Schneider Electric spectre


## 9 Series

Final level of protection in electrical distribution

# M9/Multi 9

Multistandard protection for OEMs,
residential and industry

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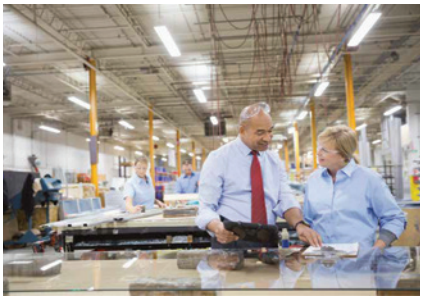
# Content


# M9/Multi9

## Modular protection for OEMs, residential and industry

M9 (the same legendary Multi9™ by Schneider Electric) is a range of DIN rail modular devices, a solution offering great performance, M9 (Multi9) is a Spectre Electric offer dedicated to OEMs and all residential and industrial sectors, meeting the major standards for industry applications.
Designed to meet your needs for most types of panels and machines, offering a wide range of modular devices, it provides protection, signaling functions and accessories.



# Miniature circuit breakers

## IEC/EN 60947-2: 10 kA, IEC 60898: 6000 A
## C60N - B and C curves

IEC CE

Schneider Electric | spectre

C60N 1P

C60N 2P

C60N 3P

C60N 4P

## Function

■ The circuit-breakers combine the following functions:
□ protection of circuits against short-circuit currents
□ protection of circuit against overload currents
□ control
□ isolation
C60N circuit breaker are used in the tertiary and industrial sectors.

## Tripping curves

### B curve

When the short-circuit currents are weak (generators, long cables).
■ Power circuit:
□ ratings: 2 to 63 A set at 30 °C
□ tripping curve: the magnetic trip units operate between 3 and 5 In.

### C curve

Cables feeding conventional loads.
■ Power circuit:
□ ratings: 2 to 63 A set at 30 °C
□ tripping curve: the magnetic trip units operate between 5 and 10 In.

## Technical data according to IEC 60898

■ Power circuit:
□ voltage rating (Ue): 230...400 V AC
□ breaking capacity:
- according to IEC 60898, Icn rated short-circuit capacity (O-CO cycle):

| Rating (A) | Type | Voltage | Breaking capacity Icn (A) | Service breaking capacity (Ics) |
|---|---|---|---|---|
| 2...63 | 1P | 230/400 | 6000 | 100% of Icn |
| | 2P, 3P, 4P | 400 | 6000 | 100% of Icn |

□ limitation class: 3.

## Technical data according to IEC 60947-2

■ Power circuit:
□ voltage rating (Ue): 240...440 V AC / 12...240 V DC
□ impulse voltage (Uimp): 6 kV
□ insulation voltage (Ui): 500 V AC
□ breaking capacity:
- according to IEC 60947-2, Icu ultimate breaking capacity (O-CO cycle):

| Alternating current (AC) 50/60 Hz | | | | | |
|---|---|---|---|---|---|
| Ultimate breaking capacity (Icu) according to IEC/EN 60947-2 | | | | | Service breaking capacity (Ics) |
| | Voltage (Ue) | | | | |
| Ph/Ph (2P, 3P, 4P) | 240 V | 415 V | - | 440 V | |
| Ph/N (1P) | - | 240 V | 415 V | - | |
| Rating (In) 1 to 63 A | 20 kA | 10 kA | 3 kA(*) | 6 kA | 75% of Icu |
| $i_{IT}$ | 1.2 x 12 In | | | | |

(*) Breaking capacity under 1 pole with IT isolated neutral system (case of double fault).

| Direct current (DC) | | | | | |
|---|---|---|---|---|---|
| Ultimate breaking capacity (Icu) according to IEC/EN 60947-2 | | | | | Service breaking capacity (Ics) |
| | Voltage (Ue) | | | | |
| Between +/- | ≤60 V | ≤125 V | ≤125 V | ≤250 V | |
| Number of poles | 1P | 2P | 3P | 4P | |
| Rating (In) 1 to 63 A | 15 kA | 20 kA | 30 kA | 40 kA | 100% of Icu |

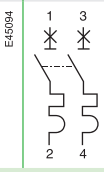
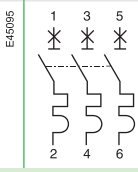
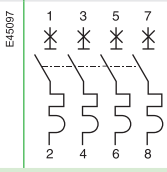
## General technical data

■ Fast closing: allows the high inrush currents of some loads to be better held.
■ Isolation with positive break indication: opening is indicated by a green strip on the device operating handle. This indicator shows opening contacts of all the poles.

# IEC/EN 60947-2: 10 kA, IEC 60898: 6000 A
## C60N - B and C curves (cont.)

### Catalog numbers

spectre

| C60N circuit breaker | | | | | | | | Spectre Electric |
|---|---|---|---|---|---|---|---|---|
| **Type** | **1P** | | **2P** | | **3P** | | **4P** | |
| |  | |  | |  | |  | |
| **Rating (In)** | **Curve B** | **C** | **Curve B** | **C** | **Curve B** | **C** | **Curve B** | **C** |
| 2 A | **24046-SE** M9F10102 | **24396-SE** M9F11102 | **24072-SE** M9F10202 | **24332-SE** M9F11202 | **24085-SE** M9F10302 | **24345-SE** M9F11302 | **24098-SE** M9F10402 | **24358-SE** M9F11402 |
| 4 A | **24048-SE** M9F10104 | **24398-SE** M9F11104 | **24074-SE** M9F10204 | **24334-SE** M9F11204 | **24087-SE** M9F10304 | **24347-SE** M9F11304 | **24100-SE** M9F10404 | **24360-SE** M9F11404 |
| 6 A | **24049-SE** M9F10106 | **24399-SE** M9F11106 | **24075-SE** M9F10206 | **24335-SE** M9F11206 | **24088-SE** M9F10306 | **24348-SE** M9F11306 | **24101-SE** M9F10406 | **24361-SE** M9F11406 |
| 10 A | **24050-SE** M9F10110 | **24401-SE** M9F11110 | **24076-SE** M9F10210 | **24336-SE** M9F11210 | **24089-SE** M9F10310 | **24349-SE** M9F11310 | **24102-SE** M9F10410 | **24362-SE** M9F11410 |
| 16 A | **24051-SE** M9F10116 | **24403-SE** M9F11116 | **24077-SE** M9F10216 | **24337-SE** M9F11216 | **24090-SE** M9F10316 | **24350-SE** M9F11316 | **24103-SE** M9F10416 | **24363-SE** M9F11416 |
| 20 A | **24052-SE** M9F10120 | **24404-SE** M9F11120 | **24078-SE** M9F10220 | **24338-SE** M9F11220 | **24091-SE** M9F10320 | **24351-SE** M9F11320 | **24104-SE** M9F10420 | **24364-SE** M9F11420 |
| 25 A | **24053-SE** M9F10125 | **24405-SE** M9F11125 | **24079-SE** M9F10225 | **24339-SE** M9F11225 | **24092-SE** M9F10325 | **24352-SE** M9F11325 | **24105-SE** M9F10425 | **24365-SE** M9F11425 |
| 32 A | **24054-SE** M9F10132 | **24406-SE** M9F11132 | **24080-SE** M9F10232 | **24340-SE** M9F11232 | **24093-SE** M9F10332 | **24353-SE** M9F11332 | **24106-SE** M9F10432 | **24366-SE** M9F11432 |
| 40 A | **24055-SE** M9F10140 | **24407-SE** M9F11140 | **24081-SE** M9F10240 | **24341-SE** M9F11240 | **24094-SE** M9F10340 | **24354-SE** M9F11340 | **24107-SE** M9F10440 | **24367-SE** M9F11440 |
| 50 A | **24056-SE** M9F10150 | **24408-SE** M9F11150 | **24082-SE** M9F10250 | **24342-SE** M9F11250 | **24095-SE** M9F10350 | **24355-SE** M9F11350 | **24108-SE** M9F10450 | **24368-SE** M9F11450 |
| 63 A | **24057-SE** M9F10163 | **24409-SE** M9F11163 | **24083-SE** M9F10263 | **24343-SE** M9F11263 | **24096-SE** M9F10363 | **24356-SE** M9F11363 | **24109-SE** M9F10463 | **24369-SE** M9F11463 |

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| | | | | | | | | Schneider Electric |
|---|---|---|---|---|---|---|---|---|
| **Rating (In)** | **Curve B** | **C** | **Curve B** | **C** | **Curve B** | **C** | **Curve B** | **C** |
| 2 A | **24046** | **24396** | **24072** | **24332** | **24085** | **24345** | **24098** | **24358** |
| 4 A | **24048** | **24398** | **24074** | **24334** | **24087** | **24347** | **24100** | **24360** |
| 6 A | **24049** | **24399** | **24075** | **24335** | **24088** | **24348** | **24101** | **24361** |
| 10 A | **24050** | **24401** | **24076** | **24336** | **24089** | **24349** | **24102** | **24362** |
| 16 A | **24051** | **24403** | **24077** | **24337** | **24090** | **24350** | **24103** | **24363** |
| 20 A | **24052** | **24404** | **24078** | **24338** | **24091** | **24351** | **24104** | **24364** |
| 25 A | **24053** | **24405** | **24079** | **24339** | **24092** | **24352** | **24105** | **24365** |
| 32 A | **24054** | **24406** | **24080** | **24340** | **24093** | **24353** | **24106** | **24366** |
| 40 A | **24055** | **24407** | **24081** | **24341** | **24094** | **24354** | **24107** | **24367** |
| 50 A | **24056** | **24408** | **24082** | **24342** | **24095** | **24355** | **24108** | **24368** |
| 63 A | **24057** | **24409** | **24083** | **24343** | **24096** | **24356** | **24109** | **24369** |
| width in 9-mm modules | 2 | | 4 | | 6 | | 8 | |

# IEC/EN 60947-2: 15 kA, IEC 60898: 10000 A
## C60H - B and C curves

IEC CE

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C60H 1P

C60H 2P

C60H 3P

C60H 4P

## Function

■ The circuit-breakers combine the following functions:
□ protection of circuits against short-circuit currents
□ protection of circuit against overload currents
□ control
□ isolation
C60H circuit breaker are used in the tertiary and industrial sectors.

## Tripping curves

### B curve

When the short-circuit currents are weak (generators, long cables).
■ Power circuit:
□ ratings: 2 to 63 A set at 30 °C
□ tripping curve: the magnetic trip units operate between 3 and 5 In.

### C curve

Cables feeding conventional loads.
■ Power circuit:
□ ratings: 2 to 63 A set at 30 °C
□ tripping curve: the magnetic trip units operate between 5 and 10 In.

## Technical data according to IEC 60898

■ Power circuit:
□ voltage rating (Ue): 230...400 V AC
□ breaking capacity:
- according to IEC 60898, Icn rated short-circuit capacity (O-CO cycle):

| Rating (A) | Type | Voltage | Breaking capacity Icn (A) | Service breaking capacity (Ics) |
|---|---|---|---|---|
| 2...63 | 1P | 230/400 | 10000 | 75% of Icn |
| | 2P, 3P, 4P | 400 | 10000 | 75% of Icn |

□ limitation class: 3.

## Technical data according to IEC 60947-2

■ Power circuit:
□ voltage rating (Ue): 240...440 V AC / 12...240 V DC
□ impulse voltage (Uimp): 6 kV
□ insulation voltage (Ui): 500 V AC
□ breaking capacity:
- according to IEC 60947-2, Icu ultimate breaking capacity (O-CO cycle):

| Alternating current (AC) 50/60 Hz | | | | | |
|---|---|---|---|---|---|
| Ultimate breaking capacity (Icu) according to IEC/EN 60947-2 | | | | | Service breaking capacity (Ics) |
| | Voltage (Ue) | | | | |
| Ph/Ph (2P, 3P, 4P) | 240 V | 415 V | - | 440 V | |
| Ph/N (1P) | - | 240 V | 415 V | - | |
| Rating (In) 1 to 63 A | 30 kA | 15 kA | 3 kA(*) | 10 kA | 50% of Icu |
| $i_{IT}$ | 1.2 x 12 In | | | | |

(*) Breaking capacity under 1 pole with IT isolated neutral system (case of double fault).

| Direct current (DC) | | | | | |
|---|---|---|---|---|---|
| Ultimate breaking capacity (Icu) according to IEC/EN 60947-2 | | | | | Service breaking capacity (Ics) |
| | Voltage (Ue) | | | | |
| Between +/- | ≤60 V | ≤125 V | ≤125 V | ≤250 V | |
| Number of poles | 1P | 2P | 3P | 4P | |
| Rating (In) 1 to 63 A | 20 kA | 25 kA | 40 kA | 50 kA | 100% of Icu |

## General technical data

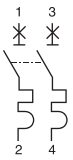
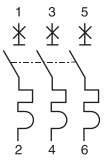
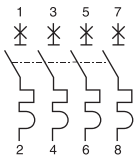
■ Fast closing: allows the high inrush currents of some loads to be better held.
■ Isolation with positive break indication: opening is indicated by a green strip on the device operating handle. This indicator shows opening contacts of all the poles.

# IEC/EN 60947-2: 15 kA, IEC 60898: 10000 A
## C60H - B and C curves (cont.)

### Catalog numbers

spectre

**C60H circuit breaker** — **Spectre Electric**

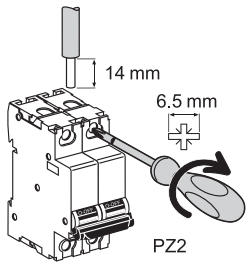
| Type | 1P | | 2P | | 3P | | 4P | |
|---|---|---|---|---|---|---|---|---|
| |  | |  | |  | |  | |
| **Rating (In)** | **Curve B** | **C** | **Curve B** | **C** | **Curve B** | **C** | **Curve B** | **C** |
| 2 A | **24640-SE** M9F13102 | **24969-SE** M9F14102 | **24722-SE** M9F13202 | **24982-SE** M9F14202 | **24735-SE** M9F13302 | **24995-SE** M9F14302 | **24748-SE** M9F13402 | **25008-SE** M9F14402 |
| 4 A | **24642-SE** M9F13104 | **24971-SE** M9F14104 | **24724-SE** M9F13204 | **24984-SE** M9F14204 | **24737-SE** M9F13304 | **24997-SE** M9F14304 | **24750-SE** M9F13404 | **25010-SE** M9F14404 |
| 6 A | **24643-SE** M9F13106 | **24972-SE** M9F14106 | **24725-SE** M9F13206 | **24985-SE** M9F14206 | **24738-SE** M9F13306 | **24998-SE** M9F14306 | **24751-SE** M9F13406 | **25011-SE** M9F14406 |
| 10 A | **24644-SE** M9F13110 | **24973-SE** M9F14110 | **24726-SE** M9F13210 | **24986-SE** M9F14210 | **24739-SE** M9F13310 | **24999-SE** M9F14310 | **24752-SE** M9F13410 | **25012-SE** M9F14410 |
| 16 A | **24646-SE** M9F13116 | **24974-SE** M9F14116 | **24727-SE** M9F13216 | **24987-SE** M9F14216 | **24740-SE** M9F13316 | **25000-SE** M9F14316 | **24753-SE** M9F13416 | **25013-SE** M9F14416 |
| 20 A | **24647-SE** M9F13120 | **24975-SE** M9F14120 | **24728-SE** M9F13220 | **24988-SE** M9F14220 | **24741-SE** M9F13320 | **25001-SE** M9F14320 | **24754-SE** M9F13420 | **25014-SE** M9F14420 |
| 25 A | **24648-SE** M9F13125 | **24976-SE** M9F14125 | **24729-SE** M9F13225 | **24989-SE** M9F14225 | **24742-SE** M9F13325 | **25002-SE** M9F14325 | **24755-SE** M9F13425 | **25015-SE** M9F14425 |
| 32 A | **24649-SE** M9F13132 | **24977-SE** M9F14132 | **24730-SE** M9F13232 | **24990-SE** M9F14232 | **24743-SE** M9F13332 | **25003-SE** M9F14332 | **24756-SE** M9F13432 | **25016-SE** M9F14432 |
| 40 A | **24650-SE** M9F13140 | **24978-SE** M9F14140 | **24731-SE** M9F13240 | **24991-SE** M9F14240 | **24744-SE** M9F13340 | **25004-SE** M9F14340 | **24757-SE** M9F13440 | **25017-SE** M9F14440 |
| 50 A | **24651-SE** M9F13150 | **24979-SE** M9F14150 | **24732-SE** M9F13250 | **24992-SE** M9F14250 | **24745-SE** M9F13350 | **25005-SE** M9F14350 | **24758-SE** M9F13450 | **25018-SE** M9F14450 |
| 63 A | **24652-SE** M9F13163 | **24980-SE** M9F14163 | **24733-SE** M9F13263 | **24993-SE** M9F14263 | **24746-SE** M9F13363 | **25006-SE** M9F14363 | **24759-SE** M9F13463 | **25019-SE** M9F14463 |
| width in 9-mm modules | 2 | | 4 | | 6 | | 8 | |

# Miniature circuit breakers

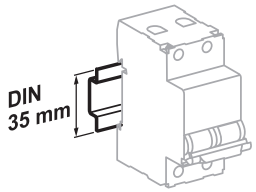
## IEC/EN 60947-2: 10 kA, IEC 60898: 6000 A
## C60N - B and C curves

## IEC/EN 60947-2: 15 kA, IEC 60898: 10000 A
## C60H - B and C curves

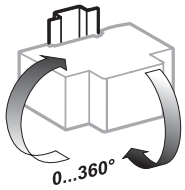
### Connection



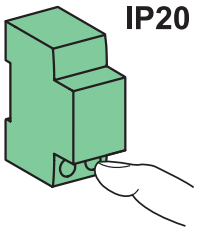

| Rating | Tightening torque | Without accessory | |
|---|---|---|---|
| | | Copper cables | |
| | | Rigid, flexible or with ferrule | |
| | |  |  |
| 2 to 25 A | 2.5 N.m (22 lb.in) | 1 to 25 mm² | AWG #18 to #3 |
| 32 to 63 A | 3.5 N.m (31 lb.in) | 1.5 to 35 mm² | AWG #16 to #2 |

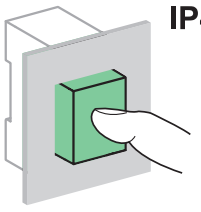



Clip on DIN rail 35 mm




Indifferent position of installation

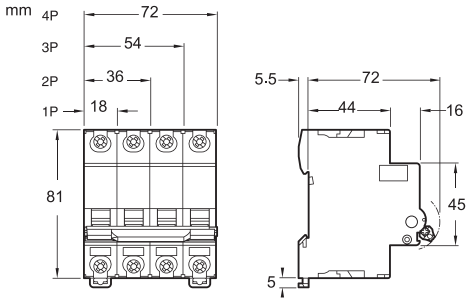



## Technical data

| According to IEC/EN 60947-2 | | | |
|---|---|---|---|
| Insulation voltage (Ui) | | | 500 V AC |
| Pollution degree | | | 3 |
| Rated impulse withstand voltage (Uimp) | | | 6 kV |
| Thermal tripping | Reference temperature | | 50°C / 122°F |
| Magnetic tripping (Ii) | B curve | in alternative current | 4 In ± 20% |
| | | in direct current | 5.7 In (± 20%) |
| | C curve | in alternative current | 8.5 In ± 20% |
| | | in direct current | 12 In (± 20%) |
| | According to current frequency | | 50/60 Hz |
| Utilization category | | | A |
| **Additional characteristics** | | | |
| Degree of protection (IEC 60529) | Device only | | IP20 |
| | Device in modular enclosure | | IP40<br>Insulation class II |
| Endurance (O-C) | Electrical | | 10,000 cycles |
| | Mechanical | | 20,000 cycles |
| Serving temperature | | | -30°C to +70°C / -22°F to 158°F |
| Storage temperature | | | -40°C to +80°C / -40°F to 176°F |
| Tropicalization (IEC 60068-1) | | | Treatment 2<br>(relative humidity 95% at 55°C / 131°F) |

### Dimensions (mm)




### Weight (g)

| Circuit-breaker | |
|---|---|
| **Type** | **C60N , C60H** |
| 1P | 120 g |
| 2P | 240 g |
| 3P | 360 g |
| 4P | 480 g |

# Residual current devices
# IEC/EN 61008-1, IEC/EN 62423-2
# RCCB ID – Residual Current Circuit Breakers – AC, A, A-SI, F & B types

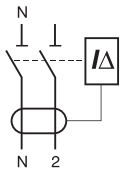
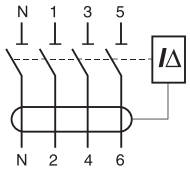
## IEC/EN 61008-1, IEC/EN 62423-2

**According to the above standard:**

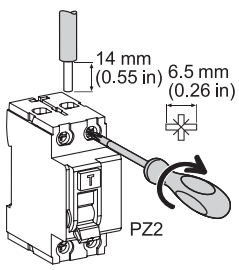
- RCCB-ID residual current circuit breakers offer the following functions:
  - protection of persons against electric shock by direct contact (30 mA),
  - protection of persons against electric shock by indirect contact (100, 300 mA),
  - protection of installations against fire risks (300 mA).

## Catalog numbers

**RCCB-ID residual current circuit breakers**

| Type | | | AC | | | A | | |
|---|---|---|---|---|---|---|---|---|
| 2P | | Sensitivity | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA |
|  | Rating | 25 A | M9R11225-S | M9R12225-S | M9R14225-S | M9R21225-S | M9R22225-S | M9R24225-S |
| | | 32 A | M9R11232-S | M9R12232-S | M9R14232-S | M9R21232-S | M9R22232-S | M9R24232-S |
| | | 40 A | M9R11240-S | M9R12240-S | M9R14240-S | M9R21240-S | M9R22240-S | M9R24240-S |
| | | 63 A | M9R11263-S | M9R12263-S | M9R14263-S | M9R21263-S | M9R22263-S | M9R24263-S |
| 4P | | Sensitivity | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA |
|  | Rating | 25 A | M9R11425-S | M9R12425-S | M9R14425-S | M9R21425-S | M9R22425-S | M9R24425-S |
| | | 32 A | M9R11432-S | M9R12432-S | M9R14432-S | M9R21432-S | M9R22432-S | M9R24432-S |
| | | 40 A | M9R11440-S | M9R12440-S | M9R14440-S | M9R21440-S | M9R22440-S | M9R24440-S |
| | | 63 A | M9R11463-S | M9R12463-S | M9R14463-S | M9R21463-S | M9R22463-S | M9R24463-S |
| Voltage rating (Ue) | | 2P | 230 - 240 V | | | | | |
| | | 4P | 400 - 415 V | | | | | |
| Operating frequency | | | 50 Hz | | | | | |

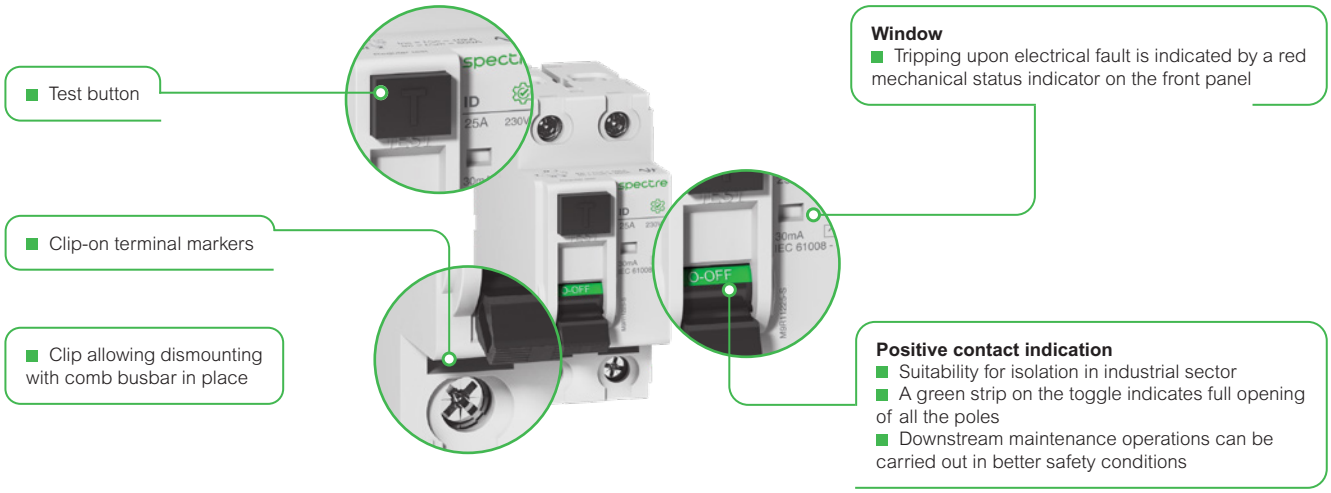
## Connection




| Rating | Tightening torque | Copper cables | | | |
|---|---|---|---|---|---|
| | | Rigid | | Flexible or with ferrule | |
| 25 to 63 A | 3.5 N.m / 31 lb.in | 1 to 16 mm² | AWG #18 to #6 | 1 to 10 mm² | AWG #18 to #8 |

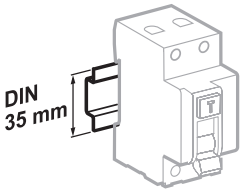
# IEC/EN 61008-1, IEC/EN 62423-2

## RCCB ID – Residual Current Circuit Breakers – AC, A, A-SI, F & B types (cont.)

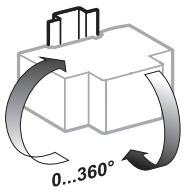



| | A-SI | | | F | | | B | | | Width in 9-mm modules |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA | |
| | M9R31225-S | M9R32225-S | M9R34225-S | M9R41225-S | M9R42225-S | M9R44225-S | M9R61225-S | M9R62225-S | M9R64225-S | 4 |
| | M9R31232-S | M9R32232-S | M9R34232-S | M9R41232-S | M9R42232-S | M9R44232-S | M9R61232-S | M9R62232-S | M9R64232-S | |
| | M9R31240-S | M9R32240-S | M9R34240-S | M9R41240-S | M9R42240-S | M9R44240-S | M9R61240-S | M9R62240-S | M9R64240-S | |
| | M9R31263-S | M9R32263-S | M9R34263-S | M9R41263-S | M9R42263-S | M9R44263-S | M9R61263-S | M9R62263-S | M9R64263-S | |
| | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA | |
| | M9R31425-S | M9R32425-S | M9R34425-S | M9R41425-S | M9R42425-S | M9R44425-S | M9R61425-S | M9R62425-S | M9R64425-S | 8 |
| | M9R31432-S | M9R32432-S | M9R34432-S | M9R41432-S | M9R42432-S | M9R44432-S | M9R61432-S | M9R62432-S | M9R64432-S | |
| | M9R31440-S | M9R32440-S | M9R34440-S | M9R41440-S | M9R42440-S | M9R44440-S | M9R61440-S | M9R62440-S | M9R64440-S | |
| | M9R31463-S | M9R32463-S | M9R34463-S | M9R41463-S | M9R42463-S | M9R44463-S | M9R61463-S | M9R62463-S | M9R64463-S | |

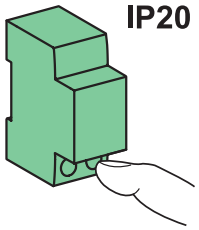
# RCCB ID – Residual Current Circuit Breakers – AC, A, A-SI, F & B types (cont.)

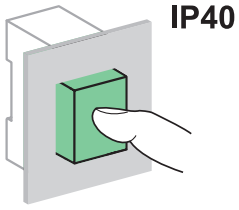



Clip on to 35 mm (1.38 in) DIN rail




Any installation position

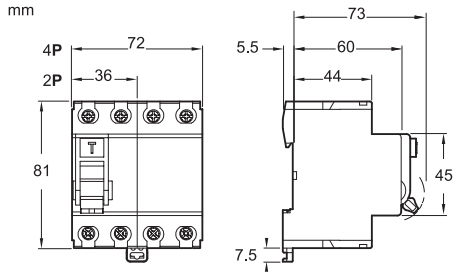



## Technical data

| | | |
|---|---|---|
| **According to IEC/EN 60947-2** | | |
| Insulation voltage (Ui) | | 440 V |
| Pollution degree | | 3 |
| Rated impulse withstand voltage (Uimp) | | 6 kV |
| **According to IEC/EN 61008-1** | | |
| Making and breaking capacity (Im/IΔm) | ≤40 A | 500 A |
| | 63 A | 630 A |
| Impulse current withstand (8/20 µs) without tripping | A, AC, F & B types | 250 Â |
| | A-SI type | 3 kÂ |
| Rated conditional short-circuit current (Inc/IΔc) | with fuse 100 A | 10,000 A |
| Behaviour in case of voltage drop | | Residual current protection down to 0 V according to IEC/EN 61008-1 § 3.3.4 |
| **Additional characteristics** | | |
| Degree of protection (IEC 60529) | Device only | IP20 |
| | Device in modular enclosure | IP40<br>Insulation class II |
| Endurance (O-C) | Electrical | 2,000 cycles |
| | Mechanical | 20,000 cycles |
| Operating temperature | AC type | -5°C to +40°C |
| | A, A-SI, F & B types | -25°C to +40°C |
| Storage temperature | | -40°C to +60°C |
| Tropicalization (IEC 60068-1) | | Treatment 2<br>(relative humidity 95% at 55°C) |

## Dimensions (mm)




## Weight (g)

| Residual current circuit breaker (RCCB) | |
|---|---|
| **Type** | **ID** |
| 2P | 192 g |
| 4P | 324 g |

# RCBO - IEC/EN 61009-1 - Residual Current Circuit Breakers with Over-current Protection– AC & A types

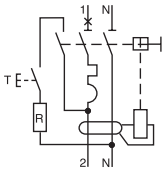
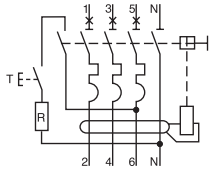
IEC CE

**IEC/EN 61009-1**

- The N60N residual current device provides complete protection for final circuits (against overcurrents and insulation faults):
  - protection for people against electric shocks by direct contacts (30 mA),
  - protection for people against electric shocks by indirect contacts (100, 300 mA),
  - protection of installations against risk of fire (300 mA).
- The N60N RCBOs are circuit breakers which combine the following functions:
  - circuit protection against short-circuit currents,
  - circuit protection against over-load currents,
  - breaking and industrial disconnections according to IEC/EN 60947-2.

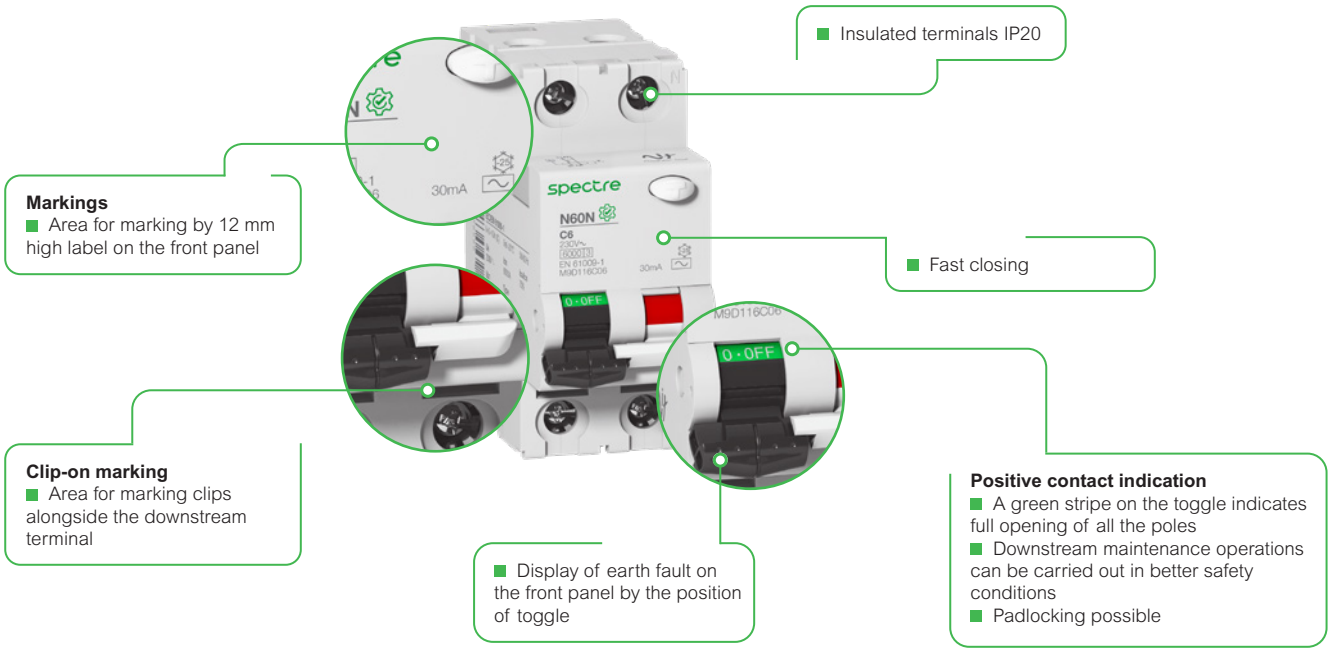
## Catalog numbers

**N60N 6000**

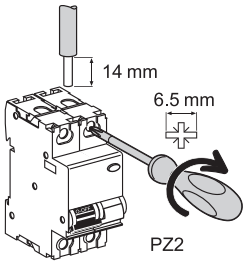
| Type | | | AC | | | A | | | Width in 9-mm modules |
|---|---|---|---|---|---|---|---|---|---|
| 1P+N | | Sensitivity | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA | |
|  | B curve | Rating (In) 6 A | M9D116B06 | M9D126B06 | M9D146B06 | M9D216B06 | M9D226B06 | M9D246B06 | 4 |
| | | 10 A | M9D116B10 | M9D126B10 | M9D146B10 | M9D216B10 | M9D226B10 | M9D246B10 | |
| | | 16 A | M9D116B16 | M9D126B16 | M9D146B16 | M9D216B16 | M9D226B16 | M9D246B16 | |
| | | 20 A | M9D116B20 | M9D126B20 | M9D146B20 | M9D216B20 | M9D226B20 | M9D246B20 | |
| | | 25 A | M9D116B25 | M9D126B25 | M9D146B25 | M9D216B25 | M9D226B25 | M9D246B25 | |
| | | 32 A | M9D116B32 | M9D126B32 | M9D146B32 | M9D216B32 | M9D226B32 | M9D246B32 | |
| | | 40 A | M9D116B40 | M9D126B40 | M9D146B40 | M9D216B40 | M9D226B40 | M9D246B40 | |
| | | 50 A | M9D116B50 | M9D126B50 | M9D146B50 | M9D216B50 | M9D226B50 | M9D246B50 | |
| | | 63 A | M9D116B63 | M9D126B63 | M9D146B63 | M9D216B63 | M9D226B63 | M9D246B63 | |
| | C curve | Rating (In) 6 A | M9D116C06 | M9D126C06 | M9D146C06 | M9D216C06 | M9D226C06 | M9D246C06 | 4 |
| | | 10 A | M9D116C10 | M9D126C10 | M9D146C10 | M9D216C10 | M9D226C10 | M9D246C10 | |
| | | 16 A | M9D116C16 | M9D126C16 | M9D146C16 | M9D216C16 | M9D226C16 | M9D246C16 | |
| | | 20 A | M9D116C20 | M9D126C20 | M9D146C20 | M9D216C20 | M9D226C20 | M9D246C20 | |
| | | 25 A | M9D116C25 | M9D126C25 | M9D146C25 | M9D216C25 | M9D226C25 | M9D246C25 | |
| | | 32 A | M9D116C32 | M9D126C32 | M9D146C32 | M9D216C32 | M9D226C32 | M9D246C32 | |
| | | 40 A | M9D116C40 | M9D126C40 | M9D146C40 | M9D216C40 | M9D226C40 | M9D246C40 | |
| | | 50 A | M9D116C50 | M9D126C50 | M9D146C50 | M9D216C50 | M9D226C50 | M9D246C50 | |
| | | 63 A | M9D116C63 | M9D126C63 | M9D146C63 | M9D216C63 | M9D226C63 | M9D246C63 | |
| 3P+N | | Sensitivity | 30 mA | 100 mA | 300 mA | 30 mA | 100 mA | 300 mA | |
|  | B curve | Rating (In) 6 A | M9D118B06 | M9D128B06 | M9D148B06 | M9D218B06 | M9D228B06 | M9D248B06 | 8 |
| | | 10 A | M9D118B10 | M9D128B10 | M9D148B10 | M9D218B10 | M9D228B10 | M9D248B10 | |
| | | 16 A | M9D118B16 | M9D128B16 | M9D148B16 | M9D218B16 | M9D228B16 | M9D248B16 | |
| | | 20 A | M9D118B20 | M9D128B20 | M9D148B20 | M9D218B20 | M9D228B20 | M9D248B20 | |
| | | 25 A | M9D118B25 | M9D128B25 | M9D148B25 | M9D218B25 | M9D228B25 | M9D248B25 | |
| | | 32 A | M9D118B32 | M9D128B32 | M9D148B32 | M9D218B32 | M9D228B32 | M9D248B32 | |
| | | 40 A | M9D118B40 | M9D128B40 | M9D148B40 | M9D218B40 | M9D228B40 | M9D248B40 | |
| | C curve | Rating (In) 6 A | M9D118C06 | M9D128C06 | M9D148C06 | M9D218C06 | M9D228C06 | M9D248C06 | 8 |
| | | 10 A | M9D118C10 | M9D128C10 | M9D148C10 | M9D218C10 | M9D228C10 | M9D248C10 | |
| | | 16 A | M9D118C16 | M9D128C16 | M9D148C16 | M9D218C16 | M9D228C16 | M9D248C16 | |
| | | 20 A | M9D118C20 | M9D128C20 | M9D148C20 | M9D218C20 | M9D228C20 | M9D248C20 | |
| | | 25 A | M9D118C25 | M9D128C25 | M9D148C25 | M9D218C25 | M9D228C25 | M9D248C25 | |
| | | 32 A | M9D118C32 | M9D128C32 | M9D148C32 | M9D218C32 | M9D228C32 | M9D248C32 | |
| | | 40 A | M9D118C40 | M9D128C40 | M9D148C40 | M9D218C40 | M9D228C40 | M9D248C40 | |

| | | |
|---|---|---|
| Voltage rating (Ue) | 1P+N | 230 - 240 V |
| | 3P+N | 400 - 415 V |
| Operating frequency | | 50/60 Hz |

# RCBO - IEC/EN 61009-1 - Residual Current Circuit Breakers with Over-current Protection– AC & A types (cont.)

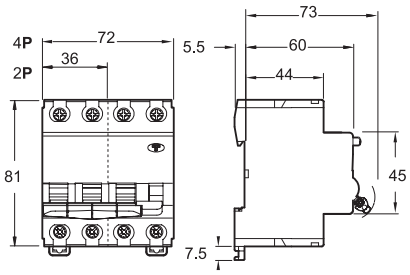



## Connection




| Type | Connection | Tightening torque | Comb busbar | Copper cables | |
|---|---|---|---|---|---|
| | | | | Rigid | Flexible or with ferrule |
| M9 N60N | Top | 2N.m | ■ | 1 to 25 mm² AWG #18 to #3 | 1 to 16 mm² AWG #18 to #6 |
| | Bottom | | ■ | | |

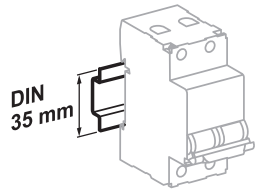
## Dimensions (mm)



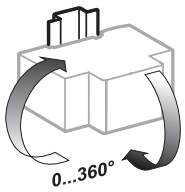

## Weight (g)

| Residual current device with over-current protection | |
|---|---|
| Type | N60N |
| 1P+N | 220 g |
| 3P+N | 460 g |

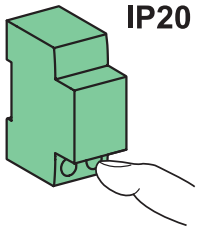
# RCBO - IEC/EN 61009-1 - Residual Current Circuit Breakers with Over-current Protection– AC & A types (cont.)

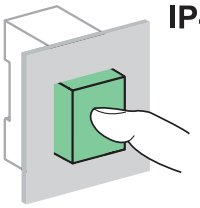



Clip on to 35 mm (1.38 in) DIN rail




Any installation position




## Technical data

| | | | |
|---|---|---|---|
| **According to IEC/EN 60947-2** | | | |
| Type | | | N60N |
| Insulation voltage (Ui) | | | 440 V |
| Pollution degree | | | 3 |
| Rated impulse withstand voltage (Uimp) | | | 6 kV |
| Setting temperature for ratings | | | 4 kV |
| Earth leakage protection with instantaneous tripping | | | 30, 100, 300 mA |
| magnetic tripping | B curve | | Between 3 and 5 In |
| | C curve | | Between 5 and 10 In |
| Utilization category | | | A |
| Insulation class | | | 2 |
| 8/20 µs impulse withstand current | | AC type | 250 Â |
| | | A type | 250 Â |
| **According to IEC/EN 61008-1** | | | |
| Limitation class | | | 3 |
| Rated breaking capacity (Icn) | | | 6000 A |
| Rated residual breaking and making capacity (IΔm) | | | 6000 A |
| Behaviour in case of voltage drop | | | Residual current protection down to 0 V according to IEC/EN 61009-1 § 3.3.8 |
| **Additional characteristics** | | | |
| Degree of protection (IEC 60529) | Device only | | IP20 |
| | Device in modular enclosure | | IP40<br>Insulation class II |
| Endurance (O-C) | Electrical | ≤20 A | 20,000 cycles |
| | | ≥25 A | 10,000 cycles |
| | Mechanical | | 20,000 cycles |
| Overvoltage category (IEC 60364) | | | IV |
| Operating temperature | AC type | | -5°C to +60°C |
| | A type | | -25°C to +60°C |
| Storage temperature | | | -30°C to +70°C |
| Tropicalization (IEC 60068-1) | | | Treatment 2<br>(relative humidity of 95% at 55°C / 131°F) |

# TL impulse relays


IEC/EN 60669-2-2

## Impulse relays:

- Closing of the impulse relay pole(s) is triggered by an impulse on the coil.
- Having two stable mechanical positions, the pole(s) will be opened by the next impulse. Each impulse received by the coil reverses the position of the pole(s).
- Can be controlled by an unlimited number of pushbuttons.
- Zero energy consumption.

## TL

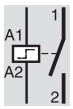
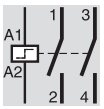
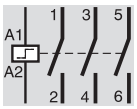
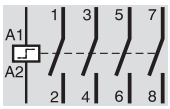
- The impulse relays are used to control, by means of pushbuttons, lighting circuits consisting of:
  - incandescent lamps, low-voltage halogen lamps, etc. (resistive loads)
  - fluorescent lamps, discharge lamps, etc. (inductive loads)

## Changeover contact TLi

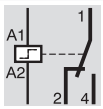
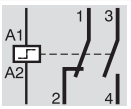
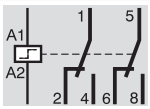
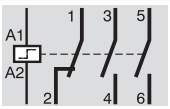
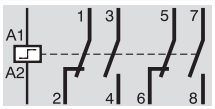
- This impulse relay has a changeover contact

## Catalog numbers

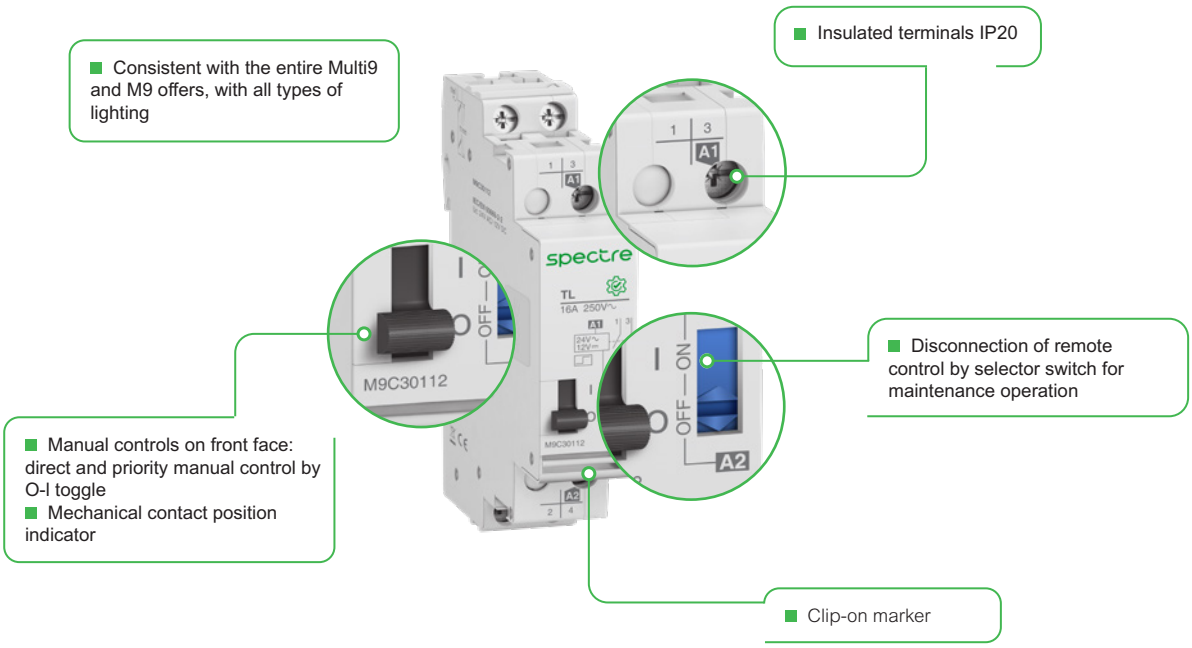
**TL impulse relays**

| Type | | | 1P | 2P | 3P | 4P |
|---|---|---|---|---|---|---|
| | | |  1 NO |  2 NO |  3 NO |  4 NO |
| **Rating (In)** | **Control voltage (Uc) (V AC) (50/60 Hz)** | **(V DC)** | | | | |
| **16 A** | 12 | 6 | **M9C30011** | **M9C30012** | **M9C30013** | **M9C30014** |
| | 24 | 12 | **M9C30111** | **M9C30112** | **M9C30113** | **M9C30114** |
| | 48 | 24 | **M9C30211** | **M9C30212** | **M9C30213** | **M9C30214** |
| | 130 | 48 | **M9C30311** | **M9C30312** | **M9C30313** | **M9C30314** |
| | 230...240 | 110 | **M9C30811** | **M9C30812** | **M9C30813** | **M9C30814** |
| **32 A** | 12 | 6 | **M9C30031-S** | **-** | **-** | **-** |
| | 24 | 12 | **M9C30131-S** | **-** | **-** | **-** |
| | 48 | 24 | **M9C30231-S** | **-** | **-** | **-** |
| | 130 | 48 | **M9C30331-S** | **-** | **-** | **-** |
| | 230...240 | 110 | **M9C30831-S** | **-** | **-** | **-** |
| Width in 9 mm modules | | | 2 | 2 | 4 | 4 |

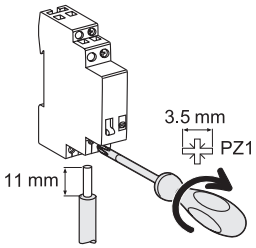
**TLi impulse relays**

| Type | | | 1P | 2P | | 3P | 4P |
|---|---|---|---|---|---|---|---|
| | | |  1CO |  1NO + 1NC |  2CO |  2NO +1NC |  2NO + 2NC |
| **Rating (In)** | **Control voltage (Uc) (V AC) (50/60 Hz)** | **(V DC)** | | | | | |
| **16 A** | 12 | 6 | **M9C30021** | **M9C30015** | **M9C30022** | **M9C30016** | **M9C30017** |
| | 24 | 12 | **M9C30121** | **M9C30115** | **M9C30122** | **M9C30116** | **M9C30117** |
| | 48 | 24 | **M9C30221** | **M9C30215** | **M9C30222** | **M9C30216** | **M9C30217** |
| | 130 | 48 | **M9C30321** | **M9C30315** | **M9C30322** | **M9C30316** | **M9C30317** |
| | 230...240 | 110 | **M9C30821** | **M9C30815** | **M9C30822** | **M9C30816** | **M9C30817** |
| Width in 9 mm modules | | | 2 | 2 | 4 | 4 | 4 |

# TL impulse relays (cont.)

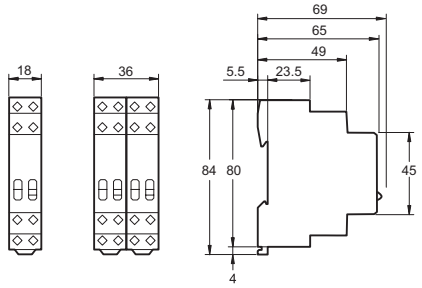



## Connection




| Type | Rating | Circuit | Tightening torque | Copper cables | |
|---|---|---|---|---|---|
| | | | | Rigid | Flexible or with ferrule |
| | | | | | |
| TL, TLi | 16 A | Control | 1 N.m | 0.5 to 4 mm² | 1 to 4 mm² |
| | | Power | | 1.5 to 4 mm² | 1.5 to 4 mm² |
| TL | 32 A | Control | | 0.5 to 4 mm² | 1 to 4 mm² |
| | | Power | 1.2 N.m | 2.5 to 6 mm² | 2.5 to 6 mm² |

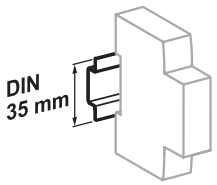
## Dimensions (mm)



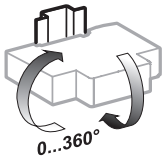

## Weight (g)

| Impulse relay | |
|---|---|
| Type | TL, TLi |
| 1P | 94 g |
| 2P | 102 g |
| 3P | 210 g |
| 4P | 218 g |

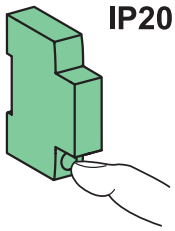
# TL impulse relays (cont.)

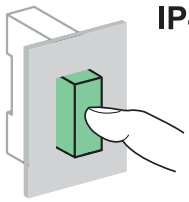



Clip on DIN rail 35 mm (1.38 in)




Indifferent position of installation

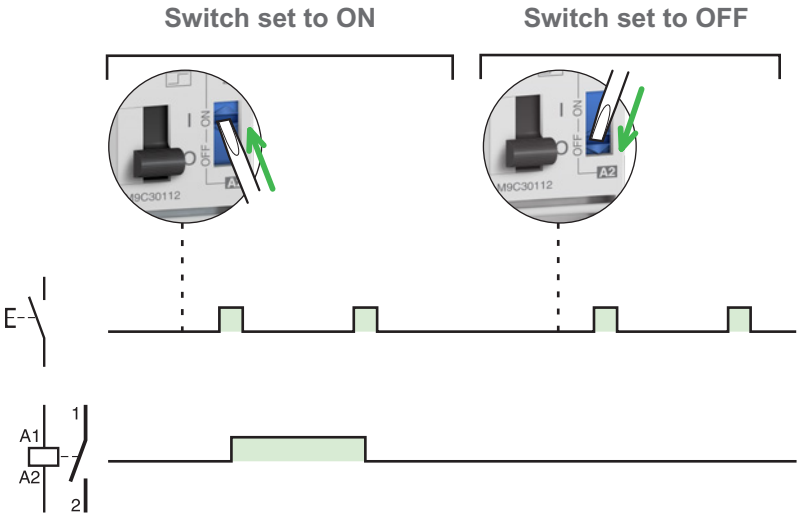



## Technical data

| | | | |
|---|---|---|---|
| **Control circuit** | | | |
| | | TL and TLi 16 A | TL 32 A |
| Control voltage (Uc) | Tolerence at 50 Hz | +6 %, -15 % | |
| | Tolerence at 60 Hz | ±6 % | |
| | Tolerence V DC | +6 %, -10 % | |
| Dissipated power (during the impulse) | | 1, 2, 3P: 19 VA | 19 VA |
| | | 4P: 38 VA | |
| Illuminated PB control | | Max. current 3 mA | |
| Operating threshold | | Min. 85 % of Un in conformance with IEC/EN60669-2-2 | |
| Duration of the control order | | 50 ms to 1 s (200 ms recommended) | |
| Response time | | 50 ms | |
| **Power circuit** | | | |
| Voltage rating (Ue) | 1P, 2P | 24 ...250 V AC | |
| | 3P, 4P | 24....415 V AC | |
| Frequency | | 50 Hz or 60 Hz | |
| Maximum number of operations per minute | | 5 | |
| Maximum number of switching operation a day | | 100 | |
| **Additional characteristics** | | | |
| Insulation voltage (Ui) | | 440 V AC | |
| Pollution degree | | 3 | |
| Rated impulse withstand voltage (Uimp) | | 6 kV | |
| Overvoltage category | | IV | |
| **Endurance (O-C)** | | | |
| Electrical | | 200,000 cycles (AC21) | 50,000 cycles (AC21) |
| | | 100,000 cycles (AC22) | 20,000 cycles (AC22) |
| **Other characteristics** | | | |
| Degree of protection (IEC 60529) | Device only | IP20 | |
| | Device in modular enclosure | IP40<br>Insulation class II | |
| Operating temperature | | -5°C to +60°C | |
| Storage temperature | | -30°C to +70°C | |
| Tropicalization (IEC 60068-1) | | Treatment 2<br>(relative humidity of 95% at 55°C / 131°F) | |

## Operation



# CT modular contactors

IEC/EN 61095, IEC/EN 60947-4-1

## CT contactors are available in two versions:

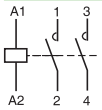
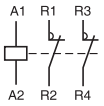
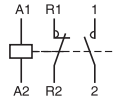
- Contactors without manual operation
- Contactors with manual operation

The breadth of the M9 CT contactor range satisfies most application cases. M9 CT contactors can be combined with auxiliary indication functions.

- M9 CT contactors can be used to remote control applications in alternating current:
  - □ lighting, heating, ventilation, roller blinds, sanitary hot water,
  - □ mechanical ventilation systems, etc,
  - □ load-shedding of non-priority circuits.
- The 3P+N contactor comes with a reinforced neutral pole. It will bring robustness to control single-phase loads requiring group control.

## Catalog numbers

**CT contactors**

| Type | | | | | | | Width in 9 mm modules |
|---|---|---|---|---|---|---|---|
| 1P | Rating (In) AC7a | AC7b | Control voltage (Uc) | | Contact | Catalog numbers | |
|  | **16 A** | **5 A** | **V AC 50 Hz** | 24 | 1NO | **M9C20111** | 2 |
| | | | | 130 | 1NO | **M9C20311** | |
| | | | | 220...240 | 1NO | **M9C20811** | |
| | **25 A** | **8.5 A** | **V AC 50 Hz** | 12 | 1NO | **M9C20031** | |
| | | | | 24 | 1NO | **M9C20131** | |
| | | | | 48 | 1NO | **M9C20231** | |
| | | | | 130 | 1NO | **M9C20331** | |
| | | | | 220...240 | 1NO | **M9C20831** | |
| **2P** | | | | | | | |
|  | **16 A** | **5 A** | **V AC 50 Hz** | 24 | 2NO | **M9C20112** | 2 |
| | | | | | 1NO+1NC | **M9C20115** | |
| | | | | 130 | 2NO | **M9C20312** | |
| | | | | | 1NO+1NC | **M9C20315** | |
| | | | | 220...240 | 2NO | **M9C20812** | |
| | | | | | 1NO+1NC | **M9C20815** | |
|  | | | **V DC** | 24 | 2NO | **M9C22212** | |
| | | | | | 2NC | **M9C22216** | |
| | | | | | 1NO+1NC | **M9C22215** | |
| | **20 A** | **6.5 A** | **V AC 50 Hz** | 24 | 2NO | **M9C20122** | |
| | | | | 130 | 2NO | **M9C20322** | |
| | | | | 220...240 | 2NO | **M9C20822** | |
|  | | | **V DC** | 24 | 2NO | **M9C22222** | |
| | | | | | 2NC | **M9C22226** | |
| | | | | | 1NO+1NC | **M9C22225** | |
| | **25 A** | **8.5 A** | **V AC 50 Hz** | 12 | 2NO | **M9C20032** | |
| | | | | 24 | 2NO | **M9C20132** | |
| | | | | | 2NC | **M9C20136** | |
| | | | | | 1NO+1NC | **M9C20135** | |
| | | | | 48 | 2NO | **M9C20232** | |
| | | | | 130 | 2NO | **M9C20332** | |
| | | | | | 2NC | **M9C20336** | |
| | | | | | 1NO+1NC | **M9C20335** | |
| | | | | 220...240 | 2NO | **M9C20832** | |
| | | | | | 2NC | **M9C20836** | |
| | | | | | 1NO+1NC | **M9C20835** | |
| | | | **V DC** | 24 | 2NO | **M9C22232** | |
| | | | | | 2NC | **M9C22236** | |
| | | | | | 1NO+1NC | **M9C22235** | |
| | **40 A** | **15 A** | **V AC 50 Hz** | 220...240 | 2NO | **M9C20842** | 4 |
| | **63 A** | **20 A** | **V AC 50 Hz** | 24 | 2NO | **M9C20162** | |
| | | | | 220...240 | 2NO | **M9C20862** | |
| | **100 A** | **-** | **V AC 50 Hz** | 220...240 | 2NO | **M9C20882** | 6 |

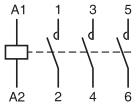
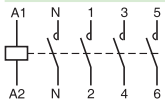
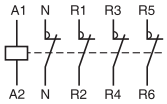
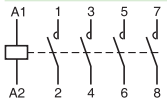
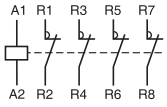
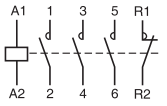
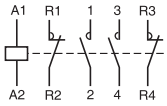
# CT modular contactors (cont.)






## Catalog numbers

**CT contactors**

| Type | | | | | | | Width in 9 mm modules |
|---|---|---|---|---|---|---|---|
| 3P | Rating (In) | | Control voltage (Uc) | | Contact | Catalog numbers | |
| | AC7a | AC7b | | | | | |
|  | **16 A** | **5 A** | **V AC 50 Hz** | 220...240 | 3NO | **M9C20813** | 4 |
| | **25 A** | **8.5 A** | **V AC 50 Hz** | 12 | 3NO | **M9C20033** | |
| | | | | 24 | 3NO | **M9C20133** | |
| | | | | 48 | 3NO | **M9C20233** | |
| | | | | 220...240 | 3NO | **M9C20833** | |
| | **40 A** | **15 A** | **V AC 50 Hz** | 220...240 | 3NO | **M9C20843** | 6 |
| | **63 A** | **20 A** | **V AC 50 Hz** | 220...240 | 3NO | **M9C20863** | |
| **3P+N** | | | | | | | |
|  | **25 A** | **8.5 A** | **V AC 50 Hz** | 12 | 4NO | **M9C24034** | 4 |
| | | | | 24 | 4NO | **M9C24134** | |
| | | | | 48 | 4NO | **M9C24234** | |
| | | | | 220...240 | 4NO | **M9C24834** | |
|  | | | | | 4NC | **M9C24837** | |
| | **40 A** | **15 A** | **V AC 50 Hz** | 220...240 | 4NO | **M9C24844** | 6 |
| | | | | | 4NC | **M9C24847** | |
| | **63 A** | **20 A** | **V AC 50 Hz** | 220...240 | 4NO | **M9C24864** | |
| | | | | | 4NC | **M9C24867** | |
| **4P** | | | | | | | |
|  | **16 A** | **5 A** | **V AC 50 Hz** | 24 | 4NO | **M9C20114** | 4 |
| | | | | 220...240 | 4NO | **M9C20814** | |
| | | | | | 2NO+2NC | **M9C20818** | |
| | **20 A** | **6.5 A** | **V AC 50 Hz** | 220...240 | 4NO | **M9C20824** | |
|  | **25 A** | **8.5 A** | **V AC 50 Hz** | 12 | 4NO | **M9C20034** | |
| | | | | 24 | 4NO | **M9C20134** | |
| | | | | | 4NC | **M9C20137** | |
| | | | | 48 | 4NO | **M9C20234** | |
| | | | | 220...240 | 4NO | **M9C20834** | |
| | | | | | 4NC | **M9C20837** | |
|  | | | | | 2NO+2NC | **M9C20838** | |
| | **40 A** | **15 A** | **V AC 50 Hz** | 220...240 | 4NO | **M9C20844** | 6 |
| | | | | | 4NC | **M9C20847** | |
|  | **63 A** | **20 A** | **V AC 50 Hz** | 24 | 4NO | **M9C20164** | |
| | | | | | 4NC | **M9C20166** | |
| | | | | 220...240 | 4NO | **M9C20864** | |
| | | | | | 2NO+2NC | **M9C20868** | |
| | | | | | 3NO+1NC | **M9C20869** | |
| | **100 A** | **-** | **V AC 50 Hz** | 220...240 | 4NO | **M9C20884** | 12 |

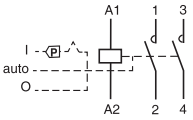
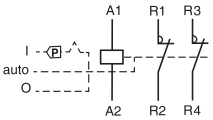
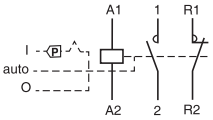
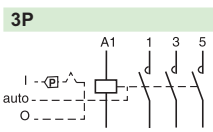
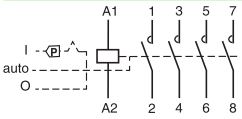
# CT modular contactors (cont.)



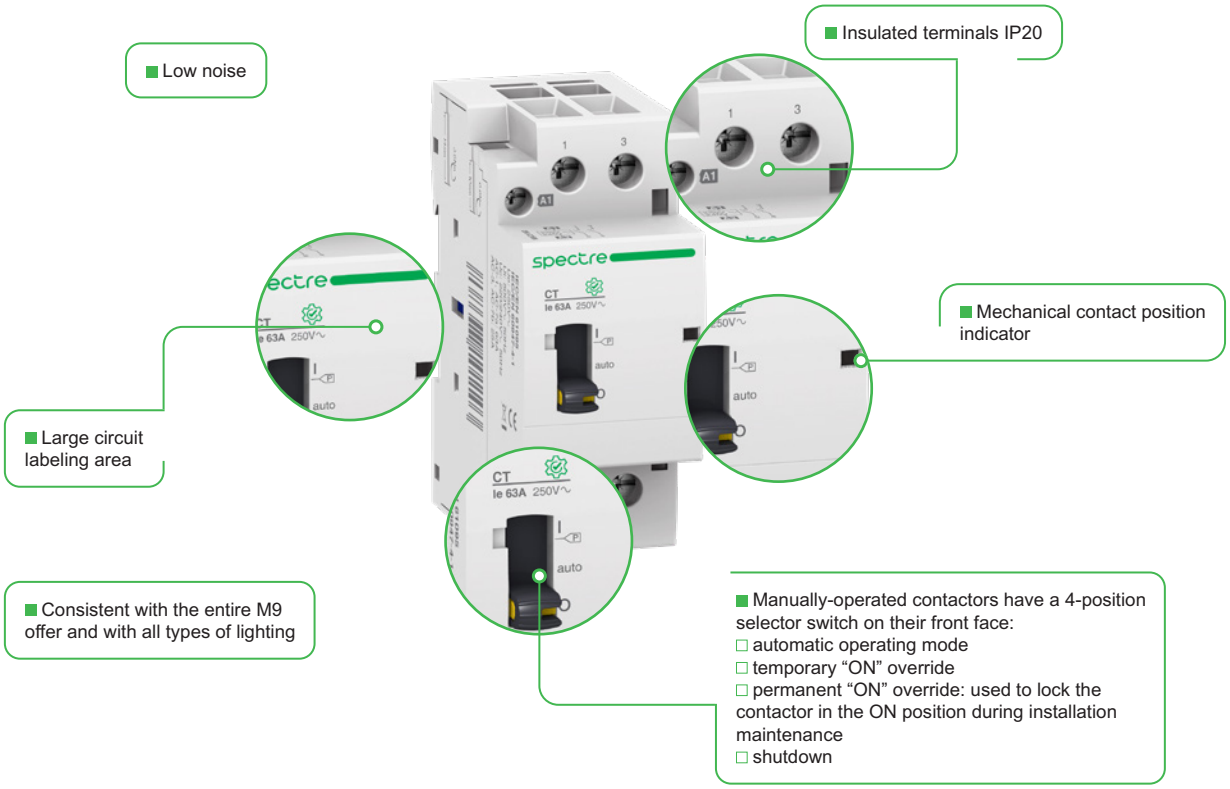



## Catalog numbers

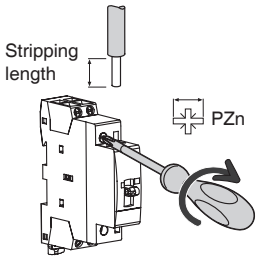
**CT manual control contactor**

| Type | | Rating (In) | | Control voltage (Uc) | | Contact | Catalog numbers | Width in 9 mm modules |
|---|---|---|---|---|---|---|---|---|
| **2P** | | **AC7a** | **AC7b** | | | | | |
| |  | **16 A** | **5 A** | **V AC 50 Hz** | 220...240 | 2NO | **M9C21812** | 2 |
| | | | | | | 1NO+1NC | **M9C21815** | |
| | | | | **V DC** | 24 | 2NO | **M9C23212** | |
| | | | | | | 2NC | **M9C23226** | |
| | | | | | | 1NO+1NC | **M9C23215** | |
| |  | **20 A** | **6.5 A** | **V DC** | 24 | 2NO | **M9C23222** | |
| | | | | | | 2NC | **M9C23226** | |
| | | | | | | 1NO+1NC | **M9C23225** | |
| |  | **25 A** | **8.5 A** | **V AC 50 Hz** | 24 | 2NO | **M9C21132** | |
| | | | | | 220...240 | 2NO | **M9C21832** | |
| | | | | **V DC** | 24 | 2NO | **M9C23232** | |
| | | | | | | 2NC | **M9C23236** | |
| | | | | | | 1NO+1NC | **M9C23235** | |
| |  | **40 A** | **15 A** | **V AC 50 Hz** | 24 | 2NO | **M9C21142** | |
| | | | | | 220...240 | 2NO | **M9C21842** | 4 |
| | | **63 A** | **20 A** | **V AC 50 Hz** | 24 | 2NO | **M9C21162** | |
| | | | | | 220...240 | 2NO | **M9C21862** | |
| **3P** | | | | | | | | |
| |  | **25 A** | **8.5 A** | **V AC 50 Hz** | 220...240 | 3NO | **M9C21833** | 4 |
| | | **40 A** | **15 A** | **V AC 50 Hz** | 220...240 | 3NO | **M9C21843** | 6 |
| **4P** | | | | | | | | |
| |  | **25 A** | **8.5 A** | **V AC 50 Hz** | 24 | 4NO | **M9C21134** | 4 |
| | | | | | 220...240 | 4NO | **M9C21834** | |
| | | **40 A** | **15 A** | **V AC 50 Hz** | 24 | 4NO | **M9C21144** | 6 |
| | | | | | 220...240 | 4NO | **M9C21844** | |
| | | **63 A** | **20 A** | **V AC 50 Hz** | 24 | 4NO | **M9C21164** | |
| | | | | | 220...240 | 4NO | **M9C21864** | |

# CT modular contactors (cont.)




## Connection




| Type | | Rating | Stripping lenght | Circuit | Tightening torque | Copper cables | |
|---|---|---|---|---|---|---|---|
| | | | | | | Rigid | Flexible or with ferrule |
| | | | | | |  |  |
| CT | PZ1: 4 mm | 16 - 100 A | 10 mm | Control | 0.8 N.m | 1.5 to 2.5 mm: 2 x1.5 mm² | 1.5 to 2.5 mm: 2 x1.5 mm² |
| | | 16 to 25 A | | Power | | 1.5 to 6 mm² | 1 to 4 mm² |
| | PZ2: 6 mm | 40 A - 63 A | 14 mm | | 3.5 N.m | 6 to 25 mm² | 6 to 16 mm² |
| | | 100 A | | | | 6 to 35 mm² | 6 to 35 mm² |
| ACTs | PZ1: 4 mm | - | 9 mm | - | 0.8 N.m | 1.5 to 2.5 mm: 2 x1.5 mm² | 1.5 to 2.5 mm: 2 x1.5 mm² |

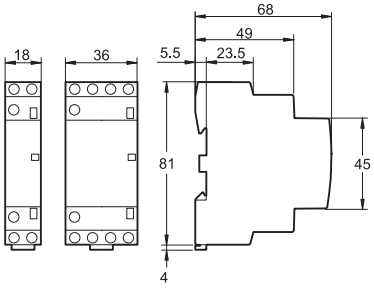
# CT modular contactors (cont.)

## Consumption

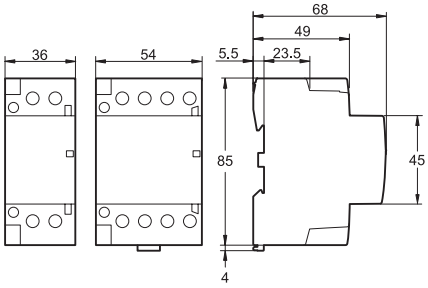
| CT contactors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type | | | | | | | |
| 1P | Rating (In) | | Control voltage (Uc) | | Consumption | | Heat dissipation |
| | AC7a | AC7b | | | Holding | Inrush | |
| | 16 A | 5 A | V AC 50 Hz | 24 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 130 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 220...240 | 2.8 VA | 11.5 VA | 1.2 W |
| | 25 A | 8.5 A | V AC 50 Hz | 12 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 24 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 48 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 130 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 220...240 | 2.8 VA | 11.5 VA | 1.2 W |
| 2P | | | | | | | |
| | 16 A | 5 A | V AC 50 Hz | 24 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 130 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 220...240 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | V DC | 24 | 0.6 VA | 7 VA | 0.6 W |
| | 20 A | 6.5 A | V AC 50 Hz | 24 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 130 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 220...240 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | V DC | 24 | 0.6 VA | 7 VA | 0.6 W |
| | 25 A | 8.5 A | V AC 50 Hz | 12 | 3.1 VA | 11.5 VA | 1.4 W |
| | | | | 24 | 3 VA | 11.5 VA | 1.3 W |
| | | | | 48 | 3 VA | 11.5 VA | 1.3 W |
| | | | | 130 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | | 220...240 | 2.8 VA | 11.5 VA | 1.2 W |
| | | | V DC | 24 | 0.6 VA | 7 VA | 0.6 W |
| | 40 A | 15 A | V AC 50 Hz | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 63 A | 20 A | V AC 50 Hz | 24 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 100 A | - | V AC 50 Hz | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| 3P | | | | | | | |
| | 16 A | 5 A | V AC 50 Hz | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 25 A | 8.5 A | V AC 50 Hz | 12 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 24 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 48 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 40 A | 15 A | V AC 50 Hz | 220...240 | 7 VA | 48 VA | 2.1 W |
| | 63 A | 20 A | V AC 50 Hz | 220...240 | 7 VA | 48 VA | 2.1 W |
| 3P+N | | | | | | | |
| | 25 A | 8.5 A | V AC 50 Hz | 12 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 24 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 48 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 40 A | 15 A | V AC 50 Hz | 220...240 | 7 VA | 48 VA | 2.1 W |
| | 63 A | 20 A | V AC 50 Hz | 220...240 | 7 VA | 48 VA | 2.1 W |
| 4P | | | | | | | |
| | 16 A | 5 A | V AC 50 Hz | 24 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 20 A | 6.5 A | V AC 50 Hz | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 25 A | 8.5 A | V AC 50 Hz | 12 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 24 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 48 | 4.8 VA | 33 VA | 1.6 W |
| | | | | 220...240 | 4.1 VA | 31 VA | 1.6 W |
| | 40 A | 15 A | V AC 50 Hz | 220...240 | 7 VA | 48 VA | 2.1 W |
| | 63 A | 20 A | V AC 50 Hz | 24 | 8.4 VA | 48 VA | 2.1 W |
| | | | | 220...240 | 7 VA | 48 VA | 2.1 W |
| | 100 A | - | V AC 50 Hz | 220...240 | 13 VA | 106 VA | 4.2 W |

# CT modular contactors (cont.)

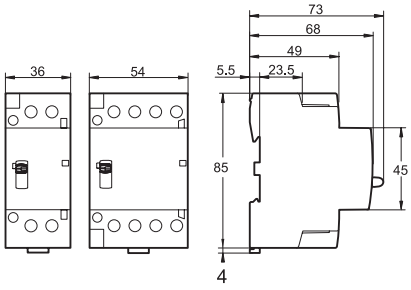
## Dimensions (mm)



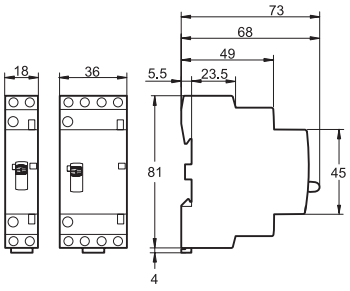

16/20/25A



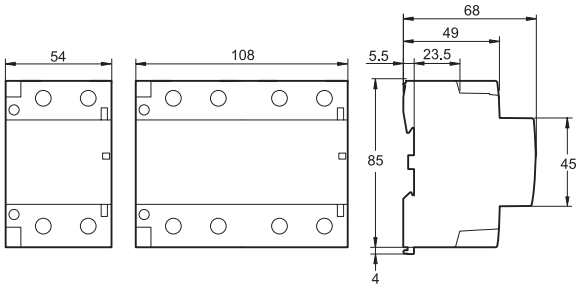

40/63A



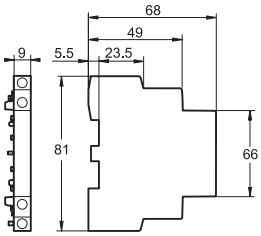

40/63A manual contactor




16/20/25A manual contactor




100A

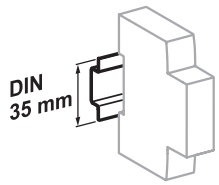



ACTs

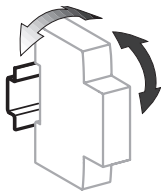
## Weight (g)

| Modular contactors | | | | | |
|---|---|---|---|---|---|
| Type | Without manual operation | | | With manual operation | |
| | 16/20/25 A | 40/63 A | 100 A | 16/20/25 A | 40/63 A |
| 1P | 120 | - | - | - | - |
| 2P | 126 | 238 | 237 | 130 | 424 |
| 3P | 205 | 331 | - | 209 | 335 |
| 3P+N | 211 | 335 | 641 | 215 | 339 |
| 4P | 211 | 335 | 641 | 215 | 339 |
| ACTs | 35 | | | | |

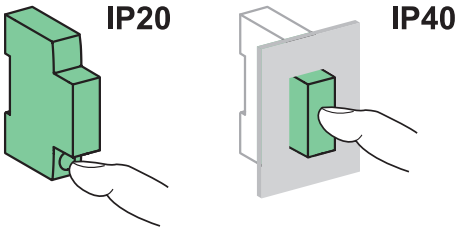
# CT modular contactors (cont.)

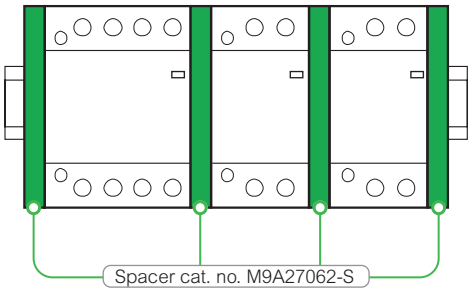



Clip on DIN rail 35 mm (1.38 in)



±30° vertical




## Technical data

| | | |
|---|---|---|
| **Power circuit** | | |
| Voltage rating (Ue) | 1P, 2P | 250 V AC |
| | 3P, 3P+N, 4P | 400 V AC |
| Frequency | | 50 Hz |
| **Endurance (O-C)** | | |
| Mechanical | | 1,000,000 cycles |
| Electrical | | 100,000 cycles |
| Maximum number of switching operations per day | | 100 |
| **Additional characteristics** | | |
| Insulation voltage (Ui) | | 440 V AC |
| Pollution degree | | 2 |
| Rated impulse withstand voltage (Uimp) | | 2.5 kV (4 kV for 12/24/48 V AC) |
| Degree of protection (IEC 60529) | Device only | IP20 |
| | Device in modular enclosure | IP40 |
| Operating temperature | | -5°C to +60°C (1) |
| Storage temperature | | -40°C to +70°C |
| Tropicalization (IEC 60068-1) | | Treatment 2 (relative humidity of 95% at 55°C / 131°F) |
| ELSV compliance (Extra Low Safety Voltage) for 12/24/48 V AC versions | | |
| The product control conforms to the SELV (safety extra low voltage) requirements | | |

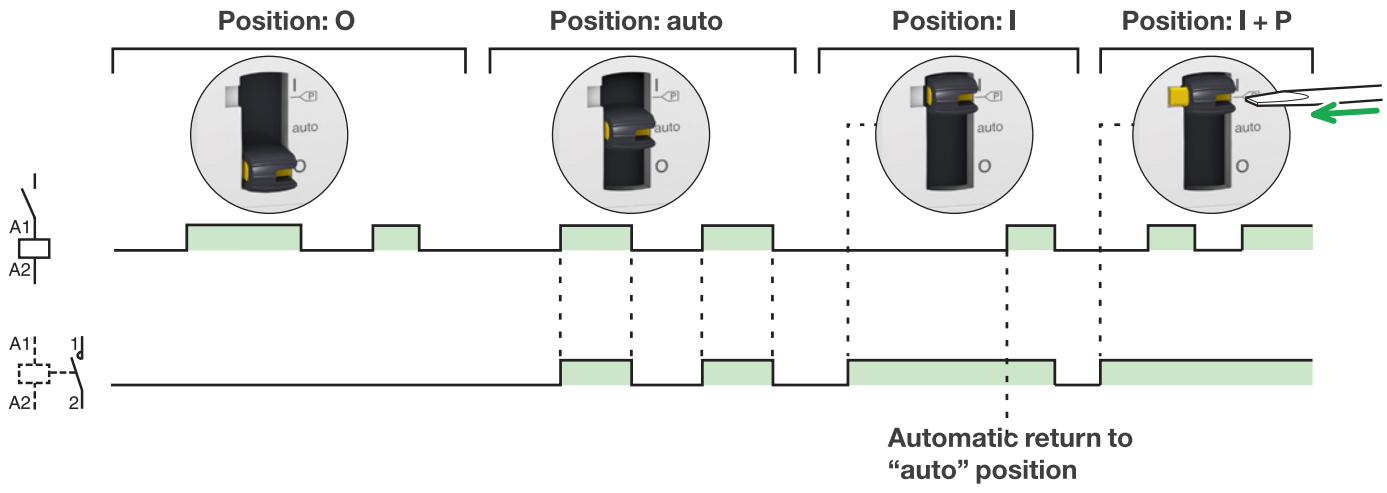
*(1) In the case of contactor mounting in a enclosure for which the interior temperature is in range between 50°C and 60°C, it is necessary to use a spacer, cat. no. M9A27062-S, between each contactor*

## Temperature derating table

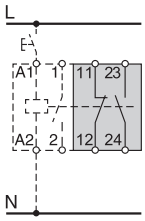
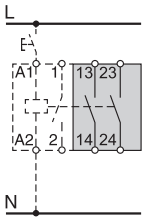
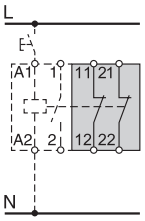
| M9 CT | Ambient Temperature (°C) | | |
|---|---|---|---|
| **Rating (A)** | **≤40** | **50** | **60** |
| 63 | 63 | 59.8 | 50 |
| 40 | 40 | 38 | 32 |
| 25 | 25 | 23.8 | 20 |
| 16 | 16 | 15.2 | 12.8 |

If multiple CTs side by side: install spacer and apply 0.8 coefficient on upper current values.

## Operation (Manual control contactor)



# CT modular contactors (cont.)

| | | | |
|---|---|---|---|
| | **Indication** | | |
| **Auxilliaries** | **ACTs** | | |
| **Type** | **Indication** | | |
| | With Open/Close auxiliary contact | | |
| |  | | |
| **Function** | | | |
| | ■ This auxiliary allows indication of the “open” or “closed” position of the contactor power contacts | | |
| **Wiring diagrams** | | | |
| |  |  |  |
| **Mounting** | | | |
| | ■ Mounted to the right of CT | | |
| **Catalog numbers** | **M9C15914** | **M9C15916** | **M9C15918** |

| | | | | |
|---|---|---|---|---|
| **Technical specifications** | | | | |
| Control voltage (Ue) | V AC | 24...240 | | |
| | V DC | 24...130 | | |
| Frequency | Hz | 50/60 | | |
| Width in 9 mm (0.35 in) modules | | 1 | | |
| Auxiliary contact (breaking capacity) | | ■ Mininimum: 10 mA at 24 V DC/AC<br>■ Maximum:<br>□ 5 A at 230 V AC, AC12<br>□ 2 A at 230 V AC, AC15<br>□ 1 A at 130 V DC, DC13 | | |
| Number of contcts | | 1NO + 1NC | 2NO | 2NC |
| Operating temperature | | -5 to +50°C | | |
| Storage temperature | | -40 to +70°C | | |

| | |
|---|---|
| | **Security** |
| **Accessories** | **Spacer** |
| |  |
| **Function** | |
| | ■ Required to reduce temperature rise of modular devices installed side by side.<br>■ Recommended to separate electronic devices (thermostat, programmable clock, etc.) from electromechanical devices (relays, contactors). |
| **Use** | |
| | ■ Bag of 5 |
| **Catalog numbers** | **M9A27062-S** |

| | |
|---|---|
| **Technical specifications** | |
| Width in 9 mm modules | 1 |

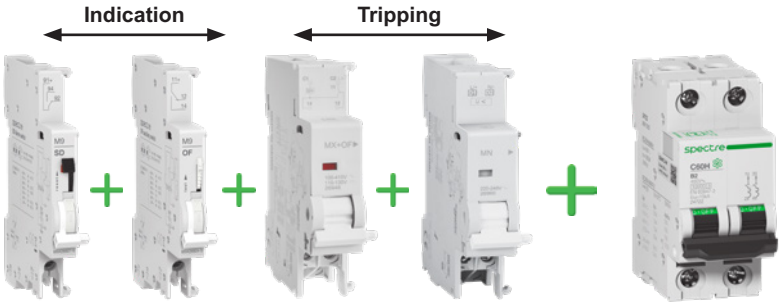
# Electrical auxiliaries

DB105727 DB105730 DB105728 DB105729 IEC
DB405227_1

## Compliance with electrical auxiliaries standards

- UL 489 Branch circuit protection File #E215117.
- CSA C22.2 No. 5 Branch circuit protection File #179014.
- UL 1077 Supplementary Protection File #E90509.
- CSA C22.2 No. 235 Supplementary Protection File #179014.
- IEC 60947-1 and IEC 60947-5-1 circuit breakers.
- CE Marked.

- The electrical auxiliaries provide the remote tripping or position (open/closed/tripped) indication functions of these devices in the event of an electrical fault.
- They clip on (no tool required) to the left-hand side of associated device.
- The SD+OF auxiliary is a two-in-one product consisting of SD and OF auxiliaries in a single device.

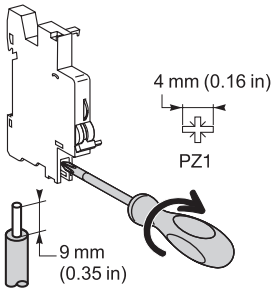



## Combination table

| Indication auxiliaries | | Tripping auxiliaries | Devices |
|---|---|---|---|
|  |  |  |  C60 |
| 1 SD+OF maxi | 1 SD+OF maxi | 1 maxi | |
| 1 OF maxi | 1 (SD+OF or SD or OF) maxi | 2 maxi |  N60 |

Tripping devices must be installed first.
If two tripping devices are used: the MN under voltage release must be installed first
Indication auxiliaries: install the SD auxiliaries first

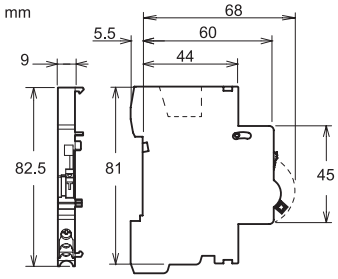
# Electrical auxiliaries (cont.)



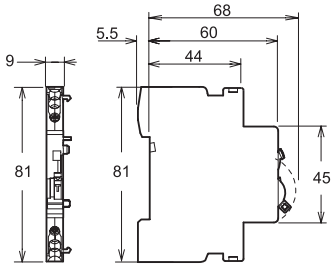

## Connection

| Type | Tightening torque | Copper cables<br>Rigid |
|---|---|---|
| | |  |
| Indication and tripping auxiliaries | 1 N.m / 9 lb.in | 2 cables, 1.5 mm² / #16 AWG  <br>or<br>1 cable, 2.5 mm² / #14 AWG  |

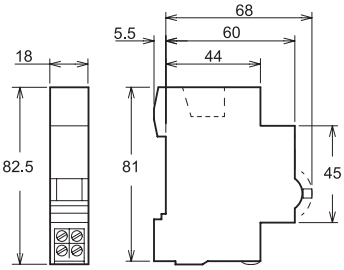
## Dimensions (mm)



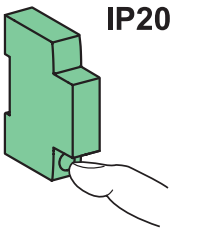

OF, SD

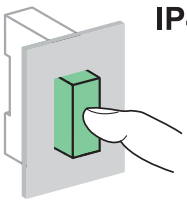


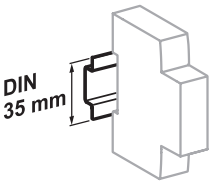

OF-SD




MX, MN, MN[S], MX+OF, MNx MNx



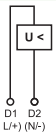
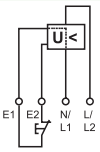

Clip on DIN rail 35 mm (1.38 in)


Indifferent position of installation

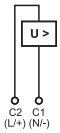
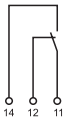
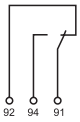
## Weight (g)

| Electrical auxiliary | |
|---|---|
| **Type** | |
| MN | 66 g |
| MN[S] | 66 g |
| MNx | 73 g |
| MX | 60 g |
| MX+OF | 65 g |
| OF | 30 g |
| SD | 30 g |
| OF-SD | 40 g |

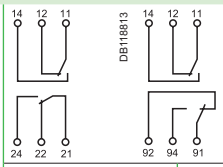
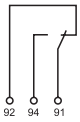
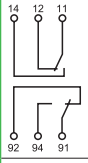
# Electrical auxiliaries (cont.)

| | Tripping | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Auxilliaries** | **MN** | | | | | **MN** S | **MNx** | |
| **Type** | **Undervoltage release** | | | | | | | |
| | Instantaneous | | | | | Delayed | Independent of the supply voltage | |
| |  | | | | |  |  | |
| **Trademark** | Schneider Electric | | | | | Schneider Electric | Schneider Electric | |
| **Function** | | | | | | | | |
| | ■ Causes the device with which it is associated to trip when its input voltage decreases (between 70% and 35% of Un). Prevents the device from closing until its input voltage has been restored | | | | | | ■ Tripping of the associated device by opening of the control circuit (e.g. push-button, dry contact) | |
| | | | | | | ■ No tripping in the event of transient voltage dips (up to 0.2 s) | ■ A drop in the supply voltage does not trip the associated device<br>■ A locking push-button control allows the circuit protected (e.g. machine control) to be placed in safety configuration | |
| **Wiring diagrams** | | | | | | | | |
| |  | | | | | |  | |
| **Utilization** | | | | | | | | |
| | ■ Emergency stop via a normally-closed pushbutton<br>■ Improves the safety of the power supply circuits of several machines by preventing “uncontrolled” restarting | | | | | | ■ Fail-safe emergency stop<br>■ Insensitive to the variation in the control circuit voltage to improve continuity of service<br>**Important: before any servicing operation switch off the main power supply (voltage presence terminals E1/E2)** | |
| **Catalog numbers** | **M9A27108** | **M9A27107** | **M9A26960** | **M9A26961** | **M9A26959** | **M9A26963** | **M9A26969** | **M9A26971** |
| **Technical specifications** | | | | | | | | |
| Rated voltage (Ue) | V AC | 24 | 120 | 220...240 | 48 | 115 | 200...240 | 230 | 400 |
| | V DC | 24 | | | 48 | | - | - | |
| Operating frequency | Hz | 50/60 | | | | 400 | 50/60 | 50/60 | |
| Pollution degree | | 3 | | | | | 3 | 3 | |
| Mechanical state indicator light, red | | On front face | | | | | On front face | On front face | |
| Test function | | - | | | | | - | - | |
| Width in 9 mm (0.35 in) modules | | 2 | | | | | 2 | 2 | |
| Operating current | | - | | | | | - | - | |
| Number of contcts | | - | | | | | - | - | |
| Operating temperature | | -25... +50°C / -13...122°F | | | | | -25... +50°C / -13...122°F | -25... +50°C / -13...122°F | |
| Storage temperature | | -40... +85°C / -40...185°F | | | | | -40... +85°C / -40...185°F | -40... +85°C / -40...185°F | |
| **Standards** | | | | | | | | |
| IEC/EN 60947-1 | | ■ | | | | | ■ | ■ | |
| IEC/EN 60947-5-1 | | - | | | | | - | - | |
| EN 60947-2 | | ■ | | | | | ■ | - | |
| EN 62019-2 | | - | | | | | - | - | |
| UL | | ■ | | | | | ■ | - | |
| CSA | | ■ | | | | | ■ | - | |
| RU | | ■ | | | | | ■ | - | |
| CCC | | - | | | | | - | - | |
| EAC | | ■ | | | | | ■ | ■ | |

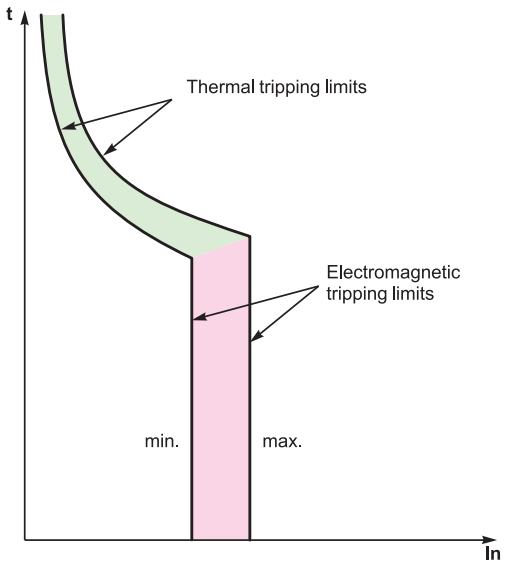
# Electrical auxiliaries (cont.)

| | Schneider Electric | | | | | | Indication | |
|---|---|---|---|---|---|---|---|---|
| **Auxilliaries** | **MX** | | | **MX+OF** | | | **OF** | **SD** |
| **Type** | **Shunt release** | | | | | | **open/closed auxilliary contact** | **Electrical fault indicating contact** |
| | | | | With open/closed auxilliary contact | | | | |
| |  | | |  | | |  |  |
| **Trademark** | Schneider Electric | | | Schneider Electric | | | Schneider Electric | Schneider Electric |
| **Function** | | | | | | | | |
| | ■ Tripping the associated device when it is powered on | | | | | | ■ Changeover contact indicating the “open” or “closed” position of the associated device | ■ Changeover contact indicating the position of the associated device in the event of:<br>□ electrical fault<br>□ action on the tripping auxiliary |
| | | | | ■ Includes an open/closed contact (OF contact) to indicate the “open” or “closed” position of the associated device | | | | |
| **Wiring diagrams** | | | | | | | | |
| |  | | | | | |  |  |
| **Utilization** | | | | | | | | |
| | ■ Emergency stop via a normally-open pushbutton | | | ■ Emergency stop via a normally-open pushbutton<br>Remote indication of the position of the associated device | | | ■ Remote indication of the position of the associated device | ■ Remote electrical fault tripping indication of the associated device |
| **Catalog numbers** | **M9A26476** | **M9A26477** | **M9A26478** | **M9A26946** | **M9A26947** | **M9A26948** | **M9A26924** | **M9A26927** |
| **Technical specifications** | | | | | | | | |
| Rated voltage (Ue) V AC | 100...415 | 48 | 12...24 | 100...415 | 48 | 12...24 | 240...415 | 240...415 |
| V DC | 110...130 | 48 | 12...24 | 110...130 | 48 | 12...24 | 24...130 | 24...130 |
| Operating frequency Hz | 50/60 | | | 50/60 | | | 50/60 | 50/60 |
| Pollution degree | 3 | | | 3 | | | 3 | 3 |
| Mechanical state indicator light, red | On front face | | | On front face | | | - | On front face |
| Test function | - | | | - | | | On front face | On front face |
| Width in 9 mm (0.35 in) modules | 2 | | | 2 | | | 1 | 1 |
| Operating current | - | | | 3 A / 415 V AC<br>6A / ⩽ 240 V AC | | | 3 A / 415 V AC<br>6A / ⩽ 240 V AC | |
| Number of contcts | - | | | 1 NO/NC | | | 1 NO/NC | 1 NO/NC |
| Operating temperature | -25... +50°C / -13...122°F | | | -25... +50°C / -13...122°F | | | -25... +50°C / -13...122°F | -25... +50°C / -13...122°F |
| Storage temperature | -40... +85°C / -40...185°F | | | -40... +85°C / -40...185°F | | | -40... +85°C / -40...185°F | -40... +85°C / -40...185°F |
| **Standards** | | | | | | | | |
| IEC/EN 60947-1 | ■ | | | ■ | | | - | - |
| IEC/EN 60947-5-1 | - | | | - | | | ■ | ■ |
| EN 60947-2 | - | | | - | | | - | - |
| EN 62019-2 | - | | | - | | | ■ | ■ |
| UL | ■ | | | ■ | | | ■ | ■ |
| CSA | ■ | | | ■ | | | ■ | ■ |
| TÜV | ■ | | | ■ | | | ■ | ■ |
| CCC | - | | | ■ | | | ■ | ■ |
| EAC | ■ | | | ■ | | | ■ | ■ |

Spectre

| | OF+OF / OF+SD | OF | SD | OF-SD |
|---|---|---|---|---|
| | **Double open/closed or fault indicating contact** | **open/closed auxilliary contact** | **Electrical fault indicating contact** | **Double open/closed or fault indicating contact** |
| |  |  |  |  |
| | Schneider Electric | Spectre | Spectre | Spectre |
| | ■ The OF+OF / OF+SD auxiliary is a two-in-one product: choice of OF or SD contact via the selector switch | ■ Changeover contact indicating the “open” or “closed” position of the associated device | ■ Changeover contact indicating the position of the associated device in the event of:<br>□ electrical fault<br>□ action on the tripping auxiliary | ■ The OF-SD auxiliary is a two-in-one product |
| |  |  |  |  |
| | OF position / SD position | | | |
| | ■ Remote position and/or fault tripping indication of the associated device | ■ Remote indication of the position of the associated device | ■ Remote electrical fault tripping indication of the associated device | ■ Remote position and/or fault tripping indication of the associated device |
| | **M9A26929** | **M9A26924-S** | **M9A26927-S** | **M9A26929-S** |
| | 240...415 | 240...415 | 240...415 | 240...415 |
| | 24...130 | 24...130 | 24...130 | 24...130 |
| | 50/60 | 50/60 | 50/60 | 50/60 |
| | 3 | 3 | 3 | 3 |
| | On front face | - | On front face | On front face |
| | On front face | On front face | On front face | On front face |
| | 1 | 1 | 1 | 1 |
| | | 3 A / 415 V AC<br>6A / ≤ 240 V AC | | |
| | 1 NO/NC + 1 NO/NC | 1 NO/NC | 1 NO/NC | 1 NO/NC + 1 NO/NC |
| | -25... +50°C / -13...122°F | -25... +50°C / -13...122°F | -25... +50°C / -13...122°F | -25... +50°C / -13...122°F |
| | -40... +85°C / -40...185°F | -40... +85°C / -40...185°F | -40... +85°C / -40...185°F | -40... +85°C / -40...185°F |
| | - | - | - | - |
| | ■ | ■ | ■ | ■ |
| | - | - | - | - |
| | ■ | - | - | - |
| | ■ | - | - | - |
| | ■ | - | - | - |
| | ■ | - | - | - |
| | ■ | - | - | - |

# Circuit breakers tripping curves




The following curves show the total fault current breaking time, depending on its amperage. For example: based on the curve on “Circuit breakers tripping curves”, page 20, a C60 circuit breaker of curve C, 20 A rating, will interrupt a current of 100 A (5 times the rated current In) in:
- 1 second at least
- 7 seconds at most.

The circuit breakers’ tripping curves consist of two parts:
- tripping of overload protection (thermal tripping device): the higher the current, the shorter the tripping time
- tripping of short-circuit protection (magnetic tripping device): if the current exceeds the threshold of this protection device, the breaking time is less than 10 milliseconds.

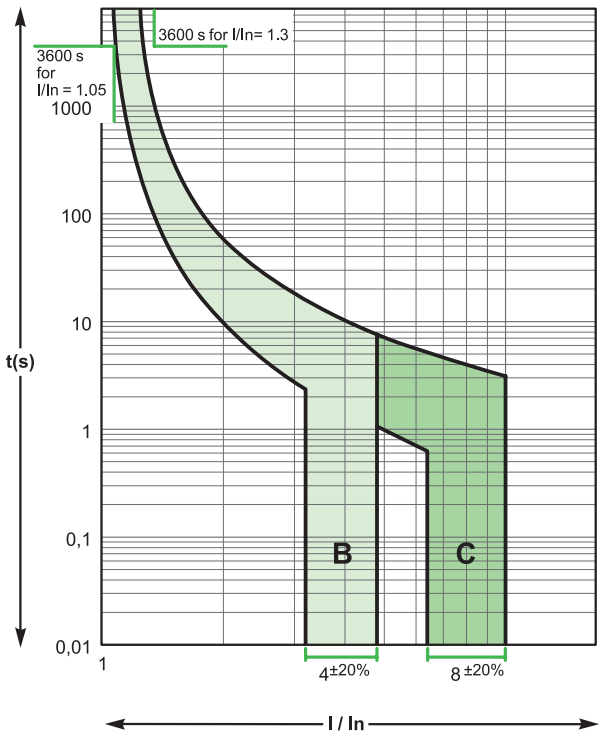
For short-circuit currents exceeding 20 times the rated current, the time-current curves do not give a sufficiently precise representation. The breaking of high short-circuit currents is characterized by the current limiting curves, in peak current and in energy. The total breaking time can be estimated at 5 times the value of the ratio $(I^2t)/(\hat{I})^2$.

## Verification of the selectivity between two circuit breakers

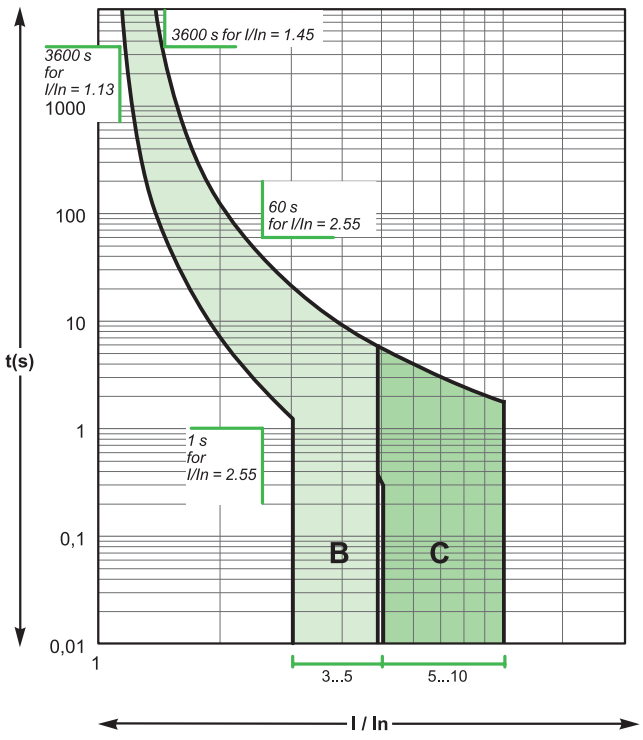
By superimposing the curve of a circuit breaker on that of the circuit breaker installed upstream, one can check whether this combination will be selective in cases of overload (selectivity for all current values, up to the magnetic threshold of the upstream circuit breaker). This verification is useful when one of the two circuit breakers has adjustable thresholds; for fixed-threshold devices, this information is provided directly by the selectivity tables.
To check selectivity on short circuit, the energy characteristics of the two devices must be compared.

## Alternative current 50/60 Hz

**C60N, C60H**
**According to IEC/EN 60947-2 (reference temperature 50°C)**
**Curves B & C**




**C60N, C60H**
**According to IEC/EN 60898-1 (reference temperature 30°C)**
**Curves B & C**

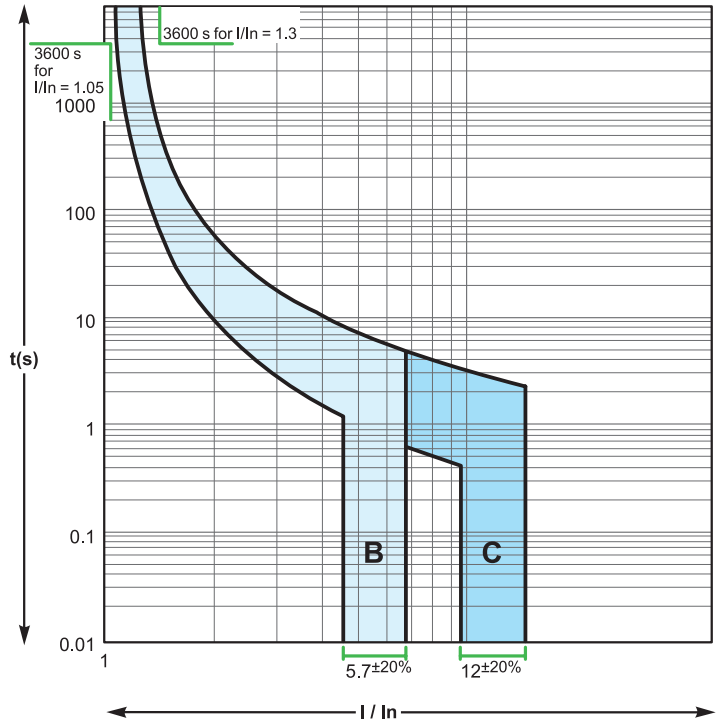


# Circuit breakers tripping curves (cont.)

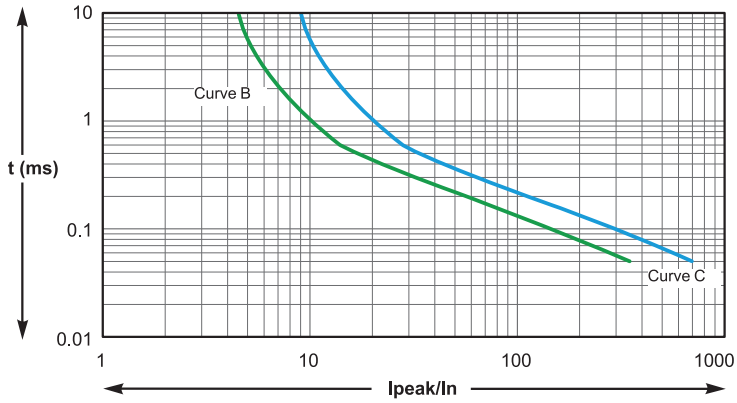
## Direct current

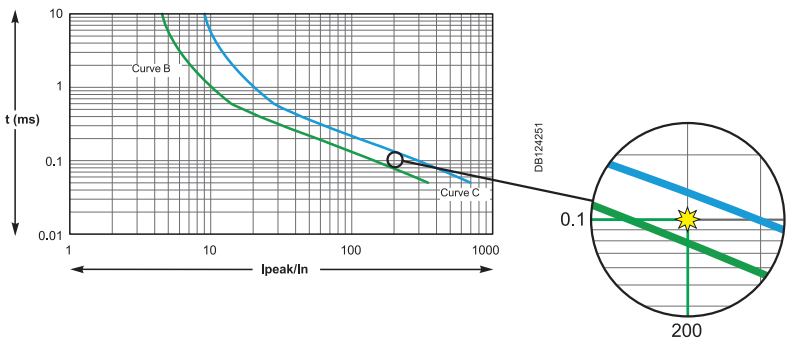
**C60N, C60H**

**According to IEC/EN 60947-2 (reference temperature 50°C)**
**Curves B & C**




**C60N, C60H**




The circuit-breaker characteristics chosen depend on the type of load downstream of the installation.
The rating depends on the size of the cables to be protected and the curves depend on the load inrush current.

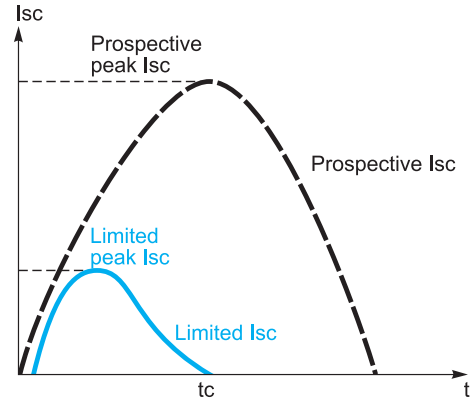
**Product selection according to the load inrush current**
When certain “capacitive” loads are switched on, very high inrush currents appear during the first milliseconds of operation. The left graphs show the average non-tripping curves of our products for this time range (50 µs to 10 ms).

This information allows us to select the most appropriate product, according to the load specifications: curve and rating.

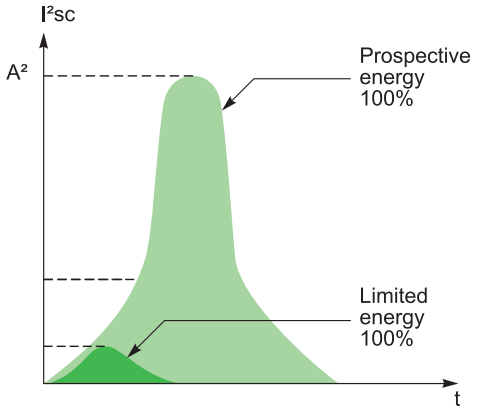
### Example

When a C60 is used with a load with current peaks in the order of 200 In during the first 0.1 millisecond, a curve C product must be installed.

# Short-circuit current limiting




Prospective current and real limit current.




## Definition

The limiting capacity of a circuit breaker is its ability to lessen the effects of a short-circuit on an electrical installation by reducing the current amplitude and the dissipated power.

## Benefits of limiting

### Long installation service life

**Thermal effects**

Lower temperature rise at the conductor level, hence increased service life for cables and all components that are not self-protected (e.g. switches, contactors, etc.)

**Mechanical effects**

Lower electrodynamic repulsion forces, hence less risk of deformation or breakage of electrical contacts and busbars.

**Electromagnetic effects**

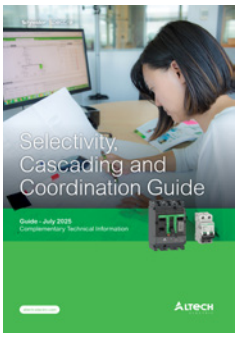
Less interference on sensitive equipment located in the vicinity of an electric circuit.

### Savings through cascading

Cascading is a technique derived directly from current limiting: downstream of a current-limiting circuit breaker it is possible to use circuit breakers of breaking capacity lower than the prospective short-circuit current (in line with the cascading tables). The breaking capacity is heightened thanks to current limiting by the upstream device. Substantial savings can be achieved in this way on switchgear and enclosures.

### Discrimination of protection devices

The circuit breakers' current limiting capacity improves discrimination with the protection devices located upstream: this is because the required energy passing through the upstream protection device is greatly reduced and can be not enough to cause it to trip. Discrimination can thus be natural without having to install a time-delayed protection device upstream.




Scan this QR code to download Selectivity, Cascading and Coordination Guide.

# Short-circuit current limiting (cont.)

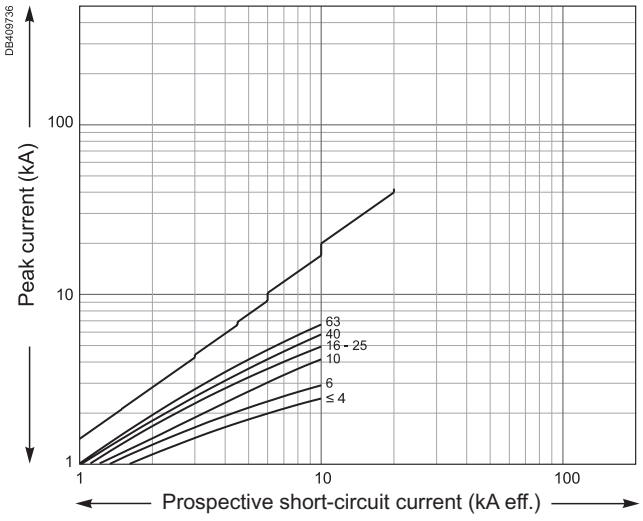
## Ue: 380-415 V AC

### Limitation curves for network Ue: 380-415 V AC (Ph/N 220-240 V AC)

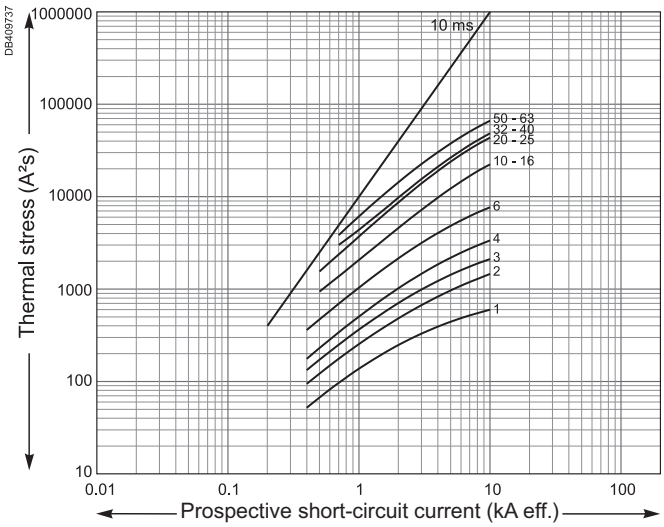
**C60N**

**1P / 2P / 3P / 4P**

Peak current




Thermal stress

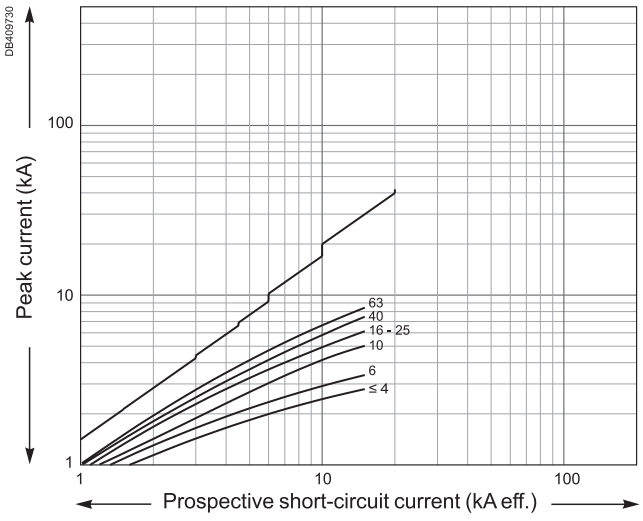



### Limitation curves for network Ue: 380-415 V AC (Ph/N 220-240 V AC)

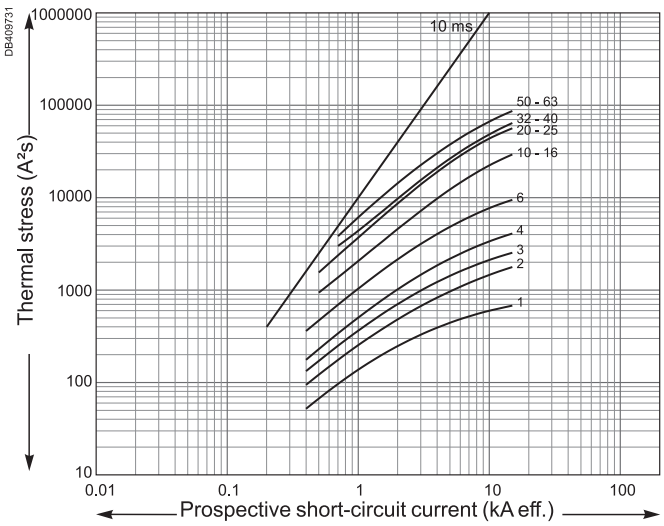
**C60H**

**1P / 2P / 3P / 4P**

Peak current



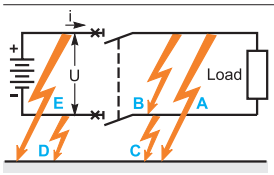
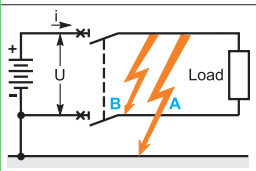
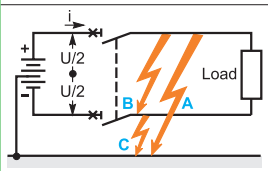
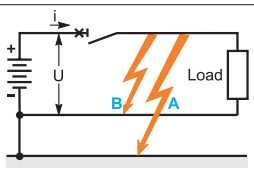

Thermal stress



# Miniature circuit breakers for DC applications up to 240 V DC

This application sheet is inteded to provide guidance for selecting the best protection and control components for a given DC system. It covers DC systems supplied by rectifier (AC/DC or DC/DC converter) and/or battery, isolated from or connected to earth.
The main voltages are 24 V DC, 48 V DC, 110 V DC and 220 V DC.

Selection of devices in DC can be challenging due to the diversity of voltage levels and earthing system.
In this document we will consider the following systems.

| IT | TN | | |
|---|---|---|---|
| **Isolated from earth** | **- (or +) earthed** | **Midpoint earthed (not distributed)** | **- (or +) earthed** |
| + and - conductors protected and disconnected | + and - conductors protected and disconnected | + and - conductors protected and disconnected | + (or -) conductor only protected and disconnected |
|  |  |  |  |



## Disconnection of one or two polarities in TN ?

IEC 60364 Electrical Installation Rules (Chapter 42) can be applied to protect and break only the polarity that is not earthed in TN, but both + & - conductors are “active” conductors, so we recommend disconnecting both polarities.

## Positive or negative polarity earthed in TN ?

According to IEC 60479-1 upward current is twice as dangerous as downward current so for protection against electric shock it is recommended to earth the negative pole. (In some DC applications the positive polarity can be earthed for galvanic corrosion reason).

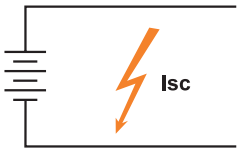
## Calculation of the short-circuit current (Isc) at the terminals of a battery

When a short-circuit occurs at its terminals, a battery discharges a current given by ohm’s law:

$$Ic = \frac{Vb}{Ri}$$

where Vb = the maximum discharge voltage (battery 100% charged)
and Ri = the internal resistance equivalent to the sum of the cell resistances (figure generally given by the manufacturer in terms of Ampere-hour capacity of the battery).

**example**
What is the short-circuit current at the terminals of standing battery with the following characteristics:
capacity: 500 Ah
maximum discharge voltage:
240V (110 cells of 2.2 V)
discharge current: 300 A
autonomy: 30 mm
internal resistance: 0.5 mΩ per cell




$Ri = 110 \times 0.5 \times 10^{-3}$

$$Isc = \frac{240}{66 \times 10^{-3}} = 4.4kA$$

As the above calculation shows, the short-circuit current is relatively weak.

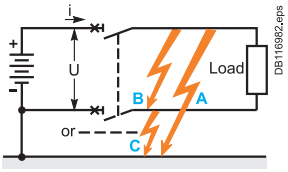
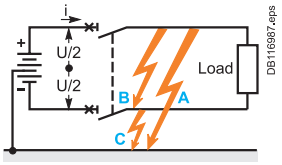
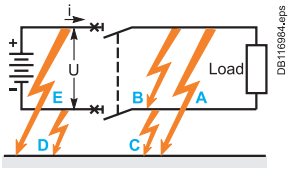
Note: If the internal resistance is not known, the following approximate formula can be used:
Isc= kC, where C is the capacity of the battery expressed in Ampere-hours, and k is a coefficient close to 10 but in any case always lower than 20.

# Miniature circuit breakers for DC applications up to 240 V DC (cont.)

## Circuit breaker selection

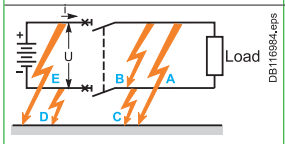
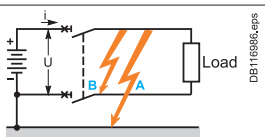
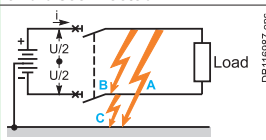
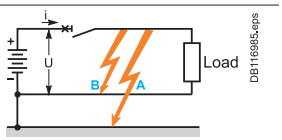
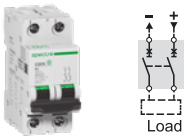
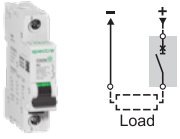
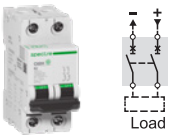
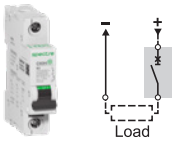
Selection of a circuit breaker depends essentially on the distribution-system parameters presented below which are used to determine the corresponding characteristics:

- Type of system - determines the type of product and the number of poles connected in series for each polarity.
- Rated voltage - determines the number of series poles taking part in current interruption.
- Nominal current - determines the rated current of the circuit breaker.
- Maximum short-circuit current at the point of installation - determines the breaking capacity.

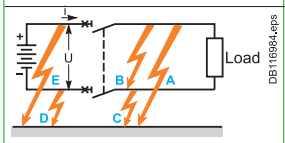
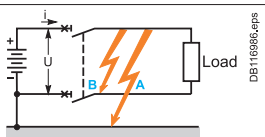
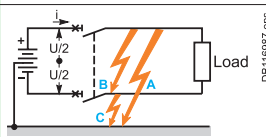
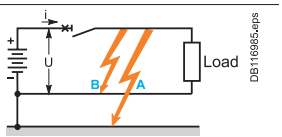
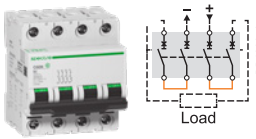
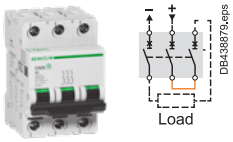
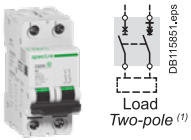
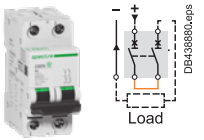
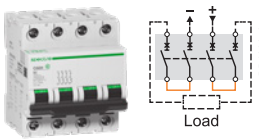
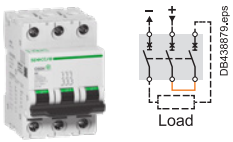
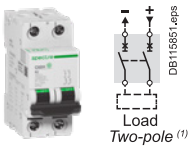
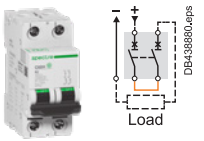
| Types of system | | | |
|---|---|---|---|
| | **Earthed systems** | | **Isolated systems** |
| | The source has one earthed polarity(1) | The source has an earthed mid-point | |
| **Diagrams and various faults** |  |  |  |
| **Fault analysis (neglecting resistance of earth electrodes)** | | | |
| Fault **A** | ■ Maximum Isc at U<br>■ Only protected polarity concerned<br>■ All poles of protected polarity must have breaking capacity ≥ Isc max. at U | ■ Maximum Isc at U/2<br>■ Only positive polarity concerned<br>■ All poles of positive polarity must have breaking capacity ≥ Isc max. at U/2 | ■ No consequences<br>■ The fault must be indicated by an IMD (insulation-monitoring device) and cleared (standard IEC/EN 60364) |
| Fault **B** | ■ Maximum Isc at U<br>■ If only one polarity (the positive here) is protected, all poles of protected polarity must have breaking capacity ≥ Isc max. at U<br>■ If both polarities are protected, to enable disconnection, all poles of the two polarities must have breaking capacity ≥ Isc max. at U | ■ Maximum Isc at U<br>■ Both polarities are concerned<br>■ All poles of the two polarities must have breaking capacity ≥ Isc max. at U | ■ Maximum Isc at U<br>■ Both polarities are concerned<br>■ All poles of the two polarities must have breaking capacity ≥ Isc max. at U |
| Fault **C** | ■ No consequences | ■ Same as fault A<br>■ All poles of the<br>■ Negative polarity must have breaking capacity ≥ Isc max. at U/2 | ■ Same as fault A with the same obligations |
| Double fault **A** and **D** or **C** and **E** | ■ Double fault not possible, system trips on first fault | ■ Double fault not possible, system trips on first fault | ■ Maximum Isc at U<br>■ Only positive polarity (cases A and D) or negative polarity (C and E) concerned<br>■ All poles of each polarity must have breaking capacity ≥ Isc max. at U |
| **Most unfavorable cases** | | | |
| | Fault **A** and fault **B** (if only one polarity is protected) | Fault **B** | Double fault **A** and **D** or **C** and **E** |

# Miniature circuit breakers for DC applications up to 240 V DC (cont.)

## A. circuit breaker selection for 24/48 V DC according to method of earthing

| Ue = 24/48 V DC | | | | | |
|---|---|---|---|---|---|
| **Method of earthing** | | **IT** | **TN** | | |
| | | **Isolated from earth**<br>+ and - conductors protected and disconnected | **- (or +) earthed**<br>+ and - conductors protected and disconnected | **Midpoint earthed (not distributed)**<br>+ and - conductors protected and disconnected | **- (or +) earthed**<br>+ (or -) conductor protected and disconnected |
| | |  |  |  |  |
| **Breaking capacity** | **Rating** | | | | |
| Isc ≤ 10 kA | In ≤ 63 A |  | | |  |
| | | C60N/H 2P | | | C60N/H 1P |
| Isc ≤ 20 kA | In ≤ 63 A |  | | |  |
| | | C60H 2P | | | C60H 1P |

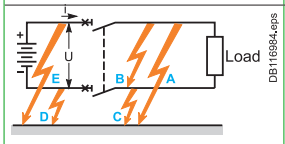
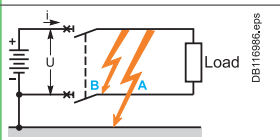
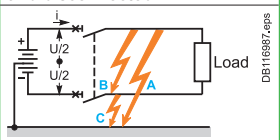
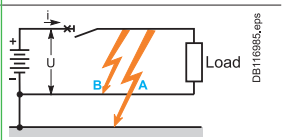
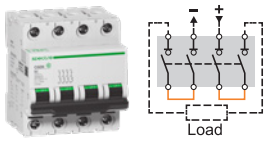
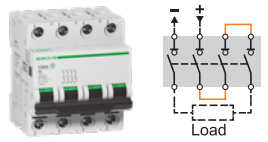
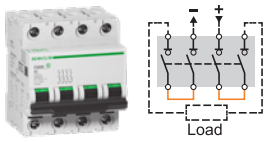
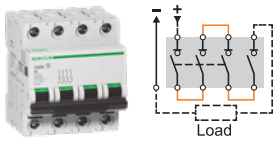
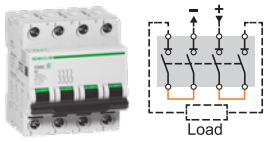
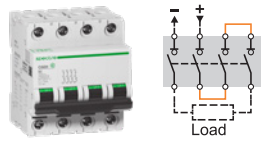
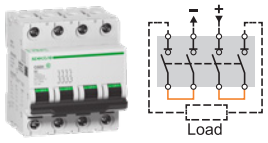
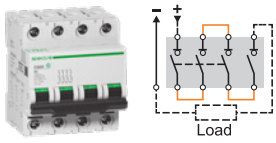
## B. circuit breaker selection for 110 V DC according to method of earthing

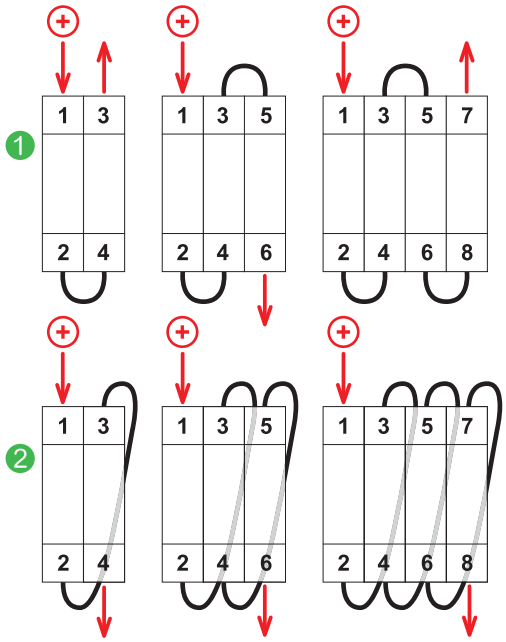
| Ue = 110 V DC | | | | | |
|---|---|---|---|---|---|
| **Method of earthing** | | **IT** | **TN** | | |
| | | **Isolated from earth**<br>+ and - conductors protected and disconnected | **- (or +) earthed**<br>+ and - conductors protected and disconnected | **Midpoint earthed (not distributed)**<br>+ and - conductors protected and disconnected | **- (or +) earthed**<br>+ (or -) conductor protected and disconnected |
| | |  |  |  |  |
| **Breaking capacity** | **Rating** | | | | |
| Isc ≤ 20 kA | In ≤ 63 A |  |  |  |  |
| | | C60N/H 4P | C60N/H 3P | C60N/H 2P | C60N/H 2P |
| Isc ≤ 25 kA | In ≤ 63 A |  |  |  |  |
| | | C60H 4P | C60H 3P | C60H 2P | C60H 2P |

Note: This table is applicable for 125 V DC floating battery voltage.

# Miniature circuit breakers for DC applications up to 240 V DC (cont.)

## C. circuit breaker selection for 240 V DC according to method of earthing

| Ue = 240 V DC | | | | | |
|---|---|---|---|---|---|
| **Method of earthing** | | **IT** | **TN** | | |
| | | **Isolated from earth**<br>+ and - conductors protected and disconnected | **- (or +) earthed**<br>+ and - conductors protected and disconnected | **Midpoint earthed (not distributed)**<br>+ and - conductors protected and disconnected | **- (or +) earthed**<br>+ (or -) conductor protected and disconnected |
| | |  |  |  |  |
| **Breaking capacity** | **Rating** | | | | |
| Isc ⩽ 10 kA | In ⩽ 63 A |  |  |  |  |
| | | C60N/H 4P (2x2P serie) | C60N/H 4P (1P+3P serie) | C60N/H 4P (2x2P serie) | C60N/H 4P (4P serie) |
| Isc ⩽ 15 kA | In ⩽ 63 A |  |  |  |  |
| | | C60H 4P (2x2P serie) | C60H 4P (1P+3P serie) | C60H 4P (2x2P serie) | C60H 4P (4P serie) |




## Pole connection

### Series connection

Series connection of the poles, by dividing the voltage per pole, optimizes the circuit breaking performance for high-voltage networks.
Series connection of the poles of a circuit breaker used in direct current therefore makes it possible to:

- Divide the network voltage by the number of poles
- Have the rated current for each pole
- Have the circuit breaker's breaking capacity for all the poles.

### Direction of cabling and cable length

In the case of series connection, the direction of cabling has a major impact on the performance of the products.

Usually the first product cabling method 1 will be used.
For special applications where there is only a single possible current direction, the second cabling method 2 is preferable, especially for electrical endurance properties.
Subsequently the cable cross section and length combination should be optimized, depending on the loads. Generally, a greater length and cross section improves performance.

| Rating (In) | Cross section ($mm^2$) | Min. shunt length (mm) |
|---|---|---|
| ⩽ 63 A | ⩽16 | 500 |
| | 25 | 200 |
| | 35 | 100 |

Note: this table gives the minimum cable (shunt) lengths optimizing the equipment's performance according to the cable cross sections.

# Influence of ambient temperature

### Influence of temperature on the operation

| Devices | Characteristics influenced by temperature | Temperature | |
|---|---|---|---|
| | | Mini | Maxi |
| C60N, C60H | Tripping on overload | -30°C | +70°C |
| N60N RCBOs | Tripping on overload | -25°C | +60°C |
| RCCB-ID | Maximum operating current | -25°C | +40°C |

Note:the temperature considered is the temperature viewed through the device.

## Circuit breakers

### High temperatures

- A rise in temperature decreases the tripping current of the thermal protection.
- Protection is still ensured: the tripping threshold remains lower than the current acceptable by the cable ($I_z$)
- To prevent nuisance tripping, it should be checked that this threshold remains higher than the maximum operating current ($I_B$) of the circuit, defined by:
  - the rated load currents,
  - the coefficients of expansion and simultaneity of use.

If the temperature is sufficiently high for the tripping threshold to become lower than the operating current $I_B$, switchboard ventilation should be provided for.

### Low temperatures

- A fall in temperature increases the tripping current of the thermal protection.
- There is no risk of nuisance tripping: the threshold remains higher than the maximum operating current of the circuit ($I_B$) demanded by the loads.
- It should be checked that the cable remains suitably protected, i.e. that its acceptable current ($I_z$) is higher than the values shown in the following tables (in amperes).

When the ambient temperature could vary within a broad range, both these aspects must be taken into account:

- the difference between the maximum operating current of the circuit ($I_B$) and the tripping threshold of the circuit breaker for the minimum ambient temperature,
- the difference between the strength of the cable ($I_Z$) and the maximum tripping threshold of the circuit breaker for the maximum ambient temperature.

# Influence of ambient temperature (cont.)

## Maximum permissible current

- The maximum current allowed to flow through the device depends on the ambient temperature in which it is placed.
- The ambient temperature is the temperature inside the enclosure or switchboard in which the devices are installed.
- The reference temperature is in a halftone colour for the different devices.
- When several devices operating simultaneously are mounted side by side in a small enclosure, a temperature rise in the enclosure results in a reduction in the operating current. A reduction coefficient of 0.8 will then have to be assigned to the rating (already derated, if applicable, depending on the ambient temperature).

- Example:

Depending on the ambient temperature and the method of installation, the table below shows how to determine, for a C60, the operating currents not to be exceeded for ratings 25 A, 32 A and 40 A (reference temperature 50°C).

| Operating current not to be exceeded (A) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Installation conditions (IEC 60947-2)** | | **C60 alone** | | | **Several C60 in the same enclosure** (calculate with the reduction coefficient indicated below) | | |
| **Ambient temperature (°C)** | | **35°C** | **50°C** | **65°C** | **35°C** | **50°C** | **65°C** |
| **Type** | **Nominal rating (A)** | **Actual rating (A)** | | | | | |
| C60 | 25 | 26.7 | 25 | 23.2 | 26.7 x 0.8 = 21.4 | 25 x 0.8 = 20 | 23.2 x 0.8 = 18.6 |
| | 32 | 34 | 32 | 29.9 | 34 x 0.8 = 27 | 32 x 0.8 = 25.6 | 29.9 x 0.8 = 24 |
| | 40 | 42.9 | 40 | 36.9 | 42.9 x 0.8 = 34.3 | 40 x 0.8 = 32 | 36.9 x 0.8 = 29.5 |

### C60N, C60H derating table

| C60N, C60H | Ambient temperature (°C) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rating** | **-30** | **-25** | **-20** | **-15** | **-10** | **-5** | **0** | **+5** | **+10** | **+15** | **+20** | **+25** | **+30** | **+35** | **+40** | **+45** | **+50** | **+55** | **+60** | **+65** | **+70** |
| 2A | 2.55 | 2.59 | 2.56 | 2.52 | 2.49 | 2.45 | 2.41 | 2.37 | 2.34 | 2.3 | 2.26 | 2.22 | 2.17 | 2.13 | 2.09 | 2.04 | 2 | 1.95 | 1.91 | 1.88 | 1.84 |
| 4A | 4.9 | 4.86 | 4.81 | 4.76 | 4.7 | 4.65 | 4.59 | 4.54 | 4.48 | 4.42 | 4.37 | 4.31 | 4.25 | 4.19 | 4.13 | 4.06 | 4 | 3.94 | 3.87 | 3.81 | 3.74 |
| 6A | 7.93 | 7.82 | 7.71 | 7.6 | 7.49 | 7.38 | 7.27 | 7.15 | 7.03 | 6.91 | 6.79 | 6.66 | 6.54 | 6.41 | 6.27 | 6.14 | 6 | 5.86 | 5.71 | 5.56 | 5.42 |
| 10A | 13.3 | 13.2 | 13 | 12.8 | 12.6 | 12.4 | 12.2 | 12 | 11.8 | 11.6 | 11.4 | 11.2 | 10.9 | 10.7 | 10.5 | 10.2 | 10 | 9.8 | 9.5 | 9.2 | 9 |
| 16A | 20 | 19.8 | 19.5 | 19.3 | 19.1 | 18.8 | 18.6 | 18.4 | 18.1 | 17.9 | 17.6 | 17.3 | 17.1 | 16.8 | 16.6 | 16.3 | 16 | 15.7 | 15.4 | 15.1 | 14.8 |
| 20A | 26.9 | 26.6 | 26.2 | 25.8 | 25.4 | 25 | 24.6 | 24.2 | 23.7 | 23.3 | 22.9 | 22.4 | 22 | 21.5 | 21 | 20.5 | 20 | 19.5 | 18.9 | 18.4 | 17.9 |
| 25A | 32.9 | 23.5 | 32.1 | 31.6 | 31.1 | 30.7 | 30.2 | 29.7 | 29.2 | 28.7 | 28.2 | 27.7 | 27.2 | 26.7 | 26.1 | 25.6 | 25 | 24.4 | 23.8 | 23.2 | 22.6 |
| 32A | 41.5 | 41.1 | 40.5 | 40 | 39.4 | 38.9 | 38.3 | 37.7 | 37.1 | 36.5 | 35.9 | 35.3 | 34.7 | 34 | 33.4 | 32.7 | 32 | 31.3 | 30.6 | 29.9 | 29.1 |
| 40A | 53.7 | 52.9 | 52.2 | 51.4 | 50.6 | 49.8 | 49 | 48.2 | 47.3 | 46.5 | 45.6 | 44.7 | 43.8 | 42.9 | 42 | 41 | 40 | 39 | 37.9 | 36.9 | 35.8 |
| 50A | 65 | 64.3 | 63.5 | 62.6 | 61.7 | 60.8 | 59.9 | 59 | 58.1 | 57.1 | 56.2 | 55.2 | 54.2 | 53.2 | 52.1 | 51.1 | 50 | 48.9 | 47.8 | 46.7 | 45.5 |
| 63A | 85.5 | 84.6 | 83.3 | 82 | 80.7 | 79.4 | 78 | 76.7 | 75.3 | 73.9 | 72.4 | 70.9 | 69.4 | 67.9 | 66.3 | 64.7 | 63 | 61.3 | 59.5 | 57.8 | 56 |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