
TECHNICAL CATALOG

SACE Tmax T/ML, Emax 2/ML

Shockproof circuit breakers



SACE Tmax T/ML, Emax 2/ML

Consultation guide



Chapter 1

Main characteristics

Introduction to the ML family, distinctive features of the series, product conformity and service.



Chapter 4

Advanced features

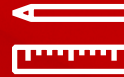
New and simple to use functionalities suitable for every kind of marine power system.



Chapter 2

The ranges

Overview of ML family circuit breaker for naval application and critical environment.



Chapter 5

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CHAPTER 1

Main characteristics

02-03	Overview of the SACE ML family
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Overview of the SACE ML family

Based on the long experience, ABB SACE is proud to offer a new family of circuit breakers for naval application and critical environment which sets a new circuit breaker benchmark for the needs of today and tomorrow.

A modern ship's operational ability is fully dependent on its onboard electrical infrastructure. Over the years, the growth in the number of electrically powered subsystems on a typical naval vessel has made this infrastructure ever more complex and extensive. It has also led to a steady increase in power requirements. These trends lead to new customer and application needs. To meet these demands, ABB has now unveiled the innovative ML family, the evolution of the ABB circuit breaker into a multifunctional platform that is able to manage the next generation of electrical plants such as microgrids.

For over 50 years, ABB SACE has been building shockproof equipment for navies around the world. The considerable installed base of the company's products on ships of the world's main navies underlines the reliability of ABB SACE electrical equipment. Since the 1950s, the company has been manufacturing circuit breakers with special features not available on the same series of equipment destined for general use.





Distinctive features

SACE ML series is the ABB low voltage circuit breakers available from 160 A up to 6300 A and with the ability to efficiently and simply control electrical navy installations – from the traditional to the more complex with the highest availability and continuity of service.

The circuit breakers of the ML series have been realized with opportune changes of the standard version with the purpose to guarantee the operations also in presence of critical environmental conditions.

The low-voltage electrical distribution plants inside the modern ship are driven by these following growing needs:

- Ensure **service continuity** by minimizing the time needed to identify and isolate faults
- Guarantee **space optimization**
- Optimize energy efficiency **maintaining the performance**
- **Safety** and **ease** of use

Reliability and service continuity

ABB SACE ML circuit breakers are the most advanced and complete solution for ensuring service continuity.

With redundant actuators and built in communication modules, ABB ML circuit breakers take electrical system reliability to new levels.

ABB's solution is the only one that uses both a communication bus and electrical connections to prevent, detect and isolate electrical faults. Its unique "digital zone selectivity" function, identifies the fault zone faster and isolate it reducing the stress in the remaining active zone. As a result, the electrical protection is more robust and costly shutdowns are more effectively prevented. Moreover ML series features enhancements to the standard circuit breaker that guarantees operation under stressful conditions:

- **Shock resistance up to 20g (IEC 60068-2-27 and BR8470)**
- High temperatures and humidity range in a saline atmosphere; ML circuit breakers can be used in ambient conditions where air temperature varies between **-25 °C and +70 °C (-13 °F and +158 °F)**
- Presence of vibrations that are persistent and have a high amplitude in specific frequency ranges



—
(*) only MCCB

Dimension and weight optimization

SACE ML series offers maximum protection, best efficiency and it is the ABB low voltage circuit breakers available from 160 A up to 6300 A. The different levels of rated nominal current and breaking capacity levels have been studied to ensure optimal sizing for all ships' configurations. SACE Emax 2 /ML is the most compact circuit breaker on the market, which makes it possible to reduce the size of switchboards up to 30%. SACE Emax 2 /ML offers the highest performances in the smallest space. Less space is required in the switchgear and in the metal structures. The result is less oversizing, lower weight and, therefore, higher saving related to space optimization. SACE ML series makes it possible to standardize the circuit breaker support structures, considerably simplifying construction of the switchboards themselves. All trip units are easily interchangeable and all communication units can be installed directly on the terminal box with a few simple operations, making the complex system ready for a new digital experience.

Performance

Next-generation ships will use more advanced microgrid technologies to overcome current power distribution challenges. Electrical distribution on a ship is an islanded microgrid, connecting multiple power generators and energy storage systems, that manages directional power flows. By using smart technologies to protect, connect and control the electrical system, ships can operate more efficiently and productively. ML low-voltage circuit breaker is the industry's first smart circuit breaker. Its embedded connectivity and load management software provides a comprehensive energy management solution. The load profile optimization functions of ML circuit breaker reduce CO₂ emissions and fuel costs. The innovative circuit breaker safeguards a ship's mission-critical loads and generators, using advanced adaptive protection to maximize productivity under all conditions.

Safety and ease of use

The ML range is available in fixed(*), plug-in(*) and withdrawable versions, with double insulation between the front of the switchgear and the live parts to ensure operation in complete safety. All essential information is available in front shield and enables immediate identification of the status of the circuit breaker: open, closed, ready to close, charged and discharged springs. Maintenance is simple and safe. Thanks to the new front shield design, the main accessories can be installed without completely removing it. As a further guarantee of safety, the shutters of the fixed part can be locked from the front when the circuit breaker mobile part is removed. The shutters of the upper terminals are independent of those of the lower terminals to facilitate checking and maintenance operations. The protection trip units are equipped with a large display which enables safe and intuitive operation. Furthermore the trip units can be programmed and consulted from a tablet, smart phone or portable PC via the Ekip Connect application some the advanced functionalities can be easily programmed thanks to predefined logic templates.

Product conformity

Quality, Sustainability and Customer Satisfaction have always been ABB's major commitment.

Resistance to shock and vibration

The ML circuit breakers are unaffected by vibrations generated mechanically or due to electromagnetic effects, in compliance with the IEC 60068-2-6 Standards and the RINA MIL regulations. Moreover ML circuit breaker are compliant with the following International SHOCK standard:

- IEC 60068-2-27 (20g-11ms)
- BR8470 (20g-25ms)

Approvals and certifications

ABB ML circuit breakers and their accessories conform to the international IEC 60947, EN 60947 (harmonized in 30 CENELEC countries), CEI EN 60947 and IEC 61000 Standards and comply with the following EC directives:

- "Low Voltage Directives" (LVD) no. 2006/95/EC
- "Electromagnetic Compatibility Directive" (EMC) no. 2004/108/EC.

Certification of conformity with the above-mentioned product Standards is carried out in compliance with the European EN 45011 Standard, by the Italian certification body ACAE (Association for the Certification of Electrical Equipment), which is recognized by the European organization LOVAG (Low Voltage Agreement Group), and by the Swedish Intertek SEMKO certification organization Intertek Semko which is recognized by the international organization IECCE.

Product conformity

The involvement of all company departments and organization of processes have led the company to develop, implement and certify management systems in compliance with international Standards:

- ISO 9001 for quality management
- IRIS for the quality of supplies in the railway sector (International Railway Industry Standards)
- ISO 14001 for environmental management
- OHSAS 18001 for the management of the health and safety of employees in the workplace
- SA 8000 for the management of social responsibility.



The ABB SACE testing laboratory, accredited by ACCREDIA in compliance with ISO/IEC 17025 Standard, provides both ABB and external customers with a qualified service for performing certification tests on devices and electric equipment of low and medium voltage in accordance with the relevant product Standards.

Thanks to the implementation of systems and their integration (Integrated Management System), ABB SACE, with a view to continuous improvement, has implemented processes with a focus on:

- quality, preventing defects and faults along the entire supply chain

- environment, reviewing production processes in terms of ecology and waste reduction, rationalizing the consumption of raw materials and energy, preventing pollution, containing noise emissions and reducing the quantity of rejects in the production processes
- health and safety of employees, offering a healthy and safe workplace in all of the various stages of work with a “zero accident objective”
- social responsibility, guaranteeing the respect of human rights and the absence of any discrimination throughout the supply chain, and offering a favourable and transparent working atmosphere.

A further commitment aimed at safeguarding the environment has been achieved by assessing products' life cycles (LCA, Life Cycle Assessment): this includes the assessment and improvement of the environmental performance of products from the engineering stage throughout their entire life cycle. The materials, processes and packaging used are chosen with a view to optimising the actual environmental impact of each product, including its energy efficiency and recyclability.



ABB SACE Global service

ABB's technical assistance service offers solutions aimed at supporting the customer in all stages of the lifespan of the circuit breaker in service and covering the entire chain of value; ABB is present from the moment of selection to the end of the life of the product, thereby guaranteeing the investments of its customers.

ABB supplies annual updates regarding the evolution of the circuit breaker ranges (Life Cycle Management) and for each product it provides details of associated services and the level of support available, so that customers can choose the products and spare parts best suited to their needs. ABB's organisation offers services that include installation and commissioning, technical training on the use and maintenance of products, the supply of original spare parts, corrective and preventive maintenance, equipment diagnostics, modernisation of systems with upgrades and retrofitting kits, consultancy services and personalised maintenance and service contracts. All this is supported by one of the most extensive global sales and service networks.

Retrofitting kit

Through continuous research targeted at the needs of the customer, ABB SACE Service has developed innovative retrofitting kits in order to simplify and speed up installation of a new circuit breaker, updating the customer's investment with the latest technology available and with very limited down times. The retrofitting kit between Emax2 and Emax is a retrofit solution: it is therefore possible to replace the withdrawable version of Emax with an equivalent Emax2 model without changing the switchboard busbars, by simply removing the fixed part of Emax replacing it with a fixed part of Emax2 which has been suitably modified with dedicated terminals.



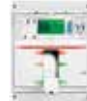


CHAPTER 2

The ranges

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20-21	Tmax T7/ML
22-23	Emax 2 E2.2/ML
24-25	Emax 2 E4.2/ML
26-27	Emax 2 E6.2/ML

Product selection



Breaker type	T4/ML	T5/ML	T6/ML	T7/ML
Rated Current [A]	250 - 320	400 - 630	630 -1000	800 - 1600
Rated service voltage (Ue)	690 Vac	690 Vac	690 Vac	690 Vac
Rated ultimate short-circuit breaking capacity (Icu) at Ue [kA]	25 - 80	25 - 80	20 - 30	30 - 60
Trip unit	Thermomagnetic	Thermomagnetic	Thermomagnetic	Electronic
	Electronic	Electronic	Electronic	
International standard	IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27
	BR8470	BR8470	BR8470	BR8470
Shock resistance	22g 11ms	22g 11ms	22g 11ms	22g 11ms
	20g 25 ms	20g 25 ms	20g 25 ms	20g 25 ms
Page	14	16	18	20



E2.2/ML	E4.2/ML	E6.2/ML
800 - 2500	2000 - 4000	4000 - 6300
690 Vac	690 Vac	690 Vac
66 - 85	66 - 100	100
Electronic	Electronic	Electronic
IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27
20g 11ms	20g 11ms	20g 11ms
22	24	26

Tmax T4/ML

Tmax T4/ML is available in **fixed**, **plug in** and **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 250/320 ⁽¹⁾
Number of poles	3/4
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 8
Rated insulation voltage, Ui	[V] 1000
Test voltage at industrial frequency 1 min.	[V] 3500

(1) T4 250 only L and V version



		Circuit-breakers				Switch-disconnectors
Version		S	H	L	V	D
Rated ultimate short-circuit breaking capacity						
Icu AC 50-60 Hz 440 V	[kA]	40	65	100	180	-
Icu AC 50-60 Hz 690 V	[kA]	25	40	70	80	-
Rated service short-circuit breaking capacity						
Ics AC 50-60 Hz 440 V	[kA]	100%	100%	100%	100%	-
Ics AC 50-60 Hz 690 V	[kA]	100%	100%	100%	100%	-
Rated service short-circuit making capacity						
Icm AC 50-60 Hz 440 V	[kA]	84	143	220	396	-
Icm AC 50-60 Hz 690 V	[kA]	52,5	84	154	176	5,3
Rated short-time withstand current						
Icw (1s)	[kA]	-	-	-	-	3,6
Reference Standard		IEC 60947-2 Utilization category A IEC 60947-4				IEC 60947-3

Dimensions	Fixed version 3 pole	Fixed version 4 pole
W [mm]	105	140
D [mm]	103,5	103,5
H [mm]	205	205
Weight [kg]	2,35	3,05

Mechanical life [No. operat.]	20000
Electrical life (at 415 V) [No. operat.]	8000 (250A) 6000 (320A)



Trip units	TMD*/TMA**	MA	PR222DS	PR223DS
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* up to 50A

**up to 250A

Accessories *	T4
Control	
Shunt opening release (YO)	●
Shunt closing release (YC)	●
Undervoltage release (YU)	●
Time-delay device for undervoltage release (D)	●
Stored energy motor operator (M)	●
Signalling	
Electrical signalling of circuit-breaker open/closed	●
Electrical signalling of circuit-breaker connected/isolated for test/isolated	●
Dialog unit (to be specified with the cbs)	●
PR021/K Signalling unit	●
Safety	
Front flange for lever operating mechanism	●
Lock in open position	●
Circuit-breaker lock in connected/isolated/isolated for test position	●
Test	
Extension for testing electrical accessories	●
TT1 Trip test Unit	●

* These are non-standard accessories. For further details, please contact ABB.

Tmax T5/ML

Tmax T5/ML is available in **fixed**, **plug in** and **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 400/630
Number of poles	3/4
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 8
Rated insulation voltage, Ui	[V] 1000
Test voltage at industrial frequency 1 min.	[V] 3500



		Circuit-breakers				Switch-disconnectors
Version		S	H	L	V	D
Rated ultimate short-circuit breaking capacity						
Icu AC 50-60 Hz 440 V	[kA]	40	65	100	180	-
Icu AC 50-60 Hz 690 V	[kA]	25	40	70	80	-
Rated service short-circuit breaking capacity						
Ics AC 50-60 Hz 440 V	[kA]	100%	100%	100%	100%	-
Ics AC 50-60 Hz 690 V	[kA]	100%	100% ⁽¹⁾	100% ⁽¹⁾	100% ⁽²⁾	-
Rated service short-circuit making capacity						
Icm AC 50-60 Hz 440 V	[kA]	84	143	220	396	-
Icm AC 50-60 Hz 690 V	[kA]	52,5	84	154	176	11
Rated short-time withstand current						
Icw (1s)	[kA]	-	-	-	-	6
Reference Standard		IEC 60947-2 Utilization category B (400 A) ^(*) Utilization category A (630 A) IEC 60947-4				IEC 60947-3

(1) 75% for T5 630

(2) 50% for T5 630

(*) Icw = 5 kA

Dimensions	Fixed version 3 pole	Fixed version 4 pole
W [mm]	140	186
D [mm]	103.5	103.5
H [mm]	205	205
Weight [kg]	3.25	4.15

Mechanical life [No. operat.]	20000
Electrical life (at 415 V) [No. operat.]	7000 (400 A) 5000 (630 A)



Trip units	TMA/TMG*	PR222DS	PR223DS	Ekip E/LSIG**
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* up to 500A

**Available for Tmax T5 in

Accessories *	T5
Control	
Shunt opening release (YO)	●
Shunt closing release (YC)	●
Undervoltage release (YU)	●
Time-delay device for undervoltage release (D)	●
Stored energy motor operator (M)	●
Signalling	
Electrical signalling of circuit-breaker open/closed	●
Electrical signalling of circuit-breaker connected/isolated for test/isolated	●
Dialog unit (to be specified with the cbs)	●
PR021/K Signalling unit	●
Safety	
Front flange for lever operating mechanism	●
Lock in open position	●
Circuit-breaker lock in connected/isolated/isolated for test position	●
Test	
Extension for testing electrical accessories	●
TT1 Trip test Unit	●

* These are non-standard accessories. For further details, please contact ABB.

Tmax T6/ML

Tmax T6/ML is available in **fixed** and **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 630/800/1000 ⁽⁴⁾
Number of poles	3/4
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 8
Rated insulation voltage, Ui	[V] 1000
Test voltage at industrial frequency 1 min.	[V] 3500

(4) W version is not available on T6 1000 A



Version	Circuit-breakers				Switch-disconnectors
	N	S	H	L	D
Rated ultimate short-circuit breaking capacity					
Icu AC 50-60 Hz 440 V	[kA] 30	45	50	80	-
Icu AC 50-60 Hz 690 V	[kA] 20	22	25	30	-
Rated service short-circuit breaking capacity					
Ics AC 50-60 Hz 440 V	[kA] 100%	100%	100%	75%	-
Ics AC 50-60 Hz 690 V	[kA] 75%	75%	75%	75%	-
Rated service short-circuit making capacity					
Icm AC 50-60 Hz 440 V	[kA] 63	94.5	105	176	-
Icm AC 50-60 Hz 690 V	[kA] 40	46	52.5	63	30
Rated short-time withstand current					
Icw (1s)	[kA] -	-	-	-	15
Reference Standard					
	IEC 60947-2 Utilization category B (630A - 800A) ⁽⁵⁾ Utilization category A (1000A) IEC 60947-4				IEC 60947-3

(5) Icw = 7.6 kA (630 A) - 10 kA (800 A)

Dimensions	Fixed version 3 pole	Fixed version 4 pole
W [mm]	210	280
D [mm]	103.5	103.5
H [mm]	268	268
Weight [kg]	9.5	12

Mechanical life [No. operat.]	20000
Electrical life (at 415 V) [No. operat.]	7000 (630A) 5000 (800A) 4000 (1000A)



Trip units	TMA	PR222DS	PR223DS
	pag. 32	pag. 34	pag. 36

Accessories *	T6
Control	
Shunt opening release (YO)	●
Shunt closing release (YC)	●
Undervoltage release (YU)	●
Time-delay device for undervoltage release (D)	●
Stored energy motor operator (M)	●
Signalling	
Electrical signalling of circuit-breaker open/closed	●
Electrical signalling of circuit-breaker connected/isolated for test/isolated	●
Dialog unit (to be specified with the cbs)	●
PR021/K Signalling unit	●
Safety	
Front flange for lever operating mechanism	●
Lock in open position	●
Circuit-breaker lock in connected/isolated/isolated for test position	●
Test	
Extension for testing electrical accessories	●
TT1 Trip test Unit	●

* These are non-standard accessories. For further details, please contact ABB.

Tmax T7/ML

Tmax T7/ML is available in **fixed** and **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 800/1000/1250/1600 ^(*)
Number of poles	3/4
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 8
Rated insulation voltage, Ui	[V] 1000
Test voltage at industrial frequency 1 min.	[V] 3500

(*) for T7D Iu=1000/1250/1600



		Circuit-breakers			Switch-disconnectors	
Version		S	H	L	V ⁽⁶⁾	D
Rated ultimate short-circuit breaking capacity						
Icu AC 50-60 Hz 440 V	[kA]	50	65	100	130	-
Icu AC 50-60 Hz 690 V	[kA]	30	42	50	60	-
Rated service short-circuit breaking capacity						
Ics AC 50-60 Hz 440 V	[kA]	100%	100%	100%	100%	-
Ics AC 50-60 Hz 690 V	[kA]	100%	75%	75%	75%	-
Rated service short-circuit making capacity						
Icm AC 50-60 Hz 440 V	[kA]	105	143	220	286	-
Icm AC 50-60 Hz 690 V	[kA]	63	88.2	105	132	52,2
Rated short-time withstand current						
Icw (1s)	[kA]	-	-	-	20 ⁽⁷⁾	20
Reference Standard		IEC 60947-2 Utilization category B				IEC 60947-3

(6) only for T7 800/1000/1250 A

(7) Icw = 20 kA (S,H,L versions) - 15 kA (V version)

Dimensions	Fixed version 3 pole	Fixed version 4 pole
W [mm]	210	280
D [mm]	154 (manual) / 178 (motorizable)	154 (manual) / 178 (motorizable)
H [mm]	268	268
Weight [kg]	9.7 (manual) 11 (motorizable)	12.5 (manual) 14 (motorizable)

Mechanical life [No. operat.]	10000
Electrical life (at 415 V) [No. operat.]	2000 (S, H, L versions) 3000 (V, versions)



Trip units	PR232/P	PR332/P
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Accessories *	T7
Control	
Shunt opening release (YO)	●
Shunt closing release (YC)	●
Undervoltage release (YU)	●
Time-delay device for undervoltage release (D)	●
Stored energy motor operator (M)	●
Signalling	
Electrical signalling of circuit-breaker open/closed	●
Electrical signalling of circuit-breaker connected/isolated for test/isolated	●
Dialog unit (to be specified with the cbs)	●
PR021/K Signalling unit	●
Safety	
Front flange for lever operating mechanism	●
Lock in open position	●
Circuit-breaker lock in connected/isolated/isolated for test position	●
Test	
Extension for testing electrical accessories	●
TT1 Trip test Unit	●

* These are non-standard accessories. For further details, please contact ABB.
(1) for T7M only

Emax 2 E2.2/ML

Emax 2 E2.2/ML is available in **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 800/1250/1600/2000/2500
Number of poles	3
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 12
Rated insulation voltage, Ui	[V] 1000



Version	Circuit-breakers			Switch-disconnectors	
	N	S	H	N/MS	H/MS
Rated ultimate short-circuit breaking capacity					
Icu AC 50-60 Hz 440 V	[kA] 66	85	100	-	-
Icu AC 50-60 Hz 690 V	[kA] 66	66	85	-	-
Rated service short-circuit breaking capacity					
Ics AC 50-60 Hz 690 V	[kA] 100%	100%	100%	-	-
Rated service short-circuit making capacity					
Icm AC 50-60 Hz 440 V	[kA] 145	187	220	145	187
Icm AC 50-60 Hz 690 V	[kA] 145	145	187	145	187
Rated short-time withstand current					
Icw (1s)	[kA] 66	66	85	66	85
Reference Standard		IEC 60947-2 Utilization category B		IEC 60947-3 Utilization category AC-23A	

Dimensions	
W [mm]	317
D [mm]	383
H [mm]	425
Weight	84
Including fixed part [kg]	

SACE EMAX 2 / ML		E2.2		
Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer				
	[Iu]	<1600	2000	2500
	[No. cycles x 1000]	25	25	20
Frequency	[Oper./Hour]	60	60	60
Electrical life				
440 V	[No. cycles x 1000]	15	10	8
690 V	[No. cycles x 1000]	15	8	7
Frequency	[Oper./Hour]	30	30	30



Trip units	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
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- Standard accessory for mobile part
- Accessory on request for mobile part
- ▲ Standard accessory for fixed part
- △ Accessory on request for fixed part
- * Only closing release YC

	Automatic circuit-breaker E2.2	Switch disconnector E2.2
Signalling		
Standard open/closed auxiliary contacts - AUX 4Q	●●	○○
Open/closed auxiliary contacts - AUX 6Q	○○	○○
Auxiliary position contacts - AUP	△	△
Ready to close signalling contact - RTC	○○	○○
TU Reset mechanical signalling of the tripping of protection trip unit - TU Reset	●●	-
Contact signalling tripping of Ekip protection trip unit - S51	●●	-
Contact signalling loaded springs - S33 M/2 (supplied with Motor)	○○	○○
Control		
Opening and closing release - YO/YC	○○	○○
Second opening and closing release - YO2/YC2	○○	○○
Undervoltage release - YU	○○	○○
Electronic time-delay device for undervoltage release - UVD	○○	○○
Motor - M	○○	○○
Remote reset - YR	○○	-
Opening and closing release test unit - YO/YC Test Unit	△	△
Safety		
Key lock in open position - KLC	○○	○○
Key lock in racked-in / test / racked-out position - KLP	○○	○○
Mechanical operation counter - MOC	○○	○○
Protection devices		
Protection device for opening and closing pushbuttons - PBC	○○	○○
IP30 Protection	▲	▲
IP54 Protection	△	△
Terminal covers - HTC/LTC	-	-
Separators - PB	△	△
Connections		
Orientable rear terminal - HR/VR	▲	▲
Front terminal - F	△	△
Other configurations	△	△

These are all standard supply accessories.

Emax 2 E4.2/ML

Emax 2 E4.2/ML is available in **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 2000/2500/3200/4000
Number of poles	3
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 12
Rated insulation voltage, Ui	[V] 1000



		Circuit-breakers			Switch-disconnectors		
Version		N	H	V	N/MS	H/MS	V/MS
Rated ultimate short-circuit breaking capacity							
Icu AC 50-60 Hz 440 V	[kA]	66	100	150	-	-	-
Icu AC 50-60 Hz 690 V	[kA]	66	85	100	-	-	-
Rated service short-circuit breaking capacity							
Ics AC 50-60 Hz 690 V	[kA]	100%	100%	100% ⁽²⁾	-	-	-
Rated service short-circuit making capacity							
Icm AC 50-60 Hz 440 V	[kA]	145	220	330	145	187	220
Icm AC 50-60 Hz 690 V	[kA]	145	187	220	145	187	220
Rated short-time withstand current							
Icw (1s)	[kA]	65	85	100	65	85	100
Reference Standard		IEC 60947-2 Utilization category B			IEC 60947-3 Utilization category AC-23A		

(2) Ics: 125kA for 400V...440V voltage;

Dimensions	
W [mm]	425
D [mm]	383
H [mm]	425
Weight Including fixed part [kg]	110

SACE EMAX 2 / ML		E4.2		
Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer				
	[Iu]	< 2500	3200	4000
	[No. cycles x 1000]	20	20	15
Frequency	[Oper./Hour]	60	60	60
Electrical life				
440 V	[No. cycles x 1000]	10	7	5
690 V	[No. cycles x 1000]	10	7	4
Frequency	[Oper./Hour]	20	20	20



Trip units	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
	pag. 46	pag. 47	pag. 48	pag. 49

- Standard accessory for mobile part
- Accessory on request for mobile part
- ▲ Standard accessory for fixed part
- △ Accessory on request for fixed part
- * Only closing release YC

	Automatic circuit-breaker E 4.2	Switch disconnector E 4.2
Signalling		
Standard open/closed auxiliary contacts - AUX 4Q	●●	○○
Open/closed auxiliary contacts - AUX 6Q	○○	○○
Auxiliary position contacts - AUP	△	△
Ready to close signalling contact - RTC	○○	○○
TU Reset mechanical signalling of the tripping of protection trip unit - TU Reset	●●	-
Contact signalling tripping of Ekip protection trip unit - S51	●●	-
Contact signalling loaded springs - S33 M/2 (supplied with Motor)	○○	○○
Control		
Opening and closing release - YO/YC	○○	○○
Second opening and closing release - YO2/YC2	○○	○○
Undervoltage release - YU	○○	○○
Electronic time-delay device for undervoltage release - UVD	○○	○○
Motor - M	○○	○○
Remote reset - YR	○○	-
Opening and closing release test unit - YO/YC Test Unit	△	△
Safety		
Key lock in open position - KLC	○○	○○
Key lock in racked-in / test / racked-out position - KLP	○○	○○
Mechanical operation counter - MOC	○○	○○
Protection devices		
Protection device for opening and closing pushbuttons - PBC	○○	○○
IP30 Protection	▲	▲
IP54 Protection	△	△
Terminal covers - HTC/LTC	-	-
Separators - PB	△	△
Connections		
Orientable rear terminal - HR/VR	▲	▲
Front terminal - F	△	△
Other configurations	△	△

These are all standard supply accessories.

Emax 2 E6.2/ML

Emax 2 E6.2/ML is available in **withdrawable** version

Common data	
Rated uninterrupted current, Iu	[A] 4000/5000/6300
Number of poles	3
Rated service voltage, Ue AC 50-60Hz	[V] 690
Rated impulse withstand voltage, Uimp	[kV] 12
Rated insulation voltage, Ui	[V] 1000



Version	Circuit-breakers		Switch-disconnectors	
	H	V	H/MS	X/MS
Rated ultimate short-circuit breaking capacity				
Icu AC 50-60 Hz 440 V	[kA] 100	150	-	-
Icu AC 50-60 Hz 690 V	[kA] 100	100	-	-
Rated service short-circuit breaking capacity				
Ics AC 50-60 Hz 690 V	[kA] 100%	100%	-	-
Rated service short-circuit making capacity				
Icm AC 50-60 Hz 440 V	[kA] 220	330	220	264
Icm AC 50-60 Hz 690 V	[kA] 220	220	220	264
Rated short-time withstand current				
Icw (1s)	[kA] 100	100	100	120
Reference Standard		IEC 60947-2 Utilization category B	IEC 60947-3 Utilization category AC-23A	

Dimensions	
W [mm]	803
D [mm]	383
H [mm]	425
Weight Including fixed part [kg]	207

SACE EMAX 2 / ML		E6.2	
Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer			
	[Iu]	4000	6300
	[No. cycles x 1000]	12	12
Frequency	[Oper./Hour]	60	60
Electrical life			
440 V	[No. cycles x 1000]	4	2
690 V	[No. cycles x 1000]	4	2
Frequency	[Oper./Hour]	10	10



Trip units	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
	pag. 46	pag. 47	pag. 48	pag. 49

- Standard accessory for mobile part
- Accessory on request for mobile part
- ▲ Standard accessory for fixed part
- △ Accessory on request for fixed part
- * Only closing release YC

	Automatic circuit-breaker E 6.2	Switch disconnector E 6.2
Signalling		
Standard open/closed auxiliary contacts - AUX 4Q	●●	○○
Open/closed auxiliary contacts - AUX 6Q	○○	○○
Auxiliary position contacts - AUP	△	△
Ready to close signalling contact - RTC	○○	○○
TU Reset mechanical signalling of the tripping of protection trip unit - TU Reset	●●	-
Contact signalling tripping of Ekip protection trip unit - S51	●●	-
Contact signalling loaded springs - S33 M/2 (supplied with Motor)	○○	○○
Control		
Opening and closing release - YO/YC	○○	○○
Second opening and closing release - YO2/YC2	○○	○○
Undervoltage release - YU	○○	○○
Electronic time-delay device for undervoltage release - UVD	○○	○○
Motor - M	○○	○○
Remote reset - YR	○○	-
Opening and closing release test unit - YO/YC Test Unit	△	△
Safety		
Key lock in open position - KLC	○○	○○
Key lock in racked-in / test / racked-out position - KLP	○○	○○
Mechanical operation counter - MOC	○○	○○
Protection devices		
Protection device for opening and closing pushbuttons - PBC	○○	○○
IP30 Protection	▲	▲
IP54 Protection	△	△
Terminal covers - HTC/LTC	-	-
Separators - PB	△	△
Connections		
Orientable rear terminal - HR/VR	▲	▲
Front terminal - F	△	△
Other configurations	△	△

These are all standard supply accessories.

CHAPTER 3

Trip units

30-31	Protection trip units
32-33	TMD/TMA and TMG
34-35	PR222DS/P, PR222DS/PD
36-37	PR223DS and PR223EF
38-39	Ekip E-LSIG
40-41	PR232/P
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48-48	Ekip G Touch
49-49	Ekip G Hi-Touch

Protection trip units

SACE ML trip units are the new benchmark for the protection, measurement and control of low voltage electrical systems. The result of ABB SACE's experience and research, they make ML circuit-breaker, embedding advanced functionalities, to become an all-in-one solution for as well distribution systems and microgrid.

The protection units are divided into different families which can be suitable for distribution protection and for generator protection. The range of trip units is available with many levels of performance to satisfy simple to advanced applications.

Thanks to their simplicity of assembly, the end customer can change the type of trip unit extremely rapidly, according to their own requirements and needs. This means an increased flexibility of use of the circuit-breakers with considerable savings in terms of costs thanks to better rationalisation of stock management. The complete, flexible protection trip unit offering, which can be adapted to the actual level of protection required, is shown in the following pages.

The Tmax T4/ML, T5/ML and T6/ML circuit-breakers can be equipped either with TMD/TMA or TMG thermomagnetic trip units, moreover there is also a wide portfolio of electronic trip units composed by PR221DS, PR222DS/P, PR222DS/PD, PR223DS and Ekip E-LSIG. Similarly, Tmax T7 can also mount the latest generation PR231/P, PR232/P, PR331/P⁽¹⁾ and PR332/P⁽¹⁾ electronic trip units.

SACE Emax 2 Ekip protection trip units are the new benchmark for the protection, measurement and control of low voltage electrical systems.

The protection units, available in the LSI and LSIG versions, are divided into two families: Ekip for distribution protection and Ekip G for generator protection.

The Ekip trip units are designed to protect a vast range of applications, such as use with transformers, motors and drives. Ekip Dip, Ekip Touch or Ekip Hi-Touch can be selected, depending on the complexity of the system, the need to take voltage or energy measurements or to include control systems in switchgear.

Ekip G enables the protection of generators without the use of external devices that require dedicated relays and wiring. Ekip G increases efficiency from the design stage to installation, minimizing the time needed for realization and commissioning of the system, and ensuring high levels of accuracy and reliability of all protection devices required for running generators in applications such as naval, GenSet or cogeneration. Thanks to the Network Analyzer function integrated in all Hi-Touch versions, the quality of energy in terms of harmonics, micro-interruptions or voltage dips is monitored without the need for dedicated instrumentation. This allows effective preventive and corrective action to be implemented through accurate analysis of the faults, thereby improving the efficiency of the system. Here below there is a summary of the trip units portfolio for Emax 2 ML circuit breaker.

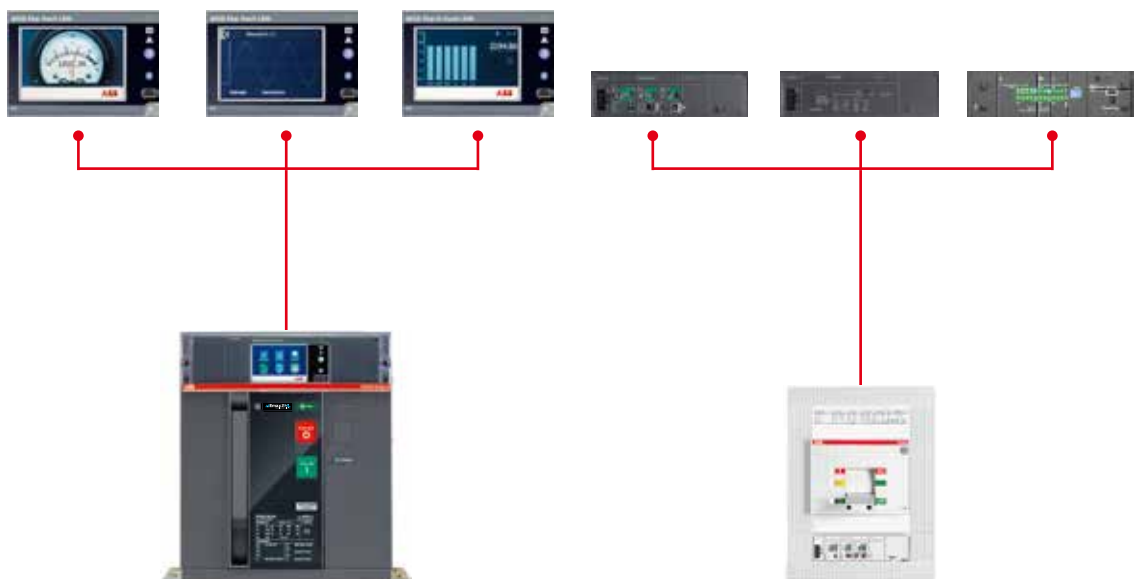
(1) If ordered loose PR331/P and PR332/P must be completed with the "trip unit adapters"

	Fields of application	Measurement and Protection of Current	Measurement of Voltage, Power, Energy	Measurement and Protection of Voltage, Power, Energy	Network analyzer
Ekip Dip	Distribution	with Ekip Multimeter	-	-	-
Ekip Touch		●	with Ekip Measuring	with Ekip Measuring Pro	-
Ekip Hi-Touch		●	●	●	●
Ekip G Touch	Generators	●	●	●	-
Ekip G Hi-Touch		●	●	●	●

All ML circuit-breakers are equipped with protection trip units that are interchangeable from the front with just a few, simple operations by the customer.

This enables personalization of the functions available, even during commissioning or when the circuit-breaker has already been installed. In particular, consists of:

- **Protection trip unit**, available with different interfaces and versions that range from basic to more complete; it contains a latest generation microprocessor that performs all the functions of protection and control.
- **Ekip Measuring Module**, connected internally to Emax 2/ML, performs voltage, power and energy measurements with high accuracy without requiring any external connection or voltage transformer. The Ekip Measuring Pro version also performs all protection functions based on voltage and power without the need for external units, thereby simplifying design and construction of the system.
- **Interchangeable rating plug** enables all protection thresholds to be adjusted according to the rated current, increasing flexibility for the customer. It is useful in installations that are prepared for future development or in cases in which the power supplied may be limited temporarily.
- **Main board** is the mechanical housing of the trip unit, which includes a micro-controller for measuring currents and the self-protection functions. The separation of trip units ensures excellent reliability and immunity to conducted and radiated emissions. Integrated new generation Rogowski sensors, which are sensitive to the true r.m.s. value of the current, guarantee high accuracy of both measurements and protection.



TMD/TMA and TMG

The Tmax ML circuit-breakers can be fitted with thermomagnetic trip units and are used in protection of alternating and direct current networks with a range of use from 20 A to 800 A. They allow the protection against overload with a thermal device realised using the bimetal technique and

protection against short-circuit with a magnetic device.

The four-pole circuit-breakers are always supplied with the neutral protected by the trip unit and with protection of the neutral at 100% of the phase setting.



Threshold
adjustable

Thermal threshold
adjustable from 0.7 to 1 x I_n

TMA= thermomagnetic trip unit with adjustable thermal threshold ($I_1 = 0.7...1 \times I_n$) and adjustable magnetic threshold ($I_2 = 5...10 \times I_n$)
 TMG (for T5) = thermomagnetic trip unit with adjustable thermal threshold ($I_1 = 0.7...1 \times I_n$) and adjustable magnetic threshold ($I_2 = 2.5...5 \times I_n$)

TMD/TMA - T4										
L $I_1 = 0.7...1 \times I_n$	In [A]	20	32	50	80	100	125	160	200	250
	Neutral [A] - 100%	20	32	50	80	100	125	160	200	250
	Neutral [A] - 50%	–	–	–	–	–	80	100	125	160
I $I_3 = 10 \times I_n$ $I_3 = 5...10 \times I_n$	$I_3 = 10 \times I_n$ [A]	320	320	500						
	$I_3 = 5...10 \times I_n$ [A]				400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500
	Neutral [A] - 100%	320	320	500	400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500
	Neutral [A] - 50%	–	–	–	–	–	400...800	500...1000	625...1250	800...1600
TMA - T5										
L $I_1 = 0.7...1 \times I_n$	In [A]	320				400			500	
	Neutral [A] - 100%	320				400			500	
	Neutral [A] - 50%	200				250			320	
I $I_3 = 5...10 \times I_n$	I_3 [A]	1600...3200				2000...4000			2500...5000	
	Neutral [A] - 100%	1600...3200				2000...4000			2500...5000	
	Neutral [A] - 50%	1000...2000				1250...2500			1600...3200	
TMG - T5										
L $I_1 = 0.7...1 \times I_n$	In [A]	320				400			500	
	Neutral [A] - 100%	320				400			500	
I $I_3 = 2.5...5 \times I_n$	I_3 [A]	800...1600				1000...2000			1250...2500	
	Neutral [A] - 100%	800...1600				1000...2000			1250...2500	
TMA - T6										
L $I_1 = 0.7...1 \times I_n$	In [A]	630						800		
	Neutral [A] - 100%	630						800		
	Neutral [A] - 50%	400						500		
I $I_3 = 5...10 \times I_n$	I_3 [A]	3150...6300						4000...8000		
	Neutral [A] - 100%	3150...6300						4000...8000		
	Neutral [A] - 50%	2000...4000						2500...5000		

Notes

- In identifies the setting current for protection of the phases (L1, L2 and L3) and of the neutral.
- The TMA and TMG thermomagnetic trip units which equip the Tmax T4, T5 and T6 circuit-breakers have the thermal element with adjustable threshold $I_1 = 0.7...1 \times I_n$. The set current value which is obtained using the special selector is intended at 40 °C. The magnetic element has adjustable trip threshold ($I_3 = 5...10 \times I_n$ for TMA and $I_3 = 2.5...5 \times I_n$ for TMG) with a tolerance of $\pm 20\%$ according to what is indicated in the IEC 60947-2 (par. 8.3.3.1.2) Standard. The trip thresholds of the magnetic protection I_3 are a function of the setting used both by the phase and neutral protection.

PR222DS/P and PR222DS/PD

The PR222DS/P trip unit has protection functions against overload L, delayed S and instantaneous I short-circuit (version PR222DS/P-LSI). Setting of the PR222DS trip unit can be carried out by means of dip switches on the front of the circuit-breaker or electronically, using the Ekip T&P programming and Ekip Connect.

There is a single setting for the phases and neutral, for which one can decide whether to set the threshold of the protection functions to OFF, to 50% or to 100% that of the phases by means of two dedicated dip switches.

Furthermore, on the front of the PR222DS/P (or PR222DS/PD) trip units, signalling of pre-alarm and alarm of protection L is available. It is also possible to transmit remotely the alarm of protection L, simply connecting connector X3 to the dedicated contact.

The PR222DS/PD trip units allow circuit-breakers to be integrated in a communication network based on the Modbus® RTU protocol.

The PR222DS/PD release, with integrated communication and control functions, allows a wide range of information to be acquired and transmitted remotely.

PR222DS/P

Protection L
Against overload

Protection S
Against short-circuit
with delayed trip

Protection I
Against short-circuit
with instantaneous trip



Socket for connection
of Ekip T&P test unit
and Ekip Bluetooth
wireless communication
unit

Socket for Ekip TT
test unit

Selection for electronic
or manual setting

Dip-switch for
neutral setting

	PR222DS/P - PR222DS/PD	PR222DS/P - PR222DS/PD
Protection functions	LSI	LSIG

PR222DS/P, PR222DS/PD - Protection functions and parameterisations

Protection functions		Trip threshold		Trip curves ⁽¹⁾		Excludability	Relation t = f(I)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I ² t=k) according to IEC 60947-2 Standard	Manual setting I1 = 0.40....1 x In step = 0.02 x In		Manual setting at 6 x I1 t1 = 3 - 6 - 9/12 - MAX ⁽²⁾		no	t = k/I ²
		Electronic setting I1= 0.40...1 x In step 0.01 x In Trip between 1.1...1.3 x I1		Electronic setting at 6 x I1 t1 = 3...18s step 0.5s ⁽²⁾ Tolerance: ± 10%			
S	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I ² t=k) or definite time	Manual setting I2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.8-6.4-7-7.6-8.2-8.8-9.4-10 x In ⁽³⁾		Manual setting at 8 x In t2 = 0.05 - 0.1 - 0.25 - 0.5s		yes	t = k/I ²
		Electronic setting I2 = 0.60...10 x In step 0.1 x In Tolerance: ± 10%		Electronic setting at 8 x In t2 = 0.05...0.5s step 0.01s Tolerance: ± 10% ⁽⁴⁾			
		Manual setting I2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.8-6.4-7-7.6-8.2-8.8-9.4-10 x In ⁽³⁾		Manual setting t2 = 0.05 - 0.1 - 0.25 - 0.5s		yes	t = k
		Electronic setting I2 = 0.60...10 x In step 0.1 x In Tolerance: ± 10%		Electronic setting t2 = 0.05...0.5s step 0.01s Tolerance: ± 10% ⁽⁴⁾			
I	Against short-circuit with instantaneous trip	Manual setting I3 = 1.5-2.5-3-4-4.5-5-5.5-6.5-7-7.5-8-9-9.5-10.5-12 x In ⁽³⁾		instantaneous		yes	t = k
		Electronic setting I3 = 1.5...12 x In ⁽³⁾ step 0.1 x In Tolerance: ± 10%					
G	Against earth fault with inverse short time delay trip and trip characteristic according to an inverse time curve (I ² t=k)	Manual setting I4 = 0.2-0.25-0.45-0.55-0.75-0.8-1 x In		Manual setting up to up to up to up to 3.15 x I4 2.25 x I4 1.6 x I4 1.10 x I4 t4 = 0.1s t4 = 0.2s t4 = 0.4s t4 = 0.8s		yes	t = k/I ² ⁽⁶⁾
		Electronic setting I4 = 0.2...1 x In step 0.1 x In Tolerance: ± 10%		Electronic setting t4 = 0.1...0.8s step 0.01s Tolerance: ± 15%			

(1) These tolerances hold in the following conditions:

- self-powered trip unit at full power and/or auxiliary supply
- two or three-phase power supply

In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	$\pm 20\%$	$\pm 20\%$
I	$\pm 20\%$	$\leq 50ms$
G	$\pm 20\%$	$\pm 20\%$

(2) t_1 values for MAX setting:

CB	Electronic setting	Manual setting
T4 320		
T5 630	3...10.5s Step 0.5s	3-6-9-10.5
T6 1000		
T4 250	3...18s Step 0.5s	3-6-9-18
T5 400		
T6 800	3...18s Step 0.5s	3-6-9-18
T6 630	3...18s Step 0.5s	3-6-12-18

(3) For $T4 I_n = 320 A$ and $T5 I_n = 630 A$. $T6 I_n = 1000 A \Rightarrow I_{2,max} = 9.5 \times I_n$ and $I_{3,max} = 9.5 \times I_n$
For $T6 I_n = 800 A \Rightarrow I_{3,max} = 10.5 \times I_n$ (4) Tolerance: $\pm 10 ms$ (6) $t = k/I^2$ up to the current value indicated, $t = k$ (equating to the chosen setting) beyond the current value indicated

PR223DS and PR223EF

Apart from the traditional L, S, I, and G protection functions, the PR223DS release, available on T4 and T6, also offers the possibility of measuring the main electrical values. In fact, using the accessory VM210, and without using any voltage transformers, the user has access not only to the current values but also to the voltage, power and energy values.

For the neutral, it is possible to set the protection threshold of the functions to OFF, to 50% and to 100% of that of the phases. The pre-alarm and alarm signalling of protection L are also available by means of a dedicated LED on the front of the release. The PR223DS trip unit, with integrated ModBus RTU protocol based dialogue unit, allows a wide range of information to be acquired and transmitted remotely and to carry out opening and closing commands.

If the PR223DS trip unit is inserted in a supervision system, during the test and configuration with the PR010/T unit, communication is automatically abandoned and starts again on completion of these operations.

The PR223EF electronic trip unit available on T4, T5 and T6 in the L version (120 kA @ 380/415 V) for use in alternating current, is able to isolate a fault present in extremely rapid times. This performance is made possible thanks to the EFDP (Early Fault Detection and Prevention) algorithm, which is able to detect the short-circuit at its onset, exploiting analysis of the trend of the shunted current in relation to the current. The PR223EF trip unit therefore offers two performances simultaneously which, until today, were antithetic: selectivity and trip rapidity.

PR223DS and PR223EF



Socket for connection of Ekip T&P test unit and Ekip Bluetooth wireless communication unit

Socket for Ekip TT test unit

LED signalling alarm of the circuit-breaker

LED signalling the status of the circuit-breaker

Push button for operation mode selection (local/remote) and on-board diagnosis system

PR223DS - PR223EF	
Protection functions	L S I G

Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves ⁽¹⁾	Excludability	Relation $t = f(I)$	EFDP zone selectivity*
L	Against overload with long inverse time-delay trip and trip characteristic according to an inverse time curve ($I^2t=k$) according to the IEC 60947-2 Standard	Electronic setting $I1=0.18...1 \times I_n^{(3)}$, step $0.01 \times I_n$ Trip between $1.1...1.3 \times I1$ (IEC 60947-2)	Electronic setting at $6 \times I1$ $t1 = 3...18s^{(2)}$, step $0.5s$ Tolerance: $\pm 10\%$	no	$t = k/I^2$	no
S	Against short-circuit with short inverse time-delay trip and trip characteristic with inverse time ($I^2t=k$) or with definite time	Electronic setting $I2 = 0.60...10 \times I_n^{(3)}$, step $0.1 \times I_n$ Tolerance: $\pm 10\%$	Electronic setting at $8 \times I_n$ $t2 = 0.05...0.5s$, step $0.01s$ Tolerance: $\pm 10\%$	yes	$t = k/I^2$	yes
		Electronic setting $I2 = 0.60...10 \times I_n^{(3)}$, step $0.1 \times I_n$ Tolerance: $\pm 10\%$	Electronic setting $t2 = 0.05...0.5s$, step $0.01s$ Tolerance: $\pm 10\%$	yes	$t = k$	yes
EF	Against short-circuit with ultra rapid trip ⁽⁴⁾			yes	$t = k$	yes
I	Against short-circuit with instantaneous trip with adjustable threshold	Electronic setting $I3 = 1.5...12 \times I_n^{(3)}$, step $0.1 \times I_n$ Tolerance: $\pm 10\%$	instantaneous	yes	$t = k$	no
G	Against earth fault with inverse short time delay trip and trip characteristic with inverse time ($I^2t=k$)	Electronic setting $I4 = 0.2...1 \times I_n$, step $0.1 \times I_n$ Tolerance: $\pm 10\%$	Electronic setting $t4 = 0.1...0.8s$, step $0.01s$ Tolerance: $\pm 15\%$	yes	$t = k/I^2$	yes

(1) These tolerances are valid under the following conditions:
 – trip unit self-supplied at full power and/or auxiliary supply;
 – two or three-phase power supply.

In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	$\pm 20\%$	$\pm 20\%$
I	$\pm 20\%$	$\leq 50ms$
G	$\pm 20\%$	$\pm 20\%$

(2) For T4. $I_n = 320 A$ and T5. $I_n = 630 A$ $\square t1 = 10.5s$

(3) For T4 $I_n = 320 A$, T5 $I_n = 630 A$ and T6 $I_n = 1000 A$ $\square I2max = 9.5 \times I_n$, $I3max = 9.5 \times I_n$
 For T6 $I_n = 800 A$ $\square I3max = 10.5 \times I_n$

(4) Active in auxiliary power supply (24 V DC)

(5) For $I1 < 0.4 \times I_n$ the neutral setting must be at 100% of that of the phases

* only for PR223EF

Ekip E-LSIG

Available for Tmax T5 in three pole and four pole version, Ekip E-LSIG is the integrated energy metering solution from 320 A to 630 A.

This trip unit can be set using manual setting using the relative dip-switches on the front of the trip unit, which allow the settings to be made even when the trip unit is off. But also using electronic setting, made both locally using Ekip T&P accessory and also via remote control, with version of trip unit with communication function.

The electronic setting have a wider range and a thicker regulation step.

With this new electrical trip unit, ABB offers an optimal solution for energy and power measurements without the usage of external accessories, as the device VM210

With Ekip E-LSIG T5, upon request, will be available simultaneously the communication, through internal bus, with ABB interface on the front of the switchgear HMI030 and, through system bus, with an external MODBUS network.



Protection function	Trip threshold	Trip curve ⁽¹⁾	Excludability	Relation	Thermal memory
L	Against overloads with long inverse time delay trip according to IEC 60947-2	Manual setting: $I_1 = 0.4...1 \times I_n$, step 0.04 Tolerance: trip between $1.1...1.3 I_1$ (IEC 60947-2)	no	$t = k/I^2$	no
	Electronic setting: $I_1 = 0.18...1 \times I_n$, step 0.01 Tolerance: trip between $1.1...1.3 I_1$ (IEC 60947-2)	Electronic setting: $t_1 = 12-60s$ ⁽⁴⁾ at $I = 3 \times I_1$ Tolerance: $\pm 10\%$	no	$t = k/I^2$	yes
S	Against short-circuits with inverse short ($t=k/I^2$) or independent ($t=k$) time delay trip	Manual setting: $I_2 = \text{OFF } 3-6-9$ Tolerance: $\pm 10\%$	yes	$t = k$	no
	Electronic setting: $I_2 = 0.6...10 \times I_n$ ⁽³⁾ , step 0.1 Tolerance: $\pm 10\%$	Electronic setting: $t_2 = 0.25-0.50s$ Tolerance: $\pm 10\%$	yes	$t = k$	no
	Electronic setting: $I_2 = 0.6...10 \times I_n$ ⁽³⁾ , step 0.1 Tolerance: $\pm 10\%$	Electronic setting: $t_2 = 0.05...0.5s$, step 0.01 at $10 \times I_n$ Tolerance: $\pm 10\%$	yes	$t = k/I^2$	no
I	Against short-circuits with adjustable threshold and instantaneous trip time	Manual setting: $I_3 = \text{OFF } 1.5-4-5.5-6-7.5-10-11.5$ ⁽³⁾ I_n Tolerance: $\pm 10\%$	yes	$t = k$	no
	Electronic setting: $I_3 = 1.5...12 \times I_n$ ⁽³⁾ , step 0.1 Tolerance: $\pm 10\%$	$\leq 40ms$	yes	$t = k$	no
G	Against earth fault with independent time delay trip ⁽²⁾	Electronic setting: $I_4 = 0.2...1 \times I_n$, step 0.02 Tolerance: $\pm 10\%$	yes	$t = k$	no
UV	Standard adjustable constant time	Electronic setting: $U_8 = 0.5...0.95 \times U_n$, step $= 0.01 \times U_n$ Tolerance: $\pm 5\%$	yes	$t = k$	no
OV	Against overvoltage with adjustable constant time	Electronic setting: $U_9 = 1.05...1.2 \times U_n$, step $= 0.01 \times U_n$ Tolerance: $\pm 5\%$	yes	$t = k$	no
Neutral		Electronic setting: OFF, 50% and 100%			
		For $I_1 < 0.4 I_n$ mandatory neutral Setting 100%			

(1) Tolerances in case of:

- self-powered trip unit at full power;
- 2 or 3 phase power supply.

In conditions other than those considered, the following tolerance hold:

Protection	Trip threshold	Trip time
S	$\pm 20\%$	$\pm 20\%$
I	$\pm 20\%$	$\leq 50ms$
G	$\pm 20\%$	$\pm 20\%$

(2) Protection G is inhibited for currents higher than 4 In.

(3) T5 630 $I_2 \text{ max} = I_3 \text{ max} = 9.5 I_n$.

(4) T5 630 $t_1 \text{ max} = 42s$.

		Value	Range	Accuracy	Specified measuring range
Current		Phase current (I1, I2, I3, IN)	0.1 ... 12 In	CI 1	0.2 ... 1.2 In
		Phase current minimum value			
		Phase current maximum value			
		Ground current (Ig)	0 ... 4 In	–	–
Voltage		Phase voltage runtime, max and min (V1N, V2N, V3N) ⁽³⁾	5 ... 480 V	±0.5%	30 ... 400 V
		Line voltage runtime, max and min (U12, U23, U31)	10 ... 828 V	±0.5%	50 ... 690 V
Power	Active	Phase power runtime, max and min (P1, P2, P3) ⁽³⁾	-5.76 In kW ... 5.76 In kW	CI 2	-480In W ... -6In W 6In W ... 480In W ⁽¹⁾
		Total power runtime, max and min	-17.28 In kW ... 17.28 In kW	CI2	-1.44In kW ... -18In W 18In W ... 1.44In kW ⁽¹⁾
	Reactive	Phase power runtime, max and min (Q1, Q2, Q3) ⁽³⁾	-5.76 In kvar ... 5.76 In kvar	CI 2	-480In var ... -6In var 6In var ... 4.80In var ⁽¹⁾
		Total power runtime, max and min	-17.28 In kvar ... 17.28 In kvar	CI2	-1.44In kvar ... -18In var 18In var ... 1.44In kvar ⁽¹⁾
	Apparent	Phase power runtime, max and min (S1, S2, S3) ⁽³⁾	In VA ... 5.76 In kVA	CI 2	6In VA ... 480In VA
		Total power runtime, max and min	3 In VA ... 17.28 In kVA	CI 2	18In VA ... 1.44In kVA
	Energy	Total energy	1 kWh ... 214.75 GWh	CI 2	1 kWh ... 214.75 GWh
		Incoming energy			
		Outgoing energy			
Power quality	Active	Total energy	1 kvarh ... 214.75 Gvarh	CI 2	1 kvarh ... 214.75 Gvarh
		Incoming energy			
		Outgoing energy			
	Reactive	Total energy	1 kVAh ... 214.75 GVAh	CI 2	1 kVAh ... 214.75 GVAh
		Incoming energy			
		Outgoing energy			
	Apparent	Total energy	1 kVAh ... 214.75 GVAh	CI 2	1 kVAh ... 214.75 GVAh
		Incoming energy			
		Outgoing energy			
Power quality		Harmonic analysis ⁽²⁾	11th (50 - 60Hz)	–	–
		THD of phase L1, L2, L3 ⁽²⁾	0 ... 1000%	±10%	0 ... 500%
		Frequency runtime, max, min	44 ... 440 Hz	±0.2%	45 ... 66 Hz
		PF of phase L1, L2, L3 ⁽³⁾	-1 ... 1	±2%	-1 ... -0.5 0.5 ... 1

(1) For: $0.2I_n < I_i < 1.2 I_n$ and $30V < V_i < 400V$

(2) Available on demand by sending a Modbus command

(3) Not available if Neutral is not connected

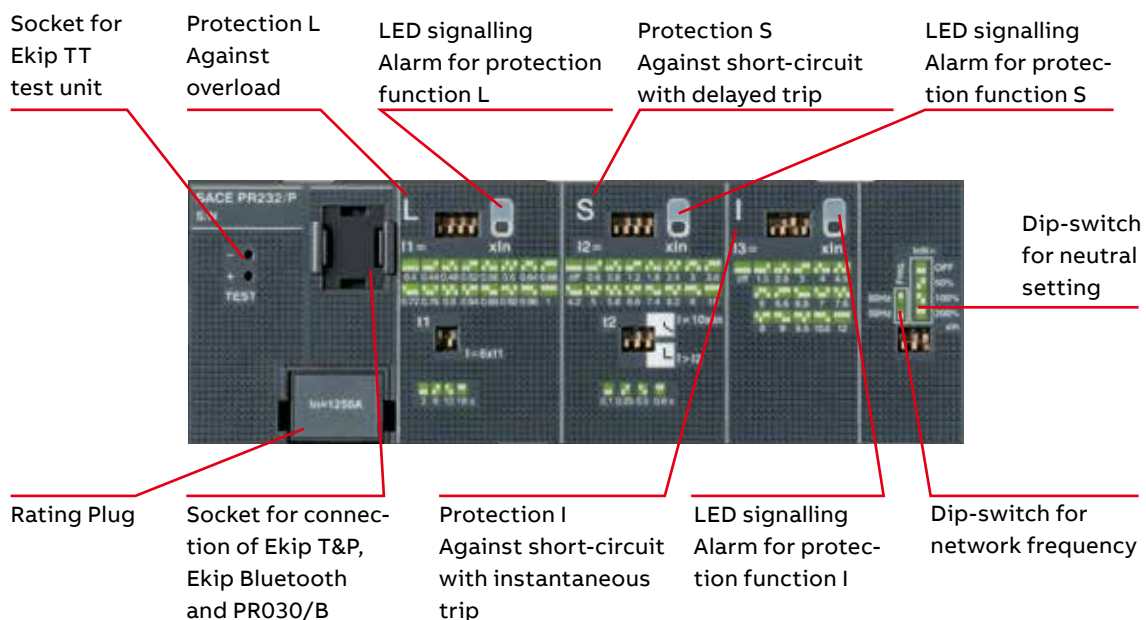
PR232/P

The PR232/P release, available for T7, provides protection functions against overload L, delayed short-circuit S and instantaneous short-circuit I (version PR232/P-LSI).

Setting the trip parameters of the PR232/P release can be carried out by means of the dip-switches. In particular, adjustment of the neutral

to 200% of the phase current requires setting protection L to respect the current-carrying capacity of the circuit-breaker.

To guarantee protection of the installation by means of the PR232/P protection release, it is necessary to select the rated network frequency (50/60 Hz), by means of the special dipswitch.



Protection functions and parameterisations

Protection functions	Trip threshold	Trip curves ⁽¹⁾	Thermal memory ⁽²⁾	Excludability	Relation $t = f(I)$
L Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve ($I^2t=k$) according to IEC 60947-2 Standard	$I_1 = 0.40...1 \times I_n$, step = $0.04 \times I_n$ Trip between $1.1...1.3 \times I_1$	at $6 \times I_1$ $t_1 = 3s$ $t_1 = 6s$ $t_1 = 12s$ $t_1 = 18s$ Tolerance: $\pm 10\%$	■	–	$t = k/I^2$
S Against short-circuit with inverse short time delay trip and trip characteristic with inverse time ($I^2t=k$) or definite time	$I_2 = 0.6 - 0.8 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5 - 5.8 - 6.6 - 7.4 - 8.2 - 9 - 10 \times I_n$ Tolerance: $\pm 10\%$	at $10 \times I_n$ $t_2 = 0.1s$ $t_2 = 0.25s$ $t_2 = 0.5s$ $t_2 = 0.8s$ Tolerance: $\pm 10\%$	■	■	$t = k/I^2$
	$I_2 = 0.6 - 0.8 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5 - 5.8 - 6.6 - 7.4 - 8.2 - 9 - 10 \times I_n$ Tolerance: $\pm 10\%$	$I > I_2$ $t_2 = 0.1s$ $t_2 = 0.25s$ $t_2 = 0.5s$ $t_2 = 0.8s$ Tolerance: $\pm 10\%$	–	■	$t = k$
I Against short-circuit with instantaneous trip	$I_3 = 1.5 - 2.5 - 3 - 4 - 4.5 - 5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 9 - 9.5 - 10.5 - 12 \times I_n$ Tolerance: $\pm 10\%$	instantaneous	–	■	$t = k$

(1) These tolerances hold in the following conditions:
– self-powered trip unit at full power (without start-up)
– two or three-phase power supply.

In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	$\pm 10\%$	$\pm 20\%$
I	$\pm 15\%$	$\leq 60ms$

(2) Active up to 7 min. after tripping of the breaker
(ON/OFF setting by means of PR010/T test unit).

PR332/P

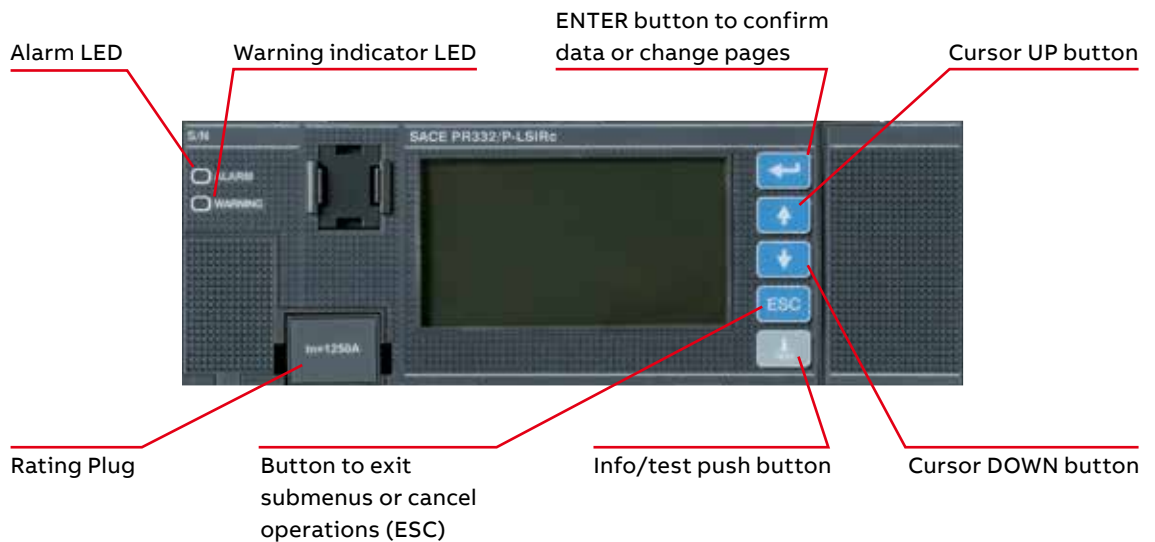
The SACE PR332/P trip unit for Tmax T7 (available in four versions: PR332/P-LI, PR332/P-LSI, PR332/P-LSIG and PR332/P-LSIRc) is a sophisticated and flexible protection system based on a state-of-the-art microprocessor and DSP technology. Fitted with the optional internal PR330/D-M dialogue unit, PR332/P turns into an intelligent protection, measurement and communication device, based on the Modbus® RTU protocol. By means of the PR330/D-M, PR332/P can also be connected to the ABB EP010 Fieldbus plug adapter, which makes it possible to choose among several different networks, such as Profibus and DeviceNet.

The new PR332/P is the result of ABB SACE's experience in designing protection trip units.

The exhaustive range of settings makes this protection unit ideal for general use in power distribution. Access to information and programming using a keyboard and graphic liquid crystal display is extremely simple and intuitive.

An integrated ammeter and many other additional features are provided over and above the protection functions. These additional functions can be further increased with addition on board of the dialogue, signalling, measurement, and wireless communication units. All the thresholds and trip curve delays of the protection functions are stored in special memories which retain the information even when no power is supplied.

PR332/P



PR332/P - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves ⁽¹⁾	Excludability	Relation t = f(I)	Thermal memory ⁽²⁾	Zone selectivity ⁽²⁾
L	Against overload with inverse long-time delay trip according to IEC 60947-2 Standard (I²t=k) or in accordance with the IEC 60255-3 Standard (t=f(α) ⁽³⁾)	I ₁ = 0.4...1 x I _n , step = 0.01 x I _n Trip between 1.05...1.2 x I ₁	at 3 x I ₁ t ₂ = 3...144s, step = 3s Tolerance: up to 6 x I _n ±20% above 6 x I _n	–	t = k/I²	■	–
		I ₁ = 0.4...1 x I _n , step = 0.01 x I _n Trip between 1.05...1.2 x I ₁	at 3 x I ₁ t ₂ = 3...144s, step = 3s Tolerance: ±10% up to 6 x I _n ±20% above 6 x I _n	■	t = f(α) ⁽³⁾ α = 0.02-1-2	■	–
S	Against short-circuit with short inverse time-delay trip and trip characteristic with inverse time (I²t=k) or with definite time	I ₂ = 0.6...10 x I _n , step = 0.1 x I _n Tolerance: ±7% up to 6 x I _n ±10% above 6 x I _n	at 10 x I _n t ₂ = 0.05...0.8s, step = 0.01s Tolerance: ±15% up to 6 x I _n ±20% over 6 x I _n	■	t = k/I²	■	–
		I ₂ = 0.6...10 x I _n , step = 0.1 x I _n Tolerance: ±7% up to 6 x I _n ±10% above 6 x I _n	t ₂ = 0.05...0.8s, step = 0.01s t _{2 sel} = 0.04...0.2s, step = 0.01s Tolerance: min (±10%; ±40ms)	■	t = k	–	■
I	Against short-circuit with adjustable instantaneous trip	I ₃ = 1.5...15 x I _n , step = 0.1 x I _n Tolerance: ±10%	≤ 30 ms	■	t = k	–	–
G	Against earth fault with short inverse time-delay trip and trip characteristic according to an inverse time curve (I²t=k) or with definite time	I ₄ = 0.2...1 x I _n , step = 0.02 x I _n Tolerance: ±7%	t ₄ = 0.1...1s, step = 0.05s Tolerance: ±15%	■	t = k/I ²⁽⁵⁾	–	–
		I ₄ = 0.2...1 x I _n , step = 0.02 x I _n Tolerance: ±7%	t ₄ = 0.1...1s, step = 0.05s t _{4 sel} = 0.04...0.2s, step = 0.05s Tolerance: min (±10%; ±40ms)	■	t = k	–	■
Rc	Against residual current fault with definite time-delay trip	IΔ = 3-5-7-10-20-30 A Tolerance: 0-20%	tΔ = 0.06-0.1-0.2-0.3-0.4-0.5-0.8s Tolerance: ±20%	■	t = k	–	–
OT	Against overtemperature of the trip unit with instantaneous trip	Trip unit temperature over 85 °C	instantaneous	–	temp = k	–	–
U	Against unbalanced phase with definite time-delay trip	I ₆ = 2%...90% x I ₁ , step = 1% x I ₁ Tolerance: ±10%	t ₆ = 0.5...60 s, step = 0.5s Tolerance: min (±20%; ±100ms)	■	t = k	–	–

(1) These tolerances are valid under the following conditions:
– trip unit self-supplied at full power and/or auxiliary supply
– two or three-phase power supply
In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
L	Release between 1.05 and $1.25 \times I_1$	$\pm 20\%$
S	$\pm 10\%$	$\pm 20\%$
I	$\pm 15\%$	$\leq 60ms$
G	$\pm 15\%$	$\pm 20\%$
Other	$\pm 10\%$	$\pm 20\%$

(2) Active with 24V auxiliary power supply

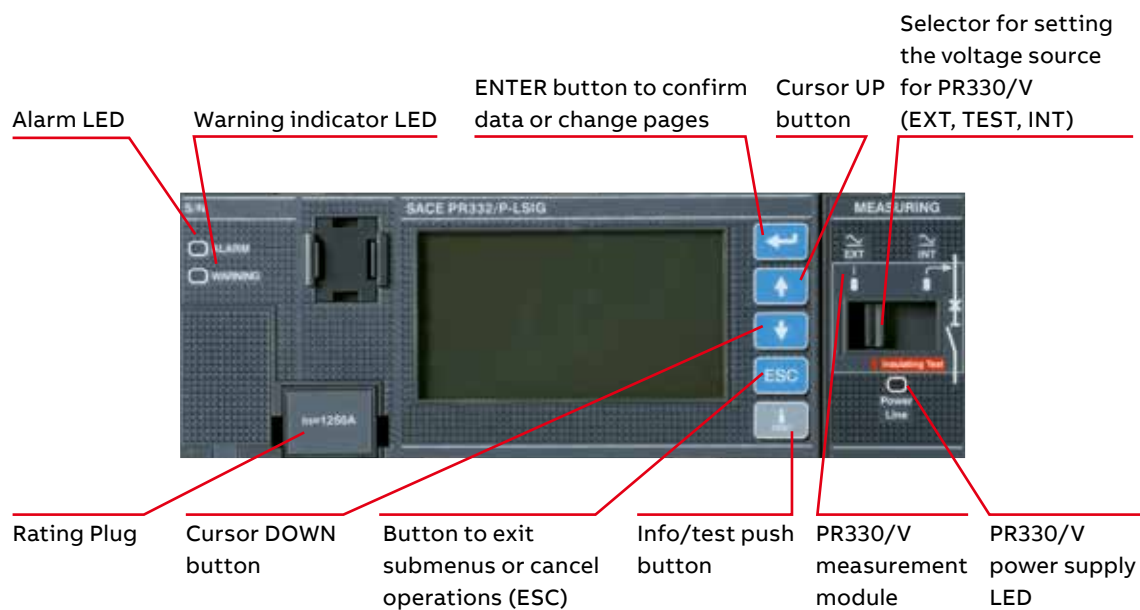
$$(3) t = \frac{(3^\alpha - 1)}{\left(\frac{I}{I_1}\right)^\alpha - 1} t_1 (3 \times I_1)$$

(4) For $T7 I_n = 1250 \text{ A}/1600 \text{ A}$ $I_{3\text{ max}} = 12 \times I_n$

(5) $k = (2s) \cdot (I_0)^2$

PR332/P

PR332/P with PR330/V



PR332/P with PR330/V - Advanced protection functions and parameterisations

Advanced protection functions		Trip threshold	Trip curves ⁽¹⁾	Excludability	Relation $t = f(I)$	Thermal memory ⁽²⁾	Zone selectivity ⁽²⁾
UV	Against undervoltage with adjustable constant time	$U_8 = 0.5...0.95 \times U_n$, step = $0.01 \times U_n$ Tolerance: $\pm 5\%$	$t_8 = 0.1...5s$, step = $0.1s$ Tolerance: min ($\pm 20\% \pm 100ms$)	■	$t = k$	–	–
OV	Against overvoltage with adjustable constant time	$U_9 = 1.05...1.2 \times U_n$, step = $0.01 \times U_n$ Tolerance: $\pm 5\%$	$t_9 = 0.1...5s$, step = $0.1s$ Tolerance: min ($\pm 20\% \pm 100ms$)	■	$t = k$	–	–
RV	Against residual voltage with adjustable constant time	$U_{10} = 0.1...0.4 \times U_n$, step = $0.01 \times U_n$ Tolerance: $\pm 5\%$	$t_{10} = 0.5...30s$, step = $0.5s$ Tolerance: min ($\pm 10\% \pm 100ms$)	■	$t = k$	–	–
RP	Against reversal of power with adjustable constant time	$P_{11} = -0.3...-0.1 \times P_n$, step = $0.02 \times P_n$ Tolerance: $\pm 10\%$	$t_{11} = 0.5...25s$, step = $0.1s$ Tolerance: min ($\pm 10\% \pm 100ms$)	■	$t = k$	–	–
UF	Against underfrequency with adjustable constant time	$f_{12} = 0.90...0.99 \times f_n$, step = $0.01 \times f_n$ Tolerance: $\pm 5\%$	$t_{12} = 0.5...3s$, step = $0.1s$ Tolerance: min ($\pm 10\% \pm 100ms$)	■	$t = k$	–	–
OF	Against overfrequency with adjustable constant time	$f_{13} = 1.01...1.10 \times f_n$, step = $0.01 \times f_n$ Tolerance: $\pm 5\%$	$t_{13} = 0.5...3s$, step = $0.1s$ Tolerance: min ($\pm 10\% \pm 100ms$)	■	$t = k$	–	–

(1) These tolerances are valid under the following conditions:
– trip unit self-supplied at full power and/or auxiliary supply
– two or three-phase power supply
In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
L	Release between 1.05 and $1.25 \times I_1$	$\pm 20\%$
S	$\pm 10\%$	$\pm 20\%$
I	$\pm 15\%$	$\leq 60ms$
G	$\pm 15\%$	$\pm 20\%$
Other	$\pm 10\%$	$\pm 20\%$

(2) Active with 24V auxiliary power supply

$$(3) t = \frac{(3^a - 1)}{\left(\frac{I}{I_1}\right)^a - 1} t_1 (3 \times I_1)$$

(4) For $T7 I_n = 1250 A / 1600 A \square I_{3max} = 12 \times I_n$

(5) $k = (2s) \cdot (I_d)^2$

Ekip Touch

Ekip Touch is the new protection trip unit for SACE Emax 2 that provides a complete series of protections and high accuracy measurements of all electric parameters and can be integrated perfectly with the most common automation and supervision systems.

The simple and intuitive interface enables the operator to access all the information and settings rapidly and easily by minimizing installation and commissioning time.

The Ekip Touch protection functions can be further increased by using the Ekip Measuring Pro measuring and protection module. With this module, all the protection functions linked to voltage, frequency and power can be enabled, thus making Ekip Touch a multifunction unit that can measure, control and protect even the most complex installation.

Key:

1. Wide high-resolution colour touch-screen display
2. Power-on LED to indicate correct operation (watchdog)
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and indicating cause of trip
7. Test and programming connector



Ekip Hi-Touch

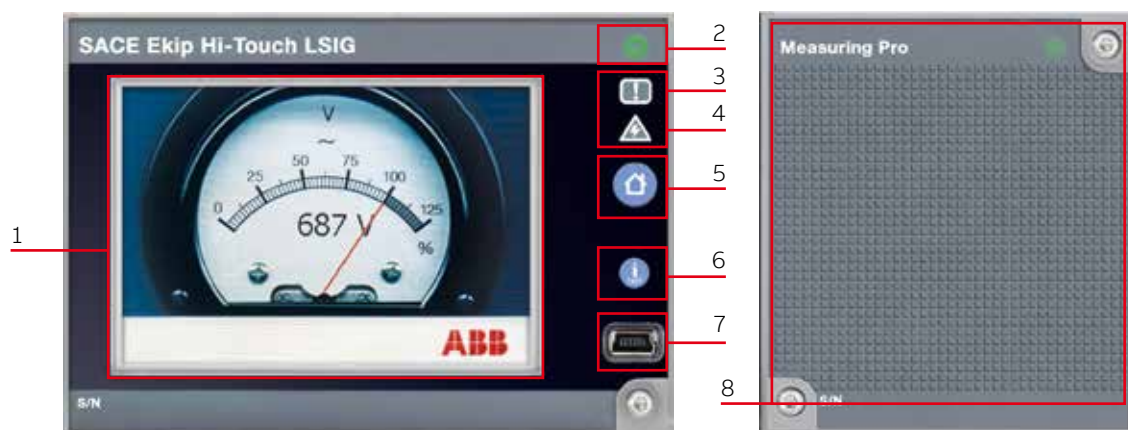
Ekip Hi-touch of SACE Emax 2 is a high-performance multifunction unit that is extraordinarily versatile and can be used in even the most complex installations. Ekip Hi-Touch, in fact, features exclusive functions such as: directional protection, restricted earth fault and dual setting of the protections. In addition, Ekip Hi-Touch is supplied with the exclusive Network Analyzer function that can monitor the quality of the power absorbed by the installation in accordance with existing standards.

Ekip Hi-Touch boasts all the features of Ekip Touch; as standard, it features the measuring and protection module Ekip Measuring Pro and can also be fitted, like Ekip Touch, with the additional features provided by the internal modules and by the external accessories.

The front interface of the unit, which is common to Ekip Touch, is extremely simply because of the touchscreen colour display; it is able to show measurements, bar graphs and sine curves of the different electrical values.

Key:

1. Wide high-resolution colour touch-screen display
2. Power-on LED indicating correct operation
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and for indicating cause of the trip
7. Test and programming connector
8. Ekip Measuring Pro module, with relative LED power on



Ekip G Touch

Ekip G Touch is the new protection trip unit designed for use in applications with generators, such as Genset, cogeneration and marine applications, in conformity to international standards IEC 60034-1 and IEEE

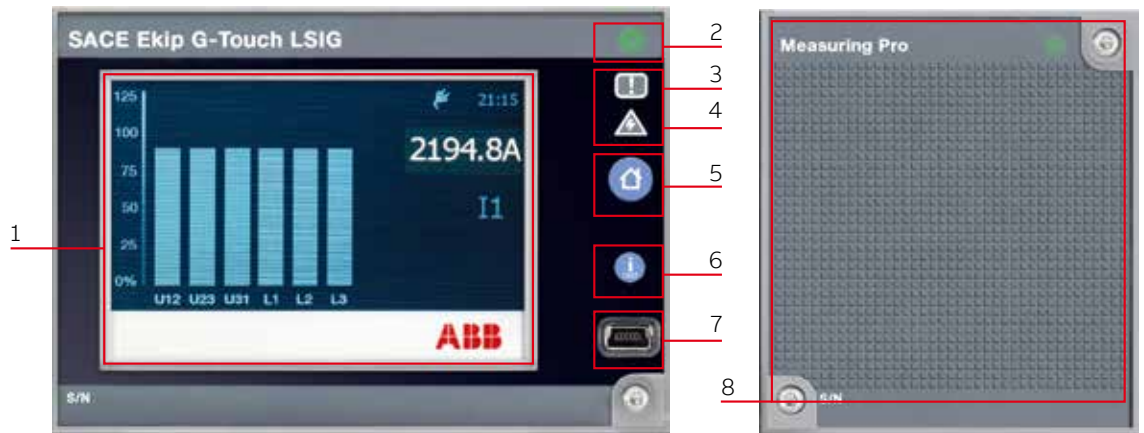
C37.102. Ekip G Touch has been approved by the main shipping registers and enables the number of components installed, such as external protection devices, current sensors, voltage transformers and the relative cabling, to be reduced. The reductions allow the installation to be significantly simplified. In addition, all the protection functions can be tested individually, using the Ekip T&P device that enables the function to be tested before commissioning.

The unit is available in the Ekip G Touch LSIG version and features all the characteristics provided by Ekip Touch. The Ekip Measuring Pro measuring and protection module is supplied as standard and, like Ekip Touch; the functions can be increased further using the internal modules and the external accessories.

The front interface of the unit, which is common to the Ekip Touch family, is characterised by a wide, high resolution touchscreen display that is simple to use and displays measurements and alarms clearly and accurately.

Key:

1. Wide, high resolution touchscreen display
2. Power-on LED indicating correct operation
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and for indicating cause of the trip
7. Test and programming connector
8. Ekip Measuring Pro module with relative power-on LED



Ekip G Hi-Touch

Ekip G Hi-Touch is the new benchmark for the protection of low voltage electric generators. It provides optimum protection, even in complex installations, due to exclusive functions such as protection against frequency creep and maximum directional current.

Ekip G Hi-Touch, like all Hi-Touch trip units, is supplied as standard with the Ekip Measuring Pro measuring and protection module and enables an independent second set of protections to be set.

In addition, the Network Analyzer function enables it to monitor the quality of the power delivered by the generator.

Ekip G Hi-Touch is available in the LSIG version and ensures all the protection, measuring and control functions of Ekip Hi-Touch and the specific protections for Ekip G Touch generators. The user interface and the accessories are common to the rest of the family.

Key:

1. Wide, high resolution touchscreen display
2. Power-on LED indicating correct operation
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and for indicating cause of the trip
7. Test and programming connector
8. Ekip Measuring Pro module with relative power-on LED



Protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Trip time	Time Step
L	49	Overload Protection	$I1 = 0.4...1 \times In$	$0.001 \times In$	with $I = 3 I1$, $t1 = 3...144 \text{ s}$	1s
		Thermal Memory				
	Tolerance	trip between 1.05 and $1.2 \times I1$		$\pm 10\% I \leq 6 \times In / \pm 20\% I > 6 \times In$		
	49	Overload Protection	$I1 = 0.4...1 \times In$	$0.001 \times In$	with $I = 3 I1$, $t1 = 3...144 \text{ s}$ Standard inverse SI: $k=0.14 \alpha=0,02$ Very Inverse VI: $k=13.5 \alpha=1$ Extremely Inverse EI: $k=80 \alpha=2$ $t=k/I4$; $k=80 \alpha=4$	1s
Tolerance		trip between 1.05 and $1.2 \times I1$		$\pm 10\% I \leq 6 \times In / \pm 20\% I > 6 \times In$		
S	50TD	Time-delayed overcurrent protection	$I2 = 0.6...10 \times In$	$0.1 \times In$	With $I > I2$, $t2 = 0.05...0.8s$	0.01s
	68	Zone selectivity			$t2sel = 0.04...0.2s$	0.01s
		Start up	Activation: $0.6...10 \times In$	$0.1 \times In$	Range: $0.1...30s$	0.01s
		Tolerance	$\pm 7\% I \leq 6 \times In$ $\pm 10\% I > 6 \times In$		The better of the two data: +-10% or +-40ms	
	51	Time-delayed overcurrent protection	$I2 = 0.6...10 \times In$	$0.1 \times In$	with $I = 10 In$, $t2 = 0.05...0.8s$	0.01s
		Thermal Memory				
I	50	Tolerance	$\pm 7\% I \leq 6 \times In$ $\pm 10\% I > 6 \times In$		$\pm 15\% I \leq 6 \times In$ $\pm 20\% I > 6 \times In$	
		Istantaneous overcurrent protection	$I3= 1.5...15 \times In$	$0.1 \times In$	With $I > I3$, instantaneous	-
		Start up	Activation: $1.5...15 \times In$	$0.1 \times In$	Range: $0.1...30s$	0.01s
G	50N TD	Tolerance	$\pm 10\%$		$\leq 30 \text{ ms}$	
		Earth fault protection	$I4^{(1)} = 0.1...1 \times In$	$0.001 \times In$	with $I > I4$, $t4 = \text{Instantaneous (with Vaux)} + 0,1...1 \text{ s}$	0.05s
		Zone selectivity			$t4sel = 0.04...0,2s$	0.01s
		Start up	Activation: $0.2...1 \times In$	$0.02 \times In$	range: $0.1...30s$	0.01s
	51N	Tolerance	$\pm 7\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$ or $50ms$ with $t4 = \text{instantaneous}$	
		Earth fault protection	$I4^{(1)} = 0.1...1 \times In$	$0.001 \times In$	with $I = 4 In$, $t4 = 0.1...1s$	0.05s
IU	46	Tolerance	$\pm 7\%$		$\pm 15\%$	
		Current unbalance protection	$I6 = 2...90\% In$ unbalance	$1\%In$	with unbalance $> I6$, $t6 = 0.5...60s$	0.5s
2I	50	Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$ (for $t<5s$) / $\pm 100ms$ (for $t\geq 5s$)	
		Programmable instantaneous overcurrent protection	$I31 = 1.5...15 \times In$	$0.1xIn$	with $I>I31$, instantaneous	
MCR		Tolerance	$\pm 10\%$		$\leq 30 \text{ ms}$	
		Closing on short-circuit protection	$I3= 1.5...15 \times In$	$0.1 \times In$	With $I > I3$, instantaneous Monitor time range: $40...500ms$	0.01s
Gext	50G TD	Tolerance	$\pm 10\%$		$\leq 30 \text{ ms}$	
		Earth fault protection	$I41^{(1)} = 0.1...1 \times In$ Toroid	$0.001 \times In$ Toroid	with $I > I41$, $t41 = 0.1...1s$	0.05s
		Zone selectivity			$t41sel = 0.04...0,2s$	0.01s
		Start up	Activation: $0.1...1 \times In$	$0.02 \times In$	range: $0.1...30s$	0.01s
	51G	Tolerance	$\pm 7\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$	
		Earth fault protection	$I41^{(1)} = 0.1...1 \times In$	$0.001 \times In$	with $I = 4 In$, $t41 = 0.1...1s$	0.05s
Rc	64 50N TD	Residual current protection	$I\Delta n = 3 - 5 - 7 - 10 - 20 - 30A$		with $I > I\Delta n$, $t\Delta n = 0.06 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.8s$	
	87N	Differential ground fault protection			$140ms @ 0.06s$ (max trip time) $950ms @ 0.80s$ (max trip time)	
UV	27	Tolerance	$\pm 2\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$ (for $t<5s$) / $\pm 100 \text{ ms}$ (for $t\geq 5s$)	
		Undervoltage Protection	$U8 = 0.5....0.98 \times Un$	$0.001 \times Un$	with $U < U8$, $t8 = 0.05...120s$	0.01s
OV	59	Tolerance	$\pm 2\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$ (for $t<5s$) / $\pm 100 \text{ ms}$ (for $t\geq 5s$)	
		Overvoltage protection	$U9 = 1.02....1.5 \times Un$	$0.001 \times Un$	with $U > U9$, $t9 = 0.05...120s$	0.01s



Excludibility	Excludibility trip	Pre-alarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
yes, with rating plug L=off	no	50...90% I1, step 1%	$t = k / I^2$	●	●	●	●
yes				●	●	●	●
yes, with rating plug L=off	no	50...90% I1, step 1%	$t = \frac{k t_1}{\left(\frac{I}{I_1}\right)^{\alpha-1}}$	●	●	●	●
yes	yes	no	$t = k$	●	●	●	●
yes				●	●	●	●
yes				●	●	●	●
yes	yes	no	$t = k / I^2$	●	●	●	●
yes				●	●	●	●
yes	no	no	$t = k$	●	●	●	●
yes				●	●	●	●
yes	yes	50...90% I4, step 1%	$t = k$	●	●	●	●
yes				●	●	●	●
yes				●	●	●	●
yes	yes	50...90% I4, step 1%	$t = k / I^2$	●	●	●	●
yes	yes	no	$t = k$	●	●	●	●
yes	no	no	$t = k$	●	●	●	●
yes	no	no	$t = k$	●	●	●	●
yes	yes	50...90% I41, step 1%	$t = k$	●	●	●	●
yes				●	●	●	●
yes				●	●	●	●
yes	yes	50...90% I41, step 1%	$t = k / I^2$	●	●	●	●
Attivabile with rating plug Rc	no	no	$t = k$	●	●	●	●
yes	yes	no	$t = k$	○	●	●	●
yes	yes	no	$t = k$	○	●	●	●

Table continued on next page

Protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Trip time	Time Step
VU	47	Voltage unbalance protection	U14 = 2...90% Un unbalance	1% Un	with unbalance > U14, t14 = 0.5...60s	0.5s
		Tolerance	± 5%		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
UF	81L	Underfrequency protection	f12 = 0.9...0.999 x fn	0.001 x fn	with f < f12, t12 = 0.15...300s	0.01s
		Tolerance	± 1% (with fn ±2%)		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
OF	81H	Overfrequency protection	f13 = 1.001...1.1 x fn	0.001 x fn	with f > f13, t13 = 0.15...300s	0.01s
		Tolerance	± 1% (with fn ±2%)		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
RP	32R	Reverse active power protection	P11 = -1...-0.05 Sn	0.001 Sn	with P > P11, t11 = 0.5...100s	0.1s
		Tolerance	± 10%		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
ABB: Cyclical direction	47	Cyclical direction of the phases	1-2-3 or 3-2-1			
ABB: Power factor	78	3phase Power factor	PF3 = 0.5...0.95	0.01		
LC1/2 Iw1/2		Current threshold	LC1 = 50%...100% I1 LC2 = 50%...100% I1 Iw1 = 0.1...10 In Iw2 = 0.1...10 In Activation: up/down	1% 1% 0.01 x In		
		Tolerance	± 10%			
S2	50TD	Time-delayed overcurrent protection	I5 = 0.6...10 x In	0.1 x In	With I > I5, t5 = 0.05...0.8s	0.01s
	68	Zone selectivity			t5sel = 0.04...0.2s	0.01s
		Start up	Activation: 0.6...10 x In	0.1 x In	Range: 0.1...30s	0.01s
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		The better of the two data: ± 10% or ± 40 ms	
D	67	Directional overcurrent protection (forward &/or backward)	I7 = 0.6...10 x In	0.1 x In	with I > I7, t7 = 0.1...0.8s	0.01s
	68	Zone selectivity			t7sel = 0.1...0.8s	0.01s
		Start up (forward &/or backward)	Activation: 0.6...10 x In	0.1 x In	Range: 0.1...30s	0.01s
		Trip direction	forward &/or backward			
		Minimum angle direction (°)	3.6, 7.2, 10.8, 14.5, 18.2, 22, 25.9, 30, 34.2, 38.7, 43.4, 48.6, 54.3, 61, 69.6			
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		The better of the two data: ± 10% or ± 40 ms	
UV2	27	Undervoltage Protection	U15 = 0.5...0.98 x Un	0.001 x Un	with U < U15, t15 = 0.05...120s	0.01s
		Tolerance	± 2%		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
OV2	59	Overvoltage protection	U16 = 1.02...1.5 x Un	0.001 x Un	with U > U16, t16 = 0.05...120s	0.01s
		Tolerance	± 2%		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
UF2	81L	Underfrequency protection	f17 = 0.9...0.999 x fn	0.001 x fn	with f < f17, t17 = 0.15...300s	0.01s
		Tolerance	± 1% (with fn ±2%)		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
OF2	81H	Overfrequency protection	f18 = 1.001...1.1 x fn	0.001 x fn	with f > f18, t18 = 0.15...300s	0.01s
		Tolerance	± 1% (with fn ±2%)		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	
S(V)	51V	Voltage controlled overcurrent protection	I20 = 0.6...10 x In	0.1 x In	With I > I20, t20 = 0.05...30s	0.01s
		Step mode	UI = 0.2...1 x Un Ks = 0.1...1	0.01 x Un 0.01		
		Linear mode	UI = 0.2...1 x Un Uh = 0.2...1 x Un Ks = 0.1...1	0.01 x Un 0.01 x Un 0.01		
		Tolerance	± 10%		The better of the two data: ± 10% or ± 40 ms (for t<5s) / ± 100 ms (for t≥5s)	



Excludibility	Excludibility trip	Pre-alarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k	○	●	●	●
yes	only signalling	no	-	○	●	●	●
yes	only signalling	no	-	○	●	●	●
yes	only signalling	no	-	●	●	●	●
yes	yes	no	t = k		●		●
yes	yes				●		●
yes					●		●
yes	yes	no	t = k		●		●
yes					●		●
yes					●		●
yes	yes	no	t = k		●		●
yes	yes	no	t = k		●		●
yes	yes	no	t = k		●		●
yes	yes	no	t = k		●		●
yes	yes	no	t = k			●	●
						●	●
						●	●

Table continued on next page

Protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	Time Step
RV	59N	Residual overvoltage protection	$U_{22} = 0.05...0.5 \times U_n$	$0.001 \times U_n$	with $U > U_{22}$, $t_{22} = 0.5...120s$	0.01s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40 ms$ (for $t < 5s$) / $\pm 100 ms$ (for $t \geq 5s$)	
OP	32OF	Active overpower protection	$P_{26} = 0.4...2 S_n$	$0.001 S_n$	with $P > P_{26}$, $t_{26} = 0.5...100s$	0.5s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 ms$ (for $t < 5s$) / $\pm 100 ms$ (for $t \geq 5s$)	
OQ	32OF	Reactive overpower protection	$Q_{27} = 0.4...2 S_n$	$0.001 S_n$	with $Q > Q_{27}$, $t_{27} = 0.5...100s$	0.5s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 ms$ (for $t < 5s$) / $\pm 100 ms$ (for $t \geq 5s$)	
UP	32LF	Active underpower protection	$P_{23} = 0.1...1 \times S_n$	$0.001 \times S_n$	with $P < P_{23}$, $t_{23} = 0.5...100s$	0.5s
		Start up			range: $0.1...30s$	0.01s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 ms$ (for $t < 5s$) / $\pm 100 ms$ (for $t \geq 5s$)	
RQ	40/32R	Loss of field or reverse reactive power protection	$Q_{24} = -1...-0.1 S_n$ $K_q = -2...2$	$0.001 S_n$ 0.01	with $Q > Q_{24}$, $t_{24} = 0.5...100s$	0.1s
		Loss of field or reverse reactive power protection	$Q_{25} = -1...-0.1 S_n$ $K_{q2} = -2...2$	$0.001 S_n$ 0.01	with $Q > Q_{25}$, $t_{25} = 0.5...100s$	0.5s
		Voltage minimum threshold	$V_{min.} = 0.5...1.2$	0.01		
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 ms$ (for $t < 5s$) / $\pm 100 ms$ (for $t \geq 5s$)	
S2(V)	51V	Voltage controlled overcurrent protection	$I_{21} = 0.6...10 \times I_n$	$0.1 \times I_n$	With $I > I_{21}$, $t_{21} = 0.05...30s$	0.01s
		Step mode	$U_{I2} = 0.2...1 \times U_n$	$0.01 \times U_n$		
			$K_{s2} = 0.1...1$	0.01		
		Linear mode	$U_{I2} = 0.2...1 \times U_n$	$0.01 \times U_n$		
			$U_{h2} = 0.2...1 \times U_n$	$0.01 \times U_n$		
			$K_{s2} = 0.1...1$	0.01		
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 ms$ (for $t < 5s$) / $\pm 100 ms$ (for $t \geq 5s$)	
ROCOF	81R	Rate of change of frequency protection	$f_{28} = 0.4...10 Hz/s$	$0.2 Hz/s$	with $f > f_{28}$, $t_{28} = 0.5...10s$	0.01s
		Trip direction	up &/or down			
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 20\%$ or $\pm 200 ms$	
Synchro-check SC	25	Synchrocheck (Live busbars)	$U_{live} = 0.5...1.1 U_n$ $\Delta U = 0.02...0.12 U_n$ $\Delta f = 0.1...1 Hz$ $\Delta \Phi = 5...50^\circ \text{ elt}$	$0.001 U_n$ $0.001 U_n$ $0.1 Hz$ 5° elt	Stability voltage time for live state = $100...30000ms$ Minimum matching Time = $100...3000ms$	$0.001 s$ $0.01 s$
		Tolerance	$\pm 10\%$			
		Synchrocheck (Live,Dead busbars)	$U_{live} = 0.5...1.1 U_n$ $U_{dead} = 0.02...0.2 U_n$	$0.001 U_n$ $0.001 U_n$	$t_{ref} = 0.1...30s$	0.1s
		Frequency check off				
		Phase check off				
		Dead bar configuration	Reverse/standard			
		Primary voltage	100...1150	100, 115, 120, 190, 208, 220, 230, 240, 277, 347, 380, 400, 415, 440, 480, 500, 550, 600, 660, 690, 910, 950, 1000, 1150		
		Secondary voltage	100...120	100, 110, 115, 120		
		Tolerance	$\pm 10\%$			

(1) With Vaux all thresholds are available. Without Vaux minimum threshold is limited to: $0.3I_n$ (with $I_n = 100A$), $0.25I_n$ (with $I_n = 400A$) or $0.2I_n$ (for all other ratings)

The tolerances above apply to trip units already powered by the main circuit with current flowing in at least two-phases or an auxiliary power supply.

In all other cases the following tolerance values apply:

ABB Code	Trip threshold	Trip time
L	Trip between 1.05 and $1.2 \times I_1$	$\pm 20\%$
S	$\pm 10\%$	$\pm 20\%$
I	$\pm 15\%$	$\leq 60ms$
G	$\pm 15\%$	$\pm 20\%$
Other protection	$\pm 15\%$	$\pm 20\%$



Excludibility	Excludibility trip	Pre-alarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
yes	yes	no	t = k			●	●
yes	yes	no	t = k			●	●
yes	yes	no	t = k			●	●
yes	yes	no	t = k			●	●
yes							
yes	yes	no	t = k			●	●
yes	yes	no	t = k				●
yes							
yes	yes	no	t = k				●
							●
							●
yes	yes	no	t = k				●
yes	yes	no	t = k				●
yes	only signalling	no	-	○ ○○	○○	○○	○○
yes	only signalling	no	-				
yes							
yes							
yes							

Key:

- not available
- available
- available with Ekip Measuring and Ekip Measuring Pro
- available with Ekip Synchrocheck

Measurement functions

Instantaneous measurements	Parameters
Currents (RMS)	[A] L1, L2, L3, Ne
Earth fault current (RMS)	[A] Ig
Phase-phase voltage (RMS)	[V] U12, U23, U31
Phase-neutral voltage (RMS)	[V] U1, U2, U3
Phase sequence	
Frequency	[Hz] f
Active power	[kW] P1, P2, P3, Ptot
Reactive power	[kVAR] Q1, Q2, Q3, Qtot
Apparent power	[KVA] S1, S2, S3, Stot
Power factor	total
Peak factor	L1, L2, L3, Ne
Counters recorded from installation or from the last reset	Parameters
Active energy	[kWh] Ep total, Ep positive, Ep negative
Reactive energy	[kVARh] Eq total, Ep positive, Ep negative
Apparent energy	[KVAh] Es total
Network Analyzer	Parameters
Hourly average voltage value	[V] - Umin= 0.75...0.95 x Un [no] - Umax= 1.05...1.25 x Un - Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)
Short voltage interruptions	[no] - Umin= 0.75...0.95 x Un - Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)
Short voltage spikes	[no] - Umax= 1.05...1.25 x Un - Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)
Slow voltage sags and swells	[no] - Umin1= 0.75...0.95 x Un - Umin2= 0.75...0.95 x Un - Umin3= 0.75...0.95 x Un - Umax1= 1.05...1.25 x Un - Umax2= 1.05...1.25 x Un - Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)
Voltage unbalance	[V] - U neg. seq.= 0.02...0.10 x Un [no] - Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)
Harmonic analysis	Current and voltage: - up to 50° - Alarm THD: 5...20% - Single harmonic alarm: 3...10% plus a count of minutes the harmonic has been exceeded



Precision	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
1%	●	●	●	●
2%	●	●	●	●
0.5%	○	●	●	●
0.5%	○	●	●	●
	○	●	●	●
0.2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
	○	●	●	●

Precision				
2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●

Intervals				
t = 5...120min	-	●	-	●
t <40ms	-	●	-	●
t <40ms	-	●	-	●
t = 0.02s...60s	-	●	-	●
t = 5...120min	-	●	-	●
	-	●	-	●

Measurement functions

Record of values: of the parameter for each interval with time-stamping	Parameters
Current: minimum and maximum	[A] I Min, I Max
Phase-phase voltage: minimum and maximum	[V] U Min, U max
Active power: average and maximum	[kW] P Mean, P Max
Reactive power: average and maximum	[kVAR] Q Mean, Q Max
Apparent power: average and maximum	[KVA] S Mean, S Max
Data logger: record of high sampling rate parameters	Parameters
Currents	[A] L1, L2, L3, Ne, Ig
Voltages	[V] U12, U23, U31
Sampling rate	[Hz] 1200-2400-4800-9600
Maximum recording duration	[s] 16
Recording stop delay	[s] 0-10s
Number of registers	[no] 2 independent
Information on trip and opening data: after a fault without auxiliary supply	Parameters
Type of protection tripped	eg. L, S, I, G, UV, OV
Fault values per phase	[A/V/Hz w/ VAR] eg. I1, I2, I3, neutral for S protection V12, V23, V32 for UV protection
Time-stamping	Date, time and progressive number
Maintenance indicators	Parameters
Information on last 30 trips	Type of protection, fault values and time-stamping
Information on last 200 events	Type of event, time-stamping
Number of mechanical operations ⁽¹⁾	[no] Can be associated to alarm
Total number of trips	[no]
Total operating time	[h]
Wear of contacts	[%] Prealarm >80% Alarm = 100%
Date of maintenance operations performed	Last
Indication of maintenance operation needed	
Circuit-breaker I.D.	Type of circuit-breaker, assigned device name, serial number
Self-diagnosis	Parameters
Check of continuity of internal connections	Alarm due to disconnection: rating plug, sensors, trip coil
Failure of circuit-breaker to open (ANSI 50BF)	Alarm following non-tripping of protection functions
Temperature (OT)	Prealarm and alarm for abnormal temperature

(1) with auxiliary supply present



Window	Intervals	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
Fixed synchronizable by remote	Duration: 5...120min Number of intervals: 24	●	●	●	●
		●	●	●	●
		○	●	●	●
		○	●	●	●
		○	●	●	●
		●	●	●	●
		○	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
		●	●	●	●
Note: Opening of circuit-breaker can be set in the event of alarm		●	●	●	●
		●	●	●	●
		●	●	●	●

Key:

- not available
- available
- available with Ekip Measuring and Ekip Measuring Pro

For the complete protection functions diagrams and availability description for each version, as well as for more information, refer to the technical catalogue of the standard version.

CHAPTER 4

Advanced functionalities

62-63	Advanced features
64-65	Ekip G generator protection trip unit
66-67	Zone selectivity for Tmax T/ML
68-69	Logic zone selectivity for Emax 2/ML
70-70	Load shedding

Advanced features

A modern ship's operational ability is fully dependent on its onboard electrical infrastructure. Over the years, the growth in the number of electrically powered subsystems on a typical naval vessel has made this infrastructure ever more complex and extensive, and has led to a steady increase in power requirements.

ABB provides the first smart circuit-breaker that combine advanced protection, programmable logic, full connectivity, and comprehensive energy management in all-in-one revolutionary device. ML circuit breaker integrates the functions of Interface Protection System and Interface Device in order to check the Main Grid conditions and disconnect the User's plant whenever grid voltage and frequency are out of the ranges prescribed by the connection standard.

ML circuit breaker and its adaptive protections recognize the network change and automatically set new thresholds to guarantee protection and coordination in on-grid and off-grid conditions. Emax 2/ML is more than a circuit breaker as traditionally defined, compactness and high reliability from pre-tested functions makes Emax 2/ML highly suitable for applications in ships and marine vessels.

Emax 2/ML is an all-in-one innovative concept, in fact it is the first intelligent circuit breaker designed to protect, connect and optimize low-voltage microgrid applications. Accessories (modules) are added to the breaker to achieve all the additional functions needed.

Besides the advanced functionalities described on the following page, Emax 2 integrates in a single device the following function:

**Synchro reclosing,
Automatic Transfer Switch,
Watchdog.**

For further detail please refer to your local ABB referent.





Ekip G generator protection trip unit

ABB SACE ML family, with the new Ekip G generator protection trip unit, offers an effective and reliable solution designed for the protection of low voltage generators.

Ekip G is the new generator protection release, which has all the protection embedded and it can monitor all the key critical parameters for connecting the generator to the system. These functions, generally provided by multifunction independent relays, are now integrated into SACE ML circuit breaker to guarantee a solution that is easy to install, compact, and reliable.

The generator is one of the most delicate part of the ship's electrical system. The protections, especially those that safeguard this machine from the most heavy failures, are often redundant. Hence the protection system for a generator is complex and complicated to be calibrated and to be managed. The protections available on Ekip G are individually activated and cover a wide spectrum of onboard electrical system. They also comply with the major international regulations and standard that provide guidance on the type of protections to be used to control generators, for example in the naval field.

Ekip G is compliant with the standard IEC 60034-1 "Rotating electrical machines - Part 1: Rating and performance" of with the IEEE C37.102 "Guide for AC Generator Protection" and IEEE 242 "Protection and Coordination of Industrial and Commercial Power Systems" or requirements requested by naval standard such RINA, DNV etc. Nevertheless, the most commonly required protections according also to the indications given in the above mentioned Standards and rules are summarized in the Table below.

Protections for synchronous generators	SnG < 500kVA	500kVA < SnG < 1500kVA	SnG > 1500kVA
Protections against loss of prime mover:			
- Active power directional protection	●	●	●
Protections against overloads:			
- Overload and overcurrent	●	●	●
- Current unbalance	●	●	●
Protections against failures of the excitation system:			
- Loss of field	–	●	●
- Under/Overvoltage	●	●	●
Protections against frequency variations:			
- Under/Overfrequency	●	●	●
Protection against network loss:			
- Rate of change of frequency	–	●	●
Protection against failures of the insulation system:			
- Stator earth fault	●	●	●

The Ekip G trip unit is able to:

- monitor the frequency and voltage inside the machine whereby tripping the machine main circuit breaker would isolate the generator from the rest of the plant without eliminating the fault;
- monitor the interaction conditions between the generator and the rest of the plant and provide for the separation and protection of the two systems when the conditions for interconnection are missing.

In both cases, programmable contacts are available that can be used to determine the shutdown of the generator, of the prime mover and of excitation. Ekip G, which is supplied as standard with Ekip Measuring Pro module, is comprised of current, frequency, voltage and power protection functions specific for generators.

The main features available are summarized in the table below.



Function	Description	ANSI	ABB
Synchrocheck	Control of adequate conditions for parallel connection	25	SC
Active overpower protection	Protection against active overpower supply	32OF	OP
Reactive overpower protection	Protection against reactive overpower supply	32OF	OQ
Reverse active power protection	Protection against active power absorption (reverse power)	32R	RP
Directional overcurrent protection	Protection against directional current	67	D
Active underpower protection	Protection against active underpower supply	32LF	UP
Loss of field or reverse reactive power protection	Protection against energizing anomalies, check of reactive power absorption	40/32R	RQ
Overload protection	Current protection against temperature rise	49	L
Instantaneous overcurrent protection	Instantaneous protection against phase overcurrents	50	I
Time-delayed overcurrent protection	Inverse/definite time protection against phase overcurrents	51 50TD	S
Earth fault protection	Inverse/definite and instantaneous time protection against earth overcurrents	51N 50NTD 50N; 51G 50GTD	G; Gext
Differential ground fault protection	Definite time protection against earth overcurrents in the generator windings	87N	Rc
Voltage controlled overcurrent protection	Protection against short circuit between phases with current threshold depending on voltage (controlled/restrained mode)	51V	S(V)
Residual overvoltage protection	Protection detecting loss of insulation in the machine	59N	RV
Undervoltage protection	Protection against voltage decrease	27	UV
Overvoltage protection	Protection against voltage increase	59	OV
Current unbalance protection	Protection against phase current unbalance	46	IU
Voltage unbalance protection	Protection against voltage unbalance and detection of rotation direction of phases	47	VU
Rate of change of frequency protection	Protection against rapid frequency variations	81R	Rocof
Overfrequency protection	Protection against frequency increase	81H	OF
Underfrequency protection	Protection against frequency reduction	81L	UF

Zone selectivity for Tmax T/ML

Using zone selectivity is possible to obtain selectivity considerably reducing the trip times and therefore the thermal stresses all the plant components are subjected to during the fault.

This type of selectivity, a development of time co-ordination, is made by means of logic connections between current measuring devices which, once the set threshold having been exceeded is detected, allow just the fault area to be identified and to have its power supply cut off. Each circuit-breaker which detects a fault communicates this to the one on the supply side sending a timed locking signal.

Thanks to extremely rapid detection and quenching of the short-circuit, the Tmax ML equipped with PR223EF or PR332/P trip unit are totally selective up to over 100 kA, and are not subject to any limits regarding the number of hierarchical levels of the installation.

All the protection functions can be programmed remotely using the dialogue function present on the trip unit or locally through the Ekip T&P which can be connected to a serial port on the front of the PR223EF.

The trip unit can be supplied from a 24 V DC auxiliary source or directly through the current transformers (self-supply). The electronic trip unit operation is guaranteed even in the case of single-phase load up to $0.18 \times I_n$.

In the presence of an auxiliary power supply:

- the device implements the L, S, EF and G protection functions; if the EF is disabled by the user, function I is enabled
- EFDP zone selectivity is implemented on the S, EF and G functions.

With the PR332/P trip unit it is now possible to extend the ZS zone selectivity function, already available on ABB SACE air circuit-breakers to the moulded-case circuit-breakers. The ZS zone selectivity, which is applicable to protection functions S and G, can be enabled in the case where the curve with fixed time is selected and the auxiliary power supply is present. ZS of selectivity is identical to that which can be obtained through the Emax 2 ML trip units. Tmax T7/ML circuit-breaker equipped with PR332/P can be connected directly without external accessories on the load side of a zone selectivity chain created through the other devices (Emax 2 ML trip units).

PR223EF



PR332/P



Logic zone selectivity for Emax 2/ML

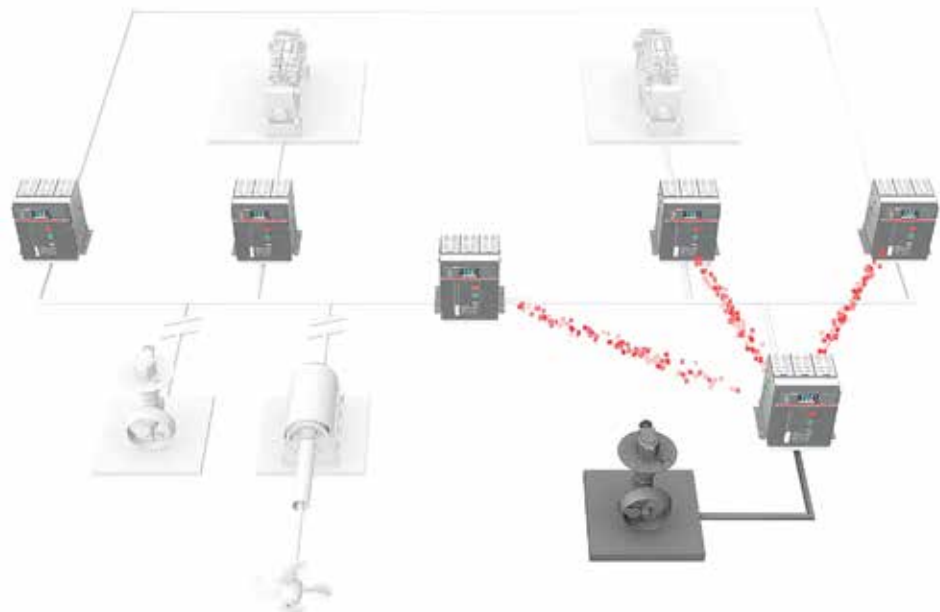
Emax 2/ML can manage the logic zone selectivity using the reliability, flexibility and efficiency of Ekip link, the ABB proprietary communication bus.

A major element of vessel power system design is protection against electrical faults. One very efficient method of handling faults is logic zone selectivity (or “discrimination”), which allows rapid fault isolation without users, other than those directly affected, seeing any effect. This approach can accurately isolate the fault branch by quickly opening the adjacent circuit breaker(s) and reduce the transitory on fault time and the electrical stresses.

Logic zone selectivity combines zone selectivity and directional protection. In contrast with traditional selectivity methods, which are based on time and/or current, the principle of logic zone selectivity is that the breaker that should trip for a fault sends a blocking signal to other breakers (upstreams) to prevent them from tripping. The principally impacted breaker can block other breakers from tripping, when appropriate. With Emax2, locking signal can be realized by traditional hardwire or by bus communication using Ekip Link.

Behind this scheme lies a logic that defines which breakers should and should not be tripped in certain situations. This logic is managed by Ekip Connect, the ABB software for the configuration of the electronic trip units.

Ekip Link, the ABB communication module for low voltage circuit breaker, communicate between circuit breaker using an internal ABB proprietary bus. The use of a proprietary bus guarantees very fast and predictable communication (independent of traffic on other buses)

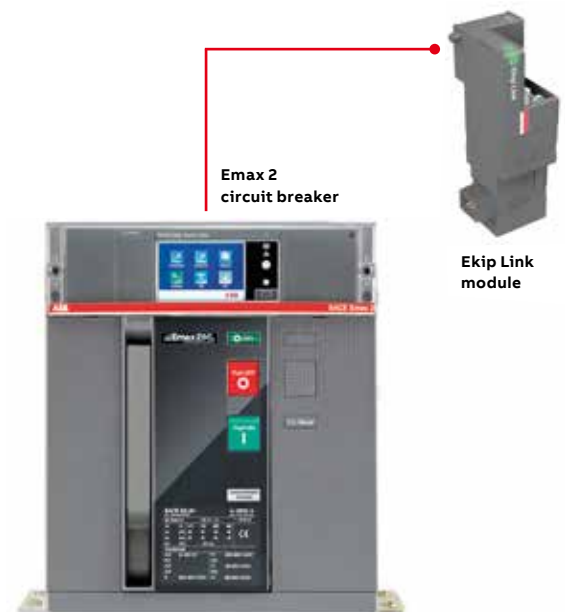


Using ABB communication protocol, Ekip Link can:

- Create complex logic selectivity without using complex wiring
- Provide redundancy, using both Ekip link bus and standard wiring
- Provide diagnostics (configurable) to test the wiring selectivity

ABB's Emax 2 is the first low-voltage circuit breaker with fully integrated directional protection and zone directional selectivity functions. using directional protection, there is also a possibility to set different delay times for the different directions.

Emax 2 air circuit breaker equipped with Ekip Link form the basis of a unique solution for low-voltage logical zone discrimination that has been designed to meet the most demanding requirements of reliability, flexibility and efficiency in vessels. This solution is easy to install, commission and test.



Load shedding

Emax 2/ML with embedded Load Shedding innovation creates the new benchmark for the service continuity in the naval electrical system.

ABB Emax 2, the all-in-one smart circuit breaker, embeds patented functions based on load shedding. This innovative algorithm manages the available resources maximizing the efficiency. Load Shedding functions are adopted to protect Microgrids, as vessels power system, during fault operation.

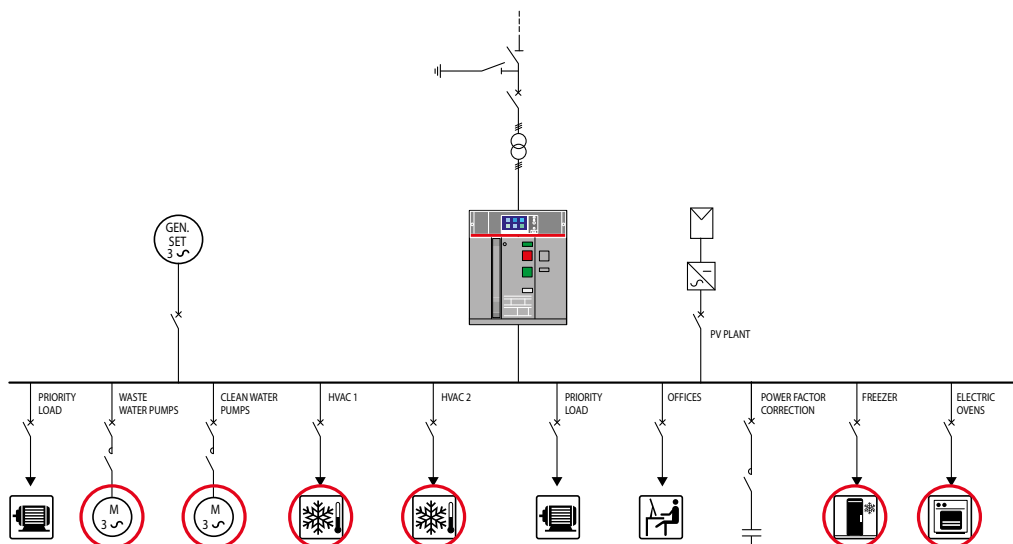
The load shedding function is able to switch from one source of energy to the other one, this happens when a fault occurs in one of the energy sources present in the power system. During this switch, the total amount of energy in the system falls down and not all loads can be fed. Load shedding, giving priority to the loads, maintains active only the primary loads while disconnecting the secondary. In this way the main functions are kept active even in case of fault. This advanced function for Microgrid can be managed by an automatic transfer switching (ATS) logic. Emax 2/ML can provide two different customizations of the load shedding which are mentioned below:

- **Basic Load Shedding**, simple logic able to recognize the Microgrid disconnection event and shed a group of not priority loads thus ensuring a fast time response and power balance.
- **Adaptive Load Shedding**, the advanced algorithm available with Emax 2 as an enhancement of the basic version. The intelligent software embedded in the circuit breaker sheds very quickly the not priority loads according to the Microgrid power consumption and frequency measurements.

Moreover, such software has a dedicated configuration for backup generation related to ATS and the software itself is even able to estimate the energy produced by the backup energy source. Emax 2/ML with embedded Load Shedding provides the following benefits:

- **Service continuity:** When a naval system has a problem in one of the main generators, there is a significant stress that turns off all the generators with consequent blackout. Load Shedding logics embedded in Emax 2 reduce the frequency drop that usually makes the local generation protection trip, maintaining the plant alive.
- **Space saving:** Neither PLC neither external relays are needed as Emax 2 has embedded the intelligence to realize the load shedding logics, taking advantage of the internal current and voltage sensors for electrical parameter measurements. Significant space and material saving up to 50% in the power distribution switchgear for panel builders.
- **Ease of use:** Load shedding logics are generally set with high engineering skills and customization effort with devices as programmable logic controllers. While Emax 2 guarantees easy installation thanks to predefined templates and the user-friendly graphic interface in the SW commissioning tool.

For further information, please refer to the White Paper "Emax 2, all-in-one innovation – Load Shedding" (1SDC007119G0201)



CHAPTER 5

Dimensional drawings

72-72	Reading information
73-73	Tmax T4/ML
74-74	Tmax T5/ML
75-76	Tmax T6/ML
77-78	Tmax T7/ML
79-80	Tmax T7/ML motorized
81-81	Emax E2.2/ML
82-82	Emax E4.2/ML
83-83	Emax E6.2/ML
84-84	Accessories

Reading information

Information on the overall dimensions is available on the web site **<http://www.abb.com/abblibrary/DownloadCenter>** in particular with the SACE Emax 2 IEC catalogue 1SDC210015D0208 and SACE Tmax IEC catalogue 1SDC210015D0208.

Tmax T4/ML

The following drawings are also available in .dxf format:

Fixed version

Poles	Document Number	Title
3p	1SDH000436R0100	T4 3p fixed version front terminals
3p	1SDH001291R0011	T4 3 poles Fixed (left connectors)
3p	1SDH001291R0012	T4 3 poles Fixed (right connectors)
3p	1SDH001291R0013	T4 3 poles Fixed
4p	1SDH000436R0114	T4 4p fixed version rear terminals residual current release
4p	1SDH001291R0018	T4 4 poles Fixed (left connectors)
4p	1SDH001291R0019	T4 4 poles Fixed (right connectors)
4p	1SDH001291R0021	T4 4 poles Fixed
3p/4p	1SDH000436R0163	T4 3p/4p fixed version motor operator

Plug-in version

Poles	Document Number	Title
3p	1SDH000436R0124	T4 III plug-in configuration rear vertical terminals
3p	1SDH000436R0126	T4 III plug-in configuration rear horizontal terminals
3p	1SDH001291R0014	T4 3 poles Plug-in fixed part (right connectors)
3p	1SDH001291R0015	T4 3 poles Plug-in fixed part
4p	1SDH000436R0125	T4 IV plug-in configuration rear vertical terminals
4p	1SDH000436R0127	T4 IV plug-in configuration rear horizontal terminals
4p	1SDH001291R0020	T4 4 poles Plug-in fixed part (right connectors)
4p	1SDH001291R0022	T4 4 poles Plug-in fixed part

Withdrawable version

Poles	Document Number	Title
3p	1SDH000436R0140	T4 3p withdrawable version front terminals
3p	1SDH000436R0144	T4 III withdrawable configuration rear vertical terminals
3p	1SDH000436R0146	T4 III withdrawable configuration rear horizontal terminals
3p	1SDH001291R0016	T4 3 poles Withdrawable fixed part
3p	1SDH001291R0017	T4 3 poles Withdrawable Plug-in fixed part (left connectors)
4p	1SDH000436R0145	T4 IV withdrawable configuration rear vertical terminals
4p	1SDH000436R0147	T4 IV withdrawable configuration rear horizontal terminals
4p	1SDH001291R0023	T4 4 poles Withdrawable fixed part
4p	1SDH001291R0024	T4 4 poles Withdrawable Plug-in fixed part (left connectors)
3p/4p	1SDH000436R0166	T4 3p/4p withdrawable version motor operator

Tmax T5/ML

Fixed version

Poles	Document Number	Title
3p	1SDH000437R0100	T5 3p fixed version front terminals
3p	1SDH000437R0108	T5 3p fixed version front extended terminals
3p	1SDH000437R0110	T5 3p fixed version front spread terminals
3p	1SDH000437R0197	T5 UL 3p Fixed 600 A front terminals for cables 2x240mm²
3p	1SDH001291R0025	T5 3 poles Fixed (left connectors)
3p	1SDH001291R0026	T5 3 poles Fixed (right connectors)
3p	1SDH001291R0027	T5 3 poles Fixed
4p	1SDH000437R0101	T5 4p fixed version front terminals
4p	1SDH000437R0114	T5 4p fixed version rear terminals residual current release
4p	1SDH000437R0199	T5 4p fixed version terminals for cables FCCu 1000V
4p	1SDH001291R0034	T5 4 poles Fixed (left connectors)
4p	1SDH001291R0035	T5 4 poles Fixed (right connectors)
4p	1SDH001291R0036	T5 4 poles Fixed 630 A
4p	1SDH001291R0037	T5 4 poles Fixed
3p/4p	1SDH000437R0160	T5 3p/4p fixed version rotary handle direct
3p/4p	1SDH000437R0161	T5 3p/4p fixed version adjustable depth rotary handle
3p/4p	1SDH000437R0164	T5 3p/4p fixed version front panel for locking devices

Plug-in version

Poles	Document Number	Title
3p	1SDH000437R0128	T5 3p plug-in version 400 A front spread terminals
3p	1SDH001291R0028	T5 3 poles Plug-in fixed part (right connectors)
3p	1SDH001291R0029	T5 3 poles Plug-in fixed part 630 A
3p	1SDH001291R0030	T5 3 poles Plug-in fixed part
4p	1SDH000437R0127	T5 4p plug-in version 400 A rear horizontal terminals
4p	1SDH000437R0137	T5 4p plug-in version 630 A front spread terminals
4p	1SDH001291R0038	T5 4 poles Plug-in fixed part
4p	1SDH001291R0039	T5 4 poles Plug-in fixed part (right connectors)
4p	1SDH001291R0043	T5 4 poles Plug-in fixed part 630 A

Withdrawable version

Poles	Document Number	Title
3p	1SDH000437R0144	T5 3p withdrawable version 400 A rear vertical terminals
3p	1SDH001291R0031	T5 3 poles Withdrawable fixed part 630 A
3p	1SDH001291R0032	T5 3 poles Withdrawable fixed part
3p	1SDH001291R0033	T5 3 poles Withdrawable Plug-in fixed part (left connectors)
4p	1SDH000437R0143	T5 4p withdrawable version 400 A terminals for copper or copper-aluminum cables
4p	1SDH000437R0191	T5 4p Withdrawable motor operator
4p	1SDH001291R0040	T5 4 poles Withdrawable fixed part 630 A
4p	1SDH001291R0041	T5 4 poles Withdrawable fixed part
4p	1SDH001291R0042	T5 4 poles Withdrawable Plug-in fixed part (left connectors)
3p/4p	1SDH000437R0169	T5 3p/4p withdrawable version 630 A motor operator

Tmax T6/ML

Fixed version

Poles	Document Number	Title
3p	1SDH000479R0104	T6 3p Fixed extended front terminals
3p	1SDH000479R0132	T6 3p Fixed extended front terminals 1000A
3p	1SDH000783R0104	T6V 3p F extended front terminals
3p	1SDH000479R0100	T6 3p Fixed front terminals-rear for cables 630A
3p	1SDH000479R0102	T6 3p Fixed front terminals-rear for cables 800A
3p	1SDH000479R0125	T6 3p Fixed front terminals for cables 1000A
3p	1SDH000479R0127	T6 3p Fixed front terminals 1000V
3p	1SDH000783R0100	T6V 3p F front terminals for cables 630A
3p	1SDH000783R0102	T6V 3p F front terminals for cables 800A
3p	1SDH000783R0108	T6V 3p F front terminals
3p	1SDH000479R0108	T6 3p Fixed front spread extended terminals
3p	1SDH000479R0106	T6 630-800A 3p Fixed front and rear terminals
3p	1SDH000479R0129	T6 3p Fixed rear terminals 1000V
3p	1SDH000479R0134	T6 1000A 3p Fixed rear terminals
3p	1SDH000783R0106	T6V 3p F rear terminals
3p	1SDH000479R0116	T6 3p Fixed rotary handle
3p	1SDH000479R0118	T6 3p Fixed adjustable rotary handle
3p	1SDH000783R0116	T6V 3p F rotary handle
3p	1SDH000783R0118	T6V 3p F with transmitted rotary handle
3p	1SDH000783R0114	T6V 3p F front panel with padlock device
3p	1SDH000479R0114	T6 3p Fixed front panel with padlock device
4p	1SDH000479R0105	T6 4p Fixed extended front terminals
4p	1SDH000479R0133	T6 4p Fixed extended front terminals 1000A
4p	1SDH000783R0105	T6V 4p F extended front terminals
4p	1SDH000479R0101	T6 4p Fixed front terminals-rear for cables 630A
4p	1SDH000479R0103	T6 4p Fixed front terminals-rear for cables 800A
4p	1SDH000479R0126	T6 4p Fixed front terminals for cables 1000A
4p	1SDH000479R0128	T6 4p Fixed front terminals 1000V
4p	1SDH000783R0101	T6V 4p F front terminals for cables 630A
4p	1SDH000783R0103	T6V 4p F front terminals for cables 800A
4p	1SDH000783R0109	T6V 4p F front terminals
4p	1SDH000479R0109	T6 4p Fixed front spread extended terminals
4p	1SDH000479R0107	T6 630-800A 4p Fixed front and rear terminals
4p	1SDH000479R0130	T6 4p Fixed rear terminals 1000V
4p	1SDH000479R0135	T6 1000A 4p Fixed rear terminals
4p	1SDH000783R0107	T6V 4p F rear terminals
4p	1SDH000479R0117	T6 4p Fixed rotary handle
4p	1SDH000479R0119	T6 4p Fixed adjustable rotary handle
4p	1SDH000783R0117	T6V 4p F rotary handle
4p	1SDH000783R0119	T6V 4p F with transmitted rotary handle
4p	1SDH000479R0115	T6 4p Fixed front panel with padlock device
4p	1SDH000783R0115	T6V 4p F front panel with padlock device
3p/4p	1SDH000479R0120	T6 3p-4p Fixed motor operator
3p/4p	1SDH000783R0120	T6V 3p-4p F motor operator



Tmax T6/ML

Withdrawable version		
Poles	Document Number	Title
3p	1SDH000479R0110	T6 3p Withdrawable front terminals
3p	1SDH000479R0112	T6 3p Withdrawable rear terminals
4p	1SDH000479R0111	T6 4p Withdrawable front terminals
4p	1SDH000479R0113	T6 4p Withdrawable rear terminals
3p/4p	1SDH000479R0121	T6 3p-4p Withdrawable motor operator
3p/4p	1SDH000479R0124	T6 3p-4p Withdrawable with rotary handle

Tmax T7/ML

Fixed version

Poles	Document Number	Title
3p	1SDH001291R0136	T7 III F EF Down - Extended front terminals EF down
3p	1SDH001291R0137	T7 III F EF Up - Extended front terminals EF up
3p	1SDH001291R0146	T7 III F ES Down - Spreaded extended front terminals ES down
3p	1SDH001291R0147	T7 III F ES Up - Spreaded extended front terminals ES up
3p	1SDH000529R0102	T7 3p Fixed front terminals
3p	1SDH001291R0148	T7 III F FCCuAl Down - Front terminals for cables CuAl down
3p	1SDH001291R0149	T7 III F FCCuAl Up - Front terminals for cables CuAl Up
3p	1SDH001291R0138	T7 III F RH Down - Rear terminals RH down
3p	1SDH001291R0139	T7 III F RH Down - Rear terminals RH orientable down
3p	1SDH001291R0140	T7 III F RH Up - Rear terminals RH orientable up
3p	1SDH001291R0141	T7 III F RH Up - Rear terminals RH up
3p	1SDH001291R0142	T7 III F RV Down - Rear terminals RV down
3p	1SDH001291R0143	T7 III F RV Down - Rear terminals RV orientable down
3p	1SDH001291R0144	T7 III F RV Up - Rear terminals RV orientable up
3p	1SDH001291R0145	T7 III F RV Up - Rear terminals RV up
3p	1SDH000529R0100	T7 3p Fixed
3p	1SDH001291R0135	T7 III F - T7 3 poles Fixed
3p	1SDH001291R0150	T7 III F HTC Down - High insulating terminal cover down
3p	1SDH001291R0151	T7 III F HTC Up - High insulating terminal cover up
3p	1SDH001291R0152	T7 III F LTC Down - low insulating terminal cover down
3p	1SDH001291R0153	T7 III F LTC Up - low insulating terminal cover up
3p	1SDH000529R0104	T7 3p Fixed with rotary handle
3p	1SDH001291R0154	T7 III F with RHD - Fixed with rotary handle
4p	1SDH001291R0164	T7 IV F EF Down - Extended front terminals EF down
4p	1SDH001291R0165	T7 IV F EF Up - Extended front terminals EF up
4p	1SDH001291R0166	T7 IV F ES Down - Spreaded extended front terminals ES down
4p	1SDH001291R0167	T7 IV F ES Up - Spreaded extended front terminals ES up
4p	1SDH000529R0103	T7 4p Fixed front terminals
4p	1SDH001291R0168	T7 IV F FCCuAl Down - Front terminals for cables CuAl Down
4p	1SDH001291R0169	T7 IV F FCCuAl Up - Front terminals for cables CuAl Up
4p	1SDH001291R0170	T7 IV F RH Down - Rear terminals RH down
4p	1SDH001291R0171	T7 IV F RH Down - Rear terminals RH orientables down
4p	1SDH001291R0172	T7 IV F RH Up - Rear terminals RH orientables up
4p	1SDH001291R0173	T7 IV F RH Up - Rear terminals RH up
4p	1SDH001291R0174	T7 IV F RV Down - Rear terminals RV down
4p	1SDH001291R0175	T7 IV F RV Down - Rear terminals RV orientables down
4p	1SDH001291R0176	T7 IV F RV Up - Rear terminals RV orientables up
4p	1SDH001291R0177	T7 IV F RV Up - Rear terminals RV up
4p	1SDH000529R0101	T7 4p Fixed
4p	1SDH001291R0163	T7 IV F - T7 4 poles Fixed
4p	1SDH001291R0179	T7 IV F HTC Down - High insulating terminal cover down
4p	1SDH001291R0180	T7 IV F HTC Up - High insulating terminal cover up
4p	1SDH001291R0181	T7 IV F LTC Down - Low insulating terminal cover down
4p	1SDH001291R0182	T7 IV F LTC Up - Low insulating terminal cover up
4p	1SDH000529R0105	T7 4p Fixed with rotary handle
4p	1SDH001291R0178	T7 IV F with RHD - With rotary handle
3p/4p	1SDH000529R0113	T7 3p 4p fixed front terminals

Tmax T7/ML

Withdrawable version

Poles	Document Number	Title
3p	1SDH001291R0155	T7 III W Front terminals Down
3p	1SDH001291R0156	T7 III W Front terminals Up
3p	1SDH001291R0158	T7 III W RH Down - Rear terminal RH Down
3p	1SDH001291R0159	T7 III W RH Up - Rear terminal RH Up
3p	1SDH001291R0160	T7 III W RV Down - Rear terminals RV Down
3p	1SDH001291R0161	T7 III W RV Up - Rear terminals RV Up
3p	1SDH001291R0157	T7 III W - T7 3 poles Withdrawable
3p	1SDH001291R0162	T7 III W with RHD - With rotary handle
4p	1SDH001291R0184	T7 IV W Front terminals Down
4p	1SDH001291R0185	T7 IV W Front terminals Up
4p	1SDH001291R0186	T7 IV W RH Down - Rear terminals RH down
4p	1SDH001291R0187	T7 IV W RH Up - Rear terminals RH up
4p	1SDH001291R0188	T7 IV W RV Down - Rear terminals RV down
4p	1SDH001291R0189	T7 IV W RV Up - Rear terminals RV up
4p	1SDH001291R0183	T7 IV W - T7 4 poles Withdrawable
4p	1SDH001291R0190	T7 IV W with RHD - With rotary handle
3p/4p	1SDH000529R0114	T7 3p 4p withdrawable rear terminals for cables
3p/4p	1SDH000529R0119	T7 3p 4p Withdrawable rear spread terminals
3p/4p	1SDH000529R0120	T7 3p 4p withdrawable rear terminals for cables
3p/4p	1SDH000529R0111	T7 3p 4p Withdrawable with rotary handle RH RV EF
3p/4p	1SDH000529R0109	T7 3p 4p Withdrawable RH RV EF
3p/4p	1SDH000529R0110	T7 3p 4p Withdrawable stored energy motor operator RH RV EF
3p/4p	1SDH000529R0121	T7 3p 4p withdrawable spread terminals for cables

Accessories

Poles	Document Number	Title
	1SDH000529R0117	T7 3p 4p with rotary handle
	1SDH000529R0106	T7 3p 4p with RH RV
	1SDH000529R0107	T7 3p 4p FCCuAL 4x240
	1SDH000529R0108	T7 3p 4p Fixed EF ES
	1SDH000529R0112	T7 3p 4p Fixed/withdrawable with interlock
	1SDH000529R0116	T7 3p 4p with lever mechanism R
	1SDH000529R0118	T7 3p 4p with lever mechanism FCCuA 2x240
	1SDH001291R0193	T7 - Flange for the rotary handle
	1SDH001291R0195	T7 - Rotary handle
	1SDH001291R0191	T7 - Flange for compartment door, max distance 164mm
	1SDH001291R0192	T7 - Flange for compartment door
	1SDH001291R0194	T7 - Reduced flange for the compartment door

Tmax T7/ML motorized

Fixed version

Poles	Document Number	Title
3p	1SDH001291R0197	T7M F III ES Down - Spreaded extended front terminals ES down
3p	1SDH001291R0198	T7M F III ES Up - Spreaded extended front terminals ES up
3p	1SDH001291R0201	T7M F III EF Down - Extended front terminals EF down
3p	1SDH001291R0202	T7M F III EF Up - Extended front terminals EF up
3p	1SDH001291R0199	T7M F III FCCuAl Down - Front terminals for cables CuAl down
3p	1SDH001291R0200	T7M F III FCCuAl Up - Front terminals for cables CuAl up
3p	1SDH001291R0203	T7M F III RH Down - Rear terminals RH down
3p	1SDH001291R0204	T7M F III RH Down - Rear terminals RH orientable down
3p	1SDH001291R0205	T7M F III RH Up - Rear terminals RH orientable up
3p	1SDH001291R0206	T7M F III RH Up - Rear terminals RH up
3p	1SDH001291R0207	T7M F III RV Down - Rear terminals RV down
3p	1SDH001291R0208	T7M F III RV Down - Rear terminals RV orientable down
3p	1SDH001291R0209	T7M F III RV Up - Rear terminals RV orientable up
3p	1SDH001291R0210	T7M F III RV Up - Rear terminals RV up
3p	1SDH001291R0196	T7M F III - T7M 3 poles Fixed
3p	1SDH001291R0211	T7M F III HTC Down - High insulating terminal cover down
3p	1SDH001291R0212	T7M F III HTC Up - High insulating terminal cover up
3p	1SDH001291R0213	T7M F III LTC Down - Low insulating terminal cover down
3p	1SDH001291R0214	T7M F III LTC Up - Low insulating terminal cover up
4p	1SDH001291R0227	T7M IV F ES Down - Spreaded extended front terminals ES down
4p	1SDH001291R0228	T7M IV F ES Up - Spreaded extended front terminals ES up
4p	1SDH001291R0231	T7M IV F EF Down - Extended front terminals EF down
4p	1SDH001291R0232	T7M IV F EF Up - Extended front terminals EF up
4p	1SDH001291R0229	T7M IV F FCCuAl Down - front terminals for cables CuAl down
4p	1SDH001291R0230	T7M IV F FCCuAl Up - front terminals for cables CuAl up
4p	1SDH001291R0233	T7M IV F RH Down - Rear terminals RH down
4p	1SDH001291R0234	T7M IV F RH Down - Rear terminals RH orientable down
4p	1SDH001291R0235	T7M IV F RH Up - Rear terminals RH orientable up
4p	1SDH001291R0236	T7M IV F RH Up - Rear terminals RH up
4p	1SDH001291R0237	T7M IV F RV Down - Rear terminals RV down
4p	1SDH001291R0238	T7M IV F RV Down - Rear terminals RV orientabledown
4p	1SDH001291R0239	T7M IV F RV Up - Rear terminals RV orientable up
4p	1SDH001291R0240	T7M IV F RV Up - Rear terminals RV up
4p	1SDH001002R0101	T7D - T7DM PV Fixed 4P 1100V 2+2
4p	1SDH001291R0222	T7M IV F - T7M 4 poles Fixed
4p	1SDH001002R0100	T7D - T7DM PV Fixed 4P 1100V 2+2 FC
4p	1SDH001291R0223	T7M IV F HTC Down - High insulating terminal cover down
4p	1SDH001291R0224	T7M IV F HTC Up - High insulating terminal cover up
4p	1SDH001291R0225	T7M IV F LTC Down - Low insulating terminal cover down
4p	1SDH001291R0226	T7M IV F LTC Up - Low insulating terminal cover up

Tmax T7/ML motorized

Withdrawable version

Poles	Document Number	Title
3p	1SDH001291R0215	T7M III W Front terminals Down
3p	1SDH001291R0216	T7M III W Front terminals Up
3p	1SDH001291R0218	T7M III W RH Down - Rear terminals RH down
3p	1SDH001291R0219	T7M III W RH Up - Rear terminals RH up
3p	1SDH001291R0220	T7M III W RV Down - Rear terminals RV down
3p	1SDH001291R0221	T7M III W RV Up - Rear terminals RV up
3p	1SDH001291R0217	T7M III W - T7M 3 poles Withdrawable
4p	1SDH001291R0242	T7M IV W Front terminals down
4p	1SDH001291R0243	T7M IV W Front terminals up
4p	1SDH001291R0244	T7M IV W RH Down - Rear terminals RH down
4p	1SDH001291R0245	T7M IV W RH Up - Rear terminals RH up
4p	1SDH001291R0246	T7M IV W RV Down - Rear terminals RV down
4p	1SDH001291R0247	T7M IV W RV Up - Rear terminals RV up
4p	1SDH001291R0241	T7M IV W - T7M 4 poles Withdrawable

Emax E2.2/ML

Withdrawable version 3 poles

Document Number	Title
1SDH001000R0110	E2.2 2000A withdrawable flat terminals FL
1SDH001000R0111	E2.2 2500A withdrawable flat terminals FL
1SDH001252R0431	E2.2 III W 2000A N0761
1SDH001252R0104	E2.2 III W 2500A N0761
1SDH001252R0105	E2.2 III W Compartment door drilling
1SDH001252R0436	E2.2 III W Flat term 2000A lower
1SDH001252R0435	E2.2 III W Flat term 2000A upper
1SDH001252R0438	E2.2 III W Flat term 2500A lower
1SDH001252R0437	E2.2 III W Flat term 2500A upper
1SDH001252R0106	E2.2 III W Floor fixing
1SDH001252R0168	E2.2 III W IP30 Protection for switchgear
1SDH001252R0323	E2.2 III W Terminals F lower
1SDH001252R0324	E2.2 III W Terminals F upper
1SDH001252R0107	E2.2 III W Terminals HR lower 2000A
1SDH001252R0108	E2.2 III W Terminals HR lower 2500A
1SDH001252R0109	E2.2 III W Terminals HR upper 2000A
1SDH001252R0110	E2.2 III W Terminals HR upper 2500A
1SDH001252R0111	E2.2 III W Terminals SHR lower 2000A
1SDH001252R0112	E2.2 III W Terminals SHR lower 2500A
1SDH001252R0113	E2.2 III W Terminals SHR upper 2000A
1SDH001252R0114	E2.2 III W Terminals SHR upper 2500A
1SDH001252R0115	E2.2 III W Terminals SVR lower 2000A
1SDH001252R0116	E2.2 III W Terminals SVR lower 2500A
1SDH001252R0117	E2.2 III W Terminals SVR upper 2000A
1SDH001252R0118	E2.2 III W Terminals SVR upper 2500A
1SDH001252R0119	E2.2 III W Terminals VR lower 2000A
1SDH001252R0120	E2.2 III W Terminals VR lower 2500A
1SDH001252R0121	E2.2 III W Terminals VR upper 2000A
1SDH001252R0122	E2.2 III W Terminals VR upper 2500A
1SDH001000R0103	E2.2 III-IV Withdrawable front terminals F

Emax E4.2/ML

Withdrawable version 3 poles

Document Number	Title
1SDH001001R0110	E4.2 3200A withdrawable flat terminals FL
1SDH001001R0102	E4.2 3-4p Withdrawable HR-VR
1SDH001001R0111	E4.2 4000A withdrawable flat terminals FL
1SDH001252R0433	E4.2 III W 3200A N0761
1SDH001252R0185	E4.2 III W 4000A N0761
1SDH001252R0186	E4.2 III W Compartment door drilling
1SDH001252R0444	E4.2 III W Flat term 3200A lower
1SDH001252R0443	E4.2 III W Flat term 3200A upper
1SDH001252R0446	E4.2 III W Flat term 4000A lower
1SDH001252R0445	E4.2 III W Flat term 4000A upper
1SDH001252R0187	E4.2 III W Floor fixing
1SDH001252R0188	E4.2 III W IP30 Protection for switchgear
1SDH001252R0327	E4.2 III W Terminals F lower
1SDH001252R0328	E4.2 III W Terminals F upper
1SDH001252R0189	E4.2 III W Terminals HR lower 3200A
1SDH001252R0190	E4.2 III W Terminals HR lower 4000A
1SDH001252R0191	E4.2 III W Terminals HR upper 3200A
1SDH001252R0192	E4.2 III W Terminals HR upper 4000A
1SDH001252R0193	E4.2 III W Terminals VR lower 3200A
1SDH001252R0194	E4.2 III W Terminals VR lower 4000A
1SDH001252R0195	E4.2 III W Terminals VR upper 3200A
1SDH001252R0196	E4.2 III W Terminals VR upper 4000A
1SDH001001R0103	E4.2 III-IV Withdrawable Front Terminals F

Emax E6.2/ML

Withdrawable version 3 poles

Document Number	Title
1SDH001060R0105	E6.2 3-4p Withdrawable HR
1SDH001060R0106	E6.2 3-4p Withdrawable VR
1SDH001252R0456	E6.2 4 FS W Flat term 6300A lower
1SDH001252R0455	E6.2 4 FS W Flat term 6300A upper
1SDH001060R0107	E6.2 4p FS Withdrawable HR-VR
1SDH001252R0237	E6.2 III W 6300A N0761
1SDH001252R0238	E6.2 III W Compartment door drilling
1SDH001252R0452	E6.2 III W Flat term 6300A lower
1SDH001252R0451	E6.2 III W Flat term 6300A upper
1SDH001252R0239	E6.2 III W Floor fixing
1SDH001252R0240	E6.2 III W IP30 Protection for switchgear
1SDH001252R0337	E6.2 III W Terminals F LOWER
1SDH001252R0338	E6.2 III W Terminals F upper
1SDH001252R0241	E6.2 III W Terminals HR lower 5000A
1SDH001252R0242	E6.2 III W Terminals HR lower 6300A
1SDH001252R0243	E6.2 III W Terminals HR upper 5000A
1SDH001252R0244	E6.2 III W Terminals HR upper 6300A
1SDH001252R0245	E6.2 III W Terminals VR lower 5000A
1SDH001252R0246	E6.2 III W Terminals VR lower 6300A
1SDH001252R0247	E6.2 III W Terminals VR upper 5000A
1SDH001252R0248	E6.2 III W Terminals VR upper 6300A
1SDH001060R0108	E6.2 III-IV Withdrawable Front Terminals F
1SDH001060R0110	E6.2 Withdrawable flat terminals 6300A FL

Accessories

Document Number	Title
1SDH001000R0811	Ekip AUP auxiliary contacts position - E1.2-E2.2-E4.2-E6.2
1SDH001000R0501	Ekip COM actuator - E2.2-E4.2-E6.2
1SDH001000R0514	Ekip COM Hub, IEC61850, Modbus TCP, ProfiNet, Ethernet IP, Ekip Link - E1.2-E2.2-E4.2-E6.2
1SDH001000R0512	Ekip COM Modbus RS-485, Profibus, DeviceNet - E1.2-E2.2-E4.2-E6.2
1SDH001000R0505	Ekip Measuring / Ekip Measuring Pro - E2.2-E4.2-E6.2
1SDH001000R0520	Ekip Multimeter - E1.2-E2.2-E4.2-E6.2
1SDH001257R0001	Ekip Programming - E1.2-E2.2-E4.2-E6.2-XT2-XT4
1SDH001000R0508	Ekip protection release - E1.2-E2.2-E4.2-E6.2
1SDH001000R0524	Ekip Signalling 2K - E1.2-E2.2-E4.2-E6.2
1SDH001000R0516	Ekip Signalling 4K - E2.2-E4.2-E6.2
1SDH001000R0511	Ekip supply - E1.2-E2.2-E4.2-E6.2
1SDH001000R0513	Ekip Synchrocheck - E1.2-E2.2-E4.2-E6.2
1SDH001000R0517	Ekip T&P - E1.2 - E2.2 - E4.2 - E6.2
1SDH001000R0519	Ekip TT, trip test unit - E1.2-E2.2-E4.2-E6.2

Installation

Document Number	Title
1SDH001000R0821	Installation instructions PF E2.2/E6.2 ML

For the complete information about current-limiting curve, temperature derating, installation environment, wiring diagrams and other dimensions please refer to the technical catalogue of the standard version.

CHAPTER 6

Ordering codes

86-87	Ordering examples
88-89	Tmax T4/ML
90-91	Tmax T5/ML
92-92	Tmax T6/ML
93-93	Tmax T7/ML
94-95	Emax 2.2/ML
96-96	Emax 4.2/ML
97-97	Emax 6.2/ML
98-100	Electrical accessories
101-102	Mechanical accessories
103-103	Switching devices
104-106	Ekip modules
107-108	Terminals
109-109	Service

Instructions for ordering

Ordering examples

The code for molded case circuit breakers includes a fixed list of accessories.
For further detail please contact ABB.

Example no. 1

Tmax T4L/ML 250 TMA 160-1600 3p P MP

1SDA079912R1	T4L 250 TMA 160-1600 3p F F KIT MP T4 P 3p SOR-C T4-T5-T6 220..240V AC - 220..250V DC MOE T4-T5 220...250 V AC/DC AUX-C T4-T5-T6 3Q 1SY 250 V AC/DC ADP 12pin AUX T4-T5-T6 P/W ADP 10pin MOE AUE T4-T5-T6 P/W
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Ordering examples

- Terminal kit codes (other than standard supply) for fixed part of withdrawable circuit-breaker.
The codes refer to 3 or 4 pieces (for mounting on

top or bottom terminals). To convert a complete circuit-breaker, 1 kit for upper terminals and 1 kit for lower terminals must be specified in the order.

Example no. 2

Emax E2.2 2000A 3 poles fixed part with spread upper vertical terminals (SVR) and rear bottom adjustable horizontal (HR) terminals (standard supply)

1SDA083381R1	E2.2/ML W FP Iu=2000 3p HR HR
1SDA074057R1	Kit SVR upper E2.2 Iu=2000 3pcs INST

- **Ordering for Ekip modules.**

Ekip Supply module enables Ekip Com, Ekip Link, Ekip 2K, Ekip Syncrocheck cartridge modules to be installed.

In addition to Ekip Supply modules, up to 3 cartridge modules can be installed on E2.2, E4.2 and E6.2.

Example no. 3

Emax E4.2H 3 poles with modules: Ekip Supply, Ekip Com Modbus TCP, Ekip Signalling 2K-1, Ekip Com Modbus TCP Redundant and Ekip Signalling 4K

1SDA083492R1	E4.2H/ML 3200 Ekip Hi-Touch LSI 3p
1SDA074173R1	Ekip Supply 24-48V DC E1.2..E6.2
1SDA074151R1	Ekip Com Modbus TCP E1.2..E6.2
1SDA074158R1	Ekip Com R Modbus TCP E1.2..E6.2
1SDA074167R1	Ekip Sign. 2K-1 E1.2..E6.2
1SDA074170R1	Ekip Sign. 4K E2.2..E6.2

Example no. 4

Emax E4.2H 3 poles with modules: Ekip Supply, Ekip Com EtherNet/IP™, Ekip Com Modbus RS-485 and Ekip Measuring Pro

1SDA083492R1	E4.2H/ML 3200 Ekip Touch LSI 3p
1SDA074173R1	Ekip Supply 24-48V DC E1.2..E6.2
1SDA074155R1	Ekip Com EtherNet/IP™ E1.2..E6.2
1SDA074150R1	Ekip Com Modbus RS-485 E1.2..E6.2
1SDA074189R1	Ekip Measuring Pro E4.2

- **Ordering for electrical accessories.**

All the accessories are available. In particular up to 4 coils for E2.2, E4.2 and E6.2.

Example no. 5

Emax E2.2S 3 poles with accessories: opening release, closing release, motor for automatic charging of the springs, second opening release

1SDA083426R1	E2.2S/ML 2000 Ekip Touch LSi LSi 3p
1SDA073674R1	YO E1.2..E6.2 220-240V AC/DC
1SDA073687R1	YC E1.2..E6.2 220-240V AC/DC
1SDA073725R1	M E2.2...E6.2 220-250V AC/DC
1SDA073674R1	YO E1.2..E6.2 220-240V AC/DC

Tmax T4/ML

Fixed version

Poles	Iu	Trip unit	Type	Code
3p	250	TMA 250-2500	T4H/ML 250 TMA 250-2500 3p F F - T45	1SDA060462R1
3p	250	TMA 250-2500	T4S/ML 250 TMA 250-2500 3p F F	1SDA063696R1
3p	250		T4D/ML 250 3p F F	1SDA063677R1
3p	250	PR222DS/P-LSI	T4H/ML 250 PR222DS/P-LSI In=250 3p F F	1SDA070372R1
3p	320	PR222DS/P-LSI	T4H/ML 320 PR222DS/P-LSI In=320 3p F F	1SDA070371R1

Plug-in moving part

Poles	Iu	Trip unit	Type	Code
3p	250	TMA 250-2500	T4N/ML 250 TMA 250-2500 3p P MP	1SDA063643R1
3p	250	TMA 200-2000	T4N/ML 250 TMA 200-2000 3p P MP	1SDA063644R1
3p	250	TMA 160-1600	T4N/ML 250 TMA 160-1600 3p P MP	1SDA063645R1
3p	250	TMA 125-1250	T4N/ML 250 TMA 125-1250 3p P MP	1SDA063646R1
3p	250	TMA 125-1250	T4N/ML 250 TMA 125-1250 3p P MP	1SDA063647R1
3p	250	TMA 80-800	T4N/ML 250 TMA 80-800 3p P MP	1SDA063648R1
3p	250	TMA 250-2500	T4L/ML 250 TMA 250-2500 3p P MP	1SDA069994R1
3p	250	TMA 160-1600	T4L/ML 250 TMA 160-1600 3p P MP	1SDA079912R1
3p	250	TMA 250-2500	T4L/ML 250 TMA 250-2500 3p P MP	1SDA079913R1
3p	250	TMA 125-1250	T4L/ML 250 TMA 125-1250 3p P MP	1SDA079914R1
3p	250	TMA 250-2500	T4L/ML 250 TMA 250-2500 3p P MP	1SDA079915R1
3p	250	TMD 32-320	T4L/ML 250 TMD 32-320 3p P MP	1SDA079916R1
3p	250	TMA 100-1000	T4L/ML 250 TMA 100-1000 3p P MP	1SDA079917R1
3p	250	TMD 20-320	T4L/ML 250 TMD 20-320 3p P MP	1SDA079918R1
3p	250	TMA 160-1600	T4L/ML 250 TMA 160-1600 3p P MP	1SDA079919R1
3p	250	TMD 32-320	T4L/MP 250 TMD 32-320 3p P MP	1SDA079920R1
3p	250	MA 100-1400	T4L/ML 250 MA 100-1400 3p P MP	1SDA080362R1
3p	250	TMA 250-2500	T4S/ML 250 TMA 250-2500 3p P MP	1SDA080987R1
3p	250	TMA 200-2000	T4S/ML 250 TMA 200-2000 3p P MP	1SDA080988R1
3p	250	TMA 80-800	T4S/ML 250 TMA 80-800 3p P MP	1SDA080989R1
3p	250	TMA 100-1000	T4S/ML 250 TMA 100-1000 3p P MP	1SDA080990R1
3p	250	TMA 125-1250	T4S/ML 250 TMA 125-1250 3p P MP	1SDA080994R1
3p	250	TMA 250-2500	T4S/ML 250 TMA 250-2500 3p P MP	1SDA080995R1
3p	250	TMA 80-800	T4S/ML 250 TMA 80-800 3p P MP	1SDA080996R1
3p	250	TMA 50-500	T4S/ML 250 TMA 50-500 3p P MP	1SDA080997R1
3p	250	TMA 250-2500	T4H/ML 250 TMA 250-2500 3p P MP	1SDA082395R1
3p	250	TMA 200-2000	T4H/ML 250 TMA 200-2000 3p P MP	1SDA082396R1
3p	250	TMA 160-1600	T4H/ML 250 TMA 160-1600 3p P MP	1SDA082397R1
3p	250	TMA 100-1000	T4S/ML 250 TMA 100-1000 3p P MP	1SDA085231R1
3p	250	TMA 160-1600	T4S/ML 250 TMA 160-1600 3p P MP	1SDA085241R1
3p	250	TMA 200-2000	T4S/ML 250 TMA 200-2000 3p P MP	1SDA085238R1
3p	250	TMA 200-2000	T4H/ML 250 TMA 200-2000 3p P MP	1SDA082478R1
4p	250	TMA 250-2500	T4V/ML 250 TMA 250-2500 4p P MP InN=100%	1SDA063592R1
4p	250	TMA 160-1600	T4V/ML 250 TMA 160-1600 4p P MP InN=100%	1SDA063594R1
3p	100	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=100 3p P MP	1SDA063636R1
3p	100	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=100 3p P MP	1SDA063623R1
3p	100	PR221LS/I	T4H/ML 250 PR221LS/I In=100 3p P MP	1SDA069041R1
3p	100	PR222DS/P-LSI	T4H/ML 250 PR222DS/P-LSI In=100 3p P MP	1SDA085418R1
3p	100	PR222DS/PD-LSI	T4L/ML 250 PR222DS/PD-LSI In=100 3p P MP, UVR, AUX	1SDA085413R1
3p	100	PR222DS/PD-LSI	T4L/ML 250 PR222DS/PD-LSI In=100 3p P MP	1SDA085412R1
3p	100	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=100 3p P MP	1SDA085411R1
3p	160	PR222DS/PD-LSI	T4L/ML 250 PR222DS/PD-LSI In=160 3p P MP	1SDA085410R1

The code for molded case circuit breakers includes a fixed list of accessories. For further details please contact ABB.

Poles	Iu	Trip unit	Type	Code
3p	160	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=160 3p P MP	1SDA085409R1
3p	160	PR222DS/PD-LSI	T4L/ML 250 PR222DS/PD-LSI In=160 3p P MP, UVR, AUX	1SDA085406R1
3p	160	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=160 3p P MP	1SDA063621R1
3p	160	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=160 3p P MP	1SDA063622R1
3p	160	PR221LS/I	T4H/ML 250 PR221LS/I In=160 3p P MP	1SDA069040R1
3p	160	PR221DS-LS/I	T4S/ML 250 PR221DS-LS/I In=160 3p P MP	1SDA085236R1
3p	250	PR221DS-LSI I	T4S/ML 250 PR221DS-LSI In=250 3p P MP	1SDA085240R1
3p	250	PR221LS/I	T4H/ML 250 PR221LS/I In=250 3p P MP	1SDA069039R1
3p	250	PR221DS-LS/I	T4N/ML 250 PR221DS-LS/I In=250 3p P MP	1SDA063590R1
3p	250	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=250 3p P MP	1SDA063620R1
3p	250	PR222DS/P-LSI	T4L/ML 250 PR222DS/P-LSI In=250 3p P MP	1SDA063635R1
3p	250	PR222DS/P-LSI	T4H/ML 250 PR222DS/P-LSI In=250 3p P MP	1SDA063670R1
3p	250	PR222DS/P-LSI	T4S/ML 250 PR222DS/P-LSI In=250 3p P MP	1SDA069694R1
3p	250	PR221LS/I	T4H/ML 250 PR221LS/I In=250 3p P MP	1SDA076110R1
3p	250	PR222DS/P-LSI	T4H/ML 250 PR222DS/P-LSI In=250 3p P MP	1SDA079906R1
3p	250	PR223EF	T4L/ML 250 PR223EF In=250A 3p P MP	1SDA082475R1
3p	320	PR221DS-LS/I	T4N/ML 320 PR221DS-LS/I In=320 3p P MP	1SDA063642R1
3p	320	PR222DS/P-LSI	T4H/ML 320 PR222DS/P-LSI In=320 3p P MP	1SDA063690R1
3p	320	PR222DS/P-LSI	T4L/ML 320 PR222DS/P-LSI In=320 3p P MP	1SDA069281R1
3p	320	PR221DS-LS/I	T4S/ML 320 PR221DS-LS/I In=320 3p P MP	1SDA080986R1
3p	320	PR221DS-LS/I	T4S/ML 320 PR221DS-LS/I In=320 3p P MP	1SDA085230R1
3p	320	PR222DS/PD-LSI	T4L/ML 320 PR222DS/PD-LSI In=320 3p P MP	1SDA085416R1
3p	320	PR222DS/PD-LSI	T4L/ML 320 PR222DS/PD-LSI In=320 3p P MP	1SDA085415R1
3p	320	PR222DS/P-LSI	T4L/ML 320 PR222DS/P-LSI In=320 3p P MP	1SDA085414R1
3p	320	PR221DS-LS/I	T4N/ML 320 PR221DS-LS/I In=320 3p P MP	1SDA063591R1

Plug-in fixed part

	Type	Code
	T4/ML P FP 3p EF	1SDA085403R1
	T4/ML P FP 3p HR	1SDA085250R1
	T4/ML P FP 3p VR	1SDA063626R1
	T4/ML P FP 3p EF	1SDA063699R1
	T4/ML P FP 3p HR	1SDA063704R1
	T4/ML P FP 4p VR	1SDA063706R1
	T4/ML P FP 3p HR-EF	1SDA080012R1

Withdrawable moving part

Poles	Iu	Trip unit	Type	Code
3p	100	PR222DS/P-LSI	T4H/ML 250 PR222DS/P-LSI In=100 3p W MP	1SDA085403R1
3p	250	PR222DS/P-LSI	T4H/ML 250 PR222DS/P-LSI In=250 3p W MP	1SDA085250R1
3p	250	PR222DS-LSI I	T4S/ML 250 PR222DS-LSI In=250 3p W MP	1SDA063626R1
3p	250	PR222DS/P-LSI	T4V/ML 250 PR222DS/P-LSI In=250 3p W MP	1SDA063699R1
3p	250	PR222DS-LSI I	T4S/ML 250 PR222DS-LSI In=250 3p W MP	1SDA063704R1
3p	320	PR221DS-LS/I	T4S/ML 320 PR221DS-LS/I In=320 3p W MP	1SDA063706R1
3p	320		T4D/ML 320 3p W MP	1SDA080012R1

Withdrawable fixed part

	Type	Code
	T4/ML W FP 3p HR	1SDA063610R1
	T4/ML W FP 3p HR	1SDA080967R1
	T4/ML W FP 3p EF	1SDA081105R1

The code for molded case circuit breakers includes a fixed list of accessories. For further details please contact ABB.

Tmax T5/ML

Fixed version

Poles	Iu	Trip unit	Type	Code
3p	400	TMA 320-3200	T5N/ML 400 TMA 320-3200 3p F F +AUX- T45	1SDA065328R1
3p	400	TMA 320-3200	T5N/ML 400 TMA 320-3200 3p F F +AUX- T45	1SDA065329R1
3p	630	PR221DS-LS/I	T5N/ML 630 PR221DS-LS/I In=630 3p F R	1SDA063641R1
3p	630	PR221DS-LS/I	T5N/ML 630 PR221DS-LS/I In=630 3p F EF	1SDA069077R1
3p	630	PR221DS-I	T5L/ML 630 PR221DS-I In=630 3p F ES	1SDA069581R1
3p	400	PR222DS/P-LSI	T5S/ML 400 PR222DS/P-LSI In=400 3p F F	1SDA070689R1
3p	630		T5D/ML 630 3p F F	1SDA063681R1
3p	630		T5D/ML 630 3p F F + AUX - T45	1SDA065327R1
4p	630		T5D/ML 630 4p F F	1SDA063675R1

Plug-in moving part

Poles	Iu	Trip unit	Type	Code
3p	400	PR222DS/P-LSI	T5L/ML 400 PR222DS/P-LSI In=400 3p P MP	1SDA063618R1
3p	400	PR222DS/P-LSI	T5L/ML 400 PR222DS/P-LSI In=320 3p P MP	1SDA063619R1
3p	400	PR222DS/P-LSI	T5L/ML 400 PR222DS/P-LSI In=320 3p P MP	1SDA063634R1
3p	400	PR222DS/P-LSI	T5H/ML 400 PR222DS/P-LSI In=400 3p P MP	1SDA063668R1
3p	400	PR222DS/P-LSI	T5L/ML 400 PR222DS/P-LSI In=400 3p P MP	1SDA063680R1
3p	400	PR222DS/P-LSI	T5H/ML 400 PR222DS/P-LSI In=400 3p P MP	1SDA079905R1
3p	400	PR221DS-LS/I	T5L/ML 400 PR221DS-LS/I In=400 3p P MP	1SDA079911R1
3p	400	PR221DS-LS/I	T5H/ML 400 PR221DS-LS/I In=400 3p P MP	1SDA082398R1
3p	400	PR221DS-LS/I	T5H/ML 400 PR221DS-LS/I In=400 3p P MP	1SDA082399R1
3p	400	PR221DS-LS/I	T5H/ML 400 PR221DS-LS/I In=400 3p P MP	1SDA082400R1
3p	400	PR221DS-LS/I	T5H/ML 400 PR221DS-LS/I In=320 3p P MP	1SDA082401R1
3p	400	PR221DS-LS/I	T5S/ML 400 PR221DS-LS/I In=400 3p P MP	1SDA085232R1
3p	400	PR223EF	T5L/ML 400 PR223EF In=400A 3p P MP	1SDA085408R1
3p	400	PR222DS/PD-LSI	T5L/ML 400 PR222DS/PD-LSI In=400 3p P MP	1SDA085405R1
3p	400	PR222DS/P-LSI	T5L/ML 400 PR222DS/P-LSI In=400 3p P MP	1SDA085407R1
3p	630	PR222DS/P-LSI	T5H/ML 630 PR222DS/P-LSI In=630 3p P MP	1SDA063667R1
3p	630	PR222DS/P-LSI	T5L/ML 630 PR222DS/P-LSI In=630 3p P MP	1SDA063691R1
3p	630	PR222DS/P-LSI	T5L/ML 630 PR222DS/P-LSI In=630 3p P MP	1SDA069272R1
3p	630	PR222DS/P-LSI	T5S/ML 630 PR222DS/P-LSI In=630 3p P MP	1SDA069692R1
3p	630	PR221DS-LS/I	T5L/ML 630 PR221DS-LS/I In=630 3p P MP	1SDA079909R1
3p	630	PR221DS-LS/I	T5L/ML 630 PR221DS-LS/I In=630 3p P MP	1SDA079910R1
3p	630	PR221DS-LS/I	T5S/ML 630 PR221DS-LS/I In=630 3p P MP	1SDA080983R1
3p	630	PR221DS-LS/I	T5H/ML 630 PR221DS-LS/I 630 P MP	1SDA083069R1
3p	400		T5D/ML 400 3p P MP	1SDA085417R1
3p	630		T5D/ML 630 3p P MP	1SDA081004R1
4p	400	TMA 320-3200	T5V/ML 400 TMA 320-3200 4p P MP InN=100%	1SDA063593R1
4p	630	TMA 500-5000	T5V/ML 630 TMA 500-5000 4p P MP InN=100%	1SDA063597R1
4p	630	TMA 500-5000	T5V/ML 630 TMA 500-5000 4p P MP InN=100%	1SDA063598R1

The code for molded case circuit breakers includes a fixed list of accessories. For further details please contact ABB.

Plug-in fixed part

	Type	Code
	T5/ML 400 P FP 3p EF	1SDA085404R1
	T5/ML 400 P FP 3p HR	1SDA085249R1
	T5/ML 630 P FP 3p VR	1SDA063624R1
	T5/ML 400 P FP 3p VR	1SDA063625R1
	T5/ML 630 P FP 3p HR	1SDA063700R1
	T5/ML 400 P FP 3p HR	1SDA063701R1
	T5/ML 630 P FP 4p VR	1SDA063707R1
	T5/ML 630 P FP 3p ES	1SDA069548R1

Withdrawable moving part

Poles	Iu	Trip unit	Type	Code
3p	400	PR221DS-LS/I	T5V/ML 400 PR221DS-LS/I In=400 3p W MP	1SDA063181R1
3p	400	PR221DS-LS/I	T5N/ML 400 PR221DS-LS/I In=400 3p W MP	1SDA063599R1
3p	400	PR222DS/P-LSI	T5S/ML 400 PR222DS/P-LSI In=400 3p W MP	1SDA069693R1
3p	400	PR222DS/P-LSI	T5V/ML 400 PR222DS/P-LSI In=400A 3p W MP	1SDA083067R1
3p	630	PR221DS-LS/I	T5V/ML 630 PR221DS-LS/I In=630 3p W MP	1SDA063182R1
3p	630	PR221DS-LS/I	T5N/ML 630 PR221DS-LS/I In=630 3p W MP	1SDA063639R1
3p	630	PR221DS-LS/I	T5N/ML 630 PR221DS-LS/I In=630 3p W MP	1SDA063640R1
3p	630	PR221DS-LS/I	T5S/ML 630 PR221DS-LS/I In=630 3p W MP	1SDA080984R1
3p	630	PR221DS-LS/I	T5S/ML 630 PR221DS-LS/I In=630 3p W MP	1SDA081884R1

Withdrawable fixed part

	Type	Code
	T5/ML 400 W FP 3p EF	1SDA063185R1
	T5/ML 630 W FP 3p EF	1SDA063186R1
	T5/ML 630 W FP 3p HR	1SDA063702R1
	T5/ML 400 W FP 3p HR	1SDA063705R1
	T5/ML 630 W FP 3p ES	1SDA069052R1
	T5/ML 400 W FP 3p HR	1SDA083066R1

The code for molded case circuit breakers includes a fixed list of accessories. For further details please contact ABB.

Tmax T6/ML

Fixed version

Poles	Iu	Trip unit	Type	Code
3p	630		T6D/ML 630 3p F EF	1SDA070208R1

Withdrawable moving part

Poles	Iu	Trip unit	Type	Code
3p	800	PR222DS/P-LSI	T6N/ML 800 PR222DS/P-LSI In=800 3p W MP	1SDA063595R1
3p	800	PR222DS/P-LSI	T6N/ML 800 PR222DS/P-LSI In=800 3p W MP	1SDA063596R1
3p	800	PR222DS/P-LSI	T6L/ML 800 PR222DS/P-LSI In=800 3p W MP	1SDA069814R1

Withdrawable fixed part

	Type	Code
	T6/ML W FP 3p HR	1SDA063713R1
	T6/ML W FP 3p VR/HR	1SDA069815R1

The code for molded case circuit breakers includes a fixed list of accessories. For further details please contact ABB.



Tmax T7/ML

Withdrawable moving part

Poles	Iu	Trip unit	Type	Code
3p	800	PR332/P LSI	T7H/ML 800 PR332/P LSI In=800A 3p W MP	1SDA063607R1

Withdrawable fixed part

Type	Code
T7-X1/ML W FP 3p HR-HR	1SDA063608R1
T7-X1/ML W FP 3p VR-VR	1SDA069833R1
T7-X1/ML W FP 3p HR-HR	1SDA080964R1

The code for molded case circuit breakers includes a fixed list of accessories. For further details please contact ABB.

Emax E2.2/ML

Circuit breaker moving part

Iu	performance frame	Type	Code
800	N	E2.2N/ML 800 Ekip Dip LSI	1SDA083405R1
800	N	E2.2N/ML 800 Ekip G Hi-Touch LSI	1SDA083409R1
800	N	E2.2N/ML 800 Ekip G Touch LSI	1SDA083408R1
800	N	E2.2N/ML 800 Ekip Hi-Touch LSI	1SDA083407R1
800	N	E2.2N/ML 800 Ekip Touch LSI	1SDA083406R1
1250	N	E2.2N/ML 1250 Ekip Dip LSI	1SDA083410R1
1250	N	E2.2N/ML 1250 Ekip G Hi-Touch LSI	1SDA083414R1
1250	N	E2.2N/ML 1250 Ekip G Touch LSI	1SDA083413R1
1250	N	E2.2N/ML 1250 Ekip Hi-Touch LSI	1SDA083412R1
1250	N	E2.2N/ML 1250 Ekip Touch LSI	1SDA083411R1
1600	N	E2.2N/ML 1600 Ekip Dip LSI	1SDA083415R1
1600	N	E2.2N/ML 1600 Ekip G Hi-Touch LSI	1SDA083419R1
1600	N	E2.2N/ML 1600 Ekip G Touch LSI	1SDA083418R1
1600	N	E2.2N/ML 1600 Ekip Hi-Touch LSI	1SDA083417R1
1600	N	E2.2N/ML 1600 Ekip Touch LSI	1SDA083416R1
2000	N	E2.2N/ML 2000 Ekip Dip LSI	1SDA083420R1
2000	N	E2.2N/ML 2000 Ekip G Hi-Touch LSI	1SDA083424R1
2000	N	E2.2N/ML 2000 Ekip G Touch LSI	1SDA083423R1
2000	N	E2.2N/ML 2000 Ekip Hi-Touch LSI	1SDA083422R1
2000	N	E2.2N/ML 2000 Ekip Touch LSI	1SDA083421R1
2500	N	E2.2N/ML 2500 Ekip Dip LSI	1SDA083425R1
2500	N	E2.2N/ML 2500 Ekip G Hi-Touch LSI	1SDA083429R1
2500	N	E2.2N/ML 2500 Ekip G Touch LSI	1SDA083428R1
2500	N	E2.2N/ML 2500 Ekip Hi-Touch LSI	1SDA083427R1
2500	N	E2.2N/ML 2500 Ekip Touch LSI	1SDA083426R1
800	S	E2.2S/ML 800 Ekip Dip LSI	1SDA083435R1
800	S	E2.2S/ML 800 Ekip G Hi-Touch LSI	1SDA083439R1
800	S	E2.2S/ML 800 Ekip G Touch LSI	1SDA083438R1
800	S	E2.2S/ML 800 Ekip Hi-Touch LSI	1SDA083437R1
800	S	E2.2S/ML 800 Ekip Touch LSI	1SDA083436R1
1250	S	E2.2S/ML 1250 Ekip Dip LSI	1SDA083440R1
1250	S	E2.2S/ML 1250 Ekip G Hi-Touch LSI	1SDA083444R1
1250	S	E2.2S/ML 1250 Ekip G Touch LSI	1SDA083443R1
1250	S	E2.2S/ML 1250 Ekip Hi-Touch LSI	1SDA083442R1
1250	S	E2.2S/ML 1250 Ekip Touch LSI	1SDA083441R1
1600	S	E2.2S/ML 1600 Ekip Dip LSI	1SDA083445R1
1600	S	E2.2S/ML 1600 Ekip G Hi-Touch LSI	1SDA083449R1
1600	S	E2.2S/ML 1600 Ekip G Touch LSI	1SDA083448R1
1600	S	E2.2S/ML 1600 Ekip Hi-Touch LSI	1SDA083447R1
1600	S	E2.2S/ML 1600 Ekip Touch LSI	1SDA083446R1
2000	S	E2.2S/ML 2000 Ekip Dip LSI	1SDA083450R1
2000	S	E2.2S/ML 2000 Ekip G Hi-Touch LSI	1SDA083454R1
2000	S	E2.2S/ML 2000 Ekip G Touch LSI	1SDA083453R1
2000	S	E2.2S/ML 2000 Ekip Hi-Touch LSI	1SDA083452R1
2000	S	E2.2S/ML 2000 Ekip Touch LSI	1SDA083451R1
2500	S	E2.2S/ML 2500 Ekip Dip LSI	1SDA083455R1
2500	S	E2.2S/ML 2500 Ekip G Hi-Touch LSI	1SDA083459R1
2500	S	E2.2S/ML 2500 Ekip G Touch LSI	1SDA083458R1
2500	S	E2.2S/ML 2500 Ekip Hi-Touch LSI	1SDA083457R1
2500	S	E2.2S/ML 2500 Ekip Touch LSI	1SDA083456R1

lu	performance frame	Type	Code
800	H	E2.2H/ML 800 Ekip Dip LSI	1SDA083460R1
800	H	E2.2H/ML 800 Ekip G Hi-Touch LSI	1SDA083463R1
800	H	E2.2H/ML 800 Ekip G Touch LSI	1SDA083462R1
800	H	E2.2H/ML 800 Ekip Hi-Touch LSI	1SDA083461R1
800	H	E2.2H/ML 800 Ekip Touch LSI	1SDA083374R1
1250	H	E2.2H/ML 1250 Ekip Dip LSI	1SDA083464R1
1250	H	E2.2H/ML 1250 Ekip G Hi-Touch LSI	1SDA083467R1
1250	H	E2.2H/ML 1250 Ekip G Touch LSI	1SDA083466R1
1250	H	E2.2H/ML 1250 Ekip Hi-Touch LSI	1SDA083465R1
1250	H	E2.2H/ML 1250 Ekip Touch-LSI	1SDA083378R1
1600	H	E2.2H/ML 1600 Ekip Dip LSI	1SDA083468R1
1600	H	E2.2H/ML 1600 Ekip G Hi-Touch LSI	1SDA083471R1
1600	H	E2.2H/ML 1600 Ekip G Touch LSI	1SDA083470R1
1600	H	E2.2H/ML 1600 Ekip Hi-Touch LSI	1SDA083469R1
1600	H	E2.2H/ML 1600 Ekip Touch-LSI	1SDA083377R1
2000	H	E2.2H/ML 2000 Ekip Dip LSI	1SDA083472R1
2000	H	E2.2H/ML 2000 Ekip G Hi-Touch LSI	1SDA083476R1
2000	H	E2.2H/ML 2000 Ekip G Touch LSI	1SDA083475R1
2000	H	E2.2H/ML 2000 Ekip Hi-Touch LSI	1SDA083474R1
2000	H	E2.2H/ML 2000 Ekip Touch LSI	1SDA083473R1
2500	H	E2.2H/ML 2500 Ekip Dip LSI	1SDA083477R1
2500	H	E2.2H/ML 2500 Ekip G Hi-Touch LSI	1SDA083480R1
2500	H	E2.2H/ML 2500 Ekip G Touch LSI	1SDA083479R1
2500	H	E2.2H/ML 2500 Ekip Hi-Touch LSI	1SDA083478R1
2500	H	E2.2H/ML 2500 Ekip Touch-LSI	1SDA083376R1

Switch disconnecter moving part

lu	performance frame	Type	Code
800	N	E2.2N/ML/MS 800 3p WMP	1SDA083571R1
1250	N	E2.2N/ML/MS 1250 3p WMP	1SDA083572R1
1600	N	E2.2N/ML/MS 1600 3p WMP	1SDA083573R1
2000	N	E2.2N/ML/MS 2000 3p WMP	1SDA083574R1
2500	N	E2.2N/ML/MS 2500 3p WMP	1SDA083575R1
800	H	E2.2H/ML/MS 800 3p WMP	1SDA083576R1
1250	H	E2.2H/ML/MS 1250 3p WMP	1SDA083577R1
1600	H	E2.2H/ML/MS 1600 3p WMP	1SDA083578R1
2000	H	E2.2H/ML/MS 2000 3p WMP	1SDA083579R1
2500	H	E2.2H/ML/MS 2500 3p WMP	1SDA083580R1

Fixed part

Size	performance	lu range	Type of terminal	Type	Code
E2.2	N, S, H	400-2000	HR-HR	E2.2/ML W FP lu=2000 HR HR	1SDA083381R1
E2.2	N, S, H	2500	HR-HR	E2.2/ML W FP lu=2500 HR HR	1SDA083382R1

Emax E4.2/ML

Circuit breaker moving part

Iu	performance frame	Type	Code
3200	N	E4.2N/ML 3200 Ekip Dip LSI	1SDA083481R1
3200	N	E4.2N/ML 3200 Ekip G Hi-Touch LSI	1SDA083485R1
3200	N	E4.2N/ML 3200 Ekip G Touch LSI	1SDA083484R1
3200	N	E4.2N/ML 3200 Ekip Hi-Touch LSI	1SDA083483R1
3200	N	E4.2N/ML 3200 Ekip Touch LSI	1SDA083482R1
4000	N	E4.2N/ML 4000 Ekip Dip LSI	1SDA083486R1
4000	N	E4.2N/ML 4000 Ekip G Hi-Touch LSI	1SDA083490R1
4000	N	E4.2N/ML 4000 Ekip G Touch LSI	1SDA083489R1
4000	N	E4.2N/ML 4000 Ekip Hi-Touch LSI	1SDA083488R1
4000	N	E4.2N/ML 4000 Ekip Touch LSI	1SDA083487R1
3200	H	E4.2H/ML 3200 Ekip Dip LSI	1SDA083491R1
3200	H	E4.2H/ML 3200 Ekip G Hi-Touch LSI	1SDA083494R1
3200	H	E4.2H/ML 3200 Ekip G Touch LSI	1SDA083493R1
3200	H	E4.2H/ML 3200 Ekip Hi-Touch LSI	1SDA083492R1
3200	H	E4.2H/ML 3200 Ekip Touch LSI	1SDA083375R1
4000	H	E4.2H/ML 4000 Ekip Dip LSI	1SDA083495R1
4000	H	E4.2H/ML 4000 Ekip G Hi-Touch LSI	1SDA083498R1
4000	H	E4.2H/ML 4000 Ekip G Touch LSI	1SDA083497R1
4000	H	E4.2H/ML 4000 Ekip Hi-Touch LSI	1SDA083496R1
4000	H	E4.2H/ML 4000 Ekip Touch LSI	1SDA083380R1
2000	V	E4.2V/ML 2000 Ekip Dip LSI	1SDA083499R1
2000	V	E4.2V/ML 2000 Ekip G Hi-Touch LSI	1SDA083503R1
2000	V	E4.2V/ML 2000 Ekip G Touch LSI	1SDA083502R1
2000	V	E4.2V/ML 2000 Ekip Hi-Touch LSI	1SDA083501R1
2000	V	E4.2V/ML 2000 Ekip Touch LSI	1SDA083500R1
2500	V	E4.2V/ML 2500 Ekip Dip LSI	1SDA083504R1
2500	V	E4.2V/ML 2500 Ekip G Hi-Touch LSI	1SDA083508R1
2500	V	E4.2V/ML 2500 Ekip G Touch LSI	1SDA083507R1
2500	V	E4.2V/ML 2500 Ekip Hi-Touch LSI	1SDA083506R1
2500	V	E4.2V/ML 2500 Ekip Touch LSI	1SDA083505R1
3200	V	E4.2V/ML 3200 Ekip Dip LSI	1SDA083509R1
3200	V	E4.2V/ML 3200 Ekip G Hi-Touch LSI	1SDA083513R1
3200	V	E4.2V/ML 3200 Ekip G Touch LSI	1SDA083512R1
3200	V	E4.2V/ML 3200 Ekip Hi-Touch LSI	1SDA083511R1
3200	V	E4.2V/ML 3200 Ekip Touch LSI	1SDA083510R1
4000	V	E4.2V/ML 4000 Ekip Dip LSI	1SDA083514R1
4000	V	E4.2V/ML 4000 Ekip G Hi-Touch LSI	1SDA083518R1
4000	V	E4.2V/ML 4000 Ekip G Touch LSI	1SDA083517R1
4000	V	E4.2V/ML 4000 Ekip Hi-Touch LSI	1SDA083516R1
4000	V	E4.2V/ML 4000 Ekip Touch LSI	1SDA083515R1

Switch disconnecter moving part

Iu	performance frame	Type	Code
3200	N	E4.2N/ML/MS 3200 3p WMP	1SDA083581R1
4000	N	E4.2N/ML/MS 4000 3p WMP	1SDA083582R1
3200	H	E4.2H/ML/MS 3200 3p WMP	1SDA083583R1
4000	H	E4.2H/ML/MS 4000 3p WMP	1SDA083584R1
2000	V	E4.2V/ML/MS 2000 3p WMP	1SDA083585R1
2500	V	E4.2V/ML/MS 2500 3p WMP	1SDA083586R1
3200	V	E4.2V/ML/MS 3200 3p WMP	1SDA083587R1
4000	V	E4.2V/ML/MS 4000 3p WMP	1SDA083588R1

Fixed part

Size	performance	Iu range	Type of terminal	Type	Code
E4.2	N, H	3200	HR-HR	E4.2/ML W FP Iu=3200 HR HR	1SDA083383R1
E4.2	V	2000-4000	HR-HR	E4.2/ML W FP Iu=4000 o versione V HR HR	1SDA083596R1

Emax E6.2/ML

Circuit breaker moving part

Iu	performance frame	Type	Code
4000	H	E6.2H/ML 4000 Ekip Dip LSI	1SDA083519R1
4000	H	E6.2H/ML 4000 Ekip G Hi-Touch LSI	1SDA083523R1
4000	H	E6.2H/ML 4000 Ekip G Touch LSI	1SDA083522R1
4000	H	E6.2H/ML 4000 Ekip Hi-Touch LSI	1SDA083521R1
4000	H	E6.2H/ML 4000 Ekip Touch LSI	1SDA083520R1
5000	H	E6.2H/ML 5000 Ekip Dip LSI	1SDA083524R1
5000	H	E6.2H/ML 5000 Ekip G Hi-Touch LSI	1SDA083528R1
5000	H	E6.2H/ML 5000 Ekip G Touch LSI	1SDA083527R1
5000	H	E6.2H/ML 5000 Ekip Hi-Touch LSI	1SDA083526R1
5000	H	E6.2H/ML 5000 Ekip Touch LSI	1SDA083525R1
6300	H	E6.2H/ML 6300 Ekip Dip LSI	1SDA083529R1
6300	H	E6.2H/ML 6300 Ekip G Hi-Touch LSI	1SDA083533R1
6300	H	E6.2H/ML 6300 Ekip G Touch LSI	1SDA083532R1
6300	H	E6.2H/ML 6300 Ekip Hi-Touch LSI	1SDA083531R1
6300	H	E6.2H/ML 6300 Ekip Touch LSI	1SDA083530R1
4000	V	E6.2V/ML 4000 Ekip Dip LSI	1SDA083534R1
4000	V	E6.2V/ML 4000 Ekip G Hi-Touch LSI	1SDA083538R1
4000	V	E6.2V/ML 4000 Ekip G Touch LSI	1SDA083537R1
4000	V	E6.2V/ML 4000 Ekip Hi-Touch LSI	1SDA083536R1
4000	V	E6.2V/ML 4000 Ekip Touch LSI	1SDA083535R1
5000	V	E6.2V/ML 5000 Ekip Dip LSI	1SDA083539R1
5000	V	E6.2V/ML 5000 Ekip G Hi-Touch LSI	1SDA083543R1
5000	V	E6.2V/ML 5000 Ekip G Touch LSI	1SDA083542R1
5000	V	E6.2V/ML 5000 Ekip Hi-Touch LSI	1SDA083541R1
5000	V	E6.2V/ML 5000 Ekip Touch LSI	1SDA083540R1
6300	V	E6.2V/ML 6300 Ekip Dip LSI	1SDA083544R1
6300	V	E6.2V/ML 6300 Ekip G Hi-Touch LSI	1SDA083548R1
6300	V	E6.2V/ML 6300 Ekip G Touch LSI	1SDA083547R1
6300	V	E6.2V/ML 6300 Ekip Hi-Touch LSI	1SDA083546R1
6300	V	E6.2V/ML 6300 Ekip Touch LSI	1SDA083545R1

Switch disconnecter moving part

Iu	performance frame	Type	Code
4000	H	E6.2H/ML/MS 4000 3p WMP	1SDA083589R1
5000	H	E6.2H/ML/MS 5000 3p WMP	1SDA083590R1
6300	H	E6.2H/ML/MS 6300 3p WMP	1SDA083591R1
4000	X	E6.2X/ML/MS 4000 3p WMP	1SDA083592R1
5000	X	E6.2X/ML/MS 5000 3p WMP	1SDA083593R1
6300	X	E6.2X/ML/MS 6300 3p WMP	1SDA083594R1

Fixed part

Size	performance	Iu range	Type of terminal	Type	Code
E6.2	H, V	4000-5000	HR-HR	E6.2/ML W FP Iu=5000 HR HR	1SDA083597R1
E6.2	H, V, X	4000-5000	HR-HR	E6.2/ML W FP Iu=6300 o versione X HR HR	1SDA083598R1

Accessories

Electrical accessories



First and second opening release - YO

Size	Type	Code
E1.2..E6.2	YO E1.2..E6.2 24V AC/DC	1SDA073668R1
E1.2..E6.2	YO E1.2..E6.2 30V AC/DC	1SDA073669R1
E1.2..E6.2	YO E1.2..E6.2 48V AC/DC	1SDA073670R1
E1.2..E6.2	YO E1.2..E6.2 60V AC/DC	1SDA073671R1
E1.2..E6.2	YO E1.2..E6.2 110-120V AC/DC	1SDA073672R1
E1.2..E6.2	YO E1.2..E6.2 120-127V AC/DC	1SDA073673R1
E1.2..E6.2	YO E1.2..E6.2 220-240V AC/DC	1SDA073674R1
E1.2..E6.2	YO E1.2..E6.2 240-250V AC/DC	1SDA073675R1
E1.2..E6.2	YO E1.2..E6.2 380-400V AC	1SDA073677R1
E1.2..E6.2	YO E1.2..E6.2 415-440V AC	1SDA073678R1
E1.2..E6.2	YO E1.2..E6.2 480-500V AC	1SDA073679R1

First and second closing release- YC

Size	Type	Code
E1.2..E6.2	YC E1.2..E6.2 24V AC/DC	1SDA073681R1
E1.2..E6.2	YC E1.2..E6.2 30V AC/DC	1SDA073682R1
E1.2..E6.2	YC E1.2..E6.2 48V AC/DC	1SDA073683R1
E1.2..E6.2	YC E1.2..E6.2 60V AC/DC	1SDA073684R1
E1.2..E6.2	YC E1.2..E6.2 110-120V AC/DC	1SDA073685R1
E1.2..E6.2	YC E1.2..E6.2 120-127V AC/DC	1SDA073686R1
E1.2..E6.2	YC E1.2..E6.2 220-240V AC/DC	1SDA073687R1
E1.2..E6.2	YC E1.2..E6.2 240-250V AC/DC	1SDA073688R1
E1.2..E6.2	YC E1.2..E6.2 380-400V AC	1SDA073690R1
E1.2..E6.2	YC E1.2..E6.2 415-440V AC	1SDA073691R1
E1.2..E6.2	YC E1.2..E6.2 480-500V AC	1SDA073692R1

YO/YC test unit

Size	Type	Code
E1.2...E6.2*	YO/YC test unit E1.2...E6.2	1SDA082751R1

*Only as loose part

Undervoltage release - YU

Size	Type	Code
E1.2..E6.2	YU E1.2..E6.2 24V AC/DC	1SDA073694R1
E1.2..E6.2	YU E1.2..E6.2 30V AC/DC	1SDA073695R1
E1.2..E6.2	YU E1.2..E6.2 48V AC/DC	1SDA073696R1
E1.2..E6.2	YU E1.2..E6.2 60V AC/DC	1SDA073697R1
E1.2..E6.2	YU E1.2..E6.2 110-120V AC/DC	1SDA073698R1
E1.2..E6.2	YU E1.2..E6.2 120-127V AC/DC	1SDA073699R1
E1.2..E6.2	YU E1.2..E6.2 220-240V AC/DC	1SDA073700R1
E1.2..E6.2	YU E1.2..E6.2 240-250V AC/DC	1SDA073701R1
E1.2..E6.2	YU E1.2..E6.2 380-400V AC	1SDA073703R1
E1.2..E6.2	YU E1.2..E6.2 415-440V AC	1SDA073704R1
E1.2..E6.2	YU E1.2..E6.2 480-500V AC	1SDA073705R1

Electronic time-delay device for undervoltage release - UVD

Size	Type	Code
E1.2...E6.2	24...30V DC	1SDA038316R1
E1.2...E6.2	48V AC/DC	1SDA038317R1
E1.2...E6.2	60V AC/DC	1SDA038318R1
E1.2...E6.2	110...127V AC/DC	1SDA038319R1
E1.2...E6.2	220...250V AC/DC	1SDA038320R1

Remote Reset - YR

Size	Type	Code
E2.2...E6.2	YR 24V DC E2.2...E6.2	1SDA073747R1
E2.2...E6.2*	YR 110V AC/DC E2.2...E6.2	1SDA073748R1
E2.2...E6.2*	YR 250V AC/DC E2.2...E6.2	1SDA073749R1

* when YR is used in DC, the activation of YR must be done with a maximum impulse time of 50ms.
The YR cannot be powered permanently.

Motor - M

Size	Type	Code
E2.2...E6.2	M E2.2...E6.2 24-30V AC/DC+S33 M/2 400V	1SDA073722R1
E2.2...E6.2	M E2.2...E6.2 48-60V AC/DC+S33 M/2 400V	1SDA073723R1
E2.2...E6.2	M E2.2...E6.2 100-130V AC/DC+S33 M/2 400V	1SDA073724R1
E2.2...E6.2	M E2.2...E6.2 220-250V AC/DC+S33 M/2 400V	1SDA073725R1
E2.2...E6.2	M E2.2...E6.2 380-415V AC+S33 M/2 400V	1SDA073727R1
E2.2...E6.2	M E2.2...E6.2 24-30V AC/DC + S33 M/2 24V DC	1SDA073729R1
E2.2...E6.2	M E2.2...E6.2 48-60V AC/DC + S33 M/2 24V DC	1SDA073730R1
E2.2...E6.2	M E2.2...E6.2 100-130V AC/DC + S33 M/2 24V DC	1SDA073731R1
E2.2...E6.2	M E2.2...E6.2 220-250V AC/DC + S33 M/2 24V DC	1SDA073732R1

Open/closed auxiliary contacts - AUX

Size	Type	Code
E2.2...E6.2*	AUX 4Q 400V E2.2...E6.2	1SDA073753R1
E2.2...E6.2	AUX 4Q 24V E2.2...E6.2	1SDA073754R1
E2.2...E6.2	AUX 2Q 400V + 2Q 24V E2.2...E6.2	1SDA073755R1
E2.2...E6.2	AUX 6Q 400V E2.2...E6.2	1SDA073756R1
E2.2...E6.2	AUX 6Q 24V E2.2...E6.2	1SDA073757R1
E2.2...E6.2	AUX 3Q 400V AC + 3Q 24V DC E2.2...E6.2	1SDA075973R1

* Standard supply with automatic circuit-breakers

Accessories

Electrical accessories



Auxiliary position contacts - AUP

Size	Type	Code
E2.2...E6.2	AUP 5 contacts 400V E2.2...E6.2 - left set	1SDA073764R1
E2.2...E6.2	AUP 5 contacts 24V E2.2...E6.2 - left set	1SDA073765R1
E2.2...E6.2	AUP 5 suppl. contacts 400V E2.2...E6.2 - right set	1SDA073766R1
E2.2...E6.2	AUP 5 suppl. contacts 24V E2.2...E6.2 - right set	1SDA073767R1
E2.2...E6.2	AUP 5 suppl. contacts 400V E2.2...E6.2 - 1in 3test 1out - right set	1SDA082749R1
E1.2...E6.2	AUP Ekip auxiliary position contact E1.2..E6.2	1SDA073768R1



Ready to close signalling contact- RTC

Size	Type	Code
E2.2...E6.2	RTC 250V E2.2...E6.2	1SDA073773R1
E2.2...E6.2	RTC 24V E2.2...E6.2	1SDA073774R1
E2.2...E6.2	RTC Ekip 24V E2.2...E6.2	1SDA073775R1



Contact signalling tripping of Ekip protection trip unit - S51

Size	Type	Code
E2.2...E6.2	S51 250V E2.2...E6.2	1SDA073778R1
E2.2...E6.2	S51 24V E2.2...E6.2	1SDA073779R1



Terminals for auxiliary connection

Size	Type	Code
E1.2...E6.2	Terminals 10 pcs.	1SDA073906R1

Accessories

Mechanical accessories



Mechanical operation counter - MOC

Size	Type	Code
E2.2...E6.2	MOC Mechanical operation counter	1SDA073781R1



Key lock in open position - KLC

Size	Type	Code
E2.2...E6.2	KLC-D Key lock open E2.2...E6.2	1SDA073791R1
E2.2...E6.2	KLC-S key lock open N.20005 E2.2...E6.2	1SDA073792R1
E2.2...E6.2	KLC-S key lock open N.20006 E2.2...E6.2	1SDA073793R1
E2.2...E6.2	KLC-S key lock open N.20007 E2.2...E6.2	1SDA073794R1
E2.2...E6.2	KLC-S key lock open N.20008 E2.2...E6.2	1SDA073795R1
E2.2...E6.2	KLC-S key lock open N.20009 E2.2...E6.2	1SDA073796R1



Key lock in racked-in / test / racked-out position- KLP

Size	Type	Code
E2.2...E6.2	KLP-D Bl. Racked in/out E2.2...E6.2 1st key	1SDA073806R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20005 E2.2...E6.2 1st key	1SDA073807R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20006 E2.2...E6.2 1st key	1SDA073808R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20007 E2.2...E6.2 1st key	1SDA073809R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20008 E2.2...E6.2 1st key	1SDA073810R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20009 E2.2...E6.2 1st key	1SDA073811R1
E2.2...E6.2	KLP-D Bl. Racked in/out E2.2...E6.2 2nd key	1SDA073812R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20005 E2.2...E6.2 2nd key	1SDA073813R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20006 E2.2...E6.2 2nd key	1SDA073814R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20007 E2.2...E6.2 2nd key	1SDA073815R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20008 E2.2...E6.2 2nd key	1SDA073816R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20009 E2.2...E6.2 2nd key	1SDA073817R1
E2.2...E6.2**	KLP-A Bl. Racked in/out RoProKirk E2.2...E6.2 1st key	1SDA073818R1
E2.2...E6.2**	KLP-A Bl. Racked in/out RoProKirk E2.2...E6.2 2nd key	1SDA073819R1
E2.2...E6.2***	KLP-A Bl. Racked in/out Castell E2.2...E6.2 1st key	1SDA073820R1
E2.2...E6.2***	KLP-A Bl. Racked in/out Castell E2.2...E6.2 2nd key	1SDA073821R1

When the PLP is already present, you have to order the KLP 2nd key and not the KLP 1st key

* only mounted. For loose supply contact ABB SACE; ** arrangement only



Accessory for supplementary lock in racked-out position

Size	Type	Code
E2.2...E6.2	Suppl. locks in racked-out E2.2...E6.2	1SDA073839R1

Accessories

Mechanical accessories



Lock for racking in / racking out the mobile part when the door is open - DLR

Size	Type	Code
E2.2...E6.2*	DLR E2.2...E6.2	1SDA073845R1

*Only as loose part



Lock to prevent door opening when circuit-breaker is in racked-in / test position - DLP

Size	Type	Code
E2.2...E6.2*	DLP E2.2...E6.2	1SDA073849R1

*Only as loose part



Protection device for opening and closing pushbuttons - PBC

Size	Type	Code
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH E2.2...E6.2	1SDA073858R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH D=4mm E2.2...E6.2	1SDA073859R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH D=7mm E2.2...E6.2	1SDA073860R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH D=8mm E2.2...E6.2	1SDA073861R1



Circuit-breaker flange

Size	Type	Code
E2.2...E6.2	IP30 Flange E2.2...E6.2 F	1SDA073864R1
E2.2...E6.2	IP30 Flange E2.2...E6.2 W	1SDA073865R1
E2.2...E6.2*	IP54 Flange different keys E2.2...E6.2	1SDA073867R1
E2.2...E6.2*	IP54 Flange key No. 20005 E2.2...E6.2	1SDA073869R1
E2.2...E6.2	Sealable trip unit cover	1SDA073870R1

*Only as loose part

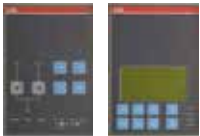
Accessories

Switching devices



Separators - PB*

Size	Type	Code
E2.2...E6.2	PB Separators 2 pz E2.2..E6.2 F 3P	1SDA076166R1
E2.2...E6.2	PB Separators 2 pz E2.2..E6.2 W FP 3P	1SDA076168R1



Automatic transfer switch

Size	Type	Code
E1.2...E6.2	ATS021	1SDA065523R1
E1.2...E6.2	ATS022	1SDA065524R1

Accessories

Ekip modules



Ekip electrical trip units - loose supply

Size	Type	Code
E1.2..E6.2	Ekip Dip LI	1SDA074194R1
E1.2..E6.2	Ekip Dip LSI	1SDA074195R1
E1.2..E6.2	Ekip Dip LSIG	1SDA074196R1
E1.2..E6.2*	Ekip Touch LI	1SDA074197R1
E1.2..E6.2*	Ekip Touch LSI	1SDA074198R1
E1.2..E6.2*	Ekip Touch LSIG	1SDA074199R1
E1.2..E6.2* **	Ekip G Touch LSIG	1SDA074200R1
E1.2..E6.2* **	Ekip Hi-Touch LSI	1SDA074201R1
E1.2..E6.2* **	Ekip Hi-Touch LSIG	1SDA074202R1
E1.2..E6.2* **	Ekip G Hi-Touch LSIG	1SDA074203R1
E1.2..E6.2* **	Ekip LCD LI	1SDA074204R1
E1.2..E6.2* **	Ekip LCD LSI	1SDA074205R1
E1.2..E6.2* **	Ekip LCD LSIG	1SDA074206R1
E1.2..E6.2* **	Ekip G LCD LSIG	1SDA074207R1
E1.2..E6.2* **	Ekip Hi-LCD LSI	1SDA074208R1
E1.2..E6.2* **	Ekip Hi-LCD LSIG	1SDA074209R1
E1.2..E6.2* **	Ekip G Hi-LCD LSIG	1SDA074210R1
E1.2..E6.2	Battery for Ekip trip units	1SDA074193R1

* Ekip TT standard supply; **provided without Ekip Measuring/Ekip Measuring Pro.

Options for Ekip electrical trip units

Size	Type	Code
E1.2..E6.2	Upper internal installed voltage outlets	1SDA074216R1
E1.2..E6.2	External installed voltage outlets	1SDA074217R1
E1.2..E6.2	Arrangement for cables with lower internal voltage outlets	1SDA074213R1
E1.2..E6.2	Arrangement for cables with upper internal voltage outlets	1SDA074214R1
E1.2..E6.2	Arrangement for cables with external voltage outlets	1SDA074215R1

Power Supply modules

Size	Type	Code
E1.2..E6.2	Ekip Supply 110-240V AC/DC	1SDA074172R1
E1.2..E6.2	Ekip Supply 24-48V DC	1SDA074173R1





Connectivity modules

Size	Type	Code
E1.2..E6.2	Ekip Com Modbus RS-485	1SDA074150R1
E1.2..E6.2	Ekip Com Modbus TCP	1SDA074151R1
E1.2..E6.2	Ekip Com Profibus	1SDA074152R1
E1.2..E6.2	Ekip Com Profinet	1SDA074153R1
E1.2..E6.2	Ekip Com DeviceNet™	1SDA074154R1
E1.2..E6.2	Ekip Com EtherNet/IP™	1SDA074155R1
E1.2..E6.2	Ekip Com IEC61850	1SDA074156R1
E1.2..E6.2	Ekip Com Hub	1SDA082894R1
E1.2..E6.2	Ekip Com R Modbus RS-485	1SDA074157R1
E1.2..E6.2	Ekip Com R Modbus TCP	1SDA074158R1
E1.2..E6.2	Ekip Com R Profibus	1SDA074159R1
E1.2..E6.2	Ekip Com R Profinet	1SDA074160R1
E1.2..E6.2	Ekip Com R DeviceNet™	1SDA074161R1
E1.2..E6.2	Ekip Com R EtherNet/IP™	1SDA074162R1
E1.2..E6.2	Ekip Com R IEC61850	1SDA076170R1
E1.2..E6.2	Ekip Link	1SDA074163R1
E1.2..E6.2	Ekip Bluetooth	1SDA074164R1
E1.2..E6.2	Ekip Com GPRS-M	1SDA074165R1
E1.2..E6.2	Ekip Com Actuator	1SDA074166R1



Signalling modules

Size	Type	Code
E1.2..E6.2	Ekip Signalling 2K-1	1SDA074167R1
E1.2..E6.2	Ekip Signalling 2K-2	1SDA074168R1
E1.2..E6.2	Ekip Signalling 2K-3	1SDA074169R1
E2.2..E6.2	Ekip Signalling 4K	1SDA074170R1
E1.2..E6.2*	Ekip Signalling 10K	1SDA074171R1

*Only as loose part



Measuring and Measuring Pro modules

Size	Type	Code
E2.2	Ekip Measuring	1SDA074186R1
E2.2	Ekip Measuring Pro	1SDA074187R1
E4.2	Ekip Measuring	1SDA074188R1
E4.2	Ekip Measuring Pro	1SDA074189R1
E6.2	Ekip Measuring	1SDA074190R1
E6.2	Ekip Measuring Pro	1SDA074191R1



Synchrocheck modules

Size	Type	Code
E1.2..E6.2	Ekip Synchrocheck	1SDA074183R1

Accessories

Ekip modules



Displaying and supervision systems

Size	Type	Code
E1.2..E6.2	Ekip T&P - Programming and Test unit	1SDA066989R1
E1.2..E6.2	Ekip TT - Trip Test unit	1SDA066988R1
E1.2..E6.2	Ekip Programming	1SDA076154R1
E1.2..E6.2*	Ekip Multimeter Display on front of switchgear	1SDA074192R1
E1.2..E6.2	Ekip Control Panel for 10 circuit-breakers	1SDA074311R1
E1.2..E6.2	Ekip control panel for 30 circuit-breakers	1SDA074312R1
E1.2..E6.2	Ekip View Software for 30 circuit-breakers	1SDA074298R1
E1.2..E6.2	Ekip View software for 60 circuit-breakers	1SDA074299R1
E1.2..E6.2	Ekip View software for unlimited circuit-breakers	1SDA074300R1

*Only as loose part

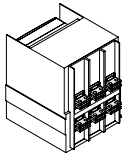


Rating plug for Ekip trip units

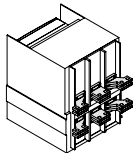
Size	Type	Code (loose supply)	Code (installed)
E1.2..E6.2	Rating Plug 400A	1SDA074221R1	1SDA074261R1
E1.2..E6.2	Rating Plug 630A	1SDA074222R1	1SDA074262R1
E1.2..E6.2	Rating Plug 800A	1SDA074223R1	1SDA074263R1
E1.2..E6.2	Rating Plug 1000A	1SDA074224R1	1SDA074264R1
E1.2..E6.2	Rating Plug 1250A	1SDA074225R1	1SDA074265R1
E1.2..E6.2	Rating Plug 1600A	1SDA074226R1	1SDA074266R1
E2.2..E6.2	Rating Plug 2000A	1SDA074227R1	1SDA074267R1
E2.2..E6.2	Rating Plug 2500A	1SDA074228R1	1SDA074268R1
E4.2..E6.2	Rating Plug 3200A	1SDA074229R1	1SDA074269R1
E4.2..E6.2	Rating Plug 4000A	1SDA074230R1	1SDA074270R1
E6.2	Rating Plug 5000A	1SDA074231R1	1SDA074271R1
E6.2	Rating Plug 6300A	1SDA074232R1	-
E1.2..E6.2	Rating Plug 400A L OFF	1SDA074236R1	1SDA074276R1
E1.2..E6.2	Rating Plug 630A L OFF	1SDA074237R1	1SDA074277R1
E1.2..E6.2	Rating Plug 800A L OFF	1SDA074238R1	1SDA074278R1
E1.2..E6.2	Rating Plug 1000A L OFF	1SDA074239R1	1SDA074279R1
E1.2..E6.2	Rating Plug 1250A L OFF	1SDA074240R1	1SDA074280R1
E1.2..E6.2	Rating Plug 1600A L OFF	1SDA074241R1	1SDA074281R1
E2.2..E6.2	Rating Plug 2000A L OFF	1SDA074242R1	1SDA074282R1
E2.2..E6.2	Rating Plug 2500A L OFF	1SDA074243R1	1SDA074283R1
E4.2..E6.2	Rating Plug 3200A L OFF	1SDA074244R1	1SDA074284R1
E4.2..E6.2	Rating Plug 4000A L OFF	1SDA074245R1	1SDA074285R1
E6.2	Rating Plug 5000A L OFF	1SDA074246R1	1SDA074286R1
E6.2	Rating Plug 6300A L OFF	1SDA074247R1	1SDA074287R1
E1.2..E6.2	Rating Plug RC 400A	1SDA074251R1	1SDA074291R1
E1.2..E6.2	Rating Plug RC 630A	1SDA074252R1	1SDA074292R1
E1.2..E6.2	Rating Plug RC 800A	1SDA074253R1	1SDA074293R1
E1.2..E6.2	Rating Plug RC 1250A	1SDA074254R1	1SDA074294R1
E2.2..E6.2	Rating Plug RC 2000A	1SDA074255R1	1SDA074295R1
E4.2..E6.2	Rating Plug RC 3200A	1SDA074256R1	1SDA074296R1
E4.2..E6.2	Rating Plug RC 4000A	1SDA074257R1	1SDA074297R1

Accessories

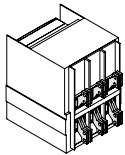
Terminals



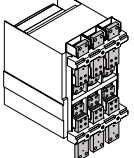
Rear adjustable terminal - HR VR



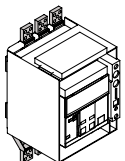
Horizontal rear terminal - SHR



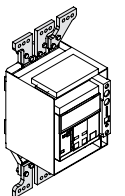
Vertical rear spread terminal - SVR



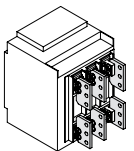
Front terminal - F



Extended front terminal - EF



Front spread terminal - ES



Terminal for cable FcCuAl
4x240mm² - Fc CuAl

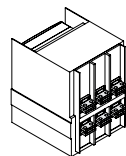
Kit for terminals - installed for fixed part of withdrawable circuit-breaker

Size	Version	Iu max	Type	3 Poles code
E2.2	W	2000	Kit FL Upper	1SDA081120R1
E2.2	W	2000	Kit FL Lower	1SDA081122R1
E2.2	W	2000	Kit VR Upper	1SDA074577R1
E2.2	W	2000	Kit VR Lower	1SDA074579R1
E2.2	W	2500	Kit VR Upper	1SDA074581R1
E2.2	W	2500	Kit VR Lower	1SDA074583R1
E2.2	W	2000	Kit SHR Upper	1SDA074585R1
E2.2	W	2000	Kit SHR Lower	1SDA074587R1
E2.2	W	2500	Kit SHR Upper	1SDA074589R1
E2.2	W	2500	Kit SHR Lower	1SDA074591R1
E2.2	W	2000	Kit SVR Upper	1SDA074593R1
E2.2	W	2000	Kit SVR Lower	1SDA074595R1
E2.2	W	2500	Kit SVR Upper	1SDA074597R1
E2.2	W	2500	Kit SVR Lower	1SDA074599R1
E2.2	W	2500	Kit FL Upper	1SDA074069R1
E2.2	W	2500	Kit FL Lower	1SDA074071R1
E2.2**	W	2500	Kit F Upper	1SDA074090R1
E2.2**	W	2500	Kit F Lower	1SDA074092R1
E4.2	W	3200	Kit FL Upper	1SDA081125R1
E4.2	W	3200	Kit FL Lower	1SDA081128R1
E4.2	W	3200	Kit VR Upper	1SDA074601R1
E4.2	W	3200	Kit VR Lower	1SDA074603R1
E4.2	W	3200	Kit SHR Upper	1SDA082840R1
E4.2	W	3200	Kit SHR Lower	1SDA082842R1
E4.2	W	3200	Kit SVR Upper	1SDA082848R1
E4.2	W	3200	Kit SVR Lower	1SDA082850R1
E4.2	W	4000	Kit VR Upper	1SDA074605R1
E4.2	W	4000	Kit VR Lower	1SDA074607R1
E4.2**	W	4000	Kit F Upper	1SDA074098R1
E4.2**	W	4000	Kit F Lower	1SDA074100R1
E4.2	W	4000	Kit FL Upper	1SDA074075R1
E4.2	W	4000	Kit FL Lower	1SDA074077R1
E4.2	W	4000	Kit HR Upper	1SDA076878R1
E4.2	W	4000	Kit HR Lower	1SDA076880R1
E4.2	W	4000	Kit SHR Upper	1SDA082844R1
E4.2	W	4000	Kit SHR Lower	1SDA082846R1
E4.2	W	4000	Kit SVR Upper	1SDA082852R1
E4.2	W	4000	Kit SVR Lower	1SDA082854R1
E6.2	W	5000	Kit VR Upper	1SDA074609R1
E6.2	W	5000	Kit VR Lower	1SDA074612R1
E6.2	W	6300	Kit VR Upper	1SDA074615R1
E6.2	W	6300	Kit VR Lower	1SDA074618R1
E6.2**	W	6300	Kit F Upper	1SDA074106R1
E6.2**	W	6300	Kit F Lower	1SDA074109R1
E6.2	W	6300	Kit FL Upper	1SDA074081R1
E6.2	W	6300	Kit FL Lower	1SDA074084R1

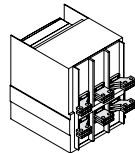
** terminals supplied, but not physically installed.

Accessories

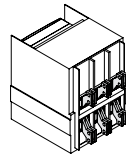
Terminals



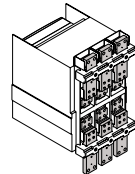
Rear orientable terminal - HR VR



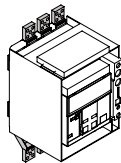
Horizontal rear terminal - SHR



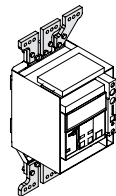
Vertical rear spread terminal - SVR



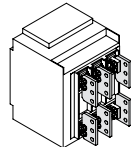
Front terminal - F



Extended front terminal - EF



Front spread terminal - ES



Terminal for cable FcCuAl
4x240mm² - Fc CuAl

Kit for terminals - loose supply for fixed part of withdrawable circuit-breaker

Size	Version	Iu max	Type	Code	Pieces
E2.2	W	2000	Kit Adjustable HR/VR	1SDA074007R1	3
E2.2	W	2500	Kit Adjustable HR/VR	1SDA074013R1	3
E2.2	W	2000	Kit SHR	1SDA074049R1	3
E2.2	W	2500	Kit SHR	1SDA074055R1	3
E2.2	W	2000	Kit SVR	1SDA074061R1	3
E2.2	W	2500	Kit SVR	1SDA074067R1	3
E2.2	W	2500	Kit F Upper	1SDA074094R1	3
E2.2	W	2500	Kit F Lower	1SDA074096R1	3
E4.2	W	3200	Kit Adjustable HR/VR	1SDA074019R1	3
E4.2	W	3200	Kit SHR	1SDA082820R1	3
E4.2	W	3200	Kit SVR	1SDA082832R1	3
E4.2	W	4000	Kit Adjustable HR/VR	1SDA074025R1	3
E4.2	W	4000	Kit F Upper	1SDA074102R1	3
E4.2	W	4000	Kit F Lower	1SDA074104R1	3
E4.2	W	4000	Kit SHR	1SDA082826R1	3
E4.2	W	4000	Kit SVR	1SDA082838R1	3
E6.2	W	5000	Kit Adjustable HR/VR	1SDA074033R1	6
E6.2	W	6300	Kit Adjustable HR/VR	1SDA074042R1	6
E6.2	W	6300	Kit F Upper	1SDA074112R1	6
E6.2	W	6300	Kit F Lower	1SDA074115R1	6

Accessories

Service



Note:
Warranty periods are measured from the date the circuit breaker leaves the factory.

Extended warranty

Size	Type	Code***
E1.2...E6.2	Warranty 2 years E1.2...E6.2*	1SDA082413R1
E2.2	Warranty 4 years E2.2**	1SDA082415R1
E4.2	Warranty 4 years E4.2**	1SDA082416R1
E6.2	Warranty 4 years E6.2**	1SDA082417R1
E2.2	Warranty 5 years E2.2**	1SDA082419R1
E4.2	Warranty 5 years E4.2**	1SDA082420R1
E6.2	Warranty 5 years E6.2**	1SDA082421R1

The registration in the Extended Warranty online tool is mandatory

* Free-of-charge with site details entered

** Warranty durations:

- 4 years when site details not entered into the Extended Warranty online tool
- 5 years when site details entered into the Extended Warranty online tool

*** Order only with the circuit breaker. Specify Registration code in the order to activate the warranty.

Test certificate

Size	Type	Code
E2.2...E6.2	Test certificate - Italian version	1SDA070197R1
E2.2...E6.2	Test certificate - English version	1SDA070198R1
E2.2...E6.2	Test certificate - German version	1SDA070199R1
E2.2...E6.2	Test certificate - French version	1SDA070200R1
E2.2...E6.2	Test certificate - Spanish version	1SDA070201R1

RINA stamp and RINA certificate

Size	Type	Code
E2.2...E6.2	RINA label E1.2-E6.2/ML EXT	1SDA083599R1

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