

Low Voltage

# Compact NS

Circuit breakers and switch-disconnectors  
from 630b to 3200 A

Catalogue  
2011



**Schneider**  
Electric



## Compact NS

# Setting the standard, once again...

The launch of Schneider Electric Compact NS in 1994 revolutionised the world of moulded-case circuit breakers. Innovative, flexible and attractive, Compact NS rapidly set the standard in its field.

Today, Schneider Electric continues to innovate, extending the Compact NS range to high power ratings to offer a comprehensive and consistent range from 630b to 3200 A.

Equipped with the new generation of Micrologic control units, Compact NS630b to 3200 circuit breakers now offer built-in power and energy metering in addition to electrical measurement and analysis functions.

The communications option makes it possible to control power consumption, simplify maintenance and improve operating comfort. A wide range of optimised auxiliaries and accessories is also available to meet the needs of even more applications.

# Compact NS, simply a step ahead...



# Compact NS range

More than 10 years of techniques and technologies...

Inventor of the unique system-block concept, Schneider Electric proposes a range of circuit breakers to meet the concerns of panel builders and contractors. The result of 30 years of experience in the field of electrical distribution, the Compact NS range is still today the international reference on the moulded case circuit breaker market.

## Consistency

The Compact NS range is available in 2 sizes only in order to homogenise installation dimensions, thus reducing switchboard dimensions and facilitating their installation: volume, depth, pole pitch and fastening points are the same for each size.

## Efficiency

The Compact NS technology satisfies all your needs from 630b to 3200 A, with a breaking capacity from 50 to 200 kA. Equipped with electronic control units, the Compact NS circuit breakers guarantee protection and measurement of your electrical installation.

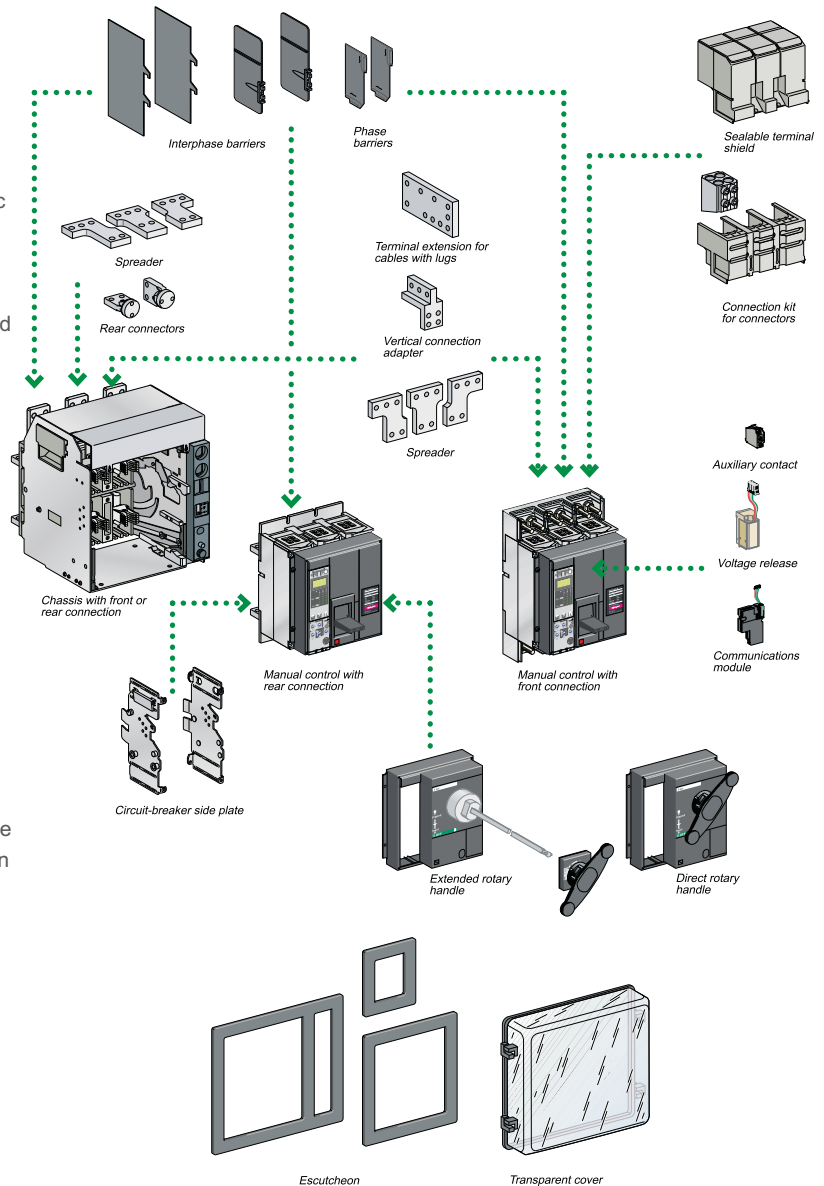
## Flexibility

Compact NS adapts to all your applications: protection of AC installations, generator protection, motor protection, applications in 1000 V, switch-disconnectors, source changeover switches. With Compact NS you have the choice.

## Open-endedness

Compact NS evolves together with your installation: interchangeable trip units, standardised accessories, changing of rating without disassembling the device and addition of indication and control functions make Compact NS the most flexible solution on the market.

> Compact NS field installable devices



An answer for each type of solutions:



Marine



Airports



Oil and gas



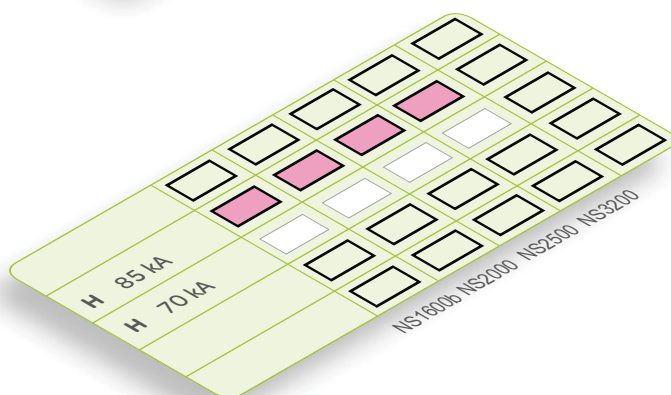
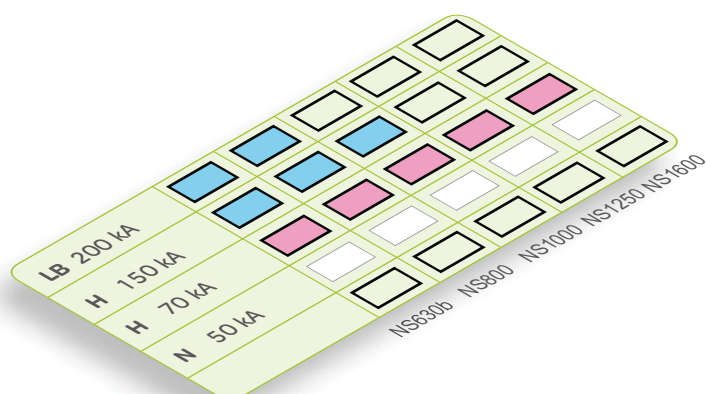
Wind mills



... ahead quite simply

The Compact NS range covers all ratings from 630b to 3200 A:

- Compact NS from 630b to 1600 A, fixed or withdrawable, front or rear connection, manual operating mechanism or motor mechanism. A new 200 kA performance now completes the Compact NS range.
- Compact NS from 1600 to 3200 A, fixed, front connection, with manual operating mechanism.



**2** sizes:

from 630b to 3200 A



Compact NS630b to 1600



Compact NS1600b to 3200



**Even in the hardest conditions,  
Compact NS is the circuit breaker to choose**



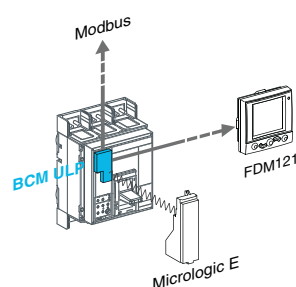
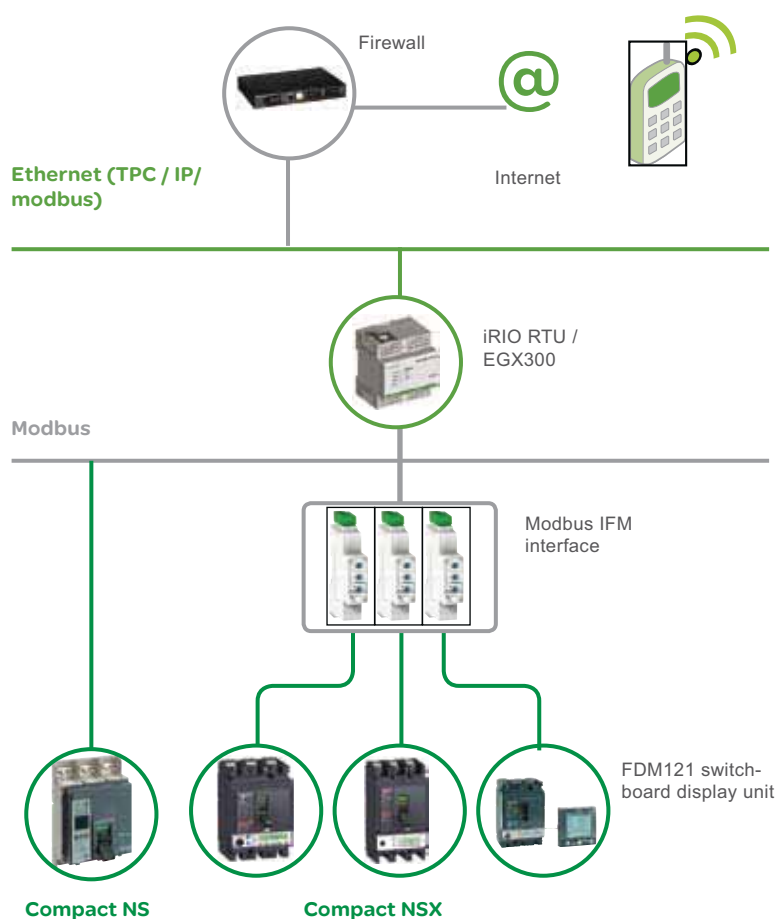
# Compact NS range...

## Optimising the management of your electrical installation

When equipped with a Micrologic types S, A, E or P, Compact NS can be integrated in a general supervision system to optimise installation operation and maintenance.

Alarms may be programmed for remote indications. Used with PowerLogic ION Enterprise software, you can exploit the electrical data (current, voltage, energy, frequency, power, and power quality) to optimise continuity of service and energy management:

- reduce energy and operations costs;
- improve power quality, reliability and uptime;
- optimise equipment use.



Module BCM ULP  
Enables local and remote data access



EGX300 gateway-server or iRIO RTU

The EGX300 web-enabled gateway-server or the iRIO RTU (remote terminal unit) can both be used as Ethernet coupler for the PowerLogic System devices and for any other communicating devices operating under Modbus RS485 protocol. Data is viewable via a standard web browser.



PowerLogic ION Enterprise

PowerLogic ION Enterprise software is a complete power management solution for your facility or plant operations. It can be connected to Masterpact through Ethernet/Modbus protocol.

## A solution for all application types: Compact NS and Compact NSX



### Source changeover

The Compact range proposes interlocking solutions between two devices to perform the source changeover switch function. As from 100 A, a motor mechanism ensures automatic replacement of the main source by a secondary source in order to ensure permanent availability of energy.

**Applications are numerous:** operating theatres, emergency lighting systems, computer rooms, bank security, etc.

### Motor applications

Associated with specific control units, the Compact range ensures motor protection functions up to 750 kW, and includes a dedicated product, Compact NS80H-MA, for applications up to 37 kW.

### DC applications

A specific range from 100 to 630 A with performance **up to 100 kA and 750 V** for battery or traction network type applications.

### 1000 V / 400 Hz applications

The Compact range **covers 1000 V / 400 Hz applications up to 630 A**: road and rail tunnels, mines, wind turbines (1000 V) and aircraft facilities (400 Hz).



#### Building

@ Hotels  
@ Hospitals  
@ Offices  
@ Retail



#### Data Centres and Networks



#### Industry

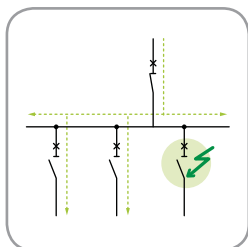
@ Mining and minerals  
@ Automotive  
@ Food and beverage  
@ Chemical industry



#### Energy and Infrastructures

@ Airports  
@ Oil and gas  
@ Water  
@ Electrical energy  
@ Marine

# ...for an installation with a longer service life



## Total control of discrimination for optimum continuity of supply

The result of a technology that has since inspired all major manufacturers, Compact NS offers an unparalleled discrimination level on the electrical distribution market.

Fully incorporated in product design, discrimination is available as standard on all the range devices, without addition of any extra accessories.

Should a fault occur, only the circuit breaker placed immediately upstream from the fault trips.

Continuity of supply is thus guaranteed for the other feeders.



## Highly immune protection system insensitive to disturbances for more reliable operation

Insensitive to external disturbances, the Compact NS range complies with the strictest requirements defined by standard IEC 60947-2 (Appendix F).

Devices are able to operate in their electromagnetic environment without generating disturbances that could result in loss of quality, create a malfunction or a failure in the electrical installation.



## A comprehensive range of trip units and control units to combine measurement and protection

The trip unit becomes a genuine control unit for the Compact NS circuit breaker. It combines various types of measurement with various types of protection.

It measures accurately network parameters, immediately calculates values, memorises, logs, reports, communicates, acts, etc. It is both an extremely reliable protection device and an accurate measuring instrument.

With the Micrologic E, P and H power measurement and advanced protection functions are now available in the Compact NS range.



Electrical  
Energy



Industry



Building,  
shopping malls



Data centres  
and networks



Hospitals

# All the guarantees of a leading brand



## Certification

The reliability of the Compact NS range circuit breakers must be total.

Such reliability is obtained thanks to faultless quality at all stages, from design to operation, in complete compliance with international standards and local certification.



## Tools for easy design

Full documentation, CAD software and a library are available to assist you in all stages of installation design.



## Distribution and service network

With more than 5000 sales outlets in 130 countries, you are guaranteed to find world-wide the range of products complying with your needs and satisfying user country standards perfectly.



## Environmentally friendly products

Schneider Electric commits itself to an environmental approach, manufacturing products in keeping with the requirements of European Directive RoHS (Restriction of Hazardous Substances) in non-polluting ISO 14001 certified manufacturing units.





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|              |   |
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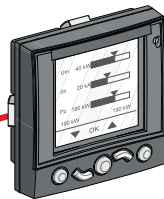
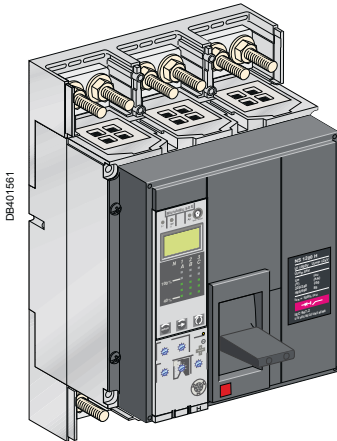
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# Compact NS, even more applications

## Functions

They can be combined with the FDM121 switchboard display unit to provide all the functions of a Power Meter as well as operating assistance.



### Power Meter ► page A-18

All Compact circuit breakers are equipped with a Micrologic control unit that can be changed on site. Control units are designed to protect Power circuits and loads. Alarms may be programmed for remote indications. In addition to protection functions, Micrologic S/A/E/P control units offer all the functions of Power Meter products as well as operating-assistance for the circuit breaker.

### Operating assistance ► page A-20

Integration of measurement functions provides operators with operating assistance functions including alarms tripped by user-selected measurement values, time-stamped event tables and histories, and maintenance indicators.

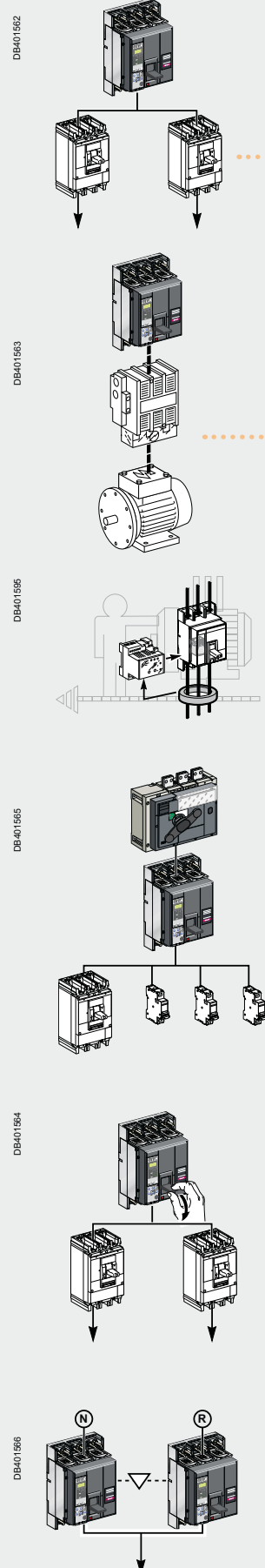
### Switchboard display unit ► page A-21

The main measurements can be read on the built-in screen of Micrologic 2 / 5 / 6 trip units. They can also be displayed on the FDM121 switchboard display unit along with pop-up windows signalling the main alarms.

### Communication ► page A-28

Compact NS equipped with Micrologic 2 / 5 / 6 trip units provide communication capabilities. Breaker ULP cords connect to a Modbus interface module.

## Applications





## Protection of LV distribution systems

► page A-2

Protection for:

- distribution systems supplied by transformers
- distribution systems supplied by engine generator sets
- long cables in IT and TN systems.

Installation :

- in power switchboards.

All circuit breakers in the Compact NS range offer positive contact indication and are suitable for isolation in compliance with standards IEC 60947-1 and 2.

## Protection of motors feeders (AC 220/690 V)

► page A-35

When combined with a motor starter, Compact NS circuit breakers protect the cables and the starter against short-circuits.

Equipped with an electronic trip unit, Compact NS circuit breakers also protect the cables, starter and motor against overloads.

The exceptional current-limiting capacity of Compact NS circuit breakers automatically ensures type-2 coordination with the motor starter, in compliance with standard IEC 60947-4-1.

## Earth leakage

► page A-36

Additional earth-leakage protection protects life and property against the risks of faulty insulation in the installation.

Depending on the circuit breaker, earth-leakage protection is provided by:

- using a specific Micrologic control unit
- using a Vigirex relay and separate toroids.

## Service connection

Compact NS service connection circuit breakers are specially designed for the service-connection function:

- lead seals and locking systems
- tripping curves certified by utilities
- fast overload curves to limit the power supplied, etc.

Interpact INV switch-disconnectors offering visible break (see the corresponding catalogue) can be combined with Compact NS circuit breakers to constitute the various types of service connections and meet the needs of all installation configurations.

## Control and isolation using switch-disconnectors

► page A-37

A switch-disconnector version of Compact NS circuit breakers exists for circuit control and isolation.

All the additional functions may be combined with the basic switch-disconnector function, including:

- earth-leakage protection
- motor mechanism.

For information on other switch-disconnector ranges, see the Interpact (offering positive contact indication and visible break) and Fupact (fuse switch) catalogues.

## Source changeover systems

► page A-44

To ensure a continuous supply of power, some electrical installations are connected to two power sources:

- a normal source
- a replacement source to supply the installation when the normal source is not available.

A mechanical and/or electrical interlocking system between two circuit breakers or switch-disconnectors avoids all risk of parallel connection of the sources during switching.

A source-changeover system can be:

- manual with mechanical device interlocking
- remote controlled with mechanical and/or electrical device interlocking
- automatic by adding a controller to manage switching from one source to the other on the basis of external parameters.

(See *Source-changeover catalogue for dimensions, connections and electrical drawings*).

# Introduction

## General characteristics for NS630b to 3200 range

DB401560

| Compact                                                                                    |           |         |
|--------------------------------------------------------------------------------------------|-----------|---------|
| NS630b H  |           |         |
| Ui 800 V                                                                                   | Uimp 8 kV |         |
| Ue (V)                                                                                     | Icu(kA)   | Ics(kA) |
| 220/240 ~                                                                                  | 70        | 35      |
| 380/415 ~                                                                                  | 70        | 35      |
| 440 ~                                                                                      | 65        | 32      |
| 500/525 ~                                                                                  | 50        | 25      |
| 660/690 ~                                                                                  | 42        | 21      |
| Icw 19.2kA / 1s cat B                                                                      |           |         |
| 50/60Hz                                                                                    |           |         |
| IEC 60947-2<br>AS UNE CEI BS<br>UTE VDE NEMA                                               |           |         |

Standardised characteristics indicated on the rating plate:

|                                                                                     |                                                                                    |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Ui:                                                                                 | rated insulation voltage                                                           |
| Uimp:                                                                               | rated impulse withstand voltage                                                    |
| Icu:                                                                                | ultimate breaking capacity, for various values of the rated operational voltage Ue |
| cat:                                                                                | utilisation category                                                               |
| Icw:                                                                                | rated short-time withstand current                                                 |
| Ics:                                                                                | service breaking capacity                                                          |
| In:                                                                                 | rated current                                                                      |
|  | suitable for isolation                                                             |

### Compliance with standards

Compact NS circuit breakers and auxiliaries comply with the following:

- international recommendations:
    - IEC 60947-1 - general rules
    - IEC 60947-2 - circuit breakers
    - IEC 60947-3 - switches, disconnectors, switch-disconnectors, etc.
    - IEC 60947-4 - contactors and motor starters
    - IEC 60947-5.1 and following - control circuit devices and switching elements; automatic control components
  - European (EN 60947-1 and EN 60947-2) and the corresponding national standards:
    - France NF
    - Germany VDE
    - U.K. BS
    - Australia AS
    - Italy CEI
  - the specifications of the marine classification companies (Veritas, Lloyd's Register of Shipping, Det Norske Veritas, etc.)
  - French standard NF C 79-130 and the recommendations issued by the CNOMO organisation for the protection of machine tools.
- For U.S. UL, Canadian CSA, Mexican NOM and Japanese JIS standards, please consult us.

### Pollution degree

Compact NS circuit breakers are certified for operation in pollution-degree 3 environments as defined by IEC standard 60947 (industrial environments).

### Tropicalisation

Compact NS circuit breakers have successfully passed the tests prescribed by the following standards for extreme atmospheric conditions:

- IEC 60068-2-1 - dry cold (-55 °C)
- IEC 60068-2-2 - dry heat (+85 °C)
- IEC 60068-2-30 - damp heat (95 % relative humidity at 55 °C)
- IEC 60068-2-52 - salt mist (severity level 2).

### Environmental protection

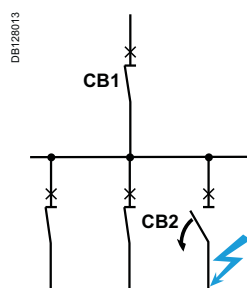
Compact NS circuit breakers take into account important concerns for environmental protection. Most components are recyclable and the parts of Compact NS630b to NS3200 circuit breakers are marked as specified in applicable standards.

### Ambient temperature

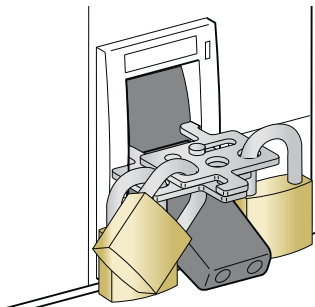
- Compact NS circuit breakers may be used between -25 °C and +70 °C.
- For temperatures higher than 40 °C (65 °C for circuit breakers used to protect motor feeders), devices must be derated as indicated in the documentation.
- circuit-breakers should be put into service under normal ambient operating-temperature conditions. Exceptionally, the circuit breaker may be put into service when the ambient temperature is between -35 °C and -25 °C.
- the permissible storage-temperature range for Compact NS circuit breakers in the original packing is -50 °C <sup>(1)</sup> to +85 °C.

### Discrimination

As standard, the Compact NS range ensures discrimination between two circuit breakers positioned in series in an installation.



<sup>(1)</sup> -40 °C for Micrologic control units with an LCD screen.



### Positive contact indication

All Compact NS circuit breakers are suitable for isolation as defined in IEC standard 60947-2:

- the isolation position corresponds to the O (OFF) position
- the operating handle cannot indicate the "OFF" position unless the contacts are effectively open
- padlocks may not be installed unless the contacts are open.

Installation of a rotary handle or a motor mechanism does not alter the reliability of the position-indication system.

The isolation function is certified by tests guaranteeing:

- the mechanical reliability of the position indication system
- the absence of leakage currents
- overvoltage withstand capacity between upstream and downstream connections.

### Installation in class II switchboards

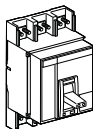
All Compact NS circuit breakers are class II front face devices. They may be installed through the door of class II switchboards (as per IEC standard 60664), without downgrading switchboard insulation. Installation requires no special operations, even when the circuit breaker is equipped with a rotary handle or a motor mechanism.

### Degree of protection

As per standards IEC 60529 (IP degree of protection) and EN 50102 (IK degree of protection against external mechanical impacts).

#### Bare circuit breaker with terminal shields

DB128015

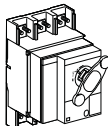


With toggle

IP40

IK07

DB128016

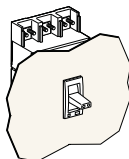
With direct rotary handle  
standard / VDE

IP40

IK07

#### Circuit breaker installed in a switchboard

DB128017

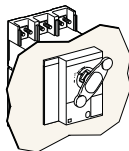


With toggle

IP40

IK07

DB128018

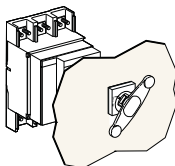
With direct rotary handle  
standard / VDE  
MCC  
CNOMO

IP40

IK07

IP435  
IP547

DB128019



With extended rotary handle

IP55

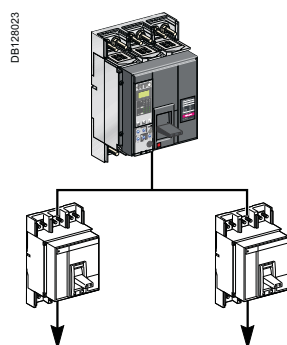
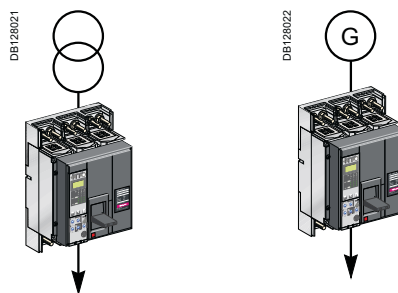
IK08

# Protection of distribution systems

## Overview of solutions

Protection of distribution systems means protection of:

- systems supplied by a transformer
- systems supplied by an engine generator set
- long cables in IT and TN systems.



## Power distribution

### Selection of circuit breakers from 630 to 3200 A page A-10

| Rated current (A) | 250 ...<br>630 | 320 ...<br>800 | 400 ...<br>1000 | 500...<br>1250 | 640...<br>1600 |
|-------------------|----------------|----------------|-----------------|----------------|----------------|
| Compact           | NS630b         | NS800          | NS1000          | NS1250         | NS1600         |



|                                            |    |     |     |     |    |
|--------------------------------------------|----|-----|-----|-----|----|
| Breaking capacity<br>(kA rms)<br>380/415 V | N  | 50  | 50  | 50  | 50 |
|                                            | H  | 70  | 70  | 70  | 70 |
|                                            | L  | 150 | 150 | 150 | -  |
|                                            | LB | 200 | 200 | -   | -  |

|                   |                 |                 |                  |                  |
|-------------------|-----------------|-----------------|------------------|------------------|
| Rated current (A) | 640 ...<br>1600 | 800 ...<br>2000 | 1000 ...<br>2500 | 1250 ...<br>3200 |
|                   | NS1600b         | NS2000          | NS2500           | NS3200           |

Compact



|                                            |   |    |    |    |
|--------------------------------------------|---|----|----|----|
| Breaking capacity<br>(kA rms)<br>380/415 V | N | 70 | 70 | 70 |
|                                            | H | 85 | 85 | 85 |

### Accompanying control units up to 3200 A page A-18

Micrologic electronic control units may be used on all Compact NS630b to NS3200 circuit breakers and can be changed on site.

|                                                         |             |
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# Protection of distribution systems

## Compact NS circuit breakers from 630b up to 3200 A

PB104842



Compact NS800L.

PB104843



Compact NS2000H.

### Compact circuit breakers

|                                                              |                           |                                   |           |           |
|--------------------------------------------------------------|---------------------------|-----------------------------------|-----------|-----------|
| Number of poles                                              |                           |                                   |           |           |
| Control                                                      | manual                    | toggle                            |           |           |
|                                                              | electric                  | direct or extended rotary handle  |           |           |
| Type of circuit breaker                                      |                           |                                   |           |           |
| Connections                                                  | fixed                     | front connection                  |           |           |
|                                                              |                           | rear connection                   |           |           |
|                                                              |                           | front connection with bare cables |           |           |
|                                                              | withdrawable (on chassis) | front connection                  |           |           |
|                                                              |                           | rear connection                   |           |           |
| Electrical characteristics as per Nema AB1                   |                           |                                   |           |           |
| Breaking capacity at 60 Hz (kA)                              |                           | 240 V                             |           |           |
|                                                              |                           | 480 V                             |           |           |
|                                                              |                           | 600 V                             |           |           |
| Electrical characteristics as per IEC 60947-2 and EN 60947-2 |                           |                                   |           |           |
| Rated current (A)                                            | In                        | 50 °C                             |           |           |
|                                                              |                           | 65 °C (1)                         |           |           |
| Rated insulation voltage (V)                                 | Ui                        |                                   |           |           |
| Rated impulse withstand voltage (kV)                         | Uimp                      |                                   |           |           |
| Rated operational voltage (V)                                | Ue                        | AC 50/60 Hz                       |           |           |
| Type of circuit breaker                                      |                           |                                   |           |           |
| Ultimate breaking capacity (kA rms)                          | Manual                    | Icu                               | AC        | 220/240 V |
|                                                              |                           |                                   | 50/60 Hz  | 380/415 V |
|                                                              |                           |                                   |           | 440 V     |
|                                                              |                           | Ics                               | 500/525 V |           |
|                                                              |                           |                                   | 660/690 V |           |
|                                                              |                           |                                   |           | 220/240 V |
|                                                              | Electrical                | Icu                               | AC        | 380/415 V |
|                                                              |                           |                                   | 50/60 Hz  | 440 V     |
|                                                              |                           |                                   |           | 500/525 V |
|                                                              |                           | Ics                               | 660/690 V |           |
|                                                              |                           |                                   |           | 220/240 V |
|                                                              |                           |                                   |           | 380/415 V |
|                                                              |                           | 440 V                             |           |           |
|                                                              |                           | 500/525 V                         |           |           |
|                                                              |                           | 660/690 V                         |           |           |
| Short-time withstand current (kA rms)                        | Icw                       | AC                                | 1 s       |           |
|                                                              |                           | 50/60 Hz                          | 3 s       |           |
| Integrated instantaneous protection                          |                           | kA peak ±10 %                     |           |           |
| Suitability for isolation                                    |                           |                                   |           |           |
| Utilisation category                                         |                           |                                   |           |           |
| Durability (C-O cycles)                                      | mechanical                |                                   |           |           |
|                                                              | electrical                | 440 V                             | In/2      |           |
|                                                              |                           | 690 V                             | In/2      |           |
|                                                              |                           |                                   | In        |           |
| Pollution degree                                             |                           |                                   |           |           |

<sup>(1)</sup> 65 °C with vertical connections. See the temperature derating tables for other types of connections.

<sup>(2)</sup> Ics: 100 % Icu for breaking capacity 440V/500V/660V  
Ics: 75 % Icu for breaking capacity 220V/380V.

|  | NS630b        |      | NS800 |      | NS1000 |      |      | NS1250 |      | NS1600 |      | NS1600b |     | NS2000 |  | NS2500 |  | NS3200 |  |  |
|--|---------------|------|-------|------|--------|------|------|--------|------|--------|------|---------|-----|--------|--|--------|--|--------|--|--|
|  | 3, 4          |      |       |      | 3, 4   |      |      | 3, 4   |      | 3, 4   |      | 3, 4    |     |        |  |        |  |        |  |  |
|  | ■             |      |       |      | ■      |      |      | ■      |      | ■      |      | ■       |     |        |  |        |  |        |  |  |
|  | ■             |      |       |      | ■      |      |      | ■      |      | ■      |      | -       |     |        |  |        |  |        |  |  |
|  | ■ (except LB) |      |       |      | ■      |      |      | ■      |      | ■      |      | -       |     |        |  |        |  |        |  |  |
|  | N             | H    | L     | LB   | N      | H    | L    | N      | H    | N      | H    | N       | H   |        |  |        |  |        |  |  |
|  | ■             | ■    | ■     | -    | ■      | ■    | ■    | ■      | ■    | ■      | ■    | ■       | ■   |        |  |        |  |        |  |  |
|  | ■             | ■    | ■     | ■    | ■      | ■    | ■    | ■      | ■    | ■      | ■    | ■       | ■   |        |  |        |  |        |  |  |
|  | ■             | ■    | -     | -    | ■      | ■    | -    | ■      | ■    | -      | -    | -       | -   |        |  |        |  |        |  |  |
|  | ■             | ■    | ■     | ■    | ■      | ■    | ■    | ■      | ■    | ■      | ■    | -       | -   |        |  |        |  |        |  |  |
|  | ■             | ■    | ■     | ■    | ■      | ■    | ■    | ■      | ■    | ■      | ■    | -       | -   |        |  |        |  |        |  |  |
|  | N             | H    | L     | LB   | N      | H    | L    | N      | H    | N      | H    | N       | H   |        |  |        |  |        |  |  |
|  | 50            | 65   | 125   | 200  | 50     | 65   | 125  | 50     | 65   | 50     | 65   | 85      | 125 |        |  |        |  |        |  |  |
|  | 35            | 50   | 100   | 200  | 35     | 50   | 100  | 35     | 50   | 35     | 50   | 65      | 85  |        |  |        |  |        |  |  |
|  | 25            | 50   | -     | 100  | 25     | 50   | -    | 25     | 50   | 25     | 50   | 50      | -   |        |  |        |  |        |  |  |
|  | 630           |      |       |      | 1000   |      |      | 1250   |      | 1600   |      | 1600    |     | 2000   |  | 2500   |  | 3200   |  |  |
|  | 630           |      |       |      | 1000   |      |      | 1250   |      | 1510   |      | 1550    |     | 1900   |  | 2500   |  | 2970   |  |  |
|  | 800           |      |       |      | 800    |      |      | 800    |      | 800    |      | 800     |     |        |  |        |  |        |  |  |
|  | 8             |      |       |      | 8      |      |      | 8      |      | 8      |      | 8       |     |        |  |        |  |        |  |  |
|  | 690           |      |       |      | 690    |      |      | 690    |      | 690    |      | 690     |     |        |  |        |  |        |  |  |
|  | N             | H    | L     | LB   | N      | H    | L    | N      | H    | N      | H    | N       | H   |        |  |        |  |        |  |  |
|  | 85            | 85   | 150   | 200  | 85     | 85   | 150  | 85     | 85   | 85     | 85   | 85      | 125 |        |  |        |  |        |  |  |
|  | 50            | 70   | 150   | 200  | 50     | 70   | 150  | 50     | 70   | 50     | 70   | 70      | 85  |        |  |        |  |        |  |  |
|  | 50            | 65   | 130   | 200  | 50     | 65   | 130  | 50     | 65   | 50     | 65   | 65      | 85  |        |  |        |  |        |  |  |
|  | 40            | 50   | 100   | 100  | 40     | 50   | 100  | 40     | 50   | 40     | 50   | 65      | -   |        |  |        |  |        |  |  |
|  | 30            | 42   | -     | 75   | 30     | 42   | -    | 30     | 42   | 30     | 42   | 65      | -   |        |  |        |  |        |  |  |
|  | 50            | 52   | 150   | 200  | 50     | 52   | 150  | 50     | 52   | 37     | 37   | 65      | 94  |        |  |        |  |        |  |  |
|  | 50            | 52   | 150   | 200  | 50     | 52   | 150  | 50     | 52   | 37     | 37   | 52      | 64  |        |  |        |  |        |  |  |
|  | 50            | 48   | 130   | 200  | 50     | 48   | 130  | 50     | 48   | 25     | 32   | 65      | 64  |        |  |        |  |        |  |  |
|  | 40            | 37   | 100   | 100  | 40     | 37   | 100  | 40     | 37   | 20     | 25   | 65      | -   |        |  |        |  |        |  |  |
|  | 30            | 31   | -     | 75   | 30     | 31   | -    | 30     | 31   | 15     | 21   | 65      | -   |        |  |        |  |        |  |  |
|  | 50            | 70   | 150   | -    | 50     | 70   | 150  | 50     | 70   | 50     | 70   | -       |     |        |  |        |  |        |  |  |
|  | 50            | 70   | 150   | -    | 50     | 70   | 150  | 50     | 70   | 50     | 70   |         |     |        |  |        |  |        |  |  |
|  | 50            | 65   | 130   | -    | 50     | 65   | 130  | 50     | 65   | 50     | 65   |         |     |        |  |        |  |        |  |  |
|  | 40            | 50   | 100   | -    | 40     | 50   | 100  | 40     | 50   | 40     | 50   |         |     |        |  |        |  |        |  |  |
|  | 30            | 42   | -     | -    | 30     | 42   | -    | 30     | 42   | 30     | 42   | -       |     |        |  |        |  |        |  |  |
|  | 37            | 35   | 150   | -    | 37     | 35   | 150  | 37     | 35   | 37     | 35   |         |     |        |  |        |  |        |  |  |
|  | 37            | 35   | 150   | -    | 37     | 35   | 150  | 37     | 35   | 37     | 35   |         |     |        |  |        |  |        |  |  |
|  | 37            | 32   | 130   | -    | 37     | 32   | 130  | 37     | 32   | 37     | 32   |         |     |        |  |        |  |        |  |  |
|  | 30            | 25   | 100   | -    | 30     | 25   | 100  | 30     | 25   | 30     | 25   |         |     |        |  |        |  |        |  |  |
|  | 22            | 21   | -     | -    | 22     | 21   | -    | 22     | 21   | 22     | 21   |         |     |        |  |        |  |        |  |  |
|  | 19.2          | 19.2 | -     | -    | 19.2   | 19.2 | -    | 19.2   | 19.2 | 19.2   | 19.2 | -       |     |        |  |        |  |        |  |  |
|  | -             | -    | -     | -    | -      | -    | -    | -      | -    | -      | -    |         |     |        |  |        |  |        |  |  |
|  | 40            | 40   | -     | -    | 40     | 40   | -    | 40     | 40   | 40     | 40   | 130     |     |        |  |        |  |        |  |  |
|  | ■             |      |       |      | ■      |      |      | ■      |      | ■      |      |         |     |        |  |        |  |        |  |  |
|  | B             | B    | A     | A    | B      | B    | A    | B      | B    | B      | B    | B       |     |        |  |        |  |        |  |  |
|  | 10000         |      |       |      | 10000  |      |      | 10000  |      | 10000  |      | 5000    |     |        |  |        |  |        |  |  |
|  | 6000          | 6000 | 4000  | 4000 | 6000   | 6000 | 4000 | 5000   |      | 5000   |      | 3000    |     |        |  |        |  |        |  |  |
|  | 5000          | 5000 | 3000  | 3000 | 5000   | 5000 | 3000 | 4000   |      | 2000   |      |         |     |        |  |        |  |        |  |  |
|  | 4000          | 4000 | 3000  | 3000 | 4000   | 4000 | 3000 | 3000   |      | 2000   |      |         |     |        |  |        |  |        |  |  |
|  | 2000          | 2000 | 2000  | 2000 | 2000   | 2000 | 2000 | 2000   |      | 1000   |      |         |     |        |  |        |  |        |  |  |
|  | 3             |      |       |      | 3      |      |      | 3      |      | 3      |      | 3       |     |        |  |        |  |        |  |  |



# Protection of distribution systems

## Compact NS circuit breakers from 630b up to 3200 A

### Compact circuit breakers

#### Protection and measurements

Interchangeable control units

Overload protection long time **I<sub>r</sub>** (I<sub>n</sub> x ...)Short-circuit protection short time **I<sub>sd</sub>** (I<sub>r</sub> x ...)instantaneous **I<sub>i</sub>** (I<sub>n</sub> x ...)Earth-fault protection **I<sub>g</sub>** (I<sub>n</sub> x ...)Residual earth-leakage protection **I<sub>Δn</sub>**Zone selective interlocking **ZSI**

Protection of the fourth pole

Current measurements

Power measurements

Advanced protection

Quick view

#### Remote communication by bus

Device-status indication

Device remote operation

Transmission of settings

Indication and identification of protection devices and alarms

Transmission of measured current values

### Compact circuit breakers

#### Additional indication and control auxiliaries

Indication contacts

Voltage releases MX shunt release/MN undervoltage release

#### Installation

Accessories

terminal extensions and spreaders  
terminal shields and interphase barriers  
escutcheons

Dimensions fixed devices, front connections (mm) 3P

H x W x D 4P

Weight fixed devices, front connections (kg) 3P

4P

#### Source changeover system (see section on "source changeover systems")

Manual, remote-operated and automatic source changeover systems

(1) Except 1600b-3200.

|  | NS630b          | NS800 | NS1000 | NS1250 | NS1600 | NS1600b | NS2000          | NS2500 | NS3200 |      |                      |                      |                      |
|--|-----------------|-------|--------|--------|--------|---------|-----------------|--------|--------|------|----------------------|----------------------|----------------------|
|  | Micrologic      |       |        |        |        |         |                 |        |        |      |                      |                      |                      |
|  | 2.0             | 5.0   | 6.0    | 2.0A   | 5.0A   | 6.0A    | 7.0A            | 2.0E   | 5.0E   | 6.0E | 5.0 P <sup>(1)</sup> | 6.0 P <sup>(1)</sup> | 7.0 P <sup>(1)</sup> |
|  | ■               | ■     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | ■     | ■      | -      | ■      | ■       | ■               | -      | ■      | ■    | ■                    | ■                    | ■                    |
|  | ■               | ■     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | ■      | -      | -      | ■       | -               | -      | -      | ■    | -                    | ■                    | -                    |
|  | -               | -     | -      | -      | -      | -       | ■               | -      | -      | -    | ■                    | ■                    | ■                    |
|  | -               | -     | -      | ■      | ■      | ■       | ■               | -      | -      | -    | ■                    | ■                    | ■                    |
|  | ■               | ■     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | -      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | -      | -      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | -      | -      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | -      | -      | -      | -       | ■               | ■      | ■      | ■    | -                    | -                    | -                    |
|  | ■               | ■     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | ■               | ■     | ■      | ■      | ■      | -       | -               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | -               | -     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | -                    | -                    | -                    |
|  | -               | -     | ■      | ■      | ■      | ■       | ■               | ■      | ■      | ■    | ■                    | ■                    | ■                    |
|  | NS630b          | NS800 | NS1000 | NS1250 | NS1600 | NS1600b | NS2000          | NS2500 | NS3200 |      |                      |                      |                      |
|  | ■               |       |        |        |        |         | ■               |        |        |      |                      |                      |                      |
|  | ■               |       |        |        |        |         | ■               |        |        |      |                      |                      |                      |
|  | ■               |       |        |        |        |         | -               |        |        |      |                      |                      |                      |
|  | ■               |       |        |        |        |         | ■               |        |        |      |                      |                      |                      |
|  | ■               |       |        |        |        |         | ■               |        |        |      |                      |                      |                      |
|  | 327 x 210 x 147 |       |        |        |        |         | 350 x 420 x 160 |        |        |      |                      |                      |                      |
|  | 327 x 280 x 147 |       |        |        |        |         | 350 x 535 x 160 |        |        |      |                      |                      |                      |
|  | 14              |       |        |        |        |         | 24              |        |        |      |                      |                      |                      |
|  | 18              |       |        |        |        |         | 36              |        |        |      |                      |                      |                      |
|  | ■               |       |        |        |        |         | -               |        |        |      |                      |                      |                      |

All Compact circuit breakers are equipped with a Micrologic control unit that can be changed on site. Control units are designed to protect Power circuits and loads. Alarms may be programmed for remote indications.

Measurements of current, voltage, frequency, power and power quality optimise continuity of service and energy management.

### Dependability

Integration of protection functions in an ASIC electronic component used in all Micrologic control units guarantees a high degree of reliability and immunity to conducted or radiated disturbances.

On Micrologic A, E and P control units, advanced functions are managed by an independent microprocessor.

### Accessories

Certain functions require the addition of Micrologic control unit accessories, described on [page A-27](#).

The rules governing the various possible combinations can be found in the documentation accessible via the Products and services menu of the [www.schneider-electric.com](http://www.schneider-electric.com) web site.

### Micrologic name codes

**2.0 E**

X Y Z

#### X: type of protection

- 2 for basic protection
- 5 for selective protection
- 6 for selective + earth-fault protection
- 7 for selective + earth-leakage protection.

#### Y: control-unit generation

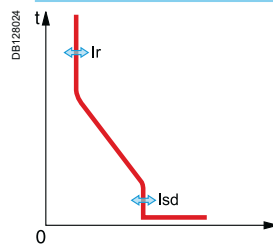
Identification of the control-unit generation.  
"0" signifies the first generation.

#### Z: type of measurement

- A for "ammeter"
- E for "energy"
- P for "power meter"

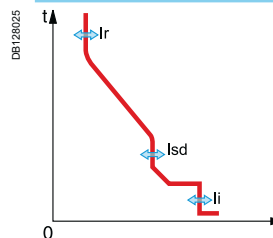
### Current protection

#### Micrologic 2: basic protection



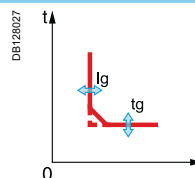
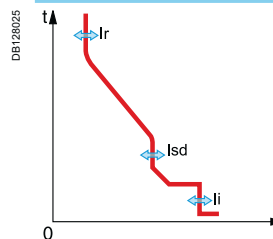
**Protection:**  
long time  
+ instantaneous

#### Micrologic 5: selective protection



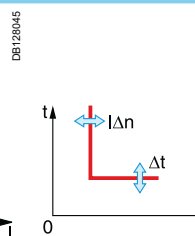
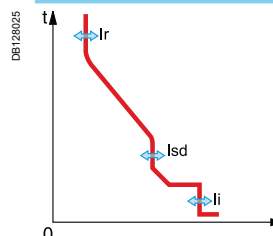
**Protection:**  
long time  
+ short time  
+ instantaneous

#### Micrologic 6: selective + earth-fault protection



**Protection:**  
long time  
+ short time  
+ instantaneous  
+ earth fault

#### Micrologic 7: selective + earth-leakage protection 6: selective + earth-fault protection



**Protection:**  
long time  
+ short time  
+ instantaneous  
+ earth leakage up to 3200A



| Micrologic without measurement                                                                                 | Measurements and programmable protection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                 |                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|                                                                                                                | <p><b>A: ammeter</b></p> <ul style="list-style-type: none"><li>■ <math>I_1</math>, <math>I_2</math>, <math>I_3</math>, <math>I_N</math>, <math>I_{\text{earth-fault}}</math>, <math>I_{\text{earth-leakage}}</math> and maximeter for these measurements</li><li>■ fault indications</li><li>■ settings in amperes and in seconds.</li></ul> <p><b>E: Energy</b></p> <ul style="list-style-type: none"><li>■ incorporates all the rms measurements of Micrologic A, plus voltage, power factor, power and energy metering measurements.</li><li>□ calculates the current demand value</li><li>□ "Quickview" function for the automatic cyclical display of the most useful values (as standard or by selection).</li></ul> <p><b>P: A + power meter + programmable protection</b></p> <ul style="list-style-type: none"><li>■ measurements of V, A, W, VAR, VA, Wh, VARh, VAh, Hz, <math>V_{\text{peak}}</math>, <math>A_{\text{peak}}</math>, power factor and maximeters and minimeters</li><li>■ IDMTL long-time protection, minimum and maximum voltage and frequency, voltage and current imbalance, phase sequence, reverse power</li><li>■ load shedding and reconnection depending on power or current</li><li>■ measurements of interrupted currents, differentiated fault indications, maintenance indications, event histories and time-stamping, etc.</li></ul> |                                                                                                                 |                                                                                                                   |
| <b>2.0</b><br>DB1128372<br>  | <b>2.0 A</b><br>DB1128290<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>2.0 E</b><br>DB128302<br>  |                                                                                                                   |
| <b>5.0</b><br>DB1128374<br> | <b>5.0 A</b><br>DB128299<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>5.0 E</b><br>DB128306<br> | <b>5.0 P</b><br>DB128308<br> |
| <b>6.0</b><br>DB128286<br>  | <b>6.0 A</b><br>DB128300<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>6.0 E</b><br>DB128307<br> | <b>6.0 P</b><br>DB128309<br> |
|                                                                                                                | <b>7.0 A</b><br>DB128301<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                 | <b>7.0 P</b><br>db128321<br> |

Micrologic 2.0, 5.0 and 6.0 control units protect power circuits. Micrologic 5.0 and 6.0 offers time discrimination for short-circuits as well.

### Protection

Protection thresholds and delays are set using the adjustment dials.

#### Overload protection

True rms long-time protection.

Thermal memory: thermal image before and after tripping.

Setting accuracy may be enhanced by limiting the setting range using a different long-time rating plug.

Overload protection can be cancelled using a specific LT rating plug "Off".

#### Short-circuit protection

Short-time (rms) and instantaneous protection.

Selection of  $I^2t$  type (ON or OFF) for short-time delay.

#### Earth-fault protection

Residual or source ground return earth fault protection.

Selection of  $I^2t$  type (ON or OFF) for delay.

#### Neutral protection

On three-pole circuit breakers, neutral protection is not possible.

On four-pole circuit breakers, neutral protection may be set using a three-position switch: neutral unprotected (4P 3d), neutral protection at 0.5  $I_r$  (4P 3d + N/2) or neutral protection at  $I_r$  (4P 4d).

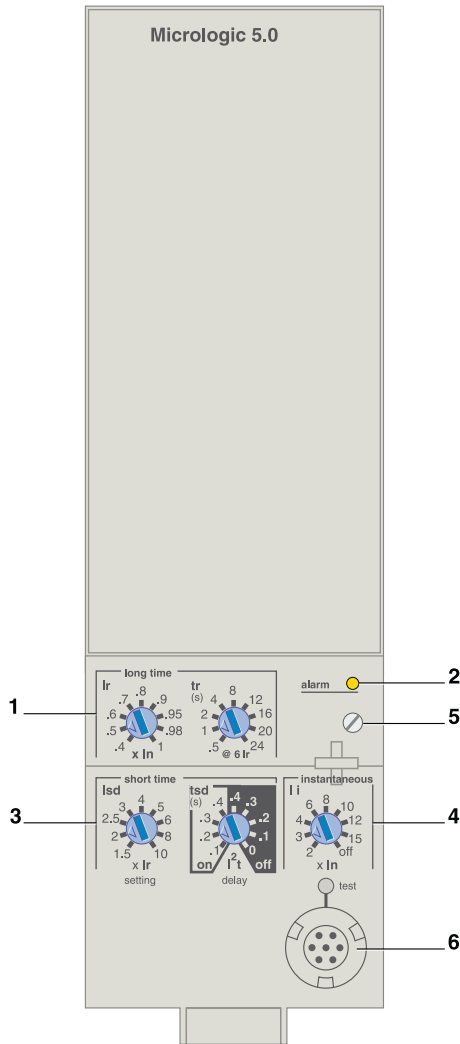
### Indications

Overload indication by alarm LED on the front; the LED goes on when the current exceeds the long-time trip threshold.

### Test

A mini test kit or a portable test kit may be connected to the test connector on the front to check circuit-breaker operation after installing the trip unit or accessories.

DB128030



- 1 long-time threshold and tripping delay
- 2 overload alarm (LED)
- 3 short-time pick-up and tripping delay
- 4 instantaneous pick-up
- 5 fixing screw for long-time rating plug
- 6 test connector

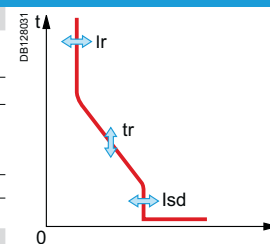
#### Note.

Micrologic control units are equipped with a transparent lead-seal cover as standard.



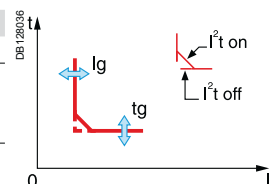
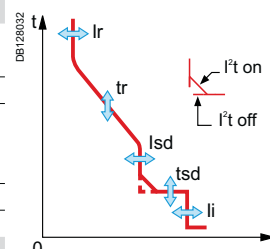
## Protection Micrologic 2.0

|                                        |                             |                                                    |                                                           |      |      |     |     |     |      |      |      |
|----------------------------------------|-----------------------------|----------------------------------------------------|-----------------------------------------------------------|------|------|-----|-----|-----|------|------|------|
| <b>Long time</b>                       |                             |                                                    |                                                           |      |      |     |     |     |      |      |      |
| Current setting (A)                    | $I_r = I_n \times \dots$    |                                                    | 0.4                                                       | 0.5  | 0.6  | 0.7 | 0.8 | 0.9 | 0.95 | 0.98 | 1    |
| tripping between 1.05 and 1.20 x $I_r$ |                             |                                                    | other ranges or disable by changing long-time rating plug |      |      |     |     |     |      |      |      |
| Time setting                           | $t_r$ (s)                   |                                                    | 0.5                                                       | 1    | 2    | 4   | 8   | 12  | 16   | 20   | 24   |
| Time delay (s)                         | accuracy: 0 to -30 %        | $1.5 \times I_r$                                   | 12.5                                                      | 25   | 50   | 100 | 200 | 300 | 400  | 500  | 600  |
|                                        | accuracy: 0 to -20 %        | $6 \times I_r$                                     | 0.7 <sup>(1)</sup>                                        | 1    | 2    | 4   | 8   | 12  | 16   | 20   | 24   |
|                                        | accuracy: 0 to -20 %        | $7.2 \times I_r$                                   | 0.7 <sup>(2)</sup>                                        | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11   | 13.8 | 16.6 |
| <b>Thermal memory</b>                  |                             | 20 minutes before and after tripping               |                                                           |      |      |     |     |     |      |      |      |
| (1) 0 to -40 % - (2) 0 to -60 %        |                             |                                                    |                                                           |      |      |     |     |     |      |      |      |
| <b>Instantaneous</b>                   |                             |                                                    |                                                           |      |      |     |     |     |      |      |      |
| Pick-up (A)                            | $I_{sd} = I_r \times \dots$ |                                                    | 1.5                                                       | 2    | 2.5  | 3   | 4   | 5   | 6    | 8    | 10   |
| accuracy: $\pm 10$ %                   |                             |                                                    |                                                           |      |      |     |     |     |      |      |      |
| <b>Time delay</b>                      |                             | max. resettable time: 20 ms; max break time: 80 ms |                                                           |      |      |     |     |     |      |      |      |



## Protection Micrologic 5.0 / 6.0

|                                                             |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
|-------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------|------|------|-----|-----|-----|------|------|------|
| <b>Long time</b>                                            |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| Current setting (A)                                         | $I_r = I_n \times \dots$                      |                                                     | 0.4                                                       | 0.5  | 0.6  | 0.7 | 0.8 | 0.9 | 0.95 | 0.98 | 1    |
| tripping between 1.05 and 1.20 x $I_r$                      |                                               |                                                     | Other ranges or disable by changing long-time rating plug |      |      |     |     |     |      |      |      |
| Time setting                                                | $t_r$ (s)                                     |                                                     | 0.5                                                       | 1    | 2    | 4   | 8   | 12  | 16   | 20   | 24   |
| Time delay (s)                                              | Accuracy: 0 to -30 %                          | $1.5 \times I_r$                                    | 12.5                                                      | 25   | 50   | 100 | 200 | 300 | 400  | 500  | 600  |
|                                                             | Accuracy: 0 to -20 %                          | $6 \times I_r$                                      | 0.7 <sup>(1)</sup>                                        | 1    | 2    | 4   | 8   | 12  | 16   | 20   | 24   |
|                                                             | Accuracy: 0 to -20 %                          | $7.2 \times I_r$                                    | 0.7 <sup>(2)</sup>                                        | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11   | 13.8 | 16.6 |
| <b>Thermal memory</b>                                       |                                               | 20 minutes before and after tripping                |                                                           |      |      |     |     |     |      |      |      |
| (1) 0 to -40 % - (2) 0 to -60 %                             |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| <b>Short time</b>                                           |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| Pick-up (A)                                                 | $I_{sd} = I_r \times \dots$                   |                                                     | 1.5                                                       | 2    | 2.5  | 3   | 4   | 5   | 6    | 8    | 10   |
| Accuracy: $\pm 10$ %                                        |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| Time setting tsd (s)                                        | Settings                                      | $I^2t$ Off                                          | 0                                                         | 0.1  | 0.2  | 0.3 | 0.4 |     |      |      |      |
|                                                             |                                               | $I^2t$ On                                           | -                                                         | 0.1  | 0.2  | 0.3 | 0.4 |     |      |      |      |
| Time delay (ms) at 10 x $I_r$<br>( $I^2t$ Off or $I^2t$ On) | tsd (max resettable time)                     |                                                     | 20                                                        | 80   | 140  | 230 | 350 |     |      |      |      |
|                                                             | tsd (max break time)                          |                                                     | 80                                                        | 140  | 200  | 320 | 500 |     |      |      |      |
| <b>Instantaneous</b>                                        |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| Pick-up (A)                                                 | $I_i = I_n \times \dots$                      |                                                     | 2                                                         | 3    | 4    | 6   | 8   | 10  | 12   | 15   | off  |
| Accuracy: $\pm 10$ %                                        |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| <b>Time delay</b>                                           |                                               | Max resettable time: 20 ms<br>Max break time: 50 ms |                                                           |      |      |     |     |     |      |      |      |
| <b>Earth fault</b>                                          |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| <b>Micrologic 6.0</b>                                       |                                               |                                                     |                                                           |      |      |     |     |     |      |      |      |
| Pick-up (A)                                                 | $I_g = I_n \times \dots$                      |                                                     | A                                                         | B    | C    | D   | E   | F   | G    | H    | J    |
| Accuracy: $\pm 10$ %                                        | $I_n \leq 400$ A                              |                                                     | 0.3                                                       | 0.3  | 0.4  | 0.5 | 0.6 | 0.7 | 0.8  | 0.9  | 1    |
|                                                             | $400 \text{ A} < I_n < 1250$ A                |                                                     | 0.2                                                       | 0.3  | 0.4  | 0.5 | 0.6 | 0.7 | 0.8  | 0.9  | 1    |
|                                                             | $I_n \geq 1250$ A                             |                                                     | 500                                                       | 640  | 720  | 800 | 880 | 960 | 1040 | 1120 | 1200 |
| Time setting tg (s)                                         | Settings                                      | $I^2t$ Off                                          | 0                                                         | 0.1  | 0.2  | 0.3 | 0.4 |     |      |      |      |
|                                                             |                                               | $I^2t$ On                                           | -                                                         | 0.1  | 0.2  | 0.3 | 0.4 |     |      |      |      |
| Time delay (ms)                                             | tg (max resettable time)                      |                                                     | 20                                                        | 80   | 140  | 230 | 350 |     |      |      |      |
|                                                             | at $I_n$ or 1200 A ( $I^2t$ Off or $I^2t$ On) | tg (max break time)                                 | 80                                                        | 140  | 200  | 320 | 500 |     |      |      |      |



**Note:** all current-based protection functions require no auxiliary source.

The test / reset button resets maximeters, clears the tripping indication and tests the battery.

# Micrologic control units

## Micrologic A "ammeter"

Micrologic A control units protect power circuits. They also offer measurements, display, communication and current maximeters. Version 6 provides earth-fault protection, version 7 provides earth-leakage protection.

### "Ammeter" measurements

Micrologic A control units measure the true (rms) value of currents. They provide continuous current measurements from 0.2 to 1.2  $I_n$  and are accurate to within 1.5 % (including the sensors). A digital LCD screen continuously displays the most heavily loaded phase ( $I_{max}$ ) or displays the  $I_1$ ,  $I_2$ ,  $I_3$ ,  $I_N$ ,  $I_g$ ,  $I_{\Delta n}$ , stored-current (maximeter) and setting values by successively pressing the navigation button. The optional external power supply makes it possible to display currents < 20 %  $I_n$ . Below 0.1  $I_n$ , measurements are not significant. Between 0.1 and 0.2  $I_n$ , accuracy changes linearly from 4 % to 1.5 %.

### Communication option

In conjunction with the COM communication option, the control unit transmits the following:

- settings
- all "ammeter" measurements
- tripping causes
- maximeter readings.

### Protection

Protection thresholds and delays are set using the adjustment dials.

#### Overload protection

True rms long-time protection.  
Thermal memory: thermal image before and after tripping.  
Setting accuracy may be enhanced by limiting the setting range using a different long-time rating plug.  
Overload protection can be cancelled using a specific LT rating plug "Off".

#### Short-circuit protection

Short-time (rms) and instantaneous protection.  
Selection of  $I^2t$  type (ON or OFF) for short-time delay.

#### Earth-fault protection

Residual or source ground return earth fault protection.  
Selection of  $I^2t$  type (ON or OFF) for delay.

#### Residual earth-leakage protection (Vigi).

Operation without an external power supply.  
 $\Lambda$  Protected against nuisance tripping.  
 $\sim$  DC-component withstand class A up to 10 A.

#### Neutral protection

On three-pole circuit breakers, neutral protection is not possible.  
On four-pole circuit breakers, neutral protection may be set using a three-position switch: neutral unprotected (4P 3d), neutral protection at 0.5  $I_r$  (4P 3d + N/2), neutral protection at  $I_r$  (4P 4d).

#### Zone selective interlocking (ZSI)

A ZSI terminal block may be used to interconnect a number of control units to provide total discrimination for short-time and earth-fault protection, without a delay before tripping.

### Overload alarm

A yellow alarm LED goes on when the current exceeds the long-time trip threshold.

### Fault indications

LEDs indicate the type of fault:

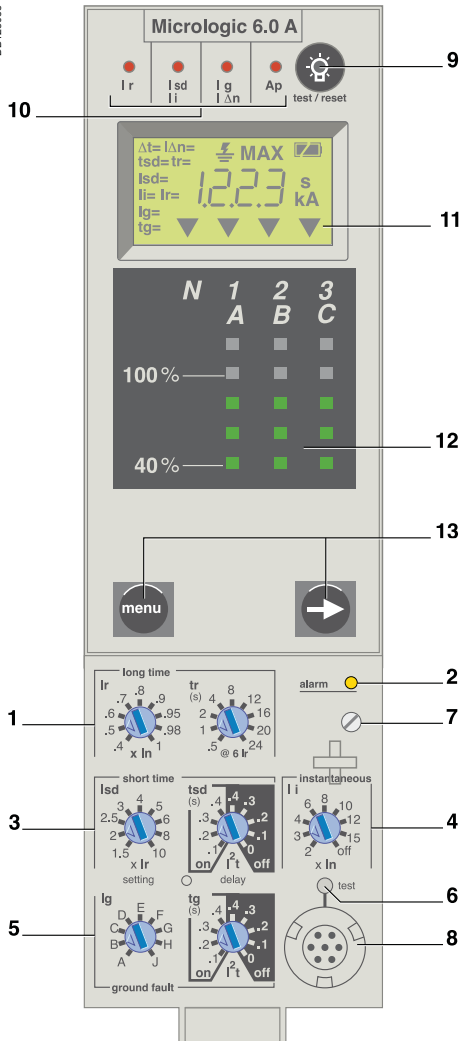
- overload (long-time protection  $I_r$ )
- short-circuit (short-time  $I_{sd}$  or instantaneous  $I_i$  protection)
- earth fault or earth leakage ( $I_g$  or  $I_{\Delta n}$ )
- internal fault (Ap).

### Battery power

The fault indication LEDs remain on until the test/reset button is pressed. Under normal operating conditions, the battery supplying the LEDs has a service life of approximately 10 years.

### Test

A mini test kit or a portable test kit may be connected to the test connector on the front to check circuit-breaker operation. For Micrologic 6.0 A and 7.0 A control units, the operation of earth-fault or earth-leakage protection can be checked by pressing the test button located above the test connector.



- 1 long-time threshold and tripping delay
- 2 overload alarm (LED) at 1.125  $I_r$
- 3 short-time pick-up and tripping delay
- 4 instantaneous pick-up
- 5 earth-leakage or earth-fault pick-up and tripping delay
- 6 earth-leakage or earth-fault test button
- 7 long-time rating plug screw
- 8 test connector
- 9 lamp test, reset and battery test
- 10 indication of tripping cause
- 11 digital display
- 12 three-phase bargraph and ammeter
- 13 navigation buttons

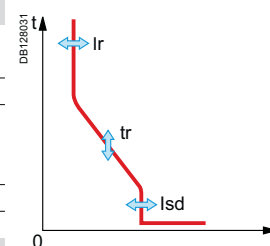
**Note.**  
Micrologic A control units come with a transparent lead-seal cover as standard.





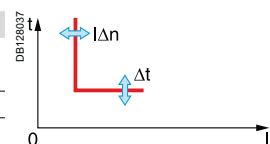
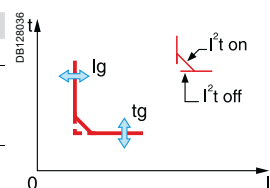
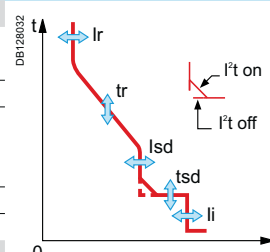
## Protection Micrologic 2.0 A

| Long time                           |                                        |                                                           |                    |      |      |     |     |      |      |      |      |
|-------------------------------------|----------------------------------------|-----------------------------------------------------------|--------------------|------|------|-----|-----|------|------|------|------|
| Current setting (A)                 |                                        | 0.4                                                       | 0.5                | 0.6  | 0.7  | 0.8 | 0.9 | 0.95 | 0.98 | 1    |      |
| Tripping between 1.05 and 1.20 x Ir |                                        | Other ranges or disable by changing long-time rating plug |                    |      |      |     |     |      |      |      |      |
| Time setting                        | tr (s)                                 | 0.5                                                       | 1                  | 2    | 4    | 8   | 12  | 16   | 20   | 24   |      |
| Time delay (s)                      | Accuracy: 0 to -30 %                   | 1.5 x Ir                                                  | 12.5               | 25   | 50   | 100 | 200 | 300  | 400  | 500  | 600  |
|                                     | Accuracy: 0 to -20 %                   | 6 x Ir                                                    | 0.7 <sup>(1)</sup> | 1    | 2    | 4   | 8   | 12   | 16   | 20   | 24   |
|                                     | Accuracy: 0 to -20 %                   | 7.2 x Ir                                                  | 0.7 <sup>(2)</sup> | 0.69 | 1.38 | 2.7 | 5.5 | 8.3  | 11   | 13.8 | 16.6 |
| Thermal memory                      |                                        | 20 minutes before and after tripping                      |                    |      |      |     |     |      |      |      |      |
| (1) 0 to -40 % - (2) 0 to -60 %     |                                        |                                                           |                    |      |      |     |     |      |      |      |      |
| Instantaneous                       |                                        |                                                           |                    |      |      |     |     |      |      |      |      |
| Pick-up (A)                         | I <sub>sd</sub> = I <sub>r</sub> x ... | 1.5                                                       | 2                  | 2.5  | 3    | 4   | 5   | 6    | 8    | 10   |      |
| Accuracy: ±10 %                     |                                        |                                                           |                    |      |      |     |     |      |      |      |      |
| Time delay                          |                                        | Max resettable time: 20 ms<br>Max break time: 80 ms       |                    |      |      |     |     |      |      |      |      |



## Protection Micrologic 5.0 / 6.0 / 7.0 A

| Long time                                                                                    |                                       |                      | Micrologic 5.0 / 6.0 / 7.0 A                              |      |      |     |      |     |      |      |      |
|----------------------------------------------------------------------------------------------|---------------------------------------|----------------------|-----------------------------------------------------------|------|------|-----|------|-----|------|------|------|
| Current setting (A)                                                                          | $I_r = I_n \times \dots$              |                      | 0.4                                                       | 0.5  | 0.6  | 0.7 | 0.8  | 0.9 | 0.95 | 0.98 | 1    |
| Tripping between 1.05 and 1.20 x I <sub>r</sub>                                              |                                       |                      | Other ranges or disable by changing long-time rating plug |      |      |     |      |     |      |      |      |
| Time setting                                                                                 |                                       | tr (s)               | 0.5                                                       | 1    | 2    | 4   | 8    | 12  | 16   | 20   | 24   |
| Time delay (s)                                                                               | Accuracy: 0 to -30 %                  | 1.5 x I <sub>r</sub> | 12.5                                                      | 25   | 50   | 100 | 200  | 300 | 400  | 500  | 600  |
|                                                                                              | Accuracy: 0 to -20 %                  | 6 x I <sub>r</sub>   | 0.7 <sup>(1)</sup>                                        | 1    | 2    | 4   | 8    | 12  | 16   | 20   | 24   |
|                                                                                              | Accuracy: 0 to -20 %                  | 7.2 x I <sub>r</sub> | 0.7 <sup>(2)</sup>                                        | 0.69 | 1.38 | 2.7 | 5.5  | 8.3 | 11   | 13.8 | 16.6 |
| Thermal memory                                                                               |                                       |                      | 20 minutes before and after tripping                      |      |      |     |      |     |      |      |      |
| (1) 0 to -40 % - (2) 0 to -60 %                                                              |                                       |                      |                                                           |      |      |     |      |     |      |      |      |
| Short time                                                                                   |                                       |                      |                                                           |      |      |     |      |     |      |      |      |
| Pick-up (A)                                                                                  | $I_{sd} = I_r \times \dots$           |                      | 1.5                                                       | 2    | 2.5  | 3   | 4    | 5   | 6    | 8    | 10   |
| Accuracy: ±10 %                                                                              |                                       |                      |                                                           |      |      |     |      |     |      |      |      |
| Time setting t <sub>sd</sub> (s)                                                             | Settings                              | I <sup>2</sup> t Off | 0                                                         | 0.1  | 0.2  | 0.3 | 0.4  |     |      |      |      |
|                                                                                              |                                       | I <sup>2</sup> t On  | -                                                         | 0.1  | 0.2  | 0.3 | 0.4  |     |      |      |      |
| Time delay (ms) at 10 x I <sub>r</sub><br>(I <sup>2</sup> t Off or I <sup>2</sup> t On)      | t <sub>sd</sub> (max resettable time) |                      | 20                                                        | 80   | 140  | 230 | 350  |     |      |      |      |
|                                                                                              | t <sub>sd</sub> (max break time)      |                      | 80                                                        | 140  | 200  | 320 | 500  |     |      |      |      |
| Instantaneous                                                                                |                                       |                      |                                                           |      |      |     |      |     |      |      |      |
| Pick-up (A)                                                                                  | $I_i = I_n \times \dots$              |                      | 2                                                         | 3    | 4    | 6   | 8    | 10  | 12   | 15   | off  |
| Accuracy: ±10 %                                                                              |                                       |                      |                                                           |      |      |     |      |     |      |      |      |
| Time delay                                                                                   |                                       |                      | Max resettable time: 20 ms<br>Max break time: 50 ms       |      |      |     |      |     |      |      |      |
| Earth fault                                                                                  |                                       |                      | Micrologic 6.0 A                                          |      |      |     |      |     |      |      |      |
| Pick-up (A)                                                                                  | $I_g = I_n \times \dots$              |                      | A                                                         | B    | C    | D   | E    | F   | G    | H    | J    |
| Accuracy: ±10 %                                                                              | $I_n \leq 400\text{ A}$               |                      | 0.3                                                       | 0.3  | 0.4  | 0.5 | 0.6  | 0.7 | 0.8  | 0.9  | 1    |
|                                                                                              | $400\text{ A} < I_n < 1250\text{ A}$  |                      | 0.2                                                       | 0.3  | 0.4  | 0.5 | 0.6  | 0.7 | 0.8  | 0.9  | 1    |
|                                                                                              | $I_n \geq 1250\text{ A}$              |                      | 500                                                       | 640  | 720  | 800 | 880  | 960 | 1040 | 1120 | 1200 |
| Time setting t <sub>g</sub> (s)                                                              | Settings                              | I <sup>2</sup> t Off | 0                                                         | 0.1  | 0.2  | 0.3 | 0.4  |     |      |      |      |
|                                                                                              |                                       | I <sup>2</sup> t On  | -                                                         | 0.1  | 0.2  | 0.3 | 0.4  |     |      |      |      |
| Time delay (ms)<br>at I <sub>n</sub> or 1200 A (I <sup>2</sup> t Off or I <sup>2</sup> t On) | t <sub>g</sub> (max resettable time)  |                      | 20                                                        | 80   | 140  | 230 | 350  |     |      |      |      |
|                                                                                              | t <sub>g</sub> (max break time)       |                      | 80                                                        | 140  | 200  | 320 | 500  |     |      |      |      |
| Residual earth leakage (Vigi)                                                                |                                       |                      | Micrologic 7.0 A                                          |      |      |     |      |     |      |      |      |
| Sensitivity (A)                                                                              | $I_{\Delta n}$                        |                      | 0.5                                                       | 1    | 2    | 3   | 5    | 7   | 10   | 20   | 30   |
| Accuracy: 0 to -20 %                                                                         |                                       |                      |                                                           |      |      |     |      |     |      |      |      |
| Time delay Δt (ms)                                                                           | Settings                              |                      | 60                                                        | 140  | 230  | 350 | 800  |     |      |      |      |
|                                                                                              | Δt (max resettable time)              |                      | 60                                                        | 140  | 230  | 350 | 800  |     |      |      |      |
|                                                                                              | Δt (max break time)                   |                      | 140                                                       | 200  | 320  | 500 | 1000 |     |      |      |      |

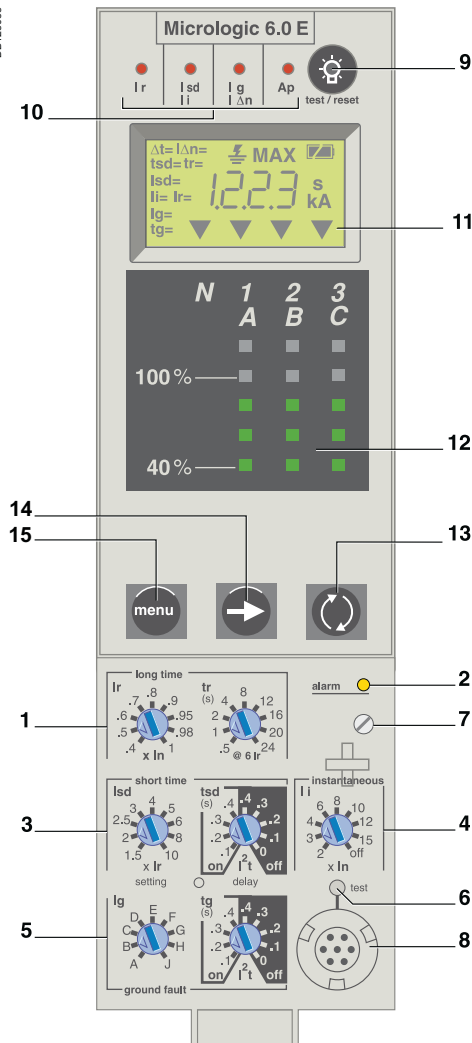


## Ammeter Micrologic 2.0 / 5.0 / 6.0 / 7.0 A

| Type of measurements   | Range                                                             | Accuracy                                     |
|------------------------|-------------------------------------------------------------------|----------------------------------------------|
| Instantaneous currents | I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>N</sub> | 0.2 x I <sub>n</sub> to 1.2 x I <sub>n</sub> |
|                        | I <sub>g</sub> (6.0 A)                                            | 0.2 x I <sub>n</sub> to I <sub>n</sub>       |
|                        | IΔn (7.0 A)                                                       | 0 to 30 A                                    |
| Current maximeters of  | I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>N</sub> | 0.2 x I <sub>n</sub> to 1.2 x I <sub>n</sub> |

**Note:** all current-based protection functions require no auxiliary source.  
The test / reset button resets maximeters, clears the tripping indication and tests the battery.

Micrologic E control units protect power circuits. They also offer measurements, display, communication and current maximeters. Version 6 provides earth-fault protection.



- 1 long-time threshold and tripping delay
- 2 overload alarm (LED) at 1.125 I<sub>r</sub>
- 3 short-time pick-up and tripping delay
- 4 instantaneous pick-up
- 5 earth-leakage or earth-fault pick-up and tripping delay
- 6 earth-leakage or earth-fault test button
- 7 long-time rating plug screw
- 8 test connector
- 9 lamp test, reset and battery test
- 10 indication of tripping cause
- 11 digital display
- 12 three-phase bargraph and ammeter
- 13 navigation button "quick View" (only with Micrologic E)
- 14 navigation button to view menu contents
- 15 navigation button to change menu

### "Energy meter" measurements

#### In addition to the ammeter measurements of Micrologic A

Micrologic E control units measure and display:

- current demand
- voltages: phase to phase, phase to neutral, average <sup>(1)</sup> and unbalanced <sup>(1)</sup>
- instantaneous power: P, Q, S
- power factor: PF
- power demand: P demand
- energy: E<sub>p</sub>, E<sub>q</sub> <sup>(1)</sup>, E<sub>s</sub> <sup>(1)</sup>

Accuracy of active energy E<sub>p</sub> is 2 % (including the sensors). The range of measurement is the same as current with Micrologic A, depending of an external power supply module (24 V DC).

### Communication option

In conjunction with the COM communication option, the control unit transmits the following:

- settings
- all "ammeter" and "energy" measurements
- enable connection to FDM121
- tripping causes
- maximeter / minimeter readings.

### Protection

Protection thresholds and delays are set using the adjustment dials.

#### Overload protection

True rms long-time protection.

Thermal memory: thermal image before and after tripping.

Setting accuracy may be enhanced by limiting the setting range using a different long-time rating plug. Overload protection can be cancelled using a specific LT rating plug "Off".

#### Short-circuit protection

Short-time (rms) and instantaneous protection.

Selection of I<sup>2</sup>t type (ON or OFF) for short-time delay.

#### Earth-fault protection

Source ground return earth fault protection.

Selection of I<sup>2</sup>t type (ON or OFF) for delay.

#### Neutral protection

On three-pole circuit breakers, neutral protection is not possible.

On four-pole circuit breakers, neutral protection may be set using a three-position switch: neutral unprotected (4P 3d), neutral protection at 0.5 I<sub>r</sub> (4P 3d + N/2), neutral protection at I<sub>r</sub> (4P 4d).

#### Zone selective interlocking (ZSI)

A ZSI terminal block may be used to interconnect a number of control units to provide total discrimination for short-time and earth-fault protection, without a delay before tripping.

### Overload alarm

A yellow alarm LED goes on when the current exceeds the long-time trip threshold.

### Programmable contacts

The programmable contacts may be used to signal events

(I<sub>r</sub>, I<sub>sd</sub>, Alarm I<sub>r</sub>, Alarm I<sub>g</sub>, I<sub>g</sub>). They can be programmed using the keypad on the Micrologic E control unit or remotely using the COM option (BCM ULP) and RSU software.

### Fault indications

LEDs indicate the type of fault:

- overload (long-time protection I<sub>r</sub>)
- short-circuit (short-time I<sub>sd</sub> or instantaneous I<sub>i</sub> protection)
- earth fault (I<sub>g</sub>)
- internal fault (Ap).

### Trip history

The trip history displays the list of the last 10 trips. For each trip, the following indications are recorded and displayed:

- the tripping cause: I<sub>r</sub>, I<sub>sd</sub>, I<sub>i</sub> or Auto-protection (Ap) trips
- the date and time of the trip (requires communication option).

### Battery power

The fault indication LEDs remain on until the test/reset button is pressed. Under normal operating conditions, the battery supplying the LEDs has a service life of approximately 10 years.

### Test

A mini test kit or a portable test kit may be connected to the test connector on the front to check circuit-breaker operation. For Micrologic 6.0 E control units, the operation of earth-fault or earth-leakage protection can be checked by pressing the test button located above the test connector.

<sup>(1)</sup> Display on FDM121 only.

**Note:** Micrologic E control units come with a transparent lead-seal cover as standard.



## Protection

## Micrologic 2.0 E

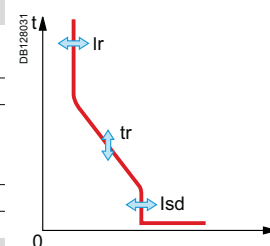
### Long time

|                                     |                      |                                                           |                    |      |      |     |     |      |      |      |
|-------------------------------------|----------------------|-----------------------------------------------------------|--------------------|------|------|-----|-----|------|------|------|
| Current setting (A)                 |                      | 0.4                                                       | 0.5                | 0.6  | 0.7  | 0.8 | 0.9 | 0.95 | 0.98 | 1    |
| Tripping between 1.05 and 1.20 x Ir |                      | Other ranges or disable by changing long-time rating plug |                    |      |      |     |     |      |      |      |
| Time setting                        | tr (s)               | 0.5                                                       | 1                  | 2    | 4    | 8   | 12  | 16   | 20   | 24   |
| Time delay (s)                      | Accuracy: 0 to -30 % | 1.5 x Ir                                                  | 12.5               | 25   | 50   | 100 | 200 | 300  | 400  | 500  |
|                                     | Accuracy: 0 to -20 % | 6 x Ir                                                    | 0.7 <sup>(1)</sup> | 1    | 2    | 4   | 8   | 12   | 16   | 20   |
|                                     | Accuracy: 0 to -20 % | 7.2 x Ir                                                  | 0.7 <sup>(2)</sup> | 0.69 | 1.38 | 2.7 | 5.5 | 8.3  | 11   | 13.8 |
| Thermal memory                      |                      | 20 minutes before and after tripping                      |                    |      |      |     |     |      |      |      |

(1) 0 to -40 % - (2) 0 to -60 %

### Instantaneous

|                 |                                        |                                                     |   |     |   |   |   |   |   |    |
|-----------------|----------------------------------------|-----------------------------------------------------|---|-----|---|---|---|---|---|----|
| Pick-up (A)     | I <sub>sd</sub> = I <sub>r</sub> x ... | 1.5                                                 | 2 | 2.5 | 3 | 4 | 5 | 6 | 8 | 10 |
| Accuracy: ±10 % |                                        |                                                     |   |     |   |   |   |   |   |    |
| Time delay      |                                        | Max resettable time: 20 ms<br>Max break time: 80 ms |   |     |   |   |   |   |   |    |



## Protection

## Micrologic 5.0 / 6.0 E

### Long time

|                                     |                                       |                                                           |                    |      |      |     |     |      |      |      |
|-------------------------------------|---------------------------------------|-----------------------------------------------------------|--------------------|------|------|-----|-----|------|------|------|
| Current setting (A)                 | I <sub>r</sub> = I <sub>n</sub> x ... | 0.4                                                       | 0.5                | 0.6  | 0.7  | 0.8 | 0.9 | 0.95 | 0.98 | 1    |
| Tripping between 1.05 and 1.20 x Ir |                                       | Other ranges or disable by changing long-time rating plug |                    |      |      |     |     |      |      |      |
| Time setting                        | tr (s)                                | 0.5                                                       | 1                  | 2    | 4    | 8   | 12  | 16   | 20   | 24   |
| Time delay (s)                      | Accuracy: 0 to -30 %                  | 1.5 x Ir                                                  | 12.5               | 25   | 50   | 100 | 200 | 300  | 400  | 500  |
|                                     | Accuracy: 0 to -20 %                  | 6 x Ir                                                    | 0.7 <sup>(1)</sup> | 1    | 2    | 4   | 8   | 12   | 16   | 20   |
|                                     | Accuracy: 0 to -20 %                  | 7.2 x Ir                                                  | 0.7 <sup>(2)</sup> | 0.69 | 1.38 | 2.7 | 5.5 | 8.3  | 11   | 13.8 |
| Thermal memory                      |                                       | 20 minutes before and after tripping                      |                    |      |      |     |     |      |      |      |

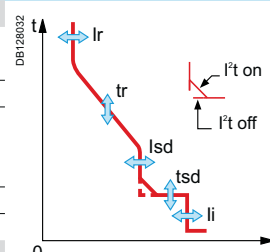
(1) 0 to -40 % - (2) 0 to -60 %

### Short time

|                                               |                                        |                      |    |     |     |     |     |   |   |    |
|-----------------------------------------------|----------------------------------------|----------------------|----|-----|-----|-----|-----|---|---|----|
| Pick-up (A)                                   | I <sub>sd</sub> = I <sub>r</sub> x ... | 1.5                  | 2  | 2.5 | 3   | 4   | 5   | 6 | 8 | 10 |
| Accuracy: ±10 %                               |                                        |                      |    |     |     |     |     |   |   |    |
| Time setting tsd (s)                          | Settings                               | I <sup>2</sup> t Off | 0  | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |
|                                               |                                        | I <sup>2</sup> t On  | -  | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |
| Time delay (ms) at 10 x Ir                    | tsd (max resettable time)              |                      | 20 | 80  | 140 | 230 | 350 |   |   |    |
| (I <sup>2</sup> t Off or I <sup>2</sup> t On) | tsd (max break time)                   |                      | 80 | 140 | 200 | 320 | 500 |   |   |    |

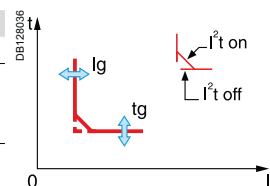
### Instantaneous

|                 |                                        |                                                     |   |   |   |   |    |    |    |     |
|-----------------|----------------------------------------|-----------------------------------------------------|---|---|---|---|----|----|----|-----|
| Pick-up (A)     | I <sub>li</sub> = I <sub>n</sub> x ... | 2                                                   | 3 | 4 | 6 | 8 | 10 | 12 | 15 | off |
| Accuracy: ±10 % |                                        |                                                     |   |   |   |   |    |    |    |     |
| Time delay      |                                        | Max resettable time: 20 ms<br>Max break time: 50 ms |   |   |   |   |    |    |    |     |



### Earth fault

|                                                                           |                                       |                      |     |     |     |     |     |      |      |      |
|---------------------------------------------------------------------------|---------------------------------------|----------------------|-----|-----|-----|-----|-----|------|------|------|
| Pick-up (A)                                                               | I <sub>g</sub> = I <sub>n</sub> x ... | A                    | B   | C   | D   | E   | F   | G    | H    | J    |
| Accuracy: ±10 %                                                           | I <sub>n</sub> ≤ 400 A                | 0.3                  | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8  | 0.9  | 1    |
|                                                                           | 400 A < I <sub>n</sub> < 1250 A       | 0.2                  | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8  | 0.9  | 1    |
|                                                                           | I <sub>n</sub> ≥ 1250 A               | 500                  | 640 | 720 | 800 | 880 | 960 | 1040 | 1120 | 1200 |
| Time setting tg (s)                                                       | Settings                              | I <sup>2</sup> t Off | 0   | 0.1 | 0.2 | 0.3 | 0.4 |      |      |      |
|                                                                           |                                       | I <sup>2</sup> t On  | -   | 0.1 | 0.2 | 0.3 | 0.4 |      |      |      |
| Time delay (ms)                                                           | tg (max resettable time)              |                      | 20  | 80  | 140 | 230 | 350 |      |      |      |
| at I <sub>n</sub> or 1200 A (I <sup>2</sup> t Off or I <sup>2</sup> t On) | tg (max break time)                   |                      | 80  | 140 | 200 | 320 | 500 |      |      |      |



## Energy

## Micrologic 2.0 / 5.0 / 6.0 E

| Type of measurements                                                                 | Range                                                                                                     | Accuracy                                            |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Instantaneous currents                                                               | I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>N</sub>                                         | ± 1.5 %                                             |
|                                                                                      | I <sub>g</sub> (6.0 E)                                                                                    | ± 10 %                                              |
| Current maximeters of                                                                | I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>N</sub>                                         | ± 1.5 %                                             |
| Demand currents of I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>g</sub> | 0.2 x I <sub>n</sub> to 1.2 x I <sub>n</sub>                                                              | ± 1.5 %                                             |
| Voltages                                                                             | V <sub>12</sub> , V <sub>23</sub> , V <sub>31</sub> , V <sub>1N</sub> , V <sub>2N</sub> , V <sub>3N</sub> | ± 0.5 %                                             |
| Active power                                                                         | P                                                                                                         | ± 2 %                                               |
| Power factor                                                                         | PF                                                                                                        | ± 2 %                                               |
| Demand power                                                                         | P demand                                                                                                  | ± 2 %                                               |
| Active energy                                                                        | E <sub>p</sub>                                                                                            | -10 <sup>10</sup> GWh to 10 <sup>10</sup> GWh ± 2 % |

Note: all current-based protection functions require no auxiliary source.

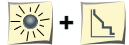
The test / reset button resets maximeters, clears the tripping indication and tests the battery.

Micrologic P control units include all the functions offered by Micrologic A.

In addition, they measure voltages and calculate power and energy values.

They also offer new protection functions based on currents, voltages, frequency and power reinforce load protection in real time.

## Protection.....



### Protection settings

The adjustable protection functions are identical to those of Micrologic A (overloads, short-circuits, earth-fault and earth-leakage protection).

#### Fine adjustment

Within the range determined by the adjustment dial, fine adjustment of thresholds (to within one ampere) and time delays (to within one second) is possible on the keypad or remotely using the COM option.

#### IDMTL (Inverse Definite Minimum Time Lag) setting

Coordination with fuse-type or medium-voltage protection systems is optimised by adjusting the slope of the overload-protection curve. This setting also ensures better operation of this protection function with certain loads.

#### Neutral protection

On three-pole circuit breakers, neutral protection may be set using the keypad or remotely using the COM option, to one of four positions: neutral unprotected (4P 3d), neutral protection at 0.5 Ir (4P 3d + N/2), neutral protection at Ir (4P 4d) and neutral protection at 1.6 Ir (4P 3d + 1.6N). Neutral protection at 1.6 Ir is used when the neutral conductor is twice the size of the phase conductors (major load imbalance, high level of third order harmonics).

On four-pole circuit breakers, neutral protection may be set using a three-position switch or the keypad: neutral unprotected (4P 3d), neutral protection at 0.5 Ir (4P 3d + N/2), neutral protection at Ir (4P 4d). Neutral protection produces no effect if the long-time curve is set to one of the IDMTL protection settings.

### Programmable alarms and other protection

Depending on the thresholds and time delays set using the keypad or remotely using the COM option, the Micrologic P control unit monitors currents and voltage, power, frequency and the phase sequence. Each threshold overrun is signalled remotely via the COM option. Each threshold overrun may be combined with tripping (protection) or an indication carried out by an optional M6C programmable contact (alarm), or both (protection and alarm).

### Load shedding and reconnection

Load shedding and reconnection parameters may be set according to the power or the current flowing through the circuit breaker. Load shedding is carried out by a supervisor via the COM option or by an M6C programmable contact.

### Indication option via programmable contacts

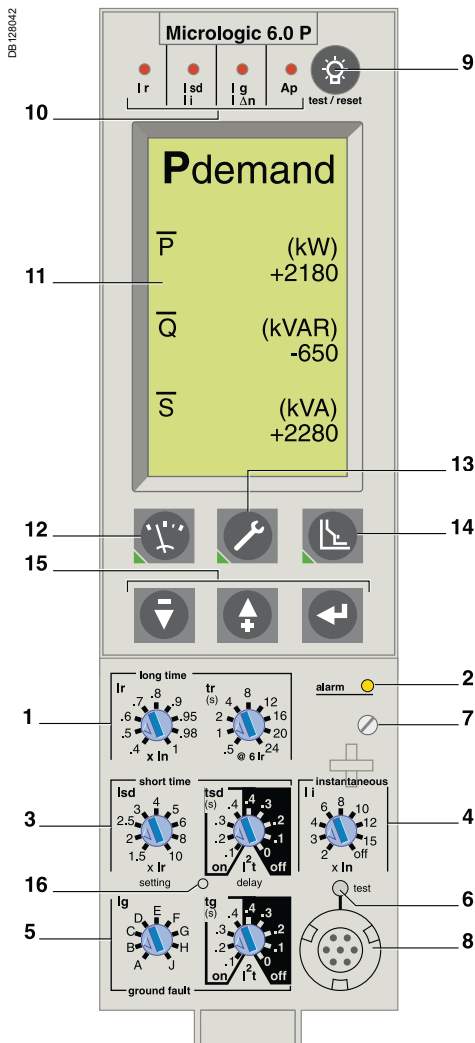
The M6C (six contacts) auxiliary contacts may be used to signal threshold overruns or status changes. They can be programmed using the keypad on the Micrologic P control unit or remotely using the COM option (BCM ULP) and RSU software.

### Communication option (COM)

The communication option may be used to:

- remotely read and set parameters for the protection functions
- transmit all the calculated indicators and measurements
- signal the causes of tripping and alarms
- consult the history files and the maintenance-indicator register.
- maximeter reset.

An event log and a maintenance register, stored in control-unit memory but not available locally, may be accessed in addition via the COM option.



- 1 Long-time current setting and tripping delay.
- 2 Overload signal (LED).
- 3 Short-time pick-up and tripping delay.
- 4 Instantaneous pick-up.
- 5 Earth-leakage or earth-fault pick-up and tripping delay.
- 6 Earth-leakage or earth-fault test button.
- 7 Long-time rating plug screw.
- 8 Test connector.
- 9 Lamp + battery test and indications reset.
- 10 Indication of tripping cause.
- 11 High-resolution screen.
- 12 Measurement display.
- 13 Maintenance indicators.
- 14 Protection settings.
- 15 Navigation buttons.
- 16 Hole for settings lockout pin on cover.

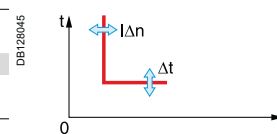
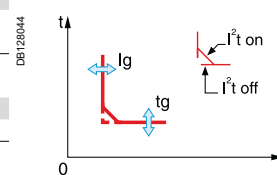
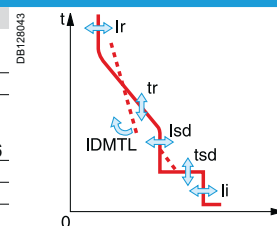
**Note:** Micrologic P control units come with a non-transparent lead-seal cover as standard.



## Protection

## Micrologic 5.0 / 6.0 / 7.0 P

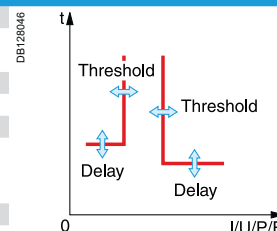
| Long time (rms)                        |                                               |                                      | Micrologic 5.0 / 6.0 / 7.0 P                        |      |      |        |      |     |      |      |      |  |
|----------------------------------------|-----------------------------------------------|--------------------------------------|-----------------------------------------------------|------|------|--------|------|-----|------|------|------|--|
| Current setting (A)                    |                                               | $I_r = \ln \times \dots$             | 0.4                                                 | 0.5  | 0.6  | 0.7    | 0.8  | 0.9 | 0.95 | 0.98 | 1    |  |
| Tripping between 1.05 and 1.20 x $I_r$ |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Time setting                           |                                               | $t_r$ (s)                            | 0.5                                                 | 1    | 2    | 4      | 8    | 12  | 16   | 20   | 24   |  |
| Time delay (s)                         | Accuracy: 0 to -30 %                          | 1.5 x $I_r$                          | 12.5                                                | 25   | 50   | 100    | 200  | 300 | 400  | 500  | 600  |  |
|                                        | Accuracy: 0 to -20 %                          | 6 x $I_r$                            | 0.7 <sup>(1)</sup>                                  | 1    | 2    | 4      | 8    | 12  | 16   | 20   | 24   |  |
|                                        | Accuracy: 0 to -20 %                          | 7.2 x $I_r$                          | 0.7 <sup>(2)</sup>                                  | 0.69 | 1.38 | 2.7    | 5.5  | 8.3 | 11   | 13.8 | 16.6 |  |
| IDMTL setting                          | Curve slope                                   |                                      | SIT                                                 | VIT  | EIT  | HVFuse | DT   |     |      |      |      |  |
| Thermal memory                         |                                               | 20 minutes before and after tripping |                                                     |      |      |        |      |     |      |      |      |  |
| (1) 0 to -40 % - (2) 0 to -60 %        |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Short time (rms)                       |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Pick-up (A)                            |                                               | $I_{sd} = I_r \times \dots$          | 1.5                                                 | 2    | 2.5  | 3      | 4    | 5   | 6    | 8    | 10   |  |
| Accuracy: $\pm 10$ %                   |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Time setting $t_{sd}$ (s)              | Settings                                      | $I^2t$ Off                           | 0                                                   | 0.1  | 0.2  | 0.3    | 0.4  |     |      |      |      |  |
|                                        |                                               | $I^2t$ On                            | -                                                   | 0.1  | 0.2  | 0.3    | 0.4  |     |      |      |      |  |
| Time delay (ms) at 10 $I_r$            | $t_{sd}$ (max resettable time)                |                                      | 20                                                  | 80   | 140  | 230    | 350  |     |      |      |      |  |
|                                        | $t_{sd}$ (max break time)                     |                                      | 80                                                  | 140  | 200  | 320    | 500  |     |      |      |      |  |
| Instantaneous                          |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Pick-up (A)                            |                                               | $I_i = \ln \times \dots$             | 2                                                   | 3    | 4    | 6      | 8    | 10  | 12   | 15   | off  |  |
| Accuracy: $\pm 10$ %                   |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Time delay                             |                                               |                                      | Max resettable time: 20 ms<br>Max break time: 50 ms |      |      |        |      |     |      |      |      |  |
| Earth fault                            |                                               |                                      | Micrologic 6.0 P                                    |      |      |        |      |     |      |      |      |  |
| Pick-up (A)                            |                                               | $I_g = \ln \times \dots$             | A                                                   | B    | C    | D      | E    | F   | G    | H    | J    |  |
| Accuracy: $\pm 10$ %                   | $\ln \leq 400$ A                              |                                      | 0.3                                                 | 0.3  | 0.4  | 0.5    | 0.6  | 0.7 | 0.8  | 0.9  | 1    |  |
|                                        | $400 \text{ A} < \ln \leq 1250$ A             |                                      | 0.2                                                 | 0.3  | 0.4  | 0.5    | 0.6  | 0.7 | 0.8  | 0.9  | 1    |  |
|                                        | $\ln \geq 1250$ A                             |                                      | 500                                                 | 640  | 720  | 800    | 880  | 960 | 1040 | 1120 | 1200 |  |
| Time setting $t_g$ (s)                 | Settings                                      | $I^2t$ Off                           | 0                                                   | 0.1  | 0.2  | 0.3    | 0.4  |     |      |      |      |  |
|                                        |                                               | $I^2t$ On                            | -                                                   | 0.1  | 0.2  | 0.3    | 0.4  |     |      |      |      |  |
| Time delay (ms)                        | $t_g$ (max resettable time)                   |                                      | 20                                                  | 80   | 140  | 230    | 350  |     |      |      |      |  |
|                                        | at $\ln$ or 1200 A ( $I^2t$ Off or $I^2t$ On) | $t_g$ (max break time)               | 80                                                  | 140  | 200  | 320    | 500  |     |      |      |      |  |
| Residual earth leakage (Vigi)          |                                               |                                      | Micrologic 7.0 P                                    |      |      |        |      |     |      |      |      |  |
| Sensitivity (A)                        |                                               | $I\Delta n$                          | 0.5                                                 | 1    | 2    | 3      | 5    | 7   | 10   | 20   | 30   |  |
| Accuracy: 0 to -20 %                   |                                               |                                      |                                                     |      |      |        |      |     |      |      |      |  |
| Time delay $\Delta t$ (ms)             | Settings                                      |                                      | 60                                                  | 140  | 230  | 350    | 800  |     |      |      |      |  |
|                                        | $\Delta t$ (max resettable time)              |                                      | 60                                                  | 140  | 230  | 350    | 800  |     |      |      |      |  |
|                                        | $\Delta t$ (max break time)                   |                                      | 140                                                 | 200  | 320  | 500    | 1000 |     |      |      |      |  |



## Alarms and other protection

## Micrologic 5.0 / 6.0 / 7.0 P

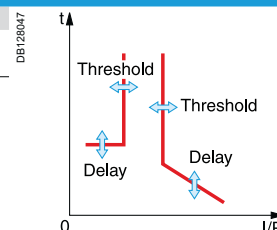
| Current                        |                                       | Threshold                              | Delay        |
|--------------------------------|---------------------------------------|----------------------------------------|--------------|
| Current unbalance              | $I_{unbalance}$                       | 0.05 to 0.6 Iaverage                   | 1 to 40 s    |
| Max. demand current            | $I_{max demand} : I_1, I_2, I_3, I_N$ | $0.2 I_n$ to $I_n$                     | 15 to 1500 s |
| Earth fault alarm              |                                       |                                        |              |
|                                | $I_{\phi}$                            | 10 to 100 % $I_n$ <sup>(3)</sup>       | 1 to 10 s    |
| Voltage                        |                                       |                                        |              |
| Voltage unbalance              | $U_{unbalance}$                       | 2 to 30 % x $U_{average}$              | 1 to 40 s    |
| Minimum voltage                | $U_{min}$                             | 100 to $U_{max}$ between phases        | 1.2 to 10 s  |
| Maximum voltage <sup>(4)</sup> | $U_{max}$                             | $U_{min}$ to 1200 between phases       | 1.2 to 10 s  |
| Power                          |                                       |                                        |              |
| Reverse power                  | $rP$                                  | 5 to 500 kW                            | 0.2 to 20 s  |
| Frequency                      |                                       |                                        |              |
| Minimum frequency              | $F_{min}$                             | 45 to $F_{max}$                        | 1.2 to 5 s   |
| Maximum frequency              | $F_{max}$                             | $F_{min}$ to 440 Hz                    | 1.2 to 5 s   |
| Phase sequence                 |                                       |                                        |              |
| Sequence (alarm)               | $\Delta \emptyset$                    | $\emptyset 1/2/3$ or $\emptyset 1/3/2$ | 0.3 s        |



## Load shedding and reconnection

## Micrologic 5.0 / 6.0 / 7.0 P

| Measured value |   | Threshold              | Delay              |
|----------------|---|------------------------|--------------------|
| Current        | I | 0.5 to 1 Ir per phases | 20 % tr to 80 % tr |
| Power          | P | 200 kW to 10 MW        | 10 to 3600 s       |



## Power

## Micrologic 5.0 / 6.0 / 7.0 P

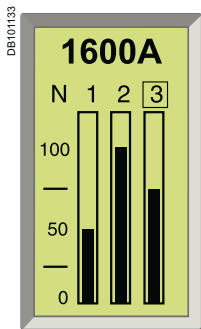
| Type of measurements  |                              | Range                | Accuracy |
|-----------------------|------------------------------|----------------------|----------|
| Current maximeters of | I1, I2, I3, IN               | 0.2 x In to 1.2 x In | ± 1.5 %  |
| Voltages              | V12, V23, V31, V1N, V2N, V3N | 100 to 690 V         | ± 0.5 %  |
| Power factor          | PF                           | 0 to 1               | ± 2 %    |
| Frequency (Hz)        |                              |                      | 0.1 %    |

(3)  $I_n \leq 400$  A 30 %  
 $400 \text{ A} < I_n < 1250$  A 20 %  
 $I_n \geq 1250$  A 10 %

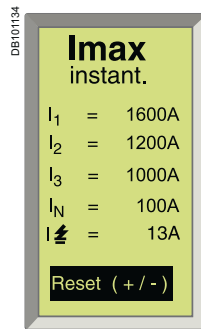
(4) For 690 V applications, a step-down transformer must be used if the voltage exceeds the nominal value of 690 V by more than 10 %.

Note: all current-based protection functions require no auxiliary source.

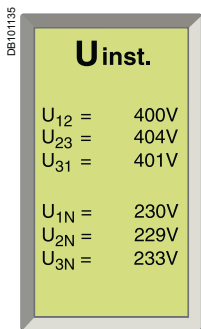
Voltage-based protection functions are connected to AC power via a voltage measurement input built into the circuit breaker.



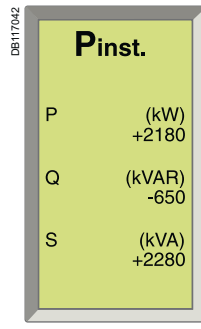
Default display.



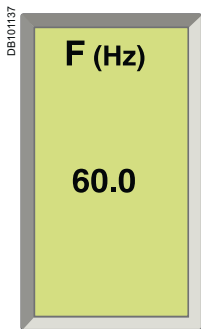
Display of a maximum current.



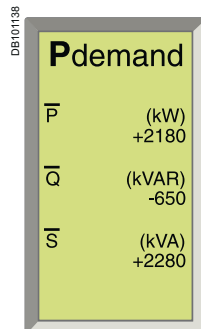
Display of a voltage.



Display of a power.



Display of a frequency.



Display of a demand power.



ION Enterprise Power Management software.

### Measurements

The Micrologic P control unit calculates in real time all the electrical values (V, A, W, VAR, VA, Wh, VARh, VAh, Hz), power factors and  $\cos\phi$  factors.

The Micrologic P control unit also calculates demand current and demand power over an adjustable time period. Each measurement is associated with a minimeter and a maximeter.

In the event of tripping on a fault, the interrupted current is stored. The optional external power supply makes it possible to display the value with the circuit breaker open or not supplied.

### Instantaneous values

The value displayed on the screen is refreshed every second.

Minimum and maximum values of measurements are stored in memory (minimeters and maximeters).

#### Currents

|           |   |         |   |           |   |
|-----------|---|---------|---|-----------|---|
| I rms     | A | 1       | 2 | 3         | N |
|           | A | E-fault |   | E-leakage |   |
| I max rms | A | 1       | 2 | 3         | N |
|           | A | E-fault |   | E-leakage |   |

#### Voltages

|               |   |                       |    |    |
|---------------|---|-----------------------|----|----|
| U rms         | V | 12                    | 23 | 31 |
| V rms         | V | 1N                    | 2N | 3N |
| U average rms | V | (U12 + U23 + U31) / 3 |    |    |
| U unbalance   | % |                       |    |    |

#### Power, energy

|                                  |               |                            |
|----------------------------------|---------------|----------------------------|
| P active, Q reactive, S apparent | W, Var, VA    | Totals                     |
| E active, E reactive, E apparent | Wh, VARh, VAh | Totals consumed - supplied |
|                                  |               | Totals consumed            |
|                                  |               | Totals supplied            |
| Power factor                     | PF            | Total                      |

#### Frequencies

|   |    |
|---|----|
| F | Hz |
|---|----|

### Demand metering

The demand is calculated over a fixed or sliding time window that may be programmed from 5 to 60 minutes. According to the contract signed with the power supplier, an indicator associated with a load shedding function makes it possible to avoid or minimise the costs of overrunning the subscribed power. Maximum demand values are systematically stored and time stamped (maximeter).

#### Currents

|              |   |         |   |           |   |
|--------------|---|---------|---|-----------|---|
| I demand     | A | 1       | 2 | 3         | N |
|              | A | E-fault |   | E-leakage |   |
| I max demand | A | 1       | 2 | 3         | N |
|              | A | E-fault |   | E-leakage |   |

#### Power

|                    |            |        |
|--------------------|------------|--------|
| P, Q, S demand     | W, Var, VA | Totals |
| P, Q, S max demand | W, Var, VA | Totals |

### Minimeters and maximeters

Only the current and power maximeters may be displayed on the screen.

### Time-stamping

Time-stamping is activated as soon as time is set manually or by a supervisor.

No external power supply module is required (max. drift of 1 hour per year).

### Reset

An individual reset, via the keypad or remotely, acts on alarms, minimum and maximum data, peak values, the counters and the indicators.

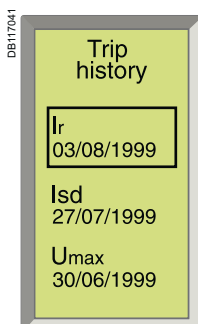
### Additional measurements accessible with the COM option

Some measured or calculated values are only accessible with the COM communication option:

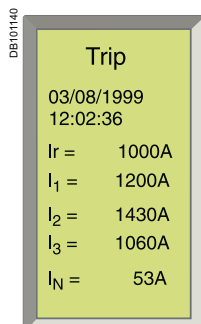
- $I_{peak} / \sqrt{2}$ ,  $(I_1 + I_2 + I_3) / 3$ , I unbalance
- load level in % Ir
- total power factor.

The maximeters and minimeters are available only via the COM option for use with a supervisor.





Display of a tripping history.



Display after tripping.

## Histories and maintenance indicators .....

The last ten trips and alarms are recorded in two separate history files that may be displayed on the screen:

- tripping history:
  - type of fault
  - date and time
  - values measured at the time of tripping (interrupted current, etc.)
- alarm history:
  - type of alarm
  - date and time
  - values measured at the time of the alarm.

**All the other events are recorded in a third history file which is only accessible through the communication network.**

- Event log history (only accessible through the communication network):
  - modifications to settings and parameters
  - counter resets
  - system faults
  - fallback position
  - thermal self-protection
  - loss of time
  - overrun of wear indicators
  - test-kit connections
  - etc.

### Note:

All the events are time stamped: time-stamping is activated as soon as time is set manually or by a supervisor. No external power supply module is required (max. drift of 1 hour per year).

## Maintenance indicators with COM option (BCM ULP)

A number of maintenance indicators may be called up on the screen to better plan for device maintenance:

- contact wear
- operation counter:
  - cumulative total
  - total since last reset.

Additional maintenance indicators are also available through the COM network, and can be used as an aid in troubleshooting:

- highest current measured
- number of test-kit connections
- number of trips in operating mode and in test mode.

## Additional technical characteristics

### Safety

Measurement functions are independent of the protection functions.

The high-accuracy measurement module operates independently of the protection module.

### Simplicity and multi-language

Navigation from one display to another is intuitive. The six buttons on the keypad provide access to the menus and easy selection of values. When the setting cover is closed, the keypad may no longer be used to access the protection settings, but still provides access to the displays for measurements, histories, indicators, etc. Micrologic is also multi-language, including the following languages: English, Spanish, Portuguese, Russian, Chinese, French, German...

### Intelligent measurement

Measurement-calculation mode:

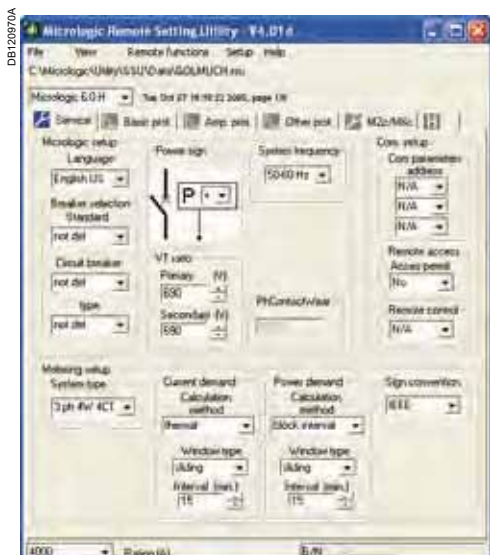
- energies are calculated on the basis of the instantaneous power values, in two manners:
  - the traditional mode where only positive (consumed) energies are considered
  - the signed mode where the positive (consumed) and negative (supplied) energies are considered separately
- measurement functions implement the new "zero blind time" concept which consists in continuously measuring signals at a high sampling rate. The traditional "blind window" used to process samples no longer exists. This method ensures accurate energy calculations even for highly variable loads (welding machines, robots, etc.).

### Always powered

All current-based protection functions require no auxiliary source. Voltage-based protection functions are connected to AC power via a voltage measurement input built into the circuit breaker.

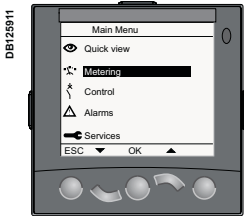
### Stored information

The fine setting adjustments, the last 100 events and the maintenance register remain in the control-unit memory even when power is lost.

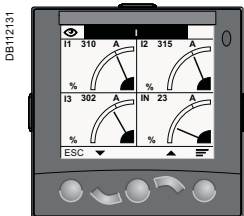


RSU configuration screen for a Micrologic.

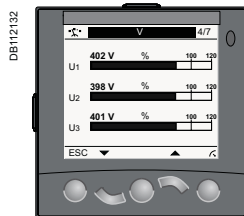
In addition to protection functions, Micrologic A/E/P control units offer all the functions of Power Meter products as well as operating-assistance for the circuit breaker.



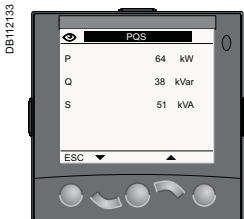
FDM121 display: navigation.



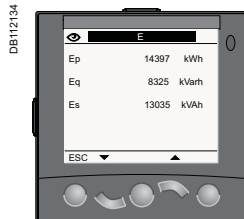
Current.



Voltage.



Power.



Consumption.

Examples of measurement screens on the FDM121 display unit.

Micrologic A/E/P measurement functions are made possible by Micrologic intelligence and the accuracy of the sensors. They are handled by a microprocessor that operates independent of protection functions.

### Display



#### FDM121 display unit

The FDM121 switchboard display unit can be connected to a Micrologic COM option (BCM ULP) using a breaker ULP cord to display all measurements on a screen. The result is a veritable 96 x 96 mm Power Meter.

In addition to the information displayed on the Micrologic LCD, the FDM121 screen shows demand, power quality and maximeter/minimeter values along with histories and maintenance indicators.

The FMD121 display unit requires a 24 V DC power supply. The COM option (BCM ULP) unit is supplied by the same power supply via the breaker ULP cord connecting it to the FDM121.

### Measurements



#### Instantaneous rms measurements

The Micrologic continuously display the RMS value of the highest current of the three phases and neutral (Imax). The navigation buttons can be used to scroll through the main measurements.

In the event of a fault trip, the trip cause is displayed.

The Micrologic A measures phase, neutral, ground fault currents.

The Micrologic E offers voltage, power, Power Factor, measurements in addition to the measurements provided by Micrologic A.

The Micrologic P offer frequency, cos.φ in addition to the measurements provided by Micrologic E.

#### Maximeters / minimeters

Every instantaneous measurement provided by Micrologic A or E can be associated with a maximeter/minimeter. The maximeters for the highest current of the 3 phases and neutral, the demand current and power can be reset via the FDM121 display unit or the communication system.

#### Energy metering

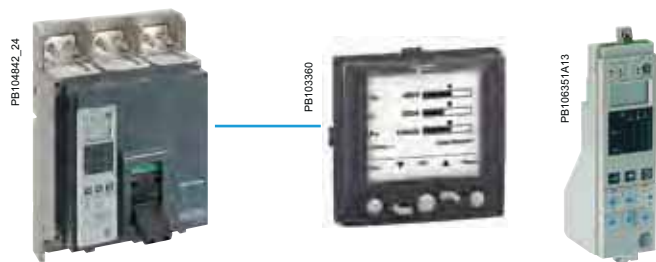
The Micrologic E/P also measures the energy consumed since the last reset of the meter. The active energy meter can be reset via Micrologic keypad or the FDM121 display unit or the communication system.

#### Demand and maximum demand values

Micrologic E/P also calculates demand current and power values. These calculations can be made using a block or sliding interval that can be set from 5 to 60 minutes in steps of 1 minute. The window can be synchronised with a signal sent via the communication system. Whatever the calculation method, the calculated values can be recovered on a PC via Modbus communication.

Ordinary spreadsheet software can be used to provide trend curves and forecasts based on this data. They will provide a basis for load shedding and reconnection operations used to adjust consumption to the subscribed power.





| Micrologic A/E/P integrated Power Meter functions |                                                |                                                                                                                        |  | Type  |   | Display          |                |
|---------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--|-------|---|------------------|----------------|
|                                                   |                                                |                                                                                                                        |  | A/E   | P | Micrologic LCD   | FDM121 display |
| Display of protection settings                    |                                                |                                                                                                                        |  |       |   |                  |                |
| Pick-ups (A) and delays                           | All settings can be displayed                  | I <sub>r</sub> , t <sub>r</sub> , I <sub>sd</sub> , t <sub>sd</sub> , I <sub>i</sub> , I <sub>g</sub> , t <sub>g</sub> |  | A/E   | P | ■                | -              |
| Measurements                                      |                                                |                                                                                                                        |  |       |   |                  |                |
| Instantaneous rms measurements                    |                                                |                                                                                                                        |  |       |   |                  |                |
| Currents (A)                                      | Phases and neutral                             | I1, I2, I3, IN                                                                                                         |  | A/E   | P | ■                | ■              |
|                                                   | Average of phases                              | Iavg = (I1 + I2 + I3) / 3                                                                                              |  | A/E   | P | -                | ■              |
|                                                   | Highest current of the 3 phases and neutral    | I <sub>max</sub> of I1, I2, I3, IN                                                                                     |  | A/E   | P | ■                | ■              |
|                                                   | Ground fault (Micrologic 6)                    | % I <sub>g</sub> (pick-up setting)                                                                                     |  | A/E   | P | ■                | ■              |
|                                                   | Current unbalance between phases               | % Iavg                                                                                                                 |  | - /E  | P | -                | ■              |
| Voltages (V)                                      | Phase-to-phase                                 | V12, V23, V31                                                                                                          |  | - /E  | P | ■                | ■              |
|                                                   | Phase-to-neutral                               | V1N, V2N, V3N                                                                                                          |  | - /E  | P | ■                | ■              |
|                                                   | Average of phase-to-phase voltages             | Vavg = (V12 + V23 + V31) / 3                                                                                           |  | - /E  | P | -                | ■              |
|                                                   | Average of phase-to-neutral voltages           | Vavg = (V1N + V2N + V3N) / 3                                                                                           |  | - /E  | P | -                | ■              |
|                                                   | Ph-Ph and Ph-N voltage unbalance               | % Vavg and % Vavg                                                                                                      |  | - /E  | P | -                | ■              |
|                                                   | Phase sequence                                 | 1-2-3, 1-3-2                                                                                                           |  | - / - | P | ■                | ■              |
| Frequency (Hz)                                    | Power system                                   | f                                                                                                                      |  | - / - | P | ■                | ■              |
| Power                                             | Active (kW)                                    | P, total                                                                                                               |  | - /E  | P | ■                | ■              |
|                                                   |                                                | P, per phase                                                                                                           |  | - /E  | P | ■ <sup>(2)</sup> | ■              |
|                                                   | Reactive (kVAR)                                | Q, total                                                                                                               |  | - /E  | P | ■                | ■              |
|                                                   |                                                | Q, per phase                                                                                                           |  | - / - | P | ■ <sup>(2)</sup> | ■              |
|                                                   | Apparent (kVA)                                 | S, total                                                                                                               |  | - /E  | P | ■                | ■              |
|                                                   |                                                | S, per phase                                                                                                           |  | - / - | P | ■ <sup>(2)</sup> | ■              |
|                                                   | Power Factor                                   | PF, total                                                                                                              |  | - /E  | P | ■                | ■              |
|                                                   |                                                | PF, per phase                                                                                                          |  | - / - | P | ■ <sup>(2)</sup> | ■              |
|                                                   | Cos.φ                                          | Cos.φ, total                                                                                                           |  | - / - | P | ■ <sup>(2)</sup> | ■              |
|                                                   |                                                | Cos.φ, per phase                                                                                                       |  | - / - | P | ■ <sup>(2)</sup> | ■              |
| Maximeters / minimeters                           |                                                |                                                                                                                        |  |       |   |                  |                |
|                                                   | Associated with instantaneous rms measurements | Reset via FDM121 display unit and Micrologic keypad                                                                    |  | A/E   | P | ■                | ■              |
| Energy metering                                   |                                                |                                                                                                                        |  |       |   |                  |                |
| Energy                                            | Active (kW), reactive (kVARh), apparent (kVAh) | Total since last reset                                                                                                 |  | - /E  | P | ■                | ■              |
| Demand and maximum demand values                  |                                                |                                                                                                                        |  |       |   |                  |                |
| Demand current (A)                                | Phases and neutral                             | Present value on the selected window                                                                                   |  | - /E  | P | ■                | ■              |
|                                                   |                                                | Maximum demand since last reset                                                                                        |  | - /E  | P | ■ <sup>(2)</sup> | ■              |
| Demand power                                      | Active (kWh), reactive (kVAR), apparent (kVA)  | Present value on the selected window                                                                                   |  | - /E  | P | ■                | ■              |
|                                                   |                                                | Maximum demand since last reset                                                                                        |  | - /E  | P | ■ <sup>(2)</sup> | ■              |
| Calculation window                                | Sliding, fixed or com-synchronised             | Adjustable from 5 to 60 minutes in 1 minute steps <sup>(1)</sup>                                                       |  | - /E  | P | -                | -              |

<sup>(1)</sup> Available via the communication system only.

<sup>(2)</sup> Available for Micrologic P only.

### Histories

- trip indications in clear text in a number of user-selectable languages
- time-stamping: date and time of trip.



### Maintenance indicators

Micrologic control unit have indicators for, among others, the number of operating cycles, contact wear P, load profile and operating times (operating hours counter) of the Masterpact circuit breaker.

It is possible to assign an alarm to the operating cycle counter to plan maintenance. The various indicators can be used together with the trip histories to analyse the level of stresses the device has been subjected to.



### Management of installed devices

Each circuit breaker equipped with a COM option (BCM ULP) can be identified via the communication system:

- serial number
- firmware version
- hardware version
- device name assigned by the user.

This information together with the previously described indications provides a clear view of the installed devices.

| Micrologic A/E/P operating assistance functions |                                |                                                                                    | Type  |   | Display        |                |
|-------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------|-------|---|----------------|----------------|
|                                                 |                                |                                                                                    | A/E   | P | Micrologic LCD | FDM121 display |
| <b>Operating assistance</b>                     |                                |                                                                                    |       |   |                |                |
| <b>Trip history</b>                             |                                |                                                                                    |       |   |                |                |
| Trips                                           | Cause of tripping              | Ir, lsd, li, Ig, lΔn                                                               | - / E | P | ■              | ■              |
| <b>Maintenance indicators</b>                   |                                |                                                                                    |       |   |                |                |
| Counter                                         | Mechanical cycles              | Assignable to an alarm                                                             | A/E   | P | -              | ■              |
|                                                 | Electrical cycles              | Assignable to an alarm                                                             | A/E   | P | -              | ■              |
|                                                 | Hours                          | Total operating time (hours) <sup>(1)</sup>                                        | A/E   | P | -              | -              |
| Indicator                                       | Contact wear                   | %                                                                                  | - / - | P | -              | ■              |
| Load profile                                    | Hours at different load levels | % of hours in four current ranges: 0-49 % In, 50-79 % In, 80-89 % In and ≥ 90 % In | A/E   | P | -              | ■              |

<sup>(1)</sup> Also available via the communication system.

### Additional technical characteristics

#### Contact wear

Each time Compact opens, the Micrologic P trip unit measures the interrupted current and increments the contact-wear indicator as a function of the interrupted current, according to test results stored in memory. Breaking under normal load conditions results in a very slight increment. The indicator value may be read on the FDM121 display. It provides an estimation of contact wear calculated on the basis of the cumulative forces affecting the circuit breaker. When the indicator reaches 100 %, it is advised to inspect the circuit breaker to ensure the availability of the protected equipment.

#### Circuit breaker load profile

Micrologic A/E/P calculates the load profile of the circuit breaker protecting a load circuit. The profile indicates the percentage of the total operating time at four current levels (% of breaker In):

- 0 to 49 % In
- 50 to 79 % In
- 80 to 89 % In
- ≥ 90 % In.

This information can be used to optimise use of the protected equipment or to plan ahead for extensions.

# Switchboard-display functions

## Micrologic A/E/P control unit with COM option (BCM ULP)

Micrologic measurement capabilities come into full play with the FDM121 switchboard display. It connects to COM option (BCM ULP) via a breaker ULP cord and displays Micrologic information. The result is a true integrated unit combining a circuit breaker and a Power Meter. Additional operating assistance functions can also be displayed.

### FDM121 switchboard display

The FDM121 switchboard display unit can be connected to a Micrologic COM option (BCM ULP). It uses the sensors and processing capacity of the Micrologic control unit. It is easy to use and requires no special software or settings. It is immediately operational when connected to the COM option (BCM ULP) by a breaker ULP cord. The FDM121 is a large display, but requires very little depth. The anti-glare graphic screen is backlit for very easy reading even under poor ambient lighting and at sharp angles.

### Display of Micrologic measurements and trips

The FDM121 is intended to display Micrologic A/E/P measurements, trips and operating information. It cannot be used to modify the protection settings. Measurements may be easily accessed via a menu.

Trips are automatically displayed.

- A pop-up window displays the time-stamped description of the trip and the orange LED flashes

### Status indications

When the circuit breaker is equipped with the COM option (BCM ULP) (including its set of sensors) the FDM121 display can also be used to view circuit breaker status conditions:

- O/F: ON/OFF
- SDE: Fault-trip indication (overload, short-circuit, ground fault).
- PF: ready to close
- CH: charged (spring loaded).

### Remote control

When the circuit breaker is equipped with the COM option (BCM ULP) (including its kit for connection to XF and MX1 communication voltage releases), the FDM121 display can also be used to control (open/close) the circuit breaker. Two operating mode are available.

- local mode : open/close commands are enabled from FDM121 while disabled from communication network
- remote mode : open/close commands are disabled from FDM121 while, enabled from communication network.

### Main characteristics

- 96 x 96 x 30 mm screen requiring 10 mm behind the door (or 20 mm when the 24 volt power supply connector is used).
- White backlighting.
- Wide viewing angle: vertical  $\pm 60^\circ$ , horizontal  $\pm 30^\circ$ .
- High resolution: excellent reading of graphic symbols.
- Alarm LED: flashing orange for alarm pick-up, steady orange after operator reset if alarm condition persists.
- Operating temperature range  $-10^\circ\text{C}$  to  $+55^\circ\text{C}$ .
- CE / UL / CSA marking (pending).
- 24 V DC power supply, with tolerances 24 V -20 % (19.2 V) to 24 V +10 % (26.4 V). When the FDM121 is connected to the communication network, the 24 V DC can be supplied by the communication system wiring system (see paragraph "Connection").
- Consumption 40 mA.

### Mounting

The FDM121 is easily installed in a switchboard.

- Standard door cut-out 92 x 92 mm.
- Attached using clips.

To avoid a cut-out in the door, an accessory is available for surface mounting by drilling only two 22 mm diameter holes.

The FDM121 degree of protection is IP54 in front. IP54 is maintained after switchboard mounting by using the supplied gasket during installation.

### Connection

The FDM121 is equipped with:

- a 24 V DC terminal block:
  - plug-in type with 2 wire inputs per point for easy daisy-chaining
  - power supply range of 24 V DC -20 % (19.2 V) to 24 V DC +10 % (26.4 V).
- A 24 V DC type auxiliary power supply must be connected to a single point on the ULP system. The FDM121 display unit has a 2-point screw connector on the rear panel of the module for this purpose. The ULP module to which the auxiliary power supply is connected distributes the supply via the ULP cable to all the ULP modules connected to the system and therefore also to Micrologic.
- two RJ45 jacks.

The Micrologic connects to the internal communication terminal block on the Compact via the breaker ULP cord. Connection to one of the RJ45 connectors on the FDM121 automatically establishes communication between the Micrologic and the FDM121 and supplies power to the Micrologic measurement functions. When the second connector is not used, it must be fitted with a line terminator.



FDM121 display.



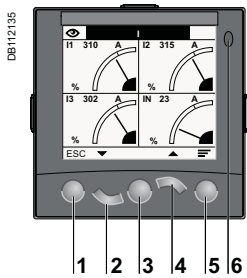
Surface mount accessory.



Connection with FDM121 display unit.

# Switchboard-display functions

## Micrologic A/E/P control unit with COM option (BCM ULP)



- 1 Escape
- 2 Down
- 3 OK
- 4 Up
- 5 Context
- 6 Alarm LED

### Navigation

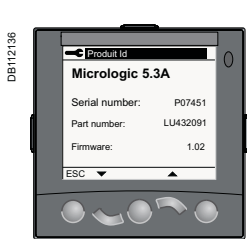
Five buttons are used for intuitive and fast navigation. The "Context" button may be used to select the type of display (digital, bargraph, analogue).

The user can select the display language (Chinese, English, French, German, Italian, Portuguese, Spanish, etc.).

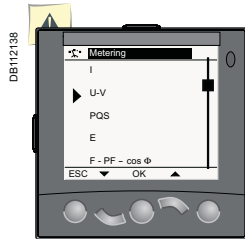
### Screens

#### Main menu

When powered up, the FDM121 screen automatically displays the ON/OFF status of the device.



Product identification.



Metering: sub-menu.



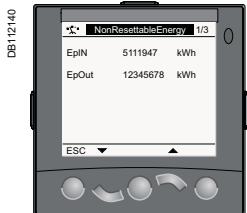
Quick view

Metering

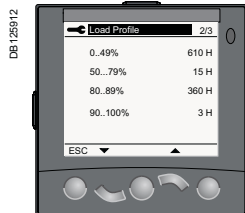
Control

Alarms

Services.



Metering: meter.



Services.

When not in use, the screen is not backlit. Backlighting can be activated by pressing one of the buttons. It goes off after 3 minutes.

#### Fast access to essential information

■ "Quick view" provides access to five screens that display a summary of essential operating information (I, U, f, P, E, THD, circuit breaker On / Off).

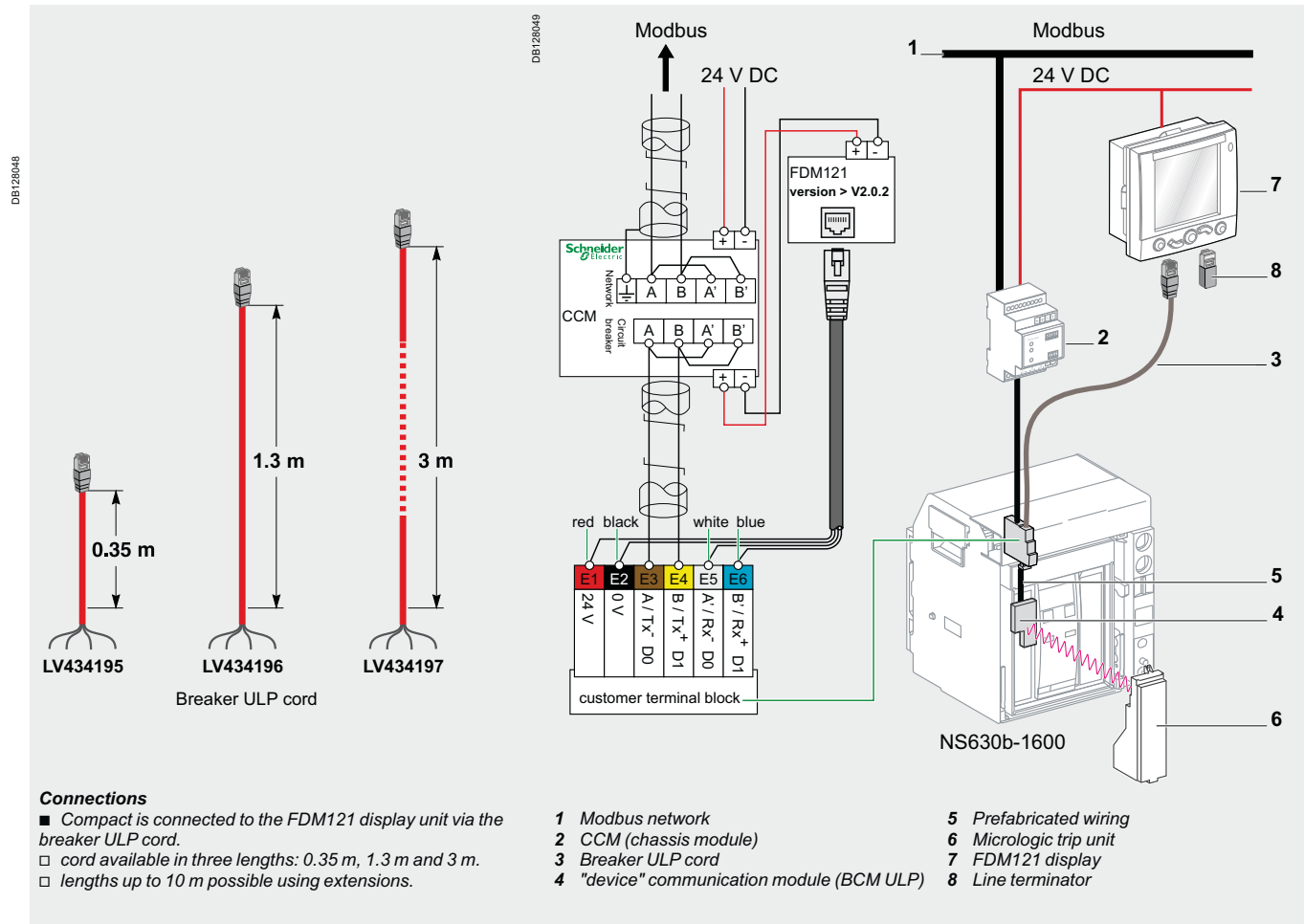
#### Access to detailed information

■ "Metering" can be used to display the measurement data (I, U-V, f, P, Q, S, E, THD, PF) with the corresponding min/max values.

■ Alarms displays the trip history.

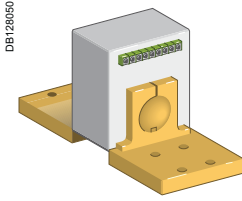
■ Services provides access to the operation counters, energy and maximeter reset function, maintenance indicators, identification of modules connected to the internal bus and FDM121 internal settings (language, contrast, etc.)

### Communication components and FDM121 connections



# Protection of distribution systems

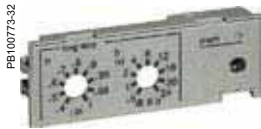
## Micrologic control units for Compact NS630b to 3200



External sensor (CT).



External sensor for source ground return protection.



Long-time rating plug.



External 24 V DC power supply module.

### External sensors

#### External sensor for earth-fault and neutral protection

The sensors, used with the 3P circuit breakers, are installed on the neutral conductor for:

- neutral protection (with Micrologic P)
- residual type earth-fault protection (with Micrologic A, E and P).

The rating of the sensor (CT) must be compatible with the rating of the circuit breaker:

- NS630b to 1600 A - 400/1600 CT
- NS1600b to 3200 A - 1000/4000 CT.

#### Rectangular sensor for earth-leakage protection

The sensor is installed around the busbars (phases + neutral) to detect the zero-phase sequence current required for the earth-leakage protection. Rectangular sensors are available in two sizes.

Inside dimensions (mm)

- 280 x 115 up to 1600 A for Compact NS630b to 1600 A
- 470 x 160 up to 3200 A for Compact NS1600b to 3200 A.

#### External sensor for source ground return protection

The sensor is installed around the connection of the transformer neutral point to earth and connects to the Micrologic 6.0 control unit via an MDGF module to provide the source ground return (SGR) protection.

### Long-time rating plug

Four interchangeable plugs may be used to limit the long-time threshold setting range for higher accuracy.

The time delay settings indicated on the plugs are for an overload of 6  $I_r$  (for further details, see the characteristics on [page A-13](#) and [page A-17](#)).

As standard, control units are equipped with the 0.4 to 1 plug.

#### Setting ranges

| Standard            | $I_r = I_n \times \dots$                                    | 0.4  | 0.5  | 0.6  | 0.7  | 0.8  | 0.9  | 0.95 | 0.98 | 1   |
|---------------------|-------------------------------------------------------------|------|------|------|------|------|------|------|------|-----|
| Low-setting option  | $I_r = I_n \times \dots$                                    | 0.4  | 0.45 | 0.50 | 0.55 | 0.60 | 0.65 | 0.70 | 0.75 | 0.8 |
| High-setting option | $I_r = I_n \times \dots$                                    | 0.80 | 0.82 | 0.85 | 0.88 | 0.90 | 0.92 | 0.95 | 0.98 | 1   |
| Off plug            | No long-time protection ( $I_r = I_n$ for $I_{sd}$ setting) |      |      |      |      |      |      |      |      |     |

**Important:** long-time rating plugs must always be removed before carrying out insulation or dielectric withstand tests.

### External 24 V DC power-supply module

The external power-supply module makes it possible to use the display even if the circuit breaker is open or not supplied (for the exact conditions of use, see the "electrical diagrams" part of this catalogue).

This module powers both the control unit (100 mA) and M6C programmable contacts (100 mA).

If the COM communication option is used, the communication bus requires 24 V DC power supply. With the Micrologic A/E control unit, this module makes it possible to display currents of less than 20 % of  $I_n$ .

With the Micrologic P, it can be used to display fault currents after tripping.

#### Characteristics

- power supply:
  - 110/130, 200/240, 380/415 V AC (+10 % -15 %)
  - 24/30, 48/60, 100/125 V DC (+20 % -20 %)
- output voltage: 24 V DC  $\pm 5$  %, 1 A.
- ripple < 1 %
- dielectric withstand : 3.5 kV rms between input/output, for 1 minutew
- overvoltage category: as per IEC 60947-1 cat. 4.

# Protection of distribution systems

## Micrologic control units for Compact NS630b to 3200



Battery module.



M6C.



Lead-seal cover.

### Battery module

The battery module maintains display operation and communication with the supervisor if the power supply to the Micrologic control unit is interrupted. It is installed in series between the Micrologic control unit and the AD module.

#### Characteristics

- battery run-time: 4 hours (approximately)
- mounted on vertical backplate or symmetrical rail.

### M6C programmable contacts

These contacts are optional equipment for the Micrologic P control units. They are described with the indication contacts for the circuit breakers.

| Micrologic                         |      |     | Type P      |
|------------------------------------|------|-----|-------------|
| Characteristics                    |      |     | M6C         |
| Minimum load                       |      |     | 100 mA/24 V |
| Breaking capacity (A)<br>p.f.: 0.7 | V AC | 240 | 5           |
|                                    |      | 380 | 3           |
|                                    | V DC | 24  | 1.8         |
|                                    |      | 48  | 1.5         |
|                                    |      | 125 | 0.4         |
|                                    |      | 250 | 0.15        |

M6C: external 24 V DC power supply required (consumption 100 mA).

### Spare parts

#### Lead-seal covers

A lead-seal cover controls access to the adjustment dials.

When the cover is closed:

- it is impossible to modify settings using the keypad unless the settings lockout pin on the cover is removed
- the test connector remains accessible
- the test button for the earth-fault and earth-leakage protection function remains accessible.

#### Characteristics

- transparent cover for basic Micrologic and Micrologic A, E control units
- non-transparent cover for Micrologic P control units.

#### Spare battery

A battery supplies power to the LEDs identifying the tripping causes. Battery service life is approximately ten years.

A test button on the front of the control unit is used to check the battery condition. The battery may be replaced on site when discharged.



Portable test kit.

## Test equipment

### Hand-held test kit

The hand-held mini test kit may be used to:

- check operation of the control unit and the tripping and pole-opening system by sending a signal simulating a short-circuit
- supply power to the control units for settings via the keypad when the circuit breaker is open (Micrologic P control units).

Power source: standard LR6-AA battery.

### Full function test kit

The test kit can be used alone or with a supporting personal computer.

The test kit without PC may be used to check:

- the mechanical operation of the circuit breaker
- the electrical continuity of the connection between the circuit breaker and the control unit
- operation of the control unit:
  - ☐ display of settings
  - ☐ automatic and manual tests on protection functions
  - ☐ test on the zone-selective interlocking (ZSI) function
  - ☐ inhibition of the earth-fault protection
  - ☐ inhibition of the thermal memory.

The test kit with PC offers in addition:

- the test report (software available on request).



# Portable data acquisition GetnSet

GetnSet is a portable data acquisition and storage accessory that connects directly to the Micrologic control units of Compact and Masterpact circuit breakers to read important electrical installation operating data and Compact protection settings. This information is stored in the GetnSet internal memory and can be transferred to a PC via USB or Bluetooth for monitoring and analysis.

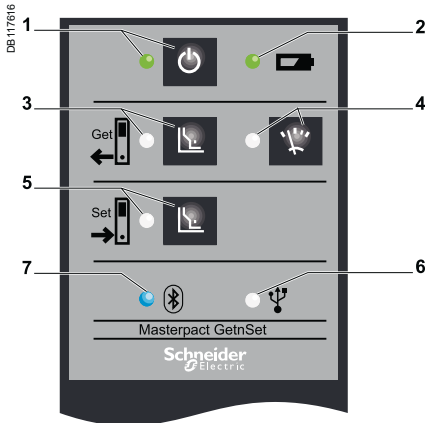
### Overview GetnSet functions

GetnSet<sup>(1)</sup> is a portable data acquisition and storage device that works like a USB drive, letting users manually transfer data to and from a Compact and Masterpact circuit breakers or PC.

GetnSet can download operating data from Compact and Masterpact, and download or upload settings.

Downloadable operating data include measurements, the last 3 trip history records and contact wear status.

Accessible settings include protection thresholds, external relay assignment modes and pre-defined alarm configurations if applicable.



- 1 On/Off
- 2 batterie indicator
- 3 Download settings
- 4 Download operating parameters
- 5 Upload settings
- 6 USB indicator
- 7 Bluetooth indicator

### Operating data functions

Electrical installation information such as energy measurements and contact wear status is increasingly important to help reduce operating expenses and increase the availability of electrical power. Such data is often available from devices within the installation, but needs to be gathered and aggregated to allow analysis and determine effective improvement actions.

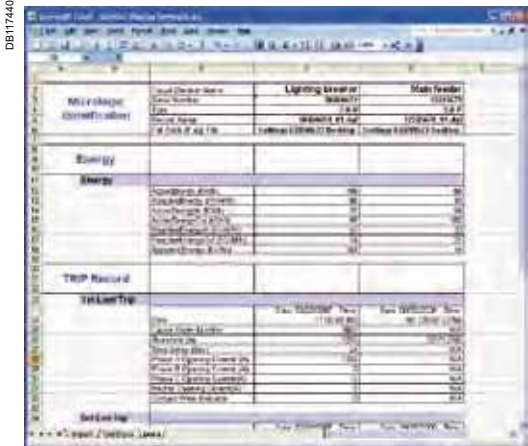
With GetnSet, this operating data can be easily read and stored as .dgl files in the internal memory. It can then be transferred to a PC via a USB or Bluetooth link and imported in an Excel spreadsheet.

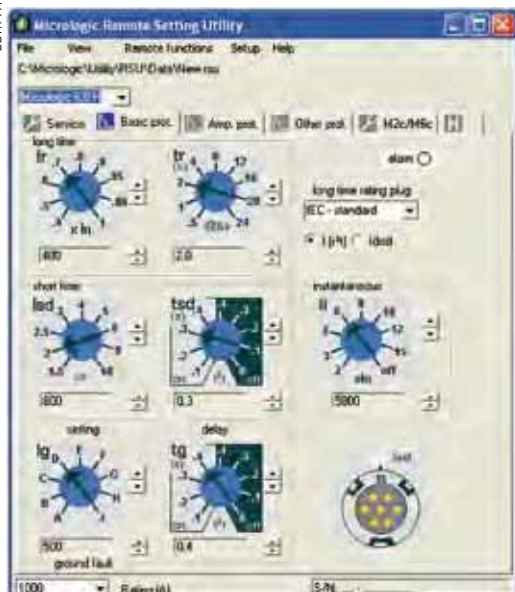
The provided Excel spreadsheet can be used to display the operating data from several breakers in order to:

- analyse changes in parameters such as energy, power factor and contact wear
- compare the values of parameters between circuit breakers
- create graphics and reports using standard Excel tools

### GetnSet data accessible in the Excel spreadsheet

| Type of data                                     | Micrologic |   |
|--------------------------------------------------|------------|---|
| Current                                          | A/E        | P |
| Energy, voltages, frequency, power, power factor | E          | P |
| Power quality: fundamental, harmonics            | -          | - |
| Trip history                                     | E          | P |
| Contact wear                                     | -          | P |





## Protection setting functions

GetnSet can also be used to back up circuit breaker settings and restore them on the same device or, under certain conditions, copy them to any Compact and Masterpact circuit breakers equipped with the same type of Micrologic control unit.

This concerns only advanced settings, as other parameters must be set manually using the dials on the Micrologic control unit.

■ When commissioning the installation, safeguard the configuration parameters of your electrical distribution system by creating a back-up of circuit breaker settings so that they can be restored at any time.

■ The settings read by GetnSet can be transferred to a PC and are compatible with RSU software (Remote Setting Utility). Protection configurations can also be created on a PC using this software, copied to GetnSet's internal memory and uploaded to a Compact and Masterpact circuit breakers with a compatible Micrologic trip unit and dial settings.

## Operating procedure

The procedure includes several steps.

- Plug GetnSet into the receptacle on the front of the Micrologic control unit of a Compact and Masterpact circuit breakers.
- On the keypad, select the type of data (operating data or settings) and the transfer direction (download or upload). This operation can be done as many times as required for the entire set of Compact and Masterpact circuit breakers.
- Downloaded data is transferred to the GetnSet internal memory and a file is created for each Compact device (either an .rsu file for settings or a .dgl file for operating data).
- Data can be transferred between GetnSet and a PC via a USB or Bluetooth connection.
- Operating data can be imported in an Excel spreadsheet and protection settings can be read with RSU (remote setting utility) software.

## Features

- Battery-powered to power a Micrologic control unit even if the breaker has been opened or tripped. This battery provides power for an average of 1 hour of use, enough for more than 100 download operations.
- Can be used on Compact and Masterpact circuit breakers equipped or not equipped with a Modbus "device" communication module.
- Portable, standalone accessory eliminating the need for a PC to connect to a Compact and Masterpact circuit breakers.
- No driver or software required for GetnSet connection to a PC.
- Can be used with many circuit breakers, one after the other.
- Embedded memory sized to hold data from more than 5000 circuit breakers.
- Supplied with its battery, a cable for connection to Micrologic trip units, a USB cable for connection to a PC and a battery charger.

## Compatibility

- Micrologic control units A, E, P.
- PC with USB port or Bluetooth link and Excel software.

## Technical characteristics

|                           |                               |
|---------------------------|-------------------------------|
| Charger power supply      | 100 – 240 V; ~1 A; 50 – 60 Hz |
| Charger power consumption | Max 100 W                     |
| Battery                   | 3.3 V DC; 9 mAh; Li-Ion       |
| Operating temperature     | -20 to +60 °C                 |
| GetnSet dimensions        | 95 x 60 x 35 mm               |

# Communication

## Compact NS630b to 3200

### COM option in Compact

All the Compact devices can be fitted with the communication function thanks to the COM option. Compact uses the Modbus communications protocol for full compatibility with the supervision management systems. An external gateway is available for communication on other networks: Eco COM is limited to the transmission of metering data. It is not used to communicate status and controls.

#### For fixed devices, the COM option is made up of:

- a Modbus BCM ULP "device" communication module, installed behind the Micrologic control unit and supplied with its set of sensors (OF, SDE, PF and CH micro switches) its kit for connection to XF and MX1 communicating voltage releases and its COM terminal block (inputs E1 to E6).

#### For drawout devices, the COM option is made up of:

- a Modbus BCM ULP "device" communication module, installed behind the Micrologic control unit and supplied with its set of sensors (OF, SDE, PF and CH micro switches) its kit for connection to XF and MX1 communicating voltage releases and its COM terminal block (inputs E1 to E6).
- a "chassis" communication module supplied separately with its set of sensors (CE, CD and CT contacts) Modbus CCM.

#### Modbus BCM ULP "Device" communication module

This module is independent of the control unit. It receives and transmits information on the communication network. An infra-red link transmits data between the control unit and the communication module.

Consumption: 30 mA, 24 V.

#### Modbus CCM "chassis" communication module

This module is independent of the control unit. With Modbus "chassis" communication module, this module makes it possible to address the chassis and to maintain the address when the circuit breaker is in the disconnected position.

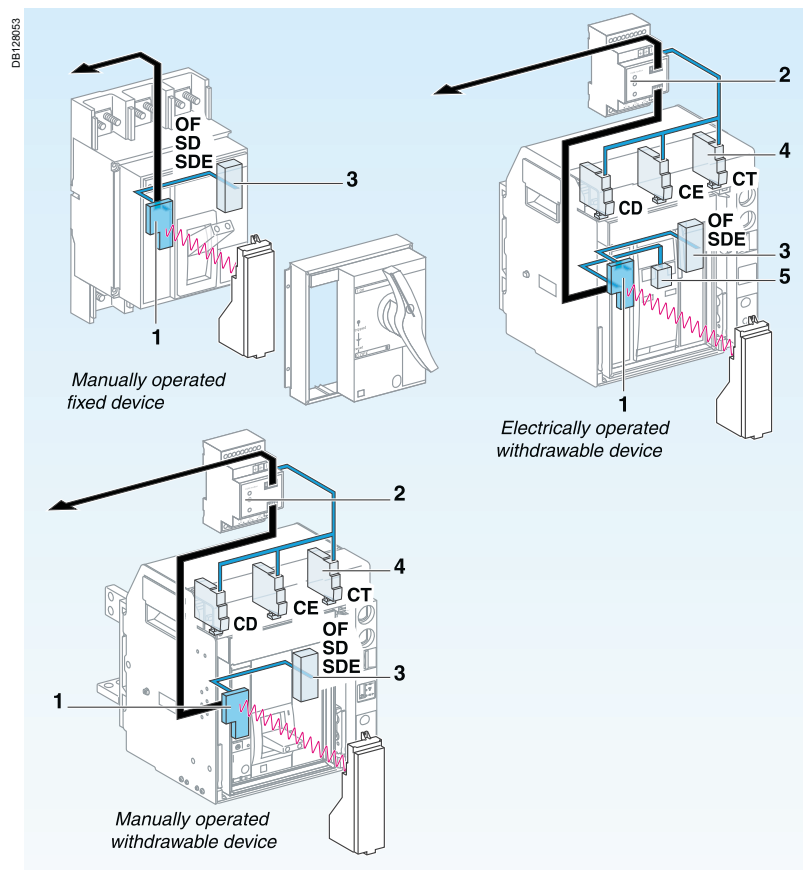
Consumption: 30 mA, 24 V.



Modbus BCM ULP "device" communication module.



Modbus CCM "chassis" communication module.



- 1 Modbus BCM ULP "Device" communication module.
  - 2 Modbus CCM "Chassis" communication module (option).
  - 3 OF, SDE, PF and CH micro switches.
  - 4 CE, CD and CT contacts.
  - 5 XF, MN or MX communicating voltage releases.
  - 6 Micrologic control unit.
  - 7 COM terminal block (E1 to E6).
- : Hard wire.  
— : Modbus.

# Overview of functions

PB104863



S: Micrologic without measurement.

A: Micrologic with ammeter

E: Micrologic "Energy"

P: Micrologic "Power"

**Note:** see the description of the Micrologic control units for further details on protection and alarms, measurements, waveform capture, histories, logs and maintenance indicators.

## Four functional levels

The Compact can be integrated into a Modbus communication environment. There are four possible functional levels that can be combined.

|                                          | Switch-<br>disconnectors | Circuit breaker |   |   |   |
|------------------------------------------|--------------------------|-----------------|---|---|---|
| Status indications                       |                          |                 |   |   |   |
| ON/OFF (O/F)                             | ■                        | S               | A | E | P |
| Spring charged CH                        | ■                        | S               | A | E | P |
| Ready to close                           | ■                        | S               | A | E | P |
| Fault-trip SDE                           | ■                        | S               | A | E | P |
| Connected / disconnected / test position | ■                        | S               | A | E | P |
| CE/CD/CT (CCM only)                      |                          | S               | A | E | P |
| Controls                                 |                          |                 |   |   |   |
| MX1 open                                 | ■                        | S               | A | E | P |
| XF close                                 | ■                        | S               | A | E | P |
| Measurements                             |                          |                 |   |   |   |
| Instantaneous measurement information    | ■                        |                 | A | E | P |
| Averaged measurement information         | ■                        |                 |   | E | P |
| Maximeter / minimeter                    | ■                        |                 | A | E | P |
| Energy metering                          | ■                        |                 |   | E | P |
| Demand for current and power             | ■                        |                 |   | E | P |
| Power quality                            | ■                        |                 |   |   | P |
| Operating assistance                     |                          |                 |   |   |   |
| Protection and alarm settings            |                          |                 |   |   | P |
| Histories                                |                          |                 |   | E | P |
| Time stamped event tables                |                          |                 |   |   | P |
| Maintenance indicators                   |                          |                 | A | E | P |

## Communication Modbus bus

The Modbus RS 485 (RTU protocol) system is an open bus on which communicating Modbus devices (Compact NS with Modbus COM, Power Meter PM700, PM800, Sepam, Vigilohm, Compact NSX, etc.) are installed. All types of PLCs and microcomputers may be connected to the bus.

## Addresses

The Modbus communication parameters (address, baud rate, parity) are entered using the keypad on the Micrologic A, E, P. For a switch-disconnector, it is necessary to use the RSU (Remote Setting Utility) Micrologic utility.

## Modbus addresses

|           |                         |              |
|-----------|-------------------------|--------------|
| @xx       | Circuit breaker manager | (1 to 47)    |
| @xx + 50  | Chassis manager         | (51 to 97)   |
| @xx + 200 | Measurement manager     | (201 to 247) |
| @xx + 100 | Protection manager      | (101 to 147) |

The manager addresses are automatically derived from the circuit breaker address @xx entered via the Micrologic control unit (the default address is 47).

## Number of devices

The maximum number of devices that may be connected to the Modbus bus depends on the type of device (Compact with Modbus COM, PM700, PM800, Sepam, Vigilohm, Compact NSX, etc.), the baud rate (19200 is recommended), the volume of data exchanged and the desired response time. The RS 485 physical layer offers up to 32 connection points on the bus (1 master, 31 slaves). A fixed device requires only one connection point (communication module on the device). A drawout device uses two connection points (communication modules on the device and on the chassis).

The number must never exceed 31 fixed devices or 15 drawout devices.

## Length of bus

The maximum recommended length for the Modbus bus is 1200 meters.

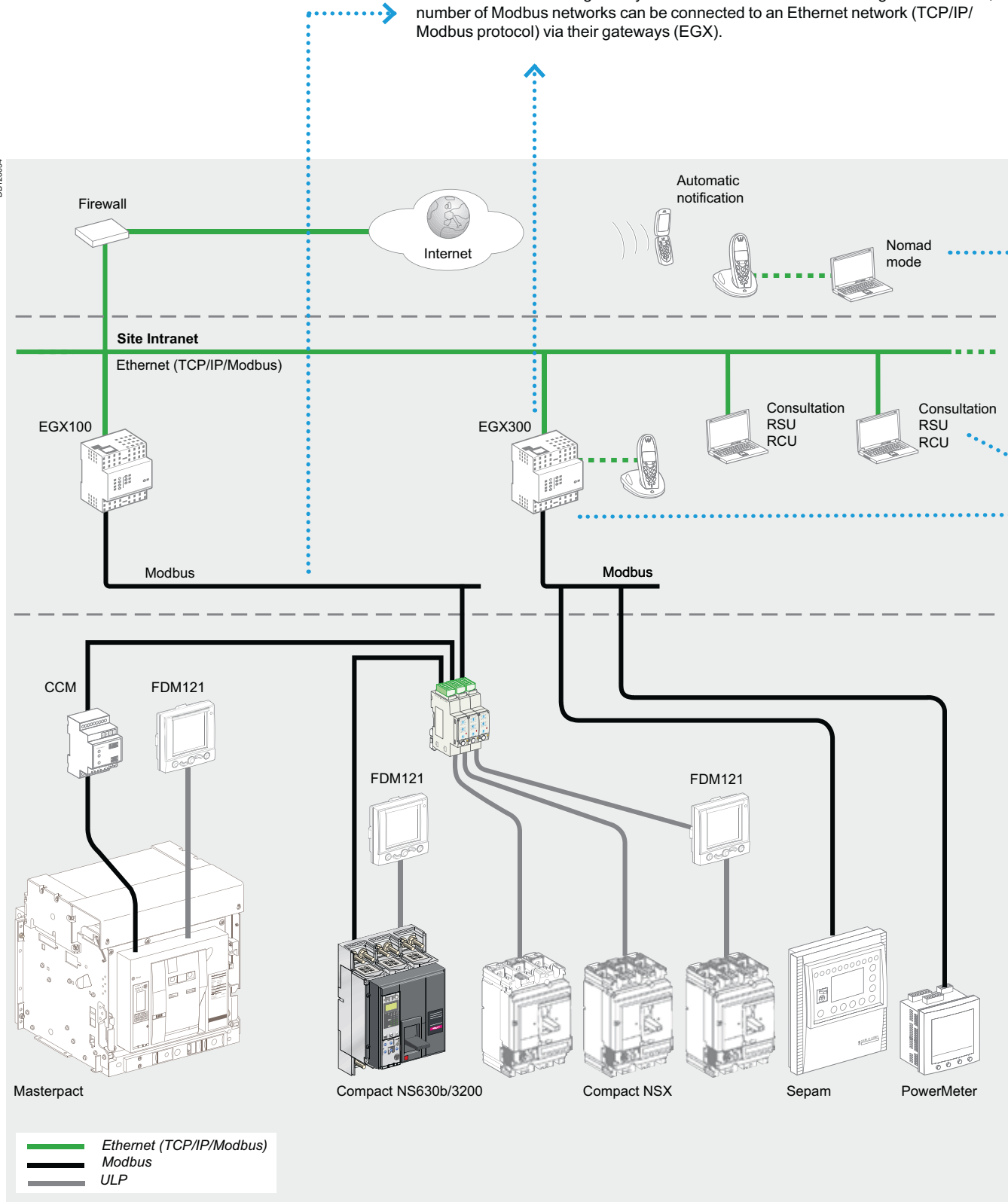
## Bus power source

A 24 V DC power supply is required (less than 20 % ripple, insulation class II).

Compact uses the Modbus communication protocol, compatible with ION-E electrical engineering expert system software.  
Two downloadable software (RSU, RCU) from [schneider-electric.com](http://schneider-electric.com) facilitate implementation of communication functions.

### Modbus

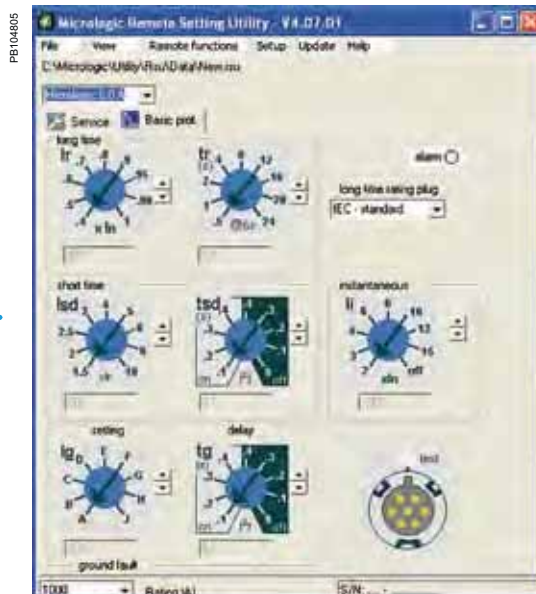
Modbus is the most widely used communication protocol in industrial networks. It operates in master-slave mode. The devices (slaves) communicate one after the other with a gateway (master). Compact, Compact NSX, PowerLogic and Sepam products all operate with this protocol. A Modbus network is generally implemented on an LV or MV switchboard scale. Depending on the data monitored and the desired refresh rate, a Modbus network connected to a gateway can serve 4 to 16 devices. For larger installations, a number of Modbus networks can be connected to an Ethernet network (TCP/IP/Modbus) via their gateways (EGX).



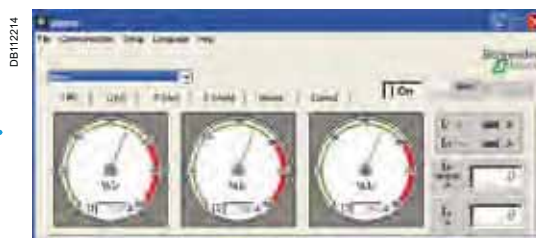


## Micrologic utilities

- Two utilities, RSU and RCU, presented on the next page, are available to assist in starting up a communicating installation. Intended for Compact and Compact NSX, the software can be downloaded from the Schneider Electric internet site.
- The "Live update" function enables immediate updating to obtain the most recent upgrades. These easy-to-use utilities include starting assistance and on-line help. They are compatible with Microsoft Windows 2000, XP and Windows 7.



RSU configuration screen for a Micrologic.



RCU mini-supervision screen for current measurements.

## Gateway

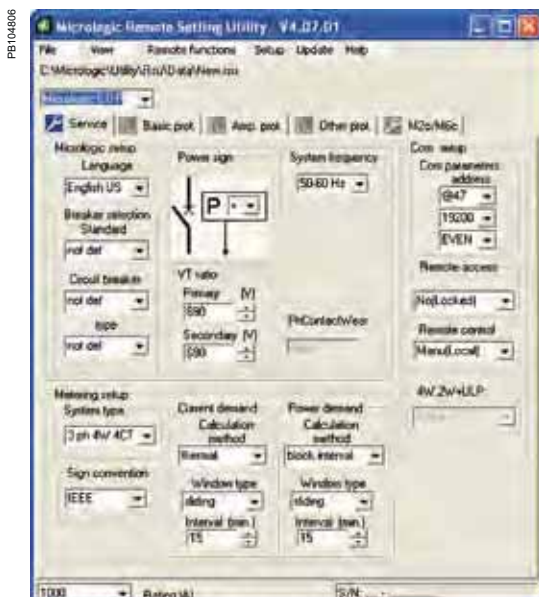
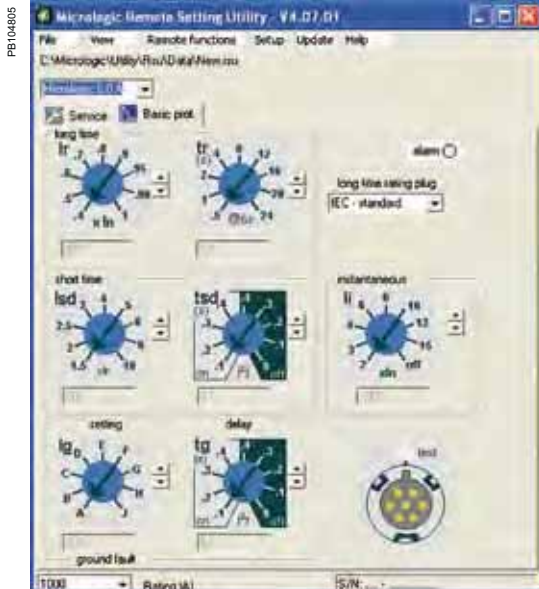
The gateway has two functions:

- access to the company intranet (Ethernet) by converting Modbus frames to the TCP/IP/Modbus protocol
  - optional web-page server for the information from the devices.
- Examples include EGX300 and EGX100.

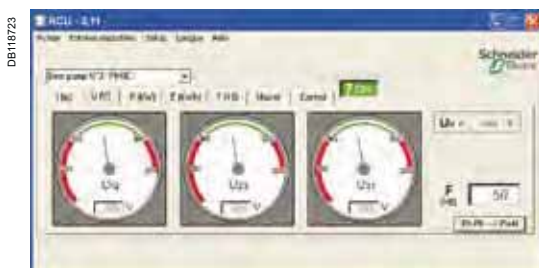


EGX300.

Two utilities, RSU and RCU, are available to assist in starting up a communicating installation. They can be downloaded from the Schneider Electric internet site and include a "Live update" function that enables immediate updating.



RSU: Micrologic Remote Setting Utility.



RCU: Remote Control Utility for communication tests.

### RSU (Remote Setting Utility)

This utility is used to set the protection functions and alarms for each Compact and Compact NSX device.

After connection to the network and entry of the circuit breaker Modbus address, the software automatically detects the type of trip unit installed.

There are two possible operating modes.

#### Off-line with the software disconnected from the communication network

For each selected circuit breaker, the user can do the following.

##### Determine the protection settings

The settings are carried out on a screen that shows the front of the trip unit.

The Micrologic setting dials, keypad and screen are simulated for easy use of all Micrologic setting functions.

##### Save and duplicate the protection settings

Each configuration created can be saved for subsequent device programming. It can also be duplicated and used as the basis for programming another circuit breaker.

#### On-line with the software connected to the network

Similarly, for each selected circuit breaker, the user can do the following.

##### Display the current settings

The software displays the trip unit and provides access to all settings.

##### View the corresponding protection curves

A graphic curve module in the software displays the protection curve corresponding to the settings. It is possible to lay a second curve over the first for discrimination studies.

##### Modify settings in a secure manner

■ There are different levels of security:

- password: by default, it is the same for all devices, but can be differentiated for each device
- locking of the Modbus interface module which must be unlocked before the corresponding device can be set remotely
- maximum settings limited by the positions of the two dials on the trip unit.

These dials, set by the user, determine the maximum settings that can be made via the communication system.

■ Settings are modified by:

- either direct, on-line setting of the protection settings on the screen
- or by loading the settings prepared in off-line mode. This is possible only if the positions of the dials allow the new settings.

All manual settings made subsequently on the device have priority.

##### Program alarms

■ Up to 12 alarms can be linked to measurements or events.

■ two alarms are predefined and activated automatically:

- Micrologic 5: overload (Ir)
- Micrologic 6: overload (Ir) and ground fault (Ig)

■ thresholds, priorities and time delays can be set for 10 other alarms. They may be selected from a list of 91 alarms

##### Set the outputs of the SDx relays

This is required when the user wants to change the standard configuration and assign different signals to the 2 outputs of the SDx relay.

### RCU (Remote Control Utility)

The RCU utility can be used to test communication for all the devices connected to the Modbus network. It is designed for use with Compact NSX, Compact, Advantys OTB and Power Meter devices. It offers a number of functions.

#### Mini supervisor

- Display of I, U, f, P, E and THD measurements for each device, via navigation.
- Display of ON/OFF status.

#### Open and close commands for each device

A common or individual password must first be entered.

When all functions have been tested, this utility is replaced by the supervision software selected for the installation.



# Supervision software

Schneider Electric electrical installation supervision, management and expert system software integrates Compact, Compact NSX and Masterpact identification modules.

## Types of software

Masterpact, Compact and Compact NSX communication functions are designed to interface with software dedicated to electrical installations:

- switchboard supervision
- electrical installation supervision
- power system management: electrical engineering expert systems
- process control
- SCADA (Supervisory Control & Data Acquisition), EMS (Enterprise Management System) or BMS (Building Management System) type software.

## Schneider Electric solutions

### Electrical switchboard supervision via EGX300 Web servers

A simple solution for customers who want to consult the main electrical parameters of switchboard devices without dedicated software.

Up to 16 switchboard devices are connected via Modbus interfaces to an EGX300 Ethernet gateway integrating the functions of a web page server. The embedded Web pages can be easily configured with just a few mouse clicks. The information they provide is updated in real time.

The Web pages can be consulted using a standard Web browser on a PC connected via Ethernet to the company Intranet or remotely via a modem. Automatic notification of alarms and threshold overruns is possible via e-mail or SMS (Short Message Service).

### Electrical installation supervision via iRIO RTU

The iRIO RTU(remote terminal unit) can be used as Ethernet coupler for the PowerLogic System devices and for any other communicating devices operating under Modbus RS 485 protocol. Data is viewable via a standard web browser.

### ION-E electrical engineering expert system software

ION-E is a family of web-enabled software products for high-end power-monitoring applications. It is designed for large power systems.

ION-E offer detailed analysis of electrical events, long-duration data logging and extensive, economical report-building capabilities (e.g. consumption monitoring and tariff management).

A wide variety of screens can be displayed in real time, including more than 50 tables, analogue meters, bargraphs, alarms logs with links to display waveforms and predefined reports on energy quality and service costs.

### Other software

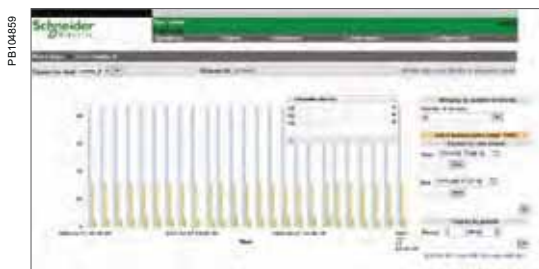
Masterpact, Compact and Compact NSX devices can forward their measurement and operating information to special software integrating the electrical installation and other technical facilities:

- SCADA process control software: Vijeo CITECT
- BMS Building Management System software: Vista.

[www.schneider-electric.com](http://www.schneider-electric.com)



EGX300



iRIO RTU

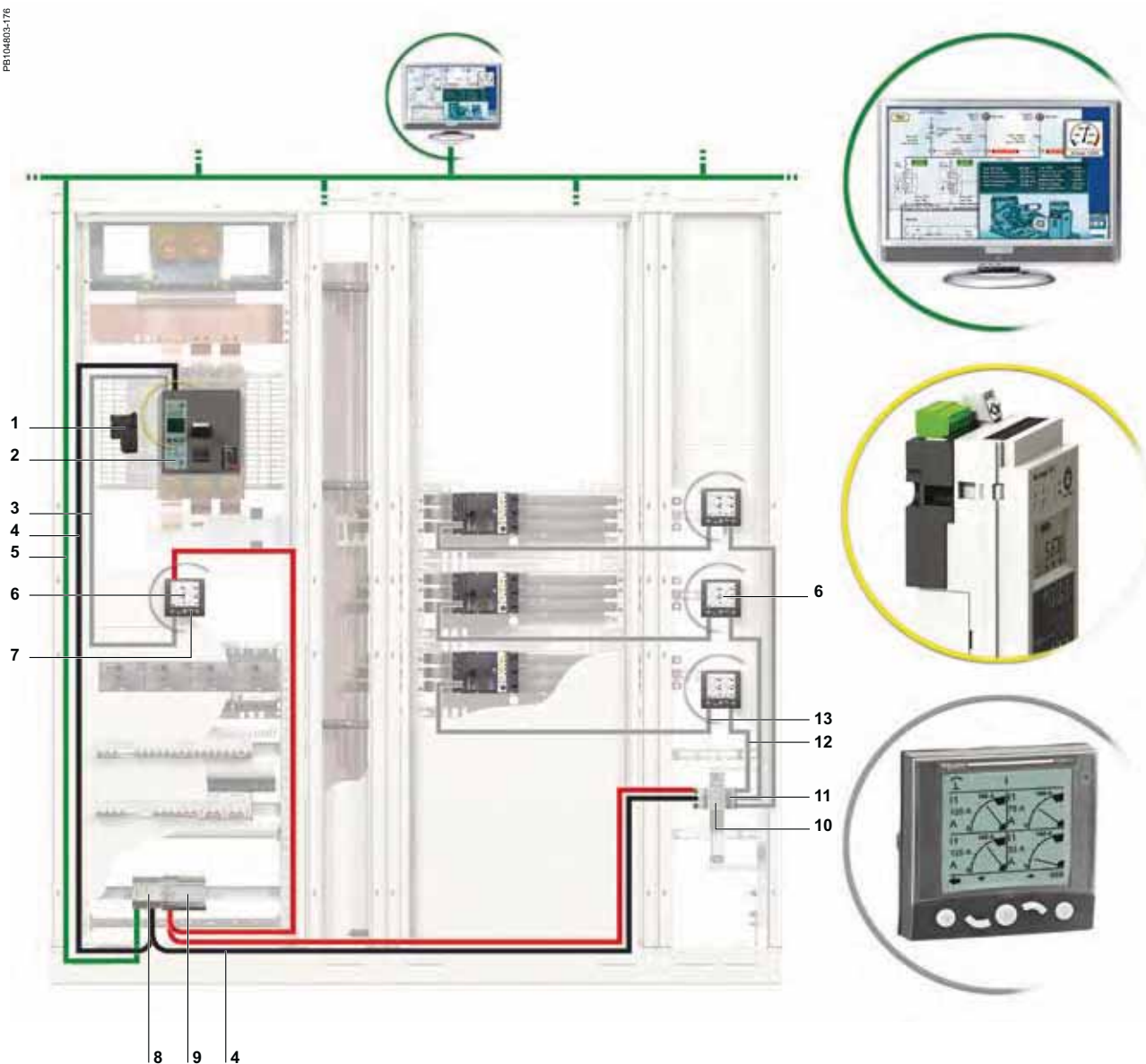


ION Enterprise Power Management Software

### Wiring system UPP

The wiring system is designed for low-voltage power switchboards. Installation requires no tools or special skills.

The prefabricated wiring ensures both data transmission (ModBus protocol) and 24 V DC power distribution for the communications modules on the Micrologic control units.



- |    |                                                     |                                                   |
|----|-----------------------------------------------------|---------------------------------------------------|
| 1  | BCM ULP: Breaker Communication Module with ULP port |                                                   |
| 2  | Micrologic control unit                             |                                                   |
| 3  | Breaker ULP cord                                    | 0.35 m LV434195<br>1.3 m LV434196<br>3 m LV434197 |
| 4  | Modbus cable                                        |                                                   |
| 5  | Ethernet cable                                      |                                                   |
| 6  | FDM121: Front Display Module                        | TRV00121                                          |
| 7  | ULP line terminators                                | TRV00880                                          |
| 8  | EGX100: Ethernet gateway                            |                                                   |
| 9  | External 24 V DC power supply module                |                                                   |
| 10 | Modbus interface                                    | TRV00210                                          |
| 11 | Stacking accessory                                  | TRV00217                                          |

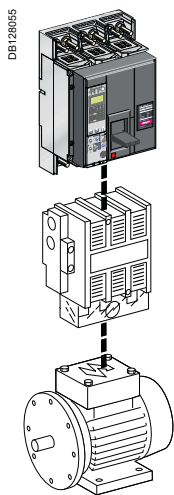
- |    |           |                                                                                                  |
|----|-----------|--------------------------------------------------------------------------------------------------|
| 12 | ULP cable | 0.3 m TRV00803<br>0.6 m TRV00806<br>1 m TRV00810<br>2 m TRV00820<br>3 m TRV00830<br>5 m TRV00850 |
|----|-----------|--------------------------------------------------------------------------------------------------|

- |    |          |                                                   |
|----|----------|---------------------------------------------------|
| 13 | NSX cord | 0.35 m LV434200<br>1.3 m LV434201<br>3 m LV434202 |
|----|----------|---------------------------------------------------|

The circuit breakers presented here provide protection against short circuits and are suitable for isolation as defined by standard IEC 60947-2.

For complete protection of the motor and its control device, overload protection may be provided by either the circuit breaker or a separate Schneider Electric thermal relay.

The control device may be of the direct on-line type (with or without reversing) or of the "star-delta" type. Combinations are governed by standard IEC 60947-4.1.



### Motor protection up to 750 kW

| Motor rating (kW) | 160...750      |
|-------------------|----------------|
| Compact           | NS630b to 1600 |



|                            |   |     |
|----------------------------|---|-----|
| Breaking capacity (kA rms) | N | 50  |
|                            | H | 70  |
|                            | L | 150 |

#### General circuit breaker characteristics

[page A-12](#)

Compact NS630b to 1600 circuit breakers equipped with Micrologic control units are the same as those for distribution systems.

#### Accompanying control units

[page A-20](#)

Micrologic electronic control units may be used on all Compact NS630b to 1600 circuit breakers.

Micrologic 2.0 A and 5.0 A electronic control units provide protection against short-circuits and overloads. Micrologic 7.0 A provides the same protection functions, plus earth-leakage protection.

### Protection coordination (as defined by IEC 60947-4)

Whatever the power of the motor, the coordination between the circuit breaker, contactor and relay can be of either type 1 or 2.

Selection depends on operational requirements concerning continuity of service and the technical skills of servicing personnel.

All type 2 have been tested under the conditions defined by standards and they are certified ASEFA/LOVAG.

### Selection of a trip unit or Micrologic control unit

| DB 12005 | P (kW) (400 V, 50 Hz)        | 0.37 | 1.1 | 5.5 | 18.5 | 37 |    |     |     |     | 110 | 160 | 250 |     | 560  | 750  |
|----------|------------------------------|------|-----|-----|------|----|----|-----|-----|-----|-----|-----|-----|-----|------|------|
|          | I <sub>r</sub> (A)           | 1.5  | 2.5 | 12  | 40   | 50 | 80 | 100 | 160 | 200 | 220 | 320 | 500 | 800 | 1000 | 1350 |
|          | Compact<br>NS630b ... NS1600 |      |     |     |      |    |    |     |     |     |     |     |     |     |      |      |
|          |                              |      |     |     |      |    |    |     |     |     |     |     |     |     |      |      |

Micrologic 2.0 A / 5.0 A / 6.0 A / 7.0 A

Micrologic 2.0 E / 5.0 E / 6.0 E

# Earth-leakage protection

## Overview of solutions

Earth-leakage protection is obtained by:

- installing a Micrologic 7.0 A control unit (Compact NS630b to 3200)
- using a Vigirex relay and separate sensors (all Compact circuit breakers).

### Circuit breakers equipped with a control unit offering integrated earth-leakage protection and an external rectangular sensor

| Rated current (A) | 630... 3200                                                                        |                                                                                     |
|-------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Compact           | NS630b to 1000 N/L<br>NS1250 and 1600 N                                            | NS1600b to 3200                                                                     |
|                   |  |  |

#### General circuit breaker characteristics

[page A-12](#)

Compact NS630b to 3200 circuit breakers are presented in the "Protection of distribution systems" section.

#### Accompanying control units

[page A-22](#)

Micrologic 7.0 A electronic control units offer earth-leakage protection as standard.

### Earth-leakage protection using a Vigirex relay

| Earth-leakage relay                                                                | Separate toroids                                                                    | Rectangular sensors                                                                  |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |  |

#### Compact circuit breaker + Vigirex relay combination

Vigirex relays may be used to add external earth-leakage protection to Compact NS circuit breakers. The circuit breakers must be equipped with an MN or MX voltage release. Vigirex relays are very useful when special time-delay or tripping-threshold values are required, or when there are major installation constraints (circuit breaker already installed and connected, limited space available, etc.).

#### Vigirex-relay characteristics:

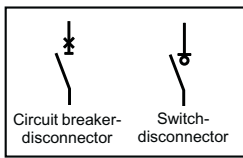
- rectangular sensors up to 3200 A
- 400 Hz distribution systems.

#### Options:

- trip alarm by a fail-safe contact
- pre-alarm LED and contact, etc.

#### Compliance with standards:

- IEC 60947-2, appendix M
- IEC/EN 60755: general requirements for residual current operated protective devices
- IEC/EN 6100-4-2 to 4-6: immunity tests
- CISPR11: radio-frequency radiated and conducted emission tests
- UL1053 and CSA22.2 No. 144 for RH10, RH21 and RH99 relays at supply voltages up to and including 220/240 V.

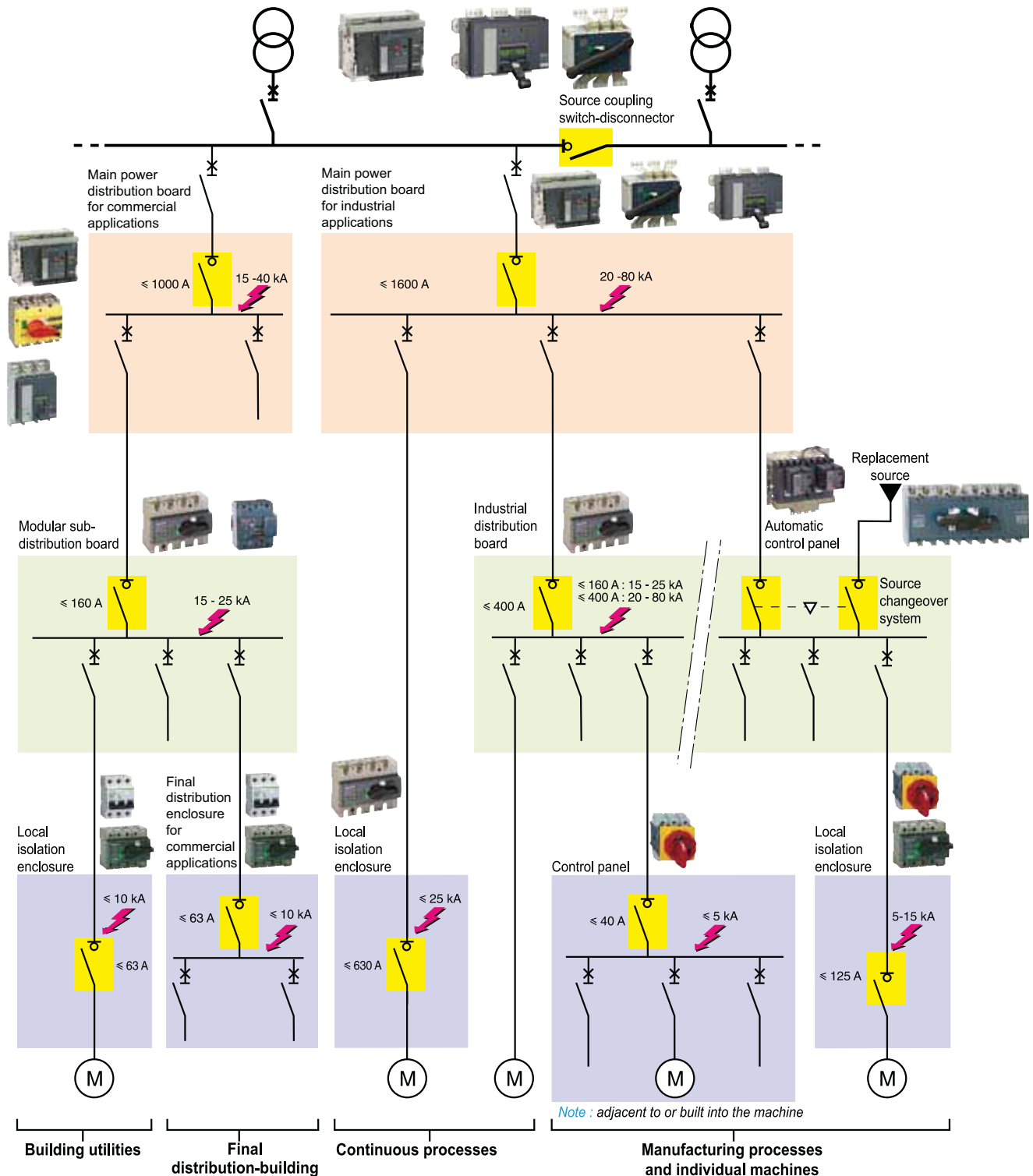


Standardised symbols

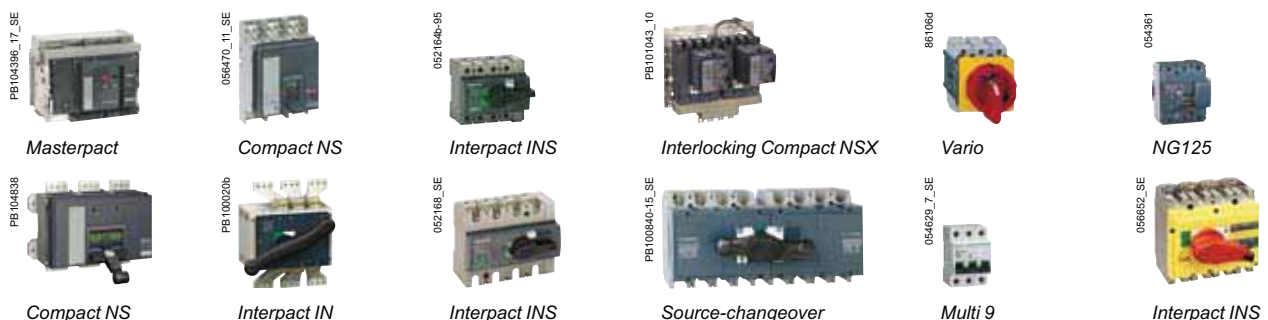
# Control and isolation

## Overview of solutions

D9401468



### Switch-disconnectors



Compact switch-disconnectors are used to control and isolate electrical distribution circuits. In addition to these basic functions, other functions for safety, remote control and convenience include:

- earth-leakage protection
- auxiliary MN/MX releases
- remote operation.

Compact switch-disconnectors may be interlocked with another Compact switch-disconnector or circuit breaker to constitute a source-changeover system.

PB104837



*Compact NS1600 switch-disconnector.*





# Control and disconnection

## Compact NS630bNA to NS1600NA switch-disconnectors

Installation standards require upstream protection.

PE104837



Compact NS800NA.

### Compact switch-disconnectors

|                                                                       |                           |                 |                                          |          |
|-----------------------------------------------------------------------|---------------------------|-----------------|------------------------------------------|----------|
| Number of poles                                                       |                           |                 |                                          |          |
| Control                                                               | manual                    |                 | toggle                                   |          |
|                                                                       | electric                  |                 | direct or extended rotary handle         |          |
| Connections                                                           | fixed                     |                 | front connection                         |          |
|                                                                       |                           |                 | rear connection                          |          |
|                                                                       | withdrawable (on chassis) |                 | front connection                         |          |
|                                                                       |                           | rear connection |                                          |          |
| Electrical characteristics as per IEC 60947-3 and EN 60947-3          |                           |                 |                                          |          |
| Conventional thermal current (A)                                      | I <sub>th</sub>           |                 | 60 °C                                    |          |
| Rated insulation voltage (V)                                          | U <sub>i</sub>            |                 |                                          |          |
| Rated impulse withstand voltage (kV)                                  | U <sub>imp</sub>          |                 |                                          |          |
| Rated operational voltage (V)                                         | U <sub>e</sub>            |                 | AC 50/60 Hz                              |          |
| Rated operational current                                             | I <sub>e</sub>            |                 | AC 50/60 Hz                              |          |
|                                                                       |                           |                 | 220/240 V                                |          |
|                                                                       |                           |                 | 380/415 V                                |          |
|                                                                       |                           |                 | 440/480 V (1)                            |          |
|                                                                       |                           |                 | 500/525 V                                |          |
|                                                                       |                           |                 | 660/690 V                                |          |
| Short-circuit making capacity                                         | I <sub>cm</sub>           |                 | (kA peak)                                |          |
| Short-time withstand current                                          | I <sub>cw</sub>           |                 | (A rms)                                  |          |
|                                                                       |                           |                 | 0.5 s                                    |          |
|                                                                       |                           |                 | 20 s                                     |          |
| Suitability for isolation                                             |                           |                 |                                          |          |
| Durability (C-O cycles)                                               | mechanical                |                 |                                          |          |
|                                                                       | electrical                | AC              | 440 V                                    | AC23A/In |
| Positive contact indication                                           |                           |                 |                                          |          |
| Pollution degree                                                      |                           |                 |                                          |          |
| Protection                                                            |                           |                 |                                          |          |
| Add-on earth-leakage protection                                       |                           |                 | combination with Vigirex relay           |          |
| Additional indication and control auxiliaries                         |                           |                 |                                          |          |
| Indication contacts                                                   |                           |                 |                                          |          |
| Voltage releases                                                      |                           |                 | MX shunt release                         |          |
|                                                                       |                           |                 | MN undervoltage release                  |          |
| Remote communication by bus                                           |                           |                 |                                          |          |
| Device status indications (communicating auxiliary contacts)          |                           |                 |                                          |          |
| Device remote operation (communicating motor mechanism)               |                           |                 |                                          |          |
| Installation                                                          |                           |                 |                                          |          |
| Accessories                                                           |                           |                 | terminal extensions and spreaders        |          |
|                                                                       |                           |                 | terminal shields and interphase barriers |          |
|                                                                       |                           |                 | escutcheons                              |          |
| Dimensions (mm)                                                       | fixed                     |                 | 3P                                       |          |
| W x H x D                                                             |                           |                 | 4P                                       |          |
| Weight (kg)                                                           | fixed                     |                 | 3P                                       |          |
|                                                                       |                           |                 | 4P                                       |          |
| Source-changeover system (see section "on source-changeover systems") |                           |                 |                                          |          |
| Manual source-changeover systems, remote-operated and automatic       |                           |                 |                                          |          |

<sup>(1)</sup> Suitable for 480 V NEMA.



# Control and disconnection

## Compact NS1600bNA to 3200NA switch-disconnectors

Installation standards require upstream protection. However, Compact NS1600b to 3200NA switch-disconnectors are self-protected for all currents higher than 130 kA peak.



Compact NS2000NA.

### Compact switch-disconnectors

|                                                                       |                                |                 |                                  |          |
|-----------------------------------------------------------------------|--------------------------------|-----------------|----------------------------------|----------|
| Number of poles                                                       |                                |                 |                                  |          |
| Control                                                               | manual                         |                 | toggle                           |          |
|                                                                       | electric                       |                 | direct or extended rotary handle |          |
| Connections                                                           | fixed                          |                 | front connection                 |          |
|                                                                       |                                |                 | rear connection                  |          |
|                                                                       | withdrawable (on chassis)      |                 | front connection                 |          |
|                                                                       |                                | rear connection |                                  |          |
| Electrical characteristics as per IEC 60947-3 and EN 60947-3          |                                |                 |                                  |          |
| Conventional thermal current (A)                                      | I <sub>th</sub>                |                 | 60 °C                            |          |
| Rated insulation voltage (V)                                          | U <sub>i</sub>                 |                 |                                  |          |
| Rated impulse withstand voltage (kV)                                  | U <sub>imp</sub>               |                 |                                  |          |
| Rated operational voltage (V)                                         | U <sub>e</sub>                 |                 | AC 50/60 Hz                      |          |
| Rated operational current                                             | I <sub>e</sub>                 |                 | AC 50/60 Hz                      |          |
|                                                                       |                                |                 | 220/240 V                        |          |
|                                                                       |                                |                 | 380/415 V                        |          |
|                                                                       |                                |                 | 440/480 V <sup>(1)</sup>         |          |
|                                                                       |                                |                 | 500/525 V                        |          |
|                                                                       |                                |                 | 660/690 V                        |          |
| Short-circuit making capacity                                         | I <sub>cm</sub>                |                 | (kA peak)                        |          |
| Short-time withstand current                                          | I <sub>cw</sub>                |                 | (A rms) 3 s                      |          |
| Integrated instantaneous protection (kA peak ±10 %)                   |                                |                 |                                  |          |
| Suitability for isolation                                             |                                |                 |                                  |          |
| Durability (C-O cycles)                                               | mechanical                     |                 |                                  |          |
|                                                                       | electrical                     | AC              | 440 V                            | AC23A/In |
| Positive contact indication                                           |                                |                 |                                  |          |
| Pollution degree                                                      |                                |                 |                                  |          |
| Protection                                                            |                                |                 |                                  |          |
| Add-on earth-leakage protection                                       | combination with Vigirex relay |                 |                                  |          |
| Additional indication and control auxiliaries                         |                                |                 |                                  |          |
| Indication contacts                                                   |                                |                 |                                  |          |
| Voltage releases                                                      | MX shunt release               |                 |                                  |          |
|                                                                       | MN undervoltage release        |                 |                                  |          |
| Installation                                                          |                                |                 |                                  |          |
| Accessories                                                           | escutcheons                    |                 |                                  |          |
| Dimensions (mm)                                                       | fixed                          |                 | 3P                               |          |
| W x H x D                                                             |                                |                 | 4P                               |          |
| Weight (kg)                                                           | fixed                          |                 | 3P                               |          |
|                                                                       |                                |                 | 4P                               |          |
| Source-changeover system (see section "on source-changeover systems") |                                |                 |                                  |          |
| Manual source-changeover systems, remote-operated and automatic       |                                |                 |                                  |          |

<sup>(1)</sup> Suitable for 480 V NEMA.

|  | NS1600bNA       | NS2000NA     | NS2500NA     | NS3200NA     |
|--|-----------------|--------------|--------------|--------------|
|  | 3, 4            | 3, 4         | 3, 4         | 3, 4         |
|  | ■               | ■            | ■            | ■            |
|  | -               | -            | -            | -            |
|  | -               | -            | -            | -            |
|  | ■               | ■            | ■            | ■            |
|  | -               | -            | -            | -            |
|  | -               | -            | -            | -            |
|  | -               | -            | -            | -            |
|  | 1600            | 2000         | 2500         | 3200         |
|  | 800             | 800          | 800          | 800          |
|  | 8               | 8            | 8            | 8            |
|  | 690             | 690          | 690          | 690          |
|  | <b>AC23A</b>    | <b>AC23A</b> | <b>AC23A</b> | <b>AC23A</b> |
|  | 1600            | 2000         | 2500         | 3200         |
|  | 1600            | 2000         | 2500         | 3200         |
|  | 1600            | 2000         | 2500         | 3200         |
|  | 1600            | 2000         | 2500         | 3200         |
|  | 1600            | 2000         | 2500         | 3200         |
|  | 135             | 135          | 135          | 135          |
|  | 32              | 32           | 32           | 32           |
|  | 130             | 130          | 130          | 130          |
|  | ■               | ■            | ■            | ■            |
|  | 6000            | 6000         | 6000         | 6000         |
|  | 1000            | 1000         | 1000         | 1000         |
|  | b               | b            | b            | b            |
|  | 3               | 3            | 3            | 3            |
|  | ■               |              |              |              |
|  | ■               |              |              |              |
|  | ■               |              |              |              |
|  | ■               |              |              |              |
|  | ■               |              |              |              |
|  | 350 x 420 x 160 |              |              |              |
|  | 350 x 535 x 160 |              |              |              |
|  | 23              |              |              |              |
|  | 36              |              |              |              |
|  | -               |              |              |              |

PB100843



### Manual source-changeover system

This is the most simple type. It is controlled manually by an operator and consequently the time required to switch from the normal to the replacement source can vary.

A manual source-changeover system is made up of two or three mechanically interlocked manually-operated circuit breakers or switch-disconnectors.

### Remote-operated source-changeover system

This is the most commonly employed system for devices with high ratings (above 400 A). No human intervention is required. Transfer from the normal to the replacement source is controlled electrically.

A remote-controlled source-changeover system is made up of two or three circuit breakers or switch-disconnectors linked by an electrical interlocking system that may have different configurations. In addition, a mechanical interlocking system protects against electrical malfunctions or incorrect manual operations.

### Automatic source-changeover systems

An automatic controller may be added to a remote-operated source-changeover system for automatic source control according to programmable operating modes. This solution ensures optimum energy management:

- transfer to a replacement source according to external requirements
- management of power sources
- regulation
- emergency source replacement, etc.

The automatic controller may be fitted with an option for communication with a supervisor.

### Communication option

The communication option must not be used to control the opening or closing of source-changeover system circuit breakers. It should be used only to transmit measurement data or circuit breaker status.

The eco COM option is perfectly suited to these equipments.

PB100844



*Commercial and service sector:*  
operating rooms in hospitals

- safety systems for tall buildings
- computer rooms (banks, insurance companies, etc.)
- lighting systems in shopping centres...

PB100845



*Industry:*

- assembly lines
- engine rooms on ships
- critical auxiliaries in thermal power stations...

PB100846



PB100847

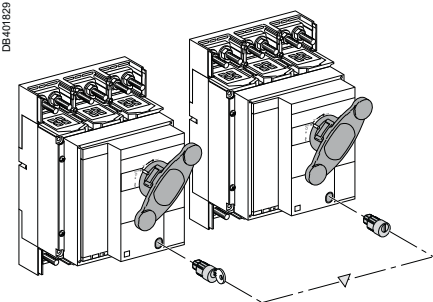


*Infrastructures:*

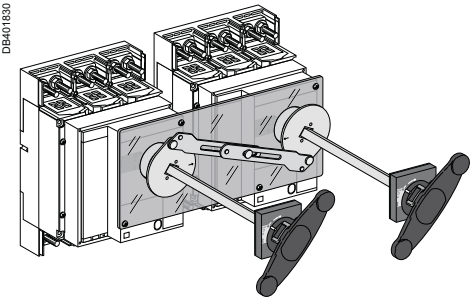
- port and railway installations
- runway lighting systems
- control systems on military sites...

# Mechanical interlocking

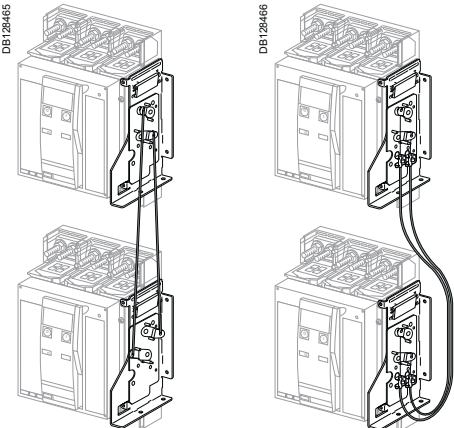
A manual source-changeover system can be installed on two to three manually-operated circuit breakers or switch-disconnectors. Interlocking is mechanical. Interlocks prevent connection to both sources at the same time, even momentarily.



Interlocking with keylocks.



Interlocking of two devices with rotary handles.



Interlocking with connecting rods

Interlocking with cables

## Interlocking of two devices with rotary handles

The rotary handles are padlocked with the devices in the OFF position. The mechanism inhibits the two devices being closed at the same time, but does allow for both to be open (OFF) at the same time.

### Combinations of Normal and Replacement devices

All Compact NS630b to 1600 circuit breakers and switch-disconnectors with rotary handles can be interlocked.

Interlocking of a Compact NS630b with a Compact NS630b to 1600 is not possible.

## Interlocking of a number of devices using keylocks (captive keys)

Interlocking uses two identical keylocks with a single key. This solution enables interlocking between two devices that are physically distant or that have significantly different characteristics, for example between a low and a medium-voltage device, or between Compact NS circuit breakers and switch-disconnectors.

A system of wall-mounted units with captive keys makes possible a large number of combinations between many devices.

### Combinations of Normal and Replacement devices

All Compact NS630b to 1600 circuit breakers and switch-disconnectors with rotary handles or motor mechanisms can be interlocked.

## Interlocking of two Compact NS630b to 1600 devices using connecting rods

The two devices must be mounted one above the other (either 2 fixed or 2 withdrawable/drawout devices).

### Installation

This function requires:

- an adaptation fixture on the right side of each circuit breaker or switch-disconnector
- a set of connecting rods with no-slip adjustments.

The adaptation fixtures, connecting rods and circuit breakers or switch-disconnectors are supplied separately, ready for assembly by the customer. The maximum vertical distance between the fixing planes is 900 mm.

### Possible combinations of “Normal” and “Replacement” source circuit breakers

Combinations are possible between Compact NS630b to NS1600 devices and between Masterpact NT and Masterpact NW devices.

## Interlocking of two Compact NS630b to 1600 devices using cables

For cable interlocking, the circuit breakers may be mounted one above the other or side-by-side.

The interlocked devices may be fixed or drawout, three-pole or four-pole, and have different ratings and sizes.

### Installation

This function requires:

- an adaptation fixture on the right side of each device
- a set of cables with no-slip adjustments.

The maximum distance between the fixing planes (vertical or horizontal) is 2000 mm.

#### Possible combinations of “Normal” and “Replacement” source circuit breakers

| “Normal N”              | “Replacement” R  |              |              |               |
|-------------------------|------------------|--------------|--------------|---------------|
|                         | NS630b to NS1600 | NT06 to NT16 | NW08 to NW40 | NW40b to NW63 |
| <b>NS630b to NS1600</b> |                  |              |              |               |
| Ratings 250... 1600 A   | ■                | -            | -            | -             |

It is not possible to combine Compact NS630b to 1600 and Masterpact (NT or NW) devices.

Electrical interlocking is used with a mechanical interlocking system.  
An automatic controller may be added to take into account information from the distribution system.

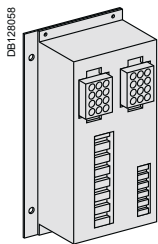
Moreover, the relays controlling the “normal” and “replacement” circuit breakers must be mechanically and/or electrically interlocked to prevent them from giving simultaneous closing commands.

Electrical interlocking is carried out by an electrical control device.  
For Compact NS630b to 1600, this function can be implemented in one of two ways:

- using the IVE unit
- by an electrician in accordance with the chapter “Electrical Diagrams” of the catalogue source-changeover system.

Characteristics of the IVE unit

- external connection terminal block:
  - inputs: circuit breaker control signals
  - outputs: status of the SDE contacts on the “Normal” and “Replacement” source circuit breakers
  - 2 connectors for the two “Normal” and “Replacement” source circuit breakers:
  - inputs:
    - status of the OF contacts on each circuit breaker (ON or OFF)
    - status of the SDE contacts on the “Normal” and “Replacement” source circuit breakers
  - outputs: power supply for operating mechanisms
  - control voltage:
  - 24 to 250 V DC
  - 48 to 415 V 50/60 Hz - 440 V 60 Hz.
- The IVE unit control voltage must be same as that of the circuit breaker operating mechanisms.



IVE unit.

Necessary equipment

For Compact NS630b to 1600, each circuit breaker must be equipped with:

- a motor mechanism
- an available OF contact
- a CE connected-position contact (carriage switch) on withdrawable circuit breakers
- an SDE contact.

Standard configuration for Compact NS

| Types of mechanical interlocking                                                    |    | Possible combinations                            | Typical electrical diagrams                         | Diagram no. |
|-------------------------------------------------------------------------------------|----|--------------------------------------------------|-----------------------------------------------------|-------------|
| 2 devices                                                                           |    |                                                  |                                                     |             |
|  | QN | QR                                               | <b>Compact NS630b to 1600:</b>                      |             |
|                                                                                     | 0  | 0                                                | ■ electrical interlocking with lockout after fault: |             |
|                                                                                     | 1  | 0                                                | □ permanent replacement source (without IVE)        | 51201180    |
|                                                                                     | 0  | 1                                                | □ with EPO by MX (without IVE)                      | 51201181    |
|                                                                                     |    |                                                  | □ with EPO by MN (without IVE)                      | 51201182    |
|                                                                                     |    | □ permanent replacement source (with IVE)        | 51201183                                            |             |
|                                                                                     |    | □ with EPO by MX (with IVE)                      | 51201184                                            |             |
|                                                                                     |    | □ with EPO by MN (with IVE)                      | 51201185                                            |             |
|                                                                                     |    | ■ automatic control without lockout after fault: |                                                     |             |
|                                                                                     |    | □ permanent replacement source (without IVE)     | 51201186                                            |             |



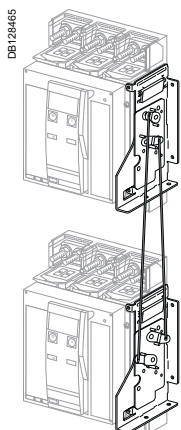
# Remote-operated systems



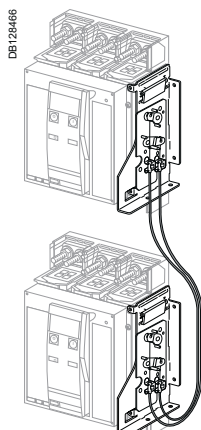
Control plate.



Controller.



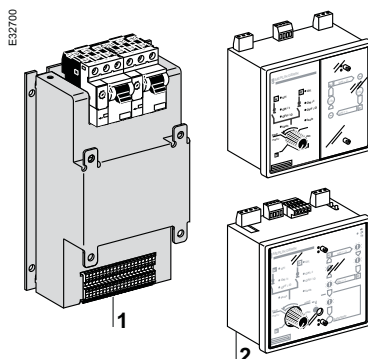
Interlocking by rods.



Interlocking by cables.

## Source-changeover system with a controller

In this case, changeovers between the Normal and Replacement sources under predefined conditions are initiated by a Schneider Electric controller.



Switching between sources can be automated by adding:

- 1 ACP control plate
- 2 BA or UA controller, or an electrical system provided by the installer for NS630b to 1600. Electrical system example: part no. 51156904 and 51156904 in the source-changeover system catalogue.

## Source-changeover systems

### Associated controllers

By combining a remote-operated source-changeover system with an integrated BA or UA automatic controller, it is possible to automatically control source transfer according to user-selected sequences. These controllers can be used on source-changeover systems comprising 2 circuit breakers. For source-changeover systems comprising 3 circuit breakers, the automatic control diagram must be prepared by the installer as a complement to the diagrams provided in the “electrical diagrams” section of this catalogue.



BA controller.



UA controller

[illegible]

(1) For example, 220 V single-phase or 220 V three-phase.

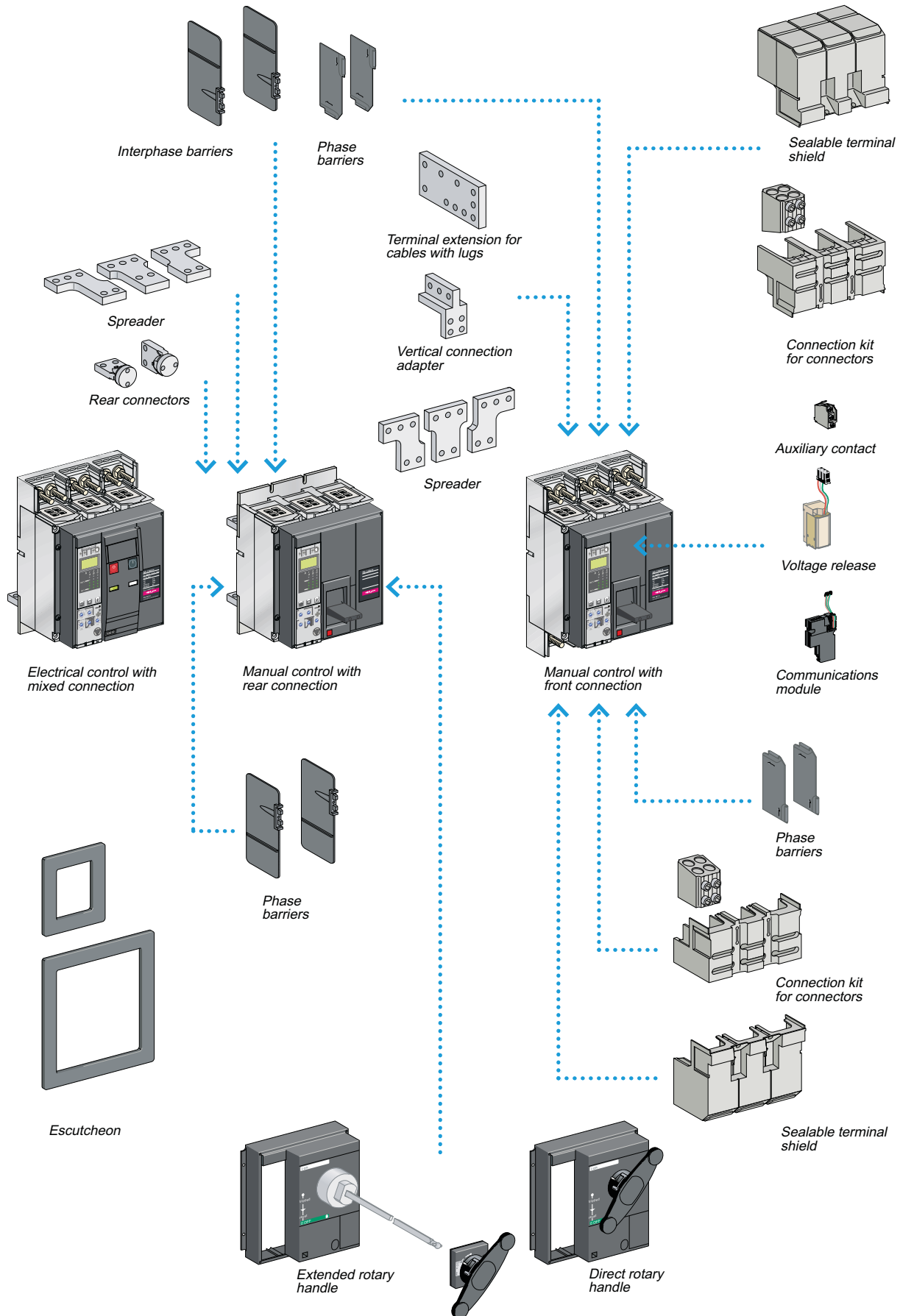
(7) The controller is powered by the ACP control plate. The same voltage must be used for the ACP plate, the IVE unit and the operating mechanisms. If this voltage is the same as the source voltage, then the "Normal" and "Replacement" sources can be used directly for the power supply. If not, an isolation transformer must be used.



# Electrical and mechanical accessories

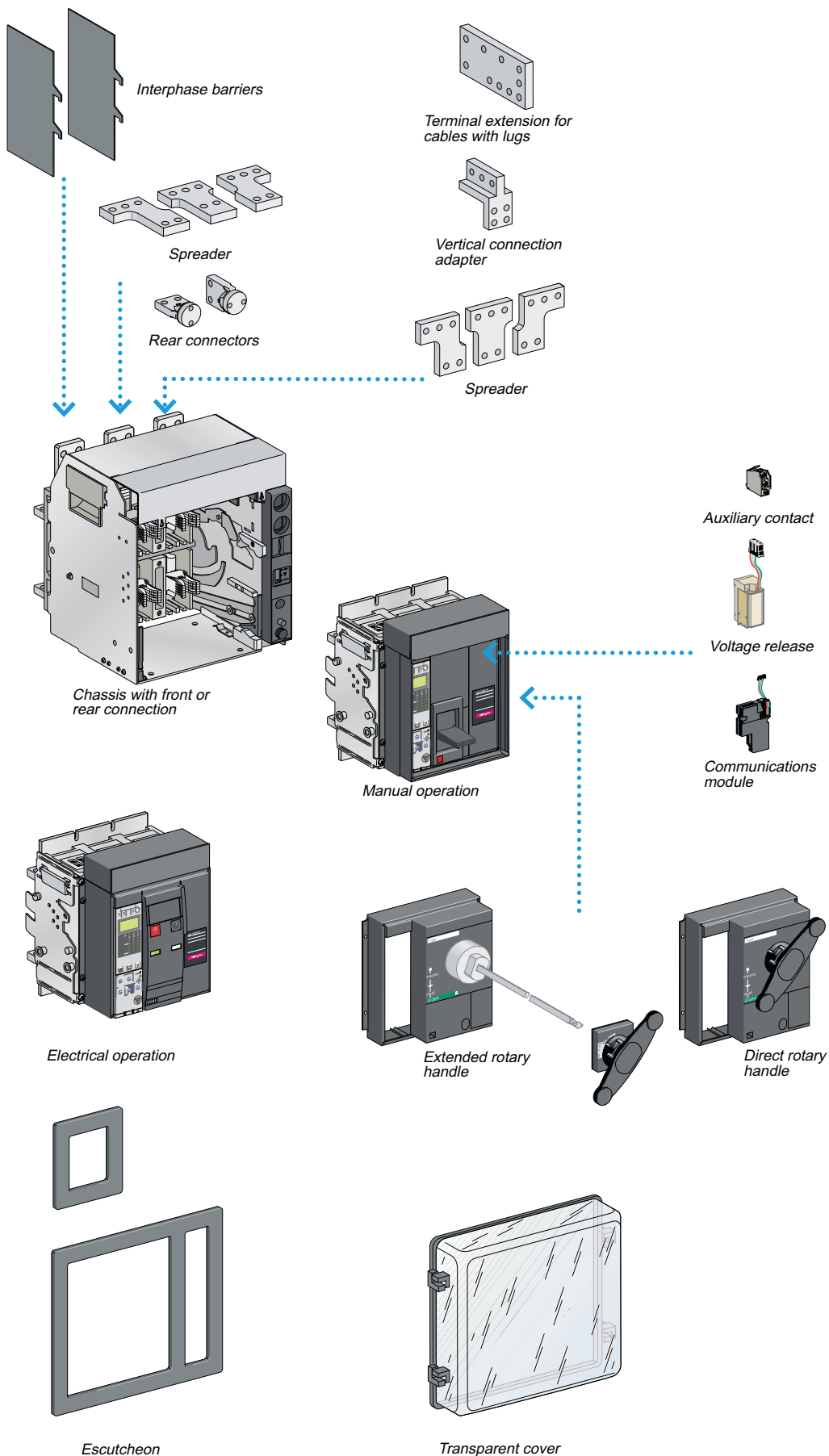
Compact NS630b to 1600  
(fixed version)

DB128062



# Compact NS630b to 1600 (withdrawable version)

DB128035

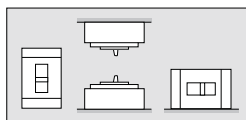


PE103391\_39\_SE



Fixed Compact NS800.

DB128034

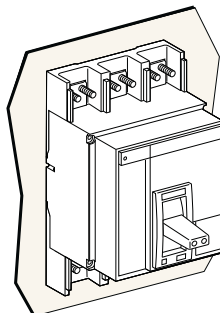


### Installation

#### Fixed configuration

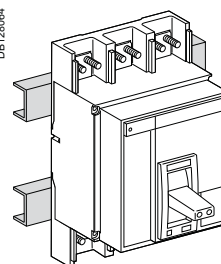
Compact NS630b to 1600 circuit breakers may be installed vertically, horizontally or flat on their back.

DB128063



Mounting on a backplate.

DB128064



Mounting on rails.

#### Withdrawable configuration

Compact NS630b to 1600 circuit breakers should be installed vertically only.

The withdrawable configuration makes it possible to:

- extract and/or rapidly replace the circuit breaker without having to touch connections;
- allow for the addition of future circuits at a later date.

059782N\_L50\_SE\_ME

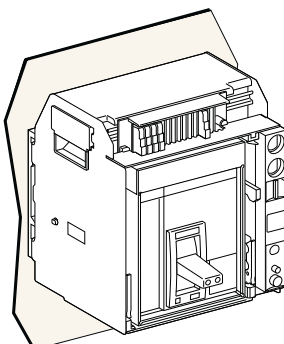


Withdrawable Compact NS800H.

DB128069

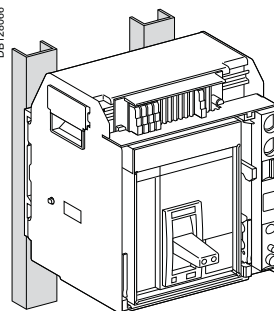


DB128065



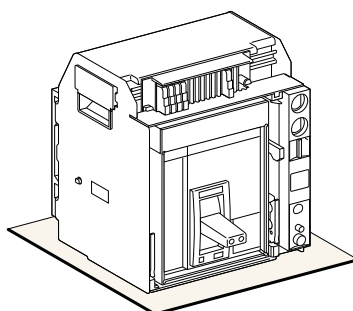
Mounting on a backplate.

DB128066



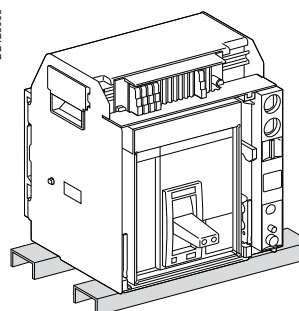
Rear mounting on rails.

DB128067



Device on mounting plate.

DB128068



Device on rails.

The device may be in one of four positions on the chassis:

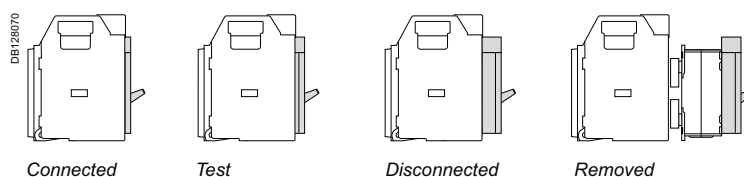
■ **connected position.** The power circuits and auxiliary contacts are all connected

■ **test position.** The power circuits are disconnected.

The auxiliary contacts are still connected and the device can be operated electrically

■ **disconnected position.** The power circuits and auxiliary contacts are all disconnected, however the device is still mounted on the chassis. It can be operated manually (ON, OFF, "push to trip").

■ **removed position.** All circuits are disconnected. The device simply rests on the chassis rails and can be removed.



The multifunctional chassis for Compact NS630b to 1600 devices is particularly suited for incoming circuit breakers. Features include:

■ device connection and disconnection through a door, using a crank that can be stored in the chassis

■ three positions (connected, test and disconnected) that are indicated:

□ locally by a position indicator

□ remotely by carriage switches (3 for the connected position, 2 for the disconnected position and 1 for the test position)

■ circuit breaker ON/OFF commands through a switchboard front panel.

### Locking

There are extensive locking possibilities:

■ chassis locking in connected, disconnected and test positions using three padlocks and two keylocks, on the switchboard front panel

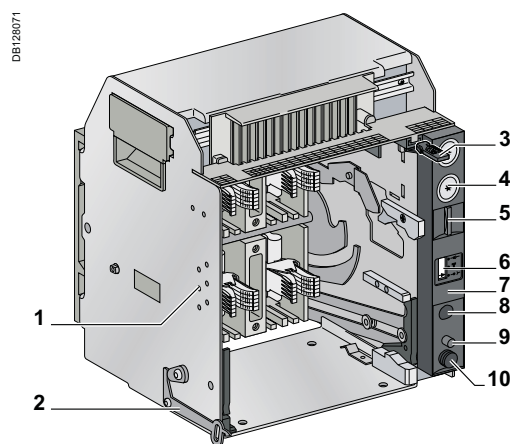
■ door interlock (inhibits door opening with breaker in connected position)

■ racking interlock (inhibits racking with door open)

■ locking in each of the connected, disconnected and test positions during device connection or disconnection. Continuation to the next position requires pressing a release button to free the crank.

### Other safety function

Mismatch protection ensures that a circuit breaker is installed only in a chassis with compatible characteristics.



1 mismatch protection

2 door interlock

3 racking interlock

4 keylock locking

5 padlock locking

6 position indicator

7 chassis front plate (accessible with cubicle door closed)

8 crank entry

9 reset button

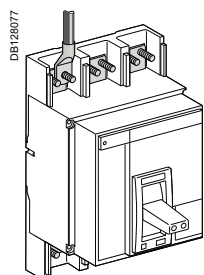
10 crank storage



### Types of connection

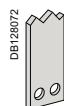
#### Fixed device

##### Front connections (N, L)



##### Connection by:

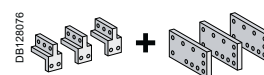
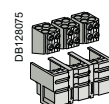
bars



bare cables (except L)

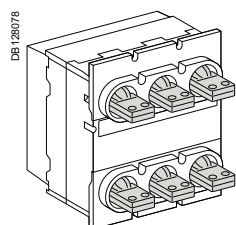


cables with lugs

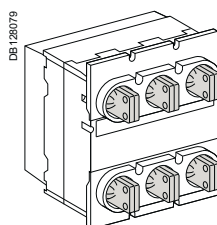


##### Rear connections (N, L, LB)

Horizontal:

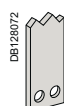


Vertical:

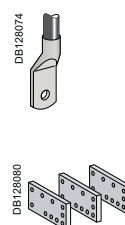


##### Connection by:

bars

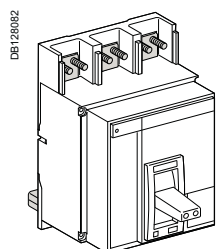
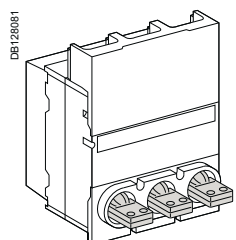


cables with lugs



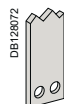
Simply turn a horizontal rear connector 90° to make it a vertical connector.

##### Combination of front and rear connections (N, L)



##### Connection by:

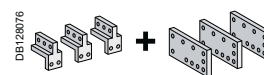
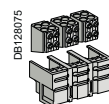
bars



bare cables (except L)

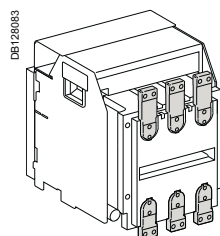


cables with lugs



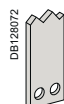
#### Withdrawable device

##### Front connections

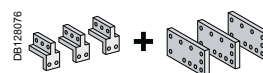


##### Connection by:

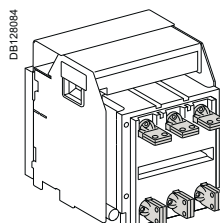
bars



cables with lugs

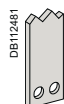


##### Rear connections

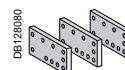


##### Connection by:

bars

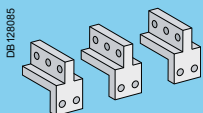
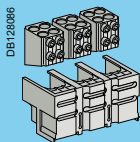
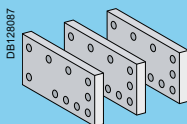
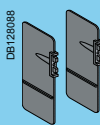
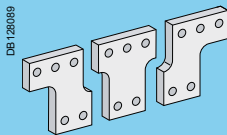
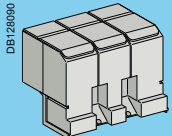
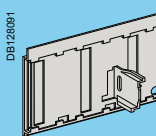


cables with lugs



To ensure performance and isolation, depending on the type of circuit breaker (N, L, LB) and type of connection, certain isolation accessories are mandatory.

## Connections accessories

| Type of accessories                                                                                                                                                | For Compact NS630b to NS1600 |                 |                                   |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|-----------------------------------|------------------------|
|                                                                                                                                                                    | Fixed:<br>Front connection   | Rear connection | Withdrawable:<br>Front connection | Rear connection        |
| <b>Vertical-connection adapters</b><br>                                           | N, L                         | -               | N, L, LB                          | -                      |
| <b>Set of bare-cable connectors and terminal shields for ratings ≤ 1250 A</b><br> | N                            | -               | -                                 | -                      |
| <b>Cable lug adapters</b><br>                                                    | N, L                         | N, L, LB        | N, L, LB                          | N, L, LB               |
| <b>Interphase barriers</b><br>                                                  | N, L, LB                     | N, L, LB        | -                                 | N, L, LB               |
| <b>Spreaders</b><br>                                                            | N, L                         | N, L, LB        | N, L, LB                          | N, L, LB               |
| <b>Connection shield</b><br>                                                    | N, L                         | -               | -                                 | -                      |
| <b>Safety shutters with locking by padlocks (IP20)</b><br>                      | -                            | -               | N, L, LB<br>(standard)            | N, L, LB<br>(standard) |
| <b>Arc chute screen</b><br>                                                     | N, L                         | -               | -                                 | -                      |

(1) Mandatory for voltages  $\leq 500$  V unless using the bare-cable connector + terminal shield kit.

(2) Mandatory for fixed devices with L and LB performance levels, whatever the voltage.

# Electrical and mechanical accessories

Compact NS630b to 1 600 (cont.)

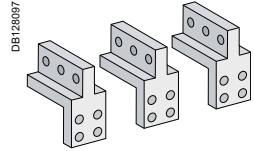
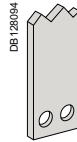
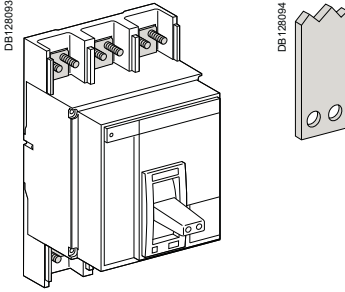
## Front connection of fixed devices

### Bars

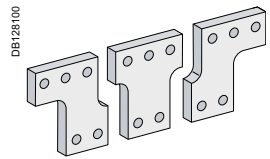
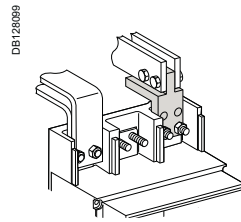
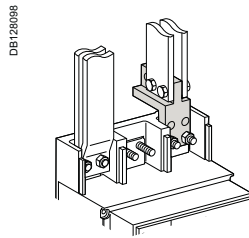
Fixed, front-connection Compact NS630b to 1600 devices are equipped with terminals comprising captive screws for direct connection of bars.

Other connection possibilities for bars include vertical-connection adapters for edgewise bars and spreaders to increase the pole pitch to 95 mm.

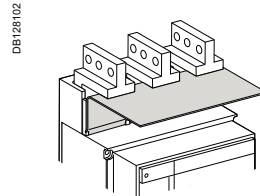
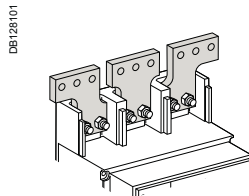
If the vertical connection adapters are front oriented, then it is mandatory to install the arc chute screen in order to comply with the safety clearances.



Vertical-connection adapters.

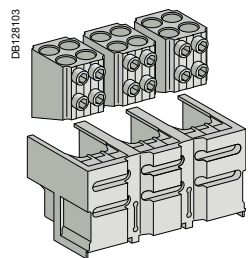
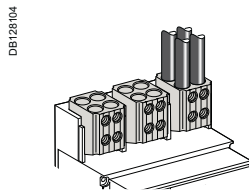


Spreaders.

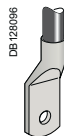


### Bare cables

Special sets of connectors and terminal shields may be used to connect up to four 240 mm<sup>2</sup> copper or aluminium cables for each phase. Bare cable connection is possible for ratings up to and including 1250 A.



4-cable connectors.



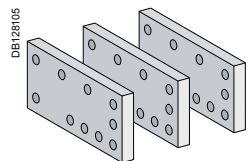
### Cables with lugs

Cable lug adapters are combined with the vertical-connection adapters.

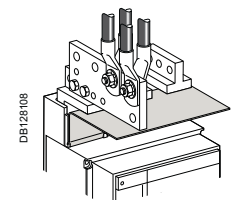
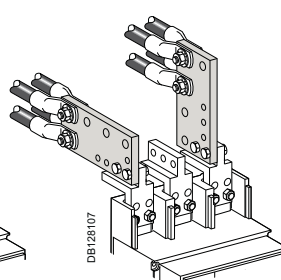
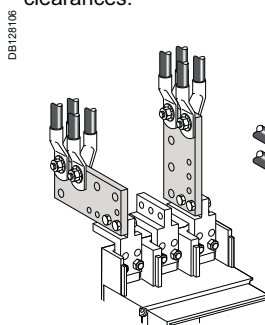
One to four cables with crimped lugs (y 300 mm<sup>2</sup>) may be connected.

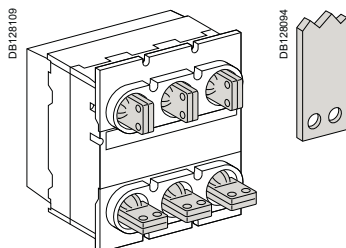
To ensure stability, spacers must be positioned between the terminal extensions.

If the cable lug adapters are installed over the top of the arc chute chambers, then it is mandatory to install the arc chute screen in order to comply with the safety clearances.



Cable lug adapters.

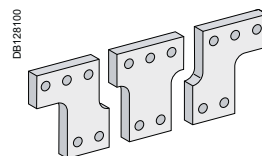




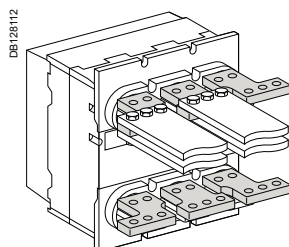
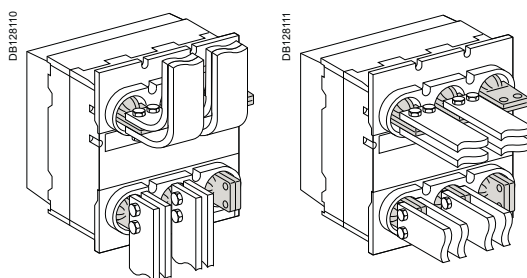
## Rear connection of fixed devices

### Bars

Fixed, rear-connection Compact NS630b to 1600 devices equipped with horizontal or vertical connectors may be directly connected to flat or edgewise bars, depending on the position of the connectors. Spreaders are available to increase the pole pitch to 95 mm.

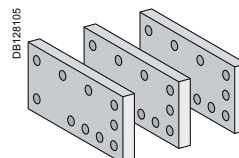


Spreaders.

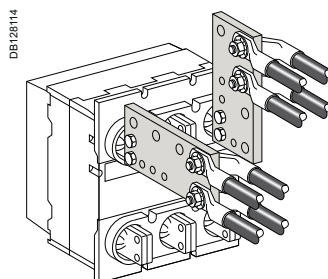
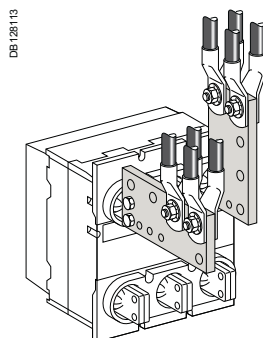


### Cables with lugs

Cable lug adapters enable connection of one to four cables with crimped lugs ( $\geq 300 \text{ mm}^2$ ). To ensure stability, spacers must be positioned between the terminal extensions.



Cable lug adapters.



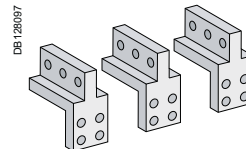
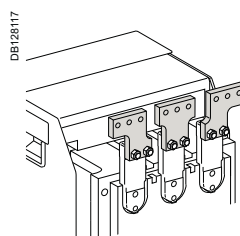
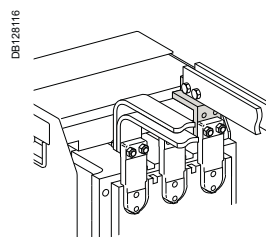
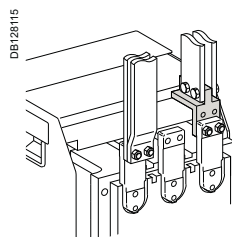
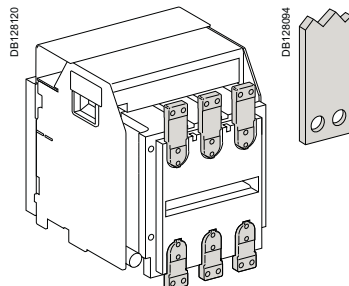
# Electrical and mechanical accessories

Compact NS630b to 1 600 (cont.)

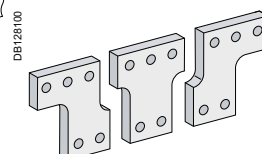
## Front connection of withdrawable devices

### Bars

Withdrawable, front-connection Compact NS630b to 1600 devices are suitable for direct connection of bars. Other connection possibilities for bars include vertical-connection adapters for edgewise bars and spreaders to increase the pole pitch to 95 mm.



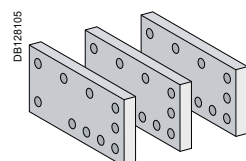
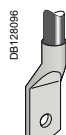
Vertical-connection adapters.



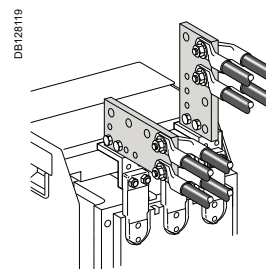
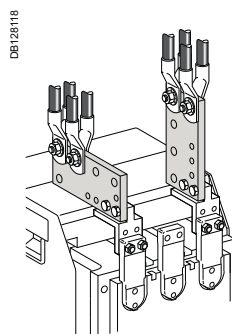
Spreaders.

### Cables with lugs

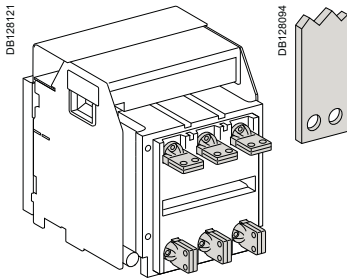
Cable lug adapters enable connection of one to four cables with crimped lugs ( $\gamma$  300 mm<sup>2</sup>). To ensure stability, spacers must be positioned between the terminal extensions.



Cable lug adapters.

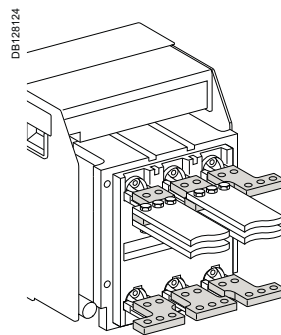
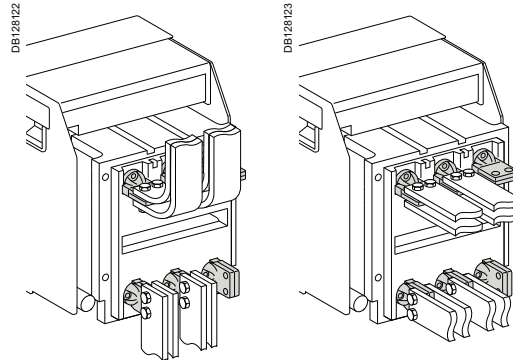
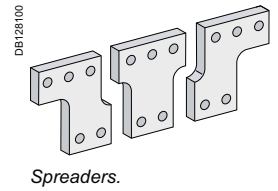


## Rear connection of withdrawable devices



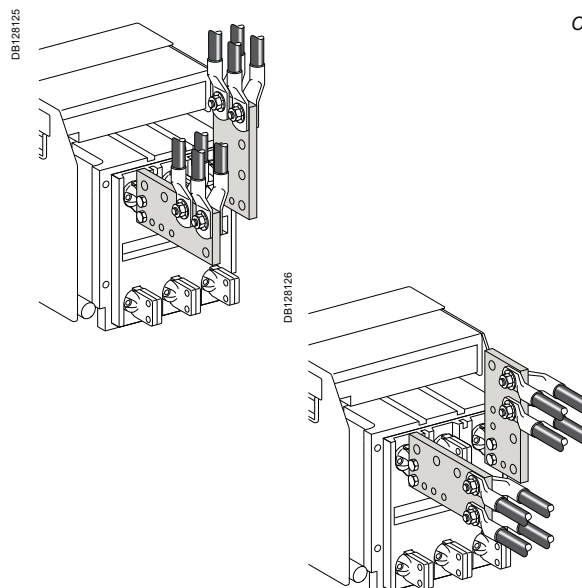
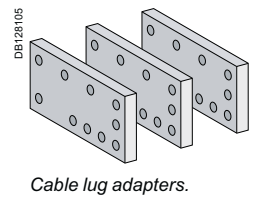
### Bars

Withdrawable, rear-connection Compact NS630b to 1600 devices equipped with horizontal or vertical connectors may be directly connected to flat or edge-wise bars, depending on the position of the connectors. Spreaders are available to increase the pole pitch to 95 mm.



### Cables with lugs

Cable lug adapters enable connection of one to four cables with crimped lugs ( $\geq 300 \text{ mm}^2$ ). To ensure stability, spacers must be positioned between the terminal extensions.



# Electrical and mechanical accessories

Compact NS630b to 1 600 (cont.)

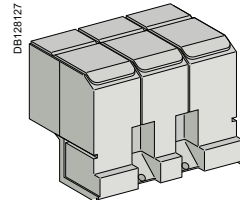


Compact NS equipped with connection shield.

## Insulation of live parts

### Connection shield

Mounted on fixed, front-connection devices, this shield insulates power-connection points, particularly when cables with lugs are used



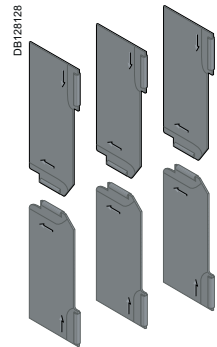
Connection shield.

### Interphase barriers

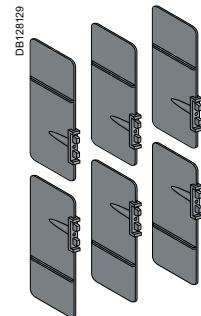
These barriers are flexible insulated partitions used to reinforce isolation of connection points in installations with busbars, whether insulated or not.

Barriers are installed vertically between front or rear connection terminals.

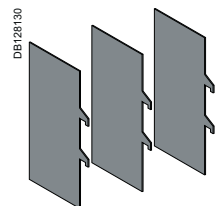
They are mandatory for voltages  $\geq 500$  V for both fixed and withdrawable products and for L and LB types, whatever the voltage.



Interphase barriers for fixed device, front connection.



Interphase barriers for fixed device, rear connection.



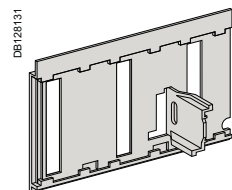
Interphase barriers for withdrawable device, rear connection.

### Safety shutters (standard)

Mounted on the chassis, the safety shutters automatically block access to the disconnecting contact cluster when the device is in the disconnected or test positions (degree of protection IP20). When the device is removed from its chassis, no live parts are accessible.

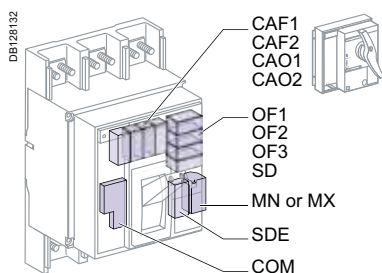
The shutters can be padlocked (padlock not supplied) to:

- prevent connection of the device
- lock the shutters in the closed position.

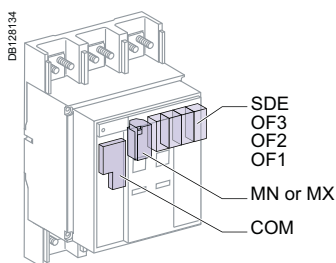


Safety shutters.

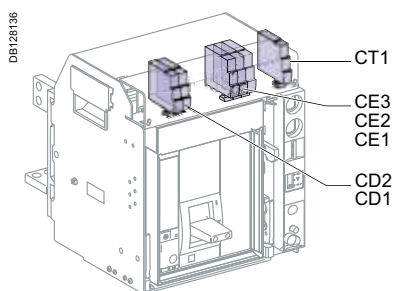




*Manually operated device.*



*Electrically operated device.*

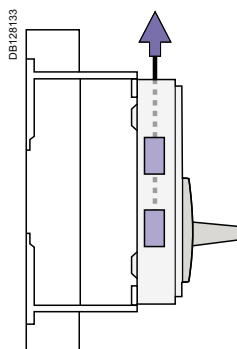


*Withdrawable device.*

## Connection of electrical auxiliaries

### Fixed devices

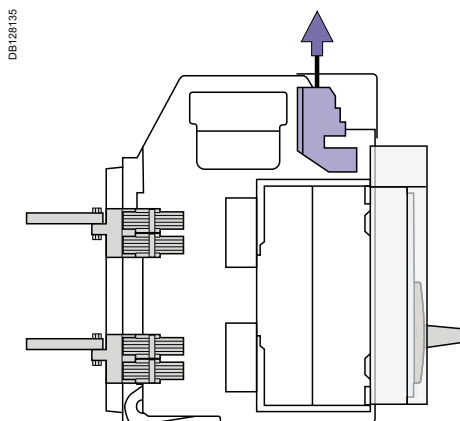
Connections are made directly to the auxiliaries once the front has been removed. Wires exit the circuit breaker through a knock-out in the top.



### Withdrawable devices

Auxiliary circuits are connected to terminal blocks located in the top part of the chassis.

The auxiliary terminal block is made up of a fixed and moving part. The two parts are in contact when the device is in the test and connected positions.



All the auxiliary contacts opposite are also available in "low-level" versions capable of switching very low loads (e.g. for the control of PLCs or electronic circuits).



OF, SD and SDE changeover contacts.

### Indication contacts

#### Contacts installed in the device

Changeover contacts are used to remote circuit breaker status information and can thus be used for indications, electrical locking, relaying, etc.

They comply with the IEC 60947-5 international recommendation.

#### Functions

■ OF (ON/OFF) - indicates the position of the main circuit breaker contacts

■ SD (trip indication) - indicates that the circuit breaker has tripped due to:

- ☐ an overload
- ☐ a short-circuit
- ☐ an earth-leakage fault.
- ☐ operation of a voltage release
- ☐ operation of the "push to trip" button
- ☐ disconnection when the device is ON.

Returns to de-energised state when the circuit breaker is reset.

■ SDE (fault indication) - indicates that the circuit breaker has tripped due to:

- ☐ an overload
- ☐ a short-circuit
- ☐ an earth-leakage fault.

Returns to de-energised state when the circuit breaker is reset.

■ CAF / CAO (early-make or early-break function) - indicates the position of the rotary handle. Used in particular for advanced opening of safety trip devices (early break) or to energise a control device prior to circuit breaker closing (early make).

#### Installation

■ OF, SD and SDE functions - a single type of contact provides all these different indication functions, depending on where it is inserted in the device. The contacts clip into slots behind the front cover of the circuit breaker

■ CAF / CAO function - the contact fits into the rotary-handle unit (direct or extended).

#### Electrical characteristics of the OF/SD/SDE/CAF/CAO auxiliary contacts

| Contacts                         |           | Standard       |      |      |      | Low level   |      |      |      |
|----------------------------------|-----------|----------------|------|------|------|-------------|------|------|------|
| Rated thermal current (A)        |           | 6              |      |      |      | 5           |      |      |      |
| Minimum load                     |           | 100 mA at 24 V |      |      |      | 1 mA at 4 V |      |      |      |
| Utilisation cat. (IEC 60947-5-1) |           | AC12           | AC15 | DC12 | DC14 | AC12        | AC15 | DC12 | DC14 |
| Operational current (A)          | 24 V      | 6              | 6    | 6    | 1    | 5           | 3    | 5    | 1    |
|                                  | 48 V      | 6              | 6    | 2.5  | 0.2  | 5           | 3    | 2.5  | 0.2  |
|                                  | 110 V     | 6              | 5    | 0.6  | 0.05 | 5           | 2.5  | 0.6  | 0.05 |
|                                  | 220/240 V | 6              | 4    | -    | -    | 5           | 2    | -    | -    |
|                                  | 250 V     | -              | -    | 0.3  | 0.03 | 5           | -    | 0.3  | 0.03 |
|                                  | 380/440 V | 6              | 2    | -    | -    | 5           | 1.5  | -    | -    |
|                                  | 480 V     | 6              | 1.5  | -    | -    | 5           | 1    | -    | -    |
| 660/690 V                        |           | 6              | 0.1  | -    | -    | -           | -    | -    | -    |

#### Connected, disconnected, test position carriage switches

A single type of changeover contact can be mounted optionally on the chassis to indicate, depending on the slot where it is installed:

- the connected (CE) position
- the disconnected (CD) position. This position is indicated when the required clearance for isolation of the power and auxiliary circuits is reached
- the test (CT) position. In this position, the power circuits are disconnected and the auxiliary circuits are connected.

#### Installation

■ contacts for the connected (CE), disconnected (CD) and test (CT) positions clip into the upper front section of the chassis.

#### Electrical characteristics of the CE/CD/CT auxiliary contacts

| Contacts                         |           | Standard       |      |      |      | Low level    |      |      |      |
|----------------------------------|-----------|----------------|------|------|------|--------------|------|------|------|
| Rated thermal current (A)        |           | 8              |      |      |      | 5            |      |      |      |
| Minimum load                     |           | 100 mA at 24 V |      |      |      | 2 mA at 15 V |      |      |      |
| Utilisation cat. (IEC 60947-5-1) |           | AC12           | AC15 | DC12 | DC14 | AC12         | AC15 | DC12 | DC14 |
| Operational current (A)          | 24 V      | 8              | 6    | 2.5  | 1    | 5            | 3    | 5    | 1    |
|                                  | 48 V      | 8              | 6    | 2.5  | 0.2  | 5            | 3    | 2.5  | 0.2  |
|                                  | 110 V     | 8              | 5    | 0.8  | 0.05 | 5            | 2.5  | 0.8  | 0.05 |
|                                  | 220/240 V | 8              | 4    | -    | -    | 5            | 2    | -    | -    |
|                                  | 250 V     | -              | -    | 0.3  | 0.03 | 5            | -    | 0.3  | 0.03 |
|                                  | 380/440 V | 8              | 3    | -    | -    | 5            | 1.5  | -    | -    |
|                                  | 660/690 V | 6              | 0.1  | -    | -    | -            | -    | -    | -    |



Carriage switches for connected (CE), disconnected (CD) and test (CT) positions.



M6C programmable contacts:  
circuit breaker external relay with six independent changeover contacts controlled from the circuit breaker via a three-wire connection (maximum length is 10 meters).

### M6C programmable contacts

These contacts, used with the Micrologic P control units, may be programmed via the control unit keypad or via a supervisory station with the COM communication option. They require an external power supply module.

They indicate:

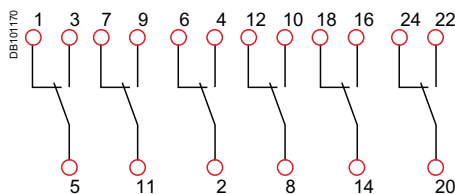
- the type of fault
- instantaneous or delayed threshold overruns.

They may be programmed:

- with instantaneous return to the initial state
- without return to the initial state
- with return to the initial state following a delay.

| Characteristics       |      |     | M6C         |
|-----------------------|------|-----|-------------|
| Minimum load          |      |     | 100 mA/24 V |
| Breaking capacity (A) | V AC | 240 | 5           |
|                       |      | 380 | 3           |
| p.f.: 0.7             | V DC | 24  | 1.8         |
|                       |      | 48  | 1.5         |
|                       |      | 125 | 0.4         |
|                       |      | 250 | 0.15        |

M6C: external 24 V DC power supply required (consumption 100 mA).



Compact NS with a direct rotary handle.



Compact NS with an extended rotary handle.

### Rotary handles

There are two types of rotary handle:

- direct rotary handle
- extended rotary handle.

There are two models:

- standard with a black handle
- VDE with a red handle and yellow front for machine-tool control.

#### Direct rotary handle

Degree of protection IP40, IK07.

The direct rotary handle maintains:

- visibility of and access to trip unit settings
- suitability for isolation
- indication of the three positions O (OFF), I (ON) and tripped
- access to the "push to trip" button
- circuit breaker locking capability in the OFF position by one to three padlocks, shackle diameter 5 to 8 mm (not supplied).

It replaces the circuit breaker front cover.

Accessories transform the standard direct rotary handle for the following situations:

- a higher degree of protection (IP43, IK07)
- machine-tool control, complying with CNOMO E03.81.501, IP54, IK07.

#### Extended rotary handle

Degree of protection IP55, IK07.

This handle makes it possible to operate circuit breakers installed at the back of switchboards, from the switchboard front.

It maintains:

- suitability for isolation
- indication of the three positions O (OFF), I (ON) and tripped
- access to trip unit settings, when the switchboard door is open
- circuit breaker locking capability in the OFF position by one to three padlocks, shackle diameter 5 to 8 mm (not supplied).

The door cannot be opened if the circuit breaker is ON or locked.

The extended rotary handle is made up of:

- a unit that replaces the front cover of the circuit breaker (secured by screws)
- an assembly (handle and front plate) on the door that is always secured in the same position, whether the circuit breaker is installed vertically or horizontally
- an extension shaft that must be adjusted to the distance. The min/max distance between the back of circuit breaker and door is 218/605 mm.

Manually operated circuit breakers may be equipped with an MX shunt release, an MN undervoltage release or a delayed undervoltage release (MN + delay unit). Electrically operated circuit breakers are equipped as standard with a remote-operating mechanism to remotely open or close the circuit breaker. An MX shunt release or an MN undervoltage release (instantaneous or delayed) may be added.



MX voltage release.

### Remote tripping

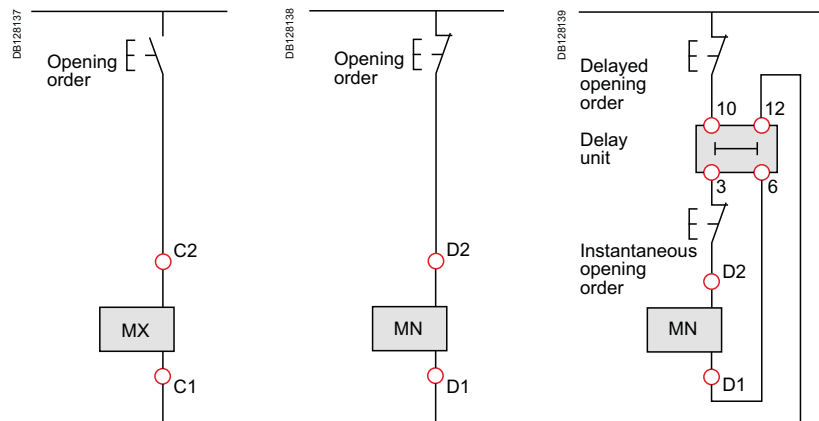
This function opens the circuit breaker via an electrical order. It is made up of:

- a shunt release (2<sup>nd</sup> MX)
- or an undervoltage release MN
- or a delayed undervoltage release MN + delay unit.

These releases (2<sup>nd</sup> MX or MN) cannot be operated by the communication bus.

The delay unit, installed outside the circuit breaker, may be disabled by an emergency OFF button to obtain instantaneous opening of the circuit breaker.

### Wiring diagram for the remote-tripping function



### Voltage releases 2<sup>nd</sup> MX

When energised, the 2<sup>nd</sup> MX voltage release instantaneously opens the circuit breaker. A continuous supply of power to the 2<sup>nd</sup> MX locks the circuit breaker in the OFF position.

#### Characteristics

|                                     |                                      |                                             |
|-------------------------------------|--------------------------------------|---------------------------------------------|
| Power supply                        | V AC 50/60 Hz                        | 24 - 48 - 100/130 - 200/250 - 277 - 380/480 |
|                                     | V DC                                 | 12 - 24/30 - 48/60 - 100/130 - 200/250      |
| Operating threshold                 | 0.7 to 1.1 Un                        |                                             |
| Permanent locking function          | 0.85 to 1.1 Un                       |                                             |
| Consumption (VA or W)               | pick-up: 200 (200 ms)      hold: 4.5 |                                             |
| Circuit breaker response time at Un | 50 ms ±10                            |                                             |

### Instantaneous voltage releases MN

The MN release instantaneously opens the circuit breaker when its supply voltage drops to a value between 35 % and 70 % of its rated voltage. If there is no supply on the release, it is impossible to close the circuit breaker, either manually or electrically. Any attempt to close the circuit breaker has no effect on the main contacts. Circuit breaker closing is enabled again when the supply voltage of the release returns to 85 % of its rated value.

#### Characteristics

|                                          |                                      |                                       |
|------------------------------------------|--------------------------------------|---------------------------------------|
| Power supply                             | V AC 50/60 Hz                        | 24 - 48 - 100/130 - 200/250 - 380/480 |
|                                          | V DC                                 | 24/30 - 48/60 - 100/130 - 200/250     |
| Operating threshold                      | opening                              | 0.35 to 0.7 Un                        |
|                                          | closing                              | 0.85 Un                               |
| Consumption (VA or W)                    | pick-up: 200 (200 ms)      hold: 4.5 |                                       |
| MN consumption with delay unit (VA or W) | pick-up: 400 (200 ms)      hold: 4.5 |                                       |
| Circuit breaker response time at Un      | 90 ms ±5                             |                                       |

### MN delay units

To eliminate circuit breaker nuisance tripping during short voltage dips, operation of the MN release can be delayed. This function is achieved by adding an external delay unit in the MN voltage-release circuit. Two versions are available, adjustable and non-adjustable.

#### Characteristics

|                                           |                                      |                                     |
|-------------------------------------------|--------------------------------------|-------------------------------------|
| Power supply                              | non-adjustable                       | 100/130 - 200/250                   |
|                                           | adjustable                           | 48/60 - 100/130 - 200/250 - 380/480 |
| Operating threshold                       | opening                              | 0.35 to 0.7 Un                      |
|                                           | closing                              | 0.85 Un                             |
| Consumption of delay unit alone (VA or W) | pick-up: 200 (200 ms)      hold: 4.5 |                                     |
| Circuit breaker response time at Un       | non-adjustable                       | 0.25 s                              |
|                                           | adjustable                           | 0.5 s - 0.9 s - 1.5 s - 3 s         |

Electrically operated circuit breakers are equipped as standard with a motor mechanism module.

Two solutions are available for electrical operation:

- a point-to-point solution
- a bus solution with the COM communication option.



Electrically operated Compact NS circuit breaker.

## Electrically operated circuit breaker

The motor mechanism module is used to remotely open and close the circuit breaker. It is made up of a spring-charging motor equipped with an opening release and a closing release.

An electrical operation function is generally combined with:

- device ON/OFF indication OF
- "fault-trip" indication SDE.

### Motor mechanism module

|                       |                             |                                           |
|-----------------------|-----------------------------|-------------------------------------------|
| Power supply          | V AC 50/60 Hz               | 48/60 - 100/130 - 200/240 - 277 - 380/415 |
|                       | V DC                        | 24/30 - 48/60 - 100/125 - 200/250         |
| Operating threshold   | 0.85 to 1.1 Un              |                                           |
| Consumption (VA or W) | 180                         |                                           |
| Motor overcurrent     | 2 to 3 In for 0.1 second    |                                           |
| Charging time         | maximum 4 seconds           |                                           |
| Operating frequency   | maximum 3 cycles per minute |                                           |

### Electrical closing order

The release remotely closes the circuit breaker if the spring mechanism is charged. Release electrical characteristics are identical to those of an MX release (see above), the operating threshold is from 0.85 to 1.1 Un and the circuit breaker response time at Un is 60 ms  $\pm$  10.

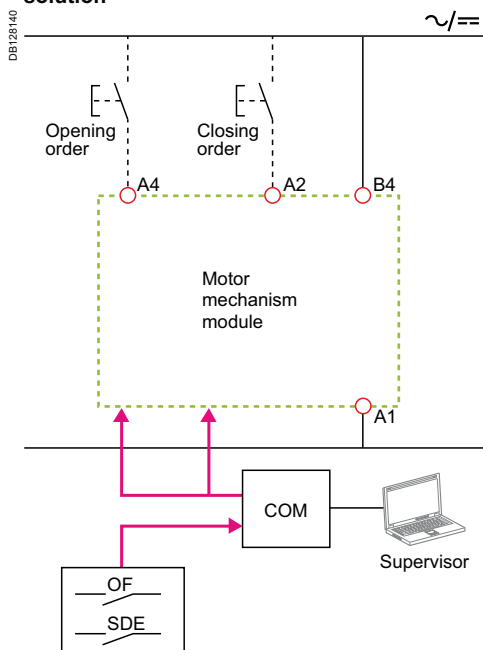
The Compact NS electrical operation function can be used to implement a synchro-coupling system.

### Electrical opening order

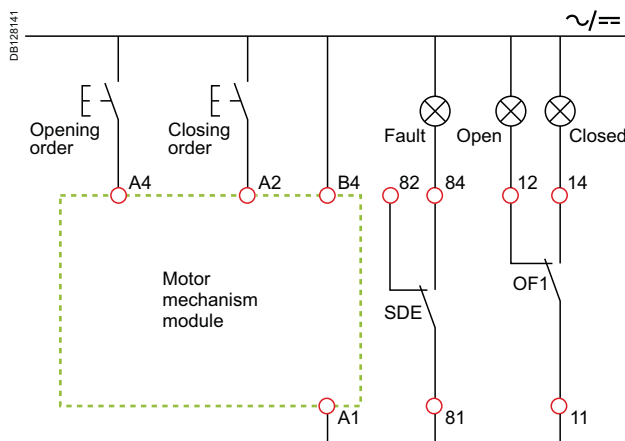
The release instantaneously opens the circuit breaker when energised. The supply can be impulse-type or maintained.

Release electrical characteristics are identical to those of an MX release (see above).

### Wiring diagram of a bus-type electrical operation solution



### Wiring diagram of a point-to-point electrical operation solution



In the event of simultaneous opening and closing orders, the mechanism discharges without any movement of the main contacts.

In the event of maintained opening and closing orders, the standard electrical operation solution provides an anti-pumping function by blocking the main contacts in open position.

# Electrical and mechanical accessories

## Compact NS630b to 1 600 (cont.)

PB104830



Toggle locked by removable padlocking device.

PB104828



Rotary handle locked by a keylock.

### Locking on manually operated devices

Locking in the OFF position guarantees isolation as per IEC 60947-2.

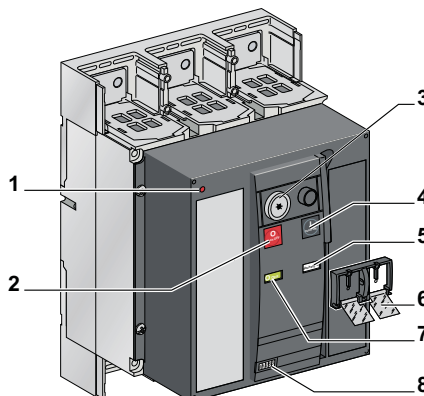
Padlocking systems can receive up to three padlocks with shackle diameters ranging from 5 to 8 mm (padlocks not supplied).

| Control device             | Function               | Means   | Required accessories     |
|----------------------------|------------------------|---------|--------------------------|
| Toggle                     | lock in                |         |                          |
|                            | b OFF position         | padlock | removable device         |
|                            | b OFF or ON position   | padlock | fixed device             |
| Direct rotary handle       | lock in                |         |                          |
|                            | b OFF position         | padlock |                          |
|                            | b OFF or ON position   | keylock | locking device + keylock |
| CNOMO direct rotary handle | lock in                |         |                          |
|                            | b OFF position         | padlock |                          |
| Extended rotary handle     | lock in OFF position,  | padlock |                          |
|                            | door opening prevented | keylock | keylock                  |

Locking in ON position does not prevent the device from tripping in the event of a fault or remote tripping order.

### Locking on electrically operated devices

DB126142



- 1 reset of mechanical trip indicator
- 2 OFF pushbutton
- 3 OFF position locking
- 4 ON pushbutton
- 5 springs charged indication
- 6 pushbutton locking
- 7 contact position indication
- 8 operation counter

PB100811A-32



Access to pushbuttons protected by transparent cover.

PB100810A-32



Pushbutton locking using a padlock.

### Pushbutton locking VBP

The transparent cover blocks access to the pushbuttons used to open and close the device.

It is possible to independently lock the opening OFF button and the closing ON button.

The pushbuttons may be locked using either:

- three padlocks (not supplied)
- lead seal
- two screws.

PB100812A-32



OFF position locking using padlocks.

PB104385A-32



OFF position locking using a keylock and padlocks.

### Device locking in the OFF position VCPO by padlocks, VSPO by keylocks

The circuit breaker is locked in the OFF position by physically maintaining the opening pushbutton pressed down:

- using padlocks in standard (one to three padlocks, not supplied)
- using a keylock (supplied).

Keys may be removed only when locking is effective (Profalux or Ronis type locks).

The keylocks are available in any of the following configurations:

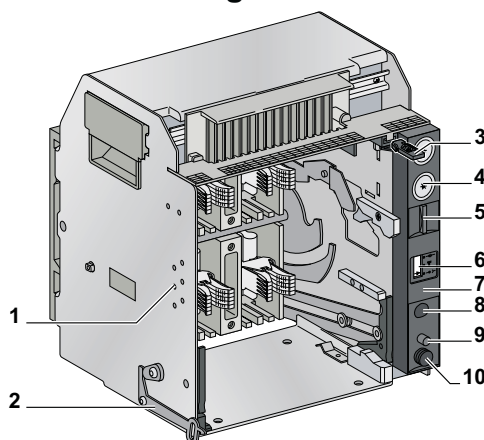
- one keylock
- one keylock mounted on the device + one identical keylock supplied separately for interlocking with another device.

A locking kit (without lock) is available for installation of a keylock (Ronis, Profalux, Kirk or Castell).



## Chassis locking

DEI28071



- 1 mismatch protection
- 2 door interlock
- 3 racking interlock
- 4 keylock locking
- 5 padlock locking
- 6 position indicator
- 7 chassis front plate  
(accessible with cubicle door closed)
- 8 crank entry
- 9 reset button
- 10 crank storage



"Disconnected" position locking by padlocks.



"Disconnected" position locking by keylocks.



Door interlock.



Racking interlock.



Mismatch protection.

### "Disconnected" position locking by padlocks (standard) or keylocks (VSPD option)

Mounted on the chassis and accessible with the door closed, these devices lock the circuit breaker in the disconnected position in two manners:

- using padlocks (standard), up to three padlocks (not supplied)
- using keylocks (optional), one or two different keylocks are available. Profalux and Ronis keylocks are available in different options:

- one keylock
- one keylock mounted on the device + one identical keylock supplied separately, using the same key, for interlocking with another device
- one (or two) keylocks mounted on the device + one (or two) identical keylocks supplied separately, for interlocking with another device.

A locking kit (without locks) is available for installation of one or two keylocks (Ronis, Profalux, Kirk or Castell).

### "Connected", "disconnected" and "test" position locking

The connected, disconnected and test positions are shown by an indicator and are mechanically indexed.

The racking crank blocks when the exact position is obtained.

A release button is used to free it.

As standard, the circuit breaker can be locked only in "disconnected position". On request, the locking system may be modified to lock the circuit breaker in any of the three positions: "connected", "disconnected" or "test".

### Door interlock catch VPEC

Mounted on the right or left-hand side of the chassis, this device inhibits opening of the cubicle door when the circuit breaker is in connected or test position. If the breaker is put in the connected position with the door open, the door may be closed without having to disconnect the circuit breaker.

### Racking interlock VPOC

This device prevents insertion of the crank when the cubicle door is open (device cannot be connected).

### Mismatch protection VDC

Mismatch protection ensures that a circuit breaker is installed only in a chassis with compatible characteristics. It is made up of two parts (one on the chassis and one on the circuit breaker) offering twenty different combinations that the user may select.



PB104740-32



*Auxiliary terminal shield.*

PB104392A32



*Operation counter.*

DB128144



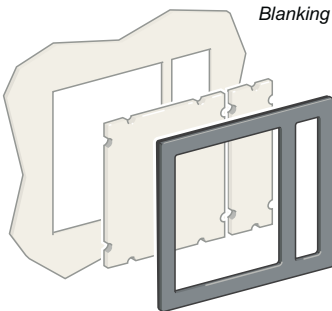
*Escutcheon.*

DB128145



*Transparent cover.*

DB128146



*Blanking plate.*

### Other accessories

#### Auxiliary terminal shield (CB)

Optional equipment mounted on the chassis, the shield prevents access to the terminal block of the electrical auxiliaries.

#### Operation counter (CDM)

The operation counter sums the number of operating cycles and is visible on the front panel. It is compatible with electrically operated devices.

#### Escutcheon (CDP)

Optional equipment mounted on the door of the cubicle, the escutcheon increases the degree of protection to IP40. It is available in fixed and withdrawable versions.

#### Transparent cover (CCP) for escutcheon

Optional equipment mounted on the escutcheon, the cover is hinged and secured by a screw. It increases the degree of protection to IP54 and the degree of protection against mechanical impacts to IK10. It may be used for withdrawable devices only.

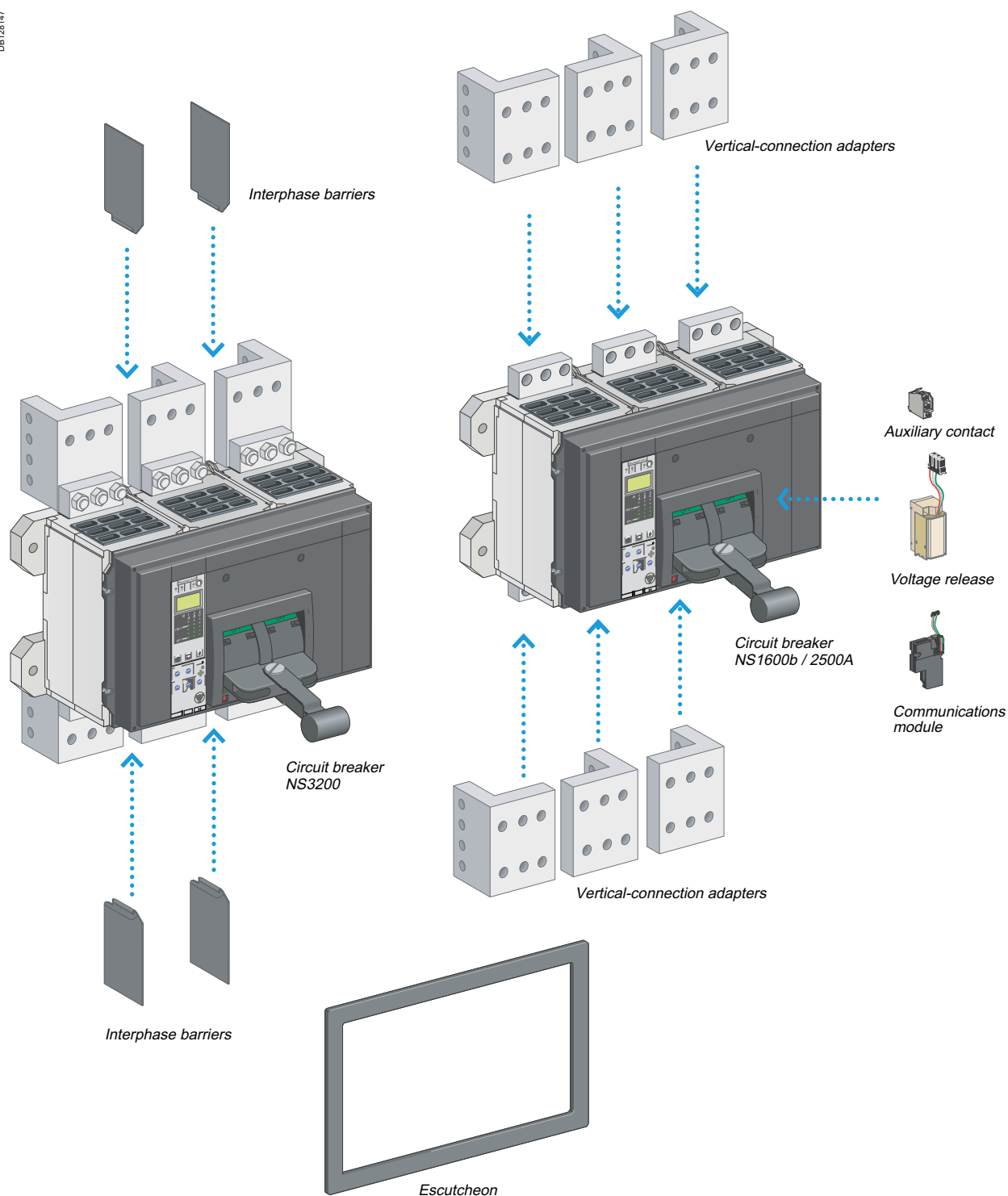
#### Blanking plate (OP) for escutcheon

Used with the escutcheon, this option closes off the door cutout of a cubicle not yet equipped with a device. It may be used with the escutcheon for both fixed and withdrawable devices.

# Electrical and mechanical accessories

Compact NS1600b to 3200  
(fixed version)

DB128147



# Electrical and mechanical accessories

Compact NS1600b to 3200 (cont.)

DB100366

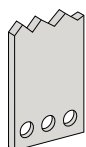


Fixed Compact NS.

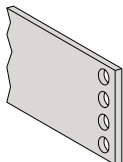
DB128069



DB128155



DB128157

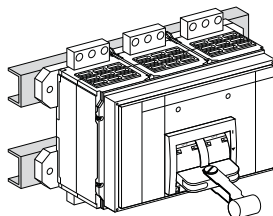


## Installation

### Fixed circuit breakers

Compact NS1600b to 3200 circuit breakers should be installed vertically only.

DB128151



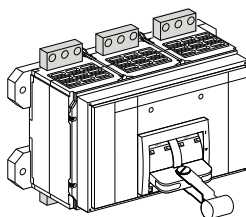
Mounting on rails.

## Connection

### Front connection

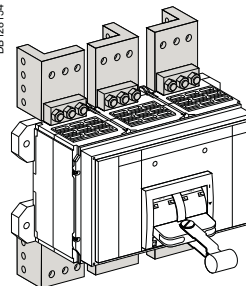
NS1600 to 2500

DB128153



NS3200

DB128154

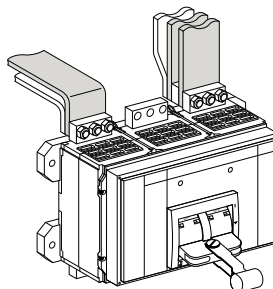


## Bars

Bars may be directly connected to the terminals of Compact NS1600b to 3200 circuit breakers.

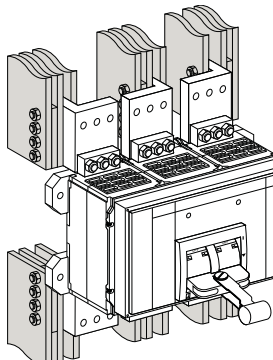
NS1600b to 2500

DB128156

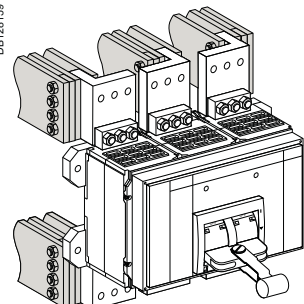


NS1600b to 2500 with connection for vertical-connection adapters or NS3200

DB128158



DB128159



All the auxiliary contacts opposite are also available in "low-level" versions capable of switching very low loads (e.g. for the control of PLCs or electronic circuits).



OF, SD and SDE changeover contacts.

## Indication contacts

### Contacts installed in the device

Changeover contacts are used to remote circuit breaker status information and can thus be used for indications, electrical locking, relaying, etc.

*They comply with the IEC 60947-5 international recommendation.*

#### Functions

■ OF (ON/OFF) - indicates the position of the main circuit breaker contacts

■ SD (trip indication) - indicates that the circuit breaker has tripped due to:

- ☐ an overload
- ☐ a short-circuit
- ☐ an earth-leakage fault
- ☐ operation of a voltage release
- ☐ operation of the "push to trip" button

■ Returns to de-energised state when the circuit breaker is reset.

SDE (fault indication) - indicates that the circuit breaker has tripped due to:

- ☐ an overload
- ☐ a short-circuit
- ☐ an earth-leakage fault.

Returns to de-energised state when the circuit breaker is reset.

#### Installation

■ OF, SD and SDE functions - a single type of contact provides all these different indication functions, depending on the position where it is inserted in the device.

The contacts clip into slots behind the front cover of the circuit breaker.

#### Electrical characteristics of the OF/SD/SDE auxiliary contacts

| Contacts                         | Standard       |      |      |      | Low level   |      |      |      |      |
|----------------------------------|----------------|------|------|------|-------------|------|------|------|------|
| Rated thermal current (A)        | 6              |      |      |      | 5           |      |      |      |      |
| Minimum load                     | 100 mA at 24 V |      |      |      | 1 mA at 4 V |      |      |      |      |
| Utilisation cat. (IEC 60947-5-1) | AC12           | AC15 | DC12 | DC14 | AC12        | AC15 | DC12 | DC14 |      |
| Operational current (A)          | 24 V           | 6    | 6    | 1    | 5           | 3    | 5    | 1    |      |
|                                  | 48 V           | 6    | 6    | 2.5  | 0.2         | 5    | 3    | 2.5  | 0.2  |
|                                  | 110 V          | 6    | 5    | 0.6  | 0.05        | 5    | 2.5  | 0.6  | 0.05 |
|                                  | 220/240 V      | 6    | 4    | -    | -           | 5    | 2    | -    | -    |
|                                  | 250 V          | -    | -    | 0.3  | 0.03        | 5    | -    | 0.3  | 0.03 |
|                                  | 380/440 V      | 6    | 2    | -    | -           | 5    | 1.5  | -    | -    |
|                                  | 480 V          | 6    | 1.5  | -    | -           | 5    | 1    | -    | -    |
| 660/690 V                        | 6              | 0.1  | -    | -    | -           | -    | -    | -    |      |

# Electrical and mechanical accessories

## Compact NS1600b to 3200 (cont.)

Compact NS1600b to 3200 circuit breakers may be equipped with an MX shunt release, an MN undervoltage release or a delayed undervoltage release (MNR = MN + delay unit).



### Remote tripping

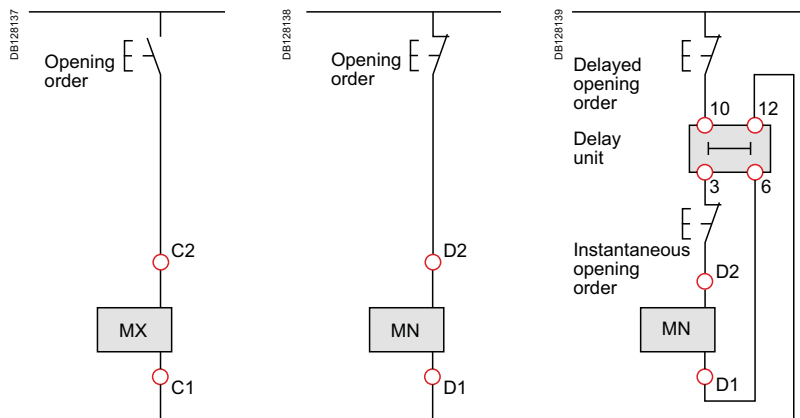
This function opens the circuit breaker via an electrical order. It is made up of:

- a shunt release 2<sup>nd</sup> MX
- or an undervoltage release MN
- or a delayed undervoltage release MNR = MN + delay unit.

These releases (2<sup>nd</sup> MX or MN) cannot be operated by the communication bus.

The delay unit, installed outside the circuit breaker, may be disabled by an emergency OFF button to obtain instantaneous opening of the circuit breaker.

Wiring diagram for the remote-tripping function



### Voltage releases 2<sup>nd</sup> MX

When energised, the 2<sup>nd</sup> MX voltage release instantaneously opens the circuit breaker. A continuous supply of power to the 2<sup>nd</sup> MX locks the circuit breaker in the OFF position.

#### Characteristics

|                                     |                                     |                                             |
|-------------------------------------|-------------------------------------|---------------------------------------------|
| Power supply                        | V AC 50/60 Hz                       | 24 - 48 - 100/130 - 200/250 - 277 - 380/480 |
|                                     | V DC                                | 12 - 24/30 - 48/60 - 100/130 - 200/250      |
| Operating threshold                 | 0.7 to 1.1 Un                       |                                             |
| Permanent locking function          | 0.85 to 1.1 Un                      |                                             |
| Consumption (VA or W)               | pick-up: 200 (80 ms)      hold: 4.5 |                                             |
| Circuit breaker response time at Un | 50 ms ± 10                          |                                             |

### Instantaneous voltage releases MN

The MN release instantaneously opens the circuit breaker when its supply voltage drops to a value between 35 % and 70 % of its rated voltage. If there is no supply on the release, it is impossible to close the circuit breaker, either manually or electrically. Any attempt to close the circuit breaker has no effect on the main contacts. Circuit breaker closing is enabled again when the supply voltage of the release returns to 85 % of its rated value.

#### Characteristics

|                                          |                                      |                                       |
|------------------------------------------|--------------------------------------|---------------------------------------|
| Power supply                             | V AC 50/60 Hz                        | 24 - 48 - 100/130 - 200/250 - 380/480 |
|                                          | V DC                                 | 24/30 - 48/60 - 100/130 - 200/250     |
| Operating threshold                      | opening                              | 0.35 to 0.7 Un                        |
|                                          | closing                              | 0.85 Un                               |
| Consumption (VA or W)                    | pick-up: 200 (200 ms)      hold: 4.5 |                                       |
| MN consumption with delay unit (VA or W) | pick-up: 400 (200 ms)      hold: 4.5 |                                       |
| Circuit breaker response time at Un      | 90 ms ± 5                            |                                       |

### MN delay units

To eliminate circuit breaker nuisance tripping during short voltage dips, operation of the MN release can be delayed. This function is achieved by adding an external delay unit in the MN voltage-release circuit. Two versions are available, adjustable and non-adjustable.

#### Characteristics

|                                           |                                      |                                     |
|-------------------------------------------|--------------------------------------|-------------------------------------|
| Power supply                              | non-adjustable                       | 100/130 - 200/250                   |
|                                           | adjustable                           | 48/60 - 100/130 - 200/250 - 380/480 |
| Operating threshold                       | opening                              | 0.35 to 0.7 Un                      |
|                                           | closing                              | 0.85 Un                             |
| Consumption of delay unit alone (VA or W) | pick-up: 200 (200 ms)      hold: 4.5 |                                     |
| Circuit breaker response time at Un       | non-adjustable                       | 0.25 s                              |
|                                           | adjustable                           | 0.5 s - 0.9 s - 1.5 s - 3 s         |

PB104836\_ME



Compact NS with toggle locked using a fixed device and padlocks.

## Device locking

Locking in the OFF position guarantees isolation as per IEC 60947-2. Padlocking systems can receive up to three padlocks with shackle diameters ranging from 5 to 8 mm (padlocks not supplied).

| Control device | Function                   | Means   | Required accessories |
|----------------|----------------------------|---------|----------------------|
| Toggle         | lock in OFF position       | padlock | removable device     |
|                | lock in OFF or ON position | padlock | fixed device         |

## Interphase barriers

These barriers are flexible insulated partitions used to reinforce isolation of connection points in installations with busbars, whether insulated or not. Barriers are installed vertically between front connection terminals.

## Escutcheon CDP

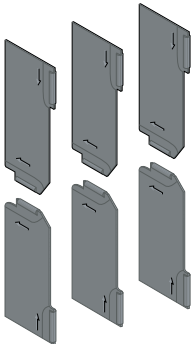
Optional equipment mounted on the door of the cubicle, the escutcheon increases the degree of protection to IP40.

PB104835\_ME



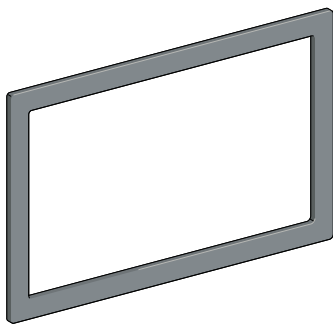
Compact NS with toggle locked using a removable device and padlocks.

DB128128



Interphase barriers.

DB128161



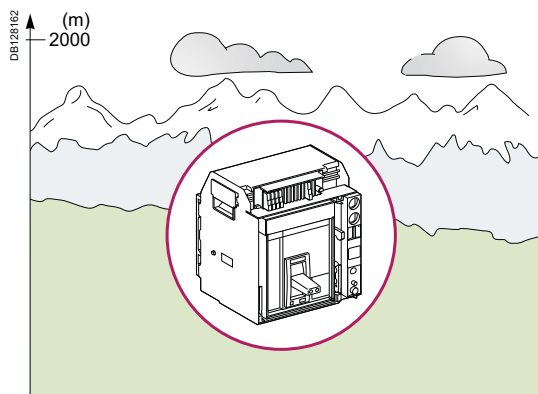
Escutcheon.

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|                                                        |            |
|--------------------------------------------------------|------------|
| <i>Presentation</i>                                    | 2          |
| <i>Functions and characteristics</i>                   | A-1        |
| <b>Operating conditions</b>                            | <b>B-2</b> |
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Compact circuit breakers have been tested for operation in industrial atmospheres. It is recommended that the equipment be cooled or heated to the proper operating temperature and kept free of excessive vibration and dust.



## Altitude derating

Altitude does not significantly affect circuit-breaker characteristics up to 2000 m. Above this altitude, it is necessary to take into account the decrease in the dielectric strength and cooling capacity of air.

The following table gives the corrections to be applied for altitudes above 2000 metres. The breaking capacities remain unchanged.

### Compact NS630b to 3200

| Altitude (m)                                         | 2000           | 3000              | 4000              | 5000              |
|------------------------------------------------------|----------------|-------------------|-------------------|-------------------|
| Impulse withstand voltage $U_{imp}$ (kV)             | 8              | 7.1               | 6.4               | 5.6               |
| Rated insulation voltage ( $U_i$ )                   | 800            | 710               | 635               | 560               |
| Maximum rated operational voltage 50/60 Hz $U_e$ (V) | 690            | 690               | 635               | 560               |
| Rated current 40 °C                                  | $1 \times I_n$ | $0.99 \times I_n$ | $0.96 \times I_n$ | $0.94 \times I_n$ |

Intermediate values may be obtained by interpolation.

## Vibrations

Compact NS devices resist electromagnetic or mechanical vibrations.

Tests are carried out in compliance with standard IEC 60068-2-6 for the levels required by merchant-marine inspection organisations (Veritas, Lloyd's, etc.):

- 2 → 13.2 Hz: amplitude  $\pm 1$  mm
- 13.2 → 100 Hz: constant acceleration 0.7 g.

Excessive vibration may cause tripping, breaks in connections or damage to mechanical parts.

## Electromagnetic disturbances

Compact NS devices are protected against:

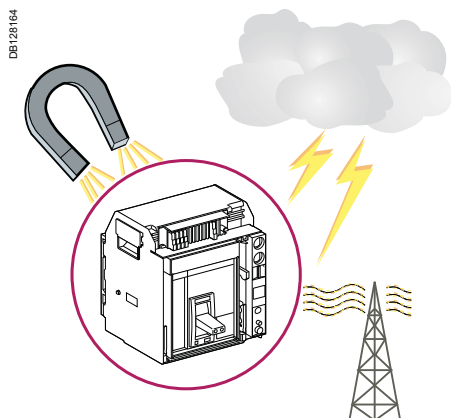
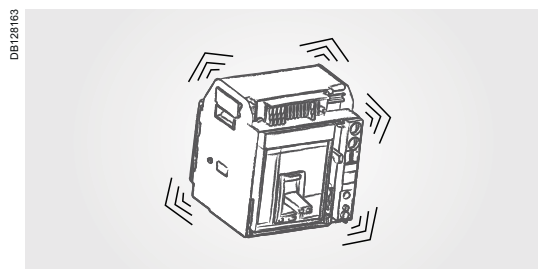
- overvoltages caused by devices that generate electromagnetic disturbances
- overvoltages caused by an atmospheric disturbances or by a distribution-system outage (e.g. failure of a lighting system)
- devices emitting radio waves (radios, walkie-talkies, radar, etc.)
- electrostatic discharges produced by users.

Compact NS devices have successfully passed the electromagnetic-compatibility tests (EMC) defined by the following international standards:

- IEC 60947-2, appendix F
- IEC 60947-2, appendix B (trip units with Vigi earth-leakage function).

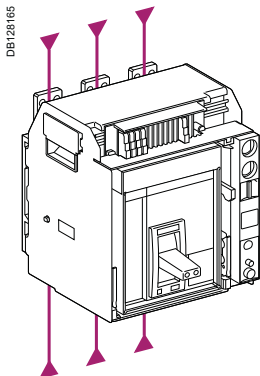
The above tests guarantee that:

- no nuisance tripping occurs
- tripping times are respected.



# Installation in switchboards

## Power supply and weights



### Power supply

Compact NS circuit breakers can be supplied from either the top or the bottom without any reduction in performance. This capability facilitates connection when installed in a switchboard.

### Weights

|                                     |    | Circuit breaker | Chassis |
|-------------------------------------|----|-----------------|---------|
| NS630b to 1600 manual operation     | 3P | 14              | 14      |
|                                     | 4P | 18              | 18      |
| NS630b to 1600 electrical operation | 3P | 14              | 16      |
|                                     | 4P | 18              | 21      |
| NS1600b to 3200                     | 3P | 24              | -       |
|                                     | 4P | 36              | -       |

The table above presents the weights (in kg) of the circuit breakers and the main accessories, which must be summed to obtain the total weight of complete configurations.

# Installation in switchboards

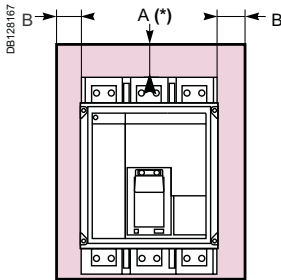
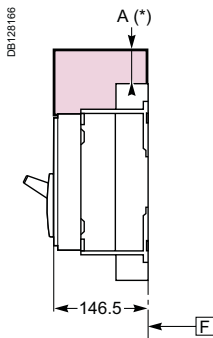
## Safety clearances and minimum distances

### General rules

When installing a circuit breaker, minimum distances (safety clearances) must be maintained between the device and panels, bars and other protection devices installed nearby. These distances, which depend on the ultimate breaking capacity, are defined by tests carried out in accordance with standard IEC 60947-2. If installation conformity is not checked by type tests, it is also necessary to:

- use insulated bars for circuit-breaker connections
- block off the busbars using insulating screens.

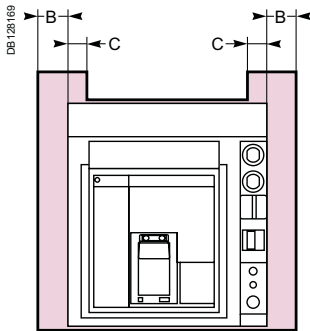
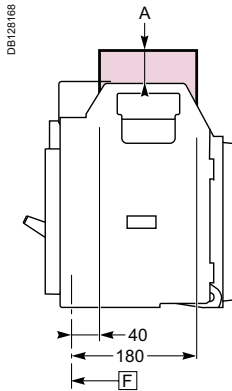
### Compact NS630b to 3200 (fixed devices)



(\*) An overhead clearance of 50 mm is required to remove the arc chutes.

| Insulated parts | Metal parts | Live parts |
|-----------------|-------------|------------|
| NS630b to 1600  |             |            |
| A 0             | 120         | 180        |
| B 0             | 10          | 60         |
| NS1600b to 3200 |             |            |
| A 50            | 170         | 230        |
| B 0             | 10          | 60         |

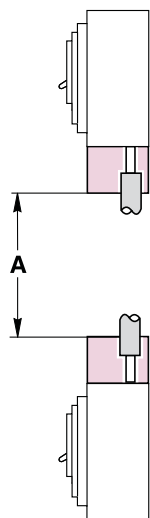
### Compact NS630b to 1600 (withdrawable devices)



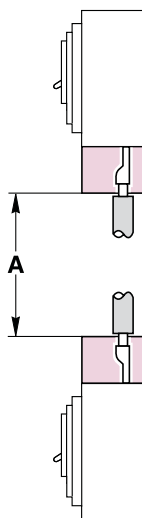
| Insulated parts | Metal parts | Live parts |
|-----------------|-------------|------------|
| A 0             | 0           | 30         |
| B 10            | 10          | 60         |
| C 0             | 0           | 30         |

F Datum

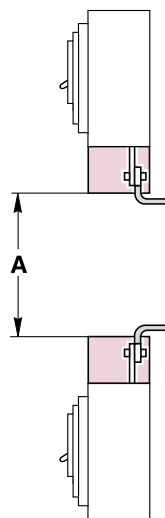
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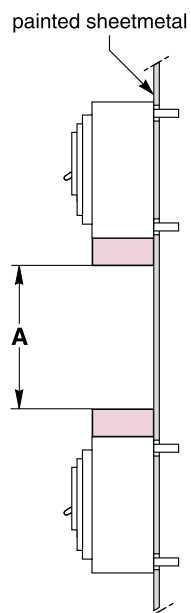
*Direct connection by bare cables, devices with terminal shields.*



*Connection by cables with lugs, devices with terminal shields.*



*Connection by insulated bars, devices with terminal shields.*

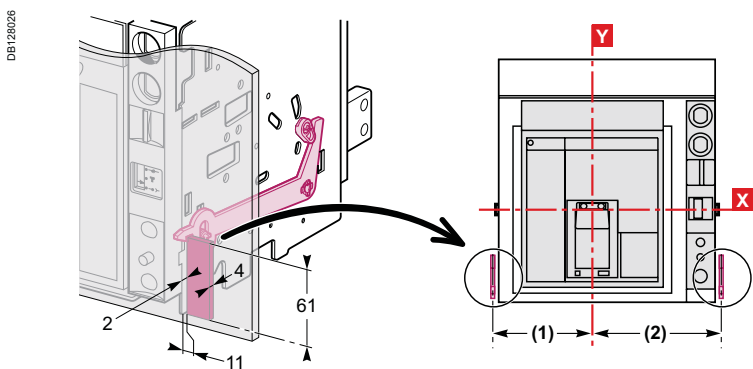


*Rear connection or plug-in base, devices with terminal shields.*

| Minimum dimensions (mm) | A   |
|-------------------------|-----|
| Compact circuit breaker |     |
| NS630b-1600             | 250 |
| NS1600b-3200            | 300 |

# Door interlock for Compact NS630b to 1600

Mounted on the left or right-hand side of the chassis, this locking device prevents opening of the door if the circuit breaker is in the connected or test positions. If the circuit breaker was connected with the door open, the door may be closed without having to disconnect the circuit breaker.

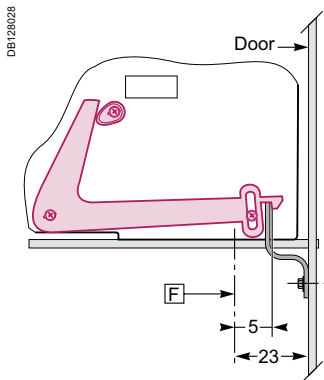


### Dimensions (mm)

| Type                | (1) | (2) |
|---------------------|-----|-----|
| NS630b to 1600 (3P) | 135 | 168 |
| NS630b to 1600 (4P) | 205 | 168 |

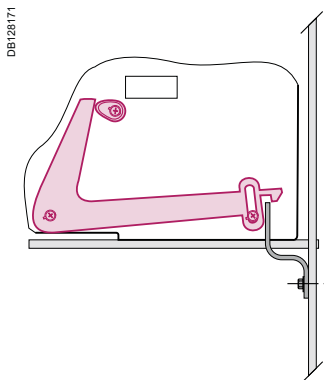
### Device in the connected or test positions

#### Door locked



### Device in the disconnected position

#### Door not locked



**Note.** The door interlock may be mounted on either the left or right-hand side of the chassis.

F Datum

## Wiring of voltage releases

During pick-up, the power consumed is approximately 150 to 200 VA.  
For low control voltages (12, 24, 48 V), maximum cable lengths are imposed by the voltage and the cross-sectional area of cables.

### Recommended maximum cable lengths (meter).

|       |                | 12 V                |                     | 24 V                |                     | 48 V                |                     |
|-------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|       |                | 2.5 mm <sup>2</sup> | 1.5 mm <sup>2</sup> | 2.5 mm <sup>2</sup> | 1.5 mm <sup>2</sup> | 2.5 mm <sup>2</sup> | 1.5 mm <sup>2</sup> |
| MN    | U source 100 % | —                   | —                   | 58                  | 35                  | 280                 | 165                 |
|       | U source 85 %  | —                   | —                   | 16                  | 10                  | 75                  | 45                  |
| MX-XF | U source 100 % | 21                  | 12                  | 115                 | 70                  | 550                 | 330                 |
|       | U source 85 %  | 10                  | 6                   | 75                  | 44                  | 350                 | 210                 |

**Note:** the indicated length is that of each of the two wires.

## 24 V DC power-supply module

### External 24 V DC power-supply module for Micrologic (F1-, F2+)

- do not connect the positive terminal (F2+) to earth
- the negative terminal (F1-) can be connected to earth, except in IT systems
- a number of Micrologic control units and M6C modules can be connected to the same 24 V DC power supply (the consumption of a Micrologic control unit or an M6C module is approximately 100 mA)
- do not connect any devices other than a Micrologic control unit or an M6C module if voltage > 480 V AC or in an environment with high level of electromagnetic disturbance
- the maximum length for each conductor is ten metres. For greater distances, it is advised to twist the supply wires together
- the 24 V DC supply wires must cross the power cables perpendicularly. If this is difficult, it is advised to twist the supply wires together
- the technical characteristics of the external 24 V DC power-supply module for Micrologic control units are indicated on [page A-28](#).

### Communication bus

- do not connect the positive terminal (E1) to earth
- the negative terminal (E2) can be connected to earth
- a number of "device" or "chassis" communication modules can be connected to the same 24 V DC power supply (the consumption of each module is approximately 30 mA).

**Note:** wiring of ZSI: it is recommended to use twisted shielded cable. The shield must be connected to earth at both ends.

# Temperature derating

## Compact NS devices equipped with electronic trip units

Compact circuit breakers have been tested for operation in industrial atmospheres.

It is recommended that the equipment be cooled or heated to the proper operating temperature and kept free of excessive vibration and dust.

### Compact NS630b to NS1600 <sup>(1)</sup>

The table below indicates the maximum rated-current value for each type of connection, depending on the ambient temperature. For mixed connections, use the same derating values as for horizontal connections.

| Version<br>Connection<br>temp. Ti <sup>(2)</sup> | Fixed device<br>Front or horizontal rear |      |      |      |      |      |      | Vertical rear |      |      |      |      |      |      |
|--------------------------------------------------|------------------------------------------|------|------|------|------|------|------|---------------|------|------|------|------|------|------|
|                                                  | 40                                       | 45   | 50   | 55   | 60   | 65   | 70   | 40            | 45   | 50   | 55   | 60   | 65   | 70   |
| NS630b N/L                                       | 630                                      | 630  | 630  | 630  | 630  | 630  | 630  | 630           | 630  | 630  | 630  | 630  | 630  | 630  |
| NS800 N/L                                        | 800                                      | 800  | 800  | 800  | 800  | 800  | 800  | 800           | 800  | 800  | 800  | 800  | 800  | 800  |
| NS1000 N/L                                       | 1000                                     | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000          | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| NS1250 N                                         | 1250                                     | 1250 | 1250 | 1250 | 1250 | 1240 | 1090 | 1250          | 1250 | 1250 | 1250 | 1250 | 1250 | 1180 |
| NS1600 N                                         | 1600                                     | 1600 | 1560 | 1510 | 1470 | 1420 | 1360 | 1600          | 1600 | 1600 | 1600 | 1600 | 1510 | 1460 |

| Version<br>Connection<br>temp. Ti <sup>(2)</sup> | Withdrawable device<br>Front or horizontal rear |      |      |      |      |      |      | Vertical rear |      |      |      |      |      |      |
|--------------------------------------------------|-------------------------------------------------|------|------|------|------|------|------|---------------|------|------|------|------|------|------|
|                                                  | 40                                              | 45   | 50   | 55   | 60   | 65   | 70   | 40            | 45   | 50   | 55   | 60   | 65   | 70   |
| NS630b N/L                                       | 630                                             | 630  | 630  | 630  | 630  | 630  | 630  | 630           | 630  | 630  | 630  | 630  | 630  | 630  |
| NS800 N/L                                        | 800                                             | 800  | 800  | 800  | 800  | 800  | 800  | 800           | 800  | 800  | 800  | 800  | 800  | 800  |
| NS1000 N/L                                       | 1000                                            | 1000 | 1000 | 1000 | 1000 | 1000 | 920  | 1000          | 1000 | 1000 | 1000 | 1000 | 1000 | 990  |
| NS1250 N                                         | 1250                                            | 1250 | 1250 | 1250 | 1250 | 1170 | 1000 | 1250          | 1250 | 1250 | 1250 | 1250 | 1250 | 1090 |
| NS1600 N                                         | 1600                                            | 1600 | 1520 | 1480 | 1430 | 1330 | 1160 | 1600          | 1600 | 1600 | 1560 | 1510 | 1420 | 1250 |

### Compact NS1600b to 3200

| Version<br>Connection<br>temp. Ti <sup>(2)</sup> | Fixed device<br>Front or horizontal rear |      |      |      |      |      |      | Vertical rear |      |      |      |      |      |      |
|--------------------------------------------------|------------------------------------------|------|------|------|------|------|------|---------------|------|------|------|------|------|------|
|                                                  | 40                                       | 45   | 50   | 55   | 60   | 65   | 70   | 40            | 45   | 50   | 55   | 60   | 65   | 70   |
| NS1600b N                                        | 1600                                     | 1600 | 1600 | 1600 | 1500 | 1450 | 1400 | 1600          | 1600 | 1600 | 1600 | 1600 | 1550 | 1500 |
| NS2000 N                                         | 2000                                     | 2000 | 2000 | 2000 | 1900 | 1800 | 1700 | 2000          | 2000 | 2000 | 2000 | 2000 | 1900 | 1800 |
| NS2500 N                                         | 2500                                     | 2500 | 2500 | 2500 | 2500 | 2500 | 2500 | 2500          | 2500 | 2500 | 2500 | 2500 | 2500 | 2500 |
| NS3200 N                                         | -                                        | -    | -    | -    | -    | -    | -    | 3200          | 3200 | 3200 | 3180 | 3080 | 2970 | 2860 |

<sup>(1)</sup> For a circuit breaker mounted in horizontal position, the derating to be applied is equivalent to that of a front or horizontal rear connected circuit breaker.

<sup>(2)</sup> Ti: temperature around the circuit breaker and its connections.



The values indicated in the tables opposite are typical values.

### Power dissipated per pole (P/pole) in Watts (W)

The value indicated in the table is the power dissipated at  $I_N$ , 50/60 Hz, for a three-pole or four-pole circuit breaker (these values can be higher than the power calculated on the basis of the pole resistance). Measurement and calculation of the dissipated power are carried out in compliance with the recommendations of Annex G of standard IEC 60947-2.

### Resistance per pole (R/pole) in milliohms (mΩ)

The value of the resistance per pole is provided as a general indication for a new device.

The value of the contact resistance must be determined on the basis of the measured voltage drop, in accordance with the manufacturer's test procedure (expert card ABT no. FE 05e).

**Note:** this measurement is not sufficient to determine the quality of the contacts, i.e. the capacity of the circuit breaker to carry its rated current.

### Compact NS630b to 1600

| Version | Fixed device |        | L      |        | LB     |        |
|---------|--------------|--------|--------|--------|--------|--------|
|         | R/pole       | P/pole | R/pole | P/pole | R/pole | P/pole |
| NS630b  | 0.026        | 10     | 0.039  | 15     | 0.056  | 15     |
| NS800   | 0.026        | 15     | 0.039  | 20     | 0.056  | 20     |
| NS1000  | 0.026        | 22     | 0.039  | 34     |        |        |
| NS1250  | 0.026        | 44     |        |        |        |        |
| NS1600  | 0.026        | 74     |        |        |        |        |

| Version | Withdrawable device |        | L      |        | LB     |        |
|---------|---------------------|--------|--------|--------|--------|--------|
|         | R/pole              | P/pole | R/pole | P/pole | R/pole | P/pole |
| NS630b  | 0.038               | 19     | 0.072  | 34     | 0.086  | 34     |
| NS800   | 0.038               | 30     | 0.072  | 40     | 0.086  | 40     |
| NS1000  | 0.038               | 50     | 0.072  | 77     |        |        |
| NS1250  | 0.036               | 84     |        |        |        |        |
| NS1600  | 0.036               | 154    |        |        |        |        |

### Compact NS1600b to 3200

| Version | Fixed device |        |
|---------|--------------|--------|
|         | R/pole       | P/pole |
| NS1600b | 0.019        | 84     |
| NS2000  | 0.013        | 84     |
| NS2500  | 0.008        | 100    |
| NS3200  | 0.008        | 227    |

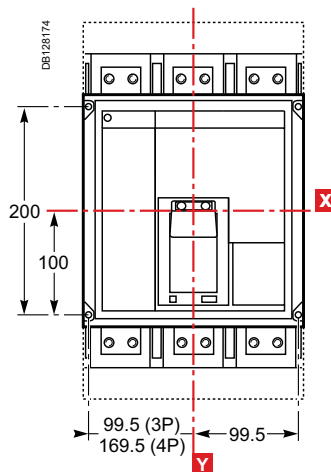
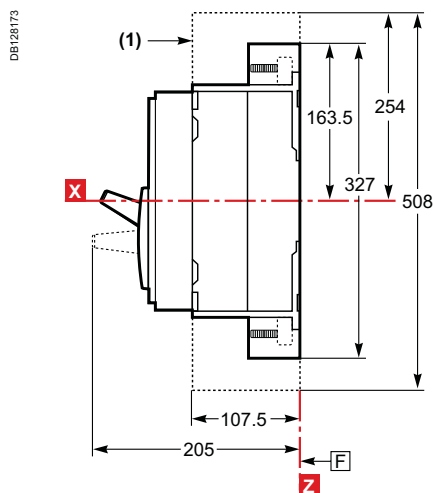


|                                                                       |             |
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# Compact NS630b to 1600 (fixed version) Dimensions

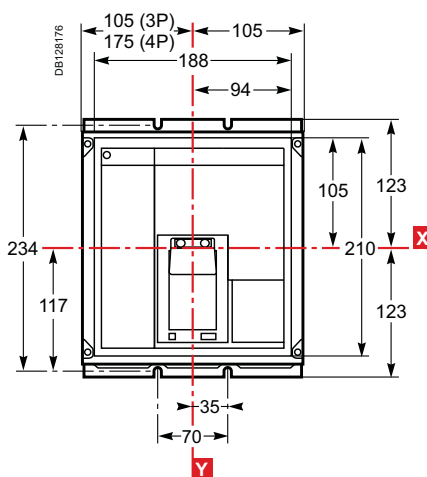
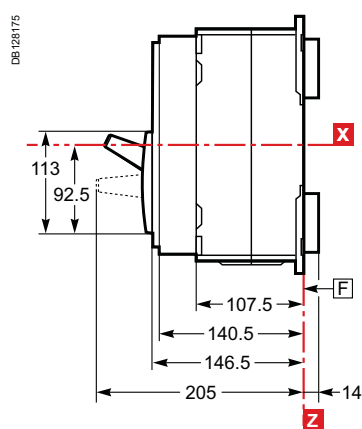
## Manual control

### Front connection (N, L)



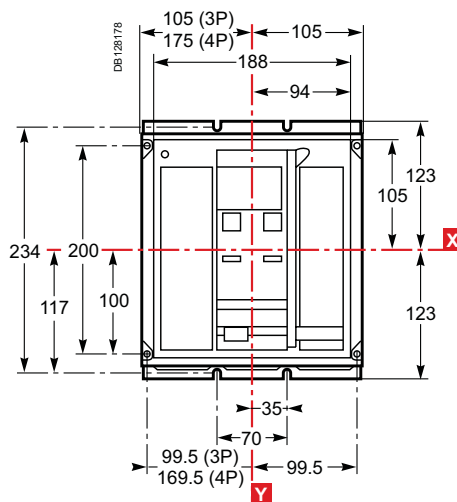
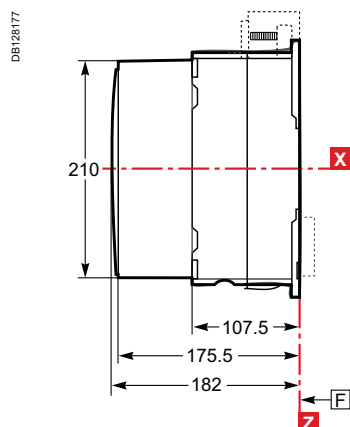
(1) terminal shields are optional

### Rear connection (N, L, LB)



## Electrical control

### Front and rear connection (N, L, LB)



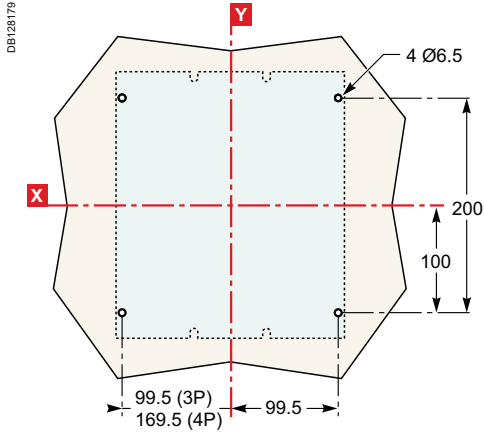
**F** : Datum

**Note.**  
Dimensions for front and rear connection on electrically operated devices are identical to those for manually operated devices.

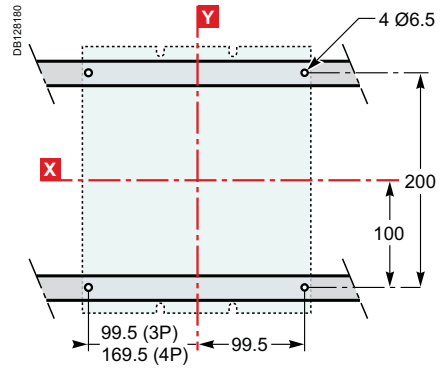
# Mounting

## Front connection

### On backplate



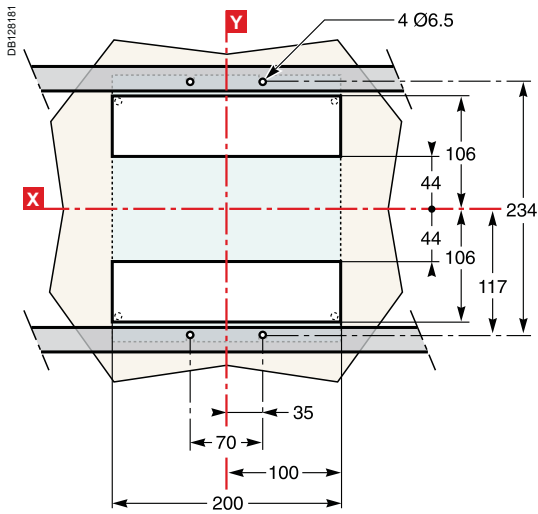
### On rails



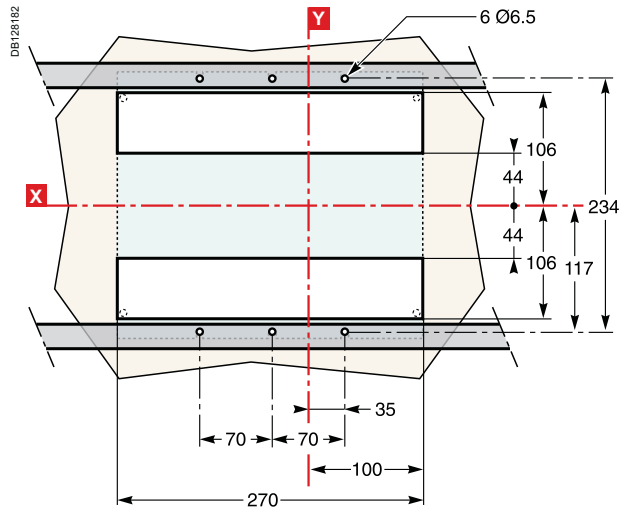
## Rear connection

### On backplate or rails

#### 3P



#### 4P



#### Note.

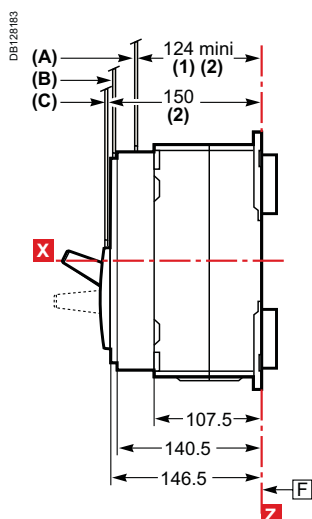
Mounting parameters for electrically operated devices are identical to those for manually operated devices.

X and Y are the symmetry planes for a 3-pole device

Z is the back plane of the device.

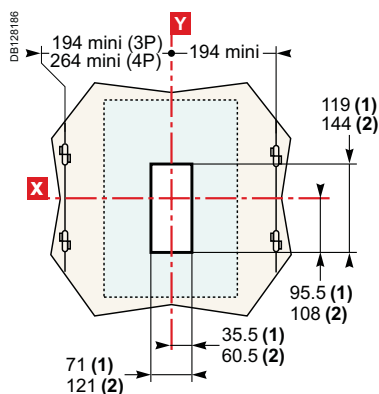
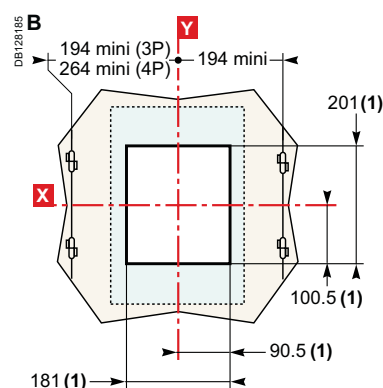
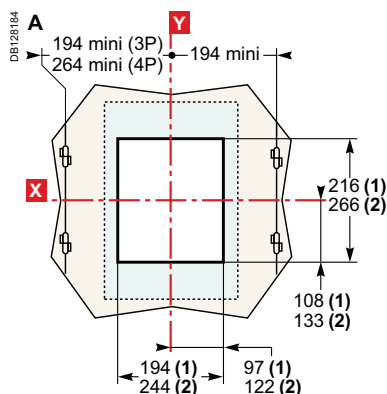
# Compact NS630b to 1600 (fixed version) Front-panel cutouts

## Toggle control

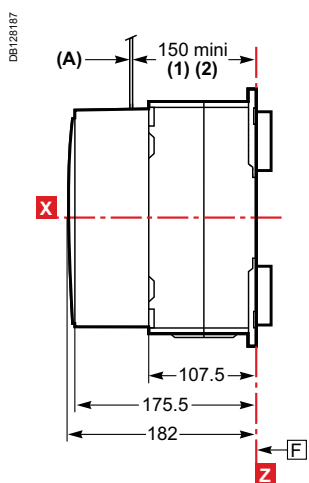


**F** : Datum.  
(1) Without escutcheon.  
(2) With escutcheon.

### Door cutout

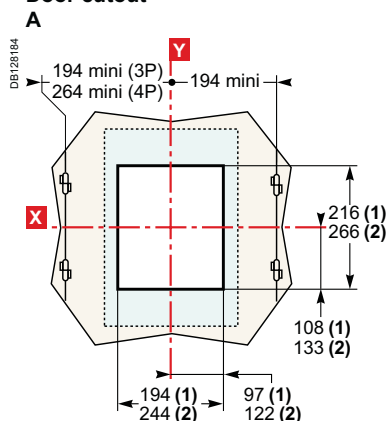


## Electrical control



**F** : Datum.  
(1) Without escutcheon.  
(2) With escutcheon.

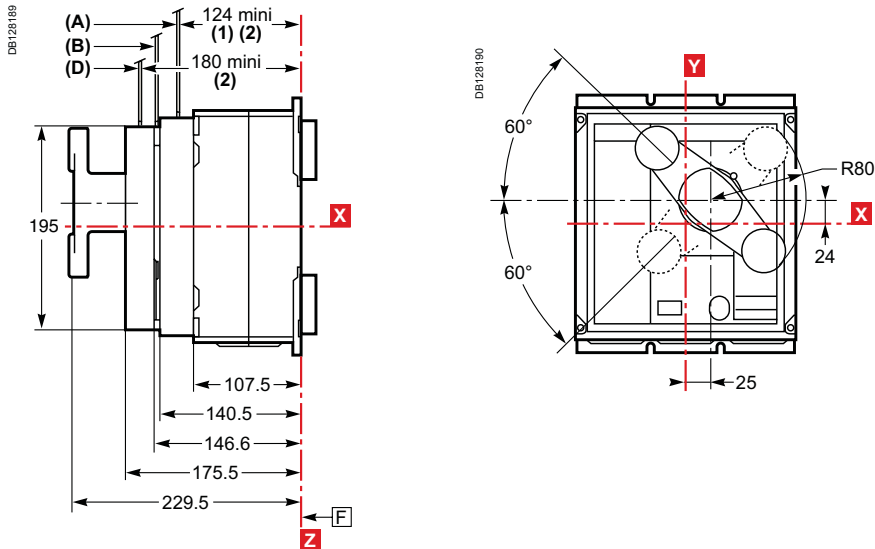
### Door cutout



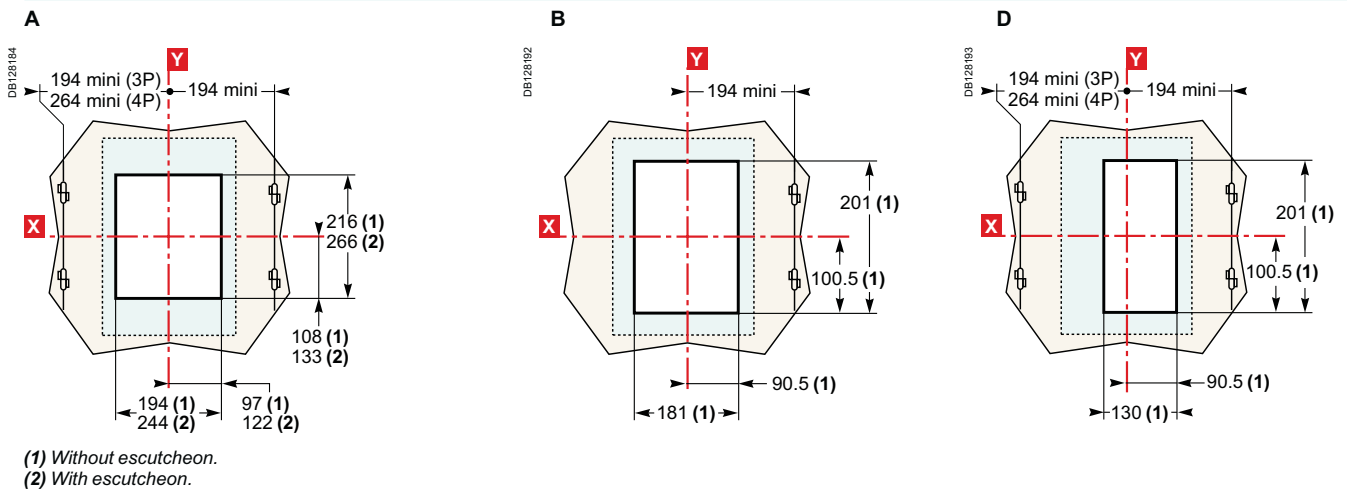
# Rotary handle

## Direct rotary handle

### Dimensions

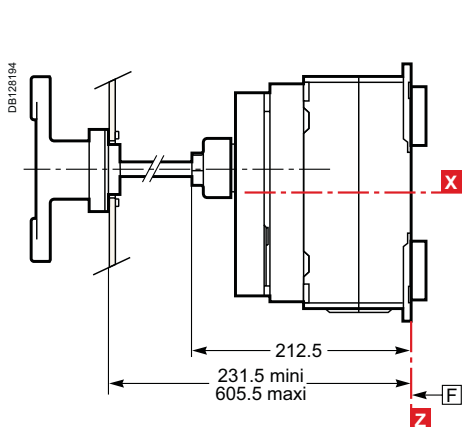


### Door cutout

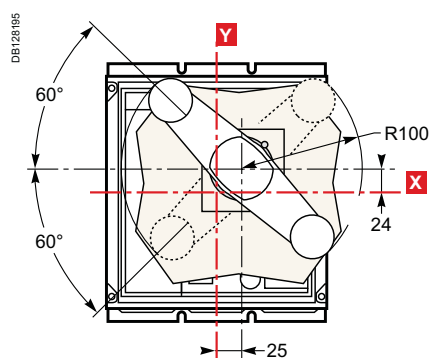


## Extended rotary handle

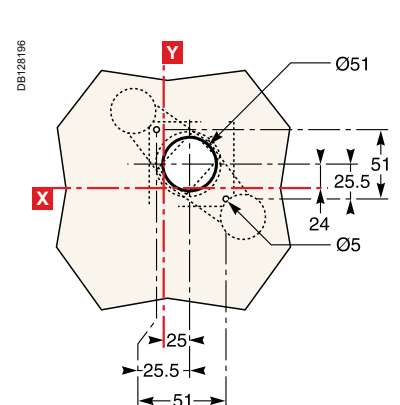
### Dimensions



**F** : Datum



**Note.**  
X and Y are the symmetry planes for a 3-pole device  
Z is the back plane of the device.



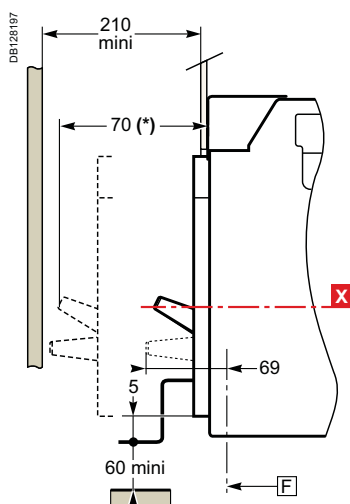


# Compact NS630b to 1600 (withdrawable version)

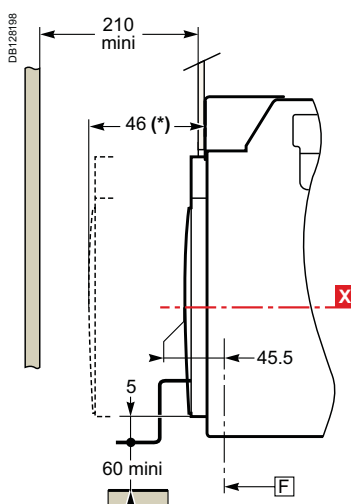
Dimensions, mounting and cutouts

## Dimensions

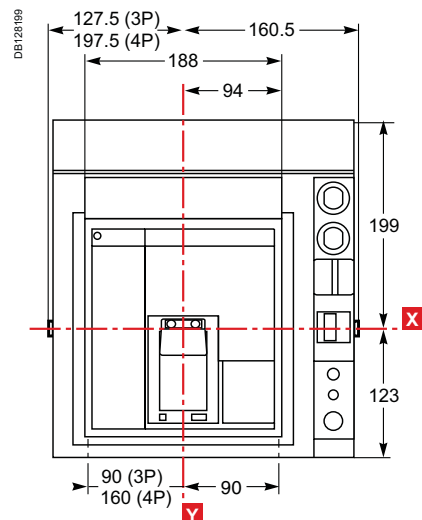
### Manual control



### Electrical control

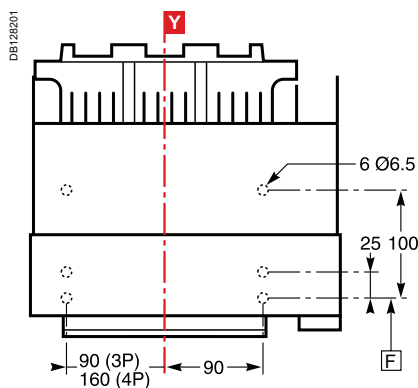
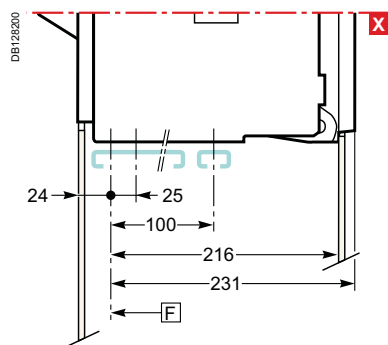


(\*) Withdrawable position

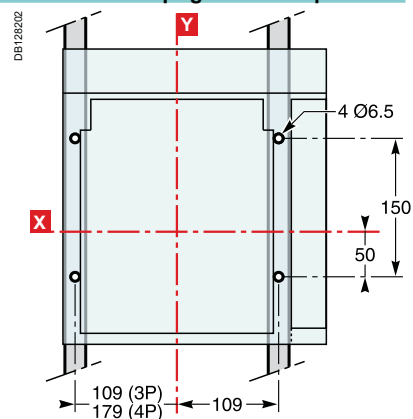


## Mounting

### Bottom mounting on base plate or rails

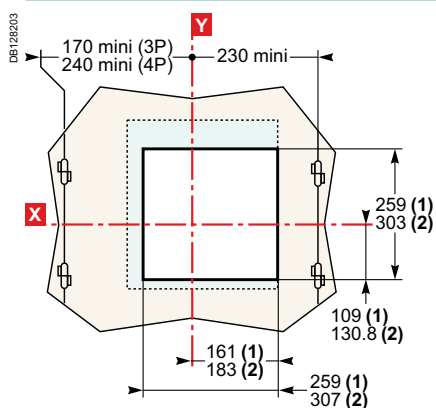


### Vertical on uprights or backplate

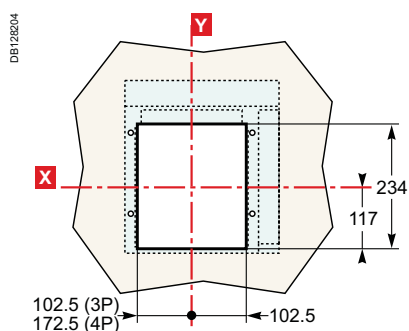


## Cutouts

### Door cutout



### Rear panel cutout



(1) Without escutcheon.  
(2) With escutcheon.

[F] : Datum

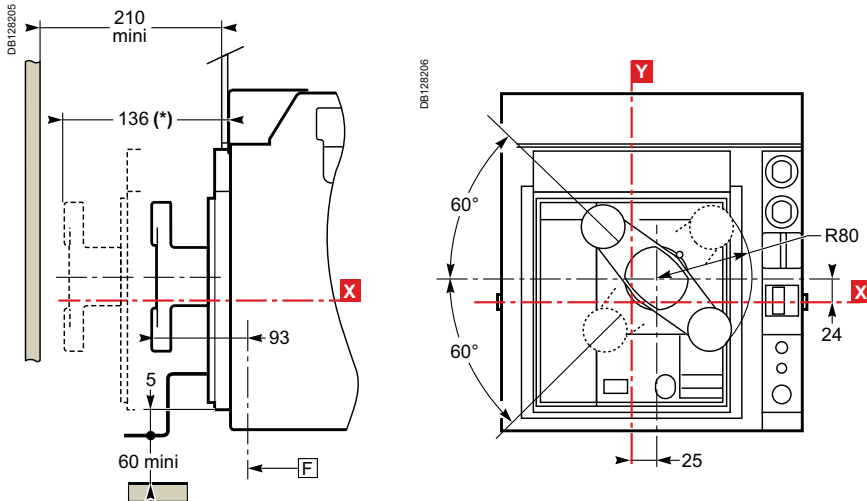
**Note.**

X and Y are the symmetry planes for a 3-pole device.

# Rotary handle

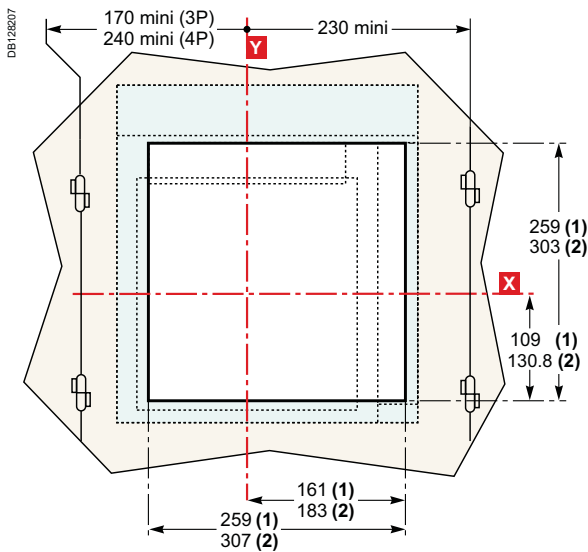
## Direct rotary handle

### Dimensions



(\*) Withdrawable position.

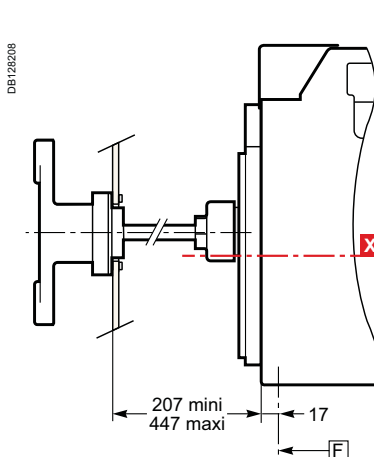
### Door cutout



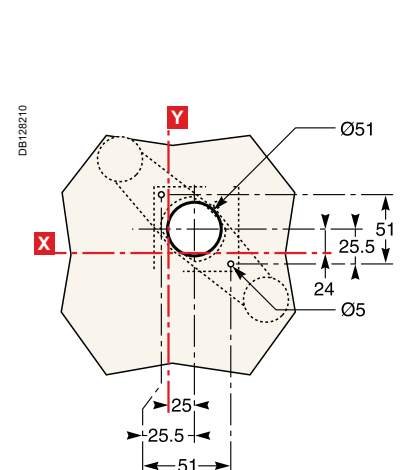
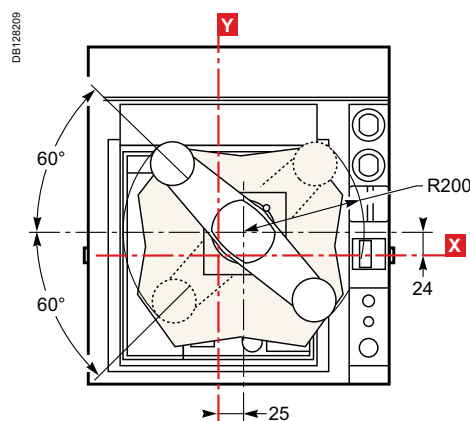
(1) Without escutcheon.  
(2) With escutcheon.

## Extended rotary handle

### Dimensions



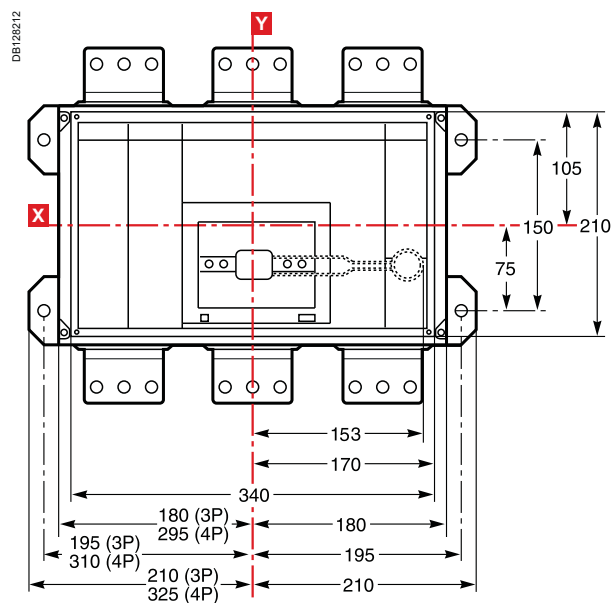
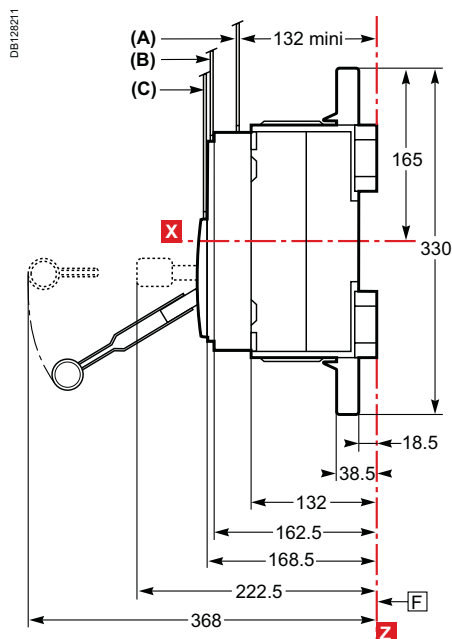
### Door cutout



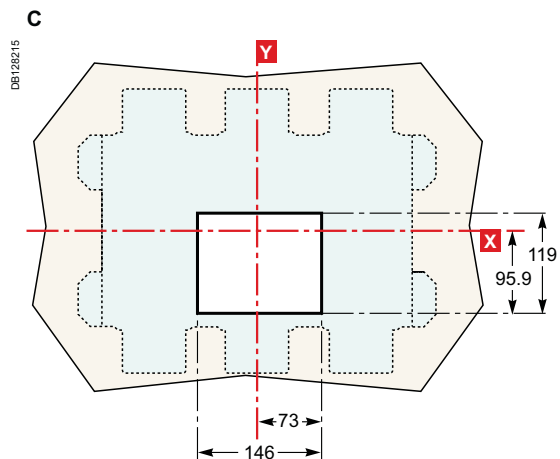
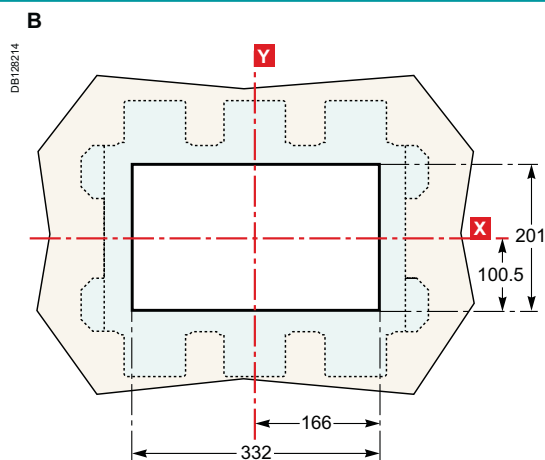
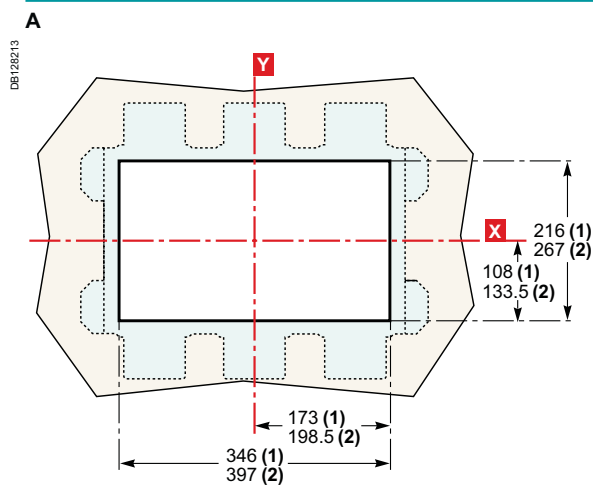
**Note.**  
X and Y are the symmetry planes for a 3-pole device.

# Compact NS1600b to 3200 (fixed version) Dimensions

## Dimensions



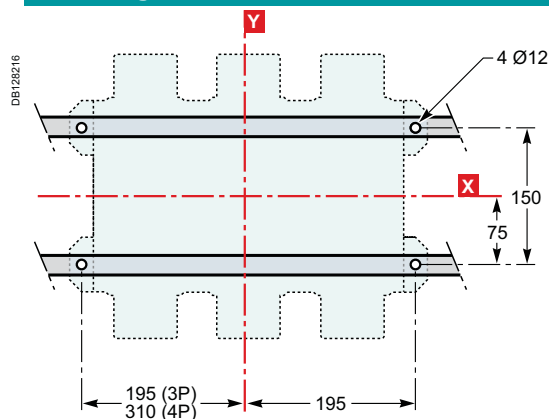
## Door cutout (A, B, C)



F : datum

(1) Without escutcheon.  
(2) With escutcheon.

## Mounting on rails



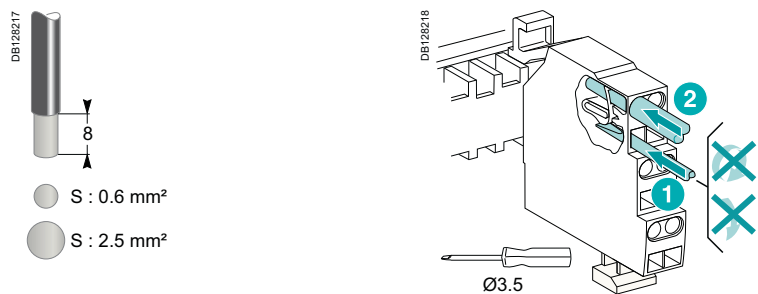
Note.

X and Y are the symmetry planes for a 3-pole device

# Compact NS630b to 3200

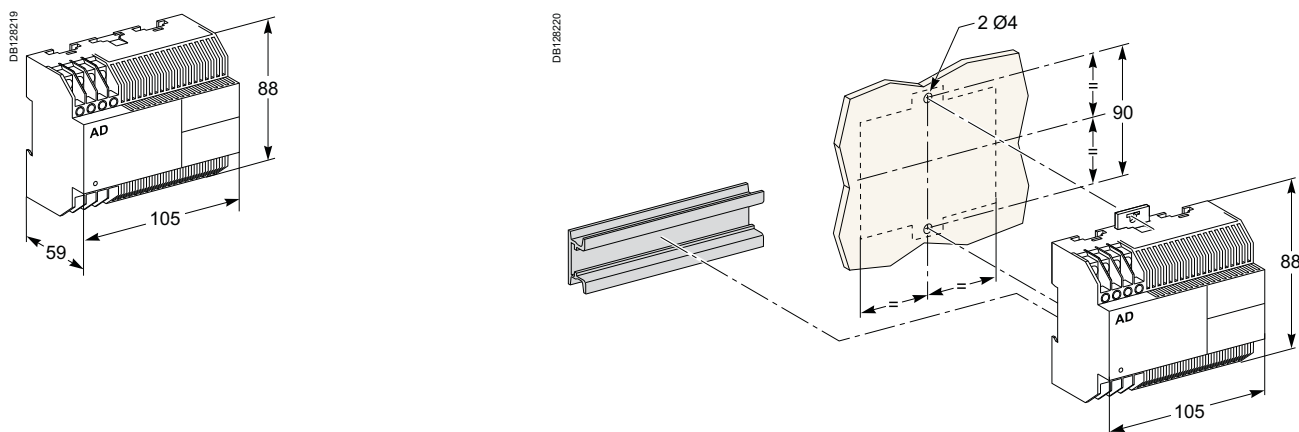
## External modules

### Control-wire connections to terminal block

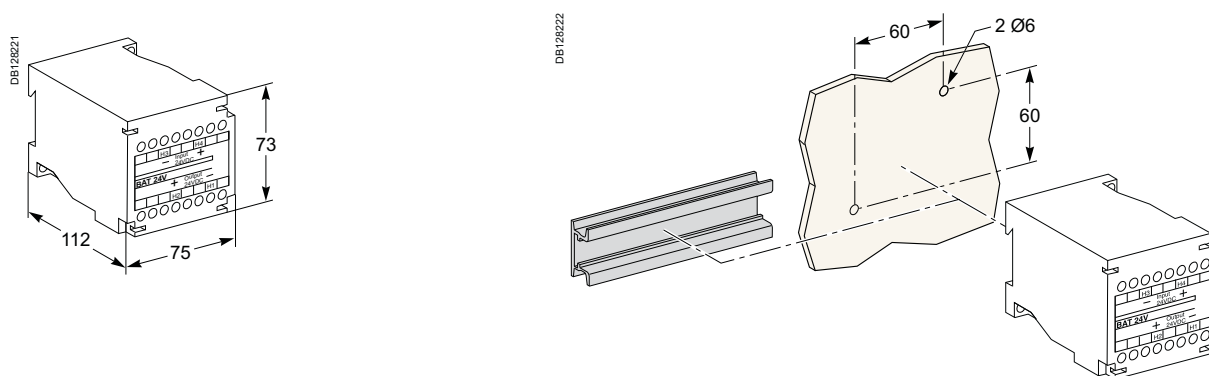


Only one wire per terminal.

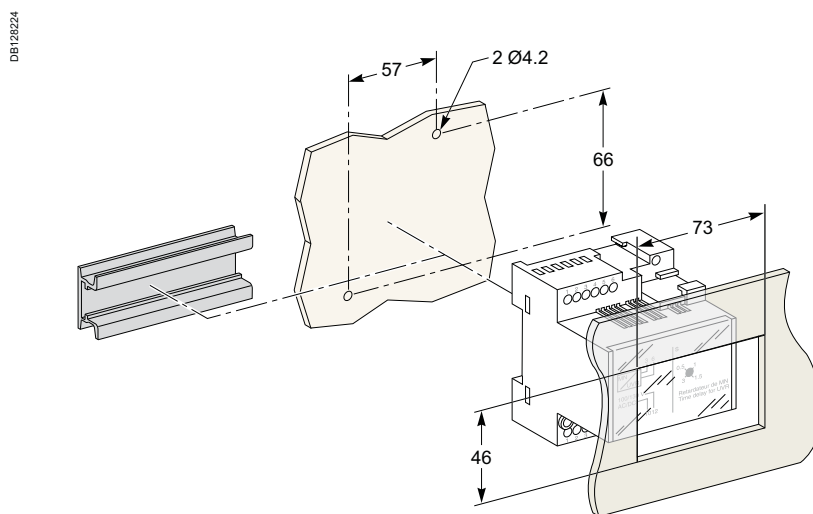
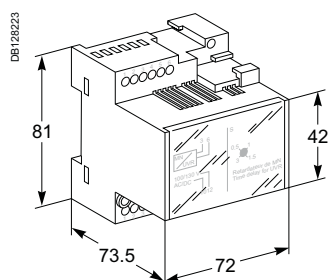
### External power-supply module (AD)



### Battery module (BAT)

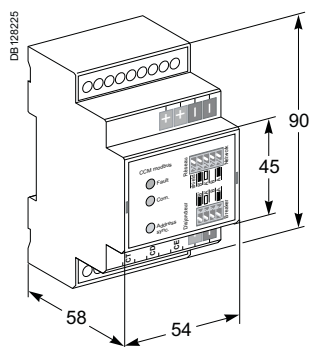


### MN delay unit



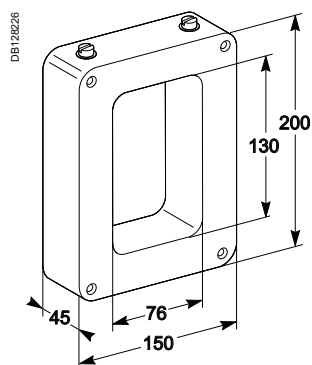
### Chassis communication module

#### Modbus

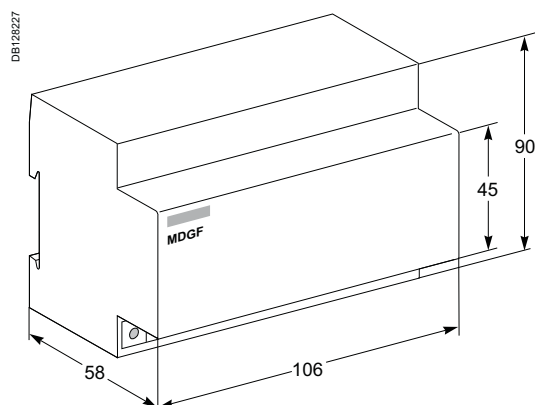


### External sensor for source ground return (SGR) protection

#### External sensor



#### "MDGF" summing module

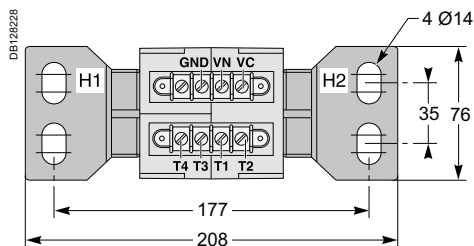


# Compact NS630b to 3200

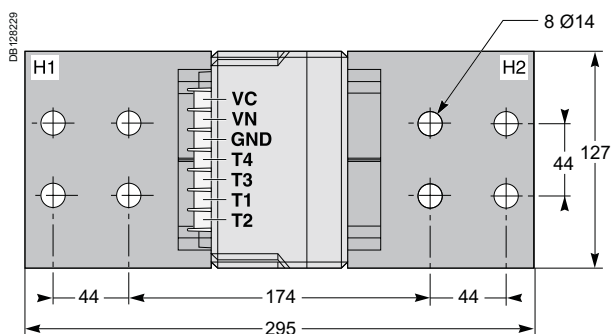
## External modules (cont.)

### External sensor for neutral

400/1600 A (NS630b to 1600)

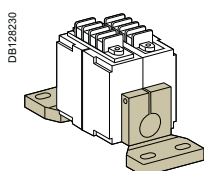


1000/4000 A (NS1600b to 3200)

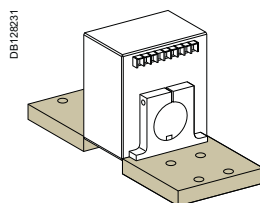


### Installation

400/1600 (NS630b to NS1600)

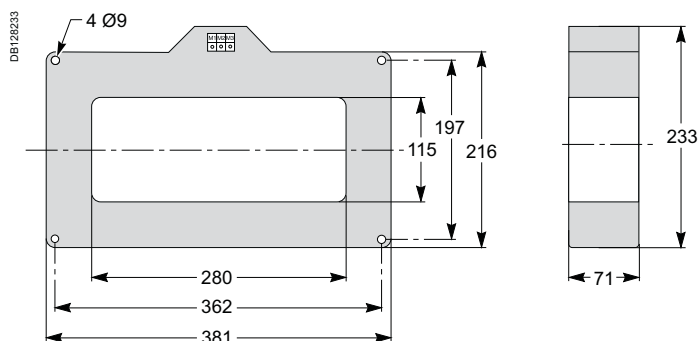
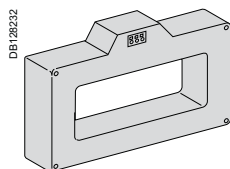


1000/4000 A (NS1600b to NS3200)

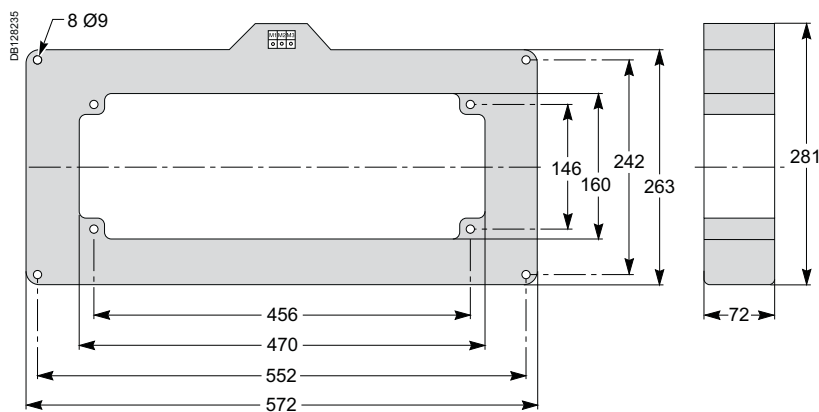
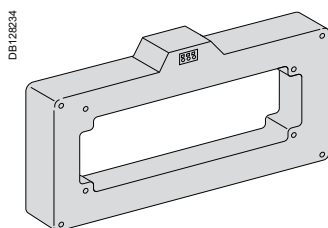


### Rectangular sensor for earth leakage protection (Vigi)

280 x 115 mm window



470 x 160 mm window

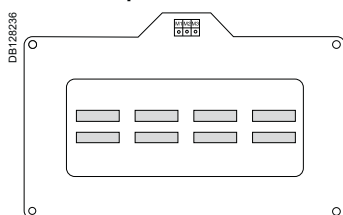


| Busbars     | I ≤ 1600 A | I ≤ 3200 A |
|-------------|------------|------------|
| Window (mm) | 280 x 115  | 470 x 160  |
| Weight (kg) | 14         | 18         |

### Busbars path

280 x 115 mm window

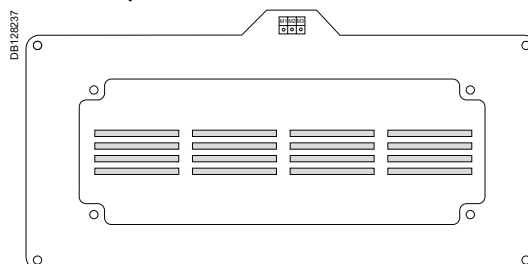
Busbars spaced 70 mm centre-to-centre



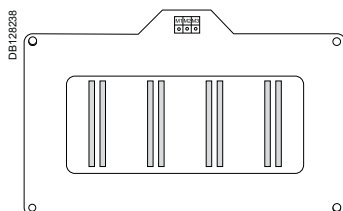
2 bars 50 x 10

470 x 160 mm window

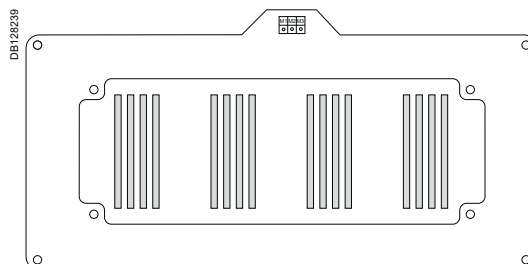
Busbars spaced 115 mm centre-to-centre



4 bars 100 x 5



2 bars 100 x 5



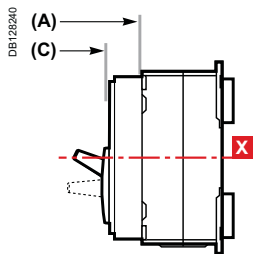
4 bars 125 x 5



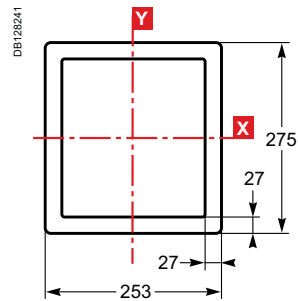
# Accessories NS630b to 3200

## Escutcheon

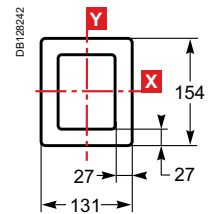
### NS630b to NS1600 (fixed control)



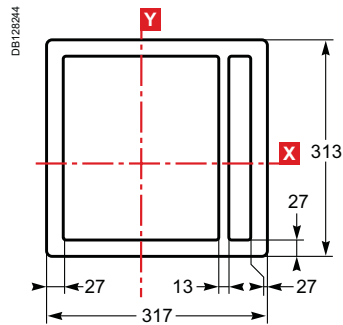
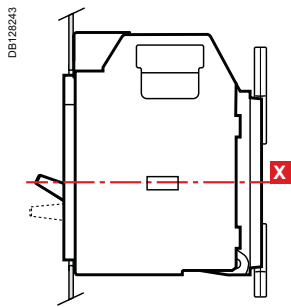
A



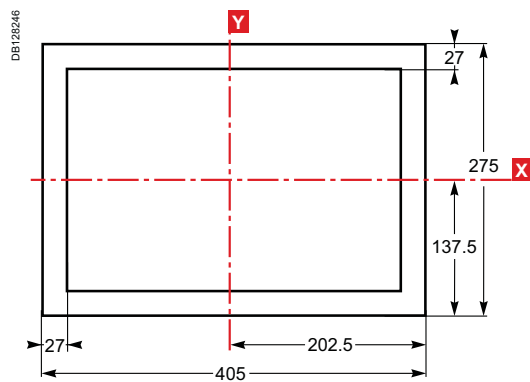
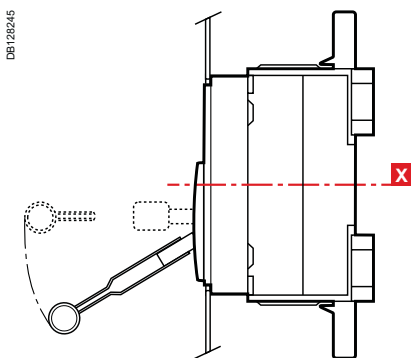
C



### NS630b to NS1600 (withdrawable control)

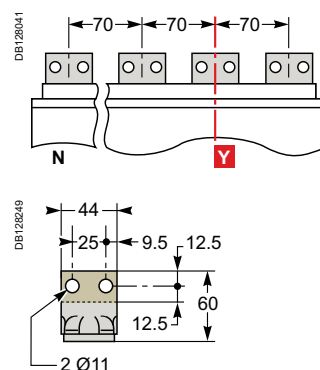
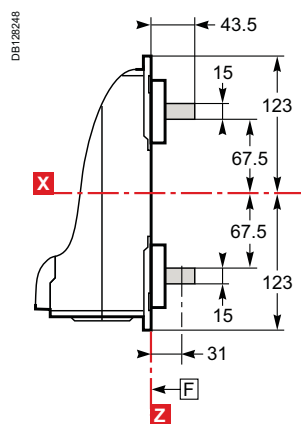
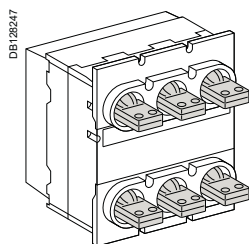


### NS1600b to NS3200 (fixed control)

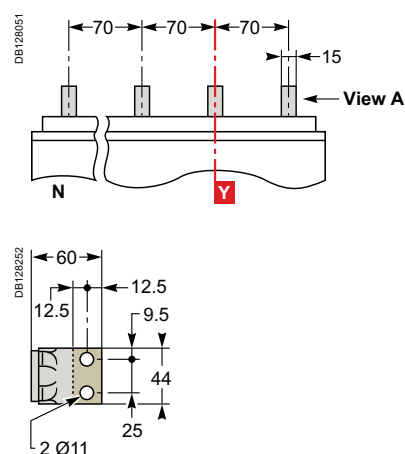
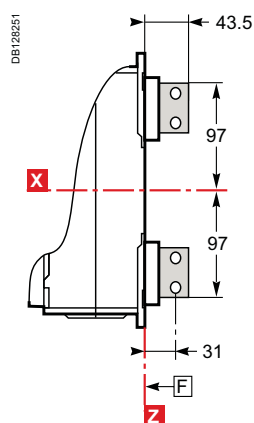
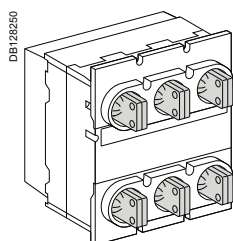


# Compact NS630b to 1600 (fixed version) Bars

## Horizontal rear connection

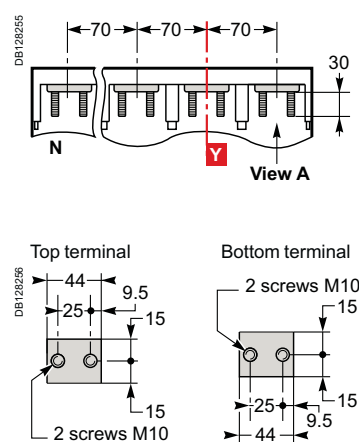
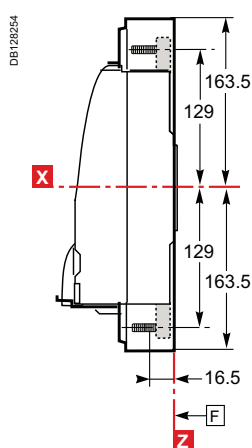
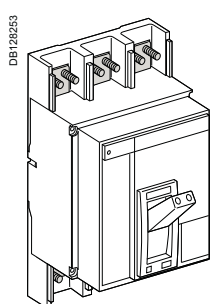


## Vertical rear connection



View A detail.

## Front connection



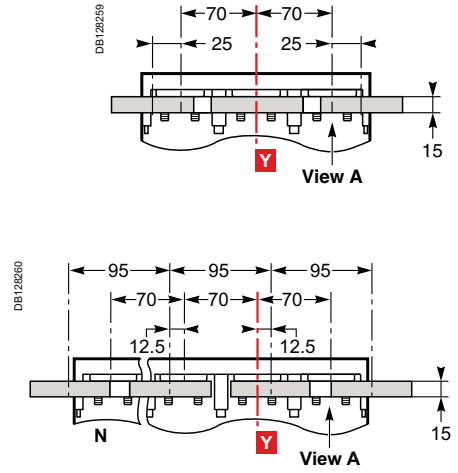
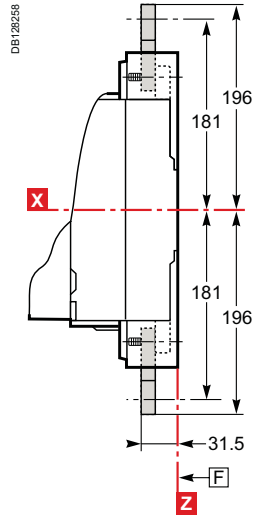
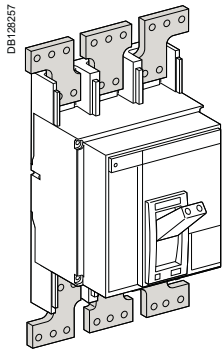
View A detail.

**F** : Datum.

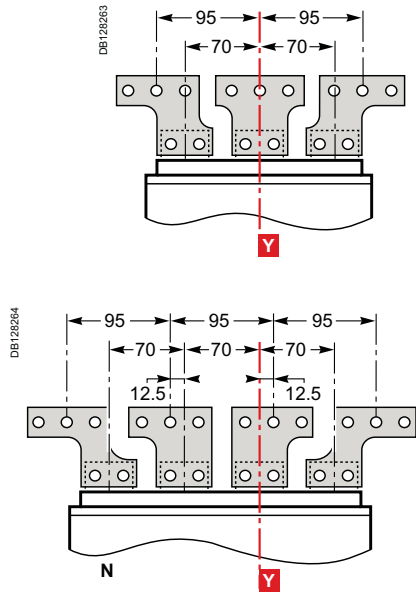
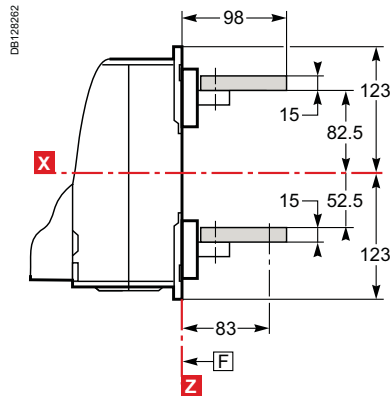
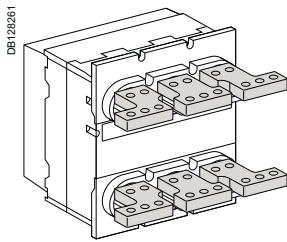
### Note.

Recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

## Front connection with spreaders



## Rear connection with spreaders



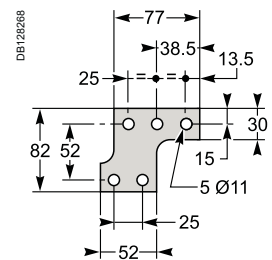
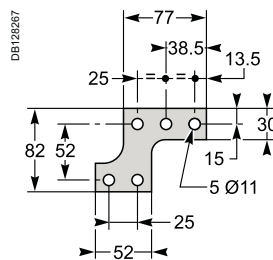
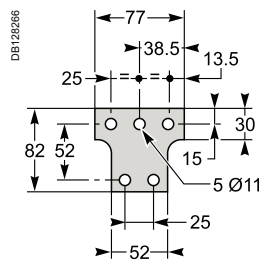
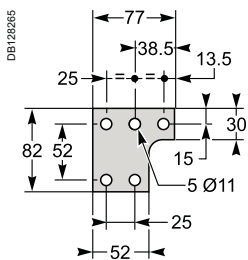
### Spreader detail

Middle left or middle right spreader for 4P

Middle spreader for 3P

Left or right spreader for 4P

Left or right spreader for 3P



View A detail.

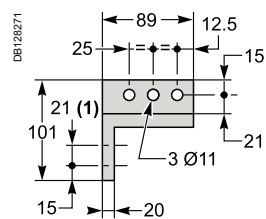
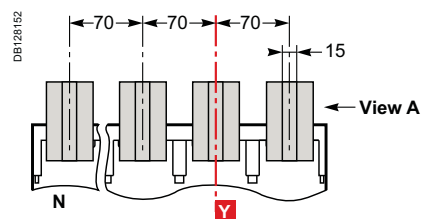
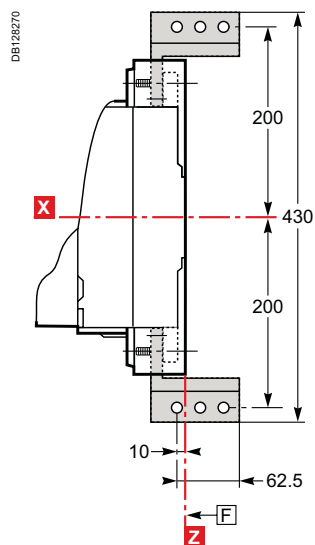
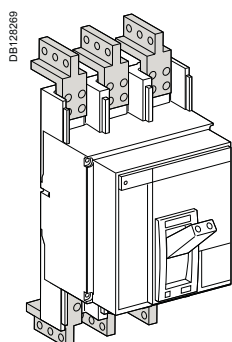
**F** : Datum.

**Note.**

X and Y are the symmetry planes for a 3-pole device.

# Compact NS630b to 1600 (fixed version) Bars

## Front connection with vertical-connection adapters



View A detail.

**F** : Datum.

### Note.

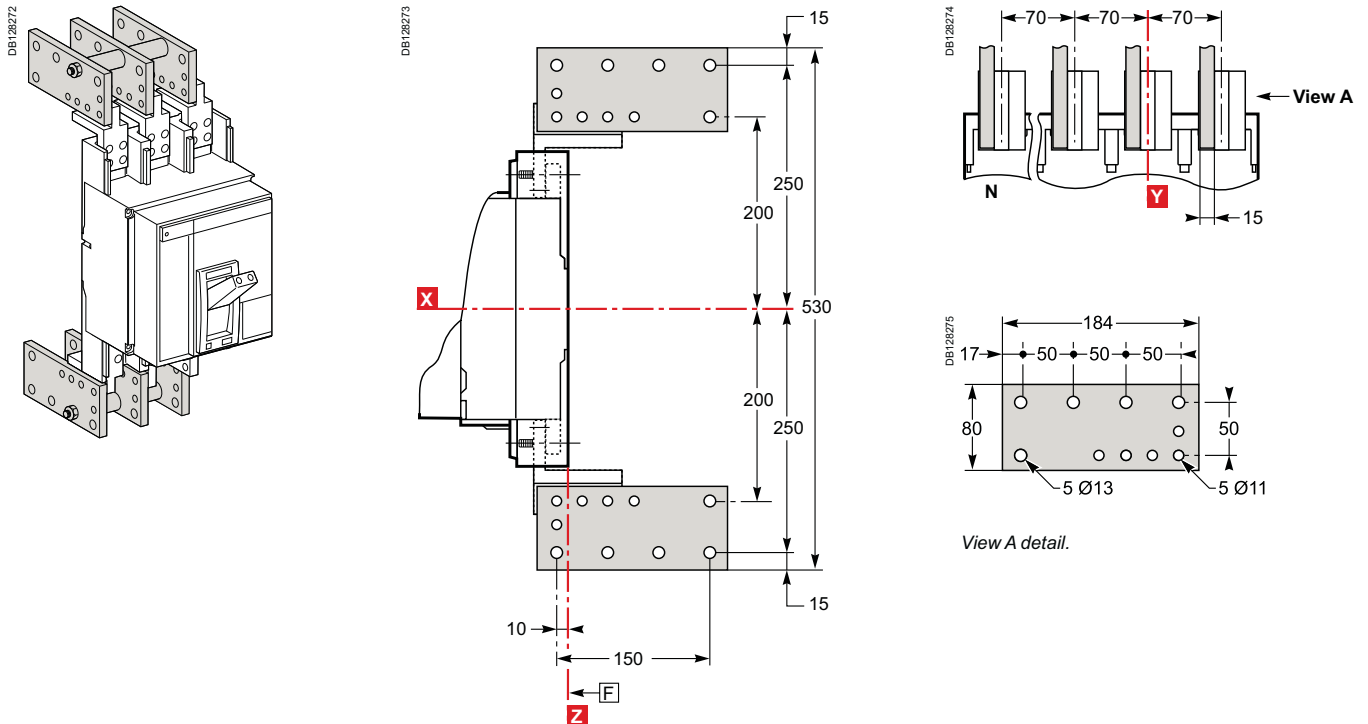
(1) two mounting possibilities for vertical-connection adapters (pitch 21 mm).

Recommended connection screws: **M10** class 8.8.

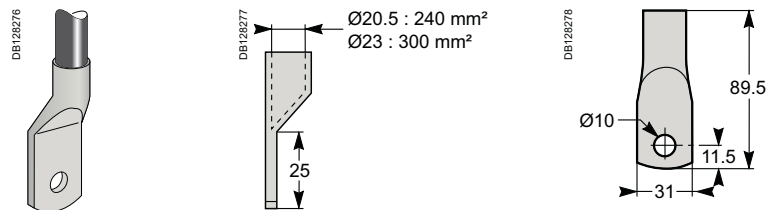
Tightening torque: **50 Nm** with contact washer.

# Cables with lugs and bare cables

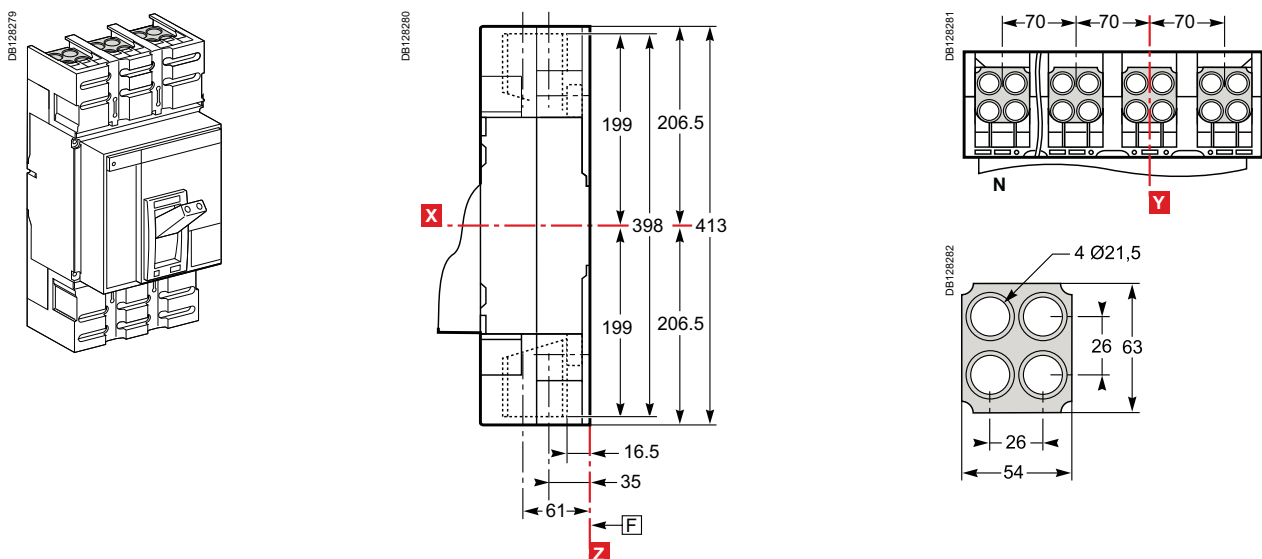
## Front connection with vertical-connection adapters and cable-lug adapters



## Lugs



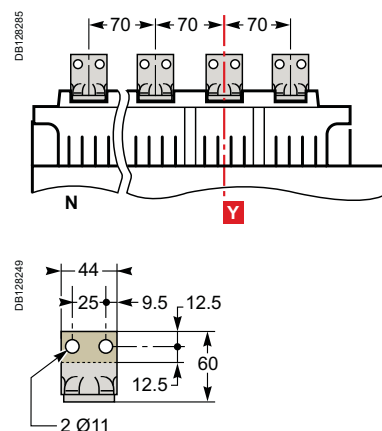
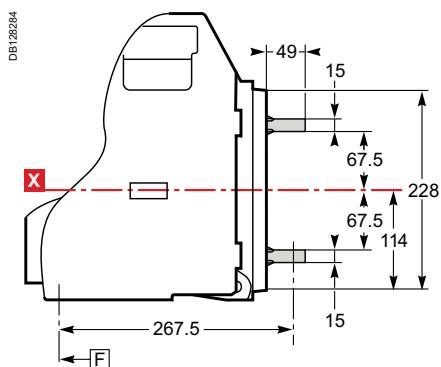
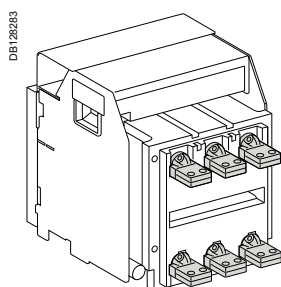
## Fixed circuit breaker with 4-cable bare-cable connectors (240 mm<sup>2</sup>)



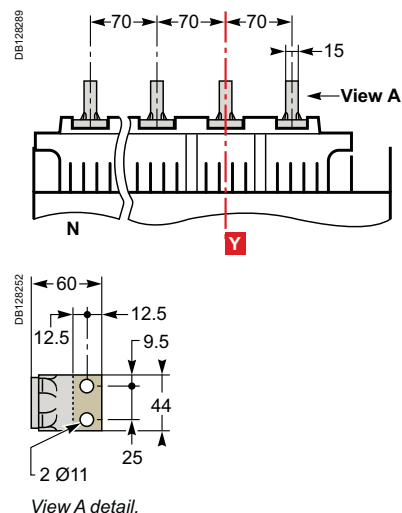
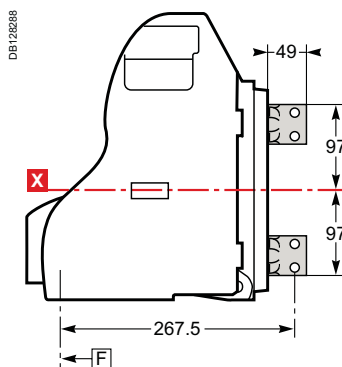
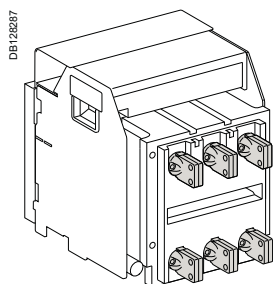
**F** : Datum.

# Compact NS630b to 1600 (plug-in and withdrawable versions) Bars

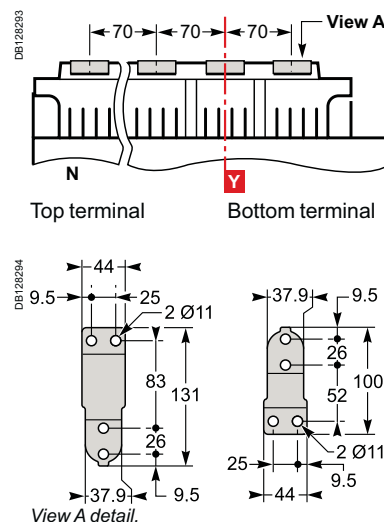
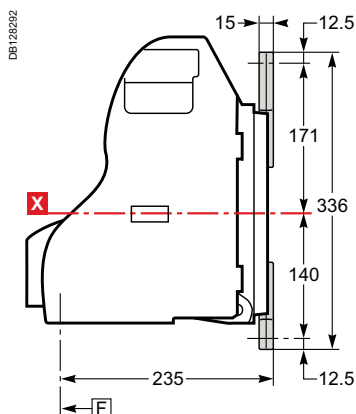
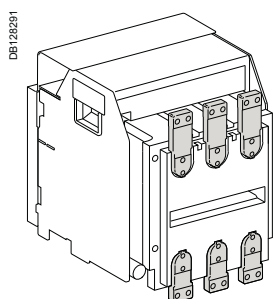
## Horizontal rear connection



## Vertical rear connection



## Front connection

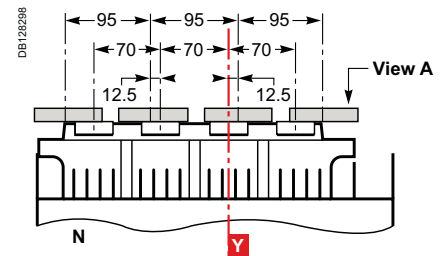
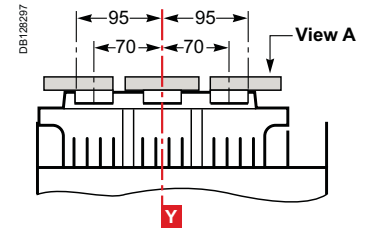
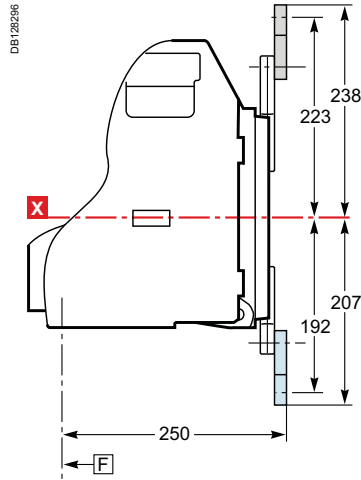
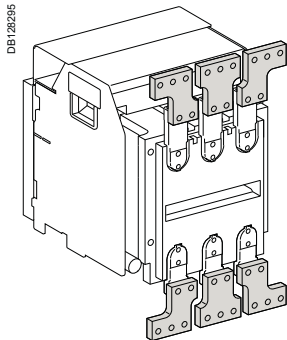


[F] : Datum.

### Note.

Recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

## Front connection with spreaders



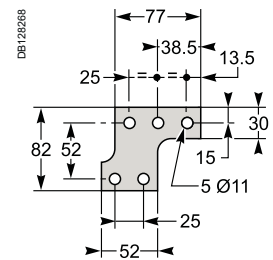
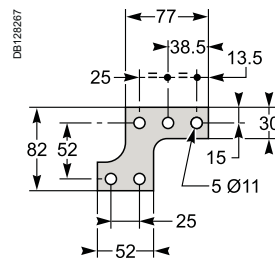
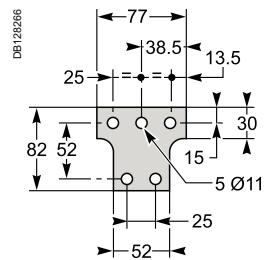
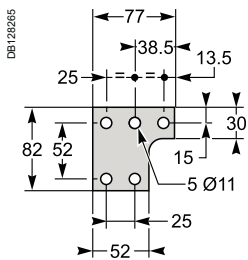
### Spreader detail

Middle left or middle right spreader for 4P

Middle spreader for 3P

Left or right spreader for 4P

Left or right spreader for 3P

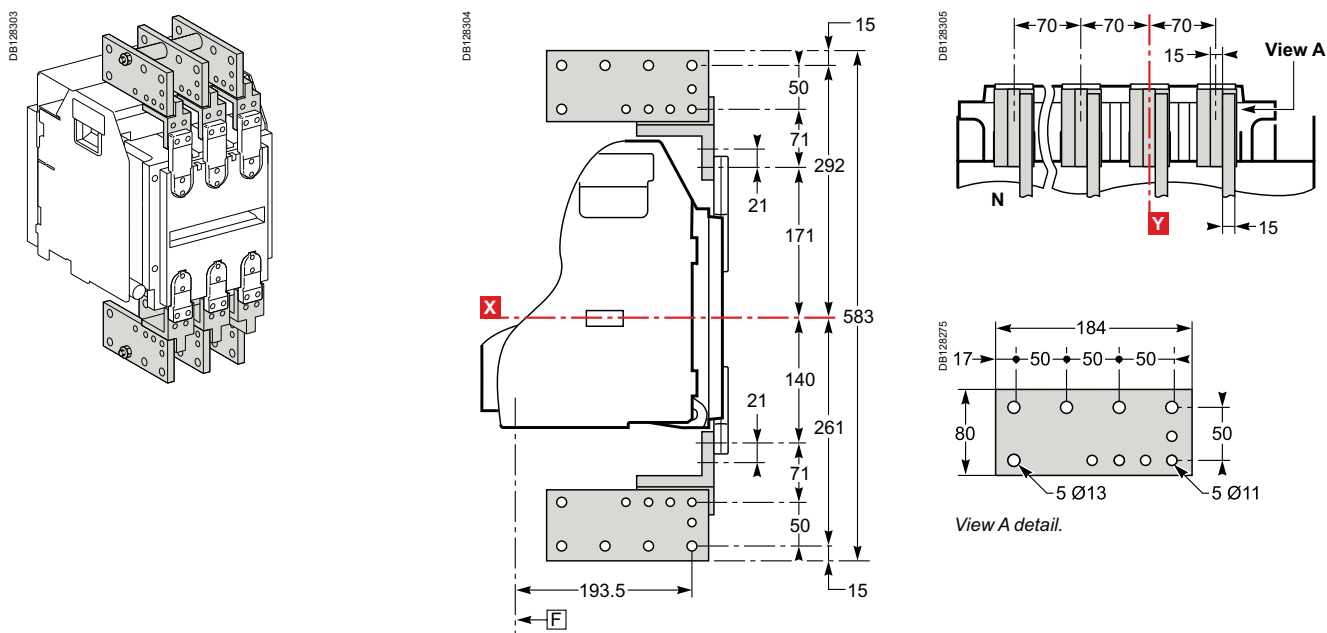


View A detail.

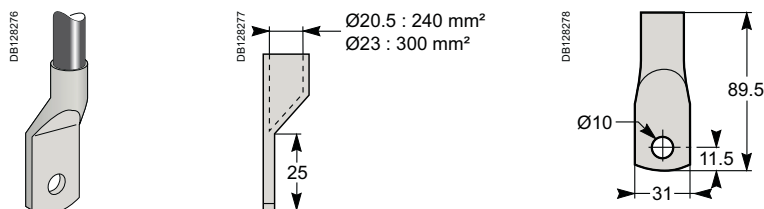
F : Datum.

# Compact NS630b to 1600 (plug-in and withdrawable versions) Cables with lugs

## Front connection with vertical-connection adapters and cable-lug adapters



## Lugs



**F** : Datum.

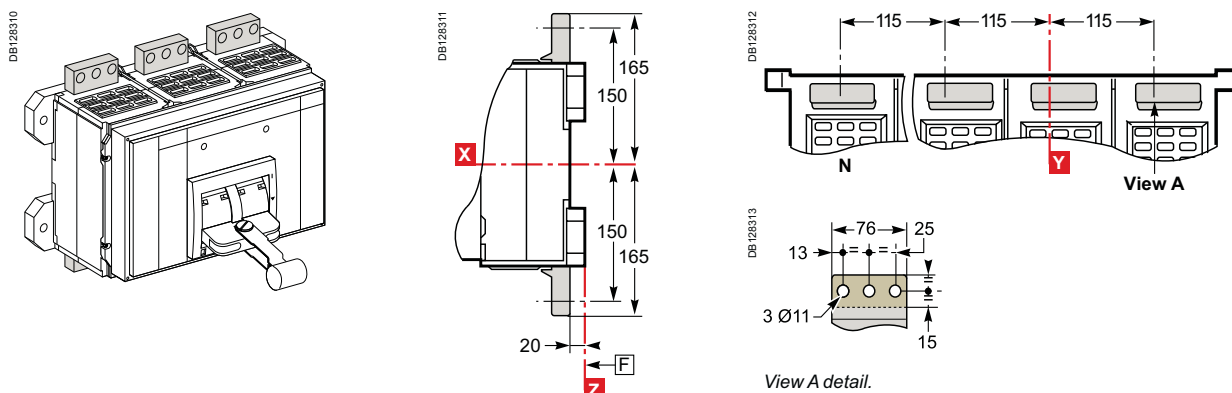
### Note.

**X** and **Y** are the symmetry planes for a 3-pole device.  
Recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

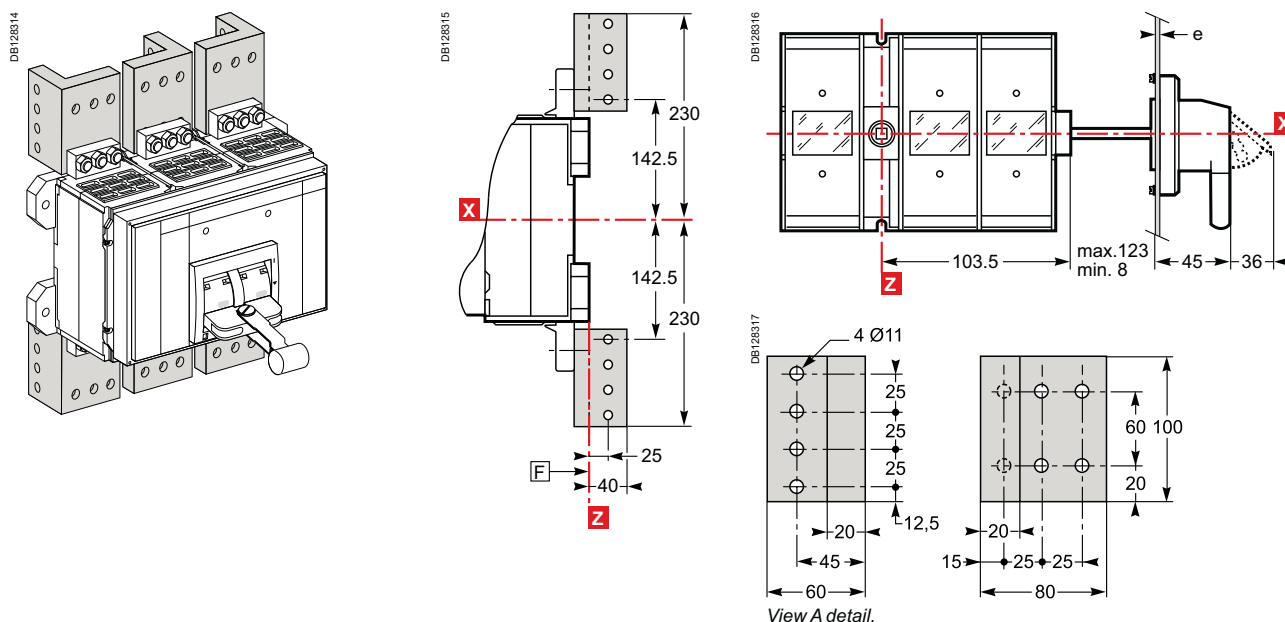


# Compact NS1600b to 3200 (fixed version)

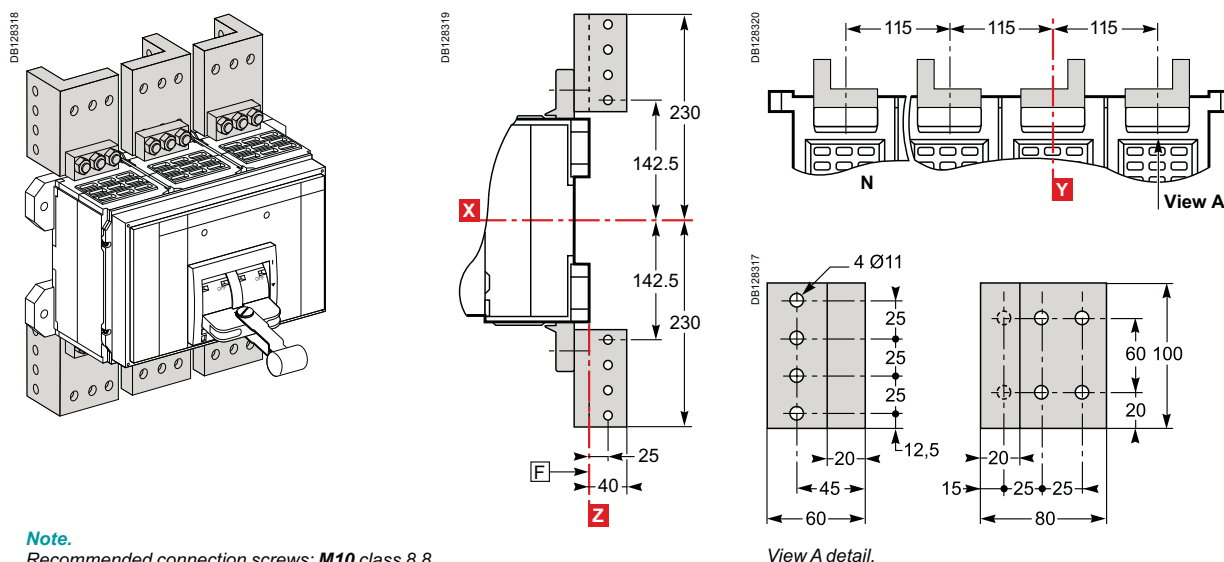
## Front connection (NS1600b to 2500)



## Front connection with vertical-connection adapters (NS1600b to 2500)



## Front connection (NS3200)



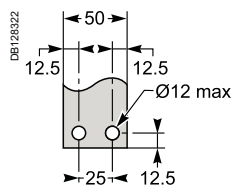
### Note.

Recommended connection screws: **M10** class 8.8.  
Tightening torque: **50 Nm** with contact washer.

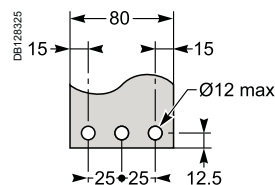
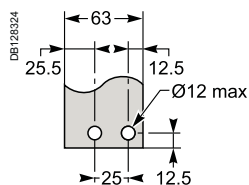
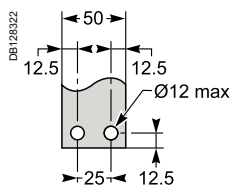
# Power connections for Compact NS630b to 1600

## Recommended drilling dimensions

### Rear connection



### Rear connection with spreaders

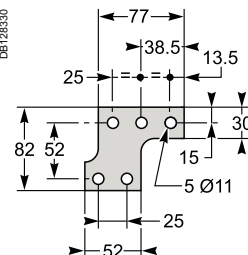
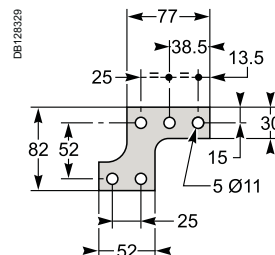
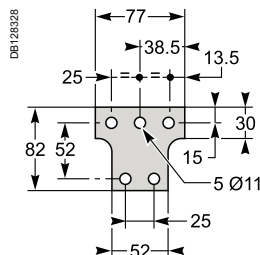
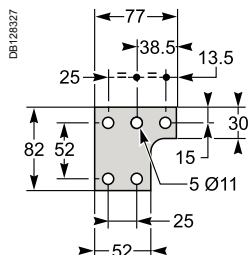
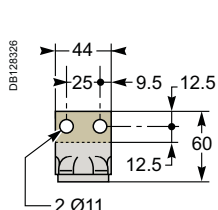


Middle left or middle right spreader for 4P

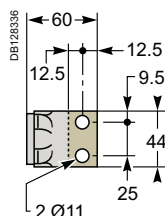
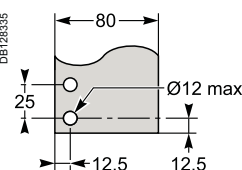
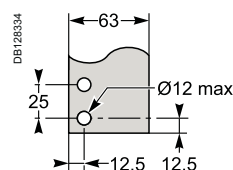
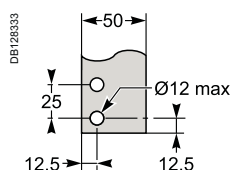
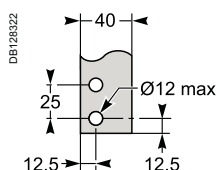
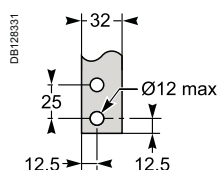
Middle spreader for 3P

Left or right spreader for 4P

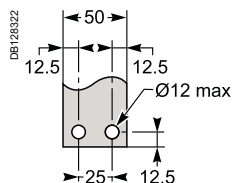
Left or right spreader for 3P



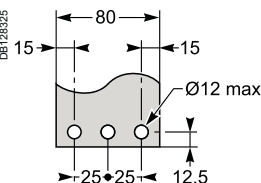
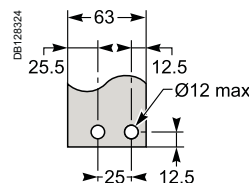
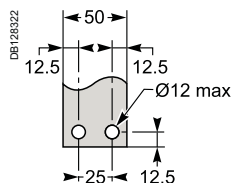
### Vertical rear connection



### Front connection

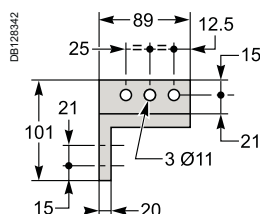
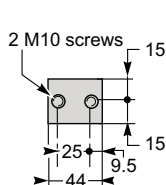
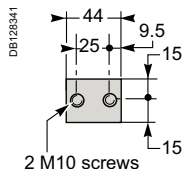


### Front connection with vertical-connection adapter



Top terminal

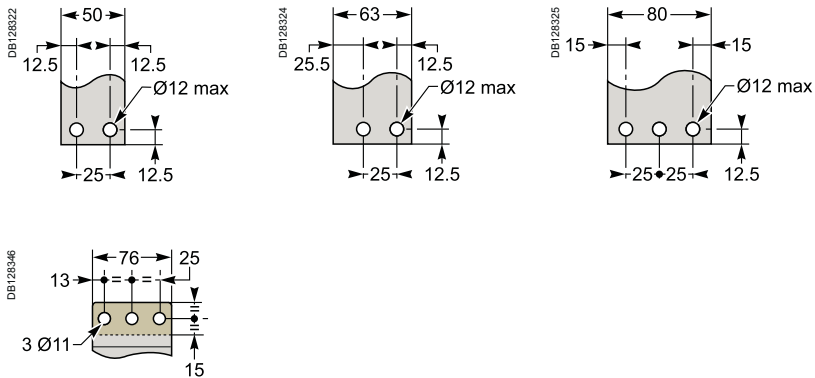
Bottom terminal



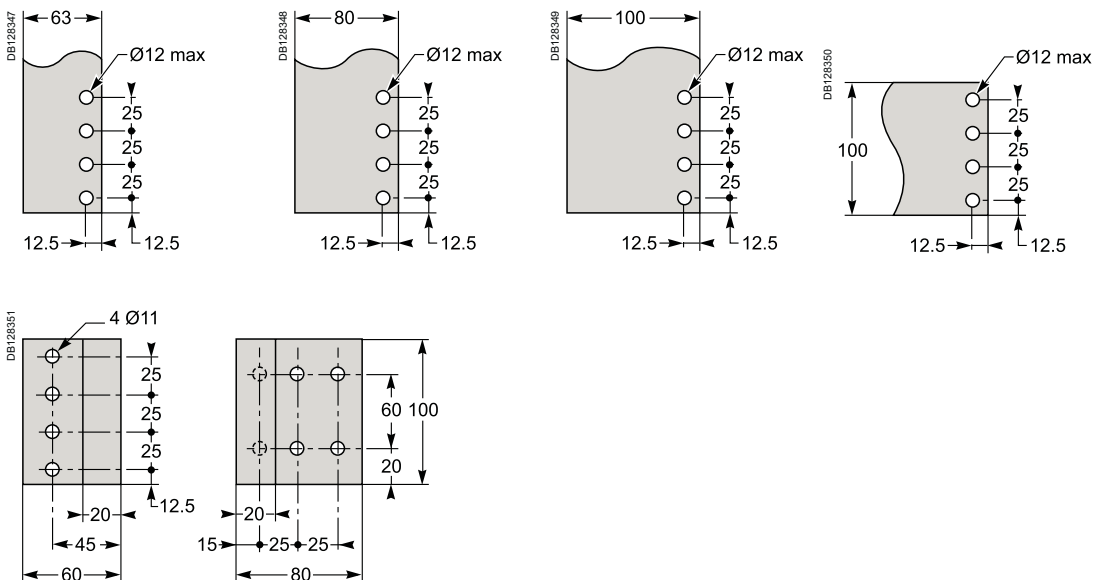
# Power connections for Compact NS1600b to 3200

## Recommended drilling dimensions

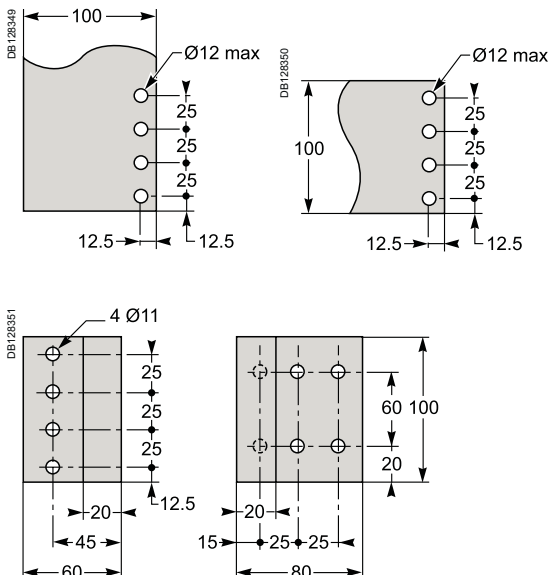
### Front connection (NS1600b to 2500)



### Front connection with vertical-connection adapter (NS1600b to 2500)



### Front connection (NS3200)



# Power connections for Compact NS630b to 3200

## Conductor materials and electrodynamic stresses

Compact circuit breakers can be connected indifferently with bare-copper, tinned-copper and tinned-aluminium conductors (flexible or rigid bars, cables). In the event of a short-circuit, thermal and electrodynamic stresses will be exerted on the conductors. They must therefore be correctly sized and maintained in place using supports.

Electrical connection points on all types of devices (switch-disconnectors, contactors, circuit breakers, etc.) should not be used for mechanical support.

Any partition between upstream and downstream connections of the device must be made of non-magnetic material.

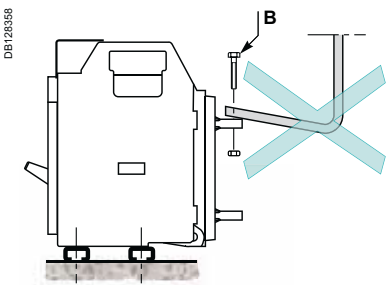
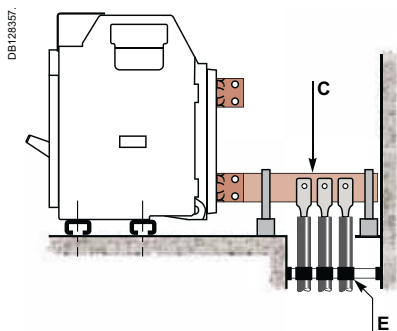
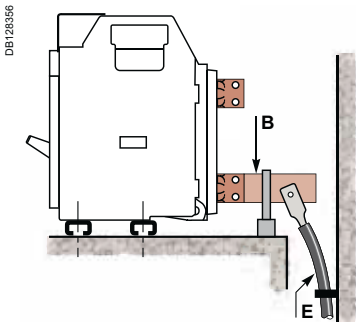
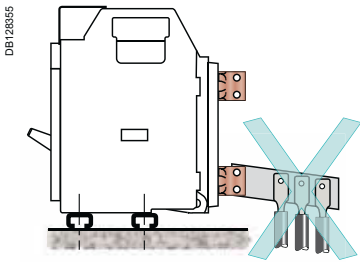
## Ties for flexible bars and cables

The table below indicates the maximum distance between ties depending on the prospective short-circuit current.

The maximum distance between ties attached to the switchboard frame is 400 mm.

| Type of tie                        | "Panduit" ties<br>Width: 4.5 mm<br>Maximum load: 22 kg<br>Colour: white |     |    | "Sarel" ties<br>Width: 9 mm<br>Maximum load: 90 kg<br>Colour: black |     |     |    |                  |
|------------------------------------|-------------------------------------------------------------------------|-----|----|---------------------------------------------------------------------|-----|-----|----|------------------|
|                                    | 200                                                                     | 100 | 50 | 350                                                                 | 200 | 100 | 70 | 50 (double ties) |
| Maximum distance between ties (mm) |                                                                         |     |    |                                                                     |     |     |    |                  |
| Short-circuit current (kA rms)     | 10                                                                      | 15  | 20 | 20                                                                  | 27  | 35  | 45 | 100              |

**Note.** For cables  $\leq 50 \text{ mm}^2$ , use 9 mm-wide ties.



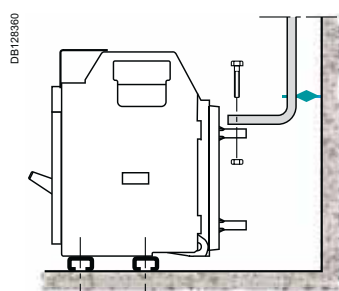
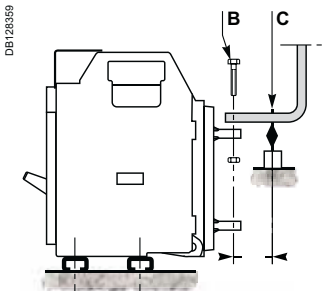
## Connection of bars

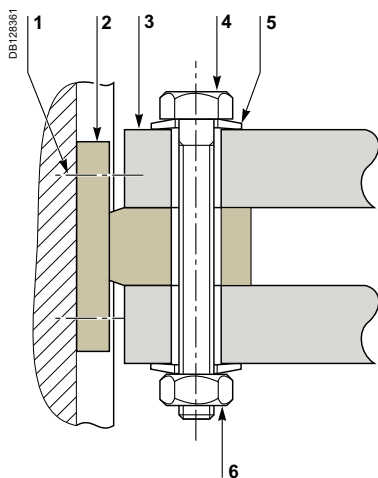
Bars must be adjusted to ensure correct positioning on the terminals before bolting (B). Bars must rest on a support firmly attached to the switchboard frame, such that the circuit-breaker terminals do not bear any weight (C).

## Electrodynamic forces

The first spacer between bars must be positioned within a maximum distance (see table below) of the connection point to the circuit breaker. This distance is calculated to resist the electrodynamic stresses exerted between the bars of each phase during a short-circuit.

| Maximum distance A between the circuit-breaker connection and the first spacer between bars, depending on the short-circuit current |     |     |     |     |     |     |
|-------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|
| I <sub>sc</sub> (kA)                                                                                                                | 30  | 50  | 65  | 80  | 100 | 150 |
| Distance (mm)                                                                                                                       | 350 | 300 | 250 | 150 | 150 | 150 |





- 1 terminal screws, factory tightened to 13 Nm
- 2 circuit-breaker terminal
- 3 bars
- 4 bolt
- 5 washer
- 6 nut

## Connections

The quality of bar connections depends, among other things, on the tightening torques used for the nuts and bolts. Over-tightening may have the same consequences as under-tightening.

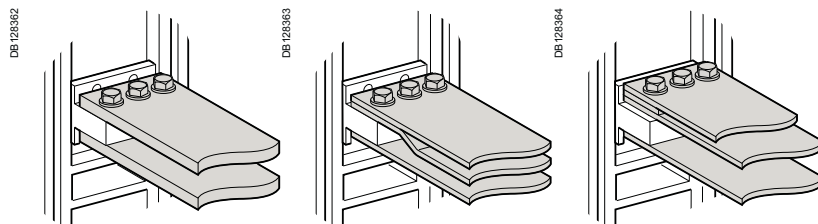
The correct tightening torques for the connection of bars to the circuit-breaker terminals are indicated in the table below.

The values below are for copper bars (Cu ETP-NFA51-100) and steel nuts and bolts (class 8.8).

The same values apply to AGS-T52 quality aluminium bars

(French standard NFA 02-104 and American National Standard H-35-1).

### Examples of bar connections

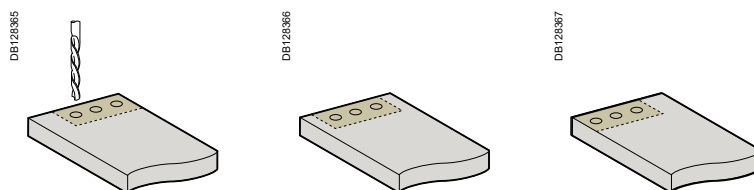


#### Tightening torque for bars

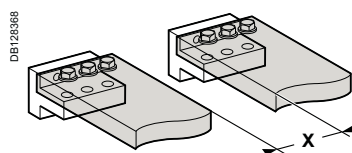
| Rated diameter (mm) | Drilling (mm) diameter | Tightening torque (Nm) with flat or grower washers | Tightening torque (Nm) with contact or split washers |
|---------------------|------------------------|----------------------------------------------------|------------------------------------------------------|
| 10                  | 11                     | 37.5                                               | 50                                                   |

## Bar drilling

### Examples



## Insulation distance

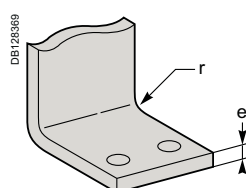


#### Dimensions (mm)

| Utilisation voltage | X minimum |
|---------------------|-----------|
| Ui y 600 V          | 8 mm      |
| Ui y 1000 V         | 14 mm     |

## Bar bending

Bars must be bent according to the table below. A tighter bend may cause cracks.



#### Dimensions (mm)

| e  | Radius r | Recommended |
|----|----------|-------------|
|    | Minimum  |             |
| 5  | 5        | 7.5         |
| 10 | 15       | 18 to 20    |

# Power connections for Compact NS630b to 3200

## Sizing of bars

The following tables are based on the following assumptions:

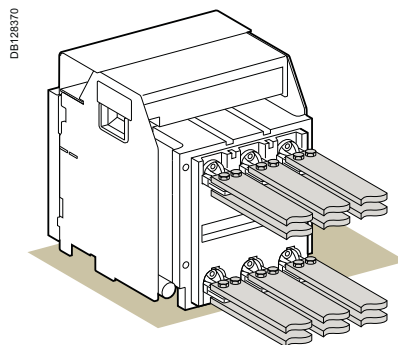
- maximum permissible temperature of bars is 100 °C
- Ti: temperature around the circuit breaker and its connections
- busbars made of copper and not painted.

**Note.**

The values presented in the tables are the result of trials and theoretical calculations on the basis of the assumptions mentioned above.

These tables are intended as an aid in designing connections, however, the actual values must be confirmed by tests on the installation.

### Front or horizontal rear connections

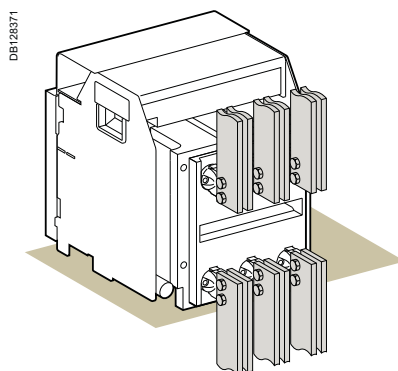


| Compact      | Maximum service current | Ti: 40 °C      |             | Ti: 50 °C      |             | Ti: 60 °C      |             |
|--------------|-------------------------|----------------|-------------|----------------|-------------|----------------|-------------|
|              |                         | Number of bars |             | Number of bars |             | Number of bars |             |
|              |                         | 5 mm thick     | 10 mm thick | 5 mm thick     | 10 mm thick | 5 mm thick     | 10 mm thick |
| NS630b       | 400                     | 2b.30 x 5      | 1b.30 x 10  | 2b.30 x 5      | 1b.30 x 10  | 2b.30 x 5      | 1b.30 x 10  |
| NS630b       | 630                     | 2b.40 x 5      | 1b.40 x 10  | 2b.40 x 5      | 1b.40 x 10  | 2b.40 x 5      | 1b.40 x 10  |
| NS800        | 800                     | 2b.50 x 5      | 1b.50 x 10  | 2b.50 x 5      | 1b.50 x 10  | 2b.50 x 5      | 1b.63 x 10  |
| NS1000       | 1000                    | 3b.50 x 5      | 1b.63 x 10  | 3b.50 x 5      | 2b.50 x 10  | 3b.63 x 5      | 2b.50 x 10  |
| NS1250       | 1250                    | 3b.50 x 5      | 2b.40 x 10  | 3b.50 x 5      | 2b.50 x 10  | 3b.63 x 5      | 2b.50 x 10  |
|              |                         | 2b.80 x 5      | 2b.40 x 10  | 2b.80 x 5      |             |                |             |
| NS1600/1600b | 1400                    | 2b.80 x 5      | 2b.40 x 10  | 2b.80 x 5      | 2b.50 x 10  | 3b.80 x 5      | 2b.63 x 10  |
| NS1600/1600b | 1600                    | 3b.80 x 5      | 2b.63 x 10  | 3b.80 x 5      | 2b.63 x 10  | 3b.80 x 5      | 3b.50 x 10  |
| NS2000       | 1800                    | 3b.80 x 5      | 2b.63 x 10  | 3b.80 x 5      | 2b.63 x 10  | 3b.100 x 5     | 2b.80 x 10  |
| NS2000       | 2000                    | 3b.100 x 5     | 2b.80 x 10  | 3b.100 x 5     | 2b.80 x 10  | 3b.100 x 5     | 3b.63 x 10  |
| NS2500       | 2200                    | 3b.100 x 5     | 2b.80 x 10  | 3b.100 x 5     | 2b.80 x 10  | 4b.80 x 5      | 2b.100 x 10 |
| NS2500       | 2500                    | 4b.100 x 5     | 2b.100 x 10 | 4b.100 x 5     | 2b.100 x 10 | 4b.100 x 5     | 3b.80 x 10  |
| NS3200       | 2800                    | 4b.100 x 5     | 3b.80 x 10  | 4b.100 x 5     | 3b.80 x 10  | 5b.100 x 5     | 3b.100 x 10 |
| NS3200       | 3000                    | 5b.100 x 5     | 3b.80 x 10  | 6b.100 x 5     | 3b.100 x 10 | 8b.100 x 5     | 4b.80 x 10  |
| NS3200       | 3200                    | 6b.100 x 5     | 3b.100 x 10 | 8b.100 x 5     | 3b.100 x 10 |                | 4b.100 x 10 |

**Note.**

With Compact NS630b to NS1600, it is recommended to use 50 mm wideness bars (see "Recommended busbars drilling").

## Vertical rear connections



| Compact | Maximum service current | Ti: 40 °C      |             | Ti: 50 °C      |             | Ti: 60 °C      |             |
|---------|-------------------------|----------------|-------------|----------------|-------------|----------------|-------------|
|         |                         | Number of bars |             | Number of bars |             | Number of bars |             |
|         |                         | 5 mm thick     | 10 mm thick | 5 mm thick     | 10 mm thick | 5 mm thick     | 10 mm thick |
| NS630b  | 400                     | 2b.30 x 5      | 1b.30 x 10  | 2b.30 x 5      | 1b.30 x 10  | 2b.30 x 5      | 1b.30 x 10  |
| NS630b  | 630                     | 2b.40 x 5      | 1b.40 x 10  | 2b.40 x 5      | 1b.40 x 10  | 2b.40 x 5      | 1b.40 x 10  |
| NS800   | 800                     | 2b.50 x 5      | 1b.50 x 10  | 2b.50 x 5      | 1b.50 x 10  | 2b.50 x 5      | 1b.50 x 10  |
| NS1000  | 1000                    | 2b.50 x 5      | 1b.50 x 10  | 2b.50 x 5      | 1b.50 x 10  | 2b.63 x 5      | 1b.63 x 10  |
| NS1250  | 1250                    | 2b.63 x 5      | 1b.63 x 10  | 3b.50 x 5      | 2b.40 x 10  | 3b.50 x 5      | 2b.40 x 10  |
| NS1600  | 1400                    | 2b.80 x 5      | 1b.80 x 10  | 2b.80 x 5      | 2b.50 x 10  | 3b.63 x 5      | 2b.50 x 10  |
| NS1600  | 1600                    | 3b.63 x 5      | 2b.50 x 10  | 3b.63 x 5      | 2b.50 x 10  | 3b.80 x 5      | 2b.63 x 10  |

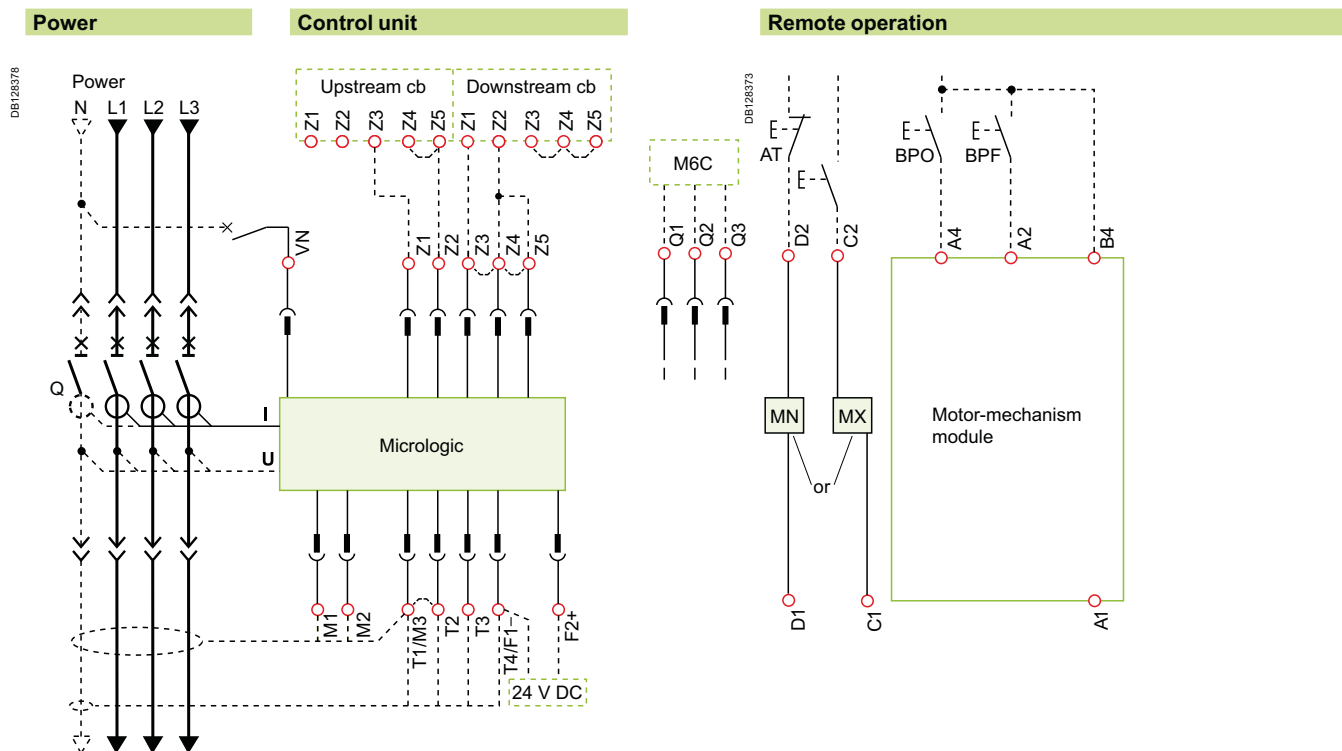




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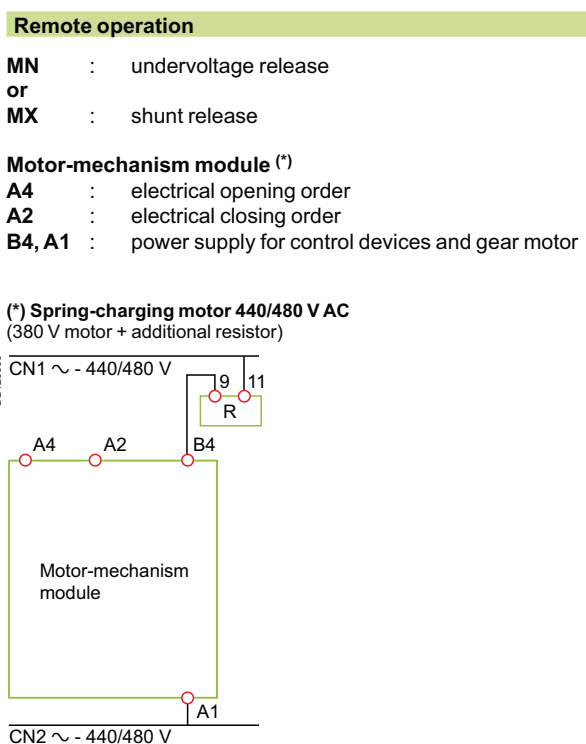
|                                                                                         |             |
|-----------------------------------------------------------------------------------------|-------------|
| <i>Presentation</i>                                                                     | 2           |
| <i>Functions and characteristics</i>                                                    | A-1         |
| <i>Installation recommendations</i>                                                     | B-1         |
| <i>Dimensions and connection</i>                                                        | C-1         |
| <b>Compact NS630b to 1600</b>                                                           | <b>D-2</b>  |
| Fixed circuit breakers                                                                  | D-2         |
| Plug-in / withdrawable circuit breakers                                                 | D-4         |
| <b>Compact NS1600b to 3200</b>                                                          | <b>D-6</b>  |
| Fixed circuit breakers                                                                  | D-6         |
| <b>Compact NS630b to 3200</b>                                                           | <b>D-8</b>  |
| Earth-fault and earth-leakage protection                                                | D-8         |
| Neutral protection                                                                      | D-8         |
| Zone selective interlocking                                                             | D-8         |
| <b>Compact NS630b to 3200</b>                                                           | <b>D-10</b> |
| Communication                                                                           | D-10        |
| <b>Compact NS630b to 3200 fixed</b>                                                     | <b>D-12</b> |
| Wiring of the COM option (Modbus BCM ULP Module)<br>with or without ULP module          | D-12        |
| <b>Withdrawable Compact NS630b to 3200</b>                                              | <b>D-13</b> |
| Wiring of the COM option (Modbus BCM ULP and CCM modules)<br>with or without ULP module | D-13        |
| <b>Compact NS630b to 3200</b>                                                           | <b>D-14</b> |
| Connection of the 24 V DC external power supply AD module                               | D-14        |
| <i>Additional characteristics</i>                                                       | E-1         |

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

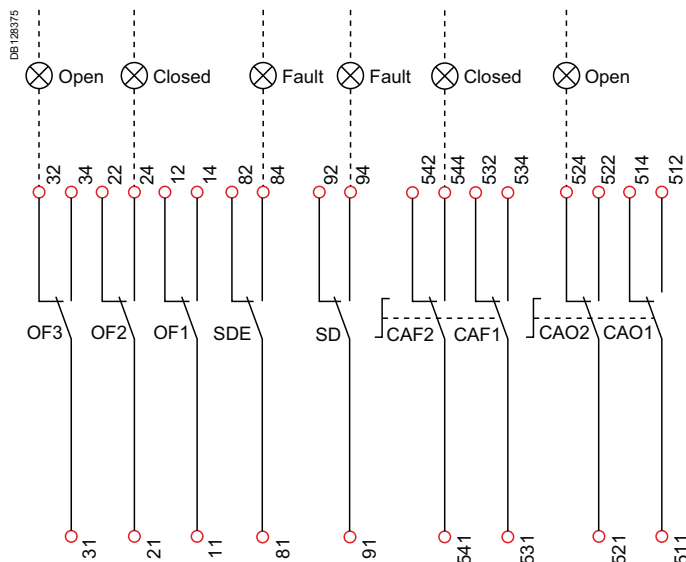


| Basic | A | E | P | Control unit                                                                                                                                                  |
|-------|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ■     | ■ | ■ | ■ | E1-E6 communication                                                                                                                                           |
|       | ■ | ■ | ■ | Z1-Z5 zone selective interlocking:<br>Z1 = ZSI OUT SOURCE<br>Z2 = ZSI OUT ; Z3 = ZSI IN SOURCE<br>Z4 = ZSI IN ST (short time)<br>Z5 = ZSI IN GF (earth fault) |
|       | ■ | ■ | ■ | M1 = Vigi module input<br>(Micrologic 7)                                                                                                                      |
|       | ■ | ■ | ■ | T1, T2, T3, T4 = external neutral;<br>M2, M3 = Vigi module input<br>(Micrologic 7)                                                                            |
|       | ■ | ■ | ■ | F2+, F1- external 24 V DC<br>power supply                                                                                                                     |
|       | ■ | ■ | ■ | VN external voltage connector<br>(must be connected to the neutral<br>with a 3P circuit breaker)                                                              |
|       |   |   | ■ | <b>M6C</b> : 6 programmable contacts (to<br>be connected to the external module<br>M6C) ext. 24 V DC power supply<br>required                                 |

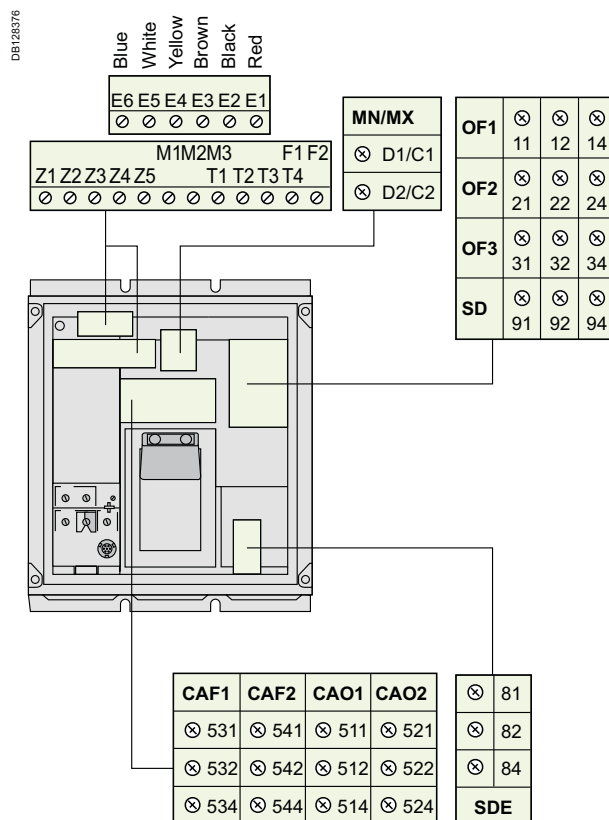
E: energy  
A: digital ammeter.  
P: A + power meter + additional protection.



### Indication contacts



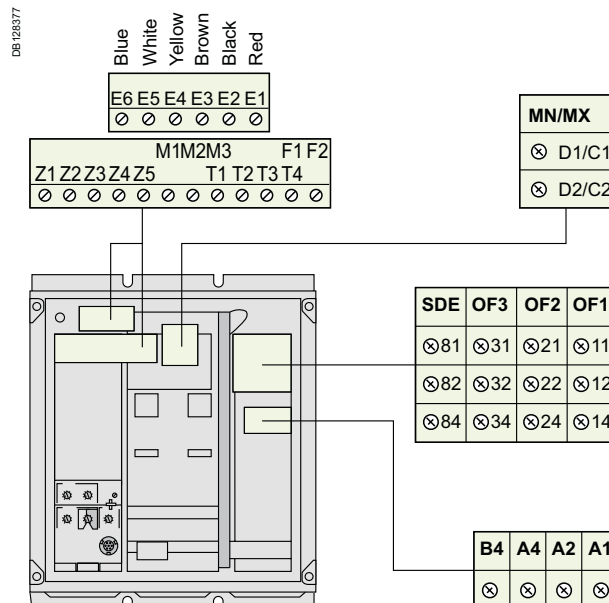
### Terminal-block marking (manual operation)



### Indication contacts

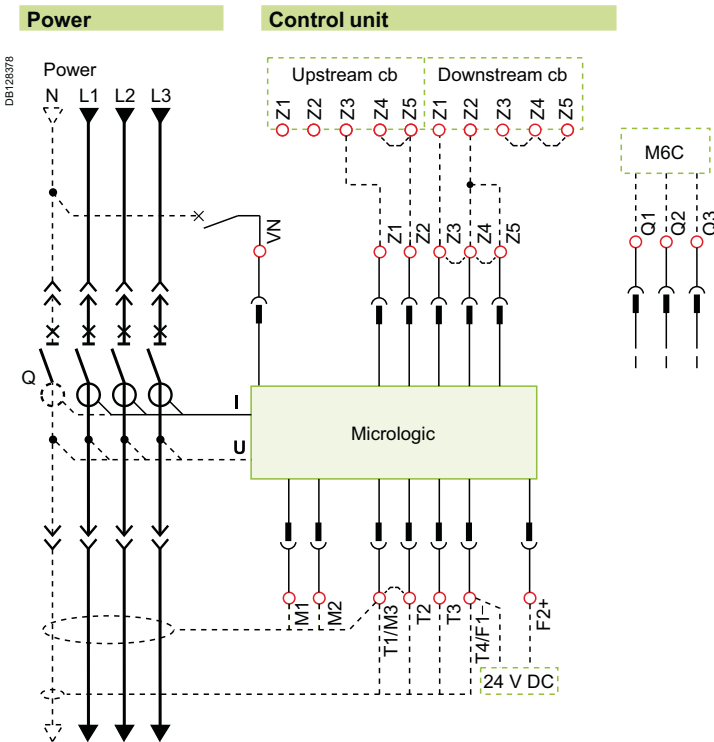
- OF3 / OF2 / OF1** : indication contacts
- SDE** : fault-trip indication contact (short-circuit, overload, earth fault)
- SD** : trip indication contact (manual operation)
- CAF2/CAF1 \*** : early-make contact (rotary handle)
- CAO2 / CAO1** : early-break contact (rotary handle)

### Terminal-block marking (electrical operation)

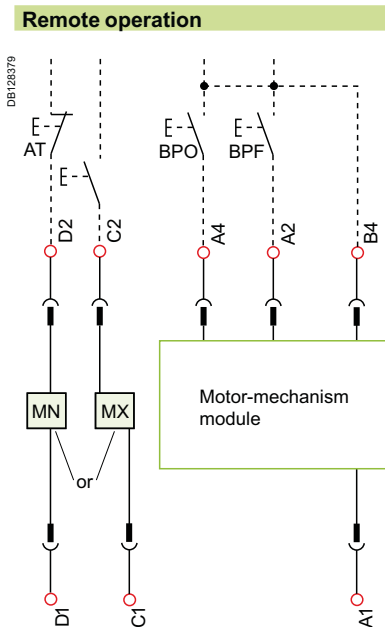


\* CAF2 option is not compatible with M6C option.

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



|                        | Control unit                                                                           |                                                                                        |                                                                                        |                                                                                        |                                                                                         |                                                                                         |
|------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Terminal-block marking | Com                                                                                    | UC1                                                                                    | UC2                                                                                    | UC3                                                                                    | M6C / CAF2                                                                              |                                                                                         |
|                        |  E5 |  Z5 |  M1 |  M2 |  M3  |  F2+ |
|                        |  E6 |  M1 |  M2 |  M3 |  F2+ |  Q3  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |
|                        |  E3 |  E4 |  Z3 |  Z4 |  T3  |  T4  |
|                        |  E4 |  Z3 |  Z4 |  T3 |  T4  |  VN  |



| Remote operation   | MT2 | MT1 |
|--------------------|-----|-----|
| MN / MX<br>D2 / C2 | A4  | A2  |
| D1 / C1            |     | B4  |
|                    |     | A1  |

| Basic | A | E | P | Control unit                                                                                                                                                                                                    |
|-------|---|---|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ■     | ■ | ■ | ■ | <b>Com:</b> E1-E6 communication                                                                                                                                                                                 |
|       | ■ | ■ | ■ | <b>UC1:</b> Z1-Z5 zone selective interlocking:<br>Z1 = ZSI OUT SOURCE<br>Z2 = ZSI OUT; Z3 ZSI IN SOURCE<br>Z4 = ZSI IN ST (short time)<br>Z5 = ZSI IN GF (earth fault)<br>M1 = Vigi module input (Micrologic 7) |
|       | ■ | ■ | ■ | <b>UC2:</b> T1, T2, T3, T4 = external neutral;<br>M2, M3 = Vigi module input (Micrologic 7)                                                                                                                     |
|       | ■ | ■ | ■ | <b>UC3:</b> F2+, F1- external 24 V DC power supply<br>VN external voltage connector (must be connected to the neutral with a 3P circuit breaker)                                                                |
|       |   |   | ■ | <b>M6C:</b> 6 programmable contacts (to be connected to the external module M6C) ext. 24 V DC power supply required                                                                                             |

A: digital ammeter.

P: A + power meter + additional protection.

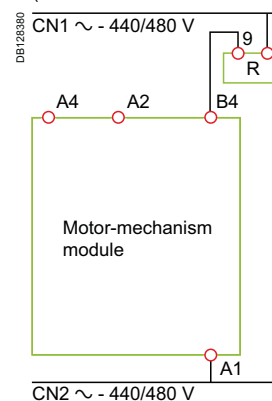
### Remote operation

**MN** : undervoltage release  
**or**  
**MX** : shunt release

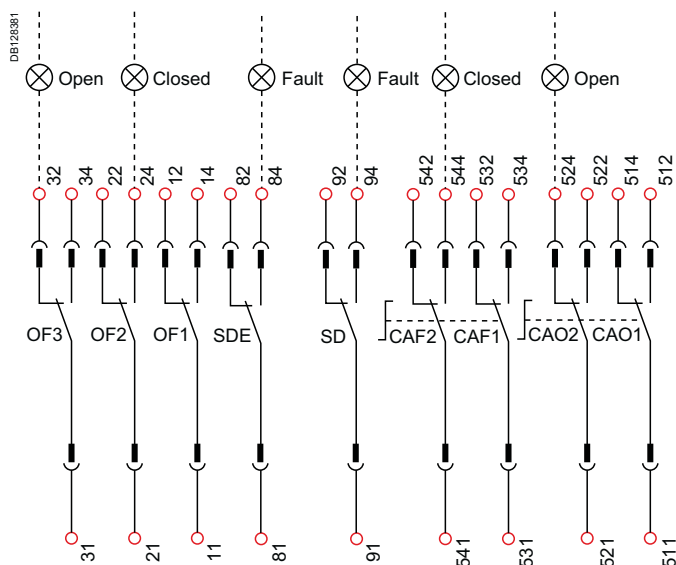
### Motor-mechanism module (\*)

**MT2** : **A4** : electrical opening order  
**MT1** : **A2** : electrical closing order  
**B4, A1** : power supply for control devices and gear motor (MCH)

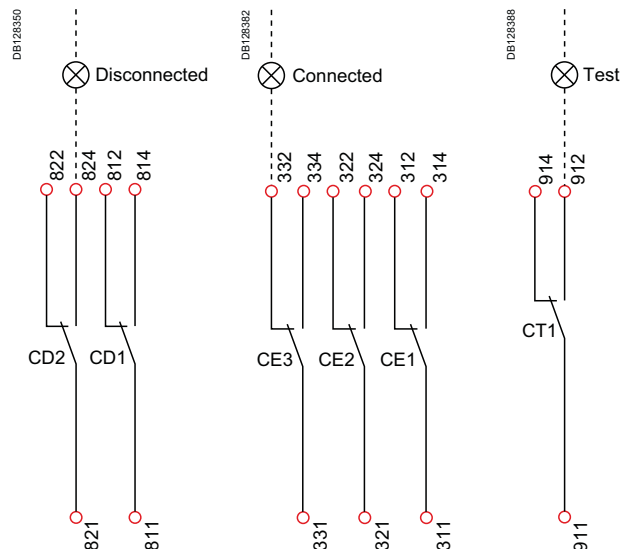
(\*) **Spring-charging motor 440/480 V AC**  
(380 V motor + additional resistor)



### Indication contacts



### Carriage switches



### Indication contacts

| M6C / CAF2                                                                          | CAF1                                                                                | SDE                                                                                 | SD                                                                                  | CAO2                                                                                | CAO1                                                                                | OF3                                                                                 | OF2                                                                                 | OF1                                                                                 |    |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----|
|  |  |  |  |  |  |  |  |  |    |
| Q3                                                                                  | 544                                                                                 | 534                                                                                 | 84                                                                                  | 94                                                                                  | 524                                                                                 | 514                                                                                 | 34                                                                                  | 24                                                                                  | 14 |
|  |  |  |  |  |  |  |  |  |    |
| Q2                                                                                  | 542                                                                                 | 532                                                                                 | 82                                                                                  | 92                                                                                  | 522                                                                                 | 512                                                                                 | 32                                                                                  | 22                                                                                  | 12 |
|  |  |  |  |  |  |  |  |  |    |
| Q1                                                                                  | 541                                                                                 | 531                                                                                 | 81                                                                                  | 91                                                                                  | 521                                                                                 | 511                                                                                 | 31                                                                                  | 21                                                                                  | 11 |

### Carriage switches

| CD2 | CD1 | CE3 | CE2 | CE1 | CT1 |
|-----|-----|-----|-----|-----|-----|
| 824 | 814 | 334 | 324 | 314 | 914 |
| 822 | 812 | 332 | 322 | 312 | 912 |
| 821 | 811 | 331 | 321 | 311 | 911 |

### Indication contacts

- OF3 / OF2 / OF1** : indication contacts
- SDE** : fault-trip indication contact (short-circuit, overload, earth fault)
- SD** : trip indication contact (manual operation)
- CAF2/CAF1 \*** : early-make contact (rotary handle)
- CAO2 / CAO1** : early-break contact (rotary handle)

### Carriage switches

- CD2** : disconnected position
- CD1** : position
- CE3** : connected position
- CE2** : position
- CE1** : position
- CT1** : test position

\* CAF2 option is not compatible with M6C option.

### Legend

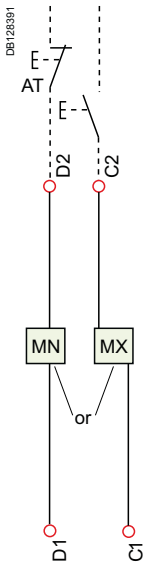
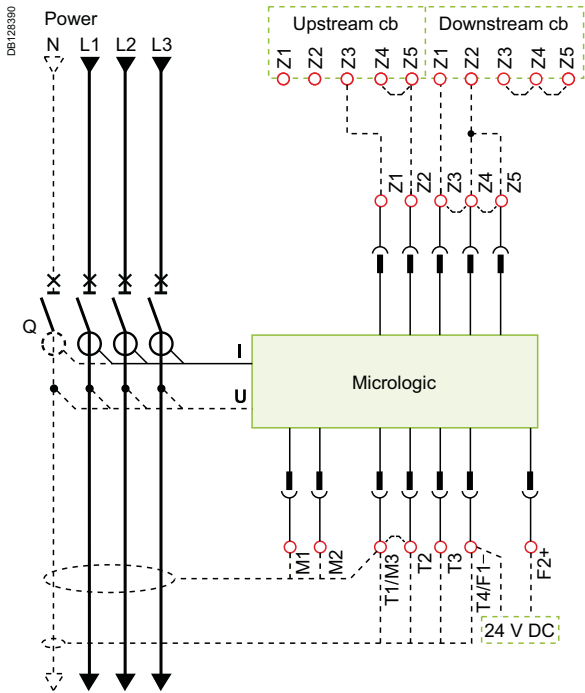
Connected (only one wire per connection point).

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

Power

Control unit

Remote operation



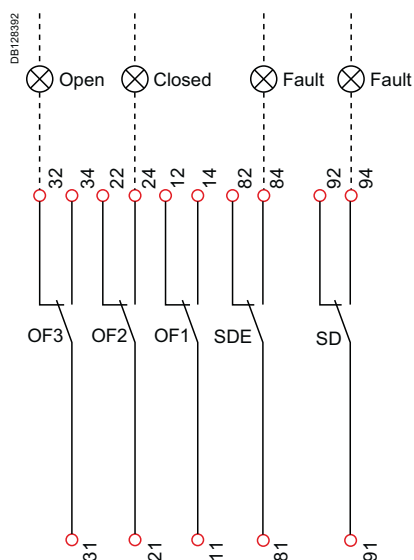
| - (basic) |  | A | E | Control unit                                                                                                                                                                                           |
|-----------|--|---|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ■         |  | ■ | ■ | E1-E6 communication                                                                                                                                                                                    |
|           |  | ■ | ■ | Z1-Z5 zone selective interlocking:<br>Z1 = ZSI OUT SOURCE<br>Z2 = ZSI OUT ; Z3 = ZSI IN SOURCE<br>Z4 = ZSI IN ST (short time)<br>Z5 = ZSI IN GF (earth fault)<br>M1 = Vigi module input (Micrologic 7) |
|           |  | ■ | ■ | T1, T2, T3, T4 = external neutral;<br>M2, M3 = Vigi module input (Micrologic 7)                                                                                                                        |
|           |  | ■ | ■ | F2+, F1- external 24 V DC power supply                                                                                                                                                                 |

Remote operation

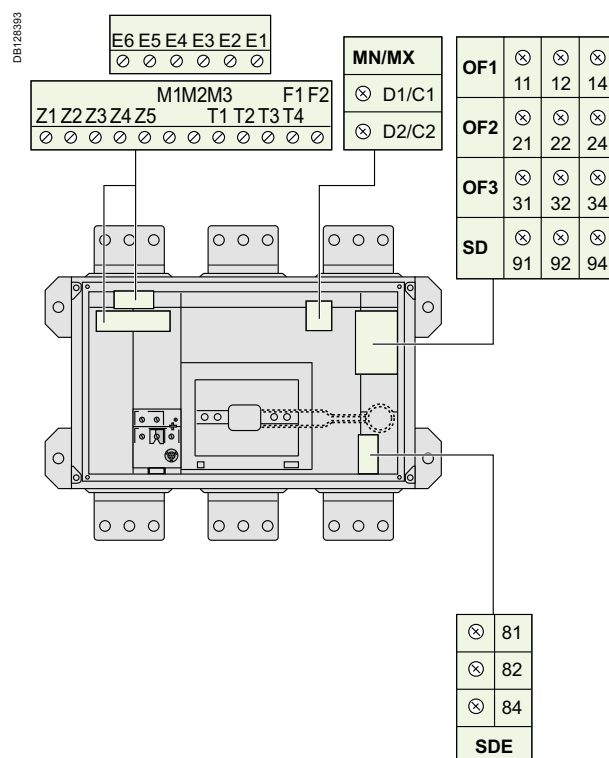
**MN** : undervoltage release  
**or**  
**MX** : shunt release

—: basic Micrologic control unit.  
A: digital ammeter.

### Indication contacts



### Terminal-block marking



### Indication contacts

**OF3 / OF2 / OF1** : ON / OFF indication contacts

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

**SD** : trip indication contact

# Compact NS630b to 3200

Earth-fault and earth-leakage protection

Neutral protection

Zone selective interlocking

## External sensor (CT) for residual earth-fault protection

### Connection of current-transformer secondary circuit for external neutral

Compact equipped with a Micrologic 6 A/E/P: <sup>(1)</sup>

- shielded cable with 2 twisted pairs
- T1 twisted with T2
- maximum length 4 meters
- cable cross-sectional area 0.4 to 1.5 mm<sup>2</sup>
- recommended cable: Belden 9552 or equivalent.

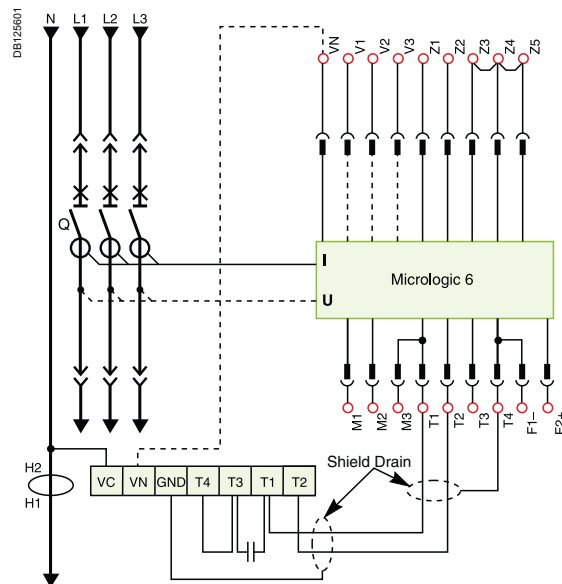
For proper wiring of neutral CT, refer to instruction Bulletin 48041-082-03 shipped with it.

Do not remove Micrologic factory-installed jumper between T1 and T2 unless neutral CT is connected. If supply is via the top, follow the schematics.

If supply is via the bottom, control wiring is identical; for the power wiring, H1 is connected to the source side, H2 to the load side.

For four-pole versions, for residual earth-fault protection, the current transformer for the external neutral is not necessary.

Connection for signal VN is required only for power measurements (3 Ø, 4 wires, 4CTs).

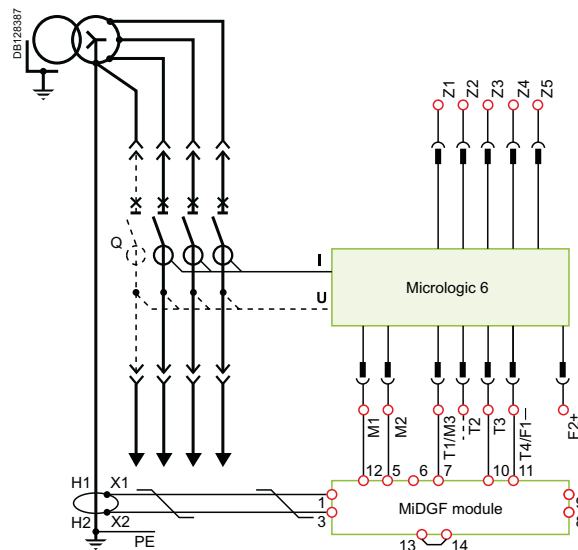
<sup>(1)</sup> Only for NS630b to 1600.

## External transformer for source ground return (SGR) earth-fault protection

### Connection of the secondary circuit

Compact equipped with a Micrologic 6 A, E, P <sup>(1)</sup>:

- unshielded cable with 1 twisted pair
- maximum length 150 metres
- cable cross-sectional area 0.4 to 1.5 mm<sup>2</sup>
- recommended cable: Belden 9409 or equivalent.

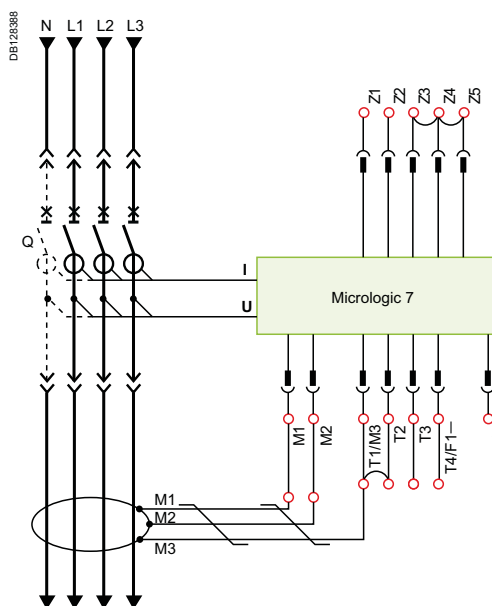
<sup>(1)</sup> Only for NS630b to 1600.



## Earth-leakage protection

## Connection of the rectangular-sensor secondary circuit

Compact equipped with a Micrologic 7 A/P:  
use the cable shipped with the rectangular sensor.



## Neutral protection

- three pole circuit breaker:
  - neutral protection is impossible with Micrologic A
  - with Micrologic E, P, an external neutral transformer is necessary; the connection diagram is the same as for residual earth-fault protection.
- four pole circuit breaker:
  - Compact equipped with Micrologic A
  - the current transformer for external neutral is not necessary.

## Zone selective interlocking

Zone-selective interlocking is used to reduce the electrodynamic forces exerted on the installation by shortening the time required to clear faults, while maintaining time discrimination between the various devices.

A pilot wire interconnects a number of circuit breakers equipped with Micrologic A/E/P control units, as illustrated in the diagram above.

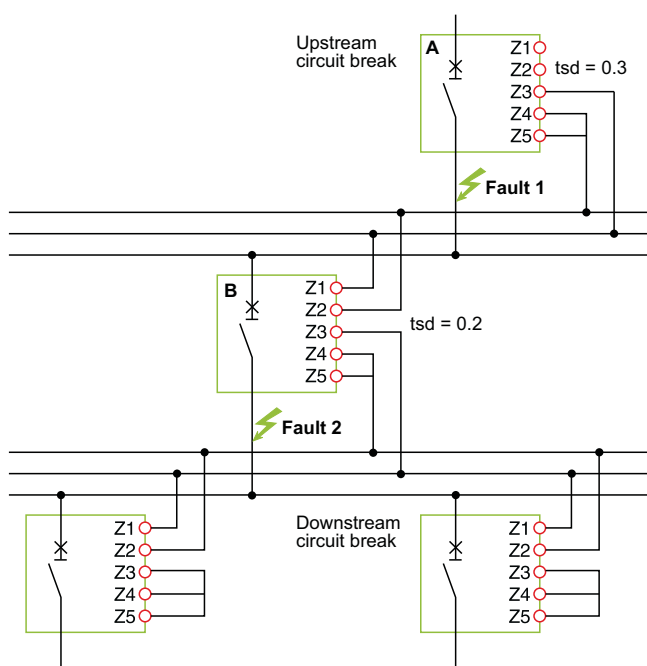
The control unit detecting a fault sends a signal upstream and checks for a signal arriving from downstream. If there is a signal from downstream, the circuit breaker remains closed for the full duration of its tripping delay. If there is no signal from downstream, the circuit breaker opens immediately, regardless of the tripping-delay setting.

**Fault 1.**

Only circuit breaker A detects the fault. Because it receives no signal from downstream, it immediately opens in spite of its tripping delay set to 0.3.

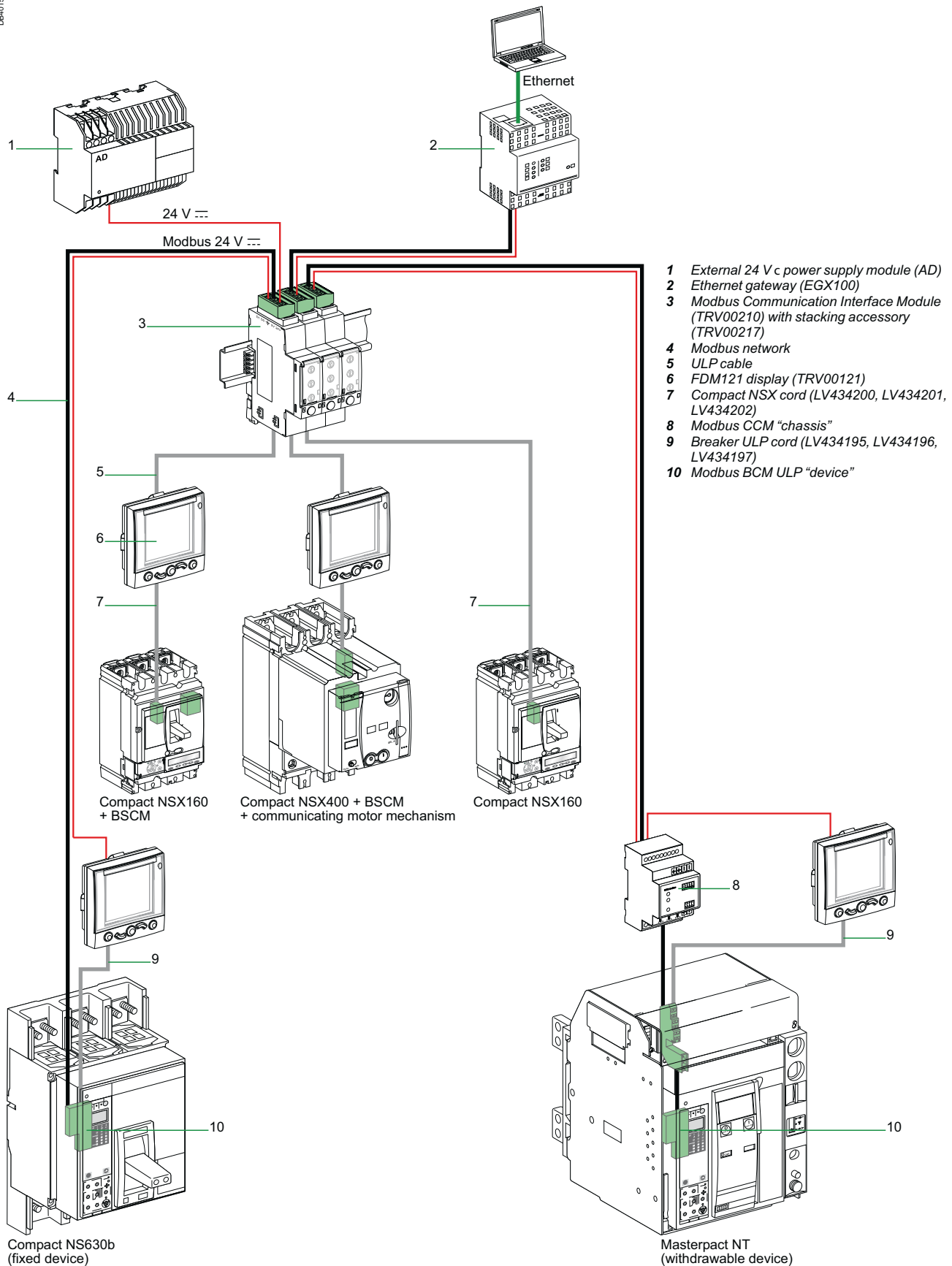
**Fault 2.**

Circuit breakers A and B detect the fault. Circuit breaker A receives a signal from B and remains closed for the full duration of its tripping delay set to 0.3. Circuit breaker B does not receive a signal from downstream and opens immediately, in spite of its tripping delay set to 0.2.

**Wiring**

- Maximum impedance: 2.7  $\Omega$  / 300 m.
- Capacity of connectors: 0.4 to 2.5 mm<sup>2</sup>.
- Wires: single or multicore.
- Maximum length: 3000 m.
- Limits to device interconnection:
  - the common ZSI - OUT (Z1) and the output ZSI - OUT (Z2) can be connected to a maximum of 10 upstream device
  - a maximum of 100 downstream devices may be connected to the common ZSI - IN (Z3) and to an input ZSI - IN CR (Z4) or GF (Z5).

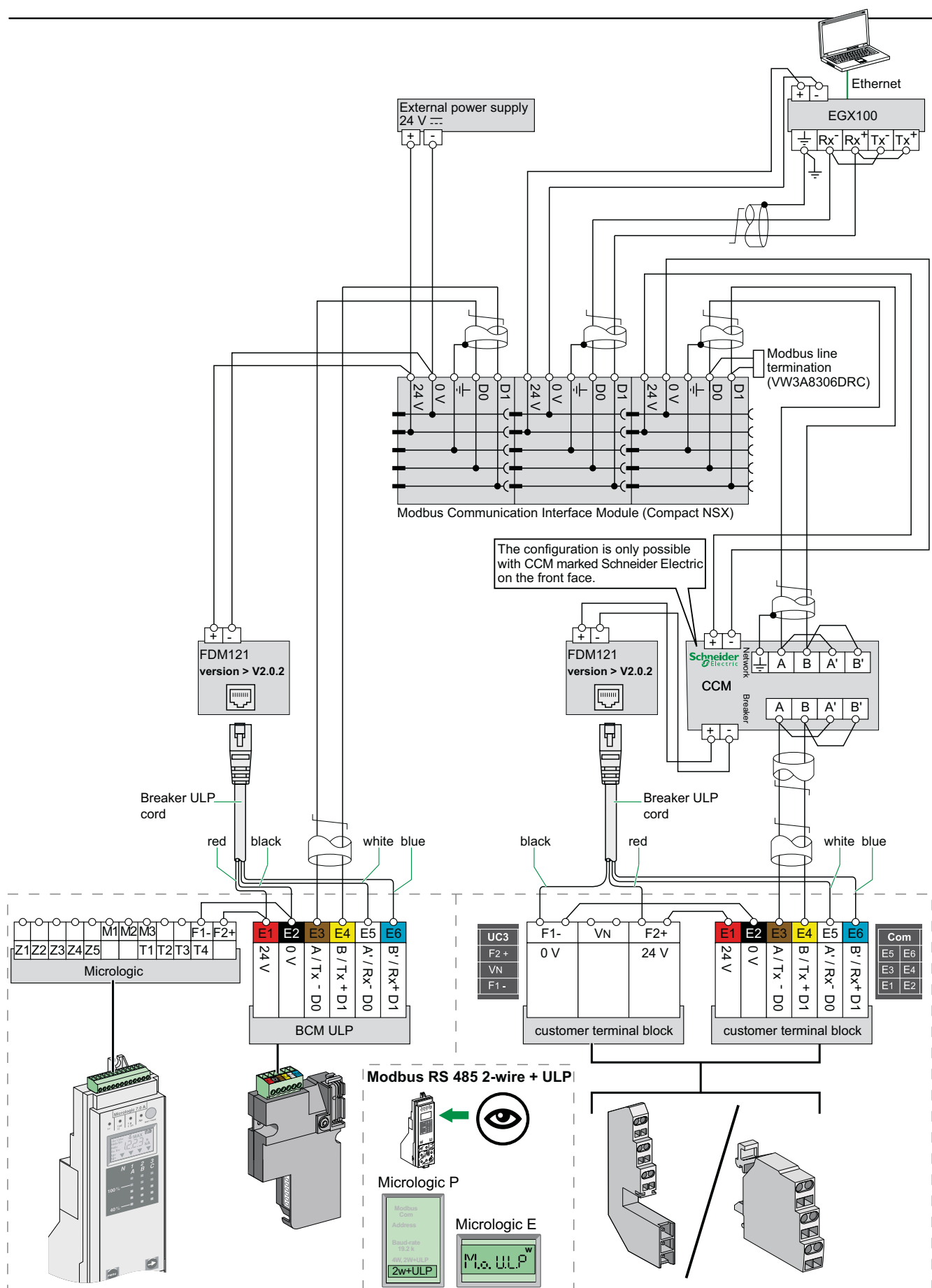
### Connection of circuit breakers to the Modbus communication network



# Compact NS630b to 3200

## Communication

DB402211

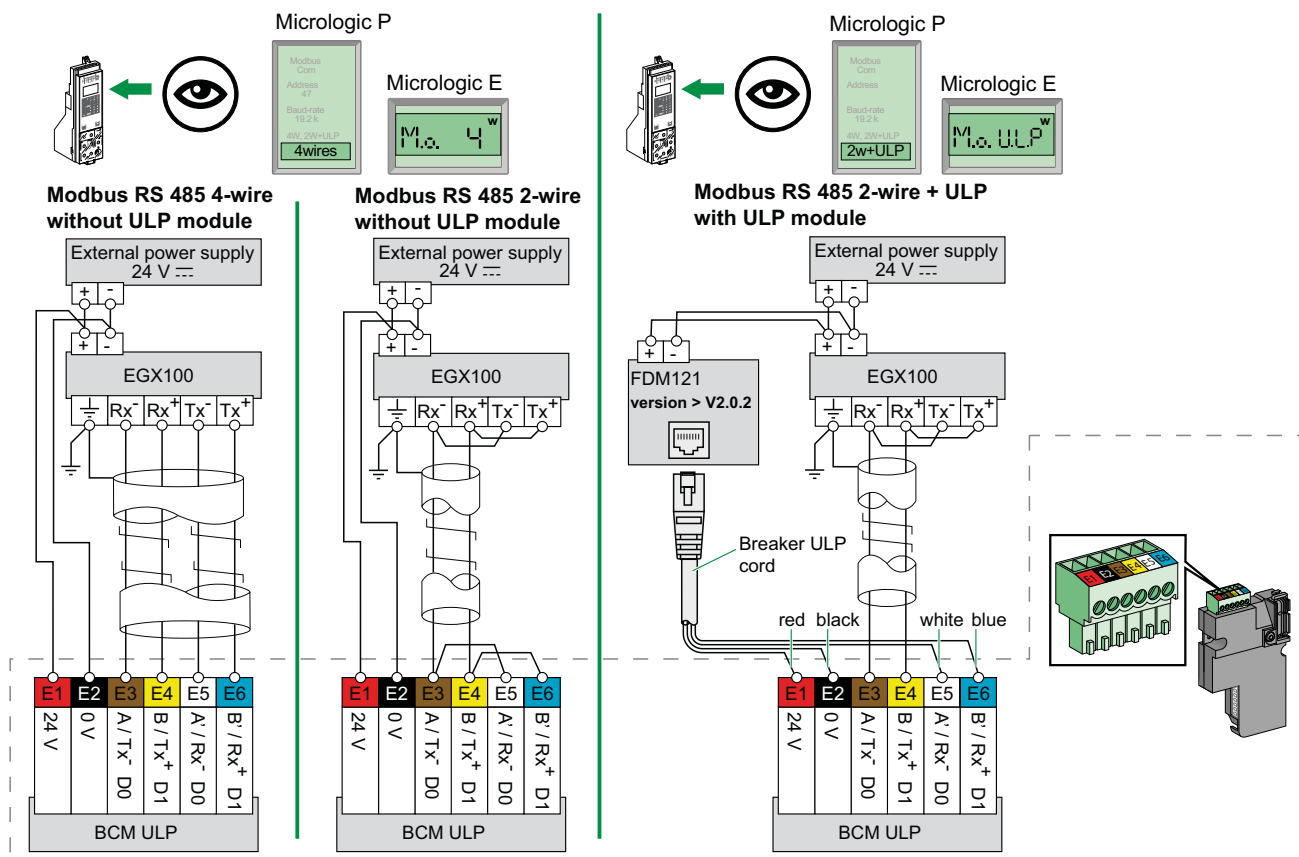


# Compact NS630b to 3200 fixed

Wiring of the COM option (Modbus BCM ULP Module) with or without ULP module

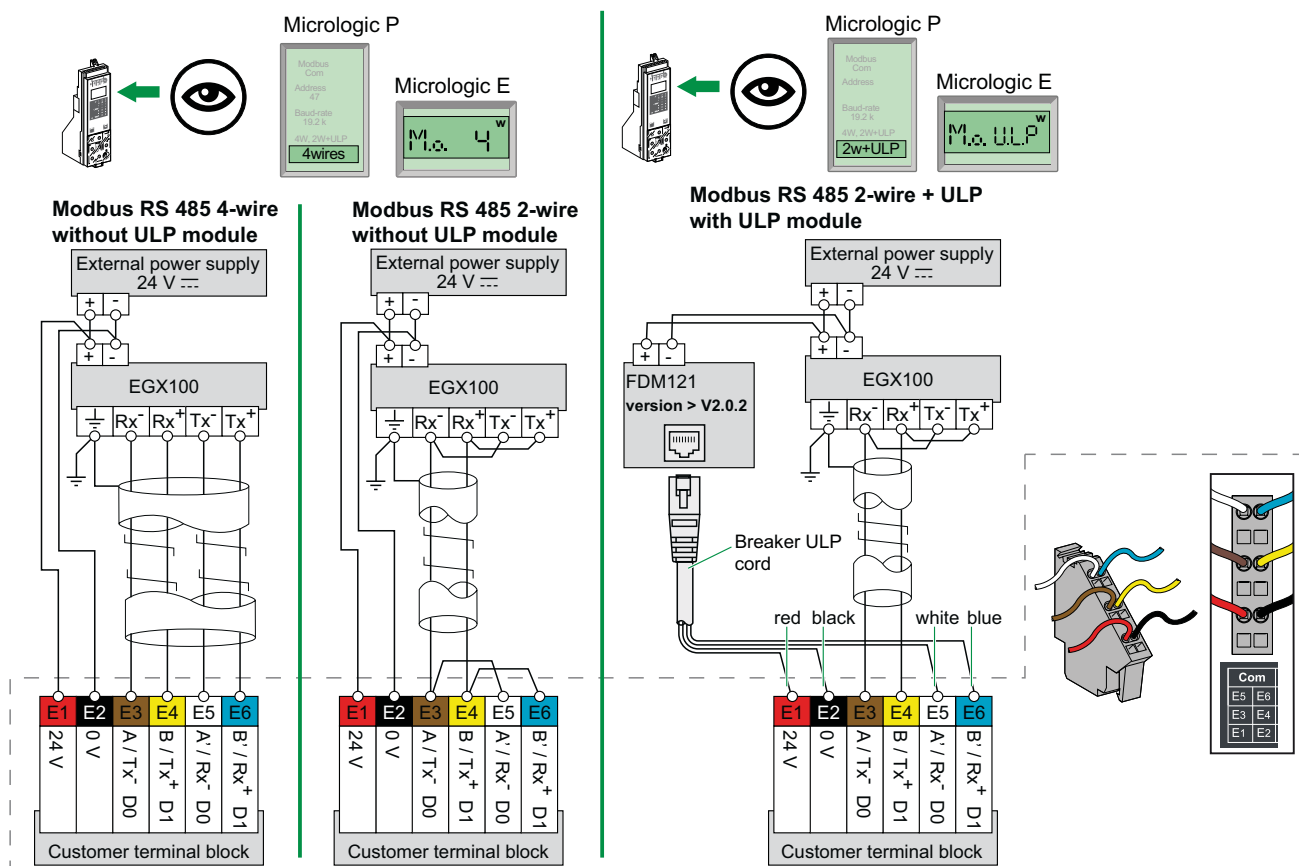
## Fixed, manually operated Compact NS

DB402062



## Fixed, electrically operated Compact NS

DB402064



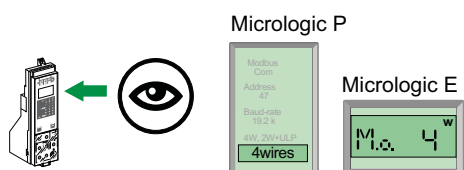
# Withdrawable Compact

## NS630b to 3200

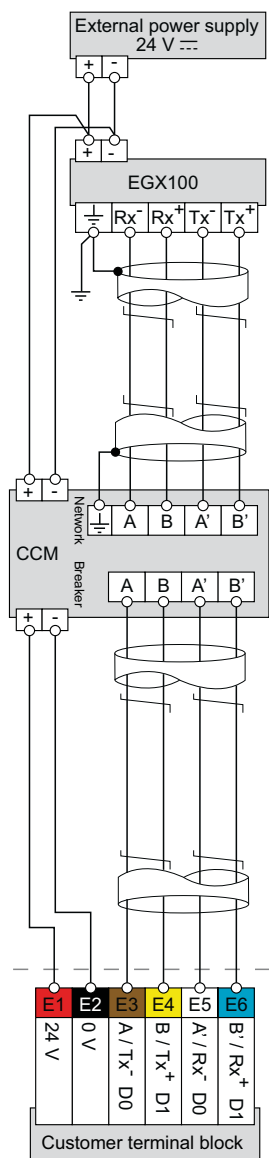
Wiring of the COM option (Modbus BCM ULP and CCM modules) with or without ULP module

### Withdrawable Compact NS

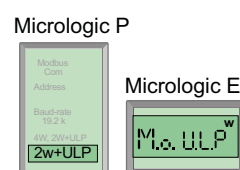
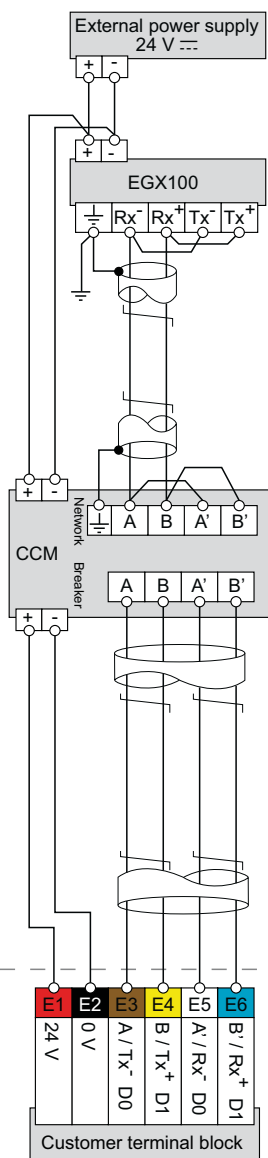
DB401477



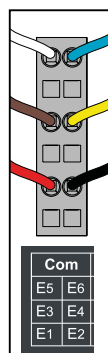
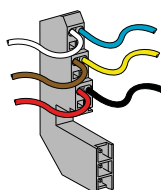
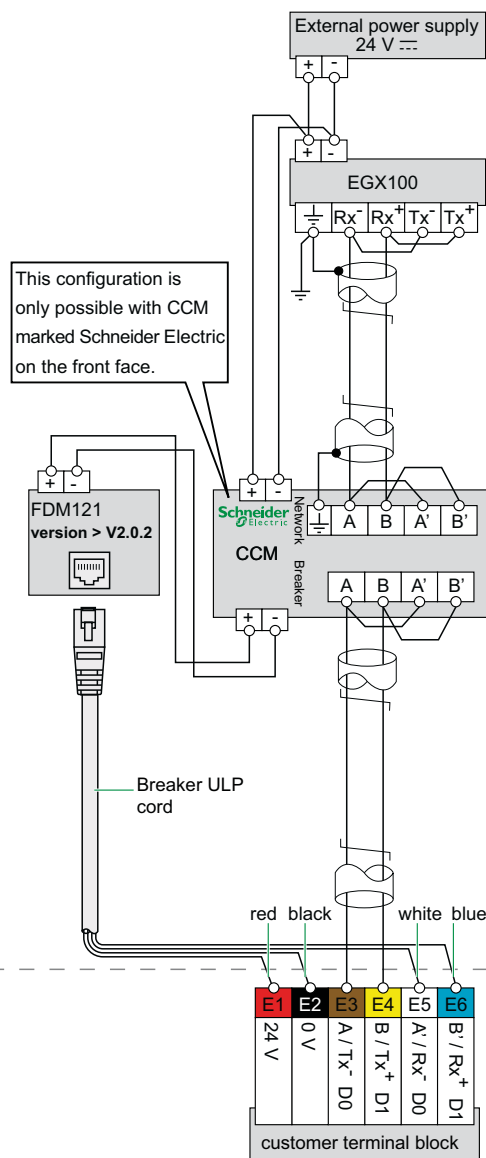
**Modbus RS 485 4-wire without ULP module**



**Modbus RS 485 2-wire without ULP module**

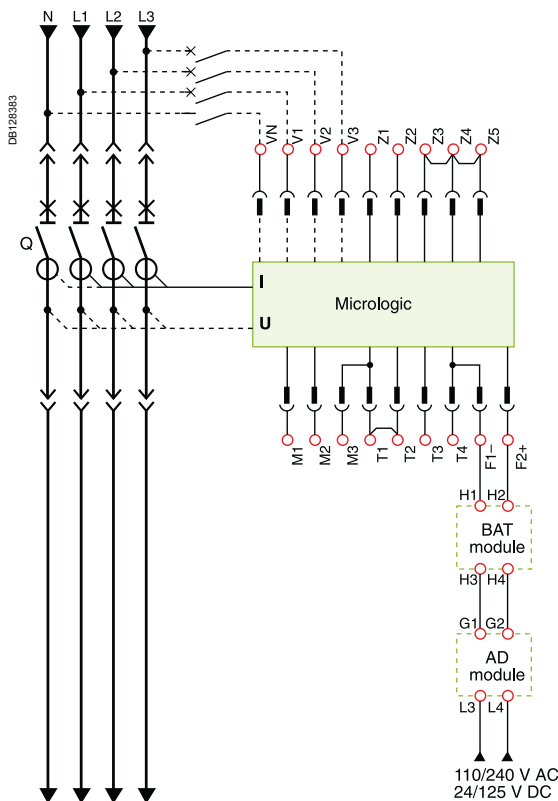


**Modbus RS 485 2-wire + ULP with ULP module**



# Compact NS630b to 3200

## Connection of the 24 V DC external power supply AD module



- The 24 V DC external power-supply (AD module) for the Micrologic control unit (F1- F2+) is not required for basic protections LSIG.
- The 24 V DC external power-supply (AD module) for the BCM ULP communication module (E1-E2) is required.
- The 24 V DC external power-supply (AD module) for the FDM121 front display module (0V +24) is required.
- The 24 V DC external power-supply (AD module) for the programmable contact M2C/M6C is required.
- The same 24 V DC external power-supply (AD module) can be connected to Micrologic control unit, BCM ULP and FDM121, M2C/M6C.
- If voltage > 480 V AC or in an environment with a high level of electromagnetic disturbances, use separate power supply: 1 power supply for Micrologic (F1- F2+) and M2C/M6C, another power supply for BCM ULP and FDM121.
- With Micrologic A/E, it is recommended to connect 24 V DC external power-supply (AD module) to the Micrologic control unit (F1- F2+) in order to keep available the display and the energy metering, even if Current < 20 % I<sub>n</sub>.

**Note:** In case of using the 24 V DC external power supply (AD module), maximum cable length between 24 V DC (G1, G2) and the control unit (F1-, F2+) must not exceed 10 meters.

The BAT battery module, mounted in series upstream of the AD module, ensures an uninterrupted supply of power if the AD module power supply fails.

The internal voltage taps are connected to the bottom side of the circuit breaker.

With Micrologic P/H, external voltage taps are possible using the PTE option.

With this option, the internal voltage taps are disconnected and the voltage taps are connected to terminals VN, V1, V2, V3.

The PTE option is required for voltages less than 220 V and greater than 690 V (in which case a voltage transformer is compulsory). For three-pole devices, the system is supplied with terminal VN connected only to the control unit (Micrologic P).

When the PTE option is implemented, the voltage measurement input must be protected against short-circuits. Installed as close as possible to the busbars, this protection function is ensured by a P25M circuit breaker (1 A rating) with an auxiliary contact (cat. no. 21104 and 21117).

This voltage measurement input is reserved exclusively for the control unit and must not ever be used to supply other circuits outside the switchboard.

### Connection

The maximum length for each conductor supplying power to the trip unit or M6C module is 10 m.

**Do not ground F2+, F1-, or power supply output:**

- the positive terminal (F2+) on the trip unit must not be connected to earth ground
- the negative terminal (F1-) on the trip unit must not be connected to earth ground
- the output terminals (- and +) of the 24 V DC power supply must not be grounded.

**Reduce electromagnetic interference:**

- the input and output wires of the 24 V DC power supply must be physically separated as much as possible
- if the 24 V DC power supply wires cross power cables, they must cross perpendicularly. If this is not physically possible, the power supply conductors must be twisted together
- Power supply conductors must be cut to length. Do not loop excess conductor.

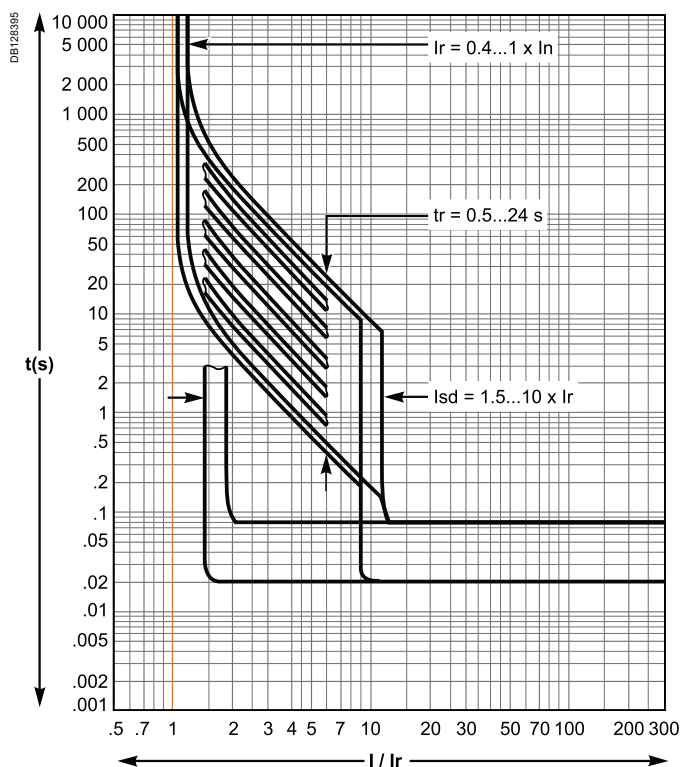
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|                                      |            |
|--------------------------------------|------------|
| <i>Presentation</i>                  | 2          |
| <i>Functions and characteristics</i> | A-1        |
| <i>Installation recommendations</i>  | B-1        |
| <i>Dimensions and connection</i>     | C-1        |
| <br>                                 |            |
| <b>Tripping curves</b>               | <b>E-2</b> |
| Compact NS630b to 3200               | E-2        |
| <br>                                 |            |
| <b>Current-limiting curves</b>       | <b>E-3</b> |

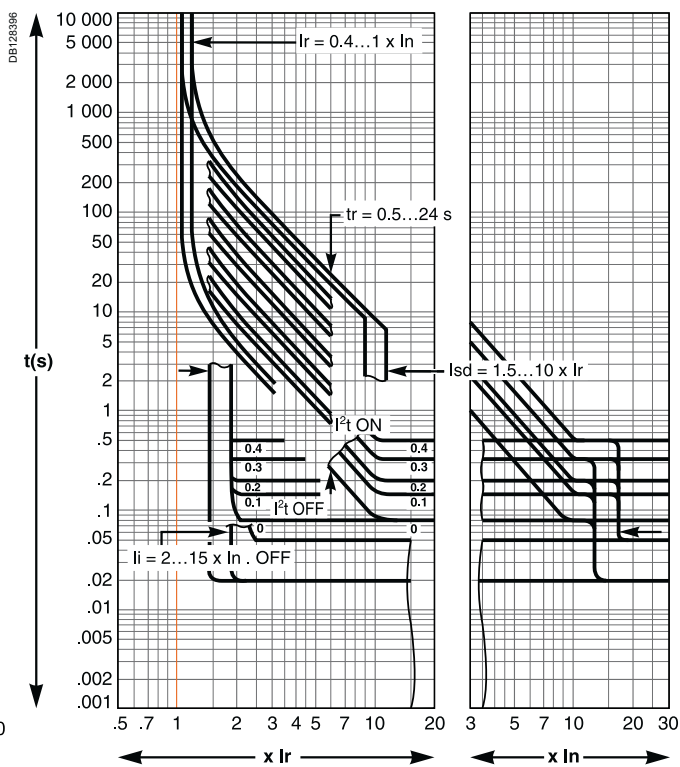
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### Micrologic electronic control units

#### Micrologic 2.0

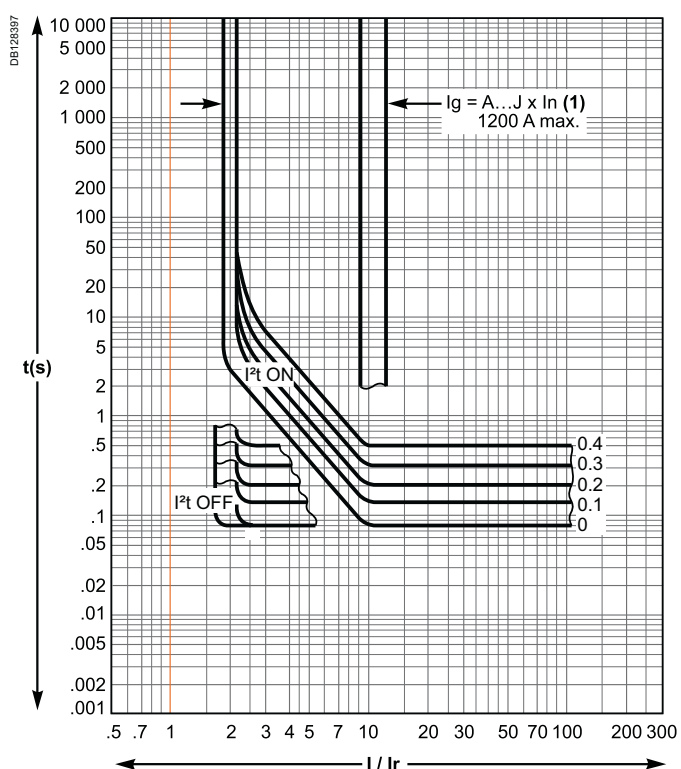


#### Micrologic 5.0, 6.0, 7.0



### Options for Micrologic electronic control units

#### Earth-fault protection (Micrologic 6.0)



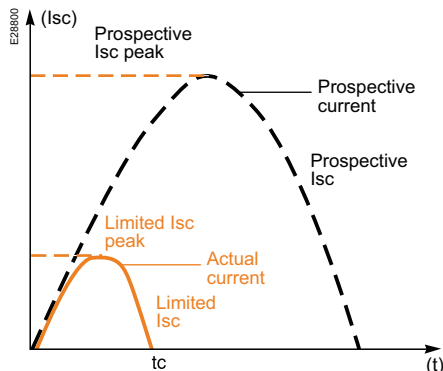
(1)

| $I_g = I_n \times \dots$          | A   | B   | C   | D   | E   | F   | G    | H    | J    |
|-----------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|
| $I_g < 400$ A                     | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8  | 0.9  | 1    |
| $400 \text{ A} \leq I_g < 1200$ A | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8  | 0.9  | 1    |
| $I_g > 1200$ A                    | 500 | 640 | 720 | 800 | 880 | 960 | 1040 | 1120 | 1200 |



# Current-limiting curves

The limiting capacity of a circuit breaker is its aptitude to limit short-circuit currents.



The exceptional limiting capacity of the Compact NS range is due to the rotating double-break technique (very rapid natural repulsion of contacts and the appearance of two arc voltages in-series with a very steep wave front).

## $I_{cs} = 100 \% I_{cu}$

The exceptional limiting capacity of the Compact NS range greatly reduces the forces created by fault currents in devices.

The result is a major increase in breaking performance. In particular, the service breaking capacity  $I_{cs}$  is equal to 100% of  $I_{cu}$ .

The  $I_{cs}$  value, defined by IEC standard 60947-2, is guaranteed by tests comprising the following operations:

- break three times consecutively a fault current equal to 100 % of  $I_{cu}$
- check that the device continues to function normally:
  - it conducts the rated current without abnormal temperature rise
  - protection functions perform within the limits specified by the standard
  - suitability for isolation is not impaired.

## Longer service life of electrical installations

Current-limiting circuit breakers greatly reduce the negative effects of short-circuits on installations.

### Thermal effects

Less temperature rise in conductors, therefore longer service life for cables.

### Mechanical effects

Reduced electrodynamic forces, therefore less risk of electrical contacts or bus bars being deformed or broken.

### Electromagnetic effects

Less disturbances for measuring devices located near electrical circuits.

## Economy by means of cascading

Cascading is a technique directly derived from current limiting. Circuit breakers with breaking capacities less than the prospective short-circuit current may be installed downstream of a limiting circuit breaker. The breaking capacity is reinforced by the limiting capacity of the upstream device.

It follows that substantial savings can be made on downstream equipment and enclosures.

## Current-limiting curves

The current-limiting capacity of a circuit breaker is expressed by two curves which are a function of the prospective short-circuit current (the current which would flow if no protection devices were installed):

- the actual peak current (limited current),
- thermal stress ( $A^2s$ ), i.e. the energy dissipated by the short-circuit in a conductor with a resistance of  $1 \Omega$ .

### Example

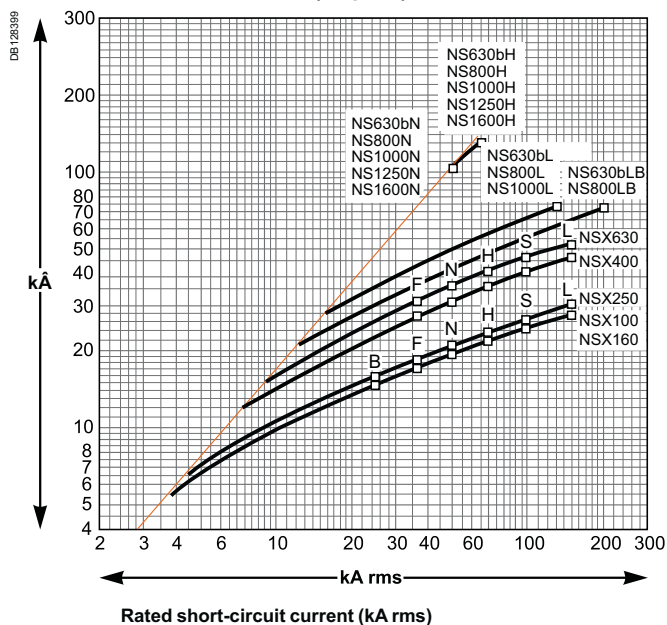
What is the real value of a 200 kA rms prospective short-circuit (i.e. 440 kA peak) limited by an NS630bLB upstream ?

Answer: 70 kA peak (see next page).

## Current-limiting curves

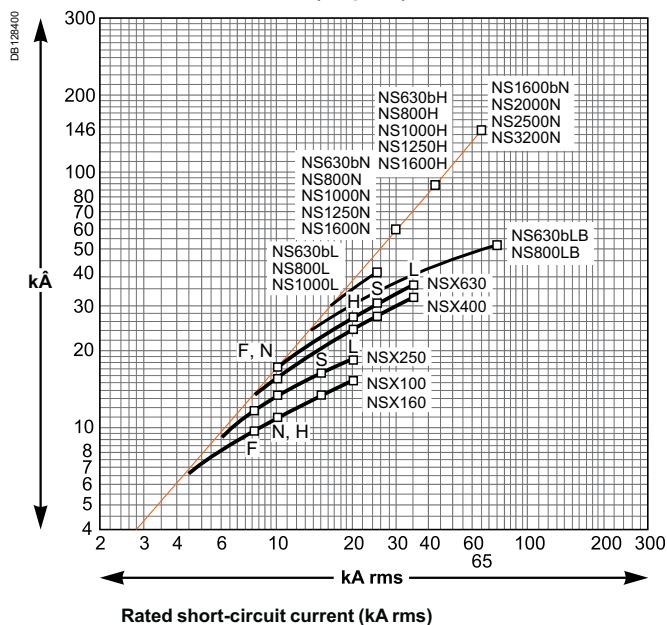
Voltage 400/440 V AC <sup>(1)</sup>

Limited short-circuit current (kA peak)



Voltage 660/690 V AC

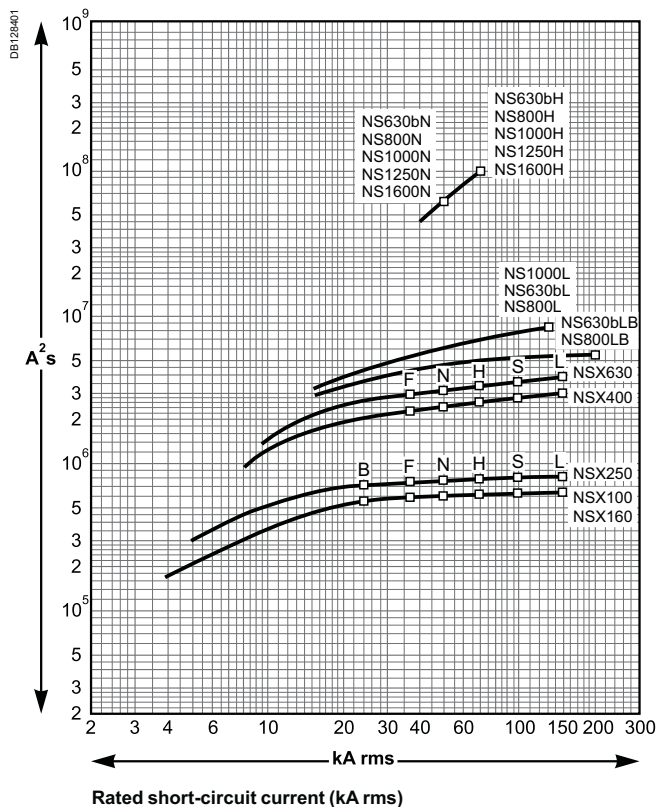
Limited short-circuit current (kA peak)



## Thermal-stress curves

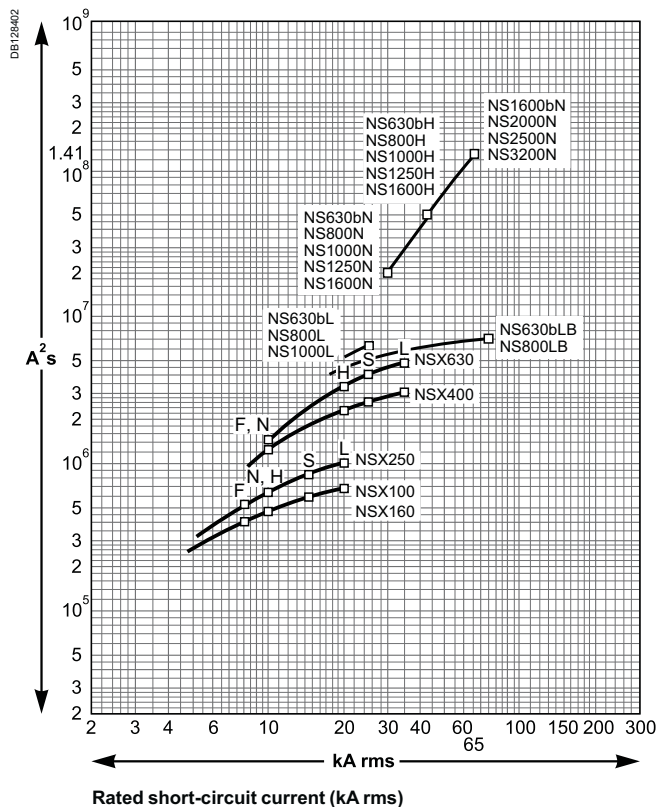
Voltage 400/440 V AC <sup>(1)</sup>

Limited energy



Voltage 660/690 V AC

Limited energy

<sup>(1)</sup> Valid for 480 V Nema.







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