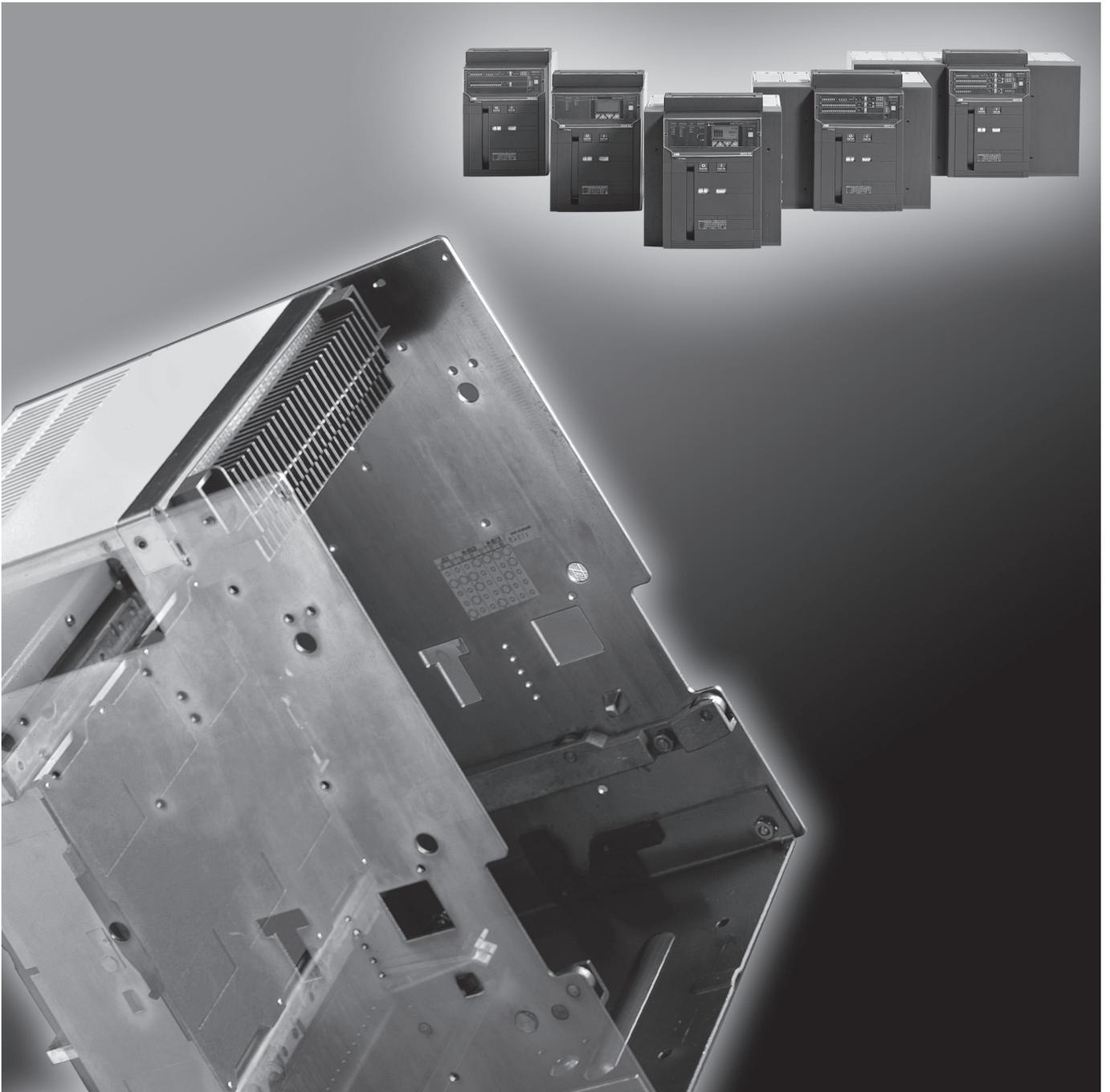


1SDH000461R0002 L5439

Emax



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Dwg.		Resp.Off.		Title Installation, service and maintenance instruction for the fixed part of withdrawable version circuit-breakers	Language
App.		Take-over Off.			en
Mod.	L2234	L5439		Apparatus Emax	Scale
	L2778			Doc. N° 1SDH000461R0002	
ABB		ABB SACE			

1. Description

1.1 General Characteristics

The SACE Emax series of circuit-breakers consists of a steel sheet structure which houses the operating mechanism, the poles and the auxiliary parts. Each pole, insulated from the others, contains the circuit-breaking parts and the current transformer of the corresponding phase.

The structure of the poles differs according to whether the circuit-breaker is selective or current-limiting. The fixed version circuit-breaker has its own terminals for connection to the power circuit; in the withdrawable version the circuit-breaker comprises the moving part of the apparatus, which is completed with a fixed part fitted with the terminals for connection to the power circuit of the installation. The moving part and the fixed part are coupled by means of special contacts installed in the fixed part.

1.2 Fixed part construction characteristics

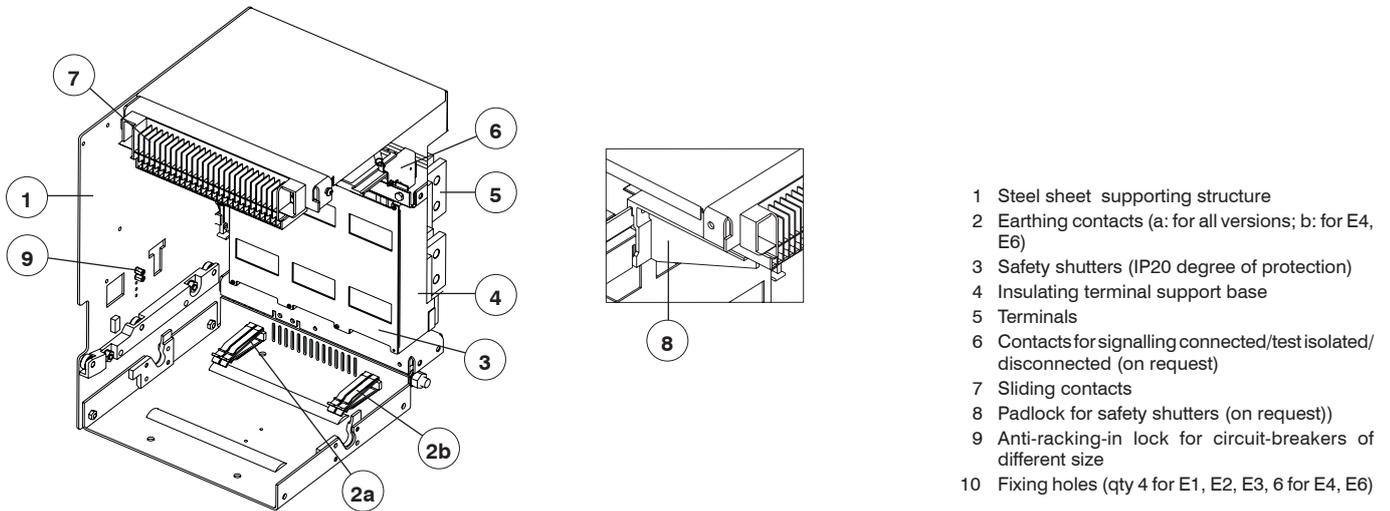


Fig. 1

2. Checking on receipt

Examine the state of the material received and its consistency with the content of the order. Should any damage or errors be found on unpacking, which must be carried out carefully, make the relative notification within and not over 5 days from the receipt of the material. The notification must indicate the number of the shipping note.

3. Storage, lifting and weights

The fixed part, protected by an external wooden crate, is fixed by means of screws to the transport pallet or to the bottom of the packing case. If the fixed part has to remain in the warehouse even for a short time before being put into service, after checking it on receipt, it must be put back in its container and covered with a waterproof sheet.

- CAUTION**
- Use a dry, dust-free room free of aggressive chemical agents as a storage room
 - Position the fixed part on a horizontal surface, not in direct contact with the floor, but on a suitable support surface (Fig. 2)
 - The maximum number of stackable circuit-breakers is indicated in figure 3.

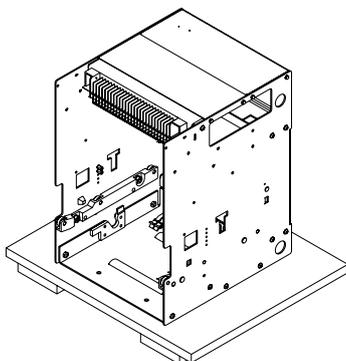


Fig. 2

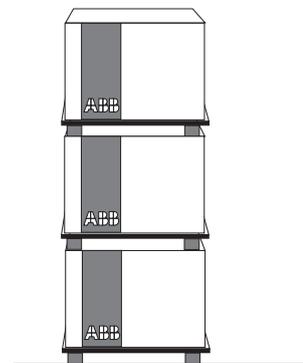


Fig. 3

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With regard to lifting, follow the instructions: the fixed part must be placed on a sturdy supporting surface and lifted, preferably, by means of a special fork-lift truck. However, the use of ropes is allowed. In this case, the lifting ropes must be hooked up as shown in the figures.

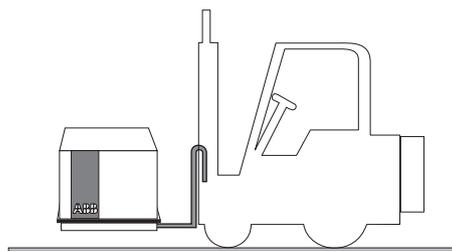
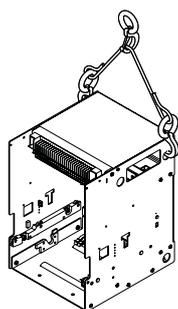


Fig. 4

Table of the fixed parts weights (Kg.)

Fixed part	3 poles withdrawable	4 poles withdrawable
	Kg	Kg
E1	25	28
E2	28	32
E3	38	45
E4	50	48
E4/f	-	50
E6	70	80
E6/f	-	85

Note

The above table refers to fixed parts with horizontal back terminals.

4. Installation

4.1 Installation room

Install the fixed part in a dry, dust-free, non-corrosive room, and in such a way that it is not subject to shocks or vibrations; where this is not possible, install it inside a switchboard with a suitable degree of protection.

For the preparation of the installation room, please refer to the "Overall dimensions" chapter, which gives information on the following points:

- minimum installation volumes of the circuit-breakers and derived versions
- distances to be respected for circuit-breakers in compartments
- overall dimensions of the circuit-breakers
- fixing drillings
- compartment door drillings



CAUTION:The installation, commissioning and any ordinary and extraordinary maintenance have to be done by skilled personnel, with a detailed knowledge of the apparatus



WARNING ELECTRICAL SHOCK HAZARD

Disconnect and lock and tag out all electrical power feeds to avoid any potential shock hazard when you are assembling, installing, maintaining or removing the circuit breaker from service. Some operations must be performed when the circuit-breaker is energized. In this case, reasonable care and compliance with all safe working practices is required.

4.2 Installation of the fixed part of the withdrawable circuit-breaker

4.2.1 Preparation of the fixed part

Assembly of the anti-racking-in lock

Before installing the fixed part, it is necessary to check the presence of the anti-racking-in lock for circuit-breakers with different electrical characteristics from those of the fixed part; if the anti-racking-in lock has been supplied separately, proceed to assemble it as follows:

- On the self-adhesive plate (4), find the assembly position of the stop bolts in relation to the circuit-breaker which has to be housed in the fixed part
- Insert the hexagonal-head screws (1) in the holes found in the previous item as shown in the figure
- Fix the screw with the washer (2) and nut (3).

Make sure that the anti-racking-in lock corresponding to the one installed on the fixed part is present on the circuit-breaker (moving part).

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Example for E1B 08 according to the nameplate diagram

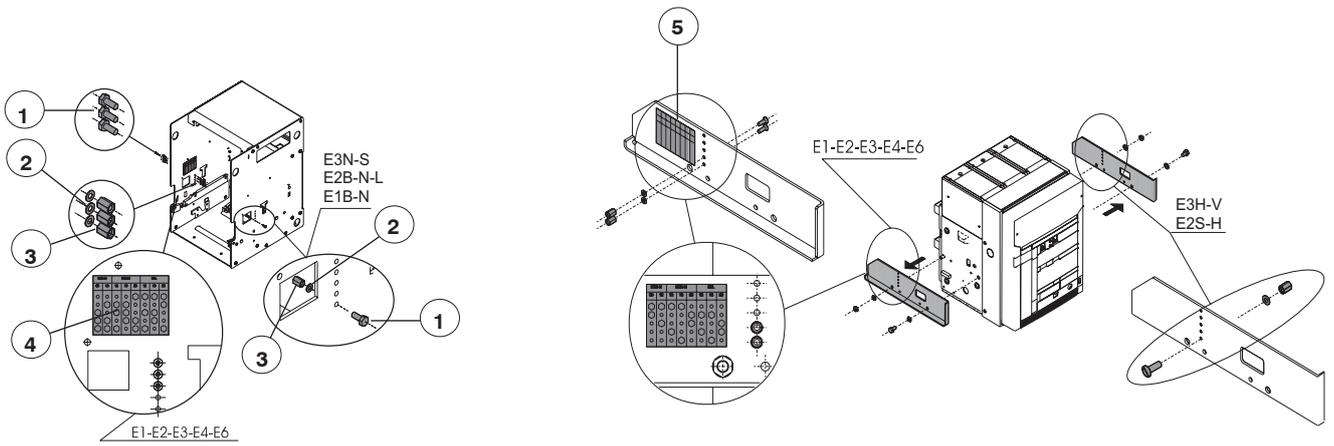


Fig. 5

Fig. 6

4.2.2 Installation of the fixed part

Attach the fixed part by means of the screws (1), washer (2) and nut (3) (M8 x 16), supplied by ABB SACE. If other screws are used, make sure that the head of the screws does not extend more than 5.5 mm from the base of the fixed part.

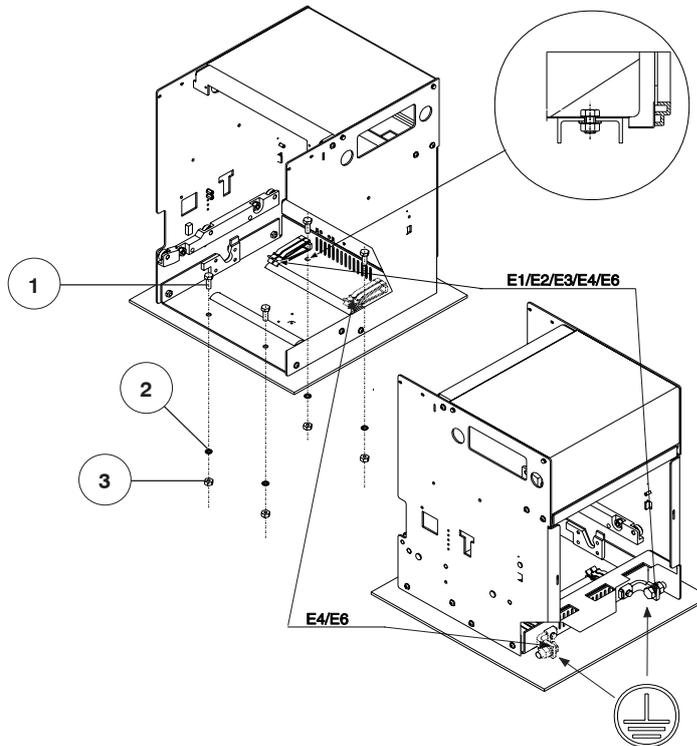


Fig. 7

Notes

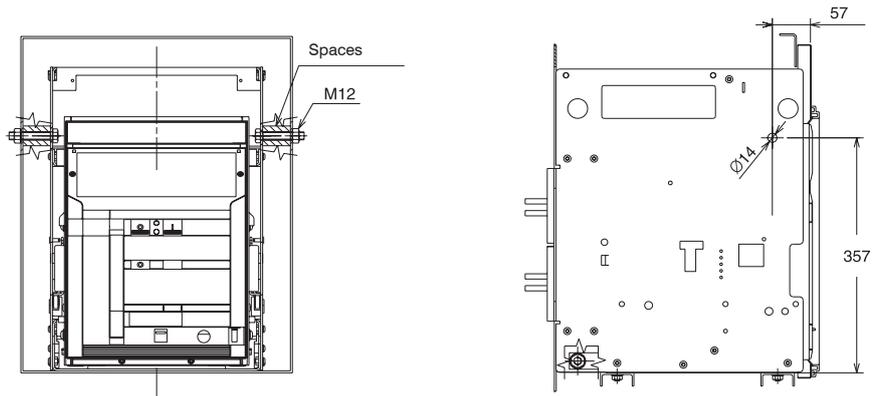
(*) For the E1-E2-E3 fixed parts, there are four fixing points, whereas there are six for E4-E6.

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4.2.3 Installation of the fixed part on board a ship

Regarding the fixing points of the SACE Emax withdrawable version air circuit-breakers, for applications on board a ship, additional fixing on the sides of the fixed part itself is recommended (the M12 screws and the spacers are not provided in the supply).

E1 - E2 - E3



E4 - E6

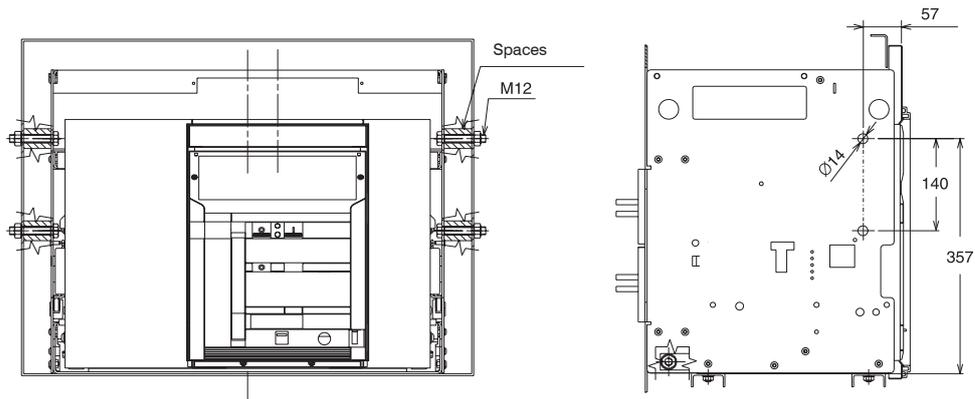


Fig. 8

4.3 Installation of the flange on the compartment door (Fig. 9)

- Make the compartment door drillings specified in the "Overall dimensions" paragraph.
- Attach the flange (1) on the front of the compartment door, fixing it from the inside by means of the self-tapping screws (2).

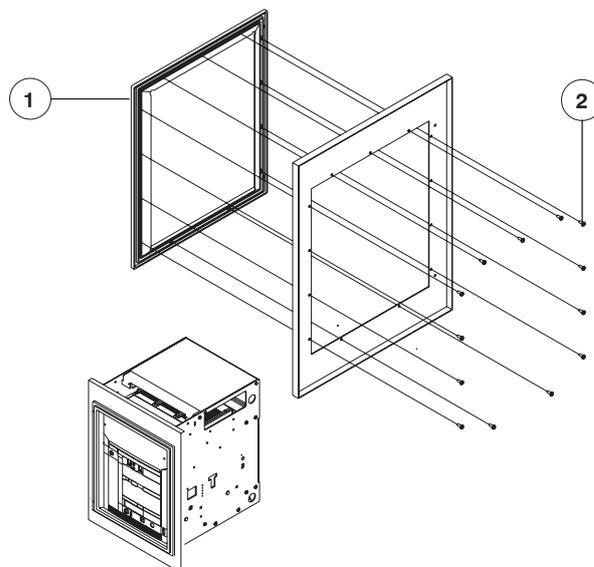


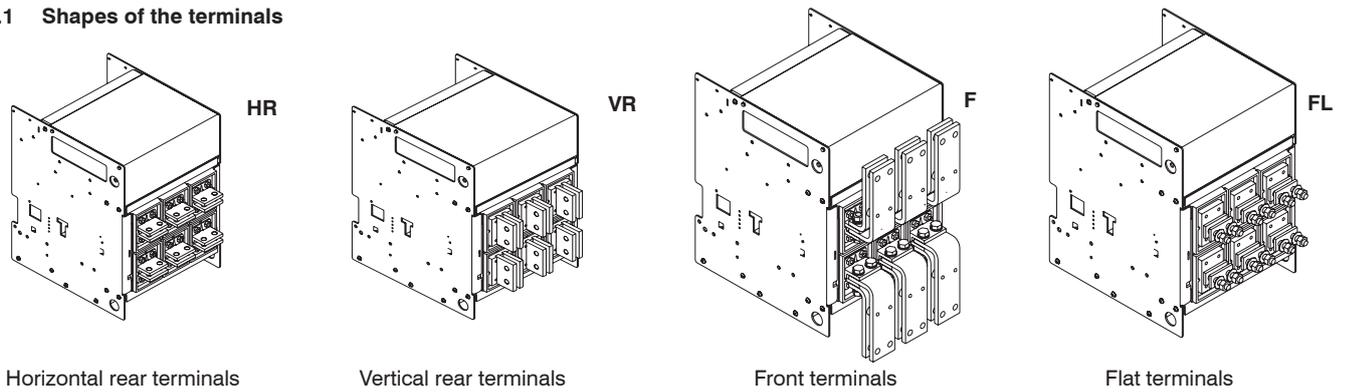
Fig. 9

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5. Electrical connections

5.1 Connections to the power circuit

5.1.1 Shapes of the terminals



Note

The drawings are provided to show the type of terminal in graphic form. The exact shape of the terminals is given in the "Overall dimensions" chapter. Different terminals can be installed between the top and bottom parts (inlet and outlet).

Fig. 10

5.1.2 Examples of positioning the connection busbars according to the types of terminal

The connection busbars enable the connection between the terminals of the circuit-breakers and the busbars of the switchgear. Their sizing must be carefully studied by the switchgear designer. Some examples of possible constructions in relation to the shape and size of the circuit-breaker terminals are given in this paragraph. The various types of terminals are of constant dimensions for each size of circuit-breaker: it is normally advisable to exploit the whole contact surface of the terminal, so the width of the connection busbars should be the same as that of the terminal. Different connection capacities can be obtained by adjusting the thickness and number of busbars in parallel. In some cases, reductions in the width of the connection in relation to that of the terminal are allowable as shown in the following examples. It is possible to mount different terminals between the upper and lower part (input and output).

Sections	I _u [A]	Vertical terminals				Horizontal and front terminals			
		Continuous current-carrying capacity			Busbar cross-section [mm ²]	Continuous current-carrying capacity			Busbar cross-section [mm ²]
		35°C	45°C	55°C		35°C	45°C	55°C	
E1B/N 08	800	800	800	800	1x(60x10)	800	800	800	1x(60x10)
E1B/N 10	1000	1000	1000	1000	1x(80x10)	1000	1000	1000	2x(60x8)
E1B/N 12	1250	1250	1250	1250	1x(80x10)	1250	1250	1200	2x(60x8)
E1B/N 16	1600	1600	1600	1500	2x(60x10)	1550	1450	1350	2x(60x10)
E2S 08	800	800	800	800	1x(60x10)	800	800	800	1x(60x10)
E2N/S 10	1000	1000	1000	1000	1x(60x10)	1000	1000	1000	1x(60x10)
E2N/S 12	1250	1250	1250	1250	1x(60x10)	1250	1250	1250	1x(60x10)
E2B/N/S 16	1600	1600	1600	1600	2x(60x10)	1600	1600	1530	2x(60x10)
E2B/N/S 20	2000	2000	2000	1800	3x(60x10)	2000	2000	1750	3x(60x10)
E2L 12	1250	1250	1250	1250	1x(60x10)	1250	1250	1250	1x(60x10)
E2L 16	1600	1600	1600	1500	2x(60x10)	1600	1500	1400	2x(60x10)
E3H/V 08	800	800	800	800	1x(60x10)	800	800	800	1x(60x10)
E3S/H 10	1000	1000	1000	1000	1x(60x10)	1000	1000	1000	1x(60x10)
E3S/H/V 12	1250	1250	1250	1250	1x(60x10)	1250	1250	1250	1x(60x10)
E3S/H/V 16	1600	1600	1600	1600	1x(100x10)	1600	1600	1600	1x(100x10)
E3S/H/V 20	2000	2000	2000	2000	2x(100x10)	2000	2000	2000	2x(100x10)
E3N/S/H/V 25	2500	2500	2500	2500	2x(100x10)	2500	2450	2400	2x(100x10)
E3N/S/H/V 32	3200	3200	3100	2800	3x(100x10)	3000	2880	2650	3x(100x10)
E3L 20	2000	2000	2000	2000	2x(100x10)	2000	2000	1970	2x(100x10)
E3L 25	2500	2500	2390	2250	2x(100x10)	2375	2270	2100	2x(100x10)
E4H/V 32	3200	3200	3200	3200	3x(100x10)	3200	3150	3000	3x(100x10)
E4S/H/V 40	4000	4000	3980	3500	4x(100x10)	3600	3510	3150	6x(60x10)
E6V 32	3200	3200	3200	3200	3x(100x10)	3200	3200	3200	3x(100x10)
E6H/V 40	4000	4000	4000	4000	4x(100x10)	4000	4000	4000	4x(100x10)
E6H/V 50	5000	5000	4850	4600	6x(100x10)	4850	4510	4250	6x(100x10)
E6H/V 63	6300	6000	5700	5250	7x(100x10)	-	-	-	-

Fig. 11

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Positioning the first anchoring baffle of the busbars according to the short-circuit current

Anchoring to the switchgear

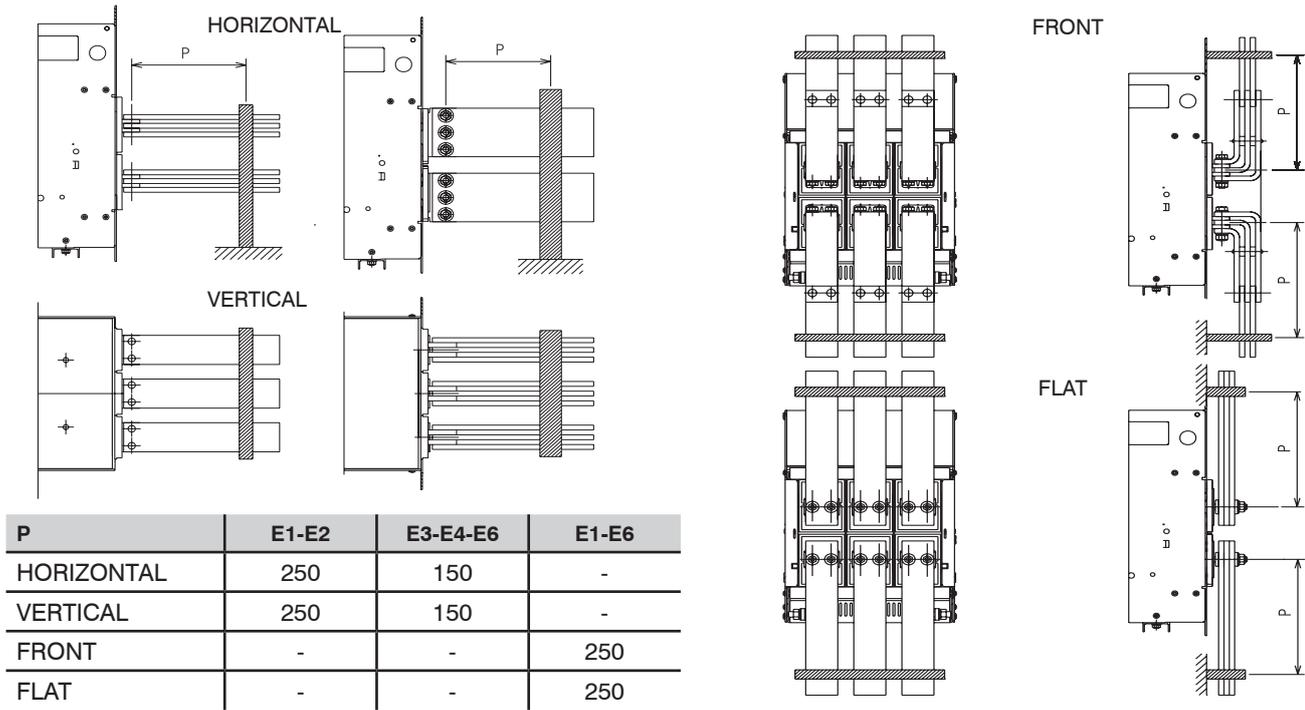


Fig. 12

5.1.3 Assembly procedure for the connection busbars

Check the state of the contact surfaces of the connections very carefully: they must be very clean with no burrs, dents or traces of rust which must be eliminated using a fine file or an emery cloth to prevent localized increases in temperature. On completion of the operation, remove all traces of grease or dust with a cloth soaked in a suitable solvent. When copper connections are used, it is advisable to tin-plate the contact surfaces. When aluminium connections are used, it is necessary to tin the contact surfaces.

The connections must not exert any strain on the terminals in any direction

Always insert a large diameter flar washer and a spring washer between them (to spread the tightening pressure over a greater area).

Make the contact between connection and terminal and tighten the fixing screws completely.

Always use two wrenches (so as not to strain the insulating parts excessively), applying the tightening torque 70 Nm and use M12 high resistance screws. Check tightness after 24 hours.

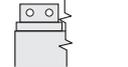
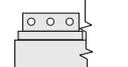
Fixed part terminals	No. screws for phase	No. screws for neutral
 E1/E2	2	2
 E3	3	3
 E4	4	2
 E4/f	4	4
 E6	6	3
 E6/f	6	6

Fig. 13

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5.2 Earthing

The fixed part of the withdrawable circuit-breaker have one or two terminals on the rear, marked with the special symbol, for connection to earth (Fig. 7).

Each terminal is complete with a bolt for fixing the connection.

A conductor with a cross-section conforming to current standards must be used for the connection. Before assembling the connection, clean and degrease the area around the screw. After the assembly tighten the bolt with a torque of 70 Nm.

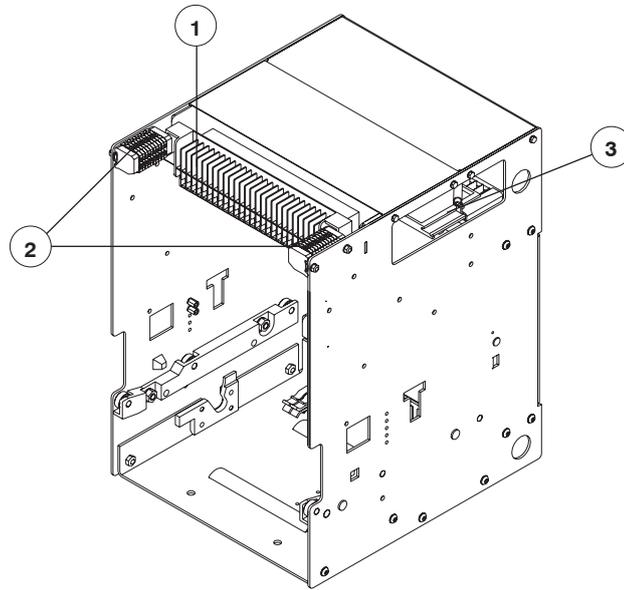
5.3 Wiring the circuit-breaker auxiliary circuits

5.3.1 Withdrawable circuit-breaker

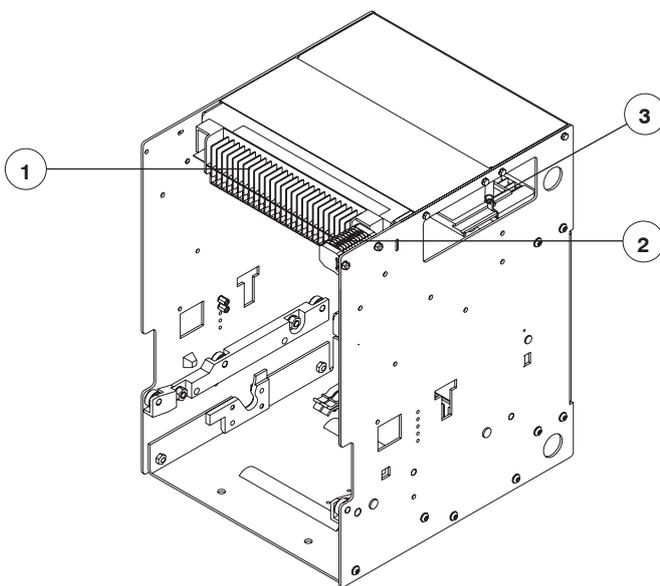
For connection of the moving part to the auxiliary circuits, a connection with sliding contacts is available on the fixed part (see figure), identified by code X on the electrical circuit diagram.

The terminals of the fixed connector are immediately accessible when the compartment door is open.

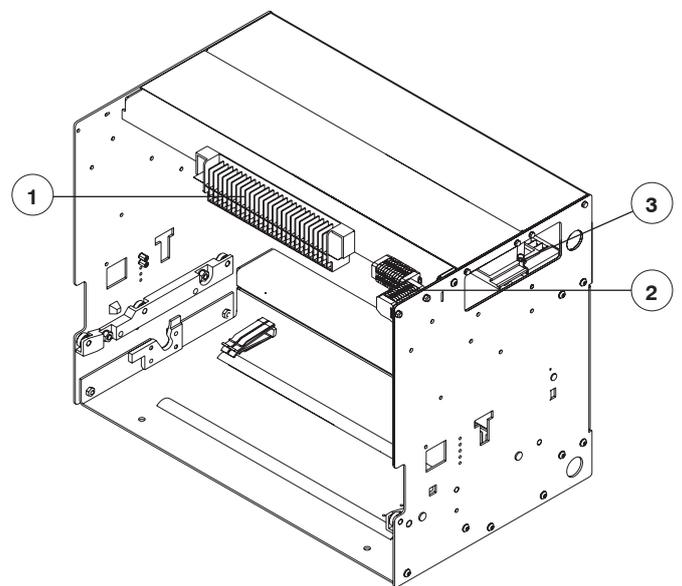
Furthermore, a terminal box identified by code XF is available for connecting the position contacts of the moving part in relation to the fixed part. The connector and terminal box have screw terminals.



E1 - E2 - E3
10 contacts in position



E1 - E2 - E3 - E4 - E6
5 contacts in position



E4 - E6
10 contacts in position

Caption

- ① Sliding contacts(X)
- ② Terminal box for position contacts (XF)
- ③ Position contacts

Fig. 14

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6. Fixed part accessories

6.1 Electrical accessories

6.1.1 Auxiliary contacts

Auxiliary contacts installed on the circuit-breaker are available enable an indication of the circuit-breaker's status. A special version of the auxiliary contacts is also available (gold plated contacts) for a rated voltage under 24 V (digital signal).

Characteristics

Un	In max	T
125 V DC	0,3 A	10 ms
250 V DC	0,15 A	10 ms

Un	In max	cosφ
250 V DC	5 A	0,3

Electrical signalling for circuit-breaker connected/test isolated/disconnected (Fig. 15)

In addition to mechanical signalling of the position of the circuit-breaker, it is possible to have electrical signalling by means of 5 or 10 auxiliary contacts which are installed on the fixed part.

Only available for circuit-breakers in withdrawable versions for installing on the fixed part.

The auxiliary contacts can have the following configurations:

Reference figures in the electrical circuit diagrams: S75I (31-32) – S75T (31-32) – S75E (31-32)

- 5 contacts; group consisting of 2 connected signalling contacts, 2 disconnected signalling contacts and 1 test position signalling contact (main contacts isolated, but sliding contacts connected)
- 10 contacts; group consisting of 4 connected signalling contacts, 4 disconnected signalling contacts and 2 test position signalling contacts (main contacts isolated, but sliding contacts connected).

6.2 Mechanical accessories

6.2.1 Accessory for shutter padlocks (Fig.16)

They enable the shutters to be padlocked (installed on the fixed part) in the closed position.

Only available for circuit-breakers in withdrawable versions for installing on the fixed part.

6.2.2 Mechanical lock on compartment door

This prevents the compartment door from being opened when the circuit-breaker is closed (connected in the case of withdrawable circuit-breakers) and prevents circuit-breaker closing with the compartment door open.

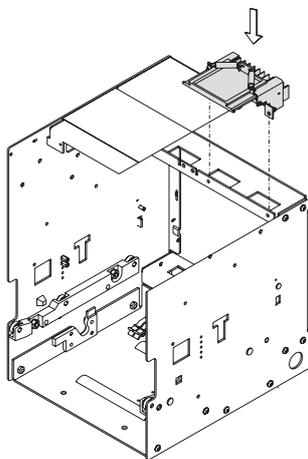


Fig. 15

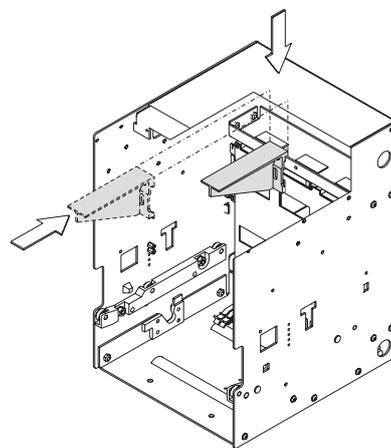


Fig. 16

6.2.3 Interlock between circuit-breakers

This mechanism makes the mechanical interlock between two or three circuit-breakers (even of different sizes and in any fixed/withdrawable version) by means of a flexible cable. The electrical circuit diagram for the electrical changeover by means of a relay (to be provided by the customer) is supplied with the mechanical interlock. The circuit-breakers can be installed vertically or horizontally.

Four types of interlocks are available:

type A: between 2 circuit-breakers (power supplies + emergency)

type B: between 3 circuit-breakers (2 power supplies + emergency)

type C: between 3 circuit-breakers (2 power supplies + bus-tie)

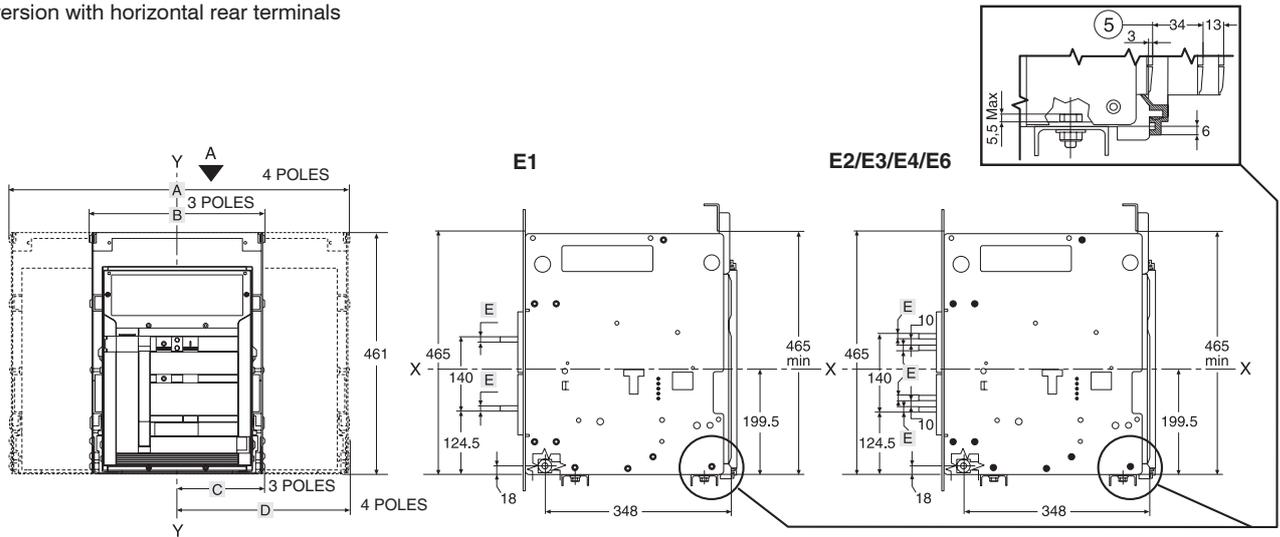
type D: between 3 circuit-breakers (3 power supplies / a single closed circuit-breaker)

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7. Overall dimensions

Withdrawable circuit-breaker

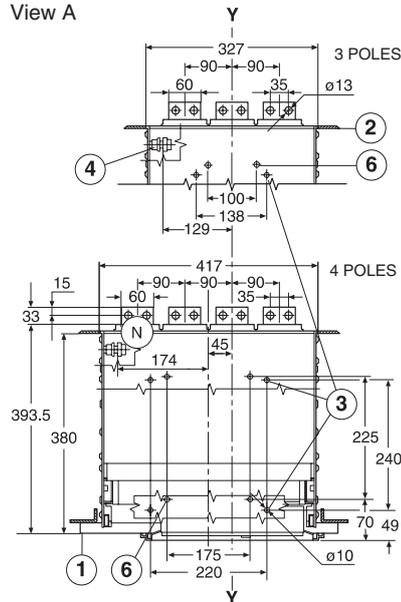
Basic version with horizontal rear terminals



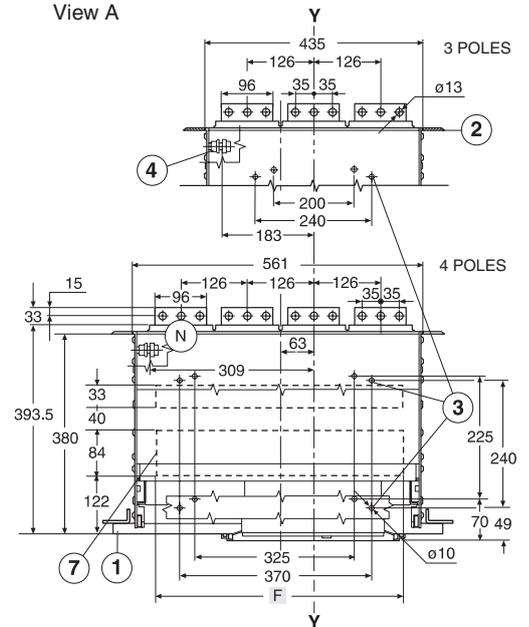
Caption

- ① Inside edge of compartment door
- ② Segregation (where foreseen)
- ③ Fixing fixed part $\varnothing 10$ drilling (use M8 screws)
- ④ No. 1 M12 screw (E1, E2, E3) or no. 2 M12 screws (E4, E6) for earthing (included in the supply)
- ⑤ Run from connected for a TEST to isolated
- ⑥ Alternative drilling with 25 mm pitch for fixing fixed part
- ⑦ Ventilation drilling on the switchgear

E1/E2
View A



E3
View A



	A	B	C	D	E	F	
						3 poli	4 poli
E1	414	324	162	162	10	-	-
E2	414	324	162	162	8	-	-
E3	558	432	216	216	8	370	490
E4	684	594	252	342	8	530	610
E4/f	774	-	-	342	8	-	700
E6	936	810	342	468	8	750	870
E6/f	1062	-	-	468	8	-	1000

Fig. 17

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Withdrawable circuit-breaker

Basic version with vertical rear terminals

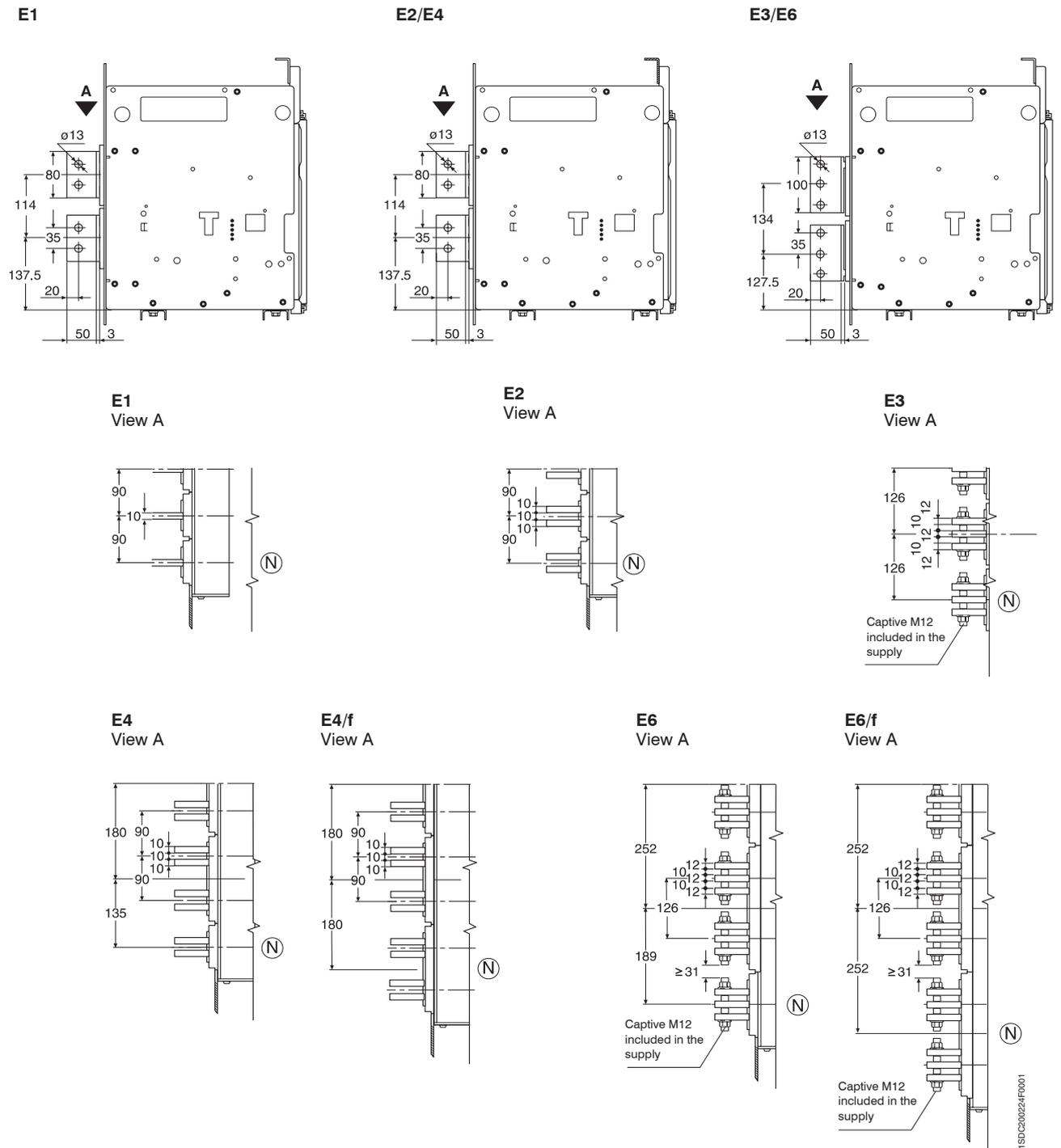


Fig. 19

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Withdrawable circuit-breaker

Version with front terminals

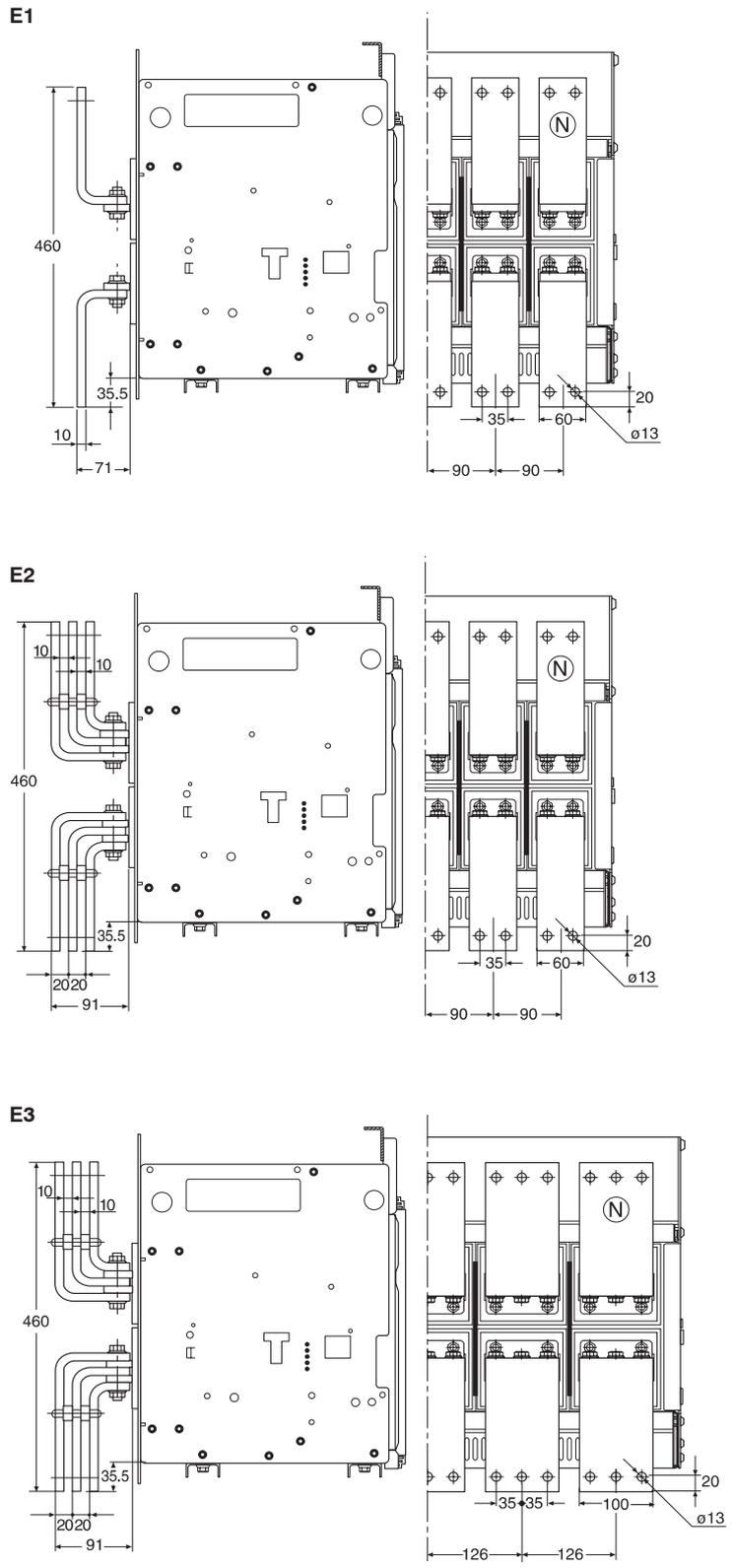


Fig. 20

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Withdrawable circuit-breaker

Version with flat terminals

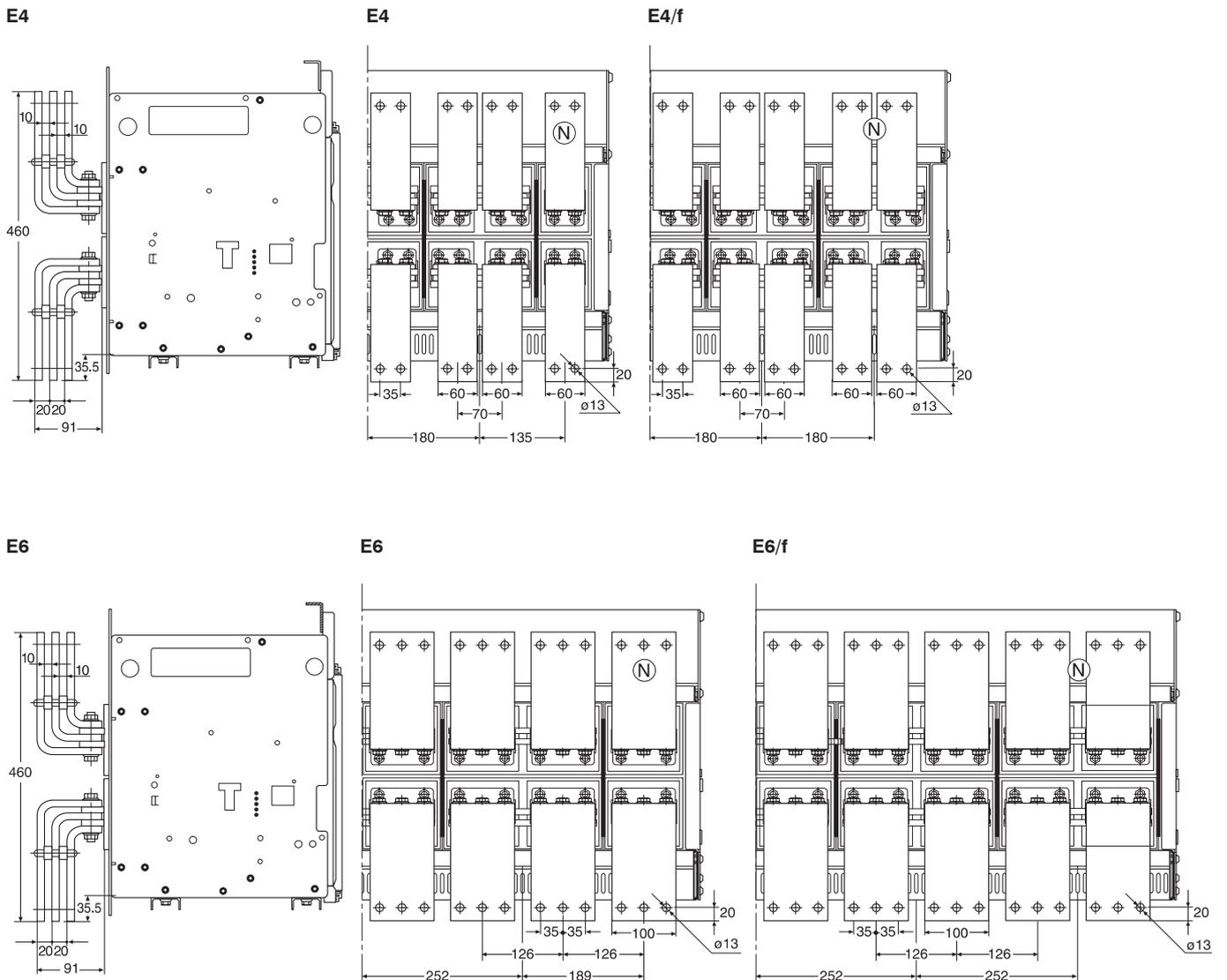


Fig. 21

Mod.	L2234	L5439	Apparatus	Emax	Scale
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Withdrawable circuit-breaker

Version with flat terminals

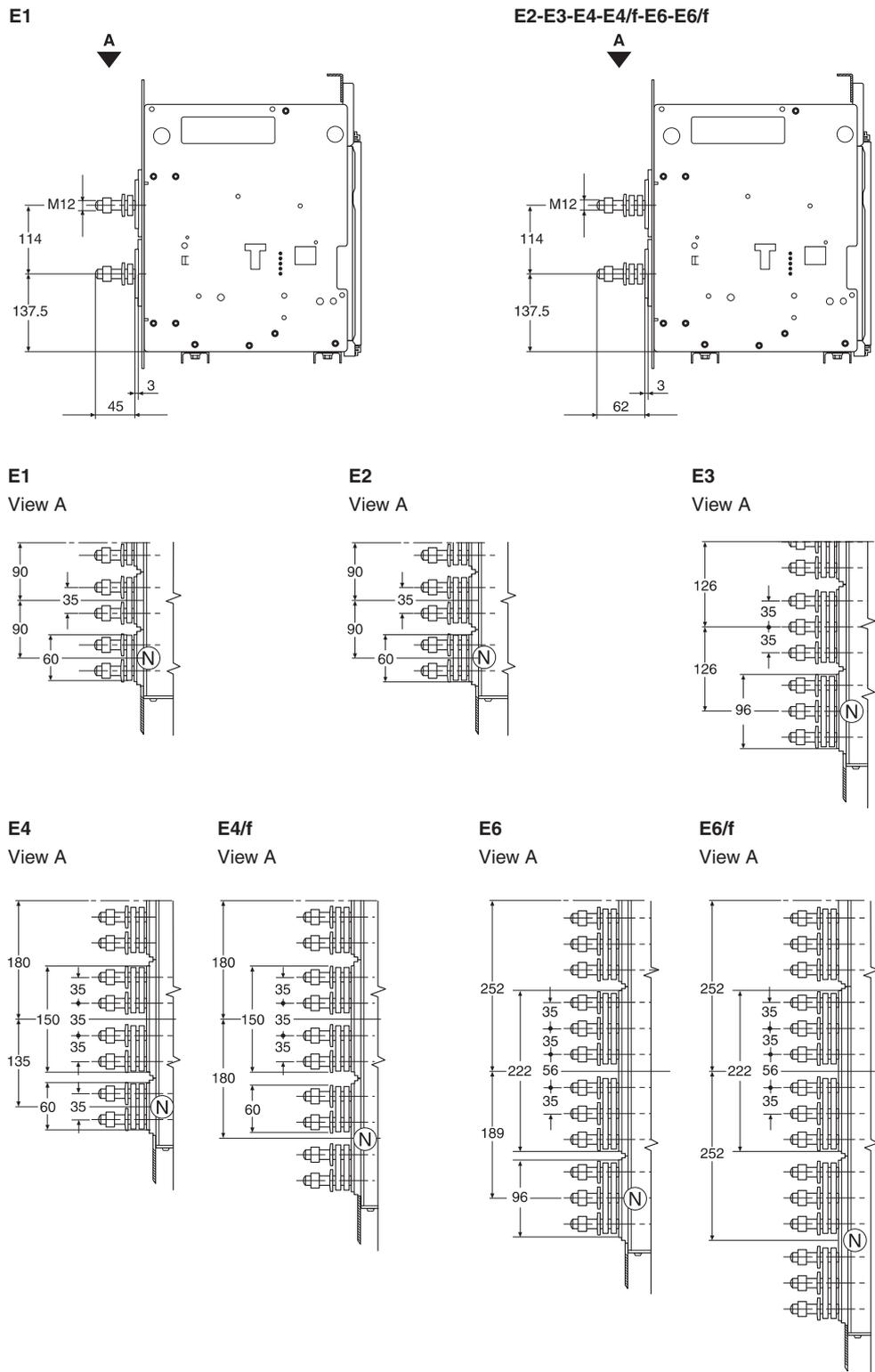
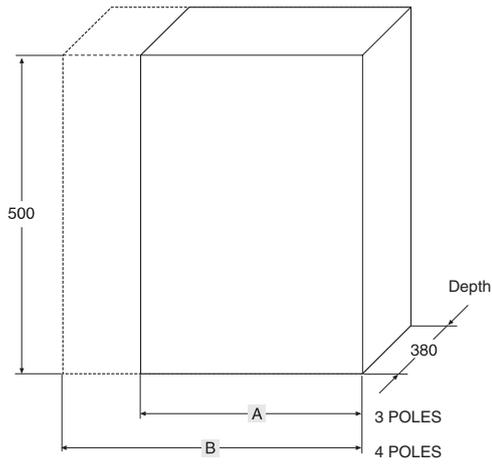


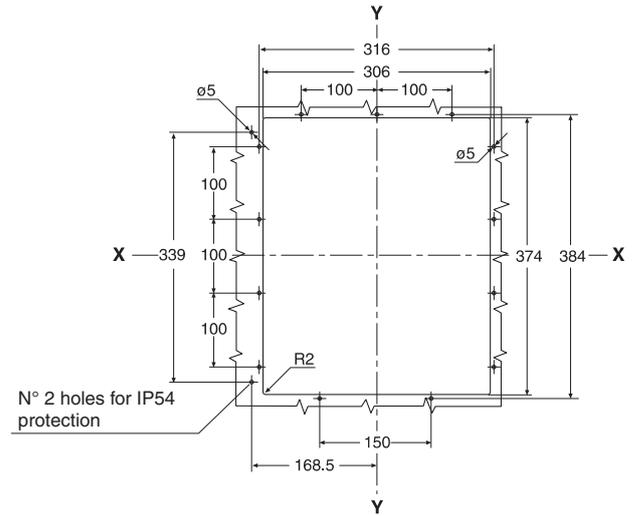
Fig. 22

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Compartment dimensions



Compartment door drilling



Tightening torque of the fixing screws: 20 Nm
Tightening torque of the main terminals: 70 Nm
Tightening torque of the earthing screw: 70 Nm

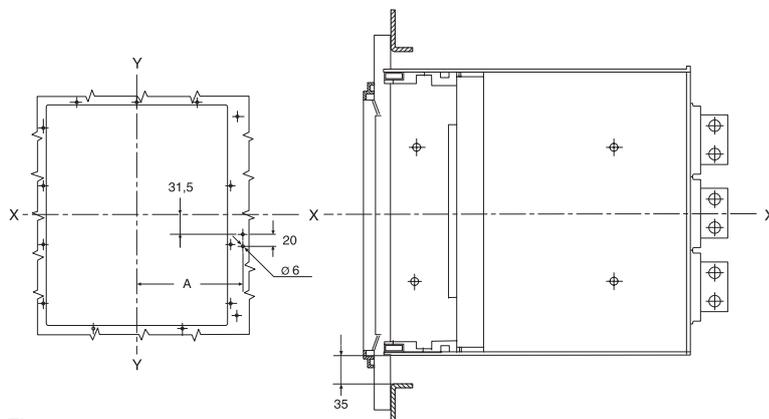
	A	B
E1	400	490
E2	400	490
E3	500	630
E4	700	790
E4/f	-	880
E6	1000	1130
E6/f	-	1260

	High resistance M12 screw Quantity per terminal	
	PHASE	NEUTRAL
E1-E2	2	2
E3	3	3
E4-E4/f	4	2-4
E6-E6/f	6	3-6

Compartment door mechanical lock

Door drilling

Minimum distance between the circuit-breaker and the switchgear wall



	A	
	3 POLES	4 POLES
E1	180	180
E2	180	180
E3	234	234
E4	270	360
E4/f	-	360
E6	360	486
E6/f	-	486

Fig. 23

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8. Circuit diagrams



Warning

Before installing the circuit-breaker, carefully read notes F and O on the circuit diagrams.

Operating status shown

The circuit diagram is for the following conditions:

- withdrawable circuit-breaker, open and racked-in
- circuits de-energised
- releases not tripped
- motor operating mechanism with springs unloaded.

Versions

The diagram shows a circuit-breaker in withdrawable version; it can be applied to a fixed version circuit-breaker as well.

Fixed version

The control circuits are fitted between terminals XV (connector X is not supplied).

With this version, the applications indicated in figures 31 and 32 cannot be provided.

Withdrawable version

The control circuits are fitted between the poles of connector X (terminal box XV is not supplied).

Version without overcurrent release

With this version, the applications indicated in figures 13, 14, 41, 42, 43, 44, 45, 46, 47, 48, 62 cannot be provided.

Version with PR121/P electronic release

With this version, the applications indicated in figures 42, 43, 44, 45, 46, 47, 48 cannot be provided.

Version with PR122/P electronic release

With this version, the applications indicated in figure 41 cannot be provided.

Version with PR123/P electronic release

With this version, the applications indicated in figure 41 cannot be provided.

Caption

□	= Circuit diagram figure number
*	= See note indicated by the letter
A1	= Circuit-breaker accessories
A3	= Accessories applied to the fixed part of the circuit-breaker (for withdrawable version only)
A4	= Example switchgear and connections for control and signalling, outside the circuit-breaker
A13	= PR021/K signalling unit (outside the circuit-breaker)
AY	= SACE SOR TEST UNIT Test/monitoring Unit (see note R)
D	= Electronic time-delay device of the undervoltage release, outside the circuit-breaker
F1	= Delayed-trip fuse
K51	= PR121/P, PR122/P, PR123/P electronic release with the following protection functions: <ul style="list-style-type: none"> - L overload protection with inverse long time-delay trip-setting I1 - S short-circuit protection with inverse or definite short time-delay trip-setting I2 - I short-circuit protection with instantaneous time-delay trip-setting I3 - G earth fault protection with inverse short time-delay trip-setting I4
K51/1...8	= Contacts for the PR021/K signalling unit
K51/GZin(DBin)	= Zone selectivity: for protection G (only with Vaux and PR122/P or PR123/P release) or "reverse" direction input for protection D (only with Vaux and PR123/P release)
K51/GZout(DBout)	= Zone selectivity: for protection G (only with Vaux and PR122/P or PR123/P release) or "reverse" direction output for protection D (only with Vaux and PR123/P release)
K51/IN1	= Digital programmable input (available only with Vaux and release PR122/P or PR123/P with indicator module PR120/K)
K51/P1...P4	= Programmable electrical signalling (available only with Vaux and release PR122/P or PR123/P with indicator module PR120/K)
K51/SZin(Dfin)	= Zone selectivity: input for protection S or "direct" input for protection D (only with Vaux and PR122/P or PR123/P release)
K51/SZout(DFout)	= Zone selectivity: output for protection S or "direct" output for protection D (only with Vaux and PR122/P or PR123/P release)
K51/YC	= Closing control from PR122/P or PR123/P electronic release with communication module PR120/D-M
K51/YO	= Opening control from PR122/P or PR123/P electronic release with communication module PR120/D-M
M	= Motor for loading the closing springs
Q	= Circuit-breaker
Q/1...27	= Circuit-breaker auxiliary contacts
S33M/1...3	= Limit contacts for spring-loading motor
S43	= Switch for setting remote/local control
S51	= Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release. The circuit-breaker may be closed only after pressing the reset pushbutton, or after energizing the coil for electrical reset (if available)
S75E/1.4	= Contacts for electrical signalling of circuit-breaker in disconnected position (only with withdrawable circuit-breakers)
S75/1..5	= Contacts for electrical signalling of circuit-breaker in connected position (only with withdrawable circuit-breakers)
S75T/1..4	= Contacts for electrical signalling of circuit-breaker in test isolated position (only with withdrawable circuit-breakers)
SC	= Pushbutton or contact for closing the circuit-breaker
SO	= Pushbutton or contact for opening the circuit-breaker
SO1	= Pushbutton or contact for opening the circuit-breaker with delayed trip
SO2	= Pushbutton or contact for opening the circuit-breaker with instantaneous trip
SR	= Pushbutton or contact for electrical circuit-breaker reset
TI/L1	= Current transformer located on phase L1
TI/L2	= Current transformer located on phase L2

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TI/L3	= Current transformer located on phase L3
TO	= Homopolar toroidal current transformer (see note W)
Vaux	= Auxiliary power supply voltage (see note F)
UI/L1	= Current sensor (Rogowski coil) located on phase L1
UI/L2	= Current sensor (Rogowski coil) located on phase L2
UI/L3	= Current sensor (Rogowski coil) located on phase L3
UI/N	= Current sensor (Rogowski coil) located on neutral
UI/0	= Current sensor (Rogowski coil) located on the conductor connecting to earth the star point of the MV/LV transformer (see note G)
W1	= Serial interface with control system (external bus): EIA RS485 interface (see note E)
W2	= Serial interface with the accessories of PR121/P, PR122/P and PR123/P releases (internal bus)
X	= Delivery connector for auxiliary circuits of withdrawable version circuit-breaker
X1...X7	= Connectors for the accessories of the circuit-breaker
XF	= Delivery terminal box for the position contacts of the withdrawable circuit-breaker (located on the fixed part of the circuit-breaker)
KK1	= Connector for power circuits of PR121/P, PR122/P and PR123/P releases
KK2 - KK3	= Connectors for auxiliary circuits of PR121/P, PR122/P and PR123/P releases
KK4	= Connector to signal open/close
KK5	= PR120V module connector
XO	= Connector for YO1 release
XV	= Delivery terminal box for the auxiliary circuits of the fixed circuit-breaker
YC	= Shunt closing release
YO	= Shunt opening release
YO1	= Overcurrent shunt opening release (trip coil)
YO2	= Second shunt opening release (see note Q)
YR	= Coil to electrically reset the circuit-breaker
YU	= Undervoltage release (see notes B and Q)

Description of figures

Fig. 1	= Motor circuit to load the closing springs.
Fig. 2	= Circuit of shunt closing release.
Fig. 4	= Shunt opening release.
Fig. 6	= Instantaneous undervoltage release (see notes B and Q).
Fig. 7	= Undervoltage release with electronic time-delay device, outside the circuit-breaker (see notes B and Q)
Fig. 8	= Second shunt opening release (see note Q).
Fig. 11	= Contact for electrical signalling of springs loaded.
Fig. 12	= Contact for electrical signalling of undervoltage release energized (see notes B and S).
Fig. 13	= Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release. The circuit-breaker may be closed only after pressing the reset pushbutton.
Fig. 14	= Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release and electrical reset coil. The circuit-breaker may be closed only after pressing the reset pushbutton or energizing the coil.
Fig. 21	= First set of circuit-breaker auxiliary contacts.
Fig. 22	= Second set of circuit-breaker auxiliary contacts (not available for PR122/P and PR123/P releases)(see note V)
Fig. 23	= Third set of supplementary auxiliary contacts outside the circuit-breaker.
Fig. 31	= First set of contacts for electrical signalling of circuit-breaker in connected, test isolated, disconnected position.
Fig. 32	= Second set of contacts for electrical signalling of circuit-breaker in connected, test isolated, disconnected position.
Fig. 41	= Auxiliary circuits of PR121/P release (see note F).
Fig. 42	= Auxiliary circuits of PR122/P and PR123/P releases (see notes F and V).
Fig. 43	= Circuits of the measuring module PR120/V of the PR122/P and PR123/P releases internally connected to the three-pole and four-pole circuit-breaker (optional for the release PR122/P) (see note U).
Fig. 44	= Circuits of the measuring module PR120/V of the PR122/P and PR123/P releases externally connected to the circuit-breaker (optional for the release PR122/P) (see note O, U and X).
Fig. 45	= Circuits of the communication module PR120/D-M of the PR122/P and PR123/P releases (optional) (see note E).
Fig. 46	= Circuits of the indicator module PR120/K of the PR122/P and PR123/P releases - connection 1 (optional) (see note V).
Fig. 47	= Circuits of the indicator module PR120/K of the PR122/P and PR123/P releases - connection 2 (optional) (see note V).
Fig. 48	= Circuits of the measuring module PR120/V of the PR122/P and PR123/P releases connected inside the three-pole circuit-breaker with outside neutral conductor (optional for the release PR122/P)(see note U).
Fig. 61	= SACE SOR TEST UNIT Test/monitoring Unit (see note R)
Fig. 62	= Circuits of the signalling unit PR021/K (outside the circuit-breaker).

Incompatibilities

The circuits indicated in the following figures cannot be supplied simultaneously on the same circuit-breaker:

6 - 7 - 8
13 - 14
22 - 46 - 47
43 - 44 - 48

Notes

- A) The circuit-breaker is only fitted with the accessories specified in the ABB SACE order acknowledgement. Consult this catalogue for information on how to make out an order.
- B) The undervoltage release is supplied for operation using a power supply branched on the supply side of the circuit-breaker or from an independent source. The circuit-breaker can only close when the release is energized (there is a mechanical lock on closing). If the same power supply is used for the closing and undervoltage releases and the circuit-breaker is required to close automatically when the auxiliary power supply comes back on, a 30 ms delay must be introduced between the undervoltage release accept signal and the energizing of the closing release. This may be achieved using an external circuit comprising a permanent make contact, the contact shown in fig. 12 and a time-delay relay.
- E) For connecting the EIA RS485 serial line see "Technical Application Book - Volume 9" communication via BUS with the ABB switches.

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- F) The auxiliary voltage Vaux allows actuation of all operations of the PR121/P, PR122/P and PR123/P releases.
Having requested a Vaux insulated from earth, one must use “galvanically separated converters” in compliance with IEC 60950 (UL 1950) or equivalent standards that ensure a common mode current or leakage current (see IEC 478/1, CEI 22/3) not greater than 3.5 mA, IEC 60364-41 and CEI 64-8.
- G) Earth fault protection is available with the PR122/P and PR123/P releases by means of a current sensor located on the conductor connecting to earth the star center of the MV/LV transformer.
The connections between terminals 1 and 2 (or 3) of current transformer UI/O and poles T7 and T8 of the X (or XV) connector must be made with a two-pole shielded and stranded cable (type BELDEN 3105A/3105B) no more than 15m long. The shield must be earthed on the circuit-breaker side and current sensor side.
- N) With releases PR122/P and PR123/P, the connections to the zone selectivity inputs and outputs must be made with a two-pole shielded and stranded cable (type BELDEN 3105A/3105B), no more than 300m long. The shield must be earthed on the selectivity input side.
- O) Systems with a rated voltage greater than 690V require the use of an insulation voltage transformer to connect to the busbars (connect according to the diagrams on the sheet provided with the kit 1SDH000460R0508).
- P) With releases PR122/P and PR123/P with communication module PR120/D-M, the coils YO and YC are controlled directly from contacts K51/YO and K51/YC with maximum voltages of 110-120 VDC and 240-250 VAC.
- Q) The second shunt opening release may be installed as an alternative to the undervoltage release.
- R) The SACE SOR TEST UNIT + opening release (YO) is guaranteed to operate starting at 75% of the Vaux of the opening release itself.
While the YO power supply contact is closing (short-circuit on terminals 4 and 5), the SACE SOR TEST UNIT is unable to detect the opening coil status.
Consequently:
- For continuously powered opening coil, the TEST FAILED and ALARM signals will be activated
- If the coil opening command is of the pulsing type, the TEST FAILED signal may appear at the same time. In this case, the TEST FAILED signal is actually an alarm signal only if it remains lit for more than 20s.
- S) Also available in the version with normally-closed contact
- U) The measuring module PR120/V is always supplied with relay PR123/P.
- V) If fig. 22 is present (second set of auxiliary contacts) simultaneously as relay PR122/P (or PR123/P), the contacts for the zone selectivity in fig. 42 (K51/Zin, K51/Zout, K51/Gzin and K51/Gzout) are not wired. In addition, the indicator module PR120/K in figures 46 and 47 cannot be supplied.
- W) For the connections between TO toroidal transformer and poles of CB X (or XV) connector, use a shielded 4-pole cable with paired braided wires (BELDEN 9696 paired type), length not exceeding 10m. The shielding will be grounded on CB side.
- X) T3 and T4 poles of X (or XV) connector are used to measure voltage when $U > 690V$. In this case, they must be connected to the secondary winding of the TU voltage transformer (see fig. 44). Ask ABB SACE for applications of the residual current protection with voltages higher than 690V.
- Y) The shielding of the connection cable will be grounded on CB side only. The connection must be made with a two-pole shielded and stranded cable (type BELDEN 3105A) no more than 15m long.
- Z) Short-circuit T5 and T6 if the external neutral current sensor (UI/N) is not connected.

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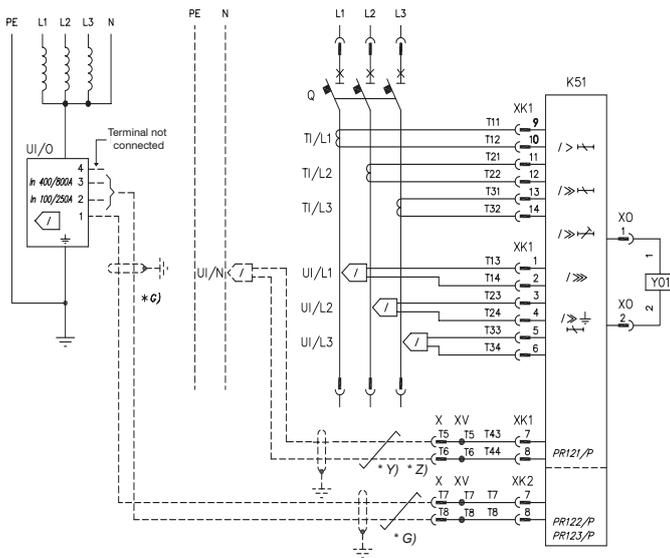
Circuit diagram symbols (IEC 60617 and CEI 3-14 ... 3-26 Standards)

	Shield (may be drawn in any shape)		Terminal		Position switch (limit switch) change-over break before make contact
	Delay		Plug and socket (male and female)		Circuit-breaker-disconnector with automatic release
	Mechanical or electrical connection		Motor (general symbol)		Switch-disconnector (on-load isolating switch)
	Manually operated control (general case)		Current transformer		Operating device (general symbol)
	Operated by turning		Voltage transformer		Instantaneous overcurrent or rate-of-rise relay
	Operated by pushing		Winding of three-phase transformer, connection star		Overcurrent relay with adjustable short time-lag characteristic
	Equipotentiality		Make contact		Overcurrent relay with inverse short time-lag characteristic
	Converter with galvanic separator		Break contact		Overcurrent relay with inverse long time-lag characteristic
	Conductors in a screened cable (i.e., 3 conductors shown)		Change-over break before make contact		Earth fault overcurrent relay with inverse short time-lag characteristic
	Twisted conductors (i.e., 3 conductors shown)		Position switch (limit switch), make contact		Fuse (general symbol)
	Connection of conductors		Position switch (limit switch), break contact		Current sensing element

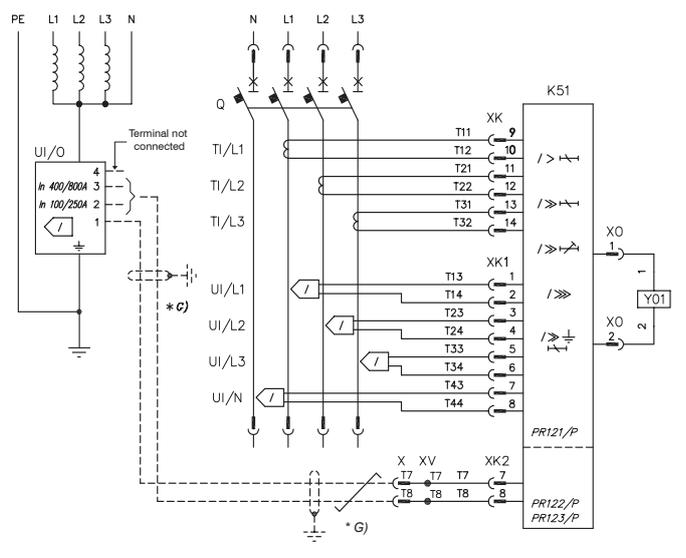
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Circuit diagram - Operating status

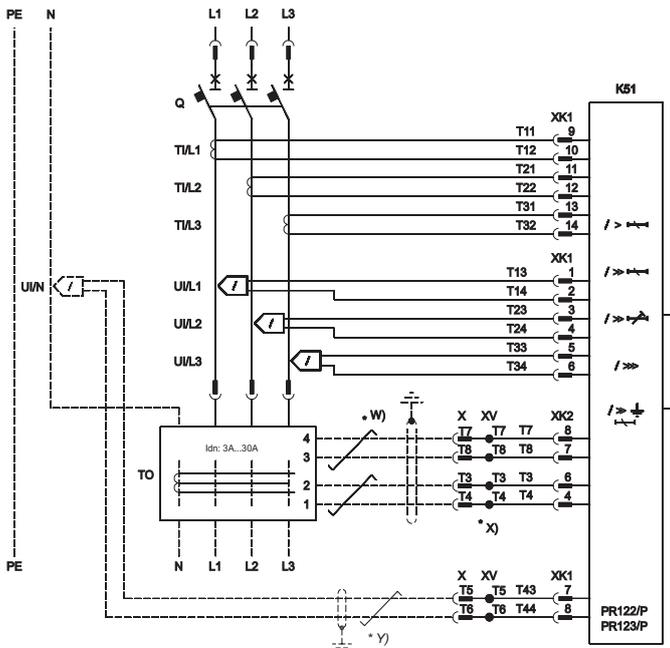
Three-pole circuit-breaker with PR121/P, PR122/P or PR123/P electronic release



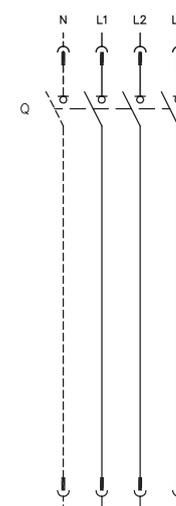
Four-pole circuit-breaker with PR121/P, PR122/P, PR123/P electronic release



Three-pole circuit-breaker with PR122/P or PR123/P electronic release, residual current protection and $U_c \leq 690V$.

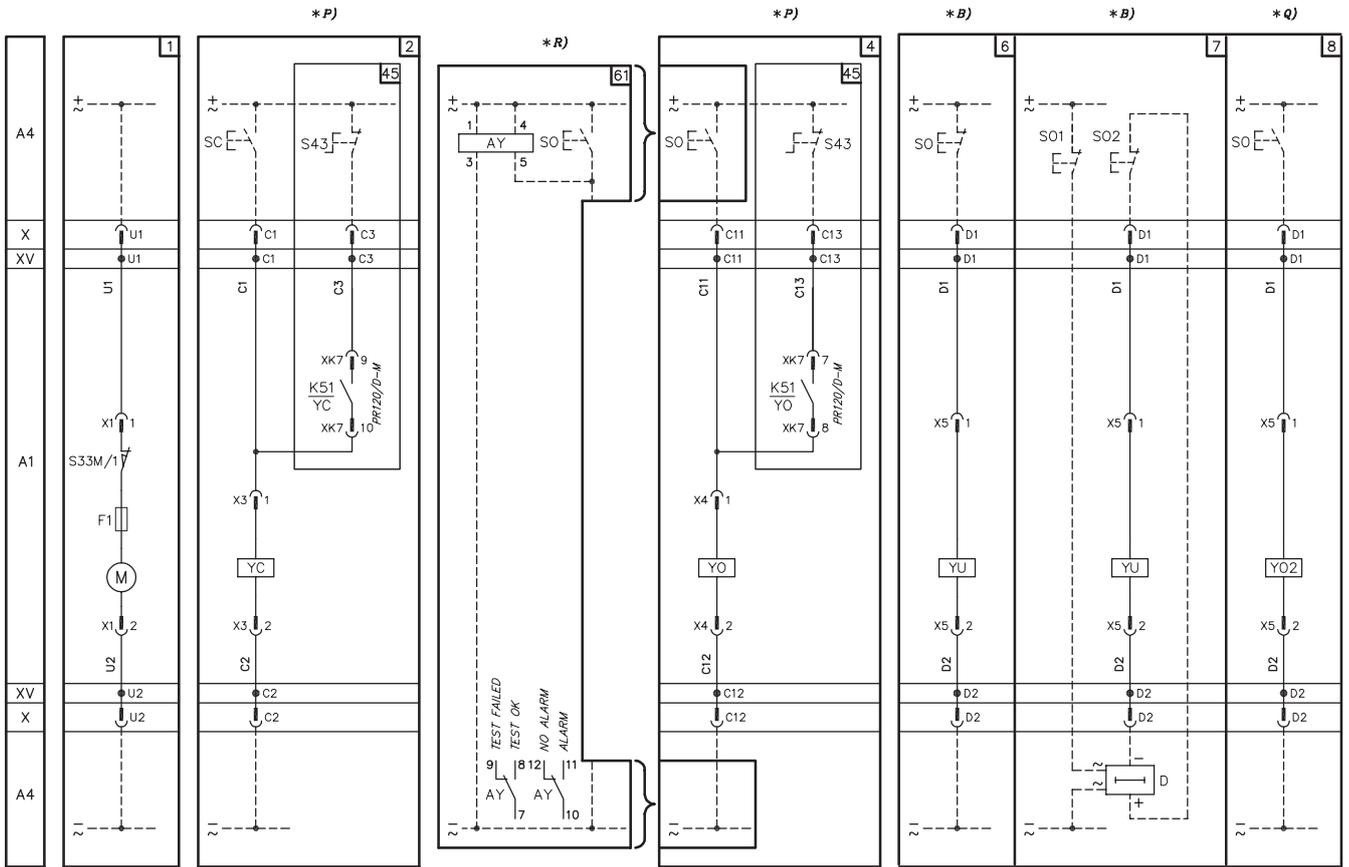


Three- or four-pole switch-disconnector

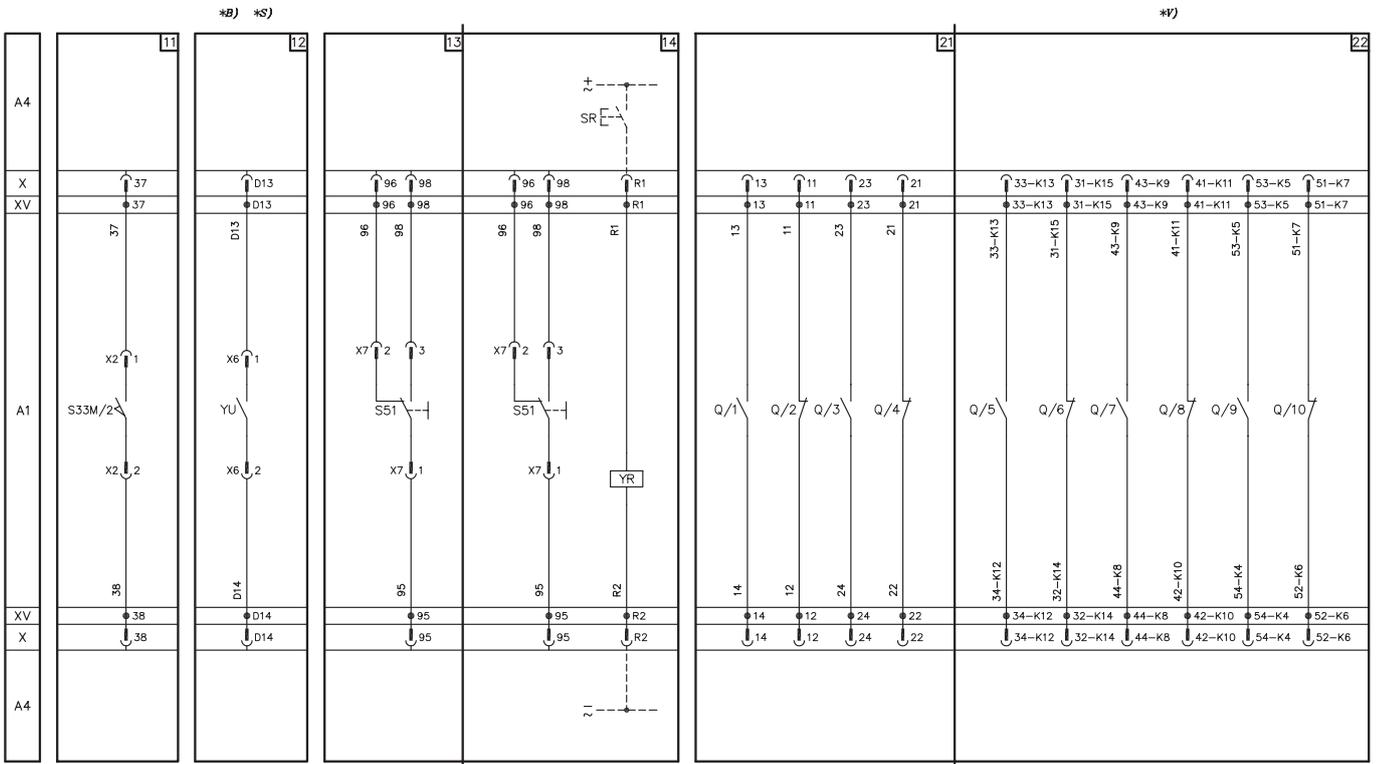


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Motor operating mechanism, opening, closing and undervoltage releases

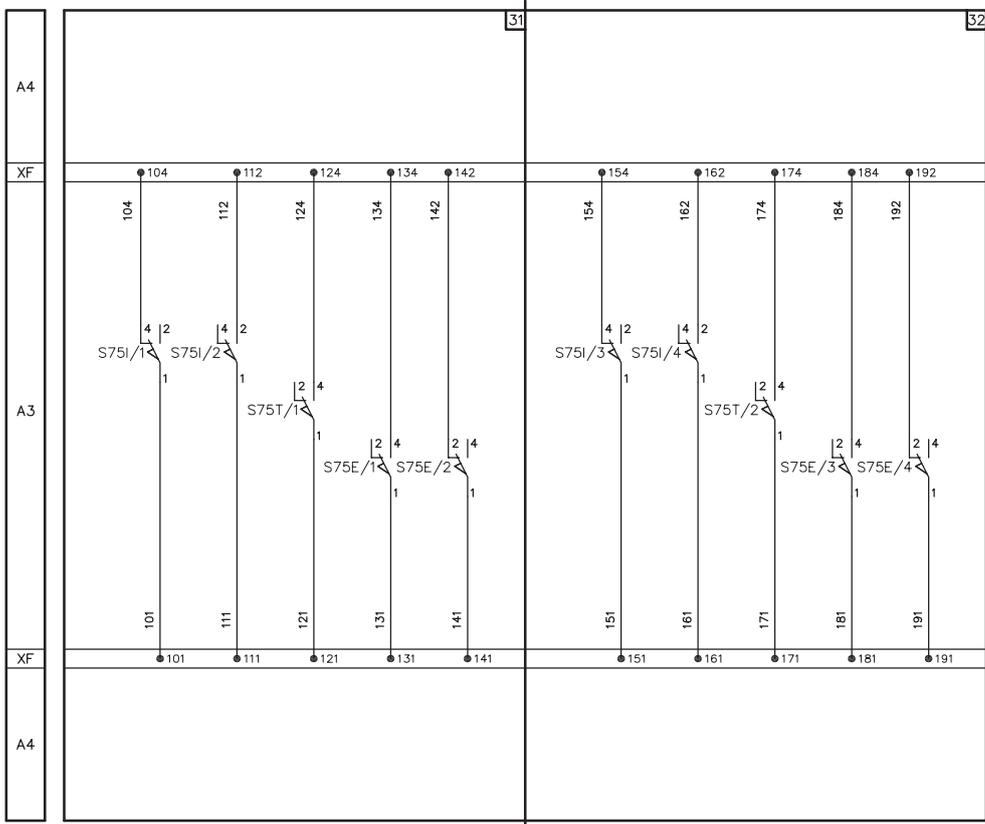
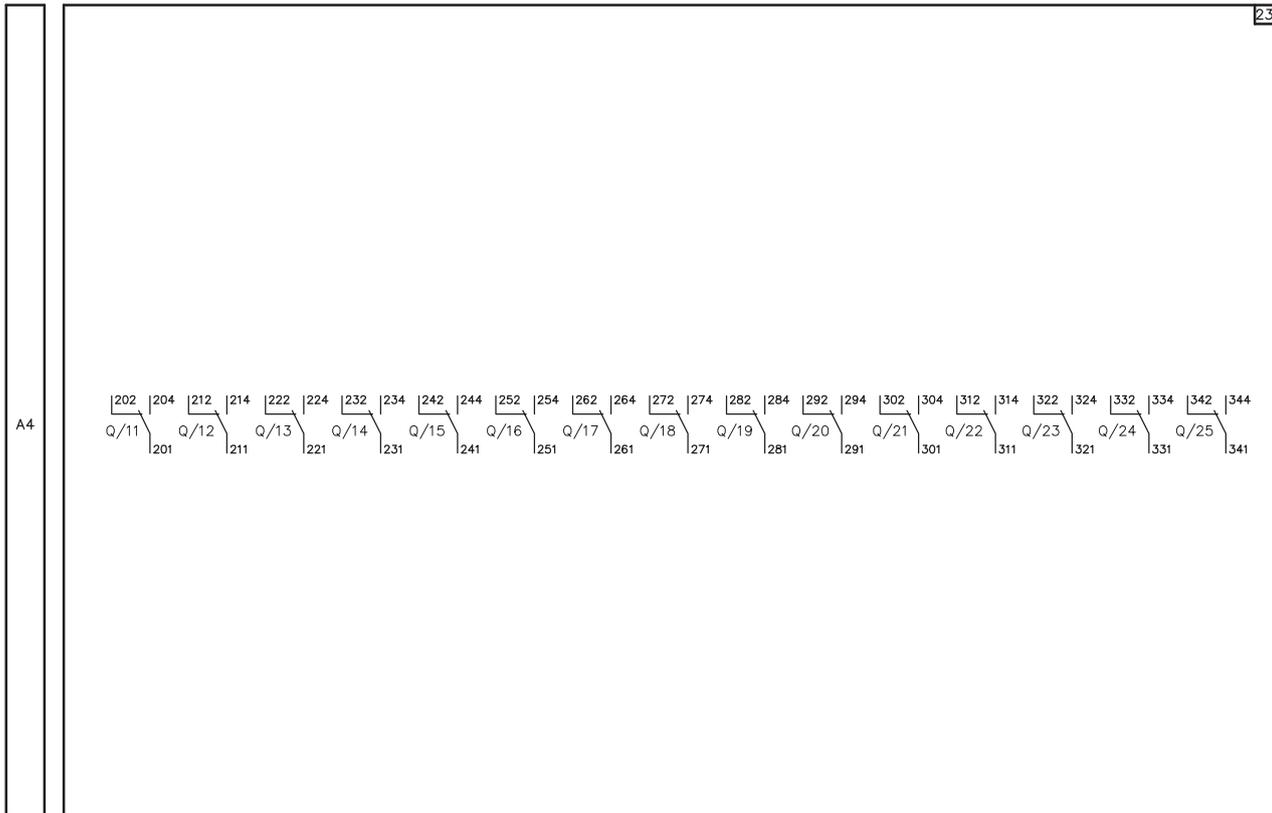


Signalling contacts



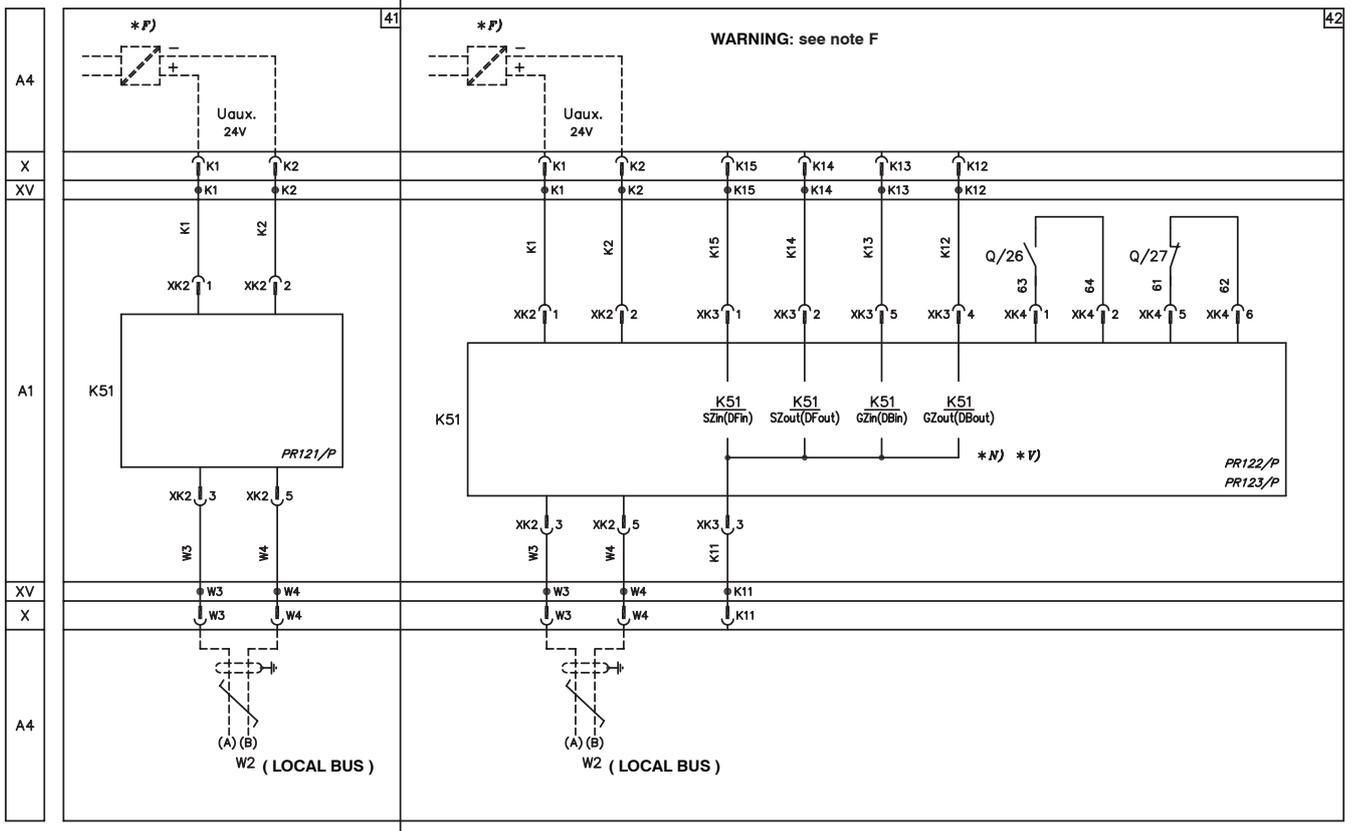
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Signalling contacts

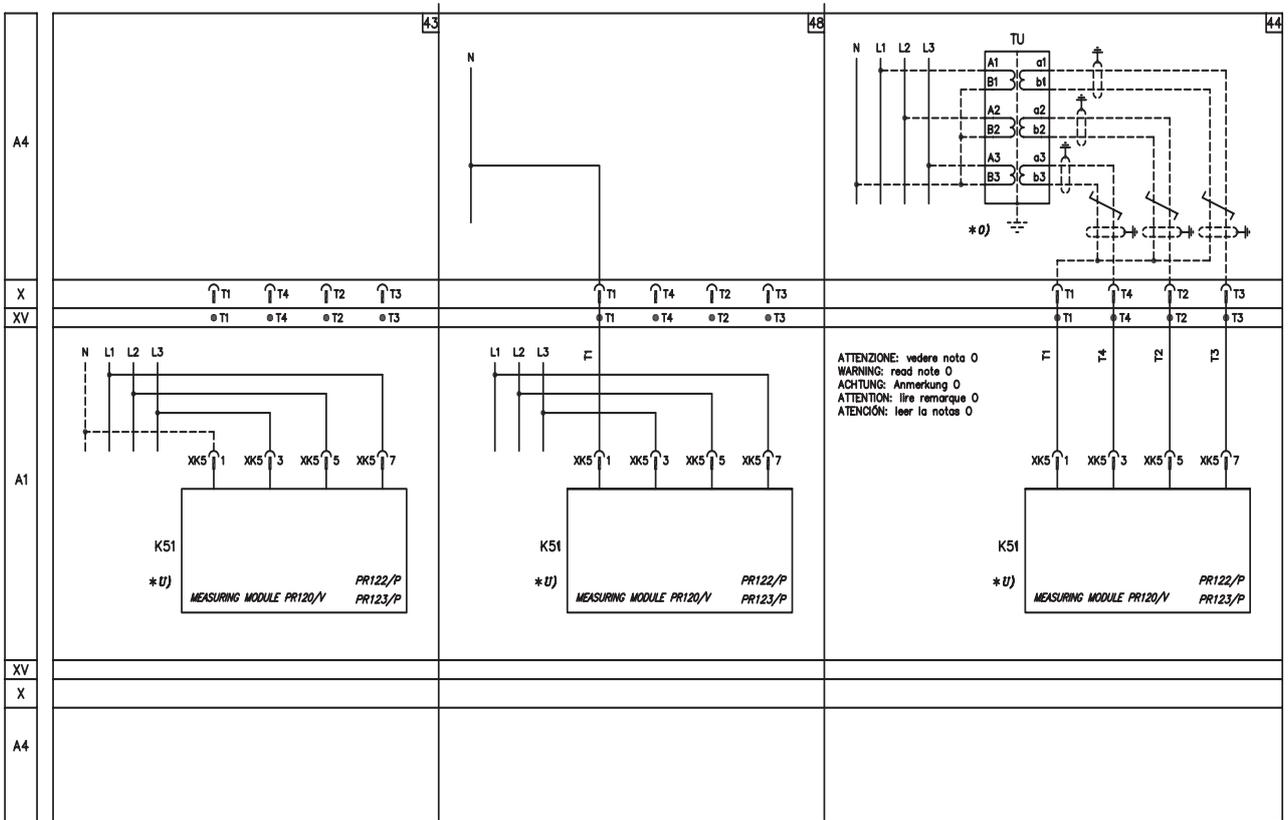


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Auxiliary circuits of the PR121, PR122 and PR123 releases

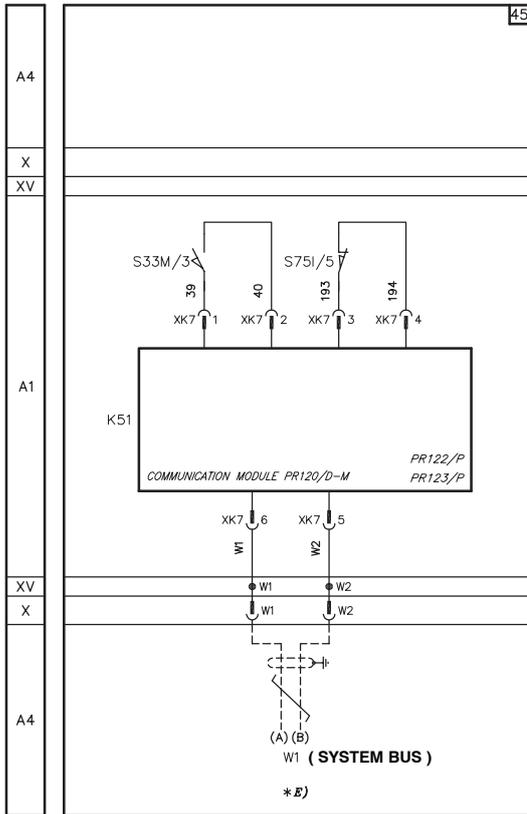


PR120/V measuring module

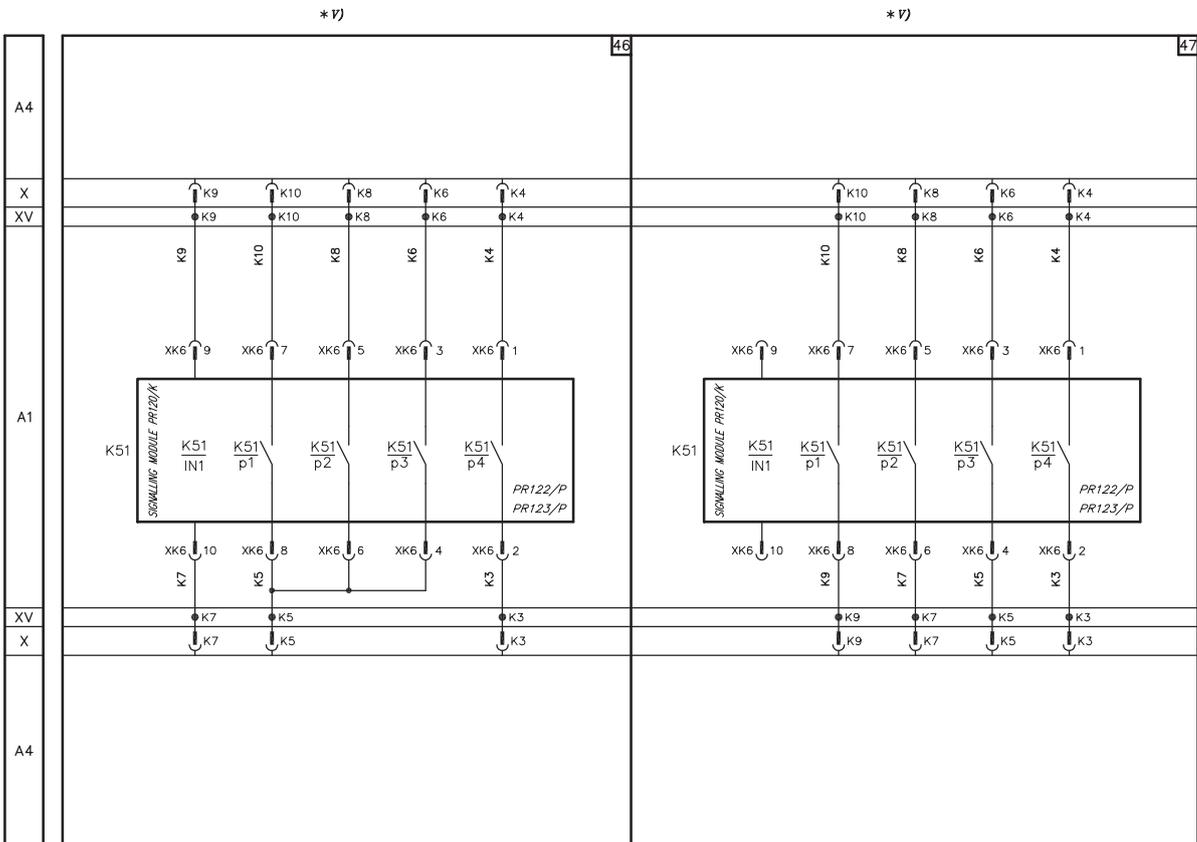


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PR120/D-M communication module



PR120/K signalling module



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Due to possible developments of standards as well as of materials, the characteristics and dimensions specified in the present catalogue may only be considered binding after confirmation by ABB SACE.