

Supplemental and Obsolescence

# Digest 178



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Section 1  
Load Centers

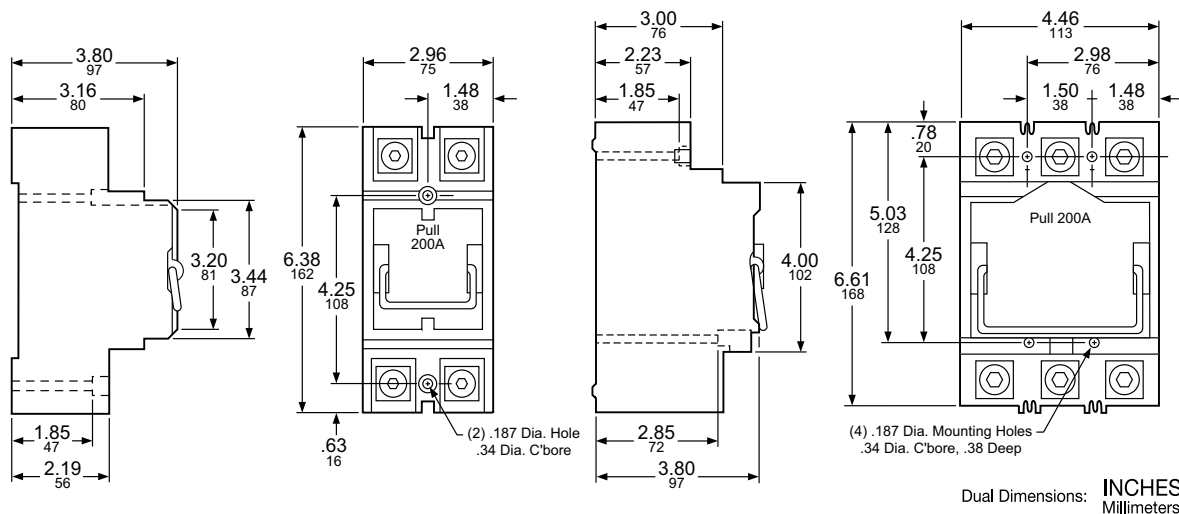
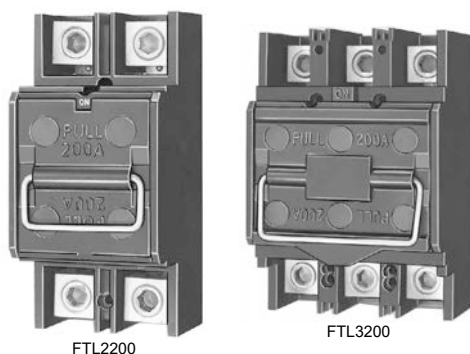
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## Class T Fusible Pullouts

- 2- or 3-pole fusible pullouts
- 200 A maximum 300 V Class T fuses (not included)
- 1Ø3W 120/240 V  
1Ø2W 240 V
- 3Ø3W 240 V delta  
3Ø4W 240/120 V delta  
3Ø4W 208Y/120 V
- UL Listed 100 kA short circuit current rating

**Table 1.1: Fusible Pullouts**

| Mains                                    |        | Cat. No.    |            | Main Wire Size<br>AWG/kcmil | Fuse Pullout Only |
|------------------------------------------|--------|-------------|------------|-----------------------------|-------------------|
| System                                   | Rating | Two Pole    | Three Pole |                             |                   |
| 1Ø3W 120/240 V<br>1Ø2W 240 V             | 100 A  | FTL2100 [1] | —          | 4–250 Al/Cu                 | 4050704950 [1]    |
|                                          | 200 A  | FTL2200 [1] | —          |                             | 4050703850 [1]    |
| 3Ø3W 240 V delta<br>3Ø4W 240/120 V delta | 100 A  | —           | FTL3100    |                             | 4050707050 [1]    |
| 3Ø4W 208Y/120 V                          | 200 A  | —           | FTL3200    |                             | 4050705950 [1]    |



**Table 1.2: Covers**

| Quantity | Cat. No. |
|----------|----------|
| 1        | BCH      |
| 1        | BCV      |

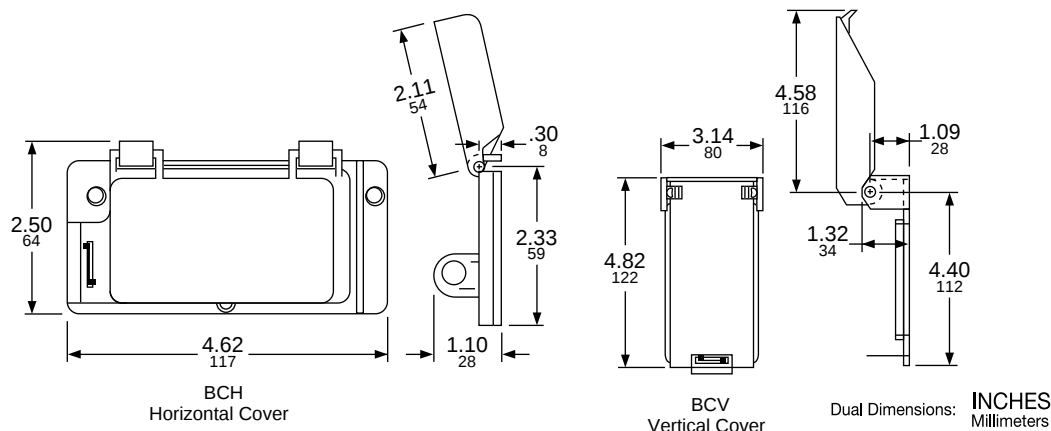
## Circuit Breaker Covers

Available now from Square D™ / Schneider Electric™ are two different versions of rainproof circuit breaker covers which are UL component recognized as being suitable for use as circuit breaker handle covers.

They are constructed of durable impact-resistant material and are intended for use by OEMs where a rainproof cover is needed (e.g. on heat pumps and air conditioners with built-in disconnects). Both models have a built-in latch with padlock provisions.

The BCH covers are for use on a horizontally-mounted circuit breaker and fit over Square D two-pole QO™, QOU, Q2, EH and three-pole Q2 and EH circuit breakers.

The BCV covers are for use on vertically-mounted circuit breakers and will fit over Square D two- and three-pole QO, QOU, Q2, EH, FA and KA circuit breakers.



[1] Not stocked in PDS. Order point Lexington.

Section 2

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## Phenolic Legend Plate

Available engraved and mounted on heavy duty safety switches [1]. Legend engraved in 1/4 in. high white letters on black background. Customer must provide legend. UL Listed.

To order, add suffix NP to standard Cat. No. Example: H363NP

## Push Button—Pilot Light—Selector Switch

Push buttons, pilot lights or selector switches are available factory-installed in the cover of NEMA 1, 3R, 4, 4X, or 5 stainless steel or NEMA 12 heavy duty safety switches and double throw switches [2]. Wiring to contact blocks is not available. Customer must furnish catalog number of push button, pilot light or selector switch device desired. UL Listed.

Contact Schneider Electric for catalog number and availability prior to quoting a job.

For enclosure sizing, 30 and 60 amperes switches will be in 100 ampere enclosures.

## Electrical Interlock Kits

Electrical interlocks for heavy duty 30–1200 A safety switches are available factory-installed or in kit form for field installation. Each kit contains instructions for proper field mounting. A pivot arm operates from switch mechanism, breaking the control circuit before the main switch blades break. Switches with electrical interlocks installed are UL Listed. For factory-installed electrical interlocks add EI (for one contact) or EI2 (for two contacts) suffix to catalog number.

**Table 2.1: Electrical Interlock Kit [3] [4]**

| Switch Amperes Rating        | Series Number [5] | Electrical Interlock Kit Cat. No. [6] |
|------------------------------|-------------------|---------------------------------------|
| 30                           | F5–F6             | EIK031                                |
|                              |                   | EIK032                                |
| 60 (600 V)                   | F5–F6             | EIK1                                  |
|                              |                   | EIK2                                  |
| 60 (240 V)                   | F5–F6             | EIK031                                |
|                              |                   | EIK032                                |
| 100–200                      | F5–F6             | EIK1                                  |
|                              |                   | EIK2                                  |
| 30–100 Receptable Switches   | F5–F7             | EIK1                                  |
|                              |                   | EIK2                                  |
| 30–200 4 and 6 Pole Switches | F5–F6             | EIK1                                  |
|                              |                   | EIK2                                  |
| 400–1200                     | E4–E5             | EIK40601                              |
|                              |                   | EIK40602                              |

**Table 2.2: Electrical Interlock Contact Ratings [7]**

| Interlock Type                                           | AC - 50 or 60 Hz |       |        |       | DC    |              |       |
|----------------------------------------------------------|------------------|-------|--------|-------|-------|--------------|-------|
|                                                          | Volts            | Make  | Break  | Cont. | Volts | Make & Break | Cont. |
| Cat. no. ending with a 1 utilize a 9007A01 limit switch. |                  |       |        |       |       |              |       |
| 1 NO/1 NC Contact                                        | 120              | 40 A  | 15 A   | 15 A  | 115   | 0.50 A       | 15 A  |
|                                                          | 240              | 20 A  | 10 A   | 15 A  | 230   | 0.25 A       | 15 A  |
|                                                          | 480              | 10 A  | 6 A    | 15 A  | —     | —            | —     |
|                                                          | 600              | 8 A   | 5 A    | 15 A  | 600   | 0.05 A       | 15 A  |
| Cat. no. ending with a 2 utilize a 9007C03 limit switch. |                  |       |        |       |       |              |       |
| 2 NO/2 NC Contacts                                       | 120              | 30 A  | 3.0 A  | 10 A  | 115   | 1.0 A        | 10 A  |
|                                                          | 240              | 15 A  | 1.5 A  | 10 A  | 230   | 0.30 A       | 10 A  |
|                                                          | 480              | 7.5 A | 0.75 A | 10 A  | —     | —            | —     |
|                                                          | 600              | 6.0 A | 0.60 A | 10 A  | 600   | 0.10 A       | 10 A  |

[1] Except NEMA 7 and 9 switches.

[2] Not UL listed for 600 A double throw safety switch.

[3] For series not shown in table refer to the switch wiring diagram.

[4] Electrical interlocks for Type 4X fiberglass reinforced polyester and Krydon™ see Digest Section 3.

[5] See Digest Section 3 for safety switch series.

[6] Electrical interlock kit catalog numbers ending in 1 indicates one normally open and one normally closed contact. These kits use a 9007A01 industrial snap switch. Electrical interlock kit catalog numbers ending in 2 indicates two normally open and two normally closed contacts. These kits use a 9007C03 industrial snap switch.

[7] Single pole single throw interlock kits are rated 1/2 hp @ 110 and 220 Vac.



## Key Interlock Systems and Sample Applications

**Factory-installed only** on heavy duty and double throw safety switches.

Interlocks are used to prevent the operator from making an unauthorized operation. Not available on hazardous location devices (NEMA 7/9) or fiberglass reinforced polyester (NEMA 4X).

The key interlock system is a simple and easy method of applying individual key interlock units and assemblies to the above equipment so as to require operation in a predetermined sequence. UL Listed.

**Quoting:** Contact Schneider Electric for catalog number, availability and pricing prior to quoting a job.

**Ordering:** Order cannot be released for production until the following information has been provided:

- End User—Company name, address
- Function of each lock (e.g., switch to be locked open with key removed, key held when switch is closed)
- Existing Equipment—if switch is to be interlocked with equipment already on site, provide brand of existing lock and key number
- Other New Equipment—if switch is to be interlocked with new equipment not yet installed at the site, then provide contact person and phone number so that locks may be coordinated
- Additional information may be required upon order entry

### Use these suffixes on switch catalog numbers:

- KI = 1 lock per switch
- KI2 = 1 lock with 2 cylinders per switch
- KIKI = 2 separate locks per switch

## Key Interlock Sample Applications

### Sample Application—1 (see Figure 1)

To prevent two devices from being closed simultaneously.

Two devices are shown in Figure 1. In operation they are not closed at the same time. With the interlocks arranged as shown only one key is required in the interlocking system. Both devices are shown open, therefore, the key is free. To close any one device the key is inserted and turned in that particular lock, the key is held in this lock until the device is again locked open. This simple interlocking sequence lends itself to a multitude of applications. The procedure is the same for two devices, neither of which is to be opened at the same time.

### Sample Application—2 (see Figure 2)

To prevent opening of switch A when circuit breaker B is closed.

Switch A and circuit breaker B are in closed position. Key A-1 is held in circuit breaker B interlock.

- Open circuit breaker.
- Turn key A-1 in L-O-R interlock on circuit breaker B to lock open. Key A-1 is now free.
- Insert key A-1 in L-C-R interlock on switch A and turn to unlock.
- Open switch A. Key A-1 is now held. Reverse sequence to restore service.

### Sample Application—3 (see Figure 3)

To prevent operation of switch A when circuit breaker B is closed. Permits re-closing of circuit breaker for servicing when switch is locked open.

Switch A and circuit breaker B are in closed position. Key A-1 is held in circuit breaker interlock.

- Open circuit breaker.
- Turn key A-1 in L-O-R interlock on circuit breaker B to lock open. Key A-1 is now free.
- Insert key A-1 in L-O-C-R interlock on switch A and turn to unlock.
- Open switch A.
- Turn key A-1 in L-O-C-R interlock on switch A to lock open. Key A-1 is now free.
- Return key A-1 to circuit breaker interlock and unlock for operation during servicing period.

Reverse sequence to restore service.

### Sample Application—4 (Main-Tie-Main) (See Figure 4)

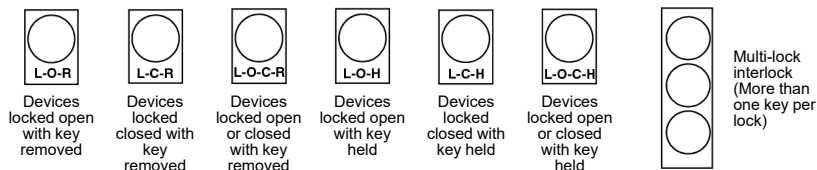
To prevent paralleling of lines A and B; two loads, fed from either source.

Circuit breaker A is closed to supply load M. Circuit breaker B is closed to supply load N. Tie-circuit breaker C is open. Keys A-1 are held in interlocks on both circuit breakers A and B. Tie-circuit breaker C cannot be closed unless either A or B is locked open.

To transfer load N to circuit breaker A, proceed as follows:

- Open circuit breaker B.
- Turn key A-1 in L-O-R interlock on circuit breaker B to lock open. Key A-1 is now free.
- Insert Key A-1 in L-O-R interlock on tie-circuit breaker C and turn to unlock. Key A-1 is now held.
- Close tie-circuit breaker C.
- Reverse sequence to restore service.
- Load M can be supplied through circuit breaker B in a similar manner.

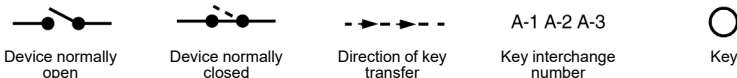
## Locking Position—Designations



## Diagram Symbols

### NOTE:

Device locked open = switch in OFF (O) position  
Device locked closed = switch in ON (I) position



## Section 3

**Molded Case Circuit Breakers and Enclosures**

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## PowerPact H- and J-Frame Circuit Breakers

Table 3.1: H-Frame 150 A UL Current-Limiting Circuit Breaker Frame with Field-Interchangeable Thermal-Magnetic Trip Units [1]  
(600 Vac, 250 Vdc)

| Ampere<br>Rating     | Fixed AC Magnetic Trip |        | Cat. No.       |                |                    |                    |                    | Terminal Wire Range            |
|----------------------|------------------------|--------|----------------|----------------|--------------------|--------------------|--------------------|--------------------------------|
|                      | Hold                   | Trip   | D Interrupting | G Interrupting | J Interrupting [2] | L Interrupting [2] | R Interrupting [2] |                                |
| 3P, 600 Vac 50/60 Hz |                        |        |                |                |                    |                    |                    |                                |
| 15 A                 | 350 A                  | 750 A  | HDL36015T      | HGL36015T      | HJL36015T          | HLL36015T          | HRL36015T          | AL150HD<br>14–3/0 AWG Al or Cu |
| 20 A                 | 350 A                  | 750 A  | HDL36020T      | HGL36020T      | HJL36020T          | HLL36020T          | HRL36020T          |                                |
| 25 A                 | 350 A                  | 750 A  | HDL36025T      | HGL36025T      | HJL36025T          | HLL36025T          | HRL36025T          |                                |
| 30 A                 | 350 A                  | 750 A  | HDL36030T      | HGL36030T      | HJL36030T          | HLL36030T          | HRL36030T          |                                |
| 35 A                 | 400 A                  | 850 A  | HDL36035T      | HGL36035T      | HJL36035T          | HLL36035T          | HRL36035T          |                                |
| 40 A                 | 400 A                  | 850 A  | HDL36040T      | HGL36040T      | HJL36040T          | HLL36040T          | HRL36040T          |                                |
| 45 A                 | 400 A                  | 850 A  | HDL36045T      | HGL36045T      | HJL36045T          | HLL36045T          | HRL36045T          |                                |
| 50 A                 | 400 A                  | 850 A  | HDL36050T      | HGL36050T      | HJL36050T          | HLL36050T          | HRL36050T          |                                |
| 60 A                 | 800 A                  | 1450 A | HDL36060T      | HGL36060T      | HJL36060T          | HLL36060T          | HRL36060T          |                                |
| 70 A                 | 800 A                  | 1450 A | HDL36070T      | HGL36070T      | HJL36070T          | HLL36070T          | HRL36070T          |                                |
| 80 A                 | 800 A                  | 1450 A | HDL36080T      | HGL36080T      | HJL36080T          | HLL36080T          | HRL36080T          |                                |
| 90 A                 | 800 A                  | 1450 A | HDL36090T      | HGL36090T      | HJL36090T          | HLL36090T          | HRL36090T          |                                |
| 100 A                | 900 A                  | 1700 A | HDL36100T      | HGL36100T      | HJL36100T          | HLL36100T          | HRL36100T          |                                |
| 110 A                | 900 A                  | 1700 A | HDL36110T      | HGL36110T      | HJL36110T          | HLL36110T          | HRL36110T          |                                |
| 125 A                | 900 A                  | 1700 A | HDL36125T      | HGL36125T      | HJL36125T          | HLL36125T          | HRL36125T          |                                |
| 150 A                | 900 A                  | 1700 A | HDL36150T      | HGL36150T      | HJL36150T          | HLL36150T          | HRL36150T          |                                |

Table 3.2: J-Frame 250 A UL Current-Limiting Circuit Breaker Frame with Field-Interchangeable Thermal-Magnetic Trip Units [1]  
(600 Vac, 250 Vdc)

| Ampere Rating        | Adjustable AC Magnetic Trip |        | Cat. No.       |                |                    |                    |                    | Terminal Wire Range                                                    |
|----------------------|-----------------------------|--------|----------------|----------------|--------------------|--------------------|--------------------|------------------------------------------------------------------------|
|                      | Low                         | High   | D Interrupting | G Interrupting | J Interrupting [2] | L Interrupting [2] | R Interrupting [2] |                                                                        |
| 3P, 600 Vac 50/60 Hz |                             |        |                |                |                    |                    |                    |                                                                        |
| 150 A                | 750 A                       | 1500 A | JDL36150T      | JGL36150T      | JJL36150T          | JLL36150T          | JRL36150T          | AL175JD<br>4–4/0 AWG Al or Cu<br>AL250JD<br>3/0 AWG–350 kcmil Al or Cu |
| 175 A                | 875 A                       | 1750 A | JDL36175T      | JGL36175T      | JJL36175T          | JLL36175T          | JRL36175T          |                                                                        |
| 200 A                | 1000 A                      | 2000 A | JDL36200T      | JGL36200T      | JJL36200T          | JLL36200T          | JRL36200T          |                                                                        |
| 225 A                | 1125 A                      | 2250 A | JDL36225T      | JGL36225T      | JJL36225T          | JLL36225T          | JRL36225T          |                                                                        |
| 250 A                | 1250 A                      | 2500 A | JDL36250T      | JGL36250T      | JJL36250T          | JLL36250T          | JRL36250T          |                                                                        |

Table 3.3: H-Frame 150 A and J-Frame 250 A 3P Basic UL Current-Limiting Circuit Breaker Frame Without Terminations [3] or Trip Unit  
(600 Vac, 250 Vdc)

| Circuit Breaker Frame | Ampere Rating | Cat. No.       |                |                    |                    |                    |
|-----------------------|---------------|----------------|----------------|--------------------|--------------------|--------------------|
|                       |               | D Interrupting | G Interrupting | J Interrupting [2] | L Interrupting [2] | R Interrupting [2] |
| H-Frame               | 15–60 A       | HDF36000F06    | HGF36000F06    | HJF36000F06        | HLF36000F06        | HRF36000F06        |
|                       | 70–150 A      | HDF36000F15    | HGF36000F15    | HJF36000F15        | HLF36000F15        | HRF36000F15        |
| J-Frame               | 150–250 A     | JDF36000F25    | JGF36000F25    | JJF36000F25        | JLF36000F25        | JRF36000F25        |



H-Frame and Trip Unit

Table 3.4: H-Frame and J-Frame 3P Field-Installable Thermal-Magnetic Trip Unit

| 15–60 A H-Frame |          | 70–150 A H-Frame |          | 150–250 A J-Frame |          |
|-----------------|----------|------------------|----------|-------------------|----------|
| Amperage        | Cat. No. | Amperage         | Cat. No. | Amperage          | Cat. No. |
| 15 A            | HT3015   | 70 A             | HT3070   | 150 A             | JT3150   |
| 20 A            | HT3020   | 80 A             | HT3080   | 175 A             | JT3175   |
| 25 A            | HT3025   | 90 A             | HT3090   | 200 A             | JT3200   |
| 30 A            | HT3030   | 100 A            | HT3100   | 225 A             | JT3225   |
| 35 A            | HT3035   | 110 A            | HT3110   | 250 A             | JT3250   |
| 40 A            | HT3040   | 125 A            | HT3125   | —                 | —        |
| 45 A            | HT3045   | 150 A            | HT3150   | —                 | —        |
| 50 A            | HT3050   | —                | —        | —                 | —        |
| 60 A            | HT3060   | —                | —        | —                 | —        |

Table 3.5: H- and J-Frame Interrupting Ratings

| Voltage | Interrupting Rating |       |        |        |        |
|---------|---------------------|-------|--------|--------|--------|
|         | D                   | G     | J      | L      | R      |
| 240 Vac | 25 kA               | 65 kA | 100 kA | 125 kA | 200 kA |
| 480 Vac | 18 kA               | 35 kA | 65 kA  | 100 kA | 200 kA |
| 600 Vac | 14 kA               | 18 kA | 25 kA  | 50 kA  | 100 kA |

Table 3.6: H- and J-Frame Termination Options

| Termination Letter                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------|
| F = No Lugs (includes terminal nut kit on both ends) [4]                                                                                   |
| L = Lugs both ends                                                                                                                         |
| M = Lugs ON end Terminal Nut Kit OFF end                                                                                                   |
| P = Lugs OFF end Terminal Nut Kit ON end                                                                                                   |
| N = Plug-in                                                                                                                                |
| D = Drawout                                                                                                                                |
| S = Rear Connected                                                                                                                         |
| For factory-installed termination, place termination letter in the third block of the circuit breaker catalog number.<br>H D L 3 6 0 1 5 T |

Accessories see Digest Section 7  
Optional Lugs see Digest Section 7  
Dimensions see Digest Section 7  
Enclosures see Digest Section 7

[1] Circuit breakers will be labeled with Line and Load markings and are not suitable for reverse connections. Available on 3P circuit breakers; not available on I-Line™ constructions. For 100% rated circuit breakers replace the "T" suffix with an "R" suffix. 100% rated is not available in I-Line, plug-in, or drawout constructions.

[2] Circuit breakers with J, L, and R interrupting ratings are UL Certified as current limiting.

[3] See Digest Section 7 for lug and termination kits.

[4] Add TS suffix for circuit breaker without terminal nut kit.

**PowerPact H- and J-Frame Circuit Breakers**

**Table 3.7: H-Frame 150 A and J-Frame 250 A Current-Limiting Circuit Breakers with Lugs and Field-Interchangeable Electronic Trip Units [5] (600 Vac, 50/60 Hz, 3P)**

| Electronic Trip Unit |          |           | Sensor Rating | Cat. No.       |                |                    |                    |                    | Terminal Wire Range                          |
|----------------------|----------|-----------|---------------|----------------|----------------|--------------------|--------------------|--------------------|----------------------------------------------|
| Type                 | Function | Trip Unit |               | D Interrupting | G Interrupting | J Interrupting [6] | L Interrupting [6] | R Interrupting [6] |                                              |
| Micrologic Standard  | LI       | 3.2       | 60 A          | HDL36060TU31X  | HGL36060TU31X  | HJL36060TU31X      | HLL36060TU31X      | HRL36060TU31X      | AL150HD<br>14-3/0 AWG<br>Al or Cu            |
|                      |          |           | 100 A         | HDL36100TU31X  | HGL36100TU31X  | HJL36100TU31X      | HLL36100TU31X      | HRL36100TU31X      |                                              |
|                      |          |           | 150 A         | HDL36150TU31X  | HGL36150TU31X  | HJL36150TU31X      | HLL36150TU31X      | HRL36150TU31X      |                                              |
|                      |          |           | 250 A         | JDL36250TU31X  | JGL36250TU31X  | JJL36250TU31X      | JLL36250TU31X      | JRL36250TU31X      | AL250JD<br>3/0 AWG-350 kcmil<br>Al or Cu [7] |
| Micrologic Standard  | LSI      | 3.2S      | 60 A          | HDL36060TU33X  | HGL36060TU33X  | HJL36060TU33X      | HLL36060TU33X      | HRL36060TU33X      | AL150HD<br>14-3/0 AWG<br>Al or Cu            |
|                      |          |           | 100 A         | HDL36100TU33X  | HGL36100TU33X  | HJL36100TU33X      | HLL36100TU33X      | HRL36100TU33X      |                                              |
|                      |          |           | 150 A         | HDL36150TU33X  | HGL36150TU33X  | HJL36150TU33X      | HLL36150TU33X      | HRL36150TU33X      |                                              |
|                      |          |           | 250 A         | JDL36250TU33X  | JGL36250TU33X  | JJL36250TU33X      | JLL36250TU33X      | JRL36250TU33X      | AL250JD<br>3/0 AWG-350 kcmil<br>Al or Cu [7] |
| Micrologic Ammeter   | LSI      | 5.2A      | 60 A          | HDL36060TU43X  | HGL36060TU43X  | HJL36060TU43X      | HLL36060TU43X      | HRL36060TU43X      | AL150HD<br>14-3/0 AWG<br>Al or Cu            |
|                      |          |           | 100 A         | HDL36100TU43X  | HGL36100TU43X  | HJL36100TU43X      | HLL36100TU43X      | HRL36100TU43X      |                                              |
|                      |          |           | 150 A         | HDL36150TU43X  | HGL36150TU43X  | HJL36150TU43X      | HLL36150TU43X      | HRL36150TU43X      |                                              |
|                      |          |           | 250 A         | JDL36250TU43X  | JGL36250TU43X  | JJL36250TU43X      | JLL36250TU43X      | JRL36250TU43X      | AL250JD<br>3/0 AWG-350 kcmil<br>Al or Cu [7] |
| Micrologic Energy    | LSI      | 5.2E      | 60 A          | HDL36060TU53X  | HGL36060TU53X  | HJL36060TU53X      | HLL36060TU53X      | HRL36060TU53X      | AL150HD<br>14-3/0 AWG<br>Al or Cu            |
|                      |          |           | 100 A         | HDL36100TU53X  | HGL36100TU53X  | HJL36100TU53X      | HLL36100TU53X      | HRL36100TU53X      |                                              |
|                      |          |           | 150 A         | HDL36150TU53X  | HGL36150TU53X  | HJL36150TU53X      | HLL36150TU53X      | HRL36150TU53X      |                                              |
|                      |          |           | 250 A         | JDL36250TU53X  | JGL36250TU53X  | JJL36250TU53X      | JLL36250TU53X      | JRL36250TU53X      | AL250JD<br>3/0 AWG-350 kcmil<br>Al or Cu [7] |
| Micrologic Ammeter   | LSIG     | 6.2A      | 60 A          | HDL36060TU44X  | HGL36060TU44X  | HJL36060TU44X      | HLL36060TU44X      | HRL36060TU44X      | AL150HD<br>14-3/0 AWG<br>Al or Cu            |
|                      |          |           | 100 A         | HDL36100TU44X  | HGL36100TU44X  | HJL36100TU44X      | HLL36100TU44X      | HRL36100TU44X      |                                              |
|                      |          |           | 150 A         | HDL36150TU44X  | HGL36150TU44X  | HJL36150TU44X      | HLL36150TU44X      | HRL36150TU44X      |                                              |
|                      |          |           | 250 A         | JDL36250TU44X  | JGL36250TU44X  | JJL36250TU44X      | JLL36250TU44X      | JRL36250TU44X      | AL250JD<br>3/0 AWG-350 kcmil<br>Al or Cu [7] |
| Micrologic Energy    | LSIG     | 6.2E      | 60 A          | HDL36060TU54X  | HGL36060TU54X  | HJL36060TU54X      | HLL36060TU54X      | HRL36060TU54X      | AL150HD<br>14-3/0 AWG<br>Al or Cu            |
|                      |          |           | 100 A         | HDL36100TU54X  | HGL36100TU54X  | HJL36100TU54X      | HLL36100TU54X      | HRL36100TU54X      |                                              |
|                      |          |           | 150 A         | HDL36150TU54X  | HGL36150TU54X  | HJL36150TU54X      | HLL36150TU54X      | HRL36150TU54X      |                                              |
|                      |          |           | 250 A         | JDL36250TU54X  | JGL36250TU54X  | JJL36250TU54X      | JLL36250TU54X      | JRL36250TU54X      | AL250JD<br>3/0 AWG-350 kcmil<br>Al or Cu [7] |

**Table 3.8: H-Frame 150 A and J-Frame 250 A 3P Basic UL Current-Limiting Circuit Breaker Frame Without Terminations [8] or Trip Unit (600 Vac, 250 Vdc)**

| Circuit Breaker Frame | Ampere Rating | Cat. No.       |                |                    |                    |                    |
|-----------------------|---------------|----------------|----------------|--------------------|--------------------|--------------------|
|                       |               | D Interrupting | G Interrupting | J Interrupting [6] | L Interrupting [6] | R Interrupting [6] |
| H-Frame               | 15-60 A       | HDF36000F06    | HGF36000F06    | HJF36000F06        | HLF36000F06        | HRF36000F06        |
|                       | 70-150 A      | HDF36000F15    | HGF36000F15    | HJF36000F15        | HLF36000F15        | HRF36000F15        |
| J-Frame               | 150-250 A     | JDF36000F25    | JGF36000F25    | JJF36000F25        | JLF36000F25        | JRF36000F25        |

**Table 3.9: H- and J-Frame Interrupting Ratings**

| Voltage | Interrupting Rating |       |        |        |        |
|---------|---------------------|-------|--------|--------|--------|
|         | D                   | G     | J      | L      | R      |
| 240 Vac | 25 kA               | 65 kA | 100 kA | 125 kA | 200 kA |
| 480 Vac | 18 kA               | 35 kA | 65 kA  | 100 kA | 200 kA |
| 600 Vac | 14 kA               | 18 kA | 25 kA  | 50 kA  | 100 kA |

**Table 3.10: Termination Letter**

| Termination Letter                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------|
| F = No Lugs (includes terminal nut kit on both ends) [9]                                                              |
| L = Lugs both ends                                                                                                    |
| M = Lugs ON end Terminal Nut Kit OFF end                                                                              |
| P = Lugs OFF end Terminal Nut Kit ON end                                                                              |
| N = Plug-in                                                                                                           |
| D = Drawout                                                                                                           |
| S = Rear Connected                                                                                                    |
| H D L 3 6 0 1 5 T                                                                                                     |
| For factory-installed termination, place termination letter in the third block of the circuit breaker catalog number. |
| Accessories see Digest Section 7                                                                                      |
| Optional Lugs see Digest Section 7                                                                                    |
| Dimensions see Digest Section 7                                                                                       |
| Enclosures see Digest Section 7                                                                                       |

**Table 3.11: Micrologic Field-Installable Trip Unit**

| Model               | Trip Function | Trip Unit | Continuous Current                | Trip Unit Cat. No. |
|---------------------|---------------|-----------|-----------------------------------|--------------------|
| Micrologic Standard | LI            | 3.2       | 15-20-25-30-35-40-45-50-60        | HE3060U31X         |
|                     |               |           | 35-40-45-50-60-70-80-90-100       | HE3100U31X         |
|                     | LSI           | 3.2S      | 50-60-70-80-90-100-110-125-150    | HE3150U31X         |
|                     |               |           | 70-80-100-125-150-175-200-225-250 | JE3250U31X         |
| Micrologic Ammeter  | LSI           | 5.2A      | 15-20-25-30-35-40-45-50-60        | HE3060U33X         |
|                     |               |           | 35-40-45-50-60-70-80-90-100       | HE3100U33X         |
|                     | LSIG          | 6.2A      | 50-60-70-80-90-100-110-125-150    | HE3150U33X         |
|                     |               |           | 70-80-100-125-150-175-200-225-250 | JE3250U33X         |
| Micrologic Energy   | LSI           | 5.2E      | 15-60                             | HE3060U43X         |
|                     |               |           | 35-100                            | HE3100U43X         |
|                     | LSIG          | 6.2E      | 50-150                            | HE3150U43X         |
|                     |               |           | 70-250                            | JE3250U43X         |
| Micrologic Energy   | LSI           | 5.2E      | 15-60                             | HE3060U44X         |
|                     |               |           | 35-100                            | HE3100U44X         |
|                     | LSIG          | 6.2E      | 50-150                            | HE3150U44X         |
|                     |               |           | 70-250                            | JE3250U44X         |
| Micrologic Energy   | LSI           | 5.2E      | 15-60                             | HE3060U53X         |
|                     |               |           | 35-100                            | HE3100U53X         |
|                     | LSIG          | 6.2E      | 50-150                            | HE3150U53X         |
|                     |               |           | 70-250                            | JE3250U53X         |
| Micrologic Energy   | LSI           | 5.2E      | 15-60                             | HE3060U54X         |
|                     |               |           | 35-100                            | HE3100U54X         |
|                     | LSIG          | 6.2E      | 50-150                            | HE3150U54X         |
|                     |               |           | 70-250                            | JE3250U54X         |

[5] Circuit breakers will be labeled with Line and Load markings and are not suitable for reverse connections.

Available on 3P circuit breakers; not available on I-Line™ constructions. For 100% rated circuit breakers replace the "T" suffix with an "R" suffix. 100% rated is not available in I-Line, plug-in, or drawout constructions.

[6] Circuit breakers with J, L, and R interrupting ratings are UL Certified as current limiting.

[7] For smaller wire (4-4/0 AWG Al or Cu), replace the lug wire binding screws with longer binding screws provided.

[8] See Digest Section 7 for lug and termination kits.

[9] Add TS suffix for circuit breaker without terminal nut kit.

## PowerPact L-Frame Molded Case Circuit Breakers

Table 3.12: L-Frame 3 Pole, 600 A Current-Limiting [10] Circuit Breakers with Lugs and Field-Interchangeable Electronic Trip Units (600 Vac, 50/60 Hz) [11][12]

| Electronic Trip Unit |          |           | Sensor Rating | Cat. No.       |                |                     |                     | Terminal Wire Range                                             |
|----------------------|----------|-----------|---------------|----------------|----------------|---------------------|---------------------|-----------------------------------------------------------------|
| Type                 | Function | Trip Unit |               | D Interrupting | G Interrupting | J Interrupting [10] | L Interrupting [10] |                                                                 |
| Micrologic Standard  | LI       | 3.3       | 250 A         | LDL36250TU31X  | LGL36250TU31X  | LJL36250TU31X       | LLL36250TU31X       | AL400L61K3D<br>(1) 2 AWG–600 kcmil Cu<br>(1) 2 AWG–500 kcmil Al |
|                      |          |           | 400 A         | LDL36400TU31X  | LGL36400TU31X  | LJL36400TU31X       | LLL36400TU31X       |                                                                 |
|                      |          |           | 600 A         | LDL36600TU31X  | LGL36600TU31X  | LJL36600TU31X       | LLL36600TU31X       |                                                                 |
| Micrologic Standard  | LSI      | 3.3S      | 250 A         | LDL36250TU33X  | LGL36250TU33X  | LJL36250TU33X       | LLL36250TU33X       | AL400L61K3D<br>(1) 2 AWG–600 kcmil Cu<br>(1) 2 AWG–500 kcmil Al |
|                      |          |           | 400 A         | LDL36400TU33X  | LGL36400TU33X  | LJL36400TU33X       | LLL36400TU33X       |                                                                 |
|                      |          |           | 600 A         | LDL36600TU33X  | LGL36600TU33X  | LJL36600TU33X       | LLL36600TU33X       |                                                                 |
| Micrologic Ammeter   | LSI      | 5.3A      | 400 A         | LDL36400TU43X  | LGL36400TU43X  | LJL36400TU43X       | LLL36400TU43X       | AL600S52K3<br>(2) 2/0 AWG–500 kcmil Al/Cu                       |
| Micrologic Energy    | LSI      | 5.3E      | 400 A         | LDL36600TU43X  | LGL36600TU43X  | LJL36600TU43X       | LLL36600TU43X       |                                                                 |
|                      |          |           | 600 A         | LDL36600TU43X  | LGL36600TU43X  | LJL36600TU43X       | LLL36600TU43X       |                                                                 |
| Micrologic Ammeter   | LSIG     | 6.3A      | 400 A         | LDL36400TU53X  | LGL36400TU53X  | LJL36400TU53X       | LLL36400TU53X       |                                                                 |
|                      |          |           | 600 A         | LDL36600TU53X  | LGL36600TU53X  | LJL36600TU53X       | LLL36600TU53X       |                                                                 |
| Micrologic Energy    | LSIG     | 6.3E      | 400 A         | LDL36400TU44X  | LGL36400TU44X  | LJL36400TU44X       | LLL36400TU44X       |                                                                 |
|                      |          |           | 600 A         | LDL36600TU44X  | LGL36600TU44X  | LJL36600TU44X       | LLL36600TU44X       |                                                                 |
|                      |          |           | 400 A         | LDL36400TU54X  | LGL36400TU54X  | LJL36400TU54X       | LLL36400TU54X       |                                                                 |
|                      |          |           | 600 A         | LDL36600TU54X  | LGL36600TU54X  | LJL36600TU54X       | LLL36600TU54X       |                                                                 |

Table 3.13: L-Frame 3 Pole, 600 A Circuit Breaker Frame without Terminations or Trip Unit (600 Vac, 50/60 Hz) [13]

| Ampere Rating     | Interrupting Rating |             |             |             |
|-------------------|---------------------|-------------|-------------|-------------|
|                   | D                   | G           | J           | L           |
| 250 A (70–250 A)  | LDF36000F25         | LGF36000F25 | LJF36000F25 | LLF36000F25 |
| 400 A (125–400 A) | LDF36000F40         | LGF36000F40 | LJF36000F40 | LLF36000F40 |
| 600 A (200–600 A) | LDF36000F60         | LGF36000F60 | LJF36000F60 | LLF36000F60 |

Table 3.14: Termination Options

| Termination Letter | Termination Option                               |
|--------------------|--------------------------------------------------|
| A                  | I-Line (See Section 9)                           |
| F                  | No lugs (includes terminal nut kit on both ends) |
| L                  | Lugs both ends                                   |
| M                  | Lugs ON end, terminal nut kit OFF end            |
| P                  | Lugs OFF end, terminal nut kit ON end            |
| N                  | Plug In                                          |
| D                  | Drawout                                          |
| S                  | Rear Connected                                   |

For factory-installed termination, place termination letter in the third block of the circuit breaker catalog number.  
J G L 3 6 2 5 0 or L G L 3 6 6 0 0 U 4 4 X

Accessories see Digest Section 7

Optional Lugs see Digest Section 7

Dimensions see Digest Section 7

Table 3.15: L-Frame 3P Field-Installable Micrologic Electronic Trip Units

| Electronic Trip Unit |          |      | Continuous Current                  | Trip Unit Cat. No. |
|----------------------|----------|------|-------------------------------------|--------------------|
| Type                 | Function | Code |                                     |                    |
| Micrologic Standard  | LI       | 3.3  | 70-80-100-125-150-175-200-225-250   | LE3250U31X         |
|                      |          |      | 125-150-175-200-225-250-300-350-400 | LE3400U31X         |
|                      | LSI      | 3.3S | 200-225-250-300-350-400-450-500-600 | LE3600U31X         |
|                      |          |      | 70-80-100-125-150-175-200-225-250   | LE3250U33X         |
| Micrologic Ammeter   | LSI      | 5.3A | 125-150-175-200-225-250-300-350-400 | LE3400U33X         |
|                      |          |      | 200-225-250-300-350-400-450-500-600 | LE3600U33X         |
|                      | LSIG     | 6.3A | 125-400                             | LE3400U43X         |
|                      |          |      | 200-600                             | LE3600U44X         |
| Micrologic Energy    | LSI      | 5.3E | 125-400                             | LE3400U53X         |
|                      |          |      | 200-600                             | LE3600U53X         |
|                      | LSIG     | 6.3E | 125-400                             | LE3400U54X         |
|                      |          |      | 200-600                             | LE3600U54X         |

Table 3.16: L-Frame Interrupting Ratings

| Voltage | Interrupting Rating |       |        |        |
|---------|---------------------|-------|--------|--------|
|         | D                   | G     | J      | L      |
| 240 Vac | 25 kA               | 65 kA | 100 kA | 125 kA |
| 480 Vac | 18 kA               | 35 kA | 65 kA  | 100 kA |
| 600 Vac | 14 kA               | 18 kA | 25 kA  | 50 kA  |

[10] J and L interrupts are UL Certified as current limiting.

[11] Circuit breakers will be labeled with Line and Load markings and are not suitable for reverse connections.

[12] Only available on 3P unit-mount circuit breakers. Not allowed on I-Line constructions. For 100% rated field-interchangeable circuit breakers, replace the "T" suffix with an "R". 100% field-interchangeable circuit breakers are not allowed on 600 A I-Line, Plug-In, or Drawout constructions.

[13] See Digest Section 7 for lug and termination kits.

## Automatic Switches

Automatic molded case switches open instantaneously at a factory preset magnetic trip point, calibrated to protect only the molded case switch itself, when it is subjected to high fault currents. The trip point is nonadjustable and provides no overload or low level fault protection.

Molded case switches open when the handle is switched to the OFF position or in response to an auxiliary tripping device such as a shunt trip.

All molded case switches will accept the same lugs and accessories as equivalent thermal-magnetic circuit breakers, with the exception of Q-frame switches which do not have electrical accessories available.

Automatic molded case switches are UL Listed per UL 489 and are CSA Certified.

**Table 3.17: Q-Frame (240 Vac) PowerPact™ Automatic Molded Case Switches**

| Circuit Breaker        | Poles | Ampere Rating | J Interrupting Rating |            | Wire Range      |
|------------------------|-------|---------------|-----------------------|------------|-----------------|
|                        |       |               | Cat. No.              | Trip Point |                 |
| Q-Frame <sup>[1]</sup> | 2     | 225 A         | QBL22000S22           | 4500 A     | 4 AWG–300 kcmil |
|                        | 3     | 225 A         | QBL32000S22           | 4500 A     |                 |

## Mag-Gard Motor Circuit Protector

Instantaneous trip magnetic only circuit breakers have a single adjustment which simultaneously sets the magnetic trip level of each individual pole. Mag-Gard circuit breakers comply with NEC® requirements for providing motor circuit protection when installed as part of a UL Listed combination controller having motor overload protection. Interrupting ratings are established for these UL Recognized Components only when they are used in combination with motor starters with properly sized overload relays and contactors.

Mag-Gard circuit breakers will accept the same lugs and accessories as equivalent thermal-magnetic circuit breakers.

**Table 3.18: Special Low-Magnetic Trip Settings for PowerPact H- and J-Frame Thermal Magnetic Circuit Breakers 70–125 A**

| Amps | Special Low Mags    |                     | li on Label | Mag Suffix | Interrupting Rating |             |             |             |             |
|------|---------------------|---------------------|-------------|------------|---------------------|-------------|-------------|-------------|-------------|
|      | Hold <sup>[1]</sup> | Trip <sup>[1]</sup> |             |            | D                   | G           | J           | L           | R           |
| 70   | 400                 | 850                 | 625         | H83        | HDL36070H83         | HGL36070H83 | HJL36070H83 | HLL36070H83 | HRL36070H83 |
| 80   | 400                 | 850                 | 625         | H83        | HDL36080H83         | HGL36080H83 | HJL36080H83 | HLL36080H83 | HRL36080H83 |
| 90   | 400                 | 850                 | 625         | H83        | HDL36090H83         | HGL36090H83 | HJL36090H83 | HLL36090H83 | HRL36090H83 |
| 100  | 400                 | 850                 | 625         | H83        | HDL36100H83         | HGL36100H83 | HJL36100H83 | HLL36100H83 | HRL36100H83 |
| 110  | 400                 | 850                 | 625         | H83        | HDL36110H83         | HGL36110H83 | HJL36110H83 | HLL36110H83 | HRL36110H83 |
| 125  | 800                 | 1450                | 1125        | H84        | HDL36125H84         | HGL36125H84 | HJL36125H84 | HLL36125H84 | HRL36125H84 |

**Table 3.19: Special High-Magnetic Trip Settings for PowerPact H- and J-Frame Thermal Magnetic Circuit Breakers**

| Amps | Special High Mags   |                     | li on Label | Mag Suffix | Interrupting Rating |             |             |             |             |
|------|---------------------|---------------------|-------------|------------|---------------------|-------------|-------------|-------------|-------------|
|      | Hold <sup>[1]</sup> | Trip <sup>[1]</sup> |             |            | D                   | G           | J           | L           | R           |
| 90   | 900                 | 1700                | 1300        | H85        | HDL36090H85         | HGL36090H85 | HJL36090H85 | HLL36090H85 | HRL36090H85 |

**Table 3.20: Special Low-Magnetic Trip Settings for PowerPact H- and J-Frame Thermal Magnetic Circuit Breakers 150–200 A**

| Amps | Special Low Mags   |                     | li on Label | Mag Suffix | Interrupting Rating |             |             |             |             |
|------|--------------------|---------------------|-------------|------------|---------------------|-------------|-------------|-------------|-------------|
|      | Low <sup>[2]</sup> | High <sup>[2]</sup> |             |            | D                   | G           | J           | L           | R           |
| 150  | 875L               | 1750H               |             | H29        | JDL36150H29         | JGL36150H29 | JJL36150H29 | JLL36150H29 | JRL36150H29 |
| 200  | 1250L              | 2500H               |             | H32        | JDL36200H32         | JGL36200H32 | JJL36200H32 | JLL36200H32 | JRL36200H32 |

**Table 3.21: H- and J-Frame Interrupting Ratings**

| Voltage | Interrupting Rating |       |        |        |        |
|---------|---------------------|-------|--------|--------|--------|
|         | D                   | G     | J      | L      | D      |
| 240 Vac | 25 kA               | 65 kA | 100 kA | 125 kA | 200 kA |
| 480 Vac | 18 kA               | 35 kA | 65 kA  | 100 kA | 200 kA |
| 600 Vac | 14 kA               | 18 kA | 25 kA  | 50 kA  | 100 kA |

Accessories see [Circuit Breaker Accessories](#), page 3-12 through page 3-16

Optional Lugs see [page 3-16](#)

Dimensions see [page 3-17](#)

<sup>[1]</sup> Withstand rating of 10 kA at 240 Vac.  
<sup>[1]</sup> Hold and Trip indicate fixed magnetic trip levels.  
<sup>[2]</sup> Low and High refer to adjustable mag level setting.

LAL3640031M  
Motor Circuit ProtectorLAL3640036M  
Motor Circuit Protector

## LA/LH Motor Circuit Protectors

Mag-Gard™ Motor Circuit Protectors (MCP) are instantaneous-trip magnetic-only circuit breakers. They have a single adjustment which simultaneously sets the magnetic trip level of each individual pole. Mag-Gard™ circuit breakers comply with NEC requirements for providing motor circuit protection when installed as part of a UL Listed combination controller having motor overload protection. Interrupting ratings are established for these UL Recognized Components only when they are used in combination with motor starters with properly sized overload relays and contactors.

LA/LH-Frame Mag-Gard™ Motor Circuit Protectors (MCP):

- 400 A rating at up to 600 Vac
- Instantaneous-trip magnetic-only circuit breakers available in unit mount and I-Line 3-pole constructions
- Accept the same lugs and accessories as equivalent LA/LH-Frame circuit breakers
- Available in unit mount and I-Line construction<sup>[3]</sup>
- High-interruption (LHL) are also available

Complies with NEC requirements for providing motor circuit protection when installed as part of a UL Listed combination controller having motor overload protection.

**Table 3.22: LA/LH Frame Magnetic Only 3 Pole, 600 Vac, 50/60 Hz <sup>[3]</sup>—Three Device Solutions <sup>[4]</sup>**

| Ampere Rating | Trip Unit | Adjustable <sup>[5]</sup> Trip Range (A) | 250 Vdc Multiplier      | Cat. No.                                                                                                                                                                                                                                             |
|---------------|-----------|------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LAL           | 400       | —                                        | High = 1.2<br>Low = 1.4 | <a href="#">LAL3640022M</a><br><a href="#">LAL3640028M</a><br><a href="#">LAL3640030M</a><br><a href="#">LAL3640031M</a><br><a href="#">LAL3640032M</a><br><a href="#">LAL3640033M</a><br><a href="#">LAL3640035M</a><br><a href="#">LAL3640036M</a> |

**Table 3.23: LAL Adjustable Instantaneous-Trip Circuit Breakers for Single Motor Circuit Protection**

| Hp Ratings of Induction Type Squirrel-Cage and Wound Rotor Motors 3Ø 60 Hz |         |         |         | Full Load Amperes <sup>[6]</sup> | Mag-Gard Circuit Breaker Cat. No. | Magnetic Trip Settings <sup>[7]</sup> |       |
|----------------------------------------------------------------------------|---------|---------|---------|----------------------------------|-----------------------------------|---------------------------------------|-------|
| 200 Vac                                                                    | 230 Vac | 460 Vac | 575 Vac |                                  |                                   | MIN                                   | MAX   |
| 75                                                                         | —       | —       | —       | 221                              | <a href="#">LAL3640033M</a>       | 700%                                  | 1400% |
| —                                                                          | —       | 200     | —       | 240                              | <a href="#">LAL3640035M</a>       | 700%                                  | 1500% |
| —                                                                          | —       | —       | 250     | 242                              | <a href="#">LAL3640035M</a>       | 700%                                  | 1400% |
| —                                                                          | 100     | —       | —       | 248                              | <a href="#">LAL3640035M</a>       | 700%                                  | 1400% |
| 100                                                                        | —       | —       | —       | 285                              | <a href="#">LAL3640036M</a>       | 700%                                  | 1400% |
| —                                                                          | —       | —       | 300     | 289                              | <a href="#">LAL3640036M</a>       | 700%                                  | 1400% |
| —                                                                          | —       | 250     | —       | 302                              | <a href="#">LAL3640036M</a>       | 700%                                  | 1300% |
| —                                                                          | 125     | —       | —       | 312                              | <a href="#">LAL3640036M</a>       | 600%                                  | 1300% |

<sup>[3]</sup> These electronic magnetic-only motor circuit protectors are available with I-Line constructions. Consult the factory.

<sup>[4]</sup> Three-device solutions are the traditional solutions: motor circuit protector plus motor starter plus overload relay.

<sup>[5]</sup> UL magnetic trip tolerances are -20%/+30% from the nominal values shown.

<sup>[6]</sup> [7] Motor full-load currents are taken from NEC Table 430.250. Select wire and circuit breakers on basis of horsepower rather than nameplate full-load current per NEC 430.6 (A) for general motor applications. Do not use these values to select overload relay thermal units. See Digest Section 14 for selection of thermal units when actual full load current is not known. The voltages listed are rated motor voltages. Corresponding nominal system voltages are 200–208, 220–240, 440–480 and 550–600 V.

<sup>[7]</sup> Only MIN and MAX settings are shown, intermediate settings are available on all circuit breakers.

## I-Line™ Special Terminal Connectors

### Bolt-On I-Line Circuit Breakers

**NOTE:** Bolt-on I-Line connectors are not available on Powerpact™ circuit breakers.

The standard I-Line circuit breaker is designed to provide a high quality, secure connection between the distribution bus and circuit breaker. I-Line circuit breakers use plug-on type line-side connectors. The parallel line-side connectors “clamp” around the bus bars. In case of a short circuit, the increased magnetic flux causes the connectors to grasp the bus bars even tighter. I-Line circuit breakers with bolted connections have clamp-on jaws that are bolted around the main bus, as shown. The bolt-on I-Line design is offered as an alternative in order to meet specifications requiring a bolted connection. Bolt-on I-Line construction is available on FY, QB, QD, QG, QJ, Q4, LA, and LH frame circuit breakers and molded case switches, and SL225 and SL400 sub-feed lugs.

To order on all products except QB, QD, QG and QJ, simply add the letter “B” in the catalog number prefix of the circuit breaker, e.g., LA36100 becomes LAB36100. For QB, QD, QG and QJ, insert the letter “E” in the third position, e.g., QBE, QDE, etc.

### Top-Feed I-Line Circuit Breakers

I-Line panelboards may require the use of a top-feed I-Line circuit breaker in applications where a top-feed main circuit breaker is required. This involves having the I-Line jaw connectors on the OFF end of the circuit breaker, as opposed to the standard location on the ON end of the circuit breaker. To designate this construction, simply place the suffix “MT” at the end of the circuit breaker catalog number, e.g., FA36100 becomes FA36100MT. On LA or LH top-feed I-Line circuit breakers, accessories must be factory installed. This option is available in PowerPact™ H and J-frame by placing a “K” in the 4th position (termination indicator) of the circuit breaker catalog number, e.g., HGA36125 becomes HGA36125K. This option is not available on 600 A LA or LH circuit breakers, or Powerpact M-, P- and R-frame circuit breakers.

### “CBA” I-Line Jaw Configuration (Non-PowerPact Circuit Breaker)

Standard 1- and 2-pole I-Line circuit breakers are ordered by designating the required phase connection letters as a suffix to the circuit breaker catalog number. 3-pole circuit breakers do not require this phase designation and are supplied with an “ABC” phase jaw configuration as standard. In most applications this is acceptable since the phase loading is evenly distributed. In applications where the phases must be reversed it is possible to order a “CBA” jaw configuration by simply placing the letters “CBA” at the end of the standard catalog number, e.g., LA36100 becomes LA36100CBA.

## Control Wire Tap Lugs

Control wire tap lugs are used in applications requiring connection to a small wire (22-14 AWG) for control circuits. This is accomplished by crimping the wire to a standard wire crimp terminal (not included) and fastening the terminal to the circuit breaker lug. On LA lugs, the lug is drilled to accept a 6-32 screw (included) to secure the crimp connector. On FA lugs, a flat slip-on crimp connector is used to attach to a shim-like connector placed under the circuit breaker lug.

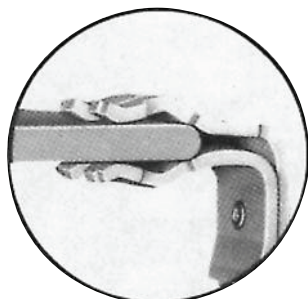
**Note:** To order as a factory-installed device on Q4, LA, or LH circuit breakers, add suffix number 8041 to circuit breaker catalog number, e.g., LAL364008041. To order as a factory-installed device on MG, MJ, PG, PJ, PL RG, RJ and RL use the product selector or the respective PowerPact catalog. Tapped lugs will be installed on the “ON” and “OFF” ends of the circuit breaker.

**Table 3.24: Control Wire Terminations for Circuit Breakers**

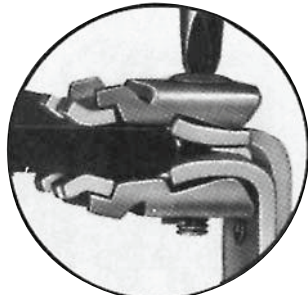
| Circuit Breaker | Cat. No. | Standard Package Qty. |
|-----------------|----------|-----------------------|
| Q4, LA, LH      | AL400LAT | 1                     |

**Table 3.25: Tapped Lugs for PowerPact™ Circuit Breakers**

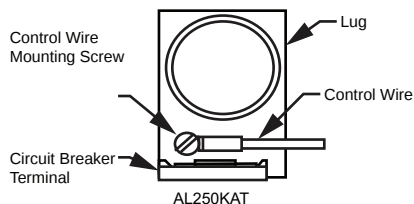
| Circuit Breaker    | Amperes Max. | Kit Cat. No.    | Standard Package Qty. |
|--------------------|--------------|-----------------|-----------------------|
| MG, MJ, PG, PJ, PL | 800 A        | AL800M23TK      | 3                     |
|                    |              | AL800P6TK       | 3                     |
|                    |              | AL800M23TK4     | 4                     |
| PG, PJ, PL         | 800 A        | AL800P6TK4      | 4                     |
|                    |              | AL1200P24TK     | 1                     |
|                    | 1200 A       | AL1200P25TK     | 3                     |
|                    |              | AL1200P25TK4    | 4                     |
| RG, RJ, RL         | 1200 A       | AL1200R53TK [1] | 1                     |



Plug-On Connector



Bolted Connector



[1] I-Line only.

Special Magnetic or Thermal Calibration  
Magnetic

The magnetic trip ranges for standard circuit breakers are listed in the Square D Digest. Requirements outside this range are best accommodated by selecting another standard circuit breaker. In some cases where this is not practical, a circuit breaker may be ordered with special magnetic calibration. Special magnetic calibration is not possible in all cases. Circuit breakers with special magnetic calibration and an **adjustable** magnetic trip range are **not** UL Listed; those with a **fixed** magnetic trip setting are UL Listed. Consult Schneider Electric local sales office for more information.

50 Degrees C

UL 489 Listed molded case circuit breakers are calibrated for 40°C ambient temperature. To meet requirements of higher ambient conditions, circuit breakers can be factory calibrated for a 50°C ambient temperature. Circuit breakers with special thermal calibration are not UL Listed. To order 50°C calibration, add “35” suffix to LA/LH or “CA” to H or J thermal magnetic circuit breaker. Consult local sales office for more information.

Rear-Connected Studs

Rear-connected studs are designed to allow rear termination in applications such as control panels where wire gutter space may be limited. The studs may be bolted directly to the bus or lugs may be attached to the studs.

**NOTE:** Long and short studs must be alternated on adjacent poles to assure proper electrical clearance.

Table 3.26: Rear-Connected Studs—Not UL Listed

| Circuit Breaker Cat. No. Prefix | Ampere Ratings | Stud Cat. No. | Dimensions     |                            |          |              |
|---------------------------------|----------------|---------------|----------------|----------------------------|----------|--------------|
|                                 |                |               | Overall Length | To Back of Circuit Breaker | Diameter | Threads/Inch |
| LAL, LHL                        | 125–400 A      | LAS114        | 12-3/16 in.    | 11-1/2 in.                 | 3/4 in.  | 16           |

**NOTE:** Use alternate size studs on adjacent poles to obtain proper electrical clearance.



Rear-Connected Studs

Visi-Blade™ Circuit Breakers

Visi-blade construction is a modification to the cover of a thermal-magnetic circuit breaker, a molded case switch, or a Mag-Gard™ circuit breaker which provides a “window” through which the position of the movable contacts can be verified. Luminescent paint is applied to the movable contact arms to clearly indicate their position. Gases produced during high level interruption may cause clouding of the Visi-blade window. Visi-Blade construction is not available on circuit breakers not included in table below.

Add suffix letter “V” to the circuit breaker catalog number, i.e., LAL36400V.

Table 3.27: Available Visi-Blade Circuit Breakers

| Circuit Breaker Prefix | Amperes   |
|------------------------|-----------|
| LA, LH                 | 125–400 A |

### Moisture and Fungus Resistant Treatment for Circuit Breakers

This treatment covers the application of moisture and fungus resistant varnish to circuit breakers and molded case switches.

- The varnish meets Military Specification MIL-V-173C VARNISH, MOISTURE AND FUNGUS RESISTANT.
- The treatment meets military Specification MIL-T-152E TREATMENT, MOISTURE AND FUNGUS-RESISTANT, OF COMMUNICATIONS, ELECTRONIC, AND ASSOCIATED ELECTRICAL EQUIPMENT.

The treatment of circuit breakers in accordance with said specifications is intended to protect them against the moisture and fungus condition encountered in service by retarding the absorption of moisture and inhibiting the growth of fungi.

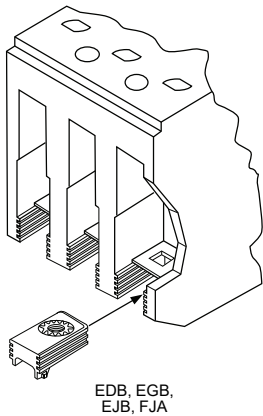
To order for L-frame circuit breakers, place the suffix "FT" at the end of the circuit breaker catalog number, e.g., LAL36100 becomes LAL36100FT. To order for QB, QD, and QG circuit breakers, place the suffix "YF" at the end of the circuit breaker catalog number, e.g., QDL32150 becomes QDL32150YF. ED, EG, EF, PowerPact™ B-, D-, H-, J-, L, M-, P- and R-frame circuit breakers are inherently fungus resistant and need no further treatment.

### Short Handle for LA/LH Circuit Breakers

Certain applications of the LA/LH circuit breakers (as mains in particular panelboards) require the use of a slightly shorter operating handle. For ordering information refer to the chart below.

**Table 3.28: Catalog Numbers for Short Handle LA/LH Circuit Breakers**

| Lug Configuration Desired |         | Catalog<br>"Prefix Indication" | Catalog<br>"Suffix Indication" | Circuit Breaker<br>Cat. No. |
|---------------------------|---------|--------------------------------|--------------------------------|-----------------------------|
| ON End                    | OFF End |                                |                                |                             |
| Lugs                      | Lugs    | "L"                            | "MB"                           | LAL36400MB                  |
| No Lugs                   | Lugs    | "P"                            | "MB"                           | LAP36400MB                  |
| Lugs                      | No Lugs | "P"                            | "MT"                           | LAP36400MT                  |
| No Lugs                   | No Lugs | "F"                            | "MB"                           | LAF36400MB                  |



Lug Deletion

In some applications, the circuit breaker does not require lugs on one or both ends. To meet this requirement, the circuit breaker should be ordered with the desired lug configuration as indicated below. If necessary, lugs may be removed in the field. However, if lugs are removed in the field, circuit breaker **Types** Q4, LA and LH must be secured with pan-mounting screws, or have "P" screws (cover screws and nuts) installed securing the base to the cover.

Table 3.29: Lug Configuration [2]

| ON End  | OFF End | Circuit Breaker Prefix – Suffix    |
|---------|---------|------------------------------------|
| Lugs    | Lugs    | "L"<br>(e.g., LAL36100)            |
| No Lugs | No Lugs | "F"<br>(e.g., LAF36100)            |
| No Lugs | Lugs    | "P"<br>(e.g., LAP36100)            |
| Lugs    | No Lugs | "P – MT" [3]<br>(e.g., LAP36100MT) |

Termination Insert Kits

The standard lugs supplied with EDB, EGB, EJB, and FJA circuit breakers and molded case switches are secured by means of a screw fastened through the circuit breaker terminal into the lug body. If the standard lug is removed and a bolted connection to the circuit breaker terminal pad is desired, a threaded insert kit is required. The insert is installed below the terminal pad. For ordering information see chart below.

Table 3.30: Termination Kit Inserts

| Kit Cat. No. | Inserts Per Kit | Circuit Breakers   |
|--------------|-----------------|--------------------|
| TIKFD        | 3               | EDB, EGB, EJB, FJA |

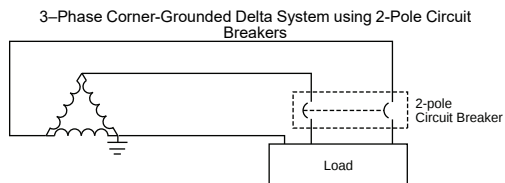
Electric Joint Compound

I-Line™ circuit breakers, I-Line busway plug-on units, I-Line panelboards and switchboards, QMB plug-on switches and motor control center plug-on units are supplied with factory applied joint compound on the plug-on connectors. The compound should not be removed because it contributes to the overall performance of the connection. Whenever one of these units is removed and reinstalled, the joint compound should be reapplied. Catalog number PJC 7201 is a two-ounce container of compound specially formulated for the I-Line, QMB and motor control center connections. No other type of commercially available joint compound should be used.

Table 3.31: Electric Joint Compound

| Use With                                                         | Cat. No. |
|------------------------------------------------------------------|----------|
| I-Line Circuit Breakers, QMB Plug-On Units, or Model-V MCC Units | PJC7201  |
| SED Drawout Circuit Breakers                                     | PJC8311  |

[2] See information on termination kits below  
[3] MT suffix also required (except for PowerPact™).

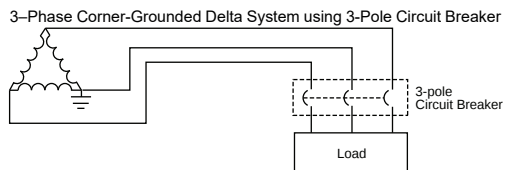


## Circuit Breakers for Grounded B-Phase (BØ) (Corner-Grounded Delta) Systems

- For use on 480 V systems, LH type circuit breakers must be ordered as 600 V versions and with a 5861 suffix (i.e. LHL361005861).
- For use on 240 V systems, circuit breakers may be ordered as 480 V versions with a 5861 suffix (i.e. LHL341005861).
- LA type circuit breakers are not available with grounded B phase markings.
- Two-pole 240 V grounded B-phase circuit breakers (except EDB, EGB, EJB, QB, QD, QG, QJ, BD, BG, and BJ) will be built using three-pole modules.
- Two-pole grounded BØ circuit breakers will be labeled with 240 Vac interrupting ratings.
- No self-certification is available for interrupting ratings greater than shown in the tables below.

**Table 3.32: Application Data for 240 Vac 3Ø Corner-Grounded Delta System**

| Cat. No. Prefix                     | Poles    | UL Listed Interrupting Rating |                             |
|-------------------------------------|----------|-------------------------------|-----------------------------|
|                                     |          | Ampere Rating                 | 240 Vac Interrupting Rating |
| QO-H, QOB-H                         | 2        | 15–100 A                      | 5 kA                        |
| QB, QD, QG, QJ                      | 2 [4]    | 70–250 A                      | 10 kA                       |
| EDB, EGB, EJB                       | 2 [4]    | 15–125 A                      | 18 kA, 35 kA, 65 kA         |
| BD, BG, BJ                          | 2 [4]    | 15–125 A                      | 18 kA, 35 kA, 65 kA         |
| HD, HG                              | 2 [4]    | 15–150 A                      | 42 kA                       |
| HJ, HL                              | 2 [5]    | 15–150 A                      | 65 kA, 100 kA               |
| JD, JG, JJ, JL                      | 2 [5]    | 150–250 A                     | 42 kA, 65 kA, 100 kA        |
| LH, LHL                             | 2 [5]    | 125–400 A                     | 30 kA                       |
| MG, MJ Electronic Trip Unit         | 2 [5][6] | 300–800 A                     | 65 kA                       |
| PG, PJ, PK, PL Electronic Trip Unit | 2 [5][6] | 600–1200 A                    | 65 kA                       |
| RG, RK Electronic Trip Unit         | 2 [5][6] | 1200–2500 A                   | 35 kA, 65 kA                |
| RJ Electronic Trip Unit             | 2 [5][6] | 1200–2500 A                   | 100 kA                      |
| RL Electronic Trip Unit             | 2 [5][6] | 1200–2500 A                   | 100 kA                      |



**NOTE:** Three-pole circuit breakers may be used on three-phase corner-grounded delta systems. The outside poles are to be connected to the ungrounded phase and the grounded conductor connected to the center pole. Connecting the circuit breaker in a manner other than that described or shown may result in an unsafe application of the circuit breaker.

**Table 3.33: 480 Vac 3Ø Corner-Grounded Delta System [7]**

| Cat. No. Prefix                     | Poles [8] | UL Listed Interrupting Rating [8] |                                |
|-------------------------------------|-----------|-----------------------------------|--------------------------------|
|                                     |           | Ampere Rating                     | 480 Vac 3Ø Interrupting Rating |
| HD, HG, HJ, HL                      | 3         | 15–150 A                          | 18 kA, 35 kA, 65 kA, 100 kA    |
| JD, JG, JJ, JL                      | 3         | 150–250 A                         |                                |
| LH, LHL                             | 3         | 125–400 A                         | 14 kA                          |
| LD, LG, LJ, LL Electronic Trip Unit | 3         | 250–600 A                         | 18 kA, 35 kA, 65 kA, 100 kA    |
| MG, MJ Electronic Trip Unit         | 3 [6]     | 300–800 A                         | 35 kA                          |
| PG, PK Electronic Trip Unit         | 3 [6]     | 600–1200 A                        | 35 kA, 50 kA                   |
| PG, PK Micrologic Trip Unit         | 3 [6]     | 250–1200 A                        |                                |
| PJ, PL Electronic Trip Unit         | 3 [6]     | 600–1200 A                        | 65 kA, 100 kA                  |
| PJ, PL Micrologic Trip Unit         | 3 [6]     | 250–1200 A                        |                                |
| RG, RJ, RK RL Electronic Trip Unit  | 3 [6]     | 1200–2500 A                       | 35 kA, 65 kA, 65 kA, 100 kA    |
| RG, RJ, RK, RL Micrologic Trip Unit | 3 [6]     | 600–2500 A                        |                                |
| NT                                  | 3         | 800–1200 A                        | 100 kA                         |
| NW                                  | 3         | 800–6000 A                        | 150 kA                         |

[4] Standard labeling includes grounded B phase.

[5] Built using 3P module.

[6] Electronic = ET1.0 Electronic Trip System

Micrologic = 3.0, 5.0, 3.0A, 5.0A, 6.0A, 5.0P, 6.0P, 5.0H and 6.0 H Micrologic Trip System.

[7] Refer to NEC 240.85 for application guidance.

[8] The grounded phase must be connected through the center pole only.

### UL Marine Listed/CSA Certified Circuit Breakers (UL 489 Supplement SA)



For use on vessels over 65 ft. (19.8 m) in length.

PowerPact H and J circuit breakers with thermal magnetic trip units meet the UL 489 SA requirements on vessels of any length under or over 65 ft. (19.8 m). PowerPact H, J, and L circuit breakers with Micrologic trip units meet the UL 489 Supplement SA requirements for use on vessels over 65 ft. (19.8 m) in length. Marine circuit breakers must not use aluminum or aluminum alloys for terminal connections and must be calibrated at an ambient temperature of 104°F (40°C). Standard circuit breakers should not be specified or used in place of marine rated circuit breakers.

Circuit breakers can be ordered with the Marine SA listing by adding the suffix "YA" (marine) to the catalog number.

**Table 3.34: Circuit Breakers for Marine Applications**

| Cat. No. Prefix                   | Poles   | Ampere Rating | Application                                                   | Cat. No.                                                                                                                                                |
|-----------------------------------|---------|---------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| LA, LAL                           | 2, 3    | 125–400 A     | For use only on vessels over 65 feet (19.8 m) in length.      | Add the number "9" after the catalog number prefix of the standard circuit breaker catalog number.<br>Example:<br>Standard FAL36100<br>Marine FAL936100 |
| LH, LHL                           | 2, 3    | 125–400 A     |                                                               |                                                                                                                                                         |
| PowerPact™ HD, HG, HJ, HL<br>[9]  | 2, 3    | 15–150 A      | For use on vessels over and under 65 feet (19.8 m) in length. | Add suffix "YA" after the standard circuit breaker catalog number.<br>Example:<br>Standard HGL36100<br>Marine HGL36100YA                                |
| PowerPact JD, JG, JJ, JL [9]      | 2, 3    | 150–250 A     |                                                               |                                                                                                                                                         |
| PowerPact HD, HG, HJ, HL, HR [10] | 2, 3    | 15–150 A      | For use on vessels over 65 feet (19.8m) in length.            |                                                                                                                                                         |
| PowerPact JD, JG, JJ, JL, JR [10] | 2, 3    | 150–250 A     |                                                               |                                                                                                                                                         |
| PowerPact LD, LG, LJ, LL, LR      | 3, 4    | 250–600 A     | For use only on vessels over 65 feet (19.8 m) in length.      |                                                                                                                                                         |
| PowerPact MG, MJ                  | 2, 3    | 300–800 A     |                                                               |                                                                                                                                                         |
| PowerPact PG, PJ, PL              | 2, 3, 4 | 100–1200 A    |                                                               |                                                                                                                                                         |
| PowerPact RG, RJ, RL              | 2, 3, 4 | 600–2500 A    |                                                               |                                                                                                                                                         |

### UL Naval Listed/CSA Certified Circuit Breakers (UL 489 Supplement SB)

PowerPact H, J, and L circuit breakers with Micrologic trip units meet the UL 489 Supplement SB requirements for naval vessels. These circuit breakers are subject to various vibration testing as described in UL 489 Supplement SB. Naval circuit breakers must not use aluminum or aluminum alloys for terminal connections and are calibrated at an ambient temperature of 122°F (50°C). Standard circuit breakers should not be specified or used in the place of naval rated circuit breakers.

Circuit breakers can be ordered with the Naval SB listing by adding the suffix "YA1" (naval) to the catalog number.

**Table 3.35: Circuit Breakers for Naval Applications**

| Cat. No. Prefix     | Poles | Ampere Rating | Application                                                   | Cat. No.                                                                                                                   |
|---------------------|-------|---------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| HD, HG, HJ, HL [11] | 2, 3  | 15–150 A      | For use on non-combat and auxiliary navalships of any length. | Add suffix "YA1" after the standard circuit breaker catalog number.<br>Example:<br>Standard HGL36100<br>Marine HGL36100YA1 |
| JD, JG, JJ, JL [11] | 2, 3  | 150–250 A     |                                                               |                                                                                                                            |
| LD, LG, LH, LL      | 3, 4  | 250–600 A     |                                                               |                                                                                                                            |

[9] Thermal-Magnetic trip units only.

[10] Micrologic trip units only.

[11] With Micrologic trip units only thermal-magnetic circuit breakers not approved.

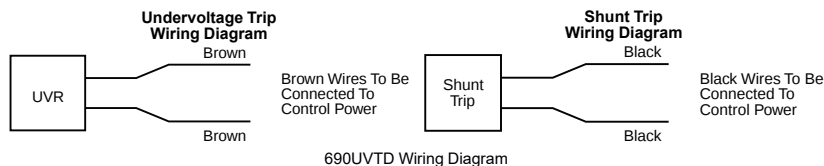
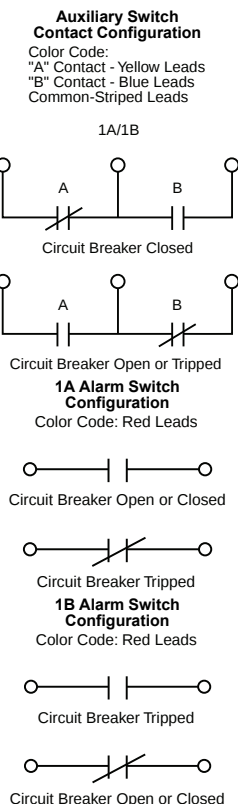
## Factory-Installed LA and Q-Frame Electrical Accessories

Electrical accessories are available on all molded case circuit breakers except QOM1 circuit breakers.

- Combination accessories may be ordered by description, i.e., 1021 and 1212.
- All AC electrical accessories shown below are rated for 50/60 Hz.
- See [page 3-14](#) for field-installable accessories. See Digest Section 7 for PowerPact™ circuit breaker accessories.

**Table 3.36: Factory-Installed Accessories for Thermal-Magnetic LA and Q-Frame Circuit Breakers**

| Accessory               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Rated Voltage                                    | Coil Burden                          | Suffix                                    |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------|-------------------------------------------|
| Shunt Trip              | Trips the circuit breaker from a remote location by means of a trip coil energized from a separate circuit. A 120 V shunt trip will operate at 55% or more of rated voltage. All other shunt trips will operate at 75% or more of rated voltage.<br><b>Application</b> <ul style="list-style-type: none"> <li>• For use with momentary or maintained push button</li> <li>• Sure Trip Capacitor Unit requires 48 Vdc shunt trip</li> <li>• Leads: (2) Black, 18 AWG Cu</li> </ul> | 24 Vac                                           | 21 VA                                | -1042                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 120 Vac                                          | 24 VA                                | -1021                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 208 Vac                                          | 107 VA                               | -1021                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 240 Vac                                          | 154 VA                               | -1021                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 277 Vac                                          | 14 VA                                | -1037                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 480 Vac                                          | 45 VA                                | -1037                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 24 Vdc                                           | 36 VA                                | -1027                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 48 Vdc                                           | 36 VA                                | -1028                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 125 Vdc                                          | 44 VA                                | -1029                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 250 Vdc                                          | 15 VA                                | -1030                                     |
| Ground-Fault Shunt Trip | Trips the circuit breaker electrically using the signal from a Micrologic™ Ground-Fault Module.<br><b>Application</b> <ul style="list-style-type: none"> <li>• For use only with obsolete GP Ground-Censor™ system or add on ground-fault module</li> <li>• Leads: (2) Orange 18 AWG Cu</li> </ul>                                                                                                                                                                                | —                                                | —                                    | -G                                        |
| Undervoltage Trip (UVR) | Trips the circuit breaker electrically when a control circuit falls below 35 to 70% of nominal (not field adjustable). Picks up at 35–85% of nominal voltage.<br><b>Application</b> <ul style="list-style-type: none"> <li>• UVR must be energized in order to close the circuit breaker</li> <li>• Leads: (2) Brown 18 AWG Cu leads</li> </ul>                                                                                                                                   | 24 Vac<br>120 Vac<br>240 Vac<br>24 Vdc<br>48 Vdc | 5 VA<br>8 VA<br>8 VA<br>2 VA<br>3 VA | -1143<br>-1121<br>-1124<br>-1127<br>-1128 |
| Auxiliary Switches      | Monitors circuit breaker contact status and provides a remote signal indicating the circuit breaker contacts are OPEN or CLOSED.<br><b>Application</b> <ul style="list-style-type: none"> <li>• Max. Load = 10 A @ 125–250 Vac, ¼ hp @ 125–250 Vac, 5 A @ 30 Vdc</li> <li>• Leads: Yellow for "A", Blue for "B", Striped for common 18 AWG Cu</li> </ul>                                                                                                                          | 1A/1B<br>2A/2B                                   | See load info. in App. text at left  | -1212<br>-1352                            |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3A/3B                                            |                                      | -1364                                     |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1A<br>1A<br>1B<br>1B                             |                                      | -2100<br>-2100<br>-2103<br>-2103          |
| Alarm Switches          | Used with control circuits and actuated only when the circuit breaker has tripped. Standard construction includes a normally-open contact.<br><b>Application</b> <ul style="list-style-type: none"> <li>• Max. Load = 10 A @ 125–250 Vac</li> <li>• Max. Load = 15 A @ 30 Vdc</li> <li>• Leads: (2) Red 18 AWG Cu</li> </ul>                                                                                                                                                      | 250 Vac<br>28 Vdc<br>250 Vac<br>48 Vdc           | See load info. in App. text at left  | -2100<br>-2100<br>-2103<br>-2103          |



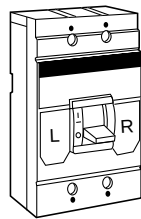
Field-Installable Electrical Accessories

Complete field-installable accessory catalog number by inserting suffix from [page 3-13](#) between the parentheses in the catalog numbers shown in the table below. (Example: LA11212)

Table 3.37: Field-Installable Accessories for Thermal-Magnetic and Electronic Trip Circuit Breakers

| Circuit Breaker                         | Shunt Trip             | Ground-Fault Shunt Trip [1] | Undervoltage Trip | Auxiliary Switches     | Alarm Switch                      |
|-----------------------------------------|------------------------|-----------------------------|-------------------|------------------------|-----------------------------------|
| Miniature Circuit Breakers EH and EH-PL | Factory-Installed Only | Not Available               | Not Available     | Factory-Installed Only | Factory-Installed Only            |
| LA, LH Series 4 [2]                     | LA1( )                 | LA1G                        | LA1 ( )           | LA1( )                 | Factory-Installed Only Right Pole |
| Q4                                      | LA1( )                 | LA1G                        | LA1 ( )           | LA1( )                 | Factory-Installed Only Right Pole |

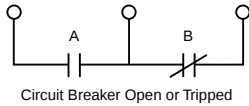
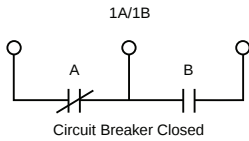
Table 3.38: Accessory Mounting Locations



LA, LH, Q4 Series 4 circuit breakers or newer = Field-installable accessories  
Both accessory ports will accept shunt trips, UVRs and auxiliary switches. Alarm switches are factory installable **only** (right pole). Maximum of one device per port.

Auxiliary Switch Contact Configuration

Color Code:  
"A" Contact - Yellow Leads  
"B" Contact - Blue Leads  
Common-Striped Leads



1A Alarm Switch Configuration

Color Code: Red Leads

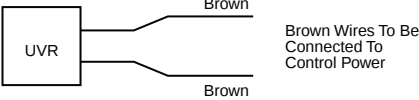


1B Alarm Switch Configuration

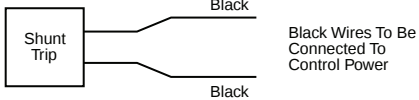
Color Code: Red Leads



Undervoltage Trip Wiring Diagram



Shunt Trip Wiring Diagram



[1] Used with obsolete GP Ground-Censor™ system or add-on ground-fault modules.  
[2] With LA and LH top-feed circuit breakers (suffix MT, I-Line jaws on OFF end) all accessories must be factory installed.

## Electrical Operators

Provides remote ON, OFF/RESET control of molded case circuit breakers.

- A complete line of field-installable electrical operators.
- Installing side mounted motor operators on non I-Line™ circuit breakers requires the use of a separate mounting pan.
- Side mounted electrical operators require an additional 4-1/2 in. (114 mm) of mounting space in I-Line installations.

When remote indication of circuit breaker status is required, order circuit breaker with 1A-1B auxiliary switch for ON-OFF Indication and alarm switch for TRIP Indication. Electrical operators require SPDT maintained contact switch. Refer to Class 9001 control unit listing for operators and pilot lights.

**NOTE:** Not available on Mag-Gard™ circuit breakers and molded case switches.

**Table 3.39: Electrical Operators**

| Circuit Breaker Prefix | Top Mount |          | Side Mount |          | Mounting Pan Cat. No. |
|------------------------|-----------|----------|------------|----------|-----------------------|
|                        | Voltage   | Cat. No. | Voltage    | Cat. No. |                       |
| LA, LH, Q4             | —         | —        | 120 Vac    | LAM01    | —                     |
| LAL, LHL, Q4L          | —         | —        | 120 Vac    | LAM01    | LAMOP                 |

## Handle Accessories

**Table 3.40: Handle Accessories**

| Circuit Breaker Prefix                      | Poles | Cat. No.        |
|---------------------------------------------|-------|-----------------|
| Handle Tie                                  |       |                 |
| 2 LA or 2 Q4                                | 2, 3  | LAHT            |
| Handle Extension                            |       |                 |
| Q4                                          | 2, 3  | AHEXLI          |
| Handle Padlock Attachment (locks ON or OFF) |       |                 |
| LA, LH, Q4                                  | 2, 3  | HPALM<br>HPAXLM |

## Cylinder Lock

Used to lock the circuit breaker in the OFF position. Circuit breaker cannot be reset when locked OFF.

**Table 3.41: Cylinder Lock**

| Circuit Breaker Prefix | Factory Installed Suffix | Field-Installable Cat. No. |
|------------------------|--------------------------|----------------------------|
| LA, LAL, LH, LHL, Q4   | Field-installable only   | LA1CL                      |

## Interlocks

**Table 3.42: Walking Beam Mechanical Interlock Components [3]**

| Circuit Breaker Prefix | Manually Operated |                     |              | Electrically Operated |                     |              |
|------------------------|-------------------|---------------------|--------------|-----------------------|---------------------|--------------|
|                        | Operator Suffix   | Walking Beam Ass'y. | Mounting Pan | Operator Suffix       | Walking Beam Ass'y. | Mounting Pan |
|                        |                   | Cat. No.            | Cat. No.     |                       | Cat. No.            | Cat. No.     |
| LAL, LHL               | WB                | LA6WB               | LAWBP6       | WBMO                  | LA10WB              | LAWBP10      |



Walking Beam Mechanical Interlock  
Requires 2 circuit breakers with WB suffix,  
1 walking beam assembly and 1 mounting pan.

[3] Fully enclosed interlocked units are available in Type 1 and Type 3R enclosures, with two neutrals provided in each enclosure. The completely enclosed assembly is not UL Listed. Please consult your nearest Schneider Electric sales office for more information.

## Mechanical Lug Kits

Table 3.43: Mechanical Lug Kit Information

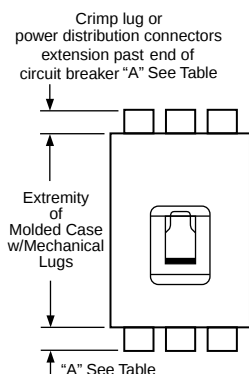
| Circuit Breaker Application           |                  |            |                  | (Number of Wires Per Lug)<br>Wire Range [4]         | Cat. No. | Lugs<br>Per<br>Kit |
|---------------------------------------|------------------|------------|------------------|-----------------------------------------------------|----------|--------------------|
| Standard                              | Ampere<br>Rating | Optional   | Ampere<br>Rating |                                                     |          |                    |
| Al Lugs for Use with Al or Cu Wire    |                  |            |                  |                                                     |          |                    |
| Q4, LA, LH                            | 125–400 A        | —          | —                | (1) 1 AWG–600 kcmil or<br>(2) 1 AWG–250 kcmil       | AL400LA  | 1                  |
| —                                     | —                | Q4, LA, LH | 125–400 A        | (1) 350–750 kcmil                                   | AL400LH7 | 1                  |
| Cu Lugs for Use with Cu Wire Only [5] |                  |            |                  |                                                     |          |                    |
| —                                     | —                | Q4, LA, LH | 125–400 A        | (1) 1 AWG–600 kcmil Cu or<br>(2) 1 AWG–250 kcmil Cu | CU400LA  | 1                  |



## Compression Lug Kits

Table 3.44: Field-installable Compression Lug Kits [6]

| Circuit Breaker<br>Type       | Wire Range [4]       | Dimension A<br>(In) | Max. Lugs<br>Per Terminal | Cat. No.  | Lug Qty.<br>Per Kit |
|-------------------------------|----------------------|---------------------|---------------------------|-----------|---------------------|
| Aluminum Compression Lug Kits |                      |                     |                           |           |                     |
| LA, LH, Q4                    | 250–350 kcmil        | 1.25                | 2                         | VC400LA35 | 2                   |
|                               | 4 AWG–300 kcmil      | 1.0                 | 2                         | VC400LA3  | 2                   |
|                               | 2/0 AWG–500 kcmil    | 2.2                 | 1                         | VC400LA5  | 1                   |
|                               | 500–750 kcmil        | 2.5                 | 1                         | VC400LA7  | 1                   |
| Copper Compression Lug Kits   |                      |                     |                           |           |                     |
| LA, LH, Q4                    | 2/0 AWG–300 kcmil Cu | 1.3                 | 2                         | CVC400LA3 | 2                   |
|                               | 250–500 kcmil Cu     | 2.3                 | 1                         | CVC400LA5 | 1                   |



## Power Distribution Connectors (PDC) for Circuit Breakers—for Field Replacement of Mechanical Lugs

Can be used for multiple load connections on one circuit breaker. Use in place of standard distribution blocks to save space and time.

Field-installable kits, including tin-plated aluminum connectors and all necessary mounting hardware are available for Square D LA and Q4-frame molded case circuit breakers.

Connectors are UL Listed:

- For use on load end of circuit breaker only
- For use in UL508 Industrial Control applications only
- For use in UL 1995/CSA C22.2 No. 236 heating and cooling equipment
- For copper wire only

Table 3.45: Power Distribution Connectors for LAL, LHL, and Q4L Circuit Breakers

| Use With<br>Circuit<br>Breaker [7] | Circuit<br>Breaker<br>Ampere<br>Rating | Wires Per Terminal<br>& Wire Range [8]<br>Cu | Cat. No.  | Lug Quantity<br>Per Kit | Dimension<br>A (in.) |
|------------------------------------|----------------------------------------|----------------------------------------------|-----------|-------------------------|----------------------|
| LAL, LHL,<br>Q4L                   | 125–400 A                              | (6) 12–2/0 AWG                               | PDC6LA20  | 1                       | 2.25                 |
|                                    |                                        | (12) 14–4 AWG                                | PDC12LA4  | 1                       | 1.25                 |
|                                    |                                        | (3) 14–2 AWG<br>(1) 2 AWG–250 kcmil          | PDC4LA250 | 1                       | 2.0                  |



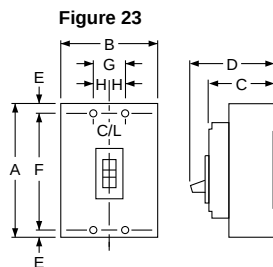
[4] Unless otherwise specified, wire sizes apply to both aluminum and copper conductors.

[5] Use suffix 8002 for factory-installed Cu lugs.

[6] See instruction bulletins for recommended tools.

[7] Not for use with I-Line circuit breakers.

[8] When using fine stranded wire, increased cross sectional area may cause maximum wire size to be reduced.



## Dimensions and Weights

**Table 3.46: Circuit Breakers Dimensions**

| Circuit Breaker<br>Catalog No. Prefix | No.<br>Poles | Fig.<br>No. | Dimensions—Inches |      |      |      |      |      |      |      |
|---------------------------------------|--------------|-------------|-------------------|------|------|------|------|------|------|------|
|                                       |              |             | A                 | B    | C    | D    | E    | F    | G    | H    |
| Q4L, LAL, LHL                         | 2, 3         | 23          | 11.00             | 6.00 | 4.06 | 5.84 | 0.88 | 9.25 | 2.00 | 1.00 |

**Table 3.47: Shipping Weights**

| Frame Size | Approx. Shipping Weight<br>(Lbs.) |
|------------|-----------------------------------|
| Q4L        | 15                                |
| LAL<br>LHL | 15                                |

Enclosed Molded Case Switches

Enclosed molded case switches are UL Listed devices supplied with factory-installed automatic molded case switch. Use the Cat. No. listed below and add the enclosure NEMA type suffix as noted in footnote in Table 3.48. An insulated groundable neutral, if required, must be ordered separately from Digest Section 7. Enclosed molded case switches are manufactured on order only.

Table 3.48: Enclosed Molded Case Switches

| System                           | Ampere Rating | Cat. No. Add Suffix [1] | 600 Vac Short Circuit Withstand Ratings |
|----------------------------------|---------------|-------------------------|-----------------------------------------|
| LH—400 A Frame, 3P, 600 Vac Max. |               |                         |                                         |
| 2P                               | 400           | LHE26000( )             | 25 kA                                   |
| 3P                               | 400           | LHE36000( )             | 25 kA                                   |

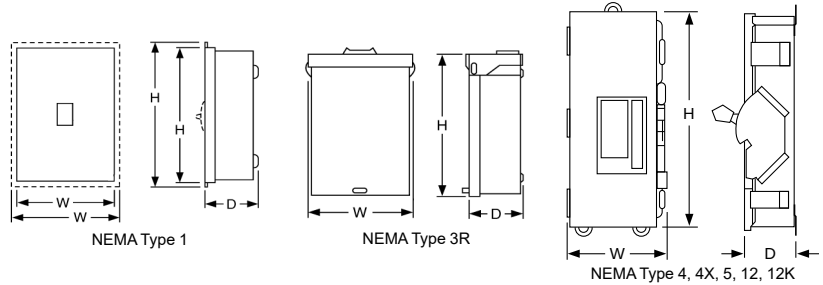


Table 3.49: Enclosed Molded Case Switch Dimensions

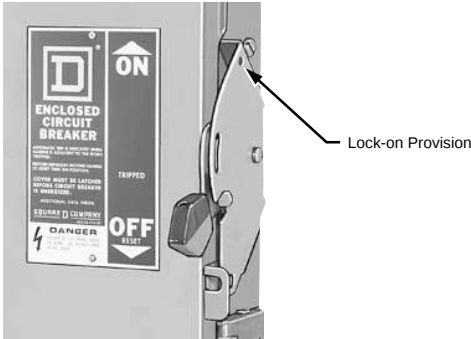
| Cat. No. Prefix—Suffix | Series | Approximate Dimension |      |       |     |      |     |
|------------------------|--------|-----------------------|------|-------|-----|------|-----|
|                        |        | H                     |      | W     |     | D    |     |
| LHE—AWK                | E05    | in.                   | mm   | in.   | mm  | in.  | mm  |
| LHE—DS                 | E05    | 42.25                 | 1073 | 13.75 | 349 | 7.25 | 184 |
| LHE—F                  | A03    | 45.63                 | 1159 | 16.50 | 419 | 6.50 | 165 |
| LHE—R                  | A03    | 44.00                 | 1118 | 15.38 | 391 | 7.88 | 200 |
| LHE—S                  | E03    | 44.50                 | 1130 | 15.38 | 391 | 6.50 | 165 |

Lock-On Provisions

Lock-off provisions are standard on all NEMA Type 4, 4X, 5 stainless steel and NEMA Type 12, 12K circuit breaker enclosures. Provision for one inch hasp padlock is available factory installed. This modification will allow the circuit breaker to be locked in the ON position. When locked in the ON position, the external operator will not indicate if circuit breaker is tripped. UL Listed.

Table 3.50: Enclosure

| Enclosure Prefix   | Suffix for Lock-On Provision |
|--------------------|------------------------------|
| FA, J, LA, L, M, P | SPLO                         |



Lock-On Provision

Pilot Light—Selector Switch—Push Button

Pilot lights, push buttons or selector switches are available factory installed in the cover of NEMA Type 4, 4X, 5 stainless steel or NEMA Type 12, 12K circuit breaker enclosures. Wiring to contact blocks is not available. Customer must furnish catalog number of device desired. Price = circuit breaker + enclosure + neutral + ground + pilot light, push button and/or selector switch + factory-installed adder. Order by description. L600 enclosures are UL Listed, other enclosures are not UL Listed.

Phenolic Legend Plate

Available engraved and mounted on most circuit breaker enclosures. Legend engraved in 1/4-inch high white letters on black background. Customer must provide legend. UL Listed. Not available on NEMA Type 7 or 9 enclosures.

To order, add suffix NP to standard catalog number (i.e. LA400SNP).

[1] Add suffix S or F for NEMA 1 surface mounted or NEMA 1 flush mounted, respectively. Add suffix RB for NEMA 3R with bolt-on hub provision (FHE prefix only) or suffix R for NEMA 3R with a blank top endwall (LHE prefix only), respectively. Add suffix AWK for NEMA 12. Add suffix DS for NEMA 4/4X/5 stainless steel.



## Key Interlock Systems for Circuit Breaker Enclosures

(Factory installed only.)

Interlocks are used to prevent the authorized operator from making an unauthorized operation. Available only on NEMA 4, 4X, 5, 12K, and 12/3R circuit breaker enclosures.

The key interlock system is a simple and easy method of applying individual key interlock units and assemblies to the above equipment so as to require operation in a predetermined sequence. UL Listed.

### Quoting

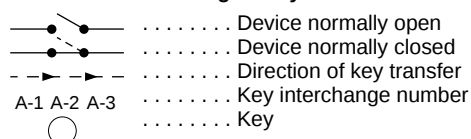
Contact local Field Sales office for catalog number, availability and pricing prior to quoting a job.

### Ordering

Order cannot be released for production until the following information has been provided:

- End User—Company name, address
- Function of each lock (e.g., circuit breaker to be locked open with key removed, key held when circuit breaker is closed)
- Existing Equipment—if circuit breaker is to be interlocked with equipment already on site, provide brand of existing lock and key number
- Other New Equipment—if circuit breaker is to be interlocked with new equipment not yet installed at the site, then provide contact person and phone number so that locks may be coordinated
- Additional information may be required upon order entry

### Diagram Symbols



### Sample Application—1 (See Figure 1)

To prevent two devices from being closed simultaneously.

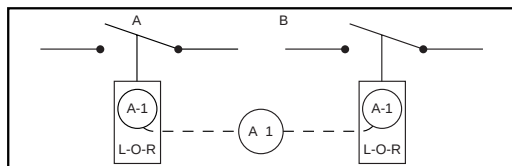


Figure 1

Two devices are shown in Figure 1. In operation they are not closed at the same time. With the interlocks arranged as shown only one key is required in the interlocking system. Both devices are shown open, therefore, the key is free. To close any one device the key is inserted and turned in that particular lock, the key is held in this lock until the device is again locked open. This simple interlocking sequence lends itself to a multitude of applications. The procedure is the same for two devices, neither of which is to be opened at the same time.

### Sample Application—2 (See Figure 2)

To prevent opening of switch A when circuit breaker B is closed.

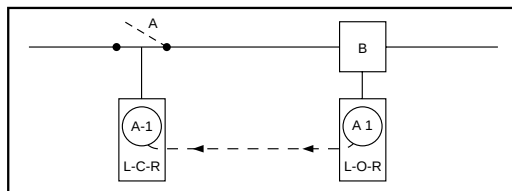


Figure 2

Switch A and circuit breaker B are in closed position. Key A-1 is held in circuit breaker B interlock.

- Open circuit breaker.
- Turn key A-1 in L-O-R interlock on circuit breaker B to lock open. Key A-1 is now free.
- Insert key A-1 in L-C-R interlock on switch A and turn to unlock.
- Open switch A. Key A-1 is now held. Reverse sequence to restore service.

### Sample Application—3 (See Figure 3)

To prevent operation of switch A when circuit breaker B is closed. Permits reclosing of circuit breaker for servicing when switch is locked open.

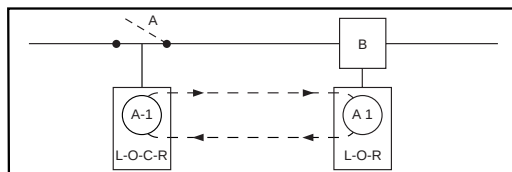


Figure 3

Switch A and circuit breaker B are in closed position. Key A-1 is held in circuit breaker interlock.

- Open circuit breaker.
- Turn key A-1 in L-O-R interlock on circuit breaker B to lock open. Key A-1 is now free.
- Insert key A-1 in L-O-C-R interlock on switch A and turn to unlock.
- Open switch A.
- Turn key A-1 in L-O-C-R interlock on switch A to lock open. Key A-1 is now free.
- Return key A-1 to circuit breaker interlock and unlock for operation during servicing period.

Reverse sequence to restore service.

**Sample Application—4 (Main-Tie-Main) (See Figure 4)**

To prevent paralleling of lines A and B.—Two loads, fed from either source.

Circuit breaker A is closed to supply load M. Circuit breaker B is closed to supply load N. Tie-circuit breaker C is open. Keys A-1 are held in interlocks on both circuit breakers A and B. Tie-circuit breaker C cannot be closed unless either A or B is locked open.

To transfer load N to circuit breaker A, proceed as follows:

- Open circuit breaker B.
- Turn key A-1 in L-O-R interlock on circuit breaker B to lock open. Key A-1 is now free.
- Insert Key A-1 in L-O-R interlock on tie-circuit breaker C and turn to unlock. Key A-1 is now held.
- Close tie-circuit breaker C.

Reverse sequence to restore service.

Load M can be supplied through circuit breaker B in a similar manner.

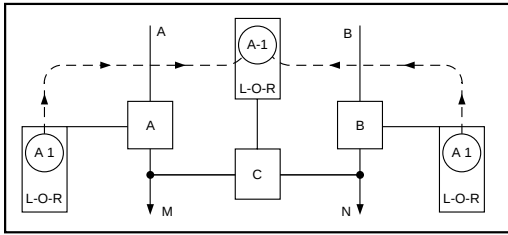


Figure 4

## Section 4

## Panelboards



NQ Panelboard with  
Door-in-Door (Hinged) Trim



MH38 Enclosure with 12-inch Wireway and  
Mono-Flat™ Trim with 12-inch Wireway Cover

|                                                                   |             |
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| <b>Panelboards</b>                                                | <b>4-2</b>  |
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| Trim Clamps and Screws                                            | 4-9         |
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## FAQs

Visit the online FAQs page to find additional technical information covering all products including discontinued and obsolete products.  
<https://www.schneider-electric.us/en/faqs/home/>

## General Instructions

The special feature options covered in this Panelboard estimating procedure are applicable to factory-assembled panelboards only. Do not apply this pricing to ready-to-assemble panelboards.

Special features are listed in three major categories:

- Mains
- Branches
- Cabinets

## Metric Conversion

Inches (in.) x 25.4 = millimeters (mm).

## I-Line™ Panelboards Factory Assembled

| Panel Type  | No. Poles | Main Circuit Breaker |                   |                    |                   |                   |                    |
|-------------|-----------|----------------------|-------------------|--------------------|-------------------|-------------------|--------------------|
|             |           | 400 A                |                   |                    | 600 A             |                   |                    |
|             |           | LX <sup>[1]</sup>    | LE <sup>[1]</sup> | LXI <sup>[1]</sup> | LX <sup>[1]</sup> | LE <sup>[1]</sup> | LXI <sup>[1]</sup> |
| HCP, HCP-SU | 2         |                      |                   |                    |                   |                   |                    |
|             | 3         |                      |                   |                    |                   |                   |                    |

## Mains

### NEMA Type 1 Enclosures Only (1200 A Maximum)

Enclosures and Interiors are shipped fully assembled.

NQ, NF and Powerlink™ require a 7-inch left side gutter extension and a 6-inch main end extension for PowerLogic Power Meter applications.

I-Line™ and QMB require a 14-inch side gutter extension for PowerLogic Circuit Monitor and Power Meter applications.

### Current Transformers In Mains (ac only and line side only)<sup>[1]</sup>

Prices listed are based on transformers having a 5 A secondary and mounted under a separate cover. Apply appropriate charge from the table below

**Table 4.1: Current Transformers**

| Primary Amperes<br>(5 A—Secondary) | Additional Enclosure Height Required <sup>[2]</sup> |
|------------------------------------|-----------------------------------------------------|
| 100–1200                           | 6 inches                                            |

### Customer Equipment Space<sup>[1]</sup>

**NOTE:** End user must specify end use equipment to be installed.

Available with NQ, and NF lighting panelboards only. Must be opposite the mains end, both main breaker and main lug, to prevent interference with incoming cables. Customer equipment space is not available with thru-feed lugs or sub-feed breakers.

A barrier exists between the equipment space and the panelboard compartment; a separate door is provided as standard (requires 18-inch additional enclosure height).

**NOTE:** A separate door is not supplied in NEMA 3R/12 construction.

## Branches

### Keyed Interlocks

**NOTE:** Not available for use in NQ, NF or I-Line™ HCN panelboards with door. Not available on I-Line™ with door when key interlocked MG/MJ/P/R frame branch-mounted circuit breakers are installed. Must use 4-piece trim or NEMA 3R/12.

Keyed mechanical interlocking of two or more circuits is available on request. Individual locks are furnished for each circuit. All locks operate by one key, which can be removed only when the circuit is locked in the desired position.

I-Line Circuit Breakers — A 3-inch filler adjacent to the circuit is necessary for mounting the interlock; contact your nearest Schneider Electric sales office for assistance with power distribution panelboards with doors. Feature not available on vertically mounted main circuit breaker.

QMB Fusible Switches — Available on 100 A singles (100 A single QMB requires 9 inches of mounting space) through 800 A switches plus LA circuit breaker adapters. Requires 3 inches of branch mounting space per switch for interlock installation.

### Motor Operators—I-Line Circuit Breakers Only

Motor operators provide remote *open*, *close*, and *reset* control of molded case circuit breakers. Price panelboard from the latest Digest, and, for each motor operator, add per table below. In I-Line panelboards, motor operators require 4.5 inches of circuit breaker mounting space. This can be provided on I-Line main circuit breaker only when the main is branch-mounted and back-fed.

**NOTE:** Not available in I-Line HCN Panelboards



<sup>[1]</sup> Std. construction back-fed main.

<sup>[1]</sup> Feature supported by product selectors in Q2C and SE Advantage.

<sup>[2]</sup> For NQ, and NF panelboards.

**Table 4.2: Motor Operators**

| Circuit Breaker Type      | Motor Operator Voltage                                                   |
|---------------------------|--------------------------------------------------------------------------|
| F-frame                   | 120 Vac                                                                  |
| H-frame (3P modules only) | 48/60, 110/130, 208/277, 380/480 Vac;<br>24/30, 48/60, 110/130, 250 Vdc  |
| J-frame                   | 48/60, 110/130, 208/277, 380/480 Vac;<br>24/30, 48/60, 110/130, 250 Vdc  |
| LA, LH                    | 120 Vac                                                                  |
| PG, PJ, PL                | 48, 110/130, 220/240, 380/480 Vac;<br>24/30, 48/60, 110/130, 200/250 Vdc |

**NOTE:** If the customer is not supplying the motor operator voltage, a control transformer can be supplied.

## Special Features

### Cabinets

#### Increased Enclosure Depth

##### NEMA Type 1 Enclosure<sup>[3]</sup>

8-inch depth (HC26)

12-inch depth (HC32, 42, 44-12-inch only)

##### NEMA Type 3R, 5, or 12 Enclosure<sup>[3]</sup>

8-inch or 12-inch depth

**NOTE:** No other depths are available.

#### Increased Side Gutters (Type 1 Enclosures Only)

**NOTE:** Available on MH enclosures (right or left) in 3, 6 and 12-inch added widths, 26-inch wide HC enclosures up to a maximum of 14 additional inches and 32-inch wide HC enclosures up to a maximum of 10 additional inches.

Not available on 42-inch wide HC enclosures.

No barrier will be supplied unless specified.

Includes one-piece trim.

Provide extended side gutters.

#### Steel Barrier in Enclosure

**NOTE:** The enclosure will be extended on one side only. If extension is required on both sides, contact your nearest Schneider Electric sales office for assistance.

#### Extended Top and Bottom End Gutters

**NOTE:** Available for Type 1 enclosures only

##### Type MH Enclosures

6-inch, 12-inch, 18-inch or 24-inch extension. Includes one-piece trim.

##### Type, HCM Enclosures

9-inch extension. Includes standard panel trim and enclosure extension cover.

##### Type HCP, HCR-U Enclosures

12-inch extension. Includes standard panel trim and enclosure extension cover.

##### Type QMB Enclosures

38-inch W x 11.5-inch D may have a 6-inch maximum increased end gutter. This is the only QMB enclosure with an increased end gutter option. Available only with a four-piece trim.

For lengths other than those listed above, refer to the Wireway section on page 4-8.

#### Drip Hoods<sup>[3]</sup>

Surface-mounted-only panelboard

#### Special Finishes

**NOTE:** The standard finish of the enclosure fronts is ANSI 49. The enclosures are galvanized steel.

##### ANSI 49 Enclosure<sup>[3]</sup>

##### ANSI 61 Front or Enclosure<sup>[3]</sup>

#### Front and Enclosure with Polyester Acrylic Powder Paint Finish

Provides increased salt spray performance in coastal areas and increased resistance to UV fading

#### Special or Custom Paint for Trim and/or Enclosure

##### Free-standing Enclosures (welded base channels)<sup>[4]</sup>

Supports extending out front and back, welded to bottom of enclosure



MH38 Enclosure with 6-inch Increased Left-side Gutter



MH38 Enclosure with 12-inch Extended Bottom End Gutter and One-Piece Trim

<sup>[3]</sup> Feature supported by product selectors in Q2C and SE Advantage.

<sup>[4]</sup> Base channels are available only for indoor applications.



Hinged Trim

**Special Trims****Hinged Trim****Hinged Trim with Outer Door Lock**<sup>[5]</sup>

**NOTE:** Outer door lock, must be priced with hinged trim.  
For door-in-door trim, use hinged trim with outer door lock.

**Stainless Steel Trim Fronts**<sup>[5]</sup>

NQ 20-inch-wide flush and surface

NF flush and surface

I-Line HCM—Standard trim with door

I-Line HCP—Standard trim with door

**Special Locks**<sup>[5]</sup>**Padlock Hasp**<sup>[5]</sup>

For hasp, staple and standard lock (padlock not included)

**Special Locks**

On trim with a 3-point latch, special locks will be installed as a secondary latch. Special locks include Corbin 60, Corbin 15767, GE 75, Yale® 511S and Best 5L7RL2-626. For all other locks, contact your nearest Schneider Electric sales office for assistance.

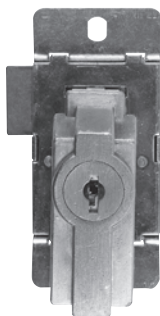
Standard key change, Corbin 60, Corbin 15767 or GE 75<sup>[5]</sup>

Standard key change, Yale 511S<sup>[5]</sup>

Standard key change, Best 5L7RL2-626<sup>[5]</sup>

Quarter turn fasteners

**NOTE:** Special locks for all HC trims and NF panelboards with three-point latches, will be installed as secondary locks. Special locks are not available on I-Line™ 42-inch and 44-inch wide panelboards or QMB type panelboards.  
Many key configurations can be accommodated with our standard Square D™ brand lock. Contact your nearest Schneider Electric sales office for assistance.

NC38S  
Padlock Hasp

Corbin 15767 Lock

NC38S with  
Yale Lock Installed

<sup>[5]</sup> Feature supported by product selectors in Q2C and SE Advantage.



Common Trim Front for Use with Multiple-Section Panelboards Mounted Side-By-Side



Panel skirt framework to be bolted to the wall.



Panel skirt bolted in place below an MH26 enclosure.



Panel skirt completely installed.

**Multi-Section Panels**

**Equal-Height Enclosures<sup>[6]</sup>**

NQ, and NF  
I-Line or QMB

**Common Trim in Place of Two Individual Fronts<sup>[6]</sup>**

Used to cover two equal-height enclosures mounted side-by-side.

**Sheared on Inside Edges**

Allows enclosures to be butted together.

**Panel Skirt for Standard Width Panelboards<sup>[6]</sup>**

Panel skirts are intended for cosmetic purposes only; they are meant to hide cables which are enclosed in conduit.  
Do not use a panel skirt as a wireway; see the Wireway section below.

**NOTE:** Panel skirts are for Type 1 surface-mounted applications with standard depth and width, Square D™ brand enclosures only.

**Table 4.3: Panel Skirts**

| Skirt Length |        |              |
|--------------|--------|--------------|
|              | NQ, NF | I-Line™, QMB |
| 4–60 inches  |        |              |
| 61–92 inches |        |              |

<sup>[6]</sup> Feature supported by product selectors in Q2C and SE Advantage.



MH38 enclosure with 12-inch wireway and Mono-Flat™ trim with 12-inch wireway cover.

### Wireway

Allows for terminating conduit in the wireway endwall. Only the cable passes through the wireway into the NEMA Type 1 panelboard enclosure. Includes trim and wireway cover.

**NOTE:** Wireway is for Type 1, surface-mounted applications with standard depth and width, Square D™ brand enclosures only.

**Table 4.4: Wireway**

| Wireway Length | NQ, NF | I-Line™, QMB |
|----------------|--------|--------------|
| 4–60 inches    |        |              |
| 61–92 inches   |        |              |

### Panels to Fit Existing Enclosures

Panelboard interiors and special fronts can be furnished to fit existing enclosures. First, price the complete panel along with the appropriate price adder from below. Next, photocopy the Retrofit Existing Enclosure data sheet found on [page 4-12](#), record the required dimensions on the photocopy and forward it with your order to the nearest Schneider Electric sales office. For interiors requiring vented enclosures, contact your nearest Schneider Electric sales office for assistance.

**NOTE:** Existing enclosure depth on flush installations must be measured from inside surface of enclosure to outer wall or plaster surface.

### Special Fronts

Existing enclosure the same depth as or deeper than our standard.

**NOTE:** Elevating brackets to be supplied by customer for existing enclosures deeper than our standard.

Existing enclosure shallower than our standard. Requires an enclosure extension (surface applications) or a formed front (flush applications). A hinged trim front option is not available for these applications.

**NOTE:** A formed front is available on NQ (225 A max.) and, NF (250 A max.). When a flush front is required for an existing enclosure that is shallower than our standard, be sure to indicate the position of the enclosure with respect to the wall in which it is mounted. This is required in order to determine whether an enclosure extension with a flat front should be supplied, or whether a flush formed front is more applicable. The interior must be centered in the enclosure and, if the enclosure is deeper than our standard, the interior must be leveled within the enclosure. The existing enclosure for NQ and, NF panels cannot be more than 3.0 inches shorter than the standard enclosure. Minimum width is 17 inches. Special trims that are manufactured to fit an existing enclosure will be within  $\pm 0.25$  inches of the specification. Refer to the table below for standard enclosure depths and for the maximum depth for which no special mounting brackets are required.

**Table 4.5: Panelboard Enclosure Depths**

| Panelboard Type                                        | Standard Enclosure Depth | Maximum Enclosure Depth for which No Special Mounting Brackets Required |
|--------------------------------------------------------|--------------------------|-------------------------------------------------------------------------|
| NQ standard width—main lugs only                       | 5.75 inches              | 5.75 inches                                                             |
| NQ standard width—main circuit breaker                 | 5.75 inches              | 5.75 inches                                                             |
| NF                                                     | 5.75 inches              | 5.75 inches                                                             |
| I-Line™—Maximum F, H or Q-frame branch circuit breaker | 6.5 inches               | 7.25 inches                                                             |
| I-Line™—Maximum J-frame branch circuit breaker         | 8.25 inches              | 9.0 inches                                                              |
| I-Line™—Maximum P or R-frame branch circuit breaker    | 9.25 inches              | 10.25 inches                                                            |

### Space Heater

**NOTE:** Enclosure, interior and trim ship fully assembled. 120 V is standard. Top feed applications only.

NQ and NF require 18 inches equipment space in NEMA 3R/12 constructions.

NQ and NF require 6 inch bottom end gutter in NEMA 1 construction.

Unwired (provisions for wiring to external source)

Wired (with overcurrent device, thermostat)

## NQ Main Lug and Main Circuit Breaker Panelboard with SPD Special Enclosures

### Type 1 Gasketed Enclosure (gasketing between front and enclosure)

20-inch maximum panel width

Over 20-inch panel width

**NOTE:** For 250 A and below enclosures only.

### Stainless Steel Enclosure (Type 3R, 4, 4X, 5 and 12; UL Listed)

**NOTE:** For #316 stainless steel, add 15% to the prices shown below.

NQ, and NF

For panelboard heights up to 41 inches

For panelboard heights of 44–56 inches

For panelboard heights of 59–80 inches

I-Line<sup>TM</sup>

HCM

HCP

**NOTE:** 304 stainless, standard

QMB [1]

### Fiberglass Enclosures (Type 4X, Non-Vented; UL Listed)

NQ, and NF

28-inch height

33-inch, 40-inch and 50-inch height

I-Line and QMB

### Type 12 Door-In-Door Enclosures

**Table 4.6: Available Enclosures**

| Interior Type | Enclosure Size |           |             |
|---------------|----------------|-----------|-------------|
|               | Height         | Width     | Depth       |
| NQ [2]        | 56 inches      | 20 inches | 6.5 inches  |
| NF [3]        | 56 inches      | 20 inches | 6.5 inches  |
| I-Line (HCM)  | 91 inches      | 32 inches | 11.5 inches |
| I-Line (HCP)  | 68 inches      | 42 inches | 12.7 inches |
| I-Line (HCP)  | 86 inches      | 42 inches | 12.7 inches |

**Table 4.7: OBSOLETE NQ SurgeLogic SurgeLoc Plug-on SPD (occupies 12–pole spaces) [4][5]**

| Voltage                     | Surge Current Rating | Part Number    |
|-----------------------------|----------------------|----------------|
| 120 / 240 V                 | 80 kA                | SSP01BIA08PBQ1 |
|                             | 100 kA               | SSP01BIA10PBQ1 |
|                             | 120 kA               | SSP01BIA12PBQ1 |
|                             | 160 kA               | SSP01BIA16PBQ1 |
|                             | 200 kA               | SSP01BIA20PBQ1 |
|                             | 240 kA               | SSP01BIA24PBQ1 |
| 208 Y / 120 V               | 80 kA                | SSP02BIA08PBQ1 |
|                             | 100 kA               | SSP02BIA10PBQ1 |
|                             | 120 kA               | SSP02BIA12PBQ1 |
|                             | 160 kA               | SSP02BIA16PBQ1 |
|                             | 200 kA               | SSP02BIA20PBQ1 |
|                             | 240 kA               | SSP02BIA24PBQ1 |
| 240 / 120<br>High Leg Delta | 80 kA                | SSP03BIA08PBQ1 |
|                             | 100 kA               | SSP03BIA10PBQ1 |
|                             | 120 kA               | SSP03BIA12PBQ1 |
|                             | 160 kA               | SSP03BIA16PBQ1 |
|                             | 200 kA               | SSP03BIA20PBQ1 |
|                             | 240 kA               | SSP03BIA24PBQ1 |



I-Line Door-in-Door Enclosure



Access to Circuit Breaker  
Handles



Access to Wiring Gutters

[1] Not available for QMB interiors over 800 A.

[2] Not available for NQ interiors over 225 A.

[3] Not available for NF interiors over 250 A.

[4] When selecting a panelboard with SurgeLoc SPD, an additional 12 circuit positions (6 adjacent mounting spaces per side) are occupied. For example, if the desired number of circuits is 30, refer to page and page to select the NQ442L2/NQ442L2C interior and corresponding Box and Trim.

[5] 96 space interiors are available factory assembled when SurgeLoc SPDs are to be installed in 84 circuit NQ panelboards.

**NF Merchandised Interiors with SPD - 480Y/277 Vac**

**NOTE:** For selecting SurgeLoc SPD for RTI NQ Panelboard application, please refer to Table 7.197 of Digest 177.

**Table 4.8: NF Merchandised Interiors with SPD—Use I-Line Panelboards on 480 V 3Ø3W Delta Applications**

| Mains Rating | Max. Breaker Spaces | SPD Ratings   |              | Interior Catalog No. | Components for adding Vertical Main Circuit Breaker |                                                                                                                 |
|--------------|---------------------|---------------|--------------|----------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|              |                     | Voltage       | Surge Rating |                      | MCB Kit Catalog No.                                 | Main Circuit Breaker Frame<br>Select the appropriate MCB and price from the tables starting on Digest page 7-22 |
| 250 A        | 42                  | 480Y/277 3P4W | 120          | NF442L2TVS412        | N250MJ                                              | PowerPact J                                                                                                     |
|              |                     |               |              | NF442L2TVS412C       |                                                     |                                                                                                                 |
| 250 A        | 42                  |               | 160          | NF442L2TVS416        |                                                     | PowerPact J                                                                                                     |
|              |                     |               |              | NF442L2TVS416C       |                                                     |                                                                                                                 |
| 400 A        | 42                  | 480Y/277 3P4W | 120          | NF442L4TVS412        | N400M                                               | LAL/LHL<br>(Powerpact L F/A only)                                                                               |
|              |                     |               |              | NF442L4TVS412C       |                                                     |                                                                                                                 |
| 400 A        | 42                  |               | 160          | NF442L4TVS416        |                                                     |                                                                                                                 |
|              |                     |               |              | NF442L4TVS416C       |                                                     |                                                                                                                 |

**NOTE:** Dry contacts standard.

**Copper Equipment Ground Bars**

Copper equivalents of our aluminum PK-GTA equipment ground bars are available. These copper ground bars accept #14-4 Cu only.

**Table 4.9: Copper Ground Bars for NF Panelboards (see the Digest, Section 9 for NQ copper ground bar kits)**

| Maximum Number of Circuits | Maximum Ampere Rating | Catalog No. |
|----------------------------|-----------------------|-------------|
| 12                         | 225                   | 8010302651  |
| 18                         | 225                   | 8010302652  |
| 23                         | 225                   | 8010302653  |
| 27                         | 400/600               | PK27GTACU   |



Catalog No.  
NC44SHR

**Field Installable I-Line™ Door Kits****Table 4.10: I-Line Door Kits**

| Panel Type            | Catalog No. [1] |
|-----------------------|-----------------|
| HCN                   | HCN52D ( )      |
|                       | HCN65D ( )      |
|                       | HCN74D ( )      |
|                       | HCN83D ( )      |
|                       | HCN92D ( )      |
| HCM                   | HCM48D ( )      |
|                       | HCM64D ( )      |
|                       | HCM73D ( )      |
|                       | HCM91D ( )      |
| HCP                   | HCW50D          |
|                       | HCW59D          |
|                       | HCW68D          |
|                       | HCW86D          |
| HCRU                  | HCW86D          |
| HCN/HCM Latch Bracket | 80104-908-50    |

- NOTE: HCRU door covers circuit breakers only, not entire box

[1] Add "S" for surface or "F" for flush in place of the parentheses.

## Type 1 Door-in-Door (Hinged) Trim Fronts

### Features

- Meets door-in-door specifications
- Provides continuous piano hinge
- Permits one-person maintenance

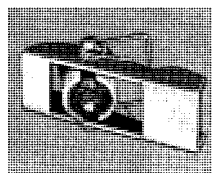
Table 4.11: Hinged Trim

| I-Line Fronts   | NQ and NF Fronts    |
|-----------------|---------------------|
| Catalog No. [2] | Catalog No. [2]/[3] |
| HC2652T( )HR    | NC26( )HR           |
| HC2665T( )HR    | NC32( )HR           |
| HC2674T( )HR    | NC38( )HR           |
| HC2683T( )HR    | NC44( )HR           |
| HC2692T( )HR    | NC50( )HR           |
| HC3248T( )HR    | NC56( )HR           |
| HC3264T( )HR    | NC62( )HR           |
| HC3273T( )HR    | NC68( )HR           |
| HC3291T( )HR    | NC74( )HR           |
| HC4250T( )HR    | NC80( )HR           |
| HC4259T( )HR    | NC86( )HR           |
| HC4268T( )HR    | NC50V( )HR          |
| HC4286T( )HR    | NC56V( )HR          |
| HC4486T( )HR    | NC62V( )HR          |
| —               | NC68V( )HR          |
| —               | NC74V( )HR          |
| —               | NC80V( )HR          |
| —               | NC86V( )HR          |

## Trim Clamps and Screws

Table 4.12: Trim Clamps and Screws

| Application                                                                                                                                                                                                                                                                                                                                                                                                                                        | Catalog No.                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| NQOD Panelboards:<br>Series E1 [1] 400 A and 600 A fronts<br>NEHB Panelboards:<br>Series E1 [1] 600 A fronts<br>I-Line Panelboards:<br>All Series E1 [1] fronts                                                                                                                                                                                                                                                                                    | LP9501                                                  |
| NQOD Panelboards:<br>All Series E1 [1] vented fronts and hinged fronts manufactured after July 1994.<br>NF Panelboards:<br>All vented fronts and hinged fronts.<br>NEHB Panelboards:<br>All Series E1 [1] hinged fronts manufactured after July 1994.<br>I-Line and QMB Panelboards:<br>I-Line front with door manufactured after July 1994 but before August 1997; and I-Line hinged fronts and QMB front with door manufactured after July 1994. | LP9502<br>(includes 8 trim screws and captive hardware) |
| NQ and NQOD Panelboards:<br>Screws for all fronts through 225 A.<br>NF Panelboards:<br>Screws for all fronts through 250 A.<br>I-Line Panelboards:<br>4-piece trim and trim with door manufactured after July 1997.<br>QMB Panelboards:<br>Screws for 4-piece covers.                                                                                                                                                                              | 4020513001K<br>(package of 10)                          |
| I-Line Panelboards:<br>Panelboard deadfront screws for 4-piece trim manufactured after July 1994 but before August 1997.                                                                                                                                                                                                                                                                                                                           | 8002506701                                              |



Catalog No  
LP9501

[2] Add "S" for surface or "F" for flush in place of the parentheses.  
[3] For welded metal directory, add "WMD" suffix to the end of the catalog number.  
[1] Panelboards that meet 1984 NEC® Wire Bending Space are Series E1.



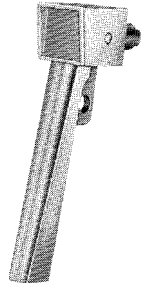
Catalog No. PK4FL and PD22FL



Catalog No. PK5FL



Catalog No. PK4NVL



Catalog No. 30007 11851

## Locks

Table 4.13: Locks—Type 1 Enclosures<sup>[2]</sup>

| Application                                                                                                                 | Catalog No.                             |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <b>NQOD, NQO, and NQOB Panelboards</b>                                                                                      |                                         |
| All fronts on enclosures up to and including 50-inch high and 53-inch through 68-inch high vented trims                     | PK4FL (Before 01/06/97)                 |
|                                                                                                                             | PK22FL (After 01/06/97 NQ or NQOD only) |
| All fronts on enclosures 56 inches high or higher, excluding 53-inch through 68-inch high vented fronts                     | PK5FL (Before 11/01/99)                 |
|                                                                                                                             | PK22FL (After 11/01/99 NQOD only)       |
| <b>NQ and NF Panelboards</b>                                                                                                |                                         |
| All fronts <sup>[3]</sup> <sup>[4]</sup> with the exception of those for use on panels using LC or LI main circuit breakers | PK22FL                                  |
| Fronts on enclosures 68 inches high or higher for panels using LC or LI main circuit breakers                               | PK5FL                                   |
| <b>I-Line Panelboards</b>                                                                                                   |                                         |
| HCN: Series 1 and 2 fronts on enclosures up to 54 inches high                                                               | PK4FL                                   |
| HCN: Series 1 and 2 fronts on enclosures 63 inches high or higher                                                           | PK5FL                                   |
| HCM: Series 1 and 2 fronts on 38-inch high enclosures                                                                       | PK4FL                                   |
| HCM: Series 1 and 2 fronts on enclosures 47 inches high or higher                                                           | PK5FL                                   |
| <b>I-Line Panelboards</b>                                                                                                   |                                         |
| HCW, HCWM: Series 1 and 2 fronts                                                                                            | PK5FL                                   |
| HCN: Series E1 <sup>[2]</sup> fronts on enclosures up to and including 74-inches high                                       | PK4FL (Before 11/14/97)                 |
|                                                                                                                             | PK22FL (After 11/14/97)                 |
| HCN: Series E1 <sup>[2]</sup> fronts on enclosures 83 inches high or higher                                                 | PK5FL (Before 04/05/02)                 |
|                                                                                                                             | PK22FL (After 04/05/02) <sup>[5]</sup>  |
| HCM: Series E1 <sup>[2]</sup> fronts on enclosures 64 inches high or higher                                                 | PK5FL (Before 11/14/97)                 |
|                                                                                                                             | PK22FL (After 11/14/97) <sup>[5]</sup>  |
| HCW, HCWM, HCWM-U, HCR-U: Series E1 <sup>[2]</sup> Front                                                                    | PK5FL                                   |
| <b>I-Line Panelboards (4-piece trim with door kit)</b>                                                                      |                                         |
| HCN: Series E1 <sup>[2]</sup> fronts on enclosures up to and including 74 inches high                                       | PK22FL                                  |
| HCN: Series E1 <sup>[2]</sup> fronts on enclosures 83 inches high or higher                                                 | PK5FL (Before 02/22/02)                 |
|                                                                                                                             | PK22FL (After 02/22/02) <sup>[5]</sup>  |
| HCM: Series E1 <sup>[2]</sup> fronts on enclosures 73 inches high or higher                                                 | PK22FL                                  |
| HCP, HCR-U: Series E1 <sup>[2]</sup> Front                                                                                  | PK5FL                                   |
| HCP-SU: Series E1 <sup>[2]</sup> Front and HCP-SU Hinged Front                                                              | PK22FL <sup>[5]</sup>                   |

● One NSR-251 key is included with each lock.

Table 4.14: Locks—Type 3R/12 Enclosures

| Application                                  | Catalog No.              |
|----------------------------------------------|--------------------------|
| NQOD, NQO, NQOB, NF all enclosures Series E1 | PK4NVL                   |
| NQ, NQOD, NF Series E2                       | 8011604350 (one handle)  |
|                                              | 8011604351 (two handles) |
| I-Line and QMB Series E1                     | PK4NVL                   |
| I-Line and QMB Series E2                     | 8012106350               |
| I-Line—Handle for padlocking Series 1 and 2  | 3000711851               |
| Stainless steel enclosures                   | HSEM-3PLH                |

## Keys

Table 4.15: Replacement Keys

| Application                                                     | Catalog No.  |
|-----------------------------------------------------------------|--------------|
| For use on all locks except those on stainless steel enclosures | LP9618       |
| Locks on stainless steel enclosures                             | 80106-456-01 |



Catalog No.  
LP9618

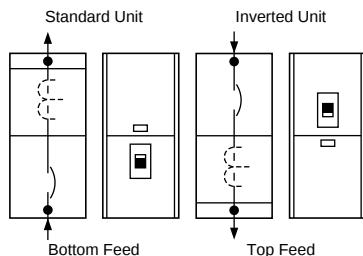
<sup>[2]</sup> Panelboards that meet 1984 NEC® Wire Bending Space are Series E1.  
<sup>[3]</sup> Fronts 56 inches or higher on 250 A maximum interior require two locks.  
<sup>[4]</sup> Front 74 inches or higher on 600 A maximum interior require two locks.  
<sup>[5]</sup> Fronts require two locks.



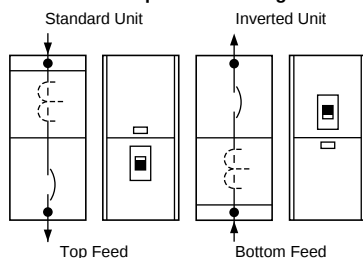
Standard Unit

Inverted Unit

**Cold Sequence Metering**



**Hot Sequence Metering**



**Main Circuit Breaker and Current Transformer Compartment**

**Service Entrance Equipment Hot or Cold Sequence Metering, Top or Bottom Feed, Indoor Construction at 600 Volts**

**General:** Suitable for use as service entrance equipment on AC systems. Listed by Underwriters' Laboratories.

**Service:** 1Ø3W, 3Ø3W, 3Ø4W, rated up to 600 Vac maximum.

**Metering:** [1] Current transformer compartment with provisions for installing bar type current transformers. For window type current transformers, order bus link kit from Table 4.16 Product Selection Table, page 4-11.

Standard unit is factory assembled for bottom feed cold sequence or top feed hot sequence metering applications. The unit is field convertible for bottom feed hot sequence or top feed cold sequence metering. Refer to instruction bulletin 80105-113-0x, *CTC Wall-Mounted Metering Equipment*, for field conversion details.

**Mains:** Main disconnects provided. 400-800 A: MJP. 1000-1200 A: PJP. Handle lock-off attachment provided for main circuit breaker as standard.

Refer to Digest pages 7-36—7-42 for field installable accessories.

**Enclosure:** Front accessible, totally enclosed, gray baked enamel finish. Available as indoor construction only. **Dimensions—78 in. H x 26 in. W x 14.3 in. D.**

- NOTE: Not EUSERC approved. For EUSERC approved Speed-D switchboards, see Digest pages 11-4 and 11-5.  
Service Applications

**Table 4.16: Product Selection Table** [2]

| System                                                                                 | Service Voltage (AC) | Ampere Rating of Main | Catalog Number            |
|----------------------------------------------------------------------------------------|----------------------|-----------------------|---------------------------|
| 1Ø3W, 3Ø3W, 3Ø4W                                                                       | 600 V Max.           | 400 A                 | <a href="#">CTC364CU</a>  |
|                                                                                        |                      | 600 A                 | <a href="#">CTC366CU</a>  |
|                                                                                        |                      | 800 A                 | <a href="#">CTC368CU</a>  |
|                                                                                        |                      | 1000 A                | <a href="#">CTC3610CU</a> |
|                                                                                        |                      | 1200 A                | <a href="#">CTC3612CU</a> |
| Bus link kit—used when installing window-type current transformers <a href="#">[3]</a> |                      |                       | SS4BLC                    |

**Table 4.17: Lug Table**

| Ampere Rating | Main Circuit Breaker Lug Wire Range [4] | Ground Lug                |
|---------------|-----------------------------------------|---------------------------|
| 400 A         | (3) 3/0–500 kcmil Al or Cu              | #6 AWG–300 kcmil Al or Cu |
| 600 A         | (3) 3/0–500 kcmil Al or Cu              |                           |
| 800 A         | (3) 3/0–500 kcmil Al or Cu              |                           |
| 1000 A        | (4) 3/0–500 kcmil Al or Cu              |                           |
| 1200 A        | (4) 3/0–500 kcmil Al or Cu              |                           |

[1] Field conversion is the customer's responsibility, only the standard configuration is built by the factory.

[2] Must specify feed (top or bottom) and sequence (hot or cold) at the time of order.

[3] Kits required per 3Ø application:

400–600 A—Order one kit

800–1200 A—Order two kits

[4] CT bus lugs and neutral lugs are identical to the main circuit breaker lugs.

## Data Sheet for Panelboards to Retrofit Existing Enclosures

Distributor: \_\_\_\_\_  
 Job Name: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Panel Marking: \_\_\_\_\_

The following dimensions are necessary for quotation and production of a panel to fit an existing enclosure. Provide dimensions in inches only.

**Existing Flush-Mounted Enclosures**

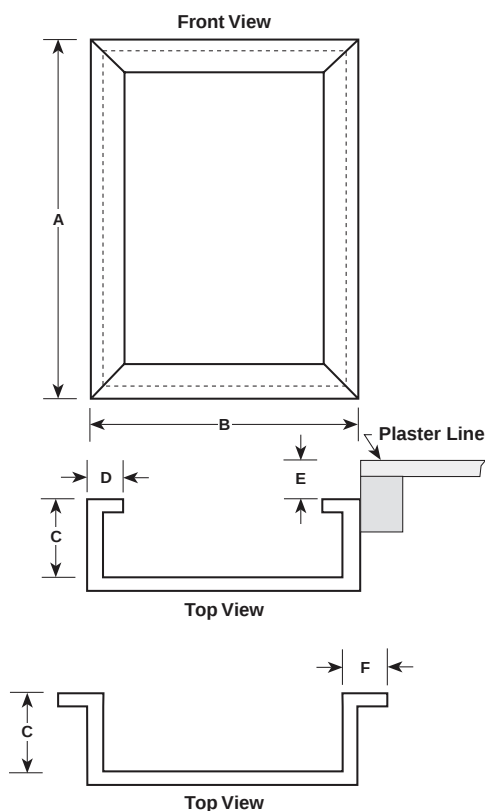
- Height dimension "A":
- Width dimension "B":
- Depth dimension "C":
- Flange width dimension "D":
- If enclosure is not flush with Plaster Line, dimension "E":

**Existing Surface-Mounted Enclosures**

- Height dimension "A":
- Width dimension "B":
- Depth dimension "C":
- Flange dimension may be either dimension "D" or "F" (select one)
  - Dimension "D":
  - Dimension "F": NOTE: Trims are furnished so that the interior must be centered within the enclosure.

If the enclosure is deeper than the standard panelboard enclosure for the required type of panelboard, *customer-supplied mounting brackets may be necessary to bring the interior out to the front of the enclosure.*

If interior requires a vented enclosure, contact your nearest Schneider Electric sales office for assistance.



Section 5

Switchboards



Power-Style™ Commercial Multi-Metering  
Switchboard Lineup

|                                                                      |            |
|----------------------------------------------------------------------|------------|
| <b>Power-Style™ Commercial Multi-Metering (CMM)<br/>Switchboards</b> | <b>5-2</b> |
| Replacement Parts                                                    | 5-2        |
| Meter Sockets, Covers, Hardware Kits                                 | 5-2        |
| Tenant Main Disconnects                                              | 5-3        |
| Class T Fusible Pullouts, CMM Pullout Heads                          | 5-3        |
| <b>Speed-D™ Switchboards</b>                                         | <b>5-4</b> |
| Service Selection                                                    | 5-4        |
| Merchandised Speed-D Switchboards                                    | 5-4        |

Frequently Asked Questions

FAQs

Visit the online FAQs page to find additional technical information covering all products including discontinued and obsolete products.  
<https://www.schneider-electric.us/en/faqs/home/>



EUSERC UCT,  
Single Main Circuit Breaker  
with I-Line Distribution Panel



EUSERC UCT,  
Fusible Multiple Mains

Speed-D™ Switchboards

## Meter Sockets, Covers, Hardware Kits

Meter socket kits include meter socket (ringless type or ring type—see tables below) and instruction bulletin. The connection cables from the line bus to the meter socket and from the meter socket to the tenant main disconnect are not included. These should be provided by the contractor.

**Table 5.1: EUSERC Meter Socket with Test Block Kit (Ring Type; Class 2756)**

| Voltage System                             | Poles | Description                          | Catalog No.  |          |
|--------------------------------------------|-------|--------------------------------------|--------------|----------|
|                                            |       |                                      | Single-Phase | 3-Phase  |
| 120/240 V, 208Y/120 V, or 240/120 V Delta  | AB    | Old design: plug on to line side bus | CM522ABE     | —        |
|                                            | AC    |                                      | CM522ACE     | —        |
|                                            | BC    |                                      | CM522BCE     | —        |
| 208Y/120 V, 240/120 V Delta, or 480Y/277 V | AC    | New design: lugs on line side        | CMLL522E     | —        |
|                                            | ABC   | Old design: plug on to line side bus | —            | CM732E   |
|                                            |       | New design: lugs on line side        | —            | CMLL732E |

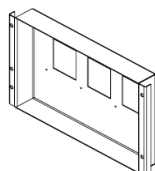
**Table 5.2: Lever Bypass Meter Socket (Ringless Type; Class 2755)**

| Voltage System | Poles | Description                          | Catalog No.  |            |
|----------------|-------|--------------------------------------|--------------|------------|
|                |       |                                      | Single-Phase | 3-Phase    |
| 480Y/277 V     | ABC   | Old design: plug on to line side bus | —            | 8024878850 |
|                |       | New design: lugs on line side        | —            | CMLL732    |

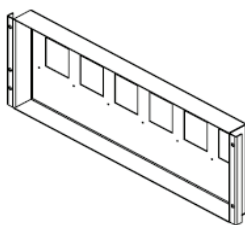
**Table 5.3: Cover and Hardware Kits**

| Description                                                                                     | Tenant Main Structure | Catalog No.  |
|-------------------------------------------------------------------------------------------------|-----------------------|--------------|
| <b>CMM Circuit Breaker Cover Kit [1]</b>                                                        |                       |              |
| Allows PowerPact™ H, J, and Q circuit breakers to be installed in legacy design CMM structures. | 3-Socket              | CM3BKRCVR    |
|                                                                                                 | 6-Socket              | CM6BKRCVR    |
| <b>CMM Meter Cover Kit for EUSERC Applications</b>                                              |                       |              |
| Includes meter cover, test block cover, and hardware.                                           | 3-Socket              | CM7CR20ER    |
|                                                                                                 | 6-Socket              | CM7CR32ER    |
| <b>CMM Meter Cover Kit for Lever Bypass Applications</b>                                        |                       |              |
| Meter socket cover                                                                              |                       | CM7CR20R [2] |
| Blank cover                                                                                     |                       | CM20BLK [2]  |
| <b>CMM Universal Hardware Kit</b>                                                               |                       |              |
| Required to add any tenant main disconnect.                                                     |                       | CMUHWKIT     |

For additional information or for custom applications, please contact your local Schneider Electric representative. Or, visit us on the web at [www.schneider-electric.us](http://www.schneider-electric.us).



CM3BKRCVR



CM6BKRCVR

[1] A new circuit breaker cover is required when adding a PowerPact Q, H, or J circuit breaker to a legacy design tenant metering structure. The new cover has larger openings to accommodate the padlock attachment for these circuit breakers.

[2] Order point: PDS.

Class 2755, 2756 / Refer to Catalogs 2755CT9501, and 2756CT9601

## Tenant Main Disconnects

Table 5.4: Circuit Breakers

| Ampacity                                                   | Catalog No.  | SCCR   |        | Load Lug Information    |
|------------------------------------------------------------|--------------|--------|--------|-------------------------|
|                                                            |              | 240 V  | 480 V  |                         |
| 100 A F-frame Circuit Breaker                              |              |        |        |                         |
| 60 A                                                       | FAL34060     | 25 kA  | 18 kA  | #12 - 1/0 AWG Al or Cu  |
| 70–100 A                                                   | FAL34xxx [3] |        |        |                         |
| 60 A                                                       | FHL36060     | 65 kA  | 25 kA  |                         |
| 70–100 A                                                   | FHL36xxx [3] |        |        |                         |
| Padlock Attachment                                         | HPAFK        | —      | —      | —                       |
| PowerPact™ Q-frame 250 A Circuit Breaker (240 Vac) [4] [5] |              |        |        |                         |
| 110–200 A                                                  | QDL32xxx [6] | 25 kA  | N/A    | #4 - 300 kcmil Al or Cu |
| 110–200 A                                                  | QGL32xxx [6] | 65 kA  | N/A    |                         |
| 110–200 A                                                  | QJL32xxx [6] | 100 kA | N/A    |                         |
| Padlock Attachment                                         | QBPAF        | —      | —      | —                       |
| PowerPact H-frame 150 A Circuit Breaker (600 Vac, 250 Vdc) |              |        |        |                         |
| 60 A                                                       | HDL36060     | 25 kA  | 18 kA  | #4 - 3/0 kcmil Al or Cu |
| 70–100 A                                                   | HDL36xxx [7] |        |        |                         |
| 110–150 A                                                  |              |        |        |                         |
| 60 A                                                       | HGL36060     | 65 kA  | 35 kA  |                         |
| 70–100 A                                                   | HGL36xxx [7] |        |        |                         |
| 110–150 A                                                  |              |        |        |                         |
| 60 A                                                       | HJL36060     | 100 kA | 65 kA  |                         |
| 70–100 A                                                   | HJL36xxx [7] |        |        |                         |
| 110–150 A                                                  |              |        |        |                         |
| 60 A                                                       | HLL36060     | 100 kA | 100 kA |                         |
| 70–100 A                                                   | HLL36xxx [7] |        |        |                         |
| 110–150 A                                                  |              |        |        |                         |
| Padlock Attachment                                         | S37422       | —      | —      | —                       |
| PowerPact J-frame 250 A Circuit Breaker (600 Vac, 250 Vdc) |              |        |        |                         |
| 175–200 A                                                  | JDL36xxx [8] | 25 kA  | 18 kA  | #4 - 300 kcmil Al or Cu |
| 175–200 A                                                  | JGL36xxx [8] | 65 kA  | 35 kA  |                         |
| 175–200 A                                                  | JJL36xxx [8] | 100 kA | 65 kA  |                         |
| 175–200 A                                                  | JLL36xxx [8] | 100 kA | 100 kA |                         |
| Padlock Attachment                                         | S37422       | —      | —      | —                       |

## Class T Fusible Pullouts, CMM Pullout Heads

Table 5.5: Class T Fusible Pullouts (Universal Hardware Kit CMUHWKIT Required)

| Ampacity | Catalog No. [9] | SCCR       |        | Wire Size Al or Cu  |
|----------|-----------------|------------|--------|---------------------|
|          |                 | 240 V [10] | 480 V  |                     |
| 100 A    | FTL3100         | 100 kA     | N/A    | #14 - 1/0 AWG       |
| 200 A    | FTL3200         | 100 kA     | N/A    | #4 - 250 kcmil      |
| 60 A     | FTL43060        | N/A        | 100 kA | #14 - #2            |
| 100 A    | FTL43100        | N/A        | 100 kA | #14 - 1/0 AWG       |
| 200 A    | FTL43200        | N/A        | 100 kA | 1/0 AWG - 300 kcmil |

Table 5.6: CMM Pullout Heads

| Mains                |            |       | Pullout Head<br>(No Base)<br>Catalog No. [11] |
|----------------------|------------|-------|-----------------------------------------------|
| Voltage System       | Rating (A) | Poles |                                               |
| 1Ø3W 120/240 V       | 100        | 3     | 4050707050 [12]                               |
| 3Ø4W 240/120 V Delta | 200        | 3     | 4050705950 [12]                               |
| 3Ø4W 208Y/120 V      | 60         | 3     | —                                             |
| 3Ø4W 480Y/277 V      | 100        | 3     | —                                             |
|                      | 200        | 3     | —                                             |

[3] To complete the catalog number for these PowerPact F-frame circuit breakers, replace xxx with the required ampacity (070, 080, 090, or 100).

[4] A shunt trip is not available on PowerPact Q-frame circuit breakers.

[5] A new circuit breaker cover is required when adding a PowerPact Q-, H-, or J-frame circuit breaker to an old-design tenant metering structure. This new cover has larger openings to accommodate the padlock attachment for these circuit breakers. See Table 5.3 Cover and Hardware Kits, page 5-2 for ordering information.

[6] To complete the catalog number for PowerPact Q-frame circuit breakers, replace xxx with the required ampacity (110, 125, 150, 175, or 200).

[7] To complete the catalog number for PowerPact H-frame circuit breakers, replace xxx with the required ampacity (070, 080, 090, 100, 110, 125, or 150).

[8] To complete the catalog number for PowerPact J-frame circuit breakers, replace xxx with the required ampacity (175 or 200).

[9] Discount schedules: FTL3100 and FTL3200 = DE5; FTL43060, FTL43100, and FTL43200 = PE1A.

[10] 240 V fusible pullouts cannot be used on a Lever Bypass CMM. Only 480 V pullouts can be used.

[11] Discount schedule: DE5.

[12] Order point: Lexington, KY.

## Merchandised Speed-D Switchboards

Table 5.7: Subfeed Circuit Breakers <sup>[1]</sup> <sup>[2]</sup>

| Description                                                                                                                                                                                                     | Rating (A) | 2-Pole <sup>[3]</sup> |             | 3-Pole      |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------|-------------|-------------|-----------|
|                                                                                                                                                                                                                 |            | Catalog No.           |             | Catalog No. |           |
|                                                                                                                                                                                                                 |            | Left                  | Right       | Left        | Right     |
| <b>Subfeed Circuit Breaker Kit—</b><br>Price includes circuit breaker, connectors and mounting hardware. The complete kit, mounting hardware, circuit breaker and connectors will be shipped direct from plant. | 100        | SASFB100L()           | SASFB100R() | SASFB100L   | SASFB100R |
|                                                                                                                                                                                                                 | 110        | SASFB110L()           | SASFB110R() | SASFB110L   | SASFB110R |
|                                                                                                                                                                                                                 | 125        | SASFB125L()           | SASFB100R() | SASFB125L   | SASFB125R |
|                                                                                                                                                                                                                 | 150        | SASFB150L()           | SASFB150R() | SASFB150L   | SASFB150R |
|                                                                                                                                                                                                                 | 175        | SASFB175L()           | SASFB175R() | SASFB175L   | SASFB175R |
|                                                                                                                                                                                                                 | 200        | SASFB200L()           | SASFB200R() | SASFB200L   | SASFB200R |
|                                                                                                                                                                                                                 | 225        | SASFB225L()           | SASFB225R() | SASFB225L   | SASFB225R |

<sup>[1]</sup> Cannot use subfeed circuit breaker kit with multiple mains service section switchboards.

<sup>[2]</sup> For use on all Speed-D switchboards except Series E4.

<sup>[3]</sup> Two pole circuit breaker catalog numbers are completed by adding required phase connection letters as suffix (for example, SASFB100LAC).

# Section 6

## Transformers

|                                                            |            |
|------------------------------------------------------------|------------|
| <b>Miscellaneous</b>                                       | <b>6-1</b> |
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| Type EO Transformers                                       | 6-7        |
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| Toroidal Current Transformers (110R, 110R, 120R, 140R)     | 6-10       |
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| Auxiliary Current Transformers                             | 6-14       |
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| Obsolete—January 1, 2016EE Watchdog Transformers           | 6-16       |
| Obsolete—January 1, 2016EE NL and NLP Series Transformers  | 6-17       |

Enclosure Dimensions and Accessories <sup>[1]</sup>

| Enclosure Number/Style |    | Height |      | Width |      | Depth |      | Mounting | Weather-shield | Wall Mounting Bracket | Ceiling Mounting Bracket | Insulation Class °C |
|------------------------|----|--------|------|-------|------|-------|------|----------|----------------|-----------------------|--------------------------|---------------------|
|                        |    | In.    | mm   | In.   | mm   | In.   | mm   |          |                |                       |                          |                     |
| 1                      | A  | 5.00   | 127  | 4.47  | 114  | 3.44  | 87   | Wall     | [2]            | [3]                   | —                        | 105                 |
| 2                      | A  | 5.50   | 140  | 4.47  | 114  | 3.44  | 87   | Wall     |                |                       | —                        | 105                 |
| 3                      | A  | 5.00   | 127  | 4.85  | 123  | 3.75  | 95   | Wall     |                |                       | —                        | 105                 |
| 4                      | A  | 5.50   | 140  | 5.23  | 133  | 4.06  | 103  | Wall     |                |                       | —                        | 130                 |
| 5                      | A  | 6.19   | 157  | 6.19  | 157  | 4.69  | 119  | Wall     |                |                       | —                        | 130                 |
| 6                      | A  | 6.69   | 170  | 6.19  | 157  | 4.69  | 119  | Wall     |                |                       | —                        | 180                 |
| 7                      | A  | 8.13   | 270  | 6.94  | 176  | 5.31  | 135  | Wall     |                |                       | —                        | 180                 |
| 8                      | A  | 8.25   | 210  | 8.68  | 220  | 6.56  | 167  | Wall     |                |                       | —                        | 180                 |
| 9                      | A  | 9.56   | 243  | 8.68  | 220  | 6.56  | 167  | Wall     |                |                       | —                        | 180                 |
| 10                     | A  | 10.50  | 267  | 8.62  | 219  | 6.50  | 165  | Wall     |                |                       | —                        | 180                 |
| 11                     | A  | 12.56  | 319  | 8.62  | 219  | 6.50  | 165  | Wall     |                |                       | —                        | 180                 |
| 12                     | C  | 13.50  | 343  | 14.75 | 375  | 9.00  | 229  | Wall     |                |                       | —                        | 180                 |
| 13                     | B  | 14.75  | 375  | 9.75  | 248  | 11.75 | 298  | Wall     |                |                       | —                        | 180                 |
| 14                     | C  | 14.75  | 375  | 19.10 | 485  | 12.25 | 311  | Wall     |                |                       | —                        | 180                 |
| 15                     | B  | 20.00  | 508  | 15.00 | 381  | 13.50 | 343  | Wall     |                |                       | —                        | 180                 |
| 16                     | C  | 22.00  | 559  | 25.00 | 635  | 13.50 | 343  | Wall     |                |                       | —                        | 180                 |
| 17                     | D  | 27.00  | 686  | 20.00 | 508  | 16.00 | 406  | Floor    | WS363          | WMB361362             | CMB363                   | 220                 |
|                        | E  | 27.00  | 686  | 20.00 | 508  | 16.00 | 406  | Floor    | [4]            | WMB361362             | CMB363                   | 220                 |
|                        | H  | 37.00  | 940  | 20.00 | 508  | 16.00 | 406  | Floor    | WS363          | WMB361362             | CMB363                   | 220                 |
| 18                     | D  | 30.00  | 762  | 20.00 | 508  | 20.00 | 508  | Floor    | WS363          | WMB363364             | CMB363                   | 220                 |
|                        | E  | 30.00  | 762  | 20.00 | 508  | 20.00 | 508  | Floor    | [4]            | WMB363364             | CMB363                   | 220                 |
|                        | H  | 37.00  | 940  | 20.00 | 508  | 20.00 | 508  | Floor    | WS363          | WMB363364             | CMB363                   | 220                 |
| 19                     | D  | 30.00  | 762  | 30.00 | 762  | 20.00 | 508  | Floor    | WS364          | WMB363364             | CMB364                   | 220                 |
|                        | E  | 30.00  | 762  | 30.00 | 762  | 20.00 | 508  | Floor    | [4]            | WMB363364             | CMB364                   | 220                 |
|                        | H  | 37.00  | 940  | 30.00 | 762  | 20.00 | 508  | Floor    | WS364          | WMB363364             | CMB364                   | 220                 |
| 20                     | D  | 37.00  | 940  | 30.00 | 762  | 20.00 | 508  | Floor    | [4]            | WMB363364             | CMB364                   | 220                 |
|                        | E  | 37.00  | 940  | 30.00 | 762  | 20.00 | 508  | Floor    | WS364          | WMB363364             | CMB364                   | 220                 |
|                        | H  | 37.00  | 940  | 30.00 | 762  | 24.00 | 610  | Floor    | WS364          | —                     | CMB364                   | 220                 |
| 21                     | D  | 43.75  | 1111 | 32.00 | 813  | 27.00 | 686  | Floor    | WS380          | —                     | CMB380                   | 220                 |
|                        | E  | 43.75  | 1111 | 32.00 | 813  | 27.00 | 686  | Floor    | [4]            | —                     | CMB380                   | 220                 |
|                        | H  | 48     | 1219 | 48    | 1219 | 29.5  | 749  | Floor    | [5]            | —                     | —                        | 220                 |
| 24                     | D  | 49.5   | 1257 | 35    | 889  | 28.5  | 724  | Floor    | WS381          | —                     | CMB381                   | 220                 |
|                        | E  | 49.5   | 1257 | 35    | 889  | 28.5  | 724  | Floor    | Note 5         | —                     | CMB381                   | 220                 |
|                        | H  | 49.5   | 1257 | 41    | 1041 | 32    | 813  | Floor    | WS382          | —                     | —                        | 220                 |
| 25                     | D  | 49.5   | 1257 | 41    | 1041 | 32    | 813  | Floor    | [4]            | —                     | —                        | 220                 |
|                        | E  | 57.5   | 1461 | 41    | 1041 | 32    | 813  | Floor    | WS382          | —                     | —                        | 220                 |
|                        | H  | 60     | 1524 | 56    | 1422 | 36    | 914  | Floor    | WS370A         | —                     | —                        | 220                 |
| 28                     | D  | 60     | 1524 | 56    | 1422 | 36    | 914  | Floor    | [4]            | —                     | —                        | 220                 |
|                        | E  | 68     | 1727 | 56    | 1422 | 36    | 914  | Floor    | WS370A         | —                     | —                        | 220                 |
|                        | H  | 71     | 1803 | 48    | 1219 | 36    | 914  | Floor    | WS383          | —                     | —                        | 220                 |
| 30                     | D  | 71     | 1803 | 48    | 1219 | 36    | 914  | Floor    | [4]            | —                     | —                        | 220                 |
|                        | E  | 74     | 1880 | 56    | 1422 | 40.5  | 1029 | Floor    | WS384          | —                     | —                        | 220                 |
|                        | H  | 74     | 1880 | 56    | 1422 | 40.5  | 1029 | Floor    | [4]            | —                     | —                        | 220                 |
| 31                     | D  | 91.5   | 2388 | 56    | 1422 | 54    | 1372 | Floor    | [6]            | —                     | —                        | 220                 |
|                        | E  | 94     | 2388 | 72    | 1829 | 54    | 1372 | Floor    |                | —                     | —                        | 220                 |
|                        | H  | 94     | 2388 | 84    | 2134 | 54    | 1372 | Floor    |                | —                     | —                        | 220                 |
| 32                     | F  | 94     | 2388 | 96    | 2438 | 54    | 1372 | Floor    |                | —                     | —                        | 220                 |
| 33                     | D  | 40.5   | 1031 | 36.5  | 916  | 21.75 | 553  | Floor    |                | —                     | —                        | 220                 |
| 34                     | D  | 51.5   | 1310 | 40.5  | 1031 | 26.5  | 674  | Floor    |                | —                     | —                        | 220                 |
| 35                     | D  | 66     | 1679 | 50.5  | 1285 | 32    | 814  | Floor    |                | —                     | —                        | 220                 |
| 36                     | F  | 90     | 2290 | 80    | 2036 | 50    | 1272 | Floor    |                | —                     | —                        | 220                 |
| 37                     | F  | 90     | 2290 | 90    | 2290 | 50    | 1272 | Floor    |                | —                     | —                        | 220                 |
| 38                     | F  | 100    | 2545 | 100   | 2545 | 60    | 1527 | Floor    |                | —                     | —                        | 220                 |
| 39                     | F  | 108    | 2748 | 108   | 2748 | 60    | 1527 | Floor    |                | —                     | —                        | 220                 |
| 40                     | F  | 90     | 2290 | 64    | 1628 | 44    | 1120 | Floor    |                | —                     | —                        | 220                 |
| 41                     | F  | 90     | 2290 | 72    | 1832 | 50    | 1272 | Floor    |                | —                     | —                        | 220                 |
| 42                     | D  | 80     | 2036 | 64    | 1628 | 44    | 1120 | Floor    |                | —                     | —                        | 220                 |
| 51                     | X  | 9.5    | 24   | 10    | 25   | 7.75  | 20   | Wall     | [7]            | [3]                   | —                        | 180                 |
|                        | X  | 12     | 30   | 13.75 | 35   | 13.75 | 35   | Wall     |                |                       | —                        | 180                 |
|                        | X  | 24     | 61   | 21.5  | 55   | 16.38 | 42   | Wall     |                |                       | —                        | 180                 |
|                        | X  | 23     | 58   | 25.5  | 65   | 13.75 | 35   | Wall     |                |                       | —                        | 180                 |
|                        | X  | 31.5   | 80   | 31.5  | 80   | 16.25 | 41   | Wall     |                |                       | —                        | 180                 |
| 61                     | HX |        |      |       |      |       |      |          |                |                       |                          |                     |
| 62                     | HX |        |      |       |      |       |      |          |                |                       |                          |                     |
| 63                     | HX |        |      |       |      |       |      |          |                |                       |                          |                     |

Contact your local Schneider Electric representative for details.

**NOTE:** Wall mounting brackets are used with units weighing no more than 700 lbs.  
 Ceiling mounting brackets are used with units weighing no more than 1200 lbs.  
 Weathershields are available for units 600 Volts and below. For 2.4, 5, and 15 kV units suitable for outdoor use, contact the factory.

[1] These dimensions are not for construction. Contact your local Schneider Electric representative for certified prints.

[2] Transformer is NEMA Type 3R Standard. Weathershield not required for outdoor use.

[3] Wall mounting brackets are a standard part of transformer enclosure. Accessory not required.

[4] Indoor/outdoor enclosure standard. Weathershield not required.

[5] Indoor/outdoor enclosure standard. Weathershield not required.

[6] Special outdoor construction required for NEMA Type 3R applications. Contact your local Schneider Electric representative for details.

[7] Transformer is NEMA Type 4X Standard. Weathershield not required.

**Obsolete—October 1, 2015**

**K-Rated, Three-Phase (15–1000 kVA)**

K-rated transformers mitigate Triplen harmonics via a Delta-Wye configuration.

- Aluminum or copper windings
- Isolation transformer with electrostatic shield
- K-4 and K-13 levels

**Harmonic Mitigating, Three-Phase (15–1000 kVA)**

Harmonic Mitigating transformers mitigate Triplen harmonics via electromagnetic phase relations. They remove 5th and 7th harmonics when using dual devices with a 0° and a +30° phase shift. They further reduce 11th and 13th harmonics when a +15° or -15° shift is added to the dual devices. Available with:

- Aluminum or copper windings
- Isolation transformer

**NEMA Premium**

**Table 6.1: 480 V Delta Primary, 208Y/120 Secondary**

| kVA                                                                                               | Catalog No.      | Taps        | Weight (lbs) | Enclosure |
|---------------------------------------------------------------------------------------------------|------------------|-------------|--------------|-----------|
| <b>NP Series for Typical Non-Linear Load Service—K-9 Rated—Copper Windings; 130 °C Rise</b>       |                  |             |              |           |
| 15                                                                                                | EP15T3HNISCUNP   | 6–2.5% 2+4– | 310          | 17D       |
| 30                                                                                                | EP30T3HNISCUNP   | 6–2.5% 2+4– | 340          | 18D       |
| 45                                                                                                | EP45T3HNISCUNP   | 6–2.5% 2+4– | 418          | 20D       |
| 75                                                                                                | EP75T3HNISCUNP   | 6–2.5% 2+4– | 642          | 21D       |
| 112.5                                                                                             | EP112T3HNISCUNP  | 6–2.5% 2+4– | 725          | 22D       |
| 150                                                                                               | EP150T3HNISCUNP  | 6–2.5% 2+4– | 915          | 24D       |
| 225                                                                                               | EP225T3HNISCUNP  | 6–2.5% 2+4– | 1125         | 25D       |
| 300                                                                                               | EP300T3HNISCUNP  | 4–2.5% 2+2– | 1535         | 30D       |
| <b>NP Series for Typical Non-Linear Load Service—K-9 Rated—Copper Windings; 115 °C Rise</b>       |                  |             |              |           |
| 15                                                                                                | EP15T3HFISCUNP   | 6–2.5% 2+4– | 310          | 17D       |
| 30                                                                                                | EP30T3HFISCUNP   | 6–2.5% 2+4– | 340          | 18D       |
| 45                                                                                                | EP45T3HFISCUNP   | 6–2.5% 2+4– | 418          | 20D       |
| 75                                                                                                | EP75T3HFISCUNP   | 6–2.5% 2+4– | 642          | 20D       |
| 112.5                                                                                             | EP112T3HFISCUNP  | 6–2.5% 2+4– | 725          | 22D       |
| 150                                                                                               | EP150T3HFISCUNP  | 6–2.5% 2+4– | 915          | 24D       |
| 225                                                                                               | EP225T3HFISCUNP  | 6–2.5% 2+4– | 1125         | 25D       |
| 300                                                                                               | EP300T3HFISCUNP  | 4–2.5% 2+2– | 1535         | 25D       |
| <b>NLP Series for More Severe Non-Linear Load Service—K-13 Rated—Copper Windings; 150 °C Rise</b> |                  |             |              |           |
| 15                                                                                                | EP15T3HISCUNLP   | 6–2.5% 2+4– | 260          | 17D       |
| 30                                                                                                | EP30T3HISCUNLP   | 6–2.5% 2+4– | 430          | 18D       |
| 45                                                                                                | EP45T3HISCUNLP   | 6–2.5% 2+4– | 730          | 20D       |
| 75                                                                                                | EP75T3HISCUNLP   | 6–2.5% 2+4– | 640          | 20D       |
| 112.5                                                                                             | EP112T3HISCUNLP  | 6–2.5% 2+4– | 985          | 22D       |
| 150                                                                                               | EP150T3HISCUNLP  | 6–2.5% 2+4– | 1135         | 24D       |
| 225                                                                                               | EP225T3HISCUNLP  | 6–2.5% 2+4– | 1477         | 25D       |
| 300                                                                                               | EP300T68HISCUNLP | 4–2.5% 2+2– | 2650         | 30D       |

As a partner in the NEMA Premium Transformer Program, Schneider Electric has determined that this product meets the NEMA Premium Efficiency specifications for premium energy efficiency.



Obsolete—October 1, 2015



**Table 6.2: Harmonic Mitigating, 480 Primary to 208zz/120 Secondary; Copper Windings**

| kVA                     | Catalog No.     | Taps        | Weight (lbs) | Enclosure |
|-------------------------|-----------------|-------------|--------------|-----------|
| <b>0° Phase Shift</b>   |                 |             |              |           |
| 15                      | HM15T208HNCUEP  | 6-2.5% 2+4- | 310          | 17D       |
| 30                      | HM30T208HNCUEP  | 6-2.5% 2+4- | 340          | 17D       |
| 45                      | HM45T208HNCUEP  | 6-2.5% 2+4- | 418          | 18D       |
| 75                      | HM75T208HNCUEP  | 6-2.5% 2+4- | 642          | 20D       |
| 112.5                   | HM112T208HNCUEP | 6-2.5% 2+4- | 725          | 21D       |
| 150                     | HM150T208HNCUEP | 6-2.5% 2+4- | 915          | 22D       |
| 225                     | HM225T208HNCUEP | 6-2.5% 2+4- | 1125         | 24D       |
| 300                     | HM300T208HNCUEP | 6-2.5% 2+4- | 1535         | 25D       |
| <b>30° Phase Shift</b>  |                 |             |              |           |
| 15                      | HM15T255HNCUEP  | 3-5% 1+2-   | 310          | 17D       |
| 30                      | HM30T255HNCUEP  | 3-5% 1+2-   | 340          | 17D       |
| 45                      | HM45T255HNCUEP  | 3-5% 1+2-   | 418          | 18D       |
| 75                      | HM75T255HNCUEP  | 3-5% 1+2-   | 642          | 20D       |
| 112.5                   | HM112T255HNCUEP | 3-5% 1+2-   | 725          | 21D       |
| 150                     | HM150T255HNCUEP | 3-5% 1+2-   | 915          | 22D       |
| 225                     | HM225T255HNCUEP | 3-5% 1+2-   | 1125         | 24D       |
| 300                     | HM300T255HNCUEP | 3-5% 1+2-   | 1535         | 25D       |
| <b>+15° Phase Shift</b> |                 |             |              |           |
| 15                      | HM15T251HNCUEP  | 6-2.5% 2+4- | 310          | 17D       |
| 30                      | HM30T251HNCUEP  | 6-2.5% 2+4- | 340          | 17D       |
| 45                      | HM45T251HNCUEP  | 6-2.5% 2+4- | 418          | 18D       |
| 75                      | HM75T251HNCUEP  | 6-2.5% 2+4- | 642          | 20D       |
| 112.5                   | HM112T251HNCUEP | 6-2.5% 2+4- | 725          | 21D       |
| 150                     | HM150T251HNCUEP | 6-2.5% 2+4- | 915          | 22D       |
| 225                     | HM225T251HNCUEP | 6-2.5% 2+4- | 1125         | 24D       |
| 300                     | HM300T251HNCUEP | 6-2.5% 2+4- | 1535         | 25D       |
| <b>-15° Phase Shift</b> |                 |             |              |           |
| 15                      | HM15T259HNCUEP  | 6-2.5% 2+4- | 310          | 17D       |
| 30                      | HM30T259HNCUEP  | 6-2.5% 2+4- | 340          | 17D       |
| 45                      | HM45T259HNCUEP  | 6-2.5% 2+4- | 418          | 18D       |
| 75                      | HM75T259HNCUEP  | 6-2.5% 2+4- | 642          | 20D       |
| 112.5                   | HM112T259HNCUEP | 6-2.5% 2+4- | 725          | 21D       |
| 150                     | HM150T259HNCUEP | 6-2.5% 2+4- | 915          | 22D       |
| 225                     | HM225T259HNCUEP | 6-2.5% 2+4- | 1125         | 24D       |
| 300                     | HM300T259HNCUEP | 6-2.5% 2+4- | 1535         | 25D       |

Additional temperature rises are available; for part numbers, see the Schneider Electric Product Configurator.

## Drive Isolation Transformers

Special design considerations must be made for the requirements of both adjustable frequency and dc motor drive power isolation. Allowance for high surge, harmonic and offset currents are taken into account in the design of Square D™ brand drive isolation transformers. Drive isolation transformers are not shielded isolation transformers, but act to lessen transient generation into the supply power and act as a buffer for SCR current surges.

**Table 6.3: Three-Phase 60 Hz; Class B  
(IEEE Standard 597-1983); 460 V Delta Primary**

| kVA                                                    | Catalog No. | Full Capacity Taps | Weight (lbs) [1] | Enclosure [1][2] |
|--------------------------------------------------------|-------------|--------------------|------------------|------------------|
| 460 V Delta Primary, 460Y/265 V Secondary, 150 °C Rise |             |                    |                  |                  |
| 7.5                                                    | 7T145HDIT   | 2-5%1 + 1-         | 180              | 17D              |
| 11                                                     | 11T145HDIT  | 2-5%1 + 1-         | 180              | 17D              |
| 15                                                     | 15T145HDIT  | 2-5%1 + 1-         | 190              | 17D              |
| 20                                                     | 20T145HDIT  | 2-5%1 + 1-         | 210              | 17D              |
| 27                                                     | 27T145HDIT  | 2-5%1 + 1-         | 250              | 17D              |
| 34                                                     | 34T145HDIT  | 2-5%1 + 1-         | 295              | 18D              |
| 40                                                     | 40T145HDIT  | 2-5%1 + 1-         | 350              | 18D              |
| 51                                                     | 51T145HDIT  | 2-5%1 + 1-         | 445              | 20D              |
| 63                                                     | 63T145HDIT  | 2-5%1 + 1-         | 465              | 20D              |
| 75                                                     | 75T145HDIT  | 2-5%1 + 1-         | 550              | 20D              |
| 93                                                     | 93T145HDIT  | 2-5%1 + 1-         | 845              | 22D              |
| 118                                                    | 118T145HDIT | 2-5%1 + 1-         | 920              | 22D              |
| 145                                                    | 145T145HDIT | 2-5%1 + 1-         | 1025             | 22D              |
| 175                                                    | 175T145HDIT | 2-5%1 + 1-         | 1120             | 25D              |
| 220                                                    | 220T145HDIT | 2-5%1 + 1-         | 1200             | 25D              |
| 275                                                    | 275T145HDIT | 2-5%1 + 1-         | 1500             | 25D              |
| 330                                                    | 330T145HDIT | 2-5%1 + 1-         | 1390             | 25D              |
| 440                                                    | 440T145HDIT | 2-5%1 + 1-         | 2700             | 30D              |
| 550                                                    | 550T145HDIT | 2-5%1 + 1-         | 3800             | 30D              |
| 460 V Delta Primary, 230Y/132 V Secondary, 150 °C Rise |             |                    |                  |                  |
| 7.5                                                    | 7T144HDIT   | 2-5%1 + 1-         | 180              | 17D              |
| 11                                                     | 11T144HDIT  | 2-5%1 + 1-         | 180              | 17D              |
| 15                                                     | 15T144HDIT  | 2-5%1 + 1-         | 190              | 17D              |
| 20                                                     | 20T144HDIT  | 2-5%1 + 1-         | 210              | 17D              |
| 27                                                     | 27T144HDIT  | 2-5%1 + 1-         | 250              | 17D              |
| 34                                                     | 34T144HDIT  | 2-5%1 + 1-         | 295              | 18D              |
| 40                                                     | 40T144HDIT  | 2-5%1 + 1-         | 350              | 18D              |
| 51                                                     | 51T144HDIT  | 2-5%1 + 1-         | 445              | 20D              |
| 63                                                     | 63T144HDIT  | 2-5%1 + 1-         | 465              | 20D              |
| 75                                                     | 75T144HDIT  | 2-5%1 + 1-         | 550              | 20D              |
| 93                                                     | 93T144HDIT  | 2-5%1 + 1-         | 845              | 22D              |
| 118                                                    | 118T144HDIT | 2-5%1 + 1-         | 920              | 22D              |
| 145                                                    | 145T144HDIT | 2-5%1 + 1-         | 1025             | 22D              |
| 175                                                    | 175T144HDIT | 2-5%1 + 1-         | 1120             | 25D              |
| 220                                                    | 220T144HDIT | 2-5%1 + 1-         | 1200             | 25D              |
| 275                                                    | 275T144HDIT | 2-5%1 + 1-         | 1500             | 25D              |
| 330                                                    | 330T144HDIT | 2-5%1 + 1-         | 1390             | 25D              |
| 440                                                    | 440T144HDIT | 2-5%1 + 1-         | 2700             | 30D              |
| 550                                                    | 550T144HDIT | 2-5%1 + 1-         | 3800             | 30D              |

**Table 6.4: Three-Phase 60 Hz; Class B  
(IEEE Standard 597-1983); 230 V Delta Primary**

| kVA                                                    | Catalog No. | Full Capacity Taps | Weight (lbs) [1] | Enclosure [1][2] |
|--------------------------------------------------------|-------------|--------------------|------------------|------------------|
| 230 V Delta Primary, 460Y/265 V Secondary, 150 °C Rise |             |                    |                  |                  |
| 7.5                                                    | 7T143HDIT   | 2-5%1 + 1-         | 180              | 17D              |
| 11                                                     | 11T143HDIT  | 2-5%1 + 1-         | 180              | 17D              |
| 15                                                     | 15T143HDIT  | 2-5%1 + 1-         | 190              | 17D              |
| 20                                                     | 20T143HDIT  | 2-5%1 + 1-         | 210              | 17D              |
| 27                                                     | 27T143HDIT  | 2-5%1 + 1-         | 250              | 17D              |
| 34                                                     | 34T143HDIT  | 2-5%1 + 1-         | 295              | 18D              |
| 40                                                     | 40T143HDIT  | 2-5%1 + 1-         | 350              | 18D              |
| 51                                                     | 51T143HDIT  | 2-5%1 + 1-         | 445              | 20D              |
| 63                                                     | 63T143HDIT  | 2-5%1 + 1-         | 465              | 20D              |
| 75                                                     | 75T143HDIT  | 2-5%1 + 1-         | 550              | 20D              |
| 93                                                     | 93T143HDIT  | 2-5%1 + 1-         | 845              | 22D              |
| 118                                                    | 118T143HDIT | 2-5%1 + 1-         | 920              | 22D              |
| 145                                                    | 145T143HDIT | 2-5%1 + 1-         | 1025             | 22D              |
| 175                                                    | 175T143HDIT | 2-5%1 + 1-         | 1120             | 25D              |
| 220                                                    | 220T143HDIT | 2-5%1 + 1-         | 1200             | 25D              |
| 275                                                    | 275T143HDIT | 2-5%1 + 1-         | 1500             | 25D              |
| 330                                                    | 330T143HDIT | 2-5%1 + 1-         | 1390             | 25D              |
| 440                                                    | 440T143HDIT | 2-5%1 + 1-         | 2700             | 30D              |
| 550                                                    | 550T143HDIT | 2-5%1 + 1-         | 3800             | 30D              |
| 230 V Delta Primary, 230Y/132 V Secondary, 150 °C Rise |             |                    |                  |                  |
| 7.5                                                    | 7T142HDIT   | 2-5%1 + 1-         | 180              | 17D              |
| 11                                                     | 11T142HDIT  | 2-5%1 + 1-         | 180              | 17D              |
| 15                                                     | 15T142HDIT  | 2-5%1 + 1-         | 190              | 17D              |
| 20                                                     | 20T142HDIT  | 2-5%1 + 1-         | 210              | 17D              |
| 27                                                     | 27T142HDIT  | 2-5%1 + 1-         | 250              | 17D              |
| 34                                                     | 34T142HDIT  | 2-5%1 + 1-         | 295              | 18D              |
| 40                                                     | 40T142HDIT  | 2-5%1 + 1-         | 350              | 18D              |
| 51                                                     | 51T142HDIT  | 2-5%1 + 1-         | 445              | 20D              |
| 63                                                     | 63T142HDIT  | 2-5%1 + 1-         | 465              | 20D              |
| 75                                                     | 75T142HDIT  | 2-5%1 + 1-         | 550              | 20D              |
| 93                                                     | 93T142HDIT  | 2-5%1 + 1-         | 845              | 22D              |
| 118                                                    | 118T142HDIT | 2-5%1 + 1-         | 920              | 22D              |
| 145                                                    | 145T142HDIT | 2-5%1 + 1-         | 1025             | 22D              |
| 175                                                    | 175T142HDIT | 2-5%1 + 1-         | 1120             | 25D              |
| 220                                                    | 220T142HDIT | 2-5%1 + 1-         | 1200             | 25D              |
| 275                                                    | 275T142HDIT | 2-5%1 + 1-         | 1500             | 25D              |
| 330                                                    | 330T142HDIT | 2-5%1 + 1-         | 1390             | 25D              |
| 440                                                    | 440T142HDIT | 2-5%1 + 1-         | 2700             | 30D              |
| 550                                                    | 550T142HDIT | 2-5%1 + 1-         | 3800             | 30D              |

NOTE: Lugs are furnished by customer.

[1] Not for construction. Contact your nearest Schneider Electric sales office for certified prints.  
[2] For enclosure styles, see the dimensions table in Digest Section for Transformers.

## Open Core and Coil Transformers Designed for General Applications for 600 V and Below

Units are designed with 220 °C insulation, aluminum windings, top terminations, compact design to save space, and are UL component recognized for:

- Non-energy efficiency (less than 15 kVA)  
Single-phase 5–10 VA  
Three-phase 3–9 VA
- Energy efficiency (meets Table 4-2 of NEMA TP1–2002)  
Single-phase 15–75 kVA  
Three-phase 15–112.5 kVA

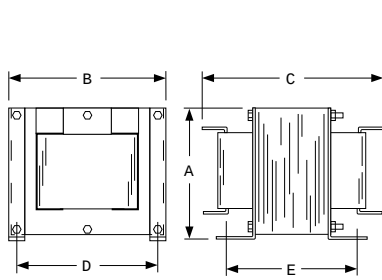


Figure 1

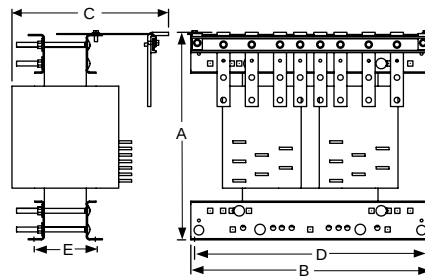


Figure 2

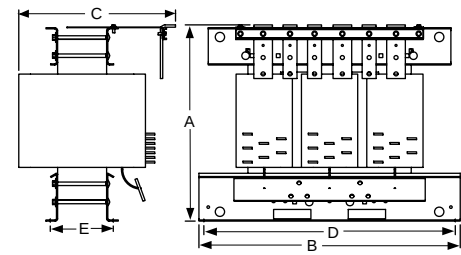


Figure 3

Table 6.5: Single-Phase Open Core and Coil Transformers—240 X 480 V Primary, 120/240 V Secondary, 60 Hz

| kVA  | Catalog No. | Deg. C Temp. Rise | Full Capacity Taps | Dimensions [3] |     |      |     |       |     |      |     |      |     | Weight (lbs) | Figure |
|------|-------------|-------------------|--------------------|----------------|-----|------|-----|-------|-----|------|-----|------|-----|--------------|--------|
|      |             |                   |                    | A              |     | B    |     | C     |     | D    |     | E[4] |     |              |        |
|      |             |                   |                    | in             | mm  | in   | mm  | in    | mm  | in   | mm  | in   | mm  |              |        |
| 5    | 5S1HFOC     | 115               | —                  | 8.00           | 203 | 9.00 | 229 | 11.00 | 279 | 8.00 | 203 | 8.00 | 203 | 66           | 1      |
| 7.5  | 7S1HFOC     | 115               | —                  | 8.00           | 203 | 9.00 | 229 | 14.25 | 362 | 8.00 | 203 | 8.50 | 216 | 80           | 1      |
| 10   | 10S1HFOC    | 115               | —                  | 20.50          | 521 | 18.5 | 470 | 14.00 | 356 | 17.0 | 432 | 4.25 | 108 | 140          | 2      |
| 15   | EE15S3HOC   | 150               | 6–2.5% 2+4–[5]     | 20.50          | 521 | 18.5 | 470 | 14.00 | 356 | 17.0 | 432 | 4.25 | 108 | 140          | 2      |
| 25   | EE25S3HOC   | 150               | 6–2.5% 2+4–[5]     | 20.25          | 514 | 18.5 | 470 | 14.00 | 356 | 17.0 | 432 | 5.00 | 127 | 200          | 2      |
| 37.5 | EE37S3HOC   | 150               | 6–2.5% 2+4–[5]     | 22.00          | 559 | 18.5 | 470 | 18.00 | 457 | 17.0 | 432 | 5.50 | 140 | 255          | 2      |
| 50   | EE50S3HOC   | 150               | 6–2.5% 2+4–[5]     | 22.00          | 559 | 18.5 | 470 | 18.00 | 457 | 17.0 | 432 | 6.50 | 165 | 310          | 2      |
| 75   | EE75S3HOC   | 150               | 6–2.5% 2+4–[5]     | 22.25          | 565 | 28.0 | 711 | 22.00 | 559 | 27.0 | 686 | 8.50 | 216 | 460          | 2      |

[3] Not for construction. Contact your nearest Schneider Electric sales office for certified prints.

[4] Dimensions may vary due to manufacturing process.

[5] When 240 V tap is used, there will be 3–5% taps, 1 above and 2 below.



**Table 6.6: Regulation Chart for Type EO Transformers**

| VA (60 Hz) | Secondary Voltage                |        |        |                                  |        |        |
|------------|----------------------------------|--------|--------|----------------------------------|--------|--------|
|            | Inrush UL VA at 20% Power Factor |        |        | Inrush UL VA at 40% Power Factor |        |        |
|            | 95%                              | 90%    | 85%    | 95%                              | 90%    | 85%    |
| 25         | 95                               | —      | 146    | 60                               | —      | 119    |
| 50         | 164                              | 213    | 277    | 123                              | 168    | 225    |
| 75         | 387                              | 487    | 622    | 284                              | 375    | 798    |
| 100        | 479                              | 606    | 770    | 346                              | 463    | 613    |
| 150        | 755                              | 1177   | 1532   | 567                              | 930    | 1252   |
| 200        | 1260                             | 1883   | 2419   | 910                              | 1462   | 1950   |
| 250        | 1530                             | 2327   | 2995   | 1115                             | 1811   | 2419   |
| 300        | 2030                             | 2981   | 3800   | 1455                             | 2290   | 3038   |
| 350        | 2920                             | 4586   | 5981   | 2180                             | 3637   | 4903   |
| 500        | 4230                             | 5984   | 7707   | 3120                             | 4661   | 6229   |
| 750        | 7430                             | 11460  | 14736  | 5380                             | 8907   | 11891  |
| 1000       | 10300                            | 16873  | 21734  | 7450                             | 13145  | 17571  |
| 1500       | 19200                            | 30042  | 39217  | 14500                            | 23859  | 32179  |
| 2000       | 27750                            | 45194  | 60022  | 21750                            | 36901  | 50994  |
| 3000       | 31800                            | 82333  | 108205 | 26750                            | 66072  | 89509  |
| 5000       | 86100                            | 148768 | 202077 | 72600                            | 126887 | 175552 |

## Type EO Transformers

Type EO units are designed with exceptional voltage regulation. These control transformers are constructed using traditional materials and manufacturing techniques, and are designed for 25–5000 VA with a 55 °C temperature rise. When exceptional regulation and very low temperature rise are an absolute necessity, choose Type EO units.

**Table 6.7: Type EO Transformer Dimensions**

| VA (60 Hz)                                                                                                    | Catalog Number<br>Class 9070 | A    |     | B    |     | C    |     | Weight |      |
|---------------------------------------------------------------------------------------------------------------|------------------------------|------|-----|------|-----|------|-----|--------|------|
|                                                                                                               |                              | IN   | mm  | IN   | mm  | IN   | mm  | lbs    | kg   |
| 220x440 V Primary, 110 V Secondary; 230x460 V Primary, 115 V Secondary; or 240x480 V Primary, 120 V Secondary |                              |      |     |      |     |      |     |        |      |
| 25                                                                                                            | 9070EO17D1                   | 3.31 | 84  | 3.00 | 76  | 2.50 | 64  | 1.9    | 0.9  |
| 50                                                                                                            | 9070EO1D1                    | 3.31 | 84  | 3.00 | 76  | 2.50 | 64  | 2.2    | 1.0  |
| 75                                                                                                            | 9070EO18D1                   | 3.78 | 96  | 3.38 | 86  | 2.81 | 71  | 3.5    | 1.6  |
| 100                                                                                                           | 9070EO2D1                    | 3.78 | 96  | 3.38 | 86  | 2.81 | 71  | 3.8    | 1.7  |
| 150                                                                                                           | 9070EO3D1                    | 4.44 | 113 | 3.75 | 95  | 3.13 | 80  | 6.0    | 2.7  |
| 200                                                                                                           | 9070EO19D1                   | 4.81 | 122 | 4.50 | 114 | 3.75 | 95  | 10.5   | 4.8  |
| 250                                                                                                           | 9070EO15D1                   | 5.19 | 132 | 4.50 | 114 | 3.75 | 95  | 13.2   | 6.0  |
| 300                                                                                                           | 9070EO04D1                   | 5.56 | 141 | 4.50 | 114 | 3.75 | 95  | 17.2   | 7.8  |
| 500                                                                                                           | 9070EO51D1                   | 6.56 | 167 | 5.25 | 133 | 4.38 | 111 | 24.5   | 11.1 |
| 750                                                                                                           | 9070EO61D1                   | 7.94 | 202 | 5.25 | 133 | 4.38 | 111 | 30.5   | 13.8 |
| 1000                                                                                                          | 9070EO71D1                   | 7.94 | 202 | 6.00 | 152 | 5.00 | 127 | 45.0   | 20.4 |
| 1500                                                                                                          | 9070EO81D1                   | 8.59 | 218 | 7.06 | 179 | 6.03 | 153 | 56.0   | 25.4 |
| 2000                                                                                                          | 9070EO91D1                   | 9.22 | 234 | 7.06 | 179 | 6.03 | 153 | 72.0   | 32.7 |
| 3000                                                                                                          | 9070EO10D1                   | 9.44 | 239 | 9.00 | 229 | 7.50 | 191 | 115.0  | 52.2 |
| 240x480 V Primary, 24 V Secondary                                                                             |                              |      |     |      |     |      |     |        |      |
| 25                                                                                                            | 9070EO17D2                   | 3.31 | 84  | 3.00 | 76  | 2.50 | 64  | 1.9    | 0.9  |
| 50                                                                                                            | 9070EO10D2                   | 3.31 | 84  | 3.00 | 76  | 2.50 | 64  | 2.2    | 1.0  |
| 75                                                                                                            | 9070EO18D2                   | 3.78 | 96  | 3.38 | 86  | 2.81 | 71  | 3.5    | 1.6  |
| 100                                                                                                           | 9070EO2D2                    | 3.78 | 96  | 3.38 | 86  | 2.81 | 71  | 3.8    | 1.7  |
| 250                                                                                                           | 9070EO16D2                   | 6.19 | 157 | 4.50 | 114 | 3.75 | 95  | 13.2   | 6.0  |
| 550 V Primary, 110 V Secondary; 575 V Primary, 115 V Secondary; or 600 V Primary, 120 V Secondary             |                              |      |     |      |     |      |     |        |      |
| 200                                                                                                           | 9070EO19D5                   | 5.56 | 141 | 4.50 | 114 | 3.75 | 95  | 10.5   | 4.8  |
| 300                                                                                                           | 9070EO04D5                   | 5.56 | 141 | 4.50 | 114 | 3.75 | 95  | 17.2   | 7.8  |
| 500                                                                                                           | 9070EO51D5                   | 6.56 | 167 | 5.25 | 133 | 4.38 | 111 | 24.5   | 11.1 |
| 750                                                                                                           | 9070EO61D5                   | 7.94 | 202 | 5.25 | 133 | 4.38 | 111 | 30.5   | 13.8 |

**Table 6.8: Regulation Chart for Type T Transformers**

| VA (60 Hz) | Secondary Voltage                |       |        |                                  |       |       |
|------------|----------------------------------|-------|--------|----------------------------------|-------|-------|
|            | Inrush UL VA at 20% Power Factor |       |        | Inrush UL VA at 40% Power Factor |       |       |
|            | 95%                              | 90%   | 85%    | 95%                              | 90%   | 85%   |
| 50         | 193                              | 266   | 339    | 151                              | 215   | 282   |
| 75         | 271                              | 396   | 500    | 210                              | 318   | 430   |
| 100        | 339                              | 499   | 659    | 266                              | 404   | 549   |
| 150        | 666                              | 893   | 1120   | 529                              | 731   | 942   |
| 200        | 588                              | 815   | 1041   | 459                              | 659   | 866   |
| 250        | 1416                             | 1910  | 2388   | 1057                             | 1494  | 1936  |
| 300        | 1634                             | 2184  | 2709   | 1194                             | 1681  | 2169  |
| 350        | 1894                             | 2592  | 3261   | 1392                             | 2005  | 2621  |
| 500        | 3197                             | 4104  | 4981   | 2374                             | 3195  | 4019  |
| 750        | 3770                             | 5515  | 7231   | 2887                             | 4391  | 5945  |
| 1000       | 6587                             | 9079  | 11430  | 4706                             | 6886  | 9051  |
| 1500       | 19324                            | 23983 | 28607  | 15066                            | 19361 | 23756 |
| 2000       | 31384                            | 38777 | 6161   | 24794                            | 31630 | 38667 |
| 3000       | 26539                            | 39934 | 52713  | 19355                            | 30721 | 42216 |
| 5000       | 53111                            | 85265 | 116277 | 39368                            | 66309 | 93882 |

## Type T and MultiTap™ Transformers

Type T transformers are designed with low impedance windings for excellent voltage regulation and can accommodate the high inrush current associated with contactors, starters, solenoids, and relays. As the most popular and complete line of control transformers with unmatched design innovations for top performance, Type Ts are manufactured using the most advanced insulating materials and are the best choice if size and cost are of concern. It is available in the MultiTap version, designed to respond to the increased need for voltage and stock flexibility. It combines multiple primary voltages with one or more secondary voltages, all in a single transformer.

### Selection Guide

1. Determine the inrush and sealed VA of each coil in the control circuit, and the VA of all other components.
2. Total the sealed VA of all operating coils and the VA of all other loads. (This determines the minimal VA size required for the circuit.)
3. Total the inrush VA of all coils that are starting at the same time, and all loads and coils that are running. (Use the regulation chart to give possible units to be used.)
4. Taking the VA size from step 2, go to the standard VA size in the chart. Make sure the inrush VA from the chart is greater than the total VA from step 3. (If not, go to the next larger VA size and repeat.)

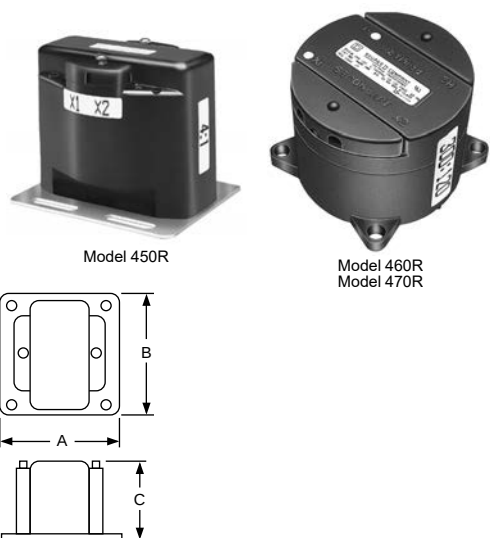
If your supply voltage is stable and fluctuates less than 5%, we recommend you use the 90% secondary voltage column. If your supply voltage is not stable and fluctuates more than 10%, we recommend you use the 95% secondary voltage column. We recommend that you never use the 85% secondary voltage column since magnetic devices lose life expectancy if they are continuously started at 85% of rated voltage.

**Table 6.9: Type T Transformer Selection**

| VA                                                                                                |      | Catalog No.  | H            | W            | D            | Weight (lbs) |
|---------------------------------------------------------------------------------------------------|------|--------------|--------------|--------------|--------------|--------------|
| UL/CSA/NOM                                                                                        | CE   |              | in (mm)      | in (mm)      | in (mm)      |              |
| 120 V Primary, 120 V Secondary; 115 V Primary, 115 V Secondary; or 110 V Primary, 110 V Secondary |      |              |              |              |              |              |
| 50                                                                                                | 50   | 9070T50D24   | 2.58 (65.5)  | 3.00 (76.2)  | 3.09 (78.5)  | 2.5          |
| 75                                                                                                | 75   | 9070T75D24   | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8          |
| 100                                                                                               | 100  | 9070T100D24  | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8          |
| 150                                                                                               | 150  | 9070T150D24  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5          |
| 200                                                                                               | 200  | 9070T200D24  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5          |
| 250                                                                                               | 160  | 9070T250D24  | 3.25 (82.6)  | 3.75 (95.3)  | 5.25 (133.4) | 7.1          |
| 300                                                                                               | 200  | 9070T300D24  | 3.80 (96.5)  | 4.50 (114.3) | 4.70 (119.4) | 8.5          |
| 350                                                                                               | 250  | 9070T350D24  | 3.80 (96.5)  | 4.50 (114.3) | 5.09 (129.3) | 10.5         |
| 500                                                                                               | 300  | 9070T500D24  | 3.80 (96.5)  | 4.50 (114.3) | 5.46 (138.7) | 11.9         |
| 750                                                                                               | 500  | 9070T750D24  | 4.43 (112.5) | 5.25 (133.4) | 5.66 (143.8) | 11.0         |
| 1000                                                                                              | 630  | 9070T1000D24 | 4.43 (112.5) | 5.25 (133.4) | 6.04 (153.4) | 20.6         |
| 1500                                                                                              | 1000 | 9070T1500D24 | 6.16 (156.5) | 7.06 (179.3) | 5.81 (147.6) | 34.0         |
| 2000                                                                                              | 1500 | 9070T2000D24 | 6.16 (156.5) | 7.06 (179.3) | 7.04 (178.8) | 47.0         |

Table 6.9 Type T Transformer Selection (cont'd.)

| VA                                                                                                                                    |      | Catalog No.  | H            | W            | D            | Weight<br>(lbs) |
|---------------------------------------------------------------------------------------------------------------------------------------|------|--------------|--------------|--------------|--------------|-----------------|
| UL/CSA/NOM                                                                                                                            | CE   |              | in (mm)      | in (mm)      | in (mm)      |                 |
| 3000                                                                                                                                  | 2000 | 9070T3000D24 | 8.46 (214.9) | 9.00 (228.6) | 6.86 (174.2) | 60.0            |
| 5000                                                                                                                                  | 3000 | 9070T5000D24 | 8.46 (214.9) | 9.00 (228.6) | 8.73 (221.7) | 89.0            |
| 120 V x 240 V Primary, 120/240 V Secondary; 115 V x 230 V Primary, 115/230 V Secondary; or 110 V x 220 V Primary, 110/220 V Secondary |      |              |              |              |              |                 |
| 50                                                                                                                                    | 50   | 9070T50D55   | 2.58 (65.5)  | 3.00 (76.2)  | 3.09 (78.5)  | 2.5             |
| 75                                                                                                                                    | 75   | 9070T75D55   | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 100                                                                                                                                   | 100  | 9070T100D55  | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 150                                                                                                                                   | 150  | 9070T150D55  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5             |
| 200                                                                                                                                   | 200  | 9070T200D55  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.20) | 5.5             |
| 250                                                                                                                                   | 160  | 9070T250D55  | 3.25 (82.6)  | 3.75 (95.3)  | 5.25 (133.4) | 7.1             |
| 300                                                                                                                                   | 200  | 9070T300D55  | 3.80 (96.5)  | 4.50 (114.3) | 4.70 (119.4) | 8.5             |
| 350                                                                                                                                   | 250  | 9070T350D55  | 3.80 (96.5)  | 4.50 (114.3) | 5.09 (129.3) | 10.5            |
| 500                                                                                                                                   | 300  | 9070T500D55  | 3.80 (96.5)  | 4.50 (114.3) | 5.46 (138.7) | 11.9            |
| 750                                                                                                                                   | 500  | 9070T750D55  | 4.43 (112.5) | 5.25 (133.4) | 5.66 (143.8) | 11.0            |
| 1000                                                                                                                                  | 630  | 9070T1000D55 | 4.43 (112.5) | 5.25 (133.4) | 6.04 (153.4) | 20.6            |
| 1500                                                                                                                                  | 1000 | 9070T1500D55 | 6.16 (156.5) | 7.06 (179.3) | 5.81 (147.6) | 34.0            |
| 2000                                                                                                                                  | 1500 | 9070T2000D55 | 6.16 (156.5) | 7.06 (179.3) | 7.04 (178.8) | 47.0            |
| 3000                                                                                                                                  | 2000 | 9070T3000D55 | 8.46 (214.9) | 9.00 (228.6) | 6.86 (174.2) | 60.0            |
| 5000                                                                                                                                  | 3000 | 9070T5000D55 | 8.46 (214.9) | 9.00 (228.6) | 8.73 (221.7) | 89.0            |
| 277 V Primary, 24 V Secondary                                                                                                         |      |              |              |              |              |                 |
| 50                                                                                                                                    | 50   | 9070T50D25   | 2.58 (65.5)  | 3.00 (76.2)  | 3.09 (78.5)  | 2.5             |
| 75                                                                                                                                    | 75   | 9070T75D25   | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 100                                                                                                                                   | 100  | 9070T100D25  | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 150                                                                                                                                   | 150  | 9070T150D25  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5             |
| 200                                                                                                                                   | 200  | 9070T200D25  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.20) | 5.5             |
| 250                                                                                                                                   | 160  | 9070T250D25  | 3.25 (82.6)  | 3.75 (95.3)  | 5.25 (133.4) | 7.1             |
| 300                                                                                                                                   | 200  | 9070T300D25  | 3.80 (96.5)  | 4.50 (114.3) | 4.70 (119.4) | 8.5             |
| 350                                                                                                                                   | 250  | 9070T350D25  | 3.80 (96.5)  | 4.50 (114.3) | 5.09 (129.3) | 10.5            |
| 500                                                                                                                                   | 300  | 9070T500D25  | 3.80 (96.5)  | 4.50 (114.3) | 5.46 (138.7) | 11.9            |
| 750                                                                                                                                   | 500  | 9070T750D25  | 4.43 (112.5) | 5.25 (133.4) | 5.66 (143.8) | 11.0            |
| 1000                                                                                                                                  | 630  | 9070T1000D25 | 4.43 (112.5) | 5.25 (133.4) | 6.04 (153.4) | 20.6            |
| 600 V Primary, 12/24 V Secondary                                                                                                      |      |              |              |              |              |                 |
| 50                                                                                                                                    | 50   | 9070T50D36   | 2.58 (65.5)  | 3.00 (76.2)  | 3.09 (78.5)  | 2.5             |
| 75                                                                                                                                    | 75   | 9070T75D36   | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 100                                                                                                                                   | 100  | 9070T100D36  | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 150                                                                                                                                   | 150  | 9070T150D36  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5             |
| 200                                                                                                                                   | 200  | 9070T200D36  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.20) | 5.5             |
| 250                                                                                                                                   | 160  | 9070T250D36  | 3.25 (82.6)  | 3.75 (95.3)  | 5.25 (133.4) | 7.1             |
| 300                                                                                                                                   | 200  | 9070T300D36  | 3.80 (96.5)  | 4.50 (114.3) | 4.70 (119.4) | 8.5             |
| 350                                                                                                                                   | 250  | 9070T350D36  | 3.80 (96.5)  | 4.50 (114.3) | 5.09 (129.3) | 10.5            |
| 500                                                                                                                                   | 300  | 9070T500D36  | 3.80 (96.5)  | 4.50 (114.3) | 5.46 (138.7) | 11.9            |
| 750                                                                                                                                   | 500  | 9070T750D36  | 4.43 (112.5) | 5.25 (133.4) | 5.66 (143.8) | 11.0            |
| 1000                                                                                                                                  | 630  | 9070T1000D36 | 4.43 (112.5) | 5.25 (133.4) | 6.04 (153.4) | 20.6            |
| 480 V Primary, 240 V Secondary; 460 V Primary, 230 V Secondary; or 440 V Primary, 220 V Secondary                                     |      |              |              |              |              |                 |
| 50                                                                                                                                    | 50   | 9070T50D12   | 2.58 (65.5)  | 3.00 (76.2)  | 3.09 (78.5)  | 2.5             |
| 75                                                                                                                                    | 75   | 9070T75D12   | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 100                                                                                                                                   | 100  | 9070T100D12  | 2.89 (73.4)  | 3.38 (85.8)  | 3.34 (84.8)  | 3.8             |
| 150                                                                                                                                   | 150  | 9070T150D12  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5             |
| 200                                                                                                                                   | 200  | 9070T200D12  | 3.20 (81.3)  | 3.75 (95.3)  | 3.59 (91.2)  | 5.5             |
| 250                                                                                                                                   | 160  | 9070T250D12  | 3.25 (82.6)  | 3.75 (95.3)  | 5.25 (133.4) | 7.1             |
| 300                                                                                                                                   | 200  | 9070T300D12  | 3.80 (96.5)  | 4.50 (114.3) | 4.70 (119.4) | 8.5             |
| 350                                                                                                                                   | 250  | 9070T350D12  | 3.80 (96.5)  | 4.50 (114.3) | 5.09 (129.3) | 10.5            |
| 500                                                                                                                                   | 300  | 9070T500D12  | 3.80 (96.5)  | 4.50 (114.3) | 5.46 (138.7) | 11.9            |
| 750                                                                                                                                   | 500  | 9070T750D12  | 4.43 (112.5) | 5.25 (133.4) | 5.66 (143.8) | 11.0            |
| 1000                                                                                                                                  | 630  | 9070T1000D12 | 4.43 (112.5) | 5.25 (133.4) | 6.04 (153.4) | 20.6            |
| 1500                                                                                                                                  | 1000 | 9070T1500D12 | 6.16 (156.5) | 7.06 (179.3) | 5.81 (147.6) | 34.0            |
| 2000                                                                                                                                  | 1500 | 9070T2000D12 | 6.16 (156.5) | 7.06 (179.3) | 7.04 (178.8) | 47.0            |
| 3000                                                                                                                                  | 2000 | 9070T3000D12 | 8.46 (214.9) | 9.00 (228.6) | 6.86 (174.2) | 60.0            |
| 5000                                                                                                                                  | 3000 | 9070T5000D12 | 8.46 (214.9) | 9.00 (228.6) | 8.73 (221.7) | 89.0            |



## Voltage Transformers

These voltage transformers are designed for line-to-line or line-to-ground connection on the primary voltage indicated. See [Table 6.10 Voltage Transformers, UR/cUR Recognized, 60 Hz](#), page 6-9 to determine the applicable configuration for proper system voltage indication.

- **Model 450R**—designed for switchboard use. This model features high accuracy and burden capacity for excellent performance in metering and indication.
- **Model 460R**—a compact, lightweight design, providing exceptional performance in indicating applications.
- **Model 470R**—a compact, low cost design optimized for maximum accuracy and performance when used with Powerlogic™ circuit monitors.

**Table 6.10: Voltage Transformers, UR/cUR Recognized, 60 Hz**

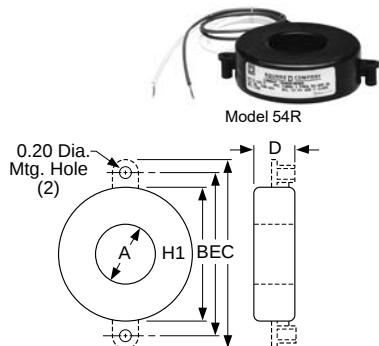
| Model 450R<br>Thermal Rating:<br>500 VA @ 30 °C;<br>300 VA @ 55 °C;<br>Accuracy 0.3W, X.M & Y:<br>1.2 Z | Model 460R<br>Thermal Rating:<br>150 VA @ 30 °C;<br>100 VA @ 55 °C;<br>Accuracy 0.6W, 1.2 X | Model 470R<br>Thermal Rating:<br>150 VA @ 30 °C;<br>100 VA @ 55 °C;<br>Accuracy 0.3W, 1.2 X | System<br>Voltage | Winding<br>Ratio |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------|------------------|
| Catalog Number                                                                                          | Catalog Number                                                                              | Catalog Number                                                                              |                   |                  |
| 450R069                                                                                                 | 460R069                                                                                     | 470R069                                                                                     | 69/120Y           | 0.58:1           |
| 450R120                                                                                                 | 460R120                                                                                     | 470R120                                                                                     | 120/208Y          | 1:1              |
| 450R208                                                                                                 | 460R208                                                                                     | 470R208                                                                                     | 120/208Y          | 1.73:1           |
| 450R240                                                                                                 | 460R240                                                                                     | 470R240                                                                                     | 240/416Y          | 2:1              |
| 450R288                                                                                                 | 460R288                                                                                     | 470R288                                                                                     | 288/500Y[1]       | 2.4:1            |
| 450R300                                                                                                 | 460R300                                                                                     | 470R300                                                                                     | 300/520Y          | 2.5:1            |
| 450R380                                                                                                 | 460R380                                                                                     | 470R380                                                                                     | 220/380Y          | 3.17:1           |
| 450R480                                                                                                 | 460R480                                                                                     | 470R480                                                                                     | 480/480Y[2]       | 4:1              |
| 450R600                                                                                                 | 460R600                                                                                     | 470R600                                                                                     | 600/600Y          | 5:1              |

| Model | Dimensions (inches) |       |       |
|-------|---------------------|-------|-------|
|       | A                   | B     | C     |
| 450R  | 6                   | 7-1/8 | 5-7/8 |
| 460R  | 4-3/4               | 4-1/2 | 3-7/8 |
| 470R  | 4-3/4               | 4-1/2 | 3-7/8 |

## Current Transformers

**Table 6.12: General Purpose Compact Units, UR/cUR Recognized**

| Window<br>Size<br>(inches) | Catalog Number<br>(without brackets) | Current<br>Rating<br>(Amperes) | VA 60<br>Hz | VA 400<br>Hz | Accuracy<br>(At Rated Current) | Rating<br>Factor<br>30 °C Ambient |
|----------------------------|--------------------------------------|--------------------------------|-------------|--------------|--------------------------------|-----------------------------------|
| 1-1/8                      | 2NR500                               | 50:5                           | 1.0         | 2.0          | = 2%                           | 1.0                               |
|                            | 2NR600                               | 60:5                           | 1.0         | 2.0          | = 2%                           | 1.0                               |
|                            | 2NR750                               | 75:5                           | 1.5         | 3.0          | = 2%                           | 1.0                               |
|                            | 2NR800                               | 80:5                           | 1.5         | 3.0          | = 2%                           | 1.0                               |
|                            | 2NR101                               | 100:5                          | 2.0         | 4.0          | = 1%                           | 1.0                               |
|                            | 2NR121                               | 120:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 2NR1250                              | 125:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 2NR151                               | 150:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 2NR201                               | 200:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 2NR251                               | 250:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 2NR301                               | 300:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
| 1-9/16                     | 5NR101                               | 100:5                          | 2.0         | 4.0          | = 1%                           | 1.0                               |
|                            | 5NR151                               | 150:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 5NR201                               | 200:5                          | 5.0         | 12.5         | = 1%                           | 1.0                               |
|                            | 5NR251                               | 250:5                          | 5.0         | 12.5         | = 1%                           | 1.0                               |
|                            | 5NR301                               | 300:5                          | 5.0         | 12.5         | = 1%                           | 1.0                               |
|                            | 5NR401                               | 400:5                          | 12.5        | 25.0         | = 1%                           | 1.0                               |
|                            | 5NR501                               | 500:5                          | 12.5        | 25.0         | = 1%                           | 1.0                               |
|                            | 5NR601                               | 600:5                          | 25.0        | 50.0         | = 1%                           | 1.0                               |
| 1-9/16                     | 54R101                               | 100:5                          | 2.0         | 4.0          | = 1%                           | 1.0                               |
|                            | 54R151                               | 150:5                          | 2.5         | 5.0          | = 1%                           | 1.0                               |
|                            | 54R201                               | 200:5                          | 5.0         | 12.5         | = 1%                           | 1.0                               |
|                            | 54R251                               | 250:5                          | 5.0         | 12.5         | = 1%                           | 1.0                               |
|                            | 54R301                               | 300:5                          | 5.0         | 12.5         | = 1%                           | 1.0                               |
|                            | 54R401                               | 400:5                          | 12.5        | 25.0         | = 1%                           | 1.0                               |
|                            | 54R501                               | 500:5                          | 12.5        | 25.0         | = 1%                           | 1.0                               |
|                            | 54R601                               | 600:5                          | 25.0        | 50.0         | = 1%                           | 1.0                               |
| 2-1/4                      | 7RL500                               | 50:5                           | 2.5         | 5.0          | = 1%                           | 1.5                               |
|                            | 7RL101                               | 100:5                          | 2.5         | 5.0          | = 1%                           | 1.5                               |
|                            | 7RL151                               | 150:5                          | 2.5         | 5.0          | = 1%                           | 1.5                               |
|                            | 7RL201                               | 200:5                          | 5.0         | 10.0         | = 1%                           | 1.5                               |
|                            | 7RL251                               | 250:5                          | 5.0         | 10.0         | = 1%                           | 1.5                               |
|                            | 7RL301                               | 300:5                          | 5.0         | 10.0         | = 1%                           | 1.5                               |
|                            | 7RL401                               | 400:5                          | 12.5        | 25.0         | = 1%                           | 1.5                               |
|                            | 7RL501                               | 500:5                          | 12.5        | 25.0         | = 1%                           | 1.5                               |
|                            | 7RL601                               | 600:5                          | 12.5        | 25.0         | = 1%                           | 1.5                               |
|                            | 7RL751                               | 750:5                          | 12.5        | 25.0         | = 1%                           | 1.5                               |
|                            | 7RL801                               | 800:5                          | 12.5        | 25.0         | = 1%                           | 1.5                               |
|                            | 7RL102                               | 1000:5                         | 25.0        | 50.0         | = 1%                           | 1.5                               |
|                            | 7RL122                               | 1200:5                         | 25.0        | 50.0         | = 1%                           | 1.5                               |
|                            | 7RL152                               | 1500:5                         | 25.0        | 50.0         | = 1%                           | 1.5                               |



**Table 6.11: Dimensions for Models 2NR, 5NR, 54R, and 7RL**

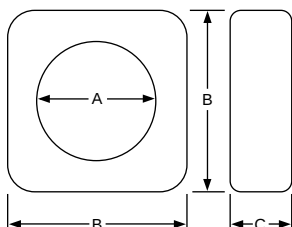
| Model | Dimensions (inches) |      |      |      |      |
|-------|---------------------|------|------|------|------|
|       | A                   | B    | C    | D    | E    |
| 2NR   | 1.13                | 2.38 | —    | .94  | —    |
| 5NR   | 1.56                | 3.50 | —    | 1.06 | —    |
| 54R   | 1.56                | 3.50 | 4.56 | 1.06 | 4.00 |
| 7RL   | 2.25                | 4.38 | —    | 1.38 | —    |

[1] For use on 277/480 Wye systems.  
[2] For use on 480 V Delta systems.

## Toroidal Current Transformers (64R, 74R, 66R, 76R)

Table 6.14: Toroidal Current Transformers, UR/cUR Recognized, 25–400 Hz

| Window Size (inches) | Catalog Number (without brackets) [3] | Current Rating (Amperes) | Relay Class | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|---------------------------------------|--------------------------|-------------|---------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                       |                          |             | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 1-15/16              | 64R101                                | 100:5                    | —           | 1.2                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 64R151                                | 150:5                    | —           | 1.2                                               | 1.2   | —     | —     | —     | 1.33                        |
|                      | 64R201                                | 200:5                    | —           | 1.2                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 64R251                                | 250:5                    | —           | 0.6                                               | 0.6   | 1.2   | —     | —     | 1.33                        |
|                      | 64R301                                | 300:5                    | —           | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 64R401                                | 400:5                    | —           | 0.3                                               | 0.6   | 0.6   | 1.2   | —     | 1.33                        |
|                      | 64R501                                | 500:5                    | —           | 0.3                                               | 0.3   | 0.6   | 0.6   | —     | 1.33                        |
|                      | 64R601                                | 600:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
| 1-15/16              | 66R751                                | 750:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 66R101                                | 100:5                    | —           | 1.2                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 66R151                                | 150:5                    | —           | 0.6                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 66R201                                | 200:5                    | C10         | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 66R251                                | 250:5                    | C10         | 0.3                                               | 0.6   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 66R301                                | 300:5                    | C10         | 0.3                                               | 0.3   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 66R401                                | 400:5                    | C10         | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 66R501                                | 500:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
| 2-11/32              | 66R601                                | 600:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 66R751                                | 750:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 74R201                                | 200:5                    | —           | 1.2                                               | 1.2   | 0.6   | —     | —     | 1.33                        |
|                      | 74R251                                | 250:5                    | —           | 1.2                                               | 1.2   | 0.6   | 1.2   | —     | 1.33                        |
|                      | 74R301                                | 300:5                    | —           | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 74R401                                | 400:5                    | —           | 0.3                                               | 0.3   | 0.6   | 1.2   | —     | 1.33                        |
|                      | 74R501                                | 500:5                    | —           | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 74R601                                | 600:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
| 2-11/32              | 74R751                                | 750:5                    | —           | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 74R801                                | 800:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 74R102                                | 1000:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 74R122                                | 1200:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 74R152                                | 1500:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.00                        |
|                      | 76R201                                | 200:5                    | C10         | 0.6                                               | 0.6   | 1.2   | 2.4   | 2.4   | 1.33                        |
|                      | 76R251                                | 250:5                    | C10         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.33                        |
|                      | 76R301                                | 300:5                    | C10         | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.33                        |
| 2-11/32              | 76R401                                | 400:5                    | C10         | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 76R501                                | 500:5                    | C10         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 76R601                                | 600:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 76R751                                | 750:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 76R801                                | 800:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 76R102                                | 1000:5                   | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 76R122                                | 1200:5                   | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 76R152                                | 1500:5                   | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.00                        |



Models 64R, 66R, 74R, 76R,

Table 6.13: Dimensions for 64R, 66R, 74R, and 76R

| Model | Dimensions (inches) |         |       |
|-------|---------------------|---------|-------|
|       | A                   | B       | C     |
| 64R   | 1-15/16             | 4-3/16  | 1-1/2 |
| 66R   | 1-15/16             | 4-3/16  | 31/16 |
| 74R   | 2-11/32             | 4-11/16 | 1-5/8 |
| 76R   | 2-11/32             | 4-11/16 | 3-1/4 |

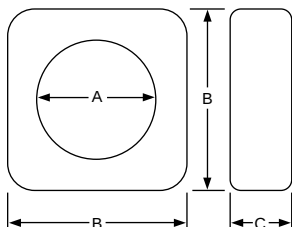
## Toroidal Current Transformers (110R, 120R, 140R)

Table 6.16: Toroidal Current Transformers, UR/cUR Recognized, 25–400 Hz

| Window Size (inches) | Catalog Number (without brackets) [3] | Current Rating (Amperes) | Relay Class | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|---------------------------------------|--------------------------|-------------|---------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                       |                          |             | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 4                    | 100R201                               | 200:5                    | C10         | 0.6                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 100R301                               | 300:5                    | C10         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.33                        |
|                      | 100R401                               | 400:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.33                        |
|                      | 100R501                               | 500:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 100R601                               | 600:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 100R801                               | 800:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 100R102                               | 1000:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 100R122                               | 1200:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 100R152                               | 1500:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 100R162                               | 1600:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 100R202                               | 2000:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
| 4                    | 110R201                               | 200:5                    | C20         | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 110R301                               | 300:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 110R401                               | 400:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 110R501                               | 500:5                    | C50         | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 110R601                               | 600:5                    | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 110R801                               | 800:5                    | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 110R102                               | 1000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 110R122                               | 1200:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 110R152                               | 1500:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 110R162                               | 1600:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 110R202                               | 2000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
| 5-3/4                | 120R201                               | 200:5                    | C10         | 1.2                                               | 2.4   | 2.4   | —     | —     | 1.33                        |
|                      | 120R301                               | 300:5                    | C10         | 0.6                                               | 1.2   | 2.4   | 2.4   | —     | 1.33                        |
|                      | 120R401                               | 400:5                    | C20         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.33                        |
|                      | 120R501                               | 500:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 120R601                               | 600:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 120R801                               | 800:5                    | C20         | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 120R102                               | 1000:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 120R122                               | 1200:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 120R152                               | 1500:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 120R162                               | 1600:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 120R202                               | 2000:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 120R252                               | 2500:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
| 5-3/4                | 120R302                               | 3000:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 120R402                               | 4000:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.00                        |



Models 100R, 110R, 120R, 140R



100R, 110R, 120R, and 140R

Table 6.15: Dimensions for 100R, 110R, 120R, and 140R

| Model | Dimensions (inches) |       |       |
|-------|---------------------|-------|-------|
|       | A                   | B     | C     |
| 100R  | 4                   | 7     | 2-1/8 |
| 110R  | 4                   | 7     | 2-7/8 |
| 120R  | 5-3/4               | 8-1/2 | 2-1/8 |
| 140R  | 8-1/8               | 11    | 3     |

[3] For mounting brackets, refer to [Bushing Current Transformers 50–400 Hz](#), page 6-14

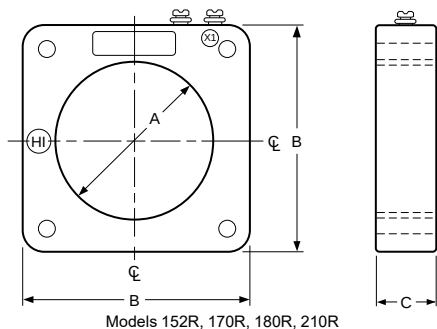
**Table 6.16 Toroidal Current Transformers, UR/cUR Recognized, 25–400 Hz (cont'd.)**

| Window Size (inches) | Catalog Number (without brackets) [4] | Current Rating (Amperes) | Relay Class | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|---------------------------------------|--------------------------|-------------|---------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                       |                          |             | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 8-1/8                | 140R500                               | 50:5                     | —           | For Ground Fault Sensing                          |       |       |       |       | 1.33                        |
|                      | 140R101                               | 100:5                    | —           |                                                   |       |       |       |       | 1.33                        |
| 8-1/8                | 140R401                               | 400:5                    | C20         | 0.6                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.33                        |
|                      | 140R501                               | 500:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.33                        |
|                      | 140R601                               | 600:5                    | C20         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 140R801                               | 800:5                    | C50         | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 140R102                               | 1000:5                   | C50         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 140R122                               | 1200:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 140R152                               | 1500:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 140R202                               | 2000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 140R252                               | 2500:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 140R302                               | 3000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 140R402                               | 4000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 140R502                               | 5000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.00                        |
|                      | 140R602                               | 6000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.00                        |

**Toroidal Current Transformers (152R, 170R, 180R, 210R)**

**Table 6.18: Toroidal Current Transformers, UR/cUR Recognized, 25–400 Hz**

| Window Size (inches) | Catalog Number (without brackets) [4] | Current Rating (Amperes) | Relay Class | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|---------------------------------------|--------------------------|-------------|---------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                       |                          |             | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 6-7/8                | 152R500                               | 50:5                     | C10         | 1.2                                               | —     | —     | —     | —     | 1.33                        |
|                      | 152R101                               | 100:5                    | C20         | 1.2                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 152R151                               | 150:5                    | C50         | 0.6                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 152R201                               | 200:5                    | C50         | 0.6                                               | 0.6   | 1.2   | 2.4   | 2.4   | 1.33                        |
|                      | 152R251                               | 250:5                    | C50         | 0.3                                               | 0.6   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 152R301                               | 300:5                    | C100        | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.33                        |
|                      | 152R401                               | 400:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 152R501                               | 500:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 152R601                               | 600:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 152R801                               | 800:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R102                               | 1000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R122                               | 1200:5                   | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R152                               | 1500:5                   | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R162                               | 1600:5                   | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
| 4-1/4                | 152R202                               | 2000:5                   | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R252                               | 2500:5                   | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R302                               | 3000:5                   | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 152R402                               | 4000:5                   | C800        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 170R201                               | 200:5                    | —           | 1.2                                               | 0.6   | 2.4   | —     | —     | 1.33                        |
|                      | 170R251                               | 250:5                    | —           | 0.6                                               | 0.6   | 2.4   | —     | —     | 1.33                        |
|                      | 170R301                               | 300:5                    | —           | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 170R401                               | 400:5                    | —           | 0.6                                               | 0.6   | 0.6   | 1.2   | —     | 1.33                        |
|                      | 170R501                               | 500:5                    | —           | 0.3                                               | 0.6   | 0.6   | 1.2   | —     | 1.33                        |
|                      | 170R601                               | 600:5                    | —           | 0.3                                               | 0.3   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 170R751                               | 750:5                    | C10         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 170R801                               | 800:5                    | C10         | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 170R102                               | 1000:5                   | C10         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 170R122                               | 1200:5                   | C10         | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
| 2-1/2                | 170R152                               | 1500:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 170R162                               | 1600:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 170R202                               | 2000:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 170R252                               | 2500:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 180R101                               | 100:5                    | —           | 2.4                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 180R151                               | 150:5                    | —           | 1.2                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 180R201                               | 200:5                    | —           | 1.2                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 180R251                               | 250:5                    | —           | 0.6                                               | 1.2   | 2.4   | 2.4   | —     | 1.33                        |
|                      | 180R301                               | 300:5                    | —           | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 180R401                               | 400:5                    | —           | 0.3                                               | 0.3   | 0.6   | 1.2   | 2.4   | 1.33                        |
|                      | 180R501                               | 500:5                    | —           | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 180R601                               | 600:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 180R751                               | 750:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 180R801                               | 800:5                    | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.33                        |
|                      | 180R102                               | 1000:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
| 2-1/2                | 180R122                               | 1200:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 180R152                               | 1500:5                   | —           | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 210R122                               | 1200:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 210R162                               | 1600:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 210R202                               | 2000:5                   | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 210R252                               | 2500:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
| 2-1/2                | 210R302                               | 3000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.0                         |
|                      | 210R402                               | 4000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.0                         |



Models 152R, 170R, 180R, 210R

**Table 6.17: Dimensions for Models 152R, 170R, 180R, and 210R**

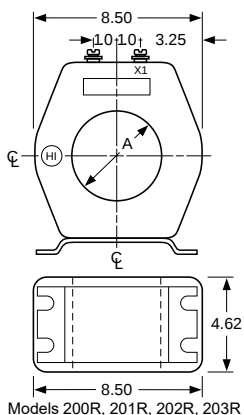
| Model | Dimensions (inches) |       |      |
|-------|---------------------|-------|------|
|       | A                   | B     | C    |
| 152R  | 6.88                | 12.25 | 4.12 |
| 170R  | 4.25                | 6.75  | 1.31 |
| 180R  | 2.50                | 4.50  | 2.12 |
| 210R  | 6.25                | 9.50  | 2.87 |

[4] For mounting brackets, refer to [Bushing Current Transformers 50–400 Hz](#), page 6-14

## Toroidal Current Transformers (200R, 201R, 202R, 203R)

Table 6.20: Toroidal Current Transformers, UR/cUR Recognized, 25–400 Hz

| Window Size (inches) | Catalog Number (without brackets) [6] | Current Rating (Amperes) | Relay Class | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|---------------------------------------|--------------------------|-------------|---------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                       |                          |             | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 2-1/2                | 200R101                               | 100:5                    | C50         | 0.6                                               | 1.2   | 1.2   | —     | —     | 1.5                         |
|                      | 200R151                               | 150:5                    | C50         | 0.3                                               | 0.6   | 0.6   | 1.2   | 2.4   | 1.5                         |
|                      | 200R201                               | 200:5                    | C100        | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.5                         |
|                      | 200R251                               | 250:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.5                         |
|                      | 200R301                               | 300:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.5                         |
|                      | 200R401                               | 400:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
| 3-1/2                | 200R501                               | 500:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 200R601                               | 600:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 201R101                               | 100:5                    | C20         | 1.2                                               | 1.2   | 2.4   | 2.4   | —     | 1.5                         |
|                      | 201R151                               | 150:5                    | C50         | 0.3                                               | 0.6   | 1.2   | 2.4   | 2.4   | 1.5                         |
|                      | 201R201                               | 200:5                    | C50         | 0.3                                               | 0.3   | 0.6   | 1.2   | 2.4   | 1.5                         |
|                      | 201R251                               | 250:5                    | C100        | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.5                         |
| 4-1/2                | 201R301                               | 300:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 1.5                         |
|                      | 201R401                               | 400:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.5                         |
|                      | 201R501                               | 500:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 201R601                               | 600:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 201R751                               | 750:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 201R801                               | 800:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
| 5-1/4                | 202R101                               | 100:5                    | C20         | 1.2                                               | 2.4   | 2.4   | —     | —     | 1.5                         |
|                      | 202R151                               | 150:5                    | C20         | 1.2                                               | 1.2   | 2.4   | 2.4   | —     | 1.5                         |
|                      | 202R201                               | 200:5                    | C50         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.5                         |
|                      | 202R251                               | 250:5                    | C50         | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.5                         |
|                      | 202R301                               | 300:5                    | C50         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.5                         |
|                      | 202R401                               | 400:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.5                         |
| 6-7/8                | 202R501                               | 500:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.8   | 1.5                         |
|                      | 202R601                               | 600:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 202R751                               | 750:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 202R801                               | 800:5                    | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 202R102                               | 1000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 203R101                               | 100:5                    | C20         | 1.2                                               | 2.4   | —     | —     | —     | 1.5                         |
| 7-1/2                | 203R151                               | 150:5                    | C20         | 0.6                                               | 1.2   | 2.4   | 2.4   | —     | 1.5                         |
|                      | 203R201                               | 200:5                    | C20         | 0.3                                               | 0.6   | 1.2   | 2.4   | 2.4   | 1.5                         |
|                      | 203R251                               | 250:5                    | C20         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.5                         |
|                      | 203R301                               | 300:5                    | C50         | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.5                         |
|                      | 203R401                               | 400:5                    | C50         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.5                         |
|                      | 203R501                               | 500:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.5                         |
| 8-1/2                | 203R601                               | 600:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.5                         |
|                      | 203R751                               | 750:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 203R801                               | 800:5                    | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 203R102                               | 1000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 203R122                               | 1200:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
|                      | 203R152                               | 1500:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                         |
| 9-1/2                | 203R162                               | 1600:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 203R202                               | 2000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 203R252                               | 2500:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 203R302                               | 3000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 203R402                               | 4000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |
|                      | 203R502                               | 5000:5                   | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.33                        |



Models 200R, 201R, 202R, 203R

Table 6.19: Dimensions for Models 200R, 201R, 202R, and 203R

| Model [5] | Dimensions A (inches) |
|-----------|-----------------------|
| 200R      | 2.50                  |
| 201R      | 3.50                  |
| 202R      | 4.50                  |
| 203R      | 5.25                  |

## Shorting Terminal Blocks

Table 6.21: Shorting Terminal Blocks

| Catalog No. | Description                      |
|-------------|----------------------------------|
| 3090TB4     | Shorting terminal block (4-pole) |
| 3090TB6     | Shorting terminal block (6-pole) |

## Multi-Ratio Current Transformers

Table 6.23: Multi-Ratio Transformers, UR/cUR Recognized 60 Hz-Model 312R, 25–400 Hz-Model 151R

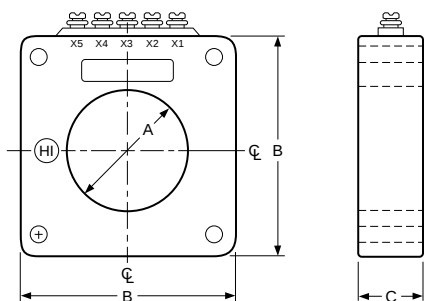
| Window Size (inches) | Catalog Number (without brackets) [6] | Current Rating [7] (Amperes) | Relay Class [8] | ANSI Accuracy Classification – 60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|---------------------------------------|------------------------------|-----------------|-----------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                       |                              |                 | B-0.1                                               | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 4-1/2                | 312R601                               | 600:5MR                      | C100            | —                                                   | —     | —     | —     | —     | 1.5                         |
|                      | 312R122                               | 1200:5MR                     | C200            | —                                                   | —     | —     | —     | —     | 1.5                         |
|                      | 312R202                               | 2000:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.5                         |
|                      | 312R302                               | 3000:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.5                         |
|                      | 312R402                               | 4000:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 151R601                               | 600:5MR                      | C200            | —                                                   | —     | —     | —     | —     | 1.33                        |
| 6-7/8                | 151R122                               | 1200:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 151R202                               | 2000:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 151R302                               | 3000:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 151R402                               | 4000:5MR                     | C800            | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 151R601                               | 600:5MR                      | C200            | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 151R122                               | 1200:5MR                     | C400            | —                                                   | —     | —     | —     | —     | 1.33                        |

Table 6.24: Multi-Ratio Taps (Models 151R, 312R, 781R, 786R)

| Nominal Ratio | Current Ratio [9] (Amperes)                      |
|---------------|--------------------------------------------------|
| 600:5         | 600/500/450/400/300/250/200/150/100/50:5         |
| 1200:5        | 1200/1000/900/800/600/500/400/300/200/100:5      |
| 2000:5        | 2000/1600/1500/1200/1100/800/500/400/300:5       |
| 3000:5        | 3000/2500/2200/2000/1500/1200/1000/800/500/300:5 |
| 4000:5        | 4000/3500/3000/2500/2000/1500/1000/500           |

Table 6.22: Dimensions for Models 151R and 312R

| Model | Dimensions (inches) |       |      |
|-------|---------------------|-------|------|
|       | A                   | B     | C    |
| 151R  | 6.88                | 12.25 | 4.12 |
| 312R  | 4.50                | 11.00 | 2.38 |



Models 151R, 312R

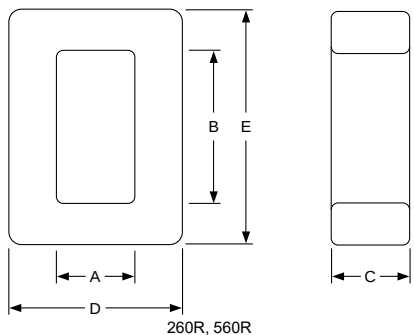
[5] Base is included.

[6] For mounting brackets, refer to [Bushings Current Transformers 50–400 Hz, page 6-14](#)

[7] For multi-ratio (MR) taps, refer to the Multi-Ratio Taps table.

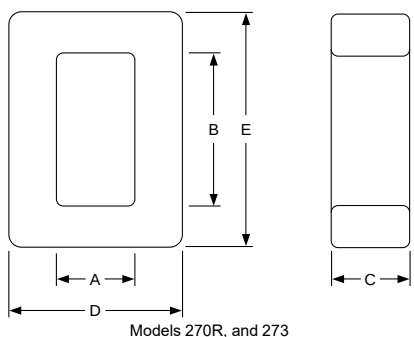
[8] Relay class applies to nominal ratio only.

[9] Taps in accordance with ANSI C57.13 and NEMA SG-4.



**Table 6.25: Dimensions for Models 260R, and 560R**

| Model | Dimensions (inches) |      |      |      |       |
|-------|---------------------|------|------|------|-------|
|       | A                   | B    | C    | D    | E     |
| 260R  | 2.13                | 4.25 | 2.12 | 4.88 | 7.25  |
| 560R  | 3.75                | 7.45 | 1.13 | 5.53 | 11.19 |



**Table 6.27: Dimensions for Models 270R, and 273**

| Model | Dimensions (inches) |      |      |      |       |
|-------|---------------------|------|------|------|-------|
|       | A                   | B    | C    | D    | E     |
| 270R  | 3.56                | 8.81 | 3.00 | 9.25 | 13.06 |
| 273   | 3.50                | 6.25 | 3.27 | 9.25 | 11.28 |

## Rectangular Window Current Transformers

**Table 6.26: Rectangular Window Transformers, UR/cUR Recognized, 50–400 Hz**

| Window Size (inches) | Catalog Number (without brackets) [10] | Current Rating (Amperes) | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|----------------------------------------|--------------------------|---------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                        |                          | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 2-1/8 x 4-1/4        | 260R101                                | 100:5                    | 1.2                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 260R151                                | 150:5                    | 1.2                                               | 2.4   | —     | —     | —     | 1.33                        |
|                      | 260R201                                | 200:5                    | 1.2                                               | 1.2   | —     | —     | —     | 1.33                        |
|                      | 260R301                                | 300:5                    | 0.6                                               | 0.6   | —     | —     | —     | 1.33                        |
|                      | 260R401                                | 400:5                    | 0.6                                               | 0.6   | —     | —     | —     | 1.33                        |
|                      | 260R601                                | 600:5                    | 0.3                                               | 0.3   | —     | —     | —     | 1.33                        |
|                      | 260R801                                | 800:5                    | 0.3                                               | 0.3   | —     | —     | —     | 1.33                        |
|                      | 260R122                                | 1200:5                   | 0.3                                               | 0.3   | —     | —     | —     | 1.33                        |
|                      | 260R162                                | 1600:5                   | 0.3                                               | 0.3   | —     | —     | —     | 1.33                        |
|                      | 260R202                                | 2000:5                   | 0.3                                               | 0.3   | —     | —     | —     | 1.33                        |
|                      | 260R252                                | 2500:5                   | 0.3                                               | 0.3   | —     | —     | —     | 1.0                         |
|                      | 260R302                                | 3000:5                   | 0.3                                               | 0.3   | —     | —     | —     | 1.0                         |
|                      | 260R402                                | 4000:5                   | 0.3                                               | 0.3   | —     | —     | —     | 1.0                         |
| 3-3/4 x 7-7/16       | 560R401                                | 400:5                    | 1.2                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 560R501                                | 500:5                    | 0.6                                               | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 560R601                                | 600:5                    | 0.6                                               | 0.6   | 1.2   | 2.4   | 2.4   | 1.33                        |
|                      | 560R751                                | 750:5                    | 0.6                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.33                        |
|                      | 560R801                                | 800:5                    | 0.6                                               | 0.6   | 1.2   | 1.2   | 2.4   | 1.33                        |
|                      | 560R102                                | 1000:5                   | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 1.33                        |
|                      | 560R122                                | 1200:5                   | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 1.33                        |
|                      | 560R152                                | 1500:5                   | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 560R162                                | 1600:5                   | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 560R202                                | 2000:5                   | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 1.33                        |
|                      | 560R252                                | 2500:5                   | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 560R302                                | 3000:5                   | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 560R322                                | 3200:5                   | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 560R402                                | 4000:5                   | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |
|                      | 560R502                                | 5000:5                   | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 1.33                        |

## Split-Core Current Transformers

**Table 6.28: Split-Core Transformers, Model 270R is UR/cUR Recognized, 60 Hz**

| Window Size (inches) | Catalog Number (without brackets) [10] | Current Rating (Amperes) | ANSI Accuracy Classification — 60 Hz Metering Class |       |       |       |       | Rating Factor 30 °C Ambient |
|----------------------|----------------------------------------|--------------------------|-----------------------------------------------------|-------|-------|-------|-------|-----------------------------|
|                      |                                        |                          | B-0.1                                               | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                             |
| 3-9/16 x 8-3/16      | 270R401                                | 400:5                    | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 270R501                                | 500:5                    | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 270R601                                | 600:5                    | —                                                   | —     | —     | —     | —     | 1.33                        |
| 3-9/16 x 8-3/16      | 270R801                                | 800:5                    | 1.2                                                 | 2.4   | —     | —     | —     | 1.33                        |
|                      | 270R102                                | 1000:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 270R122                                | 1200:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 270R152                                | 1500:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 270R162                                | 1600:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 270R202                                | 2000:5                   | 1.2                                                 | 1.2   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 270R252                                | 2500:5                   | 1.2                                                 | 1.2   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 270R302                                | 3000:5                   | 1.2                                                 | 1.2   | 1.2   | 1.2   | 2.4   | 1.0                         |
|                      | 270R402                                | 4000:5                   | 1.2                                                 | 1.2   | 1.2   | 1.2   | 1.2   | 1.0                         |
|                      | 270R502                                | 5000:5                   | 1.2                                                 | 1.2   | 1.2   | 1.2   | 1.2   | 1.0                         |
| 3-1/2 x 6-1/4        | 273201                                 | 200:5                    | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 273251                                 | 250:5                    | —                                                   | —     | —     | —     | —     | 1.33                        |
|                      | 273301                                 | 300:5                    | 2.4                                                 | —     | —     | —     | —     | 1.33                        |
|                      | 273401                                 | 400:5                    | 2.4                                                 | —     | —     | —     | —     | 1.33                        |
|                      | 273501                                 | 500:5                    | 2.4                                                 | —     | —     | —     | —     | 1.33                        |
|                      | 273601                                 | 600:5                    | 2.4                                                 | 2.4   | —     | —     | —     | 1.33                        |
|                      | 273801                                 | 800:5                    | 1.2                                                 | 2.4   | —     | —     | —     | 1.33                        |
|                      | 273102                                 | 1000:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 273122                                 | 1200:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 273162                                 | 1600:5                   | 1.2                                                 | 1.2   | 2.4   | —     | —     | 1.33                        |
|                      | 273202                                 | 2000:5                   | 1.2                                                 | 1.2   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 273252                                 | 2500:5                   | 1.2                                                 | 1.2   | 1.2   | 2.4   | —     | 1.33                        |
|                      | 273302                                 | 3000:5                   | 1.2                                                 | 1.2   | 1.2   | 1.2   | 2.4   | 1.00                        |
|                      | 273402                                 | 4000:5                   | 1.2                                                 | 1.2   | 1.2   | 1.2   | 1.2   | 1.00                        |

[10] For mounting brackets, refer to [Bushing Current Transformers 50–400 Hz](#), page 6-14

## Bushings Current Transformers 50–400 Hz

Table 6.31: Bushing Current Transformers

| Window Size (inches) | Catalog Number | Current Rating [11] (Amperes) | Relay Class | ANSI Accuracy Classification—60 Hz Metering Class |       |       |       |       | Rating Factor 30°C Ambient |
|----------------------|----------------|-------------------------------|-------------|---------------------------------------------------|-------|-------|-------|-------|----------------------------|
|                      |                |                               |             | B-0.1                                             | B-0.2 | B-0.5 | B-0.9 | B-1.8 |                            |
| 6-1/2                | 780R500        | 50:5                          | —           | —                                                 | —     | —     | —     | —     | 2.0                        |
|                      | 780R750        | 75:5                          | C10         | 1.2                                               | 2.4   | —     | —     | —     | 2.0                        |
|                      | 780R101        | 100:5                         | C10         | 2.4                                               | 2.4   | —     | —     | —     | 2.0                        |
|                      | 780R151        | 150:5                         | C20         | 0.6                                               | 1.2   | —     | —     | —     | 2.0                        |
|                      | 780R201        | 200:5                         | C20         | 0.6                                               | 1.2   | 2.4   | —     | —     | 2.0                        |
|                      | 780R251        | 250:5                         | C20         | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 2.0                        |
|                      | 780R301        | 300:5                         | C50         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 2.0                        |
|                      | 780R401        | 400:5                         | C50         | 0.3                                               | 0.3   | 0.6   | 1.2   | 1.2   | 2.0                        |
|                      | 780R501        | 500:5                         | C50         | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 2.0                        |
|                      | 780R601        | 600:5                         | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 2.0                        |
|                      | 780R751        | 750:5                         | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 2.0                        |
|                      | 780R801        | 800:5                         | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 2.0                        |
|                      | 780R102        | 1000:5                        | C100        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R122        | 1200:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R152        | 1500:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R162        | 1600:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R202        | 2000:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R252        | 2500:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R302        | 3000:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 780R402        | 4000:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                        |
| 6-1/2                | 781R601        | 600:5 MR                      | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 2.0                        |
|                      | 781R122        | 1200:5 MR                     | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 781R202        | 2000:5 MR                     | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 781R302        | 3000:5 MR                     | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 781R402        | 4000:5 MR                     | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                        |
| 6-1/2                | 785R500        | 50:5                          | C10         | 2.4                                               | 2.4   | —     | —     | —     | 2.0                        |
|                      | 785R750        | 75:5                          | C20         | 1.2                                               | 1.2   | —     | —     | —     | 2.0                        |
|                      | 785R101        | 100:5                         | C20         | 1.2                                               | 1.2   | 2.4   | —     | —     | 2.0                        |
|                      | 785R151        | 150:5                         | C50         | 0.6                                               | 0.6   | 1.2   | 2.4   | —     | 2.0                        |
|                      | 785R201        | 200:5                         | C50         | 0.6                                               | 0.6   | 1.2   | 2.4   | 2.4   | 2.0                        |
|                      | 785R251        | 250:5                         | C50         | 0.3                                               | 0.6   | 1.2   | 1.2   | 2.4   | 2.0                        |
|                      | 785R301        | 300:5                         | C100        | 0.3                                               | 0.3   | 0.6   | 0.6   | 1.2   | 2.0                        |
|                      | 785R401        | 400:5                         | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 1.2   | 2.0                        |
|                      | 785R501        | 500:5                         | C100        | 0.3                                               | 0.3   | 0.3   | 0.6   | 0.6   | 2.0                        |
|                      | 785R601        | 600:5                         | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.6   | 2.0                        |
|                      | 785R751        | 750:5                         | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R801        | 800:5                         | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R102        | 1000:5                        | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R122        | 1200:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R152        | 1500:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R162        | 1600:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R202        | 2000:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R252        | 2500:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R302        | 3000:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 785R402        | 4000:5                        | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                        |
| 6-1/2                | 786R601        | 600:5 MR                      | C200        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 786R122        | 1200:5 MR                     | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 786R202        | 2000:5 MR                     | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
|                      | 786R302        | 3000:5 MR                     | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 2.0                        |
| 6-1/2                | 786R402        | 4000:5 MR                     | C400        | 0.3                                               | 0.3   | 0.3   | 0.3   | 0.3   | 1.5                        |

Table 6.29: Dimensions for Models 780R, 781R, 785R, and 786R

| Model | T (inches) |
|-------|------------|
| 780R  | 3.38       |
| 781R  | 3.38       |
| 785R  | 6.75       |
| 786R  | 6.75       |

Table 6.30: Mounting Brackets

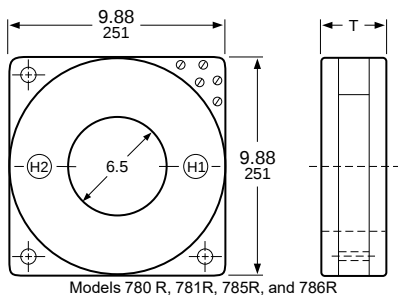
| Model | Bracket       |
|-------|---------------|
| 2NR   | MB1           |
| 5NR   | MB1           |
| 7RL   | MB7           |
| 54R   | Included      |
| 64R   | MB10          |
| 66R   | MB12          |
| 74R   | MB16          |
| 76R   | MB18          |
| 81X   | MB81          |
| 100R  | MB31          |
| 110R  | MB32          |
| 120R  | MB31          |
| 140R  | MB32          |
| 151R  | MB30          |
| 152R  | MB30          |
| 170R  | MB30          |
| 180R  | MB9           |
| 200R  | Included      |
| 201R  | Included      |
| 202R  | Included      |
| 203R  | Included      |
| 210R  | MB32          |
| 260R  | Not Available |
| 270R  | Not Available |
| 273   | Not Available |

## Auxiliary Current Transformers

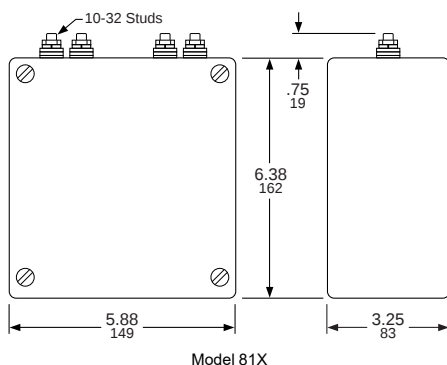
Table 6.32: Auxiliary Current Transformers

| Catalog Number (without brackets) | Ratio  |
|-----------------------------------|--------|
| 81X05000100                       | 5:1    |
| 81X05000200                       | 5:2    |
| 81X05000250                       | 5:2.5  |
| 81X05000500                       | 5:5    |
| 81X07500500                       | 7.5:5  |
| 81X10000500                       | 10:5   |
| 81X12500500                       | 12.5:5 |
| 81X15000500                       | 15:5   |

NOTE: Model 81X Accuracy 0.3B0.1, B0.2, B0.5@60 Hz, RF=1.5@30 °C



Models 780 R, 781R, 785R, and 786R



Model 81X

[11] For multi-ratio (MR) taps, refer to Table 6.24 Multi-Ratio Taps (Models 151R, 312R, 781R, 786R), page 6-12

**Obsolete—January 1, 2016**  
**Energy Efficient Three-Phase**

NOTE: International products—for export use only.

**Table 6.33: EE Three Phase; 60HZ; 208Y/120 Secondary; cULus Listed**

| kVA                                           | Catalog No. | Minimum Efficiency @ 35% 75° C | Full Capacity Taps | Degree C Temp. Rise | Insulation Class | %IZ  | Sound Level dB | Weight (lbs) | Enclosure |
|-----------------------------------------------|-------------|--------------------------------|--------------------|---------------------|------------------|------|----------------|--------------|-----------|
| <b>480 V Delta Primary, Aluminum Windings</b> |             |                                |                    |                     |                  |      |                |              |           |
| 15                                            | EE15T3H     | 97.0%                          | 6-2.5%2+4-         | 150                 | 220              | 5.1% | 45             | 220          | 17D       |
| 30                                            | EE30T3H     | 97.5%                          | 6-2.5%2+4-         | 150                 | 220              | 5.5% | 45             | 260          | 17D       |
| 45                                            | EE45T3H     | 97.7%                          | 6-2.5%2+4-         | 150                 | 220              | 6.0% | 45             | 368          | 18D       |
| 75                                            | EE75T3H     | 98.0%                          | 6-2.5%2+4-         | 150                 | 220              | 3.7% | 50             | 585          | 20D       |
| 112.5                                         | EE112T3H    | 98.2%                          | 6-2.5%2+4-         | 150                 | 220              | 5.2% | 50             | 620          | 21D       |
| 150                                           | EE150T3H    | 98.3%                          | 6-2.5%2+4-         | 150                 | 220              | 6.0% | 50             | 835          | 22D       |
| 225                                           | EE225T3H    | 98.5%                          | 6-2.5%2+4-         | 150                 | 220              | 6.5% | 55             | 1110         | 24D       |
| 300                                           | EE300T3H    | 98.6%                          | 6-2.5%2+4-         | 150                 | 220              | 5.9% | 55             | 1350         | 25D       |
| 500                                           | EE500T68H   | 98.7%                          | 4-2.5%2+2-         | 150                 | 220              | 6.1% | 60             | 1875         | 30D       |
| 750                                           | EE750T68H   | 98.8%                          | 4-2.5%2+2-         | 150                 | 220              | 5.4% | 64             | 2965         | 31D       |
| 1000                                          | EE1000T77H  | 98.9%                          | 2-5%1+1-           | 150                 | 220              | 5.7% | 64             | 5200         | 33F       |
| <b>600 V Delta Primary, Aluminum Windings</b> |             |                                |                    |                     |                  |      |                |              |           |
| 15                                            | EE15T65H    | 97.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.5% | 45             | 240          | 17D       |
| 30                                            | EE30T65H    | 97.5%                          | 6-2.5%2+4-         | 150                 | 220              | 5.9% | 45             | 290          | 17D       |
| 45                                            | EE45T65H    | 97.7%                          | 6-2.5%2+4-         | 150                 | 220              | 6.4% | 45             | 372          | 18D       |
| 75                                            | EE75T65H    | 98.0%                          | 6-2.5%2+4-         | 150                 | 220              | 3.6% | 50             | 585          | 20D       |
| 112.5                                         | EE112T65H   | 98.2%                          | 6-2.5%2+4-         | 150                 | 220              | 5.0% | 50             | 712          | 21D       |
| 150                                           | EE150T65H   | 98.3%                          | 6-2.5%2+4-         | 150                 | 220              | 3.7% | 50             | 790          | 22D       |
| 225                                           | EE225T65H   | 98.5%                          | 6-2.5%2+4-         | 150                 | 220              | 5.1% | 55             | 945          | 24D       |
| 300                                           | EE300T65H   | 98.6%                          | 6-2.5%2+4-         | 150                 | 220              | 5.6% | 55             | 1305         | 25D       |
| 500                                           | EE500T79H   | 98.7%                          | 4-2.5%2+2-         | 150                 | 220              | 6.0% | 60             | 1870         | 30D       |
| 750                                           | EE750T79H   | 98.8%                          | 4-2.5%2+2-         | 150                 | 220              | 5.4% | 64             | 2990         | 31D       |
| 1000                                          | EE1000T79H  | 98.9%                          | 4-2.5%2+2-         | 150                 | 220              | —    | 64             | 5800         | 33F       |
| <b>208 V Delta Primary, Aluminum Windings</b> |             |                                |                    |                     |                  |      |                |              |           |
| 15                                            | EE15T211H   | 97.0%                          | 3-5%1+2-           | 150                 | 220              | 5.1% | 45             | 210          | 17D       |
| 30                                            | EE30T211H   | 97.5%                          | 3-5%1+2-           | 150                 | 220              | 6.1% | 45             | 210          | 17D       |
| 45                                            | EE45T211H   | 97.7%                          | 3-5%1+2-           | 150                 | 220              | 5.7% | 45             | 374          | 18D       |
| 75                                            | EE75T211H   | 98.0%                          | 3-5%1+2-           | 150                 | 220              | 3.8% | 50             | 575          | 20D       |
| 112.5                                         | EE112T211H  | 98.2%                          | 3-5%1+2-           | 150                 | 220              | 5.3% | 50             | 604          | 21D       |
| 150                                           | EE150T211H  | 98.3%                          | 3-5%1+2-           | 150                 | 220              | 3.6% | 50             | 795          | 22D       |
| 225                                           | EE225T211H  | 98.5%                          | 3-5%1+2-           | 150                 | 220              | 4.9% | 55             | 1000         | 24D       |
| 300                                           | EE300T211H  | 98.6%                          | 3-5%1+2-           | 150                 | 220              | 5.2% | 55             | 1425         | 25D       |
| 500                                           | EE500T211H  | 98.7%                          | 3-5%1+2-           | 150                 | 220              | 6.2% | 60             | 1870         | 30D       |
| <b>240 V Delta Primary, Aluminum Windings</b> |             |                                |                    |                     |                  |      |                |              |           |
| 15                                            | EE15T67H    | 97.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.1% | 45             | 240          | 17D       |
| 30                                            | EE30T67H    | 97.5%                          | 6-2.5%2+4-         | 150                 | 220              | 6.2% | 45             | 260          | 17D       |
| 45                                            | EE45T67H    | 97.7%                          | 6-2.5%2+4-         | 150                 | 220              | 5.7% | 45             | 379          | 18D       |
| 75                                            | EE75T67H    | 98.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.2% | 50             | 590          | 20D       |
| 112.5                                         | EE112T67H   | 98.2%                          | 6-2.5%2+4-         | 150                 | 220              | 6.0% | 50             | 620          | 21D       |
| 150                                           | EE150T67H   | 98.3%                          | 6-2.5%2+4-         | 150                 | 220              | 3.3% | 50             | 805          | 22D       |
| 225                                           | EE225T67H   | 98.5%                          | 6-2.5%2+4-         | 150                 | 220              | 5.2% | 55             | 972          | 24D       |
| 300                                           | EE300T239H  | 98.6%                          | 3-5%1+2-           | 150                 | 220              | 5.4% | 55             | 1360         | 25D       |
| 500                                           | EE500T239H  | 98.7%                          | 3-5%1+2-           | 150                 | 220              | 6.3% | 60             | 1900         | 25D       |
| <b>480 V Delta Primary, Copper Windings</b>   |             |                                |                    |                     |                  |      |                |              |           |
| 15                                            | EE15T3HCU   | 97.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.6% | 45             | 310          | 17D       |
| 30                                            | EE30T3HCU   | 97.5%                          | 6-2.5%2+4-         | 150                 | 220              | 4.6% | 45             | 340          | 17D       |
| 45                                            | EE45T3HCU   | 97.7%                          | 6-2.5%2+4-         | 150                 | 220              | 4.4% | 45             | 418          | 18D       |
| 75                                            | EE75T3HCU   | 98.0%                          | 6-2.5%2+4-         | 150                 | 220              | 3.5% | 50             | 642          | 20D       |
| 112.5                                         | EE112T3HCU  | 98.2%                          | 6-2.5%2+4-         | 150                 | 220              | 3.9% | 50             | 725          | 21D       |
| 150                                           | EE150T3HCU  | 98.3%                          | 6-2.5%2+4-         | 150                 | 220              | 4.7% | 50             | 915          | 22D       |
| 225                                           | EE225T3HCU  | 98.5%                          | 6-2.5%2+4-         | 150                 | 220              | 3.8% | 55             | 1125         | 24D       |
| 300                                           | EE300T3HCU  | 98.6%                          | 6-2.5%2+4-         | 150                 | 220              | 4.8% | 55             | 1535         | 25D       |
| 500                                           | EE500T68HCU | 98.7%                          | 4-2.5%2+2-         | 150                 | 220              | 4.1% | 60             | 2350         | 30D       |
| 750                                           | EE750T68HCU | 98.8%                          | 4-2.5%2+2-         | 150                 | 220              | 4.7% | —              | 3485         | 31D       |

**Table 6.34: EE Three Phase; 60HZ; 480Y/277 Secondary; cULus Listed**

| kVA                                           | Catalog No. | Minimum Efficiency @ 35% 75° C | Full Capacity Taps | Degree C Temp. Rise | Insulation Class | %IZ  | Sound Level dB | Weight (lbs) | Enclosure | H            | W           | D           |
|-----------------------------------------------|-------------|--------------------------------|--------------------|---------------------|------------------|------|----------------|--------------|-----------|--------------|-------------|-------------|
| <b>208 V Delta Primary, Aluminum Windings</b> |             |                                |                    |                     |                  |      |                |              |           |              |             |             |
| 15                                            | EE15T212H   | 97.0%                          | 3-5%1+2-           | 150                 | 220              | 4.2% | 45             | 220          | 17D       | 27.00 / 686  | 20.00 / 508 | 16.00 / 406 |
| 30                                            | EE30T212H   | 97.5%                          | 3-5%1+2-           | 150                 | 220              | 6.5% | 45             | 260          | 17D       | 27.00 / 686  | 20.00 / 508 | 16.00 / 406 |
| 45                                            | EE45T212H   | 97.7%                          | 3-5%1+2-           | 150                 | 220              | 6.0% | 45             | 368          | 18D       | 30.00 / 762  | 20.00 / 508 | 20.00 / 508 |
| 75                                            | EE75T212H   | 98.0%                          | 3-5%1+2-           | 150                 | 220              | 6.9% | 50             | 585          | 20D       | 37.00 / 940  | 30.00 / 762 | 20.00 / 508 |
| 112.5                                         | EE112T212H  | 98.2%                          | 3-5%1+2-           | 150                 | 220              | 5.4% | 50             | 620          | 21D       | 37.00 / 940  | 30.00 / 762 | 24.00 / 610 |
| 150                                           | EE150T212H  | 98.3%                          | 3-5%1+2-           | 150                 | 220              | 6.4% | 50             | 835          | 22D       | 43.75 / 1111 | 32.00 / 813 | 27.00 / 686 |
| 225                                           | EE225T212H  | 98.5%                          | 3-5%1+2-           | 150                 | 220              | 4.7% | 55             | 1110         | 24D       | 49.5 / 1257  | 35 / 889    | 28.5 / 724  |
| 300                                           | EE300T212H  | 98.6%                          | 3-5%1+2-           | 150                 | 220              | 5.1% | 55             | 1350         | 25D       | 49.5 / 1257  | 41 / 1041   | 32 / 813    |
| 500                                           | EE500T212H  | 98.7%                          | 3-5%1+2-           | 150                 | 220              | 6.5% | 60             | 1875         | 30D       | 71 / 1803    | 48 / 1219   | 36 / 914    |
| <b>480 V Delta Primary, Aluminum Windings</b> |             |                                |                    |                     |                  |      |                |              |           |              |             |             |
| 15                                            | EE15T1814H  | 97.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.8% | 45             | 240          | 17D       | 27.00 / 686  | 20.00 / 508 | 16.00 / 406 |
| 30                                            | EE30T1814H  | 97.5%                          | 6-2.5%2+4-         | 150                 | 220              | 4.7% | 45             | 290          | 17D       | 27.00 / 686  | 20.00 / 508 | 16.00 / 406 |
| 45                                            | EE45T1814H  | 97.7%                          | 6-2.5%2+4-         | 150                 | 220              | 5.7% | 45             | 372          | 18D       | 30.00 / 762  | 20.00 / 508 | 20.00 / 508 |
| 75                                            | EE75T1814H  | 98.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.5% | 50             | 585          | 20D       | 37.00 / 940  | 30.00 / 762 | 20.00 / 508 |
| 112.5                                         | EE112T1814H | 98.2%                          | 6-2.5%2+4-         | 150                 | 220              | 5.1% | 50             | 712          | 21D       | 37.00 / 940  | 30.00 / 762 | 24.00 / 610 |
| 150                                           | EE150T1814H | 98.3%                          | 6-2.5%2+4-         | 150                 | 220              | 3.3% | 50             | 790          | 22D       | 43.75 / 1111 | 32.00 / 813 | 27.00 / 686 |
| 225                                           | EE225T1814H | 98.5%                          | 6-2.5%2+4-         | 150                 | 220              | 4.0% | 55             | 945          | 24D       | 49.5 / 1257  | 35 / 889    | 28.5 / 724  |
| 300                                           | EE300T1814H | 98.6%                          | 6-2.5%2+4-         | 150                 | 220              | 4.9% | 55             | 1305         | 25D       | 49.5 / 1257  | 41 / 1041   | 32 / 813    |
| 500                                           | EE500T76H   | 98.7%                          | 4-2.5%2+2-         | 150                 | 220              | 5.8% | 60             | 1870         | 30D       | 71 / 1803    | 48 / 1219   | 36 / 914    |

Obsolete—January 1, 2016

Table 6.35: EE Three Phase; 60HZ; 240 Delta Secondary; cULus Listed

| kVA                                                                                                                                                                                                                                                                                                                                                                   | Catalog No.   | Minimum Efficiency @ 35% 75° C | Full Capacity Taps | Degree C Temp. Rise | Insulation Class | %IZ  | Sound Level dB | Weight (lbs) | Enclosure |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------|--------------------|---------------------|------------------|------|----------------|--------------|-----------|
| <b>480 V Delta Primary, Aluminum Windings</b>                                                                                                                                                                                                                                                                                                                         |               |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                                                                                                                                                                                                                                                                                                    | EE15T6H       | 97.0%                          | 6-2.5%2+4-         | 150                 | 220              | 4.1% | 45             | 220          | 17D       |
| 30                                                                                                                                                                                                                                                                                                                                                                    | EE30T6H       | 97.5%                          | 6-2.5%2+4-         | 150                 | 220              | 5.6% | 45             | 260          | 17D       |
| 45                                                                                                                                                                                                                                                                                                                                                                    | EE45T6H       | 97.7%                          | 6-2.5%2+4-         | 150                 | 220              | 6.1% | 45             | 368          | 18D       |
| 75                                                                                                                                                                                                                                                                                                                                                                    | EE75T6H       | 98.0%                          | 6-2.5%2+4-         | 150                 | 220              | 3.9% | 50             | 585          | 20D       |
| 112.5                                                                                                                                                                                                                                                                                                                                                                 | EE112T6H      | 98.2%                          | 6-2.5%2+4-         | 150                 | 220              | 5.4% | 50             | 620          | 21D       |
| 150                                                                                                                                                                                                                                                                                                                                                                   | EE150T6H      | 98.3%                          | 6-2.5%2+4-         | 150                 | 220              | 3.9% | 50             | 835          | 22D       |
| 225                                                                                                                                                                                                                                                                                                                                                                   | EE225T6H      | 98.5%                          | 6-2.5%2+4-         | 150                 | 220              | 4.4% | 55             | 1110         | 24D       |
| 300                                                                                                                                                                                                                                                                                                                                                                   | EE300T6H      | 98.6%                          | 6-2.5%2+4-         | 150                 | 220              | 5.3% | 55             | 1350         | 25D       |
| 500                                                                                                                                                                                                                                                                                                                                                                   | EE500T63H     | 98.7%                          | 4-2.5%2+2-         | 150                 | 220              | 5.7% | 60             | 1875         | 30D       |
| 750                                                                                                                                                                                                                                                                                                                                                                   | EE750T63H     | 98.8%                          | 4-2.5%2+2-         | 150                 | 220              | 5.2% | 64             | 2965         | 31D       |
| 1000                                                                                                                                                                                                                                                                                                                                                                  | EE1000T78H    | 98.9%                          | 2-5%1+1-           | 150                 | 220              | 5.3% | 64             | 5200         | 33F       |
| <b>480 V Delta Primary, Aluminum Windings</b>                                                                                                                                                                                                                                                                                                                         |               |                                |                    |                     |                  |      |                |              |           |
| 240 Delta with 120 center taps have historically been limited to 5% capacity on the center tap. The new units from Schneider Electric offer greater limits on 120 V center tap. Limits are determined by the total transformer loading and the following formula used to size new 120 V center tap units: (240 V balanced loads) + 2.5 x (120 V loads) = kVA required |               |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                                                                                                                                                                                                                                                                                                    | EE15T151HCT   | 97.0%                          | 2-5%-              | 150                 | 220              | 5.3% | 45             | 220          | 17D       |
| 30                                                                                                                                                                                                                                                                                                                                                                    | EE30T151HCT   | 97.5%                          | 2-5%-              | 150                 | 220              | 5.6% | 45             | 295          | 17D       |
| 45                                                                                                                                                                                                                                                                                                                                                                    | EE45T151HCT   | 97.7%                          | 2-5%-              | 150                 | 220              | 5.7% | 45             | 385          | 18D       |
| 75                                                                                                                                                                                                                                                                                                                                                                    | EE75T151HCT   | 98.0%                          | 2-5%-              | 150                 | 220              | 4.7% | 50             | 590          | 19D       |
| 112.5                                                                                                                                                                                                                                                                                                                                                                 | EE112T151HCT  | 98.2%                          | 2-5%-              | 150                 | 220              | 4.3% | 50             | 635          | 21D       |
| 150                                                                                                                                                                                                                                                                                                                                                                   | EE150T151HCT  | 98.3%                          | 2-5%-              | 150                 | 220              | 3.1% | 50             | 783          | 22D       |
| 225                                                                                                                                                                                                                                                                                                                                                                   | EE225T151HCT  | 98.5%                          | 2-5%-              | 150                 | 220              | 3.8% | 55             | 1080         | 24D       |
| 300                                                                                                                                                                                                                                                                                                                                                                   | EE300T151HCT  | 98.6%                          | 2-5%-              | 150                 | 220              | 4.6% | 55             | 1355         | 25D       |
| 500                                                                                                                                                                                                                                                                                                                                                                   | EE500T151HCT  | 98.7%                          | 2-5%-              | 150                 | 220              | 5.1% | 60             | 2137         | 30D       |
| 750                                                                                                                                                                                                                                                                                                                                                                   | EE750T151HCT  | 98.8%                          | 2-5%-              | 150                 | 220              | 5.6% | 64             | 2982         | 31D       |
| 1000                                                                                                                                                                                                                                                                                                                                                                  | EE1000T151HCT | 98.9%                          | 2-5%-              | 150                 | 220              | —    | 64             | 5800         | 33F       |

Obsolete—January 1, 2016

EE Watchdog Transformers

NOTE: International products—for export use only.

Table 6.36: EE Three Phase Watchdog Transformers: 60HZ, cULus Listed

| kVA                                                               | Catalog No.  | Minimum Efficiency @ 35% 75° C | Full Capacity Taps | Degree C Temp. Rise | Insulation Class | %IZ  | Sound Level dB | Weight (lbs) | Enclosure |
|-------------------------------------------------------------------|--------------|--------------------------------|--------------------|---------------------|------------------|------|----------------|--------------|-----------|
| <b>480 V Delta Primary, 208Y/120 Secondary, Aluminum Windings</b> |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                | EE15T3HF     | 97.0%                          | 6-2.5%2+4-         | 115                 | 220              | 5.3% | 45             | 220          | 17D       |
| 30                                                                | EE30T3HF     | 97.5%                          | 6-2.5%2+4-         | 115                 | 220              | 5.3% | 45             | 368          | 18D       |
| 45                                                                | EE45T3HF     | 97.7%                          | 6-2.5%2+4-         | 115                 | 220              | 5.2% | 45             | 585          | 20D       |
| 75                                                                | EE75T3HF     | 98.0%                          | 6-2.5%2+4-         | 115                 | 220              | 6.3% | 50             | 620          | 21D       |
| 112.5                                                             | EE112T3HF    | 98.2%                          | 6-2.5%2+4-         | 115                 | 220              | 5.3% | 50             | 835          | 22D       |
| 150                                                               | EE150T3HF    | 98.3%                          | 6-2.5%2+4-         | 115                 | 220              | 5.1% | 50             | 980          | 24D       |
| 225                                                               | EE225T3HF    | 98.5%                          | 6-2.5%2+4-         | 115                 | 220              | 6.0% | 55             | 1349         | 25D       |
| 300                                                               | EE300T68HF   | 98.6%                          | 4-2.5%2+2-         | 115                 | 220              | 3.7% | 55             | 2050         | 30D       |
| 500                                                               | EE500T68HF   | 98.7%                          | 4-2.5%2+2-         | 115                 | 220              | 6.6% | 60             | 2330         | 30D       |
| <b>480 V Delta Primary, 208Y/120 Secondary, Copper Windings</b>   |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                | EE15T3HFCU   | 97.0%                          | 6-2.5%2+4-         | 115                 | 220              | 5.0% | 45             | 260          | 17D       |
| 30                                                                | EE30T3HFCU   | 97.5%                          | 6-2.5%2+4-         | 115                 | 220              | 2.8% | 45             | 420          | 18D       |
| 45                                                                | EE45T3HFCU   | 97.7%                          | 6-2.5%2+4-         | 115                 | 220              | 2.0% | 45             | 642          | 20D       |
| 75                                                                | EE75T3HFCU   | 98.0%                          | 6-2.5%2+4-         | 115                 | 220              | 3.4% | 50             | 675          | 21D       |
| 112.5                                                             | EE112T3HFCU  | 98.2%                          | 6-2.5%2+4-         | 115                 | 220              | 3.7% | 50             | 471          | 22D       |
| 150                                                               | EE150T3HFCU  | 98.3%                          | 6-2.5%2+4-         | 115                 | 220              | 2.5% | 50             | 1050         | 24D       |
| 225                                                               | EE225T3HFCU  | 98.5%                          | 6-2.5%2+4-         | 115                 | 220              | 3.8% | 55             | 1220         | 25D       |
| 300                                                               | EE300T68HFCU | 98.6%                          | 4-2.5%2+2-         | 115                 | 220              | 4.8% | 55             | 2300         | 30D       |
| 500                                                               | EE500T68HFCU | 98.7%                          | 4-2.5%2+2-         | 115                 | 220              | 4.1% | 60             | 2409         | 30D       |
| <b>480 V Delta Primary, 208Y/120 Secondary, Aluminum Windings</b> |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                | EE15T3HB     | 97.0%                          | 6-2.5%2+4-         | 80                  | 220              | 5.1% | 45             | 220          | 17D       |
| 30                                                                | EE30T3HB     | 97.5%                          | 6-2.5%2+4-         | 80                  | 220              | 3.7% | 45             | 368          | 18D       |
| 45                                                                | EE45T3HB     | 97.7%                          | 6-2.5%2+4-         | 80                  | 220              | 2.1% | 45             | 585          | 20D       |
| 75                                                                | EE75T3HB     | 98.0%                          | 6-2.5%2+4-         | 80                  | 220              | 3.3% | 50             | 620          | 21D       |
| 112.5                                                             | EE112T3HB    | 98.2%                          | 6-2.5%2+4-         | 80                  | 220              | 3.7% | 50             | 835          | 22D       |
| 150                                                               | EE150T3HB    | 98.3%                          | 6-2.5%2+4-         | 80                  | 220              | 3.1% | 50             | 980          | 24D       |
| 225                                                               | EE225T3HB    | 98.5%                          | 6-2.5%2+4-         | 80                  | 220              | 4.2% | 55             | 1349         | 25D       |
| 300                                                               | EE300T68HB   | 98.6%                          | 4-2.5%2+2-         | 80                  | 220              | 4.8% | 55             | 2400         | 30D       |
| 500                                                               | EE500T68HB   | 98.7%                          | 4-2.5%2+2-         | 80                  | 220              | 3.6% | 60             | 2964         | 30D       |
| <b>480 V Delta Primary, 208Y/120 Secondary, Copper Windings</b>   |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                | EE15T3HBCU   | 97.0%                          | 6-2.5%2+4-         | 80                  | 220              | 4.7% | 45             | 260          | 17D       |
| 30                                                                | EE30T3HBCU   | 97.5%                          | 6-2.5%2+4-         | 80                  | 220              | 2.7% | 45             | 418          | 18D       |
| 45                                                                | EE45T3HBCU   | 97.7%                          | 6-2.5%2+4-         | 80                  | 220              | 1.8% | 45             | 642          | 20D       |
| 75                                                                | EE75T3HBCU   | 98.0%                          | 6-2.5%2+4-         | 80                  | 220              | 2.5% | 50             | 725          | 21D       |
| 112.5                                                             | EE112T3HBCU  | 98.2%                          | 6-2.5%2+4-         | 80                  | 220              | 2.2% | 50             | 910          | 22D       |
| 150                                                               | EE150T3HBCU  | 98.3%                          | 6-2.5%2+4-         | 80                  | 220              | 2.3% | 50             | 1125         | 24D       |
| 225                                                               | EE225T3HBCU  | 98.5%                          | 6-2.5%2+4-         | 80                  | 220              | 3.6% | 55             | 1425         | 25D       |
| 300                                                               | EE300T68HBCU | 98.6%                          | 4-2.5%2+2-         | 80                  | 220              | 4.3% | 55             | 2400         | 30D       |
| 500                                                               | EE500T68HBCU | 98.7%                          | 4-2.5%2+2-         | 80                  | 220              | 5.0% | 60             | 2578         | 30D       |

**Obsolete—January 1, 2016**

**EE NL and NLP Series Transformers**

- International products—for export use only.
- Three-phase dry type transformers, 480 Delta to 208Y/120
- Aluminum or copper windings
- Electrostatic shield
- Class 220 insulation
- Double size neutral terminal for additional customer neutral cables
- Additional coil capacity to compensate for higher non-linear load loss
- cULus Listed

**Table 6.37: EE Three Phase; 60HZ; 480 V Delta Primary, 208Y/120 Secondary; cULus Listed**

| kVA                                                                                   | Catalog No.       | Minimum Efficiency @ 35% 75° C | Full Capacity Taps | Degree C Temp. Rise | Insulation Class | %IZ  | Sound Level dB | Weight (lbs) | Enclosure |
|---------------------------------------------------------------------------------------|-------------------|--------------------------------|--------------------|---------------------|------------------|------|----------------|--------------|-----------|
| <b>NL Series for Typical Non-Linear Load Services, K-4 Rated, Aluminum Windings</b>   |                   |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                    | EE15T3HFISNL      | 97.0%                          | 6-2.5%2+4-         | 115                 | 220              | 4.0% | 45             | 256          | 17D       |
| 30                                                                                    | EE30T3HFISNL      | 97.5%                          | 6-2.5%2+4-         | 115                 | 220              | 4.6% | 45             | 320          | 18D       |
| 45                                                                                    | EE45T3HFISNL      | 97.7%                          | 6-2.5%2+4-         | 115                 | 220              | 3.3% | 45             | 515          | 20D       |
| 75                                                                                    | EE75T3HFISNL      | 98.0%                          | 6-2.5%2+4-         | 115                 | 220              | 4.4% | 50             | 535          | 21D       |
| 112.5                                                                                 | EE112T3HFISNL     | 98.2%                          | 6-2.5%2+4-         | 115                 | 220              | 5.2% | 50             | 800          | 22D       |
| 150                                                                                   | EE150T3HFISNL     | 98.3%                          | 6-2.5%2+4-         | 115                 | 220              | 3.4% | 50             | 1110         | 24D       |
| 225                                                                                   | EE225T3HFISNL     | 98.5%                          | 6-2.5%2+4-         | 115                 | 220              | 4.4% | 55             | 1349         | 25D       |
| 300                                                                                   | EE300T68HFISNL    | 98.6%                          | 6-2.5%2+4-         | 115                 | 220              | 4.8% | 55             | 1750         | 30D       |
| 500                                                                                   | EE500T68HFISNL    | 98.7%                          | 4-2.5%2+2-         | 115                 | 220              | 4.2% | 60             | 2295         | 31D       |
| <b>NL Series for Typical Non-Linear Load Services, K-4 Rated, Copper Windings</b>     |                   |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                    | EE15T3HFISCUNL    | 97.0%                          | 6-2.5%2+4-         | 115                 | 220              | 4.7% | 45             | 260          | 17D       |
| 30                                                                                    | EE30T3HFISCUNL    | 97.5%                          | 6-2.5%2+4-         | 115                 | 220              | 3.4% | 45             | 395          | 18D       |
| 45                                                                                    | EE45T3HFISCUNL    | 97.7%                          | 6-2.5%2+4-         | 115                 | 220              | 5.2% | 45             | 730          | 20D       |
| 75                                                                                    | EE75T3HFISCUNL    | 98.0%                          | 6-2.5%2+4-         | 115                 | 220              | 6.5% | 50             | 640          | 20D       |
| 112.5                                                                                 | EE112T3HFISCUNL   | 98.2%                          | 6-2.5%2+4-         | 115                 | 220              | 3.8% | 50             | 935          | 22D       |
| 150                                                                                   | EE150T3HFISCUNL   | 98.3%                          | 6-2.5%2+4-         | 115                 | 220              | 4.6% | 50             | 1300         | 24D       |
| 225                                                                                   | EE225T3HFISCUNL   | 98.5%                          | 6-2.5%2+4-         | 115                 | 220              | 3.6% | 55             | 1450         | 24D       |
| 300                                                                                   | EE300T68HFISCUNL  | 98.6%                          | 6-2.5%2+4-         | 115                 | 220              | 4.7% | 55             | 2450         | 25D       |
| 500                                                                                   | EE500T68HFISCUNL  | 98.7%                          | 4-2.5%2+2-         | 115                 | 220              | 5.0% | 60             | —            | 31D       |
| <b>NLP Series for Typical Non-Linear Load Services, K-13 Rated, Aluminum Windings</b> |                   |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                    | EE15T3HFISNLP     | 97.0%                          | 6-2.5%2+4-         | 115                 | 220              | 4.0% | 45             | 256          | 17D       |
| 30                                                                                    | EE30T3HFISNLP     | 97.5%                          | 6-2.5%2+4-         | 115                 | 220              | 4.6% | 45             | 375          | 18D       |
| 45                                                                                    | EE45T3HFISNLP     | 97.7%                          | 6-2.5%2+4-         | 115                 | 220              | 3.3% | 45             | 500          | 20D       |
| 75                                                                                    | EE75T3HFISNLP     | 98.0%                          | 6-2.5%2+4-         | 115                 | 220              | 3.3% | 50             | 560          | 21D       |
| 112.5                                                                                 | EE112T3HFISNLP    | 98.2%                          | 6-2.5%2+4-         | 115                 | 220              | 4.7% | 50             | 800          | 22D       |
| 150                                                                                   | EE150T3HFISNLP    | 98.3%                          | 6-2.5%2+4-         | 115                 | 220              | 3.4% | 50             | 1110         | 24D       |
| 225                                                                                   | EE225T3HFISNLP    | 98.5%                          | 6-2.5%2+4-         | 115                 | 220              | 4.4% | 55             | 1335         | 25D       |
| 300                                                                                   | EE300T68HFISNLP   | 98.6%                          | 6-2.5%2+4-         | 115                 | 220              | 4.4% | 55             | 2350         | 30D       |
| 500                                                                                   | EE500T68HFISNLP   | 98.7%                          | 4-2.5%2+2-         | 115                 | 220              | 5.0% | 60             | 3200         | 31D       |
| <b>NLP Series for Typical Non-Linear Load Services, K-13 Rated, Copper Windings</b>   |                   |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                    | EE15T3HFISCUNLP   | 97.0%                          | 6-2.5%2+4-         | 115                 | 220              | 3.8% | 45             | 260          | 17D       |
| 30                                                                                    | EE30T3HFISCUNLP   | 97.5%                          | 6-2.5%2+4-         | 115                 | 220              | 3.4% | 45             | 430          | 18D       |
| 45                                                                                    | EE45T3HFISCUNLP   | 97.7%                          | 6-2.5%2+4-         | 115                 | 220              | 4.5% | 45             | 730          | 20D       |
| 75                                                                                    | EE75T3HFISCUNLP   | 98.0%                          | 6-2.5%2+4-         | 115                 | 220              | 6.5% | 50             | 640          | 20D       |
| 112.5                                                                                 | EE112T3HFISCUNLP  | 98.2%                          | 6-2.5%2+4-         | 115                 | 220              | 3.7% | 50             | 985          | 22D       |
| 150                                                                                   | EE150T3HFISCUNLP  | 98.3%                          | 6-2.5%2+4-         | 115                 | 220              | 4.4% | 50             | 1135         | 24D       |
| 225                                                                                   | EE225T3HFISCUNLP  | 98.5%                          | 6-2.5%2+4-         | 115                 | 220              | 3.6% | 55             | 1477         | 24D       |
| 300                                                                                   | EE300T68HFISCUNLP | 98.6%                          | 6-2.5%2+4-         | 115                 | 220              | 3.5% | 55             | 2650         | 30D       |
| 500                                                                                   | EE500T68HFISCUNLP | 98.7%                          | 4-2.5%2+2-         | 115                 | 220              | 5.5% | 60             | —            | 31D       |

Obsolete—January 1, 2016

NOTE: International products—for export use only.

Table 6.38: Harmonic Mitigating, 480 Primary to 208zz/120 Secondary—UL Listed

| kVA                                                                                    | Catalog No.  | Minimum Efficiency @ 35% 75° C | Full Capacity Taps | Degree C Temp. Rise | Insulation Class | %IZ  | Sound Level dB | Weight (lbs) | Enclosure |
|----------------------------------------------------------------------------------------|--------------|--------------------------------|--------------------|---------------------|------------------|------|----------------|--------------|-----------|
| <b>480 V Delta Primary to 208/120 V Secondary with a 0° Phase Shift, 130° Rise</b>     |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                     | HM15T208NCU  | 97.0%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.5% | 45             | 310          | 17D       |
| 30                                                                                     | HM30T208NCU  | 97.5%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.5% | 45             | 340          | 17D       |
| 45                                                                                     | HM45T208NCU  | 97.7%                          | 6–2.5% 2+4–        | 130                 | 200              | 6.8% | 45             | 418          | 18D       |
| 75                                                                                     | HM75T208NCU  | 98.0%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.0% | 50             | 642          | 20D       |
| 112.5                                                                                  | HM112T208NCU | 98.2%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.4% | 50             | 725          | 21D       |
| 150                                                                                    | HM150T208NCU | 98.3%                          | 6–2.5% 2+4–        | 130                 | 200              | 3.1% | 50             | 915          | 22D       |
| 225                                                                                    | HM225T208NCU | 98.5%                          | 6–2.5% 2+4–        | 130                 | 200              | 6.4% | 55             | 1125         | 24D       |
| 300                                                                                    | HM300T208NCU | 98.6%                          | 4–2.5% 2+2–        | 130                 | 200              | 5.6% | 55             | 1535         | 25D       |
| <b>480 V Primary to 208/120 V Secondary with a +30° Phase Shift, 130° C Rise</b>       |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                     | HM15T255NCU  | 97.0%                          | 3–5% 1+3–          | 130                 | 200              | 3.9% | 45             | 310          | 17D       |
| 30                                                                                     | HM30T255NCU  | 97.5%                          | 3–5% 1+3–          | 130                 | 200              | 4.5% | 45             | 340          | 17D       |
| 45                                                                                     | HM45T255NCU  | 97.7%                          | 3–5% 1+3–          | 130                 | 200              | 6.6% | 45             | 418          | 18D       |
| 75                                                                                     | HM75T255NCU  | 98.0%                          | 3–5% 1+3–          | 130                 | 200              | 4.7% | 50             | 642          | 20D       |
| 112.5                                                                                  | HM112T255NCU | 98.2%                          | 3–5% 1+3–          | 130                 | 200              | 5.2% | 50             | 725          | 21D       |
| 150                                                                                    | HM150T255NCU | 98.3%                          | 3–5% 1+3–          | 130                 | 200              | 5.2% | 50             | 915          | 22D       |
| 225                                                                                    | HM225T255NCU | 98.5%                          | 3–5% 1+3–          | 130                 | 200              | 6.4% | 55             | 1125         | 24D       |
| 300                                                                                    | HM300T255NCU | 98.6%                          | 3–5% 1+3–          | 130                 | 200              | 6.6% | 55             | 1535         | 25D       |
| <b>480 V Delta Primary to 208/120 V Secondary with a +15° Phase Shift, 130° C Rise</b> |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                     | HM15T251NCU  | 97.0%                          | 6–2.5% 2+4–        | 130                 | 200              | 2.7% | 45             | 310          | 17D       |
| 30                                                                                     | HM30T251NCU  | 97.5%                          | 6–2.5% 2+4–        | 130                 | 200              | 2.4% | 45             | 340          | 17D       |
| 45                                                                                     | HM45T251NCU  | 97.7%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.5% | 45             | 418          | 18D       |
| 75                                                                                     | HM75T251NCU  | 98.0%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.1% | 50             | 642          | 20D       |
| 112.5                                                                                  | HM112T251NCU | 98.2%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.1% | 50             | 725          | 21D       |
| 150                                                                                    | HM150T251NCU | 98.3%                          | 6–2.5% 2+4–        | 130                 | 200              | 3.2% | 50             | 915          | 22D       |
| 225                                                                                    | HM225T251NCU | 98.5%                          | 6–2.5% 2+4–        | 130                 | 200              | 5.6% | 55             | 1125         | 24D       |
| 300                                                                                    | HM300T251NCU | 98.6%                          | 4–2.5% 2+2–        | 130                 | 200              | 4.9% | 55             | 1535         | 25D       |
| <b>480 V Delta Primary to 208/120 V Secondary with a -15° Phase Shift, 130° C Rise</b> |              |                                |                    |                     |                  |      |                |              |           |
| 15                                                                                     | HM15T259NCU  | 97.0%                          | 6–2.5% 2+4–        | 130                 | 200              | 2.7% | 45             | 310          | 17D       |
| 30                                                                                     | HM30T259NCU  | 97.5%                          | 6–2.5% 2+4–        | 130                 | 200              | 2.4% | 45             | 340          | 17D       |
| 45                                                                                     | HM45T259NCU  | 97.7%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.8% | 45             | 418          | 18D       |
| 75                                                                                     | HM75T259NCU  | 98.0%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.1% | 50             | 642          | 20D       |
| 112.5                                                                                  | HM112T259NCU | 98.2%                          | 6–2.5% 2+4–        | 130                 | 200              | 4.1% | 50             | 725          | 21D       |
| 150                                                                                    | HM150T259NCU | 98.3%                          | 6–2.5% 2+4–        | 130                 | 200              | 3.2% | 50             | 915          | 22D       |
| 225                                                                                    | HM225T259NCU | 98.5%                          | 6–2.5% 2+4–        | 130                 | 200              | 5.6% | 55             | 1125         | 24D       |
| 300                                                                                    | HM300T259NCU | 98.6%                          | 4–2.5% 2+2–        | 130                 | 200              | 4.9% | 55             | 1535         | 25D       |

Additional temperature rises are available; for part numbers, see the Schneider Electric Product Configurator.

## Section 7

## International Load Centers

|                                                       |            |
|-------------------------------------------------------|------------|
| <b>International Miniature Circuit Breakers</b>       | <b>7-2</b> |
| QO™ Plug-On and Bolt-On Circuit Breakers and Switches | 7-2        |
| Plug-On QOXD and Bolt-On QOBXD                        | 7-3        |
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## QO™ Plug-On and Bolt-On Circuit Breakers and Switches

### General Description

In 1955 Square D Company introduced the QO™ Plug-on System and revolutionized the way electrical contractors install miniature circuit breakers in the United States. Today as part of Schneider Electric™ we offer the same Plug-on System technology around the world. IEC certified QO products are available for residential, commercial and industrial applications.

**Table 7.1: International Miniature Circuit Breaker Description**

| Circuit Breaker | Description            | 1Ø Consumer Units | 3Ø Distribution Boards |
|-----------------|------------------------|-------------------|------------------------|
| QOxD            | Branch circuit breaker | X                 | X                      |

### Characteristics

- Circuit breakers are rated 240 Vac single phase and 415 Vac three phase, 50/60 Hz.
- Circuit breakers are available in 1-, 2- or 3-pole construction.
- Thermal trip elements are factory calibrated to 40°C (IEC 947-2) and 30°C (IEC 898) ambient temperature.
- Trip-free handle ensures tripping even when the circuit breaker is held or locked in the ON position.
- Circuit breakers are in compliance with international standards set by the International Electrotechnical Commission (IEC).
- The CE marking is located on each circuit breaker in accordance with the low voltage directive of the European Union.
- The entire QO circuit breaker family provides the advantage of a plug-on connection. (Bolt-on connections also available)

### Accessories

**Table 7.2: Accessories**

| Accessory                 | Description                                            | Cat. No. | QOxD |
|---------------------------|--------------------------------------------------------|----------|------|
| Handle Tie                | Ties two 1P circuit breakers together                  | QO1HT    | X    |
| Handle Lock-Off (Clamp)   | Attaches to 1P circuit breaker handles                 | QO1LO    | X    |
|                           | Attaches to 1P, 2P, 3P circuit breaker handles         | HLO1     | X    |
|                           | Attaches to 1P, 2P, 3P circuit breaker handles         | QOEPLA   | —    |
| Handle Padlock Attachment | Attaches to 1P circuit breaker handles                 | QOE1PL   | —    |
|                           | Attaches to 1P circuit breaker escutcheon (fixed)      | QO1PA    | X    |
|                           | Attaches to 1P circuit breaker handles (removable)     | QOHPL    | X    |
|                           | Attaches to 2P, 3P circuit breaker handles (removable) | QO1HPL   | X    |
|                           | Attaches to 2P circuit breaker handles (removable)     | GFI2PA   | —    |

### Circuit Breaker Operating Characteristics

**Table 7.3: Branch Circuit Breakers**

| Cat. No. Prefix |         | Number of Poles | Continuous Ampere Rating | IEC 898 Service Rating I <sub>cn</sub>                      |             | Tripping Characteristics       |
|-----------------|---------|-----------------|--------------------------|-------------------------------------------------------------|-------------|--------------------------------|
| Plug-on         | Bolt-on |                 |                          | 240 V                                                       | 415 V       |                                |
| QOxD            | QOxBd   | 1, 2, 3         | 10–32 A                  | 3000                                                        | 3000        | Type D (10–20 I <sub>n</sub> ) |
| Cat. No. Prefix |         | Number of Poles | Continuous Ampere Rating | IEC 947-2 Service Rating I <sub>cu</sub> (I <sub>cs</sub> ) |             | —                              |
| Plug-on         | Bolt-on |                 |                          | 240 V                                                       | 415 V       |                                |
| QOxD            | QOxBd   | 1, 2, 3         | 10–32 A                  | 3000 (100%)                                                 | 3000 (100%) | —                              |
|                 |         | 1               | 40–63 A                  | 3000 (50%)                                                  | —           | —                              |
|                 |         | 2, 3            | 40–100 A                 | —                                                           | 3000 (50%)  | —                              |

### Main Switches

**Table 7.4: QO-M Plug-On Main Incomer Switch**

240 V Certified to IEC 947-3

| Ampere Rating | 1P Cat. No. | 2P Cat. No. | 3P and 4P Cat. No. |
|---------------|-------------|-------------|--------------------|
| 100 A         | N/A         | N/A         | N/A                |
| 125 A         | N/A         | N/A         | QO3100M            |
| 125 A–4P      | N/A         | N/A         | QO4100M            |

## Plug-On QOXD and Bolt-On QOBXD

**Table 7.5: QOXD Thermal-Magnetic, Plug-On Miniature Circuit Breakers**

240/415 V 10–32 A Certified to IEC 898 at 3 kA,

40–100 A Certified to IEC 947-2 at 3 kA

| Ampere Rating | 1P<br>Cat. No. | 2P<br>Cat. No. | 3P<br>Cat. No. | Terminal Capacity Range |
|---------------|----------------|----------------|----------------|-------------------------|
| 10 A          | QOXD110        | QOXD210        | QOXD310        | 2.5–6 mm <sup>2</sup>   |
| 16 A          | QOXD116        | QOXD216        | QOXD316        | 2.5–6 mm <sup>2</sup>   |
| 20 A          | QOXD120        | QOXD220        | QOXD320        | 2.5–6 mm <sup>2</sup>   |
| 25 A          | QOXD125        | QOXD225        | QOXD325        | 2.5–6 mm <sup>2</sup>   |
| 32 A          | QOXD132        | QOXD232        | QOXD332        | 2.5–6 mm <sup>2</sup>   |
| 40 A          | QOXD140        | QOXD240        | QOXD340        | 10–25 mm <sup>2</sup>   |
| 45 A          | QOXD145        | QOXD245        | QOXD345        | 10–25 mm <sup>2</sup>   |
| 50 A          | QOXD150        | QOXD250        | QOXD350        | 10–25 mm <sup>2</sup>   |
| 63 A          | QOXD163        | QOXD263        | QOXD363        | 10–25 mm <sup>2</sup>   |
| 80 A          | N/A            | QOXD280        | QOXD380        | 25–50 mm <sup>2</sup>   |
| 100 A         | N/A            | QOXD2100       | QOXD3100       | 25–50 mm <sup>2</sup>   |

**Table 7.6: QOBXD Thermal-Magnetic, Bolt-On Miniature Circuit Breakers**

240/415 V 10–32 A Certified to IEC 898 at 3 kA,

40–100 A Certified to IEC 947-2 at 3 kA

| Ampere Rating | 1P<br>Cat. No. | 2P<br>Cat. No. | 3P<br>Cat. No. | Terminal Capacity Range |
|---------------|----------------|----------------|----------------|-------------------------|
| 10 A          | QOBXD110       | QOBXD210       | QOBXD310       | 2.5–6 mm <sup>2</sup>   |
| 16 A          | QOBXD116       | QOBXD216       | QOBXD316       | 2.5–6 mm <sup>2</sup>   |
| 20 A          | QOBXD120       | QOBXD220       | QOBXD320       | 2.5–6 mm <sup>2</sup>   |
| 25 A          | QOBXD125       | QOBXD225       | QOBXD325       | 2.5–6 mm <sup>2</sup>   |
| 32 A          | QOBXD132       | QOBXD232       | QOBXD332       | 2.5–6 mm <sup>2</sup>   |
| 40 A          | QOBXD140       | QOBXD240       | QOBXD340       | 10–25 mm <sup>2</sup>   |
| 45 A          | QOBXD145       | QOBXD245       | QOBXD345       | 1–25 mm <sup>2</sup>    |
| 50 A          | QOBXD150       | QOBXD250       | QOBXD350       | 10–25 mm <sup>2</sup>   |
| 63 A          | QOBXD163       | QOBXD263       | QOBXD363       | 10–25 mm <sup>2</sup>   |
| 80 A          | N/A            | QOBXD280       | QOBXD380       | 25–50 mm <sup>2</sup>   |
| 100 A         | N/A            | QOBXD2100      | QOBXD3100      | 25–50 mm <sup>2</sup>   |

For Accessories, see Table 7.2 Accessories, page 7-2

For short circuit ratings, see Table 7.3 Branch Circuit Breakers, page 7-2

## IEC Certified QO™ Load Centers, Type 1 (Indoor)

### Application Data

Square D™ QO™ Three-Phase Circuit Breaker Load Centers can be certified to IEC 60439-1 and 60439-3. Contact your local Field Sales office for more information. They are designed to meet residential, commercial, and industrial requirements to protect electrical systems and equipment.

### Features

- Three phase construction
- 125, 150, 200 and 225 A mains ratings with main lugs or main circuit breaker
- 12-42 circuit indoor version
- Flush or surface mounting
- Straight-in wiring to minimize service cable installation
- Top or bottom feed
- Automatic flush adjustment cover to speed installation
- Covers sold separately
- Products are stocked in USA
- Bus on 12-42 circuit load centers is one piece; bus on 12-42 circuit load centers is a one-piece copper bus.
- Order entry point is Lexington
- For more information, contact your local Field Sales office.

**Table 7.7: Load Centers**

| Mains Rating<br>Ampere                | Spaces/<br>Max. Poles | Type 1                       |                                 |
|---------------------------------------|-----------------------|------------------------------|---------------------------------|
|                                       |                       | Box and Interior<br>Cat. No. | Cover With Door<br>Cat. No. [1] |
| Main Lugs 240/415 Vac 3Ø4W            |                       |                              |                                 |
| 125 A                                 | 12                    | QO312L125G                   | QOC16UF/S                       |
|                                       | 20                    | QO320L125G                   | QOC24UF/S                       |
|                                       | 24                    | QO324L125G                   | QOC24UF/S                       |
| 200                                   | 18                    | QO318L200G                   | QOC30UF/S                       |
|                                       | 30                    | QO330L200G                   | QOC30UF/S                       |
| 225                                   | 42                    | QO342L225G                   | QOC42UF/S                       |
| Main Circuit Breaker 240/415 Vac 3Ø4W |                       |                              |                                 |
| 125                                   | 30                    | QO330MQ125                   | QOC342MQF/S                     |
| 150                                   | 30                    | QO330MQ150                   | QOC342MQF/S                     |
|                                       | 42                    | QO342MQ150                   | QOC342MQF/S                     |
| 200                                   | 30                    | QO330MQ200                   | QOC342MQF/S                     |
|                                       | 42                    | QO342MQ200                   | QOC342MQF/S                     |
| 225                                   | 42                    | QO342MQ225                   | QOC342MQF/S                     |

[1] F/S at end of catalog number indicates to order F for flush device or S for surface device.

## Section 8

## International Safety Switches

|                                               |            |
|-----------------------------------------------|------------|
| <b>General Duty Safety Switches</b>           | <b>8-2</b> |
| CSA Certified General Duty—Fusible 240 Vac    | 8-2        |
| <b>Heavy Duty Safety Switches</b>             | <b>8-3</b> |
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| CSA Certified Double-Throw                    | 8-5        |
| CSA Certified Switch Accessories              | 8-6        |

**CSA Certified General Duty—Fusible 240 Vac**

- Switches have factory-installed ground bars.
- For optional accessories, see [CSA Certified Switch Accessories](#), page 8-6.

**Table 8.1: General Duty Single-Throw 120/240 Vac (Plug); 240 Vac (Cartridge)**

| Ampere                                                                           | Fuse      | Type 1     | Type 3R      | Field Installable Class<br>R Fuse Kits |
|----------------------------------------------------------------------------------|-----------|------------|--------------|----------------------------------------|
|                                                                                  |           | Cat. No.   | Cat. No.     | Cat. No.                               |
| 2-Pole + S/N (2 Blades and Fuseholders, 1 S/N)—Suitable For Service Entrance Use |           |            |              |                                        |
| 30                                                                               | Plug      | CD211N [1] | —            | —                                      |
| 30                                                                               | Cartridge | CD221N [1] | —            | DRK30                                  |
| 60                                                                               | —         | CD222N     | CD222NRB     | RFK03H                                 |
| 100                                                                              | —         | CD223N     | CD223NRB     | RFK10                                  |
| 200                                                                              | —         | CD224N     | CD224NRB     | HRK1020                                |
| 400                                                                              | —         | CD225N     | CD225NR      | DRK40                                  |
| 600                                                                              | —         | CD226N     | CD226NR      | DRK600                                 |
| 3-Pole + S/N (3 Blades and Fuseholders, 1 S/N)—Suitable For Service Entrance Use |           |            |              |                                        |
| 30                                                                               | Cartridge | CD321N [1] | CD321NRB [1] | DRK30                                  |
| 60                                                                               | —         | CD322N     | CD322NRB     | RFK03H                                 |
| 100                                                                              | —         | CD323N     | CD323NRB     | RFK10                                  |
| 200                                                                              | —         | CD324N     | CD324NRB     | HRK1020                                |
| 400                                                                              | —         | CD325N     | CD325NR      | DRK40                                  |
| 600                                                                              | —         | CD326N     | CD326NR      | DRK600                                 |

**Table 8.2: Light Duty Single-Throw 120 Vac Plug**

| Ampere | Fuse | Type 1    |
|--------|------|-----------|
|        |      | Cat. No.  |
| 30     | Plug | L111N [2] |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

[1] Not suitable for use as service entrance equipment.

[2] Not suitable for use as service equipment.

### CSA Certified Heavy Duty—Fusible 240 Vac

- Switches have factory-installed ground bars.
- Switches 30–200 A Type 4/4X and 3R/12 have viewing windows.
- For optional accessories, see [CSA Certified Switch Accessories](#), page 8-6.

**Table 8.3: Single-Throw 240 Vac, 250 Vdc**

| Ampere                                                                              | Type 1<br>Cat. No. | Type 3R<br>Cat. No. | Type 4/4X<br>Cat. No.           | Type 3R/12<br>Cat. No. |
|-------------------------------------------------------------------------------------|--------------------|---------------------|---------------------------------|------------------------|
| <b>2P + S/N (2 Blades and Fuseholders, 1 S/N)—Suitable For Service Entrance Use</b> |                    |                     |                                 |                        |
| 30 A                                                                                | CH221N             | CH221NRB            | Use 3P devices<br>listed below. | CH221NAWK              |
| 60 A                                                                                | CH222N             | CH222NRB            |                                 | CH222NAWK              |
| 100 A                                                                               | CH223N             | CH223NRB            |                                 | CH223NAWK              |
| 200 A                                                                               | CH224N             | CH224NRB            |                                 | CH224NAWK              |
| 400 A                                                                               | CH225N             | CH225NR             |                                 | CH225NAWK              |
| 600 A                                                                               | CH226N             | CH226NR             |                                 | CH226NAWK              |
| 800 A                                                                               | H227N [1]          | H227NR [1]          | —                               | H227NAWK [1]           |
| 1200 A                                                                              | H228N [1]          | H228NR [1]          | —                               | H228NAWK [1]           |
| <b>3P + S/N (3 Blades and Fuseholders, 1 S/N)—Suitable For Service Entrance Use</b> |                    |                     |                                 |                        |
| 30 A                                                                                | CH321N             | CH321NRB            | CH321NDS                        | CH321NAWK              |
| 60 A                                                                                | CH322N             | CH322NRB            | CH322NDS                        | CH322NAWK              |
| 100 A                                                                               | CH323N             | CH323NRB            | CH323NDS                        | CH323NAWK              |
| 200 A                                                                               | CH324N             | CH324NRB            | CH324NDS                        | CH324NAWK              |
| 400 A                                                                               | CH325N             | CH325NR             | CH325NDS                        | CH325NAWK              |
| 600 A                                                                               | CH326N             | CH326NR             | CH326NDS                        | CH326NAWK              |
| 800 A                                                                               | H327N [1]          | H327NR [1]          | —                               | H327NAWK [1]           |
| 1200 A                                                                              | H328N [1]          | H328NR [1]          | —                               | H328NAWK [1]           |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

### CSA Certified Heavy Duty—Fusible 600 Vac

- Switches have factory-installed ground bars.
- Switches 30–200 A Type 4/4X and 3R/12 have viewing windows.
- For optional accessories, see [CSA Certified Switch Accessories](#), page 8-6.

**Table 8.4: Single-Throw 600 Vac, 600 Vdc**

| Ampere                                                                           | Type 1<br>Cat. No.                                                                                                                                                                                                        | Type 3R<br>Cat. No. | Type 4/4X<br>Cat. No. | Type 3R/12<br>Cat. No. |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|------------------------|
| 3-Pole (3 Blades and Fuseholders)                                                |                                                                                                                                                                                                                           |                     |                       |                        |
| 30 A                                                                             | CH361                                                                                                                                                                                                                     | CH361RB             | CH361DS               | CH361AWK               |
| 60 A                                                                             | CH362                                                                                                                                                                                                                     | CH362RB             | CH362DS               | CH362AWK               |
| 100 A                                                                            | CH363                                                                                                                                                                                                                     | CH363RB             | CH363DS               | CH363AWK               |
| 200 A                                                                            | CH364                                                                                                                                                                                                                     | CH364RB             | CH364DS               | CH364AWK               |
| 400 A                                                                            | CH365                                                                                                                                                                                                                     | CH365R              | CH365DS               | CH365AWK               |
| 600 A                                                                            | CH366                                                                                                                                                                                                                     | CH366R              | CH366DS               | CH366AWK               |
| 800 A                                                                            | H367 [1]                                                                                                                                                                                                                  | H367R [1]           | —                     | H367AWK [1]            |
| 1200 A                                                                           | H368 [1]                                                                                                                                                                                                                  | H368R [1]           | —                     | H368AWK [1]            |
| 3-Pole + S/N (3 Blades and Fuseholders, 1 S/N)—Suitable For Service Entrance Use |                                                                                                                                                                                                                           |                     |                       |                        |
| 30 A                                                                             | For 3 pole switches 30 A–1200 A with solid neutral attachment, select switch from 3-Pole table above and add the Solid Neutral Assembly Kit from Table 8.12 Solid Neutral Assembly Kits Not Stocked—Order Only., page 8-6 |                     |                       |                        |
| 60 A                                                                             |                                                                                                                                                                                                                           |                     |                       |                        |
| 100 A                                                                            |                                                                                                                                                                                                                           |                     |                       |                        |
| 200 A                                                                            |                                                                                                                                                                                                                           |                     |                       |                        |
| 400 A                                                                            |                                                                                                                                                                                                                           |                     |                       |                        |
| 600 A                                                                            |                                                                                                                                                                                                                           |                     |                       |                        |
| 800 A                                                                            |                                                                                                                                                                                                                           |                     |                       |                        |
| 1200 A                                                                           |                                                                                                                                                                                                                           |                     |                       |                        |
| 4-Pole (4 Blades and Fuseholders)—Not Suitable For Service Entrance Use          |                                                                                                                                                                                                                           |                     |                       |                        |
| 30 A                                                                             | H461 [1]                                                                                                                                                                                                                  | —                   | H461DS                | H461AWK [1] [2]        |
| 60 A                                                                             | H462 [1]                                                                                                                                                                                                                  | —                   | H462DS                | H462AWK [1] [2]        |
| 100 A                                                                            | H463 [1]                                                                                                                                                                                                                  | —                   | H463DS                | H463AWK [1] [2]        |
| 200 A                                                                            | H464 [1]                                                                                                                                                                                                                  | —                   | H464DS                | H464AWK [1] [2]        |
| 400 A                                                                            | CH465                                                                                                                                                                                                                     | —                   | —                     | CH465AWK [2]           |
| 600 A                                                                            | CH466                                                                                                                                                                                                                     | —                   | —                     | —                      |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

[1] Dual UL Listed and CSA Certified device.  
[2] Type 3R/12 switches are suitable for Type 3R application by removing the drainscrew from bottom endwall.

### CSA Certified Heavy Duty—Special Applications

- Switches have factory-installed ground bars.
- For optional accessories, see [CSA Certified Switch Accessories](#), page 8-6.

**Table 8.5: Fiberglass Reinforced Polyester NEMA 4X Enclosures  
Single-Throw 600 Vac, 600 Vdc**

| Amperes               | Type 4X         | Type 7/9    |
|-----------------------|-----------------|-------------|
|                       | Cat. No.        | Cat. No.    |
| <b>3P Fusible</b>     |                 |             |
| 30 A                  | H361DF [3] [4]  | —           |
| 60 A                  | H362DF [3] [4]  | —           |
| 100 A                 | H363DF [3] [4]  | —           |
| 200 A                 | H364DF [3]      | —           |
| <b>3P Non-Fusible</b> |                 |             |
| 30 A                  | HU361DF [3] [4] | —           |
| 60 A                  | HU362DF [3] [4] | H60XFA [3]  |
| 100 A                 | HU363DF [3] [4] | H100XFA [3] |
| 200 A                 | HU364DF [3]     | —           |

**Table 8.6: Receptacle Switches with Crouse Hinds Receptacles—Single-Throw 600 Vac**

| Ampere                | Stainless Steel Type 4/4X [5] | Type 12 [5] | Use With Plug |
|-----------------------|-------------------------------|-------------|---------------|
|                       | Cat. No.                      | Cat. No.    | Cat. No.      |
| <b>3P Fusible</b>     |                               |             |               |
| 30 A                  | CH361DSWC                     | CH361AWC    | APJ3485       |
| 60 A                  | CH362DSWC                     | CH362AWC    | APJ6485       |
| 100 A                 | CH363DSWC                     | CH363AWC    | APJ10487      |
| <b>3P Non-Fusible</b> |                               |             |               |
| 30 A                  | CHU361DSWC                    | CHU361AWC   | APJ3485       |
| 60 A                  | CHU362DSWC                    | CHU362AWC   | APJ6485       |
| 100 A                 | CHU363DSWC                    | CHU363AWC   | APJ10487      |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

**Table 8.7: Single-Throw 600 Vac, 600 Vdc**

| Ampere                      | Type 1        | Type 3R    | Type 4/4X | Type 3R/12       |
|-----------------------------|---------------|------------|-----------|------------------|
|                             | Cat. No.      | Cat. No.   | Cat. No.  | Cat. No.         |
| <b>3P</b>                   |               |            |           |                  |
| 30 A                        | CHU361        | CHU361RB   | CHU361DS  | CHU361AWK        |
| 60 A                        | CHU362        | CHU362RB   | CHU362DS  | CHU362AWK        |
| 100 A                       | CHU363        | CHU363RB   | CHU363DS  | CHU363AWK        |
| 200 A                       | CHU364        | CHU364RB   | CHU364DS  | CHU364AWK        |
| 400 A                       | CHU365        | CHU365RB   | CHU365DS  | CHU365AWK        |
| 600 A                       | CHU366        | CHU366R    | CHU366DS  | CHU366AWK        |
| 800 A                       | HU367 [6]     | HU367R [3] | —         | HU367AWK [6]     |
| 1200 A                      | HU368 [6]     | HU368R [6] | —         | HU368AWK [6]     |
| <b>4P, 600 Vac, 600 Vdc</b> |               |            |           |                  |
| 30 A                        | HU461 [3] [4] | —          | —         | HU461AWK [3] [4] |
| 60 A                        | HU462 [3] [4] | —          | —         | HU462AWK [3] [4] |
| 100 A                       | HU463 [3] [4] | —          | —         | HU463AWK [3] [4] |
| 200 A                       | HU464 [6]     | —          | —         | HU464AWK         |
| 400 A                       | CHU465        | —          | —         | CHU465AWK        |
| 600 A                       | CHU466        | —          | —         | CHU466AWK        |
| <b>6P, 600 Vac</b>          |               |            |           |                  |
| 30 A                        | —             | —          | —         | HU661AWK [6]     |
| 60 A                        | —             | —          | —         | HU662AWK [3]     |
| 100 A                       | —             | —          | —         | HU663AWK [6]     |
| 200 A                       | —             | —          | —         | HU664AWK         |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

[3] Dual UL Listed and CSA Listed device.

[4] F Series devices.

[5] Supplied with viewing window.

[6] Dual UL Listed and CSA Listed device.

### CSA Certified Double-Throw

- Switches have factory-installed ground bars.
- For optional accessories, see [CSA Certified Switch Accessories](#), page 8-6.

**Table 8.8: Double-Throw**

| Ampere             | Type 1<br>Cat. No.                                                            | Type 3R<br>Cat. No. | Type 4/4X<br>Cat. No. | Type 12<br>Cat. No. |
|--------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|---------------------|
| 2P 240 Vac—250 Vdc |                                                                               |                     |                       |                     |
| 30 A               | C92251                                                                        | —                   | —                     | —                   |
| 60 A               | For 2P switch applications, select<br>3P switch 60–600 A from 3P table below. |                     |                       |                     |
| 100 A              |                                                                               |                     |                       |                     |
| 200 A              |                                                                               |                     |                       |                     |
| 400 A              |                                                                               |                     |                       |                     |
| 3P 600 Vac—250 Vdc |                                                                               |                     |                       |                     |
| 30 A               | C92351 [1]                                                                    | —                   | —                     | —                   |
| 60 A               | For 60–100 A, use US devices.                                                 |                     |                       |                     |
| 100 A              |                                                                               |                     |                       |                     |
| 200 A              | C82344 [2]                                                                    | C82344RB [2]        | C82344DS [2]          | CH82344 [2]         |
| 4P 240 Vac         |                                                                               |                     |                       |                     |
| 30 A               | C92451 [1]                                                                    | —                   | —                     | —                   |
| 60 A               | DTU462 [3]                                                                    | DTU462AWK [3]       | DTU462DS [3]          | DTU462AWK [3]       |
| 100 A              | DTU463 [3]                                                                    | DTU463AWK [3]       | DTU463DS [3]          | DTU463AWK [3]       |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

[1] 240 Vac Maximum  
[2] For isolation only, not Load-Make/Load-Break.  
[3] 600 Vac rated.

## CSA Certified Switch Accessories

## Optional Accessories

Table 8.9: Electrical Interlock Kits

| Ampere   | Single-Throw    | Double-Throw Type 1 Only |
|----------|-----------------|--------------------------|
|          | Cat. No.        | Cat. No.                 |
| 30–100 A | EIK-1 or -2     | EIK-1 or -2 [4]          |
| 200 A-3P | EIK-1 or -2 [5] | EK200DTU2                |
| 200 A-4P | EIK-1 or -2 [5] | EK100DTU2                |
| 400 A    | EIK4060-1 or -2 | EK400DTU2                |
| 600 A    | EIK4060-1 or -2 | —                        |
| 800 A    | EIK4060-1 or -2 | —                        |
| 1200 A   | EIK4060-1 or -2 | —                        |

Table 8.10: Fuse Puller Kits [6]

| Ampere | Cat. No. |
|--------|----------|
| 30 A   | FPK03    |
| 60 A   | FPK0610  |
| 100 A  | FPK0610  |

Table 8.11: Class R Fuse Kits

| Voltage | Ampere | Cat. No. |
|---------|--------|----------|
| 240 Vac | 30 A   | RFK03L   |
|         | 60 A   | RFK03H   |
|         | 100 A  | RFK10    |
|         | 200 A  | HRK1020  |
|         | 400 A  | HRK4060  |
|         | 600 A  | HRK4060  |
| 600 Vac | 30 A   | RFK03H   |
|         | 60 A   | RFK06H   |
|         | 100 A  | RFK10    |
|         | 200 A  | HRK1020  |
|         | 400 A  | HRK4060  |
|         | 600 A  | HRK4060  |

Table 8.12: Solid Neutral Assembly Kits [6][7]

| Ampere | Single-Throw Type 1, 3R | Single-Throw (Copper) Type 4, 4X | Double-Throw Type 1 |
|--------|-------------------------|----------------------------------|---------------------|
|        | Cat. No.                | Cat. No.                         | Cat. No.            |
| 30 A   | CSN03                   | CSN03C                           | SN0310 [8]          |
| 60 A   | CSN0610                 | CSN0610C                         | SN0310              |
| 100 A  | CSN0610                 | CSN0610C                         | SN0310              |
| 200 A  | CSN20                   | CSN20C                           | 225SNA              |
| 400 A  | CH600SN                 | CH600SNC                         | DT400N              |
| 600 A  | CH600SN                 | CH600SNC                         | —                   |
| 800 A  | H800SNE4                | —                                | —                   |
| 1200 A | H1200SNE4               | —                                | —                   |

Table 8.13: Hubs

| Size   | Type 3R  | Type 4/4X/12  |                    |
|--------|----------|---------------|--------------------|
|        |          | Standard Zinc | Chrome Plated Zinc |
| Inches | Cat. No. | Cat. No.      | Cat. No.           |
| 0.50   | —        | H050          | H050CP             |
| 0.75   | B075     | H075          | H075CP             |
| 1.00   | B100     | H100          | H100CP             |
| 1.25   | B125     | H125          | H125CP             |
| 1.50   | B150     | H150          | H150CP             |
| 2.00   | B200     | H200          | H200CP             |
| 2.50   | B250     | H250          | —                  |
| 3.00   | B300     | H300          | —                  |
| 3.50   | B350     | H350          | —                  |
| 4.00   | B400     | H400          | —                  |
| CAP    | BCAP     | —             | —                  |

**NOTE:** For more information on International Safety Switches, please see: <http://www.schneider-electric.com/products/ca/en/80377-safety-switches/>.

[4] Not for C92251, C92351, C92451.

[5] E-series uses EK1020-1 or -2. Requires 2.

[6] Not Stocked—Order Only.

[7] Non-fusible 600 V switches do not come with Neutral factory-installed. The solid neutral kit must be ordered separately.

[8] C92251, C92351, C92451 uses DT30SN.

## Section 9

## International Circuit Breakers

|                                                          |            |
|----------------------------------------------------------|------------|
| <b>Thermal-Magnetic Circuit Breakers</b>                 | <b>9-2</b> |
| SF and SL Circuit Breakers, IEC Rated 415/240 Vac Max.   | 9-2        |
| <b>Electronic Trip Circuit Breakers</b>                  | <b>9-3</b> |
| P-frame, 3P, Micrologic™ Electronic-Trip Unit, IEC Rated | 9-3        |
| R-frame, 3P, Micrologic™ Electronic-Trip Unit, IEC Rated | 9-4        |
| P-frame, 4P, Micrologic™ Electronic-Trip Unit, IEC Rated | 9-5        |
| R-frame, 4P, Micrologic™ Electronic-Trip Unit, IEC Rated | 9-6        |
| <b>Breaking Capacities</b>                               | <b>9-7</b> |
| <b>Circuit Breaker Dimensions</b>                        | <b>9-8</b> |

SF and SL Individually Mounted Circuit Breakers

- CE marking.
- S-frame circuit breakers are CCC Certified.
- International products—for export use only.
- MCCBs in I-Line™ plug-on construction and a complete line of accessories are available. Contact your local Field Sales office.
- Order entry point is Cedar Rapids, Iowa.

Table 9.1: SLAL Individually-Mounted, IEC Rated Circuit Breakers, 415/240 Vac Max., 50/60 Hz, 2P and 3P

| Frame Size | Circuit Breaker Type | Ampere Rating | Cat. No. |          |
|------------|----------------------|---------------|----------|----------|
|            |                      |               | 2P       | 3P       |
| 400 A      | SLAL <sup>[1]</sup>  | 250 A         | SLAL2250 | SLAL3250 |
|            |                      | 300 A         | SLAL2300 | SLAL3300 |
|            |                      | 350 A         | SLAL2350 | SLAL3350 |
|            |                      | 400 A         | SLAL2400 | SLAL3400 |

[1] Add suffix K for CCC label



**P-frame, 3P, Micrologic Electronic-Trip Unit, IEC Rated**

**Table 9.2: P-frame—1600 A, Individually-Mounted, Micrologic Electronic Trip Unit, IEC Rated**

| Sensor Rating                                 | Cat. No.           |                    |                    | Terminal Wire Range (AWG–kcmil) |
|-----------------------------------------------|--------------------|--------------------|--------------------|---------------------------------|
|                                               | N Interrupting [1] | H Interrupting [1] | L Interrupting [1] |                                 |
| 3P, 690 Vac 50/60 Hz with LS0 Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U32R     | NPHLE36063U32R     | NPLLE34063U32R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U32R     | NPHLE36080U32R     | NPLLE34080U32R     |                                 |
| 1000 A                                        | NPNLE36100U32R     | NPHLE36100U32R     | NPLLE34100U32R     |                                 |
| 1250 A                                        | NPNLE36125U32R     | NPHLE36125U32R     | —                  |                                 |
| 1600 A                                        | NPNLE36160U32R     | NPHLE36160U32R     | —                  |                                 |
| 3P, 690 Vac 50/60 Hz with LSI Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U33R     | NPHLE36063U33R     | NPLLE34063U33R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U33R     | NPHLE36080U33R     | NPLLE34080U33R     |                                 |
| 1000 A                                        | NPNLE36100U33R     | NPHLE36100U33R     | NPLLE34100U33R     |                                 |
| 1250A                                         | NPNLE36125U33R     | NPHLE36125U33R     | —                  |                                 |
| 1600A                                         | NPNLE36160U33R     | NPHLE36160U33R     | —                  |                                 |
| Micrologic Ammeter Trip Unit                  |                    |                    |                    |                                 |
| 3P, 690 Vac 50/60 Hz with LS0 Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U42R     | NPHLE36063U42R     | NPLLE34063U42R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U42R     | NPHLE36080U42R     | NPLLE34080U42R     |                                 |
| 1000 A                                        | NPNLE36100U42R     | NPHLE36100U42R     | NPLLE34100U42R     |                                 |
| 1250 A                                        | NPNLE36125U42R     | NPHLE36125U42R     | —                  |                                 |
| 1600 A                                        | NPNLE36160U42R     | NPHLE36160U42R     | —                  |                                 |
| 3P, 690 Vac 50/60 Hz with LSI Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U43R     | NPHLE36063U43R     | NPLLE34063U43R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U43R     | NPHLE36080U43R     | NPLLE34080U43R     |                                 |
| 1000 A                                        | NPNLE36100U43R     | NPHLE36100U43R     | NPLLE34100U43R     |                                 |
| 1250 A                                        | NPNLE36125U43R     | NPHLE36125U43R     | —                  |                                 |
| 1600 A                                        | NPNLE36160U43R     | NPHLE36160U43R     | —                  |                                 |
| 3P, 690 Vac 50/60 Hz with LSIG Trip Functions |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U44R     | NPHLE36063U44R     | NPLLE34063U44R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U44R     | NPHLE36080U44R     | NPLLE34080U44R     |                                 |
| 1000 A                                        | NPNLE36100U44R     | NPHLE36100U44R     | NPLLE34100U44R     |                                 |
| 1250 A                                        | NPNLE36125U44R     | NPHLE36125U44R     | —                  |                                 |
| 1600 A                                        | NPNLE36160U44R     | NPHLE36160U44R     | —                  |                                 |
| Micrologic Power Trip Unit                    |                    |                    |                    |                                 |
| 3P, 690 Vac 50/60 Hz with LSI Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U63RE1   | NPHLE36063U63RE1   | NPLLE34063U63RE1   | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U63RE1   | NPHLE36080U63RE1   | NPLLE34080U63RE1   |                                 |
| 1000 A                                        | NPNLE36100U63RE1   | NPHLE36100U63RE1   | NPLLE34100U63RE1   |                                 |
| 1250 A                                        | NPNLE36125U63RE1   | NPHLE36125U63RE1   | —                  |                                 |
| 1600 A                                        | NPNLE36160U63RE1   | NPHLE36160U63RE1   | —                  |                                 |
| 3P, 690 Vac 50/60 Hz with LSIG Trip Functions |                    |                    |                    |                                 |
| 630 A                                         | NPNLE36063U64RE1   | NPHLE36063U64RE1   | NPLLE34063U64RE1   | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE36080U64RE1   | NPHLE36080U64RE1   | NPLLE34080U64RE1   |                                 |
| 1000 A                                        | NPNLE36100U64RE1   | NPHLE36100U64RE1   | NPLLE34100U64RE1   |                                 |
| 1250 A                                        | NPNLE36125U64RE1   | NPHLE36125U64RE1   | —                  |                                 |
| 1600 A                                        | NPNLE36160U64RE1   | NPHLE36160U64RE1   | —                  |                                 |

**NOTE:** See Digest for accessories and other information.

**Table 9.3: Interrupting Ratings**

|           | N     |            | H     |            | L      |            |
|-----------|-------|------------|-------|------------|--------|------------|
|           | Icu   | Ics (%Icu) | Icu   | Ics (%Icu) | Icu    | Ics (%Icu) |
| 220/240 V | 50 kA | 75%        | 70 kA | 50%        | 150 kA | 100%       |
| 380/415 V | 50 kA |            | 70 kA |            | 150 kA |            |
| 440 V     | 50 kA |            | 65 kA |            | 130 kA |            |
| 500/525 V | 40 kA |            | 50 kA |            | 100 kA |            |
| 660/690 V | 30 kA |            | 42 kA |            | 25 kA  |            |

[1] New for P frame IEC only.



## R-frame, 3P, Micrologic Electronic-Trip Unit, IEC Rated

Table 9.4: R-frame—3200 A, Individually-Mounted, Micrologic Electronic Trip Unit, IEC Rated

| Sensor Rating                                        | Cat. No.        |                 |
|------------------------------------------------------|-----------------|-----------------|
|                                                      | N Interrupting  | H Interrupting  |
| <b>3P, 690 Vac 50/60 Hz with LS0 Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE36160U32R   | RHFE34160U32R   |
| 2000 A                                               | RNFE36200U32R   | RHFE34200U32R   |
| 2500 A                                               | RNFE36250U32R   | RHFE34250U32R   |
| 3200 A                                               | RNFE36320U32R   | RHFE34320U32R   |
| <b>3P, 690 Vac 50/60 Hz with LSI Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE36160U33R   | RHFE34160U33R   |
| 2000 A                                               | RNFE36200U33R   | RHFE34200U33R   |
| 2500 A                                               | RNFE36250U33R   | RHFE34250U33R   |
| 3200 A                                               | RNFE36320U33R   | RHFE34320U33R   |
| <b>Micrologic Ammeter Trip Unit</b>                  |                 |                 |
| <b>3P, 690 Vac 50/60 Hz with LS0 Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE36160U42R   | RHFE34160U42R   |
| 2000 A                                               | RNFE36200U42R   | RHFE34200U42R   |
| 2500 A                                               | RNFE36250U42R   | RHFE34250U42R   |
| 3200 A                                               | RNFE36320U42R   | RHFE34320U42R   |
| <b>3P, 690 Vac 50/60 Hz with LSI Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE36160U43R   | RHFE34160U43R   |
| 2000 A                                               | RNFE36200U43R   | RHFE34300U43R   |
| 2500 A                                               | RNFE36250U43R   | RHFE34350U43R   |
| 3200 A                                               | RNFE36320U43R   | RHFE34320U43R   |
| <b>3P, 690 Vac 50/60 Hz with LSIG Trip Functions</b> |                 |                 |
| 1600 A                                               | RNFE36160U44R   | RHFE34160U44R   |
| 2000 A                                               | RNFE36200U44R   | RHFE34200U44R   |
| 2500 A                                               | RNFE36250U44R   | RHFE34250U44R   |
| 3200 A                                               | RNFE36320U44R   | RHFE34320U44R   |
| <b>Micrologic Power Trip Unit</b>                    |                 |                 |
| <b>3P, 690 Vac 50/60 Hz with LSI Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE36160U63RE1 | RHFE34160U63RE1 |
| 2000 A                                               | RNFE36200U63RE1 | RHFE34200U63RE1 |
| 2500 A                                               | RNFE36250U63RE1 | RHFE34250U63RE1 |
| 3200 A                                               | RNFE36320U63RE1 | RHFE34320U63RE1 |
| <b>3P, 690 Vac 50/60 Hz with LSIG Trip Functions</b> |                 |                 |
| 1600 A                                               | RNFE36160U64RE1 | RHFE34160U64RE1 |
| 2000 A                                               | RNFE36200U64RE1 | RHFE34200U64RE1 |
| 2500 A                                               | RNFE36250U64RE1 | RHFE34250U64RE1 |
| 3200 A                                               | RNFE36320U64RE1 | RHFE34320U64RE1 |

NOTE: See Digest for accessories and other information.

Table 9.5: Interrupting Ratings

|           | N     |      | H      |            |
|-----------|-------|------|--------|------------|
|           | Icu   | Ics  | Icu    | Ics (%Icu) |
| 220/240 V | 85 kA | 75%  | 125 kA | 75%        |
| 380/415 V | 70 kA |      | 85 kA  |            |
| 440 V     | 65 kA |      | 85 kA  |            |
| 500/525 V | 65 kA | 100% | —      |            |
| 660/690 V | 65 kA |      | —      |            |



**P-frame, 4P, Micrologic Electronic-Trip Unit, IEC Rated**

**Table 9.6: P-frame—1600 A, Individually-Mounted, Micrologic Electronic Trip Unit, IEC Rated**

| Sensor Rating                                 | Cat. No.           |                    |                    | Terminal Wire Range (AWG–kcmil) |
|-----------------------------------------------|--------------------|--------------------|--------------------|---------------------------------|
|                                               | N Interrupting [2] | H Interrupting [2] | L Interrupting [2] |                                 |
| 4P, 690 Vac 50/60 Hz with LS0 Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U32R     | NPHLE46063U32R     | NPLLE44063U32R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U32R     | NPHLE46080U32R     | NPLLE44080U32R     |                                 |
| 1000 A                                        | NPNLE46100U32R     | NPHLE46100U32R     | NPLLE44100U32R     |                                 |
| 1250 A                                        | NPNLE46125U32R     | NPHLE46125U32R     | —                  |                                 |
| 1600 A                                        | NPNLE46160U32R     | NPHLE46160U32R     | —                  |                                 |
| 4P, 690 Vac 50/60 Hz with LSI Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U33R     | NPHLE46063U33R     | NPLLE44063U33R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U33R     | NPHLE46080U33R     | NPLLE44080U33R     |                                 |
| 1000 A                                        | NPNLE46100U33R     | NPHLE46100U33R     | NPLLE44100U33R     |                                 |
| 1250 A                                        | NPNLE46125U33R     | NPHLE46125U33R     | —                  |                                 |
| 1600 A                                        | NPNLE46160U33R     | NPHLE46160U33R     | —                  |                                 |
| Micrologic Ammeter Trip Unit                  |                    |                    |                    |                                 |
| 4P, 690 Vac 50/60 Hz with LS0 Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U42R     | NPHLE46063U42R     | NPLLE44063U42R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U42R     | NPHLE46080U42R     | NPLLE44080U42R     |                                 |
| 1000 A                                        | NPNLE46100U42R     | NPHLE46100U42R     | NPLLE44100U42R     |                                 |
| 1250 A                                        | NPNLE46125U42R     | NPHLE46125U42R     | —                  |                                 |
| 1600 A                                        | NPNLE46160U42R     | NPHLE46160U42R     | —                  |                                 |
| 4P, 690 Vac 50/60 Hz with LSI Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U43R     | NPHLE46063U43R     | NPLLE44063U43R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U43R     | NPHLE46080U43R     | NPLLE44080U43R     |                                 |
| 1000 A                                        | NPNLE46100U43R     | NPHLE46100U43R     | NPLLE44100U43R     |                                 |
| 1250 A                                        | NPNLE46125U43R     | NPHLE46125U43R     | —                  |                                 |
| 1600 A                                        | NPNLE46160U43R     | NPHLE46160U43R     | —                  |                                 |
| 4P, 690 Vac 50/60 Hz with LSIG Trip Functions |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U44R     | NPHLE46063U44R     | NPLLE44063U44R     | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U44R     | NPHLE46080U44R     | NPLLE44080U44R     |                                 |
| 1000 A                                        | NPNLE46100U44R     | NPHLE46100U44R     | NPLLE44100U44R     |                                 |
| 1250 A                                        | NPNLE46125U44R     | NPHLE46125U44R     | —                  |                                 |
| 1600 A                                        | NPNLE46160U44R     | NPHLE46160U44R     | —                  |                                 |
| Micrologic Power Trip Unit                    |                    |                    |                    |                                 |
| 4P, 690 Vac 50/60 Hz with LSI Trip Functions  |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U63RE1   | NPHLE46063U63RE1   | NPLLE44063U63RE1   | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U63RE1   | NPHLE46080U63RE1   | NPLLE44080U63RE1   |                                 |
| 1000 A                                        | NPNLE46100U63RE1   | NPHLE46100U63RE1   | NPLLE44100U63RE1   |                                 |
| 1250 A                                        | NPNLE46125U63RE1   | NPHLE46125U63RE1   | —                  |                                 |
| 1600 A                                        | NPNLE46160U63RE1   | NPHLE46160U63RE1   | —                  |                                 |
| 4P, 690 Vac 50/60 Hz with LSIG Trip Functions |                    |                    |                    |                                 |
| 630 A                                         | NPNLE46063U64RE1   | NPHLE46063U64RE1   | NPLLE44063U64RE1   | (4) 3/0–500 Al/Cu               |
| 800 A                                         | NPNLE46080U64RE1   | NPHLE46080U64RE1   | NPLLE44080U64RE1   |                                 |
| 1000 A                                        | NPNLE46100U64RE1   | NPHLE46100U64RE1   | NPLLE44100U64RE1   |                                 |
| 1250 A                                        | NPNLE46125U64RE1   | NPHLE46125U64RE1   | —                  |                                 |
| 1600 A                                        | NPNLE46160U64RE1   | NPHLE46160U64RE1   | —                  |                                 |

**NOTE:** See Digest for accessories and other information.

**Table 9.7: Interrupting Ratings**

|           | N     |            | H     |            | L      |            |
|-----------|-------|------------|-------|------------|--------|------------|
|           | Icu   | Ics (%Icu) | Icu   | Ics (%Icu) | Icu    | Ics (%Icu) |
| 220/240 V | 50 kA | 75%        | 70 kA | 50%        | 150 kA | 100%       |
| 380/415 V | 50 kA |            | 70 kA |            | 150 kA |            |
| 440 V     | 50 kA |            | 65 kA |            | 130 kA |            |
| 500/525 V | 40 kA |            | 50 kA |            | 100 kA |            |
| 660/690 V | 30 kA |            | 42 kA |            | 25 kA  |            |

[2] New for P frame IEC only.



## R-frame, 4P, Micrologic Electronic-Trip Unit, IEC Rated

Table 9.8: R-frame—3200 A, Individually-Mounted, Micrologic Electronic Trip Unit, IEC Rated

| Sensor Rating                                        | Cat. No.        |                 |
|------------------------------------------------------|-----------------|-----------------|
|                                                      | N Interrupting  | H Interrupting  |
| <b>4P, 690 Vac 50/60 Hz with LS0 Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE46160U32R   | RHFE44160U32R   |
| 2000 A                                               | RNFE46200U32R   | RHFE44200U32R   |
| 2500 A                                               | RNFE46250U32R   | RHFE44250U32R   |
| 3200 A                                               | RNFE46320U32R   | RHFE44320U32R   |
| <b>4P, 690 Vac 50/60 Hz with LSI Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE46160U33R   | RHFE44160U33R   |
| 2000 A                                               | RNFE46200U33R   | RHFE44200U33R   |
| 2500 A                                               | RNFE46250U33R   | RHFE44250U33R   |
| 3200 A                                               | RNFE46320U33R   | RHFE44320U33R   |
| <b>Micrologic Ammeter Trip Unit</b>                  |                 |                 |
| <b>4P, 690 Vac 50/60 Hz with LS0 Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE46160U42R   | RHFE44160U42R   |
| 2000 A                                               | RNFE46200U42R   | RHFE44200U42R   |
| 2500 A                                               | RNFE46250U42R   | RHFE44250U42R   |
| 3200 A                                               | RNFE46320U42R   | RHFE44320U42R   |
| <b>4P, 690 Vac 50/60 Hz with LSI Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE46160U43R   | RHFE44160U43R   |
| 2000 A                                               | RNFE46200U43R   | RHFE44300U43R   |
| 2500 A                                               | RNFE46250U43R   | RHFE44350U43R   |
| 3200 A                                               | RNFE46320U43R   | RHFE44320U43R   |
| <b>4P, 690 Vac 50/60 Hz with LSIG Trip Functions</b> |                 |                 |
| 1600 A                                               | RNFE46160U44R   | RHFE44160U44R   |
| 2000 A                                               | RNFE46200U44R   | RHFE44200U44R   |
| 2500 A                                               | RNFE46250U44R   | RHFE44250U44R   |
| 3200 A                                               | RNFE46320U44R   | RHFE44320U44R   |
| <b>Micrologic Power Trip Unit</b>                    |                 |                 |
| <b>4P, 690 Vac 50/60 Hz with LSI Trip Functions</b>  |                 |                 |
| 1600 A                                               | RNFE46160U63RE1 | RHFE44160U63RE1 |
| 2000 A                                               | RNFE46200U63RE1 | RHFE44200U63RE1 |
| 2500 A                                               | RNFE46250U63RE1 | RHFE44250U63RE1 |
| 3200 A                                               | RNFE46320U63RE1 | RHFE44320U63RE1 |
| <b>4P, 690 Vac 50/60 Hz with LSIG Trip Functions</b> |                 |                 |
| 1600 A                                               | RNFE46160U64RE1 | RHFE44160U64RE1 |
| 2000 A                                               | RNFE46200U64RE1 | RHFE44200U64RE1 |
| 2500 A                                               | RNFE46250U64RE1 | RHFE44250U64RE1 |
| 3200 A                                               | RNFE46320U64RE1 | RHFE44320U64RE1 |

NOTE: See Digest for accessories and other information.

Table 9.9: Interrupting Ratings

|           | N     |      | H      |            |
|-----------|-------|------|--------|------------|
|           | Icu   | Ics  | Icu    | Ics (%Icu) |
| 220/240 V | 85 kA | 75%  | 125 kA | 75%        |
| 380/415 V | 70 kA |      | 85 kA  |            |
| 440 V     | 65 kA |      | 85 kA  |            |
| 500/525 V | 65 kA | 100% | —      |            |
| 660/690 V | 65 kA |      | —      |            |

## Breaking Capacities

- CE Marking
- International products—IEC 60947-2 rated. North American products are dual rated, UL 489 and IEC 60947-2.
- MCCBs in I-Line™ plug-on construction and a complete line of accessories are available. Contact your nearest Field Sales office.
- Order entry point is Cedar Rapids, Iowa.

**Table 9.10: Circuit Breaker Breaking Capacities**

| Circuit Breaker Cat. Prefix |               | Current Rating (Amps) | Short-circuit Ratings (415 Vac) |                  |                    | Isolator Rating | Impulse Rating $U_{imp}$ (kV) | Insulation Rating $U_i$ (Vac) |
|-----------------------------|---------------|-----------------------|---------------------------------|------------------|--------------------|-----------------|-------------------------------|-------------------------------|
| International               | North America |                       | Ultimate $I_{cu}$               | Service $I_{cs}$ | Withstand $I_{cw}$ |                 |                               |                               |
| —                           | QB [1]        | 70–250 A [2]          | 10 kA                           | 5 kA             | N/A                | Yes             | 6                             | 750                           |
| —                           | LA            | 125–400 A             | 20 kA                           | 5 kA             | N/A                | Yes             | 6                             | 750                           |
| SLA                         | —             | 250–400 A             | 36 kA                           | 18 kA            | N/A                | Yes             | 6                             | 750                           |
| —                           | LH            | 125–400 A             | 20 kA                           | 5 kA             | N/A                | Yes             | 6                             | 750                           |
| —                           | PG            | 250–1200 A            | 35 kA                           | 17.5 kA          | 25 kA              | Yes             | 6                             | 750                           |
|                             | PJ            |                       | 50 kA                           | 25 kA            | 10 kA              |                 |                               |                               |
|                             | PL            |                       | 85 kA                           | 42.5 kA          | 10 kA              |                 |                               |                               |
|                             | PK            |                       | 50 kA                           | 25 kA            | 25 kA              |                 |                               |                               |
| —                           | RG            | 600–2500 A            | 35 kA                           | 17.5 kA          | 32 kA              | Yes             | 6                             | 750                           |
|                             | RJ            |                       | 50 kA                           | 25 kA            | 32 kA              |                 |                               |                               |
|                             | RL            |                       | 85 kA                           | 42.5 kA          | 32 kA              |                 |                               |                               |
|                             | RK            |                       | 70 kA                           | 52.5 kA          | 32 kA              |                 |                               |                               |
| —                           | PA            | 600–2000 A            | 50 kA                           | 38 kA            | N/A                | No              | 6                             | 750                           |
| —                           | PC, PH        | 600–2500 A            | 70 kA                           | 53 kA            | N/A                | No              | 6                             | 750                           |
| PE, PX                      | PE, PX        | 600–2500 A            | 70 kA                           | 53 kA            | 12.5               | No              | 6                             | 750                           |

[1] IEC rating 415Y/240 Vac; NEMA/UL rating 240 Vac.  
[2] 250 A lugs are suitable for copper conductors only.

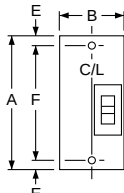


Figure 2

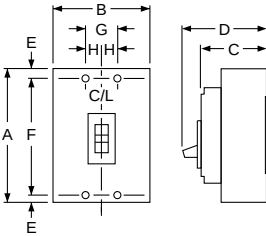


Figure 3

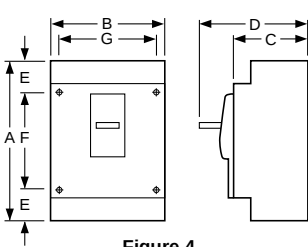


Figure 4

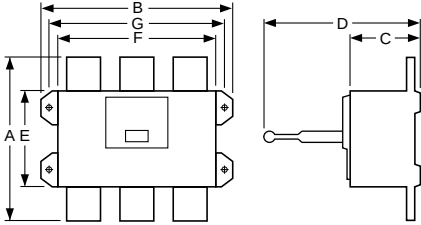


Figure 5

Dimensions

- CE Marking
- International products—IEC 60947-2 rated. North American products are dual rated, UL 489 and IEC 60947-2.
- MCCBs in I-Line™ plug-on construction and a complete line of accessories are available. Contact your nearest Field Sales office.
- Order entry point is Cedar Rapids, Iowa.

Table 9.11: Dimensions

| Circuit Breaker | No. Poles | Fig. No. | Dimensions – mm |     |     |     |     |     |     |    |
|-----------------|-----------|----------|-----------------|-----|-----|-----|-----|-----|-----|----|
|                 |           |          | A               | B   | C   | D   | E   | F   | G   | H  |
| SLA/LA, LH      | 3         | 1        | 279             | 152 | 103 | 148 | 22  | 235 | 51  | 25 |
| QB              | 2         | 2        | 164             | 76  | 77  | 100 | [1] | 108 |     |    |
|                 | 3         | 3        | 164             | 114 | 77  | 100 | [1] | 108 | 38  | 19 |
| PG, PJ, PL      | 2, 3      | 4        | 414             | 210 | 140 | 204 | 106 | 200 | 200 | —  |
| RG, RJ, RL      | 2, 3      | 5        | 381             | 420 | 160 | 365 | 222 | 362 | 390 | —  |

[1] Dimensions E are 40 mm at ON end and 16 mm at OFF end.

Section 10

International Panelboards

|                                                   |      |
|---------------------------------------------------|------|
| NQX Panelboards                                   | 10-2 |
| Factory Assembled Circuit Breaker Panelboard      | 10-2 |
| Factory Assembled NQX Circuit Breaker Panelboards | 10-2 |



NQX Panelboard

## Factory Assembled NQX Circuit Breaker Panelboards

NOTE: For export application only. Not UL Listed

**Table 10.1: Panelboard Information**

|                        |                                                                                                                                                                                                                                                                                                                                 |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Service</b>         | 1Ø3W 110/220, 127/220, 115/230/ Vac 50 Hz, 60 Hz<br>3Ø4W 220/110, 220/127, 230/115, 380/220, 415Y/240, 400/230 Vac 50 Hz, 60 Hz                                                                                                                                                                                                 |
| <b>Branches</b>        | Plug-on QOXD and Bolt-on QOBXD<br>10–100 A QOXD and QOBXD 1-, 2-, and 3-pole (3000 AIR)                                                                                                                                                                                                                                         |
| <b>Boxes</b>           | Galvanized steel with removable endwalls with knockouts on one end.<br>Two sizes:<br>• NQB — 14 in. W x 5.75 in. D — 225 A interior maximum (availability to be announced)<br>• MH — 20 in. W x 5.75 in. D — 600 A main lug interior maximum                                                                                    |
| <b>Fronts</b>          | • Gray baked enamel finish (ANSI49)<br>• Door with flush lock<br>• Mono-Flat™ fronts on 100–225 A. Front mounts to the interior with trim screws. (Both trim screws and door hinges are concealed.)<br>• Fronts for 400A–600 A interiors are louvered and mount to the enclosure with trim screws. (Door hinges are concealed.) |
| <b>Common Features</b> | Sub-Feed Lugs, Sub-Feed Circuit Breaker, Split Bus, Feed-Through Lugs                                                                                                                                                                                                                                                           |
| <b>Bus Bars</b>        | • Aluminum bus, standard — 100 A, 225 A, and 400 A interiors<br>• Copper bus, optional — 100 A, 225 A, and 400 A interiors<br>• Copper bus, standard — 600 A interiors                                                                                                                                                          |
| <b>Neutrals</b>        | • 100% Aluminum neutral, standard<br>• 100% Copper neutral, optional<br>• 200% Neutral, optional                                                                                                                                                                                                                                |
| <b>Enclosures</b>      | • Type 1, standard<br>• Type 3R, 5, and 12, optional<br>• Type 3R, 4, 4X, and 12 Stainless Steel, optional<br>NOTE: Price factory assembled NQX panelboard in the Quote to Cash Product Selector. Select "NQ" panelboard, then select the appropriate "International Voltage".                                                  |
| <b>Order Point</b>     | Peru, IN                                                                                                                                                                                                                                                                                                                        |

**Table 10.2: Mains**

| Mains Rating | Main Lugs | Main Circuit Breaker          |
|--------------|-----------|-------------------------------|
| 70 A         | —         | QOBXD <sup>[1]</sup> , QB, HD |
| 100 A        | Yes       | QOBXD <sup>[1]</sup> , QB, HD |
| 150 A        | —         | QB, HD                        |
| 225 A        | Yes       | QB                            |
| 250 A        | —         | JD                            |
| 400 A        | Yes       | LA                            |
| 600 A        | Yes       | —                             |

**Table 10.3: Distributed Phase Bussing**

| Main Lugs |                            | Main Circuit Breaker |            |                               |
|-----------|----------------------------|----------------------|------------|-------------------------------|
| 100 A     | (1) #6-2/0 Al or Cu        | 100 A                | QOXD/QOBXD | (1) #4-2/0 Al or Cu           |
| 225 A     | (1) #6-350 kcmil Al or Cu  | 150 A                | HD         | (1) #14-3/0 Al or Cu          |
| 400 A     | (1) 1/0-750 kcmil, or      | 225 A                | QB         | (1) #4-300 kcmil Al or Cu, or |
|           | (2) 1/0-350 kcmil Al or Cu |                      | JD         | (1) #3/0-350 kcmil Al or Cu   |
| 600 A     | (2) 1/0-750 kcmil Al or Cu | 250 A                | JD         | (1) #3/0-350 kcmil Al or Cu   |
|           |                            | 400 A                | LA         | (1) #1-600 kcmil, or          |
|           |                            |                      |            | (2) #1-250 kcmil Al or Cu     |

[1] Available at 240 Vac maximum.

## Section 11

## Obsolescent and Obsolete Circuit Breakers

|                                                            |              |
|------------------------------------------------------------|--------------|
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## Circuit Breaker Availability

Table 11.1: Circuit Breaker Availability

| Series of Cat. No. | Frame Size               | Volts        | Poles     | Amperes  | Availability                 |                             |
|--------------------|--------------------------|--------------|-----------|----------|------------------------------|-----------------------------|
|                    |                          |              |           |          | Obsolete No Longer Available | Obsolescent                 |
| 115A-130A          | MO-1 (Add-on)            | 120 Vac      | 1         | 15-30    | X                            |                             |
| 215A-250A          | MO-2 (Add-on)            | 120/240 Vac  | 2         | 15-50    | X                            |                             |
| 215B-250B          | MO-2B (Add-on)           | 120/240 Vac  | 2 S.P.    | 15-50    | X                            |                             |
| 70000              | Multi-Breaker            | 120 Vac      | 4 S.P.    | 15-50    | X                            |                             |
| 111600             | MO-2                     | 120/240 Vac  | 2         | 15-30    | X                            |                             |
| 131600             | MO-2                     | 120/240 Vac  | 2         | 15-30    | X                            |                             |
| 151101             | MO-1                     | 120 Vac      | 1         | 15-30    | X                            |                             |
| 151600             | MO-2                     | 120/240 Vac  | 2         | 15-30    | X                            |                             |
| 161101             | MO-1                     | 120 Vac      | 1 With SN | 15-30    | X                            |                             |
| 161600             | MO-2                     | 120/240 Vac  | 2 With SN | 15-30    | X                            |                             |
| 161700             | MO-2                     | 120/240 Vac  | 2 S.P.    | 15-30    | X                            |                             |
| 260000             | MB (Left-hand)           | 120 Vac      | 4 S.P.    | 15-50    | X                            |                             |
| 270000             | MB (Right-hand)          | 120 Vac      | 4 S.P.    | 15-50    | X                            |                             |
| 460000             | MO-8                     | 120/240 Vac  | 4 S.P.    | 15-50    | X                            |                             |
| 470000             | MO-4                     | 120/240 Vac  | 4 S.P.    | 15-40    | X                            |                             |
| 480000             | MO-4 (Plug-in)           | 120/240 Vac  | 4 S.P.    | 15-50    | X                            |                             |
| 940000             | LM                       | 600 Vac      | 2-3       | 125-800  | X                            |                             |
| 950000             | 50 A Form W              | 250 Vac      | 1, 2, 3   | 15-50    | X                            |                             |
| 951000             | 50 A Form W              | 250 Vac      | 2, 3      | 15-50    | X                            |                             |
| 952000             | 50 A Form W              | 250 Vac      | 2, 3      | 15-50    | X                            |                             |
| 953000             | Flip-on Form W           | 230 Vac      | 1, 2, 3   | 15-50    | X                            |                             |
| 954000             | 100 A Form W (Trip Unit) | 250 Vac      | 2, 3      | 50-100   | X                            |                             |
| 955000             | 100 A Form W             | 250 Vac      | 2, 3      | 50-100   | X                            |                             |
| 956000             | 225 A Form W             | 250 Vac      | 2, 3      | 70-225   | X                            |                             |
| 957000             | 400 A (KL) Form W        | 250 Vac      | 2, 3      | 125-400  | X                            |                             |
| 958000             | 600 A (WL) Form W        | 250 Vac      | 2, 3      | 225-600  | X                            |                             |
| 959000             | KL Frame Only            | 600 Vac      | 2, 3      | 125-400  | X                            |                             |
| 961000             | 50 A Form W              | 600 Vac      | 2, 3      | 15-50    | X                            |                             |
| 962000             | 50 A Form W              | 600 Vac      | 2, 3      | 15-50    | X                            |                             |
| 964000             | 100 A Form W             | 600 Vac      | 2, 3      | 50-100   | X                            |                             |
| 965000             | 100 A Form W             | 600 Vac      | 2, 3      | 50-100   | X                            |                             |
| 966000             | 225 A Form W             | 600 Vac      | 2, 3      | 70-225   | X                            |                             |
| 967000             | 400 A (KL) Form W        | 600 Vac      | 2, 3      | 125-400  | X                            |                             |
| 968000             | 600 A (WL) Form W        | 600 Vac      | 2, 3      | 225-600  | X                            |                             |
| 970000             | Type L Form W            | 240 Vac      | 1, 2, 3   | 10-50    | X                            |                             |
| 971000             | Type L Form W (Flip-on)  | 240 Vac      | 1, 2, 3   | 10-50    | X                            |                             |
| 972000             | M1 (Bolt-on)             | 240 Vac      | 2, 3      | 15-70    | X                            |                             |
| 973000             | M2 (Bolt-on)             | 240 Vac      | 2, 3      | 50-100   | X                            |                             |
| 974000             | MM (M) (Bolt-on)         | 120/240 Vac  | 2 S.P.    | 15-50    | X                            |                             |
| 975000             | 100 A Trip Unit          | 250 Vac      | 2, 3      | 50-100   | X                            |                             |
| 976000             | 225 A Trip Unit          | 250 Vac      | 2, 3      | 70-225   | X                            |                             |
| 977000             | KL Trip Unit             | 600 Vac      | 2, 3      | 125-400  | X                            |                             |
| 978000             | LM Trip Unit             | 600 Vac      | 2, 3      | 225-800  | X                            |                             |
| 979000             | WL Frame                 | 600 Vac      | 2, 3      | 225-600  | X                            |                             |
| 982000             | 50 A Form W (Flip-on)    | 125/250 Vac  | 1, 2, 3   | 15-50    | X                            |                             |
| 984000             | ML-2                     | 250 Vac      | 2, 3      | 50-100   | X                            |                             |
| 985000             | 100 A (G) Form W         | 600 Vac      | 2, 3      | 50-100   | X                            |                             |
| 986000             | 100 A (F) Form W         | 600 Vac      | 2, 3      | 10-100   | X                            |                             |
| 987000             | ML-3                     | 250 Vac      | 2, 3      | 125-225  | X                            |                             |
| 988000             | ML-1                     | 250 Vac      | 2, 3      | 15-100   | X                            |                             |
| 989000             | ML-1                     | 480 Vac      | 2, 3      | 15-100   | X                            |                             |
| 991000             | QB                       | 120/240 Vac  | 1         | 15-50    | X                            |                             |
| 992000             | ML                       | 120/240 Vac  | 1, 2, 3   | 10-50    | X                            |                             |
| 992900             | ML Form Y                | 277 Vac      | 1         | 10-20    | X                            |                             |
| 994000             | ML-2                     | 600 Vac      | 2, 3      | 15-100   | X                            |                             |
| 995000             | 100 A (G) Form W         | 600 Vac      | 2, 3      | 15-100   | X                            |                             |
| 996000             | 100 A (F) Form W         | 600 Vac      | 2, 3      | 15-100   | X                            |                             |
| 997000             | ML-3                     | 600 Vac      | 2, 3      | 50-225   | X                            |                             |
| 998000             | ML-1                     | 600 Vac      | 2, 3      | 15-100   | X                            |                             |
| 999000             | ML-1                     | 600 Vac      | 2, 3      | 15-100   | X                            |                             |
| A1B                | 100 A                    | 120/240 Vac  | 1, 2, 3   | 15-100   | X                            |                             |
| PowerPact D-Frame  | 600 A                    | 600 Vac      | 3, 4      | 150-600  | X                            |                             |
| EH, EHB            | 100 A                    | 480Y/277 Vac | 1, 2, 3   | 15-100   | X                            |                             |
| FA, FH, FC         | 100 A                    | 480 Vac      | 2, 3      | 15-100   | X                            | X                           |
| FD, FG, FJ         | 100 A                    | 480Y/277 Vac | 1, 2, 3   | 15-100   | X                            |                             |
| GJL / NENL         | 100 A                    | 480 Vac      | 3         | 15-100   | X                            |                             |
| KA, KH, KC         | 250 A                    | 480 Vac      | 2, 3      | 70-250   | X                            |                             |
| FI, FIL            | 100 A                    | 480 Vac      | 2, 3      | 20-100   | X                            |                             |
| KI, KIL            | 225 A                    | 480 Vac      | 2, 3      | 110-225  | X                            |                             |
| LI, LIL            | 400 A                    | 480 Vac      | 2, 3      | 300-400  | X                            |                             |
| KD, KG             | 250 A                    | 240 Vac      | 2, 3      | 100-250  | X                            |                             |
| LA(JKL) 0000       | 400 A                    | 600 Vac      | 2, 3      | 125-400  | X                            |                             |
| MA-0000            | 1000 A                   | 600 Vac      | 2, 3      | 125-1000 | X                            |                             |
| Masterpact M/MP/MC | 6300 A                   | 600 Vac      | 3, 4      | 800-6300 | —                            | See page through page 11-22 |
| MEC                | 225 A                    | 600 Vac      | 2, 3      | 100-225  | X                            |                             |
| MEC                | 400 A                    | 600 Vac      | 2, 3      | 250-400  | X                            |                             |
| MEC                | 800 A                    | 600 Vac      | 2, 3      | 400-800  | X                            |                             |
| MHAB, BC, CA       | MM (Plug-on)             | 120/240 Vac  | 2 S.P.    | 15-50    | X                            |                             |

Table 11.1 Circuit Breaker Availability (cont'd.)

| Series of<br>Cat. No. | Frame Size          | Volts       | Poles | Amperes   | Availability                    |             |
|-----------------------|---------------------|-------------|-------|-----------|---------------------------------|-------------|
|                       |                     |             |       |           | Obsolete No Longer<br>Available | Obsolescent |
| MHAB, BC, CA          | M1 (Plug-on)        | 120/240 Vac | 2, 3  | 15–70     | X                               |             |
| Q2, Q2-H, Q2H         | 225 A               | 240 Vac     | 2, 3  | 100–225   | X                               |             |
| QE                    | 200 A               | 120/240 Vac | 2, 3  | 70–200    | X                               |             |
| SE                    | 4000 A              | 600 Vac     | 3     | 200–4000  | X                               |             |
| CK                    | 1200 A              | 480 Vac     | 3     | 400–1200  | X                               |             |
| CM                    | 2000 A              | 480 Vac     | 3     | 1250–2000 | X                               |             |
| XO                    | 50 A                | 120/240 Vac | 1, 2  | 15–50     | X                               |             |
| Y1B                   | 100 A               | 277 Vac     | 1     | 15–100    | X                               |             |
| LXI                   | 600 A               | 600 Vac     | 3     | 100–600   | X                               |             |
| ME, MEL               | 250 A, 400 A, 800 A | 600 Vac     | 3     | 100–800   | X                               |             |
| MX, MXL               | 250 A, 400 A, 800 A | 600 Vac     | 3     | 100–800   | X                               |             |
| NA, NAL               | 1200 A              | 600 Vac     | 3     | 600–1200  | X                               |             |
| NC, NCL               | 1200 A              | 600 Vac     | 3     | 600–1200  | X                               |             |
| NX, NXL               | 1200 A              | 600 Vac     | 3     | 600–1200  | X                               |             |
| NE, NEL               | 1200 A              | 600 Vac     | 3     | 600–1200  | X                               |             |
| PAF                   | 2000 A              | 600 Vac     | 3     | 600–2000  | X                               |             |
| PHF                   | 2000 A              | 600 Vac     | 2, 3  | 600–2000  | X                               |             |
| PCF                   | 2500 A              | 600 Vac     | 2, 3  | 1600–2500 | X                               |             |
| PXF                   | 2500 A              | 600 Vac     | 2, 3  | 600–2500  | X                               |             |
| PEF                   | 2500 A              | 600 Vac     | 3     | 600–2500  | X                               |             |

Contact your local Sales Office for availability.

Dimensions



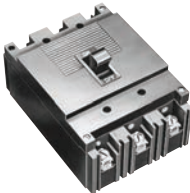
LIL



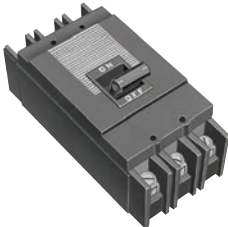
LA (W)



MA (W)



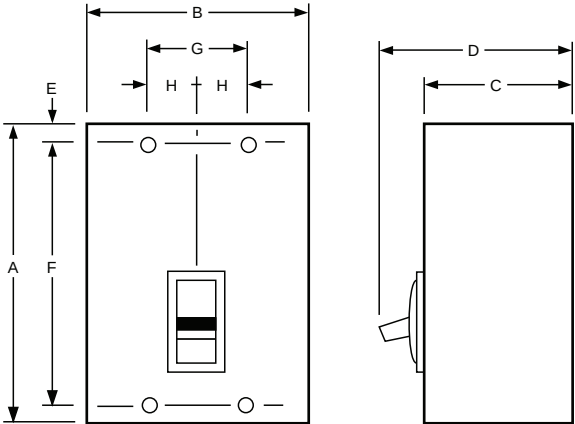
MIL-1

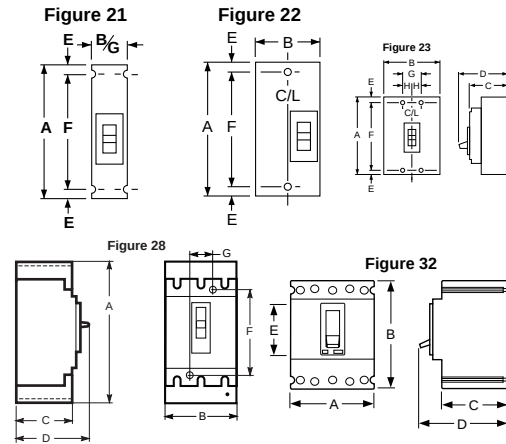
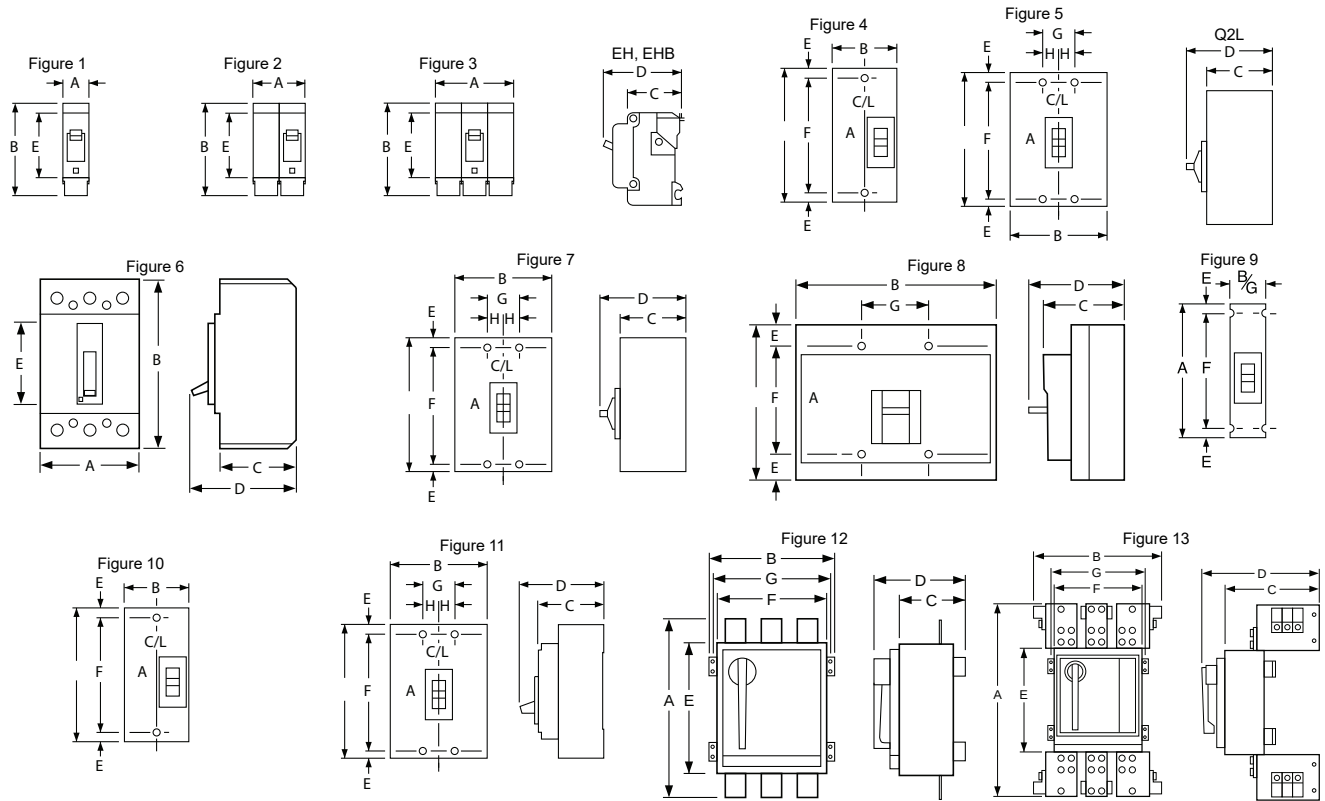


MIL-2

Table 11.2: Circuit Breaker Dimensions

| Circuit Breaker Type | Cat. No. Prefix | Number Poles | Dimensions |     |       |     |      |     |      |     |      |     |       |     |      |     |      |    |
|----------------------|-----------------|--------------|------------|-----|-------|-----|------|-----|------|-----|------|-----|-------|-----|------|-----|------|----|
|                      |                 |              | A          |     | B     |     | C    |     | D    |     | E    |     | F     |     | G    |     | H    |    |
|                      |                 |              | in.        | mm  | in.   | mm  | in.  | mm  | in.  | mm  | in.  | mm  | in.   | mm  | in.  | mm  | in.  | mm |
| QB                   | 991             | 1            | 3.75       | 95  | 1.00  | 25  | 2.50 | 63  | 3.06 | 78  | —    | —   | —     | —   | —    | —   | —    | —  |
| ML                   | 992             | 1            | 6.00       | 152 | 1.00  | 25  | 3.09 | 78  | 3.91 | 99  | .88  | 22  | 4.25  | 108 | —    | —   | .33  | 8  |
|                      | 992             | 2            | 6.00       | 152 | 2.00  | 51  | 3.09 | 78  | 3.91 | 99  | .88  | 22  | 4.25  | 108 | —    | —   | .19  | 5  |
|                      | 992             | 3            | 6.00       | 152 | 3.00  | 76  | 3.09 | 78  | 3.91 | 99  | .88  | 22  | 4.25  | 108 | —    | —   | 1.83 | 46 |
| ML-1                 | 999             | 2, 3         | 6.50       | 165 | 4.47  | 113 | 3.06 | 78  | 3.94 | 100 | .94  | 24  | 4.25  | 108 | 1.50 | 38  | .75  | 19 |
| ML-2                 | 994             | 2, 3         | 9.56       | 243 | 4.47  | 113 | 3.75 | 95  | 4.88 | 124 | 1.69 | 43  | 6.50  | 165 | 1.50 | 38  | .75  | 19 |
| ML-3                 | 997             | 2, 3         | 10.38      | 264 | 5.97  | 152 | 3.88 | 98  | 5.31 | 135 | 1.69 | 43  | 6.63  | 168 | 2.00 | 51  | 1.00 | 25 |
| LA (W)               | LA              | 2, 3         | 10.75      | 273 | 8.25  | 209 | 4.31 | 109 | 5.50 | 140 | .63  | 16  | 9.50  | 241 | 2.75 | 70  | 1.38 | 35 |
| MA (W)               | MA              | 2, 3         | 16.00      | 406 | 8.25  | 209 | 4.06 | 103 | 6.06 | 154 | .88  | 22  | 14.25 | 362 | 2.75 | 70  | 1.38 | 35 |
| KL                   | 967             | 2, 3         | 22.00      | 559 | 8.25  | 209 | 5.50 | 140 | 7.00 | 178 | .63  | 16  | 20.75 | 527 | 2.75 | 70  | 1.38 | 35 |
| LM                   | 940             | 2, 3         | 22.00      | 559 | 8.25  | 209 | 5.50 | 140 | 7.00 | 178 | .63  | 16  | 20.75 | 527 | 2.75 | 70  | 1.38 | 35 |
| FIL (4)              | IFL             | 2, 3         | 8.29       | 210 | 4.46  | 113 | 3.67 | 93  | 4.70 | 119 | .44  | 11  | 7.41  | 188 | 1.50 | 38  | .75  | 19 |
| KIL (4)              | IKL             | 2, 3         | 11.00      | 279 | 6.00  | 152 | 4.02 | 102 | 5.51 | 140 | .88  | 22  | 9.25  | 235 | 2.00 | 51  | 1.00 | 25 |
| LIL                  | ILL             | 2, 3         | 11.00      | 279 | 12.00 | 305 | 4.05 | 103 | 6.11 | 155 | .88  | 22  | 9.25  | 235 | 4.00 | 102 | 2.00 | 51 |
| NHL                  | NHL             | 2, 3         | 20.00      | 508 | 12.00 | 305 | 5.75 | 146 | 8.12 | 206 | 5.87 | 149 | 7.76  | 197 | 4.00 | 102 | 2.00 | 51 |





**Table 11.3: Shipping Weights**

| Frame Size             | Approx. Shipping Weight (Lbs.) |
|------------------------|--------------------------------|
| FAL, FHL 2-pole<br>FCL | 3                              |
| FAL, FHL 3-pole        | 5                              |
| FIL                    | 8                              |
| GJ                     | 3                              |
| KAL, KHL               | 7                              |
| MAL, MHL               | 34                             |
| PAF, PHF               | 69                             |
| PXF, PEF               | 80                             |

**Table 11.4: Circuit Breaker Dimensions**

| Circuit Breaker Cat. No. Prefix | No. Poles | Fig. No.   | Dimensions—In. |          |       |       |       |       |       |      |
|---------------------------------|-----------|------------|----------------|----------|-------|-------|-------|-------|-------|------|
|                                 |           |            | A              | B        | C     | D     | E     | F     | G     | H    |
| EH, EHB                         | 1         | 1          | 1.00           | 3.50     | 2.00  | 2.97  | 2.44  | —     | —     | —    |
|                                 | 2         | 2          | 2.00           | 3.50 [1] | 2.00  | 2.97  | 2.44  | —     | —     | —    |
|                                 | 3         | 3          | 3.00           | 3.50 [1] | 2.00  | 2.97  | 2.44  | —     | —     | —    |
| FDA, FGA, FJA                   | 1         | Width 1.50 |                |          |       |       |       |       |       |      |
|                                 | 2, 3      | Width 3.00 |                |          |       |       |       |       |       |      |
| FAL, FHL                        | 1         | 21         | 6.00           | 1.50     | 3.16  | 4.13  | 0.44  | 5.13  | 1.50  | —    |
|                                 | 2         | 22         | 6.00           | 3.00     | 3.16  | 4.13  | 0.44  | 5.13  | —     | —    |
|                                 | 3         | 23         | 6.00           | 4.50     | 3.16  | 4.13  | 0.44  | 5.13  | 1.50  | 0.75 |
| FIL, KIL                        | 2, 3      | 11         | 8.00           | 4.50     | 3.66  | 4.75  | 0.44  | 7.13  | 1.50  | 0.75 |
| DG, DJ, DL                      | 3         | 28         | 13.38          | 5.51     | 3.75  | 6.61  | 2.22  | 8.93  | 1.77  | —    |
| GJ                              | 3         | 32         | 3.54           | 4.72     | 2.76  | 3.94  | 2.20  | —     | —     | —    |
| KAL, KCL, KHL                   | 2, 3      | 23         | 8.00           | 4.50     | 3.66  | 4.75  | 0.44  | 7.13  | 1.50  | 0.75 |
| KIL                             | 2, 3      | 23         | 8.00           | 4.50     | 3.66  | 4.75  | 0.44  | 7.13  | 1.50  | 0.75 |
| KD, KG                          | 2, 3      | 6          | 4.12           | 7.35     | 3.20  | 4.17  | 3.34  | —     | —     | —    |
| LC, LI, LE, LX, LXI             | 2, 3      | 11         | 11.86          | 7.50     | 5.48  | 6.74  | 0.55  | 10.75 | 2.50  | —    |
| LIL, LXIL                       | 2, 3      | 11         | 11.86          | 7.50     | 5.48  | 6.74  | 0.55  | 10.75 | 2.50  | —    |
| Q4L, LAL, LHL                   | 2, 3      | 11         | 11.00          | 6.00     | 4.06  | 5.84  | 0.88  | 9.25  | 2.00  | 1.00 |
| Q2L, Q2L-H                      | 2         | 4          | 6.44           | 3.00     | 3.16  | 3.92  | [2]   | 4.25  | —     | —    |
|                                 | 3         | 5          | 6.44           | 4.50     | 3.16  | 3.92  | [2]   | 4.25  | 1.50  | 0.75 |
| MXL, MEL                        | 2, 3      | 7          | 14.75          | 9.00     | 4.37  | 6.50  | 1.66  | 11.43 | 3.00  | 1.50 |
| NAL, NCL, NEL, NXL              | 2, 3      | 8          | 12.12          | 14.98    | 6.40  | 8.07  | 1.69  | 8.75  | 5.00  | —    |
| FCL                             | 1         | 9          | 6.00           | 1.50     | 3.16  | 4.13  | 0.44  | 5.13  | 1.50  | —    |
|                                 | 2         | 10         | 6.00           | 3.00 [3] | 3.16  | 4.13  | 0.44  | 5.13  | —     | —    |
|                                 | 3         | 11         | 6.00           | 4.50     | 3.16  | 4.13  | 0.44  | 5.13  | 1.50  | 0.75 |
| MAL, MHL                        | 2, 3      | 23         | 14.00          | 9.00     | 4.53  | 6.50  | 1.66  | 10.69 | 3.00  | 1.50 |
| NA, NC, NX, NE                  | 2, 3      | 8          | 12.12          | 14.98    | 6.40  | 8.07  | 1.69  | 8.75  | 5.0   | —    |
| PA, PH, PX, PE                  | 2, 3      | 12         | 20.06          | 13.70    | 7.25  | 10.47 | 14.00 | 12.00 | 12.75 | —    |
| PC, PX-25, PE-20, PE-25         | 2, 3      | 13         | 26.10          | 23.30    | 13.33 | 16.55 | 14.10 | 12.00 | —     | —    |

[1] 70–100 A is 4.00 in.  
[2] Dimensions E are 1.59 in at ON end and 0.63 in at OFF end.  
[3] FCL 2-pole circuit breaker dimension B is 4.50 as in Fig. 23.

### SF Circuit Breakers

- CE marking.
- S-frame circuit breakers are CCC Certified.
- International products—for export use only.
- MCCBs in I-Line™ plug-on construction and a complete line of accessories are available. Contact your local Field Sales office.
- Order entry point is Cedar Rapids, Iowa.

**Table 11.5: SFAL, Individually-Mounted, IEC Rated Circuit Breakers, 415/240 Vac Max., 50/60 Hz, 1P, 2P, and 3P**

| Ampere Rating | Cat. No. |          |          |
|---------------|----------|----------|----------|
|               | 1P       | 2P       | 3P       |
| SFAL [1]      |          |          |          |
| 16 A          | SFAL1016 | SFAL2016 | SFAL3016 |
| 20 A          | SFAL1020 | SFAL2020 | SFAL3020 |
| 32 A          | SFAL1032 | SFAL2032 | SFAL3032 |
| 40 A          | SFAL1040 | SFAL2040 | SFAL3040 |
| 50 A          | SFAL1050 | SFAL2050 | SFAL3050 |
| 63 A          | SFAL1063 | SFAL2063 | SFAL3063 |
| 80 A          | SFAL1080 | SFAL2080 | SFAL3080 |
| 100 A         | SFAL1100 | SFAL2100 | SFAL3100 |
| 125 A         | —        | SFAL2125 | SFAL3125 |
| 160 A         | —        | SFAL2160 | SFAL3160 |

### Breaking Capacities

- CE Marking
- International products—IEC 60947-2 rated. North American products are dual rated, UL 489 and IEC 60947-2.
- MCCBs in I-Line™ plug-on construction and a complete line of accessories are available. Contact your nearest Field Sales office.
- Order entry point is Cedar Rapids, Iowa.

**Table 11.6: Circuit Breaker Breaking Capacities**

| Circuit Breaker Cat. Prefix |                     | Current Rating (Amps) | Short-circuit Ratings (415 Vac) |                  |                    | Isolator Rating | Impulse Rating $U_{imp}$ (kV) | Insulation Rating $U_i$ (Vac) |
|-----------------------------|---------------------|-----------------------|---------------------------------|------------------|--------------------|-----------------|-------------------------------|-------------------------------|
| International               | North America       |                       | Ultimate $I_{cu}$               | Service $I_{cs}$ | Withstand $I_{cw}$ |                 |                               |                               |
| —                           | FA, FH              | 15–100 A              | 10 kA                           | 2.5 kA           | N/A                | Yes             | 6                             | 750                           |
| —                           | FA, FH (1 pole) [2] | 15–100 A              | 18 kA                           | 9 kA             | N/A                | Yes             | 6                             | 750                           |
| SFA (1 pole) [2]            | —                   | 16–100 A              | 25 kA                           | 12.5 kA          | N/A                | Yes             | 6                             | 750                           |
| SFA [3]                     | —                   | 16–160 A              | 25 kA                           | 12.5 kA          | N/A                | Yes             | 6                             | 750                           |
| —                           | FC                  | 15–100 A              | 10 kA                           | 2.5 kA           | N/A                | Yes             | 6                             | 750                           |
| SFH                         | —                   | 16–63 A               | 65 kA                           | 50 kA            | N/A                | Yes             | 6                             | 750                           |
|                             |                     | 80–100 A              | 65 kA                           | 33 kA            | N/A                | Yes             | 6                             | 750                           |

### SF Circuit Breaker Dimensions

- CE Marking
- International products—IEC 60947-2 rated. North American products are dual rated, UL 489 and IEC 60947-2.
- MCCBs in I-Line™ plug-on construction and a complete line of accessories are available. Contact your nearest Field Sales office.
- Order entry point is Cedar Rapids, Iowa.

**Table 11.7: Dimensions**

| Circuit Breaker | No. Poles | Fig. No. | Dimensions – mm |     |    |     |    |     |    |    |
|-----------------|-----------|----------|-----------------|-----|----|-----|----|-----|----|----|
|                 |           |          | A               | B   | C  | D   | E  | F   | G  | H  |
| SFA, FA, FH     | 3         | 1        | 152             | 114 | 80 | 105 | 11 | 130 | 38 | 19 |

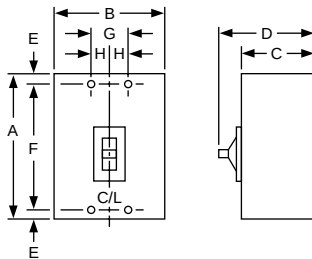


Figure 1

[1] Add suffix K for CCC label  
 [2] Single pole ratings are 240 V.  
 [3] SFA 2 & 3 pole marked Line and Load.

## Photovoltaic Accessories

**NOTE:** Photovoltaic circuit breakers and related accessories are obsolete. Limited service stock is available for replacement or fill purposes. Contact the nearest sales office for product availability.

**Table 11.8: Auxiliary Switches**

| Contacts                   | Factory-Installed Suffix | Field-Installable Kit No. | Kit Qty. |
|----------------------------|--------------------------|---------------------------|----------|
| 1A/1B Standard             | AA                       | S29450                    | 1        |
| 2A/2B Standard             | AB                       | S29450                    | 2        |
| 3A/3B Standard [4]         | AC                       | S29450                    | 3        |
| 1A/1B Low-Level (Gold)     | AE                       | S29452                    | 1        |
| 2A/2B Low-Level (Gold)     | AF                       | S29452                    | 2        |
| 3A/3B Low-Level (Gold) [4] | AG                       | S29452                    | 3        |

**Table 11.9: Alarm/Overcurrent Trip Switches**

| Suffix                   | Switch                                             | Kit No. | Kit Qty. |
|--------------------------|----------------------------------------------------|---------|----------|
| <b>PowerPact T-Frame</b> |                                                    |         |          |
| BC                       | Alarm Switch                                       | S29450  | 1        |
| BD                       | Overcurrent Trip Switch, Standard                  | S29450  | 1        |
| BE                       | Alarm Switch and Overcurrent Trip Switch, Standard | S29450  | 2        |
| <b>PowerPact U-Frame</b> |                                                    |         |          |
| BC                       | Alarm Switch                                       | S29450  | 1        |
| BD                       | Overcurrent Trip Switch, Standard                  | S29450  | 1        |
| BE                       | Alarm Switch and Overcurrent Trip Switch, Standard | S29450  | 2        |

**Table 11.10: Shunt Trips and Undervoltage Trips**

| Voltage | Shunt Trip (MX) |                              | Undervoltage Trip (MN)<br>Field-Installable<br>Kit No. | Adjustable and Fixed<br>Time Delay Units for<br>Undervoltage Trip<br>Field-Installable<br>Kit No. |
|---------|-----------------|------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|         | Suffix          | Field-Installable<br>Kit No. |                                                        |                                                                                                   |
| 120 Vac | SA              | S29386                       | —                                                      | —                                                                                                 |

[4] U-Frame only.

## F-Frame Circuit Breakers Ending Production in 2018–2019

**PowerPact B-Frame** 15–125 A molded case circuit breakers are the designated replacement for F-frame applications. The PowerPact B-frame features increased capacity, a smaller size in unit mount, same size in I-Line applications to ease retrofit, and a flexible range of field-installable accessories, auxiliaries and operators.

## F-Frame Molded Case Circuit Breakers

Thermal-magnetic molded case circuit breakers shown here are permanent trip UL Listed, CSA Certified, IEC rated, and also meet the requirements of Federal Specification W–C–375B/GEN as indicated in Digest Section 7.

**NOTE:** Consider using PowerPact™ circuit breakers for situations requiring circuit breaker accessories. See Digest Section 7 for more information.

**Table 11.12: F-Frame—100 A, Thermal-Magnetic, Individually-Mounted, Standard Interrupting, 240 Vac**

| Ampere Rating | Fixed AC Magnetic Trip |        | Cat. No.       |                |                | Terminal Wire Range (AWG)         |
|---------------|------------------------|--------|----------------|----------------|----------------|-----------------------------------|
|               | Hold                   | Trip   | 1 P<br>120 Vac | 2 P<br>240 Vac | 3 P<br>240 Vac |                                   |
| 15 A          | 275 A                  | 600 A  | FAL12015       | FAL22015       | FAL32015       | AL50FA<br>14–4 Cu or 12–4 Al      |
| 20 A          | 275 A                  | 600 A  | FAL12020       | FAL22020       | FAL32020       |                                   |
| 25 A          | 275 A                  | 600 A  | FAL12025       | FAL22025       | FAL32025       |                                   |
| 30 A          | 275 A                  | 600 A  | FAL12030       | FAL22030       | FAL32030       |                                   |
| 35 A          | 400 A                  | 850 A  | FAL12035       | FAL22035       | FAL32035       |                                   |
| 40 A          | 400 A                  | 850 A  | FAL12040       | FAL22040       | FAL32040       | AL100FA<br>14–1/0 Cu or 12–1/0 Al |
| 45 A          | 400 A                  | 850 A  | FAL12045       | FAL22045       | FAL32045       |                                   |
| 50 A          | 400 A                  | 850 A  | FAL12050       | FAL22050       | FAL32050       |                                   |
| 60 A          | 800 A                  | 1450 A | FAL12060       | FAL22060       | FAL32060       |                                   |
| 70 A          | 800 A                  | 1450 A | FAL12070       | FAL22070       | FAL32070       |                                   |
| 80 A          | 800 A                  | 1450 A | FAL12080       | FAL22080       | FAL32080       |                                   |
| 90 A          | 900 A                  | 1700 A | FAL12090       | FAL22090       | FAL32090       |                                   |
| 100 A         | 900 A                  | 1700 A | FAL12100       | FAL22100       | FAL32100       |                                   |

FAL 1P  
15–100 A

FAL/FHL 2P  
15–100 A

FAL/FHL 3P  
15–100 A

**Table 11.11: Termination Option**

| Termination Letter                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------|
| F = No Lugs                                                                                                           |
| L = Lugs both ends                                                                                                    |
| P with MT Suffix = Lugs ON end                                                                                        |
| P = Lugs OFF end                                                                                                      |
| F A L 3 6 1 0 0                                                                                                       |
| For factory-installed termination, place termination letter in the third block of the circuit breaker catalog number. |

**Table 11.13: F-Frame—100 A, Thermal-Magnetic, Individually-Mounted, 480 Vac**

| Ampere Rating | Fixed AC Magnetic Trip |        | Standard Interrupting Cat. No. |                        |                        | Terminal                                     |
|---------------|------------------------|--------|--------------------------------|------------------------|------------------------|----------------------------------------------|
|               | Hold                   | Trip   | 1P<br>277 Vac, 125 Vdc         | 2P<br>480 Vac, 250 Vdc | 3P<br>480 Vac, 250 Vdc |                                              |
| 15 A          | 275 A                  | 600 A  | FAL14015                       | FAL24015               | FAL34015               | AL50FA<br>(1) 14–4 Cu or<br>(1) 12–4 Al      |
| 20 A          | 275 A                  | 600 A  | FAL14020                       | FAL24020               | FAL34020               |                                              |
| 25 A          | 275 A                  | 600 A  | FAL14025                       | FAL24025               | FAL34025               |                                              |
| 30 A          | 275 A                  | 600 A  | FAL14030                       | FAL24030               | FAL34030               |                                              |
| 35 A          | 400 A                  | 850 A  | FAL14035                       | FAL24035               | FAL34035               |                                              |
| 40 A          | 400 A                  | 850 A  | FAL14040                       | FAL24040               | FAL34040               | AL100FA<br>(1) 14–1/0 Cu<br>or (1) 12–1/0 Al |
| 45 A          | 400 A                  | 850 A  | FAL14045                       | FAL24045               | FAL34045               |                                              |
| 50 A          | 400 A                  | 850 A  | FAL14050                       | FAL24050               | FAL34050               |                                              |
| 60 A          | 800 A                  | 1450 A | FAL14060                       | FAL24060               | FAL34060               |                                              |
| 70 A          | 800 A                  | 1450 A | FAL14070                       | FAL24070               | FAL34070               |                                              |
| 80 A          | 800 A                  | 1450 A | FAL14080                       | FAL24080               | FAL34080               |                                              |
| 90 A          | 900 A                  | 1700 A | FAL14090                       | FAL24090               | FAL34090               |                                              |
| 100 A         | 900 A                  | 1700 A | FAL14100                       | FAL24100               | FAL34100               |                                              |

**Table 11.14: F-Frame—100 A, Thermal-Magnetic, Individually-Mounted, 600 Vac**

| Ampere Rating | Fixed AC Magnetic Trip |        | Cat. No.                  |                           |                           |                           |                           |                           |                           | Terminal Wire Range (AWG)            |
|---------------|------------------------|--------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------------------|
|               |                        |        | Standard Interrupting     |                           | High Interrupting         |                           |                           | Current Limiting          |                           |                                      |
|               | Hold                   | Trip   | 2P<br>600 Vac,<br>250 Vdc | 3P<br>600 Vac,<br>250 Vdc | 1P<br>277 Vac,<br>125 Vdc | 2P<br>600 Vac,<br>250 Vdc | 3P<br>600 Vac,<br>250 Vdc | 2P<br>600 Vac,<br>250 Vdc | 3P<br>600 Vac,<br>250 Vdc |                                      |
| 15 A          | 275 A                  | 600 A  | FAL26015                  | FAL36015                  | FHL16015                  | FHL26015                  | FHL36015                  | —                         | —                         | AL50FA<br>14–4 Cu or<br>12–4 Al      |
| 20 A          | 275 A                  | 600 A  | FAL26020                  | FAL36020                  | FHL16020                  | FHL26020                  | FHL36020                  | FIL26020                  | FIL36020                  |                                      |
| 25 A          | 275 A                  | 600 A  | FAL26025                  | FAL36025                  | FHL16025                  | FHL26025                  | FHL36025                  | FIL26025                  | FIL36025                  |                                      |
| 30 A          | 275 A                  | 600 A  | FAL26030                  | FAL36030                  | FHL16030                  | FHL26030                  | FHL36030                  | FIL26030                  | FIL36030                  |                                      |
| 35 A          | 400 A                  | 850 A  | FAL26035                  | FAL36035                  | FHL16035                  | FHL26035                  | FHL36035                  | FIL26035                  | FIL36035                  |                                      |
| 40 A          | 400 A                  | 850 A  | FAL26040                  | FAL36040                  | FHL16040                  | FHL26040                  | FHL36040                  | FIL26040                  | FIL36040                  | AL100FA<br>14–1/0 Cu<br>or 12–1/0 Al |
| 45 A          | 400 A                  | 850 A  | FAL26045                  | FAL36045                  | FHL16045                  | FHL26045                  | FHL36045                  | FIL26045                  | FIL36045                  |                                      |
| 50 A          | 400 A                  | 850 A  | FAL26050                  | FAL36050                  | FHL16050                  | FHL26050                  | FHL36050                  | FIL26050                  | FIL36050                  |                                      |
| 60 A          | 800 A                  | 1450 A | FAL26060                  | FAL36060                  | FHL16060                  | FHL26060                  | FHL36060                  | FIL26060                  | FIL36060                  |                                      |
| 70 A          | 800 A                  | 1450 A | FAL26070                  | FAL36070                  | FHL16070                  | FHL26070                  | FHL36070                  | FIL26070                  | FIL36070                  |                                      |
| 80 A          | 800 A                  | 1450 A | FAL26080                  | FAL36080                  | FHL16080                  | FHL26080                  | FHL36080                  | FIL26080                  | FIL36080                  |                                      |
| 90 A          | 900 A                  | 1700 A | FAL26090                  | FAL36090                  | FHL16090                  | FHL26090                  | FHL36090                  | FIL26090                  | FIL36090                  |                                      |
| 100 A         | 900 A                  | 1700 A | FAL26100                  | FAL36100                  | FHL16100                  | FHL26100                  | FHL36100                  | FIL26100                  | FIL36100                  |                                      |

Accessories see page 11-14 through page 11-18

Optional Lugs see page 3-16

Enclosures see page 11-23

**Table 11.15: Interrupting Ratings**

| Voltage | FAL     |                              |         | FHL                          | FCL [5] | FIL    |
|---------|---------|------------------------------|---------|------------------------------|---------|--------|
|         | 240 Vac | 480 Vac                      | 600 Vac |                              |         |        |
| 240 Vac | 10 kA   | 18 kA (1P)<br>25 kA (2P, 3P) | 25 kA   | 25 kA (1P)<br>65 kA (2P, 3P) | 100 kA  | 200 kA |
| 480 Vac | —       | 18 kA                        | 18 kA   | 25 kA (2P, 3P)               | 65 kA   | 200 kA |
| 600 Vac | —       | —                            | 14 kA   | 18 kA (2P, 3P)               | —       | 100 kA |

[5] See Section 11.



## F-Frame I-Line Circuit Breakers

**NOTE:** Consider using PowerPact™ circuit breakers for situations requiring circuit breaker accessories. See Digest Section 7 for more information.

**Table 11.16: F-Frame—100 A, Thermal-Magnetic, I-Line™ Construction, 240 Vac, Standard Interrupting**

| Ampere Rating | Fixed AC Magnetic Trip |        | Cat. No.           |                | Terminal Wire Range (AWG)            |
|---------------|------------------------|--------|--------------------|----------------|--------------------------------------|
|               | Hold                   | Trip   | 2 P [6]<br>240 Vac | 3 P<br>240 Vac |                                      |
| 15 A          | 275 A                  | 600 A  | FA22015( )         | FA32015        | AL50FA<br>14–4 Cu or<br>12–4 Al      |
| 20 A          | 275 A                  | 600 A  | FA22020( )         | FA32020        |                                      |
| 25 A          | 275 A                  | 600 A  | FA22025( )         | FA32025        |                                      |
| 30 A          | 275 A                  | 600 A  | FA22030( )         | FA32030        |                                      |
| 35 A          | 400 A                  | 850 A  | FA22035( )         | FA32035        |                                      |
| 40 A          | 400 A                  | 850 A  | FA22040( )         | FA32040        | AL100FA<br>14–1/0 Cu<br>or 12–1/0 Al |
| 45 A          | 400 A                  | 850 A  | FA22045( )         | FA32045        |                                      |
| 50 A          | 400 A                  | 850 A  | FA22050( )         | FA32050        |                                      |
| 60 A          | 800 A                  | 1450 A | FA22060( )         | FA32060        |                                      |
| 70 A          | 800 A                  | 1450 A | FA22070( )         | FA32070        |                                      |
| 80 A          | 800 A                  | 1450 A | FA22080( )         | FA32080        |                                      |
| 90 A          | 900 A                  | 1700 A | FA22090( )         | FA32090        |                                      |
| 100 A         | 900 A                  | 1700 A | FA22100( )         | FA32100        |                                      |

**Table 11.17: F-Frame—100 A, Thermal-Magnetic, I-Line Construction, 480 Vac**

| Ampere Rating | Fixed AC Magnetic Trip |        | Standard Interrupting         |                            |                        | Terminal Wire Range (AWG)                    |
|---------------|------------------------|--------|-------------------------------|----------------------------|------------------------|----------------------------------------------|
|               | Hold                   | Trip   | 1P [6][7]<br>277 Vac, 125 Vdc | 2P [6]<br>480 Vac, 250 Vdc | 3P<br>480 Vac, 250 Vdc |                                              |
| 15 A          | 275 A                  | 600 A  | —                             | FA24015( )                 | FA34015                | AL50FA<br>(1) 14–4 Cu or<br>(1) 12–4 Al      |
| 20 A          | 275 A                  | 600 A  | —                             | FA24020( )                 | FA34020                |                                              |
| 25 A          | 275 A                  | 600 A  | —                             | FA24025( )                 | FA34025                |                                              |
| 30 A          | 275 A                  | 600 A  | —                             | FA24030( )                 | FA34030                |                                              |
| 35 A          | 400 A                  | 850 A  | FA14035( )                    | FA24035( )                 | FA34035                |                                              |
| 40 A          | 400 A                  | 850 A  | FA14040( )                    | FA24040( )                 | FA34040                | AL100FA<br>(1) 14–1/0 Cu<br>or (1) 12–1/0 Al |
| 45 A          | 400 A                  | 850 A  | FA14045( )                    | FA24045( )                 | FA34045                |                                              |
| 50 A          | 400 A                  | 850 A  | FA14050( )                    | FA24050( )                 | FA34050                |                                              |
| 60 A          | 800 A                  | 1450 A | FA14060( )                    | FA24060( )                 | FA34060                |                                              |
| 70 A          | 800 A                  | 1450 A | FA14070( )                    | FA24070( )                 | FA34070                |                                              |
| 80 A          | 800 A                  | 1450 A | FA14080( )                    | FA24080( )                 | FA34080                |                                              |
| 90 A          | 900 A                  | 1700 A | FA14090( )                    | FA24090( )                 | FA34090                |                                              |
| 100 A         | 900 A                  | 1700 A | FA14100( )                    | FA24100( )                 | FA34100                |                                              |

**Table 11.18: F-Frame—100 A, Thermal-Magnetic, I-Line™ Construction, 600 Vac**

| Ampere Rating | Fixed AC Magnetic Trip |        | Cat. No.                      |                            |                                  |                               |                           |                               |                           |                                      | Terminal Wire Range (AWG) |
|---------------|------------------------|--------|-------------------------------|----------------------------|----------------------------------|-------------------------------|---------------------------|-------------------------------|---------------------------|--------------------------------------|---------------------------|
|               |                        |        | Standard Interrupting         |                            |                                  | High Interrupting             |                           | Current Limiting              |                           |                                      |                           |
|               | Hold                   | Trip   | 2P [6]<br>600 Vac,<br>250 Vdc | 3 P<br>600 Vac,<br>250 Vdc | 1P [6][7]<br>277 Vac,<br>125 Vdc | 2P [6]<br>600 Vac,<br>250 Vdc | 3P<br>600 Vac,<br>250 Vdc | 2P [6]<br>600 Vac,<br>250 Vdc | 3P<br>600 Vac,<br>250 Vdc |                                      |                           |
| 15 A          | 275 A                  | 600 A  | FA26015( )                    | FA36015                    | FH16015( )                       | FH26015( )                    | FH36015                   | —                             | —                         | AL50FA<br>14–4 Cu or<br>12–4 Al      |                           |
| 20 A          | 275 A                  | 600 A  | FA26020( )                    | FA36020                    | FH16020( )                       | FH26020( )                    | FH36020                   | FI26020( )                    | FI36020                   |                                      |                           |
| 25 A          | 275 A                  | 600 A  | FA26025( )                    | FA36025                    | FH16025( )                       | FH26025( )                    | FH36025                   | —                             | —                         |                                      |                           |
| 30 A          | 275 A                  | 600 A  | FA26030( )                    | FA36030                    | FH16030( )                       | FH26030( )                    | FH36030                   | FI26030( )                    | FI36030                   |                                      |                           |
| 35 A          | 400 A                  | 850 A  | FA26035( )                    | FA36035                    | FH16035( )                       | FH26035( )                    | FH36035                   | —                             | —                         |                                      |                           |
| 40 A          | 400 A                  | 850 A  | FA26040( )                    | FA36040                    | FH16040( )                       | FH26040( )                    | FH36040                   | FI26040( )                    | FI36040                   | AL100FA<br>14–1/0 Cu<br>or 12–1/0 Al |                           |
| 45 A          | 400 A                  | 850 A  | FA26045( )                    | FA36045                    | FH16045( )                       | FH26045( )                    | FH36045                   | —                             | —                         |                                      |                           |
| 50 A          | 400 A                  | 850 A  | FA26050( )                    | FA36050                    | FH16050( )                       | FH26050( )                    | FH36050                   | FI26050( )                    | FI36050                   |                                      |                           |
| 60 A          | 800 A                  | 1450 A | FA26060( )                    | FA36060                    | FH16060( )                       | FH26060( )                    | FH36060                   | FI26060( )                    | FI36060                   |                                      |                           |
| 70 A          | 800 A                  | 1450 A | FA26070( )                    | FA36070                    | FH16070( )                       | FH26070( )                    | FH36070                   | FI26070( )                    | FI36070                   |                                      |                           |
| 80 A          | 800 A                  | 1450 A | FA26080( )                    | FA36080                    | FH16080( )                       | FH26080( )                    | FH36080                   | FI26080( )                    | FI36080                   |                                      |                           |
| 90 A          | 900 A                  | 1700 A | FA26090( )                    | FA36090                    | FH16090( )                       | FH26090( )                    | FH36090                   | FI26090( )                    | FI36090                   |                                      |                           |
| 100 A         | 900 A                  | 1700 A | FA26100( )                    | FA36100                    | FH16100( )                       | FH26100( )                    | FH36100                   | FI26100( )                    | FI36100                   |                                      |                           |

**Table 11.19: Phase Options**

| Phase Option Letter | 1P       | 2P        | 3P         |
|---------------------|----------|-----------|------------|
| A                   | FA14035A | —         | —          |
| B                   | FA14035B | —         | —          |
| C                   | FA14035C | —         | —          |
| AB                  | —        | FA24030AB | —          |
| AC                  | —        | FA24030AC | —          |
| BC                  | —        | FA24030BC | —          |
| ABC                 | —        | —         | FA34030    |
| CBA                 | —        | —         | FA34030CBA |

**Table 11.20: Interrupting Ratings**

| Voltage | FA      |                               |         | FH                            | FC[8]  | FI     |
|---------|---------|-------------------------------|---------|-------------------------------|--------|--------|
|         | 240 Vac | 480 Vac                       | 600 Vac |                               |        |        |
| 240 Vac | 10 kA   | 18 kA (1P),<br>25 kA (2P, 3P) | 25 kA   | 25 kA (1P),<br>65 kA (2P, 3P) | 100 kA | 200 kA |
| 277 Vac | —       | 18 kA                         | —       | —                             | 65 kA  | —      |
| 480 Vac | —       | 18 kA                         | 18 kA   | 25 kA (2P, 3P)                | 65 kA  | 200 kA |
| 600 Vac | —       | —                             | 14 kA   | 18 kA (2P, 3P)                | —      | 100 kA |

Accessories see page 11-14 through page 11-18

Optional Lugs see page 3-16

Enclosures see page 11-23

[6] 1P and 2P circuit breaker catalog numbers are completed by adding the required phase connection letters as a suffix. See Phase Option Table.  
[7] Rated 277 Vac, 125 Vdc, 15–30 A circuit breaker suitable for use with 60°C or 75°C conductors. 35–100 A circuit breakers are suitable for use with 75°C conductors.  
[8] See Section 11.

## Mag-Gard Motor Circuit Protector

Instantaneous trip magnetic only circuit breakers have a single adjustment which simultaneously sets the magnetic trip level of each individual pole. Mag-Gard circuit breakers comply with NEC® requirements for providing motor circuit protection when installed as part of a UL Listed combination controller having motor overload protection. Interrupting ratings are established for these UL Recognized Components only when they are used in combination with motor starters with properly sized overload relays and contactors.

Mag-Gard circuit breakers will accept the same lugs and accessories as equivalent thermal-magnetic circuit breakers.

**Table 11.21: Magnetic-Only GJL Circuit Breakers, 400 A, 600 Vac, 50/60 Hz [9]**

| Ampere Rating | Adjustable [10]<br>Trip Range | Cat. No.<br>3P Only |
|---------------|-------------------------------|---------------------|
| GJL [11]      | 3                             | GJL36003M01         |
|               | 7                             | GJL36007M02         |
|               | 15                            | GJL36015M03         |
|               | 30                            | GJL36030M04         |
|               | 50                            | GJL36050M05         |
|               | 75                            | GJL36075M06         |

**NOTE:** Each ampere rating can be ordered with any designated trip range for the frame by adding the proper suffix to the catalog numbers.

## GJL MCP Selection

Adjustable instantaneous-trip circuit breakers are intended for use in combination with motor starters with overload relays for the protection of motor circuits from short circuits. Other specific applications include rectifiers and resistance welders. These circuit breakers contain a magnetic trip element in each pole with the trip point adjustable from the front. Interrupting ratings are determined by testing the instantaneous-trip circuit breakers in combination with a contactor and overload relay.

Select instantaneous-trip circuit breakers using the selection table below.

This selection table is suitable for motors, other than NEMA Design E, with locked-rotor indicating code letters per NEC® Table 430.7 (b).

**Table 11.22: Locked-Rotor Indicating Codes**

| Horsepower   | Motor Code letter |
|--------------|-------------------|
| 1/2 or less  | A-L               |
| 3/4 to 1-1/2 | A-K               |
| 2 to 3       | A-J               |
| 5 to 25      | A-H               |
| 30 to 125    | A-G               |
| 150 or more  | A-F               |

- For other motors order a special thermal-magnetic circuit breaker with magnetic trip settings for the specific motor— specify motor horsepower, voltage, frequency, full-load current and code letter or locked rotor current.
- Determine motor hp rating from the motor nameplate.
- Refer to the tables and select an instantaneous-trip circuit breaker with an ampere rating recommended for the hp and voltage involved.
- Select an adjustable trip setting of at least 800%, not to exceed 1300%, of the motor full-load amperes (FLA) for other than Design E motors. For Design E motors, select an adjustable trip setting of at least 1100% not to exceed 1700% of FLA.
- The NEC 1300% maximum setting may be inadequate for instantaneous-trip circuit breakers to withstand current surges typical of the magnetization current of autotransformer type reduced voltage starters, or open transition wye-delta starters during transfer from “start” to “run”, constant hp multi-speed motors, and motors labeled “high efficiency”. Select thermal-magnetic circuit breakers from Digest Section 7 for those applications.
- Part-winding motors, per NEC 430.3, should have two circuit breakers selected from the above at not more than one half the allowable trip setting for the horsepower rating. The two circuit breakers should operate simultaneously as a disconnecting means per NEC 430.103.
- Based on NEC 430.52 and NEC Table 430.150. See Digest Section 7 for a available Adjustable Instantaneous-Trip Circuit Breakers.



[9] 250 Vdc ratings are available. No UL component recognition.

[10] UL magnetic trip setting tolerances are -20%/+30% from the nominal values shown.

[11] No GJL I-Line available.

## GJL MCP Selection Table

Table 11.23: GJL Adjustable Instantaneous-Trip Circuit Breakers for Single Motor  
Circuit Protection

| Hp Ratings of Induction Type Squirrel-Cage and Wound Rotor Motors<br>3Ø 60 Hz |         |         |         | Full Load<br>Amperes [12] | GJL Family<br>Mag-Gard<br>Circuit Breaker<br>Cat. No. | Magnetic Trip Settings<br>[13] |       |
|-------------------------------------------------------------------------------|---------|---------|---------|---------------------------|-------------------------------------------------------|--------------------------------|-------|
| 200 Vac                                                                       | 230 Vac | 460 Vac | 575 Vac |                           |                                                       | MIN                            | MAX   |
| —                                                                             | —       | —       | 1/2     | 0.8                       | GJL36003M01 [14]                                      | 1100%                          | 4100% |
| —                                                                             | —       | 1/2     | —       | 1                         | GJL36003M01 [14]                                      | 900%                           | 3300% |
| —                                                                             | —       | —       | 3/4     | 1.1                       | GJL36003M01 [14]                                      | 800%                           | 3000% |
| —                                                                             | —       | 3/4     | —       | 1.4                       | GJL36003M01                                           | 600%                           | 2400% |
| —                                                                             | —       | 1       | —       | 1.8                       | GJL36003M01                                           | 500%                           | 1800% |
| —                                                                             | 1/2     | —       | —       | 2                         | GJL36003M01                                           | 500%                           | 1700% |
| —                                                                             | —       | —       | 1-1/2   | 2.1                       | GJL36003M01                                           | 400%                           | 1600% |
| 1/2                                                                           | —       | —       | —       | 2.3                       | GJL36003M01                                           | 400%                           | 1400% |
| —                                                                             | —       | 1-1/2   | —       | 2.6                       | GJL36003M01                                           | 300%                           | 1300% |
| —                                                                             | —       | —       | 2       | 2.7                       | GJL36003M01 [15]                                      | 300%                           | 1200% |
| —                                                                             | 3/4     | —       | —       | 2.8                       | GJL36003M01 [15]                                      | 300%                           | 1200% |
| 3/4                                                                           | —       | —       | —       | 3.2                       | GJL36007M02                                           | 700%                           | 2400% |
| —                                                                             | —       | 2       | —       | 3.4                       | GJL36007M02                                           | 600%                           | 2300% |
| —                                                                             | 1       | —       | —       | 3.6                       | GJL36007M02                                           | 600%                           | 2100% |
| —                                                                             | —       | —       | 3       | 3.9                       | GJL36007M02                                           | 500%                           | 2000% |
| 1                                                                             | —       | —       | —       | 4.1                       | GJL36007M02                                           | 500%                           | 1900% |
| —                                                                             | —       | 3       | —       | 4.8                       | GJL36007M02                                           | 400%                           | 1600% |
| —                                                                             | 1-1/2   | —       | —       | 5.2                       | GJL36007M02                                           | 400%                           | 1500% |
| 1-1/2                                                                         | —       | —       | —       | 6                         | GJL36007M02                                           | 400%                           | 1300% |
| —                                                                             | —       | —       | 5       | 6.1                       | GJL36015M03                                           | 700%                           | 2700% |
| —                                                                             | 2       | —       | —       | 6.8                       | GJL36015M03                                           | 700%                           | 2400% |
| —                                                                             | —       | 5       | —       | 7.6                       | GJL36015M03                                           | 600%                           | 2200% |
| 2                                                                             | —       | —       | —       | 7.8                       | GJL36015M03                                           | 600%                           | 2100% |
| —                                                                             | —       | —       | 7-1/2   | 9                         | GJL36015M03                                           | 500%                           | 1800% |
| —                                                                             | 3       | —       | —       | 9.6                       | GJL36015M03                                           | 500%                           | 1700% |
| 3                                                                             | —       | 7-1/2   | 10      | 11                        | GJL36015M03                                           | 400%                           | 1500% |
| —                                                                             | —       | 10      | —       | 14                        | GJL36030M04                                           | 600%                           | 2400% |
| —                                                                             | 5       | —       | —       | 15.2                      | GJL36030M04                                           | 600%                           | 2200% |
| —                                                                             | —       | —       | 1       | 17                        | GJL36030M04                                           | 500%                           | 1900% |
| 5                                                                             | —       | —       | —       | 17.5                      | GJL36030M04                                           | 500%                           | 1900% |
| —                                                                             | —       | 15      | —       | 21                        | GJL36030M04                                           | 400%                           | 1600% |
| —                                                                             | 7-1/2   | —       | 20      | 22                        | GJL36030M04                                           | 400%                           | 1500% |
| 7-1/2                                                                         | —       | —       | —       | 25.3                      | GJL36030M04                                           | 400%                           | 1300% |
| —                                                                             | —       | 20      | 25      | 27                        | GJL36050M05                                           | 600%                           | 2000% |
| —                                                                             | 10      | —       | —       | 28                        | GJL36050M05                                           | 500%                           | 2000% |
| —                                                                             | —       | —       | 30      | 32                        | GJL36050M05                                           | 500%                           | 1700% |
| 10                                                                            | —       | —       | —       | 32.2                      | GJL36050M05                                           | 500%                           | 1700% |
| —                                                                             | —       | 25      | —       | 34                        | GJL36050M05                                           | 400%                           | 1600% |
| —                                                                             | —       | 30      | —       | 40                        | GJL36050M05                                           | 400%                           | 1400% |
| —                                                                             | —       | —       | 40      | 41                        | GJL36050M05                                           | 400%                           | 1300% |
| —                                                                             | 15      | —       | —       | 42                        | GJL36075M06                                           | 400%                           | 1300% |
| 15                                                                            | —       | —       | —       | 48.3                      | GJL36075M06                                           | 500%                           | 1700% |
| —                                                                             | —       | 40      | 50      | 52                        | GJL36075M06                                           | 400%                           | 1600% |
| —                                                                             | 20      | —       | —       | 54                        | GJL36075M06                                           | 400%                           | 1500% |
| 20                                                                            | —       | —       | 60      | 62                        | GJL36075M06                                           | 400%                           | 1300% |
| —                                                                             | —       | 50      | —       | 65                        | GJL36075M06                                           | 300%                           | 1300% |

11  
OBSOLETE AND OBSOLETE  
CIRCUIT BREAKERS

[12] Motor full-load currents are taken from NEC Table 430.150. Select wire and circuit breakers on basis of horsepower rather than nameplate full-load current per NEC 430.6 (A) for general motor applications. Do not use these values to select overload relay thermal units. See Digest Section 14 for selection of thermal units when actual full load current is not known. The voltages listed are rated motor voltages. Corresponding nominal system voltages are 200–208, 220–240, 440–480 and 550–600 V.

[13] Only MIN and MAX settings are shown, intermediate settings are available on all circuit breakers.

[14] See NEC 430.52(A) for circuit breaker settings above 800%.

[15] If due to motor starting characteristics, trip settings at the 1300% maximum permitted level are needed, the next size Mag-Gard circuit breaker should be chosen.

## Locks, Installation Accessories, and Rear Connections

Table 11.24: Locks, Interlocking

| Device                          | Description                                         | D-Frame<br>Field-Installable<br>Cat. No. |
|---------------------------------|-----------------------------------------------------|------------------------------------------|
| Handle<br>Padlocking<br>Device  | Removable (lock OFF only)                           | S29370                                   |
|                                 | Fixed (lock OFF or ON)                              | S32631                                   |
|                                 | Fixed (lock OFF only)                               | NJPAF                                    |
| Interlocking<br>(Not UL listed) | Mechanical for circuit breakers with rotary handles | 32621                                    |
|                                 | Mechanical for circuit breakers with toggles        | 32614                                    |
| Key Locking                     | Ronix                                               | 41950                                    |
|                                 | Profalux                                            | 42878                                    |

Provision and 2 locks keyed alike

Table 11.25: Installation Accessories for G- and D-Frame Circuit Breakers

| Description                                                                      | D-Frame<br>Field-Installable<br>Cat. No. |
|----------------------------------------------------------------------------------|------------------------------------------|
| Front Panel Escutcheon for Toggle Breakers                                       | 32556                                    |
| Front Panel Escutcheon for Rotary Handle, Motor Operator, or extended escutcheon | 32558                                    |
| Phase Barriers (set of 6)                                                        | 32570                                    |
| Handle Rubber Boot                                                               | 32560                                    |
| Sealing Accessories                                                              | 29375                                    |
| DIN rail adapter                                                                 | —                                        |
| Toggle Extensions (set of 10)                                                    | 32553                                    |

Table 11.26: Rear Connections

| Device                    | D-Frame                           |                                      |                             |
|---------------------------|-----------------------------------|--------------------------------------|-----------------------------|
|                           | Poles                             | Factory-Installed<br>Termination No. | Field-Installed<br>Cat. No. |
| Mixed Rear Connection Kit | 3                                 | S                                    | 32477                       |
|                           | 4                                 | S                                    | 32478                       |
| Consisting of:            | Short rear connections (set of 2) | —                                    | 2x 32475                    |
|                           | Long rear connections (set of 2)  | —                                    | 32476                       |
|                           | Short terminal cover (3P)         | —                                    | 32562                       |

Neutral Current Transformers and Micrologic Series B Trip Unit  
AccessoriesTable 11.27: Test Equipment for Circuit Breakers with Micrologic Series B Trip  
Systems

| Description                                                                                                         | Cat. No. |
|---------------------------------------------------------------------------------------------------------------------|----------|
| Test Module for Full-function and Standard-function LEL, LXL, LXIL. (For use with existing CBTU1 or UTS3 test set.) | CBTMB    |
| Replacement ribbon cable and rating plug adapter for CBTMB                                                          | CBTMBRK  |

## LA and Q-Frame Factory-Installed Electrical Accessories

Electrical accessories are available on all molded case circuit breakers except QOM1 circuit breakers.

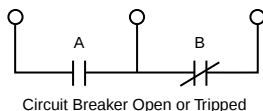
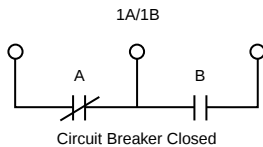
- All AC electrical accessories shown below are rated for 50/60 Hz.
- See [Field-Installable Electrical Accessories](#), page 11-13 for field-installable accessories. See Digest Section 7 for PowerPact™ circuit breaker accessories.

Table 11.28: Factory-Installed Accessories for Thermal-Magnetic LA and Q-Frame  
Circuit Breakers

| Accessory          | Description                                                                                                                                                                                                                                                                                                                                                                            | Rated<br>Voltage                                                                                 | Coil<br>Burden | Suffix   |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------|----------|
| Time Delay<br>Unit | Provides adjustable time delay for UVR of 0.1 to 0.6 second before circuit breaker trips.<br><b>Application</b> <ul style="list-style-type: none"> <li>For use only with -1121 UV trip</li> <li>Adjustable time delay (0.1 to 0.6 second)</li> <li>I-Line unit requires 1.5 in. (38 mm) of mounting space</li> <li>Leads: (2) Brown 18 AWG Cu and (2) Black/White 18 AWG Cu</li> </ul> | <br>120 Vac | Cat. No.       |          |
|                    |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                  | Unit Mt.       | I-Line™  |
|                    |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                  | 690UVTD        | 690UVTDI |

### Auxiliary Switch Contact Configuration

Color Code:  
"A" Contact - Yellow Leads  
"B" Contact - Blue Leads  
Common-Striped Leads



### 1A Alarm Switch Configuration

Color Code: Red Leads

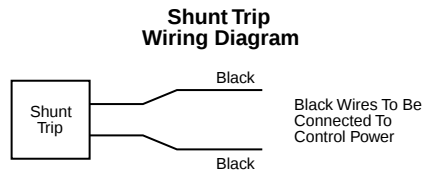
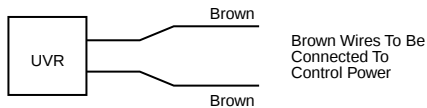


### 1B Alarm Switch Configuration

Color Code: Red Leads



### Undervoltage Trip Wiring Diagram



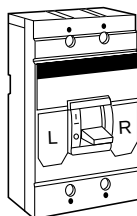
## Field-Installable Electrical Accessories

Complete field-installable accessory catalog number by inserting suffix from Digest Section 7 between the parentheses in the catalog numbers shown in the table below. (Example: LA11212)

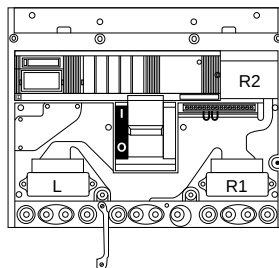
**Table 11.29: Field-Installable Accessories for Thermal-Magnetic and Electronic Trip Circuit Breakers**

| Circuit Breaker               | Shunt Trip             | Ground-Fault Shunt Trip [1] | Undervoltage Trip      | Auxiliary Switches     | Alarm Switch           |
|-------------------------------|------------------------|-----------------------------|------------------------|------------------------|------------------------|
| FI, KI                        | Factory-Installed Only | Factory-Installed Only      | Factory-Installed Only | Factory-Installed Only | Factory-Installed Only |
| LC, LI, LE, LX, LXI           | LC1( )                 | LC1G                        | LC1( )                 | LC1( )                 | Factory-Installed Only |
| MA, MH                        | MA1( )                 | MA1G                        | MA1( )                 | MA1( )                 | Factory-Installed Only |
| ME, MX                        | Factory-Installed Only | Factory-Installed Only      | Factory-Installed Only | Factory-Installed Only | Factory-Installed Only |
| NA, NC, NE, NX Series 1, 2, 3 | NA1( )                 | NA1( )                      | NA1( )                 | NA1( )                 | NA1( )                 |
| PA, PH, PC Series 4           | PA1( )                 | Factory-Installed Only      | PA11121                | PA1( )                 | Factory-Installed Only |
| PE, PX Series 4, 5, 6         | PA1( )                 | Factory-Installed Only      | PA11121                | PA1( )                 | Factory-Installed Only |

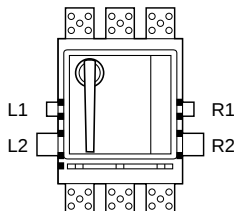
**Table 11.30: Accessory Mounting Locations**



MA, MH Series 2 circuit breakers or newer = Field-installable accessories  
ME/MX circuit breakers = Not field-installable accessories



NA, NC, NE, NX circuit breakers - Field-installable accessories  
"L" port and "R" port will accept shunt trips, alarm switches and UVRs;  
"R2" port will accept auxiliary switches. Maximum of one device per port.



PA, PH, PC, PE, PX Series 4 circuit breakers or newer = Field-installable accessories.  
"L1" and "L2" or "R1" and "R2" port combinations are required to mount a single shunt trip. Both "L2" and "R2" ports will accept a UVR. Both "L1" and "R1" ports will accept auxiliary switches. If alarm switch is factory installed in PA or PC circuit breaker, it will be installed in "R2" port. For a PE or PX circuit breaker, the alarm switch will be factory installed in "L2" port.

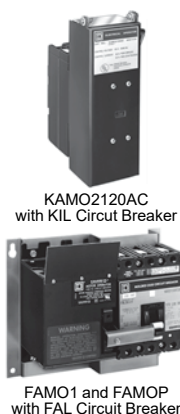
[1] Used with obsolete GP Ground-Censor™ system or add-on ground-fault modules.

## GJL Electrical Accessories

Table 11.31: Electrical Accessories

| Accessory                                                                                                                                  | Description                                                                                                                                                                                                                                      |                                   | Rated Voltage                                         | G-Frame Field-Installable Cat. No. |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------|------------------------------------|
| Auxiliary and Alarm Switches (OF, SD, SDE)<br><br>G-Frame | Provides circuit breaker contact status.<br>NOTE: The location of the accessory in the circuit breaker determines its function.                                                                                                                  | Standard Min Load = 10mA with 24V | 1 auxiliary switch (OF) 1a1b                          | AAC                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | 2 auxiliary switch (OF) 2a2b                          | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | 3 auxiliary switch (OF) 3a3b                          | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Alarm Switch (SD) 1a1b                                | AAC                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Overcurrent Trip Switch (SDE) 1a1b                    | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Consisting of:                                        | OF Switch<br>SDE Adapter           |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Alarm Switch and Overcurrent Trip Switch              | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  | Low Level Min Load = 1mA with 24V | Consisting of:                                        | OF Switch<br>SDE Adapter           |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Auxiliary Switch/Alarm Switch/Adapter (OF/SD/SDE) Kit | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | One auxiliary switch (OF) 1a1b                        | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Two auxiliary switches (OF) 2a2b                      | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | 3 auxiliary switches (OF) 3a3b                        | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Alarm Switch (SD) 1a1b                                | —                                  |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | Overcurrent Trip Switch (SDE) 1a1b                    | —                                  |
| Shunt Trip (MX)<br><br>G-Frame                            | Trips the circuit breaker from a remote location by means of a trip coil energized from a separate supply voltage circuit.                                                                                                                       |                                   | AC                                                    | 24                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 48                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 120                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 110/130                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 208                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 240                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 200/250                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 277                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 208/277                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 480                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 380/480                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 525/600                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | DC                                                    | 12                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 24                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 30                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 48                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 60                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 125                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 250                                |
| Undervoltage Trip<br><br>G-Frame                        | Instantaneously opens the circuit breaker when the undervoltage trip supply voltage drops to a value between 35% and 70% of its rated voltage. Closing is allowed when the supply voltage of the undervoltage trip reaches 85% of rated voltage. |                                   | AC                                                    | 24                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 48                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 120                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 110/130                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 208                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 240                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 200/250                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 277                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 208/277                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 480                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 380/480                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 525/600                            |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   | DC                                                    | 12                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 24                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 30                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 48                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 60                                 |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 125                                |
|                                                                                                                                            |                                                                                                                                                                                                                                                  |                                   |                                                       | 250                                |

[2] SDE Adapter used for H- and J-frame only.



## Electrical Operators

Provides remote ON, OFF/RESET control of molded case circuit breakers.

- A complete line of field-installable electrical operators.
- Not applicable on LC/LI/LE/LX/LXI circuit breakers.
- Installing side mounted motor operators on non I-Line™ circuit breakers requires the use of a separate mounting pan.
- Side mounted electrical operators require an additional 4-1/2 in. (114 mm) of mounting space in I-Line installations.

When remote indication of circuit breaker status is required, order circuit breaker with 1A-1B auxilliary switch for ON-OFF Indication and alarm switch for TRIP Indication. Electrical operators require SPDT maintained contact switch. Refer to Class 9001 control unit listing for operators and pilot lights.

**NOTE:** Not available on Mag-Gard™ circuit breakers and molded case switches.

**Table 11.32: Electrical Operators**

| Circuit Breaker Prefix | Top Mount |            | Side Mount |          | Mounting Pan Cat. No. |
|------------------------|-----------|------------|------------|----------|-----------------------|
|                        | Voltage   | Cat. No.   | Voltage    | Cat. No. |                       |
| FI, KI                 | —         | —          | 120 Vac    | KAMO1    | —                     |
| FIL, KIL               | 120 Vac   | KAMO2120AC | 120 Vac    | KAMO1    | KAMOP                 |
|                        | 240 Vac   | KAMO2240AC |            |          |                       |
|                        | 24 Vdc    | KAMO224DC  |            |          |                       |
|                        | 125 Vdc   | KAMO2125DC |            |          |                       |
| LAL, LHL, Q4L          | 120 Vac   | LAMO2120AC | —          | —        | —                     |
|                        | 240 Vac   | LAMO2240AC |            |          |                       |
|                        | 24 Vdc    | LAMO224DC  |            |          |                       |
|                        | 125 Vdc   | LAMO2125DC |            |          |                       |
| MAL, MHL               | 120 Vac   | MAMO2120AC | 120 Vac    | MAMO1    | MAMOP                 |
|                        | 240 Vac   | MAMO2240AC |            |          |                       |
|                        | 24 Vdc    | MAMO224DC  |            |          |                       |
|                        | 125 Vdc   | MAMO2125DC |            |          |                       |
| PA, PH, PC, PE, PX     | 120 Vac   | PAMO2      | —          | —        | —                     |

## Handle Accessories

**Table 11.33: Handle Accessories**

| Circuit Breaker Prefix                                   | Poles   | Cat. No.   |
|----------------------------------------------------------|---------|------------|
| <b>Handle Tie</b>                                        |         |            |
| 2 FI, 2 KI, or 1 FI + 1 KI                               | 2, 3    | FKHT       |
| <b>California Title 24 Comb. Handle Tie and Lock Off</b> |         |            |
| <b>Handle Extension</b>                                  |         |            |
| LE, LI, LX, LXI                                          | 2, 3    | AHEXLI     |
| <b>Handle Padlock Attachment (locks ON or OFF)</b>       |         |            |
| FI                                                       | 1, 2, 3 | HPAFK      |
| FY Series 1                                              | 1       | HPAFYQ     |
| FA, FH                                                   | 1, 2, 3 | HPAFK      |
| FY Series 2                                              | 2, 3    | HPAFK      |
| KI                                                       | 2, 3    | HPAFKF [3] |
| LC, LE, LI, LX, LXI                                      | 2, 3    | AHPALI     |

[3] Locks OFF only.

## Mechanical Lugs

Table 11.34: Mechanical Lug Kit Information

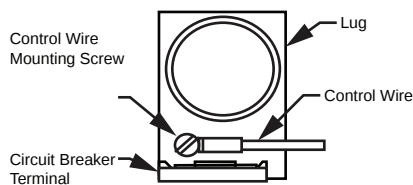
| Circuit Breaker Application           |               |                         |               | (Number of Wires Per Lug)<br>Wire Range [4] | Cat. No.    | Lugs Per Kit | Availability  |
|---------------------------------------|---------------|-------------------------|---------------|---------------------------------------------|-------------|--------------|---------------|
| Standard                              | Ampere Rating | Optional                | Ampere Rating |                                             |             |              |               |
| Al Lugs for Use with Al or Cu Wire    |               |                         |               |                                             |             |              |               |
| FA, FH                                | 15–30 A       | FA, FH                  | 35–100 A      | (1) 14–4 AWG Cu or<br>(1) 12–4 AWG Al       | AL50FA      | 3            | Not Available |
| FC                                    | 35–100 A      | FC                      | 15–30 A       | (1) 14–3 AWG Cu or<br>(1) 12–1 AWG Al       | AL100FA4    | 3            | —             |
| FA, FH                                | 35–100 A      | FA, FH                  | 15–30 A       | (1) 14–1/0 AWG Cu or<br>(1) 12–1/0 AWG Al   | AL100FA     | 3            | —             |
| —                                     | —             | FA, FH, FC              | 15–100 A      | (1) 12–3 AWG Cu                             | AL100TF [5] | 3            | Not Available |
| —                                     | —             | FA                      | 150 A (only)  | (1) 2–3/0 AWG                               | AL150FA     | 3            | —             |
| FI                                    | 15–30 A       | FI                      | 35–100 A      | (1) 14–4 AWG Cu or<br>(1) 12–4 AWG Al       | AL50FA      | 3            | Not Available |
| FI                                    | 35–100 A      | FI                      | 15–30 A       | (1) 14–1/0 AWG Cu or<br>(1) 12–1/0 AWG Al   | AL100FA     | 3            | —             |
| KI                                    | 110–175 A     | —                       | —             | (1) 4 AWG–350 kcmil                         | AL250KA     | 3            | —             |
| KI                                    | 200–250 A     | KI                      | 110–175 A     | (1) 1/0 AWG–350 kcmil                       | AL250KI     | 3            | Not Available |
| LE, LX, LXI                           | 100–250 A     | LI, LE, LX, LXI         | 300–600 A     | (2) 1 AWG–350 kcmil                         | AL600LI35   | 1            | —             |
| LI, LE, LX, LXI                       | 300–600 A     | LE, LX, LXI             | 100–250 A     | (2) 4/0 AWG–500 kcmil                       | AL600LI5    | 1            | —             |
| —                                     | —             | LC, LI, LE, LX, LXI     | —             | (1) 500–750 kcmil                           | AL600LI7    | 1            | —             |
| —                                     | —             | LC, LI, LE, LX, LXI     | —             | (1) 500–750 kcmil                           | AL600LI7    | 1            | —             |
| MA, MH                                | 300–1000 A    | —                       | —             | (3) 3/0 AWG–500 kcmil                       | AL900MA     | 1            | —             |
| —                                     | —             | MA, MH                  | 300–1000 A    | (2) 500–750 kcmil                           | AL800MA7    | 1            | —             |
| —                                     | —             | MA, MH                  | 300–1200 A    | (4) 1/0 AWG–350 kcmil                       | AL1000MA    | 1            | Not Available |
| ME, MX                                | 100–250 A     | —                       | —             | (1) 6 AWG–350 kcmil                         | AL250ME     | 3            | Not Available |
| —                                     | —             | ME, MX                  | 250–400 A     | (1) 350–750 kcmil                           | AL400ME7    | 1            | Not Available |
| —                                     | —             | ME, MX                  | 100–800 A     | (2) 500–750 kcmil                           | AL800MA7    | 1            | —             |
| ME, MX                                | 300–800 A     | ME, MX                  | 100–250 A     | (3) 3/0 AWG–500 kcmil                       | AL900MA     | 1            | —             |
| —                                     | —             | ME, MX                  | 300–1200 A    | (4) 1/0 AWG–350 kcmil                       | AL1000MA    | 1            | Not Available |
| NA, NC, NE, NX                        | 600–1200 A    | —                       | —             | (4) 3/0 AWG–600 kcmil                       | AL1200NE6   | 1            | Not Available |
| —                                     | —             | PAF, PHF, PEF, PXF, PCF | 600–2500 A    | (1) 1/0 AWG–750 kcmil                       | AL2500PA    | 2            | Not Available |
| Cu Lugs for Use with Cu Wire Only [6] |               |                         |               |                                             |             |              |               |
| FC                                    | 15–30 A       | —                       | —             | (1) 14–10 AWG Cu                            | CU30FA4     | 3            | —             |
| —                                     | —             | FA, FH, FC              | 15–100 A      | (1) 12–3 AWG Cu                             | CU100TF [5] | 3            | Not Available |
| —                                     | —             | FA, FH, FC              | 15–100 A      | (1) 14–1 AWG Cu                             | CU100FA     | 3            | —             |
| —                                     | —             | FI                      | 15–100 A      | (1) 14–1 AWG Cu                             | CU100FA     | 3            | —             |
| —                                     | —             | FI                      | 15–100 A      | (1) 14–1 AWG Cu                             | CU100FA     | 3            | —             |
| —                                     | —             | KI                      | 110–250 A     | (1) 4 AWG–250 kcmil Cu                      | CU250KA     | 3            | Not Available |
| —                                     | —             | LI, LE, LX, LXI         | —             | (2) 1 AWG–350 kcmil Cu                      | CU600LI35   | 1            | —             |
| —                                     | —             | LI, LE, LX, LXI         | —             | (2) 4/0 AWG–500 kcmil Cu                    | CU600LI5    | 1            | —             |
| —                                     | —             | LI, LE, LX, LXI         | —             | (1) 500–750 kcmil Cu                        | CU600LI7    | 1            | Not Available |
| —                                     | —             | MA, MH                  | 300–1000 A    | (3) 3/0 AWG–500 kcmil Cu                    | CU1000MA    | 1            | Not Available |
| —                                     | —             | ME, MX                  | 125–250 A     | (1) 4 AWG–250 kcmil Cu                      | CU250ME     | 3            | Not Available |
| —                                     | —             | ME, MX                  | 100–800 A     | (3) 3/0 AWG–500 kcmil Cu                    | CU1000MA    | 1            | Not Available |
| —                                     | —             | NA, NC, NE, NX          | 600–1200 A    | (4) 3/0 AWG–600 kcmil Cu                    | CU1200NE6   | 1            | Not Available |

[4] Unless otherwise specified, wire sizes apply to both aluminum and copper conductors.

[5] For use in the OFF end only, when the OFF end is the load end.

[6] Use suffix 8002 for factory-installed Cu lugs.





## Control Wire Tap Lugs

Control wire tap lugs are used in applications requiring connection to a small wire (22-14 AWG) for control circuits. This is accomplished by crimping the wire to a standard wire crimp terminal (not included) and fastening the terminal to the circuit breaker lug.

**Note:** To order as a factory-installed device on FI, KI, LC, LI, LXI, LX or LC circuit breakers, add suffix number 8041 to circuit breaker catalog number, e.g., KIL362258041.

**Table 11.35: Control Wire Terminations for Circuit Breakers**

| Circuit Breaker     | Control Wire Termination Kits |                           |
|---------------------|-------------------------------|---------------------------|
|                     | Cat. No.                      | Standard Package Quantity |
| FA, FH              | FAT [7]                       | 1                         |
| FI                  | FAT [7]                       | 1                         |
| KI                  | AL250KIT                      | 1                         |
| LC, LI, LXI, LX, LE | AL600LI35T                    | 1                         |
|                     | AL600LI5T                     | 1                         |
| MA, MH, MX, ME      | AL900MAT                      | 1                         |
|                     | AL1000MAT                     | 1                         |
| NA, NC, NX, NE      | AL1200NE6T                    | 1                         |

## Compression Lug Kits

**Table 11.36: Field-Installable Compression Lug Kits**

| Circuit Breaker Type          | Wire Range [8]                   | Dimension A (in) | Max. Lugs Per Terminal | Cat. No. [9] | Lugs Per Kit | Availability  |
|-------------------------------|----------------------------------|------------------|------------------------|--------------|--------------|---------------|
| Aluminum Compression Lug Kits |                                  |                  |                        |              |              |               |
| FA, FH, FC                    | 8-1/0 AWG                        | 1.3              | 1                      | VC100FA      | 3            | —             |
| FI                            | 8-1/0 AWG                        | 1.3              | 1                      | VC100FA      | 3            | —             |
| KI                            | 4 AWG–300 kcmil                  | 1.5              | 1                      | VC250KA3     | 3            | Not Available |
|                               | 250–350 kcmil                    | 1.5              | 1                      | VC250KA35    | 3            | Not Available |
| LI, LE, LX, LXI [10]          | 4 AWG–300 kcmil                  | 1.05             | 2                      | VC600LI3     | 2            | Not Available |
|                               | 2/0 AWG–500 kcmil                | 3.20             | 2                      | VC600LI5     | 2            | Not Available |
|                               | 500–750 kcmil                    | 3.45             | 1                      | VC600LI7     | 1            | Not Available |
| MA, MH                        | 2/0 AWG–500 kcmil                | 1.9              | 2                      | VC600MA5     | 2            | Not Available |
|                               | 500–750 kcmil                    | 2.1              | 2                      | VC800MA7     | 2            | Not Available |
| ME2, MX2                      | 4 AWG–300 kcmil                  | 1.5              | 1                      | VC250ME3     | 3            | Not Available |
|                               | 250–350 kcmil                    | 1.5              | 1                      | VC250ME35    | 3            | Not Available |
| ME4, MX4                      | 2/0 AWG–500 kcmil                | 2.2              | 1                      | VC400ME5     | 1            | Not Available |
|                               | 500–750 kcmil Al or 500 kcmil Cu | 2.5              | 1                      | VC400ME7     | 1            | Not Available |
| ME, MX, MA, MH                | 2/0 AWG–500 kcmil                | 1.9              | 2                      | VC600MA5     | 2            | Not Available |
|                               | 500–750 kcmil Al or 500 kcmil Cu | 2.1              | 2                      | VC800MA7     | 2            | Not Available |
| NA, NC, NE, NX                | 2/0 AWG–500 kcmil                | 3.3              | 4                      | VC1200NE5    | 4            | Not Available |
|                               | 500–750 kcmil Al or 500 kcmil Cu | 3.6              | 4                      | VC1200NE7    | 4            | —             |
| PAF, PHF, PCF, PEF            | 2/0 AWG–500 kcmil                | [11]             | 6–8                    | VC2000PA5    | 4            | Not Available |
|                               | 2/0 AWG–500 kcmil                | [11]             | 6–8                    | VC2500PA7    | 4            | Not Available |
| Copper Compression Lug Kits   |                                  |                  |                        |              |              |               |
| FA, FH, FC                    | 6-1/0 AWG Cu                     | 1.4              | 1                      | CVC100FA     | 3            | —             |
| FI                            | 6-1/0 AWG Cu                     | 1.4              | 1                      | CVC100FA     | 3            | —             |
| KI                            | 2/0 AWG–300 kcmil Cu             | 1.5              | 1                      | CVC250KA3    | 3            | Not Available |
| LI, LE, LX, LXI [10]          | 250–500 kcmil Cu                 | 3.20             | 2                      | CVC600LI5    | 2            | Not Available |
| ME4, MX4                      | 250–500 kcmil Cu                 | 2.6              | 1                      | CVC400ME5    | 1            | Not Available |
| ME, MX                        | 250–500 kcmil Cu                 | 2.4              | 2                      | CVC600MA5    | 2            | Not Available |
| NA, NC, NE, NX                | 250–500 kcmil Cu                 | 3.3              | 4                      | CVC1200NE5   | 4            | Not Available |
|                               | 500–750 kcmil Cu                 | 3.6              | 4                      | CVC1200NE7   | 4            | —             |



[7] Use fully-insulated 0.250 inch slip-on connectors.

[8] Unless otherwise specified, wire sizes apply to both aluminum and copper conductors.

[9] See instruction bulletins for recommended tools.

[10] These lug kits cannot be used on I-Line™ circuit breakers.

[11] All P-frame circuit breakers require terminal pads for mounting lugs of any type.

## Power Distribution Connectors (PDC) for Circuit Breakers—for Field Replacement of Mechanical Lugs

Can be used for multiple load connections on one circuit breaker. Use in place of standard distribution blocks to save space and time.

Field-installable kits, including tin-plated aluminum connectors and all necessary mounting hardware are available for Square D FA, LA and Q4-frame molded case circuit breakers.

Connectors are UL Listed:

- For use on load end of circuit breaker only.
- For use in UL508 Industrial Control applications only.
- For use in UL 1995/CSA C22.2 No. 236 heating and cooling equipment.
- For copper wire only.

**Table 11.37: Power Distribution Connectors for FAL/FHL/FCL Circuit Breakers**

| Use With Circuit Breaker [12] | Circuit Breaker Ampere Rating | Wires Per Terminal & Wire Range [13]<br>Cu | Cat. No. | Lug Quantity Per Kit | Dimension A (in.) |
|-------------------------------|-------------------------------|--------------------------------------------|----------|----------------------|-------------------|
| FAL, FHL, FCL [14]            | 15–100 A                      | (6) 14–6 AWG                               | PDC6FA6  | 3                    | 1.0               |
|                               |                               | (3) 14–2 AWG                               | PDC3FA2  | 3                    | 1.2               |

**Table 11.38: Power Distribution Connectors for M- and P-Frame Circuit Breakers**

| Use With Circuit Breaker [12] | Circuit Breaker Ampere Rating | Wires Per Terminal & Wire Range [13]<br>Cu | Cat. No. | Lug Quantity Per Kit | Dimension A (in.) | Availability  |
|-------------------------------|-------------------------------|--------------------------------------------|----------|----------------------|-------------------|---------------|
| MAL, MHL, MEL, MXL            | 125–1000 A                    | (6) 12–2/0 AWG Cu                          | PDC6MA20 | 1                    | 0.0               | Not Available |
|                               |                               | (12) 14–4 AWG Cu                           | PDC12MA4 | 1                    | 0.0               | Not Available |

[12] Not for use with I-Line circuit breakers.

[13] When using fine stranded wire, increased cross sectional area may cause maximum wire size to be reduced.

[14] OFF end only when OFF end is the load end.

**Test Information**

Universal Test Sets and related accessories are obsolete. Limited service stock is available for replacement or fill purposes. Contact the nearest sales office for product availability.

**Table 11.39: Test Equipment for Circuit Breakers with Micrologic Series B Trip Systems**

| Description                                                                                                                                                                                                                                                          | Cat. No. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| For those customers who already own the Universal Test Set and want to test the latest standard and full-function (Series B) trip systems, all that is needed is the Micrologic Series B module (CBTMB). Included is the rating plug adapter and instruction manual. | CBTMB    |
| Replacement ribbon cable and rating plug adapter for CBTMB                                                                                                                                                                                                           | CBTMBRK  |



GFM250

## GFM Ground Fault Module

The Micrologic ground-fault module (GFM) is a UL Listed circuit breaker accessory for equipment protection. It is a combination ground-fault relay and ground-fault sensing device.

Micrologic Add-On Ground-Fault Module features:

- Used in combination with the FA, KA, FC, KC, FI, and KI type circuit breakers with a ground-fault shunt trip factory installed (add the suffix "G" to the circuit breaker)
- Adjustable ground-fault pickup levels
- Adjustable ground-fault time delays
- Integral ground fault push-to-test feature and ground-fault indicator
- All GFMs supplied for I-Line™ mounting, easily convertible to unit mount by removing the I-Line brackets
- Neutral current transformer is supplied for 3-phase 4-wire applications. Refer to instructions for proper installation
- Zone-selective interlocking capability is standard with upstream Micrologic trip system circuit breakers. The GFM can also be zone interlocked with the GC ground-fault system by using a restraint interface module. See [page 11-20](#).
- 120 Vac control power is required for integral test feature. Meets NEC 230-95(c)

**NOTE:** Ground-fault modules cannot be reverse fed.

**Table 11.40: Module/Enclosure Selection Chart**

| Companion Circuit Breaker Prefix | Cat. No. | Enclosure Space Required |                          | Ground-Fault Pickup Adjustment Range | Availability  |
|----------------------------------|----------|--------------------------|--------------------------|--------------------------------------|---------------|
|                                  |          | I-Line Switchboard       | Individual Enclosure [1] |                                      |               |
| FAL, FHL, FCL, FA, FH, FC        | GFM100FA | LA                       | KA                       | 20–100 A                             | —             |
| FI                               | GFM100FI | LA                       | —                        | 20–100 A                             | Not Available |
| KAL, KHL, KI, KA, KH, KC         | GFM250   | LA                       | LA                       | 40–200 A                             | —             |

## RIM32 Restraint Interface Module

The RIM32 Restraint Interface Module is used to interface the restraint signals between various Square D Micrologic™ circuit breakers, Micrologic ground-fault modules, and GC-100 ground-fault protection systems.

The restraint interface module operates on either 120 or 240 Vac, 50/60 Hz. The module is protected by a 1/4 A fuse.

Allowable ZSI combinations are shown in the table below. (Series numbers for current design circuit breakers end in B, for example NE Series 3B.) For double-ended or larger systems, or systems which contain devices from different columns in the table below, contact your local Sales Office for combination information.

If more inputs or outputs are needed, another restraint interface module is necessary. Contact your local Sales Office for information on multiple module installations.

**NOTE:** The maximum distance between devices is 1000 ft. (305 m).

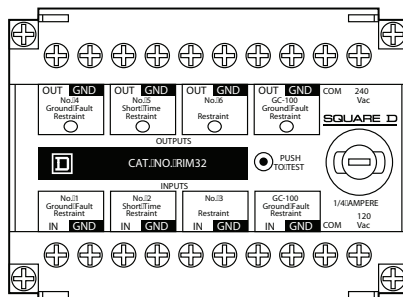
**Table 11.42: ZSI Combination (Where All Inputs Driven are Same Columns)**

| Circuit Breaker Series Outputs                      | Circuit Breaker Series Inputs |                   |                  |                                     |                            |                                   |       |       |
|-----------------------------------------------------|-------------------------------|-------------------|------------------|-------------------------------------|----------------------------|-----------------------------------|-------|-------|
|                                                     | SE 2 (Ground Fault)           | SE 2 (Short Time) | ME 3, NE 1, PE 4 | ME 4 & 5, NE 2 & 3, P 5 & 6A, SE 3A | ME 5A, NE 3A, PE 6A, SE 3A | LE 1B, ME 5B, NE 3B, PE 6B, SE 3B | GC100 | Rim32 |
| SE 2 (Ground Fault)                                 | 50                            | —                 | R                | R                                   | R                          | R                                 | R     | 50    |
| SE 2 (Short Time)                                   | —                             | 1                 | R                | R                                   | R                          | R                                 | R     | 50    |
| ME 3, NE 1, PE 4                                    | 50                            | R                 | 15               | 2                                   | 13                         | 47                                | R     | 50    |
| ME 4, 5 & 5A, NE 2, 3 & 3A, PE 5, 6 & 6A, SE 3 & 3A | 50                            | R                 | R                | 1                                   | 1                          | 7                                 | R     | 14    |
| LE 1B, ME 5B, NE 3B, PE 6B, SE 3B                   | 50                            | R                 | 10               | 1                                   | R                          | 26                                | R     | 44    |
| GC100                                               | R                             | R                 | R                | R                                   | R                          | R                                 | 7     | 50    |
| GFM [2]                                             | 50                            | —                 | 2                | 1                                   | 1                          | 5                                 | R     | 1     |
| RIM32                                               | 50                            | 6                 | 50               | 7                                   | 37                         | 50                                | 15    | 50    |

# = Maximum inputs without RIM32. Self-restraint counts as one input.

R = RIM32(s) required to restrain any device.

— = Invalid combination.



RIM32

**Table 11.41: RIM32**

| Cat. No. |
|----------|
| RIM32    |

[1] Use NEMA 1 or 3R enclosures only.

[2] GFM is an output device only.

### Masterpact™ M/MP/MC Circuit Breaker Control Units

**NOTE:** Masterpact M/MP/MC circuit breakers and related accessories are obsolete. Use Masterpact NT/NW for new applications. See Digest Section 7. Limited service stock is available for replacement or fill purposes. Contact the nearest sales office for product availability.

**Table 11.43: Control Units**

| Control Unit                                                 | Ground-Fault Protection [1]                       | Without Ground-Fault Protection [1] |
|--------------------------------------------------------------|---------------------------------------------------|-------------------------------------|
| STR 58U (long-time, short-time and instantaneous protection) | Includes Residual Type T — and Ammeter — I        |                                     |
| STR58U (long-time = 0.4x1 sensor rating)                     | External neutral sensor (TCE) [2]— see page 11-21 |                                     |
| —                                                            | M10H2                                             | M10H2NG                             |
| —                                                            | M16H2                                             | M16H2NG                             |
| —                                                            | M20H2                                             | M20H2NG                             |
| —                                                            | M25H2                                             | M25H2NG                             |
| —                                                            | M32H2                                             | M32H2NG                             |
| —                                                            | M63H2                                             | M63H2NG                             |

### Masterpact™ M/MP/MC Circuit Breaker Accessories

**NOTE:** Masterpact M/MP/MC circuit breakers and related accessories are obsolete. Use Masterpact NT/NW for new applications. See Digest Section 7. Limited service stock is available for replacement or fill purposes. Contact the nearest sales office for product availability.

**Table 11.44: Neutral Sensor for 3ØH4W Systems (TCE)**

|  | Rating | Cat. No. |
|--|--------|----------|
|  | 800 A  | 54422    |
|  | 1250 A | 54426    |
|  | 2000 A | 54427    |

**Table 11.45: Accessories (Must be ordered as separate items)**

|                          | Accessory                                                             | Description      | Cat. No. |
|--------------------------|-----------------------------------------------------------------------|------------------|----------|
| Power Supply Module (AD) |                                                                       | Input voltage    |          |
|                          | For STR 18M to STR 58U control units<br><b>Output voltage:</b> 24 Vdc | 24/30 Vdc        | 54440    |
|                          |                                                                       | 48/60 Vdc        | 54441    |
|                          |                                                                       | 10 Vac 50/60 Hz  | 54443    |
|                          |                                                                       | 220 Vac 50/60 Hz | 54444    |
|                          |                                                                       | 380 Vac 50/60 Hz | 54446    |
| Battery Module (BAT)     |                                                                       |                  |          |
|                          | Battery back-up power supply for AD module                            |                  | 54446    |

**Table 11.46: Accessories for Cradle**

|                          | Accessory                                          | Cat. No. |
|--------------------------|----------------------------------------------------|----------|
| <b>Position Switches</b> |                                                    |          |
|                          | Four SPDT connected position switches (CE)         | 54590    |
|                          | Two SPDT disconnected position switches (CD)       | 54591    |
| <b>Door Escutcheon</b>   |                                                    |          |
|                          | Can be used with fixed or drawout circuit breakers | 54594    |

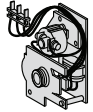
[1] External neutral sensor not included.

[2] External AD module (see page 11-21) is required if load is below 20% or if setting is red zone.

### Masterpact M/MP/MC Frame Accessories

**NOTE:** Masterpact M/MP/MC circuit breakers and related accessories are obsolete. Use Masterpact NT/NW for new applications. See Digest Section 7. Limited service stock is available for replacement or fill purposes. Contact the nearest sales office for product availability.

Table 11.47: Accessories for Circuit Breaker Frame

|                                                                                               | Volts (V) | Cat. No. (XF) | Cat. No. (MX) |
|-----------------------------------------------------------------------------------------------|-----------|---------------|---------------|
| Spring Charging Motor (MCH) — Includes Spring Charged Switch                                  |           |               |               |
|  AC 50/60 Hz | 100/127   | —             | 54512         |

### Masterpact™ M/MP/MC Circuit Breaker Spare Parts

**NOTE:** Masterpact M/MP/MC circuit breakers and related accessories are obsolete. Use Masterpact NT/NW for new applications. See Digest Section 7. Limited service stock is available for replacement or fill purposes. Contact the nearest sales office for product availability.

Table 11.48: Spare Parts

| Spare Parts                                                                        |                                                      |             | Cat. No.  |
|------------------------------------------------------------------------------------|------------------------------------------------------|-------------|-----------|
| Clusters for Cradle (Set of 2)                                                     |                                                      |             |           |
|   | MP25–MP30 3P                                         | M20–M25L 3P | 54063 (3) |
|                                                                                    | MP25–MP30 4P                                         | M20–M25L 4P | 54063 (4) |
|                                                                                    | —                                                    | M32H 3P     | 54063 (3) |
|                                                                                    | —                                                    | M32H 4P     | 54063 (4) |
|                                                                                    | MP40–MP50 3P                                         | M50H 3P     | 54063 (6) |
|                                                                                    | —                                                    | M50H 4P     | 54063 (7) |
| Charging Handle                                                                    |                                                      |             |           |
|   | One piece                                            |             | 685713    |
|                                                                                    |                                                      |             |           |
| Racking Handle                                                                     |                                                      |             |           |
|  | One piece                                            |             | 685631    |
|                                                                                    |                                                      |             |           |
| Vertical UL 489—UL 1066 Connectors                                                 |                                                      |             |           |
|                                                                                    | MP25–MP30 3P (set of three top or bottom connectors) |             | 54107 (2) |



FA100S



FA100RB



FA100DS

## F-Frame Circuit Breaker Enclosures

### F-Frame Thermal-Magnetic Circuit Breaker Enclosures

The enclosures for the F-Frame thermal-magnetic circuit breakers are UL listed and CSA certified. The enclosures are suitable for service entrance equipment when neutral assembly is installed. The short circuit ratings of these enclosed circuit breakers are equal to the interrupter rating, at the supply voltage marked on the circuit breaker installed.

The FA100RB enclosure has a provision of 3/4 through 2 1/2 inch B-Type bolt-on hubs in the top end wall. For details and hub catalog numbers see Section 3 of the Digest.

**Table 11.49: F-Frame Thermal-Magnetic Circuit Breaker Enclosures**

| Circuit Breaker |          |         | Cat. No.                                             |                         |                                  |                      |                    |
|-----------------|----------|---------|------------------------------------------------------|-------------------------|----------------------------------|----------------------|--------------------|
| Cat. No. Prefix | Rating   | Poles   | Enclosure                                            |                         |                                  | Neutral Assembly Kit | Service Ground Kit |
|                 |          |         | NEMA 1 Flush                                         | NEMA 1 Surface          | NEMA 3R                          |                      |                    |
| FAL, FHL, FCL   | 15–100 A | 1, 2, 3 | FA100F                                               | FA100S                  | FA100RB                          | SN100FA              | PKOGTA2            |
|                 |          |         | NEMA 4, 4X, 5<br>[1] Type 304 Stainless Steel<br>[2] | NEMA 12K With Knockouts | NEMA 12/3R Without Knockouts [2] |                      |                    |
| FAL, FHL, FCL   | 15–100 A | 1, 2, 3 | FA100DS                                              | FA100A                  | FA100AWK                         | SN100FA              | PKOGTA2            |

[1] Complete rating is NEMA 3, 3R, 4, 4X, 5, and 12.  
[2] For NEMA 3R applications, remove drain screw from bottom endwall.

## Enclosures for Special Applications

## Hazardous Locations: NEMA 7 And NEMA 9 Circuit Breaker Enclosures

The NEMA 7 and 9 enclosures are cULus listed unless otherwise noted. They are rated for use in hazardous locations as defined in NEC Article 500. The short circuit current rating of the enclosed circuit breakers is equal to the rating of the circuit breaker installed unless otherwise noted. They are suitable for use as service entrance equipment when neutral is installed. Enclosures require the use of 75°C copper wire only. The NEMA 7 enclosures are suitable for rainproof applications when the included PKDB1 breather and drain kit is installed.

**Table 11.50: NEMA 7 and NEMA 9 Circuit Breaker Enclosures;  
Thermal-Magnetic F-Frame Circuit Breakers**

| Circuit Breaker |          |         | Enclosure Catalog Number |                          | Neutral Assembly Kit Cat. No. | Service Ground Kit Cat. No. | Threaded Conduit Provisions, Inches |
|-----------------|----------|---------|--------------------------|--------------------------|-------------------------------|-----------------------------|-------------------------------------|
| Cat. No. Prefix | Rating   | Poles   | NEMA 7 Cast Aluminum [3] | NEMA 9 Cast Aluminum [4] |                               |                             |                                     |
| FAL, FHL        | 15–60 A  | 1, 2, 3 | FA060X                   | FA060Y                   | 100SNA                        | Included                    | 3/4 in.                             |
| FAL, FHL        | 15–100 A | 1, 2, 3 | FA100X                   | FA100Y                   | 100SNA                        | Included                    | 1 1/4 in.                           |

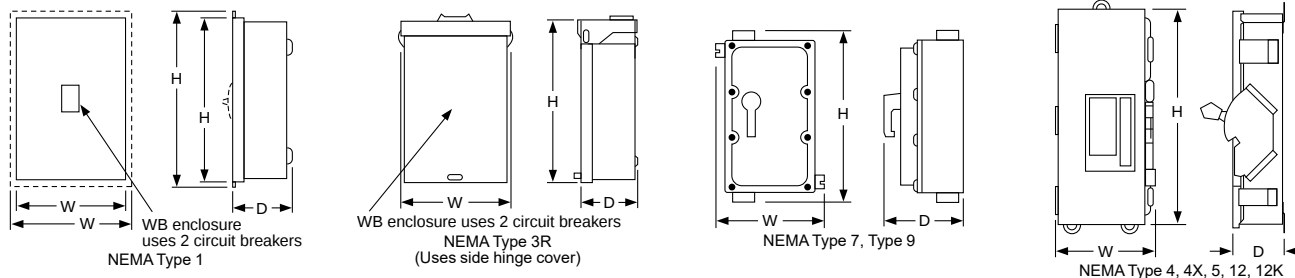
## Stainless Steel Front Enclosure

The FA100F NEMA Type 1, flush-mount circuit breaker enclosure is available with a stainless steel front. This modification is desirable in food handling areas such as cafeterias and restaurants. Not UL Listed.

**Table 11.51: Stainless Steel Front Enclosure**

| Cat. No. |
|----------|
| FA100FSS |

## Enclosure Dimensions



**Table 11.52: Dimensions**

| Cat. No.    | Series | Approximate Dimension |     |      |     |      |     |
|-------------|--------|-----------------------|-----|------|-----|------|-----|
|             |        | H                     |     | W    |     | D    |     |
|             |        | in.                   | mm  | in.  | mm  | in.  | mm  |
| FA100A, AWK | E05    | 19.5                  | 495 | 9.13 | 232 | 4.88 | 124 |
| FA100DS     | E05    | 19.5                  | 495 | 9.13 | 232 | 4.88 | 124 |
| FA100F      | E2     | 19.5                  | 495 | 9.88 | 251 | 4.13 | 105 |
| FA100RB     | E2     | 18.0                  | 457 | 8.88 | 226 | 4.88 | 124 |
| FA100S      | E2     | 18.13                 | 461 | 8.63 | 219 | 4.13 | 105 |
| FA060X      | E2     | 16.00                 | 406 | 9.88 | 251 | 7.00 | 178 |
| FA060Y      | E2     | 16.00                 | 406 | 9.88 | 251 | 7.00 | 178 |
| FA100X      | E2     | 16.00                 | 406 | 9.88 | 251 | 7.00 | 178 |
| FA100Y      | E2     | 16.00                 | 406 | 9.88 | 251 | 7.00 | 178 |

[3] NEMA 7 — Indoor Hazardous Locations — Division 1 and 2, Class I, Groups C and D; Class II, Groups E, F and G; Class III.

[4] NEMA 9 — Indoor Hazardous Locations — Division 1 and 2, Class II, Groups E, F and G; Class III.

## Section 12

## Obsolete Motor Control Centers

|                                                                  |             |
|------------------------------------------------------------------|-------------|
| <b>Model 4</b>                                                   | <b>12-2</b> |
| Branch Feeder Units                                              | 12-2        |
| Circuit Breaker Type Combination Starters                        | 12-3        |
| Fusible Switch Combination Starter Units                         | 12-4        |
| <b>Series 5600</b>                                               | <b>12-5</b> |
| General Information                                              | 12-5        |
| Branch Feeder and Circuit Breaker Type Combination Starter Units | 12-6        |

## Overview

This section covers Model 4 Motor Control Center (MCC) unit availability during product obsolescence. All Model 4 orders can be completely defined by catalog type and modifications. Layout sheets and data sheets are not required for order entry.

Note the standard features of the unit. Please refer to footnotes for important information.

Model 4 structures are no longer available. Transition sections can be provided to match an existing Model 4 MCC to a Model 6 MCC.

## Model 4 to Model 6 Transition

Provides transition from a Model 4 to a Model 6 MCC. The transition requires a 12-inch extension on the first section of the Model 6 lineup. The transition section must be ordered with at least one Model 6 section and cannot ship separately. **The Model 6 bus must be of equal or greater ampacity than the Model 4 bus.** The transition section includes all required splice bars. (Reference the Model 6 Motor Control Center Pricing Guide.)

Please supply original Model 4 factory order number, basic configuration, and Model 4 bus amperage, material, and plating at time of order.

Compatible structure depths include:

- 15-inch deep Model 6 to 14-inch deep Model 4
- 20-inch deep Model 6 to 20-inch deep Model 4

## Branch Feeder Units and Modifications

Table 12.1: Circuit Breaker Branch Feeder Units [1]

| No. of Poles | Trip Rating | Breaker Frame Type | Unit Type No. | Space Factor |
|--------------|-------------|--------------------|---------------|--------------|
| 3            | 15          | FH                 | BW423         | 1            |
|              | 20          |                    | BW424         |              |
|              | 30          |                    | BW425         |              |
|              | 40          |                    | BW429         |              |
|              | 50          |                    | BW428         |              |
|              | 60          | FH                 | BW426         |              |
|              | 70          |                    | BW450         |              |
|              | 80          |                    | BW451         |              |
|              | 90          |                    | BW452         |              |
|              | 100         |                    | BW427         |              |

Table 12.2: Dual Mounted Units

| No. of Poles | Trip Rating | Breaker Frame Type | Unit Type No. | Space Factor |
|--------------|-------------|--------------------|---------------|--------------|
| 3            | 15/15       | FH/FH              | BW453         | 1-1/2        |
|              | 20/20       |                    | BW454         |              |
|              | 30/30       |                    | BW455         |              |
|              | 50/50       | FH/FH              | BW456         |              |
|              | 60/60       |                    | BW457         |              |
|              | 100/100     |                    | BW458         |              |

Table 12.3: Miscellaneous Items

| Unit    | Description          |
|---------|----------------------|
| K401[2] | 1/2 S.F. Blank Plate |
| K402[2] | 1 S.F. Blank Plate   |
| K404[2] | 2 S.F. Blank Plate   |

Table 12.4: Fusible Switch Branch Feeder Units—3-pole [3]

| Voltage | Max. Fuse Size | Unit Type No. | Space Factor |
|---------|----------------|---------------|--------------|
| 250     | 30             | KW408         | 1            |
|         | 60             | KX409         | 1            |
|         | 100            | KY409         | 1            |
|         | 200            | KZ409         | 2-1/2        |
| 600     | 30             | KW409         | 1            |
|         | 60             | KX410         | 1            |
|         | 100            | KY410         | 1            |
|         | 200            | KZ410         | 2-1/2        |

**NOTE:** Fusible branch feeders 30-200 amp using Class H fuse clips have a short circuit rating of 10,000 AIR @ 600 V. If Class R fuse clips are required, order field install kit from Digest.

Table 12.5: Starter Unit Options

| Description                                       | Form No. |
|---------------------------------------------------|----------|
| Start-Stop PB with 1 Pilot light — Red (On)[4]    | AP       |
| Forward-Reverse-Stop PB with 2 Pilot Lights[5]    | A1PP     |
| High-Low-Stop PB with 2 Pilot Lights [6]          | A2PP     |
| Hand-Off-Auto SS with 1 Pilot Light — Red (On)[4] | CP       |
| 1 Pilot Light only — Red (On)[4]                  | P        |
| 2 Pilot Lights — Red (On)[5]                      | PP       |

Table 12.6: Miscellaneous Units

| MT Units (Undrilled Panel and Hinged Door) |               |                             |
|--------------------------------------------|---------------|-----------------------------|
| Unit Type No.                              | Space Factors | Panel Dimensions[7]         |
| MT414                                      | 1             | 11-3/4 in. H x 13-5/8 in. W |
| MT415                                      | 2             | 22-1/3 in. H x 13-5/8 in. W |

[1] All branch circuit breakers are thermal magnetic with high interrupting Form Y532.

[2] Unit support pan included.

[3] Fuses not included.

[4] Full Voltage Non-Reversing units only.

[5] Reversing units only.

[6] Two-Speed units only.

[7] Dimensions are in inches — Depth from door to panel is 7.50 inches.

**1B Wiring and 1 N.O. and 1 N.C. Auxiliary Interlock (Standard)**

**Table 12.7: Full Voltage Non-Reversing**

| Maximum Horsepower At |       |       |         | NEMA Starter Size | C/B Amp | Unit Type No. | Space Factor         | No. of Thermal Units Required <sup>[8]</sup> |
|-----------------------|-------|-------|---------|-------------------|---------|---------------|----------------------|----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V   |                   |         |               |                      |                                              |
| 1/4-1/3               | 1/3   | 1     | 1/4-1   | 1                 | 3       | EC403         | 1                    | 3                                            |
| 1/2-1                 | 1     | 3     | 1-1/2-3 |                   | 7       | EC404         |                      |                                              |
| 1-1/2-3               | 3     | 7-1/2 | 5-10    |                   | 15      | EC405         |                      |                                              |
| 5                     | 7-1/2 | 10    | —       |                   | 30      | EC406         |                      |                                              |
| 1-1/2-3               | 3     | 7-1/2 | 5-10    | 1                 | 15      | EC409         | 1-1/2 <sup>[9]</sup> | 3                                            |
| 5                     | 7-1/2 | 10    | —       |                   | 30      | EC410         |                      |                                              |
| 5                     | 7-1/2 | 15    | 15-20   |                   | 30      | ED402         |                      |                                              |
| 7-1/2-10              | 10    | 25    | 25      |                   | 50      | ED403         |                      |                                              |
| —                     | 15    | —     | —       | 2                 | 100     | ED404         | 1                    | 3                                            |
| 5                     | 7-1/2 | 15    | 15-20   |                   | 30      | ED405         |                      |                                              |
| 7-1/2-10              | 10    | 25    | 25      |                   | 50      | ED406         |                      |                                              |
| —                     | 15    | —     | —       |                   | 100     | ED407         |                      |                                              |
| 10                    | 10    | 25    | 25-30   | 3                 | 50      | EE404         | 1-1/2                | 3                                            |
| 15-25                 | 30    | 50    | 40-50   |                   | 100     | EE405         |                      |                                              |
| 30                    | 40    | —     | —       |                   | 225     | EF406         |                      |                                              |
| 40                    | —     | 75    | 100     |                   | 225     | EF407         |                      |                                              |
| —                     | 50    | 100   | —       | 4                 | 225     | EF408         | 2                    | 3                                            |

**Table 12.8: Full Voltage Reversing**

| Maximum Horsepower At |       |       |         | NEMA Starter Size | C/B Amp | Unit Type No. | Space Factor | No. of Thermal Units Required <sup>[8]</sup> |
|-----------------------|-------|-------|---------|-------------------|---------|---------------|--------------|----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V   |                   |         |               |              |                                              |
| 1/4-1/3               | 1/3   | 1     | 1/4-1   | 1                 | 3       | FC408         | 1-1/2        | 3                                            |
| 1/2-1                 | 1     | 3     | 1-1/2-3 |                   | 7       | FC409         |              |                                              |
| 1-1/2-3               | 3     | 7-1/2 | 5-10    |                   | 15      | FC410         |              |                                              |
| 5                     | 7-1/2 | 10    | —       |                   | 30      | FC411         |              |                                              |
| 5                     | 7-1/2 | 15    | 15-20   | 2                 | 30      | FD402         | 2            | 3                                            |
| 7-1/2-10              | 10    | 25    | 25      |                   | 50      | FD403         |              |                                              |
| —                     | 15    | —     | —       |                   | 100     | FD404         |              |                                              |

**Table 12.9: Two-Speed, Constant Hp, Full Voltage Non-Reversing**

| Maximum Horsepower At |       |       |         | NEMA Starter Size | C/B Amp | One Winding (Consequent Pole) |              | Two Winding (Separate Winding) |              | No. of Thermal Units Required <sup>[8]</sup> |
|-----------------------|-------|-------|---------|-------------------|---------|-------------------------------|--------------|--------------------------------|--------------|----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V   |                   |         | Unit Type No.                 | Space Factor | Unit Type No.                  | Space Factor |                                              |
| —                     | —     | 1/2   | 1/4-3/4 | 1                 | 3       | HC415                         | 2            | HC419                          | 2            | 6                                            |
| 1/4-3/4               | 3/4   | 2     | 1-2     |                   | 7       | HC416                         |              | HC420                          |              |                                              |
| 1-2                   | 2     | 5     | 3-5     |                   | 15      | HC417                         |              | HC421                          |              |                                              |
| 3-5                   | 5     | 7-1/2 | 7-1/2   |                   | 30      | HC418                         |              | HC422                          |              |                                              |
| —                     | —     | 10    | 10-15   | 2                 | 30      | HC411                         | 2            | HD413                          | 2            | 6                                            |
| 7-1/2                 | 10    | 20    | 20      |                   | 50      | HC412                         |              | HD414                          |              |                                              |

**Table 12.10: Two-Speed, Constant or Variable Torque, Full Voltage Non-Reversing**

| Maximum Horsepower At |       |       |         | NEMA Starter Size | C/B Amp | One Winding (Consequent Pole) |              | Two Winding (Separate Winding) |              | No. of Thermal Units Required <sup>[8]</sup> |
|-----------------------|-------|-------|---------|-------------------|---------|-------------------------------|--------------|--------------------------------|--------------|----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V   |                   |         | Unit Type No.                 | Space Factor | Unit Type No.                  | Space Factor |                                              |
| 1/4-1/3               | 1/3   | 1     | 1/4-1   | 1                 | 3       | HC407                         | 2            | HC411                          | 2            | 6                                            |
| 1/2-1                 | 1     | 3     | 1-1/2-3 |                   | 7       | HC408                         |              | HC412                          |              |                                              |
| 1-1/2-3               | 3     | 7-1/2 | 5-10    |                   | 15      | HC409                         |              | HC413                          |              |                                              |
| 5                     | 7-1/2 | 10    | —       |                   | 30      | HC410                         |              | HC414                          |              |                                              |
| 5                     | 7-1/2 | 15    | 15-20   | 2                 | 30      | HD405                         | 2            | HD408                          | 2            | 6                                            |
| 7-1/2-10              | 10    | 25    | 25      |                   | 50      | HD406                         |              | HD409                          |              |                                              |
| —                     | 15    | —     | —       |                   | 100     | HD407                         |              | HD410                          |              |                                              |

**NOTE:** Units are wired for 480 V unless 240 V is stated on order. The 480 V control circuit transformer is reconnectable for 240 V. For 240 V and 480 V, form FT is used. For other voltages, form SY74 must be used.

To get NEMA 12, add form N12 to unit.

Mag-Gard™ circuit breaker combination starter units through Size 4 are UL Listed for 22,000 AIR @ 600 V.

<sup>[8]</sup> Melting alloy overload relay included; thermal units must be ordered separately.  
<sup>[9]</sup> Includes extra 1/2 space factor (additional space only).

## 1B Wiring and 1 N.O. and 1 N.C. Auxiliary Interlock (Standard)

Table 12.11: Full Voltage Non-Reversing

| Maximum Horsepower At |       |       |       | NEMA Starter Size | Switch Amp Rating | Unit Type No. | Space Factor          | No. of Thermal Units Required <sup>[10]</sup> |
|-----------------------|-------|-------|-------|-------------------|-------------------|---------------|-----------------------|-----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V |                   |                   |               |                       |                                               |
| 5                     | 5     | —     | —     | 1                 | 30                | NC413         | 1                     | 3                                             |
| —                     | —     | 10    | 10    |                   | 30                | NC414         |                       |                                               |
| 7-1/2                 | 7-1/2 | —     | —     |                   | 60                | NC415         |                       |                                               |
| 7-1/2                 | 7-1/2 | —     | —     | 1                 | 60                | NC416         | 1-1/2 <sup>[11]</sup> | 3                                             |
| —                     | —     | 10    | 10    |                   | 30                | NC417         |                       |                                               |
| 10                    | 15    | —     | —     |                   | 60                | ND411         |                       |                                               |
| —                     | —     | 25    | 25    | 2                 | 60                | ND412         | 1                     | 3                                             |
| 10                    | 15    | —     | —     |                   | 60                | ND413         |                       |                                               |
| —                     | —     | 25    | 25    |                   | 60                | ND414         |                       |                                               |
| 20                    | 25    | —     | —     | 3                 | 100               | NE416         | 1-1/2                 | 3                                             |
| 25                    | 30    | —     | —     |                   | 200               | NE417         |                       |                                               |
| —                     | —     | 50    | 50    |                   | 100               | NE418         |                       |                                               |
| 40                    | 50    | —     | —     | 4                 | 200               | NF409         | 3-1/2                 | 3                                             |
| —                     | —     | 100   | 100   |                   | 200               | NF410         |                       |                                               |

Table 12.12: Full Voltage Reversing

| Maximum Horsepower At |       |       |       | NEMA Starter Size | Switch Ampere Rating | Unit Type No. | Space Factor | No. of Thermal Units Required <sup>[10]</sup> |
|-----------------------|-------|-------|-------|-------------------|----------------------|---------------|--------------|-----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V |                   |                      |               |              |                                               |
| 5                     | 5     | —     | —     | 1                 | 30                   | OC417         | 1-1/2        | 3                                             |
| 7-1/2                 | 7-1/2 | —     | —     |                   | 60                   | OC418         |              |                                               |
| —                     | —     | 10    | 10    |                   | 30                   | OC419         |              |                                               |
| 10                    | 10    | —     | —     | 2                 | 60                   | OD409         | 2            | 3                                             |
| —                     | —     | 25    | 25    |                   | 60                   | OD410         |              |                                               |

Table 12.13: Two-Speed, Constant Hp, Full Voltage Non-Reversing

| Maximum Horsepower At |       |       |       | NEMA Starter Size | Switch Amp Rating | One Winding (Consequent Pole) |              | Two Winding (Separate Winding) |              | No. of Thermal Units Required <sup>[10]</sup> |
|-----------------------|-------|-------|-------|-------------------|-------------------|-------------------------------|--------------|--------------------------------|--------------|-----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V |                   |                   | Unit Type No.                 | Space Factor | Unit Type No.                  | Space Factor |                                               |
| 5                     | 5     | —     | —     | 1                 | 30                | QC447                         | 2            | QC450                          | 2            | 6                                             |
| 5                     | 5     | —     | —     |                   | 60                | QC448                         |              | QC450                          |              |                                               |
| —                     | —     | 7-1/2 | 7-1/2 |                   | 30                | QC449                         |              | QC452                          |              |                                               |
| 7-1/2                 | 10    | —     | —     | 2                 | 60                | QD437                         | 2            | QD439                          | 2            | 6                                             |
| —                     | —     | 20    | 20    |                   | 60                | QD438                         |              | QD440                          |              |                                               |

Table 12.14: Two-Speed, Constant or Variable Torque, Full Voltage Non-Reversing

| Maximum Horsepower At |       |       |       | NEMA Starter Size | Switch Amp Rating | One Winding (Consequent Pole) |              | Two Winding (Separate Winding) |              | No. of Thermal Units Required <sup>[10]</sup> |
|-----------------------|-------|-------|-------|-------------------|-------------------|-------------------------------|--------------|--------------------------------|--------------|-----------------------------------------------|
| 208 V                 | 240 V | 480 V | 600 V |                   |                   | Unit Type No.                 | Space Factor | Unit Type No.                  | Space Factor |                                               |
| 7-1/2                 | 7-1/2 | —     | —     | 1                 | 30                | QC441                         | 2            | QC444                          | 2            | 6                                             |
| 7-1/2                 | 7-1/2 | —     | —     |                   | 60                | QC442                         |              | QC445                          |              |                                               |
| —                     | —     | 10    | 10    |                   | 30                | QC443                         |              | QC446                          |              |                                               |
| 10                    | 15    | —     | —     | 2                 | 60                | QD433                         | 2            | QD435                          | 2            | 6                                             |
| —                     | —     | 25    | 25    |                   | 60                | QD434                         |              | QD436                          |              |                                               |

**NOTE:** Units are wired for 480 V unless 240 V is stated on order. The 480 V control circuit transformer is reconnectable for 240 V. For 240 V and 480 V, form FT is used. For other voltages, form SY74 must be used.

Refer to catalog to get NEMA 12, add form N12 to unit.

Fusible starters Sizes 1–3 using Class H fuse clips have a short circuit rating of 5,000 AIR @ 600 V. Size 4 starters using Class H are rated 10 kAIR @ 600 V. If Class R fuse clips are required, order field installable kit from Digest. Fuses are not included.

<sup>[10]</sup> Melting alloy overload relay included; thermal units must be ordered separately.

<sup>[11]</sup> Includes extra 1/2 space factor (additional space only).

## Overview

This section covers Series 5600 Motor Control Center availability during product obsolescence. All Series 5600 orders can be completely defined by price, catalog type, and modifications. Layout sheets and data sheets are not required for order entry.

All unit prices are shown as NEMA 1. Note the standard features of the unit. Please refer to footnotes for important information.

### Notes:

1. All units are circuit breaker type.
2. All starter units use Square D™ brand Type S starters and contactors.

## Telemecanique™ Series 5600 History

The Series 5600 MCC was in production for more than 20 years. In 1970 it was first sold under the ITE Circuit Breaker/ITE Imperial name. In 1976 ITE Imperial merged with Gould Inc. The MCC was then sold with the Gould ITE name and later the Gould name. In 1985 the Industrial Controls Division of Gould Inc. was sold to Telemecanique Inc., and the MCC was renamed the Telemecanique Series 5600 MCC. Telemecanique, Inc., was acquired by Groupe Schneider in 1988, and in 1991 Square D Company was purchased by Groupe Schneider.

## Transition Sections From Telemecanique Series 5600 To Square D™ Brand Model 6

Provides transition from Telemecanique Series 5600 MCC to Square D™ brand Model 6 MCC. The transition requires an extension on the first section of the Model 6 lineup. The transition section must be ordered with at least one Model 6 section, and cannot ship separately. **The ampacity of the Model 6 bus will be equal to or greater than that of the Series 5600 bus.** 20 in. deep Model 6 can be spliced to 20 in. deep Series 5600. 15 in. deep Model 6 can be spliced to 15 in. deep Series 5600. 20 in. deep Model 6 can be spliced to 20 in. deep back-to-back Series 5600 (units mounted both front and back), with front only unit mounting on the Model 6 section(s). The transition section includes all required splice bars. (Reference Model 6 Motor Control Center Pricing Guide.)

**NOTE:** Not Available In NEMA Type 3R Construction.

The Model 6 to Series 5600 transition section is available in two basic configurations:

1. Model 6 on right spliced to Series 5600 on left
2. Model 6 on left spliced to Series 5600 on right

The following information must be provided when ordering a Model 6 to Series 5600 transition section:

1. Basic configuration (Model 6 Right/Series 5600 Left or Model 6 Left/Series 5600 Right)
2. Series 5600 bus amperage, material, plating, and dimensions
3. Model 6 bus amperage, material, and plating
4. Original Series 5600 factory order number

Please contact your local Schneider Electric sales office for price and availability of transition sections.

## Branch Feeder and Circuit Breaker Type Combination Starter Units

### Notes:

- On starter units, the last digits of the unit catalog number represent the horsepower.
- All units are NEMA 1 enclosure.
- All units include a control power transformer and are wired for 120 V control.
- All starter units are rated for 100 k AIR at 480 V.
- All starter units are supplied with 1B wiring, 1 N.O. auxiliary interlock, and 1 N.C. auxiliary interlock.

**Table 12.15: Full Voltage Non-Reversing Starters**

| Unit Catalog No. |        |       |       | NEMA Size | C/B Amps | Space Factor |
|------------------|--------|-------|-------|-----------|----------|--------------|
| 208 V            | 240 V  | 480 V | 600 V |           |          |              |
| 1TA.33           | 2TA.33 | TA1   | 6TA1  | 1         | 3        | 1            |
| 1TA1             | 2TA1   | TA3   | 6TA3  |           | 7        |              |
| 1TA3             | 2TA3   | TA7.5 | 6TA10 |           | 15       |              |
| 1TA5             | 2TA7.5 | TA10  | —     |           | 30       |              |
| 1TA10            | 2TA10  | TA25  | 6TA25 | 2         | 50       | 1            |
| 1TA25            | 2TA30  | TA50  | 6TA50 | 3         | 100      | 2            |

**Table 12.16: Full Voltage Reversing Starters**

| Unit Catalog No. |        |       |        | NEMA Size | C/B Amps | Space Factor |
|------------------|--------|-------|--------|-----------|----------|--------------|
| 208 V            | 240 V  | 480 V | 600 V  |           |          |              |
| 1TC.33           | 2TC.33 | TC1   | 6TC1   | 1         | 3        | 1.5          |
| 1TC1             | 2TC1   | TC3   | 6TC3   |           | 7        |              |
| 1TC3             | 2TC3   | TC7.5 | 6TC7.5 |           | 15       |              |
| 1TC5             | 2TC7.5 | TC10  | 6TC10  |           | 30       |              |
| 1TC10            | 2TC10  | TC25  | 6TC25  | 2         | 50       | 1.5          |

**Table 12.19: Single Branch Circuit Breaker Feeder Units**

| Unit Type | Trip Rating | Frame Type | Space Factor |
|-----------|-------------|------------|--------------|
| TW15      | 15          | FD         | 1            |
| TW20      | 20          |            |              |
| TW30      | 30          |            |              |
| TW40      | 40          |            |              |
| TW50      | 50          |            |              |
| TW60      | 60          |            |              |
| TW70      | 70          |            |              |
| TW80      | 80          |            |              |
| TW90      | 90          |            |              |
| TW100     | 100         | FD         | 1.5          |
| TW125     | 125         |            |              |
| TW150     | 150         |            |              |
| TW175     | 175         | JD         | 1.5          |
| TW200     | 200         |            |              |
| TW225     | 225         |            |              |
| TW250     | 250         |            |              |

**Table 12.17: 2 Speed 1 Winding Starters**

| Constant Hp      |        |       |        | Constant or Variable Torque |        |       |        |           |          |              |  |
|------------------|--------|-------|--------|-----------------------------|--------|-------|--------|-----------|----------|--------------|--|
| Unit Catalog No. |        |       |        | Unit Catalog No.            |        |       |        | NEMA Size | C/B Amps | Space Factor |  |
| 208 V            | 240 V  | 480 V | 600 V  | 208 V                       | 240 V  | 480 V | 600 V  |           |          |              |  |
| —                | —      | TH.5  | 6TH.75 | 1TE.33                      | 2TE.33 | TE1   | 6TE1   | 1         | 3        | 2            |  |
| 1TH.75           | 2TH.75 | TH2   | 6TH2   | 1TE1                        | 2TE1   | TE3   | 6TE3   |           | 7        |              |  |
| 1TH2             | 2TH2   | TH5   | 6TH5   | 1TE3                        | 2TE3   | TE7.5 | 6TE7.5 |           | 15       |              |  |
| 1TH5             | 2TH5   | TH7.5 | 6TH7.5 | 1TE5                        | 2TE7.5 | TE10  | 6TE10  |           | 30       |              |  |
| 1TH7.5           | 2TH10  | TH20  | 6TH20  | 1TE10                       | 2TE10  | TE25  | 6TE25  | 2         | 50       | 2            |  |

**Table 12.18: 2 Speed 2 Winding Starters**

| Constant Hp      |        |       |        | Constant or Variable Torque |        |       |        | NEMA Size | C/B Amps | Space Factor |
|------------------|--------|-------|--------|-----------------------------|--------|-------|--------|-----------|----------|--------------|
| Unit Catalog No. |        |       |        | Unit Catalog No.            |        |       |        |           |          |              |
| 208 V            | 240 V  | 480 V | 600 V  | 208 V                       | 240 V  | 480 V | 600 V  | 1         | 3        | 2            |
| —                | —      | TI.5  | 6TI.75 | 1TG.33                      | 2TG.33 | TG1   | 6TG1   |           |          |              |
| 1TI.75           | 2TI.75 | TI2   | 6TI2   | 1TG1                        | 2TG1   | TG3   | 6TG3   |           |          |              |
| 1TI2             | 2TI2   | TI5   | 6TI5   | 1TG3                        | 2TG3   | TG7.5 | 6TG7.5 |           |          |              |
| 1TI5             | 2TI5   | TI7.5 | 6TI7.5 | 1TG5                        | 2TG7.5 | TG10  | 6TG10  |           |          |              |
| 1TI7.5           | 2TI10  | TI20  | 6TI20  | 1TG10                       | 2TG10  | TG25  | 6TG25  | 2         | 50       | 2            |

**Table 12.20: Dual Mounted Branch Circuit Breaker Feeder Units**

| Unit Type | Trip Rating | Frame Type | Space Factor |
|-----------|-------------|------------|--------------|
| TW415     | 15/15       | FD/FD      | 1            |
| TW420     | 20/20       |            |              |
| TW430     | 30/30       |            |              |
| TW450     | 50/50       |            |              |
| TW460     | 60/60       |            |              |
| TW4100    | 100/100     |            |              |

**NOTE:** All circuit breaker branch feeder units are rated for 25 k AIR at 480 V.

**Table 12.21: Starter Unit Options**

| Description <sup>[1]</sup>                                  | Form No. |
|-------------------------------------------------------------|----------|
| Start-Stop PB with 1 Pilot Light—Red (On) <sup>[2]</sup>    | AP       |
| Forward-Reverse-Stop PB with 2 Pilot Lights <sup>[3]</sup>  | A1PP     |
| High-Low-Stop PB with 2 Pilot Lights <sup>[4]</sup>         | A2PP     |
| Hand-Off-Auto SS with 1 Pilot Light—Red (On) <sup>[2]</sup> | CP       |
| 1 Pilot Light Only—Red (On) <sup>[2]</sup>                  | P        |
| 2 Pilot Lights—Red (On) <sup>[3]</sup> <sup>[4]</sup>       | PP       |

**Table 12.22: Misc. Units—Empty Mounting Units**

| Description    | Unit Type |
|----------------|-----------|
| 1 Space Factor | TMT1      |
| 2 Space Factor | TMT2      |

**NOTE:** Undrilled panel and hinged door.

**Table 12.23: Miscellaneous Items**

| Description                         | Unit Type |
|-------------------------------------|-----------|
| ½ Space Factor Blank Door           | TBD.5     |
| 1 Space Factor Blank Door           | TBD1      |
| 2 Space Factor Blank Door           | TBD2      |
| Ground Stab Kit                     | TGSK      |
| 1 Space Factor Unit Gasketing Kit   | TGAS12    |
| 1.5 Space Factor Unit Gasketing Kit | TGAS18    |
| 2 Space Factor Unit Gasketing Kit   | TGAS24    |

- All units are NEMA 1 enclosure.
- All operators and pilot lights are 22 mm.
- 1 space factor = 12 inches.
- The ground stab kit is field installed and available for all units.

<sup>[1]</sup> To order a unit with any of the options listed, add the form number as a suffix to the unit type number. Only listed combinations of options are available. Choose only one form number option per starter unit.

<sup>[2]</sup> Full Voltage Non-Reversing units only.

<sup>[3]</sup> Reversing units only.

<sup>[4]</sup> Two-speed units only.

## Section 13

## Obsolescent Panelboards

|                                                                   |              |
|-------------------------------------------------------------------|--------------|
| <b>QMB Fusible Panelboards</b>                                    | <b>13-2</b>  |
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## QMB Main Lugs and Main Switch Interiors and Accessories

Table 13.1: QMB Main Lugs Interiors, Boxes and Fronts

| Total Branch Unit Mounting Space (Inches) | Ampere Rating of Mains | Component Selection                     |                          |             | Box Height (inches) | Box Width (inches) |
|-------------------------------------------|------------------------|-----------------------------------------|--------------------------|-------------|---------------------|--------------------|
|                                           |                        | Interior Assembly—3-pole with Main Lugs | Front (4-piece Standard) | Box         |                     |                    |
|                                           |                        | Catalog No.                             | Catalog No.              | Catalog No. |                     |                    |
| 60                                        | 225                    | QMB60902                                | QM38902TS                | QM3890B     | 90                  | 38                 |
| 45                                        | 400                    | QMB45754                                | QM38756TS                | QM3875B     | 75                  |                    |
| 45                                        | 600                    | QMB45756                                | QM38756TS                | QM3875B     | 75                  |                    |
| 45                                        | 800                    | QMB45908                                | QM38908TS                | QM3890B     | 90                  | 38                 |
| 45                                        | 1200                   | QMB459012                               | QM389012TS               | QM3890B     |                     |                    |
| 60                                        | 600                    | QMB60906                                | QM38906TS                | QM3890B     |                     |                    |

Table 13.2: QMB Main Switch Interiors, Boxes and Fronts

| Total Branch Unit Mounting Space (inches) | Ampere Rating of Mains | Maximum Voltage (ac) | Component Selection                       |                          |             | Box Height (inches) | Box Width (inches) |
|-------------------------------------------|------------------------|----------------------|-------------------------------------------|--------------------------|-------------|---------------------|--------------------|
|                                           |                        |                      | Interior Assembly—3-pole with Main Switch | Front (4-Piece Standard) | Box         |                     |                    |
|                                           |                        |                      | Catalog No.                               | Catalog No.              | Catalog No. |                     |                    |
| 51                                        | 200                    | 240                  | QMB5190324M                               | QM38902TS                | QM3890B     | 90                  | 38                 |
| 45                                        | 400                    |                      | QMB4590325M                               | QM38906TS                | QM3890B     |                     |                    |
|                                           | 600                    |                      | QMB4590326M                               |                          |             |                     |                    |
| 51                                        | 200                    | 600                  | QMB5190364M                               | QM38902TS                | QM3890B     | 90                  | 38                 |
| 45                                        | 400                    |                      | QMB4590365M                               | QM38906TS                | QM3890B     |                     |                    |
|                                           | 600                    |                      | QMB4590366M                               |                          |             |                     |                    |

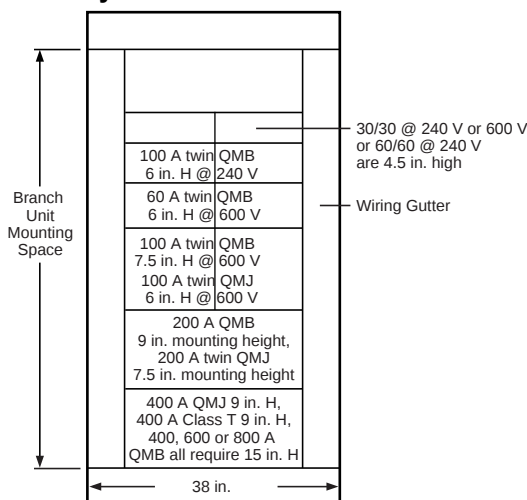
Table 13.3: Accessories [1]

| Blanks |             | Solid Neutral Assembly |             |
|--------|-------------|------------------------|-------------|
| Height | Catalog No. | Ampere Rating          | Catalog No. |
| 1.5    | QMB1BLW     | 225                    | QMB2SN      |
| 3      | QMB3BLW     | 400                    | QMB4SN2     |
| 6      | QMB6BLW     | 600                    | QMB6SN      |
| 15     | QMB15BLW    | 800                    | QMB8SN      |
| —      | —           | 1200                   | QMB12SN     |

Table 13.4: QMB Branch Circuit Breaker Units 600 Vac

| Unit Ampere Rating | Unit Height (Inches) | Catalog No. [2] | Description                                   |
|--------------------|----------------------|-----------------|-----------------------------------------------|
| 15 –150            | 6                    | QMBHW [3]       | Mounts (1) or (2) 3-pole HDL circuit breakers |
| 150 –225           | 6                    | QMBJW [4]       | Mounts (1) 3-Pole JDL circuit breaker         |
| 400                | 7.5                  | QMB3400LAW [5]  | Includes (1) 3-Pole LAL circuit breaker       |

## QMB Layout Information



[1] Equipment Ground Bar—PK32DGT

[2] Circuit breakers not included. Order HDL or JDL circuit breakers from Digest..

[3] Order one catalog number S37444 for each circuit breaker.

[4] Order catalog number S37445 with QMBJW.

[5] For trip ratings above 400A, contact your local Schneider Electric sales office.

## Main Switch Replacement Units

**Table 13.5: Main Switch Replacement Units (Replaces Series E1)**

| Ampere Rating   | Standard—Class H, R, K Fuse Spacing |                      | Class T Fuse Spacing           |                          | Class J Fuse Spacing |                         |
|-----------------|-------------------------------------|----------------------|--------------------------------|--------------------------|----------------------|-------------------------|
|                 | Catalog No.                         |                      | Catalog No.                    |                          | Catalog No.          |                         |
| 3-Pole, 240 Vac |                                     |                      |                                |                          |                      |                         |
| 100             | QMB323MW                            |                      | —                              |                          | —                    |                         |
| 200             | QMB324MW                            |                      | —                              |                          | —                    |                         |
| 400             | QMB325MW                            |                      | —                              |                          | —                    |                         |
| 600             | QMB326MW                            |                      | —                              |                          | —                    |                         |
| 800             | —                                   |                      | —                              |                          | —                    |                         |
| 3-Pole, 600 Vac |                                     |                      |                                |                          |                      |                         |
| 100             | QMB363MW                            |                      | —                              |                          | —                    |                         |
| 200             | QMB364MW                            |                      | —                              |                          | —                    |                         |
| 400             | QMB365MW                            |                      | {                              | QMB365MW/[6]<br>QMB400T6 | {                    | QMB365MW/[6]<br>QMB400J |
| 600             | QMB366MW                            |                      | {                              | QMB366MW/[6]<br>QMB600T6 | {                    | QMB366MW/[6]<br>QMB600J |
| 800             | QMB367MW                            |                      | {                              | QMB367MW/[6]<br>QMB800T6 | —                    |                         |
| Example:        | {                                   | QMB365MW<br>QMB400T6 | constitutes a complete device. |                          |                      |                         |

**Table 13.6: Main Switch Interior Lug Data**

| Mechanical Lugs     |                      |                                                         |                        | VCEL Compression Lugs |                                                         |                            |                                            |
|---------------------|----------------------|---------------------------------------------------------|------------------------|-----------------------|---------------------------------------------------------|----------------------------|--------------------------------------------|
| Mains Ampere Rating | Conductors Per Phase | Wire Range<br>Wire Bending Space per<br>NEC Table 373-6 | Lug Wire Range         | Conductors Per Phase  | Wire Range<br>Wire Bending Space per<br>NEC Table 373-6 | Catalog No.                | Lug Wire Range                             |
| 200                 | (1)                  | #6–300 kcmil Al or Cu                                   | #6–300 kcmil Al or Cu  | (1)                   | #4–300 kcmil Al or Cu                                   | VCEL030516H1               | #4–300 kcmil Al or Cu                      |
| 400                 | (2)                  | 3/0–500 kcmil Al or Cu                                  | 3/0–600 kcmil Al or Cu | (2)                   | 2/0–600 kcmil Al or Cu                                  | VCEL05012H1<br>VCEL07512H1 | 2/0–500 kcmil Al or Cu<br>500–750 kcmil Al |
| 600                 | (2)                  | 3/0–500 kcmil Al or Cu                                  | 3/0–600 kcmil Al or Cu | (2)                   | 2/0–500 kcmil Al or Cu                                  | VCEL05012H1                | 3/0–500 kcmil Al or Cu                     |
| 800                 | (3)                  | 3/0–500 kcmil Al or Cu                                  | 3/0–600 kcmil Al or Cu | (3)                   | 2/0–500 kcmil Al or Cu                                  | VCEL05012H1                | 3/0–500 kcmil Al or Cu                     |

[6] Both catalog numbers are required for a complete device.

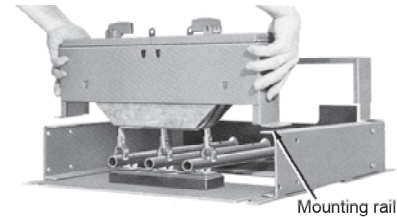
Guidelines

**STEP 1:** Determine the panelboard interior type. If the date of manufacture is not known, compare your switch with the pictures below to determine the mounting rail direction. Only mounting rails that face outward will accept the Series D2 switch and its required mounting rail extension bracket.

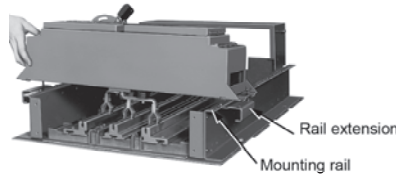
**STEP 2:** Order a replacement switch from 30–200 A Obsolete Switch Units—Series D2, page 13-5.

Table 13.7: Panelboard Interiors

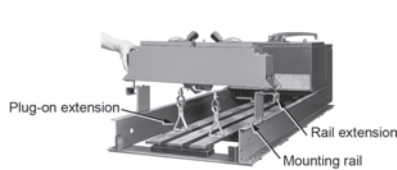
| Illustration No. | Interior Catalog No. Prefix                                            | Designed For Switch Type       | Switch Availability/Order Information                                                     |
|------------------|------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------|
| 1                | Type QM<br>in 31-inch wide box<br>built before 1961.                   | Series 1-4<br>30–200 A Maximum | NOT AVAILABLE<br>Series D2 switches are not compatible replacements for this application. |
| 2                | Type QM<br>in 31-inch wide box<br>built after 1961<br>and before 1984. | Series 1-4<br>30–200 A Maximum | NOT AVAILABLE<br>Order Series D2 switch from page 13-5.                                   |
|                  |                                                                        | Series D2<br>30–200 A Maximum  | Order Series D2 switch from page 13-5. (Many still stocked in DS.)                        |
| 3                | Type QW<br>in 38-inch wide box<br>built before 1984.                   | Series 1-4<br>30–200 A Maximum | NOT AVAILABLE<br>Order Series D2 switch and plug-on extension assembly from page 13-5.    |
|                  |                                                                        | Series 1-4<br>400–600 A        | NOT AVAILABLE<br>QMB3400LA available order only from Lexington.                           |
|                  |                                                                        | Series D2<br>30–200 A Maximum  | Order Series D2 switch and plug-on extension assembly from page 13-5.                     |
| 4                | Type QMB<br>in 35-inch or 38-inch<br>wide box<br>built after 1984.     | Series E1 or E2<br>30–800 A    | Order from Digest Section 9.                                                              |



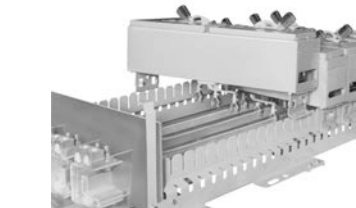
Type QM (31-inch Wide)  
Manufactured Before 1961  
Panelboards manufactured before 1961 have the interior mounting rails facing inward (toward the bus). Switches and circuit breakers that fit in this interior type are obsolete.



Type QM (31-inch Wide)  
Manufactured After 1961 But Before October 1984  
Panelboards manufactured after 1961 have the interior mounting rails facing outward (away from the bus). This interior accepts Series 1-4 switches and Series D2 switches (shown above with required rail extensions). Order the Series D2 switch (includes mounting rail extensions) from page 13-5.



Type QW (38-inch Wide)  
Manufactured Before 1984  
Type QW panelboards were built to accept bolt-on 400 A and 600 A Series 1-4 switches. 30-200 A Series D2 switches may be installed as shown using the plug-on extension assembly from page 13-5.



Type QMB  
Manufactured After October 1984  
Series E1 panelboards will accept only Series E1 or E2 switches. Order from Digest Section 9.

### 30–200 A Obsolescent Switch Units—Series D2

Available in DS Stock, except where noted.

All Series D2 switches require that rail extension assemblies be attached to the interior side rails in order to mount the switch. These rail extension assemblies are packaged with every Series D2 switch. If a rail extension is lost or missing, contact the nearest Schneider Electric™ sales office to order a replacement.

Plug-on extension assemblies must also be ordered when installing 30–200 A plug-on units in blank spaces of a QW interior in the 38-inch wide box. These plug-on extension assemblies (which extend the bus) are NOT the same as the rail extension assemblies packaged with every Series D2 switch (which extend only the mounting rails).

**Table 13.8: Branch Units—Three Pole**

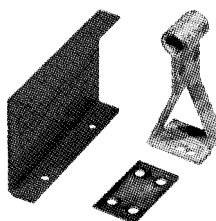
| Ampere Rating | Unit Height (inches) | Obsolescent [7]/Series 1–4 Catalog No. | Replaced By Series D2 Catalog No. | Class R Fuse Kits |             |
|---------------|----------------------|----------------------------------------|-----------------------------------|-------------------|-------------|
|               |                      |                                        |                                   | No. Kits Req'd.   | Catalog No. |
| 240 Vac       |                      |                                        |                                   |                   |             |
| 30-30         | 4.50                 | QMB3203T                               | QMB321T[8]                        | 2                 | HRK30       |
| 60-60         | 4.50                 | QMB306T                                | QMB322TD                          | 1                 | QMB36R      |
| 100-100       | 6.00                 | QMB310T                                | QMB323TD                          | 1                 | QMB100R     |
| 200           | 9.00                 | QMB3220                                | QMB324                            | 1                 | HRK1020     |
| 600 Vac       |                      |                                        |                                   |                   |             |
| 30-30         | 4.50                 | QMB3603T                               | QMB361T[8]                        | 1                 | QMB36R      |
| 30-30         | 6.00                 |                                        | QMB362T1                          |                   |             |
| 60-60         | 6.00                 | QMB3606T                               | QMB362T                           | 1                 | QMB60R      |
| 100-100       | 7.50                 | QMB3610T                               | QMB363T                           | 2                 | HRK1020     |
| 200           | 9.00                 | QMB3620                                | QMB364                            | 1                 |             |

**Table 13.9: Obsolescent Circuit Breaker Units [9]**

| Catalog No.   |
|---------------|
| QMB3400LA[10] |

**Table 13.10: Plug-On Extension Assemblies [11]**

| Ampere Rating      | Switch Mounting Height (inches) | Catalog No. |
|--------------------|---------------------------------|-------------|
| 30-30 Switch       | 3                               | QMB303LEX   |
| 30-30 Switch       | 4.5                             | QMB306LEX   |
| 30-30 Switch       | 6                               | QMB306EX    |
| 60-60 Switch       | 4.5                             | QMB306LEX   |
| 60-60 Switch       | 6                               | QMB306EX    |
| 100-100 Switch     | 6                               | QMB310LEX   |
| 100-100 Switch     | 7.5                             | QMB310EX    |
| 200 Switch         | 9                               | QMB320EX    |
| LA Circuit Breaker | 7.5                             | QMB310EX    |



Plug-On Extension Assembly

**Table 13.11: Obsolescent Main Switch Units [12]**

| Ampere Rating  | Unit Height (inches) | Catalog No. | Replaces Series 4 Unit Catalog No. |
|----------------|----------------------|-------------|------------------------------------|
| 3-pole 240 Vac |                      |             |                                    |
| 100            | 9                    | QMB323M[13] | QMB3210M                           |
| 200            |                      | QMB324M     | QMB3220M                           |
| 3-pole 600 Vac |                      |             |                                    |
| 100            | 9                    | QMB363M[13] | QMB3610M                           |
|                |                      | QMB363MJ    | QMB3610MJ                          |
| 200            | 9                    | QMB364M     | QMB3620M                           |
|                |                      | QMB364MJ    | QMB3620MJ                          |

[7] These switch units are no longer available; the catalog number is provided only for cross referencing to Series D2 units.

[8] When this Series D2 switch is used as a replacement for a Series 1-4 3-inch switch, a blank filler plate is also required. Purchase the blank filler plate from a local sheet-metal fabricator.

[9] Circuit breaker units are designed for use in all QMB interior types manufactured between 1961 and October 1984.

[10] Includes a 3-pole, LA type circuit breaker. For other ampere ratings, contact the Schneider Electric Customer Information Center.

[11] Bus extensions are required on all 30–200 A switches. They are also required on all circuit breaker units used in switchboards or in QW type panelboards with a 38-inch wide box.

[12] Replace Series 4 Units

[13] Order only from the Lexington plant.

## Application

For use on three-phase ac systems—208, 240, or 480 volts. UL® Listed.

## Starters

Line Voltage Type

- Non-Reversing—Twin Units: Sizes 0 through 3—Class 8536, Types SB, SC, SD and SE.
- Reversing—Single Units: Sizes 0 through 3—Class 8736, Types SB, SC, SD and SE

**Table 13.12: Starter Units—Not stocked in DS. Order only from the Peru plant.**

| NEMA Size | Coil Voltage [14] | Class 8536—Types SB, SC, SD and SEq<br>Type S—Non-Reversing<br>(see Digest page 16-16) |                                                   | Class 8736—Types SB, SC, SD and SE [15]<br>Reversing<br>(see Digest page 16-51) |                                                |
|-----------|-------------------|----------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------|
|           |                   | Unit Height (Inches)                                                                   | Twin-Starter Unit<br>(Two Non-Reversing Starters) | Unit Height (Inches)                                                            | Single-Starter Unit<br>(One Reversing Starter) |
|           |                   |                                                                                        | Catalog No. [16]                                  |                                                                                 | Catalog No. [16]                               |
| 0         | 120               | 9                                                                                      | QMBS8536100120W                                   | 9                                                                               | QMBS873610120W                                 |
|           | 208               |                                                                                        | QMBS8536100208W                                   |                                                                                 | QMBS873610208W                                 |
|           | 240               |                                                                                        | QMBS8536100240W                                   |                                                                                 | QMBS873610240W                                 |
|           | 480               |                                                                                        | QMBS8536100480W                                   |                                                                                 | QMBS873610480W                                 |
| 1         | 120               | 9                                                                                      | QMBS8536111120W                                   | 9                                                                               | QMBS873611120W                                 |
|           | 208               |                                                                                        | QMBS8536111208W                                   |                                                                                 | QMBS873611208W                                 |
|           | 240               |                                                                                        | QMBS8536111240W                                   |                                                                                 | QMBS873611240W                                 |
|           | 480               |                                                                                        | QMBS8536111480W                                   |                                                                                 | QMBS873611480W                                 |
| 2         | 120               | 10-1/2                                                                                 | QMBS8536222120W                                   | 10-1/2                                                                          | QMBS873622120W                                 |
|           | 208               |                                                                                        | QMBS8536222208W                                   |                                                                                 | QMBS873622208W                                 |
|           | 240               |                                                                                        | QMBS8536222240W                                   |                                                                                 | QMBS873622240W                                 |
|           | 480               |                                                                                        | QMBS8536222480W                                   |                                                                                 | QMBS873622480W                                 |
| 3         | 120               | 18                                                                                     | QMBS8536333120W                                   | 18                                                                              | QMBS873633120W                                 |
|           | 208               |                                                                                        | QMBS8536333208W                                   |                                                                                 | QMBS873633208W                                 |
|           | 240               |                                                                                        | QMBS8536333240W                                   |                                                                                 | QMBS873633240W                                 |
|           | 480               |                                                                                        | QMBS8536333480W                                   |                                                                                 | QMBS873633480W                                 |

**Table 13.13: UL Listed Short Circuit Ratings @ 600 V Maximum**

| Starter Size | Fusible Switch<br>(with Class R or J fuse)<br>RMS Sym. Amperes | Thermal-Magnetic<br>Circuit Breaker<br>RMS Sym. Amperes |
|--------------|----------------------------------------------------------------|---------------------------------------------------------|
| 0            | 100,000                                                        | 5,000                                                   |
| 1            |                                                                |                                                         |
| 2            |                                                                |                                                         |
| 3            |                                                                |                                                         |



QMB Motor Starter Panelboard

[14] See motor starter section of the current Digest for complete ratings.

[15] Space and drilling are provided for field addition of control voltage transformer and fuse base.

[16] Catalog numbers include starters, but do not include overload relay thermal units.

### Selection of Components

1. List required motor starter units (reversing or non-reversing) from the tables above.
2. Specify the HP, voltage, phase, frequency and full load current rating of the motor.
3. Specify the unit mounting space.
4. Determine the circuit breaker or fusible switch rating for motor branch circuits from the selection tables on Digest [page](#) .
5. For motor starter voltages other than standard voltages of 120, 208, 240 and 480 volts, contact the nearest Schneider Electric sales office.

### Starter Data

- Line voltage coils are furnished as standard on all starters.
- Twistouts are provided in starter covers for start-stop push buttons, selector switches and pilot lights. See accessories table below.
- Starter door interlocks are furnished with motor starter enclosures.
- Type S starter enclosures include drillings for the next smaller size.
- All Type S starters have provisions for three overload relay thermal units, as required by NEC® Table 430.37 for three phase ac motor circuits.

### Accessories

Accessories listed below are available for field installation on all units. Go to the sections shown for prices.

**Table 13.14: Field Installable Accessories**

| Description                                            | Digest Section                                     |
|--------------------------------------------------------|----------------------------------------------------|
| Push Buttons and Selector Switches: Class 9001, Type K | Push Buttons and Operator Interface                |
| Pilot Lights: Class 9001, Type KP                      |                                                    |
| Electrical Interlocks: Class 9999, Types SX6, SX7      | NEMA-Definite Purpose Type Contactors and Starters |
| Industrial Control Transformers: Class 9070            | Supplemental Digest, Transformers                  |
| Type EO1; Starter Size: 0 and 1, Non-Reversing         |                                                    |
| Type EO2; Starter Size: 0, 1 and 2, Reversing          |                                                    |
| Type EO3; Starter Size: 3                              |                                                    |
| Type EO4; Starter Size: 4                              | Terminal Blocks                                    |
| Control Circuit Fuse Block: Class 9080, Type PF1       |                                                    |

### Trim Clamps and Screws, Circuit I.D. Numbers, Locks

**Table 13.15: Trim Clamps and Screws**

| Application                                   | Catalog No. |
|-----------------------------------------------|-------------|
| NEHB Panelboards: All fronts up through 400 A | PK3TC       |

**Table 13.16: Circuit I.D. Numbers**

| Circuit Number Description | NEHB and NEHB Column Width Catalog No. |
|----------------------------|----------------------------------------|
| 1 through 54               | 8004332501                             |

**Table 13.17: Locks—Type 1 Enclosures**

| Application                                                         | Catalog No.                                                        |
|---------------------------------------------------------------------|--------------------------------------------------------------------|
| <b>NEHB Panelboards</b>                                             |                                                                    |
| All main lug fronts and all main circuit breaker fronts up to 225 A |                                                                    |
| Lock only                                                           | PK4FL                                                              |
| Complete assembly                                                   | PK7FL                                                              |
| All 400 A main circuit breaker fronts                               | PK5FL                                                              |
| <b>Telephone Cabinets</b>                                           |                                                                    |
| Fronts on boxes up to 30 inches wide                                | PK4FL<br>(Before November 1997)<br>PK22FL<br>(After November 1997) |
| Fronts on boxes 36 inches or wider                                  | PK5FL                                                              |



Catalog No. PK3TC



Catalog No. PK4FL



Catalog No. PK5FL

## Series Ratings

This page contains UL Tested and Certified series combination ratings for panelboards. These ratings apply to either an integral main located in the same enclosure or a remote main located in a separate enclosure. NOTE: Where QO(B) GFI circuit breakers are shown above, QO (B) EPD circuit breakers may also be used.

**Table 13.18: NQOD Series Ratings**

| Maximum System Voltage AC [1] | Maximum Short Circuit Current Rating (RMS Sym.) | Integral or Remote Main Circuit Breakers and Remote Main Fuses             | Branch Circuit Breaker Designations and Allowable Ampere Ranges [2] [3] |            |           |                          |
|-------------------------------|-------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------|------------|-----------|--------------------------|
|                               |                                                 |                                                                            | Type                                                                    | 1-pole     | 2-pole    | 3-pole                   |
| 120/240 1Ø                    | 22k                                             | MG                                                                         | QO (B)                                                                  | 15–30 A    | —         | —                        |
|                               | 42k                                             | HD, JD                                                                     | QO (B) PL                                                               | 15–30 A    | 15–60 A   | 15–30 A                  |
|                               | 65k                                             | HG, JG                                                                     |                                                                         |            |           |                          |
|                               | 100k                                            | HJ, JJ                                                                     |                                                                         |            |           |                          |
|                               | 125k                                            | HL, JL                                                                     |                                                                         |            |           |                          |
| 120/240 1Ø<br>208Y/120        | 100k                                            | DJ 400 A                                                                   | QO (B)                                                                  | 15–70 A    | 15–125 A  | —                        |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 40–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) VH                                                               | —          | 150 A     | 15–150 A                 |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 | QJ                                                                         | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) AS                                                               | 15–30 A    | 15–30 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) PL                                                               | 15–30 A    | 15–60 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) VH                                                               | —          | 150 A     | 35–150 A                 |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
| 208Y/120                      | 18k                                             | LA/LH (L) 34200MC, LA/LH (L) 34225MC, LA/LH (L) 34250MC, LA/LH (L) 34400MC | QO (B)                                                                  | 15–30 A    | 15–30 A   | 15–30 A                  |
| 240                           | 22k                                             | QO (B) VH                                                                  | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–100 A                 |
|                               |                                                 |                                                                            | QO (B) AS                                                               | 15–30 A    | 15–30 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) PL                                                               | 15–30 A    | 15–30 A   | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 | Q2-H[4]                                                                    | QO (B)                                                                  | 15–70 A    | 15–100 A  | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–30 A   | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 |                                                                            | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) AS                                                               | 15–30 A    | 15–30 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) PL                                                               | 15–30 A    | 15–60 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) VH                                                               | —          | 150 A     | 35–150 A                 |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
| 240                           | 25k                                             | QD                                                                         | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) AS                                                               | 15–30 A    | 15–30 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) PL                                                               | 15–30 A    | 15–60 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) VH                                                               | —          | 150 A     | 35–150 A                 |
|                               |                                                 | ED, FD[4]                                                                  | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 |                                                                            | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–100 A                 |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 |                                                                            | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–100 A                 |
|                               |                                                 | KD[4]                                                                      | QO (B) AS                                                               | 15–30 A    | 15–30 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 |                                                                            | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–100 A                 |
|                               |                                                 |                                                                            | QO (B) VH                                                               | —          | 150 A     | 35–150 A                 |
|                               |                                                 | HD, JD                                                                     | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 |                                                                            | QO (B) H                                                                | —          | 15–100 A  | —                        |
|                               |                                                 |                                                                            | QOB2150VH                                                               | —          | 150 A     | —                        |
|                               |                                                 |                                                                            | Q2L-H[4]                                                                | —          | 110–225 A | 110–225 A                |
|                               |                                                 | LA, MA                                                                     | QDL                                                                     | —          | 70–225 A  | 70–225 A                 |
|                               |                                                 |                                                                            | QO (B) VH                                                               | 15–30 A    | 15–30 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B) PL                                                               | 15–30 A    | 15–60 A   | 15–30 A                  |
|                               |                                                 |                                                                            | QO (B)                                                                  | 15–70 A[5] | —         | —                        |
|                               |                                                 |                                                                            | QO (B) VH                                                               | 15–30 A    | 15–125 A  | 15–100 A (3P 208 V Max.) |
|                               |                                                 | LC<br>600 A Maximum                                                        | QO (B) GFI                                                              | 15–30 A[6] | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 |                                                                            | QO (B) VH                                                               | 15–30 A    | 15–125 A  | 15–100 A (3P 208 V Max.) |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A[6] | —         | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
| 240                           | 65k                                             | LC<br>600 A Maximum                                                        | QO (B) VH                                                               | 15–30 A    | 15–125 A  | 15–100 A (3P 208 V Max.) |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A[6] | —         | —                        |
|                               |                                                 |                                                                            | QO (B) AFI                                                              | 15–20 A    | —         | —                        |
|                               |                                                 | DJ 400 A                                                                   | QO (B)                                                                  | 15–70 A    | 15–125 A  | —                        |
|                               |                                                 |                                                                            | QO (B) VH                                                               | —          | 150 A     | 15–150 A                 |
|                               |                                                 |                                                                            | QO (B) H                                                                | —          | 15–100 A  | —                        |
|                               |                                                 | EG, FG[4], KG[4]                                                           | QO (B)                                                                  | 15–70 A    | 15–125 A  | 15–100 A                 |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |
|                               |                                                 |                                                                            | QO (B) VH                                                               | 15–30 A    | 15–125 A  | 15–100 A                 |
|                               |                                                 |                                                                            | QO (B) GFI                                                              | 15–30 A    | 15–60 A   | —                        |

[1] For shown circuit breakers rated less than this maximum voltage, the indicated short circuit current rating also applies, but at the voltage rating of the circuit breaker.

[2] Suffixes HID, SWD and SWN may also be applied to the applicable branch circuit breakers shown above, except suffix SWN may NOT be applied in combination with LC main circuit breakers.

[3] Where QO (B) circuit breakers are shown above, QO (B) H, QO (B) VH, and QH (B) circuit breakers may also be used.

[4] Obsolete. Contact the Schneider Electric local Field Sales Office for the replacement circuit breaker. One-pole FJ circuit breakers are still available.

[5] Only 15–30 A circuit breakers may be used when the LC circuit breaker is rated 450, 500 or 600 A.

[6] Circuit breakers may not be used when the LC circuit breaker is rated 450, 500 or 600 A.

Table 13.18 NQOD Series Ratings (cont'd.)

| Maximum System Voltage AC [7] | Maximum Short Circuit Current Rating (RMS Sym.) | Integral or Remote Main Circuit Breakers and Remote Main Fuses | Branch Circuit Breaker Designations and Allowable Ampere Ranges [8] [9] |         |          |          |
|-------------------------------|-------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------|---------|----------|----------|
|                               |                                                 |                                                                | Type                                                                    | 1-pole  | 2-pole   | 3-pole   |
|                               |                                                 | QG                                                             | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 |                                                                | QO (B)                                                                  | 15–70 A | 15–125 A | 15–30 A  |
|                               |                                                 |                                                                | QO (B) AS                                                               | 15–30 A | 15–30 A  | 15–30 A  |
|                               |                                                 |                                                                | QO (B) VH                                                               | —       | —        | 35–150 A |
|                               |                                                 | QG, HG, JG                                                     | QO (B) GFI                                                              | 15–30 A | 15–60 A  | —        |
|                               |                                                 |                                                                | QO (B) PL                                                               | 15–30 A | 15–60 A  | 15–30 A  |
|                               |                                                 |                                                                | QO (B) AFI                                                              | 15–30 A | —        | —        |
|                               |                                                 |                                                                | QO (B)                                                                  | 15–70 A | 15–125 A | 15–100 A |
|                               |                                                 | HG, JG                                                         | QO (B) VH                                                               | —       | —        | 35–150 A |
|                               |                                                 |                                                                | QO (B) H                                                                | —       | 15–100 A | —        |
|                               |                                                 |                                                                | QOB2150VH                                                               | —       | 150 A    | —        |
|                               |                                                 |                                                                | QO (B)                                                                  | 15–70 A | 15–100 A | 15–100 A |
|                               |                                                 | FC22                                                           | QO (B) AS                                                               | 15–30 A | 15–30 A  | 15–30 A  |
|                               |                                                 | FC32                                                           | QO (B) GFI                                                              | 15–30 A | 15–30 A  | —        |
|                               |                                                 | KC32                                                           | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 | 400 A Max. Class J or T6 Fuses                                 | QO (B) VH                                                               | 15–30 A | 15–125 A | 15–100 A |
|                               |                                                 |                                                                | QOB-VH                                                                  | —       | 150 A    | —        |
|                               |                                                 |                                                                | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 |                                                                | QO (B)                                                                  | 15–70 A | 15–100 A | 15–100 A |
| 240                           | 100k                                            | FC24                                                           | QO (B)                                                                  | 15–70 A | 15–100 A | 15–100 A |
|                               |                                                 | KC24                                                           | QO (B) AS                                                               | 15–30 A | 15–30 A  | 15–30 A  |
|                               |                                                 | FC34                                                           | QO (B) GFI                                                              | 15–30 A | 15–30 A  | —        |
|                               |                                                 | KC34                                                           | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 | 200 A Max. Class T3 Fuses                                      | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 |                                                                | QO (B)                                                                  | 15–70 A | 15–125 A | 15–100 A |
|                               |                                                 | EJ, FJ[7]                                                      | QO (B) GFI                                                              | 15–30 A | 15–60 A  | —        |
|                               |                                                 |                                                                | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 |                                                                | QO (B)                                                                  | 15–70 A | 15–125 A | 15–100 A |
|                               |                                                 | HJ, JJ                                                         | QO (B) VH                                                               | —       | —        | 35–150 A |
| 240                           | 125k                                            | HL, JL                                                         | QO (B) GFI                                                              | 15–30 A | 15–60 A  | —        |
|                               |                                                 |                                                                | QO (B) PL                                                               | 15–30 A | 15–60 A  | 15–30 A  |
|                               |                                                 |                                                                | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 |                                                                | QO (B) H                                                                | —       | 15–100 A | —        |
|                               |                                                 |                                                                | QOB2150VH                                                               | —       | 150 A    | —        |
| 240                           | 200k                                            | FI, KI                                                         | QO (B)                                                                  | 15–70 A | 15–125 A | 15–100 A |
|                               |                                                 |                                                                | QO (B) AS                                                               | 15–30 A | 15–30 A  | 15–30 A  |
|                               |                                                 |                                                                | QO (B) GFI                                                              | 15–30 A | 15–60 A  | —        |
|                               |                                                 |                                                                | QO (B) AFI                                                              | 15–20 A | —        | —        |
|                               |                                                 | Maximum Fuses 200 A Class J or T6 400 A Class T3               | QO (B)                                                                  | 15–70 A | 15–125 A | 15–100 A |
|                               |                                                 |                                                                | QO (B) AS                                                               | 15–30 A | 15–30 A  | 15–30 A  |
|                               |                                                 |                                                                | QO (B) GFI                                                              | 15–30 A | 15–60 A  | —        |

## NQOD Merchandised Pricing Procedure

- List circuit breakers required, either plug-on or bolt-on. See appropriate pages for catalog numbers.
- Determine equivalent number of pole spaces required.
- Select proper main lugs interior or main lugs exterior and main circuit breaker adapter kit based on equivalent number of poles and ampere rating from appropriate page. Interiors include solid neutral and are field convertible to top feed.
- Select enclosure from appropriate page.  
Type 1—Select box and front catalog number corresponding to interior catalog number.  
Types 3R, 5, 12—Select enclosure, front included.
- For complete price, add the component prices. Include panelboard accessories.
- Apply appropriate discount schedule.

## NQOD Merchandised Example

Table 13.19: 208Y/120 Vac, 3Ø4W, 10 kAIR, 225 A, MLO, Type 1 surface mount, bolt-on branch circuit breakers, main sub-feed lugs

| Branches           | Page No.                                                 | Catalog Number | Spaces |
|--------------------|----------------------------------------------------------|----------------|--------|
| 225 A MLO Interior | NQOD 20-inch Wide Enclosures—240 Vac, 48 Vdc, page 13-10 | NQOD430L225CU  | 30     |
| Box                | NQOD 20-inch Wide Enclosures—240 Vac, 48 Vdc, page 13-10 | MH32           | —      |
| Cover              | NQOD 20-inch Wide Enclosures—240 Vac, 48 Vdc, page 13-10 | MHC32S         | —      |
| Main Sub-Feed Lugs | NQOD 20-inch Wide Enclosures—240 Vac, 48 Vdc, page 13-10 | NQOD225SFL     | —      |

[7] For shown circuit breakers rated less than this maximum voltage, the indicated short circuit current rating also applies, but at the voltage rating of the circuit breaker.

[8] Suffixes HID, SWD and SWN may also be applied to the applicable branch circuit breakers shown above, except suffix SWN may NOT be applied in combination with LC main circuit breakers.

[9] Where QO (B) circuit breakers are shown above, QO (B) H, QO (B) VH, and QH (B) circuit breakers may also be used.

[7] Obsolete. Contact the Schneider Electric local Field Sales Office for the replacement circuit breaker. One-pole FJ circuit breakers are still available.

## NQOD 20-inch Wide Main Lug Interiors and NQOD Accessories

Table 13.20: Main Lug Interiors—Accepts plug-on and bolt-on circuit breakers

| Max. No. of Single Pole QO™/QOB Circuit Breakers | Mains Rating | Interior Only (Order Branch Circuit Breakers Separately) | Type 1 Enclosure     |                     | Types 3R, 5, 12 Enclosures |              |
|--------------------------------------------------|--------------|----------------------------------------------------------|----------------------|---------------------|----------------------------|--------------|
|                                                  |              |                                                          | Box 20"W x 5.75"D[8] | Mono-Flat™ Front[8] | Enclosure 20"W x 6.5"D     | Height (In.) |
|                                                  |              | Catalog No.[9][10]                                       | Catalog No.[10]      | Catalog No.[10]     | Catalog No.[10]            |              |
| 20" Wide Cabinet—Single Phase 3-Wire             |              |                                                          |                      |                     |                            |              |
| 20                                               | 100          | NQOD20L100CU                                             | MH23                 | MHC23 ( )           | MH23WP                     | 23           |
| 30                                               | 225          | NQOD30L225CU                                             | MH32                 | MHC32 ( )           | MH32WP                     | 32           |
| 42                                               |              | NQOD42L225CU                                             | MH35                 | MHC35 ( )           | MH35WP                     | 35           |
| 42                                               |              | NQOD42L225CUTF[11]                                       | MH41                 | MHC41 ( )           | MH41WP                     | 41           |
| 54                                               |              | NQOD54L225CU                                             | MH41                 | MHC41 ( )           | MH41WP                     | 41           |
| 30                                               | 400          | NQOD30L400CU                                             | MH50                 | MHC50V ( )          | MH50WP                     | 50           |
| 42                                               |              | NQOD42L400CU                                             | MH53                 | MHC53V ( )          | MH53WP                     | 53           |
| 54                                               |              | NQOD54L400CU                                             | MH59                 | MHC59V ( )          | MH59WP                     | 59           |
| 30                                               | 600 [12]     | NQOD30L600                                               | MH53                 | MHC53V ( )          | MH656WP                    | 53/65        |
| 42                                               |              | NQOD42L600                                               | MH56                 | MHC56V ( )          | MH686WP                    | 56/68        |
| 42                                               |              | NQOD42L600TFL[11]                                        | MH62                 | MHC62V ( )          | MH746WP                    | 62/74        |
| 54                                               |              | NQOD54L600                                               | MH62                 | MHC62V ( )          | MH746WP                    | 62/74        |
| 20" Wide Cabinet—Three Phase 4-Wire              |              |                                                          |                      |                     |                            |              |
| 24                                               | 100          | NQOD424L100CU                                            | MH23                 | MHC23 ( )           | MH23WP                     | 23           |
| 30                                               | 225          | NQOD430L100CU                                            | MH26                 | MHC26 ( )           | MH26WP                     | 26           |
| 30                                               |              | NQOD430L225CU                                            | MH23                 | MHC32 ( )           | MH32WP                     | 32           |
| 42                                               |              | NQOD442L225CU                                            | MH35                 | MHC35 ( )           | MH35WP                     | 35           |
| 42                                               |              | NQOD442L225CUTF[11]                                      | MH41                 | MHC41 ( )           | MH41WP                     | 41           |
| 54                                               | 400          | NQOD454L225CU                                            | MH41                 | MHC41 ( )           | MH41WP                     | 41           |
| 30                                               |              | NQOD430L400CU                                            | MH50                 | MHC50V ( )          | MH50WP                     | 50           |
| 42                                               |              | NQOD442L400CU                                            | MH53                 | MHC53V ( )          | MH53WP                     | 53           |
| 54                                               |              | NQOD454L400CU                                            | MH59                 | MHC59V ( )          | MH59WP                     | 59           |
| 30                                               | 600 [12]     | NQOD430L600                                              | MH53                 | MHC53V ( )          | MH656WP                    | 53/65        |
| 42                                               |              | NQOD442L600                                              | MH56                 | MHC56V ( )          | MH686WP                    | 56/68        |
| 42                                               |              | NQOD442L600TFL[11]                                       | MH62                 | MHC62V ( )          | MH746WP                    | 62/74        |
| 54                                               |              | NQOD454L600                                              | MH62                 | MHC62V ( )          | MH746WP                    | 62/74        |

Table 13.21: NQOD Accessories[13]

| Description                                                    | Catalog No. |
|----------------------------------------------------------------|-------------|
| <b>Sub-feed lug kits—main lugs only—1Ø or 3Ø[14]</b>           |             |
| 100 A                                                          | NQOD100SFL  |
| 225 A                                                          | NQOD225SFL  |
| Sub-feed: Bolt-on: 2-pole                                      | QOB2125SL   |
| 3-pole                                                         | QOB3125SL   |
| Equipment ground bars: 12 circuit 225 A max.                   | PK9GTA      |
| 20 circuit 225 A max.                                          | PK12GTA     |
| 24 circuit 225 A max.                                          | PK15GTA     |
| 30 circuit 225 A max.                                          | PK18GTA     |
| 54 circuit 225 A max.                                          | PK23GTA     |
| 54 circuit 600 A max.                                          | PK27GTA     |
| PK15GTA with #1 to 4/0 Al/Cu lug                               | PK15GTAL    |
| PK18GTA with #1 to 4/0 Al/Cu lug                               | PK18GTAL    |
| PK23GTA with #1 to 4/0 Al/Cu lug                               | PK23GTAL    |
| Ground bar insulator kit                                       | PKGTAB      |
| Filler plate                                                   | QOFP        |
| <b>Circuit I.D. number strips</b>                              |             |
| 1-102 odd/even (left side numbered 1,3,5 ... 101)              | NQ102OE     |
| 103-204 odd/even (left side numbered 103,105,107 ... 203)      | NQ204OE     |
| 1-102 sequential (left side numbered 1,2,3 ... 102)            | NQ102S      |
| 103-204 sequential (left side numbered 103,104,105 ... 204)    | NQ204S      |
| Directory cards                                                | 8003115801  |
| Plastic stick-on directory pouch                               | 8003115901  |
| Lock—for Mono-Flat fronts                                      | PK22FL      |
| Key—NSR-251 (for all locks)                                    | LP9618      |
| Touch-up paint USAS #49 Gray (Aerosol can)                     | PK49SP      |
| <b>Handle attachments—branch circuit breakers:</b>             |             |
| Handle lock-off                                                | HLO1        |
| Handle tie - (QO and QOB only)                                 | QO1HT       |
| Handle padlock attachment - 1-pole                             | QO1PA       |
| 2- and 3-pole                                                  | QO1PL       |
| Combination handle tie and lock-off for three 1-pole (QO, QOB) | QO3HT       |
| <b>Neutral or Ground Lugs: #10 to #2 Al or #14 to #4 Cu</b>    |             |
| #4 to #1/0 Al/Cu                                               | QO70AN      |
| #1 to #4/0 Al/Cu                                               | Q1100AN     |
| <b>Endwalls for MH Boxes</b>                                   |             |
| Blank                                                          | 8011010501  |

[8] Embossed mounting holes add a 0.25 inch standoff to back of MH box.

[9] "CU" suffix indicates copper bussing. NQOD RTI interiors with aluminum bus are no longer available. Order copper bussed equivalent with a "CU" suffix when ordering replacement interior.

[10] Add "F" for flush, "S" for surface.

[11] Feed-thru lug interior.

[12] Copper bus standard on 600 A interiors.

[13] For Door-in-door (hinged) trim see the Supplemental & Obsolescence Digest, Section 4.

[14] 42 circuit MLO panelboard requires MH38 box, 54 circuit panelboard requires MH44 box.

**Table 13.21 NQOD Accessories<sup>[13.21]</sup> (cont'd.)**

| Description                 | Catalog No. |
|-----------------------------|-------------|
| With Knockouts              | 8011010401  |
| Elevating Nuts (4 required) | 2322000003  |

**NQOD 20–inch Wide Main Circuit Breaker Interiors and Adapter Kits**

**Table 13.22: Main Circuit Breaker Interiors—Accepts plug-on and bolt-on circuit breakers**

| Max.<br>No. of<br>One-pole<br>QO™/QOB<br>Circuit<br>Breakers | Mains<br>Rating | Main<br>Circuit Breaker<br>Adapter Kit                   | Interior Only<br>(Order Branch<br>Circuit Breakers Separately) | Type 1 Enclosure                        |                                     | Types 3R, 5, 12 Enclosures <sup>[15]</sup> |                 |
|--------------------------------------------------------------|-----------------|----------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------|-------------------------------------|--------------------------------------------|-----------------|
|                                                              |                 |                                                          |                                                                | Box<br>20"W x<br>5.75"D <sup>[16]</sup> | Mono-Flat™<br>Front <sup>[16]</sup> | Enclosure<br>20"W x 6.5"D                  | Height<br>(In.) |
|                                                              |                 | Catalog No.                                              | Catalog No. <sup>[17]</sup>                                    | Catalog<br>No.                          | Catalog<br>No.                      | Catalog<br>No.                             |                 |
| 20" Wide Cabinet—Single Phase 3-Wire                         |                 |                                                          |                                                                |                                         |                                     |                                            |                 |
| 20                                                           | 100             | Factory Installed<br>Backfed QOB Main Circuit<br>Breaker | NQOD20M100CU                                                   | MH26                                    | MHC26 ( )                           | MH26WP                                     | 26              |
| 30                                                           | 225             | NQODQB<br>or<br>NQODJK                                   | NQOD30L225CU                                                   | MH44                                    | MHC44 ( )                           | MH44WP                                     | 44              |
| 42                                                           |                 |                                                          | NQOD42L225CU                                                   | MH50                                    | MHC50 ( )                           | MH50WP                                     | 50              |
| 42                                                           |                 |                                                          | NQOD42L225CUTF <sup>[18]</sup>                                 | MH56                                    | MHC56 ( )                           | MH56WP                                     | 56              |
| 54                                                           |                 |                                                          | NQOD54L225CU                                                   | MH56                                    | MHC56 ( )                           | MH56WP                                     | 56              |
| 30                                                           | 400             | NQOD4                                                    | NQOD30L400CU                                                   | MH65                                    | MHC65V ( )                          | MH65WP                                     | 65              |
| 42                                                           |                 |                                                          | NQOD42L400CU                                                   | MH68                                    | MHC68V ( )                          | MH68WP                                     | 68              |
| 42                                                           |                 |                                                          | NQOD42L600TFL <sup>[18]</sup>                                  | MH77                                    | MHC77V ( )                          | MH77WP                                     | 77              |
| 54                                                           |                 |                                                          | NQOD54L400CU                                                   | MH74                                    | MHC74V ( )                          | MH74WP                                     | 74              |
| 20" Wide Cabinet—Three Phase 4-Wire                          |                 |                                                          |                                                                |                                         |                                     |                                            |                 |
| 24                                                           | 100             | Factory Installed<br>Backfed QOB Main Circuit<br>Breaker | NQOD424M100CU                                                  | MH26                                    | MHC26 ( )                           | MH26WP                                     | 26              |
| 30                                                           | 225             | NQODQB<br>or<br>NQODJK                                   | NQOD430M100CU                                                  | MH29                                    | MHC29 ( )                           | MH29WP                                     | 29              |
| 30                                                           |                 |                                                          | NQOD430L225CU                                                  | MH44                                    | MHC44 ( )                           | MH44WP                                     | 44              |
| 42                                                           |                 |                                                          | NQOD442L225CU                                                  | MH50                                    | MHC50 ( )                           | MH50WP                                     | 50              |
| 42                                                           |                 |                                                          | NQOD442L225CUTF <sup>[18]</sup>                                | MH56                                    | MHC56 ( )                           | MH56WP                                     | 56              |
| 54                                                           | 400             | NQOD4                                                    | NQOD454L225CU                                                  | MH56                                    | MHC56 ( )                           | MH56WP                                     | 56              |
| 30                                                           |                 |                                                          | NQOD430L400CU                                                  | MH65                                    | MHC65V ( )                          | MH65WP                                     | 65              |
| 42                                                           |                 |                                                          | NQOD442L400CU                                                  | MH68                                    | MHC68V ( )                          | MH68WP                                     | 68              |
| 42                                                           |                 |                                                          | NQOD442L600TFL <sup>[18]</sup>                                 | MH77                                    | MHC77V ( )                          | MH77WP                                     | 77              |
| 54                                                           |                 |                                                          | NQOD454L400CU                                                  | MH74                                    | MHC74V ( )                          | MH74WP                                     | 74              |

**Table 13.23: Main Circuit Breaker Adapter Kits (Less Circuit Breaker)**

| Amperes | Catalog Number | Circuit Breaker Frame <sup>[19]</sup> |
|---------|----------------|---------------------------------------|
| 225     | NQODQB         | QBL, QDL, QGL, QJL                    |
| 225     | NQODJK         | JDL, JGL, JJL, JLL, KIL               |
| 400     | NQOD4          | LAL, LHL, Q4L                         |

**NQOD 14–inch Wide Main Lug and Circuit Breaker Interiors**

**Table 13.24: Main Lug Interiors—Accepts plug-on and bolt-on circuit breakers**

| Max.<br>No. of<br>Single<br>Pole<br>QO™/QOB<br>Circuit<br>Breakers | Mains<br>Rating | Interior Only<br>(Order Branch Circuit<br>Breakers Separately) | Type 1 Enclosure                     |                          | Types 3R, 5, 12 Enclosures                        |                 |
|--------------------------------------------------------------------|-----------------|----------------------------------------------------------------|--------------------------------------|--------------------------|---------------------------------------------------|-----------------|
|                                                                    |                 |                                                                | Box<br>14 in. W x 5.75 in. D<br>[20] | Mono-Flat™<br>Front [21] | Enclosure<br>20 in. W x 6.5 in. D                 | Height<br>(In.) |
|                                                                    |                 | Catalog No. [17]                                               | Catalog No.                          | Catalog No.              | Catalog No.                                       |                 |
| 14-inch Wide Cabinet—Single Phase 3-Wire                           |                 |                                                                |                                      |                          |                                                   |                 |
| 12                                                                 | 100             | NQOD12L100CU                                                   | NQB520                               | NQC20 ( )                | Use 20-inch Wide Enclosure<br>for Types 3R, 5, 12 | 20              |
| 20                                                                 |                 | NQOD20L100CU                                                   | NQB523                               | NQC23 ( )                |                                                   | 23              |
| 30                                                                 | 225             | NQOD30L225CU                                                   | NQB532                               | NQC32 ( )                | Use 20-inch Wide Enclosure<br>for Types 3R, 5, 12 | 32              |
| 42                                                                 |                 | NQOD42L225CU                                                   | NQB535                               | NQC35 ( )                |                                                   | 35              |
| 54                                                                 |                 | NQOD54L225CU                                                   | NQB541                               | NQC41 ( )                |                                                   | 41              |
| 14-inch Wide Cabinet—Three Phase 4-Wire                            |                 |                                                                |                                      |                          |                                                   |                 |
| 12                                                                 | 100             | NQOD412L100CU                                                  | NQB520                               | NQC20 ( )                | Use 20-inch Wide Enclosure<br>for Types 3R, 5, 12 | 20              |
| 24                                                                 |                 | NQOD424L100CU                                                  | NQB523                               | NQC23 ( )                |                                                   | 23              |
| 30                                                                 |                 | NQOD430L100CU                                                  | NQB526                               | NQC26 ( )                |                                                   | 26              |
| 30                                                                 | 225             | NQOD430L225CU                                                  | NQB532                               | NQC32 ( )                | Use 20-inch Wide Enclosure<br>for Types 3R, 5, 12 | 32              |
| 42                                                                 |                 | NQOD442L225CU                                                  | NQB535                               | NQC35 ( )                |                                                   | 35              |
| 54                                                                 |                 | NQOD454L225CU                                                  | NQB541                               | NQC41 ( )                |                                                   | 41              |

<sup>[15]</sup> Enclosure includes trim kit.

<sup>[16]</sup> Embossed mounting holes add a 0.25 inch standoff to back of MH box.

<sup>[17]</sup> "CU" suffix indicates copper bussing. NQOD RTI interiors with aluminum bus are no longer available. Order copper bussed equivalent with a "CU" suffix when ordering replacement interior.

<sup>[18]</sup> Feed-thru lug interior.

<sup>[19]</sup> Circuit breaker interrupting ratings, see The PowerPact Advantage in Digest Section 7.

<sup>[20]</sup> 14-inch wide cabinets accept 100 A max. branch circuit breakers.

<sup>[21]</sup> Add "F" for flush, "S" for surface.

Table 13.25: Main Circuit Breaker Interiors—Accepts Plug-On and Bolt-On Circuit Breakers

| Max. No. of One Pole QO QOB Circuit Breakers | Mains Rating | Main Circuit Breaker Adapter Kit           | Interior Only (Order Branch Circuit Breakers Separately) | Type 1 Enclosure               |                      | Types 3R, 5, 12 Enclosure                      |              |
|----------------------------------------------|--------------|--------------------------------------------|----------------------------------------------------------|--------------------------------|----------------------|------------------------------------------------|--------------|
|                                              |              |                                            |                                                          | Box 14 in. W x 5.75 in. D [22] | Mono-Flat Front [23] | Enclosure 20 in. W x 6.5 in. D                 | Height (In.) |
|                                              |              | Catalog No.                                | Catalog No. [24]                                         | Catalog No.                    | Catalog No.          | Catalog No.                                    |              |
| 14-inch Wide Cabinet—Single Phase 3-Wire     |              |                                            |                                                          |                                |                      |                                                |              |
| 12                                           | 100          | Factory Installed QOB Main Circuit Breaker | NQOD12M100CU                                             | NQB523                         | NQC23 ( )            | Use 20-inch Wide Enclosure for Types 3R, 5, 12 | 23           |
| 20                                           |              |                                            | NQOD20M100CU                                             | NQB526                         | NQC26 ( )            |                                                | 26           |
| 30                                           | 225          | NQODJK or NQODQB                           | NQOD30L225CU                                             | NQB544                         | NQC44 ( )            | Use 20-inch Wide Enclosure for Types 3R, 5, 12 | 44           |
| 42                                           |              |                                            | NQOD42L225CU                                             | NQB550                         | NQC50 ( )            |                                                | 50           |
| 54                                           |              |                                            | NQOD54L225CU                                             | NQB556                         | NQC56 ( )            |                                                | 56           |
| 14-inch Wide Cabinet—Three Phase 4-Wire      |              |                                            |                                                          |                                |                      |                                                |              |
| 12                                           | 100          | Factory Installed QOB Main Circuit Breaker | NQOD412M100CU                                            | NQB523                         | NQC23 ( )            | Use 20-inch Wide Enclosure for Types 3R, 5, 12 | 23           |
| 24                                           |              |                                            | NQOD424M100CU                                            | NQB526                         | NQC26 ( )            |                                                | 26           |
| 30                                           |              |                                            | NQOD430M100CU                                            | NQB529                         | NQC29 ( )            |                                                | 29           |
| 30                                           | 225          | NQODJK or NQODQB                           | NQOD430L225CU                                            | NQB544                         | NQC44 ( )            | Use 20-inch Wide Enclosure for Types 3R, 5, 12 | 44           |
| 42                                           |              |                                            | NQOD442L225CU                                            | NQB550                         | NQC50 ( )            |                                                | 50           |
| 54                                           |              |                                            | NQOD454L225CU                                            | NQB556                         | NQC56 ( )            |                                                | 56           |

Table 13.26: Main Circuit Breaker Adapter Kits (Less Circuit Breaker)

| Amperes | Catalog No. | Circuit Breaker Frame [25] |
|---------|-------------|----------------------------|
| 225     | NQODQB      | QBL, QDL, QGL, QJL         |
| 225     | NQODJK      | JDL, JGL, JLL, JLL, KIL    |

For Non-Linear Loads (200% Rated Neutral)

Table 13.27: Main Lug Interiors—Accepts plug-on and bolt-on circuit breakers

| Max. No. of Single Pole QO/QOB Circuit Breakers | Mains Rating | Main Lugs Interior Only (Order Branch Circuit Breakers Separately) | Type 1 Enclosure       |                       | Types 3R, 5, 12 Enclosures [26] |              |
|-------------------------------------------------|--------------|--------------------------------------------------------------------|------------------------|-----------------------|---------------------------------|--------------|
|                                                 |              |                                                                    | Box 20"W x 5.75"D [27] | MONO-FLAT® Front [23] | Enclosure 20"W x 6.5"D          | Height (In.) |
|                                                 |              | Catalog No. [24]                                                   | Catalog No.            | Catalog No.           | Catalog No.                     |              |
| 20" Wide Cabinet—3 Phase 4-Wire                 |              |                                                                    |                        |                       |                                 |              |
| 30                                              | 100          | NQOD430L100CUNL                                                    | MH29                   | MHC29 ( )             | MH29WP                          | 29           |
| 42                                              | 225          | NQOD442L225CUNL                                                    | MH38                   | MHC38 ( )             | MH38WP                          | 38           |
| 42                                              | 400          | NQOD442L400CUNL                                                    | MH53                   | MHC53V ( )            | MH53WP                          | 53           |

[22] 14-inch wide cabinets accept 100 A max. branch circuit breakers.

[23] Add "F" for flush, "S" for surface.

[24] "CU" suffix indicates copper bussing. NQOD RTI interiors with aluminum bus are no longer available. Order copper bussed equivalent with a "CU" suffix when ordering replacement interior.

[25] Circuit breaker interrupting ratings, see The PowerPact Advantage in Digest Section 7.

[26] Enclosure includes trim kit.

[27] Embossed mounting holes add a 0.25 inch standoff to back of MH box.



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For Non-Linear Loads (200% Rated Neutral) **NQOD Lighting and Appliance Panelboards**

Class 1630

**Table 13.28: Main Circuit Breaker Interiors**

| Max.<br>No. of<br>Single Pole<br>QO/QOB<br>Circuit<br>Breakers | Mains<br>Rating | Main Circuit Breaker<br>Adapter Kit [28] | Main Lugs Interior Only<br>(Order Branch Circuit<br>Breakers Separately) | Type 1 Enclosure     |                         | Types 3R, 5, 12 Enclosures [29] |                 |
|----------------------------------------------------------------|-----------------|------------------------------------------|--------------------------------------------------------------------------|----------------------|-------------------------|---------------------------------|-----------------|
|                                                                |                 | Catalog No.                              | Catalog No. [31]                                                         | Box<br>20"W x 5.75"D | MONO-FLAT<br>Front [30] | Enclosure<br>20"W x 6.5"D       | Height<br>(In.) |
|                                                                |                 |                                          |                                                                          | Catalog No.          | Catalog No.             | Catalog No.                     |                 |
| 20" Wide Cabinet—3 Phase 4-Wire                                |                 |                                          |                                                                          |                      |                         |                                 |                 |
| 30                                                             | 100             | QOB Main Circuit Breaker                 | NQOD430M100CUNL                                                          | MH32                 | MHC32 ( )               | MH32WP                          | 32              |
| 42                                                             | 225             | NQODJK<br>NQODQB                         | NQOD442L225CUNL                                                          | MH50                 | MHC50 ( )               | MH50WP                          | 50              |
| 42                                                             | 400             | NQOD4                                    | NQOD442L400CUNL                                                          | MH68                 | MHC68V ( )              | MH68WP                          | 68              |

**Table 13.29: Main Circuit Breaker Adapter Kits (Less Circuit Breaker) [28]**

| Amperes | Catalog Number | Circuit Breaker Frame [32] |
|---------|----------------|----------------------------|
| 225     | NQODQB         | QBL, QDL, QGL, QJL         |
| 225     | NQODJK         | JDL, JGL, JLL, JLL, KIL    |
| 400     | NQOD4          | LAL, LHL                   |

**Table 13.30: NQOD Main Neutral Conductors—Required Size and Quantity [33]**

| Panelboard Ampacity | Neutral Conductors Required [34]                                          | Actual Lug Wire Range                 |
|---------------------|---------------------------------------------------------------------------|---------------------------------------|
| 100/125             | (2) 1/0 Cu or Al                                                          | (2) #4–300 kcmil                      |
| 225                 | (2) 4/0 Cu or (2) 300 kcmil Al                                            | (2) #4–300 kcmil                      |
| 400                 | (4) 3/0 Cu or<br>(4) 250 kcmil Al<br>(2) 600 kcmil Cu<br>(2) 750 kcmil Al | (2) 1/0–300 kcmil or<br>(1) 750 kcmil |

[28] Order main circuit breaker separately.

[29] Enclosure includes trim kit.

[30] Add "F" for flush, "S" for surface.

[31] "CU" suffix indicates copper bussing. NQOD RT1 interiors with aluminum bus are no longer available. Order copper bussed equivalent with a "CU" suffix when ordering replacement interior.

[32] Main neutral conductors must be copper or aluminum conductors of minimum size and quantity shown to maintain UL Listing.

Requirement is based on heat rise testing.

[33] Neutral conductors must be of size and quantity per table above.

[34] Main neutral conductors must be copper or aluminum conductors of minimum size and quantity shown to maintain UL Listing. Requirement is based on heat rise testing.

## I-Line HCN

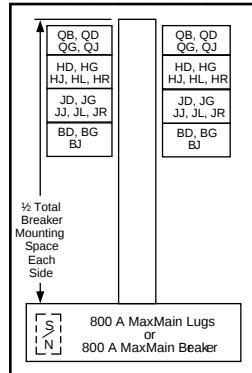
Table 13.31: Interiors, Boxes and Fronts

| Total<br>Circuit<br>Breaker<br>Mounting<br>Space (In.)                                                                             | Mains<br>Ampere<br>Rating | Interior Assembly<br>(Less Branch<br>Circuit Breakers) | Front [1]                    |                   | Box [2]           |                                         | Box<br>Heig-<br>ht<br>(In.) |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------|------------------------------|-------------------|-------------------|-----------------------------------------|-----------------------------|
|                                                                                                                                    |                           |                                                        | 4 Piece Trim<br>Without Door | Trim With Door[3] | Type 1            | NEMA<br>3R/5/12 [4]<br>(Includes Front) |                             |
|                                                                                                                                    |                           | Catalog<br>Number                                      | Catalog<br>Number            | Catalog<br>Number | Catalog<br>Number | Catalog<br>Number                       |                             |
| HCN Main Lugs Only<br>3-pole—Suitable for use as service equipment when provided with a main circuit breaker. [5]                  |                           |                                                        |                              |                   |                   |                                         |                             |
| 27                                                                                                                                 | 225 A                     | HCN14522N                                              | HCN52T( )                    | HCN52T( )D        | HC2652B           | HC2652WP                                | 52                          |
|                                                                                                                                    | 400 A                     | HCN14524                                               |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 600 A                     | HCN14526                                               |                              |                   |                   |                                         |                             |
| 45                                                                                                                                 | 225 A                     | HCN23652N                                              | HCN65T( )                    | HCN65T( )D        | HC2665B           | HC2665WP                                | 65                          |
|                                                                                                                                    | 400 A                     | HCN23654                                               |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 600 A                     | HCN23656                                               |                              |                   |                   |                                         |                             |
| 63                                                                                                                                 | 225 A                     | HCN32742N                                              | HCN74T( )                    | HCN74T( )D        | HC2674B           | HC2674WP                                | 74                          |
|                                                                                                                                    | 400 A                     | HCN32744                                               |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 600 A                     | HCN32746                                               |                              |                   |                   |                                         |                             |
| 81                                                                                                                                 | 225 A                     | HCN41832N                                              | HCN83T( )                    | HCN83T( )D        | HC2683B           | HC2683WP                                | 83                          |
|                                                                                                                                    | 400 A                     | HCN41834                                               |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 600 A                     | HCN41836                                               |                              |                   |                   |                                         |                             |
| 99                                                                                                                                 | 225 A                     | HCN50922N                                              | HCN92T( )                    | HCN92T( )D        | HC2692B           | HC2692WP                                | 92                          |
|                                                                                                                                    | 400 A                     | HCN50924                                               |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 600 A                     | HCN50926                                               |                              |                   |                   |                                         |                             |
| HCN Main Circuit Breaker [6] [7]<br>Includes 3-pole, vertically mounted main circuit breaker—Suitable for use as service equipment |                           |                                                        |                              |                   |                   |                                         |                             |
| 27                                                                                                                                 | 400 A                     | HCN14654M                                              | HCN65T( )                    | HCN65T( )D        | HC2665B           | HC2665WP                                | 65                          |
| 36                                                                                                                                 | 100 A                     | HCN18651MN                                             |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 225 A                     | HCN18652MN                                             |                              |                   |                   |                                         |                             |
| 45                                                                                                                                 | 400 A                     | HCN23744M                                              | HCN74T( )                    | HCN74T( )D        | HC2674B           | HC2674WP                                | 74                          |
| 54                                                                                                                                 | 100 A                     | HCN27741MN                                             |                              |                   |                   |                                         |                             |
|                                                                                                                                    | 225 A                     | HCN27742MN                                             |                              |                   |                   |                                         |                             |
| 63                                                                                                                                 | 225 A                     | HCN32832MN                                             | HCN83T( )                    | HCN83T( )D        | HC2683B           | HC2683WP                                | 83                          |
|                                                                                                                                    | 400 A                     | HCN32834M                                              |                              |                   |                   |                                         |                             |
| 81                                                                                                                                 | 400 A                     | HCN41924M                                              | HCN92T( )                    | HCN92T( )D        | HC2692B           | HC2692WP                                | 92                          |
| 90                                                                                                                                 | 225 A                     | HCN45922MN                                             |                              |                   |                   |                                         |                             |

## TYPE HCM

250 A max. branch circuit breaker

BD, BG, BJ, FA, FH, FY, QB, QD, QG, QJ, HD, HG, HJ, HL, HR, JD, JG, JJ, JL, JR

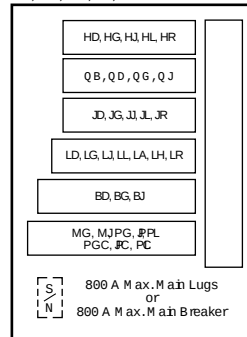
Box Size:  
32 in. Wide, 8.25 in. Deep

## TYPE HCP-SU [8]

800 A max. main circuit breaker

600 A max. branch circuit breaker

BD, BG, BJ, FY, FA, FH, LA, LD, LG, LJ, LL, LH, LR, MG, MJ, PG, PJ, PL, PGC, PJC, PLC [9], QB, QD, QG, QJ, HD, HG, HJ, HL, JD, JG, JJ, JL

Box Size:  
26 in. Wide, 9.5 in. Deep

[1] Add "F" for flush mount, "S" for surface mount.

[2] For Type 1 applications, order interior, front, and box. For Type 3R/5/12 applications, order interior and box only. The front is included with the box.

[3] For Type 1 applications order interior, trim and box. For Type 3R/5/12, order interior and box only.

[4] Remove drain screws for Type 3R rating.

[5] Suitable for use as service equipment if equipped with an integral main circuit breaker or when not more than six main disconnecting means are provided and the panelboard is not used as a lighting and appliance branch circuit panelboard.

[6] Bottom feed standard.

[7] Circuit breaker interrupt ratings, see The PowerPact Advantage in Digest Section 7.

[8] For main circuit breaker panel, order plug-on I-Line type PG, PJ, PL, MG, or MJ circuit breakers from 9–47 through 9–48 and backfeed as the main breaker (order solid neutral from 9–37).

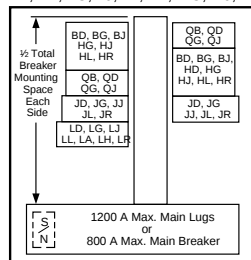
[9] PG, PJ, PL circuit breakers are available with both thermal-magnetic equivalent and Micrologic trip. The Micrologic circuit breakers are available 80% and 100% rated. "C" suffix denotes a 100% rating.

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**TYPE HCP**

800 A max. branch circuit breaker

FA [10], BD, BG, BJ, FA, FH, QB, QD, QG, QJ, HD, HG, HJ, HL, HR, JD, JG, JJ, JL, JR, LA, LH, LD, LG, LJ, LL, LR, MG, MJ, PG, PJ, PL, PGC, PJC, PLC [11]

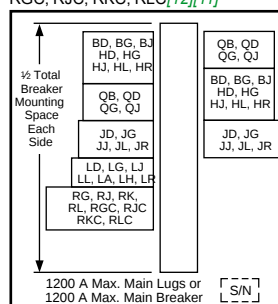


Box Size: 42 in. Wide, 9.5 in. Deep

**TYPE HCR-U Universal Mains**

1200 A max. branch circuit breaker

FA [10], BD, BG, BJ, FA, FH, QB, QD, QG, QJ, HD, HG, HJ, HL, HR, JD, JG, JJ, JL, JR, LA, LH, LD, LG, LJ, LL, LR, MG, MJ, PG, PJ, PK, PL, RG, RJ, RK, RL, PGC, PJC, PKC, PLC, RGC, RJC, RKC, RLC [12][11]



Box Size: 44 in. Wide, 9.5 in. Deep

**Table 13.32: Circuit Breaker / Sub-feed Lug Kit Mounting Space Requirement**

| Type of Circuit Breaker | Maximum Ampacity | No. of Poles | Inch Mounting Requirements |
|-------------------------|------------------|--------------|----------------------------|
| FY                      | 30               | 1            | 1.5                        |
| FA, FH                  | 100              | 1            | 1.5                        |
| FA, FH                  |                  | 2            | 3                          |
| FA, FH, SL-100          |                  | 3            | 4.5                        |
| FI                      |                  | 2, 3         | 4.5                        |
| LC, LI, LXI             | 600              | 2, 3         | 7.5                        |

**Accessories**

**Table 13.33: Sub-feed Lug Kits [13][14][15]**

| Ampere Rating | Height |      | Catalog Number | Max. Short Circuit System Ratings<br>RMS Symmetrical Amperes |         |         | Protected by Circuit Breaker | For Use in I-Line Panelboard Types |
|---------------|--------|------|----------------|--------------------------------------------------------------|---------|---------|------------------------------|------------------------------------|
|               | In.    | (mm) |                | 240 Vac                                                      | 480 Vac | 600 Vac |                              |                                    |
| 100 A         | 4.5    | 114  | SL100          | 100,000                                                      | 65,000  | 18,000  | FA, FH, FD, FG, FJ           | HCM, HCP, HCP-SU, HCR-U            |

**Table 13.34: Sub-feed Lug kit terminal data**

| Catalog No. (Prefix) | No. Poles | Ampere Rating | Standard Lug Wire Size [16]      |
|----------------------|-----------|---------------|----------------------------------|
| SL100                | 3         | 100           | #14–1/0 AWG Cu or #12–1/0 AWG Al |

[10] FA and JDA circuit breakers with field installable ground fault kits may be mounted in type HCP, HCP-SU, and HCR-U panelboards as shown, and require L-frame mounting space.  
 [11] PG, PJ, and PL circuit breakers are available with both thermal-magnetic equivalent and Micrologic trip. The Micrologic circuit breakers are available 80% and 100% rated. "C" suffix denotes a 100% rating.  
 [12] When RL main circuit breakers with equipment ground fault are applied on a 3Ø4W system, order solid neutral catalog number HCR12SNCT. The HCR12SNCT includes a neutral current transformer.  
 [13] Plug-on in same manner as a branch circuit breaker  
 [14] For other ratings, see the latest edition of I-Line Information Manual, #80043-309-xx.  
 [15] SL400 cannot be used in HCM panelboards due to inadequate wire bending space.  
 [16] Unless otherwise specified, wire sizes apply to both aluminum and copper conductors.



2 KI breakers

Table 13.35: K-frame—250 A, Thermal-magnetic, Current Limiting (600 Vac)

| Ampere Rating                | AC Magnetic Trip Settings |      | Current Limiting | Terminal Wire Range                             |
|------------------------------|---------------------------|------|------------------|-------------------------------------------------|
|                              | Low                       | High | Catalog Number   |                                                 |
| 2-pole, 600 Vac, 250 Vdc [1] |                           |      |                  |                                                 |
| 110 A                        | 550                       | 1100 | KI26110( )       | AL250KA<br>one #4 AWG—<br>350 kcmil<br>Al or Cu |
| 125 A                        | 625                       | 1250 | KI26125( )       |                                                 |
| 150 A                        | 750                       | 1500 | KI26150( )       |                                                 |
| 175 A                        | 875                       | 1750 | KI26175( )       |                                                 |
| 200 A                        | 1000                      | 2000 | KI26200( )       | AL250KI<br>one #1/0 AWG—<br>350 kcmil Al or Cu  |
| 225 A                        | 1125                      | 2250 | KI26225( )       |                                                 |
| 250 A                        | 1250                      | 2500 | KI26250( )       |                                                 |
| 3-pole, 600 Vac, 250 Vdc     |                           |      |                  |                                                 |
| 110 A                        | 550                       | 1100 | KI36110          | AL250KA<br>one #4 AWG—<br>350 kcmil<br>Al or Cu |
| 125 A                        | 625                       | 1250 | KI36125          |                                                 |
| 150 A                        | 750                       | 1500 | KI36150          |                                                 |
| 175 A                        | 875                       | 1750 | KI36175          |                                                 |
| 200 A                        | 1000                      | 2000 | KI36200          | AL250KI<br>one #1/0 AWG—<br>350 kcmil Al or Cu  |
| 225 A                        | 1125                      | 2250 | KI36225          |                                                 |
| 250 A                        | 1250                      | 2500 | KI36250          |                                                 |

2 LC, LI

Table 13.36: L-frame—600 A, Thermal-magnetic (600 Vac)[2]

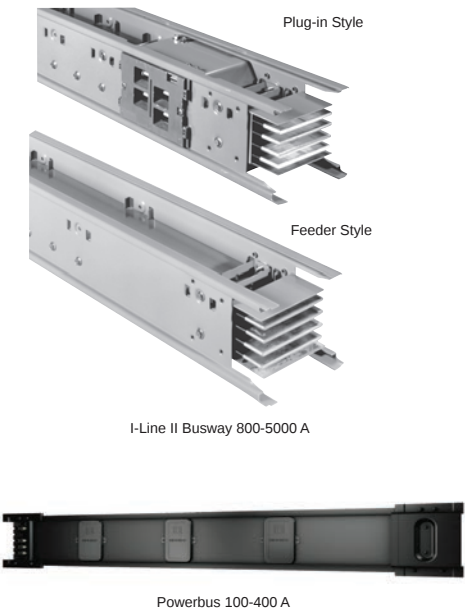


| Ampere Rating          | AC Magnetic Trip Settings |      | Extra High Interrupting | Current Limiting | Terminal Wire Range                            |
|------------------------|---------------------------|------|-------------------------|------------------|------------------------------------------------|
|                        | Low                       | High | Catalog Number          | Catalog Number   |                                                |
| 2-pole, 600 Vac<br>[1] |                           |      |                         |                  |                                                |
| 300 A                  | 1500                      | 3200 | LC26300( )              | LI26300( )       | AL600LI5<br>two #4/0 AWG—500 kcmil<br>AL or Cu |
| 350 A                  | 1750                      |      | LC26350( )              | LI26350( )       |                                                |
| 400 A                  | 2000                      |      | LC26400( )              | LI26400( )       |                                                |
| 450 A                  | 2250                      | 4200 | LC26450( )              | LI26450( )       |                                                |
| 500 A                  | 2500                      |      | LC26500( )              | LI26500( )       |                                                |
| 600 A                  | 3000                      |      | LC26600( )              | LI26600( )       |                                                |
| 3-pole, 600 Vac        |                           |      |                         |                  |                                                |
| 300 A                  | 1500                      | 3200 | LC36300                 | LI36300          | AL600LI5<br>two #4/0 AWG—500 kcmil<br>AL or Cu |
| 350 A                  | 1750                      |      | LC36350                 | LI36350          |                                                |
| 400 A                  | 2000                      |      | LC36400                 | LI36400          |                                                |
| 450 A                  | 2250                      | 4200 | LC36450                 | LI36450          |                                                |
| 500 A                  | 2500                      |      | LC36500                 | LI36500          |                                                |
| 600 A                  | 3000                      |      | LC36600                 | LI36600          |                                                |

[1] 2-pole circuit breaker catalog numbers are completed by adding required phase connection letters as suffix to catalog number. See Digest Section 9.  
[2] Type LC and LI circuit breakers are NOT recommended for use on single-motor branch circuits.

Section 14

Busway



|                                                         |             |
|---------------------------------------------------------|-------------|
| <b>I-Line™ Busway</b>                                   | <b>14-2</b> |
| Special Purpose Plug-In Units                           | 14-2        |
| APD and SD Busway Plug-In Units (Not I-Line™ Busway)    | 14-2        |
| Capacitor and Transformer Units                         | 14-2        |
| Combination Switches and Contactors (For I-Line Busway) | 14-2        |
| Ground Indicator and Neutralizer Plugs                  | 14-2        |
| <b>Powerbus™ Busway</b>                                 | <b>14-3</b> |
| Powerbus™ Busway                                        | 14-3        |
| Powerbus 225 (240 V) Ampere                             | 14-3        |
| Powerbus 100 (600 V) Ampere                             | 14-3        |
| Busbar Configurations                                   | 14-4        |

## APD and SD Busway Plug-In Units (Not I-Line™ Busway)

Table 14.1: Circuit Breaker Plug-In Units

| Breaker Frame | Trip Rating Amps | 600 Vac 3Ø4W for use on both 3-Pole and 3Ø4W Busway | Breaker Frame | Trip Rating Amps | 600 Vac 3Ø4W for use on both 3-Pole and 3Ø4W Busway |
|---------------|------------------|-----------------------------------------------------|---------------|------------------|-----------------------------------------------------|
|               |                  | Catalog Number                                      |               |                  | Catalog Number                                      |
| FA            | 15               | SD75415                                             | LA            | 125              | SD78417LA                                           |
|               | 20               | SD75420                                             |               | 150              | SD78418LA                                           |
|               | 30               | SD75430                                             |               | 175              | SD78419LA                                           |
|               | 40               | SD75440                                             |               | 200              | SD78426LA                                           |
|               | 50               | SD75450                                             |               | 225              | SD78427LA                                           |
|               | 60               | SD75460                                             |               | 250              | SD67428                                             |
|               | 70               | SD75470                                             |               | 300              | SD67436                                             |
|               | 100              | SD75416                                             |               | 350              | SD67438                                             |
|               |                  |                                                     |               | 400              | SD67446                                             |

Table 14.2: 100 A Busway Plug-In Unit Circuit Breaker Enclosures and Accessories

| Enclosure Only<br>(Price Circuit Breaker Separately) | 1Ø3W & 3Ø4W [1] | Ground Kit  | Floor Operator Attachment |
|------------------------------------------------------|-----------------|-------------|---------------------------|
|                                                      | Catalog No.     | Catalog No. | Catalog No.               |
| QO Breaker-70 A Enclosure                            | PINQO           | PGKQO2      | P11QO                     |
| QO Breaker/Recpt.-70 A Enclosure [2]                 | PINQOR          | PGKQOR      | P11QO                     |
| FA Breaker-15-100 A Enclosure                        | PIN100FA        | PGKFA2      | P11FA                     |

## Capacitor and Transformer Units

Table 14.3: 3Ø Capacitor Units (Order plug-in units separately) [3]

| 3Ø kVAR | 240 Vac        | 480 Vac        |
|---------|----------------|----------------|
|         | Catalog Number | Catalog Number |
| 2.5     | —              | PC3402         |
| 5       | PC3205         | PC3405         |
| 7.5     | PC3207         | PC3407         |
| 10      | PC3210         | PC3410         |
| 15      | PC3215         | PC3415         |
| 20      | —              | PC3420         |
| 25      | —              | PC3425         |
| 30      | —              | PC3430         |

Table 14.4: 1Ø Transformer Units (Order plug-in units separately) [4]

| 1Ø kVA | Primary Voltage |                |
|--------|-----------------|----------------|
|        | 240 Vac         | 480 Vac        |
|        | Catalog Number  | Catalog Number |
| 1      | PT2200          | PT2400         |
| 1.5    | PT2201          | PT2401         |
| 2      | PT2202          | PT2402         |
| 3      | PT2203          | PT2403         |
| 5      | PT2205          | PT2405         |
| 7.5    | PT2207          | PT2407         |
| 10     | PT2210          | PT2410         |

## Combination Switches and Contactors (For I-Line Busway)

Refer to Catalog 5600CT9101.

## Ground Indicator and Neutralizer Plugs

Table 14.5: Ground Indicator and Neutralizer Plugs

| 240 Vac—3-Pole | 600 Vac—3-Pole |
|----------------|----------------|
| Catalog Number | Catalog Number |
| PGD3200G       | PGD3600G       |

[1] With PIN-QO, use circuit breakers QO215H, QO220H, and QO230H. For higher ratings, use FA enclosures and circuit breakers.

[2] Enclosure with space for three QO circuit breaker poles and provisions for three duplex receptacles.

[3] Capacitor units do not plug into busway and must be used with plug-in switch or circuit breaker.

[4] Transformer units do not plug into busway and must be used with plug-in switch, circuit breaker or cable tap box. Standard secondary voltage terminals are provided for 120 V or 240 V 1Ø2W, or 120/240, 1Ø3W connection. Specify secondary voltage if other than standard.

## Powerbus 225 (240 V) Ampere

**Table 14.6: 1Ø Systems—Powerbus Straight Lengths and Fittings [1]**

| Component       | Configuration 3E<br>1Ø3W | Configuration 3B<br>1Ø2W<br>Isolated Ground |
|-----------------|--------------------------|---------------------------------------------|
|                 | Catalog No.              | Catalog No.                                 |
| Straight 10 ft. | PBCP3E225ST120           | PBCP3B225ST120                              |
| Straight 4 ft.  | PBCP3E225ST048           | PBCP3B225ST048                              |
| Elbow – Left    | PBCF3E225LL              | PBCF3B225LL                                 |
| Elbow – Right   | PBCF3E225LR              | PBCF3B225LR                                 |
| Cross Fitting   | PBCF3E225CR              | PBCF3B225CR                                 |
| Tap Box         | PBCF3E225TB              | PBCF3B225TB                                 |

**Table 14.7: 3Ø3W—Straight Lengths and Fittings**

| Component       | Configuration 3A | Configuration 4B<br>Isolated Ground |
|-----------------|------------------|-------------------------------------|
|                 | Catalog No.      | Catalog No.                         |
| Straight 10 ft. | PBCP3A225ST120   | PBCP4B225ST120                      |
| Straight 4 ft.  | PBCP3A225ST048   | PBCP4B225ST048                      |
| Elbow – Left    | PBCF3A225LL      | PBCF4B225LL                         |
| Elbow – Right   | PBCF3A225LR      | PBCF4B225LR                         |
| Cross Fitting   | PBCF3A225CR      | PBCF4B225CR                         |
| Tap Box         | PBCF3A225TB      | PBCF4B225TB                         |

**Table 14.8: 3Ø4W—Straight Lengths and Fittings**

| Component       | Configuration 4A<br>100% Neutral | Configuration 5A<br>100% Neutral Plus Isolated<br>Ground; or 200% Neutral |
|-----------------|----------------------------------|---------------------------------------------------------------------------|
|                 | Catalog No.                      | Catalog No.                                                               |
| Straight 10 ft. | PBCP4A225ST120                   | PBCP5A225ST120                                                            |
| Straight 4 ft.  | PBCP4A225ST048                   | PBCP5A225ST048                                                            |
| Elbow – Left    | PBCF4A225LL                      | PBCF5A225LL                                                               |
| Elbow – Right   | PBCF4A225LR                      | PBCF5A225LR                                                               |
| Cross Fitting   | PBCF4A225CR                      | PBCF5A225CR                                                               |
| Tap Box         | PBCF4A225TB                      | PBCF5A225TB                                                               |

## Powerbus 100 (600 V) Ampere

**Table 14.9: 1Ø Systems—Powerbus Straight Lengths and Fittings [1]**

| Component       | Configuration 3E<br>1Ø3W | Configuration 3B<br>1Ø2W<br>Isolated Ground |
|-----------------|--------------------------|---------------------------------------------|
|                 | Catalog No.              | Catalog No.                                 |
| Straight 10 ft. | PBCP3E100ST120           | PBCP3B100ST120                              |
| Straight 4 ft.  | PBCP3E100ST048           | PBCP3B100ST048                              |
| Elbow – Left    | PBCF3E100LL              | PBCF3B100LL                                 |
| Elbow – Right   | PBCF3E100LR              | PBCF3B100LR                                 |
| Cross Fitting   | PBCF3E100CR              | PBCF3B100CR                                 |
| Tap Box         | PBCF3E100TB              | PBCF3B100TB                                 |

**Table 14.10: 3Ø3W—Straight Lengths and Fittings**

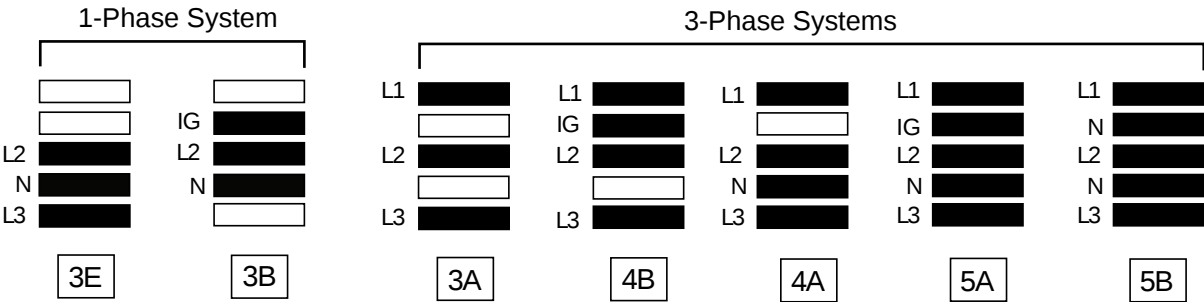
| Component       | Configuration 3A | Configuration 4B<br>Isolated Ground |
|-----------------|------------------|-------------------------------------|
|                 | Catalog No.      | Catalog No.                         |
| Straight 10 ft. | PBCP3A100ST120   | PBCP4B100ST120                      |
| Straight 4 ft.  | PBCP3A100ST048   | PBCP4B100ST048                      |
| Elbow – Left    | PBCF3A100LL      | PBCF4B100LL                         |
| Elbow – Right   | PBCF3A100LR      | PBCF4B100LR                         |
| Cross Fitting   | PBCF3A100CR      | PBCF4B100CR                         |
| Tap Box         | PBCF3A100TB      | PBCF4B100TB                         |

**Table 14.11: 3Ø4W—Straight Lengths and Fittings**

| Component       | Configuration 4A<br>100% Neutral | Configuration 5A<br>100% Neutral Plus Isolated<br>Ground; or 200% Neutral |
|-----------------|----------------------------------|---------------------------------------------------------------------------|
|                 | Catalog No.                      | Catalog No.                                                               |
| Straight 10 ft. | PBCP4A100ST120                   | PBCP5A100ST120                                                            |
| Straight 4 ft.  | PBCP4A100ST048                   | PBCP5A100ST048                                                            |
| Elbow – Left    | PBCF4A100LL                      | PBCF5A100LL                                                               |
| Elbow – Right   | PBCF4A100LR                      | PBCF5A100LR                                                               |
| Cross Fitting   | PBCF4A100CR                      | PBCF5A100CR                                                               |
| Tap Box         | PBCF4A100TB                      | PBCF5A100TB                                                               |

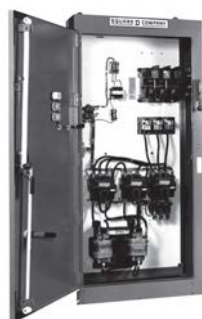
[1] Also suitable for DC applications.

Busbar Configurations



## Section 15

## Operating Mechanisms and Disconnect Switches



Electromechanical  
Reduced Voltage Starter

|                                           |              |
|-------------------------------------------|--------------|
| <b>IEC Style Disconnect Switches</b>      | <b>15-2</b>  |
| <b>UL508 Motor Disconnect Switches</b>    | <b>15-8</b>  |
| <b>NEMA Style Disconnect Switches</b>     | <b>15-9</b>  |
| <b>Door-Mounted Operating Mechanisms</b>  | <b>15-10</b> |
| <b>Door Closing Mechanisms</b>            | <b>15-13</b> |
| Introduction                              | <b>15-13</b> |
| Types M5, M6, M1, and M8                  | <b>15-14</b> |
| Single and Multi-Door Enclosures          | <b>15-15</b> |
| Types M5, M6, M1, and M8                  | <b>15-16</b> |
| <b>Operating Mechanisms, Accessories</b>  | <b>15-17</b> |
| Disconnect Switches and Circuit Breakers  | <b>15-17</b> |
| <b>Bracket-Mounted Disconnect Devices</b> | <b>15-18</b> |
| <b>Disconnect Switch Accessories</b>      | <b>15-19</b> |



200 A Switch

30 A Side Handle  
GS1EERU30

Compact 30 A Switch

**Table 15.3: Fusible Switches with Direct Mount  
Side Handle**

| Catalog No. | Description                                   |
|-------------|-----------------------------------------------|
| GS1EERU20   | 30 A, 2-pole, Class CC                        |
| GS1EERU30   | 30 A, 3-pole, Class CC                        |
| GS1AH01     | Right-side handle for GS1EERU20 and GS1EERU30 |

**For example:**

LK3SU3 (600 A nonfusible switch, use 15x15 shaft)  
 + GS1AE6 (15x15 200 mm Type H shaft)  
 + LK3AH150 (black/black, lockable)

**To add auxiliary contacts:**

For front-mounted contacts order  
 GS1AD30 (front-mounted auxiliary contact holder)  
 + GS1AM110 (NO contact for GS1AD10, 20, 30)

**Catalog Number Identification System**

The GS1 part numbers can be identified as shown in Table 15.1.  
 See Catalog 9421CT0301 for specific applications.

**Table 15.1: Identification System**

| GS1                                                                        |                                        |     |                          | D | U | 3 |
|----------------------------------------------------------------------------|----------------------------------------|-----|--------------------------|---|---|---|
| Model GS1 Fusible (Class J fuse unless noted), LK3 Nonfusible              |                                        |     |                          |   |   |   |
| Current Range, Operator Type (front operator unless noted), Accessory Type |                                        |     |                          |   |   |   |
| D                                                                          | 30 A front and side operation          | T   | 800 A (Class L if fused) |   |   |   |
| DD                                                                         | 30 A Class CC front and side operation | U   | 1000 A                   |   |   |   |
| E                                                                          | 30 A                                   | W   | 1200 A                   |   |   |   |
| EE                                                                         | 30 A Class CC                          | AH  | handle                   |   |   |   |
| G                                                                          | 60 A                                   | AHT | handle with test         |   |   |   |
| J                                                                          | 100 A                                  | AE  | extension shaft          |   |   |   |
| M                                                                          | 200 A                                  | AD  | auxiliary contact holder |   |   |   |
| Q                                                                          | 400 A                                  | AM  | auxiliary contact        |   |   |   |
| S                                                                          | 600 A                                  |     |                          |   |   |   |
| UL Certification                                                           |                                        |     |                          |   |   |   |
| Poles—Number of Poles, 2 or 3                                              |                                        |     |                          |   |   |   |

**NOTE:** All fusible switches through 400 A, and nonfused switches through 200 A, are equipped with a feature to test the optional auxiliary contacts without energizing the load, when the appropriate GS1AHT\*\*\* handle is used.

**Table 15.2: Fusible Switches, 3-pole**

| Catalog No.                                       | Rating | Fuses    | Shaft to Use |
|---------------------------------------------------|--------|----------|--------------|
| Compact GS1 Fusible IEC Style Disconnect Switches |        |          |              |
| GS1DDU3                                           | 30 A   | Class CC | 5x5 shaft    |
| GS1DU3                                            | 30 A   | Class J  | 5x5 shaft    |
| GS1 Fusible IEC Style Disconnect Switches         |        |          |              |
| GS1EEU3                                           | 30 A   | Class CC | 10x10 shaft  |
| GS1EU3                                            | 30 A   | Class J  | 10x10 shaft  |
| GS1GU3                                            | 60 A   | Class J  | 10x10 shaft  |
| GS1JU3 [1] [2]                                    | 100 A  | Class J  | 10x10 shaft  |
| GS1MU3 [1] [2]                                    | 200 A  | Class J  | 10x10 shaft  |
| GS1QU3 [1]                                        | 400 A  | Class J  | 10x10 shaft  |
| GS1SU3 [1] [2]                                    | 600 A  | Class J  | 15x15 shaft  |
| GS1TU3 [1]                                        | 800 A  | Class L  | 15x15 shaft  |

**Table 15.4: Nonfusible Switches, 3-pole**

| Catalog No.                                          | Rating | Shaft to Use |
|------------------------------------------------------|--------|--------------|
| Compact LK3 Nonfusible IEC Style Disconnect Switches |        |              |
| LK3DU3 [2]                                           | 30 A   | 5x5 shaft    |
| LK3 Nonfusible IEC Style Disconnect Switches         |        |              |
| LK3GU3                                               | 60 A   | 10x10 shaft  |
| LK3JU3 [2]                                           | 100 A  | 10x10 shaft  |
| LK3MU3 [1]                                           | 200 A  | 10x10 shaft  |
| LK3QU3 [1]                                           | 400 A  | 15x15 shaft  |
| LK3SU3 [1]                                           | 600 A  | 15x15 shaft  |
| LK3TU3 [1]                                           | 800 A  | 15x15 shaft  |
| LK3UU3 [1]                                           | 1000 A | 15x15 shaft  |
| LK3WU3 [1]                                           | 1200 A | 15x15 shaft  |

**Example of the parts to order to build a complete GS or LK switch:**

| Choose a Switch | + | Shaft                | + | Handle Assembly        | + | Lugs, if needed    |
|-----------------|---|----------------------|---|------------------------|---|--------------------|
| 600 A, LK3SU3   |   | Shaft 200 mm, GS1AE6 |   | Black Handle, LK3AH150 |   | Lugs Kit, GS1AW503 |



[1] Shipped with line side terminal shrouds—for additional shrouds, see Table 15.12. Terminal lug must be ordered separately—see Table 15.11.

[2] Obsolete.



GS1AH101 GS1AH102

Type D—alternate handles  
for compact switches only



GS1AE7/AE71 Shafts  
5 mm x 5 mm  
Compact Shaft Kits



GS1AH110 GS1AH120  
Type G—Standard Handle Design

Use these shaft kits when using compact switches:



GS1AE8/AE81 Shafts  
5 mm x 5 mm



LK3AH160 GS1AE6



GS1AE2/AE21 Shafts

## Handles

**Table 15.5: Operating Handles for Compact GS1 and LK3 for Use with Shaft Type D**

| Type    |      | Defeatable | Padlockable | Color               | Operation    | Catalog Number       |
|---------|------|------------|-------------|---------------------|--------------|----------------------|
| NEMA/UL | IEC  |            |             |                     |              |                      |
| 1, 12   | IP54 | Yes        | Yes         | Black<br>Red/Yellow | Off/On (O/I) | GS1AH101<br>GS1AH102 |

**Table 15.6: Operating Handles for Compact GS1 and LK3 for Use with Shaft Type G**

| Type             |      | Defeatable | Padlockable | Color      | Operation           | Catalog Number |
|------------------|------|------------|-------------|------------|---------------------|----------------|
| NEMA/UL          | IEC  |            |             |            |                     |                |
| 1, 3R, 12        | IP54 | Yes        | Yes         | Black      | Off/On (O/I)        | GS1AH110       |
|                  |      |            |             | Red/Yellow | Off/On (O/I)        | GS1AH120       |
|                  |      |            |             | Black      | Test/Off/On (T/O/I) | GS1AHT110      |
|                  |      |            |             | Red/Yellow | Test/Off/On (T/O/I) | GS1AHT120      |
| 1, 3R, 4, 4X, 12 | IP65 | Yes        | Yes         | Black      | Off/On (O/I)        | GS1AH410 [3]   |
|                  |      |            |             | Red/Yellow | Off/On (O/I)        | GS1AH420       |
|                  |      |            |             | Black      | Test/Off/On (T/O/I) | GS1AHT410      |
|                  |      |            |             | Red/Yellow | Test/Off/On (T/O/I) | GS1AHT420      |

**Table 15.7: Operating Handles for Standard GS1 and LK3**

| Type                                          |      | Defeatable | Padlockable | Color      | Operation           | Catalog Number |
|-----------------------------------------------|------|------------|-------------|------------|---------------------|----------------|
| NEMA/UL                                       | IEC  |            |             |            |                     |                |
| GS1 30–100 A and LK3 60–100 A (3 in. handles) |      |            |             |            |                     |                |
| 1, 3R, 12                                     | IP54 | Yes        | Yes         | Black      | Off/On (O/I)        | GS1AH110       |
|                                               |      |            |             | Red/Yellow | Off/On (O/I)        | GS1AH120       |
|                                               |      |            |             | Black      | Test/Off/On (T/O/I) | GS1AHT110      |
|                                               |      |            |             | Red/Yellow | Test/Off/On (T/O/I) | GS1AHT120      |
| 1, 3R, 4, 4X, 12                              | IP65 | Yes        | Yes         | Black      | Off/On (O/I)        | GS1AH410       |
|                                               |      |            |             | Red/Yellow | Off/On (O/I)        | GS1AH420       |
|                                               |      |            |             | Black      | Test/Off/On (T/O/I) | GS1AHT410      |
|                                               |      |            |             | Red/Yellow | Test/Off/On (T/O/I) | GS1AHT420      |
| GS1 200–400 A and LK3 200 A (5 in. handles)   |      |            |             |            |                     |                |
| 1, 3R, 12                                     | IP54 | Yes        | Yes         | Black      | Off/On (O/I)        | GS1AH130       |
|                                               |      |            |             | Red/Yellow | Off/On (O/I)        | GS1AH140       |
|                                               |      |            |             | Black      | Test/Off/On (T/O/I) | GS1AHT130      |
|                                               |      |            |             | Red/Yellow | Test/Off/On (T/O/I) | GS1AHT140      |
| 1, 3R, 4, 4X, 12                              | IP65 | Yes        | Yes         | Black      | Off/On (O/I)        | GS1AH430       |
|                                               |      |            |             | Red/Yellow | Off/On (O/I)        | GS1AH440       |

**Table 15.8: Operating Handles for Use with Shaft Type H**

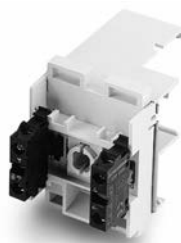
| Type               |      | Defeatable | Padlockable | Color      | Operation    | Catalog Number |
|--------------------|------|------------|-------------|------------|--------------|----------------|
| NEMA/UL            | IEC  |            |             |            |              |                |
| For LK3 400–1200 A |      |            |             |            |              |                |
| 1, 3R, 4, 4X, 12   | IP65 | No         | Yes         | Black      | Off/On (O/I) | LK3AH150 [3]   |
|                    |      | No         |             | Red/Yellow |              | LK3AH160 [3]   |
|                    |      | Yes        |             | Black      |              | LK3AH170       |
|                    |      | Yes        |             | Red/Yellow |              | LK3AH180       |
| For GS1 600–800 A  |      |            |             |            |              |                |
| 1, 3R, 4, 4X, 12   | IP65 | No         | Yes         | Black      | Off/On (O/I) | LK3AH150 [3]   |
|                    |      | No         |             | Red/Yellow |              | LK3AH160 [3]   |
|                    |      | Yes        |             | Black      |              | GS1AH170       |
|                    |      | Yes        |             | Red/Yellow |              | GS1AH180 [3]   |

**NOTE:** UL approved for indoor or outdoor applications.

**Table 15.9: Shafts**

| Length                                                     |     | Catalog No. |
|------------------------------------------------------------|-----|-------------|
| in.                                                        | mm  |             |
| Shaft 5 mm x 5 mm—For use with Operating Handles, Type D   |     |             |
| 12.6                                                       | 320 | GS1AE7      |
| 15.7                                                       | 400 | GS1AE71 [3] |
| Shaft 5 mm x 5 mm—For use with Operating Handles, Type G   |     |             |
| 12.6                                                       | 320 | GS1AE8 [3]  |
| 15.7                                                       | 400 | GS1AE81     |
| Shaft 10 mm x 10 mm—For Standard GS1 and LK3               |     |             |
| 12.6                                                       | 320 | GS1AE2      |
| 15.7                                                       | 400 | GS1AE21     |
| Shaft 15 mm x 15 mm—For use with Operating Handles, Type H |     |             |
| 7.9                                                        | 200 | GS1AE6 [3]  |
| 15.7                                                       | 400 | GS1AE61 [3] |

[3] Obsolete.

GS1AD10 +  
GS1AM110GS1AD20 +  
GS1AM110GS1AD30 +  
GS1AM110

Terminal Lugs



Terminal Shrouds



Shorting Links

## Accessories

**Table 15.10: Auxiliary Contacts**

| Type                                  | Description                                                                                                                          | Catalog No.  |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>For Compact LK3 / GS1</b>          |                                                                                                                                      |              |
| U = Upper or Top mounted              | Standard products allow up to 4 auxiliary contacts without any extra contact holders. Contact holder (for 5 to 8 auxiliary contacts) | GS1AD10      |
| 10 A                                  | 1 N.O. Contact Block                                                                                                                 | GS1AM110     |
| 600 Vac                               | 1 N.C. Contact Block                                                                                                                 | GS1AM101     |
| <b>For LK3 60–200 A, GS1 30–400 A</b> |                                                                                                                                      |              |
| U = Upper or Top mounted              | Contact holder required (for 1 to 8 upper auxiliary contacts)                                                                        | GS1AD20      |
| 10 A                                  | 1 N.O. Contact Block                                                                                                                 | GS1AM110     |
| 600 Vac                               | 1 N.C. Contact Block                                                                                                                 | GS1AM101     |
| S = Side mounted [4]                  | 1 N.O. & N.C. Contact Block (max of two blocks—any mix)                                                                              | GS1AN11      |
|                                       | 2 N.O. & N.C. Contact Block (max of two blocks—any mix)                                                                              | GS1AN22      |
| S = Side mounted [4]                  | 1 N.O. & N.C. Contact Block w/ Test (max of two blocks—any mix)                                                                      | GS1ANT11 [5] |
|                                       | 2 N.O. & N.C. Contact Block w/ Test (max of two blocks—any mix)                                                                      | GS1ANT22 [5] |
| <b>For LK3 400–1200 A</b>             |                                                                                                                                      |              |
| U = Upper or Top mounted              | Contact holder (for 1 to 4 auxiliary contacts)                                                                                       | LK3AD30      |
| 10 A                                  | 1 N.O. Contact Block                                                                                                                 | GS1AM110     |
| 600 Vac                               | 1 N.C. Contact Block                                                                                                                 | GS1AM101     |
| <b>For GS1 600–800 A</b>              |                                                                                                                                      |              |
| Micro-switch (top mounted)            | 1 N.O./N.C. Contact                                                                                                                  | GS1AMU3 [5]  |
|                                       | 2 N.O./N.C. Contact                                                                                                                  | GS1AMU4 [5]  |

**Table 15.11: Terminal Lugs**

| For Use On                     | Wire Size (AWG) | No. of Wires per Lug | Wire Type | Lugs per Kit | Catalog No.  |
|--------------------------------|-----------------|----------------------|-----------|--------------|--------------|
| Compact GS1/LK3                | 14–10           | 1                    | Cu        | —            | Standard     |
| GS1 30 A CC                    | 14–10           | 1                    | Cu        | —            | Standard     |
| GS1 30 A J                     | 14–10           | 1                    | Cu        | —            | Standard     |
| GS1/LK3 60 A J                 | 10–3            | 1                    | Cu        | —            | Standard     |
| LK3 100 A                      | 14–2/0          | 1                    | Cu        | —            | Standard     |
| GS1 100 A                      | 14–2/0          | 1                    | Cu/Al     | 6            | GS1AW303     |
| GS1/LK3 200 A                  | 6–3/0           | 1                    | Cu/Al     | 6            | GS1AW403     |
| GS1/LK3 400–600 A [6]          | 2 x 2–2 x 600   | 2                    | Cu/Al     | 6            | GS1AW503     |
| GS1/LK3 800 A / LK3 1000 A [6] | 3 x 2–3 x 600   | 3                    | Cu/Al     | 6            | GS1AW803 [5] |
| LK3 1250 A [6]                 | 4 x 2–4 x 600   | 2                    | Cu/Al     | 12           | GS1AW903     |

**Table 15.12: Terminal Shrouds**

| For Use On                       | Catalog No. |
|----------------------------------|-------------|
| <b>For Line or Load Side [7]</b> |             |
| Compact GS1/LK3                  | Standard    |
| All GS1/LK3 30 A                 | Standard    |
| All GS1/LK3 60 A                 | Standard    |
| LK3 100 A                        | Standard    |
| GS1 100 A [8]                    | GS1AP33     |
| GS1/LK3 200 A [8]                | GS1AP43     |
| GS1 400 A                        | GS1AP63     |
| LK3 400–600 A                    | LK3AP63     |
| GS1 600–800 A                    | GS1AP83     |
| LK3 800–1250 A                   | LK3AP83     |

**Table 15.13: Shorting Links**

| For Use On    | Shorting Links per Kit | Catalog No. |
|---------------|------------------------|-------------|
| GS1 60 A      | 3                      | GS1AU203    |
| GS1 100 A     |                        | GS1AU303    |
| GS1 200 A     |                        | GS1AU403    |
| GS1 400 A     |                        | GS1AU503    |
| GS1 600–800 A |                        | GS1AU803    |

**Table 15.14: Shaft Padlocking Kit**

| For Use On      | Catalog No. |
|-----------------|-------------|
| Compact GS1/LK3 | Standard    |
| LK3 60–200 A    |             |
| GS1 30–400 A    |             |
| LK3 400–1250 A  |             |

[4] A GS1AN\*\* contact block may not be used on the same switch as a GS1ANT\*\*. A single switch must use all GS1AN11/GS1AN22 contact blocks or all GS1ANT11/GS1ANT22 contact blocks.

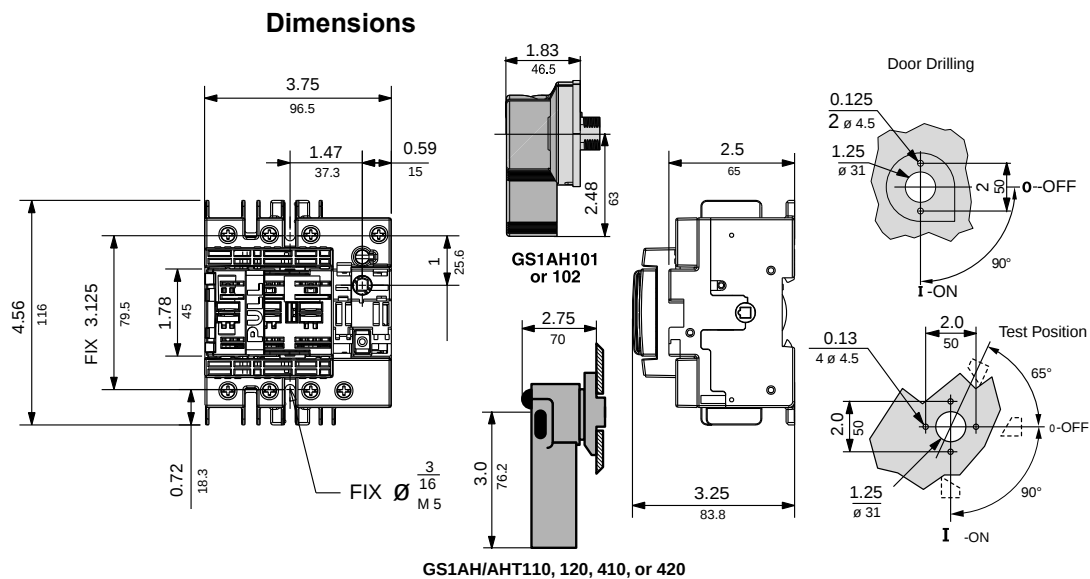
[5] Obsolete.

[6] GS1 600–800 A and LK3 800–1250 A can receive 1 lug for 3 cables per terminal or 2 lugs for 2 cables per terminal.

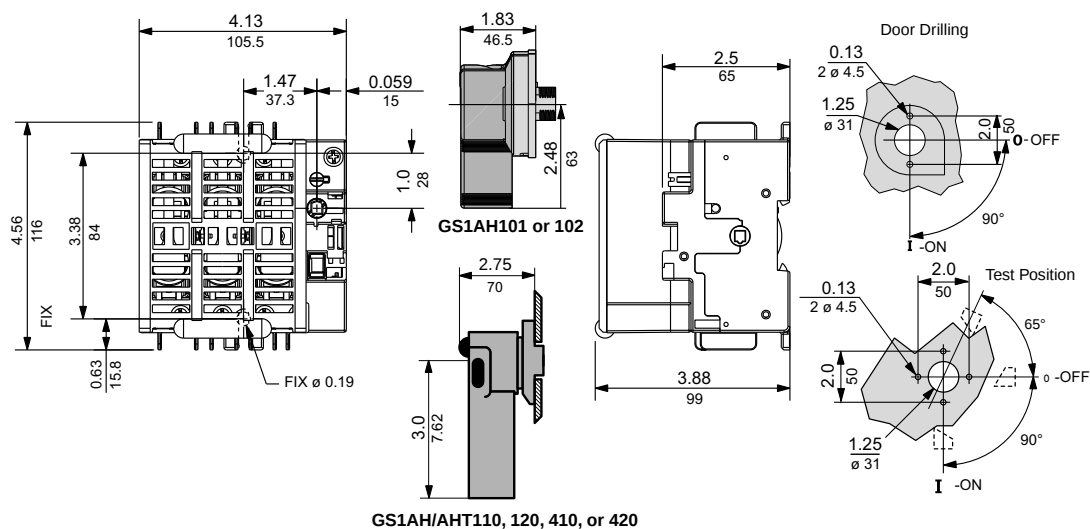
[7] All GS1 and LK3 switches are provided with line side shrouding.

[8] Three-piece kit for either the line or load side.

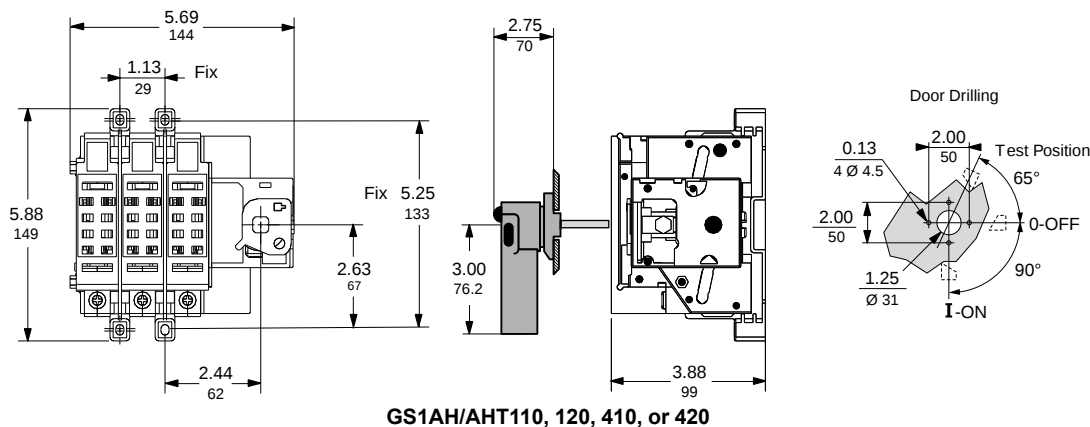
**GS1DDU3**  
Compact  
30 A rating  
Class CC fuses

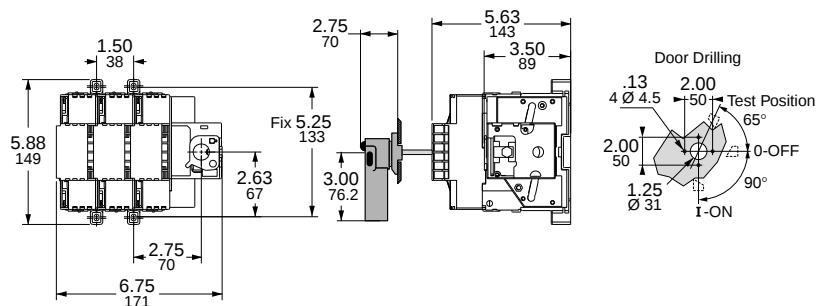


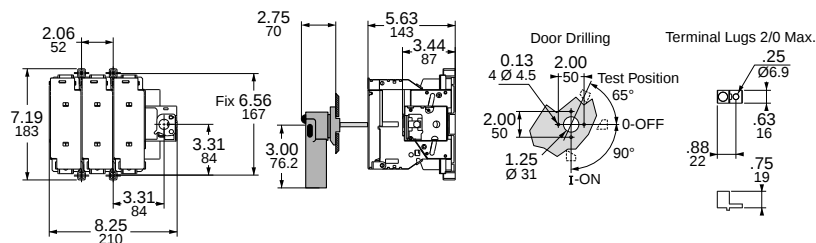
**GS1DU3**  
Compact  
30 A rating  
Class J fuses

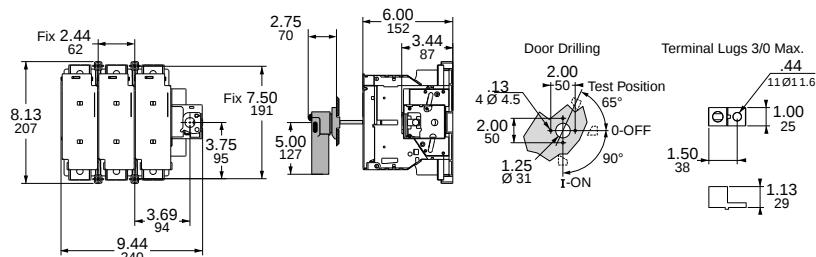


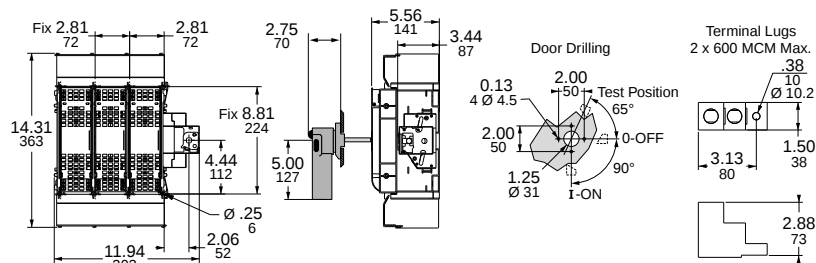
**GS1EEU3**  
30 A rating  
Class CC fuses

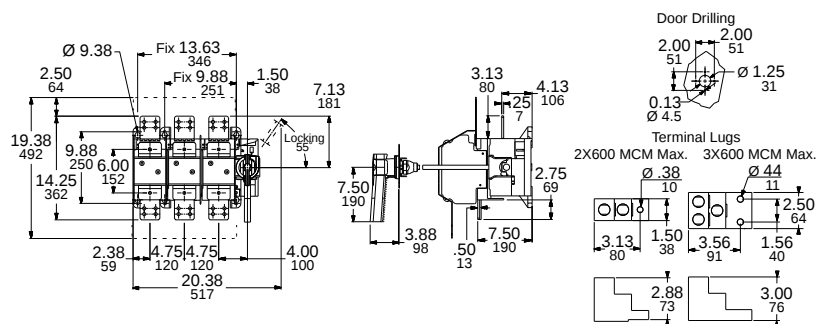


**GS1 Dimensions**
**GS1EU3/GS1GU3,  
30 and 60 A (Class J)**

 Mounting Hole  
 Dimension:  
 0.19 in. (4.8 mm)

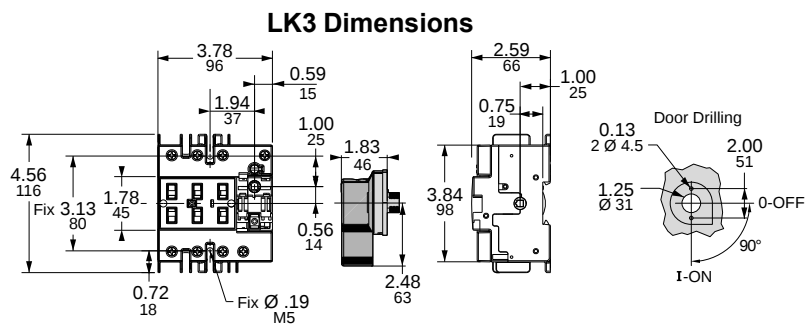
**GS1JU3,  
100 A (Class J)**

 Mounting Hole  
 Dimension:  
 0.19 in. (4.8 mm)

**GS1MU3,  
200 A (Class J)**

 Mounting Hole  
 Dimension:  
 0.19 in. (4.8 mm)

**GS1QU3,  
400 A (Class J)**

 Mounting Hole  
 Dimension:  
 0.25 in. (6.3 mm)

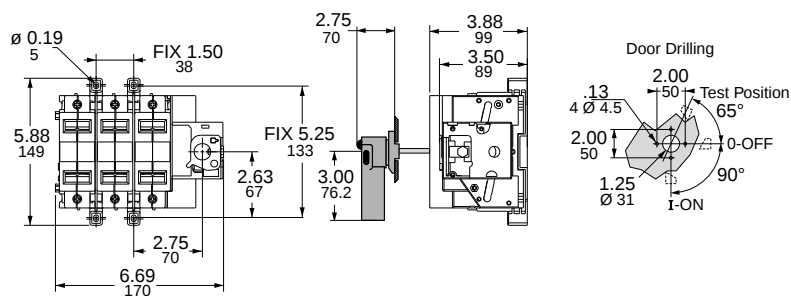
**GS1SU3/GS1TU3,  
600 A (Class J) and  
800 A (Class L)**

 Mounting Hole  
 Dimension:  
 0.38 in. (9.6 mm)

**LK3DU3,  
Compact LK3  
30 A**



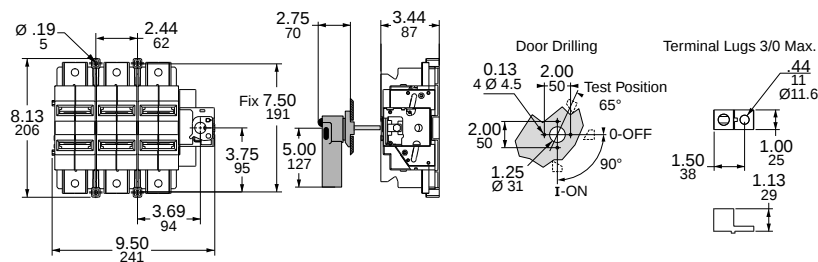
Mounting Hole  
Dimension:  
0.19 in. (4.8 mm)

**LK3GU3/LK3JU3,  
60 and 100 A**



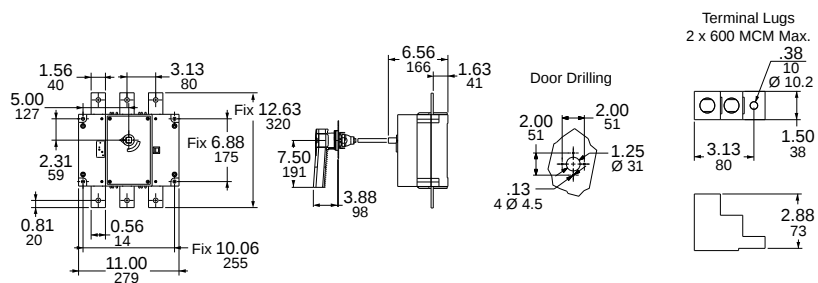
Mounting Hole  
Dimension:  
0.19 in. (4.8 mm)

**LK3MU3,  
200 A**



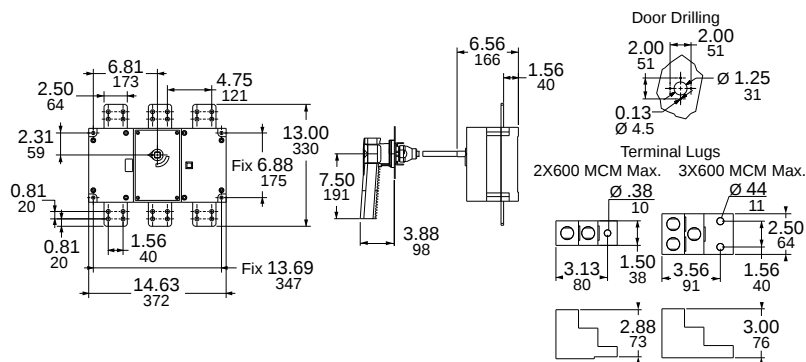
Mounting Hole  
Dimension:  
0.19 in. (4.8 mm)

**LK3QU3/LK3SU3,  
400 and 600 A**



Mounting Hole  
Dimension:  
0.25 in. (6.3 mm)

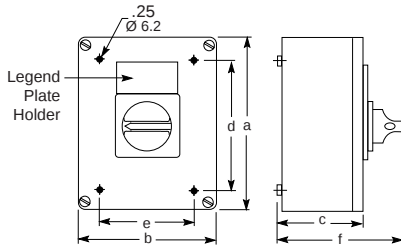
**LK3TU3/LK3UU3/  
LK3WU3,  
800, 1000, and 1250 A**



Mounting Hole  
Dimension:  
0.38 in. (9.6 mm)



Non-Metallic Enclosure



VC1GU–VC6GU

## Vario

The Vario motor disconnect switch is also offered as an enclosed switch made of corrosion resistant material. The 3-pole version makes the Vario switch ideal for manual motor control applications. The switches are compact, easy to wire and connect, and come undrilled to allow variable cable entry positions.

**NOTE:** VCGUN enclosures are UL approved.

**Table 15.15: Non-Metallic Enclosed Switches [1]**

| Ampere Size |     | IP55-PVC 3-Pole,<br>NEMA Type 1 & 12 |
|-------------|-----|--------------------------------------|
| UL          | IEC | Catalog No.                          |
| 20          | 32  | VC1GUN                               |
| 25          | 40  | VC2GUN                               |
| 45          | 63  | VC3GUN                               |
| 63          | 80  | VC4GUN                               |
| 100         | 125 | VC5GUN                               |
| 115         | 175 | VC6GUN                               |

**Table 15.16: Non-Metallic Enclosed Switch Dimensions**

| Catalog No. [2] | No. of Poles | Dimensions |     |     |     |     |     |     |     |     |     |     |     |
|-----------------|--------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                 |              | a          |     | b   |     | c   |     | d   |     | e   |     | f   |     |
|                 |              | in.        | mm  | in. | mm  | in. | mm  | in. | mm  | in. | mm  | in. | mm  |
| VC1GU–VC2GU     | 3            | 6.7        | 170 | 4.1 | 105 | 3.2 | 82  | 4.8 | 122 | 2.1 | 53  | 5.0 | 128 |
| VC3GU–VC4GU     |              | 6.7        | 170 | 5.3 | 135 | 3.3 | 85  | 5.1 | 130 | 3.7 | 95  | 5.2 | 131 |
| VC5GU–VC6GU     |              | 11.0       | 280 | 8.6 | 220 | 5.0 | 126 | 7.9 | 201 | 7.5 | 190 | 8.6 | 203 |

**Table 15.17: Vario Manual Motor Control Switches, IEC**

| Rating (A)<br>IEC | kW Rating |       |       |       | 3-Pole Switch Body |       |
|-------------------|-----------|-------|-------|-------|--------------------|-------|
|                   | 230 V     | 240 V | 400 V | 415 V | 500 V              | 690 V |
| 20                | 4         | 4     | 5.5   | 5.5   | 7.5                | 11    |
| 25                | 5.5       | 5.5   | 7.5   | 7.5   | 11                 | 15    |
| 32                | 5.5       | 5.5   | 11    | 11    | 11                 | 15    |
| 40                | 7.5       | 7.5   | 15    | 15    | 18.5               | 15    |
| 63                | 15        | 15    | 22    | 22    | 30                 | 22    |
| 80                | 18.5      | 18.5  | 30    | 30    | 37                 | 30    |
| 125               | 22        | 22    | 37    | 37    | 45                 | 37    |
| 175               | 30        | 30    | 45    | 45    | 55                 | 45    |

[1] Assembled, includes switches mounted in an enclosure with a handle.

[2] UL Rated, NEMA Type 1, 12, IP55.

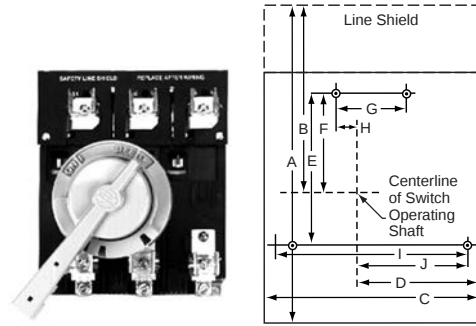
## File D10

The D10 disconnect switch features high I<sup>2</sup>T rating, longer contact life, visible contact indication, fuse-mounting flexibility, dead-front construction, and auxiliary interlocks.

A complete installation includes a D10 disconnect switch, D11 handle operator, and D12 fuse clip kit. The D10 accepts Class H, K, J, or R fuses, or can be used for nonfusible applications. The D10 disconnect switch is operated by a cast metal handle operator that is lockable in the Off position and defeatable in the On position.

**Table 15.18: Lug Data**

| Rating (A) | Number Per Pole | Wire Range [1]    | Wire Type |
|------------|-----------------|-------------------|-----------|
| 30         | 1               | 14–8 AWG          | Cu        |
| 60         |                 | 14–4 AWG          | Cu        |
| 100        |                 | 14–1/0 AWG        | Al–Cu     |
| 200        |                 | 6 AWG – 250 kcmil | Al–Cu     |



**Table 15.19: Fuse Clip Kits**

| D10 Switch Size | Fuse Clip Rating [2] |          |      | Catalog Number |
|-----------------|----------------------|----------|------|----------------|
|                 | Amperes              | AC Volts | Type |                |
| 30 A            | No Fuse              |          |      | D12C01         |
|                 | 0–30                 | 250      | H, K | D12C21 [3]     |
|                 | 0–30                 | 250      | R    | D12CR21        |
|                 | 0–30                 | 600      | H, K | D12C61         |
|                 | 0–30                 | 600      | R    | D12CR61        |
|                 | 0–30                 | 600      | J    | D12CJ1         |
|                 | 31–60                | 250      | H, K | D12C22 [3]     |
|                 | 31–60                | 600      | H, K | D12C62         |
|                 | 31–60                | 600      | R    | D12CR62        |
|                 | 31–60                | 600      | J    | D12CJ2 [3]     |
| 60 A            | 61–100               | 250      | H, K | D12C23         |
|                 | No Fuse              |          |      | D12D02         |
|                 | 0–30                 | 250      | R    | D12DR21 [3]    |
|                 | 0–30                 | 600      | H, K | D12D61         |
|                 | 0–30                 | 600      | R    | D12DR61        |
|                 | 31–60                | 250      | H, K | D12D22         |
|                 | 31–60                | 250      | R    | D12DR22        |
|                 | 31–60                | 600      | H, K | D12D62         |
|                 | 31–60                | 600      | R    | D12DR62        |
|                 | 31–60                | 600      | J    | D12DJ2         |
|                 | 61–100               | 250      | H, K | D12D23 [3]     |
|                 | 61–100               | 600      | H, K | D12D63 [3]     |
|                 | 61–100               | 600      | J    | D12DJ3 [3]     |
|                 | 61–100               | 600      | R    | D12DR63 [3]    |
| 100 A           | No Fuse              |          |      | D12E03         |
|                 | 31–60                | 250      | H, K | D12E22 [3]     |
|                 | 31–60                | 600      | H, K | D12E62         |
|                 | 61–100               | 250      | H, K | D12E23         |
|                 | 61–100               | 250      | R    | D12ER23        |
|                 | 61–100               | 600      | H, K | D12F63         |
|                 | 61–100               | 600      | R    | D12FR63        |
|                 | 61–100               | 600      | J    | D12EJ3         |
|                 | 101–200              | 250      | H, K | D12F24         |
|                 | 101–200              | 600      | H, K | D12F64         |
| 200 A           | 101–200              | 600      | J    | D12FJ4         |
|                 | No Fuse              |          |      | D12F04         |
|                 | 61–100               | 600      | H, K | D12F63         |
|                 | 101–200              | 250      | H, K | D12F24         |
|                 | 101–200              | 250      | R    | D12FR24        |
|                 | 101–200              | 600      | H, K | D12F64         |

**Table 15.20: Disconnect Switches**

(without fuse clips or shorting straps)

| 600 V—Without Service Entrance Rating |            |                            |           |       |       |                |
|---------------------------------------|------------|----------------------------|-----------|-------|-------|----------------|
| Starter NEMA Size                     | Rating (A) | Max. Horsepower Rating [4] |           |       |       | Catalog Number |
|                                       |            | 120 V                      | 200–240 V | 480 V | 600 V |                |
| 0–1                                   | 30         | 5                          | 10        | 20    | 25    | D10S1          |
| 2                                     | 60         | 10                         | 20        | 40    | 50    | D10S2          |
| 3                                     | 100        | 15                         | 30        | 60    | 75    | D10S3          |
| 4                                     | 200        | 25                         | 50        | 100   | 100   | D10S4          |

| 600 V—With Service Entrance Rating |            |                            |           |       |       |                |
|------------------------------------|------------|----------------------------|-----------|-------|-------|----------------|
| Starter NEMA Size                  | Rating (A) | Max. Horsepower Rating [4] |           |       |       | Catalog Number |
|                                    |            | 120 V                      | 200–240 V | 480 V | 600 V |                |
| 0–1                                | 30         | 5                          | 10        | 20    | 25    | D10S1H         |
| 2                                  | 60         | 10                         | 20        | 40    | 50    | D10S2H         |
| 3                                  | 100        | 15                         | 30        | 60    | 75    | D10S3H         |
| 4                                  | 200        | 25                         | 50        | 100   | 100   | D10S4H         |

**Table 15.21: Rotary Handle Operator Kits and Shafts**

| Kits include: Handle, Shaft, and Actuator<br>NEMA Type 1, 3, 3R, 4, and 12 |                  |                                |                |
|----------------------------------------------------------------------------|------------------|--------------------------------|----------------|
| Description                                                                | Rating (A)       | Enclosure Interior Depth (in.) | Catalog Number |
| Complete Kit with Handle, Shaft, and Actuator                              | 30, 60, 100, 200 | 5–6                            | D11SF4         |
|                                                                            |                  | 6–10                           | D11SF10        |
|                                                                            |                  | 10–16                          | D11SF16        |
| Shaft only                                                                 |                  | 6                              | D11SH10 [3]    |
|                                                                            |                  | 12                             | D11SH16        |

**Table 15.22: Auxiliary Electrical Interlock (for mounting on a 30–200 A disconnect switch) [5]**

| Block Description (with switch contacts open) | Catalog Number |
|-----------------------------------------------|----------------|
| 1 N.O.                                        | D11N0 [3]      |
| 1 N.C.                                        | D11NC          |
| 1 N.O. and 1 N.C.                             | D11N0C         |
| 2 N.O.                                        | D11N00 [3]     |
| 2 N.O. and 2 N.C.                             | D11N0C2        |

**Table 15.23: Interrupting and Withstandability Ratings**

| Rating (A) | Interrupting Rating<br>Amperes Symmetrical<br>600 Vac, 3Ø | Withstandability I <sup>2</sup> T<br>(Amperes <sup>2</sup> seconds) |
|------------|-----------------------------------------------------------|---------------------------------------------------------------------|
| 30         | 1,200                                                     | 0.38 x 10 <sup>6</sup>                                              |
| 60         | 1,800                                                     | 1.28 x 10 <sup>6</sup>                                              |
| 100        | 2,000                                                     | 2.62 x 10 <sup>6</sup>                                              |
| 200        | 3,600                                                     | 5.25 x 10 <sup>6</sup>                                              |

**NOTE:** These switches are for motor circuit applications.

**Table 15.24: Switch Dimensions (in.)**

| Rating (A) | Length  |         | Width  |         | Mounting Hole Dimensions |         |         |       |        |        | Depth   |         |
|------------|---------|---------|--------|---------|--------------------------|---------|---------|-------|--------|--------|---------|---------|
|            | A       | B       | C      | D       | E                        | F       | G       | H     | I      | J      | K [6]   | L [7]   |
| 30         | 7-5/16  | 4-15/32 | 5-7/8  | 3-15/32 | 6                        | 3-15/32 | 1-7/8   | 13/32 | 5-7/16 | 3-1/4  | 4-3/32  | 4-11/32 |
| 60         | 7-5/16  | 4-15/32 | 5-7/8  | 3-15/32 | 6                        | 3-15/32 | 1-7/8   | 13/32 | 5-7/16 | 3-1/4  | 4-11/32 | 4-11/32 |
| 100        | 9-27/32 | 5-11/32 | 8-3/16 | 4-5/8   | 5-13/16                  | 3-13/16 | 2-11/16 | 51/64 | 7-5/16 | 4-3/16 | 5-23/32 | 4-27/32 |
| 200        | 12-3/16 | 7-7/32  | 8-3/16 | 4-5/8   | 5-13/16                  | 3-13/16 | 2-11/16 | 51/64 | 7-5/16 | 4-3/16 | 5-23/32 | 4-27/32 |

[1] One conductor per lug.

[2] Continuous current should not exceed switch rating (size). Fuse clip kits should be sized to accommodate inrush.

[3] Obsolete.

[4] Nonfused ratings.

[5] One block per switch.

[6] Maximum depth with largest fuse.

[7] Depth including insulating barrier on service entrance switches.

## Type L Circuit Breaker Mechanisms

Type L door-mounted, variable-depth operating mechanisms feature heavy duty, all metal construction with trip indication. All can be padlocked in the Off position when the enclosure door is open. Further, the handle assemblies can be locked Off with up to three padlocks, which also locks the enclosure when the door is closed. (The 3" handle accepts one padlock.) Complete kits are rated for NEMA Type 1, 3R, and 12 enclosures. They include a handle assembly, operating mechanism, and shaft assembly.

**Table 15.25: Electrical Interlock Kits—Class 9999**

| [1]                       |       |      |
|---------------------------|-------|------|
| Description               | Class | Type |
| Single-Pole, Double-Throw | 9999  | R47  |
| Double-Pole, Double-Throw | 9999  | R48  |

**Table 15.26: Complete Kits**

| For Use With Circuit Breakers<br>(Not Included in the Complete Kit) |              |                | Operating Mechanism<br>Standard 6 in. Handle |                          |                |                          | Operating Mechanism<br>Short 3 in. Handle                              |                          |
|---------------------------------------------------------------------|--------------|----------------|----------------------------------------------|--------------------------|----------------|--------------------------|------------------------------------------------------------------------|--------------------------|
|                                                                     |              |                | Standard Shaft Kit                           |                          | Long Shaft Kit |                          | Long Shaft Kit                                                         |                          |
| Circuit Breaker or Interrupter Type                                 | No. of Poles | Frame Size (A) | Type                                         | Mounting Depth [2] Range | Type           | Mounting Depth [2] Range | Type                                                                   | Mounting Depth [2] Range |
| GJL                                                                 | 3            | 75, 100        | LG1                                          | 5-1/2 to 10-1/4          | LG4            | 5-1/2 to 20-7/8          | LG3                                                                    | 5-1/2 to 20-7/8          |
| FAL, FCL, FHL                                                       | 2-3          | 100            | LN1                                          | 5-1/2 to 10-7/16         | LN4            | 5-1/2 to 21              | LN3                                                                    | 5-1/2 to 21              |
| KAL, KCL, KHL                                                       | 2-3          | 250            | LP1                                          | 6-1/4 to 11-3/16         | LP4            | 6-1/4 to 21-3/4          | LP3                                                                    | 6-1/4 to 21-3/4          |
| LAL [3], LHL [3], Q4L                                               | 2-3          | 400            | LR1                                          | 6-5/16 to 10-7/8         | LR4            | 6-5/16 to 21-1/2         | LJ3                                                                    | 5-1/2 to 21-3/8          |
| MEL, MXL                                                            | 2-3          | 800            | LT1 [4]                                      | 7-3/16 to 11-5/8         | LT4 [4]        | 7-3/16 to 22-1/4         | Not recommended.                                                       |                          |
| MAL, MHL                                                            | 2-3          | 1200           | LT1 [4]                                      | 7-3/16 to 11-5/8         | LT4 [4]        | 7-3/16 to 22-1/4         |                                                                        |                          |
| NAL, NCL, NEL, NXL                                                  | 2-3          | 1200           | LX1 [4]                                      | 8-1/4 to 12-3/4          | LX4 [4]        | 8-1/4 to 23-3/8          |                                                                        |                          |
| NSF                                                                 | 2-3          | 250            | 9421LJ1                                      | 5.50–10.75               | 9421LJ4        | 5.50–21.38               | 9421LJ3                                                                | 5.50–21.38               |
| PowerPact D                                                         | 2-3          | 600            | 9421LD1                                      | 7.25–12.06               | 9421LD4        | 7.25–22.63               | 3 in. handles are not recommended for use with these circuit breakers. |                          |

**Table 15.27: Component Parts**

| Use With                            |              |                | Handle Assemblies<br>NEMA 1, 3R, 12 |             | Operating Mechanism<br>(Lockout Included) | Standard Shaft<br>(Support Bracket Not Required) |         | Long Shaft<br>(Support Bracket Included) |          |
|-------------------------------------|--------------|----------------|-------------------------------------|-------------|-------------------------------------------|--------------------------------------------------|---------|------------------------------------------|----------|
|                                     |              |                | 3 in.                               | Standard    |                                           | Mounting Depth [2] Range                         | Type    | Mounting Depth [2] Range                 | Type     |
| Circuit Breaker or Interrupter Type | No. of Poles | Frame Size (A) | Type                                | Type        | Type                                      | Mounting Depth [2] Range                         | Type    | Mounting Depth [2] Range                 | Type     |
| GJL                                 | 3            | 75, 100        | LH3                                 | LH6         | LG7                                       | 5-1/2 to 10-7/16                                 | LS8     | 5-1/2 to 21                              | LS13     |
| FAL, FCL, FHL                       | 2-3          | 100            | LH3                                 | LH6         | LF1                                       | 5-1/2 to 10-7/16                                 | LS8     | 5-1/2 to 21                              | LS12     |
| KAL, KCL, KHL                       | 2-3          | 250            | LH3                                 | LH6         | LK1                                       | 6-1/4 to 11-3/16                                 | LS8     | 6-1/4 to 21-3/4                          | LS12     |
| LAL [3], LHL [3], Q4L               | 2-3          | 400            | Not recommended                     | LH6         | LL1                                       | 6-5/16 to 10-7/8                                 | LS8     | 6-5/16 to 21-1/2                         | LS10     |
| MEL, MXL                            | 2-3          | 800            |                                     | LH8         | LM1                                       | 7-3/16 to 11-5/8                                 | LS8     | 7-3/16 to 22-1/4                         | LS10     |
| MAL, MHL                            | 2-3          | 1200           |                                     | LH8         | LM1                                       | 7-3/16 to 11-5/8                                 | LS8     | 7-3/16 to 22-1/4                         | LS10     |
| NAL, NCL, NEL, NXL                  | 2-3          | 1200           |                                     | LH8         | LX7                                       | 8-1/4 to 12-3/4                                  | LS8     | 8-1/4 to 23-3/8                          | LS10     |
| NSF                                 | 2-3          | 250            | 9421LH3 [5]                         | 9421LH6 [5] | 9421LJ7                                   | 5.50–10.25                                       | 9421LS8 | 5.50–21.38                               | 9421LS13 |

**Table 15.28: NEMA Type 4 and 4X Handle Assemblies [6]**

| Use With                            |              |                | Standard Handle Assemblies     |                                          | 3 in. Handle Version        |                                          |
|-------------------------------------|--------------|----------------|--------------------------------|------------------------------------------|-----------------------------|------------------------------------------|
|                                     |              |                | NEMA 1, 3R, 4, 12<br>(Painted) | NEMA 1, 3R, 4, 4X, 12<br>(Chrome Plated) | NEMA 1, 3R, 4, 12 (Painted) | NEMA 1, 3R, 4, 4X, 12<br>(Chrome Plated) |
| Circuit Breaker or Interrupter Type | No. of Poles | Frame Size (A) | Type                           | Type                                     | Type                        | Type                                     |
| GJL                                 | 3            | 75             | LH46                           | LC46                                     | LH43                        | LC43                                     |
| FAL, FCL, FHL                       | 2-3          | 100            | LH46                           | LC46                                     | LH43                        | LC43                                     |
| KAL, KCL, KHL                       | 2-3          | 250            | LH46                           | LC46                                     | LH43                        | LC43                                     |
| LAL, LHL, Q4L                       | 2-3          | 400            | LH46                           | LC46                                     | Not recommended             |                                          |
| MEL, MXL                            | 2-3          | 800            | LH48                           | LC48                                     |                             |                                          |
| MAL, MHL                            | 2-3          | 1000           | LH48                           | LC48                                     |                             |                                          |
| NAL, NCL, NEL, NXL                  | 2-3          | 1200           | LH48                           | LC48                                     |                             |                                          |

**Table 15.29: IEC Style Operating Mechanisms**

| Circuit Breaker or Interrupter Type | Handle<br>Type 1, 4, 4X, 12 |         | Operating Mechanism<br>(Lockout Included) | Extension Shafts |        |           |
|-------------------------------------|-----------------------------|---------|-------------------------------------------|------------------|--------|-----------|
|                                     | Color                       | Type    |                                           | Mounting Depth   |        | Type      |
|                                     |                             |         |                                           | Min.             | Max.   |           |
| GJL                                 | Red/Yellow                  | NW3 [7] | LG8                                       | 6-1/8            | 10-3/4 | NS16      |
|                                     | Black                       | NW3B    |                                           | 6-1/8            | 17-7/8 | NS336 [8] |



Operating Mechanism



Operating Mechanism  
(includes lockout)



3 in. Handle  
Assembly



Standard Handle  
Assembly

[1] Optional accessory for use with 9421L operating mechanisms. Not used with GJL, NAL, NCL, NEL, NXL, NSF, NSJ, PowerPact™ C, D, H, and J circuit breakers; use field-installed circuit breaker interlocks instead.

[2] Mounting depth in inches, measured from the circuit breaker mounting surface (control panel) to the outside of the enclosure door.

[3] These operating mechanisms cannot be used with any LA/LH circuit breakers with an MB or MT suffix.

[4] Types LT1, LT4, LX1, and LX4 include an 8 in. handle rather than a 6 in. handle.

[5] For a red handle and yellow bezel, add suffix RY to catalog number, e.g., 9421LH6RY.

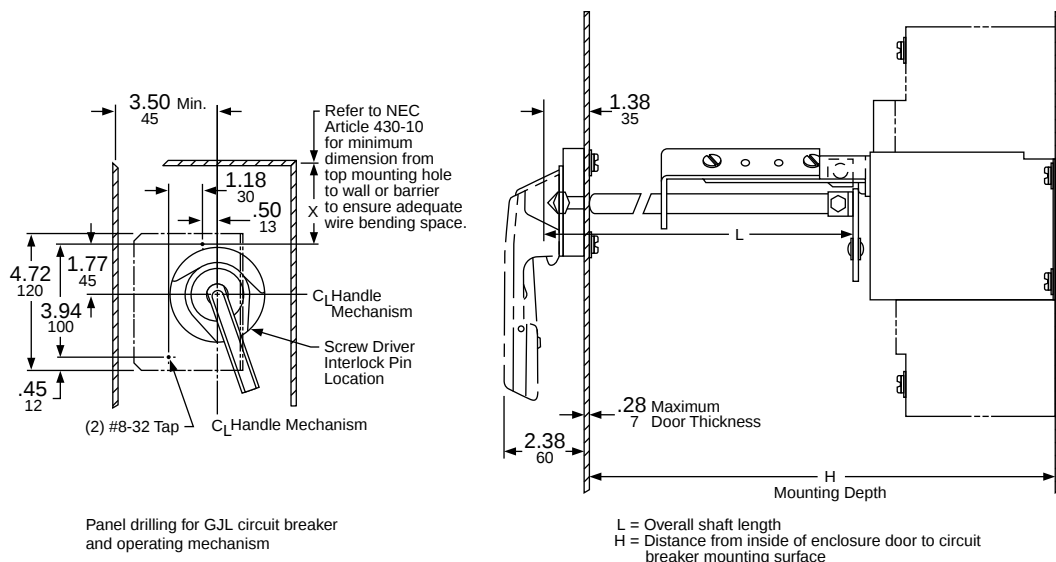
[6] Due to gasketing, NEMA Type 3 and 4 handle assemblies are **not** trip indicating.

[7] Obsolete.

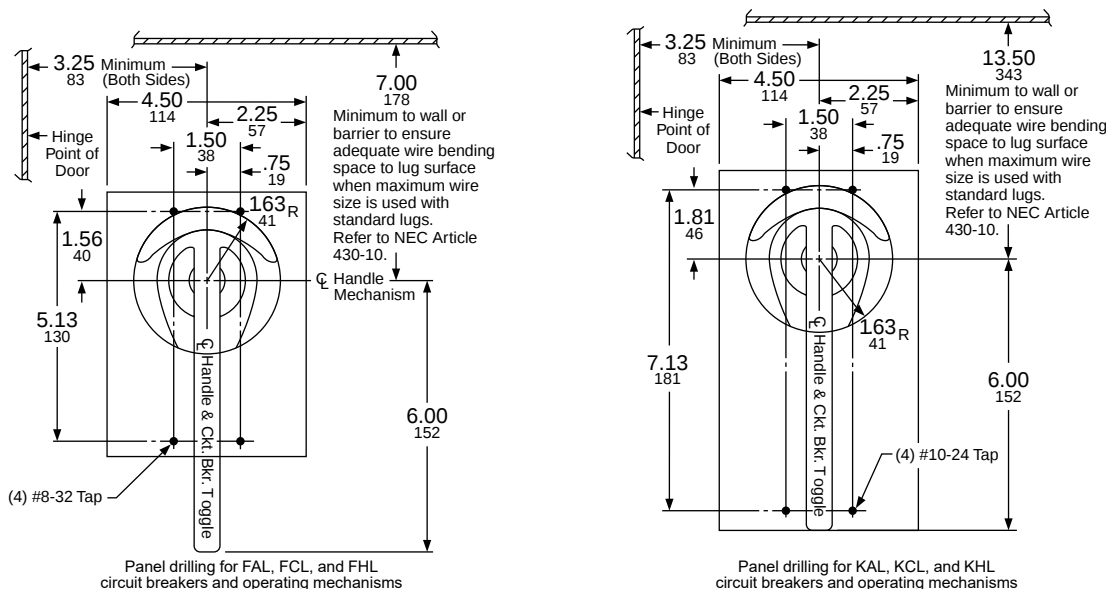
[8] Contains support bracket.

### Panel Drilling, Types G, F, and K

Refer to Table 15.30 for the shaft cutting dimensions.



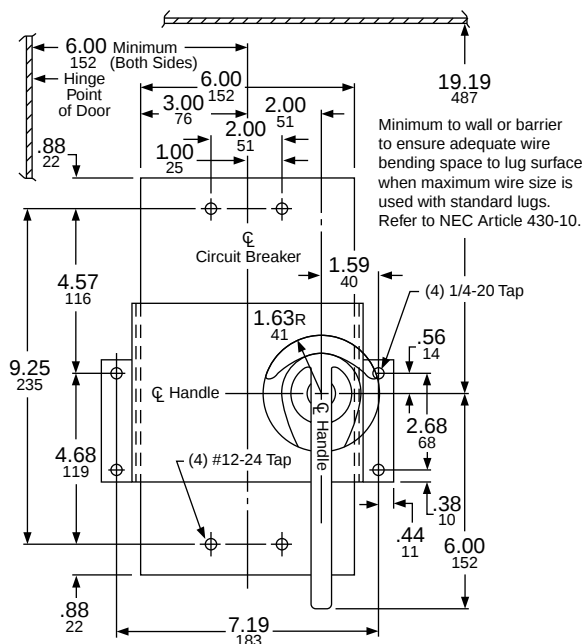
**NOTE:** The mounting depth is measured from the circuit breaker mounting surface (control panel) to the outside of the enclosure door.



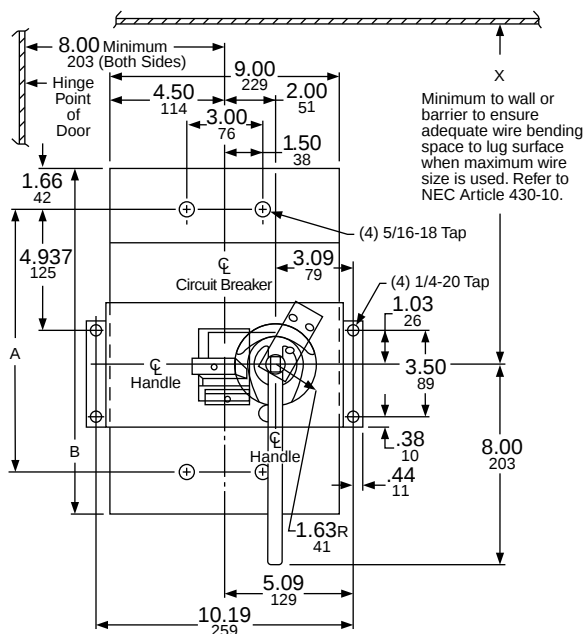
**Table 15.30: Shaft Cutting Dimensions, in. (mm)**

| Class | Type               | Shaft Length Formula | H = Standard Shaft |                | H = Long Shaft |                |
|-------|--------------------|----------------------|--------------------|----------------|----------------|----------------|
|       |                    |                      | Min.               | Max.           | Min.           | Max.           |
| 9421  | LG7, LG1, LG4, LG3 | L = H - 2.50 (64)    | 5.50<br>(140)      | 10.25<br>(260) | 5.50<br>(140)  | 20.85<br>(530) |
| 9421  | LF1, LN1, LN3, LN4 | L = H - 2.88 (73)    | 5.50<br>(140)      | 10.44<br>(265) | 5.50<br>(140)  | 21.00<br>(533) |
| 9421  | LK1, LP1, LP3, LP4 | L = H - 3.63 (92)    | 6.25<br>(159)      | 11.19<br>(284) | 6.25<br>(159)  | 21.75<br>(552) |
| 9421  | LL1, LR1, LR4      | L = H - 3.13 (79)    | 6.31<br>(160)      | 10.88<br>(276) | 6.31<br>(160)  | 21.50<br>(546) |
| 9421  | LM1, LT1, LT4      | L = H - 4.00 (102)   | 7.18<br>(182)      | 11.63<br>(295) | 7.18<br>(182)  | 22.25<br>(565) |
| 9421  | LX7, LX1, LX4      | L = H - 5.17 (131)   | 8.25<br>(210)      | 12.75<br>(324) | 8.25<br>(210)  | 23.38<br>(594) |

## Panel Drilling, Types L, M, and N

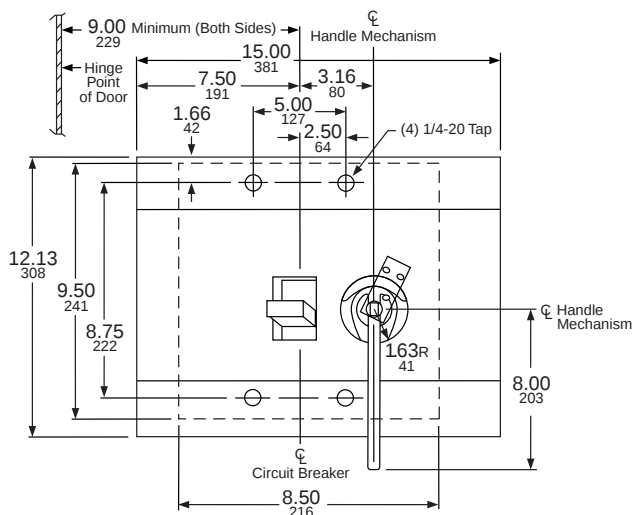


Panel drilling for LAL, LHL, and Q4L circuit breakers and operating mechanisms



Panel drilling for MAL, MEL, MHL, and MXL circuit breakers and operating mechanisms

| Circuit Breaker Type | Dimensions = in. (mm) |             |
|----------------------|-----------------------|-------------|
|                      | A                     | B           |
| MAL, MHL             | 10.69 (272)           | 14.00 (356) |
| MEL, MXL             | 11.47 (291)           | 14.75 (375) |



Panel drilling for NAL, NCL, NEL, and NXL circuit breakers and operating mechanisms

Dimensions:  $\frac{\text{in.}}{\text{mm}}$

## Door Closing Mechanisms

Class 9423 door closing mechanisms cover a range of enclosures with door openings up to a maximum of 91 in. high. The door closing mechanisms are designed to be used on control enclosures and interlocked with a Class 9422 disconnect device, although they all can be used independently. Three different systems are available, and their use is as recommended below. A complete system is available for interlocking all the doors of a multi-door enclosure with the master door when using the 6 in. or 8 in. vault handle mechanism.

Note that the "Master Door" is defined to be the door of a single or multi-door enclosure which is interlocked directly with the disconnect device. The master door can be hinged on either the right or left hand side. It can be located in any position on a multi-door enclosure. An "Auxiliary Door" is defined to be any remaining doors of a multi-door enclosure which are interlocked with the master door by means of the overhead interlocking system as illustrated on [page 15-13](#) and [page 15-14](#).

### Selection Procedure

1. Determine enclosure construction (no. of doors, door height, hinge location, etc.).
2. Determine Class 9422 disconnect device to be used—either a disconnect switch or a circuit breaker mechanism.
3. Determine the location of the disconnect device and handle mechanism (right- or left-hand flange or center channel).
4. Select the door closing mechanism required.
5. Select the auxiliary door closing mechanisms and multi-door interlocking hardware, if required. (A complete system for interlocking all auxiliary doors of a multi-door enclosure with center channel is available for the medium and large enclosures.)

Table 15.31: Door Closing Mechanism

| 60 in. Maximum Door Opening (Recommended)                                                                                                                                                                                                                                  | 46–60 in. Door Opening (Recommended)                                                                                                                                                                                                                                                                                                        | 61–91 in. Door Opening (Recommended)                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <ul style="list-style-type: none"> <li>• 2 Point Locking is Standard</li> <li>• A Third Roller Latch Kit is Available for 3 Point Locking</li> <li>• For 3/4 in. Door Depths</li> </ul> |  <ul style="list-style-type: none"> <li>• For use on Single or Multi-Door Enclosures</li> <li>• For use with Doors Hinged on Right or Left Side</li> <li>• Referred to as the 6 in. Vault Handle Mechanism</li> <li>• For 3/4 in. Door Depths</li> </ul> |  <ul style="list-style-type: none"> <li>• For use on Single or Multi-Door Enclosures</li> <li>• For use with Doors Hinged on Right or Left Side</li> <li>• Referred to as the 8 in. Vault Handle Mechanism</li> <li>• For 1-1/8 in. Door Depths</li> </ul> |

Type M4 Latch bar not included, but most prepunched enclosures that accept Square D™ operating mechanisms supply a pre-drilled latch bar.

The door closing mechanisms listed below are for use on small to medium size single door control enclosures. They are designed to be used in conjunction with Class 9422 flange-mounted disconnect switches and circuit breaker operating mechanisms; however, they can be used independently as well. When used on properly designed and gasketed NEMA Type 12 enclosures, they meet NFPA 79 standards.

Table 15.32: Single Door Enclosures—NEMA Type 4 or 12 with 60 in. High Maximum Opening

| Description                                                                                                               | For Use On: (Enclosure Type)       | Use in Conjunction With:          | Door Latch Handle Length | Suggested Maximum Door Opening | Door Depth | Cat. No. |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|--------------------------|--------------------------------|------------|----------|
| Two point, roller latch, door closing mechanism for use on enclosures with doors hinged on the <b>left</b> side.          | NEMA Type 4 and 12 Sheet Steel     | Class 9422 Types A1, A3, A9       | 4 in.                    | Less than 39 in.               | 3/4 in.    | 9423M4   |
|                                                                                                                           |                                    |                                   | 4 in.                    | Less than 39 in.               | [1]        | 9423M10  |
|                                                                                                                           |                                    |                                   | 6 in.                    | 60 in.                         | 3/4 in.    | 9423M9   |
| Two point, roller latch, door closing mechanism for use on enclosures with doors hinged on the <b>right</b> side.         | NEMA Type 4 and 12 Stainless Steel | Class 9422 Types A2, A4, A10      | 4 in.                    | Less than 39 in.               | 3/4 in.    | 9423M24  |
|                                                                                                                           |                                    |                                   | 4 in.                    | Less than 39 in.               | 3/4 in.    | 9423M4L  |
|                                                                                                                           |                                    |                                   | 6 in.                    | 60 in.                         | 3/4 in.    | 9423M9L  |
| Third roller latch kit for 3 point locking; for use where 3 point locking is desired or where the door opening is ≥39 in. | NEMA Type 4 and 12 Sheet Steel     | Class 9423 Types M4, M9, M4L, M9L | —                        | —                              | 3/4 in.    | 9423M3   |
|                                                                                                                           |                                    |                                   | —                        | —                              | 3/4 in.    | 9423M24L |
|                                                                                                                           |                                    |                                   | —                        | —                              | 3/4 in.    | 9423M23  |



[1] Suitable for door depths of 1-1/8 in., 1-1/4 in., 1-3/8 in. and 1-1/2 in.

## Vault Type for Single and Multi-Door Enclosures

Table 15.33 shows the requirements for the door closing mechanism, the locking bar kit, and the mechanical interlock kit, if used.

Table 15.33: Single or Multi-Door Enclosures—NEMA Type 12 with 40 in. to 60 in. Door Opening

| Single-Door Enclosure                                      |                                                                                                  | Multi-Door Enclosure                                                                |                                                                                                                                 |                                                                                                                                                                    |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Without Interlocking                                       | With Interlocking                                                                                | Without Interlocking                                                                | With Interlocking                                                                                                               |                                                                                                                                                                    |
| 1—M6 door closing mechanism<br>1—Type M660 locking bar kit | 1—M6 door closing mechanism<br>1—Type M660 locking bar kit<br>1—Type M5 (use with 9422A handles) | For <i>each</i> door:<br>1—M6 door closing mechanism<br>1—Type M660 locking bar kit | For <i>Master</i> door:<br>1—M6 door closing mechanism<br>1—Type M660 locking bar kit<br>1—Type M5 (for use with 9422A handles) | For <i>each Auxiliary</i> door:<br>1—M6 door closing mechanism<br>1—Type M660 locking bar kit<br>Necessary quantities of Types M2 and M7 for each door (see below) |

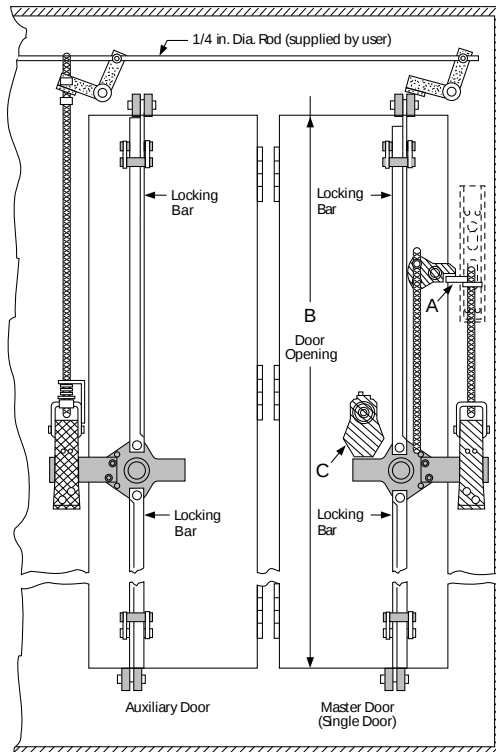
**NOTE:** All mechanisms listed on this page are suitable for either left or right hand mounting.

Table 15.34: Door Interlocks

| Type                                  | Description                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type M6 Door Closing Mechanism</b> | The Class 9423 Type M6 door closing mechanism is designed to close and seal 0.75 in. deep doors of single or multi-door NEMA Type 12 enclosures. The Type M6 can be used on doors hinged on either the left or right hand side. Recommended door openings are from 40–60 in. Vault type handle length is 6 in.                                                                                        |
| <b>Type M660 Locking Bar Kits</b>     | The lock bar kit for the Type M6 door closing mechanism contains two lock bars and is available from stock. The bars can be cut to fit door openings through 60 in. One lock bar kit is required for each Type M6 ordered.                                                                                                                                                                            |
| <b>Type M5</b>                        | The Class 9423 Type M5 mechanical interlock kit is designed to interlock a Class 9422 handle mechanism with the Type M6 door closing mechanism. This kit prevents the opening of the master door (or single door) with the disconnect handle in the "ON" position, making it mandatory to use a screwdriver to gain entry to the enclosure at any time, regardless of the disconnect handle position. |

Table 15.35: Required Accessories for Auxiliary Doors

| Type           | Description                                                                                                                                                                                                                                                                                                                                |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type M2</b> | One Type M2 kit is required for each auxiliary door. This kit is required to interlock any auxiliary door(s) with the master door.                                                                                                                                                                                                         |
| <b>Type M7</b> | The first auxiliary door requires 2 Type M7 kits. Additional auxiliary doors require only 1 Type M7 kit. The 0.25 in. diameter rod used to interconnect the M7 kits is furnished by the user. If the distance between any two Type M7 kits exceeds 36 in., an additional Type M7 kit should be installed to prevent the rod from buckling. |



Type M8



Type M1



Type M7



Type M2

**NOTE:** A - Interlocking lever extension of the flange-mounted handle mechanism.

**NOTE:** B - Actual enclosure opening—not door height.

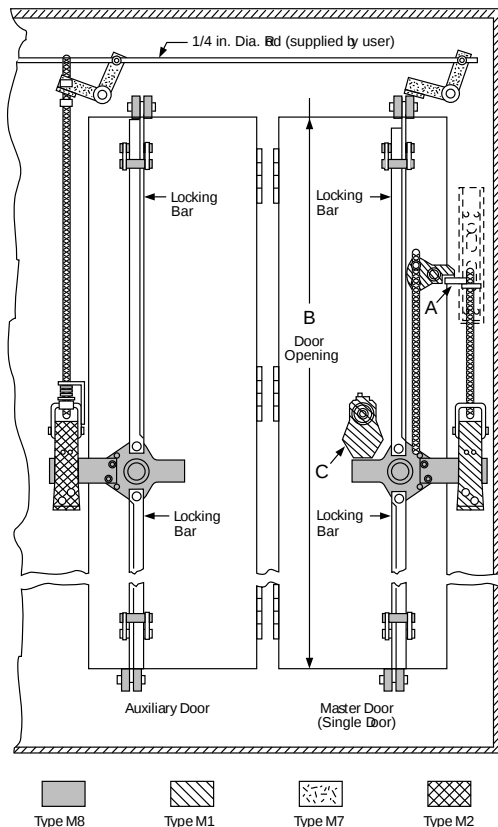
**NOTE:** C - Screwdriver interlock assembly can be ordered separately. Class 9423 Type CEQ2493.

## Vault Type for Single and Multi-Door Enclosures

Table 15.36 shows the requirements for the door closing mechanism, the locking bar kit, and the mechanical interlock kit, if used.

**Table 15.36: Single Or Multi-Door Enclosures—NEMA Type 12 with 61 in. to 91 in. Door Openings**

| Single-Door Enclosure                                      |                                                                                                      | Multi-Door Enclosure                                                         |                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Without Interlocking                                       | With Interlocking                                                                                    | Without Interlocking                                                         | With Interlocking                                                                                                                                                                                                                                                                                         |
| 1—M8 door closing mechanism<br>1—Type M891 locking bar kit | 1—M8 door closing mechanism<br>1—Type M891 locking bar kit<br>1—Type M1 (for use with 9422A handles) | For each door:<br>1—M8 door closing mechanism<br>1—Type M891 locking bar kit | For <i>Master</i> door:<br>1—M8 door closing mechanism<br>1—Type M891 locking bar kit<br>1—Type M1 (for use with 9422A handles)<br><br>For each <i>Auxiliary</i> door:<br>1—M8 door closing mechanism<br>1—Type M891 locking bar kit<br>Necessary quantities of Types M2 and M7 for each door (see below) |



**NOTE:** A - Interlocking lever extension of the flange-mounted handle mechanism.

**NOTE:** B - Actual enclosure opening—not door height.

**NOTE:** C - Screwdriver interlock assembly can be ordered separately. Class 9423 Type CEQ2493.

**NOTE:** All mechanisms listed on this page are suitable for either left or right hand mounting.

**Table 15.37: Door Interlocks**

| Type                                  | Description                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type M8 Door Closing Mechanism</b> | The Class 9423 Type M8 door closing mechanism is designed to close and seal 1.125 in. deep doors of single or multi-door NEMA Type 12 enclosures. The Type M8 can be used on doors hinged on either the left or right hand side. Recommended door openings are from 61–91 in. Vault type handle length is 8 in.                                                                                       |
| <b>Type M891 Locking Bar Kits</b>     | The lock bar kit for the Type M8 door closing mechanism contains two lock bars and is available from stock. The bars can be cut to fit door openings through 91 in.. One lock bar kit is required for each Type M8 ordered.                                                                                                                                                                           |
| <b>Type M1</b>                        | The Class 9423 Type M1 mechanical interlock kit is designed to interlock a Class 9422 handle mechanism with the Type M8 door closing mechanism. This kit prevents the opening of the master door (or single door) with the disconnect handle in the "ON" position, making it mandatory to use a screwdriver to gain entry to the enclosure at any time, regardless of the disconnect handle position. |

**Table 15.38: Required Accessories for Auxiliary Doors**

| Type           | Description                                                                                                                                                                                                                                                                                                                                |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type M2</b> | One Type M2 kit is required for each auxiliary door. This kit is required to interlock any auxiliary door(s) with the master door.                                                                                                                                                                                                         |
| <b>Type M7</b> | The first auxiliary door requires 2 Type M7 kits. Additional auxiliary doors require only 1 Type M7 kit. The 0.25 in. diameter rod used to interconnect the M7 kits is furnished by the user. If the distance between any two Type M7 kits exceeds 36 in., an additional Type M7 kit should be installed to prevent the rod from buckling. |

## Enclosure Construction and General Location Information For Types M5 and M6

Drilling and location information below is complete for a single door enclosure with door hinged on left side, incorporating a Type M6, M5, and Class 9422 handle mechanism. Transpose all horizontal dimensions for doors hinged on right side.

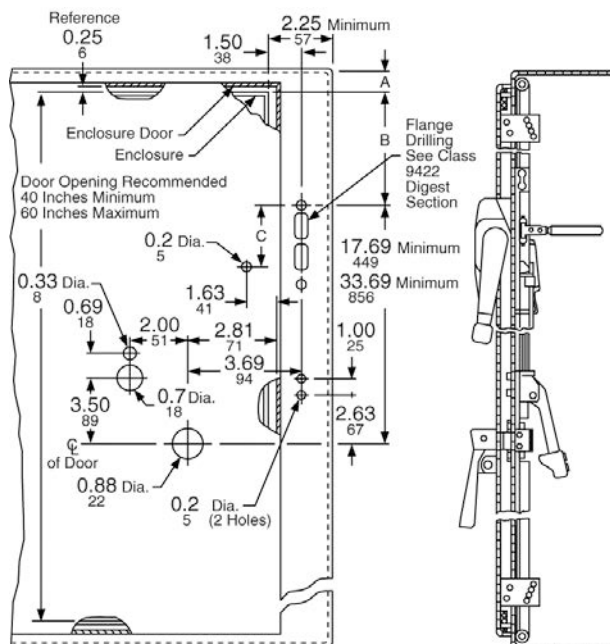
### Dimension A

- Single door enclosures: A minimum = 1 in.
- Multi-door enclosures without overhead interlocking system:  
A minimum = 1 in.
- Multi-door enclosures with overhead interlocking system:  
A minimum = 4-1/2 in.

**NOTE:** Overhead interlocking system consists of the required number of Class 9423 Type M2 and M7 kits for interlocking the auxiliary doors with the master door. See page 15-14.

**Table 15.39: Dimension B (Minimum)**

| Type                   | Disconnect Device                  | If A = 1<br>Minimum B = | If A = 4-1/2<br>Minimum B = | C      |
|------------------------|------------------------------------|-------------------------|-----------------------------|--------|
| TCF, TCN, TDF, TDN, TD | 60 A Disconnect Switch             | 3-1/16                  | 2-1/2                       | 3-3/16 |
| TE, TEF, TEN           | 100 A Disconnect Switch            | 5-1/4                   | 2-1/2                       | 3-3/16 |
| TF                     | 200 A Disconnect Switch            | 11-5/8                  | 8-1/8                       | 3-3/16 |
| TG                     | 400 A Disconnect Switch            | 15-1/16                 | 11-9/16                     | 6-3/4  |
| RN1                    | FAL, FHL, Circuit Breaker          | 4-27/32                 | 2-1/2                       | 3-3/16 |
| RP1                    | KAL, KHL Circuit Breaker           | 11-5/32                 | 7-21/32                     | 3-3/16 |
| RR2                    | ILL Circuit Breaker                | 17-31/32                | 14-15/32                    | 3-3/16 |
| RT1                    | MAL, MHL, MEL, MXL Circuit Breaker | 18-5/8                  | 15-1/8                      | 3-3/16 |



## Enclosure Construction and General Location Information For Types M1 and M8

Drilling and location information below is complete for a single door enclosure with the door hinged on the left side, incorporating a Type M8, M1, and Class 9422 handle mechanism. Transpose all horizontal dimensions for doors hinged on the right side.

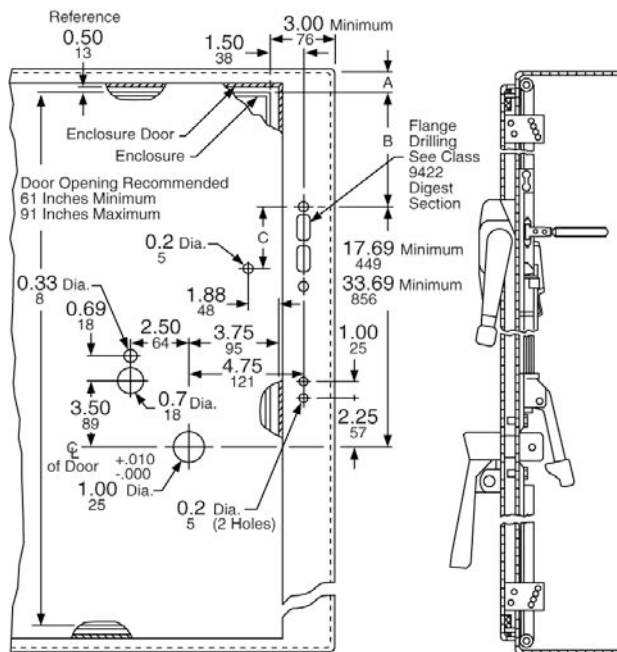
### Dimension A

- Single door enclosures: A minimum = 1-1/2 in.
- Multi-door enclosures without overhead interlocking system:  
A minimum = 1-1/2 in.
- Multi-door enclosures with overhead interlocking system:  
A minimum = 4-1/2 in.

**NOTE:** Overhead interlocking system consists of the required number of Class 9423 Type M2 and M7 kits for interlocking the auxiliary doors with the master door. See page 15-14.

**Table 15.40: Dimension B (Minimum)**

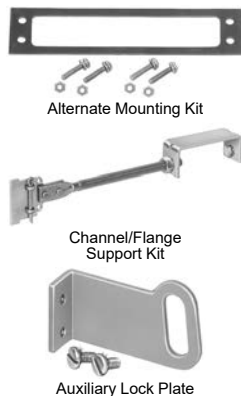
| Type                   | Disconnect Device                  | If A = 1-1/2<br>Minimum<br>B = | If A = 4-1/2<br>Minimum<br>B = | C      |
|------------------------|------------------------------------|--------------------------------|--------------------------------|--------|
| TCF, TCN, TDF, TDN, TD | 60 A Disconnect Switch             | 2-15/16                        | 2-1/2                          | 3-3/16 |
| TE, TEF, TEN           | 100 A Disconnect Switch            | 4-3/4                          | 2-1/2                          | 3-3/16 |
| TF                     | 200 A Disconnect Switch            | 11-1/8                         | 8-1/8                          | 3-3/16 |
| TG                     | 400 A Disconnect Switch            | 14-9/16                        | 11-9/16                        | 5-7/8  |
| RN1                    | FAL, FHL Circuit Breaker           | 4-11/32                        | 2-1/2                          | 3-3/16 |
| RP1                    | KAL, KHL Circuit Breaker           | 10-21/32                       | 7-21/32                        | 3-3/16 |
| RR2                    | ILL Circuit Breaker                | 17-15/32                       | 14-15/32                       | 3-3/16 |
| RT1                    | MAL, MHL, MEL, MXL Circuit Breaker | 18-1/8                         | 15-1/8                         | 3-3/16 |

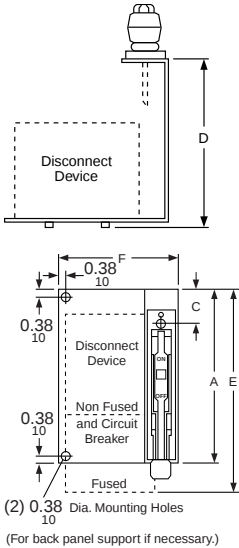


## Additional Accessories

**Table 15.41: Additional Accessories**

| Accessory                            | Description                                                                                                                                                                                                                                                                                                                                                                                      | Cat. No.         |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Alternate Mounting Kit               | Permits mounting Class 9422 Type A1 or A2 handle mechanisms in enclosures with flange thickness of 16 gauge to 0.5 in.                                                                                                                                                                                                                                                                           | 9422AM2          |
| Auxiliary Lock Plate                 | Auxiliary kit recommended for use with the Class 9422 Type A-1 flange handle to facilitate padlocking the handle in the "OFF" position. Primarily used when the handle is mounted on the center channel of a multi-door enclosure. Also in any case where the enclosure doors interfere with the normal padlock slot in the flange handle. Meets both the Automotive and NFPA 79 specifications. | 9422L1           |
| Special Lugs for Disconnect Switches | Copper Lugs only—Specify Form Y157<br>Tin Plated Aluminum Lugs for 400 A Type TG Switch—Specify Form Y1572 (000–750 kcmil Cu/Al wire)<br>Anderson Type VCEL Compression Lugs—Specify Form Y1574<br><b>Exceptions:</b> None of the 30 A or 60 A disconnect switches are available with compression lugs.                                                                                          | —                |
| Operating Rods                       | Standard operating rod for use with Class 9422 variable depth mechanisms. Included as standard in each kit.<br>Extra long operating rod for use with Class 9422 variable depth mechanisms. Can be used as a substitute for the standard rod included in each kit to increase the maximum mounting depth 7 in. (Two are required for Types ARR, RR, ART, RT, ATE, TE, ATF, TF).                   | 9422R1<br>9422R2 |





**NOTE:** No external auxiliary contacts are available for the following circuit breakers: GJL circuit breakers must use internal auxiliary contacts, catalog number AAC. PowerPact D circuit breakers must use internal auxiliary contacts, catalog number AAC.

**NOTE:** For additional variations, contact the Customer Care Center (CCC) at 1-888-778-2733.

## Bracket-Mounted Operating Mechanisms for Use With Square D™ Circuit Breakers

The circuit breaker operating mechanisms listed below are shipped with the external operating handle assembled to a bracket. Circuit breakers are not included and must be ordered separately. A trim plate is provided with each kit to prevent any mounting screws from being accessible from the front and also to provide an attractive installation. The operating handle is Type A1. These switches can be used with Class 9423 door closing mechanisms.

**Table 15.42: Bracket-Mounted Operating Mechanisms for Use With Square D™ Circuit Breakers**

| Circuit Breaker or Interrupter Type | Use With     |                | Operating Mechanism                     |
|-------------------------------------|--------------|----------------|-----------------------------------------|
|                                     | No. of Poles | Frame Size (A) | Right Hand, Flange Mounting<br>Cat. No. |
| FAL, FHL                            | 2–3          | 100            | BN1                                     |
| KAL, KHL                            | 2–3          | 250            | BP1                                     |
| LAL [1], LHL [1], Q4L               | 2–3          | 400            | BR1                                     |

**NOTE:** Some enclosures may not accept the listed bracket-mounted operating mechanisms; contact the enclosure manufacturer.

**Table 15.43: Electrical Interlock Kits—Class 9999**

Optional accessory for use with circuit breaker operating mechanisms listed to the left and the flexible cable mechanisms listed below, except GJL

| Description               | Class | Type |
|---------------------------|-------|------|
| Single Pole, Double Throw | 9999  | R26  |
| Double Pole, Double Throw | 9999  | R27  |

**NOTE:** Not used with GJL; use field installed circuit breaker interlocks.

**Table 15.44: Dimensions, in. (mm)**

| Type     | A          | C         | D          | Min. Enclosure Depth [2]<br>in. (mm) | F          |
|----------|------------|-----------|------------|--------------------------------------|------------|
| BG1, BN1 | 8.75 (222) | 1.13 (29) | 6.50 (165) | 8.00 (203)                           | 7.13 (181) |
| BP1      | 9.13 (232) |           |            |                                      | 7.38 (187) |

**NOTE:** Back panel support is recommended for Types TFB1, 2, and 3. Other devices may also require support if the flange is not sufficiently rigid.

**Table 15.45: Class 9422—Flexible Cable Mechanisms for Use with Square D Circuit Breakers**

For use with Square D circuit breakers and Class 9422 A handle operators. Especially designed for tall, deep enclosures where placement flexibility is required. See Digest 177, Section 8 for dimensions.

| Circuit Breaker Type  | No. of Poles | Frame Size (A) | Cable Mechanism |             | Cable Mechanisms with A1 Handle For Types 1, 3, 3R, 4, 12 |
|-----------------------|--------------|----------------|-----------------|-------------|-----------------------------------------------------------|
|                       |              |                | Cable Length    | Catalog No. | Catalog No.                                               |
| GJL                   | 3            | 100            | 36 in.          | CGJ30       | CGJ31                                                     |
|                       |              |                | 48 in.          | CGJ40       | CGJ41                                                     |
|                       |              |                | 60 in.          | CGJ50       | CGJ51                                                     |
|                       |              |                | 120 in.         | CGJ10       | CGJ11 [3]                                                 |
| FAL, FHL              | 2, 3         | 100            | 36 in.          | CFA30       | CFA31                                                     |
|                       |              |                | 60 in.          | CFA50       | CFA51                                                     |
|                       |              |                | 120 in.         | CFA10       | CFA11                                                     |
| KAL, KHL              | 2, 3         | 250            | 36 in.          | CKA30       | CKA31                                                     |
|                       |              |                | 60 in.          | CKA50       | CKA51                                                     |
|                       |              |                | 120 in.         | CKA10       | CKA11                                                     |
| LAL [4], LHL [4], Q4L | 2, 3         | 400            | 36 in.          | CLA30       | CLA31                                                     |
|                       |              |                | 60 in.          | CLA50       | CLA51                                                     |
|                       |              |                | 120 in.         | CLA10 [3]   | CLA11                                                     |

**Table 15.46: Class 9999 Auxiliary Contact Kits for Disconnect Switches and Circuit Breakers**

| Class                                | Type                           | SPDT<br>Type | DPDT<br>Type |
|--------------------------------------|--------------------------------|--------------|--------------|
| Disconnect Switches                  |                                |              |              |
| 9422                                 | TF                             | R8           | R9           |
| Circuit Breaker Operating Mechanisms |                                |              |              |
| 9421                                 | LF, LK, LL, LM, LN, LP, LR, LT | R47          | R48          |
| 9422                                 | RM, RN, RP, RR, RT             | R26          | R27          |
| 9422                                 | CFA, CKA, CLA, CSF             | R26          | R27          |

[1] These operating mechanisms cannot be used with any LA/LH circuit breakers with an MB or MT suffix.

[2] The minimum enclosure depth is greater than Dimension D, since additional space is needed when mounting the mechanism.

[3] Obsolete.

[4] These operating mechanisms cannot be used with any LA/LH circuit breakers with an MB or MT suffix.

## Variable-Depth Mechanisms

Designed for installation in custom built control enclosures where main or branch circuit protective devices are required. All circuit breaker operating mechanisms are suitable for either right- or left-hand flange mounting, convertible on the job.

**Table 15.47: Variable-Depth Mechanisms for Use with Square D™ Circuit Breakers and Schneider Electric™ (formerly Merlin Gerin™) Circuit Breakers**

| Use With                   |              |              |                                         | Operating Mechanism                                         |                                          |                                   |
|----------------------------|--------------|--------------|-----------------------------------------|-------------------------------------------------------------|------------------------------------------|-----------------------------------|
| Circuit Breaker Frame Size | No. of Poles | Frame Size A | Variable-Depth Mounting Range [1] (in.) | Operating Mechanism Only— Does Not Include Handle Mechanism | Operating Mechanism and Handle Mechanism |                                   |
|                            |              |              |                                         |                                                             | Includes Type A1 Handle Mechanism        | Includes Type A2 Handle Mechanism |
|                            |              |              |                                         | Type                                                        | Type                                     | Type                              |
| Square D Circuit Breakers  |              |              |                                         |                                                             |                                          |                                   |
| GJL                        | 3            | 100          | 6.00–17.75                              | RG1                                                         | ARG11                                    | ARG21                             |
| FAL, FHL                   | 2–3          | 100          | 5.38–17.75                              | RN1                                                         | ARN11                                    | ARN21                             |
| KAL, KHL                   | 2–3          | 250          | 6.38–17.88                              | RP1                                                         | ARP11                                    | ARP21                             |
| LAL [2], LHL [2], Q4L      | 2–3          | 400          | 7.44–18.25                              | RR1                                                         | ARR11                                    | ARR21                             |
| MEL, MXL                   | 2–3          | 800          | 9.00–18.38                              | RT1                                                         | ART11                                    | ART21                             |
| MAL, MHL                   | 2–3          | 1200         | 9.00–18.38                              | RT1                                                         | ART11                                    | ART21                             |
| NAL, NCL, NEL, NXL         | 2–3          | 1200         | 11.00–18.37                             | RX1                                                         | —                                        | —                                 |

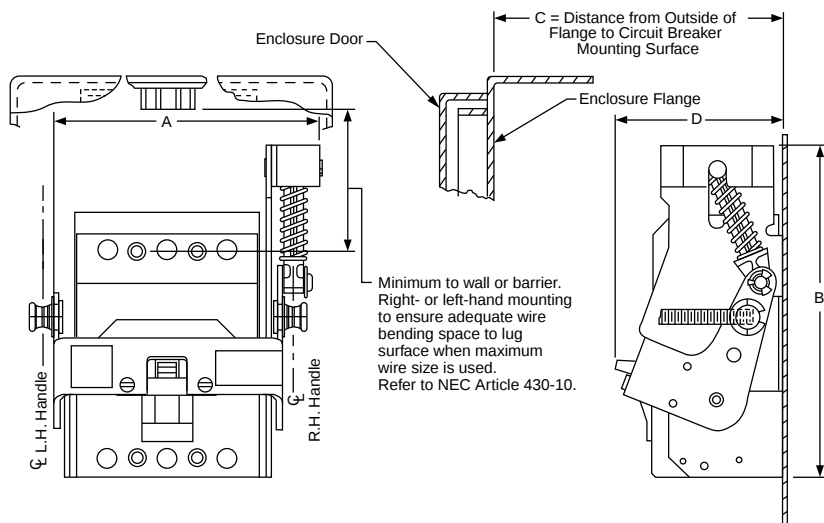


**Table 15.48: Electrical Interlocks—Class 9999**

| Description               | Class | Type    |
|---------------------------|-------|---------|
| Single Pole, Double Throw | 9999  | R26 [3] |
| Double Pole, Double Throw | 9999  | R27 [3] |

**Table 15.49: Dimensions**

| Circuit Breaker Frame Size | Type | Width (A) |     | Height (B) |     | Distance to Enclosure Flange [4] (C) |     |         |     | Bracket Depth (D) |     |
|----------------------------|------|-----------|-----|------------|-----|--------------------------------------|-----|---------|-----|-------------------|-----|
|                            |      | in.       | mm  | in.        | mm  | Minimum                              |     | Maximum |     | in.               | mm  |
|                            |      |           |     |            |     | in.                                  | mm  | in.     | mm  |                   |     |
| GJL                        | RG1  | 5.00      | 127 | 4.75       | 121 | 6.00                                 | 152 | 17.75   | 451 | 4.00              | 102 |
| FAL, FHL                   | RN1  | 6.75      | 171 | 8.50       | 216 | 5.51                                 | 140 | 17.75   | 451 | 4.26              | 108 |
| KAL, KHL                   | RP1  | 7.13      | 181 | 10.13      | 257 | 6.51                                 | 165 | 17.88   | 454 | 4.94              | 125 |
| LAL [2], LHL [2], Q4L      | RR1  | 10.19     | 259 | 11.00      | 279 | 7.44                                 | 189 | 18.25   | 464 | 6.00              | 152 |
| MEL, MXL                   | RT1  | 13.38     | 340 | 14.00      | 356 | 9.00                                 | 229 | 18.38   | 467 | 9.69              | 246 |
| MAL, MHL [5]               | RT1  | 13.38     | 340 | 14.00      | 356 | 9.00                                 | 229 | 18.38   | 467 | 9.69              | 246 |
| NAL, NCL, NEL, NXL         | RX1  | 19.63     | 499 | 13.50      | 343 | 11.00                                | 279 | 18.37   | 467 | 9.00              | 229 |



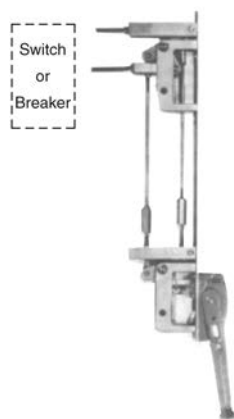
[1] Class 9422 Type R2 extends the mounting depth by 7 in.

[2] These operating mechanisms cannot be used with any LA/LH circuit breakers with an MB or MT suffix.

[3] Not for use with the GJL operating mechanism.

[4] 9422R2 extends the dimension by 7 in. Two are required.

[5] The minimum mounting depth when using MAL or MHL circuit breakers can be decreased to 7.63 in. by using the Class 9422 Type RT1B conversion kit.



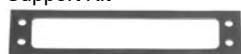
Remote operation shown  
(the handle mechanism is  
not included in the kit)



Air valve interlock mounted on the enclosure



Channel/Flange  
Support Kit



Alternate Mounting Kit



Auxiliary Lock Plate

## Remote or Dual Adapter Kit

For the remote or dual operation of GJL, FAL, FHL, KAL, KHL, LAL, LHL, Q4L, MAL, MHL, MEL, and MXL circuit breakers.

**Remote Operation**—permits mounting the Class 9422 Type A9 or A10 handle mechanism at a lower level than the disconnect device it controls. This arrangement is often required where the disconnect device is mounted too high for personnel to easily reach a conventional operator.

**Dual Operation**—permits controlling two disconnect devices, one in line with, and one remote from, a single Class 9422 Type A9 or A10 handle mechanism.

**NOTE:** A Class 9422 Type A9 or A10 handle (see Digest 177, Section 8) and the preferred mounting method **must** be used.

Table 15.50: Disconnect Device

| Table 10-56: Disconnect Device |                          |       |      |
|--------------------------------|--------------------------|-------|------|
| Disconnect Device              | Enclosure Mounting Depth |       | Type |
|                                | Min.                     | Max.  |      |
| Circuit Breaker                |                          |       |      |
| GJL                            | 10.50                    | 19.50 | D2   |
| FAL, FHL                       | 10.66                    | 19.50 |      |
| KAL, KHL                       | 11.13                    | 19.50 |      |
| LAL, LHL, Q4L                  | 12.13                    | 19.88 |      |
| MAL, MHL, MEL, MXL             | 13.75                    | 20.25 |      |

Table 15.51: Air Valve Interlock

**NOTE:** Air valve interlocks only accept the specific three-way air valves, manufactured by Parker, listed in the table below.

| Parker Valve Model Number [6] |               | Class 9422<br>Air Valve Interlock |
|-------------------------------|---------------|-----------------------------------|
| Air Valve Size                | Knob Operated | Type                              |
| 0.50 in. NPT (13)             | M04841885     | G1                                |
|                               | M08541848     |                                   |
| 0.75 in. NPT (19)             | M04861885     | G2                                |
|                               | M08561848     |                                   |
| 1.00 in. NPT (25)             | M00080004     | G1                                |

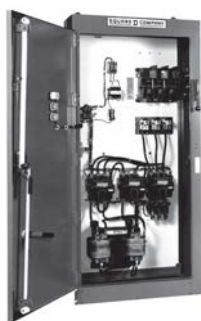
Table 15.52: Other Accessories

| Accessory                  | Description                                                                                                                                                                                                                                                                                                                                                                                                               | Class | Type |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| Channel/Flange Support Kit | Auxiliary kit recommended for use with 30 A and 60 A disconnect switches and FAL, FCL, FHL, KAL, KHL, NSF, and NSJ circuit breaker mechanisms when these devices are to be mounted on the center channel of a multi-door enclosure or when extra rigidity for the flange is required. Supplied as standard with 100 A and 200 A disconnect switches and LAL, LHL, Q4L, MAL, MHL, MEL, and MXL circuit breaker mechanisms. | 9422  | C1   |

[6] Prices do not include air valves or the handle mechanism. For more information on the air valves listed, contact Parker at c-parker@parker.com, or call 1-800-272-7537.

## Section 16

## Contactors and Starters



Electromechanical  
Reduced Voltage Starter

|                                            |       |
|--------------------------------------------|-------|
| Reversing Drum Switches                    | 16-2  |
| Electromechanical Reduced Voltage Starters | 16-3  |
| Multispeed Magnetic Starters               | 16-9  |
| Lighting Contactors                        | 16-15 |
| Well-Guard™ Pump Panel                     | 16-16 |
| Factory Modifications (Forms)              | 16-18 |
| Definite Purpose Contactors                | 16-21 |
| Thermal Overload Relays—NEMA Style         | 16-22 |



Type AG2

### NEMA 1, 3R, 4, and 13 Without Overload

Class 2601 reversing drum switches may be used for across-the-line starting and reversing of AC polyphase, AC single phase or DC motors, where overload protection is not required or is provided separately. They are compact and inexpensive but ruggedly constructed. Drum switches are field convertible from Maintained-On to Momentary-On operation. This conversion consists of removing the handle screw and handle, turning the shaft 180 degrees, then replacing the handle and handle screw.

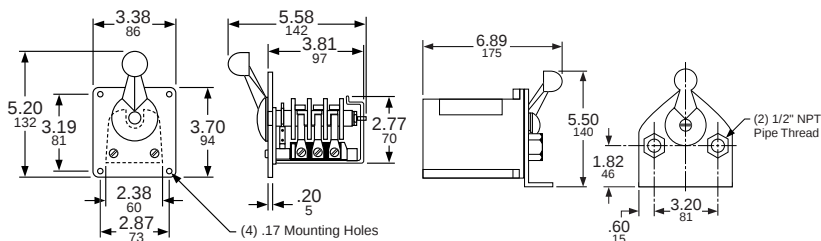
**Table 16.1: Reversing Drum Switches**

| 600 Vac Maximum Ratings |                    |               |     | Class 2601                            |                                              | 360 Vdc Maximum                        |                                      |
|-------------------------|--------------------|---------------|-----|---------------------------------------|----------------------------------------------|----------------------------------------|--------------------------------------|
| Voltage                 | Maximum Horsepower |               |     | NEMA Type 1 General Purpose Enclosure | NEMA Type 4 Watertight & Dusttight Enclosure | NEMA Type 1 Maintained & Momentary [1] | NEMA Type 13 Oiltight Flush Mounting |
|                         | AC Single Phase    | AC Poly-Phase | DC  | Type                                  | Type                                         | Type                                   | Type                                 |
| 115-200/230             | 1-1/2              | —             | 1/4 | AG2                                   | AW2                                          | AG2S2                                  | AF2                                  |
| 230                     | 2                  | —             | 1/4 |                                       |                                              |                                        |                                      |
| 460/575                 | —                  | 2             | —   |                                       |                                              |                                        |                                      |
| 115-200/230             | 1-1/2              | —             | 2   | BG1                                   | BW1                                          | —                                      | —                                    |
| 230                     | 3                  | 5             | 2   |                                       |                                              |                                        |                                      |
| 460/575                 | 5                  | 7-1/2         | —   |                                       |                                              |                                        |                                      |


 File E42243  
 CCN NLRV

 File LR25490  
 Class 3211-05

### Approximate Dimensions—Class 2601 Reversing Drum Switches



Type AW2

**Table 16.2: How to Order**

| To Order Specify: | Catalog Number |      |
|-------------------|----------------|------|
| • Class Number    | Class          | Type |
| • Type Number     | 2601           | AG2  |

[1] Maintained—Forward, Momentary—Reverse (not field convertible)

## Reduced Voltage Starting of Squirrel Cage Motors

A squirrel cage motor draws high starting current (inrush) and produces high starting torque when started at full voltage. While these values differ for different motor designs, for a typical NEMA design B motor, the inrush will be approximately 600% of the motor full load amperage (FLA) rating, and the starting torque will be approximately 150% of full load torque at full voltage. High current inrush and starting torque can cause problems in the electrical and mechanical systems, or may even damage the materials being processed.

When a motor is started at reduced voltage, the current at the motor terminals is reduced in direct proportion to the voltage reduction, while the torque is reduced by the square of the voltage reduction. If the "typical" NEMA B motor is started at 70% of line voltage, the starting current would be 70% of the full voltage value (that is,  $0.70 \times 600\% = 420\%$  FLA). The torque would then be  $(0.70)^2$  or 49% of the normal starting torque (that is,  $0.49 \times 150\% = 74\%$  full load torque). Therefore, reduced voltage starting provides an effective means of reducing both inrush current and starting torque.

If the motor has a high inertia or if the motor rating is marginal for the applied load, reducing the starting torque may prevent the motor from reaching full speed before the thermal overload relays trip. Applications that require high starting torque should be reviewed to determine if reduced voltage starting is suitable.

Square D™ offers several types of electromechanical as well as solid-state reduced voltage starters that provide different starting characteristics. The following describes the 8600 series of reduced voltage starters.

## Electromechanical Reduced Voltage Starters

**Class 8606—Autotransformer Starter:** Autotransformer starters provide reduced voltage to the motor terminals during starting through the use of a tapped, three phase autotransformer. Taps on the autotransformer allow for selection of the motor with 50%, 65%, or 80% of line voltage values supplying 50%, 65%, or 80% of the current inrush seen during a full voltage start. The resulting starting torque will be 25%, 42%, or 64% of full voltage values, as will be the current draw on the line. Thus, the autotransformer provides the maximum torque with minimum line current.

**Class 8630—Wye-Delta Starter:** Wye-delta starters can only be used on wye-delta motors which have six leads that allow for motor winding to be connected in either a wye or delta configuration. During start up, the windings are connected in the wye, resulting in 58% of line voltage applied across two windings. This reduces both inrush and starting torque to 33% of the delta connected values. After a set time delay, the motor leads are switched to the delta connection. The wye-delta starter is available in both open and closed transition configurations. Closed transition starters are supplied with an additional contactor and resistor bank used to keep the motor windings energized for a few cycles until the transition from wye to delta is complete.

**Class 8640—Part Winding Starter:** Part winding starters can be used only with part winding motors. During a part winding start, only one winding is energized, reducing the inrush current to 60–70% (depending on the motor design) and starting torque to 50% of normal starting values with both windings energized. Most (but not all) dual voltage 230/460 volt motors are suitable for part winding starts at 230 volts.

## Specifications

**Table 16.3: Starter Characteristics**

| Characteristic                     | Full Voltage                                                                                               | Autotransformer, Class 8606                                                                                              | Wye-Delta Class, 8630                                                                                                                | Part Winding, Class 8640                                                                                           | Solid-State ATS46                                                                                                                                    |
|------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage at Motor                   | 100%                                                                                                       | 50% / 65% / 80% (tap setting)                                                                                            | 100%                                                                                                                                 | 100%                                                                                                               | Ramped Up                                                                                                                                            |
| Line Current (% Full Load Current) | 600%                                                                                                       | 150% / 250% / 380%                                                                                                       | 200%                                                                                                                                 | 390%                                                                                                               | 150% to 700% (adjustable)                                                                                                                            |
| Starting Torque (% Rated Torque)   | 150%                                                                                                       | 40% / 60% / 100%                                                                                                         | 50%                                                                                                                                  | 70%                                                                                                                | 0% to 100% (adjustable)                                                                                                                              |
| Start Time (Factory Setting)       | —                                                                                                          | 6–7 s                                                                                                                    | 10 s / 15 s (open/closed transition)                                                                                                 | 1–1.5 s                                                                                                            | 10 s (adjustable 1–60 s)                                                                                                                             |
| Advantages                         | <ul style="list-style-type: none"> <li>Simple</li> <li>Economical</li> <li>High Starting Torque</li> </ul> | <ul style="list-style-type: none"> <li>High torque/amperage</li> <li>High inertial loads</li> <li>Flexibility</li> </ul> | <ul style="list-style-type: none"> <li>High inertial loads</li> <li>Long acceleration loads</li> <li>Good torque/amperage</li> </ul> | <ul style="list-style-type: none"> <li>Simple</li> <li>Small size</li> </ul>                                       | <ul style="list-style-type: none"> <li>Greatest flexibility</li> <li>Smooth ramp</li> <li>Solid-state overload relay</li> <li>Diagnostics</li> </ul> |
| Disadvantages                      | <ul style="list-style-type: none"> <li>Abrupt starts</li> <li>Large current inrush</li> </ul>              | <ul style="list-style-type: none"> <li>Large size</li> </ul>                                                             | <ul style="list-style-type: none"> <li>Low torque</li> <li>No flexibility</li> </ul>                                                 | Not suitable for: <ul style="list-style-type: none"> <li>High inertial loads</li> <li>Frequent starting</li> </ul> | <ul style="list-style-type: none"> <li>SCR heat dissipation</li> <li>Ambient limitations</li> </ul>                                                  |
| Motor                              | Standard                                                                                                   | Standard                                                                                                                 | Special                                                                                                                              | Special                                                                                                            | Standard                                                                                                                                             |

**Table 16.4: Line Voltage Codes (60 Hz)**

| Line | Control | Code |
|------|---------|------|
| 208  | 208     | V08  |
| 240  | 240     | V03  |
| 380  | 380     | V05  |
| 480  | 480     | V06  |
| 600  | 600     | V07  |

**Table 16.5: Coil Voltage Codes (60 Hz)**

| Line  | Control | Code |
|-------|---------|------|
| 208   | 120     | V84  |
| 240   | 24      | V82  |
| 240   | 120     | V80  |
| 480   | 24      | V83  |
| 480   | 120     | V81  |
| 480   | 240     | V87  |
| 600   | 120     | V86  |
| 380   | 110/50  | V95  |
| other | specify | V99  |

**Table 16.6: Form Codes**

| Form Description                      | Form Code |
|---------------------------------------|-----------|
| Fused CPT for timing relay only       | F4T       |
| Fused CPT for all coils               | F4T40     |
| Separate control of timing relay only | S         |
| Separate control for all coils        | Y195      |

### How to Order

**NOTE:** Table 16.4 and Table 16.5 are for 60 Hz; for 50 Hz codes, see Table 16.8.

- Specify the Class Number and the Type Number.
- If all coils are at the line voltage, and not Sizes 6 or 7, select the voltage code from Table 16.4 (Sizes 6 and 7 are supplied with a fused transformer with 120 Vac as standard).
- If the coils are at a different voltage than line supply, or Size 6 or 7, select a voltage code from Table 16.5 and also select a Form code from Table 16.6 (note that a Form code may be used with any voltage code, except as noted).

See Table 16.7 for sizing of 380 V starters.

24 V coils are not available on Sizes 4–7.

**Factory Modifications (Forms):** see [Factory Modifications \(Forms\)](#), page 16-18.

### 380 Vac, 50 Hz Starters

The Class 8600 starters are available for 380 Vac, 50 Hz applications. Table 16.7 provides maximum horsepower ratings. To determine the Type number, select the second digit based on the NEMA size. Select the fifth digit based on the horsepower requirement. Specify V05 voltage code.

**Table 16.7: 380 Vac, 50 Hz Starters, Maximum Horsepower Rating**

| Autotransformer, Class 8606 |           | Wye-Delta, Class 8630 |           | Part Winding, Class 8640 |           |
|-----------------------------|-----------|-----------------------|-----------|--------------------------|-----------|
| Max. hp                     | NEMA Size | Max. hp               | NEMA Size | Max. hp                  | NEMA Size |
| —                           | —         | 15                    | 1YD       | 15                       | 1PW       |
| 25                          | 2         | 40                    | 2YD       | 40                       | 2PW       |
| 50                          | 3         | 75                    | 3YD       | 75                       | 3PW       |
| 75                          | 4         | 150                   | 4YD       | 125                      | 4PW       |
| 150                         | 5         | 250                   | 5YD       | 250                      | 5PW       |
| 300                         | 6         | 500                   | 6YD       | 500                      | 6PW       |

### 50 Hz Control Voltage

The starters in this section can also be operated at 50 Hz at the coil voltages listed in Table 16.8. For additional coil voltage availability, contact the Customer Care Center (CCC) at 1-888-778-2733.

**Table 16.8: Coil Voltage Codes (50 Hz)**

| Hz | V   | Code | V   | Code | V   | Code | V   | Code |
|----|-----|------|-----|------|-----|------|-----|------|
| 60 | 120 | V02  | 240 | V03  | 480 | V06  | 600 | V07  |
| 50 | 110 |      | 220 |      | 440 |      | 550 |      |

## Selection, 3-Pole Polyphase

**NOTE:** Devices require 3 thermal units (Sizes 00–6). See Digest Section 16 for selection information.

Table 16.9: 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

| Motor Voltage<br>(Starter Voltage) | Max.<br>Hp | NEMA<br>Size | NEMA Type 1<br>General Purpose<br>Enclosure<br>Type [4] | NEMA Type 4 [1]<br>Watertight and<br>Dusttight Enclosure<br>Type [4] | NEMA Type 12/3R [2]<br>Dusttight & Driptight<br>Industrial Use Enclosure<br>Type [4] | Open Type<br>Type [4] | OEM Kit [3]<br>Type [4] |
|------------------------------------|------------|--------------|---------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|-------------------------|
| 200<br>(208)                       | 10         | 2            | SDG1C                                                   | SDW1C                                                                | SDA1C                                                                                | SDO1C                 | SDK1C                   |
|                                    | 15         | 3            | SEG1D                                                   | SEW1D                                                                | SEA1D                                                                                | SEO1D                 | SEK1D                   |
|                                    | 20         |              | SEG1E                                                   | SEW1E                                                                | SEA1E                                                                                | SEO1E                 | SEK1E                   |
|                                    | 25         |              | SEG1F                                                   | SEW1F                                                                | SEA1F                                                                                | SEO1F                 | SEK1F                   |
|                                    | 30         | 4            | SFG1G                                                   | SFW1G                                                                | SFA1G                                                                                | SFO1G                 | SFK1G                   |
|                                    | 40         |              | SFG1H                                                   | SFW1H                                                                | SFA1H                                                                                | SFO1H                 | SFK1H                   |
|                                    | 50         | 5            | SGG1J                                                   | SGW1J                                                                | SGA1J                                                                                | SGO1J                 | SGK1J                   |
|                                    | 75         |              | SGG1L                                                   | SGW1L                                                                | SGA1L                                                                                | SGO1L                 | SGK1L                   |
|                                    | 100        | 6            | SHG1M                                                   | SHW1M                                                                | SHA1M                                                                                | SHO1M                 | SHK1M                   |
|                                    | 125        |              | SHG1N                                                   | SHW1N                                                                | SHA1N                                                                                | SHO1N                 | SHK1N                   |
|                                    | 150        |              | SHG1P                                                   | SHW1P                                                                | SHA1P                                                                                | SHO1P                 | SHK1P                   |
| 230<br>(240)                       | 10         | 2            | SDG1C                                                   | SDW1C                                                                | SDA1C                                                                                | SDO1C                 | SDK1C                   |
|                                    | 15         | 3            | SDG1D                                                   | SDW1D                                                                | SDA1D                                                                                | SDO1D                 | SDK1D                   |
|                                    | 20         |              | SEG1E                                                   | SEW1E                                                                | SEA1E                                                                                | SEO1E                 | SEK1E                   |
|                                    | 25         |              | SEG1F                                                   | SEW1F                                                                | SEA1F                                                                                | SEO1F                 | SEK1F                   |
|                                    | 30         | 4            | SEG1G                                                   | SEW1G                                                                | SEA1G                                                                                | SEO1G                 | SEK1G                   |
|                                    | 40         |              | SFG1H                                                   | SFW1H                                                                | SFA1H                                                                                | SFO1H                 | SFK1H                   |
|                                    | 50         | 5            | SFG1J                                                   | SFW1J                                                                | SFA1J                                                                                | SFO1J                 | SFK1J                   |
|                                    | 75         |              | SGG1L                                                   | SGW1L                                                                | SGA1L                                                                                | SGO1L                 | SGK1L                   |
|                                    | 100        | 6            | SGG1M                                                   | SGW1M                                                                | SGA1M                                                                                | SGO1M                 | SGK1M                   |
|                                    | 125        |              | SHG1N                                                   | SHW1N                                                                | SHA1N                                                                                | SHO1N                 | SHK1N                   |
| 460<br>(480) /<br>575<br>(600)     | 150        |              | SHG1P                                                   | SHW1P                                                                | SHA1P                                                                                | SHO1P                 | SHK1P                   |
|                                    | 200        | 7            | SHG1Q                                                   | SHW1Q                                                                | SHA1Q                                                                                | SHO1Q                 | SHK1Q                   |
|                                    | 250        |              | SJG1R                                                   | SJW1R                                                                | SJA1R                                                                                | —                     | —                       |
|                                    | 300        |              | SJG1S                                                   | SJW1S                                                                | SJA1S                                                                                | —                     | —                       |
|                                    | 10         | 2            | SDG1C                                                   | SDW1C                                                                | SDA1C                                                                                | SDO1C                 | SDK1C                   |
|                                    | 15         |              | SDG1D                                                   | SDW1D                                                                | SDA1D                                                                                | SDO1D                 | SDK1D                   |
|                                    | 20         |              | SDG1E                                                   | SDW1E                                                                | SDA1E                                                                                | SDO1E                 | SDK1E                   |
|                                    | 25         | 3            | SDG1F                                                   | SDW1F                                                                | SDA1F                                                                                | SDO1F                 | SDK1F                   |
|                                    | 30         |              | SEG1G                                                   | SEW1G                                                                | SEA1G                                                                                | SEO1G                 | SEK1G                   |
|                                    | 40         |              | SEG1H                                                   | SEW1H                                                                | SEA1H                                                                                | SEO1H                 | SEK1H                   |
| 460<br>(480) /<br>575<br>(600)     | 50         | 4            | SEG1J                                                   | SEW1J                                                                | SEA1J                                                                                | SEO1J                 | SEK1J                   |
|                                    | 60         |              | SFG1K                                                   | SFW1K                                                                | SFA1K                                                                                | SFO1K                 | SFK1K                   |
|                                    | 75         |              | SFG1L                                                   | SFW1L                                                                | SFA1L                                                                                | SFO1L                 | SFK1L                   |
|                                    | 100        | 5            | SFG1M                                                   | SFW1M                                                                | SFA1M                                                                                | SFO1M                 | SFK1M                   |
|                                    | 125        |              | SGG1N                                                   | SGW1N                                                                | SGA1N                                                                                | SGO1N                 | SGK1N                   |
|                                    | 150        |              | SGG1P                                                   | SGW1P                                                                | SGA1P                                                                                | SGO1P                 | SGK1P                   |
|                                    | 200        |              | SGG1Q                                                   | SGW1Q                                                                | SGA1Q                                                                                | SGO1Q                 | SGK1Q                   |
|                                    | 250        | 6            | SHG1R                                                   | SHW1R                                                                | SHA1R                                                                                | SHO1R                 | SHK1R                   |
|                                    | 300        |              | SHG1S                                                   | SHW1S                                                                | SHA1S                                                                                | SHO1S                 | SHK1S                   |
|                                    | 400        |              | SHG1T                                                   | SHW1T                                                                | SHA1T                                                                                | SHO1T                 | SHK1T                   |
| 460<br>(480) /<br>575<br>(600)     | 500        | 7            | SJG1U                                                   | SJW1U                                                                | SJA1U                                                                                | SJO1U                 | —                       |
|                                    | 600        |              | SJG1W                                                   | SJW1W                                                                | SJA1W                                                                                | SJO1W                 | —                       |

**NOTE:** Class 8606 starters come with a NEMA style medium-duty autotransformer. Medium-duty service includes applications to motors that drive loads such as fans, pumps, compressors, and line shafts.

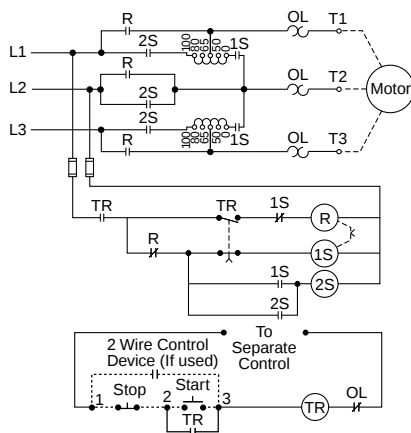
NEMA Sizes 2–5: Autotransformer is rated for fifteen 15-second starts per hour.

NEMA Sizes 6–7: Autotransformer is rated for three 30-second starts per hour.

Contact the Customer Care Center (CCC) at 1-888-778-2733 for applications that require frequent starting or jogging, or have extremely high inertia.

Table 16.10: How to Order

| To Order Specify: | Catalog Number                                                 |       |              |         |
|-------------------|----------------------------------------------------------------|-------|--------------|---------|
| • Class Number    | Class                                                          | Type  | Voltage Code | Form(s) |
| • Type Number     | 8606                                                           | SFG1M | V81          | S       |
| • Voltage Code    | Description: 100 hp, 480 V line, 120 V separate control, 60 Hz |       |              |         |
| • Form(s) [5]     |                                                                |       |              |         |



Typical Autotransformer Starter  
Sizes 2–5  
Separate Control (Form S)

[1] NEMA 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specify as **Form G17**.

[2] NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

[3] No factory modifications (Forms) are available with the OEM kit.

[4] Both the line and control voltage must be specified to order this product. See page 16-3 for the necessary codes and instructions for ordering.

[5] Specify Forms only if any of the coils are at a different voltage than line supply (V8•). See page 16-3 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications.

**Selection, 3-Pole Polyphase**

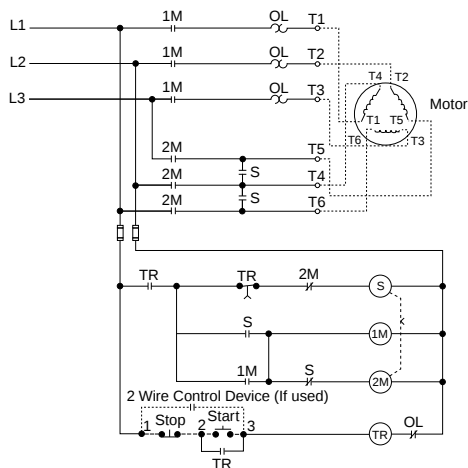
**NOTE:** Devices require 3 thermal units (Sizes 00–6). See Digest Section 16 for selection information.

**Table 16.11: 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz**

| Motor Voltage<br>(Starter Voltage) | Max.<br>Hp | NEMA<br>Size | NEMA Type 1<br>General Purpose<br>Enclosure<br>Type [9] | NEMA Type 4 [6]<br>Watertight and Dusttight Enclosure<br>(Stainless Steel 1YD–4YD)<br>Type [9] | NEMA Type 12/3R [7]<br>Dusttight & Driptight<br>Industrial Use Enclosure<br>Type [9] | Open Type<br>Type [9] | OEM Kit [8]<br>Type [9] |
|------------------------------------|------------|--------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|-------------------------|
| 200<br>(208)                       | 10         | 1YD          | SCG1C                                                   | SCW1C                                                                                          | SCA1C                                                                                | SCO1C                 | —                       |
|                                    | 15         | 2YD          | SDG1D                                                   | SDW1D                                                                                          | SDA1D                                                                                | SDO1D                 | —                       |
|                                    | 20         |              | SDG1E                                                   | SDW1E                                                                                          | SDA1E                                                                                | SDO1E                 | —                       |
|                                    | 25         |              | SEG1F                                                   | SEW1F                                                                                          | SEA1F                                                                                | SEO1F                 | SEK1F                   |
|                                    | 30         | 3YD          | SEG1G                                                   | SEW1G                                                                                          | SEA1G                                                                                | SEO1G                 | SEK1G                   |
|                                    | 40         |              | SEG1H                                                   | SEW1H                                                                                          | SEA1H                                                                                | SEO1H                 | SEK1H                   |
|                                    | 50         | 4YD          | SFG1J                                                   | SFW1J                                                                                          | SFA1J                                                                                | SFO1J                 | SFK1J                   |
|                                    | 60         |              | SFG1K                                                   | SFW1K                                                                                          | SFA1K                                                                                | SFO1K                 | SFK1K                   |
|                                    | 75         | 5YD          | SGG1L                                                   | SGW1L                                                                                          | SGA1L                                                                                | SGO1L                 | SGK1L                   |
|                                    | 100        |              | SGG1M                                                   | SGW1M                                                                                          | SGA1M                                                                                | SGO1M                 | SGK1M                   |
|                                    | 125        |              | SGG1N                                                   | SGW1N                                                                                          | SGA1N                                                                                | SGO1N                 | SGK1N                   |
|                                    | 150        |              | SGG1P                                                   | SGW1P                                                                                          | SGA1P                                                                                | SGO1P                 | SGK1P                   |
| 230<br>(240)                       | 200        | 6YD          | SHG1Q                                                   | SHW1Q                                                                                          | SHA1Q                                                                                | SHO1Q                 | SHK1Q                   |
|                                    | 250        |              | SHG1R                                                   | SHW1R                                                                                          | SHA1R                                                                                | SHO1R                 | SHK1R                   |
|                                    | 300        |              | SHG1S                                                   | SHW1S                                                                                          | SHA1S                                                                                | SHO1S                 | SHK1S                   |
|                                    | 400        |              | —                                                       | —                                                                                              | —                                                                                    | —                     | —                       |
|                                    | 10         | 1YD          | SCG1C                                                   | SCW1C                                                                                          | SCA1C                                                                                | SCO1C                 | —                       |
|                                    | 15         | 2YD          | SDG1D                                                   | SDW1D                                                                                          | SDA1D                                                                                | SDO1D                 | —                       |
|                                    | 20         |              | SDG1E                                                   | SDW1E                                                                                          | SDA1E                                                                                | SDO1E                 | —                       |
|                                    | 25         |              | SDG1F                                                   | SDW1F                                                                                          | SDA1F                                                                                | SDO1F                 | —                       |
|                                    | 30         | 3YD          | SEG1G                                                   | SEW1G                                                                                          | SEA1G                                                                                | SEO1G                 | SEK1G                   |
|                                    | 40         |              | SEG1H                                                   | SEW1H                                                                                          | SEA1H                                                                                | SEO1H                 | SEK1H                   |
|                                    | 50         | 4YD          | SEG1J                                                   | SEW1J                                                                                          | SEA1J                                                                                | SEO1J                 | SEK1J                   |
|                                    | 60         |              | SFG1K                                                   | SFW1K                                                                                          | SFA1K                                                                                | SFO1K                 | SFK1K                   |
| 460<br>(480) /<br>575<br>(600)     | 75         | 5YD          | SFG1L                                                   | SFW1L                                                                                          | SFA1L                                                                                | SFO1L                 | SFK1L                   |
|                                    | 100        |              | SGG1M                                                   | SGW1M                                                                                          | SGA1M                                                                                | SGO1M                 | SGK1M                   |
|                                    | 125        |              | SGG1N                                                   | SGW1N                                                                                          | SGA1N                                                                                | SGO1N                 | SGK1N                   |
|                                    | 150        |              | SGG1P                                                   | SGW1P                                                                                          | SGA1P                                                                                | SGO1P                 | SGK1P                   |
|                                    | 200        | 6YD          | SHG1Q                                                   | SHW1Q                                                                                          | SHA1Q                                                                                | SHO1Q                 | SHK1Q                   |
|                                    | 250        |              | SHG1R                                                   | SHW1R                                                                                          | SHA1R                                                                                | SHO1R                 | SHK1R                   |
|                                    | 300        |              | SHG1S                                                   | SHW1S                                                                                          | SHA1S                                                                                | SHO1S                 | SHK1S                   |
|                                    | 400        |              | —                                                       | —                                                                                              | —                                                                                    | —                     | —                       |
|                                    | 500        | 7YD          | SJG1T                                                   | SJW1T                                                                                          | SJA1T                                                                                | SJO1T                 | —                       |
|                                    | 600        |              | SJG1U                                                   | SJW1U                                                                                          | SJA1U                                                                                | SJO1U                 | —                       |
|                                    | 800        | 7YD          | —                                                       | —                                                                                              | —                                                                                    | —                     | —                       |
|                                    | 1000       |              | —                                                       | —                                                                                              | —                                                                                    | —                     | —                       |

**Table 16.12: How to Order**

| To Order Specify: | Catalog Number                                               |       |              |         |
|-------------------|--------------------------------------------------------------|-------|--------------|---------|
| • Class Number    | Class                                                        | Type  | Voltage Code | Form(s) |
| • Type Number     | 8630                                                         | SFG1M | V06          |         |
| • Voltage Code    | Description: 100 hp, 480 V line, 480 V common control, 60 Hz |       |              |         |
| • Form(s) [10]    |                                                              |       |              |         |



Typical Wye-Delta Starter Sizes 1–4 (Open Transition)  
Common Control (Standard)

[6] NEMA 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specify as **Form G17**.

[7] NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

[8] No factory modifications (Forms) are available with the OEM kit.

[9] Both the line and control voltage must be specified to order this product. See page 16-3 for the necessary codes and instructions for ordering.

[10] Specify Forms only if any of the coils are at a different voltage than line supply (V8\*). See page 16-3 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications.

## Selection, 3-Pole Polyphase

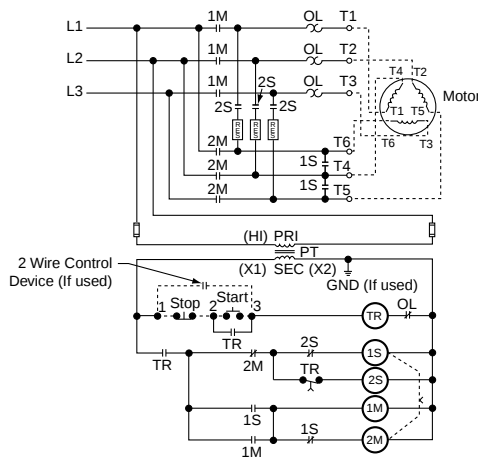
**NOTE:** Devices require 3 thermal units (Sizes 00–6). See Digest Section 16 for selection information.

Table 16.13: 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

| Motor Voltage<br>(Starter Voltage) | Max.<br>Hp | NEMA<br>Size | NEMA Type 1 General<br>Purpose Enclosure | NEMA Type 4 <sup>[11]</sup><br>Watertight and Dusttight Enclosure<br>(Stainless Steel 1YD–4YD) | NEMA Type 12/3R <sup>[12]</sup><br>Dusttight & Driptight<br>Industrial Use Enclosure | Open Type            | OEM Kit<br><sup>[13]</sup> |
|------------------------------------|------------|--------------|------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|----------------------------|
|                                    |            |              | Type <sup>[14]</sup>                     | Type <sup>[14]</sup>                                                                           | Type <sup>[14]</sup>                                                                 | Type <sup>[14]</sup> | Type <sup>[14]</sup>       |
| 200<br>(208)                       | 10         | 1YD          | SCG2C                                    | SCW2C                                                                                          | SCA2C                                                                                | SCO2C                | —                          |
|                                    | 15         | 2YD          | SDG2D                                    | SDW2D                                                                                          | SDA2D                                                                                | SDO2D                | —                          |
|                                    | 20         |              | SDG2E                                    | SDW2E                                                                                          | SDA2E                                                                                | SDO2E                | —                          |
|                                    | 25         |              | SDG2F                                    | SDW2F                                                                                          | SDA2F                                                                                | SDO2F                | —                          |
|                                    | 30         | 3YD          | SEG2F                                    | SEW2F                                                                                          | SEA2F                                                                                | SEO2F                | SEK2F                      |
|                                    | 40         |              | SEG2G                                    | SEW2G                                                                                          | SEA2G                                                                                | SEO2G                | SEK2G                      |
|                                    | 50         |              | SEG2H                                    | SEW2H                                                                                          | SEA2H                                                                                | SEO2H                | SEK2H                      |
|                                    | 60         | 4YD          | SFG2J                                    | SFW2J                                                                                          | SFA2J                                                                                | SFO2J                | SFK2J                      |
|                                    | 75         |              | SFG2K                                    | SFW2K                                                                                          | SFA2K                                                                                | SFO2K                | SFK2K                      |
|                                    | 100        |              | SGG2L                                    | SGW2L                                                                                          | SGA2L                                                                                | SGO2L                | SGK2L                      |
|                                    | 125        | 5YD          | SGG2M                                    | SGW2M                                                                                          | SGA2M                                                                                | SGO2M                | SGK2M                      |
|                                    | 150        |              | SGG2N                                    | SGW2N                                                                                          | SGA2N                                                                                | SGO2N                | SGK2N                      |
|                                    | 200        |              | SGG2P                                    | SGW2P                                                                                          | SGA2P                                                                                | SGO2P                | SGK2P                      |
| 230<br>(240)                       | 200        | 6YD          | SHG2Q                                    | SHW2Q                                                                                          | SHA2Q                                                                                | SHO2Q                | SHK2Q                      |
|                                    | 250        |              | SHG2R                                    | SHW2R                                                                                          | SHA2R                                                                                | SHO2R                | SHK2R                      |
|                                    | 300        |              | SHG2S                                    | SHW2S                                                                                          | SHA2S                                                                                | SHO2S                | SHK2S                      |
|                                    | 10         | 1YD          | SCG2C                                    | SCW2C                                                                                          | SCA2C                                                                                | SCO2C                | —                          |
|                                    | 15         | 2YD          | SDG2D                                    | SDW2D                                                                                          | SDA2D                                                                                | SDO2D                | —                          |
|                                    | 20         |              | SDG2E                                    | SDW2E                                                                                          | SDA2E                                                                                | SDO2E                | —                          |
|                                    | 25         |              | SDG2F                                    | SDW2F                                                                                          | SDA2F                                                                                | SDO2F                | —                          |
|                                    | 30         | 3YD          | SEG2G                                    | SEW2G                                                                                          | SEA2G                                                                                | SEO2G                | SEK2G                      |
|                                    | 40         |              | SEG2H                                    | SEW2H                                                                                          | SEA2H                                                                                | SEO2H                | SEK2H                      |
|                                    | 50         |              | SEG2J                                    | SEW2J                                                                                          | SEA2J                                                                                | SEO2J                | SEK2J                      |
|                                    | 60         | 4YD          | SFG2K                                    | SFW2K                                                                                          | SFA2K                                                                                | SFO2K                | SFK2K                      |
|                                    | 75         |              | SFG2L                                    | SFW2L                                                                                          | SFA2L                                                                                | SFO2L                | SFK2L                      |
| 460<br>(480) /<br>575<br>(600)     | 100        | 5YD          | SGG2M                                    | SGW2M                                                                                          | SGA2M                                                                                | SGO2M                | SGK2M                      |
|                                    | 125        |              | SGG2N                                    | SGW2N                                                                                          | SGA2N                                                                                | SGO2N                | SGK2N                      |
|                                    | 150        |              | SGG2P                                    | SGW2P                                                                                          | SGA2P                                                                                | SGO2P                | SGK2P                      |
|                                    | 200        | 6YD          | SHG2Q                                    | SHW2Q                                                                                          | SHA2Q                                                                                | SHO2Q                | SHK2Q                      |
|                                    | 250        |              | SHG2R                                    | SHW2R                                                                                          | SHA2R                                                                                | SHO2R                | SHK2R                      |
|                                    | 300        |              | SHG2S                                    | SHW2S                                                                                          | SHA2S                                                                                | SHO2S                | SHK2S                      |
|                                    | 400        | 7YD          | SJG2T                                    | SJW2T                                                                                          | SJA2T                                                                                | SJO2T                | —                          |
|                                    | 500        |              | SJG2U                                    | SJW2U                                                                                          | SJA2U                                                                                | SJO2U                | —                          |
|                                    | 10         | 1YD          | SCG2C                                    | SCW2C                                                                                          | SCA2C                                                                                | SCO2C                | —                          |
|                                    | 15         | 2YD          | SDG2D                                    | SDW2D                                                                                          | SDA2D                                                                                | SDO2D                | —                          |
|                                    | 20         |              | SDG2E                                    | SDW2E                                                                                          | SDA2E                                                                                | SDO2E                | —                          |
|                                    | 25         |              | SDG2F                                    | SDW2F                                                                                          | SDA2F                                                                                | SDO2F                | —                          |
| 460<br>(480) /<br>575<br>(600)     | 30         | 3YD          | SDG2G                                    | SDW2G                                                                                          | SDA2G                                                                                | SDO2G                | —                          |
|                                    | 40         |              | SDG2H                                    | SDW2H                                                                                          | SDA2H                                                                                | SDO2H                | —                          |
|                                    | 50         |              | SDG2J                                    | SDW2J                                                                                          | SDA2J                                                                                | SDO2J                | —                          |
|                                    | 60         | 4YD          | SEG2K                                    | SEW2K                                                                                          | SEA2K                                                                                | SEO2K                | SEK2K                      |
|                                    | 75         |              | SEG2L                                    | SEW2L                                                                                          | SEA2L                                                                                | SEO2L                | SEK2L                      |
|                                    | 100        | 5YD          | SFG2M                                    | SFW2M                                                                                          | SFA2M                                                                                | SFO2M                | SFK2M                      |
|                                    | 125        |              | SFG2N                                    | SFW2N                                                                                          | SFA2N                                                                                | SFO2N                | SFK2N                      |
|                                    | 150        |              | SFG2P                                    | SFW2P                                                                                          | SFA2P                                                                                | SFO2P                | SFK2P                      |
|                                    | 200        | 6YD          | SGG2Q                                    | SGW2Q                                                                                          | SGA2Q                                                                                | SGO2Q                | SGK2Q                      |
|                                    | 250        |              | SGG2R                                    | SGW2R                                                                                          | SGA2R                                                                                | SGO2R                | SGK2R                      |
|                                    | 300        |              | SGG2S                                    | SGW2S                                                                                          | SGA2S                                                                                | SGO2S                | SGK2S                      |
|                                    | 400        | 7YD          | SHG2T                                    | SHW2T                                                                                          | SHA2T                                                                                | SHO2T                | SHK2T                      |
|                                    | 500        |              | SHG2U                                    | SHW2U                                                                                          | SHA2U                                                                                | SHO2U                | SHK2U                      |
|                                    | 700        |              | SHG2W                                    | SHW2W                                                                                          | SHA2W                                                                                | SHO2W                | SHK2W                      |
| 460<br>(480) /<br>575<br>(600)     | 800        | 7YD          | SJG2Y                                    | SJW2Y                                                                                          | SJA2Y                                                                                | SJO2Y                | —                          |
|                                    | 1000       |              | SJG2Z                                    | SJW2Z                                                                                          | SJA2Z                                                                                | SJO2Z                | —                          |

Table 16.14: How to Order

| To Order Specify:                                                                                                                          | Catalog Number |       |              |         |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|--------------|---------|
|                                                                                                                                            | Class          | Type  | Voltage Code | Form(s) |
| <ul style="list-style-type: none"> <li>Class Number</li> <li>Type Number</li> <li>Voltage Code</li> <li>Form(s) <sup>[15]</sup></li> </ul> | 8630           | SFG1M | V81          | F4T40   |
| Description: 100 hp, 480 V line, 120 V separate control, 60 Hz                                                                             |                |       |              |         |



Typical Wye-Delta Starter  
Sizes 1–4 (Closed Transition)  
Fused Control Transformer (Form F4T40)

<sup>[11]</sup> NEMA 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specify as **Form G17**.

<sup>[12]</sup> NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

<sup>[13]</sup> No factory modifications (Forms) are available with the OEM kit.

<sup>[14]</sup> Both the line and control voltage must be specified to order this product. See page 16-3 for the necessary codes and instructions for ordering.

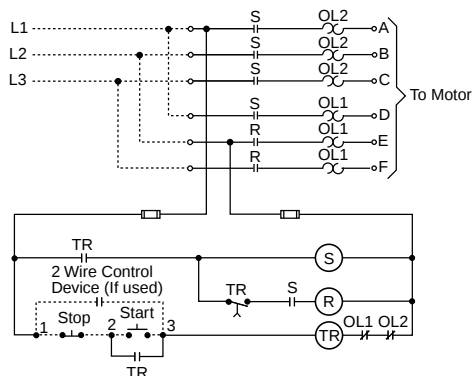
<sup>[15]</sup> Specify Forms only if any of the coils are at a different voltage than line supply (V8•). See page 16-3 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications.

## Part Winding Starters, Selection

**NOTE:** Devices require 6 thermal units (Sizes 00–6). See Digest Section 16 for selection information.

**Table 16.15: 3-Pole Polyphase—600 Vac Maximum—50–60 Hz**

| Motor Voltage<br>(Starter Voltage) | Max.<br>Hp | NEMA<br>Size | NEMA Type 1 General<br>Purpose Enclosure | NEMA Type 4 <sup>[16]</sup><br>Watertight and Dusttight Enclosure<br>(Stainless Steel 1PW–4PW) | NEMA Type 12/3R <sup>[17]</sup><br>Dusttight & Driptight<br>Industrial Use Enclosure | Open Type            | OEM Kit<br><sup>[18]</sup> |
|------------------------------------|------------|--------------|------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|----------------------------|
|                                    |            |              | Type <sup>[19]</sup>                     | Type <sup>[19]</sup>                                                                           | Type <sup>[19]</sup>                                                                 | Type <sup>[19]</sup> | Type <sup>[19]</sup>       |
| 200<br>(208)                       | 10         | 1PW          | SCG1C                                    | SCW1C                                                                                          | SCA1C                                                                                | SCO1C                | —                          |
|                                    | 15         | 2PW          | SDG1D                                    | SDW1D                                                                                          | SDA1D                                                                                | SDO1D                | SDK1D                      |
|                                    | 20         |              | SDG1E                                    | SDW1E                                                                                          | SDA1E                                                                                | SDO1E                | SDK1E                      |
|                                    | 25         |              | SEG1F                                    | SEW1F                                                                                          | SEA1F                                                                                | SEO1F                | SEK1F                      |
|                                    | 30         | 3PW          | SEG1G                                    | SEW1G                                                                                          | SEA1G                                                                                | SEO1G                | SEK1G                      |
|                                    | 40         |              | SEG1H                                    | SEW1H                                                                                          | SEA1H                                                                                | SEO1H                | SEK1H                      |
|                                    | 50         | 4PW          | SFG1J                                    | SFW1J                                                                                          | SFA1J                                                                                | SFO1J                | SFK1J                      |
|                                    | 60         |              | SFG1K                                    | SFW1K                                                                                          | SFA1K                                                                                | SFO1K                | SFK1K                      |
|                                    | 75         |              | SFG1L                                    | SFW1L                                                                                          | SFA1L                                                                                | SFO1L                | SFK1L                      |
|                                    | 100        | 5PW          | SGG1M                                    | SGW1M                                                                                          | SGA1M                                                                                | SGO1M                | SGK1M                      |
|                                    | 125        |              | SGG1N                                    | SGW1N                                                                                          | SGA1N                                                                                | SGO1N                | SGK1N                      |
|                                    | 150        |              | SGG1P                                    | SGW1P                                                                                          | SGA1P                                                                                | SGO1P                | SGK1P                      |
| 230<br>(240)                       | 10         | 1PW          | SCG1C                                    | SCW1C                                                                                          | SCA1C                                                                                | SCO1C                | —                          |
|                                    | 15         | 2PW          | SDG1D                                    | SDW1D                                                                                          | SDA1D                                                                                | SDO1D                | SDK1D                      |
|                                    | 20         |              | SDG1E                                    | SDW1E                                                                                          | SDA1E                                                                                | SDO1E                | SDK1E                      |
|                                    | 25         |              | SDG1F                                    | SDW1F                                                                                          | SDA1F                                                                                | SDO1F                | SDK1F                      |
|                                    | 30         | 3PW          | SEG1G                                    | SEW1G                                                                                          | SEA1G                                                                                | SEO1G                | SEK1G                      |
|                                    | 40         |              | SEG1H                                    | SEW1H                                                                                          | SEA1H                                                                                | SEO1H                | SEK1H                      |
|                                    | 50         |              | SEG1J                                    | SEW1J                                                                                          | SEA1J                                                                                | SEO1J                | SEK1J                      |
|                                    | 60         | 4PW          | SFG1K                                    | SFW1K                                                                                          | SFA1K                                                                                | SFO1K                | SFK1K                      |
|                                    | 75         |              | SFG1L                                    | SFW1L                                                                                          | SFA1L                                                                                | SFO1L                | SFK1L                      |
|                                    | 100        | 5PW          | SGG1M                                    | SGW1M                                                                                          | SGA1M                                                                                | SGO1M                | SGK1M                      |
|                                    | 125        |              | SGG1N                                    | SGW1N                                                                                          | SGA1N                                                                                | SGO1N                | SGK1N                      |
|                                    | 150        |              | SGG1P                                    | SGW1P                                                                                          | SGA1P                                                                                | SGO1P                | SGK1P                      |
| 460<br>(480) /<br>575<br>(600)     | 200        | 6PW          | SHG1Q                                    | SHW1Q                                                                                          | SHA1Q                                                                                | SHO1Q                | —                          |
|                                    | 250        |              | SHG1R                                    | SHW1R                                                                                          | SHA1R                                                                                | SHO1R                | —                          |
|                                    | 300        |              | SHG1S                                    | SHW1S                                                                                          | SHA1S                                                                                | SHO1S                | —                          |
|                                    | 400        | 7PW          | SJG1T                                    | SJW1T                                                                                          | SJA1T                                                                                | SJO1T                | —                          |
|                                    | 10         | 1PW          | SCG1C                                    | SCW1C                                                                                          | SCA1C                                                                                | SCO1C                | —                          |
|                                    | 15         |              | SCG1D                                    | SCW1D                                                                                          | SCA1D                                                                                | SCO1D                | —                          |
|                                    | 20         | 2PW          | SDG1E                                    | SDW1E                                                                                          | SDA1E                                                                                | SDO1E                | SDK1E                      |
|                                    | 25         |              | SDG1F                                    | SDW1F                                                                                          | SDA1F                                                                                | SDO1F                | SDK1F                      |
|                                    | 30         |              | SDG1G                                    | SDW1G                                                                                          | SDA1G                                                                                | SDO1G                | SDK1G                      |
|                                    | 40         | 3PW          | SEG1J                                    | SEW1J                                                                                          | SEA1J                                                                                | SEO1J                | SEK1J                      |
|                                    | 50         |              | SEG1K                                    | SEW1K                                                                                          | SEA1K                                                                                | SEO1K                | SEK1K                      |
|                                    | 60         |              | SEG1L                                    | SEW1L                                                                                          | SEA1L                                                                                | SEO1L                | SEK1L                      |
| 460<br>(480) /<br>575<br>(600)     | 75         | 4PW          | SFG1M                                    | SFW1M                                                                                          | SFA1M                                                                                | SFO1M                | SFK1M                      |
|                                    | 100        |              | SFG1N                                    | SFW1N                                                                                          | SFA1N                                                                                | SFO1N                | SFK1N                      |
|                                    | 125        |              | SFG1P                                    | SFW1P                                                                                          | SFA1P                                                                                | SFO1P                | SFK1P                      |
|                                    | 150        | 5PW          | SGG1Q                                    | SGW1Q                                                                                          | SGA1Q                                                                                | SGO1Q                | SGK1Q                      |
|                                    | 200        |              | SGG1R                                    | SGW1R                                                                                          | SGA1R                                                                                | SGO1R                | SGK1R                      |
|                                    | 250        |              | SGG1S                                    | SGW1S                                                                                          | SGA1S                                                                                | SGO1S                | SGK1S                      |
|                                    | 350        | 6PW          | SHG1T                                    | SHW1T                                                                                          | SHA1T                                                                                | SHO1T                | —                          |
|                                    | 400        |              | SHG1U                                    | SHW1U                                                                                          | SHA1U                                                                                | SHO1U                | —                          |
|                                    | 500        |              | SHG1W                                    | SHW1W                                                                                          | SHA1W                                                                                | SHO1W                | —                          |
|                                    | 600        | 7PW          | SJG1X                                    | SJW1X                                                                                          | SJA1X                                                                                | SJO1X                | —                          |
|                                    | 700        |              | SJG1Y                                    | SJW1Y                                                                                          | SJA1Y                                                                                | SJO1Y                | —                          |
|                                    | 800        |              |                                          |                                                                                                |                                                                                      |                      | —                          |



Typical Part Winding  
Sizes 1–4  
Common Control (Standard)

**Table 16.16: How to Order**

| To Order Specify:                                                                                                                          | Catalog Number |       |              |         |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|--------------|---------|
|                                                                                                                                            | Class          | Type  | Voltage Code | Form(s) |
| <ul style="list-style-type: none"> <li>Class Number</li> <li>Type Number</li> <li>Voltage Code</li> <li>Form(s) <sup>[20]</sup></li> </ul> | 8640           | SFG1M | V06          | C       |
| Description: 100 hp, 480 V line, 480 V common control, 60 Hz                                                                               |                |       |              |         |

<sup>[16]</sup> NEMA 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specify as **Form G17**.

<sup>[17]</sup> NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

<sup>[18]</sup> No factory modifications (Forms) are available with the OEM kit.

<sup>[19]</sup> Both the line and control voltage must be specified to order this product. See page 16-3 for the necessary codes and instructions for ordering.

<sup>[20]</sup> Specify Forms only if any of the coils are at a different voltage than line supply (V8•). See page 16-3 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications.

## Approximate Dimensions—Not for Construction

NOTE: H = Height, W = Width, D = Depth

Table 16.17: Class 8606—Autotransformer

| NEMA Size | Dim. | Open |      | NEMA Type 1 / 12 Enclosure               |      |                               |      | NEMA Type 4 Enclosure                    |      |                               |      |
|-----------|------|------|------|------------------------------------------|------|-------------------------------|------|------------------------------------------|------|-------------------------------|------|
|           |      |      |      | Non-Combo or Combo, with Circuit Breaker |      | Combo, with Disconnect Switch |      | Non-Combo or Combo, with Circuit Breaker |      | Combo, with Disconnect Switch |      |
|           |      | in.  | mm   | in.                                      | mm   | in.                           | mm   | in.                                      | mm   | in.                           | mm   |
| 2         | H    | 43   | 1092 | 52                                       | 1320 | 52                            | 1320 | 52                                       | 1320 | 52                            | 1320 |
|           | W    | 22   | 559  | 25                                       | 635  | 25                            | 635  | 25                                       | 635  | 25                            | 635  |
|           | D    | 8    | 203  | 10                                       | 254  | 10                            | 254  | 10                                       | 254  | 10                            | 254  |
| 3 or 4    | H    | 63   | 1600 | 70 [21]                                  | 1778 | 70 [21]                       | 1778 | 75 [21]                                  | 1778 | 75 [21]                       | 1778 |
|           | W    | 28   | 711  | 32                                       | 813  | 32                            | 813  | 32                                       | 813  | 32                            | 813  |
|           | D    | 9    | 229  | 16                                       | 406  | 16                            | 406  | 16                                       | 406  | 16                            | 406  |
| 5         | H    | 63   | 1600 | 70 [21]                                  | 1778 | 90 [21]                       | 2286 | 75 [21]                                  | 1778 | 95 [21]                       | 2413 |
|           | W    | 28   | 711  | 32                                       | 813  | 36                            | 914  | 32                                       | 813  | 36                            | 914  |
|           | D    | 9    | 229  | 16                                       | 406  | 16                            | 406  | 16                                       | 406  | 16                            | 406  |
| 6         | H    | 56   | 1422 | 90 [21]                                  | 2286 | 90 [21]                       | 2286 | 98 [21]                                  | 2489 | 98 [21]                       | 2489 |
|           | W    | 30   | 762  | 34                                       | 864  | 64                            | 1626 | 34                                       | 864  | 64                            | 1626 |
|           | D    | 14   | 354  | 20                                       | 508  | 24                            | 610  | 20                                       | 508  | 24                            | 610  |

Class 8606  
Autotransformer

Table 16.18: Class 8630—Wye-Delta, Open Transition

| NEMA Size  | Dim. | Open |      | NEMA Type 1 / 12 Enclosure |      |         |      | NEMA Type 4 Enclosure |      |         |      |
|------------|------|------|------|----------------------------|------|---------|------|-----------------------|------|---------|------|
|            |      |      |      | Non-Combo                  |      | Combo   |      | Non-Combo             |      | Combo   |      |
|            |      | in.  | mm   | in.                        | mm   | in.     | mm   | in.                   | mm   | in.     | mm   |
| 1YD or 2YD | H    | 21   | 553  | 25                         | 635  | 25      | 635  | 25                    | 635  | —       | —    |
|            | W    | 21   | 553  | 23                         | 584  | 23      | 584  | 23                    | 584  | —       | —    |
|            | D    | 7    | 178  | 8                          | 203  | 8       | 203  | 8                     | 203  | —       | —    |
| 3YD or 4YD | H    | 42   | 1067 | 48                         | 1219 | 49      | 1245 | 48                    | 1219 | 49      | 1245 |
|            | W    | 25   | 635  | 28                         | 712  | 30      | 762  | 28                    | 712  | 30      | 762  |
|            | D    | 7    | 178  | 8                          | 203  | 11      | 279  | 8                     | 203  | 11      | 279  |
| 5YD or 6YD | H    | 62   | 1576 | 90 [21]                    | 2286 | 90 [21] | 2286 | 98 [21]               | 2489 | 98 [21] | 2489 |
|            | W    | 29   | 737  | 36                         | 914  | 36      | 914  | 36                    | 914  | 36      | 914  |
|            | D    | 10   | 254  | 16                         | 406  | 16      | 406  | 16                    | 406  | 16      | 406  |

Class 8630  
Wye-Delta

Table 16.19: Class 8630—Wye-Delta, Closed Transition

| NEMA Size  | Dim. | Open |      | NEMA Type 1 / 12 Enclosure |      |         |      | NEMA Type 4 Enclosure |      |         |      |
|------------|------|------|------|----------------------------|------|---------|------|-----------------------|------|---------|------|
|            |      |      |      | Non-Combo                  |      | Combo   |      | Non-Combo             |      | Combo   |      |
|            |      | in.  | mm   | in.                        | mm   | in.     | mm   | in.                   | mm   | in.     | mm   |
| 1YD or 2YD | H    | 21   | 553  | 25                         | 635  | 25      | 635  | 25                    | 635  | —       | —    |
|            | W    | 21   | 553  | 23                         | 584  | 23      | 584  | 23                    | 584  | —       | —    |
|            | D    | 14   | 354  | 16                         | 406  | 16      | 406  | 16                    | 406  | —       | —    |
| 3YD or 4YD | H    | 42   | 1067 | 48                         | 1219 | 49      | 1245 | 48                    | 1219 | 49      | 1245 |
|            | W    | 25   | 635  | 28                         | 712  | 30      | 762  | 28                    | 712  | 30      | 762  |
|            | D    | 14   | 354  | 16                         | 406  | 18      | 457  | 16                    | 406  | 18      | 457  |
| 5YD or 6YD | H    | 80   | 2032 | 90 [21]                    | 2286 | 90 [21] | 2286 | 98 [21]               | 2489 | 98 [21] | 2489 |
|            | W    | 30   | 762  | 36                         | 914  | 36      | 914  | 36                    | 914  | 36      | 914  |
|            | D    | 12   | 305  | 16                         | 406  | 16      | 406  | 16                    | 406  | 16      | 406  |

Table 16.20: Class 8640—Part Winding

| NEMA Size  | Dim. | Open |      | Enclosed—NEMA Type 1 / 4 / 12 |      |                             |      |                               |      |
|------------|------|------|------|-------------------------------|------|-----------------------------|------|-------------------------------|------|
|            |      |      |      | Non-Combo                     |      | Combo, with Circuit Breaker |      | Combo, with Disconnect Switch |      |
|            |      | in.  | mm   | in.                           | mm   | in.                         | mm   | in.                           | mm   |
| 1PW or 2PW | H    | 21   | 553  | 25                            | 635  | 34                          | 853  | 25                            | 635  |
|            | W    | 21   | 553  | 23                            | 584  | 19                          | 483  | 23                            | 584  |
|            | D    | 6    | 152  | 8                             | 203  | 11                          | 279  | 8                             | 203  |
| 3PW        | H    | 42   | 1067 | 48                            | 1219 | 44                          | 1118 | 52                            | 1321 |
|            | W    | 26   | 660  | 28                            | 712  | 30                          | 762  | 25                            | 635  |
|            | D    | 7    | 178  | 8                             | 203  | 12                          | 305  | 11                            | 279  |
| 4PW        | H    | 42   | 1067 | 48                            | 1219 | 44                          | 1118 | 78 [21]                       | 1981 |
|            | W    | 26   | 660  | 28                            | 712  | 30                          | 762  | 32                            | 813  |
|            | D    | 7    | 178  | 8                             | 203  | 12                          | 305  | 16                            | 406  |
| 5PW        | H    | 35   | 889  | 44                            | 1118 | 78 [21] [22]                | 1981 | 78 [21] [22]                  | 1981 |
|            | W    | 22   | 559  | 24                            | 610  | 36                          | 914  | 36                            | 914  |
|            | D    | 10   | 254  | 12                            | 305  | 16                          | 406  | 16                            | 406  |
| 6PW        | H    | 49   | 1245 | 64                            | 1626 | —                           | —    | 90 [21]                       | 2286 |
|            | W    | 24   | 610  | 28                            | 712  | —                           | —    | 64                            | 1626 |
|            | D    | 11   | 279  | 16                            | 406  | —                           | —    | 24                            | 406  |

### Combination Starter Form Reference

Circuit Breaker: Y791, Y7911

Nonfusable Disconnect Switch: Y792, Y7910

Fusable Disconnect Switch: Y793-Y799

Refer to [page 16-18](#) for a complete listing of Forms for combination devices.

[21] Free-standing enclosure.  
[22] Subtract 8 in. from the height for a Type 1 or 12 enclosure.

**Table 16.21: Typical Applications**

| Constant Hp                                             | Constant Torque                                                       | Variable Torque                 |
|---------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------|
| A. Spindles<br>B. Cutting Tools<br>1. Lathes<br>2. Saws | A. Conveyors<br>B. Mills<br>C. Dough Mixers<br>D. Reciprocating Pumps | A. Fans<br>B. Centrifugal Pumps |

## Multispeed Magnetic Starters Application Data

Multispeed motors are available in two basic versions:

1) separate winding, and 2) consequent pole. A separate winding motor has a winding for each speed while a consequent pole motor has a winding for every two speeds (three-speed motors have two windings). The motor connections (and thus the types of controllers) for two speed starters are exemplified by the schematic diagrams shown in Table 16.22. Note that consequent pole two-speed controllers involve a 5-pole and a 3-pole starter, while separate winding controllers have two 3-pole starters.

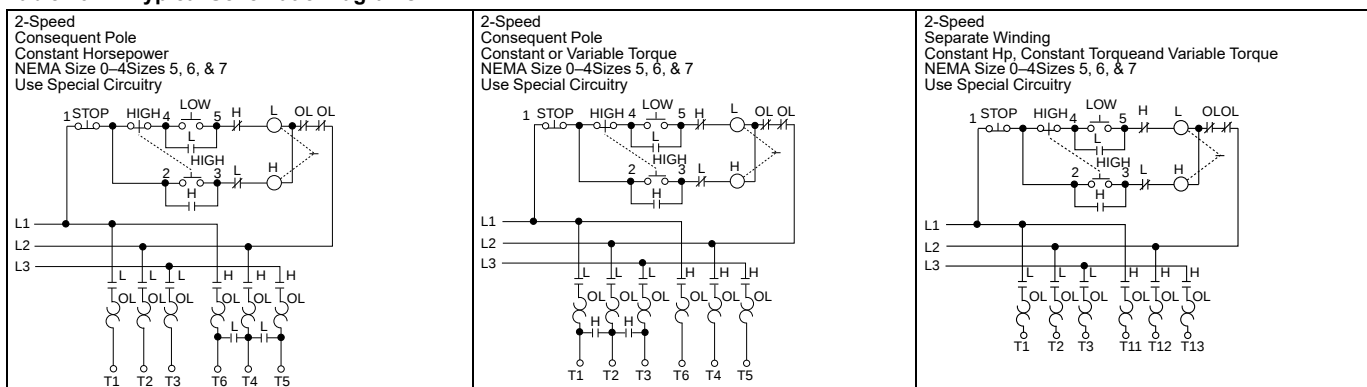
**Verify the type of motor before ordering.** Field modification of starters to match the motor **may not be possible.**

Separate winding motors are usually chosen when flexibility is important, since the speeds of a consequent pole motor are usually limited to a 2/1 ratio; a broad range of speeds can be obtained on a separate winding motor.

Both separate winding and consequent pole motors are available in three types: 1) constant horsepower, 2) constant torque, and 3) variable torque. Table 16.21 shows typical applications for these different types of motors.

**NOTE:** For detailed information involving the technical aspects of flexibility of the starters used in the multispeed controllers, see Classes 8702, 8736, and 8810 application data.

**Table 16.22: Typical Schematic Diagrams**



## Additional Features—Special Relays for Non-Reversing and Reversing Multispeed Starters

**General.** Some applications require special relays to control the speed change and/or starting of the motor.

The descriptions that follow cover the four common relay schemes for these applications.

**Form R1 Compelling Relay.** This relay requires the motor to be started at low speed before any higher speed can be selected. This arrangement ensures that the motor will always start the load at low speed. The stop button must be pressed before it is possible to change from a higher to a lower speed. (Not available with Form R2.)

**Form R2 Accelerating Relay/Timer.** With Form R2 accelerating relays, the ultimate speed is determined by the button which is pressed, but the starter will start the motor at low speed and automatically accelerate it through successive steps until the selected speed is reached. Definite time intervals must elapse between each speed change. Individual adjustable timing relays are provided for each interval.

The stop button must be pressed before it is possible to change from a higher to a lower speed.

(Not available with Form R1.)

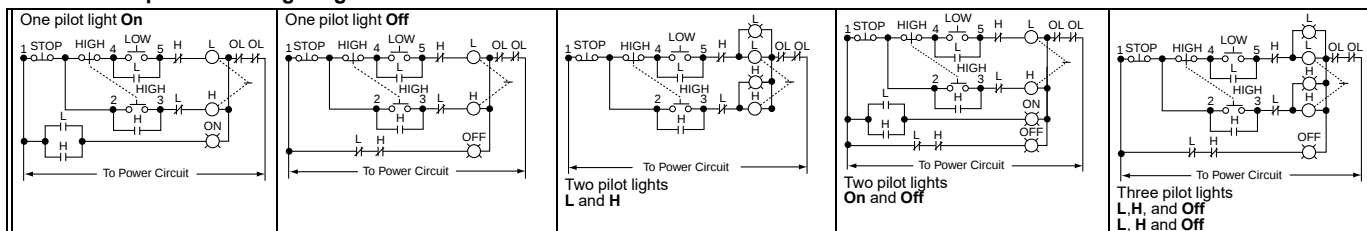
**Form R3 Decelerating Relay/Timer.** This is similar in action to Form R2 accelerating relays, except that they function to prevent immediate transfer from a higher to a lower speed. A definite time interval, preset on the timer, must elapse between each speed change.

**Form R10 Antiplugging Relays/Timers.** This Form imposes a time delay when transferring from the forward to the reverse direction or reverse to forward, for reversing multispeed starters. This provides up to a 60 second delay in the transfer of the direction of the motor, and can help prevent damage which could result from plugging.

**Form Y81 (Low Speed) Overload Relay Modification.**

For NEMA size 3 and 4, when the low speed full load current does not appear on the appropriate thermal unit selection tables, include Form Y81 (low speed) (no charge for this Form). This Form modifies the overload relay block to accept Type B thermal units. For assistance on thermal unit selection, contact the Customer Care Center (CCC) at 1-888-778-2733.

**Table 16.23: Special Pilot Lighting**



## 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

Multispeed motors are available in two basic versions: 1) consequent pole, and 2) separate winding. A separate winding motor has a winding for each speed while a consequent pole motor has a winding for every two speeds (three-speed motors have two windings).

Devices require 6 thermal units (Sizes 0–6). See Digest Section 16 for selection information.

Table 16.24: Class 8810—Non-Combination Type

| Type of Motor                                               | NEMA Size | Maximum Polyphase Horsepower Ratings |       |           |                                           |       |           | NEMA 1 General Purpose Enclosure | NEMA 4 & 4X Watertight and Dusttight Enclosure (Stainless Steel) (304) (Sizes 0—5) Sheet Steel (Size 6) | NEMA 4X <sup>[1]</sup> Watertight, Dusttight and Corrosion Resistant Enclosure | NEMA 12/3R <sup>[2]</sup> Dusttight and Drip Tight Industrial Use Enclosure | Open Type |
|-------------------------------------------------------------|-----------|--------------------------------------|-------|-----------|-------------------------------------------|-------|-----------|----------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------|
|                                                             |           | Constant Horsepower Motors           |       |           | Constant Torque or Variable Torque Motors |       |           |                                  |                                                                                                         |                                                                                |                                                                             |           |
|                                                             |           | 200 V                                | 230 V | 460—575 V | 200 V                                     | 230 V | 460—575 V |                                  |                                                                                                         |                                                                                |                                                                             |           |
| Single Winding (Consequent Pole) 5-Pole—3-Pole              |           |                                      |       |           |                                           |       |           |                                  |                                                                                                         |                                                                                |                                                                             |           |
| Constant Hp                                                 | 0         | 2                                    | 2     | 3         | —                                         | —     | —         | SBG1●●●                          | SBW1●●●                                                                                                 | SBW51●●●                                                                       | SBA1●●●                                                                     | SBO1●●●   |
|                                                             | 1         | 5                                    | 5     | 7-1/2     | —                                         | —     | —         | SCG1●●●                          | SCW1●●●                                                                                                 | SCW51●●●                                                                       | SCA1●●●                                                                     | SCO1●●●   |
|                                                             | 2         | 7-1/2                                | 10    | 20        | —                                         | —     | —         | SDG1●●●                          | SDW1●●●                                                                                                 | SDW51●●●                                                                       | SDA1●●●                                                                     | SDO1●●●   |
|                                                             | 3         | 20                                   | 25    | 40        | —                                         | —     | —         | SFG1●●●                          | SEW1●●●                                                                                                 | —                                                                              | SEA1●●●                                                                     | SEO1●●●   |
|                                                             | 4         | 30                                   | 40    | 75        | —                                         | —     | —         | SFG1●●●                          | SFW1●●●                                                                                                 | —                                                                              | SFA1●●●                                                                     | SFO1●●●   |
|                                                             | 5         | 60                                   | 75    | 150       | —                                         | —     | —         | SGG1●●●                          | SGW1●●●                                                                                                 | —                                                                              | SGA1●●●                                                                     | SGO1●●●   |
| Constant Torque or Variable Torque                          | 6         | 100                                  | 150   | 300       | —                                         | —     | —         | SHG1●●●                          | SHW1●●●                                                                                                 | —                                                                              | SHA1●●●                                                                     | SHO1●●●   |
|                                                             | 0         | —                                    | —     | —         | 3                                         | 3     | 5         | SBG2●●●                          | SBW2●●●                                                                                                 | SBW52●●●                                                                       | SBA2●●●                                                                     | SBO2●●●   |
|                                                             | 1         | —                                    | —     | —         | 7-1/2                                     | 7-1/2 | 10        | SCG2●●●                          | SCW2●●●                                                                                                 | SCW52●●●                                                                       | SCA2●●●                                                                     | SCO2●●●   |
|                                                             | 2         | —                                    | —     | —         | 10                                        | 15    | 25        | SDG2●●●                          | SDW2●●●                                                                                                 | SDW52●●●                                                                       | SDA2●●●                                                                     | SDO2●●●   |
|                                                             | 3         | —                                    | —     | —         | 25                                        | 30    | 50        | SEG2●●●                          | SEW2●●●                                                                                                 | —                                                                              | SEA2●●●                                                                     | SEO2●●●   |
|                                                             | 4         | —                                    | —     | —         | 40                                        | 50    | 100       | SFG2●●●                          | SFW2●●●                                                                                                 | —                                                                              | SFA2●●●                                                                     | SFO2●●●   |
| Constant Torque or Variable Torque                          | 5         | —                                    | —     | —         | 75                                        | 100   | 200       | SGG2●●●                          | SGW2●●●                                                                                                 | —                                                                              | SGA2●●●                                                                     | SGO2●●●   |
|                                                             | 6         | —                                    | —     | —         | 150                                       | 200   | 400       | SHG2●●●                          | SHW2●●●                                                                                                 | —                                                                              | SHA2●●●                                                                     | SHO2●●●   |
| Two Winding (Separate Winding) 3-Pole—3-Pole <sup>[4]</sup> |           |                                      |       |           |                                           |       |           |                                  |                                                                                                         |                                                                                |                                                                             |           |
| Constant Hp <sup>[4]</sup>                                  | 0         | 2                                    | 2     | 3         | —                                         | —     | —         | SBG3●●●                          | SBW3●●●                                                                                                 | SBW53●●●                                                                       | SBA3●●●                                                                     | SBO3●●●   |
|                                                             | 1         | 5                                    | 5     | 7-1/2     | —                                         | —     | —         | SCG3●●●                          | SCW3●●●                                                                                                 | SCW53●●●                                                                       | SCA3●●●                                                                     | SCO3●●●   |
|                                                             | 2         | 7-1/2                                | 10    | 20        | —                                         | —     | —         | SDG3●●●                          | SDW3●●●                                                                                                 | SDW53●●●                                                                       | SDA3●●●                                                                     | SDO3●●●   |
|                                                             | 3         | 20                                   | 25    | 40        | —                                         | —     | —         | SEG3●●●                          | SEW3●●●                                                                                                 | —                                                                              | SEA3●●●                                                                     | SEO3●●●   |
|                                                             | 4         | 30                                   | 40    | 75        | —                                         | —     | —         | SFG3●●●                          | SFW3●●●                                                                                                 | —                                                                              | SFA3●●●                                                                     | SFO3●●●   |
|                                                             | 5         | 60                                   | 75    | 150       | —                                         | —     | —         | SGG3●●●                          | SGW3●●●                                                                                                 | —                                                                              | SGA3●●●                                                                     | SGO3●●●   |
|                                                             | 6         | 100                                  | 150   | 300       | —                                         | —     | —         | SHG3●●●                          | SHW3●●●                                                                                                 | —                                                                              | SHA3●●●                                                                     | SHO3●●●   |
| Constant Torque or Variable Torque <sup>[4]</sup>           | 7         | —                                    | 225   | 450       | —                                         | —     | —         | SJG3●●●                          | —                                                                                                       | —                                                                              | SJA3●●●                                                                     | SJO3●●●   |
|                                                             | 0         | —                                    | —     | —         | 3                                         | 3     | 5         | SBG4●●●                          | SBW4●●●                                                                                                 | SBW54●●●                                                                       | SBA4●●●                                                                     | SBO4●●●   |
|                                                             | 1         | —                                    | —     | —         | 7-1/2                                     | 7-1/2 | 10        | SCG4●●●                          | SCW4●●●                                                                                                 | SCW54●●●                                                                       | SCA4●●●                                                                     | SCO4●●●   |
|                                                             | 2         | —                                    | —     | —         | 10                                        | 15    | 25        | SDG4●●●                          | SDW4●●●                                                                                                 | SDW54●●●                                                                       | SDA4●●●                                                                     | SDO4●●●   |
|                                                             | 3         | —                                    | —     | —         | 25                                        | 30    | 50        | SEG4●●●                          | SEW4●●●                                                                                                 | —                                                                              | SEA4●●●                                                                     | SEO4●●●   |
|                                                             | 4         | —                                    | —     | —         | 40                                        | 50    | 100       | SFG4●●●                          | SFW4●●●                                                                                                 | —                                                                              | SFA4●●●                                                                     | SFO4●●●   |
|                                                             | 5         | —                                    | —     | —         | 75                                        | 100   | 200       | SGG4●●●                          | SGW4●●●                                                                                                 | —                                                                              | SGA4●●●                                                                     | SGO4●●●   |
| Constant Torque or Variable Torque <sup>[4]</sup>           | 6         | —                                    | —     | —         | 150                                       | 200   | 400       | SHG4●●●                          | SHW4●●●                                                                                                 | —                                                                              | SHA4●●●                                                                     | SHO4●●●   |
|                                                             | 7         | —                                    | —     | —         | —                                         | 300   | 600       | SJG4●●●                          | —                                                                                                       | —                                                                              | SJA4●●●                                                                     | SJO4●●●   |

Table 16.25: Class 8810—Combination Circuit Breaker Type (Thermal Magnetic Circuit Breakers) [5][6]

|                                                  |   |       |     |       |       |       |     |         |         |          |         |   |
|--------------------------------------------------|---|-------|-----|-------|-------|-------|-----|---------|---------|----------|---------|---|
| Single Winding (Consequent Pole) 5-Pole–3-Pole   |   |       |     |       |       |       |     |         |         |          |         |   |
| Constant Hp                                      | 0 | 2     | 2   | 3     | —     | —     | —   | CBG1●●● | CBW1●●● | CBW51●●● | CBA1●●● | — |
|                                                  | 1 | 5     | 5   | 7-1/2 | —     | —     | —   | CCG1●●● | CCW1●●● | CCW51●●● | CCA1●●● | — |
|                                                  | 2 | 7-1/2 | 10  | 20    | —     | —     | —   | CDG1●●● | CDW1●●● | CDW51●●● | CDA1●●● | — |
|                                                  | 3 | 20    | 25  | 40    | —     | —     | —   | CEG1●●● | CEW1●●● | —        | CEA1●●● | — |
|                                                  | 4 | 30    | 40  | 75    | —     | —     | —   | CFG1●●● | CFW1●●● | —        | CEA1●●● | — |
|                                                  | 5 | 60    | 75  | 150   | —     | —     | —   | CGG1●●● | CGW1●●● | —        | CEA1●●● | — |
| Constant Torque or Variable Torque               | 6 | 100   | 150 | 300   | —     | —     | —   | CHG1●●● | CHW1●●● | —        | CHA1●●● | — |
|                                                  | 0 | —     | —   | —     | 3     | 3     | 5   | CBG2●●● | CBW2●●● | CBW52●●● | CBA2●●● | — |
|                                                  | 1 | —     | —   | —     | 7-1/2 | 7-1/2 | 10  | CCG2●●● | CCW2●●● | CCW52●●● | CCA2●●● | — |
|                                                  | 2 | —     | —   | —     | 10    | 15    | 25  | CDG2●●● | CDW2●●● | CDW52●●● | CDA2●●● | — |
|                                                  | 3 | —     | —   | —     | 25    | 30    | 50  | CEG2●●● | CEW2●●● | —        | CEA2●●● | — |
|                                                  | 4 | —     | —   | —     | 40    | 50    | 100 | CFG2●●● | CFW2●●● | —        | CFA2●●● | — |
| Constant Torque or Variable Torque [4]           | 5 | —     | —   | —     | 75    | 100   | 200 | CGG2●●● | CGW2●●● | —        | CGA2●●● | — |
|                                                  | 6 | —     | —   | —     | 150   | 200   | 400 | CHG2●●● | CHW2●●● | —        | CHA2●●● | — |
| Two Winding (Separate Winding) 3-Pole–3-Pole [4] |   |       |     |       |       |       |     |         |         |          |         |   |
| Constant Hp [4]                                  | 0 | 2     | 2   | 3     | —     | —     | —   | CBG3●●● | CBW3●●● | CBW53●●● | CBA3●●● | — |
|                                                  | 1 | 5     | 5   | 7-1/2 | —     | —     | —   | CCG3●●● | CCW3●●● | CCW53●●● | CCA3●●● | — |
|                                                  | 2 | 7-1/2 | 10  | 20    | —     | —     | —   | CDG3●●● | CDW3●●● | CDW53●●● | CDA3●●● | — |
|                                                  | 3 | 20    | 25  | 40    | —     | —     | —   | CEG3●●● | CEW3●●● | —        | CEA3●●● | — |
|                                                  | 4 | 30    | 40  | 75    | —     | —     | —   | CFG3●●● | CFW3●●● | —        | CFA3●●● | — |
|                                                  | 5 | 60    | 75  | 150   | —     | —     | —   | CGG3●●● | CGW3●●● | —        | CGA3●●● | — |
|                                                  | 6 | 100   | 150 | 300   | —     | —     | —   | CHG3●●● | CHW3●●● | —        | CHA3●●● | — |
| Constant Torque or Variable Torque [4]           | 7 | —     | 225 | 450   | —     | —     | —   | CJG3●●● | —       | —        | CJA3●●● | — |
|                                                  | 0 | —     | —   | —     | 3     | 3     | 5   | CBG4●●● | CBW4●●● | CBW54●●● | CBA4●●● | — |
|                                                  | 1 | —     | —   | —     | 7-1/2 | 7-1/2 | 10  | CCG4●●● | CCW4●●● | CCW54●●● | CCA4●●● | — |
|                                                  | 2 | —     | —   | —     | 10    | 15    | 25  | CDG4●●● | CDW4●●● | CDW54●●● | CDA4●●● | — |
|                                                  | 3 | —     | —   | —     | 25    | 30    | 50  | CEG4●●● | CEW4●●● | —        | CEA4●●● | — |
|                                                  | 4 | —     | —   | —     | 40    | 50    | 100 | CFG4●●● | CFW4●●● | —        | CFA4●●● | — |
|                                                  | 5 | —     | —   | —     | 75    | 100   | 200 | CGG4●●● | CGW4●●● | —        | CGA4●●● | — |
|                                                  | 6 | —     | —   | —     | 150   | 200   | 400 | CHG4●●● | CHW4●●● | —        | CHA4●●● | — |
|                                                  | 7 | —     | —   | —     | —     | 300   | 600 | CJG4●●● | —       | —        | CJA4●●● | — |

[1] NEMA 4X hubs are included with each starter at no additional cost.

[2] NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

[3] Replace the bullets (●●●) with the voltage code when ordering this product. Refer to the standard voltage codes shown on page 16-3.

[4] Type numbers shown for three-phase, separate-winding motor starters apply only when motor windings are wye connected.

When motor windings are connected open delta, prices for three-phase, consequent pole motor starters apply.

[5] The NEC 1300% maximum setting for instantaneous trip circuit breakers may be inadequate for multispeed motors.

[6] Not available in Mag-Gard versions.

### 3-Pole Polyphase, 600 Vac Max., 50–60 Hz

Devices require 6 thermal units (Sizes 0–6). See Digest Section 16 for selection information.

**Table 16.26: Class 8810—Combination Disconnect Switch Type (Class H Fuse Clips)**

| Type of Motor                                  | NEMA Size | Maximum Polyphase Horsepower Ratings |       |           |                                           |       |           | Fuse Clip Size A | NEMA 1 General Purpose Enclosure | NEMA 4 & 4X Watertight and Dusttight Enclosure<br>Stainless Steel (304) (Sizes 0–5)<br>Sheet Steel (Size 6 not 4X) | NEMA 12/3R [7]<br>Dusttight and Driptight Industrial Use Enclosure |
|------------------------------------------------|-----------|--------------------------------------|-------|-----------|-------------------------------------------|-------|-----------|------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|                                                |           | Constant Horsepower Motors           |       |           | Constant Torque or Variable Torque Motors |       |           |                  |                                  |                                                                                                                    |                                                                    |
|                                                |           | 200 V                                | 230 V | 460–575 V | 200 V                                     | 230 V | 460–575 V |                  | Type [8]                         | Type [8]                                                                                                           | Type [8]                                                           |
| Single Winding (Consequent Pole) 5-Pole–3-Pole |           |                                      |       |           |                                           |       |           |                  |                                  |                                                                                                                    |                                                                    |
| Constant Hp                                    | 0         | 2                                    | 2     | 3         | —                                         | —     | —         | None 30 [9]      | UBG1●●●<br>DBG1●●●               | UBW1●●●<br>DBW1●●●                                                                                                 | UBA1●●●<br>DBA1●●●                                                 |
|                                                | 1         | 5                                    | 5     | 7-1/2     | —                                         | —     | —         | None 30 [9]      | UCG1●●●<br>DCG1●●●               | UCW1●●●<br>DCW1●●●                                                                                                 | UCA1●●●<br>DCA1●●●                                                 |
|                                                | 2         | 7-1/2                                | 10    | 20        | —                                         | —     | —         | None 60          | UDG1●●●<br>DDG1●●●               | UDW1●●●<br>DDW1●●●                                                                                                 | UDA1●●●<br>DDA1●●●                                                 |
|                                                | 3         | 20                                   | 25    | 40        | —                                         | —     | —         | None 100         | UEG1●●●<br>DEG1●●●               | UEW1●●●<br>DEW1●●●                                                                                                 | UEA1●●●<br>DEA1●●●                                                 |
|                                                | 4         | 30                                   | 40    | 75        | —                                         | —     | —         | None 200         | UFG1●●●<br>DFG1●●●               | UFW1●●●<br>DFW1●●●                                                                                                 | UFA1●●●<br>DFA1●●●                                                 |
|                                                | 5         | 60                                   | 75    | 150       | —                                         | —     | —         | None 400         | UGG1●●●<br>DGG1●●●               | UGW1●●●<br>DGW1●●●                                                                                                 | UGA1●●●<br>DGA1●●●                                                 |
|                                                | 6         | 100                                  | 150   | 300       | —                                         | —     | —         | None 600         | UHG1●●●<br>DHG1●●●               | UHW1●●●<br>DHW1●●●                                                                                                 | UHA1●●●<br>DHA1●●●                                                 |
| Constant Torque or Variable Torque             | 0         | —                                    | —     | —         | 3                                         | 3     | 5         | None 30 [9]      | UBG2●●●<br>DBG2●●●               | UBW2●●●<br>DBW2●●●                                                                                                 | UBA2●●●<br>DBA2●●●                                                 |
|                                                | 1         | —                                    | —     | —         | 7-1/2                                     | 7-1/2 | 10        | None 30 [9]      | UCG2●●●<br>DCG2●●●               | UCW2●●●<br>DCW2●●●                                                                                                 | UCA2●●●<br>DCA2●●●                                                 |
|                                                | 2         | —                                    | —     | —         | 10                                        | 15    | 25        | None 60          | UDG2●●●<br>DDG2●●●               | UDW2●●●<br>DDW2●●●                                                                                                 | UDA2●●●<br>DDA2●●●                                                 |
|                                                | 3         | —                                    | —     | —         | 25                                        | 30    | 50        | None 100         | UEG2●●●<br>DEG2●●●               | UEW2●●●<br>DEW2●●●                                                                                                 | UEA2●●●<br>DEA2●●●                                                 |
|                                                | 4         | —                                    | —     | —         | 40                                        | 50    | 100       | None 200         | UFG2●●●<br>DFG2●●●               | UFW2●●●<br>DFW2●●●                                                                                                 | UFA2●●●<br>DFA2●●●                                                 |
|                                                | 5         | —                                    | —     | —         | 75                                        | 100   | 200       | None 400         | UGG2●●●<br>DGG2●●●               | UGW2●●●<br>DGW2●●●                                                                                                 | UGA2●●●<br>DGA2●●●                                                 |
|                                                | 6         | —                                    | —     | —         | 150                                       | 200   | 400       | None 600         | UHG2●●●<br>DHG2●●●               | UHW2●●●<br>DHW2●●●                                                                                                 | UHA2●●●<br>DHA2●●●                                                 |
| Two Winding (Separate Winding) 3-Pole–3-Pole   |           |                                      |       |           |                                           |       |           |                  |                                  |                                                                                                                    |                                                                    |
| Constant Hp [10]                               | 0         | 2                                    | 2     | 3         | —                                         | —     | —         | None 30 [9]      | UBG3●●●<br>DBG3●●●               | UBW3●●●<br>DBW3●●●                                                                                                 | UBA3●●●<br>DBA3●●●                                                 |
|                                                | 1         | 5                                    | 5     | 7-1/2     | —                                         | —     | —         | None 30 [9]      | UCG3●●●<br>DCG3●●●               | UCW3●●●<br>DCW3●●●                                                                                                 | UCA3●●●<br>DCA3●●●                                                 |
|                                                | 2         | 7-1/2                                | 10    | 20        | —                                         | —     | —         | None 60          | UDG3●●●<br>DDG3●●●               | UDW3●●●<br>DDW3●●●                                                                                                 | UDA3●●●<br>DDA3●●●                                                 |
|                                                | 3         | 20                                   | 25    | 40        | —                                         | —     | —         | None 100         | UEG3●●●<br>DEG3●●●               | UEW3●●●<br>DEW3●●●                                                                                                 | UEA3●●●<br>DEA3●●●                                                 |
|                                                | 4         | 30                                   | 40    | 75        | —                                         | —     | —         | None 200         | UFG3●●●<br>DFG3●●●               | UFW3●●●<br>DFW3●●●                                                                                                 | UFA3●●●<br>DFA3●●●                                                 |
|                                                | 5         | 60                                   | 75    | 150       | —                                         | —     | —         | None 400         | UGG3●●●<br>DGG3●●●               | UGW3●●●<br>DGW3●●●                                                                                                 | UGA3●●●<br>DGA3●●●                                                 |
|                                                | 6         | 100                                  | 150   | 300       | —                                         | —     | —         | None 600         | UHG3●●●<br>DHG3●●●               | UHW3●●●<br>DHW3●●●                                                                                                 | UHA3●●●<br>DHA3●●●                                                 |
| Constant Torque or Variable Torque [10]        | 0         | —                                    | —     | —         | 3                                         | 3     | 5         | None 30 [9]      | UBG4●●●<br>DBG4●●●               | UBW4●●●<br>DBW4●●●                                                                                                 | UBA4●●●<br>DBA4●●●                                                 |
|                                                | 1         | —                                    | —     | —         | 7-1/2                                     | 7-1/2 | 10        | None 30 [9]      | UCG4●●●<br>DCG4●●●               | UCW4●●●<br>DCW4●●●                                                                                                 | UCA4●●●<br>DCA4●●●                                                 |
|                                                | 2         | —                                    | —     | —         | 10                                        | 15    | 25        | None 60          | UDG4●●●<br>DDG4●●●               | UDW4●●●<br>DDW4●●●                                                                                                 | UDA4●●●<br>DDA4●●●                                                 |
|                                                | 3         | —                                    | —     | —         | 25                                        | 30    | 50        | None 100         | UEG4●●●<br>DEG4●●●               | UEW4●●●<br>DEW4●●●                                                                                                 | UEA4●●●<br>DEA4●●●                                                 |
|                                                | 4         | —                                    | —     | —         | 40                                        | 50    | 100       | None 200         | UFG4●●●<br>DFG4●●●               | UFW4●●●<br>DFW4●●●                                                                                                 | UFA4●●●<br>DFA4●●●                                                 |
|                                                | 5         | —                                    | —     | —         | 75                                        | 100   | 200       | None 400         | UGG4●●●<br>DGG4●●●               | UGW4●●●<br>DGW4●●●                                                                                                 | UGA4●●●<br>DGA4●●●                                                 |
|                                                | 6         | —                                    | —     | —         | 150                                       | 200   | 400       | None 600         | UHG4●●●<br>DHG4●●●               | UHW4●●●<br>DHW4●●●                                                                                                 | UHA4●●●<br>DHA4●●●                                                 |

**Table 16.27: Coil Voltage Codes**

| Voltage     |         | Code |
|-------------|---------|------|
| 60 Hz       | 50 Hz   |      |
| 24 [11][12] | —       | V01  |
| 120 [12]    | 110     | V02  |
| 208         | —       | V08  |
| 240         | 220     | V03  |
| —           | 380     | V05  |
| 480         | 440     | V06  |
| 600         | 550     | V07  |
| Specify     | Specify | V99  |

**NOTE:** For voltage codes used with control transformers, see page 16-18. **Form S** (separate control) is used when a separate source of power is available for the control (coil) voltage. Form S is provided at no charge.

For dimensions, see page 16-13.

Refer to Digest Section 16 factory modifications (Forms), replacement parts (Class 9998), and Type S accessories (Class 9999).

[7] NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

[8] Replace the bullets (●●●) with the voltage code when ordering this product. Refer to the standard voltage codes shown in Table 16.27.

[9] When separate control is specified, use V8x voltage codes (see Table 16.53) to specify motor and control voltages.

[10] Type numbers shown for three-phase, separate-winding motor starters apply only when motor windings are wye connected.

When motor windings are connected open delta, prices for three-phase, consequent pole motor starters apply.

[11] 24 V coils are not available on Sizes 4–7. On Sizes 00–3, 24 V coils are available using **Form S** (separate control) (for example, order as 8810UBG1V01S).

[12] These voltage codes must include **Form S** (provided at no charge) (for example, order as 8810UCG1V02S).

## 3-Pole Polyphase, 600 Vac Max., 50–60 Hz

Devices require 6 thermal units (Sizes 0–6). See Digest Section 16 for selection information.

Table 16.28: Class 8810—Reversing

| Type of Motor                                        | NEMA Size | Maximum Polyphase Ratings |       |           |                                           |       |           | Reversing In One Speed Only (Specify High or Low) [13] |                                                           |           | Reversing In Both Speeds         |                                                                   |           |
|------------------------------------------------------|-----------|---------------------------|-------|-----------|-------------------------------------------|-------|-----------|--------------------------------------------------------|-----------------------------------------------------------|-----------|----------------------------------|-------------------------------------------------------------------|-----------|
|                                                      |           | Constant Hp Motors        |       |           | Constant Torque or Variable Torque Motors |       |           | NEMA 1 General Purpose Enclosure                       | NEMA 12 Dusttight and Drip-tight Industrial Use Enclosure | Open Type | NEMA 1 General Purpose Enclosure | NEMA 12/3R [14] Dusttight and Drip-tight Industrial Use Enclosure | Open Type |
|                                                      |           | 200 V                     | 230 V | 460–575 V | 200 V                                     | 230 V | 460–575 V | Type [15]                                              | Type [15]                                                 | Type [15] | Type [15]                        | Type [15]                                                         | Type      |
| Single Winding, Constant Hp                          | 0         | 2                         | 2     | 3         | —                                         | —     | —         | SBG21•••                                               | SBA21•••                                                  | SBO21•••  | SBG31•••                         | SBA31•••                                                          | SBO31•••  |
|                                                      | 1         | 5                         | 5     | 7-1/2     | —                                         | —     | —         | SCG21•••                                               | SCA21•••                                                  | SCO21•••  | SCG31•••                         | SCA31•••                                                          | SCO31•••  |
|                                                      | 2         | 7-1/2                     | 10    | 20        | —                                         | —     | —         | SDG21•••                                               | SDA21•••                                                  | SDO21•••  | SDG31•••                         | SDA31•••                                                          | SDO31•••  |
|                                                      | 3         | 20                        | 25    | 40        | —                                         | —     | —         | SEG21•••                                               | SEA21•••                                                  | SEO21•••  | SEG31•••                         | SEA31•••                                                          | SEO31•••  |
|                                                      | 4         | 30                        | 40    | 75        | —                                         | —     | —         | SFG21•••                                               | SFA21•••                                                  | SFO21•••  | SFG31•••                         | SFA31•••                                                          | SFO31•••  |
| Single Winding, Constant Torque or Variable Torque   | 5         | 60                        | 75    | 150       | —                                         | —     | —         | SGG21•••                                               | SGA21•••                                                  | SGO21•••  | SGG31•••                         | SGA31•••                                                          | SGO31•••  |
|                                                      | 0         | —                         | —     | —         | 3                                         | 3     | 5         | SBG22•••                                               | SBA22•••                                                  | SBO22•••  | SBG32•••                         | SBA32•••                                                          | SBO32•••  |
|                                                      | 1         | —                         | —     | —         | 7-1/2                                     | 7-1/2 | 10        | SCG22•••                                               | SCA22•••                                                  | SCO22•••  | SCG32•••                         | SCA32•••                                                          | SCO32•••  |
|                                                      | 2         | —                         | —     | —         | 10                                        | 15    | 25        | SDG22•••                                               | SDA22•••                                                  | SDO22•••  | SDG32•••                         | SDA32•••                                                          | SDO32•••  |
|                                                      | 3         | —                         | —     | —         | 25                                        | 30    | 50        | SEG22•••                                               | SEA22•••                                                  | SEO22•••  | SEG32•••                         | SEA32•••                                                          | SEO32•••  |
| Two Winding, Constant Hp [16]                        | 4         | —                         | —     | —         | 40                                        | 50    | 100       | SFG22•••                                               | SFA22•••                                                  | SFO22•••  | SFG32•••                         | SFA32•••                                                          | SFO32•••  |
|                                                      | 5         | —                         | —     | —         | 75                                        | 100   | 200       | SGG22•••                                               | SGA22•••                                                  | SGO22•••  | SGG32•••                         | SGA32•••                                                          | SGO32•••  |
|                                                      | 0         | 2                         | 2     | 3         | —                                         | —     | —         | SBG23•••                                               | SBA23•••                                                  | SBO23•••  | SBG33•••                         | SBA33•••                                                          | SBO33•••  |
|                                                      | 1         | 5                         | 5     | 7-1/2     | —                                         | —     | —         | SCG23•••                                               | SCA23•••                                                  | SCO23•••  | SCG33•••                         | SCA33•••                                                          | SCO33•••  |
|                                                      | 2         | 7-1/2                     | 10    | 20        | —                                         | —     | —         | SDG23•••                                               | SDA23•••                                                  | SDO23•••  | SDG33•••                         | SDA33•••                                                          | SDO33•••  |
| Two Winding, Constant Torque or Variable Torque [16] | 3         | 20                        | 25    | 40        | —                                         | —     | —         | SEG23•••                                               | SEA23•••                                                  | SEO23•••  | SEG33•••                         | SEA33•••                                                          | SEO33•••  |
|                                                      | 4         | 30                        | 40    | 75        | —                                         | —     | —         | SFG23•••                                               | SFA23•••                                                  | SFO23•••  | SFG33•••                         | SFA33•••                                                          | SFO33•••  |
|                                                      | 5         | 60                        | 75    | 150       | —                                         | —     | —         | SGG23•••                                               | SGA23•••                                                  | SGO23•••  | SGG33•••                         | SGA33•••                                                          | SGO33•••  |
|                                                      | 0         | —                         | —     | —         | 3                                         | 3     | 5         | SBG24•••                                               | SBA24•••                                                  | SBO24•••  | SBG34•••                         | SBA34•••                                                          | SBO34•••  |
|                                                      | 1         | —                         | —     | —         | 7-1/2                                     | 7-1/2 | 10        | SCG24•••                                               | SCA24•••                                                  | SCO24•••  | SCG34•••                         | SCA34•••                                                          | SCO34•••  |
| Two Winding, Constant Torque or Variable Torque [16] | 2         | —                         | —     | —         | 10                                        | 15    | 25        | SDG24•••                                               | SDA24•••                                                  | SDO24•••  | SDG34•••                         | SDA34•••                                                          | SDO34•••  |
|                                                      | 3         | —                         | —     | —         | 25                                        | 30    | 50        | SEG24•••                                               | SEA24•••                                                  | SEO24•••  | SEG34•••                         | SEA34•••                                                          | SEO34•••  |
|                                                      | 4         | —                         | —     | —         | 40                                        | 50    | 100       | SFG24•••                                               | SFA24•••                                                  | SFO24•••  | SFG34•••                         | SFA34•••                                                          | SFO34•••  |
|                                                      | 5         | —                         | —     | —         | 75                                        | 100   | 200       | SGG24•••                                               | SGA24•••                                                  | SGO24•••  | SGG34•••                         | SGA34•••                                                          | SGO34•••  |

## 3-Pole Polyphase, 600 Vac Max., 50–60 Hz

Devices require 6 thermal units (Sizes 0–6). See Digest Section 16 for selection information.

Table 16.29: Class 8810—Non-Reversing, Vertically Arranged, Open Type, Two-Speed Starters

| Type of Motor                      | NEMA Size | Maximum Hp Ratings |       |       |           | For Consequent Pole Motors | For Separate Winding Motors |
|------------------------------------|-----------|--------------------|-------|-------|-----------|----------------------------|-----------------------------|
|                                    |           | 200 V              | 230 V | 380 V | 460–575 V | Type [15]                  | Type [15]                   |
| Constant Hp                        | 0         | 2                  | 2     | 3     | 3         | SBO11•••                   | SBO13•••                    |
|                                    | 1         | 5                  | 5     | 7-1/2 | 7-1/2     | SCO11•••                   | SCO13•••                    |
|                                    | 2         | 7-1/2              | 10    | 20    | 20        | SDO11•••                   | SDO13•••                    |
|                                    | 3         | 20                 | 25    | 40    | 40        | SEO11•••                   | SEO13•••                    |
|                                    | 4         | 30                 | 40    | 60    | 75        | SFO11•••                   | SFO13•••                    |
| Constant Torque or Variable Torque | 0         | 3                  | 3     | 5     | 5         | SBO12•••                   | SBO14•••                    |
|                                    | 1         | 7-1/2              | 7-1/2 | 10    | 10        | SCO12•••                   | SCO14•••                    |
|                                    | 2         | 10                 | 15    | 25    | 25        | SDO12•••                   | SDO14•••                    |
|                                    | 3         | 25                 | 30    | 50    | 50        | SEO12•••                   | SEO14•••                    |
|                                    | 4         | 40                 | 50    | 75    | 100       | SFO12•••                   | SFO14•••                    |

Table 16.30: Coil Voltage Codes

| Voltage      |         | Code |
|--------------|---------|------|
| 60 Hz        | 50 Hz   |      |
| 24 [17] [18] | —       | V01  |
| 120 [18]     | 110     | V02  |
| 208          | —       | V08  |
| 240          | 220     | V03  |
| —            | 380     | V05  |
| 480          | 440     | V06  |
| 600          | 550     | V07  |
| Specify      | Specify | V99  |

**NOTE:** For voltage codes used with control transformers, see page 16-18.

**Form S** (separate control) is used when a separate source of power is available for the control (coil) voltage.

Form S is provided at no charge.

For dimensions, see page 16-13.

Refer to Digest Section 16 for factory modifications (Forms), replacement parts (Class 9998), and Type S accessories (Class 9999).

[13] Specify the speed that requires reversing by adding an L (low) or an H (high) after the type number—for example, a Class 8810 Type SBG21 with reversing in low only would be ordered as a Class 8810 Type SBG21L.

[14] NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service-entrance rated applications. See Digest Section 16 for more information.

[15] Replace the bullets (•••) with the voltage code when ordering this product. Refer to the standard voltage codes shown in Table 16.30.

[16] Type numbers shown for three-phase, separate-winding motor starters apply only when motor windings are wye connected.

When motor windings are connected open delta, prices for three-phase, consequent pole motor starters apply.

[17] 24 V coils are not available on Sizes 4–7. On Sizes 00–3, 24 V coils are available using **Form S** (separate control) (for example, order as 8810SCG21V01S).

[18] These voltage codes must include **Form S** (provided at no charge) (for example, order as 8810SDG21V02S).

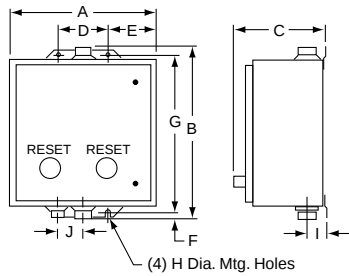


Figure 1:  
NEMA Type 1, 4, and 12 Enclosures

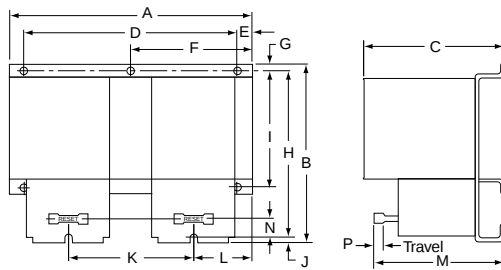


Figure 2:  
Class 8810 NEMA Sizes 0, 1, and 2

## Dimensions

**Table 16.31: NEMA Type 1 Enclosure (see Figure 1)**

| Type                  | A                | B       | C        | D           | E       | F       | G      | H    |
|-----------------------|------------------|---------|----------|-------------|---------|---------|--------|------|
| SBG and SCG           | 11-7/8           | 11-7/8  | 7-17/32  | 9-3/4       | 1-1/16  | 1-1/16  | 9-3/4  | 5/16 |
| SDG                   | 14-7/8           | 14-1/8  | 7-21/32  | 12-3/4      | 1-1/16  | 1-1/16  | 12     | 5/16 |
| SEG3 & 4 and SFG3 & 4 | 18-5/32          | 29-5/32 | 9-15/64  | 15-1/2      | 1-11/32 | 1-11/32 | 26-1/2 | 7/16 |
| SEG1 & 2 and SFG1 & 2 | 22-5/32          | 39-5/32 | 10-15/64 | 19-1/2      | 1-11/32 | 1-11/32 | 36-1/2 | 7/16 |
| SGG1, 2, 3, 4         | 20-7/32          | 65-3/4  | 16-29/64 | 31          | 2-1/8   | 2-1/8   | 42     | 9/16 |
| SHG1, 2, 3, 4         | 36-7/32          | 62-7/32 | 19-15/32 |             |         |         |        |      |
| SJG3 & 4              | Consult Square D |         |          | Floor Mount |         |         |        |      |

**Table 16.32: NEMA Type 4 Enclosure (see Figure 1)**

| Type                  | A       | B        | C       | D     | E      | F     | G      | H    | I       | J       |
|-----------------------|---------|----------|---------|-------|--------|-------|--------|------|---------|---------|
| SBW and SCW           | 12-5/8  | 14-11/16 | 7-13/16 | 4-1/4 | 4-3/16 | 19/32 | 13-1/2 | 5/16 | 1-21/32 | 2-5/16  |
| SDW                   | 14-7/8  | 15-3/4   | 8-1/4   | 4-1/4 | 5-5/16 | 3/8   | 15     | 5/16 | 2-1/32  | 2-5/8   |
| SEW3 & 4 and SFW3 & 4 | 18-5/32 | 32-7/32  | 8-19/64 | 12    | 3-5/64 | 55/64 | 30-1/2 | 7/16 | 2-37/64 | 3-3/16  |
| SEW1 & 2 and SFW1 & 2 | 22-5/32 | 42-7/32  | 9-49/64 | 16    | 3-5/64 | 55/64 | 40-1/2 | 7/16 | 2-21/64 | 2-57/64 |
| SGW1, 2, 3, 4         | 35-7/32 | 49-7/32  | 12-1/8  | 27    | 4-3/32 | 39/64 | 48     | 9/16 | 2-63/64 | 3-1/2   |

**Table 16.33: NEMA Type 12/3R Enclosure (see Figure 1)**

| Type                  | A                | B       | C        | D           | E       | F   | G      | H    |
|-----------------------|------------------|---------|----------|-------------|---------|-----|--------|------|
| SBA and SCA           | 11-7/8           | 13-1/2  | 7-3/4    | 4-1/4       | 3-13/16 | 3/8 | 12-3/4 | 5/16 |
| SDA                   | 14-7/8           | 15-3/4  | 7-7/8    | 4-1/4       | 5-5/16  | 3/8 | 15     | 5/16 |
| SEA3 & 4 and SFA3 & 4 | 18-5/32          | 31-1/2  | 9-19/32  | 16          | 3-3/32  | 1/2 | 30-1/2 | 7/16 |
| SEA1 & 2 and SFA1 & 2 | 22-5/32          | 41-1/2  | 10-19/32 | 16          | 3-3/32  | 1/2 | 40-1/2 | 7/16 |
| SGA1, 2, 3, 4         | 35-7/32          | 49      | 13-7/64  | 27          | 4-7/64  | 1/2 | 48     | 9/16 |
| SHA1, 2, 3, 4         | 36-7/32          | 62-7/32 | 19-15/32 |             |         |     |        |      |
| SJA3 & 4              | Consult Square D |         |          | Floor Mount |         |     |        |      |

**Table 16.34: Non-Reversing, Open Type**

| Fig. No. | NEMA Size | Type               | Mtg. Holes                                                | A        | B        | C       | D       | E       | F       | G     | H       | I       | J       | K        | L       | M       | N      |
|----------|-----------|--------------------|-----------------------------------------------------------|----------|----------|---------|---------|---------|---------|-------|---------|---------|---------|----------|---------|---------|--------|
| 2        | 0 and 1   | SBO1, 2<br>SCO1, 2 | 4                                                         | 9-5/8    | 7-11/32  | 5-5/16  | 8       | 5/8     | —       | 7/32  | 6-29/32 | —       | 7/32    | 4-3/4    | 2-1/4   | 5-1/16  | 19/32  |
|          |           | SBO3, 4<br>SCO3, 4 | 3                                                         | 7-1/8    | 6-29/32  | 5-5/16  | —       | —       | 3-13/32 | 15/32 | 6-7/32  | —       | 7/32    | 3-9/16   | 1-5/8   | 5-1/16  | 19/32  |
|          | 2         | SDO1, 2            | 6                                                         | 12-1/32  | 8-17/32  | 6-1/32  | 10-3/8  | 1/2     | —       | 1/4   | 8-1/8   | 6-1/4   | 5/32    | 5-3/4    | 2-13/16 | 5-5/32  | 25/32  |
|          |           | SDO3, 4            | 3                                                         | 9        | 8-1/16   | 6-1/32  | —       | —       | 4-1/2   | 3/8   | 7-1/2   | —       | 3/16    | 4-11/32  | 2-5/32  | 5-5/32  | 25/32  |
| 3        | 3         | SEO1, 2            | 4                                                         | 18       | 14-7/16  | 17      | 12-1/4  | 1-1/2   | 11/16   | 1/2   | 6-7/16  | 7-3/8   | 1-21/32 | 2-5/32   | —       | —       | —      |
|          |           | SEO3, 4            | 4                                                         | 12-3/4   | 12-9/32  | 11-3/4  | 10-3/4  | 1-1/32  | 1/2     | 1/2   | 2-1/2   | 6-3/4   | 1-5/32  | 1-5/32   | —       | —       | —      |
|          | 4         | SFO1, 2            | 4                                                         | 18-5/8   | 15-19/32 | 17      | 12-1/4  | 1-27/32 | 1-1/2   | 1-1/8 | 6-7/16  | 7-21/32 | 1-21/32 | 1-21/32  | —       | —       | —      |
|          |           | SFO3, 4            | 4                                                         | 14-1/4   | 14-19/32 | 13-1/4  | 12-1/4  | 1-27/32 | 1/2     | 1/2   | 2-15/16 | 7-3/8   | 1-21/32 | 1-21/32  | —       | —       | —      |
| 4        | 5         | SGO1, 2<br>[19]    | 4                                                         | 29-9/32  | 20-9/32  | 9-3/8   | 5-13/32 | 1-9/32  | 28      | 5/8   | 12-9/16 | 19      | 5/8     | 22-17/32 | 1/2     | 2-13/32 | 6-5/8  |
|          |           | SGO3, 4            | 4                                                         | 19-9/32  | 20-9/32  | 9-3/8   | 5-13/32 | 1-9/32  | 18      | 5/8   | 2-5/8   | 19      | 5/8     | 12-17/32 | 1/2     | 2-13/32 | 6-5/8  |
| 4        | 6 [20]    | SHO1, 2<br>[19]    | 4                                                         | 29-17/32 | 22-7/16  | 9-17/32 | 6-31/32 | 3-13/16 | 28      | 3/4   | 11-5/8  | 21-3/16 | 5/8     | 9-7/8    | 9/16    | 3-1/32  | 9-5/16 |
|          |           | SHO3, 4            | 4                                                         | 19-17/32 | 22-7/16  | 9-17/32 | 6-31/32 | 3-13/16 | 18      | 3/4   | 21-3/16 | 1-11/16 | 5/8     | 9-7/8    | 9/16    | 3-1/32  | 9-5/16 |
| —        | 7 [21]    | SJO3, 4            | Consult the Customer Care Center (CCC) at 1-888-778-2733. |          |          |         |         |         |         |       |         |         |         |          |         |         |        |

**NOTE:** Illustrations are for dimensional information only and may not represent the actual enclosure. Dimension units are in. or in. (mm).

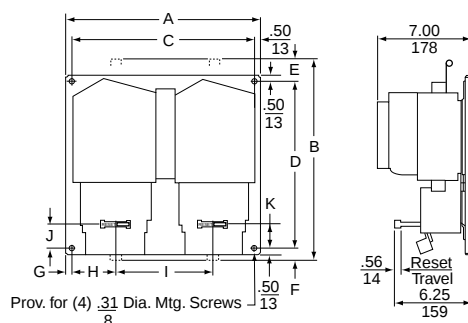


Figure 3: Class 8810 NEMA Sizes 3 and 4

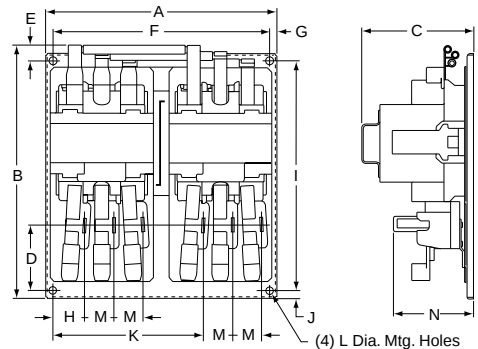


Figure 4: Class 8810 NEMA Size 5 and 6

[19] Consequent pole style starters consist of two 3-pole starters as pictured in Figure 4 and an additional 2-pole shorting contactor (not shown), all on a common baseplate, horizontally mounted.

[20] Current transformers used with Size 1 overload relay blocks.

[21] Solid-state overload relays and special current transformers.

## Disconnect Switch or Circuit Breaker Type

Dimensions are for reference only. For precise measurements, contact the Customer Care Center (CCC) at 1-888-778-2733.

Table 16.35: Class 8810, NEMA 1 Enclosure, Figure 1

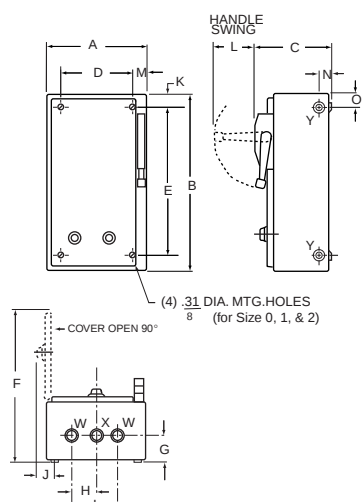
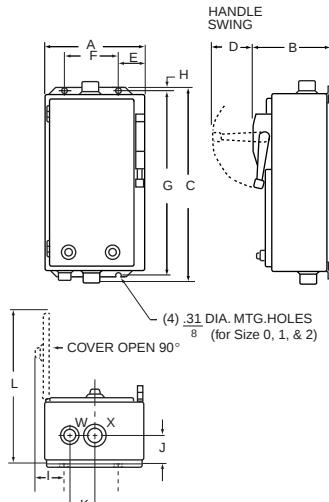
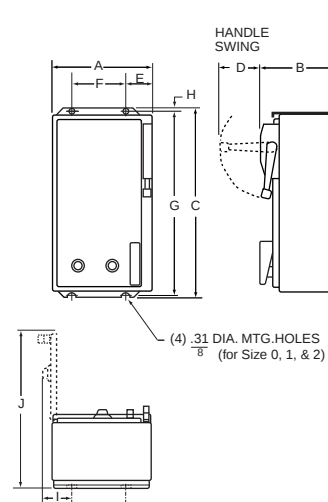
| NEMA Size | Type                       | Dimensions (in.)—see Figure 1 |       |       |       |       |       |      |      |      |      |      |     |      |      |      | Hubs         |            |       |
|-----------|----------------------------|-------------------------------|-------|-------|-------|-------|-------|------|------|------|------|------|-----|------|------|------|--------------|------------|-------|
|           |                            |                               |       |       |       |       |       |      |      |      |      |      |     |      |      |      | Top & Bottom |            | Sides |
|           |                            | A                             | B     | C     | D     | E     | F     | G    | H    | I    | J    | K    | L   | M    | N    | O    | W            | X          | Y     |
| 0-1       | CBG UBG DBG<br>CCG UCG DCG | 13.88                         | 23.13 | 8.25  | 10.63 | 21    | 19.28 | 1.88 | 1.88 | 3.75 | 2.31 | 1.06 | 3.3 | 2.19 | 1.25 | 0.88 | 0.5-0.75-1   | 0.5-0.75-1 | 0.5   |
| 2         | CDG UDG DDG                | 15.16                         | 28.91 | 9.56  | 11.63 | 26.25 | 21.81 | 2.19 | 2    | 4    | 2.63 | 1.33 | 3.3 | 2.22 | 1.27 | 0.91 | 1-1.25       | 0.5-0.75   | 0.5   |
| 3 [22]    | CEG UEG DEG                | 22.13                         | 42.63 | 10.13 | 18.63 | 40    | 29.13 | 2.34 | 2.13 | 4.25 | 2.63 | 1.25 | 3.3 | 2.25 | 0.88 | 0.75 | 1-1.25-1.5   | 0.5-0.75   | 0.5   |
| 4 [22]    | CFG UFG DFG                | 22.13                         | 50.13 | 10.19 | 18.63 | 47.5  | 29.19 | 2.91 | 2.69 | 5.38 | 2.63 | 1.31 | 3.3 | 2.25 | 0.88 | 0.75 | 2.5          | 0.5-0.75   | 0.5   |

Table 16.36: Class 8810, NEMA 4 Enclosure, Figure 2

| NEMA Size | Type                             | Dimensions (in.)—see Figure 2 |       |       |     |      |      |       |      |      |      |      |       | Hubs        |                   |
|-----------|----------------------------------|-------------------------------|-------|-------|-----|------|------|-------|------|------|------|------|-------|-------------|-------------------|
|           |                                  | A                             | B     | C     | D   | E    | F    | G     | H    | I    | J    | K    | L     | Bottom<br>W | Top & Bottom<br>X |
| 0–1       | CBW UBW<br>DBW<br>CCW UCW<br>DCW | 13.88                         | 8.33  | 25.19 | 3.3 | 2.56 | 8.75 | 24    | 0.59 | 3.95 | 1.63 | 2.31 | 18.53 | 0.75        | 1                 |
| 2         | CDW UDW<br>DDW                   | 15.13                         | 9.58  | 30.94 | 3.3 | 2.56 | 10   | 29.75 | 0.59 | 3.95 | 2    | 2.63 | 21.34 | 0.75        | 1.5               |
| 3 [22]    | CEW UEW<br>DEW                   | 22.13                         | 10.13 | 46.25 | 3.3 | 3    | 16   | 44    | 0.63 | 3.94 | 1.75 | 2.63 | 29.13 | 0.75        | 2                 |
| 4 [22]    | CFW UFW DFW                      | 22.13                         | 10.19 | 53.75 | 3.3 | 3    | 16   | 51.5  | 0.63 | 3.94 | 2.28 | 3.19 | 29.19 | 0.75        | 2.5               |

Table 16.37: Class 8810, NEMA 12 Enclosure, Figure 3

| NEMA Size | Type                       | Dimensions (in.)—see Figure 3 |       |       |     |      |      |       |      |      |       |
|-----------|----------------------------|-------------------------------|-------|-------|-----|------|------|-------|------|------|-------|
|           |                            | A                             | B     | C     | D   | E    | F    | G     | H    | I    | J     |
| 0-1       | CBA UBA DBA<br>CCA UCA DCA | 13.88                         | 10.09 | 24.75 | 3.3 | 2.56 | 8.75 | 24    | 0.38 | 3.95 | 20.28 |
| 2         | CDA UDA DDA                | 15.16                         | 10.97 | 31.25 | 3.3 | 3.08 | 9    | 30.25 | 0.5  | 4.83 | 23.44 |
| 3 [22]    | CEA UEA DEA                | 22.13                         | 10.13 | 45    | 3.3 | 3    | 16   | 44    | 0.63 | 3.94 | 29.13 |
| 4 [22]    | CFA UFA DFA                | 22.13                         | 10.19 | 52.5  | 3.3 | 3    | 16   | 51.5  | 0.63 | 3.94 | 29.19 |

Figure 1:  
NEMA Type 1 EnclosureFigure 2:  
NEMA Type 4 EnclosureFigure 3:  
NEMA Type 12 Enclosure

**NOTE:** Illustrations are intended for dimensional information only and may not represent the actual enclosure. Dimensions are shown in inches.

[22] **Size 3** (5-Pole-3-Pole) with FA, KA circuit breaker or 100 A disconnect switch. **Size 4** (5-Pole-3-Pole) with KA circuit breaker or 200 A disconnect switch. **Size 3 & 4** (3-Pole-3-Pole) enclosures may be smaller. Consult the Customer Care Center (CCC) at 1-888-778-2733 for additional dimensional information.



Panel Mount



## General Information

Panelboard lighting contactors, sometimes called remote control switches, are designed for use with lighting panelboards and motor control centers where either panel or bus mounting is desired. Type PB lighting contactors can be used in a retrofit or new project without increasing the panelboard depth. They can be used to directly replace many inoperative existing switches.

The features include: mechanically held; compatible with Square D panelboards; short-circuit ratings to 100 kA; compact arc suppression; bus or panel mounted; fits in standard-depth lighting panelboards; easy manual operation; standard coil clearing contacts; and operates in any position.

**Table 16.38: Class 8903 Type PB Lighting Contactors**

| Description |       | Bus Mount | Panel Mount (Includes Lugs) |
|-------------|-------|-----------|-----------------------------|
| Size (A)    | Poles | Type [1]  | Type [1]                    |
| 30          | 2     | PBM10B●●● | PBM10●●●                    |
|             | 3     | PBM11B●●● | PBM11●●●                    |
| 60          | 2     | PBP10B●●● | PBP10●●●                    |
|             | 3     | PBP11B●●● | PBP11●●●                    |
| 75          | 2     | PBN10B●●● | PBN10●●●                    |
|             | 3     | PBN11B●●● | PBN11●●●                    |
| 100         | 2     | PBQ10B●●● | PBQ10●●●                    |
|             | 3     | PBQ11B●●● | PBQ11●●●                    |
| 150         | 2     | PBR10B●●● | PBR10●●●                    |
|             | 3     | PBR11B●●● | PBR11●●●                    |
| 200         | 2     | PBV10B●●● | PBV10●●●                    |
|             | 3     | PBV11B●●● | PBV11●●●                    |
| 225         | 2     | PBW10B●●● | PBW10●●●                    |
|             | 3     | PBW11B●●● | PBW11●●●                    |

**Table 16.39: AC Coil Voltage Codes**

| 60 Hz   | Voltage Code |
|---------|--------------|
| 120     | V02          |
| 208     | V08          |
| 240/277 | V39          |
| 480     | V28          |

**Table 16.40: Class 8903—Auxiliary Contacts**

| Type | Description                 |
|------|-----------------------------|
| PBX1 | (1) Auxiliary Contact SPDT  |
| PBX2 | (2) Auxiliary Contacts SPDT |

**Table 16.41: Factory Modifications**

| Form | Description                 |
|------|-----------------------------|
| X11  | (1) Auxiliary Contact SPDT  |
| X22  | (2) Auxiliary Contacts SPDT |

**Table 16.42: Maximum Wire Size (AWG)**

| Current Range | Power Wire (Cu/Al) | Control Wire (Cu Only) |
|---------------|--------------------|------------------------|
| 30–100 A      | #1/0 Max.          | #18–#10                |
| 150–225 A     | 350 MCM Max.       | #18–#10                |

**Table 16.43: Control Distance**

| Wire Gauge<br>AWG | Maximum Distance (feet) |       |       |       |       |
|-------------------|-------------------------|-------|-------|-------|-------|
|                   | 120 V                   | 208 V | 240 V | 277 V | 480 V |
| 14                | 550                     | 1650  | 2200  | 2925  | 8800  |
| 12                | 900                     | 2700  | 3600  | 4700  | 14400 |
| 10                | 1425                    | 4275  | 5700  | 7550  | 22800 |

**Table 16.44: Short-Circuit Ratings**

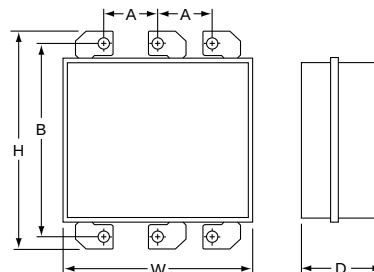
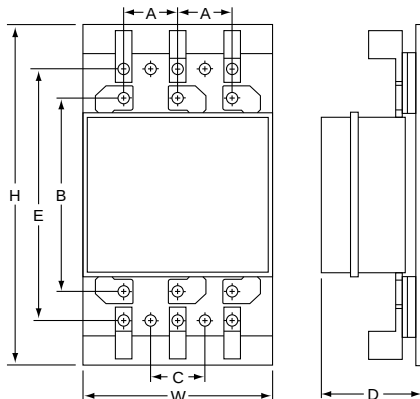
| RMS Sym.<br>Current (A) | Max. Volts | Short Circuit<br>Protection Device Recommended |
|-------------------------|------------|------------------------------------------------|
| 100,000                 | 600        | Class J Fuses                                  |
| 22,000                  | 600        | Circuit Breaker—Square D—Type LHL              |
| 65,000                  | 240        | Circuit Breaker—Square D—Type LHL              |

**Table 16.45: Dimensions (Panel Mount)**

| A       | Dimensions |     |      |     |      |    |      |    |      |     |
|---------|------------|-----|------|-----|------|----|------|----|------|-----|
|         | H          |     | W    |     | D    |    | A    |    | B    |     |
|         | in.        | mm  | in.  | mm  | in.  | mm | in.  | mm | in.  | mm  |
| 30–100  | 11.75      | 298 | 7.50 | 191 | 3.88 | 98 | 2.25 | 57 | 7.38 | 187 |
| 150–225 | 14.50      | 368 | 7.50 | 191 | 3.88 | 98 | 2.88 | 73 | 8.50 | 216 |

**Table 16.46: Dimensions (Bus Mount)**

| A       | Dimensions |     |      |     |      |    |          |    |      |     |
|---------|------------|-----|------|-----|------|----|----------|----|------|-----|
|         | H          |     | W    |     | D    |    | A        |    | B    |     |
|         | in.        | mm  | in.  | mm  | in.  | mm | in.      | mm | in.  | mm  |
| 30–100  | 8.31       | 211 | 7.50 | 191 | 3.38 | 86 | 2.25     | 57 | 7.38 | 187 |
| 150–225 | 9.50       | 241 | 7.50 | 191 | 3.38 | 86 | 2.88 [2] | 73 | 8.50 | 216 |



[1] Replace the bullets (●●●) with the voltage code when ordering this product. Refer to the standard voltage codes shown in Table 16.39.

[2] Slotted mounting holes are suitable for 2.88–3.19 in. mounting centers.

Table 16.47: Coil Voltage Codes

| Voltage |         | Code |
|---------|---------|------|
| 60 Hz   | 50 Hz   |      |
| 24 [1]  | —       | V01  |
| 120 [2] | 110     | V02  |
| 208     | —       | V08  |
| 240     | 220     | V03  |
| —       | 380     | V05  |
| 480     | 440     | V06  |
| 600     | 550     | V07  |
| Specify | Specify | V99  |

For How to Order Information, see Digest Section 16 for selection information.

## Well-Guard Reduced Voltage Pump Panels

Class 8940 reduced voltage panels in NEMA 3R enclosures are specifically designed for pumping applications. Extra space is provided for field installation of auxiliary equipment.

- Type S contactors/starters provided as standard
- All devices are UL Listed, and marked "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT"
- Includes a Hand-Off-Auto selector switch and a Start push button

**NOTE:** Illustrations may not represent the actual enclosure; they are intended for dimensional information only.



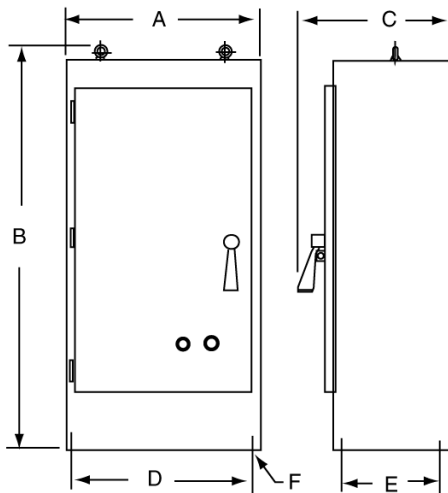
Type VG4V06K15

Table 16.48: Closed Transition Autotransformer Type, 3-Pole Polyphase—480 Vac Maximum (50–60 Hz)

| Motor (Starter) Volts | Max. Hp Polyphase | Coil Voltage               | NEMA Size | Fusible Disconnect Style |          | Circuit Breaker Style |          |
|-----------------------|-------------------|----------------------------|-----------|--------------------------|----------|-----------------------|----------|
|                       |                   |                            |           | Fuse Clip Amperes [3]    | Type [4] | Circuit Breaker       | Type [4] |
| 230 (240)             | 15                | 240 @ 60 Hz<br>220 @ 50 Hz | 2         | 60                       | RD4DV03  | FAL36080              | VD1DV03  |
|                       | 25                |                            | 3         | 100                      | RE4FV03  | FAL36100              | VE1FV03  |
|                       | 30                |                            |           | 200                      | RE1GV03  | KAL36100              | VE2GV03  |
|                       | 50                |                            |           | 200                      | RF4JV03  | KAL36200              | VF1JV03  |
|                       | 75                |                            | 5         | 400                      | RG1LV03  | LAL36250              | VG2LV03  |
|                       | 100               |                            |           | 400                      | RG1MV03  | LAL36350              | VG2MV03  |
| 460 (480)             | 25                | 480 @ 60 Hz<br>440 @ 50 Hz | 2         | 60                       | RD2FV06  | FAL36070              | VD1FV06  |
|                       | 30                |                            | 3         | 100                      | RE2GV06  | FAL36080              | VE1GV06  |
|                       | 50                |                            |           | 100                      | RE2JV06  | FAL36100              | VE1JV06  |
|                       | 75                |                            | 4         | 200                      | RF2LV06  | KAL36125              | VF1LV06  |
|                       | 100               |                            |           | 200                      | RF2MV06  | KAL36200              | VF1MV06  |
|                       | 150               |                            | 5         | 400                      | RG3PV06  | LAL36250              | VG4PV06  |
|                       | 200               |                            |           | 400                      | RG3QV06  | LAL36350              | VG4QV06  |
|                       | 300               |                            | 6         | —                        | —        | MAL36600              | VH1SV06  |
|                       | 400               |                            |           | —                        | —        | MAL36900              | VH2TV06  |
|                       | 600               |                            |           | —                        | —        | MAL361000             | VJ1WV06  |

Table 16.49: Autotransformer—Reduced Voltage Type

| Type           | Figure | A     |      | B     |      | C     |     | D     |      | E     |      | F    |    |
|----------------|--------|-------|------|-------|------|-------|-----|-------|------|-------|------|------|----|
|                |        | in.   | mm   | in.   | mm   | in.   | mm  | in.   | mm   | in.   | mm   | in.  | mm |
| RD, VD         | 3      | 25.00 | 635  | 52.50 | 1334 | 11.13 | 283 | 19.00 | 483  | 51.50 | 1308 | 0.44 | 11 |
| RE, VE, RF, VF | 4      | 32.00 | 813  | 72.50 | 1842 | 19.25 | 489 | 29.75 | 756  | 12.50 | 318  | 0.68 | 17 |
| RG             | 4      | 36.00 | 914  | 93.00 | 2362 | 19.25 | 489 | 33.75 | 857  | 12.50 | 318  | 0.69 | 17 |
| VG             | 4      | 32.00 | 813  | 72.50 | 1842 | 19.25 | 489 | 29.75 | 756  | 12.50 | 318  | 0.68 | 17 |
| VH             | 4      | 34.00 | 864  | 93.00 | 2362 | 23.25 | 591 | 31.75 | 806  | 16.50 | 419  | 0.69 | 17 |
| VJ [5]         | 4      | 64.00 | 1626 | 93.00 | 2362 | 27.25 | 692 | 61.75 | 1568 | 17.25 | 438  | 0.81 | 21 |



[1] 24 V coils are not available on Sizes 4–7. On Sizes 2–3, 24 V coils are available using **Form S** (separate control).

[2] This voltage code must include **Form S** (no charge).

[3] Fuse clips are sized for use with dual-element time-delay fuses.

[4] Specify the coil voltage code to order this product. Refer to the standard voltage codes shown in Table 16.47.

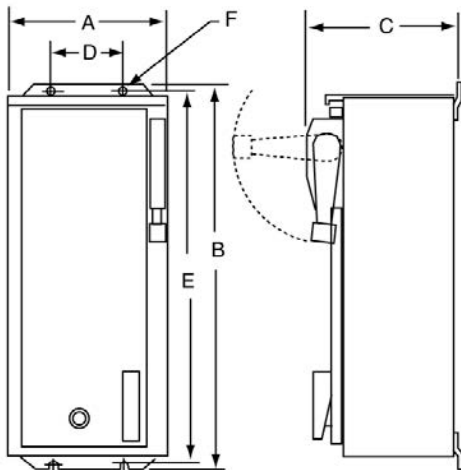
[5] The cabinet has double doors.

**Table 16.50: Part Winding Type, 3-Pole Polyphase—480 Vac Maximum (50–60 Hz)—Obsolete December 31, 2015**

| Motor<br>(Starter)<br>Voltage | Max. Hp<br>Polyphase | Coil<br>Voltage            | NEMA<br>Size | Combination                      |          |                                               |          |
|-------------------------------|----------------------|----------------------------|--------------|----------------------------------|----------|-----------------------------------------------|----------|
|                               |                      |                            |              | Fusible Disconnect Style         |          | Circuit Breaker Style                         |          |
|                               |                      |                            |              | Fuse Clip<br>(2 Sets)<br>(A) [6] | Type [7] | Circuit Breaker<br>(2 Breakers)<br>Frame Size | Type [7] |
| 230<br>(240)                  | 25                   | 240 @ 60 Hz<br>220 @ 50 Hz | 2PW          | 60                               | MD4FV03  | FAL36070                                      | PD1FV03  |
|                               | 30                   |                            | 3PW          | 60                               | ME5GV03  | FAL36080                                      | PE3GV03  |
|                               | 50                   |                            |              | 100                              | ME6JV03  | FAL36100                                      | PE3JV03  |
|                               | 75                   |                            | 4PW          | 200                              | MF1LV03  | KAL36150                                      | PF3LV03  |
|                               | 100                  |                            | 5PW          | 200                              | MG3MV03  | KAL36175                                      | PG2MV03  |
|                               | 125                  |                            |              | 400                              | MG1NV03  | LAL36250                                      | PG3NV03  |
|                               | 150                  |                            |              | 400                              | MG1PV03  | LAL36250                                      | PG3PV03  |
| 460<br>(480)                  | 30                   | 480 @ 60 Hz<br>440 @ 50 Hz | 2PW          | 30                               | MD5GV06  | FAL36040                                      | PD1GV06  |
|                               | 40                   |                            |              | 60                               | MD2HV06  | FAL36050                                      | PD1HV06  |
|                               | 60                   |                            | 3PW          | 60                               | ME7KV06  | FAL36070                                      | PE3KV06  |
|                               | 75                   |                            |              | 100                              | ME3LV06  | FAL36090                                      | PE3LV06  |
|                               | 100                  |                            |              | 200                              | MF3MV06  | FAL36100                                      | PF2MV06  |
|                               | 150                  |                            | 4PW          | 200                              | MF3PV06  | KAL36125                                      | PF3PV06  |
|                               | 200                  |                            |              | 200                              | MG4QV06  | KAL36175                                      | PG2QV06  |
|                               | 250                  |                            |              | 200                              | MG4RV06  | KAL36225                                      | PG3RV06  |
|                               | 350                  |                            | 5PW          | 400                              | MG2TV06  | LAL36300                                      | PG3TV06  |

**Table 16.51: Part Winding, Reduced Voltage Type—Obsolete December 31, 2015**

| Type   | Figure | A     |     | B     |      | C     |     | D     |     | E     |      | F    |    |
|--------|--------|-------|-----|-------|------|-------|-----|-------|-----|-------|------|------|----|
|        |        | in.   | mm  | in.   | mm   | in.   | mm  | in.   | mm  | in.   | mm   | in.  | mm |
| PD     | 3      | 19.00 | 483 | 34.50 | 876  | 12.25 | 311 | 13.00 | 330 | 33.50 | 851  | 0.44 | 11 |
| MD     | 3      | 23.00 | 584 | 25.50 | 648  | 10.60 | 269 | 17.00 | 432 | 24.50 | 622  | 0.44 | 11 |
| PE, PF | 3      | 30.00 | 762 | 47.00 | 1194 | 13.25 | 337 | 22.00 | 559 | 46.00 | 1168 | 0.56 | 14 |
| ME     | 3      | 25.00 | 635 | 52.50 | 1334 | 12.13 | 308 | 19.00 | 483 | 51.50 | 1308 | 0.44 | 11 |
| MF     | 4      | 36.00 | 914 | 93.00 | 2362 | 19.25 | 489 | 33.75 | 857 | 12.50 | 318  | 0.69 | 18 |
| PG, MG | 4      | 36.00 | 914 | 73.00 | 1854 | 19.25 | 489 | 33.75 | 857 | 12.50 | 318  | 0.69 | 18 |
| PH     | 4      | 38.00 | 965 | 93.00 | 2362 | 19.25 | 489 | 35.75 | 908 | 12.50 | 318  | 0.69 | 18 |



[6] Fuse clips are sized for use with dual-element time-delay fuses.  
[7] Specify the coil voltage code to order this product. Refer to the standard voltage codes shown in Table 16.47.

## Forms—Reduced Voltage Controllers Only

Table 16.52: Reduced Voltage Controllers Only—Classes 8606, 8630, 8640

| Factory Modifications                                                                                                                | Enclosure Type                                                             | Form      | NEMA Size        |                  |                  |                  |                  |                  |                  |         |         |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|---------|---------|
|                                                                                                                                      |                                                                            |           | 1<br>1PW<br>1 YD | 2<br>2PW<br>2 YD | 3<br>3PW<br>3 YD | 4<br>4PW<br>4 YD | 5<br>5PW<br>5 YD | 6<br>6PW<br>6 YD | 7<br>7PW<br>7 YD |         |         |
| Pilot Devices in Cover and Control Circuit<br>Reduced Voltage<br>Controllers Only<br>Classes<br>8606<br>8630<br>8640<br>8647<br>8650 | Push Buttons [1]                                                           |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | Start-Stop                                                                 | 1, 4, 12  | A                | X                | X                | X                | X                | X                | X                | X       |         |
|                                                                                                                                      | Selector Switches                                                          |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | Hand-Off-Auto                                                              | 1, 4, 12  | C                | X                | X                | X                | X                | X                | X                | X       |         |
|                                                                                                                                      | On-Off                                                                     | 1, 4, 12  | C6               | X                | X                | X                | X                | X                | X                | X       |         |
|                                                                                                                                      | Pilot Lights (specify color) [2]                                           |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | One light On                                                               | 1, 4, 12  | P                | X                | X                | X                | X                | X                | X                | X       |         |
|                                                                                                                                      | Separate Control Circuit [3] [4]                                           |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | TR coil only (at control voltage)                                          | 1, 4, 12  | S                | N/C              | N/C              | N/C              | N/C              | N/C              | N/C              | N/C     |         |
|                                                                                                                                      | All coils (at control voltage)                                             | 1, 4, 12  | Y195             | N/C              | N/C              | N/C              | N/C              | N/C              | N/C              | N/C     |         |
|                                                                                                                                      | Fused Control Circuit [3] [4] [5] [6]                                      |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | One fuse                                                                   | 1, 4, 12  | F                | X                | X                | X                | X                | X                | N/C [7]          | N/C [7] |         |
|                                                                                                                                      | Two fuses                                                                  | 1, 4, 12  | F4               | X                | X                | X                | X                | X                | N/C [7]          | N/C [7] |         |
|                                                                                                                                      | Control Circuit Transformer [3] [4] [5]<br>Standard Capacity (50 or 60 Hz) |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | Fuses                                                                      |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | Primary                                                                    | Secondary |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | 2—                                                                         | 0—        | 1, 4, 12         | F4T              | X                | X                | X                | X                | X                | N/C [7] | N/C [7] |
|                                                                                                                                      | 2—                                                                         | 1—        | 1, 4, 12         | FF4T             | X                | X                | X                | X                | X                | X       | X       |
|                                                                                                                                      | 2—                                                                         | 0—        | 1, 4, 12         | F4T40            | X                | X                | X                | X                | X                | X       | X       |
|                                                                                                                                      | 2—                                                                         | 1—        | 1, 4, 12         | FF4T40           | X                | X                | X                | X                | X                | X       | X       |
|                                                                                                                                      | Additional capacity (50 or 60 Hz) [8]                                      |           |                  |                  |                  |                  |                  |                  |                  |         |         |
|                                                                                                                                      | 100 VA additional capacity                                                 | 1, 4, 12  | T11              | X                | X                | X                | X                | X                | X                | X       | X       |
|                                                                                                                                      | 200 VA additional capacity                                                 | 1, 4, 12  | T12              | X                | X                | X                | X                | X                | X                | X       | X       |
| 300 VA additional capacity                                                                                                           | 1, 4, 12                                                                   | T13       | X                | X                | X                | X                | X                | X                | X                | X       |         |
| 400 VA additional capacity                                                                                                           | 1, 4, 12                                                                   | T14       | X                | X                | X                | X                | X                | X                | X                | X       |         |
| 500 VA additional capacity                                                                                                           | 1, 4, 12                                                                   | T15       | X                | X                | X                | X                | X                | X                | X                | X       |         |
| Substitute nonstandard single primary and/or single secondary                                                                        |                                                                            |           |                  |                  |                  |                  |                  |                  |                  |         |         |
| Voltage rating on the control transformer [5]                                                                                        | 1, 4, 12                                                                   | T1[9]     | X                | X                | X                | X                | X                | —                | —                | —       |         |

Table 16.53: Selection of Control Circuit Transformers

| Voltage<br>60 Hz (Primary–Secondary) | Code |
|--------------------------------------|------|
| 120–12                               | V88  |
| 120–24                               | V89  |
| 208–120                              | V84  |
| 240–24                               | V82  |
| 240–120                              | V80  |
| 277–120                              | V85  |
| 480–24                               | V83  |
| 480–120                              | V81  |
| 480–240                              | V87  |
| 600–120                              | V86  |
| Specify                              | V99  |

## Selection of Control Circuit Transformers

The standard primary and secondary voltages for control circuit transformers are indicated in Table 16.53.

To order, select the desired device with the appropriate transformer Form designation. Then convert the previously selected voltage code (V\*\*) to reflect the desired primary/secondary voltage for the transformer. The secondary voltage should equal the previously selected coil voltage of the device. (24 Vac coils for NEMA Sizes 4–7 are not available).

## Example:

You have a Class 8606SDG1V02S. The designation V02S means that you need a coil voltage of 120-60/110-50 wired for separate control. You want to add **Form FF4T** with the transformer voltages at 480 V primary, 120 V secondary. The new, complete Class, Type, Voltage Code, and Form are:

| Class | Type | Voltage Code | Form [10] |
|-------|------|--------------|-----------|
| 8606  | SDG1 | V81          | FF4T      |

[1] All push buttons are momentary contact.

[2] For pilot light details, refer to the pilot light table in Digest Section 16.

[3] As standard, reduced voltage controllers are supplied with common control. If **Form S** or **T** is specified, only the TR coil will be at control voltage. Specify **Form Y195** or **T40** (ex. **Form FF4T40**) if all coils must be at control voltage. Refer to page 16-3 for control circuit arrangements.

[4] Reduced voltage controllers include two control circuit fuses for conductors at line voltage. Additional fusing may be provided if a fused control circuit transformer or separate control is specified.

[5] See Table 16.53.

[6] Must be used with a Form specifying separate control (Ex. **Form FS**).

[7] Size 6 and 7 controllers come with **Form FF4T** as standard.

[8] Add Form letters to the standard control transformer (example: for Size 1, **Form F4T** plus 100 VA becomes **F4T11**; **Form F4T40** plus 100 VA becomes **F4T41**).

[9] Must be used in conjunction with a variation of Form **F4T** (ex.: standard capacity transformer required, 208–24 V; order as **Form F4TT1**, 208–24 V).

[10] Always list Form numbers in alphabetical order.

**Class 8606 Reduced Voltage Starters**

**Table 16.54: Class 8606 Reduced Voltage Starters Only**

| Factory Modifications                |                                                             | Enclosure Type | Form  | NEMA Size |   |   |   |   |   |   |
|--------------------------------------|-------------------------------------------------------------|----------------|-------|-----------|---|---|---|---|---|---|
|                                      |                                                             |                |       | 1         | 2 | 3 | 4 | 5 | 6 | 7 |
| Circuit Breaker or Disconnect Switch | Molded case thermal magnetic circuit breaker [11]           | 1              | Y791  | X         | X | X | X | X | X | X |
|                                      |                                                             | 4              | Y791  | X         | X | X | X | X | X | X |
|                                      |                                                             | 12             | Y791  | X         | X | X | X | X | X | X |
|                                      | Nonfusible disconnect switch                                | 1              | Y792  | X         | X | X | X | X | — | — |
|                                      |                                                             | 4              | Y792  | X         | X | X | X | X | — | — |
|                                      |                                                             | 12             | Y792  | X         | X | X | X | X | — | — |
|                                      | Automatic molded case switch                                | 1              | Y7910 | —         | — | — | — | — | X | X |
|                                      |                                                             | 4              | Y7910 | —         | — | — | — | — | X | X |
|                                      |                                                             | 12             | Y7910 | —         | — | — | — | — | X | X |
|                                      | Fusible Disconnect Switch with Fuse Clips [12]              |                |       |           |   |   |   |   |   |   |
|                                      | 30 A clips                                                  | 1              | Y793  | X         | X | — | — | — | — | — |
|                                      |                                                             | 4              | Y793  | X         | X | — | — | — | — | — |
|                                      |                                                             | 12             | Y793  | X         | X | — | — | — | — | — |
|                                      | 60 A clips                                                  | 1              | Y794  | X         | X | X | — | — | — | — |
|                                      |                                                             | 4              | Y794  | X         | X | X | — | — | — | — |
|                                      |                                                             | 12             | Y794  | X         | X | X | — | — | — | — |
|                                      | 100 A clips                                                 | 1              | Y795  | —         | — | X | X | — | — | — |
|                                      |                                                             | 4              | Y795  | —         | — | X | X | — | — | — |
|                                      |                                                             | 12             | Y795  | —         | — | X | X | — | — | — |
|                                      | 200 A clips                                                 | 1              | Y796  | —         | — | X | X | — | — | — |
|                                      |                                                             | 4              | Y796  | —         | — | X | X | — | — | — |
|                                      |                                                             | 12             | Y796  | —         | — | X | X | — | — | — |
|                                      | 400 A clips                                                 | 1              | Y797  | —         | — | — | — | X | X | — |
|                                      |                                                             | 4              | Y797  | —         | — | — | — | X | X | — |
|                                      |                                                             | 12             | Y797  | —         | — | — | — | X | X | — |
|                                      | Automatic molded case switch with 600 A fuse clips          | 1              | Y798  | —         | — | — | — | — | X | — |
|                                      |                                                             | 4              | Y798  | —         | — | — | — | — | X | — |
|                                      |                                                             | 12             | Y798  | —         | — | — | — | — | X | — |
|                                      | Automatic molded case switch with fuse clips 1200 A or less | 1              | Y799  | —         | — | — | — | — | — | X |
|                                      |                                                             | 4              | Y799  | —         | — | — | — | — | — | X |
|                                      |                                                             | 12             | Y799  | —         | — | — | — | — | — | X |

**Table 16.55: Class 8630 Reduced Voltage Controllers Only [13]**

| Factory Modifications                |                                                             | Enclosure Type | Form  | NEMA Size |      |      |      |      |      |      |
|--------------------------------------|-------------------------------------------------------------|----------------|-------|-----------|------|------|------|------|------|------|
|                                      |                                                             |                |       | 1 YD      | 2 YD | 3 YD | 4 YD | 5 YD | 6 YD | 7 YD |
| Circuit Breaker or Disconnect Switch | Molded case thermal magnetic circuit breaker [11]           | 1              | Y791  | X         | X    | X    | X    | X    | X    | X    |
|                                      |                                                             | 4              | Y791  | X         | X    | X    | X    | X    | X    | X    |
|                                      |                                                             | 12             | Y791  | X         | X    | X    | X    | X    | X    | X    |
|                                      | Nonfusible disconnect switch                                | 1              | Y792  | X         | X    | X    | X    | —    | —    | —    |
|                                      |                                                             | 4              | Y792  | X         | X    | X    | X    | —    | —    | —    |
|                                      |                                                             | 12             | Y792  | X         | X    | X    | X    | —    | —    | —    |
|                                      | Automatic molded case switch                                | 1              | Y7910 | —         | —    | —    | —    | X    | X    | X    |
|                                      |                                                             | 4              | Y7910 | —         | —    | —    | —    | X    | X    | X    |
|                                      |                                                             | 12             | Y7910 | —         | —    | —    | —    | X    | X    | X    |
|                                      | Fusible Disconnect Switch with Fuse Clips [12]              |                |       |           |      |      |      |      |      |      |
|                                      | 30 A clips                                                  | 1              | Y793  | X         | X    | —    | —    | —    | —    | —    |
|                                      |                                                             | 4              | Y793  | X         | X    | —    | —    | —    | —    | —    |
|                                      |                                                             | 12             | Y793  | X         | X    | —    | —    | —    | —    | —    |
|                                      | 60 A clips                                                  | 1              | Y794  | X         | X    | —    | —    | —    | —    | —    |
|                                      |                                                             | 4              | Y794  | X         | X    | —    | —    | —    | —    | —    |
|                                      |                                                             | 12             | Y794  | X         | X    | —    | —    | —    | —    | —    |
|                                      | 100 A clips                                                 | 1              | Y795  | —         | X    | X    | —    | —    | —    | —    |
|                                      |                                                             | 4              | Y795  | —         | X    | X    | —    | —    | —    | —    |
|                                      |                                                             | 12             | Y795  | —         | X    | X    | —    | —    | —    | —    |
|                                      | 200 A clips                                                 | 1              | Y796  | —         | —    | X    | X    | —    | —    | —    |
|                                      |                                                             | 4              | Y796  | —         | —    | X    | X    | —    | —    | —    |
|                                      |                                                             | 12             | Y796  | —         | —    | X    | X    | —    | —    | —    |
|                                      | 400 A clips                                                 | 1              | Y797  | —         | —    | —    | X    | X    | —    | —    |
|                                      |                                                             | 4              | Y797  | —         | —    | —    | X    | X    | —    | —    |
|                                      |                                                             | 12             | Y797  | —         | —    | —    | X    | X    | —    | —    |
|                                      | Automatic molded case switch with 600 A fuse clips          | 1              | Y798  | —         | —    | —    | —    | X    | X    | —    |
|                                      |                                                             | 4              | Y798  | —         | —    | —    | —    | X    | X    | —    |
|                                      |                                                             | 12             | Y798  | —         | —    | —    | —    | X    | X    | —    |
|                                      | Automatic molded case switch with fuse clips 1200 A or less | 1              | Y799  | —         | —    | —    | —    | —    | X    | X    |
|                                      |                                                             | 4              | Y799  | —         | —    | —    | —    | —    | X    | X    |
|                                      |                                                             | 12             | Y799  | —         | —    | —    | —    | —    | X    | X    |

[11] Mag-Gard™ circuit breakers are not supplied nor recommended.

[12] Fuses not included.

[13] Wye-Delta motor starters typically have higher current ratings per NEMA Size than full voltage motor starters. Care must be taken in selecting the appropriate short circuit protection. The table in Digest Section 7 will assist in selecting proper protection based on motor full-load current.

## Class 8640 Reduced Voltage Starters

**NOTE:** To comply with Section 430-3 of the National Electrical Code®, combination part-winding starters come as follows:

- Circuit breaker: two thermal-magnetic, adjustable-trip circuit breakers—one for each motor winding. In the smaller controllers that use the FA and KA frames, a single external operating mechanism operates the two circuit breakers simultaneously. In the larger controllers that use the KA and LA frames, each circuit breaker has its own operating mechanism.
- Nonfusible disconnect switch: a single 3-pole unfused disconnect switch of the proper rating for both windings. The user must provide proper short-circuit protection external to the starter, using only Class J fuses.
- Fusible disconnect switch: a single unfused disconnect switch with two sets of fuse clips (each set of the rating indicated) to provide short-circuit protection for each winding.

Table 16.56: Class 8640 Reduced Voltage Starters Only

| Factory Modifications                |                                                                            | Enclosure Type | Form  | NEMA Size |      |      |      |        |        |
|--------------------------------------|----------------------------------------------------------------------------|----------------|-------|-----------|------|------|------|--------|--------|
|                                      |                                                                            |                |       | 1 PW      | 2 PW | 3 PW | 4 PW | 5 PW   | 6 PW   |
| Circuit Breaker or Disconnect Switch | Molded case thermal magnetic circuit breaker [14]                          | 1              | Y7911 | X         | X    | X    | X    | X      | —      |
|                                      |                                                                            | 4              | Y7911 | X         | X    | X    | X    | X      | —      |
|                                      |                                                                            | 12             | Y7911 | X         | X    | X    | X    | X      | —      |
|                                      | Fusible Disconnect Switch with Fuse Clips [15]                             |                |       |           |      |      |      |        |        |
|                                      | 30 A clips (two sets)                                                      | 1              | Y7931 | X         | X    | —    | —    | —      | —      |
|                                      |                                                                            | 4              | Y7931 | X         | X    | —    | —    | —      | —      |
|                                      |                                                                            | 12             | Y7931 | X         | X    | —    | —    | —      | —      |
|                                      | 60 A clips (two sets)                                                      | 1              | Y7941 | —         | X    | X    | —    | —      | —      |
|                                      |                                                                            | 4              | Y7941 | —         | X    | X    | —    | —      | —      |
|                                      |                                                                            | 12             | Y7941 | —         | X    | X    | —    | —      | —      |
|                                      | 100 A clips (two sets)                                                     | 1              | Y7951 | —         | X    | X    | X    | —      | —      |
|                                      |                                                                            | 4              | Y7951 | —         | X    | X    | X    | —      | —      |
|                                      |                                                                            | 12             | Y7951 | —         | X    | X    | X    | —      | —      |
|                                      | 200 A clips (two sets)                                                     | 1              | Y7961 | —         | —    | X    | X    | X      | —      |
|                                      |                                                                            | 4              | Y7961 | —         | —    | X    | X    | X      | —      |
|                                      |                                                                            | 12             | Y7961 | —         | —    | X    | X    | X      | —      |
|                                      | 400 A clips (two sets)                                                     | 1              | Y7971 | —         | —    | —    | X    | X [16] | X [16] |
|                                      |                                                                            | 4              | Y7971 | —         | —    | —    | X    | X [16] | X [16] |
|                                      |                                                                            | 12             | Y7971 | —         | —    | —    | X    | X [16] | X [16] |
|                                      | Automatic molded case switch with 600 A fuse clips (two sets)              | 1              | Y7920 | —         | —    | —    | —    | —      | X      |
|                                      |                                                                            | 4              | Y7920 | —         | —    | —    | —    | —      | X      |
|                                      |                                                                            | 12             | Y7920 | —         | —    | —    | —    | —      | X      |
|                                      | Automatic molded case switch with fuse clips 601–1200 A or less (two sets) | 1              | Y7921 | —         | —    | —    | —    | —      | X      |
|                                      |                                                                            | 4              | Y7921 | —         | —    | —    | —    | —      | X      |
|                                      |                                                                            | 12             | Y7921 | —         | —    | —    | —    | —      | X      |

Table 16.57: Reduced Voltage Controllers Only—Classes 8606, 8630, 8640 [17]

| Factory Modifications                                                                                                                                                                                                     | Enclosure Type       | Form                 | NEMA Size    |              |              |              |              |              |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|
|                                                                                                                                                                                                                           |                      |                      | 1 PW<br>1 YD | 2 PW<br>2 YD | 3 PW<br>3 YD | 4 PW<br>4 YD | 5 PW<br>5 YD | 6 PW<br>6 YD | 7 PW<br>7 YD     |
| <b>Overload relays</b><br>Substitute 9999SO4 isolated alarm contact on melting alloy overload relay<br>Substitute 9999SO5 isolated alarm contact on melting alloy overload relay                                          | Any<br>Any           | Y342<br>Y344         | X<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>X       | — [18]<br>— [18] |
| <b>Motor Logic™ overload relays</b> (Class 10/20 Selectable) [19] [20]                                                                                                                                                    | Any                  | H30                  | X            | X            | X            | X            | X            | X            | X                |
| <b>Add for thermal protector Class 8606</b><br><b>Coil transient suppressor, per coil</b><br><b>Addition of terminal blocks</b> (specify wired or unwired).<br>—Wired, per terminal, each<br>—Unwired, per terminal, each | 1, 4, 12<br>Any      | Y116<br>Y145         | —<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>—       | —<br>—           |
|                                                                                                                                                                                                                           | 1, 4, 12<br>1, 4, 12 | G56 [21]<br>G50 [21] | X<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>X       | X<br>X           |

[14] Mag-Gard™ circuit breakers are not supplied nor recommended.

[15] Fuses not included.

[16] Consists of automatic molded case switch with two sets of 400 A fuse clips.

[17] NEMA 7 and 9 enclosures not available with Class 8600 devices.

[18] Size 7 uses a solid-state overload relay. See Class 8536 for complete details.

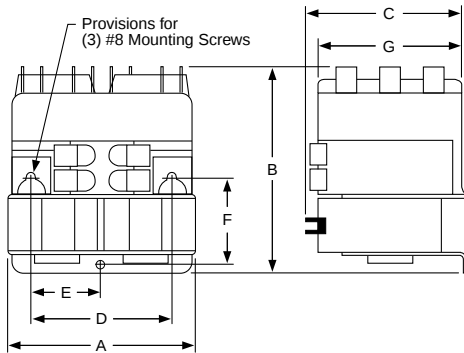
[19] Motor Logic overload relays are not available on Class 8640 Size 1PW to 4PW starters.

[20] See Motor Logic overload relays in the Full Voltage section in Digest Section 16 for additional Form options of Motor Logic overload relays.

[21] Addition of terminal block 9080CA or 9080GR6 only. The number of circuits is the same as the ending of the Form number. (Example: G505 is a 5-wire terminal block.) Available in groups of 5 only. Order in increments of 5. The number of circuits is the same as the ending of the Form number. (Example: G505 = 5 unwired terminals, G510 is 10 unwired terminals.)



Type RO10V02



**Table 16.58: Approximate Dimensions  
(3 Poles per Contactor)**

| Type        | A          | B          | C          | D          | E          | F          | G          |
|-------------|------------|------------|------------|------------|------------|------------|------------|
| RO10,<br>11 | 3.31<br>84 | 3.31<br>84 | 3.03<br>77 | 2.69<br>68 | 1.34<br>34 | 1.56<br>40 | 2.66<br>68 |
| RO12,<br>13 | 3.31<br>84 | 3.69<br>94 | 2.69<br>68 | 2.69<br>68 | 1.34<br>34 | 1.56<br>40 | 2.66<br>68 |

**Table 16.64: Cross Reference—Obsolete Devices**

| Obsolete Device    |       | Replacement Device |      | Auxiliary Contact Required |      | Obsolete Device |       | Replacement Device |      | Auxiliary Contact Required |      |
|--------------------|-------|--------------------|------|----------------------------|------|-----------------|-------|--------------------|------|----------------------------|------|
| Class              | Type  | Class              | Type | Class                      | Type | Class           | Type  | Class              | Type | Class                      | Type |
| 8702<br>or<br>8965 | HO3   | 8965               | RO12 | —                          | —    | 8965            | RO2   | 8965               | RO10 | 9999                       | R10  |
|                    | HO4   |                    | RO12 | 9999                       | R12  |                 | RO2S1 |                    | RO11 | 9999                       | R10  |
|                    | HO5   |                    | RO12 | 9999                       | R13  |                 | RO2S2 |                    | RO10 | 9999                       | R10  |
|                    | HO6   |                    | RO12 | —                          | —    |                 | RO3   |                    | RO10 | 9999                       | R11  |
|                    | HO7   |                    | RO12 | 9999                       | R12  |                 | RO3S1 |                    | RO11 | 9999                       | R11  |
|                    | HO8   |                    | RO12 | 9999                       | R13  |                 | RO3S2 |                    | RO10 | 9999                       | R11  |
| 8965               | RG2S1 | 8965               | RO10 | 9999                       | R10  |                 | RO3S3 |                    | RO10 | 9999                       | R11  |
|                    | RG5S1 |                    | RO12 | 9999                       | R12  |                 | RO4   |                    | RO12 | —                          | —    |
|                    | RG5S2 |                    | RO12 | 9999                       | R12  |                 | RO4S1 |                    | RO13 | —                          | —    |
|                    | RO1   |                    | RO10 | —                          | —    |                 | RO5   |                    | RO12 | 9999                       | R12  |
|                    | RO1S1 |                    | RO10 | —                          | —    |                 | RO5S1 |                    | RO13 | 9999                       | R12  |
|                    | RO1S2 |                    | RO10 | —                          | —    |                 | RO5S2 |                    | RO12 | 9999                       | R12  |
|                    | RO1S3 |                    | RO10 | —                          | —    |                 | RO6   |                    | RO12 | 9999                       | R13  |
|                    | RO1S4 |                    | RO10 | —                          | —    |                 | RO6S1 |                    | RO13 | 9999                       | R13  |
|                    | RO1S5 |                    | RO10 | —                          | —    |                 | RO6S2 |                    | RO12 | 9999                       | R13  |
|                    | RO1S6 |                    | RO10 | —                          | —    |                 |       |                    |      |                            |      |

**Table 16.65: Application Data**

|               |                                                                                         |
|---------------|-----------------------------------------------------------------------------------------|
| <b>Coils</b>  | Duty: Hoist Duty—H4 Intermittent<br>Voltage Range: AC coils only; +10%, –15% of nominal |
| <b>Burden</b> | Inrush 76 VA, Sealed 27 VA                                                              |

**Table 16.66: Approvals**

UL Component Recognized: File E78351, CCN NLDX2  
CSA Certified: File LR60905, Class 3211 04

## Selection—AC Reversing/Hoist Contactors

Class 8965 reversing hoist contactors meet the small space requirements found in electrical hoists, light duty cranes, door operators, and related products. They are designed to perform in the short periods of jogging experienced in hoist service. Note that these contactors must be mounted upright on the vertical plane; the contactors will not operate properly when mounted in any other position.

**Table 16.59: AC Reversing/Hoist Contactors—600 Vac Maximum**

| No. of Poles      | Horsepower Ratings |           |           |               | Power Terminals   | With [1] Jumper Straps | Without [1] Jumper Straps |
|-------------------|--------------------|-----------|-----------|---------------|-------------------|------------------------|---------------------------|
|                   | 115 V 1 Ø          | 230 V 1 Ø | 230 V 3 Ø | 460/575 V 3 Ø |                   | Open Type              | Open Type                 |
| 3-Pole Poly-phase | 1                  | 1-1/2     | 3         | 3             | Quick Connect     | RO10 [2]               | RO11 [2]                  |
|                   |                    |           |           |               | Pressure Wire [3] | RO12 [2]               | RO13 [2]                  |

**Table 16.60: Miscellaneous Hoist Contactor Kits For Use With Class 8965**

| Type                         | Series | Description     | Class                           | Type    | Series | Description     | Class                           | Type    |
|------------------------------|--------|-----------------|---------------------------------|---------|--------|-----------------|---------------------------------|---------|
| RO10<br>RO11<br>RO12<br>RO13 | A & B  | Armature Kit    | 9998                            | RP1 [4] | C      | Armature Kit    | 9998                            | RP2 [4] |
|                              |        | Contact Carrier | Order as Part Number 3100206050 |         |        | Contact Carrier | Order as Part Number 3100208150 |         |

**Table 16.61: Class 8965 Replacement Contact Kits**

| Device Type | Device Series | Class 9998 Kit Type | Device Series | Class 9998 Kit Type |
|-------------|---------------|---------------------|---------------|---------------------|
| RO10        | A & B         | RA10                | C             | RA14                |
| RO11        |               | RA11                |               | RA15                |
| RO12        |               | RA12                |               | RA16                |
| RO13        |               | RA13                |               | RA17                |

**Table 16.62: Auxiliary Contacts Separate Module**

| Description         | Terminals     | Class 9999 Type |
|---------------------|---------------|-----------------|
| 1 N.O.<br>Each Side | Quick Connect | R10             |
|                     | Screw         | R12             |
| 1 N.C.<br>Each Side | Quick Connect | R11             |
|                     | Screw         | R13             |

**Table 16.63: Coil Table**

| Voltage 60 Hz | Voltage 50 Hz | Voltage Code | Replacement Part Number |
|---------------|---------------|--------------|-------------------------|
| 24            | —             | V01          | 3100240319 [5]          |
| 120           | 110           | V02          | 3100240340 [5]          |
| 208/220       | —             | V21          | 3100240047 [6]          |
| 240           | 220           | V03          | 3100240049 [6]          |
| 480           | 440           | V06          | 3100240058 [6] [7]      |
| 600           | 550           | V07          | 3100240060 [6]          |

**Table 16.67: How to Order**

| To Order Specify:                                                                                                  | Catalog Number |      |                       |
|--------------------------------------------------------------------------------------------------------------------|----------------|------|-----------------------|
| <ul style="list-style-type: none"> <li>Class Number</li> <li>Type Number</li> <li>Voltage and Frequency</li> </ul> | Class          | Type | Voltage and Frequency |
|                                                                                                                    | 8695           | RO10 | V02                   |

[1] Jumper straps connect the line side power terminals of the same phase between the forward (up) and reverse (down) contactors in common—i.e., L1 to L1, L2 to L2, and L3 to L3.  
 [2] Specify the voltage code to order this product. Refer to the standard voltage codes shown in Table 16.63.  
 [3] Coils rated 120 Vac or less are provided with quick connect terminals only.  
 [4] One armature per kit.  
 [5] Tape wound coils, 2 per package.  
 [6] Molded coil, 1 per package.  
 [7] Suitable for 440 V 50 Hz applications.

## Motor Logic Plus—Class 9065



Motor Logic Plus

The Motor Logic Plus solid-state overload relay is separately powered and fully programmable. It is designed to protect 3-phase AC motor applications, 200–480 Vac or 600 Vac. The SSOLR has one Form C relay output rated for 300 Vac maximum.

Table 16.68: Motor Logic Plus—Replacement Only

| Class 9065 SP Solid-State Overload Relay |          |               |
|------------------------------------------|----------|---------------|
| 200–480 V                                | 600 V    | Current Range |
| SPB4                                     | SPB6     | 0.5–2.3 A     |
| SPC4                                     | SPC6     | 2.0–9.0 A     |
| SP14                                     | SP16     | 6.0–27.0 A    |
| SP24                                     | SP26     | 10.0–45.0 A   |
| SP34                                     | SP36     | 20.0–90.0 A   |
| SP44 [1]                                 | SP46 [1] | 60.0–135.0 A  |
| SP54 [2]                                 | SP56 [2] | 120.0–270.0 A |
| SP64 [3]                                 | SP66 [3] | 240.0–540.0 A |

## Lug-Lug Kit

This kit can be field installed on separately mounted Motor Logic Plus overload relays.

Table 16.69: Lug-Lug Kit

| For Use With |           | Parts Kit Description | Class 9999 Type |
|--------------|-----------|-----------------------|-----------------|
| Class & Type | NEMA Size |                       |                 |
| 8536 SA-SH   | 1–6       | Lug-Lug Kit           | MLPL            |
| 9065 SP      | 1–6       |                       |                 |

## Software Kit

Solutions software program allows an IBM PC compatible computer (with Windows 95 or greater) to communicate with a Motor Logic Plus overload relay connected to an RS-485 network using Modbus protocol.

Table 16.70: Software Kit

| For Use With |           | Parts Kit Description | Class 9999 Type |
|--------------|-----------|-----------------------|-----------------|
| Class & Type | NEMA Size |                       |                 |
| 8536 SA-SH   | 1–6       | Software Kit          | MLPS            |
| 9065 SP      |           |                       |                 |

## Communication Module

This module allows the Motor Logic Plus overload relay to support RS-485 electrical communications standards. Up to 99 Motor Logic Plus overload relays can be controlled and monitored from one remote personal computer.

Table 16.71: How to Order

| To Order Specify: | Catalog Number |      |
|-------------------|----------------|------|
| • Class Number    | Class          | Type |
| • Type Number     | 9999           | AC04 |

Table 16.72: Communication Module

| For Use With |           | Parts Kit Description       | Class 9999 Type |
|--------------|-----------|-----------------------------|-----------------|
| Class & Type | NEMA Size |                             |                 |
| 8536 SA-SH   | 1–6       | Modbus Communication Module | MB22            |
| 9065 SP      |           |                             |                 |

Table 16.73: Full Voltage Controllers Only—Classes 8502, 8536, 8538, 8539, 8702, 8736, 8738, 8739, 8810, 8811 and 8812

| Factory Modifications |                                                                                                                                                         | Enclosure Type | Form | NEMA Size |   |   |   |     |   |     |   |     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|-----------|---|---|---|-----|---|-----|---|-----|
|                       |                                                                                                                                                         |                |      | 00        | 0 | 1 | 2 | 3   | 4 | 5   | 6 | 7   |
| Overload Relays       | Overload Relays—General<br>Modify Size 3 Type SE starters with melting alloy overload relays to accept Type FB quick trip or SB slow trip thermal units | Any            | Y81  | —         | — | — | — | N/C | — | —   | — | —   |
|                       | Substitute 9999 SO4 isolated alarm contact (N.O.) on melting alloy overload relay                                                                       | Any            | Y342 | X         | X | X | X | X   | X | [4] | X | [5] |
|                       | Substitute 9999 SO5 isolated alarm contact (N.C.) on melting alloy overload relay                                                                       | Any            | Y344 | X         | X | X | X | X   | X | [4] | X | [5] |

[1] Must use 150:5 external current transformer, purchased separately.

[2] Must use 300:5 external current transformer, purchased separately.

[3] Must use 600:5 external current transformer, purchased separately.

[4] For Classes 8736, 8738, and 8739 Type SG, consult the Customer Care Center at 1-888-778-2733.

[5] Size 7 uses a solid-state overload relay as standard. See Digest Section 16 for complete details.

## Conductor Ampacity Based on the 2017 National Electrical Code®

Ampacity based on NEC® Table 310.15(B)(16) [Formerly Table 310.16] – Allowable Ampacities of Insulated Conductors Rated Up to and Including 2000 Volts, 60° Through 90°C (140° Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)\*

For conduit fill see 2017 NEC Annex C.

For Information on Temperature Ratings of Terminations to Equipment See NEC 110.14(C).

| Size            | Temperature Rating of Conductor. [See Table 310.104(A).] |                                                             |                                                                                                                                   |                 |                                                         |                                                                                                                    | Size            |
|-----------------|----------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|
| AWG or<br>kcmil | 60°C<br>(140°F)                                          | 75°C<br>(167°F)                                             | 90°C<br>(194°F)                                                                                                                   | 60°C<br>(140°F) | 75°C<br>(167°F)                                         | 90°C<br>(194°F)                                                                                                    | AWG<br>or kcmil |
|                 | Types TW,<br>UF                                          | Types<br>RHW,<br>THHW,<br>THW,<br>THWN,<br>XHHW,<br>USE, ZW | Types<br>TBS, SA, SIS,<br>FEP, FEPB, MI,<br>RHH, RHW-2,<br>THHN,<br>THHW, THW-2,<br>THWN-2, USE-<br>2, XHH, XHHW,<br>XHHW-2, ZW-2 | Types<br>TW, UF | Types<br>RHW,<br>THHW,<br>THW,<br>THWN,<br>XHHW,<br>USE | Types<br>TBS, SA, SIS,<br>THHN, THHW,<br>THW-2,<br>THWN-2, RHH,<br>RHW-2, USE-<br>2, XHH, XHHW,<br>XHHW-2,<br>ZW-2 |                 |
|                 |                                                          |                                                             |                                                                                                                                   |                 |                                                         |                                                                                                                    |                 |
|                 |                                                          |                                                             |                                                                                                                                   |                 |                                                         |                                                                                                                    |                 |
| Copper          |                                                          |                                                             | Aluminum or Copper-Clad Aluminum                                                                                                  |                 |                                                         |                                                                                                                    |                 |
| 18**            | —                                                        | —                                                           | 14                                                                                                                                | —               | —                                                       | —                                                                                                                  | —               |
| 16**            | —                                                        | —                                                           | 18                                                                                                                                | —               | —                                                       | —                                                                                                                  | —               |
| 14**            | 15                                                       | 20                                                          | 25                                                                                                                                | —               | —                                                       | —                                                                                                                  | —               |
| 12**            | 20                                                       | 25                                                          | 30                                                                                                                                | 15              | 20                                                      | 25                                                                                                                 | 12**            |
| 10**            | 30                                                       | 35                                                          | 40                                                                                                                                | 25              | 30                                                      | 35                                                                                                                 | 10**            |
| 8               | 40                                                       | 50                                                          | 55                                                                                                                                | 35              | 40                                                      | 45                                                                                                                 | 8               |
| 6               | 55                                                       | 65                                                          | 75                                                                                                                                | 40              | 50                                                      | 55                                                                                                                 | 6               |
| 4               | 70                                                       | 85                                                          | 95                                                                                                                                | 55              | 65                                                      | 75                                                                                                                 | 4               |
| 3               | 85                                                       | 100                                                         | 115                                                                                                                               | 65              | 75                                                      | 85                                                                                                                 | 3               |
| 2               | 95                                                       | 115                                                         | 130                                                                                                                               | 75              | 90                                                      | 100                                                                                                                | 2               |
| 1               | 110                                                      | 130                                                         | 145                                                                                                                               | 85              | 100                                                     | 115                                                                                                                | 1               |
| 1/0             | 125                                                      | 150                                                         | 170                                                                                                                               | 100             | 120                                                     | 135                                                                                                                | 1/0             |
| 2/0             | 145                                                      | 175                                                         | 195                                                                                                                               | 115             | 135                                                     | 150                                                                                                                | 2/0             |
| 3/0             | 165                                                      | 200                                                         | 225                                                                                                                               | 130             | 155                                                     | 175                                                                                                                | 3/0             |
| 4/0             | 195                                                      | 230                                                         | 260                                                                                                                               | 150             | 180                                                     | 205                                                                                                                | 4/0             |
| 250             | 215                                                      | 255                                                         | 290                                                                                                                               | 170             | 205                                                     | 230                                                                                                                | 250             |
| 300             | 240                                                      | 285                                                         | 320                                                                                                                               | 195             | 230                                                     | 260                                                                                                                | 300             |
| 350             | 260                                                      | 310                                                         | 350                                                                                                                               | 210             | 250                                                     | 280                                                                                                                | 350             |
| 400             | 280                                                      | 335                                                         | 380                                                                                                                               | 225             | 270                                                     | 305                                                                                                                | 400             |
| 500             | 320                                                      | 380                                                         | 430                                                                                                                               | 260             | 310                                                     | 350                                                                                                                | 500             |
| 600             | 350                                                      | 420                                                         | 475                                                                                                                               | 285             | 340                                                     | 385                                                                                                                | 600             |
| 700             | 385                                                      | 460                                                         | 520                                                                                                                               | 315             | 375                                                     | 425                                                                                                                | 700             |
| 750             | 400                                                      | 475                                                         | 535                                                                                                                               | 320             | 385                                                     | 435                                                                                                                | 750             |
| 800             | 410                                                      | 490                                                         | 555                                                                                                                               | 330             | 395                                                     | 445                                                                                                                | 800             |
| 900             | 435                                                      | 520                                                         | 585                                                                                                                               | 355             | 425                                                     | 480                                                                                                                | 900             |
| 1000            | 455                                                      | 545                                                         | 615                                                                                                                               | 375             | 445                                                     | 500                                                                                                                | 1000            |
| 1250            | 495                                                      | 590                                                         | 665                                                                                                                               | 405             | 485                                                     | 545                                                                                                                | 1250            |
| 1500            | 525                                                      | 625                                                         | 705                                                                                                                               | 435             | 520                                                     | 585                                                                                                                | 1500            |
| 1750            | 545                                                      | 650                                                         | 735                                                                                                                               | 455             | 545                                                     | 615                                                                                                                | 1750            |
| 2000            | 555                                                      | 655                                                         | 750                                                                                                                               | 470             | 560                                                     | 630                                                                                                                | 2000            |

\* Refer to Section 310.15(B)(2)(a) for the ampacity correction factors where the ambient temperature is other than 30°C (86°F). Refer to 310.15(B)(3)(a) for more than three current-carrying conductors.

\*\* See Section 240.4(D) for conductor overcurrent protection limitations.

## 120/240 Volt Single Phase Dwelling Services and Feeders [Section 310.15(B)(7)]

For one family dwellings and the individual dwelling units of two family and multifamily dwellings, service and feeder conductors supplied by a single phase, 120/240 volt system shall be permitted to be sized as follows:

- For a service rated 100 through 400 A, the service conductors supplying the entire load associated with a one family dwelling, or the service conductors supplying the entire load associated with an individual dwelling unit in a two family or multifamily dwelling, shall be permitted to have an ampacity not less than 83 percent of the service rating.
- For a feeder rated 100 through 400 A, the feeder conductors supplying the entire load associated with a one family dwelling, or the feeder conductors supplying the entire load associated with an individual dwelling unit in a two-family or multifamily dwelling, shall be permitted to have an ampacity not less than 83 percent of the feeder rating.
- In no case shall a feeder for an individual dwelling unit be required to have an ampacity greater than that specified in (1) or (2).
- Grounded conductors shall be permitted to be sized smaller than the ungrounded conductors, provided that the requirements of Sections 220.61 and 230.42 for service conductors or the requirements of Sections 215.2 and 220.61 for feeder conductors are met.

Where correction or adjustment factors are required by 310.15(B)(2) or (3), they shall be applied to the ampacity associated with the temperature rating of the conductor.

## NEC 210.19 Conductors—Min. Ampacity and Size

For branch circuits not more than 600 volts, conductors shall have an ampacity not less than the maximum load to be served. Conductors shall be sized to carry not less than the larger of (a) or (b).

- Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load.
- The minimum branch-circuit conductor size shall have an allowable ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

Exception: If the assembly, including the overcurrent devices protecting the branch circuit(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the branch-circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

## Correction Factors

Based on NEC Table 310.15(B)(2)(a) Ambient Temperature Correction Factors Based on 30°C (86°F)

| Ambient Temperature (°C) | Temperature Rating of Conductor |      |      | Ambient Temperature (°F) |
|--------------------------|---------------------------------|------|------|--------------------------|
|                          | 60°C                            | 75°C | 90°C |                          |
| 10 or less               | 1.29                            | 1.20 | 1.15 | 50 or less               |
| 11–15                    | 1.22                            | 1.15 | 1.12 | 51–59                    |
| 16–20                    | 1.15                            | 1.11 | 1.08 | 60–68                    |
| 21–25                    | 1.08                            | 1.05 | 1.04 | 69–77                    |
| 26–30                    | 1.00                            | 1.00 | 1.00 | 78–86                    |
| 31–35                    | 0.91                            | 0.94 | 0.96 | 87–95                    |
| 36–40                    | 0.82                            | 0.88 | 0.91 | 96–104                   |
| 41–45                    | 0.71                            | 0.82 | 0.87 | 105–113                  |
| 46–50                    | 0.58                            | 0.75 | 0.82 | 114–122                  |
| 51–55                    | 0.41                            | 0.67 | 0.76 | 123–131                  |
| 56–60                    | —                               | 0.58 | 0.71 | 132–140                  |
| 61–65                    | —                               | 0.47 | 0.65 | 141–149                  |
| 66–70                    | —                               | 0.33 | 0.58 | 150–158                  |
| 71–75                    | —                               | —    | 0.50 | 159–167                  |
| 76–80                    | —                               | —    | 0.41 | 168–176                  |
| 81–85                    | —                               | —    | 0.29 | 177–185                  |

## Adjustment Factors – See NEC Table 310.15 (B)(3)(a)

Where the number of current-carrying conductors in a raceway or cable exceeds three, the allowable ampacities shall be reduced as shown in the following table:

| Number of Conductors*** | Percent of Values in Table 310.15(B)(16) through Table 310.15(B)(19) as Adjusted for Ambient Temperature if Necessary |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 4 through 6             | 80                                                                                                                    |
| 7 through 9             | 70                                                                                                                    |
| 10 through 20           | 50                                                                                                                    |
| 21 through 30           | 45                                                                                                                    |
| 31 through 40           | 40                                                                                                                    |
| 41 and Above            | 35                                                                                                                    |

\*\*\* Number of conductors is the total number of conductors in the raceway or cable, including spare conductors. The count shall be adjusted in accordance with Section 310.15(B)(5) and (6). The count shall not include conductors that are connected to electrical components but that cannot be simultaneously energized.

## NEC 210.20(A) Continuous and Noncontinuous Loads

Where a branch-circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

## NEC 240.4 Protection of Conductors

Conductors, other than flexible cords, flexible cables, and fixture wires, shall be protected against overcurrent in accordance with their ampacities specified in 310.15, unless otherwise permitted or required in 240.4(A) through (G).

## NEC 240.4 (D) Small Conductors

Unless specifically permitted in 240.4(E) or (G), the overcurrent protection shall not exceed that required by (D)(1) through (D)(7) after any correction factors for ambient temperature and number of conductors have been applied.

## NEC 430.22(A) Direct-Current Motor-Rectifier Supplied

For dc motors operating from a rectified power supply, the conductor ampacity on the input of the rectifier shall not be less than 125 percent of the rated input current to the rectifier. For dc motors operating from a rectified single-phase power supply, the conductors between the field wiring output terminals of the rectifier and the motor shall have an ampacity of not less than the following percentages of the motor full-load current rating:

- (1) Where a rectifier bridge of the single-phase, half-wave type is used, 190 percent.
- (2) Where a rectifier bridge of the single-phase, full-wave type is used, 150 percent.

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Schneider Electric USA, Inc.

800 Federal Street  
Andover, MA 01810 USA  
888-778-2733

[www.schneider-electric.us](http://www.schneider-electric.us)

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