Compact™ NSXm

Catalogue 2017

Molded-case circuit breakers and switch-disconnectors up to 160 A and 690 V

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Life Is On Schneider Electric

Green Premium™

Endorsing eco-friendly products in the industry

Green Premium™
Product

Green Premium is the only label that allows you to effectively develop and promote an environmental policy whilst preserving your business efficiency. This ecolabel guarantees compliance with up-to-date environmental regulations, but it does more than this.

Over 75% of Schneider Electric manufactured products have been awarded the Green Premium ecolabel

Discover what we mean by green ….

Check your products!

Schneider Electric's Green Premium ecolabel is committed to offering transparency, by disclosing extensive and reliable information related to the environmental impact of its products:

RoHS

Schneider Electric products are subject to RoHS requirements at a worldwide level, even for the many products that are not required to comply with the terms of the regulation. Compliance certificates are available for products that fulfil the criteria of this European initiative, which aims to eliminate hazardous substances.

REACh

Schneider Electric applies the strict REACh regulation on its products at a worldwide level, and discloses extensive information concerning the presence of SVHC (Substances of Very High Concern) in all of these products.

PEP: Product Environmental Profile

Schneider Electric publishes complete set of environmental data, including carbon footprint and energy consumption data for each of the lifecycle phases on all of its products, in compliance with the ISO 14025 PEP ecopassport program. PEP is especially useful for monitoring, controlling, saving energy, and/or reducing carbon emissions.

EoLI: End of Life Instructions

Available at the click of a button, these instructions provide:

- Recyclability rates for Schneider Electric products.
- Guidance to mitigate personnel hazards during the dismantling of products and before recycling operations.
- Parts identification for recycling or for selective treatment, to mitigate environmental hazards/ incompatibility with standard recycling processes.

Compact NSXm molded case circuit breakers

Schneider Electric introduces a new family member of the Compact™ NSX range of circuit breakers, the Compact NSXm.

The Compact NSX and NSXm ranges benefit from 60 years of Schneider Electric background and leadership in industrial circuit breakers based on the roto-active breaking technology.

As well as offering proven performance, flexibility, and reliability, the Compact NSXm features new innovations such as EverLink™ patented connections and embedded earth leakage protection.[1]

[1] Available in Q4 2017

schneider-electric.com/compactNSXm

Version : 1.0 - 06/09/2016
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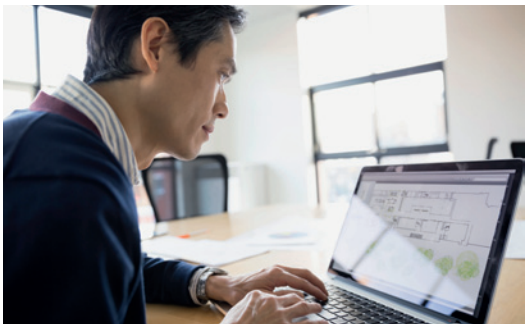
Your efficiency is our first concern.



I design electrical solutions.

Win more projects and deliver the best solution for your customers.

- Ensure reliable connection over time using creep-compensating technology — EverLink
- Enhance power availability with outstanding discrimination
- Optimize panel cost with cascading
- Benefit from our customer support to help design the best solution for your customers

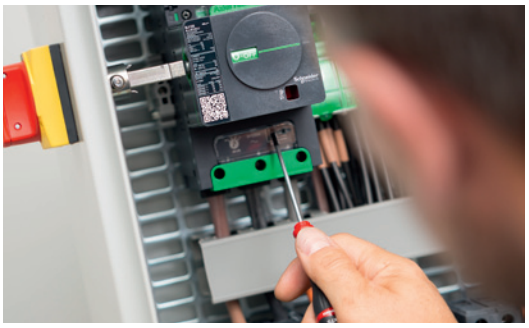
Equipment with Compact NSXm is tested and complies with IEC 61439 1&2.

I build and install electrical equipment.

Make your business more profitable.

- Save up to 40% of time spent mounting and cabling with built-in DIN rail, EverLink connectors, and spring-type auxiliaries
- Gain up to 40% of space when using the new earth leakage circuit breakers*
- Easy to select with new Schneider Electric™ online tools

* Available in Q4 2017



I design and build machines.

Optimize your solution.

- Best combination of size and performance
- Same footprint, accessories, and auxiliaries for both IEC and multistandard (UL/IEC) range
- Benefit from working with one single worldwide equipment provider (Compact™, TeSys™, Altivar™, Modicon™, etc.)

Version : 1.0 - 06/09/2016
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Version : 1.0 - 06/05/2016
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Compact NSXm circuit breakers: Optimized for your needs

The Compact NSXm range of circuit breakers and switch disconnectors is a newcomer in the Compact NSX family. It is one of the smallest on the market with innovative features. Built on the design of roto-active breaking technology, we have made it as robust as Compact NSX products.

Compact NSXm main features and innovations

- Up to 160 A and 70 kA at 415V
- Thermal magnetic trip unit integrated
- Built-in DIN rail and plate mount
- Auxiliaries externally visible
- EverLink connectors

Earth leakage protection embedded (VIGI)

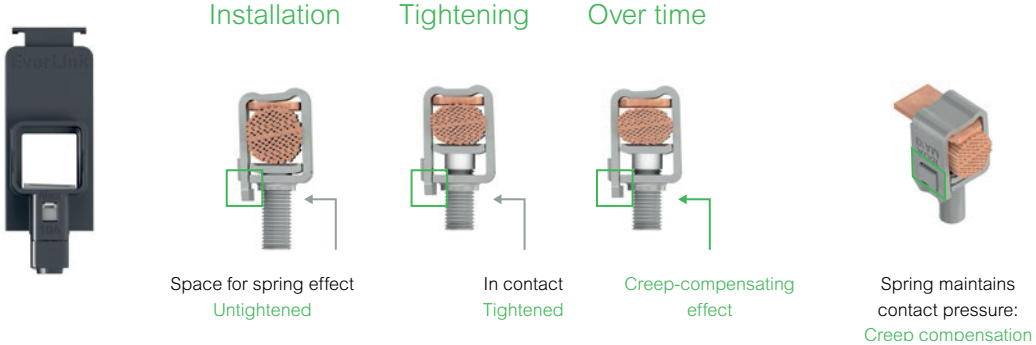
- Save up to 40% of space with the smallest earth leakage circuit breaker
- Save time; no need to order or install an add-on block

EverLink patented technology

The Compact NSXm features a new cable connection method with patented creep-compensating technology built directly into the terminal — EverLink:

- With EverLink connectors, save space and time during panel assembly.
- Bare cable connections are as safe as compression lug ones.

More than 35 patents have been registered for this new Compact NSXm offer.



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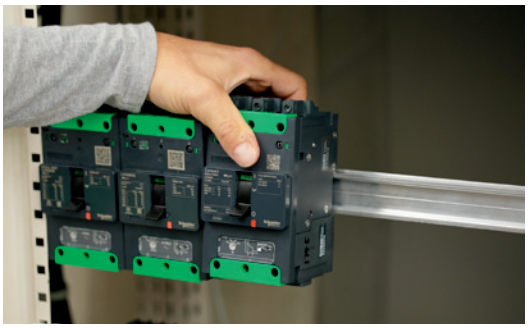
Efficiency that clicks.

Compact NSXm accessories are available to answer all your needs from power connection to operating mechanism, including electrical auxiliaries. All of them are easily field installable.



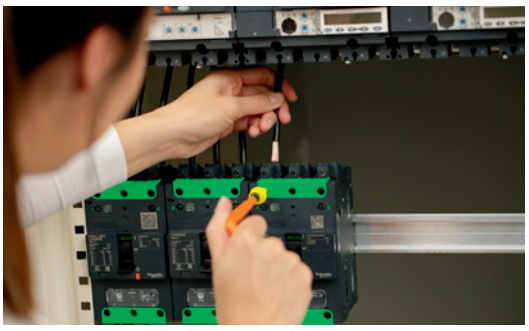
Mounting: DIN rail and plate

Embedded DIN rail and plate mounting capabilities for every circuit breaker; no extra parts required.

Auxiliaries: Field-installable offer

All electrical auxiliaries (contacts OF/SD and voltage release MN/MX) can be easily installed in the product by simply opening the front cover and snapping them into cavities.

Their presence in the breaker is externally visible through flags or a window.



Power connection: Flexible

Compact NSXm circuit breakers come with EverLink or compression lug or busbar connector. As an option, you can get EverLink connectors with control wire terminal.

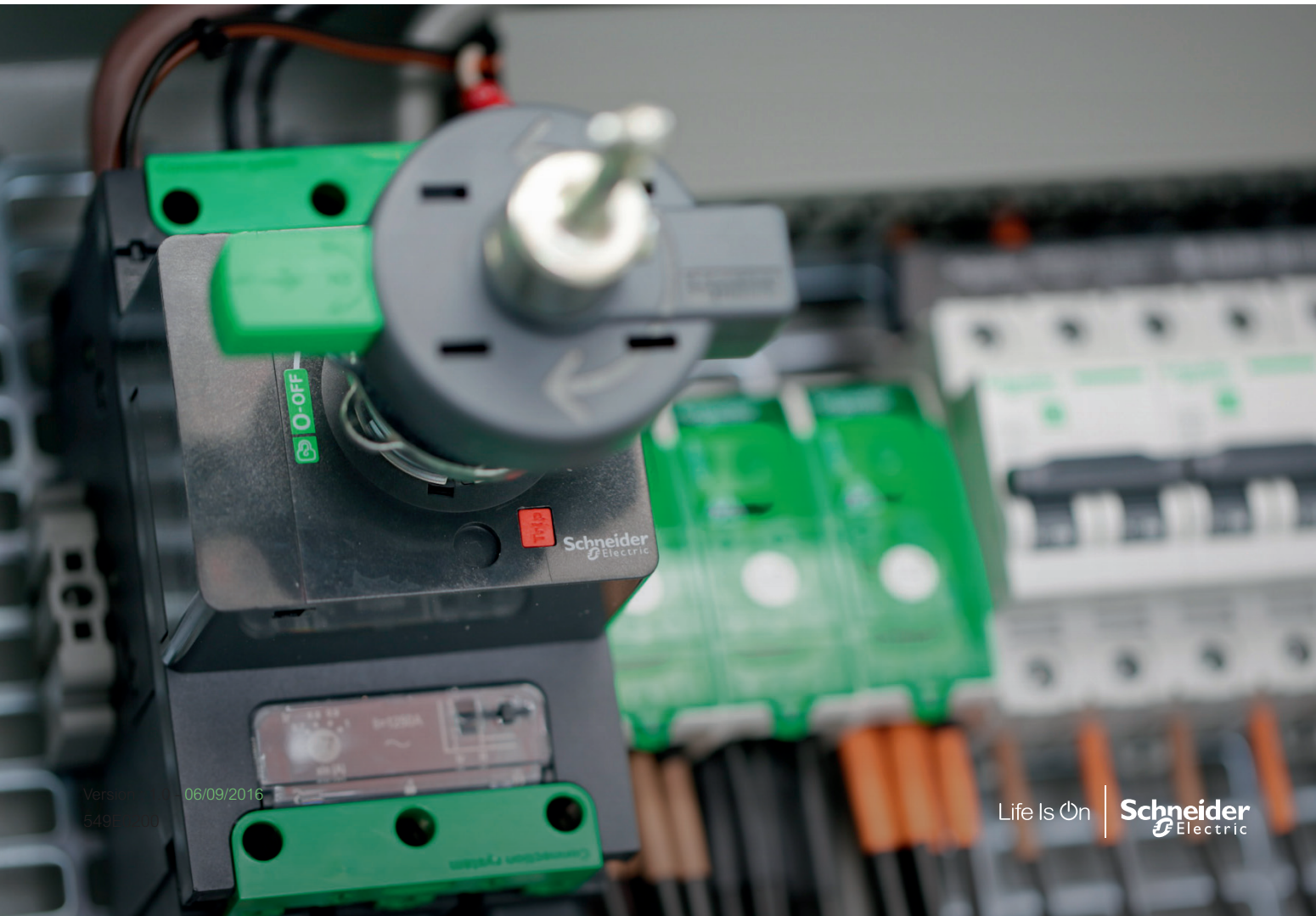
New torque-limiting breakaway bits can be used to tighten power connections in the field.

Insulation

New transparent long terminal shield can allow you to achieve IP40.

A wide range of operating mechanism

A wide range of rotary handles enables the Compact NSXm to meet all standards and applications. They are available as direct, extended, and side mount. We also feature an open door shaft operator (NFPA79 code), which allows you to operate the breaker safely when the panel door is open.



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Compact NSXm circuit breakers: Select and order

1 Design

Ecodial software

Single-line diagram design software that calculates and sizes your electric installation.

Ecoreal software

Quick configuration and quotation tool for switchboards.

2 Configure and order

MyPact

Configure and order Compact NSXm to save time and ensure accuracy.
config.schneider-electric.com

3 Build

Build faster

One-click installation and flexibility with field-installable accessories and auxiliaries.

4 Operate and maintain

Get quick access to product information

Auxiliaries are externally visible. QR code provides easy access to information on the product and quick access to the customer care center.

Ensure continuity of service

With EverLink, no need for periodic retightening of terminals.

General contents

Compact™ NSXm

Compact NSXm
Overview of applications and functions

Compact NSXm up to 160 A offers high performance and a wide range of breaking capacities to protect most applications. Earth leakage electronic version provide highly accurate protection with wide setting ranges.

Molded case circuit breakers
> page A-4

- Ratings:
  - Compact NSXm up to 160 A
- Circuit breakers type E, B, F, N, H .
- 3 or 4 poles.

Trip units
> page A-6

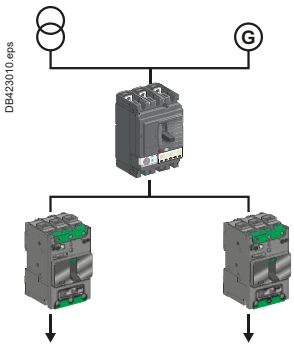
TM-D
- Thermal Magnetic protection.

Micrologic 4.1[*]
- Electronic protection.
- Embedded earth leakage protection.
- Indications with SDx (local and remote).

Switch-disconnectors
> page A-16

- Ratings:
  - Compact NSXm up to 160 A
- 3 or 4 poles.

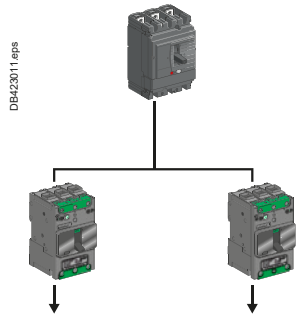
Protection of distribution systems (AC 220/690 V)
> page A-8, page A-10



Compact NSXm devices are equipped with TM thermal-magnetic trip units or Micrologic 4.1 electronic trip units to provide protection against short-circuits, overloads and insulation faults (Micrologic 4.1) for:
- distribution systems supplied by transformers
- distribution systems supplied by engine generator sets
- long cables in IT and TN systems.

They can be easily installed at all levels in distribution systems, from the main LV switchboard to the subdistribution boards and enclosures.

Control and isolation using switch-disconnectors
> page A-16



A switch-disconnector version of Compact NSXm circuit breakers is available for circuit control and isolation.
All accessories of Compact NSXm circuit breakers may be combined with the basic switch-disconnector function.
For information on other switch-disconnector ranges, see the Compact INS/INV (offering positive contact indication and visible break) and Fupact (fusegear) catalogues.

[*] Available Q4 2017.

Functions and characteristics

A

Other chapters
Installation recommendations B-1
Dimensions and connection C-1
Wiring diagrams D-1
Additional characteristics E-1
Catalogue numbers F-1
Glossary G-1

Introduction

General characteristics of the Compact NSXm range

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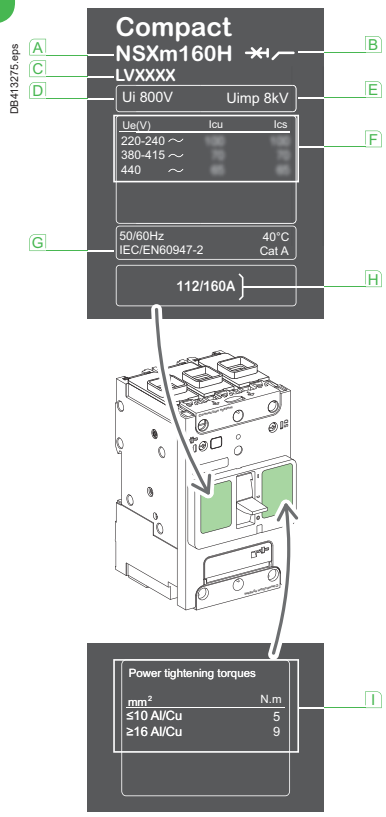

Standardised characteristics indicated on the rating plate:

- A Type of device: frame size and breaking capacity class
- B Circuit breaker/switch-disconnector symbol.
- C Commercial reference.
- D Ui: rated insulation voltage.
- E Uimp: rated impulse withstand voltage.
- F Ue: operational voltage.
- G Reference standard.
- H Circuit breaker rating.
- I Power connections tightening torques.

Note: when the circuit breaker is equipped with an extended rotary handle, the door must be opened to access the rating plate.

Compliance with standards

Compact NSXm circuit breakers and auxiliaries comply with the following:

- ■ international recommendations:
  - □ IEC 60947-1: general rules
  - □ IEC 60947-2: circuit breakers
  - □ IEC 60947-3: switch-disconnectors
  - □ IEC 60947-5-1 and following: control circuit devices and switching elements; automatic control components
- ■ European (EN 60947-1, EN 60947-2, EN 60947-3 and EN 60947-5-1) and corresponding national standards:
  - □ China CCC
  - □ EAC (Customs Union)
- ■ the specifications of the marine classification companies (Veritas, Lloyd's Register of Shipping, Det Norske Veritas, etc.), standard NF C 79-130 and recommendations issued by the CNOMO organisation for the protection of machine tools.

Pollution degree

Compact NSXm circuit breakers are certified for operation in pollution-degree 3 environments as defined by IEC standards 60947-1 and 60664-1 (industrial environments).

Climatic withstand

Compact NSXm circuit breakers have successfully passed the tests defined by the following standards for extreme atmospheric conditions.

Dry cold and dry heat:

- ■ IEC 60068-2-1: dry cold at -55 °C
- ■ IEC 60068-2-2: dry heat at +85 °C.

Damp heat (tropicalization)

- ■ IEC 60068-2-30: damp heat (temperature + 55 °C and relative humidity of 95 %).
- ■ IEC 60068-2-52: severity 2 - Cycling salt mist.

Environment

Compact NSXm respects the European environment directive EC/2002/95 concerning the restriction of hazardous substances (RoHS) and is Green Premium.
Product environment profiles (PEP) have been prepared, describing the environmental impact of every product throughout its life cycle, from production to the end of its service life.
All Compact NSXm production sites have set up an environmental management system certified ISO 14001.
Each factory monitors the impact of its production processes. Every effort is made to prevent pollution and to reduce consumption of natural resources.

Ambient temperature

- ■ Compact NSXm circuit breakers may be used between -25 °C and +70 °C. For temperatures higher than 40 °C, devices must be derated (pages B-4 and B-5).
- ■ 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 NSXm circuit breakers in the original packing is -50 °C [1] and +85 °C.

[1] - 40 °C for Earth Leakage Circuit Breaker (ELCB).

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Green Premium™ Product

Electromagnetic compatibility

Compact NSXm devices are protected against:
- overvoltages caused by circuit switching (e.g. lighting circuits)
- overvoltages caused by atmospheric disturbances
- devices emitting radio waves such as mobile telephones, radios, walkie-talkies, radar, etc.
- electrostatic discharges produced by users.

Immunity levels for Compact NSXm comply with the standards below.
- IEC/EN 60947-2: Low-voltage switchgear and controlgear, part 2: Circuit breakers:
  - Annex F: Immunity tests for circuit breakers with electronic protection
  - Annex B: Immunity tests for residual current protection
- IEC/EN 61000-4-2: Electrostatic-discharge immunity tests
- IEC/EN 61000-4-3: Radiated, radio-frequency, electromagnetic-field immunity tests
- IEC/EN 61000-4-4: Electrical fast transient/burst immunity tests
- IEC/EN 61000-4-5: Surge immunity tests
- IEC/EN 61000-4-6: Immunity tests for conducted disturbances induced by radio-frequency fields
- IEC/EN 61000-4-8: Power frequency magnetic field immunity test
- IEC/EN 61000-4-11: Voltage dips, short interruptions and voltage variations immunity tests
- CISPR 11: Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.

Suitable for isolation with positive contact indication

All Compact NSXm devices 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 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.

The tripped position does not insure isolation with positive contact indication.
Only the OFF position guarantees isolation.

Installation in class II switchboards

All Compact NSXm devices are class II front face devices. They may be installed through the door of class II switchboards (as per IEC standards 61140 and 60664-1) without downgrading switchboard insulation. Installation requires no special operations, even when the circuit breaker is equipped with a rotary handle.

Degree of protection

The following indications are in accordance with standards IEC 60529 (IP degree of protection) and IEC 62262 (IK protection against external mechanical impacts).

Bare circuit breaker with terminal shields
- With toggle: IP40, IK07.
- With direct rotary handle: IP40 IK07.

Circuit breaker installed in a switchboard
- With toggle: IP40, IK07.
- With direct rotary handle: IP40, IK07.
- With extended rotary handle: IP54 or IP65 IK08
- With side rotary handle: IP54 or IP65 IK08.

For more detail about IP, see page B-3.

Protection of distribution systems

Characteristics and performance of Compact NSXm circuit breakers from 16 to 160 A up to 690 V

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Compact NSXm

Common characteristics

Rated voltages	Insulation voltage (V)	Ui		800
	Insulation voltage for ELCB [1][*] (V)	Ui		500
	Impulse withstand voltage (kV)	Uimp		8
	Operational voltage (V)	Ue	AC 50/60 Hz	690
	Operational voltage for ELCB [1][*] (V)	Ue	AC 50/60 Hz	440
Suitability for isolation		IEC/EN 60947-2		yes
Utilisation category				A
Pollution degree		IEC 60664-1		3

Circuit breakers

Breaking capacity levels

Breaking capacity (kA rms)

	Icu	AC 50/60 Hz	220...240 V	
			380...415 V	
			440 V	
			500 V	
			525 V	
			660...690 V	

Service breaking capacity (kA rms)

	Ics	AC 50/60 Hz	220...240 V	
			380...415 V	
			440 V	
			500 V	
			525 V	
			660...690 V	
Durability (C-O cycles)		Mechanical		
		Electrical	440 V	In/2
				In
			690 V	In/2
				In

Protection and measurements

Overload / short-circuit protection	Thermal magnetic
	Electronic with Earth Leakage Protection (ELCB)
Options	Device status/control
	For ELCB [1][*]: alarming and fault differenciation

Installation / connections

Dimensions and weights

Dimensions (mm) W x H x D		3P
		4P
		ELCB [1][*]
Weight (kg)		3P
		4P
		ELCB [1][*]

Connections

Pitch (mm)		Standard
		With spreaders
EverLink lug Cu or Al [2] cables	Cross-section (mm²)	Rigid
		Flexible
Crimp lugs Cu or Al	Cross-section (mm²)	Rigid
		Flexible

[1] ELCB: Earth Leakage Circuit Breaker (Micrologic 4.1).
[2] Al up to 100 A.
[*] Available Q4 2017.

Protection of distribution systems

Characteristics and performance of Compact NSXm circuit breakers from 16 to 160 A up to 690 V

Common characteristics			
Control	Manual	With toggle	◉
		With direct or extended rotary handle	◉
		With side rotary handle	◉
Versions	Fixed		◉

	NSXm up to 63 A					NSXm from 80 to 160 A and ELCB [1][*]				
	E	B	F	N	H	E	B	F	N	H
	25	50	85	90	100	25	50	85	90	100
	16	25	36	50	70	16	25	36	50	70
	10	20	35	50	65	10	20	35	50	65
	8	10	15	25	30	-	-	-	-	-
	-	-	10	15	22	-	-	-	-	-
	-	-	-	10	10	-	-	-	-	-
	25	50	85	90	100	25	50	85	90	100
	16	25	36	50	70	16	25	36	50	70
	10	20	30	50	65	10	20	30	50	65
	8	10	10	25	30	-	-	-	-	-
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	1.63									
	27									
	35									
	95									
	70									
	120									
	95									

Protection of distribution systems
Overview of trip units for Compact NSXm circuit breakers

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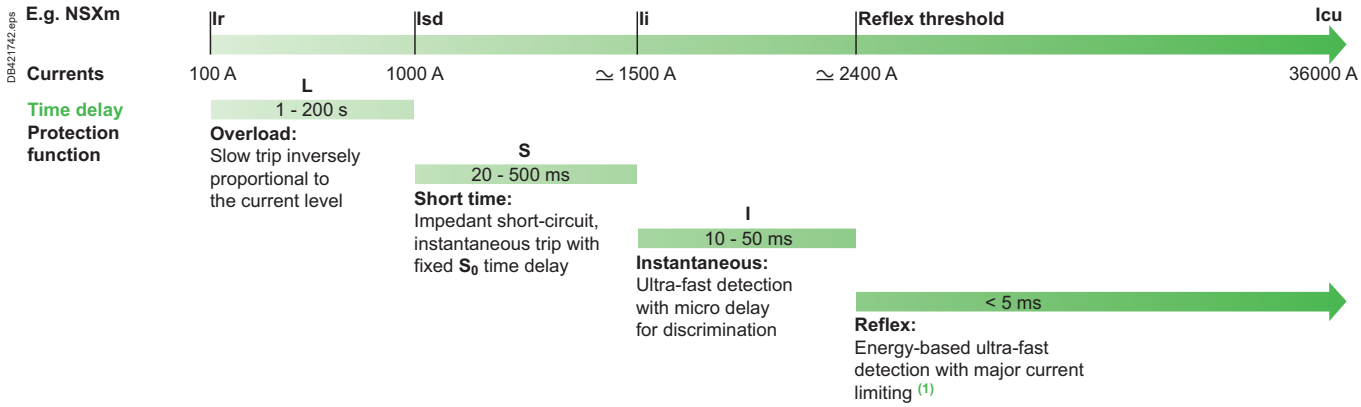
Compact NSXm is available with 3 types of protection

- **Magnetic NA** for switch-disconnectors with self-protection embeded
- **Thermal-magnetic TM-D** which protects cables on distribution systems against over currents and short-circuits
- **Micrologic 4.1 electronic with earth leakage protection embedded.**

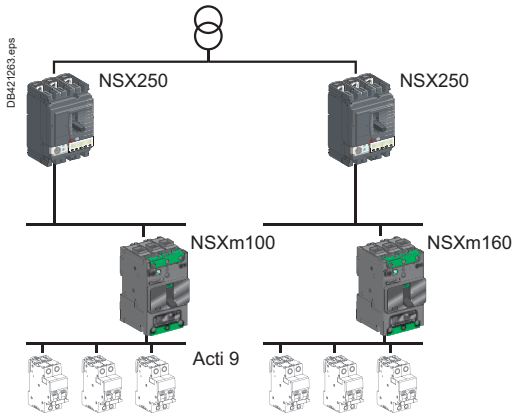
It combines reflex tripping, intelligent operation, and earth leakage protection.
Thanks to digital electronics, trip units have become faster as well as more accurate and reliable. Wide setting ranges make installation upgrades easier.
And with earth leakage protection embeded in a 4 poles frame, the space needed for such a protection in a panel is much smaller.

Coordinated tripping systems

Compact NSXm detects faults even faster and its tripping time is reduced.
It protects the installation better and limits contact wear.



[1] This tripping system is completely independent of the trip unit.
Because it directly actuates the mechanism, it precedes the trip unit by a few milliseconds.



Compact NSX250 for total discrimination with NSXm160 up to 70 kA.
Compact NSXm100 (N and H) for total discrimination with Acti 9 devices rated ⩽ 40 A or a iC60.
Better coordination between protection functions reduces the difference in ratings required for total discrimination.

Unmatched discrimination

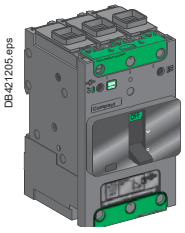
Discrimination

Compact NSXm provides maximum continuity of service and savings through an unmatched level of discrimination:
- given the high accuracy of measurements, overload discrimination is ensured even between very close ratings
- for major faults, the fast processing of the Micrologic trip units means the upstream device can anticipate the reaction of the downstream device.
The upstream breaker adjusts its tripping delay to provide discrimination
- for very high faults, the energy of the arc dissipated by the short-circuit in the downstream breaker causes reflex tripping. The current seen by the upstream device is significantly limited. The energy is not sufficient to cause tripping, so discrimination is maintained whatever the short-circuit current.

For total discrimination up to 70 kA between Compact NSX and Compact NSXm over the entire range of possible faults, from the long-time pick-up Ir to the ultimate short-circuit current Icu, a ratio of 1.6 must be maintained between the ratings of the upstream and downstream devices (for example NSXm160 with NSX250).
This ratio is required to ensure selective reflex tripping for high short-circuits.
For discrimination between different ranges, see rules in "Complementary technical information" document.

Protection of distribution systems
Overview of trip units for Compact NSXm circuit breakers

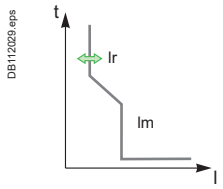
Compact NSXm offers a range of trip units, whether they are thermal-magnetic or electronic with earth leakage protection.



Compact NSXm

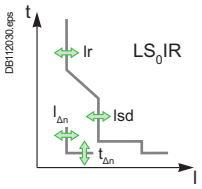
Type of protection and applications

TM-D thermal-magnetic



Distribution

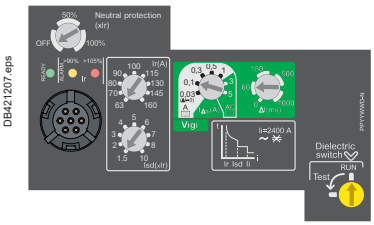
Micrologic 4 electronic (ELCB)



Distribution

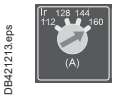
Circuit breakers and trip units

TM-D Distribution

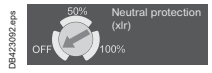


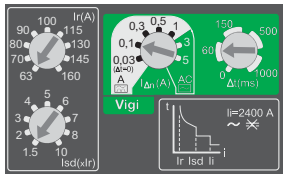
4.1 Distribution with earth leakage protection

Settings and indications



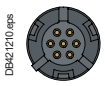
Adjustment and reading
Pick-up set in amps using dials
Non-adjustable time delay



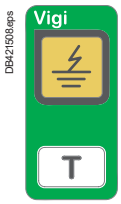


Adjustment and reading
Pick-up set with adjustment using dials
Non-adjustable time delay

Front indications

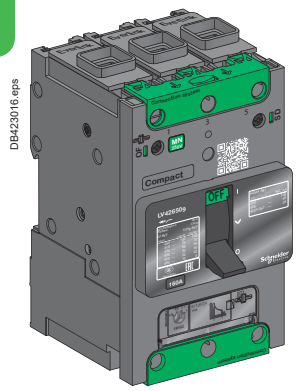


Test connector

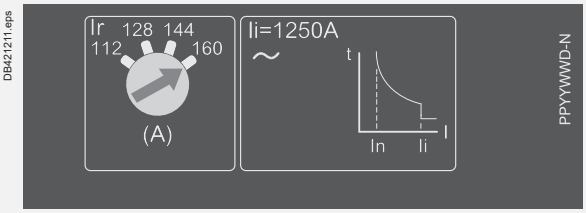


Earth Leakage trip indication and Test button (T)

Protection of distribution systems
TM thermal-magnetic



TM-D thermal-magnetic trip units



Circuit breakers equipped with thermal-magnetic trip units are used mainly in industrial and commercial electrical distribution applications for protection of cables on distribution systems supplied by transformers

Protection

Thermal protection (Ir)

Thermal overload protection based on a bimetal strip providing an inverse time curve I^2t, corresponding to a temperature rise limit. Above this limit, the deformation of the strip trips the circuit breaker operating mechanism.
This protection operates according to:
- **Ir** that can be adjusted in amps from 0.7 to 1 times the rating of the circuit breaker (16 A to 160 A), corresponding to settings from 11 to 160 A for the range of products
- a non-adjustable time delay, defined to ensure protection of the cables.

Magnetic protection (Im)

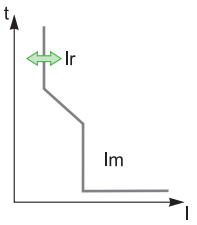
Short-circuit protection with a fixed pick-up Im that initiates instantaneous tripping if exceeded with a non adjustable time delay to ensure discrimination and cascading.

Protection versions

- 3-pole:
  - 3P 3D: 3-pole frame (3P) with detection on all 3 poles (3D).
- 4-pole:
  - 4P 3D: 4-pole frame (4P) with detection on 3 poles (3D).
  - 4P 4D: 4-pole frame (4P) with detection on all 4 poles (same threshold for phases and neutral).

Note: All the circuit breakers have a transparent lead-sealable cover that protects access to the adjustment dials.

Thermal-magnetic trip units		TM16D to 160D									
Ratings (A)	**In at 40 °C [1]**	**16**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Circuit breaker	Compact NSXm	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉
Thermal protection											
Pick-up (A) tripping between 1.05 and 1.20 Ir	**Ir** = In x ...	adjustable in amps from 0.7 to 1 x In									
Time delay (s)	**tr**	non-adjustable									
Magnetic protection											
Pick-up (A)	**Im**	fixed									
accuracy ±20 %	Compact NSXm	500	600	600	600	600	800	1000	1250	1250	1250
Time delay	**tm**	fixed									
Neutral protection											
Unprotected neutral	4P 3D	no detection									
Fully protected neutral	4P 4D	1 x Ir									



[1] If the circuit breakers are used in high-temperature environments, the setting must take into account the thermal limitations of the circuit breaker. See the temperature derating table page B-4.

Protection of distribution systems
Micrologic 4.1 (Earth Leakage Circuit Breaker)[*]

A

Compact NSXm circuit breakers up to 160 A can be ordered with Micrologic 4.1 trip unit with performance levels E/B/F/N/H. They provide:
- ■ standard protection of distribution cables
- ■ earth leakage protection
- ■ indication of:
- □ overload alarming (via LEDs and via SDx module)
- □ overload tripping (via the SDx module)
- □ earth leakage alarming (via the SDx module)
- □ earth leakage tripping (via front face screen and the SDx module).

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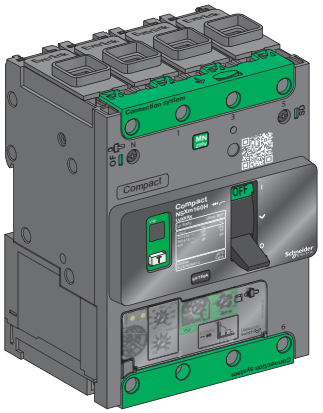
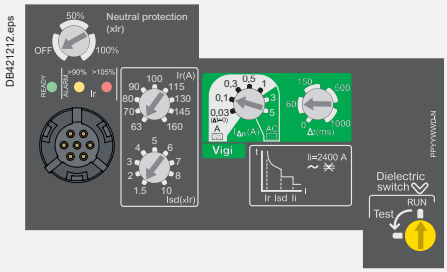


Micrologic 4.1



Circuit breakers equipped with Micrologic 4.1 trip units can be used to protect distribution systems supplied by transformers.

Short-circuit and overload protection.....

Settings are made using the adjustment dials.

Overloads: Long time protection (Ir)

Inverse time protection against overloads with a wide range adjustable current pick-up Ir set using a dial and a non-adjustable time delay tr.

Short-circuits: Short-time protection with fixed time delay (Isd)

Protection with an adjustable pick-up Isd. Tripping takes place after a very short delay used to allow discrimination with the downstream device.

Short-circuits: Non-adjustable instantaneous protection

Instantaneous short-circuit protection with a fixed pick-up.

Neutral protection

- ■ On 3-pole circuit breakers, neutral protection is not possible.
- ■ On 4-pole circuit breakers, neutral protection may be set using a three-position switch:
- □ OFF: neutral unprotected
- □ 50 % [1]: neutral protection at half the value of the phase pick-up, i.e. 0.5 x Ir
- □ 100 %: neutral fully protected at Ir.

Earth leakage protection.....

Protection with an adjustable leakage level ($I_{\Delta n}$) with an adjustable delay (Δt).

Compliance with standards

- ■ IEC 60947-2, annex B.
- ■ Decree dated 14 November 1988 (for France).
- ■ IEC 60755, class A, immunity to DC components up to 6 mA.
- ■ Operation down to -25 °C as per VDE 664.

Power supply

It is self-supplied internally and therefore do not require any external source. It's still working even when supplied by only two phases.

Sensitivity $I_{\Delta n}$ (A)

- ■ Class A: 0.03 - 0.1 - 0.3 - 0.5 - 1
- ■ Class AC: 0.03 - 0.1 - 0.3 - 0.5 - 1 - 3 - 5.

Intentional delay Δt (ms)

0 - 60 [2] - 150 [2] - 500 [2] - 1000 [2].

Operated voltage

200...440 V AC - 50/60 Hz.

Operating safety

The earth leakage protection is a user safety device. It must be tested at regular intervals (every 6 months) via test button.

[1] On 100A and 160A circuit breakers only.
[2] If the sensitivity is set to 30 mA, there is no time delay, whatever the time-delay setting.

Note: all the trip units have a transparent lead-sealable cover that protects access to the adjustment dials.

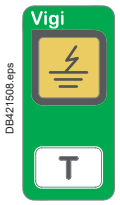
[*] Available Q4 2017.

Protection of distribution systems
Micrologic 4.1 (Earth Leakage Circuit Breaker)[*]

Indications

Front indications

- Green “Ready” LED: flashes slowly when the circuit breaker is ready to trip in the event of an overload or short circuit fault.
- Orange overload pre-alarm LED: steady on when I > 90 % Ir.
- Red overload LED: steady on when I > 105 % Ir.
- Screen that indicate an earth leakage fault trip - reset when product is powered.



Alarming and fault differentiation

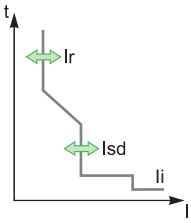
A side module SDx can be installed to provide alarming and fault differenciation:

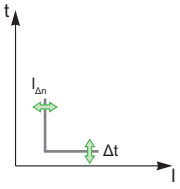
- overload alarm (I > 105 % Ir)
- overload trip indication
- earth leakage alarm ($I_{\Delta n}$ > 80 % threshold)
- earth leakage trip indication.

This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block through NO/NC dry contacts.
The signal is cleared when the circuit breaker is restarted.
For description, see page A-27.

Micrologic 4.1

Ratings (A)	**In at 40 °C** [1]		**25**	**50**	**100**	**160**					
Circuit breaker	Compact NSXm		◉	◉	◉	◉					
L Long-time protection											
Pick-up (A)		Ir	value depending on trip unit rating (In) and setting on dial								
tripping between 1.05 and 1.20 Ir	In = 25 A	Ir =	10	11	12	14	16	18	20	22	25
	In = 50 A	Ir =	20	22	25	28	32	36	40	45	50
	In = 100 A	Ir =	40	45	50	56	63	70	80	90	100
	In = 160 A	Ir =	63	70	80	90	100	115	130	145	160
Time delay (s) accuracy 0 to -20%	**tr**		non-adjustable								
		1.5 x Ir	200								
		6 x Ir	8								
		7.2 x Ir	5								
Thermal memory			20 minutes before and after tripping								
S_0 Short-time protection with fixed time delay											
Pick-up (A) accuracy ±15 %	**Isd** = Ir x ...		1.5	2	3	4	5	6	7	8	10
Time delay (ms)	**tsd**		non-adjustable								
	Non-tripping time		20								
	Maximum break time		80								
I Instantaneous protection											
Pick-up (A) accuracy ±15 %	Ii non-adjustable		375	750	1500	2400					
	Non-tripping time		10 ms								
	Maximum break time		50 ms for I > 1.5 Ii								
R Earth leakage protection											
Sensitivity $I_{\Delta n}$ (A)	Adjustable	$I_{\Delta n}$ =	0.03	0.1	0.3	0.5	1	3	5		
	Class		A and AC					AC			
Time delay Δt (ms)	Adjustable	Δt =	0	60 [2]	150 [2]	500 [2]	1000 [2]				
	Maximum break time (ms)		< 40	< 140	< 300	< 800	< 1500				



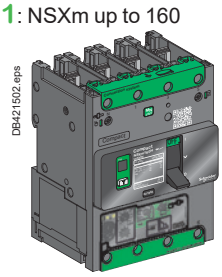
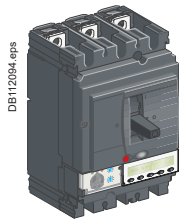
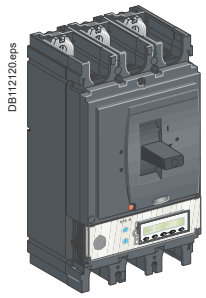


[1] If the circuit breakers are used in high-temperature environments, the setting must take into account the thermal limitations of the circuit breaker. See the temperature derating table page B-4.
[2] If the sensitivity is set to 30 mA, there is no time delay, whatever the time-delay setting.
[*] Available Q4 2017.

Protection of distribution systems
Micrologic 4.1 (Earth Leakage Circuit Breaker)[*]

A

Understanding the names of Micrologic electronic trip units

Example: Micrologic 6.3 E-M	6	3	E	M
	Protection	Frame	Measurements	Applications
	1: I **2**: LS_0I **4**: LS_0IR **5**: LSI **6**: LSIG **I**: Instantaneous **L**: Long time **R**: Residual current **S_0**: Short time [2] (fixed delay) **S**: Short time **G**: Ground fault	**1**: NSXm up to 160  **2**: NSX 100/160/250  **3**: NSX 400/630 	**A**: Ammeter  **E**: Energy 	Distribution, otherwise **G**: Generator **AB**: Public distribution [1] **M**: Motors **Z**: 16 Hz 2/3 [1]

Examples				
Micrologic 1.3	Instantaneous only	400 or 630 A	-	Distribution
Micrologic 2.3	LS_0I	400 or 630 A	-	Distribution
Micrologic 4.1	LS_0IR	up to 160 A	-	Distribution
Micrologic 5.2 A	LSI	100, 160 or 250 A	Ammeter	Distribution
Micrologic 6.3 E-M	LSIG	400 or 630 A	Energy	Motor

[1] AB-Z: except NSXm R, HB1, HB2.
[2] LS0I protection is standard on Micrologic 2 and 4. To ensure discrimination, it offers short-time protection S0 with a non-adjustable delay and instantaneous protection.
[*] Available Q4 2017.

Protection of distribution systems
Micrologic 4.1 (Earth Leakage Circuit Breaker)[*]

Maintenance case

The case includes:
- test and maintenance module
- power supply (110...220 V AC / 50-60 Hz 24 V DC - 1 A)
- special cable for connection to the trip-unit test connector
- standard USB cable
- standard RJ45 cable
- user manual
- optional Bluetooth link (to PC).

Test and maintenance module

Included in the maintenance kit, this module tests Micrologic operation and provides access to all parameters and settings. It connects to the Micrologic test connector and can operate in two modes.
- Stand-alone mode to:
  - supply the Micrologic and check operation via the Ready LED
  - check mechanical operation of the circuit breaker (trip using pushbutton).
- PC mode, connected to a PC via USB or Bluetooth link. This mode provides reading access to protection settings, alarm settings and all indicators.

Using the associated Ecoreach software utility, it is possible to store, in a dedicated file for each device, all the data.
This mode also offers operating-test functions:
- check on trip time delay (trip curve)
- check on non-tripping time (discrimination)
- check on ZSI (Zone Selective Interlocking) function
- alarm simulation
- display of setting curves
- display of currents
- printing of test reports.

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Maintenance case (cat. no. TRV00910).

PB103794-32.eps

Configuration and maintenance module (cat. no. TRV00911).

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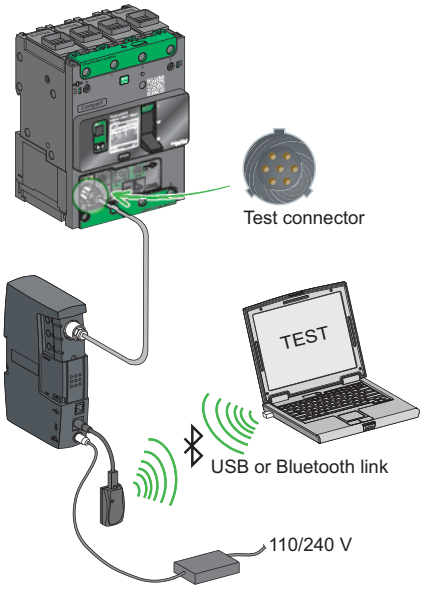


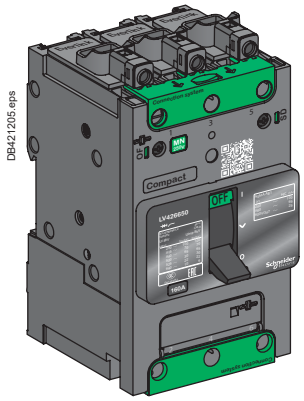
Using the configuration and maintenance module.

[*] Available Q4 2017.

Switch-disconnectors

Characteristics and performance of Compact NSXm switch-disconnectors from 50 to 160 A up to 690 V

Installation standards require upstream protection.
However Compact NSXm 50 to 160 NA switch-disconnectors are self-protected by their high-set magnetic release.



NSXm with Everlink connectors and control wire terminal upstream

Common characteristics

Rated voltages	Insulation voltage (V)	Ui		800
	Impulse withstand voltage (kV)	Uimp		8
	Operational voltage (V)	Ue	AC 50/60 Hz	690
Suitability for isolation			IEC/EN 60947-3	yes
Utilisation category			AC 22 A/AC 23 A	
Pollution degree			IEC 60664-1	3

Switch-disconnectors

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

Conventional thermal current (A)	Ith 40 °C			
Number of poles				
Operational current (A) depending on the utilisation category	Ie	AC 50/60 Hz		
			220/240 V	
			380/415 V	
			440/480 V	
			500/525 V	
			660/690 V	
Short-circuit making capacity (kA peak)	Icm	min. (switch-disconnector alone)		
		max. (protection by upstream circuit breaker)		
Rated short-time withstand current (A rms)	Icw	for	1 s	
			3 s	
			20 s	
Durability (C-O cycles)	mechanical			
	electrical	AC		
			440 V	Ie/2
				Ie
			690 V	Ie/2
				Ie
Positive contact indication				
Pollution degree				

Additional indication and control auxiliaries

Indication contacts		
Voltage releases	MX shunt trip release	
	MN undervoltage release	

Installation / connections

Dimensions and weights

Dimensions (mm) W x H x D		3P
		4P
Weight (kg)		3P
		4P

Connections

Pitch (mm)		Standard
		With spreaders
EverLink lug Cu or Al [1] cables	Cross-section (mm²)	Rigid
		Flexible
Crimp lugs Cu or Al	Cross-section (mm²)	Rigid
		Flexible

Source-changeover systems

Manual source-changeover systems

[1] Al up to 100 A.

Switch-disconnectors

Characteristics and performance of Compact NSXm switch-disconnectors from 50 to 160 A up to 690 V

Common characteristics			
Control	Manual	With toggle	◉
		With direct or extended rotary handle	◉
		With side rotary handle	◉
Versions	Fixed		◉

	NSXm50NA	NSXm100NA	NSXm160NA
	50	**100**	**160**
	3.4	3.4	3.4
	AC22A / AC23A	**AC22A / AC23A**	**AC22A / AC23A**
	50	100	160 / 100
	50	100	160 / 100
	50	100	160 / 100
	50	100	160 / 100
	50	100	160 / 100
	1.28	2.13	2.13
	330	330	330
	900	1500	1500
	900	1500	1500
	200	335	335
	20000	20000	20000
	AC22A / AC23A	**AC22A / AC23A**	**AC22A / AC23A**
	20000 / 20000	20000 / 20000	20000 / 20000
	10000 / 10000	10000 / 10000	10000 / 10000
	10000 / 6000	10000 / 6000	10000 / 6000
	5000 / 3000	5000 / 3000	5000 / 3000
	◉	◉	◉
	3	3	3
	◉	◉	◉
	◉	◉	◉
	◉	◉	◉
	81 x 137 x 80		
	108 x 137 x 80		
	1.06		
	1.42		
	27		
	35		
	95		
	70		
	120		
	95		
	◉		

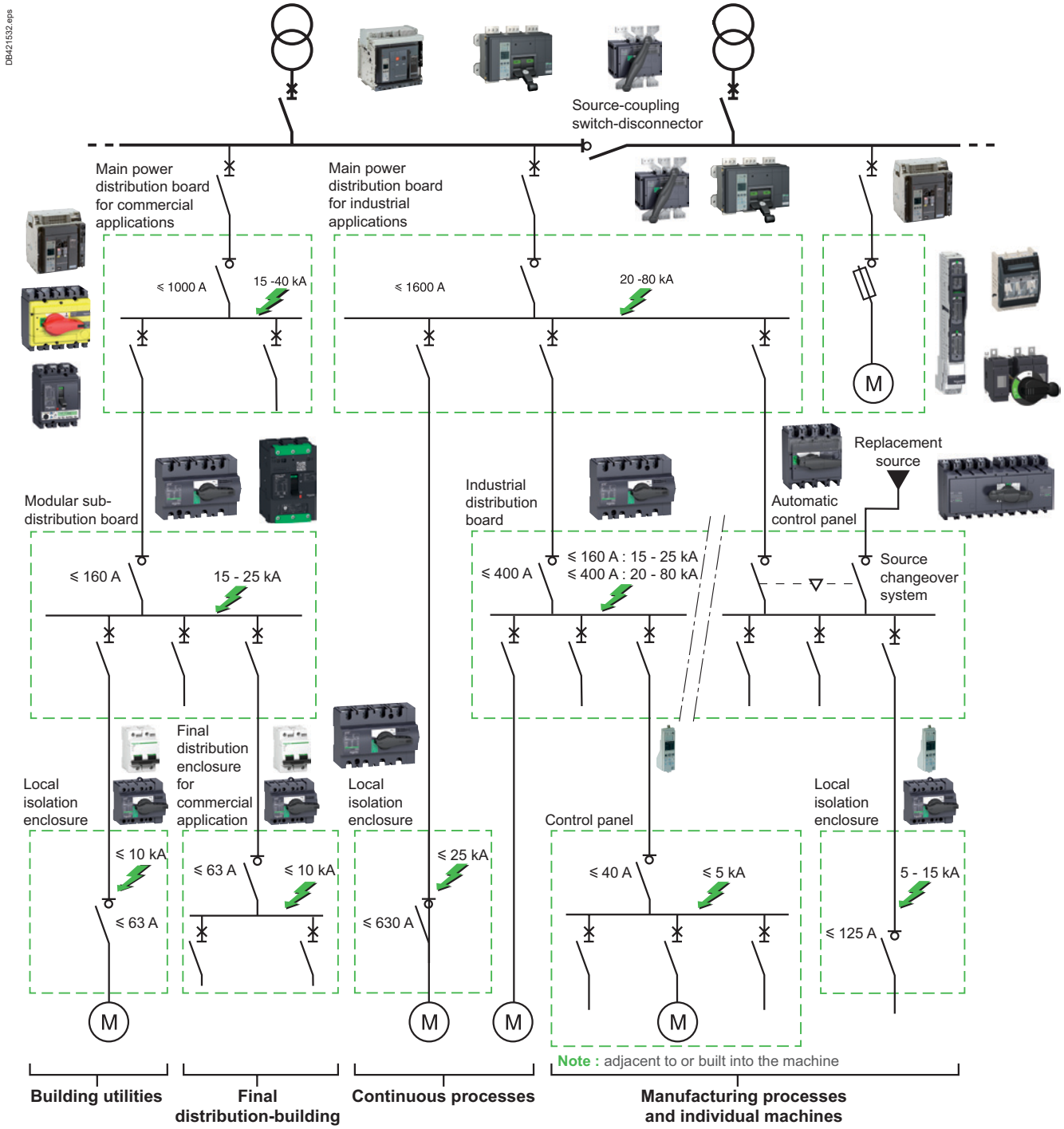
Switch-disconnectors
Overview of applications

A

A switch-disconnector is a control device that can be used to open and close a circuit under normal operating conditions. It is suitable for isolation as indicated on the front by the symbol  .

Position of switch-disconnectors

Compact switch-disconnectors are used primarily for the following applications:
- busbar coupling and isolation
- isolation of industrial distribution boards and industrial control panels
- isolation of subdistribution boards for modular devices
- isolation of local enclosures
- isolation of final distribution enclosures for commercial applications
- industrial control panel switch-disconnectors.



Suitability for isolation with positive contact indication

Compact NSXm switch-disconnectors are suitable for isolation as defined by standard IEC 60947-3. The corresponding conformity tests guarantee:
- the mechanical reliability of the position indication, i.e. the O (OFF) position indicated by the control device always reflects the open position of the contacts:
  - the required distance between contacts is provided
  - padlocks may not be installed unless the contacts are open
- the absence of leakage currents
- overvoltage withstand capacity between upstream and downstream connections.

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

Emergency-off function

A Compact NSXm NA is combined with an MN release connected to an emergency-off button. In an emergency, an operator at a remote location can interrupt the circuit at rated load to isolate the entire switchboard and the downstream loads.

Switch-disconnector protection

The switch-disconnector can make and break its rated current. For an overload or a short-circuit, it must be protected by an upstream device, in compliance with installation standards.
The circuit breaker/switch-disconnector coordination tables determine the required upstream circuit breaker. However, due to their high-set magnetic release, Compact NSXm 50 to160 A switch-disconnectors are self-protected.

Switch-disconnector utilisation category

Depending on the rated operational current and the mechanical durability (A for frequent operation or B for infrequent operation), standard IEC 60947-3 defines the utilisation categories as shown in the table below. Compact NSXm NA switch-disconnectors comply with utilisation categories AC-21A or AC-22A up to 160 A and AC-23A up to 100 A.

Utilisation categories

Infrequent operation	Frequent operation	Characteristics
AC-21B	AC-21A	Switching of resistive loads including moderate overloads (cos φ = 0.95)
AC-22B	AC-22A	Switching of mixed resistive and inductive loads, including moderate overloads (cos φ = 0.65)
AC-23B	AC-23A	Switching of motor loads or other highly inductive loads (cos φ = 0.45 or 0.35)

Compact NSXm NA switch-disconnectors use the same accessories and offer the same connection possibilities as the circuit breaker versions.

Compact NSXm switch-disconnector.

A

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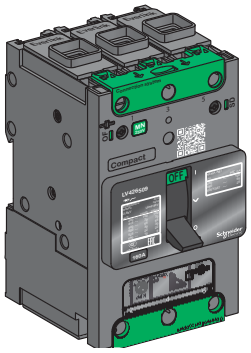

Compact NSXm.

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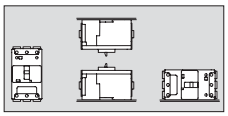

Installation positions.

Mounting

Compact NSXm may be mounted vertically, horizontally or flat on their back or on their side without any derating of characteristics.
These devices can be mounted on a DIN rail using the integrated DIN rail mounting feature.
For backplate mounting, the devices are supplied with two mounting screws (M4), washers and nuts. These mounting screws can be inserted through mounting holes molded into the device case and threaded into the mounting enclosure, rails or plate.

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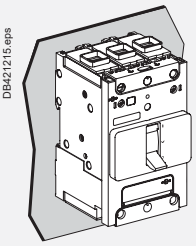

Mounting on a backplate.

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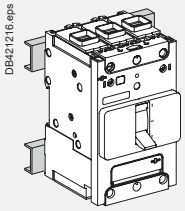

Mounting on rails.

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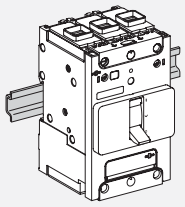

Mounting on DIN rail.

Accessories and auxiliaries

Overview

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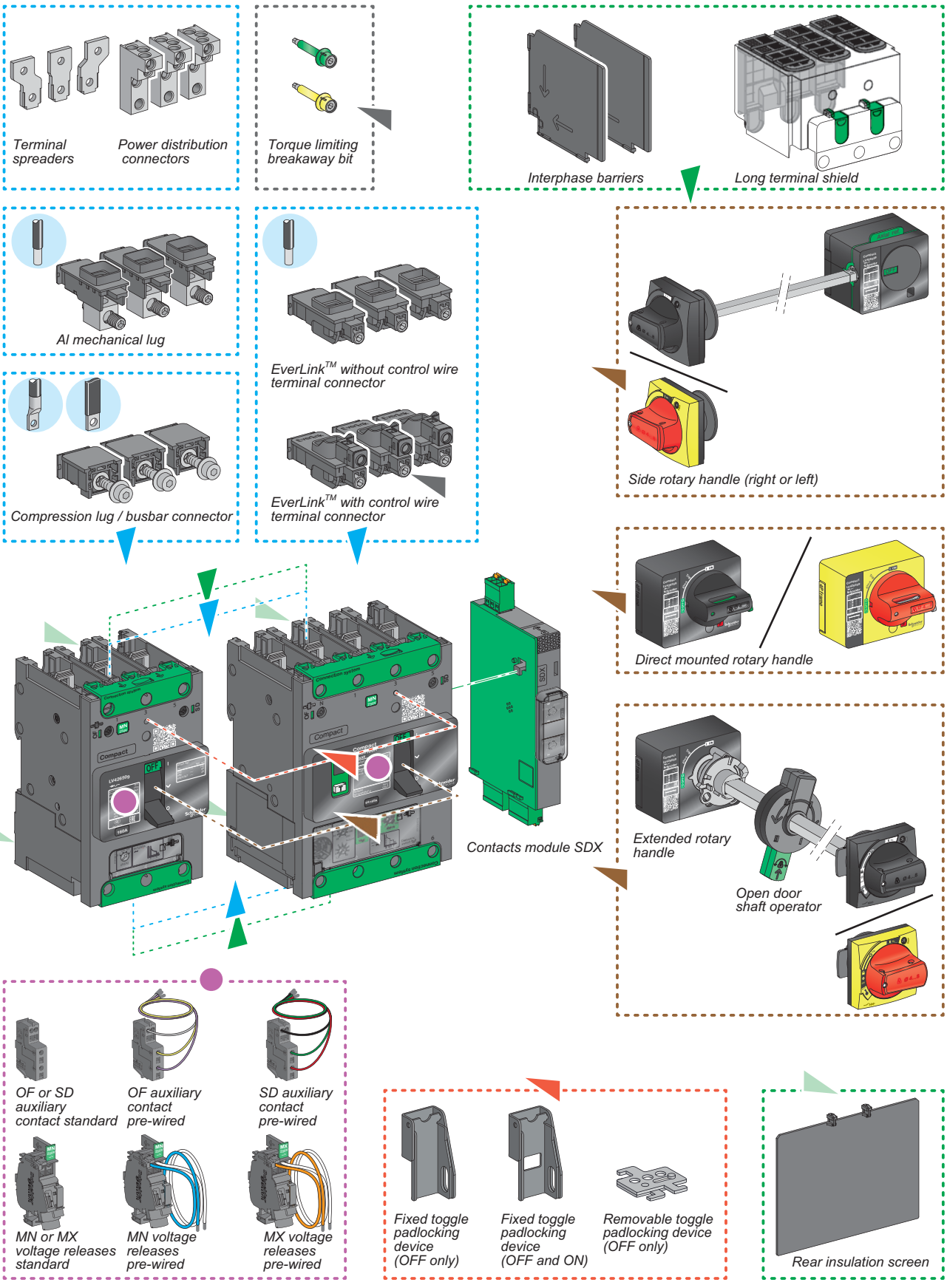

Accessories and auxiliaries
Power connection of fixed devices

A

Fixed circuit breakers are designed for standard front connection using bare cables.
Bars or cables with lugs connectors are also available.

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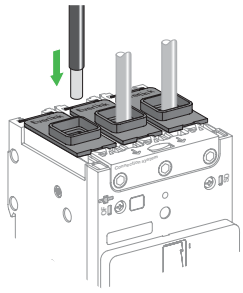

EverLink™ lug connector (standard).

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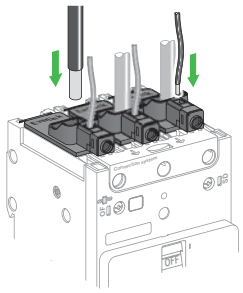

EverLink™ lug connector with control wire terminal (spare part).

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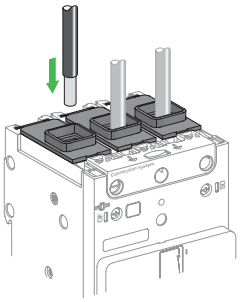

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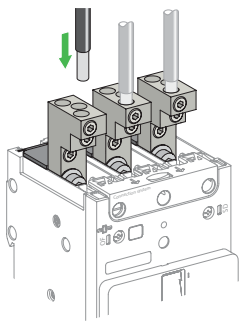


Power connection

Circuit breakers are delivered with EverLink™ lug connectors for bare cables.
They may be delivered with connectors for bars or cables with compression lugs.
Whatever, the connectors can be removed for the installation of one of the 4 kinds of connectors available (EverLink™ lug with control wire terminal, EverLink™ lug, compression lug / busbar, aluminium mechanical lug).
For connection of large cables, a number of solutions with spreaders may be used for both cables with lugs or bars.

Bare cables

Standard terminal: EverLink™ lug connector

This type of connection uses the EverLink™ system with creep [1] compensation (Schneider Electric patent).
This technique makes it possible to achieve accurate and durable tightening torque, in order to avoide cable creep.
When ordered as spare part, EverLink™ connectors have control wire terminal in order to make some measurment connection (limited to 10 A).

EverLink™ lugs for use with Al or Cu wire		
Wire range		
Solid/stranded	Flexible	Torque
Power connection 15-160 A (Cu), 15-100 A (Al)		
2.5 - 10 mm²	2.5 - 10 mm²	5 N.m ±0.5
16 - 95 mm²	16 - 70 mm²	9 N.m ±0.9
Control wire terminal up to 10 A (Cu)		
1.5 - 6 mm²	0.5 - 6 mm²	1 N.m ±0.1

Aluminium mechanical connectors up to 125 A

The standard EverLink lugs can be removed for the installation of mechanical lugs.
Lugs suitable for copper and aluminum conductors are made of tin-plated aluminum.
The mechanical lugs are fastened to the terminals with lug mounting screws, inserted from the bottom of the circuit breaker. The lug cover is held in place with built-in snap features. They are sold as field installable kits.

Aluminium mechanical connectors, 15-125 A (Cu/Al)	
Wire range	
Solid/stranded	Torque
2.5 - 6 mm²	4 N.m ±0.4
10 - 70 mm²	5.6 N.m ±0.6

Power distribution connectors up to 125 A [*]

These connectors are screwed directly to device terminals equiped with compression lug/busbar connectors. Interphase barriers are supplied with power distribution connectors, but may be replaced by long terminal shields.
Each connector can receive three or six cables.

Power distribution connectors, 15-125 A (Cu/Al)		
Number wires	Wire range	
	Solid/stranded	Torque
3	35 mm² 2.5 - 25 mm²	4.5 N.m ±0.5 4 N.m ±0.4
6	10 - 16 mm² 2.5 - 6 mm²	2.8 N.m ±0.3 2.3 N.m ±0.2

[1] Creep: normal crushing phenomenon of conductors, that is accentuated over time.

[*] Available Q4 2017.

Bars or cables with lugs

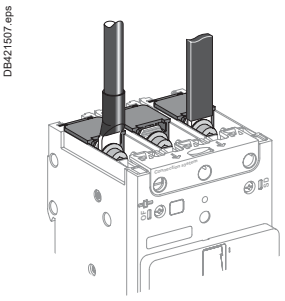
Compression lug / busbar connectors

The Compact NSXm circuit breakers may be equipped with captive nuts and M6 screws connectors. These are readily field-installable, simply by removing the EverLink lug and replacing with the appropriate terminal nut.
They are also available factory installed. These terminals may be used for:

- direct connection of insulated bars or cables with compression (crimp) lugs.
- terminal extensions offering a wide range of connection possibilities.

Compression lug / busbar connectors, 15-160 A	
Power connection	Torque
⩽ 10 mm²	5.0 N.m ±0.5
⩾ 16 mm²	9 N.m ±0.9

Interphase barriers or terminal shields are recommended. They are mandatory for certain connection accessories (in which case the interphase barriers are provided).



Crimp lugs large size cables

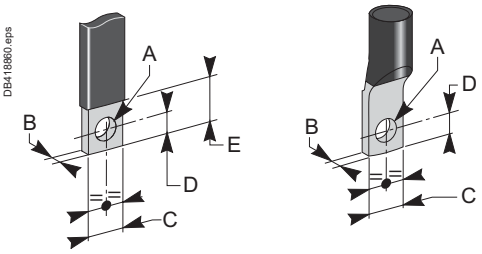
There are two models, for aluminium and for copper cables. It is necessary to use narrow lugs, compatible with device connections. They must be used with interphase barriers or long terminal shields.
The lugs are supplied with interphase barriers and may be used for the types of cables listed below.

Crimp lugs for use with Compact NSXm					
Copper cables	size	rigid	70 mm²	95 mm²	120 mm²
		flexible	50 mm²	70 mm²	95 mm²
	crimping		hexagonal barrels or punching		
Aluminium cables	size	rigid		95 mm²	120 mm²
	crimping		hexagonal barrels		

Bars

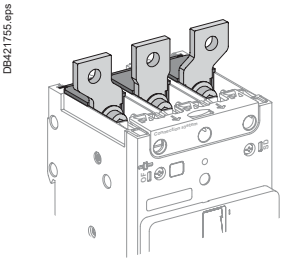
When the switchboard configuration has not been tested, insulated bars are mandatory.

Bar and lugs dimensions					
Dimensions	A	B	C	D	E
mm	6.4	⩽ 8	⩽ 20	7	⩾ 17



Spreaders

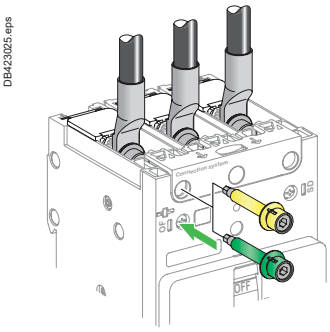
Spreaders may be used to increase the pitch from 21 mm to 35 mm. Bars or cable lugs can be attached to the ends.
They are provided with M8 screws for power connection and interphase barriers (not compatible with long terminal shield). Rear insulation screens may have to be used too depending on the distance between the live uninsulated parts and the grounded metallic back pan (see page B-6).



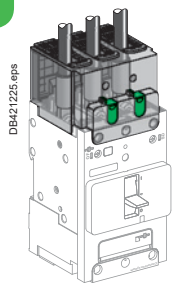
Torque limiting breakaway bits

Torque limiting breakaway bits may be used, particularly in the field, to tighten at the right torque EverLink™, compression lug or busbar power connections.

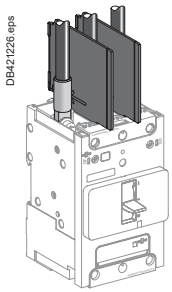
Throwaway tips		
Circuit breaker application		Qty per kit
Torque		
5 N.m		6 or 8
9 N.m		6 or 8



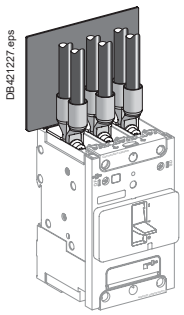
Accessories and auxiliaries
Insulation of live parts



Long terminal shields.



Interphase barriers.



Rear insulating screens.

Long terminal shields IP40

Compact NSXm 3P or 4P can be equiped with long terminal shields. They can be mounted upstream and downstream and are used for protection against direct contact with power circuits. They provide IP40 degree of protection and IK07 mechanical impact protection. Moreover long terminal shields can be mounted after product installation on plate or DIN rail, and can be removed and put in place even if there are auxiliary wires.
They are used for connection with cables or insulated bars.
They are comprised of two parts assembled with 2 locks and/or captive screws, forming an IP40 cover.
- The top part is transparent in order to be able to see the connection through it and is equipped with sliding grids with break marks for precise adaptation to cables or insulated bars.
- The rear part completely blocks off the connection zone. Partially cut squares can be removed to adapt to all types of connection for cables with lugs or copper bars.

Interphase barriers

Safety accessories for maximum insulation at the power-connection points:
- they clip easily onto the circuit breaker
- not compatible with long terminal shield
- 2 ways mounting: short / long insulation.

Rear insulating screens

Safety accessories providing insulation at the rear of the device.
Their use may be mandatory if no long terminal shield depending of the distance between bare conductors and backplate (see table page B-6).
The screen dimensions are shown below.

Circuit breaker		NSXm
3P	W x H x thickness (mm)	110 x 84 x 1
4P	W x H x thickness (mm)	145 x 84 x 1

Standard

All Compact NSXm circuit breakers and switch-disconnectors have slots for the electrical auxiliaries listed below:

- ■ 2 indication contacts (see page A-25) :
- □ 1 ON/OFF (OF)
- □ 1 trip indication (SD)
- ■ either 1 MN undervoltage release or 1 MX shunt trip (see page A-26).

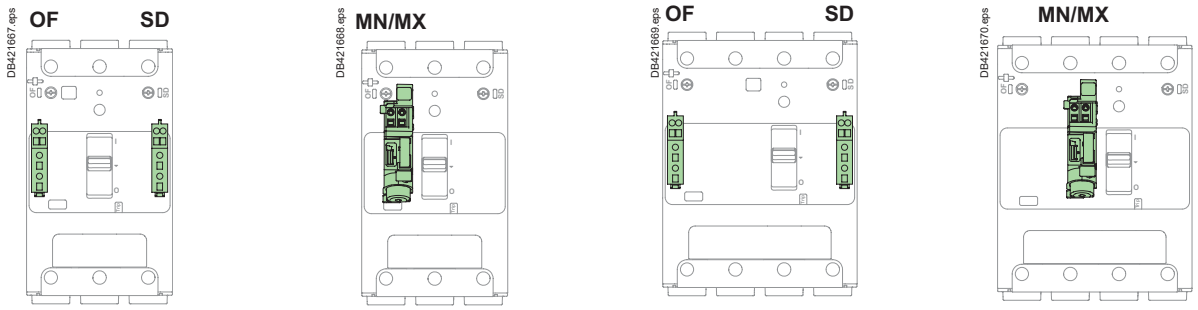
Remote indications

Circuit breakers with Micrologic 4.1 (ELCB) may be equipped with an alarming / fault trip indication module to prevent to trip or to identify the type of fault (see page A-27).

All these auxiliaries may be installed with a rotary handle or a toggle handle.

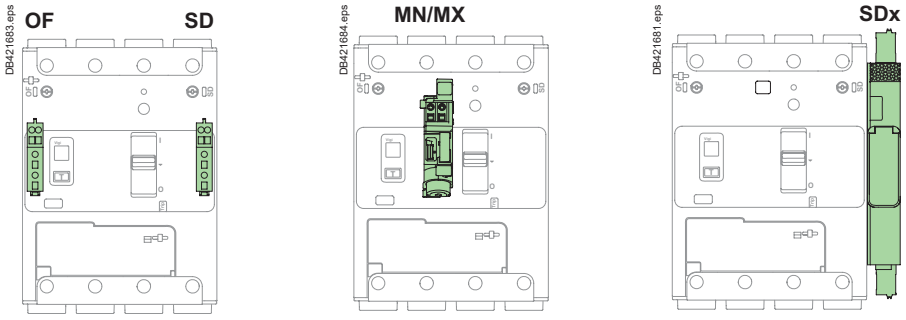
The following drawing indicates auxiliary possibilities depending on the type of device.

Thermal magnetic circuit breaker (TM-D), switch (NA)



3 poles device **4 poles device**

Earth leakage circuit breaker (Micrologic 4.1)[*]



3/4 poles device in 4 poles footprint

[*] Available Q4 2017.

Accessories and auxiliaries
Connection of auxiliaries

Wiring

Electrical accessories are fitted with numbered spring terminal blocks for wires. The maximum wire size is 1.5 mm^2 for auxiliary switches (OF or SD), shunt trip MX or undervoltage release MN.

Electrical accessory wire routing can be exited out any of the four corners of the breaker, under the accessory cover even when using long terminal shield

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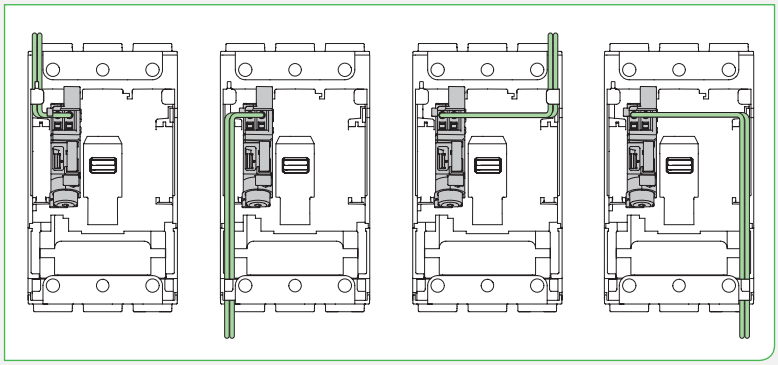

Auxiliary and alarm indication contacts

Indication contacts provide remote information of the circuit breaker status and can thus be used for indications, electrical locking, relays, etc.
They are common point changeover type contacts, with a normaly open (NO) contact and a normaly closed (NC) contact.

Open/Closed - Auxiliary switches (OF)

- Indicates the position of the circuit breaker contacts.

Trip indication - Alarm switch (SD)

- Indicates that the circuit breaker has tripped due to:
  - an electrical fault (overload, short circuit)
  - the operation of a shunt trip
  - undervoltage release
  - the “push-to-trip” button.
- Resets when the circuit breaker is reset.

Installation and connection

- The auxiliary switch (OF) and alarm switch (SD) indication contacts snap into cavities behind the front accessory cover of the circuit breaker and their presence is visible on the front face through green flags.
- One model serves for all indication functions depending on where it is fitted in the circuit breaker.
- Each NO and NC spring terminal may be connected by one 0.5...1.5 mm² flexible copper wire and by two for the common point.

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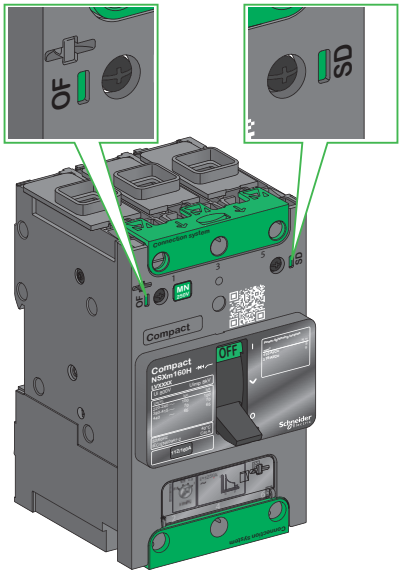
Auxiliary Switch (OF) / Alarm Switch (SD).

Electrical characteristics of auxiliary contacts

Characteristics						
Rated thermal current (A)		5				
Minimum load		5 mA at 17 V DC				
Utilization cat. (IEC 60947-5-1)		AC12	AC15	DC12	DC13	DC14
Operational current (A)	24 V AC/DC	5	5	5	2.5	1
	48 V AC/DC	5	5	2.5	1.2	0.2
	110...127 V AC / 110 V DC	5	4	0.6	0.35	0.05
	220/240 V AC	5	3	-	-	-
	250 V DC	-	-	0.3	0.05	0.03
	380/440 V AC	5	2.5	-	-	-
	660/690 V AC	5	0.1	-	-	-



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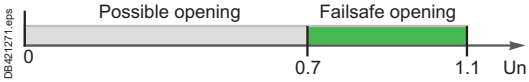
Standards

- Auxiliary indicator contacts comply with IEC 60947-5-1 Standards.
- Auxiliary contacts have also been tested according IEC 60 947-5-4 standard.

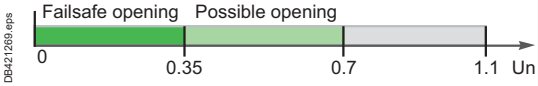
Accessories and auxiliaries
Voltage release

A

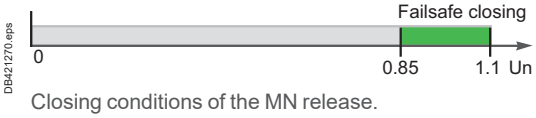
MX or MN voltage release.



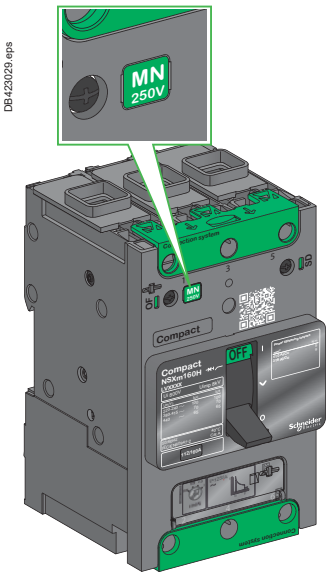
Opening conditions of the MX release.



Opening conditions of the MN release.



Closing conditions of the MN release.



Operating voltages for MN/MX.

Shunt trip (MX) and undervoltage release (MN)

A voltage release can be used to trip the circuit breaker using a control signal. They serve primarily for remote, emergency-off commands. It is advised to test the system every six months.

Shunt trip (MX)

- Trips the circuit breaker when the control voltage rises above 70 % of its rated voltage (Un).
- Impulse type ≥ 20 ms or maintained control signals.
- Shunt trip 110...130 V AC is suitable for ground-fault protection when combined with a Class I ground-fault sensing element.
- Continuous duty rated coil [1].

Undervoltage release (MN)

- Trips the circuit breaker when the control voltage drops below 35 % of its rated voltage.
- Between 35 % and 70 % of the rated voltage opening is possible but not guaranted.
- Above 70 % of the rated voltage, opening does not take place.
- Continuous duty rated coil.
- Circuit breaker closing is possible only if the voltage exceeds 85 % of the rated voltage. If an undervoltage condition exists, operation of the closing mechanism of the circuit breaker will not permit the main contacts to touch, even momentarily. This is commonly called “Kiss Free”.

Time-delay unit for an undervoltage release (MN)

- A time delay unit eliminates the risk of nuisance tripping due to a transient voltage dip lasting less than 200 ms for fixed delay units and up to 3 seconds for adjustable units. For shorter micro-outages, a system of capacitors provides temporary supply to the MN at U > 0.7 Un to ensure non tripping.

The correspondence between MN and time-delay units is shown below.

Power supply	Corresponding MN
Unit with fixed delay 200 ms	
48 V AC	48 V DC
220 / 240 V AC	250 V DC
Unit with adjustable delay ≥ 200 ms	
48 - 60 V AC/DC	48 V DC
100 - 130 V AC/DC	125 V DC
220 - 250 V AC/DC	250 V DC

Installation and connection

- Accessories snap into cavities under the front accessory cover of the circuit breaker. The presence and characteristics of the voltage release is visible from the front face through a window
- Terminals are spring type in order to insure a fast and reliable connection
- Each terminal may be connected by one 0.5...1.5 mm² flexible copper wire.

Operation

- The circuit breaker must be reset locally after being tripped by shunt trip (MX) or undervoltage release (MN)
- Tripping by the shunt trip or undervoltage release has priority over manual closing; in the presence of a standing trip order such an action does not result in any closing, even temporarily, of the main contacts
- Endurance: 50 % of the rated mechanical endurance of the circuit breaker.

Standard

- MN/MX voltage releases comply with IEC 60947-2 Standards.

[1] Except for MX 24 V AC/DC (in case of continuous activation, may generate some minor perturbation in sensitive environment).

SDx module for ELCB[1][*]

The SDx module provides alarming and fault differentiation for the Compact NSXm with Micrologic 4.1 (ELCB) circuit breaker.
This module has 2 NO/NC outputs dry contacts. Each can be assigned with one of the following status:

- overload alarm (SDT105): current is higher than 105 % of the setting current (Ir)
- overload trip indication (SDT): cricuit breaker has tripped due to an overload fault
- earth leakage alarm (SDV80): leakage current is higher than 80 % of the earth leakage trip threshold (IΔn)
- earth leakage trip indication (SDV): cricuit breaker has tripped due to an earth leakage current.

Outputs are automatically reseted either when alarm disapear or when the circuit breaker is restarted.

Output characteristics

- 2 NO/NC dry contacts
- 24...250 V AC/DC
- 0.3...5 A max
- AC15 (230 V max - 400 VA)
- DC13 (24 V - 50 W)

Power characteristics

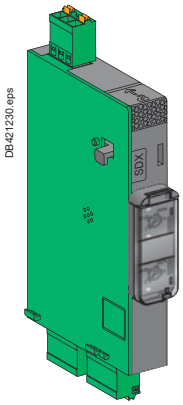
- 24...240 V AC/DC

Front face indication

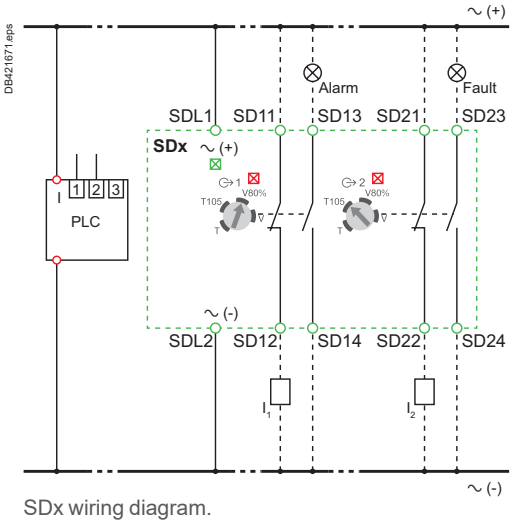
- green led "On": flashes slowly when the module is powered
- 2 red led for output status indication
- 2 setting dials

Installation and connection

The SDx module is cliped on the right side on the circuit breaker.
Each removable spring terminal can be connected by one 0.5... 1.5 mm² copper wire.



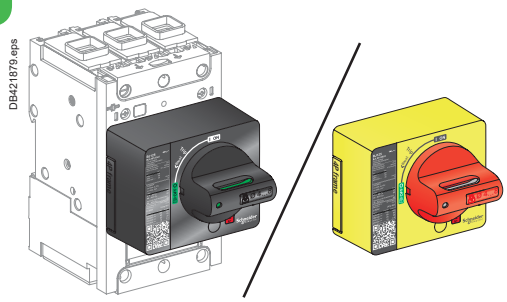
SDx relay module with its terminal block.



SDx wiring diagram.

[1] ELCB: Earth Leakage Circuit Breaker (Micrologic 4.1).
[*] Available Q4 2017.

Accessories and auxiliaries
Rotary handles



Directly mounted rotary handle.

Direct rotary handles

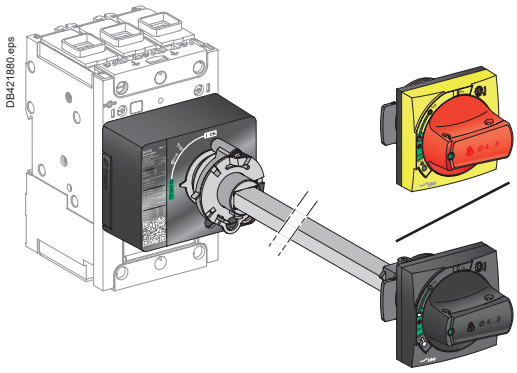
Installation
The direct mounted rotary handle has to be mounted by 3 screws on the front accessory cover.

Operation
The direct rotary handle maintains:
- suitability for isolation
- indication of the three positions OFF (**O**), ON (**I**) and tripped (**Trip**)
- access to the “push-to-trip” button
- visibility and access to the trip unit.

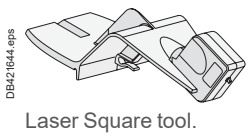
Device padlocking
The circuit breaker may be locked in the OFF position by using one to three padlocks (not supplied) or in ON position after customer modification of the rotary handle before installation, padlock shackle Ø4-8 mm. Locking in the ON position does not prevent the circuit breaker from tripping if a fault occurs. In this case, the handle remains in the ON position after the circuit breaker trips. Unlocking is required for the handle to go to the tripped then the OFF position.

Variations: door locking
Door locking built-in functionality can be activated by the customer to prevent opening the door when the circuit breaker is ON or in trip position. For exceptional situations, door locking can be temporarily disabled with a tool by qualified personel to open the door when the circuit breaker is closed.

Models
- Standard with black handle.
- VDE type with red handle and yellow bezel for machine tool control.



Door-mounted rotary handle.



Laser Square tool.

Extended rotary handles

Installation
The door-mounted (extended) rotary handle is made up of:
- a unit that has to be screwed on the front accessory cover of the circuit breaker
- an assembly (handle mechanism and front plate) on the door that is always secured in the same position, whether the circuit breaker is installed vertically or horizontally
- an adjustable extension shaft.

The handle mechanism is fixed with a nut (Ø22 mm) to make assembly easier. The Laser Square tool (GVAPL01) can be used to accurately align the hole on the door with the circuit breaker.

Operation when door is closed
The door mounted handle makes it possible to operate a circuit breaker installed in an enclosure from the front. The door mounted operating handle maintains:
- suitability for isolation
- indication of the three positions OFF (**O**), ON (**I**) and tripped (**Trip**)
- visibility and access to trip unit when the door is open
- degree of protection of the handle on the door: IP54 or IP65 as per IEC 529.

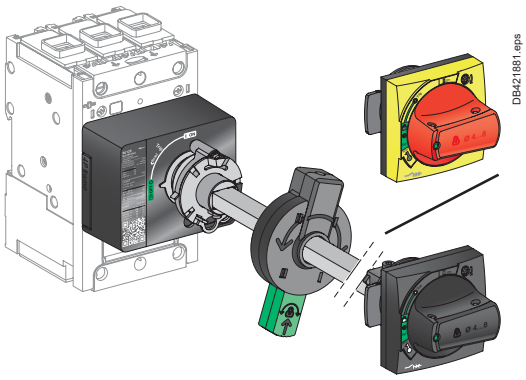
Mechanical door locking when device closed
A standard feature of the extended rotary handle is a locking function, built into the shaft, that disables door opening when the circuit breaker is in the ON or tripped positions.
Door locking can be temporarily disabled with a tool by qualified personnel to open the door without opening the circuit breaker. This operation is not possible if the handle is locked by a padlock.

Device and door padlocking
Padlocking locks the circuit breaker handle and disables door opening:
- standard situation, in the OFF position, using 1 to 3 padlocks, shackle Ø4-8 mm, padlocks are not supplied
- for the black handle, with a voluntary modification of the door handle (to be done by the customer during installation), in the ON and OFF positions. Locking in the ON position does not prevent the circuit breaker from tripping if a fault occurs. In this case, the handle remains in the ON position after the circuit breaker trips. Unlocking is required for the handle to go to the tripped then the OFF position.

Operation when door is opened
An open door shaft operator can be used to operate the circuit breaker when door is opened. This accessory complies with UL508.
The indication of the three positions OFF (**O**), ON (**I**) and tripped (**Trip**) is visible on the circuit breaker.
The circuit breaker itself may be locked in OFF position when the door is opened by 1 padlock / lockout hasp, shackle Ø4-8 mm.

Shaft length
The shaft length is the distance between the back of the circuit breaker and the door:
- minimum shaft length is 200 mm
- maximum shaft length is 600 mm
- shaft length must be adjusted.

Models
- Standard with black handle (IP54).
- VDE type with red handle and yellow bezel for machine tool control (IP54).
- IP65 with red handle and yellow bezel.



Door-mounted rotary handle with open door shaft operator.

Side rotary handles (left or right)

Installation
The side-mounted rotary handle is made up of:
- a unit that has to be screwed on the front accessory cover of the circuit breaker
- an assembly (handle and front plate) on the side (left or right) of the enclosure
- an adjustable extension shaft
- IP54 handle mechanisms
- IP65 handle mechanisms.

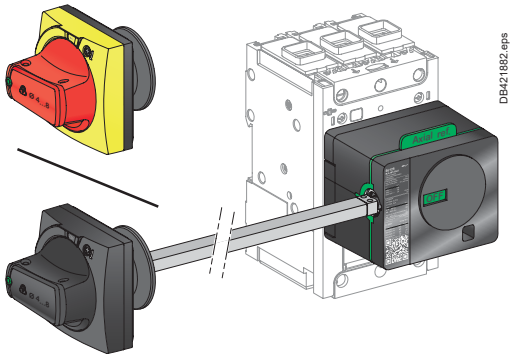
The handle mechanism is fixed with a nut (Ø22 mm) to make assembly easier.

Operation
The side mounted rotary handle makes it possible to operate circuit breakers installed in enclosure from the side. The side mounted rotary handle maintains:
- suitability for isolation
- indication of the three positions OFF (**O**), ON (**I**) and tripped (**Trip**). Moreover, the position is visible on the circuit breaker itself.
- visibility and access to trip unit when the door is open
- degree of protection of the handle on the side: IP54 or IP65 as per IEC 529.

Device padlocking
The circuit breaker may be locked in the OFF position, or, for the black rotary handle only, in ON position after voluntary modification of the side handle (to be done by the customer during installation), by using one to three padlocks, padlock shackle Ø4-8 mm ; padlocks are not supplied.
Locking in the ON position does not prevent free circuit breaker from tripping if a fault occurs. In this case, the handle remains in the ON position after the circuit breaker tripping. Unlocking is required to go to the tripped then the OFF position.

Shaft length
The shaft length is the distance between the side of the circuit breaker and the side of the enclosure:
- minimum shaft length is 45 mm
- maximum shaft length is 480 mm
- shaft length must be adjusted.

Models
- Standard with black handle (IP54).
- VDE type with red handle and yellow bezel for machine tool control (IP54).
- IP65 with red handle and yellow bezel (by ordering a standard one and an IP65 universal handle).



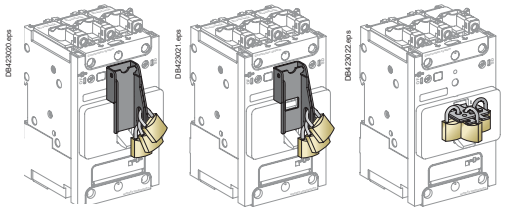
Side mounted rotary handle.

Accessories and auxiliaries
Locks and sealing accessories

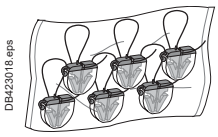
A

Handle padlocking device [1]

Fixed (OFF only)	Fixed (OFF or ON)	Removable (OFF only)



[1] Rotary handle has integrated padlocking capability.



LV429335: Bag of sealing accessories.

Locks

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

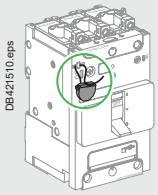
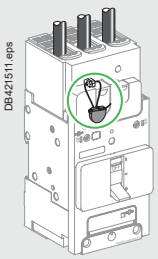
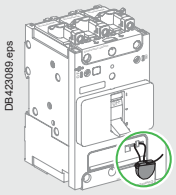
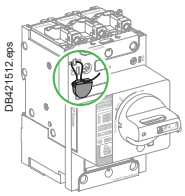
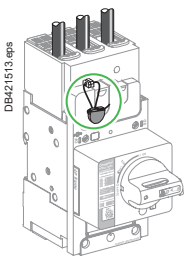
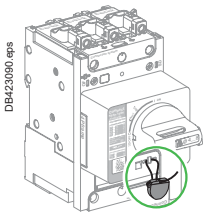
Control device	Function	Means	Required accessories
Toggle	Lock in OFF position	Padlock	Removable device
	Lock in OFF or ON position	Padlock	Fixed device
	Lock in OFF position	Padlock	Fixed device
Direct rotary handle	Lock in ■ OFF position ■ OFF or ON position [1]	Padlock	-
Extended/side rotary handle	Lock in ■ OFF position ■ OFF or ON position [2] with door opening prevented	Padlock	-

[1] Following a simple modification of the mechanism.
[2] Following a simple modification of the mechanism - black handle only.

Sealing accessories

Sealing accessories are available. Each bag of accessories contains all the parts required for the types of sealing indicated below.
A bag contains:
- 6 sealing accessories
- 6 lead seals.

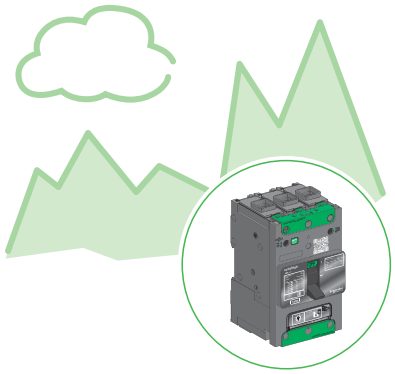
Types of seals and corresponding functions

Protected operations			
Control type	■ Front removal ■ Access to auxiliaries.	■ Access to power connections	■ Access to settings and test connector
Toggle			
Rotary handle			

Installation recommendations

B

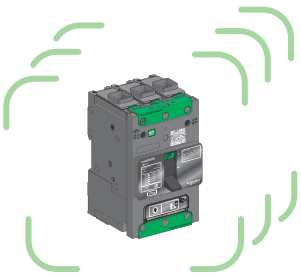
Operating and installation conditions


DB421514.eps

Altitude derating

Altitude does not significantly affect the characteristics of Compact NSXm circuit breakers 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 m. The breaking capacities remain unchanged.

Altitude (m)		2000	3000	4000	5000
Impulse withstand voltage (kV)		8	7.1	6.4	5.6
Insulation voltage (V)	Ui	800	710	635	560
for ELCB	Ui	500	445	400	350
Maximum operational voltage (V)	Ue	690	690	635	560
for ELCB	Ue	440	440	400	350
Average current capacity (A) at 40 °C	In x	1.0	0.98	0.96	0.94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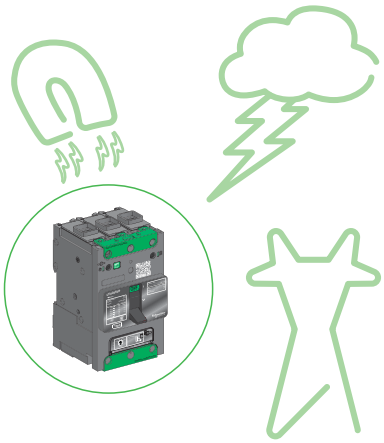
Vibrations

Compact NSXm devices resist mechanical vibrations.
They meet IEC 60068-2-6:
- 2.0 to 13.2 Hz and amplitude ±1 mm
- 13.2 to 100 Hz acceleration ±0.7 g.

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

Compact NSXm devices are protected against:
- overvoltages caused by circuit switching
- 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 directly by users.

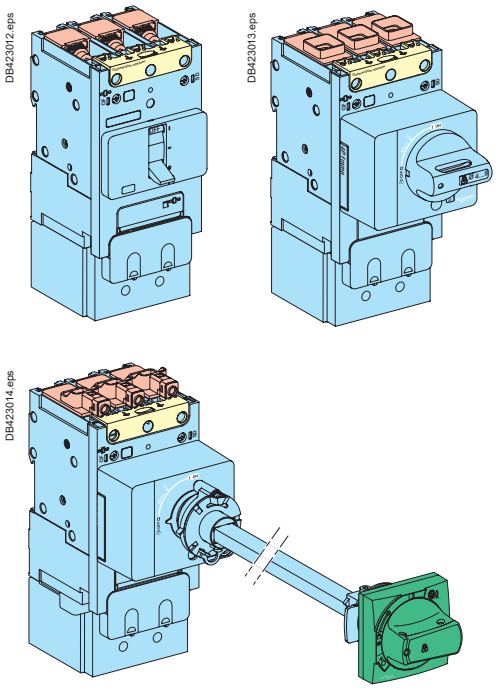
Compact NSXm devices have successfully passed the electromagnetic-compatibility tests (EMC) defined by the international standards listed page A-3.
These tests ensure that:
- no nuisance tripping occurs
- tripping times are respected.

Operating and installation conditions

Protection degree

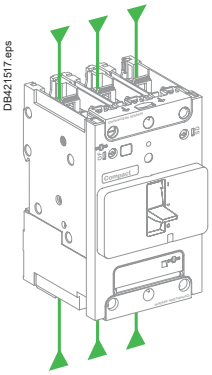
Protection degree of the product, according to IEC60259, depends of its configuration:

Colours	Definition
	IP54/65: side / front extended rotary handle
	IP40: front cover, side, back, long terminal shield, direct rotary handle
	IP20: power connection cover
	may be IP20 or less depending of the kind of power connections and cable size used



Power supply from the top or bottom

Compact NSXm circuit breakers can be supplied from either the top or the bottom, even when equipped with a Micrologic 4.1 with earth leakage protection embedded, without any reduction in performance. This capability facilitates connection when installed in a switchboard.
All connection and insulation accessories can be used on circuit breakers supplied either from the top or bottom.



Operating and installation conditions

Derating and correction factor depending of temperature

The overload protection is calibrated at 40 °C in the lab. This means that when the ambient temperature is less or greater than 40 °C, the Ir protection pick-up is slightly modified.

Choosing the right rating depending of the temperature:

Over the reference temperature of 40 °C, the circuit breaker has to be derated following the table below:

Temperature derating for thermal-magnetic (TM-D) NSXm at In						
Temperature °C						
40	**45**	**50**	**55**	**60**	**65**	**70**
Rating (A) In						
16	16	15	15	14	14	13
25	24	24	23	23	22	21
32	31	30	30	29	28	27
40	39	38	37	36	34	33
50	49	48	46	45	44	42
63	61	60	58	56	54	53
80	77	73	70	67	64	60
100	96	94	90	87	83	80
125	120	117	113	109	104	100
160	155	149	144	139	133	126

Temperature derating for NSXm with Micrologic 4.1 (ELCB) at In						
Temperature °C						
40	**45**	**50**	**55**	**60**	**65**	**70**
Rating (A) In						
25	25	25	25	25	25	25
50	50	50	50	50	50	50
100	100	100	100	100	100	100
160	155	150	145	140	135	130

B

Doing the setting or calculating the tripping time for a given temperature:

After having determine the corrected ratio I/In, the tripping time at 40 °C is defined with the tripping curves (see page E-2 to page E-3).
To obtain the right setting or the tripping time at a different temperature, the ratio I/In has to be corrected with the correction factor below:

Correction factor table for thermal magnetic (TM-D) NSXm to determine setting or tripping time at In

Rating (A) In	Temperature °C												
	10	15	20	25	30	35	40	45	50	55	60	65	70
16	1.16	1.13	1.11	1.08	1.05	1.03	1.00	0.97	0.94	0.91	0.88	0.85	0.81
25	1.13	1.11	1.09	1.07	1.05	1.02	1.00	0.98	0.95	0.93	0.90	0.88	0.85
32	1.14	1.11	1.09	1.07	1.05	1.02	1.00	0.98	0.95	0.93	0.90	0.87	0.84
40	1.15	1.12	1.10	1.08	1.05	1.03	1.00	0.97	0.95	0.92	0.89	0.86	0.83
50	1.13	1.11	1.09	1.07	1.05	1.02	1.00	0.98	0.95	0.93	0.90	0.87	0.85
63	1.14	1.12	1.10	1.07	1.05	1.02	1.00	0.97	0.95	0.92	0.89	0.86	0.83
80	1.21	1.18	1.14	1.11	1.07	1.04	1.00	0.96	0.92	0.88	0.83	0.80	0.75
100	1.18	1.16	1.12	1.10	1.06	1.04	1.00	0.96	0.94	0.90	0.87	0.83	0.80
125	1.17	1.14	1.11	1.08	1.06	1.03	1.00	0.96	0.93	0.90	0.87	0.84	0.80
160	1.17	1.15	1.12	1.09	1.06	1.03	1.00	0.97	0.93	0.90	0.87	0.83	0.79

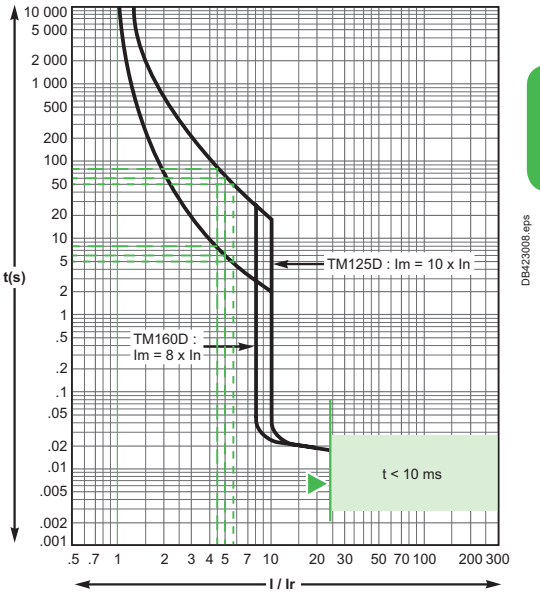
Doing the right setting depending of the temperature:
Example: What is the setting to obtain a real Ir of 105 A, taking into account the temperature, for a Compact NSXm 125 A?
The necessary dial setting, in amperes, is shown below.

- At 40 °C, Ir = 105 / 1 = 105 A
- At 20 °C, Ir = 105 / 1.11 = 95 A
- At 60 °C, Ir = 105 / 0.87 = 121 A.

Calculating the tripping time at Ir = In for a given temperature:
Example: What is the tripping time of a Compact NSXm 100A at Ir = In for an overload of 500 A?

- At 40 °C, I/Ir = 5, tripping time is between 6 and 60 seconds
- At 20 °C, I/Ir = 5 / 1.12 = 4.46, tripping time is between 8 and 80 seconds
- At 60 °C, I/Ir = 5 / 0.87 = 5.75, tripping time is between 5 and 50 seconds

For Ir = 0.7 to 0.9 In, additional correction factor need to be applied - please consult us.



Safety clearances and minimum distances

General rules

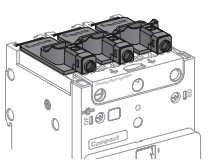
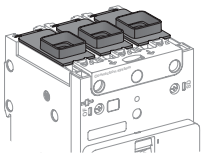
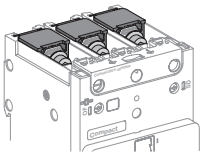
When installing a circuit breaker, minimum distances (safety clearances) must be maintained between the device and panels, bars and other protection devices installed nearby. These distances, which depend on the ultimate breaking capacity, are defined by tests carried out in accordance with standard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

For Compact NSXm devices, terminal shields and interphase barriers are recommended and may be mandatory depending on the kind of power connections of the device and type of installation.

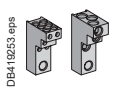
Power connections

The table below indicates the rules to be respected for Compact NSXm devices to ensure insulation of live parts for the various types of connection.
Connection accessories such as crimp lugs, power distribution connectors, and spreaders are supplied with interphase barriers.
Long terminal shields provide a degree of protection of IP40 (ingress) and IK07 (mechanical impact).

Compact NSXm: rules to be respected to ensure insulation of live parts

	EverLink connector with or without control wire terminal	Mechanical lug connector	Compression lug / busbar connector
	 DB421518.eps	 DB418827.eps	 DB421519.eps

Insulation accessory options per conductor type

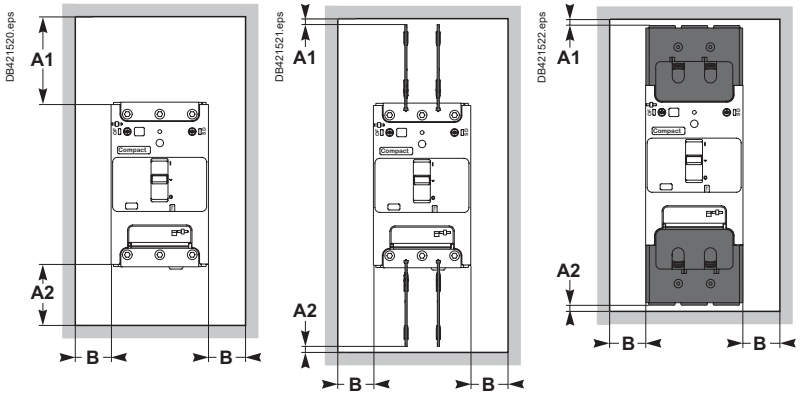
Type of conductor		No insulating accessory	Interphase barriers	Long terminal shield	No insulating accessory	Interphase barriers	Long terminal shield	No insulating accessory	Interphase barriers	Long terminal shield
Cables	 DB419248.eps	Possible	-	-	Possible	Possible	Possible	-	-	-
Insulated bars	 DB419249.eps	-	-	-	-	-	-	Possible [2]	Possible	Possible
Cables + crimp lugs	 DB419250.eps	-	-	-	-	-	-	Forbidden	Mandatory	Possible [1]
Cables + crimp lugs with heat-shrinkable sheath	 DB419251.eps	-	-	-	-	-	-	Possible [2]	Possible	Possible
Extension terminals: spreader	 DB419252.eps	-	-	-	-	-	-	Forbidden	Mandatory	-
Extension terminals: cables + power distribution connector	 DB419253.eps	-	-	-	-	-	-	Forbidden	Mandatory	Possible [1]

[1] Instead of phase barriers.
[2] Safety air clearance of 8 mm has to be respected between live parts.
Note: For uninsulated bar connections, please consult us.

Safety clearances and minimum distances

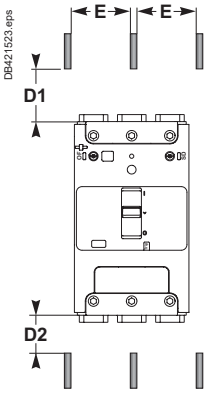
IEC standard

Minimum safety clearances



Operating voltage	Clearance (mm)						
	Between devices	Between device and sheet metal					
		Painted sheet metal			Bare sheet metal		
U ⩽ 690 V		A1	A2	B	A1	A2	B
for devices equipped with:							
no accessories	0	30 mm	5 mm	0	40 mm	5 mm	5 mm
interphase barriers	0	0	0	0	0	0	5 mm
long terminal shields	0	0	0	0	0	0	5 mm

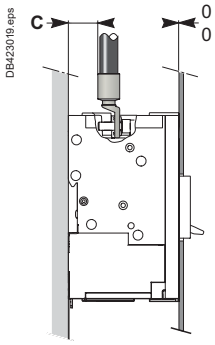
Minimum safety clearances to bare busbars



Operating voltage	Clearances to live bare busbars [1]			
	Spacing E ⩽ 60 mm		Spacing E > 60 mm	
	D1	D2	D1	D2
U ⩽ 690 V	200 mm	100 mm	120 mm	60 mm

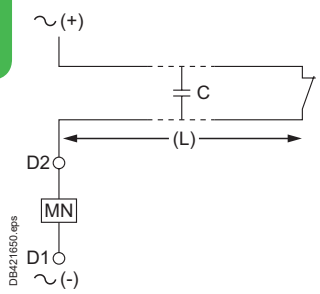
[1] These clearances can be reduced for special installations as long as the configuration is checked by tests.

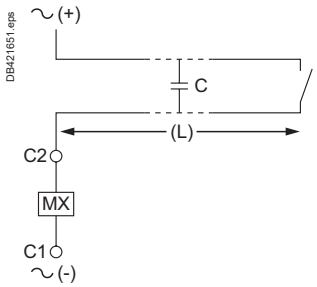
Compression lug safety clearance

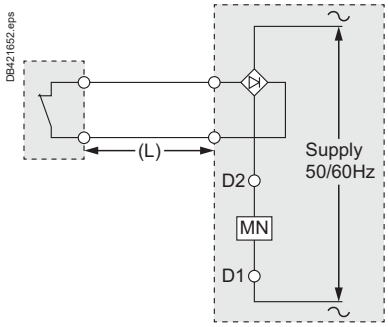


An insulating screen or long terminal shield is required if C < 8 mm.

Voltage release wiring rules







Shunt trip (MX) and undervoltage release (MN)

Recommended maximum cable lengths

In certain circumstances, high cable capacitance due to an excessive cable length could prevent an undervoltage release MN from dropping out resulting in safety issues. In case of a shunt trip MX, an untimely trip may occur due to capacitive current leak.
To avoid these dysfunction due to cable capacitance C, the maximum cable length (L) is defined by the following table for a 1.5 mm² cable.

Power supply voltage (Un)	Maximum cable length undervoltage trip (MN) [1]	Shunt trip (MX) [1]
24 V AC	1 243 m	3 653 m
24 V DC	unlimited	> 3653 m
48 V AC	583 m	1 667 m
48 V DC	unlimited	> 1667 m
110...130 V AC	126 m	913 m
110...130 V DC	unlimited	> 913 m
208-240 V AC	109 m	160 m
250 V DC	unlimited	> 160 m
277 V AC	98 m	120 m
380-415 V AC	86 m	80 m
440-480 V AC	56 m	67 m

[1] Make sure auxiliaries supply voltage is within working range (0.85 Un mini...1.1 Un maxi).

If a longer cable length is required, several solutions are possible to counteract excessive cable capacitance:
- use DC operated auxiliaries
- use lower control voltage (make sure auxiliaries supply voltage is within working range: 0.85 Un minimum...1.1 Un maximum)
- if high voltage and long control cables are required for an AC undervoltage release (MN), add a rectifier bridge (ref LV426899 – DIN rail compatible) in the control circuit. It will prevent drop out problems but increase operating time.

Electrical characteristics of MN/MX

Characteristics				
			AC	DC
Rated voltage (V)			24, 48, 110...130, 208...240, 277, 380...415, 440...480	24, 48, 125, 250
Power requirements	MX	Pickup (< 50 ms)	< 6 VA	< 10 W
		Seal-in	< 4 VA	< 1 W
	MN		< 7 VA	< 2 W
Clearing time (ms)			< 50	< 50
Operating range			up to 1.1 Un	

Power loss / Resistance

Compact NSXm thermal power loss values are used to calculate total temperature rise in the switchboard in which the circuit breakers are installed.

The values indicated in the tables below are typical values for a device at full rated load and 50/60 Hz.

Power loss per pole (P/pole) in Watts (W)

The value indicated is the power loss at In, 50/60 Hz, for a three-pole or four-pole circuit breaker. Measurement and calculation of power loss 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 is determined on the basis of the measured voltage drop, in accordance with the manufacturer's test procedure.

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.

Calculation of total power loss

Total power loss at full rated load and 50/60 Hz is equal to power losses per pole multiplied by the number of poles (3 or 4).

Compact NSXm with TM-D

Rating (A)	R total / pole (mΩ)	P / Pole (W)
16	8.87	2.3
25	4.50	2.8
32	3.10	3.3
40	2.30	3.8
50	1.85	4.6
63	1.44	5.7
80	0.90	5.8
100	0.75	7.5
125	0.59	9.3
160	0.53	13.7

Compact NSXm with Micrologic 4.1

Rating (A)	R total / pole (mΩ)	P / Pole (W)
25	2.44	1.5
50	0.48	1.2
100	0.48	4.8
160	0.48	12.3

B

Dimensions and connection

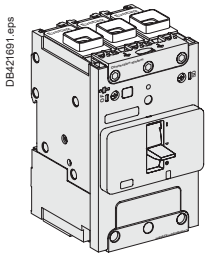
Circuit breaker and switch-disconnector

C

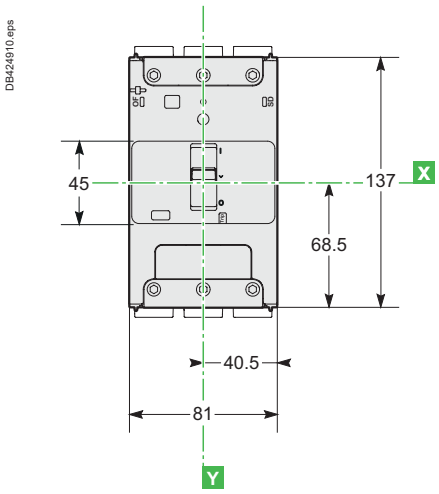
Other chapters

Circuit breaker and switch-disconnector
Compact NSXm

Circuit breaker



3P



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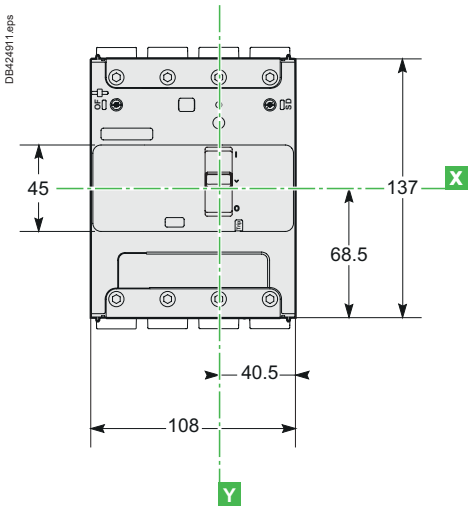
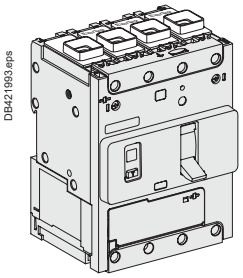


Earth Leakage Circuit Breaker (ELCB)



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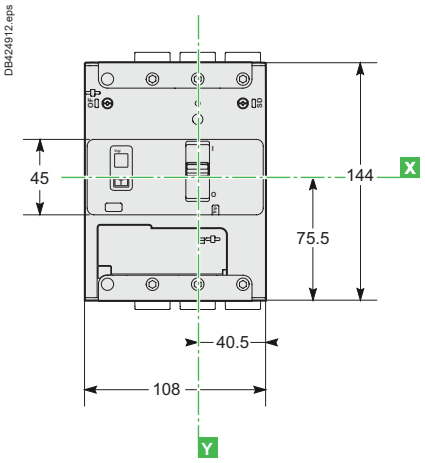

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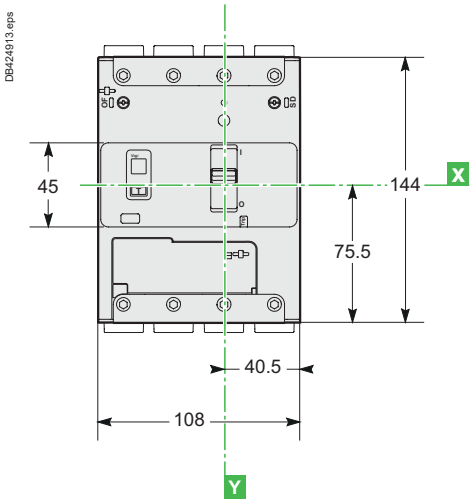
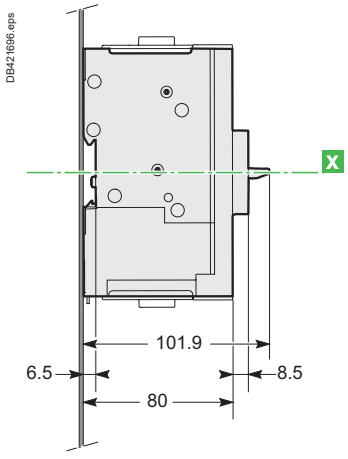
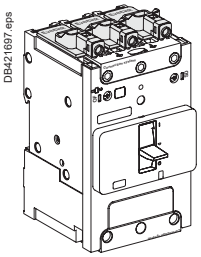


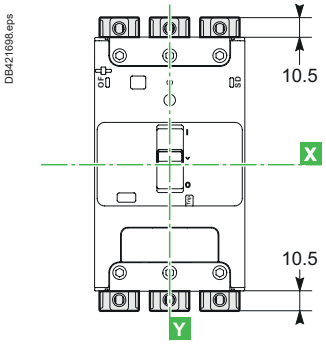
Side view

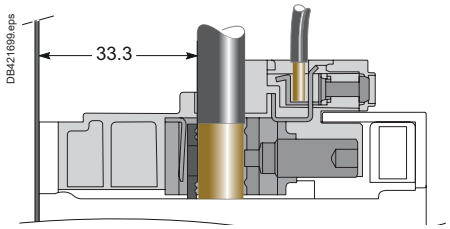


Connectors

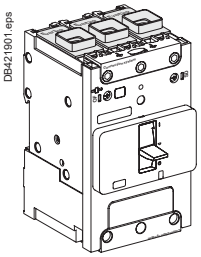
EverLink with control wire terminal connector

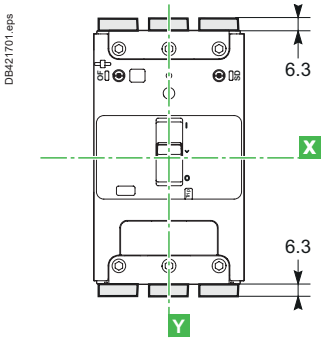


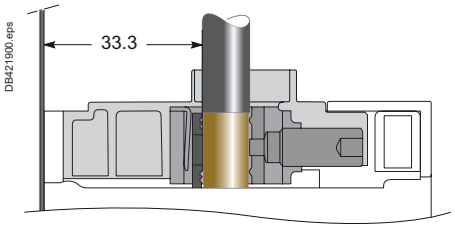




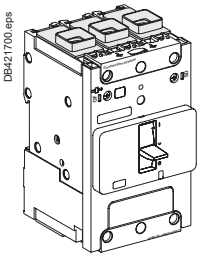
EverLink without control wire terminal connector

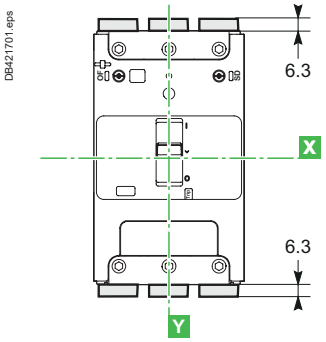


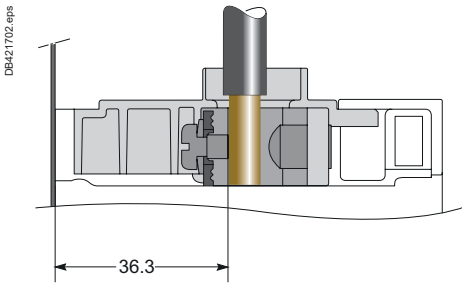




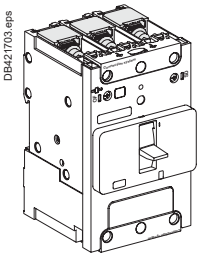
Mechanical lug connector

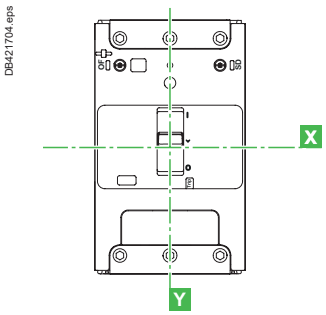


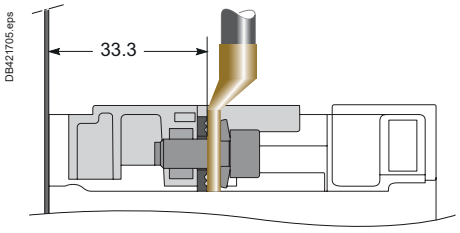




Compression lug / busbar connector







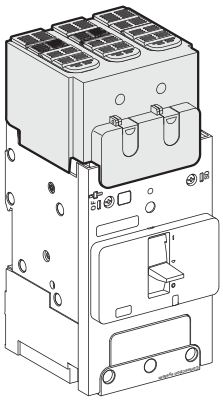
C

Circuit breaker and switch-disconnector
Compact NSXm

Insulation of live parts

Long terminal shields

DB421706.eps



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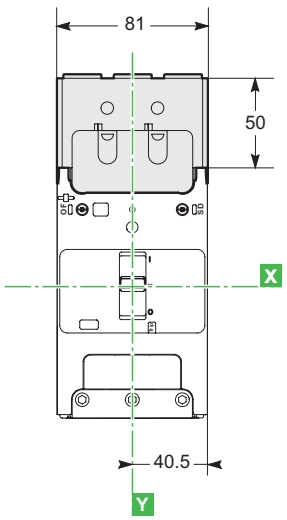

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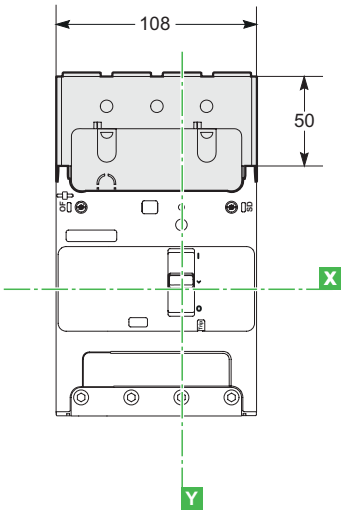

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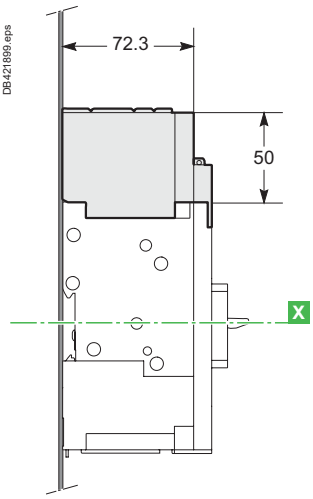
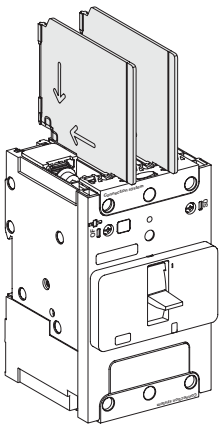


Interphase barriers

DB421708.eps



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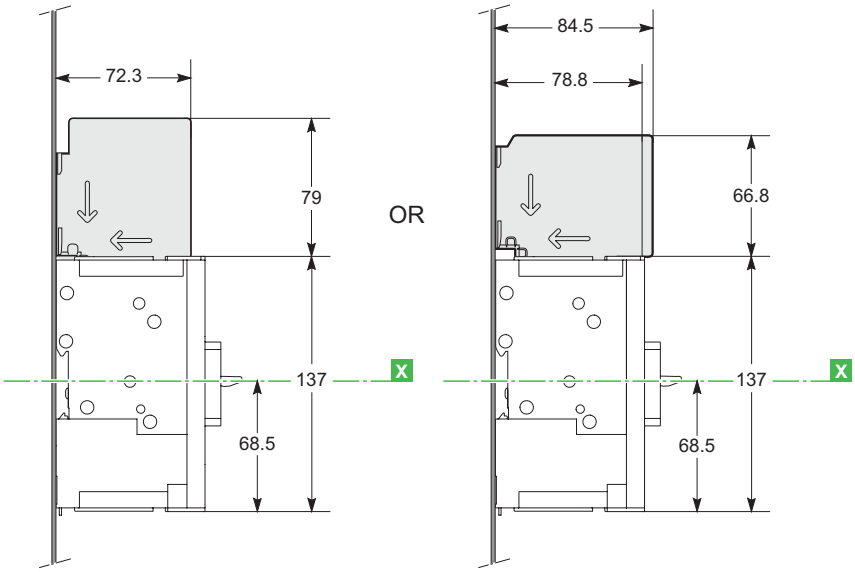
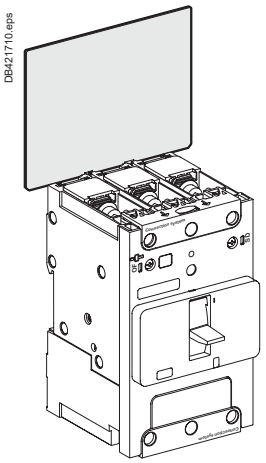
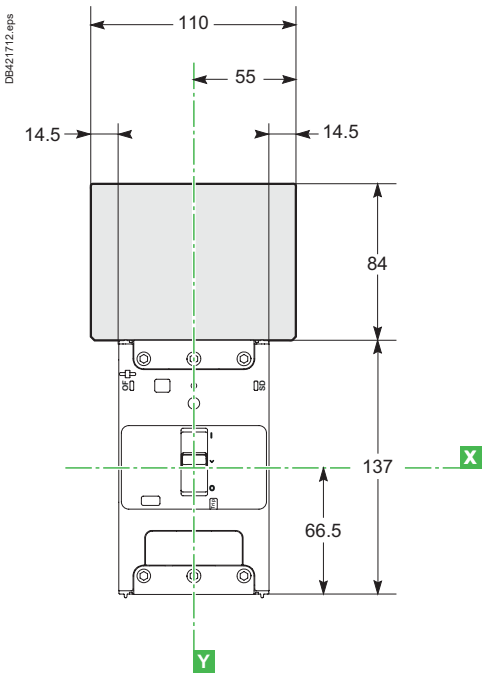


Rear insulating screens



3P



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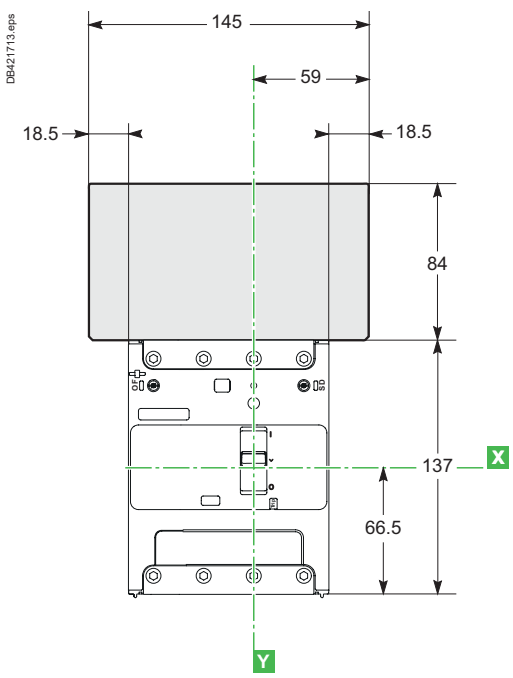


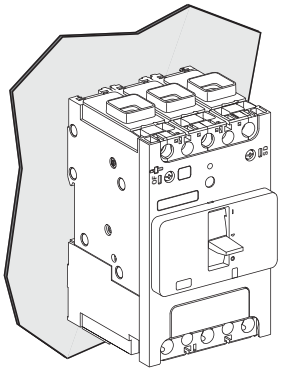
C

Circuit breaker and switch-disconnector
Compact NSXm

Mounting on backplate

3P/4P

DB421718.eps



3P

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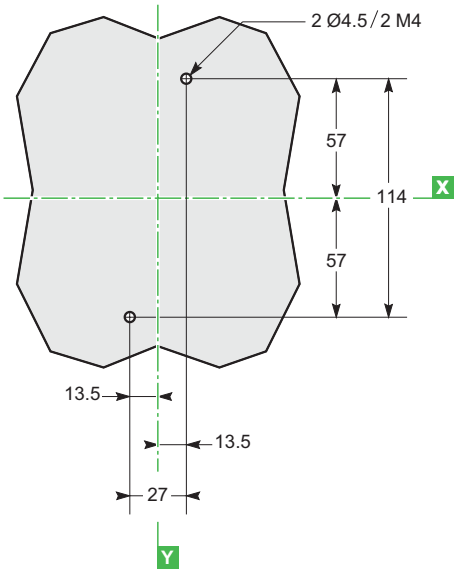

4P

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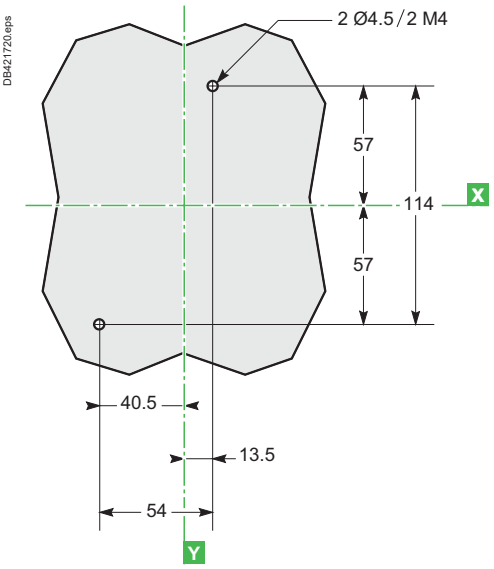

3P/4P ELCB

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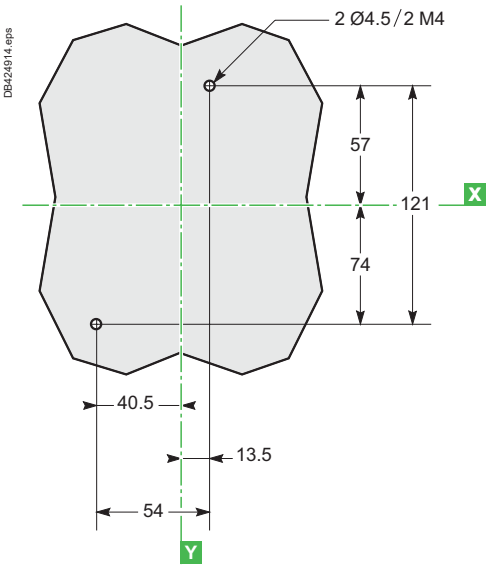
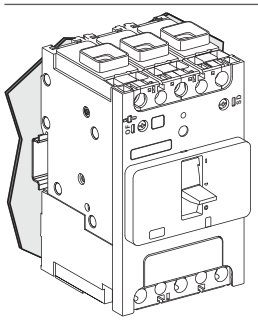


Mounting on DIN rail

3P

DB421721.eps



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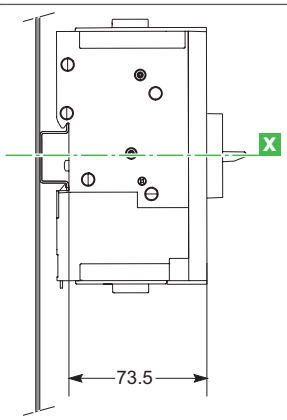
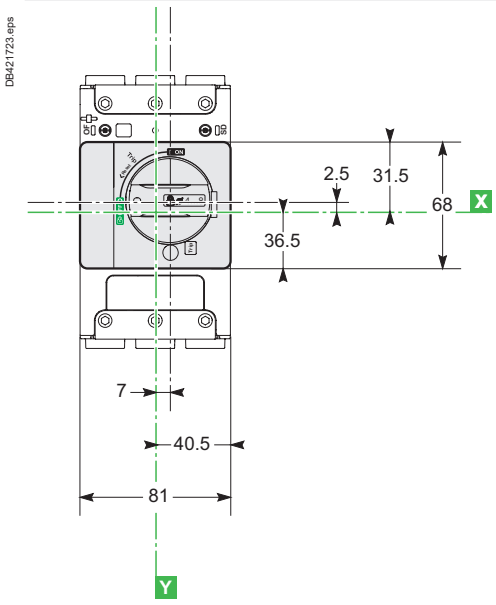
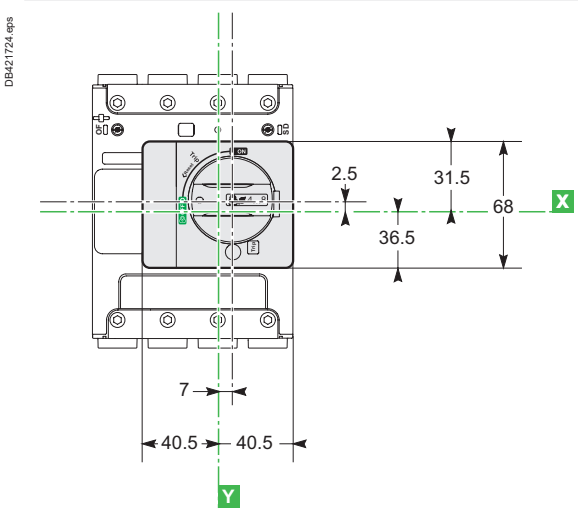


Direct rotary handle

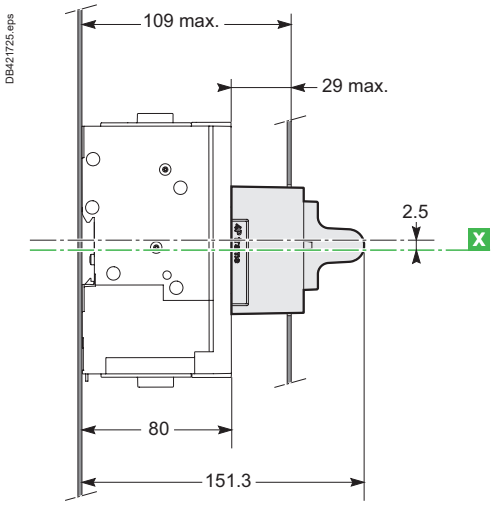
3P



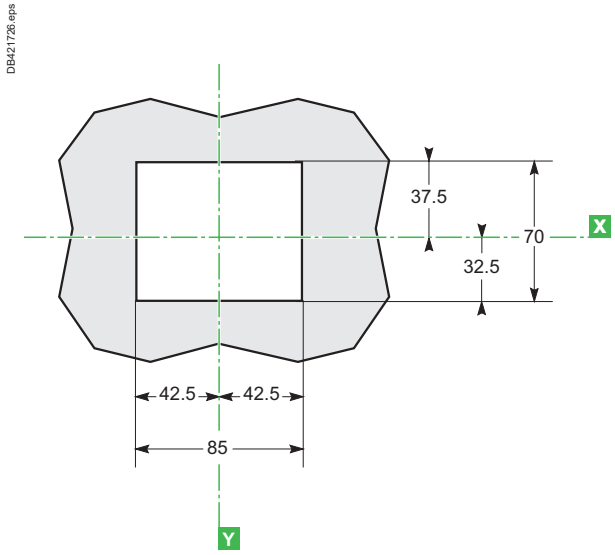
4P



Side view



Door cutout for 3P/4P

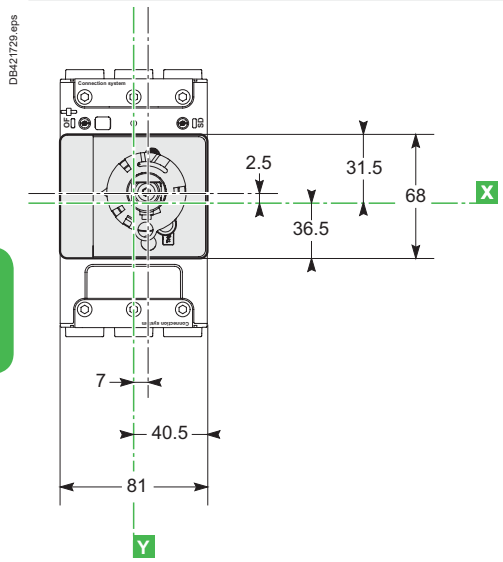


C

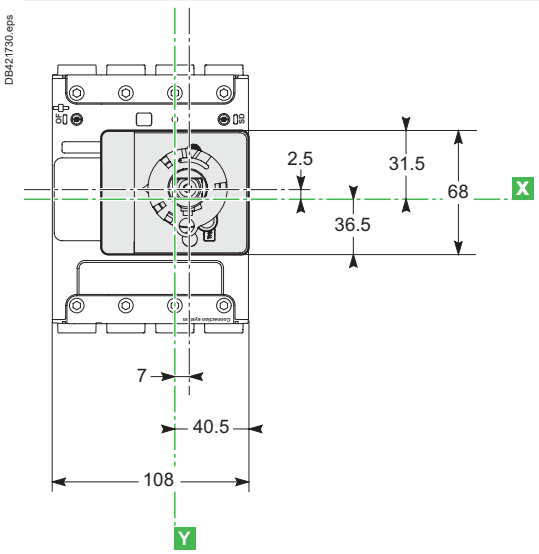
Circuit breaker and switch-disconnector
Compact NSXm

Extended rotary handle

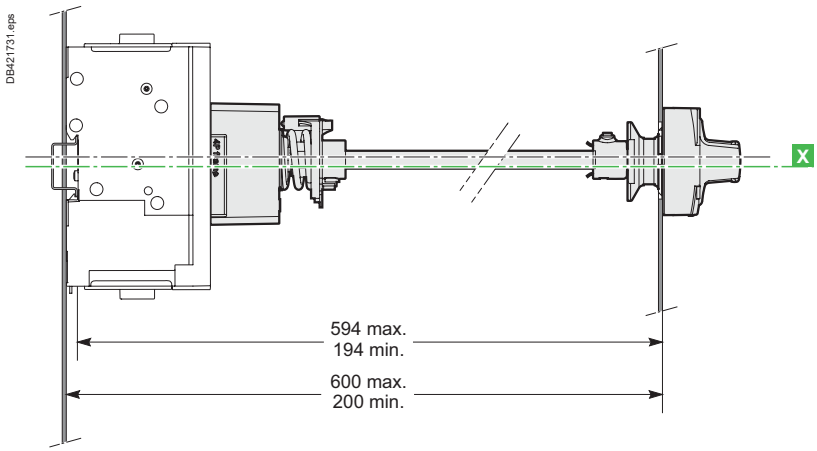
3P



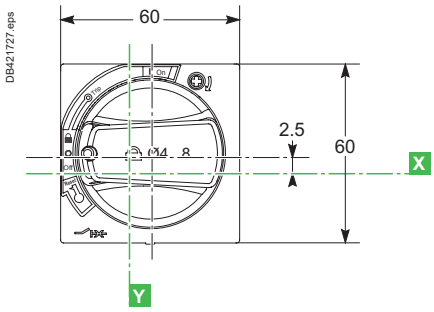
4P

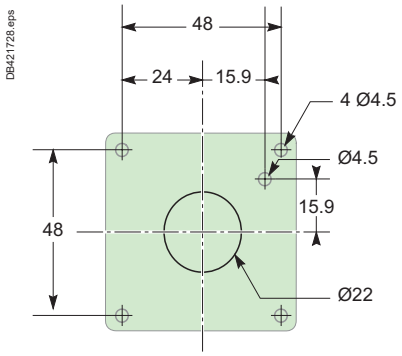


3P/4P



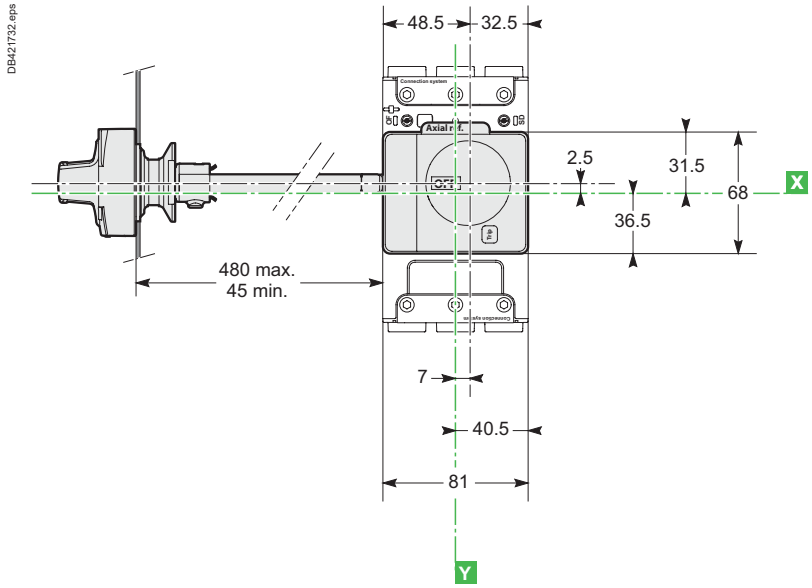
Dimensions and front-panel cutout



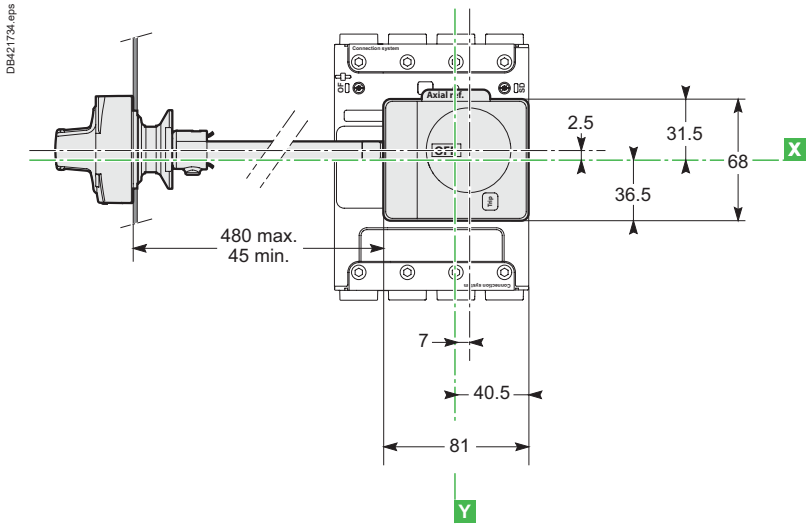


Side rotary handle

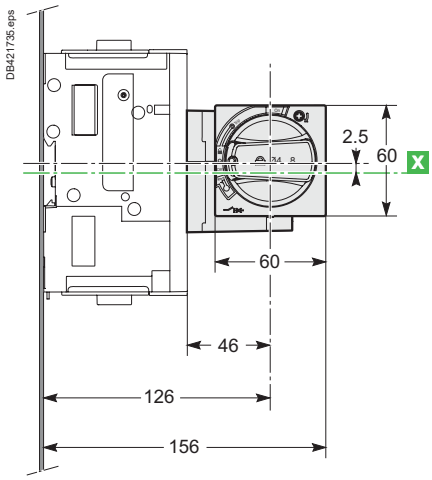
3P - Extended



4P - Extended



4P - Direct

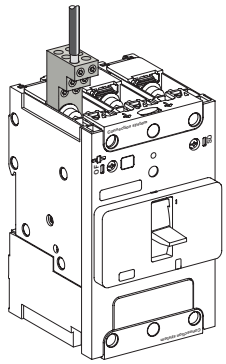


Circuit breaker and switch-disconnector
Compact NSXm

Connection with accessories

Bare-cable connectors

DB421884.eps



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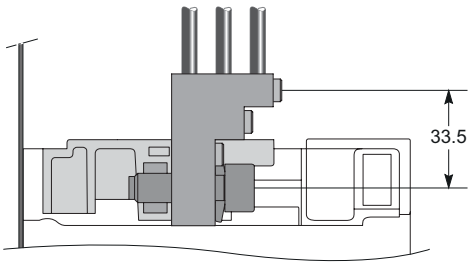

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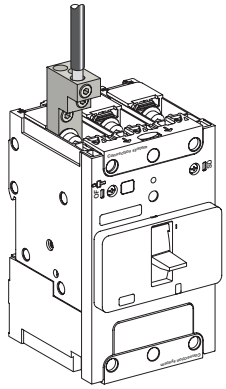

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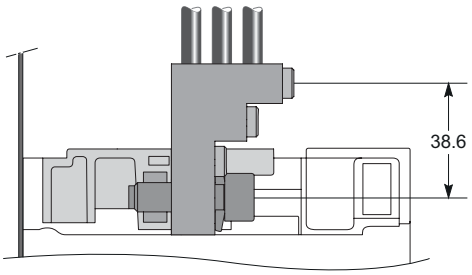
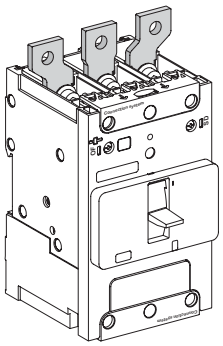


Spreaders

DB421736.eps



3P

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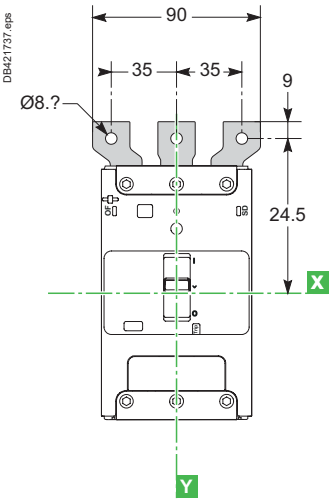
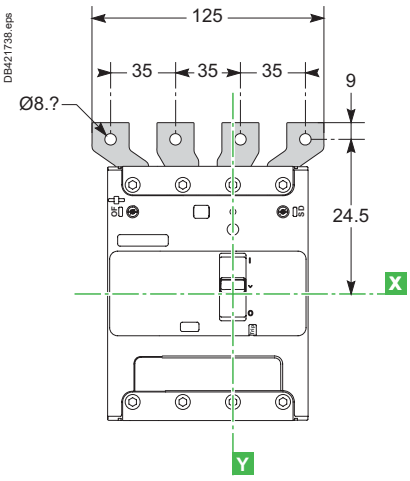


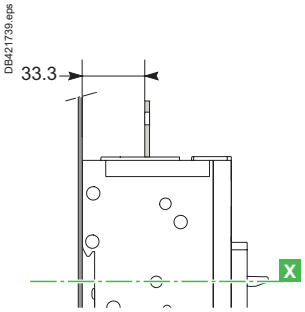
4P

DB421738.eps



Side view

DB421739.eps



Wiring diagrams

Compact NSXm

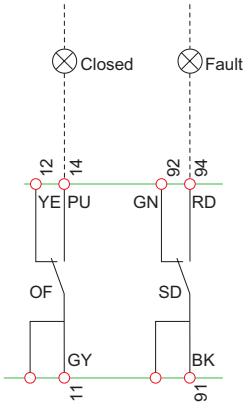
D

Other chapters

The diagram is shown with circuits de-energized, relays in normal position, and all devices open, connected, and charged. Terminal connections shown as **O** must be connected by the customer.

Indication contacts

DB419268.eps



Indication contacts

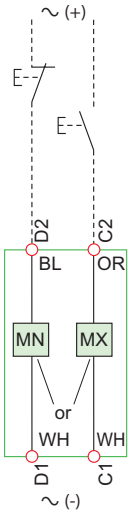
OF	Device ON/OFF indication contacts
SD	Trip indication contact

Color code for auxiliary wiring

BK: Black
GN: Green
GY: Grey
RD: Red
PU: Purple
YE: Yellow

Remote operation

DB419267.eps



Remote operation

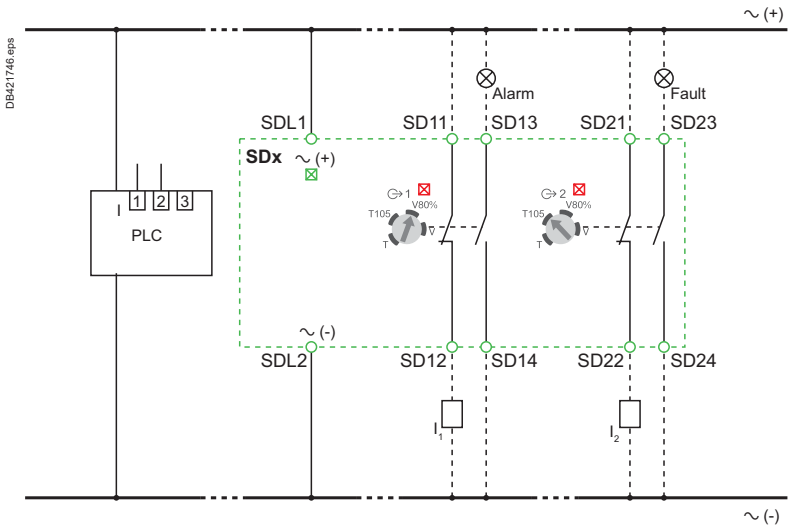
MN	Undervoltage Release
or	
MX	Shunt trip Release

Color code for auxiliary wiring

BL: Blue
OR: Orange
WH: White

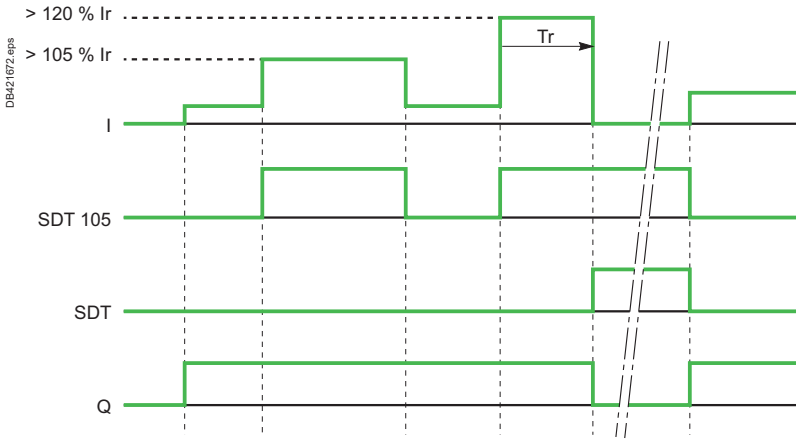
The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

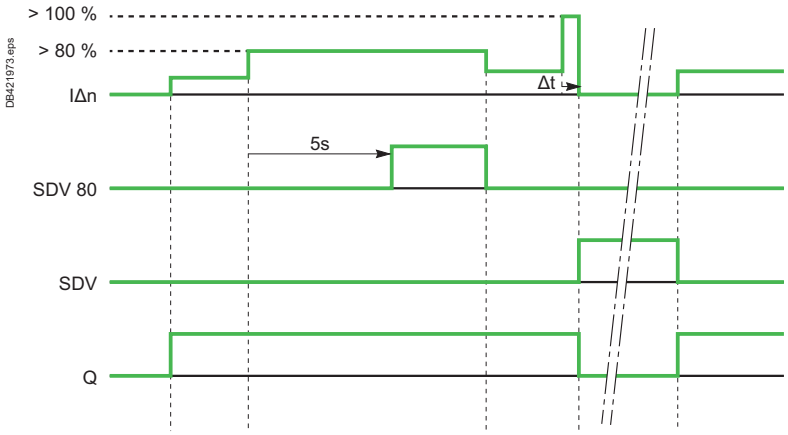
Connection



Operation

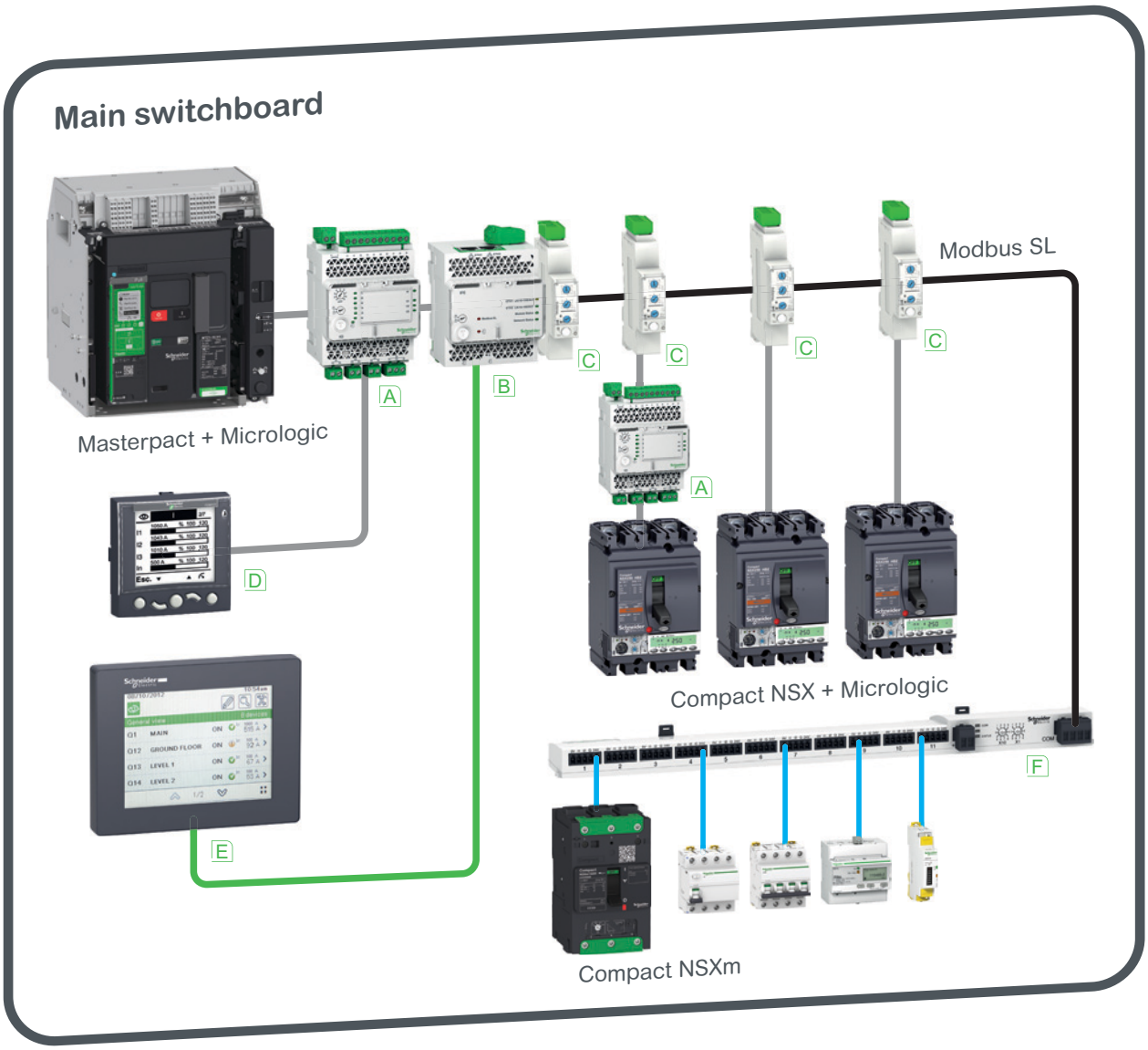
I: charge current
SDT105: overload alarm
SDT: overload trip indication
$I_{\Delta n}$: earth leakage current
SDV80: earth leakage alarm
SDV: earth leakage trip indication
Q: circuit breaker





Connection of circuit breakers to the Modbus communication network

PB115715.eps



A I/O
B IFE interface + gateaway
C IFM
D FDM121
E FDM128
F Acti9 Smartlink Modbus

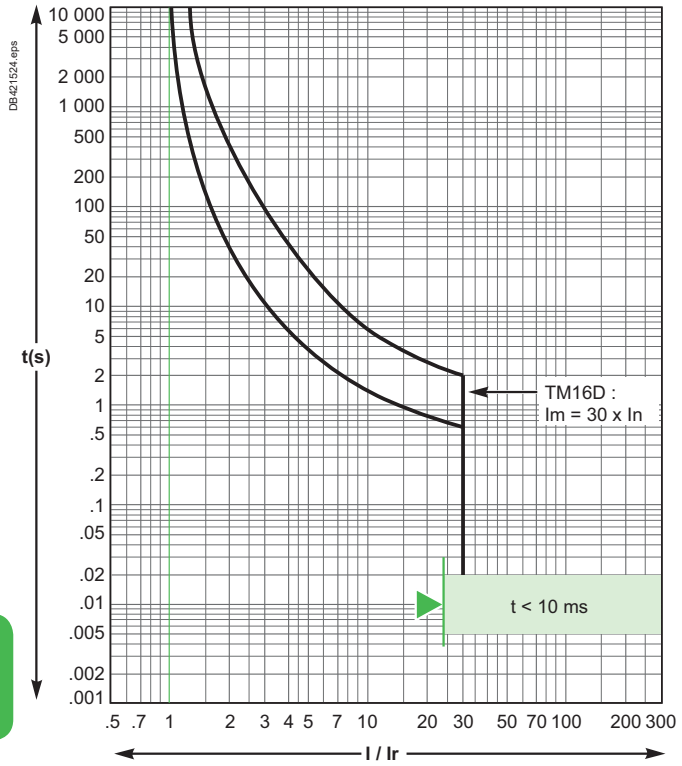
Ethernet
Modbus SL
ULP
Hard wired

Additional characteristics

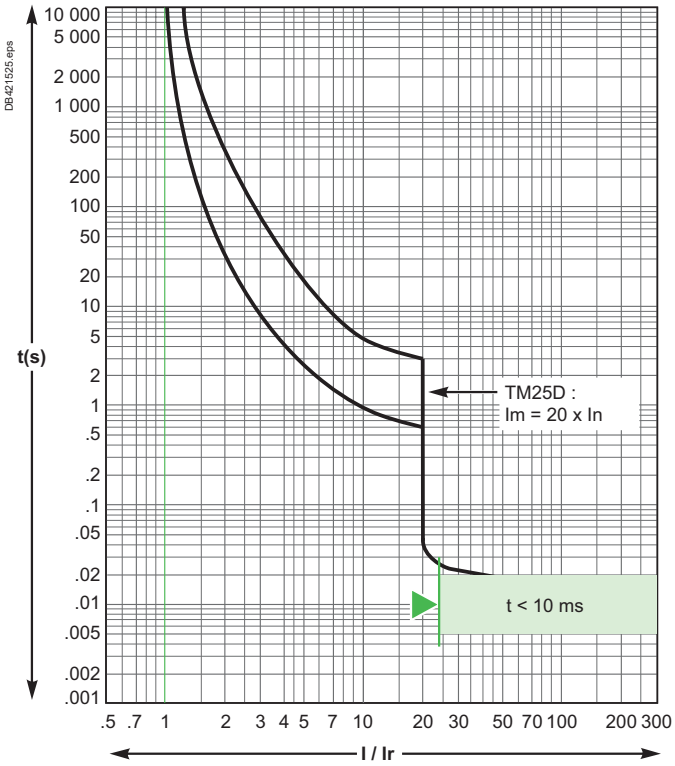
E

Tripping curves
TMD magnetic trip units, Protection of distribution systems

TM16D

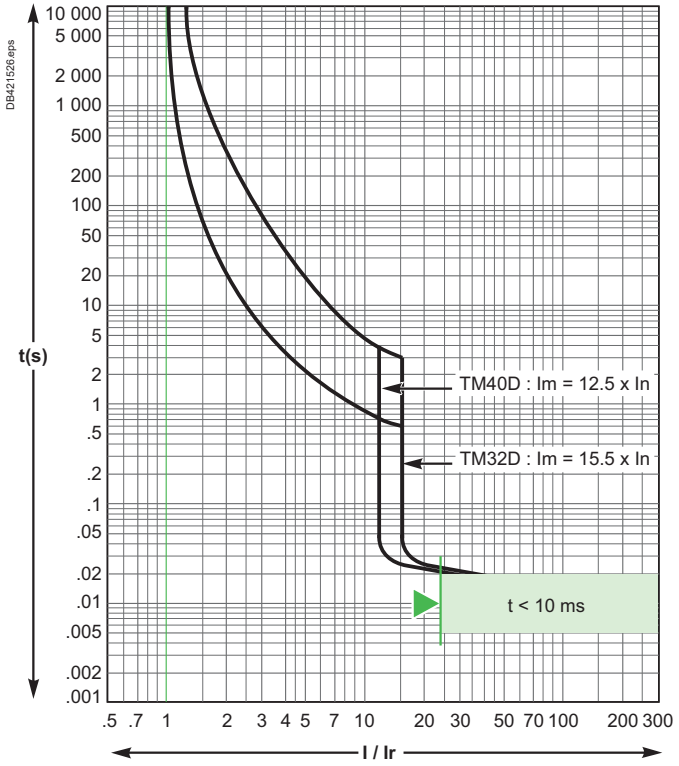


TM25D

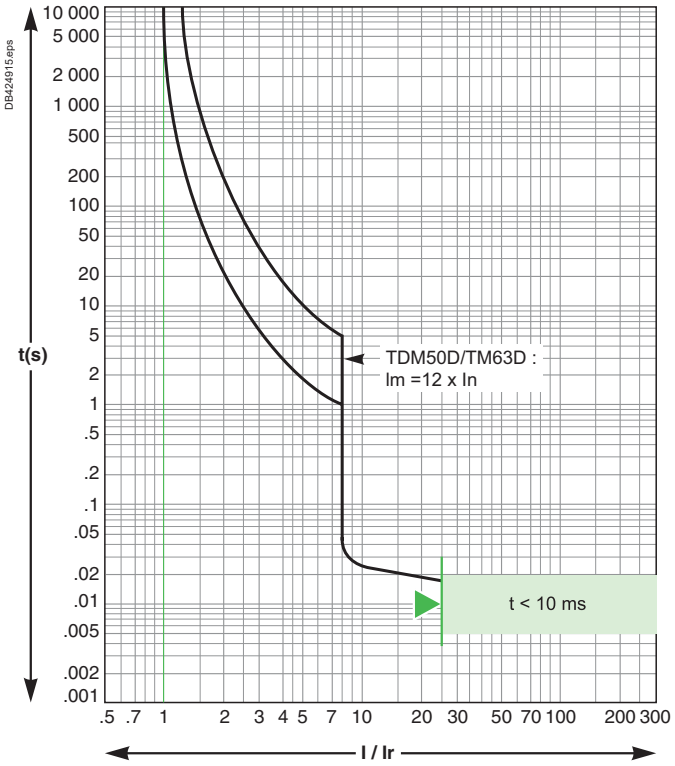


Reflex tripping.

TM32D / TM40D



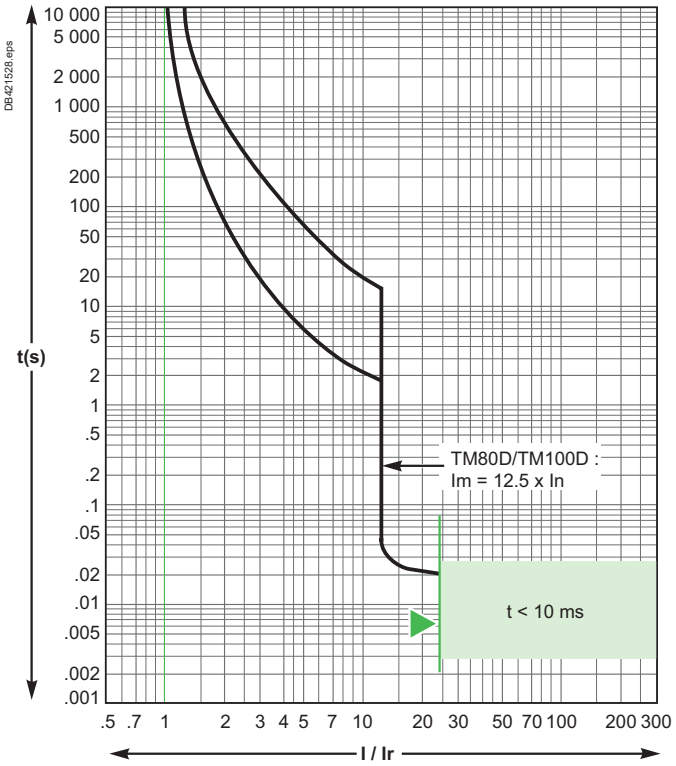
TM50D / TM63D



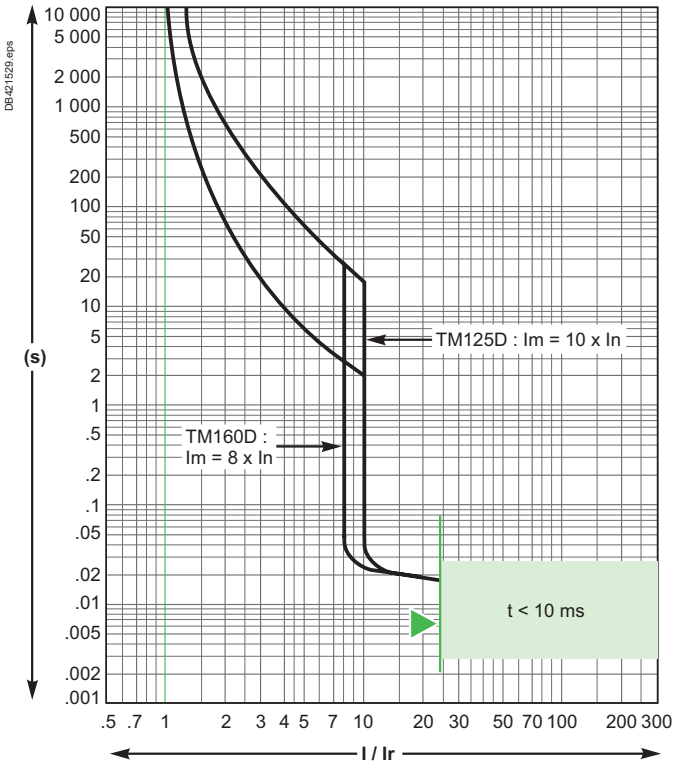
Reflex tripping.

Tripping curves
TMD magnetic trip units, Protection of distribution systems

TM80D / TM100D



TM125D / TM160D

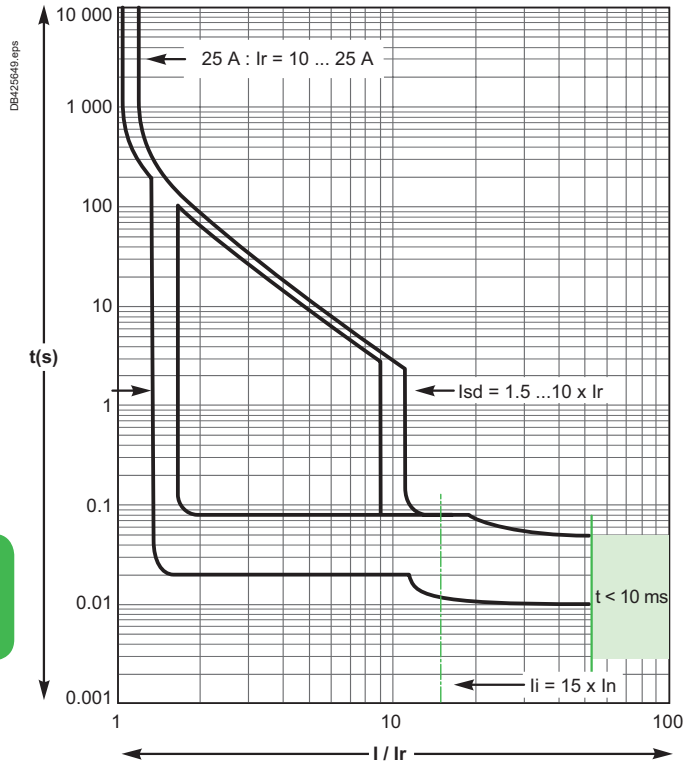


Reflex tripping.

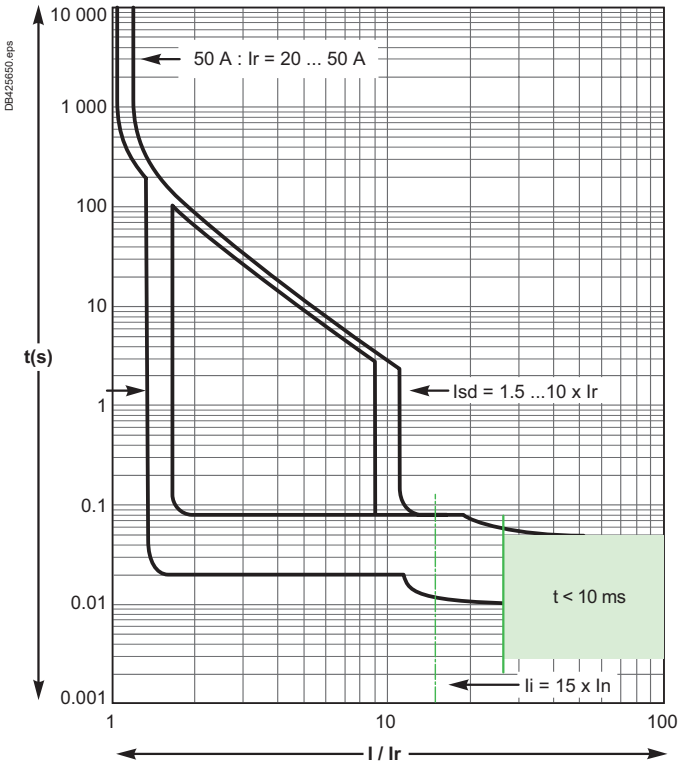
For all TMD curves :
Values are given for 40 °C ambiant, Ir = 1xIn, 3 poles loaded, cold start.
For Ir = k x In, read the time corresponding to 1/k times given current.
For 1 pole tripping, read the time corresponding to 0.85 times given current.
For hot start (0.9 x Ir), divide max. time by 2, min. time by 4.

Tripping curves
Micrologic 4.1 electronic (ELCB), Protection of distribution systems

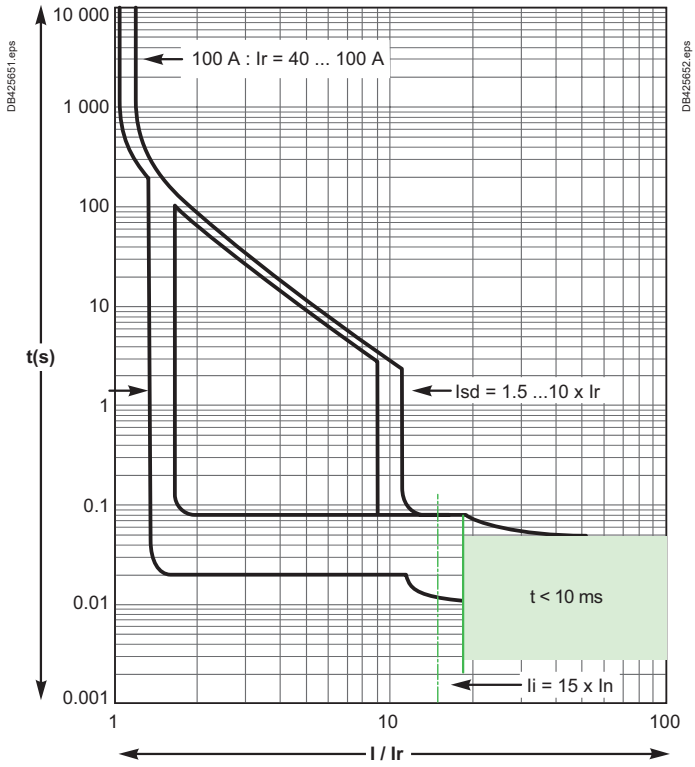
25 A



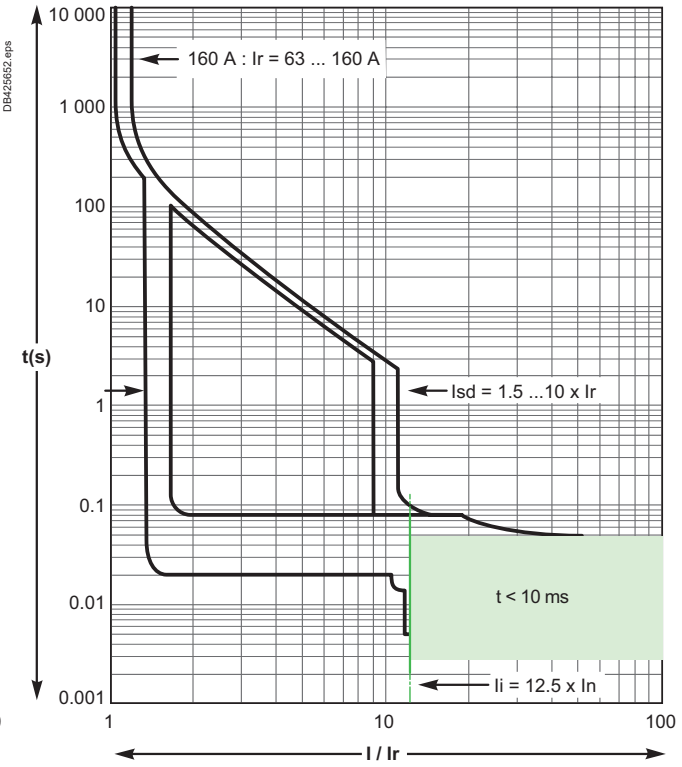
50 A



100 A



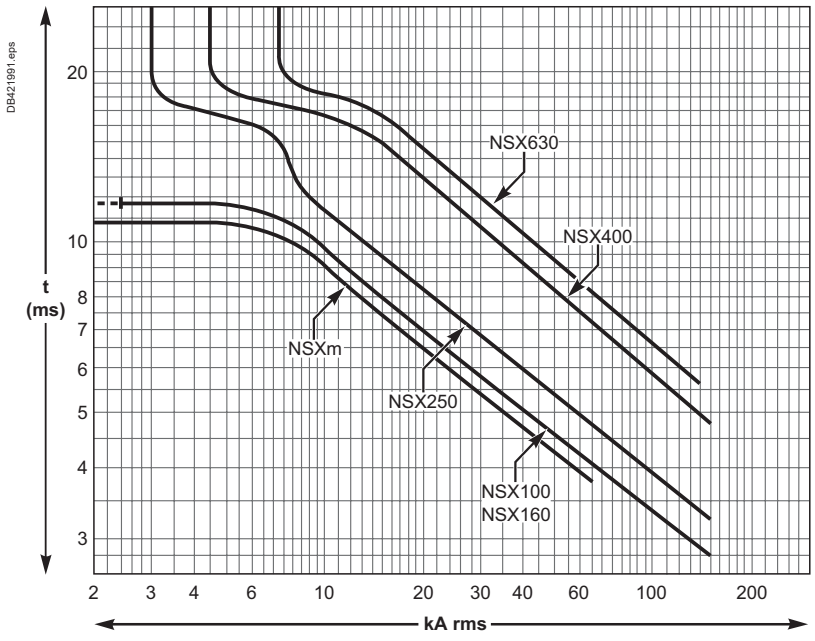
160 A



Reflex tripping.

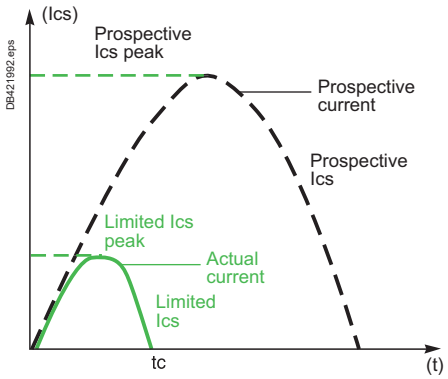
Tripping curves
Reflex tripping

Compact NSXm and NSX100 to 630 devices incorporate the exclusive reflex-tripping system. This system breaks very high fault currents. The device is mechanically tripped via a "piston" actuated directly by the pressure produced in the breaking units by the short-circuit.
For high short-circuits, this system provides a faster break, thereby ensuring discrimination.
Reflex-tripping curves are exclusively a function of the circuit-breaker rating.



Current and energy limiting curves

The limiting capacity of a circuit breaker is its aptitude to let through a current, during a short-circuit, that is less than the prospective short-circuit current.



The exceptional limiting capacity of the Compact NSX 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).

E

Ics = 100 % Icu

The exceptional limiting capacity of the Compact NSX and NSXm ranges 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 steps:

- ■ break three times consecutively a fault current equal to 100 % of Icu
- ■ check that the device continues to function normally, that is:
- □ 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 busbars being deformed or broken.

Electromagnetic effects
Fewer 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 and energy limiting curves

The 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 70 kA rms prospective short-circuit (i.e. 100 kA peak) limited by an NSXm160H upstream ?
The answer is 20 kA peak (curve page E-7).

Maximum permissible cable stresses

The table below indicates the maximum permissible thermal stresses for cables depending on their insulation, conductor (Cu or Al) and their cross-sectional area (CSA). CSA values are given in mm² and thermal stresses in A^2s.

CSA		1.5 mm²	2.5 mm²	4 mm²	6 mm²	10 mm²
PVC	Cu	$2.97x10^4$	$8.26x10^4$	$2.12x10^5$	$4.76x10^5$	$1.32x10^6$
	Al					$5.41x10^5$
PRC	Cu	$4.10x10^4$	$1.39x10^5$	$2.92x10^5$	$6.56x10^5$	$1.82x10^6$
	Al					$7.52x10^5$
CSA		**16 mm²**	**25 mm²**	**35 mm²**	**50 mm²**	
PVC	Cu	$3.4x10^6$	$8.26x10^6$	$1.62x10^7$	$3.31x10^7$	
	Al	$1.39x10^6$	$3.38x10^6$	$6.64x10^6$	$1.35x10^7$	
PRC	Cu	$4.69x10^6$	$1.39x10^7$	$2.23x10^7$	$4.56x10^7$	
	Al	$1.93x10^6$	$4.70x10^6$	$9.23x10^6$	$1.88x10^7$	

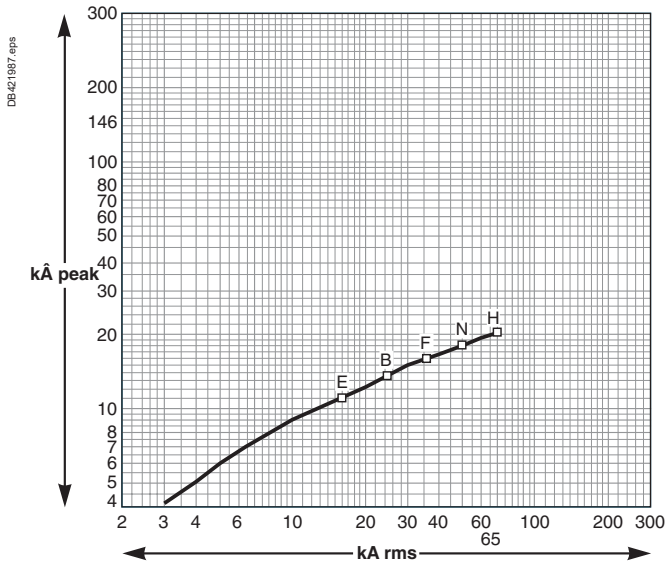
Example
Is a Cu/PVC cable with a CSA of 10 mm² adequately protected by an NSX160F?
The table above indicates that the permissible stress is $1.32x10^6$ A^2s.
All short-circuit currents at the point where an NSX160F (Icu = 35 kA) is installed are limited with a thermal stress less than $6x10^5$ A^2s (curve page E-7).
Cable protection is therefore ensured up to the limit of the breaking capacity of the circuit breaker.

Current and energy limiting curves

Current-limiting curves

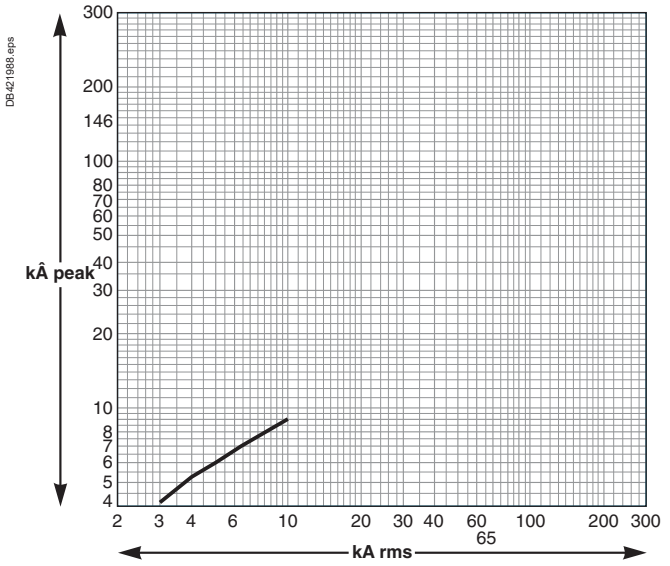
Voltage 400/440 V AC

Limited short-circuit current (kÂ peak)



Voltage 660/690 V AC

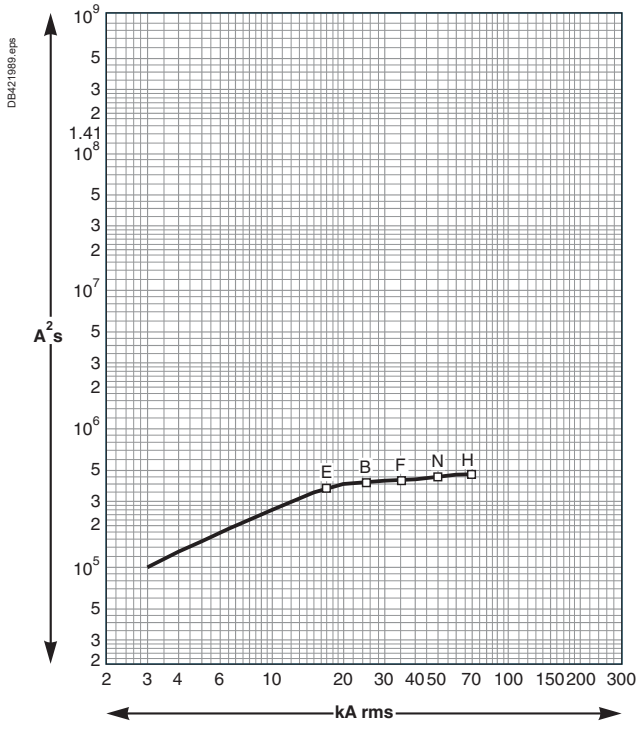
Limited short-circuit current (kÂ peak)



Energy-limiting curves

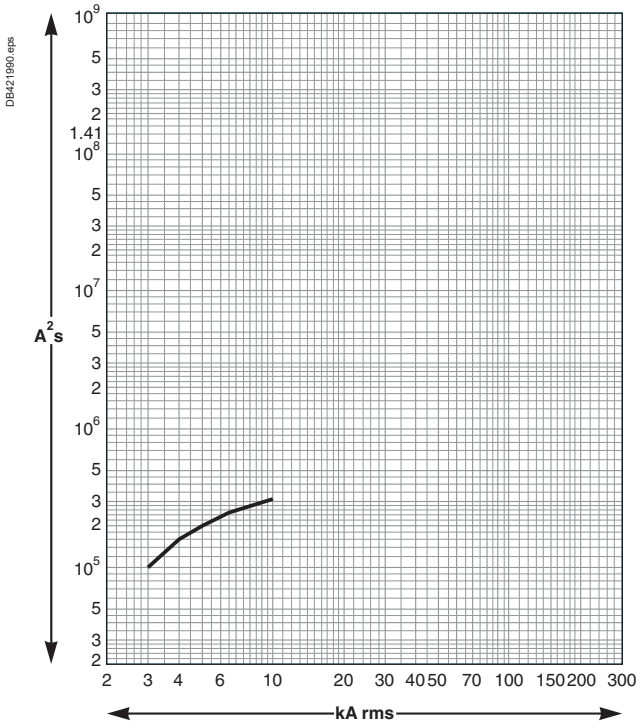
Voltage 400/440 V AC

Limited energy



Voltage 660/690 V AC

Limited energy



E

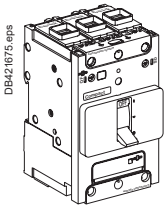
Catalogue numbers

F

Compact NSXm: complete fixed device
Compact NSXm E/B (16/25 kA at 380/415 V)

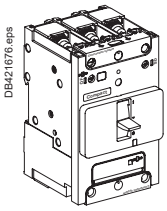
Compact NSXm E (16 kA at 380/415 V)

With thermal-magnetic trip unit TM-D



EverLink™ connectors

Rating	3P	4P 3d	4P 4d
TM16D	LV426100	LV426110	LV426120
TM25D	LV426101	LV426111	LV426121
TM32D	LV426102	LV426112	LV426122
TM40D	LV426103	LV426113	LV426123
TM50D	LV426104	LV426114	LV426124
TM63D	LV426105	LV426115	LV426125
TM80D	LV426106	LV426116	LV426126
TM100D	LV426107	LV426117	LV426127
TM125D	LV426108	LV426118	LV426128
TM160D	LV426109	LV426119	LV426129

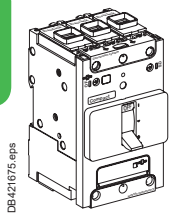


Compression lug/busbar connectors

Rating	3P	4P 3d	4P 4d
TM16D	LV426150	LV426160	LV426170
TM25D	LV426151	LV426161	LV426171
TM32D	LV426152	LV426162	LV426172
TM40D	LV426153	LV426163	LV426173
TM50D	LV426154	LV426164	LV426174
TM63D	LV426155	LV426165	LV426175
TM80D	LV426156	LV426166	LV426176
TM100D	LV426157	LV426167	LV426177
TM125D	LV426158	LV426168	LV426178
TM160D	LV426159	LV426169	LV426179

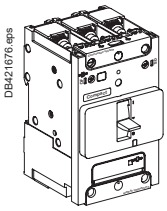
Compact NSXm B (25 kA at 380/415 V)

With thermal-magnetic trip unit TM-D



EverLink™ connectors

Rating	3P	4P 3d	4P 4d
TM16D	LV426200	LV426210	LV426220
TM25D	LV426201	LV426211	LV426221
TM32D	LV426202	LV426212	LV426222
TM40D	LV426203	LV426213	LV426223
TM50D	LV426204	LV426214	LV426224
TM63D	LV426205	LV426215	LV426225
TM80D	LV426206	LV426216	LV426226
TM100D	LV426207	LV426217	LV426227
TM125D	LV426208	LV426218	LV426228
TM160D	LV426209	LV426219	LV426229



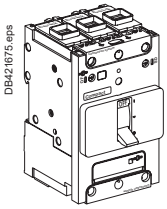
Compression lug/busbar connectors

Rating	3P	4P 3d	4P 4d
TM16D	LV426250	LV426260	LV426270
TM25D	LV426251	LV426261	LV426271
TM32D	LV426252	LV426262	LV426272
TM40D	LV426253	LV426263	LV426273
TM50D	LV426254	LV426264	LV426274
TM63D	LV426255	LV426265	LV426275
TM80D	LV426256	LV426266	LV426276
TM100D	LV426257	LV426267	LV426277
TM125D	LV426258	LV426268	LV426278
TM160D	LV426259	LV426269	LV426279

Compact NSXm: complete fixed device
Compact NSXm F/N (36/50 kA at 380/415 V)

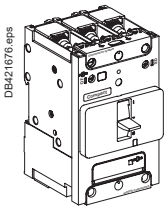
Compact NSXm F (36 kA at 380/415 V)

With thermal-magnetic trip unit TM-D



EverLink™ connectors

Rating	**3P**	**4P** 3d	**4P** 4d
TM16D	**LV426300**	**LV426310**	**LV426320**
TM25D	**LV426301**	**LV426311**	**LV426321**
TM32D	**LV426302**	**LV426312**	**LV426322**
TM40D	**LV426303**	**LV426313**	**LV426323**
TM50D	**LV426304**	**LV426314**	**LV426324**
TM63D	**LV426305**	**LV426315**	**LV426325**
TM80D	**LV426306**	**LV426316**	**LV426326**
TM100D	**LV426307**	**LV426317**	**LV426327**
TM125D	**LV426308**	**LV426318**	**LV426328**
TM160D	**LV426309**	**LV426319**	**LV426329**

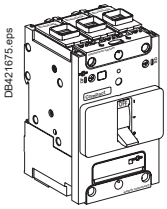


Compression lug/busbar connectors

Rating	**3P**	**4P** 3d	**4P** 4d
TM16D	**LV426350**	**LV426360**	**LV426370**
TM25D	**LV426351**	**LV426361**	**LV426371**
TM32D	**LV426352**	**LV426362**	**LV426372**
TM40D	**LV426353**	**LV426363**	**LV426373**
TM50D	**LV426354**	**LV426364**	**LV426374**
TM63D	**LV426355**	**LV426365**	**LV426375**
TM80D	**LV426356**	**LV426366**	**LV426376**
TM100D	**LV426357**	**LV426367**	**LV426377**
TM125D	**LV426358**	**LV426368**	**LV426378**
TM160D	**LV426359**	**LV426369**	**LV426379**

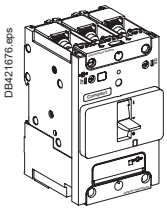
Compact NSXm N (50 kA at 380/415 V)

With thermal-magnetic trip unit TM-D



EverLink™ connectors

Rating	**3P**	**4P** 3d	**4P** 4d
TM16D	**LV426400**	**LV426410**	**LV426420**
TM25D	**LV426401**	**LV426411**	**LV426421**
TM32D	**LV426402**	**LV426412**	**LV426422**
TM40D	**LV426403**	**LV426413**	**LV426423**
TM50D	**LV426404**	**LV426414**	**LV426424**
TM63D	**LV426405**	**LV426415**	**LV426425**
TM80D	**LV426406**	**LV426416**	**LV426426**
TM100D	**LV426407**	**LV426417**	**LV426427**
TM125D	**LV426408**	**LV426418**	**LV426428**
TM160D	**LV426409**	**LV426419**	**LV426429**



Compression lug/busbar connectors

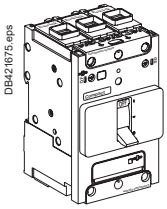
Rating	**3P**	**4P** 3d	**4P** 4d
TM16D	**LV426450**	**LV426460**	**LV426470**
TM25D	**LV426451**	**LV426461**	**LV426471**
TM32D	**LV426452**	**LV426462**	**LV426472**
TM40D	**LV426453**	**LV426463**	**LV426473**
TM50D	**LV426454**	**LV426464**	**LV426474**
TM63D	**LV426455**	**LV426465**	**LV426475**
TM80D	**LV426456**	**LV426466**	**LV426476**
TM100D	**LV426457**	**LV426467**	**LV426477**
TM125D	**LV426458**	**LV426468**	**LV426478**
TM160D	**LV426459**	**LV426469**	**LV426479**

F

Compact NSXm: complete fixed device
Compact NSXm H (70 kA at 380/415 V)

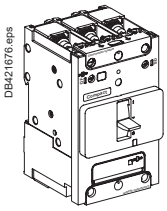
Compact NSXm H (70 kA at 380/415 V)

With thermal-magnetic trip unit TM-D



EverLink™ connectors

Rating	**3P**	**4P** 3d	**4P** 4d
TM16D	**LV426500**	**LV426510**	**LV426520**
TM25D	**LV426501**	**LV426511**	**LV426521**
TM32D	**LV426502**	**LV426512**	**LV426522**
TM40D	**LV426503**	**LV426513**	**LV426523**
TM50D	**LV426504**	**LV426514**	**LV426524**
TM63D	**LV426505**	**LV426515**	**LV426525**
TM80D	**LV426506**	**LV426516**	**LV426526**
TM100D	**LV426507**	**LV426517**	**LV426527**
TM125D	**LV426508**	**LV426518**	**LV426528**
TM160D	**LV426509**	**LV426519**	**LV426529**



Compression lug/busbar connectors

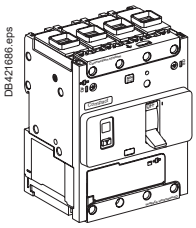
Rating	**3P**	**4P** 3d	**4P** 4d
TM16D	**LV426550**	**LV426560**	**LV426570**
TM25D	**LV426551**	**LV426561**	**LV426571**
TM32D	**LV426552**	**LV426562**	**LV426572**
TM40D	**LV426553**	**LV426563**	**LV426573**
TM50D	**LV426554**	**LV426564**	**LV426574**
TM63D	**LV426555**	**LV426565**	**LV426575**
TM80D	**LV426556**	**LV426566**	**LV426576**
TM100D	**LV426557**	**LV426567**	**LV426577**
TM125D	**LV426558**	**LV426568**	**LV426578**
TM160D	**LV426559**	**LV426569**	**LV426579**

F

Compact NSXm: complete fixed device
ELCB Compact NSXm E/B/F (16/25/36 kA at 380/415 V)

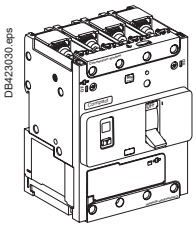
ELCB [1][*] Compact NSXm E (16 kA at 380/415 V)

With electronic trip unit Micrologic 4.1 (ELCB)



EverLink™ connectors

Rating	3P	4P
25 A	**LV426700**	**LV426705**
50 A	**LV426701**	**LV426706**
100 A	**LV426702**	**LV426707**
160 A	**LV426703**	**LV426708**

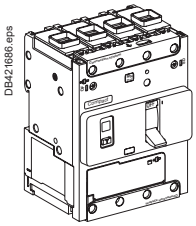


Compression lug/busbar connectors

Rating	3P	4P
TM25D	**LV426750**	**LV426755**
TM50D	**LV426751**	**LV426756**
TM100D	**LV426752**	**LV426757**
TM160D	**LV426753**	**LV426758**

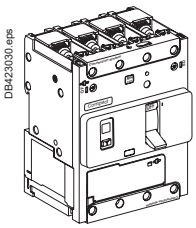
ELCB [1][*] Compact NSXm B (25 kA at 380/415 V)

With electronic trip unit Micrologic 4.1



EverLink™ connectors

Rating	3P	4P
25 A	**LV426710**	**LV426715**
50 A	**LV426711**	**LV426716**
100 A	**LV426712**	**LV426717**
160 A	**LV426713**	**LV426718**

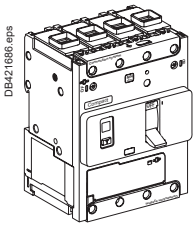


Compression lug/busbar connectors

Rating	3P	4P
25 A	**LV426760**	**LV426765**
50 A	**LV426761**	**LV426766**
100 A	**LV426762**	**LV426767**
160 A	**LV426763**	**LV426768**

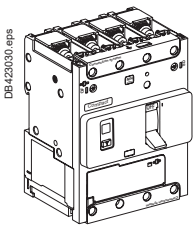
ELCB [1][*] Compact NSXm F (36 kA at 380/415 V)

With electronic trip unit Micrologic 4.1



EverLink™ connectors

Rating	3P	4P
25 A	**LV426720**	**LV426725**
50 A	**LV426721**	**LV426726**
100 A	**LV426722**	**LV426727**
160 A	**LV426723**	**LV426728**



Compression lug/busbar connectors

Rating	3P	4P
25 A	**LV426770**	**LV426775**
50 A	**LV426771**	**LV426776**
100 A	**LV426772**	**LV426777**
160 A	**LV426773**	**LV426778**

[1] ELCB: Earth Leakage Circuit Breaker.

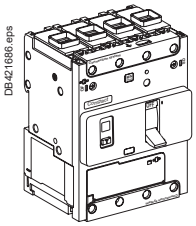
[*] Available Q4 2017.

F

Compact NSXm: complete fixed device
ELCB Compact NSXm N/H (50/70kA at 380/415 V)

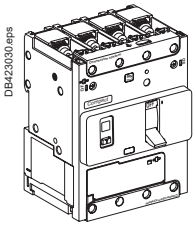
ELCB [1][*] Compact NSXm N (50 kA at 380/415 V)

With electronic trip unit Micrologic 4.1



EverLink™ connectors

Rating	3P	4P
25 A	**LV426730**	**LV426735**
50 A	**LV426731**	**LV426736**
100 A	**LV426732**	**LV426737**
160 A	**LV426733**	**LV426738**

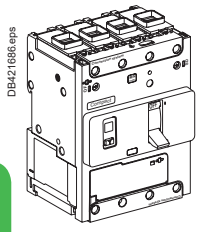


Compression lug/busbar connectors

Rating	3P	4P
25 A	**LV426780**	**LV426785**
50 A	**LV426781**	**LV426786**
100 A	**LV426782**	**LV426787**
160 A	**LV426783**	**LV426788**

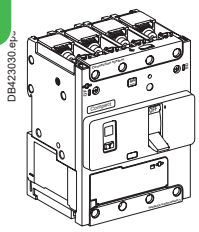
ELCB [1][*] Compact NSXm H (70 kA at 380/415 V)

With electronic trip unit Micrologic 4.1



EverLink™ connectors

Rating	3P	4P
25 A	**LV426740**	**LV426745**
50 A	**LV426741**	**LV426746**
100 A	**LV426742**	**LV426747**
160 A	**LV426743**	**LV426748**



Compression lug/busbar connectors

Rating	3P	4P
25 A	**LV426790**	**LV426795**
50 A	**LV426791**	**LV426796**
100 A	**LV426792**	**LV426797**
160 A	**LV426793**	**LV426798**

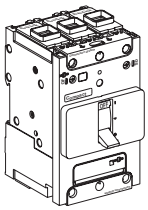
[1] ELCB: Earth Leakage Circuit Breaker.

[*] Available Q4 2017.

F

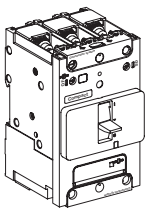
Compact NSXm: complete fixed device
Compact NSXm NA

Compact NSXm NA switch-disconnector



EverLink™ connectors

Rating	3P	4P
50NA	**LV426600**	**LV426610**
100NA	**LV426601**	**LV426611**
160NA	**LV426602**	**LV426612**



Compression lug/busbar connectors

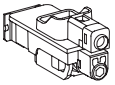
Rating	3P	4P
50NA	**LV426650**	**LV426660**
100NA	**LV426651**	**LV426661**
160NA	**LV426652**	**LV426662**

F

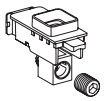
Compact NSXm: accessories
Connection and insulation

Connection accessories (Cu or Al)

Bare cable connectors


DB421533.eps

Everlink connector with control wire terminal	1x (2.5 to 95 mm²) ; ⩽ 160 A Cu or ⩽ 100 A Al	Set of 3	**LV426970**
		Set of 4	**LV426971**


DB418793.eps

Aluminium connector	1x (2.5 to 70 mm²) ; ⩽ 125 A Cu or Al	Set of 2	**LV426966**
		Set of 3	**LV426967**

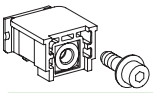

DB421535.eps

Aluminium connector for 3 cables [1][*]	3x (2.5 to 35 mm²) ; ⩽ 125 A Cu or Al	Set of 3	**PDC3BD2**


DB421536.eps

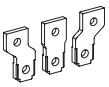
Aluminium connector for 6 cables [1][*]	6x (2.5 to 16 mm²) ; ⩽ 125 A Cu or Al	Set of 3	**PDC6BD6**

Compression lugs / busbar connectors


DB421537.eps

Terminal with nuts and screws M6	⩽ 160 A	Set of 3	**LV426960**
		Set of 4	**LV426961**

Terminal extensions


DB421538.eps

Spreaders from 27 to 35 mm pitch [1]		3P	**LV426940**
		4P	**LV426941**

Crimp lugs for copper cable [1]


DB421539.eps

For cable 70 mm² rigid / 50 mm² flexible		Set of 3	**LV426978**
		Set of 4	**LV426979**
For cable 95 mm² rigid / 70 mm² flexible		Set of 3	**LV426980**
		Set of 4	**LV426981**
For cable 120 mm² rigid / 95 mm² flexible		Set of 3	**LV426982**
		Set of 4	**LV426983**

Crimp lugs for aluminium cable [1]


DB421540.eps

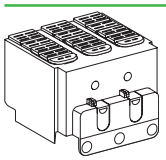
For cable 95 mm² rigid		Set of 3	**LV426984**
		Set of 4	**LV426985**
For cable 120 mm² rigid		Set of 3	**LV426976**
		Set of 4	**LV426977**

Torque limiting breakaway bits

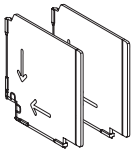

DB421541.eps

9 N.m		Set of 6	**LV426990**
		Set of 8	**LV426991**
5 N.m		Set of 6	**LV426992**
		Set of 8	**LV426993**

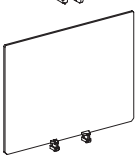
Insulation accessories


DB421542.eps

1 long terminal shield		3P	**LV426912**
		4P	**LV426913**


DB421543.eps

Interphase barriers		Set of 6	**LV426920**


DB421544.eps

2 rear insulation screens		3P	**LV426922**
		4P	**LV426923**

[1] Supplied with 2 or 3 interphase barriers.

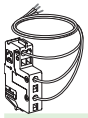
[*] Available Q3 2017.

Electrical auxiliaries

Auxiliary contacts (changeover)

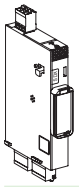

DB421545.eps

Standard OF or SD	**LV426950**


DB421546.eps

Pre-wired OF [2]	**LV426951**
Pre-wired SD [2]	**LV426952**

SDx for ELCB [1] Micrologic 4.1


DB425315.eps

SDx module 24-250 V AC/DC	**LV426900**

Voltage releases

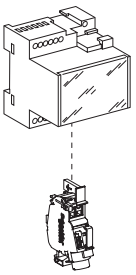

DB421548.eps

Standard	Voltage	MX	MN
AC	24 V 50/60 Hz	**LV426841**	**LV426801**
	48 V 50/60 Hz	**LV426842**	**LV426802**
	110...130 V 50/60 Hz	**LV426843**	**LV426803**
	220...240 V 50 Hz 208...240 V 60 Hz	**LV426844**	**LV426804**
	277 V 60 Hz	**LV426844**	**LV426805**
	380...415 V 50 Hz	**LV426846**	**LV426806**
	440...480 V 60 Hz	**LV426846**	**LV426807**
DC	24 V DC	**LV426841**	**LV426801**
	48 V DC	**LV426842**	**LV426802**
	125 V DC	**LV426843**	**LV426803**
	250 V DC	**LV426844**	**LV426815**


DB421549.eps

Pre-wired [2]	Voltage	MX	MN
AC	24 V 50/60 Hz	**LV426861**	**LV426821**
	48 V 50/60 Hz	**LV426862**	**LV426822**
	110...130 V 50/60 Hz	**LV426863**	**LV426823**
	220...240 V 50 Hz 208...240 V 60 Hz	**LV426864**	**LV426824**
	277 V 60 Hz	**LV426864**	**LV426825**
	380...415 V 50 Hz	**LV426866**	**LV426826**
	440...480 V 60 Hz	**LV426866**	**LV426827**
DC	24 V DC	**LV426861**	**LV426821**
	48 V DC	**LV426862**	**LV426822**
	125 V DC	**LV426863**	**LV426823**
	250 V DC	**LV426864**	**LV426835**

Time delay unit for undervoltage release (MN)


DB421688.eps

MN 48 V 50/60 Hz with fixed time delay		
Composed of:	MN 48 V DC	**LV426802**
	Delay unit 48 V 50/60 Hz	**LV429426**
MN 220-240 V 50/60 Hz with fixed time delay		
Composed of:	MN 250 V DC	**LV426815**
	Delay unit 220-240 V 50/60 Hz	**LV429427**
MN 48 V DC/AC 50/60 Hz with adjustable time delay		
Composed of:	MN 48 V DC	**LV426802**
	Delay unit 48 V DC/AC 50/60 Hz	**33680**
MN 110-130 V DC/AC 50/60 Hz with adjustable time delay		
Composed of:	MN 125 V DC	**LV426803**
	Delay unit 100-130 V DC/AC 50/60 Hz	**33681**
MN 220-250 V DC/AC 50/60 Hz with adjustable time delay		
Composed of:	MN 250 V DC	**LV426815**
	Delay unit 200-250 V DC/AC 50-60 Hz	**33682**

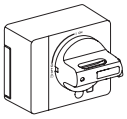
[1] ELCB: Earth Leakage Circuit Breaker.
[2] Cable: 1 meter long - AWG 18 - 480 V UL certified.

F

Compact NSXm: accessories
Rotary handles, locks and seals

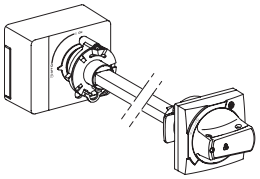
Rotary handle

Direct rotary handle


DB421550.eps

With black handle	**LV426930**
With red handle on yellow front	**LV426931**

Extended rotary handle


DB421551.eps

With black handle IP54	**LV426932**
With red handle on yellow front IP54	**LV426933**
With red handle on yellow front IP65	**LV426934**

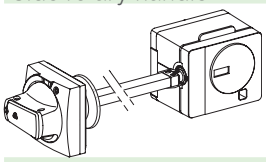

DB421689.eps

Open door shaft operator	**LV426937**


DB421677.eps

Laser tool	**GVAPL01**

Side rotary handle


DB421552.eps

With black handle IP54	**LV426935**
With red handle on yellow front IP54	**LV426936**

Universal handle


DB421553.eps

Black handle IP54	**LV426997**
Red handle on yellow front IP54	**LV426998**
Red handle on yellow front IP65	**LV426999**

Locks

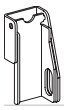
Toggle locking device for 1 to 3 padlocks


DB421554.eps

By removable device	**29370**


DB421555.eps

By fixed device (OFF or ON)	**LV426905**


DB421690.eps

By fixed device (OFF only)	**LV426906**

Lead - Sealing accessories

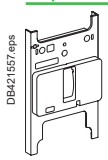
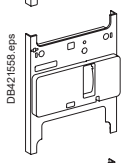
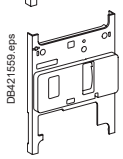

DB421556.eps

Bag of accessories	**LV429375**

F

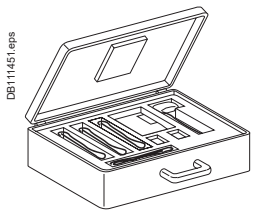
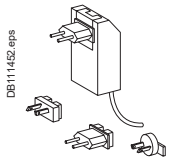
Compact NSXm: accessories
Spare parts, test tool and software

Spare parts

 DB421557.eps	Front cover	3P	**LV426946**
 DB421558.eps		4P	**LV426947**
 DB421559.eps		ELCB [1]	**LV426948**

Test tool, software, demo

Test tool

 DB111449.eps	Pocket battery for Micrologic	**LV434206**
 DB111451.eps	Maintenance case Comprising: ■ USB maintenance interface ■ Power supply ■ Micrologic cord ■ USB cord ■ RJ45/RJ45 male cord	**TRV00910**
 DB111450.eps	Spare USB maintenance interface	**TRV00911**
 DB111452.eps	Spare power supply 110-240 V AC	**TRV00915**
 DB111453.eps	Spare Micrologic cord for USB maintenance interface	**TRV00917**
 DB111448.eps	Bluetooth/Modbus option for USB maintenance interface	**VW3A8114**

Software

 DB117158.eps	Configuration and setting software Ecoreach	**LV4ST100**
	Test software LTU	**LV4ST121** [2]
	Monitoring software RCU	**LV4SM100** [2]

Demo tool

	Demo case for Compact	**LV434207**

[1] ELCB: Earth Leakage Circuit Breaker.
[2] Downloadable from http://schneider-electric.com.

F

G

Glossary

G

Glossary

For each major section (Accessories, Switchgear, etc.) and for each item (Adapter for plug-in base, Connection terminal, etc.), this glossary provides:
- the page number in the concerned catalogue
- the reference standard
- the standardised IEC symbol
- the definition.

Text in quotation marks is drawn from the standards.

Accessories

Adapter for plug-in base	The adapter is a plastic component that can be installed upstream and/or downstream of the plug-in base and enables use of all the connection accessories of the fixed device.
Bare-cable connector	Conducting part of the circuit breaker intended for connection to power circuits. On Compact NSX, it is an aluminium part that screws to the connection terminals of the circuit breaker. There are one or more holes (single or multiple cable connector) for the ends of bare cables.
Connection terminals	Flat copper surface, linked to the conducting parts of the circuit breaker and to which power connections are made using bars, connectors or lugs.
One-piece spreader	The spreader is a plastic component with copper connectors that can be installed upstream and/or downstream of a Compact NSX100 to 250 circuit breaker with a pole pitch of 35 mm. It increases the pitch of the circuit-breaker terminals to the 45 mm pitch of a NSX400/630 device to facilitate connection of large cables.
Spreaders	Set of three (3P device) or four (4P) flat, conducting parts made of aluminium. They are screwed to the circuit-breaker terminals to increase the pitch between poles.

Circuit-breaker characteristics (IEC 60947-2)

Breaking capacity	Value of prospective current that a switching device is capable of breaking at a stated voltage under prescribed conditions of use and behaviour. Reference is generally made to the ultimate breaking capacity (Icu) and the service breaking capacity (Ics).
Degree of protection (IP) IEC 60529	Defines device protection against the penetration of solid objects and liquids, using two digits specified in standard IEC 60259. Each digit corresponds to a level of protection, where 0 indicates no protection. ■ First digit (0 to 6): protection against penetration of solid foreign objects. 1 corresponds to protection against objects with a diameter > 50 mm, 6 corresponds to total protection against dust. ■ Second digit (0 to 8): protection against penetration of liquids (water). 1 corresponds to protection against falling drops of water (condensation), 8 corresponds to continuous immersion. The enclosure of Compact NSX circuit breakers provides a minimum of IP40 (protection against objects > 1 mm) and can reach IP56 (protection against dust and powerful water jets) depending on the installation conditions.
Degree of protection against external mechanical impacts (IK)	Defines the aptitude of an object to resist mechanical impacts on all sides, indicated by a number from 0 to 10 (standard IEC 62262). Each number corresponds to the impact energy (in Joules) that the object can handle according to a standardised procedure. 0 corresponds to no protection, 1 to an impact energy of 0.14 Joules, 10 to an impact energy of 20 Joules. Compact NSX provide IK07 (2 Joules) and can provide IK08 (5 Joules) depending on the installation conditions.
Durability	The term "durability" is used in the standards instead of "endurance" to express the expectancy of the number of operating cycles which can be performed by the equipment before repair or replacement of parts. The term "endurance" is used for specifically defined operational performance.
Electrical durability IEC 60947-1	With respect to its resistance to electrical wear, equipment is characterised by the number of on-load operating cycles, corresponding to the service conditions given in the relevant product standard, which can be made without re replacement.

Frame size	"A term designating a group of circuit breakers, the external physical dimensions of which are common to a range of current ratings. Frame size is expressed in amperes corresponding to the highest current rating of the group. Within a frame size, the width may vary according to the number of poles. This definition does not imply dimensional standardization." Compact NSX has two frame sizes covering 100 to 250 A and 400 to 630 A.
Insulation class	Defines the type of device insulation in terms of earthing and the corresponding safety for user, in one of three classes. ■ Class I. The device is earthed. Any electrical faults, internal or external, or caused by the load, are cleared via the earthing circuit, thus ensuring user safety. ■ Class II. The device is not connected to a protective conductor. User safety is ensured by reinforced insulation around the live parts (an insulating case and no contact with live parts, i.e. plastic buttons, molded connections, etc.) or double insulation. ■ Class III. The device may be connected only to SELV (safety extra-low voltage) circuits. The Compact NSX are class II devices (front) and may be installed through the door in class II switchboards (standards IEC 61140 and IEC 60664-1), without reducing insulation, even with a rotary handle or motor mechanism module.
Making capacity	Value of prospective making current that a switching device is capable of making at a stated voltage under prescribed conditions of use and behaviour. Reference is generally made to the short-circuit making capacity Icm.
Maximum break time	Maximum time after which breaking is effective, i.e. the contacts separated and the current completely interrupted.
Mechanical durability	With respect to its resistance to mechanical wear, equipment is characterised by the number of no-load operating cycles which can be effected before it becomes necessary to service or replace any mechanical parts.
Non-tripping time	This is the minimum time during which the protective device does not operate in spite of pick-up overrun, if the duration of the overrun does not exceed the corresponding voluntary time delay.
Pollution degree of environment conditions IEC 60947-1 IEC 60664-1	"Conventional number based on the amount of conductive or hygroscopic dust, ionized gas or salt and on the relative humidity and its frequency of occurrence, resulting in hygroscopic absorption or condensation of moisture leading to reduction in dielectric strength and/or surface resistivity". Standard IEC 60947-1 distinguishes four pollution degrees. ■ Degree 1. No pollution or only dry, non-conductive pollution occurs. ■ Degree 2. Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation may be expected. ■ Degree 3. Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation. ■ Degree 4. The pollution generates persistent conductivity caused, for instance, by conductive dust or by rain or snow. Compact NSX meets degree 3, which corresponds to industrial applications.
Prospective short-circuit current	Current that would flow through the poles if they remained fully closed during the short-circuit.
Rated current (In)	This is the current that the device can carry continuously with the contacts closed and without abnormal temperature rise.
Rated impulse withstand voltage (Uimp)	"The peak value of an impulse voltage of prescribed form and polarity which the equipment is capable of withstanding without failure under specified conditions of test and to which the values of the clearances are referred. The rated impulse withstand voltage of an equipment shall be equal to or higher than the values stated for the transient overvoltages occurring in the circuit in which the equipment is fitted".
Rated insulation voltage (Ui)	"The rated insulation voltage of an equipment is the value of voltage to which dielectric tests and creepage distances are referred. In no case shall the maximum value of the rated operational voltage exceed that of the rated insulation voltage".
Rated operational current (Ie)	"A rated operational current of an equipment is stated by the manufacturer and takes into account the rated operational voltage, the rated frequency, the rated duty, the utilization category and the type of protective enclosure, if appropriate".
Rated operational voltage (Ue)	"A value of voltage which, combined with a rated operational current, determines the application of the equipment and to which the relevant tests and the utilisation categories are referred. For multipole equipment, it is generally stated as the voltage between phases". This is the maximum continuous voltage at which the equipment may be used.

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Rated short-time withstand current (Icw)	"Value of short-time withstand current, assigned to the equipment by the manufacturer, that the equipment can carry without damage, under the test conditions specified in the relevant product standard". Generally expressed in kA for 0.5, 1 or 3 seconds. This is an essential characteristic for air circuit breakers. It is not significant for molded-case circuit breakers for which the design targets fast opening and high limiting capacity.
Service breaking capacity (Ics)	Expressed as a percentage of Icu, it provides an indication on the robustness of the device under severe conditions. It is confirmed by a test with one opening and one closing/opening at Ics, followed by a check that the device operates correctly at its rated current, i.e. 50 cycles at In, where temperature rise remains within tolerances and the protection system suffers no damage.
Short-circuit making capacity (Icm)	Value indicating the capacity of the device to make and carry a high current without repulsion of the contacts. It is expressed in kA peak.
Suitability for isolation (see also below Positive contact indication)	This capability means that the circuit breaker meets the conditions below. ■ In the open position, it must withstand, without flashover between the upstream and downstream contacts, the impulse voltage specified by the standard as a function of the Uimp indicated on the device. ■ It must indicate contact position by one or more of the following systems: □ position of the operating handle □ separate mechanical indicator □ visible break of the moving contacts ■ Leakage current between each pole, with the contacts open, at a test voltage of 1.1 x the rated operating voltage, must not exceed: □ 0.5 mA per pole for new devices □ 2 mA per pole for devices already subjected to normal switching operations □ 6 mA, the maximum value that must never be exceeded. ■ It must not be possible to install padlocks unless the contacts are open. Locking in the closed position is permissible for special applications. Compact NSX complies with this requirement by positive contact indication.
Suitable for isolation with positive contact indication (see also above Suitability for isolation)	Suitability for isolation is defined here by the mechanical reliability of the position indicator of the operating mechanism, where: ■ the isolation position corresponds to the O (OFF) position ■ the operating handle cannot indicate the "OFF" position unless the contacts are effectively open. The other conditions for isolation must all be fulfilled: ■ locking in the open position is possible only if the contacts are effectively open ■ leakage currents are below the standardised limits ■ overvoltage impulse withstand between upstream and downstream connections.
Ultimate breaking capacity (Icu)	Expressed in kA, it indicates the maximum breaking capacity of the circuit breaker. It is confirmed by a test with one opening and one closing/opening at Icu, followed by a check that the circuit is properly isolated. This test ensures user safety.

Communication

Acti 9 Smartlink Ethernet	Acti 9 Smartlink Ethernet collects data from Smartlink Modbus and transfers them via the Ethernet network.
Acti 9 Smartlink Modbus	Acti 9 Smartlink Modbus is used to transfer data from Acti 9 devices to a PLC or monitoring system via the communication system: Modbus serial line.
BSCM (Breaker status and control module)	The optional BSCM for Compact NSX is used to acquire device status indications and control the communicating remote-control function. It includes a memory used to manage the maintenance indicators. It serves as a converter between the analog outputs of the device indication contacts (O/F, SD, SDE) and the digital communicating functions.
Com'X 200 energy server	Com'X 200 energy server is a compact, plug-and-play data logger that merges seamlessly with the Smart Panels energy management solution. It consolidates inputs from analog environmental sensors (e.g. temperature), digital readers (e.g. pulsed signals from smart energy or water meters, load running hours), and energy management equipment running over the Modbus protocol. Designed for ease of implementation, data can be transmitted securely via Ethernet, Wi-Fi, or GPRS to any energy management platforms. The Com'X 200 energy server is scalable and can be easily adaptable to accommodate future upgrades. Com'X 200 is a perfect fit with our energy management services, enabling visualization, tracking, and analysis of energy data to support optimization of energy performance and cost management.

Ethernet TCP/IP (Transmission Control Protocol / Internet Protocol)	Ethernet is a very common network protocol and complies with IEEE standard 802.3. Ethernet TCP/IP is the protocol that brings web functions to Ethernet networks. Most PCs have an Ethernet 10/100 card (10 or 100 Mbit/s) for connection to the internet. Data communicated from Compact NSX via Modbus are accessible on a PC via a TCP/IP-Modbus gateway such as MPS100 or EGX100.
FDM121 switchboard display	An FDM121 switchboard display unit can be connected to a ULP IMU using a prefabricated cord to display all measurements, alarms, histories and event tables, maintenance indicators, management of installed devices on a screen. The result is a veritable 96 x 96 mm Power Meter. The FMD121 display unit requires a 24 V DC power supply. The FDM121 is a switchboard display unit that can be integrated in the Compact NSX100 to 630 A, Powerpact H/J/L/P/R, Compact NS or Masterpact systems.
FDM128 switchboard display	The FDM128 is an intelligent Ethernet display. It collects the data from up to 8 devices via Ethernet network. The FDM128 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.
IFE Ethernet interface, **IFE Ethernet interface + gateway**	The IFE Ethernet interface for LV circuit breaker enables an intelligent modular unit (IMU), for example a Masterpact NT/NW or Compact NSX circuit breaker to be connected to an Ethernet network.
IFM Module interface Modbus	This module required for connection to the network, contains the Modbus address (1 to 99) declared by the user via the two dials in front. It automatically adapts (baud rate, parity) to the Modbus network in which it is installed. It is equipped with a lock-out switch to enable or disable operations involving writing to Micrologic, i.e. reset, counter reset, setting modifications, device opening and closing commands, etc. There is a built-in test function to check the connections of the Modbus interface module with the Micrologic and FDM121 display unit.
I/O application module	The I/O (Input/Output) application module for LV breaker is part of an ULP system with built-in functionalities and applications to enhance the application needs. The ULP system architecture can be built without any restrictions using the wide range of circuit breakers. The I/O application module is compliant with the ULP system specifications. Two I/O application modules can be connected in the same ULP network.
Network	Set of communicating devices that are interconnected by communication lines in order to share data and resources.
Open protocol	A protocol for system communication, interconnection or data exchange for which technical specifications are public, i.e. there are no restrictions on access or implementation. An open protocol is the opposite of a proprietary protocol.
Protocol	Standardised specification for dialog between digital components that exchange data. It is an operating mode based on the length and structure of binary words and it must be used by all the components exchanging data between themselves. Communication is not possible without using a protocol.
RJ45 connector	Universal, 8-wire connector that is widely used in digital communication networks. The RJ45 connector is used to interconnect computer equipment (Ethernet, Modbus, etc.), telephones and audiovisual equipment.
RS485 Modbus	Modbus is the most widely used communication protocol in industrial networks. It operates in master-slave mode. An RS485 multipoint link connects the master and slaves via a pair of wires offering throughputs of up to 38400 bits/second over distances up to 1200 m). The master cyclically polls the slaves which send back the requested information. The Modbus protocol uses frames containing the address of the targeted slave, the function (read, write), the datum and the CRC (cyclical redundancy check).
SDTAM	Relay module with two static outputs specifically for the motor-protection Micrologic trip units 1 M, 2 M and 6 E-M. An output, linked to the contactor controller, opens the contactor when an overload or other motor fault occurs, thus avoiding opening of the circuit breaker. The other output stores the opening event in memory.
SDx	Relay module with two outputs that remotes the trip or alarm conditions of Compact NSX circuit breakers equipped with a Micrologic electronic trip unit.
Static output	Output of a relay made up of a thyristor or triac electronic component. The low switching capability means that a power relay is required. This is the case for the SDx and SDTAM outputs.
ULP (Universal Logic Plug) 	Connection system used by Compact NSX to communicate information to the Modbus interface via a simple RJ45 cable. Compatible modules are indicated by the symbol opposite.

Glossary

Components

ASIC (Application Specific Integrated Circuit)	Integrated circuit designed, built and intended for a specific application. It carries out repetitive sequences of instructions engraved in the silicon chip. For that reason, it is extremely reliable because it cannot be modified and is not affected by environment conditions. Micrologic trip units use an ASIC for the protection functions. The ASIC cyclically polls the network status at a high frequency, using the values supplied by captors. Comparison with the settings forms the basis for orders to the electronic trip units.
Microprocessor	A microprocessor is a more general purpose device than an ASIC. In Micrologic, a microprocessor is used for measurements and it can be programmed. It is not used for the main protection functions that are carried out by the ASIC.

Controls

Communicating motor mechanism	For Compact NSX remote control via the communication system, a communicating motor mechanism is required. Except for the communication function, it is identical to the standard motor mechanism module and connects to and controlled by the BSCM module.
CNOMO machine-tool rotary handle	Handle used for machine-tool control enclosures and providing IP54 and IK08.
Direct rotary handle	This is an optional control handle for the circuit breaker. It has the same three positions I (ON), O (OFF) and TRIPPED as the toggle control. It provides IP40, IK07 and the possibility, due to its extended travel, of using early-make and early-break contacts. It maintains suitability for isolation and offers optional locking using a keylock or a padlock.
Emergency off	In a circuit equipped with a circuit breaker, this function is carried out by an opening mechanism using an MN undervoltage release or an MX shunt release in conjunction with an emergency off button.
Extended rotary handle	Rotary handle with an extended shaft to control devices installed at the rear of switchboards. It has the same characteristics as direct rotary handles. It offers multiple locking possibilities using a keylock, a padlock or a door interlock.
Failsafe remote tripping	Remote tripping is carried out by an opening mechanism using an MN undervoltage release in conjunction with an emergency off button. If power is lost, the protection device opens the circuit breaker.
Manual toggle control	This is the standard control mechanism for the circuit breaker, with a toggle that can be flipped up or down. In a molded-case circuit breaker (MCCB), there are three positions, I (ON), O (OFF) and TRIPPED. Once in the TRIPPED position, manual reset is required by switching to O (OFF position before reclosing.The TRIPPED position does not offer isolation with positive contact indication. This is guaranteed only by the O (OFF) position.
MCC rotary handle	Handle used for motor control centres and providing IP43 and IK07.
Motor mechanism module	The optional motor mechanism module is used to remotely open, close and recharge the circuit breaker.

Discrimination / Cascading

Cascading	Cascading implements the current-limiting capacity of a circuit breaker, making it possible to install downstream circuit breakers with lower performance levels. The upstream circuit breaker reduces any high short-circuit currents. This makes it possible to install downstream circuit breakers with breaking capacities less than the prospective short-circuit current at their point of installation. The main advantage of cascading is to reduce the overall cost of switchgear. Because the current is limited throughout the circuit downstream of the limiting circuit breaker, cascading applies to all the devices located downstream.
Current discrimination	Discrimination based on the difference between the current-protection settings of the circuit breakers. The difference in settings between two successive circuit breakers in a circuit must be sufficient to allow the downstream breaker to clear the fault before the upstream breaker trips.

Discrimination	Discrimination is ensured between upstream and downstream circuit breakers if, when a fault occurs, only the circuit breaker placed immediately upstream of the fault trips. Discrimination is the key to ensuring the continuity of service of an installation.
Energy discrimination	This function is specific to Compact NSX (see Reflex tripping on page G-7) and supplements the other types of discrimination.
Partial discrimination	Discrimination is partial if the conditions for total discrimination are not met up to the ultimate short-circuit current Icu, but only up to a lesser value. This value is called the discrimination limit. If a fault exceeds the discrimination limit, both circuit breakers trip.
Time discrimination	Discrimination based on the difference between the time-delay settings of the circuit breakers. The upstream trip unit is delayed to provide the downstream breaker the time required to clear the fault.
Total discrimination	Total discrimination is ensured between upstream and downstream circuit breakers if, for all fault values, from overloads up to solid short-circuits, only the downstream circuit breaker trips and the upstream circuit breaker remains closed.
Zone selective interlocking (ZSI)	A number of circuit breakers with Micrologic electronic trip units are interconnected one after another by a pilot wire. In the event of a short-time or ground fault: ■ in the absence of information from downstream, the circuit breaker directly concerned by the fault (i.e. located just upstream of the fault) shifts to the shortest time delay and sends a signal upstream ■ the upstream device, on receiving the signal from the downstream device, maintains its normal time delay. In this manner, the fault is cleared rapidly by the circuit breaker closest to the fault.

Environment

EMC (Electromagnetic compatibility)	EMC is the capacity of a device not to disturb its environment during operation (emitted electromagnetic disturbances) and to operate in a disturbed environment (electromagnetic disturbances affecting the device). The standards define various classes for the types of disturbances. Micrologic trip units comply with annexes F and J in standard IEC IE60947-2.
Power loss **Pole resistance**	The flow of current through the circuit-breaker poles produces Joule-effect losses caused by the resistance of the poles.
Product environmental profile (PEP) **LCA: Life-cycle assessment** **ISO 14040**	An assessment on the impact of the construction and use of a product on the environment, in compliance with standard ISO 14040, Environmental management, life-cycle assessment (LCA), principles and framework. For Compact NSX, this assessment is carried out using the standardised EIME (Environmental Impact and Management Explorer) software, which makes possible comparisons between the products of different manufacturers. It includes all stages, i.e. manufacture, distribution, use and end of life, with set usage assumptions: ■ use over 20 years at a percent load of 80% for 14 hours per day and 20% for ten hours ■ according to the European electrical-energy model. It provides the information presented below. ■ Materials making up the product: composition and proportions, with a check to make sure no substances forbidden by the RoHS directive are included. ■ Manufacture: on Schneider Electric production sites that have set up an environmental management system certified ISO 14001. ■ Distribution: packaging in compliance with the 94/62/EC packaging directive (optimised volumes and weights) and optimised distribution flows via local centres. ■ Use: no aspects requiring special precautions for use. Power lost through Joule effect in Watts (W) must be < 0.02% of total power flowing through the circuit breaker. Based on the above assumptions, annual consumption from 95 to 200 kWh. ■ End of life: products dismantled or crushed. For Compact NSX, 81% of materials can be recycled using standard recycling techniques. Less than 2% of total weight requires special recycling.

Glossary

Product environmental profile (PEP) **Environmental indicators**	Environmental indicators are also frequently used for the PEP (sheet available on request for Compact NSX): ■ Depletion of natural resources ■ Depletion of energy ■ Depletion of water ■ Potential for atmospheric warming (greenhouse effect) ■ Potential for stratospheric ozone depletion ■ Creation of atmospheric ozone (ozone layer) ■ Acidification of air (acid rain) ■ Production of hazardous waste.
RoHS directive (Restriction of Hazardous substances)	European directive 2002/95/EC dated 27 January 2003 aimed at reducing or eliminating the use of hazardous substances. The manufacturer must attest to compliance, without third-party certification. Circuit breakers are not included in the list of concerned products, which are essentially consumer products. That not withstanding, Schneider Electric decided to comply with the RoHS directive. Compact NSX products are designed in compliance with RoHS and do not contain (above the authorised levels) lead, mercury, cadmium, hexavalent chromium or flame retardants (polybrominated biphenyls PBB and polybrominated diphenyl ether PBDE).
Safety clearances	When installing a circuit breaker, minimum distances (safety clearances) must be maintained between the device and panels, bars and other protection systems installed nearby. These distances, which depend on the ultimate breaking capacity, are defined by tests carried out in accordance with standard IEC 60947-2.
Temperature derating	An ambient temperature varying significantly from 40°C can modify operation of magnetic or thermal-magnetic protection functions. It does not affect electronic trip units. However, when electronic trip units are used in high-temperature situations, it is necessary to check the settings to ensure that only the permissible current for the given ambient temperature is let through.
Vibration withstand IEC 60068-2-6	Circuit breakers are tested in compliance with standard IEC 60068-2-6 for the levels required by merchant-marine inspection organisations (Veritas, Lloyd's, etc.): ■ 2 to 13.2 Hz: amplitude of ±1 mm ■ 13.2 to 100 Hz: constant acceleration of 0.7 g.
WEEE directive (Waste of Electrical and Electronic Equipment)	European directive on managing the waste of electrical and electronic equipment. Circuit breakers are not included in the list of concerned products. However, Compact NSX products respect the WEEE directive.

G

Harmonics

Current harmonics	Non-linear loads cause harmonic currents that flow in the 50 Hz (or 60 Hz) distribution system. Total harmonic current is the sum of sinusoidal AC currents for which the rms values can be measured and broken down into: ■ the fundamental current at the 50/60 Hz frequency of the distribution system, with an rms value of IH_1 ■ harmonic currents with whole, odd multiples (3, 5, 7, etc.) of the 50/60 Hz frequency, called the third-order, fifth-order, etc. harmonics. For example, IH_3, the third-order harmonic at 150/180 Hz, IH_5, the fifth-order harmonic at 250/300 Hz, etc. The presence of harmonics in the system must be monitored and limited because it results in temperature rise, currents in the neutral (caused by the third-order harmonics and multiples), malfunctions of sensitive electronic devices, etc. Micrologic E trip units take into account harmonics up to order 15 in the THDI and THDU calculations.
Non-linear load	Systems producing harmonics are present in all industrial, commercial and residential sectors. Harmonics are caused by non-linear loads. A load is said to be non-linear when the current drawn does not have the same waveform as the supply voltage. Typically, loads using power electronics are non-linear. Examples of non-linear loads include computers, rectifiers, variable-speed drives, arc furnaces and fluorescent lighting.
Total harmonic distortion of current (THDI)	THDI characterises the distortion of the current wave by harmonics. It indicates the quantity of harmonics in the resulting waveform. It is expressed in percent. The higher the THDI, the more the current is distorted by harmonics. THDI should remain below 10%. Above that level, there is said to be harmonic pollution that is considered severe when it rises above 50%.

Total harmonic distortion of voltage (THDU)	THDU characterises the distortion of the voltage wave by harmonics. It indicates the quantity of harmonics in the resulting waveform. It is expressed in percent. The higher the THDU, the more the system voltage is distorted by harmonics. It is advised not to exceed 5% for low-voltage systems.
Voltage harmonics	For each current harmonic IHk, there is a voltage harmonic UHk of the same order k, where the resulting voltage is the sum of the two waves. The voltage wave is therefore distorted with respect to the standard sinusoidal wave.

Measurements

Contact wear	Each time Compact NSX opens, the Micrologic 5 / 6 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.
Current transformer with iron-core toroid	It is made up of a coil wound around an iron frame through which a power busbar runs. The current flowing in the bar, on passing through the sensor, induces a magnetic field that reverses for each half period. This variation in the field in turn creates an induced current in the coil. This current is proportional to the current flowing in the bar. It is sufficient to supply the measurement electronics. The disadvantage of iron-core measurement current transformers (CT) is that they rapidly saturate for currents > 10 In.
Current transformer with Rogowski toroid or air-core CT	It is made up of a coil without an iron frame, through which a power busbar runs. The output voltage at the coil terminals is proportional to the current flowing through the bar. The result is a current transformer (CT) with a voltage output. The advantage is that it never saturates whatever the primary current and thus enables measurement of high currents. The output is however a very low current that is too low to supply the measurement electronics. For Micrologic, Rogowski CTs measure the current and a second CT, with an iron core, provides the electrical supply.
Demand current, demand power and peak values	Average of the instantaneous current or power values over an adjustable fixed or sliding time interval. The highest value observed over the time interval is the peak value. The time interval runs from the last reset.
Instantaneous current	True rms value of the current measured by the current transformers over a sliding time interval. Available on Micrologic 5/6 A or E.
Instantaneous voltage	True rms value of the voltage measured by the voltage sensors over a sliding time interval. Available on Micrologic 5/6 A or E.
Maximeters/minimeters	Micrologic 5 and 6 A or E can record the minimum and maximum values of electrical parameters over set time periods.
Overvoltage category (OVC - Overvoltage category) IEC 60947-1. Annex H	Standard IEC 60664-1 stipulates that it is up to the user to select a measurement device with a sufficient overvoltage category, depending on the network voltage and the transient overvoltages likely to occur. Four overvoltage categories define the field of use for a device. ■ Cat. I. Devices supplied by a SELV isolating transformer or a battery. ■ Cat. II. Residential distribution, handheld or laboratory tools and devices connected to standardised 2P + earth electrical outlets (230 V). ■ Cat. III. Industrial distribution, fixed distribution circuits in buildings (main low voltage switchboards, rising mains, elevators, etc.). ■ Cat. IV. Utility substations, overhead lines, certain industrial equipment.
Percent load	Percentage of current flowing through the circuit breaker with respect to its rated current. Micrologic 6 E-M offers this information and can sum it over the total operating time to provide the load profile for the following ranges, 0 to 49%, 50 to 79%, 80 to 89% and ≥ 90%.
Phase sequence	The order in which the phases are connected (L1, L2, L3 or L1, L3, L2) determines the direction of rotation for three-phase asynchronous motors. Micrologic 6 E-M trip units provide this information.
Power and energy metering (consumption)	The digital electronics in Micrologic 5/6 E calculate the instantaneous power levels, apparent (S in kVA), active (P in kW) and (Q in kV), and integrate over a time interval to determine the corresponding energies (kVAh, kWh kvarh). Calculations are for each phase and for the total.

Glossary

Time-stamped histories	Micrologic trip units store information on events (e.g. alarms and their cause) that are time-stamped to within a millisecond.

Protection

Ground-fault protection G (Ig)	Protection function specific to electronic circuit breakers, symbolised by G (Ground). This protection can calculate high-threshold residual earth-leakage currents (in the order of tens of Amperes) on the basis of phase-current measurements. Micrologic 5/6 offers this protection function with adjustable pick-up Ig and time delay.
Instantaneous protection I (Ii)	This protection supplements Isd. It provokes instantaneous opening of the device. The pick-up may be adjustable or fixed (built-in). This value is always lower than the contact-repulsion level.
Long-time protection L (Ir)	Protection function where the adjustable Ir pick-up determines a protection curve similar to the thermal-protection curve (inverse-time curve I^2t). The curve is generally determined on the basis of the Ir setting which corresponds to a theoretically infinite tripping time (asymptote) and of the point at 6 Ir at which the tripping time depends on the rating.
Magnetic protection (Im)	Short-circuit protection provided by magnetic trip units (see this term). The pick-up setting may be fixed or adjustable.
Neutral protection (IN)	The neutral is protected because all circuit-breaker poles are interrupted. The setting may be that used for the phases or specific to the neutral, i.e. reduced neutral (0.5 times the phase current) or OSN (oversized neutral) at 1.6 times the phase current. For OSN protection, the maximum device setting is limited to 0.63 In.
Residual-current earth-leakage protection (IΔn)	Protection provided by Vigi modules, in which the residual-current toroids directly detect low-threshold earth-leakage currents (in the order of tens of mA) caused by insulation faults.
Short-delay protection S (Isd)	Protection function specific to electronic circuit breakers, symbolised by S (Short delay or short time). This protection supplements thermal protection. The reaction time is very short, but has a slight time delay to enable discrimination with the upstream device. The short-delay pick-up Isd is adjustable from approximately 1.5 to 10 Ir.
Short-delay protection with fixed time delay So (Isd)	Short-delay protection, but with a fixed time delay. This function is available on Micrologic 2. It is symbolised by So. It ensures discrimination with downstream devices.
Thermal protection (Ir)	Overload protection provided by thermal trip units (see this term) using an inverse-time curve (I^2t).

G

Relays and auxiliary contacts

Auxiliary contact IEC 60947-1	"Contact included in an auxiliary circuit and mechanically operated by the switching device".
Break contact IEC 60947-1	"Control or auxiliary contact which is open when the main contacts of the mechanical switching device are closed and closed when they are open".
Make contact IEC 60947-1	"Control or auxiliary contact which is closed when the main contacts of the mechanical switching device are closed and open when they are open".
Relay (electrical) IEC 60947-1	"Device designed to produce sudden, predetermined changes in one or more electrical output circuits when certain conditions are fulfilled in the electrical input circuits controlling the device".
Relay module with static output	Output of a relay made up of a thyristor or triac electronic component. The low interrupting capacity means that a power relay is required. This is the case for the SDx and SDTAM outputs.

Switchgear

Circuit breaker
IEC 60947-2

"Mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short circuit". Circuit breakers are the device of choice for protection against overloads and short-circuits. Circuit breakers may, as is the case for Compact NSX, be suitable for isolation.

Circuit-breaker utilisation category
IEC 60947-2

The standard defines two utilisation categories, A and B, depending on breaker discrimination with upstream breakers under short-circuit conditions.
- Category A. Circuit breakers not specifically designed for discrimination applications.
- Category B. Circuit breakers specifically designed for discrimination, which requires a short time-delay (which may be adjustable) and a rated short-time withstand current in compliance with the standard.

Compact NSX100 to 630 circuit breakers are category A, however, by design, they provide discrimination with downstream devices (see the Complementary technical information guide).

Contactor
IEC 60947-1

"Mechanical switching device having only one position of rest, operated otherwise than by hand, capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions". A contactor is provided for frequent opening and closing of circuits under load or slight overload conditions. It must be combined and coordinated with a protective device against overloads and short-circuits, such as a circuit breaker.

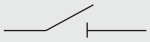
Contactor utilisation categories
IEC 60947-4-1

The standard defines four utilisation categories, AC1, AC2, AC3 and AC4 depending on the load and the control functions provided by the contactor. The class depends on the current, voltage and power factor, as well as contactor withstand capacity in terms of frequency of operation and endurance.

Current-limiting circuit breaker
IEC 60947-2

"A circuit-breaker with a break-time short enough to prevent the short-circuit current reaching its otherwise attainable peak value".

Disconnector
IEC 60947-3



"Mechanical switching device which, in the open position, complies with the requirements specified for the isolating function". A disconnector serves to isolate upstream and downstream circuits. It is used to open or close circuits under no-load conditions or with a negligible current level. It can carry the rated circuit current and, for a specified time, the short-circuit current.

Switch-disconnector
IEC 60947-3

"Switch which, in the open position, satisfies the isolating requirements specified for a disconnector". A switch-disconnector serves for switching and isolation. The switch function breaks the circuit under load conditions and the disconnection function isolates the circuit. Protection is not provided. It may be capable of making short-circuit currents if it has the necessary making capacity, but it cannot break short-circuit currents. Compact NSX100 to 630 NA switch-disconnectors have a making capacity.

Switch-disconnector utilisation category
IEC 60947-3

The standard defines six utilisation categories, AC-21A or B, AC-22 A or B, AC23 A or B. They depend on the rated operational current and the mechanical durability (A for frequent operation or B for infrequent operation). Compact NSX NA switch-disconnectors comply with utilisation categories AC22A or AC23A.

Three-phase asynchronous motors and their protection

Locked-rotor protection (Ijam)

This function steps in when the motor shaft cannot or can no longer drive the load. The result is a high overcurrent.

Long-start protection (Ilong)

An overly long start means the current drawn remains too high or too low for too long, with respect to the starting current. In all cases, the load cannot be driven and the start must be interrupted. The resulting temperature rise must be taken into account before restarting.

Phase-unbalance or phase- loss protection (Iunbal)

This protection function steps in if the current values and/or the unbalance in the three phases supplying the motor exceeds tolerances. Currents should be equal and displacement should be one third of a period. Phase loss is a special case of phase unbalance.

Glossary

Starting current	Start-up of a three-phase, asynchronous motor is characterised by: ■ a high inrush current, approximately 14 In for 10 to 15 ms ■ a starting current, approximately 7.2 In for 5 to 30 seconds ■ return to the rated current after the starting time.
Starting time	Time after which the motor ceases to draw the starting current and falls back to the operating current Ir (≤ In).
Thermal image of the rotor and stator	The thermal image models the thermal behaviour of a motor rotor and stator, taking into account temperature rise caused by overloads or successive starts, and the cooling constants. For each motor power rating, the algorithm takes into account a theoretical amount of iron and copper which modifies the cooling constants.
Thermal protection	Protection against overcurrents following an inverse time curve I^2t = constant, which defines the maximum permissible temperature rise for the motor. Tripping occurs after a time delay that decreases with increasing current.
Trip class IEC 60947-4-1	The trip class determines the trip curve of the thermal protection device for a motor feeder. The standard defines trip classes 5, 10, 20 and 30. These classes are the maximum durations, in seconds, for motor starting with a starting current of 7.2 Ir, where Ir is the thermal setting indicated on the motor rating plate.
Under-load protection (lund)	This function steps in when the driven load is too low. It detects a set minimum phase current which signals incorrect operation of the driven machine. In the example of a pump, under-load protection detects when the pump is no longer primed.

Trip units

Electronic trip unit (Micrologic)	Trip unit that continuously measures the current flowing through each phase and the neutral if it exists. For Micrologic, the measurements are provided by built-in current sensors linked to an analog-digital converter with a high sampling frequency. The measurement values are continuously compared by the ASIC to the protection settings. If a setting is overrun, a Mitop release trips the circuit-breaker operating mechanism. This type of trip unit offers much better pick-up and delay setting accuracy than thermal-magnetic trip units. It also provides a wider range of protection functions.
Magnetic release	Release actuated by a coil or a lever. A major increase in the current (e.g. a short-circuit) produces in the coil or the lever a change in the magnetic field that moves a core. This trips the circuit breaker operating mechanism. Action is instantaneous. The pick-up setting may be adjustable.
Reflex tripping	Compact NSX circuit breakers have a patented reflex-tripping system based on the energy of the arc and that is independent of the other protection functions. It operates extremely fast, before the other protection functions. It is an additional safety function that operates before the others in the event of a very high short-circuit.
Release IEC 60947-1	Device, mechanically connected to a mechanical switching device (e.g. a circuit breaker), which releases the holding means and permits the opening or the closing of the switching device. For circuit breakers, releases are often integrated in a trip unit.
Shunt release (MX)	This type of release operates when supplied with current. The MX release provokes circuit-breaker opening when it receives a pulse-type or maintained command.
Thermal-magnetic trip unit	Trip unit combining thermal protection for overloads and magnetic protection.
Thermal release	Release in which a bimetal strip is heated by the Joule effect. Above a temperature-rise threshold that is a function of the current and its duration (I^2t curve = constant, which is representative of temperature rise in cables), the bimetal strip bends and releases the circuit-breaker opening mechanism. The pick-up setting may be adjustable.
Undervoltage release (MN)	This type of release operates when the supply voltage drops below the set minimum.

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