Low Voltage

Compact NS

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

Catalogue
2011
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.

An answer for each type of solutions:

- Marine
- Airports
- Oil and gas
- Wind mills

> Compact NS field installable devices
... 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.

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.

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**Ethernet (TPC / IP / modbus)**

**Modbus**

**Modbus IFM interface**

**FDM121 switchboard display unit**

**Compact NS**

**Compact NSX**

**IRIO RTU / EGX300**

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

Presentation

Compact NS, even more applications

Functions

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.
<table>
<thead>
<tr>
<th>Protection of LV distribution systems ➤ page A-2</th>
</tr>
</thead>
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<tr>
<td>Protection for:</td>
</tr>
<tr>
<td>● distribution systems supplied by transformers</td>
</tr>
<tr>
<td>● distribution systems supplied by engine generator sets</td>
</tr>
<tr>
<td>● long cables in IT and TN systems.</td>
</tr>
<tr>
<td>Installation:</td>
</tr>
<tr>
<td>● in power switchboards.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection of motors feeders (AC 220/690 V) ➤ page A-35</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Earth leakage ➤ page A-36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional earth-leakage protection protects life and property against the risks of faulty insulation in the installation.</td>
</tr>
<tr>
<td>Depending on the circuit breaker, earth-leakage protection is provided by:</td>
</tr>
<tr>
<td>● using a specific Micrologic control unit</td>
</tr>
<tr>
<td>● using a Vigirex relay and separate toroids.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact NS service connection circuit breakers are specially designed for the service-connection function:</td>
</tr>
<tr>
<td>● lead seals and locking systems</td>
</tr>
<tr>
<td>● tripping curves certified by utilities</td>
</tr>
<tr>
<td>● fast overload curves to limit the power supplied, etc.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control and isolation using switch-disconnectors ➤ page A-37</th>
</tr>
</thead>
<tbody>
<tr>
<td>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:</td>
</tr>
<tr>
<td>● earth-leakage protection</td>
</tr>
<tr>
<td>● motor mechanism.</td>
</tr>
<tr>
<td>For information on other switch-disconnector ranges, see the Interpact (offering positive contact indication and visible break) and Fupact (fuse switch) catalogues.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source changeover systems ➤ page A-44</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure a continuous supply of power, some electrical installations are connected to two power sources:</td>
</tr>
<tr>
<td>● a normal source</td>
</tr>
<tr>
<td>● 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.</td>
</tr>
<tr>
<td>A source-changeover system can be:</td>
</tr>
<tr>
<td>● manual with mechanical device interlocking</td>
</tr>
<tr>
<td>● remote controlled with mechanical and/or electrical device interlocking</td>
</tr>
<tr>
<td>● 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).</td>
</tr>
</tbody>
</table>
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 (1) to +85 °C.

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

<table>
<thead>
<tr>
<th>配置</th>
<th>IP40</th>
<th>IK07</th>
</tr>
</thead>
<tbody>
<tr>
<td>With toggle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With direct rotary handle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Circuit breaker installed in a switchboard

<table>
<thead>
<tr>
<th>配置</th>
<th>IP40</th>
<th>IK07</th>
</tr>
</thead>
<tbody>
<tr>
<td>With toggle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With direct rotary handle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCC CNOMO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With extended rotary handle</td>
<td>IP45</td>
<td>IK08</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Rated current (A)</th>
<th>250</th>
<th>320</th>
<th>400</th>
<th>500</th>
<th>640</th>
<th>630</th>
<th>800</th>
<th>1000</th>
<th>1250</th>
<th>1600</th>
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<tbody>
<tr>
<td>Compact</td>
<td>NS630b</td>
<td>NS800</td>
<td>NS1000</td>
<td>NS1250</td>
<td>NS1600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Breaking capacity (kA rms)</th>
<th>50</th>
<th>50</th>
<th>50</th>
<th>50</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>380/415 V</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>L</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LB</td>
<td>200</td>
<td>200</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Rated current (A)</th>
<th>640</th>
<th>800</th>
<th>1000</th>
<th>1250</th>
<th>1600</th>
<th>2000</th>
<th>2500</th>
<th>3200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact</td>
<td>NS1600b</td>
<td>NS2000</td>
<td>NS2500</td>
<td>NS3200</td>
<td></td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Breaking capacity (kA rms)</th>
<th>70</th>
<th>70</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>380/415 V</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
</tbody>
</table>

### 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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<td>A-50</td>
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<td>Compact NS630b to 1600 (withdrawable version)</td>
<td>A-51</td>
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<tr>
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</table>

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**Dimensions and connection**

C-1

**Electrical diagrams**

D-1

**Additional characteristics**

E-1
## Protection of distribution systems

Compact NS circuit breakers from 630b up to 3200 A

### Compact circuit breakers

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<th>Number of poles</th>
<th>Control</th>
<th>Type of circuit breaker</th>
<th>Connections</th>
<th>Electrical characteristics as per Nema AB1</th>
<th>Electrical characteristics as per IEC 60947-2 and EN 60947-2</th>
</tr>
</thead>
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<tr>
<td></td>
<td>manual</td>
<td></td>
<td>fixed</td>
<td>Breaking capacity at 60 Hz (kA)</td>
<td>Rated current (A) In</td>
</tr>
<tr>
<td></td>
<td>toggle</td>
<td></td>
<td>front</td>
<td>240 V</td>
<td>50 °C</td>
</tr>
<tr>
<td></td>
<td>electric</td>
<td></td>
<td>rear</td>
<td>480 V</td>
<td>65 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>front connection with bare cables</td>
<td></td>
<td>600 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>front</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>front connection</td>
<td>rear</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>rear connection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Compact circuit breakers

- **Compact NS800L.**
- **Compact NS2000H.**

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

- **PB104842 Compact NS800L.**
- **PB104843 Compact NS2000H.**

### Functions and characteristics

#### (1) 65 °C with vertical connections. See the temperature derating tables for other types of connections.

#### (2) Ics: 100 % Icu for breaking capacity 440V/500V/660V

Ics: 75 % Icu for breaking capacity 220V/380V.

---

### Compact circuit breakers

<table>
<thead>
<tr>
<th>Number of poles</th>
<th>Control</th>
<th>Type of circuit breaker</th>
<th>Connections</th>
<th>Electrical characteristics as per Nema AB1</th>
<th>Electrical characteristics as per IEC 60947-2 and EN 60947-2</th>
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<tr>
<td></td>
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<td>Breaking capacity at 60 Hz (kA)</td>
<td>Rated current (A) In</td>
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<td>front</td>
<td>240 V</td>
<td>50 °C</td>
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<td>rear</td>
<td>480 V</td>
<td>65 °C</td>
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<td>front connection with bare cables</td>
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<td>600 V</td>
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</table>

### Compact circuit breakers

- **Compact NS800L.**
- **Compact NS2000H.**

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

- **PB104842 Compact NS800L.**
- **PB104843 Compact NS2000H.**

### Functions and characteristics

#### (1) 65 °C with vertical connections. See the temperature derating tables for other types of connections.

#### (2) Ics: 100 % Icu for breaking capacity 440V/500V/660V

Ics: 75 % Icu for breaking capacity 220V/380V.

---

### Compact circuit breakers

<table>
<thead>
<tr>
<th>Number of poles</th>
<th>Control</th>
<th>Type of circuit breaker</th>
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</thead>
<tbody>
<tr>
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<td></td>
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<td>front connection with bare cables</td>
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</tbody>
</table>

### Compact circuit breakers

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- **Compact NS2000H.**

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

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- **PB104843 Compact NS2000H.**

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Ics: 75 % Icu for breaking capacity 220V/380V.
<table>
<thead>
<tr>
<th>Compact circuit breakers</th>
<th>NS630b</th>
<th>NS800</th>
<th>NS1000</th>
<th>NS1250</th>
<th>NS1600</th>
<th>NS1600b</th>
<th>NS2000</th>
<th>NS2500</th>
<th>NS3200</th>
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<tr>
<td>Electrical characteristics as per Nema AB1</td>
<td>N</td>
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<td>L</td>
<td>LB</td>
<td>N</td>
<td>H</td>
<td>L</td>
<td>N</td>
<td>H</td>
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<tr>
<td>Breaking capacity at 60 Hz (kA) 240 V</td>
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<td>50 65 125</td>
<td>50 65 65 65</td>
<td>50 65 65 65</td>
<td>50 65 65</td>
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<td>Electrical characteristics as per IEC 60947-2 and EN 60947-2</td>
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<td>H</td>
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<td>LB</td>
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<td>Rated current (A) In 50 °C</td>
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<td>1600</td>
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Protection and measurements

Interchangeable control units

<table>
<thead>
<tr>
<th>Protection</th>
<th>Protection and measurements</th>
<th>Protection</th>
<th>Protection</th>
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<tbody>
<tr>
<td>Overload protection</td>
<td>long time</td>
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<td>Isd (Ir x ...</td>
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<tr>
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<td>Earth-fault</td>
<td>lg (In x ...</td>
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<td>Residual earth-leakage</td>
<td>I∞</td>
<td>ZSI</td>
</tr>
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<td>Zone selective interlocking</td>
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<td>Advanced protection</td>
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<td>Quick view</td>
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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

Compact circuit breakers

Protection and measurements

Interchangeable control units

<table>
<thead>
<tr>
<th>Protection</th>
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<td>Isd (Ir x ...</td>
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<td>lg (In x ...</td>
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<tr>
<td>protection</td>
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<td>I∞</td>
<td>ZSI</td>
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<td>Zone selective interlocking</td>
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<td>Protection of the fourth</td>
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<tr>
<td>pole</td>
<td>Current measurements</td>
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<td>Quick view</td>
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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

Compact circuit breakers

Additional indication and control auxiliaries

Indication contacts

Voltage releases

Installation

Accessories

terminal extensions and spreaders

terminal shields and interphase barriers

escutechons

Dimensions fixed devices, front connections (mm)

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Fixed devices, front connections (mm)</th>
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<td>4P</td>
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Weight fixed devices, front connections (kg)

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<th>Weight</th>
<th>Fixed devices, front connections (kg)</th>
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Source changeover system (see section on "source changeover systems")

Manual, remote-operated and automatic source changeover systems

(1) Except 1600b-3200.
<table>
<thead>
<tr>
<th>Micrologic</th>
<th>Overload protection</th>
<th>Short-circuit protection</th>
<th>Earth-fault protection</th>
<th>Residual earth-leakage protection</th>
<th>Zone selective interlocking</th>
<th>Protection of the fourth pole</th>
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<td>5.0</td>
<td>6.0</td>
<td>2.0 A</td>
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<tr>
<td>2.0 E</td>
<td>5.0 E</td>
<td>6.0 E</td>
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<td>7.0 P</td>
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<table>
<thead>
<tr>
<th>Micrologic</th>
<th>Current measurements</th>
<th>Power measurements</th>
<th>Advanced protection</th>
<th>Quick view</th>
<th>Remote communication by bus</th>
<th>Device-status indication</th>
<th>Device remote operation</th>
<th>Transmission of settings</th>
<th>Indication and identification of protection devices and alarms</th>
<th>Transmission of measured current values</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Compact circuit breakers</th>
<th>Additional indication and control auxiliaries</th>
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</thead>
<tbody>
<tr>
<td>NS630b</td>
<td></td>
</tr>
<tr>
<td>NS800</td>
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<td>NS1000</td>
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<td>NS1600b</td>
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<td>NS2000</td>
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<td>NS2500</td>
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<tr>
<td>NS3200</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions fixed devices, front connections (mm)</th>
<th>Weight fixed devices, front connections (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3P</td>
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<td>327 x 280 x 147</td>
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<td>4P</td>
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<td>350 x 420 x 160</td>
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<td>350 x 420 x 160</td>
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</tbody>
</table>

**Source changeover system (see section on “source changeover systems”)**

**Manual, remote-operated and automatic source changeover systems**
Functions and characteristics

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.

**Micrologic control units**

**Overview of functions**

**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 web site.

**Micrologic name codes**

<table>
<thead>
<tr>
<th>2.0 E</th>
<th>X Y Z</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>X</strong>: type of protection</td>
<td>2 for basic protection</td>
</tr>
<tr>
<td><strong>Y</strong>: control-unit generation</td>
<td>Identification of the control-unit generation. “0” signifies the first generation.</td>
</tr>
<tr>
<td><strong>Z</strong>: type of measurement</td>
<td>A for “ammeter”</td>
</tr>
</tbody>
</table>

**Current protection**

**Micrologic 2: basic protection**

Protection: long time + instantaneous

**Micrologic 5: selective protection**

Protection: long time + instantaneous

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

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

**Micrologic 7: selective + earth-leakage protection**

Protection: long time + short time + instantaneous + earth leakage up to 3200A
<table>
<thead>
<tr>
<th>Micrologic without measurement</th>
<th>Measurements and programmable protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: ammeter</td>
<td>E: Energy</td>
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<tr>
<td></td>
<td>▪ incorporates all the rms measurements</td>
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<tr>
<td></td>
<td>▪ of Micrologic A, plus voltage,</td>
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<td></td>
<td>▪ power factor, power and</td>
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<tr>
<td></td>
<td>▪ energy metering measurements.</td>
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<td></td>
<td>▪ calculates the current</td>
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<td>▪ demand value</td>
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<td></td>
<td>▪ “Quickview” function for</td>
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<td></td>
<td>▪ the automatic cyclical</td>
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<td></td>
<td>▪ display of the most useful</td>
</tr>
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<td></td>
<td>▪ values (as standard or by selection).</td>
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</tbody>
</table>

|                                | P: A + power meter + programmable protection |
|                                | ▪ measurements of V, A, W, VAR, VA, Wh, VARh, VAh, |
|                                | ▪ Hz, V_\text{peak}, A_\text{peak}, power factor and maximeters and |
|                                | ▪ minimeters                             |
|                                | ▪ IDMTL long-time protection, minimum and maximum |
|                                | ▪ voltage and frequency, voltage and current imbalance, |
|                                | ▪ phase sequence, reverse power          |
|                                | ▪ load shedding and reconnection depending on power |
|                                | ▪ or current                              |
|                                | ▪ measurements of interrupted currents, differentiated |
|                                | ▪ fault indications, maintenance indications, event |
|                                | ▪ histories and time-stamping, etc.       |

| 2.0                            | 2.0 A                                      |
|                                | 2.0 E                                      |

| 5.0                            | 5.0 A                                      |
|                                | 5.0 E                                      |
|                                | 5.0 P                                      |

| 6.0                            | 6.0 A                                      |
|                                | 6.0 E                                      |
|                                | 6.0 P                                      |

| 7.0                            | 7.0 A                                      |
|                                | 7.0 P                                      |
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\textsubscript{t} type (ON or OFF) for short-time delay.

Earth-fault protection
Residual or source ground return earth fault protection.
Selection of I\textsubscript{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 Ir (4P 3d + N/2) or neutral protection at Ir (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.
Protection Micrologic 2.0

**Long time**
- Current setting (A) \( I_r = I_n \times \cdots \) 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 0.98, 1
- Tripping between 1.05 and 1.20 \( x \) \( I_r \) or 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 \( x \) \( I_r \)
- Accuracy: 0 to -20% 6 \( x \) \( I_r \); 0.7 \( (1) \)
- Accuracy: 0 to -20% 7.2 \( x \) \( I_r \); 0.7 \( (2) \)

**Thermal memory**
- 20 minutes before and after tripping

\[(1) 0 \text{ to } -40 \% \quad (2) 0 \text{ to } -60 \% \]

**Instantaneous**
- Pick-up (A) \( Isd = I_r \times \cdots \) 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10
- Time delay: max. resettable time: 20 ms; max break time: 80 ms

Protection Micrologic 5.0 / 6.0

**Long time**
- Current setting (A) \( I_r = I_n \times \cdots \) 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 0.98, 1
- Tripping between 1.05 and 1.20 \( x \) \( I_r \) or 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 \( x \) \( I_r \)
- Accuracy: 0 to -20% 6 \( x \) \( I_r \); 0.7 \( (1) \)
- Accuracy: 0 to -20% 7.2 \( x \) \( I_r \); 0.7 \( (2) \)

**Thermal memory**
- 20 minutes before and after tripping

\[(1) 0 \text{ to } -40 \% \quad (2) 0 \text{ to } -60 \% \]

**Short time**
- Pick-up (A) \( Isd = I_r \times \cdots \) 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10
- Accuracy: ±10%

**Time setting** \( I_s (s) \)
- Settings \( I_t \) Off: 0, 0.1, 0.2, 0.3, 0.4
- \( I_t \) On: 0.1, 0.2, 0.3, 0.4

**Time delay (ms) at 10 \( x \) \( I_r \)**
- \( Isd \) (max resettable time): 20, 80, 140, 230, 350
- \( Isd \) (max break time): 80, 140, 200, 320, 500

**Instantaneous**
- Pick-up (A) \( I_s = I_n \times \cdots \) 2, 3, 4, 6, 8, 10, 12, 15, off
- Accuracy: ±10%

**Time delay**
- Max. resettable time: 20 ms
- Max break time: 50 ms

Earth fault Micrologic 6.0

**Pick-up (A)** \( I_g = I_n \times \cdots \) A, B, C, D, E, F, G, H, J
- Accuracy: ±10%

**Time setting** \( I_s (s) \)
- Settings \( I_t \) Off: 0, 0.1, 0.2, 0.3, 0.4
- \( I_t \) On: 0.1, 0.2, 0.3, 0.4

**Time delay (ms)**
- \( I_s \) (max resettable time): 20, 80, 140, 230, 350
- \( I_s \) (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 In and are accurate to within 1.5 % (including the sensors).

A digital LCD screen continuously displays the most heavily loaded phase (Imax) or displays the $I_1$, $I_2$, $I_3$, $I_{ng}$, stored-current (maximeter) and setting values by successively pressing the navigation button.

The optional external power supply makes it possible to display currents < 20 % In. Below 0.1 In, measurements are not significant. Between 0.1 and 0.2 In, 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 $I_{g}$ 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 Ir (4P 3d + N/2), neutral protection at Ir (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 Ir)
- short-circuit (short-time Isd or instantaneous li protection)
- earth fault or earth leakage (Ig 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.

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

#### Micrologic 2.0 A

**Long time**

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

**Thermal memory**

20 minutes before and after tripping

<table>
<thead>
<tr>
<th>(1) 0 to -40 %</th>
<th>(2) 0 to -60 %</th>
</tr>
</thead>
</table>

#### Instantaneous

**Pick-up (A)**

\( \text{Isd} = \text{Ir} \times \ldots \)

<table>
<thead>
<tr>
<th>Accuracy: ±10 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time delay</td>
</tr>
<tr>
<td>Max break time</td>
</tr>
</tbody>
</table>

### Protection

#### Micrologic 5.0 / 6.0 / 7.0 A

**Long time**

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

**Thermal memory**

20 minutes before and after tripping

<table>
<thead>
<tr>
<th>(1) 0 to -40 %</th>
<th>(2) 0 to -60 %</th>
</tr>
</thead>
</table>

#### Short time

**Pick-up (A)**

\( \text{Isd} = \text{Ir} \times \ldots \)

<table>
<thead>
<tr>
<th>Accuracy: ±10 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time setting tsd (s)</td>
</tr>
<tr>
<td>Max resettable time: 20 ms</td>
</tr>
<tr>
<td>Max break time: 50 ms</td>
</tr>
</tbody>
</table>

#### Instantaneous

**Pick-up (A)**

\( \text{Ii} = \text{In} \times \ldots \)

<table>
<thead>
<tr>
<th>Accuracy: ±10 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time delay</td>
</tr>
<tr>
<td>Max break time</td>
</tr>
</tbody>
</table>

### Earth fault

#### Micrologic 6.0 A

**Pick-up (A)**

\( \text{Ig} = \text{In} \times \ldots \)

<table>
<thead>
<tr>
<th>Accuracy: ±10 %</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sensitivity (A)</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>10</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time delay (ms)</td>
<td>60</td>
<td>140</td>
<td>230</td>
<td>350</td>
<td>800</td>
<td>960</td>
<td>1040</td>
<td>1120</td>
<td>1200</td>
</tr>
</tbody>
</table>

### Residual earth leakage (Vigi)

#### Micrologic 7.0 A

**Sensitivity (A)**

<table>
<thead>
<tr>
<th>0 to -20 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time delay ( \Delta t ) (ms)</td>
</tr>
</tbody>
</table>

### Ammeter

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

**Type of measurements**

<table>
<thead>
<tr>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous currents</td>
<td>( \text{I1, I2, I3, IN} )</td>
</tr>
<tr>
<td>( \text{Ig (6.0 A)} )</td>
<td>( \text{0.2 x In to 1.2 x In} )</td>
</tr>
<tr>
<td>( \text{Ig (7.0 A)} )</td>
<td>( \text{0.2 x In to 1.2 x In} )</td>
</tr>
<tr>
<td>Current maximeters of</td>
<td>( \text{I1, I2, I3, IN} )</td>
</tr>
</tbody>
</table>

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 E “energy”

Functions and characteristics

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

"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 (1) and unbalanced (1)
- instantaneous power: P, Q, S
- power factor: PF
- power demand: P demand
- energy: Ep, Eq (1), Es (1)

Accuracy of active energy Ep is 2 % (including the sensors). The range of measurement is the same as current with Micrologic A, depending on 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 I²t type (ON or OFF) for short-time delay.

Earth-fault protection
Source ground return earth fault protection.
Selection of I²t 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 Ir (4P 3d + N/2), neutral protection at Ir (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 (Ir, Isd, Alarm Ir, Alarm Ig, Ig). 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 Ir)
- short-circuit (short-time Isd or instantaneous li protection)
- earth fault (Ig)
- 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: Ir, Isd, li, Ig 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.

(1) Display on FDM121 only.

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

**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 A
- **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 s
- **Time delay (s)**: Accuracy: 0 to -30 % 1.5 x Ir, 12.5, 25, 50, 100, 200, 300, 400, 500, 600 s
- **Thermal memory**: 20 minutes before and after tripping

**Protection Micrologic 5.0 / 6.0 E**

**Long time**

- **Current setting (A)**: 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 0.98, 1 A
- **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 s
- **Time delay (s)**: Accuracy: 0 to -30 % 1.5 x Ir, 12.5, 25, 50, 100, 200, 300, 400, 500, 600 s
- **Thermal memory**: 20 minutes before and after tripping

**Short time**

- **Pick-up (A)**: Ig = In x ...
- **Accuracy**: ±10 %
- **Time setting tsd (s)**: Settings
  - P1 Off: 0, 0.1, 0.2, 0.3, 0.4 s
  - P1 On: 0, 0.1, 0.2, 0.3, 0.4 s
- **Time delay (ms) at 10 x Ir**
  - tsd (max resettable time): 20, 80, 140, 230, 350 ms
  - tsd (max break time): 80, 140, 200, 320, 500 ms

**Protection Micrologic 6.0 E**

**Earth fault**

- **Pick-up (A)**: Ig = In x ...
- **Accuracy**: ±10 %
- **Time setting Ig (s)**: Settings
  - P1 Off: 0, 0.1, 0.2, 0.3, 0.4 s
  - P1 On: 0, 0.1, 0.2, 0.3, 0.4 s
- **Time delay (ms) at In or 1200 A (P1 Off or P1 On)**
  - Ig (max resettable time): 20, 80, 140, 230, 350 ms
  - Ig (max break time): 80, 140, 200, 320, 500 ms

**Energy**

**Type of measurements**

- **Instantaneous currents**: I1, I2, I3, In
- **Demand currents**: I1, I2, I3, Ig
- **Voltages**: V12, V23, V31, V1N, V2N, V3N
- **Active power**: P
- **Power factor**: PF
- **Demand power**: P demand
- **Active energy**: Ep

**Range**

- **Instantaneous currents**: 0.2 x In to 1.2 x In
- **Demand currents**: 0.2 x In to 1.2 x In
- **Voltages**: 100 to 690 V
- **Active power**: 30 to 2000 kW
- **Power factor**: 0 to 1
- **Demand power**: 30 to 2000 kW
- **Active energy**: -10^{15} GWh to 10^{15} GWh

**Accuracy**

- **Instantaneous currents**: ± 1.5%
- **Demand currents**: ± 1.5%
- **Voltages**: ± 0.5%
- **Active power**: ± 2%
- **Power factor**: ± 2%
- **Demand power**: ± 2%
- **Active energy**: ± 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 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 1 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.

**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)**

<table>
<thead>
<tr>
<th>Protection</th>
<th>Micrologic 5.0 / 6.0 / 7.0 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current setting (A)</td>
<td>$I_r = I_n / \ldots 0.4 \ 0.5 \ 0.6 \ 0.7 \ 0.8 \ 0.9 \ 0.95 \ 0.98 \ 1$</td>
</tr>
<tr>
<td>Tripping between 1.05 and 1.20 x Ir</td>
<td>Other ranges or disable by changing long-time rating plug</td>
</tr>
</tbody>
</table>

**Time setting**

<table>
<thead>
<tr>
<th>Time setting</th>
<th>$t_r$ (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>64</td>
<td>128</td>
</tr>
<tr>
<td>128</td>
<td>256</td>
</tr>
<tr>
<td>256</td>
<td>512</td>
</tr>
<tr>
<td>512</td>
<td>1024</td>
</tr>
<tr>
<td>1024</td>
<td>2048</td>
</tr>
</tbody>
</table>

**Time delay**

<table>
<thead>
<tr>
<th>Time delay (s)</th>
<th>Accuracy: 0 to -30 % $I_r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 x Ir</td>
<td>$0.6 \ 0.7 \ 0.8 \ 0.9 \ 0.95 \ 1$</td>
</tr>
<tr>
<td>6 x Ir</td>
<td>$0.7 \ 0.8 \ 0.9 \ 0.95 \ 1$</td>
</tr>
</tbody>
</table>

**IDMTL setting**

<table>
<thead>
<tr>
<th>Curve slope</th>
<th>VIT</th>
<th>EIT</th>
<th>DT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500</td>
<td>350</td>
<td>150</td>
</tr>
<tr>
<td>1.5</td>
<td>100</td>
<td>70</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>2.5</td>
<td>25</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

**Thermal memory**

<table>
<thead>
<tr>
<th>Time delay</th>
<th>Accuracy: 0 to -40 % $I_r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 minutes before and after tripping</td>
<td></td>
</tr>
</tbody>
</table>

**Earth fault**

**Micrologic 6.0 P**

<table>
<thead>
<tr>
<th>Protection</th>
<th>Micrologic 6.0 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick-up (A)</td>
<td>$I_s = I_n / \ldots 2 \ 3 \ 4 \ 6 \ 8 \ 10$</td>
</tr>
</tbody>
</table>

**Time delay**

<table>
<thead>
<tr>
<th>Time delay</th>
<th>Accuracy: 0 to -40 % $I_r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max resettable time: 20 ms</td>
<td></td>
</tr>
</tbody>
</table>

**Earth fault alarm**

<table>
<thead>
<tr>
<th>Time delay</th>
<th>Accuracy: 0 to -40 % $I_r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max break time: 50 ms</td>
<td></td>
</tr>
</tbody>
</table>

**Alarms and other protection**

**Micrologic 5.0 / 6.0 / 7.0 P**

<table>
<thead>
<tr>
<th>Protection</th>
<th>Micrologic 5.0 / 6.0 / 7.0 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>Threshold</td>
</tr>
<tr>
<td>Current unbalance</td>
<td>$I_{unbalance}$</td>
</tr>
<tr>
<td>Max. demand current</td>
<td>$I_{max}$</td>
</tr>
<tr>
<td>Earth fault alarm</td>
<td>$I_f$</td>
</tr>
</tbody>
</table>

**Voltage**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Threshold</th>
<th>Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage unbalance</td>
<td>$U_{unbalance}$</td>
<td>2 to 30 % x $U_{av}$</td>
</tr>
<tr>
<td>Minimum voltage</td>
<td>$U_{min}$</td>
<td>100 to $U_{max}$ between phases</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>$U_{max}$</td>
<td>$U_{min}$ to 1200 between phases</td>
</tr>
</tbody>
</table>

**Power**

<table>
<thead>
<tr>
<th>Power</th>
<th>Threshold</th>
<th>Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse power</td>
<td>$P_r$</td>
<td>5 to 500 kW</td>
</tr>
<tr>
<td>Minimum frequency</td>
<td>$F_{min}$</td>
<td>45 to $F_{max}$</td>
</tr>
<tr>
<td>Maximum frequency</td>
<td>$F_{max}$</td>
<td>$F_{min}$ to 440 Hz</td>
</tr>
<tr>
<td>Phase sequence</td>
<td>$\Delta \phi$</td>
<td>$\phi_1/3$ or $\phi_1/3$</td>
</tr>
</tbody>
</table>

**Load shedding and reconnection**

**Micrologic 5.0 / 6.0 / 7.0 P**

<table>
<thead>
<tr>
<th>Protection</th>
<th>Micrologic 5.0 / 6.0 / 7.0 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured value</td>
<td>Threshold</td>
</tr>
<tr>
<td>Current</td>
<td>$I_r$</td>
</tr>
<tr>
<td>Power</td>
<td>$P_r$</td>
</tr>
</tbody>
</table>

**Power**

**Micrologic 5.0 / 6.0 / 7.0 P**

<table>
<thead>
<tr>
<th>Type of measurements</th>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current maximeters of $I_1, I_2, I_3, I_N$</td>
<td>$0.2 \times I_n$ to $1.2 \times I_n$</td>
<td>± 1.5 %</td>
</tr>
<tr>
<td>Voltages $V_{12}, V_{23}, V_{31}, V_{1N}, V_{2N}, V_{3N}$</td>
<td>$100$ to $690 \ V$</td>
<td>± 0.5 %</td>
</tr>
<tr>
<td>Power factor</td>
<td>$P_F$</td>
<td>0 to 1</td>
</tr>
<tr>
<td>Frequency (Hz)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.
**Micrologic control units**

**Micrologic P "power"**

### 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 cosφ 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).

<table>
<thead>
<tr>
<th>Currents</th>
<th>Imax rms</th>
<th>A</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>N</th>
<th>A</th>
<th>E-fault</th>
<th>E-leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I rms</td>
<td>A</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>N</td>
<td>A</td>
<td>E-fault</td>
<td>E-leakage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltages</th>
<th>U rms</th>
<th>V</th>
<th>12</th>
<th>23</th>
<th>31</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V rms</td>
<td>V</td>
<td>1N</td>
<td>2N</td>
<td>3N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power, energy</th>
<th>P active, Q reactive, S apparent</th>
<th>W, Var, VA</th>
<th>Totals</th>
<th>E active, E reactive, E apparent</th>
<th>Wh, VArh, VAh</th>
<th>Totals consumed - supplied</th>
<th>Totals supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power factor</th>
<th>PF</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hz</td>
</tr>
</tbody>
</table>

#### 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).

<table>
<thead>
<tr>
<th>Currents</th>
<th>I demand</th>
<th>A</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>N</th>
<th>A</th>
<th>E-fault</th>
<th>E-leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I max demand</td>
<td>A</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>N</td>
<td>A</td>
<td>E-fault</td>
<td>E-leakage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power</th>
<th>P, Q, S demand</th>
<th>W, Var, VA</th>
<th>Totals</th>
<th>P, Q, S max demand</th>
<th>W, Var, VA</th>
<th>Totals</th>
</tr>
</thead>
</table>

#### 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 = \( \sqrt{2} \), \((I_1 + I_2 + I_3)/3\), \( I_{\text{unbalance}} \)
- load level in % \( I_r \)
- total power factor.

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

Power Meter functions
Micrologic A/E/P control unit with COM option (BCM ULP)

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.

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.\( \phi \) 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

<table>
<thead>
<tr>
<th>Display of protection settings</th>
<th>Type</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick-ups (A) and delays</td>
<td>All settings can be displayed</td>
<td>A/E</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Type</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display of protection settings</td>
<td>A/E</td>
<td>P</td>
</tr>
<tr>
<td><em>Instantaneous rms measurements</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currents (A)</td>
<td>Phases and neutral</td>
<td>A/E</td>
</tr>
<tr>
<td></td>
<td>Average of phases</td>
<td>A/E</td>
</tr>
<tr>
<td></td>
<td>Highest current of the 3 phases and neutral</td>
<td>A/E</td>
</tr>
<tr>
<td></td>
<td>Ground fault (Micrologic 6)</td>
<td>A/E</td>
</tr>
<tr>
<td></td>
<td>Current unbalance between phases</td>
<td>-/E</td>
</tr>
<tr>
<td>Voltages (V)</td>
<td>Phase-to-phase</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Phase-to-neutral</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Average of phase-to-phase voltages</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Average of phase-to-neutral voltages</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Ph-Ph and Ph-N voltage unbalance</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Phase sequence</td>
<td>-/E</td>
</tr>
<tr>
<td>Frequency (Hz)</td>
<td>Power system</td>
<td>-/E</td>
</tr>
<tr>
<td>Power</td>
<td>Active (kW)</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Reactive (kVAR)</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Apparent (kVA)</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Power Factor</td>
<td>-/E</td>
</tr>
<tr>
<td></td>
<td>Cos.¿</td>
<td>-/E</td>
</tr>
<tr>
<td>Maximeters / minimeters</td>
<td>Associated with instantaneous rms measurements</td>
<td>A/E</td>
</tr>
<tr>
<td>Energy metering</td>
<td>Reset via FDM121 display unit and Micrologic keypad</td>
<td>P</td>
</tr>
<tr>
<td>Energy</td>
<td>Active (kW), reactive (kVARh), apparent (kVAh)</td>
<td>-/E</td>
</tr>
<tr>
<td>Demand and maximum demand values</td>
<td>Demand current (A)</td>
<td>Present value on the selected window</td>
</tr>
<tr>
<td></td>
<td>Maximum demand since last reset</td>
<td>-/E</td>
</tr>
<tr>
<td>Demand power</td>
<td>Active (kWh), reactive (kVARh), apparent (kVAh)</td>
<td>Present value on the selected window</td>
</tr>
<tr>
<td></td>
<td>Maximum demand since last reset</td>
<td>-/E</td>
</tr>
<tr>
<td>Calculation window</td>
<td>Sliding, fixed or com-synchronised</td>
<td>Adjustable from 5 to 60 minutes in 1 minute steps</td>
</tr>
</tbody>
</table>

1. Available via the communication system only.
2. Available for Micrologic P only.
Functions and characteristics

Operating-assistance functions
Micrologic A/E/P control unit with COM option (BCM ULP)

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

<table>
<thead>
<tr>
<th>Operating assistance</th>
<th>Type</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trip history</strong></td>
<td>A/E</td>
<td>Micrologic LCD</td>
</tr>
<tr>
<td>Trips</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Cause of tripping</td>
<td>Ir, Isd, li, Ig, IΔn</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maintenance indicators</th>
<th>Counter</th>
<th>Mechanical cycles</th>
<th>Assignable to an alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>A/E</td>
<td>P</td>
<td>-</td>
</tr>
<tr>
<td>Total operating time (hours) (1)</td>
<td>A/E</td>
<td>P</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Contact wear</th>
<th>% of hours in four current ranges: 0-49 % In, 50-79 % In, 80-89 % In and ≥ 90 % In</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/E</td>
<td>P</td>
<td>-</td>
</tr>
</tbody>
</table>

(1) 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.
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) via 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.

**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 modes are available.

- **Local mode**: open/close commands are enabled from FDM121 while disable 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.
- 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 °C to +55 °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.
Functions and characteristics

Switchboard-display functions
Micrologic A/E/P control unit with COM option (BCM ULP)

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.

- Quick view
- Alarms
- Metering
- Services
- Control

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 ammeter reset function, maintenance indicators, identification of modules connected to the internal bus and FDM121 internal settings (language, contrast, etc.)

Communication components and FDM121 connections

Connections
- Compact is connected to the FDM121 display unit via the breaker ULP cord.
- Cord available in three lengths: 0.35 m, 1.3 m and 3 m.
- Lengths up to 10 m possible using extensions.
Protection of distribution systems
Micrologic control units for Compact NS630b to 3200

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 Ir (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.

<table>
<thead>
<tr>
<th>Setting ranges</th>
<th>Standard</th>
<th>Low-setting option</th>
<th>High-setting option</th>
<th>No long-time protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>lr = In x...</td>
<td>0.4</td>
<td>0.44</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>0.5</td>
<td>0.50</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>0.6</td>
<td>0.55</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>0.7</td>
<td>0.60</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>0.8</td>
<td>0.65</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>0.9</td>
<td>0.70</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>0.95</td>
<td>0.75</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>lr = In x...</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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 In.
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 ±5 %, 1 A.
- ripple < 1 %
- dielectric withstand: 3.5 kV rms between input/output, for 1 minute
- overvoltage category: as per IEC 60947-1 cat. 4.
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.

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

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.
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).
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 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.

### 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

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Micrologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>A/E</td>
</tr>
<tr>
<td>Energy, voltages, frequency, power, power factor</td>
<td>E</td>
</tr>
<tr>
<td>Power quality: fundamental, harmonics</td>
<td>-</td>
</tr>
<tr>
<td>Trip history</td>
<td>E</td>
</tr>
<tr>
<td>Contact wear</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Charged power supply</th>
<th>100 – 240 V; ~1 A; 50 – 60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charged power consumption</td>
<td>Max 100 W</td>
</tr>
<tr>
<td>Battery</td>
<td>3.3 V DC; 9 mAh; Li-Ion</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20 to +60 °C</td>
</tr>
<tr>
<td>GetnSet dimensions</td>
<td>95 x 60 x 35 mm</td>
</tr>
</tbody>
</table>
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.

---

**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).**

---

*Image of a Modbus BCM ULP “device” communication module.*

*Image of a Modbus CCM “chassis” communication module.*
Overview of functions

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

<table>
<thead>
<tr>
<th>Status indications</th>
<th>Switch-disconnectors</th>
<th>Circuit breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON/OFF (O/F)</td>
<td>S</td>
<td>A</td>
</tr>
<tr>
<td>Spring charged CH</td>
<td>S</td>
<td>A</td>
</tr>
<tr>
<td>Fault-trip SDE</td>
<td>S</td>
<td>A</td>
</tr>
<tr>
<td>Connected / disconnected / test position</td>
<td>S</td>
<td>A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MX1 open</td>
<td>S</td>
<td>A</td>
</tr>
<tr>
<td>XF close</td>
<td>S</td>
<td>A</td>
</tr>
</tbody>
</table>

| 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                        |                      |                 |

| Operating assistance                 |                      |                 |
| Protection and alarm settings        | P                    |                 |
| Histories                            | E                    | P               |
| Time stamped event tables            | E                    | 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 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 protocol) 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.

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.
Functions and characteristics
Compact communication
RSU and RCU utilities

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 (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

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
Functions and characteristics

Compact communication
Communication wiring system

**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.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Code</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BCM ULP: Breaker Communication Module with ULP port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Micrologic control unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Breaker ULP cord</td>
<td>0.35 m</td>
<td>LV434195</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3 m</td>
<td>LV434196</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 m</td>
<td>LV434197</td>
</tr>
<tr>
<td>4</td>
<td>Modbus cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ethernet cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>FDM121: Front Display Module</td>
<td>TRV00121</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>ULP linet terminators</td>
<td>TRV00880</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>EGX100: Ethernet gateway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>External 24 V DC power supply module</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Modbus interface</td>
<td>TRV00210</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Stacking accessorie</td>
<td>TRV00217</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ULP cable</td>
<td>0.3 m</td>
<td>TRV00803</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6 m</td>
<td>TRV00806</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 m</td>
<td>TRV00810</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 m</td>
<td>TRV00820</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 m</td>
<td>TRV00830</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 m</td>
<td>TRV00850</td>
</tr>
<tr>
<td>13</td>
<td>NSX cord</td>
<td>0.35 m</td>
<td>LV434200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3 m</td>
<td>LV434201</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 m</td>
<td>LV434202</td>
</tr>
</tbody>
</table>
Motor protection up to 750 kW

<table>
<thead>
<tr>
<th>Motor rating (kW)</th>
<th>160…750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact NS630b to 1600</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>P (kW) (400 V, 50 Hz)</th>
<th>0.37</th>
<th>1.1</th>
<th>5.5</th>
<th>18.5</th>
<th>37</th>
<th>110</th>
<th>160</th>
<th>250</th>
<th>560</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (A)</td>
<td>1.5</td>
<td>2.5</td>
<td>12</td>
<td>40</td>
<td>50</td>
<td>80</td>
<td>100</td>
<td>200</td>
<td>220</td>
<td>320</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compact NS630b … NS1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micrologic 2.0 A / 5.0 A / 6.0 A / 7.0 A</td>
</tr>
<tr>
<td>Micrologic 2.0 E / 5.0 E / 6.0 E</td>
</tr>
</tbody>
</table>
Functions and characteristics

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

<table>
<thead>
<tr>
<th>Rated current (A)</th>
<th>630...3200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact</td>
<td></td>
</tr>
<tr>
<td>NS630b to 1000 N/L NS1250 and 1600 N</td>
<td></td>
</tr>
<tr>
<td>NS1600b to 3200</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Earth-leakage relay</th>
<th>Separate toroids</th>
<th>Rectangular sensors</th>
</tr>
</thead>
</table>

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.
Control and isolation
Overview of solutions

Main power distribution board for commercial applications
- ≤ 1000 A
- 10 - 40 kA

Main power distribution board for industrial applications
- ≤ 1600 A
- 20 - 90 kA

Modular sub-distribution board
- ≤ 160 A
- 15 - 25 kA

Industrial distribution board
- ≤ 400 A
- 160 A: 15 - 25 kA
- 400 A: 20 - 80 kA

Local isolation enclosure
- ≤ 10 kA
- ≤ 63 A

Automatic control panel
- Source changeover system
- Replacement source

Building utilities
- Compact NS Interpact INS

Continuous processes
- Interlocking Compact NSX
- Masterpact
- Interpact INS

Manufacturing processes and individual machines
- Source-changeover
- Vario
- Multi 9
- Compact NS Interpact INS

Switch-disconnectors
- Compact NS Interpact IN
- Interpact INS
- Interlockning Compact NSX

Note: adjacent to or built into the machine
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.
## Control and disconnection
Compact NS630bNA to NS1600NA switch-disconnectors

### Functions and characteristics

- **Installation standards** require upstream protection.

### Compact switch-disconnectors

<table>
<thead>
<tr>
<th>Number of poles</th>
<th>Control</th>
<th>Connections</th>
<th>Electric characteristics as per IEC 60947-3 and EN 60947-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>manual</td>
<td>fixed</td>
<td>Conventional thermal current (A) Ith 60 °C</td>
</tr>
<tr>
<td></td>
<td>toggle</td>
<td>front connection</td>
<td>Rated insulation voltage (V) Ui</td>
</tr>
<tr>
<td></td>
<td>direct or extended rotary handle</td>
<td>rear connection</td>
<td>Rated impulse withstand voltage (kV) Uimp AC 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>electric</td>
<td>withdrawable (on chassis)</td>
<td>Rated operational voltage (V) Ue AC 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>front connection</td>
<td>Rated operational current le AC 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rear connection</td>
<td></td>
</tr>
</tbody>
</table>

#### Short-circuit making capacity
- **lcml** (kA peak)

#### Short-time withstand current
- **lcw** (A rms) 0.5 s
- **lcw** (A rms) 20 s

#### Suitability for isolation
- **Suitability for isolation**

#### Durability (C-O cycles)
- **mechanical**
- **electrical**

#### Positive contact indication
- **Positive contact indication**

#### Pollution degree
- **Pollution degree**

#### Protection
- **Protection**

#### Additional indication and control auxiliaries
- **Additional indication and control auxiliaries**

### Indication contacts

#### Voltage releases
- **Voltage releases**

#### Remote communication by bus
- **Remote communication by bus**

#### Device status indications (communicating auxiliary contacts)
- **Device status indications (communicating auxiliary contacts)**

#### Device remote operation (communicating motor mechanism)
- **Device remote operation (communicating motor mechanism)**

### Installation

#### Accessories
- **Accessories**

#### Dimensions (mm)
- **Dimensions (mm)**

#### Weight (kg)
- **Weight (kg)**

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

- Manual source-changeover systems, remote-operated and automatic

---

(1) Suitable for 480 V NEMA.
<table>
<thead>
<tr>
<th>Type</th>
<th>NS630bNA</th>
<th>NS800NA</th>
<th>NS1000NA</th>
<th>NS1250NA</th>
<th>NS1600NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>3, 4</td>
<td>3, 4</td>
<td>3, 4</td>
<td>3, 4</td>
<td>3, 4</td>
</tr>
<tr>
<td>Control manual</td>
<td></td>
<td>b</td>
<td></td>
<td>b</td>
<td></td>
</tr>
<tr>
<td>Connections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawable (on chassis)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional thermal current (A)</td>
<td>630 800 1000 1250 1600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated insulation voltage (V)</td>
<td>800 800 800 800 800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated impulse withstand voltage (kV)</td>
<td>8 8 8 8 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated operational voltage (V)</td>
<td>690 690 690 690 690</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated operational current (AC 50/60 Hz)</td>
<td>AC23A AC23A AC23A AC23A AC23A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit making capacity (kA peak)</td>
<td>630 800 1000 1250 1600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-time withstand current (A rms)</td>
<td>25 25 25 25 25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>14 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source-changeover system</td>
<td>327 x 210 x 147 327 x 280 x 147</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>327 x 210 x 147 327 x 280 x 147</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Compact switch-disconnectors**
- **Schneider Electric**
**Functions and characteristics**

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

---

**Control and disconnection**

**Compact NS1600bNA to 3200NA switch-disconnectors**

---

**Compact switch-disconnectors**

<table>
<thead>
<tr>
<th>Number of poles</th>
<th>Control manual</th>
<th>Control electric</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>direct or extended rotary handle</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connections</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fixed</td>
<td>front connection</td>
</tr>
<tr>
<td></td>
<td>rear connection</td>
<td></td>
</tr>
</tbody>
</table>

**Electrical characteristics as per IEC 60947-3 and EN 60947-3**

<table>
<thead>
<tr>
<th>Conventional thermal current (A)</th>
<th>( I_{th} )</th>
<th>60 °C</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rated insulation voltage (V)</th>
<th>( U_i )</th>
<th>800</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rated impulse withstand voltage (kV)</th>
<th>( U_{imp} )</th>
<th>AC 50/60 Hz</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rated operational current</th>
<th>( I_e )</th>
<th>AC 50/60 Hz</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Short-circuit making capacity</th>
<th>( I_{cm} ) (kA peak)</th>
<th>220/240 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-time withstand current</td>
<td>( I_{cw} ) (A rms)</td>
<td>3 s</td>
</tr>
<tr>
<td>Integrated instantaneous protection (kA peak ±10 %)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Suitability for isolation | | |

<table>
<thead>
<tr>
<th>Durability (C-O cycles)</th>
<th>mechanical</th>
<th>electrical</th>
</tr>
</thead>
</table>

| 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 | |
|-------------|------------||

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>fixed</th>
<th>3P</th>
</tr>
</thead>
<tbody>
<tr>
<td>W x H x D</td>
<td></td>
<td>4P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>fixed</th>
<th>3P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4P</td>
</tr>
</tbody>
</table>

**Source-changeover system (see section “on source-changeover systems”)**

Manual source-changeover systems, remote-operated and automatic

---

(1) Suitable for 480 V NEMA.
<table>
<thead>
<tr>
<th></th>
<th>NS1600bNA</th>
<th>NS2000NA</th>
<th>NS2500NA</th>
<th>NS3200NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>3, 4</td>
<td>3, 4</td>
<td>3, 4</td>
<td>3, 4</td>
</tr>
<tr>
<td>Control manual</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Direct or extended rotary handle</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Electric</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Connections</td>
<td>fixed</td>
<td>fixed</td>
<td>fixed</td>
<td>fixed</td>
</tr>
<tr>
<td>Rear connection</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rear connection</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Electrical features as per IEC 60947-3 and EN 60947-3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional thermal current (A)</td>
<td>Ith</td>
<td>60 °C</td>
<td>1600</td>
<td>2000</td>
</tr>
<tr>
<td>Rated insulation voltage (V)</td>
<td>Ui</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Rated impulse withstand voltage (kV)</td>
<td>Uimp</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Rated operational voltage (V)</td>
<td>Ue</td>
<td>AC 50/60 Hz</td>
<td>690</td>
<td>690</td>
</tr>
<tr>
<td>Rated operational current</td>
<td>le</td>
<td>AC 50/60 Hz</td>
<td>AC23A</td>
<td>AC23A</td>
</tr>
<tr>
<td>220/240 V</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>3200</td>
</tr>
<tr>
<td>380/415 V</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>3200</td>
</tr>
<tr>
<td>440/480 V (1)</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>3200</td>
</tr>
<tr>
<td>500/525 V</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>3200</td>
</tr>
<tr>
<td>660/690 V</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>3200</td>
</tr>
<tr>
<td>Short-circuit making capacity</td>
<td>lcm</td>
<td>(kA peak)</td>
<td>135</td>
<td>135</td>
</tr>
<tr>
<td>Short-time withstand current</td>
<td>lcw</td>
<td>(A rms) 3 s</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Integrated instantaneous protection (kA peak ±10 %)</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>Suitability for isolation</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Durability (C-O cycles) mechanical</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Electrical</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Positive contact indication</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Protection</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Add-on earth-leakage protection combination with Vigirex relay</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Additional indication and control auxiliaries</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Indication contacts</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Voltage releases MX shunt release</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>MN undervoltage release</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Installation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Accessories</td>
<td>escutcheons</td>
<td>escutcheons</td>
<td>escutcheons</td>
<td>escutcheons</td>
</tr>
<tr>
<td>Dimensions (mm) fixed 3P</td>
<td>W x H x D</td>
<td>350 x 420 x 160</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Weight (kg) fixed 4P</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source-changeover system (see section “on source-changeover systems”)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Source-changeover systems
Presentation

Functions and characteristics

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.

Commercial and service sector:
- operating rooms in hospitals
- safety systems for tall buildings
- computer rooms (banks, insurance companies, etc.)
- lighting systems in shopping centres…

Industry:
- assembly lines
- engine rooms on ships
- critical auxiliaries in thermal power stations…

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 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

<table>
<thead>
<tr>
<th>“Normal N”</th>
<th>“Replacement” R</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS630b to NS1600</td>
<td>NT06 to NT16</td>
</tr>
<tr>
<td>NW08 to NW40</td>
<td>NW40b to NW63</td>
</tr>
</tbody>
</table>

NS630b to NS1600
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.

**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**

<table>
<thead>
<tr>
<th>Types of mechanical interlocking</th>
<th>Possible combinations</th>
<th>Typical electrical diagrams</th>
<th>Diagram no.</th>
</tr>
</thead>
</table>
| ![DIAGRAM](image.png) | ON QR | Compact NS630b to 1600:  
- Electrical interlocking with lockout after fault:
  - permanent replacement source (without IVE)  
  - with EPO by MX (without IVE)  
  - with EPO by MN (without IVE)  
  - permanent replacement source (with IVE)  
  - with EPO by MX (with IVE)  
  - with EPO by MN (with IVE)  
  - automatic control without lockout after fault:  
  - permanent replacement source (without IVE) | 51201180  
51201181  
51201182  
51201183  
51201184  
51201185  
51201186 |
Remote-operated systems

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.
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 diagrams provided in the “electrical diagrams” section of this catalogue.

**Controller**

<table>
<thead>
<tr>
<th>4-position switch</th>
<th>BA</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatible circuit breaker</td>
<td>All Compact NS circuit breaker</td>
<td></td>
</tr>
</tbody>
</table>

**Automatic operation**

- Forced operation on “Normal” source
- Forced operation on “Replacement” source
- Stop (both Normal and Replacement sources OFF)

**Automatic operation**

- Monitoring of the “Normal” source and automatic transfer
- Generator set startup control
- Delayed shutdown (adjustable) of engine generator set
- Load shedding and reconnection of non-priority circuits
- Transfer to the “Replacement” source if one of the phases of the “Normal” phase is absent

**Test**

- By opening the P25M circuit breaker supplying the controller
- By pressing the test button on the front of the controller

**Indications**

- Circuit breaker status indication on the front of the controller: on, off, fault trip
- Automatic mode indication contact

**Other functions**

- Selection of type of “Normal” source (single-phase or three-phase)
- Voluntary transfer to “Replacement” source (e.g. energy-management commands)
- During peak-tariff periods (energy-management commands) forced operation on “Normal” source if “Replacement” source not operational
- Additional control contact (not in controller).
- Transfer to “Replacement” source only if contact closed (e.g. used to test the frequency of UR)

**Options**

- Setting of maximum startup time for the replacement source

**Power supply**

- Control voltages (2)
  - 110 V
  - 220 to 240 V 50/60 Hz
  - 380 to 415 V 50/60 Hz
  - 440 V 60 Hz

**Operating thresholds**

- Undervoltage: 0.35 Un y voltage y 0.7 Un
- Phase failure: 0.5 Un y voltage y 0.7 Un
- Voltage presence: voltage u 0.85 Un

**IP degree of protection (EN 60529) and IK degree of protection against external mechanical impacts (EN 50102)**

- Front: IP40
- Side: IP30
- Connectors: IP20
- Front: IK07

**Characteristics of output contacts (dry, volt-free contacts)**

- Rated thermal current (A): 8
- Minimum load: 10 mA at 12 V

**Utilisation category (IEC 60947-5-1)**

<table>
<thead>
<tr>
<th>Utilisation category (IEC 60947-5-1)</th>
<th>AC12</th>
<th>AC13</th>
<th>AC14</th>
<th>AC15</th>
<th>DC12</th>
<th>DC13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational current (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>48 V</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>110 V</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>0.6</td>
<td>-</td>
</tr>
<tr>
<td>220/240 V</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>250 V</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>380/415 V</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>440 V</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>660/690 V</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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

(2) 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.
Functions and characteristics

Electrical and mechanical accessories
Compact NS630b to 1600 (fixed version)

- Interphase barriers
- Phase barriers
- Terminal extension for cables with lugs
- Vertical connection adapter
- Sealable terminal shield
- Connection kit for connectors
- Auxiliary contact
- Voltage release
- Communications module
- Spreaders
- Rear connectors
- Electrical control with mixed connection
- Manual control with front connection
- Manual control with rear connection
- Phase barriers
- Escutcheons
- Extended rotary handle
- Direct rotary handle
- Phase barriers
- Connection kit for connectors
- Sealable terminal shield

Electrical and mechanical accessories
Compact NS630b to 1600 (fixed version)
Compact NS630b to 1600 (withdrawable version)

- Interphase barriers
- Spreader
- Rear connectors
- Terminal extension for cables with lugs
- Vertical connection adapter
- Spreader
- Chassis with front or rear connection
- Manual operation
- Electrical operation
- Extended rotary handle
- Direct rotary handle
- Auxiliary contact
- Voltage release
- Communications module
- Escutcheon
- Transparent cover
### Electrical and mechanical accessories

**Compact NS630b to 1600**

#### Installation

**Fixed configuration**

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

**Withdrawable configuration**

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

---

**Fixed Compact NS800.**

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.

**Withdrawable Compact NS800H.**

- **Mounting on a backplate.**
- **Mounting on rails.**
- **Rear mounting on rails.**
- **Device on mounting plate.**
- **Device on rails.**
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.

---

**Table of Parts**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mismatch protection</td>
</tr>
<tr>
<td>2</td>
<td>Door interlock</td>
</tr>
<tr>
<td>3</td>
<td>Racking interlock</td>
</tr>
<tr>
<td>4</td>
<td>Keylock locking</td>
</tr>
<tr>
<td>5</td>
<td>Padlock locking</td>
</tr>
<tr>
<td>6</td>
<td>Position indicator</td>
</tr>
<tr>
<td>7</td>
<td>Chassis front plate (accessible with cubicle door closed)</td>
</tr>
<tr>
<td>8</td>
<td>Crank entry</td>
</tr>
<tr>
<td>9</td>
<td>Reset button</td>
</tr>
<tr>
<td>10</td>
<td>Crank storage</td>
</tr>
</tbody>
</table>

---
## Types of connection

### Fixed device

#### Front connections (N, L)
Connection by:
- bars
- bare cables (except L)
- cables with lugs

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

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

(1) Mandatory for voltages ≤ 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.
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.

Bare cables
Special sets of connectors and terminal shields may be used to connect up to four 240 mm² copper or aluminium cables for each phase. Bare cable connection is possible for ratings up to and including 1250 A.

Cables with lugs
Cable lug adapters are combined with the vertical-connection adapters. One to four cables with crimped lugs (≤ 300 mm²) 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.
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.

Cables with lugs
Cable lug adapters enable connection of one to four cables with crimped lugs (y 300 mm²). To ensure stability, spacers must be positioned between the terminal extensions.
Electrical and mechanical accessories
Compact NS630b to 1600 (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.

Cables with lugs
Cable lug adapters enable connection of one to four cables with crimped lugs (≤ 300 mm²). To ensure stability, spacers must be positioned between the terminal extensions.
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 (≤ 300 mm²). To ensure stability, spacers must be positioned between the terminal extensions.

Spreaders.

Cable lug adapters.
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.

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 ≤ 500 V for both fixed and withdrawable products and for L and LB types, whatever the voltage.

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.
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.
**Indication contacts**

**Contacts installed in the device**

Changeover contacts are used to remotely receive 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**

<table>
<thead>
<tr>
<th>Contacts</th>
<th>Standard</th>
<th>Low level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated thermal current (A)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Minimum load</td>
<td>100 mA at 24 V</td>
<td>1 mA at 4 V</td>
</tr>
<tr>
<td>Utilisation cat. (IEC 60947-5-1)</td>
<td>AC12 AC15 DC12 DC14 AC12 AC15 DC12 DC14</td>
<td></td>
</tr>
<tr>
<td>Operational current (A)</td>
<td>24 V</td>
<td>6</td>
</tr>
<tr>
<td>48 V</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>110 V</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>220/240 V</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>250 V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>380/440 V</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>480 V</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>560/690 V</td>
<td>6</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Contacts</th>
<th>Standard</th>
<th>Low level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated thermal current (A)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Minimum load</td>
<td>100 mA at 24 V</td>
<td>2 mA at 15 V</td>
</tr>
<tr>
<td>Utilisation cat. (IEC 60947-5-1)</td>
<td>AC12 AC15 DC12 DC14 AC12 AC15 DC12 DC14</td>
<td></td>
</tr>
<tr>
<td>Operational current (A)</td>
<td>24 V</td>
<td>8</td>
</tr>
<tr>
<td>48 V</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>110 V</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>220/240 V</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>250 V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>380/440 V</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>560/690 V</td>
<td>8</td>
<td>0.1</td>
</tr>
</tbody>
</table>

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).
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.

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.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>M6C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum load</td>
<td>100 mA/24 V</td>
</tr>
<tr>
<td>Breaking capacity (A)</td>
<td></td>
</tr>
<tr>
<td>V AC</td>
<td>240</td>
</tr>
<tr>
<td>390</td>
<td>3</td>
</tr>
<tr>
<td>V DC</td>
<td>24</td>
</tr>
<tr>
<td>48</td>
<td>1.8</td>
</tr>
<tr>
<td>125</td>
<td>1.5</td>
</tr>
<tr>
<td>250</td>
<td>0.4</td>
</tr>
</tbody>
</table>

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

Remote tripping
This function opens the circuit breaker via an electrical order. It is made up of:
- a shunt release (2nd MX)
- or an undervoltage release MN
- or a delayed undervoltage release MN + delay unit.
These releases (2nd 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 2nd MX
When energised, the 2nd MX voltage release instantaneously opens the circuit breaker. A continuous supply of power to the 2nd MX locks the circuit breaker in the OFF position.

Characteristics
- Power supply: VAC 50/60 Hz
- 24 - 48 - 100/130 - 200/250 - 277 - 380/480 VDC
- Operating threshold opening: 0.7 to 1.1 Un
- Permanently 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: VAC 50-60 Hz
- 24 - 48 - 100/130 - 200/250 - 380/480 VDC
- Operating opening threshold: 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: VAC 50-60 Hz/DC
- Non-adjustable: 100/130 - 200/250 adjustable: 48/60 - 100/130 - 200/250 - 380/480
- Operating opening threshold: 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 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**

<table>
<thead>
<tr>
<th>Power supply</th>
<th>V AC 50/60 Hz</th>
<th>48/60 - 100/130 - 200/240 - 277 - 380/415</th>
</tr>
</thead>
<tbody>
<tr>
<td>V DC</td>
<td>24/30 - 48/60 - 100/125 - 200/250</td>
<td></td>
</tr>
<tr>
<td>Operating threshold</td>
<td>0.85 to 1.1 Un</td>
<td></td>
</tr>
<tr>
<td>Consumption (VA or W)</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Charging time</td>
<td>maximum 4 seconds</td>
<td></td>
</tr>
<tr>
<td>Operating frequency</td>
<td>maximum 3 cycles per minute</td>
<td></td>
</tr>
</tbody>
</table>

**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 ±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 point-to-point electrical operation solution**

**Wiring diagram of a bus-type 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.
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).

<table>
<thead>
<tr>
<th>Control device</th>
<th>Function</th>
<th>Means</th>
<th>Required accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toggle</td>
<td>lock in</td>
<td>padlock</td>
<td>removable device</td>
</tr>
<tr>
<td></td>
<td>b OFF position</td>
<td>padlock</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b OFF or ON position</td>
<td>padlock</td>
<td></td>
</tr>
<tr>
<td>Direct rotary handle</td>
<td>lock in</td>
<td>padlock</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b OFF position</td>
<td>padlock</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b OFF or ON position</td>
<td>keylock</td>
<td>locking device + keylock</td>
</tr>
<tr>
<td>CNOMO direct rotary handle</td>
<td>lock in</td>
<td>padlock</td>
<td></td>
</tr>
<tr>
<td>Extended rotary handle</td>
<td>lock in OFF position, door opening prevented</td>
<td>padlock</td>
<td>keylock</td>
</tr>
</tbody>
</table>

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

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.

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).
“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.
  - 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.
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)
**Electrical and mechanical accessories**
Compact NS1600b to 3200 (cont.)

**Installation**

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

**Connection**

**Front connection**
NS1600 to 2500
NS3200

**Bars**
Bars may be directly connected to the terminals of Compact NS1600b to 3200 circuit breakers.
NS1600b to 2500

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

<table>
<thead>
<tr>
<th>Contacts</th>
<th>Standard</th>
<th>Low level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated thermal current (A)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Minimum load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 mA at 24 V</td>
<td>AC12</td>
<td>AC15</td>
</tr>
<tr>
<td>DC12</td>
<td>DC14</td>
<td>AC12</td>
</tr>
<tr>
<td>DC12</td>
<td>DC14</td>
<td></td>
</tr>
<tr>
<td>Operational current (A)</td>
<td>24 V</td>
<td>5</td>
</tr>
<tr>
<td>48 V</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>110 V</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>220/240 V</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>250 V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>380/440 V</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>480 V</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>660/690 V</td>
<td>6</td>
<td>0.1</td>
</tr>
</tbody>
</table>

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).
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 2nd MX
- an undervoltage release MN
- or a delayed undervoltage release MNR = MN + delay unit.
These releases (2nd 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 2nd MX
When energised, the 2nd MX voltage release instantaneously opens the circuit breaker. A continuous supply of power to the 2nd 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 | V AC 50-60 Hz / DC | 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
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).

<table>
<thead>
<tr>
<th>Control device</th>
<th>Function</th>
<th>Means</th>
<th>Required accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toggle</td>
<td>lock in OFF position</td>
<td>padlock</td>
<td>removable device</td>
</tr>
<tr>
<td></td>
<td>lock in OFF or ON position</td>
<td>padlock</td>
<td>fixed device</td>
</tr>
</tbody>
</table>

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.
Installation recommendations

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Compact NS devices equipped with electronic trip units B-9

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Electrical diagrams D-1
Additional characteristics E-1
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.

<table>
<thead>
<tr>
<th>Compact NS630b to 3200</th>
<th>2000</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulse withstand voltage Uimp (kV)</td>
<td>8</td>
<td>7.1</td>
<td>6.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Rated insulation voltage (Ui)</td>
<td>690</td>
<td>710</td>
<td>635</td>
<td>560</td>
</tr>
<tr>
<td>Maximum rated operational voltage 50/60 Hz Ue (V)</td>
<td>690</td>
<td>690</td>
<td>635</td>
<td>560</td>
</tr>
<tr>
<td>Rated current 40 °C</td>
<td>1 x In</td>
<td>0.99 x In</td>
<td>0.96 x In</td>
<td>0.94 x In</td>
</tr>
</tbody>
</table>

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 ±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

<table>
<thead>
<tr>
<th></th>
<th>Circuit breaker</th>
<th>Chassis</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS630b to 1600 manual operation</td>
<td>3P 14</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>4P 16</td>
<td>18</td>
</tr>
<tr>
<td>NS630b to 1600 electrical operation</td>
<td>3P 14</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>4P 16</td>
<td>21</td>
</tr>
<tr>
<td>NS1600b to 3200</td>
<td>3P 24</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>4P 36</td>
<td>-</td>
</tr>
</tbody>
</table>

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)**

<table>
<thead>
<tr>
<th>Insulated parts</th>
<th>Metal parts</th>
<th>Live parts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NS630b to 1600</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 0</td>
<td>120</td>
<td>180</td>
</tr>
<tr>
<td>B 0</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td><strong>NS1600b to 3200</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 50</td>
<td>170</td>
<td>230</td>
</tr>
<tr>
<td>B 0</td>
<td>10</td>
<td>60</td>
</tr>
</tbody>
</table>

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

**Compact NS630b to 1600 (withdrawable devices)**

<table>
<thead>
<tr>
<th>Insulated parts</th>
<th>Metal parts</th>
<th>Live parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>B 10</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>C 0</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

Datum
## Installation recommendations

### Installation example

<table>
<thead>
<tr>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct connection by bare cables, devices with terminal shields.</td>
<td><img src="diagram1.png" alt="Direct connection" /></td>
</tr>
<tr>
<td>Connection by cables with lugs, devices with terminal shields.</td>
<td><img src="diagram2.png" alt="Connection by cables" /></td>
</tr>
<tr>
<td>Connection by insulated bars, devices with terminal shields.</td>
<td><img src="diagram3.png" alt="Connection by insulated" /></td>
</tr>
<tr>
<td>Rear connection or plug-in base, devices with terminal shields.</td>
<td><img src="diagram4.png" alt="Rear connection" /></td>
</tr>
</tbody>
</table>

### Minimum dimensions (mm)

<table>
<thead>
<tr>
<th>Compact circuit breaker</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS630b-1600</td>
<td>250</td>
</tr>
<tr>
<td>NS1600b-3200</td>
<td>300</td>
</tr>
</tbody>
</table>
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)

<table>
<thead>
<tr>
<th>Type</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS630b to 1600 (3P)</td>
<td>135</td>
<td>168</td>
</tr>
<tr>
<td>NS630b to 1600 (4P)</td>
<td>205</td>
<td>168</td>
</tr>
</tbody>
</table>

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

**Datum**
Control wiring

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).

<table>
<thead>
<tr>
<th></th>
<th>12 V</th>
<th>24 V</th>
<th>48 V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.5 mm²</td>
<td>1.5 mm²</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>MN U source 100 %</td>
<td>–</td>
<td>–</td>
<td>58</td>
</tr>
<tr>
<td>MN U source 85 %</td>
<td>–</td>
<td>–</td>
<td>16</td>
</tr>
<tr>
<td>MX-XF U source 100 %</td>
<td>21</td>
<td>12</td>
<td>115</td>
</tr>
<tr>
<td>MX-XF U source 85 %</td>
<td>10</td>
<td>6</td>
<td>75</td>
</tr>
</tbody>
</table>

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

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.

<table>
<thead>
<tr>
<th>Version</th>
<th>Connection</th>
<th>Fixed device</th>
<th>Vertical rear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front or horizontal rear</td>
<td>Front or horizontal rear</td>
<td>Front or horizontal rear</td>
</tr>
<tr>
<td>NS630b N/L</td>
<td>40</td>
<td>630</td>
<td>630</td>
</tr>
<tr>
<td>NS800 N/L</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>NS1000 N/L</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>NS1250 N</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
</tr>
<tr>
<td>NS1600 N</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
</tr>
</tbody>
</table>

#### Version Withdrawable device

<table>
<thead>
<tr>
<th>Version</th>
<th>Connection</th>
<th>Fixed device</th>
<th>Vertical rear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front or horizontal rear</td>
<td>Front or horizontal rear</td>
<td>Front or horizontal rear</td>
</tr>
<tr>
<td>NS630b N/L</td>
<td>40</td>
<td>630</td>
<td>630</td>
</tr>
<tr>
<td>NS800 N/L</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>NS1000 N/L</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>NS1250 N</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
</tr>
<tr>
<td>NS1600 N</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
</tr>
</tbody>
</table>

#### Compact NS1600b to 3200

<table>
<thead>
<tr>
<th>Version</th>
<th>Connection</th>
<th>Fixed device</th>
<th>Vertical rear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front or horizontal rear</td>
<td>Front or horizontal rear</td>
<td>Front or horizontal rear</td>
</tr>
<tr>
<td>NS1600b N</td>
<td>40</td>
<td>1600</td>
<td>1600</td>
</tr>
<tr>
<td>NS2500 N</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>NS3200 N</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(1) 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.

(2) Ti: temperature around the circuit breaker and its connections.
Power dissipation / Resistance
Compact NS devices equipped with electronic trip units

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 \( I_{\text{N}} \), 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

<table>
<thead>
<tr>
<th>Version</th>
<th>Fixed device</th>
<th></th>
<th>Withdrawable device</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N R/pole</td>
<td>P/pole</td>
<td>L R/pole</td>
<td>P/pole</td>
</tr>
<tr>
<td>LS630b</td>
<td>0.026</td>
<td>10</td>
<td>0.039</td>
<td>15</td>
</tr>
<tr>
<td>LS800</td>
<td>0.026</td>
<td>15</td>
<td>0.039</td>
<td>20</td>
</tr>
<tr>
<td>LS1000</td>
<td>0.026</td>
<td>22</td>
<td>0.039</td>
<td>34</td>
</tr>
<tr>
<td>LS1250</td>
<td>0.026</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS1600</td>
<td>0.026</td>
<td>74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Compact NS1600b to 3200

<table>
<thead>
<tr>
<th>Version</th>
<th>Fixed device</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N R/pole</td>
<td>P/pole</td>
</tr>
<tr>
<td>LS1600b</td>
<td>0.019</td>
<td>84</td>
</tr>
<tr>
<td>LS2000</td>
<td>0.013</td>
<td>84</td>
</tr>
<tr>
<td>LS2500</td>
<td>0.008</td>
<td>100</td>
</tr>
<tr>
<td>LS3200</td>
<td>0.008</td>
<td>227</td>
</tr>
</tbody>
</table>
## Compact NS630b to 3200

### Dimensions and connection

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<th>Page</th>
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<td>Installation recommendations</td>
<td>B-1</td>
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<td>C-2</td>
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<td>Dimensions</td>
<td>C-2</td>
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<td>Mounting</td>
<td>C-3</td>
</tr>
<tr>
<td>Front-panel cutouts</td>
<td>C-4</td>
</tr>
<tr>
<td>Rotary handle</td>
<td>C-5</td>
</tr>
<tr>
<td><strong>Compact NS630b to 1600 (withdrawable version)</strong></td>
<td>C-6</td>
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<tr>
<td>Dimensions, mounting and cutouts</td>
<td>C-6</td>
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<tr>
<td>Rotary handle</td>
<td>C-7</td>
</tr>
<tr>
<td><strong>Compact NS1600b to 3200 (fixed version)</strong></td>
<td>C-8</td>
</tr>
<tr>
<td>Dimensions</td>
<td>C-8</td>
</tr>
<tr>
<td><strong>Compact NS630b to 3200</strong></td>
<td>C-9</td>
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<td>External modules</td>
<td>C-9</td>
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<tr>
<td><strong>Accessories NS630b to 3200</strong></td>
<td>C-13</td>
</tr>
<tr>
<td><strong>Compact NS630b to 1600 (fixed version)</strong></td>
<td>C-14</td>
</tr>
<tr>
<td>Bars</td>
<td>C-14</td>
</tr>
<tr>
<td>Cables with lugs and bare cables</td>
<td>C-17</td>
</tr>
<tr>
<td><strong>Compact NS630b to 1600 (plug-in and withdrawable versions)</strong></td>
<td>C-18</td>
</tr>
<tr>
<td>Bars</td>
<td>C-18</td>
</tr>
<tr>
<td>Cables with lugs</td>
<td>C-20</td>
</tr>
<tr>
<td><strong>Compact NS1600b to 3200 (fixed version)</strong></td>
<td>C-21</td>
</tr>
<tr>
<td>Recommended drilling dimensions</td>
<td>C-22</td>
</tr>
<tr>
<td><strong>Power connections for Compact NS1600b to 3200</strong></td>
<td>C-23</td>
</tr>
<tr>
<td>Recommended drilling dimensions</td>
<td>C-23</td>
</tr>
<tr>
<td>Sizing of bars</td>
<td>C-26</td>
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<tr>
<td><strong>Electrical diagrams</strong></td>
<td>D-1</td>
</tr>
<tr>
<td><strong>Additional characteristics</strong></td>
<td>E-1</td>
</tr>
</tbody>
</table>
Compact NS630b to 1600 (fixed version)
Dimensions

Manual control
Front connection (N, L)

Rear connection (N, L, LB)

Electrical control
Front and rear connection (N, L, LB)

(1) terminal shields are optional

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

Front connection

<table>
<thead>
<tr>
<th>On backplate</th>
<th>On rails</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Rear connection

<table>
<thead>
<tr>
<th>On backplate or rails</th>
</tr>
</thead>
<tbody>
<tr>
<td>3P</td>
</tr>
<tr>
<td><img src="image3" alt="Diagram" /></td>
</tr>
</tbody>
</table>

| 4P                     |
| ![Diagram](image4)    |

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

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Door cutout</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
</tr>
</tbody>
</table>

#### Without escutcheon:
- 107.5
- 140.5
- 146.5

#### With escutcheon:
- 119.5

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

### Electrical control

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Door cutout</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
</tr>
</tbody>
</table>

#### Without escutcheon:
- 107.5
- 140.5
- 146.5

#### With escutcheon:
- 119.5

**Datum:**
- (1) Without escutcheon.
- (2) With escutcheon.
## Rotary handle

### Direct rotary handle

#### Dimensions

<table>
<thead>
<tr>
<th>Door cutout</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) With escutcheon.</td>
<td>(2) With escutcheon.</td>
<td>(2) With escutcheon.</td>
<td>(2) With escutcheon.</td>
</tr>
</tbody>
</table>

### Extended rotary handle

#### Dimensions

<table>
<thead>
<tr>
<th>Door cutout</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) With escutcheon.</td>
<td>(2) With escutcheon.</td>
<td>(2) With escutcheon.</td>
<td>(2) With escutcheon.</td>
</tr>
</tbody>
</table>

---

**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

<table>
<thead>
<tr>
<th>Manual control</th>
<th>Electrical control</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="DB128197.png" alt="Diagram" /></td>
<td><img src="DB128209.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

(*) Withdrawable position

### Mounting

#### Bottom mounting on base plate or rails

![Diagram](DB128200.png)

### Cutouts

#### Door cutout

![Diagram](DB128202.png)

#### Rear panel cutout

![Diagram](DB128203.png)

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

Not.

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

Direct rotary handle

Dimensions

Door cutout

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

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

External power-supply module (AD)

Battery module (BAT)
Compact NS630b to 3200
External modules

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)
Compact NS630b to 3200
External modules (cont.)

Rectangular sensor for earth leakage protection (Vigi)

280 x 115 mm window

470 x 160 mm window

<table>
<thead>
<tr>
<th>Busbars</th>
<th>I ≤ 1600 A</th>
<th>I ≤ 3200 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window (mm)</td>
<td>280 x 115</td>
<td>470 x 160</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>14</td>
<td>18</td>
</tr>
</tbody>
</table>

Busbars path

280 x 115 mm window
Busbars spaced 70 mm centre-to-centre

470 x 160 mm window
Busbars spaced 115 mm centre-to-centre

2 bars 50 x 10

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)

NS630b to NS1600 (withdrawable control)

NS1600b to NS3200 (fixed control)
**Compact NS630b to 1600 (fixed version) Bars**

### Dimensions and connection

#### Horizontal rear connection

![Diagram of horizontal rear connection]

- **Dimensions:**
  - DB128247: 15 mm
  - DB128248: 15 mm
  - DB128249: 67.5 mm
  - DB128250: 123 mm

#### Vertical rear connection

![Diagram of vertical rear connection]

- **Dimensions:**
  - DB128247: 15 mm
  - DB128248: 15 mm
  - DB128249: 67.5 mm
  - DB128250: 123 mm

#### Front connection

![Diagram of front connection]

- **Dimensions:**
  - DB128253: 163.5 mm
  - DB128254: 163.5 mm

**Note:**

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

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

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.

Datum.
Compact NS630b to 1600 (fixed version)
Bars

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.

Dimensions and connection

Front connection with vertical-connection adapters
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 mm²)
Compact NS630b to 1600 (plug-in and withdrawable versions)
Bars

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

Spreader detail

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

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
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)
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.

<table>
<thead>
<tr>
<th>Type of tie</th>
<th>&quot;Panduit&quot; ties</th>
<th>&quot;Sarei&quot; ties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 4.5 mm</td>
<td>Width: 9 mm</td>
<td></td>
</tr>
<tr>
<td>Maximum load: 22 kg</td>
<td>Maximum load: 90 kg</td>
<td></td>
</tr>
<tr>
<td>Colour: white</td>
<td>Colour: black</td>
<td></td>
</tr>
<tr>
<td>Maximum distance between ties (mm)</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>Short-circuit current (kA rms)</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Note. For cables u 50 mm², 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 |
|---|---|---|---|---|---|
| Isc (kA) | 30 | 50 | 65 | 80 | 100 | 150 |
| Distance (mm) | 350 | 300 | 250 | 150 | 150 | 150 |
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

<table>
<thead>
<tr>
<th>Tightening torque for bars</th>
</tr>
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<tbody>
<tr>
<td>Rated diameter (mm)</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Bar drilling

Examples

Insulation distance

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>X minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation voltage</td>
<td></td>
</tr>
<tr>
<td>U₁ y 600 V</td>
<td>8 mm</td>
</tr>
<tr>
<td>U₁ y 1000 V</td>
<td>14 mm</td>
</tr>
</tbody>
</table>

Bar bending

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

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>e</th>
<th>Radius r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radius r</td>
<td>e</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>7.5</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>18 to 20</td>
</tr>
</tbody>
</table>
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

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

Note: With Compact NS630b to NS1600, it is recommended to use 50 mm wideness bars (see "Recommended busbars drilling").
### Vertical rear connections

<table>
<thead>
<tr>
<th>Compact</th>
<th>Maximum service current</th>
<th>T: 40 °C Number of bars</th>
<th>T: 50 °C Number of bars</th>
<th>T: 60 °C Number of bars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 mm thick</td>
<td>10 mm thick</td>
<td>5 mm thick</td>
</tr>
<tr>
<td>NS630b</td>
<td>400</td>
<td>2b.30 x 5</td>
<td>1b.30 x 10</td>
<td>2b.30 x 5</td>
</tr>
<tr>
<td>NS630b</td>
<td>630</td>
<td>2b.40 x 5</td>
<td>1b.40 x 10</td>
<td>2b.40 x 5</td>
</tr>
<tr>
<td>NS800</td>
<td>800</td>
<td>2b.50 x 5</td>
<td>1b.50 x 10</td>
<td>2b.50 x 5</td>
</tr>
<tr>
<td>NS1000</td>
<td>1000</td>
<td>2b.63 x 5</td>
<td>1b.63 x 10</td>
<td>3b.50 x 5</td>
</tr>
<tr>
<td>NS1250</td>
<td>1250</td>
<td>2b.80 x 5</td>
<td>1b.80 x 10</td>
<td>2b.80 x 5</td>
</tr>
<tr>
<td>NS1600</td>
<td>1600</td>
<td>3b.63 x 5</td>
<td>2b.50 x 10</td>
<td>3b.63 x 5</td>
</tr>
</tbody>
</table>
# Compact NS630b to 3200

## Electrical diagrams

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<td>D-12</td>
</tr>
<tr>
<td><strong>Withdrawable Compact NS630b to 3200</strong></td>
<td>D-13</td>
</tr>
<tr>
<td>Wiring of the COM option (Modbus BCM ULP and CCM modules) with or without ULP module</td>
<td>D-13</td>
</tr>
<tr>
<td><strong>Compact NS630b to 3200</strong></td>
<td>D-14</td>
</tr>
<tr>
<td>Connection of the 24 V DC external power supply AD module</td>
<td>D-14</td>
</tr>
<tr>
<td><strong>Additional characteristics</strong></td>
<td>E-1</td>
</tr>
</tbody>
</table>
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:
  - Z1 = ZSI OUT SOURCE
  - Z2 = ZSI OUT; Z3 = ZSI IN SOURCE
  - Z4 = ZSI IN ST (short time)
  - Z5 = ZSI IN GF (earth fault)
- M1 = Vigi module input (Micrologic 7)
- T1, T2, T3, T4 = external neutral
- F2+, F1– = external 24 V DC power supply
- VN = external voltage connector (must be connected to the neutral with a 3P circuit breaker)
- M6C: 6 programmable contacts (to be connected to the external module M6C) ext. 24 V DC power supply required

**Remote operation**
- MN: undervoltage release
- MX: shunt release
- A4: electrical opening order
- A2: electrical closing order
- B4, A1: power supply for control devices and gear motor

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

**Parameters**
- E: energy
- A: digital ammeter
- P: A * power meter + additional protection
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 (manual operation)

- **MN/MX**
- **D2/C2**
- **D1/C1**
- **OF1**
- **OF2**
- **OF3**
- **SD**
- **Z1**
- **Z2**
- **Z3**
- **Z4**
- **T1**
- **T2**
- **T3**
- **T4**
- **E6**
- **E5**
- **E4**
- **E3**
- **E2**
- **E1**
- **E3**
- **E2**
- **E1**
- **M1**
- **M2**
- **M3**
- **T1**
- **T2**
- **T3**
- **F1**
- **F2**
- **B4**
- **A4**
- **A2**
- **A1**

Terminal-block marking (electrical operation)

- **MN/MX**
- **D2/C2**
- **D1/C1**
- **OF1**
- **OF2**
- **OF3**
- **SD**
- **Z1**
- **Z2**
- **Z3**
- **Z4**
- **T1**
- **T2**
- **T3**
- **T4**
- **E6**
- **E5**
- **E4**
- **E3**
- **E2**
- **E1**
- **E3**
- **E2**
- **E1**
- **M1**
- **M2**
- **M3**
- **T1**
- **T2**
- **T3**
- **F1**
- **F2**
- **B4**
- **A4**
- **A2**
- **A1**

*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.

**Power**

- **Control unit**
  - **Terminal-block marking**
  - **Com**: undervoltage release
  - **MN / MX**: shunt release
  - **Motor-mechanism module (*)**: Spring-charging motor 440/480 V AC (380 V motor + additional resistor)

**Remote operation**

- **Remote operation**
  - **MN / MX**: undervoltage release
  - **MT1** : A2: electrical closing order
  - **MT2** : A4: electrical opening order
  - **MT1** : A2: power supply for control devices and gear motor (MCH)

**Basic**

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

**Control unit**

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

---

*(*) Spring-charging motor 440/480 V AC*
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)

Legend
Connected
( only one wire per connection point).

* CAF2 option is not compatible with M6C option.
Compact NS1600b to 3200
Fixed circuit breakers

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

<table>
<thead>
<tr>
<th>Power</th>
<th>Control unit</th>
<th>Remote operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

---

- \(A\): digital ammeter.
- \(E\): undervoltage release or shunt release
- \(M1, M2\): Vigi module input (Micrologic 7)
- \(T1, T2, T3, T4\): external neutral
- \(F2+, F1-\): external 24 V DC power supply

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Electrical diagrams

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Indication contacts

OF3 / OF2 / OF1 : ON / OFF indication contacts

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

SD : trip indication contact

Terminal-block marking

Compact NS1600b to 3200
Fixed circuit breakers
### 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: (1)
  - shielded cable with 2 twisted pairs
  - T1 twisted with T2
  - maximum length 4 meters
  - cable cross-sectional area 0.4 to 1.5 mm²
  - 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).

(1) 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: (1)
  - unshielded cable with 1 twisted pair
  - maximum length 150 metres
  - cable cross-sectional area 0.4 to 1.5 mm²
  - recommended cable: Belden 9409 or equivalent.

(1) 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 Ω / 300 m.
- Capacity of connectors: 0.4 to 2.5 mm².
- 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

1. External 24 V power supply module (AD)
2. Ethernet gateway (EGX100)
3. Modbus Communication Interface Module (TRV00210) with stacking accessory (TRV00217)
4. Modbus network
5. ULP cable
6. FDM121 display (TRV00121)
7. Compact NSX cord (LV434200, LV434201, LV434202)
8. Modbus CCM “chassis”
9. Breaker ULP cord (LV434195, LV434196, LV434197)
10. Modbus BCM ULP “device”

Compact NS630b
(fixed device)

Masterpact NT
(withdrawable device)
Electrical diagrams

Compact NS630b to 3200 Communication

Modbus Communication Interface Module (Compact NSX)

The configuration is only possible with CCM marked Schneider Electric on the front face.

Modbus line termination (VW3A8306DRC)

External power supply 24 V

Modbus RS 485 2-wire + ULP

Micrologic E

Breaker ULP cord

Modbus line termination
Electrical diagrams

Compacted NS630b to 3200 fixed
Wiring of the COM option (Modbus BCM ULP Module) with or without ULP module

Fixed, manually operated Compact NS

Modbus RS 485 4-wire without ULP module
External power supply 24 V... 
EGX100

Modbus RS 485 2-wire without ULP module
External power supply 24 V... 
EGX100

Modbus RS 485 2-wire + ULP module
External power supply 24 V...

Modbus RS 485 4-wire without ULP module
External power supply 24 V...

Fixed, electrically operated Compact NS

Modbus RS 485 4-wire without ULP module
External power supply 24 V... 
EGX100

Modbus RS 485 2-wire without ULP module
External power supply 24 V... 
EGX100

Modbus RS 485 2-wire + ULP module
External power supply 24 V...

Modbus RS 485 4-wire without ULP module
External power supply 24 V...
Withdrawable Compact NS630b to 3200
Wiring of the COM option (Modbus BCM ULP and CCM modules) with or without ULP module

- 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

This configuration is only possible with CCM marked Schneider Electric on the front face.

- External power supply 24 V
- Customer terminal block
- EGX100
- CCM
- Micrologic P
- Micrologic E
- Breaker ULP cord
- red black blue white

Network Breaker

DB401477

Electrical diagrams
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 % In.

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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Tripping curves
Compact NS630b to 3200

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) Ig = In x... A B C D E F G H J
Ig ≤ 400 A 0.3 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
400 A ≤ Ig ≤ 1200 A 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Ig > 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).

Ics = 100 % Icu

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 Ics is equal to 100% of Icu.

The Ics 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 Icu
- 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 Ω.

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
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
Limited energy

Voltage 660/690 V AC
Limited energy

Valid for 480 V Nema.
As a global specialist in energy management with operations in more than 100 countries, Schneider Electric offers integrated solutions across multiple market segments, including leadership positions in energy and infrastructure, industrial processes, building automation, and data centres/networks, as well as a broad presence in residential applications.

Focused on making energy safe, reliable, and efficient, the company’s 110,000 plus employees achieved sales of 19.6 billion euros in 2010, through an active commitment to help individuals and organizations “Make the most of their energy.”

We are changing our brand names and becoming one Schneider Electric. You’ll get the same great quality products, but from one name you can remember and trust. This provides you and your customers with the reassurance associated with Schneider Electric.

Some of our market leading brands have already become Schneider Electric including Merlin Gerin, Telemecanique, Square D, GET, Mita, Sarel, Himel, Thorsman, Tower and TAC.

Working as one Schneider Electric makes it clearer that our ranges are highly compatible for integrated solutions.