Instructions for installation
and service

Instructions for installation, service and maintenance of low voltage moulded case circuit-breakers

1SDH000682R0002 L5757

Tmax T8

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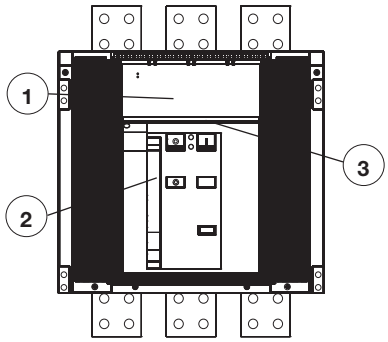
Index

1. Description

1.1 General characteristics

Tmax T8 circuit-breakers and disconnectors consist of a plastic structure which houses the operating mechanism, the poles and the auxiliary parts. Each pole is insulated from the others and contains the circuit breaking parts and the current sensor of the corresponding phase.
The fixed version circuit-breaker has its own terminals for connection to the power circuit.

1.2 External front view of the circuit-breaker



1 PR232/P-T8, PR331 or PR332 electronic microprocessor-based release
2 Operating and control parts of the operating mechanism and release-tripped signals
3 Rating plate

Fixed circuit-breaker

Fig. 1

1.3.1 IEC circuit-breaker rating plate data

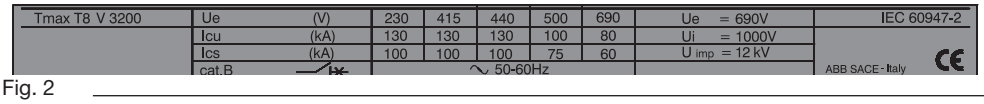


Fig. 2

1.3.2 UL circuit-breaker rating plate data

Fig. 3

2. Checking on receipt

Examine the condition of the material received and make sure that it corresponds to what was ordered. Any damage or non-compliance found when the material has been unpacked, which must be carried out with due care, must be notified within 5 days of receipt and the number of the shipping notice must be indicated on the notification.

3. Storage, lifting and weights

Protected by an external wooden crate, the circuit-breaker is fastened with screws to the pallet used for transport or to the bottom of the packing crate.
If the circuit-breaker must be stored for even a short period of time before being put into service, after having been checked on receipt it must be its back into its container and covered with a waterproof tarpaulin.

Caution
- Store the circuit-breaker in a dry, dust-free room well away from aggressive chemicals.
- Place the circuit-breaker and any fixed part on a horizontal surface, not in direct contact with the floor but on a suitable support (Fig. 4).
- The maximum number of circuit-breakers that can be stacked on top of each other is shown in figure 5.
- Keep the circuit-breaker in the open position with the closing springs unloaded to prevent unwarranted stress and the risk of accidents to the personnel.

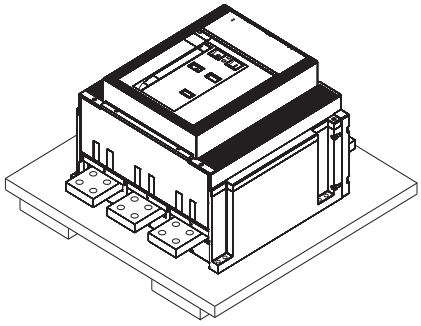


Fig. 4

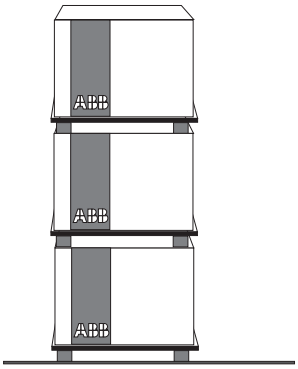


Fig. 5

Comply with the following instructions when lifting the circuit-breaker: the circuit-breakers must be placed on a sturdy surface and preferably lifted with an appropriate fork-lift truck. The use of ropes is, however, permitted: In this case, the lifting ropes ust be attached as shown in the figure.

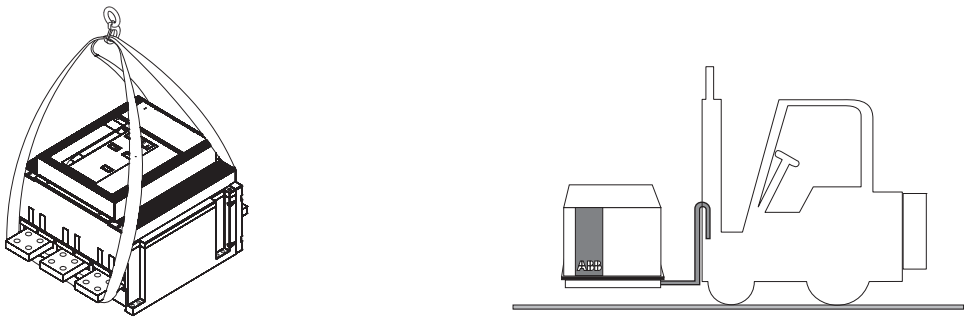


Fig. 6

Table of circuit-breaker weights (kg)

Circuit-breaker	3 poles		4 poles	
	kg	lbs	kg	lbs
T8 1600 (UL)	73	161	95	209
T8 2000	73	161	95	209
T8 2500	73	161	95	209
T8 3000 (UL)	107	236	140	308
T8 3200 (IEC)	107	236	140	308

Note
The weights given in the table refer to circuit-breakers complete with PR232/P-T8, PR331 or PR332 releases and relative current sensors, excluding the accessories.

4. Installation

4.1 Installation conditions

Install the circuit-breaker in a dry, dust-free, non-corrosive place where it will not be subjected to shocks or vibrations. When this is not possible, assemble it inside a switchboard with a suitable degree of protection. For preparation of the installation ambient, refer to the “Overall dimensions” chapter, which provides information about the following points:

– minimum installation volumes of the circuit-breakers and derived versions
– clearances to be respected for circuit-breakers in compartments
– overall dimensions of the circuit-breakers
– drilling holes for fixing purposes
– drilling holes in the compartment door

The operations required for installation, putting into service, routine and supplementary maintenance must be performed by skilled personnel with detailed knowledge of the equipment.

To install a circuit-breaker in the switchboard, just fix it to a vertical surface with M8 screws. (fig. 7)

The circuit-breaker must only be installed in a vertical position.

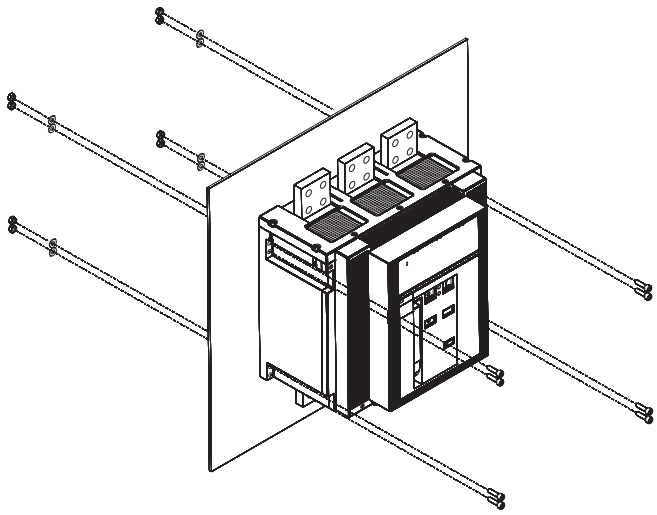


Fig.7

4.2 Installation of the flange on the compartment door (Fig. 8)

– Drill the holes in the compartment door indicated in the section entitled “Overall dimensions”.
– Apply the flange (1) to the front of the compartment door and fix it from the inside with the self-tapping screws (2).

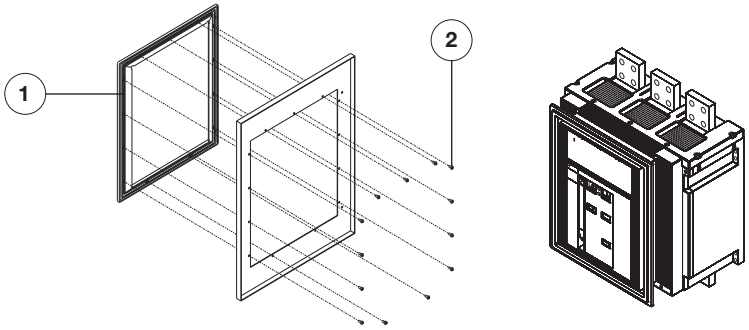


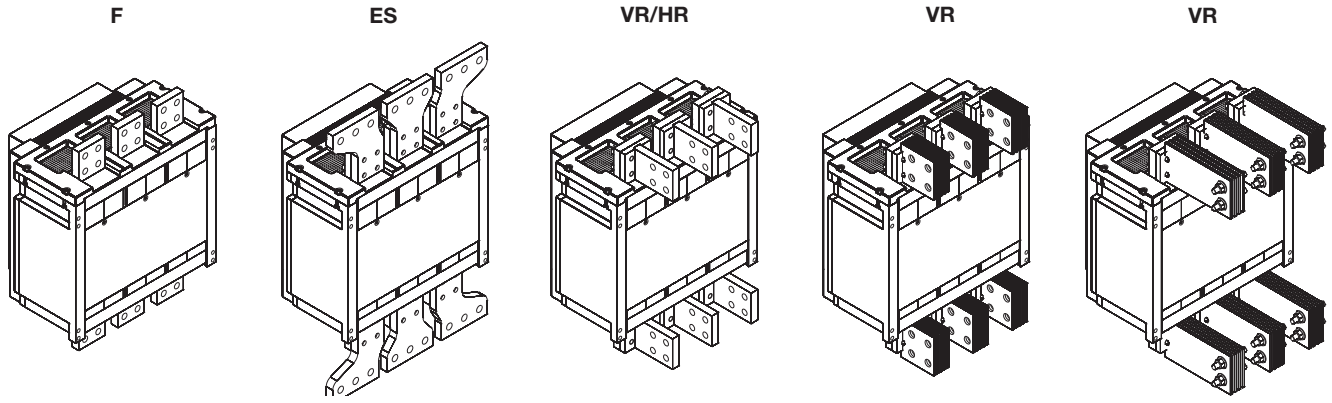
Fig. 8

5. Electrical connections

5.1 Power circuit connections

Use insulated bars/ perform specific type tests on the installation.

5.1.1 Shapes of the terminals



Front terminals (IEC/UL) | Extended front terminals (IEC) | Adjustable rear terminals for flat bar (VR for IEC/UL; HR for IEC) | Vertical rear terminals (IEC) | Vertical rear terminals (UL)

Fig. 9

Note
The drawings provide a schematic illustration of the type of terminal. The exact shape of the terminals is given in the chapter entitled “Overall dimensions". The terminals installed on the upper and lower parts (input and output) can be different from each other.

5.1.2. Examples of connection busbar layouts depending on the types of terminals

The busbars allow connections to be made between the terminals of the circuit-breaker and the busbars of the switchboard. They must be accurately sized by the switchboard design engineer.
This section illustrates examples of possible constructions, depending on the shape and size of the circuit-breaker terminals.
It is normally advisable to use the entire contact surface of the terminal, thus the width of the busbar should be the same as that of the terminal. Different capacities can be obtained for the connections by adjusting the thickness and number of busbars in parallel. In certain cases, reductions in the width of the connection in relation to that of the terminal can be allowed, as shown in the examples below.

		Front terminals	Vertical rear terminals
Circuit-breaker	Iu [A]	Busbar cross-section [mm²]/[in²]	Busbar cross-section [mm²]/[in²]
T8 V	1600	3x(100x5) / 3x(3.94x0.2)	3x(100x5) / 3x(3.94x0.2)
T8 L-V	2000	3x(100x5) / 3x(3.94x0.2)	3x(100x5) / 3x(3.94x0.2)
T8 L-V	2500	4x(100x5) / 4x(3.94x0.2)	4x(100x5) / 4x(3.94x0.2)
T8 V	3000	-	6x(100x5) / 6x(3.94x0.2)
T8 L-V	3200	-	6x(100x5) / 6x(3.94x0.2)

Fig. 10

Positioning the first anchor plate of the busbars

Anchoring to the switchboard

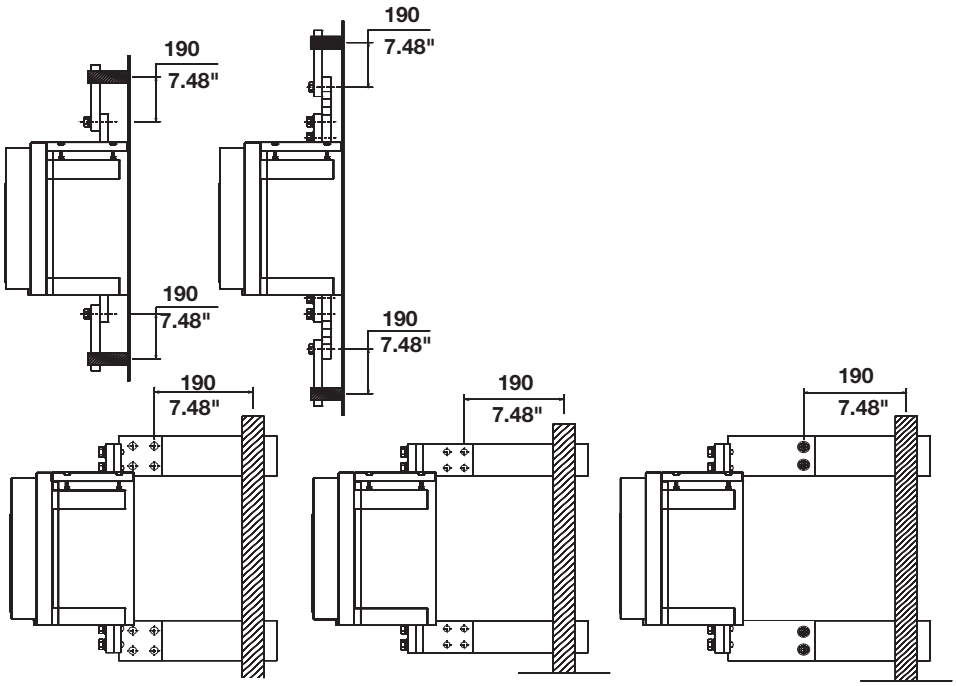


Fig. 11

5.2.3 Assembly procedures for the connection busbars

Check the state of the contact surfaces of the connections very carefully: they must be very clean and free from burrs, dents and traces of rust - which must be removed with a fine file or emery cloth to prevent localized increases in temperature. On completion of the operation, remove any traces of grease or dust with a cloth soaked in a suitable solvent.
When aluminium connections are used, the contact surfaces must be tin-plated.
Make sure that the connections are unable to exert any strain on the terminals in any direction.
Always insert a flat washer with a large diameter (to distribute the tightening pressure over the widest possible area) and a spring washer.
Establish contact between the connection and terminal and fully tighten the fixing screws.
Always use two wrenches (to prevent the insulating parts from being unduly stressed) and apply the tightening torque of the main terminals = 70 Nm/615 lb in for M12 high-strength screws. Check tightness after 24 hours.

5.2 Wiring of the auxiliary circuits of the circuit-breaker

There is a special terminal board fitted with screw terminals for connecting the auxiliary circuits.
The terminals are marked with alphanumerical identification codes as indicated in the electrical circuit diagram.
The terminal board is identified by the letters XV on the electrical circuit diagram.
The terminal board is accessed immediately when the compartment door is opened.

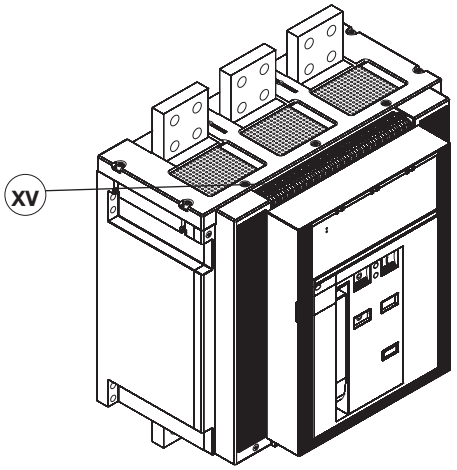


Fig. 12

6. Putting into service

6.1 General procedures

– Make sure that the power connections to the circuit-breaker terminals are tight
– Perform al the preparatory operations on the release
– Make sure that the power supply voltage of the auxiliary circuits is between 85% and 110% of the rated voltage of the electrical applications
– To avoid temperature rises, make sure that there is sufficient air exchange in the installation area
– Also perform the inspections indicated in the following table.

Item inspected	Procedure	Successful check
1 Manual operating mechanism	Perform a few opening, closing and release operations (see chap. 7.2). WARNING When there is an undervoltage release, the circuit-breaker can only be closed after the release itself has been electrically energized.	The spring loading lever moves normally.
2 Gearmotor (if provided)	Supply the spring loading gearmotor at the relative rated voltage. Perform a few closing and opening operations. Note. Supply the undervoltage release at the relative rated voltage (if provided).	The springs are loaded normally. The signals are normal. The gearmotor stops when the springs have been loaded. The gearmotor reloads the springs after each closing operation.
3 Undervoltage release (if provided)	Supply the undervoltage release at the relative rated voltage and perform the circuit-breaker closing operation. Turn off the voltage supply to the release. Supply the undervoltage release at the relative rated voltage and perform the circuit-breaker closing operation.	The circuit-breaker closes normally. The signals are normal. The circuit-breaker opens. The signal changes over.
4 Shunt closing release (if provided)	Close the circuit-breaker. Supply the shunt opening release at the relative rated voltage.	The circuit-breaker opens normally. The signals are normal.
5 Shunt closing release (if provided).	Open the circuit-breaker. Power the shunt closing release at the its rated voltage.	The circuit-breaker closes normally. The signals are normal.
6 Lock for circuit-breaker in open position (key or padlock)	Open the circuit-breaker, turn the key and remove it. Attempt the circuit-breaker closing operation.	Both manual and electrical closing are prevented.
7 Auxiliary circuit-breaker contacts	Insert the auxiliary contacts into appropriate signalling circuits. Perform a few circuit-breaker closing and opening operations.	Signalling occurs normally.

7. Instructions for use

7.1 Operating and signalling components

1 Push-button for the manual opening operation
2 Lever for manual loading of the closing springs
3 Mechanical indicator for circuit-breaker open “O” and closed “I”
4 Mechanical indicator for protection release tripped
5 Pushbutton for the manual closing operation
6 Indicator for springs loaded - unloaded
7 Operation counter (to order)
8 Key lock on the closing operation (to order)

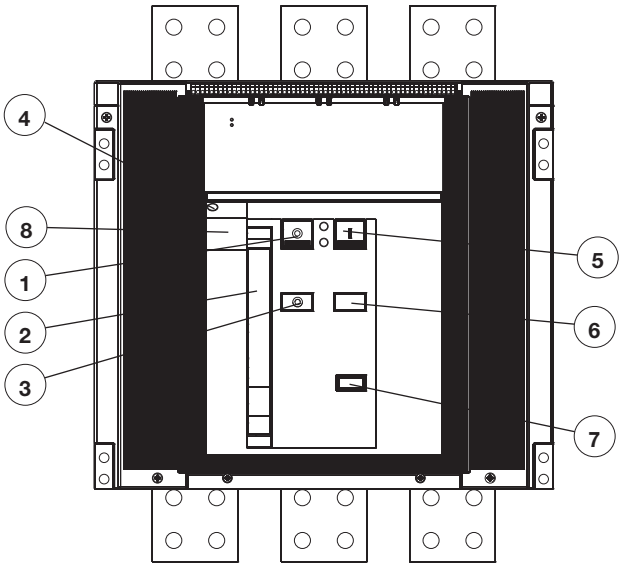


Fig.13

Note
On request, a transparent cover that increases the degree of protection to IP54 can be installed on the front of the circuit-breaker. The cover is equipped with a key lock.
As an alternative to the transparent cover, a protection can be installed on the manual opening and closing controls so that the push-buttons can only be operated with the relative tool.

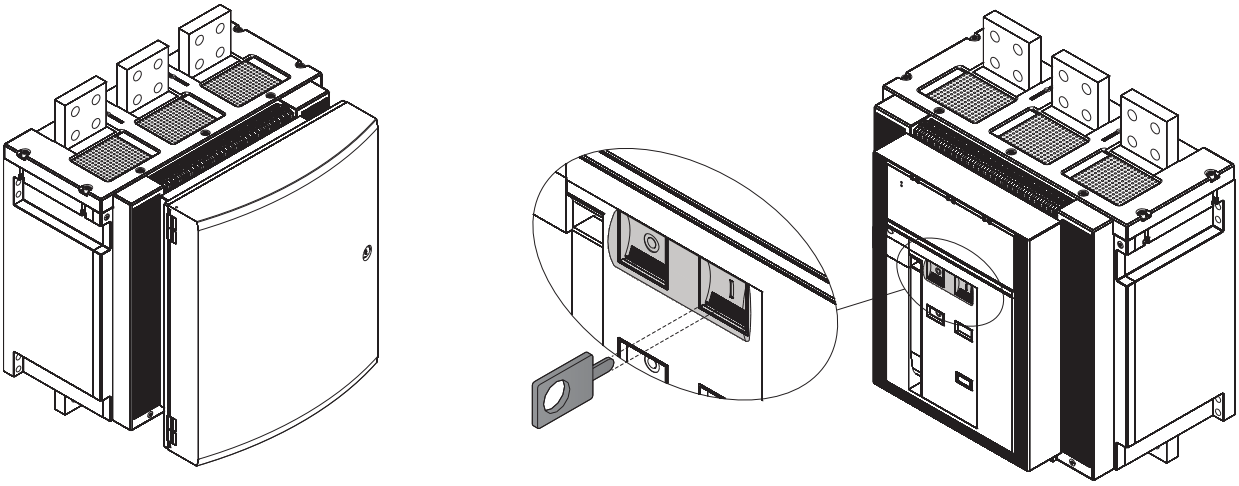


Fig. 14

7.2 Circuit-breaker closing and opening procedures

Circuit-breaker operation can be either manual or electrical.

a) Manual operation for loading the closing springs

– Make sure that “O” (circuit-breaker open) is displayed by the indicator
– Make sure that the indicator (6) is WHITE (springs unloaded)
– Repeatedly operate the lever (2) until the colour of the indicator (6) changes to YELLOW

b) Electrical operation for loading the closing springs

Electrica operation of the circuit-breaker is possible when the following accessories are present (supplied to order):
– gearmotor for automatic loading of the closing springs
– shunt closing release
– shunt opening release.
The gearmotor automatically reloads the springs after each closing operation until the yellow indicator appears (6, Fig. 15). If there is a power failure during the loading operation, the gearmotor stops and automatically continues with the spring loading operation once the power returns. However, it is always possible to complete the reloading operation in the manual mode.

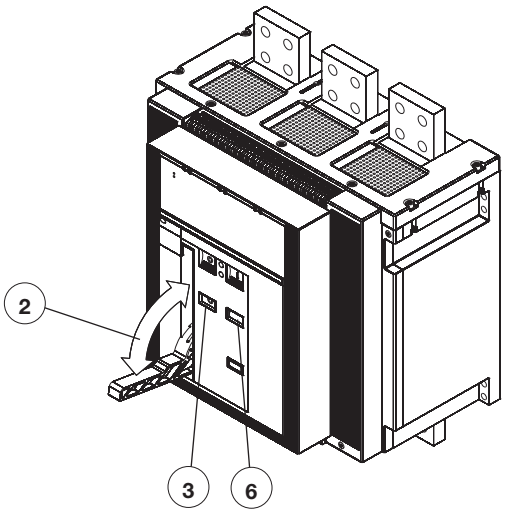


Fig. 15

c) Circuit-breaker closing

This operation can only be carried out when the closing springs are fully loaded.
Press the push-button (5) marked with the letter “I” for closing in the manual mode. When there is a shunt closing release, the operation can also be carried out in the remote mode by means of the special control circuit. Closing is signalled by the relative indicator (3), which moves to the “I” position. Moreover, the indicator of the state of the springs (6) moves to the WHITE position. The control has enough energy for the opening operation even when the closing springs are unloaded. If present, the gearmotor immediately begins the automatic spring loading operation.

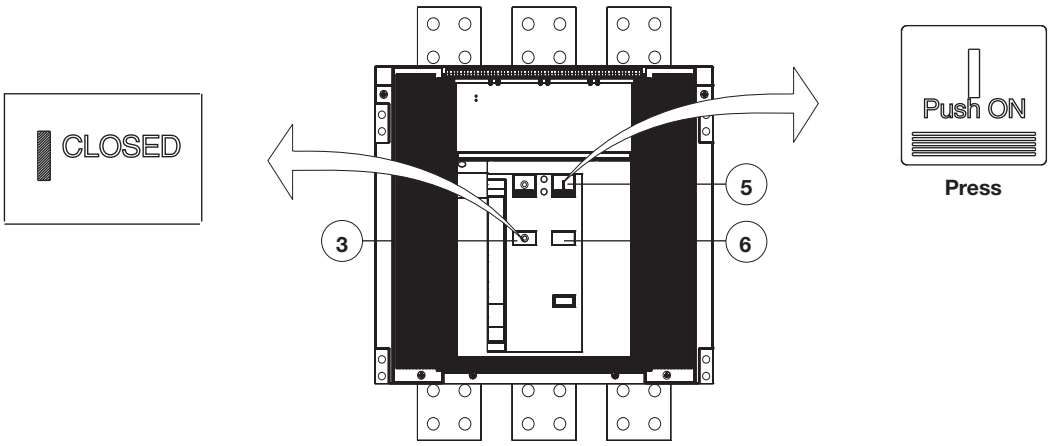


Fig. 16

d) Circuit-breaker opening

Press the push-button “O” (1) to open the circuit-breaker in the manual mode. When there is a shunt opening release, the operation can also be carried out in the remote mode by means of the special control circuit. The open state is signalled by the appearance of the letter “O” in the indicator (3).

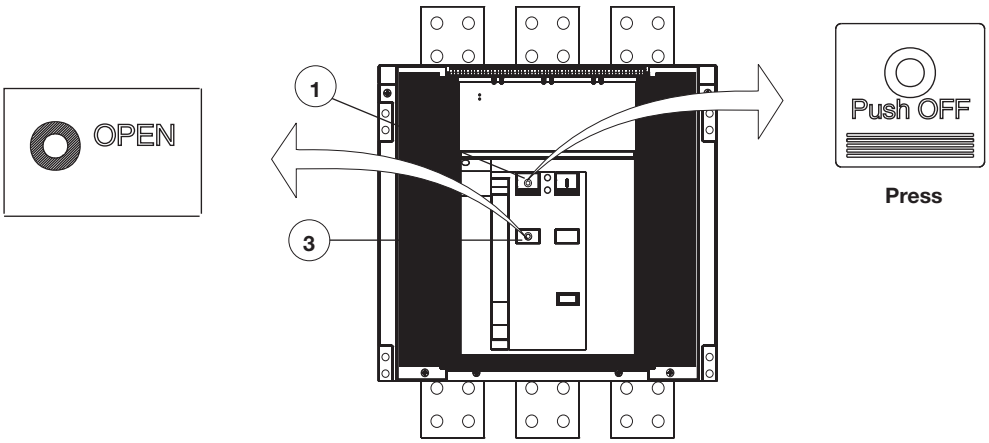


Fig. 17

8. Maintenance

8.1. Warnings

WARNING: before proceeding with any maintenance operation, it is obligatory to:
- **Oen the circuit-breaker and make sure that the springs of the operating mechanism are unloaded;**
- **if work must be performed on fixed circuit-breakers or on fixed parts, disconnect the power supply to the power circuit and auxiliary circuits and visibly earth the terminals on both the supply side and load side;**
- **Set the equipment to safe conditions as established by the standards and laws in force.**

WARNING RISK OF ELECTRIC SHOCK: Risk of electric shock or accident.

ABB declines all liability for damage to persons or property caused by failure to comply with the instructions in this document.
The maintenance operations must be performed by skilled personnel with detailed knowledge of the equipment.

8.2. Maintenance program

8.2.1. Circuit-breaker life

When regular maintenance is performed, SACE Emax circuit-breakers - with or without shunt opening or shunt closing devices - can withstand the following operating cycles without replacement of parts. (1)

Rated uninterrupted current		**Mechanical life (2)**		**Electrical life (2)**	
Iu (40 °C) [A]		**N° of operations x 1000**	**Frequency operations/ hour**	**415 V ~ N° of operations x 1000**	**Frequency operations/hour**
T8 (UL)	1600	15	60	4,5	30
T8	2000	15	60	4,5	30
T8	2500	15	60	4	30
T8 (UL)	3000	15	60	3	30
T8 (IEC)	3200	15	60	3	30

(1) These data refer to the standard installation in accordance with the product standards. Ask ABB Sace if different applications are involved.
(2) Extreme weather conditions, polluted atmosphere or vibrations can reduce the life of the application. Ask ABB Sace.

8.2.2. Maintenance program

We hereby include the table indicating the frequency with which maintenance should be carried out and the relative routine maintenance operations required.
Compliance with the following rules is also recommended:
- Even circuit-breakers that are operated infrequently or that remain closed or open for long periods of time must be subjected to programmed maintenance.
- Installation of the mechanical operation counter (supplied on request) is recommended for circuit-breakers equipped with SACE PR232 and PR331 releases. The SACE PR232 release with Vaux allows the number of operations performed by the circuit-breaker in service to be shown at all times on the relative display.
- During service, visually inspect the circuit-breaker from the outside to make sure there is no dust, dirt or damage of any kind.

Maintenance operations	**Intervals**	
	Installations in normal places	Installations in dusty or polluted places (1)/(2)[(1) = level of dust measured > 1 mg/m³]
First Level	One year, or 20% of mechanical life, or 20% of electrical life	6 months, or 10% of mechanical life, or 10% of electrical life
Second Level	Three years, or 50% of mechanical life, or 50% of electrical life, or after a trip under short-circuit	18 months, or 25% of mechanical life, or 25% of electrical life, or after a trip under short-circuit

(1) These data refer to the standard installation in accordance with the product standards. Ask ABB Sace if different applications are involved.
(2) Extreme weather conditions, polluted atmosphere or vibrations can reduce the life of the application. Ask ABB Sace.

8.3.1. Preliminary operations:

- open the circuit-breaker and make sure that the springs of the operating mechanism are unloaded.

WARNING: if work must be performed on the circuit-breakers, disconnect the power circuit and auxiliary circuits and earth the terminals in a visible way on both the supply side and load side.

8.3.2. General inspections and cleaning:

- Check to make sure that the device is clean. Remove any dust and traces of oil or grease with a clean, dry cloth (use a mild detergent if necessary - A cleaning product such as Henkel's 273471 or equivalent can be used if there is a heavy coating of dirt).
- Make sure that the rating plates with the technical specifications of the apparatus are affixed.
- The rating plates must be cleaned with a clean, dry cloth.
- Remove all traces of dust, mould, condensation and tarnish
- Make sure that there are no foreign bodies in the circuit-breaker compartment.

8.3.3. Circuit-breaker connections and connections between circuit-breaker and switchboard

- Remove any dust and dirt with a brush and dry cloth - use a mild detergent if necessary. Use a cleaning product such as Henkel's 273471 or equivalent if there is a heavy coating of dirt.
- Make sure that there are no traces of localized overheating on the terminals. This problem is denoted by the change in the colour of the parts in contact. These parts are usually silvery in colour.
- Make sure that the bolts of the terminal connections are well tightened (M12 - 70 Nm).

WARNING: if work must be performed on the circuit-breakers, disconnect the power circuit and auxiliary circuits and earth the terminals in a visible way on both the supply side and load side.

- Make sure that the cable connecting screws are well tightened in the terminal boxes (0.7 Nm).

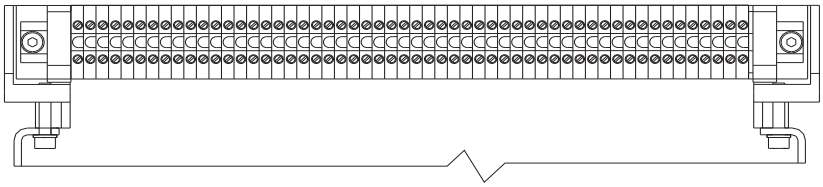
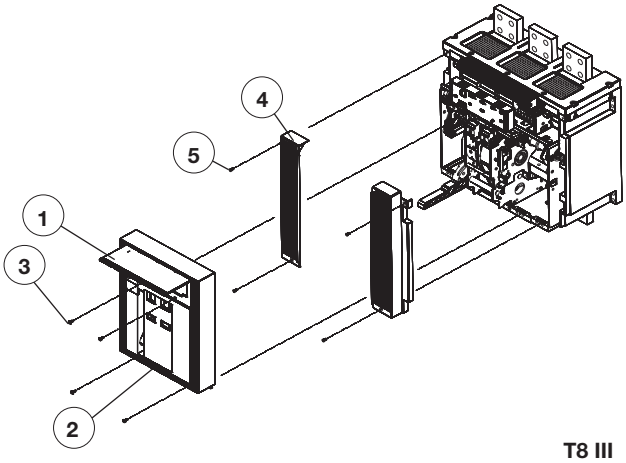


Fig. 18

8.3.4. Flange and escutcheon plate disassembly operations

– Make sure that the circuit-breaker has been set to safe conditions as described in sect. 8.1
– Remove the flange (1) of the release as shown in figure 19.
– Remove the front escutcheon plate (2) by removing the four screws (3).
– Remove both the side guards (4) by removing the front screws (5).



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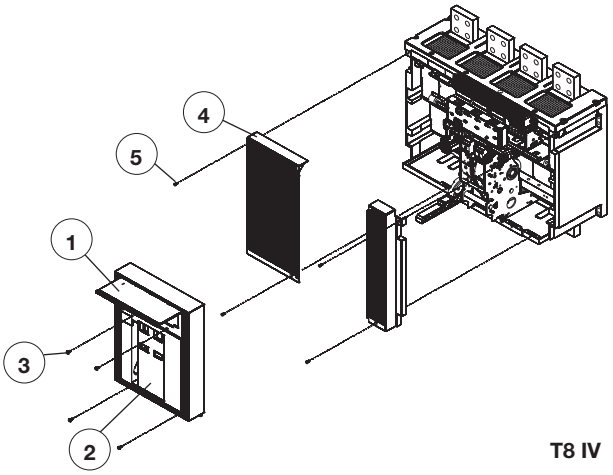


T8 IV

Fig. 19

- If the undervoltage release is installed, disassemble the coil support and unload the springs of the operating mechanism by closing and opening the circuit-breaker.

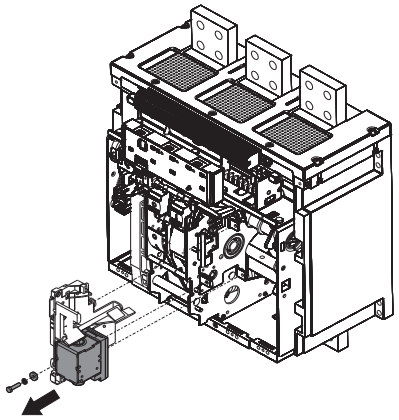


Fig. 20

8.3.5. Mechanical operating mechanism

- Clean the points indicated in figure 21. Use a cleaning product such as Henkel's 273471 or equivalent if there is a heavy coating of dirt.
- Lubricate the opening and closing latches and the shafts in the points indicated in figure 21 with MOBILGREASE 28 (EXXON MOBIL).
- Make sure that the opening and closing shafts are free to turn.

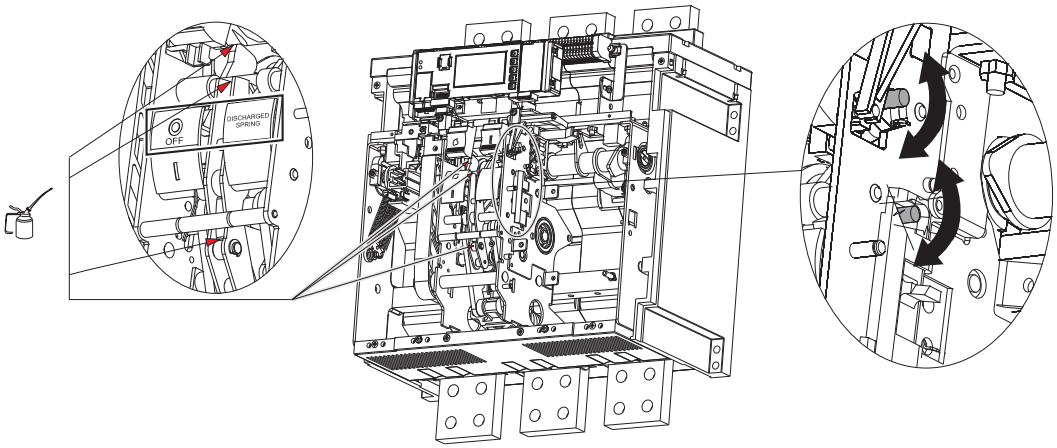


Fig. 21

8.3.6. Electrical and mechanical accessories

- Make sure that the accessories are securely fixed to the circuit-breaker.
- Make sure that the electrical accessories are correctly connected to the circuit-breaker.
- Gearmotor: after every 10000 operations, check the brushes for wear and replace the gearmotor if necessary.
- Make sure that the releases (SOR-UVR-SRC) are in good conditions (absence of excessive wear, overheating, breakages) Fig. 22.
- Make sure that the mechanical operation counter functions correctly (if applicable) by operating the circuit-breaker.

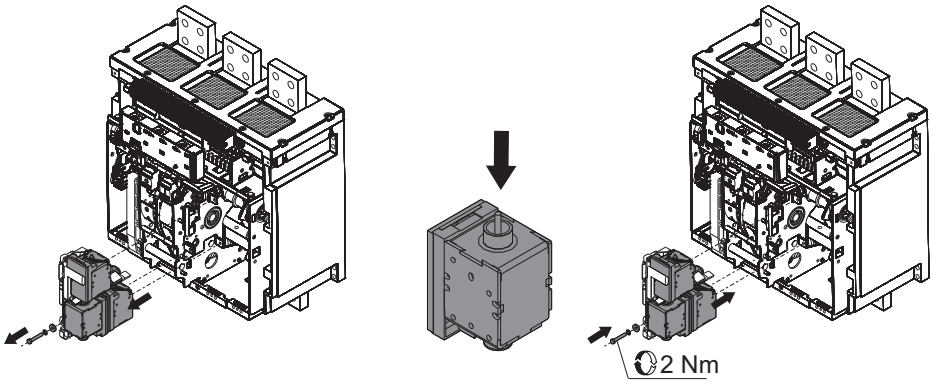


Fig. 22

8.3.7. Protection releases

- -Power the protection release with a PR030/B battery unit.
- Make sure that the protection release functions correctly: release test with the “Trip Test” (PR232, PR331, PR332) and “Autotest” (PR332)
- With release PR332, make sure that the front leds or display do not indicate the presence of alarms.
- With release PR232 and PR331, make sure that the front leds do not indicate the presence of alarms.
- Make sure that the cables are correctly connected to the release modules and to the release itself (if applicable).
- Check the percentage of wear on the circuit-breaker contacts in PR332.
- Remove the PR030/B battery unit from the relay upon termination.

8.3.8.1 Test with SD Testbus2 (optional)

- Connect unit BT030 or BT030-USB to the relay that needs to be tested.
- Run the SD.TestBus2 program in a PC equipped with Bluetooth or Flash Drive connection, depending on the version of the BT030 used.
- Once the connection between the relay and PC has been established, make sure that there are no alarm signals from the relay. If this is the case, consult the ‘error messages’ and/or ‘troubleshooting’ sections of this manual.
- In normal operating conditions, proceed with the trip test and autotest (depending on the type of relay). For future check-outs, you are advised to enter the current information in the area called User Data and/or Tag Name. These data will remain stored in the relay itself.
- Remove the BT030 or BT030-USB flash drive from the relay.

8.4.8.2 Test with EKIP Connect (optional)

- Connect unit T&P unit to the relay that needs to be tested.
- Run the Ekip Connect program in a PC with flash drive connection.
- Once the connection between the relay and PC has been established, make sure that there are no alarm signals from the relay. If this is the case, consult the ‘error messages’ and/or ‘troubleshooting’ sections of this manual.
- In normal operating conditions, proceed with the trip test and autotest (depending on the type of relay). For future check-outs, you are advised to enter the current information in the area called User Data and/or Tag Name. These data will remain stored in the relay itself.
- Remove the T&P cable from the relay.

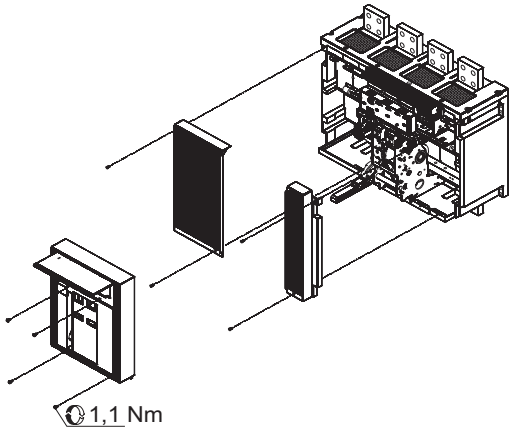


Fig. 23

8.3.9. Maintenance operations; final inspections

- Fit all the parts back in place and re-connect the auxiliary power supply if necessary.
- Re-assemble the escutcheon plate as shown in figure 23.

- Using the different auxiliaries in succession, perform the operations 10 times:
  - Opening (in both the local and remote modes, if applicable)
  - Closing (in both the local and remote modes, if applicable)
  - Release by means of the trip test via relay

- Check the operations in accordance with the following sequence:
  - Open - Springs unloaded
  - Open - Springs loaded
  - Closed - Springs unloaded
  - Closed - Springs loaded

  - Make sure that the accessories (if installed) function correctly
  - Make sure that the gearmotor (if installed) functions correctly
  - Make sure that the undervoltage release functions correctly (if installed)
  - Make sure that the shunt opening release functions correctly (if installed)
  - Make sure that the shunt closing release functions correctly (if installed)
  - Make sure that the circuit-breaker's auxiliary contacts function correctly (if installed)
  - Make sure that the lock for circuit-breaker in open position (key or padlock) functions correctly (if installed)

8.3.10. Interlocks

- Make sure that the interlocks between circuit-breakers side by side and on top of each other (if applicable) have been correctly installed and function correctly.

8.4. Second Level maintenance operations

8.4.1. Preliminary operations:

- open the circuit-breaker and make sure that the springs of the operating mechanism are discharged.

WARNING: if work must be performed on the circuit-breakers, disconnect the power circuit and auxiliary circuits and earth the terminals in a visible way on both the supply side and load side.

8.4.2. General inspections and cleaning:

- Check to make sure that the device (interrupting part) is clean. Remove any dust and traces of oil or grease with a clean, dry cloth (use a mild detergent if necessary - A cleaning product such as Henkel's 273471 or equivalent can be used if there is a heavy coating of dirt).
- Make sure that the rating plates with the technical specifications of the apparatus are affixed
- The data plates can be cleaned with a clean, dry cloth.
- Remove all traces of dust, mould, condensation and tarnish
- Make sure that there are no traces of overheating or cracks, which could impair the isolating parts of the circuit-breaker
- Make sure that there are no foreign bodies in the circuit-breaker compartment
- Make sure that the screws that fasten the fixed part to the switchboard are well tightened (M8 - 25 Nm).

8.4.3. Circuit-breaker connections and connections between circuit-breaker and switchboard

- Remove any dust and dirt from the isolating parts with a brush and dry cloth (use a mild cleaning product if necessary - A cleaning products such as Henkel's 273471 or equivalent can be used if there is a heavy coating of dirt).
- Make sure that there are no traces of localized overheating on the terminals. This problem is denoted by the change in the colour of the parts in contact. These parts are usually silvery in colour.
- Make sure that the bolts of the terminal connections are well tightened (M12 - 70 Nm).

WARNING:
if work must be performed on the circuit-breakers, disconnect the power circuit and auxiliary circuits and earth the terminals in a visible way on both the supply side and load side.

- Make sure that the cable connecting screws are well tightened in the terminal boxes (0.7 Nm).

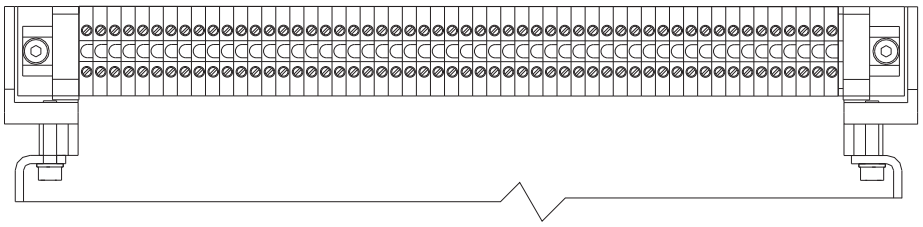
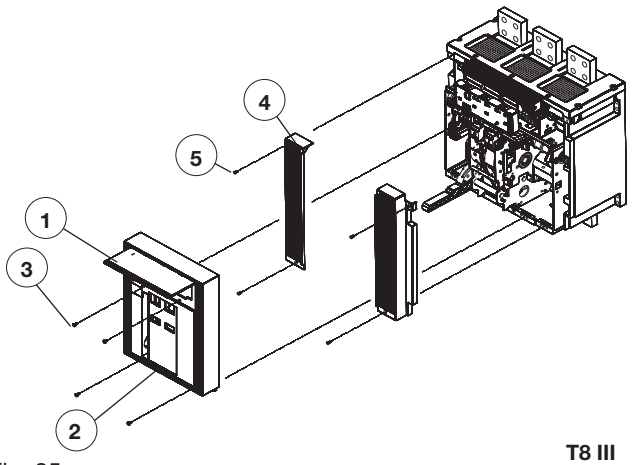


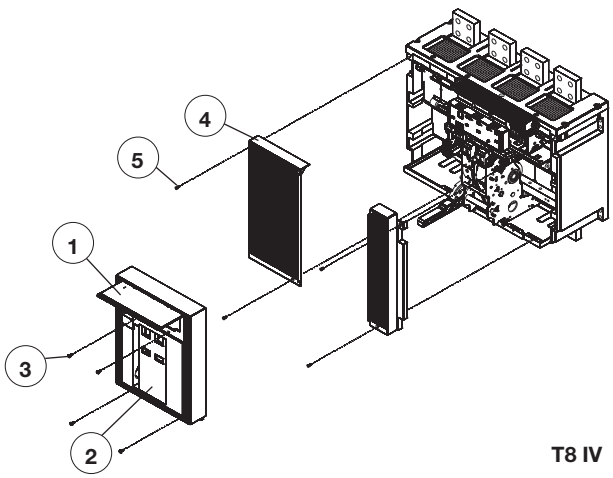
Fig. 24

8.4.4. Flange and escutcheon plate disassembly operations

– Make sure that the circuit-breaker has been set to safe conditions as described in sect. 8.1
– Remove the flange (1) of the release as shown in figure 25.
– Remove the front escutcheon plate (2) by removing the four screws (3).
– Remove both the side guards (4) by removing the front screws (5).



T8 III



T8 IV

Fig. 25

- If the undervoltage release is installed, disassemble the coil support and unload the springs of the operating mechanism by closing and opening the circuit-breaker.

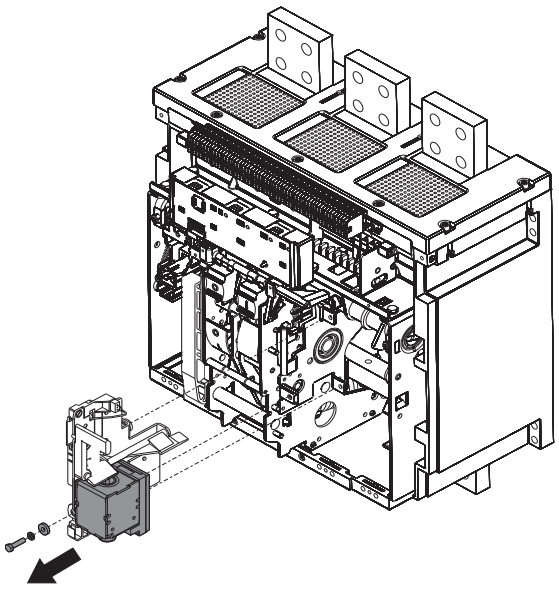


Fig. 26

8.4.5. Mechanical operating mechanism

- Clean (use a cleaning product such as Henkel's 273471 or equivalent if there is a heavy coating of dirt) and lubricate (in the points indicated in figure 27, det. A, as per the First Level) the shafts and opening closing latches with MOBILGREASE 28 (EXXON MOBIL).
- Clean (use a cleaning product such as Henkel's 273471 or equivalent if there is a heavy coating of dirt) and lubricate the operating shaft supports, including those on the sides of the circuit-breaker (see figure 27, det. B) with MOBILGREASE 28 (EXXON MOBIL).
- Make sure that the opening and closing shafts are free to turn.

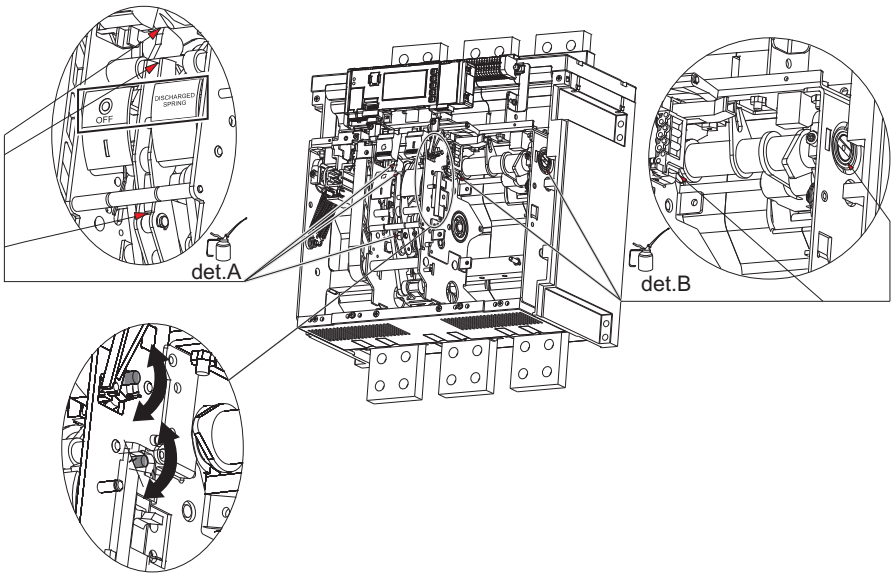


Fig. 27

- Contact ABB Sace (*) if the springs are deformed or tarnished, if rings are missing or if the control is excessively worn.

(*) ABB may replace spare parts type "A" after having obtained the customer's approval.

8.4.6. Electrical and mechanical accessories

- Make sure that the accessories are securely fixed to the circuit-breaker.
- Make sure that the electrical accessories are correctly connected to the circuit-breaker.
- Gearmotor: after every 10000 operations, check the brushes for wear and replace the gearmotor if necessary.
- Make sure that the releases (YO, YU, YC) are in good conditions (absence of excessive wear, overheating, breakages) Fig. 28.
- Make sure that the mechanical operation counter functions correctly (if applicable) by operating the circuit-breaker.

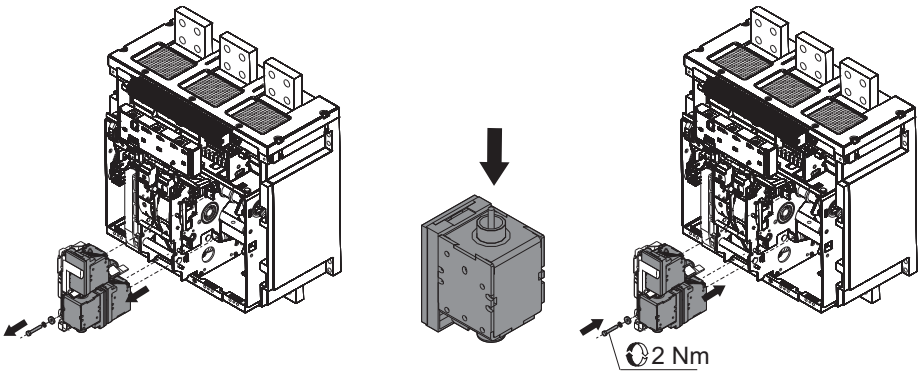


Fig. 28

8.4.7. Protection releases

- -Power the protection release with a PR030/B battery unit.
- Make sure that the protection release functions correctly: release test with the “Trip Test” (PR232, PR331, PR332) and “Autotest” (PR332)
- With release PR332, make sure that the front leds or display do not indicate the presence of alarms.
- With release PR232 and PR331, make sure that the front leds do not indicate the presence of alarms.
- Make sure that the cables are correctly connected to the release modules and to the release itself (if applicable).
- Check the percentage of wear on the circuit-breaker contacts in PR332.
- Remove the PR030/B battery unit from the relay upon termination.

8.4.8.1 Test with SD Testbus2 (optional)

- Connect unit BT030 or BT030-USB to the relay that needs to be tested.
- Run the SD.TestBus2 program in a PC equipped with Bluetooth or Flash Drive connection, depending on the version of the BT030 used.
- Once the connection between the relay and PC has been established, make sure that there are no alarm signals from the relay. If this is the case, consult the ‘error messages’ and/or ‘troubleshooting’ sections of this manual.
- In normal operating conditions, proceed with the trip test and autotest (depending on the type of relay). For future check-outs, you are advised to enter the current information in the area called User Data and/or Tag Name. These data will remain stored in the relay itself.
- Remove the BT030 or BT030-USB flash drive from the relay.

8.4.8.2 Test with EKIP Connect (optional)

- Connect unit T&P unit to the relay that needs to be tested.
- Run the Ekip Connect program in a PC with flash drive connection.
- Once the connection between the relay and PC has been established, make sure that there are no alarm signals from the relay. If this is the case, consult the ‘error messages’ and/or ‘troubleshooting’ sections of this manual.
- In normal operating conditions, proceed with the trip test and autotest (depending on the type of relay). For future check-outs, you are advised to enter the current information in the area called User Data and/or Tag Name. These data will remain stored in the relay itself.
- Remove the T&P cable from the relay.

8.4.9. Maintenance operations; final inspections

- Fit all the parts back in place and re-connect the auxiliary power supply if necessary.

- Re-assemble the escutcheon plate as shown in figure 30.

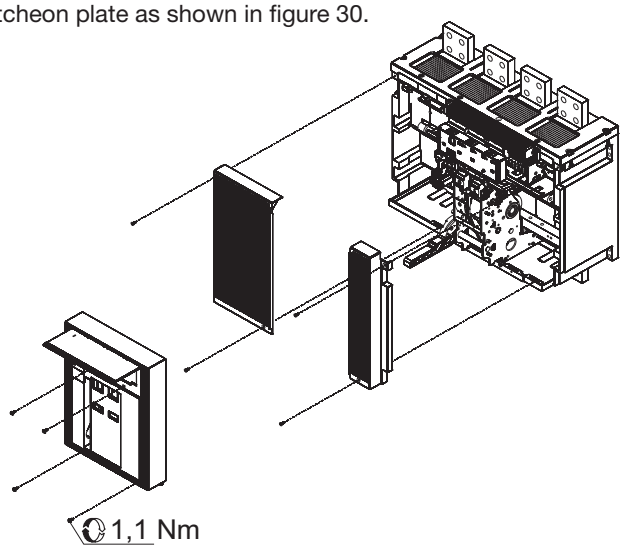


Fig. 29

- Using the different auxiliaries in succession, perform the operations 10 times:
  - Opening (in both the local and remote modes, if applicable)
  - Closing (in both the local and remote modes, if applicable)
  - Release by means of the trip test via relay

- Check the operations in accordance with the following sequence:
  - Open - Springs unloaded
  - Open - Springs loaded
  - Closed - Springs unloaded
  - Closed - Springs loaded

  - Make sure that the accessories (if installed) function correctly
  - Make sure that the gearmotor (if installed) functions correctly
  - Make sure that the undervoltage release functions correctly (if installed)
  - Make sure that the shunt opening release functions correctly (if installed)
  - Make sure that the shunt closing release functions correctly (if installed)
  - Make sure that the circuit-breaker's auxiliary contacts function correctly (if installed)
  - Make sure that the lock for circuit-breaker in open position (key or padlock) functions correctly (if installed)

8.4.10. Interlocks

Make sure that the interlocks between circuit-breakers side by side and on top of each other (if applicable) have been correctly installed and function correctly.

9. Measures to be taken if operating faults occur

The circuit-breaker fails to open when the opening pushbutton is pressed	The circuit-breaker fails to open because service release YO has tripped	The circuit-breaker fails to open because undervoltage release YU has tripped	The circuit-breaker fails to open when the protection relay release test is performed	The circuit-breaker fails to close when the closing pushbutton is pressed	The circuit-breaker fails to close because closing coil YC has tripped	The closing springs cannot be loaded with the manual loading lever	The closing springs cannot be loaded with the spring-loading motor	The circuit-breaker cannot be locked in the open position	Possible causes	Checks and solutions
			•						The opening solenoid of the relay is not connected properly	Make sure that the opening solenoid is connected correctly
			•	•	•				Relay tripping signal not reset	Press the mechanical pushbutton to reset the relay tripping signal
	•				•				Supply votage of the auxiliary circuits too low	Measure the voltage: it must not be less than 85% of the rated voltage of the coil
	•				•				Supply voltage different from the value indicated on the nameplate of these releases	Check the voltage indicated on the nameplate of the releases
					•				Faulty switching circuit	Check the connections, fuses, interlocks, protection switches and accept contacts
	•				•		•		Loose clamping screws of the wires and auxiliary circuits	Make sure that the wire clamping screws are tight
	•				•		•		Incorrect electrical connections in the power supply circuit	Check the connections with the relative functional diagram
	•				•				Coil damaged	Replace the coil
		•			•				Operating mechanism locked	Operate in the manual mode. Contact ABB SACE if the fault persists
				•	•				Open position key lock activated	Unlock by inserting the key
				•	•				Undervoltage release not energized	Check the relative supply circuit and the supply voltage
				•	•				Shunt opening release remains permanently energized	Check the supply circuit
•		•				•			Operating mechanism locked	Call ABB SACE
							•		The fuse that protects the spring loading motor protection has tripped	Replace the fuse
							•		Faulty gearmotor for automatic spring loading	Replace the gearmotor
								•	Circuit-breaker closed	Press the opening pushbutton and activate the lock
								•	Lock in open position defective	Call ABB SACE

WARNING: If the fault or failure of the circuit-breaker in your application could cause injuries, material damage or is highly critical, the circuit-breaker itself must be immediately removed so that it can be inspected or repaired.

10. Accessories

10.1 Electrical accessories

Shunt opening / closing release (YO/YC) and second shunt opening release (Y02)

Allows the device to be opened or closed by remote control. Given the characteristics of the circuit-breaker operating mechanism, opening (with the circuit-breaker closed) is always possible, whereas closing is only possible when the closing springs are loaded. Most of the releases can operate with both direct and alternate current.
This release provides an instantaneous service (*), but can be supplied permanently (**).
In uses where the shunt closing release is supplied permanently, the shunt closing release must be momentarily de-energized in order to reclose the circuit-breaker after opening (the circuit-breaker operating mechanism is, in fact, fitted with an anti-pumping device).
Some applications require a very high degree of safety for the remote opening control of the circuit-breaker. Duplication of the control circuit of the shunt opening release is required in particular. Tmax T8 circuit-breakers can be fitted with a second shunt opening release in order to achieve this. The second shunt opening release is located in the same seat as the undervoltage release and its technical characteristics are the same as the standard shunt opening release.
(*) In the case of instantaneous service, the current impulse must last at least 100 ms.
(**) In the case of permanent power supply to the shunt opening release, wait for at least 30 ms before transmitting the control to the shunt closing release.

Reference figure in the electrical circuit diagrams: YO (4) - YC (2) - YO2 (8)

Power supply [Un]	24 V DC
	30 V AC/DC
	48 V AC/DC
	60 V AC/DC
	110-120 V AC/DC
	120-127 V AC/DC
	220-240 V AC/DC
	240-250 V AC/DC
	380-400 V AC
	440 V AC

Operating limits	(YO-YO2) : 70…110% Un
(Standard CEI EN 60947-2)	(YC) : 85…110% Un
Inrush power consumption (Ps)	DC = 200 W
Inrush power time ~100 ms	AC = 200 VA
Continuous power (Pc)	DC = 5 W
	AC = 5 VA
Opening time (YO - YO2)	(max) 60 ms
Closing time (YC)	(max) 80 ms
Insulation voltage	2500V 50 Hz (for 1 min.)

Undervoltage release (YU)

The undervoltage release opens the circuit-breaker when there is a sensible reduction or lack of the voltage that powers it. It can be used for remote tripping (by means of normally closed pushbuttons), as a lock on closing or to control the voltage in primary or secondary circuits. The release power supply is therefore branched on the supply side of the circuit-breaker or from an independent source. Circuit-breaker closing is only allowed with the release powered (the closing lock is obtained mechanically). The release can operate with both direct and alternate current.

Power supply [Un]	24 V DC
	30 V AC/DC
	48 V AC/DC
	60 V AC/DC
	110-120 V AC/DC
	120-127 V AC/DC
	220-240 V AC/DC
	240-250 V AC/DC
	380-400 V AC
	440 V AC
Operating limits:	(YO-YO2): 70% ... 110% Un
Standard CEI EN 60947-2.	(YC): 85% ... 110% Un

Circuit-breaker opening takes place with power supply voltage values of the release equivalent to 35 - 70% Un.
Circuit-breaker closing can take place with power supply voltage values of the release equivalent to 85 - 110% Un.

IT can be fitted with a signalling contact for undervoltage release energized (C. aux YU).

Reference figure in the electrical circuit diagrams: YU (6)

Inrush power consumption (Ps):	DC = 200 W
	AC = 200 VA
Continuous power (Pc):	DC = 5 W
	AC = 5 VA
Opening time (YU):	30 ms
Insulation voltage	2500V 50 Hz (per 1 min.)

Time-delay for undervoltage release (UVD)

The undervoltage release can be used in conjunction with an electronic time-delay device, which must be installed outside the circuit-breaker and which delays release tripping with preset, adjustable times. Use of the delayed undervoltage release is useful for preventing trips when the power supply network of the release may be subject to power cuts or brief voltage dips.
When it is not powered, circuit-breaker closing is prevented.
The time-delay device must be used with an undervoltage release with the same voltage.

Reference figure in the electrical circuit diagrams: YU + D; (7).

The characteristics of the time-delay device are:

Power supply (D):	24-30 V AC/DC
	48 V AC/DC
	60 V AC/DC
	110-127 V AC/DC
	220-250 V AC/DC
Adjustable opening time (YU+UVD):	0.5-1-1.5-2-3 s

Gearmotor for automatic loading of the closing springs (M)

Automatically loads the closing springs of the circuit-breaker's operating mechanism. Once the circuit-breaker has closed, the gearmotor immediately begins to reload the closing springs.
The closing springs can still be loaded in the manual mode (using the relative lever of the operating mechanism) in a power failure or during maintenance work.

Power supply	24-30 V AC/DC
	48-60 V AC/DC
	100-130 V AC/DC
	220-250 V AC/DC
Operating limits:	85…110% Un (Standard CEI EN 60947-2)
Insulation voltage:	2500 V 50 Hz (for 1 min.)

Inrush power consumption (Ps):	DC = 500 W
	AC = 500 VA
Rated power (Pn):	DC = 200 W
	AC = 200 VA
Inrush time	0.2 s
Loading time:	4-5 s

IT is always supplied with limit contacts and microswitch for signalling closing springs loaded.

Reference figure in the electrical circuit diagrams: M (1)

Mechanical and electrical trip signalling for overcurrent releases

The following signals are available after the overcurrent release has tripped:

a) Mechanical trip signalling for overcurrent releases

Enables visual signalling on the operating mechanism by pushing the trip button in when the circuit-breaker has been opened after the overcurrent releases have tripped. The circuit-breaker can only be closed again by putting the pushbutton back in its normal position in the standard configuration. Reference figure in the electrical circuit diagrams: S51 (13).

b) Electrical trip signalling for overcurrent releases

Enables visual signalling on the operating mechanism (mechanical) and remotely (electrically, by means of a change-over switch) of the circuit-breaker having opened after tripping of the overcurrent releases. The mechanical indicator pushbutton must be reset before the circuit-breaker can be reset. Reference figure in the electrical circuit diagrams: S51 (13).

c) Coil for resetting the mechanical release trip indicator

Enables visual signalling on the operating mechanism (mechanical) and remotely (electrically, by means of a change-over switch) of the circuit-breaker having opened after tripping of the overcurrent releases. Using this accessory, you can reset the mechanical indicator with an electrical relay via remote control and this allows the circuit-breaker to be reset.

Power supply:	24-30 V AC/DC
	220-240 V AC/DC
	110-130 V AC/DC

Reference figure in the electrical circuit diagrams: S51 (14)

Auxiliary contacts

Auxiliary contacts installed on the circuit-breaker are available and allow an indication of the circuit-breaker's state to be obtained. A special version of the auxiliary contacts is also available (gold plated contacts) for use at less than 24 V rated voltage (digital signals).

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 AC	5 A	0,3
400 V AC	2 A	0,3

The following versions are available:

a) Electrical signalling of circuit-breaker open/closed

ELECTRICAL signalling of the circuit-breaker state (open/closed) can be obtained with 4 auxiliary contacts.
The auxiliary circuits can have the following configurations:
– 4 break/make contacts for PR232-PR331 (4 change-over position contacts)
– 4+1 break/make contacts for PR232 (4 change-over position contacts + 1 for the release)

Reference figure in the electrical circuit diagrams: Q/1 to 4 (22)

b) Contact for signalling closing springs loaded/unloaded

This consists of a microswitch, which allows remote signalling of the state of the closing springs of the circuit-breaker operating mechanism. The contact is always supplied with the spring loading gearmotor.
Reference figure in the electrical circuit diagrams: S33 M/2 (11)

c) Contact for signalling undervoltage release energized (C.aux YU)

The undervoltage releases can be equipped with an undervoltage energized signalling contact (normally closed or open, as required) for remote signalling of the state of the undervoltage release.
Reference figure in the electrical circuit diagrams: (12)

Sensors and operations counter

a) Current sensor for the neutral conductor outside the circuit-breaker

The sensor allows neutral protection to be achieved by means of connection to the overcurrent release and is only available for three-pole circuit-breakers. It is supplied on request.
Reference figure in the electrical circuit diagrams: UI/N

b) Homopolar torord for the power supply earthing conductor (neutral point of the transformer)

The PR332 microprocessor-based electronic release can be used in conjunction with an external toroid positioned, for example, on the conductor that earths the neutral point of the MV/LV transformer (homopolar transformer): in this case, the earth protection is known as Source Ground Return. The In of the toroid can be regulated to 100 A, 250 A, 400 A, 800 A by using different combinations of connections.
Reference figure in the electrical circuit diagrams: UI/0.

c) Homopolar toroid for residual current protection

The toroid enables the residual current protection to be activated and can be used in conjunction with the PR332/P LSIRc release. The accessory is fitted with a dip switch-type multiple selector, which is set to suit the required sensitivity (from 3A to 30A). The accessory must be installed on the busbars and is available in various sizes, up to 3200A.

d) Mechanical operations counter

This is connected to the operating mechanism by means of a simple lever mechanism. It indicates the number of mechanical operations of the circuit-breaker. The indication is visible on the outside front of the circuit-breaker.

10.2 Mechanical locks

a-b) Lock in open position

Different mechanisms allowing the circuit-breaker to be locked in the open position are available.
These devices can be controlled by:
– A key (a): a special circular lock with different keys (for one single circuit-breaker) or with the same keys (for several circuit-breakers). In this latter case, up to four different key code numbers are available.
– Padlocks b): up to 3 padlocks (not supplied): Ø 4 mm.

Transparent protection covers

a) Protection covers for opening and closing pushbuttons

Applied over the opening and closing pushbuttons, these protection covers prevent the corresponding circuit-breaker operations unless a special tool is used.

b) IP54 door protection

This is provided by means of a transparent plastic escutcheon plate which fully protects the front of the circuit-breaker and allows the IP54 degree of protection to be obtained. It is assembled on hinges and equipped with a key lock.

10.3 Spare parts

The following spare parts are available:
– Front guards and escutcheon plate
– Closing springs
– Operating mechanism
– PR030/B Ultra power supply unit
– Dust-guard flange for compartment door
– Lubricating grease for the operating mechanism
– Tool case

Ask for the ABB spare parts catalogue for further details.

11. Protection releases - References

The Tmax T8 circuit-breaker can be accessorized with PR232 - PR331 - PR332 protection releases.
The following modules are available: PR330/V-T8, PR330/D-M, PR330/R, BT030.

Details about the operation of the relays are given in the following documents:
1SDH000587R0001 Operating instructions for the protection releases of T7-T8-X1 circuit-breakers
1SDH000591R0001 PR232/P-T8 Getting started
1SDH000592R0001 PR331 Getting started
1SDH000593R0001 PR332/PR333 Getting started
1SDH000650R0501 ABB SACE PR232/P-T8 microprocessor-based electronic release
1SDH000650R0502 ABB SACE PR331 T8 microprocessor-based electronic release
1SDH000650R0503 ABB SACE PR332 T8 microprocessor-based electronic release

11.1 Safety notes

WARNING: this symbol highlights information about operations, actions or circumstances that can cause injuries to the personnel, damage to the unit or economic losses.

Read this manual, the specific manuals of the electronic releases and the getting started manuals carefully and fully.
This device must only be used by qualified and expert personnel.

Ifb there are doubts about whether it can be used safely, the unit must be put out of service to prevent it from being used accidentally.

You must assume that the device is not safe to use if:
1. The unit shows visible signs of damage.
2. The unit does not function (e.g. with autotest or with the trip test unit).
3. The unit has been damaged during transport.

The circuit-breaker must be open before any servicing or replacements are made.
Also remember to disconnect any power supplies connected.

11.1.1. Notes for dielectric strength tests

it is forbidden to perform dielectric strength tests on the inputs and outputs of the releases.

11.2 General characteristics

The following table clearly illustrates the technical characteristics and the mix-and-matchability of the three relays.

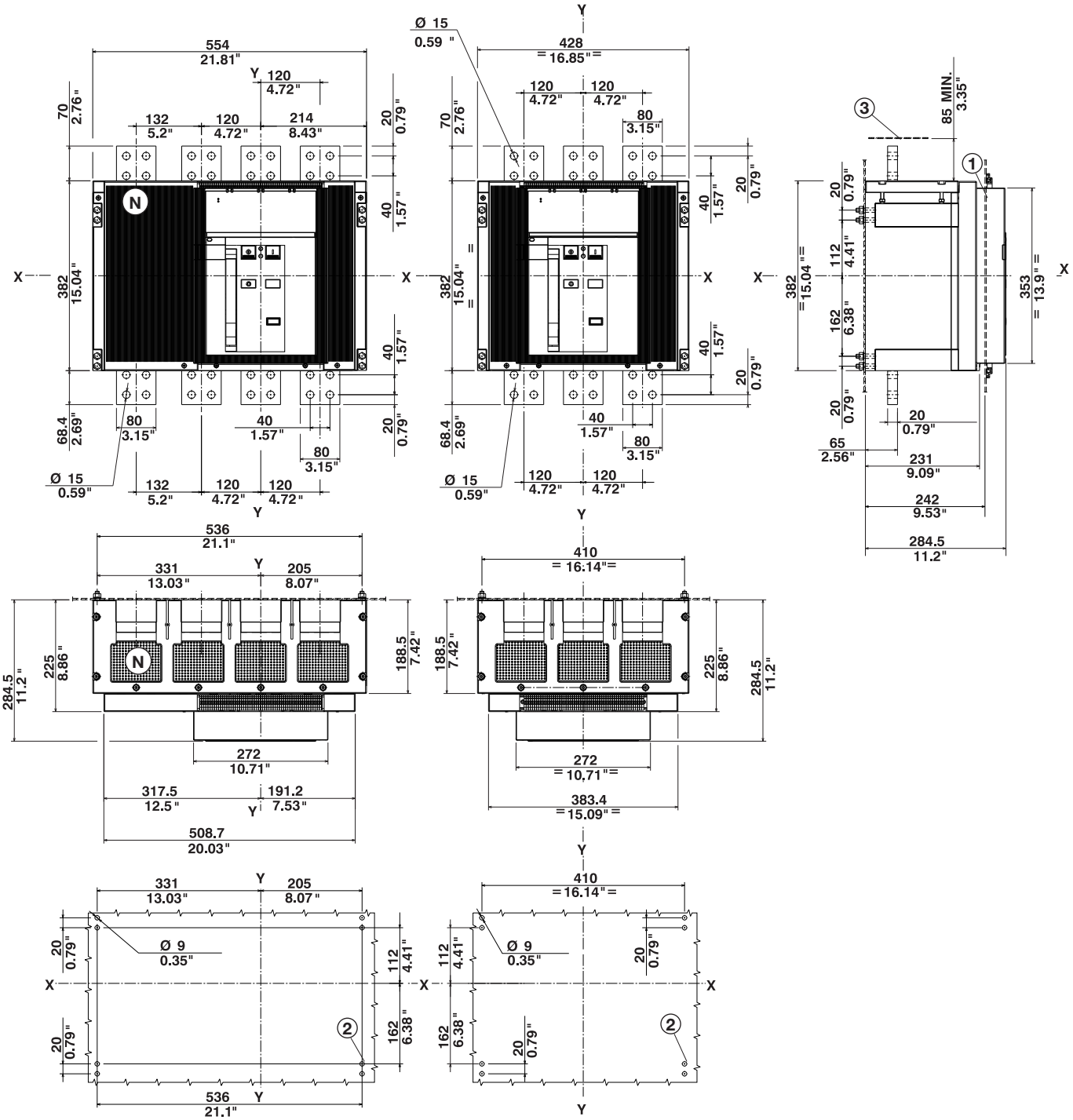
Function/Unit	PR232	PR331	PR332
Current protections (L, S, I, G)	**S** (1)	**S**	**S**
Additional protections(U, OT)	**-**	**-**	**S**
Voltage protections (UV, OV, RV, RP, UF, OF)	**-**	**-**	**S**(4)
Temperature protection	**-**	**-**	**S**
MCR protection	**-**	**-**	**S**
Thermal memory	**S**	**S**	**S**
Local bus for external accessory units	**-**	**S**	**S**
Wired communication (RS485)	**-**	**-**	**S** (3)
Radio communication (wireless Bluetooth)	**S** (2)	**S** (2)	**S** (2)
Data Logger	**-**	**-**	**S**
Compatibility with SD-Testbus	**S**	**S**	**S**
Compatibility with PR010/T	**S**	**S**	**S**
PR330/V Measuring (Internal voltage module)	**-**	**-**	**O**
PR330/D-M Com (Internal communication module)	**-**	**-**	**O**
Residual current protection	**-**	**-**	**O**
PR021/K (Separate signalling unit)	**-**	**O**	**O**
HMI030 (Separate graphic interface)	**-**	**O**	**O**
PR030/B (Separate power supply unit)	**O**	**O**	**S**
BT030 (Separate Bluetooth communication unit)	**O**	**O**	**O**

Key:
S : standard function/unit,
O : optional function/unit,
- : function/unit unavailable.

Notes:
1. : function G is not available
2. : with separate BT030 unit (for temporary connection),
3. : with PR330/D-M module,
4. : with PR330/V module.

12. Overall dimensions

Version with front terminals 1600A/2000A/2500A - F (IEC/UL)



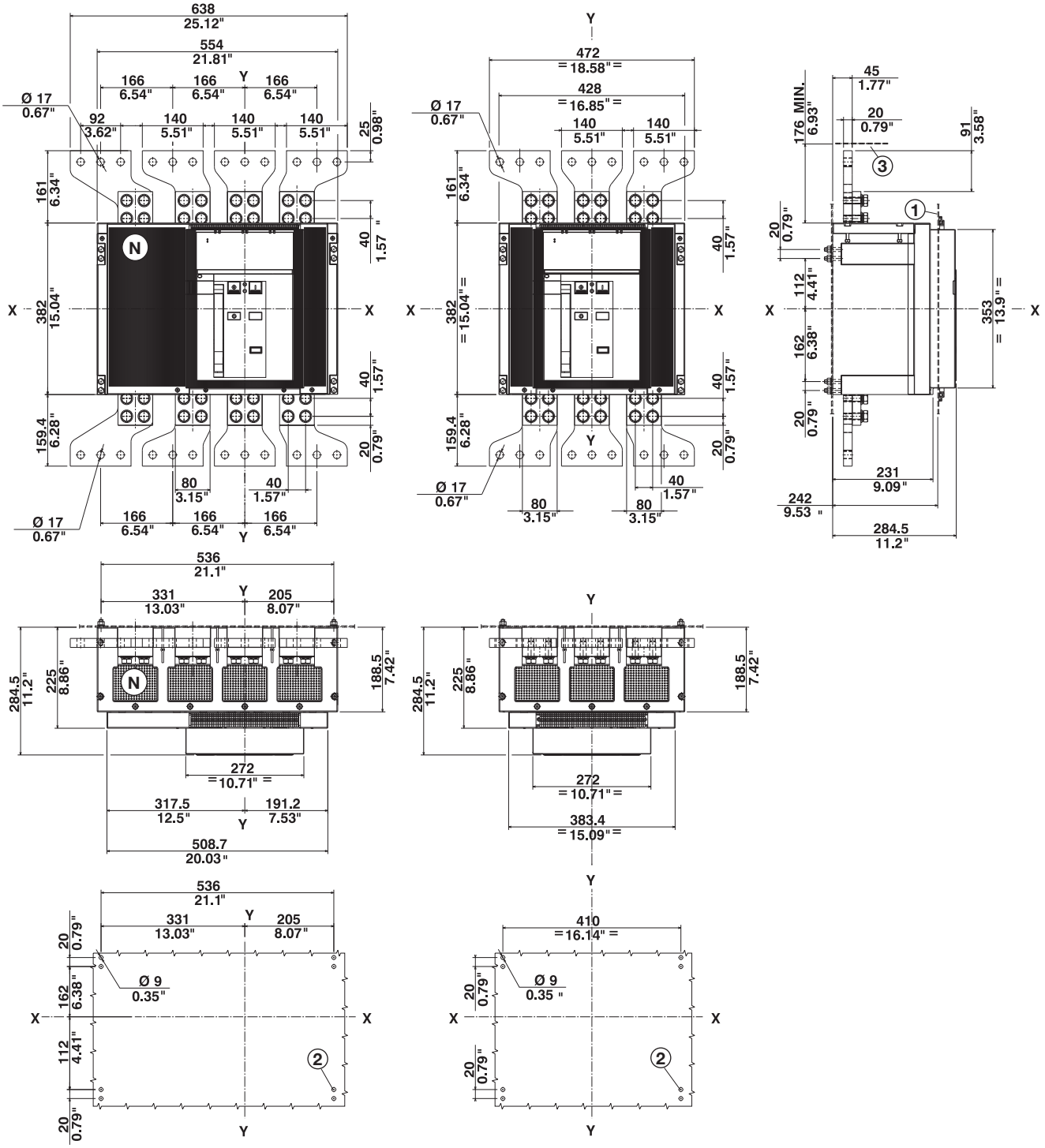
Key

① Inside edge of compartment door

② Drilled M8 holes for fixing circuit-breaker (use M8 screws)

③ Insulating or insulated metal wall

Fig. 31



Key

① Inside edge of compartment door

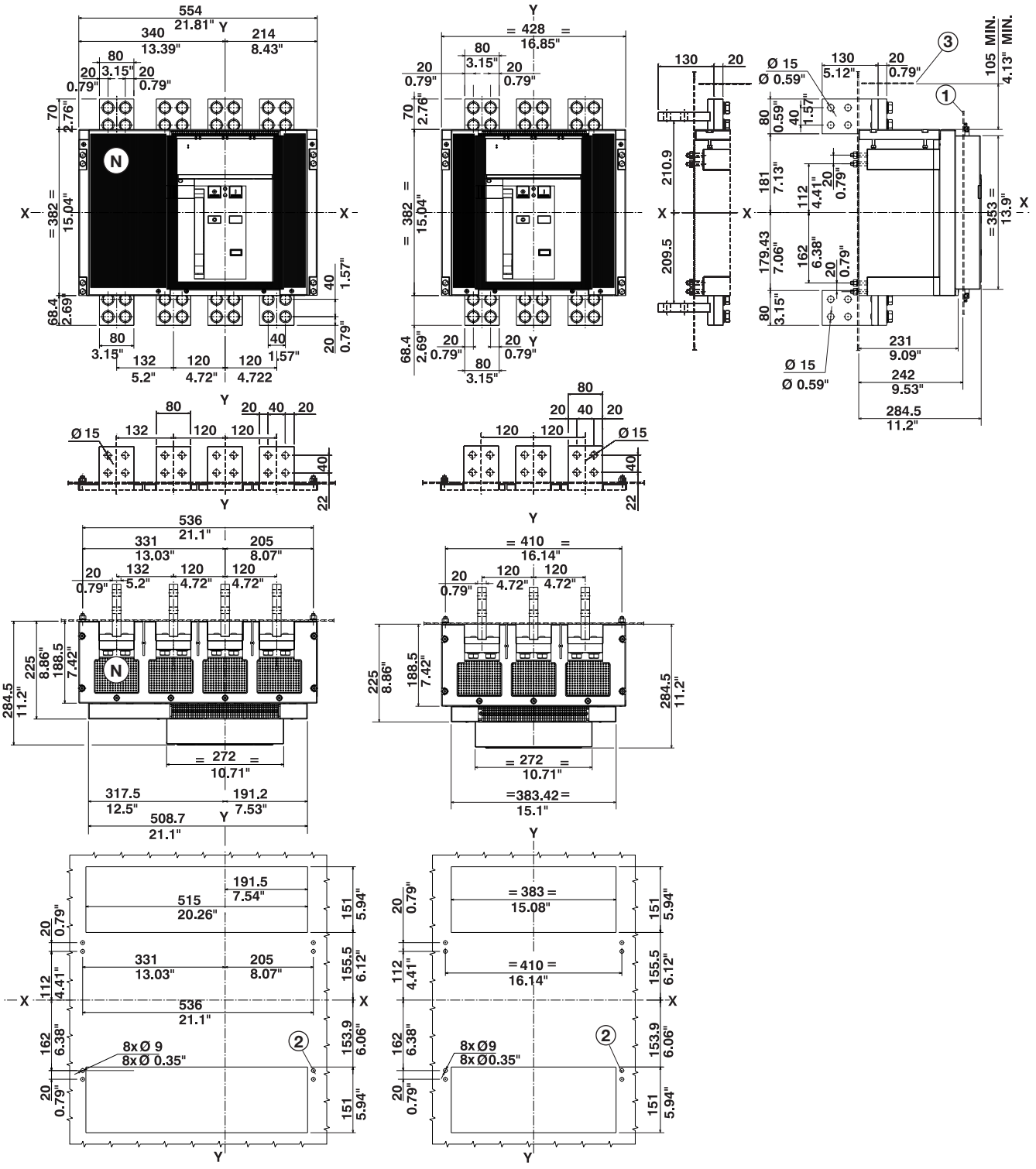
② Drilled M8 holes for fixing circuit-breaker (use M8 screws)

③ Insulating or insulated metal wall

Fig. 32

Version with adjustable rear terminals in flat bar 2000A/2500A* - HR (IEC) / VR (IEC-UL)

*NOTE: if installed vertically, the adjustable rear terminals in flat bar are also suitable for 3200A (IEC).



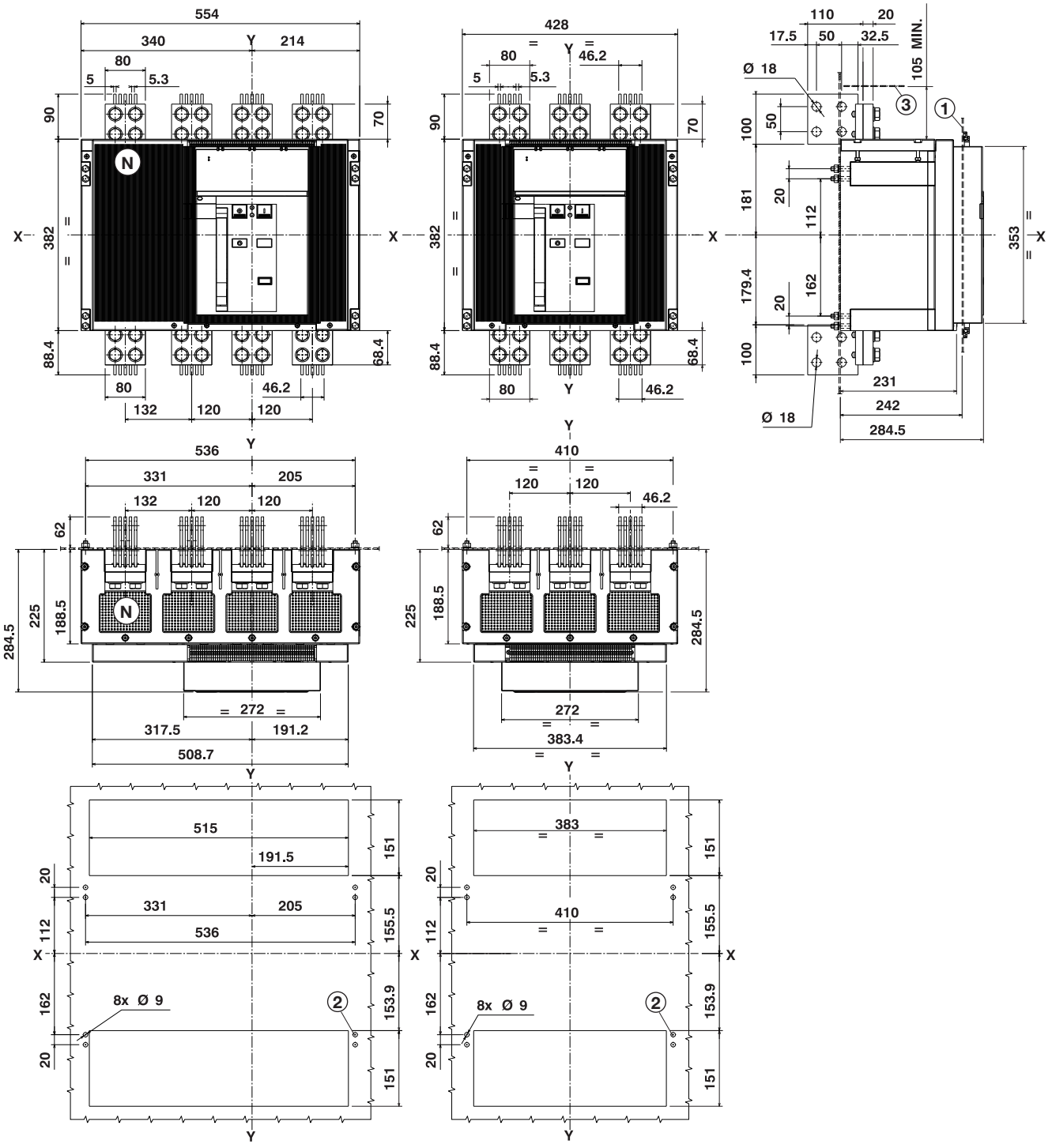
Key

(1) Inside edge of compartment door

(2) Drilled M8 holes for fixing circuit-breaker (use M8 screws)

(3) Insulating or insulated metal wall

Fig. 33



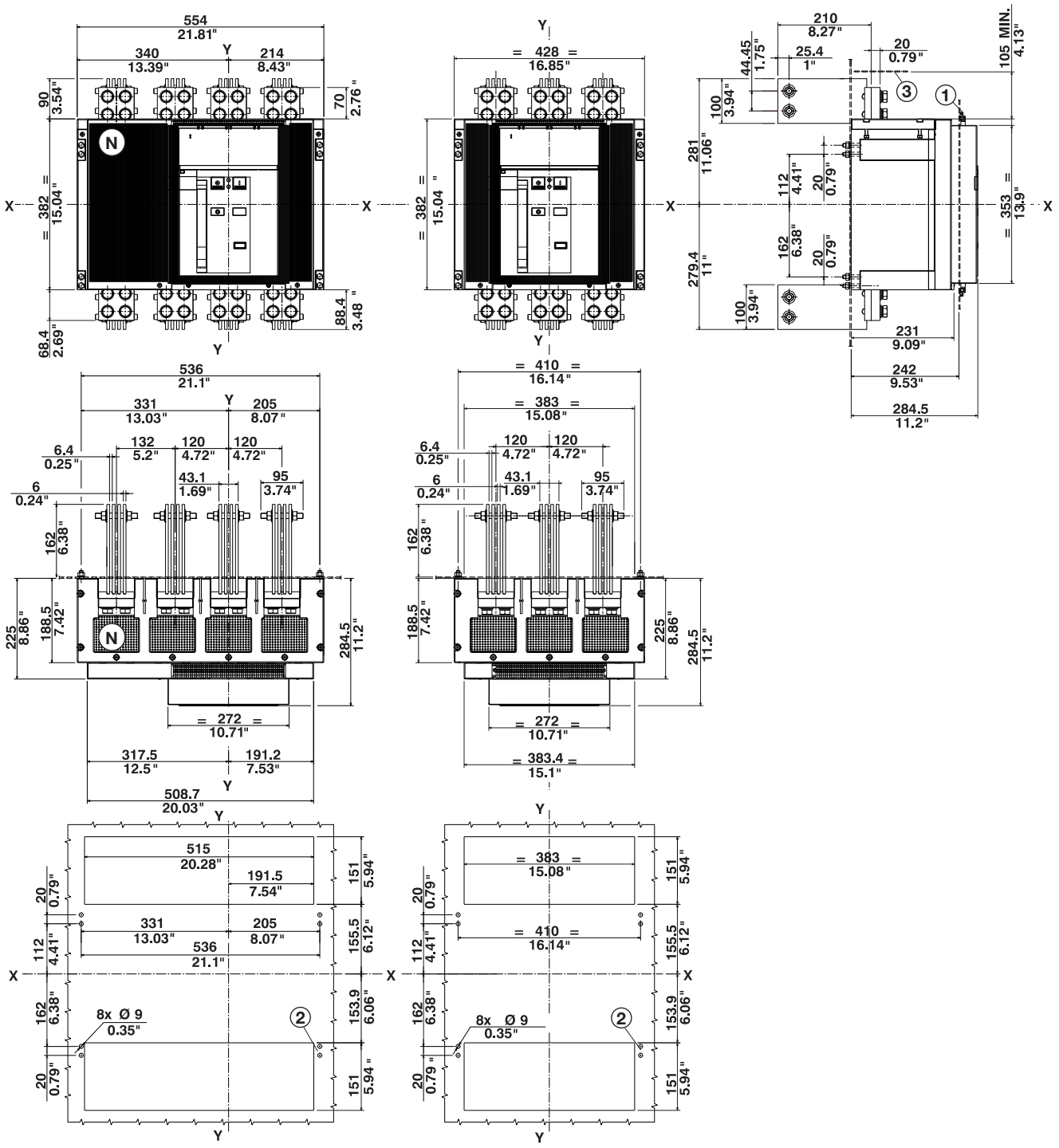
Key

① Inside edge of compartment door

② Drilled M8 holes for fixing circuit-breaker (use M8 screws)

③ Insulating or insulated metal wall

Fig. 34



Key

1. Inside edge of compartment door
2. Drilled M8 holes for fixing circuit-breaker (use M8 screws)
3. Insulating or insulated metal wall

Fig. 35

Compartment dimensions

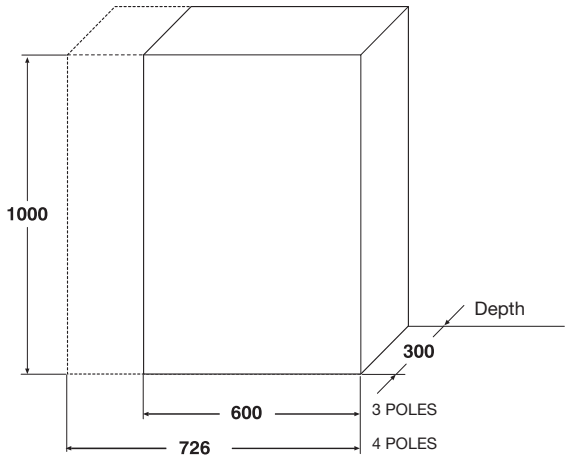


Fig.36

Holes drilled in compartment door

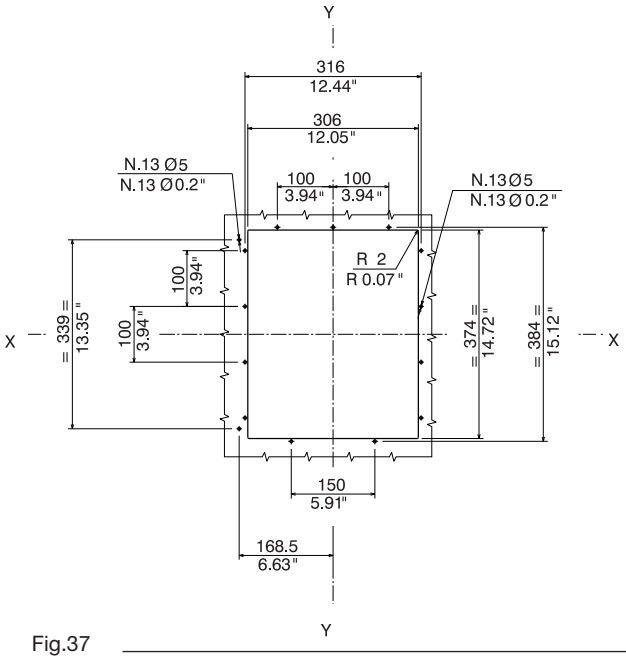


Fig.37

Insulation distances for installation in metal cubicle

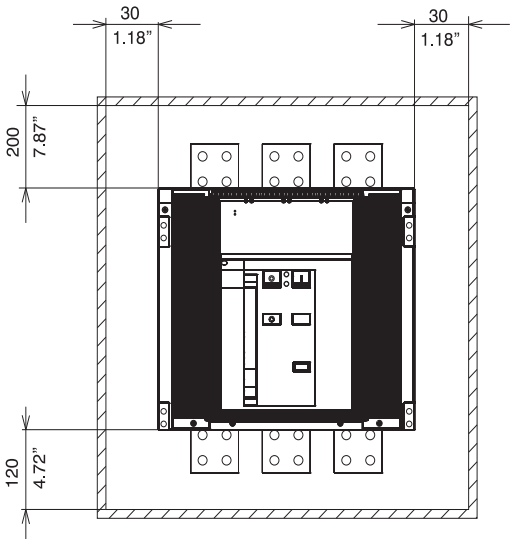


Fig.38

13. Circuit diagrams

WARNING:
Carefully read notes F and O on the circuit diagrams before installing the circuit-breaker.

OPERATING STATE SHOWN
The diagram illustrates the components in the following conditions:
- circuit-breaker open
- circuits de-energized
- releases not tripped
- motor operator with unloaded springs.

VERSIONS
Version without overcurrent release
The applications indicated in figures 13, 14, 41, 42, 43, 44, 45, 46, 62 cannot be provided with this version.

Version with PR232/P-T8 electronic release
The applications indicated in figures 41, 42, 43, 44, 45, 46, 62 cannot be provided with this version.

Version with PR331/P electronic release
The applications indicated in figures 42, 43, 44, 45, 46 cannot be provided with this version.

Version with PR332/P electronic release
The applications indicated in figure 41 cannot be provided with this version.

KEY

☐	=	Figure number of the diagram
*	=	See note indicated by the letter
A1	=	Circuit-breaker appications
A4	=	Example switchgear and connections for operation 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	=	PR232/P-T8, PR331/P, PR332/P electronic release with the following protection functions: - 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: input for protection G or “reverse” direction input for protection D (only with Uaux. and PR332/P release)
K51/GZout(DBout)	=	Zone selectivity: input for protection G or “reverse” direction input for protection D (only with Uaux. and PR332/P release)
K51/SZin(DFin)	=	Zone selectivity: input for protection S or “direct” direction input for protection D (only with Uaux. and PR332/P release)
K51/SZout(DFout)	=	Zone selectivity: input for protection S or “direct” direction input for protection D (only with Uaux. and PR332/P release)
K51/YC	=	Closing control from PR122/DC or PR123/DC microprocessor-based release with communication module PR330/D-M and with actuator unit PR330/R
K51/YO	=	Closing control from PR332/P microprocessor-based release with communication module PR330/D-M and with actuator unit PR330/R
M	=	Motor for loading the closing springs
Q	=	Circuit-breaker
Q/1...5	=	Auxiliary contacts of the circuit-breaker
S33M/1...3	=	Limit contacts of the 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 can only be closed after the reset pushbutton has been pressed,or after the coil has been energized for electrical reset (if available)
S51/P1	=	Programmable contact (signals overload in progress - start by default)
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 resetting of the circuit-breaker
SRTC	=	Contact for electrical signalling of circuit-breaker open, with springs loaded and ready to close.
TI/L1	=	Current transformer located on phase L1
TI/L2	=	Current transformer located on phase L2
TI/L3	=	Current transformer located on phase L3
TO	=	Homopolar toroidal current transformer (see note T)
TU	=	Isolation voltage transformer (see note O)
Uaux.	=	Auxiliary power supply voltage (see note F)
UI/0	=	Current sensor (Rogowski coil) located on the conductor that earths the neutral point of the MV/LV transformer (see note G)
UI/L1	=	Current transformer (Rogowski coil) located on phase L1
UI/L2	=	Current transformer (Rogowski coil) located on phase L2
UI/L3	=	Current transformer (Rogowski coil) located on phase L3
UI/N	=	Current transformer (Rogowski coil) located on neutral
W1	=	Serial interface with control system (external bus): EIA RS485 interface (see note E)
W2	=	Serial interface with the accessories of releases PR331/P and PR332/P (internal bus)

X1...X7 = Connectors for the circuit-breaker appications
XK1 = Connector for the power circuits of releases PR232/P-T8, PR331/P, PR332/P.
XO = Connector for YO1 release
XR3…XR13 = Connectors for the auxiliary circuits of releases PR232/P-T8, PR331/P, PR332/P.
XV = Delivery terminal box for the auxiliary circuits of the 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 = Circuit of the motor for loading 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.12A = Contact for electrical signalling of circuit-breaker open, with springs loaded and ready to close.
Fig.13 = Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release. The circuit-breaker can only be closed after the reset pushbutton has been pressed, or after the coil has been energized for electrical reset (if available)
Fig.14 = Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release and coil for electrical reset. The circuit-breaker can only be closed after the reset pushbutton has been pressed or after the coil has been energized.
Fig.22 = Auxiliary contacts of the circuit-breaker
Fig.41 = Auxiliary circuits of the PR331/P release (see note F).
Fig.42 = Auxiliary circuits of the PR332/P release (see notes F and N).
Fig.43 = Circuits of the PR330/V-T8 measuring module of the PR332/P release connected inside the three-pole or or four-pole circuit-breaker (optional).
Fig.44 = Circuits of the PR330/V-T8 measuring module of the PR332/P release connected outside the circuit-breaker (optional) (see note O).
Fig.45 = Auxiliary circuits of the PR332/P release with communication module PR330/D-M connected to actuator unit PR330/R (see notes E, F, N and P).
Fig.46 = Circuits of the PR330/V-T8 measuring module of the PR332/P release connected inside the three-pole circuit-breaker with outside neutral conductor (optional).
Fig.61 = SACE SOR TEST UNIT test/monitoring unit (see note R).
Fig.62 = Circuits of signalling unit PR021/K (outside the circuit-breaker)

INCOMPATIBILITY

The circuits indicated in the following figures cannot be supplied at the same time in the same circuit-breaker:
6 - 7 – 8
13 - 14
41 - 42 – 45
43 - 44 - 46

NOTES

A) The circuit-breaker is only fitted with the accessories specified in the ABB SACE order acknowledgement. Consult this catalogue for instructions about how to make the 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 there is the same power supply for the closing and undervoltage releases and the circuit-breaker must close automatically when the auxiliary voltage returns, a 30 ms delay must be introduced between the accept instant of the undervoltage release and energizing of the closing release. This can be achieved by means of a circuit outside the circuit-breaker comprising a permanent closing contact, the contact indicated in fig. 12 and a time-delay relay.
E) Consult “Technical Application Handbook - vol. 9” communication via BUS with ABB circuit-breakers for connection of the EIA RS485 serial link.
F) The auxiliary voltage Vaux allows all the functions of PR331/P and PR332/P releases to be activated.
Since a Vaux isolated from earth is required, it is necessary to use “galvanically separated converters” conforming to standards IEC 60950 (UL 1950) or equivalent, able to guarantee a common mode current or leakage current (see IEC 478/1, CEI 22/3) of no more than 3.5mA, IEC 60364-41 and CEI 64-8.
G) Earth fault protection is available with the PR332/P release by means of a current sensor on the conductor that earths the neutral point of the MV/LV transformer.
The connection between terminals 1 and 2 (or 3) of current transformer UI/O and terminals T7 and T8 of terminal box XV must be made with two-pole shielded stranded cable (the BELDEN 8762/8772 type) no more than 15 m in length. The shield must be earthed on the circuit-breaker side and on the current sensor side.
N) With release PR332/P release, the connections to the zone selectivity inputs and outputs must be made with two-pole shielded and stranded cable (the BELDEN 8762/8772 type) no more than 300m in length. The shield must be earthed on the selectivity input side.
O) It is obligatory to use an insulation voltage transformer for connection to the busbars in systems with over 690V rated voltage or with a PR330/V module connected by external sockets.
P) With the PR332/P release with communication module PR330/D-M, coils YO and YC are controlled directly from contacts K51/YO and K51/YC with 110-120Vdc and 240-250Vac maximum voltage values.
Q) The second shunt opening release may be installed as an alternative to the undervoltage release.

R) Operation of the SACE SOR TEST UNIT + shunt opening release (YO) is guaranteed from 75% of the Uaux of the shunt opening release itself.
While the YO power supply contact is closing (short-circuit of terminals 4 and 5), the SACE SOR TEST UNIT is unable to detect the opening coil state. For this reason:
- The TEST FAILED and ALARM signals will be activated if the opening coil is powered in the continuous mode
- If the opening coil is controlled in the pulsing mode, the TEST FAILED signal may be activated at the same instant. In this case, the TEST FAILED signal should only be considered an alarm signal if it remains for more than 20s.

S) Also available in the version with normally closed contact.

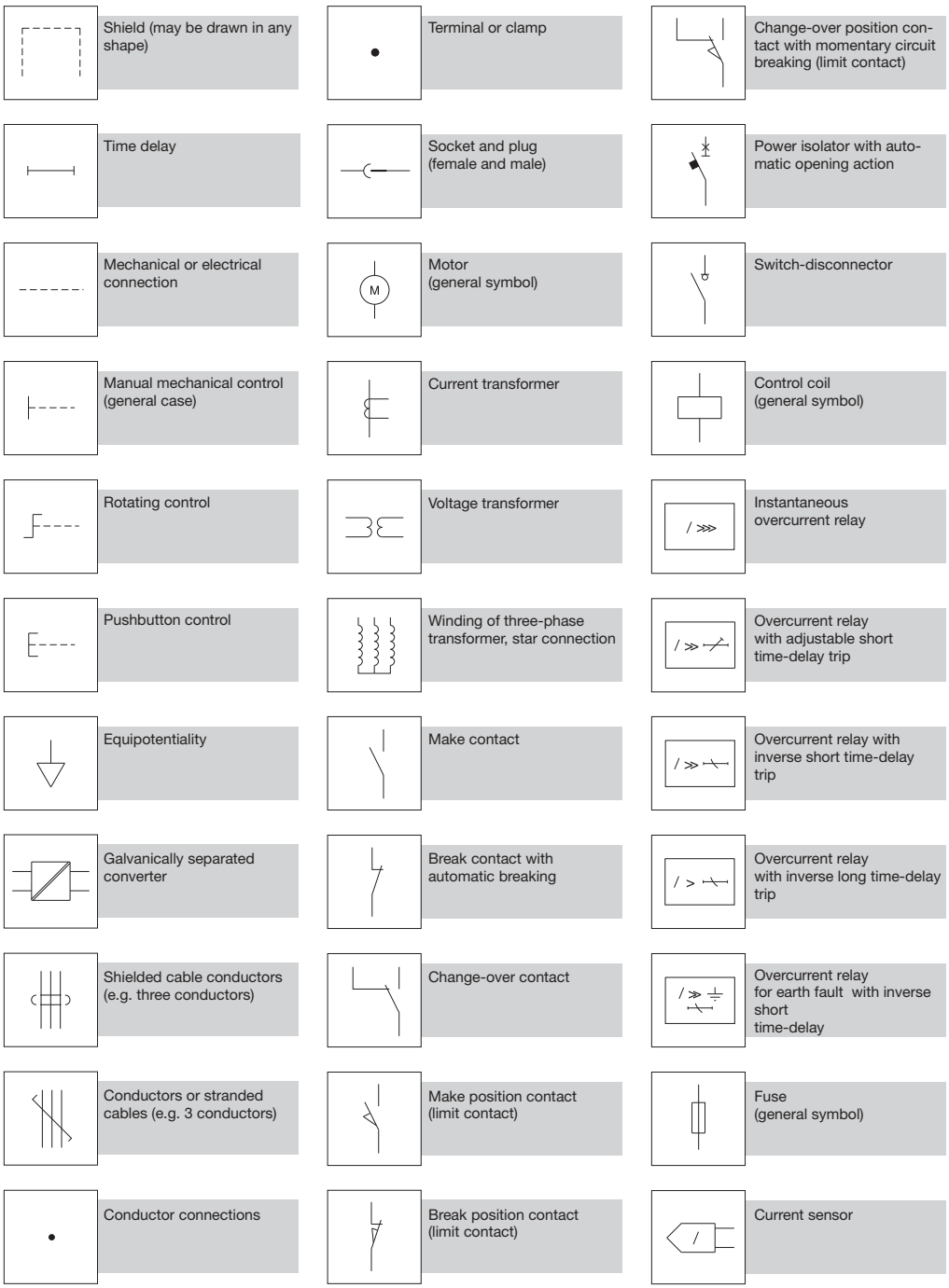
T) The connections between the toroidal transformer TO and the terminals of terminal box XV of the circuit-breaker must be made with shielded four-pole cable with paired braided wires (the BELDEN 9696 paired type) no more than 10m in length. The shield must be earthed on the circuit-breaker side.

U) The shield of the connection cable must be earthed on the circuit-breaker side only. The connection must be made with shielded two-wire cable (the BELDEN 3105A type) no more than 15 meters in length.

X) Poles T3 and T4 of connector XV are reserved for voltage measurements if U>690 V. In this case, they must be connected to the secondary of the voltage transformer TU (see fig. 44). Ask ABB SACE for residual current applications with over 690 V voltage values.

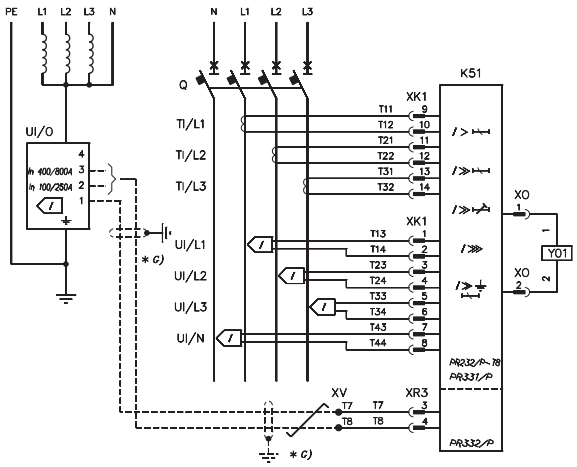
Z) Short-circuit T5 and T6 if the outside neutral current sensor (UI/N) is not connected.

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

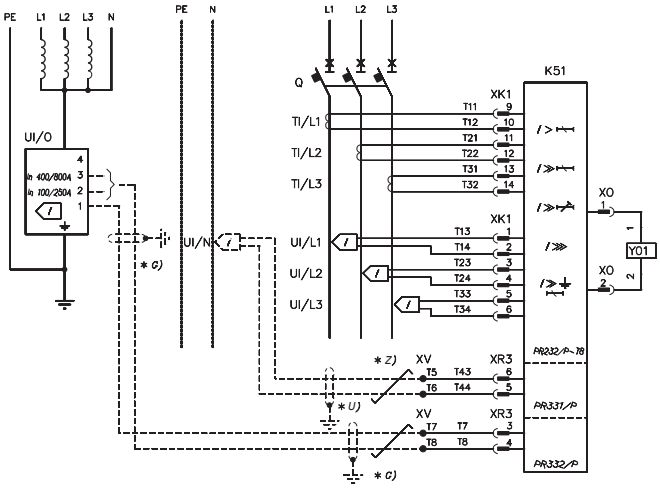


Circuit diagram - Operating state

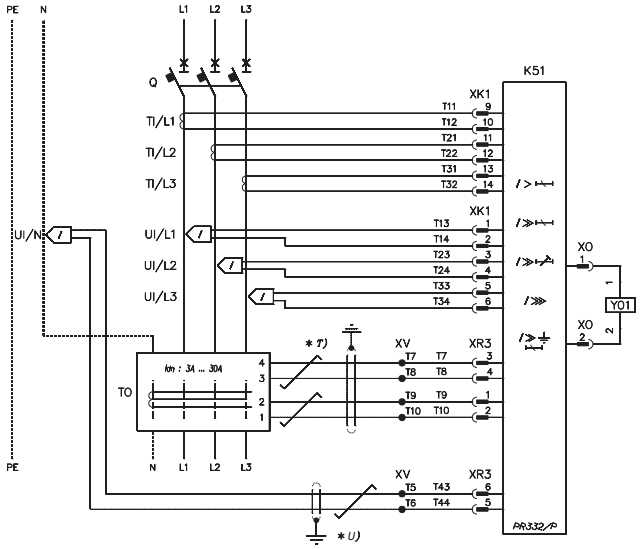
Three-pole circuit-breaker with PR232/P-T8, PR331/P or PR332/P electronic release



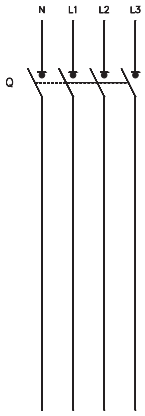
Four-pole circuit-breaker with PR232/P-T8, PR331/P or PR332/P electronic release



Three-pole circuit-breaker with PR332/P electronic release, residual current protection and U<=690 V.

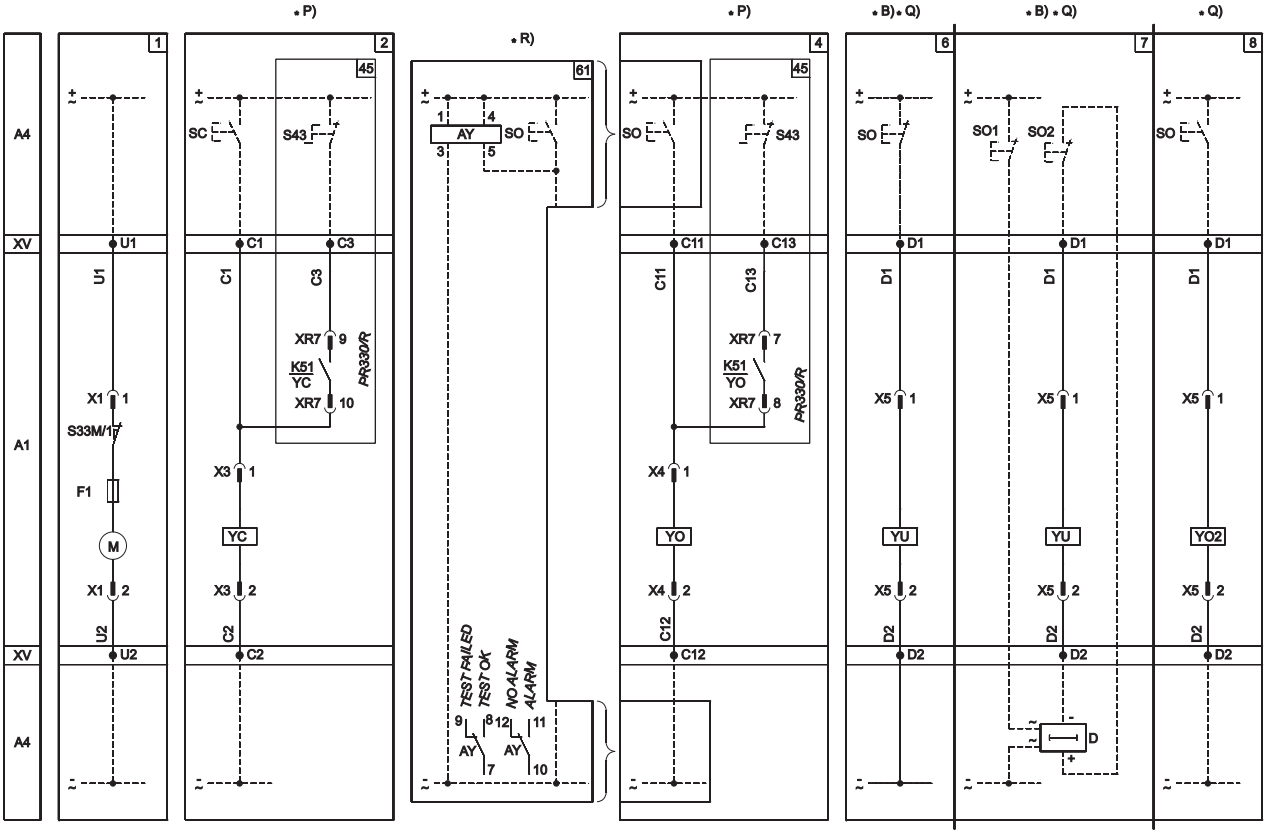


Three-pole or four-pole switch-disconnector

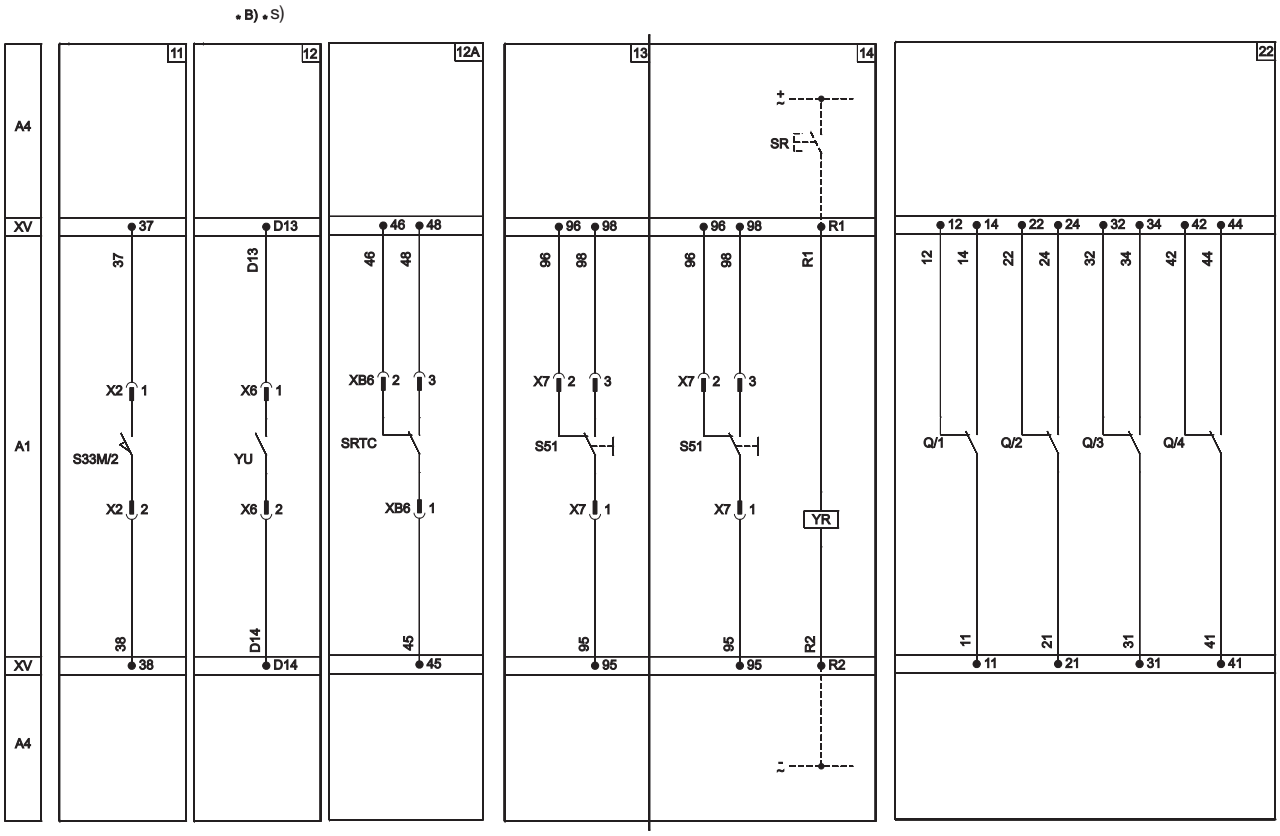


Mod.	L3692	L5757		Apparatus	**Tmax T8**	Scale
	L3885					
				Doc N°	**1SDH000682R0002**	Page N° **34/39**

Motor operator, opening, closing and undervoltage releases

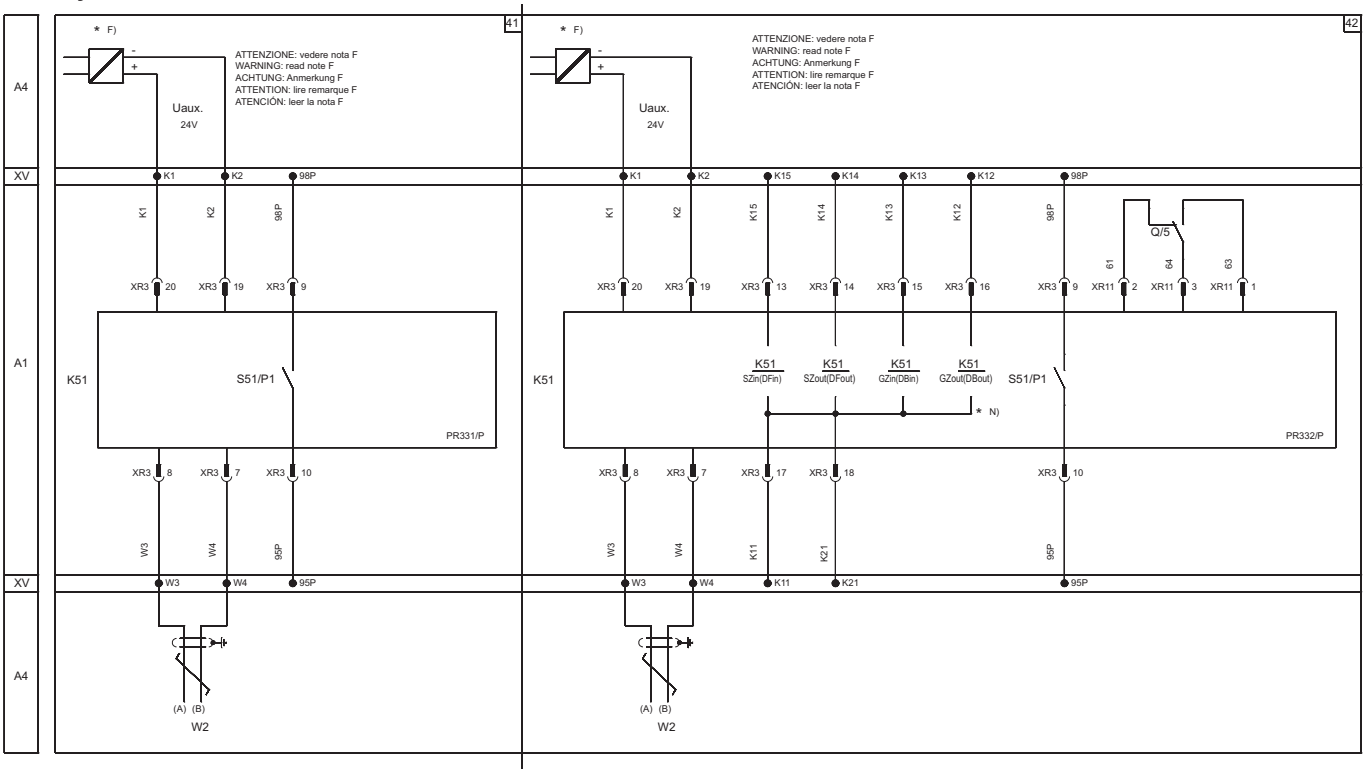


Signalling contacts

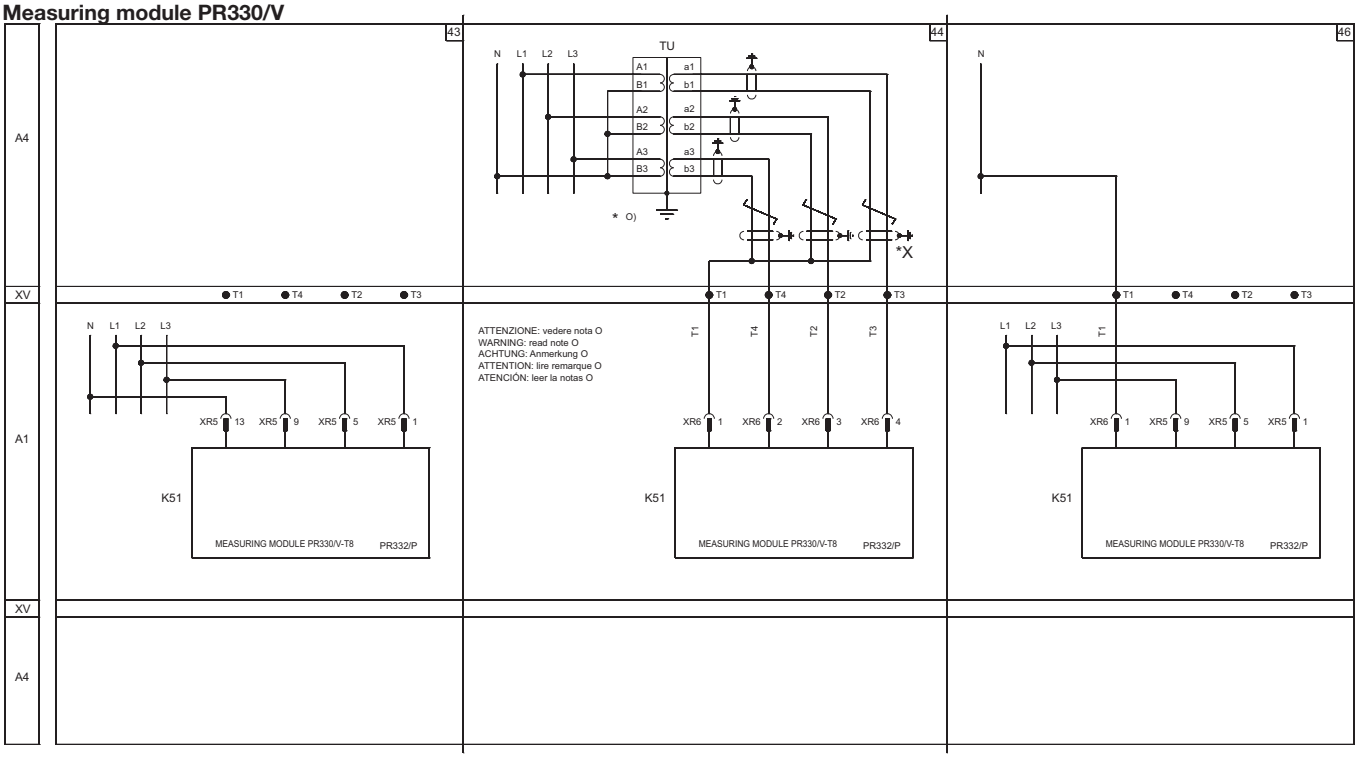


Mod.	L3692	L5757		Apparatus	Tmax T8	Scale
	L3885					
				Doc N°	1SDH000682R0002	Page N° 35/39

Auxiliary circuits of releases PR331 and PR332

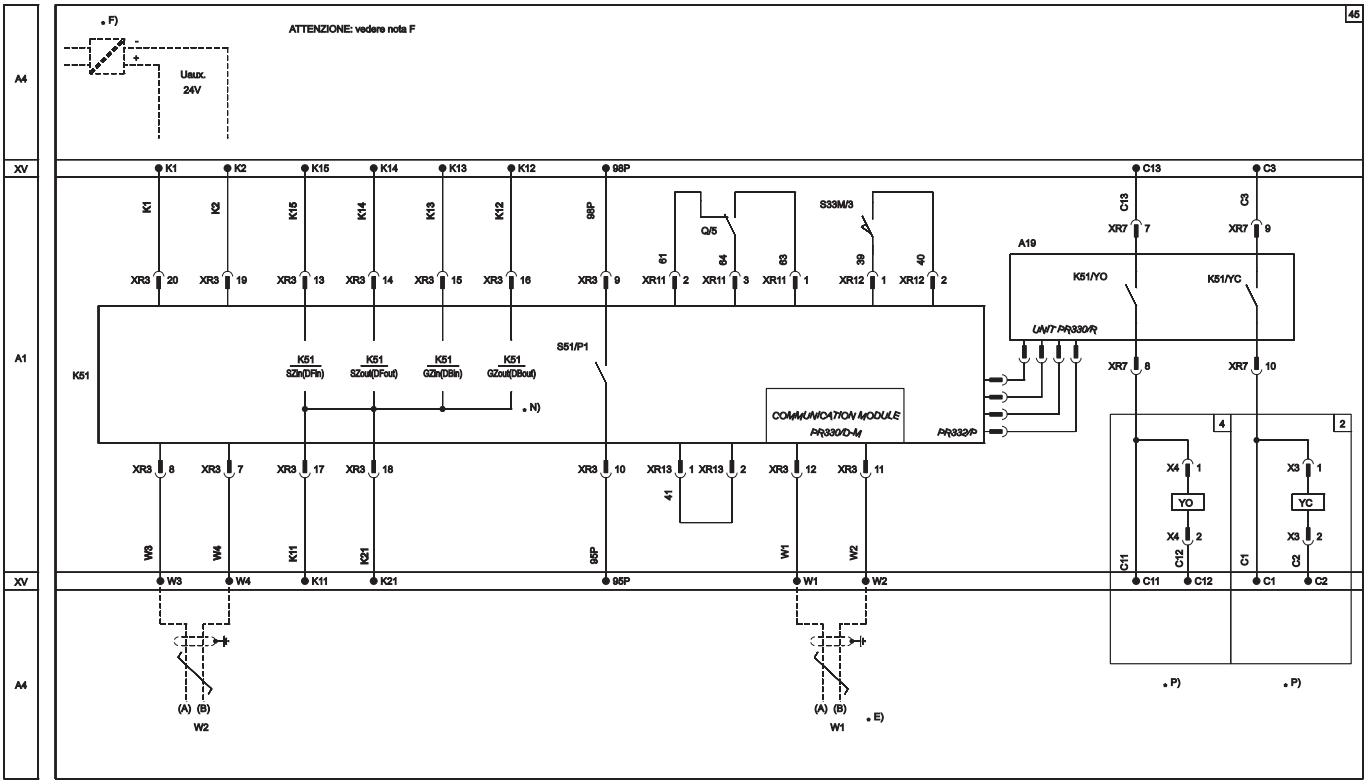


Measuring module PR330/V

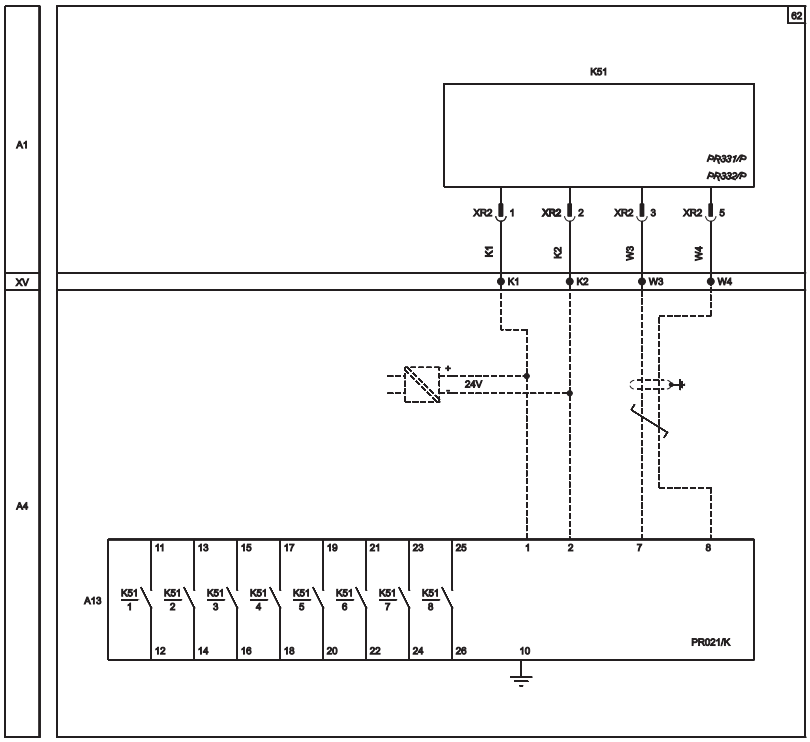


Mod.	L3692	L5757		Apparatus	**Tmax T8**	Scale
	L3885					
				Doc N°	**1SDH000682R0002**	Page N° **36/39**

Auxiliary circuits of the PR332 release with communication module PR330/D-M connected to actuator unit PR330/R



PR120/K signalling module



Since both the Standards and materials used are subject to continual developments, the characteristics and overall dimensions given in this catalogue may only be considered binding after they have been confirmed by ABB.

1SDH000682R0002 L5757

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