

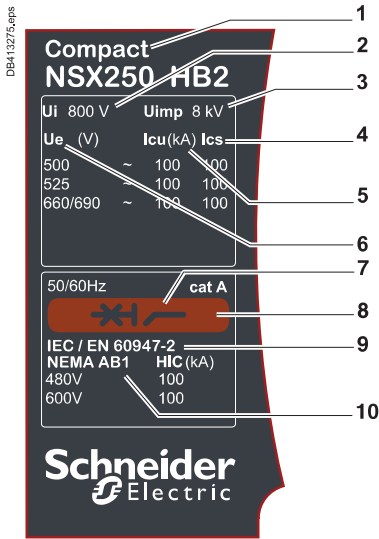
Protection, measurement and communication...



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Introduction

General characteristics of the Compact NSX range



Standardised characteristics indicated on the rating plate:

- 1 Type of device: frame size and breaking capacity class
- 2 Ui: rated insulation voltage.
- 3 Uimp: rated impulse withstand voltage.
- 4 Ics: service breaking capacity.
- 5 Icu: ultimate breaking capacity for various values of the rated operational voltage Ue
- 6 Ue: operational voltage.
- 7 Colour label indicating the breaking capacity class.
- 8 Circuit breaker-disconnector symbol.
- 9 Reference standard.
- 10 Main standards with which the device complies.

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 NSX 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 60947-4: contactors and motor starters
 - IEC 60947-5.1 and following: control circuit devices and switching elements; automatic control components
 - European (EN 60947-1 and EN 60947-2) and corresponding national standards:
 - France NF
 - Germany VDE
 - United Kingdom BS
 - Australia AS
 - Italy CEI
 - 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.
- For U.S. UL, Canadian CSA, Mexican NOM and Japanese JIS standards, please consult us.

Pollution degree

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

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

Environment

Compact NSX respects the European environment directive EC/2002/95 concerning the restriction of hazardous substances (RoHS).

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 NSX 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 NSX circuit breakers may be used between -25 °C and +70 °C. For temperatures higher than 40 °C (65 °C for circuit breakers used to protect motor feeders), devices must be derated ([pages B-8 and B-9](#)).
- 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 NSX circuit breakers in the original packing is -50 °C ⁽¹⁾ and +85 °C.

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

Electromagnetic compatibility

Compact NSX 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 NSX 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
- CISPR 11: Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.

Discrimination

Compact NSX reinforces the discrimination capabilities of the Compact NS range by applying the rapid calculation capacity of the Micrologic trip units.

Total discrimination is now possible between NSX100 and modular Multi 9 circuit breakers rated ≤ 63 A (see page A-10).

Suitable for isolation with positive contact indication

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

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

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

The isolation function is certified by tests guaranteeing:

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

The tripped position does not insure isolation with positive contact indication.

Only the OFF position guarantees isolation.

Installation in class II switchboards

All Compact NSX circuit breakers 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 or a motor mechanism.

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 standard direct rotary handle / VDE: IP40 IK07

Circuit breaker installed in a switchboard

- With toggle: IP40, IK07.
- With direct rotary handle:
 - standard / VDE: IP40, IK07
 - MCC: IP43 IK07
 - CNOMO: IP54 IK08
- With extended rotary handle: IP55 IK08
- With motor mechanism: IP40 IK07.



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DB112083r.eps



Introduction

Characteristics and performance of Compact NSX circuit breakers from 100 to 250 A up to 690 V

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Compact NSX single-pole.

PE107524_23.eps



Compact NSX two-pole

Compact circuit breakers

Number of poles		
Control	manual	toggle direct or extended rotary handle

Connections	electric	
	fixed	front connection rear connection
	withdrawable	front connection rear connection

Electrical characteristics as per IEC 60947-2 and EN 60947-2

Rated current (A)	I_n	40 °C
Rated insulation voltage (V)	U_i	
Rated impulse withstand voltage (kV)	U_{imp}	
Rated operational voltage (V)	U_e	AC 50/60 Hz DC

Type of circuit breaker

Ultimate breaking capacity (kA rms)	I_{cu}	AC	220/240 V 380/415 V 440 V 500/525 V 660/690 V
		DC	250 V (1P) 500 V (2P)

Service breaking capacity (kA rms)	I_{cs}	% I _{cu}
------------------------------------	-----------------------	-------------------

Suitability for isolation

Utilisation category

Durability (C-O cycles)	mechanical		
	electrical	277 V	I _n /2 I _n

Electrical characteristics as per NEMA AB1

Breaking capacity (kA)	240 V
V AC 50/60 Hz	277 V 480 V 600 V

Protection and measurements

Type of trip units		
Ratings		I_n
Overload protection (thermal)	long time threshold	I_r
Short-circuit protection (magnetic)	instantaneous pickup	I_m value indicated for AC ⁽¹⁾ real value for DC
Add-on earth-leakage protection	add-on Vigi module combination with Vigirex relay	

Additional indication and control auxiliaries

Indication contacts	
Voltages releases	MX shunt release MN undervoltage release

Installation

Accessories	terminal extensions and spreaders terminal shields and interphase barriers escutcheons
Dimensions (mm)	W x H x D
Weight (kg)	

Source changeover system

Interlocking systems

⁽¹⁾ The thresholds for TMD and TMG 1-pole and 2-pole magnetic trip units up to 63 A are indicated for AC. The real DC thresholds are indicated on the following line.

NSX100					NSX160					NSX250								
1					2					1			2			1		
■					■					■			■			■		
-					-					-			-			-		
-					-					-			-			-		
■					■					■			■			■		
■					■					■			■			■		
-					-					-			-			-		
-					-					-			-			-		
100					100					160			160			250		
750					750					750			750			750		
8					8					8			8			8		
277					690					277			690			277		
250					500					250			500			-		
F N M					F M S					F N M			F M S			N		
18 25 40					36 85 100					18 25 40			36 85 100			25		
- - -					18 25 70					- - -			18 25 70			-		
- - -					15 25 65					- - -			15 25 65			-		
- - -					10 18 35					- - -			10 18 35			-		
- - -					5 8 10					- - -			5 8 10			-		
36 50 85					36 85 100					36 50 85			36 85 100			-		
- - -					36 85 100					- - -			36 85 100			-		
100 %					100 %					100 %			100 %			100 %		
■					■					■			■			■		
A					A					A			A			A		
20000					20000					20000			20000			10000		
20000					20000					20000			20000			10000		
10000					10000					10000			10000			5000		
F N M					F M S					F N M			F M S			N		
18 25 40					36 85 100					18 25 40			36 85 100			25		
18 25 40					- - -					18 25 40			- - -			25		
- - -					10 18 35					- - -			10 18 35			-		
- - -					5 8 10					- - -			5 8 10			-		
built-in thermal-magnetic					built-in thermal-magnetic					built-in thermal-magnetic								
16 20 25 30 40					50 63 80 100					125 160			160 200 250					
fixed					fixed					fixed			fixed					
16 20 25 30 40					50 63 80 100					125 160			160 200 250					
fixed					fixed					fixed			fixed					
190 190 300 300 500					500 500 640 800					1000 1250			850 850 850					
260 260 400 400 700					700 700 800 1000					1200 1250			- - -					
-					-					-			-					
-					■					-			■					
-					■					-			■					
-					■					-			■					
■					■					■			■					
■					■					■			■					
■					■					■			■					
35 x 161 x 86					70 x 161 x 86					35 x 161 x 86			70 x 161 x 86			35 x 161 x 86		
0.7					1.2					0.7			1.2			0.7		
-					-					-			-			-		

Introduction

Characteristics and performance of Compact NSX circuit breakers from 100 to 250 A up to 690 V



Compact NSX100/160/250.



Compact NSX250 R.



Compact NSX250 HB2.

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 60947-2	yes
Utilisation category			A
Pollution degree		IEC 60664-1	3

Circuit breakers

Breaking capacity levels

Electrical characteristics as per IEC 60947-2

Rated current (A)	In	40 °C	
Number of poles			
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/2 690 V In/2 In

Characteristics as per Nema AB1

Breaking capacity (kA rms)	AC 50/60 Hz	240 V 480 V 600 V
----------------------------	-------------	-------------------------

Characteristics as per UL 508

Breaking capacity (kA rms)	AC 50/60 Hz	240 V 480 V 600 V
----------------------------	-------------	-------------------------

Protection and measurements

Short-circuit protection	Magnetic only
Overload / short-circuit protection	Thermal magnetic
	Electronic
	with neutral protection (Off-0.5-1-OSN) ⁽¹⁾
	with ground-fault protection
	with zone selective interlocking (ZSI) ⁽²⁾
Display / I, U, f, P, E, THD measurements / interrupted-current measurement	
Options	Power Meter display on door Operating assistance Counters Histories and alarms Metering Com Device status/control Com
Earth-leakage protection	By Vigì module ⁽³⁾
	By Vigìrex relay

Installation / connections

Dimensions and weights

Dimensions (mm)	Fixed, front connections	2/3P W x H x D 4P
Weight (kg)	Fixed, front connections	2/3P 4P

Connections

Connection terminals	Pitch	With/without spreaders
Large Cu or Al cables	Cross-section	mm ²

⁽¹⁾ OSN: Over Sized Neutral protection for neutrals carrying high currents (e.g. 3rd harmonics).

⁽²⁾ ZSI: Zone Selective Interlocking using pilot wires.

⁽³⁾ Vigì module is not available for breaking capacity levels HB1/HB2.

⁽⁴⁾ There is no 160 A frame, use 250 A frame with lower rating trip units for R, HB1, HB2.

⁽⁵⁾ 2P circuit breaker in 3P case for B and F types, only with thermal-magnetic trip unit.

Common characteristics

Control

Manual	With toggle	■
	With direct or extended rotary handle	■
Electrical	With remote control	■

Versions

Fixed		■
Withdrawable	Plug-in base	■
	Chassis	■

NSX100									NSX160 ⁽⁴⁾									NSX250								
B	F	N	H	S	L	R	HB1	HB2	B	F	N	H	S	L	R	HB1	HB2	B	F	N	H	S	L	R	HB1	HB2
100						100			160						250						250					
2 ⁽⁵⁾ , 3, 4						3, 4			2 ⁽⁵⁾ , 3, 4						2 ⁽⁵⁾ , 3, 4						3, 4					
40	85	90	100	120	150	200	-	-	40	85	90	100	120	150	200	-	-	40	85	90	100	120	150	200	-	-
25	36	50	70	100	150	200	-	-	25	36	50	70	100	150	200	-	-	25	36	50	70	100	150	200	-	-
20	35	50	65	90	130	200	-	-	20	35	50	65	90	130	200	-	-	20	35	50	65	90	130	200	-	-
15	25	36	50	65	70	80	85	100	15	30	36	50	65	70	80	85	100	15	30	36	50	65	70	80	85	100
-	22	35	35	40	50	65	80	100	-	22	35	35	40	50	65	80	100	-	22	35	35	40	50	65	80	100
-	8	10	10	15	20	45	75	100	-	8	10	10	15	20	45	75	100	-	8	10	10	15	20	45	75	100
40	85	90	100	120	150	200	-	-	40	85	90	100	120	150	200	-	-	40	85	90	100	120	150	200	-	-
25	36	50	70	100	150	200	-	-	25	36	50	70	100	150	200	-	-	25	36	50	70	100	150	200	-	-
20	35	50	65	90	130	200	-	-	20	35	50	65	90	130	200	-	-	20	35	50	65	90	130	200	-	-
7	12	36	50	65	70	80	85	100	15	30	36	50	65	70	80	85	100	15	30	36	50	65	70	80	85	100
-	11	35	35	40	50	65	80	100	-	22	35	35	40	50	65	80	100	-	22	35	35	40	50	65	80	100
-	4	10	10	15	20	45	75	100	-	8	10	10	15	20	45	75	100	-	8	10	10	15	20	45	75	100
50000						20000			40000						20000						20000					
50000						20000			40000						20000						20000					
30000						10000			20000						10000						10000					
20000						10000			15000						10000						10000					
10000						5000			7500						5000						5000					
40	85	90	100	120	150	200	-	-	40	85	90	100	120	150	200	-	-	40	85	90	100	120	150	200	-	-
20	35	50	65	90	130	150	85	100	20	35	50	65	90	130	150	85	100	20	35	50	65	90	130	150	85	100
-	8	20	35	40	50	50	75	100	-	20	20	35	40	50	50	75	100	-	20	20	35	40	50	50	75	100
-	85	85	85	-	-	-	-	-	-	85	85	85	-	-	-	-	-	-	85	85	85	-	-	-	-	-
-	25	50	65	-	-	-	-	-	-	35	50	65	-	-	-	-	-	-	35	50	65	-	-	-	-	-
-	10	10	10	-	-	-	-	-	-	10	10	10	-	-	-	-	-	-	15	15	15	-	-	-	-	-
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Introduction

Characteristics and performance of Compact NSX circuit breakers from 400 to 630 A up to 690 V



Compact NSX400/630.



Compact NSX630 R.



Compact NSX630 HB2.

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 60947-2	yes
Utilisation category			A
Pollution degree		IEC 60664-1	3

Circuit breakers

Breaking capacity levels

Electrical characteristics as per IEC 60947-2

Rated current (A)	In	40 °C		
Number of poles				
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
			690 V	In/2
				In

Characteristics as per Nema AB1

Breaking capacity (kA rms)	AC 50/60 Hz	240 V	
		480 V	
		600 V	

Characteristics as per UL 508

Breaking capacity (kA rms)	AC 50/60 Hz	240 V	
		480 V	
		600 V	

Protection and measurements

Short-circuit protection	Magnetic only
Overload / short-circuit protection	Thermal magnetic
	Electronic
	with neutral protection (Off-0.5-1-OSN) ⁽¹⁾
	with ground-fault protection
	with zone selective interlocking (ZSI) ⁽²⁾
Display / I, U, f, P, E, THD measurements / interrupted-current measurement	
Options	Power Meter display on door
	Operating assistance
	Counters
	Histories and alarms
	Metering Com
	Device status/control Com
Earth-leakage protection	By Vigi module ⁽³⁾
	By Vigirex relay

Installation / connections

Dimensions and weights

Dimensions (mm)	Fixed, front connections	2/3P
	W x H x D	4P
Weight (kg)	Fixed, front connections	2/3P
		4P

Connections

Connection terminals	Pitch	With/without spreaders
Large Cu or Al cables	Cross-section	mm ²

⁽¹⁾ OSN: Over Sized Neutral protection for neutrals carrying high currents (e.g. 3rd harmonics).

⁽²⁾ ZSI: Zone Selective Interlocking using pilot wires.

⁽³⁾ Vigi module is not available for breaking capacity levels HB1/HB2.

With Micrologic electronic trip units, Compact NSX stands out from the crowd. Thanks to the new generation of sensors and its processing capability, protection is enhanced even further. It also provides measurements and operating information.

Thermal-magnetic or electronic trip unit?

Thermal-magnetic trip units protect against overcurrents and short-circuits using tried and true techniques. But today, installation optimisation and energy efficiency have become decisive factors and electronic trip units offering more advanced protection functions combined with measurements are better suited to these needs. **Micrologic electronic trip units** combine reflex tripping and intelligent operation. Thanks to digital electronics, trip units have become faster as well as more accurate and reliable. Wide setting ranges make installation upgrades easier. Designed with processing capabilities, Micrologic trip units can provide measurement information and device operating assistance. With this information, users can avoid or deal more effectively with disturbances and can play a more active role in system operation. They can manage the installation, anticipate on events and plan any necessary servicing.

Accurate measurements for complete protection

Compact NSX devices take advantage of the vast experience acquired since the launch of Masterpact NW circuit breakers equipped with Micrologic trip units. From 40 amperes on up to the short-circuit currents, they offer excellent measurement accuracy. This is made possible by a new generation of current transformers combining "iron-core" sensors for self-powered electronics and "air-core" sensors (Rogowski toroids) for measurements. The protection functions are managed by an ASIC component that is independent of the measurement functions. This independence ensures immunity to conducted and radiated disturbances and a high level of reliability.

Numerous security functions

Torque-limiting screws

The screws secure the trip unit to the circuit breaker. When the correct tightening torque is reached, the screw heads break off. Optimum tightening avoids any risk of temperature rise. A torque wrench is no longer required.

Easy and sure changing of trip units

All trip units are interchangeable, without wiring. A mechanical mismatch-protection system makes it impossible to mount a trip unit on a circuit breaker with a lower rating.

"Ready" LED for a continuous self-test

The LED on the front of the electronic trip units indicates the result of the self-test runs continuously on the measurement system and the tripping release. As long as the green LED is flashing, the links between the CTs, the processing electronics and the Mitop release are operational. The circuit breaker is ready to protect. No need for a test kit. A minimum current of 15 to 50 A, depending on the device, is required for this indication function.

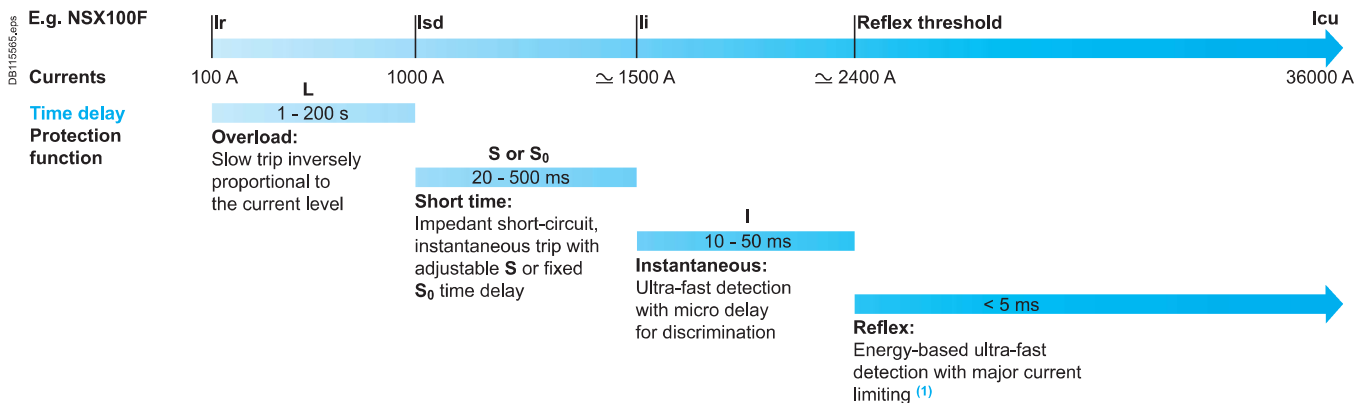
A patented dual adjustment system for protection functions.

Available on Micrologic 5 / 6, the system consists of:

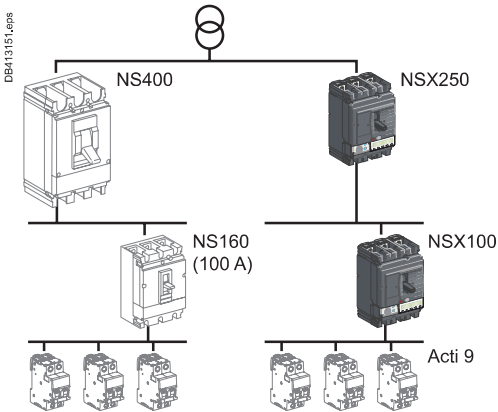
- an adjustment using dials sets the maximum value
- an adjustment, made via the keypad or remotely, fine-tunes the setting. This setting may not exceed the first one. It can be read directly on the Micrologic screen, to within one ampere and a fraction of a second.

Coordinated tripping systems

Compact NSX 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 NSX100 with Micrologic for total discrimination with Acti 9 devices rated ≤ 40 A or a C60. Better coordination between protection functions reduces the difference in ratings required for total discrimination.

Unmatched discrimination

Discrimination

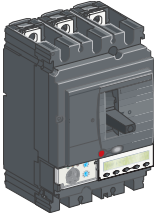
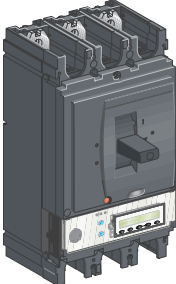


Compact NSX provides maximum continuity of service and savings through an unmatched level of discrimination:

- 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 over the entire range of possible faults, from the long-time pick-up I_r to the ultimate short-circuit current I_{cu} , a ratio of 2.5 must be maintained between the ratings of the upstream and downstream devices.

This ratio is required to ensure selective reflex tripping for high short-circuits.

Understanding the names of Micrologic electronic trip units

Protection	Frame	Measurements	Applications
1: I 2: LS ₀ I 5: LSI 6: LSIG I: Instantaneous L: Long time S ₀ : Short time ⁽²⁾ (fixed delay) S: Short time G: Ground fault	2: NSX100/160/250  3: NSX400/630 	A: Ammeter  E: Energy 	Distribution, otherwise G: Generator AB: Public distribution ⁽¹⁾ M: Motors Z: 16 Hz 2/3 ⁽¹⁾

Examples

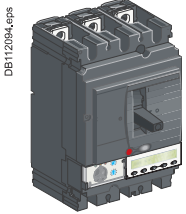
Micrologic 1.3	Instantaneous only	400 or 630 A		Distribution
Micrologic 2.3	LS ₀ I	400 or 630 A		Distribution
Micrologic 5.2 A	LSI	100, 160 or 250 A	Ammeter	Distribution
Micrologic 6.3 E-M	LSIG	400 or 630 A	Energy	Motor

⁽¹⁾ AB-Z: except NSX R, HB1, HB2.

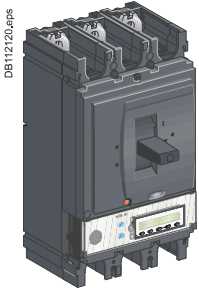
⁽²⁾ LS₀I protection is standard on Micrologic 2. To ensure discrimination, it offers short-time protection S₀ with a non-adjustable delay and instantaneous protection.

Compact NSX offers a range of trip units in interchangeable cases, whether they are magnetic, thermal-magnetic or electronic. Versions 5 and 6 of the electronic trip unit offer communication and metering. Using Micrologic sensors and intelligence, Compact NSX supplies all the information required to manage the electrical installation and optimise energy use.

Compact NSX100/160/250

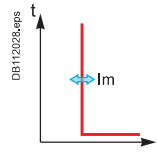


Compact NSX400/630



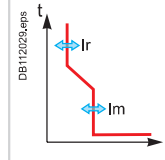
Type of protection and applications

MA magnetic



- Distribution and motors

TM-D thermal-magnetic

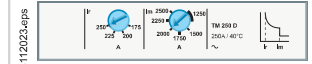


- Distribution
- Generators

Circuit breakers and trip units



- MA Distribution and motors

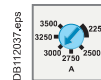


- TM-D Distribution
- TM-G Generators

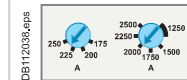


- 1.3 M Distribution and motors

Settings and indications

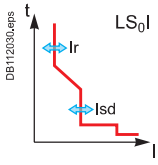


- Adjustment and reading**
Pick-up set in amps using dials
Non-adjustable time delay



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

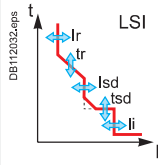
Micrologic 2 electronic



- Distribution
- Service connection (public distribution)
- Generators
- Motors (I only)
- Motors

Micrologic 5 / 6 A or E electronic trip units

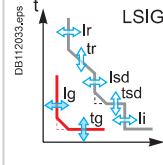
5 A or E



- Distribution and generators

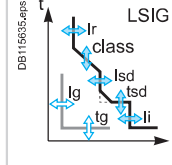
A: current metering functions
E: current and energy metering functions.

6 A or E

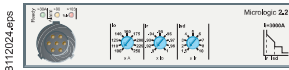


- Distribution and generators

6 E-M



- Motors



- 2.2 Distribution
- 2.2 AB Service connection (public distribution)
- 2.2 G Generators
- 2.2 M Motors

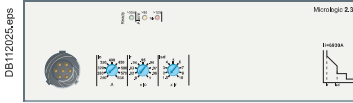


- 5.2 A Distribution and generators
- 5.2 E Distribution and generators
- 5.2 A-Z 16 Hz 2/3 networks

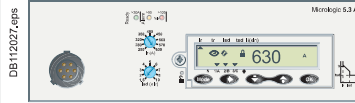
- 6.2 A Distribution and generators
- 6.2 E Distribution and generators



- 6.2 E-M Motors



- 2.3 Distribution
- 2.3 AB Service connection (public distribution)
- 1.3 M Motors
- 2.3 M Motors

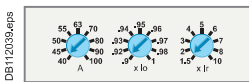


- 5.3 A Distribution and generators
- 5.3 E Distribution and generators
- 5.3 A-Z 16 Hz 2/3 networks

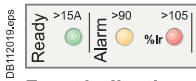
- 6.3 A Distribution and generators
- 6.3 E Distribution and generators



- 6.3 E-M Motors



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

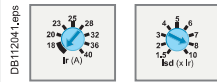


Front indications



Test connector

Self test



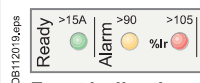
Adjustment and reading
Pick-up set in amps



Fine adjustment via keypad



Adjustable time delays



Front indications

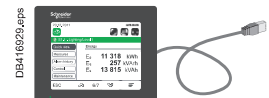


Test connector

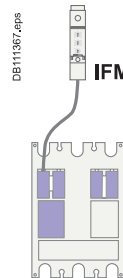
Self test



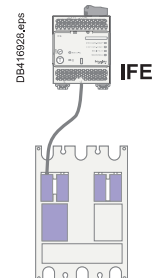
FDM121
Connection to switchboard display unit



FDM128



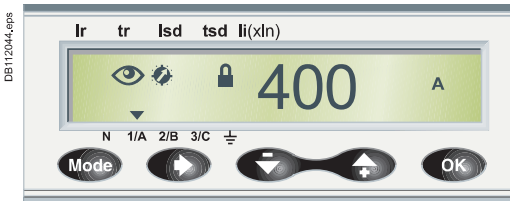
Communication to Modbus



IFE

The capabilities of Micrologic 5 / 6 A and E trip units come into full play with the FDM121 switchboard display unit.

When the two are connected via a simple cord with RJ45 connectors, the combination offers full Power Meter capabilities and all the measurements required to monitor the electrical installation.



Ammeter Micrologic (A)

I measurements

Current measurements

- Phase and neutral currents I1, I2, I3, IN
- Average current of the 3 phases Iavg
- Highest current of the three phases I_{max}
- Ground-fault current I_g (Micrologic 6.2 / 6.3 A)
- Maximeter/minimeter for I measurements

Operating and maintenance assistance

Indications, alarms and histories

- Indication of fault types
- Alarms for high/low alarm thresholds linked to I measurements
- Trip, alarm and operating histories
- Time-stamped tables for settings and maximeters

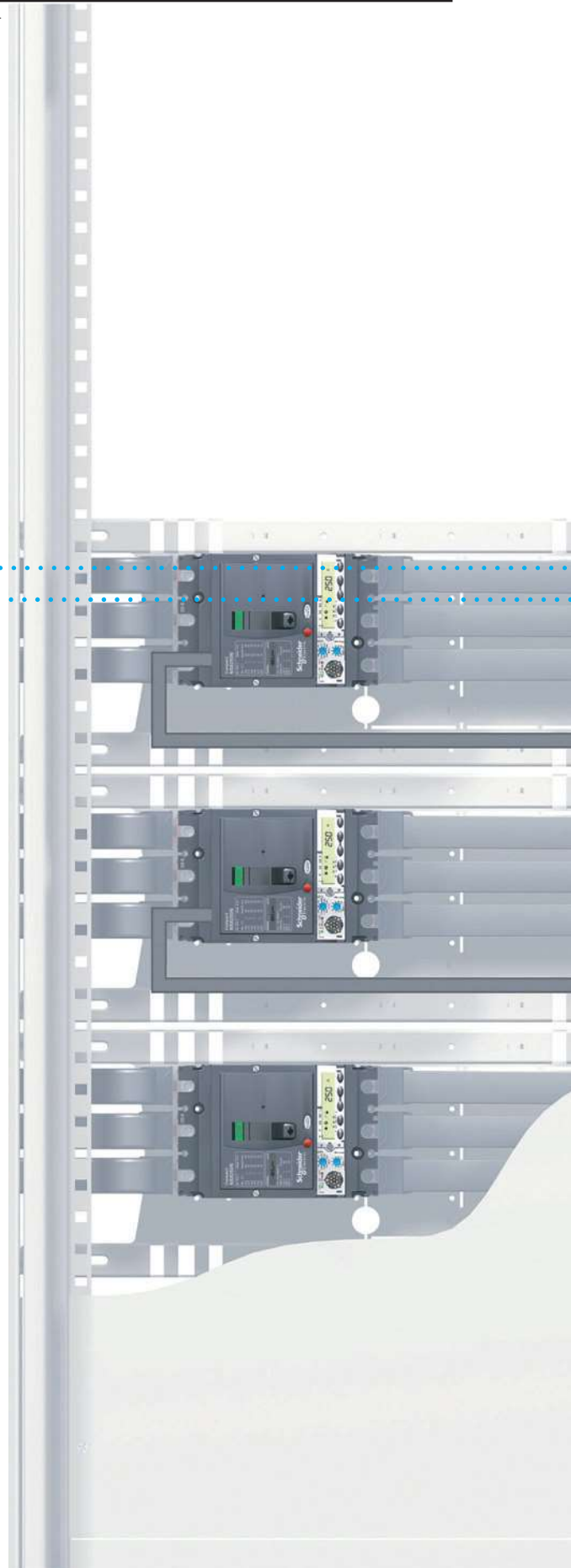
Maintenance indicators

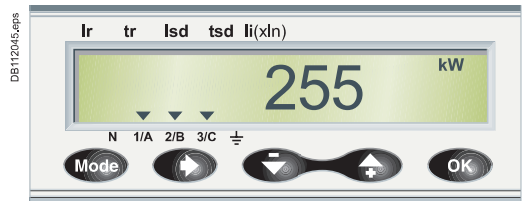
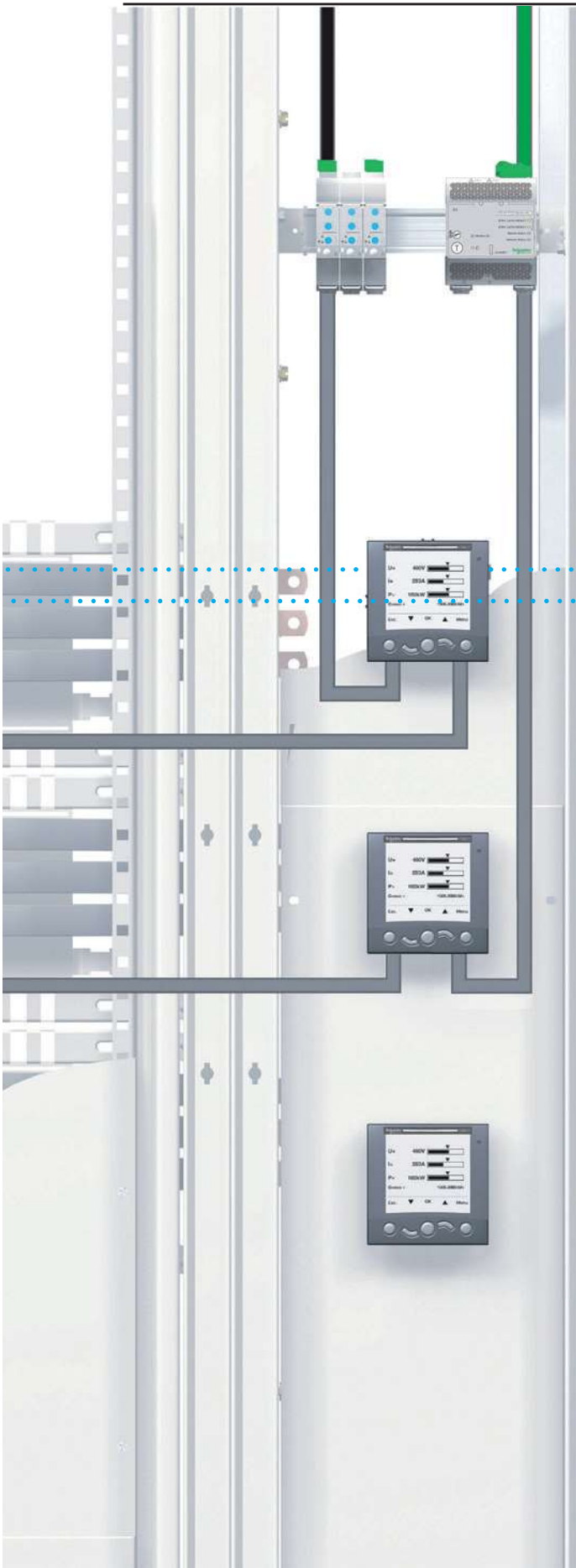
- Operation, trip and alarm counters
- Operating hours counter
- Contact wear
- Load profile and thermal image

Communication

- Modbus with add-on module
- Ethernet with add-on module

DB416933_0.eps





Energy Micrologic (E)

I, U, f, P, E, THD measurements

Current measurements

- Phase and neutral currents I1, I2, I3, IN
- Average current of the 3 phases Iavg
- Highest current of the three phases I_{max}
- Ground-fault current I_g (Micrologic 6.2 / 6.3 A)
- Maximeter/minimeter for I measurements
- Current unbalance between phases

Voltage measurements

- Phase-to-phase (U) et phase-to-neutral (V) voltages
- Average voltages U_{avg}, V_{avg}
- Ph-Ph (U) and Ph-N (V) voltage unbalance

Frequency measurements

- Frequency (f)

Power-quality indicators

- Total harmonic distortion (THD) for current and voltage

Power measurements

- Active, reactive and apparent power, total and per phase
- Power factor and cos φ

Maximeters/minimeters

- For all I, U, f, P, E measurements

Demand current and power measurements

- Demand values, total and per phase
- Maximum demand

Energy metering

- Active, reactive and apparent energy, total and per phase

Operating and maintenance assistance

Indications, alarms and histories

- Indication of fault types
- Alarms for high/low thresholds linked to I, U, f, P, E measurements
- Trip, alarm and operating histories
- Time-stamped tables for settings and I, U, f, P, E maximeters

Maintenance indicators

- Operation, trip and alarm counters
- Operating hours counter
- Contact wear
- Load profile and thermal image

Communication

- Modbus with add-on module
- Ethernet with add-on module

Protection of distribution systems

TM thermal-magnetic and MA magnetic trip units

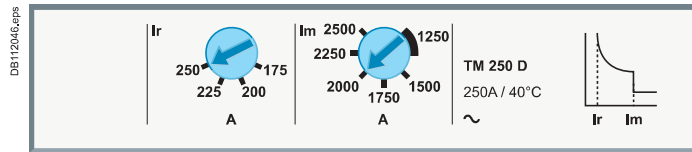
TM thermal-magnetic and MA magnetic trip units can be used on Compact NSX100/160/250 circuit breakers with performance levels B/F/H/N/S/L.

TM trip units are available in 2 versions:

- TM-D, for the protection of distribution cables
- TM-G, with a low threshold, for the protection of generators or long cable lengths.

Vigi modules or Vigirex relays can be added to all the circuit breakers to provide external earth-leakage protection.

TM-D and TM-G thermal-magnetic trip units



Circuit breakers equipped with thermal-magnetic trip units are used mainly in industrial and commercial electrical distribution applications:

- TM-D, for protection of cables on distribution systems supplied by transformers
- TM-G, with a low pick-up for generators (lower short-circuit currents than with transformers) and distribution systems with long cable lengths (fault currents limited by the impedance of the cable).

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 trip unit (16 A to 250 A), corresponding to settings from 11 to 250 A for the range of trip units
- a non-adjustable time delay, defined to ensure protection of the cables.

Magnetic protection (Im)

Short-circuit protection with a fixed or adjustable pick-up Im that initiates instantaneous tripping if exceeded.

- TM-D: fixed pick-up, Im, for 16 to 160 A ratings and adjustable from 5 to 10 x In for 200 and 250 A ratings
- fixed pick-up for 16 to 63 A ratings.

Protection against insulation faults

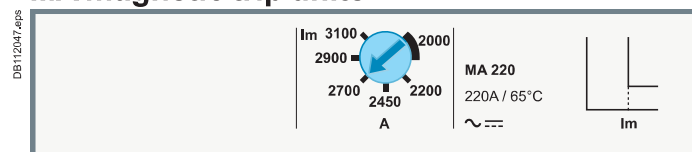
Two solutions are possible by adding:

- a Vigi module acting directly on the trip unit of the circuit breaker
- a Vigirex relay connected to an MN or MX voltage release.

Protection versions

- 3-pole:
 - 3P 3D: 3-pole frame (3P) with detection on all 3 poles (3D)
 - 3P 2D: 3-pole frame (3P) with detection on 2 poles (2D).
- 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).

MA magnetic trip units



In distribution applications, circuit breakers equipped with MA magnetic-only trip units are used for:

- short-circuit protection of secondary windings of LV/LV transformers with overload protection on the primary side.
- as an alternative to a switch-disconnector at the head of a switchboard in order to provide short-circuit protection.

Their main use is however for motor protection applications, in conjunction with a thermal relay and a contactor or motor starter (see "Motor protection", page A-48).

Protection

Magnetic protection (Im)

Short-circuit protection with an adjustable pick-up Im that initiates instantaneous tripping if exceeded.

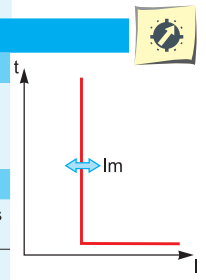
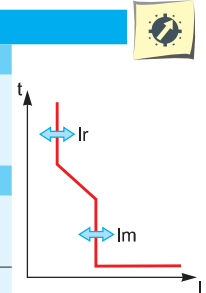
- $I_m = I_n \times \dots$ set in amps on an adjustment dial covering the range 6 to 14 x In for 2.5 to 100 A ratings or 9 to 14 In for 150 to 220 A ratings.

Protection versions

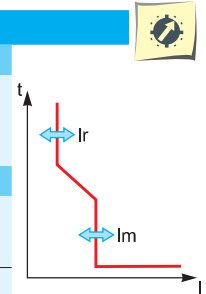
- 3-pole (3P 3D): 3-pole frame (3P) with detection on all 3 poles (3D).
- 4-pole (4P 3D): 4-pole frame (4P) with detection on 3 poles (3D).

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

Thermal-magnetic trip units		TM16D to 250D											
Ratings (A)	In at 40 °C ⁽¹⁾	16	25	32	40	50	63	80	100	125	160	200	250
Circuit breaker	Compact NSX100	■	■	■	■	■	■	■	■	-	-	-	-
	Compact NSX160	-	-	■	■	■	■	■	■	■	■	-	-
	Compact NSX250	-	-	-	-	-	■	■	■	■	■	■	■
Thermal protection													
Pick-up (A) tripping between 1.05 and 1.20 I _r	I _r = I _n x ...	adjustable in amps from 0.7 to 1 x I _n											
Time delay (s)	t _r	non-adjustable											
	t _r at 1.5 x I _n	120 to 400											
	t _r at 6 x I _r	15											
Magnetic protection													
Pick-up (A) accuracy ±20 %	I _m	fixed										adjustable	
	Compact NSX100	190	300	400	500	500	500	640	800				
	Compact NSX160/250	190	300	400	500	500	500	640	800	1250	1250	5 to 10xI _n	
Time delay	t _m	fixed											
Neutral protection													
Unprotected neutral	4P 3D	no detection											
Fully protected neutral	4P 4D	1 x I _r											
Magnetic trip units		MA 2.5 to 220											
Ratings (A)	In at 65 °C	2.5	6.3	12.5	25	50	100	150	220				
Circuit breaker	Compact NSX100	■	■	■	■	■	■	-	-				
	Compact NSX160	-	-	-	■	■	■	■	-				
	Compact NSX250	-	-	-	-	-	-	■	■	■			
Instantaneous magnetic protection													
Pick-up (A) accuracy ±20 %	I _m = I _n x ...	adjustable in amps from 6 to 14 x I _n (9 settings)								adjustable in amps from 9 to 14 x I _n			
Time delay (ms)	t _m	none											



Thermal-magnetic trip units		TM16G to 250G											
Ratings (A)	In at 40 °C ⁽¹⁾	16	25	40	63	80	100	125	160	200	250		
Circuit breaker	Compact NSX100	■	■	■	■	■	■	-	-	-	-		
	Compact NSX160	-	■	■	■	■	■	■	■	-	-		
	Compact NSX250	-	-	-	-	-	-	-	■	■	■		
Thermal protection													
Pick-up (A) tripping between 1.05 and 1.20 I _r	I _r = I _n x ...	adjustable in amps from 0.7 to 1 x I _n											
Time delay (s)	t _r	non-adjustable											
	t _r at 1.5 x I _n	120 to 400											
	t _r at 6 x I _r	-											
Magnetic protection													
Pick-up (A) accuracy ±20 %	I _m	fixed											
	Compact NSX100	63	80	80	125	200	320	-	-	-	-		
	Compact NSX160	-	80	80	125	200	320	440	440	-	-		
	Compact NSX250	-	-	-	-	-	-	-	440	440	520		
Time delay	t _m	fixed											
Neutral protection													
Unprotected neutral	4P 3D	no											
Fully protected neutral	4P 4D	1 x I _r											



(1) For temperatures greater than 40 °C, the thermal protection characteristics are modified. See the temperature derating table.

Protection of distribution systems

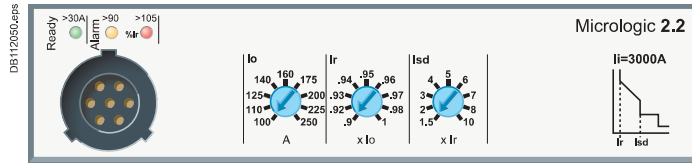
Micrologic 2 and 1.3 M trip units

Micrologic 2 trip units can be used on Compact NSX100 to 630 circuit breakers with performance levels B/F/H/N/S/L.

They provide:

- standard protection of distribution cables
 - indication of:
 - overloads (via LEDs)
 - overload tripping (via the SDx relay module).
- Circuit breakers equipped with Micrologic 1.3 M trip units, without thermal protection, are used in certain applications to replace switch-disconnectors at the head of switchboards. Micrologic 1.3 M trip units are dedicated to Compact NSX400/630 A circuit breakers.

Micrologic 2



Circuit breakers equipped with Micrologic 2 trip units can be used to protect distribution systems supplied by transformers. For generators and long cables, Micrologic 2 G trip units offer better suited low pick-up solutions (see page A-62).

Protection

Settings are made using the adjustment dials with fine adjustment possibilities.

Overloads: Long time protection (Ir)

Inverse time protection against overloads with an 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)

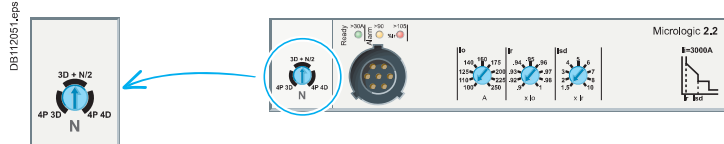
Protection with an adjustable pick-up Isd. Tripping takes place after a very short delay used to allow discrimination with the downstream device.

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 four-pole circuit breakers, neutral protection may be set using a three-position switch:
 - 4P 3D: neutral unprotected
 - 4P 3D + N/2: neutral protection at half the value of the phase pick-up, i.e. $0.5 \times I_r$
 - 4P 4D: neutral fully protected at I_r .



Indications

Front indications

- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Orange overload pre-alarm LED: steady on when $I > 90\% I_r$.
- Red overload LED: steady on when $I > 105\% I_r$.



Remote indications

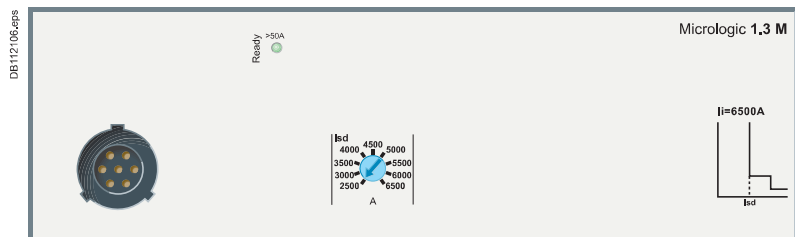
An overload trip signal can be remoted by installing an SDx relay module inside the circuit breaker.

This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is reclosed. For description, see page A-93.



SDx remote indication relay module with its terminal block.

Micrologic 1.3 M for magnetic protection only



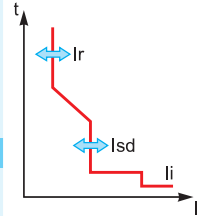
Micrologic 1.3 M trip units provide magnetic protection only, using electronic technology. They are dedicated to 400/630 A 3-pole (3P 3D) circuit breakers or 4-pole circuit breakers with detection on 3 poles (4P, 3D) and are used in certain applications to replace switch-disconnectors at the head of switchboards. They are especially used in 3-pole versions for motor protection, see page A-52.

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

Micrologic 2



Ratings (A)	In at 40 °C ⁽¹⁾	40	100	160	250	400	630
Circuit breaker	Compact NSX100	■	■	-	-	-	-
	Compact NSX160	■	■	■	-	-	-
	Compact NSX250	■	■	■	■	-	-
	Compact NSX400	-	-	-	■	■	-
	Compact NSX630	-	-	-	■	■	■



L Long-time protection

Pick-up (A)	I_o	value depending on trip unit rating (I_n) and setting on dial										
tripping between 1.05 and 1.20 I_r	$I_n = 40$ A	$I_o =$	18	18	20	23	25	28	32	36	40	
	$I_n = 100$ A	$I_o =$	40	45	50	55	63	70	80	90	100	
	$I_n = 160$ A	$I_o =$	63	70	80	90	100	110	125	150	160	
	$I_n = 250$ A (NSX250)	$I_o =$	100	110	125	140	160	175	200	225	250	
	$I_n = 250$ A (NSX400)	$I_o =$	70	100	125	140	160	175	200	225	250	
	$I_n = 400$ A	$I_o =$	160	180	200	230	250	280	320	360	400	
	$I_n = 630$ A	$I_o =$	250	280	320	350	400	450	500	570	630	
	$I_r = I_o \times \dots$		9 fine adjustment settings from 0.9 to 1 (0.9 - 0.92 - 0.93 - 0.94 - 0.95 - 0.96 - 0.97 - 0.98 - 1) for each value of I_o									
Time delay (s) accuracy 0 to -20%	t_r		non-adjustable									
		$1.5 \times I_r$	400									
		$6 \times I_r$	16									
		$7.2 \times I_r$	11									
Thermal memory		20 minutes before and after tripping										

S₀ Short-time protection with fixed time delay

Pick-up (A) accuracy ±10 %	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	7	8	10	
Time delay (ms)	t_{sd}	non-adjustable									
	Non-tripping time	20									
	Maximum break time	80									

I Instantaneous protection

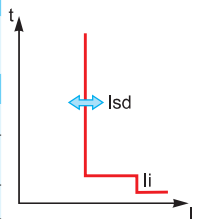
Pick-up (A) accuracy ±15 %	I_{li} non-adjustable	600	1500	2400	3000	4800	6900				
	Non-tripping time	10 ms									
	Maximum break time	50 ms for $I > 1.5 I_{li}$									

(1) If the trip units are used in high-temperature environments, the Micrologic setting must take into account the thermal limitations of the circuit breaker. See the temperature derating table.

Micrologic 1.3 M



Ratings (A)	In at 65 °C	320	500
Circuit breaker	Compact NSX400	■	-
	Compact NSX630	■	■



S Short time protection

Pick-up (A) accuracy ±15 %	I_{sd}	adjustable directly in amps	
		9 settings: 1600, 1920, 2440, 2560, 2880, 3200, 3520, 3840, 4160 A	9 settings: 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500 A
Time delay (ms)	t_{sd}	non-adjustable	
		Non-tripping time	
		Maximum break time	

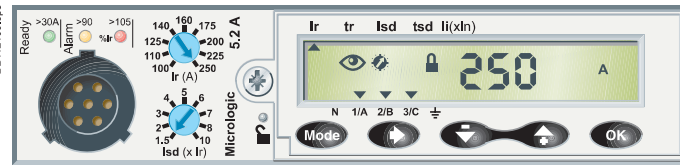
I Instantaneous protection

Pick-up (A) accuracy ±15 %	I_{li} non-adjustable	4800	6500
	Non-tripping time	0	
	Maximum break time	30 ms	

Protection of distribution systems

Micrologic 5 / 6 A or E trip units

Micrologic 5 / 6 A (Ammeter) or E (Energy) trip units can be used on Compact NSX100 to 630 circuit breakers with performance levels B/F/H/N/S/L. They all have a display unit. They offer basic LSI protection (Micrologic 5) or LSI and ground-fault protection G (Micrologic 6). They also offer measurement, alarm and communication functions.



Protection

Settings can be adjusted in two ways, using the dials and/or the keypad. The keypad can be used to make fine adjustments in 1 A steps below the maximum value defined by the setting on the dial. Access to setting modifications via the keypad is protected by a locking function displayed on the screen and controlled by a microswitch. The lock is activated automatically if the keypad is not used for 5 minutes. Access to the microswitch is protected by a transparent lead-sealable cover. With the cover closed, it is still possible to display the various settings and measurements using the keypad.

Overloads: Long time protection (Ir)

Inverse time protection against overloads with an adjustable current pick-up **Ir** set using a dial or the keypad for fine adjustments. The time delay **tr** is set using the keypad.

Short-circuits: Short-time protection (I_{sd})

Short-circuit protection with an adjustable pick-up **I_{sd}** and adjustable time delay **tsd**, with the possibility of including a portion of an inverse time curve (I²t On).

Short-circuits: Instantaneous protection (Ii)

Instantaneous protection with adjustable pick-up **Ii**.

Additional ground fault protection (I_g) on Micrologic 6

Residual type ground-fault protection with an adjustable pick-up **I_g** (with Off position) and adjustable time delay **tg**. Possibility of including a portion of an inverse time curve (I²t On).

Neutral protection

■ On 4-pole circuit breakers, this protection can be set via the keypad:

- Off: neutral unprotected
- 0.5: neutral protection at half the value of the phase pick-up, i.e. 0.5 x Ir
- 1.0: neutral fully protected at Ir
- OSN: Oversized neutral protection at 1.6 times the value of the phase pick-up. Used when there is a high level of 3rd order harmonics (or orders that are multiples of 3) that accumulate in the neutral and create a high current. In this case, the device must be limited to Ir = 0.63 x In for the maximum neutral protection setting of 1.6 x Ir.
- With 3-pole circuit breakers, the neutral can be protected by installing an external neutral sensor with the output (T1, T2) connected to the trip unit.

Zone selective interlocking (ZSI)

A ZSI terminal block may be used to interconnect a number of Micrologic control units to provide zone selective interlocking for short-time (I_{sd}) and ground-fault (I_g) protection, without a time delay. For Compact NSX 100 to 250, the ZSI function is available only in relation to the upstream circuit breaker (ZSI out).

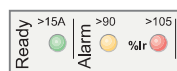
Display of type of fault

On a fault trip, the type of fault (Ir, I_{sd}, Ii, I_g), the phase concerned and the interrupted current are displayed. An external power supply is required.



Indications

Front indications



- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Orange overload pre-alarm LED: steady on when I > 90 % Ir.
- Red overload LED: steady on when I > 105 % Ir.

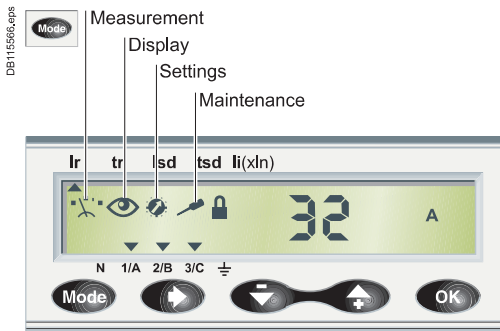
Remote indications

An SDx relay module installed inside the circuit breaker can be used to remote the following information:

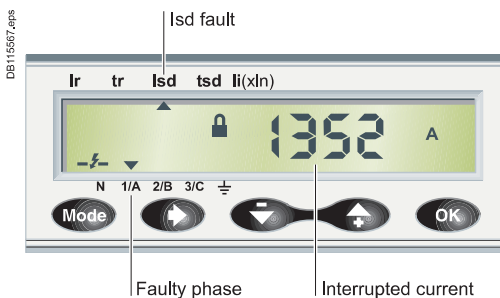
- overload trip
- overload prealarm (Micrologic 5) or ground fault trip (Micrologic 6).

This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is closed.

These outputs can be reprogrammed to be assigned to other types of tripping or alarm. The module is described in detail in the section dealing with accessories.



Trip unit menus.



Display of interrupted current.

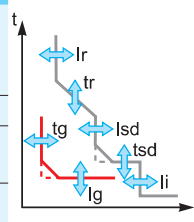
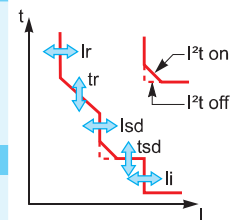


SDx remote indication relay module with its terminal block.

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



Protection		Micrologic 5 / 6 A or E trip units										
Ratings (A)	In at 40 °C ⁽¹⁾	40 ⁽²⁾	100	160	250	400	630					
Circuit breaker	Compact NSX100	■	■	-	-	-	-					
	Compact NSX160	■	■	■	-	-	-					
	Compact NSX250	■	■	■	■	-	-					
	Compact NSX400	-	-	-	-	■	-					
	Compact NSX630	-	-	-	-	-	■	■				
L Long-time protection												
Pick-up (A) tripping between 1.05 and 1.20 I _r	I _r = ...	dial setting	value depending on trip unit rating (I _n) and setting on dial									
		I _n = 40 A	I _o =	18	18	20	23	25	28	32	36	40
		I _n = 100 A	I _o =	40	45	50	55	63	70	80	90	100
		I _n = 160 A	I _o =	63	70	80	90	100	110	125	150	160
		I _n = 250 A	I _o =	100	110	125	140	160	175	200	225	250
		I _n = 400 A	I _o =	160	180	200	230	250	280	320	360	400
		I _n = 630 A	I _o =	250	280	320	350	400	450	500	570	630
		keypad setting	Fine adjustment in 1 A steps below maximum value set on dial									
Time delay (s) accuracy 0 to -20 %	tr = ...	keypad setting	0.5	1	2	4	8	16				
		1.5 x I _r	15	25	50	100	200	400				
		6 x I _r	0.5	1	2	4	8	16				
		7.2 x I _r	0.35	0.7	1.4	2.8	5.5	11				
Thermal memory		20 minutes before and after tripping										
S Short-time protection with adjustable time delay												
Pick-up (A) accuracy ±10 %	I _{sd} = I _r x ...	dial setting for Micrologic 5	1.5	2	3	4	5	6	7	8	10	
		keypad settings for micrologic 6	Adjustment in steps of 0.5 x I _n over the range 1.5 x I _n to: 15 x I _n (40 to 160 A), 12 x I _n (250 to 400 A) or 11 x I _n (630 A)									
Time delay (s)	tsd = ...	keypad setting	I ² Off	0	0.1	0.2	0.3	0.4				
		setting	I ² On	-	0.1	0.2	0.3	0.4				
		Non-tripping time (ms)	20	80	140	230	350					
		Maximum break time (ms)	80	140	200	320	500					
I Instantaneous protection												
Pick-up (A) accuracy ±15 %	I _i = I _n x	keypad setting	Adjustment in steps of 0.5 x I _n over the range 1.5 x I _n to: 15 x I _n (40 to 160 A), 12 x I _n (250 to 400 A) or 11 x I _n (630 A)									
		Non-tripping time	10 ms									
		Maximum break time	50 ms for I > I _i									
G Ground-fault protection - for Micrologic 6 A or E												
Pick-up (A) accuracy ±10 %	I _g = I _n x	dial setting	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1	Off	
		I _n = 40 A	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1	Off	
		I _n > 40 A	Fine adjustment in 0.05 A steps using the keypad									
Time delay (s)	tg = ...	keypad setting	I ² Off	0	0.1	0.2	0.3	0.4				
		setting	I ² On	-	0.1	0.2	0.3	0.4				
		Non-tripping time (ms)	20	80	140	230	350					
		Maximum break time (ms)	80	140	200	320	500					
Test	I _g function	built-in										



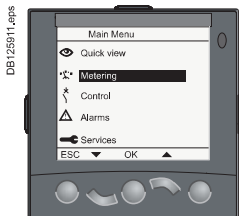
(1) If the trip units are used in high-temperature environments, the Micrologic setting must take into account the thermal limitations of the circuit breaker. See the temperature derating table.
 (2) For 40 A rating, the neutral N/2 adjustment is not possible.

In addition to protection functions, Micrologic 5 / 6 trip units offer all the functions of Power Meter products as well as operating-assistance for the circuit breaker.

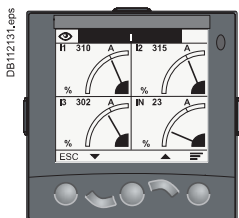
- display of settings
- measurement functions:
 - Ammeter (A)
 - Energy (E)
- alarms
- time-stamped histories and event tables
- maintenance indicator
- communication
- Refer to: user manual "ULP system" TRV99101.



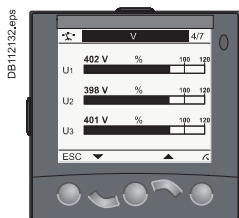
Micrologic built-in LCD display showing an energy measurement.



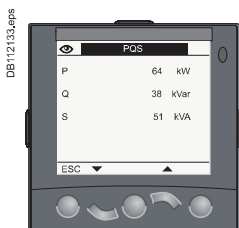
FDM121 display: navigation.



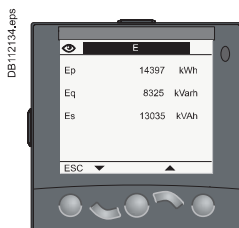
Current.



Voltage.



Power.



Consumption.

Examples of measurement screens on the FDM121 display unit.

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

Display



Micrologic LCD

The user can display all the protection settings and the main measurements on the LCD screen of the trip unit.

- Micrologic A: instantaneous rms current measurements.
- Micrologic E: voltage, frequency and power measurements and energy metering, in addition to the measurements offered by Micrologic A

To make the display available under all conditions and increase operating comfort, an external power supply is recommended for Micrologic A.

It is indispensable to:

- display faults and interrupted current measurements
- use all the functions of Micrologic E (e.g. metering of low power and energy values)
- ensure operation of the communication system.

The external power supply can be shared by several devices. For description, see page A-44.

FDM121 display unit

An FDM121 switchboard display unit can be connected to a Micrologic trip unit using a prefabricated cord to display all measurements on a screen. The result is a veritable 96 x 96 mm Power Meter.

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

The FMD121 display unit requires a 24 V DC power supply. The Micrologic trip unit is supplied by the same power supply via the cord connecting it to the FDM121.

PC screen

When the Micrologic, with or without an FDM121 switchboard display unit, is connected to a communication network, all information can be accessed via a PC.

Measurements



Instantaneous rms measurements

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

In the event of a fault trip, the current interrupted is memorised.

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

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

Maximeters / minimeters

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

Energy metering

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

Demand and maximum demand values

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

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

Power quality

Micrologic E calculates power quality indicators taking into account the presence of harmonics up to the 15th order, including the total harmonic distortion (THD) of current and voltage.



Micrologic 5 / 6 integrated Power Meter functions			Type		Display	
			A	E	Micrologic LCD	FDM display
Display of protection settings						
Pick-ups (A) and delays	All settings can be displayed	Ir, tr, lsd, tsd, li, lg, tg	■	■	■	-
Measurements						
Instantaneous rms measurements						
Currents (A)	Phases and neutral	I1, I2, I3, IN	■	■	■	■
	Average of phases	$I_{avg} = (I1 + I2 + I3) / 3$	■	■	-	■
	Highest current of the 3 phases and neutral	I_{max} of I1, I2, I3, IN	■	■	■	■
	Ground fault (Micrologic 6)	% Ig (pick-up setting)	■	■	■	■
	Current unbalance between phases	% Iavg	-	■	-	■
Voltages (V)	Phase-to-phase	U12, U23, U31	-	■	■	■
	Phase-to-neutral	V1N, V2N, V3N	-	■	■	■
	Average of phase-to-phase voltages	$U_{avg} = (U12 + U21 + U23) / 3$	-	■	-	■
	Average of phase-to-neutral voltages	$V_{avg} = (V1N + V2N + V3N) / 3$	-	■	-	■
	Ph-Ph and Ph-N voltage unbalance	% Uavg and % Vavg	-	■	-	■
	Phase sequence	1-2-3, 1-3-2	-	■	■	■ ⁽³⁾
Frequency (Hz)	Power system	f	-	■	-	■
Power	Active (kW)	P, total / per phase	- / -	■ / ■	■ / -	■ / ■
	Reactive (kVAR)	Q, total / per phase	- / -	■ / ■	■ / -	■ / ■
	Apparent (kVA)	S, total / per phase	- / -	■ / ■	■ / -	■ / ■
	Power factor and cos φ (fundamental)	PF and cos φ, total and per phase	-	■	-	■
Maximeters / minimeters						
	Associated with instantaneous rms measurements	Reset via Micrologic or FDM display unit	■	■	-	■
Energy metering						
Energy	Active (kW), reactive (kVARh), apparent (kVAh)	Total since last reset Absolute or signed mode ⁽¹⁾	-	■	■	■
Demand and maximum demand values						
Demand current (A)	Phases and neutral	Present value on the selected window	-	■	-	■
		Maximum demand since last reset	-	■	-	■
Demand power	Active (kWh), reactive (kVAR), apparent (kVA)	Present value on the selected window	-	■	-	■
		Maximum demand since last reset	-	■	-	■
Calculation window	Sliding, fixed or com-synchronised	Adjustable from 5 to 60 minutes in 1 minute steps ⁽²⁾	-	■	-	-
Power quality						
Total harmonic distortion (%)	Of voltage with respect to rms value	THDU, THDV of the Ph-Ph and Ph-N voltage	-	■	-	■
	Of current with respect to rms value	THDI of the phase current	-	■	-	■

⁽¹⁾ Absolute mode: $E_{absolute} = E_{out} + E_{in}$; Signed mode: $E_{signed} = E_{out} - E_{in}$.

⁽²⁾ Available via the communication system only.

⁽³⁾ FDM121 only.

Additional technical characteristics

Measurement accuracy

Accuracies are those of the entire measurement system, including the sensors:

- current: Class 1 as per IEC 61557-12
- voltage: 0.5 %
- power and energy: Class 2 as per IEC 61557-12
- frequency: 0.1 %.

Personalised alarms with time-stamping



Alarm types

The user can assign an alarm to all Micrologic A or E measurements or events:

- up to 12 alarms can be used together:
- two alarms are predefined and activated automatically:
 - Micrologic 5: overload (Ir)
 - Micrologic 6: overload (Ir) and ground fault (Ig)
- thresholds, priorities and time delays can be set for ten other alarms.
- the same measurement can be used for different alarms to precisely monitor certain values, e.g. the frequency or the voltage
- alarms can also be assigned to various states: phase lead/lag, four quadrants, phase sequence
- selection of display priorities, with pop-up possibility
- alarm time-stamping.

Alarm settings

Alarms cannot be set via the keypad or the FDM121 display unit. They are set via communication with the PC. Set-up includes the threshold, priority, activation delay before display and deactivation delay. It is also possible to reprogram the standard assignment for the two SDx relay outputs to user-selected alarms.

Alarm reading

Remote alarm indications.

- Reading on FDM121 display unit or on PC via the communication system.
- Remote indications via SDx relay with two output contacts for alarms.

PB103365.eps



Micrologic built-in LCD display.

DB125971.eps



FDM121 display: navigation.

Histories and event tables



Micrologic A and E have histories and event tables that are always active.

Three types of time-stamped histories

- Tripping due to overruns of Ir, Isd, li, Ig: last 17 trips
- Alarms: last 10 alarms
- Operating events: last 10 events

Each history record is stored with:

- indications in clear text in a number of user-selectable languages
- time-stamping: date and time of event
- status: pick-up / drop-out

Two types of time-stamped event tables

- Protection settings.
- Minimizers / maximeters.

Display of alarms and tables

The time-stamped histories and event tables may be displayed on a PC via the communication system.

Embedded memory

Micrologic A and E have a non-volatile memory that saves all data on alarms, histories, event tables, counters and maintenance indicators even if power is lost.

Maintenance indicators



Micrologic A and E have indicators for, among others, the number of operating cycles, contact wear and operating times (operating hours counter) of the Compact NSX circuit breaker.

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

The information provided by the indicators cannot be displayed on the Micrologic LCD. It is displayed on the PC via the communication system.

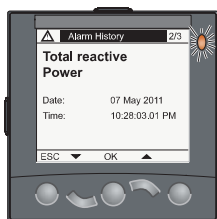
Management of installed devices

Each circuit breaker equipped with a Micrologic 5 or 6 trip unit can be identified via the communication system:

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

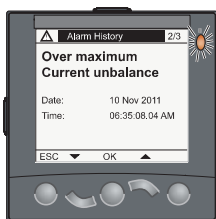
This information together with the previously described indications provides a clear view of the installed devices.

DB413152.eps



Overpower alarm.

DB413153.eps



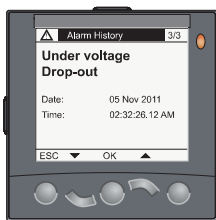
Phase unbalance alarm.

DB413154.eps



Alarm pick-up and drop-out.

DB413155.eps



Examples of operating-assistance screens on the FDM121 display unit.



Micrologic 5 / 6 operating assistance functions			Type		Display	
			A	E	Micrologic LCD	FDM display
Operating assistance						
Personalised alarms						
Settings	Up to 10 alarms assigned to all A and E measurements ⁽²⁾			-	-	-
	Phase lead/lag, four quadrants, phase sequence, display priority selection ⁽²⁾			-	-	-
Display	Alarms / tripping			- / ■	■ / ■	
Remote indications	Activation of two dedicated contacts on SDx module			-	-	-
Time-stamped histories (ms)						
Trips (last 17)	Cause of tripping	Ir, Isd, li (Micrologic 5, 6)			-	■
		Ig (Micrologic 6)			-	■
		Phase fault			-	■
		Interrupted current value			-	■
Alarms (last 10)				-		■
Operating events (last 10)	Event types	Modification of protection setting by dial			-	■
		Opening of keypad lock			-	■
		Test via keypad			-	■
		Test via external tool			-	■
		Time setting (date and time)			-	■
		Reset for maximeter/minimeter and energy meter			-	■
Time stamping (date and time, text, status)				-		■
Time-stamped event tables						
Protection settings	Setting modified (value displayed)	Ir tr Isd tsd li lg tg ⁽²⁾			-	-
	Time-stamping	Date and time of modification ⁽²⁾			-	-
	Previous value	Value before modification ⁽²⁾			-	-
Min/Max	Values monitored	I1 I2 I3 IN			-	■
		U12 U23 U31 f			-	■
	Time-stamping of each value	Date and time of min/max record			-	■
		Current min/max value	Min/max value			-
Maintenance indicators						
Counter	Mechanical cycles ⁽¹⁾ Electrical cycles ⁽¹⁾ Trips Alarms Hours	Assignable to an alarm			-	■
		Assignable to an alarm			-	■
		One per type of trip ⁽²⁾			-	-
		One for each type of alarm ⁽²⁾			-	-
		Total operating time (hours) ⁽²⁾			-	-
Indicator	Contact wear	%			-	■
Load profile	Hours at different load levels	% of hours in four current ranges: 0-49 % In, 50-79 % In, 80-89 % In and ≥ 90 % In			-	■

⁽¹⁾ The BSCM module (page A-33) is required for these functions.

⁽²⁾ Available via the communication system only.

Additional technical characteristics

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. Breaking under normal load conditions results in a very slight increment. The indicator value may be read on the FDM121 display. It provides an estimation of contact wear calculated on the basis of the cumulative forces affecting the circuit breaker. When the indicator reaches 80 %, it is advised to replace the circuit breaker to ensure the availability of the protected equipment.

Circuit breaker load profile

Micrologic 5 / 6 calculates the load profile of the circuit breaker protecting a load circuit. The profile indicates the percentage of the total operating time at four current levels (% of breaker In):

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

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

Switchboard-display functions

Micrologic A/E trip unit with COM option (ULP)

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

FDM121 switchboard display

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. It uses the sensors and processing capacity of the Micrologic trip unit. It is easy to use and requires no special software or settings. It is immediately operational when connected to the Compact NSX by a simple cord.

Also, it provides monitoring and control with the use of the I/O application module, the motor mechanism module, or the Breaker Status module.

The FDM121 is a large display, but requires very little depth. The anti-glare graphic screen is backlit for very easy reading even under poor ambient lighting and at sharp angles.

Display of Micrologic measurements and alarms

The FDM121 is intended to display Micrologic 5 / 6 measurements, alarms and operating information. It cannot be used to modify the protection settings.

Measurements may be easily accessed via a menu. All user-defined alarms are automatically displayed. The display mode depends on the priority level selected during alarm set-up:

- high priority: a pop-up window displays the time-stamped description of the alarm and the orange LED flashes
- medium priority: the orange "Alarm" LED goes steady on
- low priority: no display on the screen.

All faults resulting in a trip automatically produce a high-priority alarm, without any special settings required. In all cases, the alarm history is updated. Micrologic saves the information in its non-volatile memory in the event of an FDM121 power failure.

Status indications and remote control

When the circuit breaker is equipped with the Breaker Status Module, the FDM121 display can also be used to view circuit breaker status conditions:

- O/F: ON/OFF
- SD: trip indication
- SDE: Fault-trip indication (overload, short-circuit, ground fault).

When the circuit breaker system is equipped with the I/O Application module, the FDM121 can monitor and control:

- cradle management
- circuit breaker operation
- light and load control
- custom application.

When the circuit breaker system is equipped with the motor mechanism module, the FDM121 offers remote closing and opening control.

Main characteristics

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

Mounting

The FDM121 is easily installed in a switchboard.

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

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

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

Connection

The FDM121 is equipped with:

- a 24 V DC terminal block:
 - plug-in type with 2 wire inputs per point for easy daisy-chaining
 - power supply range of 24 V DC -20 % (19.2 V) to 24 V DC +10 % (26.4 V).

A 24 V DC type auxiliary power supply must be connected to a single point on the ULP system. The FDM121 display unit has a 2-point screw connector on the rear panel of the module for this purpose. The ULP module to which the auxiliary power supply is connected distributes the supply via the ULP cable to all the ULP modules connected to the system and therefore also to Micrologic.



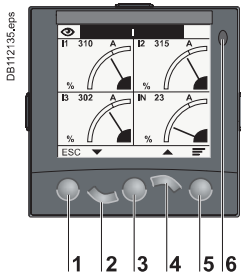
FDM121 display.



Surface mount accessory.



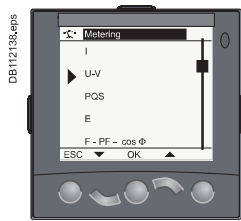
Connection with FDM121 display unit.



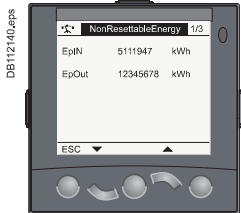
- 1 Escape
- 2 Down
- 3 OK
- 4 Up
- 5 Context
- 6 Alarm LED



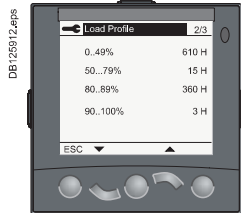
Product identification.



Metering: sub-menu.



Metering: meter.



Services.

■ two RJ45 jacks.

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

Navigation

Five buttons are used for intuitive and fast navigation. The "Context" button may be used to select the type of display (digital, bargraph, analogue). The user can select the display language (Chinese, English, French, German, Italian, Portuguese, Spanish, etc.).

Screens

Main menu

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

- Quick view
- Alarms
- Metering
- Services.
- Control

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

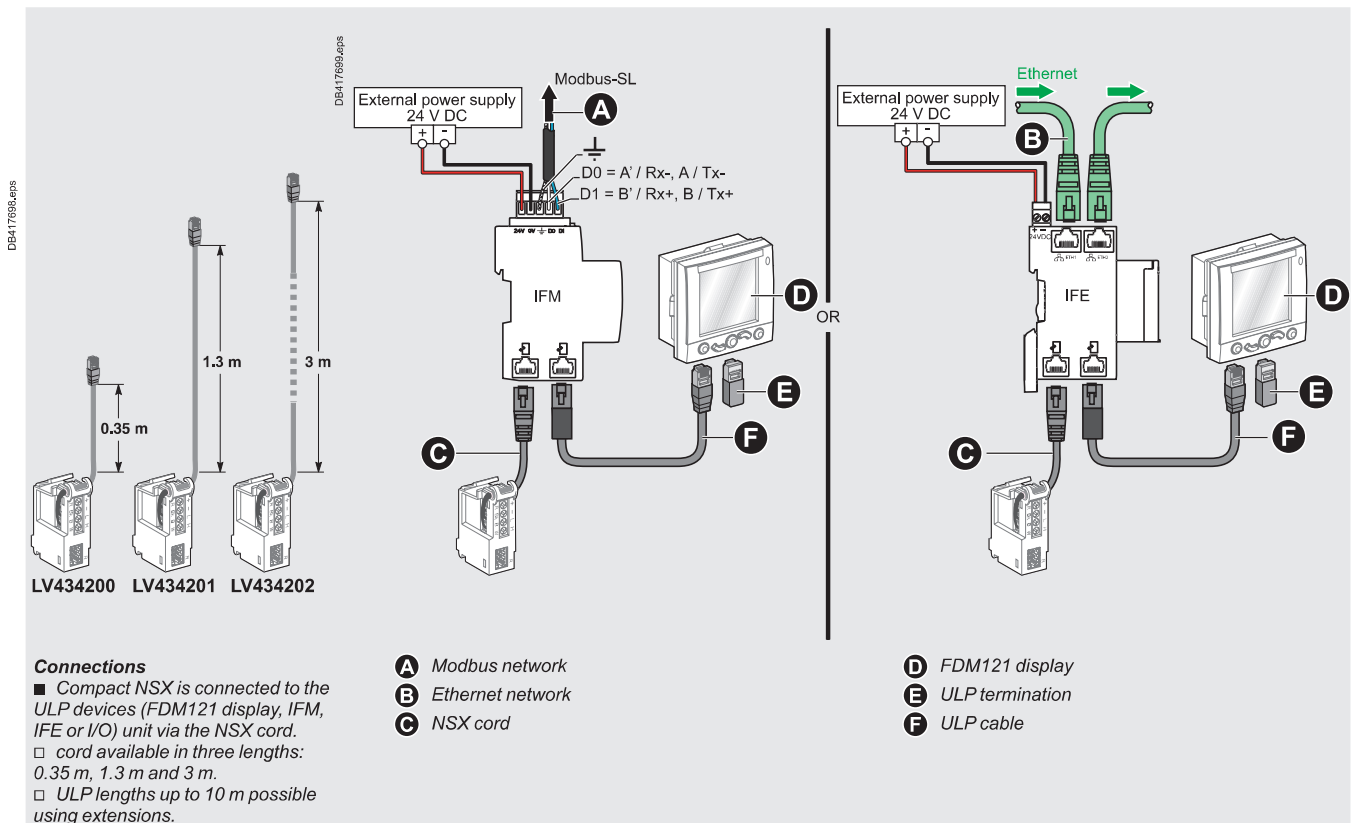
Fast access to essential information

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

Access to detailed information

- "Metering" can be used to display the measurement data (I, U-V, f, P, Q, S, E, THD, PF) with the corresponding min/max values.
- Alarms displays active alarms and the alarm history.
- Services provides access to the operation counters, energy and maximeter reset function, maintenance indicators, identification of modules connected to the internal bus and FDM121 internal settings (language, contrast, etc.).

Communication components and FDM121 connections



Connections

- Compact NSX is connected to the ULP devices (FDM121 display, IFM, IFE or I/O) unit via the NSX cord.
- cord available in three lengths: 0.35 m, 1.3 m and 3 m.
- ULP lengths up to 10 m possible using extensions.

- A** Modbus network
- B** Ethernet network
- C** NSX cord

- D** FDM121 display
- E** ULP termination
- F** ULP cable

Switchboard-display functions

Micrologic A/E control unit with COM Ethernet gateway

Micrologic measurement capabilities come into full play with the FDM128 switchboard display. It connects to Ethernet communication via RJ45 port and displays Micrologic information. The result is a true integrated unit combining a circuit breaker and a Power Meter. Additional operating assistance functions can also be displayed.

FDM128 switchboard display

The FDM128 is an intelligent Ethernet display. It collects the data from up to 8 devices via Ethernet network.

The FDM128 switchboard display unit can be connected to a Micrologic COM option (BCM ULP via IFE). It uses the sensors and processing capacity of the Micrologic control unit. It is easy to use and requires no special software or settings.

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.

Display of Micrologic measurements and trips

The FDM128 is intended to display Micrologic A/E measurements, trips and operating information. It cannot be used to modify the protection settings.

Measurements may be easily accessed via a menu.

Trips are automatically displayed.

A pop-up window displays the time-stamped description of the trip.

Status indications

When the circuit breaker is equipped with the Breaker Status Command Module (BSCM) and NSX cord, the FDM128 display can also be used to view circuit breaker status conditions:

- O/F: ON/OFF
- SDE: Fault-trip indication (overload, short-circuit, ground fault)
- CE, CD cradle management with I/O application module.

Remote control

When the circuit breaker is equipped with the BSCM, NSX cord and Communicating Motor Mechanism (MTc), the FDM128 display can also be used to control (open/close) the circuit breaker.

Main characteristics

- 115.2 x 86.4 mm with 5.7" QVGA display 320 x 240 pixels.
- Color TFT LCD, LED backlight.
- Wide viewing angle: vertical $\pm 80^\circ$, horizontal $\pm 70^\circ$.
- High resolution: excellent reading of graphic symbols.
- Operating temperature range -10°C to $+55^\circ\text{C}$.
- CE / UL / CSA marking (pending).
- 24 V DC power supply, with tolerances 24 V (limit 20.4 - 28.8 V DC).
- Consumption ≤ 6.8 W.

Mounting

The FDM128 is easily installed in a switchboard.

- Standard door hole $\varnothing 22$ mm.

The FDM128 degree of protection is IP65 in front and IP54.

Connection

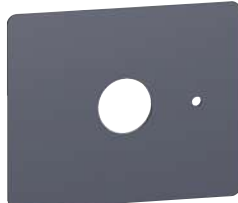
The FDM128 is equipped with:

- a 24 V DC terminal block:
 - power supply range of 24 V DC (limit 20.4 - 28.8 V DC). The FDM128 display unit has a 2-point screw connector on the rear panel of the module for this purpose.
- One RJ45 Ethernet jacks.

The Micrologic connects to the internal communication terminal block on the Masterpact via the breaker ULP cord and Ethernet connection through IFE.

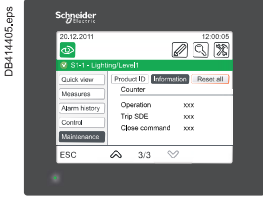


FDM128 display.

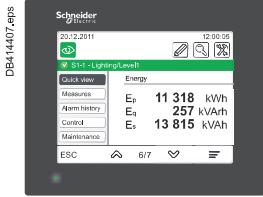


Surface mount accessory.

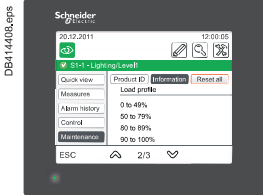




Product identification.



Metering: meter.





Services.

Navigation

Touch screen is used for intuitive and fast navigation. The user can select the display language (Chinese, English, French, German, Italian, Portuguese, Spanish, etc.).

Screens

Main menu

-  Quick view
-  Metering
-  Control
-  Alarms
-  Maintenance

When not in use, the screen is automatically shifted to low back-lighting.









Fast access to essential information

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

Access to detailed information

- "Metering" can be used to display the measurement data (I, U-V, f, P, Q, S, E, THD, PF) with the corresponding min/max values.
- Alarms displays the trip history.
- Services provides access to the operation counters, energy and maximeter reset function, maintenance indicators, identification of modules connected to the internal bus and FDM128 internal settings (language, contrast, etc.).

Enerlin'X communication devices and displays

	Name	Function	Port		Bin. Input	Analog. Input	Bin. Output	Cial. Ref.
			(to device)	(to server)				
A	 Com'X 200	Energy Server with Ethernet Gateway ⁽¹⁾ function	Modbus Master	Ethernet cable + WiFi	6	2	-	EBX200
B	 FDM128	Ethernet LCD colour touch screen	-	Ethernet	-	-	-	LV434128
C	 FDM121	LCD display for circuit breaker	ULP	-	-	-	-	TRV00121
D		IFE interface + gateway	Modbus Master & ULP	Ethernet	-	-	-	LV434011
		IFE interface	ULP	Ethernet	-	-	-	LV434010
E	 Acti9 Smartlink Ethernet	Ethernet interface with Input/Output functions & Gateway	Modbus Master	Ethernet	14	2	7	A9XMEA08
F	 Acti9 Smartlink Modbus	Modbus interface with Input/Output functions	-	Modbus Slave	22	-	11	A9XMSB11
G	 IFM	Modbus interface for circuit breaker	ULP	Modbus Slave	-	-	-	TRV00210
H	 I/O	Input/Output application module for circuit breaker	ULP	ULP	6	-	3	LV434063

(1) Gateway: transfers data from a network to another (ie.: Modbus to Ethernet).

(2) Interface: transfers data from an equipment to a network (ie.: ULP to Modbus).



Plug and play commissioning tools give a real peace of mind to panel builders as their panels can be functionally checked before delivery.

Commissioning / maintenance tools

Web pages embedded into Com'X 200 and Acti9 Smartlink Ethernet gateways

Access with a standard PC and common browser:

- commissioning,
- communication diagnosis,
- functional tests...

Electrical Asset Manager

Loaded into a standard PC Error free commissioning. Time saving, easier management and maintenance thanks to the advanced services:

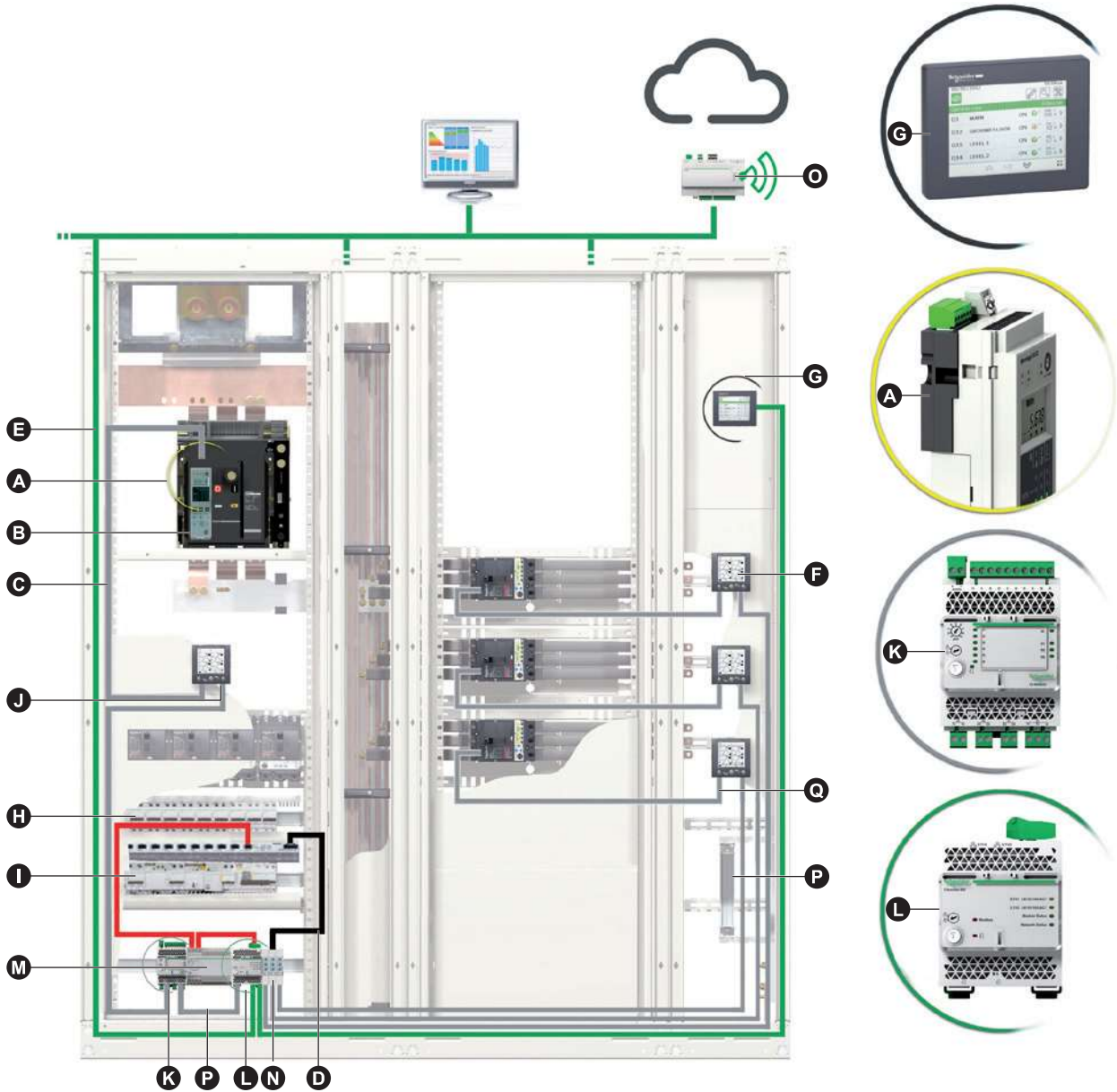
- project management,
- configuration of controllers, gateways, ...
- test of communication networks, diagnostic report...

Wiring system ULP

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

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

PB108180_005



- A** BCM ULP: Breaker Communication Module with ULP port
- B** Micrologic control unit
- C** Breaker ULP cord

0.35 m	LV434195
1.3 m	LV434196
3 m	LV434197
- D** Modbus cable
- E** Ethernet cable
- F** FDM121: Front Display Module TRV00121
- G** FDM128: Front Display Module LV434128
- H** Smartlink A9XMSB11
- I** Acti9
- J** ULP line terminators TRV00880
- K** Input/Output interface LV434063

- L** IFE: Ethernet interface LV434010 or LV434011
 - M** External 24 V DC power supply module
 - N** IFM: Modbus-SL interface TRV00210
 - O** Com'X 200
 - P** ULP cable

0.3 m	TRV00803
0.6 m	TRV00806
1 m	TRV00810
2 m	TRV00820
3 m	TRV00830
5 m	TRV00850
 - Q** NSX cord

0.35 m	LV434200
1.3 m	LV434201
3 m	LV434202
- Ethernet
— Modbus
— ULP
— 24 V DC

Overview of functions

Available information and functions



Micrologic trip units for 3 poles, 4 poles Compact NSX circuit breakers.

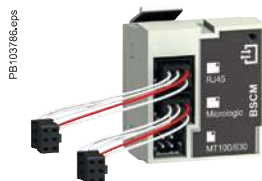
Available functions	Micrologic type	
Status indications		
ON/OFF (O/F)	A	E
Fault-trip SDE	A	E
Connected / disconnected / test position CE/CD (I/O application module only)	A	E
Controls		
Open/close MT or MTc	A	E
Measurements		
Instantaneous measurement information	A	E
Averaged measurement information		E
Maximeter / minimeter	A	E
Energy metering		E
Demand for current and power		E
Power quality		E
Operating assistance		
Protection and alarm settings	A	E
Histories	A	E
Time stamped event tables	A	E
Maintenance indicators	A	E

Embedded trip unit and communication module



Micrologic trip unit

All Compact circuit breakers are equipped with a Micrologic trip unit. This adjustable unit is mainly designed for tripping the circuit breaker in case of necessity and monitoring the downstream circuit. Alarms may be programmed for remote indications. Electrical measurements, operation data for predictive maintenance, are provided for local display or distant monitoring.



BSCM module.

BSCM module

Functions

The optional BSCM Breaker Status & Control Module is used to acquire device status indications and control the communicating remote-control function. It includes a memory used to manage the maintenance indicators.

Status indications

Indication of device status:
O/F, SD and SDE.

Maintenance indicators

The BSCM module manages the following indicators:

- mechanical operation counter
- electrical operation counter
- history of status indications.

It is possible to assign an alarm to the operation counters.

Controls

The module can be used to carry out communicating remote control operations: (open, close and reset) in different modes (manual, auto).

Mounting

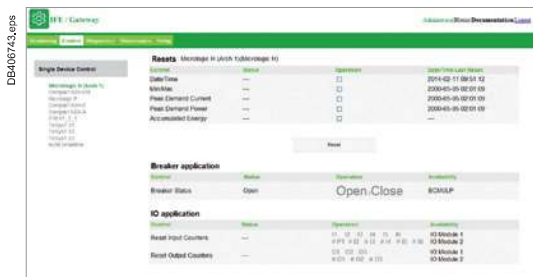
The BSCM module can be installed on all Compact NSX circuit breakers and switch-disconnectors. It simply clips into the auxiliary contact slots. It occupies the slots of one O/F contact and one SDE contact. The BSCM is supplied with 24 V DC power automatically via the NSX cord when the communication system is installed.



IFE interface, ref.: LV434010



IFE interface + gateway, ref.: LV434011



IFE interface, IFE interface + gateway description

Introduction

The IFE interface and IFE interface + gateway enable LV circuit breakers as Masterpact NT/NW, Compact NSX or Powerpact to be connected to an Ethernet network.

IFE interface: ref. LV434010

Provides an Ethernet access to a single LV circuit breaker.

Function

Interface - one circuit breaker is connected to the IFE interface via its ULP port.

IFE interface + gateway: ref. LV434011

Provides an Ethernet access to one or several LV circuit breakers.

Functions

- Interface - one circuit breaker is connected to the IFE interface via its ULP port.
- Gateway: several circuit breakers on a Modbus network are connected via the IFE interface + gateway master Modbus port.

IFE interface, IFE interface + gateway features

- Dual 10/100 Mbps Ethernet port for simple daisy chain connection.
- Device profile web service for discovery of the IFE interface, IFE interface + gateway on the LAN.
- ULP compliant for localization of the IFE interface in the switchboard.
- Ethernet interface for Compact, Masterpact and Powerpact circuit breakers.
- Gateway for Modbus-SL connected devices (IFE interface + gateway only).
- Embedded set-up web pages.
- Embedded monitoring web pages.
- Embedded control web pages.
- Built-in e-mail alarm notification.

Mounting

The IFE interface, IFE interface + gateway are DIN rail mounting devices. A stacking accessory enables the user to connect several IFMs (ULP to Modbus interfaces) to an IFE interface + gateway without additional wiring.

24 V DC power supply

The IFE interface, IFE interface + gateway must always be supplied with 24 V DC. The IFMs stacked to an IFE interface + gateway are supplied by the IFE interface + gateway, thus it is not necessary to supply them separately. It is recommended to use an UL listed and recognized limited voltage/limited current or a class 2 power supply with a 24 V DC, 3 A maximum.

IFE interface, IFE interface + gateway firmware update

The firmware can be updated using:

- FTP
- customer engineering tool.

Required circuit breaker communication modules

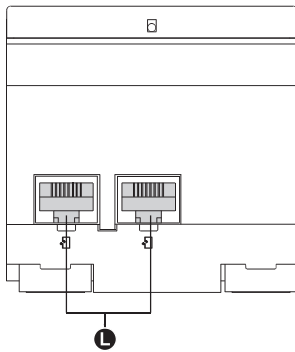
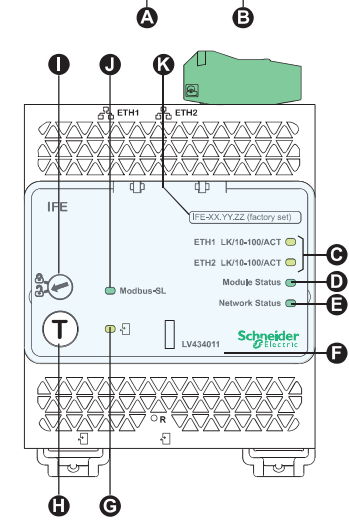
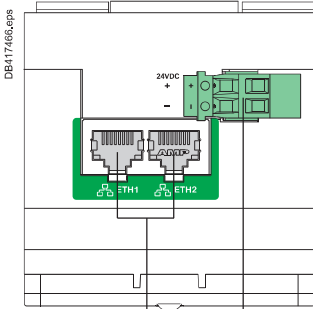
The connection to IFE interface or IFE interface + gateway requires a communication module embedded into the circuit breaker:

- Compact NSX: NSX cord and/or BSCM module

The insulated NSX cord is mandatory for system voltages greater than 480 V AC. When the second ULP RJ45 connector is not used, it must be closed with an ULP terminator (TRV00880).

Network communication interface

Characteristic		Value
Type of interface module		Modbus RTU, RS485 serial connection Modbus TCP/IP Ethernet
Transmission	Modbus RS485	Transfer rate: 9,600...19,200 Baud Medium Double shielded twisted pair Impedance 120 Ω
	Ethernet	Transfer rate : 10/100 Mbps Medium STP, Cat5e, straight cable
Structure	Type	Modbus, Ethernet
	Method	Master/Slave
Device type	Modbus	Master
	Ethernet	Server
Turnaround time	Modbus	10 ms
	Ethernet	1 ms
Maximum length of cable	Modbus	1000 m
	Ethernet	100 m
Type of bus connector	Modbus	4-pin connector
	Ethernet	RJ45 (Shielded)



- A** Ethernet 1 and Ethernet 2 communication port.
- B** 24 V DC power supply terminal block.
- C** Ethernet communication LEDs:
 - yellow: 10 Mb
 - green: 100 Mb.
- D** Module status LED:
 - steady off: no power
 - steady green: device operational
 - steady red: major fault
 - flashing green: standby
 - flashing red: minor fault
 - flashing green/red: self-test.
- E** Network status LED:
 - steady off: not power/no valid IP address
 - steady green: connected, valid IP address
 - steady orange: default IP address
 - steady red: duplicated IP address
 - flashing green/red: Self-test.
- F** Sealable transparent cover.
- G** ULP status LED.
- H** Test button (accessible closed cover).
- I** Locking pad.
- J** Modbus traffic status LED (LV434011 only).
- K** Device name label.
- L** ULP ports.

General characteristics

Environmental characteristics

Conforming to standards	UL 508, UL 60950, IEC 60950, 60947-6-2
Certification	cUIUs, GOST, FCC, CE
Ambient temperature	-20 to +70 °C (-4 to +158 °F)
Relative humidity	5–85 %
Level of pollution	Level 3
Flame resistance	ULV0

Mechanical characteristics

Shock resistance	1000 m/s ²
Resistance to sinusoidal vibrations	-5 Hz < f < 8.4 Hz

Electrical characteristics

Resistance to electromagnetic discharge	Conforming to IEC/EN 61000-4-3
Immunity to radiated fields	10 V/m
Immunity to surges	Conforming to IEC/EN 61000-4-5
Consumption	120 mA at 24 V input

Physical characteristics

Dimensions	72 x 105 x 71 mm (2.83 x 4.13 x 2.79 in.)
Mounting	DIN rail
Weight	182.5 g (0.41 lb)

Degree of protection of the installed IO	<ul style="list-style-type: none"> ■ On the front panel (wall mounted enclosure): IP4x ■ Connectors: IP2x ■ Other parts: IP3x
--	--

Connections	Screw type terminal blocks
-------------	----------------------------

Technical characteristics - 24 V DC power supply

Power supply type	Regulated switch type
Rated power	72 W
Input voltage	100–120 V AC for single phase 200–500 V AC phase-to-phase
PFC filter	With IEC 61000-3-2
Output voltage	24 V DC
Power supply out current	3 A

Note: it is recommended to use an UL listed/UL listed recognized limited voltage/Limited current or a class 2 power supply with a 24 V DC, 3 A maximum.

IFE web page description

Monitoring web page

Real time data 67	■
Device logging	■

Control web page

Single device control	■
-----------------------	---

Diagnostics web page

Statistics	■
Device information	■
IMU information	■
Read device registers	■
Communication check	■

Maintenance web page

Maintenance log	■
Maintenance counters	■

Setup web page

Device localization/name	■
Ethernet configuration (dual port)	■
IP configuration	■
Modbus TCP/IP filtering	■
Serial port	■
Date and time	■
E-mail server configuration	■
Alarms to be e-mailed	■
Device list	■
Device logging	■
Device log export	■
SNMP parameters	■
Documentation links	■
Preferences	■
Advanced services control	■
User accounts	■
Web page access	■

PB103798-50,ups



IFM Modbus communication interface.
Ref.: TRV00210.

Function

A IFM - Modbus communication interface - is required for connection of a Masterpact or Compact to a Modbus network as long as this circuit breaker is provided with a ULP (Universal Logic Plug) port. The port is available on respectively a BCM ULP or BSCM embedded module.

The IFM is defined as an IMU (Intelligent Modular Unit) in the ULP connection System documentation.

Once connected, the circuit breaker is considered as a slave by the Modbus master. Its electrical values, alarm status, open/close signals can be monitored or controlled by a Programmable Logic Controller or any other system.

Characteristics

ULP port

2 RJ45 sockets, internal parallel wiring.

- Connection of a single circuit breaker (eventually via its I/O application module).
- A ULP line terminator or an FDM121 display unit must be connected to the second RJ45 ULP socket.

The RJ45 sockets deliver a 24 VDC supply fed from the Modbus socket.

Built-in test function, for checking the correct connection to the circuit breaker and FDM121 display unit.

Modbus slave port

- Top socket for screw-clamp connector, providing terminals for:

- 24 VDC input supply (0V, +24V)
- Modbus line (D1, D2, Gnd).

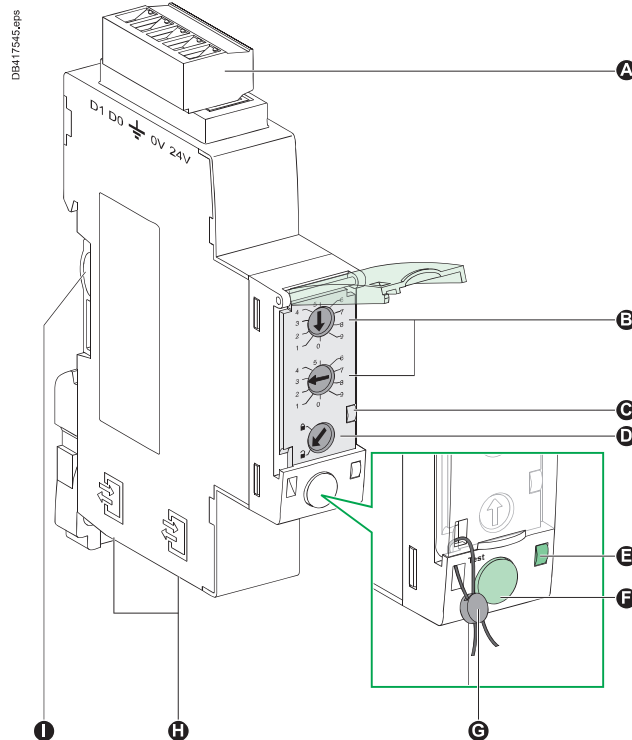
- Lateral socket, for Din-rail stackable connector.

Both top and lateral sockets are internally parallel wired.

- Multiple IFM can be stacked, thus sharing a common power supply and Modbus line without individual wiring.

- On the front face:

- Modbus address setting (1 to 99): 2 coded rotary switches
- Modbus locking pad: enables or disable the circuit breaker remote control and modification of IFM parameters.
- Self adjusting communication format (Baud rate, parity).



A Modbus screw clamp connector.

B Modbus address switches.

C Modbus traffic LED.

D Modbus locking pad.

E ULP activity LED.

F Test button.

G Mechanical lock.

H ULP RJ45 connectors.

I Stacking accessory connection.

Technical characteristics

IFM Modbus communication interface

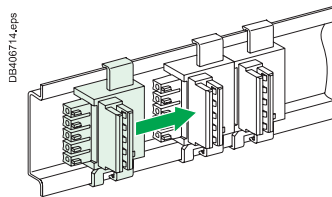
Dimensions	18 x 72 x 96 mm	
Maximum number of stacked IFM	12	
Degree of protection of the installed module	Part projecting beyond the escutcheon	IP4x
	Other module parts	IP3x
	Connectors	IP2x
Operating temperature	-25... +70 °C	
Power supply voltage	24 V DC -20 %/+10 % (19.2...26.4 V DC)	
Consumption	Typical	21 mA/24 V DC at 20 °C
	Maximum	30 mA/19.2 V DC at 60 °C

Certification

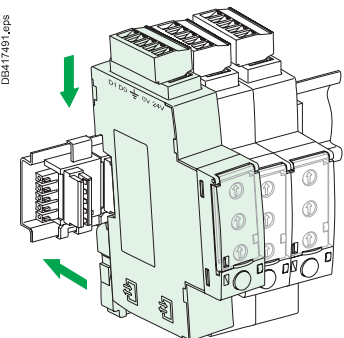
CE	IEC/EN 60947-1
UL	UL 508 - Industrial Control Equipment
CSA	No. 142-M1987 - Process Control Equipment
	■ CAN/CSA C22.2 No. 0-M91 - General requirements - Canadian Electrical Code Part
	■ CAN/CSA C22.2 No. 14-05 - Industrial Control Equipment

Simplified IFM installation

Stacking IFM



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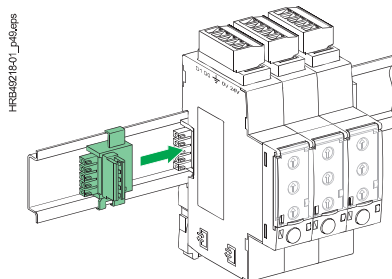


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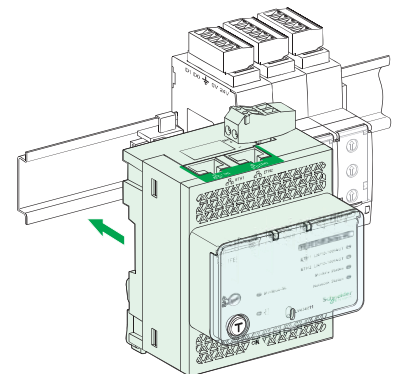
Stacking accessories

Up to 12 stacked IFM

Stacking an IFE interface + gateway with IFMs



FR8A0218-01_p850198





Description

The IO 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 IO application is compliant with the ULP system specifications.

Two IO application module can be connected in the same ULP network.

The ranges of LV circuit breakers enhanced by the I/O are:

- Masterpact NW
- Masterpact NT
- Compact NS1600b-3200
- Compact NS630b-1600
- Compact NSX100-630 A.

IO input/output interface for LV breaker resources

The IO application module resources are:

- 6 digital inputs that are self powered for either NO and NC dry contact or pulse counter
- 3 digital outputs that are bistable relay (5 A maximum)
- 1 analog input for Pt100 temperature sensor.

Pre-defined applications

Pre-defined application adds new functions to the IMU in a simple way:

- selection by the application rotary switch on the IO, defining the application with pre-defined input/output assignment and wiring diagram.
- no additional setting with the customer engineering tool required.

The resources not assigned to the pre-defined application are free for additional user-defined applications:

- cradle management
- breaker operation
- light and load control
- custom.

User-defined applications

User-defined applications are processed by the IO in addition to the pre-defined application selected.

The user-defined applications are available depending on:

- the pre-defined application selected
- the IO resources (inputs and outputs) not used by the application.

The resources required by user-defined applications are assigned using the customer engineering tool:

- protection
- control
- energy management
- monitoring.

Mounting

The IO is a DIN rail mounting device.

Application rotary switch

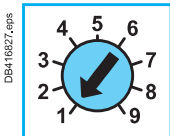
The application rotary switch enables the selection of the pre-defined application.

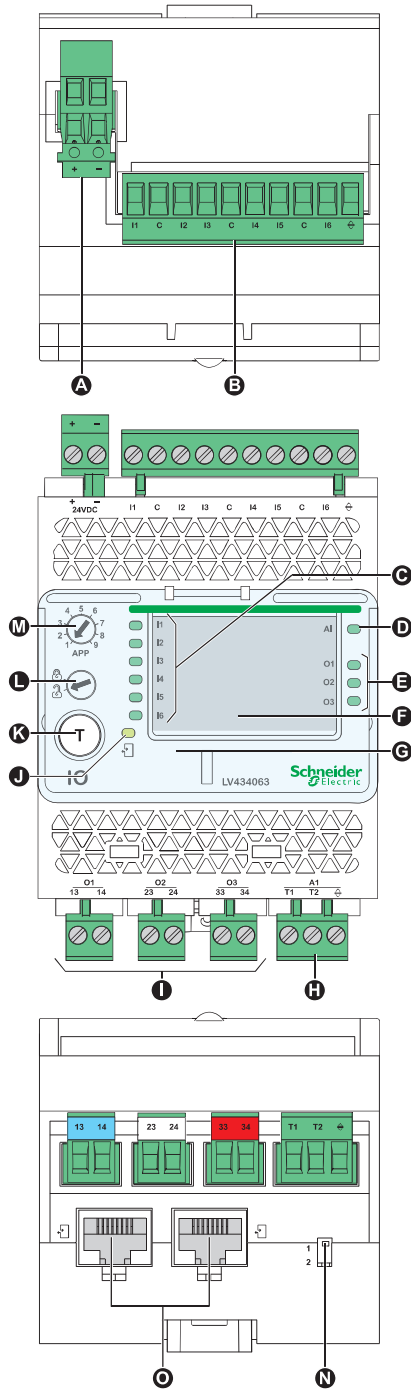
It has 9 positions and each position is assigned to a pre-defined application.

The factory set position of the switch is pre-defined application 1.

Setting locking pad

The setting locking pad on the front panel of the IO enables the setting of the IO by the customer engineering tool.





- A** 24 V DC power supply terminal block.
B Digital input terminal block: 6 inputs, 3 commons and 1 shield.
C 6 input status LEDs.
D Analog input status LED.
E 3 output status LEDs.
F I/O identification labels.
G Sealable transparent cover.
H Analog input terminal block.
I Digital output terminal blocks.
J ULP status LED.
K Test/reset button (accessible with cover closed).
L Setting locking pad.
M Application rotary switch: 1 to 2.
N Switch for IO addressing (IO 1 or IO 2).
O ULP connectors.

General characteristics

Environmental characteristics

Conforming to standards	UL 508, UL 60950, IED 60950, 60947-6-2
Certification	cUIUs, GOST, FCC, CE
Ambient temperature	-20 to +70 °C (-4 to +158 °F)
Relative humidity	5–85 %
Level of pollution	Level 3
Flame resistance	ULV0

Mechanical characteristics

Shock resistance	1000 m/s ²
Resistance to sinusoidal vibrations	-5 Hz < f < 8.4 Hz

Electrical characteristics

Resistance to electromagnetic discharge	Conforming to IEC/EN 61000-4-3
Immunity to radiated fields	10 V/m
Immunity to surges	Conforming to IEC/EN 61000-4-5
Consumption	165 mA

Physical characteristics

Dimensions	71.7 x 116 x 70.6 mm (2.83 x 4.56 x 2.78 in.)
Mounting	DIN rail
Weight	229.5 g (0.51 lb)
Degree of protection of the installed IO	<ul style="list-style-type: none"> ■ On the front panel (wall mounted enclosure): IP4x ■ IO parts: IP3x ■ Connectors: IP2x
Connections	Screw type terminal blocks

Technical characteristics - 24 V DC power supply

Power supply type	Regulated switch type
Rated power	72 W
Input voltage	100–120 V AC for single phase 200–500 V AC phase-to-phase
PFC filter	With IEC 61000-3-2
Output voltage	24 V DC
Power supply out current	3 A

Note: it is recommended to use an UL listed/UL listed recognized limited voltage/Limited current or a class 2 power supply with a 24 V DC, 3 A maximum.

Digital inputs

Digital input type	Self powered digital input with current limitations as per IEC 61131-2 type 2 standards (7 mA)
Input limit values at state 1 (close)	19.8–25.2 V DC, 6.1–8.8 mA
Input limit values at state 0 (open)	0–19.8 V DC, 0 mA
Maximum cable length	10 m (33 ft)

Note: for a length greater than 10 m (33 ft) and up to 300 m (1,000 ft), it is mandatory to use a shielded twisted cable. The shield cable is connected to the IO functional ground of the IO.

Digital outputs

Digital output type	Bistable relay
Rated load	5 A at 250 V AC
Rated carry current	5 A
Maximum switching voltage	380 V AC, 125 V DC
Maximum switch current	5 A
Maximum switching power	1250 VA, 150 W
Minimum permissible load	10 mA at 5 V DC
Contact resistance	30 mΩ
Maximum operating frequency	<ul style="list-style-type: none"> ■ 18000 operations/hr (Mechanical) ■ 1800 operations/hr (Electrical)
Digital output relay protection by an external fuse	External fuse of 5 A or less
Maximum cable length	10 m (33 ft)

Analog inputs

The IO analog input can be connected to a Pt100 temperature sensor

Range	-30 to 200 °C	-22 to 392 °F
Accuracy	<ul style="list-style-type: none"> ±2 °C from -30 to 20 °C ±1 °C from 20 to 140 °C ±2 °C from 140 to 200 °C 	<ul style="list-style-type: none"> ±3.6 °F from -22 to 68 °F ±1.8 °F from 68 to 284 °F ±3.6 °F from 284 to 392 °F
Refresh interval	5 s	5 s

All Compact NSX devices can be equipped with the communication function via a prewired connection system and a Modbus or Ethernet network interface. The interface can be connected directly or via the FDM121 switchboard display unit. Four functional levels can be combined to adapt to all supervision requirements.

Four functional levels

The Compact NSX can be integrated in a Modbus or Ethernet communication environment. Four functional levels can be used separately or combined.

Communication of status indications

This level is compatible with all Compact NSX circuit breakers, whatever the trip unit, and with all switch-disconnectors. Using the BSCM module, the following information is accessible:

- ON/OFF position (O/F)
- trip indication (SD)
- fault-trip indication (SDE).

Communication of commands

Also available on all circuit breakers and switch-disconnectors, this level (communicating remote control) can be used to:

- open
- close
- reset.

Communication of measurements with Micrologic 5 / 6 A or E

This level provides access to all available information:

- instantaneous values A, E
- demand values E
- maximeters/minimeters A, E
- energy metering E
- demand current and power E
- power quality E.

Communication of operating assistance with Micrologic 5 / 6 A or E

- protection and alarm settings A, E
- time-stamped histories A, E
- event tables A, E
- maintenance indicators A, E.

Modbus principle

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

Addresses

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

Number of devices

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

A fixed device requires only one connection point (communication module on the device). A drawout device uses two connection points (communication modules on the device and on the chassis).

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

Length of bus

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

Bus power source

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

Ethernet principle

Ethernet is a data link and physical layer protocol defined by IEEE 802.10 and 100 Mbps specifications that connects computer or other Ethernet devices. Ethernet is an asynchronous Carrier Sense Multiple Access with Collision detection (referred as CSMA/CD) protocol. Carrier Sense means that the hosts can detect whether the medium (coaxial cable) is idle or busy. Multiple Access means that multiple hosts can be connected to the common medium. Collision Detection means a host detects whether its transmission has collided with the transmission of another host (or hosts). IFE Ethernet interface can be connected to a PC or a laptop over Ethernet. The maximum length of Ethernet cable is 100 meters. IFE Ethernet interface + gateway provides a Modbus TCP/IP gateway over Ethernet to enable Modbus TCP communication from a Modbus TCP master to any Modbus slave devices connected to it. The maximum active Modbus TCP client connection is twelve.

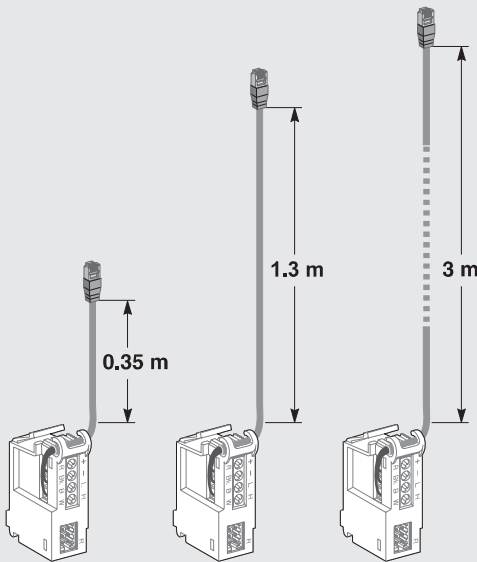
IFE Ethernet interface has an embedded web server (web page).

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

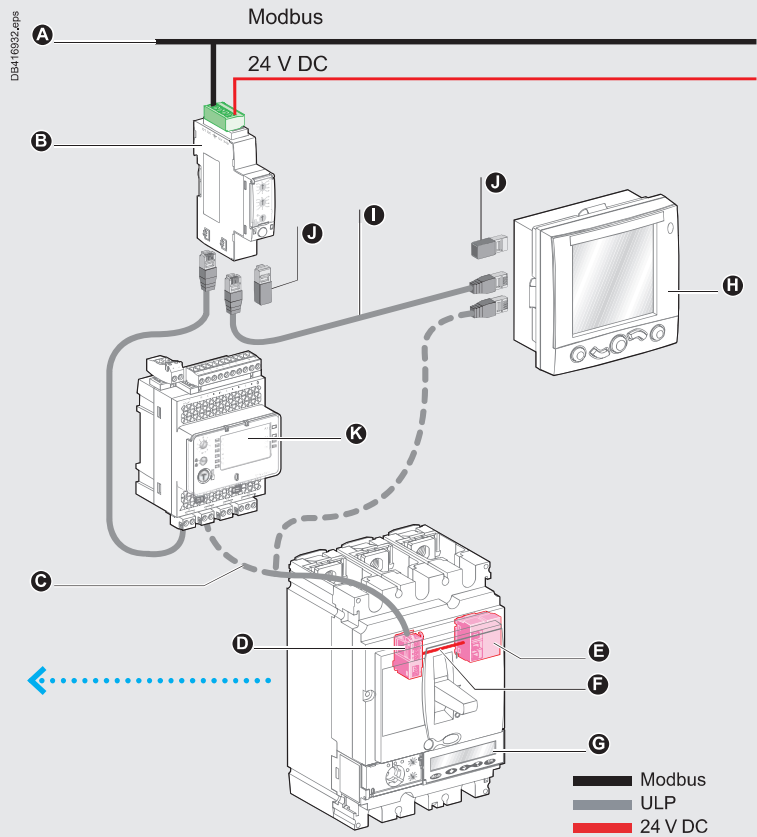
Communication components and connections

Connections

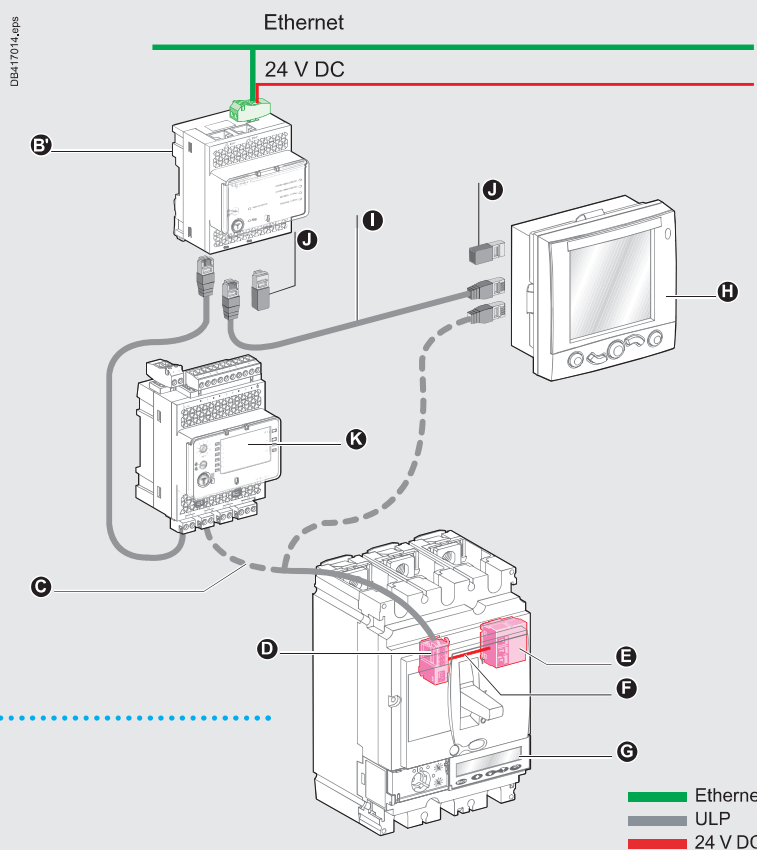
- Compact NSX is connected to the I/O application module or FDM121 display unit via the internal terminal block for the NSX cord equipped with an RJ45 connector:
 - cord available in three lengths: 0.35 m, 1.3 m and 3 m.
 - insulated 1.3 m version for installations > 480 V AC
 - lengths up to 10 m possible using extensions.
- The FDM121 display unit and the I/O application module are connected to:
 - the IFM Modbus interface by a communication cable with RJ45 connectors on both ends
 - or
 - the IFE Ethernet interface module by a communication cable with RJ45 connectors on both ends.



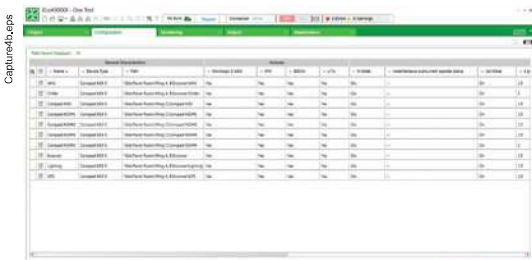
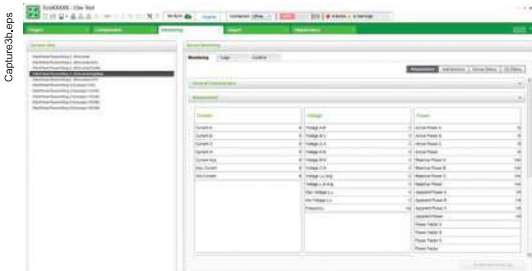
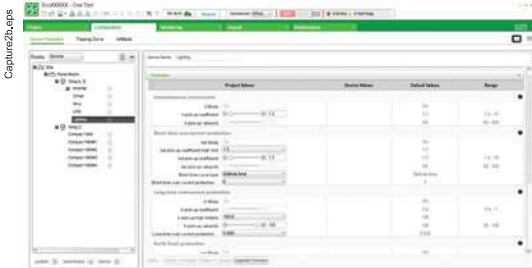
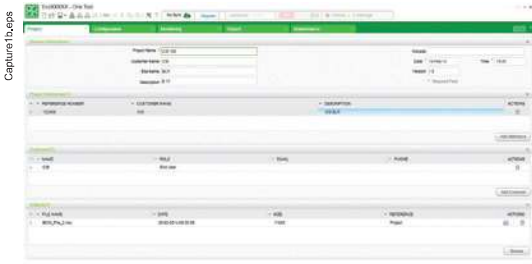
Communication components and connections, IFM



Communication components and connections, IFE



- A** Modbus network
- B** IFM Modbus interface
- B'** IFE Ethernet interface module
- C** NSX cord
- D** Internal terminal block for communication via NSX cord
- E** BSCM module
- F** Prefabricated wiring
- G** Micrologic trip unit
- H** FDM121 display
- I** RJ45 cable
- J** Line terminator (on unused connector if applicable)
- K** I/O application module



Introduction

Electrical Asset Manager is a software application that helps the user to manage a project as part of designing, testing, site commissioning, and maintenance of the project life cycle.

It enables the user to prepare the settings of the devices offline (without connecting to the device) and configure them when connected with the devices.

Also it provides lot of other value added features for the user to manage the project such as, safe repository in cloud, attach artifacts to each device or at the project level, organize devices in switchboard wise, manage a hierarchical structure of the installation etc.

Compatible devices (configuration and device management)

Electrical Asset Manager is compatible with the following devices:

- Compact NSX100-630 (IEC)
- PowerPact™ (UL) circuit breaker
- Compact NS630b-3200 (IEC)
- Masterpact NT/NW (IEC and UL) circuit breaker
- Acti9 Smartlink.
- Compatible devices (Device Management in the project)
- Switch disconnectors (Compact NSX, Masterpact & PowerPact Family)
- Third party devices.

References:

Electrical Asset Manager software package can be downloaded from our website www.schneider-electric.com.

Features

Electrical Asset Manager supersedes the Schneider Electric customer engineering tools such as Remote setting Utility (RSU) and Remote Control Utility (RCU) with additional features.

Electrical Asset Manager supports the connection of Schneider Electric communicable devices to:

- create projects by device discovery, selection of devices, and import Bill of Material (BOM)
- monitor the status of protection and IO status
- read information (alarms, measurements, parameters)
- check protection discrimination between two devices
- upload and download of configuration or settings in batch mode to multiple devices.
- carry out commands and tests
- generate and print device settings report and communication test report
- manage multiple devices with electrical and communication hierarchy model
- manage artifacts (project documents)
- check consistency in settings between devices on a communication network
- compare configuration settings between PC and device (online)
- download latest firmware.

Electrical Asset Manager enables the user to avail the advanced features of the software once the project is saved in Schneider Electric cloud.



Functions

Offline Mode

A project can be built in offline mode through 2 different ways:

- through BOM file import
- through Device Selection.

Additionally, the user can open an existing project and modify the settings offline. The user can do the discrimination curve check and firmware compatibility check for devices in the project.

Online Mode

A project can be built in online mode through device discovery also other than the methods possible through offline method.

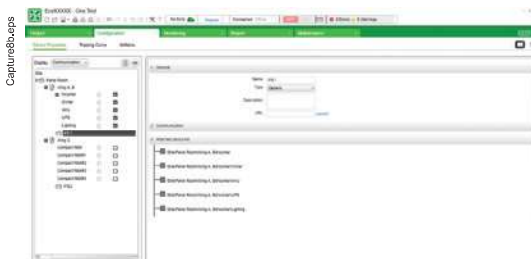
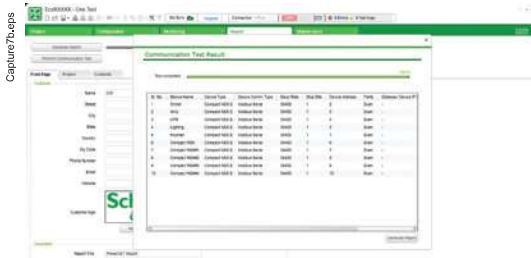
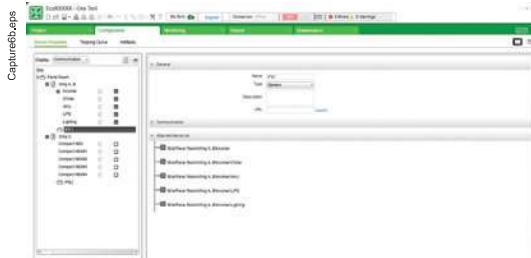
Once the project is built, the following functions can be performed in addition to the functions available in offline mode:

- compare the device parameters with project parameters
- load parameters from project to the device and vice versa
- firmware downloads to the device
- monitor the measurement, maintenance, device status and I/O status
- control functions.

User Interface

Electrical Asset Manager software provides fast direct access to the project and the devices in the project through different tabs.

- **Project:** to provide the project information including customer details, project references and to add project artifacts (documents related to the project).
- **Configuration:** to build up the tree structure of the project architecture ; to have a table view of the devices added in the project ; to set the parameters of the devices ; to transfer the device settings ; to view the tripping curves; to attach device artifacts and to download the latest firmware, to do the communication test for all the devices and generate the test report.
- **Monitoring:** this allows the user to monitor the real time values of different devices through different sub tabs namely Monitoring, Logs and Control.
- **Reports:** report tab allows you to generate and print a report of the project settings from the report tab. The user details and project characteristics are automatically filled with the details entered in the Project page.



Accessories for Micrologic trip units

PB1105129,eps



External neutral current transformers.

External neutral current transformer (ENCT)

The external transformer is a sensor required for a three-pole circuit breaker in a system with a distributed neutral to measure the neutral current in order to:

- protect the neutral conductor
- protect against insulation faults.

This current transformer can be connected to Micrologic 5 / 6 trip units. The transformer rating must be compatible with that of the circuit breaker.

Required current transformers for different circuit breaker models

Type of circuit breaker	Rating	Catalogue number
NSX100/160/250	25 – 100 A	LV429521
	150 – 250 A	LV430563
NSX400/630	400 – 630 A	LV432575

External neutral voltage tap (ENVT)

The neutral voltage transformer is required for Micrologic E power metering with a three-pole circuit breaker in a system with a distributed neutral. It is used to connect the neutral to the Micrologic trip unit to measure phase-to-neutral (Ph-N) voltages.

External 24 V DC power-supply module

Use: an external 24 V DC power supply is required for installations with communication, whatever the type of trip unit.

On installations without communication, it is available as an option for Micrologic 5/6 in order to make it possible to:

- modify settings when the circuit breaker is open
- display measurements when the current flowing through the circuit breaker is low (15 to 50 A depending on the rating)
- maintain the display of the cause of tripping and interrupted current.

Characteristics: a single external 24 V DC supply may be used for the entire switchboard.

The required characteristics are:

- output voltage: 24 V DC $\pm 5\%$
- ripple: $\pm 1\%$.
- overvoltage category: OVC IV - as per IEC 60947-1.

External 24 V DC power-supply modules with an output current of 1 A are available:

Available external power-supply modules			Cat. no.
Power supply	V DC ($\pm 5\%$)	24/30	54440
		48/60	54441
		100/125	54442
	V AC (+10 %, -15 %)	110/130	54443
		200/240	54444
	380/415	54445	
Output voltage	24 V DC ($\pm 5\%$)		
Ripple	$\pm 1\%$		
Overvoltage category (OVC)	OVC IV - as per IEC 60947-1		

An external 24 V DC power-supply module with an output current of 3 A is also available:

Available external power-supply modules			Cat. no.
Power supply	V DC	110/230	ABL8RPS24030
	V AC	110/240	
Output voltage	24 V DC ($\pm 5\%$)		
Ripple	$\pm 1\%$		
Overvoltage category (OVC)	OVC II		

Total consumption: To determine the required output current of the 24 V DC power supply, it is necessary to sum up the currents consumed by the different loads supplied:

Module	Typical Consumption (24 V DC at 20 °C / 68 °F)	Maximum Consumption (19.2 V DC at 60 °C / 140 °F)
BCM ULP for Masterpact and Compact NS	40 mA	65 mA
Micrologic 5 or 6 trip unit for Compact NSX circuit breakers	30 mA	55 mA
BSCM for Compact NSX circuit breakers	9 mA	15 mA
2-wire RS 485 isolated repeater	15 mA	19 mA
FDM121 display for LV circuit breaker	21 mA	30 mA
IFM Modbus-SL interface for LV circuit breaker	21 mA	30 mA
IFE Ethernet interface for LV circuit breaker	120 mA	3 A (with gateway)
I/O input/output interface module for LV circuit breaker	165 mA	420 mA
Maintenance module	0 mA (the maintenance module has its own power supply)	0 mA (the maintenance module has its own power supply)

PB1105115,eps



External 24 V DC power-supply module.



Test battery (cat. no. LV434206).



Battery module (cat. no. 54446).



24 V DC power-supply terminal block (cat. no. LV434210).



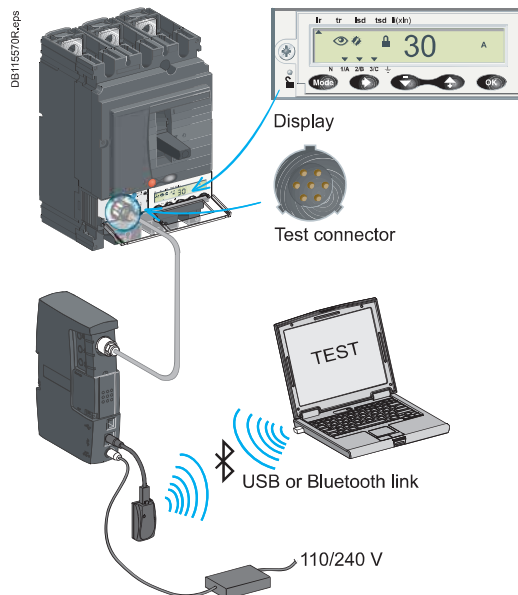
NSX cord U > 480 V (cat. no. LV434204).



Maintenance case (cat. no. TRV00910).



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



Using the configuration and maintenance module.

Test battery

This pocket battery connects to the Micrologic test connector. It powers up the Micrologic and the Ready LED. It supplies the screen and allows settings to be made via the keypad.

Battery module

The battery module is a back-up supply for the external power-supply module. The input/output voltages are 24 V DC and it can supply power for approximately three hours (100 mA).

24 V DC power-supply terminal block

The 24 V DC power-supply terminal block can be installed only on Micrologic 5/6 trip units. It is required to power the trip unit when the trip unit is not connected to an FDM121 display unit or to the communication system. When used, it excludes connection of an NSX cord.

NSX cord

- For voltage $U \leq 480$ V, available in 3 prefabricated lengths: 0.35 m, 1.3 m and 3 m.
- For voltages $U > 480$ V, a special 1.3 m cord with an insulation accessory is required.
- A set of cords with RJ45 connectors is available to adapt to different distances between devices.

Maintenance case

The case includes:

- configuration 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).

Configuration 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 access to protection settings, alarm settings and readings of all indicators. Using the associated RSU software utility, it is possible to store, in a dedicated file for each device, all the data that can be transferred to another device.

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.

Earth-leakage protection

Add-on protection against insulation faults using a Vigi module or Vigirex relay

There are two ways to add earth-leakage protection to any three or four-pole Compact NSX100 to 630 circuit breaker equipped with a magnetic, thermal-magnetic or Micrologic 2, 5 or 6 trip unit:

- by adding a Vigi module to the circuit breaker to form a Vigicompact NSX
- by using a Vigirex relay and separate toroids.

Circuit breaker with add-on Vigi module (Vigicompact NSX)

- For general characteristics of circuit breakers, see page A-6 and page A-7.
- Add-on Vigi modules. Earth-leakage protection is achieved by installing a Vigi module (characteristics and selection criteria on next page) directly on the circuit breaker terminals. It directly actuates the trip unit (magnetic, thermal-magnetic or Micrologic).

Circuit breaker combined with a Vigirex relay

Compact NSX circuit breaker + Vigirex relay

Vigirex relays may be used to add external earth-leakage protection to Compact NSX circuit breakers. The circuit breakers must be equipped with an MN or MX voltage release. The Vigirex relays add special tripping thresholds and time delays for earth-leakage protection.

Vigirex relays are very useful when faced with major installation constraints (circuit breaker already installed and connected, limited space available, etc.).

Vigirex-relay characteristics

- Sensitivity adjustable from 30 mA to 250 mA and 9 time-delay settings (0 to 4,5 seconds).
- Closed toroids up to 630 A (30 to 300 mm in diameter), split toroids up to 250 A (46 to 110 mm in diameter) or rectangular sensors up to 630 A.
- 50/60 Hz, 400 Hz distribution systems.

Options

- Trip indication by a fail-safe contact.
- Pre-alarm contact and LED, etc.

Compliance with standards

- IEC 60947-2, annex M.
- IEC/EN 60755: general requirements for residual-current operated protective devices.
- IEC/EN 61000-4-2 to 4-6: immunity tests.
- CISPR11: radio-frequency radiated and conducted emission tests.
- UL 1053 and CSA22.2 No. 144 for RH10, RH21 and RH99 relays at supply voltages up to and including 220/240 V.



Vigicompact NSX100 to 630.



Earth-leakage relay.



Separate toroids.

PB105113.eps



Vigicomact NSX100 to 630 circuit breakers with earth-leakage protection

Addition of the Vigi module does not alter circuit-breaker characteristics:

- compliance with standards
- degree of protection, class II front-face insulation
- positive contact indication
- electrical characteristics
- trip-unit characteristics
- installation and connection modes
- indication, measurement and control auxiliaries
- installation and connection accessories.

Dimensions and weights		NSX100/160/250	NSX400/630
Dimensions	3 poles	105 x 236 x 86	140 x 355 x 110
W x H x D (mm)	4 poles	140 x 236 x 86	185 x 355 x 110
Weight (kg)	3 poles	2.5	8.8
	4 poles	3.2	10.8

Vigi earth-leakage protection modules

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.

Remote indications

Vigi modules may be equipped with an auxiliary contact (SDV) to remotely signal tripping due to an earth fault.

Use of 4-pole Vigi module with a 3-pole Compact NSX

In a 3-phase installation with an uninterrupted neutral, an accessory makes it possible to use a 4-pole Vigi module with connection of the neutral cable.

Power supply

Vigi modules are self-supplied internally by the distribution-system voltage and therefore do not require any external source. They continue to function even when supplied by only two phases.

Vigi module selection

Type	Vigi ME	Vigi MH	Vigi MB
Number of poles	3, 4 ⁽¹⁾	3, 4 ⁽¹⁾	3, 4 ⁽¹⁾
NSX100	■	■	-
NXS160	■	■	-
NSX250	-	■	-
NSX400	-	-	■
NSX630	-	-	■

Protection characteristics			
Sensitivity	fixed	adjustable	adjustable
I _{Δn} (A)	0.3	0.03 - 0.3 - 1 - 3 - 10	0.3 - 1 - 3 - 10 - 30
Time delay	fixed	adjustable	adjustable
Intentional delay (ms)	< 40	0 - 60 ⁽²⁾ - 150 ⁽²⁾ - 310 ⁽²⁾	0 - 60 - 150 - 310
Max. break time (ms)	< 40	< 40 < 140 < 300 < 800	< 40 < 140 < 300 < 800
Rated voltage V AC 50/60 Hz	200...440	200... 440 - 440...550	200...440 - 440...550

⁽¹⁾ Vigi 3P modules may also be used on 3P circuit breakers used for two-phase protection.

⁽²⁾ If the sensitivity is set to 30 mA, there is no time delay, whatever the time-delay setting.

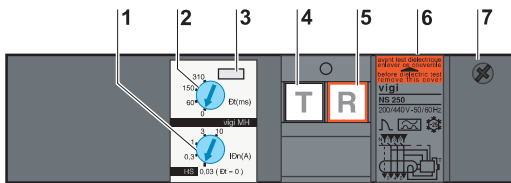
Operating safety

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

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DE112147.eps



- 1 Sensitivity setting
- 2 Time-delay setting (for selective earth-leakage protection).
- 3 Lead-seal fixture for controlled access to settings.
- 4 Test button simulating an earth-fault for regular checks on the tripping function
- 5 Reset button (reset required after earth-fault tripping).
- 6 Rating plate
- 7 Housing for SDV auxiliary contact.

Plug-in devices

The Vigi module can be installed on a plug-in base. Special accessories are required (see catalogue number chapter).

The parameters to be considered for motor-feeder protection depend on:

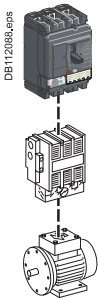
- the application (type of machine driven, operating safety, frequency of operation, etc.)
- the level of continuity of service required by the load or the application
- the applicable standards for the protection of life and property.

The required electrical functions are:

- isolation
- switching, generally at high endurance levels
- protection against overloads and short-circuits, adapted to the motor
- additional special protection.

A motor feeder must comply with the requirements of standard IEC 60947-4-1 concerning contactors and their protection:

- coordination of feeder components
- thermal-relay trip classes
- contactor utilisation categories
- coordination of insulation.



Motor-feeder function

A motor feeder comprises a set of devices for motor protection and control, as well as for protection of the feeder itself.

Isolation

The purpose is to isolate the live conductors from the upstream distribution system to enable work by maintenance personnel on the motor feeder at no risk. This function is provided by a motor circuit breaker offering positive contact indication and lockout/tagout possibilities.

Switching

The purpose is to control the motor (ON / OFF), either manually, automatically or remotely, taking into account overloads upon start-up and the long service life required. This function is provided by a contactor. When the coil of the contactor's electromagnet is energised, the contactor closes and establishes, through the poles, the circuit between the upstream supply and the motor, via the circuit breaker.

Basic protection

■ Short-circuit protection

Detection and breaking, as quickly as possible, of high short-circuit currents to avoid damage to the installation. This function is provided by a magnetic or thermal-magnetic circuit breaker.

■ Overload protection

Detection of overload currents and motor shutdown before temperature rise in the motor and conductors damages insulation. This function is provided by a thermal-magnetic circuit breaker or a separate thermal relay.

Overloads: $I < 10 \times I_n$

They are caused by:

- an electrical problem, related to an anomaly in the distribution system (e.g. phase failure, voltage outside tolerances, etc.)
- a mechanical problem, related to a process malfunction (e.g. excessive torque) or damage to the motor (e.g. bearing vibrations).

These two causes will also result in excessively long starting times.

Impedant short-circuits: $10 \times I_n < I < 50 \times I_n$

This type of short-circuit is generally due to deteriorated insulation of motor windings or damaged supply cables.

Short-circuits: $I > 50 \times I_n$

This relatively rare type of fault may be caused by a connection error during maintenance.

■ Phase unbalance or phase loss protection

Phase unbalance or phase loss can cause temperature rise and braking torques that can lead to premature ageing of the motor. These effects are even greater during starting, therefore protection must be virtually immediate.

Additional electronic protection

- Locked rotor.
- Under-load.
- Long starts and stalled rotor.
- Insulation faults.

Motor-feeder solutions

Standard IEC 60947 defines three types of device combinations for the protection of motor feeders.

Three devices

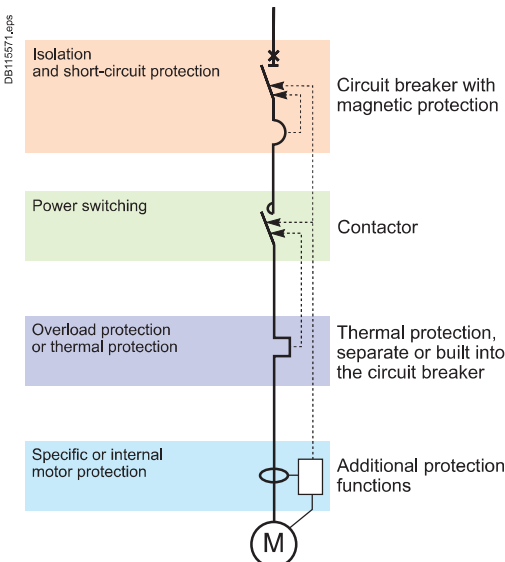
- Magnetic circuit breaker + contactor + thermal relay.

Two devices

- Thermal-magnetic circuit breaker + contactor.

One device

- Thermal-magnetic circuit breaker + contactor in an integrated solution (e.g. Tesys U).



Switchgear functions in a motor feeder.

Device coordination

The various components of a motor feeder must be coordinated. Standard IEC 60947-4-1 defines three types of coordination depending on the operating condition of the devices following a standardised short-circuit test.

Type-1 coordination

- No danger to life or property.
- The contactor and/or the thermal relay may be damaged.
- Repair and replacement of parts may be required prior to further service.

Type-2 coordination

- No danger to life or property.
- No damage or adjustments are allowed. The risk of contact welding is accepted as long as they can be easily separated.
- Isolation must be maintained after the incident, the motor feeder must be suitable for further use without repair or replacement of parts.
- A rapid inspection is sufficient before return to service.

Total coordination

- No damage and no risk of contact welding is allowed for the devices making up the motor feeder. The motor feeder must be suitable for further use without repair or replacement of parts.

This level is provided by integrated 1-device solutions such as Tesys U.

Contactor utilisation categories

For a given motor-feeder solution, the utilisation category determines the contactor withstand capacity in terms of frequency of operation and endurance. Selection, which depends on the operating conditions imposed by the application, may result in oversizing the contactor and circuit-breaker protection. Standard IEC 60947 defines the following contactor utilisation categories.

Contactor utilisation categories (AC current)

Contactor utilisation categories	Type of load	Control function	Typical applications
AC1	Non-inductive ($\cos \varphi \geq 0.8$)	Energising	Heating, distribution
AC2	Slip-ring motor ($\cos \varphi \geq 0.65$)	Starting Switching off motor during running Counter-current braking Inching	Wiring-drawing machine
AC3	Squirrel-cage motor ($\cos \varphi = 0.45$ for ≤ 100 A) ($\cos \varphi = 0.35$ for > 100 A)	Starting Switching off motor during running	Compressors, elevators, pumps, mixers, escalators, fans, conveyer systems, air-conditioning
AC4		Starting Switching off motor during running Regenerative braking Plugging Inching	Printing machines, wire-drawing machines

Utilisation category AC3 - common coordination tables for circuit breakers and contactors

This category covers asynchronous squirrel-cage motors that are switched off during running, which is the most common situation (85 % of cases). The contactor makes the starting current and switches off the rated current at a voltage approximately one sixth of the nominal value. The current is interrupted without difficulty. The circuit breaker-contactor coordination tables for Compact NSX are for use with contactors in the AC3 utilisation category, in which case they ensure type-2 coordination.

Utilisation category AC4 - possible oversizing

This category covers asynchronous squirrel-cage motors capable of operating under regenerative braking or inching (jogging) conditions. The contactor makes the starting current and can interrupt this current at a voltage that may be equal to that of the distribution system. These difficult conditions make it necessary to oversize the contactor and, in general, the protective circuit breaker with respect to category AC3.

Motor protection

Motor-feeder characteristics and solutions

The trip class determines the trip curve of the thermal protection device (inverse-time curve) for a motor feeder.

Standard IEC 60947-4-1 defines trip classes 5, 10, 20 and 30.

These classes are the maximum durations, in seconds, for motor starting with a starting current of $7.2 I_r$, where I_r is the thermal setting indicated on the motor rating plate.

Example: In class 20, the motor must have finished starting within 20 seconds (6 to 20 s) for a starting current of $7.2 I_r$.

Standardised values in kW

Rated operational power kW	Standardised values in kW currents I_e (A) for:			
	230 V A	400 V A	500 V A	690 V A
0.06	0.35	0.32	0.16	0.12
0.09	0.52	0.3	0.24	0.17
0.12	0.7	0.44	0.32	0.23
0.18	1	0.6	0.48	0.35
0.25	1.5	0.85	0.68	0.49
0.37	1.9	1.1	0.88	0.64
0.55	2.6	1.5	1.2	0.87
0.75	3.3	1.9	1.5	1.1
1.1	4.7	2.7	2.2	1.6
1.5	6.3	3.6	2.9	2.1
2.2	8.5	4.9	3.9	2.8
3	11.3	6.5	5.2	3.8
4	15	8.5	6.8	4.9
5.5	20	11.5	9.2	6.7
7.5	27	15.5	12.4	8.9
11	38	22	17.6	12.8
15	51	29	23	17
18.5	61	35	28	21
22	72	41	33	24
30	96	55	44	32
37	115	66	53	39
45	140	80	64	47
55	169	97	78	57
75	230	132	106	77
90	278	160	128	93
110	340	195	156	113
132	400	230	184	134
160	487	280	224	162
200	609	350	280	203
250	748	430	344	250
315	940	540	432	313

Trip class of a thermal-protection device

The motor feeder includes thermal protection that may be built into the circuit breaker. The protection must have a trip class suited to motor starting. Depending on the application, the motor starting time varies from a few seconds (no-load start) to a few dozen seconds (high-inertia load).

Standard IEC 60947-4-1 defines the trip classes below as a function of current setting I_r for thermal protection.

Trip class of thermal relays as a function of their I_r setting

Class	$1.05 I_r^{(1)}$	$1.2 I_r^{(1)}$	$1.5 I_r^{(2)}$	$7.2 I_r^{(1)}$
5	$t > 2$ h	$t < 2$ h	$t < 2$ mn	2 s $< t \leq 5$ s
10	$t > 2$ h	$t < 2$ h	$t < 4$ mn	4 s $< t \leq 10$ s
20	$t > 2$ h	$t < 2$ h	$t < 8$ mn	6 s $< t \leq 20$ s
30	$t > 2$ h	$t < 2$ h	$t < 12$ mn	9 s $< t \leq 30$ s

(1) Time for a cold motor (motor off and cold).

(2) Time for warm motor (motor running under normal conditions).

Currents of squirrel-cage motors at full rated load

Standardised values in HP

Rated operational power hp	Indicative values of the rated operational currents I_e (A) for						
	110 - 120 V	200 V	208 V	220 - 240 V	380 - 415 V	440 - 480 V	550 - 600 V
1/2	4.4	2.5	2.4	2.2	1.3	1.1	0.9
3/4	6.4	3.7	3.5	3.2	1.8	1.6	1.3
1	8.4	4.8	4.6	4.2	2.3	2.1	1.7
1 1/2	12	6.9	6.6	6	3.3	3	2.4
2	13.6	7.8	7.5	6.8	4.3	3.4	2.7
3	19.2	11	10.6	9.6	6.1	4.8	3.9
5	30.4	17.5	16.7	15.2	9.7	7.6	6.1
7 1/2	44	25.3	24.2	22	14	11	9
10	56	32.2	30.8	28	18	14	11
15	84	48.3	46.2	42	27	21	17
20	108	62.1	59.4	54	34	27	22
25	136	78.2	74.8	68	44	34	27
30	160	92	88	80	51	40	32
40	208	120	114	104	66	52	41
50	260	150	143	130	83	65	52
60	-	177	169	154	103	77	62
75	-	221	211	192	128	96	77
100	-	285	273	248	165	124	99
125	-	359	343	312	208	156	125
150	-	414	396	360	240	180	144
200	-	552	528	480	320	240	192
250	-	-	-	604	403	302	242
300	-	-	-	722	482	361	289

Note: 1 hp = 0.7457 kW.

Asynchronous-motor starting parameters

The main parameters of direct on-line starting of three-phase asynchronous motors (90 % of all applications) are listed below.

■ I_r : rated current

This is the current drawn by the motor at full rated load (e.g. approximately 100 A rms for 55 kW at 400 V).

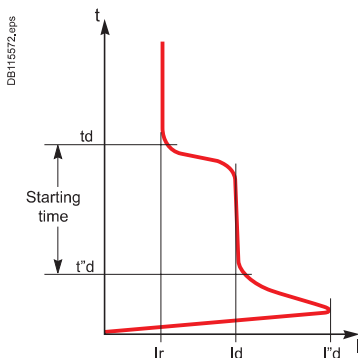
■ I_d : starting current

This is the current drawn by the motor during starting, on average $7.2 I_r$ for a duration t_d of 5 to 30 seconds depending on the application (e.g. 720 A rms for 10 seconds). These values determine the trip class and any additional "long-start" protection devices that may be needed.

■ I''_d : peak starting current

This is the subtransient current during the first two half-waves when the system is energised, on the average $14 I_r$ for 10 to 15 ms (e.g. 1840 A peak).

The protection settings must effectively protect the motor, notably via a suitable thermal-relay trip class, but let the peak starting current through.



Typical motor-starting curve

Compact NSX motor-feeder solutions

Compact NSX motor circuit breakers are designed for motor-feeder solutions using:

- three devices, including an MA or 1.3 M magnetic-only trip unit
- two devices including a TM-D or 2 M thermal-magnetic trip unit.

They are designed for use with contactors in the AC3 utilisation category (80 % of all cases) and they ensure type-2 coordination with the contactor.

For the AC4 utilisation category, the difficult conditions generally make it necessary to oversize the protection circuit breaker with respect to the AC3 category.

Compact NSX motor-protection range





Compact NSX trip units can be used to create motor-feeder solutions comprising two or three devices. The protection devices are designed for continuous duty at 65 °C.

Three-device solutions

- 1 NSX circuit breaker with an MA or Micrologic 1.3 M trip unit.
- 1 contactor.
- 1 thermal relay.

Two-device solutions

- 1 Compact NSX circuit breaker
 - with a Micrologic 2.2 M or 2.3 M electronic trip unit
 - with a Micrologic 6 E-M electronic trip unit. This version offers additional protection and Power Meter functions.
- 1 contactor.

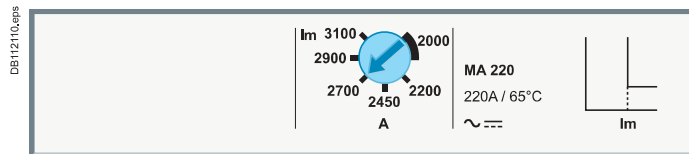
Type of motor protection		3 devices		2 devices	
Compact NSX circuit breaker		NSX100/160/250	NSX400/630	NSX100 to 630	
Type-2 coordination with		Contactor + thermal relay		Contactor	
Trip unit	Type	MA	Micrologic 1.3 M	Micrologic 2 M	Micrologic 6 E-M
	Technology	Magnetic	Electronic	Electronic	Electronic
					
Thermal relay	Separate	■	■		
	Built-in, class			■	■
				■	■
				■	■
					■
Protection functions of Compact NSX circuit breaker					
Short-circuits		■	■	■	■
Overloads				■	■
Insulation faults	Ground-fault				■
Special motor functions	Phase unbalance			■	■
	Locked rotor				■
	Under-load				■
	Long start				■
Built-in Power Meter functions					
I, U, energy					■
Operating assistance					
Counters (cycles, trips, alarms, hours)					■
Contact-wear indicator					■
Load profile and thermal image					■

Motor protection

MA and Micrologic 1.3 M instantaneous trip units

MA magnetic trip units are used in **3-device motor-feeder solutions**. They can be mounted on all Compact NSX100/160/250 circuit breakers with performance levels B/F/H/N/S/L. They provide short-circuit protection for motors up to 110 kW at 400 V.

MA magnetic trip units



Circuit breakers with an MA trip unit are combined with a thermal relay and a contactor or a starter.

Protection

Magnetic protection (I_m)

Short-circuit protection with an adjustable pick-up I_m that initiates instantaneous tripping if exceeded.

- $I_m = I_n \times \dots$ is set on an adjustment dial in multiples of the rating:
 - 6 to 14 x I_n (2.5 to 100 A ratings)
 - 9 to 14 x I_n (150 to 200 A ratings)

Protection version

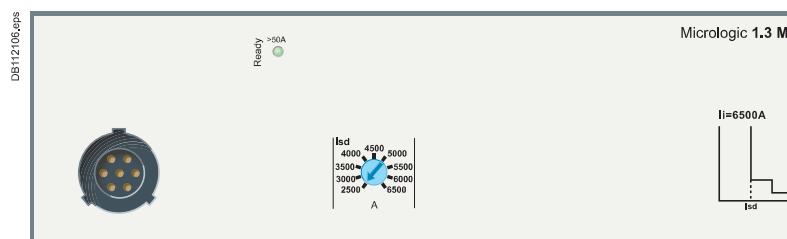
- 3-pole (3P 3D): 3-pole frame (3P) equipped with detection on all 3 poles (3D).

Micrologic 1.3 M trip units are used in **3-device motor-feeder solutions** on Compact NSX400/630 circuit breakers with performance levels B/F/H/N/S/L. They provide short-circuit protection for motors up to 250 kW at 400 V.

They also provide the benefits of electronic technology:

- accurate settings
- tests
- "Ready" LED.

Micrologic 1.3 M trip units



Circuit breakers with a Micrologic 1.3 M trip unit are combined with a thermal relay and a contactor.

Protection

Settings are made using a dial.

Short-circuits: Short-time protection (I_{sd})

Protection with an adjustable pick-up I_{sd} . There is a very short delay to let through motor starting currents.

- I_{sd} is set in amperes from 5 to 13 x I_n , as follows:
 - from 1600 to 4160 A for the 320 A rating
 - from 2500 to 6500 A for the 500 A rating.

Short-circuits: Non-adjustable instantaneous protection (I_i)

Instantaneous protection with non-adjustable pick-up I_i .

Protection version

- 3-pole (3P 3D): 3-pole frame (3P) equipped with detection on all 3 poles (3D).

Indications

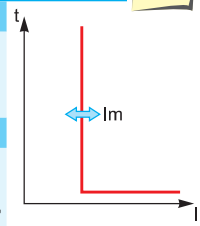
Front indications

- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.

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



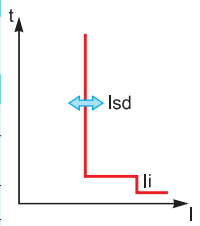
Magnetic trip units		MA 2.5 to 220								
Ratings (A)	In at 65 °C ⁽¹⁾	2.5	6.3	12.5	25	50	100 ⁽¹⁾	150	220	
Circuit breaker	Compact NSX100	■	■	■	■	■	■	-	-	
	Compact NSX160	-	-	-	■	■	■	■	-	
	Compact NSX250	-	-	-	-	-	■	■	■	
Instantaneous magnetic protection										
Pick-up (A) accuracy ±20 %	I_m = I _n x ...	Adjustable from 6 to 14 x I _n (settings 6, 7, 8, 9, 10, 11, 12, 13, 14)						Adjustable from 9 to 14 x I _n (settings 9, 10, 11, 12, 13, 14)		
Time delay (ms)	t _m	fixed								



⁽¹⁾ MA100 3P adjustable from 6 to 14 x I_n.
MA100 4P adjustable from 9 to 14 x I_n.



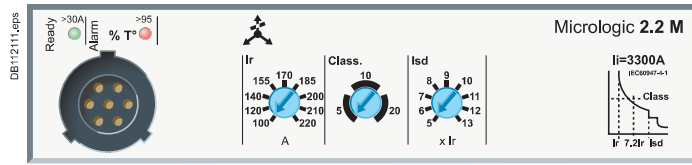
Micrologic 1.3 M		320		500	
Ratings (A)	In at 65 °C ⁽¹⁾				
Circuit breaker	Compact NSX400	■			-
	Compact NSX630	■			■
S Short-time protection					
Pick-up (A) accuracy ±15 %	I_{sd}	Adjustable directly in amps			
		9 settings: 1600, 1920, 2440, 2560, 2880, 3200, 3520, 3840, 4160 A		9 settings: 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500 A	
Time delay (ms)	t_{sd}	Non-adjustable			
	Non-tripping time	10			
	Maximum break time	60			
I Instantaneous protection					
Pick-up (A) accuracy ±15 %	I_i non-adjustable	4800		6500	
	Non-tripping time	0			
	Maximum break time	30 ms			



⁽¹⁾ Motor standards require operation at 65 °C. Circuit-breaker ratings are derated to take this requirement into account.

Micrologic 2.2 / 2.3 M trip units provide built-in thermal and magnetic protection. They are used in **2-device motor-feeder solutions** on Compact NSX100 to 630 circuit breakers with performance levels B/F/H/N/S/L. They provide protection for motors up to 315 kW at 400 V against:

- short-circuits
- overloads with selection of a trip class (5, 10 or 20)
- phase unbalance.



Circuit breakers with a Micrologic 2.2 / 2.3 M trip unit include protection similar to an inverse-time thermal relay. They are combined with a contactor.

Protection

Settings are made using a dial.

Overloads (or thermal protection): Long-time protection and trip class (Ir)

Inverse-time thermal protection against overloads with adjustable pick-up Ir.

Settings are made in amperes. The tripping curve for the long-time protection, which indicates the time delay **tr** before tripping, is defined by the selected trip class.

Trip class (class)

The class is selected as a function of the normal motor starting time.

- Class 5: starting time less than 5 s.
- Class 10: starting time less than 10 s.
- Class 20: starting time less than 20 s.

For a given class, it is necessary to check that all motor-feeder components are sized to carry the 7.2 Ir starting current without excessive temperature rise during the time corresponding to the class.

Short-circuits: Short-time protection (Isd)

Protection with an adjustable pick-up Isd. There is a very short delay to let through motor starting currents.

Short-circuits: Non-adjustable instantaneous protection (Ii)

Instantaneous protection with non-adjustable pick-up Ii.

Phase unbalance or phase loss (Iunbal)

This function opens the circuit breaker if a phase unbalance occurs:

- that is greater than the 30 % fixed pick-up Iunbal
- following the non-adjustable time delay tunbal equal to:
 - 0.7 s during starting
 - 4 s during normal operation.

Phase loss is an extreme case of phase unbalance and leads to tripping under the same conditions.

Indications

Front indications

- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Red alarm LED for motor operation: goes ON when the thermal image of the rotor and stator is greater than 95 % of the permissible temperature rise.

Remote indications via SDTAM module

Compact NSX devices with a Micrologic 2 can be equipped with an SDTAM module dedicated to motor applications for:

- a contact to indicate circuit-breaker overload
- a contact to open the contactor. In the event of a phase unbalance or overload, this output is activated 400 ms before circuit-breaker tripping to open the contactor and avoid circuit breaker tripping.

This module takes the place of the MN/MX coils and an OF contact.



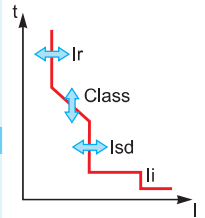
SDTAM remote indication relay module with its terminal block.

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

Micrologic 2.2 / 2.3 M



Ratings (A)	In at 65 °C ⁽¹⁾	25	50	100	150	220	320	500
Circuit breaker	Compact NSX100	■	■	■	-	-	-	-
	Compact NSX160	■	■	■	■	-	-	-
	Compact NSX250	■	■	■	■	■	-	-
	Compact NSX400	-	-	-	-	-	■	-
	Compact NSX630	-	-	-	-	-	■	■



L Overloads (or thermal protection): Long-time protection and trip class		value depending on trip unit rating (In) and setting on dial									
Pick-up (A)	Ir										
tripping between 1.05 and 1.20 Ir	In = 25 A	Ir = 12	14	16	18	20	22	23	24	25	
	In = 50 A	Ir = 25	30	32	36	40	42	45	47	50	
	In = 100 A	Ir = 50	60	70	75	80	85	90	95	100	
	In = 150 A	Ir = 70	80	90	100	110	120	130	140	150	
	In = 220 A	Ir = 100	120	140	155	170	185	200	210	220	
	In = 320 A	Ir = 160	180	200	220	240	260	280	300	320	
In = 500 A	Ir = 250	280	320	350	380	400	440	470	500		

Trip class as per IEC 60947-4-1		5	10	20						
---------------------------------	--	---	----	----	--	--	--	--	--	--

Time delay (s)	tr	1.5 x Ir	120	240	480	for warm motor				
depending on selected trip class		6 x Ir	6.5	13.5	26	for cold motor				
		7.2 x Ir	5	10	20	for cold motor				

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

Cooling fan		non-adjustable - motor self-cooled									
-------------	--	------------------------------------	--	--	--	--	--	--	--	--	--

S₀ Short-circuits: Short-time protection with fixed time delay

Pick-up (A)	Isd = Ir x ...	5	6	7	8	9	10	11	12	13
-------------	----------------	---	---	---	---	---	----	----	----	----

Time delay (ms)	tsd	non-adjustable									
	Non-tripping time	10									
	Maximum break time	60									

I Short-circuits: Non-adjustable instantaneous protection

Pick-up (A)	li non-adjustable	425	750	1500	2250	3300	4800	6500
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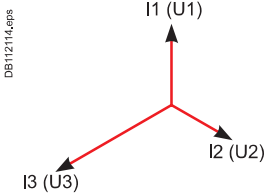
Time delay (ms)	Non-tripping time	0									
	Maximum break time	30									

Phase unbalance or phase loss

Pick-up (A)	lunbal in % average current ⁽²⁾	> 30 %									
-------------	--	--------	--	--	--	--	--	--	--	--	--

Time delay (s)	non-adjustable	0.7 s during starting									
		4 s during normal operation									

(1) Motor standards require operation at 65 °C. Circuit-breaker ratings are derated to take this requirement into account (see page B-8).
 (2) The unbalance measurement takes into account the most unbalanced phase with respect to the average current.



Unbalance of phase currents and voltages.

Additional technical characteristics

Phase unbalance
 An unbalance in three-phase systems occurs when the three voltages are not equal in amplitude and/or not displaced 120° with respect to each other. It is generally due to single-phase loads that are incorrectly distributed throughout the system and unbalance the voltages between the phases.

These unbalances create negative current components that cause braking torques and temperature rise in asynchronous machines, thus leading to premature ageing.

Phase loss
 Phase loss is a special case of phase unbalance.
 ■ During normal operation, it produces the effects mentioned above and tripping must occur after four seconds.

■ During starting, the absence of a phase may cause motor reversing, i.e. it is the load that determines the direction of rotation. This requires virtually immediate tripping (0.7 seconds).
Starting time in compliance with the class (Micrologic 2 M)

For normal motor starting, Micrologic 2 M checks the conditions below with respect to the thermal-protection (long-time) pick-up Ir:

- current > 10 % x Ir (motor-off limit)
- overrun of 1.5 x Ir threshold, then return below this threshold before the end of a 10 s time delay.

If either of these conditions is not met, the thermal protection trips the device after a maximum time equal to that of the selected class.

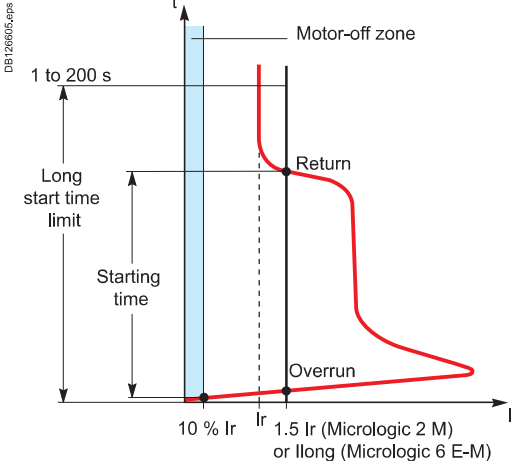
Pick-up Ir must have been set to the current indicated on the motor rating plate.

Long starts (Micrologic 6 E-M)
 When this function is not activated, the starting conditions are those indicated above. When it is activated, this protection supplements thermal protection (class).

A long start causes tripping and is characterised by:

- current > 10 % x Ir (motor-off limit) with:
- either overrun of the long-time pick-up (1 to 8 x Ir) without return below the pick-up before the end of the long-time time delay (1 to 200 s)
- or no overrun of the long-time pick-up (1 to 8 x Ir) before the end of the long-time time delay (1 to 200 s).

Pick-up Ir must have been set to the current indicated on the motor rating plate. This protection should be coordinated with the selected class.



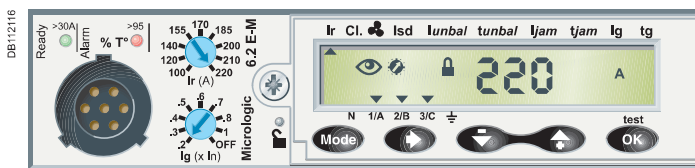
Motor starting and long starts.

Micrologic 6 E-M is used in **2-device motor-feeder solutions**.

It provides the same protection as Micrologic 2 M:

- short-circuits
- overloads with selection of the same trip classes (5, 10 or 20), plus trip class 30 for starting of machines with high inertia.

In addition, it offers specific motor-protection functions that can be set via the keypad.



Protection

The protection functions are identical to those of Micrologic 2 M and can be fine-adjusted via the keypad.

Access to setting modifications via the keypad is protected by a locking function that is controlled by a microswitch. The lock is activated automatically if the keypad is not used for 5 minutes. Access to the microswitch is protected by a transparent lead-sealable cover. It is possible to scroll through settings and measurements with the cover closed.

Overloads (or thermal), class and short-circuits

The long-time, short-time and instantaneous functions are identical to those of Micrologic 2 M.

In addition, there is trip class 30 for long-time protection and a setting for self-cooled or fan-cooled motors.

Ground-fault protection (lg)

Residual type ground-fault protection with an adjustable pick-up **lg** (with Off position) and adjustable time delay **tg**.

Phase unbalance or phase loss (lunbal)

This function opens the circuit breaker if a phase unbalance occurs:

- that is greater than the **lunbal** pick-up that can be fine-adjusted from 10 to 40 % (30 % by default)
- following the **tunbal** time delay that is:
 - 0.7 s during starting
 - adjustable from 1 to 10 seconds (4 seconds by default) during normal operation.

Phase loss is an extreme case of phase unbalance and leads to tripping under the same conditions.

Locked rotor (ljam)

This function detects locking of the motor shaft caused by the load.

During motor starting (see page A-55), the function is disabled.

During normal operation, it causes tripping:

- above the **ljam** pick-up that can be fine-adjusted from 1 to 8 x **Ir**
- in conjunction with the **tjam** time delay that can be adjusted from 1 to 30 seconds.

Under-load (lund)

This function detects motor no-load operation due to insufficient load (e.g. a drained pump). It detects phase undercurrent.

During motor starting (see page A-55), the function is always enabled.

During normal operation, it causes tripping:

- below the **lund** pick-up that can be fine-adjusted from 0.3 to 0.9 x **Ir**
- in conjunction with the **tund** time delay that can be adjusted from 1 to 200 seconds.

Long starts (llong)

This protection supplements thermal protection (class).

It is used to better adjust protection to the starting parameters.

It detects abnormal motor starting, i.e. when the starting current remains too high or too low with respect to a pick-up value and a time delay.

It causes tripping:

- in relation with a **llong** pick-up that can be fine-adjusted from 1 to 8 x **Ir**
- in conjunction with the **tlong** time delay that can be adjusted from 1 to 200 seconds.

(see "long starts" page A-55)

Display of type of fault

On a fault trip, the type of fault (**Ir**, **Isd**, **li**, **lg**, **lunbal**, **ljam**), the phase concerned and the interrupted current are displayed.

Indications

Front indications

- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Red alarm LED for motor operation: goes ON when the thermal image of the rotor or stator is greater than 95% of the permissible temperature rise.

Remote indications via SDTAM or SDx module

See description on page A-54 for SDTAM and page A-93 for SDx.

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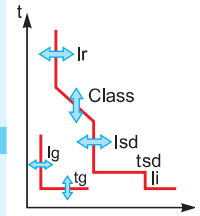
SDTAM remote indication relay module with its terminal block.

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

Micrologic 6.2 / 6.3 E-M



Ratings (A)	In at 65 °C ⁽¹⁾	25	50	80	150	220	320	500
Circuit breaker	Compact NSX100	■	■	■	-	-	-	-
	Compact NSX160	■	■	■	■	■	-	-
	Compact NSX250	■	■	■	■	■	-	-
	Compact NSX400	-	-	-	-	-	■	-
	Compact NSX630	-	-	-	-	-	■	■



L Overloads: Long-time protection

Pick-up (A)	Ir	Dial setting	Value depending on trip-unit rating (In) and setting on dial									
Tripping between 1.05 and 1.20 Ir	In = 25 A	Ir =	12	14	16	18	20	22	23	24	25	
	In = 50 A	Ir =	25	30	32	36	40	42	45	47	50	
	In = 80 A	Ir =	35	42	47	52	57	60	65	72	80	
	In = 150 A	Ir =	70	80	90	100	110	120	130	140	150	
	In = 220 A	Ir =	100	120	140	155	170	185	200	210	220	
	In = 320 A	Ir =	160	180	200	220	240	260	280	300	320	
	In = 500 A	Ir =	250	280	320	350	380	400	440	470	500	
		Keypad setting	Fine adjustments in 1 A steps below maximum value defined by dial setting									

Trip class as per IEC 60947-4-1		5	10	20	30		
Time delay (s)	tr	1.5 x Ir	120	240	480	720	for warm motor
depending on selected trip class		6 x Ir	6.5	13.5	26	38	for cold motor
		7.2 x Ir	5	10	20	30	for cold motor
Thermal memory		20 minutes before and after tripping					
Cooling fan		Settings for self-cooled or fan-cooled motors					

S₀ Short-circuits: Short-time protection with fixed time delay

Pick-up (A) accuracy ±15 %	I _{sd} = Ir x ...	5	6	7	8	9	10	11	12	13
		Fine adjustment in 0.5 x Ir steps using the keypad								
Time delay	tsd	non-adjustable								
	Non-tripping time	10 ms								
	Maximum break time	60 ms								

I Short-circuits: Non-adjustable instantaneous protection

Pick-up (A) accuracy ±15 %	I _i non-adjustable	425	750	1200	2250	3300	4800	6500	
	Non-tripping time	0 ms							
	Maximum break time	30 ms							

G Ground faults

Pick-up (A) accuracy ±10 %	I _g = In x ...	Dial setting										
		In = 25 A	I _g =	0.6	0.6	0.6	0.6	0.7	0.8	0.9	1	Off
		In = 50 A	I _g =	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	Off
		In > 50 A	I _g =	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1	Off
		fine adjustments in 0.05 x In steps										
Time delay (ms)	tg		0	0.1	0.2	0.3	0.4					
		Non-tripping time	20	80	140	230	350					
		Maximum break time	80	140	200	320	500					

Phase unbalance or phase loss

Pick-up (A) accuracy ±20 %	I _{unbal} = in % average current ⁽²⁾	adjustable from 10 to 40 %, default setting = 30 % fine adjustments in 1 % steps using the keypad activated during motor starting								
Time delay (s)	t _{unbal}	0.7 s during starting 1 to 10 seconds during normal operation, default setting = 4 seconds fine adjustments in 1 s steps using the keypad								

Locked rotor

Pick-up (A) accuracy ±10 %	I _{jam} = Ir x ...	1 x 8 Ir with Off position, default setting = Off fine adjustments in 0.1 x Ir steps using the keypad disabled during motor starting								
Time delay (s)	t _{jam} =	1 to 30 seconds fine adjustments in 1 s steps using the keypad, default setting = 5 s								

Under-load (under-current)

Pick-up (A) accuracy ±10 %	I _{und} = Ir x ...	0.3 x 0.9 Ir with Off position, default setting = Off Fine adjustments in Ir x 0.01 steps using the RSU software activated during motor starting								
Time delay (s)	t _{und} =	1 to 200 seconds fine adjustments in 1 s steps using the RSU software, default setting = 10 s								

Long starts

Pick-up (A) accuracy ±10 %	I _{long} = Ir x ...	1 x 8 Ir with Off position, default setting = Off Fine adjustments in Ir x 0.1 steps using the RSU software activated during motor starting								
Time delay (s)	t _{long} =	1 to 200 seconds fine adjustments in 1 s steps using the RSU software, default setting = 10 s								

(1) Motor standards require operation at 65 °C. Circuit-breaker ratings are derated to take this requirement into account (see page B-8).

(2) The unbalance measurement takes into account the most unbalanced phase with respect to the average current.

Micrologic 6 E-M provides Power Meter functions with energy metering. With the FDM121 display unit, all metering data and operating indicators are available on the switchboard front panel. This version also displays the thermal image of the motor.

Power Meter functions

The built-in Power Meter functions of the Micrologic 6 E-M are the same as those for the Micrologic 6 E presented in the section on distribution (see page A-22). When used exclusively in the three-phase version, neutral measurements are excluded.

Operating-assistance functions

The operating-assistance functions of the Micrologic 6 E-M are the same as those for the Micrologic 6 E presented in the section on distribution (see page A-24).

Special functions for motor feeders

Additional operating functions specifically for motor feeders are available.

Phase sequence

The order in which the phases L1, L2, L3 are connected determines the direction of motor rotation. If two phases are inverted, the direction is reversed. Information on the direction of rotation is provided. It can be linked to an alarm to detect an inversion in the direction following servicing on the supply under de-energised conditions and disable restarting.

Thermal image of the rotor and stator

Micrologic 6 E-M offers a thermal-image function.

Taking into account the I_r setting and the class, an algorithm simulates rotor and stator temperature rise. It includes the slow temperature rise of the stator and its metal mass. Also included is the faster temperature rise of the copper rotor.

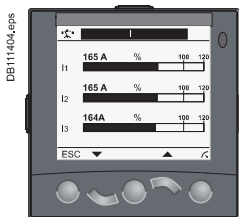
The thermal protection function trips the circuit breaker when the calculated thermal image reaches 100 % of the permissible temperature rise.

The communication indicates the thermal-image value as a percentage of the permissible temperature rise. One or more alarms may be assigned to selected thresholds. A red LED on the front signals when the value exceeds 95 %.

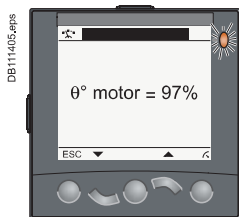
An SDx module with two outputs programmed for thermal-image values can be used to implement other alarm functions.



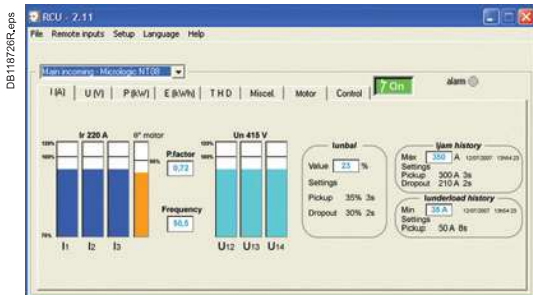
Micrologic 6 E-M.



Current values.



Thermal-image alarm.



PC screen with motor thermal image and value monitoring.

The additional technical characteristics are identical to those of Micrologic 6 E (see page A-23 and page A-25).



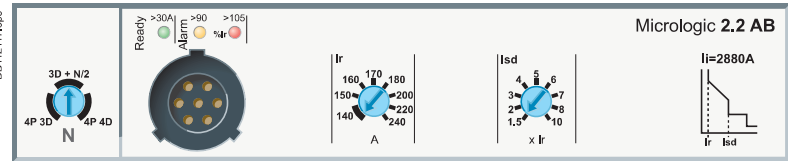
Micrologic 6 E-M integrated Power Meter and operating-assistance functions			Display	
			Micrologic LCD	FDM display
Measurements				
Instantaneous rms measurements				
Currents (A)	Phase currents and average value	I1, I2, I3 and Iavg = (I1 + I2 + I3) / 3	■	■
	Highest current of the 3 phases	I _{max} of I1, I2, I3	■	■
	Ground-fault protection	% I _g (pick-up setting)	■	■
	Current unbalance between phases	% Iavg	-	■
Voltages (V)	Phase-to-phase voltages and average value	U12, U23, U31 and Uavg = (U12 + U21 + U23) / 3	■	■
	Unbalance between phase-to-phase voltages	% Uavg	-	■
	Phase sequence	1-2-3, 1-3-2	-	-
Frequency (Hz)	Power system	F	■	■
Power	Active (kW), reactive (kVAR), apparent (kVA)	P, Q, S total and per phase	-	■
	Power factor and cos φ (fundamental)	PF, cos φ, total and per phase	-	■
Maximeters / minimeters	Associated with instantaneous rms measurements	Reset via Micrologic and the display unit	-	■
Energy metering				
Energy	Active (kWh), reactive (kVARh), apparent (kVAh)	Total since last reset Absolute or signed mode ⁽¹⁾	■	■
Demand and maximum demand values				
Demand current (A)	Phases	Present value on the selected window	-	(2)
		Maximum demand since last reset	-	(2)
Demand power	Active (kWh), reactive (kVARh), apparent (kVAh)	Present value on the selected window	-	(2)
		Maximum demand since last reset	-	(2)
Calculation window	Sliding, fixed or com-synchronised	Adjustable from 5 to 60 minutes in 1 minute steps	-	(2)
		Absolute or signed mode ⁽¹⁾	-	(2)
Power quality				
Total harmonic distortion (%)	Of voltage with respect to rms value	THDU, THDV of the Ph-Ph and Ph-N voltage	-	■
	Of current with respect to rms value	THDI of the phase current	-	■
Operating assistance				
Personalised alarms				
Settings	Up to 10 alarms can be assigned to all measurements and events as well as to phase lead/lag, four quadrants, phase sequence and thermal image		-	(2)
Time-stamped histories				
Trips	last 17	I _r , I _{sd} , I _i , I _g , I _{unbal} , I _{jam} , I _{lund} , I _{long}	-	(2)
Alarms	last 10		-	(2)
Operating events	last 10 events and type:	Modification of protection setting by dial	-	(2)
		Opening of keypad lock	-	(2)
		Test via keypad	-	(2)
		Test via external tool	-	(2)
		Time setting (date and time)	-	(2)
		Reset for maximeter/minimeter and energy meter	■	(2)
Time stamping	Presentation	Date and time, text, status	-	(2)
Time-stamped event tables				
Protection settings	One of the following settings modified	I _r tr I _{sd} t _{sd} I _i I _g t _g	-	(2)
	Time-stamping of modification	Date and time of modification	-	(2)
	Previous value	Value before modification	-	(2)
Min/Max	Value monitored	I1 I2 I3 U12 U23 U31 f	-	(2)
	Time-stamping of min/max value	Date and time of record	-	(2)
	Present min/max value	Min/max recorded for the value	-	(2)
Maintenance indicators				
Counter	Mechanical cycles ⁽³⁾	Assignable to an alarm	-	(2)
	Electrical cycles ⁽³⁾	Assignable to an alarm	-	(2)
	Trips	One per type of trip	-	(2)
	Alarms	One for each type of alarm	-	(2)
	Hours	Total operating time (hours)	-	(2)
Indicator	Contact wear	%	-	■
Load profile	Hours at different load levels	% of hours in four current ranges: 0-49 % I _n , 50-79 % I _n , 80-89 % I _n , ≥ 90 % I _n	-	(2)
Thermal image	Stator and rotor	% of permissible temperature rise	-	(2)

(1) Absolute mode: $E_{absolute} = E_{out} + E_{in}$; Signed mode: $E_{signed} = E_{out} - E_{in}$.

(2) Available via the communication system only.

(3) The BSCM module (page A-33) is required for these functions.

Micrologic AB trip units are used in public distribution systems to limit the current supplied according to the consumer's contract. They are available in 100, 160, 240 and 400 A ratings and are supplied with a lead-seal device to protect the settings.



Compact INV switch-disconnector with visible break.



Compact NSX with Micrologic 2 AB.



SDx remote indication relay module with its terminal block.

Compact NSX circuit breakers equipped with Micrologic AB trip units are installed as incoming devices for consumer installations connected to the public LV distribution system.

With respect to the utility, they have two functions.

- Consumption is limited to the contractual power level. If the limit is exceeded, a fast thermal-protection function trips the device at the head of the consumer's installation without the utility having to intervene.
- Total discrimination is ensured with the upstream fuses on the public distribution system in the event of a fault, overload or short-circuit in the consumer's installation, protecting the utility line.

In addition, they provide the consumer with:

- protection for the installation as a whole, with the possibility of adding a Vigi earth-leakage protection module
- the possibility of downstream discrimination.

This type of Compact NSX is often used in conjunction with an Compact INV switch-disconnector located outside the consumer's building and providing the visible-break function.

This means the operator can directly see, through a transparent cover, the physical separation of the main contacts. The Compact INV range is also suitable for isolation with positive contact indication.

This means utility operators can work on the service-connection unit after isolating it from the upstream line.

Protection

Settings are made using the adjustment dials with fine-adjustment possibilities and a lead-seal fixture.

Overloads: Long-time protection (Ir)

Inverse-time thermal protection against overloads with an adjustable current pick-up I_r and a very short, non-adjustable time delay t_r (15 seconds for $1.5 \times I_r$).

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

Short-circuit protection with an adjustable pick-up I_{sd} . The short-time pick-up values are high enough to avoid nuisance tripping in the event of transient current spikes.

Short-circuits: Non-adjustable instantaneous protection

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

Neutral protection

Available on four-pole circuit breakers only. Neutral protection may be set using a three-position switch:

- 4P 3D: neutral unprotected
- 4P 3D + N/2: neutral protection at half the value of the phase pick-up, i.e. $0.5 \times I_r$
- 4P 4D: neutral fully protected at I_r .

Indications

Front indications



- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Orange overload pre-alarm LED: steady on when $I > 90 \% I_r$.
- Red overload LED: steady on when $I > 105 \% I_r$.

Remote indications

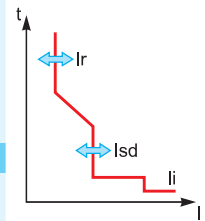
An SDx relay module installed inside the circuit breaker can be used to remote the overload-trip signal. This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is closed.

The module is described in detail in the section dealing with accessories [page A-95](#).

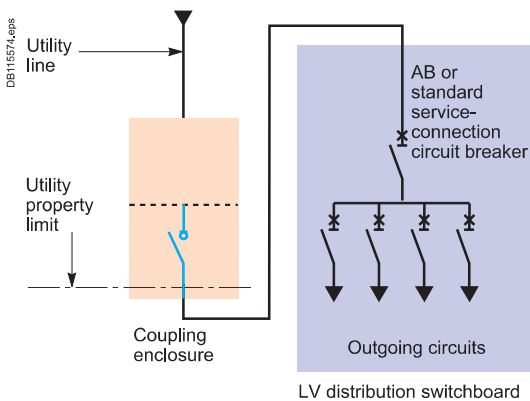
Micrologic 2.2 / 2.3 AB



Ratings (A)		In at 40 °C ⁽¹⁾	100	160	240	400				
Circuit breaker	Compact NSX100		■	-	-	-				
	Compact NSX160		■	■	-	-				
	Compact NSX250		■	■	■	-				
	Compact NSX400		-	-	-	■				
	Compact NSX630		-	-	-	■				
L Long-time protection										
Pick-up (A) tripping between 1.05 and 1.20 Ir	Ir	value depending on trip unit rating (In) and setting on dial								
	In = 100 A Ir =	40	40	50	60	70	80	90	100	
	In = 160 A Ir =	90	100	110	120	130	140	150	160	
	In = 240 A Ir =	140	150	160	170	180	200	220	240	
	In = 400 A Ir =	260	280	300	320	340	360	380	400	
Time delay (s)	tr	non-adjustable								
	1.5 Ir	15								
	6 Ir	0.5								
	7.2 Ir	0.35								
Thermal memory		20 minutes before and after tripping								
S₀ Short-time protection with fixed time delay										
Pick-up (A) accuracy ±10 %	I_{sd} = Ir x ...	1.5	2	3	4	5	6	7	8	10
Time delay (ms)	tsd	non-adjustable: 20								
	Non-tripping time	20								
	Maximum break time	80								
I Non-adjustable instantaneous protection										
Pick-up (A) accuracy ±15 %	I_i non-adjustable	1500	1600	2880	4800					
Time delay (ms)	Non-tripping time	10								
	Maximum break time	50								



(1) If the trip units are used in high-temperature environments, the Micrologic setting must take into account the thermal limitations of the circuit breaker. See the temperature derating table.



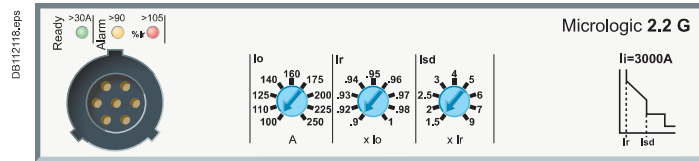
Consumer connection diagram.

Technical details

Advantages of the AB trip unit

- Controls the power drawn with respect to contractual power levels. If the contractual level is overrun, the circuit breaker opens and the consumer is not billed excess costs.
- If a short-circuit occurs, the circuit breaker opens and the upstream HRC fuses on utility lines are not affected. No expensive utility servicing is billed to the consumer.

Micrologic G trip units are used for the protection of systems supplied by generators or comprising long cable lengths. They can be mounted on all Compact NSX100/160/250 circuit breakers. With extensive setting possibilities, Micrologic 5 offers the same functions from 100 to 630 A. A thermal-magnetic trip unit is also available for the NSX100 to 250 (see page A-16).



Circuit breakers equipped with Micrologic G trip units protect systems supplied by generators (lower short-circuit currents than with transformers) and distribution systems with long cable lengths (fault currents limited by the impedance of the cable).

Protection

Settings are made using the adjustment dials with fine adjustment possibilities.

Overloads: Long-time protection (Ir)

Inverse-time thermal protection against overloads with an adjustable current pick-up I_r and a very short, non-adjustable time delay t_r (15 seconds for $1.5 \times I_r$).

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

Short-circuit protection with an adjustable pick-up I_{sd} , delayed 200 ms, in compliance with the requirements of marine classification companies.

Short-circuits: Non-adjustable instantaneous protection (Ii)

Instantaneous short-circuit protection with a fixed pick-up required for generator protection.

Neutral protection

- On 3-pole circuit breakers, neutral protection is not possible.
- On four-pole circuit breakers, neutral protection may be set using a three-position switch:
 - 4P 3D: neutral unprotected
 - 4P 3D + N/2: neutral protection at half the value of the phase pick-up, i.e. $0.5 \times I_r$
 - 4P 4D: neutral fully protected at I_r .

Indications

Front indications



- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Orange overload pre-alarm LED: steady on when $I > 90 \% I_r$.
- Red overload LED: steady on when $I > 105 \% I_r$.

Remote indications

An SDx relay module installed inside the circuit breaker can be used to remote the overload-trip signal.

This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is closed.

The module is described in detail in the section dealing with accessories.

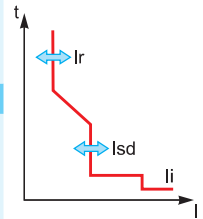


SDx remote indication relay module with its terminal block.

Micrologic 2.2 G



Ratings (A)	In at 40 °C (1)	40	100	160	250						
Circuit breaker	Compact NSX100	■	■	-	-						
	Compact NSX160	■	■	■	-						
	Compact NSX250	■	■	■	■						
L Long-time protection											
Pick-up (A) tripping between 1.05 and 1.20 Ir	In = 40 A In = 100 A In = 160 A In = 250 A (NSX250)	lo = lo = lo = lo =	value depending on trip unit rating (In) and setting on dial								
			18	20	23	25	28	32	36	40	
			40	45	50	55	63	70	80	90	100
			63	70	80	90	100	110	125	150	160
			100	110	125	140	150	176	200	225	250
		Ir = lo x ...	9 fine-adjustment settings from 0.9 to 1 for each lo value								
Time delay (s) accuracy 0 to -20 %	tr		non-adjustable								
		1.5 x Ir	15								
		6 x Ir	0.5								
		7.2 x Ir	0.35								
Thermal memory		20 minutes before and after tripping									
S0 Short-time protection with fixed time delay											
Pick-up (A) accuracy ±10 %	Isd = Ir x ...	1.5	2	2.5	3	4	5	6	7	8	9
Time delay (ms)	tsd	non-adjustable									
		Non-tripping time									
		Maximum break time									
		140									
		200									
I Non-adjustable instantaneous protection											
Pick-up (A) accuracy ±15 %	li non-adjustable	600	1500	2400	3000						
	Non-tripping time	15 ms									
	Maximum break time	50 ms									



(1) If the trip units are used in high-temperature environments, the Micrologic setting must take into account the thermal limitations of the circuit breaker. See the temperature derating table.

Compact NSX circuit breakers are also used in industrial control panels.

They serve as incoming devices or can be combined with contactors to protect motor feeders:

- compliance with worldwide standards including IEC 60947-2 and UL 508 / CSA 22-2 no. 14
- overload and short-circuit protection
- isolation with positive contact indication, making it possible to service machines safely by isolating them from all power sources
- installation in universal and functional type enclosures
- NA switch-disconnector version.

Industrial control panels

Compact NSX circuit breakers equipped for public distribution or motor protection functions as described in the previous pages can be used in industrial control panels. The accessories for the Compact NSX range are suitable for the special needs of these switchboards.

Auxiliaries

All auxiliaries can be added to the circuit breaker by the user:

- padlocking devices (in the OFF position)
- rotary handle
- status-indication auxiliary contacts (ON, OFF and tripped)
- shunt (MX) or undervoltage (MN) releases
- early-make or early-break contacts.

Rotary handle

Direct or extended versions for mounting up to 600 mm behind the front:

- black front with black handle
- yellow front with red handle (for machine tools or emergency off as per IEC 204 / VDE 0013).

All rotary handles can be padlocked in the OFF position. Optional door interlock, recommended for MCC panels (motor control centres).

When the device is equipped with an extended rotary handle, a control accessory mounted on the shaft makes it possible to operate the device with the door open. The device can be padlocked in the OFF position in compliance with UL508.

Early-make or early-break contacts

These contacts can be used respectively to supply an MN undervoltage release before the circuit breaker closes or to open the contactor control circuit before the circuit breaker opens.

Special functions

- Indication of thermal overloads with the SDx module.
- Early opening of the contactor for overload faults with the SDTAM module.
- Links with PLCs via the communication system.
- Measurement of all electrical parameters with Micrologic A and E.
- Programmable alarms with Micrologic 5 and 6.

Installation in enclosures

Compact circuit breakers can be installed in a metal enclosure together with other devices (contactors, motor-protection circuit breakers, LEDs, etc.) (see page A-104).

Compliance with North American industrial control equipment standards

Compact NSX devices have received UL508 / CSA 22-2 no. 14 approval for industrial control equipment of the "Manual Motor Controller", "Across the Line Starter", "General Use" and "Disconnecting Means" types.

Type NA devices are switch-disconnectors that must always be protected upstream.

UL508 approval

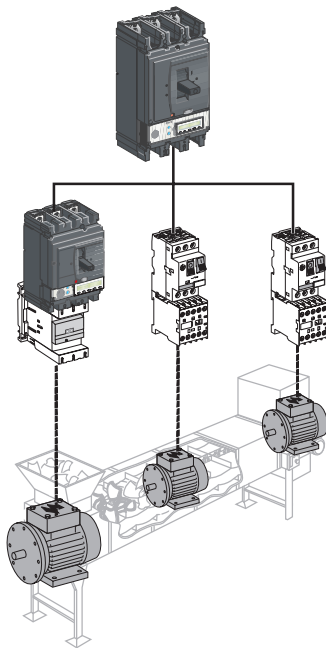
Circuit breakers	Trip units	Approvals
Compact NSX100 to 630 F/N/H	TMD, Micrologic 2, 5 and 6	General Use Motor Disconnecting Means
	NA, MA, Micrologic 1.3 M, 2.2 M, 2.3 M, Micrologic 6.2 E-M and 6.3 E-M	Manual Motor Controller Across the Line Starter Motor Disconnecting Means

Table of 3-phase motor ratings in hp (1 hp = 0.7457 kW)

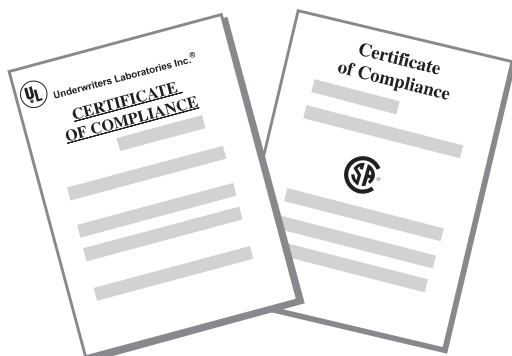
V AC ratings	NA, MA Micrologic 1.3 M, 2.2 M, 2.3 M Micrologic 6.2 E-M and 6.3 E-M	115	230	460	575
TMD Micrologic 2, 5 and 6					
25	25	3	7.5	15	20
50	50	7.5	15	30	40
100	100	15	30	75	100
160	150	25	50	100	150
250	220	40	75	150	200
400	320	-	125	250	300
550	500	-	150	350	500

The deratings indicated on page B-8 and page B-9 apply to TMD, Micrologic 2, 5 and 6 trip units, rated at 40 °C.

DB417468.jpg



DB115224.jpg



16 Hz 2/3 network protection Micrologic 5 A-Z trip unit

Compact NSX circuit breakers may be used on 16 Hz 2/3 systems with special thermal-magnetic and electronic (Micrologic 5 A-Z) trip units.

16 Hz 2/3 networks

Single-phase distribution networks with a frequency of 16 Hz 2/3 are used for railroad applications in certain European countries.

Breaking capacity for 16 Hz 2/3 at 250/500 V

Compact NSX circuit breakers of the 3P 2D or the 3P 3D type protect 16 Hz 2/3 networks at 250 V or 500 V.

They can be equipped with either:

- a TM-D thermal-magnetic trip unit for Compact NSX100 to 250
- or an electronic Micrologic 5.2 A-Z trip unit for Compact NSX100 to 250 or a 5.3 A-Z for Compact NSX400/630.

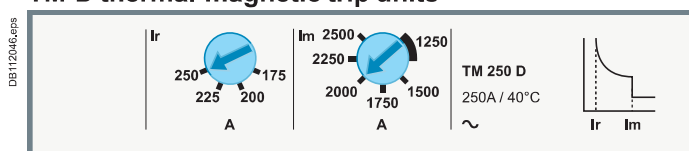
The possible breaking-capacity performance levels are B, F, N and H as indicated below.

Breaking capacity I_{cu}

Operating voltage	Performance	TMD and Micrologic 5 A-Z trip units			
		B	F	N	H
250 V / 500 V	I _{cu} (kA)	25	36	50	70

Protection

TM-D thermal-magnetic trip units

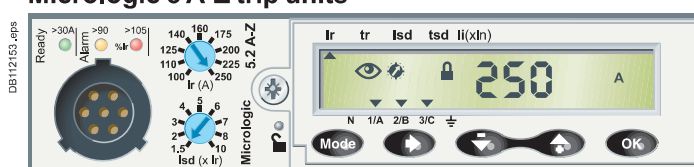


The 16 Hz 2/3 frequency does not modify the thermal settings with respect to those at 50 Hz (see page A-17). The magnetic pick-ups are modified as shown below.

Magnetic protection for Compact NSX 100/160/250 at 50 Hz and at 16 Hz 2/3

Rating (A) I _n at 40 °C	16	25	32	40	50	63	80	100	125	160	200	250
Pick-up (A) I _m accur. ±20%	Fixed											Adjustable
NSX100 50Hz	190	300	400	500	500	500	640	800				
16 Hz 2/3	170	270	360	450	450	450	580	720				
NSX160/250 50Hz	190	300	400	500	500	500	640	800	1250	1250		5 to 10 I _n
16 Hz 2/3	170	270	360	450	450	450	580	720	1100	1100		4,5 to 9 I _n

Micrologic 5 A-Z trip units



Micrologic 5.2 A-Z and 5.3 A-Z are dedicated to 16 Hz 2/3 networks.

They use a suitable sampling frequency. The protection settings are identical to those of Micrologic 5 A (see page A-21). They also offer a current-measurement function for this specific frequency.

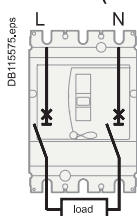
Trip-unit selection

Rating	16	63	100	160	250	400	630
Compact							
NSX100	TM-D						
NSX160		TM-D					
NSX250				TM-D			
NSX100 to 250			Micrologic 5.2 A-Z				
NSX400/630						Micrologic 5.3 A-Z	

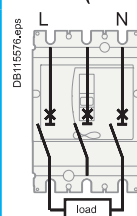
Wiring for NSX100 to 630 A

Phase and isolated neutral interrupted- 250 / 500 V

B and F (3P 2D version)

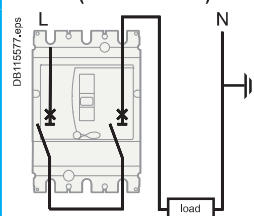


N and H (3P 3D version)

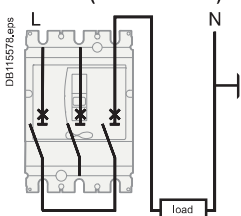


2 poles in series - Earthed neutral - 250 / 500 V

B and F (3P 2D version)



N and H (3P 3D version)



Remark. For an operating voltage > 250 V, the installation must be designed to eliminate all risk of double earth faults.

Compact NSX circuit breakers may be used on 400 Hz systems.

400 Hz distribution systems

The main 400 Hz applications are in aeronautics and certain military ships. Modern aircraft have three-phase 115/200 V 400 Hz networks.

Impact on protective devices

Due to the higher frequency, circuit breakers are subjected to additional temperature rise for identical current levels, resulting from higher losses caused by Foucault currents and an increase in the skin effect (reduction in the useful CSA of conductors). To remain within the rated temperature-rise limits of devices, current derating is required.

The power levels of 400 Hz applications rarely exceed a few hundred kW with relatively low short-circuit currents, generally not exceeding four times the rated current.

The standard Compact NSX and Masterpact NT/NW ranges are suitable for 400 Hz applications if derating coefficients are applied to the protection settings. See the derating table below.

Breaking capacity of Compact NSX circuit breakers in 400 Hz, 440 V systems

Circuit breaker	Breaking capacity Icu
NSX100	10 kA
NSX160	10 kA
NSX250	10 kA
NSX400	10 kA
NSX630	10 kA



Micrologic TM-D trip unit.

Trip units equipped with thermal-magnetic protection

The 400 Hz current settings are obtained by multiplying the 50 Hz values by the following adaptation coefficient:

- K1 for thermal trip units
- K2 for magnetic trip units.

These coefficients are independent of the trip-unit setting.

Thermal trip units

The current settings are lower at 400 Hz than at 50 Hz ($K1 < 1$).

Magnetic trip units

The current settings are conversely higher at 400 Hz than at 50 Hz ($K2 > 1$). Consequently, when the trip units are adjustable, they must be set to the minimum value.

Adaptation coefficients for thermal-magnetic trip units

Circuit breaker	Trip unit	In (A) 50Hz	Thermal at 40°C		Im (A) 50Hz	Magnetic	
			K1	400 Hz		K2	400 Hz
NSX100	TM16G	16	0.95	15	63	1.6	100
	TM25G	25	0.95	24	80	1.6	130
	TM40G	40	0.95	38	80	1.6	130
	TM63G	63	0.95	60	125	1.6	200
NSX100	TM16D	16	0.95	15	240	1.6	300
	TM25D	25	0.95	24	300	1.6	480
	TM40D	40	0.95	38	500	1.6	800
	TM63D	63	0.95	60	500	1.6	800
	TM80D	80	0.9	72	650	1.6	900
	TM100D	100	0.9	90	800	1.6	900
NSX250	TM100D	100	0.9	90	800	1.6	900
	TM160D	160	0.9	144	1250	1.6	2000
	TM200D	200	0.9	180	1000 to 2000	1.6	1600 to 3200
	TM250D	250	0.9	225	1250 to 2500	1.6	2000 to 4000

Example

NSX100 equipped with a TM16G with 50 Hz settings $I_r = 16 A$ and $I_m = 63 A$.
400 Hz settings $I_r = 16 \times 0.95 = 15 A$ and $I_m = 63 A \times 1.6 = 100 A$.

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Micrologic 5 E trip unit.

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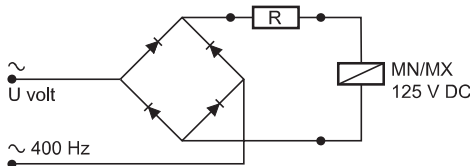
OF auxiliary contact.

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MX or MN voltage release.

DB115576.eps



Wiring diagram.

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SDx remote indication relay module with its terminal block.

Protection (cont.)

Micrologic electronic trip units

Micrologic 2.2, 2.3 or 5.2, 5.3 with A or E measurement functions are suitable for 400 Hz. The use of electronics offers the advantage of greater operating stability when the frequency varies. However the units are still subject to temperature rise caused by the frequency.

The practical consequences are:

- limit settings: see the I_r derating table below
- the long-time, short-time and instantaneous pick-ups are not modified (see page A-19 or page A-21)
- the accuracy of the displayed measurements is 2 % (class II).

Thermal derating: maximum I_r setting

Circuit breaker	Maximum setting coefficient	Max. I_r setting at 400 Hz
NSX100	1	100
NSX250	0.9	225
NSX400	0.8	320
NSX630	0.8	500

Example

An NSX250N, equipped with a Micrologic 2.2, $I_r = 250$ A at 50 Hz, must be limited to use at $I_r = 250 \times 0.9 = 225$ A.

Its short-time pick-up with fixed time delay is adjustable from 1.5 to 10 I_r (337.5 to 2250 A).

The instantaneous pick-up remains at 3000 A.

OF auxiliary contacts in 400 Hz networks

Electrical characteristics of auxiliary contacts

Contacts	Standard		Low level		
	AC12	AC15	AC12	AC15	
Utilisation cat. (IEC 60947-5-1)	AC12	AC15	AC12	AC15	
Operational current (A)	24 V	6	5	3	
	48 V	6	5	3	
	110 V	6	5	2.5	
	220/240 V	6	4	5	2
	380/415 V	6	2	5	1.5

MN and MX voltage releases for Compact NSX100/630 at 400 Hz and 440 V

For circuit breakers on 400 Hz systems, only 125 V DC MN or MX releases may be used. The release must be supplied by the 400 Hz system via a rectifier bridge (to be selected from the table below) and an additional resistor with characteristics depending on the system voltage.

U (V) 400 Hz	Rectifier	Additional resistor
220/240 V	Thomson 110 BHz or General Instrument W06 or Semikron SKB at 1.2/1.3	4.2 k Ω -5 W
380/420 V	Semikron SKB at 1.2/1.3	10.7 k Ω -10 W

Note: other models of rectifier bridges may be used if their characteristics are at least equivalent to those stated above.

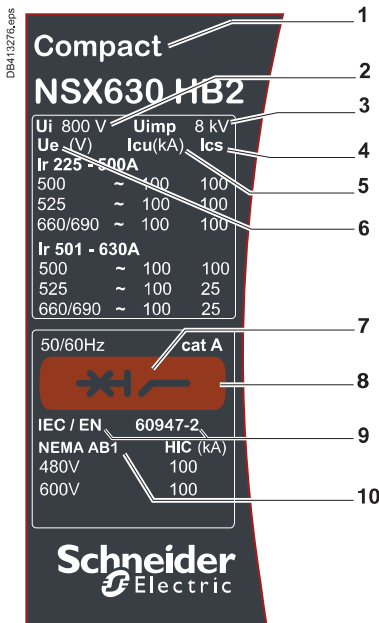
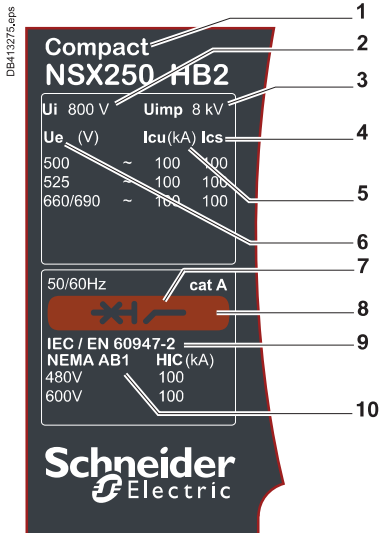
SDx indication contacts

The SDx module may be used in 400 Hz systems for voltages from 24 to 440 V. An SDx relay module installed inside the circuit breaker can be used to remote the overload-trip signal.

This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is closed.

These outputs can be reprogrammed to be assigned to other types of tripping or alarm (see page A-95).

Compact NSX HB circuit breaker is designed specifically for the needs of systems operating at 690 V.



- Standardised characteristics indicated on the rating plate:
- 1 Type of device: frame size and breaking capacity class.
 - 2 U_i : rated insulation voltage.
 - 3 U_{imp} : rated impulse withstand voltage.
 - 4 I_{cs} : service breaking capacity.
 - 5 I_{cu} : ultimate breaking capacity for various values of the rated operational voltage U_e .
 - 6 U_e : operational voltage.
 - 7 Circuit breaker-disconnector symbol.
 - 8 Colour label indicating the breaking capacity class.
 - 9 Reference standard.
 - 10 Main standards with which the device complies.

Markets

- Marine.
- Oil and gas.
- Data centers.
- Other markets pursuing energy efficiency (water, industrial, etc.).

Ability to service high power densities

- Upgrade voltage from ~415-440 to 690 V system allows:
 - smaller cables can be used
 - reduced cost and space
 - reduced energy loss in transmission
 - motors are more efficient at 690 V.
- Consider 690 V as an alternative MV system:
 - lower cost, smaller footprint, and improved maintenance.

Safety

- IACS (International Association of Classification Societies) change, requires I_{cs} rating for emergency systems:
 - key influence on Marine systems of high I_{cs} ratings
 - continuity of service after 3 faults.

Technology

- Best in class technology and performance:
 - high breaking capacity
 - NSX family consistency of energy metering, alarming and diagnosis.
- Provides alternative to fuse protection at 690 V applications.

Enhancing solutions

- Using smaller frames for 690 V high performance circuits:
 - space and cost benefit
 - NSX family consistency with same NSX accessories.
- 200 kA breaking capacity on R rating will be mainly used for:
 - high power factor applications : around 2.8 instead of 2.2
 - selectivity with Masterpact UR.

Type I & II coordination for motor applications

- Type I & II coordination with Tesys contactors is available up to 690 V.
- Coordination tables are prepared with external overload relays and protection integrated into the Micrologic trip units.
- See complementary bulletin for ratings.

Compliance with standards

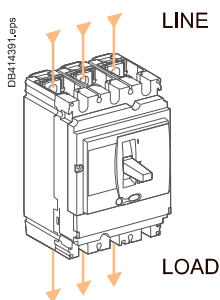
Compact NSX circuit breakers and auxiliaries comply with the following:

- international recommendations:
 - IEC 60947-1: general rules
 - IEC 60947-2: circuit breakers
 - IEC 60947-3: switch-disconnectors
 - IEC 60947-4: contactors and motor starters
 - IEC 60947-5.1 and following: control circuit devices and switching elements; automatic control components
 - European (EN 60947-1 and EN 60947-2) and corresponding national standards:
 - France NF
 - Germany VDE
 - United Kingdom BS
 - Australia AS
 - Italy CEI
 - 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.
- For U.S. UL, Canadian CSA, Mexican NOM and Japanese JIS standards, please consult us.

Characteristics and performance of Compact NSX circuit breakers from 100 to 630 A

Circuit breakers		NSX100-250 ⁽¹⁾			NSX400			NSX630					
Breaking capacity levels		R	HB1	HB2	R	HB1	HB2	R	HB1	HB2	R	HB1	HB2
Electrical characteristics													
Breaking capacity (kA rms)								Ir < 500 A			Ir > 501 A		
Icu AC 50/60 Hz	220/240 V	200	-	-	200	-	-	200	-	-	200	-	-
	380/415 V	200	-	-	200	-	-	200	-	-	200	-	-
	440 V	200	-	-	200	-	-	200	-	-	200	-	-
	500 V	80	85	100	80	85	100	80	85	100	80	85	100
	525 V	65	80	100	65	80	100	65	80	100	65	80	100
	690 V	45	75	100	45	75	100	45	75	100	45	75	100
Service breaking capacity (kA rms)								Ir < 500 A			Ir > 501 A		
Ics AC 50/60 Hz	220/240 V	200	-	-	200	-	-	200	-	-	200	-	-
	380/415 V	200	-	-	200	-	-	200	-	-	200	-	-
	440 V	200	-	-	200	-	-	200	-	-	200	-	-
	500 V	80	85	100	80	85	100	80	85	100	80	85	100
	525 V	65	80	100	65	80	100	65	80	100	-	-	-
	690 V	45	75	100	45	75	100	45	75	100	-	-	-

(1) There is no 160 A frame, use the 250 A frame with lower rating trip units.






For breaking capacities R/HB1/HB2.

Offer structure

The Compact NSX HB offer has some differences compared to the standard NSX offer.

- 100 A frame and 250 A frame, there is no 160 A frame. The 125 - 160 A trip units are used in a 250 A frame.
- All R, HB1 and HB2 circuit breakers are restricted for use as line-load connection. They can not have power fed from the bottom of the circuit breaker. They will be marked with Line and Load markings.
- Compact NSX400-630 R/HB1/HB2, U > 440 V, Icu 20 kA, Line/Load connection possible with insulation screen (see page B-3).
- All trip units will be assembled in the factory.

Type of protection		Distribution protection		Motor protection	
		TMD	Micrologic	MA	Micrologic
 <small>PB110005_40.eps</small>	Compact NSX100	40-100	2.2: 40-100 5.2 E: 40-100 6.2 E: 40-100	12.5-100	2.2 M: 25, 50, 100 6.2 E-M: 25, 50, 100
	Compact NSX250	125-250	2.2: 100, 160, 250 5.2 E: 100, 160, 250 6.2 E: 100, 160, 250	150, 220	2.2 M: 150, 220 6.2 E-M: 150, 220
 <small>PB11001_44.eps</small>	Compact NSX400	-	2.3: 250, 400 5.3 E: 250, 400 6.3 E: 250, 400	-	1.3 M: 320 2.3 M: 320 6.3 M: 320
	Compact NSX630	-	2.3: 630 5.3 E: 630 6.3 E: 630	-	1.3 M: 500 2.3 M: 500 6.3 M: 500

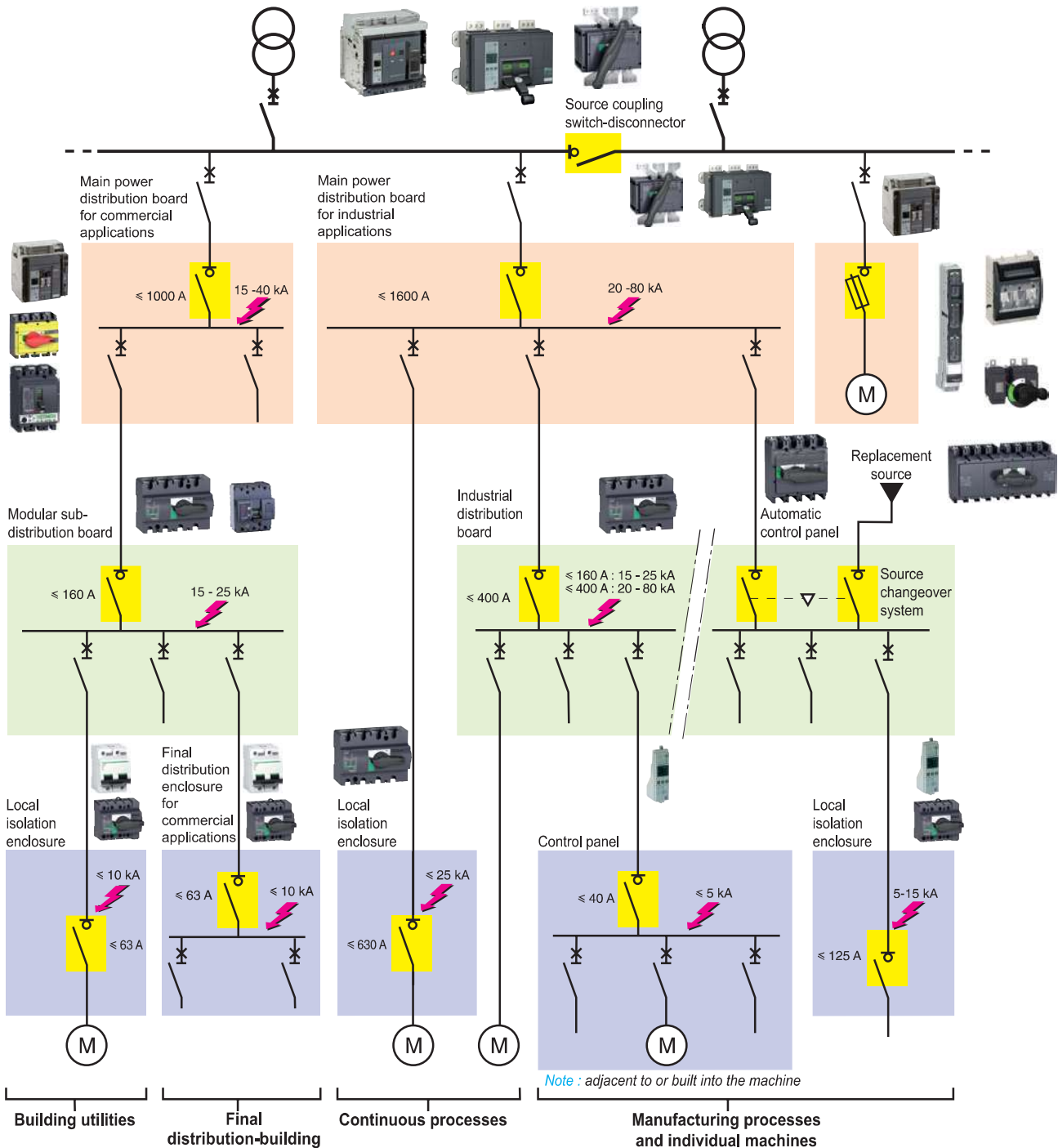
A switch-disconnector is a control device that can be used to open and close a circuit under normal operating conditions. It is suitable for isolation as indicated on the front by the symbol .

Position of switch-disconnectors

Compact NSX 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.

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Switch-disconnector functions

Compact NSX100 to 630 NA switch-disconnectors are available in fixed, plug-in and withdrawable versions. They use the same accessories and offer the same connection possibilities as the circuit-breaker versions. They may be interlocked with another Compact switch-disconnector or circuit breaker to form a source-changeover system.

Suitability for isolation with positive contact indication

Compact NSX 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 or a motor mechanism does not alter the reliability of the position-indication system.

Emergency-off function

A Compact NSX 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.

Motor mechanism

Compact NSX NA devices equipped with a motor mechanism module enable remote closing and opening. This function may be combined with the emergency-off function. In this case, the emergency off function is combined with a closing lock-out that must be intentionally reset (electrical diagram with closing lock-out).

Earth-leakage protection

A Vigi module may be added to a switch-disconnector to monitor all leakage currents in the outgoing circuits of the switchboard on which the switch-disconnector is installed. When the Vigi module detects an earth-leakage current, the switch-disconnector interrupts the load current. This function may be combined with the motor mechanism and the emergency-off function using an MN or MX release.

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 NSX100 to 630 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 NSX NA switch-disconnectors comply with utilisation categories AC22A or AC23A.

Utilisation categories		Characteristics
Infrequent operation	Frequent operation	
AC-21B	AC-21A	Switching of resistive loads including moderate overloads ($\cos \varphi = 0,95$)
AC-22B	AC-22A	Switching of mixed resistive and inductive loads, including moderate overloads ($\cos \varphi = 0,65$)
AC-23B	AC-23A	Switching of motor loads or other highly inductive loads ($\cos \varphi = 0,45$ or $0,35$)



Compact NSX switch-disconnector.



Compact NSX switch-disconnector equipped with a motor mechanism module.



Compact NSX switch-disconnector equipped with a Vigi module.

Switch-disconnectors

Characteristics and performance of Compact NSX switch-disconnectors from 100 to 630 NA

Installation standards require upstream protection. However Compact NSX100 to 630 NA switch-disconnectors are self-protected by their high-set magnetic release.



Compact NSX100 to 250 NA.



Compact NSX400 to 630 NA.

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 - DC 22 A/DC 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 60 °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 ⁽²⁾	
		500/525 V	
	660/690 V		
DC			
		250 V (1 pole)	
		500 V (2 poles in series)	
		750 V (3 poles in series)	
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	In/2
		690 V	In/2
			In
	DC 250 V (1 pole) and		In/2
	500 V (2 poles in series)		In

Positive contact indication

Pollution degree

Protection

Add-on earth-leakage protection By Vigi module
By Vigirex relay

Additional indication and control auxiliaries

Indication contacts

Voltages releases MX shunt release
MN undervoltage release

Voltage-presence indicator

Current-transformer module

Ammeter module

Insulation monitoring module

Remote communication by bus

Device-status indication

Device remote operation

Operation counter

Installation / connections

Dimensions (mm)	fixed, front connections	2/3P
W x H x D		4P
Weight (kg)	fixed, front connections	3P
		4P

Source-changeover systems (see chapter on Source-changeover systems)

Manual source-changeover systems

Remote-operated or automatic source-changeover systems

(1) 2P in 3P case.

(2) Suitable for 480 V NEMA.

PB191613-00.eps



Some installations use two supply sources to counter the temporary loss of the main supply.

A source-changeover system is required to safely switch between the two sources. The replacement source can be a generator set or another network.

Manual source-changeover system

or **M**: Manual Transfer Switching Equipment

The simplest way to switch the load.

It is controlled manually by an operator.

The time required to switch from the S1 source to S2 source is variable.

System

2 or 3 mechanically interlocked circuit breakers or
2 switch-disconnectors.

Applications

Small commercial buildings and small and medium industrial activities where the need for continuity of service is significant but not a priority.

65587-117.eps



Automatic source-changeover system

or **A**: Automatic Transfer Switching Equipment

An automatic controller may be added to a remote operated source-changeover system. It is possible to automatically control source transfer according to programmed (dedicated controllers) or programmable (PLC) operating modes. These solutions ensure optimum energy management.

The time required to switch from the S1 source to S2 source is fixed.

System

2 or 3 circuit breakers linked by an electrical interlocking system. A mechanical interlocking system protects also against incorrect manual operations, with an automatic control system (dedicated controllers).

Applications

Large infrastructures, industry, critical buildings & process where the continuity of service is a priority.

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Remote source-changeover system

or **R**: Remote Transfer Switching Equipment

In this case, no direct human intervention is required. The time required to switch from the S1 source to S2 source is fixed.

System

2 or 3 circuit breakers linked by an electrical interlocking system. A mechanical interlocking system protects also against incorrect manual operations. In this case is necessary to add a PLC controller not dedicated for source-changeover application.

Applications

Industry & Infrastructure where continuity of service requirements are meaningful but not a priority.

Manual source-changeover systems



Interlocking of two or three toggle-controlled devices.

Interlocking of two or three toggle-controlled devices

Interlocking system

Two devices can be interlocked using this system. Two identical interlocking systems can be used to interlock three devices installed side by side.

Authorised positions:

- one device closed (ON), the others open (OFF)
- all devices open (OFF).

The system is locked using one or two padlocks (shackle diameter 5 to 8 mm).

This system can be expanded to more than three devices.

There are two interlocking-system models:

- one for Compact INS/INV
- one for Compact NSX100 to NSX250
- one for Compact NSX400 to NSX630.

Combinations of Normal and Replacement devices

All toggle-controlled fixed or plug-in Compact NSX100 to NSX630 circuit breakers and switch-disconnectors of the same frame size can be interlocked. The devices must be either all fixed or all plug-in versions.

Interlocking of two devices with rotary handles

Interlocking system

Interlocking involves padlocking the rotary handles on two devices which may be either circuit breakers or switch-disconnectors.

Authorised positions:

- one device closed (ON), the other open (OFF)
- both devices open (OFF).

The system is locked using up to three padlocks (shackle diameter 5 to 8 mm).

There are two interlocking-system models:

- one for Compact INS/INV
- one for Compact NSX100 to NSX250
- one for Compact NSX400 to NSX630.

Combinations of Normal and Replacement devices

All rotary-handle fixed or plug-in Compact NSX100 to NSX630 circuit breakers and switch-disconnectors of the same frame size can be interlocked. The devices must be either all fixed or all plug-in versions.



Interlocking of two devices with rotary handles.

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

Interlocking using keylocks is very simple and makes it possible to interlock two or more devices that are physically distant or that have very different characteristics, for example medium-voltage and low-voltage devices or a Compact NSX100 to NSX630 switch-disconnector.

Interlocking system

Each device is equipped with an identical keylock and the key is captive on the closed (ON) device. A single key is available for all devices. It is necessary to first open (OFF position) the device with the key before the key can be withdrawn and used to close another device.

A system of wall-mounted captive key boxes makes a large number of combinations possible between many devices.

Combinations of Normal and Replacement devices

All rotary-handle Compact NSX100 to NSX630 circuit breakers and switch-disconnectors can be interlocked between each other or with any other device equipped with the same type of keylock.



Interlocking with keylocks.

Interlocking of two devices on a base plate

Interlocking system

A base plate designed for two Compact NSX devices can be installed horizontally or vertically on a mounting rail. Interlocking is carried out on the base plate by a mechanism located behind the devices. In this way, access to the device controls and trip units is not blocked.

Combinations of Normal and Replacement devices

All rotary-handle and toggle-controlled Compact NSX100 to NSX630 circuit breakers and switch-disconnectors can be interlocked. Devices must be either all fixed or all plug-in versions, with or without earth-leakage protection or measurement modules. An adaptation kit is required to interlock:

- two plug-in devices
- a Compact NSX100 to NSX250 with an NSX400 to NSX630.

Connection to the downstream installation can be made easier using a coupling accessory (see next page).



Interlocking on a base plate.

Source-changeover systems

Mechanical and electrical interlocking for source-changeover systems

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Remote-operated source-changeover system.

It is made up of two devices with motor mechanisms, mounted on a base plate and combined with:

- an electrical interlocking unit
- optional mechanical interlocking system.

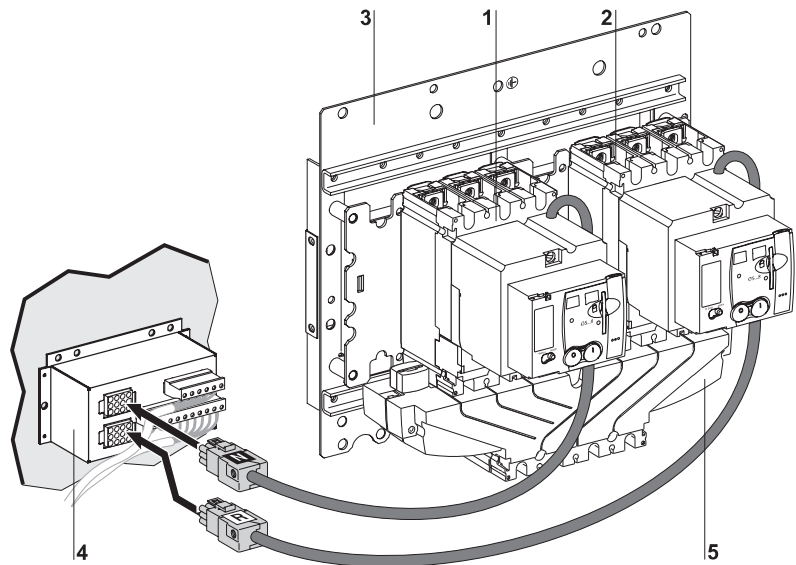
Electrical interlocking unit (IVE)

Interlocks two devices equipped with motor mechanisms and auxiliary contacts. The IVE unit is mandatory to ensure the necessary time-delays required for safe switching.

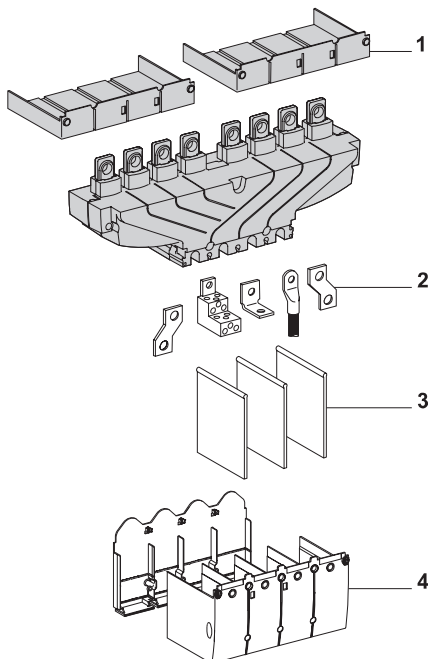
Mechanical interlocking system

The mechanical interlocking system is strongly recommended to limit the effects of design or wiring errors and to avoid manual switching errors.

- 1 Circuit breaker QS1 equipped with a motor mechanism and auxiliary contacts, connected to the S1 source
- 2 Circuit breaker QS2 equipped with a motor mechanism and auxiliary contacts, connected to the S2 source
- 3 Base plate with mechanical interlocking
- 4 Electrical interlocking unit IVE
- 5 Coupling accessory (downstream connection)



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- 1 Short terminal shields
- 2 Terminals
- 3 Interphase barriers
- 4 Long terminal shields

Downstream coupling accessory

This accessory simplifies connection to bars and cables with lugs. It may be used to couple two circuit breakers of the same size.

Pitch between outgoing terminals:

- Compact NSX100 to NSX250: 35 mm
- Compact NSX400 to NSX630: 45 mm.

For Compact NSX circuit breakers, the downstream coupling accessory can be used only with **fixed versions**.

Connection and insulation accessories

The coupling accessory can be fitted with the same connection and insulation accessories as the circuit breakers.

Possible uses	Downstream coupling	
	Possible mounting	Outgoing pitch (mm)
Remote-operated source-changeover systems		
NSX100 to NSX250	■	35
NSX400 to NSX630	■	45

Automatic source-changeover systems with controller

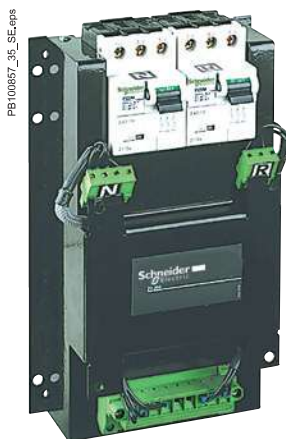
By combining a remote-operated source-changeover system with an integrated BA or UA automatic controller, it is possible to automatically control source transfer according to user-selected sequences.



BA controller.



UA controller.



Auxiliary control plate for a BA or UA controller.

Functions of the BA and UA controllers

Controller	BA	UA					
Compatible circuit breakers	Compact NSX100 to 630 circuit breakers						
4-position switch							
Automatic operation	■	■					
Forced operation on Normal source	■	■					
Forced operation on Replacement source	■	■					
Stop (both Normal and Replacement sources OFF)	■	■					
Automatic operation							
Monitoring of the Normal source and automatic transfer from one source to the other	■	■					
Engine generator set start-up control		■					
Delayed shutdown (adjustable) of engine generator set		■					
Load shedding and reconnection of non-priority loads		■					
Transfer to Replacement source if one of the Normal source phases is absent		■					
Test							
By opening the P25M circuit breaker upstream of the controller	■	■					
By pressing the test button on the front of the controller		■					
Indications							
Circuit-breaker status indication on the front of the controller: ON, OFF, fault trip	■	■					
Automatic-mode indication contact	■	■					
Other functions							
Selection of type of Normal source (single-phase or three-phase)		■					
Voluntary transfer to Replacement source	■	■					
Forced operation on Normal source if Replacement source is not operational		■					
Additional test contact (not part of controller)	■	■					
Transfer to Replacement source only if contact closed (e.g. for a UR frequency check)		■					
Setting of maximum start-up time for the Replacement-source		■					
Power supply							
Control voltages ⁽¹⁾	220 to 240 V 50/60 Hz	■	■				
	380 to 415 V 50/60 Hz	■	■				
	440 V 60 Hz	■	■				
Operating thresholds							
Undervoltage	0.35 Un ≤ voltage ≤ 0.7 Un		■	■			
Phase failure	0.5 Un ≤ voltage ≤ 0.7 Un			■			
Voltage presence	voltage ≥ 0.85 Un		■	■			
Characteristics of output contacts (dry, volt-free contacts)							
Rated thermal current (A)	8						
Minimum load	10 mA at 12 V						
	AC				DC		
Utilisation category (IEC 60947-5-1)	AC12	AC13	AC14	AC15	DC12	DC13	
Operational current (A)	24 V	8	7	5	6	8	2
	48 V	8	7	5	5	2	-
	110 V	8	6	4	4	0.6	-
	220/240 V	8	6	4	3	-	-
	250 V	-	-	-	-	0.4	-
	380/415 V	5	-	-	-	-	-
	440 V	4	-	-	-	-	-
660/690 V	-	-	-	-	-	-	

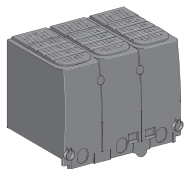
⁽¹⁾ The controller is powered by the ACP control plate. The same voltage must be used for the ACP plate, the IVE unit and the circuit-breaker operating mechanisms. If this voltage is the same as the source voltage, then the "Normal" and "Replacement" sources can be used directly for the power supply. If not, an isolation transformer must be used.

Accessories and auxiliaries

Overview of Compact NSX100 to 630 fixed version

Insulation accessories [▶ page A-87](#)

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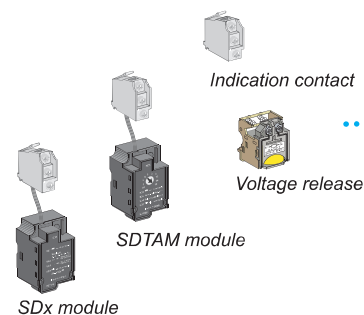


Sealable terminal shields



Interphase barriers

Electrical auxiliaries [▶ page A-94](#)



SDx module

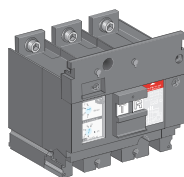
SDTAM module

Indication contact

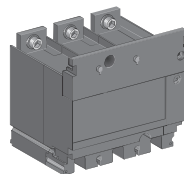
Voltage release

Protection and measurements [▶ page A-100](#)

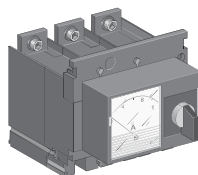
(1)



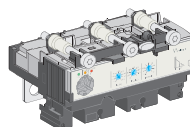
Vigi module



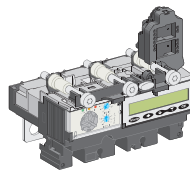
Current-transformer module



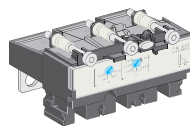
Ammeter module



Micrologic 2 trip unit



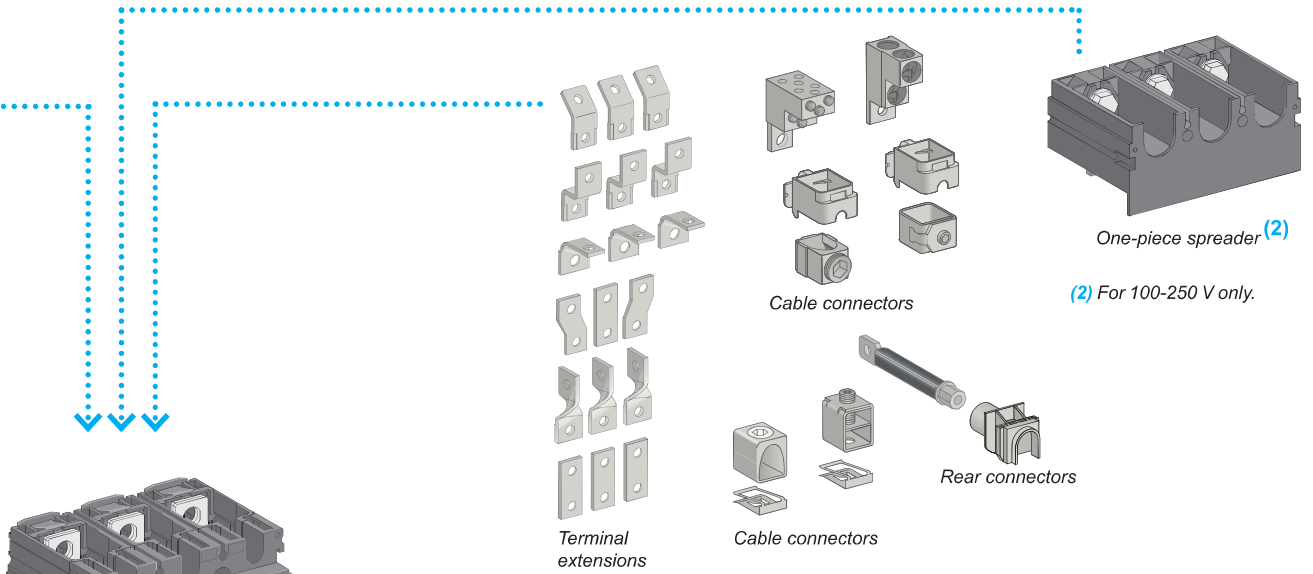
Micrologic 5 / 6 trip unit



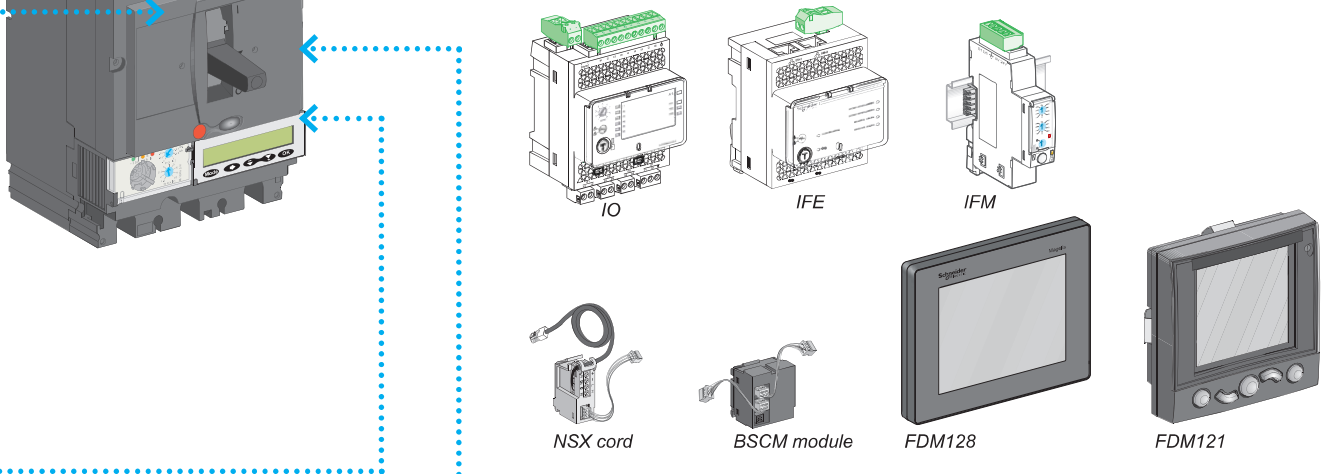
TM-D, TM-G trip unit

(1) Up to 525 V.

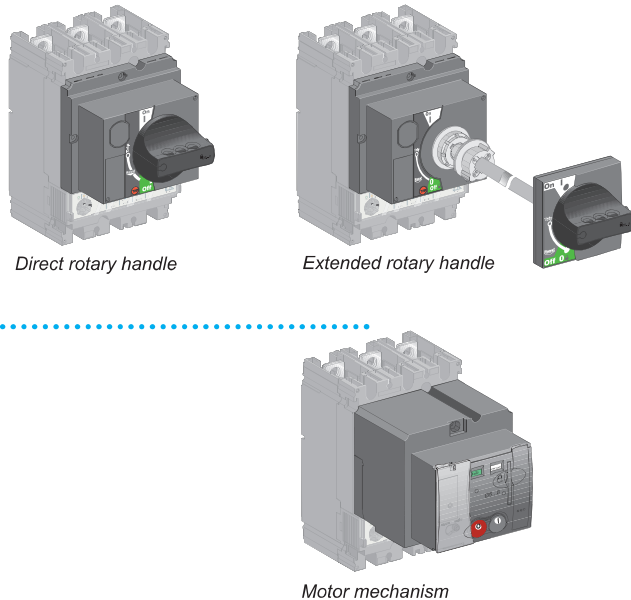
Connection ► page A-84



Communication and display ► page A-26



Control accessories ► page A-96

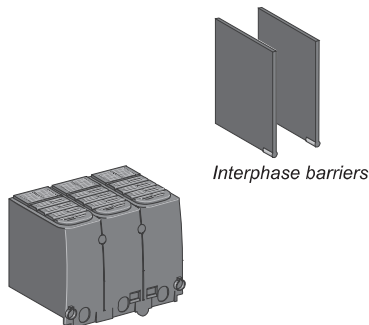


Accessories and auxiliaries

Overview of Compact NSX100 to 630 plug-in and withdrawable versions

Insulation accessories ▶ [page A-87](#)

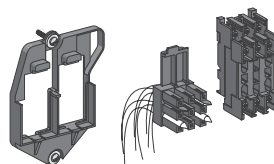
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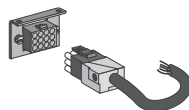
Interphase barriers

Sealable long terminal shields for plug-in base

Electrical accessories ▶ [page A-92](#)

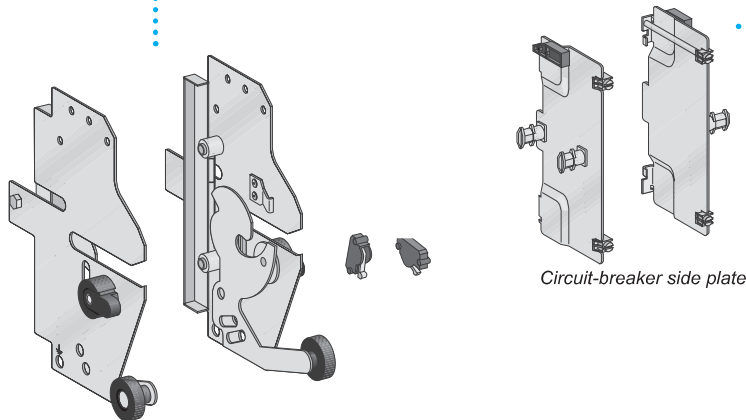


Automatic withdrawable auxiliary connector



Manual auxiliary connector

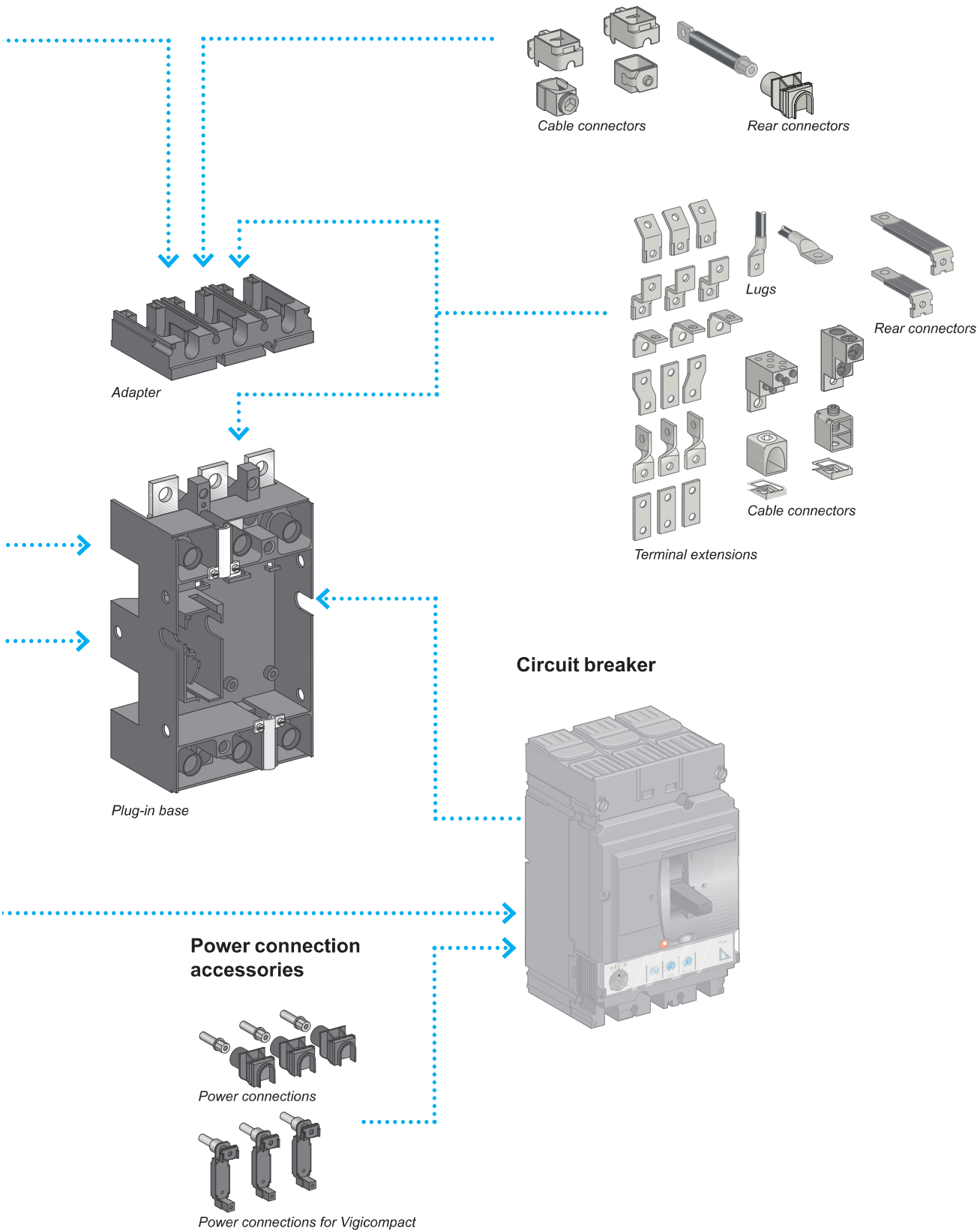
Mechanical accessories ▶ [page A-83](#)



Chassis side plate

Circuit-breaker side plate

Connection ► page A-84 and page A-86



Compact NSX circuit breakers may be installed horizontally, vertically or flat on their back, without derating performance levels.

There are three installation versions:

- fixed
- plug-in (on a base)
- withdrawable (on a chassis).

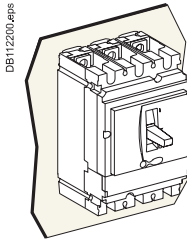
For the last two, components must be added (base, chassis) to the fixed version.

Many connection components are shared by the three versions.

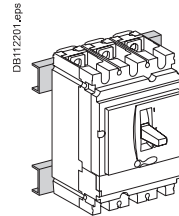
Fixed circuit breakers

Fixed circuit breakers are designed for standard connection using bars or cables with lugs. Bare-cable connectors are available for connection to bare copper or aluminium cables.

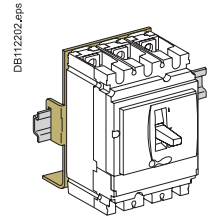
For connection of large cables, a number of solutions with spreaders may be used for both cables with lugs or bare cables.



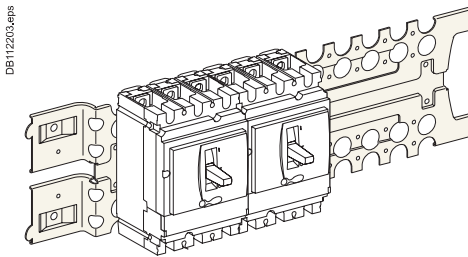
Mounting on a backplate.



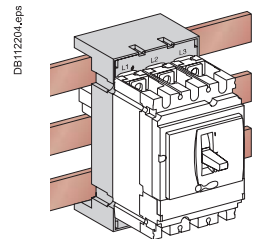
Mounting on rails.



Mounting on DIN rail (with adapter).



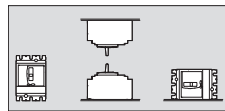
Mounting on a Prisma mounting plate.



Mounting on busbars with an adapter.



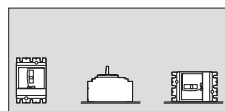
Fixed Compact NSX250.



Installation positions.



Plug-in Compact NSX250.



Installation positions.

Plug-in circuit breakers

The plug-in version makes it possible to:

- extract and/or rapidly replace the circuit breaker without having to touch the connections on the base
- allow for the addition of future circuits by installing bases that will be equipped with a circuit breaker at a later date
- isolate the power circuits when the device is mounted on or through a panel. It acts as a barrier for the connections of the plug-in base. Insulation is made complete by the mandatory short terminal shields on the device. The degrees of protection are:
 - circuit breaker plugged in = IP4
 - circuit breaker removed = IP2
 - circuit breaker removed, base equipped with shutters = IP4.

Parts of a plug-in configuration

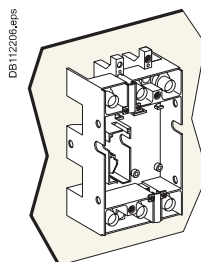
A plug-in configuration is made by adding a "plug-in kit" to a fixed device. To avoid connecting or disconnecting the power circuits under load conditions, a safety trip causes automatic tripping if the device is ON, before engaging or withdrawing it. The safety trip, supplied with the kit, must be installed on the device. If the device is disconnected, the safety trip does not operate. The device can be operated outside the switchboard.

Accessories

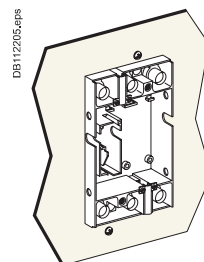
Optional insulation accessories are available.

- Terminal shields to protect against direct contact.
- Interphase barriers to reinforce insulation between phases and protect against direct contact.

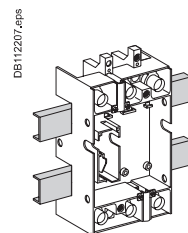
Mounting



Mounting on a backplate.



Mounting through a front panel.



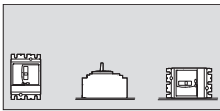
Mounting on rails.

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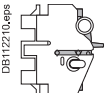
Withdrawable Compact NSX250.

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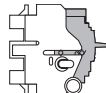


Installation positions.

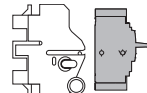
DB1122110.eps



Connected.

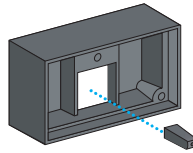


Disconnected.



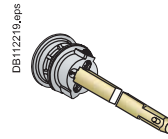
Removed.

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Protection collar for toggle and toggle extension to provide IP4 in the connected and disconnected positions.

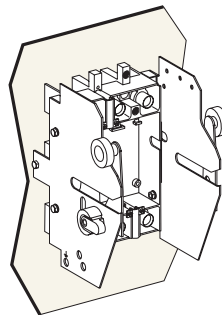
DB1122190.eps



Telescopic shaft.

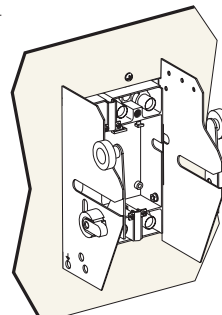
Mounting

DB112220.eps



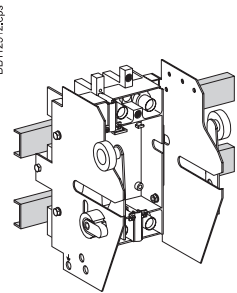
Mounting on a backplate.

DB112221.eps



Mounting through a front panel.

DB112312.eps



Mounting on rails.

Withdrawable circuit breakers

In addition to the advantages provided by the base, installation on a chassis facilitates handling. It offers three positions, with transfer from one to the other after mechanical unlocking:

- connected: the power circuits are connected
- disconnected: the power circuits are disconnected, the device can be operated to check auxiliary operation
- removed: the device is free and can be removed from the chassis.

Parts of a withdrawable configuration

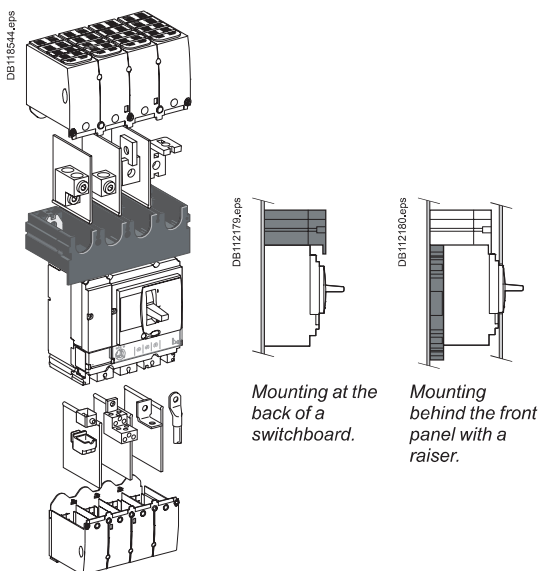
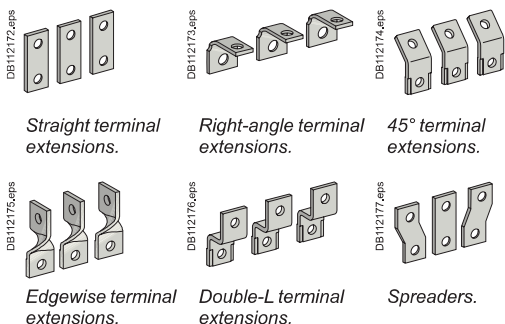
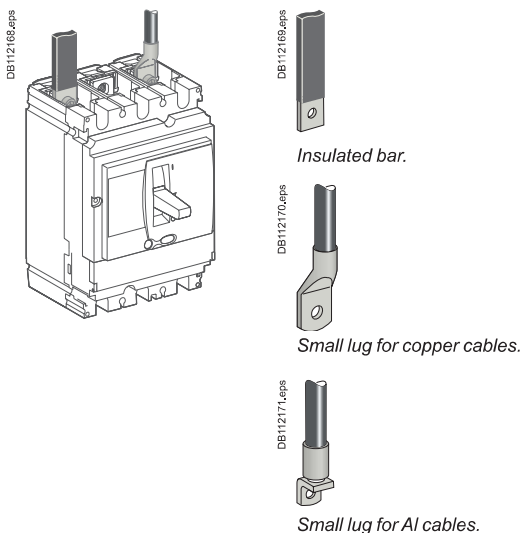
A withdrawable configuration requires two side plates installed on the base and two sides plates mounted on the circuit breaker. Similar to the plug-in version, a safety trip causes automatic tripping if the device is ON, before engaging or withdrawing it, and enables device operation in the disconnected position.

Accessories

Accessories are the same as for the base, with in addition:

- auxiliary contacts for installation on the fixed part, indicating the "connected" and "disconnected" positions
- locking by 1 to 3 padlocks (shackle diameter 5 to 8 mm), to:
 - prevent insertion for connection
 - lock the circuit breaker in connected or disconnected position
- toggle collar for circuit breakers with a toggle mounted through a front panel, intended to maintain the degree of protection whatever the position of the circuit breaker (supplied with a toggle extension)
- telescopic shaft for extended rotary handles. The door can then be closed with the device in the connected and disconnected positions.

Fixed circuit breakers are designed for standard front connection using bars or cables with lugs. Cable connectors are available for bare cables. Rear connection is also possible.



Front connection

Bars or cables with lugs

Standard terminals

Compact NSX100 to 630 come with terminals comprising snap-in nuts with screws:

- Compact NSX100: M6 nuts and screws. Compact NSX160/250: M8 nuts and screws
- Compact NSX400/630: M10 nuts and screws.

These terminals may be used for:

- direct connection of insulated bars or cables with lugs
- terminal extensions offering a wide range of connection possibilities. Interphase barriers or terminal shields are recommended. They are mandatory for certain connection accessories (in which case the interphase barriers are provided).

Bars

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

Maximum size of bars

Compact NSX circuit breaker	100/160/250	400/630	
Without spreaders	pitch (mm)	35	45
	maximum bar size (mm)	20 x 2	32 x 6
With spreaders	pitch (mm)	45	52.5
	maximum bar size (mm)	32 x 2	40 x 6

Crimp lugs

There are two models, for aluminium and 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.

Cable sizes for connection using lugs

Compact NSX circuit breaker	100/160/250	400/630	
Copper cables	size (mm ²)	120, 150, 185	240, 300
	crimping	hexagonal barrels or punching	
Aluminium cables	size (mm ²)	120, 150, 185	240, 300
	crimping	hexagonal barrels	

Terminal extensions

Extensions with anti-rotation ribs can be attached to the standard terminals to provide numerous connection possibilities in little space:

- straight terminal extensions
- right-angle terminal extensions
- edgewise terminal extensions
- double-L extensions
- 45° extensions.

Spreaders

Spreaders may be used to increase the pitch:

- NSX100 to 250: the 35 mm pitch can be increased to 45 mm
- NSX400/630: the 45 mm pitch can be increased to 52 or 70 mm.

Bars, cable lugs or cable connectors can be attached to the ends.

One-piece spreader for NSX100 to 250

Connection of large cables may require an increase in the distance between the device terminals.

The one-piece spreader is the means to:

- increase the 35 mm pitch of the NSX100 to 250 circuit-breaker terminals to the 45 mm pitch of a NSX400/630 device
- use all the connection and insulation accessories available for the next largest frame size (lugs, connectors, spreaders, right-angle and edgewise terminal extensions, terminal shields and interphase barriers).

It may also be used for Compact INS switch-disconnectors.

Equipped with a single-piece spreader, Compact NSX devices can be mounted:

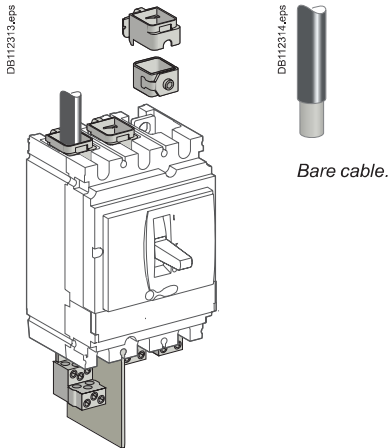
- at the back of a switchboard
- behind the front panel with a raiser.

The one-piece spreader is also the means to:

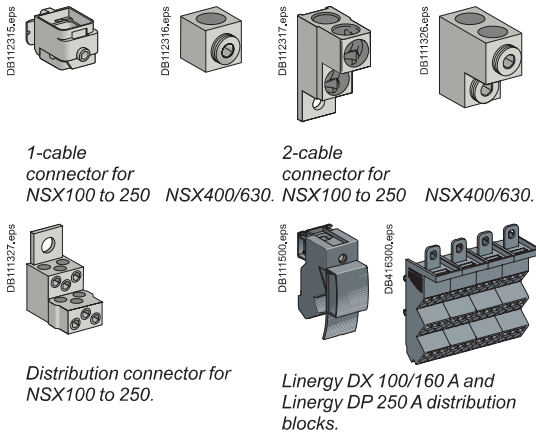
- align devices with different frame sizes in the switchboard
- use the same mounting plate, whatever the device.

Pitch (mm) depending on the type of spreader

Compact NSX circuit breaker	NSX100 to 250	NSX100 to 630
Without spreaders	35	45
With spreaders	45	52.5 or 70
With one-piece spreader	45	-



Bare cable.



1-cable connector for NSX100 to 250 NSX400/630. 2-cable connector for NSX100 to 250 NSX400/630.

Distribution connector for NSX100 to 250.

Linerage DX 100/160 A and Linerage DP 250 A distribution blocks.

Bare cables

For bare cables (without lugs), the prefabricated bare-cable connectors may be used for both copper and aluminium cables.

1-cable connectors for Compact NSX100 to 250

The connectors snap directly on to the device terminals or are secured by clips to right-angle and straight terminal extensions as well as spreaders.

1-cable connectors for Compact NSX400 to 630

The connectors are screwed directly to the device terminals.

2-cable connectors for Compact NSX100 to 250 and 400/630

The connectors are screwed to device terminals or right-angle terminal extensions.

Distribution connectors for Compact NSX100 to 250

These connectors are screwed directly to device terminals. Interphase barriers are supplied with distribution connectors, but may be replaced by long terminal shields. Each connector can receive six cables with cross-sectional areas ranging from 1.5 to 35 mm² each.

Linerage DX and Linerage DP distribution block for Compact NSX100 to 630

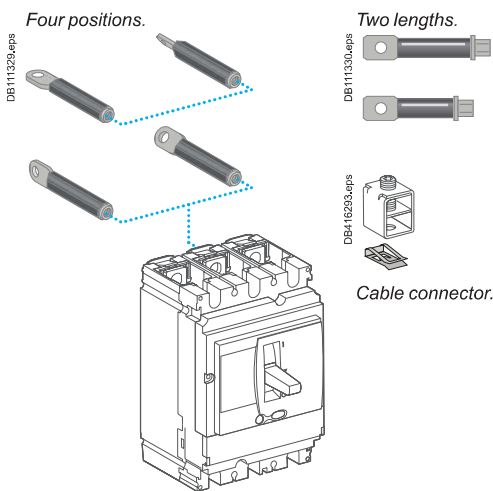
Linerage DX and Linerage DP connects directly to device terminals.

It is used to connect up to six or nine flexible or rigid cables with cross-sectional areas not exceeding 10 mm² or 16 mm², to each pole.

Connection is made to spring terminals without screws.

Maximum size of cables depending on the type of connector

Compact NSX circuit breaker		100/160	250	400	630
Steel connectors	1.5 to 95 mm ²	■			
Aluminium connectors	25 to 95 mm ²	■	■		
	120 to 185 mm ²	■	■		
	2 cables 50 to 120 mm ²	■	■		
	2 cables 35 to 240 mm ²			■	■
Distribution connectors	6 cables 35 mm ²	■	■		
Linerage DX and Linerage DP distribution blocks	6 or 9 cables 10/16 mm ²	■	■		



Four positions.

Two lengths.

Cable connector.

Rear connection

Device mounting on a backplate with suitable holes enables rear connection.

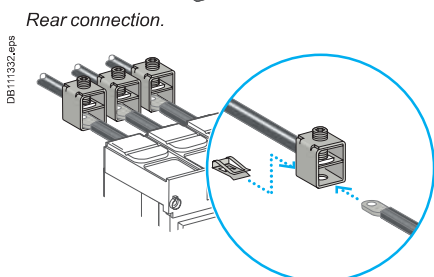
Bars or cables with lugs

Rear connections for bars or cables with lugs are available in two lengths. Bars may be positioned flat, on edge or at 45° angles depending on how the rear connections are positioned.

The rear connections are simply fitted to the device connection terminals. All combinations of rear connection lengths and positions are possible on a given device.

Bare cables

For the connection of bare cables, the 1-cable connectors for Compact NSX100 to 250 may be secured to the rear connections using clips.

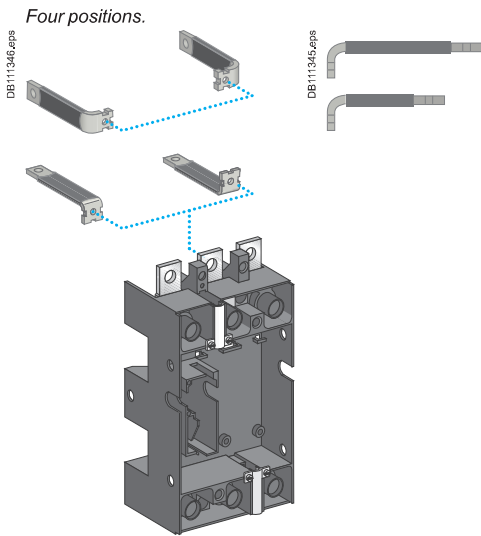


Connection of bare cables to NSX100 to 250 by clips.

Accessories and auxiliaries

Connection of withdrawable and plug-in devices

Connection is identical for both withdrawable and plug-in versions. The same accessories as for fixed devices may be used.

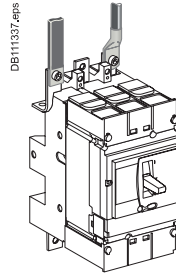


Bars or cables with lugs

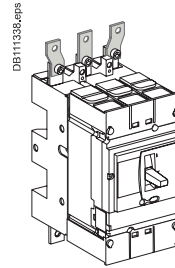
The plug-in base is equipped with terminals which, depending on their orientation, serve for front and rear connection.

For rear connection of a base mounted on a backplate, the terminals must be replaced by insulated, long right-angle terminal extensions.

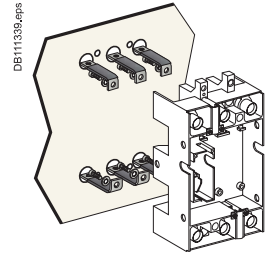
For Compact NSX630 devices, connection most often requires the 52.5 or 70 mm pitch spreaders.



Front connection.



Front connection with spreaders.



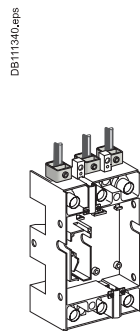
Rear connection of a base mounted on a backplate.

Connection accessories

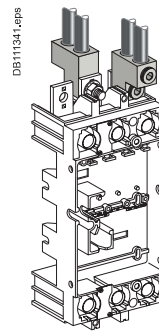
All accessories for fixed devices (bars, lugs, terminal extensions and spreaders) may be used with the plug-in base (see page A-84 and page A-85).

Bare cables

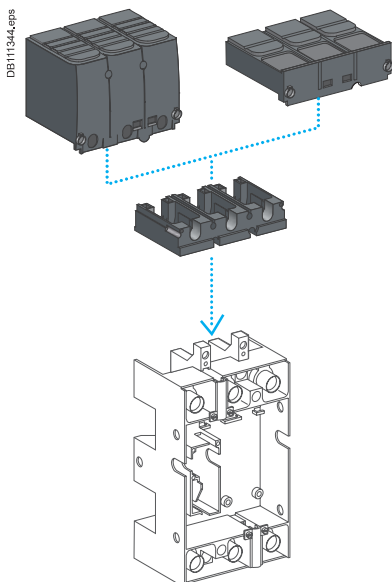
All terminals may be equipped with bare-cable connectors. See the "Connection of fixed devices" section.



With a 100 to 250 A base.



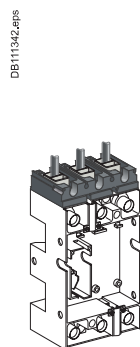
With a 400/630 A base.



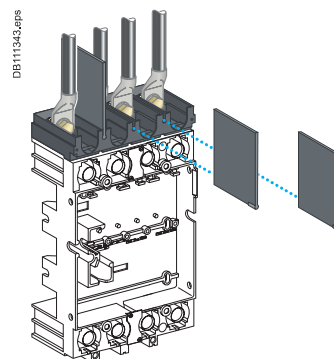
Adapter for plug-in base

The adapter is a plastic component for the 100 to 250 base and the 400/630 base that enables use of all the connection accessories of the fixed device.

It is required for interphase barriers and the long and short terminal shields.



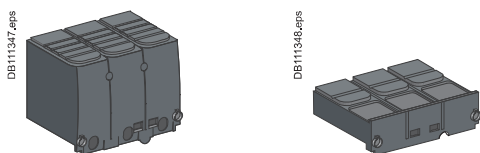
Adapter for 100 to 250 A - 3P base.
Connection with bars or cables with lugs.



Adapter for 400/630 A - 4P base.
Connection with spreaders and interphase barriers.

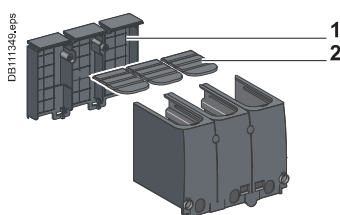
Insulation of live parts

Terminal shields are identical for fixed and plug-in/withdrawable versions and cover all applications up to 1000 V. They exist for the 100 to 250 A and 400/630 A ratings, in long and short versions.

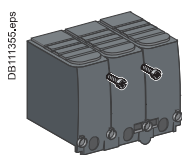


Long terminal shields.

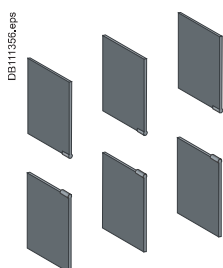
Short terminal shields.



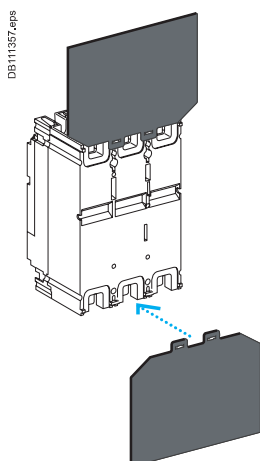
1 Partially cut removable squares.
2 Grids with break marks.



Assembled with captive screws.



Interphase barriers.



Rear insulating screens.

Terminal shields

Insulating accessories used for protection against direct contact with power circuits. They provide IP40 degree of protection and IK07 mechanical impact protection.

Terminal-shield types

Compact NSX100 to 250 and NSX400/630 3P or 4P can be equipped with:

- short terminal shields
- short terminal shields ≥ 500 V
- long terminal shields.

All terminal shields have holes or knock-outs in front for voltage-presence indicators.

Short terminal shields

They are used with:

- plug-in and withdrawable versions in all connection configurations
- fixed versions with rear connection.

Long terminal shields

They are used for front connection with cables or insulated bars.

They comprise two parts assembled with captive screws, forming an IP40 cover.

- The top part 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.

Long terminal shields may be mounted upstream and downstream of:

- fixed devices
- the base of plug-in and withdrawable versions, thus completing the insulation provided by the mandatory short terminal shields on the device
- the one-piece spreader for NSX100 to 250
- the 52.5 mm spreaders for NSX400/630.

Terminal shields and pitch

Combination possibilities are shown below.

Circuit breaker	NSX100/160/250	NSX400/630	
Short terminal shields			
Pitch (mm)	35	45	
Long terminal shields			
Pitch (mm)	35	45	52.5

Interphase barriers

Safety accessories for maximum insulation at the power-connection points:

- they clip easily onto the circuit breaker
- single version for fixed devices and adapters on plug-in bases
- not compatible with terminal shields
- the adapter for the plug-in base is required for mounting on plug-in and withdrawable versions.

Rear insulating screens

Safety accessories providing insulation at the rear of the device.

Their use is mandatory for devices with spreaders, installed on backplates, when terminal shields are not used.

The available screen dimensions are shown below.

Circuit breaker	NSX100/160/250	NSX400/630
3P W x H x thickness (mm)	140 x 105 x 1	203 x 175 x 1.5
4P W x H x thickness (mm)	175 x 105 x 1	275 x 175 x 1.5

Standard

All Compact NSX100/160/250 circuit breakers and switch-disconnectors have slots for the electrical auxiliaries listed below.

5 indication contacts (see page A-94)

- 2 ON/OFF (OF1 and OF2)
- 1 trip indication (SD)
- 1 fault-trip indication (SDE)
- 1 earth-fault indication (SDV), when the device is equipped with a Vigi module.

1 remote-tripping release (see page A-97)

- either 1 MN undervoltage release
- or 1 MX shunt release.

Remote indications

Circuit breakers equipped with Micrologic trip units may be equipped with a fault-trip indication to identify the type of fault by installing:

1 indication module with two outputs (see page A-95)

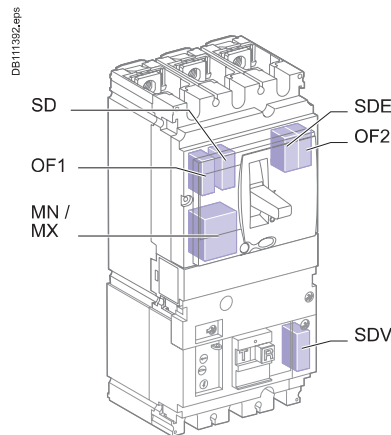
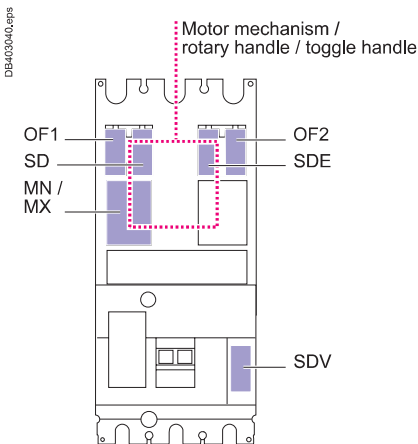
- either an SDx module with Micrologic 2.2 / 5.2 A or E / 6.2 A or E
 - or an SDTAM module with Micrologic 2.2 M or 6-2 E-M (motor protection).
- This module occupies the slots of one OF contact and an MN/MX release.

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

The following table indicates auxiliary possibilities depending on the type of trip unit.

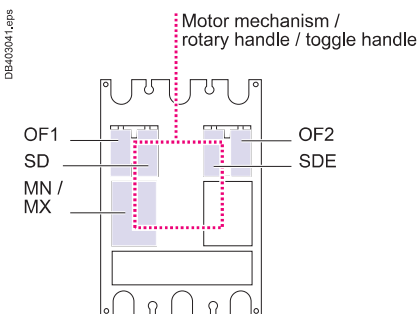
NA, TMD, TMG, MA

Standard



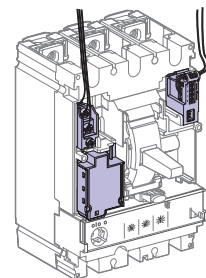
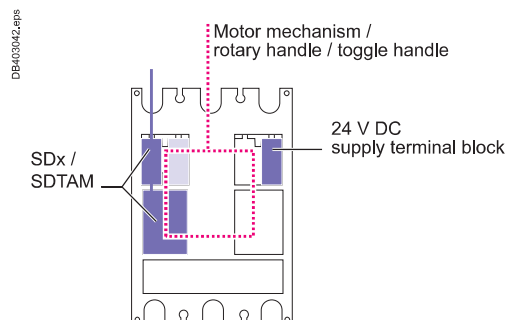
Micrologic 2 / 5 / 6

Standard



or

Remote indications via SDx or SDTAM



The SDx or SDTAM uses the OF1 and MN/MX slots.

External connection is made via a terminal block in the OF1 slot.

The 24 V DC supply provides for the Micrologic 5 / 6 display when the device is OFF or under low-load conditions.

Communication

Communication requires specific auxiliaries (see page A-40).

Communication of status indications

- 1 BSCM module.
- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the BSCM.

Communication of status conditions is compatible with a toggle handle and a rotary handle.

Communication of status indications and controls

This requires, in addition to the previous auxiliaries:

- 1 communicating motor mechanism connected to the BSCM.

Communication of measurements

Available on Micrologic 5 / 6, the system consists of:

- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the Micrologic.

Communication of measurements is compatible with a standard or communicating motor mechanism and a rotary handle.

Communication of status indications, controls and measurements

Available on Micrologic 5 / 6, the system consists of:

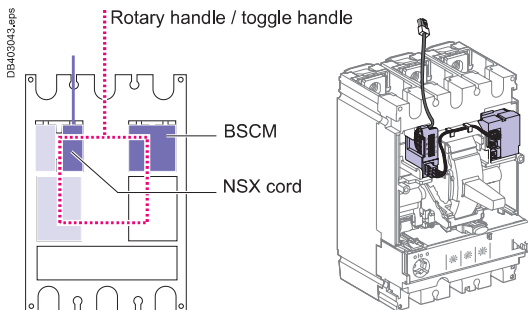
- 1 BSCM module
- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the BSCM and the Micrologic
- 1 communicating motor mechanism connected to the BSCM.

Installation of SDx or SDTAM is compatible with communication.

The following table indicates auxiliary possibilities depending on the type of trip unit.

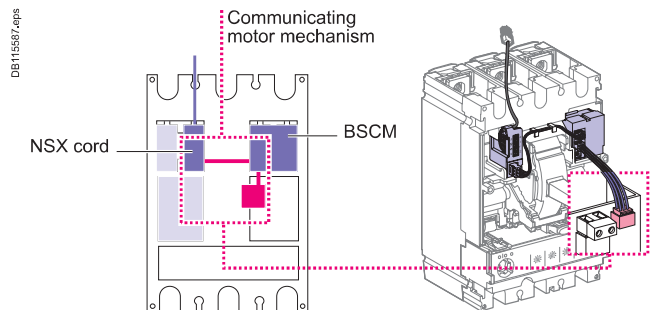
NA, TMD, TMG, MA, Micrologic 2

Communication of status indications



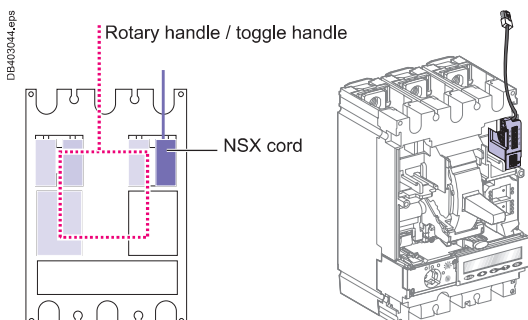
or

Communication of status indications and controls



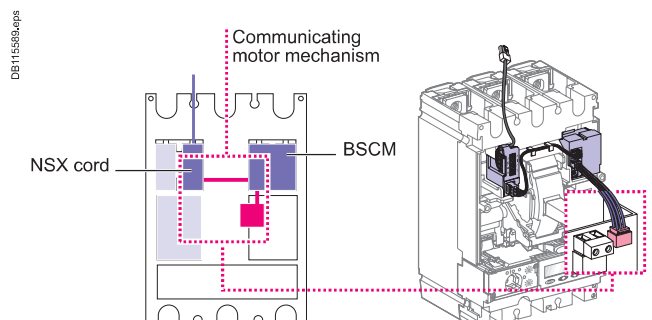
Micrologic 5 / 6

Communication of measurements with or without FDM121 display



or

Communication of status indications, controls and measurements with or without FDM121 display



Standard

All Compact NSX400/630 circuit breakers and switch-disconnectors have slots for the electrical auxiliaries listed below.

7 indication contacts (see page A-94)

- 4 ON/OFF (OF1, OF2, OF3, OF4)
- 1 trip indication (SD)
- 1 fault-trip indication (SDE)
- 1 earth-fault indication (SDV), when the device is equipped with a Vigi module.

1 remote-tripping release (see page A-97)

- either 1 MN undervoltage release
- or 1 MX shunt release.

Remote indications

Circuit breakers equipped with Micrologic trip units may be equipped with a fault-trip indication to identify the type of fault by installing:

1 indication module with two outputs (see page A-95)

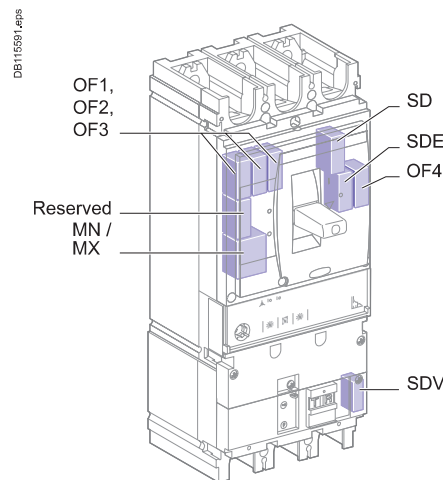
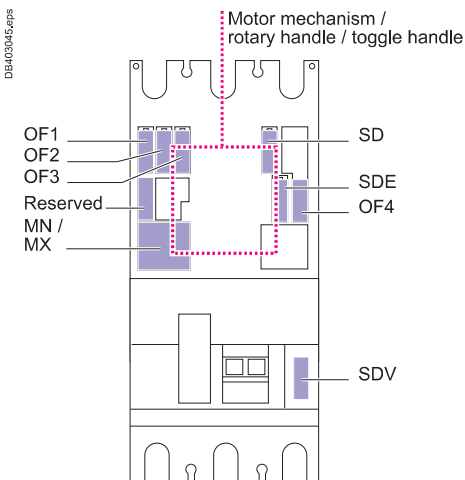
- either an SDx module with Micrologic 2.2 / 5.2 A or E / 6.2 A or E
 - or an SDTAM module with Micrologic 2.2 M or 6-2 E-M (motor protection).
- This module occupies the slots of an MN/MX release.

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

The following table indicates auxiliary possibilities depending on the type of trip unit.

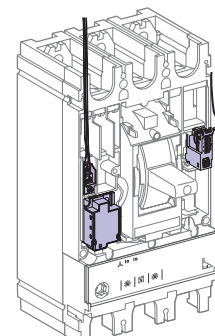
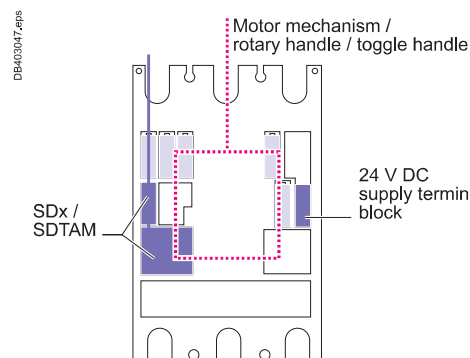
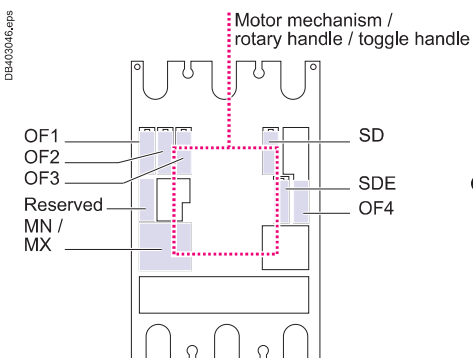
NA, Micrologic 1.3 M

Standard



Micrologic 2 / 5 / 6

Standard



The SDx or SDTAM uses the reserved slot and the MN/MX slots.

External connection is made via a terminal block in the reserved slot.

The 24 V DC supply provides for the Micrologic 5 / 6 display when the device is OFF or under low-load conditions.

Communication

Communication requires specific auxiliaries (see page A-40).

Communication of status indications

- 1 BSCM module
- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the BSCM.

Communication of status conditions is compatible with a toggle handle and a rotary handle.

Communication of status indications and controls

This requires, in addition to the previous auxiliaries:

- 1 communicating motor mechanism connected to the BSCM.

Communication of measurements

Available on Micrologic 5 / 6, the system consists of:

- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the Micrologic.

Communication of measurements is compatible with a standard or communicating motor mechanism and a rotary handle.

Communication of status indications, controls and measurements

Available on Micrologic 5 / 6, the system consists of:

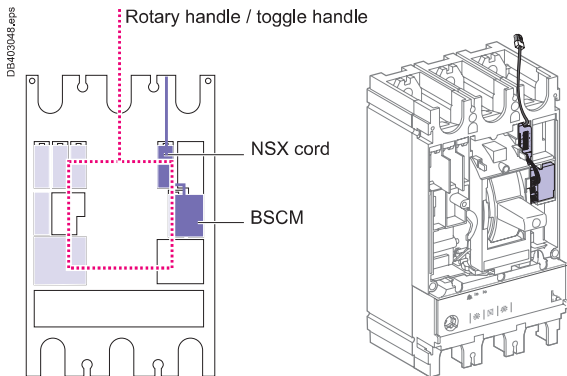
- 1 BSCM module
- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the BSCM and the Micrologic
- 1 communicating motor mechanism connected to the BSCM.

Installation of SDx or SDTAM is compatible with communication.

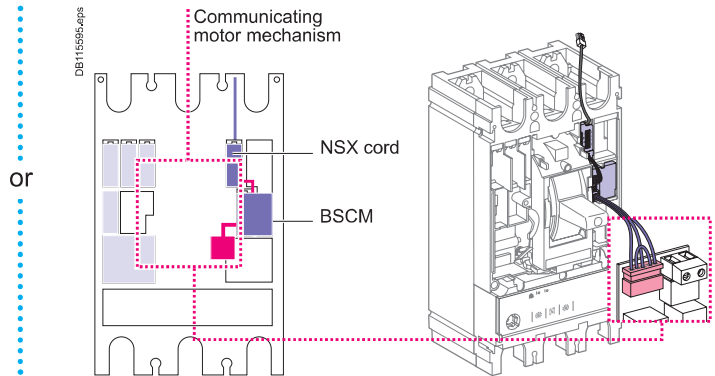
The following table indicates auxiliary possibilities depending on the type of trip unit.

NA, Micrologic 1.3 M, Micrologic 2

Communication of status indications

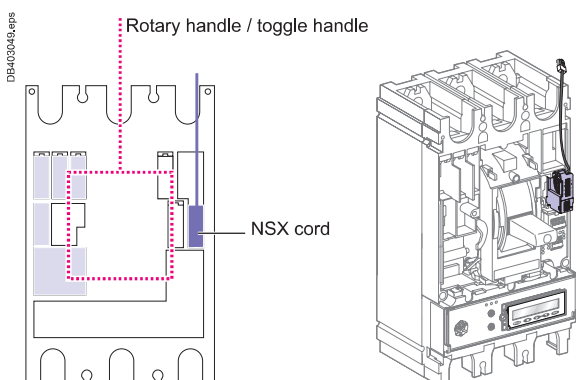


Communication of status indications and controls

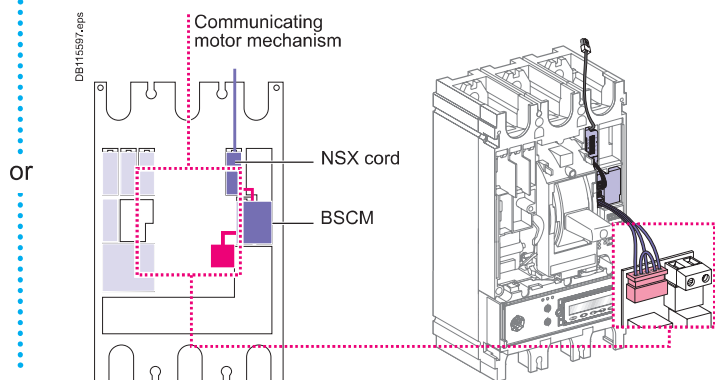


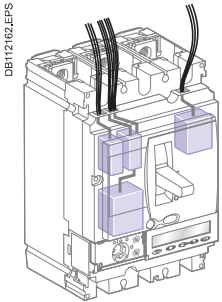
Micrologic 5 / 6

Communication of status indications



Communication of status indications, controls and measurements with or without FDM121 display

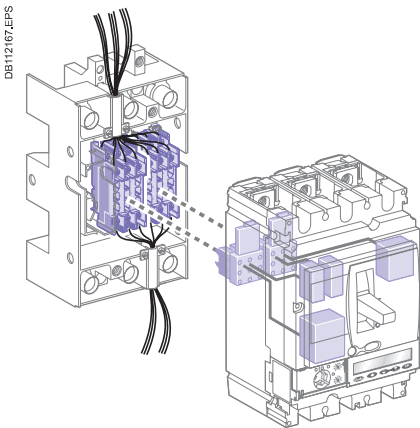




Fixed Compact NSX.

Fixed Compact NSX

Auxiliary circuits exit the device through a knock-out in the front cover.



Plug-in/withdrawable
Compact NSX.

Withdrawable or plug-in Compact NSX

Automatic auxiliary connectors

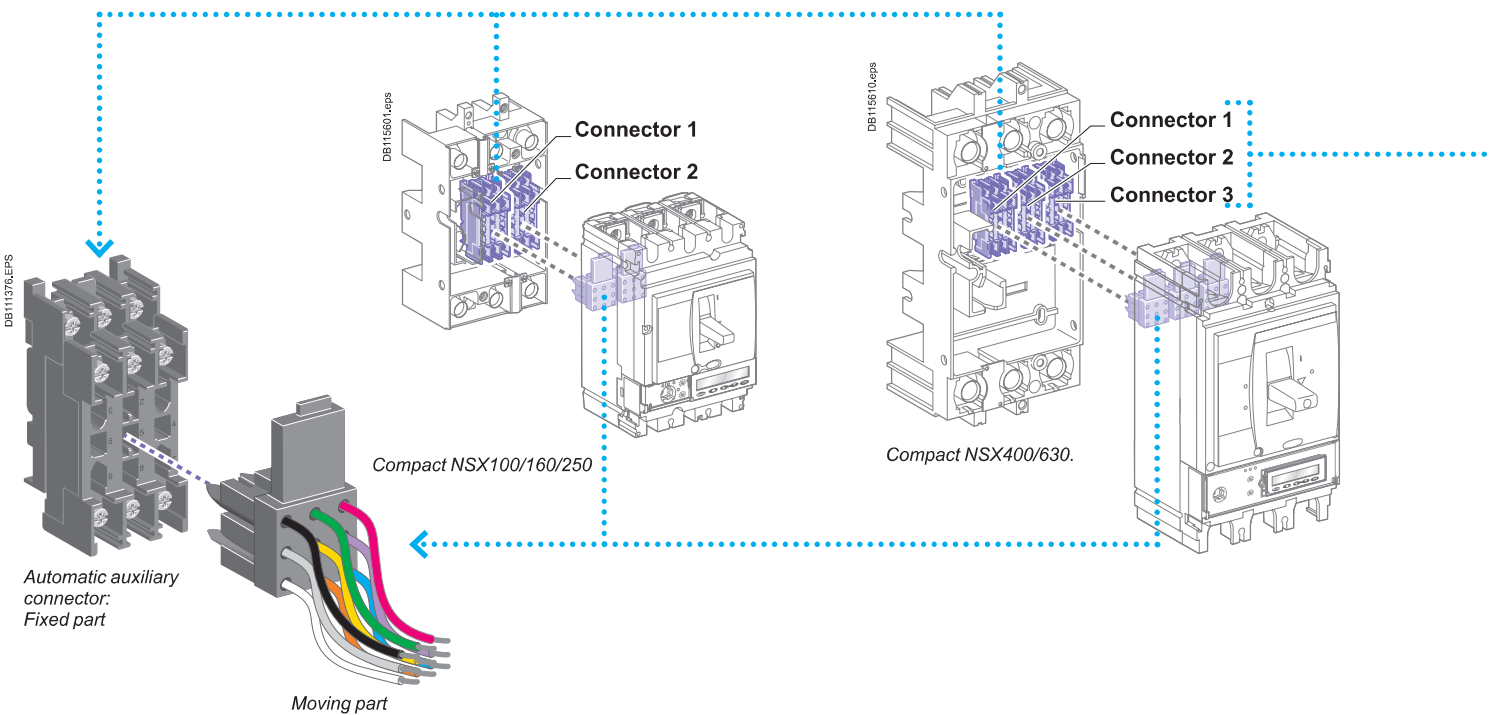
Auxiliary circuits exit the circuit breaker via one to three automatic auxiliary connectors (nine wires each). These are made up of:

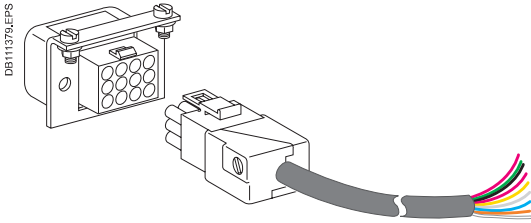
- a moving part, connected to the circuit breaker via a support (one support per circuit breaker)
- a fixed part, mounted on the plug-in base, equipped with connectors for bare cables up to 2.5 mm².

Micrologic trip unit options are also wired via the automatic auxiliary connectors.

Selection of automatic auxiliary connectors

Depending on the functions installed, one to three automatic auxiliary connectors are required.



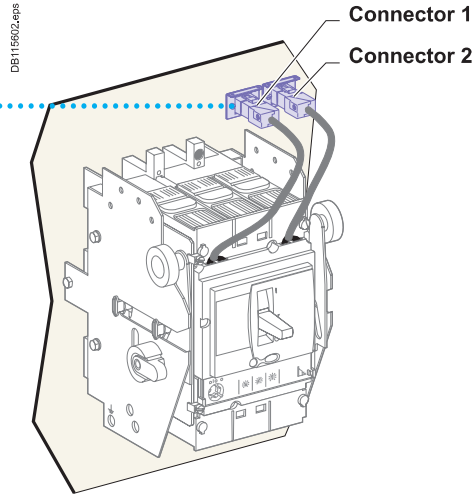


Nine-wire manual auxiliary connector.

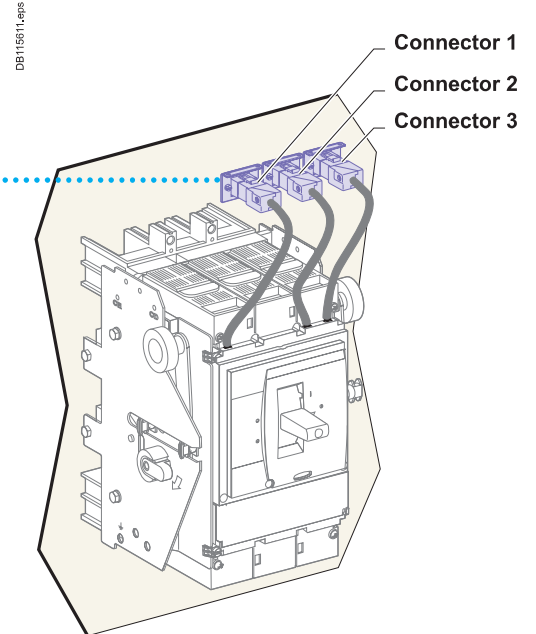
Withdrawable Compact NSX

Manual auxiliary connectors

As an option to the automatic auxiliary connectors, withdrawable circuit breakers may be equipped with one to three plugs with nine wires each. In "disconnected" position, the auxiliaries remain connected. They can then be tested by operating the device.



Compact NSX100/160/250.



Compact NSX400/630.

Each auxiliary is equipped with a terminal block with numbered terminals for connection of wires up to:

- 1.5 mm² for auxiliary contacts and voltage releases
- 2.5 mm² for the motor-mechanism module.

Circuit breaker	Connector 1	Connector 2	Connector 3
	OF1 MN/ MX SD	SDx/ or SDTAM	OF2/SDV / ZSI out ⁽¹⁾ SDE NSX cord MT MTc 24 V DC
NSX100/160/250	■	■	-
NSX400/630	■	■	■

⁽¹⁾ Only for NSX100 to 250.

MT: motor mechanism.

MTc: communicating motor mechanism.

One contact model provides circuit-breaker status indications (OF - SD - SDE - SDV).
 An early-make or early-break contact, in conjunction with a rotary handle, can be used to anticipate device opening or closing.
 A CE / CD contact indicates that the chassis is connected / disconnected.



Indication contacts.



CE/CD carriage switches.

These common-point changeover contacts provide remote circuit-breaker status information.
 They can be used for indications, electrical locking, relaying, etc.
 They comply with the IEC 60947-5 international recommendation.

Functions

Breaker-status indications, during normal operation or after a fault

A single type of contact provides all the different indication functions:

- OF (ON/OFF) indicates the position of the circuit breaker contacts
- SD (trip indication) indicates that the circuit breaker has tripped due to:
 - an overload
 - a short-circuit
 - an earth fault (Vigi) or a ground fault (Micrologic 6)
 - operation of a voltage release
 - operation of the "push to trip" button
 - disconnection when the device is ON.

The SD contact returns to de-energised state when the circuit breaker is reset.

- SDE (fault-trip indication) indicates that the circuit breaker has tripped due to:
 - an overload
 - a short-circuit
 - an earth fault (Vigi) or a ground fault (Micrologic 6).

The SD contact returns to de-energised state when the circuit breaker is reset.

- SDV indicates that the circuit breaker has tripped due to an earth fault. It returns to de-energised state when the Vigi module is reset.

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

Rotary-handle position contact for early-make or early-break functions

- CAM (early-make or early-break function) contacts indicate the position of the rotary handle.

They are used in particular for advanced opening of safety trip devices (early break) or to energise a control device prior to circuit-breaker closing (early make).

Chassis-position contacts

- CE/CD (connected/disconnected) contacts are microswitch-type carriage switches for withdrawable circuit breakers.

Installation

- OF, SD, SDE and SDV functions: a single type of contact provides all these different indication functions, depending on where it is inserted in the device. The contacts clip into slots behind the front cover of the circuit breaker (or the Vigi module for the SDV function).

The SDE function on a Compact NSX100 - 250 A equipped with a magnetic, thermal-magnetic or Micrologic 2 trip unit requires the SDE actuator.

- CAM function: the contact fits into the rotary-handle unit (direct or extended).
- CE/CD function: the contacts clip into the fixed part of the chassis.

Electrical characteristics of auxiliary contacts

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

SDx and SDTAM modules for Micrologic

SDx and SDTAM are relay modules with two static outputs. They send different signals depending on the type of fault. They may not be used together.



SDx relay module with its terminal block.



SDTAM relay module with its terminal block.

SDx module

The SDx module removes the trip or alarm conditions of Compact NSX circuit breakers equipped with electronic protection.

The SD2 output, available on all Micrologic trip units, corresponds to the overload-trip indication.

The SD4 output, available on Micrologic 5 / 6, is assigned to:

- overload pre-alarm (Micrologic 5)
- ground-fault trip indication (Micrologic 6).

These two outputs automatically reset when the device is closed (turned ON).

For Micrologic 5 / 6, the SD2 and SD4 outputs can be reprogrammed to be assigned to other types of tripping or alarm.

Output characteristics

It is possible to assign a function:

- latching with a time delay. Return to the initial state occurs at the end of the time delay
- permanent latching. In this case, return to the initial state takes place via the communication function.

Static outputs: 24 to 415 V AC / V DC; 80 mA max.

SDTAM module

The SDTAM module is specifically for the motor-protection Micrologic trip units 2.2 M, 2.3 M and 6.2 E-M, 6.3 E-M.

The SDTAM module, linked to the contactor controller, opens the contactor when an overload or other motor fault occurs, thus avoiding opening of the circuit breaker.

Micrologic 2 M

The SD4 output opens the contactor 400 ms before normal circuit-breaker opening in the following cases:

- overload (long-time protection for the trip class)
- phase unbalance or phase loss.

The SD2 output serves to memorise contactor opening by SDTAM.

Micrologic 6 E-M

The SD4 output opens the contactor 400 ms before normal circuit-breaker opening in the following cases:

- overload (long-time protection for the trip class)
- phase unbalance or phase loss
- locked rotor
- underload (undercurrent protection)
- long start.

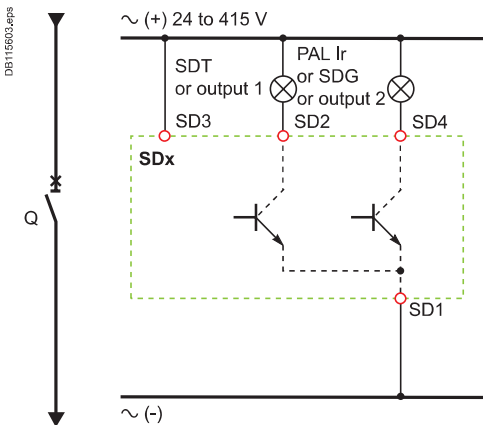
The SD2 output serves to memorise contactor opening by SDTAM.

Output characteristics

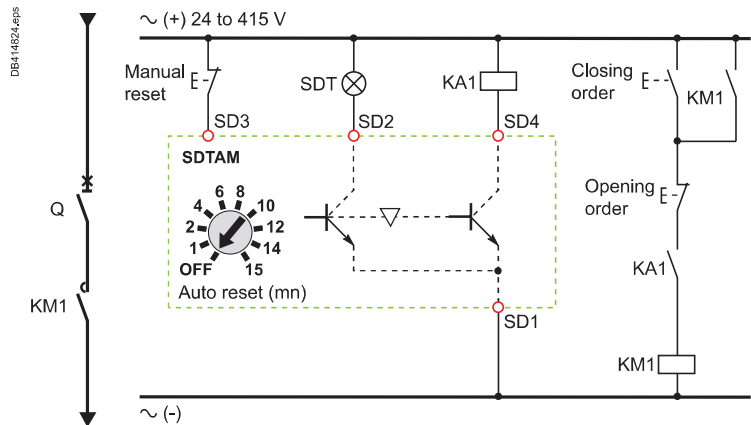
Output reset can be:

- manual by a pushbutton included in the wiring diagram
- automatic after an adjustable time delay (1 to 15 minutes) to take into account the motor-cooling time.

Static outputs: 24 to 415 V AC / V DC; 80 mA max.



SDx wiring diagram.



SDTAM wiring diagram with contactor control.



Compact NSX250 with motor mechanism.

When equipped with a **motor-mechanism** module, Compact NSX circuit breakers feature very high mechanical endurance as well as easy and sure operation:

- all circuit-breaker indications and information remain visible and accessible, including trip-unit settings and indications
- suitability for isolation is maintained and padlocking remains possible
- double insulation of the front face.

A specific motor mechanism is required for operation via the communication function. This **communicating motor mechanism** must be connected to the BSCM module to receive the opening and closing orders. Operation is identical to that of a standard motor mechanism.

Applications

- Local motor-driven operation, centralised operation, automatic distribution control.
- Normal/standby source changeover or switching to a replacement source to ensure availability or optimise energy costs.
- Load shedding and reconnection.
- Synchrocoupling.

Operation

The type of operation is selected using the manual/auto mode selection switch (7). A transparent, lead-seal cover controls access to the switch.

Automatic

When the switch is in the "auto" position, the ON/OFF (I/O) buttons and the charging lever on the mechanism are locked.

- Circuit-breaker ON and OFF controlled by two impulse-type or maintained signals.
- Automatic spring charging following voluntary tripping (by MN or MX), with standard wiring.
- Mandatory manual reset following tripping due to an electrical fault.

Manual

When the switch is in the "manual" position, the ON/OFF (I/O) buttons may be used. A microswitch linked to the manual position can remote the information.

- Circuit-breaker ON and OFF controlled by 2 pushbuttons I/O.
- Recharging of stored-energy system by pumping the lever 8 times.
- Padlocking in OFF position.

Installation and connections

All installation (fixed, plug-in/withdrawable) and connection possibilities are maintained.

Motor-mechanism module connections are made behind its front cover to integrated terminals, for cables up to 2.5 mm².

Optional accessories

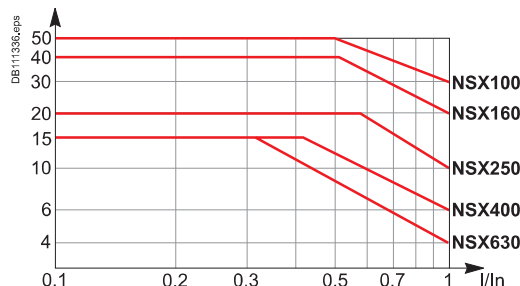
- Keylock for locking in OFF position.
- Operations counter for the Compact NSX400/630, indicating the number of ON/OFF cycles. Must be installed on the front of the motor-mechanism module.

Characteristics

Motor mechanism		MT100 to MT630	
Response time (ms)	opening	< 700	
	closing	< 80	
Operating frequency	cycles/minute max.	4	
Control voltage (V)	DC	24/30 - 48/60 - 110/130 - 250	
	AC 50/60 Hz	48 (50 Hz) - 110/130 - 220/240 - 380/440	
Consumption ⁽¹⁾	DC (W)	opening	≤ 500
		closing	≤ 500
	AC (VA)	opening	≤ 500
		closing	≤ 500

⁽¹⁾ For NSX100 to NSX250, the inrush current is 2 I_n for 10 ms.

Electrical endurance



Circuit breaker + motor-mechanism module, in thousands of operations (IEC 60947 2), at 440 V.

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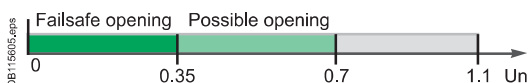
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- 1 Position indicator (positive contact indication)
- 2 Spring status indicator (charged, discharged)
- 3 Manual spring-charging lever
- 4 Keylock device (optional)
Locking device (OFF position), using 1 to 3 padlocks, shackle diameter 5 to 8 mm, not supplied
- 5 I (ON) pushbutton
- 6 O (OFF) pushbutton
- 7 Manual/auto mode selection switch. The position of this switch can be indicated remotely.
- 8 Operation counter (Compact NSX400/630)

Remote tripping



MX or MN voltage release.



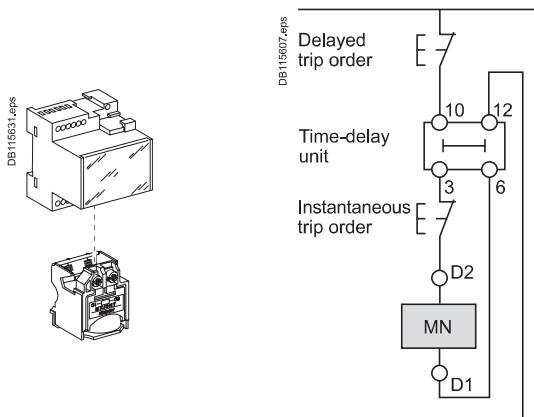
Opening conditions of the MN release.



Closing conditions of the MN release.

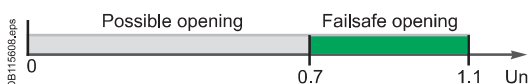


MN voltage release.



MN release with a time-delay unit.

Wiring diagram for emergency-off function with MN + time-delay unit.



Opening conditions of the MX release.

MX or MN voltage releases are used to trip the circuit breaker. They serve primarily for remote, emergency-off commands. It is advised to test the system every six months.

MN undervoltage release

The MN release opens the circuit breaker when its supply voltage drops to a value below 35 % of its rated voltage U_n .

Undervoltage tripping, combined with an emergency-off button, provides fail-safe tripping. The MN release is continuously supplied, i.e. if supply is interrupted:

- either voluntarily, by the emergency-off button,
- or accidentally, through loss of power or faulty wiring, the release provokes opening of the circuit breaker.

Opening conditions

Circuit-breaker tripping by an MN release meets the requirements of standard IEC 60947-2.

- Automatic opening of the circuit breaker is ensured when the continuous voltage supply to the release $U \leq 0.35 \times U_n$.
- If the supply voltage is between 0.35 and 0.7 U_n , opening is possible, but not guaranteed. Above 0.7 U_n , opening does not take place.

Closing conditions

If there is no supply to the MN release, it is impossible to close the circuit breaker, either manually or electrically. Closing is ensured when the voltage supply to the release $U \geq 0.85 \times U_n$. Below this threshold, closing is not guaranteed.

Characteristics

Power supply	V AC	50/60 Hz: 24 - 48 - 100/130 - 200/240
		50 Hz: 380/415 60 Hz: 208/277
Operating threshold	V DC	12 - 24 - 30 - 48 - 60 - 125 - 250
	Opening	0.35 to 0.7 U_n
	Closing	0.85 U_n
Operating range		0.85 to 1.1 U_n
Consumption (VA or W)		Pick-up: 10 - Hold: 5
Response time (ms)		50

Time-delay unit for an MN release

A time delay unit for the MN release eliminates the risk of nuisance tripping due to a transient voltage dip. For shorter micro-outages, a system of capacitors provides temporary supply to the MN at $U > 0.7$ to ensure non tripping. The correspondence between MN releases and time-delay units is shown below.

Power supply	Corresponding MN release
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

MX shunt release

The MX release opens the circuit breaker via an impulse-type (≥ 20 ms) or maintained order.

Opening conditions

When the MX release is supplied, it automatically opens the circuit breaker. Opening is ensured for a voltage $U \geq 0.7 \times U_n$.

Characteristics

Power supply	V AC	50/60 Hz: 24 - 48 - 100/130 - 200/240
		50 Hz: 380/415 60 Hz: 208/277
Operating range	V DC	12 - 24 - 30 - 48 - 60 - 125 - 250
		0.7 to 1.1 U_n
Consumption (VA or W)		Pick-up: 10
Response time (ms)		50

Circuit breaker control by MN or MX

When the circuit breaker has been tripped by an MN or MX release, it must be reset before it can be reclosed.

MN or MX tripping takes priority over manual closing.

In the presence of a standing trip order, closing of the contacts, even temporary, is not possible.

Connection using wires up to 1.5 mm² to integrated terminal blocks.

Note: circuit breaker opening using an MN or MX release must be reserved for safety functions. This type of tripping increases wear on the opening mechanism. Repeated use reduces the mechanical endurance of the circuit breaker by 50 %.

There are two types of rotary handle:

- direct rotary handle
- extended rotary handle.

There are two models:

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



Compact NSX with a rotary handle.



Compact NSX with an MCC rotary handle.



Compact NSX with a CNOMO machine-tool rotary handle.



Compact NSX with an extended rotary handle installed at the back of a switchboard, with the keylock option and key.

Direct rotary handle

Standard handle

Degree of protection IP40, IK07.

The direct rotary handle maintains:

- visibility of and access to trip-unit settings
- suitability for isolation
- indication of the three positions O (OFF), I (ON) and tripped
- access to the "push to trip" button.

Device locking

The rotary handle facilitates circuit-breaker locking.

■ Padlocking:

□ standard situation, in the OFF position, using 1 to 3 padlocks, shackle diameter 5 to 8 mm, not supplied

□ with a simple modification, in the ON and OFF positions. Locking in the ON position does not prevent free circuit-breaker 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.

■ Keylock (and padlock)

It is possible to install a Ronis or Profalux keylock (optional) on the base of the handle to obtain the same functions as with a padlock.

Early-make or early-break contacts (optional)

Early-make and/or early-break contacts may be used with the rotary handle. It is thus possible to:

- supply an MN undervoltage release before the circuit breaker closes
- open the contactor control circuit before the circuit breaker opens.

MCC switchboard control

Control of an MCC switchboard is achieved by adding a kit to the standard handle. In addition to the standard functions, the kit offers the characteristics listed below.

Higher degree of protection IP

Degree of protection IP43, IK07.

The IP is increased by a built-in gasket.

Door locking depending on device position

■ The door cannot be opened if the circuit breaker is ON or in the tripped position. For exceptional situations, door locking can be temporarily disabled with a tool to open the door when the circuit breaker is closed.

■ Circuit-breaker closing is disabled if the door is open. This function can be deactivated.

Machine-tool control in compliance with CNOMO

Control of a machine-tool is achieved by adding a kit to the standard handle. In addition to the standard functions, the kit offers the characteristics listed below.

Enhanced waterproofness and mechanical protection

- Degree of protection IP54, IK08.
- Compliance with CNOMO E03.81.501N.

Extended rotary handle

Degree of protection IP55, IK08.

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

It maintains:

- visibility of and access to trip-unit settings
- suitability for isolation
- indication of the three positions O (OFF), I (ON) and tripped.

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 to open the door without opening the circuit breaker. This operation is not possible if the handle is locked by a padlock.

Voluntary disabling of mechanical door locking

A modification to the handle, that can be carried out on site, completely disables door locking, including when a padlock is installed on the handle. The modification is reversible.

When a number of extended rotary handles are installed on a door, this disabling function is the means to ensure door locking by a single device.



Extended rotary handle (cont.)

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 diameter 5 to 8 mm, not supplied
 - with a simple modification, in the ON and OFF positions. Locking in the ON position does not prevent free circuit-breaker 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.
- If the door controls were modified to voluntarily disable door locking, padlocking does not lock the door, but does disable handle operation of the device.

Device locking using a keylock inside the switchboard

It is possible to install a Ronis or Profalux keylock (optional) on the base of the rotary handle to lock the device in the OFF position or in either the ON or OFF positions.

Accessory for device operation with the door open

When the device is equipped with an extended rotary handle, a control accessory mounted on the shaft makes it possible to operate the device with the door open.

- The device can be padlocked in the OFF position.
- The accessory complies with UL508.

Early-make or early-break contacts (optional)

The extended rotary handle offers the same possibilities with early-make and/or early-break contacts as the standard rotary handle.

Parts of the extended rotary handles

- A unit that replaces the front cover of the circuit breaker (secured by screws).
- An assembly (handle and front plate) on the door that is always secured in the same position, whether the circuit breaker is installed vertically or horizontally.
- An extension shaft that must be adjusted to the distance. The min/max distance between the back of circuit breaker and door is:
 - 185...600 mm for Compact NSX100 to 250
 - 209...600 mm for Compact NSX400/630.

For withdrawable devices, the extended rotary handle is also available with a telescopic shaft to compensate for device disconnection. In this case, the min/max distances are:

- 248...600 mm for Compact NSX100 to 250
- 272...600 mm for Compact NSX400/630.

Manual source-changeover systems

An additional accessory interlocks two devices with rotary handles to create a source-changeover system. Closing of one device is possible only if the second is open.

This function is compatible with direct or extended rotary handles.

Up to three padlocks can be used to lock in the OFF or ON position.



PB1103795-32,4pp8



Voltage-presence indicator.

Voltage-presence indicator

The indicator detects and indicates that circuit breaker terminals are supplied with power.

Installation

- Mounted in the long or short terminal shields, via the knockouts.
- May be positioned upstream or downstream of the circuit breaker.
- Degree of protection IP40, IK04.
- Not compatible with the motor-mechanism module.

Electrical characteristics

Operates on all networks with voltages ranging from 220 to 550 V AC.

Current-transformer module

This module enables direct connection of a measurement device such as an ammeter or a power meter.

Installation

- The module is installed directly on the downstream circuit-breaker terminals.
- Degree of protection IP40, IK04.
- Class II insulation between front and the power circuits.
- Connection to 6 integrated connectors for cables up to 2.5 mm².

Electrical characteristics

- Current transformer with 5 A secondary winding.
- Class 3 for the following output-power consumptions:

Accuracy:

- 100 A rating: 1.6 VA
- 150 A rating: 3 VA
- 250 A rating: 5 VA
- 400/600 A rating: 8 VA.

Current-transformer module with voltage measurement outputs

This module enables direct connection of a digital measurement device such as a Power Meter PM700, PM800, etc. (not supplied).

Installation

- The module is installed directly on the downstream circuit-breaker terminals.
- Degree of protection IP40, IK04.
- Class II insulation between front and the power circuits.
- Built-in connectors for cables from 1.5 to 2.5 mm².

Electrical characteristics

- Rated operational voltage U_e: 530 V
- Frequencies of measured values: 50...60 Hz
- Three CTs with 5 A secondary windings for the rated primary current I_n:
 - class 0,5 to 1 for rated power consumption values at the output:
 - 125 A, 150 A and 250 A ratings: class 1 for 1.1 VA
 - 400/600 A rating: class 0,5 for 2 VA
 - Connection using a 2,5 mm² cable up to 2,5 m long.
- Four voltage measurement outputs including protection with automatic reset.
- voltage measurement output impedance 3500 Ω ±25 %, maximum current 1 mA
- The voltage measurement outputs are intended only for measurements (1 mA max.) and may not be used to supply the display.

Ammeter and I_{max} ammeter modules

Ammeter module

Measures and displays (dial-type ammeter) the current of each phase (selection of phases by 3-position switch in front).

I_{max} ammeter module

Measures and displays (dial-type ammeter) the maximum current flowing in the middle phase. The I_{max} value can be reset on the front.

Installation

- Identical for both types of ammeter module.
- The module is installed directly on the downstream circuit-breaker terminals.
- The ammeter clips into the module in any of four 90° positions, i.e. it can be installed of devices mounted both vertically and horizontally.
- Degree of protection IP40, IK04.
- Class II insulation between front and the power circuits.

Electrical characteristics

- Ammeter module: accuracy class 4,5.
- I_{max} ammeter module: accuracy ±6 %.
- Maximum currents are displayed only if they last ≥ 15 minutes.

PB105123,4pp8



Compact NSX with current-transformer module.

PB105124,4pp8



Compact NSX with ammeter module.



Insulation monitoring module.

Insulation monitoring module

This module detects and indicates an insulation drop on a load circuit (TN-S or TT systems).

Operation is identical to that of a Vigi module, but without circuit-breaker tripping.

Indication by a red LED in front.

An auxiliary contact may be installed for remote insulation-drop indications.

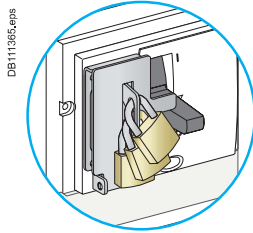
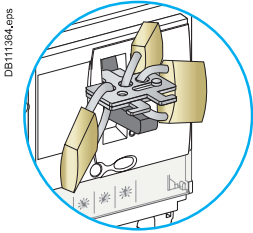
When insulation drops below a minimum, user-set threshold, the LED goes on and the auxiliary contact switches. The fault indication cannot be cancelled except by pressing the manual reset button.

Installation

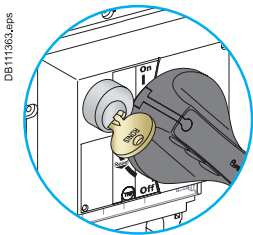
- The module is installed directly on the downstream circuit-breaker terminals.
- Degree of protection IP40, IK04.
- Double insulation of the front face.

Electrical characteristics

- Settings: 100 - 200 - 500 - 1000 mA.
- Accuracy: -50 +0 %.
- Time delay following insulation drop: 5 to 10 seconds.
- AC-system voltage: 200 to 440 V AC.



Toggle locking using padlocks and an accessory:
Removable device
Fixed device attached to the case (3).

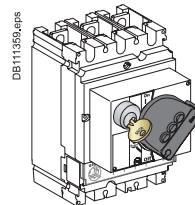
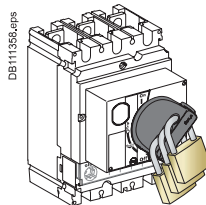


Rotary-handle locking using a keylock.

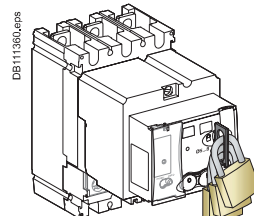
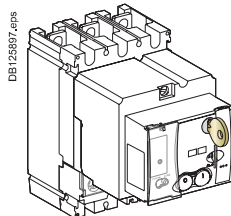
Locking in the OFF position guarantees isolation as per IEC 60947-2. Padlocking systems can receive up to three padlocks with shackle diameters ranging from 5 to 8 mm (padlocks not supplied). Certain locking systems require an additional accessory.

Control device	Function	Means	Required accessories	
Toggle	Lock in OFF position	Padlock	Removable device	
	Lock in OFF or ON position	Padlock	Fixed device	
Direct rotary handle	Standard	Lock in	Padlock	
		<ul style="list-style-type: none"> ■ OFF position ■ OFF or ON position (1) 	Keylock	Locking device + keylock
	MCC	Lock in	Padlock	-
CNOMO	Lock in	<ul style="list-style-type: none"> ■ OFF position ■ OFF or ON position (1) 	Padlock	-
		Extended rotary handle	Lock in	Padlock
Extended rotary handle	Lock in	<ul style="list-style-type: none"> ■ OFF position ■ OFF or ON position (1) with door opening prevented (2) 	Padlock	-
		Lock in OFF position	Padlock	UL508 control accessory
	<ul style="list-style-type: none"> ■ OFF or ON position (1) inside the switchboard 	Keylock	Locking device + keylock	
Motor mechanism	Lock in OFF position remote operation disabled	Padlock	-	
		Keylock	Locking device + keylock	
Withdrawable circuit breaker	Lock in	<ul style="list-style-type: none"> ■ disconnected position 	Padlock	-
		Keylock	Locking device + keylock	
	<ul style="list-style-type: none"> ■ connected position 	Keylock	Locking device + keylock	

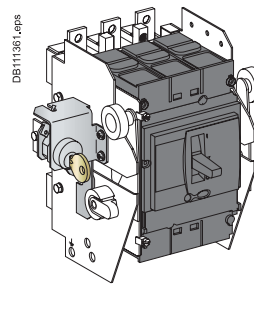
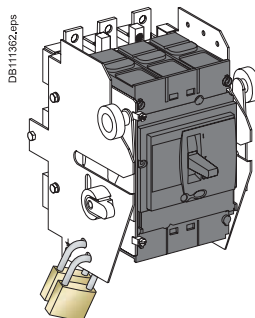
(1) Following a simple modification of the mechanism.
(2) Unless door locking has been voluntarily disabled.
(3) Only for 3P-4P.



Rotary-handle locking using a padlock or a keylock.

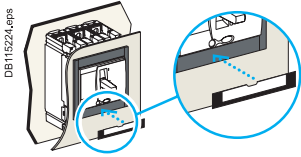


Motor-mechanism locking using a padlock or a keylock.

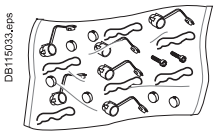


Chassis locking in the connected position.

Sealing accessories



Identification accessories.



Sealing accessories.

Outgoing-circuit identification

Compact NSX100 to 630 can be equipped with label holders supplied in sets of ten (cat. no. LV429226). They are compatible with escutcheons.

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
- 0.5 m of wire
- 2 screws.

Types of seals and corresponding functions

Toggle control	 DB112300.eps	 DB112301.eps	 DB112303.eps	 DB112304.eps
Rotary handle	 DB112302.eps	 DB112306.eps	 DB112307.eps	 DB117470.eps
Motor mechanism	 DB112304.eps	 DB112305.eps	 DB125896.eps	 DB112307.eps
Types of seals	Front-cover fixing screw	Trip-unit transparent cover	Motor-mechanism transparent cover	Terminal-shield fixing screw
Protected operations	<ul style="list-style-type: none"> ■ front removal ■ access to auxiliaries ■ trip-unit removal. 	<ul style="list-style-type: none"> ■ modification of settings ■ access to test connector. 	<ul style="list-style-type: none"> ■ access to manual/auto mode selection switch: depending on its position, manual ^(*) or automatic operation is not possible. ^(*) In this case, local operation is not possible. 	<ul style="list-style-type: none"> ■ access to power connections (protection against direct contact).
Access to Vigi-module settings	 DB112310.eps	 DB112311.eps		
Types of seals	Vigi-module fixing device	Protection cover for settings		
Protected operations	<ul style="list-style-type: none"> ■ removal of the Vigi module. 	<ul style="list-style-type: none"> ■ modification of settings. 		

PE103959a-40.jpg



IP55 metal enclosure.

PE105120.jpg



IP55 insulating enclosure.

Individual enclosures are available for Compact/Vigicompact NSX devices with two, three or four poles.

All fixed, front connections are possible, except right-angle, 45°, double-L and edgewise terminal extensions.

All spreaders may be installed in the enclosures intended for Compact/Vigicompact NSX250 to 630 devices, except the 70 mm spreaders for NSX400/630.

Two models of enclosures

■ IP55 metal individual enclosure, with:

- metal enclosure
- door with keylock and cut-out for rotary handle
- extended rotary handle, IP55, IK08, black or red/yellow
- device mounting plate
- removable plate (without holes) for cable entry through bottom.

■ IP55 insulating individual enclosure, with:

- polyester insulating enclosure
- transparent cover, screwed, neoprene gasket, with cut-out for extended rotary handle
- extended rotary handle, IP55, IK08, black or red/yellow
- device mounting plate
- 2 removable plates (without holes) for cable entry through bottom and/or top.

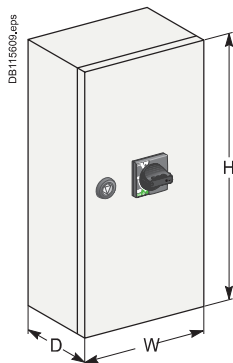
Dimensions (H x W x D in mm)

■ Metal enclosures:

- | | |
|---|-----------------|
| <input type="checkbox"/> Compact NSX100/160 | 450 x 350 x 250 |
| <input type="checkbox"/> Compact NSX250 and Vigicompact NSX100 to 250 | 650 x 350 x 250 |
| <input type="checkbox"/> Compact NSX400 | 650 x 350 x 250 |
| <input type="checkbox"/> Compact NSX630 and Vigicompact NSX400/630 | 850 x 600 x 250 |

■ Insulating enclosures:

- | | |
|--|-----------------|
| <input type="checkbox"/> Compact NSX100/160 | 360 x 270 x 235 |
| <input type="checkbox"/> Compact NSX250 and Vigicompact NSX100/160 | 540 x 270 x 235 |
| <input type="checkbox"/> Compact NSX400/630 | 720 x 360 x 235 |
| <input type="checkbox"/> Vigicompact NSX250/630 | 720 x 360 x 235 |



Escutcheons and protection collars

Escutcheons are an optional feature mounted on the switchboard door. They increase the degree of protection to IP40, IK07. Protection collars maintain the degree of protection, whatever the position of the device (connected, disconnected).

IP30 or IP40 escutcheons for fixed devices

IP30

The three types are glued to the cut-out in the front door of the switchboard:

- escutcheon for all control types (toggle, rotary handle or motor mechanism)
- without access to the trip unit
- with access to the trip unit
- for Vigi modules, can be combined with the above.

IP40

The four types, with a gasket, are screwed to the door cut-out:

- three escutcheons identical to the previous, but IP40
- a wide model for Vigi and ammeter modules that can be combined with the above.

PB105119.eps



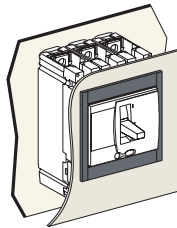
IP30 escutcheon.

PB105126.eps

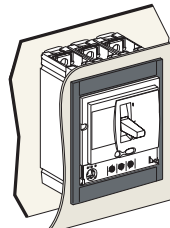


IP30 escutcheon with access to the trip unit.

DB112290.eps

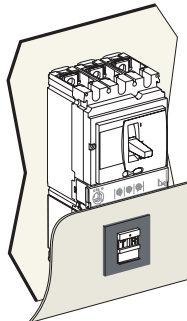


DB112291.eps

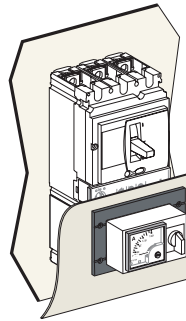


Escutcheon for toggle without and with access to the trip unit.

DB112292.eps



DB112293.eps



Escutcheon for Vigi module.

Wide escutcheon for ammeter.

IP40 escutcheons for withdrawable devices

IP40 for withdrawable devices

The two types, with a gasket, are screwed to the door cut-out:

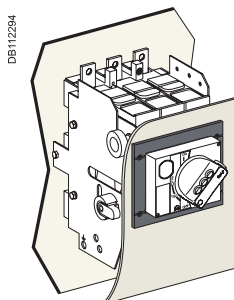
- for rotary handle or motor mechanism: standard IP40 escutcheon
- for toggle with extension: standard escutcheon + collar for withdrawal.



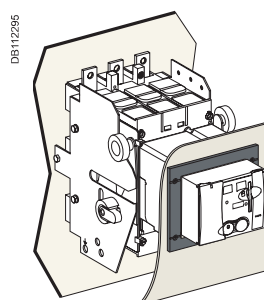
Escutcheon with collar for toggle.



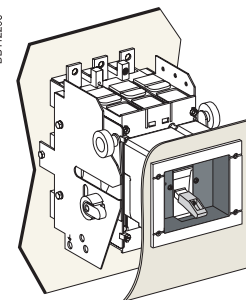
Escutcheon for Vigi module.



Standard escutcheon with rotary handle.



Standard escutcheon for motor mechanism.

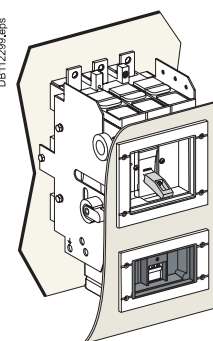
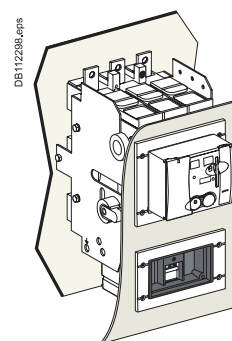
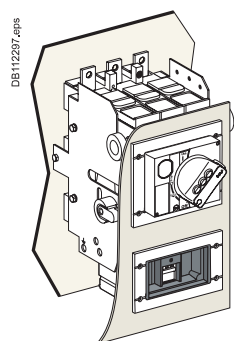


Standard escutcheon with collar for withdrawal, for toggle.

IP40 for Vigi module on withdrawable devices

The two types, with a gasket, are screwed to the door cut-out:

- for rotary handle or motor mechanism: standard IP40 escutcheon
- for toggle: standard escutcheon + collar for withdrawal.



Escutcheon for Vigi module, with escutcheons for the three types of control.

FB103775_40.eps



Toggle cover.

IP43 toggle cover

Available only for devices with toggles. Fits over toggle and front cover of the device.

- Mounted on the front of the circuit breaker.
- Degree of protection IP43, IK07.

DB112218.eps



Toggle cover.

PE103820_35.eps



NS retrofit front cover.

Retrofit front covers

These replacement front covers make it possible to install NSX devices in existing switchboards containing NS devices by installing the NS-type retrofit covers on the NSX devices.

- NS100 to 250 cover.
- NS400/630 cover.