

### 8.5 Operating the ET 200SP on grounded incoming supply

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#### NOTE

In general, you need to connect the DC I/O modules of the ET 200SP distributed I/O system to your own distribution (or batteries) via an upstream, local power supply unit.  
If you connect the DC I/O modules directly to your own distribution, you need to provide additional protective measures against overvoltages.

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## 8.6 Electrical configuration of the ET 200SP

### Electrical isolation

### Electrical relationships

With the ET 200SP distributed I/O system, there is electrical isolation between:

- The load circuits/process and all other circuit components of the ET 200SP distributed I/O system.
- The communication interfaces of the CPU (PROFINET) or of the interface module (PROFINET/PROFIBUS) and all other circuit components.

The figures below show the electrical relationships of the ET 200SP distributed I/O system with the CPU and the interface module. Only the most important components are represented in the figures.

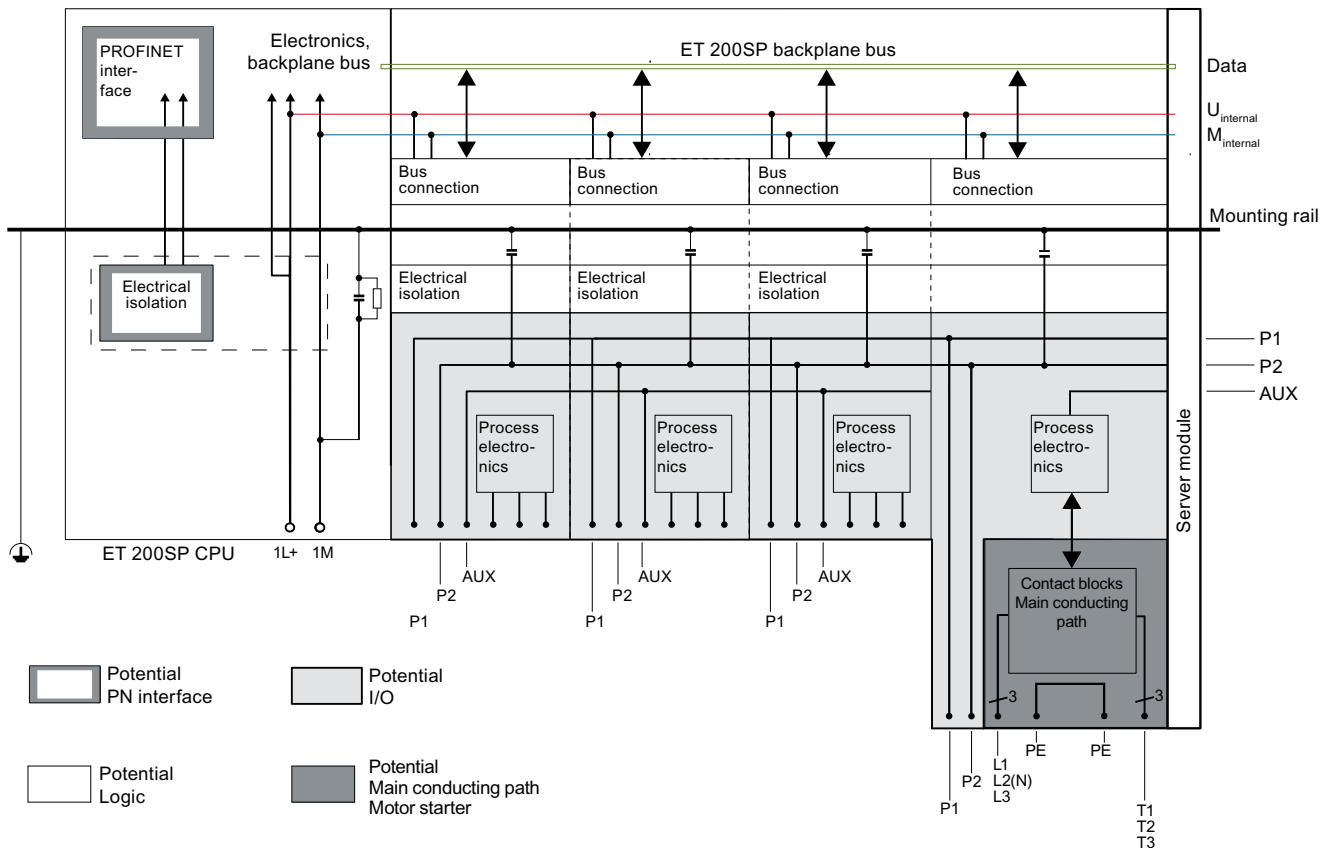


Figure 8-2 Electrical relationships for ET 200SP with CPU

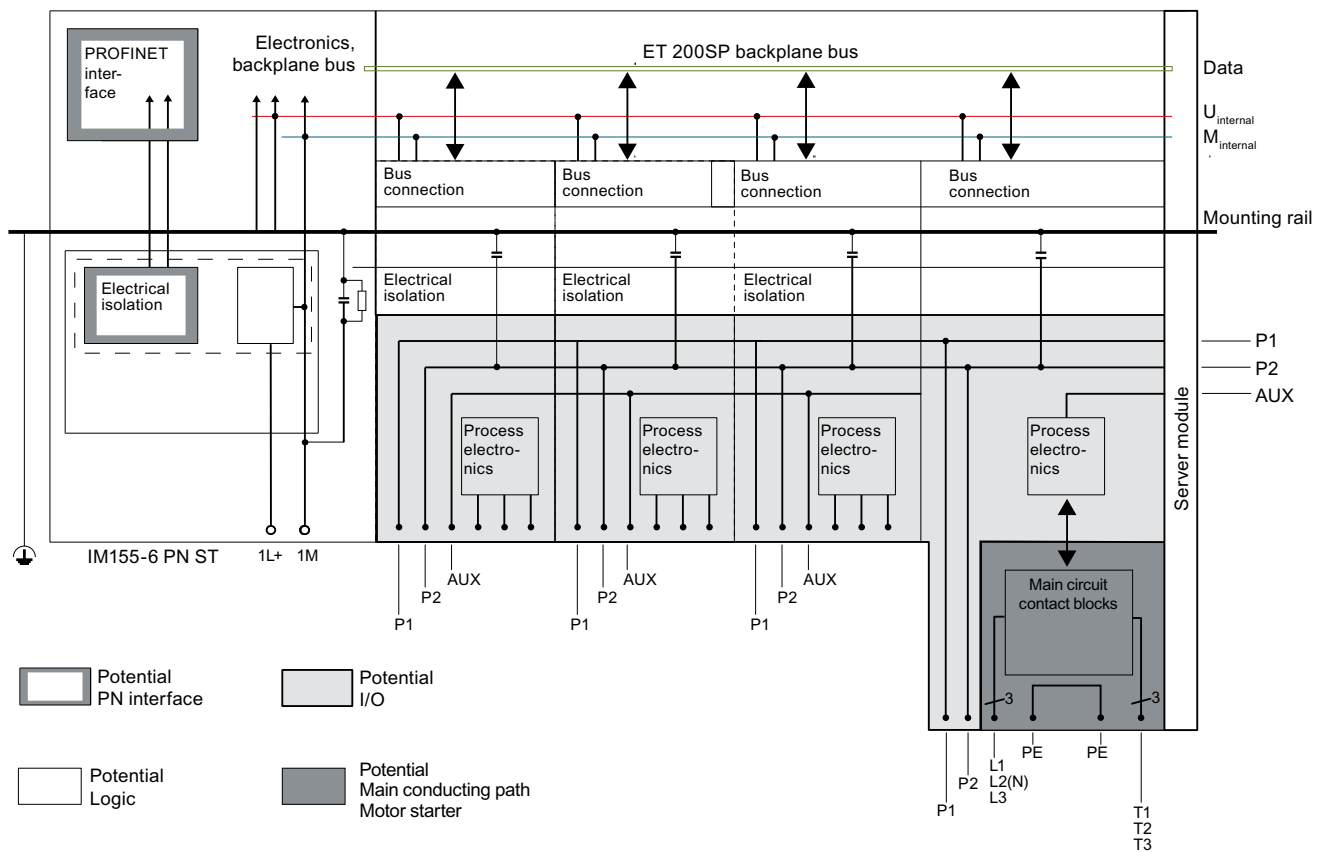


Figure 8-3 Electrical relationships for ET 200SP with interface module (using IM 155-6 PN ST as an example)

## 8.7 Wiring rules

### Introduction

Use suitable cables to connect the ET 200SP distributed I/O system. Also select the cable insulation corresponding to the applied voltage. The tables below set out the wiring rules for CPU/interface module, BaseUnits and motor starter.

### Wiring rules for the CPU/interface module and BaseUnits for I/O modules

Wiring rules for ...		CPU/interface module (supply voltage)	BaseUnits (push-in terminal)
Permitted cable cross-sections of solid cables (Cu)		0.2 to 2.5 mm <sup>2</sup>	
		AWG*: 24 to 13	
Permitted cable cross-	Without end sleeve	0.2 to 2.5 mm <sup>2</sup>	

\* AWG: American Wire Gauge

\*\* End sleeves without plastic sleeve: 0.25 to 2.5 mm<sup>2</sup>/AWG: 24 to 13

\*\*\* See note on end sleeves

Wiring rules for ...		CPU/interface module (supply voltage)	BaseUnits (push-in terminal)
sections of flexible cables (Cu)	Without end sleeve	AWG*: 24 to 13	AWG*: 24 to 14
	With end sleeve (with plastic sleeve)***	0.25 mm to 1.5 mm <sup>2**</sup>	0.14 mm to 1.5 mm <sup>2</sup>
		AWG*: 24 to 16	AWG*: 26 to 16
	With TWIN end sleeve***	0.5 mm to 1 mm <sup>2</sup>	0.5 to 0.75 mm <sup>2</sup> (see below)
		AWG*: 20 to 17	AWG*: 20 to 18
Stripping length of the wires		8 to 10 mm	
End sleeves in accordance with DIN 46228 with plastic sleeve***		8 and 10 mm long	
TWIN end sleeves		12 mm long	

\* AWG: American Wire Gauge

\*\* End sleeves without plastic sleeve: 0.25 to 2.5 mm<sup>2</sup>/AWG: 24 to 13

\*\*\* See note on end sleeves

**Note the following for BaseUnits with function version < FS10:**

#### NOTE

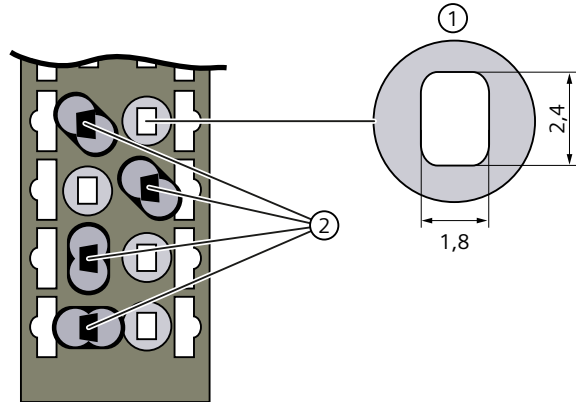
##### End sleeves

Optimum results with respect to a high-quality and permanent electrical connection with maximum conductor pull forces at the same time can be achieved by using crimping dies, preferably with smooth surfaces, which are provided, for example, with rectangular and trapezoidal crimp cross-sections.

Crimping dies with a pronounced wave profile are unsuitable.

### TWIN end sleeves for the cables of the I/O modules' push-in terminals

Due to the space required by TWIN end sleeves with 0.75 mm<sup>2</sup> cross-section, you must ensure a correct angle for the cable arrangement when crimping the TWIN end sleeve so that the cables are optimally arranged.



- ① Cross-section of the terminal compartment  
 ② Crimping TWIN end sleeves at the correct angle

Figure 8-4 TWIN end sleeves

### Wiring rules for motor starters

Wiring rules for ...		L1(L), L2(N), L3, PE	T1, T2, T3, PE, 24 V DC, F-DI, M	DI1 ... DI3, LC, M, 24 V OUT
Permitted cable cross-sections of solid cables (Cu)		1 to 6 mm <sup>2</sup>	0.5 to 2.5 mm <sup>2</sup>	0.2 to 1.5 mm <sup>2</sup>
		AWG: 18 to 10	AWG: 20 to 12	AWG: 24 to 16
Permitted cable cross-sections of flexible cables (Cu)	Without end sleeve	1 to 6 mm <sup>2</sup>	0.5 to 2.5 mm <sup>2</sup>	0.2 to 1.5 mm <sup>2</sup>
		AWG: 18 to 10	AWG: 20 to 12	AWG: 24 to 16
	With end sleeve	1 to 6 mm <sup>2</sup>	0.5 to 2.5 mm <sup>2</sup>	0.25 to 1.5 mm <sup>2</sup>
		AWG: 18 to 10	AWG: 20 to 12	AWG: 24 to 16
	With end sleeve (with plastic sleeve)	1 to 4 mm <sup>2</sup>	0.5 to 1.5 mm <sup>2</sup>	0.25 to 0.75 mm <sup>2</sup>
		AWG: 18 to 11	AWG: 20 to 16	AWG: 24 to 18
Stripping length of the wires		15 mm	10 mm	8 mm
End sleeves according to DIN 46228 with plastic sleeve		15 mm long	10 mm long	8 mm long

### Safety standards for fail-safe motor starters

Fail-safe motor starters fulfill the following standards under certain conditions:

- PLe/Cat.4 according to EN ISO 13849-1
- Safety Integrity Level SIL 3 according to IEC 62061

To fulfill both standards, lay cross-circuit proof and P-cross-circuit proof control cables from the safe output of a sensor or F-DQ to the safe input of the motor starter, e.g. as a separately sheathed cable or in a separate cable duct.

## Line protection

The line protection of the SIMATIC ET 200SP motor starter is provided for the motor outgoing feeder cable when the following condition is met:

The cross-section of the motor outgoing feeder cable must be dimensioned for the load ratios of the motor and for the cable-laying method.

Comply with national regulations. The user is responsible for the correct selection and dimensioning of the motor connection cable to DIN VDE 0100 and DIN VDE 0298-4 and/or UL 508.

The conductor protection for the incoming feeders must be ensured by the owner of the installation depending on the cross-section.

## Cable temperature measurement threshold

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### NOTE

#### Cable temperature measurement threshold

When choosing a cable, remember that the cable temperature in operation can be up to 30 °C higher than the ambient temperature of the ET200SP system (example: at an ambient temperature of 60 °C, a connection conductor must be dimensioned for a temperature range of at least 90 °C).

You should specify other connection types and material requirements based on the electrical characteristics of the circuits you use and the installation environment.

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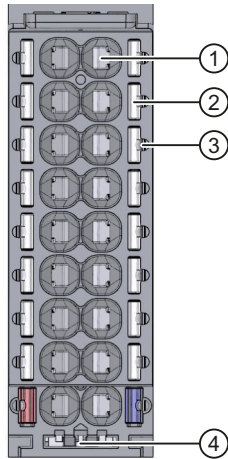
## 8.8 Wiring BaseUnits for I/O modules

### Introduction

The BaseUnits connect the ET 200SP distributed I/O system to the process. The following versions of the BaseUnits can be used:

- BaseUnits (with light-colored terminal box) for opening a potential group: BU..D
- BaseUnits (with dark-colored terminal box) for extending the potential group: BU..B
- BaseUnits with additional AUX terminals or additional terminals: BU..+10..
- BaseUnits with integrated thermal resistor for compensation of the reference junction temperature when connecting thermocouples: BU..T
- PotDis-BaseUnits (with light-colored terminal box) for opening a PotDis potential group: PotDis-BU..D

- PotDis-BaseUnits (with dark-colored terminal box) for extending the potential group:  
PotDis-BU..B



- ① Push-in terminal
- ② Spring release
- ③ Measuring probe (suitable probes: 1 mm diameter, length  $\geq 10$  mm while observing the permitted voltage category)
- ④ Holder for shield connection

Figure 8-5 View of the BaseUnit

#### NOTE

The pin assignment of the BaseUnit depends on the connected I/O module. Information on the BaseUnits and I/O modules can be found in the associated manuals.

Replacement of the terminal box on the BaseUnit is described in the section Replacing the terminal box on the BaseUnit (Page 290).

#### NOTE

##### Special terminal designations in the wiring and block diagrams of the I/O modules/BaseUnits

- **RES:** Reserve, these terminals must remain unconnected so that they can be used for future expansions
- **n.c.:** Not connected, these terminals have no function. However, they can be connected to potentials specifically defined for a module, for example, for the laying unused wires.

## Requirements

- The supply voltages are turned off.
- Follow the wiring rules.
- Color identification labels (Page 175) (optional) have been applied.

**Required tools**

3 to 3.5 mm screwdriver

**Tool-free connection of cables: single-wire without wire end ferrule, multi-wire (stranded) with wire end ferrule or ultrasonically sealed**

Watch the video sequence (<https://support.automation.siemens.com/WW/view/en/95886218>)

To connect a wire without tools, follow these steps:

1. Strip 8 to 10 mm of the wires.
2. Only in the case of stranded conductors (except for 2.5 mm<sup>2</sup> cross-section):  
Seal or crimp the wire with wire end ferrules.
3. Insert the wire into the push-in terminal as far as it will go.

**Connection of cables: multi-wire (stranded), without wire end ferrule, unprocessed**

To connect a wire without a wire end ferrule, follow these steps:

1. Strip 8 to 10 mm of the wires.
2. Push with the screwdriver into the spring release.
3. Insert the wire into the push-in terminal as far as it will go.
4. Pull the screwdriver out of the spring release.

**Removing wires**

Using the screwdriver, press the spring release of the terminal as far as it will go and pull out the wire.

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**NOTE**

When you press the spring release, you should not pull on the wire/cable at the same time. This prevents you from damaging the terminal.

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## 8.9 Connecting cable shields for I/O modules

**Introduction**

- You need the shield connector to contact cable shields (e.g. for analog modules). The shield connector conducts interference currents on cable shields to ground via the mounting rail. It is not necessary to contact the shield at where the cable enters the cabinet.
- Attach the shield connector to the BaseUnit.
- The shield connection consists of a shield support, a shield terminal and a supporting element.
- The shield connector is automatically connected to the functional ground (FG) of the mounting rail after installation.



## Requirements

- BaseUnit must be one of the following types:
  - A0, A1
  - B0
  - C0, C1
  - F0
  - U0
- The shield terminal is suitable for cables with max. Ø 7 mm each.

## Required tools

- Stripping tool
- Slotted screwdriver with a 3.5 mm blade or Torx T10

## Procedure

Watch the "Wiring BaseUnits" video sequence

(<https://support.automation.siemens.com/WW/view/en/95886218>)

To connect the cable shield, follow these steps:

1. If necessary, connect the supply voltage L+ and ground to the BaseUnit.
2. Push the supporting element with the shield support into the guideway till the supporting element clicks into place.  
If you use a 7.5 mm mounting rail, you must first shorten the supporting element. To do so, unscrew the spacer of the support element.
3. Remove the cable insulation material around the shield terminal.  
Connect the cable to the BaseUnit and place the cable in the shield contact.
4. Insert the shield terminal into the corresponding clamping position of the shield support.
  - Clamping space height 1: 1.9 mm to 15.5 mm
  - Clamping space height 2: 10.9 mm to 23.5 mm

5. Tighten the shield terminal with approximately 0.5 Nm.  
When doing this, ensure that the terminal is completely in contact with the exposed protective braided shield.

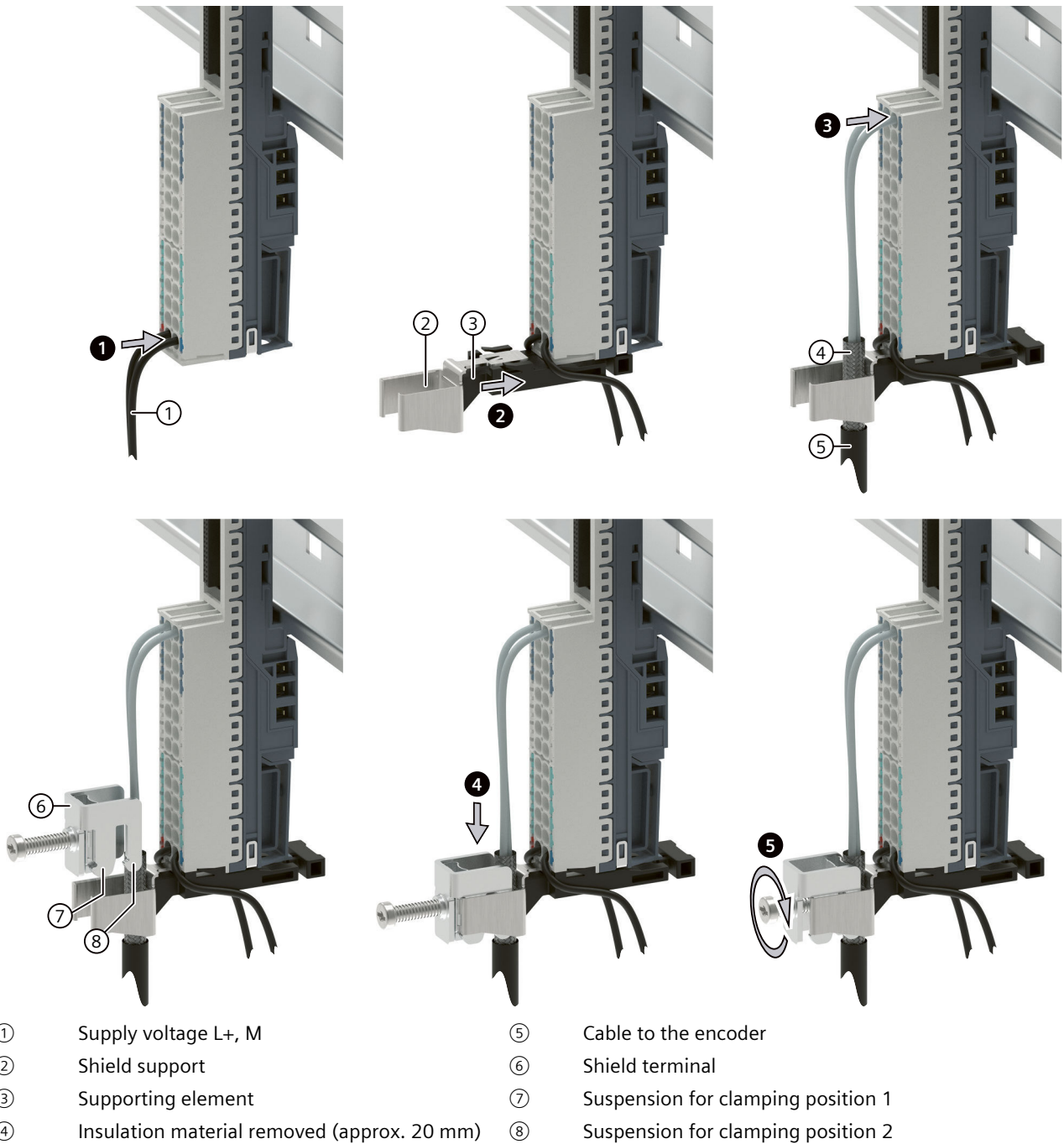


Figure 8-6 Mounting the shield contact