

System Manual · 11/2008



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Switch disconnecter Fuse switch disconnecter 3NP1




System Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

| |
|--|
|  DANGER |
| indicates that death or severe personal injury will result if proper precautions are not taken. |
|  WARNING |
| indicates that death or severe personal injury may result if proper precautions are not taken. |
|  CAUTION |
| with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken. |
| CAUTION |
| without a safety alert symbol, indicates that property damage can result if proper precautions are not taken. |
| NOTICE |
| indicates that an unintended result or situation can occur if the corresponding information is not taken into account. |


If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Proper use of Siemens products

Note the following:

| |
|---|
|  WARNING |
| Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed. |

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

Purpose of the manual

The manual describes the basic functions of the "3NP1 fuse switch disconnecter" range of switching devices.

It contains information about

- Selection
- Configuring
- Commissioning






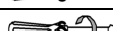





Required basic knowledge

A general knowledge of low-voltage controls and distribution is required to understand this manual.

Used symbols

The following table explains the meaning of the various symbols used within this document:

Table 1- 1 **Symbols:**

| Symbol | Meaning |
|---|---|
|  | Solid cables without end sleeve |
|  | Solid cables with end sleeve |
|  | Finely stranded cables without end sleeve |
|  | Finely stranded cables with end sleeve |
|  | Necessary tools |
|  | Permissible tightening torque |
|  | Allen key |
|  | Hexagon socket head screw |
|  | "Phillips PH" cross-tip screwdriver |
|  | "Pozidrive PZ" cross-tip screwdriver |
|  | Slotted screwdriver |
| | Layered conductors |

General information

Degrees of protection

The maximum degree of protection of the fuse switch disconnecter is IP40.

Definitions

Definition of fuse switch disconnectors

Fuse switch disconnectors are switching devices for occasional manual switching / isolation of loads and distribution boards. They are capable of making, carrying, and breaking the specified rated current (including a defined overload). They protect downstream electrical loads, safely disconnecting all poles from the power supply under load.

Standards

| | |
|-----------------------------|---|
| IEC 60947-3 | Low-voltage switchgear and controlgear (switch disconnectors) |
| IEC 60947-3, Tables 6 and 7 | EMC requirements |
| IEC 60269-2-1 | Fuses |
| DIN 43620 | Fuses |
| DIN 1759 | Busbars |
| DIN 46433 | Busbars |
| DIN EN 12167 | Busbars |
| DIN EN 61140 | Protection against electric shock |
| DIN VDE 0100-410 | Erection of power installations - Protection for safety |
| DIN EN 60715 | Standard mounting rails (TH35-15) |

Requirements

Overload and short-circuit protection is provided for downstream devices / loads by inserting LV HRC fuses, sizes 000 to 3, depending on the type of mounting.

Shock and vibration tests must be performed based on SN 31205. Shock and vibration tests are additionally carried out according to the customer's requirements.

CE marking

All products described in this manual conform to the device-specific EC directives (see below) and bear the CE mark (CE).

Directives

EC directives:

- Low-voltage directive
- EMC directive
- Machinery directive

Environmental compatibility

All materials used are environmentally compatible, taking account of "Hazardous substances, list of prohibited substances, list of substances to be avoided" (SN 36350).

Product description

3.1 Functions, performance features, application areas, applications

Functions

The 3NP1 fuse switch disconnecter is used to make, carry, and break rated currents up to 630 A.

The current is switched on and off by operating the handle unit.

Performance features

- 3-pole device versions
- 5 frame sizes from 160 A to 630 A
- Types of mounting: Floor mounting, mounting onto standard rail, mounting onto 40/60 mm busbar system
- Busbar systems: Siemens and Rittal
- Conversion option for cable outlet on the top or bottom without interfering with the internal conducting paths
- Option of converting from a 5 mm busbar to a 10 mm busbar without non-captive or breakable parts
- Busbar holders suitable for top mounting
- Reach-round protection for the busbar system as standard in case of mounting onto a busbar system
- Connection types:
 - Blade terminal
 - Box terminal
 - Saddle terminal
 - Prism terminal
- Fuses can be unlocked and removed without contact
- Fuse monitoring:
 - Mechanical
 - Electronic
- Extended touch and reach-round protection with optional terminal covers
- Two auxiliary switches for indicating switch positions
- Locking option
- Sealing option

Table 3- 1 Versions, sizes, and types of mounting

| | Frame size | Blade terminal | | | | Box terminal | | | |
|---------------------|------------|----------------|-----|--------|-----------|--------------|-----|--------|-----------|
| | | Basic device | MFM | EFM 10 | EFM 20/25 | Basic device | MFM | EFM 10 | EFM 20/25 |
| Floor mounting | 000 | | | | | ✓ | | ✓ | ✓ |
| | 00 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Busbar system 40 mm | 000 | | | | | ✓ | | ✓ | ✓ |
| | 00 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 1 | | | | | | | | |
| | 2 | | | | | | | | |
| | 3 | | | | | | | | |
| Busbar system 60 mm | 000 | | | | | ✓ | | ✓ | ✓ |
| | 00 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Application areas

The 3NP1 fuse switch disconnecter is suitable for the following branches of industry:

- Process and basic industries
- Manufacturing industry
- Infrastructure (building installations, supply and disposal)
- Mining

Applications

Industrial

- Fused combination motor controllers
- Combination with semiconductor fuse for fuse protection of frequency converters
- Fuse protection of distribution boards, cables, and leads
- Fuse protection in reactive-power compensation modules

Infrastructure

- Fuse protection of distribution boards, cables, and leads

Product line, product group

4.1 Frame sizes

3NP1 fuse switch disconnectors are available in the following frame sizes:

- Size 000
- Size 00
- Size 1
- Size 2
- Size 3

4.2 Application areas

Utilization category, rated operational voltage

The devices are suitable for use at up to 690 V AC and 440 V DC.

Installation points

The 3NP1 product range is primarily used in the following places:

- Distribution boards with standard system dimensions (e.g. 32 mm / 194 mm, 70 mm / 184 mm)
- Cabinets
- Mounting plates (free assembly)
- Busbar systems

4.3 Types of mounting

Types of installation and mounting

| Type of installation | Frame size |
|-----------------------------------|------------------|
| Floor mounting | 000, 00, 1, 2, 3 |
| Mounting onto 40 mm busbar system | 000, 00 |
| Mounting onto 60 mm busbar system | 000, 00, 1, 2, 3 |

Floor mounting, mounting onto Siemens busbar system, mounting onto Rittal busbar system, fuse switch disconnecter sizes 000 to 160 A



Floor mounting, mounting onto Siemens busbar system, mounting onto Rittal busbar system, fuse switch disconnecter sizes 00 to 160 A



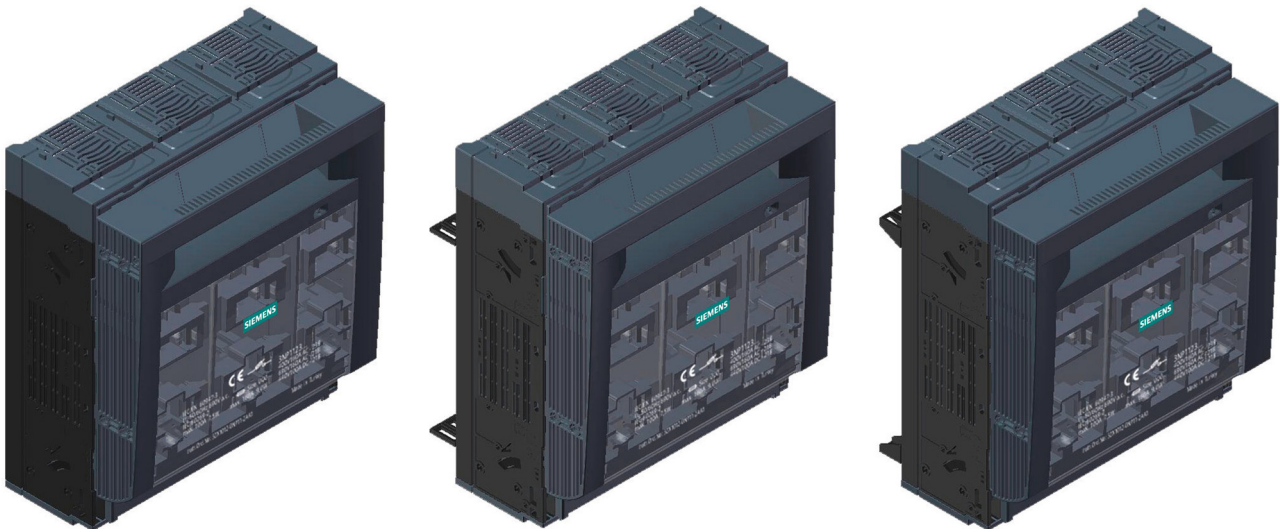
Floor mounting, mounting onto Siemens busbar system, mounting onto Rittal busbar system, fuse switch disconnecter sizes 1 to 250 A



Floor mounting, mounting onto Siemens busbar system, mounting onto Rittal busbar system, fuse switch disconnecter sizes 2 to 400 A



Floor mounting, mounting onto Siemens busbar system, mounting onto Rittal busbar system, fuse switch disconnecter sizes 3 to 630 A



4.4 Connection

Connection types

Cable connections via box terminals are permissible for all frame sizes.

Flat connectors with blade terminals are available for size 00 to 3 fuse switch disconnectors.

Saddle or prism terminals can be supplied as optional accessories for the "blade terminal" version.

Refer also to chapter 8 "Connection, wiring".

Conversion options

If necessary, all versions can be converted for a cable outlet on the top or bottom without interfering with the internal conducting paths.

Refer to chapter 7.7 "Conversion options for the cable outlet".

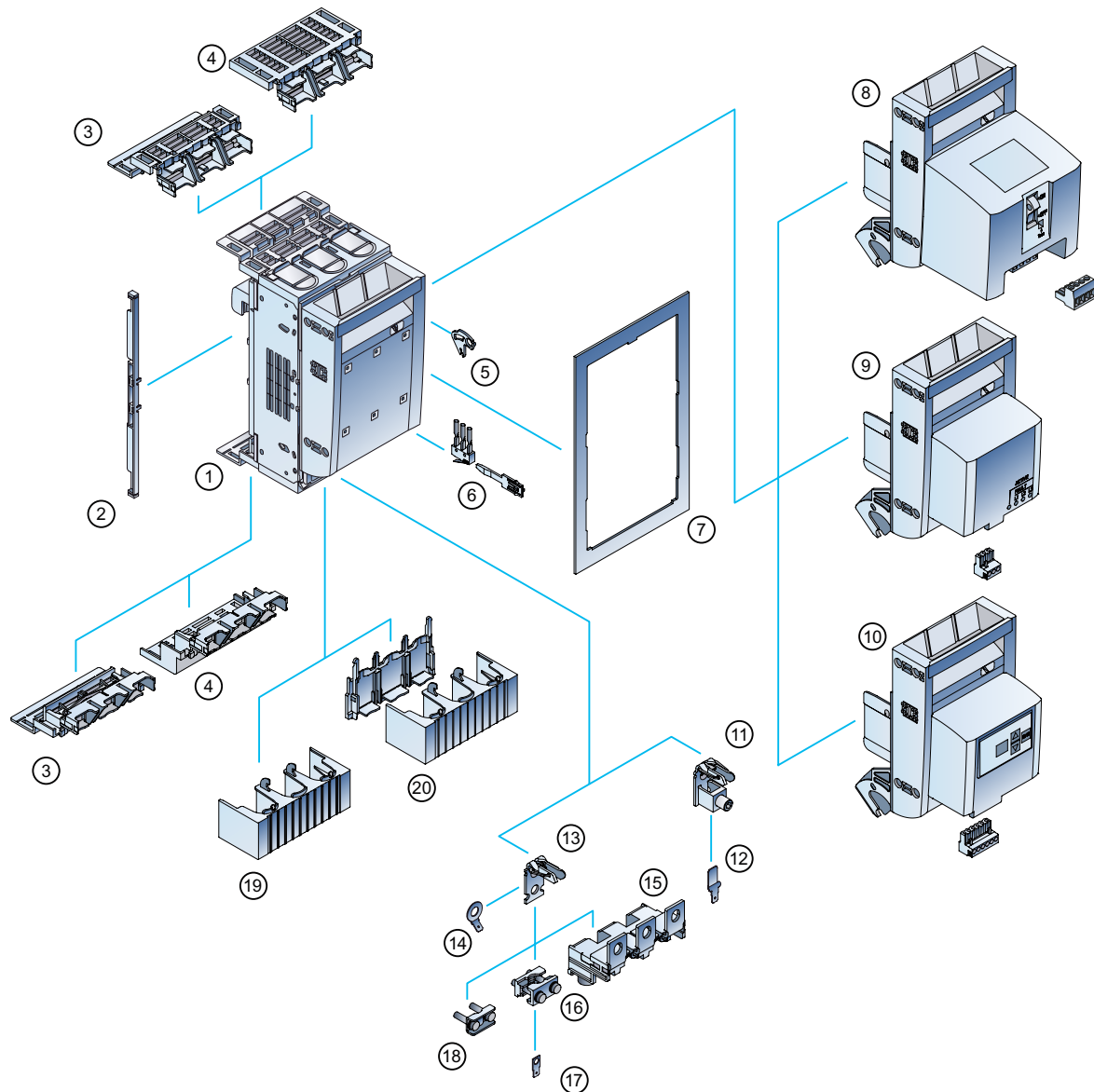
4.5 Accessories

Optional accessories

- Mechanical fuse monitoring
- Electronic fuse monitoring
- Saddle terminals
- Prism terminals
- 3-phase busbars
- Auxiliary switches
- Auxiliary conductor terminals
- Terminal covers
- System panels

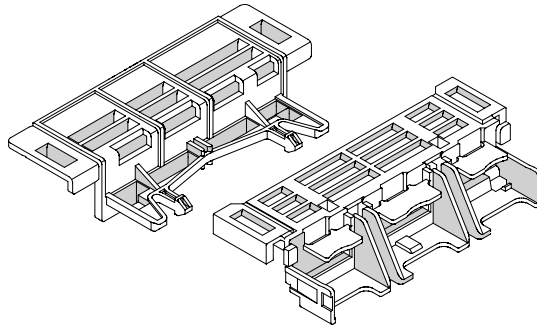
Refer also to chapter 4.6 "Product range, taking size 00 as an example".

4.6 Product range, taking size 00 as an example

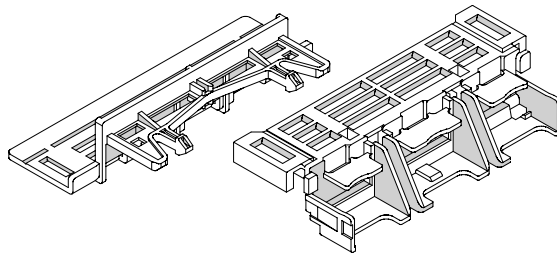


- | | |
|--|--|
| ① SENTRON 3NP1 fuse switch disconnecter | ⑪ Box terminal |
| ② Cover support | ⑫ Auxiliary conductor terminal for box terminal |
| ③ Reach-round protection for mounting onto Siemens busbar system | ⑬ Blade terminal |
| ④ Reach-round protection for mounting onto Rittal busbar system | ⑭ Auxiliary conductor terminal for blade terminal |
| ⑤ Locking device | ⑮ Deep-drawn terminal module |
| ⑥ Auxiliary switch with actuator | ⑯ Prism terminal |
| ⑦ Molded plastic cover | ⑰ Auxiliary conductor terminal for prism terminal |
| ⑧ Handle unit with mechanical fuse monitoring (MFM) | ⑱ Saddle terminal |
| ⑨ Handle unit with electronic fuse monitoring (EFM 10) | ⑲ Terminal cover |
| ⑩ Handle unit with electronic fuse monitoring (EFM 20/25) | ⑳ Terminal cover with reach-round protection on the back |

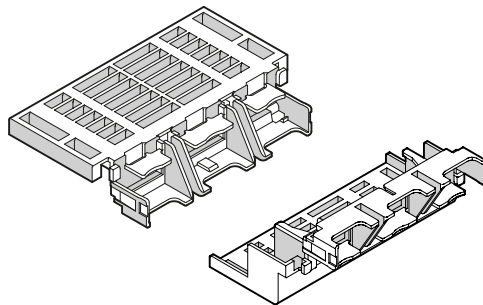
Reach-round protection for mounting onto Siemens 40 mm busbar system, taking size 00 as an example



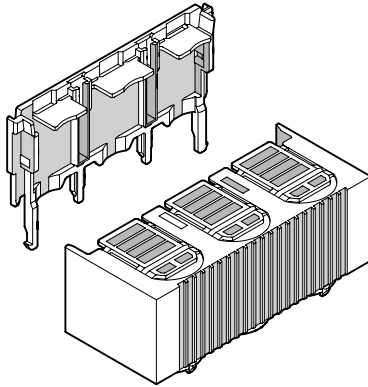
Reach-round protection for mounting onto Siemens 60 mm busbar system, taking size 00 as an example



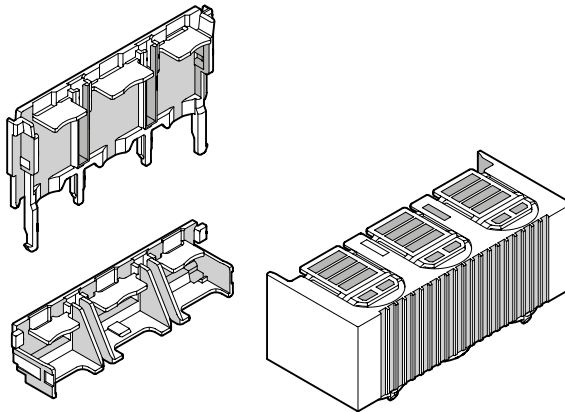
Reach-round protection for mounting onto Rittal 40/60 mm busbar system, taking size 00 as an example



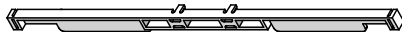
Terminal cover with reach-round protection on the back for Siemens busbar system



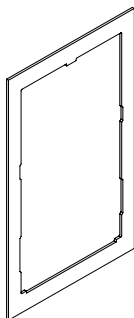
Terminal cover with reach-round protection on the back and bottom cover for floor mounting, size 00



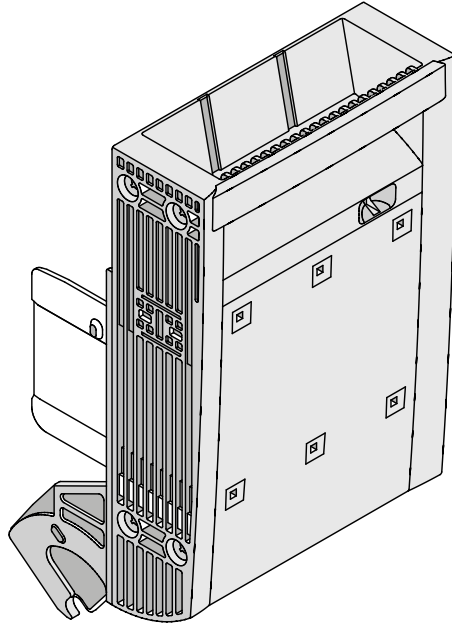
Cover support



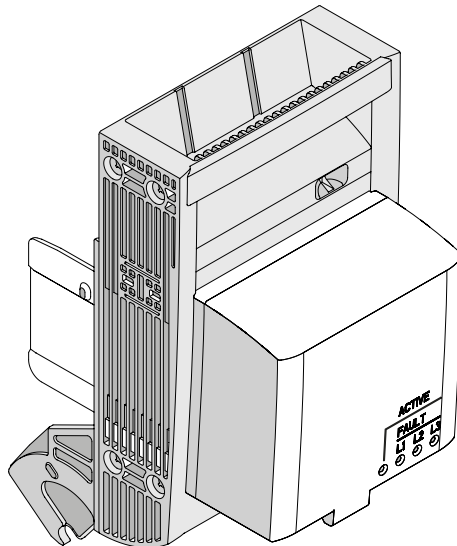
Molded plastic cover, taking size 00 as an example



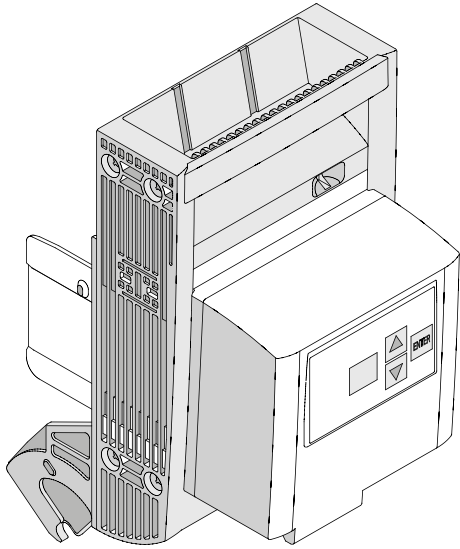
Standard handle unit



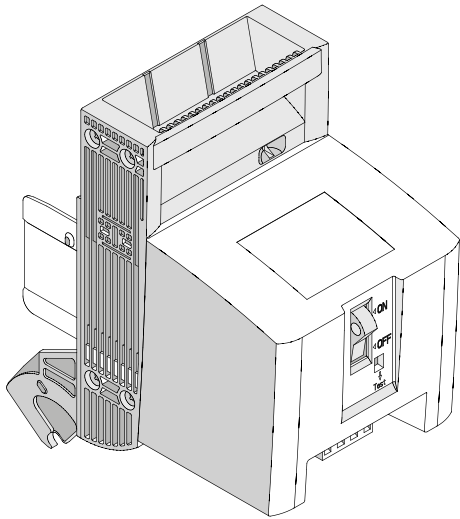
Handle unit with electronic fuse monitoring (EFM 10)



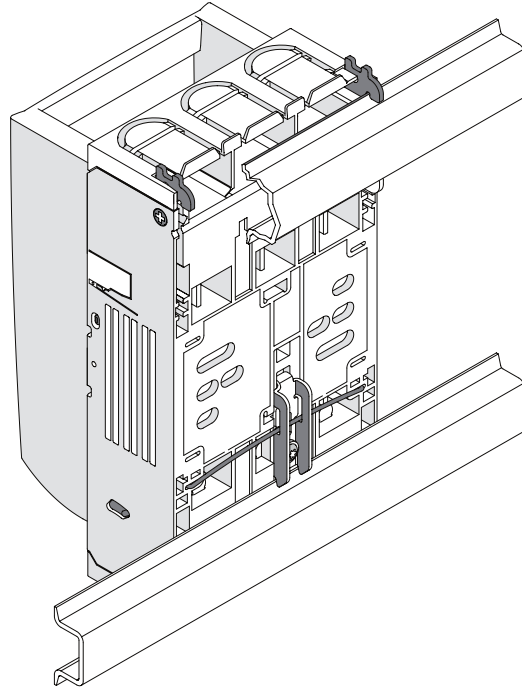
Handle unit with electronic fuse monitoring (EFM 20/25)



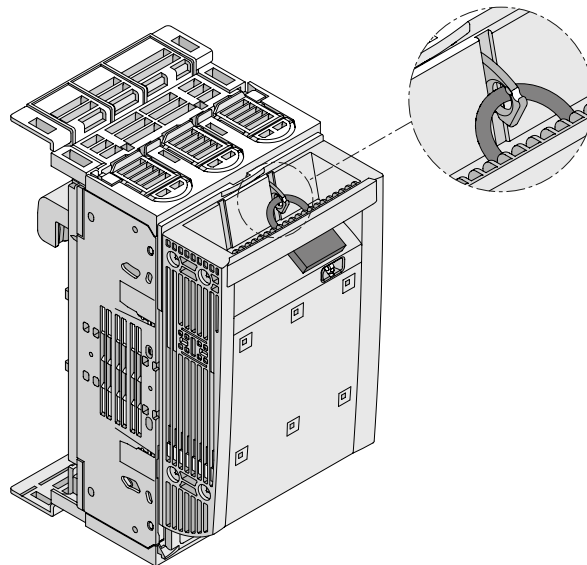
Handle unit with mechanical fuse monitoring (MFM)



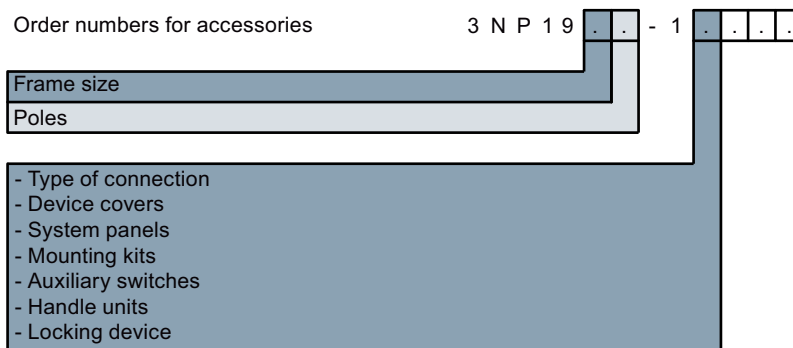
Mounting kit for mounting a 3NP1 fuse switch disconnecter between two standard rails, taking size 00 as an example



Locking device



Order number structure for the main devices



Product combinations

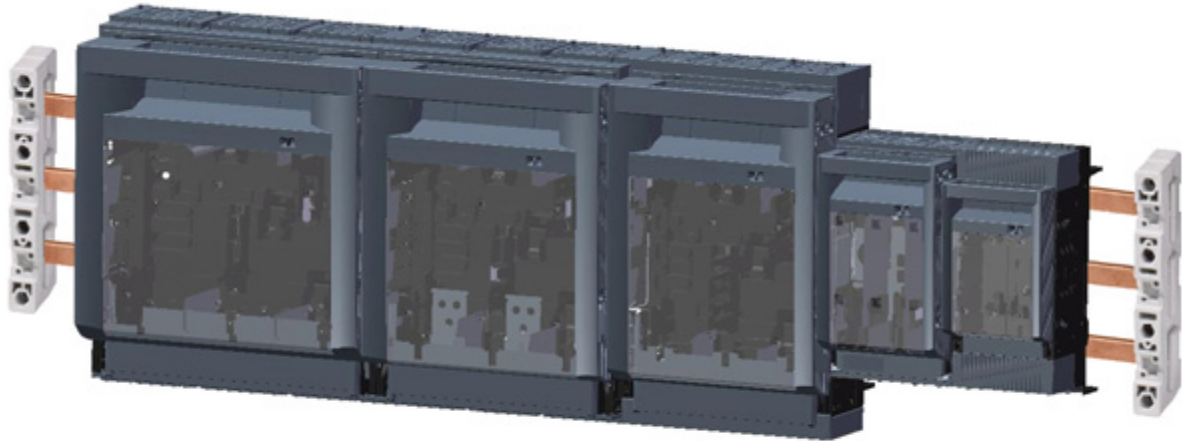
5.1 Mounting onto a 40 mm busbar system

Mounting onto a 40 mm busbar system



5.2 Mounting onto a 60 mm busbar system

Mounting onto a 60 mm busbar system

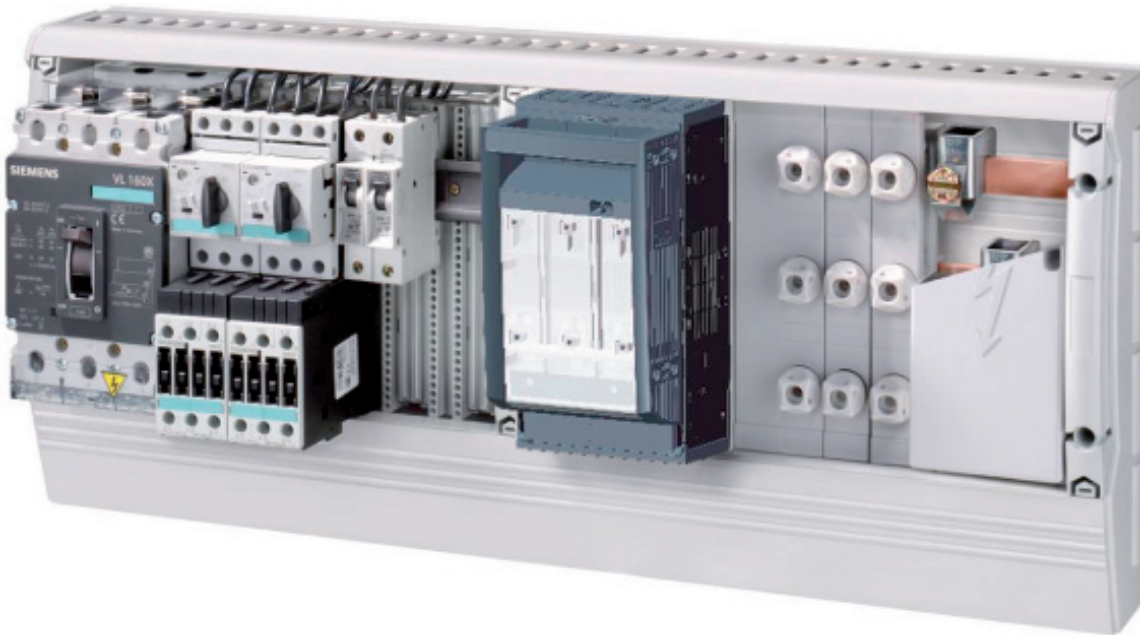


Required product order (from right to left):

1. Fuse switch disconnectors, size 000 (3NP1123-1BC20)
2. Fuse switch disconnectors, size 00 (3NP1133-1BC10)
3. Fuse switch disconnectors, size 1 (3NP1143-1BC10)
4. Fuse switch disconnectors, size 2 (3NP1153-1BC10)
5. Fuse switch disconnectors, size 3 (3NP1163-1BC10)

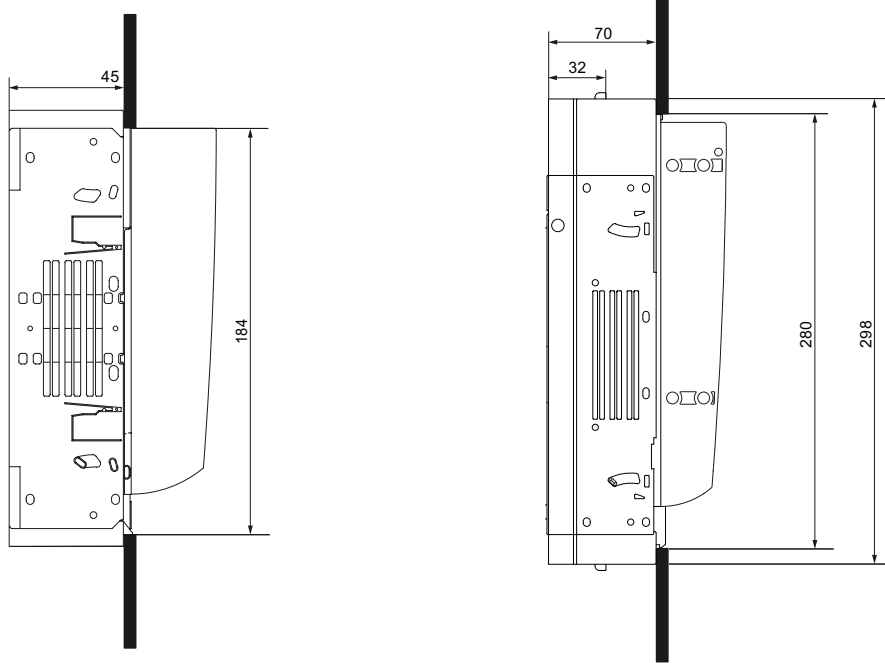
5.3 Mounting onto a 60 mm busbar system with a bottom trough

Mounting onto a 60 mm busbar system with a bottom trough

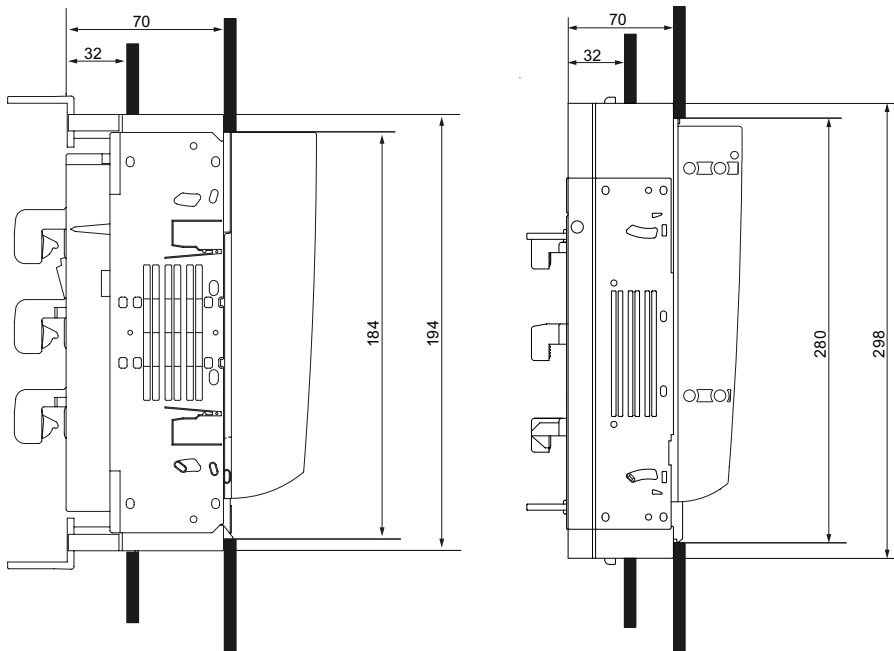


5.4 Mounting in distribution boards

Floor mounting in distribution boards, sizes 000 and 00 / sizes 1, 2, 3



Busbar system mounting in distribution boards, sizes 000 and 00 / sizes 1, 2, 3



Functions, operation

6.1 Auxiliary switches - purpose, number and settings of the switching instant

Purpose of the auxiliary switches

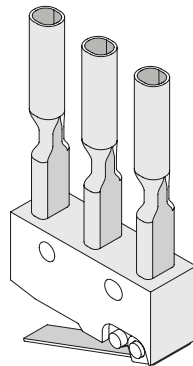
Auxiliary switches are used to signal the switch position of the handle unit. They can also be retrofitted if required.

Number of auxiliary switches per basic enclosure

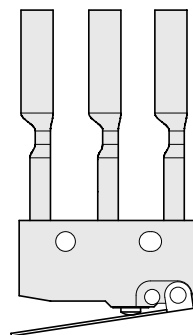
One basic enclosure can accommodate up to two auxiliary switches (changeover contacts).

Auxiliary switch versions

- 1 changeover contact, version DB2



- 1 "solid-state compatible" changeover contact, version DB3



Switching instant settings for the auxiliary switches

You can set different switching instants (leading, lagging / simultaneously) for the auxiliary switches, depending on the frame size. Refer to chapter 7.4 "Installing the auxiliary switches" for more information.

| Switching instant of auxiliary switch | Frame size | | | | | Switching operation of fuse switch disconnecter | Remarks | Application |
|---------------------------------------|------------|----|---|---|---|---|---|---|
| | 000 | 00 | 1 | 2 | 3 | | | |
| Leading | X | X | X | X | X | Open | The auxiliary switch is actuated ≥ 20 ms <i>before</i> the main contacts | A downstream contactor is disconnected before the main contacts of the fuse switch disconnecter are isolated |
| | | | | | | Close | The auxiliary switch is actuated ≥ 20 ms <i>after</i> the main contacts | A downstream contactor cannot be connected until the main contacts of the fuse switch disconnecter are closed |
| Lagging / simultaneously | — | X | X | X | X | Open | The auxiliary switch is actuated either <i>after</i> the main contacts or <i>simultaneously</i> with the main contacts | This ensures that the outgoing side of the fuse switch disconnecter is deenergized |
| | | | | | | Close | The auxiliary switch is actuated either <i>before</i> the main contacts or <i>simultaneously</i> with the main contacts | The auxiliary switch warns against voltages that are present on the outgoing side of the fuse switch disconnecter |

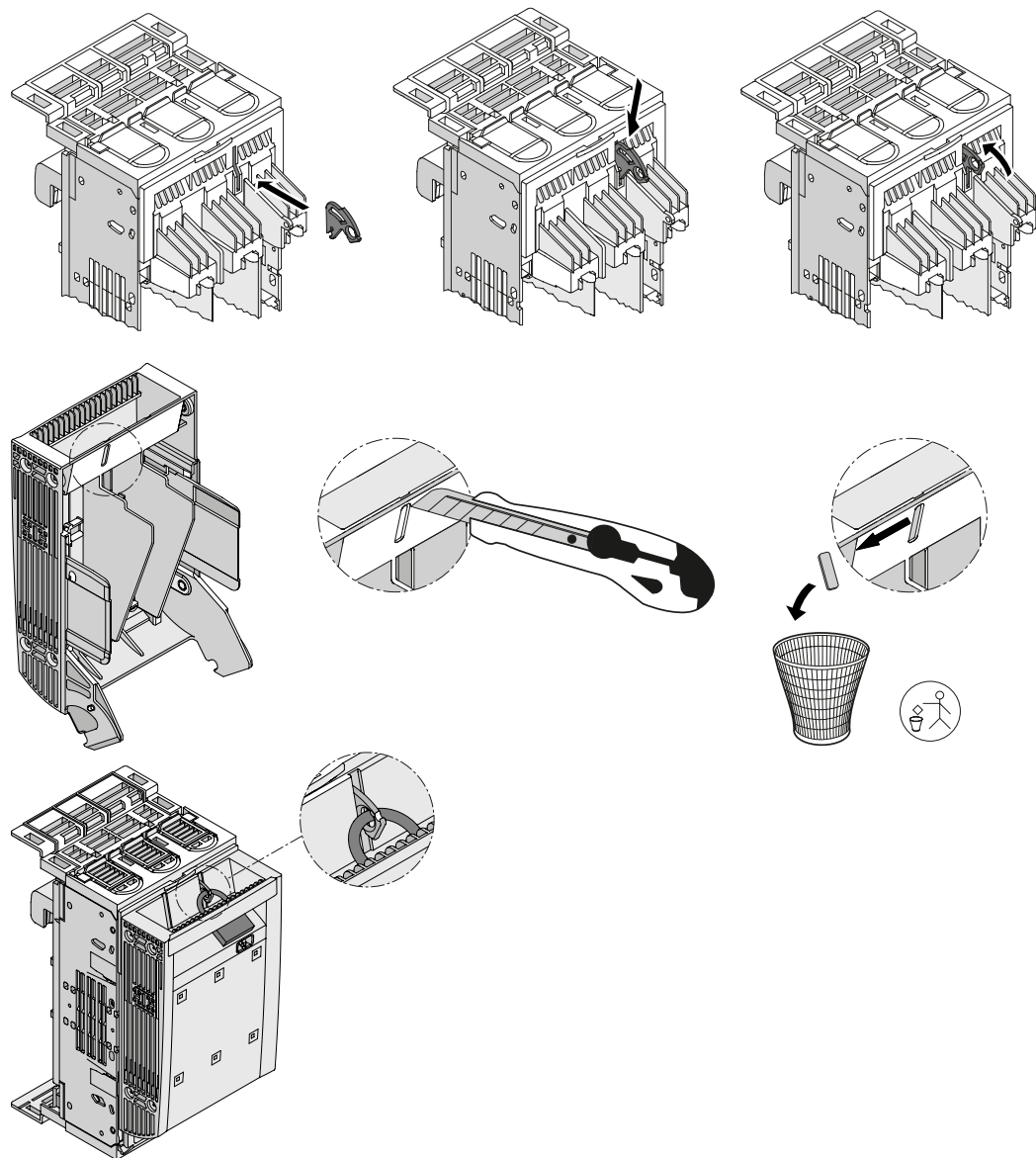
6.2 Locking device

Locking the fuse switch disconnecter

You can lock the 3NP1 fuse switch disconnecter to protect it against unauthorized actuation. Either an eye (optional accessory, see below) and a padlock (shackle diameter: 6 mm) or two padlocks (shackle diameter: 2x 3 mm) are required for this purpose. The padlocks are not supplied with the fuse switch disconnecter.

NOTICE

You can open the handle unit of a fuse switch disconnecter that has been locked with an eye and one padlock by force in order to trip an emergency stop (rupture point on the eye).



6.3 Electronic fuse monitoring

Electronic fuse monitoring EFM - overview

The electronic fuse monitoring devices EFM 10 and EFM 20/25 (for sizes 000 to 3) are mounted on the handle unit and wired in the factory. The EFM 10 and the EFM 20 for monitoring AC systems (up to $U_{in} = 690\text{ V}$) work regardless of whether or not a load is present. They detect, signal, and indicate the states of the fuses. The EFM 25 is designed for monitoring DC systems (up to $U_{in} = 440\text{ V}$).

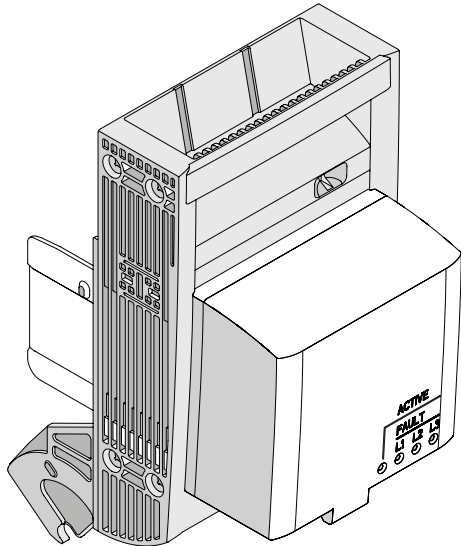


Figure 6-1 Handle unit with electronic fuse monitoring (EFM 10)

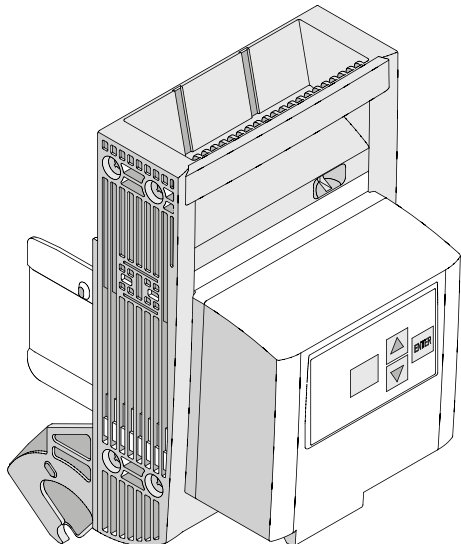


Figure 6-2 Handle unit with electronic fuse monitoring (EFM 20-25)

Typical applications of the EFM

- If a fuse fails, a "general fault" is signaled to a control room by means of integrated auxiliary switches (1 signaling relay with 1 changeover contact).
- If a fuse fails, a load is disconnected, e.g. a contactor.

Possible areas of application for the EFM

The 3NP1 fuse switch disconnecter is allowed to be used as follows to ensure safe isolation in conjunction with the EFM:

- EFM 10 and EFM 20: 3-phase, sine wave AC systems (50/60 Hz) up to 690 V
- EFM 25: DC systems up to 440 V

Principle of the EFM 10

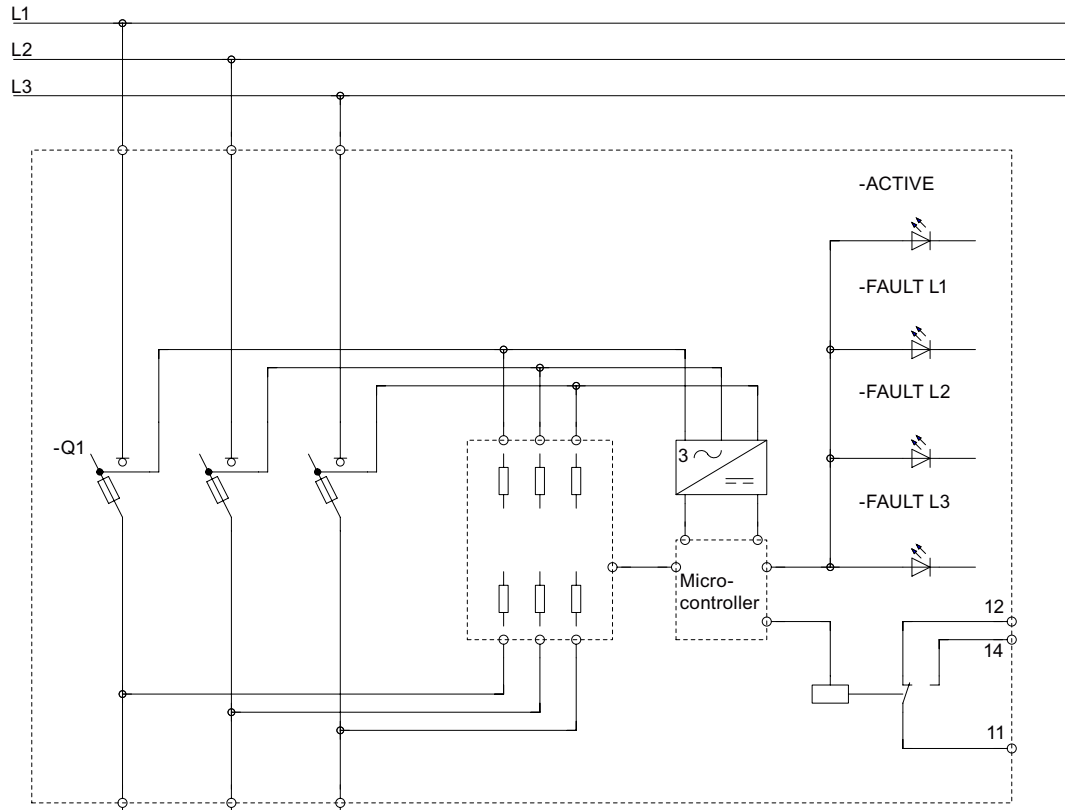
The electronic fuse monitoring device EFM 10 is supplied via the phases of the AC system. It works according to the closed-circuit principle: The signaling relay is normally energized (no fault). The electronic fuse monitoring device measures the voltages upstream and downstream of the three fuses. If the voltage drop at one of the three fuses exceeds $20\text{ V} \pm 10\%$, the following operating states occur:

- The electronic fuse monitoring device trips
- The signaling relay (changeover contact) drops out as the general alarm output
- The red LED on the fuse concerned lights up.

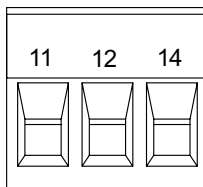
The red LED and the signaling relay always indicate the current states of the fuses. The states are not stored.

The green LED indicates that power is being supplied to the electronic fuse monitoring device.

Circuit diagram of the EFM 10



Pin assignment of the EFM 10



! WARNING

The green LED does not light up if the electronic fuse monitoring device is connected in a way other than that described above when the infeed is live and more than one fuse is faulty! In this case, the EFM's internal power supply can no longer be guaranteed (refer to "Voltage tap for the internal power supply and direction of the incoming supply" below)!

Principle of the EFM 20

The electronic fuse monitoring device EFM 20 is supplied via the three phases L1, L2, and L3 of the AC system. It works according to the closed-circuit principle (default setting): The signaling relay is normally energized (no fault). The electronic fuse monitoring device measures the voltages upstream and downstream of the three fuses. If the voltage drop at one of the three fuses exceeds $13\text{ V} \pm 10\%$, the following operating states occur:

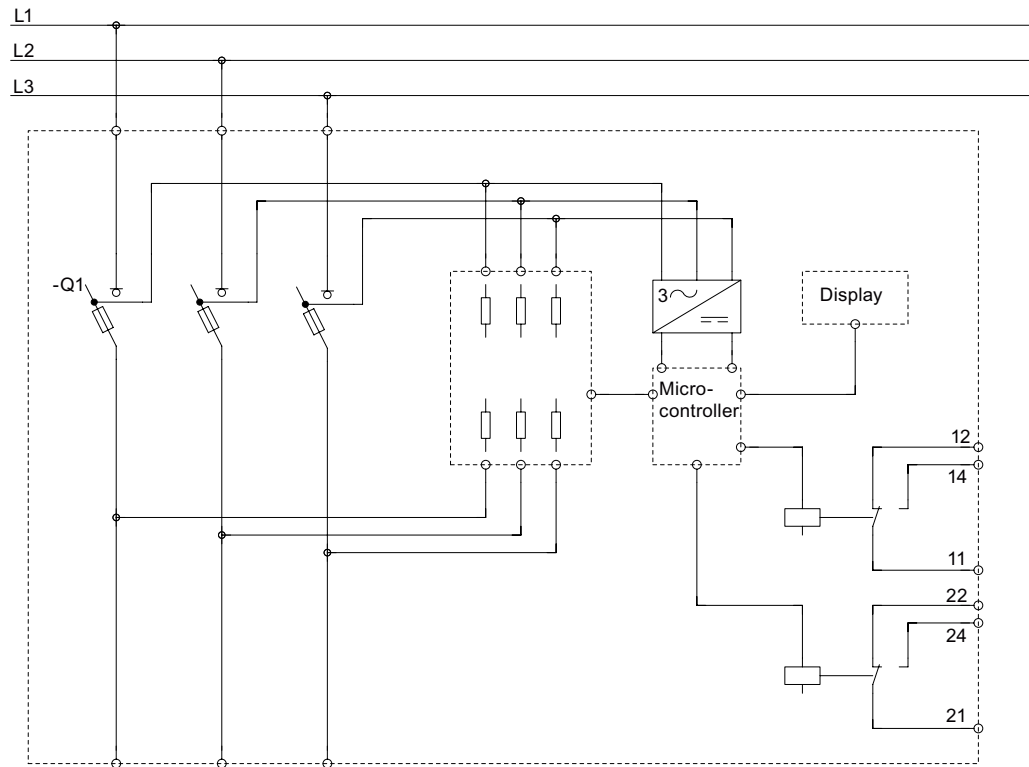
- The electronic fuse monitoring device trips
- The signaling relay drops out
- The corresponding signal is indicated on the display

If line monitoring is active, the following signals may also be output:







- "Undervoltage" line function active
- "Overvoltage" line function active
- "Phase failure" line function active

The illuminated display indicates that power is being supplied to the electronic fuse monitoring device.

Circuit diagram of the EFM 20



Pin assignment of the EFM 20

| 11 | 12 | 14 | 21 | 22 | 24 |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

WARNING

The display is not illuminated if the electronic fuse monitoring device is connected in a way other than that described above when the infeed is live and more than one fuse is faulty! In this case, the EFM's internal power supply can no longer be guaranteed (refer to "Voltage tap for the internal power supply and direction of the incoming supply" below)!

Principle of the EFM 25

The electronic fuse monitoring device EFM 25 is supplied via the two poles L+ and L- of the DC system. It works according to the closed-circuit principle (default setting): The signaling relay is normally energized (no fault). The electronic fuse monitoring device measures the voltages upstream and downstream of the three fuses. If the voltage drop at one of the fuses exceeds $20 \text{ V} \pm 10\%$, the following operating states occur:

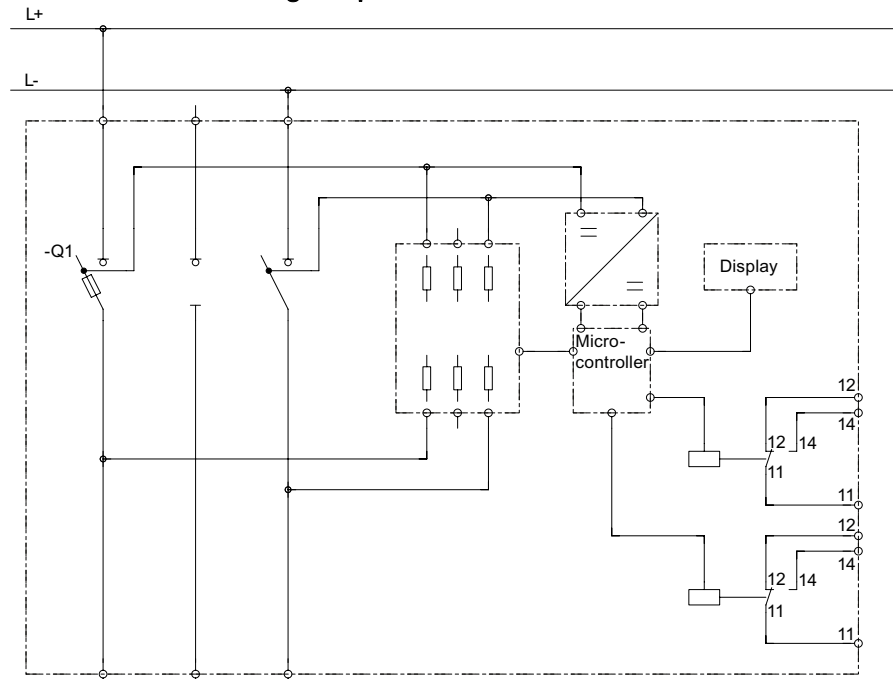
- The electronic fuse monitoring device trips
- The signaling relay drops out
- The corresponding signal is indicated on the display.

If line monitoring is active, the following signals may also be output:

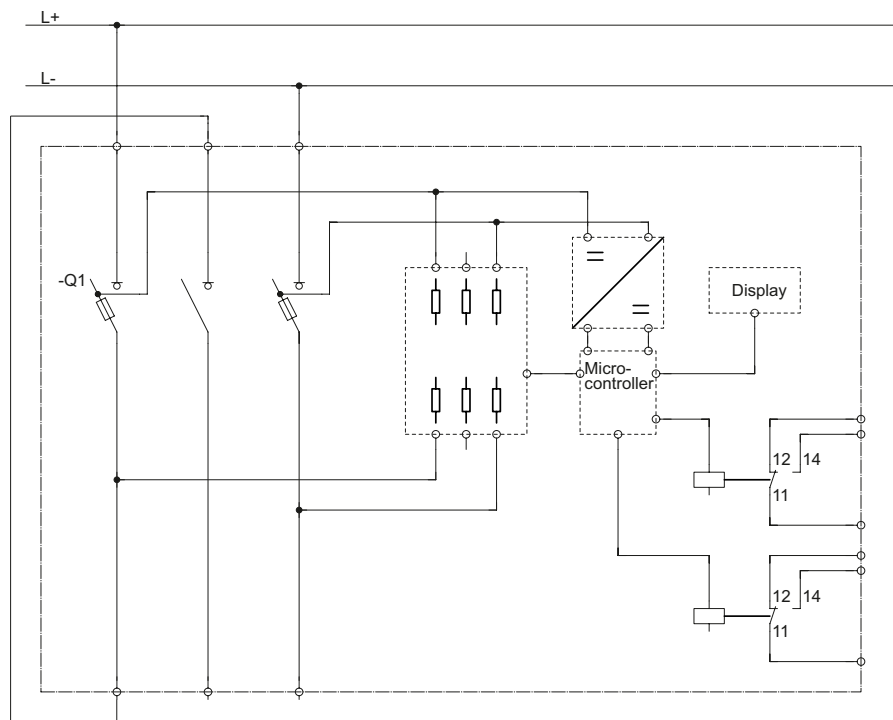
- "Undervoltage" line function active
- "Overvoltage" line function active

The illuminated display indicates that power is being supplied to the electronic fuse monitoring device.

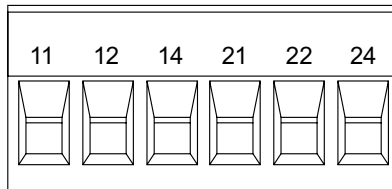
Circuit diagram of the EFM 25 for voltages up to 240 V DC



Circuit diagram of the EFM 25 for voltages up to 440 V DC



Pin assignment of the EFM 25



WARNING

The display is not illuminated if the electronic fuse monitoring device is connected in a way other than that described above when the infeed is live and more than one fuse is faulty! In this case, the EFM's internal power supply can no longer be guaranteed!

Short-circuit protection of the EFM 25:

Max. protection: "DIAZED 2 A gLgG" fuse

Operation of the EFM 20 and EFM 25

To activate SETUP or RUN mode, press the "Enter" key for longer than 2 seconds. The memory function is activated by means of the setup functions.

2 pushbutton units for setting values



1 "Enter" pushbutton unit for selecting the mode and "branching" within the menu



WARNING

The fuse or the line is not monitored in SETUP mode. Monitoring is only assured in RUN mode.

If line monitoring is active, the voltage limits are monitored. If one of the voltages exceeds or falls below the limit, relay 2 drops out providing closed-circuit principle is selected (see below). The symbol for undervoltage or overvoltage appears on the display.

If a fault occurs, the relays respond according to the selected operating principle after the set error delay time (Del):

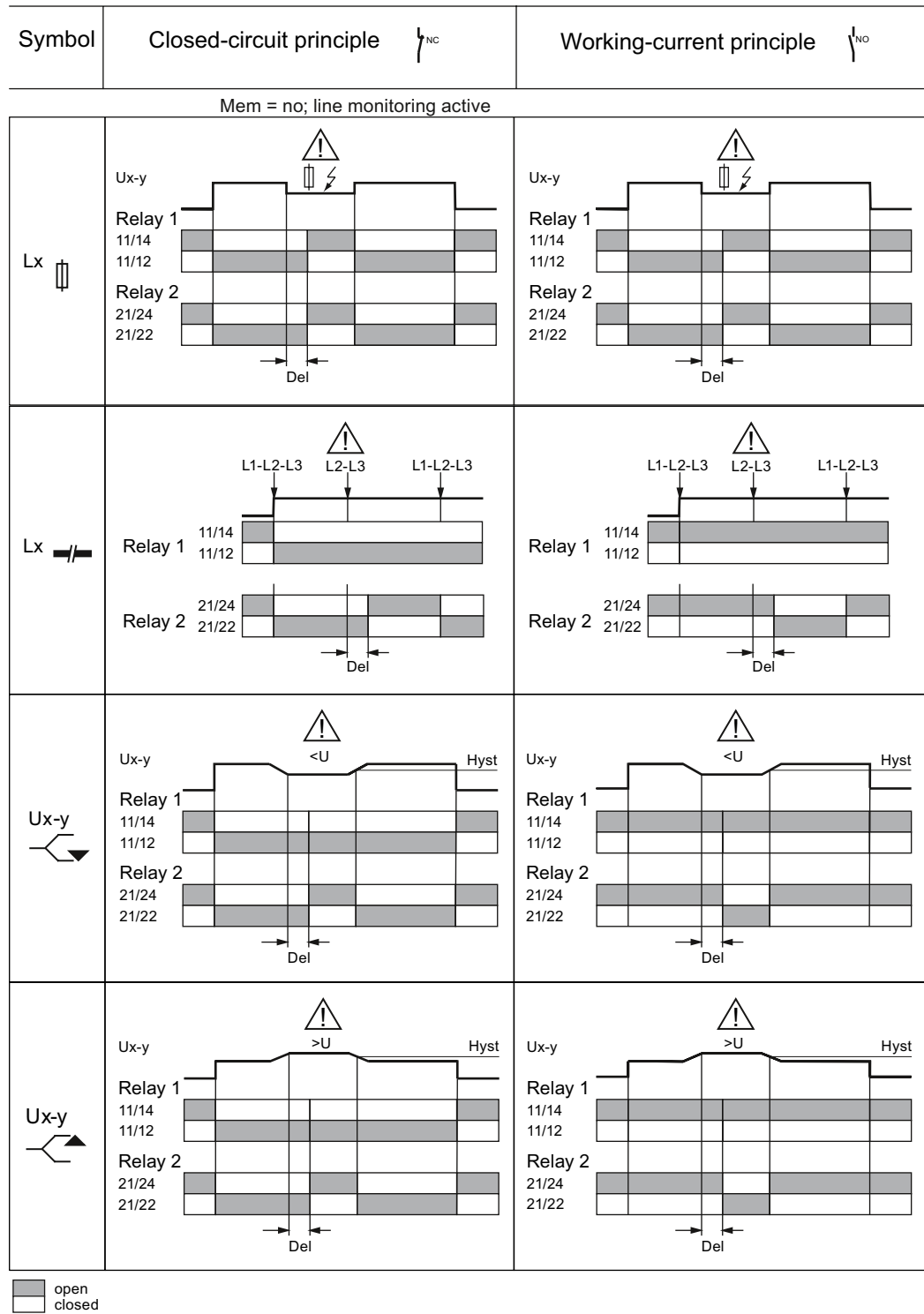


Figure 6-3 Closed-circuit / working current principle, EFM 20 (AC)

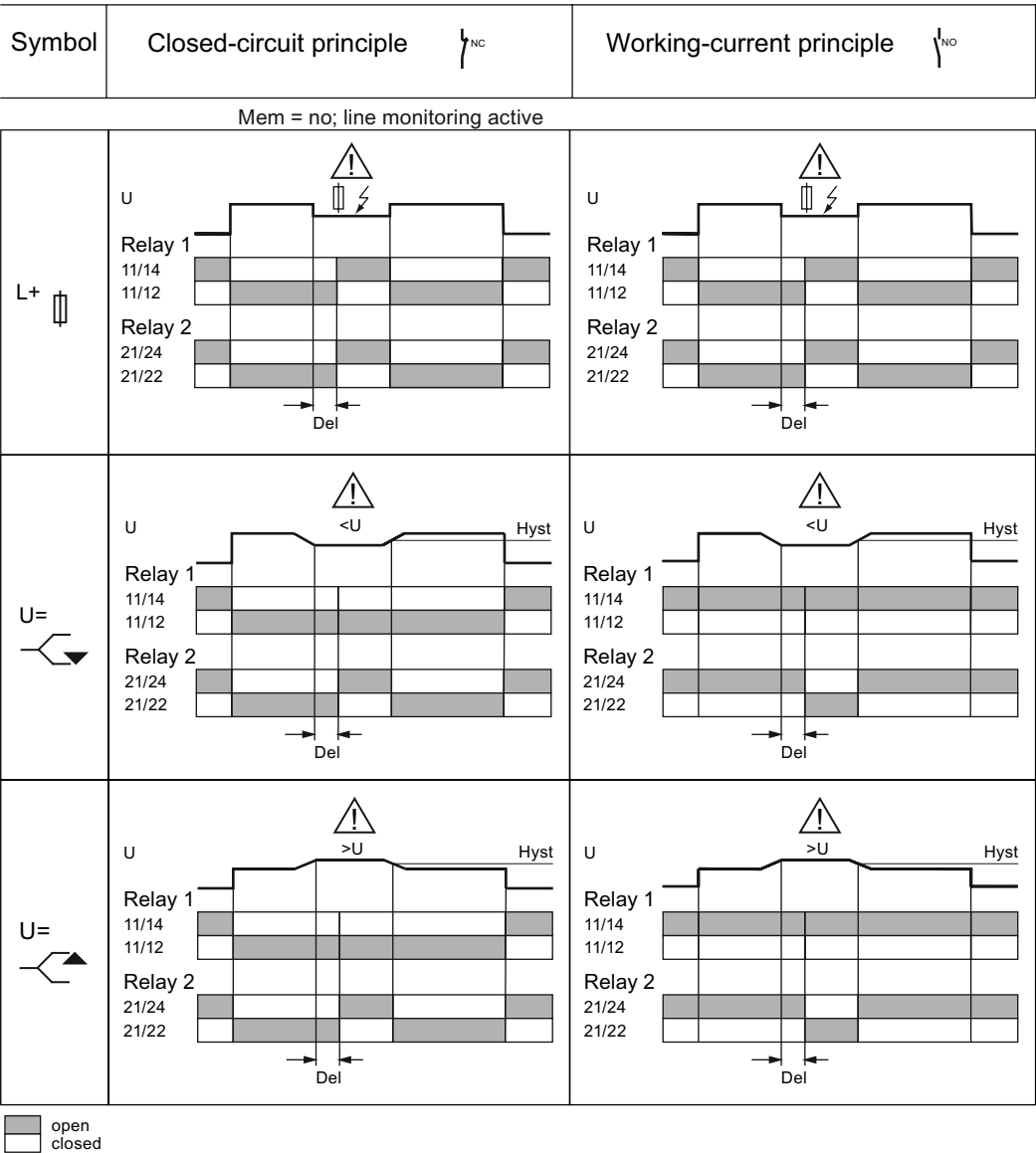


Figure 6-4 Closed-circuit / working current principle, EFM 25 (DC)

You acknowledge an alarm by simultaneously pressing the Up and Down keys (only if the memory function is active).

| |
|---|
| NOTICE |
| All alarms should be acknowledged, even if they are no longer present! |










If several alarms are present, only the alarm with the highest priority is actually displayed. An alarm for a faulty fuse takes priority over all others (refer to the alarm priorities below).

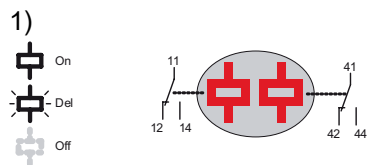
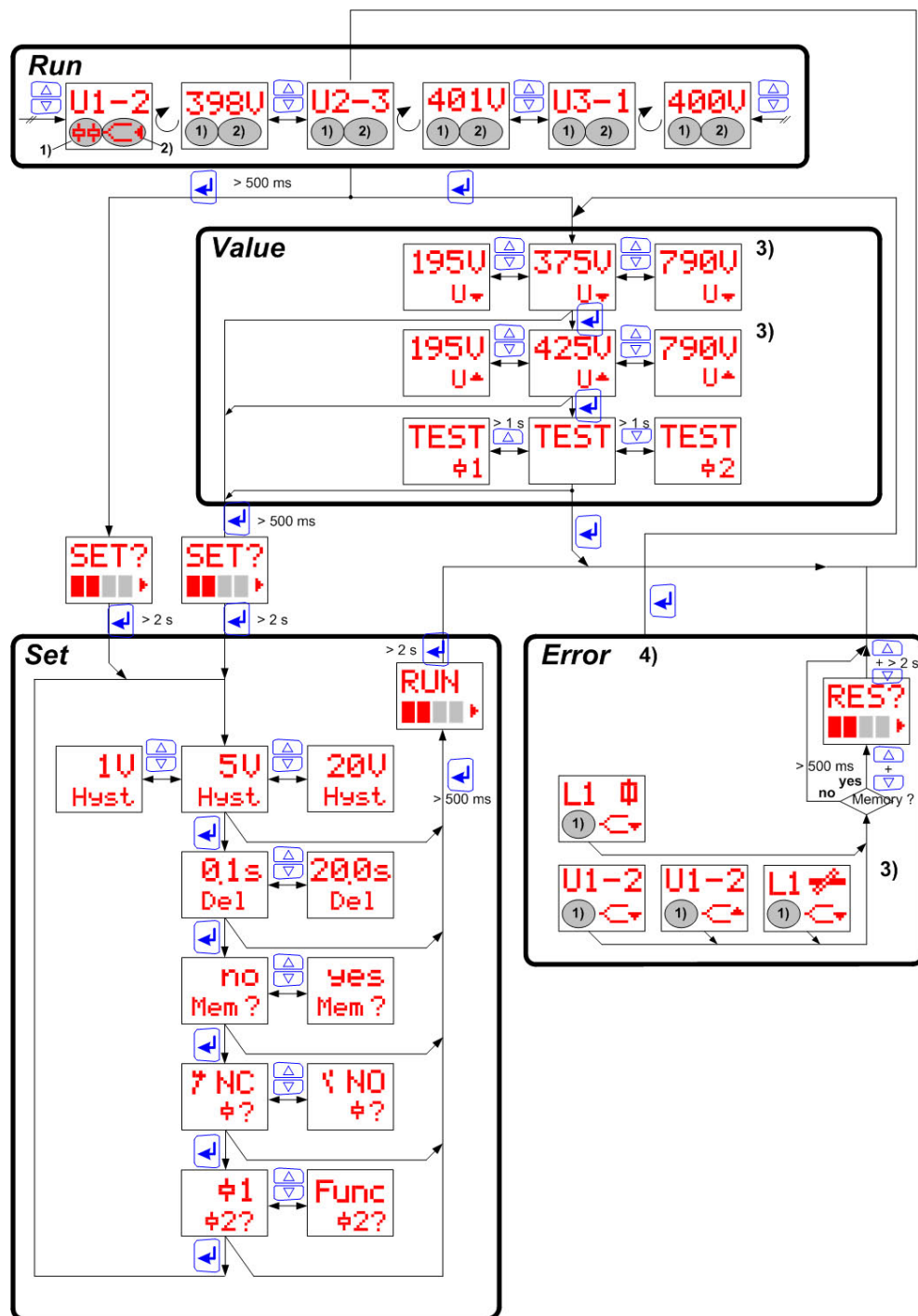
Menu structure on the display of the EFM 20 (AC)

Legend:


- RUN: Operating mode

| |
|---|
|  WARNING |
| The fuse or the line is not monitored in SETUP mode. Monitoring is only assured in RUN mode. |


- U1-2, U2-3, U3-1: phase-to-phase voltages
- Value: Value range (195 V to 790 V)
- TEST 1, TEST 2: Test on relay 1, test on relay 2
- SET?: Setup mode
- Hyst: Hysteresis (fluctuation range) in V (1 V - 20 V, default setting: 5 V)
- Del: Delay time after which a fault is indicated (0.1 to 20 s), e.g. in a system with large voltage fluctuations or if the motor that is used draws a very high current on starting
- Mem?: Save yes / no
- NC: Normally closed - closed-circuit principle, i.e. the relay is energized (default setting)
- NO: Normally open - working current principle
-  1  2? : Contactor 1 responds like contactor 2
- Func  2? : Contactor 2 responds to overvoltage / undervoltage / phase failure
- Error: Fault indication
- RES?: Reset fault indication
- Memory?: Save fault indication yes / no
- L1   : Voltage at the fuses: Lower threshold exceeded:
- U1-2  : Phase-to-phase voltage: Lower threshold exceeded:
- U1-2  : Phase-to-phase voltage: Upper threshold value exceeded
- L1   : Phase failure L1



2)

Upper limit exceeded: 

No limit violation: 

Lower limit exceeded: 

3) Functions or indication are only active if line monitoring is activated




4) If the memory function is active, the fault indication alternates with the following symbol:










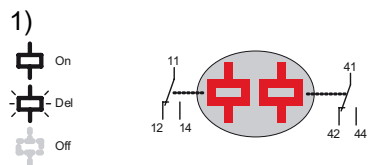
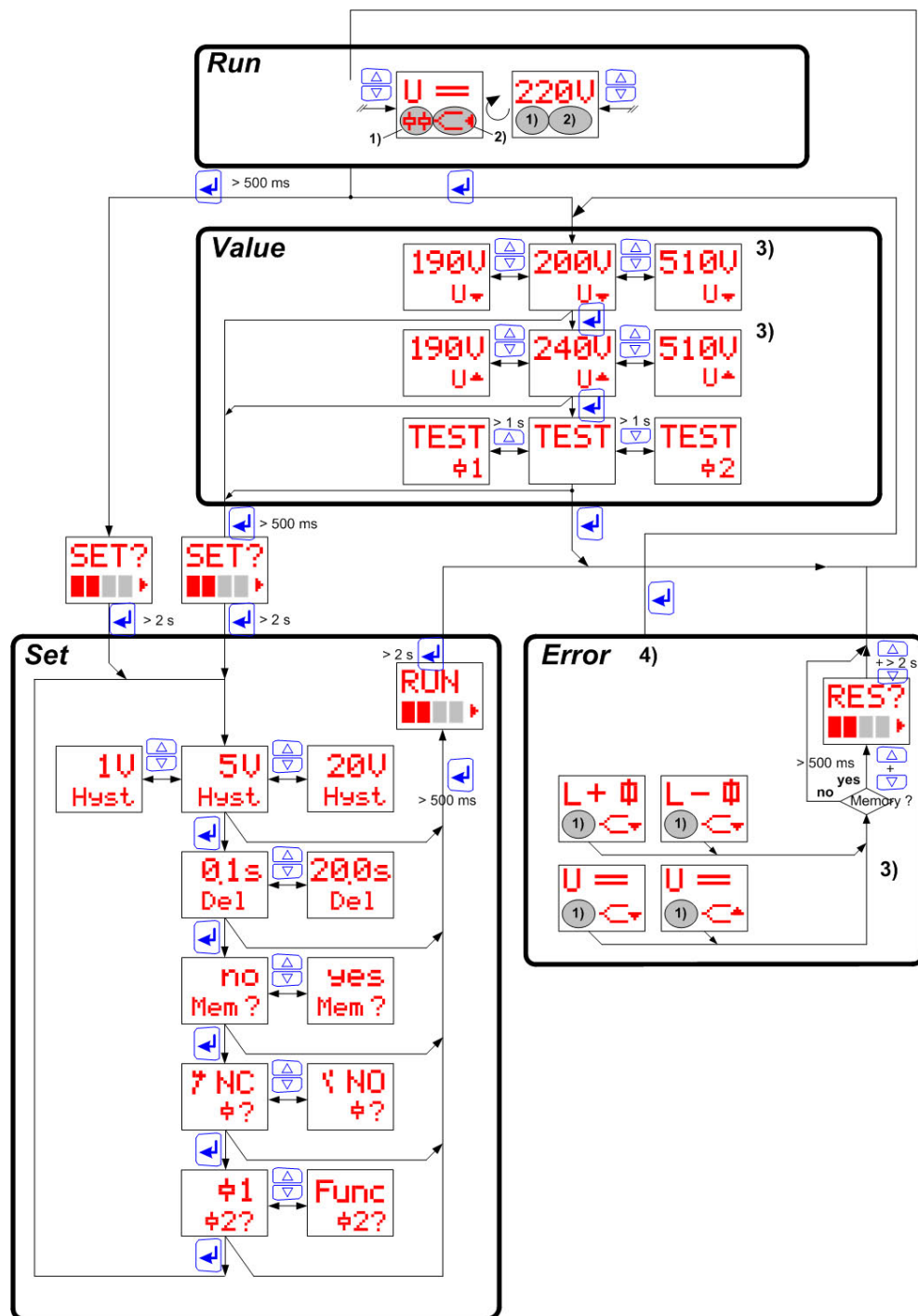
Menu structure on the display of the EFM 25 (DC)

Legend:


- RUN: Operating mode


| |
|---|
|  WARNING |
| The fuse or the line is not monitored in SETUP mode. Monitoring is only assured in RUN mode. |


- U =: Line-to-line voltage
- Value: Value range (190 V to 510 V)
- TEST 1, TEST 2: Test on relay 1, test on relay 2
- SET?: Setup mode
- Hyst: Hysteresis (fluctuation range) in V (1 V - 20 V, default setting: 5 V)
- Del: Delay time after which a fault is indicated (0.1 to 20 s)
- Mem?: Save yes / no
- NC: Normally closed - closed-circuit principle, i.e. the relay is energized (default setting)
- NO: Normally open - working current principle
-  1  2?: Contactor 1 responds like contactor 2
- Func  2?: Contactor 2 responds to overvoltage / undervoltage / phase failure
- Error: Fault indication
- RES?: Reset fault indication
- Memory?: Save fault indication yes / no
- L+  , L-  : Voltage at the fuse: Lower threshold exceeded:
- U =  : Line-to-line voltage: Lower threshold exceeded:
- U =  : Line-to-line voltage: Upper threshold value exceeded



2)

Upper limit exceeded: 

No limit violation: 

Lower limit exceeded: 

3) Functions or indication are only active if line monitoring is activated



4) If the memory function is active, the fault indication alternates with the following symbol:



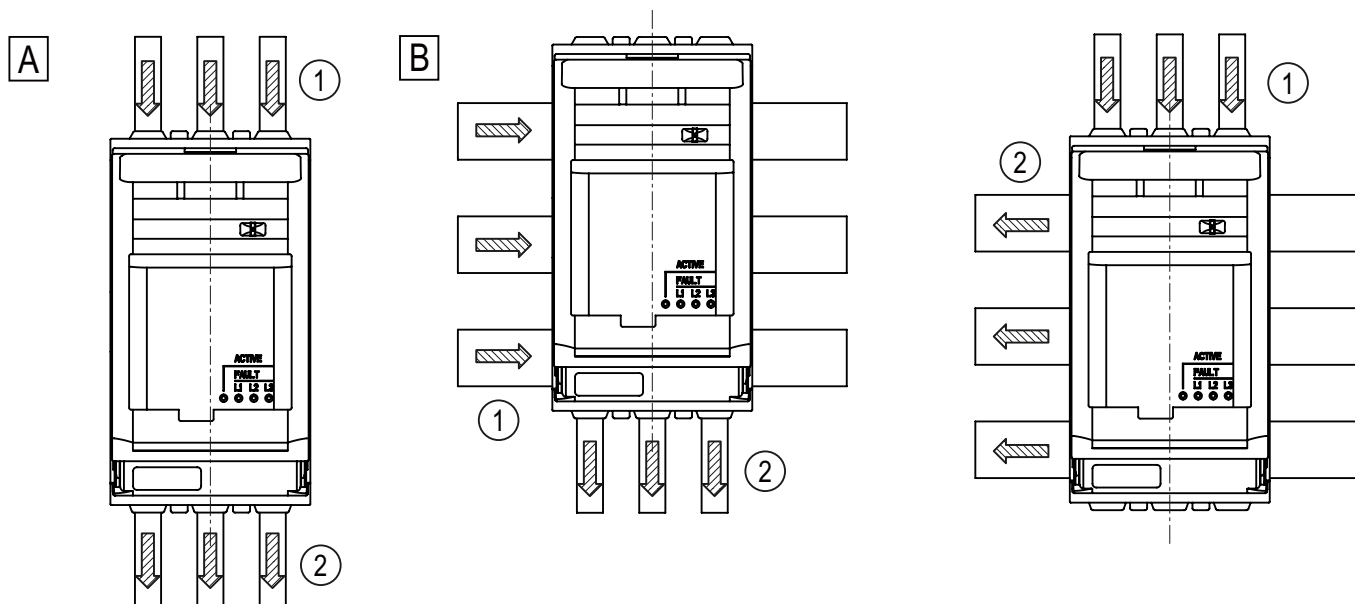
Alarm priorities on the EFM 20-25

| Priority | Alarm | Function type | Remarks |
|----------|---------------|-----------------|---|
| 1 | Phase failure | Line monitoring | AC version only. The fault (phase or fuse failure) that was detected first in the monitoring sequence from L1 to L2 to L3 is indicated. |
| 2 | Fuse faulty | Fuse monitoring | DC version: A faulty fuse can only be detected if a load is connected. |
| 3 | Overvoltage | Line monitoring | — |
| 4 | Overvoltage | Line monitoring | — |

If several alarms are present, only the alarm with the highest priority is actually displayed.

Voltage tap for the internal power supply and direction of the incoming supply on all EFM's, taking the EFM 10 as an example

The EFM electronics are supplied via the phases (L1, L2, L3 or L+, L-) of the main circuit. The voltage for the internal power supply is always tapped on the side of the handle unit. Owing to the internal power supply, the electronics are only fully functional if at least two phases on the input side are supplied with power. Please also note the direction of the incoming supply as shown in the diagrams below:



| | |
|---|--------------------------------|
| A | 3NP11.3-1.A.. |
| B | 3NP11.3-1.B.. 3NP11.3-1.C.. |
| 1 | Infeed |
| 2 | Outgoing feeder |

⚠ WARNING

The green LED on the EFM 10 does not light up, and the display of the EFM 20 or the EFM 25 is not illuminated, if the electronic fuse monitoring device is connected in a way other than that described above when the infeed is live and more than one fuse is faulty! In this case, the EFM's internal power supply can no longer be guaranteed!

⚠ WARNING

If the green LED does not light up or the display is not illuminated when the infeed is live and the EFM is correctly connected, the EFM must be immediately replaced!

The table below shows:

- The number of tripped fuses
- Whether or not the electronics are active
- The "Fault" signal

as a function of the voltage tap (infeed side, outgoing side).

Table 6- 1 Number of tripped fuses, electronics active or not active and fault signal as a function of the voltage tap (infeed side, outgoing side) on the EFM 10/20

| | Number of tripped fuses | | Electronics active | | Fault signal | |
|---|-------------------------|------------------|--------------------|-----|---|---|
| | AC ¹⁾ | DC ²⁾ | AC | DC | AC | DC |
| Voltage tap for electronics = infeed side of the main conducting paths. Infeed correct: see pictures above | 0 | 0 | Yes | Yes | No | No |
| | 1 | 1 | Yes | Yes | Yes | Yes |
| | 2 | 2 | Yes | Yes | Yes | Yes |
| | 3 | — | Yes | — | Yes | — |
| Voltage tap for electronics = outgoing side of the main conducting paths | 0 | 0 | Yes | Yes | No | No |
| | 1 | 1 | Yes | No | Yes | Relay returns to the deenergized state (closed-circuit principle) |
| | 2 | 2 | No | No | Relay returns to the deenergized state (closed-circuit principle) | |
| | 3 | — | No | — | Relay returns to the deenergized state | |

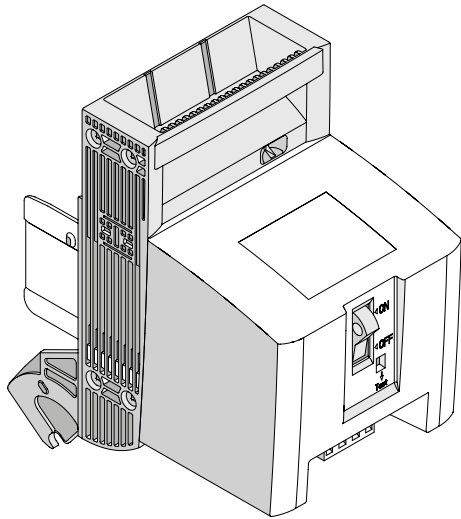
1) AC \triangleq EFM 10/20

2) DC \triangleq EFM 25

6.4 Mechanical fuse monitoring

Mechanical fuse monitoring MFM - overview

Mechanical fuse monitoring (sizes 00 to 3) is implemented with a SIRIUS circuit breaker. The circuit breaker is mounted on the handle unit of the 3NP1 fuse switch disconnecter and wired in the factory.



Possible areas of application for the MFM

The MFM is used in AC systems up to U_{in} 690 V and DC systems up to U_{in} 440 V.



Fuse monitoring by means of SIRIUS circuit breakers is not permissible in branch circuits with circuit breakers in which DC regeneration with a voltage > 220 V DC can occur in the event of a fault.

Principle of the MFM

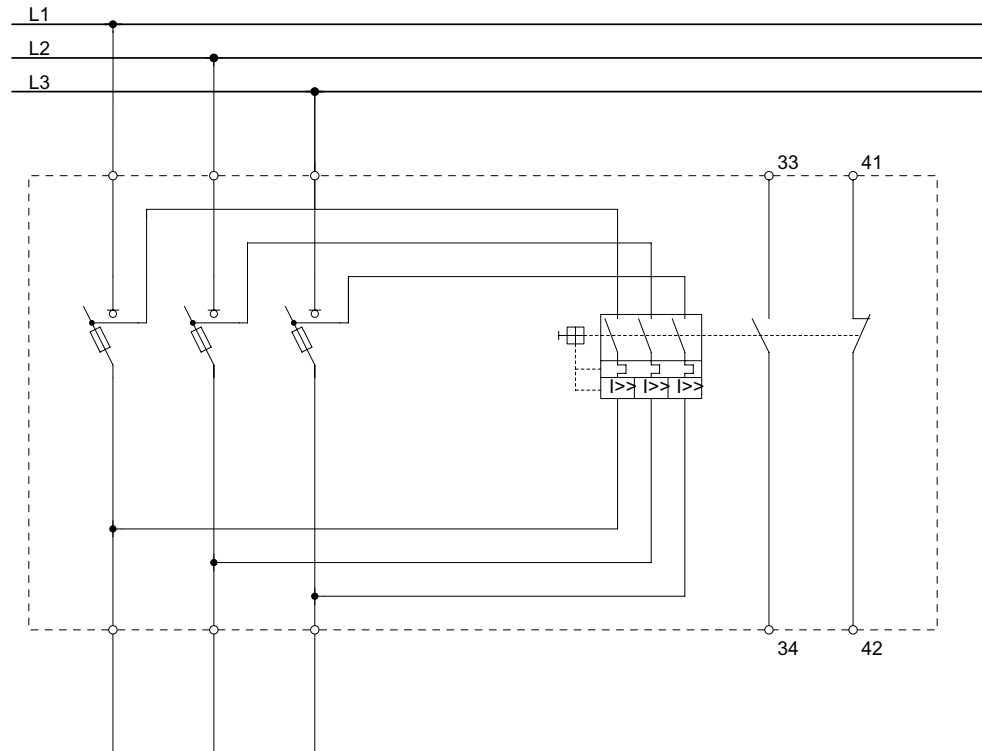
When the handle unit is closed, the three conducting paths of the SIRIUS circuit breaker are connected in parallel with the fuse links to be monitored.

When the handle unit is open, all the main conducting paths of the circuit breaker are deenergized. The internal resistance of the circuit breaker has a high rated value to prevent any impairment to the protection of the monitored fuse links.

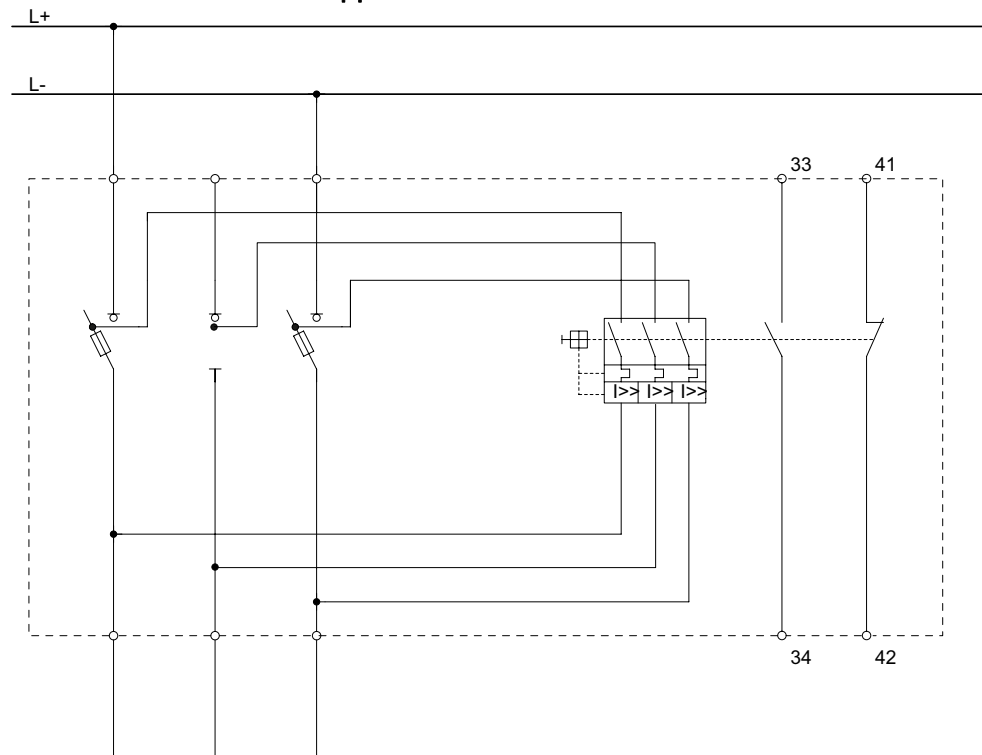
The circuit breaker trips if a fuse melts due to overloading.

The auxiliary switch of the circuit breaker is required for an alarm or to disconnect the main circuit, e.g. by means of a contactor.

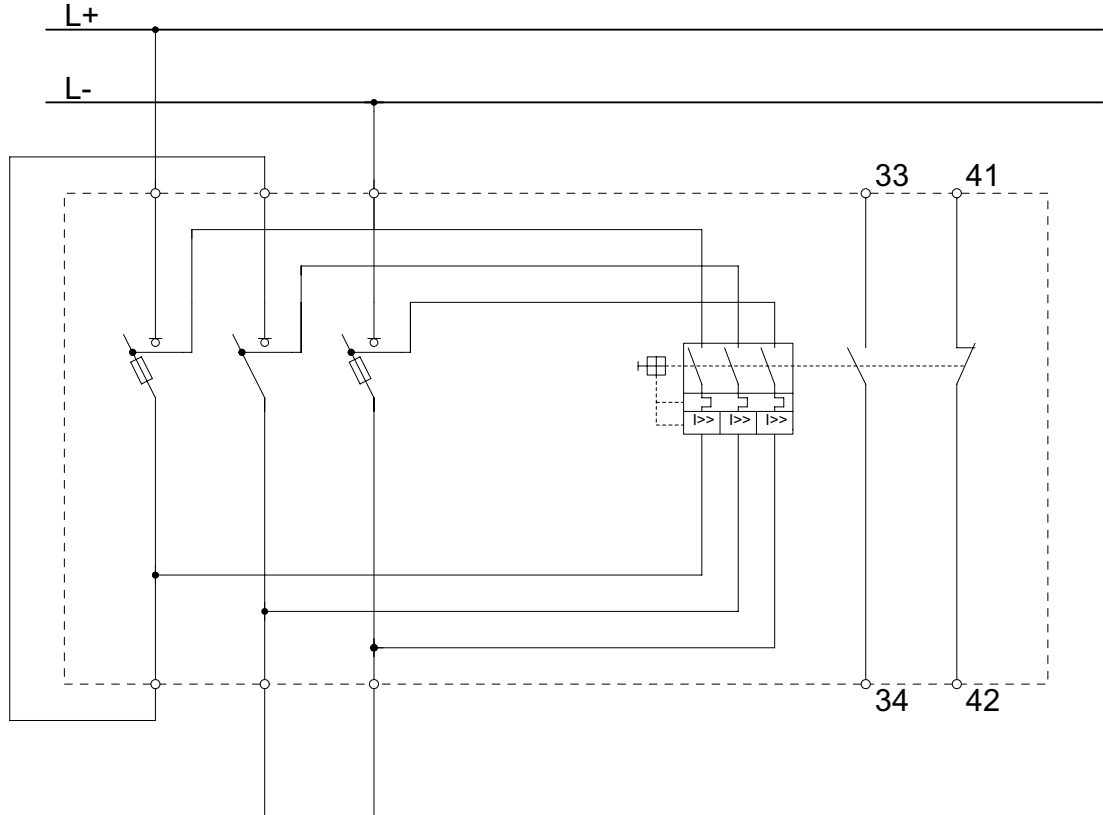
Circuit diagram of the MFM for AC applications



Circuit diagram of the MFM for 240 V DC applications

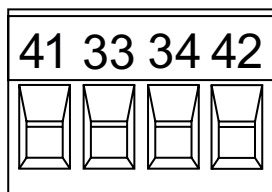


Circuit diagram of the MFM for 440 V DC applications



Connection of external signal lines to the MFM

The external signal lines are connected to the 4-pole connector:



Mounting and installation

7.1 Mounting position of the 3NP1 fuse switch disconnecter (all frame sizes)

Mounting position of the fuse switch disconnecter, taking size 00 as an example

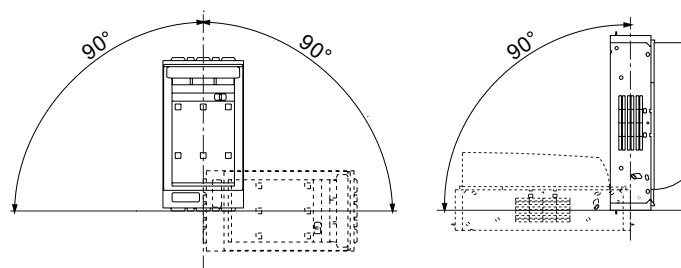


Figure 7-1 Mounting position, size 00

7.2 Approved circuits

The following circuits are approved:

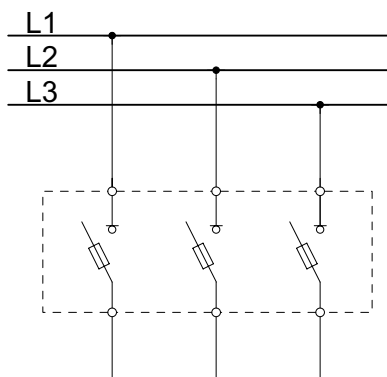


Figure 7-2 Circuit diagram for AC applications

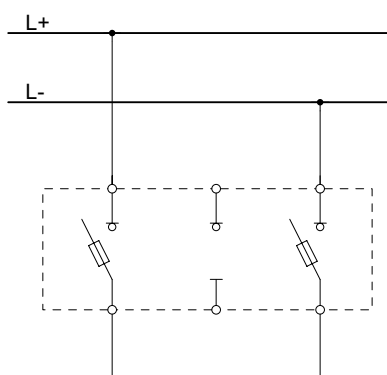


Figure 7-3 Circuit diagram for 220 V / 240 V DC applications

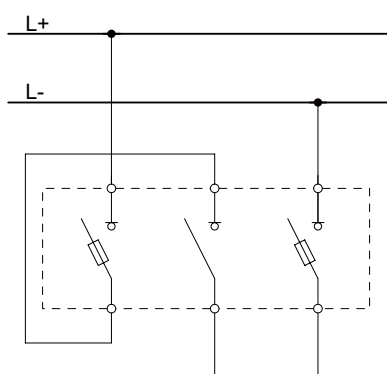


Figure 7-4 Circuit diagram for 440 V DC applications (floor mounting only)

7.3 Mounting onto standard rails

Mounting the 3NP1 fuse switch disconnecter onto standard rails

You can upgrade sizes 000, 00, or 1 with accessories for mounting onto standard rails as follows:

| Frame size | 000 | 00 | 1 |
|--|-----|----|---|
| Mounting onto 1 standard rail | X | — | — |
| Mounting between 2 standard rails 125 mm apart | — | X | X |
| Mounting between 2 standard rails 150 mm apart | — | X | X |

Mounting the fuse switch disconnecter, size 000 onto standard rail

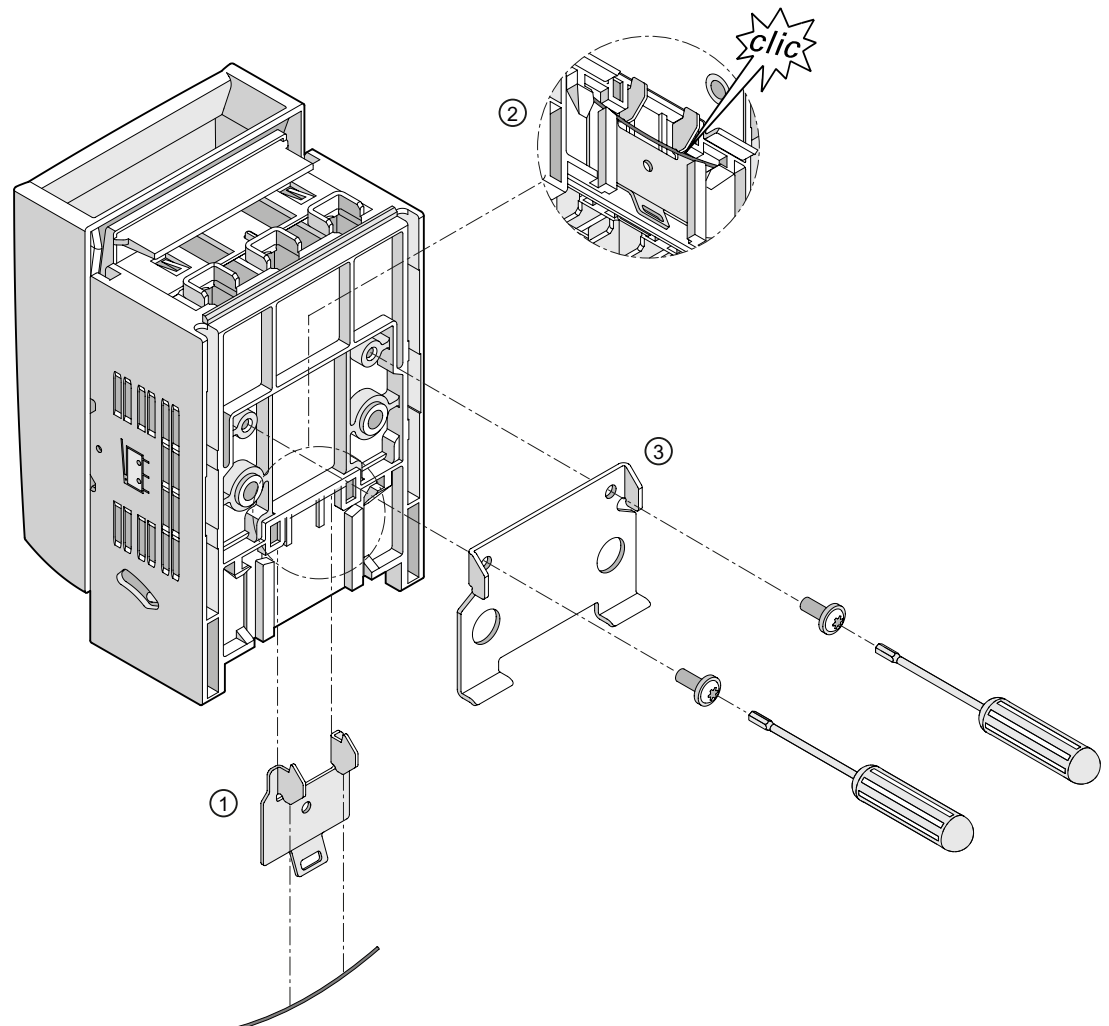


Figure 7-5 Mounting the fuse switch disconnecter, size 000 onto a standard rail (1)

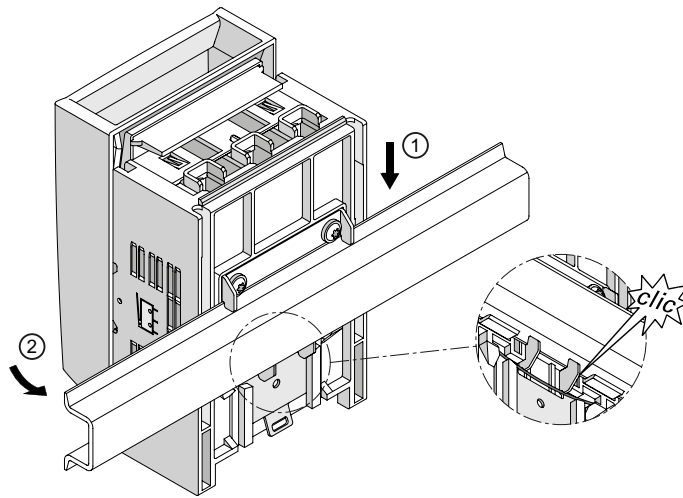


Figure 7-6 Mounting the fuse switch disconnecter, size 000 onto a standard rail (2)

Dismantling the fuse switch disconnecter, size 000, from a standard rail

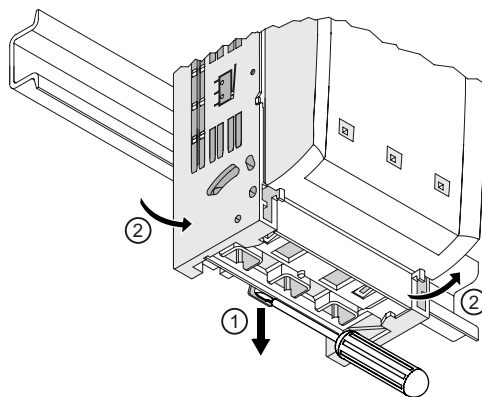


Figure 7-7 Dismantling the fuse switch disconnecter, size 000, from a standard rail

Mounting the fuse switch disconnecter, sizes 00 and 1 onto a standard rail

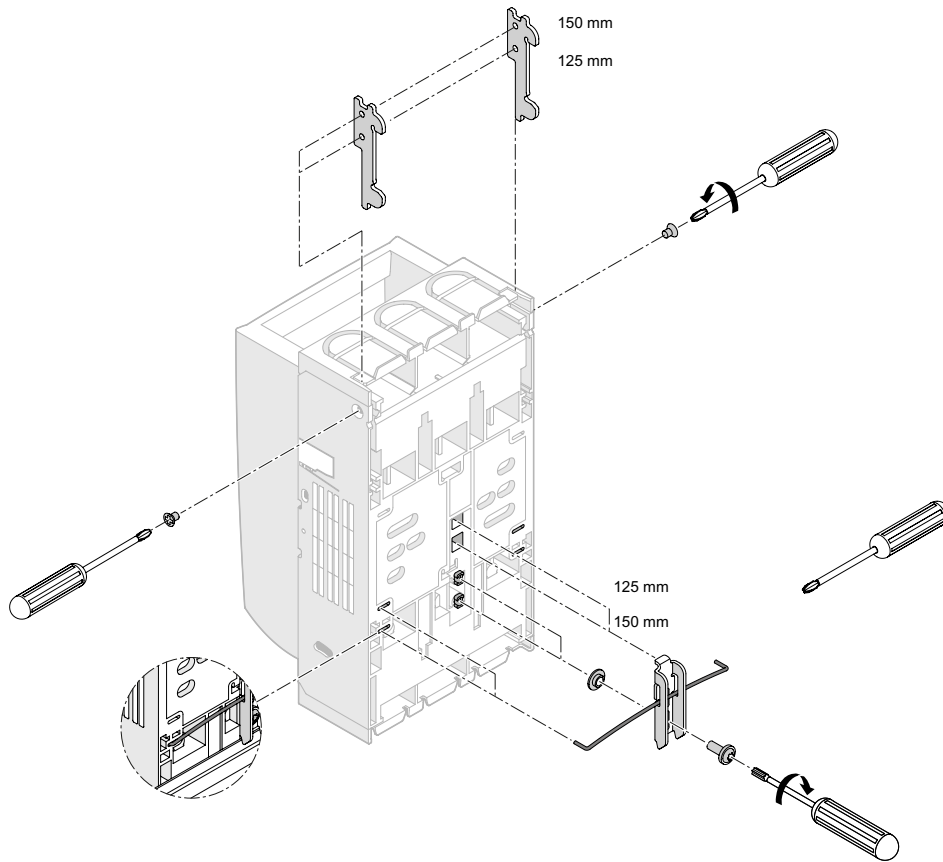


Figure 7-8 Mounting the fuse switch disconnecter, sizes 00 and 1 onto a standard rail (1)

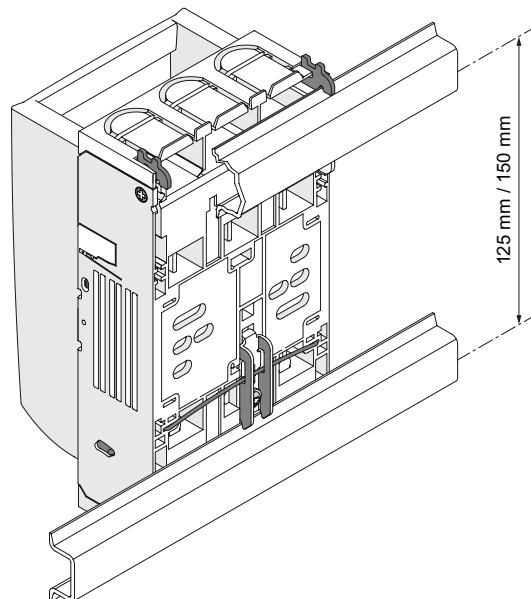


Figure 7-9 Mounting the fuse switch disconnecter, sizes 00 and 1 onto a standard rail (2)

Dismantling the fuse switch disconnecter, sizes 00 and 1

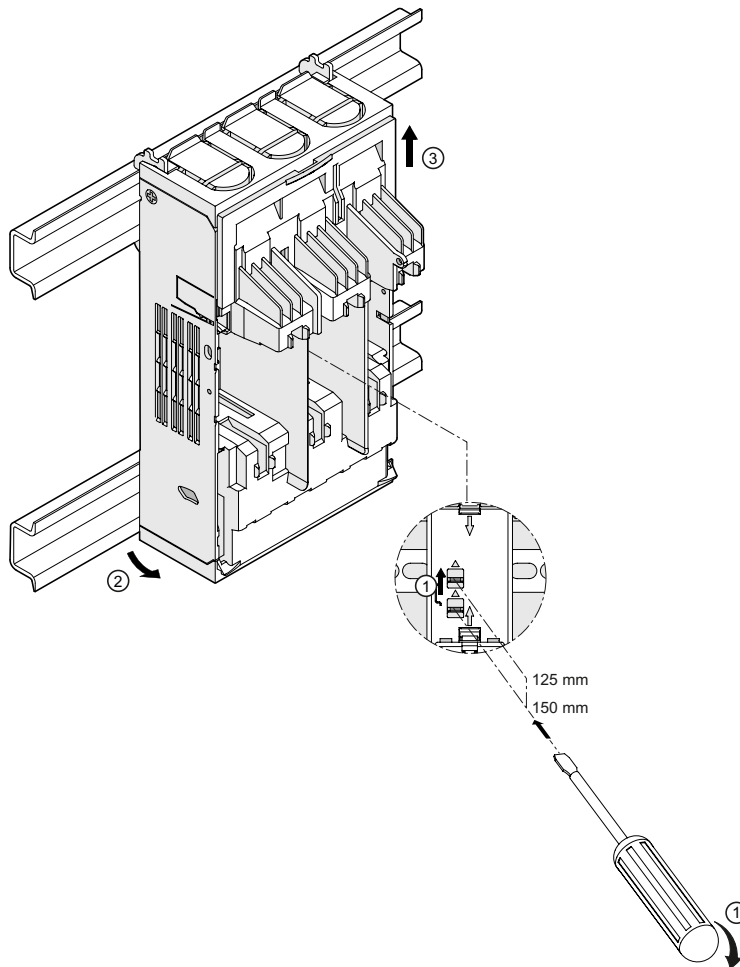


Figure 7-10 Dismantling the fuse switch disconnecter, sizes 00 and 1 from a standard rail

The TH35-15 rail type to DIN EN 60715 is recommended (and preferred) for mounting onto standard rails.

CAUTION

Mounting onto TH35-7.5 type standard rails is not permissible!

CAUTION

The device must audibly snap onto the standard rail when mounted, to prevent it from being inadvertently loosened or turned.



WARNING

The cantilever length of the standard rail between 2 fixing points must not exceed 250 mm when the device is mounted owing to the bending moments that occur when the switch is actuated!

7.4 Installation of the auxiliary switches

Purpose of the auxiliary switches

Auxiliary switches can be mounted as follows in accordance with IEC 60947-3:

- Size 000: "Leading" only
- Sizes 00, 1, 2, and 3: "Leading" or "lagging / simultaneously".

Refer to chapter "Functions, operation: Auxiliary switches - purpose, number and settings of the switching instant".

Installing the auxiliary switch, size 000

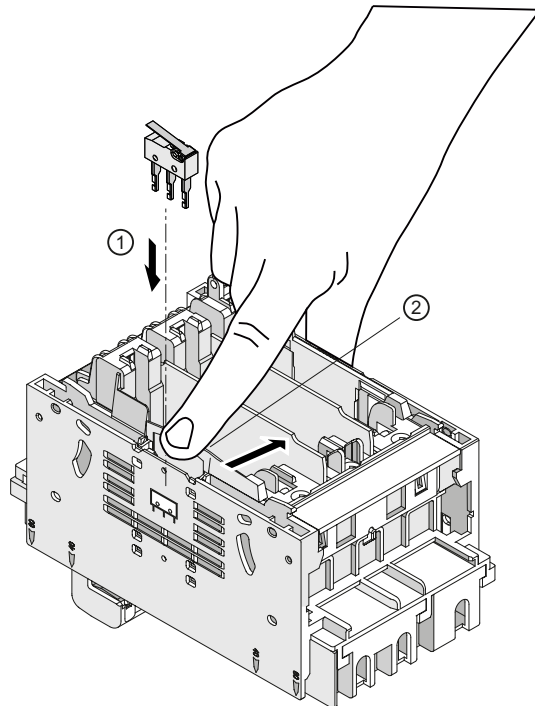


Figure 7-11 Installing the auxiliary switch, size 000 (1)

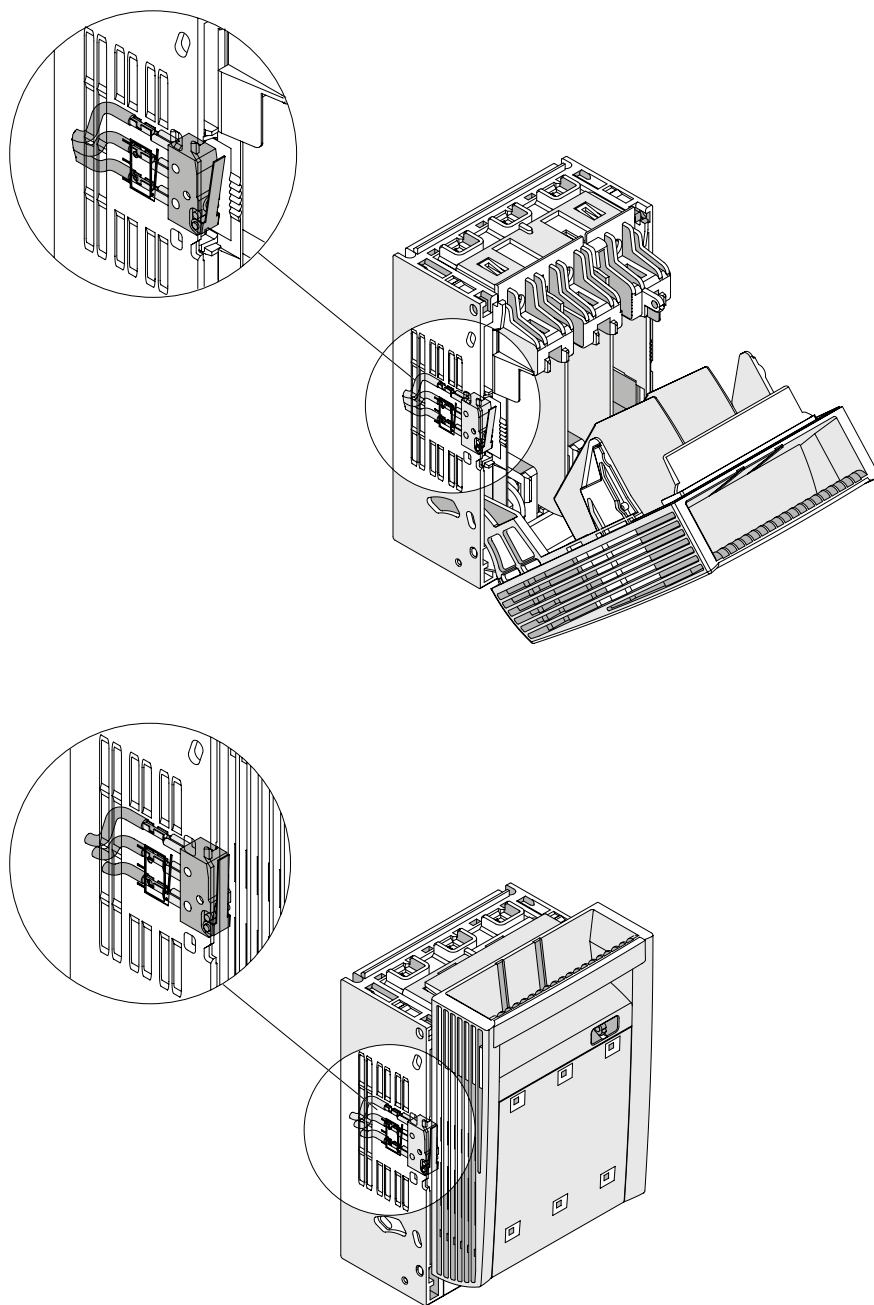


Figure 7-12 Installing the auxiliary switch, size 000 (2)

Installing the auxiliary switch, size 00

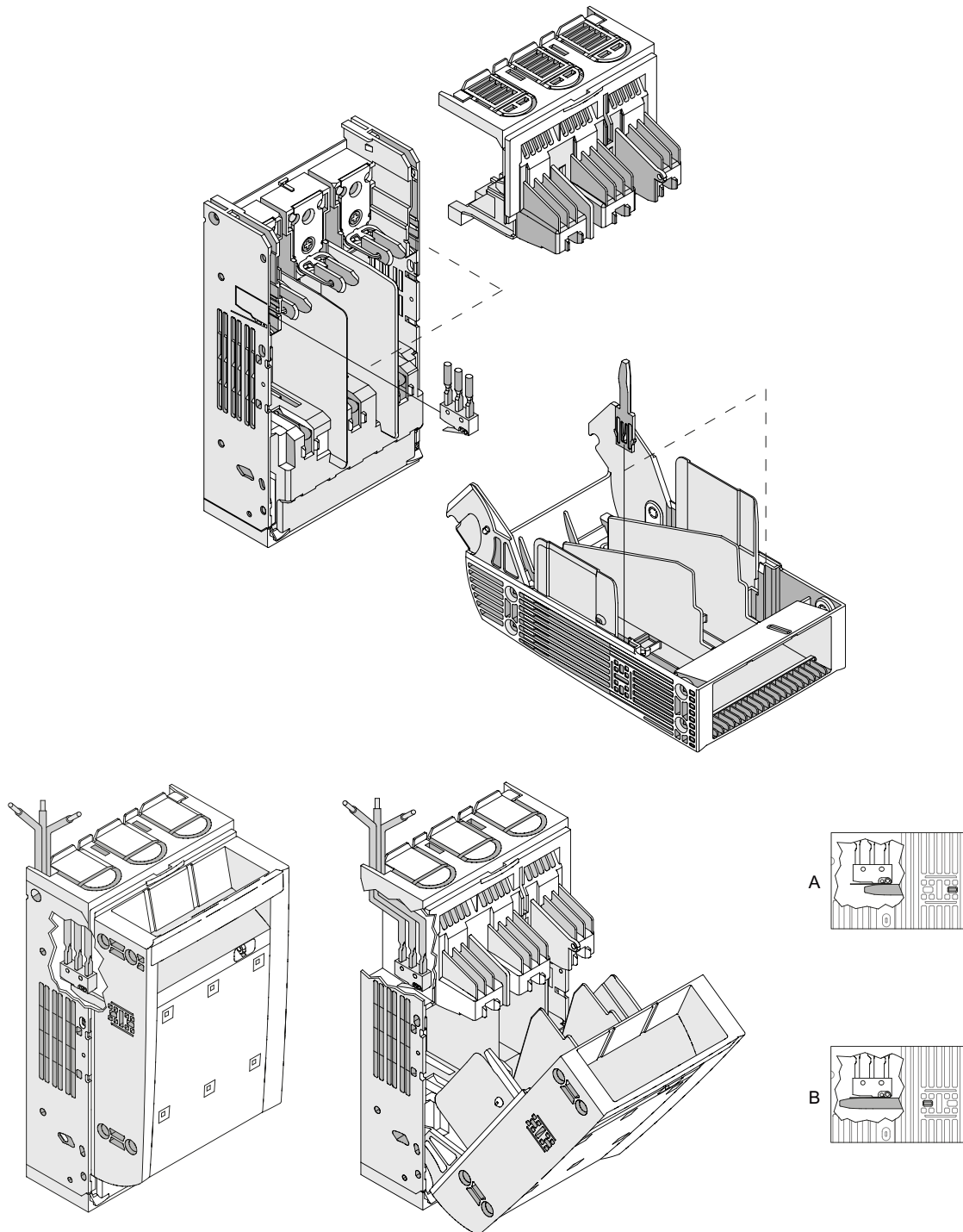


Figure 7-13 Installing the auxiliary switch, size 00

| | |
|---|--------------------------|
| A | Leading |
| B | Lagging / simultaneously |

Installing the auxiliary switch, sizes 1, 2, 3

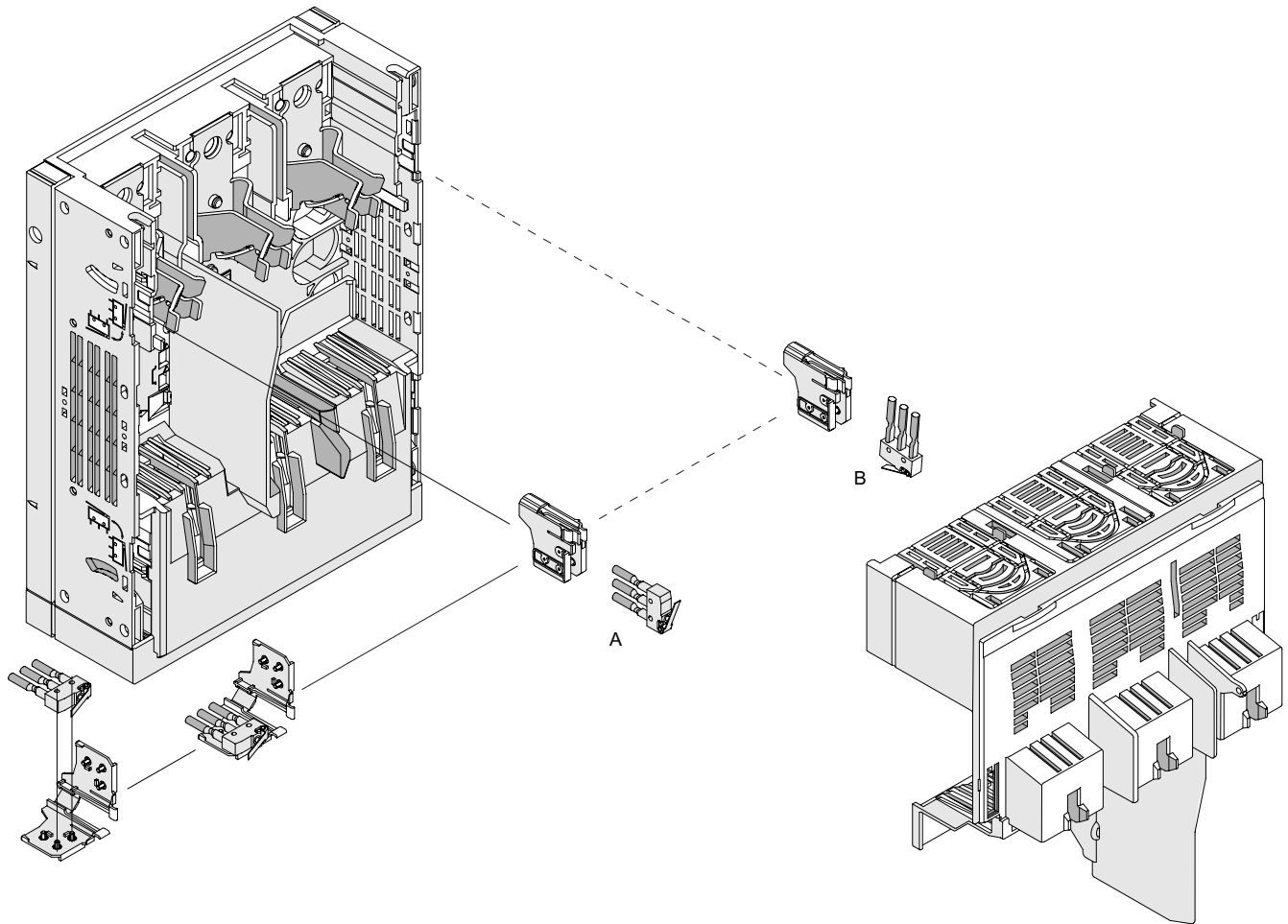


Figure 7-14 Installing the auxiliary switch, sizes 1, 2 and 3

| | |
|---|--------------------------|
| A | Leading |
| B | Lagging / simultaneously |

7.5 Installing and removing the LV HRC fuses

Removing the fuses without contact

Fuse links can reach very high temperatures on melting. Removing them manually immediately after melting is almost impossible.

By operating the release shaft and tilting sideways, the fuse links drop out contactlessly.

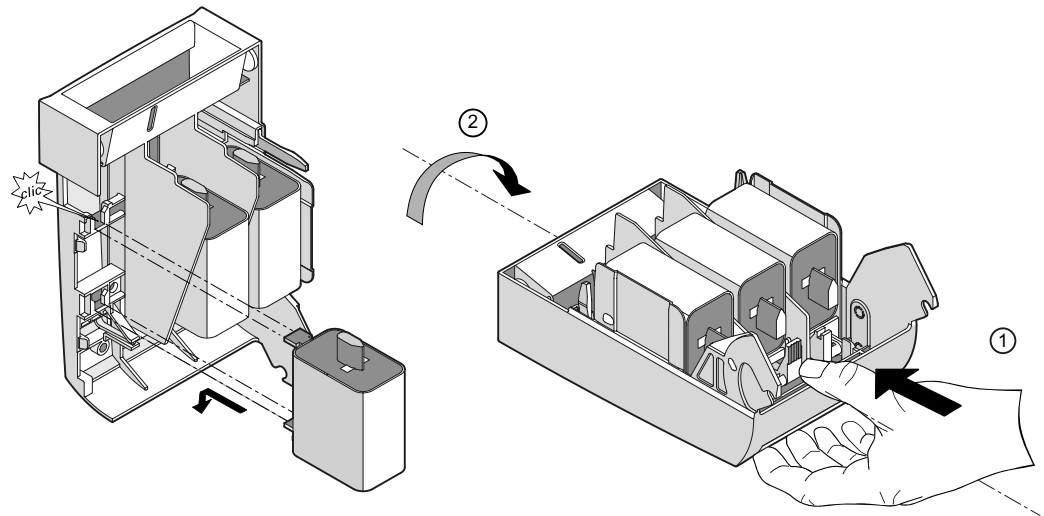


Figure 7-15 Installing and dismantling the fuses, sizes 000 and 00

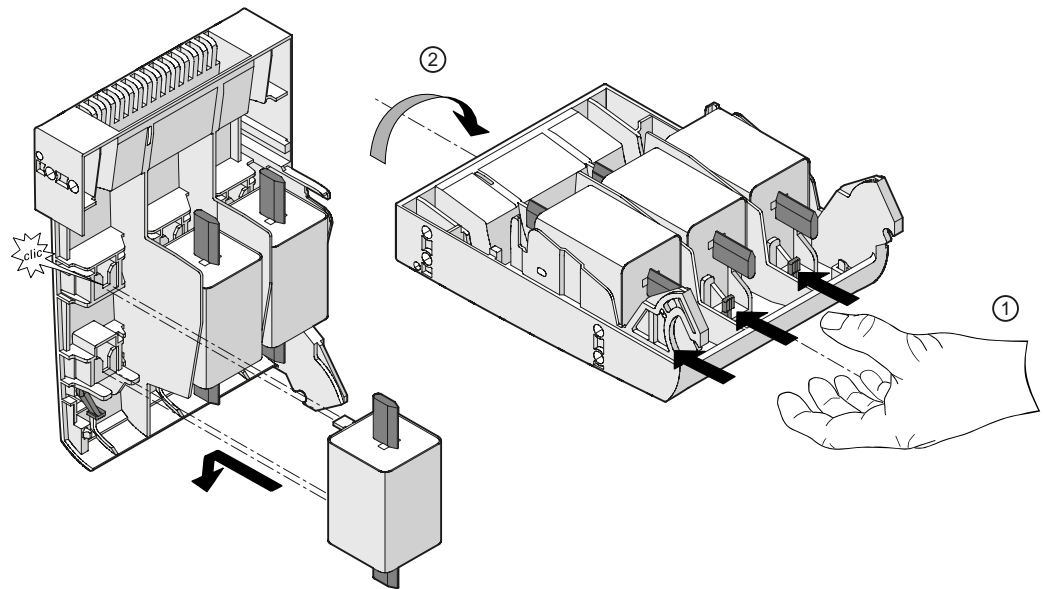


Figure 7-16 Installing and dismantling the fuses, sizes 1, 2, 3

7.6 Mounting onto and dismantling from a busbar system

Mounting onto a busbar system

General information

The following versions of the fuse switch disconnectors can be supplied for mounting onto a busbar system:

- Sizes 000 and 00 for a 40 mm busbar system
- All sizes for a 60 mm busbar system

Bars with a thickness of 5 mm or 10 mm, e.g. manufactured by Siemens, Rittal, Wöhner, or Jean Müller, can be used for both busbar systems. The devices can also be mounted onto special 1-section busbars (Rittal) or double / triple T-section busbars (Wöhner).

Mounting onto and dismantling from a busbar system, sizes 000 and 00

In the delivery condition, the fuse switch disconnector is adjusted for busbars with a thickness of 5 mm. To convert it to a 10 mm busbar, the terminal contacts must be shifted with a screwdriver as shown below.

| |
|--|
| NOTICE |
| The fuse switch disconnector must audibly snap onto the busbar, to prevent it from being inadvertently loosened or turned. |



7.6 Mounting onto and dismantling from a busbar system

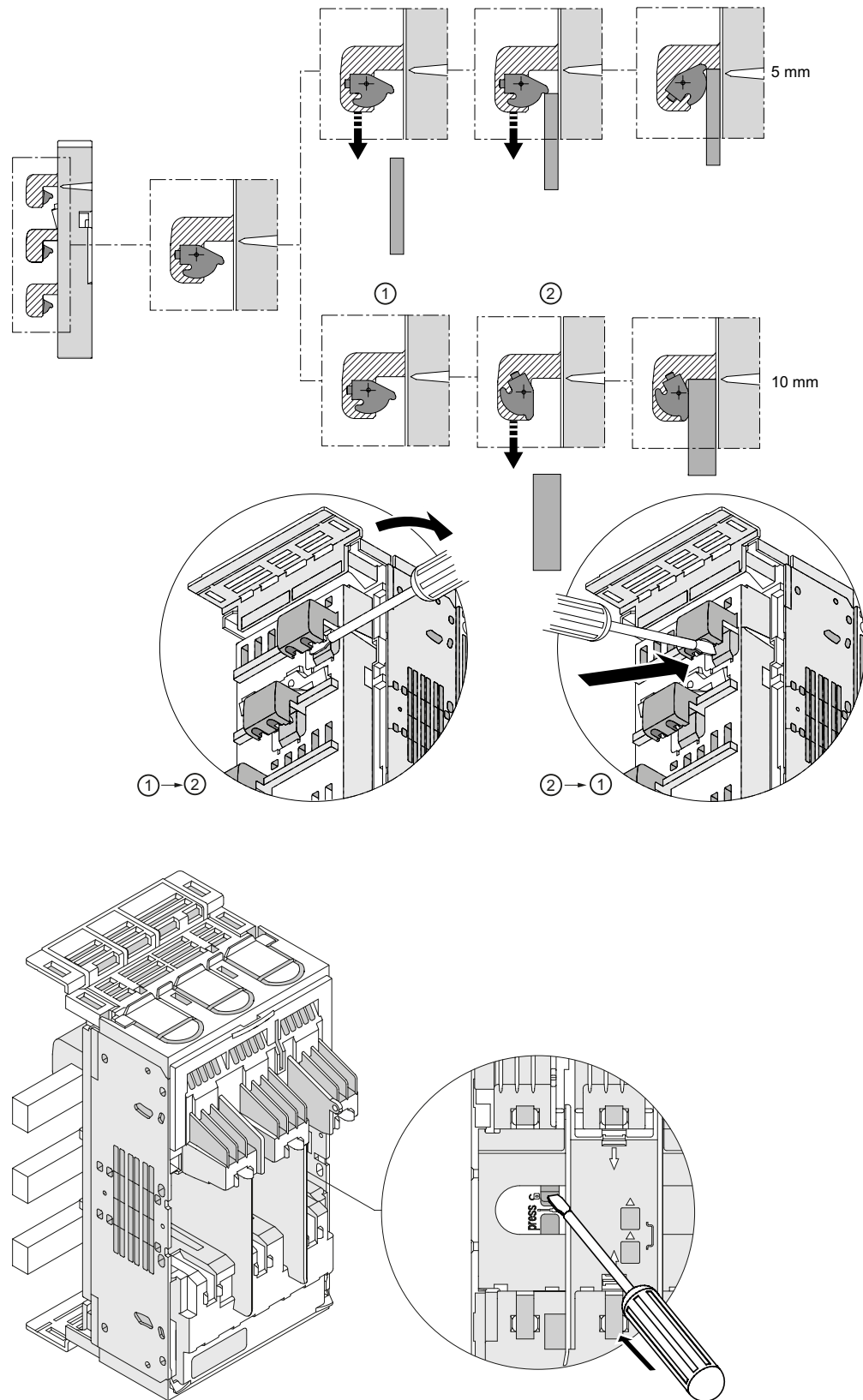


Figure 7-17 Mounting onto and dismantling from a busbar system, sizes 000 and 00

Mounting onto and dismantling from a busbar system, sizes 1, 2, and 3

NOTICE

It may be necessary to shorten the reach-round protection (Siemens standard reach-round protection with knockout openings) for installation in certain busbar system environments (refer also to "Knockout openings").

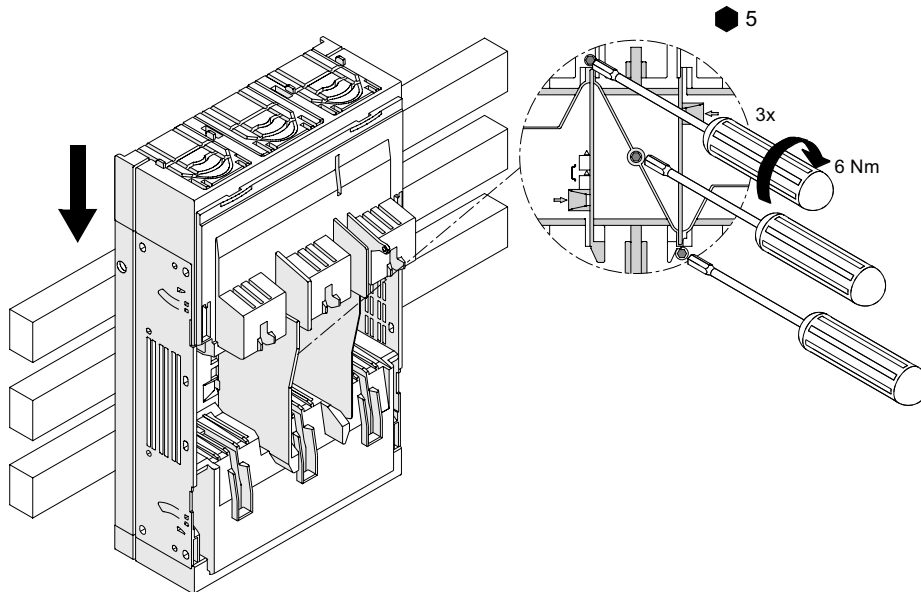


Figure 7-18 Mounting onto and dismantling from a busbar system, sizes 1, 2, and 3

⚠ WARNING

The device must be tightly screwed to the busbars. The specified tightening torque (6 Nm) must be complied with!

Dismantling from a busbar system, sizes 1, 2, and 3

Follow the procedure described above for sizes 000 and 00.

7.7 Conversion options for the cable outlet

Conversion options for the cable outlet

All busbar devices are supplied with the cable outlet on the bottom.

Mount the parts removed previously in reverse order without changing their orientation.

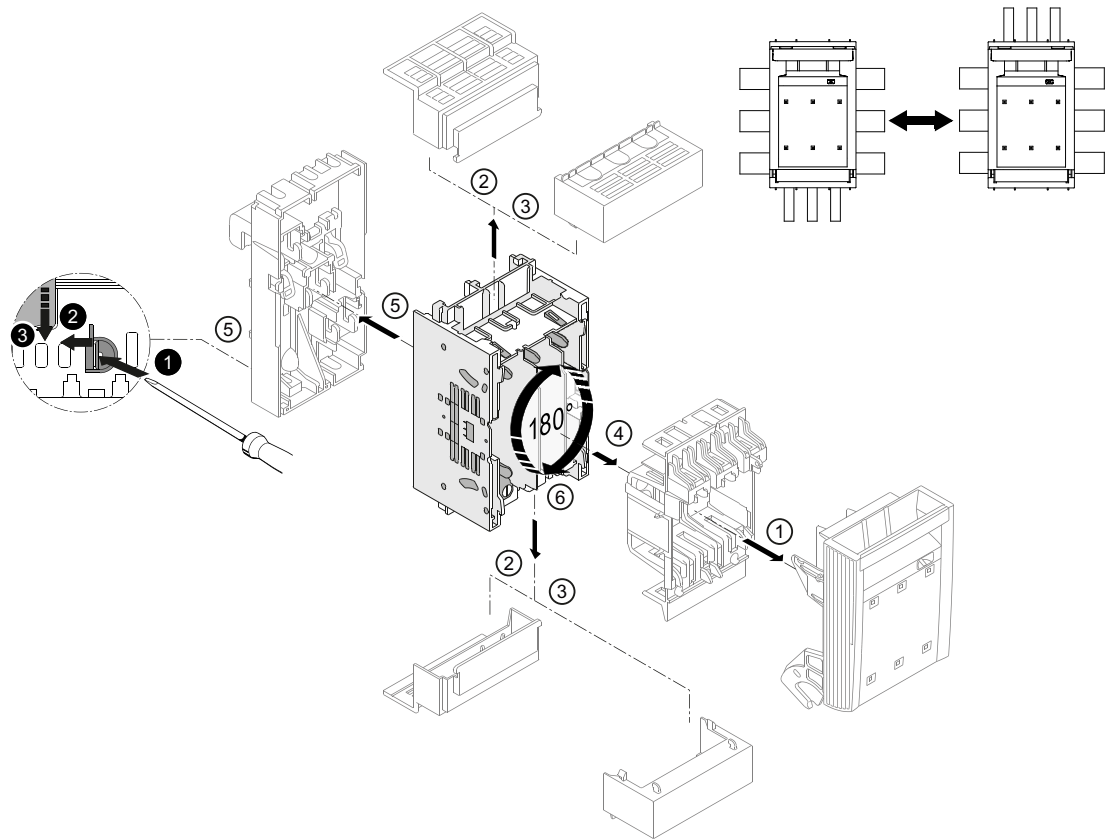


Figure 7-19 Converting the cable outlet, size 000

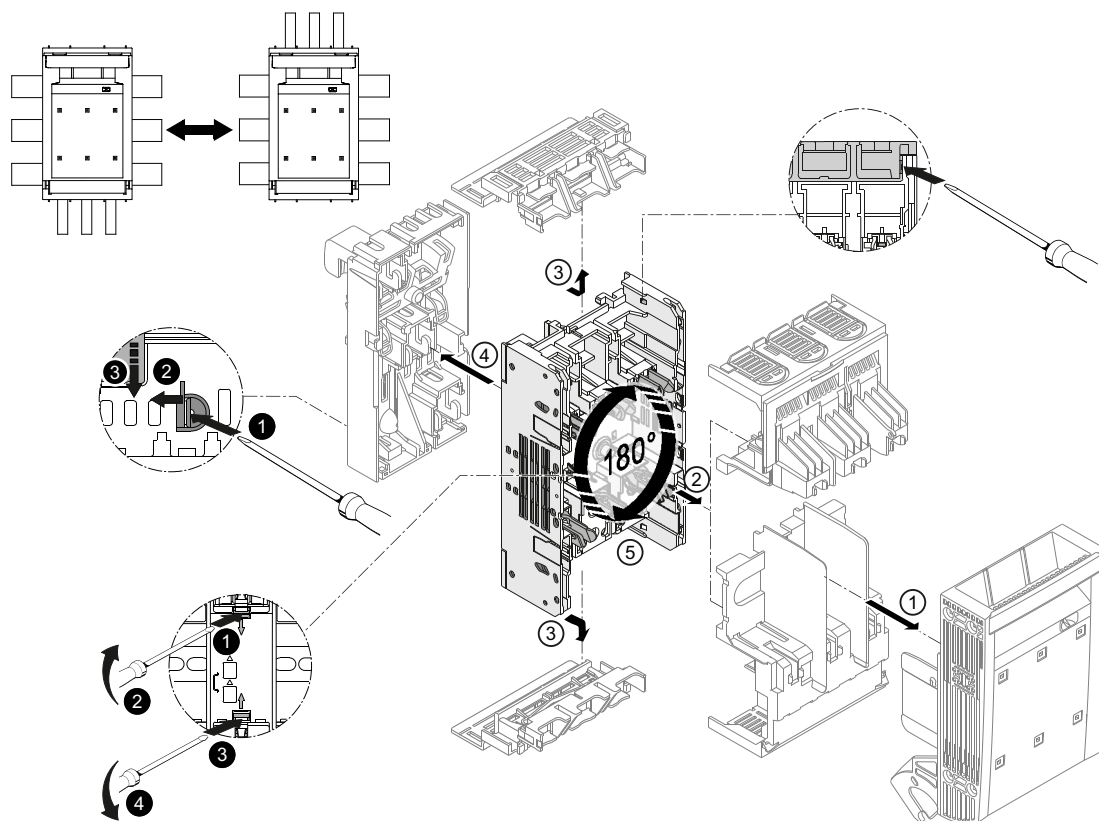


Figure 7-20 Converting the cable outlet, size 00

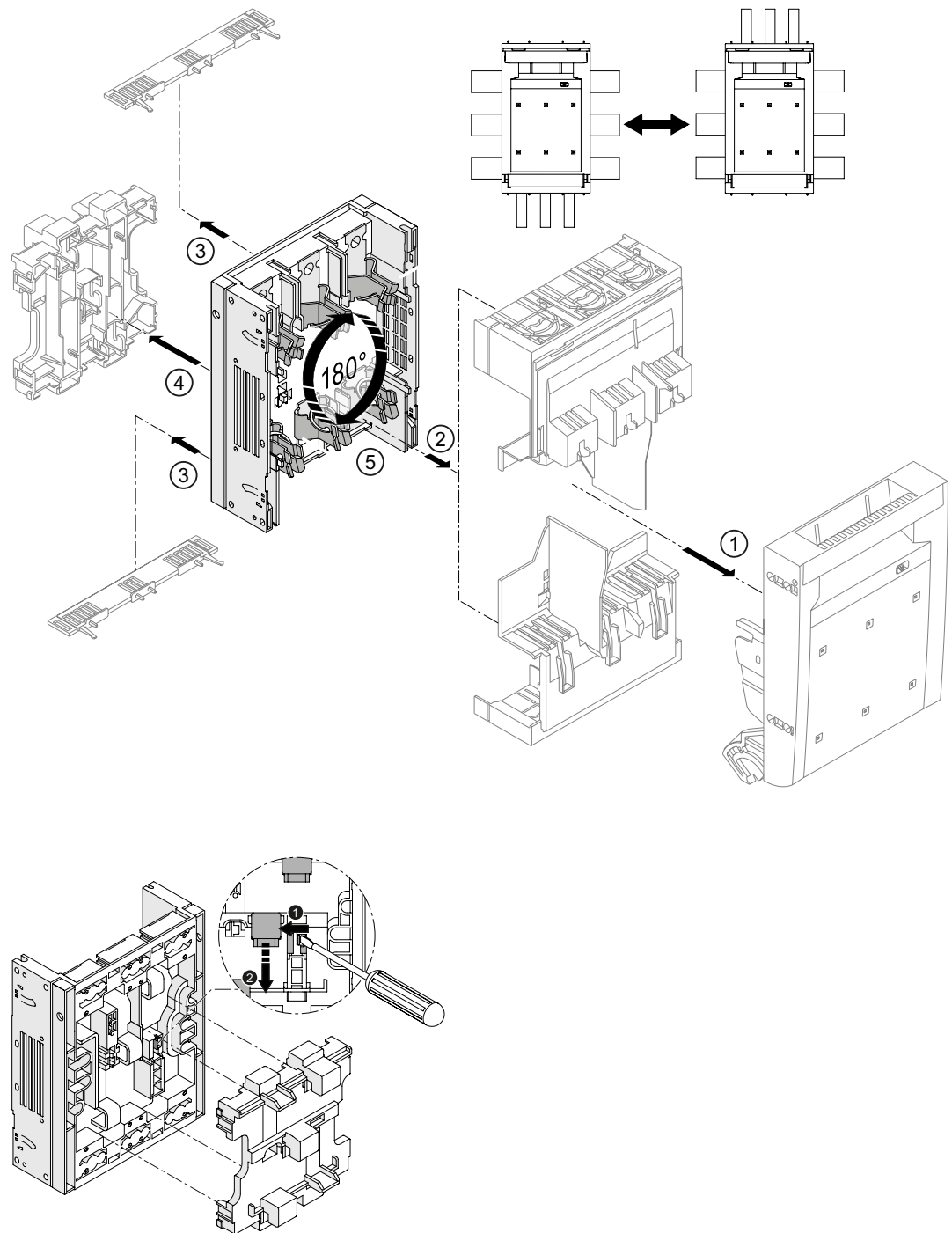


Figure 7-21 Installing the cable outlet, sizes 1, 2, 3

7.8 Locking the 3NP1 fuse switch disconnecter

Locking the 3NP1 fuse switch disconnecter

Refer to Chapter 6.2 "Locking device".

7.9 Knockout openings

Knockout openings for voltage testing with a test probe

These six knockout openings are provided for testing whether or not the fuses are live using the test probe of a measuring instrument.

CAUTION

The IP40 degree of protection in front of the window is reduced to IP30 if the knockouts are removed.

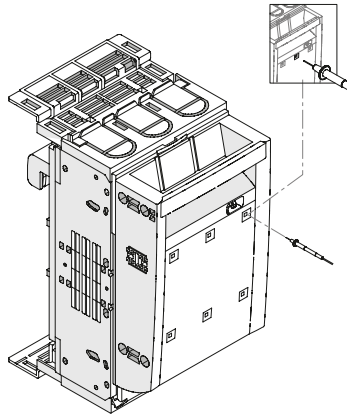


Figure 7-22 Knockout openings for voltage testing with a test probe, taking size 00 as an example

Knockout openings for system installation

Knockout opening for the "shortest device"

Only provided on size 00 fuse switch disconnectors in conjunction with floor mounting and box terminals (most compact version)

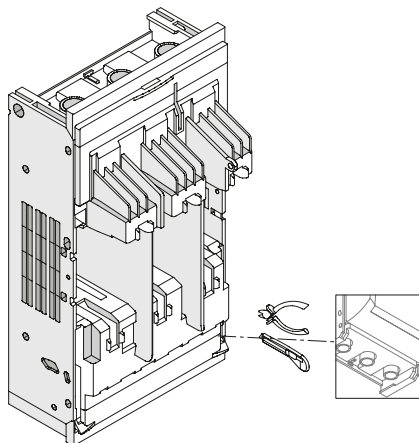


Figure 7-23 Knockout opening for the "shortest device" (size 00 only)

Knockout opening for "top mounting of busbar holders"

- For top-mounted busbar holders when the device is mounted onto a busbar system
- Only available for the Siemens system cover

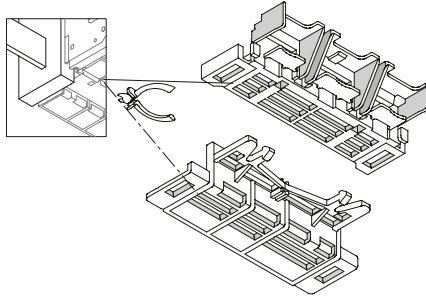


Figure 7-24 Knockout opening for "top mounting", size 00

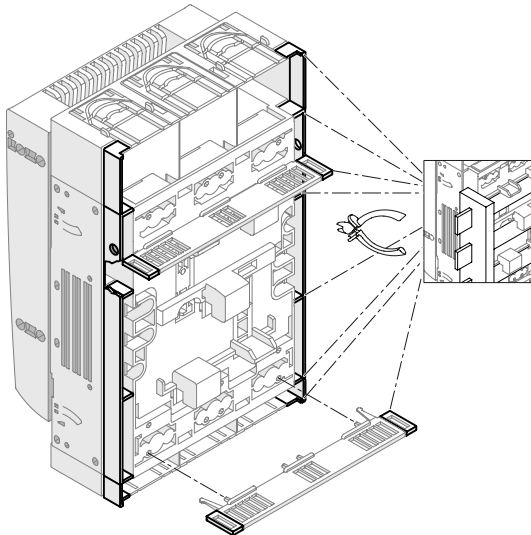
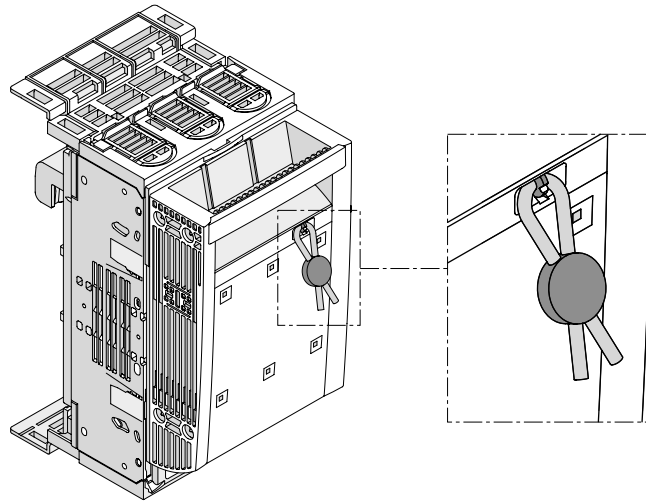


Figure 7-25 Knockout openings for "top mounting", sizes 1, 2, and 3

7.10 Sealing the fuse switch disconnect

Protection against unauthorized opening by means of a seal

Seal the fuse switch disconnect as shown below. Sealing wires with a maximum diameter of 2.5 mm² can be used for this purpose.



Connection, wiring

8.1 Uncovering the cable connections

The cable connections for the various frame sizes are uncovered as follows:

Size 000

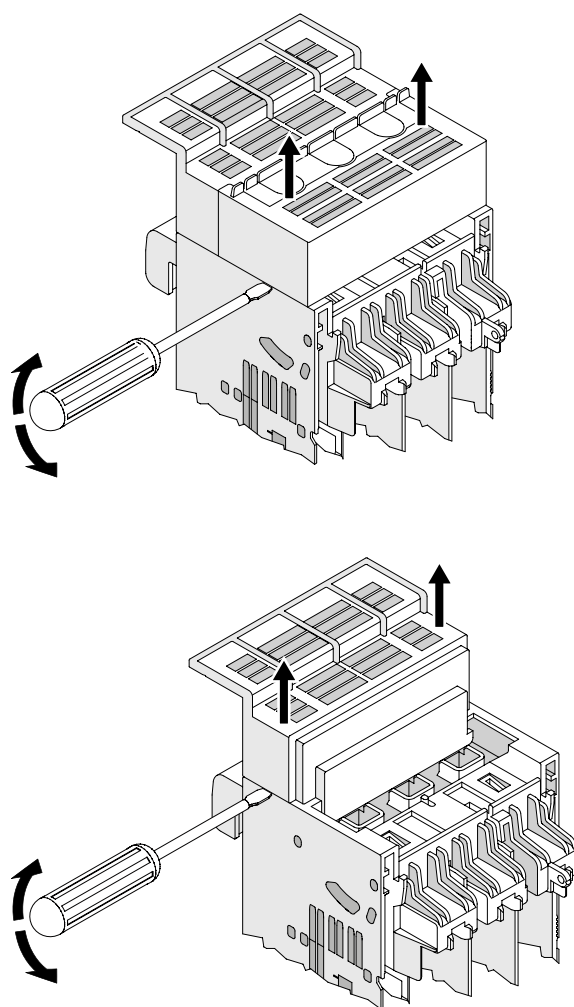


Figure 8-1 Removing the cable cover, size 000

Size 00

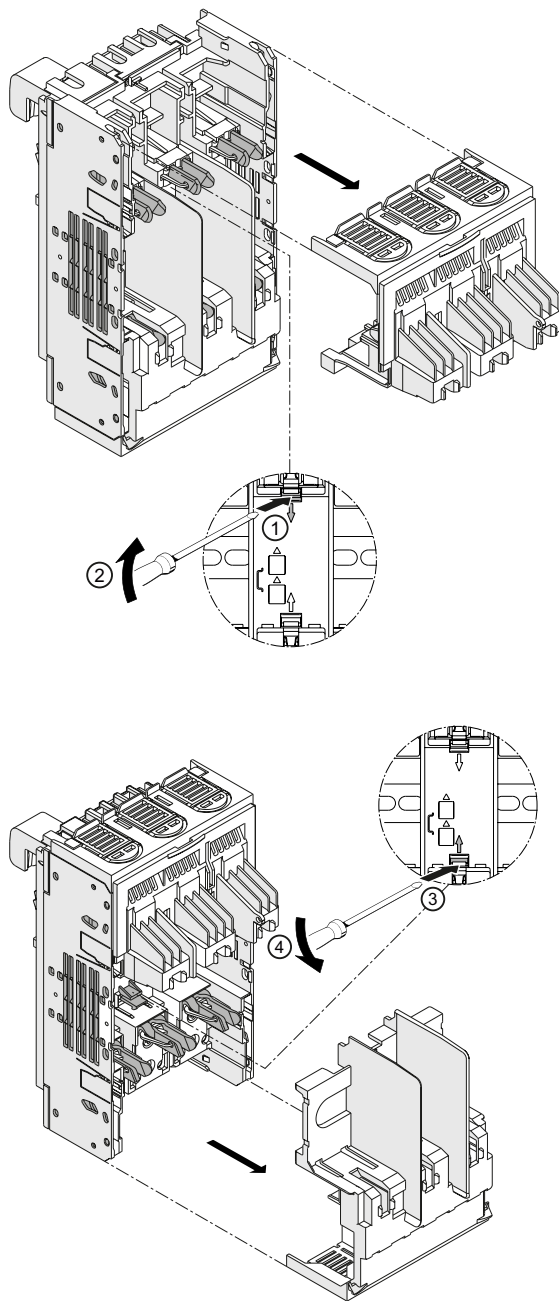


Figure 8-2 Removing the cable cover, size 00

Sizes 1, 2, 3

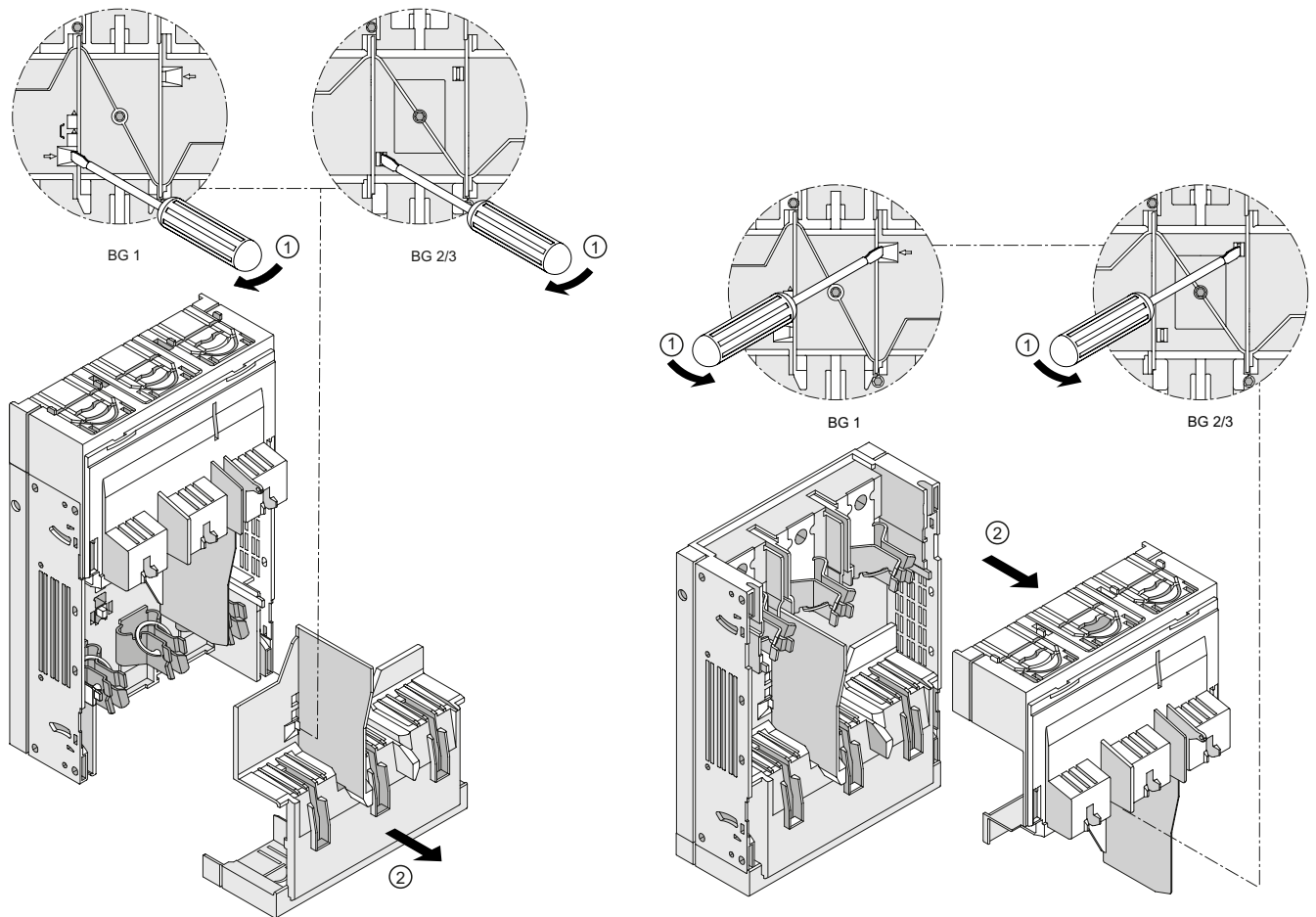
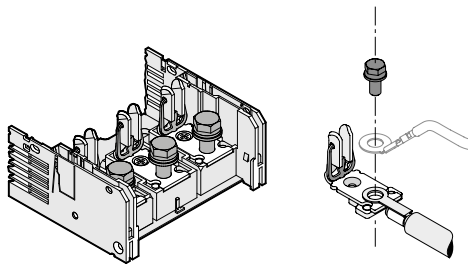


Figure 8-3 Removing the cable cover, sizes 1, 2, 3

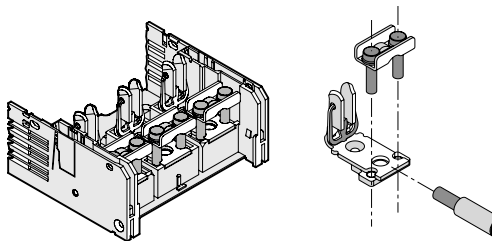
8.2 Connection types for the main and auxiliary conductors

The following connection types are available for the main and auxiliary conductors:

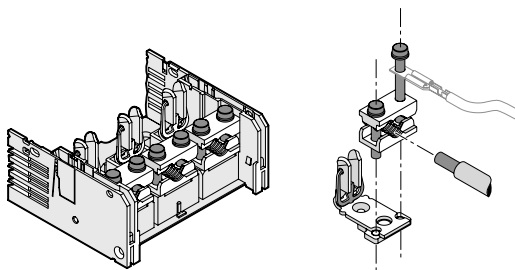
Blade terminal (all sizes except size 000)



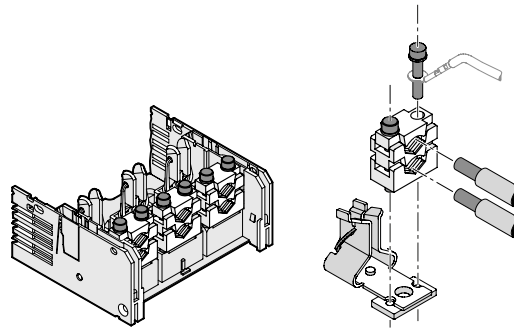
Saddle terminal (accessory for blade terminal)



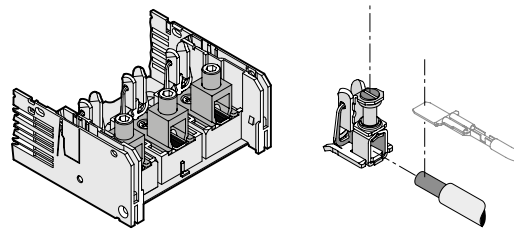
Prism terminal (accessory for blade terminal)



Double prism terminal (accessory for blade terminal, not size 00)



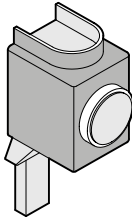
Box terminal (all sizes)



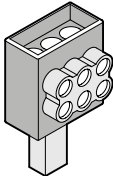
8.3 Connection accessories

Terminals

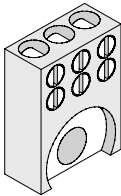
Supply terminal, size 000, 16 to 95 mm²



Triple terminal for mounting to box terminals, size 00 (max. 16 mm²)

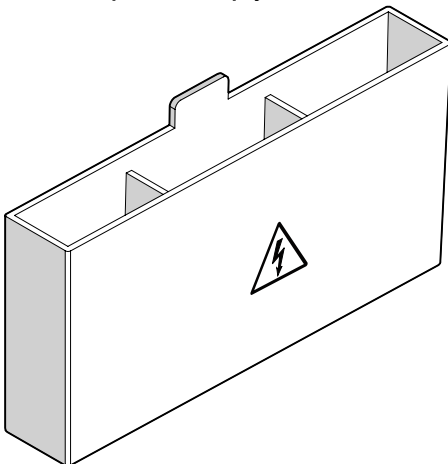


Triple terminal for mounting to blade terminal, size 00 (max. 16 mm²)

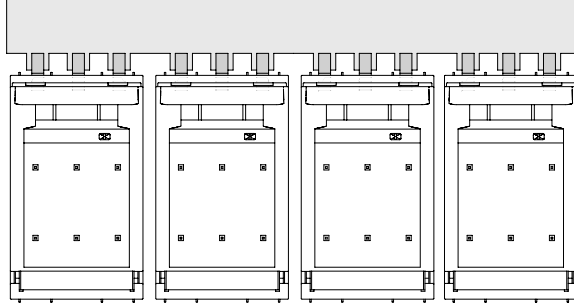


Other connection accessories

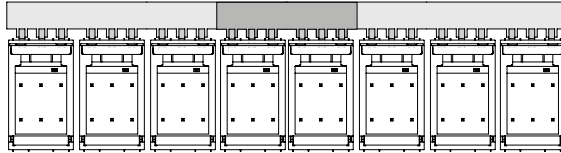
Cover cap for 1 empty location on a 3-phase busbar



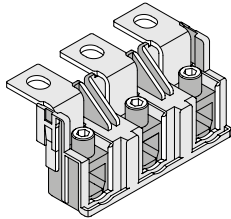
3-phase busbar, e.g. for connecting 4 fuse switch disconnectors



Link rail for 3-phase busbar



32 mm terminal module for 32 mm cover plane for size 00, blade terminal



8.4 Main conductor connection










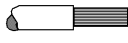
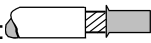
Main conductor connections for the various frame sizes

The connections of the main conductors for the various frame sizes are described below.

The following information is shown in table form:



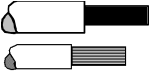
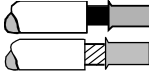



- Tool to be used
- Tightening torque range
- Permissible conductor cross-sections

The following symbols are used in the tables:

- Necessary tools: 
- Permissible tightening torque: 
- Allen key: 
- Hexagon socket head screw: 
- Phillips "PH" cross-tip screwdriver: 
- Pozidrive "PZ" cross-tip screwdriver: 
- Slotted screwdriver: 
- Solid without end sleeve: 
- Solid with end sleeve: 
- Finely stranded without end sleeve: 
- Finely stranded with end sleeve: 
- Layered conductors:

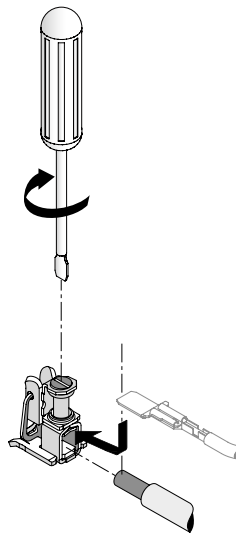


Main conductor connection, size 000

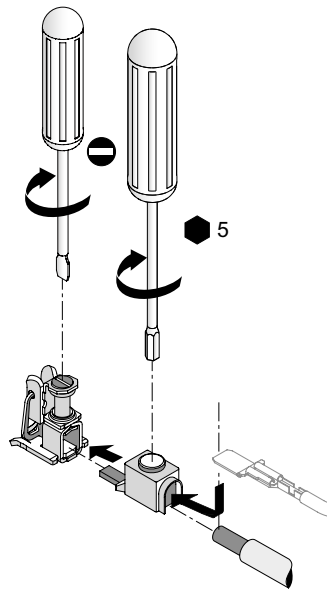
| Version | Necessary tools | Permissible tightening torque | Permissible conductor cross-section without end sleeve / with end sleeve / layered conductors | | |
|---------------|--|---|---|---|---|
| |  |  |  |  |  |
| 3NP1123-1..2. |  6 x 1 mm | 10 to 12 Nm | 1.5 to 50 mm ² | 1.5 to 35 mm ² | 8 mm x 8 mm |
| 3NP1923-1BD00 |  6 mm | 10 Nm | 16 to 95 mm ² | 16 to 95 mm ² | 10 mm x 8 mm |

WARNING

The cable should always be connected centrally on the 3NP11.3-1..20!














3NP1123-1..2.



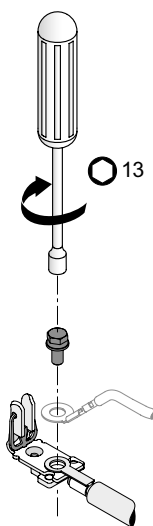
3NP1923-1BD00

Main conductor connection, size 00

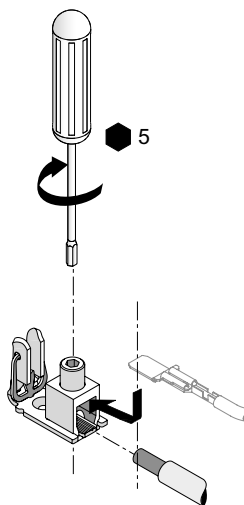
| Version | Necessary tools | Permissible tightening torque | Permissible conductor cross-section without end sleeve / with end sleeve / layered conductors | | |
|---------------|---|---|---|---|---|
| |  |  |  |  |  |
| 3NP1133-1..1. |  13 mm | 10 to 12 Nm | 2.5 to 95 mm ² | — | — |
| 3NP1133-1..2. |  5 mm | 10 Nm | 6 to 70 mm ² | 6 to 50 mm ² | 9 mm x 8 mm |
| 3NP1933-1BA00 |  PH2 | 2.6 Nm | 1.5 to 70 mm ² | 1.5 to 70 mm ² | 10 mm x 13 mm |
| 3NP1933-1BB10 |  PZ2 | 2.6 Nm | 16 to 95 mm ² | 16 to 95 mm ² | 10 mm x 13 mm |
| 3NP1933-1BC00 |  13 mm | 10 to 12 Nm | 6 to 70 mm ² | 6 to 50 mm ² | 9 mm x 8 mm |
| |  5 mm | 10 Nm | | | |

WARNING

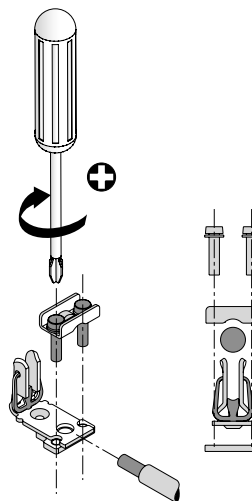
The cable should always be connected centrally on the 3NP11.3-1..20!



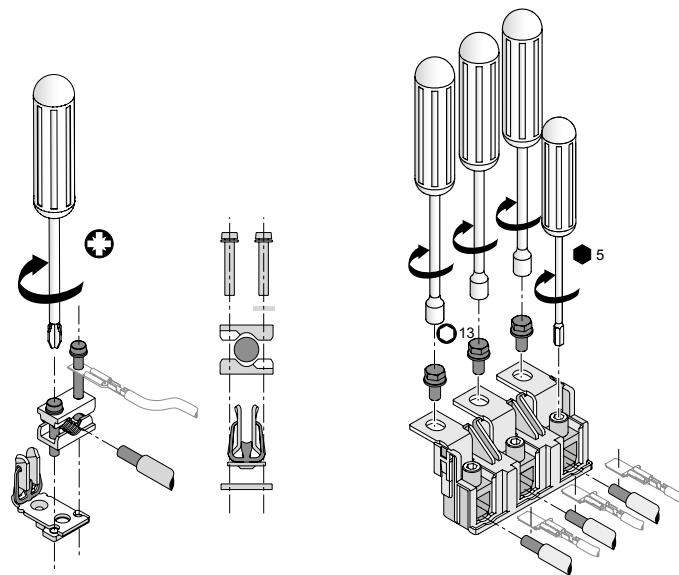
3NP1133-1..1.



3NP1133-1..2.



3NP1933-1BA00



3NP1933-1BB10

3NP1933-1BC00

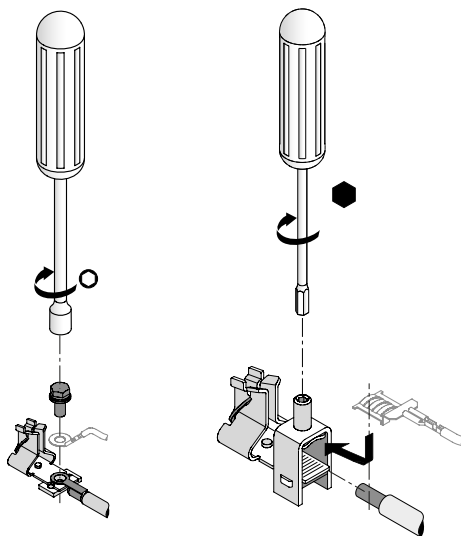
Main and auxiliary conductor connections, sizes 1, 2, and 3

| Version | Necessary tools | Permissible tightening torque | Permissible conductor cross-section without end sleeve / with end sleeve / layered conductors | | Auxiliary conductor connection |
|------------------|-----------------|-------------------------------|---|---|--------------------------------|
| | | | | | |
| 3NP1143-1..10 | 17 mm | 10 to 12 Nm | 16 to 150 mm ² | — | 3NP1943-1BG10 |
| 3NP1153-1..10... | 17 mm | 10 to 12 Nm | 25 to 240 mm ² | — | 3NP1943-1BG10 |
| 3NP1163-1..10 | 17 mm | 10 to 12 Nm | 50 to 300 mm ² | — | 3NP1943-1BG10 |
| 3NP1143-1..20... | 5 mm | 10 Nm | 70 to 185 mm ² | — | 10 mm x 20 mm 3NP1943-1BG40 |
| 3NP1153-1..20 | 8 mm | 25 Nm | 120 to 300 mm ² | — | 10 mm x 32 mm 3NP1953-1BG40 |
| 3NP1163-1..20 | 8 mm | 25 Nm | 120 to 300 mm ² | — | 20 mm x 32 mm 3NP1953-1BG40 |

WARNING

The cable should always be connected centrally on the 3NP11.3-1..20!

8.4 Main conductor connection



3NP1143-1..1.




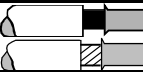
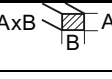









3NP1153-1..1.

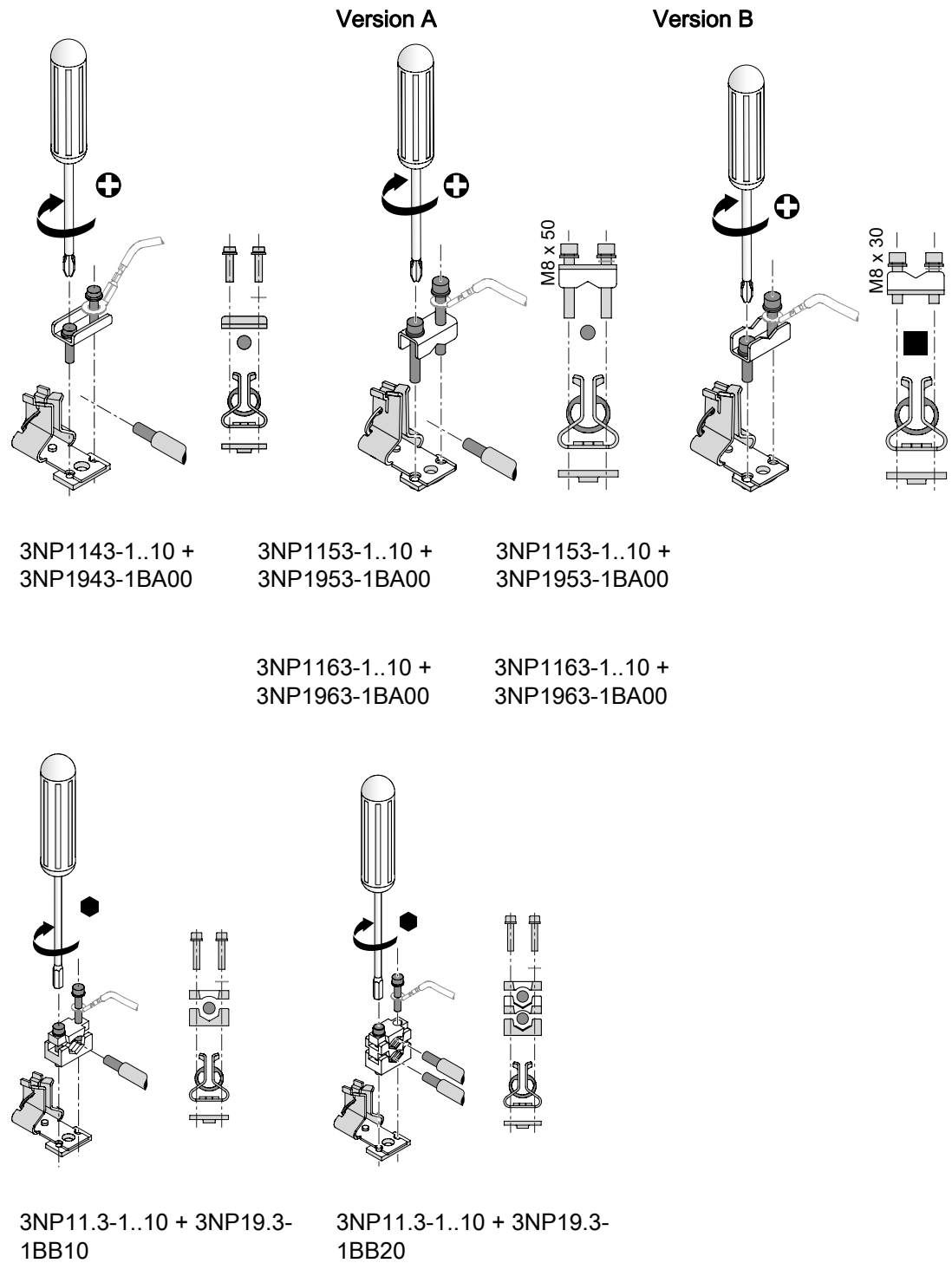
3NP1163-1..1.

3NP1143-1..2.

3NP1153-1..2.

3NP1163-1..2.

| Version | Necessary tools | Permissible tightening torque | Permissible conductor cross-section without end sleeve / with end sleeve / layered conductors | | | Auxiliary conductor connection |
|-------------------------------------|--|---|---|---|--|--------------------------------|
| |  |  |  |  |  | |
| 3NP1943-1BA00 |  PH2 | 6 Nm | 70 to 120 mm ² | 70 to 120 mm ² | 10 mm x 18 mm | 3NP1943-1BG30 |
| 3NP1953-1BA00 Version A / Version B |  PH2 | 8 Nm / 8 Nm | 120 to 240 mm ² /- | 120 to 240 mm ² /- | — /12 mm x 20 mm | 3NP1953-1BG30 |
| 3NP1963-1BA00 Version A / Version B |  PH2 | 10 Nm / 8 Nm | 150 to 300 mm ² /- | 150 to 300 mm ² /- | —/16 mm x 24 mm | 3NP1953-1BG30 |
| 3NP1943-1BB10 |  5 mm | 6 Nm | 70 to 150 mm ² | 70 to 150 mm ² | 10 mm x 18 mm | 3NP1943-1BG30 |
| 3NP1953-1BB10 |  6 mm | 8 Nm | 120 to 240 mm ² | 120 to 240 mm ² | 10 mm x 20 mm | 3NP1953-1BG30 |
| 3NP1963-1BB10 |  6 mm | 8 Nm | 150 to 300 mm ² | 150 to 300 mm ² | 10 mm x 24 mm | 3NP1953-1BG30 |
| 3NP1943-1BB20 |  5 mm | 6 Nm | 2 x 35 ... 70 mm ² | 2 x 35 ... 70 mm ² | — | 3NP1943-1BG30 |
| 3NP1953-1BB20 |  6 mm | 8 Nm | 2 x 70 ... 120 mm ² | 2 x 70 ... 120 mm ² | — | 3NP1953-1BG30 |
| 3NP1963-1BB20 |  6 mm | 8 Nm | 2 x 150 ... 185 mm ² | 2 x 150 ... 185 mm ² | — | 3NP1953-1BG30 |



8.5 Auxiliary conductor connection

Application

You can use the auxiliary conductor connection to tap control voltages.

Compatible, standard tab receptacles with a terminal width of 6.3 mm according to DIN 46218/T3 are suitable for clamping conductor cross-sections from 0.5 mm² to 6 mm².



CAUTION

One auxiliary conductor can be connected to each conductor connection point.

Connection types for auxiliary conductor connections

| Type of connection | Size 000 | Size 00 | Size 1 | Size 2 | Size 3 |
|--------------------|----------|---------|--------|--------|--------|
| Blade terminal | — | X | X | X | X |
| Saddle terminal | — | — | X | X | X |
| Prism terminal | — | X | X | X | X |
| Box terminal | X | X | X | X | X |

Maintenance

No maintenance procedures are necessary.

Technical data

Technical data of the fuse switch disconnectors

| Standards | | IEC / EN 60439-1, IEC / EN 60947-3 | | | | |
|--|-------------------|------------------------------------|------------|------------|------------|------------|
| Type | | 3NP1123... | 3NP1133... | 3NP1143... | 3NP1153... | 3NP1163... |
| Rated uninterrupted current I_u | A | 160 | 160 | 250 | 400 | 630 |
| For fuse links according to DIN 43620 | Size | 000 | 00 and 000 | 1 and 0 | 2 and 1 | 3 and 2 |
| Conventional free air thermal current I_{th} | A | 160 | 160 | 250 | 400 | 630 |
| Rated operating voltage U_e | | | | | | |
| 50 Hz / 60 Hz AC | V | 690 | 690 | 690 | 690 | 690 |
| DC (3 conducting paths in series) | V | 440 | 440 | 440 | 440 | 440 |
| DC (2 conducting paths in series) | V | 220/240 | 220/240 | 220/240 | 220/240 | 220/240 |
| Rated insulation voltage U_i ¹⁾ | V | 1000 | 1000 | 1000 | 1000 | 1000 |
| Rated impulse withstand voltage U_{imp} | kV | 8 | 8 | 8 | 8 | 8 |
| Rated conditional short-circuit current with fuses | Size / A | 000 / 160 | 00 / 160 | 1 / 250 | 2 / 400 | 3 / 630 |
| Rated current at 500 / 690 V AC | kA | 80 | 80 | 80 | 80 | 50 |
| Permissible let-through current of fuses | kA | 10 | 15 | 25 | 40 | 50 |
| Short-circuit strength with fuses | Size / A | 000 / 160 | 00 / 160 | 1 / 250 | 2 / 400 | 3 / 630 |
| Rated current at 500 / 690 V | kA (rms) | 120 | 120 | 120 | 100 | 100 |
| Let-through I^2t value | kA ² s | 56 | 158 | 780 | 2150 | 5400 |
| Permissible let-through current of fuses | kA | 15 | 23 | 32 | 40 | 60 |
| Rated making capacity at 500 V AC | kA | 2 | 6 | 17 | 17 | 17 |
| Rated making / breaking capacity | | | | | | |
| 21B, 22B, 23B 400 V AC | A | 160 | 160 | 250 | 400 | 630 |
| 21B 500 V AC | A | 160 | 160 | 250 | 400 | 630 |
| 22B 500 V AC | A | 125 | 160 | 250 | 400 | 630 |
| 23B 500 V AC | A | 40 | 63 | 200 | 315 | 500 |
| 21 B 690 V AC | A | 160 | 160 | 250 | 400 | 630 |
| 22B 690 V AC | A | 50 | 125 | 250 | 400 | 500 |
| 23B 690 V AC | A | 25 | 35 | 100 | 125 | 200 |
| 21B 240 V DC | A | 160 | 160 | 250 | 400 | 630 |
| 22B 240 V DC | A | 100 | 160 | 250 | 400 | 630 |
| 23B 240 V DC | A | 80 | 100 | 200 | 250 | 400 |
| 21B 440 V DC | A | 100 | 160 | 250 | 400 | 630 |
| 22B 440 V DC | A | 50 | 125 | 200 | 315 | 500 |
| 23B 440 V DC | A | 25 | 63 | 100 | 160 | 250 |

1) Up to degree of pollution 2, above it $U_i = 690$ V

| Type | | 3NP1123... | 3NP1133... | 3NP1143... | 3NP1153... | 3NP1163... |
|---|------------------|--|---|------------|-------------|-------------|
| Capacitor switching capacity | | | | | | |
| At 400 V AC | | | | | | |
| Reactive power | kvar | 50 | 50 | 50 | 50 | 50 |
| Rated current I _n | A | 72 | 72 | 72 | 72 | 72 |
| At 525 V AC | | | | | | |
| Reactive power | kvar | 50 | 50 | 50 | 50 | 50 |
| Rated current I _n | A | 55 | 55 | 55 | 55 | 55 |
| Permissible ambient temperature ²⁾ | °C | -25 to +55°C (operating), -50 to +80°C (storage) | | | | |
| Mechanical endurance | Switching cycles | 2000 | 2000 | 2000 | 2000 | 2000 |
| Degree of protection (operator side) | | | | | | |
| Without molded plastic cover / cable lug cover | | | IP30 (switch closed) / IP20 (switch open) | | | |
| With molded plastic cover / cable lug cover | | | IP40 (switch closed) / IP20 (switch open) | | | |
| Power loss of the switch at I _{th} (plus fuses) | W | 9 | 12 | 23 | 34 | 48 |
| Max. conductor cross-section of main conductor connection | | | | | | |
| Blade terminal | mm ² | — | Max. 95 | Max. 150 | Max. 240 | Max. 300 |
| Box terminal | mm ² | 1,5 ... 50 | 6 ... 70 | 70 ... 185 | 120 ... 240 | 150 ... 300 |
| Prism terminal | mm ² | — | 16 ... 95 | 70 ... 150 | 120 ... 240 | 150 ... 300 |
| Saddle terminal | mm ² | — | 1,5 ... 70 | 70 ... 150 | 120 ... 240 | 150 ... 300 |
| Layered conductors, box terminal | mm x mm | 8 x 8 | 9 x 8 | 10 x 20 | 10 x 32 | 10 x 32 |
| Tightening torques for terminal screws | | | | | | |
| Blade terminal | Nm | — | 10 ... 12 | 10 ... 12 | 10 ... 12 | 10 ... 12 |
| Box terminal | Nm | 10 ... 12 | 10 | 10 | 25 | 25 |
| Prism terminal / saddle terminal | Nm | — | 2,6 | 6 | 8 | 10 |
| Rated operational current of auxiliary switch | | | | | | |
| Auxiliary switch 3NP19.3-1FA00 | A | 0.25 (I _{th} = 5 A) | | | | |
| Auxiliary switch 3NP19.3-1FB00 | A | 0.1 (I _{th} = 0.1 A) | | | | |
| Permissible mounting positions | | Vertical and horizontal (no derating) | | | | |
| Weight, floor mounting | | | | | | |
| Standard | kg | 0,47 | 0,73 | 2,19 | 4,21 | 4,63 |
| EFM | kg | 0,59 | 0,87 | 2,33 | 4,35 | 4,77 |
| MFM | kg | 0,89 | 1,17 | 2,63 | 4,65 | 5,07 |
| Weight, mounting onto busbar system | | | | | | |
| Standard | kg | 0,82 | 0,98 | 2,85 | 4,76 | 6,84 |
| EFM | kg | 0,94 | 1,12 | 2,99 | 4,90 | 6,98 |
| MFM | kg | 1,24 | 1,42 | 3,29 | 5,20 | 7,28 |

2) Only with disconnecting blade, otherwise observe the fuse manufacturers' information

Technical data of the EFM 10

| | |
|---|---|
| Rated operational voltage of the main switching devices U_e | 230 V to 690 V AC, 50 / 60 Hz |
| Apparent power consumption S | Approx. 2.5 VA |
| Internal resistance of the measuring circuit R_{in} | > 6 M Ω |
| Storage temperature | -20°C to +80°C |
| Operating temperature | -20°C to +65°C |
| Degree of protection when the main device is closed | IP40 |
| Signaling relay | in accordance with IEC 60947-5-1 |
| Loadability of the signaling relay | |
| Rated operational voltage U_e | 24 V |
| DC - 13; rated operational current I_e | 1 A |
| AC - 15; rated operational current I_e | 1.5 A |
| Conventional free air thermal current I_{th} | 1.5 A |
| Rated impulse withstand voltage U_{imp} | 4 kV |
| Rated insulation voltage U_i | 250 V |
| Short-circuit protection | Max. protection: "DIAZED 2 A gLgG" fuse |

Technical data of the EFM 20 and EFM 25 (common technical data)

| | |
|---|--|
| Apparent power consumption S | Approx. 2.5 VA |
| Internal resistance of the measuring circuit R_{in} | > 6 M Ω |
| Storage temperature | -20°C to +80°C |
| Operating temperature | -20°C to +65°C |
| Degree of protection when the main device is closed | IP40 |
| Signaling relay | in accordance with IEC 60947-5-1 |
| Signaling relay 1 | 1 changeover contact for fuse monitoring only |
| Signaling relay 2 | 1 changeover contact as general alarm output or like signaling relay 1 (default setting) |
| Loadability of the signaling relay | |
| Rated operational voltage U_e | 24 V |
| DC - 13; rated operational current I_e | 1 A |
| AC - 15; rated operational current I_e | 1.5 A |
| Conventional free air thermal current I_{th} | 1.5 A |
| Rated impulse withstand voltage U_{imp} | 4 kV |
| Rated insulation voltage U_i | 250 V |
| Short-circuit protection | Max. protection: "DIAZED 2 A gLgG" fuse |
| Harmonic test | On 3rd, 5th, and 7th harmonics |

Technical data of the EFM 20 (AC version)

| | |
|---|-------------------------------|
| Rated operational voltage U_e | 230 V to 690 V AC, 50 / 60 Hz |
| Undervoltage (default setting) | 195 V (375 V) |
| Overvoltage (default setting) | 790 V (425 V) |
| Voltage drop for faulty fuse | > 13 V |
| Delay time (relay 1 for fuse monitoring, relay 2) | 0.1 s |
| Memory function | Off |
| Working current / closed-circuit principle | Closed-circuit |
| Mode | RUN mode |
| Menu command | Show voltage values / alarms |

Technical data of the EFM 25 (DC version)

| | |
|---|------------------------------|
| Rated operational voltage U_e | 220 V to 440 V DC |
| Undervoltage (default setting) | 190 V (200 V) |
| Overvoltage (default setting) | 510 V (240 V) |
| Voltage drop for faulty fuse | > 20 V |
| Delay time (relay 1 for fuse monitoring, relay 2) | 0.1 s |
| Memory function | Off |
| Working current / closed-circuit principle | Closed-circuit |
| Mode | RUN mode |
| Menu command | Show voltage values / alarms |

Dimensional drawings and hole drilling templates

Handle positions

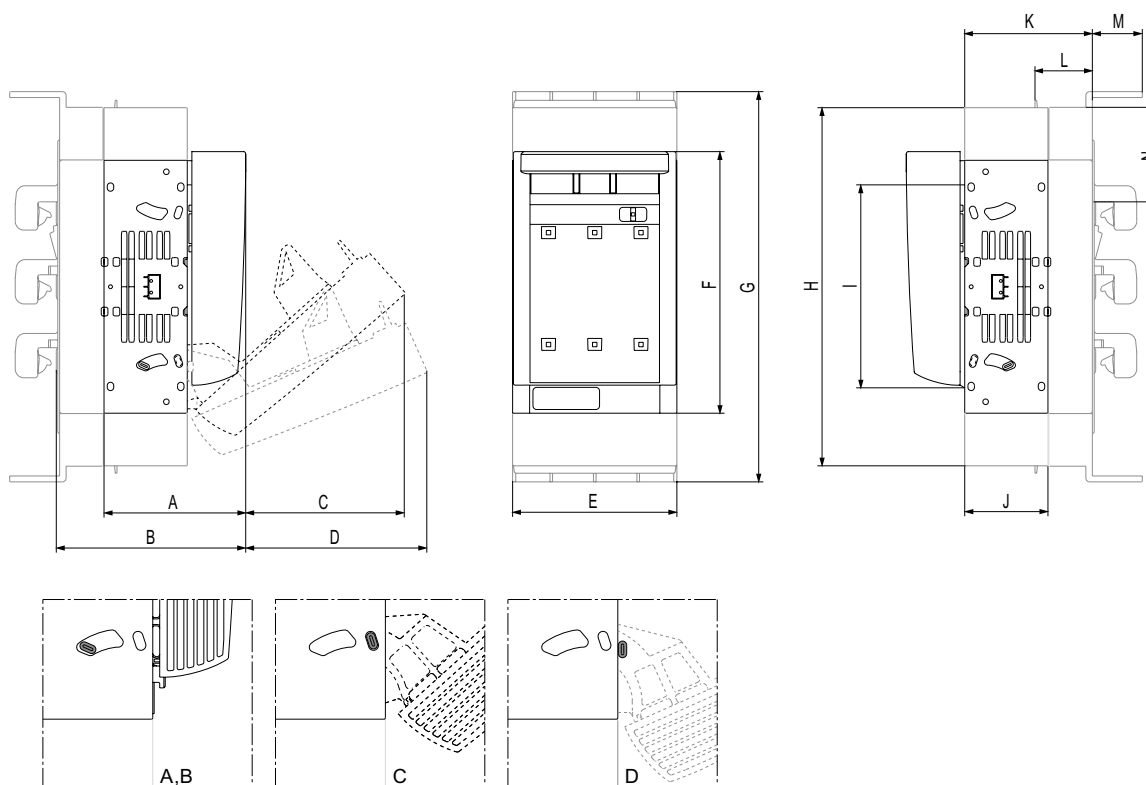


Figure 11-1 Handle positions, size 000

1 ON position

2 Ready position

3 OFF / removal position

| Dimensions (mm) | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|-----------------|------|-------|------|------|------|-------|-------|-----|-------|----|----|----|----|----|
| 3NP1123-1CA20 | 76,6 | — | 60,6 | 71,6 | 88,8 | 141,7 | — | — | 110,4 | 45 | — | — | — | — |
| 3NP1123-1BB20 | — | 101,6 | 60,6 | 71,6 | 88,8 | — | 211,4 | 196 | 110,4 | — | 70 | 32 | 26 | 51 |
| 3NP1123-1BC20 | — | 101,6 | 60,6 | 71,6 | 88,8 | — | 207 | 196 | 110,4 | — | 70 | 32 | 26 | 51 |
| 3NP1123-1J.20 | — | 101,6 | 60,6 | 71,6 | 88,8 | — | 210,4 | — | — | — | — | — | — | — |

| | |
|------|-------------------------------------|
| A, B | Switch closed |
| C | Parking position of handle unit |
| D | Dismantling position of handle unit |

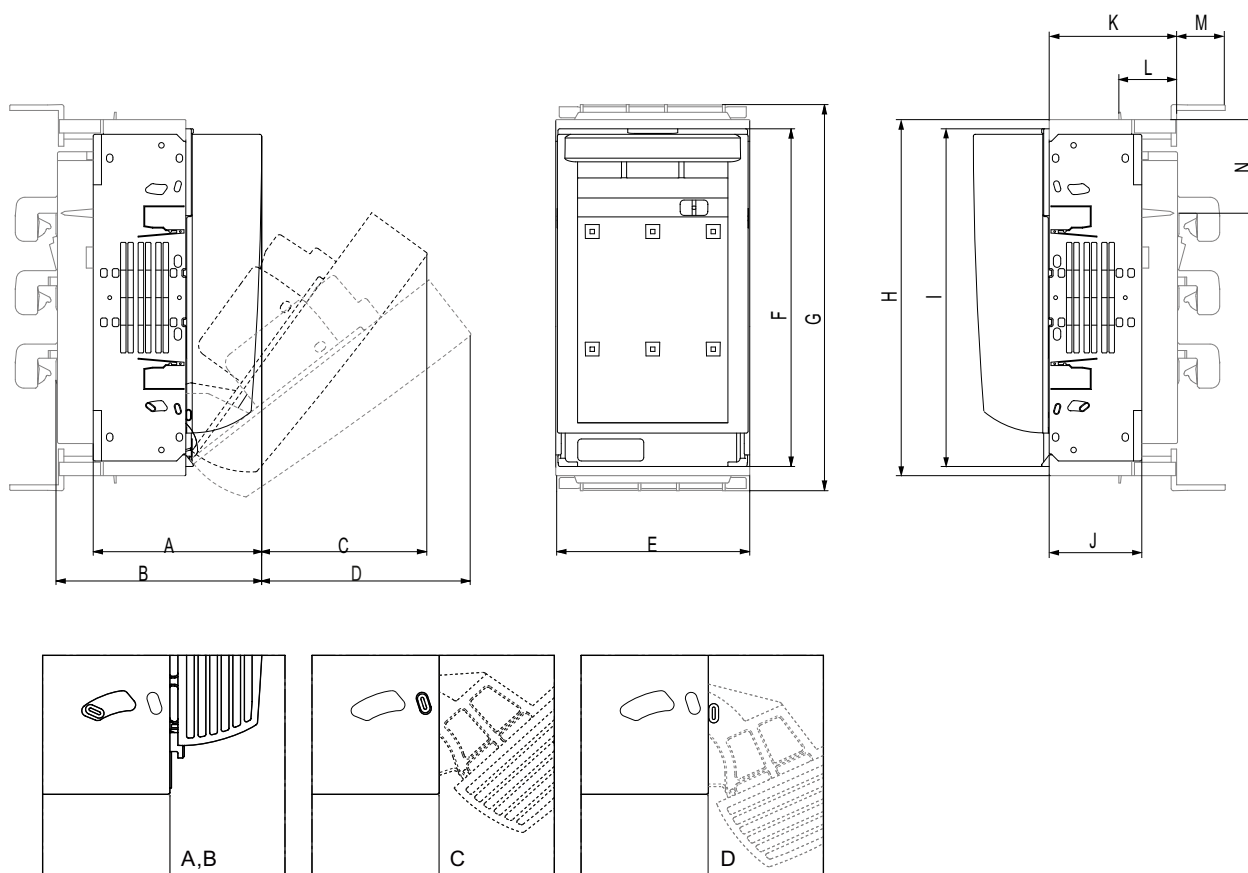


Figure 11-2 Handle positions, size 00

- 1 ON position
- 2 Ready position
- 3 OFF / removal position

| Dimensions (mm) | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|-----------------|------|-------|------|------|-------|-----|-------|-----|-----|----|----|----|----|----|
| 3NP1133-1CA10 | 86,5 | — | 63,7 | 87,7 | 105,8 | 202 | — | — | 184 | 45 | — | — | — | — |
| 3NP1133-1CA20 | 86,5 | — | 63,7 | 87,7 | 105,8 | 200 | — | — | 184 | 45 | — | — | — | — |
| 3NP1133-1BB.0 | — | 111,5 | 63,7 | 87,7 | 105,8 | — | 210,2 | 196 | 184 | — | 70 | 32 | 26 | 51 |
| 3NP1133-1BC.0 | — | 111,5 | 63,7 | 87,7 | 105,8 | — | 206,2 | 196 | 184 | — | 70 | 32 | 26 | 31 |
| 3NP1133-1J..0 | — | 111,5 | 63,7 | 87,7 | 105,8 | — | 215,1 | — | — | — | — | — | — | — |

| | |
|------|-------------------------------------|
| A, B | Switch closed |
| C | Parking position of handle unit |
| D | Dismantling position of handle unit |

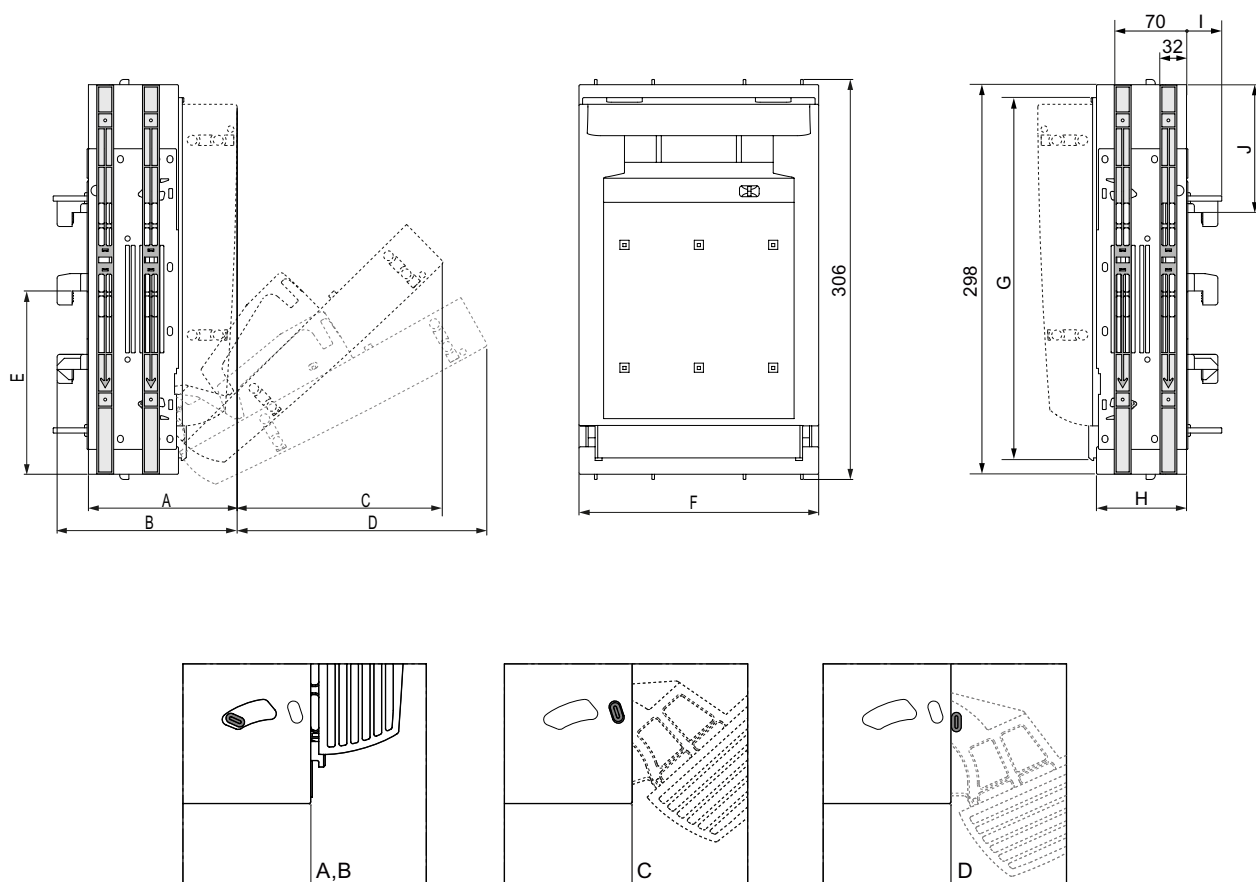


Figure 11-3 Handle positions, sizes 1,2 and 3

- 1 ON position
- 2 Ready position
- 3 OFF / removal position

| Dimensions (mm) | A | B | C | D | E | F | G | H | I | J |
|-----------------|-------|-------|-----|-----|-------|-------|-------|----|----|------|
| 3NP1143-1CA.0 | 115 | — | 180 | 186 | — | 183,7 | 275,6 | — | — | — |
| 3NP1153-1CA.0 | 129,9 | — | 200 | 207 | — | 209,4 | 280 | 90 | — | — |
| 3NP1163-1CA.0 | 138,5 | — | 200 | 207 | — | 249,4 | 280 | 90 | — | — |
| 3NP1143-BC.0 | 115 | 138 | 180 | 186 | 144,2 | 183,7 | 275,6 | — | 26 | 97,8 |
| 3NP1153-BC.0 | 129,9 | 153 | 200 | 207 | 144,2 | 209,4 | 280 | 90 | 26 | 97,8 |
| 3NP1163-BC.0 | 138,5 | 161,5 | 200 | 207 | 144,2 | 249,4 | 280 | 90 | 26 | 97,8 |

| | |
|------|-------------------------------------|
| A, B | Switch closed |
| C | Parking position of handle unit |
| D | Dismantling position of handle unit |

Dimensional drawings: Mounting onto standard rail

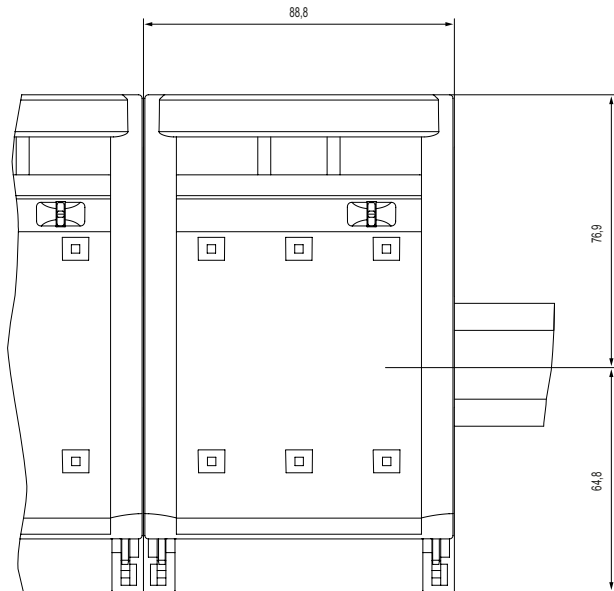


Figure 11-4 Dimensional drawing: Mounting onto standard rail, 3NP1 size 000

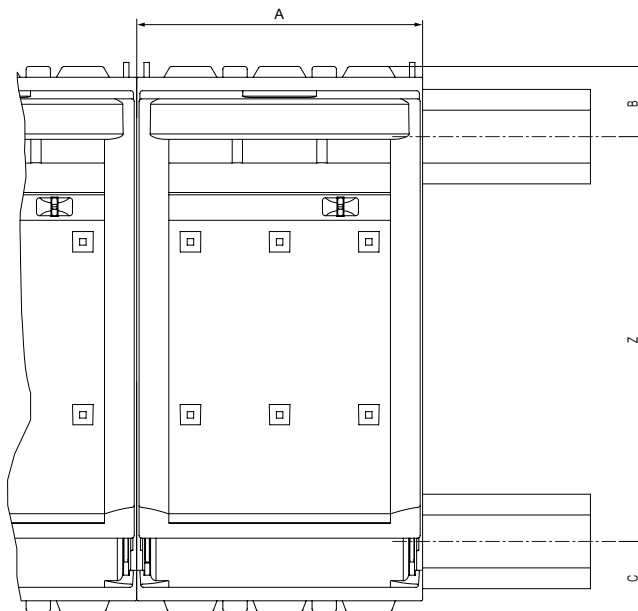


Figure 11-5 Dimensional drawing: Mounting onto standard rail, 3NP1 size 00

| Dimensions (mm) | Z | A | B | C |
|-----------------|-----|-------|-------|------|
| 3NP1133-1CA10 | 150 | 105,8 | 26 | 26 |
| 3NP1133-1CA10 | 125 | 105,8 | 38,5 | 38,5 |
| 3NP1133-1CA20 | 150 | 105,8 | 25 | 25 |
| 3NP1133-1CA20 | 125 | 105,8 | 37,5 | 37,5 |
| 3NP1143-1CA .. | 150 | 183,7 | 93 | 63 |
| 3NP1143-1CA .. | 125 | 183,7 | 105,5 | 75,5 |

Hole drilling templates



CAUTION

The hole drilling templates are not exactly to scale (1:1).

Hole drilling templates for the fuse switch disconnectors

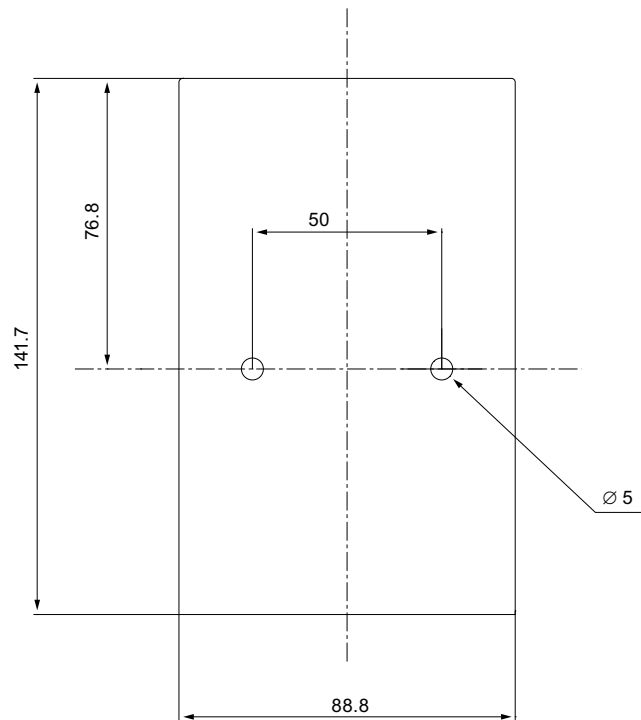


Figure 11-6 Hole drilling template: Fuse switch disconnector size 000

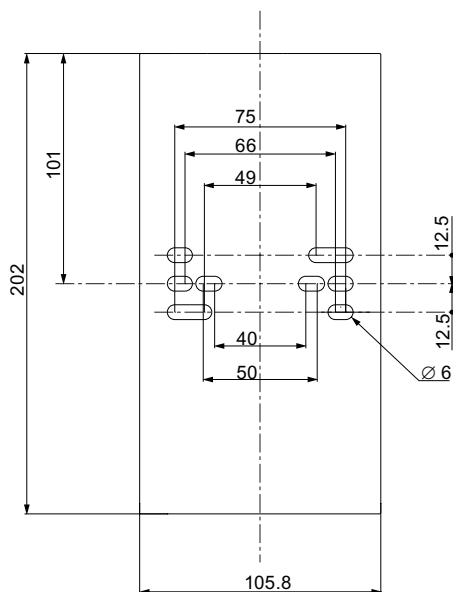


Figure 11-7 Hole drilling template: Fuse switch disconnectors size 00

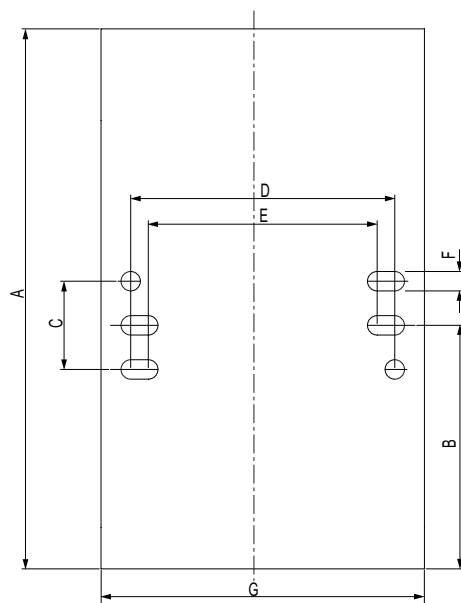


Figure 11-8 Hole drilling template: Fuse switch disconnectors sizes 1, 2, 3

| Dimensions (mm) | A | B | C | D | E | F |
|-----------------|-----|-----|----|-----|-----|----|
| 3NP1143-1CA.0 | 306 | 138 | 50 | 150 | 130 | 11 |
| 3NP1153-1CA.0 | 306 | 138 | 50 | 166 | 130 | 11 |
| 3NP1163-1CA.0 | 306 | 138 | 50 | 195 | 160 | 11 |

A

ESD guidelines

Radio interference

| |
|--|
| NOTICE |
| This is a class A product. The device may cause RF interference in residential areas. Take appropriate measures in this case! |

List of abbreviations

The following abbreviations are used in the manual:

Table B- 1 List of abbreviations

| | |
|--------|---|
| LV HRC | Low-Voltage High Breaking Capacity fuse |
| EFM | Electronic Fuse Monitoring |
| MFM | Mechanical Fuse Monitoring |

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