SIEMENS

Room Control Box AP 641	5WG1641-3AB01

Product and functional description

The square AP 641 Room Control Box with a height of 50 mm is designed for installation in a false ceiling, in a raised floor or directly on a wall. The Room Control Box is affixed with screws at the four corners of the housing. The Room Control Box offers eight mounting locations for these RS / RL modules:

5WG1125-4AB23	Decentralized Power Supply 80 mA
5WG1260-4AB23	Binary input, quadruple, AC/DC, 12...230 V
5WG1510-2AB23	Binary output (relay), 2 x 10 A
5WG1512-4AB23	Load switch (relay), 1 x 16 A
5WG1513-4DB23	Binary output (relay), 3 x 6 A
5WG1520-2AB23	Blind / shutter actuator, 1 x 6 A
5WG1521-4AB23	Blind / shutter actuator, 2 x 6 A
5WG1525-2AB23	Universal dimmer, 1 x 250 VA
5WG1526-4DB23	Switch-/dim actuator, 2 x AC 230 V, 6 A, 1...10 V
5WG1510-2KB23	Thermal drive actuator, 2 x 1.5 A

The mounted modules are each connected to an internal bus line via a bus terminal block.

For four mounting locations each the Room Control Box contains a bus bar for PE and N conductors. This allows for secure connection of the PE and N conductors of the cables inserted into the AP 641 Room Control Box.

The Room Control Box has 20 wire bushings. The housing of the Room Control Box as well as the bushings for wiring are designed for IP 54. For strain relief, cables can be secured at the cable bushing with cable ties.

Line voltage supply and load conductors are terminated at the terminals of the mounted modules.

Calculation of the total thermal dissipation loss

The RS/RL modules installed in the room control box generate thermal dissipation losses. The thermal dissipation loss generated by an RS / RL module depends on the loads connected to the channels of each module. The documentation for each module describes how to calculate the thermal dissipation loss for that module type.

The AP 641 Room Control Box dissipates the thermal losses of the installed modules to the installation space. The ambient temperature of the environment, in which the Room Control Box is installed, determines the total thermal losses P_V that can be dissipated.

The thermal dissipation loss P_V [W] of the Room Control Box depends on the ambient temperature T_U [°C]. This formula applies:

$$(1)\ P_V = 30 - 0{,}5 * T_U \qquad [W]$$

The sum of the thermal dissipation losses P_M of all installed RS/RL modules shall not exceed the value P_V at the ambient temperature T_U.

If dimmers are installed in the AP 641 Room Control Box the maximum permissible dimmer load is derated if the condition

$$(2)\ T_U + 2 * P_M > 45$$

is fulfilled. In that case, the maximum dimming load is derated to

$$(3)\ Dimmload_{derated} = 100 - 3{,}1 * (T_U + 2 * P_M - 45)\ [\%]$$

for all dimmers in an AP 641 Room Control Box.

The following table provides an overview over the calculation of the thermal dissipation losses for the RS / RL modules.

Device	Device [W]	varibale loss per channel [W]	channels	max. [W]
RL 125/23	1,00	$I_{bus} * 26{,}3 - 1$	1	2,10
RL 260/23	0,15	$0{,}42/250 * U_{DC}$	4	1,70
	0,15	$0{,}24/250 * U_{AC}$	4	1,03
RS 510/23	0,15	$0{,}022 * I^2$	2	3,14
RL 512/23	0,15	$0{,}004 * I^2$	1	1,17
RL 520/23	0,15	$(1+0{,}033 * I^2) * ED$	1	2,34
RL 521/23	0,15	$(1+0{,}033 * I^2) * ED$	2	4,53
RS 525/23	0,60	$0{,}014 * P\ [\%]$	1	2,00
RL 526D23	0,36	$0{,}0153 * I^2 + 10{,}1 * I_{EVG}$	2	2,40
RL 513/23	0,15	$0{,}22 * (I_{eff})^2$	3	2,09
RS 510K23	0,15	$0{,}022 * I^2$	2	3,14

ED: on-time

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Example for calculation of the thermal dissipation losses

Installation of the Room Control Box in an ambient temperature of 35°C;
Installed RS/RL modules:
a) 2x Dimmer RS 525, 150W lighting, each (LV-halogen + transformer)
b) 1x switching actuator RS 510, per channel 250W lighting
c) 1x load switch RL 512, 3kW
d) 2x load switch RL 512, 2.2kW
e) 1x shutter/blind actuator AP 521 2x6A, 10% on-time
f) 1x binary input RL 260, 4 x channels, DC230V

P_M of RS/RL modules:
a) Thermal dissipation losses, one dimmer RS 525/23
Device: 0.6 W;
Dimmer (one channel) with 150W: $P_M = 0.84$ W;
Total thermal dissipation losses for one dimmer (one channel):
Device + channel value
$P_{M,Dimmer} = 0.6 + 0.84$ [W] = 1.44 [W]
2 Dimmers, each with 150W load:
$P_{M,a} = 2 * 1.44$ [W] = 2.88 [W]
b) Thermal dissipation losses, one switching actuator RS 510/23
Device: 0.15 W;
Channel A with 250W: $P_M = 0.025$ W
Channel B with 250W: $P_M = 0.025$ W
Total thermal dissipation loss switching actuator:
Device + sum of channel values
$P_{M,switching\ actuator} = 0.15 + 2 * 0.025$ [W] = 0.2 [W]
$P_{M,b} = 0.2$ [W]
c) Thermal dissipation losses, one load switch RL 512/23
Device: 0.15 W;
Channel with 3kW (13,04 A @ AC 230V): $P_M = 0.68$ W
Total thermal dissipation loss switching actuator:
Base value + channel value
$P_{M,switching\ actuator} = 0.15 + 0.68$ [W] = 0.83 [W]
$P_{M,c} = 0.83$ [W]
d) Thermal dissipation losses, two load switches RL 512/23
Device: 0.15 W;
Channel with 2.2kW (9.56 A @ AC 230V): $P_M = 0.37$W
Total thermal dissipation loss switching actuator:
Base value + channel value
$P_{M,switching\ actuator} = 0.15 + 0.37$ [W] = 0.52 [W]
$P_{M,d} = 2 * 0.52$ [W] = 1.04 [W]
e) Thermal dissipation losses, one solar protection actuator RL 521/23
Device: 0.15 W;

Solar protection (per channel) with 6A, 10% on-time:
$P_M = 0.22$ W;
Total thermal dissipation loss for one solar protection actuator (two channels):
Device + 2 * channel value
$P_{M,Solar\ protection\ actuator} = 0.15 + 2 * 0.22$ [W] = 0.59 [W]
$P_{M,e} = 0.59$ [W]
f) Thermal dissipation losses, one binary input device RL 260/23
Device: 0.15 W;
Binary input (per channel @ DC230V): $P_M = 0.39$ W;
Total thermal dissipation loss for one binary input device (four channels):
Device + 4 * channel value
$P_{M,Binary\ input} = 0.15 + 4 * 0.39$ [W] = 1.7 [W]
$P_{M,f} = 1.7$ [W]

Total thermal dissipation losses of all RS /RL modules:
$P_{M,Total} = P_{M,a} + P_{M,b} + P_{M,c} + P_{M,d} + P_{M,e} + P_{M,f}$
$P_{M,Total} = 7,24$ W

Permissible total thermal dissipation losses P_v at ambient temperature $T_U = 35°C$:
$P_v = 12,5$W

Heating issues are not to be expected because the permissible total thermal dissipation loss P_v of the Room Control Box is larger than the calculated total of the thermal dissipation losses of all modules $P_{V,Modules}$.

At the ambient temperature $T_U = 35°C$ the condition

(2) $T_U + 2 * P_M > 45$

is met with $P_M = 7,24$:
$35 + 2 * 7,24 = 49,48 > 45$

Therefore the permissible dimmer load of both dimmers is derated according to the equation

(3) $Dimmload_{derated} = 100 - 3,1 * (T_U + 2 * P_M - 45)$ [%]

to
$100 - 3,1 * (35 + 2 * 7,24 - 45) = 86\%$
of the maximum permissible dimming value (250VA), i.e. to 215 VA.
In this example, only 150VA loads are to be dimmed. The derating does not affect the planned dimmer loads.

Application programs

None.

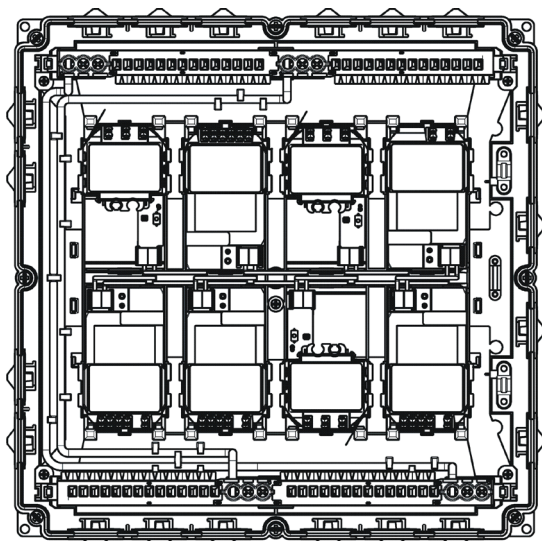| Room Control Box AP 641	5WG1641-3AB01

Example of operation

figure 1. Example of operation

Installation instructions
- The room control box may be used for permanent interior installations, for mounting in dry or wet rooms, in false ceilings and raised floors.

⚠ **DANGER**

- The room control box must be mounted and commissioned by an authorized electrician.
- A safety disconnection of the room control box must be possible.
- For planning and construction of electric installations, the relevant guidelines, regulations and standards of the respective country are to be considered.

Technical Specifications

Power supply
- for RS/RL modules: via the bus line
- KNX bus voltage: DC 24V (DC 21...30V) via KNX/EIB bus line
- Mains power: 230 V AC ± 10 %, 50...60 Hz, max. 3 x 16A

Physical Specifications
- housing: plastic
- dimensions:
  Length x Width x Height (in mm): 300 x 300 x 50
- weight: approx. 1450 g
- fire load: approx. 42000 kJ
- mounting: via four screws
- eight mounting locations for RS / RL modules
- 20 wire bushings, IP54, each with fixation provision for strain relief
- max. total permissible thermal dissipation loss of all mounted modules at ambient temperature T_U:
  $P_V = 30 - 0.5 * T_U$ [W]
  P_V at $T_U = 0°C$: ca. 30 W
  P_V at $T_U = 45°C$: ca. 7,5 W

Connections
- Bus line: screwless bus connection block (red-black) 0.6...0.8 mm Ø single core, strip insulation 5mm
- Internal bus line with bus connection blocks for eight RS / RL modules
- Mains power: bus bar terminals respectively terminals of RS / RL modules
- Two bus bars, connected to each other ex factory, for PE and N conductors, per bus bar
  N terminals: 3 x 2,5 - 16 mm² and 14 x 1,5 - 4 mm²
  PE terminals: 3 x 2,5 - 16 mm² and 14 x 1,5 - 4 mm²

Electrical Safety
- Degree of pollution (according to IEC 60664-1): 2
- Type of protection (according to EN 60529): IP 54
- Overvoltage category (according to IEC 60664-1): III
- Bus: safety extra low voltage SELV DC 24 V

Environmental specifications
- Climatic withstand capability: EN 50090-2-2
- Ambient temperature operating: - 5 ... + 45 °C
- Ambient temperature non-op.: - 25 ... + 70 °C
- relative humidity (non-condensing): 5 % ... 93 %

CE norm
- complies with low voltage regulations

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Installation and wiring

General description
The Room Control Box is designed for on-surface mounting on ceilings, walls, on the floor or any even surface. The holes for screw fastening of the Room Control Box are located on the corners of the box and are accessible without opening the housing. The Room Control Box is affixed with four screws.

Mounting

A1 Product label
A2 Hole for screw fastening of Room Control Box
A3 Lid screws (quarter-turn quick fastening screws)
A4 Room Control Box, Lid
A5 Cable bushing
A6 SELV (Class 2) cover for eight modules
A7 Lug to release SELV (Class 2) cover with a screw driver
A8 Protective cover with prepared break-outs in SELV (Class 2) cover
A9 Room Control Box, base
A10 Bus bar with PE / N terminals
A11 PE wire / N wire between bus bars
A12 Internal bus wiring with bus terminal blocks
A13 Mounting location for RS / RL module (1 ... 8)
A14 RS module (to be ordered separately)
A15 RL module (to be ordered separately)

• Mounting of the Room Control Box:
- Distance between drill holes for screw fastening: 289 mm
- Fix the Room Control Box at the fixation points (A2) with screws e.g. 4.5 x 50 mm.

• Removing the lid of the Room Control Box :
- Turn the quick fastening screws (A3) a quarter turn counter clock-wise.
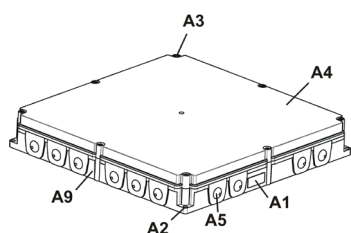- Remove the lid (A4).

figure 2: Mounting of the Room Control Box / Removing the lid of the Room Control Box

• Mounting / Dismounting the SELV (class 2) cover :
- Mounting:
  Insert the SELV (Class 2) cover (A6) in a level position, find the mounting position, and then push it down until the catches snap audibly.
- Dismounting:
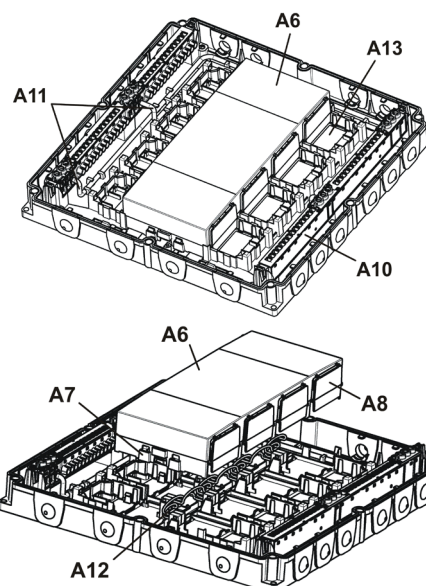 Move the SELV (Class 2) cover (A6) outwards with a screw driver inserted into the lug (A7)and then lift it upwards.

figure 3: Mounting / Dismounting the SELV (class 2) cover

• Breaking out the protective cover :
The SELV (Class 2) cover (A6) is delivered with eight closed protective covers (A8). Each of these can be removed individually.
For each mounting location (A13) used the associated protective cover (A8) of the SELV (Class 2) cover (A6) has to be removed.
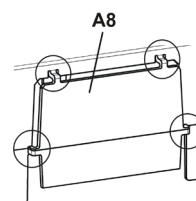

figure 4: Breaking out the protective cover

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Mounting / Dismounting of RS /RL modules :

A RS module (A14) or an RL module (A15) may be installed at any of the eight mounting locations (A13) of the Room Control Box. Mounting of the RS and RL modules is described generically in these mounting and operating instructions.

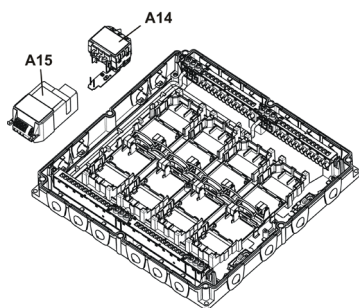Notes on wiring and commissioning of specific modules may be found in the respective documentation for that module.

figure 5: Mounting / Dismounting of RS / RL modules

Mounting of RS / RL modules

B1 RS module
B2 RL module
B3 Type label (with space for physical address of the module)
B4 Mounting location for RS / RL module in AP 641 Room Control Box
B5 Bus connection module with bus connection pins for bus terminal block, LED for indicating normal operating mode (LED off) or addressing mode (LED on), Learning button and contacts to RS module
B6 Insertion point for bus connection module of the RS module
B7 Snap-in point for bus connection module of the RS module
B8 Learning button for switching between normal operating mode and addressing mode and for receiving the physical address
B9 LED for indicating normal operating mode (LED off) or addressing mode (LED on); returns to normal operating mode automatically after receiving the physical address
B10 Bus connection pins for connection of the bus terminal block
B11 Insertion point for bus terminal block
B12 Bus terminal block for single core conductors with 0,6...0,8 mm Ø
B13 Hinge joint for mounting hinge of the RL module
B14 Terminals

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• Mounting of a RS module :

- Remove the lid of the AP 641 Room Control Box.
- Remove the SELV (Class 2) cover
- Insert the bus connection module (B5) in such a way into the insertion point (B6) for the bus connection module that the bus connection pins (B10) point to the insertion point for the bus terminal (B11).
- Press the bus connection module (B5) down until it snaps into the locking position (B7).
- Insert the RS module (B1) from the top with the terminals (B14) pointing away from the bus terminal insertion point (B11). The type label (B3) is on top.
- Insert the bus terminal (B12) of the mounting location (B4) onto the bus connection pins (B10) of the bus connection module (B5).
- For assignment of the Physical Address press the learning button (B8) for a maximum of 2 seconds. The addressing mode is indicated when the LED is on (B9). It returns to normal operating mode (LED Off) automatically after receiving the physical address.
- Insert the SELV (Class 2) cover again.
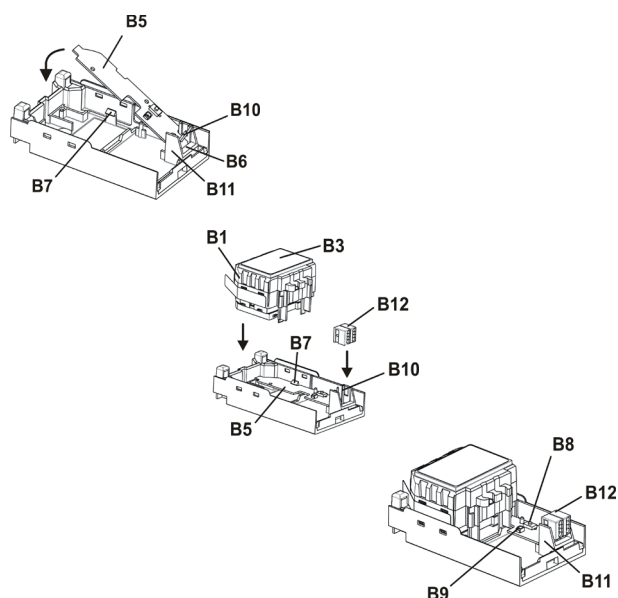- Mount the lid again.

figure 6: Mounting of a RS module

• Dismounting an RS module (Figure 3-b):

- Remove the lid of the AP 641 Room Control Box.
- Remove the SELV (Class 2) cover
- Remove the wiring from the terminals (B14).
- Remove the bus terminal (B12).
- To remove the RS module (B1), insert a screw driver between the module and the mounting location siding and push it up to release it from the snap-in hooks. Do this on both sides.
- Pull the RS module (B1) from the mounting location (B4).
- If an RL module (B2) shall be inserted into the mounting location, detach the bus connection module (B5) from the snap-in point (B7), swivel it up and pull it out of the insertion point (B6).
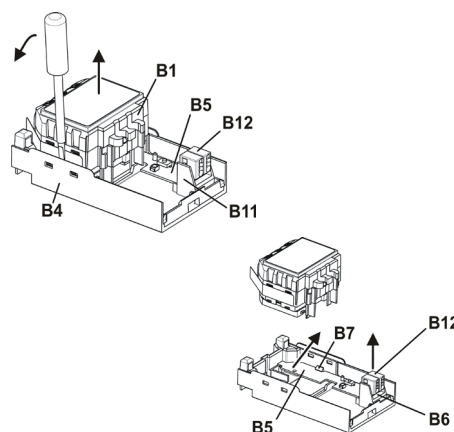- Insert the SELV (Class 2) cover again.
- Mount the lid again.

figure 7: Dismounting of a RS module

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- Mounting of an RL module (Figure 3-c):

- Remove the lid of the AP 641 Room Control Box.
- Remove the SELV (Class 2) cover
- Insert the RL module (B2) into the hinge (B13) of the mounting location (B4). The terminals (B14) point away from the insertion point for the bus terminal (B11). The type label (B3) is on top.
- Swivel the RL module (B2) down until it audibly snaps into the mounting location (B4).
- Insert the bus terminal (B12) of the mounting location (B4) onto the bus connection pins (B10) of the RL module (B2).
- For assignment of the Physical Address press the learning button (B8) for a maximum of 2 seconds. The addressing mode is indicated when the LED is on (B9). It returns to normal operating mode (LED Off) automatically after receiving the physical address.
- Insert the SELV (Class 2) cover again.
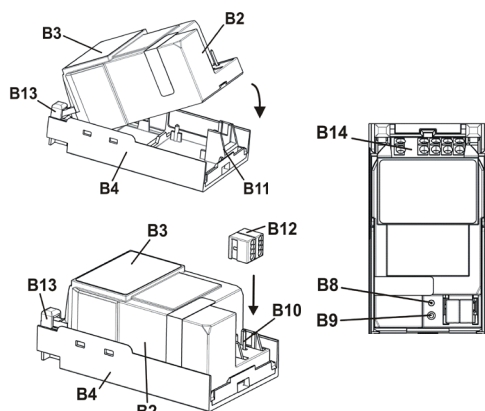- Mount the lid again.

figure 8: Mounting of an RL module

- Dismounting an RL module (Bild 3-d):

- Remove the lid of the AP 641 Room Control Box.
- Remove the SELV (Class 2) cover
- Remove the wiring from the terminals (B14).
- Remove the bus terminal (B12).
- To remove the RL module (B2), insert a screw driver between the module and the mounting location on the bus terminal side and push it up to release it from the snap-in hooks.
- Swivel the RL module (B2) up, pull it down out of the hinge (B13) and remove it from the mounting location (B4).
- Insert the SELV (Class 2) cover again.
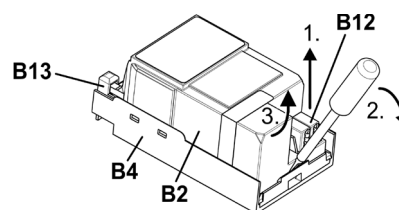- Mount the lid again.

figure 9: Dismounting an RL module

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Wiring

Slipping off/on bus connection blocks

The bus connection block (C2) is situated on the back of the actuator (C1).
It consists of two components (C2.1 and C2.2) with four terminal contacts each. Take care not to damage the two test sockets (C2.3) by accidentally connecting them to the bus cable or with the screw driver (e.g. when attempting to unplug the bus connection block).

Slipping off bus connection blocks
- Carefully put the screw driver to the wire insertion slit of the bus connection block's grey component (C2.2) and
- pull the bus connection block (C2) from the module.

Note

Don't try to remove the bus connection block from the bottom side. There is a risk of shorting-out the device!

Slipping on bus connection blocks
- Slip the bus connection block (C2) onto the guide slot of the module and
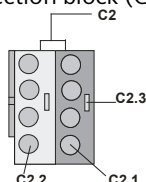- press the bus connection block (C2) down to the stop.

Figure 10: Slipping off/on bus connection blocks

Connecting bus cables
- The bus connection block (D2) can be used with single core conductors Ø 0.6...0.8 mm.
- Remove approx. 5 mm of insulation from the conductor (D1) and plug it into the bus connection block (D2) (red = +, grey = -)

Disconnecting bus cables
- Unplug the bus connection block (D2) and remove the bus cable conductor (D1) while simultaneously wiggling it.
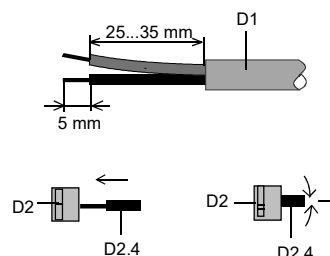

figure 11: Connecting / Disconnecting bus cables

Connecting/disconnecting mains and load circuit:

Connect wires
- The load circuits are connected via screwless plug-in terminals (E1).
- Remove approx. 9...10 mm of insulation from the wire (E 1.1) and plug it into the terminal (E1).
- The terminals are designed for connection of two wires allowing to loop through the terminal block.
Note:
The maximum permissible terminal load current is 16A.

Remove wires
- Press the terminal interlocking of the terminal (F1) with a screw-driver and remove the wire (F2) from the terminal (F1).
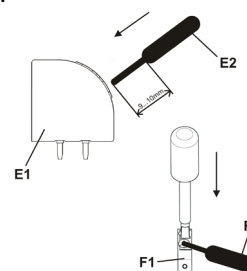

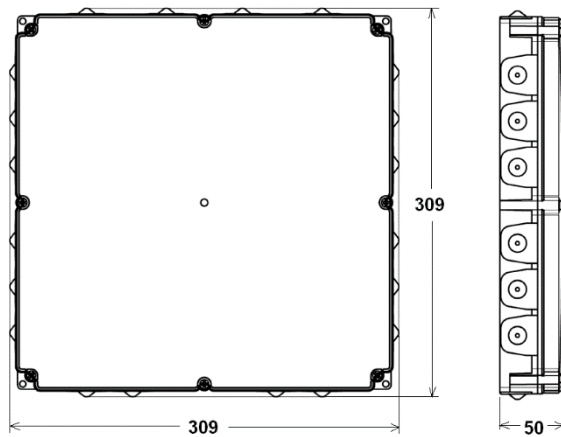figure 12: Connecting/disconnecting mains and load circuit

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Dimension drawing

Dimensions in mm

Space for notes

General Notes

- The operating instructions must be handed over to the client.
- A faulty device shall be returned with a Return Good Note for Service provided by the appropriate Siemens sales office.
- If you have further questions concerning the product please contact our technical support.
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- 🖷 +49 (911) 895-7223
- ✉ support.automation@siemens.com