

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

Class 615



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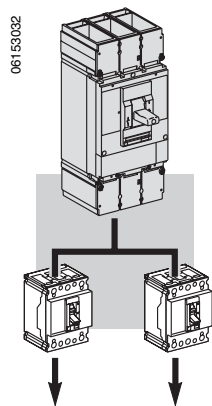
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# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 1—The Compact® Circuit Breaker Line

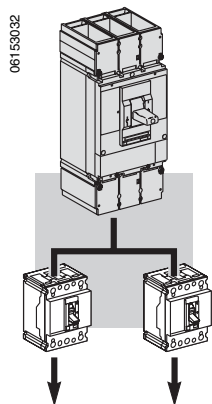
## SECTION 1—THE COMPACT® CIRCUIT BREAKER LINE

### CIRCUIT BREAKERS—PAGE 8



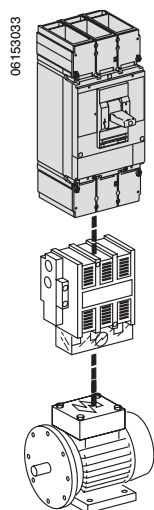
|   |          |                  |                  |              |               |
|---|----------|------------------|------------------|--------------|---------------|
|   |          |                  |                  |              |               |
| <b>Rated Current (A)</b>                | 15–100   | 15–250           | 150–600          | 400–1200     | 1250–2500     |
| <b>COMPACT®</b>                         | NSE100   | NSF150<br>NSF250 | NSJ400<br>NSJ600 | CK400–CK1200 | CM1250–CM2500 |
| <b>Interrupting<br/>Rating at 480 V</b> | <b>N</b> | 18               | 35               | 50           | —             |
|   | <b>H</b> | —                | 65               | 65           | 85            |
|   | <b>L</b> | —                | 100              | 150          | —             |

### SWITCHES—PAGE 17



|                          |         |                    |                    |           |                                  |
|--------------------------|---------|--------------------|--------------------|-----------|----------------------------------|
| <b>Rated Current (A)</b> | 70      | 150, 250           | 400, 600           | 800, 1200 | 1600–2500                        |
| <b>COMPACT®</b>          | NSE100A | NSF150A<br>NSF250A | NSJ400A<br>NSJ600A | CK800NA   | CM1600HA<br>CM2000HA<br>CM2500HA |

### MOTOR CIRCUIT PROTECTORS—PAGE 19

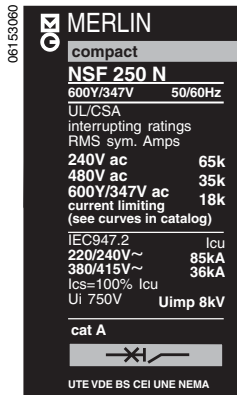


|                          |         |                    |                    |          |
|--------------------------|---------|--------------------|--------------------|----------|
| <b>Rated Current (A)</b> | 3–75    | 100–250            | 400–600            | 800–1200 |
| <b>COMPACT®</b>          | NSE100A | NSF150A<br>NSF250A | NSJ400A<br>NSJ600A | CK800NA  |

For NSE, CK and CM circuit breakers see appropriate catalog.

## SECTION 2—GENERAL CHARACTERISTICS

### COMPLIANCE WITH STANDARDS



#### Compliance with North American Standards

Compact® NS circuit breakers are built in accordance with Underwriters Laboratories Inc. UL 489 Standard and Canadian Standards Association CSA C22.2 No. 5.02 Standard. Circuit breakers, switches and their accessories, except where noted, are Listed under UL files E63335, E103740, E103955, and Certified under CSA files LR69561 and LR88980.

#### Compliance with International Standards

Compact NS circuit breakers and their accessories comply also with the following international standards:

- IEC 60947-1: general rules
- IEC 60947-2: circuit breakers
- IEC 60947-3: switches, disconnectors, switch disconnectors, etc.

In that these standards are applied in most countries, Compact circuit breakers and their accessories comply with European (EN 60947-1 and EN 60947-2) and the corresponding national standards:

- France NF
- Germany VDE
- U.K. BS
- Australia AS
- Italy CEI

#### Compliance with the Specifications of Marine Classification Organizations

Compact NS circuit breakers have been approved for marine application by the American Bureau of Shipping, Bureau Veritas, Lloyd's Register of Shipping, Registro Italiano Navale, Germanischer Lloyd's and Det Norske Veritas.

They comply with the following standards:

- UL 489 Supplement SA. Marine use on vessels over 65 feet in length
- US Coast Guard specifications
- IEC 92-504 and marine specifications: inclination, vibrations, insulation resistance
- IEC 803 Electromagnetic Disturbance Immunity

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 2—General Characteristics

#### Tropicalization

Compact® NS circuit breakers comply with NF C 63-100 standard level 2 conditions (95% relative humidity at 45° C or 80% at 55° C, hot and humid climate conditions). The materials used in Compact NS circuit breakers will not support the growth of fungus or mold.

They also comply with the following standards:

- IEC 68-2-30 damp heat
- IEC 68-2-2 dry heat
- IEC 68-2-11 salt spray
- IEC 68-2-1 low temperatures

#### Pollution Degree

Compact NS circuit breakers are certified for operation in pollution degree III environments as defined by IEC standard 947 (industrial environments).

#### Environmental Protection

Compact NS circuit breakers take into account concerns for environmental protection. Most components are recyclable and parts are marked as specified in applicable standards.

#### Suitability for Isolation (Positive Contact Indication)



All Compact NS circuit breakers and switches are suitable for isolation as defined in the IEC 947-2 Standard:

- The isolation position corresponds to the O (OFF position).
- The operating handle cannot indicate the OFF position unless the contacts are open.
- Padlocks may not be installed unless the contacts are open

Installation of a rotary handle or a motor mechanism does not alter the functionality of the position indication system.

The isolation function is certified by tests guaranteeing:

- The mechanical reliability of the position indication system
- The absence of leakage currents
- Overvoltage withstand capacity between upstream and downstream connections



#### Installation in Class II Switchboards

All Compact NS circuit breakers, even when fitted with a rotary handle or a motor mechanism, can be installed through the door of Class II IEC switchboards (as per IEC 664 Standard). Refer to circuit breaker installation instructions prior to installing circuit breaker.

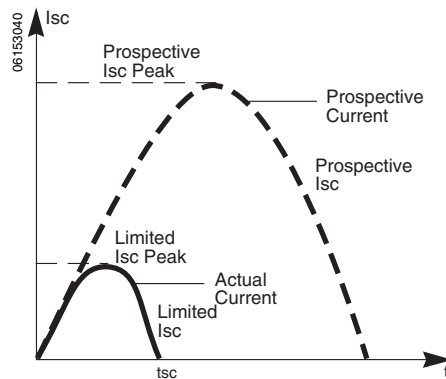
Installation requires no special insulation because Compact NS circuit breakers provide Class II insulation between the front face and all internal circuits.

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 2—General Characteristics

#### Suitability for Isolation (Positive Contact Indication)

The limiting capacity of a circuit breaker is its ability to limit short-circuit currents.



The exceptional limiting capacity of the Compact® NS line is due to the double break technique (rapid natural repulsion of contacts and the appearance of two arc voltages in series with a steep wavefront).

The limiting capacity of the Compact NS line greatly reduces the forces created by fault currents in devices. The result is a major increase in breaking performance. In particular, the service breaking capacity I<sub>cs</sub> is equal to 100% of I<sub>cu</sub>.

The I<sub>cs</sub> value, defined by IEC 947-2, is guaranteed by tests comprising the following operations:

- Breaking a fault current equal to 100% of I<sub>cu</sub> three times consecutively
- Checking that the device continues to function normally
- Conduction of rated current without abnormal temperature rise
- Protection functions perform within the limits specified by the standard
- Suitability for isolation is not impaired

#### Longer Service Life of Electrical Installations

Current limiting circuit breakers greatly reduce the negative effects of short circuits on installations.

#### Thermal Effects

Less temperature rise in conductors, therefore longer service life for cables.

#### Mechanical Effects

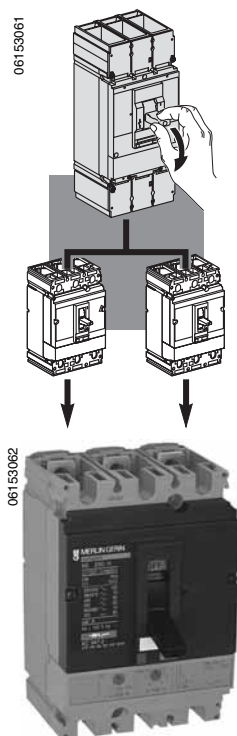
Reduced electrodynamic forces, therefore less risk of electrical contacts or busbars being distorted or broken.

#### Electromagnetic Effects

Less disturbance for measuring devices located near electrical circuits.

## SECTION 3—CIRCUIT BREAKERS

## UL 489 Listed Ratings



| Compact® Circuit Breakers     |  |  | NSF150       |  | NSF250   |  |
|-------------------------------|--|--|--------------|--|----------|--|
| Number of Poles               |  |  | 3, 4, 4 OSN* |  | 3, 4     |  |
| Rated Voltage (V)             |  |  | AC 50/60 Hz  |  | 600Y/347 |  |
| Rated Current (A)             |  |  | In 40° C     |  | 150      |  |
|                               |  |  | N            |  | H        |  |
| Interrupting Ratings (kA rms) |  |  | 240 V        |  | 65       |  |
|                               |  |  | 480 V        |  | 35       |  |
|                               |  |  | 600 Y/ 347 V |  | 18       |  |
|                               |  |  | 600 V        |  | —        |  |

\*Oversized Neutral Protection: four-pole OSN 125/250N and 150/250N are same ratings as NSE250A

| Compact® Circuit Breakers            |  |             |                          | NSF150       |      | NSF250 |      |
|--------------------------------------|--|-------------|--------------------------|--------------|------|--------|------|
| Number of Poles                      |  |             |                          | 3, 4, 4 OSN* |      | 3, 4   |      |
| Rated Insulation Voltage (V)         |  | Ui          |                          | 750          |      | 750    |      |
| Rated Impulse Withstand Voltage (kV) |  | Uimp        |                          | 8            |      | 8      |      |
| Rated Operational Voltage (V)        |  | AC 50/60 Hz |                          | 690          |      | 690    |      |
|                                      |  | DC          |                          | 500          |      | 500    |      |
| Rated Current (A)                    |  | In          |                          | 150          |      | 250    |      |
|                                      |  |             |                          | N            |      | H      |      |
| Ultimate Breaking Capacity (kA rms)  |  | Icu         | AC 50/50 Hz 220/ 240 V   | 85           | 100  | 85     | 100  |
|                                      |  |             | 380/ 415 V               | 36           | 70   | 36     | 70   |
|                                      |  |             | 440 V                    | 35           | 65   | 35     | 65   |
|                                      |  |             | 500 V                    | 30           | 50   | 30     | 50   |
|                                      |  |             | 525 V                    | 22           | 35   | 22     | 35   |
|                                      |  |             | 600/ 690 V               | 8            | 10   | 8      | 10   |
|                                      |  | DC          | 250 V (1 pole)           | 50           | 85   | 50     | 85   |
|                                      |  |             | 500 V (2 pole in series) | 50           | 85   | 50     | 85   |
| Service Breaking Capacity            |  | Ics         | (% Icu)                  | 100%         | 100% | 100%   | 100% |
| Utilization Category                 |  |             |                          | A            | A    | A      | A    |

\*Oversized Neutral Protection: four-pole OSN 125/250N and 150/250N are same ratings as NSF250A.



# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 3—Circuit Breakers

### UL 489 Listed Ratings

| Compact® Circuit Breakers     |              | NSJ400                           |     |     | NSJ600 |     |     |
|-------------------------------|--------------|----------------------------------|-----|-----|--------|-----|-----|
| Number of Poles               |              | 3, 4, 4 OSN*                     |     |     | 3, 4   |     |     |
| Rated Voltage (V)AC 50/60 Hz  |              | 600                              |     |     | 600    |     |     |
| Rated Current (A)In 40° C     |              | 400 (100% Rated Circuit Breaker) |     |     | 600    |     |     |
|                               |              | N                                | H   | L   | N      | H   | L   |
| Interrupting Ratings (kA rms) | 240 V        | 65                               | 100 | 150 | 65     | 100 | 150 |
|                               | 480 V        | 35                               | 65  | 100 | 35     | 65  | 100 |
|                               | 600 Y/ 347 V | —                                | —   | —   | —      | —   | —   |
|                               | 600 V        | 18                               | 25  | 25  | 18     | 25  | 25  |

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 4—Trip Units

## SECTION 4—TRIP UNITS

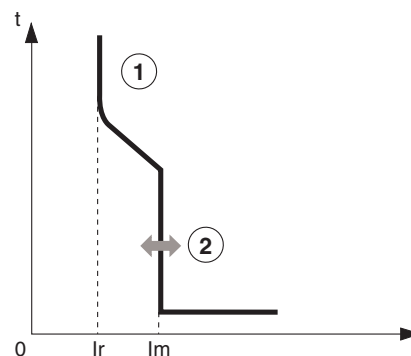
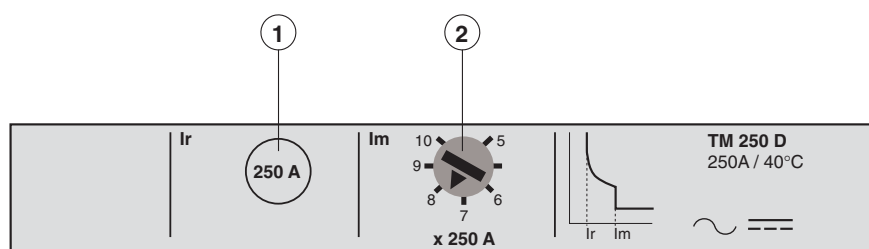
### TRIP UNITS FOR COMPACT® NSF150 AND NSF250 CIRCUIT BREAKERS

Compact NSF150 and NSF250 circuit breakers are equipped with thermal-magnetic (TM) trip units.

#### Protection

- Against overload (1) with a fixed thermal protection
- Against short circuits (2) with fixed (on NSF150) or adjustable (on NSF250) magnetic protection

06153064



| Trip Units for Compact® NSF150–NSF250 Circuit Breakers |                     |         | TM15DP–TM250DP Trip Units    |    |         |      |       |      |         |    |       |                       |                                       |      |           |            |     |     |  |  |
|--|---------------------|---------|------------------------------|----|---------|------|-------|------|---------|----|-------|-----------------------|---------------------------------------|------|-----------|------------|-----|-----|--|--|
| Rating (A)   | In                  | 40° C   | 15                           | 20 | 30      | 40   | 50    | 60   | 70      | 80 | 90    | 100                   | 125                                   | 150  | 175       | 200        | 225 | 250 |  |  |
| 3P   |                     | 50° C   | 14.2                         | 19 | 28.5    | 38   | 47.5  | 57   | 66.5    | 76 | 85    | 95                    | 118                                   | 142  | 166       | 190        | 213 | 237 |  |  |
| 4P3T   |                     | 60° C   | 13.5                         | 18 | 27      | 36   | 45    | 54   | 63      | 72 | 81    | 90                    | 112                                   | 135  | 158       | 180        | 203 | 225 |  |  |
| 4P4T   |                     | 70° C   | 12.8                         | 17 | 25.6    | 34.2 | 43    | 51   | 60      | 68 | 77    | 85                    | 107                                   | 128  | 150       | 171        | 192 | 214 |  |  |
| Circuit Breaker  | Compact® NSF150 N/H |         | ■                            | ■  | ■       | ■    | ■     | ■    | ■       | ■  | ■     | ■                     | ■                                     | ■    |           |            |     |     |  |  |
|  | Compact® NSF250 N/H |         |                              |    |         |      |       |      |         |    |       |                       |                                       |      | ■         | ■          | ■   | ■   |  |  |
|  |                     |         | TM100OSN–TM150OSN Trip Units |    |         |      |       |      |         |    |       |                       |                                       |      |           |            |     |     |  |  |
|  |                     |         | Phase                        |    | Neutral |      | Phase |      | Neutral |    | Phase |                       | Neutral                               |      |           |            |     |     |  |  |
| Rating (A)   | In                  | 40° C   | 100                          |    | 150     |      | 125   |      | 250     |    | 150   |                       | 250                                   |      |           |            |     |     |  |  |
| 4P OSN   |                     | 50° C   | 95                           |    | 142     |      | 118   |      | 237     |    | 142   |                       | 237                                   |      |           |            |     |     |  |  |
|  |                     | 60° C   | 90                           |    | 135     |      | 112   |      | 225     |    | 135   |                       | 225                                   |      |           |            |     |     |  |  |
|  |                     | 70° C   | 85                           |    | 128     |      | 107   |      | 214     |    | 128   |                       | 214                                   |      |           |            |     |     |  |  |
|  |                     |         |                              |    |         |      |       |      |         |    |       |                       |                                       |      |           |            |     |     |  |  |
| Overload Protection                                    |                     |         |                              |    |         |      |       |      |         |    |       |                       |                                       |      |           |            |     |     |  |  |
| Thermal  |                     | 3P      | Non-adjustable               |    |         |      |       |      |         |    |       |                       |                                       |      |           |            |     |     |  |  |
|  |                     | 4P3T    |                              |    |         |      |       |      |         |    |       |                       | Non-adjustable, No Neutral Protection |      |           |            |     |     |  |  |
|  |                     | 4P4T    |                              |    |         |      |       |      |         |    |       |                       | Non-adjustable                        |      |           |            |     |     |  |  |
|  |                     | 4P OSN* |                              |    |         |      |       |      |         |    |       |                       | Non-adjustable                        |      |           |            |     |     |  |  |
| Short-circuit Protection                               |                     |         |                              |    |         |      |       |      |         |    |       |                       |                                       |      |           |            |     |     |  |  |
| Magnetic   |                     |         | Non-adjustable               |    |         |      |       |      |         |    |       |                       |                                       |      |           | Adjustable |     |     |  |  |
| Compact® NSF150  |                     |         | 400                          |    |         | 500  |       | 1000 |         |    |       |                       | 1250                                  |      | 1500      |            |     |     |  |  |
| Compact® NSF250  |                     |         |                              |    |         |      |       |      |         |    |       |                       |                                       |      |           | 5–10 x In  |     |     |  |  |
|  |                     |         | 4P3T                         |    |         |      |       |      |         |    |       | No Neutral Protection |                                       |      |           |            |     |     |  |  |
| Neutral Protection                                     |                     |         | 4P4T                         |    |         |      |       |      |         |    |       | 1000                  | 1250                                  | 1500 | 5–10 x In |            |     |     |  |  |
|  |                     |         | 4P OSN*                      |    |         |      |       |      |         |    |       | 1000                  | 1250                                  | 1500 |           |            |     |     |  |  |

\*Oversized Neutral

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 4—Trip Units

### TRIP UNITS FOR COMPACT® NSJ400 AND NSJ600 CIRCUIT BREAKERS

Compact NSJ400 and NSJ600 circuit breakers are equipped with current sensors and electronic trip units.

#### Current Sensors

Four different sizes are available and can be mounted with all trip units:

- NSJ400—150, 250 and 400 A
- NSJ600—600 A

#### Trip Units

#### STR23SP, STR53UP and STR23SP-OSN

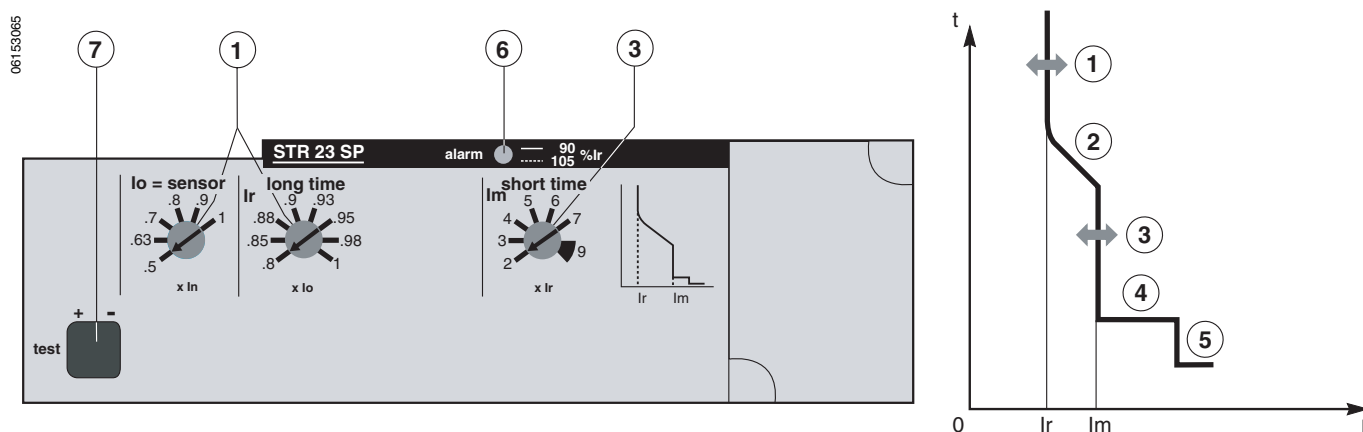
- Protection for loads, from 60 to 600 A
  - STR23SP and STR53UP for standard protection
  - STR23SP-OSN for oversized neutral protection (factory-installed only)
  - STR53UP for generator supplied network protection and long cable runs
- Trip units STR23SP and STR53UP can be mounted on all Compact NSJ400 and NSJ600 circuit breaker types N, H and L
- Trip unit STR53UP offers a greater number of optional indication and measurement functions, protection settings and ground-fault protection
- STR23SP and STR53UP available on four-pole circuit breakers with sealable, 3-position neutral protection setting:
  - 4P 3D (neutral unprotected)
  - 4P 3D + N/2 (neutral protection at  $0.5 \times I_r$ ) where  $I_r$  is trip unit current setting
  - 4P 4D (neutral protection at  $I_r$ ) where  $I_r$  is trip unit current setting

| Trip Units for Compact® NSJ400 and NSJ600 Circuit Breakers |                                       |             | STR23SP                             |              | STR53UP   |         |         | STR23SP OSN (Oversized Neutral) |                                  |         |
|--|---------------------------------------|-------------|-------------------------------------|--------------|---|---------|---------|---------------------------------|----------------------------------|---------|
| Overload Protection (Long Time)                            |                                       |             |                                     |              |   |         |         |                                 |                                  |         |
| Tripping Threshold (A)                                     | Ir                                    | 20–70° C    | Adjustable (48 Settings) 0.4–1 x In |              |   |         |         |                                 |                                  |         |
|  |                                       |             | Fixed                               |              | Adjustable                                      |         |         |                                 | Fixed                            |         |
|  |                                       |             | At 1.5 x Ir                         | 120–180      | 17–25   | 34–50   | 69–100  | 138–200                         | 277–400                          | 120–180 |
|  |                                       |             | At 6 x Ir                           | 5–7.5        | 0.8–1   | 1.6–2   | 3.2–4   | 6.4–8                           | 12.8–16                          | 5–7.5   |
| Tripping Time (s) (Min–Max)                                |                                       | At 7.2 x Ir | 3.2–5.0                             | 0.5–0.7      | 1.1–1.4   | 2.2–2.8 | 4.4–5.5 | 8.8–11                          | 3.2–5.0                          |         |
|  |                                       |             |                                     |              |   |         |         |                                 |                                  |         |
| Short-circuit Protection (Short Time)                      |                                       |             |                                     |              |   |         |         |                                 |                                  |         |
| Tripping   | Im / Isd                              |             | Adjustable (7 Settings) 2–9 x Ir    |              | Adjustable (7 Settings) 1.5–7 x Ir              |         |         |                                 | Adjustable (7 Settings) 2–9 x Ir |         |
|  | Accuracy                              |             | ± 15%                               |              |   |         |         |                                 |                                  |         |
| Time Delay (ms)  | Max. Overcurrent Time Before Tripping |             | Fixed ≤40                           |              | Adjustable (4 Settings + Constant I²t Function) |         |         |                                 | Fixed ≤40                        |         |
|  |                                       |             |                                     |              | ≤15   | ≤60     | ≤140    | ≤230                            |                                  |         |
|  | Total Breaking Time                   |             | ≤60                                 |              | ≤60   | ≤140    | ≤230    | ≤350                            | ≤60                              |         |
| Short-circuit Protection (Instantaneous)                   |                                       |             |                                     |              |   |         |         |                                 |                                  |         |
| Tripping Threshold (A)                                     |                                       |             | Fixed ≥ 9 x In                      |              | Adjustable (7 Settings) 1.5–9 x In              |         |         |                                 | Fixed ≥ 9 x In                   |         |
| Adjustable Neutral Protection (Three Position Switch)      |                                       |             |                                     |              |   |         |         |                                 |                                  |         |
|  | Switch                                | Settings    | Protection Level                    |              |   |         |         | NSJ250/400N                     | NSJ400/600N                      |         |
|  | Position 1                            | 4P 3D       | No Protection                       |              | No Protection                                   |         |         | No Protection                   | No Protection                    |         |
|  | Position 2                            | 4P 3D + N/2 | 0.5 x Ir                            |              | 0.5 x Ir  |         |         | 0.8 x Ir                        | 0.75 x Ir                        |         |
|  | Position 3                            | 4P 4D       | 1.0 x Ir                            |              | 1.0 x Ir  |         |         | 1.6 x Ir                        | 1.5 x Ir                         |         |
| Other Functions  |                                       |             |                                     |              |   |         |         |                                 |                                  |         |
| Indication of Fault Type                                   |                                       |             |                                     | ■ (Standard) |   |         |         |                                 |                                  |         |
| Equipment Ground-fault Protection (T)                      |                                       |             |                                     | ■            |   |         |         |                                 |                                  |         |
| Built-in Ammeter (I)                                       |                                       |             |                                     | ■            |   |         |         |                                 |                                  |         |
| Zone-selective Interlocking (ZSI)                          |                                       |             |                                     | ■            |   |         |         |                                 |                                  |         |
| Communication (COM)  |                                       |             |                                     | ■            |   |         |         |                                 |                                  |         |

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 4—Trip Units

#### Electronic Trip Unit STR23SP and STR23SP-OSN (Oversized Neutral)



#### Protection

- Long-time (LT) overload protection, adjustable threshold, based on the actual rms current
  - Adjustable threshold (1) using six  $I_o$  base settings (0.5–1) and fine adjustment  $I_r$  with eight settings ranging from (0.8–1)
  - Non-adjustable tripping time (2)
- Short-time (ST) short-circuit protection
  - Adjustable threshold  $I_m$  (3)
  - Fixed time delay (4)
- Instantaneous (I) short-circuit protection, fixed threshold (5)
- Neutral protection available on standard four-pole circuit breakers; protection level controlled using three-position switch
  - 4P 3D: no protection
  - 4P 3D + N/2: neutral protection at 0.5  $I_r$
  - 4P 4D: neutral protection at  $I_r$
- Neutral protection for STR23SP-OSN (oversized neutral) available on four-pole circuit breakers equipped with oversized neutral protection; protection level controlled using three-position switch

#### NSJ250/400N:

- 4P 3D: no protection
- 4P 3D + N/2: neutral protection at 0.8 x  $I_r$
- 4P 4D: neutral protection at 1.6 x  $I_r$

#### NSJ400/600N:

- 4P 3D: no protection
- 4P 3D + N/2: neutral protection at 0.75 x  $I_r$
- 4P 4D: neutral protection at 1.5 x  $I_r$

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 4—Trip Units

#### Indications

Load indication (LED) in front (6):

- Lights solid at 90% of  $I_r$  threshold
- Flashes at >105% or greater of  $I_r$  threshold

#### Test

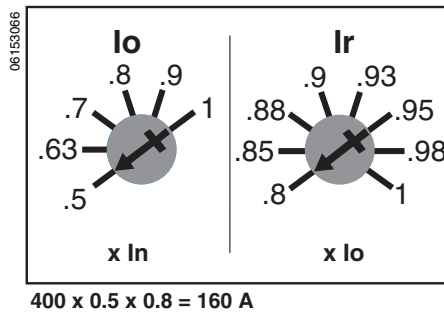
Test connector in front (7) for connection to test kit to check circuit breaker operation after fitting the trip unit or other accessories.

#### Setting Example

Question: What is the overload protection threshold of a Compact NSJ400 circuit breaker equipped with trip unit STR23SP where  $I_o = 0.5$  and  $I_r = 0.8$ ?

Answer:  $I_n \times I_o \times I_r = 400 \times 0.5 \times 0.8 = 160 \text{ A}$

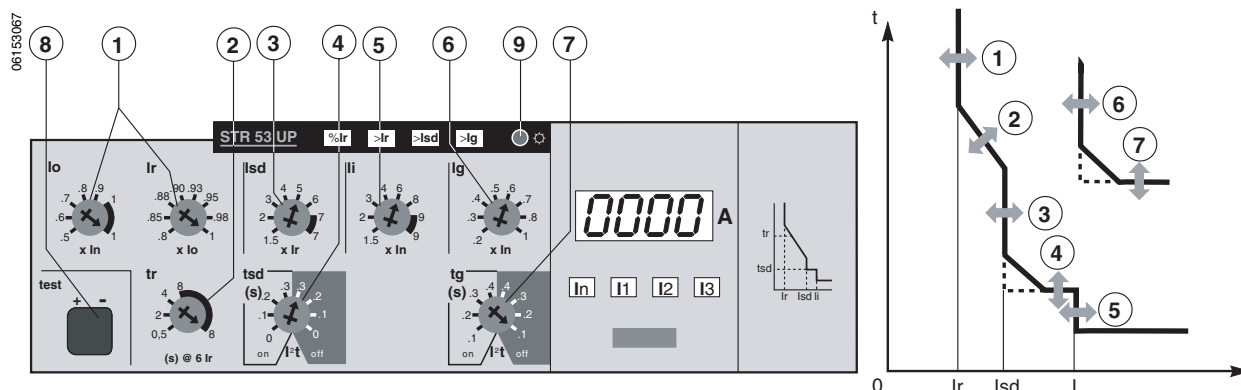
The same trip unit with the same settings, mounted on an NSJ600 circuit breaker will have the following tripping threshold:  $I_n \times I_o \times I_r = 600 \times 0.5 \times 0.8 = 240 \text{ A}$ .



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 4—Trip Units

#### Electronic Trip Unit STR53UP



#### Protection

- Long-time (LT) overload protection, adjustable threshold, based on actual rms current, as defined by IEC 947-2, appendix F
  - Adjustable threshold (1) using six  $I_o$  base settings (0.5–1) and fine adjustment  $I_r$  with eight settings ranging from (0.8–1)
  - Adjustable tripping time (2)
- Short-time (ST) short-circuit protection
  - Adjustable threshold  $I_{sd}$  (3)
  - Adjustable time delay (4), with or without constant  $I^2t$  function
- Instantaneous (Ii) short-circuit protection, adjustable threshold (5)
- Neutral protection available on standard four-pole circuit breakers; protection level controlled using three-position switch
  - 4P 3D: no protection
  - 4P 3D + N/2: neutral protection at 0.5  $I_r$
  - 4P 4D: neutral protection at  $I_r$

#### Overload Indications (% $I_r$ )

- LED (9) lights solid when current exceeds 0.9  $I_r$
- LED (9) flashes when current exceeds long-time threshold  $I_r$

#### Fault Indications

LEDs indicate the type of fault that caused tripping:

- Overload (LT protection) or abnormal component temperature (> $I_r$ )
- Short-circuit (ST or instantaneous protection) (> $I_{sd}$ )
- Ground-fault (if earth-fault protection option is present) (> $I_g$ )
- Microprocessor malfunction—both (> $I_r$ ) and (> $I_{sd}$ ) LEDs go on, plus the (> $I_g$ ) LED, if the ground-fault protection option is present

The LEDs are battery powered with spare batteries supplied in the adapter box. When a fault occurs, the LED indicating type of fault shuts off after approximately 10 minutes to conserve battery power. The fault data is stored in memory and the LED can be re-illuminated by pressing the battery/LED test button (9). The LED automatically goes off and memory is cleared when the circuit breaker is reset.

#### Test

- Test connector in front (8) for connection to test kit (see page 16); used to check circuit breaker operation after fitting trip unit or other accessories
- Test button (9) for (% $I_r$ ), (> $I_r$ ), (> $I_m$ ) and (> $I_g$ ) LEDs and battery

#### Self-monitoring

The circuit breaker trips for both microprocessor faults and abnormal temperatures.

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

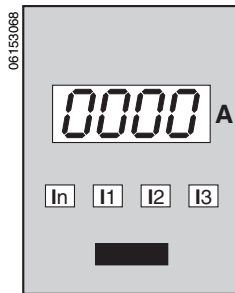
## Section 4—Trip Units

### Options for Electronic Trip Unit STR53UP

#### Equipment Ground-fault Protection (T)—see (6) and (7), page 14

| Type               |   | Residual Current   |
|--------------------|---|--|
| Tripping threshold | I <sub>g</sub>  | Adjustable (8 Settings) 0.2–1 x I <sub>n</sub>                                 |
|                    | Accuracy  | ± 15%  |
| Tripping time (ms) | Max. overcurrent time before tripping (T <sub>g</sub> ) | Adjustable (4 Settings + Constant I <sup>2</sup> t Function) 60, 140, 230, 350 |
|                    | Total Breaking Time                                     | -140, -230, -350, -500   |

### Ammeter (I)



A digital display continuously indicates the current of the phase with the greatest load. By pressing a scroll button, it is also possible to display successively the readings of I1, I2, I3 and I neutral. LEDs indicate the phase for which the current is displayed.

### Zone-selective Interlocking (ZSI)

A number of circuit breakers are interconnected one after another by a pilot wire. In the event of a short-time or earth fault:

- If a given trip unit STR53UP detects the fault, it informs the upstream circuit breaker which applies the set time delay
- If the trip unit STR53UP does not detect the fault, the upstream circuit breaker trips after its shortest time delay

In this way, the fault is cleared rapidly by the nearest circuit breaker. In addition, thermal stresses on the circuits are minimized and time discrimination is maintained throughout the installation.

### Opto-electronic Outputs

The use of opto-transistors ensures total isolation between the internal circuits of the trip unit and the circuits wired by the user.

### Communication (COM)

Transmission of the following data to Digipact® distribution monitoring and control modules:

- Settings
- Phase and neutral currents (rms values)
- Highest current of the three phases
- Overload condition alarm

### Possible Combinations

- I
- T
- I + T
- I + COM
- I + T + COM
- ZSI
- ZSI + I
- ZSI + T
- ZSI + I + T
- ZSI + I + COM
- ZSI + I + T + COM

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 4—Trip Units

#### ELECTRONIC TRIP UNIT TEST KITS

The test kits presented below are compatible with Compact® and Masterpact® MP/MC/M circuit breakers.

Tests performed by test kits are only functional tests designed to electrically test the operating integrity of the trip unit, the flux shifter and the mechanical operation of the circuit breaker. Tests are not designed to calibrate the circuit breaker.

##### Mini Test Kit and Hand-held Test Kit

The Mini Test Kit and the new generation Hand-held Test Kit are portable units which require no external power supply. Both are powered by five 9 V alkaline batteries, not supplied. These test kits are used to check operation of the electronic trip unit and circuit breaker tripping. Connection of either test kit is made via the test port on the front of the trip unit.



Mini Test Kit



Hand-held Test Kit

##### Portable Test Kit and Full-function Test Kit

The Portable Test Kit and the new generation Full-function Test Kit are calibration units. Both require a power supply of 110 or 240 Vac, 50/60 Hz (two-position selector). These test kits are used to check the operation of the trip unit by measuring actual trip times:

- At  $1.5 \times I_r$  for long-time protection
- At  $15 \times I_r$  for short-time protection
- At  $0.8 \times I_n$  for ground-fault protection



Portable Test Kit



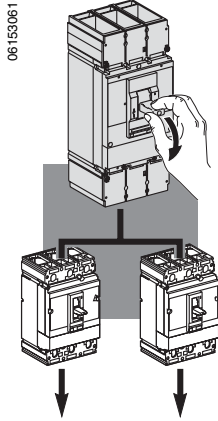
Full-function Test Kit



## SECTION 5—SWITCHES

### RATINGS AND INTERRUPTING RATINGS

#### UL 1087 Listed Ratings



| Compact® Switches | NSF150A       | NSF250A   |
|-------------------|---------------|-----------|
| Number of Poles   | 3, 4, 4P OSN* | 3, 4      |
| Rated Voltage (V) | AC 50/60 Hz   |           |
|                   | 600Y/ 347     | 600Y/ 347 |
| Rated Current (A) | 150           | 250       |

\*Oversized Neutral Protection: four-pole OSN 125/250 and 150/250 are same ratings as NSF250A.

#### IEC 947-3 Ratings

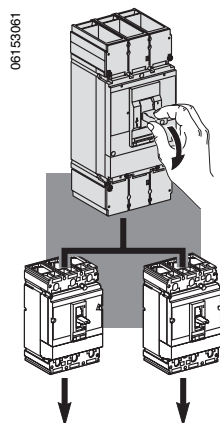
| Compact® Switches                     |      |                                 | NSF150A       | NSF250A |
|---------------------------------------|------|---------------------------------|---------------|---------|
| Number of Poles                       |      |                                 | 3, 4, 4P OSN* | 3, 4    |
| Rated Insulation Voltage (V)          | Ui   |                                 | 750           | 750     |
| Rated Impulse Withstand Voltage (kV)  | Uimp |                                 | 8             | 8       |
| Rated Operational Voltage (V)         | Ue   | AC 50/60 Hz                     | 690           | 690     |
|                                       |      | DC                              | 500           | 500     |
| Rated Operational Current (V)         | Ie   | AC23A 690 V                     | 160           | 250     |
|                                       |      | DC23A 250 V                     | 160           | 250     |
|                                       |      | DC23A 500 V (2 poles in series) | 160           | 250     |
| Making Capacity (kA peak)             |      |                                 | 3.6           | 4.9     |
| Short-time Withstand Current (kA rms) | Icw  | Icw (kA rms)                    | 2.5           | 3.5     |
|                                       |      | Duration (s)                    | 3             | 3       |

\*Oversized Neutral Protection

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 5—Switches

### UL 489 Listed Ratings



| Compact® Switches                    | NSJ400A       | NSJ600A |
|--------------------------------------|---------------|---------|
| <b>Number of Poles</b>               | 3, 4, 4P OSN* | 3, 4    |
| <b>Rated Voltage (V)</b> AC 50/60 Hz | 600           | 600     |
| <b>Rated Current (A)</b>             | 400           | 600     |

\*Oversized Neutral Protection: four-pole OSN 125/250 and 150/250 are same ratings as NSF250A.

### IEC 947-3 Ratings

| Compact® Switches                                       | NSF150A                         | NSF250A |
|---|---------------------------------|---------|
| <b>Number of Poles</b>                                  | 3, 4, 4P OSN*                   | 3, 4    |
| <b>Rated Insulation Voltage (V)</b> <b>Ui</b>           | 750                             | 750     |
| <b>Rated Impulse Withstand Voltage (kV)</b> <b>Uimp</b> | 8                               | 8       |
| <b>Rated Operational Voltage (V)</b> <b>Ue</b>          | AC 50/60 Hz                     | 690     |
|   | DC                              | 500     |
| <b>Rated Operational Current (V)</b> <b>Ie</b>          | AC23A 690 V                     | 400     |
|   | DC23A 250 V                     | 400     |
|   | DC23A 500 V (2 poles in series) | 400     |
| <b>Making Capacity (kA peak)</b>                        | 7.1                             | 8.5     |
| <b>Short-time Withstand Current (kA rms)</b> <b>Icw</b> | Icw (kA rms)                    | 5       |
|   | Duration (s)                    | 3       |

\*Oversized Neutral Protection

## Short-circuit Withstand Current

Molded case switches are identical to molded case circuit breakers, except they are not equipped with trip units and sensors. 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 or an undervoltage release.

These switches open instantaneously at a non-adjustable, factory preset, magnetic trip point calibrated to protect only the molded case switch itself. Magnetic settings:

- NSF150/250 A switches: 2000 A
- NSJ 400/600 A switches: 6000 A

These switches are suitable for use on a circuit capable of delivering not more than:

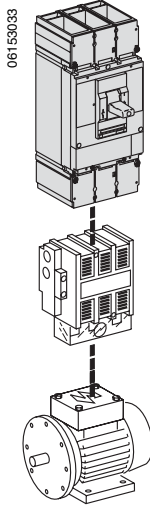
- 240 V: 100 kA for NSF switches and 150 kA for NSJ switches
- 480 V: 65 kA for NSF switches and 100 kA for NSJ switches
- 600 V (600Y/347 for NSF switches): 25 kA

Switches are Listed under UL file E103740 and Certified under CSA file LR 88980.

## SECTION 6—MOTOR CIRCUIT PROTECTORS

### RATINGS AND INTERRUPTING RATINGS

UL 489 Recognized Component



| Compact® Circuit Breakers |  |  | NSF150HC    | NSF250HC |           |
|---------------------------|--|--|-------------|----------|-----------|
| Number of Poles           |  |  | 3           | 3        |           |
| Rated Voltage (V)         |  |  | AC 50/60 Hz |          | 600Y/347  |
| Rated Current (A)         |  |  | In          | 40° C    | 150       |
| Magnetic Trip Setting     |  |  | Im          | 900-1800 | 1000–2000 |
|                           |  |  |             |          | 1250–2500 |

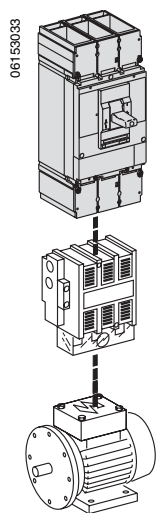
#### IEC 947-2 and EN 60947-2 Ratings

| Compact® Circuit Breakers            |  |  | NSF150HC | NSF250HC    |                           |
|--------------------------------------|--|--|----------|-------------|---------------------------|
| Number of Poles                      |  |  | 3        | 3           |                           |
| Rated Insulation Voltage (V)         |  |  | Ui       | 750         | 750                       |
| Rated Impulse Withstand Voltage (kV) |  |  | Uimp     | 8           | 8                         |
| Rated Operational Voltage (V)        |  |  | Ue       | AC 50/60 Hz | 690                       |
|                                      |  |  |          | DC          | 500                       |
| Rated Current (A)                    |  |  | In       | 40° C       | 150                       |
|                                      |  |  |          |             | 200                       |
|                                      |  |  |          |             | 250                       |
|                                      |  |  |          | HC          | HC                        |
| Ultimate Breaking Capacity           |  |  | Icu      | AC 50/60 Hz | 220/240 V                 |
|                                      |  |  |          |             | 380/415 V                 |
|                                      |  |  |          |             | 440 V                     |
|                                      |  |  |          |             | 500 V                     |
|                                      |  |  |          |             | 525 V                     |
|                                      |  |  |          |             | 660/690 V                 |
|                                      |  |  |          | DC          | 250 V (1 pole)            |
|                                      |  |  |          |             | 500 V (2 poles in series) |
| Service Breaking Capacity            |  |  | Ics      | (% Icu)     | 100%                      |
| Utilization Category                 |  |  |          |             | A                         |

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 6—Motor Circuit Protectors

### UL 489 Recognized Component



| Compact® Circuit Breakers |  |             |       | NSJ400HC                         | NSJ600HC  |
|---------------------------|--|-------------|-------|----------------------------------|-----------|
| Number of Poles           |  |             |       | 3                                | 3         |
| Rated Voltage (V)         |  | AC 50/60 Hz |       | 600                              | 600       |
| Rated Current (A)         |  | In          | 40° C | 400 (100% Rated Circuit Breaker) | 600       |
| Magnetic Trip Setting     |  | Im          |       | 2000–4000                        | 3000–6000 |

### IEC 947-2 and EN 60947-2 Ratings

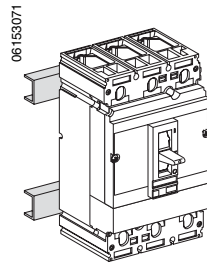
| Compact® Circuit Breakers            |  |      |             | NSF150HC                  | NSF250HC |     |
|--------------------------------------|--|------|-------------|---------------------------|----------|-----|
| Number of Poles                      |  |      |             | 3                         | 3        |     |
| Rated Insulation Voltage (V)         |  | Ui   |             | 750                       | 750      |     |
| Rated Impulse Withstand Voltage (kV) |  | Uimp |             | 8                         | 8        |     |
| Rated Operational Voltage (V)        |  | Ue   | AC 50/60 Hz | 690                       | 690      |     |
|                                      |  |      | DC          | 500                       | 500      |     |
| Rated Current (A)                    |  | In   | 40° C       | 400                       | 600      |     |
|                                      |  |      |             | HC                        | HC       |     |
| Ultimate Breaking Capacity           |  | Icu  | AC 50/60 Hz | 220/240 V                 | 100      | 100 |
| (kA rms)                             |  |      |             | 380/415 V                 | 70       | 70  |
|                                      |  |      |             | 440 V                     | 65       | 65  |
|                                      |  |      |             | 500 V                     | 30       | 30  |
|                                      |  |      |             | 525 V                     | 35       | 35  |
|                                      |  |      |             | 660/690 V                 | 20       | 20  |
|                                      |  |      | DC          | 250 V (1 pole)            | 85       | 85  |
|                                      |  |      |             | 500 V (2 poles in series) | 85       | 85  |
| Service Breaking Capacity            |  | Ics  | (% Icu)     | 100%                      | 100%     |     |
| Utilization Category                 |  |      |             | A                         | A        |     |

## SECTION 7—MOUNTING CONFIGURATIONS

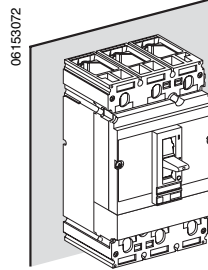
Refer to circuit breaker installation instructions before installing circuit breaker, accessories or wiring.

### FIXED MOUNTING

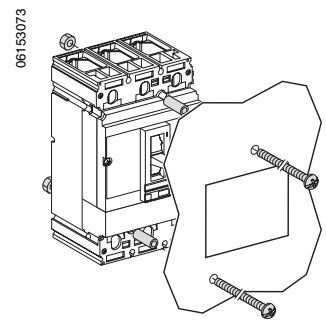
Mounting on Rails



Mounting on Backplate



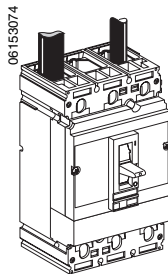
Flush Mounting



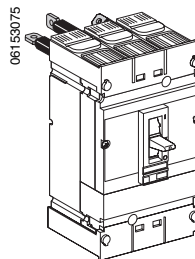
### CONNECTIONS

See Section 8—Connections for details. Compact® NSF and NSJ circuit breakers suitable for reverse feeding.

Front Connection



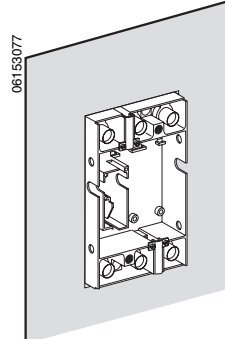
Rear Connection



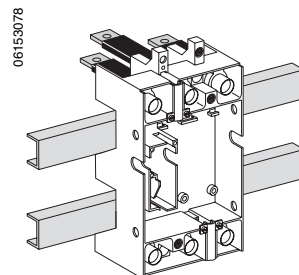
### PLUG-IN MOUNTING



Mounting through Front Panel



Mounting on Rails



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 7—Mounting Configurations

The plug-in configuration makes it possible to:

- Extract and/or rapidly replace the circuit breaker without having to touch connections
- Allow for addition of future circuits at a later date

When the circuit breaker is in the connected position, the primary voltage is fed through the circuit breaker by means of multiple finger disconnects. Control voltage of internal accessories is provided through secondary disconnects.

#### Parts of a Plug-in Configuration

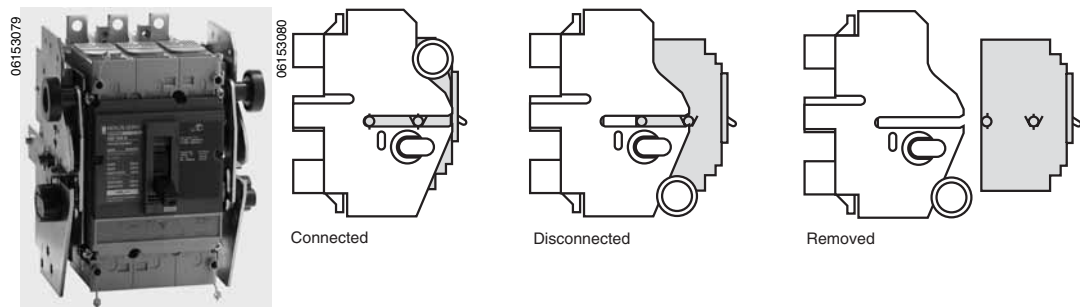
Compact® circuit breaker (fixed mounted)

- Set of power and secondary disconnects that are added to the circuit breaker
- Plug-in base for mounting through a front panel or on rails
- Safety trip, to be installed on the circuit breaker, which causes automatic tripping if the circuit breaker is ON before engaging or withdrawing it; the safety trip does not prevent circuit breaker operation, even when the circuit breaker is disconnected
- Mandatory short terminal shields

The plug-in mounting is Listed under UL file E113555 and Certified under CSA file LR 69561.

### DRAWOUT MOUNTING

The chassis is made up of two side plates installed on the base and two other plates mounted on the circuit breaker.



#### Chassis Functions

All functions of the plug-in base, plus:

- Disconnected position: the power circuits are disconnected, the circuit breaker is simply "withdrawn" and may still be operated (on, off, push-to-trip)
- Circuit breaker may be locked using 1 to 3 padlocks—diameter 0.19 to 0.31 inch (5 to 8 mm)—to prevent connection
- Auxiliaries can be tested using manual auxiliary connector

#### Mounting

- On a backplate, through a front panel or on rails
- Horizontally or vertically

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 7—Mounting Configurations

#### Accessories

- Auxiliary switches for installation on the fixed part of the chassis, indicating the "connected" and "disconnected" positions
- Toggle collar for circuit breakers with toggle through front panel, intended to maintain the degree of protection whatever the position of the circuit breaker (supplied with a toggle extension)
- Keylock which, depending on the bolt fitted, can be used to:
  - Prevent insertion for connection
  - Lock the circuit breaker in connected or disconnected position
- Telescopic shaft for extended rotary handles

#### Connection of Auxiliaries

Control voltage is provided through automatic secondary disconnects in the connected position only. See Section 8—Connections for more details. Electrical accessories can be tested in the disconnected position with an external wiring harness.

The drawout-mounted chassis is Listed under UL file E113555 and Certified under CSA file LR 69561.

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

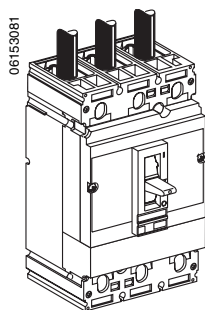
## Section 8—Connections

## SECTION 8—CONNECTIONS

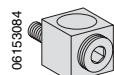
### FRONT CONNECTION

#### Connection to Cables

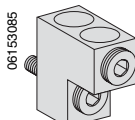
Cable connectors for Compact® NSF150 and NSF250 circuit breakers surround the circuit breaker terminals. They are positioned by an insulating lug pack which is anchored to the circuit breaker case.



Cable connectors for Compact NSJ400 and NSJ600 circuit breakers bolt onto the circuit breaker terminals or the terminals of the plug-in base.




One-wire Cable



Two-wire Cable

#### Copper or Aluminum Cable

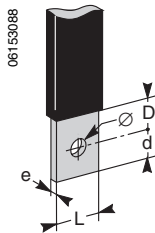
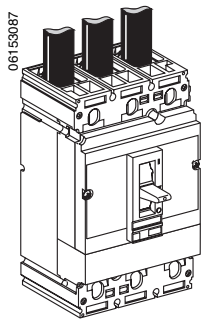
| NSF150  |  |  | NSF150/250              |  |
|---|--|--|-------------------------|--|
|  | Steel Lug (15–60 A)  |  | Aluminum Lug (70–250 A) |  |
|   | S  | #14 AWG–#3/0 AWG Cu (Solid or Stranded)<br>#12 AWG–#4/0 AWG Al (Stranded Only)<br>2.5–95 mm <sup>2</sup> CU/AL | S                       | #2/0 AWG–250 kcmil Cu (Stranded Only)<br>70–120 mm <sup>2</sup><br>#4/0 AWG–300 kcmil Al (Stranded Only)<br>95–150 mm <sup>2</sup> |
|   | L  | 0.79 in.<br>20 mm  | L                       | 0.79 in.<br>20 mm  |
| NSJ400  |  |  | NSJ600                  |  |
| 1 Cable   |  |  | 1–2 Cable               |  |
| S   | #2 AWG–600 kcmil Cu (Stranded Only)<br>35–300 mm <sup>2</sup><br>#2 AWG–500 kcmil Al (Stranded Only)<br>35–240 mm <sup>2</sup> Cu/AL |  | S                       | #2/0 AWG–350 kcmil Cu (Stranded Only)<br>70–185 mm <sup>2</sup><br>#2/0 AWG–500 kcmil Al (Stranded Only)<br>70–240 mm <sup>2</sup> |
| L   | 1.2 in.<br>31 mm   |  | L                       | 1.2–2.4 in.<br>31–61 mm  |



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 8—Connections

#### Connection to Bars



Compact® NSF150 to NSJ600 circuit breakers are equipped as standard with captive nuts and screws for direct connection to bars:

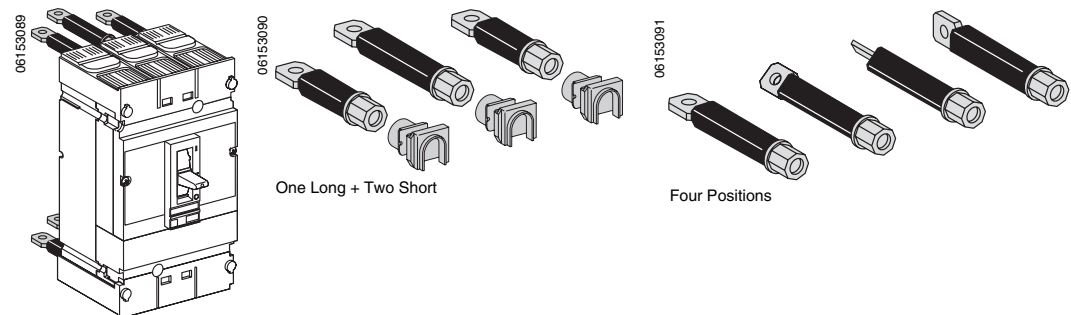
- Compact NSF150/250 circuit breakers—M8 screws
- Compact NSJ400/600 circuit breakers—M10 screws

| Compact® Circuit Breaker |          | NSF150/250 | NSJ400/600       |
|--------------------------|----------|------------|------------------|
| Pole Pitch               | in. / mm | 1.4 / 35   | 1.8 / 45         |
| L                        | in. / mm | -1 / 25    | -1.3 / 32        |
| d                        | in. / mm | -0.4 / 10  | -0.64 / 16       |
| D                        | in. / mm | < 0.35 / 9 | < 0.51 / 13      |
| e                        | in. / mm | -0.23 / -6 | 0.11–0.39 / 3–10 |
| Ø                        | in. / mm | < 0.32 / 8 | < 0.4 / 10       |

#### REAR CONNECTION

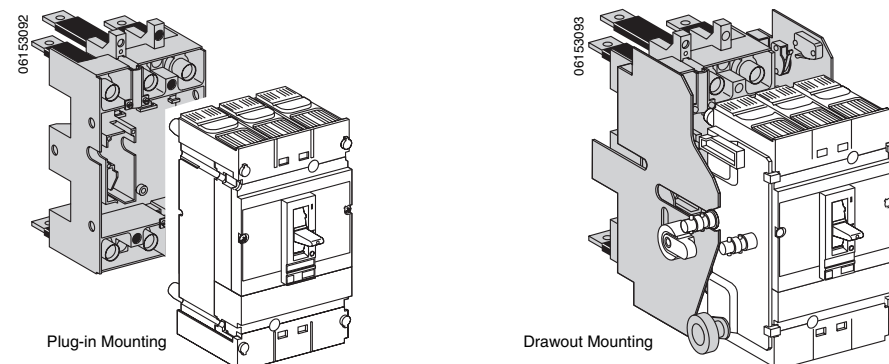
##### Fixed Mounting

For connection of bars or cables with compression lugs. Rear connections are easily installed on the circuit breaker terminals. The same connection may be installed flat, edgewise or at a 45° angle. All combinations are possible. The circuit breaker is mounted on a backplate.



##### Plug-in Mounting and Drawout Mounting

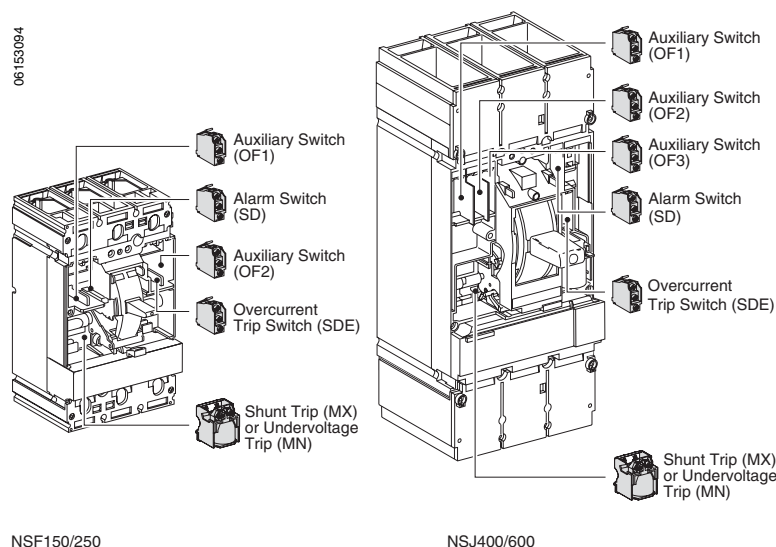
For connection of bars or cables with compression lugs. Rear connections are installed flat. The plug-in base or the chassis are mounted through a front panel.



## SECTION 9—ACCESSORIES

### LOCATION

Internal accessories comply with requirements of Underwriters Laboratories Inc. UL 489 and Canadian Standard Association C22.2 No. 5.1 Standards. All internal accessories are Listed for fixed installation per UL file E103955 and Certified under CSA file LR 69561.



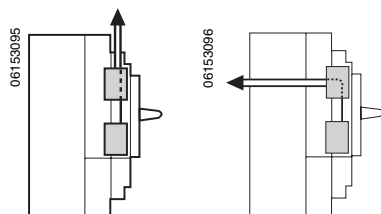
### CONNECTIONS

Each electrical accessory is fitted with numbered terminal blocks for wires with the following maximum size:

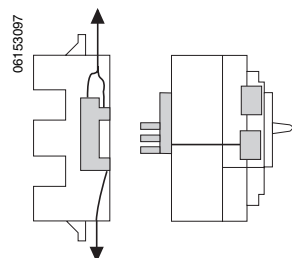
- #16 AWG (1.5 mm<sup>2</sup>) for auxiliary switches, undervoltage and shunt trip or undervoltage trip
- #14 AWG (2.5 mm<sup>2</sup>) for the motor operator

#### Fixed Mounting

Auxiliary circuits exit the device through a knock-out in the front cover.



#### Plug-in and Drawout Mounting



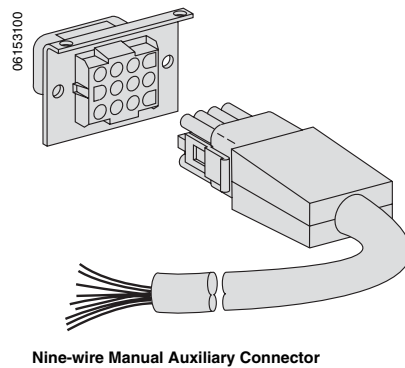
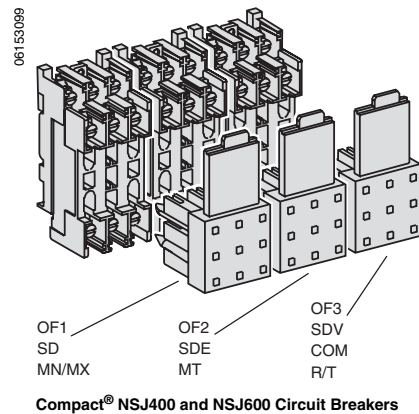
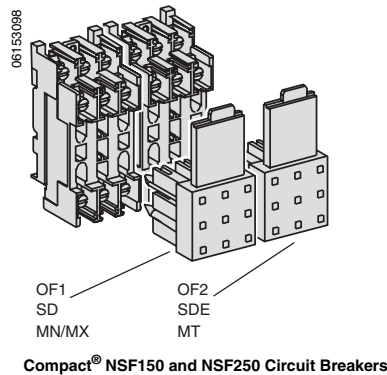
## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 9—Accessories

#### AUTOMATIC SECONDARY DISCONNECTING BLOCKS

Accessory circuits exit the circuit breaker via one to three secondary disconnecting blocks (nine wires each). For Compact® NSJ400/600 circuit breakers connection wires for the options installed with trip unit STR53UP also exit via the automatic secondary disconnecting blocks. These are made up of:

- A moving part connected to the circuit breaker via a support (one support per circuit breaker)
- A fixed part mounted on the plug-in base, equipped with connectors for wires up to #14 AWG (2.5 mm<sup>2</sup>)



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 9—Accessories

#### AUXILIARY AND ALARM SWITCHES



#### Changeover Switches

Auxiliary switches provide remote information of the circuit breaker status and can thus be used for indications, electrical locking, relays, etc.

#### Functions

- OF (open/closed): auxiliary switch—indicates position of the circuit breaker contacts
- SD (trip indication): bell alarm—indicates that the circuit breaker has tripped due to
  - Overload
  - Short circuit
  - Ground fault
  - The operation of a shunt trip or undervoltage trip or the "push-to-trip" button which resets when the circuit breaker is reset
- Operation of a plug-in base or chassis when attempting to withdraw the circuit breaker in ON position; SDE (fault indication): indicates the circuit breaker has tripped due to an overload, short circuit or ground fault; resets when circuit breaker is reset
- CAM (early-make or early-break function): indicates the position of the rotary handle; used in particular for advanced-opening safety trip devices
- Connected/disconnected: indicates the position of a drawout circuit breaker
- Switching of very low loads: all above auxiliary switches are also available in low-level versions capable of switching very low loads (e.g., for controlling PLCs or electronic circuits)

#### Standards

Auxiliary switches comply with UL 489, CSA C22.2 No. 5.1 and IEC 947-5 Standards. "Low-level" switches are not UL Listed.

#### Installation

- Functions OF, SD and SDE:
  - Switches snap into cavities under front accessory cover of the circuit breaker
  - For Compact® NSF150–NSJ600 circuit breakers, one model serves for all indication functions depending on where it is fitted in the circuit breaker
- SDE function of a circuit breaker equipped with a thermal-magnetic trip unit requires the SDE actuator
- CAM: to be fitted in the rotary handle module; depending on how it is installed, it ensures either the CAO (early-break) or the CAF (early-make) function "Connected/disconnected" function; two parts to be fitted on the chassis and the drawout circuit breaker

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 9—Accessories

### Electrical Ratings

#### UL 489 and CSA C22.2 No. 5.1 Ratings

|                                    |          |       | Low-level Switches  | Regular Switches |
|------------------------------------|----------|-------|---|------------------|
| <b>Minimum Rating</b>              |          |       | 1 mA–4 V  | 10 mA–24 V       |
| <b>Maximum Current and Voltage</b> |          |       | 100 mA–10 V   | 6 A–480 V        |
|                                    |          |       | If the maximum voltage and current are exceeded, the low-level characteristics of the switch will be compromised. However, the switch will still function as a standard switch to the following specifications: |                  |
| <b>Maximum Rating</b>              | 50/60 Hz | 240 V | 5   | 6                |
|                                    |          | 480 V | 5   | 6                |
|                                    |          | 600 V | —   | 3                |
|                                    | DC       | 48 V  | 2.5   | 2.5              |
|                                    |          | 125 V | 0.8   | 0.8              |
|                                    |          | 250 V | 0.3   | 0.3              |

#### IEC 947 Ratings

|   |           | Low-level Switches  |      |      |      | Regular Switches |      |      |      |
|---|-----------|---|------|------|------|------------------|------|------|------|
| <b>Rated Thermal Current (A)</b>        |           | 5   |      |      |      | 6                |      |      |      |
| <b>Minimum Rating</b>                   |           | 1 mA–4 V  |      |      |      | 10 mA–24 V       |      |      |      |
| <b>Maximum Current and Voltage</b>      |           | 100 mA–10 V   |      |      |      | 6 A–480 V        |      |      |      |
|   |           | If the maximum voltage and current are exceeded, the low-level characteristics of the switch will be compromised. However, the switch will still function as a standard switch to the following specifications: |      |      |      |                  |      |      |      |
|   |           | ac  |      | dc   |      | ac               |      | dc   |      |
| <b>Utilization Category (IEC 947-4)</b> |           | AC12  | AC15 | DC12 | DC14 | AC12             | AC15 | DC12 | DC14 |
| <b>Operational Current (A)</b>          | 24 V      | 5   | 3    | 5    | 1    | 6                | 6    | 2.5  | 1    |
|   | 48 V      | 5   | 3    | 2.5  | 0.2  | 6                | 6    | 2.5  | 0.2  |
|   | 110 V     | 5   | 2.5  | 0.8  | 0.05 | 6                | 5    | 0.8  | 0.05 |
|   | 220/240 V | 5   | 2    | —    | —    | 6                | 4    | —    | —    |
|   | 250 V     | —   | —    | 0.3  | 0.03 | —                | —    | 0.3  | 0.03 |
|   | 380/415 V | 5   | 1.5  | —    | —    | 6                | 3    | —    | —    |
|   | 440 V     | 5   | 1.5  | —    | —    | 6                | 3    | —    | —    |
|   | 660/690 V | —   | —    | —    | —    | 6                | 0.1  | —    | —    |

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 9—Accessories

#### SHUNT TRIP AND UNDERVOLTAGE TRIP

A voltage release can be used to trip the circuit breaker via a control signal.



##### Undervoltage trip (MN)

- Trips circuit breaker when the control voltage drops below a tripping threshold
- Drops out between 35% and 70% of rated voltage
- Circuit breaker closing is possible only if the voltage exceeds 85% of rated voltage
- Permanent type
- If an overvoltage condition exists, operation of circuit breaker closing mechanism will not permit the main contacts to touch, even momentarily

##### Shunt trip (MX)

- Trips the circuit breaker when control voltage rises above 70% of its rated voltage
- Impulse type  $\geq 20$  ms or maintained control signals
- AC shunt trips can be operated at 55% of their rated voltage, making them suitable for ground-fault protection when combined with a Class I ground-fault sensing element

##### Operation

- The circuit breaker must be reset locally after being tripped by shunt trip or undervoltage trip (MN or MX)
- MN or MX tripping has priority over manual (or motor operator) closing; in the presence of a standing trip order such an action does not result in any closing, even temporarily, of the main contacts
- Endurance: 50% of the rated mechanical endurance of the circuit breaker for Compact® NSF150–NSJ600 circuit breakers

##### Installation and Connection

- Accessories are common to NSF and NSJ circuit breakers and are located within the circuit breaker behind front accessory cover
- Each terminal may be connected by one #18–#14 AWG (1.0–2.5 mm<sup>2</sup>) stranded copper wire

##### Electrical Characteristics

|                    |              | AC  | DC                           |
|--------------------|--------------|---|------------------------------|
| Rated Voltage (V)  |              | 24, 48, 110–130, 208–277, 380–480, 525, 600 | 12, 24, 30, 48, 60, 125, 250 |
| Consumption        | Pickup (MX)  | < 10 VA                                     | < 5 W                        |
|                    | Seal-in (MN) | < 5 VA                                      | < 5 W                        |
| Clearing Time (ms) |              | < 50  | < 50                         |

## MOTOR OPERATOR

The motor operator remotely operates the circuit breaker featuring easy and sure operation:

- All circuit breaker indications and information remain visible and accessible, including trip units settings and circuit breaker connection
- Suitability for isolation is maintained and padlocking remains possible
- Double insulation front face



### Applications

- Local motor-driven operation, centralized operation, automatic distribution control
- Normal/standby source changeover or switching to a replacement source to optimize energy costs
- Load shedding and reconnection to optimize energy costs
- Synchrocoupling—less than five cycle closing time

### Automatic Operation

- On and off by two impulse type or continuous control signals
- Depending on the wiring, resetting can be done locally, remotely or automatically
- Mandatory manual reset following tripping due to an electrical fault

### Manual Operation

- Transfer to manual mode using switch with possibility of remote mode indication
- On and off by two push buttons
- Recharging of stored-energy system by pumping the lever nine times
- Padlocking in off position

### Installation and Connection

- All installation (fixed, plug-in/drawout mounting) and connection capabilities are maintained
- Connection of the motor operator module behind its front cover to a built-in terminal block, for stranded copper wire #14 AWG (2.5 mm<sup>2</sup>)

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

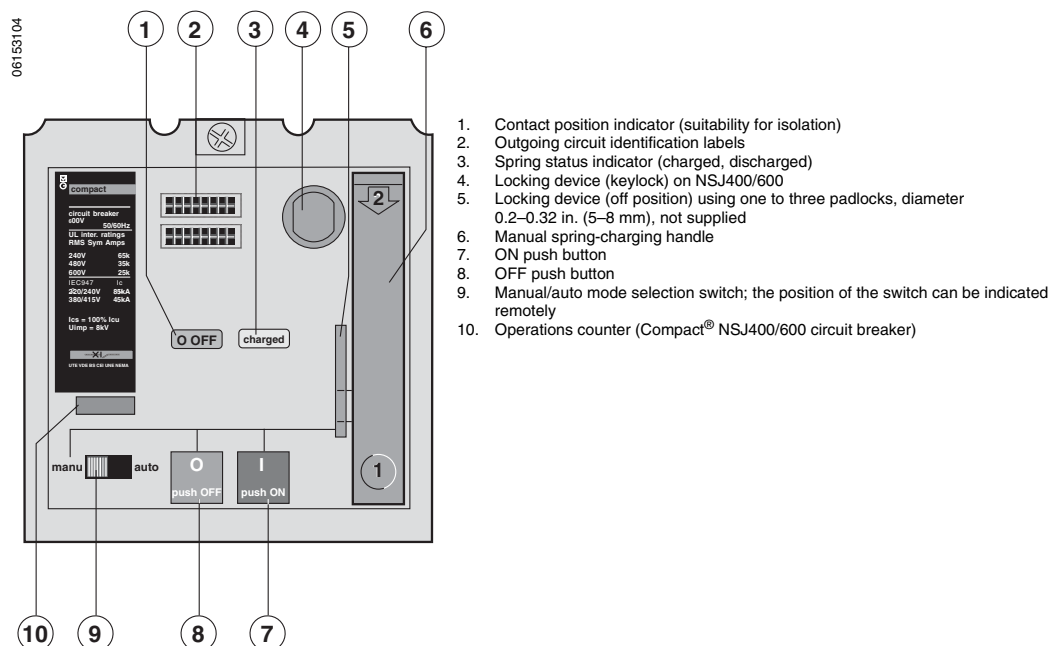
### Section 9—Accessories

#### Accessories for NSJ400/600

- Keylock for locking in OFF position
- Operations counter, indicating the number of ON and OFF cycles; the counter must be installed on the front of the motor operator module.

#### Characteristics

|                                  |             |         | NSF                   | NSJ     |
|----------------------------------|-------------|---------|-----------------------|---------|
| Response Time (ms)               | Opening     |         | < 500                 | —       |
|                                  | Closing     |         | < 80                  | —       |
| Max. Cycles Frequency Per Minute |             |         | 4                     | —       |
| Control Voltage (V)              | AC 50/60 Hz |         | 48–60                 | 48–60   |
|                                  |             |         | 110–130               | 110–130 |
|                                  |             |         | 208–277               | 208–277 |
|                                  |             |         | 380–480               | 380–415 |
|                                  |             |         |                       | 440–480 |
|                                  | DC          |         | 24–30                 | 24–30   |
|                                  |             |         | 48–60                 | 48–60   |
|                                  |             |         | 110–130               | 110–130 |
|                                  |             |         | 250                   | 250     |
| Consumption                      | AC (VA)     | Opening | -500                  | —       |
|                                  |             | Closing | -500                  | —       |
|                                  | DC (W)      | Opening | -500                  | —       |
|                                  |             | Closing | -500                  | —       |
| Minimum Operating Order          |             |         | 700 ms                | —       |
| Operating Voltage                |             |         | 85–110% Rated Voltage | —       |

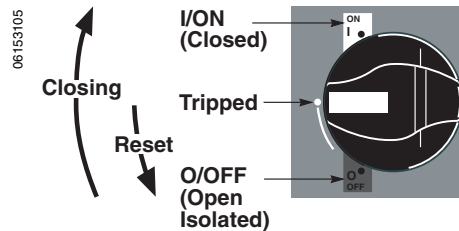




## ROTARY OPERATING HANDLES

### Operation

- The direct rotary handle maintains
  - Suitability for isolation
  - Indication of three positions: O (off), I (on) and tripped
  - Access to the "push-to-trip" button
  - Visibility of, and access to, trip unit settings



- The circuit breaker may be locked in the off position by using one to three padlocks, padlock shackle diameter 0.19–0.31 in. (5–8 mm); padlocks are not supplied

### Directly Mounted



### Installation

Replaces the circuit breaker front accessory cover (secured by screws).

### Models

- Standard with black handle
- VDE type with red handle and yellow bezel for machine tool control

### Variations for Compact® NSF150–NSJ600 Circuit Breakers

Accessories transform the standard direct rotary handle for the following situations:

- Motor control centers (MCCs)
  - Opening of door prevented when circuit breaker is on
  - Closing of circuit breaker inhibited when door is open
- Machine tool control; complies with CNOMO E03.81.501N; degree of protection IP54

The directly-mounted rotary operating handle is Listed under UL file E103955 and Certified under CSA file LR 69561.

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 9—Accessories

#### Door Mounted

Makes it possible to operate circuit breakers installed inside an enclosure from the front. The handle mechanism can be used in NEMA 3R and 12 enclosure applications. Degree of protection: IP40 as per IEC 529.



#### Operation

- The unit maintains:
  - Suitability for isolation
  - Indication of the three positions: O (off), I (on) and tripped
  - Visibility of and access to trip unit settings when door is open
- Defeatable interlock prevents opening of door when circuit breaker is on
- Circuit breaker may be locked in the off position by using one to three padlocks, padlock shackle diameter 0.19–0.31 in. (5–8 mm); padlocks are not supplied; locking prevents opening of the switchboard door

#### Models

- Standard with black handle
- VDE type with red handle and yellow bezel for machine tool control

#### Installation

The extended rotary operating handle is made up of:

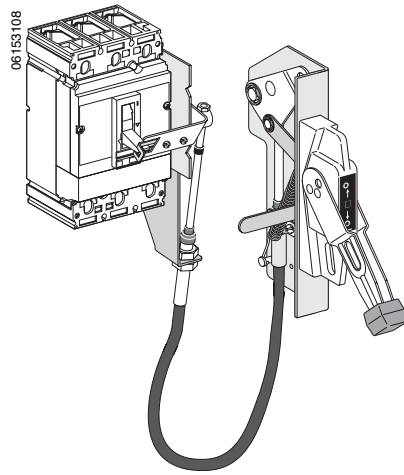
- A unit that replaces the front accessory cover of the circuit breaker (secured by screws)
- An assembly (handle and front plate) on the door that is always secured in the same position, whether the circuit breaker is installed vertically or horizontally
- An extension shaft that must be adjusted; the distances between back of circuit breaker and door are
  - Compact® NSF150/250 circuit breakers: 7.4–24 in. (185–600 mm)
  - Compact NSJ400/600 circuit breakers: 8.4–25 in. (210–625 mm)

#### Variation for Compact® NSF150– NSJ600 Circuit Breakers

For withdrawable configurations, the extended rotary handle is also available with a telescopic shaft containing two stable positions. The extended rotary operating handle is Listed under UL file E103955 and Certified under CSA file LR 69561.

## **CABLE OPERATING HANDLE**

The extended rotary operating handle is Listed under UL file E103955 and Certified under CSA file LR 69561.



### **Flange-mounted Handle Cable Operating Mechanism**

- The cable operator maintains:
  - Suitability for isolation
  - Indication of three positions: O (Off), I (On) and tripped
  - Access to push-to-test
- The circuit breaker may be locked in the off position by one to three padlocks, padlock shackle diameter 0.19–0.31 in. (5–8 mm); padlocks are not supplied
- Door can be locked closed due to interlocking features of handle operator

### **Installation**

Handle is mounted on flange of enclosure using specified mounting dimensions while circuit breaker and operating mechanism are mounted to inside of enclosure using two screws.

Cable lengths available in 3-, 5- or 10-foot lengths to accommodate a variety of mounting locations. Handles are available in painted Nema 1, 3, 3R, 4 (sheet steel) and 12 ratings or chrome (Nema 4, 4x).

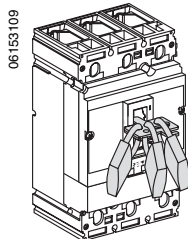
# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 9—Accessories

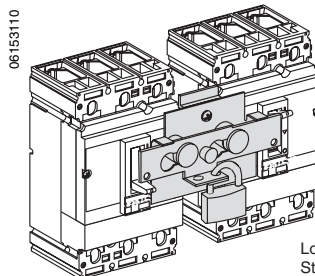
### LOCKING SYSTEMS

Padlocking systems can receive up to three padlocks with diameters ranging from 0.19–0.31 in. (5–8 mm) ; padlocks not supplied.

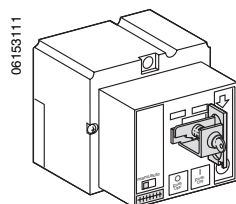
#### Locking In the Off Position



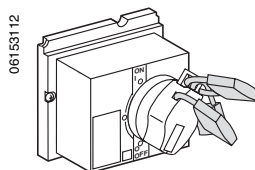
Locking of the Toggle Using a Fixed Device



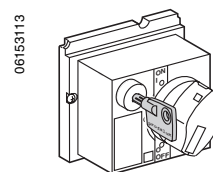
Locking of the Toggle Using a Stationary Device



Locking of the Motor Operator Using a Keylock



Locking of the Rotary Handle Using a Padlock or a Keylock



Locking of the Rotary Handle Using a Keylock

| Control Device                          | Function                                     | Means   | Required Accessories                  | Compact® NSF150/250 | Compact® NSJ400/600 |
|---|--|---------|---------------------------------------|---------------------|---------------------|
| <b>Toggle</b>                           | Lock In Off Position                         | Padlock | Removable Device                      | ■                   | ■                   |
|   | Lock In Off or On Position                   | Padlock | Stationary Device                     | ■                   | ■                   |
| <b>Direct Rotary Handle</b>             | Lock In Off Position                         | Padlock | —                                     | ■                   | ■                   |
|   |  | Keylock | Locking Device + Keylock              |                     |                     |
| <b>MCC Rotary Operating Handle</b>      | Lock In Off Position                         | Padlock | —                                     | ■                   | ■                   |
| <b>Extended Rotary Operating Handle</b> | Lock In Off Position, Door Opening Prevented | Padlock | —                                     | ■                   | ■                   |
|   |  | Keylock | Keylock                               |                     |                     |
| <b>Motor Operator</b>                   | Lock In Off Position, Motor                  | Padlock | —                                     | ■                   | ■                   |
|   | Mechanism Locked Out                         | Keylock | Locking Device (Keylock Incorporated) | ■                   |                     |

## INTERLOCKING ACCESSORIES

Interlocking prevents simultaneous closing of two circuit breakers.

| Control Device                           | Means                                      | NSF150–NSJ600 |
|--|--|---------------|
| Toggle                                   | Sliding Bar Interlocking Mechanical Device | ■             |
| Rotary Handle (Directly or Door Mounted) | Mechanical Interlocking                    | ■             |
|  | 2 Keylocks and 1 Key                       | ■             |

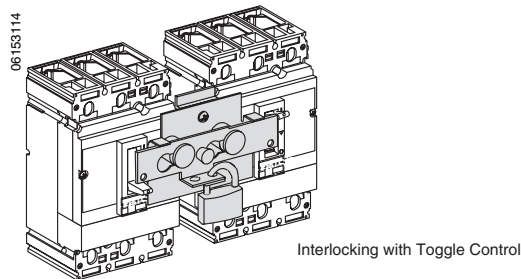
### Interlocking of Circuit Breakers with Toggle Control

Two models:

- For Compact® NSF150–NSF250 circuit breakers (three-pole or four-pole)
- For Compact® NSJ400–NSJ600 circuit breakers (three-pole or four-pole)

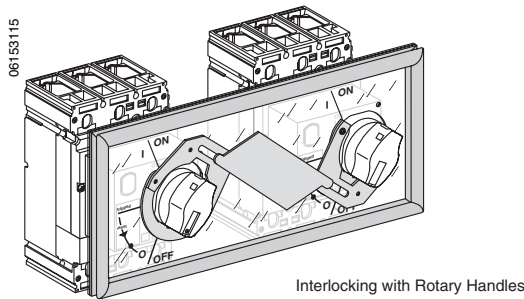
Padlocking systems can receive one or two padlocks with diameters ranging from 0.19–0.31 inch (5–8 mm). Both interlocked circuit breakers should be fixed version or plug-in version.

Two sliding interlocking bars can be used to interlock three circuit breakers installed side-by-side, in which case one circuit breaker is in the ON position and the two others in the OFF position.



### Interlocking of Circuit Breakers with Rotary Handles

For Compact® NSF150–NSJ600 circuit breakers



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

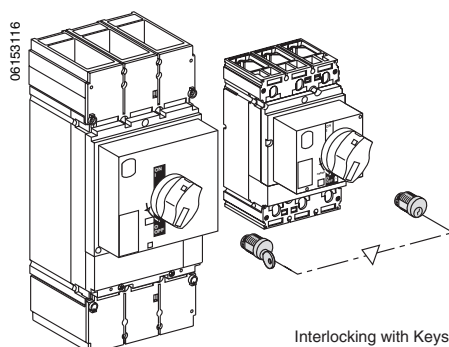
### Section 9—Accessories

#### Interlocking with Keys

For circuit breakers equipped with rotary handles or a motor mechanism. Interlocking with keys may be easily implemented by equipping each of the Compact® circuit breakers, either fixed or drawout mounted, with a directly mounted rotary operating handle and a standard keylock, but with only one key for the two keylocks. This solution enables interlocking between two circuit breakers that are geographically distant or that have significantly different characteristics.

Use:

- A keylock adapter (different for each device)
- Two identical keylocks with a single key



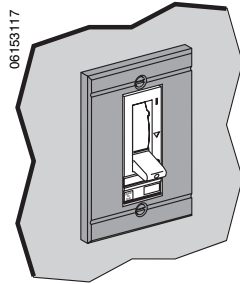
## FRONT-PANEL ESCUTCHEONS

### For Fixed or Plug-in Mounting

Door escutcheon provides better appearance of the door contact.

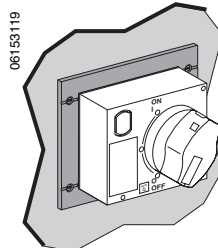
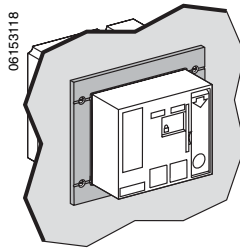
### Front-panel Escutcheons for Toggle

Secures to the panel, from the front.



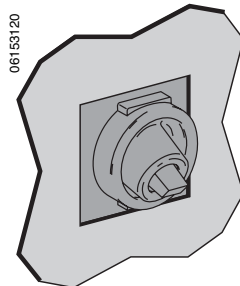
### Front-panel Escutcheon for Motor Operator Module or Rotary-operating Handle

Secures to the panel by four screws, from the front.



### Toggle Boot

- Protection up to NEMA 3M
- Fits on front of circuit breaker



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 9—Accessories

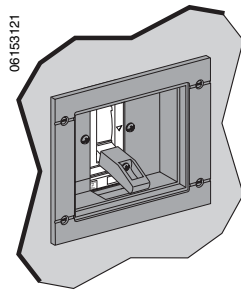
#### For Drawout Mounting

##### Toggle Collars

The toggle collars make it possible to maintain degrees of protection regardless of the circuit breaker position (connected, disconnected).

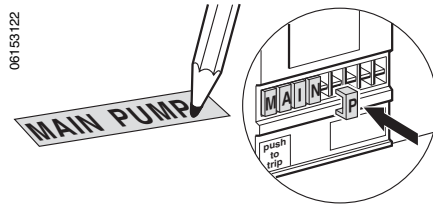
- Front panel escutcheons are obligatory (identical to those for rotary handle and ammeter module)
- Toggle collars secured by two screws on the circuit breaker
- Front panel escutcheons secured on the switchboard
- Toggle extension is supplied with the toggle collar

Front panel escutcheons for motor operator, rotary operating handles are the same as for the fixed-mounted circuit breaker with the same equipment.



##### Outgoing Circuit Identification

Compact® NS circuit breakers come with labels designed for handwritten indications.



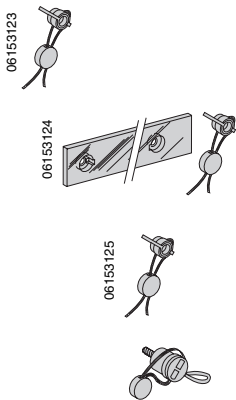
It is also possible to use preprinted Telemecanique labels, catalog No. AB1

- Compact® NSF150–NSF250 circuit breakers: eight characters
- Compact® NSJ400–NSJ600 circuit breakers: sixteen characters

##### Sealing Accessory

This accessory includes the elements required to fit lead seals to prevent:

- Front accessory cover removal
- Rotary handle removal
- Opening of the motor operator
- Access to accessories
- Access to trip unit settings
- Access to ground-fault protection settings
- Trip unit removal
- Terminal cover removal
- Access to power connections

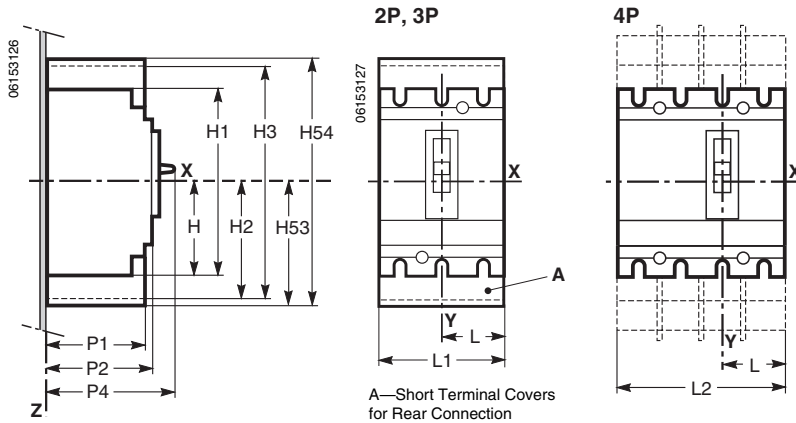




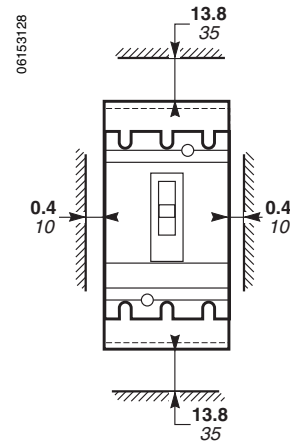
## SECTION 10—DIMENSIONS

### FIXED MOUNTED

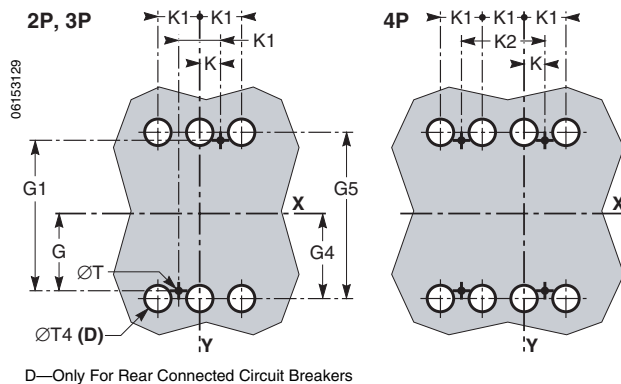
#### Dimensions



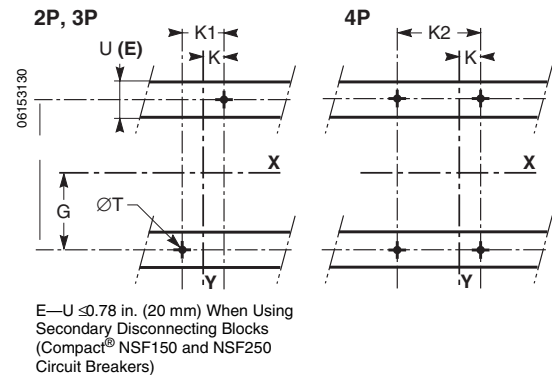
#### Electrical Clearances



#### Mounting on Backplate

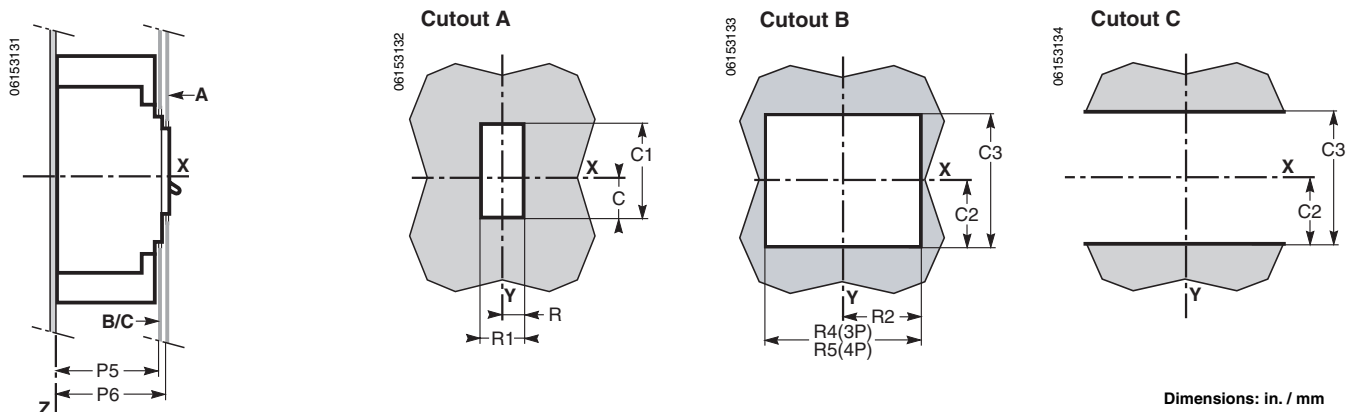


#### Mounting on Rails



#### Front Panel Cutouts

#### For Fixed or Plug-in Circuit Breakers

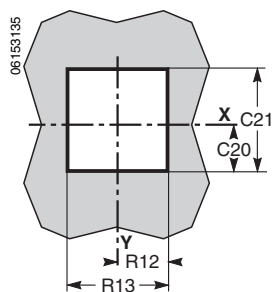


# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 10—Dimensions

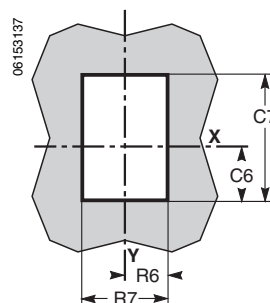
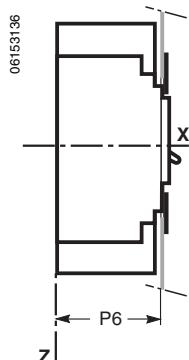
### Front-panel Cutouts

#### With Toggle Boot



Front Accessories: See Page 39

#### With Escutcheon



Dimensions: in. / mm

|                 |      | C    | C1   | C2   | C3   | C6   | C7   | C20  | C21  | G    | G1   | G4    |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| NSF150/250N/H/L | Inch | 1.14 | 2.99 | 2.12 | 4.25 | 1.69 | 4.09 | 1.33 | 3.38 | 2.46 | 4.92 | 2.75  |
|                 | mm   | 29   | 76   | 54   | 108  | 43   | 104  | 34   | 86   | 62,5 | 125  | 70    |
| NSJ400/600N/H/L | Inch | 1.63 | 4.56 | 3.64 | 7.24 | 2.08 | 5.74 | 1.83 | 4.96 | 3.93 | 7.87 | 4.46  |
|                 | mm   | 41.5 | 116  | 92.5 | 184  | 53   | 146  | 46.5 | 126  | 100  | 200  | 113.5 |

|                 |      | G5   | H     | H1    | H2    | H3    | H53  | H54   | K    | K1   | L    | L1   |
|-----------------|------|------|-------|-------|-------|-------|------|-------|------|------|------|------|
| NSF150/250N/H/L | Inch | 5.51 | 3.16  | 6.33  | 3.70  | 7.40  | 3.74 | 7.48  | 0.68 | 1.37 | 2.06 | 4.13 |
|                 | mm   | 140  | 80.5  | 161   | 94    | 188   | 95   | 190   | 17.5 | 35   | 52.5 | 105  |
| NSJ400/600N/H/L | Inch | 8.93 | 5.01  | 10.03 | 5.61  | 11.22 | 6.69 | 13.38 | 0.88 | 1.77 | 2.75 | 5.51 |
|                 | mm   | 227  | 127.5 | 255   | 142.5 | 285   | 170  | 340   | 22.5 | 45   | 70   | 140  |

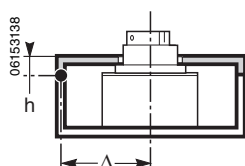
|                 |      | L2   | P1   | P2   | P4      | P5   | P6   | R    | R1   | R2   | R4   | R6   |
|-----------------|------|------|------|------|---------|------|------|------|------|------|------|------|
| NSF150/250N/H/L | Inch | 5.51 | 3.18 | 3.38 | 4.37(*) | 3.26 | 3.46 | 0.57 | 1.14 | 2.12 | 4.25 | 1.14 |
|                 | mm   | 140  | 81   | 86   | 111(*)  | 83   | 88   | 14.5 | 29   | 54   | 108  | 29   |
| NSJ400/600N/H/L | Inch | 7.28 | 3.75 | 4.33 | 6.61    | 4.21 | 4.40 | 1.24 | 2.48 | 2.81 | 5.62 | 1.83 |
|                 | mm   | 185  | 95.5 | 110  | 168     | 107  | 112  | 31.5 | 63   | 71.5 | 143  | 46.5 |

|                 |      | R7   | R12  | R13  | ØT   | ØT4  | U**    |
|-----------------|------|------|------|------|------|------|--------|
| NSF150/250N/H/L | Inch | 2.28 | 1.69 | 3.38 | 0.23 | 0.86 | - 1.25 |
|                 | mm   | 58   | 43   | 86   | 6    | 22   | - 32   |
| NSJ400/600N/H/L | Inch | 3.66 | 2.48 | 4.96 | 0.23 | 1.25 | - 1.25 |
|                 | mm   | 93   | 63   | 126  | 6    | 32   | - 32   |

\* P4 = 4.96 in./126mm for Compact® NSF250N/H/L Circuit Breaker

\*\* U ≤0.78 in./20mm When Using Secondary Disconnecting Blocks (Compact® NSF150 and NSF250 Circuit Breakers)

**NOTE:** Door cutouts require a minimum distance between the center of the circuit breaker and the door hinge point  $\Delta$  3.93 in./100 mm + (h x 5).



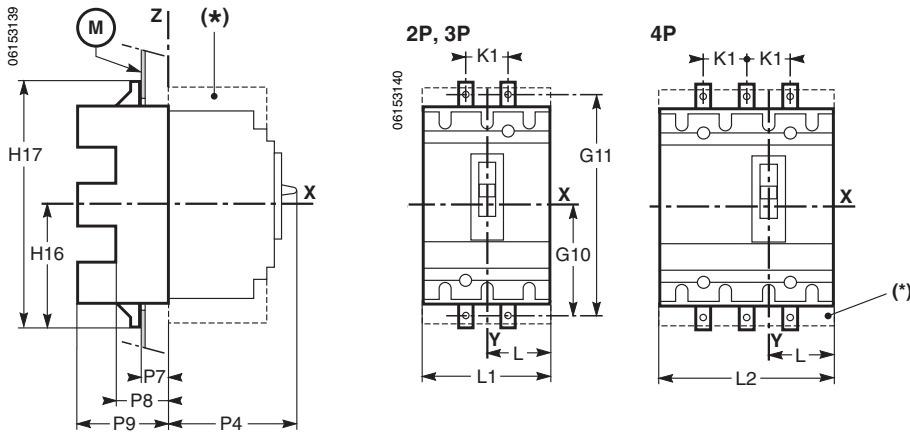
# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 10—Dimensions

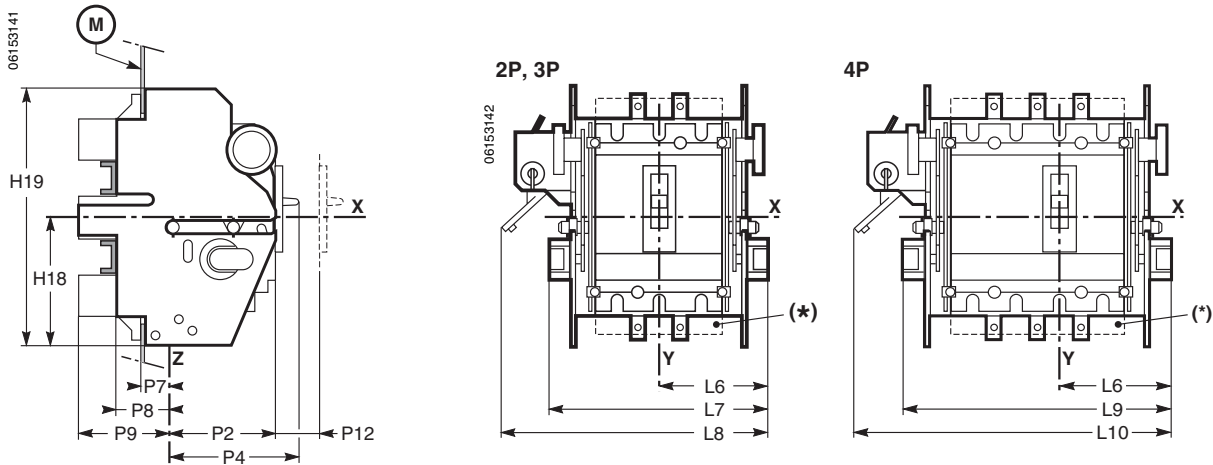
### PLUG-IN AND DRAWOUT MOUNTING

#### Dimensions

##### Plug-in (On Base)



##### Drawout (On Chassis)



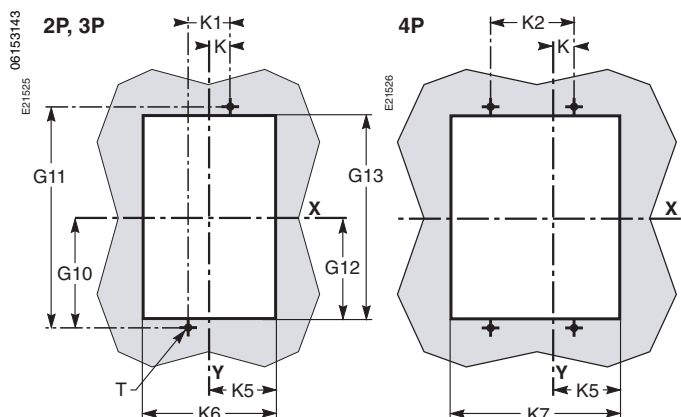
Dimensions: in. / mm

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

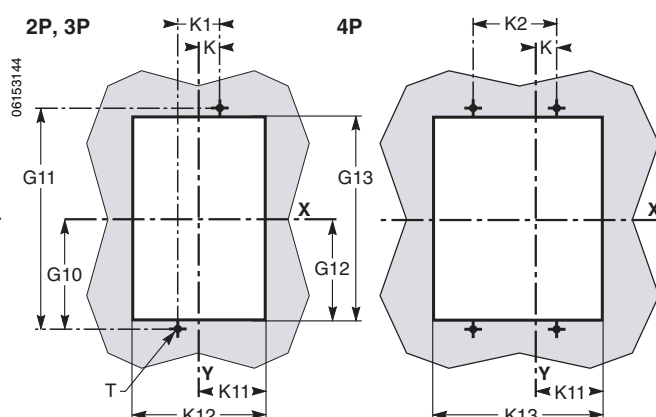
## Section 10—Dimensions

### Mounting

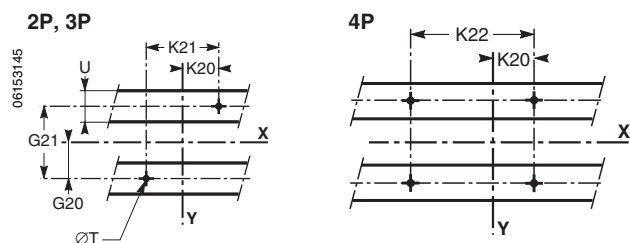
#### Through a Backplate (Plug-in Base)



#### Through a Backplate (Chassis)



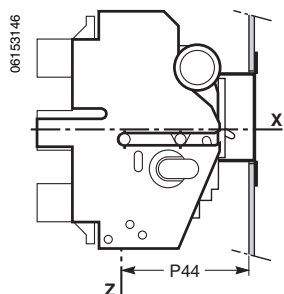
### On Rails (Plug-in Base or Chassis)



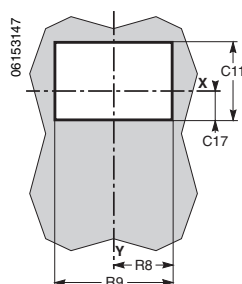
### Front-panel Cutouts

#### Plug-in Mounting

See Fixed-mounted Installation Page 41



#### Drawout with Extended Front-panel Escutcheons



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 10—Dimensions

|                 |      | <b>C11</b> | <b>C17</b> | <b>G10</b> | <b>G11</b> | <b>G12</b> | <b>G13</b> | <b>G20</b> | <b>G21</b> | <b>H16</b> | <b>H17</b> | <b>H18</b> | <b>H19</b> | <b>K</b> | <b>K1</b> |
|-----------------|------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------|-----------|
| NSF150/250N/H/L | Inch | 4.05       | 1.67       | 3.74       | 7.48       | 3.42       | 6.85       | 1.47       | 2.95       | 4.03       | 8.07       | 4.07       | 8.26       | 0.68     | 1.37      |
|                 | mm   | 103        | 42.3       | 95         | 190        | 87         | 174        | 37.5       | 75         | 102.5      | 205        | 103.5      | 210        | 17.5     | 35        |
| NSJ400/600N/H/L | Inch | 6.10       | 1.65       | 5.90       | 11.8       | 5.39       | 10.7       | 2.95       | 5.90       | 6.20       | 12.40      | 5.51       | 11.02      | 0.88     | 1.77      |
|                 | mm   | 115        | 42         | 150        | 300        | 137        | 274        | 75         | 150        | 157.5      | 315        | 140        | 280        | 22.5     | 45        |

|                 |      | <b>K5</b> | <b>K6</b> | <b>K11</b> | <b>K12</b> | <b>K13</b> | <b>K20</b> | <b>K21</b> | <b>L</b> | <b>L1</b> | <b>L2</b> | <b>L6</b> | <b>L7</b> | <b>L8</b> | <b>L9</b> |
|-----------------|------|-----------|-----------|------------|------------|------------|------------|------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| NSF150/250N/H/L | Inch | 2.14      | 4.29      | 2.91       | 5.82       | 7.20       | 1.37       | 2.75       | 2.06     | 4.13      | 5.51      | 3.64      | 7.28      | 8.50      | 8.66      |
|                 | mm   | 54.5      | 109       | 74         | 148        | 183        | 35         | 70         | 52.5     | 105       | 140       | 92.5      | 185       | 216       | 220       |
| NSJ400/600N/H/L | Inch | 2.81      | 2.81      | 7.40       | 3.60       | 7.20       | 8.97       | 1.96       | 2.75     | 5.51      | 7.28      | 4.33      | 8.66      | 98.46     | 10.43     |
|                 | mm   | 71.5      | 143       | 91.5       | 183        | 228        | 50         | 100        | 70       | 140       | 185       | 110       | 220       | 250       | 265       |

|                 |      | <b>L10</b> | <b>P2</b> | <b>P4</b> | <b>P7</b> | <b>P8</b> | <b>P9</b> | <b>P12</b> | <b>P44</b> | <b>R8</b> | <b>R9</b> | <b>U**</b> | <b>ØT</b> |  |
|-----------------|------|------------|-----------|-----------|-----------|-----------|-----------|------------|------------|-----------|-----------|------------|-----------|--|
| NSF150/250N/H/L | Inch | 9.88       | 3.38      | 4.37(*)   | 1.06      | 1.77      | 2.95      | 1.25       | 4.84       | 2.91      | 5.82      | ≤1.25      | 0.23      |  |
|                 | mm   | 251        | 86        | 111(*)    | 27        | 45        | 75        | 32         | 123        | 74        | 148       | ≤32        | 6         |  |
| NSJ400/600N/H/L | Inch | 11.61      | 4.33      | 6.61      | 1.06      | 1.77      | 3.93      | 1.25       | 5.78       | 3.54      | 7.08      | ≤1.25      | 0.11      |  |
|                 | mm   | 295        | 110       | 168       | 27        | 45        | 100       | 32         | 147        | 90        | 180       | ≤32        | 3         |  |

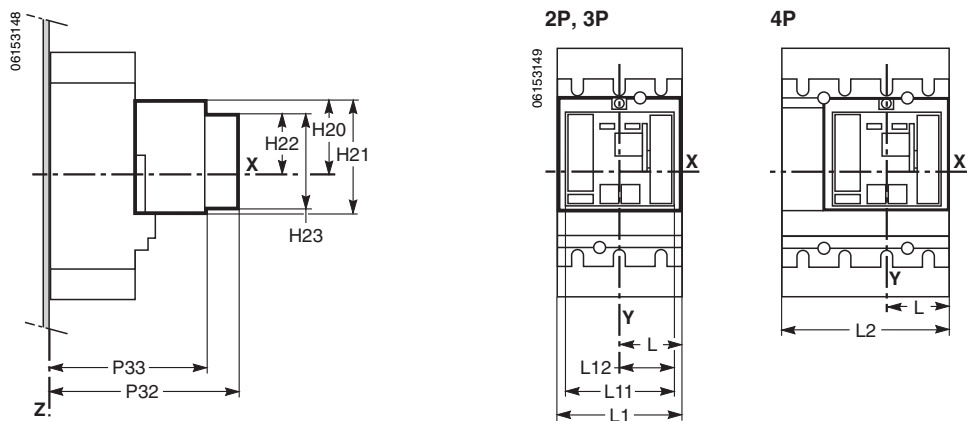
\* P4 = 4.96 in./126mm for Compact NSF250N/H/L Circuit Breaker

\*\* U ≤0.78 in./20mm When Using Automatic Auxiliary Connectors (Compact NSF150 and NSF250 Circuit Breakers)

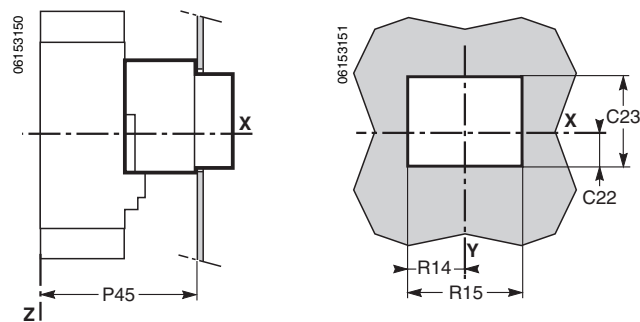
Compact® NSF and NSJ 150 to 600 A Circuit Breakers

Section 10—Dimensions

Motor Operators



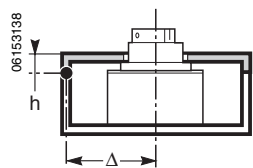
Front-panel Cutouts



Dimension Table

|                 |      | C22  | C23  | H20  | H21  | H22  | H23  | L    | L1   | L2   | L11  | L12  | P32  | P33  | P45  | R14  |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| NSF150/250N/H/L | Inch | 1.14 | 2.99 | 2.46 | 3.81 | 1.79 | 2.87 | 2.06 | 4.13 | 5.51 | 3.58 | 1.79 | 7.00 | 5.62 | 5.70 | 1.90 |
|                 | mm   | 29   | 76   | 62.5 | 97   | 45.5 | 73   | 52.5 | 105  | 140  | 91   | 45.5 | 178  | 143  | 145  | 48.5 |
| NSJ400/600N/H/L | Inch | 1.63 | 4.96 | 3.93 | 5.98 | 3.26 | 4.84 | 2.75 | 5.51 | 7.28 | 4.84 | 2.42 | 9.84 | 8.46 | 8.54 | 2.53 |
|                 | mm   | 41.5 | 126  | 100  | 152  | 83   | 123  | 70   | 140  | 185  | 123  | 61.5 | 250  | 215  | 217  | 64.5 |

NOTE: Door cutouts require a minimum distance between the center of the circuit breaker and the door hinge point  $\Delta \geq 3.93 \text{ in./100 mm} + (h \times 5)$ .

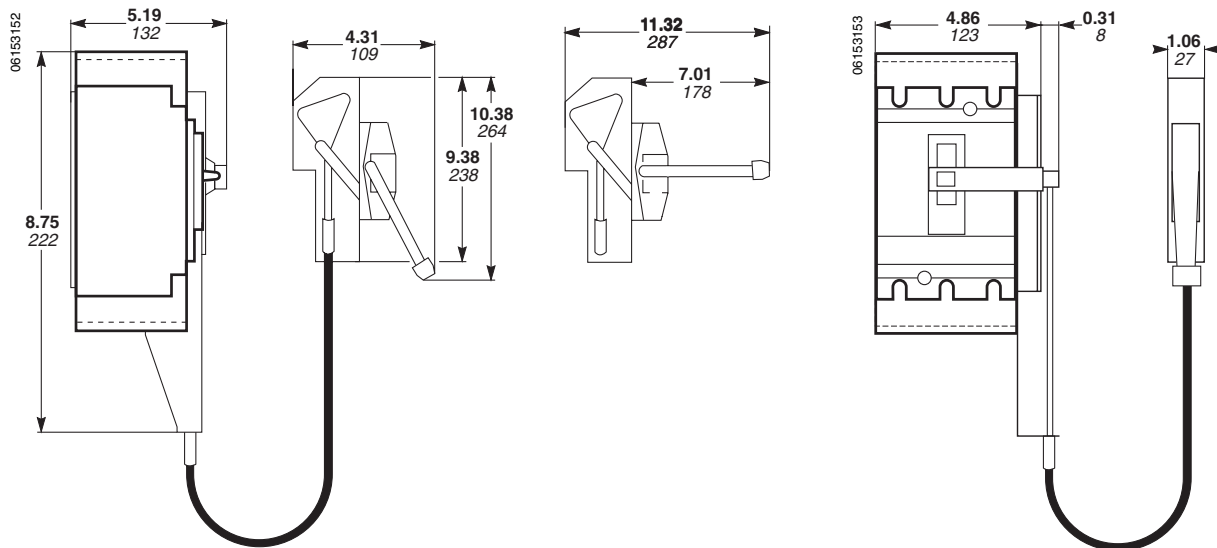


# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

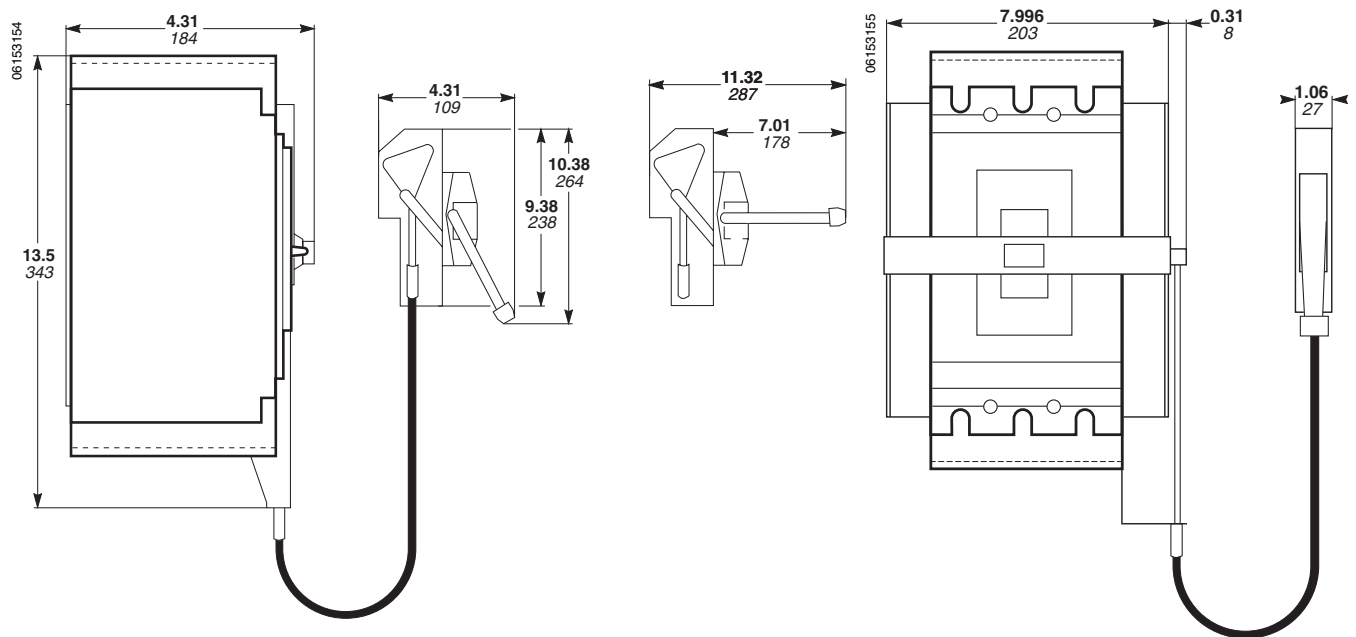
## Section 10—Dimensions

### CABLE-OPERATING HANDLES

#### Compact NSF



#### Compact NSJ



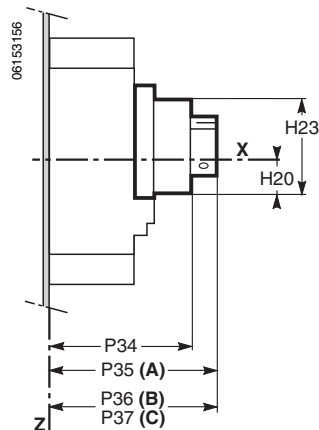
Dimensions: in. / mm

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 10—Dimensions

### ROTARY-OPERATING HANDLES

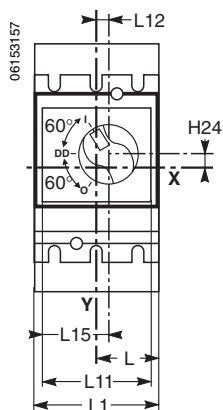
#### Dimensions



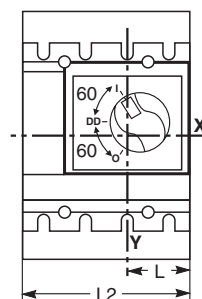
A—Without Keylock  
B—With Ronis™ Keylock  
C—With Profalux™ Keylock

Ronis and Profalux are trademarks of HF Sécurité

#### 2P, 3P

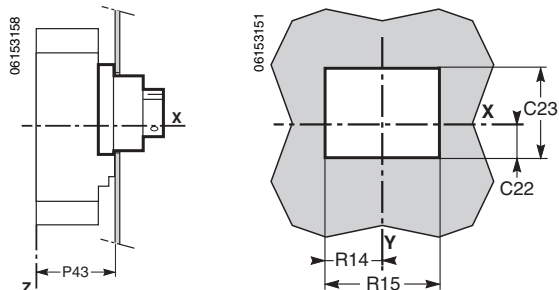


#### 4P

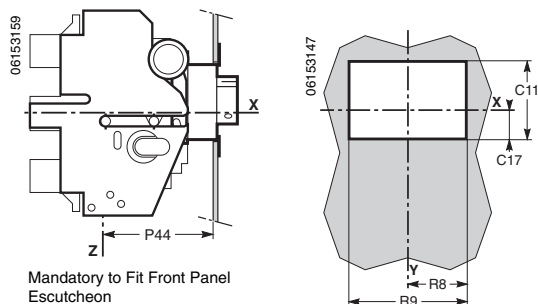


#### Front-panel Cutouts

##### Fixed or Plug-in Mounted



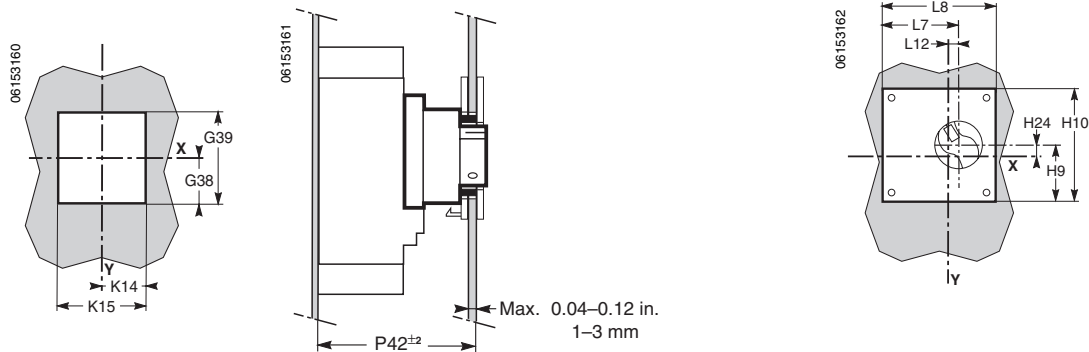
##### Drawout Mounting



#### Motor Control Center Type Direct Rotary-operating Handle

##### Front-panel Cutout

##### Dimensions



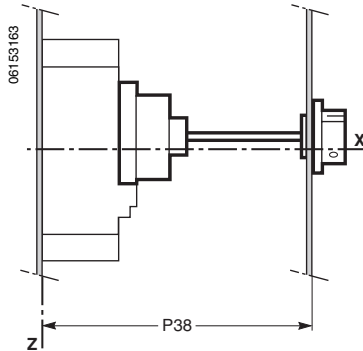


# Compact® NSF and NSJ 150 to 600 A Circuit Breakers Section 10—Dimensions

## Dimensions

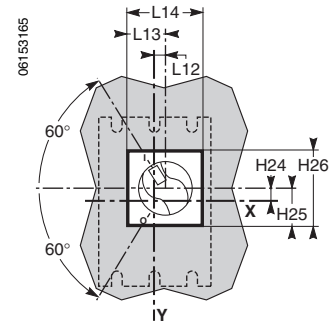
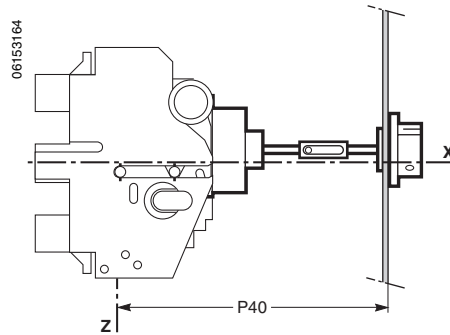
### Fixed or Plug-in Mounted

Cut Shaft at Length:  
P38—4.96 in. (126 mm) NSF150/250  
P38—5.90 in. (150 mm) NSJ400/600

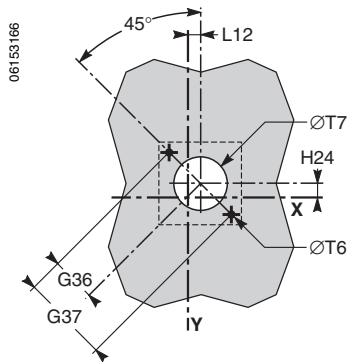


### Drawout Mounting

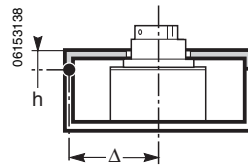
Cut Shaft at Length:  
P38—4.80 in. (122 mm) NSF150/250  
P40—5.90 in. (150 mm) NSJ400/600



### Front-panel Cutout



**NOTE:** Door cutouts require a minimum distance between the center of the circuit breaker and the door hinge point  $\Delta 3.93 \text{ in./100mm} + (h \times 5)$



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 10—Dimensions

|                 |      | C11  | C17  | C22  | C23  | G36  | G37  | G38  | G39  | H9   | H10  | H20  | H23  | H24  | H25  |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| NSF150/250N/H   | Inch | 4.05 | 1.67 | 1.14 | 2.99 | 1.41 | 2.83 | 1.61 | 3.93 | 2.36 | 4.72 | 1.10 | 2.87 | 0.35 | 1.47 |
|                 | mm   | 103  | 42.5 | 29   | 76   | 36   | 72   | 41   | 100  | 60   | 120  | 28   | 73   | 9    | 37.5 |
| NSJ400/600N/H/L | Inch | 6.10 | 1.65 | 1.63 | 4.96 | 1.41 | 2.83 | 2.00 | 5.70 | 3.26 | 6.29 | 1.47 | 4.84 | 0.96 | 1.47 |
|                 | mm   | 155  | 42   | 41.5 | 126  | 36   | 72   | 51   | 145  | 83   | 160  | 40   | 123  | 24.5 | 37.5 |

|                 |      | H26  | K14  | K15  | L    | L1   | L2   | L7   | L8   | L11  | L12  | L13  | L14  | L15  | P34  |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| NSF150/250N/H   | Inch | 2.95 | 1.96 | 3.93 | 2.06 | 4.13 | 5.51 | 2.71 | 4.72 | 3.58 | 0.36 | 1.47 | 2.95 | 2.16 | 4.76 |
|                 | mm   | 75   | 50   | 100  | 52.5 | 105  | 140  | 69   | 120  | 91   | 9.25 | 37.5 | 75   | 55   | 121  |
| NSJ400/600N/H/L | Inch | 2.95 | 2.85 | 5.70 | 2.75 | 5.51 | 7.28 | 3.34 | 6.29 | 4.84 | 0.19 | 1.47 | 2.95 | 2.61 | 5.70 |
|                 | mm   | 75   | 72.5 | 145  | 70   | 140  | 185  | 85   | 160  | 123  | 5    | 37.5 | 75   | 66.5 | 145  |

|                 |      | P35       | P36  | P37  | P38       | P40       | P42  | P43  | P44  | R8   | R9   | R14  | R15  | ØT6  | ØT7  |
|-----------------|------|-----------|------|------|-----------|-----------|------|------|------|------|------|------|------|------|------|
| NSF150/250N/H   | Inch | 6.10/7.04 | 6.14 | 6.45 | 7.28 min. | 9.76 min. | 4.92 | 3.50 | 4.84 | 2.91 | 5.82 | 1.90 | 3.81 | 0.16 | 1.96 |
|                 |      |           |      |      | 23.6 max. | 23.6 max. |      |      |      |      |      |      |      |      |      |
|                 | mm   | 155/179   | 156  | 164  | 185 min.  | 248 min.  | 125  | 89   | 123  | 74   | 148  | 48.5 | 97   | 4.2  | 50   |
|                 |      |           |      |      | 600 max.  | 600 max.  |      |      |      |      |      |      |      |      |      |
| NSJ400/600N/H/L | Inch | 7.08      | 7.08 | 7.40 | 8.22 min. | 10.7 min. | 5.86 | 4.40 | 5.78 | 3.54 | 7.08 | 2.53 | 5.07 | 0.16 | 1.96 |
|                 |      |           |      |      | 23.6 max. | 23.6 max. |      |      |      |      |      |      |      |      |      |
|                 | mm   | 180       | 180  | 188  | 209 min.  | 272 min.  | 149  | 112  | 147  | 90   | 180  | 64.5 | 129  | 4.2  | 50   |
|                 |      |           |      |      | 600 max.  | 600 max.  |      |      |      |      |      |      |      |      |      |

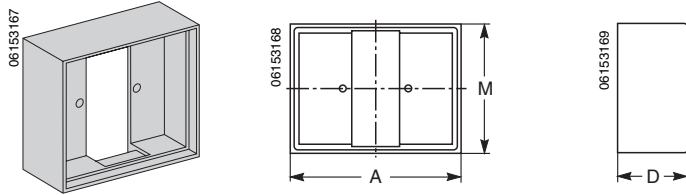
# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 10—Dimensions

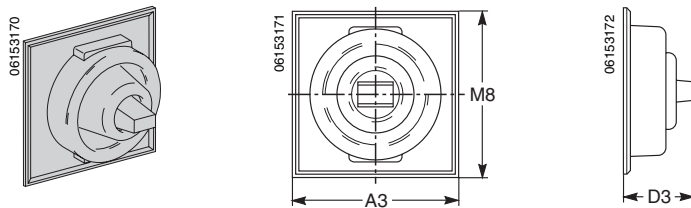
### FRONT ACCESSORIES

#### Extended Escutcheons

##### For Toggle

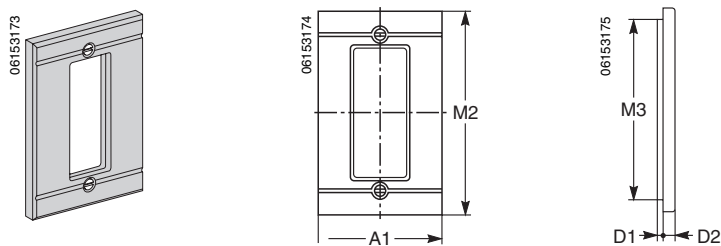


##### Toggle Boot

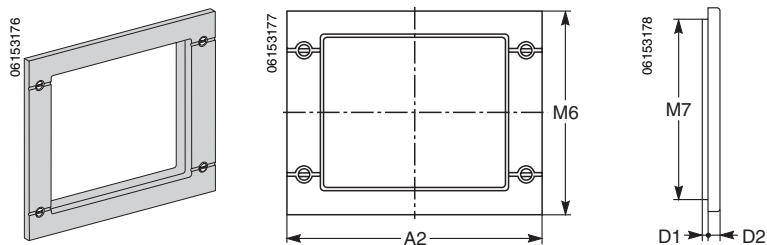


#### Front-panel Escutcheons

##### For Toggle



##### For Extended Escutcheon, Motor Operator Module or Rotary Handle



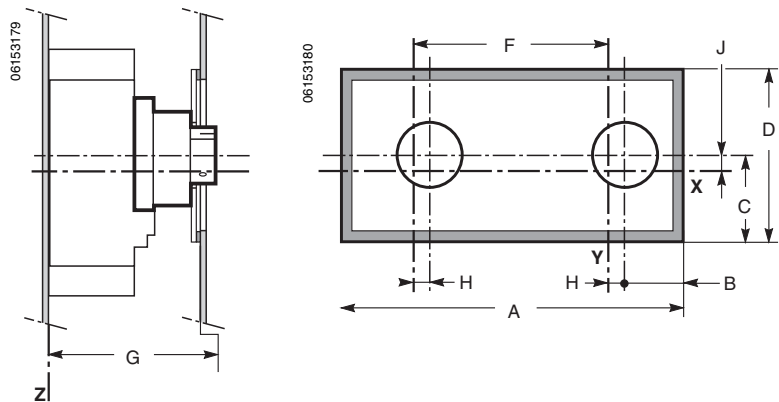
|                 |      | A    | A1   | A2   | A3   | D    | D1   | D2   | D3   | M    | M2   | M3   | M6   | M7   | M8   |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| NSF150/250N/H   | Inch | 3.58 | 2.71 | 6.18 | 3.70 | 1.37 | 0.13 | 0.25 | 1.57 | 2.87 | 4.52 | 4.01 | 4.48 | 3.97 | 3.70 |
|                 | mm   | 91   | 69   | 157  | 94   | 35   | 3.5  | 6.5  | 40   | 73   | 115  | 102  | 114  | 101  | 94   |
| NSJ400/600N/H/L | Inch | 4.84 | 4.01 | 7.44 | 1.37 | 5.27 | 0.13 | 0.25 | 2.36 | 4.84 | 6.10 | 5.59 | 6.45 | 5.94 | 5.27 |
|                 | mm   | 123  | 102  | 189  | 35   | 134  | 3.5  | 6.5  | 60   | 123  | 155  | 142  | 164  | 151  | 134  |

Compact® NSF and NSJ 150 to 600 A Circuit Breakers  
Section 10—Dimensions

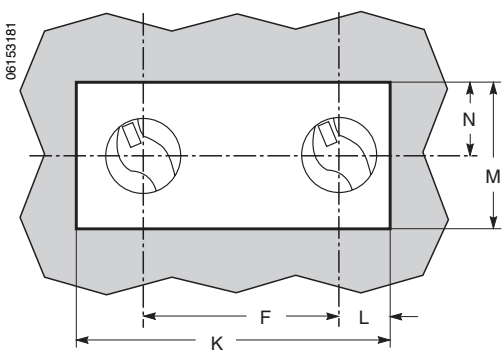
INTERLOCKING SYSTEMS

Interlocking Systems with Rotary-operating Handles

Dimensions



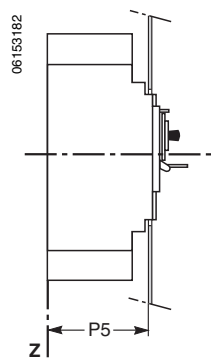
Front-panel Cutout



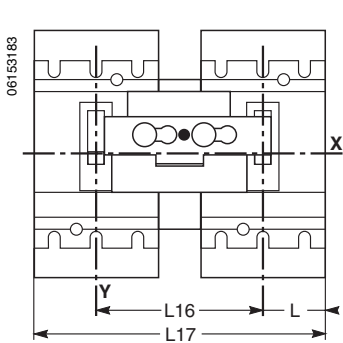
|            |      | A     | B    | C    | D    | F    | G    | H    | J    | K     | L    | M    | N    |
|------------|------|-------|------|------|------|------|------|------|------|-------|------|------|------|
| NSF150/250 | Inch | 12.79 | 3.54 | 3.44 | 6.89 | 6.14 | 5.23 | 0.36 | 0.35 | 11.61 | 2.97 | 5.90 | 2.95 |
|            | mm   | 325   | 90   | 87.5 | 175  | 156  | 133  | 9.25 | 9    | 295   | 75.5 | 150  | 75   |
| NSJ400/600 | Inch | 16.38 | 4.53 | 3.94 | 7.87 | 8.27 | 6.18 | 0.20 | 0.97 | 15.20 | 3.94 | 6.89 | 2.93 |
|            | mm   | 416   | 115  | 100  | 200  | 210  | 157  | 5    | 24.6 | 386   | 100  | 175  | 74.5 |

Interlocking Systems with Toggles

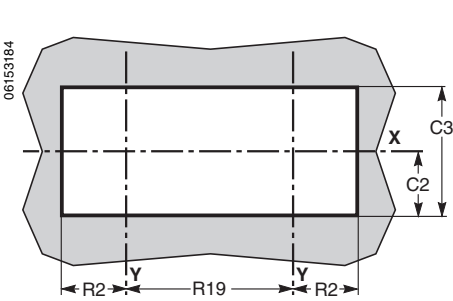
Dimensions



Three-pole



Front-panel Cutout



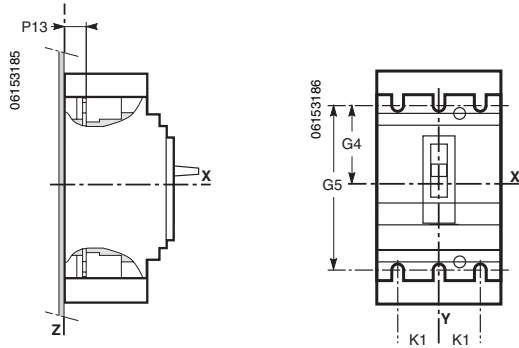
|                 |      | C2   | C3   | L    | L16  | L17   | R2   | R19  | P5   |
|-----------------|------|------|------|------|------|-------|------|------|------|
| NSF150/250N/H   | Inch | 2.12 | 4.25 | 2.06 | 5.51 | 9.64  | 2.12 | 5.51 | 3.26 |
|                 | mm   | 54   | 108  | 52.5 | 140  | 245   | 54   | 140  | 83   |
| NSJ400/600N/H/L | Inch | 3.64 | 7.24 | 2.75 | 7.28 | 12.79 | 2.81 | 7.28 | 4.21 |
|                 | mm   | 92.5 | 184  | 70   | 185  | 325   | 71.5 | 185  | 107  |

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 11—Connection Dimensions

### SECTION 11—CONNECTION DIMENSIONS

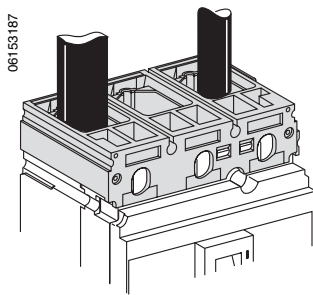
#### Fixed Mounted



|                 |      | G4    | G5   | K1   | P13   |
|-----------------|------|-------|------|------|-------|
| NSF150/250N/H   | Inch | 2.75  | 5.51 | 1.37 | 0.76* |
|                 | mm   | 70    | 140  | 35   | 19.5* |
| NSJ400/600N/H/L | Inch | 4.46  | 8.93 | 1.77 | 1.02  |
|                 | mm   | 113.5 | 227  | 45   | 526   |

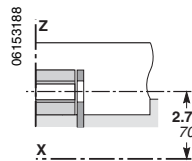
\* P13 = 0.84 in./21.5 mm for Compact® NSF250N/H Circuit Breaker

#### Front Connections

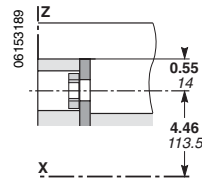


#### Bar Connection

NSF 150/250 (M8 Screws)

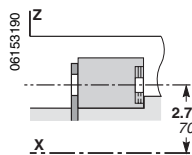


NSJ 400/600 (M10 Screws)

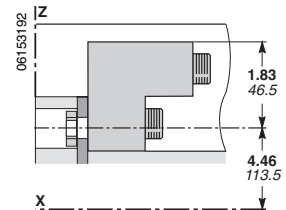
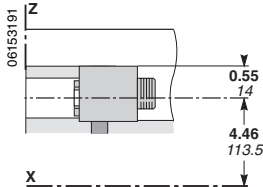


#### Cable Connection

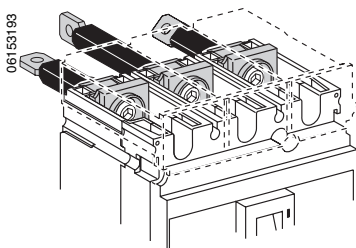
NSF 150/250



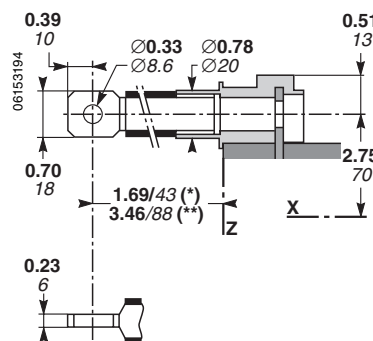
NSJ 400/600



#### Rear Connections

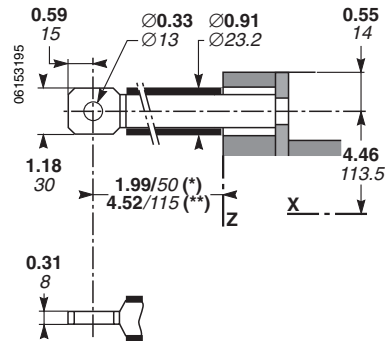


NSF 150/250



(\*) Short RC : 1.69/43  
(\*\*) Long RC : 3.46/88

NSJ 400/600



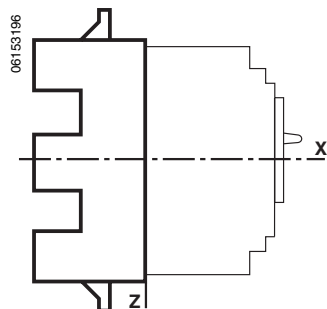
(\*) Short RC : 1.96/50  
(\*\*) Long RC : 4.52/115

Dimensions of Energized Parts: See Section 8—Connections

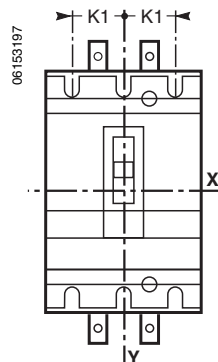
Dimensions: in. / mm

# **Compact® NSF and NSJ 150 to 600 A Circuit Breakers** **Section 11—Connection Dimensions**

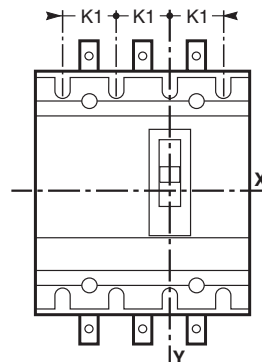
## **Plug-in or Drawout Mounting**



**2P, 3P**

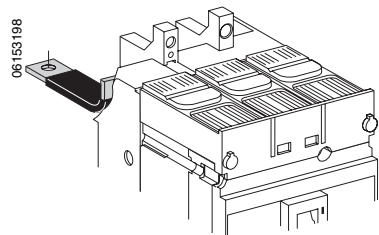


**4P**

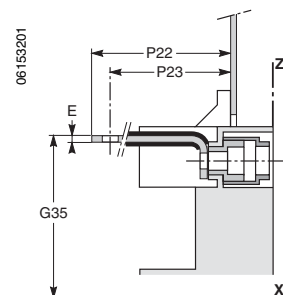
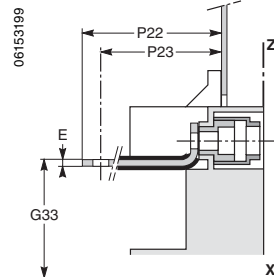
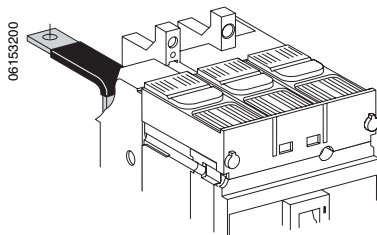


## **Rear Connections**

### **Rear Connections Fitted at Lower Limit**



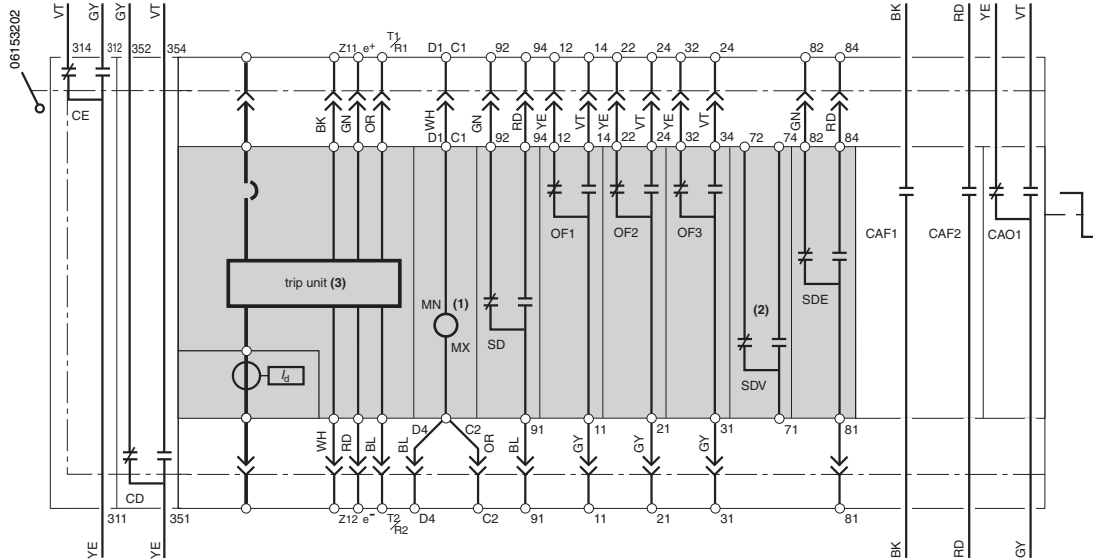
### **Rear Connections Fitted at Upper Limit**



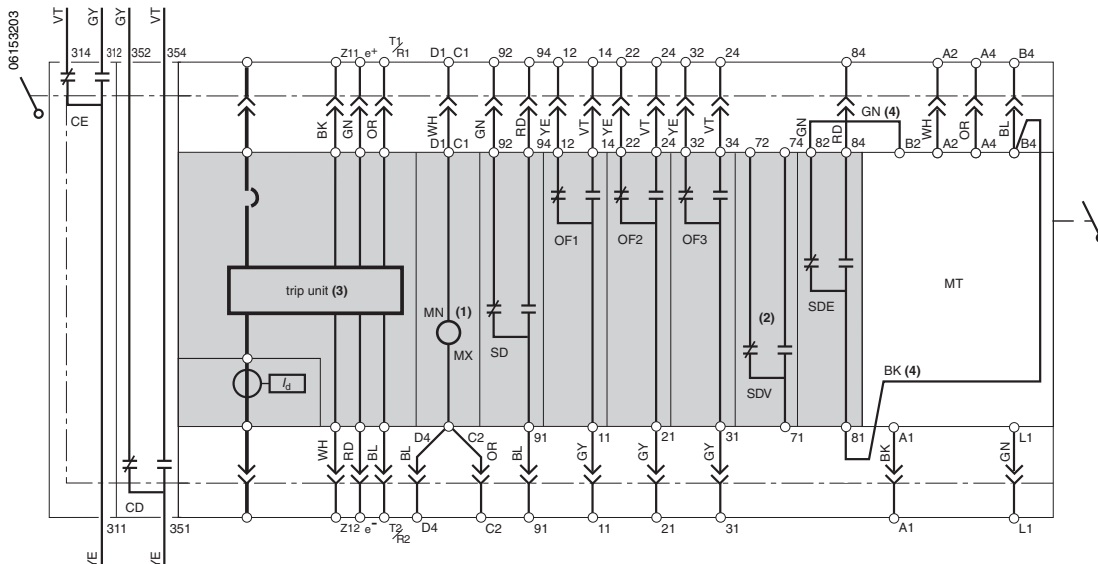
|                 |      | <b>E</b> | <b>G33</b> | <b>G35</b> | <b>K1</b> | <b>P22</b> |       | <b>P23</b> |      |
|-----------------|------|----------|------------|------------|-----------|------------|-------|------------|------|
| NSF150/250N/H   | Inch | 0.15     | 2.5        | 3.16       | 1.37      | 2.93       | 4.86  | 2.59       | 4.52 |
|                 | mm   | 4        | 63.5       | 80.5       | 35        | 74.5       | 123.5 | 66         | 115  |
| NSJ400/600N/H/L | Inch | 0.23     | 4.09       | 5.07       | 1.77      | 4.50       | 7.14  | 3.93       | 6.57 |
|                 | mm   | 6        | 104        | 129        | 45        | 114.5      | 181.5 | 100        | 167  |

## SECTION 12—WIRING DIAGRAMS

### Manually-operated Circuit Breaker



### Motor-operated Circuit Breaker



All schemes are shown without the control voltage present, all devices open and relays in the de-energized position.

Switches CD, CE: on drawout chassis.

Switches CAO, CAF: on rotary handle.

#### Symbols

**CAF** = early-make switch  
**CAO** = early-break switch  
**CE** = "connected" position indication switch  
**CD** = "disconnected" position indication switch  
**MN** = undervoltage trip  
**MT** = motor operator  
**MX** = shunt trip  
**OF** = position indication switch  
**SD** = trip indication switch  
**SDE** = overcurrent trip switch  
**SDV** = ground-fault indication switch

#### Legend

(1) Undervoltage or shunt trip  
 (2) For plug-in/drawout versions, SDV and OF2 switches can be installed together, but only one of them will be connected through automatic secondary disconnecting blocks  
 (3) Options are only installed on trip unit STR53UP  
 (4) Wiring supplied, mandatory to connect

#### Color code

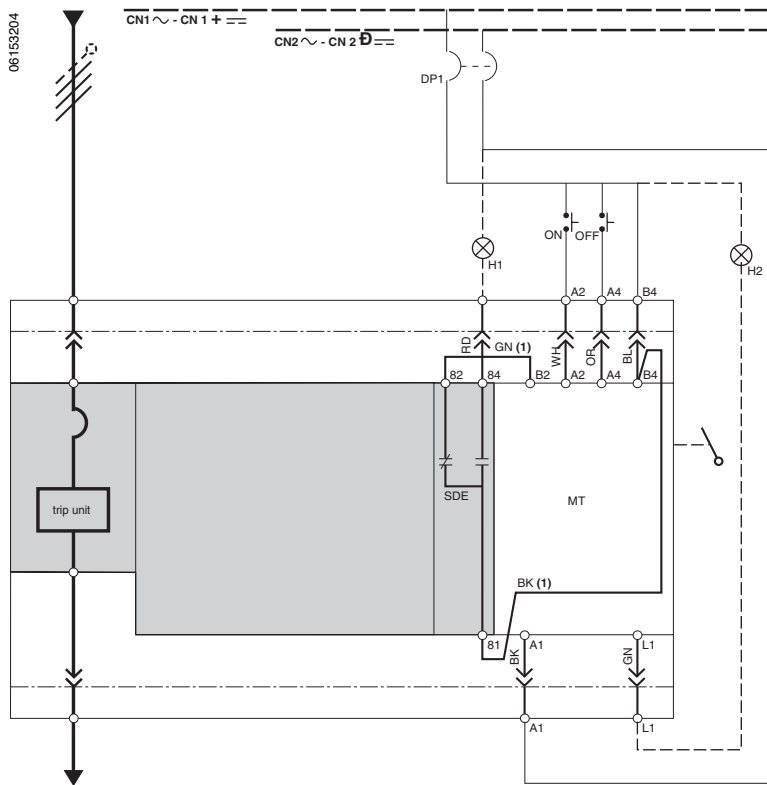
VT: Purple  
 YE: Yellow  
 RD: Red  
 BK: Black  
 GN: Green  
 GY: Grey  
 WH: White  
 OR: Orange  
 BL: Blue

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

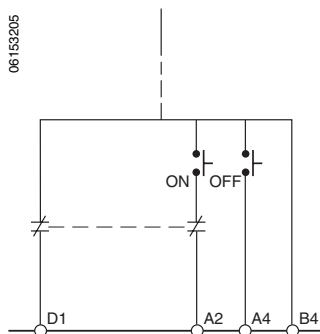
## Section 12—Wiring Diagrams

### Motor Operator—Automatic Resetting After Tripping

#### Use of the Motor Operator (Standard Wiring Diagram)



#### Motor Operator + Undervoltage Trip



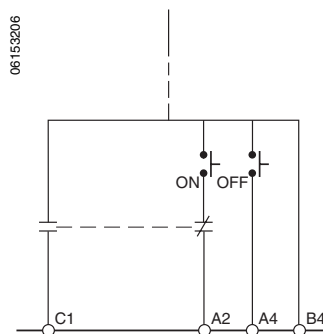
Mandatory manual reset after tripping due to an electrical fault.

#### Symbols

**DP1** = protection circuit breakers  
**OFF** = opening push button  
**ON** = closing push button  
**H2** = "manual" position indication  
**H1** = electrical fault indication  
**MT** = motor operator  
**SDE** = electrical fault indication switch

(1) Jumper is supplied and must be connected by user. Overcurrent trip switch is strongly recommended to lock remote or automatic resetting after an overcurrent fault.

#### Motor Operator + Shunt Trip

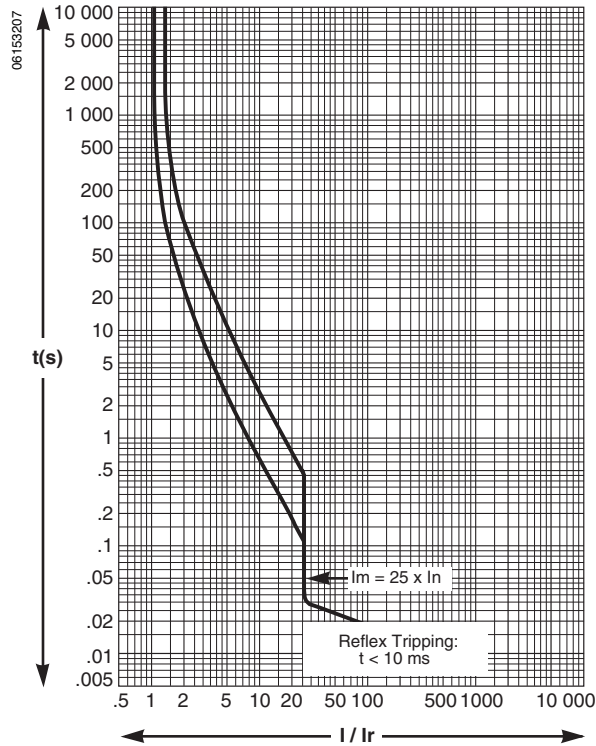




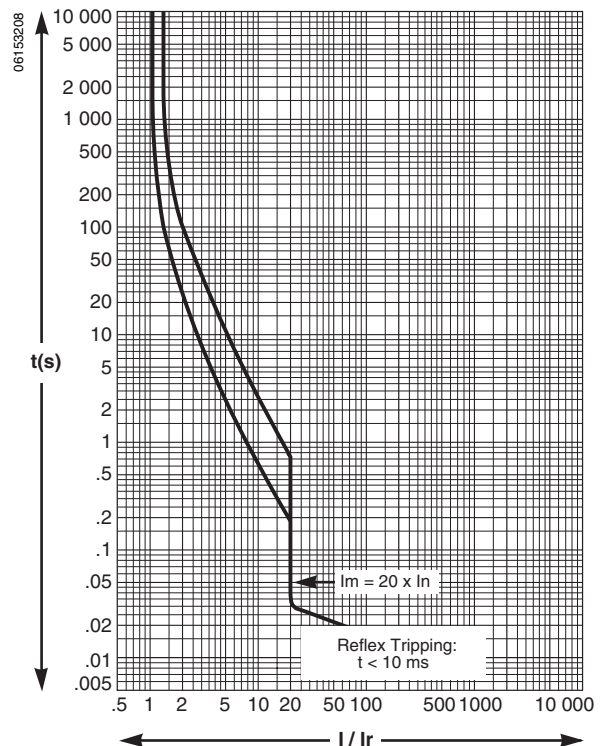
## SECTION 13—SUPPLEMENTARY TECHNICAL INFORMATION

### TRIP UNITS FOR COMPACT® NSF150–NSF250 CIRCUIT BREAKERS

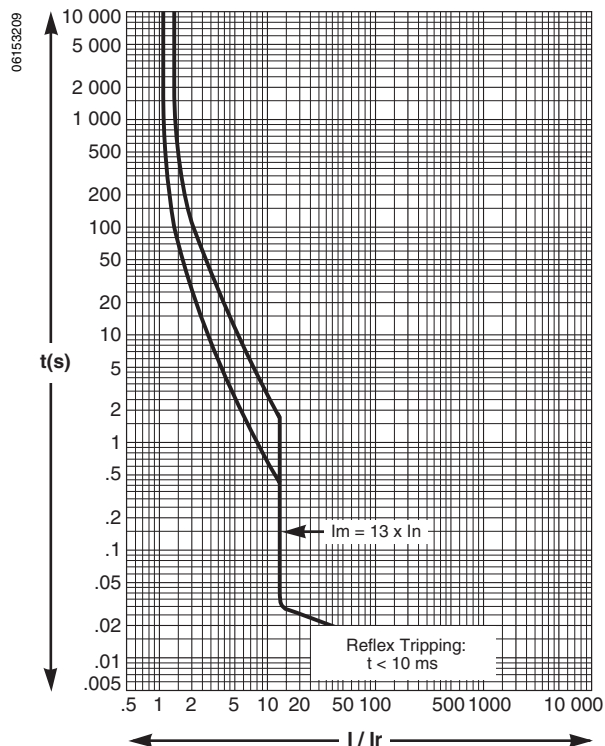
TM15DP



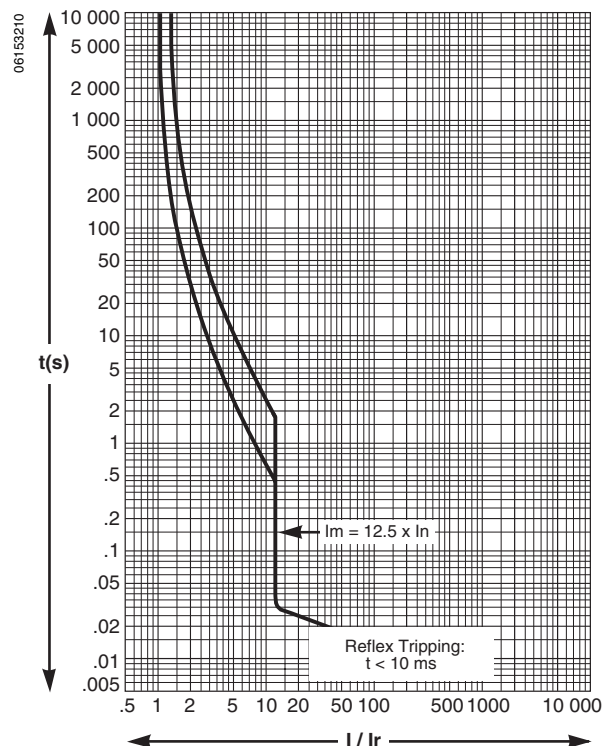
TM20DP



TM30DP



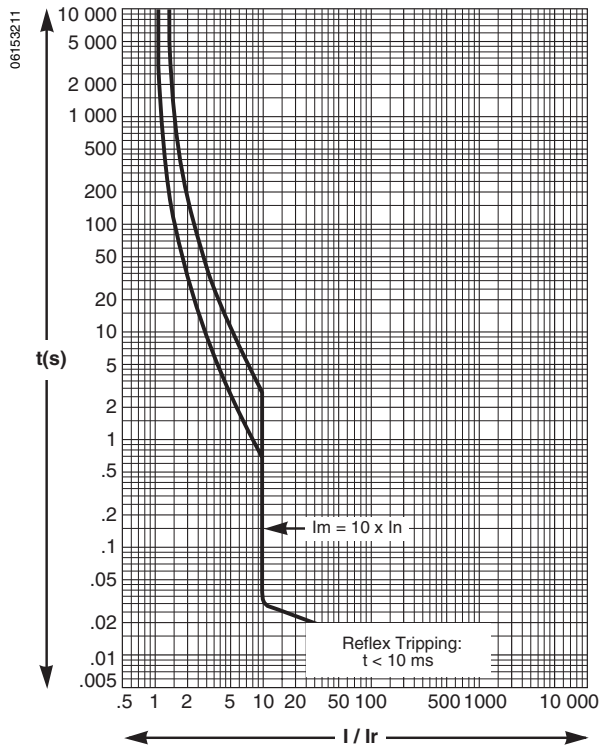
TM40DP



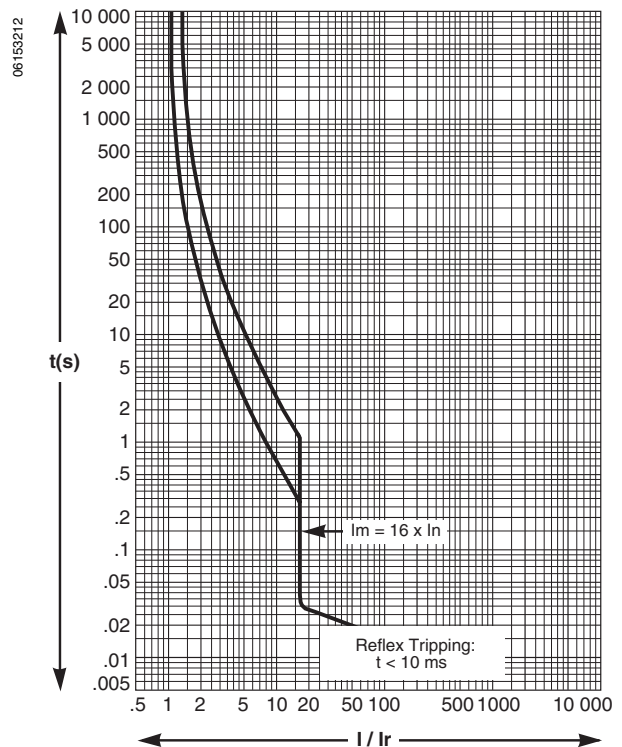
Reflex Tripping: See Page 62

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers Section 13—Supplementary Technical Information

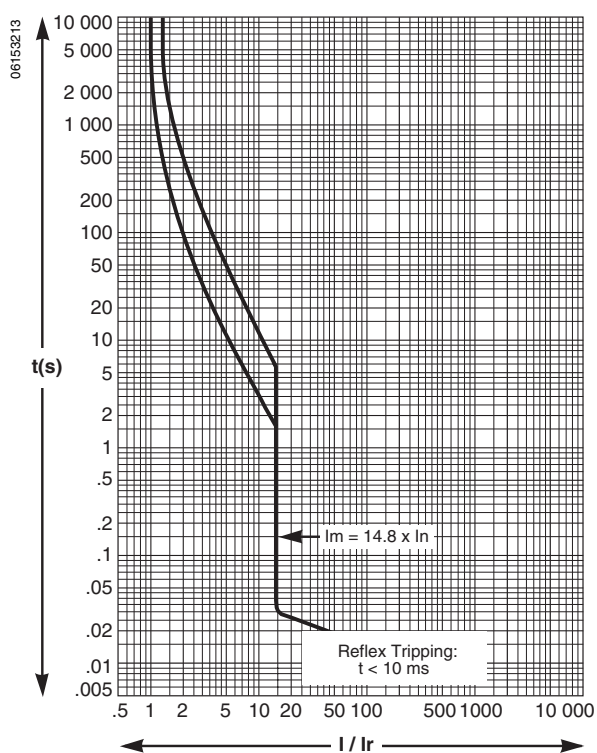
**TM50DP**



**TM60DP**

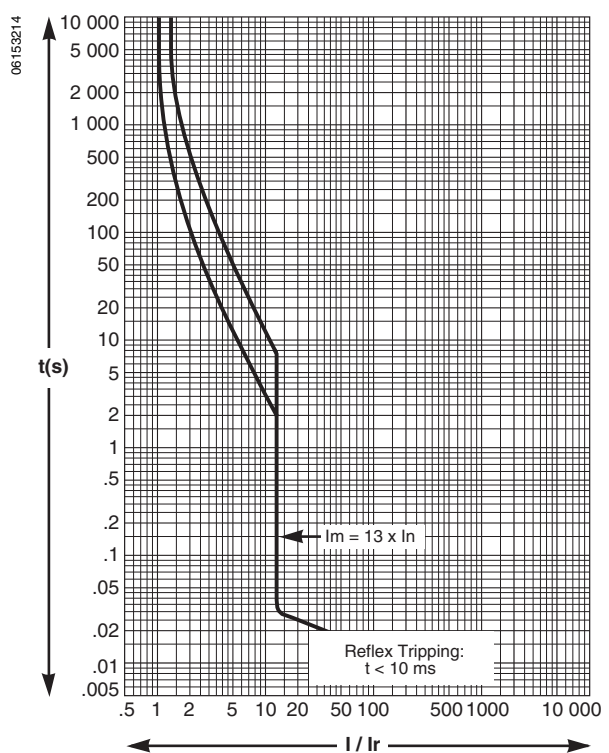


**TM70DP**



Reflex Tripping: See Page 62

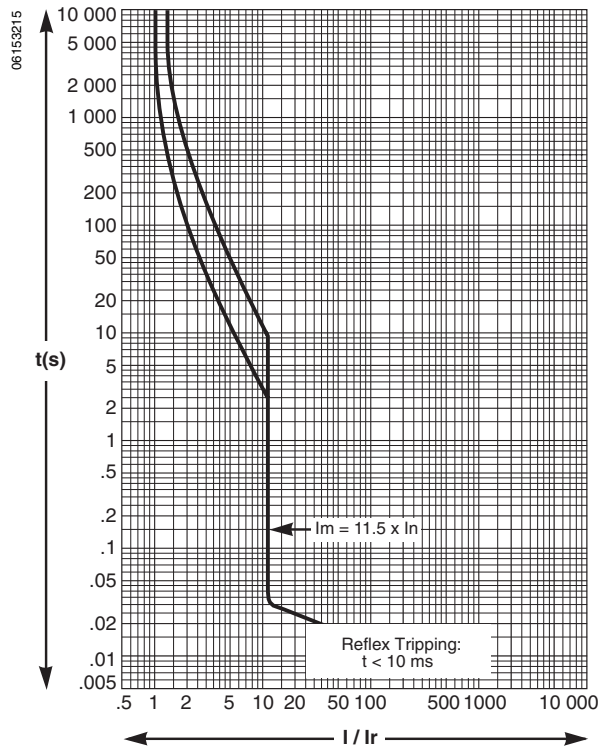
**TM80DP**



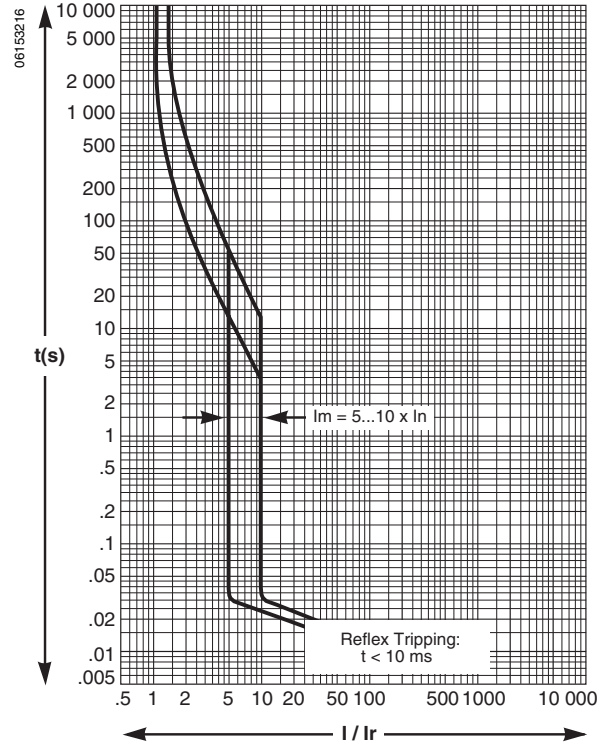
# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 13—Supplementary Technical Information

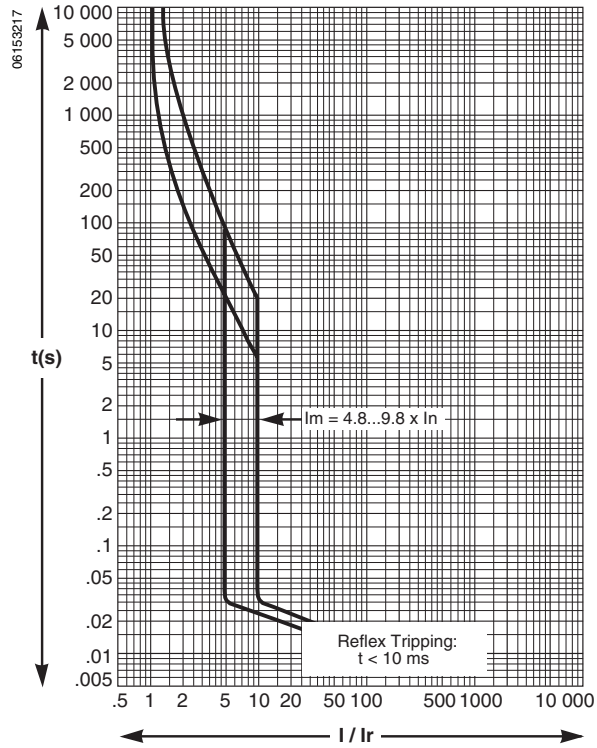
**TM90DP**



**TM100-225DP**



**TM250DP**



Reflex Tripping: See Page 62

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 13—Supplementary Technical Information

#### EFFECT OF HIGH TEMPERATURES

When the ambient temperature is greater than 40° C, overload protection characteristics are slightly modified. When determining tripping times using time/current curves, the  $I_r$  values corresponding to the thermal setting on the circuit breaker must be reduced using the coefficients below:

| 45° C | 50° C | 55° C | 60° C | 65° C | 70° C |
|-------|-------|-------|-------|-------|-------|
| 0.975 | 0.95  | 0.925 | 0.90  | 0.875 | 0.85  |

#### Example

What is the tripping time for a TM200DP circuit breaker with a 400A fault current and an ambient temperature of 40° C?

- $I_r = 200 \text{ A}$
- $I/I_r = 400/200 = 2$

On the time/current curve,  $t = 100 \text{ s}$ .

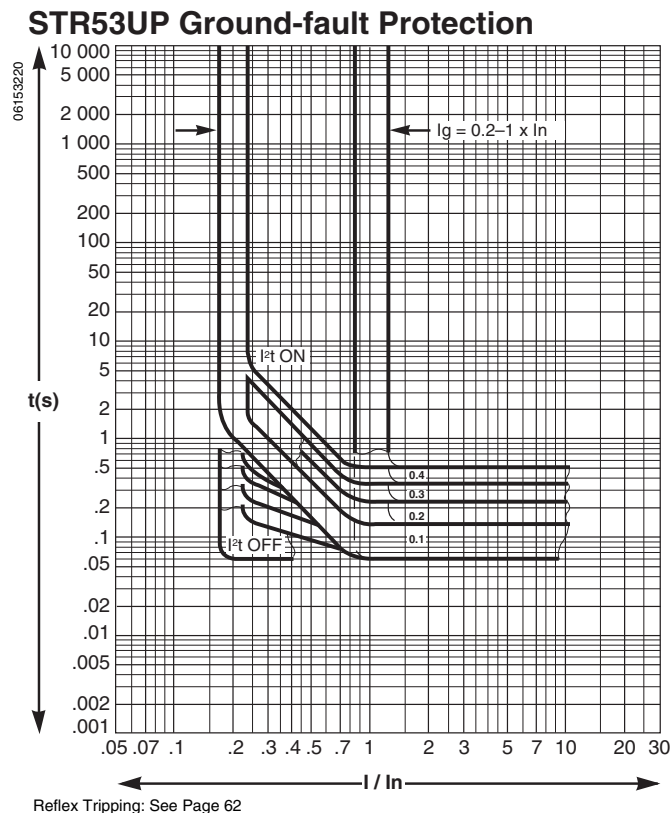
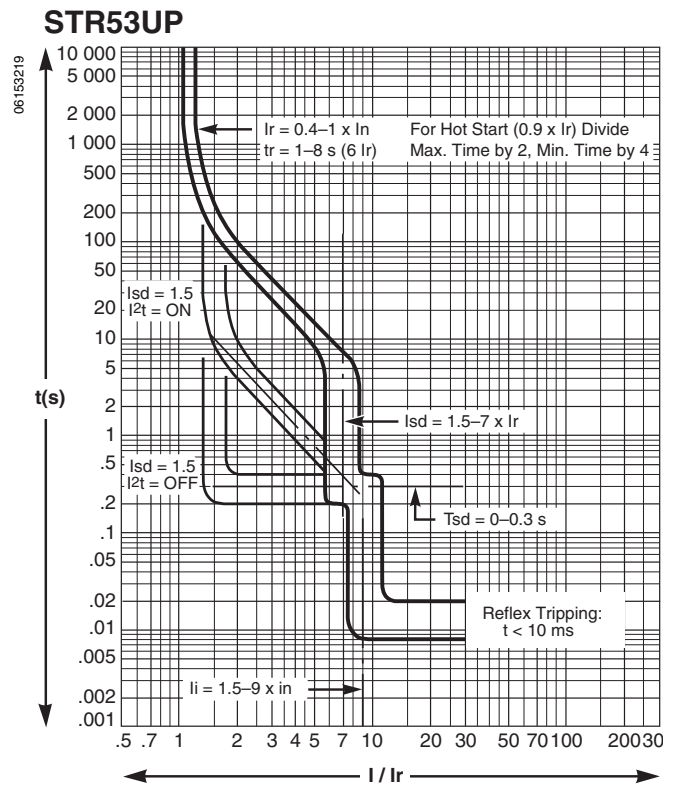
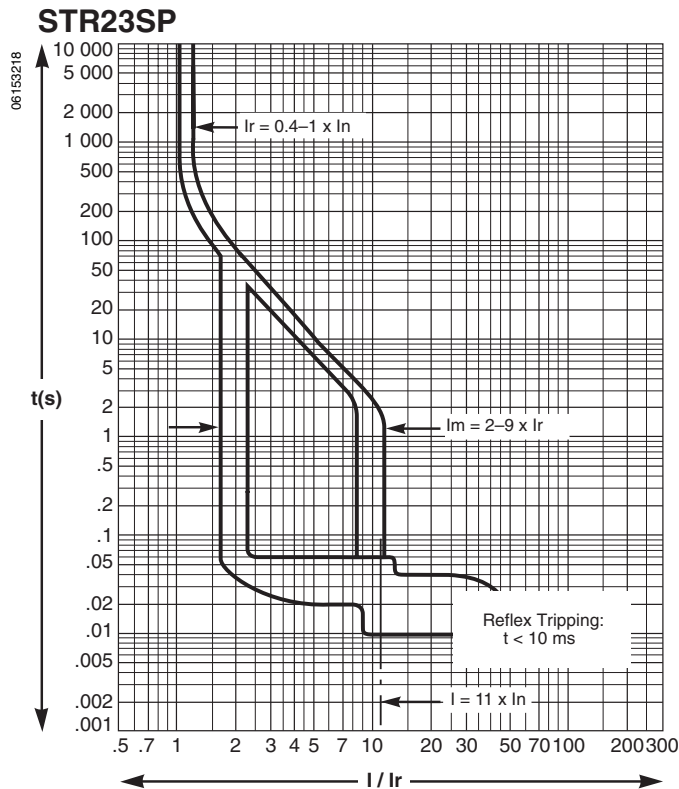
Consider the same conditions, except an ambient temperature of 65° C. What is the tripping time?

- $I_r = 200 \times 0.875 = 175 \text{ A}$
- $I/I_r = 400/175 = 2.28$

On the time/current curve,  $\approx 65 \text{ s}$ .

**Compact® NSF and NSJ 150 to 600 A Circuit Breakers**  
**Section 13—Supplementary Technical Information**

**TRIP UNITS FOR COMPACT® NSJ400–NSJ600 CIRCUIT BREAKERS**



## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

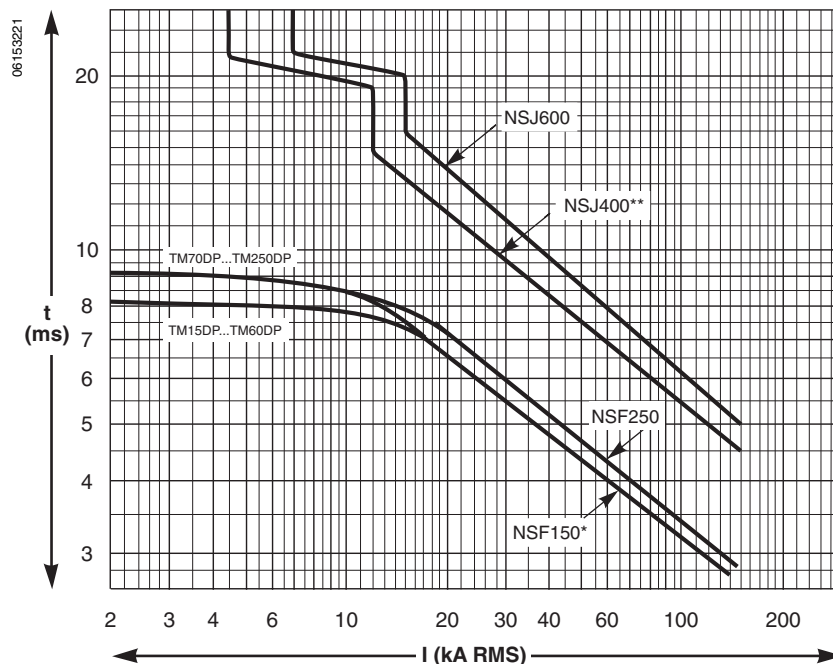
### Section 13—Supplementary Technical Information

#### REFLEX TRIPPING

All Compact® NS circuit breakers and switches incorporate the exclusive reflex tripping system.

This extremely simple system breaks very high fault currents by mechanically tripping the device via a "piston" actuated directly by the pressure produced in the breaking units resulting from a short circuit.

For high short-circuit thermal withstand, this system provides a faster break. Reflex tripping curves are exclusively a function of the circuit breaker rating.



\* 4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

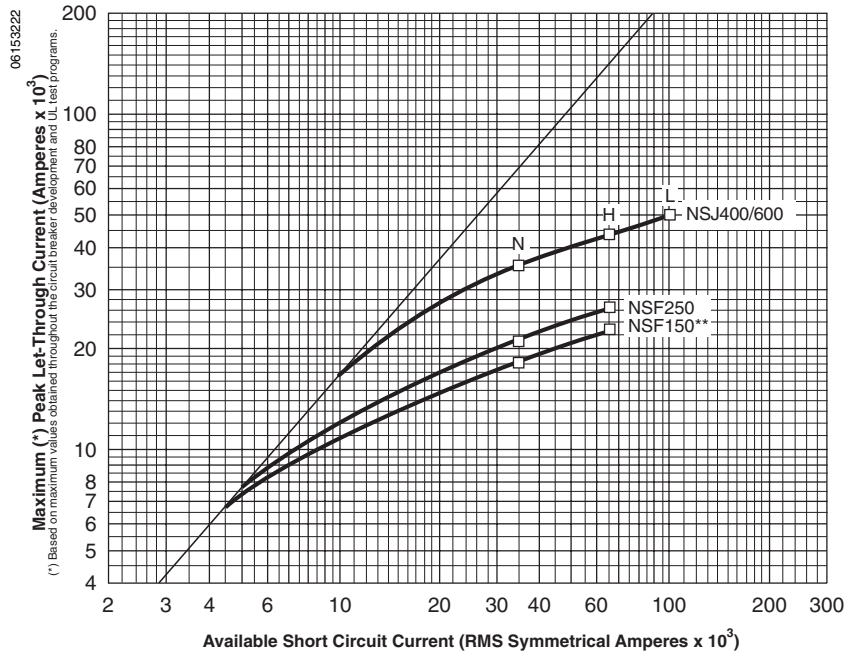
\*\* 4P OSN NSJ 400/600N Ratings Are Same As NSJ600

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 13—Supplementary Technical Information

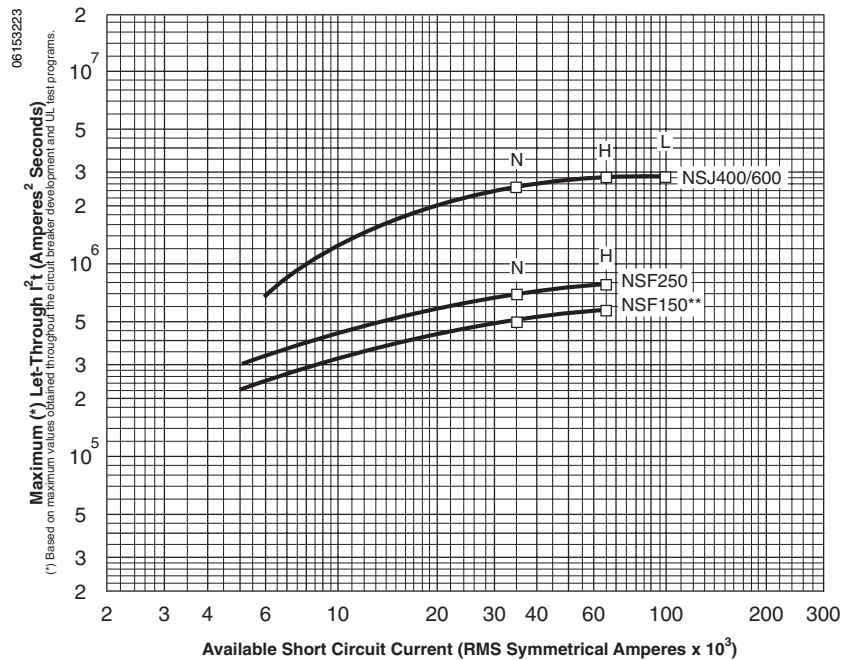
### LET-THROUGH CURVES AT 480 V

Maximum Peak  
Let-through  
Current (Amperes)



\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

Maximum Let-  
through I<sup>2</sup>t  
(Amperes<sup>2</sup>  
Seconds)



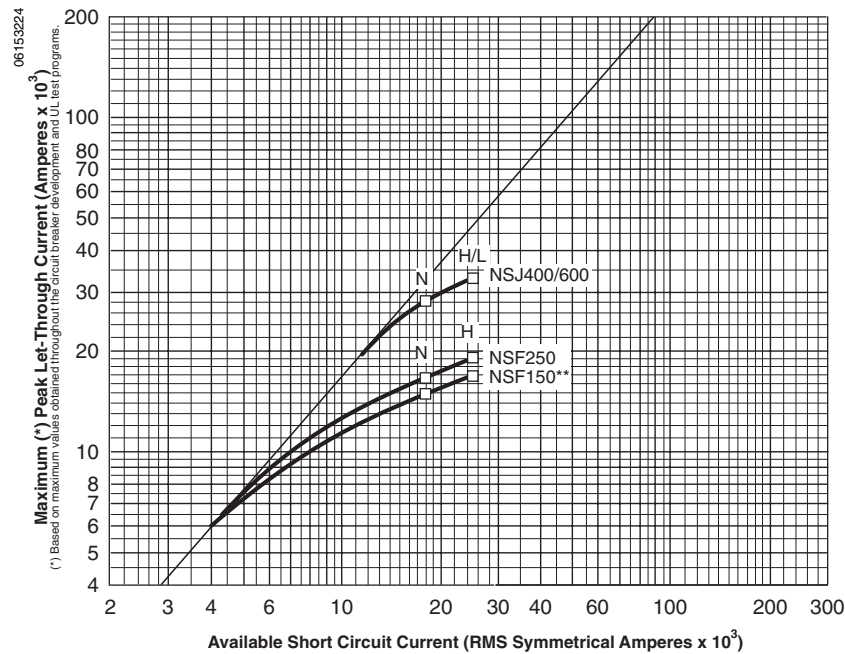
\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 13—Supplementary Technical Information

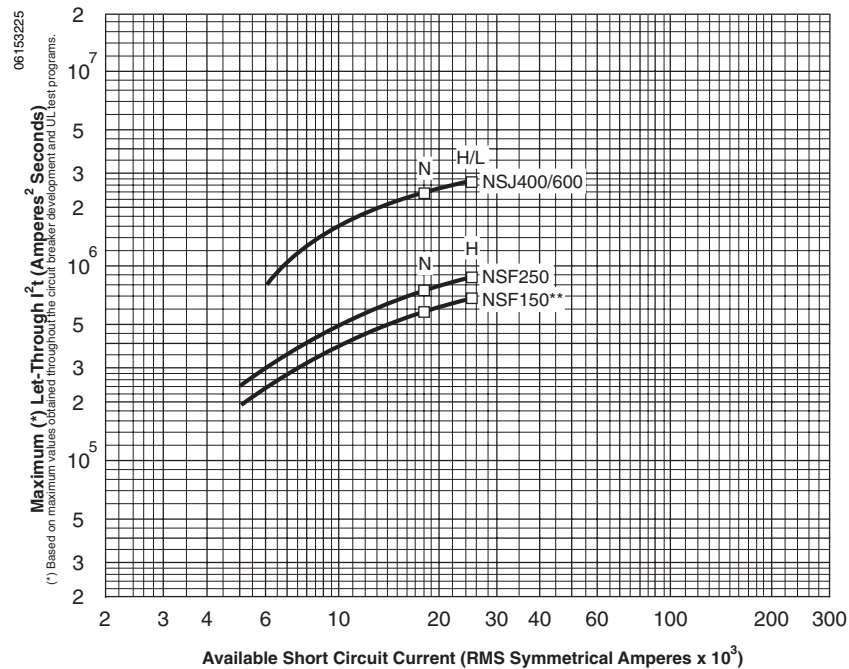
### LET-THROUGH CURVES AT 600 V

Maximum Peak  
Let-through  
Current (Amperes)



\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

Maximum Let-  
through  $I^2t$   
(Amperes<sup>2</sup>  
Seconds)



\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

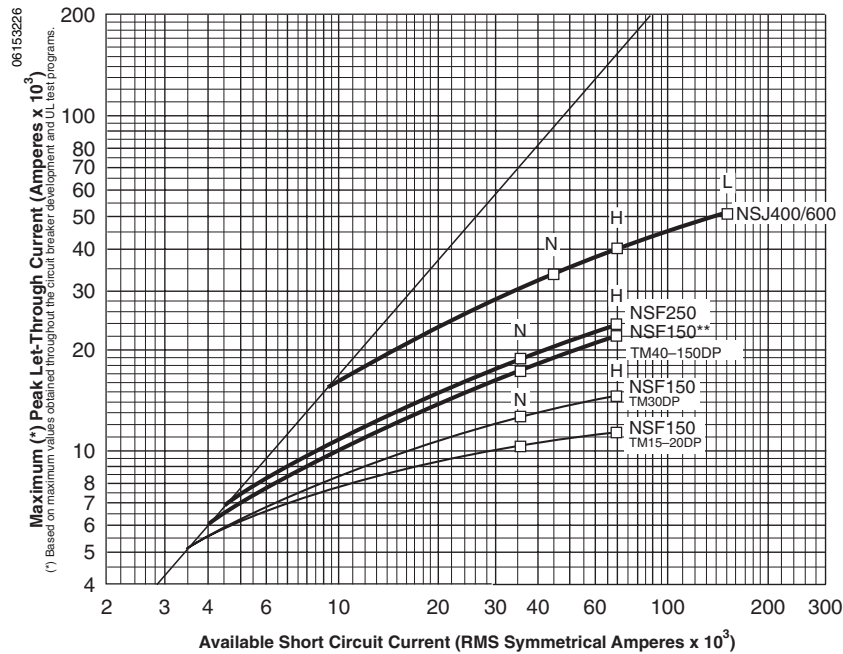


# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 13—Supplementary Technical Information

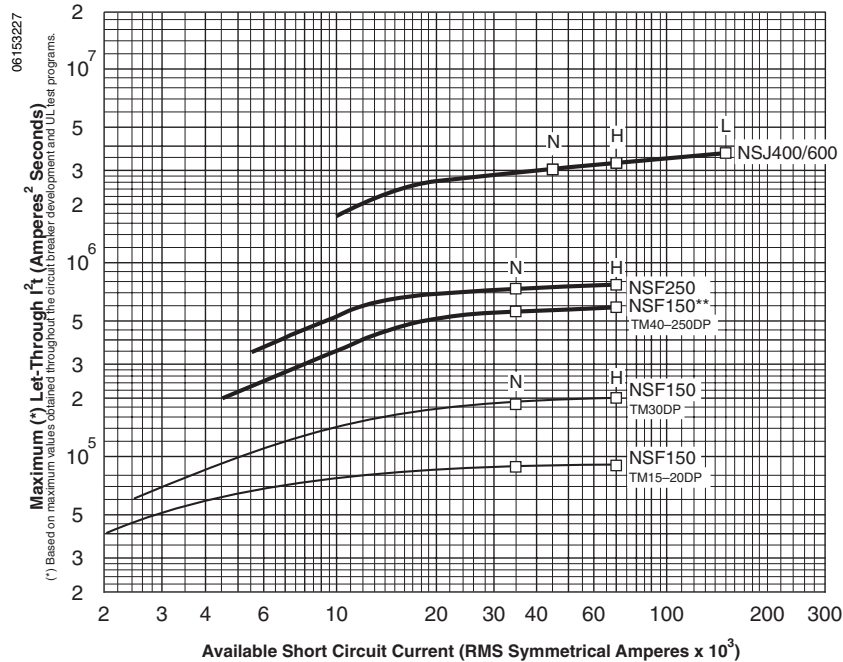
### CURRENT-LIMITING CURVES AT 380/415 V

Maximum Peak  
Let-through  
Current (Amperes)



\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

Maximum Let-  
through  $I^2t$   
(Amperes<sup>2</sup>  
Seconds)



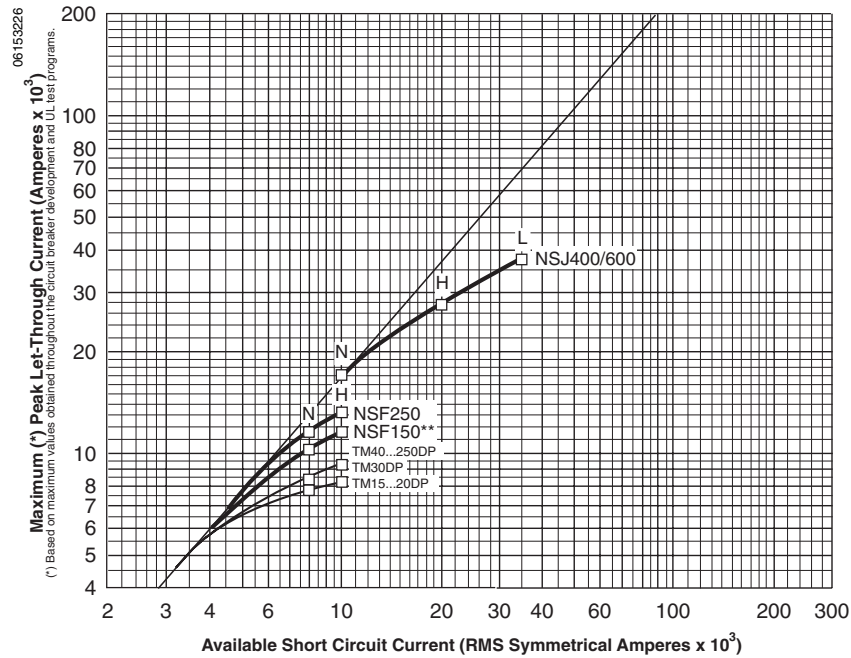
\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 13—Supplementary Technical Information

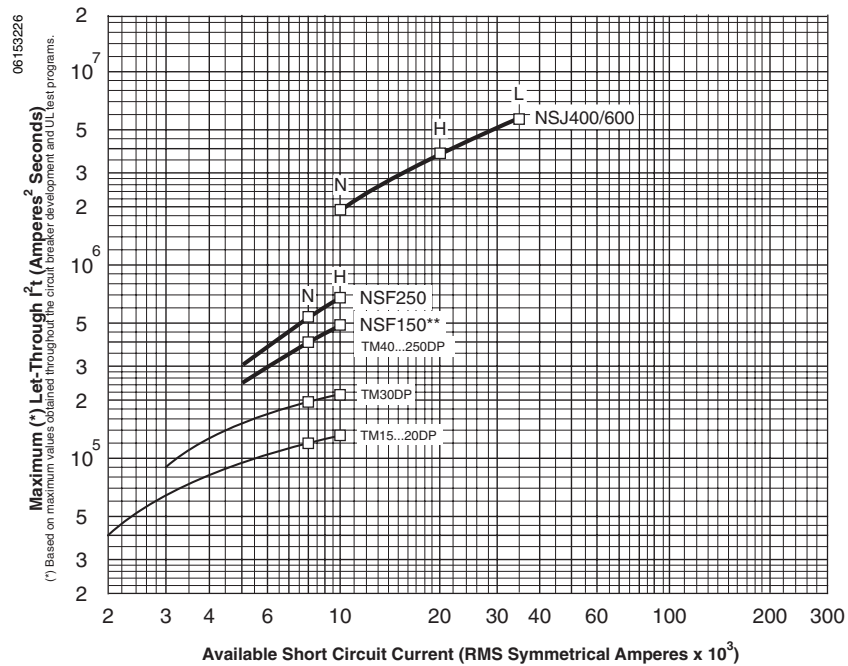
### CURRENT-LIMITING CURVES AT 690 V

Maximum Peak  
Let-through  
Current (Amperes)



\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

Maximum Let-  
through I<sup>2</sup>t  
(Amperes<sup>2</sup>  
Seconds)



\*\*4P OSN Compact® NSF125/250N and NSF 150/250N Ratings Are Same As NSF250

# Compact® NSF and NSJ 150 to 600 A Circuit Breakers

## Section 13—Supplementary Technical Information

### UL 489 TEST PROCEDURE

#### Standard Tests

For electronic trip circuit breakers and uncompensated thermal-magnetic circuit breakers rated 40° C, the test sequences are as shown in the table below:

| Test  | Sequence |   |   |
|---|----------|---|---|
|   | X        | Y | Z |
| 200% Calibration at 25° C (77° F)                 | ■        | ■ | ■ |
| 135% Calibration at 25° C (77° F)                 | ■        |   |   |
| Calibration of Adjustable Instantaneous Trip      | ■        |   |   |
| Overload  | ■        |   |   |
| Tungsten Lamp Load                                | ①        |   |   |
| 100% Calibration at 40° C (104° F)                | ②        |   |   |
| Temperature and 100% Calibration at 25° C (77° F) | ■        |   |   |
| Endurance   |          | ■ |   |
| 200% Calibration at 25° C (77° F) Repeated        |          | ■ |   |
| 135% Calibration at 25° C (77° F) Repeated        |          | ■ |   |
| Interrupting Ability (Y sequence)                 |          | ■ |   |
| Interrupting Ability (Z sequence)                 |          |   | ■ |
| 200% Trip Out at 25° C (77° F)                    |          | ■ | ■ |
| Dielectric Voltage Withstand                      | ■        | ■ | ■ |

① Applies only to circuit breakers rated 50 A or less, and 125 or 125/250 V or less.

② Applies only to thermal-magnetic breakers rated 40° C.

#### Standard Specifications

##### Temperature

The temperature rise at the circuit breaker and at its terminals does not exceed specified limits when connected with specified cables or bus bars (see below) and at its rated current.

Examples of specified wires and bus:

- 75° C Copper Wire

| Rating | Number | Size           |
|--------|--------|----------------|
| 100 A  | 1      | #1 AWG (60° C) |
|        | 1      | #3 AWG         |
| 250 A  | 1      | 250 kcmil      |
| 400 A  | 2      | 3/0 AWG        |
| 600 A  | 2      | 350 kcmil      |
| 800 A  | 3      | 300 kcmil      |
| 1000 A | 3      | 400 kcmil      |
| 1200 A | 4      | 350 kcmil      |

- Copper Busbar

| Rating | Number | Size        |
|--------|--------|-------------|
| 1600 A | 2      | 1/4 x 3     |
| 2000 A | 2      | 1/4 x 4     |
| 2500 A | 2      | 1/4 x 5     |
|        | 4      | 1/4 x 2-1/2 |
| 3000 A | 4      | 1/4 x 4     |

(1200 A or Less—1000 A / in<sup>2</sup>)

#### Calibration

200% calibration at 25° C—the circuit breaker must trip within time limits which depend on the rating from three minutes for 30 A rated circuit breakers to 30 minutes for over 2000 A rated circuit breakers.

135% calibration at 25° C—the circuit breaker must trip within two hours for circuit breakers rated more than 50 A.

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 13—Supplementary Technical Information

Calibration of adjustable instantaneous trip—the circuit breaker must trip within the range of 80–120% of the maximum marked tripping current and 75–125% of the minimum marked tripping current.

#### Overload

- Up to 1600 A—50 operations at 600% of rated current
- 2000 and 2500 A—25 operations at 600% of rated current
- 3000–6000 A—three operations at 600% of rated current followed by 25 operations at 200% of rated current

The power factor shall be from 0.45–0.50 lagging.

#### Endurance

The circuit breaker must complete an endurance test:

- Operations at rated current and rated voltage
- Followed by no load operation.

The power factor shall be 0.75–0.80 lagging.

| Frame Size | Number of Cycles of Operations |                 |        |
|------------|--------------------------------|-----------------|--------|
|            | With Current                   | Without Current | Total  |
| 100 A      | 6,000                          | 4,000           | 10,000 |
| 225 A      | 4,000                          | 4,000           | 8,000  |
| 400 A      | 1,000                          | 5,000           | 6,000  |
| 600 A      | 1,000                          | 5,000           | 6,000  |
| 800 A      | 500                            | 3,000           | 3,500  |
| 1200 A     | 500                            | 2,000           | 2,500  |
| 1600 A     | 500                            | 2,000           | 2,500  |
| 2000 A     | 500                            | 2,000           | 2,500  |
| 2500 A     | 500                            | 2,000           | 2,500  |
| 3000 A     | 400                            | 1,100           | 1,500  |

#### Interrupting Ability

Interrupting ability (Y sequence)—after endurance tests and calibrations are repeated, the circuit breaker completes an opening (O) followed by a close-open operation (O-t-CO), with specified current.

| Frame Rating | RMS Sym. Amperes<br>(3-pole O-and-CO) |
|--------------|---------------------------------------|
| 100 A ①      | 3,000                                 |
| 225 A        | 3,000                                 |
| 400 A        | 5,000                                 |
| 600 A        | 6,000                                 |
| 800 A        | 10,000                                |
| 1200 A       | 14,000                                |
| 1600 A       | 20,000                                |
| 2000 A       | 25,000                                |
| 3000 A       | 35,000                                |

① Above 250 V

Interrupting ability (Z sequence)—a three-pole circuit breaker rated 240, 480 or 600 V has to complete an opening operation (O) and a close-open operation (O-and-CO) on each pole, at rated voltage, followed by an opening operation (O) using all three poles.

| Frame rating   | RMS Sym. Amperes      |             |
|----------------|-----------------------|-------------|
|                | Each Pole<br>O-and-CO | Common<br>O |
| 100 to 800 A   | 8,660                 | 10,000      |
| 1000 to 1200 A | 12,120                | 14,000      |
| 1600 A         | 14,000                | 20,000      |
| 2000 A         | 14,000                | 25,000      |
| 3000 A         | 25,000                | 35,000      |

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

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#### Dielectric

After testing, the circuit breaker must withstand for one minute a voltage of 1000 V plus twice the rated voltage between:

- Line and load terminals with circuit breaker in open, tripped and off positions
- Terminals of opposite polarity with circuit breaker closed
- Live parts and the overall enclosure with circuit breaker open and closed

#### Optional Tests

- High available fault current—circuit breakers having passed all the standard tests may have the UL Listing label applied at higher values than the standard; test sequence is as follows:
  - 200% calibration
  - Interrupting capacity: an opening operation followed by a close-open operation (O-and-CO) on all poles are performed on the circuit breakerThe power factor over 20000 A shall be 0.15–0.2 lagging:
  - Trip out at 250%
  - Dielectric at twice the rated test voltage
- 100% rated—circuit breakers having passed all the standard tests may have the UL Listing label applied to use the circuit breaker in an enclosure when carrying 100% of its maximum rating

The circuit breaker is submitted to additional temperature tests performed as standard tests, except that the circuit breaker is installed in an enclosure. The dimensions and possible ventilations shall be recorded and shall be marked on the circuit breaker.

#### Tests On Accessories

Shunt trip and Undervoltage Trip—these devices are submitted to temperature, overvoltage, operation, endurance and dielectric tests.

Overvoltage Test—the device must be capable of withstanding 110% of its rated voltage continuously without damage (this test does not apply to a shunt trip with an "a" contact connected in series).

Operation:

Shunt Trip—must operate at 75% of its rated voltage (except shunt trip devices for use with ground-fault protection shall operate at 55%).

Undervoltage Trip—must trip the circuit breaker when the voltage is less than 35% and may trip the circuit breaker between 35 and 70% of its rated voltage and shall pick-up and seal when the voltage is at 85% or more of its rated voltage.

Endurance—the device must be capable of performing successfully for 10% of the number of "with current" operations of the circuit breaker.

Auxiliary and Alarm Switches—auxiliary and alarm switches must be submitted to temperature, overload, endurance and dielectric tests.

Overload Test—the test consists of fifty operations making and breaking 150% of rated current at rated voltage, with a 75–80% power factor in ac and non-inductive load in dc.

Endurance—the switch must make and break its rated current at rated voltage, with a 75–80% power factor in ac, and non-inductive load in dc for 100% of the number of operations "with current" for auxiliary switches, and 10% of this number for alarm switches.

Motor Operator—the motor operator shall perform the number of "without current" operations indicated for the circuit breaker endurance tests. The first 25 operations shall be conducted at 85% of the motor operator voltage rating. The circuit breaker is to be tripped during these tests. The next 25 operations shall be conducted at 110% of the motor operator voltage rating. The balance shall be completed at rated voltage without tripping the circuit breaker.

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 13—Supplementary Technical Information

#### IEC 947-2 TEST PROCEDURE

**Standard Tests** Consisting of seven parts, the IEC 947 Standard applies to all low-voltage equipment designed for industrial application.

Three documents are to be consulted for circuit breakers and switches:

- IEC 947-1: general regulations
- IEC 947-2: circuit breakers
- IEC 947-3: switches

**Two Categories of Devices** The IEC 947-1 standard defines two categories of devices:

- Category A—devices not specifically designed to carry out chronometric selectivity
- Category B—devices specifically designed to carry out chronometric selectivity; these circuit breakers possess a compulsory additional characteristic: short-time withstand (Icw)

#### Breaking Capacity

**Ultimate Breaking Capacity: Icu** Icu is the value to be taken into account when calculating an installation. The rule remains:  $I_{cu} > I_{cc}$  (maximum fault current of the installation).

**Breaking Performance During Operation: Ics** This characteristic indicates the ability of the device to eliminate short-circuit currents less than  $I_{cc}$  and with a greater likelihood of occurring, generally near the application. Ics is expressed in % of Icu (values retained by the standard IEC 25-50-75-100% of Icu). This test sequence designed to check the Ics performance, groups together on the same device, following the breaking test (O-CO-CO, see page 72), certain checks such as:

- Temperature rise under  $I_n$
- Calibration at  $1.45 I_n$
- Leakage current (for devices suitable for disconnection)

The leakage current should not exceed 2 mA under the application voltage (0.5 mA when new). These checks ensure that the device is able to carry out all its functions after elimination of a fault of Ics value and to be put back in operation; hence the notion of breaking power performance during operation Ics.

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 13—Supplementary Technical Information

#### Isolation

##### Function

Recognition and definition of the disconnection capacity for industrial low-voltage equipment:

Until recently, circuit breaker standards have established no regulations concerning the isolation function. Only the installation standards provided some rather vague information. The IEC 947 standard takes this function into account. In the "general regulations" section, it clearly states:

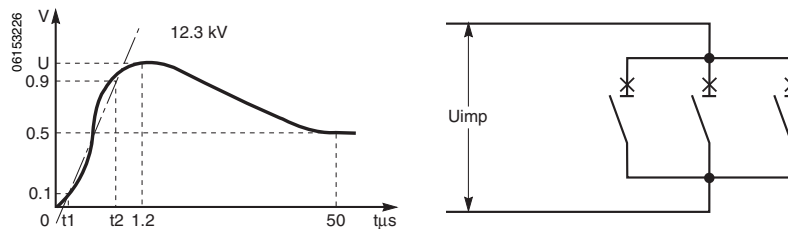
- The manufacturing regulation
- The tests to be performed

The circuit breaker standard should define the manner in which the tests are to be performed (under study). The manufacturing regulations state, for example:

- Both the isolation and the inner contact distances (open > 8 mm)
- A device indicating the true position of the contacts (operating handle if representative of the state of all the contacts)
- When a "locked" position is provided, this should only be possible with "open" contacts

The tests to be performed are as follow:

- Shock wave voltage strength ( $U_{imp}$ )



1.2/50  $\mu s$ –12.3 kV plus 25% between open contacts in comparison with devices not fitted with the applied isolation function according to the figure below. The test is validated if no triggering occurs between the contacts.

- Measurement of leakage current—under 110% of the device application voltage, maximum leakage currents proposed per pole:
  - 0.5 mA new device
  - 2 mA device after  $I_{cs}$
  - 6 mA device after  $I_{cu}$  or after endurance tests, representative of the "end of service life."

## Compact® NSF and NSJ 150 to 600 A Circuit Breakers

### Section 13—Supplementary Technical Information

#### Test Sequences

| Sequence                                  | Category of Devices   | Tests   |
|---|---|---|
| 1—General Characteristics                 | All Circuit Breakers  | <ul style="list-style-type: none"> <li>• Trip Unit Control</li> <li>• Dielectric Properties</li> <li>• Mechanical and Electrical Endurance</li> <li>• Overload</li> <li>• Dielectric Voltage Withstand</li> <li>• Temperature Rise</li> <li>• 145% Calibration (3 Phases Test)</li> </ul>   |
| 2—Breaking Capacity During Operation      | All Circuit Breakers  | <ul style="list-style-type: none"> <li>• Breaking Capacity During Operation (Ot-CO-t-CO)</li> <li>• Dielectric Voltage Withstand</li> <li>• Temperature Rise</li> <li>• 145% Calibration (3 Phases Test)</li> </ul>   |
| 3—Ultimate Breaking Capacity (Icu)        | A<br>B if Icu > Icw   | <ul style="list-style-type: none"> <li>• 200% Calibration (Each Pole Separately)</li> <li>• Ultimate Breaking Capacity (O-t-CO)</li> <li>• Dielectric Voltage Withstand</li> <li>• 250% Calibration (Each Pole Separately)</li> </ul>   |
| 4—Admissible Short Duration Current (Icw) | B   | <ul style="list-style-type: none"> <li>• 200% Calibration (Each Pole Separately)</li> <li>• Short-time Current Withstand</li> <li>• Temperature Rise</li> <li>• Breaking Capacity at Admissible Short-time Current (O-t-CO)</li> <li>• Dielectric Voltage Withstand</li> <li>• 200% Calibration (Each Pole Separately)</li> </ul>   |
| Combined Sequence                         | <ul style="list-style-type: none"> <li>• Icw = Ics Replaces Sequences 2 and 4</li> <li>• Icw = Ics = Icu Replaces Sequences 2, 3 and 4</li> </ul> | <ul style="list-style-type: none"> <li>• 200% Calibration (Each Pole Separately)</li> <li>• Short-time Current Withstand Icw</li> <li>• Breaking Capacity at Ics (O-CO-CO) at Maximum Relay Temp.</li> <li>• Dielectric Voltage Withstand</li> <li>• Temperature Rise</li> <li>• 200% Calibration (Each Pole Separately)</li> </ul> |



## ROUTINE AND MAINTENANCE GUIDELINES

### Recommended Inspection Intervals

#### **⚠ DANGER**

##### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

**Failure to follow this instruction will result in Failure to follow these instructions will result in death or serious injury.**

#### **CAUTION**

##### **HAZARD OF EQUIPMENT DAMAGE**

Molded case circuit breakers contain factory-sealed and calibrated elements. The seal must not be broken and the circuit breaker must not be tampered with. Molded case circuit breakers should not be field adjusted or repaired. In the case of a malfunction, the circuit breaker should be replaced or inspected at the Schneider Electric factory, or by an authorized representative.

**Failure to follow this instruction can result in equipment damage.**

Merlin Gerin circuit breakers are designed to be maintenance-free. However, all equipment with moving parts requires periodic inspection to ensure optimum performance and reliability. It is recommended that the circuit breakers be routinely inspected six months after installation, followed by annual inspection. Intervals can vary depending on particular usages and environments.

### Inspection of Terminals

- Connections to circuit breaker terminals should be inspected. If there is discoloration due to overheating, the connections should be disassembled and the surface cleaned before reinstallation. It is essential that electrical connections be made carefully in order to prevent overheating.
- Check for terminal tightness.

### Cleaning

Remove dust and dirt that have accumulated on the circuit breaker surface and terminals.

### Mechanical Checks

Even over long periods of time, circuit breakers are not often required to operate on overload or short-circuit conditions. Therefore it is essential to operate the circuit breaker periodically. To trip the circuit breaker, push the push-to-trip button.

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#### Insulation Resistance Tests

When a circuit breaker is subjected to severe operating conditions, an insulation resistance test should be performed as indicated in NEMA standard publication No. AB4-1996. An insulation resistance test is used to determine the quality of the insulation between phases and phase-to-ground. The resistance test is made with a dc voltage higher than the rated voltage to determine the actual resistance of the insulation.

The most common testing method employs a "megger" type instrument. A 1000 V instrument will provide a more reliable test because it is capable of detecting tracking on insulated surfaces. Resistance values below one megohm are unsafe and should be investigated. An insulation test should be made:

- Between line and load terminals of individual poles with the circuit breaker contacts open
- Between adjacent poles and from poles to the metallic supporting structure with the circuit breaker contacts closed. The latter test may be done with the circuit breaker in place after the line and load conductors have been removed, or with the circuit breaker bolted to a metallic base which simulates the in-service mounting.

#### Electrical Tests

These tests require equipment for conducting pole resistance, overcurrent and instantaneous tripping, in accordance with NEMA Standard publication No. AB4. They are not within the scope of normal field operation.



Square D Company  
3700 Sixth St. SW  
Cedar Rapids, IA 52404  
1-888-SquareD  
(1-888-778-2733)  
[www.SquareD.com](http://www.SquareD.com)

Schneider Canada Inc.  
19 Waterman Avenue,  
M4B 1 Y2  
Toronto, Ontario  
1-800-565-6699  
[www.schneider-electric.ca](http://www.schneider-electric.ca)

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