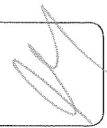


# Compact NSX motor protection MA instantaneous trip units

MA magnetic trip units are used in 3 devices 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


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.

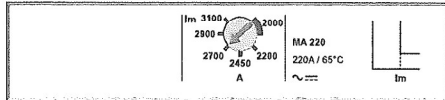
## Protection

**Magnetic protection (Im)**  
Short-circuit protection with an adjustable pick-up  $I_m$  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  $I_n$  for 2.5 to 100 A ratings or 9 to 14  $I_n$  for 150 to 220 A ratings.

### Protection versions

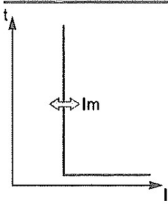
- 3-pole (3P 3D): 3-pole frame (3P) with detection on all 3 poles (3D).
- 4-pole (4P 3D): 4-pole frame (4P) with detection on 3 poles (3D).



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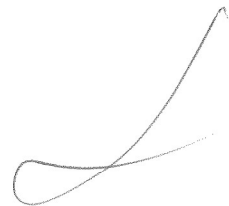


## Magnetic trip units MA 2.5 to 220

	Ratings (A)	$I_n$ at 65 °C [1]	2.5	6.3	12.5	25	50	100 [1]	150	220
	Circuit breaker	Compact NSX100	⊙	⊙	⊙	⊙	⊙	⊙	-	-
		Compact NSX160	-	-	-	⊙	⊙	⊙	⊙	-
		Compact NSX250	-	-	-	-	-	⊙	⊙	⊙
<b>Instantaneous magnetic protection</b>										
Pick-up (A) accuracy ±20 %	$I_m = I_n \times \dots$		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  $I_n$ .

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



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# Select your protection

## Compact NSX motor protection

### Micrologic 1.3 M instantaneous trip units

Micrologic 1.3 M trip units are used in 3 devices 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<sub>sd</sub>)

Protection with an adjustable pick-up I<sub>sd</sub>. There is a very short delay to let through motor starting currents.

- I<sub>sd</sub> is set in amperes from 5 to 13 x I<sub>n</sub>, 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<sub>i</sub>)

Instantaneous protection with non-adjustable pick-up I<sub>i</sub>.

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.

### Micrologic 1.3 M

	Ratings (A)	I <sub>n</sub> at 65 °C <sup>(1)</sup>	320	500
Circuit breaker		Compact NSX400	⊙	-
		Compact NSX630	⊙	⊙
<b>S Short-time protection</b>				
Pick-up (A) accuracy ±15 %	I <sub>sd</sub>	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 <sub>sd</sub>	Non-adjustable		
		Non-tripping time	10	
		Maximum break time	60	
<b>I Instantaneous protection</b>				
Pick-up (A) accuracy ±15 %	I <sub>i</sub> 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 (see pages E-14 to E-17).



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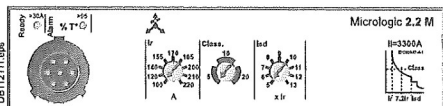
# Compact NSX motor protection

## Micrologic 2.2 / 2.3 M electronic trip units

Micrologic 2.2 / 2.3 M trip units provide built-in thermal and magnetic protection. They are used in 2 devices 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

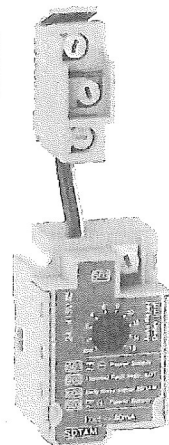
- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in the event of a fault.
- Red alarm LED for motor operation: goes ON when the thermal image of the rotor and stator is greater than 95 % of the permissible temperature rise.

#### Remote indications via SDTAM module

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

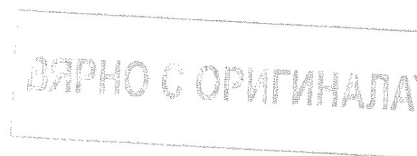
- a contact to indicate circuit-breaker overload
- a contact to open the contactor. In the event of a phase unbalance or overload, this output is activated 400 ms before circuit-breaker tripping to open the contactor and avoid circuit breaker tripping.

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.



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# Select your protection

## Compact NSX motor protection

### Micrologic 2.2 / 2.3 M electronic trip units

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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		-	-	-	-	-	⊙	⊙

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

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

Tripping between 1.05 and 1.20 Ir

Time delay (s) depending on selected trip class

tr	1.5 x Ir	6 x Ir	7.2 x Ir	Notes
5	120	6.5	5	for warm motor
10	240	13.5	10	for cold motor
20	480	26	20	for cold motor

Thermal memory: 20 minutes before and after tripping

Cooling fan: non-adjustable - motor self-cooled

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

Pick-up (A)	Isd = Ir x ...	5	6	7	8	9	10	11	12	13
accuracy ±15 %										
Time delay (ms)	tsd	non-adjustable								
	Non-tripping time	10								
	Maximum break time	60								

**Short-circuits: Non-adjustable instantaneous protection**

Pick-up (A)	Ii non-adjustable	425	750	1500	2250	3300	4800	6500
accuracy ±15 %								
Time delay (ms)	Non-tripping time	0						
	Maximum break time	30						

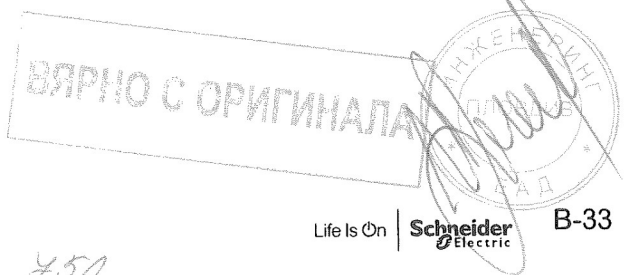
**Phase unbalance or phase loss**

Pick-up (A)	Iunbal in % average current [2]	> 30 %
accuracy ±20 %		
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 pages E-14 to E-17).  
 [2] The unbalance measurement takes into account the most unbalanced phase with respect to the average current.

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Select your protection

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# Compact NSX motor protection Micrologic 6 E-M electronic trip units

Micrologic 6.E-M is used in 2 devices 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 (I<sub>g</sub>)

Residual type ground-fault protection with an adjustable pick-up I<sub>g</sub> (with Off position) and adjustable time delay t<sub>g</sub>.

### Phase unbalance or phase loss (I<sub>unbal</sub>)

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

- that is greater than the I<sub>unbal</sub> pick-up that can be fine-adjusted from 10 to 40 % (30 % by default)
  - following the t<sub>unbal</sub> 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 (I<sub>jam</sub>)

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

During motor starting (see page B-37), the function is disabled.

During normal operation, it causes tripping:

- above the I<sub>jam</sub> pick-up that can be fine-adjusted from 1 to 8 x I<sub>r</sub>
- in conjunction with the t<sub>jam</sub> time delay that can be adjusted from 1 to 30 seconds.

### Under-load (I<sub>und</sub>)

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 B-37), the function is always enabled.

During normal operation, it causes tripping:

- below the I<sub>und</sub> pick-up that can be fine-adjusted from 0.3 to 0.9 x I<sub>r</sub>
- in conjunction with the t<sub>und</sub> time delay that can be adjusted from 1 to 200 seconds.

### Long starts (I<sub>long</sub>)

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 I<sub>long</sub> pick-up that can be fine-adjusted from 1 to 8 x I<sub>r</sub>
- in conjunction with the t<sub>long</sub> time delay that can be adjusted from 1 to 200 seconds (see "long starts" page B-37).

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

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# Select your protection

## Compact NSX motor protection

### Micrologic 6 E-M electronic trip units

*M*

### 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 C-31 for SDTAM and for SDx.

B

### 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	-	-	-	-	-	⊙	⊙

Overloads: Long-time protection		Value depending on trip-unit rating (In) and setting on dial										
Pick-up (A)	Ir	Dial setting										
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									
			5	10	20	30						
Trip class as per IEC 60947-4-1			20 minutes before and after tripping									
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									

Short-circuits: Short-time protection with fixed time delay		Fine adjustment in 0.5 x Ir steps using the keypad									
Pick-up (A)	Isd = Ir x ...	5	6	7	8	9	10	11	12	13	
accuracy ±15 %		non-adjustable									
Time delay	tsd	non-adjustable									
	Non-tripping time	10 ms									
	Maximum break time	60 ms									

Short-circuits: Non-adjustable instantaneous protection		Maximum break time						
Pick-up (A)	li non-adjustable	425	750	1200	2250	3300	4800	6500
accuracy ±15 %	Non-tripping time	0 ms						
	Maximum break time	30 ms						

Ground faults		Dial setting										
Pick-up (A)	lg = ln x ...											
accuracy ±10 %		In = 25 A lg =	0.6	0.6	0.6	0.6	0.7	0.8	0.9	1	Off	
		In = 50 A lg =	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	Off	
		In > 50 A lg =	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						

[1] Motor standards require operation at 65 °C. Circuit-breaker ratings are derated to take this requirement into account (see pages E-14 to E-17).  
 [2] The unbalance measurement takes into account the most unbalanced phase with respect to the average current.

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# Compact NSX motor protection

## Micrologic 6 E-M electronic trip units

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### Micrologic 6.2 / 6.3 E-M

#### Phase unbalance or phase loss

Pick-up (A) accuracy $\pm 20\%$	$I_{unbal} = \text{in \% average current}^{[2]}$	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 $\pm 10\%$	$I_{jam} = I_r \times \dots$	1 x 8 $I_r$ with Off position, default setting = Off fine adjustments in 0.1 x $I_r$ 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 $\pm 10\%$	$I_{und} = I_r \times \dots$	0.3 x 0.9 $I_r$ with Off position, default setting = Off Fine adjustments in $I_r \times 0.01$ steps using the Ecoreach software activated during motor starting
Time delay (s)	$t_{und} =$	1 to 200 seconds fine adjustments in 1 s steps using the Ecoreach software, default setting = 10 s

#### Long starts

Pick-up (A) accuracy $\pm 10\%$	$I_{long} = I_r \times \dots$	1 x 8 $I_r$ with Off position, default setting = Off Fine adjustments in $I_r \times 0.1$ steps using the Ecoreach software activated during motor starting
Time delay (s)	$t_{long} =$	1 to 200 seconds fine adjustments in 1 s steps using the Ecoreach 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 pages E-14 to E-17).

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

**B**

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ВЕРНО С ОРИГИНАЛОМ  
 ИНЖЕНЕРИ  
 ДИСТРИБ  
 ШЕД

# Select your protection Compact NSX motor protection

## 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  $I_r$ :

- current  $> 10\% \times I_r$  (motor-off limit)
- overrun of  $1.5 \times I_r$  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  $I_r$  must have been set to the current indicated on the motor rating plate.

### Long starts (Micrologic 6 E-M)

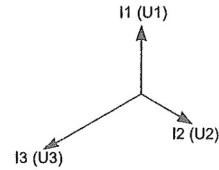
When this function is not activated, the starting conditions are those indicated above. When it is activated, this protection supplements thermal protection (class).

A long start causes tripping and is characterised by:

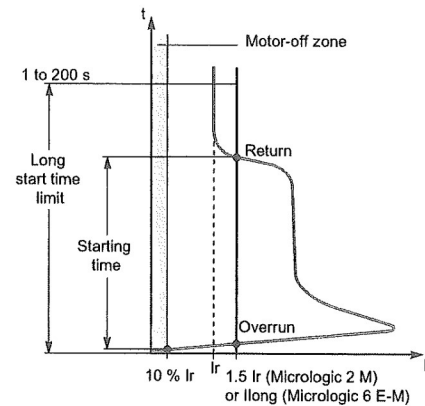
- current  $> 10\% \times I_r$  (motor-off limit) with:
  - either overrun of the long-time pick-up ( $1$  to  $8 \times I_r$ ) without return below the pick-up before the end of the long-time time delay ( $1$  to  $200$  s)
  - or no overrun of the long-time pick-up ( $1$  to  $8 \times I_r$ ) before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

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

This protection should be coordinated with the selected class.



Unbalance of phase currents and voltages.



Motor starting and long starts.

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# Compact NSX measurement

## Micrologic 5 / 6 / 7 E electronic trip units

Compact NSX with its embedded current sensors handled by a microprocessor that operates independently of protection functions and Micrologic 5 / 6 / 7 E is a PMD-DD Power Meter Device complying with IEC/EN 61557-12, Class 0.5 for voltage, Class 1 for current and Class 2 for active power and energy measurements.

### Measures and electrical parameters calculated by the Micrologic 5 / 6 / 7 E trip units

Based on the measure of line currents, neutral current, phase to phase voltages and phase to neutral voltages, the Micrologic 5 / 6 / 7 E trip units calculate and display all the parameters required to monitor any AC electrical power supply including power quality, power management and energy efficiency:

- RMS values of currents and voltages,
- Active, reactive and apparent powers, active, reactive and apparent energies,
- Power factor,
- Frequency,
- Unbalance on voltage and THD of voltages and currents,
- Demand and maximum demand values.

The maximum and minimum values are stored in the Micrologic 5 / 6 / 7 E trip units non volatile memory. They are resettable from the embedded display, FDM display or a PC running Ecoreach software.

### 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.

Electrical values can be displayed on the embedded HMI, a PC running Ecoreach software and on the FDM display unit. They are refreshed every second.

The display on the embedded HMI is accessed by means of a contextual menu allowing to navigate easily through the electrical values. Alternatively a Quickview option allows to display the main basic values.

Optional external 24 Vdc supply module is required to process and display the measurements including energy counters for currents below 20 % of the rated current.

The phase to neutral voltages are available for 4 poles circuit breakers and 3 poles circuit breakers as well providing the connection of the Micrologic 5 / 6 E to the neutral (ENVN). To guarantee the accuracy for the active power measurement this connection is mandatory.

Neutral-Phase measurement is only possible on the 4-pole Micrologic Vigi 7 E (not on the 3-pole).

No External Neutral connection on the Micrologic Vigi 7 E.

Please refer to the user manual for more details concerning the wiring and the configuration of Micrologic 5 / 6 / 7 E.



# Select your protection

## Compact NSX measurement

### Micrologic 5 / 6 / 7 E electronic trip units

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#### Micrologic 5 / 6 / 7 E for energy management functions

Active Power and Energy metering in Compact NSX with Micrologic 5 / 6 / 7 E has been designed and tested to provide accuracy: **Class 2 according to IEC/EN 61557-12**. This standard specifies requirements for combined performance of measuring and monitoring devices that measure and monitor the electrical parameters within electrical distribution systems. It covers both devices with external sensors such as current and/or voltage transformers like stand alone power meter (PMD-S) and devices with embedded sensors (PMD-D) like circuit breakers.

In addition a list of available performance class for all relevant measurement functions is specified in IEC/EN 61557-12, in opposition to most other standards such as IEC 62053-2x series that are dealing only with active and reactive energy.

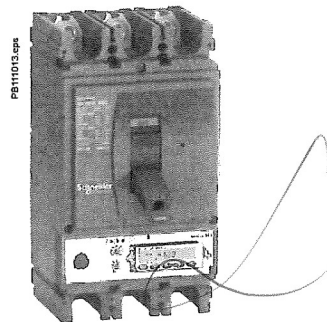
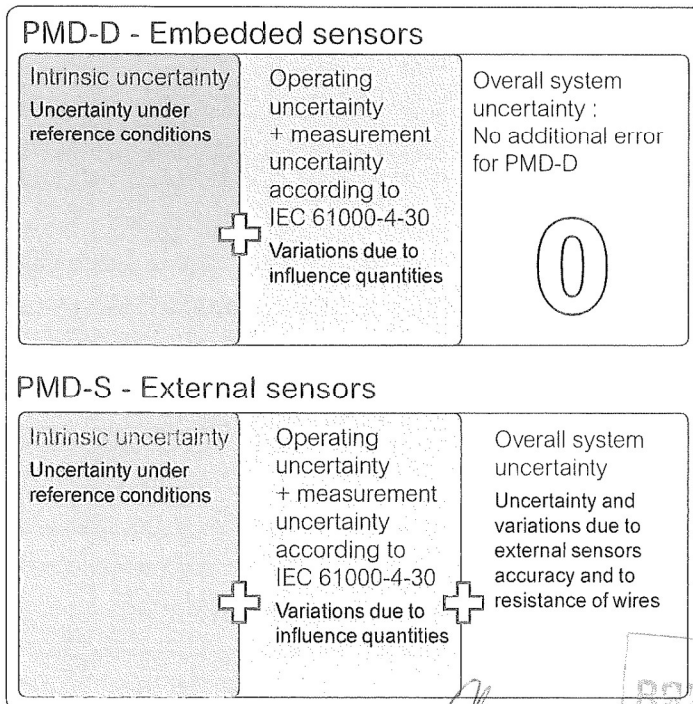
Compact NSX equipped with Micrologic 5 / 6 / 7 E and its own embedded sensors is a Class 2 full chain measurement PMD-DD device for active power and energy metering according to IEC/EN 61557-12.

PMD-DD offer the benefit of avoiding uncertainty and variation due to external sensors and wiring.

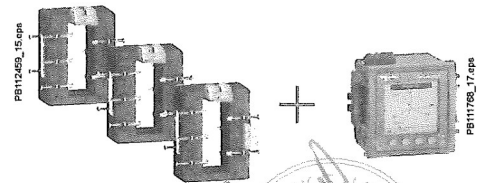
IEC/EN 61557-12 standard defines three levels of uncertainty (intrinsic uncertainty, operating uncertainty, overall system uncertainty) that need to be checked to ensure accuracy class.

The uncertainty is the estimated amount or percentage by which a measured value may differ from the true value. According to IEC/EN 61557-12, the total uncertainty of a measurement, in general, depends on the instrument, the environment, and other elements to be considered.

Note: Requirements for Class 2 active power and energy in IEC/EN 61557-12 regarding limits of uncertainty due to variation of the current for different power factor, and limits of uncertainty due to influence quantities such as temperature are equivalent to IEC 62053-2x standards.



PMD-D - Embedded sensors



PMD-S - External sensors

ВЪЗНО С ОРИГИНАЛ

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# Compact NSX measurement Micrologic 5 / 6 / 7 E electronic trip units

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Compliance with ISO 50001: Reliability and repeatability over time of energy measurement

Scope and main requirements of ISO 50001:

ISO 50001 specifies requirements for systems and organization dedicated to energy management. This international standard defines rules and gives recommendations to achieve continual improvement of energy performance, including energy efficiency, energy use and consumption, measurements, documentation and reporting. Energy performance shall be monitored and significant deviations shall be investigated. It implies that the accuracy of the instruments used for this purpose remains stable throughout their entire operating life which ensures the repeatability of the measurements (ISO 50001, clause 4.6 and 4.6.1 Checking, monitoring, measurement and analysis).

In Compact NSX with Micrologic 5 / 6 / 7 E, the metering and protection functions are designed to perform accurate and repeatable measurements during Micrologic E life time, provided it's used in the specified environmental conditions as defined in Compact NSX User Guide. Current sensors and Micrologic E are calibrated during circuit breaker manufacturing and are not supposed to be re-calibrated during this life time. In general, electronic instrument measuring electric parameters don't request any specific maintenance provided they are working within environmental specifications. Accuracy can be reduced in case of operation under exceptional conditions, lightning strikes, high temperature, high degree of humidity, this is why a periodic verification is recommended (please refer to the annex I of the AFNOR Document FD X30-147: Metrological maintenance recommendations, applicable to electrical and fluidic measurements).

IEC 60364-8-1 Clause 8.3.1.1 Requirement on accuracy and measuring range

Scope and main requirements of IEC 60364-8-1:

IEC 60364-8-1 provides requirements and recommendations for the design, erection and verification of low voltage electrical installations including local production and storage of energy for optimizing the overall efficient use of electricity. It introduces recommendations for the design of an electrical installation within the framework of an energy efficiency management approach in order to get low electrical energy consumption and acceptable energy availability. It also specifies the accuracies of the measuring instruments involved in the functions of energy management such as:

- Energy usage analysis and optimization
- Contract optimization
- Cost allocation
- Efficiency assessment
- Energy usage trends assessment.

Compact NSX with Micrologic 5 / 6 / 7 E complies with the requirements of IEC 60364-8-1 dedicated to the optimization of energy efficiency. It provides a range of measurements with accuracies required for complex energy efficiency approaches.

The table below from IEC 60364-8-1:2014 Clause 8.3.1.1 "Requirement on accuracy and measuring range" specifies the accuracies required for the measurements dedicated to cost management

	Incomer	Compact NSX main applications		Final distribution board
		Main LV switchboard	Intermediate distribution boards	
<b>Measurement objectives for cost management</b>	<ul style="list-style-type: none"> <li>■ Revenue metering</li> <li>■ Bill checking</li> <li>■ Energy usage analysis and optimization</li> <li>■ Contract optimization</li> <li>■ Regulatory compliance</li> </ul>	<ul style="list-style-type: none"> <li>■ Cost allocation</li> <li>■ Energy usage analysis and optimization</li> <li>■ Efficiency assessment</li> <li>■ Contract optimization</li> <li>■ Regulatory compliance</li> </ul>	<ul style="list-style-type: none"> <li>■ Cost allocation</li> <li>■ Energy usage analysis and optimization</li> <li>■ Efficiency assessment</li> <li>■ Contract optimization</li> <li>■ Regulatory compliance</li> </ul>	<ul style="list-style-type: none"> <li>■ Energy usage analysis and optimization</li> <li>■ Energy usage trends assessment</li> </ul>
<b>Overall system accuracy of active energy measurement</b>	In general, excellent accuracy, e.g. class 0.2 to class 1	In general, good accuracy, e.g. class 0.5 to class 2	In general, medium accuracy, e.g. class 1 to class 3	In general, reliable indication should be more important than accuracy

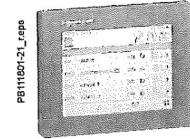
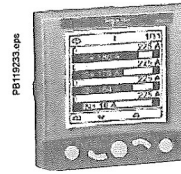
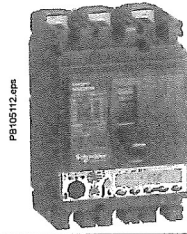


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# Select your protection Compact NSX measurement Micrologic 5 / 6 / 7 E electronic trip units



Micrologic 5 / 6 / 7 integrated Power Meter functions			Type		Display	
			A	E	Micrologic LCD	FDM display
<b>Display of protection settings</b>						
Pick-ups (A) and delays	Settings Micrologic 5 / 6	I <sub>r</sub> , I <sub>tr</sub> , I <sub>sd</sub> , I <sub>td</sub> , I <sub>l</sub> , I <sub>g</sub> , I <sub>tg</sub>	⊙	⊙	⊙	-
	Settings Micrologic Vigi 7 E [4]	I <sub>r</sub> , I <sub>tr</sub> , I <sub>sd</sub> , I <sub>td</sub> , I <sub>l</sub> , I <sub>Δn</sub> , Δt, I <sub>Δn</sub> % pre-alarm		⊙	⊙	
<b>Measurements</b>						
<b>Instantaneous rms measurements</b>						
Currents (A)	Phases and neutral	I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>N</sub>	⊙	⊙	⊙	⊙
	Average of phases	I <sub>avg</sub> = (I <sub>1</sub> + I <sub>2</sub> + I <sub>3</sub> ) / 3	⊙	⊙	-	⊙
	Highest current of the 3 phases and neutral	I <sub>max</sub> of I <sub>1</sub> , I <sub>2</sub> , I <sub>3</sub> , I <sub>N</sub>	⊙	⊙	⊙	⊙
	Ground fault (Micrologic 6)	% I <sub>g</sub> (pick-up setting)	⊙	⊙	⊙	⊙
	Earth leakage (Micrologic Vigi 7 E)	% I <sub>Δn</sub> (pick-up setting)	-	⊙	-	-
	Highest Earth Leakage current	I <sub>Δn</sub> max	-	⊙	-	-
	Current unbalance between phases	% I <sub>avg</sub>	-	⊙	-	⊙
Voltages (V)	Phase-to-phase	U <sub>12</sub> , U <sub>23</sub> , U <sub>31</sub>	-	⊙	⊙	⊙
	Phase-to-neutral	V <sub>1N</sub> , V <sub>2N</sub> , V <sub>3N</sub>	-	⊙	⊙	⊙
	Average of phase-to-phase voltages	U <sub>avg</sub> = (U <sub>12</sub> + U <sub>21</sub> + U <sub>23</sub> ) / 3	-	⊙	-	⊙
	Average of phase-to-neutral voltages	V <sub>avg</sub> = (V <sub>1N</sub> + V <sub>2N</sub> + V <sub>3N</sub> ) / 3	-	⊙	-	⊙
	Ph-Ph and Ph-N voltage unbalance	% U <sub>avg</sub> and % V <sub>avg</sub>	-	⊙	-	⊙
	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	-	⊙	-	⊙
<b>Maximeters / minimeters</b>						
	Associated with instantaneous rms measurements	Reset via Micrologic or FDM display unit	⊙	⊙	-	⊙
<b>Energy metering</b>						
Energy	Active (kWh), reactive (kvarh), apparent (kVAh)	Total since last reset Absolute or signed mode [1]	-	⊙	⊙	⊙
<b>Demand and maximum demand values</b>						
Demand current (A)	Phases and neutral	Present value on the selected window	-	⊙	-	⊙
		Maximum demand since last reset	-	⊙	-	⊙
Demand power	Active (kWh), reactive (kvarh), 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]	-	⊙	-	-
<b>Power quality</b>						
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	-	⊙	-	⊙

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[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.  
 [4] Two last I<sub>Δn</sub> and Δt values are available as well as date of setting.

**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 %.

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Select your protection

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# Compact NSX diagnostics & maintenance Micrologic 5 / 6 / 7 A or E electronic trip units

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## 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)
  - Micrologic Vigi 7 E: overload (Ir) and earth leakage fault (Idn)
- 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 FDM 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 FDM display unit or on PC via the communication system.
- Remote indications via SDx relay with two output contacts for alarms.

## 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, lsd, li, Ig, Idn: 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.
- Minimeters / 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.

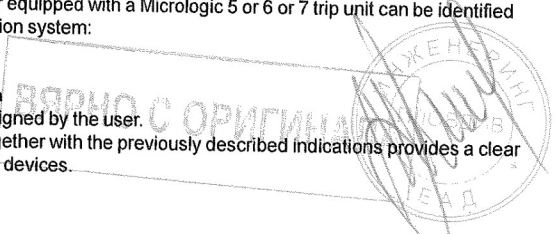
The information provided by the indicators cannot be displayed on the Micrologic LCD. It is displayed on the PC via the communication system.

## Management of installed devices

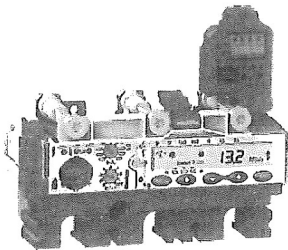
Each circuit breaker equipped with a Micrologic 5 or 6 or 7 trip unit can be identified via the communication system:

- 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.

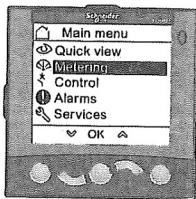


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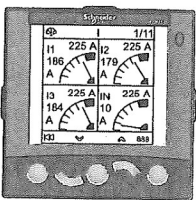
PR10356.epb

Micrologic built-in LCD display.



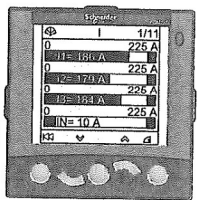
DB432516.epb

FDM121 display: navigation.



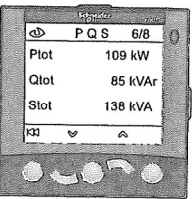
DB432517.epb

FDM121 display: current



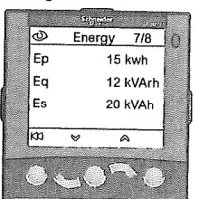
DB432518.epb

FDM121 display: voltage



DB432519.epb

FDM121 display: power.



DB432520.epb

FDM121 display: consumption

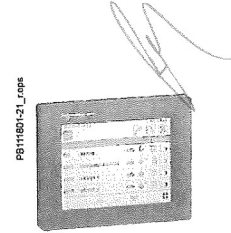
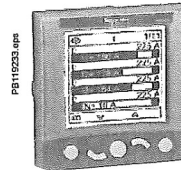
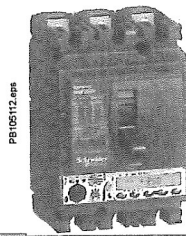
Examples of operating-assistance screens on the FDM121 display unit.

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# Select your protection

## Compact NSX diagnostics & maintenance

### Micrologic 5 / 6 / 7 A or E electronic trip units



Micrologic 5 / 6 / 7 operating assistance functions			Type		Display	
			A	E	Micrologic LCD	FDM display
<b>Operating assistance</b>						
<b>Personalised alarms</b>						
Settings	Up to 10 alarms assigned to all A and E measurements <sup>[2]</sup>		⊙	⊙	-	-
	Phase lead/lag, four quadrants, phase sequence, display priority selection <sup>[2]</sup>		-	⊙	-	-
Display	Alarms / tripping / test (Earth Leakage)		⊙	⊙	- / ⊙ / ⊙	⊙ / ⊙ / ⊙
Remote indications	Activation of two dedicated contacts on SDx module		⊙	⊙	-	-
<b>Time-stamped histories (ms)</b>						
Trips (last 17)	Cause of tripping	Ir, Isd, li (Micrologic 5, 6)	⊙	⊙	-	⊙
		Ig (Micrologic 6)	⊙	⊙	-	⊙
		Ir, Isd, li, IΔn (Micrologic Vigi 7 E)	-	⊙	-	⊙
		Phase fault	⊙	⊙	-	⊙
		Interrupted current value	⊙	⊙	-	⊙
Alarms (last 10)			⊙	⊙	-	⊙
Test Earth Leakage Micrologic Vigi 7 E (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)			⊙	⊙	-	⊙
<b>Time-stamped event tables</b>						
Protection settings	Setting modified (value displayed)	Ir, tr, Isd, tsd, li, Ig, tg <sup>[2]</sup>	⊙	⊙	-	-
		Ir, tr, Isd, tsd, I, IΔn, Δt (Micrologic Vigi 7 E) <sup>[2]</sup>	-	⊙	-	⊙
	Time-stamping	Date and time of modification <sup>[2]</sup>	⊙	⊙	-	-
	Previous value	Value before modification <sup>[2]</sup>	⊙	⊙	-	-
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	⊙	⊙	-	⊙
<b>Maintenance indicators</b>						
Counter	Mechanical cycles <sup>[1]</sup>	Assignable to an alarm	⊙	⊙	-	⊙
	Electrical cycles <sup>[1]</sup>	Assignable to an alarm	⊙	⊙	-	⊙
	Trips	One per type of trip <sup>[2]</sup>	⊙	⊙	-	-
	Alarms	One for each type of alarm <sup>[2]</sup>	⊙	⊙	-	-
	Hours	Total operating time (hours) <sup>[2]</sup>	⊙	⊙	-	-
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	⊙	⊙	-	⊙

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[1] The BSCM module 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 / 7 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 / 7 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.

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# Compact NSX diagnostics & maintenance Micrologic 5 / 6 / 7 A or E electronic trip units

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Electrical power supply availability and reliability are the main critical issues affecting profitability and competitiveness. Outage management focuses on preventing, detecting, locating and clearing of faults.

The Micrologic 5 / 6 / 7 A or E control units perform in real time a high level of diagnostics on Compact NSX circuit breakers. They generate and store appropriate warnings, alarms and messages to help the users with maintenance and power restoration.

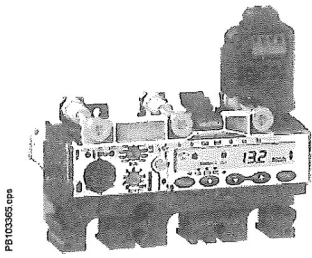
This function complies with the following end user values:

- Prevent interruption of the power supply, to ensure continuity of operation, preserve the asset from any damage and supports the safety of persons,
- Reduce downtime resulting from an unexpected failure in the electrical distribution system, to be able to restart as quickly as possible after a trip,
- To keep the devices in good condition of operation.

### Prevention of power supply interruptions

Prevention of power supply interruptions is achieved by generation of warnings to the users, preventive operations of maintenance, and anticipation of device replacement.

By means of dedicated features, Micrologic 5 / 6 / 7 A or E monitors the health of the circuit breaker and generates appropriate information to help the users in scheduling periodic checks and, if needed, anticipated replacement of devices.



Micrologic built-in LCD display.

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Select your protection

# Compact NSX special applications

## Protection of public distribution systems with Micrologic 2-AB

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 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 selectivity 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.

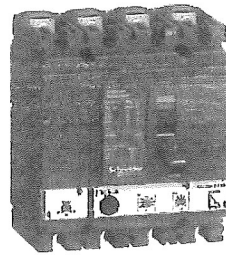
In addition, they provide the consumer with:

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

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.



Compact NSX with Micrologic 2 AB.

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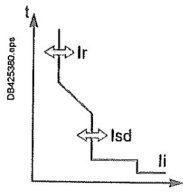


# Compact NSX special applications

## Protection of public distribution systems with Micrologic 2-AB

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### 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	-	-	-	⊙

Long-time protection		value depending on trip unit rating (In) and setting on dial								
Pick-up (A) tripping between 1.05 and 1.20 Ir	Ir	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

Short-time protection with fixed time delay		value depending on trip unit rating (In) and setting on dial								
Pick-up (A) accuracy ±10 %	Isd = 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								

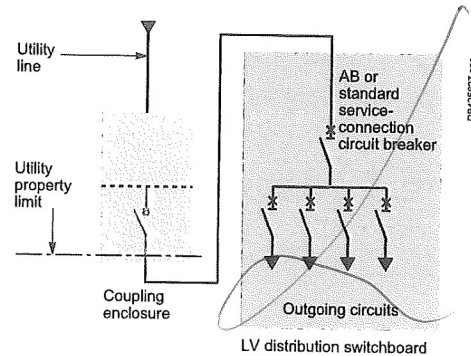
Non-adjustable instantaneous protection		value depending on trip unit rating (In)			
Pick-up (A) accuracy ±15 %	Ii non-adjustable	1500	1600	2880	4800
Time delay (ms)	Non-tripping time	10			
	Maximum break time	50			

[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.

### 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.



Consumer connection diagram.

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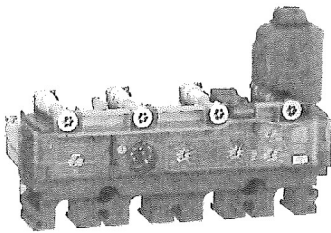
# Compact NSX special applications

## Compact NSX Micrologic Vigi 4-AB trip unit with embedded earth leakage protection

The Compact NSX range for public distribution is now complemented with a new type of Micrologic AB trip unit including both circuit protection and earth leakage protection. It means that the earth leakage protection, previously located within the Vigi Add-on, will be embedded within the existing size of the Micrologic AB trip unit.



LV43817-ep



Micrologic Vigi 4-AB trip unit.

### Micrologic Vigi 4-AB

Compact ELCB <sup>(1)</sup> equipped with that "new" earth leakage trip unit Micrologic AB are installed as an incoming device for installation connected with the public LV distribution system. With respect to the utility requirement, it ensures the same functions as the standard circuit breaker: limitation of consumption, selectivity upstream and downstream, combination with Compact INV to ensure the visible break or positive contact indication.

### Short circuit and overload protections

Settings are made using the rotary dial with fine adjustment capabilities and lead-seal fixture.

Overload: long-time protection ( $I_r$ )

Inverse time protection against overload with an adjustable current pick-up  $I_r$  set using a dial and a very short non adjustable time delay  $t_r$  (15 seconds at 1.5  $I_r$ ).

Short-circuit: short-time protection with fixed time delay ( $I_{sd}$ )

That protection is set 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 circuit: non-adjustable instantaneous protection (with a fix pick-up)

Neutral protection

Available on four-pole Compact NSX Micrologic Vigi 4-AB only, the neutral protection may be set using the dedicated coding wheel to meet the following configurations: 4P 3D, 4P 3D + N/2 or 4P 4D. (same as for the Micrologic 2-AB)

### Earth leakage protections

Adjustable leakage threshold ( $I_{\Delta n}$ ) and adjustable time threshold ( $\Delta t$ ) by using the two dials on the green area of the trip unit.

The Compact NSX Micrologic Vigi 4-AB, embedding a Micrologic AB can only be "Trip" type, the "Alarm" version (as for Micrologic Vigi 4 and 7 E) doesn't exist.

Power supply

The trip unit is self supplied, and so does not need any external source. It works even when fed by 2 phases only!

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

- Type A: 30mA - 100mA - 300mA - 500mA - 1A - 3A - 5A (for the ratings 100 to 240A)
- Type A: 300mA - 500mA - 1A - 3A - 5A - 10A (for the rating 400A)

**Caution:** "OFF" setting of  $I_{\Delta n}$  is possible, it cancels the earth leakage protection, in that case, the Compact NSX Micrologic Vigi 4-AB behaves as a standard circuit breaker. "OFF" position is located on the highest side of the coding wheel.

Intentional delay  $\Delta t$  (s)

Case  $I_{\Delta n} = 30mA$ : 0 sec (whatever the setting)

Case  $I_{\Delta n} > 30mA$ : 0 - 60ms - 150ms - 500ms - 1sec (by setting)

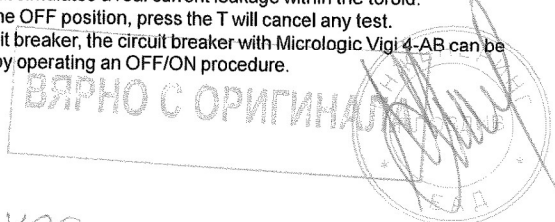
Operated voltage

200 to 440 VAC (only) - 50/60 Hz

Operating safety

The earth leakage protection is a user safety device. It must be regularly tested using the test button (T) that simulates a real current leakage within the toroid. When  $I_{\Delta n}$  is set on the OFF position, press the T will cancel any test.

As for standard circuit breaker, the circuit breaker with Micrologic Vigi 4-AB can be reset after any fault by operating an OFF/ON procedure.



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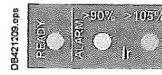
# Compact NSX special applications

## Compact NSX Micrologic Vigi 4-AB trip unit with embedded earth leakage protection

### Indications

#### Front indications

- Green "Ready" LED: flashes slowly when the circuit breaker is ready to trip in case of a fault.
- Orange overload pre-alarm LED: steady ON when  $I > 90\% I_r$ .
- Red overload LED: steady ON when  $I > 105\% I_r$ .
- Yellow Screen: indicates an earth leakage fault (reset when the device is operated OFF/ON).



#### Alarming and fault differentiation

- An overload trip signal can be remotely available by installing an SDx relay module inside the circuit breaker.
- An earth leakage pre-alarm can be remotely available by installing an SDx module, only on the Compact NSX Micrologic Vigi 4-AB.

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 reset when the breaker is operated.

### Micrologic Vigi 4-AB (earth leakage "Trip" version only)

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)	$I_r$	value depending on the rating ( $I_n$ ) and the dial setting (9 positions)									
tripping between 1.05 and 1.20 $I_r$	$I_n = 100$ A	$I_o =$	40	40	40	50	60	70	80	90	100
	$I_n = 160$ A	$I_o =$	90	90	100	110	120	130	140	150	160
	$I_n = 240$ A	$I_o =$	140	140	150	160	170	180	200	220	240
	$I_n = 400$ A	$I_o =$	260	260	280	300	320	340	360	380	400
Time delay (s)	$t_r$	non-adjustable									
accuracy 0 to -20%		at	1.5 x $I_r$		$t_r = 15$ s						
		at	6 x $I_r$		$t_r = 0.5$ s						
		at	7.2 x $I_r$		$t_r = 0.35$ s						
Thermal memory		20 minutes before and after tripping									

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

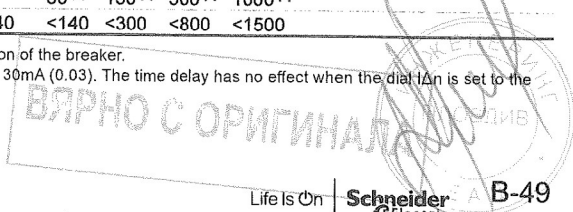
I Instantaneous protection										
Pick-up (A)	$I_i$ non-adjustable	1500	1600	2880	4800					
accuracy $\pm 15\%$										
	Non-tripping time	10 ms								
	Maximum break time	50 ms								

R Earth leakage protection											
Sensitivity (A)	Type A, adjustable (9 positions)										
	$I_n = 100$ A	$\Delta I_n =$	0.03	0.03	0.1	0.3	0.5	1	3	5	OFF
	$I_n = 160$ A	$\Delta I_n =$	0.03	0.03	0.1	0.3	0.5	1	3	5	OFF
	$I_n = 240$ A	$\Delta I_n =$	0.03	0.03	0.1	0.3	0.5	1	3	5	OFF
	$I_n = 400$ A	$\Delta I_n =$	0.3	0.3	0.5	1	3	5	10	10	OFF
Time delay $\Delta t$ (ms)	Adjustable	$\Delta t =$	0	60 [2]	150 [2]	500 [2]	1000 [2]				
		Maximum break time (ms)	<40	<140	<300	<800	<1500				

[1] For the use in high temperature environment, take into account the thermal limitation of the breaker.

[2] The time delay ( $\Delta t$ ) is mandatory and designed " $\Delta t = 0$ " when the  $\Delta I_n$  dial is set on 30mA (0.03). The time delay has no effect when the dial  $\Delta I_n$  is set to the "OFF" position.



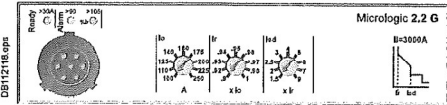
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# Compact NSX special applications

## Generator protection with Micrologic 2.2 G

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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 B-6).



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 resistance 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 (I<sub>sd</sub>) 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 (I<sub>i</sub>)

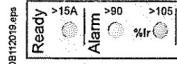
Instantaneous short-circuit protection with a fixed pick-up required for generator protection.

#### 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

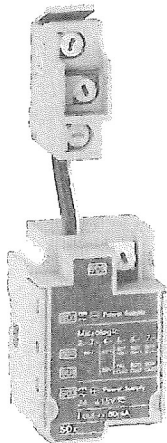
An SDx relay module installed inside the circuit breaker can be used to remote the overload-trip signal.

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.

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SDx remote indication relay module with its terminal block.

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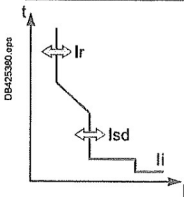
# Select your protection

## Compact NSX special applications

### Generator protection with Micrologic 2.2 G



#### Micrologic 2.2 G



Ratings (A)	In at 40 °C [1]	40	100	160	250
Circuit breaker	Compact NSX100	⊙	⊙	-	-
	Compact NSX160	⊙	⊙	⊙	-
	Compact NSX250	⊙	⊙	⊙	⊙

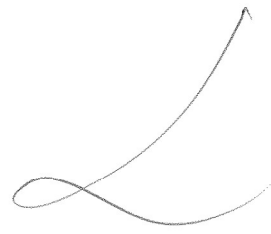
Long-time protection										
Pick-up (A) tripping between 1.05 and 1.20 Ir	Io	value depending on trip unit rating (In) and setting on dial								
In = 40 A	Io =	18	18	20	23	25	28	32	36	40
In = 100 A	Io =	40	45	50	55	63	70	80	90	100
In = 160 A	Io =	63	70	80	90	100	110	125	150	160
In = 250 A (NSX250)	Io =	100	110	125	140	150	176	200	225	250

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									

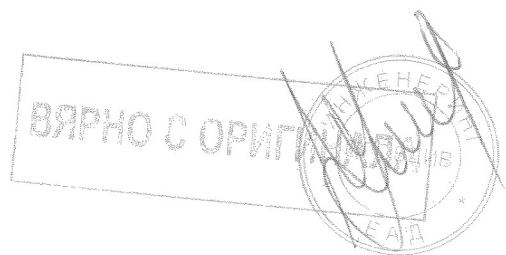
Short-time protection with fixed time delay											
Pick-up (A) accuracy ±10 %	I <sub>sd</sub> = Ir x ...	1.5	2	2.5	3	4	5	6	7	8	9
Time delay (ms)	tsd	non-adjustable									
	Non-tripping time	140									
	Maximum break time	200									

Non-adjustable instantaneous protection					
Pick-up (A) accuracy ±15 %	Ii 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.



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# Compact NSX special applications

## Protection of industrial control panels

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

They serve as an 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.

B

### 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.

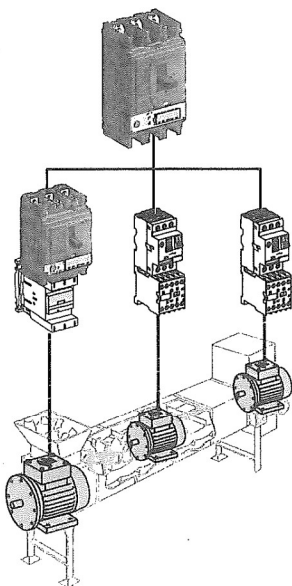
### Special functions

- 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.

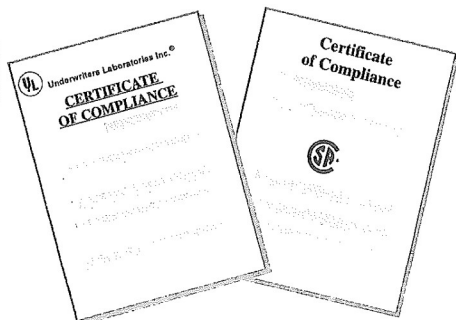
### Installation in enclosures

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

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# Select your protection

## Compact NSX special applications

### Protection of industrial control panels

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### 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		115	230	460	575
<b>TMD</b> <b>Micrologic 2, 5</b> <b>and 6</b>	<b>NA, MA</b> <b>Micrologic 1.3 M, 2.2 M, 2.3 M</b> <b>Micrologic 6.2 E-M</b> <b>and 6.3 E-M</b>				
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 pages E-14 to E-17 apply to TMD, Micrologic 2, 5 and 6 trip units, rated at 40 °C.



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# Compact NSX special applications

## 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 Icu

Operating voltage	Performance	TMD and Micrologic 5 A-Z trip units			
		B	F	N	H
250 V / 500 V	Icu (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 B-6). 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

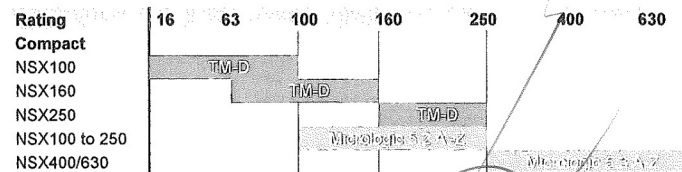
Rating (A) In at 40 °C		16	25	32	40	50	63	80	100	125	160	200	250	
Pick-up (A) Im accur. ±20%	Fixed												Adjustable	
NSX100	50Hz	190	300	400	500	500	500	640	800					
	16Hz 2/3	170	270	360	450	450	450	580	720					
NSX160/250	50Hz	190	300	400	500	500	500	640	800	1250	1250	5 to 10 In		
	16 Hz 2/3	170	270	360	450	450	450	580	720	1100	1100	4.5 to 9 In		

### Micrologic 5 A-Z trip units

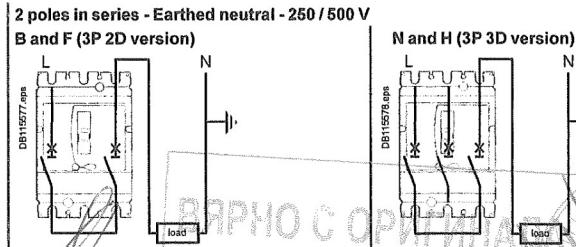
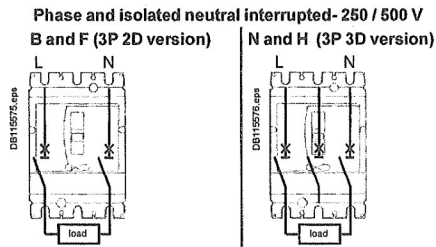
Micrologic 5.2 A-Z and 5.3 A-Z are dedicated to 16 Hz 2/3 networks.

They use a suitable sampling frequency. The protection settings are identical to those of Micrologic 5 A (see page B-12). They also offer a current-measurement function for this specific frequency.

### Trip-unit selection

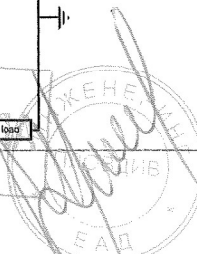


### Wiring for NSX100 to 630 A



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

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# Select your protection

## Compact NSXm special applications

### Protection of 400 Hz systems

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

#### Breaking capacity in 400 Hz, 440 V Systems

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

Circuit breaker	Max. Breaking Capacity at 400 Hz
NSXm	10 kA

#### Thermal-Magnetic Trip Units

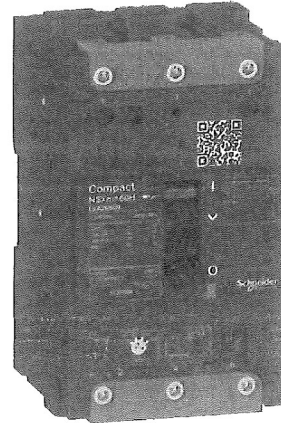
Thermal-Magnetic trip units require the current rating (In) to be derated and the magnetic trip setting (Im) to be increased.

#### Current Rating (In) and Magnetic Trip Setting (Im) Derating

Circuit breaker	Maximum setting Coefficient	Max Ir setting at 400 Hz	Magnetic Im coefficient at 400 Hz
NSXm	0.9	144	1.6

#### Shunt Trip (MX) or Undervoltage Trip (MN) Voltage Release at 400 Hz and 440V

Undervoltage releases (MN) rated 24 V AC/DC, 48 V AC/DC, or 110/130 V AC/DC are 400 Hz compliant with their nominal voltages. For voltages greater than 110/130 V AC/DC, please contact Schneider Electric for additional information. Shunt Trips (MX), please contact Schneider Electric.



Compact NSXm TM-D.

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# Compact NSX special applications

## Protection of 400 Hz systems

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

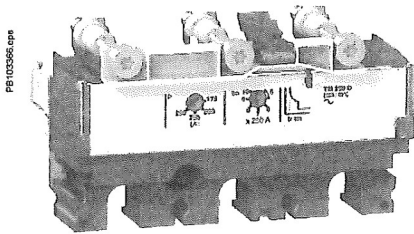
Due to the higher frequency, circuit breakers are subjected to additional temperature rise for identical current levels, resulting from higher losses caused by Foucault currents and an increase in the skin effect (reduction in the useful CSA of conductors). To remain within the rated temperature-rise 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 range is 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	1040		
	TM100D	100	0.9	90	800	1.6	1280		
NSX160	TM80D	80	0.9	72	650	1.6	1040		
	TM100D	100	0.9	90	800	1.6	1280		
	TM125D	125	0.9	112.5	1250	1.6	2000		
NSX250	TM160D	160	0.9	144	1250	1.6	2000		
	TM100D	100	0.9	90	800	1.6	1280		
	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

NSX 100 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  $I_m = 63 \text{ A} \times 1.6 = 100$  A.

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# Select your protection

## Compact NSX special applications

### Protection of 400 Hz systems

### Protection

#### 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 Ir derating table below
- the long-time, short-time and instantaneous pick-ups are not modified (see page B-10 or page B-12)
- the accuracy of the displayed measurements is 2 % (class II).

#### Thermal derating: maximum Ir setting

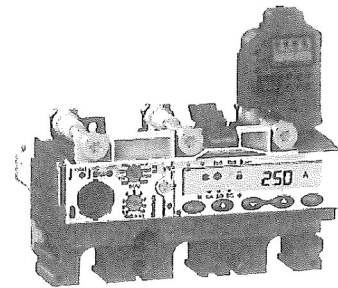
Circuit breaker	Maximum setting coefficient	Max. Ir setting at 400 Hz
NSX100	1	100
NSX250	0.9	200
NSX400	0.8	320
NSX630	0.63	400

#### Example

An NSX250N, equipped with a Micrologic 2.2, Ir = 250 A at 50 Hz, must be limited to use at Ir = 250 x 0.9 = 225 A.

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

The instantaneous pick-up remains at 3000 A.



Micrologic 5 E trip unit.

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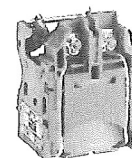
OF auxiliary contact.

DB125547.eps

### OF auxiliary contacts in 400 Hz networks

#### Electrical characteristics of auxiliary contacts

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



MX or MN voltage release.

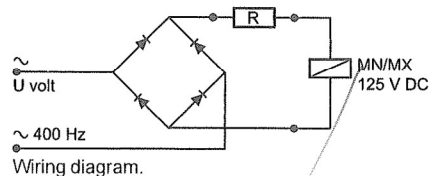
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### MN and MX voltage releases for Compact NSX100/630 at 400 Hz and 440 V

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 kΩ-5 W
380/420 V	Semikron SKB at 1.2/1.3	10.7 kΩ-10 W

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



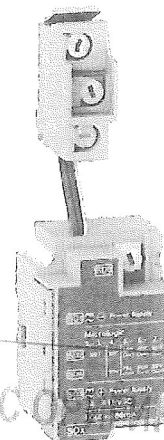
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### SDx indication contacts

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.

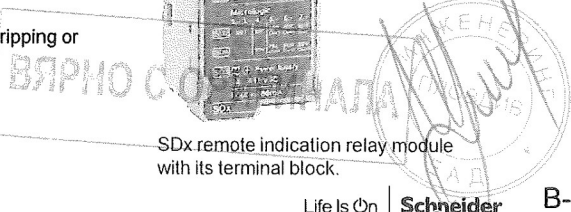
This module receives the signal from the Micrologic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is closed.

These outputs can be reprogrammed to be assigned to other types of tripping or alarm (see page C-31).



SDx remote indication relay module with its terminal block.

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ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕР  
ИГОРЬ

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# Customize your circuit breaker with accessories

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## Compact NSXm accessories and auxiliaries

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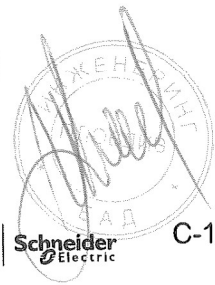


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ДИПЛОМ ОРИГИНАЛ

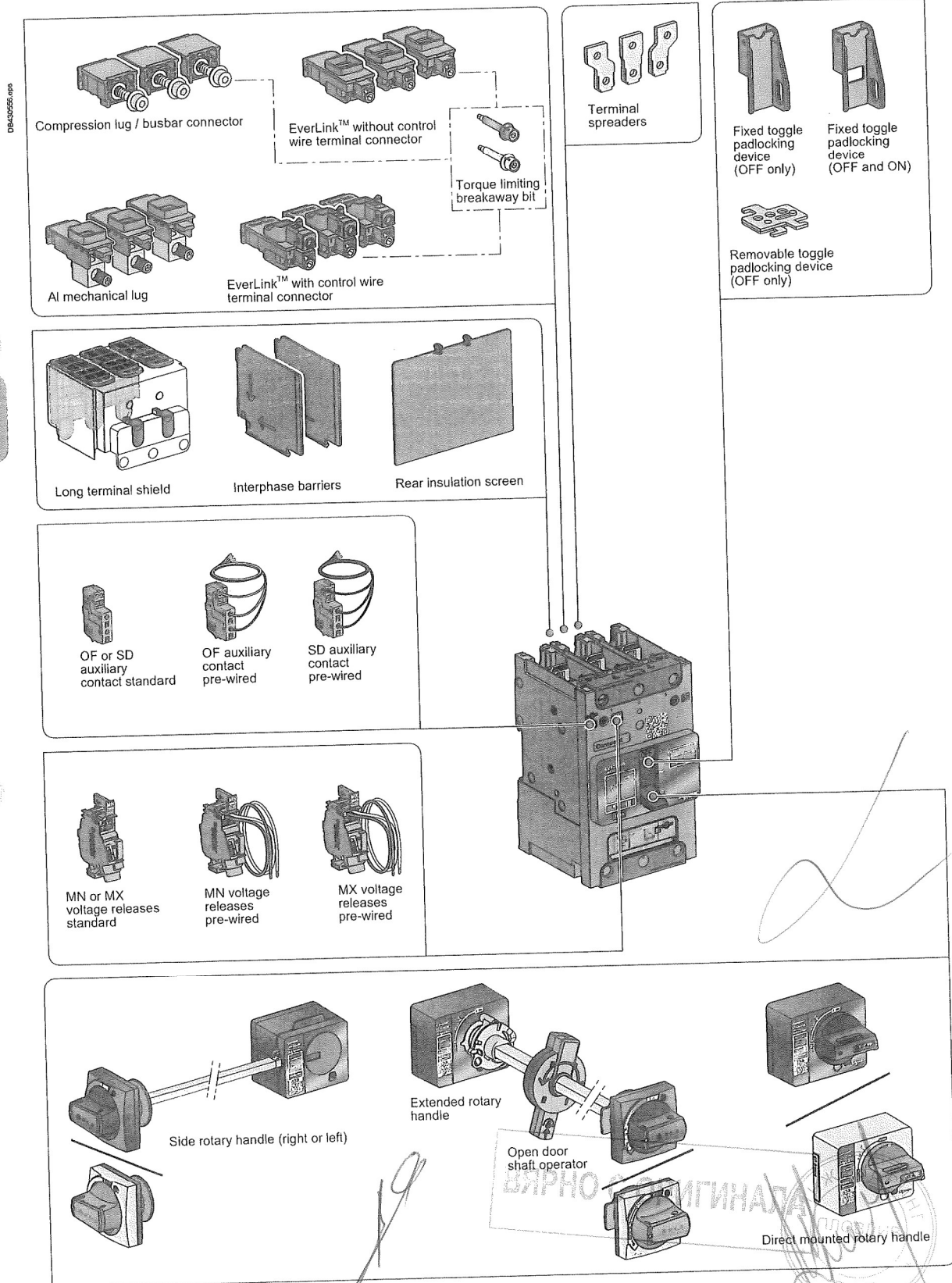


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# Customize your circuit breaker with accessories

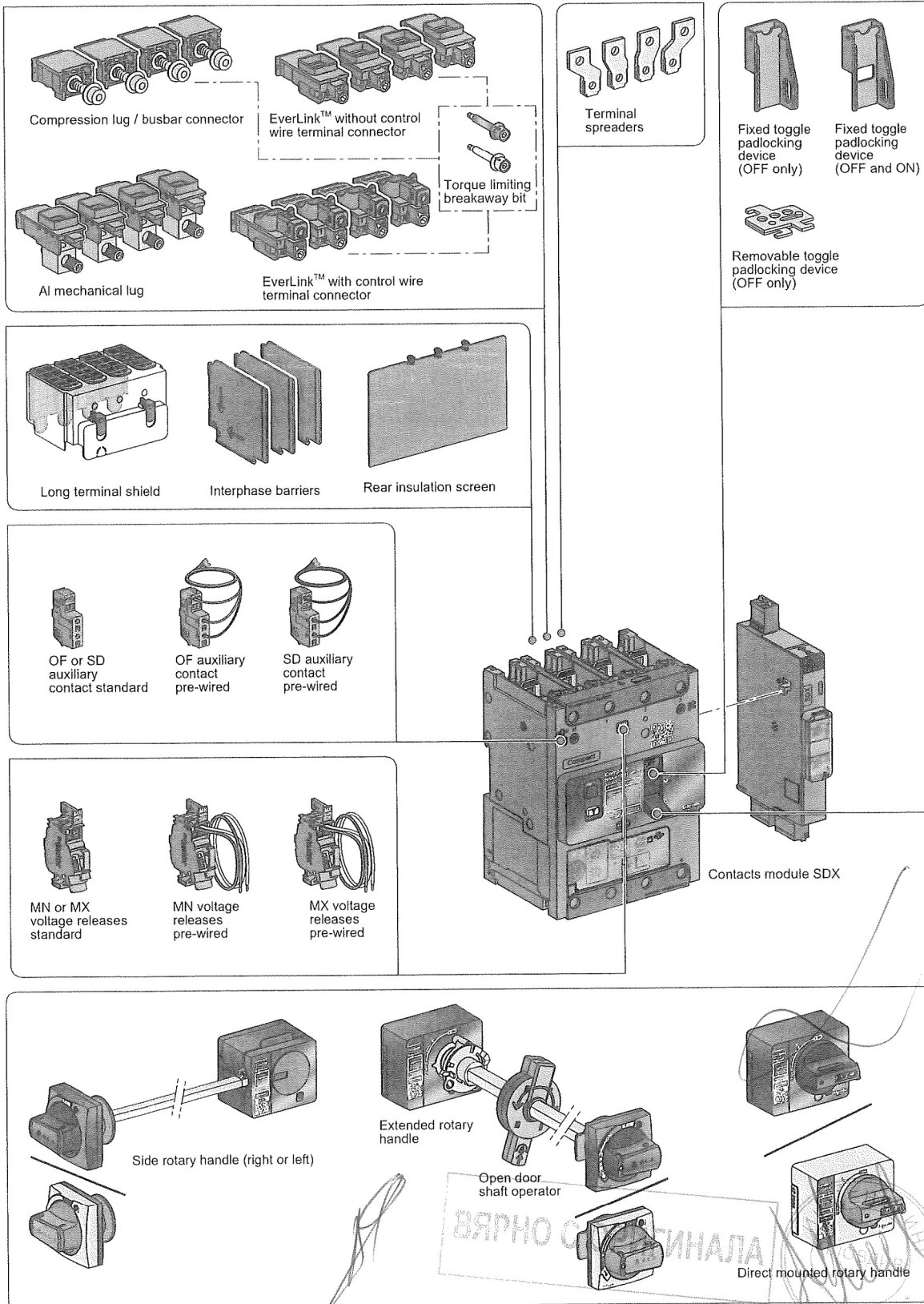
## Compact NSXm accessories and auxiliaries

### Overview



# Customize your circuit breaker with accessories Compact NSXm accessories and auxiliaries Overview

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# Compact NSXm accessories and auxiliaries

## Power connection of fixed devices

*M*

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

### Power connection

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

### Bare cables

#### Standard terminal: EverLink™ lug connector

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

#### EverLink™ lugs for use with Al or Cu wire

##### Wire range

Solid/stranded	Flexible	Torque
<b>Power connection 15-160 A (Cu), 15-100 A (Al)</b>		
2.5 - 10 mm <sup>2</sup>	2.5 - 10 mm <sup>2</sup>	5 N.m ±0.5
16 - 95 mm <sup>2</sup>	16 - 70 mm <sup>2</sup>	9 N.m ±0.9
<b>Control wire terminal up to 10 A (Cu)</b>		
1.5 - 6 mm <sup>2</sup>	0.5 - 6 mm <sup>2</sup>	1 N.m ±0.1

#### Aluminium mechanical connectors up to 125 A

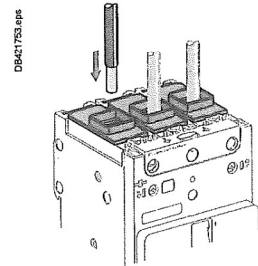
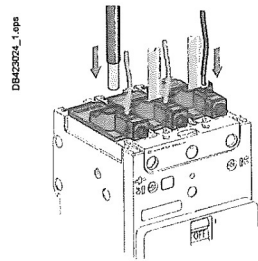
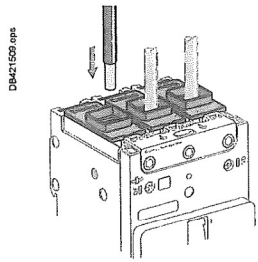
The standard EverLink lugs can be removed for the installation of mechanical lugs. Lugs suitable for copper and aluminum conductors are made of tin-plated aluminum. The mechanical lugs are fastened to the terminals with lug mounting screws, inserted from the bottom of the circuit breaker. The lug cover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

#### Aluminium mechanical connectors up to 125 A

##### Power connection

Ampere rating	Wire range	
	Solid/stranded	Torque
15-125 A (Cu)	2.5 - 6 mm <sup>2</sup>	4 N.m ±0.4
15-125 A (Al)	10 - 70 mm <sup>2</sup>	5.6 N.m ±0.6

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



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# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Power connection of fixed devices

### Bars or cables with lugs

#### Compression lug / busbar connectors

The Compact NSXm circuit breakers may be equipped with captive nuts and M6 screws connectors. These are readily field-installable, simply by removing the EverLink lug and replacing with the appropriate terminal nut.

They are also available factory installed. These terminals may be used for:

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

#### Compression lug / busbar connectors, 15-160 A

Power connection	Torque
≤ 10 mm <sup>2</sup>	5 N.m ±0.5
≥ 16 mm <sup>2</sup>	9 N.m ±0.9

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

#### Crimp lugs large size cables

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

The lugs are supplied with interphase barriers and may be used for the types of cables listed below.

#### Crimp lugs for use with Compact NSXm

Copper cables	size	rigid	70 mm <sup>2</sup>	95 mm <sup>2</sup>	120 mm <sup>2</sup>
		flexible	50 mm <sup>2</sup>	70 mm <sup>2</sup>	95 mm <sup>2</sup>
	crimping		hexagonal barrels or punching		
Aluminium cables	size	rigid		95 mm <sup>2</sup>	120 mm <sup>2</sup>
	crimping		hexagonal barrels		

#### Bars

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

#### Bar and lugs dimensions

Dimensions	A	B	C	D	E
mm	6.4	≤ 8	≤ 20	7	≥ 17

#### Spreaders

Spreaders may be used to increase the pitch from 27 mm to 35 mm. Bars or cable lugs can be attached to the ends.

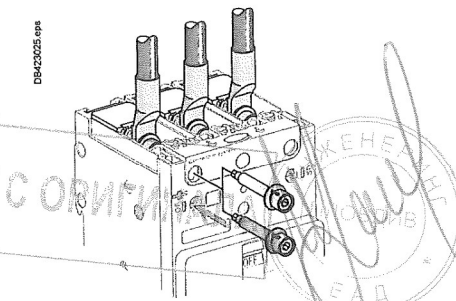
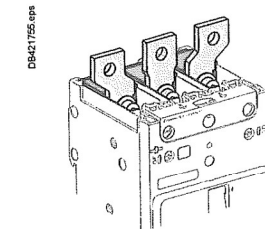
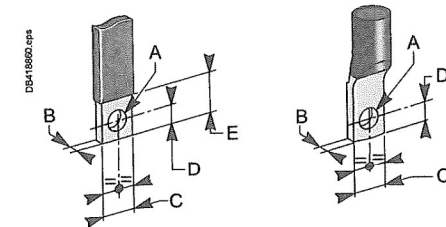
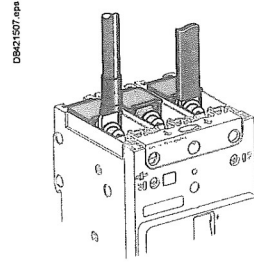
They are provided with M8 screws for power connection and interphase barriers (not compatible with long terminal shield). Rear insulation screens may have to be used too depending on the distance between the live uninsulated parts and the grounded metallic back pan.

#### Torque limiting breakaway bits

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

#### Throwaway tips

Circuit breaker application	Ampere rating	Torque	Qty per kit
	16-160 A	5 N.m	6 or 8
	16-160 A	9 N.m	6 or 8



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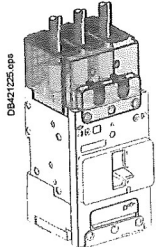
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# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Insulation of live parts

PM



Long terminal shields.

#### Long terminal shields IP40

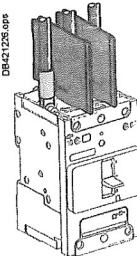
Compact NSXm 3P or 4P can be equipped with long terminal shields. They can be mounted upstream and downstream and are used for protection against direct contact with power circuits. They provide IP40 degree of protection and IK07 mechanical impact protection. Moreover long terminal shields can be mounted after product installation on plate or DIN rail, and can be removed and put in place even if there are auxiliary wires.

They are used for connection with cables or insulated bars.

They are comprised of two parts assembled with 2 locks and/or captive screws, forming an IP40 cover.

- The top part is transparent in order to be able to see the connection through it and is equipped with sliding grids with break marks for precise adaptation to cables or insulated bars.

- The rear part completely blocks off the connection zone. Partially cut squares can be removed to adapt to all types of connection for cables with lugs or copper bars.

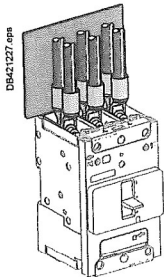


Interphase barriers.

#### Interphase barriers

Safety accessories for maximum insulation at the power-connection points:

- they clip easily onto the circuit breaker
- not compatible with long terminal shield
- 2 ways mounting: short / long insulation.



Rear insulating screens.

#### Rear insulating screens

Safety accessories providing insulation at the rear of the device.

Their use may be mandatory if no long terminal shield depending of the distance between bare conductors and backplate.

The screen dimensions are shown below.

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

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# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Selection of auxiliaries

#### Standard

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

- 2 indication contacts (see page C-9) :
- 1 ON/OFF (OF)
- 1 trip indication (SD)
- either 1 MN undervoltage release or 1 MX shunt trip (see page C-10).

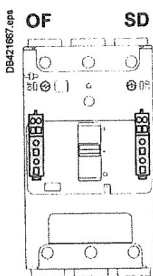
#### Remote indications

Circuit breakers with Micrologic Vigi 4.1 may be equipped with an alarming / fault trip indication module to prevent to trip or to identify the type of fault (see page C-11).

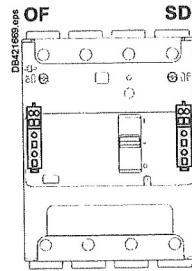
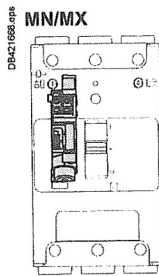
All these auxiliaries may be installed with a rotary handle or a toggle handle.

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

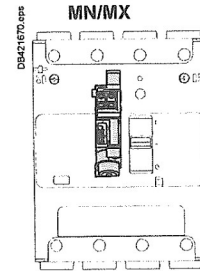
#### Thermal magnetic circuit breaker (TM-D), switch (NA)



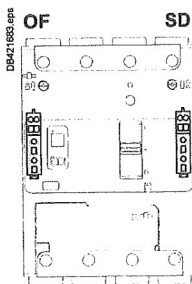
3 poles device



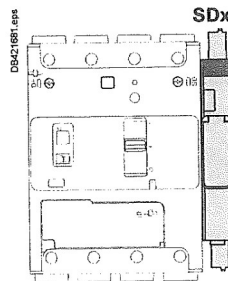
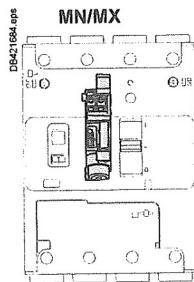
4 poles device



#### Earth leakage circuit breaker (Micrologic Vigi 4.1)



3/4 poles device in 4 poles footprint



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Customize your circuit breaker with accessories

www.schneider-electric.com

# Compact NSXm accessories and auxiliaries

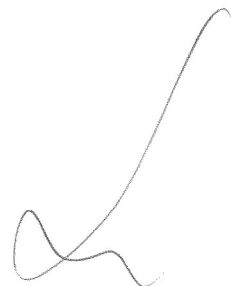
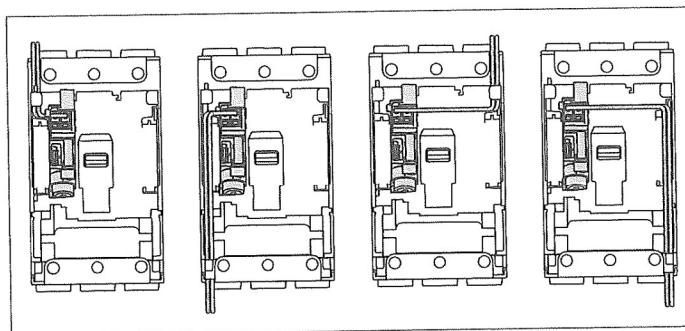
## Connection of auxiliaries



### Wiring

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

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



ВЯРНО С ОРИГИНАЛА

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# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Indication contacts

#### Auxiliary and alarm indication contacts

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

#### Open/Closed - Auxiliary switches (OF)

- Indicates the position of the circuit breaker contacts.

#### Trip indication - Alarm switch (SD)

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

#### Installation and connection

- The auxiliary switch (OF) and alarm switch (SD) indication contacts snap into cavities behind the front accessory cover of the circuit breaker and their presence is visible on the front face through green flags.
- One model serves for all indication functions depending on where it is fitted in the circuit breaker.
- Each NO and NC spring terminal may be connected by one 0.5...1.5 mm<sup>2</sup> flexible copper wire and by two for the common point.

#### Electrical characteristics of auxiliary contacts

Characteristics						
Rated thermal current (A)	5					
Minimum load	2 mA at 17 V DC					
Utilization cat. (IEC 60947-5-1)	AC12	AC15	DC12	DC13	DC14	
Operational current (A)	24 V AC/DC	5	5	5	2.5	1
	48 V AC/DC	5	5	2.5	1.2	0.2
	110...127 V AC / 110 V DC	5	4	0.6	0.35	0.05
	220/240 V AC	5	3	-	-	-
	250 V DC	-	-	0.3	0.05	0.03
	380/440 V AC	5	2.5	-	-	-
660/690 V AC	5	0.1	-	-	-	

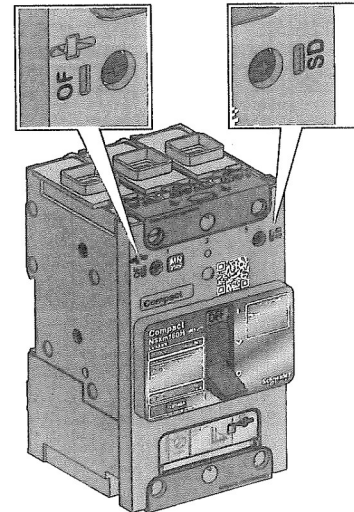
#### Standards

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



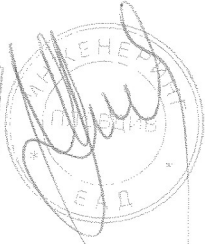
Auxiliary Switch (OF) / Alarm Switch (SD).

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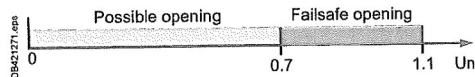
# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

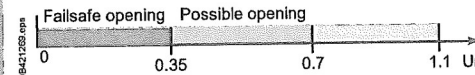
### Voltage release



MX or MN voltage release.



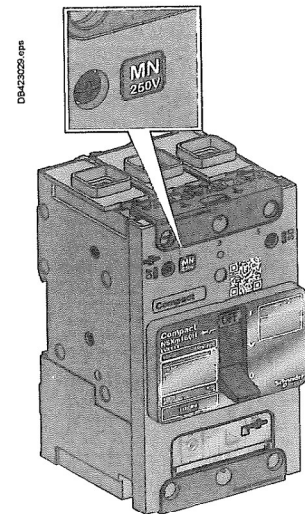
Opening conditions of the MX release.



Opening conditions of the MN release.



Closing conditions of the MN release.



Operating voltages for MN/MX.

### Shunt trip (MX) and undervoltage release (MN)

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

#### Shunt trip (MX)

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

#### Undervoltage release (MN)

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

#### Time-delay unit for an undervoltage release (MN)

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

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

Power supply	Corresponding MN
<b>Unit with fixed delay 200 ms</b>	
48 V AC	48 V DC
220 / 240 V AC	250 V DC
<b>Unit with adjustable delay <math>\geq 200</math> ms</b>	
48 - 60 V AC/DC	48 V DC
100 - 130 V AC/DC	125 V DC
220 - 250 V AC/DC	250 V DC

#### Installation and connection

- Accessories snap into cavities under the front accessory cover of the circuit breaker. The presence and characteristics of the voltage release is visible from the front face through a window
- Terminals are spring type in order to insure a fast and reliable connection
- Each terminal may be connected by one 0.5...1.5 mm<sup>2</sup> flexible copper wire.

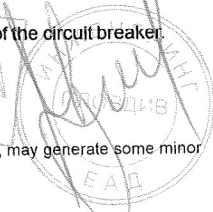
#### Operation

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

#### Standard

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

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



# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### SDx module for Micrologic Vigi 4.1

#### SDx module for Compact NSXm Micrologic Vigi 4.1

The SDx module provides alarming and fault differentiation for the Compact NSXm with Micrologic Vigi 4.1.

This module has 2 NO/NC outputs dry contacts. Each can be assigned with one of the following status:

- overload alarm (SDT105): current is higher than 105 % of the setting current (I<sub>r</sub>)
- overload trip indication (SDT): circuit breaker has tripped due to an overload fault
- earth leakage alarm (SDV80): leakage current is higher than 80 % of the earth leakage trip threshold (I<sub>Δn</sub>)
- earth leakage trip indication (SDV): circuit breaker has tripped due to an earth leakage current.

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

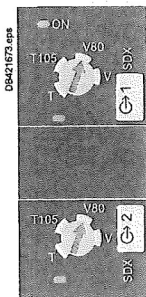
#### Output characteristics

- 2 NO/NC dry contacts
- 24...250 V AC/DC
- 2 mA...5 A max
- AC-15 (230 V max - 400 VA)
- DC-13 (24 V - 50 W)

#### Power characteristics

- 24...240 V AC/DC

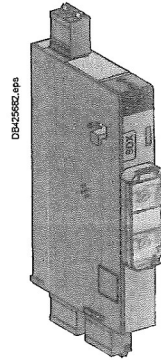
#### Front face indication



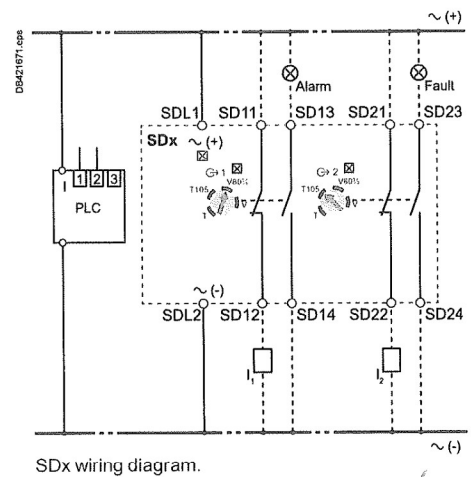
- green led "On": flashes slowly when the module is powered
- 2 red led for output status indication
- 2 setting dials

#### Installation and connection

The SDx module is clipped on the right side on the circuit breaker. Each removable spring terminal can be connected by one 0.5... 1.5 mm<sup>2</sup> copper wire.



SDx relay module with its terminal block.



SDx wiring diagram.

ВЯРНО С ОРИГИНАЛА

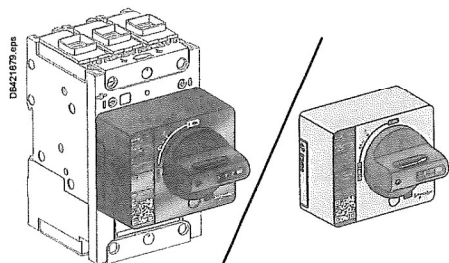




# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Rotary handles



Directly mounted rotary handle.



#### Direct rotary handles

##### Installation

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

##### Operation

The direct rotary handle maintains:

- suitability for isolation
- indication of the three positions OFF (O), ON (I) and tripped (Trip)
- access to the "push-to-trip" button
- visibility and access to the trip unit.

##### Device padlocking

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

##### Variations: door locking

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

##### Models

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

#### Extended rotary handles

##### Installation

The door-mounted (extended) rotary handle is made up of:

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

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

##### Operation when door is closed

The door mounted handle makes it possible to operate a circuit breaker installed in an enclosure from the front. The door mounted operating handle maintains:

- suitability for isolation
- indication of the three positions OFF (O), ON (I) and tripped (Trip)
- visibility and access to trip unit when the door is open
- degree of protection of the handle on the door: IP54 or IP65, as per 60520.

##### Mechanical door locking when device closed

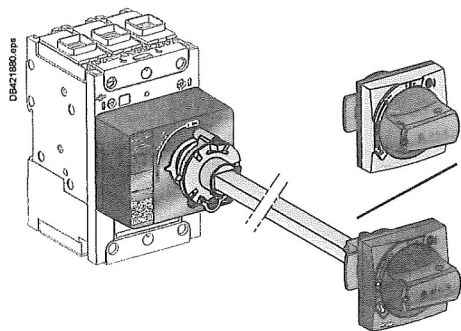
A standard feature of the extended rotary handle is a locking function, built into the shaft, that disables door opening when the circuit breaker is in the ON or tripped positions.

Door locking can be temporarily disabled with a tool by qualified personnel to open the door without opening the circuit breaker. This operation is not possible if the handle is locked by a padlock.

##### Device and door padlocking

Padlocking locks the circuit breaker handle and disables door opening:

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



Door-mounted rotary handle.



Laser Square tool.

ВАРНО С ОРИГИНАЛА

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# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Rotary handles

#### Operation when door is opened

An open door shaft operator can be used to operate the circuit breaker when door is opened. This accessory complies with UL 508A.

The indication of the three positions OFF (O), ON (I) and tripped (Trip) is visible on the circuit breaker.

The circuit breaker itself may be locked in OFF position when the door is opened by 1 padlock / lockout hasp, shackle Ø4-8 mm.

#### Shaft length

The shaft length is the distance between the back of the circuit breaker and the door:

- minimum shaft length is 200 mm
- maximum shaft length is 600 mm
- shaft length must be adjusted.

#### Models

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

#### Side rotary handles (left or right)

##### Installation

The side-mounted rotary handle is made up of:

- a unit that has to be screwed on the front accessory cover of the circuit breaker
  - an assembly (handle and front plate) on the side (left or right) of the enclosure
  - an adjustable extension shaft.
- The handle mechanism is fixed with a nut (Ø22 mm) to make assembly easier.

##### Operation

The side mounted rotary handle makes it possible to operate circuit breakers installed in enclosure from the side. The side mounted rotary handle maintains:

- suitability for isolation
- indication of the three positions OFF (O), ON (I) and tripped (Trip). Moreover, the position is visible on the circuit breaker itself.
- visibility and access to trip unit when the door is open
- degree of protection of the handle on the side: IP54 or IP65 as per 60520.

##### Device padlocking

The circuit breaker may be locked in the OFF position, or, for the black rotary handle only, in ON position after voluntary modification of the side handle (to be done by the customer during installation), by using one to three padlocks, padlock shackle Ø4-8 mm ; padlocks are not supplied.

Locking in the ON position does not prevent free circuit breaker from tripping if a fault occurs. In this case, the handle remains in the ON position after the circuit breaker tripping. Unlocking is required to go to the tripped then the OFF position.

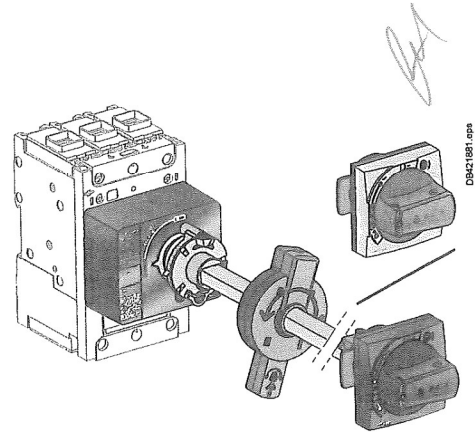
##### Shaft length

The shaft length is the distance between the side of the circuit breaker and the side of the enclosure:

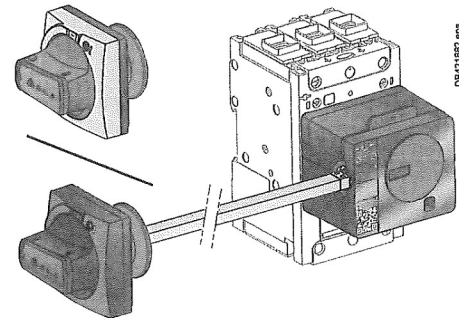
- minimum shaft length is 45 mm
- maximum shaft length is 480 mm
- shaft length must be adjusted.

##### Models

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

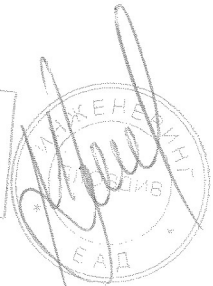


Door-mounted rotary handle with open door shaft operator.



Side mounted rotary handle.

ВЯРНО С ОРИГИНАЛА



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Customize your circuit breaker with accessories  
**Compact NSXm accessories and auxiliaries**  
 Locks and sealing accessories

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**Locks**

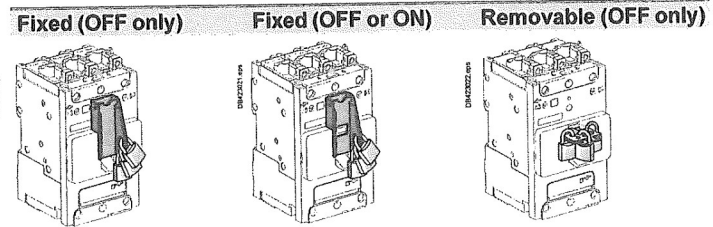
Padlocking systems can receive up to three padlocks with diameters of 5-8 mm ; padlocks not supplied. Locking in the OFF position guarantees isolation as per IEC 60947-2.

Control device	Function	Means	Required accessories
Toggle	Lock in OFF position	Padlock	Removable device
	Lock in OFF or ON position	Padlock	Fixed device
Direct rotary handle	Lock in OFF position	Padlock	Fixed device
	Lock in <input type="checkbox"/> OFF position <input type="checkbox"/> OFF or ON position <sup>[1]</sup>	Padlock	-
Extended/side rotary handle	Lock in <input type="checkbox"/> OFF position <input type="checkbox"/> OFF or ON position <sup>[2]</sup> with door opening prevented	Padlock	-

[1] Following a simple modification of the mechanism.

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

Handle padlocking device <sup>[1]</sup>



[1] Rotary handle has integrated padlocking capability.



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# Customize your circuit breaker with accessories

## Compact NSXm accessories and auxiliaries

### Locks and sealing accessories

*M*

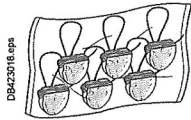
### Sealing accessories

Sealing accessories are available. Each bag of accessories contains all the parts required for the types of sealing indicated below.

A bag contains:

- 6 sealing accessories
- 6 lead seals.

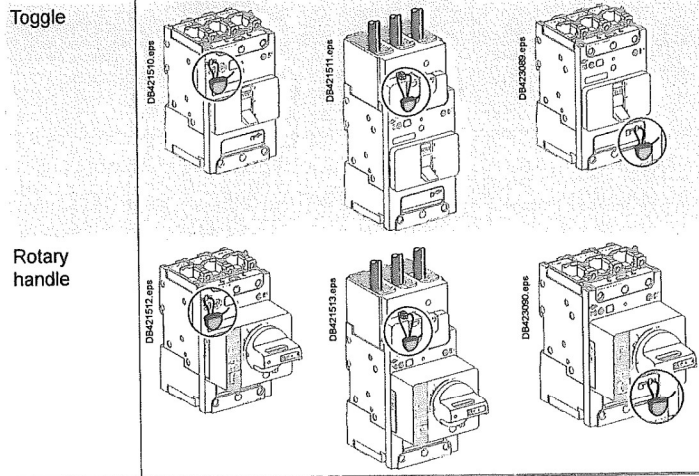
Types of seals and corresponding functions



LV429335: Bag of sealing accessories.

### Protected operations

- |              |   |                               |   |
|--------------|---|-------------------------------|---|
| Control type | ■ Front removal<br>■ Access to auxiliaries. | ■ Access to power connections | ■ Access to settings and test connector |
|--------------|---|-------------------------------|---|



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ВЯРНО С ОРИГИНАЛА



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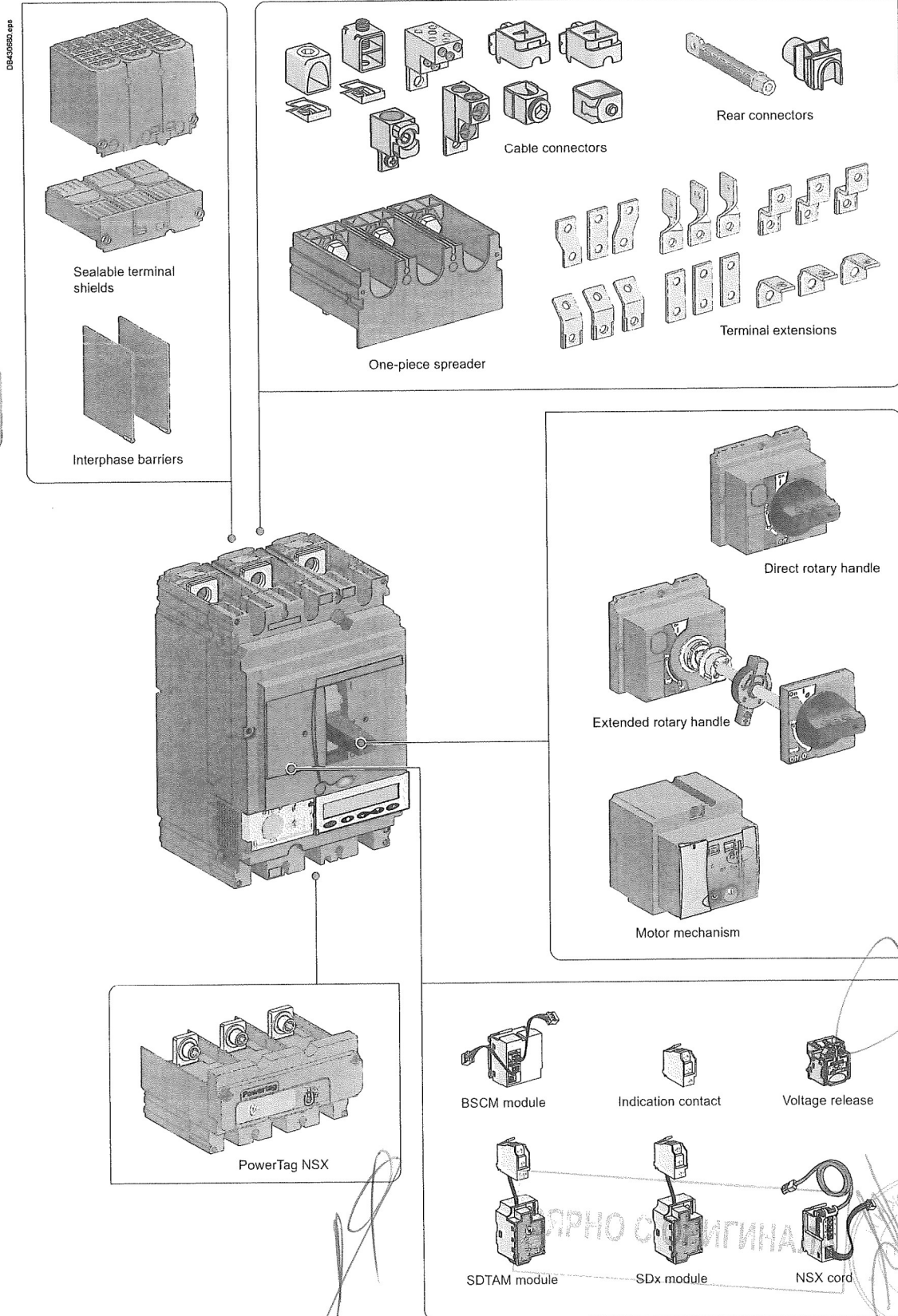
Customize your circuit breaker with accessories

www.schneider-electric.com

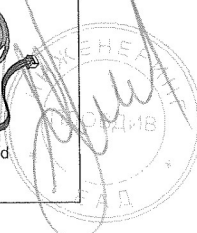
# Compact NSX accessories and auxiliaries

## Overview fixed version

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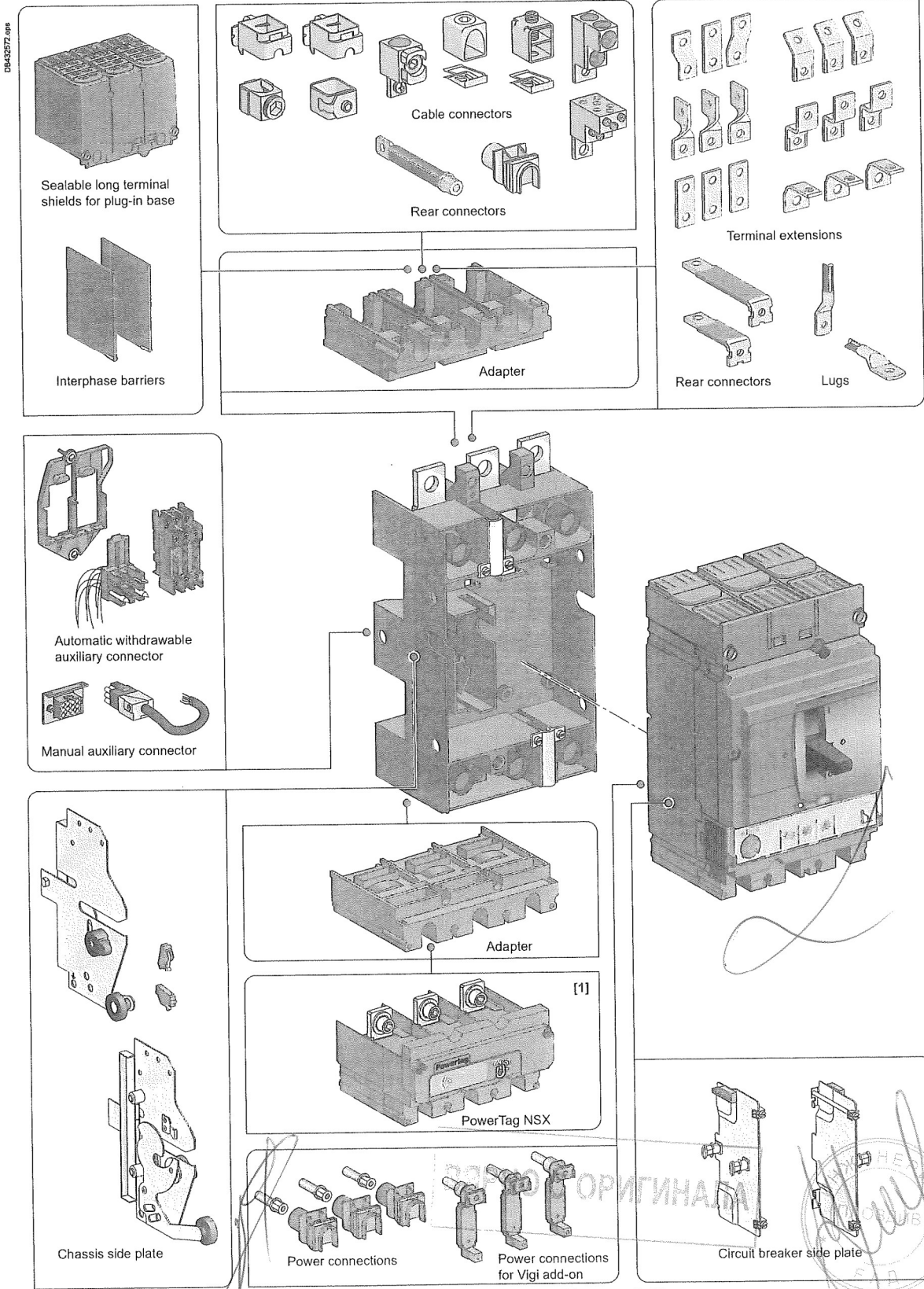
*492*



# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Overview plug-in and withdrawable versions



[1] For PowerTag NSX 630 A, add a 4 mm intercalary under the module when plate mounted (see page C-43).

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# Compact NSX accessories and auxiliaries

## Device installation

*M*

### 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

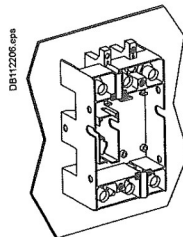
A plug-in configuration is made by adding a "plug-in kit" to a fixed device. To avoid connecting or disconnecting the power circuits under load conditions, a safety trip causes automatic tripping if the device is ON, before engaging or withdrawing it. The safety trip, supplied with the kit, must be installed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

### Accessories

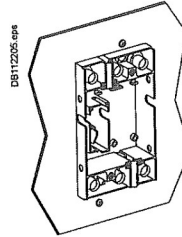
Optional insulation accessories are available.

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

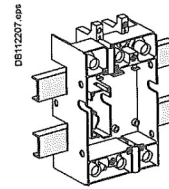
### Mounting



Mounting on a backplate.



Mounting through a front panel.



Mounting on rails.



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# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Device installation

#### 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.

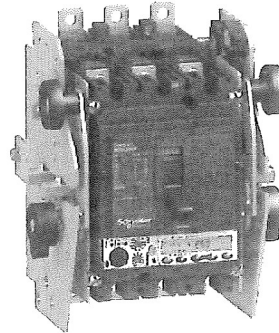
#### Parts of a withdrawable configuration

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

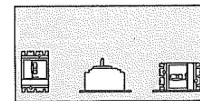
Accessories are the same as for the base, with in addition:

- 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.



FB10512.eps

Withdrawable Compact NSX250.



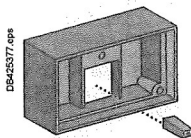
Installation positions.



Connected. Disconnected. Removed.

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DB112210.eps

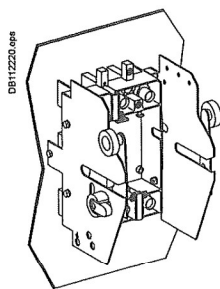


Protection collar for toggle and toggle extension to provide IP4 in the connected and disconnected positions.

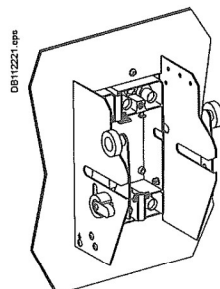


Telescopic shaft.

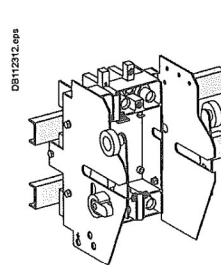
#### Mounting



Mounting on a backplate.



Mounting through a front panel.



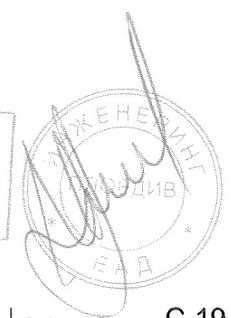
Mounting on rails.

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ВАРНО С ОРИГИНАЛА



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# Compact NSX accessories and auxiliaries

## Connection of fixed devices

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 NSX 100 to 630 come with terminals comprising snap-in nuts with screws:

- Compact NSX 100: M6 nuts and screws. Compact NSX 160/250: M8 nuts and screws
- Compact NSX 400/630: 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 10

#### 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 <sup>2</sup> )	120, 150, 185	240, 300
	crimping	hexagonal barrels or punching	
Aluminium cables	size (mm <sup>2</sup> )	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:

- NSX 100 to 250: the 35 mm pitch can be increased to 45 mm
- NSX 400/630: 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 NSX 100 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 NSX 100 to 250 circuit-breaker terminals to the 45 mm pitch of a NSX 400/630 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:

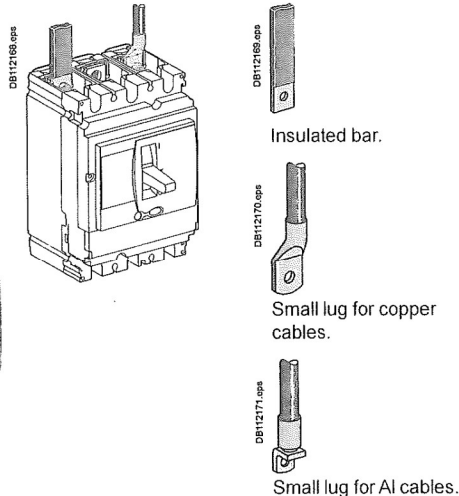
- at the back of a switchboard
- behind the front panel with a raiser.

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

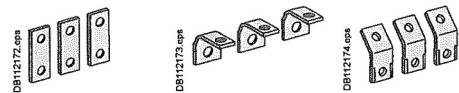
Compact NSX circuit breaker	NSX 100 to 250	NSX 400 to 630
Without spreaders	35	45
With spreaders	45	52.5 or 70
With one-piece spreader	45	-



Insulated bar.

Small lug for copper cables.

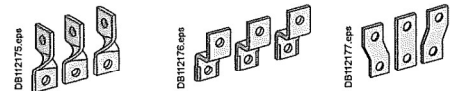
Small lug for Al cables.



Straight terminal extensions.

Right-angle terminal extensions.

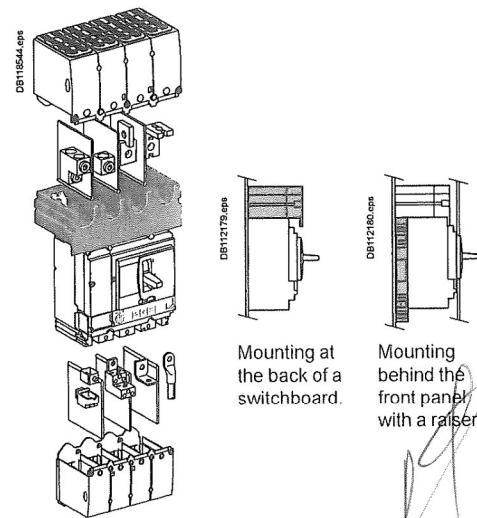
45° terminal extensions.



Edgewise terminal extensions.

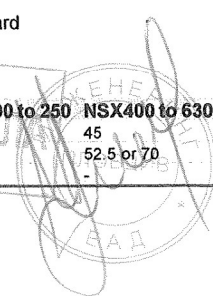
Double-L terminal extensions.

Spreaders.



Mounting at the back of a switchboard.

Mounting behind the front panel with a raiser.



# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Connection of fixed devices

#### 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 mm<sup>2</sup> each.

#### Linery DX and Linergy DP distribution block for Compact NSX100 to 630

Linery DX and Linergy 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 mm<sup>2</sup> or 16 mm<sup>2</sup>, 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 <sup>2</sup>	⊙			
Aluminium connectors	25 to 95 mm <sup>2</sup>	⊙	⊙		
	120 to 185 mm <sup>2</sup>	⊙	⊙		
	120 to 240 mm <sup>2</sup>	⊙	⊙		
	2 cables 50 to 120 mm <sup>2</sup>	⊙	⊙		
	2 cables 35 to 240 mm <sup>2</sup>			⊙	⊙
	35 to 300 mm <sup>2</sup>			⊙	⊙
Distribution connectors	6 cables 35 mm <sup>2</sup>	⊙	⊙		
Linery DX and Linergy DP distribution blocks	6 or 9 cables 10/16 mm <sup>2</sup>	⊙	⊙		

#### Rear connection

Device mounting on a backplate with suitable holes enables rear connection.

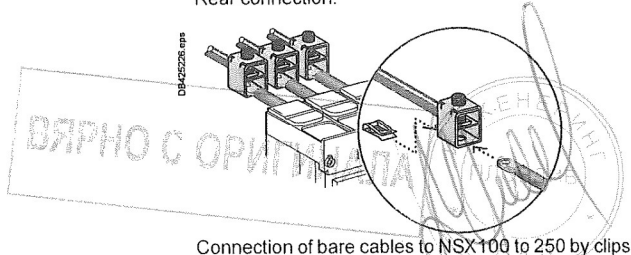
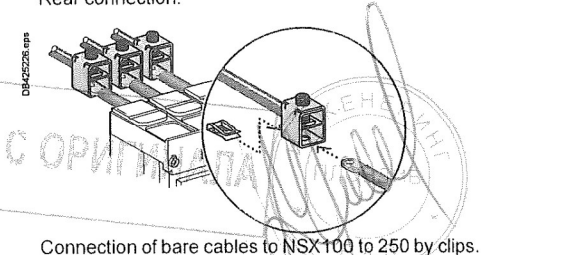
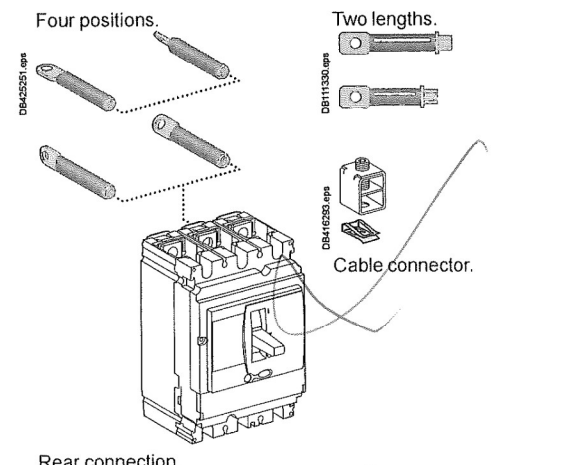
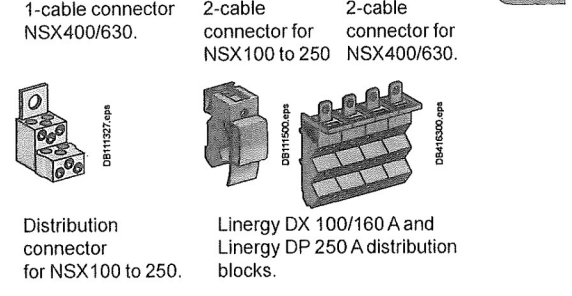
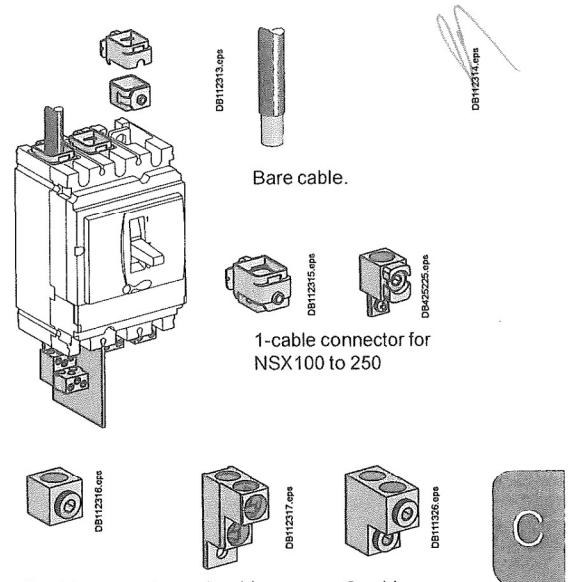
#### Bars or cables with lugs

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 NSX 100 to 250 may be secured to the rear connections using clips.



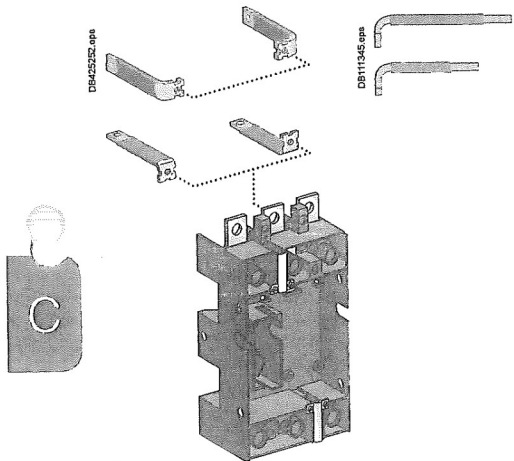
494

Customize your circuit breaker with accessories

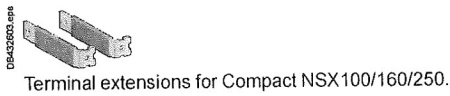
# Compact NSX accessories and auxiliaries

## 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.



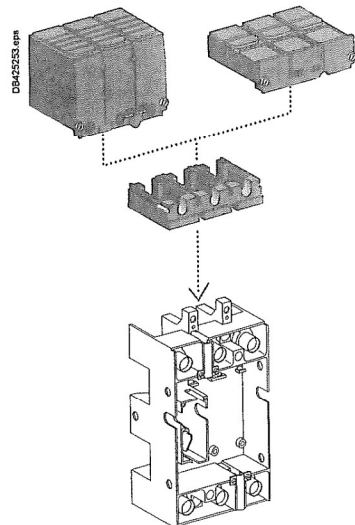
Four positions.



Terminal extensions for Compact NSX100/160/250.



Terminal extensions for Compact NSX400/630.

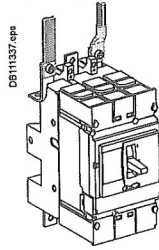


### Bars or cables with lugs

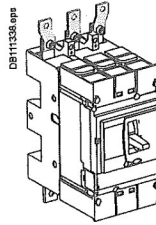
The plug-in base is equipped with terminals which, depending on their orientation, serve for front and rear connection.

For rear connection of a base mounted on a backplate, the terminals must be replaced by insulated, long right-angle terminal extensions.

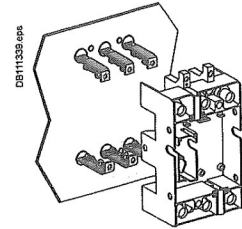
For Compact NSX630 devices, connection most often requires the 52.5 or 70 mm pitch spreaders.



Front connection.



Front connection with spreaders.



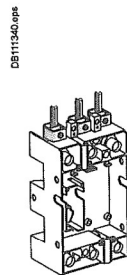
Rear connection of a base mounted on a backplate.

### Connection accessories

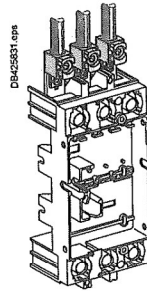
All accessories for fixed devices (bars, lugs, terminal extensions and spreaders) may be used with the plug-in base.

### Bare cables

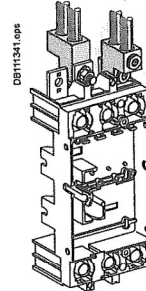
All terminals may be equipped with bare-cable connectors. See the "Connection of fixed devices" section.



With a 100 to 250 A base.



With 240 mm<sup>2</sup> cable connector for NSX100 to 250.

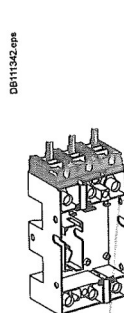


With a 400/630 A base.

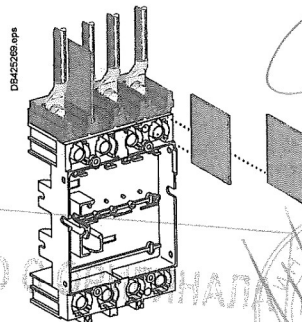
### Adapter for plug-in base

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.

# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Insulation of live parts

#### 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  $\geq 500$  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.

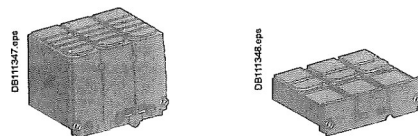
##### Terminal shields and pitch

Combination possibilities are shown below.

Circuit breaker	NSX100/160/250	NSX400/630	
<b>Short terminal shields</b>			
Pitch (mm)	35	45	
<b>Long terminal shields</b>			
Pitch (mm)	35	45	52.5

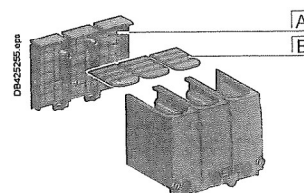
Terminal shields are identical for fixed and plug-in/withdrawable versions and cover all applications up to 1000 V.

They exist for the 100 to 250 A and 400/630 A ratings, in long and short versions.

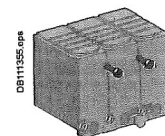


Long terminal shields.

Short terminal shields.



- A Partially cut removable squares.
- B Grids with break marks.

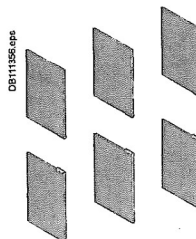


Assembled with captive screws.

#### 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.



Interphase barriers.

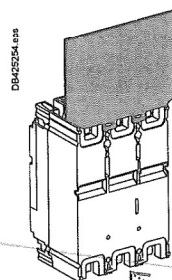
#### Rear insulating screens

Safety accessories providing insulation at the rear of the device.

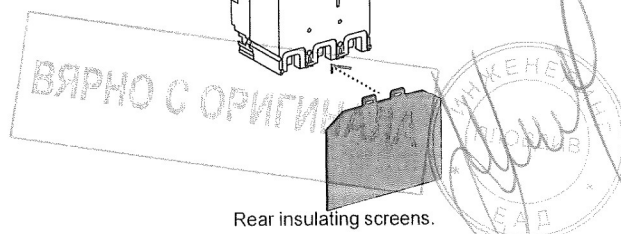
Their use is mandatory for devices with spreaders, installed on backplates, when terminal shields are not used.

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



Rear insulating screens.



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# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Selection of auxiliaries

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#### Standard

All Compact NSX100/160/250 circuit breakers and switch-disconnectors have slots for the electrical auxiliaries listed below.

- 5 **indication contacts** (see page C-30)
  - 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 add-on.
- 1 **remote-tripping release** (see page C-33)
  - 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:

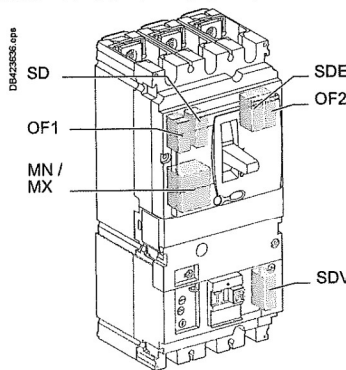
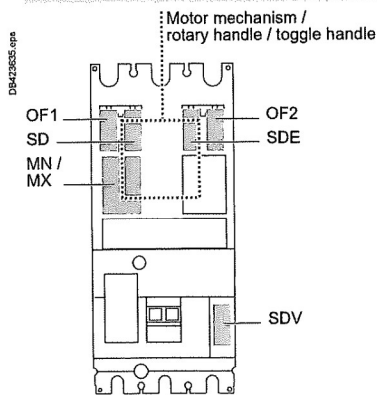
- 1 **indication module with two outputs** (see page C-31)
    - either an SDx module with Micrologic 2.2 / 4.2 / 5.2 A or E / 6.2 A or E or 7 E
    - or an SDTAM module with Micrologic 2.2 M or 6-2 E-M (motor protection).
- This module occupies the slots of one OF contact and an MN/MX release.

**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.



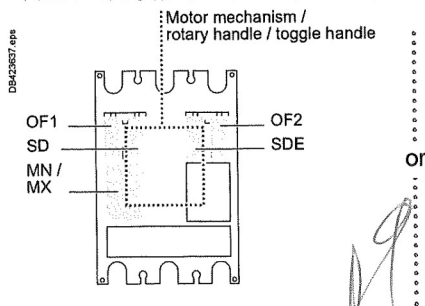
### NA, TMD, TMG, MA

#### Standard

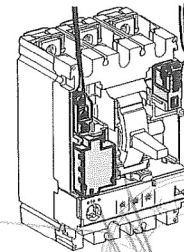
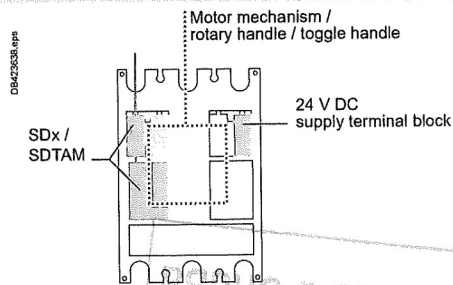


### Micrologic 2 / 4 / 5 / 6 / 7

#### Standard



#### 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 / 7 display when the device is OFF or under low-load conditions.

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# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Selection of auxiliaries

#### Communication

Communication requires specific auxiliaries.

##### 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 / 7, 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 / 7, the system consists of:

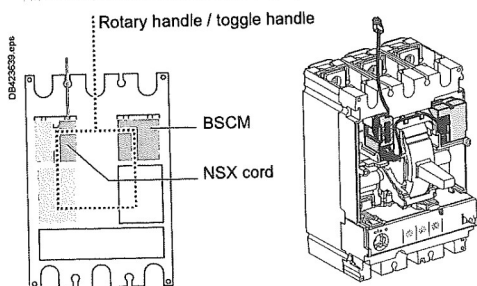
- 1 BSCM module
- 1 NSX cord (internal terminal block) for both communication and 24 V DC supply to the BSCM and the Micrologic
- 1 communicating motor mechanism connected to the BSCM.

#### Installation of SDx or SDTAM is compatible with communication.

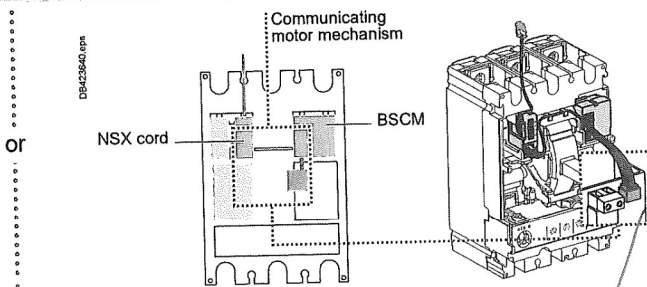
The following table indicates auxiliary possibilities depending on the type of trip unit.

#### NA, TMD, TMG, MA, Micrologic 2 / 4

##### Communication of status indications

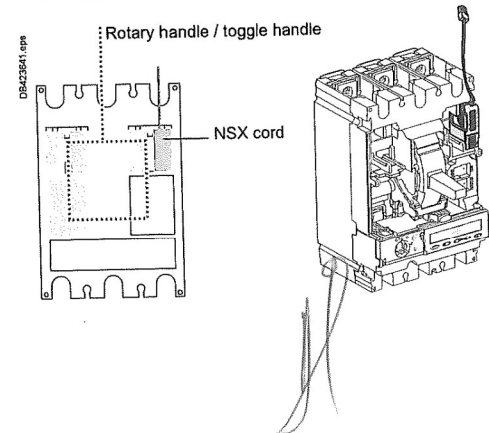


##### Communication of status indications and controls

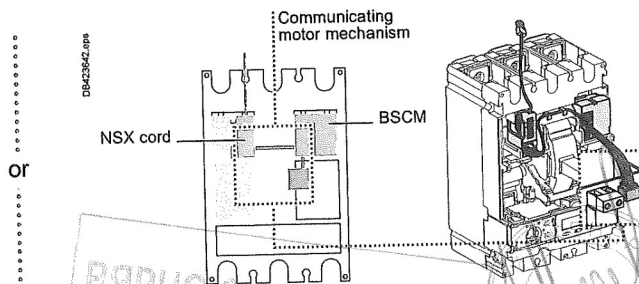


#### Micrologic 5 / 6 / 7

##### Communication of measurements with or without FDM121 display



##### Communication of status indications, controls and measurements with or without FDM121 display



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# Compact NSX accessories and auxiliaries

## Selection of auxiliaries

*M*

### Standard

All Compact NSX400/630 circuit breakers and switch-disconnectors have slots for the electrical auxiliaries listed below.

**7 indication contacts** (see page C-30)

- 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 add-on.
- 1 remote-tripping release** (see page C-33)
- 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 C-31)

- either an SDx module with Micrologic 2.3 / 4.3 / 5.3 A or E / 6.3 A or E or 7 E
  - or an SDTAM module with Micrologic 2.3 M or 6-3 E-M (motor protection).
- This module occupies the slots of an MN/MX release.

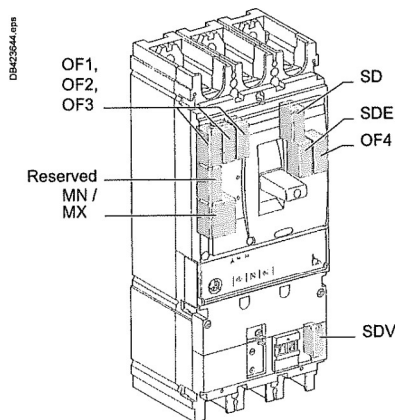
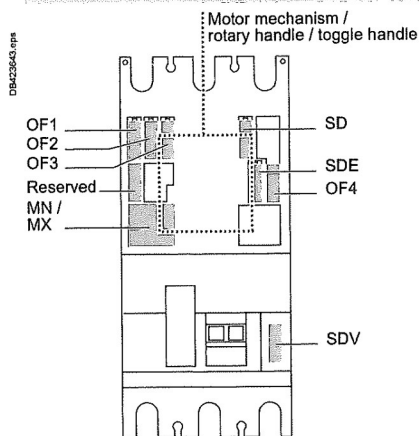
**All these auxiliaries may be installed with a motor mechanism or a rotary handle or a toggle handle.**

The following table indicates auxiliary possibilities depending on the type of trip unit.



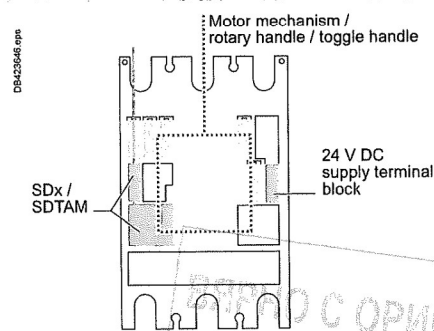
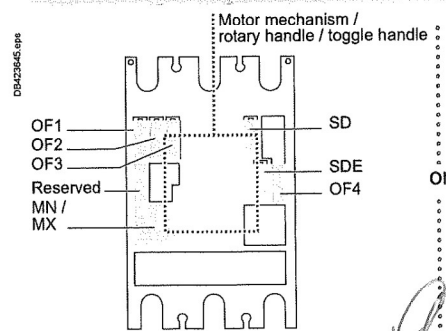
### NA, Micrologic 1.3 M

#### Standard



### Micrologic 2 / 4 / 5 / 6 / 7

#### 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 / 7 display when the device is OFF or under low-load conditions.

*802*

# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Selection of auxiliaries

by

### Communication

Communication requires specific auxiliaries.

#### 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 / 7, 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

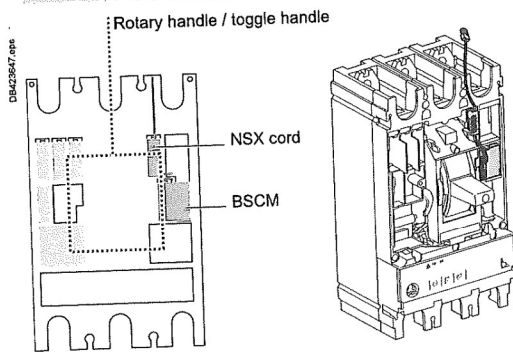
Available on Micrologic 5 / 6 / 7, the system consists of:

- 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.

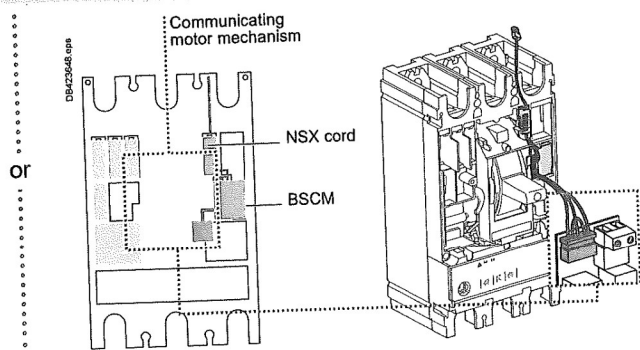
**Installation of SDx or SDTAM is compatible with communication.**  
The following table indicates auxiliary possibilities depending on the type of trip unit.

### NA, Micrologic 1.3 M, Micrologic 2 / 4

#### Communication of status indications

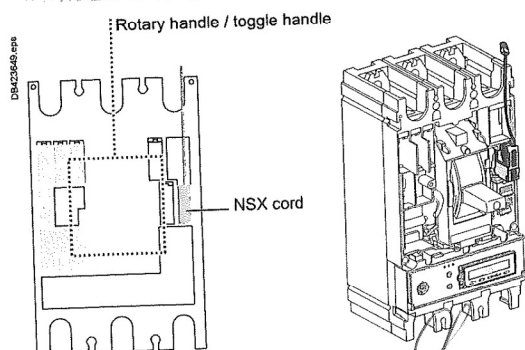


#### Communication of status indications and controls

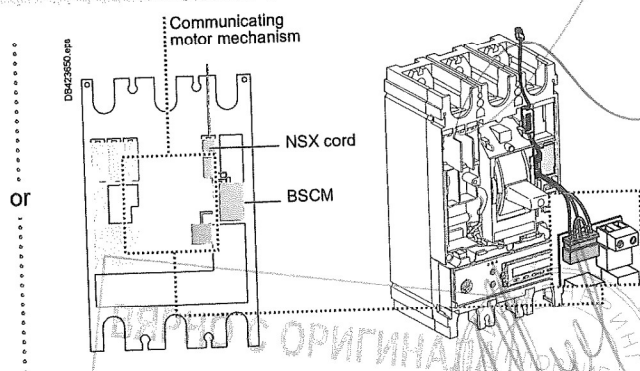


### Micrologic 5 / 6 / 7

#### Communication of status indications



#### Communication of status indications, controls and measurements with or without FDM121 display



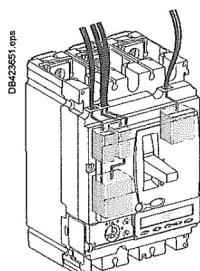
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# Compact NSX accessories and auxiliaries

## Connection of electrical auxiliaries

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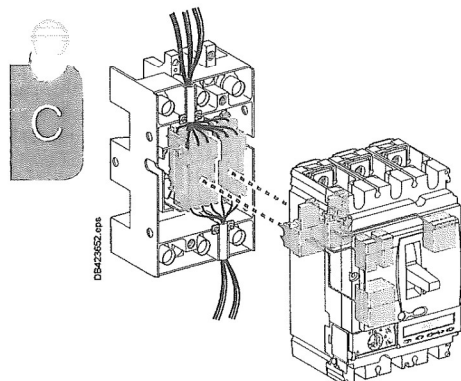


DB423651.eps

Fixed Compact NSX.

### Fixed Compact NSX

Auxiliary circuits exit the device through a knock-out in the front cover.



DB423652.eps

Plug-in/withdrawable Compact NSX.

### Withdrawable or plug-in Compact NSX

#### Automatic auxiliary connectors

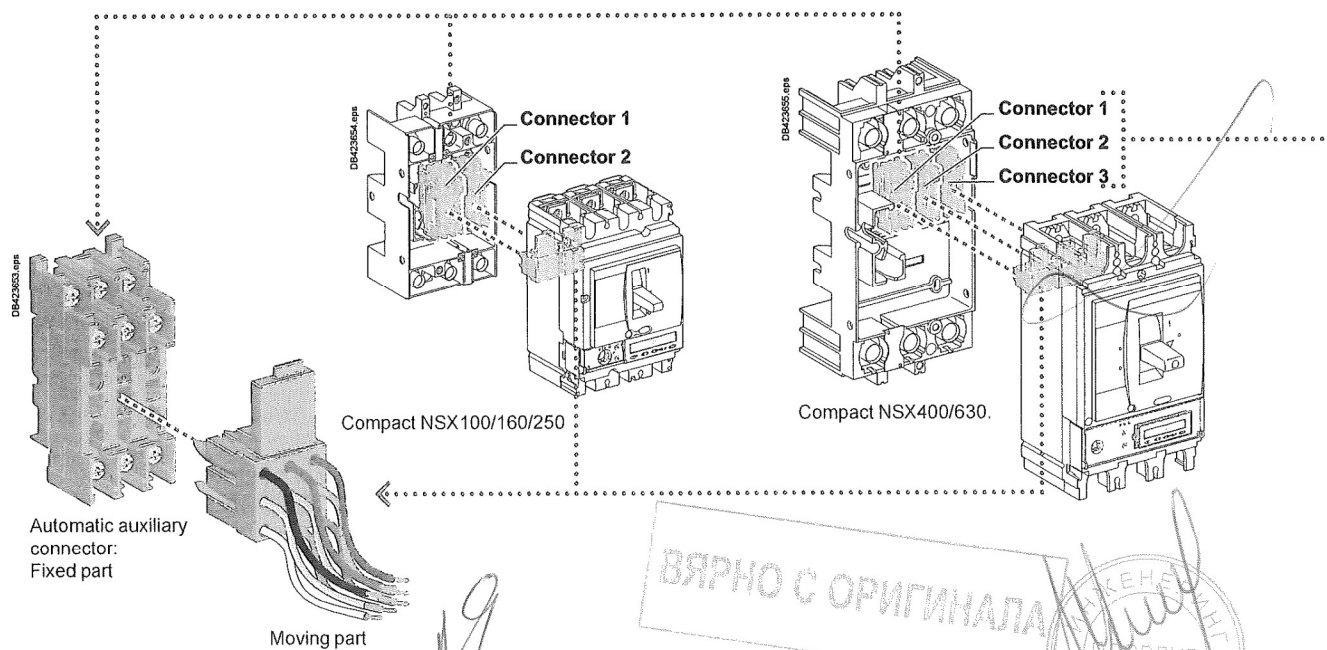
Auxiliary circuits exit the circuit breaker via one to three automatic auxiliary connectors (nine wires each). These are made up of:

- 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 mm<sup>2</sup>.

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.

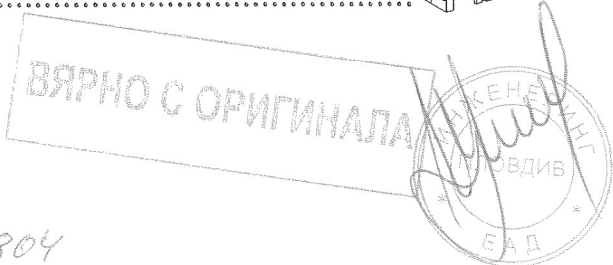


Automatic auxiliary connector:  
Fixed part

Moving part

Compact NSX100/160/250

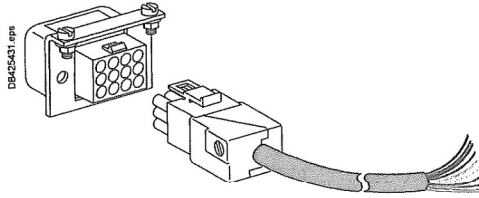
Compact NSX400/630.



# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Connection of electrical auxiliaries

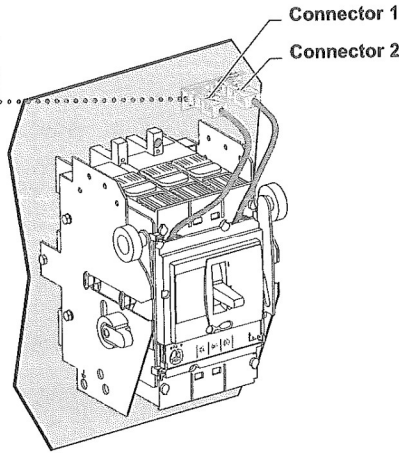


Nine-wire manual auxiliary connector.

#### 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.

Connector 1  
Connector 2

Connector 1  
Connector 2  
Connector 3

Each auxiliary is equipped with a terminal block with numbered terminals for connection of wires up to:

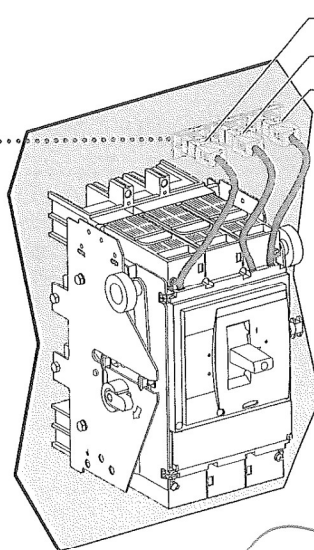
- 1.5 mm<sup>2</sup> for auxiliary contacts and voltage releases
- 2.5 mm<sup>2</sup> for the motor-mechanism module.

Circuit breaker	Connector 1 OF1 MN/MX or SDx/ SDTAM SD	Connector 2 OF2/SDV / ZSI out <sup>(1)</sup> SDE NSX cord MT MTc 24 V DC	Connector 3 OF3 OF4 ZSI in ZSI out
NSX100/160/250	⊙	⊙	-
NSX400/630	⊙	⊙	⊙

[1] Only for NSX100 to 250.

**MT**: motor mechanism.

**MTc**: communicating motor mechanism.



Compact NSX400/630.



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# Customize your circuit breaker with accessories

## Compact NSX accessories and auxiliaries

### Indication contacts

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.

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 standards.

#### 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 add-on 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).

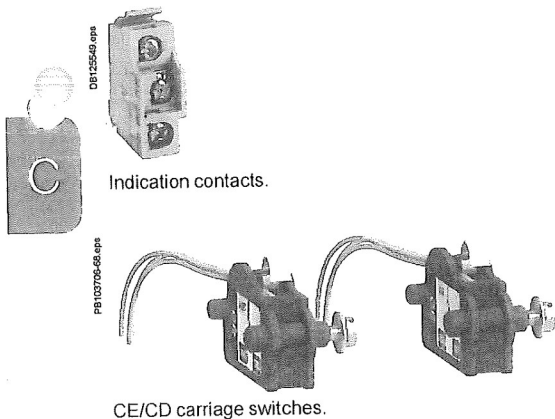
##### Rotary-handle position contact for early-make or early-break functions

■ 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 add-on 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			
	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 - -	-	- - -			

