



Technical catalogue - Preliminary

SACE FORMULA

New low voltage moulded-case circuit-breakers

FORMULA



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SACE FORMULA.

Simplicity and Quality in a Single Product.



[FORMULA

SACE FORMULA is the expression of all ABB SACE's long experience of several decades in all its effectiveness: SACE FORMULA was born basic, but is able to amaze with its extreme versatility of use.

The main strong points of the new moulded-case circuit-breakers are:

- just a few but essential versions of the circuit-breakers, easy to select and order;
- availability of circuit-breakers of all polarities, dedicated to the various different applications;
- possibility of using the accessories most often requested;
- circuit-breaker depths even further reduced;
- a new installation system making assembly of the circuit-breakers easier.

LA



The new SACE FORMULA family consists of three new A1, A2 and A3 frames which reach up to 125A, 250A and 630A respectively.

The three frames are available in the fixed version, with front terminals.

The protection trip unit has fixed thermal and magnetic threshold values for putting the circuit-breaker into service more rapidly. This way selection becomes simple and precise. Just a few sales codes which simplify selection and make ordering easier. Installation is also simplified, and thanks to easy and rapid fixing operations and set-up, the circuit-breaker is ready for use immediately.

SACE FORMULA.

The Easy and Precise Choice.

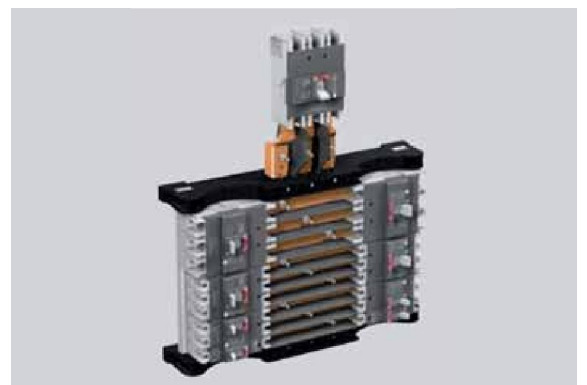


How simple and functional can a range of moulded-case circuit-breakers be? It was answering this question, which would appear very elementary, that the idea for a new family of circuit-breakers was conceived at ABB SACE.

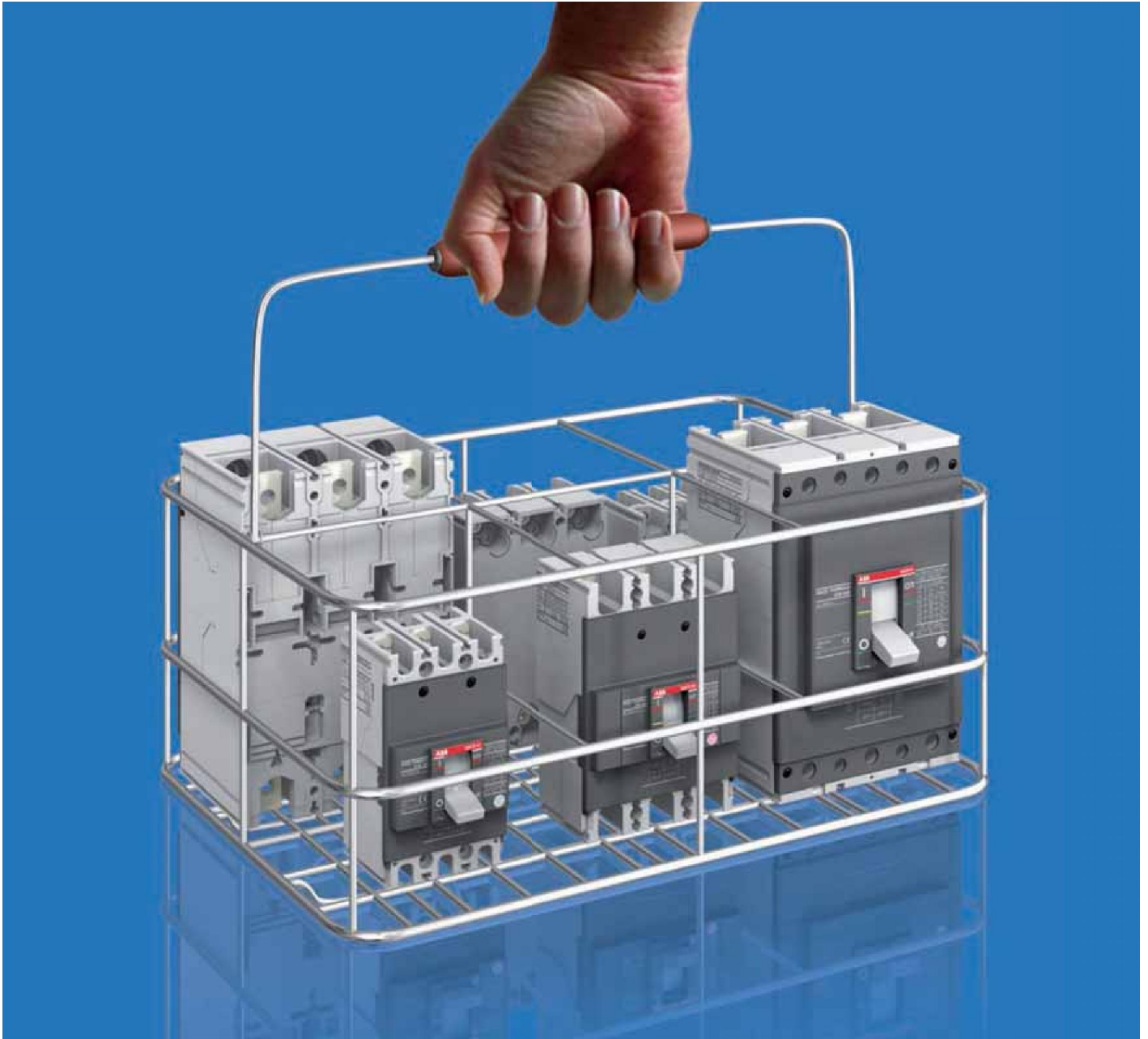
The result is SACE FORMULA, the perfect synthesis between ABB SACE's great quality and reliability and all-round simplicity: installation, sizing and fitting with accessories.

Reducing the dimensions without giving up anything on performances and reliability further helps installation, increasing the work space inside the switchboards.

Compactness of dimensions is a great advantage, especially for OEMs, panel builders and installers.



SACE FORMULA. Winners in All Applications.



Quality is great versatility. As well as proposing all three frames in the three-pole and four-pole version, for the first time ABB SACE now proposes single-pole and two-pole versions up to 250A, opening the door to the most varied application fields. Quality is compact overall dimensions. The SACE FORMULA A1 and A2 depth of just 60 mm is the lowest on the market up to 250A. Simplicity is this, too.



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Construction characteristics

General information

The references in round brackets^(G1.x) in the technical catalogue refer to the Glossary in the final chapter of the technical catalogue.

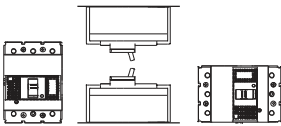
All the moulded-case circuit-breakers in the SACE FORMULA family are constructed in accordance with the following construction characteristics:

- double insulation^(G1.4);
- positive operation^(G1.5);
- isolation behaviour^(G1.6);
- electromagnetic compatibility^(G1.7);
- tropicalization^(G1.8);
- power supply from the top towards the bottom or vice versa;
- versatility of the installation. It is possible to mount the circuit-breaker either in the horizontal, vertical, or lying down position without undergoing any derating of the rated characteristics;
- no nominal performance derating for use up to an altitude of 2000m. Above 2000m, the properties of the atmosphere (composition of the air, dielectric strength, cooling power and pressure) change, having an impact on the main parameters which define the circuit-breaker. The table below gives the changes to the main performance parameters;



Double insulation

1SDC21061RF0001



Installation positions

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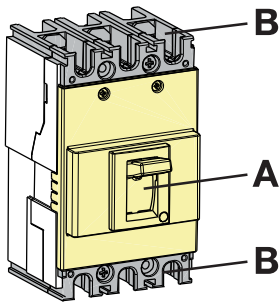


Positive operation

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Altitude	2000m		3000m		4000m		5000m		
	A1	A2-A3	A1	A2-A3	A1	A2-A3	A1	A2-A3	
Rated service voltage, Ue	[V]	500	550	440	484	390	429	340	374
Rated uninterrupted current	%	100	100	98	98	95	95	90	90

- SACE FORMULA circuit-breakers can be used in ambient with a temperature between -25°C +70°C and stored in a room with atmospheric temperature between -40°C +70°C. For a use at different temperatures from +40°C, see the paragraph on "temperature performances" in the Characteristics Curve and Technical Information chapter;
- different protection degrees IP (International Protection)^(G1.2);



Protection degrees

1SDC21061RF0001

	Circuit-breaker with front	Circuit-breaker without front ⁽¹⁾	Circuit-breaker with RHE RHD	Circuit-breaker with HTC	Circuit-breaker with LTC	Circuit-breaker with FLD
A	IP 40	IP 20	IP 40	IP 40	IP 40	IP 40
B	IP 20	IP 20	IP 20	IP 40	IP 30	IP 20

(1) During installation of the electrical accessories

- circuit-breaker weights;



Test pushbutton

1SDC21061RF0001

Weights	A1 [Kg]	A2 [Kg]	A3 [Kg]
Circuit-breaker 1 pole	0.245	0.37	-
Circuit-breaker 2 poles	0.47	0.73	-
Circuit-breaker 3 poles	0.7	1.1	3.25
Circuit-breaker 4 poles	0.925	1.145	4.15

- all the SACE FORMULA circuit-breakers are fitted with a Test pushbutton which allows the release test to be done. This test must be carried out with the circuit-breaker closed.

Construction characteristics

Regulations and reference Standards



Hologram

Conformity with Standards

The SACE FORMULA circuit-breakers and their accessories are constructed in conformity with:

- Standards ^(G.4.1):
 - IEC 60947-2;
- Directives ^(G.4.2):
 - EC directive: “Low Voltage Directives” (LVD) no. 2006/95/CE (in replacement of 73/23/CEE and subsequent amendments);
 - EC directive: “Electromagnetic Compatibility Directive” (EMC) no. 89/336 EEC.

Certification of conformity with the product Standards is carried out in the ABB SACE test room (accredited by SINAL - certificate No. 062/1997-) in respect of the EN 45011 European Standard, by the Italian certification body ACAE (Association for Certification of Electrical Apparatus), member of the European LOVAG organisation (Low Voltage Agreement Group) and by the Swedish certification body SEMKO belonging to the international IECEE organisation.

The SACE FORMULA series has a hologram on the front, obtained using special anti-forgery techniques, a guarantee of the quality and genuineness of the circuit-breaker as an ABB SACE product.

Company Quality System

The ABB SACE Quality System conforms with the following Standards:

- ISO 9001 international Standard;
- EN ISO 9001 (equivalent) European Standards;
- UNI EN ISO 9001 (equivalent) Italian Standards.

The ABB SACE Quality System attained its first certification with the RINA certification body in 1990.

Environmental Management System, Social Responsibility and Ethics

Attention to protection of the environment is a priory commitment for ABB SACE. Confirmation of this is the realisation of an Environmental Management System certified by RINA (ABB SACE was the first industry in the electromechanical sector in Italy to obtain this recognition) in conformity with the International ISO14001 Standard. In 1999 the Environmental Management System was integrated with the Occupational Health and Safety Management System according to the OHSAS 18001 Standard and later, in 2005, with the SA 8000 (Social Accountability 8000) Standard, committing itself to respect of business ethics and working conditions.

The commitment to environmental protection becomes concrete through:

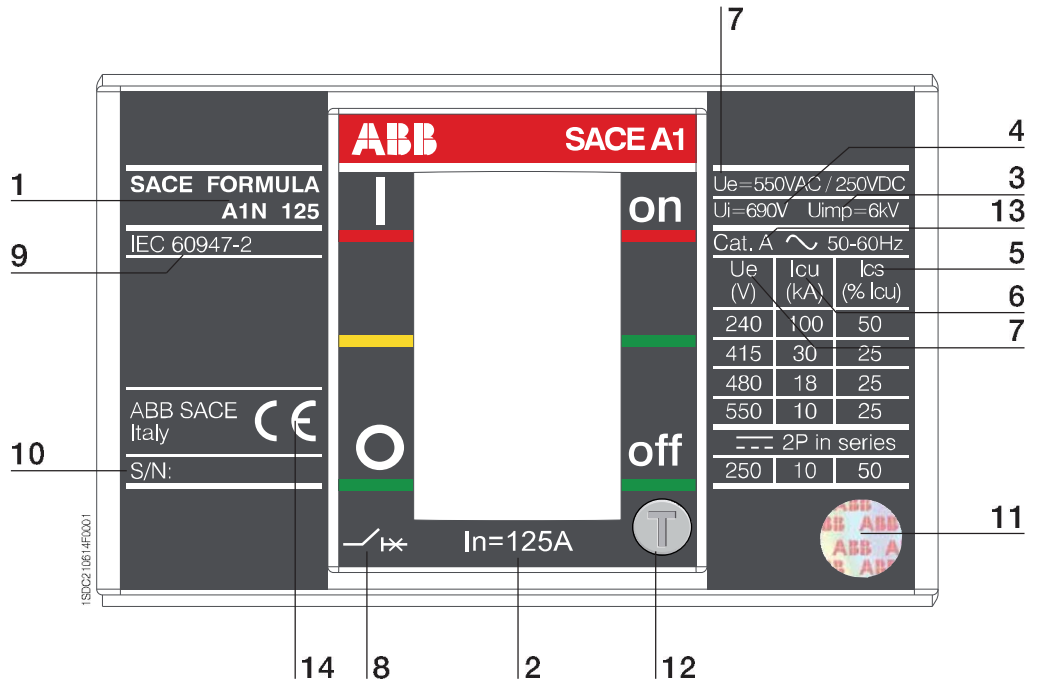
- selection of materials, processes and packaging which optimise the true environmental impact of the product;
- use of recyclable materials;
- voluntary respect of the RoHS directive ^(G4.3).

Construction characteristics

Identification of the SACE FORMULA circuit-breakers

The characteristics of the circuit-breakers are given on the label on the front of the circuit-breaker, and on the side label.

Front label



Side label

1	SACE FORMULA A1N 125 IEC 60947-2		9
7	Ue=550V AC / 250V DC		3
4	Ui=690V Uimp=6kV		3
6	Ue (V)	240 415 480 550 250	
6	Icu (kA)	100 36 18 10 10	
5	Ics (% Icu)	50 25 25 25 50	
13	Cat. A	~ 50-60Hz	--- 2P in series
10	ABB SACE Italy	S/N:	CE

1. Name of the circuit-breaker and performance level;
2. In: rated uninterrupted current*;
3. Uimp: rated impulse withstand voltage*;
4. Ui: insulation voltage*;
5. Ics: rated short-circuit service breaking capacity*;
6. Icu: rated ultimate short-circuit breaking capacity*;
7. Ue: rated service voltage*;
8. Symbol of isolation behaviour*;
9. Reference Standard IEC 60947-2*;
10. Serial number;
11. Anti-forgery;
12. Test pushbutton;
13. Category of use;
14. CE Marking.

* in compliance with the IEC 60947-2 Standard



Circuit-breakers for power distribution

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Circuit-breakers for power distribution

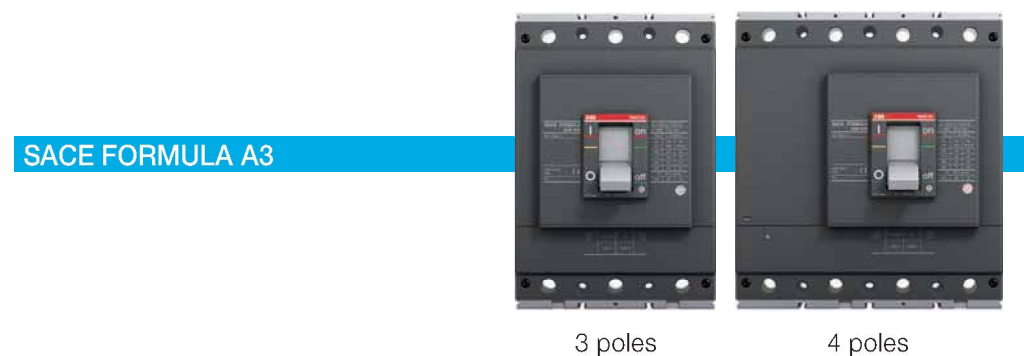
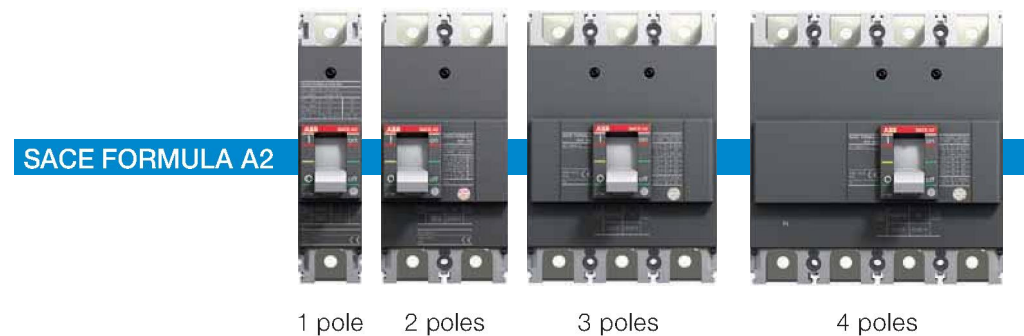
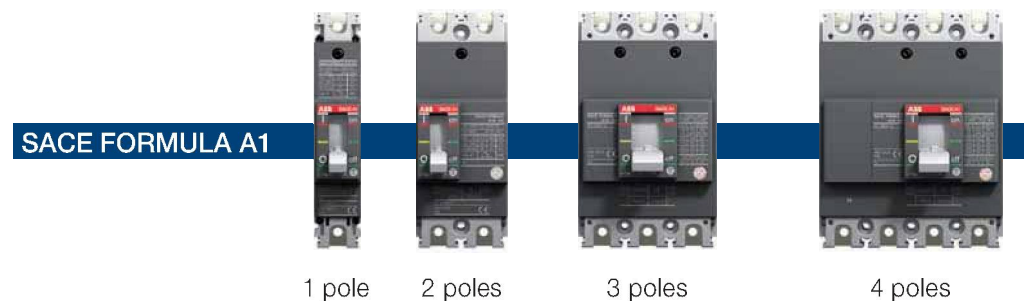
General characteristics

The SACE FORMULA circuit-breakers from 15A to 630A consist of the interruption part together with the trip unit and they can be installed:

- directly on the back plate of the cubicles;
- on a DIN rail (A1 and A2);
- back door (A1, A2 and A3, 2-3 4 poles).

They are characterised by:

- fixed version;
- polarity: 1 pole (A1 and A2), 2 poles (A1 and A2), 3 poles (A1, A2 and A3), 4 poles (A1, A2 and A3);
- maximum breaking capacity of 30kA for A1 and 36kA for A2 and of 50kA for A3 at 415V AC;
- fixed thermomagnetic trip unit (TMF) for protection of networks in alternating and direct current (A1, A2, A3);
- ELT LI electronic trip unit with fixed adjustment thresholds for the protection of networks in alternating current (A3);
- only two depths: 60mm (A1, A2) and 103.5mm (A3);
- standard front terminals.



		A1						A2						A3		
Frame size ^(G2.1)	[A]	125						250						400/630		
Rated current, I_n ^(G2.2)	[A]	15...125						125...250						320...630		
Poles	[Nr]	1, 2, 3, 4						1, 2, 3, 4						3, 4		
Rated service voltage, U_e ^(G2.3)	(AC) 50-60 Hz	550 (2p-3p-4p); 415 (1p)						550 (2p-3p-4p); 415 (1p)						550		
	(DC)	250 (2p-3p-4p); 125 (1p)						250 (2p-3p-4p); 125 (1p)						250		
Rated insulation voltage, U_i ^(G2.4)	[V]	690						690						690		
Rated impulse withstand voltage, U_{imp} ^(G2.5)	[kV]	6						6						6		
Versions		Fixed						Fixed						Fixed		
Performance Level		A	B	C		N			B	C		N		N	S	
Poles	[Nr]	3/4	3/4	1	3/4	1	2	3/4	3/4	1	3/4	1	2	3/4	3/4	3/4
Rated ultimate short-circuit breaking capacity, I_{cu} ^(G2.6)																
I_{cu} @ 240 V 50-60 Hz (AC)	[kA]	25	25	18	30	25	50	100	25	18	50	25	50	85	85	100
I_{cu} @ 380 V 50-60 Hz (AC)	[kA]	10	18	2.5	25	5	36	36	18	2.5	25	5	36	36	36	50
I_{cu} @ 415 V 50-60 Hz (AC)	[kA]	10	18	2.5	25	5	30	30	18	2.5	25	5	36	36	36	50
I_{cu} @ 440 V 50-60 Hz (AC)	[kA]	8	15	-	20	-	25	25	15	-	20	-	25	25	36	50
I_{cu} @ 480 V 50-60 Hz (AC)	[kA]	7.5	10	-	15	-	18	18	15	-	18	-	18	25	25	35
I_{cu} @ 500 V 50-60 Hz (AC)	[kA]	5	5	-	8	-	10	10	5	-	8	-	10	10	20	25
I_{cu} @ 550 V 50-60 Hz (AC)	[kA]	5	5	-	8	-	10	10	5	-	8	-	10	10	15	20
I_{cu} @ 125 V (DC) 1 pole	[kA]	-	-	5	-	10	-	-	-	5	-	10	-	-	-	-
I_{cu} @ 250 V (DC) 2 poles in series	[kA]	5	5	-	10	-	10	10	18	-	25	-	10	36	36	50
Rated short-circuit service breaking capacity, I_{cs} ^(G2.7)																
I_{cs} @ 240 V 50-60 Hz (AC)	[kA]	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
I_{cs} @ 380 V 50-60 Hz (AC)	[kA]	50%	50%	50%	50%	50%	50%	50%	50%	100%	50%	50%	50%	50%	50%	50%
I_{cs} @ 415 V 50-60 Hz (AC)	[kA]	50%	25%*	50%	25%	25%	25%	25%	50%	100%	50%	50%	50%	50%	50%	50%
I_{cs} @ 440 V 50-60 Hz (AC)	[kA]	50%	25%*	-	25%	-	25%	25%	50%	-	50%	-	50%	50%	50%	50%
I_{cs} @ 480 V 50-60 Hz (AC)	[kA]	50%	50%	-	25%**	-	25%	25%	50%	-	50%	-	50%	50%	50%	50%
I_{cs} @ 500 V 50-60 Hz (AC)	[kA]	50%	50%	-	25%***	-	25%	25%	50%	-	50%	-	50%	50%	50%	50%
I_{cs} @ 550 V 50-60 Hz (AC)	[kA]	50%	50%	-	25%***	-	25%	25%	50%	-	50%	-	50%	50%	50%	50%
I_{cs} @ 250 V (DC) 2 poles in series	[kA]	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Rated short-circuit making capacity, I_{cm} ^(G2.8)																
I_{cm} @ 240 V 50-60 Hz (AC)	[kA]	52.5	52.5	36	63	52.5	105	220	52.5	36	105	52.5	105	187	187	220
I_{cm} @ 380 V 50-60 Hz (AC)	[kA]	17	36	3.8	52.5	7.5	75.6	75.6	36	3.8	52.5	7.5	75.6	75.6	75.6	105
I_{cm} @ 415 V 50-60 Hz (AC)	[kA]	17	36	3.8	52.5	7.5	63	63	36	3.8	52.5	7.5	75.6	75.6	75.6	105
I_{cm} @ 440 V 50-60 Hz (AC)	[kA]	13.6	30	-	40	-	52.5	52.5	30	-	40	-	52.5	52.5	75.6	105
I_{cm} @ 480 V 50-60 Hz (AC)	[kA]	12.8	17	-	30	-	36	17	30	-	36	-	36	52.5	52.5	73.5
I_{cm} @ 500 V 50-60 Hz (AC)	[kA]	7.5	7.5	-	13.6	-	17	17	7.5	-	13.6	-	17	17	40	52.5
I_{cm} @ 550 V 50-60 Hz (AC)	[kA]	7.5	7.5	-	13.6	-	17	17	7.5	-	13.6	-	17	17	30	40
Utilization category (IEC 60947-2) ^(G2.9)		A						A						A		
Reference Standard		IEC 60947-2						IEC 60947-2						IEC 60947-2		
Isolation behaviour		■						■						■		
Fixing onto DIN rail		DIN EN 50022						DIN EN 50022						-		
Mechanical life ^(G2.10)	[No. operations]	8500						10000						5000		
Electrical life @ 415 V (AC) ^(G2.11)	[No. operations]	1500						4000						2000		
Total opening time	Shunt opening release (SOR) [ms]	15						15						15		
	Undervoltage release (UVR) [ms]	15						15						≤ 25		
Dimensions (Width x Depth x Height)	1 pole	[mm] 25.4x60x130						35x60x150						-		
	2 poles	[mm] 50.8x60x130						70x60x150						-		
	3 poles	[mm] 76.2x60x130						105x60x150						139.5x 103.5x 205		
	4 poles	[mm] 101.6x60x130						140x60x150						186x 103.5x 205		
Weight	1 pole	[kg] 0.245						0.370						-		
	2 poles	[kg] 0.470						0.730						-		
	3 poles	[kg] 0.700						1.100						3.25		
	4 poles	[kg] 0.925						1.450						4.15		
Trip Unit ^(G3.1)																
Thermomagnetic TME ^(G3.2)		■						■						■ (up to 630A)		
Electronic ELT LI ^(G3.3)														■ (up to 630A)		
* 5KA; ** 4KA; *** 2.5KA																

