



Technical Submission

Project	Sunlight House, Manchester	Project Ref.	1394
Tech Sub Ref.	TS-E- 1003	Issued By	Paul Moss
Date	29/05/2024	Authorised By	David Wilson

Technical Submission	Main LV Switchboard	
SPECIFICATION COMPLIANCE	✓	In compliance with 4084-KIN-XX-XX-SP-E-001-T4 - 4.2.1
DEROGATIONS		
CALCULATIONS PROVIDED		

Please refer to the following data for the main LV switchboard to be installed on the above project

Proposed panel layout
Eastron energy management system
Schneider circuit breakers
Schneider ACB
ABB surge protection information

Information Required From	Myco
Latest Date Required	12/06/2024

Acceptance/Refusal	
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STATUS A	STATUS B	STATUS C
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Response From	
Response Date	



Manufacturers of Custom Built Package Substations, H.V. /L.V. Switchgear,
PDU's & Sub Distribution

Technical Submittal Report

Project: - Sunlight House -Manchester

Our Ref: - GH/SS/55205

Equipment Reference: -

The Following information is provided to enable general approval for order status, following the order we will provide full working layout & schematic drawings for status A approval and confirm delivery dates

Merlin House, Aviation Road, Sherburn Enterprise Park, Sherburn in Elmet, Leeds, LS25 6NB
Tel: 01977 681681 Email sales@gr-electrical.co.uk www.gr-electrical.co.uk
Registered in England - 1845054





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Section 3	General Arrangement Drawings
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Section 1

Issue Statement

[illegible]

Section 2

Equipment Details

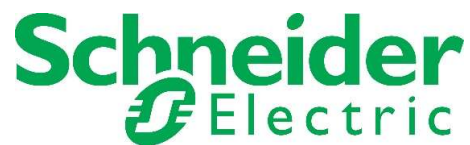
GR Electrical Services Ltd Company Profile



<https://www.gr-electrical.co.uk/>

Complete in House Manufacturing Facility in Leeds
GR Profile - Below & Attached at the back of the quotation

A Schneider Premier Plus Partner



Schneider Recommended Switchboard Manufacturer
Proposed on the Schneider's Exchange

<https://exchange.se.com/collaborate/service-providers/001A000000d1uSIIAY/GR%20Electrical%20Services%20Limited>



Manufacturers of Complete Power Distribution Solutions

Established in 1976 and with over 45 years' experience in the design & manufacture of L.V Distribution equipment within excess of 150 Million Pounds of switchgear in service. GR Electrical Services Ltd is a Building Services turnkey provider of the Complete Electrical Distribution Infrastructure from M.V Switchboards to Sub Distribution, & everything in between.



GR Electrical have established themselves as one of the main market leaders within the industry due to their quality, reliability and continuous innovation and development. Providing complete power distribution solutions, enabling, with assurance the single port supply for our customers to deal with on supplier throughout their project's requirements. Our reputation & expertise has been achieved through a quality range of switchgear manufactured to high standards offering cost effective solutions.

UK Based Design, Engineering & Manufacture

Engineering, Fabrication & Manufacturing from cradle to dispatch is undertaken at the company's purpose-built factory at the heart of the Leeds, York, Harrogate & Selby district catchment area. enabling a UK wide solution for projects successfully completed throughout retail, commercial, technological & industrial sectors. Ensuring complete conceptual design solutions to each bespoke project needs, delivering an engineered proven and fully type tested certified complete conceptual solutions for across the Complete Building Infrastructure requirements.

Engineering & Manufacturing Approach

Modular fabrication is at the heart of the GR Electrical Services Ltd manufacturing process, developed to help ease the strain of upscaling power requirements and delivering projects with greater efficiency to tighter time frame. As of 2006 GR have been design engineering in 3D, from ACB's to nuts and bolts, providing precision engineered modelling for manufacturer. Ensuring that all our equipment is designed & manufactured to the highest quality, standards and precision. 3D technology introduced so early has meant such induction of BIM/Revit has been taken in stride to ensure you project has GR Electrical Services precision 3D models for your project.



Certified Product Solutions

GR Electrical Services Ltd is a proud designer, engineer, manufacturer, tester, and service provider. We deliver complete fully type tested product certified solutions, from the nuts and bolts, the supports, the copper, the breakers, the steel enclosure, the complete engineered full GR Electrical Services Ltd designed, engineered and manufactured certified solution. All designed, engineered, and certified, reliable precision engineered manufacturing.



Products & Services - The Complete Solution

Complete Engineered Certified Building Infrastructure Solutions

- MV Switchgear
- Dry & Oil Type Transformers
- MV to LV Package Substations, up to 6300A
- Rear Access LV Switchboards, up to 6300A
- Front Access LV Switchboards, up to 6300A
- Interconnecting & Rising Busbar
- PDU's
- Sub Distribution Switchboards
- Panel Boards, up to 1000A
- Distribution Boards (DBs)
- Energy Management & Monitoring Solutions
- Full Power Management & Monitoring Solutions
- Various On-Site & Design Services
 - Installation & Testing
 - Maintenance & Modifications
 - Analysis & Training
 - Design Reviews & Design Assistance
 - Fault Level Analysis
 - Space Planning
 - 3rd Party Interfacing
- In-House Temperature Rise Testing Station for up to 7000 Amps



The GR Vision

Always ensuring the business and the product, is firstly on an even keel and vertically integrated to deliver solutions to suit the needs for the real engineering deliverance of projects of all sizes. This is applied across the business to give that precision and detail when delivering the products and services for the future. Quite simply enabling fast innovation.

GR Electrical Services managed growth and expansion is all catered to our client's needs with the sole direction of ensuring the client's confidence that the Engineer they need is nothing less than a direct connection away, imperative when delivering real engineered solutions by real engineers, at your service.

We take ongoing product development seriously with continued reinvestment with the company. The results of this approach are demonstrated in the finished product; fully installed and tested LV Switchboards with built-in benefits perfecting the top-level assembly.

Section 3

Equipment Details

Drawings: - 4084-KIN-XX-XX-SC-E-6001

Specification: - 4084-KIN-XX-XX-SP-E-001-T4

Section 4

General Arrangement Drawings (Equipment Layout Drawings)

Item No 2.01 New Landlords 1600A Switchboard

MAIN INCOMER

- 1 1600A HA N/A TPN Fixed MTZ1 ACB
- 1 Multifunction Energy Meter + RS485 Comms O/P
- 1 3No. 1600A Metering CT's

SURGE PROTECTION

- 1 TPN NSX160-N-160-TMD MCCB (50kA) c/w Rotary handles
- 1 Transient Lightning & Surge Arrestor - Type 1 & 2 combined

OUT GOING WAYS

- 1 TPN NSX100-N-40-ML2.2 Trip MCCB (50kA) c/w Rotary handles
- 9 TPN NSX100-N-100-ML2.2 Trip MCCB (50kA) c/w Rotary handles
- 3 TPN NSX250-N-160-ML2.2 Trip MCCB (50kA) c/w Rotary handles
- 1 TPN NSX250-N-250-ML2.2 Trip MCCB (50kA) c/w Rotary handles
- 5 TPN NSX630-N-630-ML2.3 Trip MCCB (50kA) c/w Rotary handles
- 5 Un-populated Spare Way up to 250A (MCCB)
- 1 Un-populated Spare Way 400-630A (MCCB)

SPECIAL REQUIREMENTS

- 1 Panel Front Busbar Mimic Diagram
- 1 Live Side Test Points
- 1 Mains LED Phase Indication

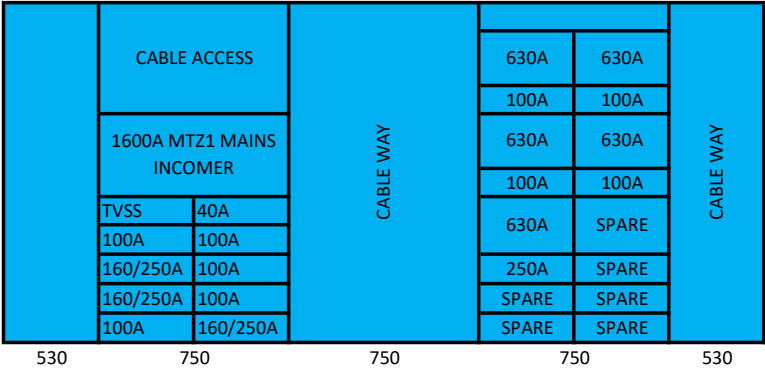
Main BUS BAR rated at 1600A.

Panel Segregation Will Be Form 4b Type 6 (Fully Compartmentalised) Front Access - EVO Range IP31

Overall Dimensions of Panel will be 2150mm H x 530mm D x 3310mm W

Overall Weight of Equipment 1297 KG

2.01 - New Landlords 1600A Switchboard



ml trips

BUSBAR RATING:	1600A
CABLE ACCESS:	FRONT ACCESS
CABLE ENTRY:	TOP
CABLE EXIT:	TOP
FAULT RATING:	50kA FOR 1 SECOND
FORMS OF SEP:	FORM 4b TYPE 6
INGRESS PROT:	IP31
INCOMING SUPPLY:	400V, 50Hz
BS EN COMPLIANCE:	BS EN 61439-01/02 2011
WEIGHT:	TBC
SWITCHBOARD DIMENSIONS:	
3310mm(L)	
550mm(D)	
2200mm(H)	
Project Name: Sunlight House - Manchester	
Contact: Jack Fairbrother	
General Arrangement Drawing	

GR ELECTRICAL SERVICES LIMITED - TELEPHONE 01977 681681 - EMAIL: SALES@GR-ELECTRICAL.CO.UK		Drawn By:	K. Stafford
SCALE. NTS		Date:	14/05/2024

Revision & Date:	
Rev **	14/05/2024
THIS DRAWING IS CONFIDENTIAL AND MAY NOT BE USED, COPIED OR DISCLOSED TO ANYONE WITHOUT PERMISSION OF GR ELECTRICAL SERVICES LTD	

Section 5

General Build Specification

L.V. Switchboard Enclosure

The extensible cubicle constructed switchboard is an all welded 2mm sheet metal framework designed and manufactured by GR Electrical Services for strength and robustness. The completely modular internal assembly is designed to allow for increased flexibility and is also manufactured from 2mm thick steel.

All cubicle compartments are accessed via hinged lockable doors, which are also manufactured from 2mm thick sheet steel complete with double returned edges and neoprene gaskets. All busbar chambers and cableways are accessed via bolt-on covers

Busbars are completely segregated via 2mm thick sheet metal partitions.

Cable entry either top or bottom as required is achieved via removable undrilled gland plates.

For larger cross sectional area cables cable entry can be made directly onto the device via a cable access compartment located directly above or below the device compartment (depending on cable entry).

Busbars

The HDHC copper busbar system is air insulated according to BS1432 with an ASTA certified busbar system. The design allows for all connections from the main busbar system to the protective device via solid copper connection studs. These solid copper connections are fully rated to the maximum current rated device that can be fitted in the cubicle it supplies. Hence a modular cubicle 1 by 1 will have 250A rated copper connection studs as the maximum size device that can be fitted is 250A. Copper connection studs are also present in all spare ways.

The HDHC Copper Busbar System will be rated in accordance with BS61439-2 Temperature Rise requirements; the diversity factor will also be applied as stated within BS61439-2 dependant on number of outgoing ways.

L.V. Switchboard Paint Standards

We have standardised on the following paint specification, which conforms to BS3189 Type 2

- Pre-treatment
 - Alkaline degreaser and cleaner
 - Cold water rinse
 - Acid degreaser and etch
 - Cold water rinse
 - Zinc Phosphate
 - Cold water rinse
 - Final hot water rinse
- Powder Coating
 - Polyester powder coating
 - Full gloss 60 microns DFT to BS4800 20E51 cornflower blue.

Our standard colours are cornflower blue exterior with white interior. Other RS/RAL colours can be achieved.

L.V. Switchboard Labels

All items of equipment are identified by suitable engraved laminated labels and are secured by fixing screws, chamfered and drilled 2.5mm W/B/W Gravoply complete with adhesive tape unless stated otherwise.

L.V. Switchboard Outgoing Devices

Form 4 is achieved by each functional device including its Neutral having its own compartment that is mechanically separated from all other devices and busbar system using 2mm thick rigid metallic barriers. These compartments are accessed via door interlocked lockable rotary handles.

Where TP&N devices are utilised a dis-connectable bolted Neutral link will be provided. This ensures all conductors are terminated within the same compartment (as per Form 4).

The Live Side of the functional device will be fitted complete with a terminal shroud.

The "Type" rating refers to the cable termination and is determined by the compartments in which it is terminated and the terminal shrouding used.

Type 2

The armoured cable for each outgoing way is glanded onto a common metallic gland plate, the tails of said cable are then passed through the cable way and into the device compartment and terminated directly onto the device (via copper extension terminals for larger C.S.A cables)

Type 5

The armoured cable for each outgoing way is glanded onto a common metallic gland plate; the tails of said cable are then passed through the cableway and terminated onto copper terminal extensions (one per phase and neutral). This termination is insulated using cable boots (one per phase and neutral). The copper terminal extensions transition through a metallic plate complete with insulating lugs into the device compartment and onto the device.

Type 6

The armoured cable for each outgoing way is glanded onto a common metallic gland plate. The tails of the cable are then passed through the cable way and into a terminal box via a foamex "gland plate" (drilled or cut-out) and terminated onto copper terminal extensions (one per phase and neutral). The metallic terminal box encloses all four terminals. The copper terminal extensions transition through a metallic plate complete insulating lugs into the device compartment and onto the device.

Type 7

The armoured cable is directed directly into the cableway and glanded off onto the metallic gland plate of the relevant terminal box. The tails of the armoured cable are then terminated onto copper terminal extensions (one per phase and neutral). The metallic terminal box encloses all four terminals. The copper terminal extensions transition through a metallic plate complete with insulating lugs into the device compartment and onto the device.

Where TP&N devices are utilised a dis-connectable bolted Neutral link will be provided. This ensures all conductors are terminated within the same compartment (as per Form 4).

The Live Side of the functional device will be fitted complete with a terminal shroud.

Where circuit breaker technology is utilised the device manufacturer will be Merlin Gerin. The ACB range is Masterpact NW and MCCB range is NSX.

Where fuse technology is utilised the device manufacturer will be Socomec

Section 6

General Build Specification

L.V. Switchboard Enclosure

The extensible cubicle constructed switchboard is an all welded 2mm sheet metal framework designed and manufactured by GR Electrical Services for strength and robustness. The completely modular internal assembly is designed to allow for increased flexibility and is also manufactured from 2mm thick steel.

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Manufacturer's Information

<u>No</u>	<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>
1	Air Circuit Breakers (ACB)	MTZ1 & MTZ2	Schneider
2	Moulded Case Circuit Breakers	NSX & NS	Schneider
3	Multifunction Meter	Smart X96 (MID)	Eastron
4	Surge Suppression	T1 & T2	ABB/Furse

Section 6.1

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>
Air Circuit Breakers (ACB)	MTZ1 & MTZ2	Schneider

Masterpact™ MTZ

Catalogue 2016
Power circuit breakers
and switch-disconnectors



schneider-electric.com

Life Is On

Schneider
Electric



Green Premium™

Endorsing eco-friendly products in the industry



**Green
Premium™**
Product

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

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



Discover what we
mean by green

Check your products!

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

RoHS

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

REACH

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

PEP: Product Environmental Profile

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

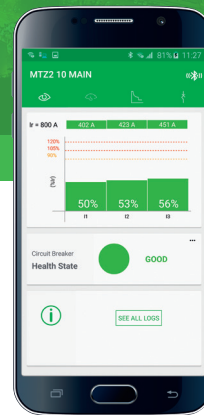
EoLI: End of Life Instructions

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

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

Life Is On

Schneider
Electric



Future ready

Masterpact MTZ circuit breakers

Schneider Electric has been the benchmark for air circuit breakers (ACB) in electrical distribution since 1987; first with the Masterpact™ M, followed by the Masterpact NT/NW circuit breakers. Masterpact circuit breakers incorporate innovative features, along with its legendary breaking principle and modular design.

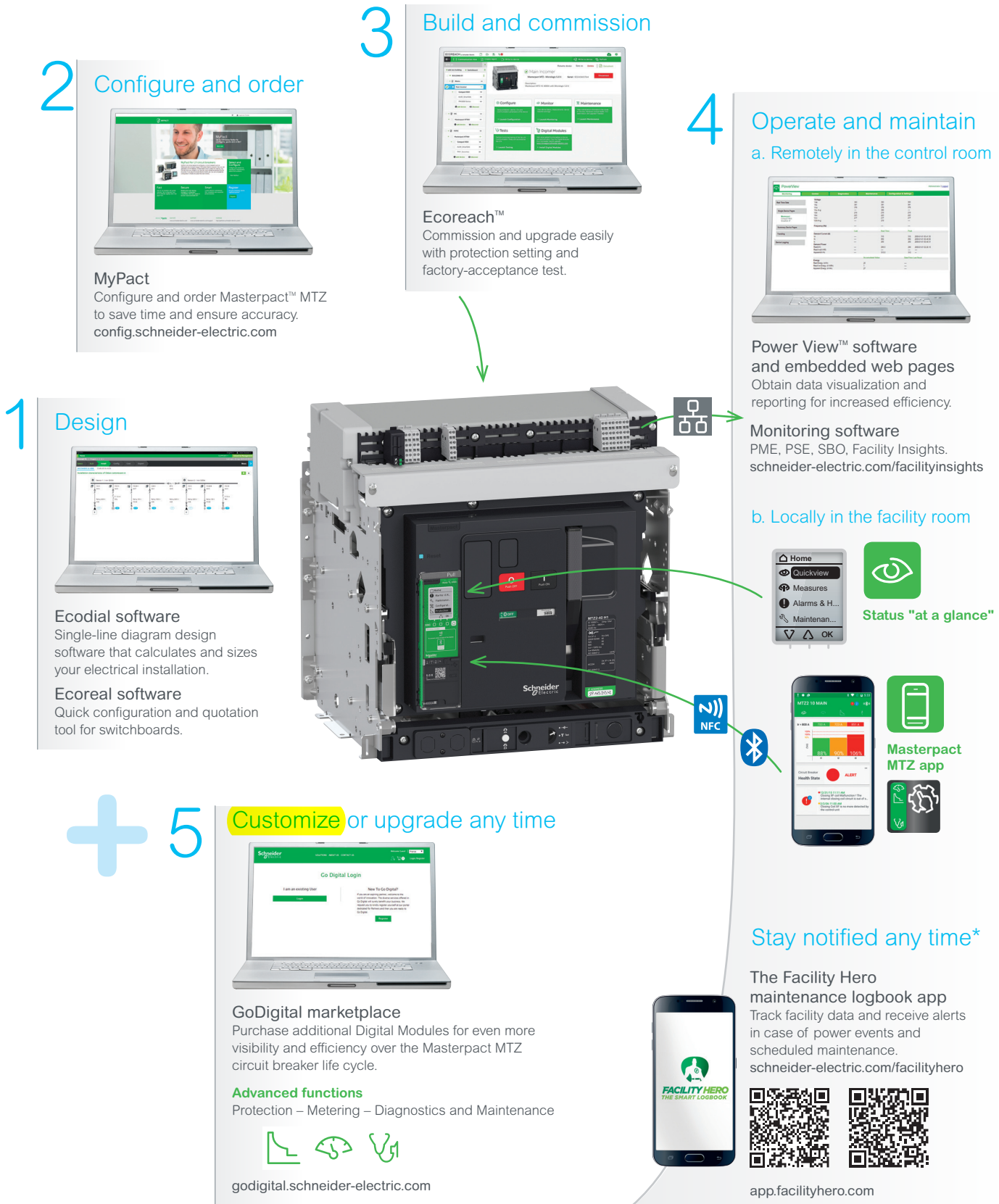
Schneider Electric is building on this heritage with Masterpact MTZ circuit breaker, the connected breaker. As well as offering proven performance, reliability, and safety, Masterpact MTZ circuit breaker now incorporates the latest digital technologies, and becomes a key component of the Smart Panels solution.

Masterpact MTZ circuit breaker is pushing electrical distribution into the "Internet of Things" era. It embeds communication functionality as well as Class 1 accuracy power/energy measurement for smart operation. It connects your electrical switchboard to any building and energy management system. On top of this, you can now use your smartphone as main HMI to monitor and control Masterpact MTZ circuit breaker for convenience and easy management.

Once again, Masterpact circuit breakers offer the ultimate in power uptime and energy efficiency.

schneider-electric.com/masterpactmtz

Masterpact MTZ circuit breakers: a new digital user experience



* See technical specifications in this catalogue.

Masterpact MTZ circuit breakers overview

The comprehensive and **optimized** Masterpact MTZ range of circuit breakers covers your protection needs. Now featuring Digital Modules to **customize** Micrologic X control units.

Masterpact™ MTZ circuit breakers in three sizes

MTZ1

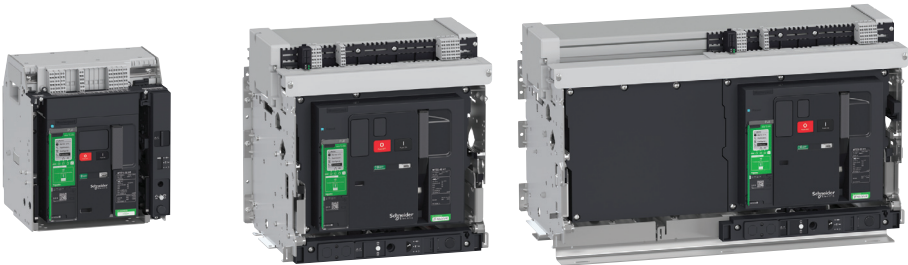
From 630 to 1600 A

MTZ2

From 800 to 4000 A

MTZ3

From 4000 to 6300 A



Micrologic™ X control units

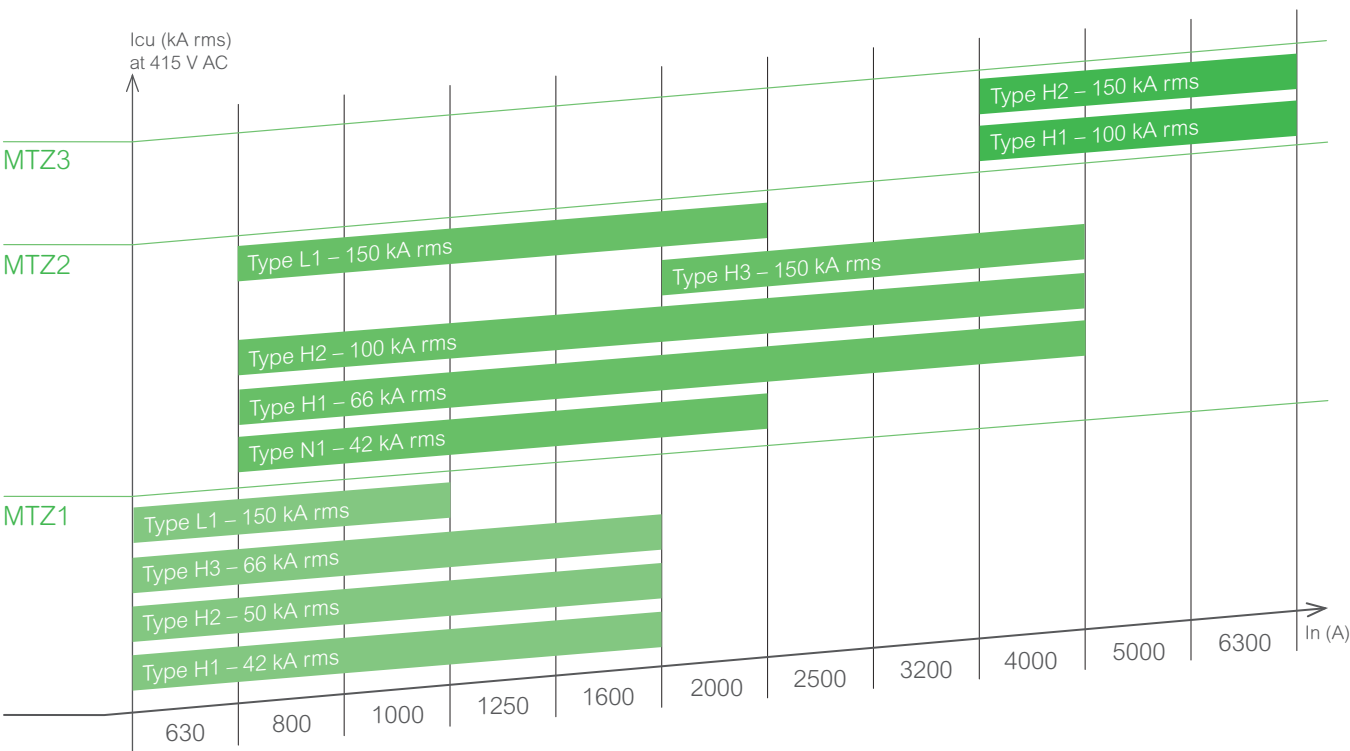
| 2.0X | 5.0X | 6.0X | 7.0X |

Only four references



Five performance levels

N1, H1, H2, H3, L1



Circuit breakers

A

PB115335 50-amp

From 630 to 1600 A

Installation characteristics

7] For Masterpact MTZ2-H10 circuit breaker the Micrologic X control unit cannot be directly connected to the internal voltage pick-up on the downstream terminal. The external voltage pick-up option PTE associated with external voltage transformer shall be used (See page B-28).

Selection guide

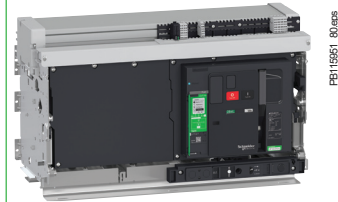
Circuit breakers

A



Masterpact MTZ2

From 800 to 4000 A



Masterpact MTZ3

From 4000 to 6300 A

Type	N1	H1	H2	H3	L1	H10 ^[6]	Type	H1	H2
MTZ2 08	800	800	800		800	800			
MTZ2 10	1000	1000	1000		1000	1000			
MTZ2 12	1250	1250	1250		1250	1250			
MTZ2 16	1600	1600	1600		1600	1600			
MTZ2 20	2000	2000	2000	2000	2000	2000			
MTZ2 25		2500	2500	2500		2500			
MTZ2 32		3200	3200	3200		3200			
MTZ2 40		4000	4000	4000		4000	MTZ3 40	4000	4000
							MTZ3 50	5000	5000
							MTZ3 63	6300	6300
	B	B	B	B	B	B		B	B
	42	66	100	150	150	-		100	150
	-	-	-	-	-	50		-	-
	42	66	100	150	150	-		100	150
	-	-	-	-	-	50		-	-
	42	66	85	66	30	50		100	100
	42	66	85	66	30	50		100	100
	22	36	50	66	30	50		100	100
	L	L or R ^[5]	L or R ^[5]	L	L	L		L or R ^[5]	L or R ^[5]
	⊙	⊙	⊙	⊙	⊙	⊙ ^[7]		⊙	⊙

N1	H1	H2	H3	L1	H10	H1	H2
⊙	⊙ ^[3]	⊙ ^[3]	⊙ ^[3]	⊙		⊙ ^[4]	⊙ ^[4]
⊙	⊙	⊙	⊙	⊙	⊙	⊙ ^[4]	⊙ ^[4]
⊙	⊙ ^[3]	⊙ ^[3]	⊙	⊙		⊙	⊙
⊙	⊙	⊙	⊙	⊙		⊙ ^[4]	⊙ ^[4]
439 x 441 x 403						479 x 786 x 403	
439 x 556 x 403						479 x 1016 x 403	
352 x 422 x 300						352 x 767 x 300	
352 x 537 x 300						352 x 997 x 300	
90/120						225/300	
50/65						120/160	

Selection guide

Switch-disconnectors

A

Selection criteria



Masterpact MTZ1
From 630 to 1600 A

Type

Rated current (A) at 40/50 °C ^[1]

Type

HA

MTZ1 06	630
MTZ1 08	800
MTZ1 10	1000
MTZ1 12	1250
MTZ1 16	1600

Switch-disconnector (as per IEC/EN 60947-3)

Rated making capacity Vac 50/60 Hz	I _{cm} (kA)	at 690 V	75
		at 1150 V	-
Rated short-time withstand current Vac 50/60 Hz	I _{cs} (kA rms)	1 s	36
Utilisation category ^[2]			AC23A

Unprotected circuit breaker (tripping by shunt trip as per IEC/EN 60947-2)

External protection relay: short-circuit protection, maximum delay: 400 ms ^[2]

Ultimate breaking capacity Vac 50/60 Hz	I _{cu} (kA rms) at 415 V	-
Rated service breaking capacity	I _{cs} (kA rms) % I _{cu}	-
Rated short-time withstand current Vac 50/60 Hz	I _{cs} (kA rms) 1 s	-
	3 s	-
Rated making capacity Vac 50/60 Hz	I _{cm} (kA) at 220 to 690 V	-
Position of neutral (Left: L, Right: R)		L or R

Installation characteristics

Type	HA
Connection	
Drawout, front	⊙
Drawout, rear	⊙
Fixed, front	⊙
Fixed, rear	⊙
Dimensions (mm) H x W x D	
Drawout 3P	322 x 288 x 291
Drawout 4P	322 x 358 x 291
Fixed 3P	301 x 276 x 209
Fixed 4P	301 x 346 x 209

Weight (kg) approximate

Drawout 3P/4P	30/39
Fixed 3P/4P	14/18

^[1] 50 °C for rear vertical connected only, refer to temperature derating tables for other connection types.

^[2] For details on unprotected circuit breaker and utilisation category AC23A, see page A-10.

^[3] No front connection for 4000 A.

^[4] No horizontal rear connection for 6300 A.

^[5] MTZ2-H10 dedicated to 1000 V systems.

Characteristics and performance

Switch-disconnectors

A

Common characteristics		MTZ1	MTZ2 & MTZ3	MTZ2 H10
Number of poles		3/4	3/4	3/4
Rated insulation voltage	Ui (V)	1000	1000	1250
Impulse withstand voltage	Uimp (kV)	12	12	12
Rated operational voltage	Ue (Vac 50/60 Hz)	690	690	1150
Suitability for isolation	IEC/EN 60947-2			
Degree of pollution	IEC 60664-1	3	3	3

Characteristics

Masterpact MTZ1

From 630 to 1600 A

Switch-disconnector as per IEC/EN 60947-3 and Annex A

Masterpact		06	08	10	12	16
Rated current at 40/50 °C ^[1]	In (A)	630	800	1000	1250	1600
Type of Masterpact		HA			HA	
Rated making capacity	Icm (kA)	220...690 V	75		75	
AC23A/AC3 category Vac 50/60 Hz		1150 V	-		-	
Rated short-time withstand current	Icw (kA rms)	0.5 s	36			
AC23A/AC3 category Vac 50/60 Hz		1 s	36			
		3 s	20			

Unprotected circuit breaker - Tripping by shunt trip as per IEC/EN 60947-2

Type of Masterpact		
Ultimate breaking capacity AC 50/60 Hz	Icu (kA rms)	220...690 V
Rated service breaking capacity	Ics (kA rms)	% Icu
Rated short-time withstand current	Icw (kA rms)	1 s
		3 s
Rated making capacity Vac 50/60 Hz	Icm (kA)	220...690 V
Overload and short-circuit protection		-
External protection relay: short-circuit protection, maximum delay: 400 ms ^[2]		

Durability as per IEC/EN 60947-2/3

Mechanical durability ^[4]		MTZ1 06 to 10		MTZ1 12 to 16		
Mechanical durability, C/O cycles x 1000	with periodic preventive maintenance	12.5		12.5		
Electrical durability ^[4] at Rated operational current Ie in AC23A ^[3]		MTZ1 06 to 12 630 to 1000 A		MTZ1 16 1600 A		
Type of Masterpact		HA				
Electrical durability, C/O cycles x 1000 IEC/EN 60947-3	440 V	6	6	6		
	690 V	3	3	3		
	1150 V	-	-	-		
Electrical durability ^[4] at Rated operational current Ie in AC3 ^[3]		MTZ1 06 to 10 500 A		630 A	800 A	1000 A
Type of Masterpact		HA				
Motor power (kW)	380/415 V	≤ 250	250 to 335	335 to 450	450 to 560	
	440 V	≤ 300	300 to 400	400 to 500	500 to 630	
	690 V	-	-	-	-	
Electrical durability, C/O cycles x 1000 IEC/EN 60947-3 and IEC/EN 60947-4-1	440 V	6				
	690 V	-				

[1] 50 °C: rear vertical connected. Refer to temperature derating tables for other connection types.

[2] External protection must comply with permissible thermal constraints of the circuit breaker (please consult us).
No fault-trip indication by the SDE or the reset button.

[3] For details on utilisation category AC3 and AC23A, see page A-10.

[4] The term "durability" is used to express the expectancy of the number of the operating cycles which can be performed by the device.

Utilisation category

A

Selectivity category A and B (IEC/EN 60947-2)

The Selectivity category is defined by the IEC/EN 60947-2 : 2013 standard:

■ Selectivity category A:

Circuit breakers not specifically intended for selectivity under short-circuit conditions with respect to other short-circuit protective devices in series on the load side, i.e. without an intentional short-circuit delay provided for selectivity under short-circuit conditions, and therefore without a short-circuit withstand current rating according to 4.3.5.4.

■ Selectivity category B:

Circuit breakers specifically intended for selectivity under short-circuit conditions with respect to other short-circuit protective devices in series on the load side, i.e. with an intentional short-circuit delay (which may be adjustable), provided for selectivity under short-circuit conditions. Such circuit breakers have a short-circuit withstand current rating according to 4.3.5.4.

Note: Selectivity is not necessarily ensured up to the ultimate short-circuit breaking capacity of the circuit breakers (for example in the case of operation of an instantaneous release) but at least to the value specified in Table 3.

The selectivity between Masterpact MTZ category B circuit breakers is guaranteed up to the rated short-time withstand current (I_{cw}).

When $I_{cu} > I_{cw}$, the circuit breakers integrate an instantaneous override protection (DIN) which operates above I_{cw} .

On top of the selectivity category, the selectivity performance between 2 circuit breakers depends on the Micrologic X control units type and on their settings. Please refer to the selectivity tables in the Complementary Technical Guide or to the Schneider Electric calculation tools.

DIN-DINF

Masterpact MTZ circuit breakers integrate two types of instantaneous short-circuit protection :

- 1: A "DIN" (Instantaneous override protection) active when the circuit breaker is closed. The DIN is activated above I_{cw} . It operates on the instantaneous value of the current.
- 2: A "DINF" (Instantaneous making over-current release) intended to instantaneously trip the circuit breaker in case of closing on a short-circuit current higher than its threshold. The DINF operates on the instantaneous value of the current. The DINF is disabled around 50 ms after the circuit breaker closing.

Unprotected circuit breaker

Circuit breaker without integrated protection control unit. The protection is ensured by an external protection relay which trips the circuit breaker MX or MN tripping coil. The rated short-time withstand current (I_{cw}) of the circuit breaker shall be higher than the maximum expected short-circuit current on the protected circuit.

Utilisation category AC23A

Defined in standard for Switches (IEC/EN 60947-3); applies to devices specifically intended for the switching of motor loads or other highly inductive loads.

Utilization categories with suffix A (e.g. "AC23A") designate devices which are intended for frequent operation. The corresponding number of operating cycles with the associated operational currents are specified in table 4 of IEC/EN 60947-3.

Utilisation category AC3

Defined in standard for Contactors and motor starters (IEC/EN 60947-4-1); applies to devices specifically intended for the switching of asynchronous squirrel-cage motors.

Overview of functions

B

Measurement

Energy management is the challenge of present & future generations. To meet this requirement Micrologic X incorporates all the measuring functions of a power meter including **Energy Class 1 accuracy** third-party party certified.

Diagnostics & Maintenance

Optimal continuity of services as well as extended life of equipment is one of customers main concerns. For that purpose **Micrologic X integrates new extended diagnosis** and assistance to maintenance.

Protection

Improvement of the reliability of Micrologic X, dual settings and additional facilities **increase the performance and the flexibility** of low voltage systems of protection.



4 Optional 24/7 downloadable digital modules dedicated to upgrading Micrologic X

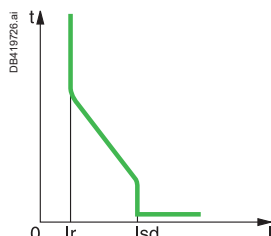
- Energy per phase
- Power restoration assistant
- Masterpact operation assistant
- Waveform capture on trip event

Communication

- It is now usual to make available most of the information processed by a Protection Control Unit, locally for network operation and maintenance, and remotely for higher functions of control, monitoring, energy efficiency and assets management.
- To comply with this requirement Micrologic X, **incorporates several channels of communication, including Ethernet and wireless communication facilities.**

> Protection for ...

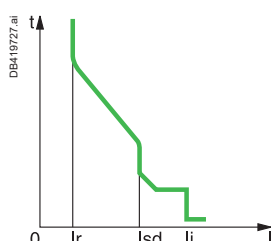
... Micrologic 2.0X



LI: Long-time
+ Instantaneous



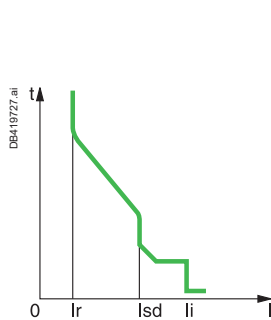
... Micrologic 5.0X



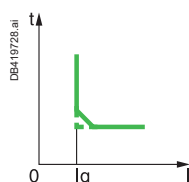
LSI: Long-time
+ Short-time
+ Instantaneous



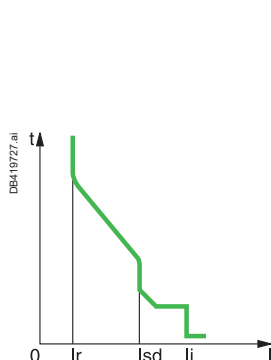
... Micrologic 6.0X



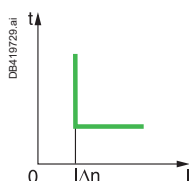
LSIG: Long-time
+ Short-time
+ Instantaneous
+ Earth fault



... Micrologic 7.0X



LSIV: Long-time
+ Short-time
+ Instantaneous
+ Earth leakage



> Additional features of protections (page B-8)

Along with the LSIGV protections, new additional features and facilities allow to improve the protection performance of a system when difficulties are met such as low values of the short circuit current or the need to limit the thermal constraints to the equipment: dual setting, fine setting, zone selective interlock, fast tripping.

> Measurement (page B-14)

Micrologic X measures all electrical parameters of an electrical network: Currents, voltages, frequency, power, energy power factor, current and power demand. Min/Max and average values are calculated for most of the parameters. Optional digital modules allow the measurement of energy per phase, and to perform wave form capture.

> Diagnostics & Maintenance (page B-22)

Diagnostic features are intended to limit the risk of power interruptions and to re-energize the installation as quickly as possible after a trip.

They provide warnings and messages to help the user in scheduling both preventive and predictive maintenance, and device replacement.

> Communication (page E-1)

New generation Micrologic X incorporates wireless technology (Bluetooth and NFC) that allow to get most of the critical information (protection, measurements, diagnostics and maintenance) inside your mobile device by means of Masterpact MTZ mobile App. Alternatively, Masterpact MTZ can be equipped with ETHERNET communication through either IFE module or the new embedded EIFE that includes embedded webpages.

> Optional digital modules (page C-1)

As an option four digital modules are available on Schneider Electric WEB Site. They can be downloaded 24/7 to upgrade Micrologic X.

Section 6.2

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>

Section 6.1

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>
Moulded Case Circuit Breakers	NSX & NS	Schneider

PacT Series

ComPacT

NSX & NSXm

Catalog 2021

Molded-Case Circuit Breakers
and Switch-Disconnectors
from 16 to 630 A - up to 690 V



Characteristics and Performance

ComPacT NSX Circuit Breakers from 400 to 630 A up to 690 V



ComPacT NSX630 HB2

Common Characteristics

Rated voltages	Insulation voltage (V)	Ui	800
	Insulation voltage for ELCB [4]		500
	Impulse withstand voltage (kV)	Uimp	8
	Operational voltage (V)	Ue AC 50/60 Hz	690
	Operation voltage for ELCB [4]	Ue AC 50/60 Hz	440
Suitability for isolation		IEC/EN 60947-2	yes
Utilization category			A
Pollution degree		IEC 60664-1	3

Circuit Breakers

Breaking Capacity Levels

Electrical characteristics as per IEC/EN 60947-2

Rated current (A)	In	40 °C
Number of poles		

Breaking capacity (kA rms)

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

Service breaking capacity (kA rms)

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

Durability (C-O cycles)	Mechanical		
	Electrical	440 V	In/2
			In
		690 V	In/2
			In

Characteristics as per UL 60947-4-1

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

Protection and Measurements

Short-circuit protection	Magnetic only
Overload/short-circuit protection	Thermal magnetic
	Electronic
	With neutral protection (Off-0.5-1-OSN) [1]
	With ground-fault protection
	With zone selective interlocking (ZSI) [2]

Display/I, U, f, P, E, THD measurements/interrupted-current measurement

Options	Power meter display on door
	Operating assistance
	Counters
	Histories and alarms
	Metering Com
	Device status/control Com
Earth-leakage protection	By VigiPacT add-on [3]
	By VigiPacT relay

Installation/Connections

Dimensions and weights

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

Connections

Connection terminals	Pitch	With/without spreaders
Large Cu or Al cables	Cross-section	mm²

Source-Changeover System

Manual mechanical interlocking

Automatic source-changeover

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

[2] ZSI: Zone Selective Interlocking using pilot wires.

[3] VigiPacT add-on is not available for breaking capacity levels HB1/HB2.

[4] Earth Leakage Circuit Breaker (MicroLogic Vigi 4.3 and 7.3 E)

Characteristics and Performance

ComPacT NSX Circuit Breakers from 400 to 630 A up to 690 V

A

Common Characteristics

Control	Manual	With toggle	
		With direct or extended rotary handle	
Versions	Electrical	With remote control	
	Fixed		
	Withdrawable	Plug-in base	
		Chassis	

NSX400									NSX630									Ir = 225 - 500 A			Ir = 501 - 630 A		
F	N	H	S	L	R	HB1	HB2		F	N	H	S	L	R	HB1	HB2		R	HB1	HB2	R	HB1	HB2
400									630									630			630		
3, 4									3, 4									3, 4			3, 4		
40	85	100	120	150	200	-	-		40	85	100	120	150	200	-	-		200	-	-	200	-	-
36	50	70	100	150	200	-	-		36	50	70	100	150	200	-	-		200	-	-	200	-	-
30	42	65	90	130	200	-	-		30	42	65	90	130	200	-	-		200	-	-	200	-	-
25	30	50	65	70	80	85	100		25	30	50	65	70	80	85	100		80	85	100	80	85	100
20	22	35	40	50	65	80	100		20	22	35	40	50	65	80	100		65	80	100	65	80	100
10	10	20	25	35	45	75	100		10	10	20	25	35	45	75	100		45	75	100	45	75	100
40	85	100	120	150	200	-	-		40	85	100	120	150	200	-	-		200	-	-	200	-	-
36	50	70	100	150	200	-	-		36	50	70	100	150	200	-	-		200	-	-	200	-	-
30	42	65	90	130	200	-	-		30	42	65	90	130	200	-	-		200	-	-	200	-	-
25	30	50	65	70	80	85	100		25	30	50	65	70	80	85	100		80	85	100	80	85	100
10	11	11	12	12	65	80	100		10	11	11	12	12	65	80	100		-	-	-	-	-	-
10	10	10	12	12	45	75	100		10	10	10	12	12	45	75	100		-	-	-	-	-	-
15000					15000				15000					15000									
12000					12000				8000					8000									
6000					6000				4000					4000									
6000					6000				6000					6000									
3000					3000				2000					2000									
85	85	85	-	-	-	-	-		85	85	85	-	-	-	-	-		-	-	-	-	-	-
35	50	65	-	-	-	-	-		35	50	65	-	-	-	-	-		-	-	-	-	-	-
20	10	20	-	-	-	-	-		20	20	20	-	-	-	-	-		-	-	-	-	-	-

-	-

140 x 255 x 110	140 x 255 x 110
185 x 255 x 110	185 x 255 x 110
6.05	6.2
7.90	8.13
45/52.5 mm	45/52.5 mm
45/70 mm	45/70 mm
4 x 240	4 x 240

Characteristics and Performance

ComPacT NSXm Switch-Disconnectors from 50 to 160 A NA

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



ComPacT NSXm switch-disconnectors

Common Characteristics

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

Switch-Disconnectors

Electrical characteristics as per IEC/EN 60947-3

Conventional thermal current (A) Ith 40 °C

Number of poles

Operational current (A) depending on the utilization category	Ie	AC 50/60 Hz	220/240 V
			380/415 V
			440/480 V
			500/525 V
			660/690 V

Short-circuit making capacity (kA peak)	Icm	min. (switch-disconnector alone) max. (protection by upstream circuit breaker)
---	-----	---

Rated short-time withstand current (A rms)	Icw	for	1 s
			3 s
			20 s

Durability (C-O cycles)	Mechanical		
	Electrical	AC	
		440 V	Ie/2
			Ie
		690 V	Ie/2
			Ie

Positive contact indication

Pollution degree

Additional indication and control auxiliaries

Indication contacts

Voltage releases	MX shunt trip release
	MN undervoltage release

Installation/connections

Dimensions and Weights

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

Connections

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

Source-changeover systems

Manual mechanical interlocking

[1] Al up to 100 A.

Characteristics and Performance

ComPacT NSXm Switch-Disconnectors from 50 to 160 A NA

A

Common Characteristics

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

	NSXm50NA	NSXm100NA	NSXm160NA
	50	100	160
	3, 4	3, 4	3, 4
	AC22A/AC23A	AC22A/AC23A	AC22A/AC23A
	50	100	160/100
	50	100	160/100
	50	100	160/100
	50	100	160/100
	50	100	160/100
	1.28	2.13	2.13
	150	150	150
	900	1500	1500
	900	1500	1500
	200	335	335
	20000	20000	20000
	AC22A/AC23A	AC22A/AC23A	AC22A/AC23A
	20000/20000	20000/20000	20000/20000
	10000/10000	10000/10000	10000/10000
	10000/6000	10000/6000	10000/6000
	5000/3000	5000/3000	5000/3000
	3	3	3
	81 x 137 x 80		
	108 x 137 x 80		
	1.06		
	1.42		
	27		
	35		
	95		
	70		
	120		
	95		

Characteristics and Performance

ComPacT NSX Switch-Disconnectors from 100 to 630 A NA

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

Common Characteristics

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

Switch-Disconnectors

Electrical characteristics as per IEC/EN 60947-3

Conventional thermal current (A) Ith 50 °C

Number of poles

Operational current (A) depending on Ie the utilization category	AC 50/60 Hz	
	220/240 V	
	380/415 V	
	440/480 V	
	500/525 V	
	660/690 V	
	DC	
	250 V (1 pole)	
	500 V (2 poles in series)	
	750 V (3 poles in series)	

Short-circuit making capacity (kA peak) Icm Min. (switch-disconnector alone)
Max. (protection by upstream circuit breaker)

Rated short-time withstand current (A rms) Icw for 1 s
3 s
20 s

Durability (C-O cycles)

Mechanical

Electrical

AC

440 V

In/2

690 V

In/2

In

DC

250 V (1 pole) and In/2

500 V (2 poles in series) In

Positive contact indication

Pollution degree

Protection

Add-on earth-leakage protection By VigipacT add-on

By VigipacT relay

Additional indication and control auxiliaries

Indication contacts

Voltages releases

MX shunt release

MN undervoltage release

Current-transformer module

Insulation monitoring module

Remote communication by bus

Device-status indication

Device remote operation

Operation counter

Installation/connections

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

Source-changeover systems

(see chapter on Source-changeover systems)

Manual mechanical interlocking

Automatic source-changeover



ComPacT NSX100 to 250 NA



ComPacT NSX400 to 630 NA

> Discover Schneider Electric specific switch-disconnectors offer: ComPacT INS/INV



LVPED213024EN

[1] 2P in 3P case.

Characteristics and Performance

ComPacT NSX Switch-Disconnectors from 100 to 630 A NA

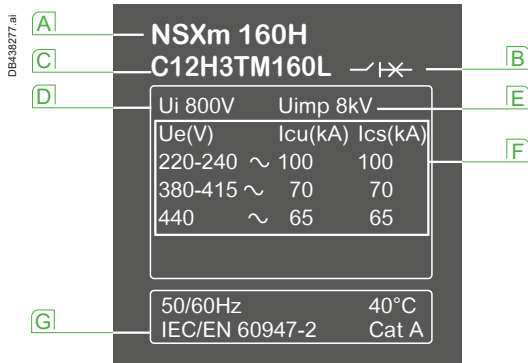
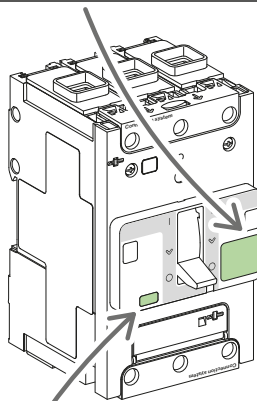
A

Common Characteristics

Control	Manual	With toggle	
		With direct or extended rotary handle	
Versions	Electrical	With remote control	
	Fixed		
	Withdrawable	Plug-in base	
		Chassis	

NSX100NA	NSX160NA	NSX250NA	NSX400NA	NSX630NA
100	160	250	400	630
2 [1], 3, 4	2 [1], 3, 4	2 [1], 3, 4	3, 4	3, 4
AC22A/AC23A	AC22A/AC23A	AC22A/AC23A	AC22A/AC23A	AC22A/AC23A
100	160	250	400	630
100	160	250	400	630
100	160	250	400	630
100	160	250	400	630
100	160	250	400	630
DC22A/DC23A	DC22A/DC23A	DC22A/DC23A	-	-
100	160	250	-	-
100	160	250	-	-
100	160	250	-	-
2.6	3.6	4.9	7.1	8.5
330	330	330	330	330
1800	2500	3500	5000	6000
1800	2500	3500	5000	6000
690	960	1350	1930	2320
50000	40000	20000	15000	15000
AC22A/AC23A	AC22A/AC23A	AC22A/AC23A	AC22A/AC23A	AC22A/AC23A
35000	30000	15000	10000	6000
20000	15000	7500	5000	3000
15000	10000	6000	5000	3000
8000	5000	3000	2500	1500
10000	10000	10000	-	-
5000	5000	5000	-	-
3	3	3	3	3
105 x 161 x 86			140 x 255 x 110	
140 x 161 x 86			185 x 255 x 110	
1.5 to 1.8			5.2	
2.0 to 2.2			6.8	

General Characteristics of the ComPacT Range



Ir(A) 63/160
In=60A

Standardized characteristics indicated on the rating plate:

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

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



Compliance with Standards

ComPacT NSX and NSXm circuit breakers and switch-disconnectors comply with the following:

- International standards
 - IEC 60947-1: general rules
 - IEC 60947-2: circuit breakers
 - IEC 60947-3: switch-disconnectors
 - IEC 60947-4-1: contactors and motor starters ^[1]
 - IEC 60947-5-1 and following: control circuit devices and switching elements; automatic control components
- European standards (EN 60947-1, EN 60947-2, EN 60947-3, EN 60947-4-1 and EN 60947-5-1)
- China CCC
- EAC (Customs Union)
- The specifications of the marine classification companies (Bureau Veritas, Lloyd's Register of Shipping, Det Norske Veritas, etc.), recommendations issued by the CNOMO organization.

Pollution Degree

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

Climatic Withstand

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

Dry cold and dry heat

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

Damp heat (tropicalization)

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

Environment

ComPacT NSX and NSXm respects the European environment directive 2011/65/EU (amendment 2015/863/EU) concerning the restriction of hazardous substances (RoHS) and is Green Premium.

Product environment profiles (PEP) have been prepared, describing the environmental impact of every product throughout its life cycle, from production to the end of its service life.

All ComPacT production sites have set up an environmental management system certified ISO 14001.

Each factory monitors the impact of its production processes. Every effort is made to prevent pollution and to reduce consumption of natural resources.

Ambient Temperature

- ComPacT NSX and NSXm circuit breakers may be used between -25 °C and +70 °C. For temperatures higher than 40 °C, (for ComPacT NSX: +65 °C for circuit breakers used to protect motor feeders) devices must be derated (pages E-8 to E-9 and E-14 to E-17).
- Circuit breakers should be put into service under normal ambient, operating-temperature conditions. Exceptionally, the circuit breaker may be put into service when the ambient temperature is between -35 °C and -25 °C.
- The permissible storage temperature range for ComPacT NSX and NSXm circuit breakers in the original packing is -50 °C ^[2] ^[3] and +85 °C.

^[1] For ComPacT NSX

^[2] For ComPacT NSXm: -40 °C for ComPacT NSXm MicroLogic Vigi 4.1.

^[3] For ComPacT NSX: -40 °C for MicroLogic Vigi 4, MicroLogic 5, MicroLogic 6 and MicroLogic Vigi 7.

Select Circuit Breakers and Switch-Disconnectors

General Characteristics of the ComPacT Range

Electromagnetic Compatibility

ComPacT NSX and NSXm devices are protected against:

- Overvoltages caused by circuit switching (e.g. lighting circuits)
- Overvoltages caused by atmospheric disturbances
- Devices emitting radio waves such as mobile telephones, radios, walkie-talkies, radar, etc.
- Electrostatic discharges produced by users.

Immunity levels for ComPacT NSXm comply with the standards below.

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

Suitable for Isolation with Positive Contact Indication

All ComPacT NSX and NSXm devices are suitable for isolation as defined in IEC standard 60947-2:

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

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

The isolation function is certified by testing:

- The mechanical reliability of the position-indication system
 - The absence of leakage currents
 - Overvoltage withstand capacity between upstream and downstream connections.
- The tripped position does not insure isolation with positive contact indication. Only the OFF position confirms isolation.

Installation in Class II Switchboards

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

Degree of Protection

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

Bare Circuit Breaker with Terminal Shields

- With toggle: IP40, IK07
- With direct rotary handle: IP40 IK07

Circuit Breaker Installed in a Switchboard

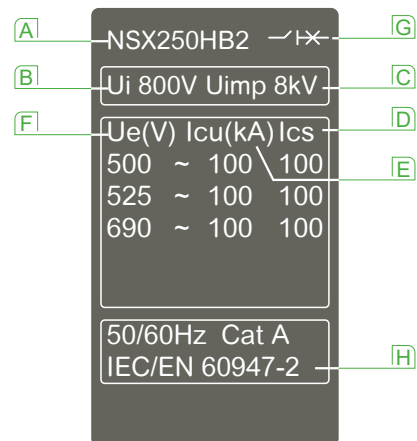
ComPacT NSXm

- With toggle: IP40, IK07
- With direct rotary handle: IP40, IK07
- With extended rotary handle: IP54 or IP65 IK08
- With side rotary handle: IP54 or IP65 IK08

ComPacT NSX

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

For more detail about IP, see [page E-7](#).



Standardized characteristics indicated on the rating plate:

- A** Type of device: frame size and breaking capacity class
- B** Ui: rated insulation voltage
- C** Uimp: rated impulse withstand voltage
- D** Ics: service breaking capacity
- E** Icu: ultimate breaking capacity for various values of the rated operational voltage Ue
- F** Ue: operational voltage
- G** Circuit breaker/switch-disconnector symbol
- H** Reference standard

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

ComPacT NSX Special Applications

High Performance at 690 V

ComPacT NSX R/HB1/HB2 circuit breaker is designed specifically for the needs of systems operating at 690 V.

A



ComPacT NSX100 to 250



ComPacT NSX400 to 630

Markets

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

Ability to Service High Power Densities

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

Safety

IACS (International Association of Classification Societies) change, requires Ics rating for emergency systems:

- Key influence on Marine systems of high Ics ratings
- Continuity of service after 3 faults.

Technology

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

Enhancing Solutions

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

Type I & II Coordination for Motor Applications

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

Compliance with Standards

ComPacT NSX circuit breakers and auxiliaries comply with the following:

- International recommendations
 - IEC 60947-1: general rules
 - IEC 60947-2: circuit breakers
 - IEC 60947-3: switch-disconnectors
 - IEC 60947-4: contactors and motor starters
 - IEC 60947-5.1 and following: control circuit devices and switching elements; automatic control components
- European (EN 60947-1, EN 60947-2, EN 60947-3, EN 60947-4-1 and EN 60947-5.1) and corresponding national standards
- China CCC
- EAC (Customs Union)
- The specifications of the marine classification companies (Bureau Veritas, Lloyd's Register of Shipping, Det Norske Veritas, etc.), recommendations issued by the CNOMO organization for the protection of machine tools.



Select Protection

Trip Unit Overview

Protection of Distribution Systems

ComPacT NSXm TM Thermal-Magnetic Trip Units	B-4
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ComPacT NSX Motor Protection

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ComPacT NSX Special Applications

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Select Protection

Trip Unit Overview

www.se.com

ComPacT NSXm has a built-in trip unit.

B

	ComPacT NSXm up to 160 A		ComPacT NSX up to 250 A	
	 <p>TM-D Distribution</p>	 <p>MicroLogic Vigi 4.1 Distribution and Earth Leakage Protection</p>	 <p>MA Distribution and Motors</p>	 <p>TM-D Distribution TM-G Generators</p>
Protections				
Standard protections	LI	LS ₀ IR	I	LI
Settings and indications	Pick-up set in amps using dials Non-adjustable time delay			
Front indication	☒	☒	☒	☒
Test connector		☒		
Self test	☒	☒	☒	☒
Measurements				
Embedded measurements ^[1]				
Diagnostic & Maintenance				
Status indication	☒	☒	☒	☒
Operating assistance				
Control				
Voltage release	☒	☒	☒	☒
Motor mechanism			☒	☒
Communication				
Modbus SL			☒	☒
Ethernet			☒	☒
Local display			☒	☒
Input/Output control				
SDx		☒		
I/O module			☒	☒
Earth Leakage				
Embedded protection		☒		
VigiPacT add-on module			☒	☒
VigiPacT relay	☒		☒	☒

[1] For more details, refer to page B-41.

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

ComPacT NSX up to 630 A

							
MicroLogic 2 and 1.3 100-250 A 400-630 A	MicroLogic 4 100-250 A 400-630 A	MicroLogic 5 and 6 100-250 A 400-630 A	MicroLogic 7 100-250 A 400-630 A	MicroLogic 2 and 1.3 100-250 A 400-630 A	MicroLogic 4 100-250 A 400-630 A	MicroLogic 5 and 6 100-250 A 400-630 A	MicroLogic 7 100-250 A 400-630 A
Distribution	Distribution and earth-leakage protection	Distribution and generators	Distribution and earth-leakage protection	Distribution	Distribution and earth-leakage protection	Distribution and generators	Distribution and earth-leakage protection
2.2 2.3	2.2 2.3	5.2 E/6.2 E 5.3 E/6.3 E	7.2 E 7.3 E	2.2 2.3	2.2 2.3	5.2 E/6.2 E 5.3 E/6.3 E	7.2 E 7.3 E
Service connection utilities	Service connection utilities	Motors		Service connection utilities	Service connection utilities	Motors	
2.2 AB 2.3 AB	4.2 AB 4.3 AB	6.2 E-M 6.3 E-M		2.2 AB 2.3 AB	4.2 AB 4.3 AB	6.2 E-M 6.3 E-M	7.2 E AL 7.3 E AL
Motors				Motors			
2.2 M 1.3 M/2.3 M				2.2 M 1.3 M/2.3 M			
Generators				Generators			
2.2 G 2.3 G				2.2 G 2.3 G			
LS ₀ I	LS ₀ I	LSI, LSIG	LSIR	LS ₀ I	LS ₀ I	LSI, LSIG	LSIR
Pick-up set in amps using dials				Pick-up set in amps using dials			
Non-adjustable time delay				Non-adjustable time delay			
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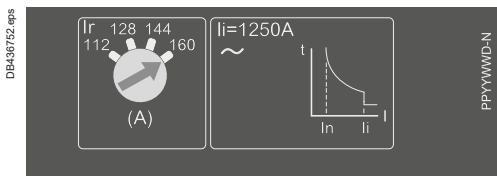
Protection of Distribution Systems

ComPacT NSXm TM Thermal-Magnetic Trip Units

ComPacT NSXm has a built-in thermal magnetic trip unit.



ComPacT NSXm 160



TM-D Thermal-Magnetic Trip Units

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

Protection

L Thermal Protection (I_r)

Thermal overload protection based on a bimetal strip providing an inverse time curve I^2t , corresponding to a temperature rise limit. Above this limit, the deformation of the strip trips the circuit breaker operating mechanism.

This protection operates according to:

- I_r that can be adjusted in amps from 0.7 to 1 times the rating of the circuit breaker (16 A to 160 A), corresponding to settings from 11 to 160 A for the range of products
- A non-adjustable time delay for cable protection.

I Magnetic Protection (I_i)

Short-circuit protection with a fixed pick-up I_i that initiates instantaneous tripping if exceeded with a non-adjustable time delay for selectivity and cascading.

Protection Versions

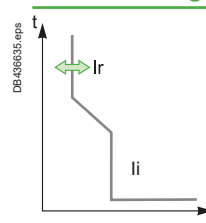
- 3-pole:
 - 3P 3D: 3-pole frame (3P) with detection on all 3 poles (3D)
- 4-pole:
 - 4P 3D: 4-pole frame (4P) with detection on 3 poles (3D)
 - 4P 4D: 4-pole frame (4P) with detection on all 4 poles (same threshold for phases and neutral).

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

Protection of Distribution Systems

ComPacT NSXm TM Thermal-Magnetic Trip Units

Thermal-Magnetic Trip Units TM16D to 160D



Ratings (A)	In at 40 °C ^[1]	16	25	32	40	50	63	80	100	125	160
Circuit breaker	ComPacT NSXm										
L Thermal protection											
Pick-up (A) tripping between 1.05 and 1.20 Ir	Ir = In x ...	Adjustable in amps from 0.7 to 1 x In									
Time delay (s)	tr	Non-adjustable									
I Magnetic protection											
Pick-up (A)	Ii	Fixed									
accuracy ±20 %	ComPacT NSXm	500	600	600	600	600	800	1000	1250	1250	1250
Time delay	tm	Fixed									
Neutral protection											
Unprotected neutral	4P 3D	No detection									
Fully protected neutral	4P 4D	1 x Ir									

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

B

Protection of Distribution Systems

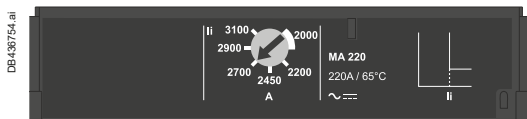
ComPacT NSX TM Thermal-Magnetic and MA Magnetic Trip Units

TM thermal-magnetic and MA magnetic trip units can be used on ComPacT NSX100/160/250 circuit breakers with performance levels B/F/N/H/S/L. TM trip units are available in 2 versions:

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



ComPacT NSX250 F



TM-D and TM-G Thermal-Magnetic Trip Units

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

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

Protection

L Thermal Protection (I_r)

Thermal overload protection based on a bimetal strip providing an inverse time curve I^2t , corresponding to a temperature rise limit. Above this limit, the deformation of the strip trips the circuit breaker operating mechanism.

This protection operates according to:

- I_r that can be adjusted in amps from 0.7 to 1 times the rating of the trip unit (16 A to 250 A), corresponding to settings from 11 to 250 A for the range of trip units
- A non-adjustable time delay for cable protection.

I Magnetic Protection (I_i)

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

- TM-D: fixed pick-up, I_i , for 16 to 160 A ratings and adjustable from 5 to 10 x I_n for 200 and 250 A ratings.
- TM-G: fixed pick-up for 16 to 250 A ratings.

Protection against insulation faults

Two solutions are possible by adding:

- A VigiPacT add-on acting directly on the trip unit of the circuit breaker
- A VigiPacT relay connected to an MN or MX voltage release.

Protection Versions

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

MA Magnetic Trip Units

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

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

Their main use is however for motor protection applications, in conjunction with a thermal relay and a contactor or motor starter.

Protection

I Magnetic Protection (I_i)

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

- $I_i = I_n \times \dots$ 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)

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

Protection of Distribution Systems

ComPacT NSX TM Thermal-Magnetic and MA Magnetic Trip Units

Thermal-Magnetic Trip Units TM16D to 250D

Ratings (A)	In at 40 °C [1]	16	25	32	40	50	63	80	100	125	160	200	250
Circuit breaker	ComPacT NSX100	●	●	●	●	●	●	●	●	-	-	-	-
	ComPacT NSX160	-	-	●	●	●	●	●	●	●	●	-	-
	ComPacT NSX250	-	-	-	-	-	●	●	●	●	●	●	●
L Thermal protection													
Pick-up (A) tripping between 1.05 and 1.20 Ir	Ir = In x ...	Adjustable in amps from 0.7 to 1 x In											
Time delay (s)	tr	Non-adjustable											
	tr at 1.5 x In	120 to 400											
	tr at 6 x Ir	15											
I Magnetic protection													
Pick-up (A) accuracy ±20 %	Ii	Fixed										Adjustable	
	ComPacT NSX100	190	300	400	500	500	500	640	800				
	ComPacT NSX160/250	190	300	400	500	500	500	640	800	1250	1250	5 to 10xIn	
Time delay	tm	Fixed											
Neutral protection													
Unprotected neutral	4P 3D	No detection											
Fully protected neutral	4P 4D	1 x Ir											

Thermal-Magnetic Trip Units TM16G to 250G

Ratings (A)	In at 40 °C [1]	16	25	40	63	80	100	125	160	200	250
Circuit breaker	ComPacT NSX100	●	●	●	●	●	●	-	-	-	-
	ComPacT NSX160	-	●	●	●	●	●	●	●	-	-
	ComPacT NSX250	-	-	-	-	-	-	-	●	●	●

L Thermal protection

Pick-up (A) tripping between 1.05 and 1.20 Ir

Ir = In x ...

Adjustable in amps from 0.7 to 1 x In

Time delay (s)

tr

Non-adjustable

tr at 1.5 x In

120 to 400

tr at 6 x Ir

-

I Magnetic protection

Pick-up (A) accuracy ±20 %

Ii

Fixed

ComPacT NSX100

63

80

80

125

200

320

-

-

-

-

ComPacT NSX160

-

80

80

125

200

320

440

440

-

-

ComPacT NSX250

-

-

-

-

-

-

440

440

520

Time delay

tm

Fixed

Neutral protection

Unprotected neutral

4P 3D

No

Fully protected neutral

4P 4D

1 x Ir

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

Magnetic Trip Units MA 2.5 to 220

Ratings (A)	In at 65 °C ^[1]	2.5	6.3	12.5	25	50	100 ^[1]	150	220
Circuit breaker	ComPacT NSX100							-	-
	ComPacT NSX160	-	-	-					-
	ComPacT NSX250	-	-	-	-	-			
<div>I</div> Instantaneous magnetic protection									
Pick-up (A) accuracy ±20 %	$I_i = I_n \times \dots$	Adjustable from 6 to 14 x In (settings 6, 7, 8, 9, 10, 11, 12, 13, 14)						Adjustable from 9 to 14 x In (settings 9, 10, 11, 12, 13, 14)	
Time delay (ms)	t_m	Fixed							

^[1] MA100 3P adjustable from 6 to 14 x In.

MA100 4P adjustable from 9 to 14 x In.

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

Protection of Distribution Systems

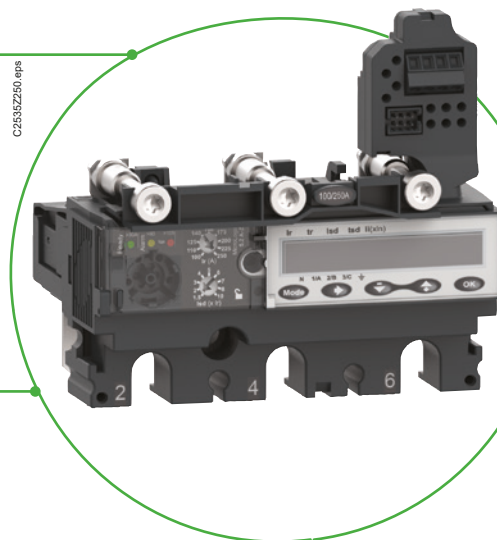
Function Overview

Measurement

Energy management is the challenge of present and future generations. To meet this requirement, MicroLogic E incorporates all the measuring functions of a power meter.

Diagnostics and Maintenance

Optimal continuity of services as well as extended life of equipment is one of customer main concerns. For that purpose MicroLogic E trip units contributes to corrective, preventive and predictive maintenance.



Protection

MicroLogic 5 (LSI), 6 (LSIG) and 7 (LSIR) offer a large long time delay setting range (0.4 to 1 xIn) and protection accuracy for a wide temperature range (-25 to +70 °C).

Communication

- Protection Control Unit, provides local information for network operation and maintenance, as well as remote information for higher functions of control, monitoring, energy efficiency and assets management.
- To comply with those requirements MicroLogic trip unit and Enerlin'X communication system provides access to status, electrical values and devices control using Ethernet and Modbus SL communication protocols.

Protection of Distribution Systems

ComPacT NSXm + NSX Circuit Breakers Trip Units

Understanding the Names of MicroLogic Electronic Trip Units				
Example: MicroLogic 6.3 E-M	6	3	E	M
	Protection	Frame	Measurements	Applications
	1: I 2: LS ₀ I 4: LS ₀ IR 5: LSI 6: LSIG 7: LSIR I: Instantaneous L: Long time R: Residual current S ₀ : Short time ^[2] (fixed delay) S: Short time G: Ground fault	1: NSXm 16 to 160  C12H44V160L eps 2: NSX 100/160/250  C25V36E250 eps 3: NSX 400/630  O3W36E630 eps	E: Energy  DB112156 eps	Distribution, otherwise G: Generator AB: Public distribution ^[1] M: Motors Z: 16 Hz 2/3 ^[1]
Examples				
MicroLogic 1.3	Instantaneous only	400 or 630 A	-	Distribution
MicroLogic 2.3	LS ₀ I	400 or 630 A	-	Distribution
MicroLogic Vigi 4.1	LS ₀ IR	16 to 160 A	-	Distribution
MicroLogic 5.2 E	LSI	100, 160 or 250 A	Energy	Distribution
MicroLogic 6.3 E-M	LSIG	400 or 630 A	Energy	Motor
MicroLogic 4.2	LS ₀ IR	100, 160 or 250 A	-	Distribution
MicroLogic 7.3	LSIR	400 or 630 A	Energy	Distribution

[1] AB-Z: except NSXm and NSX R, HB1, HB2.

[2] LS₀I protection is standard on MicroLogic 2. To allow selectivity, it offers short-time protection S₀ with a non-adjustable delay and instantaneous protection.

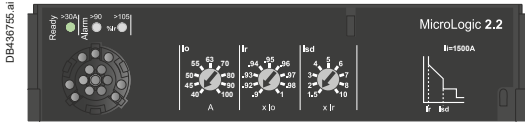
Select Protection

Protection of Distribution Systems ComPacT NSX MicroLogic 2 and 1.3 Trip Units

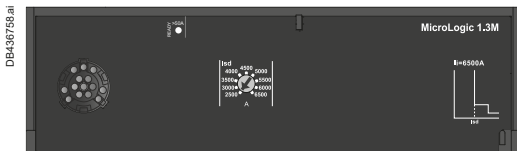
MicroLogic 2 trip units can be used on ComPacT NSX100 to 630 circuit breakers with performance levels B/F/N/H/S/L/R/HB1/HB2.

They provide:

- Standard protection of distribution cables
- Indication of:
 - Overloads (via LEDs)
 - Overload tripping (via the SDx relay module).



SDx remote indication relay module with its terminal block



MicroLogic 2

Circuit breakers equipped with MicroLogic 2 trip units can be used to protect distribution systems supplied by transformers. For generators and long cables, MicroLogic 2 G trip units offer better suited low pick-up solutions (see page B-50).

Protection

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

L Overloads: Long Time Protection (Ir)

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

S Short-Circuits: Short-Time Protection with Fixed Time Delay (Isd)

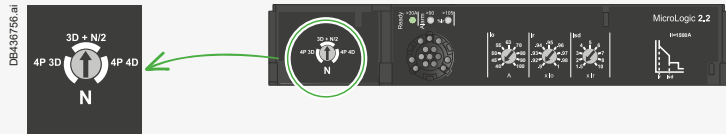
Protection with an adjustable pick-up Isd. Tripping takes place after a very short delay used to allow selectivity with the downstream device.

I Short-Circuits: Non-Adjustable Instantaneous Protection

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

Neutral Protection

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



Indications

Front Indications

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



Remote Indications

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

This module receives the signal from the MicroLogic electronic trip unit via an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is reclosed. For description, see page C-28.

MicroLogic 1.3 M for Magnetic Protection Only

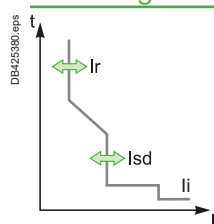
MicroLogic 1.3 M trip units provide magnetic protection only, using electronic technology. They are dedicated to 400/630 A 3-poles (3P 3D) circuit breakers or 4-pole circuit breakers with detection on 3 poles (4P, 3D) and are used in certain applications to replace switch-disconnectors at the head of switchboards. They are especially used in 3-poles versions for motor protection, see page B-30.

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

Protection of Distribution Systems

ComPacT NSX MicroLogic 2 and 1.3 Trip Units

MicroLogic 2



Ratings (A)	In at 40 °C [1]	40	100	160	250	400	630
Circuit breaker	ComPacT NSX100	●	●	-	-	-	-
	ComPacT NSX160	●	●	●	-	-	-
	ComPacT NSX250	●	●	●	●	-	-
	ComPacT NSX400	-	-	-	●	●	-
	ComPacT NSX630	-	-	-	●	●	●

L Long-time protection

Pick-up (A) tripping between 1.05 and 1.20 Ir	lo	Value depending on trip unit rating (In) and setting on dial								
In = 40 A	lo =	18	18	20	23	25	28	32	36	40
In = 100 A	lo =	40	45	50	55	63	70	80	90	100
In = 160 A	lo =	63	70	80	90	100	110	125	150	160
In = 250 A (NSX250)	lo =	100	110	125	140	160	175	200	225	250
In = 250 A (NSX400)	lo =	70	100	125	140	160	175	200	225	250
In = 400 A	lo =	160	180	200	230	250	280	320	360	400
In = 630 A	lo =	250	280	320	350	400	450	500	570	630
Ir = lo x ...		9 fine adjustment settings from 0.9 to 1 (0.9 - 0.92 - 0.93 - 0.94 - 0.95 - 0.96 - 0.97 - 0.98 - 1) for each value of lo								

Time delay (s) accuracy 0 to -20%	tr	Non-adjustable								
	1.5 x Ir	400								
	6 x Ir	16								
	7.2 x Ir	11								

Thermal memory 20 minutes before and after tripping

S₀ Short-time protection with fixed time delay

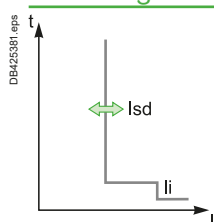
Pick-up (A) accuracy ±10 %	Isd = Ir x ...	1.5	2	3	4	5	6	7	8	10
Time delay (ms)	tsd	Non-adjustable								
	Non-tripping time	20								
	Maximum break time	80								

I Instantaneous protection

Pick-up (A) accuracy ±15 %	Ii non-adjustable	600	1500	2400	3000	4800	6900
	Non-tripping time	10 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.

MicroLogic 1.3 M



Ratings (A)	In at 65 °C [1]	320	500
Circuit breaker	ComPacT NSX400	●	-
	ComPacT NSX630	●	●

S Short-time protection

Pick-up (A) accuracy ±15 %	Isd	Adjustable directly in amps	
		9 settings: 1600, 1920, 2240, 2560, 2880, 3200, 3520, 3840, 4160 A	9 settings: 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500 A
Time delay (ms)	tsd	Non-adjustable	
	Non-tripping time	10	
	Maximum break time	60	

I Instantaneous protection

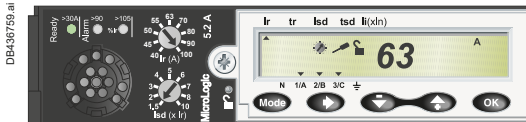
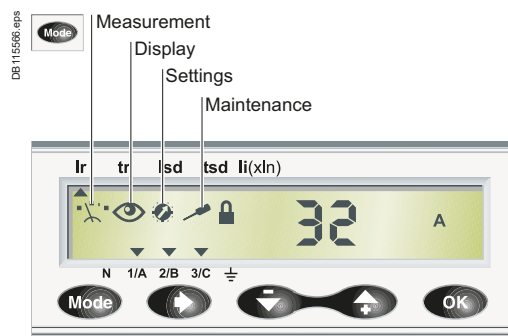
Pick-up (A) accuracy ±15 %	Ii non-adjustable	4800	6500
	Non-tripping time	0	
	Maximum break time	30 ms	

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

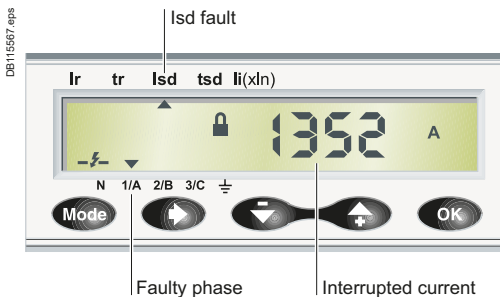
Protection of Distribution Systems

ComPacT NSX MicroLogic 5/6 E Trip Units

MicroLogic 5/6 E (Energy) trip units can be used on ComPacT NSX100 to 630 circuit breakers with performance levels B/F/N/H/N/S/L/R/HB1/HB2. They all have a display unit. They offer basic LSI protection (MicroLogic 5) or LSI and ground-fault protection G (MicroLogic 6). They also offer measurement, alarm and communication functions.



Trip unit menus



Display of interrupted current

Protection

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

L Overloads: Long Time Protection (Ir)

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

S Short-Circuits: Short-Time Protection (Isd)

Short-circuit protection with an adjustable pick-up I_{sd} and adjustable time delay tsd , with the possibility of including a portion of an inverse time curve (I^2t On).

I Short-Circuits: Instantaneous Protection (Ii)

Instantaneous protection with adjustable pick-up I_i .

G Ground Fault Protection (Ig) on MicroLogic 6

Residual type ground-fault protection with an adjustable pick-up I_g (with Off position) and adjustable time delay tg . Possibility of including a portion of an inverse time curve (I^2t On).

Neutral Protection

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

- Off: neutral unprotected
- 0.5: neutral protection at half the value of the phase pick-up, i.e. $0.5 \times I_r$
- 1.0: neutral fully protected at I_r
- OSN: Oversized neutral protection at 1.6 times the value of the phase pick-up. Used when there is a high level of 3rd order harmonics (or orders that are multiples of 3) that accumulate in the neutral and create a high current. In this case, the device must be limited to $I_r = 0.63 \times I_n$ for the maximum neutral protection setting of $1.6 \times I_r$.

■ With 3-pole circuit breakers, the neutral can be protected as an option by installing an external neutral sensor with the output (T1, T2) connected to the trip unit.

Zone Selective Interlocking (ZSI)

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

Display of Type of Fault

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

Indications

Front Indications



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

- Overload trip
- Overload prealarm (MicroLogic 5) or ground fault trip (MicroLogic 6).

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

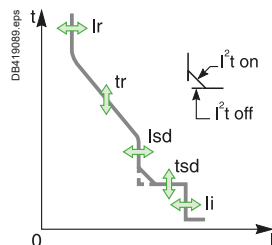
These outputs can be reprogrammed to be assigned to other types of tripping or alarm. The module is described in detail in the section dealing with accessories.

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

Protection of Distribution Systems

ComPacT NSX MicroLogic 5/6 E Trip Units

MicroLogic 5/6 E Trip Units



Ratings (A)	In at 40 °C [1]	40 [2]	100	160	250	400	630
Circuit breaker	ComPacT NSX100	●	●	-	-	-	-
	ComPacT NSX160	●	●	●	-	-	-
	ComPacT NSX250	●	●	●	●	-	-
	ComPacT NSX400	-	-	-	-	●	-
	ComPacT NSX630	-	-	-	-	●	●

L Long-time protection

Pick-up (A) tripping between 1.05 and 1.20 Ir	Ir = ...	Dial setting	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	Io =	100	110	125	140	160	175	200	225	250	
	In = 400 A	Io =	160	180	200	230	250	280	320	360	400	
	In = 630 A	Io =	250	280	320	350	400	450	500	570	630	
		Keypad setting	Fine adjustment in 1 A steps below maximum value set on dial									
Time delay (s) accuracy 0 to -20 %	tr = ...	Keypad setting	0.5	1	2	4	8	16				
		1.5 x Ir	15	25	50	100	200	400				
		6 x Ir	0.5	1	2	4	8	16				
		7.2 x Ir	0.35	0.7	1.4	2.8	5.5	11				

Thermal memory 20 minutes before and after tripping

S Short-time protection with adjustable time delay

Pick-up (A) accuracy ±10 %	Isd = Ir x ...	Dial setting for MicroLogic 5	1.5	2	3	4	5	6	7	8	10
		Keypad settings for MicroLogic 6	Fine adjustment in 0.5 x Ir steps using the keypad								
			Adjustment in steps of 0.5 x Ir over the range 1.5 x Ir to 10 x Ir								
Time delay (s)	tsd = ...	Keypad setting	I²Off	0	0.1	0.2	0.3	0.4			
		I²On	-	0.1	0.2	0.3	0.4				
	Non-tripping time (ms)			20	80	140	230	350			
	Maximum break time (ms)			80	140	200	320	500			

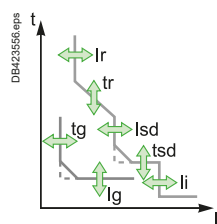
I Instantaneous protection

Pick-up (A) accuracy ±15 %	Ii = In x	Keypad setting	Adjustment in steps of 0.5 x In over the range 1.5 x In to: 15 x In (40 to 160 A), 12 x In (250 to 400 A) or 11 x In (630 A)								
	Non-tripping time		10 ms								
	Maximum break time		50 ms								

G Ground-fault protection - for MicroLogic 6 E

Pick-up (A) accuracy ±10 %	Ig = In x	Dial setting										
	In = 40 A		0.4	0.4	0.5	0.6	0.7	0.8	0.9	1	Off	
	In > 40 A		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1	Off	
			Fine adjustment in 0.05 A steps using the keypad									
Time delay (s)	tg = ...	Keypad setting	I²Off	0	0.1	0.2	0.3	0.4				
		I²On	-	0.1	0.2	0.3	0.4					
	Non-tripping time (ms)			20	80	140	230	350				
	Maximum break time (ms)			80	140	200	320	500				

Test Ig function Built-in



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

[2] For 40 A rating, the neutral N/2 adjustment is not possible.

Section 6.3

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>
MULTIFUNCTION METER	SMART X96 (MID)	EASTRON

- Three Phase 1/5A Current Transformer operated
- MID B+D Certified
- UL Registered
- Accuracy Class 0.5 (Active Energy)
- Bi-directional Measurement for kW and kWh
- Configurable Pulsed output (Import/ Export / Nett kWh)
- Modbus (SMART X96-5) or Mbus (SMART X96-5-Mbus)
- Multi Parameter measurement
- Phase Sequence indication
- Phase Summary Page
- 2nd~63rd Individual Harmonic Distortion
- Internal three phase supply
- Multi-Tariff
- Free Configuration software



The SMART X96 series is an advanced multifunction three-phase energy monitoring solution with optional outputs such as Pulsed, RS485 RTU Modbus and Mbus. Equipped with configuration and display buttons for ease of navigation through the various parameters and settings. Housed for 96mm panel mounting, IP51 protection and 1/5A current transformer operated. Selectable measurement modes using our free configurations software for kWh display, Total kWh (Import + Export), Import kWh and Net kWh (Export - Import) Certified in the UK according to EU Directive 2014/32/EU. MID Certificate number 0120 / SGS0288.

Specification table

Input	
Nominal input voltage	100-276V AC (L-N) 173-480V AC(L-L)
Max. continuous input overload voltage	120% of nominal
Max. short duration input voltage	2 x nominal voltage for 1 second
Nominal input voltage burden	< 0.2VA per phase
Nominal input current	1/5A
Nom. Input current burden	< 0.1 VA
Max. continuous input overload current	120% of nominal
Max. short duration input current	20 x nominal current for 1 second
Power supply	
Operating range	Self powered (from any of the three phases)
Supply burden	< 2W / 10 VA
Accuracy	
Voltage (V)	0.5% of range maximum
Current (A)	0.5% of range maximum
Frequency (Hz)	0.2% of mid-frequency
Power factor (PF)	1% of unity (0.01)
Active power (W)	1.0% of range maximum
Reactive power (VAr)	1.0% of range maximum
Apparent power (VA)	1.0% of range maximum
Active energy (kWh)	Class 0.5S IEC62053-22 Class 1.0 IEC62053-21
Reactive energy (kVarh)	1.0% of range maximum to IEC 62053-24
THD	2% to 63rd harmonic
Environment	
Operating temperature	- 25°C to +55°C
Storage temperature	-40°C to +70°C

Relative humidity	0 to 95%, non-condensing
Shock	30g in 3 planes
Vibration	10Hz to 50Hz, IEC 60068-2-6, 2g
Dielectric Voltage	4kV between voltage and current to earth
Altitude	3000m
Warm-up	1 minute

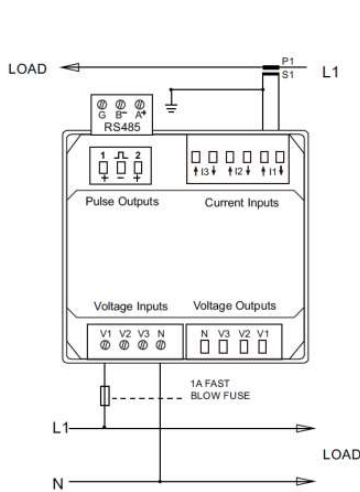
Outputs	
Pulsed output relay (configurable)	Opto-coupled, potential-free SPST-NO contact
Contact Rating current	2-27mA at 27V DC
Contact Rating voltage	5-27V DC
Pulse Width	60 / 100 / 200 ms
Pulse rate of S0 1	0.01 / 0.1 / 1 / 10 / 100 kWh/kVarh
Pulsed output of S0 2 (non-configurable)	3200IMP/kWh
Communications	Modbus RTU (RS485)
Type	2-wire half duplex
Baud rate	2400,4800, 9600, 19200, 38400
Address	1 to 247

Enclosure	
Enclosure Style	DIN 96 panel mount
Dimensions	96x96x62 mm
Panel cut-out	92x92mm
Panel thickness	1-2 mm
Protection rating	Ip51 (Indoor)
Material	UL 94-V0
Weight	340 g
Cable size	0.05mm-4mm stranded wire
Terminals	Voltage: Shrouded screw-clamp. Current: RJ12

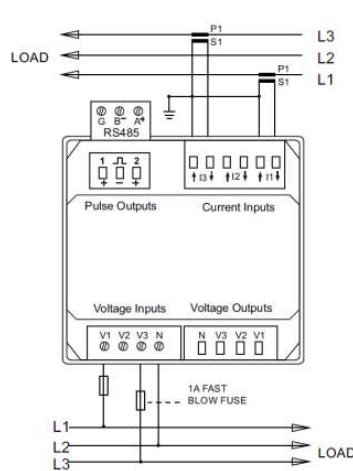
For more information on these products, please contact our sales team on 0203 758 3494 or email sales@eastroneurope.com

www.eastroneurope.com

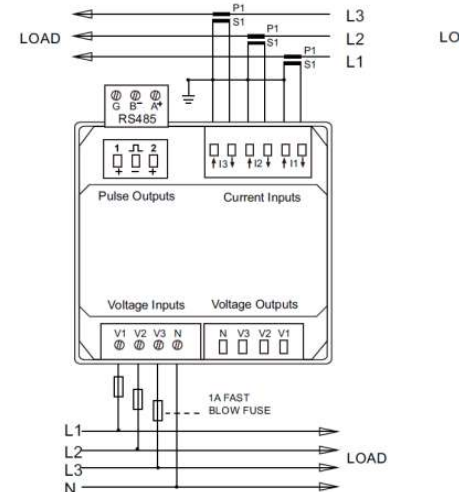
Wiring Configuration



Single phase two wires
(No Voltage Output on
SMART X96-5E Model)

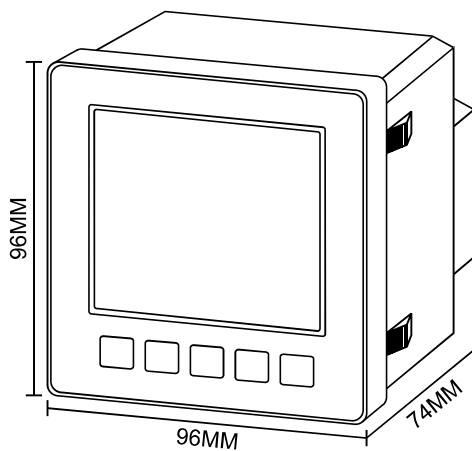


Three phase three wires
(N/A for SMART X96-5E Model)



Three phase four wires
(No Voltage Output on
SMART X96-5E Model)

Dimension Drawing



Ordering options

Meter Type	Description of Meter
SMART X96-5	Active Import/Export (kWh) 3x230/400V, 0.25-5(6)A, Transformer operated, Multifunction, RS485 Modbus RTU
SMART X96-5E	Active Import/Export (kWh) 3x230/400V, 0.25-5(6)A, Transformer operated, Multifunction, RS485 Modbus RTU, No THD, No Voltage Output and 1P2W and 3P4W only.

Conformity References

Electromagnetic Compatibility: EN61326-1:2013 & EN61326-2-3:2013

Low Voltage Directive: EN61010-1-2010 & EN61010-2-30-2010

MID DIRECTIVE: 2014/32/EU

Section 6.4

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>
Surge Supression	T1 + T2	ABB

ABB Surge & Lightning Protection Solutions

OVR T1-T2 3N 12.5-275s P
TS QS- **Type 1&2**

Technical Specification

Electrical Specification	OVR T1-T2 3N 12.5-275s P TS QS
Nominal Voltage - Phase Neutral U_o (RMS)	230V
Maximum Voltage - U_c (RMS/DC)	275V
Temporary Overvoltage TOV U_t	337V
Short circuit withstand capability	100kA/50Hz
Max. back-up fuse	160A

Transient Specification	OVR T1-T2 3N 12.5-275s P TS QS
TYPE 1 (BS EN/EN), Class 1 (IEC)	
Nominal discharge current 8/20 μ s	30kA
Let through voltage U_p at I_n	1.3kV
Impulse discharge current 10/350 μ s I_{imp} (per mode)	50kA
Let through voltage U_p at 3Ka	0.5kV

Description

Type 1+2 surge protective devices are designed to discharge high current surges without any destruction of the installation. These surge protective devices are characterized by their capacity to withstand impulse current with 10/350 μ s wave form which simulate natural lightning current

Pluggable cartridge, Integrated thermal disconnecter & Status indicator

Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

Use on three phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes

Section 6.6

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>

Section 6.7

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>

Section 6.8

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>

Section 6.9

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>

Section 5.10

<u>Equipment</u>	<u>Product Range</u>	<u>Manufacturer</u>

Section 6

Test Certification

1. Short Circuit Test Certification

<u>No.</u>	<u>Product Range</u>	<u>Certificate Number</u>	<u>Test Detail</u>	<u>Product Ref:</u>
1				
2				
3				
4				
5				

Section 7

Testing & Commissioning

The following is a copy of our standard test procedures to be carried out at our factory witness test

TESTING SCHEDULE (BS EN 61439-1)

WITNESSED/APPROVED

1. CHECK TORQUE SETTINGS OF ALL BOLTS

Check tightness of all Busbar joints, connections and support fixings

2. CHECK OVERALL QUALITY OF PANEL

Check quality of construction, paintwork and workmanship etc

3. CHECK TO DRAWINGS

Checking of produced drawings and equipment schedules with actual manufactured equipment

4. CHECK LABELS

Check details and location of fitted labels to General Arrangement Drawing(s)

5. CHECK CABLE SIZE

Check incoming and outgoing cable sizes and ensure adequate provisions have been allocated

6. CHECK EARTH BONDS

Ensure correct earth bonding throughout the panel

7. CHECK SHROUDING

Ensure all live operational materials are adequately shrouded and the correct Form of Segregation

8. CHECK PHASE LABELLING

Check correct phase labelling is completed for each device

9. INSULATION RESISTANCE TEST

Insulation Resistance Test of Busbar Systems completed at 1000V - Note MΩ readings

10. HIGH VOLTAGE TEST

High Voltage Test of Busbar System at 2.5KV for 5 Seconds per test - Note mA readings

11. CHECK PHASE CONTINUITY

Check the phase continuity from the main incoming device to each and every outgoing device

12. PRIMARY INJECTION TESTING

Restricted Earth Fault Relay

Reverse Power Relay

Main Incoming Multifunction Meter

ACB Control Unit

C.T Polarity

Outgoing Multifunction Meter(s)

Other Project Specific Specialist Equipment

13. CHECK AUTO CHANGEOVER CONTROLS

Check correct operation of Changeover Control Circuits
Check correct operation of Synchronisation Equipment

14. CHECK OPERATION OF CONTROL CIRCUITS & BMS Outputs

Check correct operation of Manual Interlocks
Check correct operation of all BMS Outputs

15. CHECK CLEANLINESS

Check Cleanliness and overall appearance of all equipment, internally and externally