Low voltage electrical distribution

Compact NSX 100-630 A

Circuit breakers and switch-disconnectors

User manual

04/2010

Schneider Electric

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

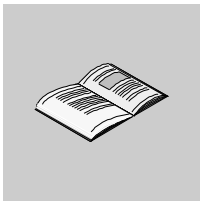
All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

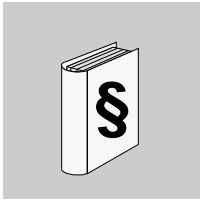
Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents



Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

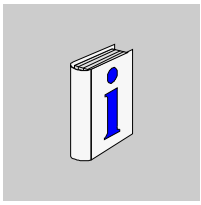
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

The aim of this manual is to provide users, installers and maintenance personnel with the technical information needed to operate Compact NSX circuit breakers and switches in compliance with the IEC standards.

Validity Note

This document applies to Compact NSX circuit breakers.

Related Documents

These documents can be downloaded from the web site **www.schneider-electric.com**.

Title of Documentation	Reference Number
Micrologic 5 and 6 trip units - User manual	LV434103
Modbus Compact NSX - User manual	LV434106
ULP system - User manual	TRV99100
Compact NSX 100-630 A - Catalogue	LVPED208001EN

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Description of the Compact NSX Circuit Breaker

1

Aim of This Chapter

This chapter describes the different types of Compact NSX circuit breaker.

What's in this Chapter?

This chapter contains the following sections:

1.1 Quick Overview of Your Circuit Breaker

Aim

This section briefly describes:

- The Compact NSX circuit breaker functions
- Where to find the information and performance relating to your circuit breaker
- How to carry out the main operations on your circuit breaker

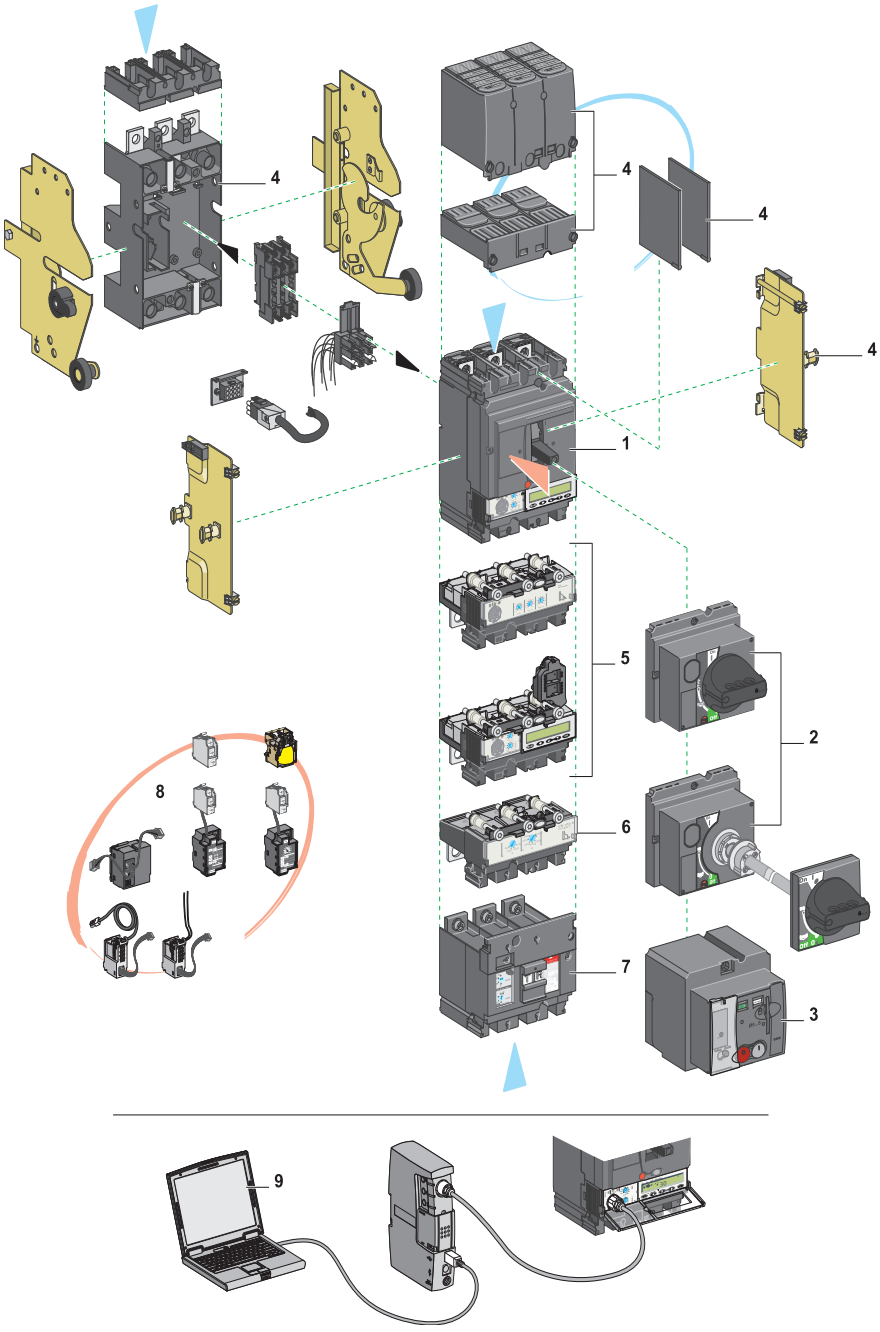
What's in this Section?

This section contains the following topics:

The Main Compact NSX Circuit Breaker Functions

Choice of Numerous Functions that can be Adapted on Site

The design of Compact NSX circuit breakers offers a wide choice of functions. They are very easy to use. These functions can be adapted on site in complete safety.

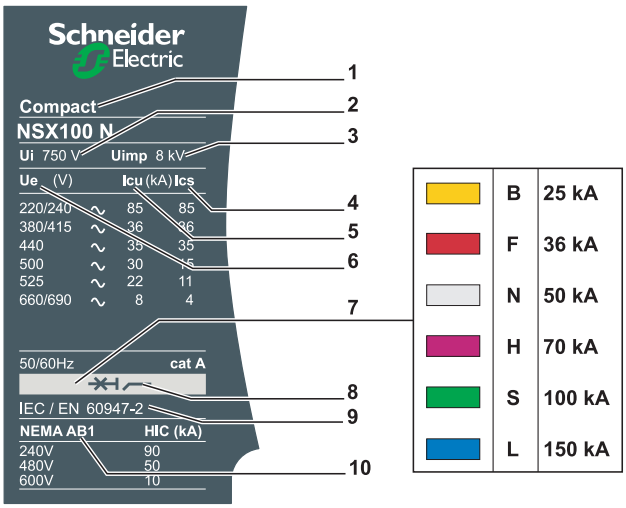


1 Toggle switch
2 Rotary handles
3 Motor mechanism
4 Associated equipment
5 Micrologic electronic trip units
6 TM-D thermal-magnetic trip unit
7 Vigi earth leakage protection module
8 Micrologic trip unit auxiliaries
9 Micrologic maintenance interface

Identification of Compact NSX Circuit Breakers

Characteristics of the Compact NSX Circuit Breaker Case

The case characteristics are indicated on the rating plate on the front of the circuit breakers:



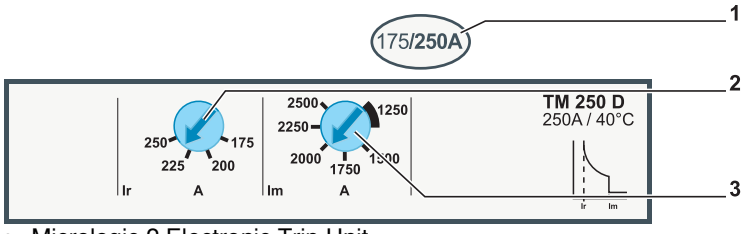
1 Circuit breaker type: Case rating and breaking performance
2 Ui: Insulation voltage
3 Uimp: Rated impulse withstand voltage
4 Ics: Service breaking capacity
5 Icu: Ultimate breaking capacity
6 Ue: Operating voltage
7 Color code indicating the breaking performance
8 Circuit breaker-disconnector symbol
9 Reference standard IEC 60947-2
10 Performance according to the NEMA standard

In the case of extended rotary handles, the door has to be opened to access the rating plate.

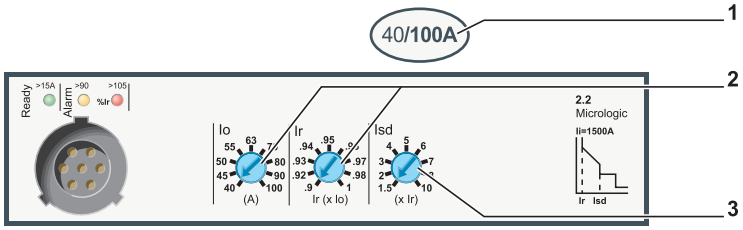
Setting the Circuit Breaker Trip Unit

The dial positions on the front of the trip unit indicate the circuit breaker pick-up settings.

- TM-D Thermal-Magnetic Trip Unit



- Micrologic 2 Electronic Trip Unit



1. Micrologic trip unit adjustment range: Minimum setting/maximum setting = trip unit rating In
2. Overload protection setting (where applicable)
3. Short-circuit protection setting (where applicable)

Using the Performance and Settings Data

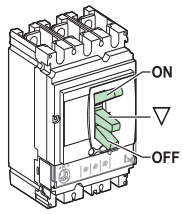
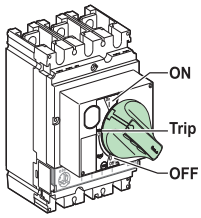
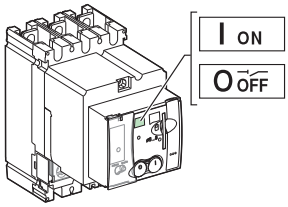
The circuit breaker performance and settings must satisfy the performance and settings required by the installation diagram (see *Startup, page 126*).

In the case of Micrologic 5 and 6 electronic trip units, all settings can be read on the display unit (see *Micrologic 5 and 6 Electronic Trip Units, page 95*).

Operating the Switchgear When Energized

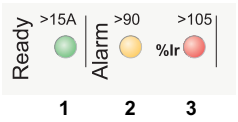
Position of the Actuator

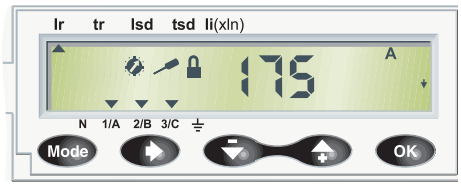
The position of the actuator indicates the state of the circuit breaker:

Toggle switch	Rotary handle	Motor mechanism
		
• I (ON): Circuit breaker closed This position is obtained manually. • O (OFF): Circuit breaker open This position is obtained manually. • ▼, Trip or Tripped: Circuit breaker tripped This position is obtained by the protection (trip unit or trip auxiliaries) as well as by the push to trip button and the maintenance interface.		• I (ON): Circuit breaker closed This position is obtained in auto or manu mode. • O (OFF): Circuit breaker open or tripped This position is obtained in auto or manu mode.

Local Indication

Circuit breakers equipped with a Micrologic trip unit offer very precise indications on the state of the circuit breaker or the installation.





These easily accessible indications are useful for the management and maintenance of the installation:

1. The Ready LED (green) blinks slowly when the electronic trip unit is ready to provide protection.
2. The overload pre-alarm LED (orange) shows a steady light when the load exceeds 90% of the Ir setting.
3. The overload alarm LED (red) shows a steady light when the load exceeds 105% of the Ir setting.

The pre-alarm or alarm indication makes it possible to avoid a fault situation. Should this happen, it is advisable to carry out load shedding in order to avoid tripping due to circuit breaker overload.

Remote Indication

Information is available remotely:

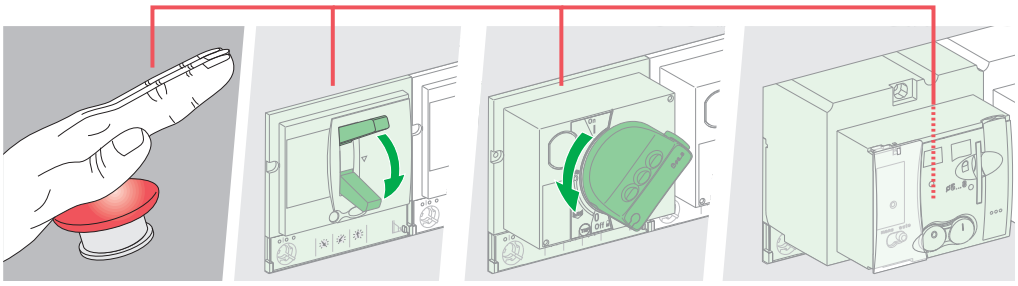
- Via indication contacts
- By using a communication bus

These indication auxiliaries can be installed on site.

For more details on the remote indication and communication options, see *Summary Tables of Auxiliaries, page 60* and refer to the *Micrologic 5 and 6 trip units - User manual*.

Remote Safety Stop Command

The remote safety stop command can be given by electrical control auxiliaries regardless of the control type in use.



To obtain	Use
A safety opening command	An MX shunt release
A failsafe opening command	An MN undervoltage release
	An MN undervoltage release with time-delay unit (the time-delay unit overcomes the problem of micro-cuts)

For more details on the electrical control auxiliaries, see *Control Auxiliaries, page 58*.

The remote safety stop function is specifically linked to the safety of people and property.

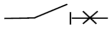
NOTE: It is advisable to test operation of the remote safety stop commands at regular intervals (every 6 months).

De-Energizing the Switchgear

Isolation Capacity of Compact NSX Circuit Breakers

Compact NSX circuit breakers offer *positive contact indication* and are suitable for isolation in accordance with standards IEC 60947-1 and 2: the O (OFF) position of the actuator is sufficient to isolate the circuit breaker concerned.

Circuit breakers capable of isolation are indicated by the following marking on the rating plate:



To confirm this suitability, standards IEC 60947-1 and 2 require particularly stringent shock withstand tests.

Compact NSX circuit breakers can be locked in the O (OFF) position: this enables work to be carried out with the power off in accordance with installation rules. The circuit breaker can only be locked in the open position if the circuit breaker is in the O (OFF) position, whatever type of control is in use.

NOTE: Locking a Compact NSX circuit breaker in the open position is sufficient to isolate the circuit breaker.

The locking devices depend on the type of actuator:

- For circuit breakers with toggle switch, see *How to Lock Your Circuit Breaker, page 21*
- For circuit breakers with rotary handle, see *How to Lock Your Circuit Breaker (With Direct Rotary Handle), page 26* and *How to Lock Your Circuit Breaker (With Extended Rotary Handle), page 30*
- For circuit breakers with motor mechanism, see *How to Lock Your Circuit Breaker, page 39*

Maintenance and Servicing Work on the Installation

Maintenance and servicing work on an installation requires the installation to be de-energized. In the event of partial de-energization of the installation, the installation and safety rules require the feed on which work is to be carried out to be clearly labeled and isolated.

⚠ DANGER

RISK OF ELECTROCUTION, BURNS OR EXPLOSION

- Only qualified persons are authorized to isolate a protection.
- Use isolating switchgear to isolate the part of the installation that has been de-energized.
- Lock the switchgear in the isolated position.
- Use an appropriate voltage detector to confirm that no voltage is present in the equipment.
- Install safety barriers.
- Display a danger sign.
- Replace all isolation components, doors and covers before re-energizing the equipment.

Failure to follow these instructions will result in death or serious injury.

Maintenance Work Following Trip Fault

⚠ CAUTION
RISK OF CLOSING ON ELECTRICAL FAULT Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment. **Failure to follow these instructions can result in injury or equipment damage.**

The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

The table below describes the procedure to be followed after a fault trip:

Step	Action
1	Isolate the feed (see *Maintenance and Servicing Work on the Installation, page 15*) before inspecting the downstream electrical equipment.
2	Look for the cause of the fault.
3	Inspect and, if necessary, repair the downstream equipment.
4	Inspect the equipment (retightening of connections, etc.) in the event of a short-circuit trip.
5	Close the circuit breaker again.

For more information on troubleshooting and restarting following a fault, see *What to do in the Event of a Trip, page 133*.

Checking, Testing and Setting the Compact NSX Circuit Breaker

Checking

Settings can be checked without the need for any particular precautions. However, it is recommended that they be carried out by a qualified person.

Testing

When testing Compact NSX circuit breaker trip mechanisms, the necessary precautions must be taken:
- Not to disrupt operations
- Not to trip inappropriate alarms or actions

⚠ CAUTION
RISK OF NUISANCE TRIPPING Only qualified persons are authorized to carry out protection tests. **Failure to follow these instructions can result in injury or equipment damage.**

For example, tripping the circuit breaker via the push to trip button or the LTU test software can lead to fault indications or corrective actions (such as switching to a replacement power source) if the indications are not dealt with correctly.

Setting

Modifying settings requires a thorough knowledge of the installation characteristics and safety rules.

⚠ CAUTION
RISK OF NO TRIPPING OR NUISANCE TRIPPING Only qualified persons are authorized to modify the protection parameters. **Failure to follow these instructions can result in injury or equipment damage.**

1.2 Your Manually-Operated Circuit Breaker (With Toggle Switch)

Aim

This section describes the controls, indications and locking mechanisms accessible on the front of your Compact NSX circuit breaker.

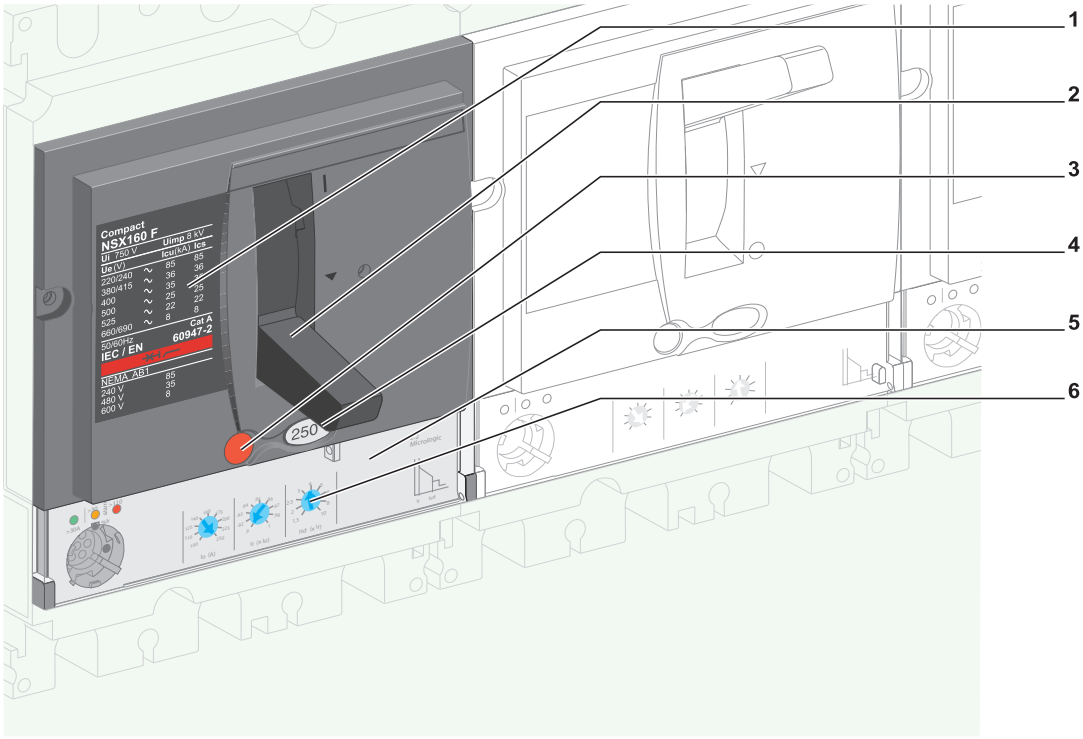
What's in this Section?

This section contains the following topics:

Where to Find the Controls and Information on Your Circuit Breaker

Presentation of the Front Face

The controls, operation indicators and settings can be accessed directly on the front of your circuit breaker.

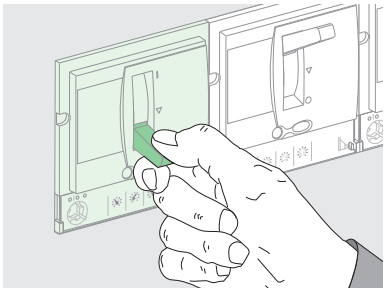


1 Rating plate
2 Toggle switch for setting, opening and closing
3 Push to trip button
4 Trip unit setting range
5 Trip unit
6 Trip unit adjustment dials

For more information on trip units, see *Description of Trip Units, page 63*.

How to Open, Close and Reset Your Circuit Breaker

Opening and Closing Locally



- To close the circuit breaker, move the toggle switch from the O (OFF) position to the I (ON) position.
- To open the circuit breaker, move the toggle switch from the I (ON) position to the O (OFF) position.

Resetting after a Trip

Your circuit breaker has tripped: the toggle switch has moved from the I (ON) position to the ▼ position.

The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

⚠ CAUTION

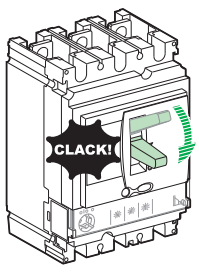
RISK OF CLOSING ON ELECTRICAL FAULT

Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.

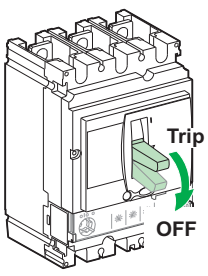
Failure to follow these instructions can result in injury or equipment damage.

The table below describes the procedure to be followed after a fault trip:

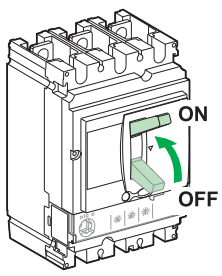
Step	Action	Toggle switch position
1	Isolate the feed (see *Maintenance and Servicing Work on the Installation, page 15*) before inspecting the downstream electrical equipment.	▼
2	Look for the cause of the fault.	▼
3	Inspect and, if necessary, repair the downstream equipment.	▼
4	Inspect the equipment (retightening of connections, etc.) in the event of a short-circuit trip.	▼
5	Reset the circuit breaker by moving the toggle switch from the Trip position to the O (OFF) position: the circuit breaker is open.	O (OFF)
6	Reclose the circuit breaker by moving the toggle switch from the O (OFF) position to the I (ON) position: the circuit breaker is closed.	I (ON)



Circuit breaker trip



Resetting the circuit breaker

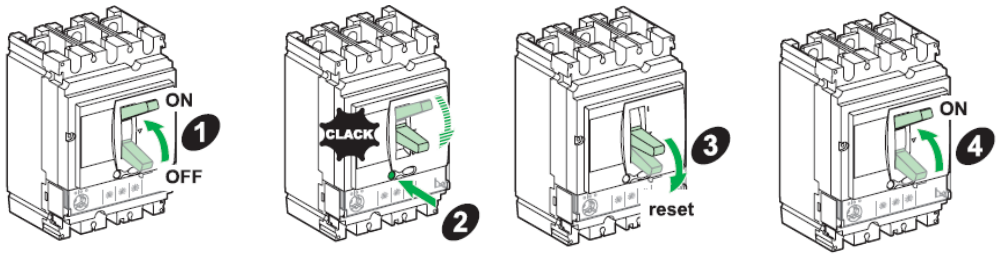


Reclosing the circuit breaker

How to Test Your Circuit Breaker

Press the push to trip Button

The push to trip button checks whether the trip mechanism is working correctly.



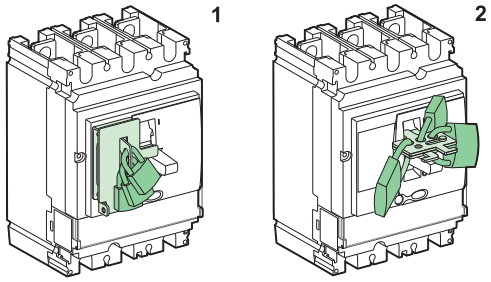
The table below describes the procedure for checking whether the trip mechanism is working correctly by pressing the push to trip button:

Step	Action	Position
1	Close the circuit breaker.	I (ON)
2	Press the push to trip button: the circuit breaker trips.	▼
3	Move the toggle switch to the OFF/Reset position: the circuit breaker is open and reset.	O (OFF)
4	Move the toggle switch to the I (ON) position: the circuit breaker is closed.	I (ON)

How to Lock Your Circuit Breaker

Locking Accessories

Locking accessories are used to lock the toggle switch in the I (ON) or O (OFF) position.



Use up to 3 padlocks (not supplied) 5 to 8 mm in diameter with an accessory that is either part of the case (diagram 1) or detachable (diagram 2).

NOTE: The circuit breaker's protection function is not disabled by locking the toggle switch in the I (ON) position: in the event of a fault, it trips without altering its performance.

When unlocked, the toggle switch moves to the ▼ position. To return the circuit breaker to service, see *How to Open, Close and Reset Your Circuit Breaker, page 19*.

Lead Sealing Accessories

Lead sealing accessories are used to prevent the following operations:

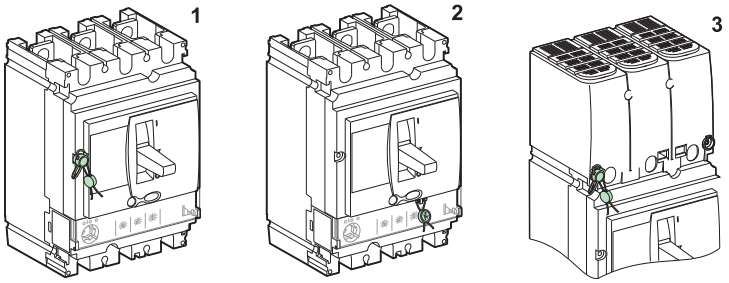


Diagram	Seal	Prohibited operations
1	Escutcheon fixing screw	• Dismantling the escutcheon • Accessing the auxiliaries • Dismantling the trip unit
2	Transparent protective cover for the trip units	Altering any settings and accessing the test port
3	Fixing screw for terminal shields	Accessing the power connection (protection against direct contact)

1.3 Your Circuit Breaker With Rotary Handle

Aim

This section introduces the controls, indications and locking mechanisms accessible on your Compact NSX circuit breaker.

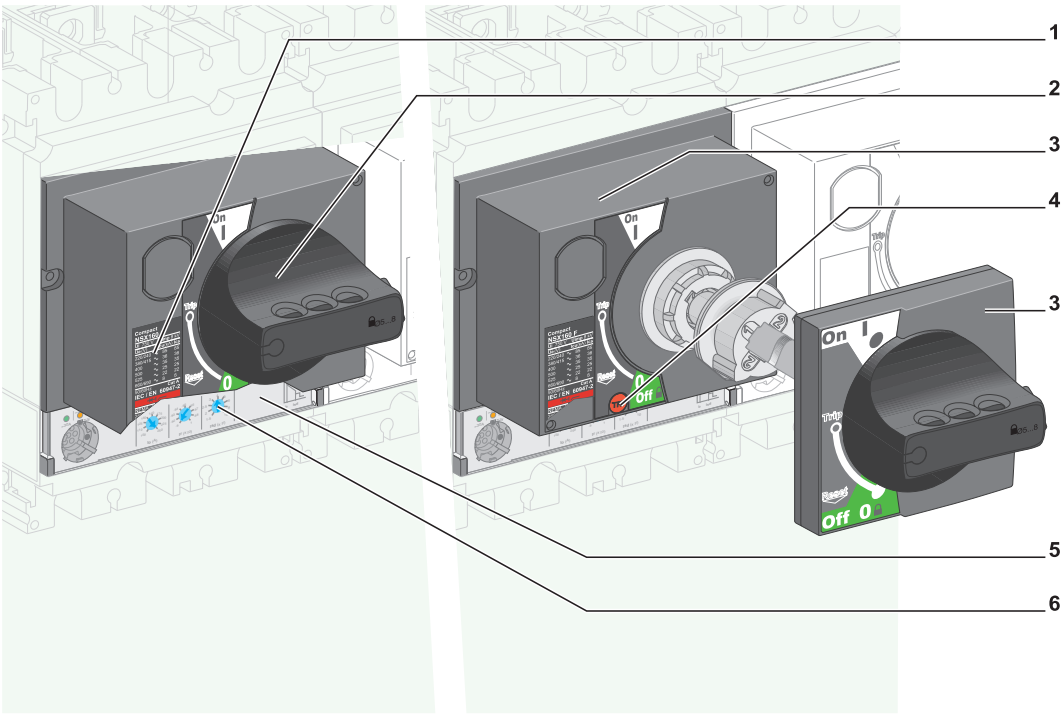
What's in this Section?

This section contains the following topics:

Where to Find the Controls and Locking Mechanisms on Your Circuit Breaker

Presentation of the Front Face

- The circuit breaker operating controls, operation indicators, settings and locking mechanisms for the direct rotary handle can be accessed directly on the front of your circuit breaker.
- In the case of the extended rotary handle:
  - The circuit breaker operating controls can be accessed on the door escutcheon.
  - The operation indicators and settings are only accessible when the door is open.
  - The locking mechanisms can be operated on the case (door open) or on the door escutcheon (door closed).

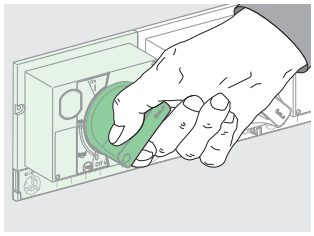


1 Rating plate
2 Direct rotary handle
3 Extended rotary handle
4 Push to trip button
5 Trip unit
6 Trip unit adjusting dials

For more information on trip units, see *Description of Trip Units, page 63*.

How to Open, Close and Reset Your Circuit Breaker

Opening and Closing Locally



- To close the circuit breaker, turn the rotary handle clockwise from the O (OFF) position to the I (ON) position.
- To open the circuit breaker, turn the rotary handle anticlockwise from the I (ON) position to the O (OFF) position.

Resetting After a Trip

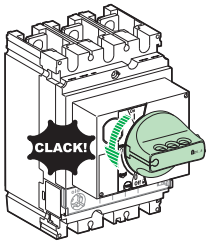
Your circuit breaker has tripped: the rotary handle has moved from the I (ON) position to the Trip/Tripped position.

The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

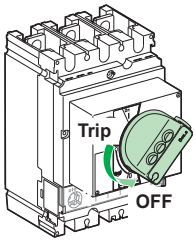
⚠ CAUTION
RISK OF CLOSING ON ELECTRICAL FAULT Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment. **Failure to follow these instructions can result in injury or equipment damage.**

The table below describes the procedure to be followed after a fault trip:

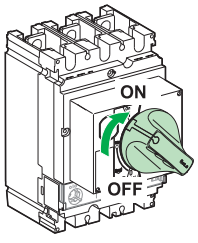
Step	Action	Handle position
1	Isolate the feed (see *Maintenance and Servicing Work on the Installation, page 15*) before inspecting the downstream electrical equipment.	Trip
2	Look for the cause of the fault.	Trip
3	Inspect and, if necessary, repair the downstream equipment.	Trip
4	Inspect the equipment (retightening of connections, etc.) in the event of a short-circuit trip.	Trip
5	Reset the circuit breaker by turning the rotary handle anticlockwise from the Trip position to the O (OFF) position: the circuit breaker is open.	O (OFF)
6	Close the circuit breaker again by turning the rotary handle clockwise, from the O (OFF) position to the I (ON) position: the circuit breaker is closed.	I (ON)



Circuit breaker trip



Resetting the circuit breaker

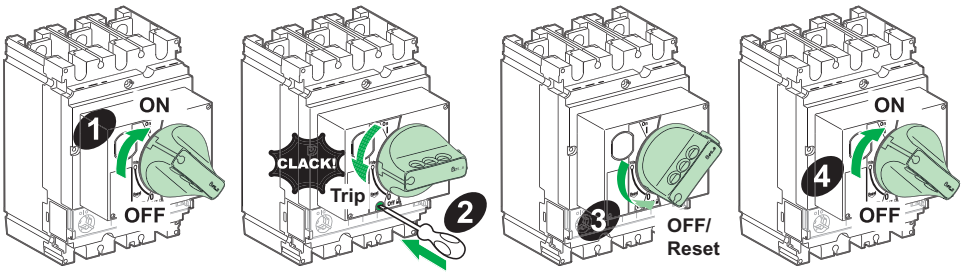


Reclosing the circuit breaker

How to Test Your Circuit Breaker (With Direct Rotary Handle)

Press the push to trip Button

The push to trip button checks whether the trip mechanism is working correctly.

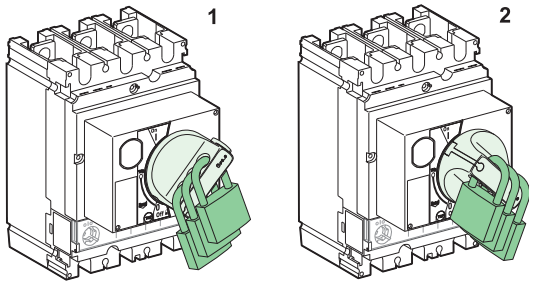


Step	Action	Handle position
1	Close your circuit breaker.	I (ON)
2	Press the push to trip button: the circuit breaker trips and the handle moves to the Trip position.	Trip
3	Turn the rotary handle anticlockwise from the Trip position to the O (OFF/Reset)) position: the circuit breaker is open and reset.	O (OFF)
4	Turn the rotary handle clockwise from the O (OFF) position to the position I (ON) : the circuit breaker is closed.	I (ON)

How to Lock Your Circuit Breaker (With Direct Rotary Handle)

Locking the Direct Rotary Handle

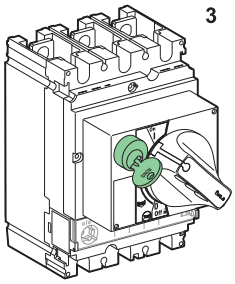
Locking with up to 3 padlocks (not supplied) with shackle diameter 5 to 8 mm



Padlocking is an option:

- As standard, only in the O (OFF) position (diagram 1)
- After modification of the rotary handle during installation, in both the I (ON) (diagram 2) and O (OFF) positions.

Locking with a Profalux or Ronis Key (Optional)



It is possible to use one of the above locks in the I (OFF) position or in the O (OFF) and I (ON) positions (diagram 3) depending on the bolt chosen. The lock can be added on site.

Keylocking can be used at the same time as padlocking.

NOTE: The circuit breaker's protection function is not inhibited by locking the rotary handle in the I (ON) position. In the event of a fault, it trips without affecting its performance.

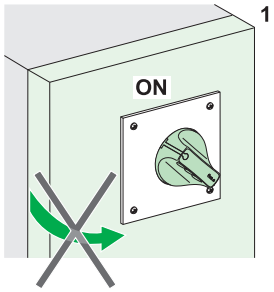
When unlocked, the toggle switch moves to the Trip position. To return the circuit breaker to service, follow the resetting instructions (see *Resetting After a Trip, page 24*).

Door Locking (MCC Function)

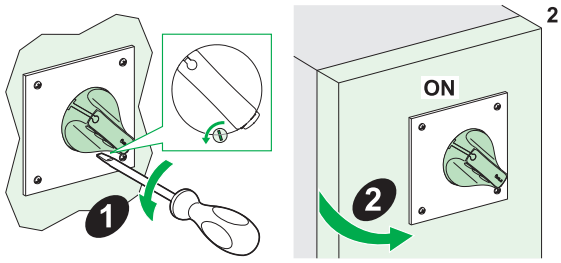
Further options are offered with the direct rotary handle in the MCC function.

Door locking

The direct rotary handle locks the door in the closed position when the circuit breaker is in the I (ON) position (diagram 1).



This lock can be temporarily disabled so that the door can be opened (diagram 2).



⚠ DANGER

RISK OF ELECTROCUTION, BURNS OR EXPLOSION

Only qualified persons are authorized to disable the door lock.

Failure to follow these instructions will result in death or serious injury.

Preventing Circuit Breaker Closing When the Door is Open

The door locking device can also prevent moving the direct rotary handle to the I (ON) position when the door is open.

Free door option

The lock can be omitted, but the rotary handle must then be modified (see *Quick Reference Guide*). In this case, the two functions - door locking and preventing the circuit breaker from being closed when the door is open - are inoperative.

Lead Sealing Accessories

Lead sealing accessories are used to prevent the following operations:

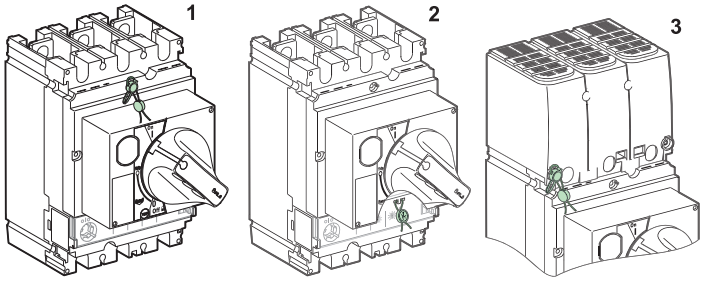


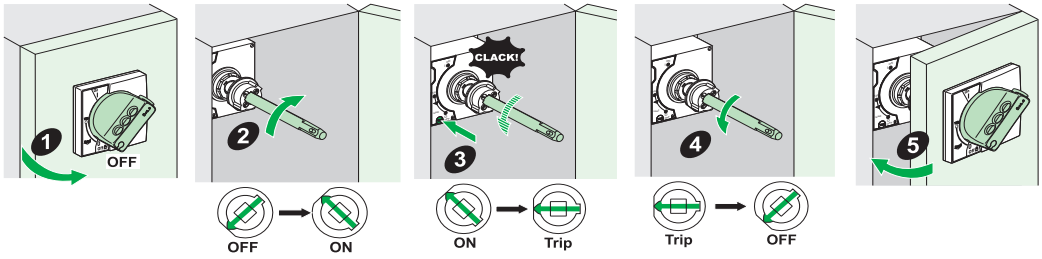
Diagram	Seal	Prohibited operations
1	Escutcheon fixing screw	• Dismantling the escutcheon • Accessing the auxiliaries • Dismantling the trip unit
2	Transparent protective cover for the trip units	Altering any settings and accessing the test port.
3	Fixing screw for terminal shields	Accessing the power connection (protection against direct contact)

How to Test Your Circuit Breaker (With Extended Rotary Handle)

Pressing the Push to Trip Button

The push to trip button checks whether the trip mechanism is working correctly.

The push to trip button is not accessible on the front face: the test has to be conducted with the door open.



Step	Action	Position
1	Switch the circuit breaker to the open O (OFF) position. Open the door.	O (OFF)
2	Use a special tool (1) to turn the extension shaft clockwise and switch the circuit breaker to the I (ON) position. The circuit breaker is ready for the test.	I (ON)
3	Press the push to trip button: the circuit breaker trips.	Trip
4	Use a special tool (1) to turn the extension shaft anticlockwise and switch the circuit breaker from the Trip position to the O (OFF) position: the circuit breaker is in the open position.	O (OFF)
5	Close the door	–

(1) The special tool can be:
- A standard rotary handle designed for tests
- A flat wrench, taking care not to damage either the extension shaft (hollow square tube 10 mm x 10 mm) or its surface treatment

How to Lock Your Circuit Breaker (With Extended Rotary Handle)

Locking Functions Offered

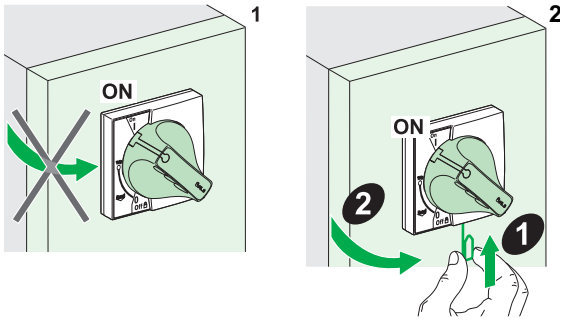
The extended rotary handle offers several locking functions to:

- Prevent the door being opened
- Prevent the rotary handle being operated

Some locking functions can be inhibited on different adaptations.

Locking the Door

The extended rotary handle locks the door in the I (ON) position as standard (diagram 1):



This lock can be temporarily disabled so that the door can be opened (diagram 2).

⚠ DANGER

RISK OF ELECTROCUTION, BURNS OR EXPLOSION

Only qualified persons are authorized to disable the door lock.

Failure to follow these instructions will result in death or serious injury.

This lock can be omitted, but the extended rotary handle must then be modified (see *Quick Reference Guide*).

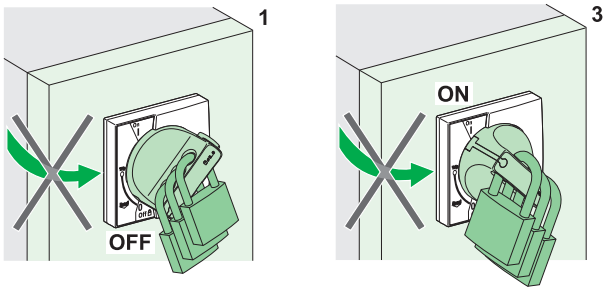
Example:

An application comprises a circuit breaker for a switchboard incoming supply and several load circuit breakers with extended rotary handles installed behind the same door. Locking the door with a single rotary handle (incoming supply circuit breaker) simplifies maintenance work on the switchboard.

Locking the Extended Rotary Handle

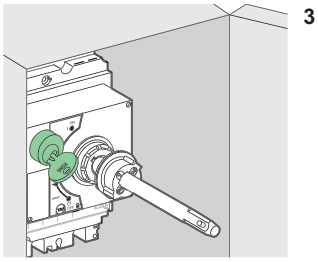
Locking with up to 3 padlocks (not supplied) with shackle diameter 5 to 8 mm

The extended rotary handle can be locked in the I (ON) position or O (OFF) position.



- As standard in the O (OFF) position (diagram 1)
  Padlocking the rotary handle prevents the door being opened. **Door locking cannot be inhibited**.
- Possible in the two positions I (ON) (diagram 2) and O (OFF), after modification of the rotary handle during installation.
  There is a choice of two options when the rotary handle is locked in the I (ON) position:
  - Standard with door opening locked. Door locking cannot be inhibited.
  - As an option, door stays free: locking the rotary handle does not stop the door being opened.

Locking with a Profalux or Ronis Key (Optional)



The lock is mounted on the case inside the switchboard (diagram 3). It is possible to lock in the O (OFF) position or in both the O (OFF) and I (ON) positions depending on the bolt chosen. The lock can be added on site.

NOTE: The circuit breaker's protection function is not inhibited by locking the rotary handle in the I (ON) position. In the event of a fault, it trips without affecting its performance.

When unlocked, the toggle switch moves to the Trip position. To return the circuit breaker to service, follow the resetting instructions (see *Resetting After a Trip, page 24*).

Keylocking Procedure

Keylocking can be performed with a circuit breaker in either the O (OFF) position or the I (ON) position.

Step	Action (circuit breaker in the O (OFF) position).	Action (circuit breaker in the I (ON) position).
1	Open the door.	Open the door by disabling the door locking device if necessary.
2	Use the keylock mounted on the case inside the switchboard to lock the rotary handle.	Use the keylock mounted on the case inside the switchboard to lock the rotary handle.
3	Close the door.	Close the door, disabling the door locking device if necessary.

Lead Sealing Accessories

The sealing accessories for circuit breakers with extended rotary handles are identical to those for circuit breakers with standard direct handles (see *How to Lock Your Circuit Breaker (With Direct Rotary Handle), page 26*).

1.4 Your Circuit Breaker With Motor Mechanism

Aim

This section describes the controls, indications and locking mechanisms accessible on the front of your Compact NSX circuit breaker with motor mechanism. There are two possible types of motor mechanism:

- Motor mechanism, which can be used to open and close a circuit breaker remotely by means of electrical commands (using pushbuttons)
- Communicating motor mechanism, which can be used to open and close a circuit breaker remotely via the communication bus

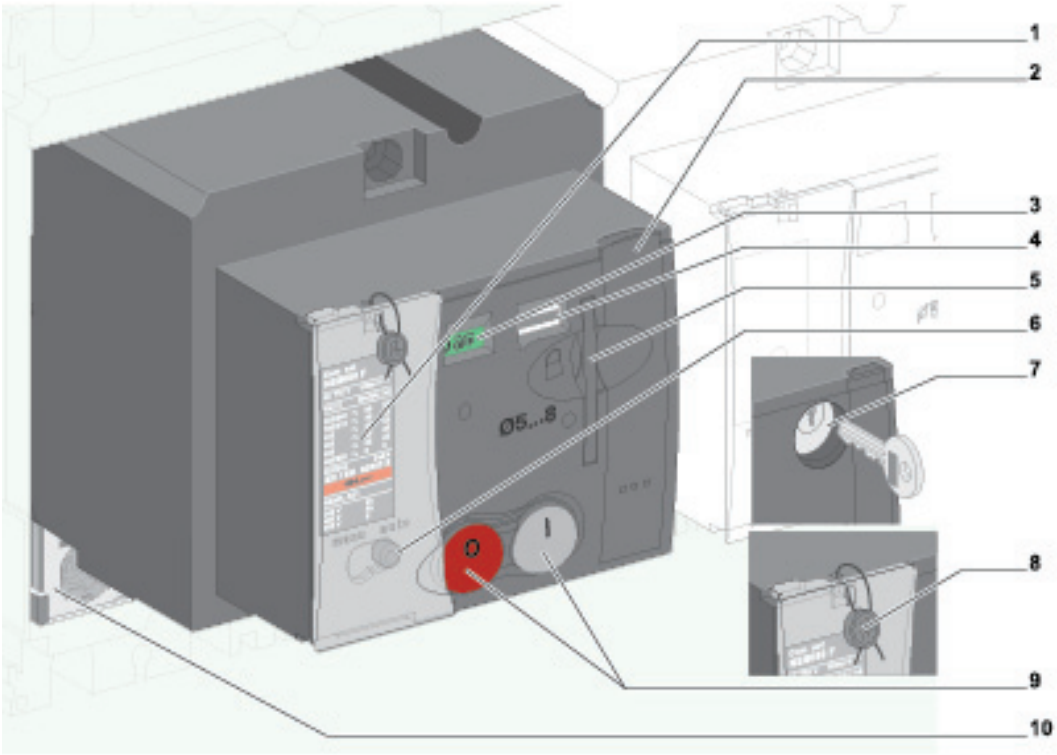
What's in this Section?

This section contains the following topics:

Where to Find the Controls and Locking Mechanisms on Your Circuit Breaker

Presentation of the Front Face

The main controls, operation indicators, settings and locking mechanisms can be accessed directly on the front of your electrically operated circuit breaker (with motor mechanism).



1 Rating plate
2 Stored energy control in manual mode
3 Main contacts position indicator
4 Control position indicator
5 Padlocking in O (OFF) position
6 Manual/automatic operating mode selector
7 Keylocking in O (OFF) position (Compact NSX 400/630 only)
8 Lead sealing accessory
9 Closing (I) and opening (O) controls
10 Trip unit

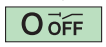
Front Indications

Two operation indicators on the front of the trip unit show the position and state of the motor mechanism.

Main contacts position indicator:

- I (ON) position

- O (OFF) or tripped position

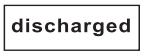


NOTE: The tripped position is distinguished from the O (OFF) position by means of the SD (or SDE) indication contact.

Control charge indicator:

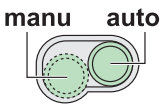
- Stored energy control charged

- Stored energy control discharged



Stored energy control is used only to provide the necessary energy for the circuit breaker closing switch. The energy for tripping is supplied directly by the mechanism incorporated in the circuit breaker.

Manu/Auto Selector



- In automatic operating mode, only electrical commands are executed.
- In manual operating mode, all electrical commands are disabled.

How to Open, Close and Reset Your Circuit Breaker (With Motor Mechanism)

At a Glance

The motor mechanism can be used to open and close a circuit breaker remotely by means of electrical commands. There are many applications:

- Automation of electrical distribution in order to optimize operating costs
- Normal/standby source changeover: changes over to a replacement source in order to improve continuity of service
- Load shedding/reconnection in order to optimize tariff-based contracts

The motor mechanism must be wired in strict accordance with the connection diagram shown in *Motor Mechanism, page 146*.

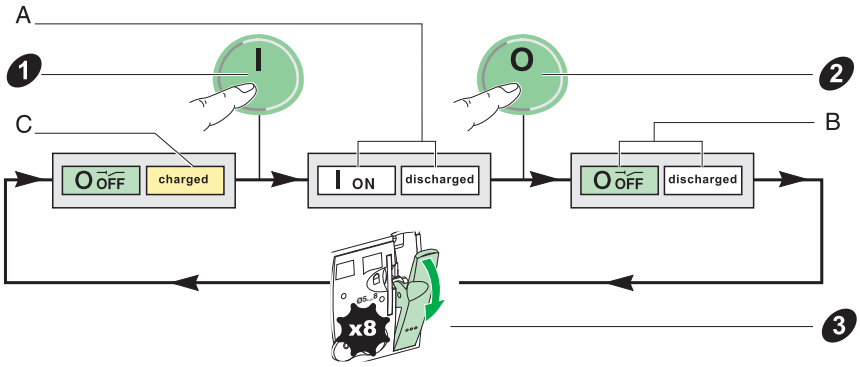
⚠ CAUTION
RISK OF REPEATED CLOSING ON ELECTRICAL FAULT Only a trained specialist is authorized to modify the wiring diagram for the motor mechanism. **Failure to follow these instructions can result in injury or equipment damage.**

In automatic operating mode, wiring the SDE contact prevents the circuit breaker from resetting automatically on an electrical fault. For more details on the SDE contact, see *Indication Contacts, page 47*.

Manual Operation: Opening, Closing and Resetting Locally

Move the selector to the Manu position.

Cycle of operation:



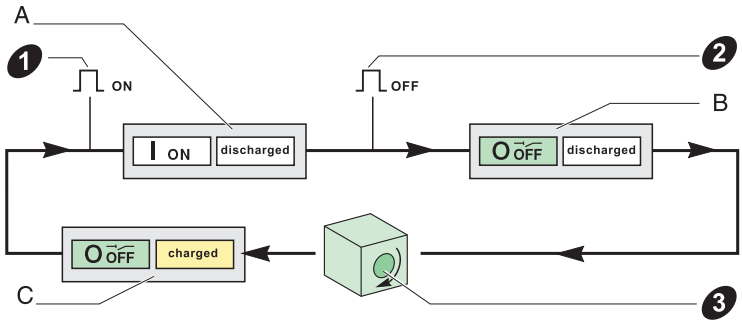
Check that the stored energy control is actually charged: charge indicator on **charged** (C). Otherwise reset the circuit breaker (3).

Step	Action
Close the circuit breaker	
1	Press the closing switch I (ON).
A	The circuit breaker is closed: ● The contact position indicator changes to I (ON) ● The charge indicator changes to **discharged**
Open the circuit breaker	
2	Press the opening switch O.
B	The circuit breaker is open: ● The contact position indicator changes to O (OFF) ● The charge indicator stays on **discharged**
Reset the circuit breaker	
3	Reset the stored energy control by operating the handle (8 times).
C	The circuit breaker is ready to be closed: ● The contact position indicator stays on O (OFF) ● The charge indicator changes to **charged**

Automatic Operation: Opening, Closing and Resetting Remotely

Move the selector to the Auto position.

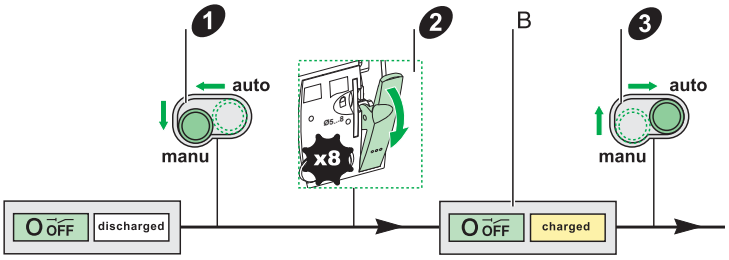
Cycle of operation:



Step	Action
Close/Open the circuit breaker	
1	Send a close command (ON).
A	The circuit breaker is closed: ● The contact position indicator changes to I (ON) ● The charge indicator changes to **discharged**
2	Send an open command (OFF).
B	The circuit breaker opens: ● The contact position indicator changes to O (OFF) ● The charge indicator stays on **discharged**
3	Reset the stored energy control. 3 reset modes are offered depending on the connection diagram (see *Motor Mechanism, page 146*): ● Automatic reset ● Remote reset via pushbutton ● Manual reset by operating the handle
C	The circuit breaker opens in the O (OFF) position: ● The contact position indicator stays on O (OFF) ● The charge indicator changes to **charged**

Resetting After a Fault Trip

Resetting after a fault trip can only be done locally. When operating in automatic mode, return to manual operation to reset the circuit breaker.



Step	Action
Manual operation	
2	Reset the stored energy control by operating the handle (8 times).
B	The charge indicator changes to **charged** and the internal mechanism goes from the Tripped position to the O (OFF). position
Lock the circuit breaker and look for the cause of the fault.	

Step	Action
Automatic operation	
1	Move the operating mode selector to manu.
2	Reset the stored energy control by operating the handle (8 times).
B	The charge indicator changes to **charged** and the internal mechanism goes from the Tripped position to the O (OFF) position.
Lock the circuit breaker and look for the cause of the fault.	
3	Move the position selector back to automatic (Auto).

The fact that a protection has tripped does not remedy the cause of the fault on the downstream electrical equipment.

⚠ CAUTION

RISK OF CLOSING ON ELECTRICAL FAULT

Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.

Failure to follow these instructions can result in injury or equipment damage.

The table below describes the procedure to be followed after a fault trip:

Step	Action
1	Isolate the feed (see *Maintenance and Servicing Work on the Installation, page 15*) before inspecting the downstream electrical equipment.
2	Look for the cause of the fault.
3	Inspect and, if necessary, repair the downstream equipment.
4	Inspect the equipment (retightening of connections, etc.) in the event of a short-circuit trip.

How to Open, Close and Reset Your Circuit Breaker (With Communicating Motor Mechanism)

Overview

The communicating motor mechanism is managed via the communication bus.

For this function it is necessary to:
- Install a BSCM module (see *BSCM Module, page 52*) and the NSX cord (see *NSX Cord, page 55*)
- Use a communicating motor mechanism

The BSCM module is connected to the communication bus by the NSX cord.
- It receives closing, opening and reset commands from the circuit breaker
- It transmits the circuit breaker states (O (OFF), I (ON), Tripped by SDE)

NOTE: The communicating motor mechanism has a specific reference (see the *Compact NSX Catalog*).

The BSCM module can be configured using the RSU software (see *BSCM Module, page 52*).

The schematic for the communicating motor mechanism in the BSCM module can be configured. It must be created in strict accordance with the simplified schematic shown in *Motor Mechanism, page 146*.

⚠ CAUTION

RISK OF REPEATED CLOSING ON ELECTRICAL FAULT

Only a trained specialist is authorized to reconfigure the schematic for the communicating motor mechanism in the BSCM module.

Failure to follow these instructions can result in injury or equipment damage.

Manual Operation: Opening, Closing and Resetting Locally

The **manual** operating principle for opening, closing and resetting the circuit breaker with motor mechanism locally also applies to the circuit breaker with communicating motor mechanism.

Automatic Operation: Opening, Closing and Resetting Remotely

The **automatic** operating principle for opening, closing and resetting the circuit breaker with motor mechanism remotely also applies to the circuit breaker with communicating motor mechanism.

Resetting After a Fault Trip

Without modifying the factory configuration, the operating principle for resetting after a fault trip on a circuit breaker with motor mechanism also applies to the circuit breaker with communicating motor mechanism.

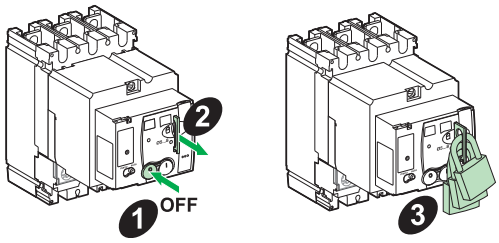
Reconfiguration of the BSCM module (see *Configuring Resetting of the Communicating Motor Mechanism, page 54*) authorizes remote resetting after a fault trip on a circuit breaker with communicating motor mechanism: the precise data on the cause of the electrical fault transmitted by Micrologic 5 and 6 trip units via the communication bus enables the operator to take this decision.

How to Lock Your Circuit Breaker

Locking Accessories

Locking accessories enable two methods of locking:
- Using up to 3 padlocks (not supplied) 5 to 8 mm in diameter
- Using the motor mechanism lock

Both locking methods can be used at the same time.



Step	Action
1	Switch the circuit breaker to the O (OFF) position.
2	Pull out the tab.
3	Lock the tab using up to three padlocks (5 to 8 mm diameter). Lock the circuit breaker using the keylock (leaving the tab out).

The circuit breaker is locked: no commands in auto mode or manu mode will be executed.

Lead Sealing Accessories

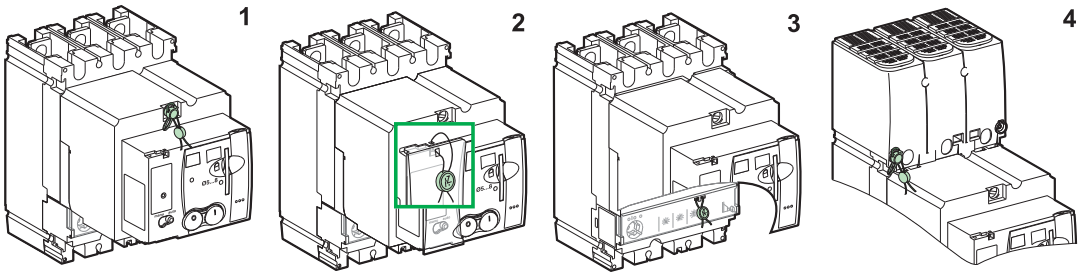


Diagram	Seal	Prohibited operations
1	Motor mechanism fixing screw	• Dismantling the escutcheon • Accessing the auxiliaries • Dismantling the trip unit
2	Transparent cover for the motor mechanism	Accessing the manual/automatic selector (depending on its position, manual operation (1) or automatic operation is disabled)
3	Transparent protective cover for the trip units	Altering any settings and accessing the test port
4	Fixing screw for terminal shields	Accessing the power connection (protection against direct contact)
(1) In this case no local operations are possible.		

Equipment Associated With Your Circuit Breaker

2

Aim

This chapter describes the electrical accessories and auxiliaries installed on your Compact NSX circuit breaker and/or that you can install on site.

What's in this Chapter?

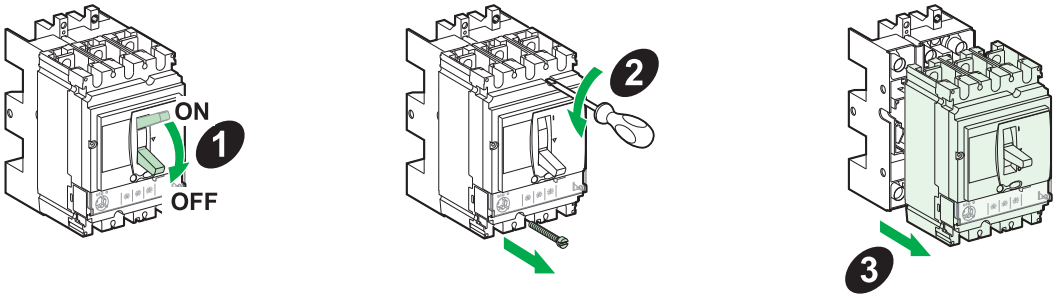
This chapter contains the following topics:

Plug-in Base for Compact NSX Circuit Breaker

At a Glance

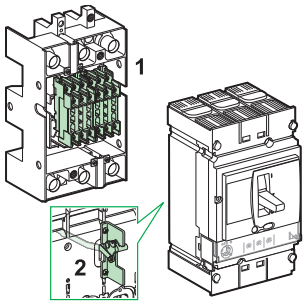
Plug-in bases can be used with all circuit breaker types including those equipped with a Vigi module:
- With toggle switch
- With rotary handle
- With motor mechanism

Disconnection Procedure



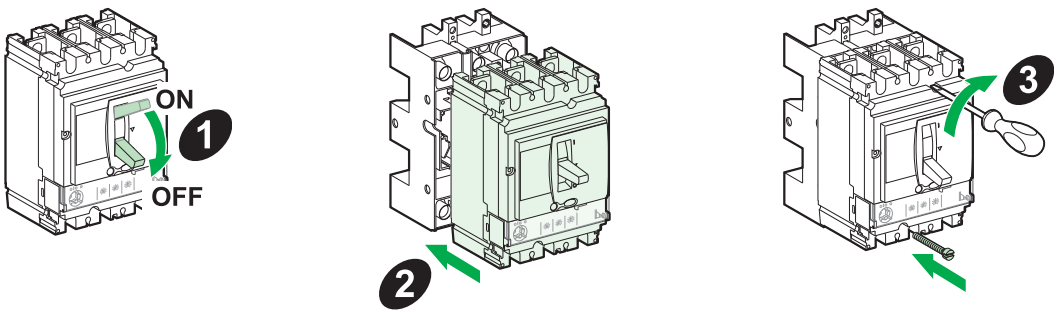
Step	Action
1	Switch the circuit breaker to the O (OFF) position.
2	Remove both fixing screws.
3	Pull out the circuit breaker, keeping it horizontal.

Safety During Disconnection



- The auxiliary circuits are automatically disconnected because of the connectors located on the base (diagram 1) and at the rear of the circuit breaker.
- It is advisable to open the circuit breaker before disconnecting it. If the circuit breaker is in the closed I (ON) position when disconnecting, a pre-trip safety mechanism (diagram 2) trips the circuit breaker before the pins are disconnected.

Connection Procedure



Step	Action
1	Switch the circuit breaker to the O (OFF) position.
2	Connect the circuit breaker.
3	Replace both fixing screws.

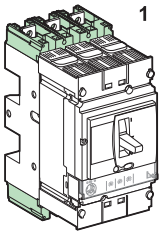
Safety During Connection

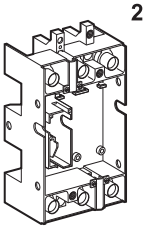
The same additional safety measures as for disconnecting are activated:

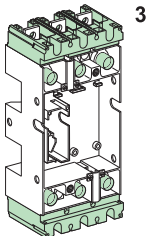
- The auxiliary circuits are automatically disconnected because of the connectors located on the base and at the rear of the circuit breaker.
- It is advisable to open the circuit breaker before connecting it. If the circuit breaker is in the closed I (ON) position when connecting, the pre-trip safety mechanism trips the circuit breaker before the pins are connected.

Protection Against Direct Contact with Power Circuits

An adapter enables the base to take the same isolation and connection accessories as the fixed circuit breaker.







Circuit breaker connected	IP40 with terminal shields (diagram 1)
Circuit breaker removed	IP20 base only (diagram 2)
	IP40 base equipped with terminal shields and blanking covers (diagram 3)

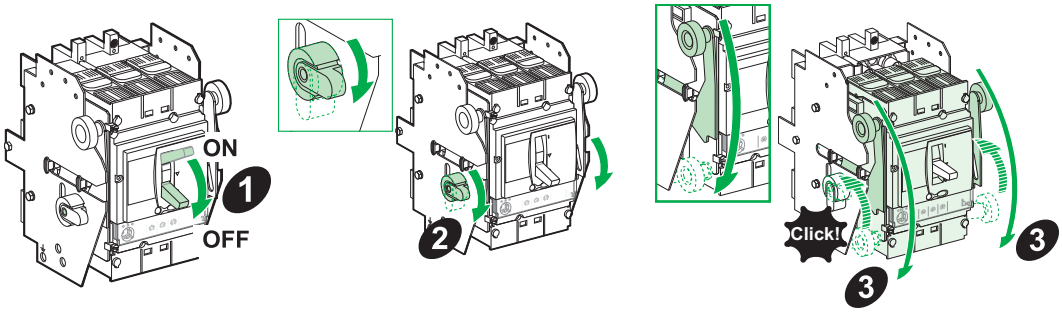
Withdrawable Chassis for Compact NSX

At a Glance

Withdrawable chassis can be used with all circuit breaker types including those equipped with a Vigi module:

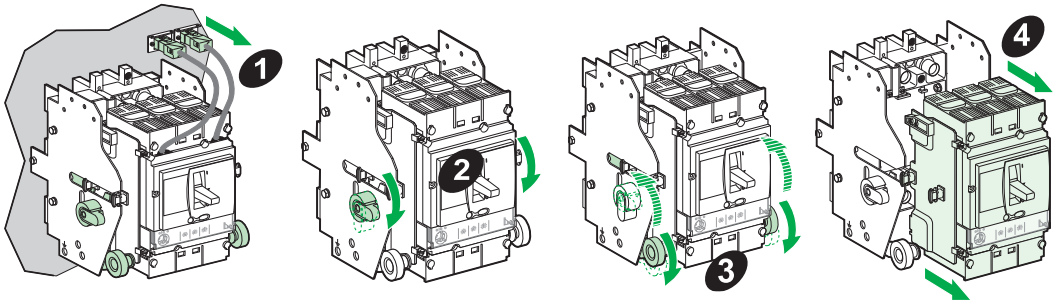
- With toggle switch
- With rotary handle
- With motor mechanism

Disconnection Procedure



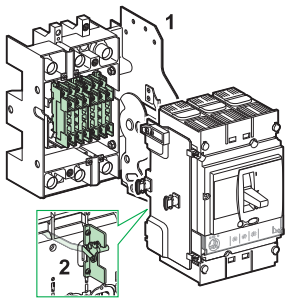
Step	Action
1	Switch the circuit breaker to the O (OFF) position.
2	Move both locking levers down as far as they will go.
3	Push down both operating handles at the same time until you hear a double click from the locking levers (as the locking levers return to their original position). The circuit breaker is disconnected.

Procedure for Removing the Disconnected Circuit Breaker



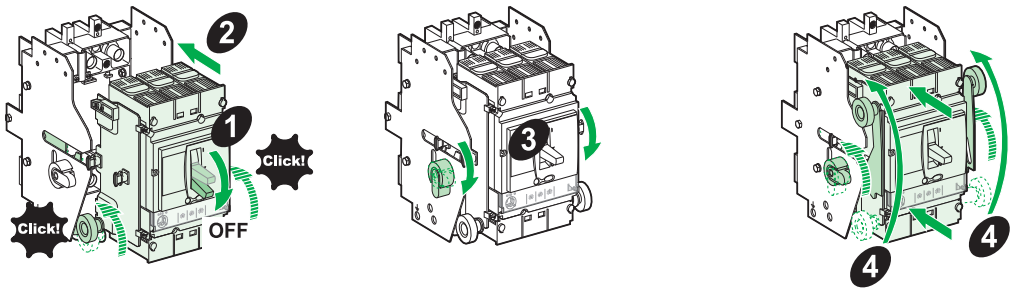
Step	Action
1	Disconnect the manual auxiliary connector (if the circuit breaker has one).
2	Move both locking levers down (as in the disconnection procedure).
3	Push down both operating handles as far as the next notch.
4	Remove the circuit breaker, keeping it horizontal.

Safety During Disconnection



- The auxiliary circuits can be:
  - Automatically disconnected because of the connectors located on the chassis (diagram 1) and at the rear of the circuit breaker
  - Or left connected if the circuit breaker is equipped with a manual auxiliary connector
- It is advisable to open the circuit breaker before disconnecting it. If the circuit breaker is in the closed I (ON) position when disconnecting, a pre-trip safety mechanism (diagram 2) trips the circuit breaker before the pins are disconnected.

Connection Procedure



Step	Action
1	Switch the circuit breaker to the O (OFF) position.
2	Move both operating handles down to the low position on the chassis. Push in the circuit breaker until you hear a click from the locking levers.
3	Move both locking levers forward (as in the disconnection procedure).
4	Raise both locking levers at the same time.

Safety During Connection

The same additional safety measures as for disconnecting are activated:

It is advisable to open the circuit breaker before connecting it. If the circuit breaker is in the closed I (ON) position when connecting, the pre-trip safety mechanism trips the circuit breaker before the pins are connected.

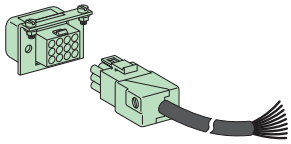
Protection of the Chassis Against Direct Contact

The chassis can be protected against direct contact by blanking covers.

Circuit breaker disconnected or removed	IP20 base only
	IP40 base fitted with blanking covers

Auxiliary Circuit Test with Circuit Breaker Disconnected

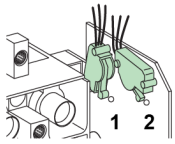
The auxiliary circuit test function is possible with devices fitted with manual auxiliary connectors.



In the disconnected position the device can be operated (by the actuator or push to trip button) to check whether the auxiliary circuits are working correctly.

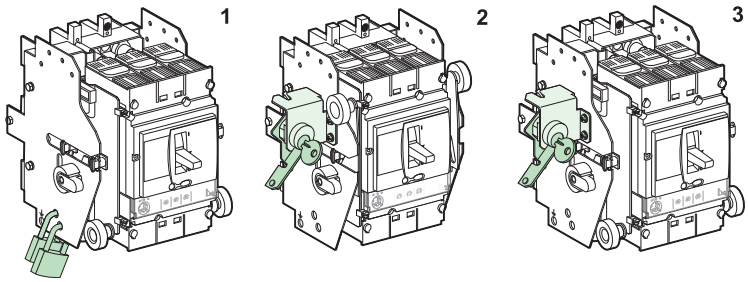
Carriage Switches (Optional)

2 volt-free changeover contacts can be installed on the chassis (for more details of contact operation, see *Control Auxiliaries, page 58*):



1 Connected-position carriage switch (CE)
2 Disconnected-position carriage switch (CD)

Locking the Chassis



The circuit breaker can be locked using up to 3 padlocks (not supplied) with a shackle diameter of 5 to 8 mm to prevent connection (diagram 1).

When a lock is used, the circuit breaker is locked in the connected position (diagram 2) or the disconnected position (diagram 3).

Indication Contacts

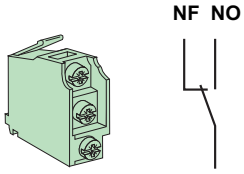
Characteristics of Indication Contacts

The indication contacts are located under the front face of the circuit breaker, under the motor mechanism, or in the rotary handle. They are installed in a compartment which is isolated from the power circuits. There are three types:

- Standard volt-free contact
- Low-level volt-free contact
- Solid-state output for SDx and SDTAM modules

Standard and Low-Level Volt-Free Contacts

Standard and low-level volt-free contacts are the common point changeover type.



NC Normally Closed contact
NO Normally Open contact

NOTE: A single contact model provides all the OF, SD, SDE and SDV indication functions: the function of the OF, SD and SDE contacts is determined by their position inside the case.

The table below describes the operation of standard and low-level volt-free contacts:

Name	Definition
OF	**Changeover**: The NO contact is normally open when the circuit breaker is in the O (OFF) position.
SD	**Trip indication**: This contact indicates that the circuit breaker has tripped due to: ● Long time protection ● Short time protection ● Ground fault protection ● An earth leakage fault detected by the Vigi module ● Operation of the MX or MN voltage releases ● Operation of the push to trip button ● Connecting/Disconnecting the circuit breaker ● Manually opening the motor mechanism
SDE	**Electrical fault indication**: This contact indicates that the circuit breaker has tripped on an electrical fault due to: ● Long time protection ● Short time protection ● Ground fault protection ● An earth leakage fault detected by the Vigi module
SDV	**Earth leakage fault indication** (tripped by **Vigi**): This contact indicates that the circuit breaker has tripped due to an earth leakage fault detected by the Vigi module.

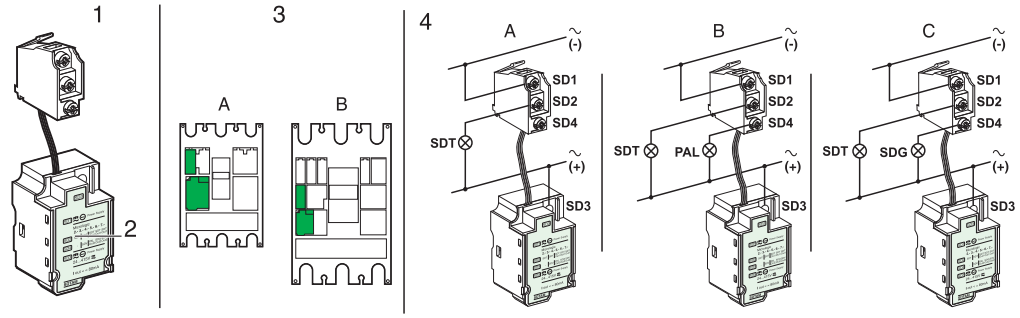
SDx Module (Micrologic 2, 5 and 6)

At a Glance

Compact NSX circuit breakers equipped with Micrologic 2, 5 and 6 trip units can take the optional SDx module.

The SDx module receives data from the trip unit via a fiber optic link and makes available:
- For Micrologic 2 trip units, a solid state output (non-configurable) for remote feedback from a thermal trip alarm
- For Micrologic 5 and 6, two solid state outputs (configurable) for remote feedback from alarms

Description, Installation and Connection



1 SDx module with output terminal block
2 Rating plate
3 Slot:
A: Compact NSX 100-250
B: Compact NSX 400/630
4 A: Micrologic 2 wiring diagram
B: Micrologic 5 wiring diagram
C: Micrologic 6 wiring diagram

The SDx module cannot be installed at the same time as an MN/MX release and OF contact.

The SDx module and the two solid state outputs must be connected in strict accordance with the wiring diagram.

The characteristics of the SDx module solid state outputs are:
- Voltage: 24...415 V AC/V DC
- Current:
  - Active outputs: 80 mA max
  - Idle outputs: 0.25 mA

Default Output Assignment

The functions offered by the SDx module outputs depend on the type of trip unit installed with the module:
- For all Micrologic trip units, output 1 (SD2) is assigned to the thermal fault indication (SDT) alarm. This alarm indicates that the long time protection was the cause of the trip.
- Output 2 (SD4) is only available with Micrologic 5 and 6 trip units. It is assigned:
  - For Micrologic 5 trip units, to the long time pre-alarm (PAL Ir) (alarm activated as soon as the current in the load reaches 90% Ir or higher)
  - For Micrologic 6 trip units, to the ground fault indication alarm (SDG)

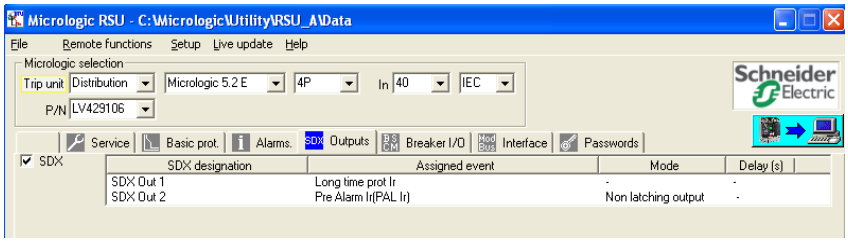
NOTE: Outputs SDT and SDG return automatically to their initial state when the device is closed.

Reconfiguring the SDx Module Outputs

Output 1 (SD2) and output 2 (SD4) can be reconfigured on site:

- Using only Micrologic 5 and 6 trip units
- Using the maintenance module
- Using the RSU software

For more details on the list of alarms and configuration options, see *Maintenance Module Connected to a PC With RSU Software, page 119* and the *Micrologic 5 and 6 trip units - User manual*.



The operating mode of the outputs can be configured:.

- Without latching
- With latching (the return to the initial state takes place via the communication bus or via the Micrologic keypad)
- Time-delayed without latching (the return to the initial state takes place at the end of the time delay)
- Forced to the closed state (the return to the initial state takes place via the communication bus or via the Micrologic keypad)
- Forced to the open state (the return to the initial state takes place via the communication bus or via the Micrologic keypad)

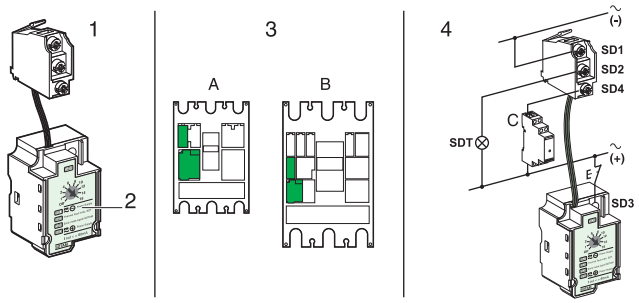
SDTAM Module (Micrologic 2 M and 6 E-M)

At a Glance

Compact NSX circuit breakers equipped with a Micrologic 2 M and 6 E-M trip unit designed to protect motors can take the SDTAM module.

The SDTAM module receives data from the Micrologic trip unit via a fiber optic link and makes available 2 inverted solid state outputs assigned to management of tripping due to overload.

Description, Installation and Connection



1 SDTAM module with output terminals
2 Rating plate
3 Slot:
A: Compact NSX 100-250
B: Compact NSX 400/630
4 Wiring diagram:
SDT: Indication
C: Contactor control

The SDTAM module cannot be installed at the same time as an MN/MX release and OF contact.

The SDTAM module and the two solid state outputs must be connected in strict accordance with the wiring diagram.

The characteristics of the SDTAM module solid state outputs are:
- Voltage: 24...415 V AC/V DC
- Current:
  - Active outputs: 80 mA max
  - Idle outputs: 0.25 mA

Output Assignment

Output 1 (SD2), normally open, is assigned to indicating thermal faults.

Output 2 (SD4), normally closed, is used to open the contactor.

They are activated 400 ms before the circuit breaker trips in the case of:
- Long time protection
- Phase unbalance protection
- Locked rotor protection (Micrologic 6 E-M)
- Undercurrent protection (Micrologic 6 E-M)

Contactor Safety Control

Contactor control by the output 2 signal (SD4) optimizes continuity of service in the application. This is also a safety feature because:

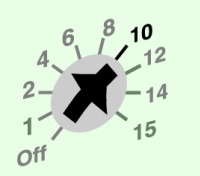
- The risks of motor deterioration are eliminated.
- Activation of the output means the application is not working normally. Abnormal operation is not caused by an anomaly or internal fault in the motor-feeder.
- The cause of this abnormal operation can be temporary (for example, a voltage drop causing an overly long starting time).

The equipment can therefore be powered up again when the cause of the overload or unbalance has disappeared.

NOTE: In order to control a contactor with a consumption exceeding 80 mA, it is necessary to provide an interface (RBN or RTBT relay).

Operating Mode

The SDTAM module incorporates an operating mode selection dial.



Following activation, the method for returning the outputs to their initial state can be:

- Manual (SDTAM switch in the OFF position) after canceling the module power supply
- Automatic (SDTAM switch on one of the time delay adjustment settings) following a time delay which can be set between 1 and 15 minutes to allow for the motor cooling time.

BSCM Module

At a Glance

The BSCM module (Breaker Status & Control Module) can be used to send the following data via the communication bus:

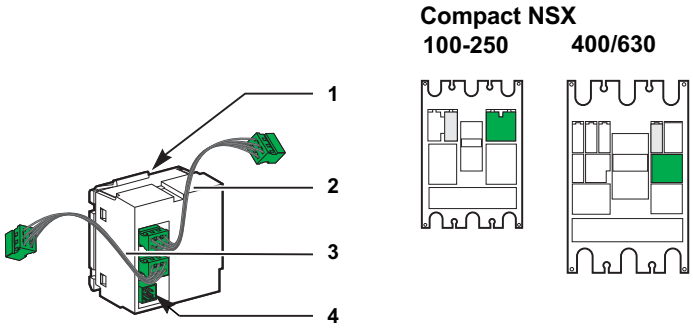
- Device states (feedback from OF, SD and SDE contacts)
- Control instructions for the communicating motor mechanism (opening, closing and resetting)
- Information to assist the operator (storage of the last 10 events)

This module can be used with all Compact NSX circuit breakers equipped with thermal-magnetic and Micrologic electronic trip units and with all Compact NSX switches.

The BSCM module must always be used:
- With the NSX cord
- When the communicating motor mechanism has been installed

Description, Installation and Connection

Installation involves plugging in the module and connecting up the different connectors.



Green: BSCM module
Gray: NSX cord

No.	Data medium	Data transmitted	Comments
1	BSCM module micro-switches	State of OF and SDE contacts	The BSCM takes the place of the auxiliary contacts in the OF and SDE slots.
2	Connector for the NSX cord	Communication bus and state of SD contact via the micro-switch on the NSX cord	The NSX cord goes in the SD slot instead of the auxiliary contact.
3	Connector for the Micrologic 5 or 6 trip unit	Communication bus	Only with Micrologic 5 and 6 trip units.
4	Connector for the communicating motor mechanism	Controlling the communicating motor mechanism Status of the communicating motor mechanism	Use the connector supplied with the communicating motor mechanism.

The BSCM module cannot be installed at the same time as an OF contact or the SDE contact.

The BSCM module can be installed on site.

Setting Up the BSCM Module

Setting up the BSCM module on the communication bus requires no addressing.

LED indication on the BSCM module confirms that the BSCM module is working.

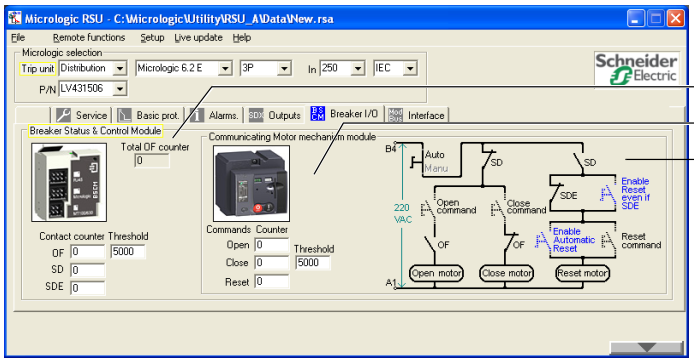
LED indication	Information
ON: 50 ms/OFF: 950 ms	Correct operation
ON: 250 ms/OFF: 250 ms	Addressing error
ON: 1000 ms/OFF: 1000 ms	Communication test (test button on the Modbus interface module)
ON: 500 ms/OFF: 500 ms	No communication with other modules
ON continuously	Internal error on the BSCM module
OFF continuously	BSCM module de-energized

Data Sent and Configuration of the BSCM Module

The BSCM module can be accessed and configured on site:

- Using the RSU software
- Using a PC connected to the maintenance module, itself connected:
  - To the trip unit test port (Micrologic 5 and 6 trip units)
  - Or to the RJ45 socket of a ULP module (Modbus communication interface module or front display module FDM121)

The BSCM module sends data on the operational states of the Compact NSX circuit breaker and its communicating motor mechanism (if present) in the BSCM Breaker I/O tab.



1 Data made available to all devices equipped with a BSCM module
2 Additional data made available to devices equipped with a BSCM module and a communicating motor mechanism
3 Simplified schematic of communicating motor mechanism

For more details on the list of alarms and configuration options, see *Maintenance Module Connected to a PC With RSU Software, page 119* and the *Micrologic 5 and 6 trip units - User manual*.

Data Made Available by the BSCM Module

For all Compact NSX circuit breakers, the BSCM module provides the following information:

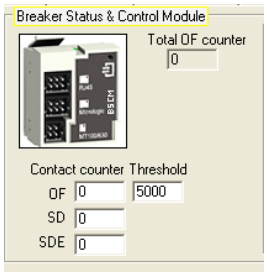
Information	Configurable
Count of the total number of times the Compact NSX circuit breaker opens and closes (count of OF contact operations). This counter (totalizer) cannot be reset.	No
Count of the total number of times the Compact NSX circuit breaker opens and closes (count of OF contact operations) (1)	Yes
Maximum number of times the device can open and close (2)	Yes
Count of the number of fault trips by the Compact NSX circuit breaker (count of SD contact operations) (1)	Yes
Count of the number of electrical fault trips by the Compact NSX circuit breaker (count of SDE contact operations) (1)	Yes
(1) The user can modify the content of the counter if, for example, the BSCM module is replaced or the BSCM module is installed during operation. (2) Overshooting the threshold results in a medium priority alarm. To acknowledge this fault: • Modify the content of the counter • Or modify the value of the threshold	

In addition to the previous information, for Compact NSX circuit breakers equipped with a communicating motor mechanism, the BSCM module provides the following information:

Information	Configurable
Count of the number of times the communicating motor mechanism opens (1)	No
Count of the number of times the communicating motor mechanism closes (1)	Yes
Maximum number of times the communicating motor mechanism closes (2)	Yes
Count of the number of times the communicating motor mechanism resets (1)	Yes
(1) The user can modify the content of the counter if, for example, the BSCM module is replaced or the BSCM module is installed during operation. (2) Overshooting the threshold results in a medium priority alarm. To acknowledge this fault: • Modify the content of the counter • Or modify the value of the threshold	

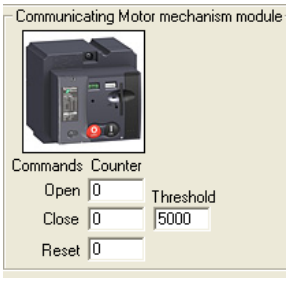
Configuring the Thresholds

In the **Breaker I/O** tab, select the **Breaking Status & Control Module** window.



In the **Threshold** window, indicate the maximum number of times the device can open and close (for example, maximum number of operations before level IV maintenance (see *Maintaining the Compact NSX During Operation, page 131*)).

In the **Breaker I/O** tab, select the **Communicating Motor mechanism module** window (left-hand side).

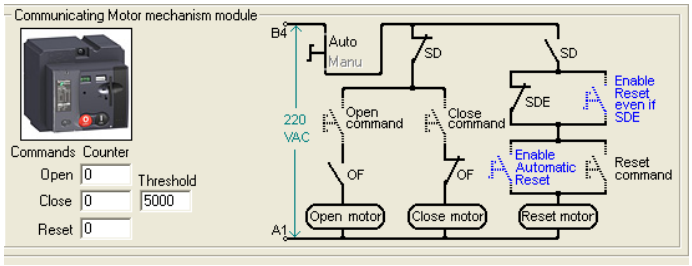


In the **Threshold** window, indicate the maximum number of closures that must not be exceeded for the communicating motor mechanism.

For more details on the maintenance indicators for Micrologic trip units associated with a BSCM module, see the *Micrologic 5 and 6 trip units - User manual*.

Configuring Resetting of the Communicating Motor Mechanism

In the **Breaker I/O** tab, select the **Communicating Motor mechanism module** window (schematic on the right-hand side).



- Clicking on the blue switch **Enable Reset even if SDE** on the schematic (the blue switch closes) authorizes resetting of the mechanism via the communication bus even after an electrical fault trip.
- Clicking on the blue switch **Enable Automatic Reset** (the blue switch closes) authorizes automatic resetting after tripping by the MN, MX release or push to trip button.
- Clicking on the 2 blue switches **Enable Reset even if SDE** and **Enable Automatic Reset** (both blue switches close) authorizes **automatic** resetting even after an electrical fault trip.

⚠ CAUTION
RISK OF REPEATED CLOSING ON ELECTRICAL FAULT
Only a trained specialist is authorized to reconfigure the BSCM module.
Failure to follow these instructions can result in injury or equipment damage.

NSX Cord

At a Glance

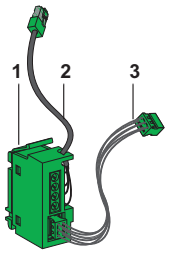
The NSX cord connects a Compact NSX circuit breaker to the communication bus.

The NSX cord can be used:
- On its own for communicating measurements and settings (only with Micrologic 5 and 6 trip units)
- Or with a BSCM module:
  - For communicating measurements and settings (only with Micrologic 5 and 6 trip units)
  - For communicating states (with all types of trip unit)

For more details on integrating Compact NSX communication functions, see the *ULP system - User manual* and the *Modbus - User manual*.

Description

The NSX cord consists of a junction box, a cable equipped with an RJ45 connector and a cable equipped with a screw terminal block.

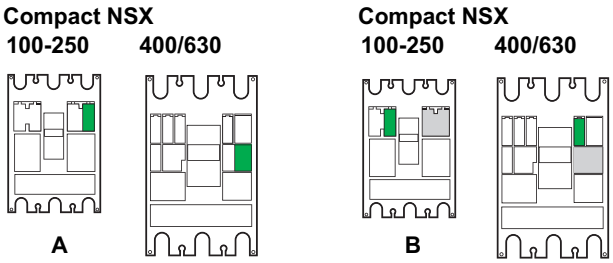
Graphic	No.	Data medium	Data transmitted	Comments
	1	NSX cord micro-switch	State of SD contact	The NSX cord goes in the SD slot instead of the auxiliary contact.
	2	Cable equipped with an RJ45 connector for the Modbus communication interface module or the front display module FDM121	Communication bus	3 cable lengths are available: 0.3 m, 1.3 m and 3 m.
	3	Internal link to the Micrologic trip unit (5 or 6) or the BSCM module	Communication bus	With the BSCM module, the NSX cord also transmits the Compact NSX circuit breaker states.

The NSX cord also provides the 24 V DC power supply:
- For the Micrologic 5 or 6 trip unit (without BSCM module)
- Or for the BSCM module (when this module is installed)

The NSX cord cannot be installed at the same time as the SD contact.

Installation

The figure below illustrates installation of an NSX cord:



A NSX cord used on its own
B NSX cord used with a BSCM module
Green: NSX cord
Gray: BSCM module

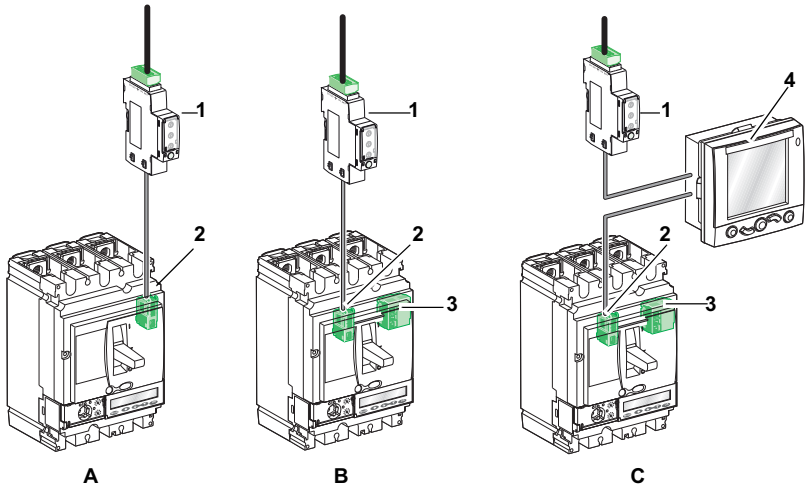
The NSX cord can be installed on site.

Connection

The NSX cord connects:

- Directly to the Modbus communication interface module
- Or via the front display module FDM121 (see the *Micrologic 5 and 6 trip units - User manual*)

The figure below illustrates the connections from the NSX cord to the Modbus communication interface module or the front display module FDM121:



A NSX cord (no. 2) on its own connected directly to the Modbus communication interface module (no. 1)

B NSX cord (no. 2) connected to the BSCM module (no. 3) and directly to the Modbus communication interface module (no. 1)

C NSX cord (no. 2) connected to the BSCM module (no. 3) and to the Modbus communication interface module (no. 1) via the front display module FDM121 (no. 4)

Isolated NSX Cord

At a Glance

For applications > 480 V AC, an isolated variant of the NSX cord needs to be used, terminated by an electronic module with a female RJ45 connector. A ULP cord must be used to connect the isolated NSX cord electronic module to a ULP module.

The reference for the isolated NSX cord is LV434204.

The isolated NSX cord electronic module must be supplied with 24 V DC in order to guarantee isolation of the ULP system.

Electronic Module Characteristics

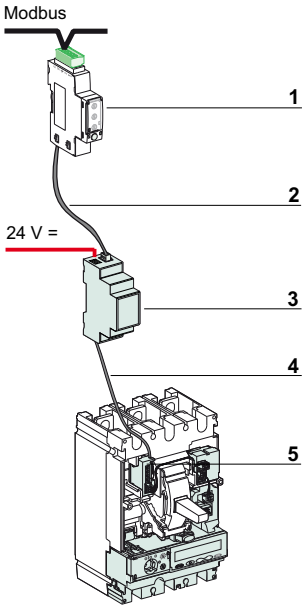
The table below summarizes the electronic module characteristics:

Characteristic	Value
Dimensions	27 x 27 x 27 mm
Mounting	On DIN rail
Degree of protection of the installed module	• On the front panel (wall-mounted enclosure): IP40 • On the connections (behind the enclosure door): IP20
Operating temperature	-25...+70°C
Power supply voltage	24 V DC -20%/+10% (19.2...26.4 V DC)
Consumption	• Typical: 20 mA/24 V DC at 20°C • Maximum: 30 mA/19.2 V DC at 60°C

Isolated NSX cord Connection

The isolated NSX cord connects:
- Directly to the Modbus communication interface module
- Or via the front display module FDM121 (see the *Micrologic 5 and 6 trip units - User manual*)

The figure below illustrates the connections from the isolated NSX cord to the Modbus communication interface module:

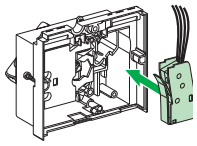
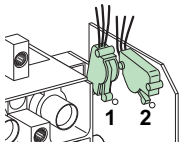


1 Modbus communication interface module
2 ULP cord
3 Electronic module, with female RJ45 connector
4 1.3 m cord
5 Compact NSX internal connector

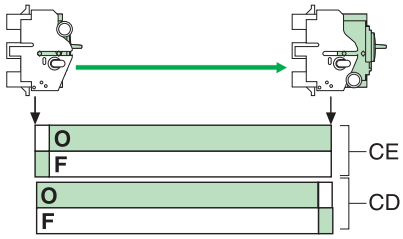
Control Auxiliaries

Control and Indication Contacts Installed Outside the Case

Control and indication contacts installed outside the case are contacts for specific applications (see *Compact NSX Catalog*).

CAM contacts 	**Early-operation contacts** These contacts are installed in the rotary handle: ● Early-make contacts (CAF1, CAF2) are actuated before the poles close when a circuit breaker manual command is given. ● The early-break changeover contact (CAO1) is actuated before the poles open when a circuit breaker manual command is given.
Carriage switches 	**Connected (CE)/Disconnected (CD) carriage switches** These changeover contacts are installed on the chassis. They indicate the position of the circuit breaker in the chassis: **1.** Connected-position carriage switch (CE) **2.** Disconnected-position carriage switch (CD)

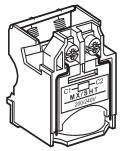
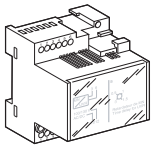
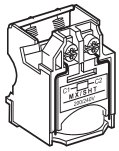
Operation of connected/disconnected carriage switches



CD Disconnected position carriage switch
CE Connected position carriage switch

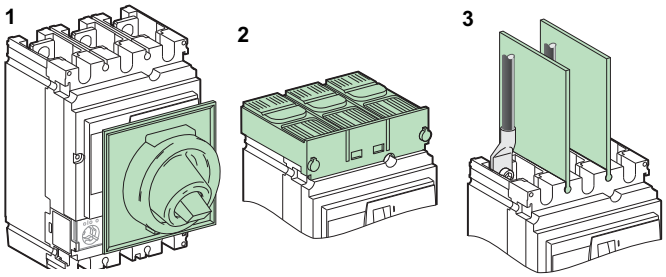
Voltage Releases

Voltage releases are used to trip circuit breakers deliberately by means of an electrical signal. These auxiliaries are installed in the case under the front face. The characteristics of these auxiliaries comply with the recommendations of standard IEC 60 947-2.

MN release 	**Undervoltage release** This release is used to: ● Trip the Compact NSX circuit breaker when the supply voltage is less than 0.35 times nominal voltage Un. If the voltage is between 0.35 and 0.7 times the rated voltage Un, opening is possible but not guaranteed. Above 0.7 times the rated voltage Un, opening is impossible. ● Close the circuit breaker again once the voltage reaches 0.85 times the rated voltage. This type of voltage release is used for failsafe emergency stops.
Time-delay unit 	**Time-delay unit for MN release** This auxiliary eliminates nuisance tripping of an undervoltage release due to transient voltage dips lasting < 200 ms. There are 2 types of time-delay unit: adjustable or non-adjustable.
MX release 	**Shunt release** This release causes the Compact NSX circuit breaker to open on the appearance of a voltage exceeding 0.7 times the rated voltage.

Other Accessories

Accessories for Safety and Ease of Operation

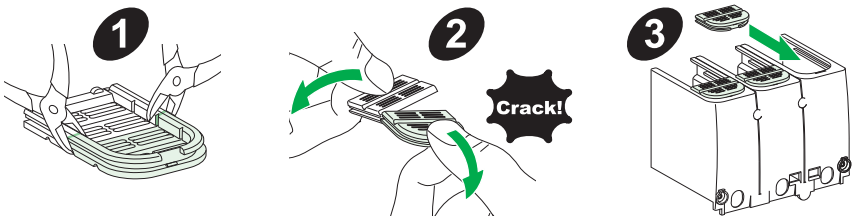


A comprehensive accessories offer is available for your Compact NSX circuit breaker; these can be easily installed on site to improve safety and ease of operation:

1. Sealed boot for the toggle switch, providing IP43 protection on the front
2. Short or long terminal shields, providing IP40 protection
3. Flexible interphase barriers improving isolation between power connections

For more details on the accessories offer, see the *Compact NSX Catalog*.

Terminal Shields with Precut Grids



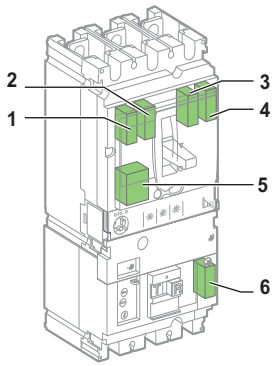
1 Cutting a grid
2 Adjusting the size of the grid
3 Inserting the grid in the terminal shield

Terminal shields with precut grids simplify the onsite connection of circuit breakers regardless of the number of conductors to be connected (see *Instruction Sheet).*

Summary Tables of Auxiliaries

Slots for Control and Indication Auxiliaries on Compact NSX 100-250

The table below shows the possible slots for the auxiliary contacts, electronic indication modules and control auxiliaries mounted in the case (for further details see the *Compact NSX Catalog*):



The choice of auxiliaries depends on the functions desired. This choice is exclusive: only one auxiliary per slot.

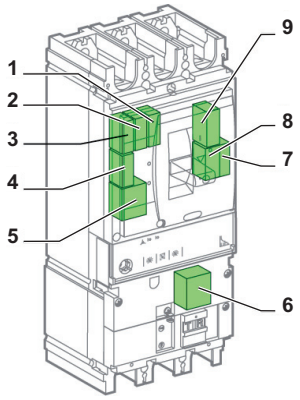
Compact NSX 100-250							
Name	**Slot**						**Comments**
	1	**2**	**3**	**4**	**5**	**6**	
Standard remote indication and control auxiliaries							
OF1	■						All these auxiliaries can be installed regardless of: ● The trip unit type ● The control type (toggle switch, rotary handle or motor mechanism)
OF2				■			
SD		■					
SDE			■				
SDV						■	
MN					■		
MX					■		
Specific remote indication (Micrologic trip units)							
SDx or SDTAM	■				■		These auxiliaries are designed for Micrologic trip units.
24 V DC power supply terminal block				■			
Communication							
BSCM			■	■			These auxiliaries send OF, SDE (BSCM) and SD (NSX cord) data to the communication bus.
NSX cord		■					
Communication with Modbus communication interface module (Micrologic trip unit)							
NSX cord				■			This auxiliary is designed for Micrologic trip units.

Example:

The SDx remote indication option cannot be installed at the same time as an MN or MX release and the OF1 contact.

Slots for Control and Indication Auxiliaries on Compact NSX 400/630

The table below shows the possible slots for the auxiliary contacts, electronic indication modules and control auxiliaries mounted in the case (for further details see the *Compact NSX Catalog*):

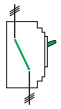
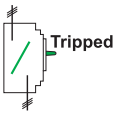
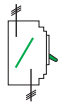


Compact NSX 400/630 circuit breakers are exclusively equipped with Micrologic trip units.

Compact NSX 400/630										
Name	**Slot**									**Comments**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Standard remote indication and control auxiliaries										
OF1			■							
OF2		■								All these auxiliaries can be installed regardless of: ● The trip unit type ● The control type (toggle switch, rotary handle or motor mechanism)
OF3	■									
OF4							■			
SD									■	
SDE								■		
SDV						■				
Reserved				■						
MN					■					
MX					■					
Specific remote indication										
SDx or SDTAM				■	■					These auxiliaries are designed for Micrologic trip units.
24 V DC power supply terminal block							■			
Communication										
BSCM							■	■		These auxiliaries send OF, SDE (BSCM) and SD (NSX cord) data to the communication bus.
NSX cord									■	
Communication with Modbus communication interface module (Micrologic trip unit)										
NSX cord							■			This auxiliary is designed for the Micrologic trip unit.

Operation of the Auxiliary Indication Contacts

The table below shows the position of the indication contacts (or outputs) in relation to the position of the actuator and the main contacts.

		Position of the actuator and the main contacts								
		 **ON**	 **Tripped by:**							 **OFF**
			MN/MX	**PT (2)**	**Trip unit (3)** **L**	**S or So**	**I**	**V**	**G**	
Name		**Position of indication contacts**								
OF		■								
SD			■	■	■	■	■	■	■	
SDE					■	■	■	■	■	
SDV								■		
SDx outputs (1)										
SD2	SDT				■					
SD4	PAL				■					
	SDG								■	
SDTAM outputs										
SD2	Early make/break SDT				□					
SD4		Contactor control								

(1) Default SDx output assignment, user-definable for Micrologic 5/6 trip units with the RSU software
PT: Push to trip

(2) ● L: Long time protection

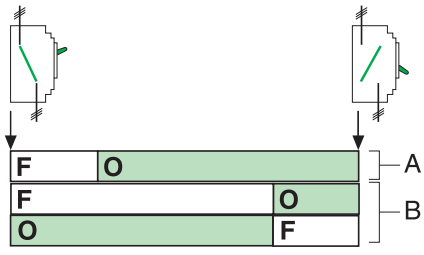
(3) ● S or So: Short time protection
● I: Instantaneous protection
● V: Vigi protection
● G: Ground fault protection

■ : Contact closed, □ : Early-make output (400 ms)

NOTE: The indication auxiliary (changeover) contacts are represented in the switchboard by the state of the Normally Open (NO) contact.

The state of the NO contact is open:
- For OF contacts, when the circuit breaker is in the O (OFF) position
- For SD, SDE and SDV contacts, when the associated function is not active

Sequence chart of the OF contacts relative to the main contacts



A Main contacts
B Position of OF changeover contacts

Description of Trip Units

3

Aim

This chapter describes the adjustment, metering, indication and communication functions of the Micrologic thermal-magnetic and electronic trip units in the Compact NSX range.

What's in this Chapter?

This chapter contains the following sections:

3.1 Fault Currents and Trip Units

Aim

This section describes the main definitions and characteristics of fault currents.

What's in this Section?

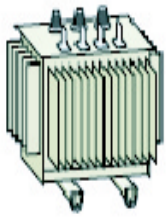
This section contains the following topics:

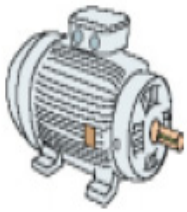
Applications

The Two Main Types of Application Requiring Protection

Compact NSX circuit breaker trip units offer protection for all applications due to the great flexibility of their settings.

Two types of application are generally taken into consideration:
- Electrical distribution protection
- Special protection for receivers (motors, transformers, etc.) or generators





Fault Currents in Electrical Distribution

The Four Fault Current Types That Need to be Taken Into Account

There are four types of fault current, divided into two categories:

- The overcurrent category:
  - Overload currents
  - Short-circuit currents
- The ground fault category:
  - Low intensity ground faults
  - High intensity ground faults

The Overcurrent Category

The main characteristics and associated risks are described below:

- Overload currents:
  These are mainly due to problems with excessive loads on receivers. For example operating too many consumers in a workshop at the same time (lighting, heating, power) can bring about an electrical distribution overload.
  The main risks from overload currents are a gradual deterioration in equipment, or a fire.
- Short-circuit currents:
  These can be due to a deterioration in the plant or within a receiver, for example a short-circuit between two phases in the winding of a motor being operated in severe conditions (vibration, damp and/or corrosive atmosphere).
  The risks associated with short-circuit currents are the instantaneous deterioration of equipment, a fire or even an explosion due to the high energy level at the site of the fault.

The Ground Fault Category

Ground faults can be due to abnormal aging of the plant, of a load or conductors, that have deteriorated in damp conditions.

The intensity of such fault currents depends on the ground connection diagram used. These currents can be:

- Very low in value, i.e. well below the rated feed current in the TT system (these are known as leakage currents or residual ground fault currents)
- High in value, i.e. identical to a short-circuit current in the TN-S system (these are known as ground fault currents)

Whatever the value of ground leakage currents, they present a very grave risk of electrocution or fire.

Protection Against Overcurrents in Electrical Distribution

Compact NSX Circuit Breaker Overcurrent Trip Units

Compact NSX circuit breaker trip units are designed to handle overcurrents (overload currents and short-circuit currents) and in certain cases ground fault currents.

- Pick-up adjustments are calculated relative to the downstream circuit to be protected.
- Time delay adjustments are calculated in relation to the protection management (coordination).

NOTE: The protection plan is based on coordination of the protections - and in particular on discrimination. This can be achieved by time delays (time-related discrimination) while complying with ammeter- and power-related discrimination rules.

There are two types of trip unit:

- Thermal-magnetic trip units for Compact NSX 100-250 circuit breakers
- Micrologic electronic trip units for Compact NSX 100-630 circuit breakers

Standard Settings for Overcurrent Protections

Standard IEC 60947-2 states the trip characteristics at the circuit breaker limits.

The table below summarizes the recommendations of standard IEC 60947-2 for the circuit breaker's protection function:

Long time protection

Long time protection of the *inverse time* type (with I^2t constant):
● No trip for a current below 105% of Ir
● Trip in less than two hours for a current equal to:
  ● 120% of Ir for an electronic trip unit
  ● 130% of Ir for a thermal-magnetic trip unit
For a higher fault current, the trip time is inversely proportional to the fault current value.

Short time protection
Short time protection is *definite time*: ● No trip for a current below 80% of the short time setting ● Trip for a current equal to 120% of the short time setting The trip time is: ● Less than 0.2 s for a short time protection with no time delay ● Equal to the value of the time delay tsd for a protection with time delay
Instantaneous protection
Instantaneous protection is *definite time*: ● No trip for a current below 80% of the instantaneous setting ● Trip for a current equal to 120% of the instantaneous setting The trip time is less than 0.2 s.

Conductors to be Protected: The Neutral Conductor

The installation rules closely define the type of protection to be used having regard to:

- Potential overcurrents (overloads and short-circuits)
- Conductors to be protected
- Simultaneous cutoff of all conductors including the neutral conductor (multi-pole breaking)

NOTE: All three of the phase conductors must be protected at all times. The neutral conductor (if it is distributed and identical to the phases in size, i.e. full neutral) is normally protected by the phase protection.

Description of the Neutral Protection

The neutral must have specific protection if:
- It is reduced in size compared to the phases
- Nonlinear loads generating third order harmonics and multiples thereof are installed

It may be necessary to cut off the neutral for functional reasons (multiple source diagram) or safety reasons (working with power off).

To summarize, the neutral conductor can be:
- Non-distributed (3P)
- Distributed, not cut off and not protected (3P)
- Distributed, not cut off but protected (3P with ENCT option) (see *Micrologic 5 and 6 trip units - User manual*)
- Distributed, cut off and protected (4P)

Compact NSX trip units are suitable for all protection types.

Compact NSX	Possibilities	Neutral protection
3P	3P, 3D	None
3P + ENCT	3P, 3D	None
	3P, 3D + N/2	Half neutral
	3P, 3D + N	Full neutral
	3P, 3D + OSN (1)	Oversized neutral
4P	4P, 3D	None
	4P, 3D + N/2	Half neutral
	4P, 4D	Full neutral
	4P, 4D + OSN (1)	Oversized neutral
(1) OSN (OverSized Neutral) protection is used when high third harmonic (and multiples of the third harmonic) currents are present. OSN protection is installed on Micrologic 5 and 6 trip units (see *Micrologic 5 and 6 trip units - User manual*).		
P: Breaking pole, D: Pole protected by the trip unit, N: Neutral protection.		

Protection Against Ground Faults

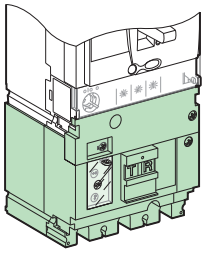
At a Glance

Protection against ground faults is provided by:
- Earth leakage protection in the case of low intensity fault currents (fault current limitation is linked to ground connection diagram TT)
- Ground fault protection in the case of high intensity fault currents (this protection can be used only with ground connection diagram TN-S)

Earth Leakage Protection

The Vigi module, which is external to the trip unit, is specifically designed to provide earth leakage protection. This module can be installed on Compact NSX circuit breakers equipped with either a thermal-magnetic trip unit or a Micrologic electronic trip unit.

Vigi module installed on a Compact NSX circuit breaker



Setting the Earth Leakage Protection

Installation standards require or recommend particular sensitivity and trip time values for earth leakage protection:

Type of protection	**IΔn**	**Δt**	**Installation standards**
Protection against direct contact	≤ 30 mA	≤ 40 ms (1)	Required
Fire protection	≤ 300 mA or ≤ 500 mA	≤ 40 ms (1)	Required if necessary
Protection against indirect contact	IΔn	≤ 1 s	Lowest possible recommended values of IΔn and Δt (the value of IΔn depends on the ground resistance)
(1) Value of Δt for a fault current ≥ 10 IΔn			

Ground Fault Protection

Ground fault protection is incorporated in Micrologic 6 trip units (see *Micrologic 5 and 6 trip units - User manual*.

Setting the Ground Fault Protection

Installation standards (in particular the NEC - National Electrical Code - defining installation rules in the USA) require or recommend the pick-up and trip time values for ground fault protection.

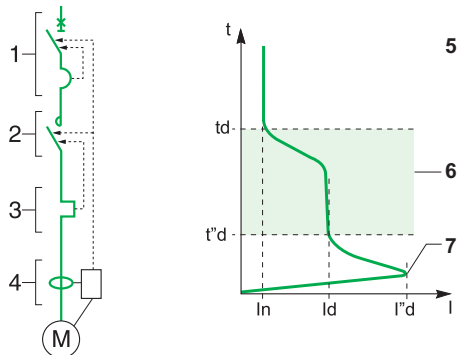
Location	**Ig**	**tg**	**NEC**
On the incoming supply to the low voltage distribution (and for In > 1,000 A)	≤ 1,200 A	–	Required
	≤ 3,000 A	≤ 1 s	Required
Downstream of the low voltage distribution	Ig	–	Lowest possible recommended values for Ig

Protection for Motor-Feeders

Structure of a Motor-Feeder

Direct-on-line starting is the most widely used type of motor-feeder.

The direct-on-line starting motor-feeder can comprise up to four different items of switchgear providing one or more functions. It must also incorporate the specific characteristics of the application.



1 Switchgear for short-circuit protection
2 Control gear
3 Switchgear for overload protection
4 Switchgear for ground fault protection
5 Characteristic t = f(I) of an asynchronous D.O.L. starting motor
6 Starting phase
7 Current peak on activation

Characteristics Defined by Standard IEC 60947-4-1

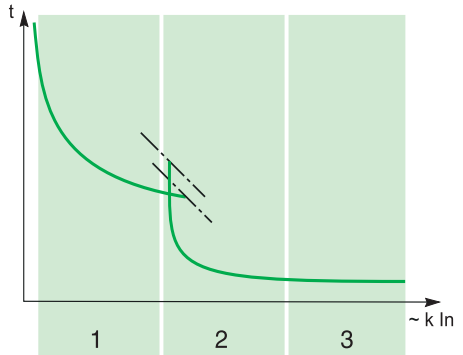
A motor-feeder must satisfy the general rules of standard IEC 60947-4-1, in particular the rules concerning the protection of contactors and motor-feeders.

In the matter of protection, this standard defines:
- Coordination of motor-feeder protections
- Thermal relay trip classes
- Insulation coordination

Coordination According to Standard IEC 60947-4-1

Two types of coordination are allowed - type 1 coordination or type 2 coordination.
- In type 1 coordination, deterioration of the contactor and relay is accepted under the 2 following conditions:
  - The contactor or starter does not represent a danger to people or installations.
  - The starter can operate correctly when parts have been repaired or replaced.
- In type 2 coordination, some slight welding of the contactor or starter contacts is allowed if, following type 2 coordination tests:
  - They are easy to separate
  - The control and protection switchgear functions then work without the need for repair

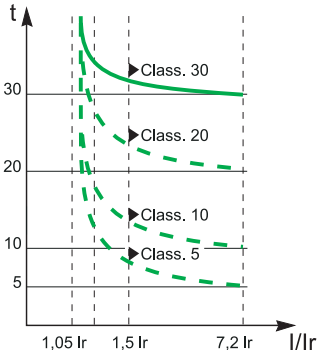
To ensure type 2 coordination, standard IEC 60947-4-1 lays down three Id fault current tests intended to check that the equipment behaves correctly in overload and short-circuit conditions.



1 Overload zone Id < 10 In
2 Impedant short-circuit zone 10 In < Id < 50 In
3 Short-circuit zone Id > 50 In

Thermal Relay Trip Classes

The four thermal relay trip classes are 5, 10, 20 and 30 (values correspond to the maximum relay trip time in seconds at 7.2 In).



Standard trip time values

Class	1.05 In	1.2 In	1.5 In	7.2 In
5	t > 2 h	t < 2 h	t < 2 min	0.5 s ≤ t ≤ 5 s
10	t > 2 h	t < 2 h	t < 4 min	4 s ≤ t ≤ 10 s
20	t > 2 h	t < 2 h	t < 8 min	6 s ≤ t ≤ 20 s
30	t > 2 h	t < 2 h	t < 12 min	9 s ≤ t ≤ 30 s

Classes 5 and 10 are most commonly used. Classes 20 and 30 concern applications in which motor starting conditions are difficult.

Additional Protection

Depending on the application and the operating constraints, additional protection may be required concerning:

- Phase unbalance or phase loss
- Locked rotor
- Undercurrent
- Long starts

Compact NSX Motor Circuit Breakers

Compact NSX motor circuit breakers incorporate MA thermal-magnetic trip units and Micrologic type M electronic trip units.

Protection functions by trip unit type

Protection	Trip unit type			
	MA	Micrologic 1.3 M	Micrologic 2 M	Micrologic 6 E-M
Overloads	–	–	■	■
Short-circuits	■	■	■	■
Insulation faults (ground fault protection)	–	–	–	■
Phase unbalance or phase loss	–	–	■	■
Locked rotor Undercurrent Long starts	–	–	–	■ ■ ■

The protection against insulation faults in the Micrologic 6 E-M trip unit is the ground fault protection type.

Type 1 and 2 coordination tests have been carried out with motor-feeder components in respect of all Compact NSX motor circuit breakers.

Trip classes by trip unit type

	Trip unit type			
Class	MA	Micrologic 1.3 M	Micrologic 2 M	Micrologic 6 E-M
5	–	–	■	■
10	–	–	■	■
20	–	–	■	■
30	–	–	–	■

Trip Unit Long Time Protection

The pick-up setting Ir for trip unit long time protection is expressed in amperes:
- This value corresponds to the operating current used in the motor application
- The maximum Ir setting corresponds to the trip unit rating In

3.2 TM-D, TM-G Thermal-Magnetic and MA Magnetic Trip Units

Aim

This section describes the thermal-magnetic trip units. These trip units are mounted on Compact NSX circuit breakers rated 100 A, 160 A and 250 A.

What's in this Section?

This section contains the following topics:

Characteristics of Thermal-Magnetic Trip Units

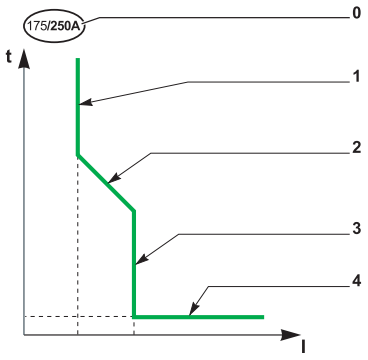
At a Glance

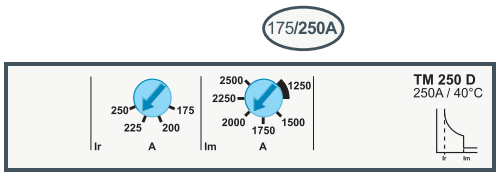
Thermal-magnetic trip units are designed to provide protection for distribution or for specific applications.

Identification	Type of protection
TM-D	Thermal-magnetic trip unit
TM-G	Thermal-magnetic trip unit with low pick-up (for protecting generators, very long feeds)
MA	Magnetic-only trip unit (for protecting motors, transformers, etc.)

Accessible Protections and Settings

The adjustment dials are on the front of the trip units.

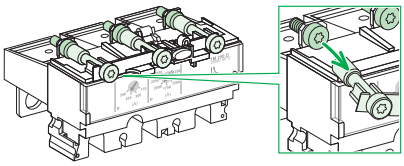




No.	Parameter	Description	Type		
			TM-D	TM-G	MA
0	In	Trip unit setting range: minimum setting/maximum setting = trip unit rating In	□	□	□
1	Ir	Thermal protection pick-up	■	■	–
2	tr	Thermal protection time delay	□	□	–
3	Im	Magnetic protection pick-up	☒	□	■
4	tm	Magnetic protection time delay	□	□	□
■ : Adjustable, □ : Non-adjustable, ☒ : Adjustable or non-adjustable according to the trip unit rating, – : Not present					

Upgradability of Thermal-Magnetic Trip Units

Onsite swapping of trip units is simple and safe:
- No connections to make
- No special tools (e.g. calibrated torque wrench)
- Compatibility of trip units ensured by mechanical cap
- Torque limited screw ensures safe mounting (see drawing below)

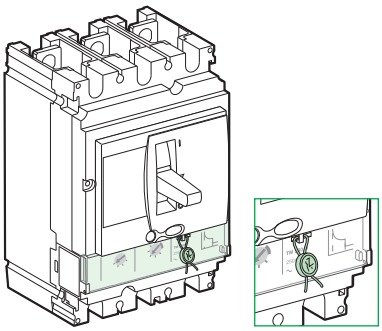


The safety of the swapping process eliminates the risk of incorrect tightening or oversights. The simplicity of the swapping process means it is easy to make the necessary adjustments as operation and maintenance processes evolve.

NOTE: When the trip unit has been mounted by this means, the trip unit can still be removed: the screw head is accessible.

Sealing the Protection

The transparent cover on thermal-magnetic trip units can be sealed to prevent modification of the protection settings.



TM-D Thermal-Magnetic Trip Unit

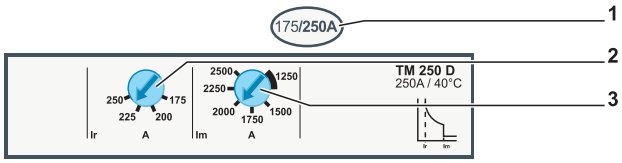
At a Glance

The TM-D thermal-magnetic trip unit is designed to protect conductors in commercial and industrial electrical distribution.

This trip unit exists in two versions - (3P, 3D) and (4P, 3D).

Description

The adjustment dials are on the front of the trip unit.

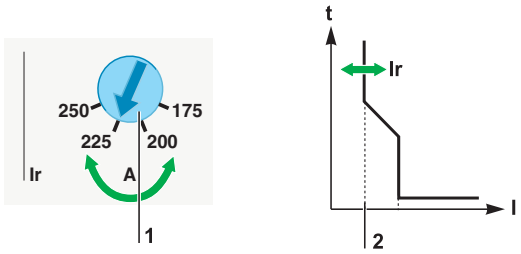


1 Setting range for the TM-D thermal-magnetic trip unit
2 Adjustment dial for the thermal protection pick-up Ir
3 Adjustment dial for the magnetic protection pick-up Im (for TM-D 200/250 only)

Setting the Thermal Protection

The thermal protection pick-up Ir is set by a 4-setting dial.

Turning the thermal protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Ir (in amperes) for thermal protection (values indicated on the dial) with respect to every trip unit rating, relative to the position of the dial Ir.

Trip unit rating In (A)											
16	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
Pick-up Ir (A)											
11	18	22	28	35	44	56	70	88	112	140	175
13	20	26	32	40	50	64	80	100	128	160	200
14	23	29	36	45	57	72	90	113	144	180	225
16	25	32	40	50	63	80	100	125	160	200	250

Setting the Magnetic Protection

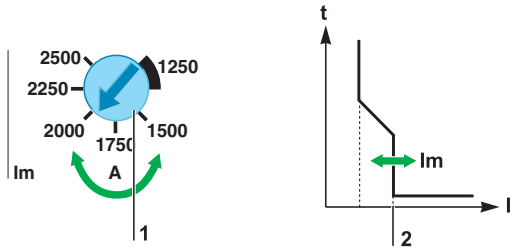
For trip units rated below 200 A, the magnetic protection pick-up cannot be adjusted and equals the value shown below:

For all case types	Trip unit rating In (A)									
	16	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Pick-up Im (A)	190	300	400	500	500	500	640	800	1250	1250

The precision range is +/- 20%.

For trip units rated between 200 A and 250 A, the magnetic protection pick-up Im is set using a 6-setting dial.

Turning the magnetic protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Im (in amperes) for magnetic protection (values indicated on the dial), relative to the position of the Im dial:

Trip unit rating In (A)	
200	**250**
Pick-up Im (A)	
1000	1250
1200	1500
1400	1750
1600	2000
1800	2250
2000	2500

The precision range is +/- 20%.

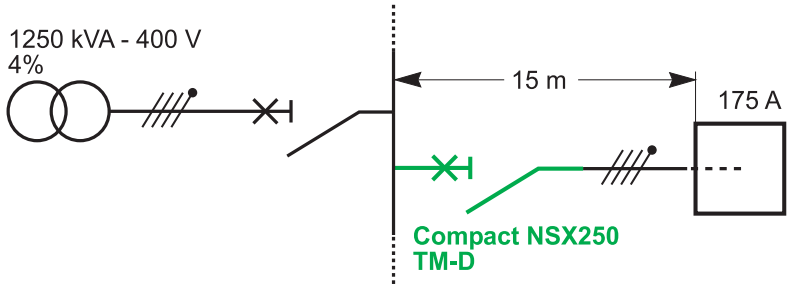
Example of Application

Protection of a feed with the following characteristics:

- Power supplied by a 1,250 kVA transformer - 400 V, 4%
- Protection of a distribution box located 15 m away, the loads on which are mainly for lighting (incandescent bulbs), heating and small machines

The value of the calculated rated current (load consumption) is In = 175 A.

Installation diagram



Calculations performed on the installation in accordance with the regulations can be used to determine the characteristics of the appropriate Compact NSX to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen Compact NSX	Comments
In = 175 A	Compact NSX 250	Determination of case size
Distributed neutral	4P, 3D	Full neutral and linear loads
Isc = 28.5 kA	F	Icu performance can be read from rating plate
Ikmin = 14.0 kA	–	–

Trip unit protection settings

Installation	Chosen trip unit	Comments
In = 175 A	TM-D 200, Ir set to 180	Optimizing the choice
	TM-D 250, Ir set to 175	Necessary if extensions envisaged
Ikmin = 14.0 kA	Im = 2,000 A or 2,500 A	Natural adjustment to the Im protection for distribution, compatible with: ● Inrush currents (no trip) ● Short-circuit protection (trip)

TM-G Thermal-Magnetic Trip Unit

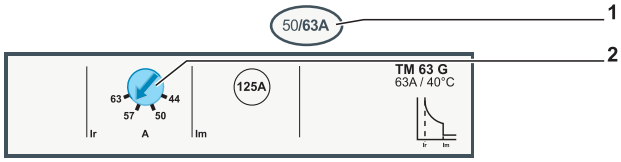
At a Glance

The TM-G thermal-magnetic trip unit has low thermal and magnetic pick-ups. It is designed to protect long conductors and/or distribution systems powered by generators.

There is one version of this trip unit (3P, 3D).

Description

The adjustment dial is on the front of the trip unit.

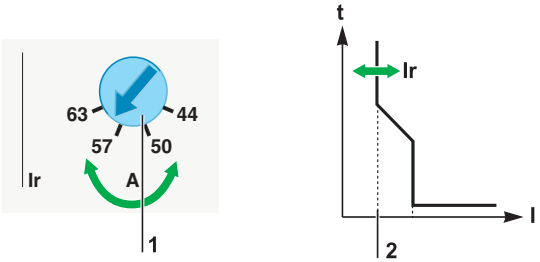


1 Setting range for the TM-G thermal-magnetic trip unit
2 Adjustment dial for the thermal protection pick-up Ir

Setting the Thermal Protection

The thermal protection pick-up Ir is set by a 4-setting dial.

Turning the thermal protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Ir (in amperes) for thermal protection (values indicated on the dial) with respect to every trip unit rating, relative to the position of the dial Ir.

Trip unit rating In (A)			
16	**25**	**40**	**63**
Pick-up Ir (A)			
11	18	28	44
13	20	32	50
14	23	36	57
16	25	40	63

Setting the Magnetic Protection

The magnetic protection pick-up Im cannot be adjusted and equals the value shown below:

	Trip unit rating In (A)			
	16	**25**	**40**	**63**
Pick-up Im (A)	64	80	80	125

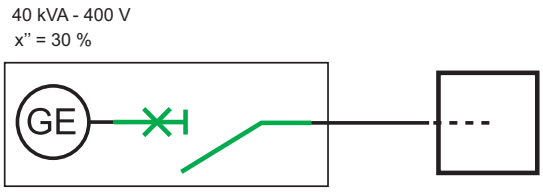
The precision range is +/- 20%.

Example of Application

Protection of an incoming feed with the following characteristics:

- Power supplied by a generator defined by:
  - Generator power 40 kVA - 400 V, giving an operating current of 58 A
  - Subtransient reactance: 30%
- Generator protection. The loads mainly consist of heating and lighting (incandescent bulbs). The neutral is distributed.

Installation diagram



Compact NSX100
TM-G

Calculations performed on the installation in accordance with the regulations have determined the characteristics of the appropriate Compact NSX to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen Compact NSX	Comments
In = 57 A	Compact NSX 100	Determination of case size
Distributed neutral	4P, 3D	Full neutral and linear loads
Isc = 0.3 kA	B	Icu performance can be read from rating plate
Ikmin = 0.25 kA	TM-G	Generator protection circuit breaker

Trip unit protection settings

Installation	Chosen trip unit	Comments
In = 57 A	TM-G 63, Ir set to 57	Thermal protection Ir setting
Ikmin = 0.25 kA	Im =125 A	Low pick-up magnetic protection Im cannot be adjusted

MA Magnetic Trip Unit

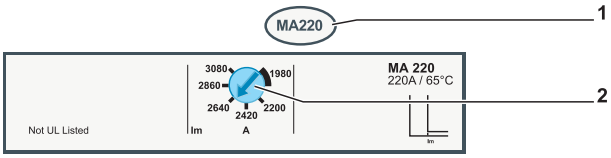
At a Glance

The MA trip unit has a high magnetic pick-up. It is designed to provide motor-feeders with short-circuit protection.

The MA trip unit can be used to create a type 1 or type 2 coordination motor-feeder.

Description

The adjustment dial is on the front of the trip unit.

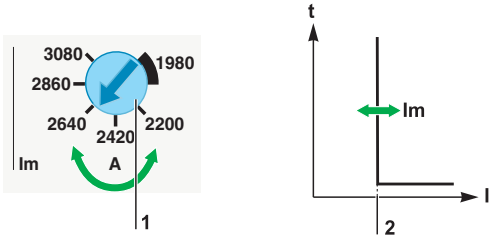


1 MA magnetic trip unit rating
2 Adjustment dial for the magnetic protection pick-up Im:

Setting the Magnetic Protection

The magnetic protection pick-up Im is set by:
- A 9-setting dial for 2.5 A to 50 A ratings
- A 6-setting dial for 100 A to 220 A ratings

Turning the magnetic protection adjustment dial (1) modifies the trip curve as shown (2).



The table below shows the values of the pick-up Im (in amperes) for magnetic protection (values indicated on the dial) with respect to every trip unit rating, relative to the position of the dial Im.

Trip unit rating In (A)							
2.5	**6.3**	**12.5**	**25**	**50**	**100**	**150**	**220**
Pick-up Im (A)							
15	38	75	150	300	–	–	–
18	44	88	175	350	–	–	–
20	50	100	200	400	–	–	–
23	57	113	225	450	900	1350	1980
25	63	125	250	500	1000	1500	2200
28	69	138	275	550	1100	1650	2420
30	76	150	300	600	1200	1800	2640
33	82	163	325	650	1300	1950	2860
35	88	175	350	700	1400	2100	3080

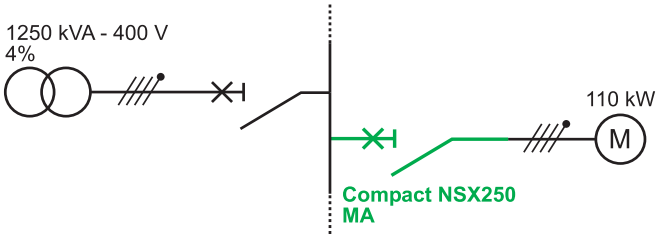
The precision range is +/- 20%.

Example of Application

Protection of a motor-feeder with the following characteristics:

- Power supplied by a 1,250 kVA transformer - 400 V, 4%
- Protection of a motor application defined by:
  - 3-component motor-feeder (circuit breaker, thermal relay, contactor)
  - Direct-on-line starting
  - Motor power 110 kW, i.e. In = 196 A
  - Type 2 coordination

Installation diagram



Calculations performed on the installation in accordance with the regulations can be used to determine the characteristics of the appropriate Compact NSX to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen Compact NSX	Comments
In = 196 A	Compact NSX 250 MA 220	Determination of case size
Isc = 28.5 kA	F	Icu performance can be read from rating plate
Ikmin = 14.8 kA	–	–

Trip unit protection settings

Installation	Chosen trip unit	Comments
Ikmin = 14.8 kA Transient current = 14 In i.e. 2,800 A	Im = 2,860 A	The Isd protection setting is compatible with: ● Transient startup currents ● Short-circuit protection

Vigi Earth Leakage Protection Module

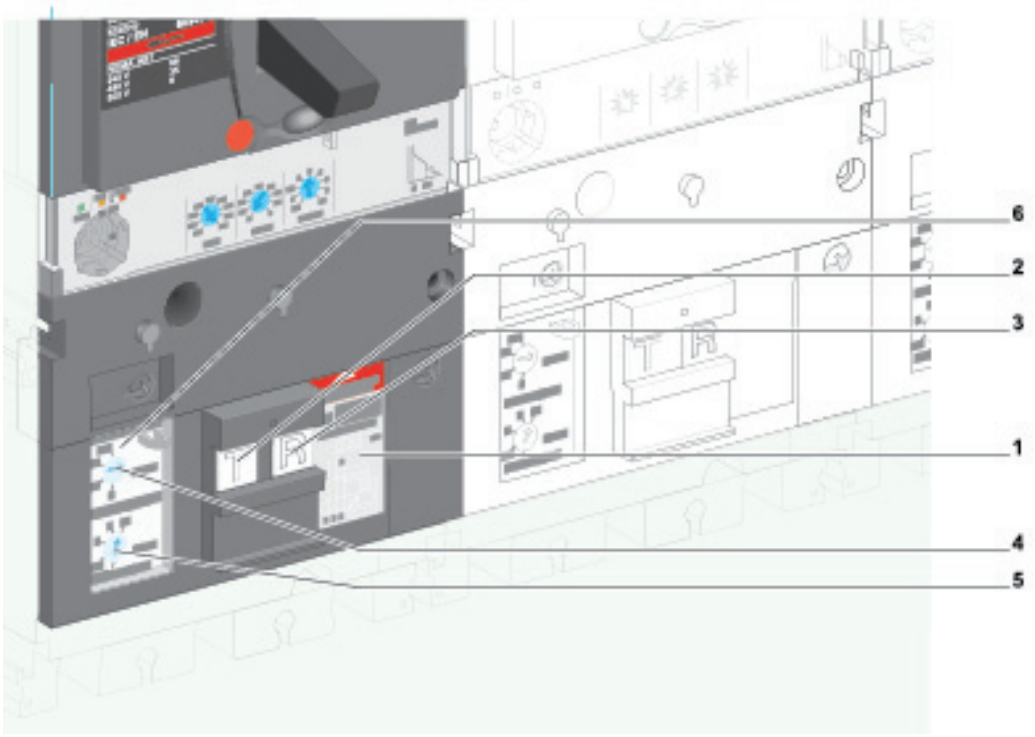
At a Glance

The Vigi earth leakage protection module is designed to provide protection against very low value ground fault currents. In the event of a fault, this earth leakage protection module causes the circuit breaker to trip very rapidly by acting directly on the circuit breaker mechanism.

Earth leakage protection by the Vigi module is provided:
- For the Compact NSX 100 to 250 series by adding a Vigi MH module (high sensitivity)
- For the Compact NSX 400 and 630 by adding a Vigi MB module (low sensitivity)

Description

The settings and controls are on the front face:



1 Rating plate
2 Test pushbutton
3 Reset pushbutton
4 Intentional delay adjustment dial: Δt
5 Sensitivity pick-up adjustment dial: IΔn
6 Protective cover for settings
7 Protective cover for connections

Installation

The Vigi module is installed below the trip unit. An intermediate terminal shield is needed: this provides protection against direct contact with the connection block downstream of the circuit breaker.

A Vigi module can be installed on all types of circuit breaker:
- With toggle switch
- With rotary handle
- With motor mechanism

A circuit breaker complete with Vigi module can be installed on a mounting plate, a chassis or a base.

Setting the Earth Leakage Protection

The Vigi module is designed to protect personnel and equipment.

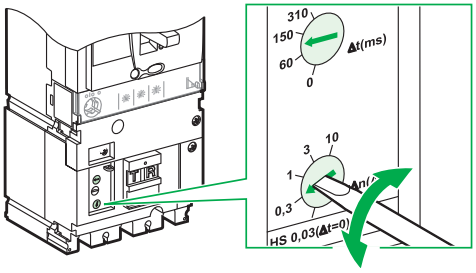
⚠ DANGER

RISK OF ELECTROCUTION, BURNS OR EXPLOSION

Only qualified persons are authorized to make adjustments to Vigi modules.

Failure to follow these instructions will result in death or serious injury.

The sensitivity I∆n is set by a dial on the front face. The sensitivity value is expressed in amperes.



Setting the Intentional Delay

The intentional delay ∆t is set by a dial on the front face. The intentional delay value is expressed in milliseconds.

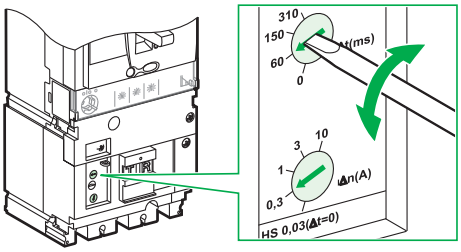


Table of Setting Values

The table below shows the setting values for sensitivity I∆n and intentional delay ∆t for each Vigi module type.

Vigi MH module		**Vigi MB module**	
I∆n (A)	**∆t (ms)**	**I∆n (A)**	**∆t (ms)**
0.03	0	0.3	0
0.3	60	1	60
1	150	3	150
3	310	10	310
10	–	30	–

NOTE: For the sensitivity 0.03 A (Vigi MH module), the intentional delay cannot be set by design and tripping is instantaneous (in conformity with IEC 609472 appendix B).

Testing and Resetting

A test pushbutton T can be accessed on the front of the circuit breaker: pressing this button creates a real earth leakage fault that fully tests the device.

NOTE: It is advisable to test that the earth leakage protection works at regular intervals (every 6 months).

Installation standards may require these periodic tests.

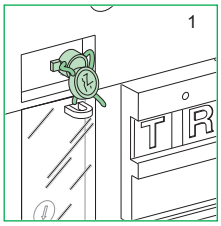
After a ground fault trip, the circuit breaker cannot be closed again until the Vigi module has been reset by pressing the reset pushbutton R.

Insulation and Dielectric Strength Tests

There is a specific procedure for carrying out the insulation and dielectric strength tests on equipment incorporating a Vigi module (see *Startup, page 126*).

Lead Sealing Accessories for Earth Leakage Protection

Lead sealing accessories are used to prevent the following operations:



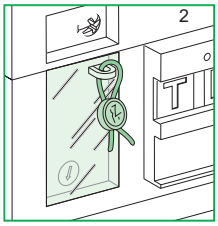


Diagram	Seal	Prohibited operations
1	Vigi module fixing screw	Dismantling the Vigi module
2	Transparent protective cover for the settings	Modification of the Vigi module settings

3.3 Micrologic Electronic Trip Units

Aim

This section describes the Micrologic electronic trip units. These trip units can be installed on all Compact NSX circuit breakers.

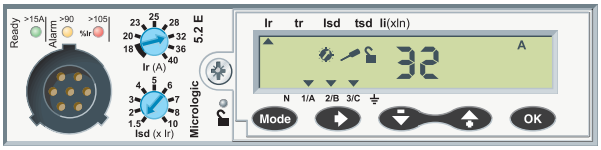
What's in this Section?

This section contains the following topics:

Characteristics of Micrologic Electronic Trip Units

At a Glance

Micrologic electronic trip units are designed to provide multiple functions:
- Protection of the electrical distribution or specific applications
- Measurement of instantaneous values, measurement of demand values for electrical quantities
- Kilowatt hour metering
- Operational assistance (peak demand, customized alarms, operation counters, etc.)
- Communication



Identification

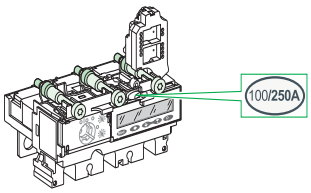
The trip unit installed on the circuit breaker is identified by a combination of 4 characters on the front face:

Micrologic 6.3 E-M
X Y Z T

	Protection (X)	Case (Y)	Measurements (Z)	Application (T)
	1 I **2** LS_0 **5** LSI **6** LSIG	**2** Compact NSX 100/160/250 **3** Compact NSX 400/630	**A** Ammeter **E** Energy	Distribution, if not **G** Generator **AB** Subscriber **M** Motor **Z** 16 Hz 2/3
Examples				
Micrologic 1.3	I	400 or 630 A		Distribution
Micrologic 2.2 G	LS_0	100, 160 or 250 A		Generator
Micrologic 2.3	LS_0	400 or 630 A		Distribution
Micrologic 2.3 M	LS_0	400 or 630 A		Motor
Micrologic 5.2 A	LSI	100, 160 or 250 A	Ammeter	Distribution
Micrologic 5.3 E	LSI	400 or 630 A	Energy	Distribution
Micrologic 6.3 E-M	LSIG	400 or 630 A	Energy	Motor
I: Instantaneous, **L**: Long time, **S** $_0$: Short time (time delay cannot be adjusted), **S**: Short time, **G**: Ground fault				

In Rating of Micrologic Trip Units

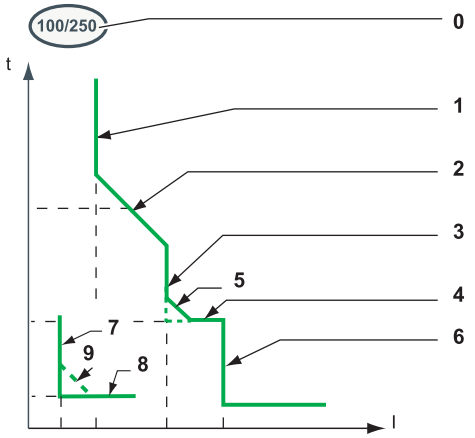
The In rating (in amps) of a Micrologic trip unit corresponds to the trip unit setting range maximum value. The setting range is indicated on the label on the front face of the trip unit (this label is visible on the front face of the Compact NSX circuit breaker after the trip unit has been fitted).

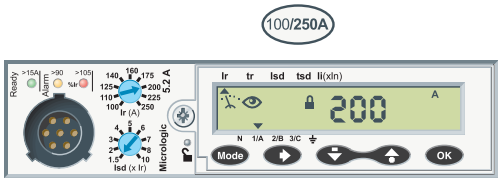


Example: Micrologic 5.2 A 250 trip unit:
- Setting range: 100...250 A
- In rating = 250 A

Distribution Trip Unit

The figure and table below define the protection functions for distribution type Micrologic trip units:





No.	Parameter	Description		Micrologic		
				2	5	6
0	In	Trip unit setting range: minimum setting/maximum setting = trip unit rating In		□	□	□
1	Ir	Long time protection pick-up	L	■	■	■
2	tr	Long time protection time delay		□	■	■
3	Isd	Short time protection pick-up	S	■	■	■
4	tsd	Short time protection time delay		□	■	■
5	I^2t ON/OFF	Short time protection I^2t curve in ON or OFF position		–	■	■
6	Ii	Instantaneous protection pick-up	I	□	■	■
7	Ig	Ground fault protection pick-up	G	–	–	■
8	tg	Ground fault protection time delay		–	–	■
9	I^2t ON/OFF	Ground fault protection I^2t curve in ON or OFF position		–	–	■
■ : Adjustable, □ : Non-adjustable, – : Not present						

Thermal Memory

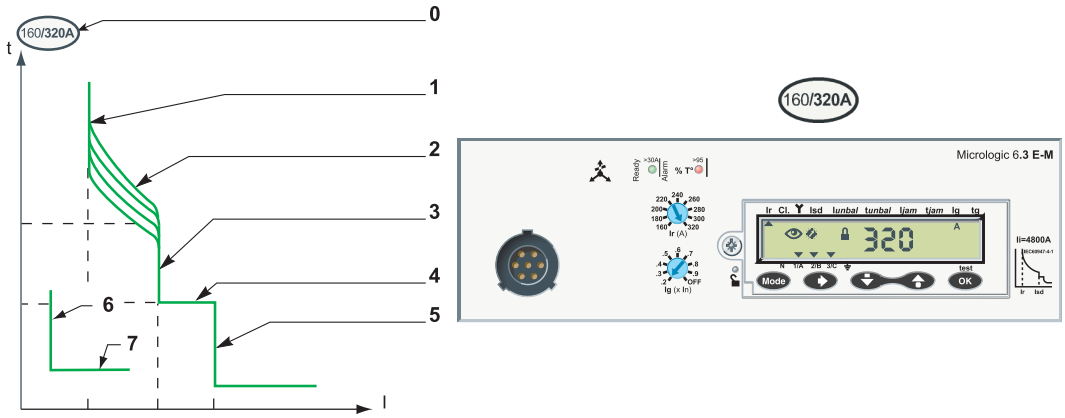
The thermal memory is used to simulate temperature build-up and cooling in conductors caused by current variations, according to a time constant. In the event of an overload, the trip units with a thermal memory memorize the build-up temperature caused by the current. Memorizing the build-up temperature leads to a reduction in the trip time.

All Micrologic trip units incorporate a thermal memory as standard:

- For Micrologic 2 trip units, the time constant is 15 min.
- For Micrologic 5 and 6 trip units, the time constant is 20 min.

Motor Trip Units

The figure and table below define the protection functions for Micrologic type M trip units:



No.	Parameter	Description		Micrologic type M		
				1.3	2	6 E
0	In	Trip unit setting range: minimum setting/maximum setting = trip unit rating In		□	□	□
1	Ir	Long time protection pick-up	**L**	–	■	■
2	Class	Long time protection trip class		–	■	■
3	Isd	Short time protection pick-up	**S**	■	■	■
4	tsd	Short time protection time delay		□	□	□
5	Ii	Instantaneous protection pick-up	**I**	□	□	□
6	Ig	Ground fault protection pick-up	**G**	–	–	■
7	tg	Ground fault protection time delay		–	–	■
	Iunbal	Phase unbalance protection pick-up			□	■
	tunbal	Phase unbalance protection time delay			□	■
■ : Adjustable, □ : Non-adjustable, – : Not present						

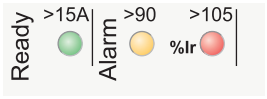
Motor Trip Unit: Additional Protection

Micrologic type M trip units (in particular Micrologic 6 E-M) also incorporate additional protection for the motor application. For more details, see the *Micrologic 5 and 6 trip units - User manual*.

Indication LEDs

Indication LEDs on the front of the trip unit indicate its operational state.

The number of LEDs and their meaning depend on the type of Micrologic trip unit.

Type of Micrologic trip unit	Description
Distribution 	• Ready LED (green): Blinks slowly when the electronic trip unit is ready to provide protection. • Overload pre-alarm LED (orange): Shows a steady light when the load exceeds 90% of the Ir setting. • Overload alarm LED (red): Shows a steady light when the load exceeds 105% of the Ir setting.
Motor 	• Ready LED (green): Blinks slowly when the electronic trip unit is ready to provide protection. • Overload temperature alarm LED (red): Shows a steady light when the motor thermal image exceeds 95% of the Ir setting. The Micrologic 1.3 M trip unit, which provides short time protection only, displays the Ready LED (green).

NOTE: The reliability of information provided by the indication LEDs is guaranteed for circuit breaker load currents:

- Above 15 A on a Micrologic trip unit rated 40 A
- Above 30 A on Micrologic trip units rated > 40 A

This limit value is indicated above the Ready LED, on the front face of the Micrologic trip unit.

To activate the Ready LED when the load current is below the limit value, you can:
- Install a 24 V DC external power supply module (see the *Compact NSX Catalog)* which allows the trip unit to be monitored continuously, even when the circuit breaker is open
- Or, during maintenance visits, connect the pocket battery module (see *Pocket Battery Module, page 113*) which can be used to monitor the trip unit

NOTE: If the pre-alarm and alarm LEDs keep lighting up, it is advisable to carry out load shedding in order to avoid tripping due to a circuit breaker overload.

Test Port

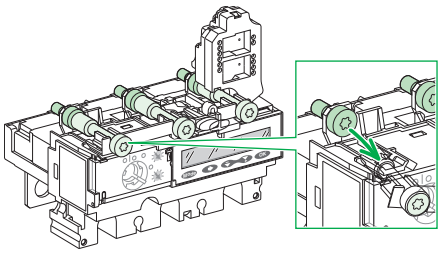
Micrologic trip units feature a test port specifically for maintenance actions (see *Maintenance Interface for Micrologic Trip Units, page 111*).

This port is designed for:
- Connecting a pocket battery module for local Micrologic testing
- Connecting the maintenance configuration module for testing, setting the Micrologic trip unit and/or for installation diagnostics

Upgradability of Micrologic Trip Units

Onsite swapping of trip units is simple and safe:

- No connections to make
- No special tools (e.g. calibrated torque wrench)
- Compatibility of trip units ensured by mechanical cap
- Torque limited screw ensures safe mounting (see drawing below)

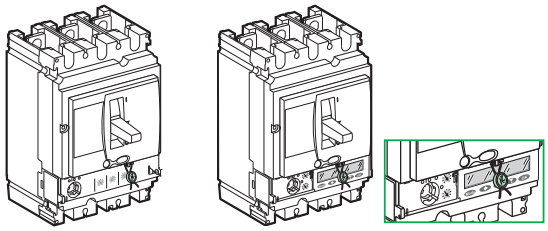


The safety of the swapping process eliminates the risk of incorrect tightening or oversights. The simplicity of the swapping process means it is easy to make the necessary adjustments as operation and maintenance processes evolve.

NOTE: When the trip unit has been mounted by this means, the trip unit can still be removed: the screw head is accessible.

Sealing the Protection

The transparent cover on Micrologic trip units can be sealed to prevent modification of the protection settings and access to the test port.



On Micrologic 5 and 6 trip units, it is possible to use the keypad, with the cover sealed, to read the protection settings and measurements.

Micrologic 2 Electronic Trip Unit

At a Glance

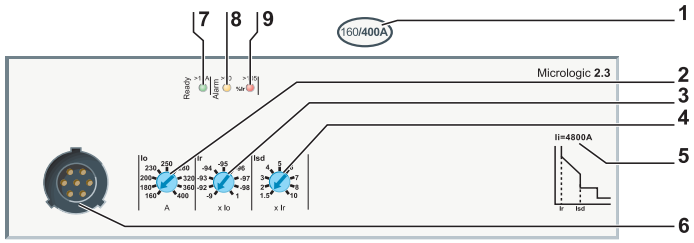
The Micrologic 2 electronic trip unit is designed to protect conductors in commercial and industrial electrical distribution.

This trip unit exists in three versions (3P, 3D), (4P, 3D) and (4P, 4D).

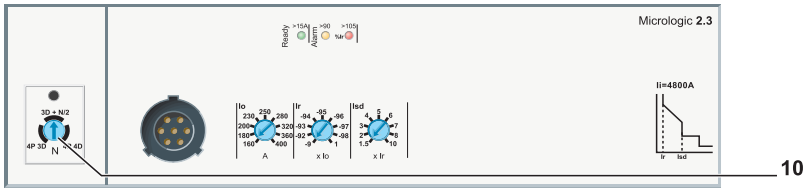
Description

The adjustment dials and indications are on the front face.

- Micrologic 2.3 3P version



- Micrologic 2.3 4P version



1 Micrologic 2 electronic trip unit setting range
2 Adjustment dial for the long time protection pick-up Io
3 Fine-tuning dial for the long time protection pick-up Ir
4 Adjustment dial for the short time protection pick-up Isd
5 Value of instantaneous protection pick-up Ii
6 Test port
7 Ready LED (green)
8 Overload pre-alarm LED (orange): 90% Ir
9 Overload alarm LED (red): 105% Ir
10 Selection dial for setting the neutral protection (4P only)

The trip unit rating In corresponds to the maximum value of the setting range.

Setting the Long Time Protection

The long time protection pick-up Ir is set using two 9-setting dials.

- The preset dial allows the pick-up to be preset to the value Io (displayed in amperes on the dial). The maximum preset value (maximum setting on preset dial) equals the trip unit rating value In.
- The adjustment dial can be used to fine-tune the pick-up Ir (value displayed in multiples of Io on the dial).

Step	Action
1	Set both adjustment dials to maximum (for Io: to the value In (A); for Ir: to 1).
2	Turn the Io adjustment dial higher than the value required. The Ir setting value is: Io setting (A).
3	Turn the fine-tuning dial to specify the value of Ir from 0.9 Io to Io.
4	The Ir setting value is: Io (A) setting x fine tuning.

The time delay tr for long time protection cannot be adjusted.

The table below shows the value of the time delay tr for long time protection (in seconds) according to the overload current (in multiples of Ir):

at 1.5 Ir	at 6 Ir	at 7.2 Ir
tr = 400 s	tr = 16 s	tr = 11 s

The precision range is - 20%, + 0%.

Setting the Short Time Protection

The short time protection pick-up Isd is set by a 9-setting dial.

The setting value is expressed in multiples of Ir.

Step	Action
1	Set the long time protection first: the setting pick-up is Ir.
2	Turn the Isd adjustment dial to the value required. The Isd value is adjustable from 1.5 Ir to 10 Ir.
3	Isd = Isd setting x Ir.

The precision range is +/- 15%.

The time delay tr for short time protection cannot be adjusted:
- Non-trip time: 20 ms
- Maximum breaking time: 80 ms.

Setting the Instantaneous Protection

The pick-up Ii for instantaneous protection cannot be adjusted.

The table below shows the value of the pick-up Ii for instantaneous protection (in amperes) according to the trip unit rating In:

	Trip unit rating In (A)					
	40	**100**	**160**	**250**	**400**	**630**
Pick-up Ii (A)	600	1500	2400	3000	4800	6930

The precision range is +/- 15%.

The time delay for instantaneous protection cannot be adjusted:
- Non-trip time: 0 ms
- Maximum breaking time: 50 ms.

Setting the Neutral Protection (4P Only)

The neutral selection dial gives a choice of three values for the neutral long time and short time protection pick-ups.

The table below shows the values of the pick-up for neutral long time protection (in multiples of Ir) and neutral short time protection (in multiples of Isd) according to the dial position:

Dial	Dial position	Long time setting value	Short time setting value
	4P 3D	0	0
	4P 3D + N/2	Ir/2	Isd/2
	4P 4D	Ir	Isd

The time delay for the neutral long time and short time protections is the same as that for the phases.

Example of Setting the Long Time Protection

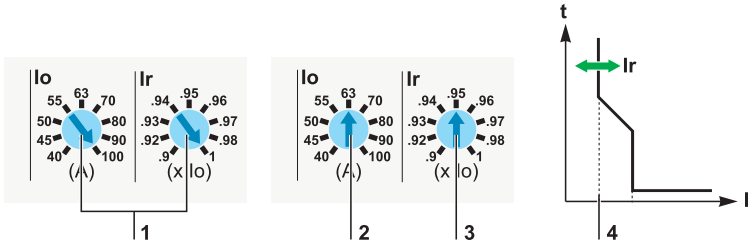
Setting the long time protection pick-up Ir to 63 A on a Micrologic 2.2 rated In 100 A (see diagram below)

Step	Action
1	Io is positioned on 100 A and Ir on 1 (x Io): factory setting.
2	Io is set to 63 A.
3	Adjustment not needed; Ir fine-tuning stays at setting 1
4	Ir is set to 63 A x 1.

A precise coordination calculation indicates that the desirable value is Ir = 60 A.

Step	Action
1	Io is positioned at 100 A and Ir at 1 (x Io).
2	Io is set to 63 A.
3	Setting calculation: 60 A = 0.95 x 63 A Fine-tune Ir on setting 0.95.
4	Ir is set to 63 A x 0.95 (= 59.9 A).

The actions in steps (2) and (3) on the adjustment dials modify the trip curves as shown (4).

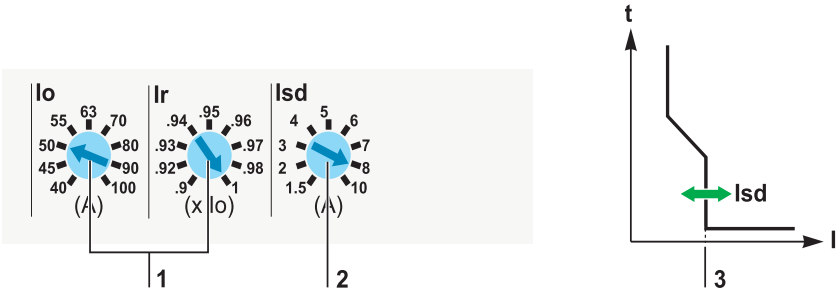


Example of Setting the Short Time Protection

Setting the short time protection pick-up Isd to 400 A on a Micrologic 2.2 rated (In) 100 A on a 50 A feed (see diagram below)

Step	Action
1	The setting pick-up Ir for long time protection is equal to the feeder operating current, i.e. Ir = 50 A.
2	Setting calculation: 400 A = 8 x 50 A Position the Isd adjustment dial on setting 8.
3	Isd is set to 50 A x 8 (= 400 A).

The action in step (2) on the adjustment dial modifies the trip curve as shown (3).



Micrologic 5 and 6 Electronic Trip Units

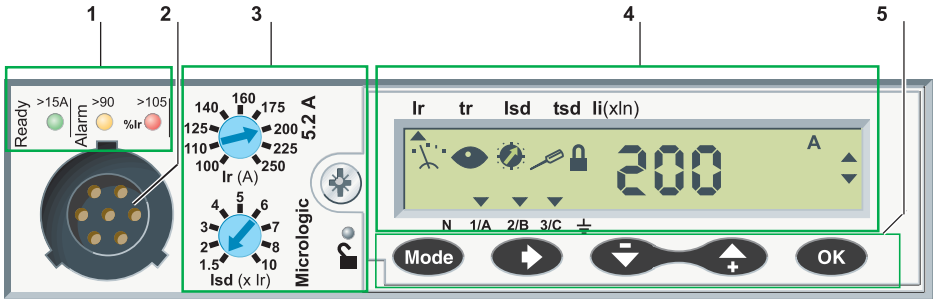
At a Glance

Micrologic 5 and 6 electronic trip units provide protection which can be adapted to all types of application. They also incorporate metering functions, operational and maintenance assistance functions and communication functions as standard.

The information given in this guide is a summary. For more detailed information on the operation of Micrologic 5 and 6 trip units, refer to the *Micrologic 5 and 6 trip units - User manual*.

Description

Front of a Micrologic 5.2 A trip unit for 3P circuit breaker



1 Indication LEDs
2 Test port
3 Set of 2 dials and a microswitch
4 LCD display
5 Keypad

Indication LEDs

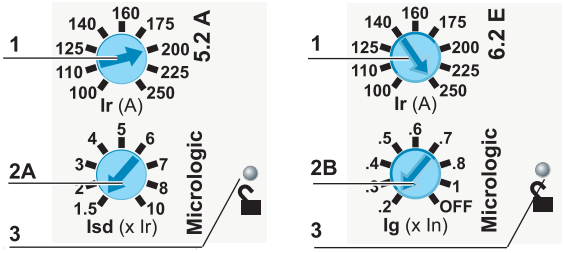
Indication LEDs on the front indicate the operational state of the trip unit (see *Indication LEDs, page 90*).

Test Port

Micrologic trip units feature a test port specifically for maintenance actions (see *Test Port, page 90*).

Set of 2 Dials and a Microswitch

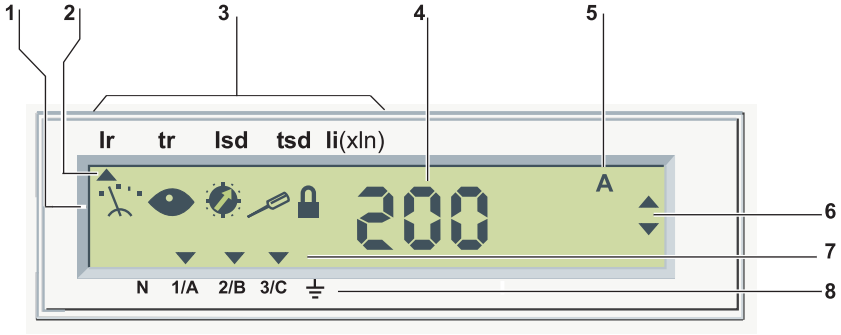
The 2 dials are assigned to presetting the protection parameters. The microswitch is assigned to locking/unlocking the protection parameter settings.



No.	Description
1	Pick-up Ir preset dial for all Micrologic trip unit types
2	Preset dial: ● 2A (Micrologic 5): For the short time protection pick-up Isd ● 2B (Micrologic 6): For the ground fault protection pick-up Ig
3	Microswitch for locking/unlocking the protection parameter settings

Display Unit

The display unit provides all the information needed to use the trip unit. The list of protection parameters is customized according to the Micrologic trip unit type: 5, 6 or 6 E-M.



No.	Description
1	5 mode definition pictograms
2	Up arrow pointing to protection parameter currently being set
3	List of protection parameters according to the Micrologic trip unit type: ● Micrologic 5: Ir tr Isd tsd Ii(xIn) ● Micrologic 6: Ir tr Isd tsd Ii(xIn) Ig tg ● Micrologic 6 E-M: Ir Cl. Isd Iunbal tunbal Ijam tjam Ig tg
4	Value of the measured quantity
5	Unit of the measured quantity
6	Navigation arrows
7	Down arrow(s) pointing to the selected phase(s), neutral or the ground
8	Phases (1/A,2/B,3/C), neutral (N) and ground

Keypad

The 5-button keypad is used for navigation.

Key	Description
Mode	Selecting the mode
→	Scrolling navigation
−	Navigation back (measurement) or - (setting the protection parameters)
+	Navigation forward (measurement) or + (setting the protection parameters)
OK	Confirmation

Locking/Unlocking the Protection Parameter Settings

The protection parameter settings are locked when the transparent cover is closed and sealed to prevent access to the adjustment dials and the locking/unlocking microswitch.

A pictogram on the display unit indicates whether the protection parameter settings are locked:

- Padlock locked : The protection parameter settings are locked.
- Padlock unlocked : The protection parameter settings are unlocked.

To unlock the protection parameter settings, you need to open the transparent cover and:
- Press the locking/unlocking microswitch
- Or actuate one of the adjustment dials

To lock the protection parameter settings, press the unlocking microswitch again.

The protection parameter settings also lock automatically 5 minutes after the Micrologic keypad was last pressed.

Mode Definition

The information that can be accessed on the Micrologic display unit is split between different modes.

The modes that can be accessed depend on:
- Whether the protection parameter settings are locked
- The Micrologic version (3P or 4P)

A mode is defined by a combination of 5 pictograms.

The tables below show the possible modes:

Pictograms	Mode accessible with padlock locked
	• **Reading** instantaneous measurements • **Reading** and resetting kilowatt hour meters
Max Reset ? Ok	**Reading** and resetting peak demand
	Reading the protection parameters
	Reading the neutral declaration (3P Micrologic trip unit)

Pictograms	Mode accessible with padlock unlocked
	• **Reading** instantaneous measurements • **Reading** and resetting kilowatt hour meters
Max Reset ? Ok	**Reading** and resetting peak demand
	Setting the protection parameters
	Setting the neutral declaration (3P Micrologic trip unit)

Mode Selection

A mode is selected by successive presses on the Mode button.
- The modes scroll cyclically.
- The unlocking/locking microswitch is pressed to switch from a read mode to a setting mode (and vice versa).

Screensaver

The Micrologic display unit automatically reverts to a screensaver 5 minutes after the last action on the keypad or dials.

The screensaver displays the current intensity of the most heavily loaded phase (**Reading** instantaneous measurements mode).

Micrologic 5 Trip Unit: Setting the Protection

The summary description below refers to the settings for the Micrologic 5 trip unit.

Setting the Long Time Protection

The long time protection pick-up Ir is set using the 9-setting preset dial and the keypad.

- The preset dial allows the pick-up to be preset to the value Io (displayed in amperes on the dial). The maximum preset value (maximum setting on preset dial) equals the trip unit rating value In.
- The pick-up Ir is fine-tuned via the keypad.

Step	Action
1	Turn the Ir preset dial higher than the value required.
2	Access the Ir screen in parameter setting mode (padlock open).
3	Set Ir to the exact value required (in steps of 1 A), using the keypad.
4	Confirm the setting by pressing the OK button twice.

The time delay tr is set directly via the keypad.

Step	Action
1	Switch to setting mode (padlock open) and access the tr setting screen.
2	Set tr to the value required: 0.5 s, 2 s, 4 s, 8 s, 16 s, using the keypad.
3	Confirm the setting by pressing the OK button twice.

Setting the Short Time Protection

The short time protection pick-up Isd is set using the 9-setting preset dial and the keypad.

- The preset dial allows the pick-up to be preset to a value Isd (displayed in multiples of Ir on the dial).
- The pick-up Isd is fine-tuned via the keypad.

Step	Action
1	Turn the Isd adjustment dial higher than the value required (range: 1.5 Ir ...10 Ir in steps of Ir).
2	Access the Isd screen in setting mode (padlock open).
3	Set Isd to the exact value required (in steps of 0.5 Ir up to 1.5 Ir), using the keypad.
4	Confirm the setting by pressing the OK button twice.

The time delay tsd is set directly via the keypad. The same setting is also used for selecting option I^2t ON.

Step	Action
1	Switch to setting mode (padlock open) and access the tsd setting screen.
2	Set tsd to the desired value (0.0 s, 0.1 s, 0.2 s, 0.3 s, 0.4 s with or without I^2t ON), using the keypad.
3	Confirm the setting by pressing the OK button twice.

Setting the Instantaneous Protection

The instantaneous protection pick-up Ii is set directly via the keypad.

Step	Action
1	Switch to setting mode (padlock open) and access the Ii setting screen.
2	Set Ii to the value required (range: 0.5...12 In in steps of 0.5 In), using the keypad.
3	Confirm the setting by pressing the OK button twice.

Micrologic 6 Trip Unit: Setting the Protection

The settings for protection against overcurrents on the Micrologic 6 trip unit are carried out in the same way as for the Micrologic 5 (except the Isd setting, which is carried out directly via the keypad).

The Micrologic 6 trip unit incorporates ground fault protection; both pick-up and time delay can be adjusted.

Setting the Ground Fault Protection

The ground fault protection pick-up Ig is set using the 9-setting preset dial and the keypad.

- The preset dial allows the pick-up to be preset to a value Ig (displayed in multiples of In on the dial).
- The pick-up Ig is fine-tuned via the keypad.

Step	Action
1	Turn the Ig adjustment dial higher than the value required (range: 0.4...In in steps of 0.1 In for In < 100 A, 0.2...In, in steps of 0.1 In for In ≥ 100 A).
2	Access the Ig screen in setting mode (padlock open).
3	Set Ig to the exact value required (in steps of 0.05 In up to 0.2 In), using the keypad.
4	Confirm the setting by pressing the OK button twice.

The time delay tg is set directly via the keypad. The same setting is also used for selecting option I^2t ON.

Step	Action
1	Switch to setting mode (padlock open) and access the setting screen tg.
2	Set tg to the desired value (0.0 s, 0.1 s, 0.2 s, 0.3 s, 0.4 s - with or without I^2t ON), using the keypad.
3	Confirm the setting by pressing the OK button twice.

Neutral Protection

Neutral protection for a 4P circuit breaker is incorporated in the trip unit. The protection setting values are accessible on the screen in setting mode.

Neutral protection for a 3P circuit breaker is not incorporated in the trip unit. It is effected by phase tripping.

Micrologic 5 and 6 trip units incorporate the ENCT function in order to provide dedicated neutral protection with a 3P circuit breaker. In setting mode, it is necessary to:

- Declare whether the neutral has to be protected
- Indicate the protection setting value

This requires the installation of an ad hoc external sensor (for more details on sensor characteristics, see the *Compact NSX Catalog)*.

Setting the Neutral Protection

Setting the neutral protection pick-up is the same for a 4P circuit breaker as for a 3P circuit breaker with ENCT option.

Setting on the screen allows a choice of four values for the neutral protection pick-up.

Screen setting		Ir setting or adjustment range	Isd setting or adjustment range
0		0	0
0.5		Ir/2	Isd/2
1		Ir	Isd
OSN	3P	1.6 Ir	1.6 Isd
	4P	1...1.6 Ir according to value of Ir	1...1.6 Isd according to value of Ir

The time delays for the long and short time protections are the same as those for the phases.

NOTE: Micrologic 5 and 6 trip units incorporate the OSN function, which enables the neutral protection to be managed when third harmonic currents and multiples thereof are present.

For more details, see the *Micrologic 5 and 6 trip units - User manual*.

Micrologic 1.3 M Electronic Trip Unit

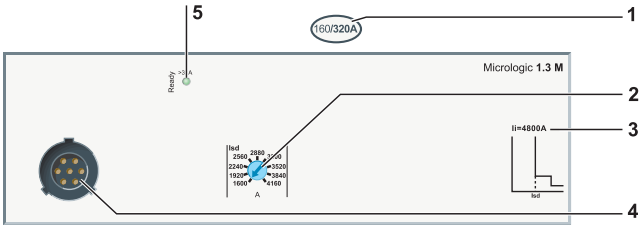
At a Glance

The Micrologic 1.3 M electronic trip unit with high short time protection pick-up is designed to provide motor-feeders with short-circuit protection.

The Micrologic 1.3 M electronic trip unit can be used to create a type 1 or type 2 coordination motor-feeder.

Description

The adjustment dial and indication are on the front face.



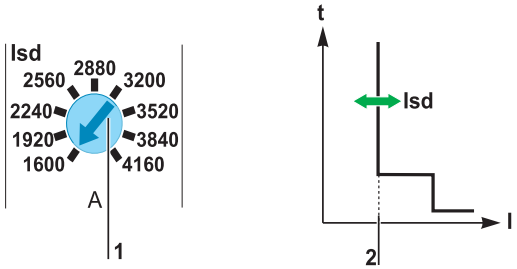
1 Micrologic trip unit setting range
2 Adjustment dial for the short time protection pick-up Isd
3 Instantaneous protection pick-up Ii
4 Test port
5 Ready LED (green)

The trip unit rating In corresponds to the maximum value of the setting range. 2 ratings are available: 320 A and 500 A.

Setting the Short Time Protection

The short time protection pick-up Isd is set by a 9-setting dial.

Turning the pick-up Isd adjustment dial (1) modifies the curves as shown (2).



The table below shows the values of the pick-up Isd (in amperes) for short time protection (values indicated on the dial) relative to the position of the Isd dial and the values of the pick-up Ii for instantaneous protection.

Trip unit rating In (A)	
320	**500**
Pick-up Isd (A)	
1600	2500
1920	3000
2240	3500
2560	4000
2880	4500
3200	5000
3520	5500
3840	6000
4160	6500
Pick-up Ii (A)	
4800	6500

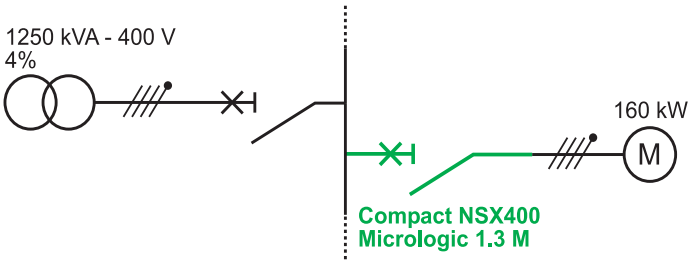
The precision range is +/- 15%.

Example of Application

Protection of a motor-feeder

- Power supplied by a 1,250 kVA transformer - 400 V, 4%
- Power supply downstream of a motor-feeder with the following characteristics:
  - 3-component motor-feeder (circuit breaker, thermal relay, contactor)
  - Direct-on-line starting
  - Motor power 160 kW, i.e. In = 280 A
  - Type 2 coordination

Installation diagram



Calculations performed on the installation in accordance with the regulations can be used to determine the characteristics of the appropriate Compact NSX to install (calculations performed using the Ecodial software).

Circuit breaker selection

Installation	Chosen Compact NSX	Comments
In = 280 A	Compact NSX 400 Micrologic 1.3 M 320	Motor circuit breaker, case size
Isc = 28.5 kA	F	Icu performance can be read from rating plate
Ikmin = 18.3 kA	–	–

Trip unit protection settings

Installation	Trip unit setting	Comments
Ikmin = 18.3 kA Inrush current = 14 In	Isd = 4,160 A	The Isd protection setting is compatible with: ● Transient startup currents ● Short-circuit protection

Micrologic 2 M Electronic Trip Unit

At a Glance

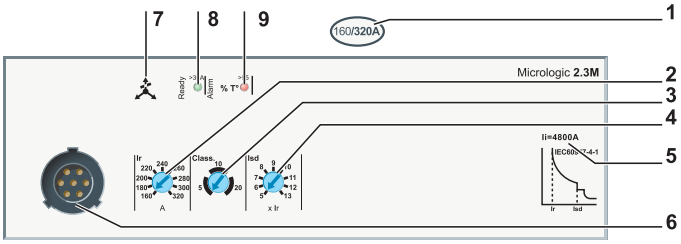
The Micrologic 2 M electronic trip unit is suitable for protecting motor-feeders on standard applications. The thermal trip curves are calculated for self-ventilated motors.

The Micrologic 2 M electronic trip unit can be used to create a type 1 or type 2 coordination motor-feeder.

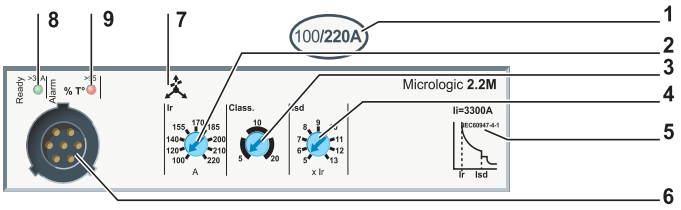
Description

The adjustment dials and indications are on the front face.

- Micrologic 2.3 M



- Micrologic 2.2 M

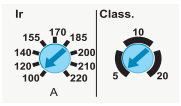


1 Micrologic 2.2 M/2.3 M electronic trip unit setting range
2 Adjustment dial for the long time protection pick-up Ir
3 Selection dial for the long time protection time delay class
4 Adjustment dial for the short time protection pick-up Isd
5 Value of instantaneous protection pick-up Ii
6 Test port
7 Phase unbalance
8 Ready LED (green)
9 Alarm LED

The trip unit rating In corresponds to the maximum value of the setting range.

Setting the Long Time Protection

The long time protection is set by 2 dials according to the starting characteristics of the application.



- The long time protection pick-up Ir is set by the 9-setting dial.
  The maximum setting value (maximum setting on adjustment dial) equals the trip unit rating value In.

The table below shows the values of the pick-up Ir (in amperes) for long time protection that are displayed directly on the dial with respect to every trip unit rating.

Trip unit rating In (A)						
25	**50**	**100**	**150**	**220**	**320**	**500**
Pick-up Ir (A)						
12	25	50	70	100	160	250
14	30	60	80	120	180	280
16	32	70	90	140	200	320
18	36	75	100	155	220	350
20	40	80	110	170	240	380
22	42	85	120	185	260	400
23	45	90	130	200	280	440
24	47	95	140	210	300	470
25	50	100	150	220	320	500

- The long time protection time delay class is set by the 3-setting dial: the choice of class is 5, 10 and 20.

The table below shows the value of the trip time delay depending on the current in the load for all 3 classes:

Current in the load	**Class**		
	5	**10**	**20**
	Trip time delay tr (in seconds)		
1.5 Ir	120	240	400
6 Ir	6.5	13.5	26
7.2 Ir	5	10	20

The precision range is - 20%, + 0%.

Setting the Short Time Protection

The pick-up for short time protection is set by a 9-setting dial. It is displayed in multiples of Ir.

Step	**Action**
1	Set the long time protection first: the setting pick-up is Ir (A).
2	Turn the Isd adjustment dial to the value required (the setting range is: 5...13 Ir in steps of Ir (9 settings)).
3	Isd is set to Ir (A) x Isd setting.

The precision range is +/- 15%.

The short time protection time delay cannot be adjusted: 30 ms.

Setting the Instantaneous Protection

The table below shows the pick-up Ii values (in amperes) according to the trip unit rating In.

	Trip unit rating In (A)						
	25	**50**	**100**	**150**	**220**	**320**	**500**
Pick-up Ii (A)	425	750	1500	2250	3300	4800	7500

The precision range is +/- 15%.

Phase Unbalance Protection

Micrologic 2 M trip units incorporate a protection against phase unbalance. The characteristics are:
- Protection not adjustable
- Pick-up: 30% phase unbalance (the precision range is +/- 20%)
- Overshoot time: 4 s in steady state, 0.7 s during startup

Example:

A phase unbalance exceeding 30% for longer than 4 s in steady state causes the protection to trip.

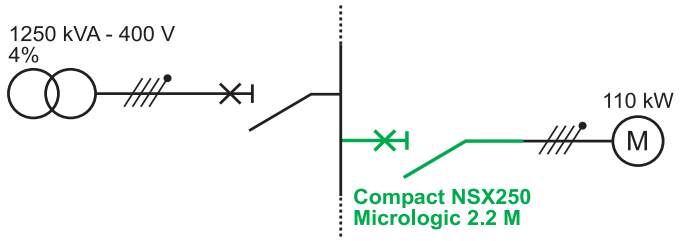
Contactor Opening Command

Trip units fitted with an SDTAM module can use output 2 (SD4) from this module to activate the contactor opening command for the motor-feeder before the circuit breaker trips (see *SDTAM Module (Micrologic 2 M and 6 E-M), page 50*).

Example of Application

Protection of a motor-feeder with the following characteristics:
- Power supplied by a 1,250 kVA transformer - 400 V, 4%
- Protection of a motor application defined by:
  - 2-component motor-feeder (circuit breaker, contactor)
  - Direct-on-line starting
  - Motor power 110 kW, i.e. In = 196 A
  - Type 2 coordination
  - The application constraints dictate a slow startup

Installation diagram



Calculations performed on the installation in accordance with the regulations have determined the characteristics of the appropriate Compact NSX to install (calculations performed using the Ecodial software).

Installation diagram

Installation	Chosen Compact NSX	Comments
In = 196 A	Compact NSX 250 Micrologic 2.2 M 220	Motor circuit breaker, case size
Isc = 28.5 kA	F	Icu performance can be read from rating plate
Ikmin = 14.8 kA	–	–

Trip unit protection settings

Installation	Trip unit setting	Comments
In = 196 A	Micrologic 2.2 M 220 set to 200 A	Micrologic trip unit setting
Slow starting	Set in class 20	Long time protection trip class
Ikmin = 14.8 kA Transient = 14 In	Isd/In > 12 or Isd > 2,400 A	Isd protection setting compatible with: ● Transient startup currents ● Short-circuit protection

Micrologic 6 E-M Electronic Trip Unit

At a Glance

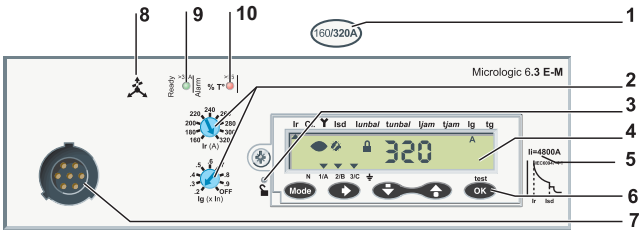
Micrologic 6 E-M electronic trip units are suitable for all types of motor-feeder application. They also incorporate metering functions, operational and maintenance assistance functions and communication functions as standard.

The Micrologic 6 E-M electronic trip unit can be used to create a type 1 or type 2 coordination motor-feeder.

For more detailed information on the operation of Micrologic 6 E-M trip units, refer to the *Micrologic 5 and 6 trip units - User manual*.

Description

The adjustment dials and indications are on the front face.



1 In rating of the Micrologic 6.3 E-M electronic trip unit
2 Protection pick-up Ir and Ig adjustment dials
3 Locking/unlocking microswitch
4 Display unit
5 Instantaneous protection pick-up value: Ii
6 Keypad
7 Test port
8 Phase unbalance
9 Ready LED (green)
10 Alarm LED

Overcurrent Protections

The overcurrent protection settings on the Micrologic 6 E-M trip unit are entered in the same way as for the Micrologic 6, except the I^2t setting for the short time protections and ground fault protection, which is always OFF (see *Micrologic 5 and 6 Electronic Trip Units, page 95*).

Additional Protection

The Micrologic 6 E-M trip unit incorporates additional protection functions for LSIG protection:

- Phase unbalance or phase loss protection
- Locked rotor protection
- Undercurrent protection
- Long start protection
- Monitoring motor insulation during operation protection

These protections are set on the screen or by using the **RSU** software (see the *Micrologic 5 and 6 trip units - User manual*).

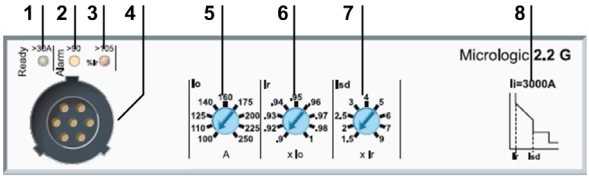
Micrologic 2 G Electronic Trip Unit

At a Glance

The Micrologic 2 G electronic trip unit is used to protect distribution systems powered by generators or distribution systems with long cables.

Description

The adjustment dials and indications are on the front face.



1 Ready LED (green)
2 Overload pre-alarm LED (orange): 90% Ir
3 Overload alarm LED (red): 105% Ir
4 Test port
5 Preset dial for the long time protection pick-up Io
6 Fine-tuning dial for the long time protection pick-up Ir
7 Adjustment dial for the short time protection pick-up Isd
8 Value of instantaneous protection pick-up Ii

The trip unit rating In corresponds to the maximum value of the setting range.

Setting the Long Time Protection

The long time protection pick-up Ir is set using two 9-setting dials.

- The preset dial allows the pick-up to be preset to the value Io (displayed in amperes on the dial). The maximum preset value (maximum setting on preset dial) equals the trip unit rating value In.
- The adjustment dial can be used to fine-tune the pick-up Ir (value displayed in multiples of Io on the dial).

Step	Action
1	Set both adjustment dials to maximum (for Io: to the value In (A); for Ir: to 1).
2	Turn the Io preset dial higher than the value required. The Ir setting value is: Io setting (A).
3	Turn the fine-tuning dial to adjust the value of Ir from 0.9 Io to Io.
4	The Ir setting value is: Io (A) setting x fine tuning.

The time delay tr for long time protection cannot be adjusted.

The table below shows the value of the time delay tr for long time protection (in seconds) according to the overload current (in multiples of Ir):

Current in the load In	Trip time delay
1.5 Ir	15 s
6 Ir	0.5 s
7.2 Ir	0.35 s

The precision range is - 20%, + 0%.

Setting the Short Time Protection

The short time protection pick-up Isd is set by a 9-setting dial.

The setting value is expressed in multiples of Ir.

Step	Action
1	Set the long time protection first: the setting pick-up is Ir (A).
2	Turn the Isd adjustment dial to the value required. The Isd value is adjustable from 1.5 Ir to 9 Ir.
3	Isd is set to Ir (A) x Isd setting.

The precision range is +/- 10%.

The time delay tr for short time protection cannot be adjusted:
- Non-trip time: 140 ms
- Maximum breaking time: 200 ms.

Setting the Instantaneous Protection

The pick-up Ii for instantaneous protection cannot be adjusted.

The table below shows the value of the pick-up Ii for instantaneous protection (in amperes) according to the trip unit rating In:

	Trip unit rating In (A)			
	40	**100**	**160**	**250**
Pick-up Ii (A)	600	1500	2400	3000

The precision range is +/- 15%.

The time delay for instantaneous protection cannot be adjusted:
- Non-trip time: 15 ms
- Maximum breaking time: 50 ms.

Micrologic 2 AB Electronic Trip Unit

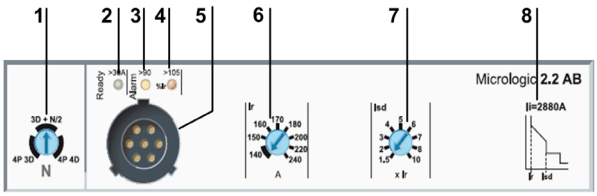
At a Glance

The Micrologic 2 AB electronic trip unit is used in public distribution to limit the intensity provided to the subscriber according to the contract signed up for.

This trip unit only exists in 4-pole versions: (4P, 3D), (4P, 3D + N/2) and (4P, 4D).

Description

The adjustment dials and indications are on the front face.



1 Selection dial for setting the neutral protection
2 Ready LED (green)
3 Overload pre-alarm LED (orange): 90% Ir
4 Overload alarm LED (red): 105% Ir
5 Test port
6 Fine-tuning dial for the long time protection pick-up Ir
7 Adjustment dial for the short time protection pick-up Isd
8 Value of instantaneous protection pick-up Ii

The trip unit rating In corresponds to the maximum value of the adjustment range.

Setting the Long Time Protection

The long time protection pick-up Ir is set by the 8-setting dial. The maximum setting value (maximum setting on adjustment dial) equals the trip unit rating value In.

The table below shows the values of the pick-up Ir (in amperes) for long time protection that are displayed directly on the dial with respect to every trip unit rating.

Trip unit rating In (A)			
100	**160**	**240**	**400**
Pick-up Ir (A)			
40	90	140	260
40	100	150	280
50	110	160	300
60	120	170	320
70	130	180	340
80	140	200	360
90	150	220	380
100	160	240	400

The long time protection time delay class cannot be adjusted. The table below shows the value of the trip time delay according on the current in the load:

Current in the load In	**Trip time delay**
1.5 Ir	15 s
6 Ir	0.5 s
7.2 Ir	0.35 s

Setting the Short Time Protection

The short time protection pick-up Isd is set by a 9-setting dial. It is displayed in multiples of Ir.

Step	Action
1	Set the long time protection first: the setting pick-up is Ir (A).
2	Turn the Isd adjustment dial to the value required. The Isd value is adjustable from 1.5 Ir to 10 Ir.
3	Isd is set to Ir (A) x Isd setting.

The precision range is +/- 10%.

The time delay tsd for short time protection cannot be adjusted: 20 ms
- Non-trip time: 20 ms
- Maximum breaking time: 80 ms.

Setting the Instantaneous Protection

The pick-up Ii for instantaneous protection cannot be adjusted.

The table below shows the value of the pick-up Ii for instantaneous protection (in amperes) according to the trip unit rating In:

	Trip unit rating In (A)			
	100	**160**	**240**	**400**
Pick-up Ii (A)	1500	1600	2800	4800

The precision range is +/- 15%.

The time delay for instantaneous protection cannot be adjusted:
- Non-trip time: 10 ms
- Maximum breaking time: 50 ms.

Setting the Neutral Protection (4P Only)

The neutral selection dial gives a choice of three values for the neutral long time and short time protection pick-ups.

The table below shows the values of the pick-up for neutral long time protection (in multiples of Ir) and neutral short time protection (in multiples of Isd) according to the dial position:

Dial	Dial position	Long time setting value	Short time setting value
	4P 3D	0	0
	4P 3D + N/2	Ir/2	Isd/2
	4P 4D	Ir	Isd

The time delay for the neutral long time and short time protections is the same as that for the phases.

Maintenance Interface for Micrologic Trip Units

4

Aim

This chapter describes the maintenance interface associated with Micrologic trip units.

What's in this Chapter?

This chapter contains the following topics:

Functions of the Micrologic Maintenance Interface

Description of Requirements

A 24 V DC power supply is needed for carrying out local checks on a trip unit. These can also be done using the maintenance interface:

Maintenance interface	Availability on the trip unit
24 V DC external power supply module	□
Pocket battery module for Micrologic	■
Standalone maintenance module	■
Maintenance module connected to a PC with RSU software	■
Maintenance module connected to a PC with LTU software	■
■ Possible for all Micrologic trip units □ Possible for Micrologic 5 and 6 trip units	

The table below shows the different checking functions of each maintenance interface:

Maintenance interface	Setting	Checking	Testing	Saving settings
24 V DC external power supply module	■	□	–	–
Pocket battery module	■	□	–	–
Standalone maintenance module	■	□	X	–
Maintenance module connected to a PC with RSU software	■	■	X	■
Maintenance module connected to a PC with LTU software	■	■	■	■
■ In full for all Micrologic trip units □ In full for Micrologic trip units 5 and 6 (for Micrologic 2 trip units, only the position of the dials is checked) X Only on tripping via the *push to trip* button				

Precautions Before Checking, Testing or Setting

Checking

Settings can be checked without the need for any particular precautions. However, it is recommended that they be carried out by a qualified person.

Testing

When testing Compact NSX circuit breaker trip mechanisms, the necessary precautions must be taken:
- Not to disrupt operations
- Not to trip inappropriate alarms or actions

⚠ CAUTION

RISK OF NUISANCE TRIPPING

Only qualified persons are authorized to carry out protection tests.

Failure to follow these instructions can result in injury or equipment damage.

Setting

Modifying settings requires a thorough knowledge of the installation characteristics and safety rules.

⚠ CAUTION

RISK OF NO TRIPPING OR NUISANCE TRIPPING

Only qualified persons are authorized to modify the protection parameters.

Failure to follow these instructions can result in injury or equipment damage.

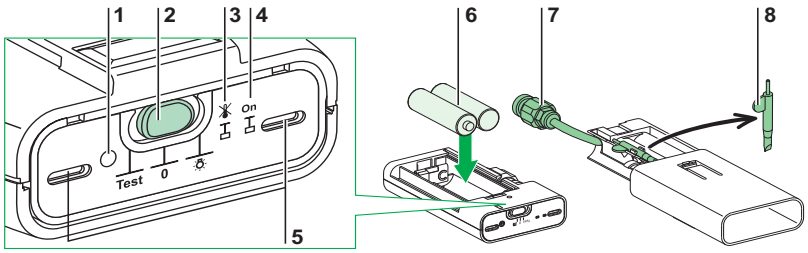
Pocket Battery Module

At a Glance

The pocket battery module is easily transportable and can be used anywhere for the local inspection and maintenance of Micrologic trip units.

Description

The pocket battery module contains two mini-batteries which can be connected to the test port on Micrologic electronic trip units.



1 Green LED for checking battery status
2 Yellow LED for checking thermal memory inhibition
3 3-position slide switch:
Left = Test position; Center = OFF; Right = pocket flashlight
4 Inhibit thermal memory button
5 Two illumination LEDs
6 Two 1.5 V type AA batteries (not supplied)
7 Connector for connecting to the test port on the Micrologic trip unit
8 Stylus/screwdriver

Pocket Flashlight Function

To use the module as a pocket flashlight, move the slide switch to the pocket flashlight position (right).

Preparing the Equipment

To prepare the equipment before carrying out maintenance:

Step	Action
1	Slide open the protective cover to access the trip unit connector.
2	Click the battery module connector into the test port on the Micrologic trip unit.
3	Move the slide switch to the Test position (left).
4	Check the battery status: the green LED must be on.

Inspection and Checking

To check and inspect the trip unit after preparing the equipment:

Step	Action
Inspection	
1	Check that the green Ready LED on the trip unit is blinking. This means that all the Micrologic trip unit functions are in a satisfactory operational state (internal self-test).
Checking the setting values on the display unit (for Micrologic 5 and 6 trip units)	
2	Use the navigation buttons to display the *Reading protection parameters* mode (see *Micrologic 5 and 6 Electronic Trip Units, page 95*).
3	Scroll down and check the values of the different settings (Micrologic 5 trip unit): ● Ir (A) ● IN (A) (if present) long time ● tr (s) ● Isd (A) ● IN (A) (if present) short time ● tsd (ms) with/without I^2t ● Ii (A) The settings can be modified.
The screen backlighting is not activated so as to optimize battery life (4 hours).	

Inhibit Thermal Memory Function (Maintenance Level IV)

The *Inhibit thermal memory* button temporarily cancels the thermal memory *(see page 88)*. This inhibition is necessary in order to obtain a true measurement of the long time protection time delay tr during tripping tests by primary current injection. This operation forms part of maintenance level IV. It is reserved for a specialist maintenance service (see *Maintaining the Compact NSX During Operation, page 131*).

To carry out the test after preparing the equipment:

Step	Action
1	Switch the circuit breaker to the I (ON) position.
2	Move the slide switch to the OFF position (center).
Inhibiting the thermal memory	
3	Press the button for inhibiting the thermal memory, using the stylus.
4	The yellow confirmation LED and the green LED light up. The thermal memory on the trip unit is inhibited for 15 mins.

NOTE: Thermal memory inhibition is immediately canceled (the yellow confirmation LED goes out) if, in the course of running the test, the slide switch is moved to another position.

Standalone Maintenance Module

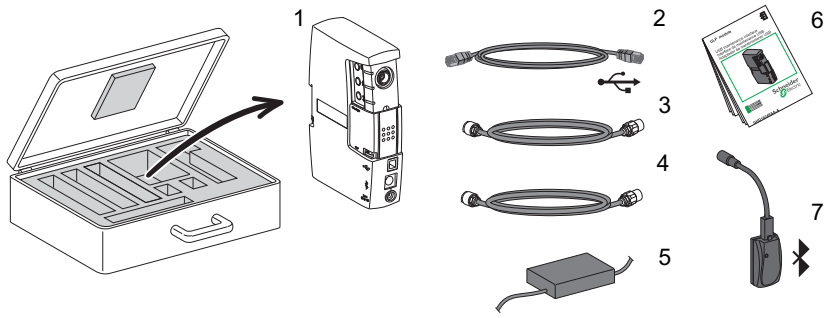
At a Glance

The standalone maintenance module is used for the following:
- Maintenance checks and inspections
- Tripping tests
- The inhibition functions required for tripping tests by primary current injection (maintenance level IV)

A maintenance kit comprising the maintenance module and its accessories is available (see the *Compact NSX Catalog*).

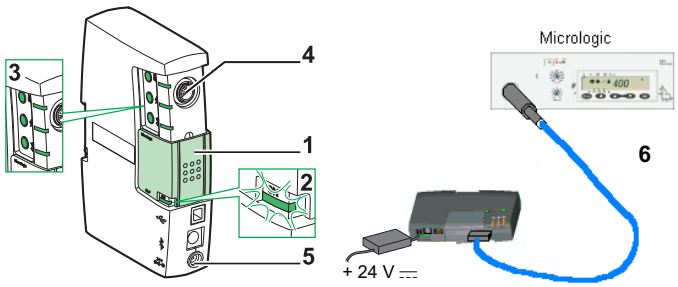
Description of Maintenance Kit

The maintenance kit comprises the following elements:



1 Maintenance module
2 Standard USB cord for connection to the PC
3 Special cord for connecting the maintenance module to the test port on the trip unit
4 Standard RJ45 cord for connecting the maintenance module to a ULP module
5 Maintenance module power supply unit
6 Quick reference guide
7 Optionally: A Bluetooth wireless connection (to PC)

Description of Maintenance Module



1 Mechanical cap in central position
2 Green ON LED
3 Test buttons (3) with LEDs (3)
4 Connection socket for special cord connecting maintenance module to test port on trip unit
5 Connection socket for power supply unit
6 Special cord for connecting the maintenance module to the test port on the trip unit

Preparing the Equipment

Prepare the equipment before carrying out maintenance:

Step	Action
1	Position the maintenance module sliding mechanical cap in the central position.
2	Connect the 24 V DC power cord: the green ON LED lights up.
3	Click the maintenance module connector into the test port on the Micrologic trip unit.

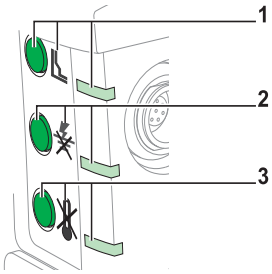
Inspection and Checking

Check and inspect the trip unit after preparing the equipment:

Step	Action
Inspection	
1	Check that the green Ready LED on the Micrologic trip unit is blinking. This means that all the Micrologic trip unit functions are in a satisfactory operational state (internal self-test).
Checking the setting values on the display unit (for Micrologic 5 and 6).	
2	Use the navigation buttons to display the *Reading protection parameters* mode (see *Micrologic 5 and 6 trip units - User manual*).
3	Scroll down and check the values of the different settings (Micrologic 5 trip unit): ● Ir (A) ● IN (A) (if present) long time ● tr (s) ● Isd (A) ● IN (A) (if present) short time ● tsd (ms) with/without I^2t ● Ii (A) The settings can be modified.

The Three Test Functions

Tests are carried out with the aid of the three test buttons. The associated LEDs provide confirmation.



1 Electrical push to trip test button with pictogram and red confirmation LED
2 Inhibit ground fault protection button with pictogram and yellow confirmation LED
3 Inhibit thermal memory button with pictogram and yellow confirmation LED

Tripping Test Using the Electrical push to trip Button

The electrical push to trip button causes an electronic trip in the circuit breaker. This test is used to check the electronic and mechanical circuit breaker controls.

Carry out the test after preparing the equipment:

Step	Action
1	Switch the circuit breaker to the I (ON) position.
Tripping the circuit breaker	
2	Press the electrical push to trip button.
3	The red confirmation LED on the maintenance module lights up and goes off immediately. The circuit breaker on test trips: ● The control mechanism moves to the tripped position: ▾ (with toggle switch), Trip or Tripped (rotary handle), OFF (motor mechanism) ● The green Ready LED on the Micrologic trip unit continues blinking The screen on the Micrologic 5 and 6 stays unchanged
Resetting the circuit breaker	
4	Reset the control mechanism. The circuit breaker is ready.

Inhibit Ground Fault Protection Function (Maintenance Level IV)

The *Inhibit ground fault protection* button temporarily cancels this protection (Micrologic 6) and the thermal memory: it is then possible to inject the test current on each phase separately and calculate the true time delay tr.

Carry out the test after preparing the equipment:

Step	Action
1	Switch the circuit breaker to the I (ON) position.
Inhibiting ground fault protection	
2	Press the button for inhibiting the ground fault protection.
3	The yellow confirmation LEDs for ground fault protection and thermal memory inhibition show a steady light. Ground fault protection and the thermal memory on the trip unit are inhibited for 15 min.
Canceling ground fault protection inhibition (before 15 mins)	
4	Press the button for inhibiting the ground fault protection again.
5	The yellow confirmation LEDs for ground fault protection and thermal memory inhibition go out. Ground fault protection and the thermal memory on the trip unit are reactivated.

Inhibiting the ground fault protection also causes the *ZSI* function to be forced (if this option is present on the trip unit). This forcing prevents the time delay for short time protection tsd from being taken out of commission during the tests.

Inhibit Thermal Memory Function (Maintenance Level IV)

The *Inhibit thermal memory* button temporarily cancels the thermal memory. This inhibition is necessary in order to obtain a true measurement of the long time protection time delay tr during tripping tests by primary current injection. This operation, which is maintenance level IV, is reserved for a specialist maintenance service (see *Maintaining the Compact NSX During Operation, page 131*).

Carry out the test after preparing the equipment:

Step	Action
1	Switch the circuit breaker to the I (ON) position.
Inhibiting the thermal memory	
2	Press the button for inhibiting the thermal memory.
3	The yellow confirmation LED shows a steady light. The thermal memory on the trip unit is inhibited for 15 mins.
Canceling thermal memory inhibition (before 15 mins)	
4	Press the button for inhibiting the thermal memory again.
5	The yellow confirmation LED goes out. The thermal memory on the trip unit is reactivated.

Inhibiting the thermal memory also causes the *ZSI* function to be forced (if this option is present on the trip unit). This forcing prevents the time delay for short time protection tsd and time delay for ground fault protection tg (Micrologic 6) from being taken out of commission during the tests.

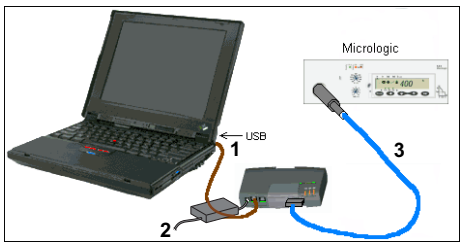
Maintenance Module Connected to a PC

Description and Connection

The maintenance module connected to a PC can be used to carry out the complete range of checks, tests and settings on the Micrologic trip unit.

There are two possible ways to connect the PC to the maintenance module:
- Using the USB port
- Using the Bluetooth option

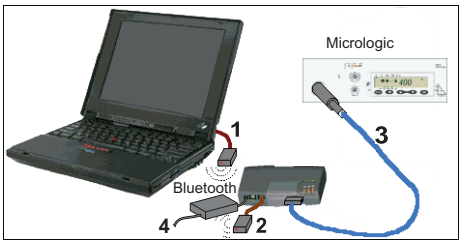
Connection via the USB port



1 USB standard connection cord from the maintenance module to the PC
2 Maintenance module power supply unit
3 Micrologic cord for connecting the maintenance module to the test port on the trip unit

NOTE: If the USB port does not supply enough power to energize the Micrologic trip unit and the maintenance module, the three test LEDs  on the maintenance module start to blink. The maintenance module must then be energized by the power supply module supplied with the maintenance kit.

Connection via Bluetooth



1 RJ45 cord for Bluetooth transmitter-receiver, on PC
2 PS/2/RJ45 cord for Bluetooth transmitter-receiver, on the maintenance module
3 Micrologic cord for connecting the maintenance module to the test port on the trip unit
4 Maintenance module power supply unit

NOTE: Use the power supply unit supplied with the kit.

NOTE: Connect the Bluetooth option firmly to the maintenance module with the PS/2 connector (do not use the RJ45 connection used in the ULP connection method by forcing the mechanical cap).

Hardware and Software

The following hardware and software are required for operational use:
- Hardware:
  - The maintenance kit provides all the necessary connections (the Bluetooth wireless method is optional and has to be ordered separately).
  - The test PC is standard with a minimum Windows XP configuration and a USB1 port.
- Software:
  Two software options are offered:
  - RSU protection and alarm parameter-setting software. This free software can be downloaded from **www.schneider-electric.com**.
  - LTU settings test software (fault simulation, pick-up and time delay measurement, etc.)

NOTE: Access for the purpose of modifying the Micrologic trip unit settings via communication is protected by user passwords. The factory-set administrator password is '*0000*'. To check whether to use a password, contact the authorized maintenance administrators.

Maintenance Module Connected to a PC With RSU Software

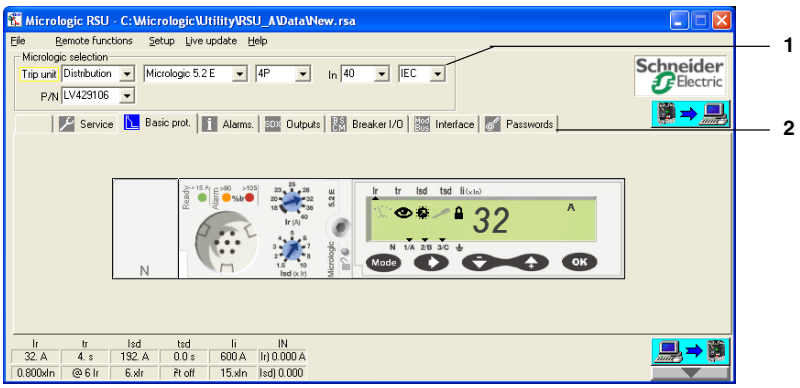
At a Glance

The RSU (Remote Setting Utility) software is a Micrologic utility designed to help the operator:

- To check and/or configure:
  - Protection parameters
  - Measurement parameters
  - Alarm parameters
  - Assignment of the SDx module outputs
  - BSCM module parameters
  - Communication interface module parameters
- To modify passwords
- To save these configurations
- To edit configurations
- To display trip curves

Description

The protection, measurement, alarm and communication functions of the Micrologic trip unit can be programmed or checked.



1 Micrologic selection window
2 Accessible function tabs

The table below summarizes the functions handled by the RSU software

Tab	Functions
Service	Configuring the measurement functions (Micrologic E)
Basic prot	Setting protection parameters
Alarms.	Configuring 10 user alarms and pre-alarms
SDx Outputs	Assignment of the two SDx outputs
Passwords	Configuring four password levels
BSCM module option	
BSCM Breaker I/O	• Counters for OF operations and actions on SD and SDE faults • Alarm threshold associated with OF counters • Communicating motor mechanism: motor mechanism counters • communicating motor mechanism: Configuring the reset function
Modbus interface option	
Modbus Interface	• Reading Modbus addresses • Configuring communication • Configuring the dataset

For more details about the **Services**, **Alarms** and **Outputs** tabs, see the *Micrologic 5 and 6 trip units - User manual*.

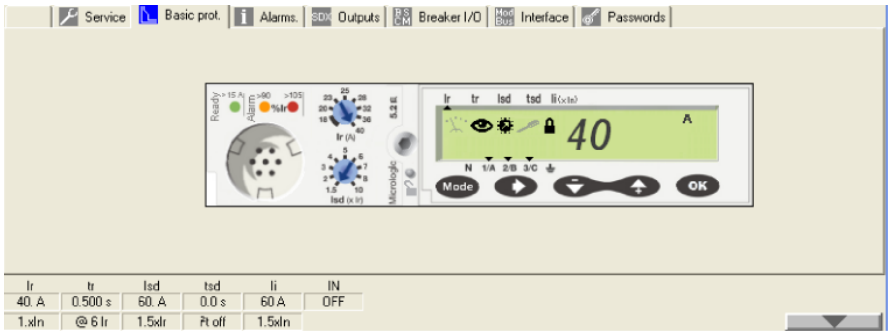
Preparing the Equipment

Prepare the equipment before carrying out maintenance:

Step	Action
1	Position the maintenance module mechanical cap in the central position.
2	Start up the PC.
3	Set up the connections between the PC and the maintenance module or connect the Bluetooth connectors.
4	Click the maintenance module connector into the test port on the Micrologic trip unit.

Inspection and Checking

Check and inspect the trip unit after preparing the equipment:

Step	Action
Inspection	
1	Check that the green Ready LED is blinking. This means that all the Micrologic functions are in a satisfactory operational state (internal self-test).
Checking the settings	
2	Run the *RSU* software: ● An active screen showing the front of the Micrologic variant tested appears under the **Basic prot.** tab  ● Access to settings and navigation between screens are identical to those used for Micrologic (see the *Micrologic 5 and 6 trip units - User manual*).
3	Scroll down and check the values of the different settings (Micrologic 5 trip unit): ● Ir (A) ● IN (A) (if present) long time ● tr (s) ● Isd (A) ● IN (A) (if present) short time ● tsd (ms) with/without I^2t ● Ii (A) The settings can be modified.

The settings can be modified: the padlock must be unlocked.

Tests Using the Maintenance Module

When connected to a PC the maintenance module can operate in standalone mode: all three test functions are accessible (see *Standalone Maintenance Module, page 115*).

Saving and Printing

The different settings and data can be saved and printed.

Maintenance Module Connected to a PC With LTU Software

At a Glance

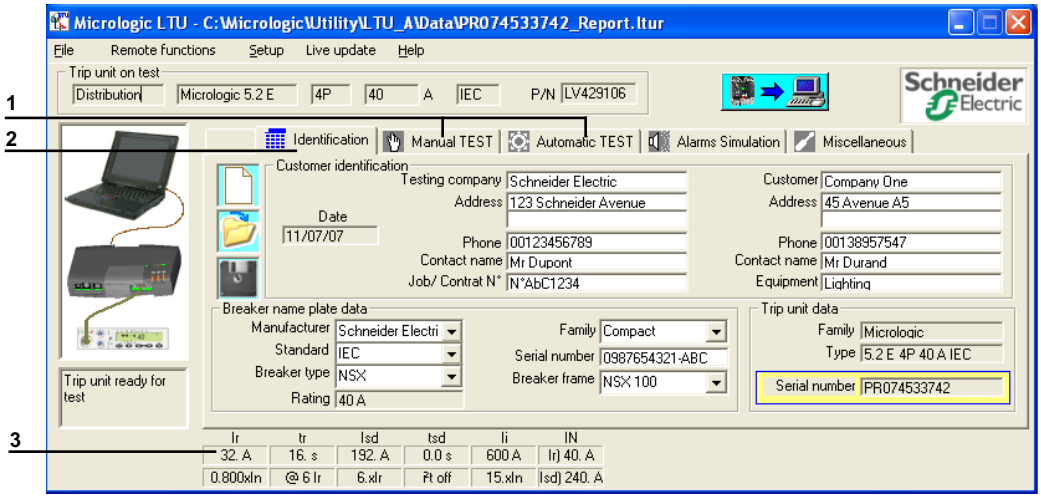
The LTU (Local Test Utility) software is a Micrologic utility designed to help the operator:
- Test the protection time delays
- Simulate alarms
- Save test results
- Print test reports
- Display trip curves
- Display current values
- Test the non-trip time (check discrimination)
- Test the ZSI function

Description

Trip simulations are used to check the protection time delay values (see *LTU Online Help*).

Two types of test are offered:
- Under the **Automatic TEST** tab, the LTU software automatically performs trip tests in sequence. The test result is immediately shown as a value and by a bar which is:
  - Green (trip time within tolerance): Passed
  - Red (trip time outside tolerance): Failed
- Under the **Manual TEST** tab: The LTU software prompts the user to choose values for the intensity and duration of the fault current. This test can be used to check the pick-ups and non-trip times on the trip unit.

Description of the LTU screen under the **Identification** tab



1 Accessible test tabs
2 Installation, customer and product identification tab
3 Setting values area for Micrologic being tested

The table below summarizes the test functions accessible on the PC:

Tab	Functions
Identification	Identification of the installation and the circuit breaker/trip unit
Manual TEST	Manual setting of fault current values
Automatic TEST	Automatic setting of fault current values
Alarm simulation	Alarm simulation for system testing
Miscellaneous	push to trip button, ZSI test

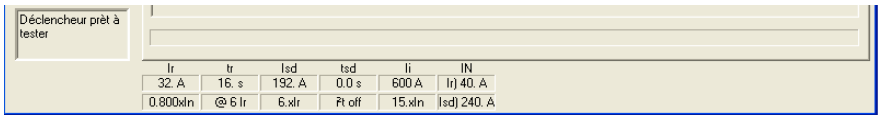
Preparing the Equipment

Prepare the equipment before carrying out maintenance:

Step	Action
1	Position the maintenance module mechanical cap in the central position.
2	Start up the PC.
3	Set up the connections between the PC and the maintenance module or connect the Bluetooth connectors.
4	Click the maintenance module connector into the test port on the Micrologic trip unit.

Inspection and Checking

Check and inspect the trip unit after preparing the equipment:

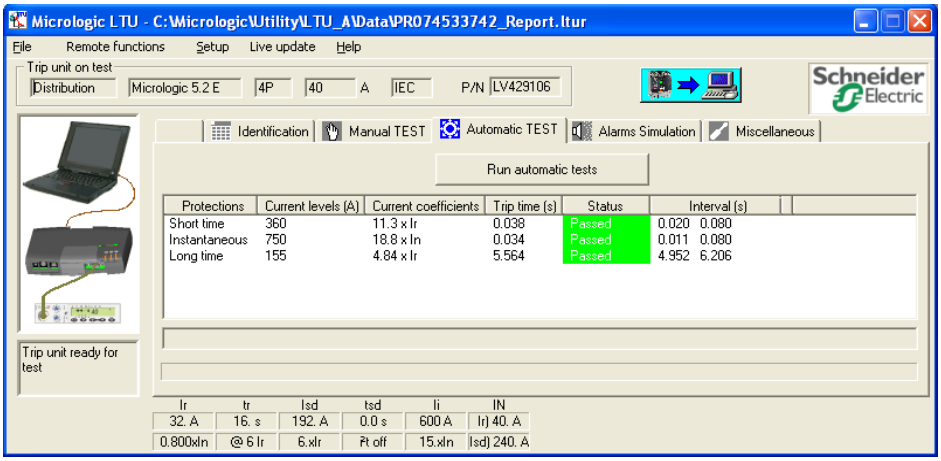
Step	Action
Inspection	
1	Check that the green Ready LED is blinking. This means that all the Micrologic functions are in a satisfactory operational state (internal self-test).
Checking the settings	
2	Run the LTU software. A description of the Micrologic variant tested appears under the **Trip unit on test** tab. The setting values appear in the area at the foot of the screen. 

Tests Using the Maintenance Module

When connected to a PC the maintenance module can operate in standalone mode: all three test functions are accessible (see *Standalone Maintenance Module, page 115*).

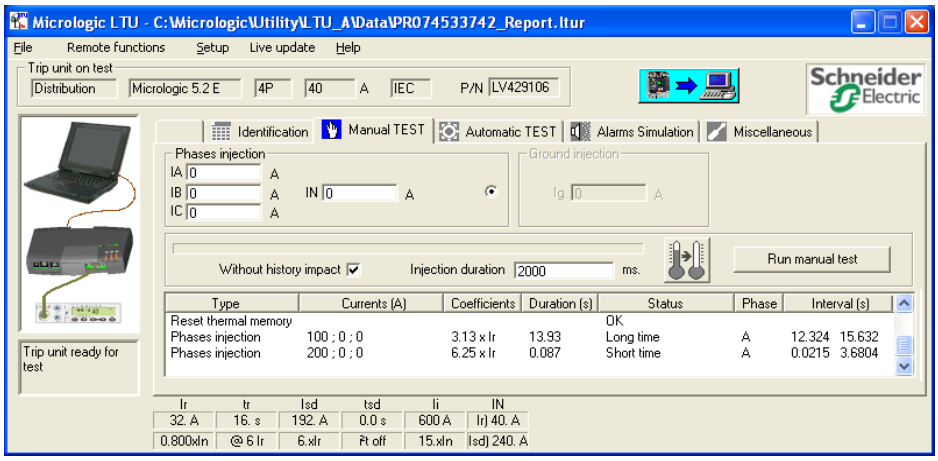
Test Using the LTU Software

Automatic TEST tab

Step	Action
1	Run the LTU software. A description of the Micrologic variant tested appears under the **Trip unit on test** tab. The setting values appear in the area at the foot of the screen.
2	Select the **Automatic TEST** tab.
3	Click on **Run automatic tests**. Fault current simulation is performed on all the protection types in succession: long time, short time, instantaneous and ground fault protection, as applicable.
4	The results are displayed in the table of values: 

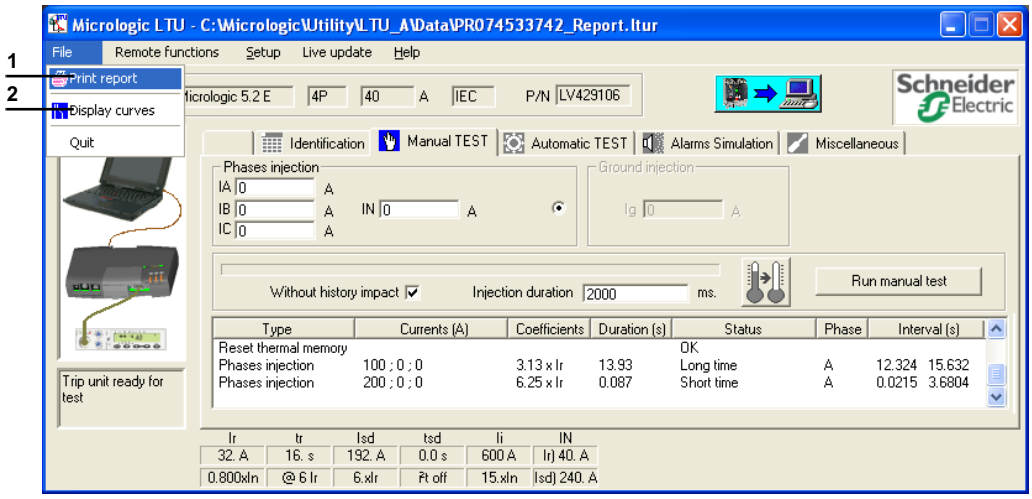
Test Using the LTU Software

Manual TEST tab

Step	Action
1	Run the LTU software. A description of the Micrologic variant tested appears under the **Trip unit on test** tab. The setting values appear at the foot of the screen.
2	Select the Manual TEST tab.
3	Indicate the three fault current values (in A) in the three **Phase injection** areas. Indicate the duration (in ms) of the fault current in the **Injection duration** area.
4	Click on **Run manual test**. The simulation shows the type of trip (e.g. long time) or NON trip.
5	The results are displayed in the table of values: 

Saving and Printing

Settings and data can be saved and printed. The software also provides an option to examine a trace of the trip curve calculated by the trip unit being tested.



1 Printing data
2 Trip curves

The data is saved automatically by the software.

Operating the Compact NSX

5

Aim

This chapter sets out the recommendations concerning the startup phase, operating conditions and maintenance of Compact NSX circuit breakers. Observing these recommendations will ensure a useful service life for the equipment and the installation.

What's in this Chapter?

This chapter contains the following topics:

Startup

List of Checks and Inspections

When starting up new equipment, or following lengthy downtime, a general check takes just a few minutes. Such a check will remove all risk of a malfunction due to error or oversight.

NOTE: The switchboard must be powered down before carrying out any checks and tests.

The table below indicates the checks and inspections to be performed according to the event:

	A	B	C	D	E	F
Prior to startup	■	■	■	■	■	■
Periodically during operation, see *Regular Preventive Maintenance, page 131*.				■	■	■
After carrying out work on the switchboard		■	■	■	■	■
Periodically during lengthy downtime		■		■		■
Following lengthy downtime		■		■	■	■
Following lengthy downtime and modification to the switchboard	■	■	■	■	■	■

A Insulation and dielectric strength tests

B Inspection of the switchboard

C Compliance with the diagram

D Inspection of mechanical equipment

E Mechanical operation

F Check of electronic trip units and Vigi modules

A: Insulation and Dielectric Strength Tests.

Insulation and dielectric strength tests are carried out before the switchboard is delivered. These tests are subject to the currently applicable standards.

⚠ CAUTION

RISK OF EQUIPMENT DAMAGE

Only a trained specialist is authorized to carry out insulation and dielectric strength tests.

Failure to follow these instructions can result in injury or equipment damage.

Dielectric strength tests impose great stress on the equipment and may even destroy it if they are not rigorously performed, and in particular:

- The value used for the test voltage reduces according to the number of consecutive tests on the same piece of equipment
- It may be necessary to disconnect electronic equipment

NOTE: Micrologic trip units do not need to be disconnected, even if equipped with voltage measurement (ENVT option).

A: Insulation and Dielectric Strength Tests on Vigi Modules

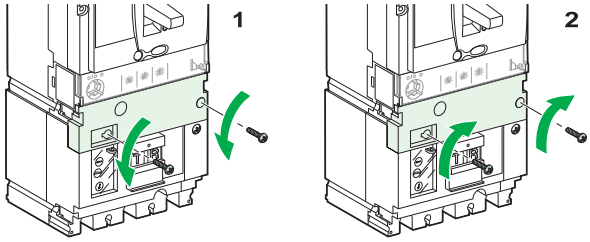
Vigi modules are electronic devices which do need to be disconnected before dielectric tests.

⚠ CAUTION

RISK OF EQUIPMENT DAMAGE

Disconnect the protective cover on the front of the Vigi module.

Failure to follow these instructions can result in injury or equipment damage.



Disconnecting Vigi modules (diagram 1):

A Vigi module is disconnected automatically by removing the protective cover for the connections on the front.

Reconnecting Vigi modules (diagram 2):

Following dielectric tests, it is essential to put the protective cover for the connections back in place.

⚠ DANGER

RISK OF ELECTROCUTION, BURNS OR EXPLOSION

The protective cover for the connections must be reconnected without fail following dielectric tests.

Failure to follow these instructions will result in death or serious injury.

If the cover is not put back in place:
- There is a risk of direct contact with connections
- Protection of people against electrical risks due to a ground fault is no longer guaranteed downstream

B: Inspection of the Switchboard

Check that the circuit breakers are installed:
- In a clean environment where no waste has been left behind from assembling the equipment (wiring, tools, shavings, metallic particles, etc.)
- In a properly ventilated switchboard (unobstructed ventilation grilles)

C: Compliance with the Diagram

Check that the circuit breakers comply with the installation diagram (see *Identification of Compact NSX Circuit Breakers, page 12*):
- Identification of the feeds on the front of the circuit breakers
- Rating and breaking capacity (indications on the rating plate)
- Identification of the trip units (type, rating)
- Presence of additional functions (Vigi earth leakage protection module, motor mechanism, rotary handle, control or indication auxiliaries, locking, sealing)
- Protection settings (overload, short-circuit, earth leakage):
  - Thermal-magnetic and Micrologic 2 electronic trip unit: visually check the position of the switches
  - Micrologic 5 and 6 electronic trip units: visually check the main settings and use the maintenance interface to check in detail

NOTE: In the case of Compact NSX circuit breakers fitted with a Vigi module, check for the presence of the intermediate terminal shield, without which the earth leakage protection will not work (see below).

D: Inspection of Mechanical Equipment

Check the mounting and mechanical strength:
- Of circuit breakers in the switchboard and of power connections
- Of auxiliaries and accessories on the circuit breakers:
  - Rotary handles or motor mechanisms
  - Installation accessories (terminal shields, escutcheons, etc.)
  - Auxiliary circuit connections

E: Mechanical Operation

Check the circuit breaker mechanical operation (see *Description of the Compact NSX Circuit Breaker, page 9*):
- Opening
- Closing
- Tripping with the *push to trip* button
- Resetting

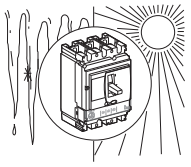
F: Operation of Electronic Trip Units and Vigi Modules

Check that the following are working correctly:
- Micrologic electronic trip units, with the aid of special testing tools:
  - External battery
  - Configuration and maintenance module
- Vigi modules, by operating test button T on the front (this test checks the whole measurement system and guarantees tripping on earth leakage fault)
- Communication via the bus (see *ULP system - User manual*)

Environmental Conditions

Ambient Temperature

The ambient temperature refers to the temperature of the air immediately surrounding the Compact NSX circuit breaker.

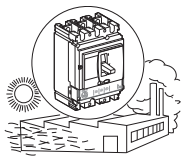


Operating temperature:
- –25°C to +70°C: Normal operating temperature
- –35°C to –25°C: Commissioning possible

Storage temperature:
- –50°C to +85°C: Without Micrologic trip unit
- –40°C to +85°C: With liquid crystal Micrologic trip unit

Extreme Atmospheric Conditions

Compact NSX circuit breakers are designed to operate in industrial atmospheres as defined in standard IEC 60947-2 for the highest level of pollution (level 3).



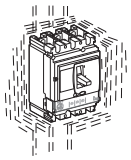
They are also tested for extreme storage conditions according to the following standards:

Standard	Title
IEC 60068-2-2	Dry heat, severity level +85°C
IEC 60068-2-1	Dry cold, severity level –55°C
IEC 60068-2-30	Damp heat, cyclic (temperature +55°C, relative humidity 95%)
IEC 60068-2-52	Salt-mist test

To get the very best use from the circuit breakers, it is advisable to install them in properly ventilated switchboards where excessive dust is not a problem.

Vibration

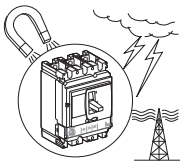
Compact NSX circuit breakers are protected against mechanical or electromagnetic vibration.



Conformity tests are carried out in accordance with standard IEC 60068-2-6 at the levels of severity required by the merchant shipping regulatory bodies (IACS, Veritas, Lloyds), namely:
- 2 Hz to 13.2 Hz with an amplitude of +/- 1 mm
- 13.2 Hz to 100 Hz at a constant acceleration of 0.7 g

Electromagnetic Disturbances

Compact NSX circuit breakers are designed to be immune to electromagnetic disturbance.



They comply with the requirements of the electromagnetic compatibility (EMC) standard.

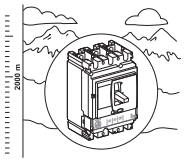
Standard	Title
IEC 60947-2 annexes F and J	Overcurrent protection tests
IEC 60947-2 annexes B and J	Specific tests for earth leakage protection

Compliance with EMC standards is validated by tests for immunity to:
- Overvoltages produced by the operation of electromagnetic switchgear
- Overvoltages produced by atmospheric disturbance passing through the electrical network (for example, lightning)
- The use of apparatus emitting radio waves (radio transmitters, walkie-talkies, radar, etc.)
- Electrostatic discharges produced by the operators themselves

Conformity with EMC standards as described above ensures:
- The Compact NSX circuit breaker will operate correctly in a disturbed environment
  - without nuisance tripping
  - in accordance with the trip time
- There will be no disturbance to any type of industrial or commercial environment

Altitude

Compact NSX circuit breakers are designed to operate within specification at altitudes of up to 2,000 m.



Above 2,000 m modifying the characteristics of the surrounding air (dielectric strength, cooling capacity) causes derating as follows:

Altitude (m)	< 2,000	3,000	4,000	5,000
Maximum operating voltage (V)	690	590	520	460
Rated thermal current (A) at 40°C	In	0.96 x In	0.93 x In	0.9 x In

Maintaining the Compact NSX During Operation

At a Glance

The electrical switchboard and all its equipment continue to age whether they operate or not. This aging process is due mainly to environmental influences and operating conditions.

To ensure that your Compact NSX circuit breaker retains the operating and safety characteristics specified in the catalog for the whole of its service life, it is recommended that:

- The device is installed in optimum environmental and operating conditions (described in the table below).
- Routine inspections and regular maintenance are carried out by qualified personnel.

Environmental and Operating Conditions

The environmental conditions previously described (see *Environmental Conditions, page 129*) refer to harsh operating environments.

The table below describes the optimum environmental and operating conditions:

Environmental and operating factor	Comments
Temperature	Average annual temperature outside the switchboard: < 25°C.
Loading	Loading remains < 80% of In 24 hours a day.
Harmonics	The harmonic current per phase is < 30% of In.
Humidity	The relative humidity is < 70%.
Corrosive atmosphere (SO_2, NH_3, H_2S, Cl_2, NO_2)	The circuit breaker is installed in environmental category 3C1 or 3C2 (IEC 60721-3-3).
Saline environment	The circuit breaker is installed in an environment free of salt mist.
Dust	The dust level is low: the circuit breaker is protected within a switchboard fitted with filters or IP54 ventilated
Vibration	Continuous vibration is < 0.2 g.

The maintenance programs described below apply to these environmental and operating conditions. Outside these limits circuit breakers are subject to accelerated aging which can quickly lead to malfunctions.

Regular Preventive Maintenance

Maintenance (servicing and inspection) recommendations for each product are made by the technical departments concerned. These operations are intended to maintain the equipment or subassemblies in a satisfactory operational state for their useful service life.

There are three recommended maintenance levels.

The table below indicates maintenance operations and their intervals according to the level:

Level	Maintenance interval	Maintenance operations
Level II	1 year	Visual inspection and functional testing, replacement of faulty accessories
Level III	2 years	As for level II plus servicing operation and subassembly tests
Level IV	5 years	As for level III plus diagnostics and repairs (by Schneider Electric Services)
The intervals stated are for normal environmental and operating conditions.		

Provided **all** the environmental conditions are more favorable, maintenance intervals can be longer (for example, Level III maintenance can be carried out every 3 years).

If **just one** of the conditions is more severe, maintenance must be carried out more frequently (for advice contact Schneider Electric Services).

Functions linked specifically to safety require particular intervals.

NOTE: It is advisable to test operation of the remote safety stop commands and the earth leakage protection (Vigi module) at regular intervals (every 6 months).

Inspection and Servicing Operations Required

Inspection and servicing chiefly consist of checks and inspections D, E and F as defined for the commissioning phase (see *Startup, page 126*).

	Inspection definition	Level II	Level III	Level IV

D	Visually inspect the circuit breaker general condition: escutcheon, trip unit, case, chassis, connections.
	Check the mounting and mechanical strength:
	• Of circuit breakers in the switchboard and of power connections
	• Of auxiliaries and accessories on the circuit breakers:
	  • Rotary handles or motor mechanisms
	  • Installation accessories (terminal shields, escutcheons, etc.)
	  • Auxiliary circuit connections
	• Of the chassis (withdrawable circuit breaker)
	• Of locks, padlocks and padlock support tabs
		Yes	As for level II	As for level III plus measurement of insulation resistance

E	Check the circuit breaker mechanical operation: • Opening, closing and resetting • Tripping with the *push to trip* button • Tripping by MN/MX control auxiliaries • Opening, closing, resetting by motor mechanism	Yes	As for level II plus check of the closing/opening times and voltage characteristics (releases)	As for level III

F	Check operation of the electronic subassemblies:
	• Micrologic electronic trip units with the aid of special testing tools:
	  • pocket battery
	  • maintenance interface
	  • RSU and LTU software
	• Vigi modules, using the test button T on the front
	• communication (see *ULP system - User manual*)
		Yes	As for level II plus check of the trip curves (LTU software)	As for level III plus check of the trip characteristics by primary injection

For a detailed definition of these operations, contact Schneider Electric Services.

Maintenance Following Short-Circuit Trip

A circuit breaker is tested in severe conditions in accordance with standard IEC 60947-2, to check that it can break a short-circuit current at maximum permissible value 3 times.

After a short-circuit fault, it is necessary to:

- Carefully clean off any traces of black smoke (the particles may be conducting)
- Check the power connections and fine wires
- Operate the circuit breaker several times at no load (at least 5 times)

Cleaning the Circuit Breakers

To avoid dust deposits that can affect the circuit breaker mechanical operation, it is recommended that the circuit breakers be cleaned if necessary when maintenance is carried out.

Non-metallic parts	Always use a dry cloth. Do not use cleaning products.
Metallic parts	Preferably use a dry cloth. If a cleaning product must be used, avoid applying and/or splashing the product onto non-metallic parts.

What to do in the Event of a Trip

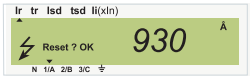
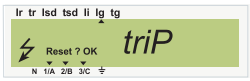
Identify the Cause of the Trip

Local and remote indication provides information on the probable cause of a trip. In particular, the indications specific to the Micrologic 5 or 6 trip unit provide a high level of certainty about the cause of the fault (see *Micrologic 5 and 6 trip units - User manual*).

There are several types of cause:
- Faults on the installation
- Faults due to a malfunction
- Intentional tripping

Trip Following a Fault on the Installation

The control mechanism is positioned on ▼, Trip or Tripped.

Indication			**Probable cause**
TM-D	**Micrologic 2**	**Micrologic 5 and 6**	
SD	SD	SD Information on the display 	Tripped manually by: ● push to trip test ● Manually opening the motor mechanism ● Disconnecting the circuit breaker ● MN or MX releases
SD, SDE	SD, SDE, SDT	SD, SDE, SDT Information on the display 	● TM-D: Tripped on electrical fault, cause unknown ● Micrologic 2: Tripped by long time protection ● Micrologic 5 and 6: Tripped by long time protection on phase 1 at 930 A
	SD, SDE	SD, SDE Information on the display 	● TM-D: Tripped on electrical fault, cause unknown ● Micrologic 2: Tripped by short time or instantaneous protection ● Micrologic 5 and 6: Tripped by instantaneous protection on short-circuit on phase 2 at 18 kA
SD, SDE, SDV Button R on Vigi module in the out position	SD, SDE, SDV Button R on Vigi module in the out position	Micrologic 5 SD, SDE, SDV Button R on Vigi module in the out position Information on the display 	● TM-D: Tripped by earth leakage protection ● Micrologic 2: Tripped by earth leakage protection ● Micrologic 5 and 6: Tripped by earth leakage protection (no other faults reported)
-	-	Micrologic 6 SD, SDE, SDG Information on the display 	● Micrologic 6: Tripped by ground fault protection

Maintenance of the Equipment Following Trip on Fault

The fact that the protection has tripped does not remedy the cause of the fault on the downstream equipment.

⚠ CAUTION

RISK OF CLOSING ON ELECTRICAL FAULT

Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.

Failure to follow these instructions can result in injury or equipment damage.

The feed must be isolated before inspecting the electrical equipment downstream of the protection.

⚠ DANGER

RISK OF ELECTROCUTION, BURNS OR EXPLOSION:

- Only qualified persons are authorized to isolate a protection.
- Use isolating switchgear to isolate the part of the installation that has been de-energized.
- Lock the switchgear in the isolated position.
- Use an appropriate voltage detector to confirm that no voltage is present in the equipment.
- Install safety barriers.
- Display a danger sign.
- Replace all isolation components, doors and covers before re-energizing the equipment.

Failure to follow these instructions will result in death or serious injury.

Depending on the type of fault, maintenance inspections must be carried out on all or part of the equipment where the fault occurred (see *Startup, page 126*):

- Minor faults:
  - Tripped by long time protection
  - Tripped by earth leakage protection

  Following repairs, checks D, E and F must be carried out.
- Serious or destructive faults:
  - Tripped due to unknown electrical fault
  - Tripped by short time protection
  - Tripped by ground fault protection

  Following repairs, checks A, B, D, E and F must be carried out. The circuit breaker that tripped must be specifically checked (see *Maintaining the Compact NSX During Operation, page 131*) before being returned to service.

NOTE: Checks, tests and inspections must be carried out by qualified personnel.

If restarting is a high priority (for example, a safety installation), the defective part of the installation must be isolated and logged in order to carry out this maintenance.

Malfunction: Repetitive Tripping

The table below shows the checks and/or repairs that have to be carried out in relation to the probable causes of the malfunction indicated, according to the trip unit type:

All trip unit types		
Indication	**Probable cause**	**Checks or repairs**
SD	Supply voltage to the MN undervoltage release is too low or subject to significant variations	Check whether the release is powered by a disturbed supply (for example, a supply powering motors with high power ratings may be disturbed). If so, connect the release to a clean or stable supply.
	Supply voltage to an MX shunt release applied unintentionally	Check that the release connection is correct compared to the installation diagram.
SD, SDE	Operating temperature too high	Check the switchboard ventilation and/or the temperature in the room.
SD, SDE, SDV Button R on Vigi module in the out position	Inappropriate earth leakage protection (Vigi module) setting	Check the value of the natural leakage current. Depending on the results: ● Isolate the equipment with excessive natural leakage current ● Or raise the earth leakage (Vigi module) protection setting, observing the safety rules.
	Transient ground fault on the equipment	Check whether the fault coincides with commissioning an item of equipment Depending on the results: ● Repair the faulty equipment ● Isolate the equipment with excessive natural leakage current ● Or raise the earth leakage (Vigi module) protection setting, observing the safety rules.
Micrologic 5 and 6		
Indication	**Probable cause**	**Checks or repairs**
SD, SDE TriP screen then StoP 	Operating temperature too high	Check the switchboard ventilation and/or the temperature in the room.

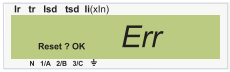
Malfunction: Circuit Breaker Fails to Close

The table below shows the checks and/or repairs that have to be carried out in relation to the probable causes of the malfunction indicated:

All trip unit types		
Indication	**Probable cause**	**Checks or repairs**
Manually-operated circuit breaker		
SD	MX shunt release energized MN undervoltage release not energized	Check that the release connection is correct compared to the installation diagram.
OF	Circuit breaker interlocked	Check the installation and interlock diagram (mechanical or electrical) for both circuit breakers
Circuit breaker with motor mechanism		
OF	Close instruction not operational	Check the Auto position of the selector on the front of the circuit breaker. Also check: ● The power supply to the motor mechanism, the motor voltage ● The voltage at the motor terminals on the motor mechanism ● The close command path

Malfunction: Micrologic 5 and 6 Fault Screens

The table below shows the checks and/or repairs that have to be carried out according to the Micrologic 5 and 6 fault screens (for more details, see the *Micrologic 5 and 6 trip units - User manual*) :

Indication	Probable cause	Checks or repairs
TriP screen then StoP 	Serious fault on the Micrologic trip unit: the trip unit can no longer provide protection	Change the trip unit urgently. The circuit breaker cannot be reset.
Err screen 	Fault on the Micrologic trip unit	Change the trip unit on the next maintenance visit. The trip unit can still provide protection.
OUT screen 	Acknowledgment of a latching alarm has not been reset on the SDx module	Check the cause of the alarm and use the OK button to carry out the reset.

Appendices

Connection Diagrams

A

Aim

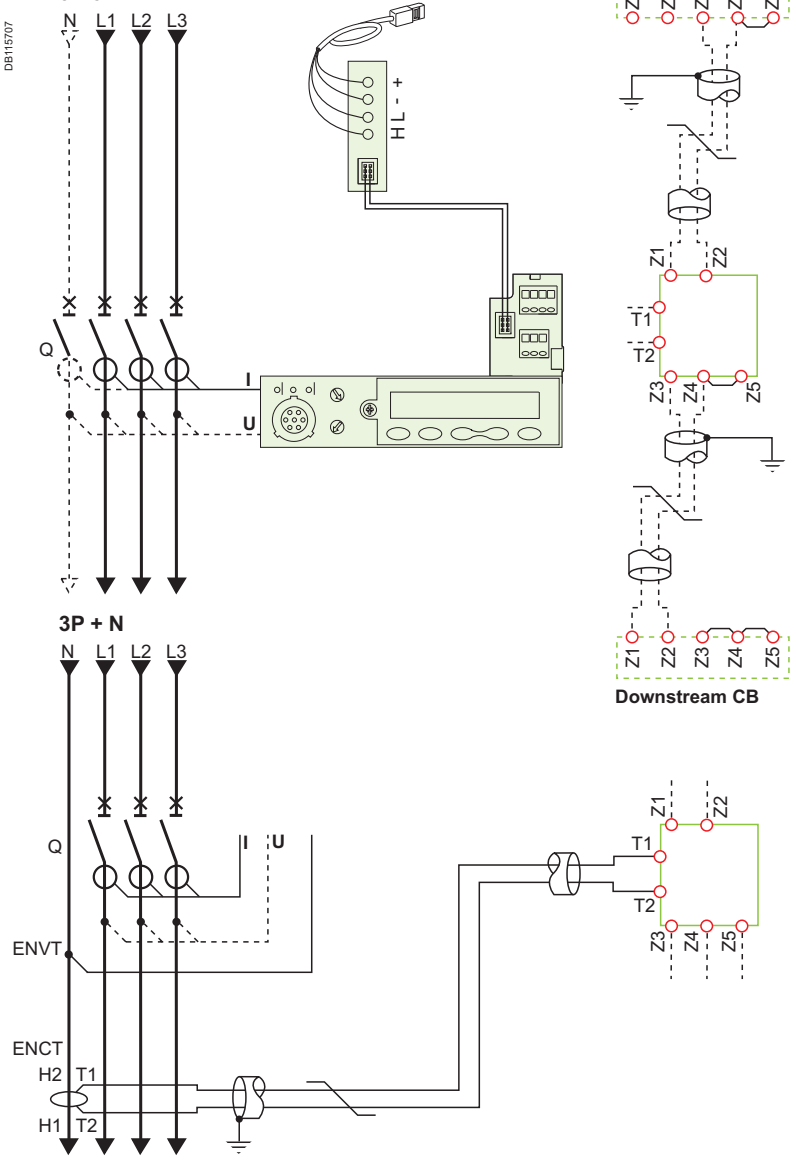
This chapter reproduces the connection diagrams from part D of the Compact NSX catalog.

What's in this Chapter?

This chapter contains the following topics:

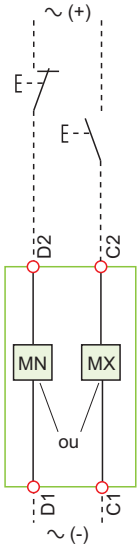
Fixed Devices

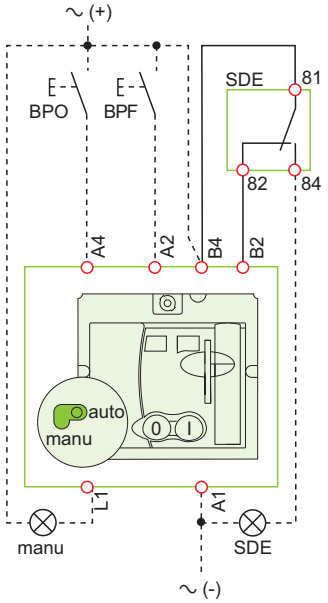
Power



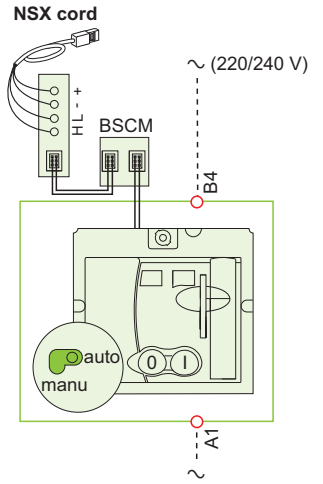
Micrologic

Remote operation





Motor mechanism (MT)



Communicating motor mechanism (MTc)

Micrologic A or E

A/E	**Communication** H(WH), L(BL): data - (BK), + (RD): 24 V DC power supply
A/E	ZSI (Zone Selective Interlocking) Z1: ZSI OUT SOURCE Z2: ZSI OUT Z3: ZSI IN SOURCE Z4: ZSI IN ST (short time) Z5: ZSI IN GF (ground fault) *Note: Z3, Z4, Z5 for NSX400/630 only.*
A/E	ENCT: external neutral current transformer: - shielded cable with 1 twisted pair (T1, T2) - shielding earthed at one end only (CT end). Connection L = 30 cm max. - maximum length of 10 metres - cable size 0.4 to 1.5 mm^2 - recommended cable: Belden 8441 or equivalent.
E	ENVT: external neutral voltage tap for connection to the

Remote operation

MN:	undervoltage release
or	
MX:	shunt release

Motor mechanism (MT)

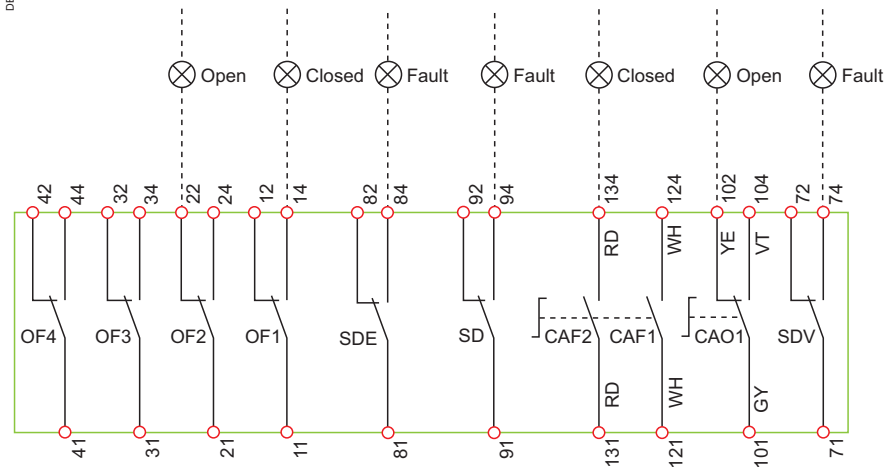
A4:	opening order
A2:	closing order
B4, A1:	power supply to motor mechanism
L1:	manual position (manu)
B2:	SDE interlocking (mandatory for correct operation)
BPO:	opening pushbutton
BPF:	closing pushbutton

Communicating motor mechanism (MTc)

B4, A1:	motor mechanism power supply
BSCM:	breaker status and control module

Indication contacts

DB115708



The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

Terminals shown in red O must be connected by the customer.

Indication contacts

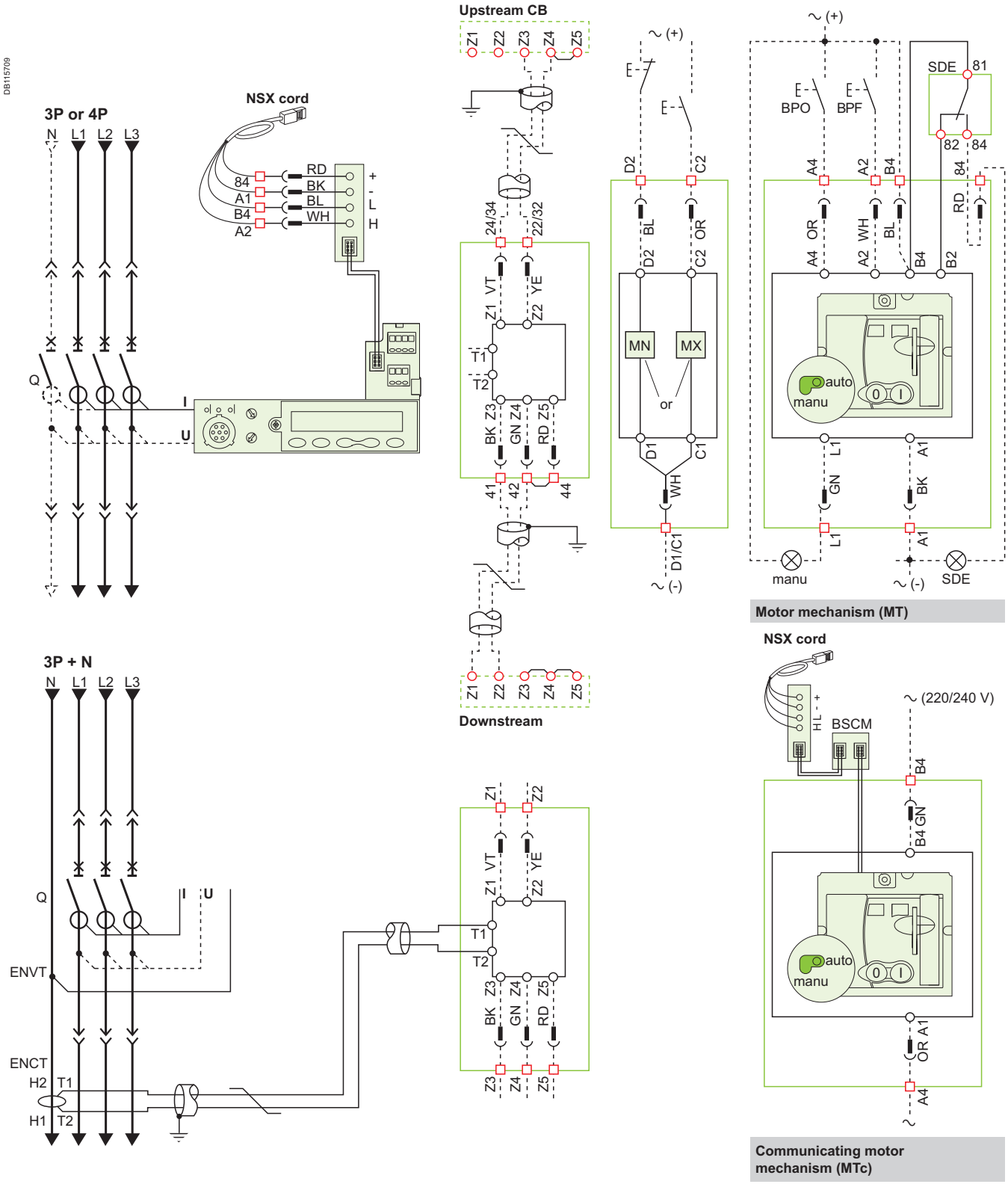
OF2 / OF1: device ON/OFF indication contacts
OF4 / OF3: device ON/OFF indication contacts (NSX400/630)
SDE: fault-trip indication contact (short-circuit, overload, ground fault, eart leakage)
SD: trip-indication contact
CAF2/CAF1: early-make contact (rotary handle only)
CAO1: early-break contact (rotary handle only)
SDV: earth leakage fault trip indication contact (add-on Vigi module)

Colour code for auxiliary wiring

RD:	red	**VT:**	violet
WH:	white	**GY:**	grey
YE:	yellow	**OR:**	orange
BK:	black	**BL:**	blue

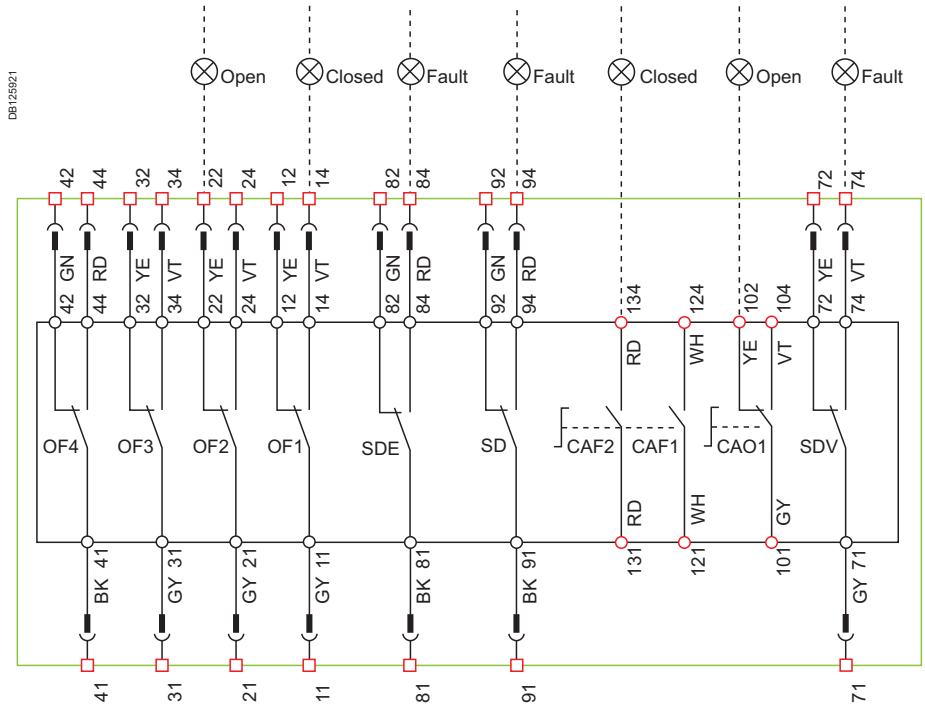
Withdrawable Devices

Power | **Micrologic** | **Remote operation**

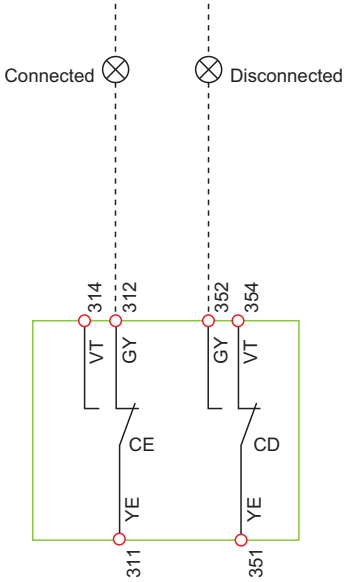


The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

Indication contacts



Carriage switches



Micrologic A or E

A/E	**Communication** H(WH), L(BL): data - (BK), + (RD): 24 V DC power supply
A/E	ZSI (Zone Selective Interlocking) Z1: ZSI OUT SOURCE Z2: ZSI OUT Z3: ZSI IN SOURCE Z4: ZSI IN ST (short time) Z5: ZSI IN GF (ground fault) *Note: Z3, Z4, Z5 for NSX400/630 only.*
A/E	ENCT: external neutral current transformer: - shielded cable with 1 twisted pair (T1, T2) - shielding earthed at one end only (CT end). Connection L = 30 cm max. - maximum length of 10 metres - cable size 0.4 to 1.5 mm^2 - recommended cable: Belden 8441 or equivalent.
E	ENVT: external neutral voltage tap for connection to the neutral via a 3P circuit breaker.

Colour code for auxiliary wiring

RD:	red	**VT:**	violet
WH:	white	**GY:**	grey
YE:	yellow	**OR:**	orange
BK:	black	**BL:**	blue
GN:	green		

Terminals shown in red □ / O must be connected by the customer.

Remote operation

MN: undervoltage release

or

MX: shunt release

Motor mechanism (MT)

A4: opening order

A2: closing order

B4, A1: motor mechanism power supply

L1: manual position (manu)

B2: SDE interlocking (mandatory for automatic or remote recharging)

BPO: opening pushbutton

BPF: closing pushbutton

Communicating motor mechanism (MTc)

B4, A1: motor mechanism power supply

BSCM: breaker status and control module

Indication contacts

OF2 / OF1: device ON/OFF indication contacts

OF4 / OF3: device ON/OFF indication contacts (NSX400/630)

SDE: fault-trip indication contact (short-circuit, overload, ground fault, earth leakage)

SD: trip-indication contact

CAF2/CAF1: early-make contact (rotary handle only)

CAO1: early-break contact (rotary handle only)

SDV: earth leakage fault trip indication contact (add-on Vigi module)

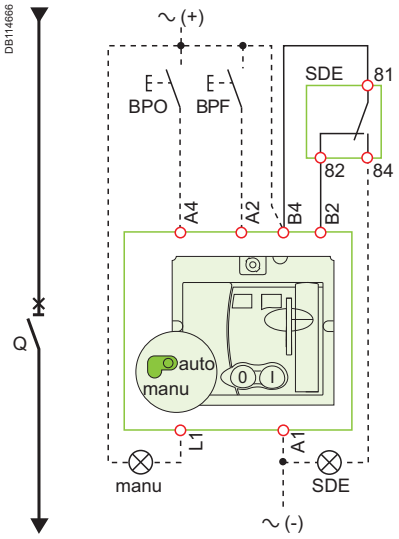
Motor Mechanism

The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

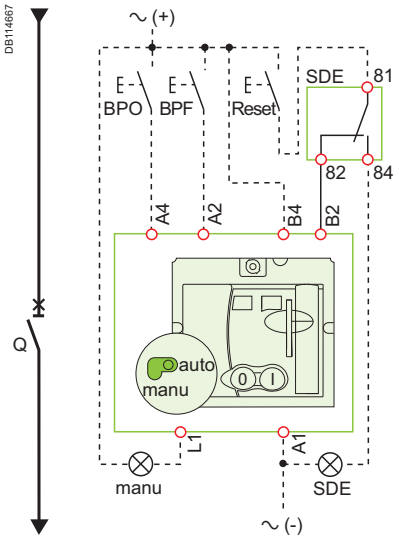
After tripping initiated by the "Push to trip" button or by the undervoltage (MN) release or the shunt (MX) release, device reset can be automatic, remote or manual.

Following tripping due to an electrical fault (with an SDE contact), reset must be carried out manually.

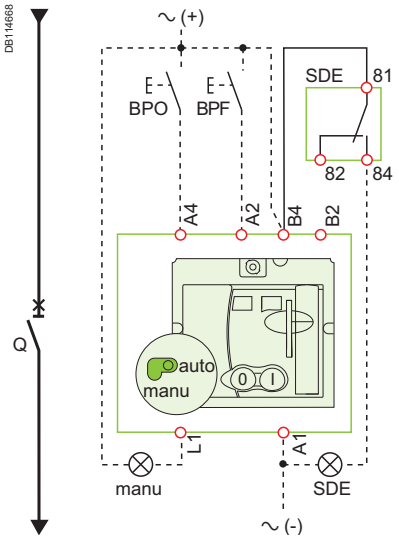
Motor mechanism (MT) with automatic reset



Motor mechanism (MT) with remote reset



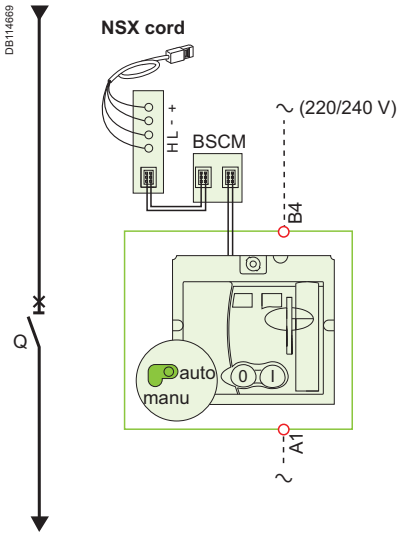
Motor mechanism (MT) with manual reset



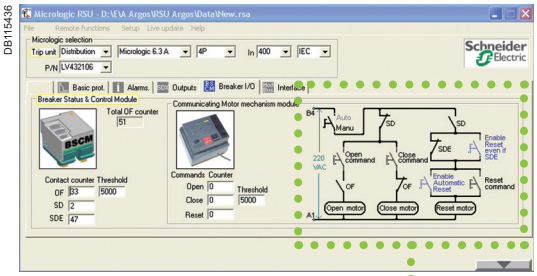
Symbols

Q:	circuit breaker
A4 :	opening order
A2:	closing order
B4, A1:	motor mechanism power supply
L1:	manual position (manu)
B2:	SDE interlocking (mandatory for correct operation)
BPO:	opening pushbutton
BPF:	closing pushbutton
SDE:	fault-trip indication contact (short-circuit, overload, ground fault, earth leakage)

Communicating motor mechanism (MTc)

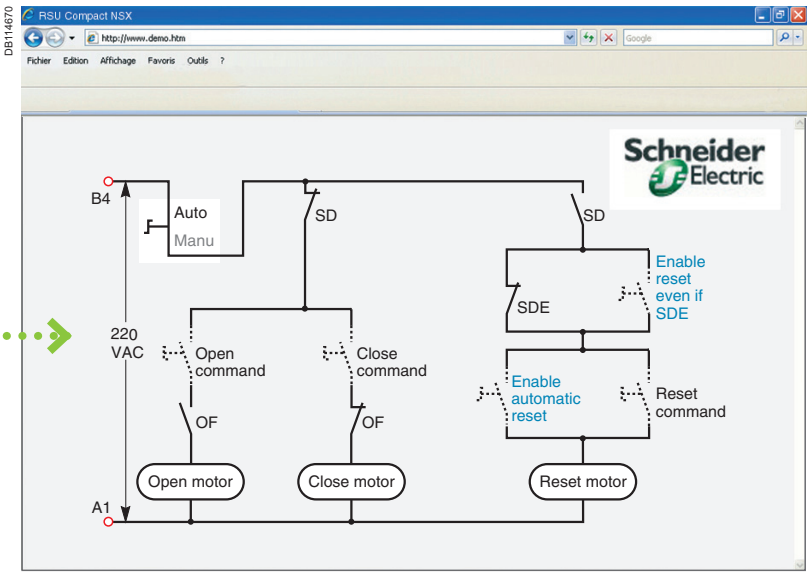


Schematic representation of the communicating motor mechanism (MT).



RSU utility setup screen for the communicating motor mechanism.

RSU screen for the communicating motor mechanism (MTc)



Single-line diagram of communicating motor mechanism
Opening, closing and reset orders are transmitted via the communication network. The "Enable automatic reset" and "Enable reset even if SDE" parameters must be set using the RSU software via the screen by clicking the blue text.

"**Auto/manu**" is a switch on the front of the motor mechanism.

Symbols

Q:	circuit breaker
B4, A1:	motor mechanism power supply
BSCM:	breaker status and control module

Terminals shown in red O must be connected by the customer.

SDx Module With Micrologic 2, 5 and 6 Trip Unit

The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

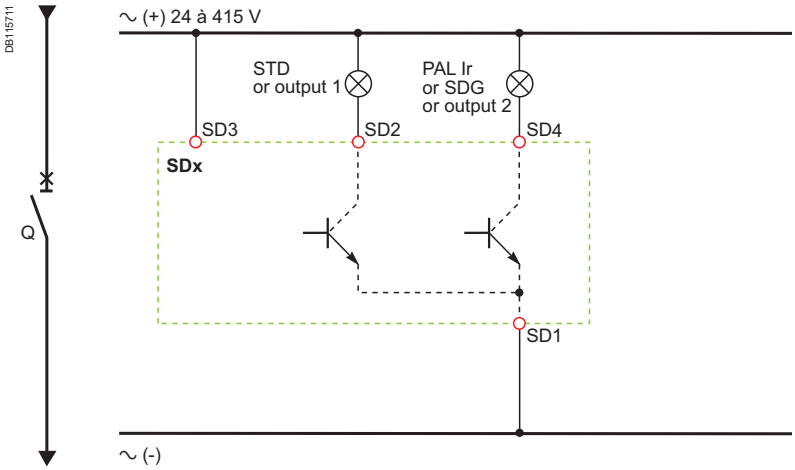
Symbols

SD1, SD3: SDx-module power supply
SD2: output 1 (80 mA max.)
SD4: output 2 (80 mA max.)

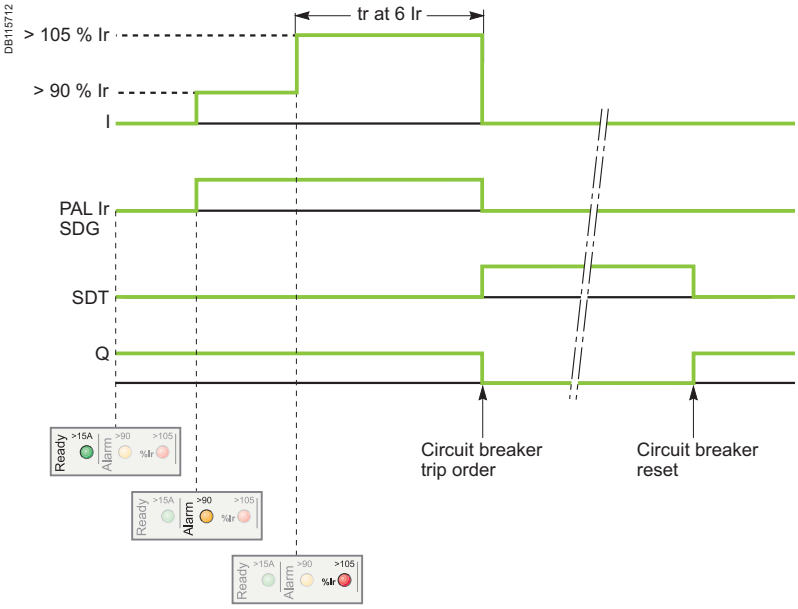
	SD2	SD4
Micrologic 2	SDT	-
Micrologic 5	SDT or output 1	PAL Ir or output 2
Micrologic 6	SDT or output 1	SDG or output 2

Terminals shown in red O must be connected by the customer.

Connection



Operation



I: *charge current*
PAL Ir: *thermal overload pre-alarm*
SDG: *ground-fault signal*
SDT: *thermal-fault signal*
Q: *circuit breaker*

SDTAM Module With Micrologic 2 M and 6 E-M Trip Unit

The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

Symbols

SD1, SD3: SDTAM-module power supply

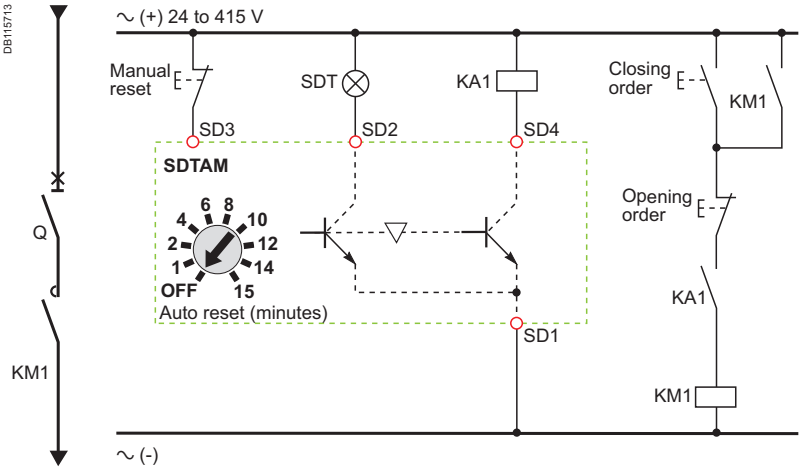
SD2: thermal-fault signal output (80 mA max.)

SD4: contactor-control output (80 mA max.)

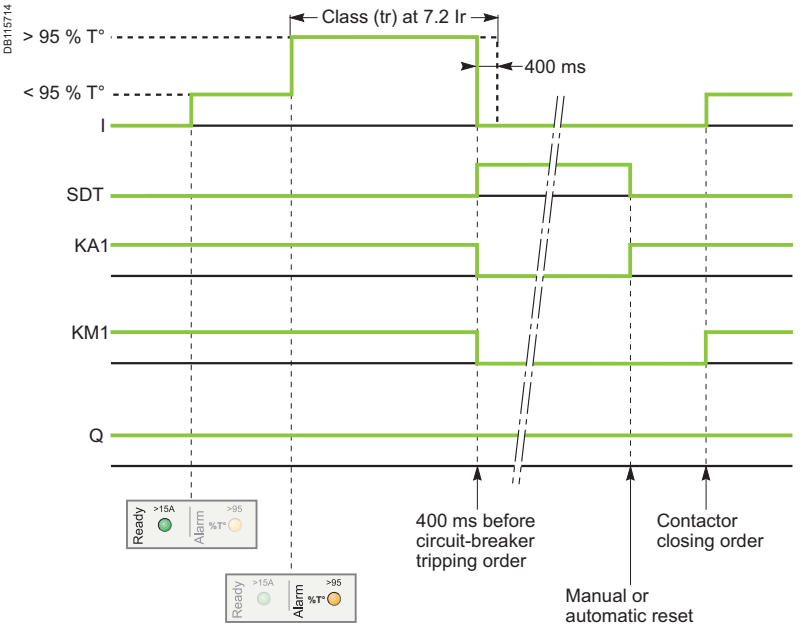
	SD2	SD4
Micrologic 2-M	SDT	KA1
Micrologic 6 E-M	SDT	KA1

Terminals shown in red O must be connected by the customer.

Connection



Operation



I: *charge current*

SDT: *thermal-fault signal*

KA1: *auxiliary relay (e.g. RBN or RTBT relay)*

KM1: *motor contactor*

Q: *circuit breaker*

LV434101

Compact NSX circuit breakers
User manual

Compact NSX

CE

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