

**Installation instruction for 140G-R**
**Istruzioni di installazione**
**Installationsanleitung**
**Instructions pour l'installation**
**Instrucciones de instalación**
**Installation - Installazione - Instalación**  
**Instalação - 取付け方法 - 安裝**

**WARNING:** To prevent electrical shock, disconnect from power source before installing or servicing. Install in suitable enclosure. Keep free from contaminants. (Follow NFPA70E requirements).

**AVVERTENZA:** Per prevenire infortuni, togliere tensione prima dell'installazione o manutenzione. Installare in custodia idonea. Tenere lontano da contaminanti.

**WARNUNG:** Vor Installations- oder Servicearbeiten Stromversorgung zur Vermeidung von elektrischen Unfällen trennen. Die Geräte müssen in einem passenden Gehäuse eingebaut und gegen Verschmutzung geschützt werden.

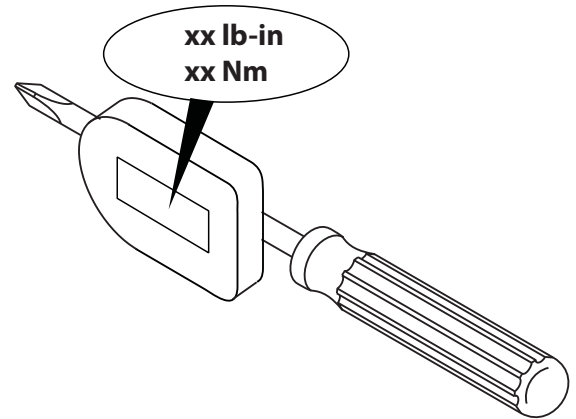
**AVERTISSEMENT:** Avant le montage et la mise en service, couper l'alimentation secteur pour éviter toute décharge. Prévoir une mise en coffret ou armoire appropriée. Protéger le produit contre les environnements agressifs.

**ADVERTENCIA:** Desconéctese de la corriente eléctrica, antes de la instalación o del servicio, a fin de impedir sacudidas eléctricas. Instálelo en una caja apropiada. Manténgalo libre de contaminantes.

**ATENÇÃO:** Para evitar choques, desconectar da corrente elétrica antes de fazer a instalação ou a manutenção. Instalar em caixa apropriada. Manter livre de contaminantes.

警告：感電事故防止のため、取付けまたは修理の際は電源から取り外してください。適切なケース内に取付けてください。また、汚染物質がないことを確認してください。

警告：为了防止触电，在安装或维修之前必须先切断电源。安装在合适的设备箱内。防止接触污染。

**Required tool**


		T25 Ch10 A B SCREW M5 x 14 NUT M5 A - PLAIN WASHER B - ELASTIC WASHER	3000A ONLY CH19 PLAIN WASHER NUT M12	3000A ONLY 95 SCREW M12x95	3000A 100% ONLY	3000A 100% ONLY SCREW M4 x 14	Escutcheon	
<b>3p</b>   2500A (100%) 3000A 2000A 2500A (80%)	X1	X2	X3	X48	X24	X8	X32	X1
<b>4p</b>   2500A (100%) 3000A 2000A 2500A (80%)	X1	X2	X3	X64	X32	X10	X40	X1

NOTE: MCCB without door interlock is not shown

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## Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purpose. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.



**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe practices and for Personal Protective Equipment.



**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



**PINCH POINT LABEL:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that cut/crush hazard may be present.



**READ INSTRUCTION SYMBOL:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people to read the Instruction Manual of the equipment.



At the end of its life, this equipment should be collected separately from any unsorted municipal waste

# 1 Description

## 1.1 General characteristics

140G-R MCCB and molded case switch 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 circuit breaking parts and the current sensor of the corresponding phase.

## 1.2 External front view of the circuit breaker

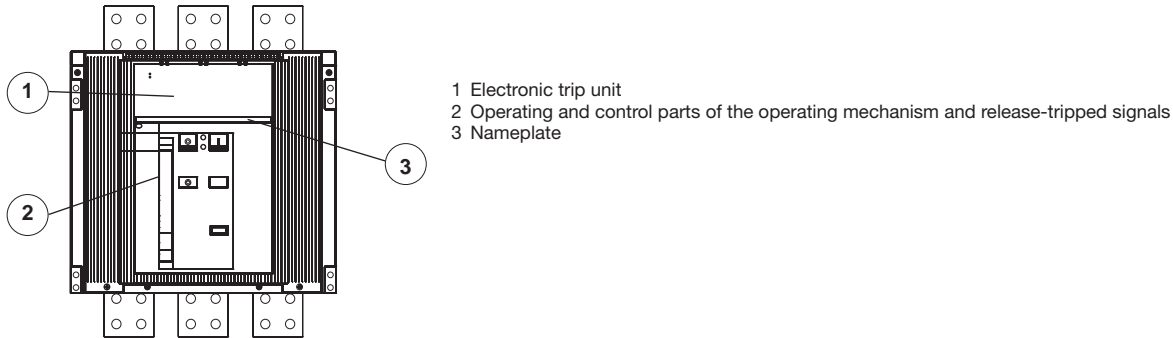


Fig. 1

# 2 Inspect Packaging

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 put back into its container and covered with a waterproof material.

### 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.

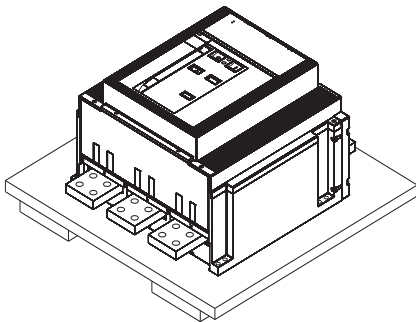


Fig. 4

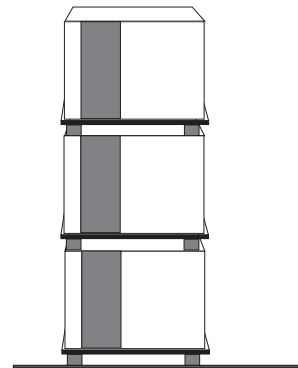


Fig. 5

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 permitted: In this case, the lifting ropes must be attached as shown in the figure 6.

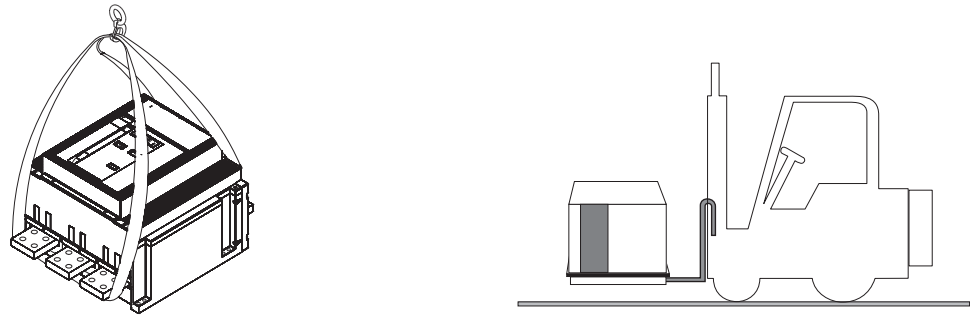


Fig. 6

**Table of circuit breaker weights**

Circuit breaker Frame	3 poles		4 poles	
	kg	lbs	kg	lbs
2000 A	73	161	95	209
2500 A	73	161	95	209
3000 A	95	209	125	276

**Note**

The weights given in the table refer to circuit breakers complete with LSIG trip unit, excluding the accessories.

**4 Installation**

**4.1 Installation conditions**

Install the circuit breaker in a dry, dust-free, non-corrosive environment where it will not be subjected to shocks or vibrations. When this is not possible, assemble it inside an enclosure with a suitable degree of protection.

Refer to the “Overall dimensions” chapter, which provides information about the following points:

- minimum installation volume for the circuit breaker
- clearances to uninsulated parts of enclosure
- overall dimensions of the circuit breakers
- drilling holes for panel mounting
- drilling holes for escutcheon and IP54 flush mount enclosure door.

Installation, commissioning, service and preventive maintenance must be performed by skilled personnel with detailed knowledge of the equipment.

The R frame must only be mounted in a vertical plane. Installation of the frame requires eight (8) M8 fasteners as shown in figure 7.

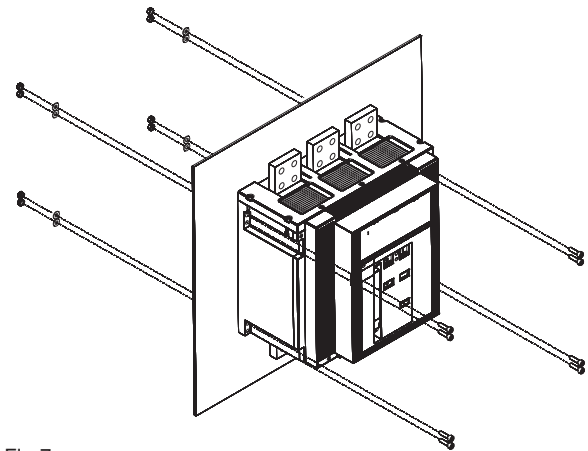


Fig.7

**4.2 Installation of door interlock (factory supplied option)**

Make the latching bracket holes on the door-panel, as indicated in the drilling template (see chapter 12).

To ensure the correct device operation, align the bracket with the C.B.'s interlock mechanism.

The indicated dimensions must be respected; if needed use properly the spacers provided.

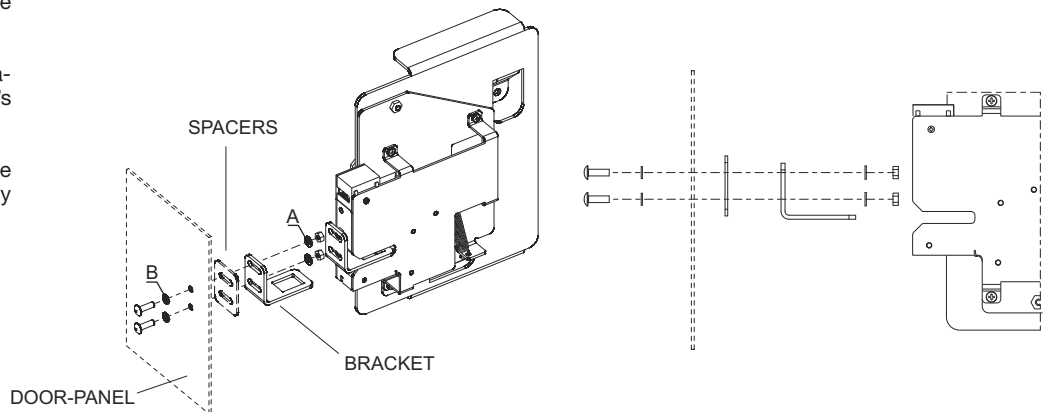


Fig.7a

#### 4.3 Installation of the escutcheon for flush mounted (to door) applications

- Drill the holes in the enclosure door indicated in the section entitled "Overall dimensions".
- Install the escutcheon (Fig. 8) to the front of the enclosure door. Attach from the inside using self tapping screws (2).

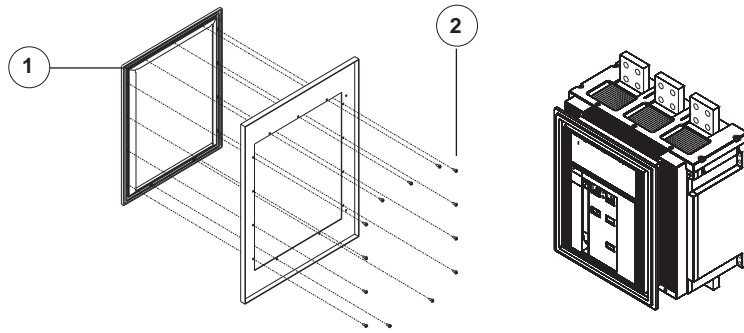


Fig. 8

#### 4.4 Heat sink installation (3000A 100% rated only)

Assemble the heat sink on the terminals according to the scheme indicated (Fig.9). Tightening torque 4 Nm - 35,4 lb-in. Then re-assemble the terminals to the circuit breaker. Tightening torque 40 Nm - 354 lb-in.

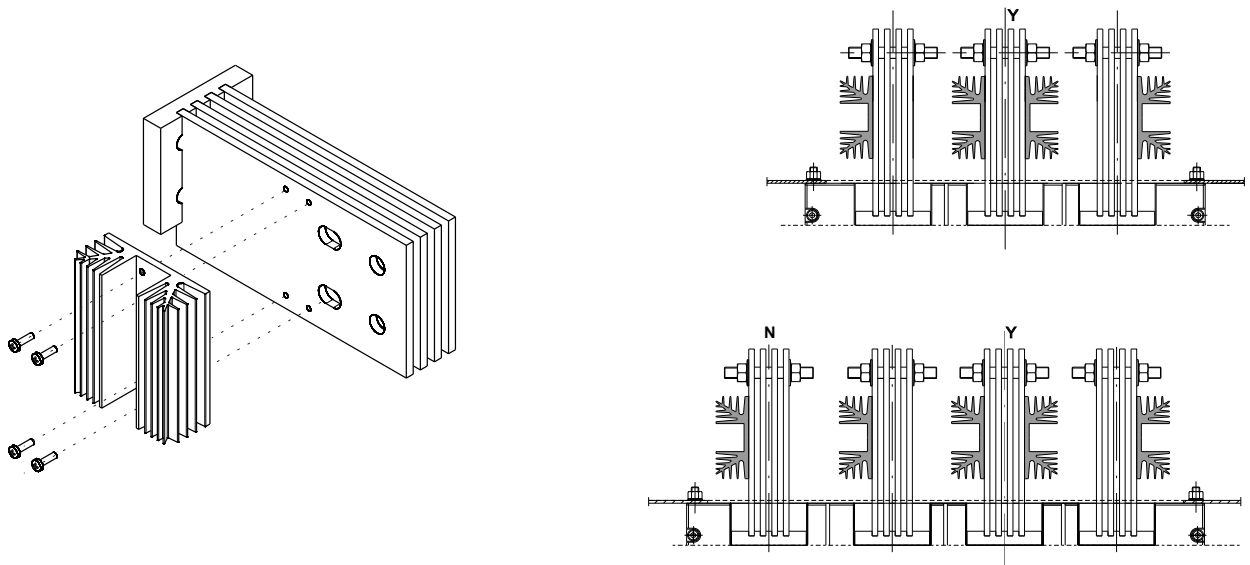


Fig. 9

#### 4.5 Mechanical Door Interlock operating instruction (factory supplied option)

##### 4.5.1 Normal operating conditions (interlock armed)

- Panel door can be opened with circuit-breaker open only
- If panel door is open it is not possible to close the circuit-breaker

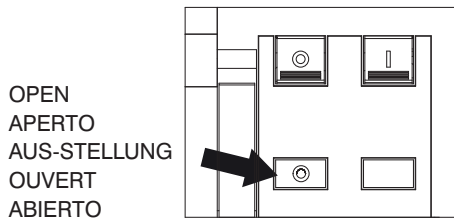


Fig. 9A

##### 4.5.2 Defeating the interlock for service operations



**WARNING: Defeating the interlock for service operations must be done only by trained qualified personnel. A safety indicator shows when the interlock is defeated.**



**WARNING: Defeating of the interlock for service operations must be done only with the panel door closed.**

a) With panel door closed, insert a pin (dia. 4mm. max.) in the panel door hole and press until it stops (see fig.9B).

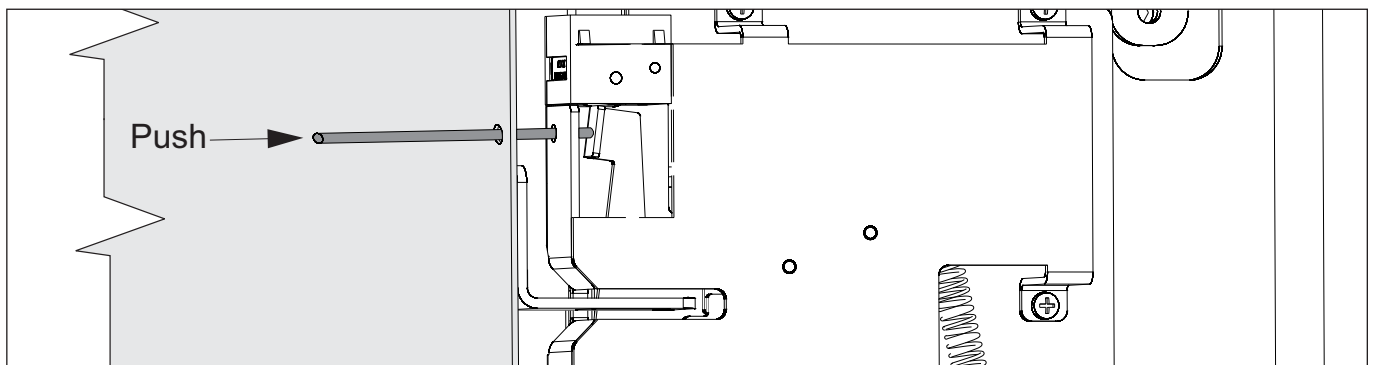


Fig. 9B

b) Open the door for half an inch keeping the pin pressed; then remove the pin and complete the door opening. The circuit-breaker remains close and the interlock is defeated (see fig.9C).

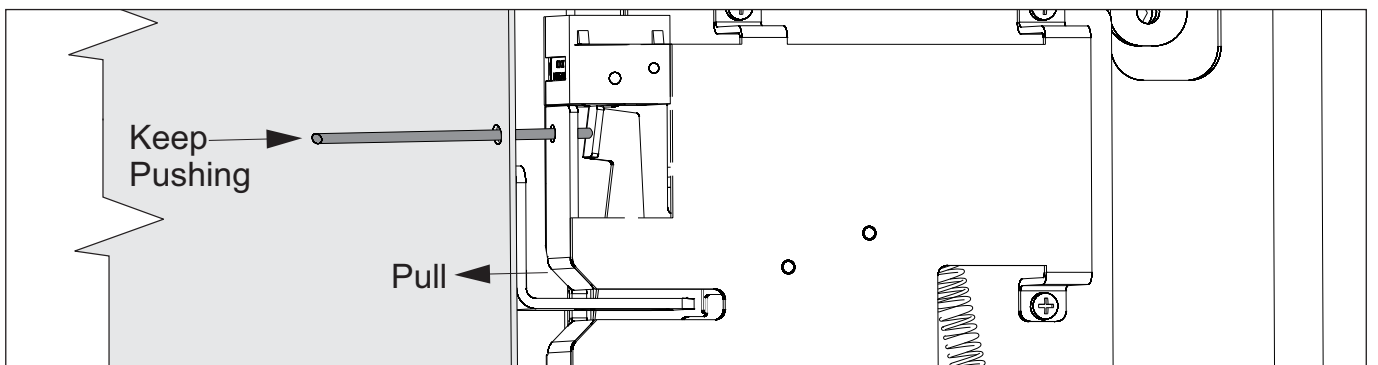


Fig. 9C



**WARNING: Upon release of door, an indicator on the Circuit breaker interlock will display a "Dangerous Condition" symbol.**



**WARNING:**  
 - Panel door can be opened with circuit-breaker closed.  
 - If panel door is open it is possible to open and re-close the circuit-breaker

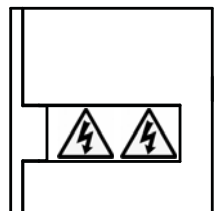


Fig. 9D

c) Interlock is automatically re-armed when panel door is re-closed.

##### 4.5.3 Coils support maintenance

If coils support should be removed or reassembled, see 8.3.6

## 5 Electrical connections

### 5.1 Power circuit connections

Use cables or insulated bars or perform specific type tests according to the reference standard of the specific installation.

#### 5.1.1 Shapes of the terminals

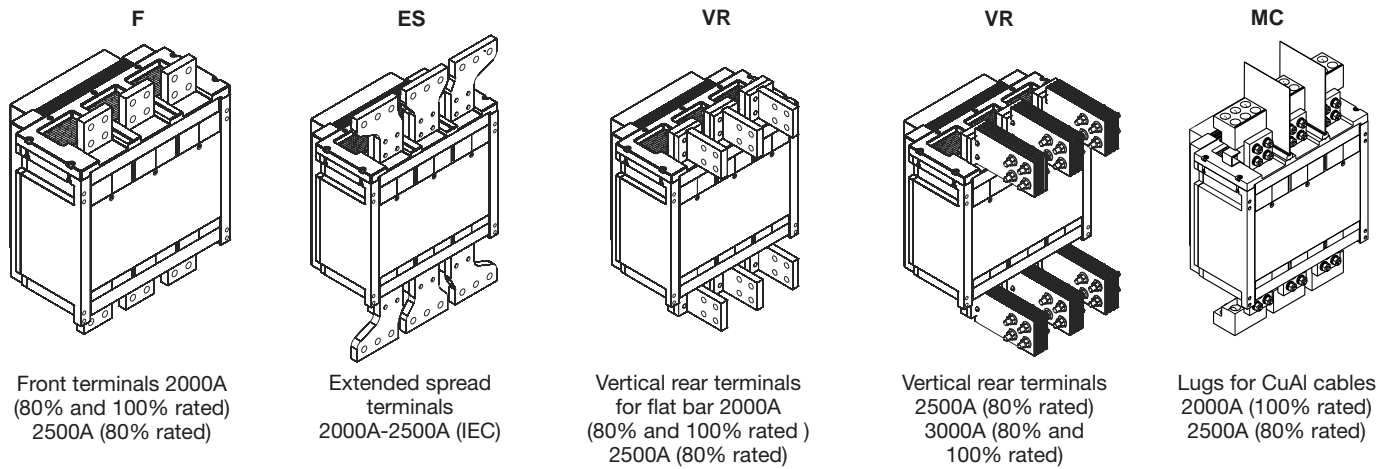


Fig. 10

#### 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 MCCB and the system bus

The following table illustrates the minimum dimensional cross section for busbar connection.

140G-R Frame Size	Qty. Required	Busbar Dimensions						Terminal Torque			Wrench size
		Width(A)	Thickness(B)	Terminal Holes (four) Diameter (C)	Hole Center (D)	Distance Between Terminal Holes (E)	Fastener	[lb-in.]	[Nm]		
Front Busbar											
2000 A	2	[in.] 4	0.25	0.59	0.79	1.57	Fasteners supplied by customer				
		[mm] 102	6.4	15	20	40					
2500 A, 80%	2	[in.] 4	0.25	0.59	0.79	1.57					
		[mm] 102	6.4	15	20	40					
Rear Busbar <sup>(1)</sup>											
2000 A	2	[in.] 4	0.25	0.59	4.5	1.57	Fasteners supplied by customer				
		[mm] 102	6.4	15	114	40					
2500 A, 80%	2	[in.] 4	0.25	0.59	4.5	1.57					
		[mm] 102	6.4	15	114	40					
2500 A, 100%	4	[in.] 4	0.25	0.512	3.87	1.75	M12 Stud	615	70	19 mm	
		[mm] 102	6.4	13	98	44.45					
3000 A, 80%	4	[in.] 4	0.25	0.512	3.87	1.75	M12 Stud	615	70	19 mm	
		[mm] 102	6.4	13	98	44.45					
3000A, 100%	4	[in.] 4	0.25	0.512	3.87	1.75	M12 Stud	615	70	19 mm	
		[mm] 102	6.4	13	98	44.45					

(1) Always use two wrenches (to avoid straining the insulating parts of the breaker), and apply the tightening torque of the terminals using high-strength fasteners. Check tightness after 24 hours.

Fig. 11

There are variables when using different dimensional sized busbar, and/or the number of busbars. It is requirement to maintain the minimum cross section as shown in the table and use the entire contact surface of the terminal. Vertical busbar for 2500A (100%) and 3000A (80...100%) are required to have .25 inch (6.4 mm) thickness for the inner (3) busbars.

### Positioning the first anchor plate of the busbars

Anchoring to the switchboard max dimensions

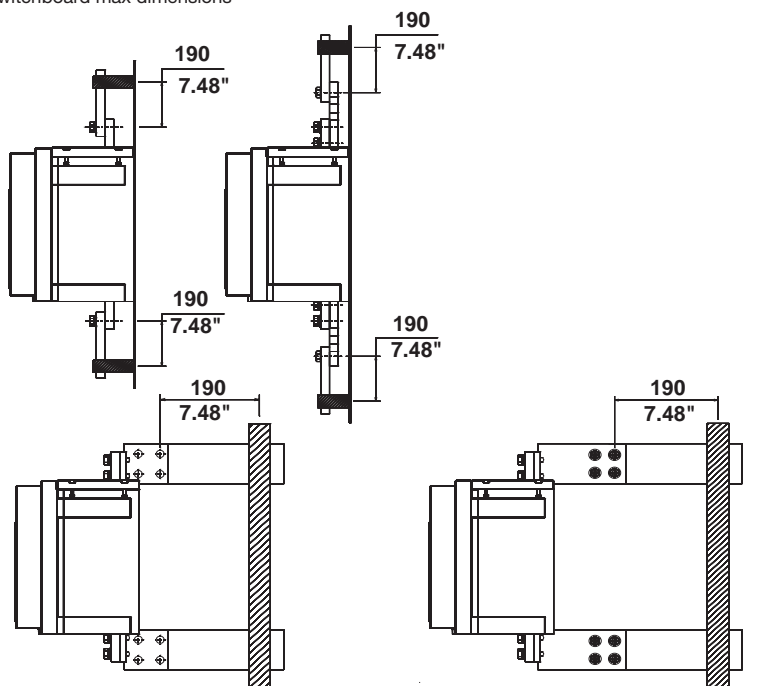


Fig. 12

### 5.1.3 Assembly procedures for the busbar connection

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 busbar connections do not exert strain on the terminals in any direction.

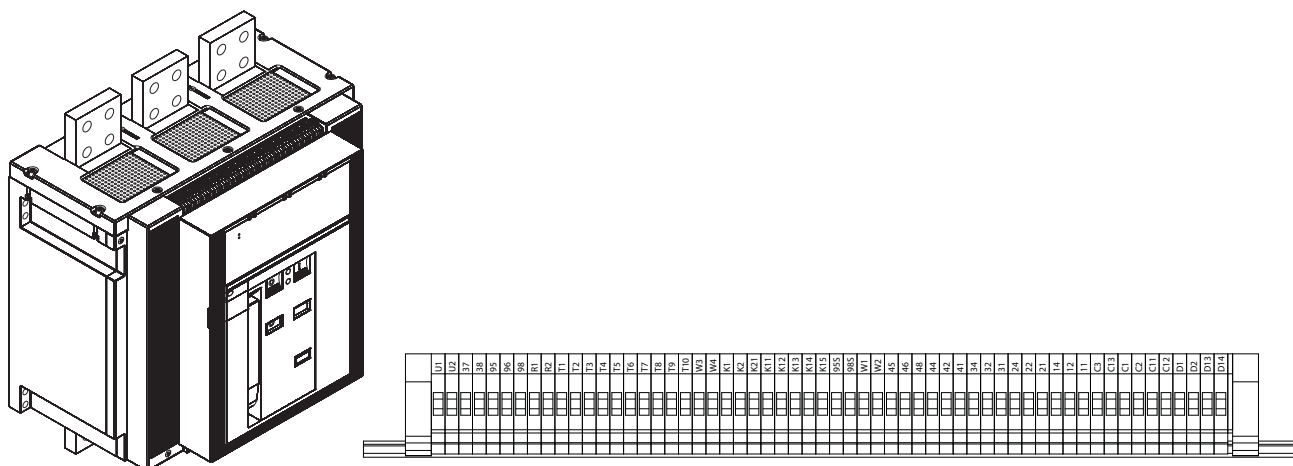
Always insert a large diameter flat washer and spring washer (to distribute the tightening pressure over the widest possible area).

Establish contact between the connection and terminal and fully tighten to the required torque.

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 Control circuit and field wiring

The field connection are made using screw terminals. Terminals are marked with identification codes as indicated in the electrical circuit diagram.



## 6 Commissioning the MCCB

### 6.1 General procedures

- Make sure that the power connections to the circuit breaker terminals are tight
- Make adjustments to the trip unit protection functions [LSIG].
- Make sure that voltage of the auxiliary circuits is between 85% and 110% of the rated voltage
- 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	<p>Perform a few opening, closing and release operations (see chap. 7.2).</p> <p><b>WARNING</b> When there is an undervoltage release, the circuit breaker can only be closed after the release itself has been electrically energized.</p>	The spring loading lever moves normally.
2 Spring charging motor (if provided)	<p>Operate the Charging motor at the rated voltage.</p> <p>Perform a few closing and opening operations.</p> <p>Note. Supply the undervoltage release at the rated voltage (if provided).</p>	<p>The springs are loaded normally. The signals are normal.</p> <p>The motor stops when the springs have been loaded.</p> <p>The motor reloads the springs after each closing operation.</p>
3 Undervoltage release (if provided)	<p>Supply the undervoltage release at the rated voltage and perform the circuit breaker closing operation.</p> <p>Turn off the voltage supply to the release. Supply the undervoltage release at the rated voltage and perform the circuit breaker closing operation.</p>	<p>The circuit breaker closes normally. The signals are normal.</p> <p>The circuit breaker opens. The signal changes over.</p>
4 Shunt opening release (if provided)	<p>Close the circuit breaker.</p> <p>Supply the shunt opening release at the rated voltage.</p>	The circuit breaker opens normally. The signals are normal.
5 Shunt closing release (if provided).	<p>Open the circuit breaker.</p> <p>Power the shunt closing release at the its rated voltage.</p>	The circuit breaker closes normally. The signals are normal.
6 Lock for circuit breaker in open position (key or padlock)	<p>Open the circuit breaker, turn the key and remove it. Attempt the circuit breaker closing operation.</p>	Both manual and electrical closing are prevented.
7 Auxiliary circuit breaker contacts	<p>Connect the auxiliary contacts to signalling circuits. Perform a few circuit breaker closing and opening operations.</p>	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 (purchase separately) Catalog No.140-G-R-MOC
- 8 Key lock on the closing operation (purchase separately) Kirk SD series cam lock PN-387658 available through Rockwell Automation Customer Care.

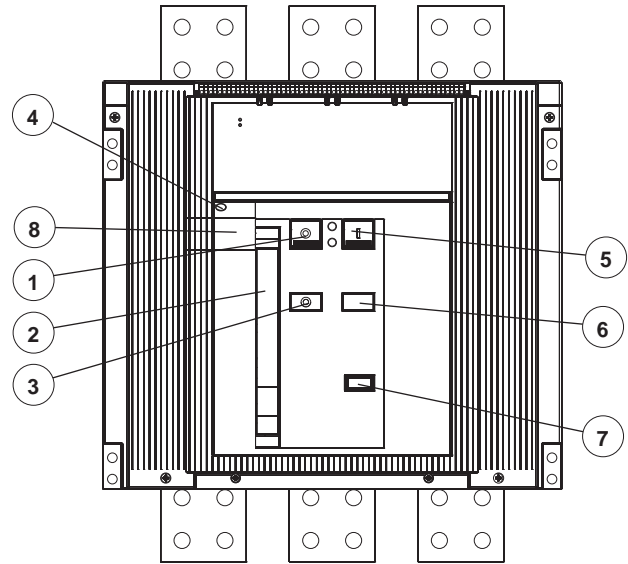


Fig.14

#### Note

A transparent plastic cover with IP54 (Purchase separately) can be flush mounted to the enclosure door. The cover is equipped with a key lock.

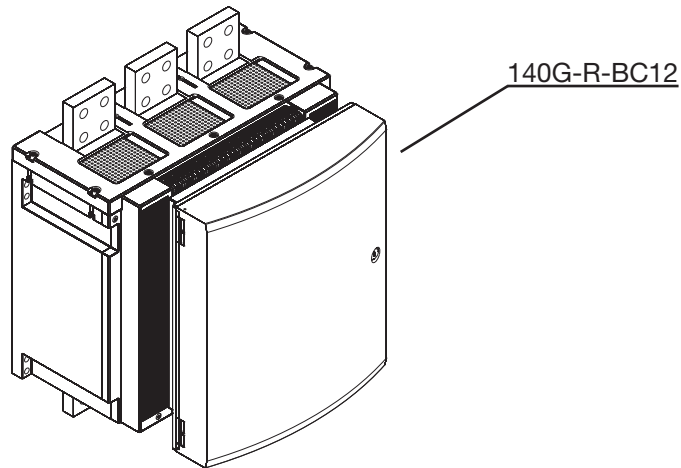


Fig. 15

### 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 color of the indicator (6) changes to YELLOW

#### b) Electrical operation for loading the closing springs

Electrical operation of the circuit breaker is possible when the following accessories are installed:

- charging motor for automatic loading of the closing springs
- shunt closing release
- shunt opening release.

The charging motor automatically reloads the springs after each closing operation until the yellow indicator appears (6, Fig. 16). If there is a power failure during the loading operation, the charging motor 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.

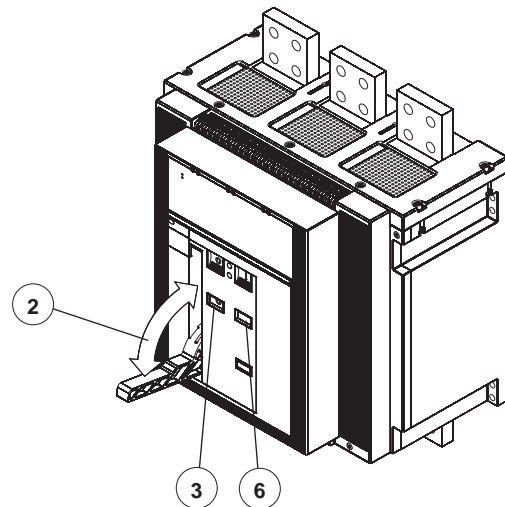


Fig. 16

### c) Circuit breaker closing

This operation can only be carried out when the closing springs are fully loaded.

Press the push-button (5, Fig. 17) 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 a separate 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 charging motor immediately begins the automatic spring loading operation.

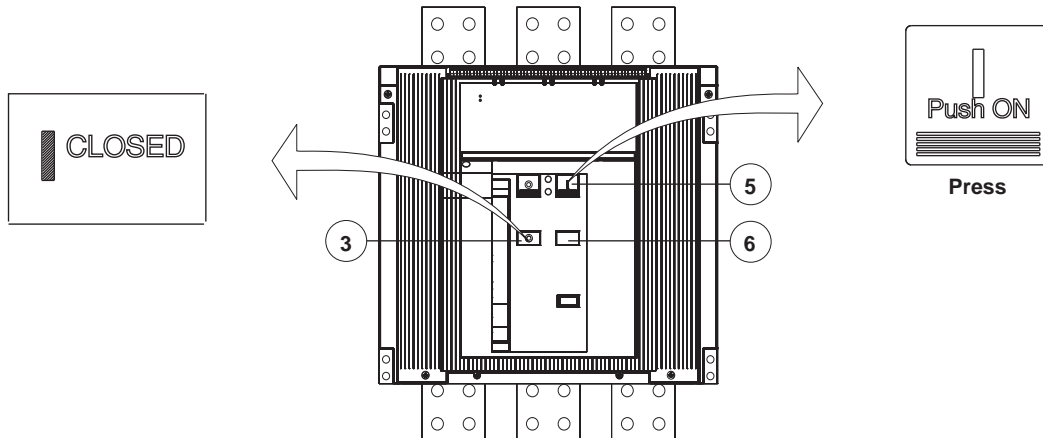


Fig. 17

### 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 a separate control circuit. The open state is signalled by the appearance of the letter “O” in the indicator (3, Fig. 18).

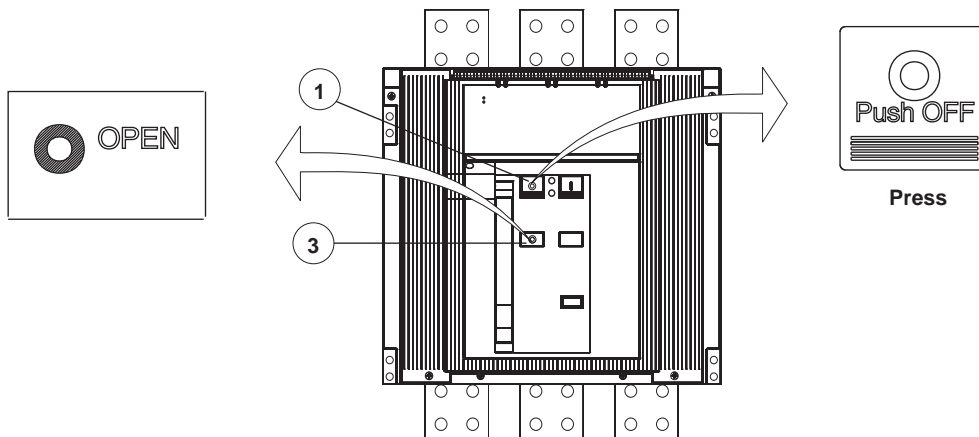


Fig. 18

## 8 Maintenance

### 8.1 Warnings



#### **WARNING RISK OF ELECTRICAL SHOCK**



#### **IMPORTANT NOTE: before performing any maintenance operation:**

- Turn circuit breaker to the OFF position. Make sure springs of the operating mechanism are discharged.
- Remove power from Power and Control terminals and visibly ground line side and load side terminals.

Rockwell Automation declines any responsibility for the injury of people or property damage resulting from the failure to comply with the instructions set out in this document.

Installation putting into service routine and emergency maintenance shall be performed by qualified personnel with detailed knowledge of this device.

### 8.2 Maintenance program

#### 8.2.1 Circuit breaker life

When regular maintenance is performed, 140G-R circuit breakers - with or without shunt opening or shunt closing devices - can withstand the following operating cycles without replacement of parts. <sup>(1)</sup>

Frame rated current [A]	Mechanical life <sup>(2)</sup>		Electrical life <sup>(2)</sup>	
	N° of operations x 1000	Frequency operations/hour	415 V ~ N° of operations x 1000	Frequency operations/hour
2000A	15	60	4.5	30
2500A	15	60	4	30
3000A	15	60	3	30

<sup>(1)</sup> Values reflect installation in accordance with the Installation Instructions.

<sup>(2)</sup> Extreme environmental conditions, pollutants and/or shock and vibrations can reduce the life of this product.

#### 8.2.2 Maintenance program

Carry out the following operations at least once a year in normal operation or otherwise every 6 months, and under all circumstances after tripping due to a short circuit.

- Circuit-breakers that are operated infrequently or that remain closed or open for long periods of time are subject to First Level maintenance.
- Installation of the mechanical operation counter (supplied separately) is recommended.
- Visually inspect from the outside for damage; remove any dust or dirt using clean dry rags.

Maintenance operations	Intervals	
	Installations in normal places	Installations in dusty or polluted places <sup>(1)(2)</sup> [ (1) = level of dust measured > 1 mg/m <sup>3</sup> ]
<b>First Level</b>	One year, or 20% of mechanical life, or 20% of electrical life	6 months, or 10% of mechanical life, or 10% of electrical life
<b>Second Level</b>	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

<sup>(1)</sup> Values reflect installation in accordance with the Installation Instructions.

<sup>(2)</sup> Extreme environmental conditions, pollutants and/or shock and vibrations can reduce the life of this product.

### 8.3 First Level maintenance operations

#### 8.3.1 Preliminary operations:

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



**WARNING: disconnect the power circuit and auxiliary circuits and ground 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 nameplate must be cleaned with a clean, dry cloth.
- Remove all traces of dust, mold, condensation and tarnish
- Make sure that there are no foreign bodies in the circuit breaker.

#### 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 color of the parts in contact. These parts are usually silvery in color.
- Make sure that the bolts of the terminal connections are tightened (M12 - 619.5 lb-in / 70 Nm).



**WARNING: disconnect the power circuit and auxiliary circuits and ground the terminals in a visible way on both the supply side and load side.**

- Make sure that the control circuit and field connection screws are well tightened in the terminal boxes (6.19 lb-in / 0.7 Nm).

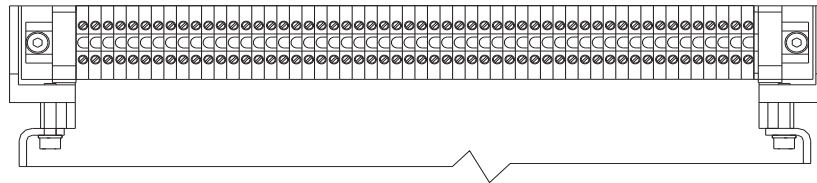


Fig. 19

#### 8.3.4 Circuit-breaker Cover and Side Guards disassembly

- Make sure the circuit-breaker has been disabled as described in sect. 8.1
- Open Clear Door (1) on the trip unit as shown in figure 19.
- Remove the Breaker Cover (2) by removing the four screws (3).
- Remove both the Side Guards (4) by removing the mounting screws (5).

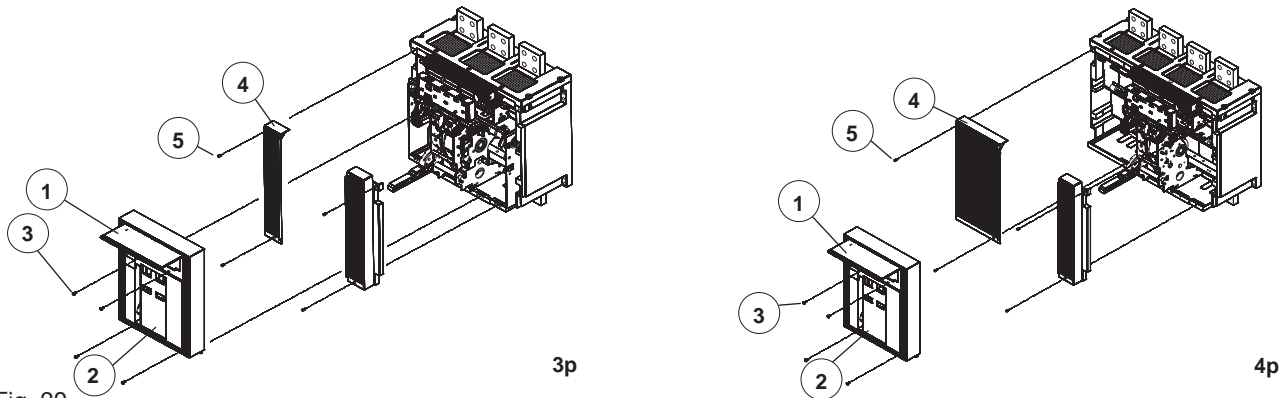


Fig. 20

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

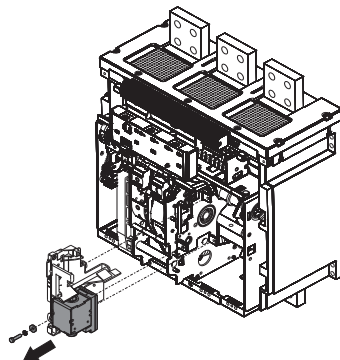


Fig. 21

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 22.
- Make sure that the opening and closing shafts are free to turn.

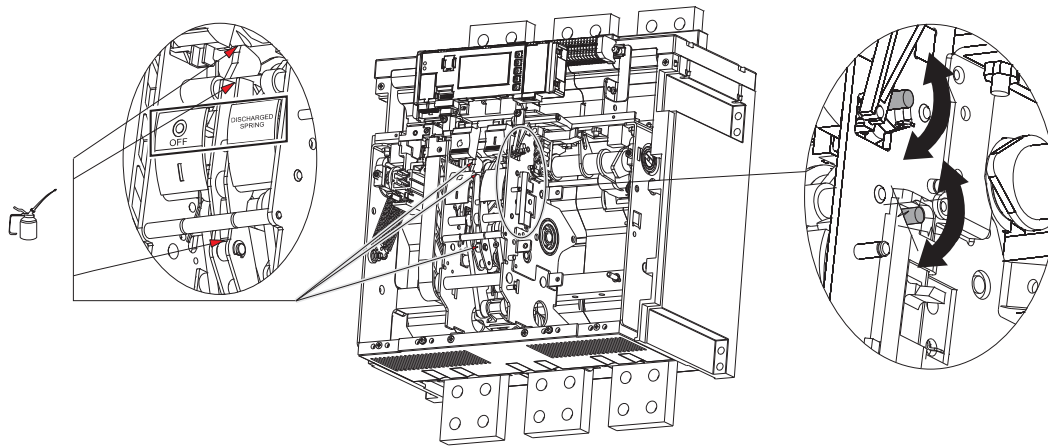


Fig. 22

8.3.6 Electrical and mechanical accessories

- Make sure that internal accessories (i.e. shunt, spring charging motor) are securely mounted in the circuit breaker.
- Make sure the control circuit and field connects terminals are tightened (6 lb-in / 0.7 Nm).
- Spring Charging Motor: After every 10,000 operations, inspect brushes for wear and replace the motor if necessary.
- Inspect internal accessories (i.e. Shunt trip, Shunt Close & UV relay) for absence of excessive wear, overheating and breakage, Fig. 23.
- Test the mechanical counter (by operating the circuit-breaker) for proper functionality.



**WARNING:** If the mechanical door interlock is present, before removing the coils support, defeat the interlock as indicated (see 4.5.2).

8.3.7 Trip Unit Operation

Power a trip unit with a battery accessory 140G-ELBU and verify proper functionality.

8.3.7.1 Test Menu

The Test menu provides various options for checking the trip unit and CB. Up to 5 options are available:

Name	Description
1. CB status	allows the user to view the CB state read by the trip unit
2. Auto Test	allows the display and led test to be performed
3. Trip Test	allows an opening command to be transmitted to the CB
4. MM Test module	allows output 95S/98S to be checked and the state of K14/K15

8.3.7.2 Autotest

When autotest is activated, the display and leds will perform a test procedure allowing the user to check the state of display and operation of the leds themselves. The procedure lasts several seconds and the sequence is as follows:

Phase	ALARM AND WARNING leds	Display
1	On and fixed	The words "ALLEN-BRADLEY" and message with the name of "LSIG-MM"
2	Off	Flashing backlighting (only if 24V DC supply is present)
3	Normal operation	Contrast from 100% (display dark) to 0% (display light), after which the words and logo reappear

The test result and assessment are at the user's discretion. Inform AB if faults occur (Leds fail to function, display areas that fail to function correctly)

8.3.7.3 Trip test

The state of CB opening can be checked by activating the trip test. The trip unit sends a command to the CT, which activates a CB opening mechanism. Opening of the circuit-breaker denotes a positive test result.



**ATTENTION:** To perform the trip test, there must be no current circulating and the CB must be closed (failing this, the Exception 6 error will appear).

#### 8.3.7.4 MM test

The test menu is available with the MM trip unit version. 2 possible option can be selected:

- Auto Test causes contacts 95s/98s to close for 1s.
  - Input allows the state of inputs K14/K15 to be verified: On for 15 VDC voltage values, Off for < 2 VDC voltage values.
- The verification and test setup are at the user's discretion and must comply with the maximum limits of the inputs and outputs.

#### 8.3.8 Maintenance Operations: Final Inspection

- Fit all the parts back in place and reconnect the auxiliary power supply (if requires).
- Re-assemble the circuit-breaker cover and side guards as shown in figure 25.

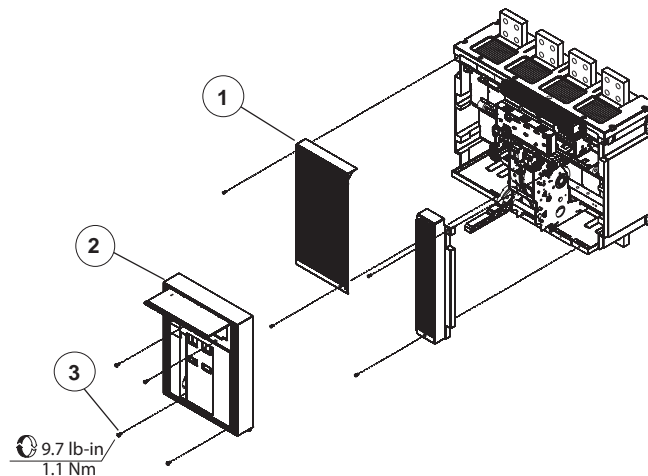


Fig. 25

Manual Operation (if applicable): Check the Circuit-breaker operation; perform the operations 10 times:

- Charge the Springs - refer to 7.2.a Manual Operation for loading the closing Spring
- Close the Circuit-breaker - refer to 7.2.b Circuit-breaker closing
- Open the Circuit-breaker - refer to 7.2.d Circuit-breaker opening
- Charge the Spring - repeating the operation.
- While sequencing the Circuit-breaker check to see that the Auxiliary contacts are functioning correctly.
- Open the Circuit-breaker - Inspect and test to determine that the padlock (or key) are functioning correctly, when installed.

Remote Operation (if applicable): Installed in the circuit-breaker will be (1) spring charging motor, (1) Shunt Trip Relay and (1) Shunt Close Relay to perform the operations of opening and closing the circuit-breaker. Using local or remote functions from the control circuit, perform the operations 10 times:

- Charge the spring Motor - refer to 7.2.b Electrical operation for loading the closing springs.
- Close the Circuit-breaker - Using local or remote signal, energize Shunt Close Relay. Refer to 7.2.c Circuit-breaker closing.
- Open the Circuit-breaker - Using local or remote signal, energize Shunt Open Relay. Refer to 7.2.d Circuit-breaker opening.
- Repeating the operation - the spring charging motor should be continuously charging as the circuit-breaker is cycled ON-OFF.
- While sequencing the Circuit-breaker check to see that Auxiliary contacts are functioning correctly.
- Open the Circuit-breaker - Inspect and test to determine that the padlock (or key) are functioning correctly, when installed.

## 8.4 Second Level maintenance operations

### 8.4.1 Warnings:



#### WARNING RISK OF ELECTRICAL SHOCK



#### IMPORTANT NOTE: before performing any maintenance operation:

- Turn circuit breaker to the OFF position. Make sure springs of the operating mechanism are discharged.
- Remove power from Power and Control terminals and visibly ground line side and load side terminals.

Rockwell Automation declines any responsibility for the injury of people or property damage resulting from the failure to comply with the instructions set out in this document.

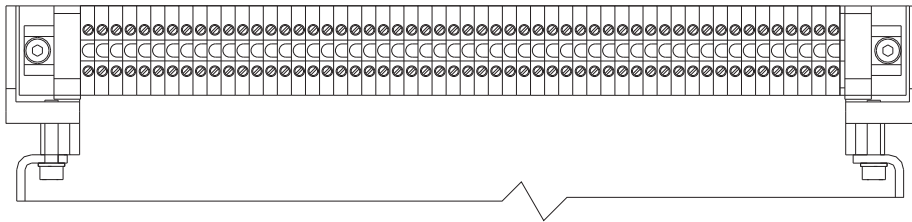
Installation putting into service routine and emergency maintenance shall be performed by qualified personnel with detailed knowledge of this device.

### 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 nameplate can be cleaned with a clean, dry cloth.
- Remove all traces of dust, mold, condensation and tarnish
- Inspect for traces of overheating or cracks, which could create conductive paths across isolating devices.
- Inspect for and remove any foreign bodies inside of the breaker assembly.
- Inspect and check the torque on the eight mounting bolts attaching the circuit-breaker to the panel (M8 - 221 lb-in / 25 Nm).

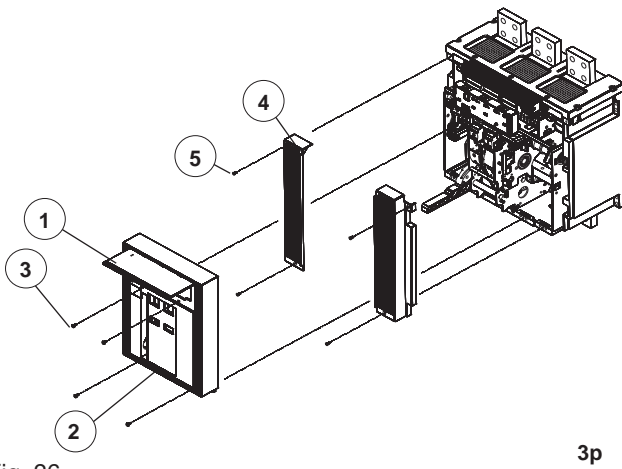
### 8.4.3 Circuit breaker connections and connections between circuit breaker and switchboard

- 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 color of the parts in contact. These parts are usually silvery in color.
- Make sure that the bolts of the terminal connections are tightened (M12 - 619.5 lb-in / 70 Nm).
- Make sure that the control circuit and field connection screws are tightened in the terminal boxes (6.19 lb-in / 0.7 Nm).

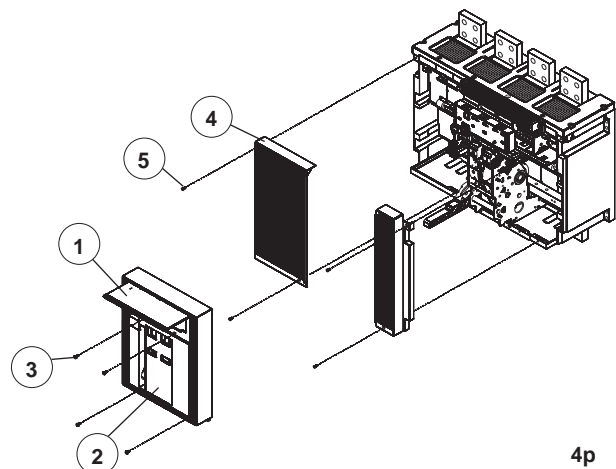


### 8.4.4 Circuit-breaker Cover and Side Guards disassembly

- Make sure the circuit-breaker has been disabled, as described in sec. 8.4.1
- Open the Clear Door (1) on the Trip Unit as shown in figure 26.
- Remove the Breaker Cover (2) by removing the four screws (3).
- Remove both the Side Guards (4) by removing the mounting screws (5).



3p



4p

Fig. 26

- 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.

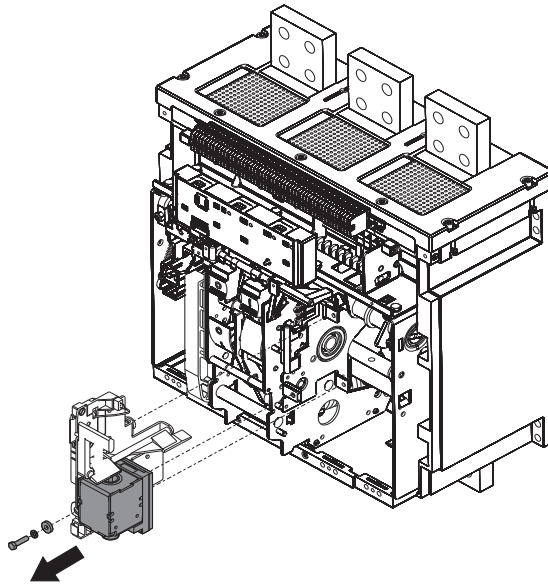


Fig. 27

#### 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 28, det. A, as per the First Level) the shafts and opening closing latches.
- 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 28, det. B).
- Make sure that the opening and closing shafts are free to turn.

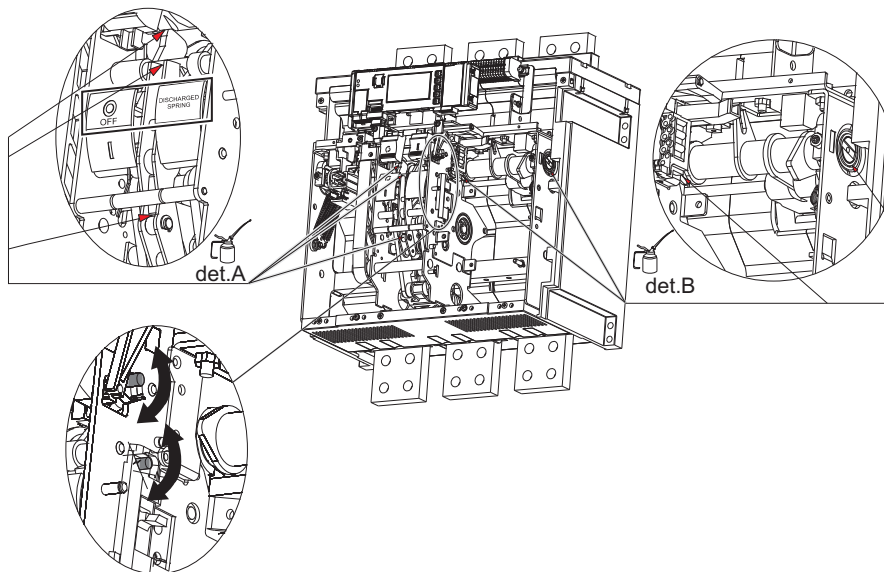


Fig. 28

- If the springs are deformed or tarnished, if rings are missing or if the control is excessively worn, the MCCB should be replaced.

#### 8.4.6 Electrical and mechanical accessories

- Make sure that internal accessories (i.e. shunt, spring charging motor) are securely mounted in the circuit breaker.
- Make sure the control circuit and field connects terminals are tightened (6 lb-in / 0.7 Nm).
- Spring Charging Motor: After every 10,000 operations, inspect brushes for wear and replace the motor if necessary.
- Inspect internal accessories (i.e. Shunt trip, Shunt Close & UV relay) for absence of excessive wear, overheating and breakage, Fig. 29.
- Test the mechanical counter (by operating the circuit-breaker) for proper functionality.



**WARNING:** in case of trip coil set substitution refer to par. 4.5.2

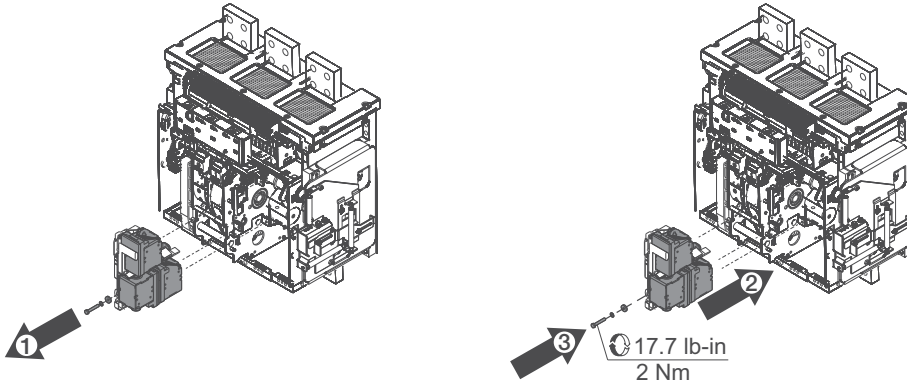


Fig. 29

#### 8.4.7 Trip Unit Operation

Power a trip unit with a battery accessory 140G-ELBU and verify proper functionality.

##### 8.4.7.1 Test Menu

The Test menu provides various options for checking the trip unit and CB. Up to 5 options are available:

Name	Description
1. CB status	allows the user to view the CB state read by the trip unit
2. Auto Test	allows the display and led test to be performed
3. Trip Test	allows an opening command to be transmitted to the CB
4. MM Test module	allows output 95S/98S to be checked and the state of K14/K15

##### 8.4.7.2 Autotest

When autotest is activated, the display and leds will perform a test procedure allowing the user to check the state of display and operation of the leds themselves.

The procedure lasts several seconds and the sequence is as follows:

Phase	ALARM AND WARNING leds	Display
1	On and fixed	The words "ALLEN-BRADLEY" and message with the name of "LSIG-MM"
2	Off	Flashing backlighting (only if 24V DC supply is present)
3	Normal operation	Contrast from 100% (display dark) to 0% (display light), after which the words and logo reappear

The test result and assessment are at the user's discretion. Inform AB if faults occur (Leds fail to function, display areas that fail to function correctly)

##### 8.4.7.3 Trip test

The state of CB opening can be checked by activating the trip test.

The trip unit sends a command to the CT, which activates a CB opening mechanism. Opening of the circuit-breaker denotes a positive test result.



**ATTENTION:** To perform the trip test, there must be no current circulating and the CB must be closed (failing this, the Exception 6 error will appear).

##### 8.4.7.4 MM test

The test menu is available with the MM trip unit version. 2 possible options can be selected:

- Auto Test causes contacts 95s/98s to close for 1s.
  - Input allows the state of inputs K14/K15 to be verified: On for 15 VDC voltage values, Off for < 2 VDC voltage values.
- The verification and test setup are at the user's discretion and must comply with the maximum limits of the inputs and outputs.

#### 8.4.8 Maintenance operations; final inspections

- Fit all the parts back in place and re-connect the auxiliary power supply if necessary.
- Re-assemble the circuit-breaker cover and side guards as shown in figure 30.

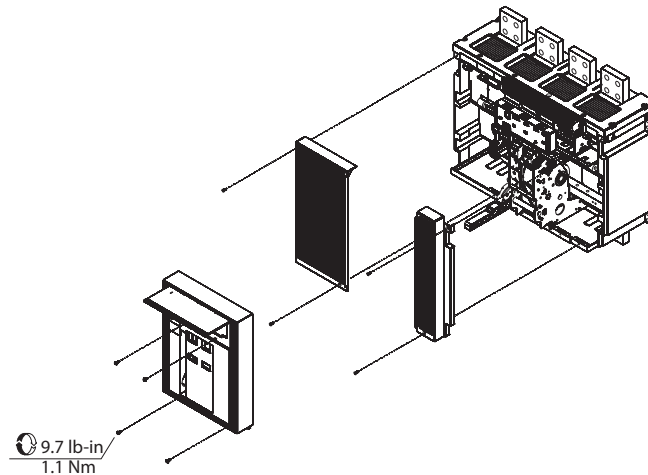


Fig. 23

Manual Operation (if applicable): Check the circuit-breaker operation; perform the operations 10 times:

- Charge the Springs - refer to 7.2.a Manual Operation for loading the closing Spring
- Close the Circuit-breaker - refer to 7.2.b Circuit-breaker closing
- Open the Circuit-breaker - refer to 7.2.d Circuit-breaker opening
- Charge the Spring - repeating the operation.
- While sequencing the Circuit-breaker check to see that the Auxiliary contacts are functioning correctly.
- Open the Circuit-breaker - Inspect and test to determine that the padlock (or key) are functioning correctly, when installed.

Remote Operation (if applicable): Installed in the circuit-breaker will be (1) spring charging motor, (1) Shunt Trip Relay and (1) Shunt Close Relay to perform the operations of opening and closing the circuit-breaker. Using local or remote functions from the control circuit, perform the operations 10 times:

- Charge the spring Motor - refer to 7.2.b Electrical operation for loading the closing springs.
- Close the Circuit-breaker - Using local or remote signal, energize Shunt Close Relay. Refer to 7.2.c Circuit-breaker closing.
- Open the Circuit-breaker - Using local or remote signal, energize Shunt Open Relay. Refer to 7.2.d Circuit-breaker opening.
- Repeating the operation - the spring charging motor should be continuously charging as the circuit-breaker is cycled ON-OFF.
- While sequencing the Circuit-breaker check to see that Auxiliary contacts are functioning correctly.
- Open the Circuit-breaker - Inspect and test to determine that the padlock (or key) are functioning correctly, when installed.



## 10 Accessories

### 10.1 Electrical accessories

#### Shunt Trip / Shunt Close (SNT/SNC)

A shunt Trip Relay is typically used to remote (electrically) open the circuit-breaker. Used in conjunction with a spring charging motor and the Shunt Close Relay the circuit-breaker can be operated with remote control.

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).

(\*) 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 signal to the shunt closing release.

Reference figure in the electrical circuit diagrams: SNT (4) - SNC (2)

Operating voltage [Un]	24 V DC	Operating limits (Standard IEC 60947-2)	(SNT) : 70...110% Un	
	60 V AC/DC		(SNC) : 85...110% Un	
	110-120 V AC/DC		Inrush power consumption (Ps)	DC = 200 W
	220-240 V AC/DC		Inrush power time ~100 ms	AC = 200 VA
	380-400 V AC		Continuous power (Pc)	DC = 5 W
				AC = 5 VA
		Opening time (SNT)	(max) 60 ms	
		Closing time (SNC)	(max) 80 ms	
		Insulation voltage	2500V 50 Hz (for 1 min.)	

#### Undervoltage Relay (UVR)

The undervoltage relay is energized with the presence of supply power. The relay will de-energize when supply power drops below 70%. It can be used to remote trip the circuit-breaker (by means of normally closed pushbutton).

Operating voltage [Un]	24 V DC
	60 V AC/DC
	110-120 V AC/DC
	220-240 V AC/DC
	380-400 V AC
	440 V AC

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.

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

Inrush power consumption (Ps):	DC = 200 W
	AC = 200 VA
Continuous power (Pc):	DC = 5 W
	AC = 5 VA
Opening time (UVR):	30 ms
Insulation voltage	2500V 50/60 Hz (per 1 min.)

## Spring Charging Motor 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 spring charging motor immediately begins to reload the closing springs.

The closing springs can still be charged in the manual mode (using the lever operating mechanism) in a power failure or during maintenance work.

Operating voltage	24-30 V AC/DC	Inrush power consumption (Ps):	DC = 500 W
	48-60 V AC/DC		AC = 500 VA
	100-130 V AC/DC	Rated power (Pn):	DC = 200 W
	220-250 V AC/DC		AC = 200 VA
Operating limits:	85...110% Un (Standard CEI EN 60947-2)	Inrush time	0.2 s
Insulation voltage:	2500 V 50/60 Hz (for 1 min.)	Loading time:	4-5 s

Spring Charging Motor is always supplied with limit contacts and microswitch for signalling closing springs loaded.

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

### Auxiliary contacts

The circuit-breaker is supplied with (1) AX1 24 DC gold plated contact and (3) AX2-AX3-AX4 250 AC/DC, microswitch Form C contacts. The contacts change state based on the opening and closing of the circuit-breaker.

Auxiliary Contact		Power Supply Voltage	Service Current (A)	
			AC	DC
AX 1	24 DC	24 V	-	≥ 0.75 mA
		5 V	-	≥ 1 mA
AX2 AX3 AX4	250 AC/DC	250 V	5 A	0.15 A
		125 V	6 A	0.3 A

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 have following configuration: 4 break/make contacts (4 change-over position contacts)

Reference figure in the electrical circuit diagrams: AX/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 charging motor.

Reference figure in the electrical circuit diagrams: S33 M/2 (11)

### Sensors 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

## 10.2 Mechanical locks

### Lock in open position

The circuit breaker can be locked in open position by means of a padlocks up to 3 padlocks (not supplied): Ø 4 mm.

### Mechanical Door Interlock (provided on some models)

This device stops the enclosure door from being opened when the circuit breaker is closed and prevents the circuit breaker from being closed when compartment door is open.

### IP54 door protection

This is provided by means of a transparent plastic door 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.

## 11 Trip Unit References

The 140G-R circuit breaker is supplied with a LSIG-MM Trip Unit.

Details about the operation of the trip unit are given in the following documents:

140G-IN067      Operating instructions for the protection releases of 140G-N, 140G-NS and 140G-R circuit breakers  
140G-IN068      LSIG Getting started

### 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.

If 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.

#### **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.**

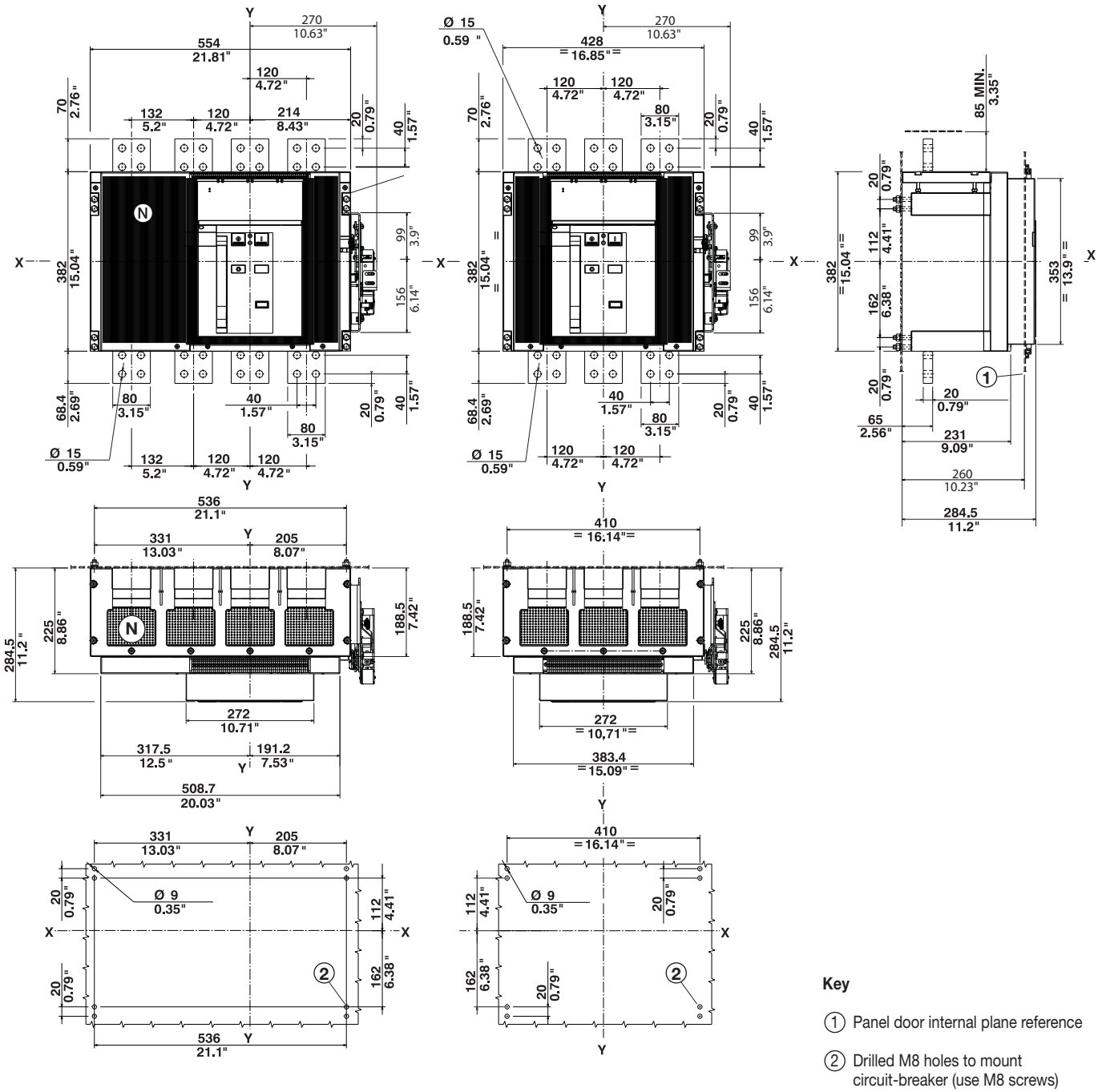
#### 11.1.1 Notes for dielectric strength tests



**Do Not to perform dielectric strength tests on the inputs and outputs of the trip unit.**

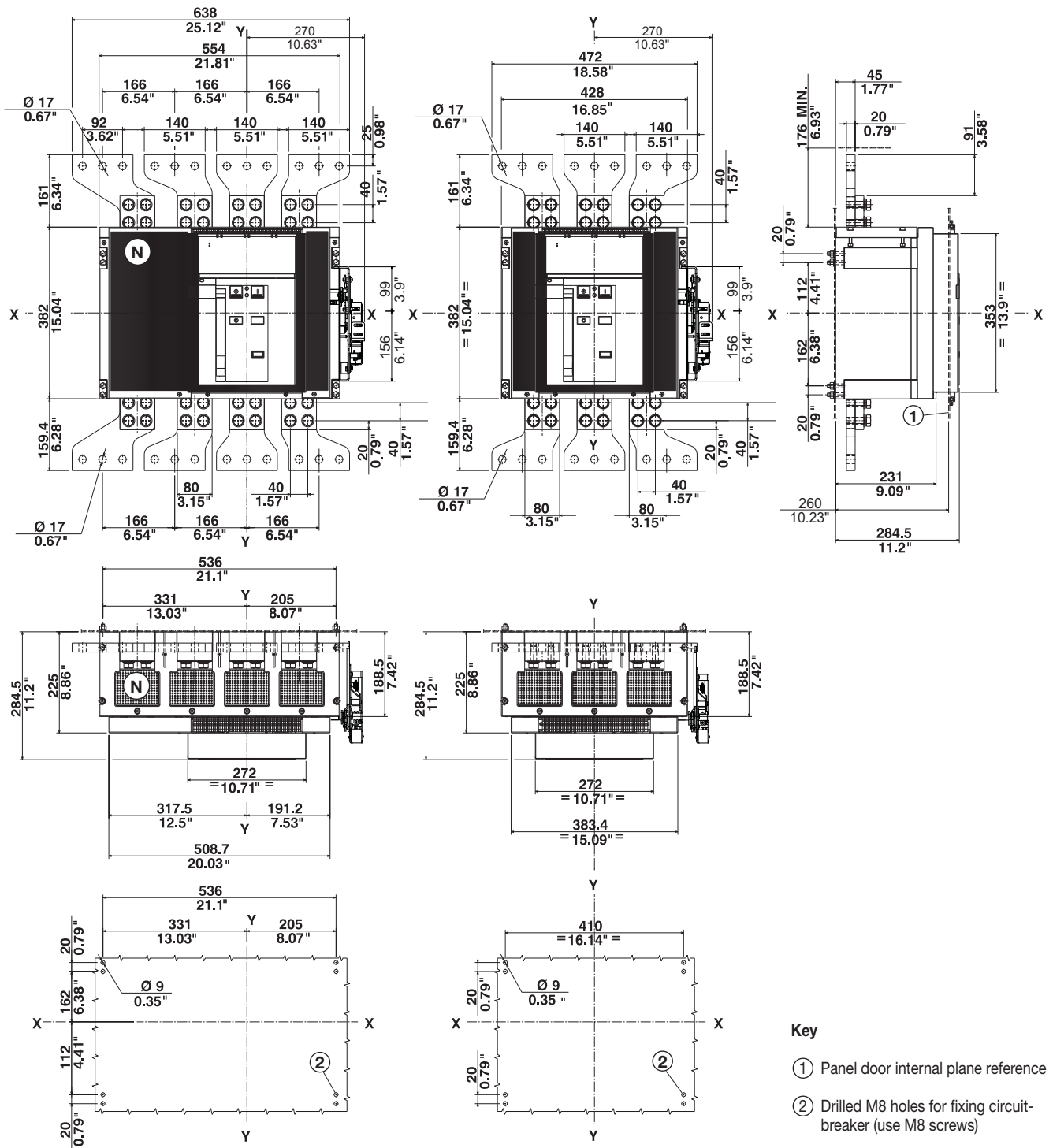
## 12 Overall dimensions

Version with front terminals 2000A (80% and 100% rated)/2500A (80% rated)



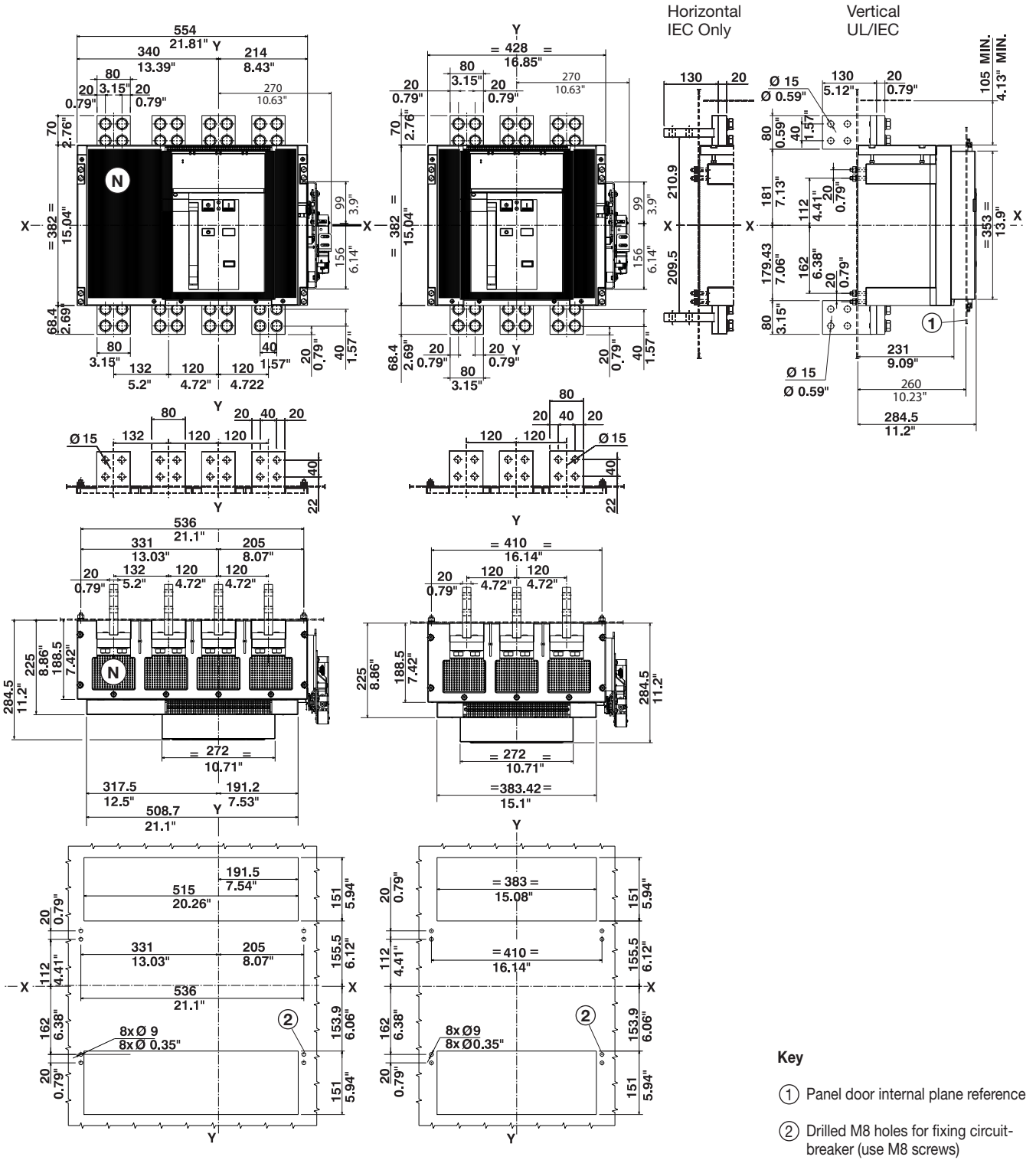
Refer to figure 38 for door interlock hook mounting dimensions.

Fig. 31



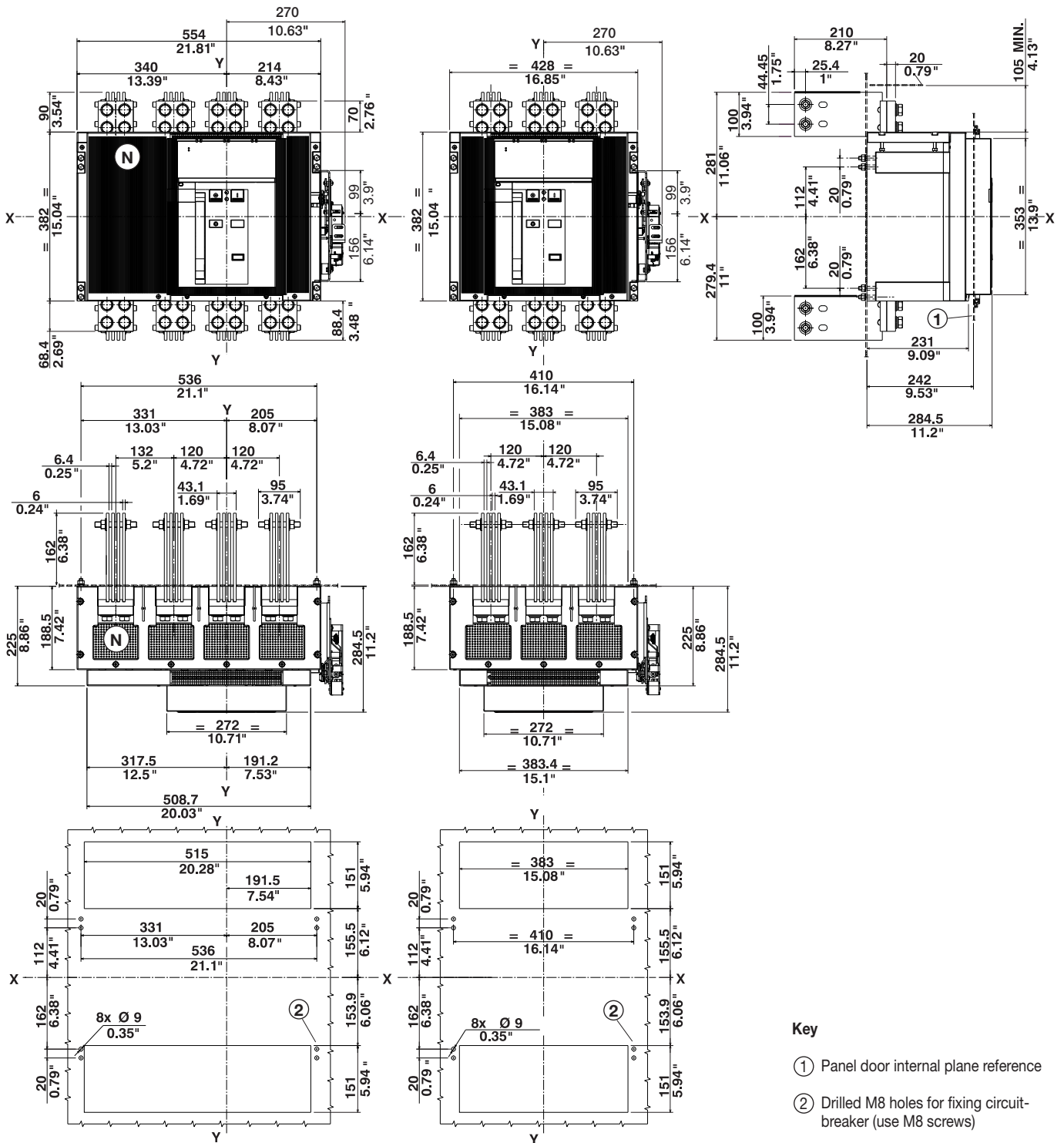
Refer to figure 38 for door interlock hook mounting dimensions.

Fig. 32



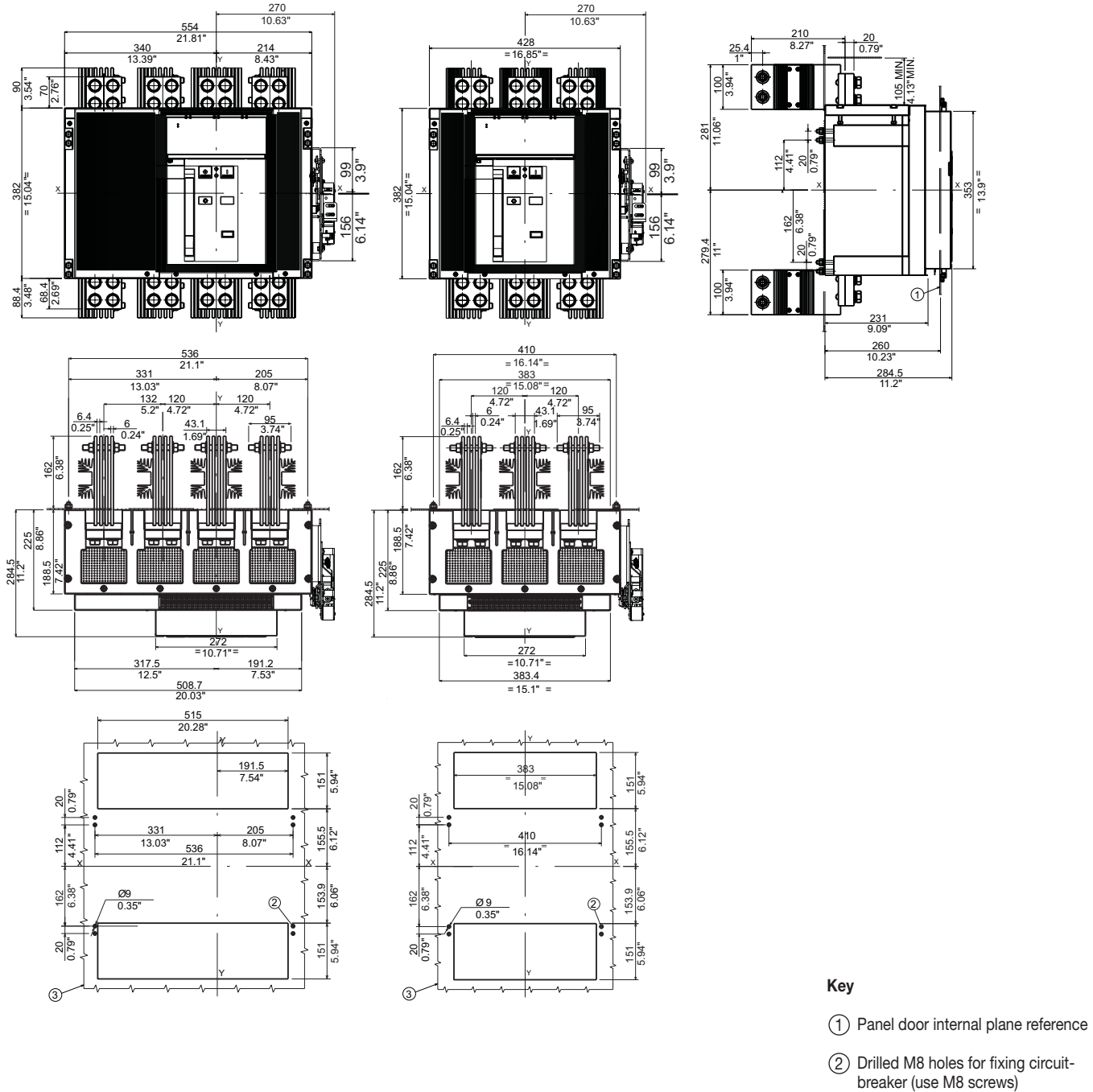
Refer to figure 38 for door interlock hook mounting dimensions.

Fig. 33



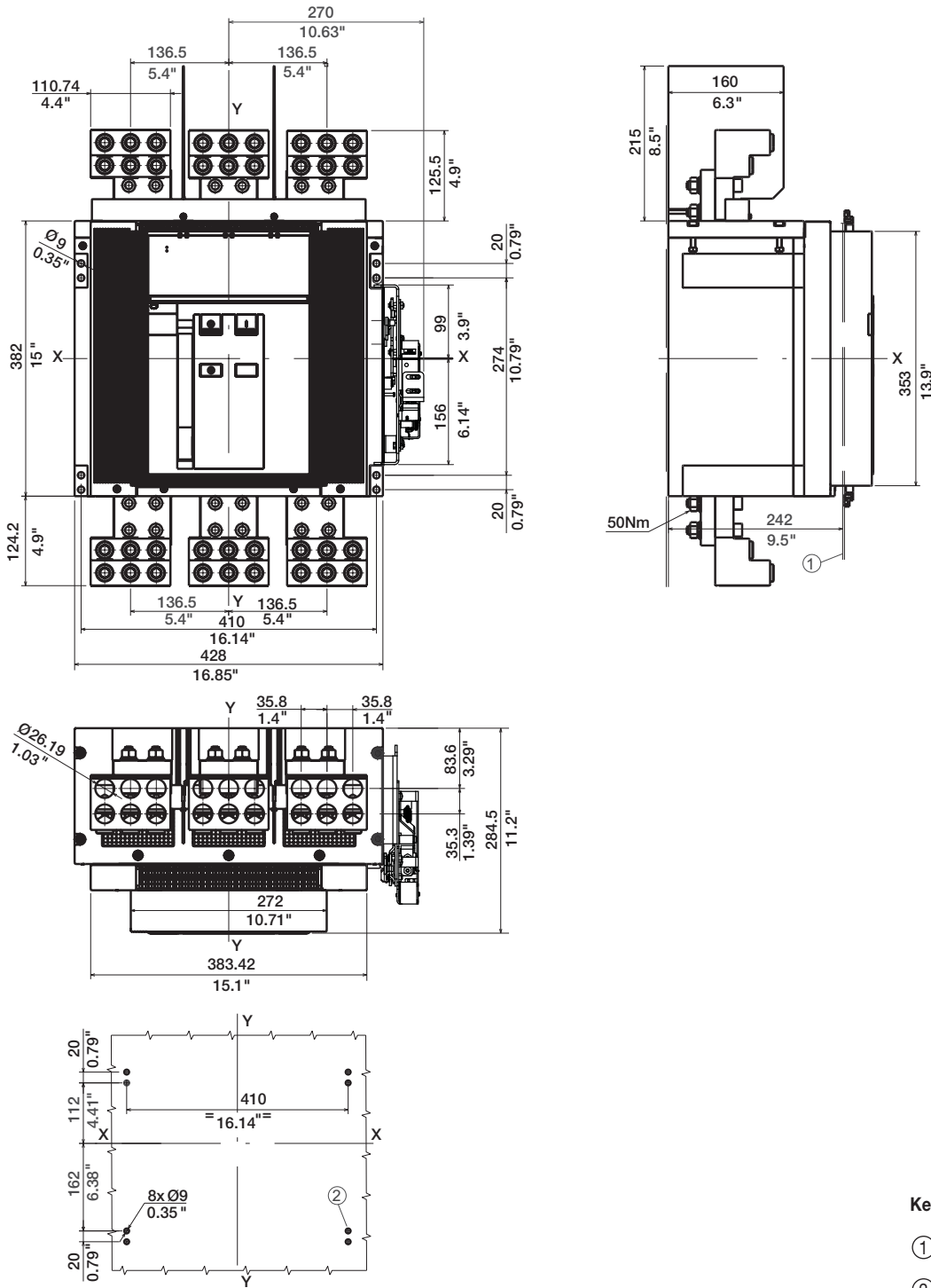
Refer to figure 38 for door interlock hook mounting dimensions.

Fig. 34



Refer to figure 38 for door interlock hook mounting dimensions.

Fig. 35



Refer to figure 38 for door interlock hook mounting dimensions.

Fig. 36



## 13 Circuit diagrams

### WARNING:

Carefully read note F 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 figure 42 cannot be provided with this version.

### KEY

□	=	Figure number of the diagram
*	=	See note indicated by the letter
K51	=	LSIG-MM electronic release with the following protection functions: <ul style="list-style-type: none"><li>- L overload protection with inverse long-time delay trip setting I1</li><li>- S short-circuit protection with inverse or definite short time-delay trip setting I2</li><li>- I short-circuit protection with instantaneous time-delay trip-setting I3</li><li>- G earth fault protection with inverse short time-delay trip-setting I4</li></ul>
M	=	Motor for loading the closing springs
Q	=	Circuit-breaker
AX/1...5	=	Auxiliary contacts of the circuit-breaker
SC	=	Pushbutton or contact for closing the circuit-breaker
SO	=	Pushbutton or contact for opening the circuit-breaker
SO2	=	Pushbutton or contact for opening the circuit-breaker with instantaneous trip
TI/L1	=	Current transformer located on phase L1
TI/L2	=	Current transformer located on phase L2
TI/L3	=	Current transformer located on phase L3
TU	=	Isolation voltage transformer (see note O)
Uaux.	=	Auxiliary power supply voltage (see note F)
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
W2	=	Serial interface with the accessories of releases LSIG-MM (internal bus)
X1...X7	=	Connectors for the circuit-breaker applications
XK1	=	Connector for the power circuits of releases LSIG-MM.
XO	=	Connector for YO1 release
XR3...XR13	=	Connectors for the auxiliary circuits of releases LSIG-MM.
XV	=	Delivery terminal box for the auxiliary circuits of the circuit-breaker
SNC	=	Shunt closing release
SNT	=	Shunt opening release
EL SNT	=	Overcurrent shunt opening release (trip coil)
UVR	=	Undervoltage release (see notes B and Q)
OUT MM	=	Contact providing MM protection status (Active / Not Active)

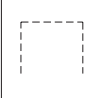
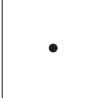
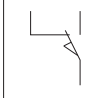
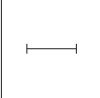
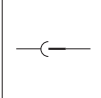
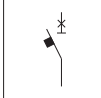

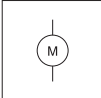
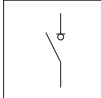

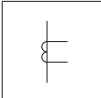
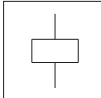
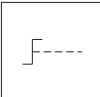
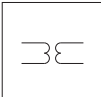
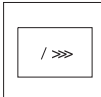
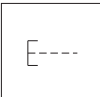
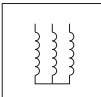
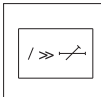
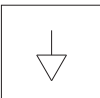
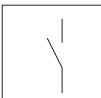
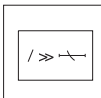
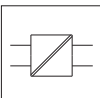
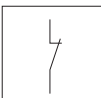
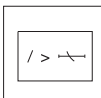
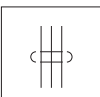
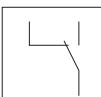
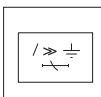
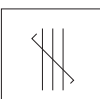
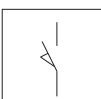
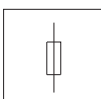
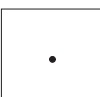
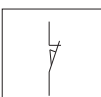
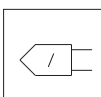
### DESCRIPTION OF FIGURES

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.11	=	Contact for electrical signalling of springs loaded.
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.22	=	Auxiliary contacts of the circuit-breaker
Fig.42	=	Auxiliary circuits of the LSIG-MM release (see note F).

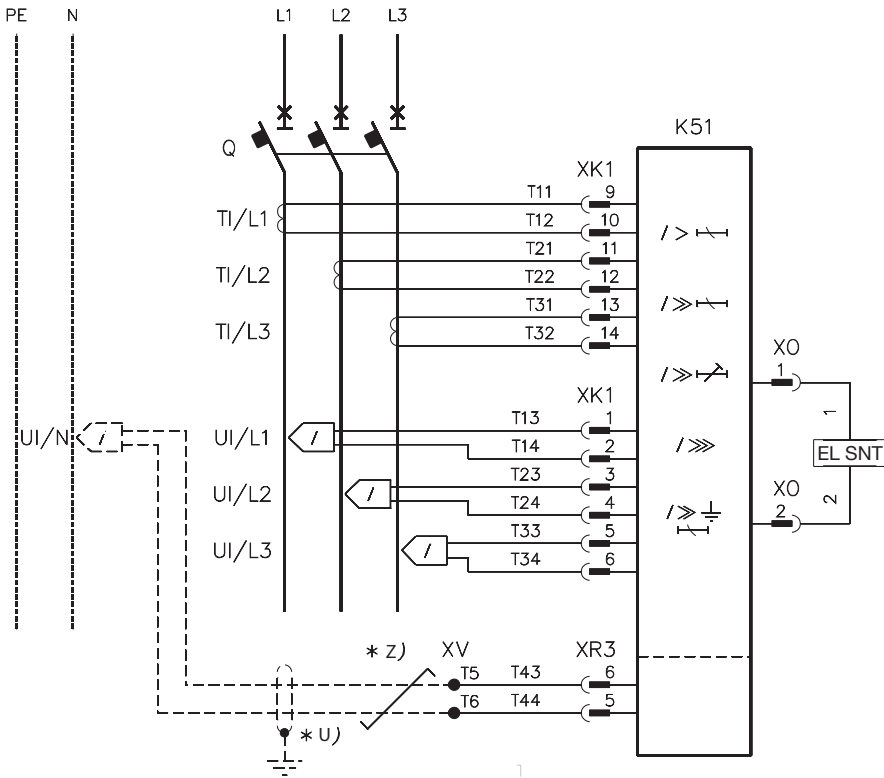
### NOTES

- 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.
- F) The auxiliary voltage Vaux allows all the functions of LSIG-MM 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 60950) 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.
- Q) The second shunt opening release may be installed as an alternative to the undervoltage release.
- 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.
- Z) Short-circuit T5 and T6 if the outside neutral current sensor (UI/N) is not connected.

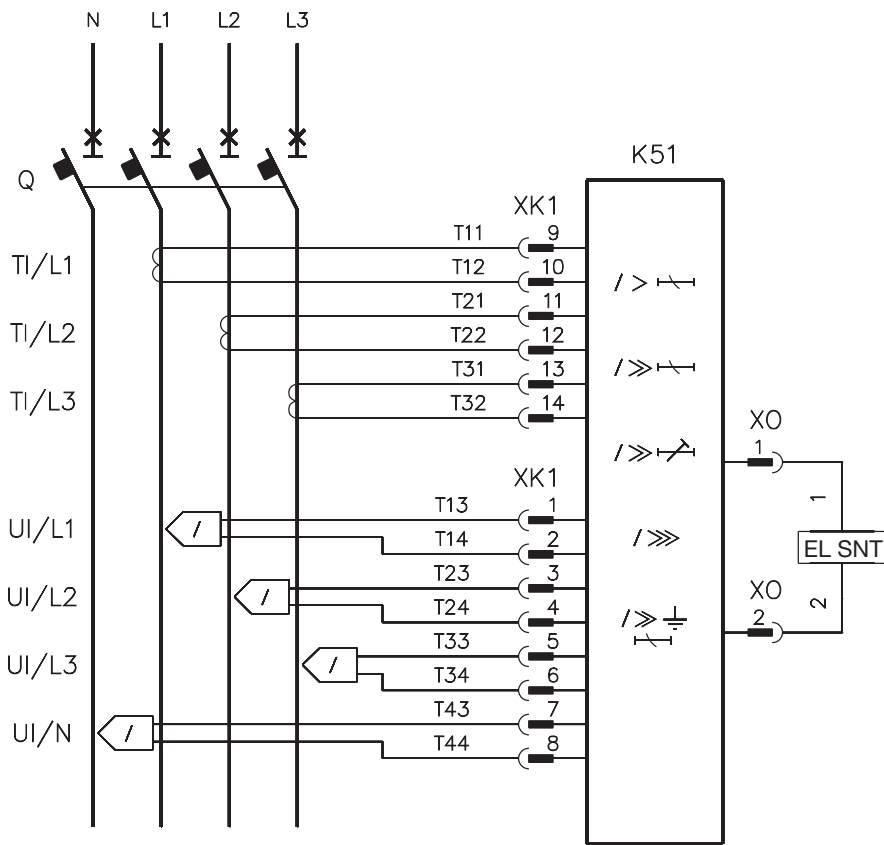
**Circuit diagram symbols (Standards IEC 60617 and CEI 3-14...3-26)**

	Shield (may be drawn in any shape)		Terminal or clamp		Change-over position contact with momentary circuit breaking (limit contact)
	Time delay		Socket and plug (female and male)		Power isolator with automatic opening action
	Mechanical or electrical connection		Motor (general symbol)		Switch-disconnector
	Manual mechanical control (general case)		Current transformer		Control coil (general symbol)
	Rotating control		Voltage transformer		Instantaneous overcurrent relay
	Pushbutton control		Winding of three-phase transformer, star connection		Overcurrent relay with adjustable short time-delay trip
	Equipotentiality		Make contact		Overcurrent relay with inverse short time-delay trip
	Galvanically separated converter		Break contact with automatic breaking		Overcurrent relay with inverse long time-delay trip
	Shielded cable conductors (e.g. three conductors)		Change-over contact		Overcurrent relay for earth fault with inverse short time-delay
	Conductors or stranded cables (e.g. 3 conductors)		Make position contact (limit contact)		Fuse (general symbol)
	Conductor connections		Break position contact (limit contact)		Current sensor

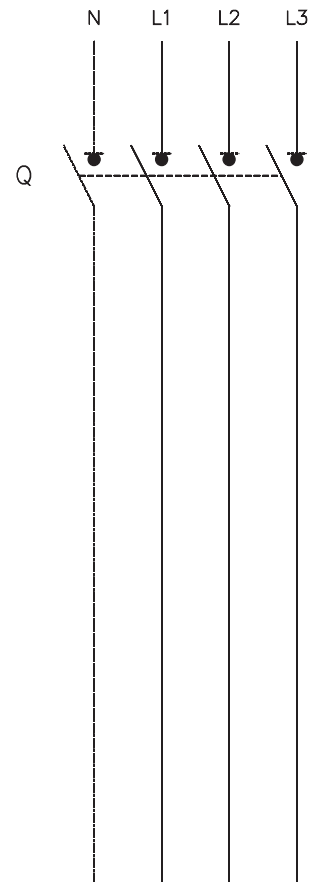
Circuit diagram - Operating state



Three-pole circuit-breaker with LSIG-MM electronic release



Four-pole circuit-breaker with LSIG-MM electronic release



Three-pole or four-pole switch disconnector



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