TECHNICAL CATALOG

SACE Emax 2

Low voltage power circuit breakers
ANSI C37 / UL 1066 standards

SACE Emax 2 UL
Consultation guide

CHAPTER 1

Main characteristics

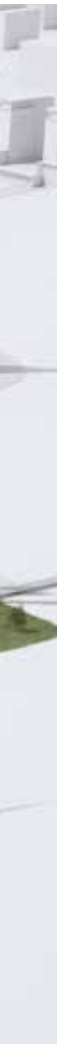
Overview of the SACE Emax 2 family

Emax 2, a further leap forward

The world of electrical power distribution changes fast and major new trends such as renewables, energy storage and microgrids are now crowding onto the stage. These trends lead to new customer and application demands. To meet these demands, ABB has now unveiled the innovative Emax 2 all-in-one , the evolution of the Emax 2 into a multifunctional platform that is able to manage the next generation of electrical plants such as microgrids.
Emax 2 all-in-one is the first circuit breaker that matches new grid requirements. It enables a direct communication to the new energy management cloud-computing platform ABB Ability™ Electrical Distribution Control System.
Smart and plug and play architecture makes Emax 2 all-in-one easy to use. Leveraging also unmatched electrical performances, Emax 2 sets a new circuit breaker benchmark for the needs of today and tomorrow.

Distinctive features

SACE Emax 2 evolution from circuit breaker to Power Manager continues, embedding more and more functionalities to become the all-in-one solution to manage "low-voltage distribution systems".



Efficiency
Achieving maximum efficiency of an electrical installation requires intelligent management of power supplies and energy use. For this reason, the new technologies used in the SACE Emax 2 circuit breakers allow the productivity and reliability of installations to be optimized, and at the same time, power consumption to be reduced while fully respecting the environment.
New advanced functionalities, together with Protection trip units and Communication and system devices contribute to make SACE Emax 2 the circuit breaker that maximizes efficiency in all low-voltage electrical installation.

Control
SACE Emax 2 circuit breaker is the first single device ready to manage all the dynamics of a low-voltage electrical installation.
Managing loads in any condition is now possible thanks to Advanced Functionalities such as:

- Adaptive load shedding: fast load shedding to guarantee continuity for critical loads during black-outs. Typical scenario is when LV distribution is disconnected from the grid (MV).
- Predictive load shedding: slow load shedding to avoid overloads, giving the possibility to modulate loads consumption.
- Power controller: patented algorithm to reduce the peak of power consumed, allowing savings on electricity bills.
  Managing different power sources and connecting them to main grid is also crucial, so that service continuity is maaximized.
- Embedded ATS functions: an automatic transfer switch system used in all application where continuity is essential and where there are multi source supplies.
- Synchro-reclosing: Sinchronization and automatic reconnection of the Microgrid to the main grid when the power is back.
  Emax 2 is able to act as a controller of Main grid condition, disconnecting a plant when necessary and also to adapt protection to on-grid or off-grid conditions.
- Interface protection system and Interface Device: Check of Main grid conditions and plant disconnection whenever grid voltage and frequency are out of the ranges.
- Adaptive protection: Network changes recognition and automatic set of thresholds to guarantee protection and coordination in on-grid and off-grid conditions.

Distinctive features

Connectivity

SACE Emax 2 series circuit breakers can be integrated perfectly into all automation and energy management systems to improve productivity and energy consumption and to carry out remote service.

All circuit breakers can be equipped with communication units for use with Modbus, Profibus, and DeviceNet™ protocols as well as the modern Modbus TCP, Profinet, EtherNet/IP™ and Open ADR. The cartridge-type modules can be easily installed directly on the terminal box, even at a later date.

Furthermore, the integrated IEC61850 communication module enables connection to automation systems widely used in medium voltage power distribution to create intelligent networks (Smart Grids).

All circuit breaker functions are also accessible via the Internet, in complete safety, through the Ekip Link switchgear supervision system and the Ekip Control Panel.

Furthermore with an easy connection thanks to Ekip Com Hub module, SACE Emax 2 can be integrated in an energy management system, ABB Ability™ Electrical Distribution Control System.

The power and auxiliary connections are optimized to simplify connection to the switchgear. The power terminals, which can be oriented horizontally or vertically, have been designed for the most common busbars, while the push-in connections of the auxiliaries ensure immediate and safe wiring.

Performance

The SACE Emax 2 range is made up of 4 sizes: E1.2, E2.2, E4.2 and E6.2 up to 6000A, which enable switchgear of compact dimensions and high ratings to be built with busbars of reduced length and cross-section.

The protection trip units, auxiliary connections and main accessories are the same throughout the range to simplify design and installation.

Furthermore, the sizes from E2.2 to E6.2 have the same height and depth.

The rating levels are updated and standardized throughout the sizes to meet the demands and needs of today's installations, from 42kA to 150kA, and to standardize switchgear projects.

High short-time currents, together with the efficiency of the protection functions, guarantee complete selectivity in all situations.

Accurate design and choice of materials enable optimization of the overall dimensions of the circuit breaker. In this way switchgear of compact dimensions can be built and outstanding savings at the same performance can be obtained.

The SACE Emax 2 range is extended also to the UL market, up to 6000A. Furthermore it can be ordered with a triple marking label, IEC, UL and CCC.


ABB
SACE Emax 2
OPEN
Push OFF
Push ON
SACE E2.2V-A
In 2000 A

Distinctive features

Ease of use
The entire range is available in fixed and withdrawable versions, with double insulation between the front of the switchgear and the live parts to ensure operation in complete safety. The circuit breakers can be powered indifferently from above or below.
All essential information is available in the central area of the 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.
The withdrawable circuit breaker is inserted and removed via dedicated guide rails that simplify movement. The correct movement from racked-in, test isolated, to racked-out position is guaranteed by a lock in each position.

As a further guarantee of safety, the shutters of the fixed part can be locked from the front when the circuit breaker is removed. The shutters of the upper terminals are independent of those of the lower terminals to facilitate checking and maintenance operations.
The Ekip Touch protection trip units are equipped with a large colour touch-screen display which enables safe and intuitive operation. Furthermore the Ekip units can be programmed and consulted from a tablet, smart phone or portable PC via the Ekip Connect application and all the advanced functionalities can be easily programmed thanks to predefined logic templates.
The trip units are easily interchangeable from the front of the circuit breaker, 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.

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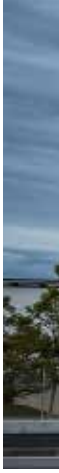
Key

1 Trademark and size of circuit breaker
2 SACE Ekip protection trip unit
3 Pushbutton for manual opening
4 Pushbutton for manual closing
5 Lever to manually charge closing springs
6 Electrical rating plate
8 Signal for springs charged or discharged
9 Mechanical signalling of overcurrent release tripped
10 Size and serial number



Product conformity

The SACE Emax 2 circuit breakers and their accessories conform with ANSI C37.13, C37.16, C37.17 and C37.50 standards and are UL 1066 certified. The UL 1066 certification allows Emax 2 to be used in UL 1558 switchgear, UL 891 switchboards and CSA C22.2 no. 31 switchgear assemblies.

Approvals and certifications
The SACE Emax 2 family also includes a range that conforms to the international IEC 60947, EN 60947 (harmonized in 30 CENELEC countries), CEI EN 60947 and IEC 61000 Standards and complies with the following EC directives:

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

The IEC range is also certified by the Russian certification body GOST (Russia Certificate of Conformity) and has achieved China CCC Certification (China Compulsory Certification).

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 IECEE.

The main versions of the devices are approved by the following shipping registers

Registro Italiano Navale (RINA): Italian

Lloyd's Register of Shipping (LR): English

American Bureau Shipping (ABS): American

Germanischer Lloyd (GL): Deutsch

Bureau Veritas (BV): French

Det Norske Veritas (DNV): Norway

Russian Maritime Regiser of Shipping (RMRS): Russian

Nippon Kaiji Kyokai (NKK): Japan

For the types of certified circuit breakers, certified ratings and corresponding validity, please contact ABB.

Quality and Sustainability: company efficiency and integrated management systems. Quality, Sustainability and Customer Satisfaction have always been ABB SACE's major commitment.

The involvement of all company departments and organization of processes have led ABB 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 the ISO/IEC 17025 Standard, provides both ABB and external customers with a qualified service of 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 Low Voltage Product 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 chose 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 retrofill 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

SACE Emax 2 power circuit breakers UL 1066

Common data		
Rated maximum voltage	[V]	635
Rated voltage	[V]	600
Test voltage (1min. 50/60 Hz)	[kV]	2.2
Frequency	[Hz]	50 - 60
Number of poles		3 - 4
Version		Fixed (F) - Drawout (W)

SACE Emax 2 for UL1066			**E1.2**		
Performance levels			**B-A**	**N-A**	**S-A**
Current		[A]	800	800	250
		[A]	1200	1200	400
		[A]			800
		[A]			1200
		[A]			
		[A]			
Neutral pole current-carrying capacity for 4 pole CBs		[%Iu]	100	100	100
Interrupting rating at rated maximum voltage	254 V	[kA]	42	50	65
	508 V	[kA]	42	50	65
	635 V	[kA]	42	42	42
Rated short time current		[kA]	42	50	50
Trip times	Break time with fault current < rated short time current	[ms]	40	40	40
	Break time with fault current > rated short time current	[ms]	25	25	25
Overall dimensions	H - Fixed	[in/mm]	11.65 / 296		
	D - Fixed	[in/mm]	7.20 / 183		
	W - Fixed 3p	[in/mm]	8.27 / 210		
	W - Fixed 4p/4p full size	[in/mm]	11.02 / 280		
	H - Draw out	[in/mm]	14.33 / 363.5		
	D - Draw out	[in/mm]	11.06 / 281		
	W - Draw out 3p	[in/mm]	10.94 / 278		
	W - Draw out 4p/4p full size	[in/mm]	13.70 / 348		
Weights	Fixed 3p / 4p / 4p full size	[lbs/Kg]	30.9/35.3 lbs - 14/16 kg		
	Draw out 3p / 4p / 4p full size	[lbs/Kg]	90.4/102.5 lbs - 41/46.5 kg		

1) Fixed version only
2) 3 poles and draw out only - Overall dimension as 4 poles full size

SACE Emax 2 for UL1066			**E1.2**		
Mechanical life with regular ordinary maintenance prescribed by the manufacturer		[A]	< 800	800	1200
		[No. cycles x 1000]	20	20	20
	Frequency	[Cycles/Hour]	60	60	60
Electrical life with regular ordinary maintenance prescribed by the manufacturer	508 V	[No. cycles x 1000]	8	8	7
	635 V	[No. cycles x 1000]	8	8	6.5
	Frequency	[Cycles/Hour]	30	30	30

E2.2					E4.2			E6.2	
B-A	**N-A**	**S-A**	**H-A**	**V-A**	**S-A**	**H-A**	**V-A**	**H-A**	**V-A**
1600	1600	800	800	250	2500	2500	800	4000	4000
	2000	1200	1200	400	3200	3200	1600	5000	5000
		1600	1600	800	3600 [1)]	3600 [1)]	2000	6000 [2)]	6000 [2)]
		2000	2000	1200			2500		
				1600			3200		
				2000			3600 [1)]		
100	100	100	100	100	100	100	100	50-100	50-100
42	50	65	85	100	65	85	100	85	100
42	50	65	85	100	65	85	100	85	100
42	50	65	85	85	65	85	100	85	100
42	50	65	85	85	65	85	100	85	100
40	40	40	40	40	40	40	40	40	40
25	25	25	25	25	25	25	25	25	25
14.61/371					14.61/371			14.61/371	
10.63/270					10.63/270			10.63/270	
10.87/276					15.12/384			30.00/762	
14.41/366					20.08/510			34.96/888 - 39.92/1014	
16.73/425					16.73/425			16.73/425	
15.47/393					15.47/393			15.47/393	
12.48/317					16.73/425			31.61/803	
407/16.02					21.69/551			36.57/929 - 42.09/1069	
115/148 lbs - 52/67 Kg					Up to 2500A: 161/203 lbs - 73/92 kg 3200A: 201/256 lbs - 91/116 kg 3600A: 210 lbs - 95 kg			314/360/406 lbs 142/163/184 kg	
up to 1600A: 128/150 lbs - 58/68 Kg 2000A: 135/239lbs - 61/108kg					Up to 2500A: 261/325 lbs - 118/147 kg 3200A: 300/377 lbs - 136/171 kg			Up to 5000A: 486/554/620 lbs - 220/251/281 kg 6000A: 818 lbs - 371 Kg	

E2.2			E4.2				E6.2		
< 1600	1600	2000	< 2500	2500	3200	3600	4000	5000	6000
25	25	25	20	20	20	20	12	12	12
60	60	60	60	60	60	60	60	60	60
15	12	10	10	8	7	7	4	3	2
15	10	8	10	8	7	7	4	2	2
30	30	30	20	20	20	20	10	10	10

SACE Emax 2 switch disconnectors UL 1066

Common data		
Rated maximum voltage	[V]	635
Rated voltage	[V]	600
Test voltage (1min. 50/60 Hz)	[kV]	2.2
Frequency	[Hz]	50 - 60
Number of poles		3 - 4
Version		Fixed (F) - Drawout (W)

SACE Emax 2 for UL1066			**E1.2**	
Performance levels			**B-A**	**N-A**
Current		[A]	800	800
		[A]	1200	1200
		[A]		
		[A]		
		[A]		
		[A]		
Neutral pole current-carrying capacity for 4 pole CBs		[%Iu]	100	100
Rated short time current		[kA]	42	50 [1)]
Overall dimensions	H - Fixed	[in/mm]	11.65 / 296	
	D - Fixed	[in/mm]	7.20 / 183	
	W - Fixed 3p	[in/mm]	8.27 / 210	
	W - Fixed 4p/4p full size	[in/mm]	11.02 / 280	
	H - Draw out	[in/mm]	14.33 / 363.5	
	D - Draw out	[in/mm]	11.06 / 281	
	W - Draw out 3p	[in/mm]	10.94 / 278	
	W - Draw out 4p/4p full size	[in/mm]	13.70 / 348	

1) Rated short-time current is equal to 42kA at 635V.

SACE Emax 2 for UL1066			**E1.2**	
Mechanical life with regular ordinary maintenance prescribed by the manufacturer		[A]	800	1200
		[No. cycles x 1000]	20	20
	Frequency	[Cycles/Hour]	60	60
Electrical life with regular ordinary maintenance prescribed by the manufacturer	508 V	[No. cycles x 1000]	8	7
	635 V	[No. cycles x 1000]	8	6.5
	Frequency	[Cycles/Hour]	30	30

E2.2			E4.2			E6.2
N-A	**S-A**	**V-A**	**S-A**	**H-A**	**V-A**	**L-A**
1600	800	800	1600 V	2500	800	4000
2000	1600	1600	2000 V	3200	1600	5000
	2000	2000	2500	3600	2000	6000
			3200		2500	
			3600		3200	
					3600	
100	100	100	100	100	100	50-100
50	65	85	65	85	100	100
14.61/371			14.61/371			14.61/371
10.63/270			10.63/270			10.63/270
10.87/276			15.12/384			30.00/762
14.41/366			20.08/510			34.96/888 - 39.92/1014
16.73/425			16.73/425			16.73/425
15.47/393			15.47/393			15.47/393
12.48/317			16.73/425			31.61/803
407/16.02			21.69/551			36.57/929 - 42.09/1069

E2.2			E4.2				E6.2		
< 1600	1600	2000	< 2500	2500	3200	3600	4000	5000	6000
25	25	25	20	20	20	20	12	12	12
60	60	60	60	60	60	60	60	60	60
15	12	10	10	8	7	7	4	3	2
15	10	8	10	8	7	7	4	2	2
30	30	30	20	20	20	20	10	10	10

SACE Emax 2 power circuit breakers multi-standard version IEC 60947, UL1066 and CCC

Common data		
Rated service voltage Ue	[V]	690
Rated insulation voltage Ui	[V]	1000
Rated impulse withstand voltage Uimp	[kV]	12
Frequency	[Hz]	50 - 60
Number of poles		3- 4
Version		Fixed (F) - Drawout (W)
Isolation behaviour		IEC 60947-2

Standard			**E2.2**				
Performance levels			**B-A**	**N-A**	**S-A**	**H-A**	**V-A**
Rated uninterrupted current Iu @ 40°C		[A]	1600	1600	800	800	400
		[A]		2000	1200	1200	800
		[A]			1600	1600	1200
		[A]			2000	2000	1600
		[A]					2000
UL1066							
Interrupting rating at rated maximum voltage	254 V	[kA]	42	50	65	85	100
	508 V	[kA]	42	50	65	85	100
	635 V	[kA]	42	50	65	85	85
Rated short time current		[kA]	42	50	65	85	85
IEC 60947							
Rated ultimate short-circuit breaking capacity Icu	400-415 V	[kA]	42	50	66	85	100
	440 V	[kA]	42	50	66	85	100
	500-525 V	[kA]	42	50	66	85	85
	690 V	[kA]	42	50	66	85	85
Rated service short-circuit breaking capacity Ics	400-415 V	[kA]	42	50	66	85	100
	440 V	[kA]	42	50	66	85	100
	500-525 V	[kA]	42	50	66	85	85
	690 V	[kA]	42	50	66	85	85
Overall dimensions	H - Fixed	[in/mm]	14.61/371				
	D - Fixed	[in/mm]	10.63/270				
	W - Fixed 3p	[in/mm]	10.87/276				
	W - Fixed 4p/4p full size	[in/mm]	14.41/366				
	H - Draw out	[in/mm]	16.73/425				
	D - Draw out	[in/mm]	15.47/393				
	W - Draw out 3p	[in/mm]	12.48/317				
	W - Draw out 4p/4p full size	[in/mm]	407/16.02				
Weights	Fixed 3p / 4p / 4p full size	[lbs/Kg]	115/148 lbs - 52/67 Kg				
	Draw out 3p / 4p / 4p full size	[lbs/Kg]	up to 1600A: 128/150 lbs - 58/68 Kg 2000A: 135/239lbs - 61/108kg				

SACE Emax 2 for IEC 60947, UL1066 and CCC			**E2.2**		
Mechanical life with regular ordinary maintenance prescribed by the manufacturer		[Iu]	< 1600	1600	2000
		[No. cycles x 1000]	25	25	25
	Frequency	[Oper./Hour]	60	60	60
Electrical life with regular ordinary maintenance prescribed by the manufacturer	440 V	[No. cycles x 1000]	15	12	10
	690 V	[No. cycles x 1000]	15	10	8
	Frequency	[Oper./Hour]	30	30	30

E4.2			E6.2
S-A	**H-A**	**V-A**	**V-A**
2500	2500	800	4000
3200	3200	1600	5000
		2000	
		2500	
		3200	
65	85	100	100
65	85	100	100
65	85	100	100
65	85	100	100
66	85	100	100
66	85	100	100
66	85	100	100
66	85	100	100
66	85	100	100
66	85	100	100
66	85	100	100
66	85	100	100
14.61/371			14.61/371
10.63/270			10.63/270
15.12/384			30.00/762
20.08/510			34.96/888 - 39.92/1014
16.73/425			16.73/425
15.47/393			15.47/393
16.73/425			31.61/803
21.69/551			36.57/929 - 42.09/1069
Up to 2500A: 161/203 lbs - 73/92 kg - 3200A: 201/256 lbs - 91/116 kg			314/360/406 lbs - 142/163/184 kg
Up to 2500A: 261/325 lbs - 118/147 kg 3200A: 300/377 lbs - 136/171 kg			486/554/620 lbs 220/251/281 kg

E4.2			E6.2	
< 2500	2500	3200	4000	5000
20	20	20	12	12
60	60	60	60	60
10	8	7	4	3
10	8	7	4	2
20	20	20	10	10

CHAPTER 3

Protection trip units

Introduction

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

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Ekip Power Controller function monitors installation loads and generators, permitting the power consumed to be limited and allowing savings on electricity bills.

The result of ABB SACE's experience and research, they embed advanced functionality in the Emax 2 circuit breaker to make it an all-in-one solution for distribution systems and microgrids.
The protection units are divided into two families: Ekip for distribution protection and Ekip G for generator protection.

The range of trip units is available with three levels of performance, Dip, Touch and Hi-Touch, to satisfy simple to advanced applications.
The complete, flexible Ekip protection trip unit offering, which can be adapted to the actual level of protection required, is shown below:

	Fields of applications	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		•	•	•	•

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Ekip G enables the protection of generators without the use of external devices that require dedicated relays and wiring.

The **protection units for power distribution**, available in the LI, LSI and LSIG versions, are suited to all distribution systems.
The Ekip trip units are designed to protect a vast range of applications, such as use with transformers, motors and drives. Depending on the complexity of the system, the need to take voltage or energy measurements or to include control systems in switchgear. Ekip Dip, Ekip Touch or Ekip Hi-Touch can be selected.

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.

Architecture

All SACE Emax 2 circuit breakers are equipped with protection trip units that are interchangeable from the front with just a few, simple operations by the customer.

There is no need to dismantle the circuit breaker or access any internal or sensitive parts.
This enables personalization of the functions available, even during commissioning or when the circuit breaker has already been installed. In particular, SACE Ekip 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, 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.

All protection trip units in the SACE Emax 2 family are self-powered by current that crosses the circuit breaker. They guarantee excellent reliability due to a system of self-control of internal connections.

The setting, testing and downloading of reports can be carried out directly from a Smartphone, Tablet or PC. In addition, the commissioning stage can be further accelerated, minimizing the possibility of errors, by directly configuring the protection trip unit with the DOC design software settings. Cartridge-type modules that are easily installed onboard enable the units to be integrated into the most complex systems.
Additional functions can be created, such as:

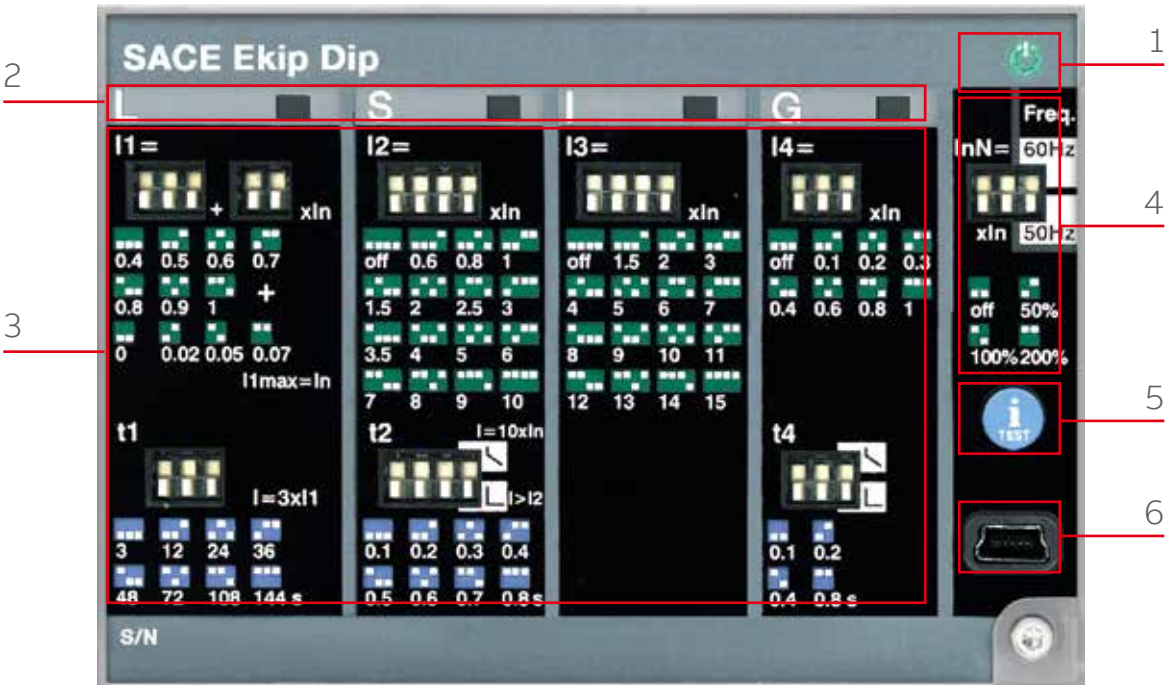
- **Synchrocheck**, to check the synchronization of the two half-busbars before enabling circuit breaker closing;
- Communication with all **supervision systems** available in the Modbus, Profibus and DeviceNet™ protocols as well as the modern Modbus TCP, Profinet, EtherNet/IP™ and open ADR protocols;
- **Integration into Smart Grids** thanks to the possibility of communicating without the assistance of any external converter, according to standards (IEC 61850) already in use in the automation systems of high and medium voltage substations;
- Multi-voltage **supply module**, which enables the protection trip unit and modules present to be supplied with any auxiliary voltage available in direct or alternating current;
- Programmable logic management with **Ekip Signalling** modules that provide a high number of electrical input and output contacts;
- Logical interlocks between circuit breakers, which can be made with the **Ekip Link** proprietary communication protocol, avoiding complex wiring thanks to the transmission of all signals via a bus..

Protection trip units for power distribution
Ekip Dip

Key:
1. Power-on LED for signalling correct operation (watchdog)
2. LEDs for alarm signalling of L, S, I and G protection functions and diagnostics
3. Dip switches for setting the protection functions
4. Dip switches for setting the network frequency and neutral protection device
5. Pushbutton for test and for indicating the cause of tripping
6. Test and programming connector

Ekip Dip is the new protection trip unit for all applications in which high accuracy and reliable protection against overcurrent are required.

Characteristics
Ekip Dip offers a complete set of standard protection functions.
Dedicated LEDs allow the fault that caused tripping to be determined.
The unit is available in the following versions:
- Ekip Dip LI
- Ekip Dip LSI
- Ekip Dip LSIG



Protection functions
Ekip Dip offers overcurrent protection functions and, in the event of tripping, controls the opening of the circuit breaker, preventing it from closing again unless it has been reset by the operator (lock-out device – code ANSI 86).
- Overload (L - ANSI 49)
- Time-delayed overcurrent (S - ANSI 51 & 50TD)
- Thermal memory
- Instantaneous overcurrent (I - ANSI 50)
- Earth Fault (G)
- Neutral protection

Measurements
The Ekip Dip unit measures phase and neutral current with great accuracy: 1% including the current transformers in the 0.2 ... 1.2 In range (class 1 in accordance with IEC 61557-12). Using the current sensors in the circuit breaker and without the need to install an external measuring system, it is possible to view the measurements by the display on the front of the Ekip Multimeter and Ekip Control Panel. Ekip Dip also records the characteristics of the circuit breaker, to enable a rapid analysis in the event of maintenance:
- Maximum and average current values per phase;
- Date, time, fault current per phase and type of protection tripped over the last 30 trips;
- Date, time and type of operation of the last 200 events (for example: opening/closing of circuit breaker, pre-alarms, editing settings);
- Number of mechanical and electric operations of the circuit breaker;
- Total operating time;
- Contact wear;
- Date and time of the last maintenance carried out, in addition to the estimate of the next maintenance required;
- Circuit breaker identifying data: type, serial number, firmware version, name of the device as assigned by the user.

The values can be displayed on the front of the Ekip Multimeter or Ekip Control Panel or by Ekip Connect software on a Smartphone, Tablet or PC by using the communication units Ekip T&P or Ekip Bluetooth.

Watchdog
All the protection trip units of the SACE Emax 2 family ensure high reliability owing to an electronic circuit that periodically checks the continuity of the internal connections, such as trip coil, rating plug and each current sensor (Ansi 74). In the event of a malfunction, the LEDs indicate the corresponding alarm to enable the fault to be identified rapidly. Furthermore, Ekip Dip detects
and indicates that the circuit breaker has been opened because one of the protection functions has been tripped (Ansi BF code).
In order to ensure the correct operation of the unit, Ekip Dip is also provided with self-protection against abnormal temperature (OT) inside the protection trip unit. The user can set it to open the circuit breaker or to merely indicate an alarm.

User interface
Ekip offers a great variety of thresholds and trip times, which can be set by dip-switches. Up to 5 LEDs are also available (depending on the version) to indicate correct operation or alarms. The interface always enables the status of the
installation to be identified clearly and quickly:

- correct operation (green LED)
- overcurrent pre-alarms or alarms
- presence of self-check functions alarms
- maintenance interval expired
- indication of tripped protection after a fault

The protection tripped indication is activated by pressing the iTest key, and operates without the need for an external power supply because a battery is installed inside the unit.

Protection trip units for power distribution
Ekip Dip

Communication
The Ekip Bluetooth wireless communication unit enables the operator to interact with the protection trip unit by computer, Smartphone or Tablet. In fact, the free Ekip Connect software for smartphones, tablets and PC, enables measurements and fault data to be read and alarm status and information on the circuit breaker or maintenance to be displayed. It is also possible to set parameters such as date, time and thermal memory and for the records to be reset.

Test function
The test port on the front of the protection trip unit can be used to run the circuit breaker tests by connecting one of the following devices:

- Ekip TT, which allows trip test, LED test and a check for the absence of alarms detected by the watchdog function;
- Ekip T&P permits not only the trip test and LEDs test but also testing of the individual protection functions and the saving of the relative report;
- iTest key, pressed to run the battery test when the circuit breaker is disconnected.

Supply
The Ekip Dip protection trip unit does not require an external supply for the protection functions or for the alarm indication functions because it is self-supplied by the current sensors installed on the circuit breaker. A three-phase 100A current suffices to activate the LED indications.
The Ekip Supply module enables an auxiliary supply to be easily connected and is able to receive both a direct current supply (24-48V DC or 110-240V DC) and an alternating current (110-240V AC) to activate additional functions such as:

- G protection at values below 100A or below 0.2 In;
- connecting to external devices such as Ekip Multimeter and Ekip Control Panel;
- recording the number of operations.

The Ekip Dip protection trip unit also has a battery that enables the indication of the cause of the fault to be viewed for an unlimited time after tripping. In addition to that, the battery enables date and time to be maintained and updated, thus ensuring the chronology of the events. On the other hand, when the unit is switched off, the battery test can be run by simply pressing the iTest key.

Supply	**Ekip Supply**	
Nominal voltage	24-48V DC	110-240V AC/DC
Voltage range	21.5 - 53V DC	105-265V AC/DC
Rated power (including modules)	10W max.	10W max.
Inrush current	~2 A for 20 ms	~2 A for 20 ms

Whenever cartridge modules are not used in the terminal box area, the trip unit can be supplied by means of a galvanically isolated 24V DC auxiliary voltage.

Protection trip units for power distribution
Ekip Touch

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 Touch provides a complete series of protections and high accuracy measurements of all electrical parameters and can be integrated perfectly with the most common automation and supervision systems.

Characteristics
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 unit is available in the versions:
- Ekip Touch LI
- Ekip Touch LSI
- Ekip Touch LSIG

Protection trip units for power distribution
Ekip Touch

Protection functions
Ekip Touch enables all the protection functions to be set with a few simple steps directly from the wide touchscreen display. If the circuit breaker is tripped it must be reset manually or electrically by the operator (lockout relay – code ANSI 86).

- Overload (L - ANSI 49)
- Time-delayed overcurrent (S - ANSI 51 & 50TD)
- Thermal memory
- Instantaneous overcurrent (I - ANSI 50)
- Earth fault (G - ANSI 51N & 50NTD)
- Instantaneous Earth Fault (G-ANSI 50N)
- Earth fault on toroid (G ext - ANSI 51G & 50GTD)
- Neutral protection
- Start-up function
- Current unbalance (IU – ANSI 46)
- Zone selectivity for S and G protection (ANSI 68)
- Current thresholds
- Power Controller

In addition, the following protection functions are available with Ekip Measuring Pro:
- Undervoltage (UV - ANSI 27)
- Overvoltage (OV - ANSI 59)
- Underfrequency (UF - ANSI 81L)
- Overfrequency (OF - ANSI 81H)
- Voltage unbalance (VU – ANSI 47)
- Residual current (Rc – ANSI 64 & 50NDT)
- Reverse active power (RP - ANSI 32R)
- Synchrocheck (SC - ANSI 25)
- Cyclical direction of the phases (ANSI 47)
- Power factor (ANSI 78).

Measurements and meters
All versions of the Ekip Touch unit measure the RMS value of the currents of the three phases (L1, L2, L3) and of neutral (Ne) with 1% accuracy in the 0.2 to 1.2 In range (class 1 in accordance with IEC 61557-12). The complete range of measurement is from 0.03 to 16x In, where In is the value of the rating plug.
The display shows the current of the most loaded phase both in numeric and analogue format on an ammeter with a 0-125% In scale for rapid identification of the load of the circuit breaker.
Alternatively, bar graphs that show the currents of the three phases and of neutral on a 0-125% In scale in addition to the numeric value of the most loaded phase can be selected as the default page. The bar graphs are yellow in the event of a pre-alarm and red in the event of an overload to enable an irregular condition to be identified immediately.
Where applicable, the measurement of the earth fault current is shown on a dedicated page. The ammeter can operate both in self-supplied mode and with auxiliary voltage. In the latter case, the display always has back lighting and the ammeter is also active at currents below 100A.

Adding the Ekip Measuring or Ekip Measuring Pro module to Ekip Touch enables Ekip Touch to be used as a multimeter to measure the values of:
- Voltage: phase-phase, phase-neutral (accuracy 0.5%);
- Power: active, reactive, apparent (accuracy 2%);
- Energy: active, reactive, apparent (accuracy 2%);
- Frequency (accuracy 0.2%);
- Power factor by phase and total;
- Peak factor.

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Measurements and meters

Maximum values and values register
The Ekip Touch unit is able to supply the measurement trend of certain parameters over a settable period of time such as: average power, maximum power, maximum and minimum current, maximum and minimum voltage. The values of the last 24 time intervals are recorded in the unit with a relative timestamp and can be consulted directly from the display or remotely using one of the available communication protocols. The communication can also be used to synchronize the recording time interval.

Data logger
Ekip Touch is always supplied with the exclusive Data Logger (register) function that stores with high sampling frequency the instantaneous values of all the measurements in two memory buffer registers. The data can be easily downloaded by the Ekip Connect unit and transferred to any personal computer. This enables the current and voltage waveforms to be analyzed for rapid fault analysis. The function continuously stores and stops recording, with a selectable delay, whenever the event set by the user occurs (e.g. trip or alarm). In this manner, it is possible to analyze the complete evolution of the fault: from the start to its complete elimination.

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Maintenance indicators

Information on trip and opening data
If a trip occurs, Ekip Touch stores all the information that is required for rapid identification and elimination of the causes:
- Protection tripped
- Opening data (current, voltage or frequency)
- Time-stamping (data, time and consecutive opening number)

If the iTest key is pressed, the trip unit displays all these data directly on the display. No auxiliary supply is required. The information is also available to the user with the circuit breaker open or without current flow, due to the battery installed inside the unit.

Maintenance indicators
A complete set of information about the circuit-breaker and its operation is available for effective fault analysis and preventive scheduling of maintenance. All the information can be seen from the display or from a PC using a communication unit.
In particular:
- Date, time, fault current by phase and type of protection tripped over the last 30 trips;
- Date, time and type of operation of the last 200 events (example: opening/closing of circuit-breaker, pre-alarms, editing of settings, ect.);
- Number of operations of the circuit breaker: divided into mechanical operations (no current), electrical operations (with current) and protection function (trip);
- Contact wear estimated as a function of the number and type of openings;
- Total operating time of the circuit breaker with circulating current;
- Date and time of the last maintenance session, scheduling of the next maintenance session;
- Circuit breaker identifying data: type, serial number, firmware version, device name assigned by the user.

All the information can be viewed directly from the display and from a Smartphone, Tablet (with Ekip Bluetooth) or PC using the front port of the trip unit or the system communication.

Protection trip units for power distribution
Ekip Touch

Watchdog
All of the trip units in the SACE Emax 2 family ensure high reliability because of an electronic circuit that periodically checks continuity of the internal connections, such as the trip coil, rating plug and each current sensor (Ansi 74). In the event of an alarm, a message is shown on the display, and if it is set during the installation phase, the trip unit can command the opening of the circuit breaker. If a protection function intervenes, Ekip Touch always checks that the circuit breaker has been opened by auxiliary contacts that indicate the position of the main contacts. Otherwise, Ekip Touch indicates an alarm (ANSI BF code - Breaker Failure) to be used to command the opening of the circuit breaker located upstream. Ekip also contains self-protection that ensures the correct operation of the unit under abnormal temperatures (OT) inside the protection trip unit. The user has the following indications or controls:

- "Warning" LED for temperature below -20 °C or above +70 °C, at which the trip unit operates correctly with the display switched off
- "Alarm" LED for temperature outside the operating range, at which the trip unit commands the opening of the circuit breaker (if set during the configuration phase).

User interface
All Ekip Touch operations are simple and intuitive due to the wide graphic colour touchscreen display. For example, all the main information is listed on one page (settable by default), thus enabling the state of the installation to be identified rapidly: maximum current, maximum voltage and active, reactive, apparent power and energy.
In addition, the use of Ekip Touch is further simplified by the possibility of scrolling through the menu and reading the alarms in one of the languages that can be set directly from the display: Italian, English, German, French, Spanish, Portuguese, Chinese, Russian, Turkish and Thai.
The home pushbutton enables the user to return, at any moment, to the main page and the iTest key enables the information to be viewed after a circuit breaker trip and test.

As in the previous generation of trip units, a password system is used to manage "Read" or "Edit" modes. The default password, 00001, can be edited by the user. The protection parameters (curve and trip thresholds) are settable in "Edit" mode whereas it is always possible to consult the information in "Read" mode.
On the front of the trip unit there are also two LEDs: a pre-alarm LED (square yellow LED) and an alarm LED (red triangular LED); a message on the display always accompanies the flashing of the LEDs for clear identification of the type of event.
The list of all the alarms active at that moment can be viewed by simply touching the display on the white strip in the bottom left of the alarms zone.

Ekip Touch is also supplied with a front port that permits a temporary connection to devices for test, supply or communication (for example Ekip T&P).

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User interface

Communication
Communication modules that can be installed inside the circuit breaker enable Ekip Touch to be integrated into the most modern supervision systems with protocols:
- IEC 61850
- Modbus TCP
- Modbus RS-485
- Profibus
- Profinet
- DeviceNet™
- EtherNet/IP™
- Open ADR
- Hub

The integration into communication systems enables measurements, statuses and alarms to be programmed and viewed by remote functions.
If the circuit breaker has to be opened and closed remotely, the Ekip Com Actuator module can be installed in the circuit breaker front, in the right-hand accessories chamber.
For each circuit breaker, several communication modules with different protocols can be used simultaneously; for example, this enables the circuit breaker to be connected to the Ekip link system to obtain local supervision from the front of the switchgear and to simultaneously integrate it into a communication network. In addition, for applications requiring very high reliability, up to two modules using the same protocol can be inserted and two different addresses used to provide a level of redundancy.

Test function
For circuit breaker testing it is possible to use the test port and the iTest key positioned on the front of the protection trip unit.

The available functions are:
- trip test, test of the display and of the LEDs and check of absence of alarms detected by the watchdog function using Ekip TT;
- test of the single protection functions and saving of the report, in addition to the trip test and test of the display, using Ekip T&P;
- test of the battery with the circuit breaker switched off by pressing the iTest key.

Protection trip units for power distribution
Ekip Touch

Supply
The Ekip Touch protection trip unit is self-supplied by the current sensors and does not require an external supply for the basic protection functions or for the alarm indication functions. All protection settings are stored in a non-volatile memory that maintains the information, even without a power supply. To activate the indication functions the ammeter and the display, a 100A three-phase current suffices.
An auxiliary supply can easily be connected. The Ekip Supply module can be connected to supplies of both direct current and alternating current to activate additional functions such as:
- using the unit with circuit breaker open;
- using additional modules such as Ekip Signalling and Ekip Com;
- connection to external devices such as Ekip Multimeter and Ekip Control Panel;
- recording the number of operations;
- G protection with values below 100A or below 0.2 In;
- zone selectivity;
- Gext and MCR protection functions.

Supply	**Ekip Supply**	
Nominal voltage	24-48V DC	110-240V AC/DC
Voltage range	21.5-53V DC	105-265V AC/DC
Rated power (including modules)	10W max.	10W max.
Inrush current	~10 A for 5 ms	~10 A for 5 ms

The Ekip Supply module allows the cartridge modules to be used in the terminal box area.
Otherwise, the trip unit can be supplied by means of a galvanically isolated 24V DC auxiliary voltage.
The Ekip Measuring Pro module can supply the Ekip Touch trip unit with line voltage above 85V. In addition, if the module is installed with voltage pick-ups on the supply side, the trip unit can be used even if the circuit breaker is open.
The Ekip Touch protection trip unit is also supplied with a battery that enables the cause of the fault to be indicated after a trip, without a time limit. In addition, the battery enables date and time to be updated, thus ensuring the chronology of the events.
When Ekip Touch is operating, it uses an internal control circuit to indicate automatically that the battery is flat. On the other hand, when the unit is switched off the battery test can be run by simply pressing the iTest key.

Protection trip units for power distribution
Ekip Hi-Touch

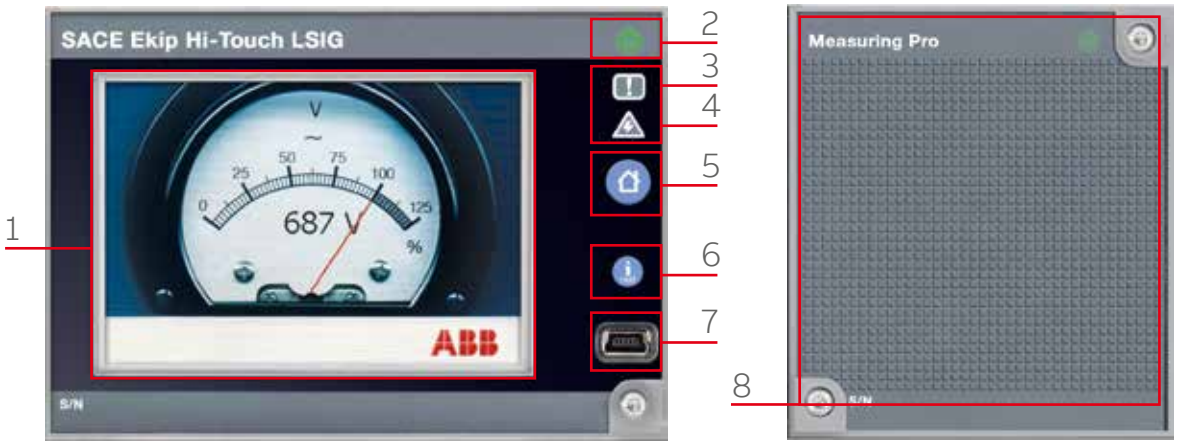
Key:
1. Wide high-resolution colour touch-screen display
2. Power-on LED indicating correct operation
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and for indicating cause of the trip
7. Test and programming connector
8. Ekip Measuring Pro module, with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

The Ekip Hi-Touch is a high-performance multifunction unit that is extraordinarily versatile and can be used in even the most complex installations.

Characteristics

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.
The unit is available in the versions:
- Ekip Hi-Touch LSI
- Ekip Hi-Touch LSIG



Protection trip units for power distribution
Ekip Hi-Touch

Protection functions

The Ekip Hi-Touch trip unit has the following protection functions, which it shares with Ekip Touch:

- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Closing on short-circuit (MCR);
- Earth fault (G – ANSI 51N & 50NTD);
- Instantaneous Earth Fault (G – ANSI 50N);Earth fault on toroid (G ext – ANSI 51G & 50GTD);
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Current unbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Voltage unbalance (VU – ANSI 47);
- Residual current (Rc – ANSI 64 & 50NTD);
- Reverse active power (RP – ANSI 32R);
- Synchrocheck (SC – ANSI 25, optional);
- Cyclical direction of the phases (ANSI 47);
- Power factor (ANSI 78);
- Current thresholds;
- Power Controller function (optional)
- Second time-delayed overcurrent protection (S2 – ANSI 50TD)
- Second protection against earth fault (ANSI 50GTD/51G & 64REF
- Directional overcurrent (D – ANSI 67)
- Zone selectivity for protection D (ANSI 68)
- Start-up function for protection D
- Second protection against undervoltage and overvoltage (UV2 and OV2 – ANSI 27 and 59)
- Second protection against underfrequency and overfrequency (UF2 and OF2 – ANSI 81L and 87H)
- Dual setting of protections.

Measurements

The Ekip Hi-Touch trip unit offers a complete series of measurements, common to Ekip Touch:

- Measurements and counters: currents, voltage, power, energy;
- Maximum values and value log;
- Data logger;
- Information on the trip and opening data;
- Maintenance indicators.

Ekip Hi-Touch integrates the exclusive Network Analyzer function, which analyzes the quality of energy consumed by the installation, in accordance with the provisions of international standards EN50160 and IEC 61000-4-30, in terms of harmonic content, average value and long or short term changes in voltage. Changes in the energy quality can cause malfunctions in the switchgear and a reduction in their lifespan, as well as increased losses and reduced energy efficiency of the installation. It is therefore increasingly important to assess the quality of the energy and the economic impact it has on the productive process, so that the appropriate preventive and corrective actions can be taken. With Ekip Hi-Touch, the causes of an increase in power lost in transformers or motors, or a reduction in the lifespan of cables and capacitors, can be identified without the need to install any external instrumentation.

The Network Analyzer function performs continuous monitoring of the energy quality, and shows all results via a display or communication module. In particular:

- **Hourly average voltage value**: in accordance with international standards, this must remain within 10% of the rated value, but different limits can be defined according to the needs of the installation. The positive sequence voltage is obtained from the three line voltages and compared with the limits. If the limits are exceeded, Ekip Hi-Touch generates a signalling event. The quantity of these events is stored in a suitable counter. The counter values are available for each of the last 7 days, as is the total. The measurements available are the positive and negative sequence voltages and positive and negative sequence currents of the last interval monitored. The time of the calculation of the average values can be set between 5 minutes and 2 hours.
- **Interruptions / short dips in voltage** (voltage interruptions / voltage dip): if the voltage remains below the threshold for more than 40ms, Ekip Hi-Touch generates an event that is counted in a dedicated log. The voltage is monitored on all lines.
- **Short voltage spikes** (voltage transients, spikes): if the voltage exceeds the threshold for 40ms, for a pre-determined time, Ekip Hi-Touch generates an event that is counted.
- **Slow-voltage sags and swells** (voltage sag / voltage swell): when the voltage goes outside the range of acceptable limit values for a time greater than the one set, Ekip Hi-Touch generates an event that is counted. Three values can be configured for voltage sags and two for voltage swells, each of which associated with a time limit: this enables us to verify whether the voltage remains within a curve of values that are acceptable by equipment such as computers. The voltage is monitored on all lines.
- **Voltage unbalances**: if the voltages are not equal or the phase displacements between them are not exactly 120°, an unbalance occurs, which is manifested by a negative sequence voltage value. If this limit exceeds the threshold value set, an event is stored which is counted.
- **Harmonic analysis**: the harmonic content of voltages and currents, measured to the 50th harmonic, as well as the value of total harmonic distortion (THD), is available in real time on the display or through the communication modules. Ekip Hi-Touch also generates an alarm if the THD value or the magnitude of at least one of the harmonics exceeds the values set. The voltage is monitored on all lines and currents on all phases.

All information can be displayed directly on the screen or on a smartphone, tablet or PC using the front port of the trip unit (with Ekip Bluetooth) or installation communication.

Other functions

Ekip Hi-Touch integrates all the features in terms of user interface, communication, test and supply described for Ekip Touch equipped with Ekip Measuring Pro.

Protection trip units for generators
Ekip G Touch

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 poweron LED

Ekip G Touch is designed for use in applications with generators, such as Genset, cogeneration and marine applications, in conformity with international standards IEC 60034-1 and IEEE C37.102.

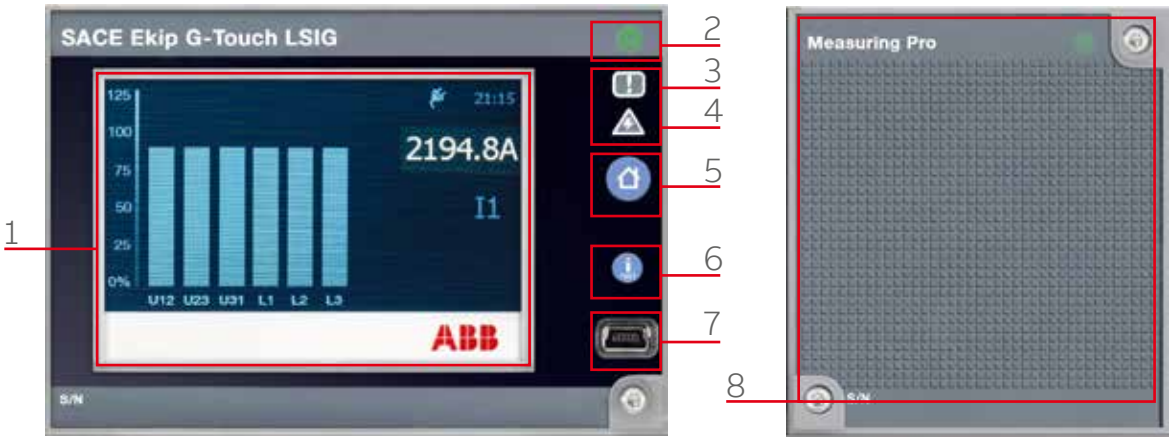
Characteristics

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 characterized by a wide, high resolution touchscreen display that is simple to use and displays measurements and alarms clearly and accurately.



Protection functions
The Ekip G Touch trip unit provides all the protection functions of Ekip Touch and, in addition, provides a series of dedicated generator protections.
If Ekip is tripped, it opens the circuit breaker and prevents it from closing again until it has been reset manually or electrically by the operator (lockout relay – code ANSI 86).
The trip unit is provided with the following protection functions:
- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Closing on short circuit (MCR);
- Earth fault (G – ANSI 51N & 50NTD);
- Instantaneous Earth Fault (G – ANSI 50N);
- Earth fault on toroid (G ext – ANSI 51G & 50GTD)
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Current unbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Voltage unbalance (VU – ANSI 47);
- Differential ground fault (Rc – ANSI 87N);
- Reverse active power (RP – ANSI 32R);
- Synchrocheck (SC – ANSI 25, optional);
- Cyclical direction of phases (ANSI 47);
- Power factor (ANSI 78);
- Current thresholds;
- Power Controller function (optional)
- Differential ground fault (Rc - ANSI 87N)
- Voltage controlled overcurrent protection (S(V) - ANSI 51V)
- Residual overvoltage (RV – ANSI 59N)
- Loss of field or reverse reactive power (RQ – ANSI 40 or 32RQ)
- Loss of field or reverse reactive power (RQ – ANSI 40 or 32RQ)
- Reactive overpower (OQ – ANSI 32OF)
- Active overpower (OP – ANSI 32OF)
- Active underpower (UP – ANSI 32LF).

Measurements
The Ekip G Touch trip unit provides a complete series of measurements, which are common to Ekip Touch:
- Measurements and meters: currents, voltage, power, energy, frequency;
- Maximum values and values register;
- Data logger;
- Information on trip and opening data;
- Maintenance indicators.

All the information can be viewed directly on the display of the trip-unit, by means of the external Ekip Multimeter display or by Smartphone, Tablet or PC using the front port of the trip unit (with Ekip Bluetooth) or the system communications.

Other functions
Ekip G Touch provides the same characteristics in terms of user interface, communication, test and power supply described for Ekip Touch equipped with Ekip Measuring Pro.

Protection trip units for generators
Ekip G Hi-Touch

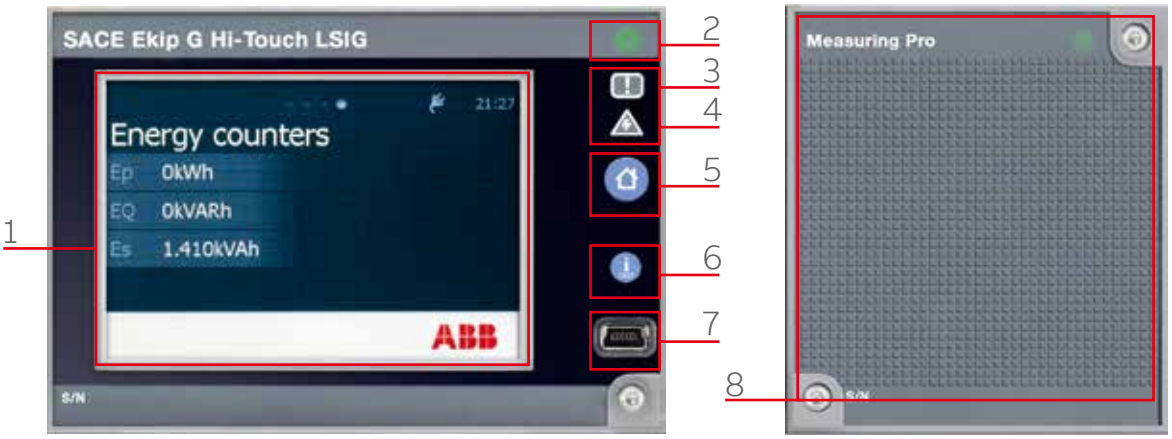
Key:
1. Wide, high resolution touchscreen display
2. Power-on LED indicating correct operation
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and for indicating cause of the trip
7. Test and programming connector
8. Ekip Measuring Pro module with relative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

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.

Characteristics

Ekip G Hi-Touch, like all Hi-Touch trip units, is supplied as standard with the Ekip Measuring Pro measurement 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 and control functions of Ekip Hi- Touch and the specific protections for for generators protected by Ekip G Touch. The user interface and the accessories are common to the rest of the family.



Protection functions
The Ekip G Hi-Touch trip unit is provided with the following protection functions, common to Ekip Hi-Touch:
- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Time-delayed overcurrent, second threshold (S2 – ANSI 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Directional overcurrent (D – ANSI 67);
- Voltage controlled overcurrent protection (S(V) – ANSI 51V);
- Closing on short circuit (MCR);
- Earth fault (G – ANSI 51N & 50NTD);
- Second protection against earth fault (ANSI 50GTD/51G & 64REF);
- Earth fault on toroid (Gext – ANSI 51G & 50GTD);
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Zone selectivity for directional protection D (ANSI 68)
- Start-up function for protection D;
- Current unbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Undervoltage, second threshold (UV2 – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Overvoltage, second threshold (OV2 – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Underfrequency, second threshold (UF2 – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Overfrequency, second threshold (OF2 – ANSI 81H);
- Voltage unbalance (VU – ANSI 47);
- Residual overvoltage (RV – ANSI 59N);
- Differential ground fault (Rc – ANSI 87N);
- Loss of field or reverse reactive power (RQ – ANSI 40 or 32R);
- Reverse active power (RP – ANSI 32R);
- Reactive overpower (OQ – ANSI 32OF);
- Active overpower (OP – ANSI 32OF);
- Active underpower (UP - ANSI 32LF);
- Synchrocheck (SC – ANSI 25, optional);
- Cyclical direction of phases (ANSI 47);
- Power factor (ANSI 78);
- Current thresholds;
- Dual setting of protections;
- Power Controller function (optional)
- Rate of change of frequency (ROCOF – ANSI 81R)
- Second protection against voltage controlled overcurrent protection (S2(V) - ANSI 51V)
- Second protection against loss of field or reverse reactive power (RQ – ANSI 40 or 32R).

Measurements
The Ekip G Hi-Touch trip unit provides all the measurements available with Ekip Hi-Touch:
- Network Analyzer, in conformity with EN50160 and IEC 61000-4-30;
- Measurements and meters: currents, voltage, power, energy, frequency;
- Maximum values and values register;
- Data logger;
- Information on trip and opening data;
- Maintenance indicators.

Other functions
Ekip G Hi-Touch has all the features of Ekip Touch equipped with Ekip Measuring Pro in terms of user interface, communication, test and power supply.

Technical characteristics for protection trip units

Protection functions

ABB Code	ANSI/IEEE C37.2 Code	Function	Threshold
L	49	Overload protection	I1 = 0.4 - 0.42 - 0.45 - 0.47 - 0.5 - 0.52 - 0.55 - 0.57 - 0.6 - 0.62 - 0.65 - 0.67 - 0.7 - 0.72 - 0.75 - 0.77 - 0.8 - 0.82 - 0.85 - 0.87 - 0.9 - 0.92 - 0.95 - 0.97 - 1 x In
		Thermal memory	
		Tolerance	tripping between 1.05 and 1.2 x I1
S	50TD	Time-delayed overcurrent protection	I2 = 0.6 - 0.8 - 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4 - 5 - 6 - 7 - 8 - 9 - 10 x In
		Tolerance	± 7% If ≤ 6 x In ± 10% If > 6 x In
	51	Time-delayed overcurrent protection	I2 = 0.6 - 0.8 - 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4 - 5 - 6 - 7 - 8 - 9 - 10 x In
		Thermal memory	
		Tolerance	± 7% If ≤ 6 x In ± 10% If > 6 x In
I	50	Istantaneous overcurrent protection	I3= 1.5 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 -11 - 12 - 13 - 14 - 15 x In
		Tolerance	± 10%
G	50N TD	Earth fault protection	I4 (1)(2) = 0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1 x In
		Tolerance	± 7%
	51N	Earth fault protection	I4 (1)(2) = 0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1 x In
		Tolerance	± 7%

(1) With Vaux all thresholds are available. Without Vaux minimum threshold is limitated to: 0.3 In (with In = 100 A), 0.25 In (with In = 400 A) or 0.2 In (for all others ratings).
(2) Maximum acceptable setting = 1200A; if user sets higher values, Ekip Dip limits the active threshold at 0.4s and shows the incongruency by led flashing.
(3) Maximum acceptable setting = 0.4s; if user sets higher values, Ekip Dip limits the active tripping time time at 0.4s and shows the incongruency by led flashing.

The tollerances 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 tollerance values apply

ABB Code	Trip threshold	Trip time
L	Trip between 1.05 and 1.2 x I1	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60ms
G	± 15%	± 20%

Trip time	Excludibility	Pre Alarm	Trip curve	Ekip Dip
with If = 3 I1 t1 = 3 - 12 - 24 - 36 - 48 - 72 - 108 - 144 s	Not allowed for UL	50 ... 90 I1 Step 1%	t = k / I^2	●
	Yes			●
± 10% If ≤ 6 x In ± 20% If > 6 x In				
with If > I2 t2 = 0,1 - 0,2 - 0,3 - 0,4s (3)	Yes		t = k	●
The better of the two data: ± 10% o ± 40 ms"				
with If = 10 In t2 = 0,1 - 0,2 - 0,3 - 0,4s (3)	Yes		t = k / I^2	●
	Yes			
± 15% If ≤ 6 x In ± 20% If > 6 x In				
Instantaneous	Yes		t = k	●
≤ 30 ms				
with If > I4 t4 = 0,1 - 0,2 - 0,4s (3)	Yes	50.....90% I4 step 1%	t = k	●
The better of the two data: ± 10% o ± 40 ms				
with If = 3 In t4 = 0,1 - 0,2 - 0,4s (3)	Yes	50.....90% I4 step 1%	t = k / I^2	●
± 15%				

Technical characteristics for protection trip units

Protection functions

ABB Code	ANSI Code	Function	Thereshold	Threshold step	Tripping time	Time Step
L	49	Overload Protection	I1 = 0,4…1 x In	0,001 x In	with I = 3 I1 t1 = 3…144 s	1s
		Thermal Memory				
		Tolerance	Sgancio tra 1,05 e 1,2 x I1		± 10% I ≤ 6 x In ± 20% I > 6 x In	
S	50TD	Time-delayed overcurrent protection	I2 = 0,6…10 x In	0,1 x In	with I > I2 t2 = 0,05…0,4s	0,01s
	68	Zone selectivity			t2sel = 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% o ± 40 ms	
	51	Time-delayed overcurrent protection	I2 = 0,6…10 x In	0,1 x In	with I = 10 In t2 = 0,05…0,4s	0,01s
		Thermal Memory				
		Tolerance	± 7% I ≤ 6 x In ± 10% I > 6 x In		± 15% I ≤ 6 x In ± 20% I > 6 x In	
I	50	Istantaneous overcurrent protection	I3= 1,5…15 x In	0,1 x In	with I> I3 Instantaneous	
		Start up	Activation: 1,5…15 x In	0,1 x In	Range: 0,1…30s	0,01s
		Tolerance	± 10%		≤ 30 ms	
G	50N TD	Earth fault protection	I4[(1)(2)] = 0,1…1 x In	0,001 x In	with I > I4 t4 = Istantaneous (with vaux) + 0,1…0,4s	0,05s
	68	Zone selectivity			t4sel = 0,04…0,2s	0,01s
		Start up	Activation: 0,2…1 x In	0,02 x In	Range: 0,1…30s	0,01s
		Tolerance	± 7%		The better of the two data: ± 10% o ± 40 ms or 50 ms with t4=Istantaneous	
	51N	Earth fault protection	I4[(1)(2)] = 0,1…1 x In	0,001 x In	with I = 4 In t4 = 0,1…0,4s	0,05s
		Tolerance	± 7%		± 15%	
IU	46	Current unbalance protection	I6= 2…90% In unbalance	1%In	with unbalance > I6 t6 = 0,5…60s	0,5s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
2I	50	Programmable istantaneous overcurrent protection	I31= 1,5…….15 xIn	0,1 x In	with I> I31 Instantaneous	
		Tolerance	± 10%		≤ 30 ms	
MRC		Closing on short-circuit protection	I3= 1,5…15 x In	0,1 x In	with I> I3 Instantaneous Monitor time Range: 40…500ms	0,01s
		Tolerance	± 10%		≤ 30 ms	




Excludibility	Excludibility trip	Block	Pre-allarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
Not allowed for UL	no	no	50...90% I1 step 1%	t = k / I²	●	●	●	●
Not allowed for UL					●	●	●	●
yes	yes	yes	no	t = k	●	●	●	●
yes					●	●	●	●
yes					●	●	●	●
yes	yes	yes	no	t = k / I²	●	●	●	●
yes					●	●	●	●
yes	no	yes	no	t = k	●	●	●	●
yes					●	●	●	●
yes	yes	yes	50.....90% I4 step 1%"	t = k	●	●	●	●
yes					●	●	●	●
yes					●	●	●	●
yes	yes		50.....90% I4 step 1%	t = k / I²	●	●	●	●
yes	yes	no	no	t = k	●	●	●	●
yes	no	no		t = k	●	●	●	●
yes	no	yes	no	t = k	●	●	●	●

Table continued on next page

Technical characteristics for protection trip units

Protection functions

ABB Code	ANSI Code	Function	Thereshold	Threshold step	Tripping time	Time Step
Gext	50G TD	Earth fault protection	I41[(1)(2)] = 0,1...1 x In Toroid	0,001 x In Toroid	with I > I41 t41 = 0,1…0,4s	0,05s
	68	Zone selectivity			t41sel = 0,04…0,2s	0,01s
		Start up	Activation: 0,1…1 x In	0,02 x In	Range: 0,1…30s	0,01s
		Tolerance	± 7%		The better of the two data: ± 10% o ± 40 ms	
	51G	Earth fault protection	I41[(1)(2)] = 0,1...1 x In	0,001 x In	with I = 4 In t41 = 0,1…0,4s	0,05s
		Tolerance	± 7%		± 15%	
Rc	64 50N TD 87N	Residual current protection Differential ground fault protection	IΔn= 3 - 5 - 7 - 10 - 20 - 30A		with I > IΔn tΔn = 0,06 - 0,1 - 0,2 - 0,3 - 0,4 - 0,5 - 0,8s	
		Tolerance	- 20% ÷ 0%		140ms@0.06s (maximum trip time) 950ms@0.80s (maximum trip time)	
LC1/2 **Iw1/2**		Current threshold LC	LC1=50%...100% I1 LC2=50%...100% I1	1% 1%		
		Current threshold Iw	Iw1= 0,1…10 In Activation Iw1: Up/Down Iw2= 0,1…10 In Activation Iw2: Up/Down	0,01 x In 0,01 x In		
		Tolerance	± 10%			
UV	27	Undervoltage Protection	U8= 0,5….0,98 x Un	0,001 x Un	with U < U8 t8 = 0,05…120s	0,01s
		Tolerance	± 2%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
OV	59	Overvoltage protection	U9= 1,02….1,5 x Un	0,001 x Un	with U > U9 t9 = 0,05…120s	0,01s
		Tolerance	± 2%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
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 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
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 % (min=30ms) o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
OF	81H	Overfrequency protection	f13= 1,001….1,1 x fn	0,001 x fn	with f > f13 t18 = 0.15…300s	0,01s
		Tolerance	± 1% (with fn ± 2%)		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	




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

Table continued on next page

Technical characteristics for protection trip units

Protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	Time Step
RP	32R	Reverse active power protection	P11= -1…-0,05 Sn	0,001 Sn	P > P11 t11 = 0,5…100s	0,1s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
Cyclical direction	47	Cyclical direction of the phases	1-2-3 or 3-2-1			
Power factor	78	3phase Power factor	PF3 = 0,5…0,95	0,01		
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% o ± 40 ms	
D	67	Directional overcurrent protection (forward & 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 & backward)	Activation: 0,6…10 x In	0,1 x In	Range: 0,1…30s	0,01s
		Trip direction	Forward & backward			
		Minimun 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% o ± 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 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
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 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
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 % (min=30ms) o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
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 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	




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

Table continued on next page

Technical characteristics for protection trip units

Protection functions

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	Time Step
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	Ul= 0,2...1 x Un	0,01 x Un		
			Ks= 0,1...1	0,01		
		Linear Mode	Ul= 0,2...1 x Un	0,01 x Un		
			Uh= 0,2...1 x Un	0,01 x Un		
			Ks= 0,1...1	0,01		
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
RV	59N	Residual overvoltage protection	U22= 0,05....0,5 x Un	0,001 x Un	with U > U22 t22 = 0,05...120s	0,01s
		Tolerance	± 5%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
OP	32OF	Active overpower protection	P26= 0,4...2 Sn	0,001 Sn	P > P26 t26 = 0,5...100s	0,5s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
OQ	32OF	Reactive overpower protection	Q27= 0,4...2 Sn	0,001 Sn	Q > Q27 t27 = 0,5...100s	0,5s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
UP	32LF	Active underpower protection	P23 = 0,1...1 x Sn	0,001 x Sn	with P < P23 t23 = 0,5...100s	0,5s
		Start up			Range: 0,1...30s	0,01s
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	

1) With Vaux all thresholds are available. Without Vaux minimum threshold is limitated to: 0.3 In (with In = 100 A), 0.25 In (with In = 400 A) or 0.2 In (for all others ratings).
2) The maximum value for G protection is 1200A.

The tollerances 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 tollerance values apply:

ABB Code	Trip threshold	Trip time
L	Trip between 1.05 and 1.2 x I1	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60ms
G	± 15%	± 20%
Other protection	± 15%	± 20%




	Excludibility	Excludibility trip	Block	Pre-allarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
	yes	yes	yes	no	t = k			●	●
								●	●
								●	●
	yes	yes	yes	no	t = k			●	●
	yes	yes	yes	no	t = k			●	●
	yes	yes	yes	no	t = k			●	●
	yes	yes		no	t = k			●	●
	yes								

Key:
- \- not available
- ● available
- ○ available with Ekip Measuring and Ekip Measuring Pro.
- ○○ available with Ekip Synchrocheck

Technical characteristics for protection trip units

Measurement functions

Instantaneous measurements		Displayed with Ekip Multimeter	Parameters
Currents (RMS)	[A]	●	L1, L2, L3, Ne
Ground fault current (RMS)	[A]	●	Ig
Record of values: of the parameter for each interval with time-stamping			**Parameters**
Current: minimum and maximum	[A]	●	I Min, I Max
Information on trip and opening data: after a fault with or without auxiliary supply			**Parameters**
Type of protection tripped		●	eg. L, S, I, G
Fault values per phase	[A]	●	eg. I1, I2, I3, neutral for S 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 connnections		●	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 (T)		●	Pre-alarm and alarm for abnormal temperature

(1) with auxiliary supply present

	Precision	Standard di riferimento	Ekip Dip
	1%	Class 1 IEC 61557-12	●
	2%		●
	Window	**Intervals**	
	Fixed, synchronizable by remote	Duration: 5...120min Number of intervals: 24	●
			●
			●
			●
			●
			●
			●
			●
			●
			●
			●
			●
	Note: Opening of the circuit breaker can be set in the event of alarm		●
			●
			●

Technical characteristics for protection trip units

Measurement functions

Instantaneous measurements		**Parameters**
Currents (RMS)	[A]	L1, L2, L3, Ne
Ground 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		PF1, PF2, PF3, PF total
Peak factor		total
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] [no]	- Umin= 0.75…0.95 x Un - 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 imbalance	[V] [no]	- U neg. seq.= 0.02…0.10 x Un - 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	-	●	-	●
		-	●	-	●

Technical characteristics for protection trip units

Measurement functions

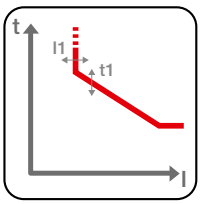
Record of values: of the parameter for each interval with time-stamping		**Parameters**
Current: minimum and maximum	[A]	I Min, I Max
Phase-phase voltage: minimum and maximum	[V]	U Min, U max
Active power: average and maximum	[kW]	P Mean, P Max
Reactive power: average and maximum	[kVAR]	Q Mean, Q Max
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]	1200-9600
Maximum recording duration	[s]	18
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 connnections		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



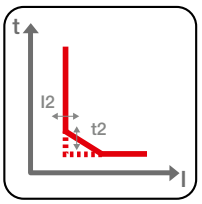

	Window	Intervals	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
	Fixed synchronizable by remote	Duration: 5...120min Number of intervals: 24	●	●	●	●
			●	●	●	●
			○	●	●	●
			○	●	●	●
			○	●	●	●
			●	●	●	●
			○	●	●	●
			●	●	●	●
			●	●	●	●
			●	●	●	●
			●	●	●	●
			●	●	●	●
			●	●	●	●
			●	●	●	●
	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

Description of protection functions

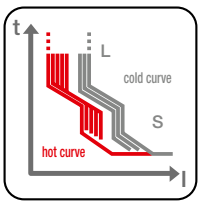


Overload (L - ANSI 49): available with three different types of trip curve:
1. $t = k/I^2$ with inverse long time;
2. with $t = k/I^4$ curve for better coordination with upstream circuit breakers or with fuses.

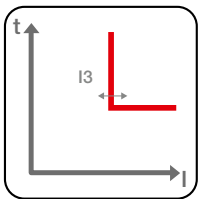
The thresholds can be fine tuned (for example 1A for circuit breaker E1.2 1000A) and the timings to the second can be set directly from the display. The settable pre-alarm indicates the set threshold is reached before the protection is tripped. Available for Ekip touch and Hi-Touch.



Time-delayed overcurrent (S - ANSI 51 & 50TD): with constant tripping time (t = k), or with constant specific let-through energy ($t = k/I^2$), this provides 15 current thresholds and 8 curves, for fine adjustment. The function can be excluded by setting the dip switch combination to “OFF”.

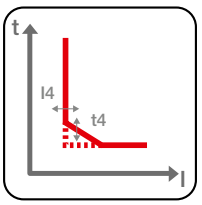


Thermal memory: for L and S protection functions, this is used to protect components, such as transformers, from overheating following an overload. The function, which can be enabled by the Ekip Connect software, adjusts the protection tripping time according to the length of time that has elapsed since the first overload, taking into account the amount of heat generated.

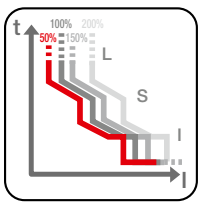


Instantaneous overcurrent (I - ANSI 50): with tripping curve without intentional delay, it offers 15 tripping thresholds and can be excluded by setting the dip switch combination to “OFF”.

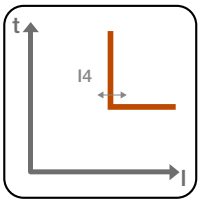
Closing on short-circuit (MCR): the protection uses the same algorithm of the protection I, limiting operation to a settable time window from the closing of the circuit breaker. The protection can be disabled, also alternatively to protection I. The function is active with an auxiliary supply.



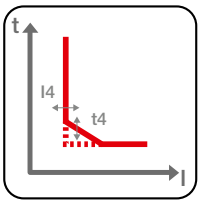
Earth fault (G - ANSI 51N & 50NTD): with tripping time independent of current (t = k) or constant specific let-through energy ($t = k/I^2$). The function can be excluded by setting the dip switch combination to “OFF”.



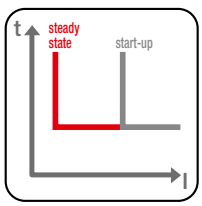
Neutral protection: available at 50%, 100% or 200% of the phase currents, or disabled, it is applied to the overcurrent protections L, S and I.



Instantaneous Earth Fault (G-ANSI 50N): with trip curve without instantaneous delay.

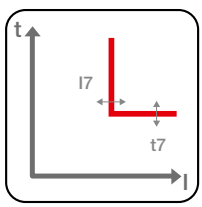


Earth fault on toroid (G ext - ANSI 51G & 50GTD): with trip time independent of the current (t = k) or with constant specific let-through energy ($t = k/I^2$). Pre-alarm that 90% threshold has been reached permits the fault to be reported to supervision systems without interruption of continuity. The protection uses the external toroid installed, for example, on the star centre of the transformer, and is an alternative to the G and Rc functions. The function is active with an auxiliary supply.

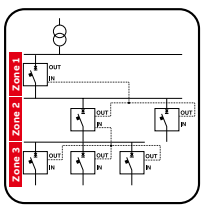


Start-up function: enables protections S, I and G to operate with higher trip thresholds during the starting phase, avoiding untimely trips due to high inrush currents of certain loads (motors, transformers, lamps). The starting phase lasts 100 ms to 30 s and is recognized automatically by the trip unit:

- at the closing of the circuit breaker with a self-supplied trip unit;
- when the peak value of the maximum current exceeds the set threshold (0.1…10 x In) with an externally supplied trip unit; a new start-up is possible after the current falls below the threshold.



Current unbalance (IU – ANSI 46): with constant trip time (t = k), protects from an unbalance between the currents of the single phases protected by the circuit breaker.



Zone selectivity for S and G protection (ANSI 68): can be used to minimize circuit- breaker trip times closer to the fault. The protection is provided by connecting all the zone selectivity outputs of the trip units belonging to the same zone and taking this signal to the trip unit input that is immediately upstream. Each circuit breaker that detects a fault reports it to the circuit breaker upstream; the circuit- breaker thus detects the fault but does not receive any communication from those downstream and opens without waiting for the set delay to elapse. It is possible to enable zone selectivity if the fixed-time curve has been selected and the auxiliary supply is present.

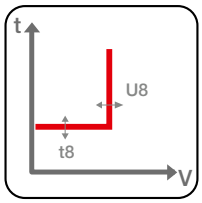
Description of protection functions

Current thresholds: this function enables four independent thresholds to be indicated in order to enable corrective action implementation before the overload L protection trips the circuit breaker. For example, by disconnecting loads located downstream of the circuit breaker that are controlled by Ekip Signalling.

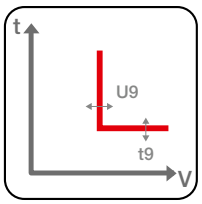
Power Controller: Power controller function (optional) with Ekip Measuring module.

Protection functions with Ekip Measuring Pro
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.
A different operating mode can be chosen for each protection function:
1. Active: protection enabled by opening of the circuit- breaker when the threshold is reached;
2. Only alarm: protection active, with only alarm indication when the threshold is reached;
3. Deactivated: protection disabled.

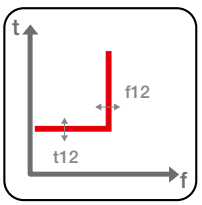
Furthermore, when the voltage and frequency protections are activated, they indicate an alarm status even when the circuit breaker is open so that a fault can be identified before the circuit breaker closes.



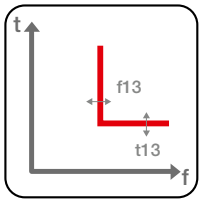
Undervoltage (UV - ANSI 27): with constant trip time (t = k), function is tripped when phase voltage falls below set threshold.



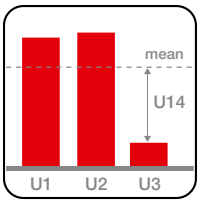
Overvoltage (OV - ANSI 59): with constant trip time (t = k), function is tripped when phase voltage exceeds the set threshold.



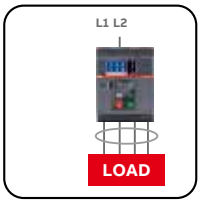
Underfrequency (UF - ANSI 81L): with constant trip time (t = k), function is tripped when network frequency falls below set threshold.



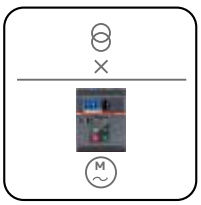
Overfrequency (OF - ANSI 81H): with constant trip time (t = k), function is tripped when network frequency exceeds the set threshold.



Voltage unbalance (VU – ANSI 47): with constant trip time (t = k), protects against an unbalance between the voltages of the individual phases that are protected by the circuit- breaker.



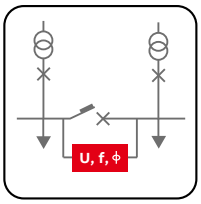
Residual current (Rc – ANSI 64 & 50NDT): with constant temperature (t=k) protects against indirect contacts and is integrated into Ekip Touch LSIG with Ekip Measuring Pro by a dedicated residual current rating plug and external toroid. The protection is an alternative to the functions G and Gext.



Reverse active power (RP - ANSI 32R): with constant trip time (t = k), function is tripped when total active power – in the opposite direction of the current - exceeds the set threshold.

Description of protection functions

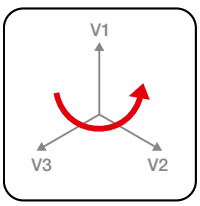
In addition to the protection functions, the following indication and control functions are available to warn the user that a given condition has been reached. The active indications are always shown on the display and are also available by communication on the system bus (with Ekip Com modules) or electrical indication (with Ekip Signalling modules).



Synchrocheck (SC - ANSI 25): the synchronism control function compares the voltages in the modules as well as the frequencies and phases of two circuit breakers to which the circuit breaker is connected. Ekip Touch indicates that conditions have been reached that enable the two lines to be made parallel.
The function is available with two work modes:

- In systems with both busbars supplied, where synchronism is determined by:
  1. voltage of the two half-busbars above the Ulive threshold for the set time
  2. difference of the module of the two voltages below the threshold ΔU
  3. difference in the frequency of the two voltages below the threshold Δf
  4. difference in the phase of the two voltages below the threshold Δ
  5. desirable time for synchronism condition tsyn
  6. circuit breaker open
- In systems with an out-of-service line (dead busbar), where the synchronism condition is determined by the concurrence of the following conditions for the tref set time:
  1. voltage of the active half-busbar above threshold Ulive
  2. voltage of the dead half-busbar below threshold Udead
  3. circuit breaker open

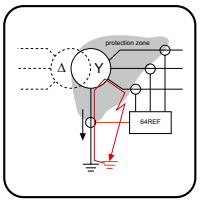
In both cases, synchronism consent is withdrawn when one of the above conditions is missing and it has not been less than 200ms from the change of the circuit- breaker condition (when the relationship has been set).
The indication of reached synchronism is available directly as an electrical indication via a contact that is always supplied with the module. The function can be activated simply by connecting the Ekip Synchro-check module to any Ekip Touch provided with an Ekip Measuring Pro module.



Cyclical direction of the phases (ANSI 47): indicates an alarm through inversion of the phases sequence.

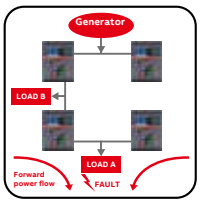
Power factor (ANSI 78): available with a three-phase threshold, warns when the system operates with a power factor that is less than the set power factor.

The following protections are also available:
Second time-delayed overcurrent protection (S2 – ANSI 50TD): in addition to the standard protection S, a second (excludable) time-constant protection is available that enables two independent thresholds to be set in order to ensure precise selectivity, especially in highly critical conditions.



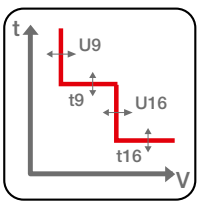
Second protection against earth fault (ANSI 50GTD/51G & 64REF): whereas with Ekip Touch the user has to choose between implementation of the protection G by internal current sensors (calculating the vector sum of the currents) or G ext external toroids (direct measurement of the earth fault current), Ekip Hi-Touch offers the exclusive feature of simultaneous management of both configurations by two independent earth fault protection curves. Owing to this characteristic, the trip unit is able to distinguish a non-restricted earth fault and then activate the opening of Emax 2, from a restricted earth fault, and to thus command the opening of the medium voltage circuit breaker.
Another possible configuration is with the residual current protection replacing the Gext protection, whilst the G protection remains active. The residual current protection is activated in the presence of the residual current rating-plug and of the toroid.

Directional overcurrent (D – ANSI 67): the protection is able to recognize the direction of the current during the fault period and thus detect if the fault is upstream or downstream of the circuit-breaker. The protection, with fixed time trip curve (t=k), intervenes with two different time delays (t7bw and t7fw), according to the current direction. In ring distribution systems, this enables the distribution portion to be identified in which the fault occurred and to disconnect it while maintaining the operation of the rest of the installation.

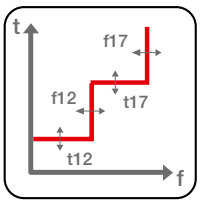


Zone selectivity for protection D (ANSI 68): enables the possibility to interconnect circuit breakers so that, in the event of a fault, the fault area can be rapidly isolated. Disconnection only occurs at the level close to the fault and operation to the rest of the operation continues uninterrupted. The function is particularly useful in ring and grid installations where, in addition to the zone, it is also essential to define the flow direction of the power that supplies the fault. It is possible to enable directional zone selectivity alternatively to the zone selectivity of the protections S and G, and in the presence of an auxiliary supply.

Start-up function for protection D: enables higher trip thresholds to be set at the outgoing point, as available for protections S, I and G.



Second protection against undervoltage and overvoltage (UV2 and OV2 – ANSI 27 and 59): enables two minimum and maximum voltage thresholds to be set with different delays in order to be able to discriminate, for example, between voltage dip transients due to the start-up of a motor and an actual fault.

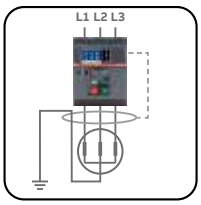


Second protection against underfrequency and overfrequency (UF2 and OF2 – ANSI 81L and 87H): enables two minimum and maximum frequency thresholds to be set simultaneously. For example, only an alarm can be set to be tripped when the first threshold is reached, and the circuit breaker can be set to be opened when the second threshold is reached.

Description of protection functions

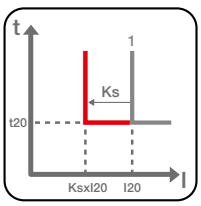
Dual setting of protections: Ekip Hi-Touch can store a set of alternative parameters for all protections. This second series (set B) can replace, if necessary, the default series (set A) by an external command. The command can be given when the network configuration is edited, for example when an emergency source is activated in the system, changing the load capacity and the short-circuit levels. Another typical application is protecting the operator opposite the switchgear against the electric arc. In this case, protection delays are minimized to safeguard the operator (Set A), whereas in the absence of an operator the protections are set to ensure selectivity with the circuit breakers downstream (Set B). It is possible to activate series B by:

- Digital input available with an Ekip Signalling module;
- Communication network, by means of one of the Ekip Com communication modules;
- Directly from the Ekip Hi-Touch display;
- By a settable internal time, after the circuit breaker has closed.

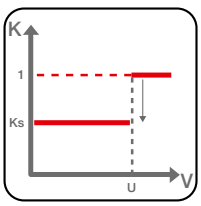


Differential ground fault (Rc - ANSI 87N): protects against internal earth fault on generator winding. It is required that the toroid hugs the active conductors and the ground conductor. Rc protection is integrated by a dedicated residual current rating plug and the external toroid.

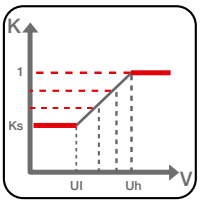
The specific functions for generator protections are described below. For each of these it is possible to choose the operating mode: active, only alarm or deactivated. All the voltage and frequency protections also operate when the circuit- breaker is open, enabling the fault to be identified before the closing of the circuit breaker.



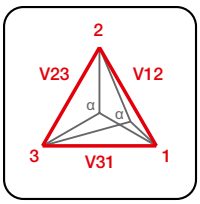
Voltage controlled overcurrent protection (S(V) - ANSI 51V): protection from maximum current with a constant trip time (t = k) that is sensitive to the voltage value. The set current threshold, following a voltage drop, decreases by steps or linearly.



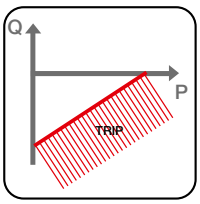
In step mode (controlled mode) the protection is tripped at the set threshold (I20) if the voltage is above U, whereas it is tripped at the lower threshold of the factor Ks (I20 * Ks) if the voltage is below U.



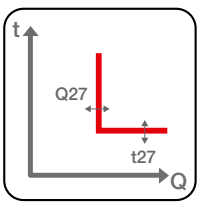
On the other hand, in linear mode (restrained mode) two voltage limits are selected within which the protection is tripped at the set threshold (I20) reduced by the factor K corresponding to the measured voltage. The variation of the factor K is proportional to the voltage, and for voltages greater than the upper threshold (Uh) the threshold I20 works, whereas for voltages below the lower threshold (UI) the minimum threshold (I20 * Ks) applies.



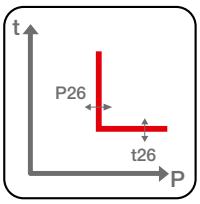
Residual overvoltage (RV – ANSI 59N): with constant trip time (t = k), protects against insulation loss in systems with insulated neutral or with neutral earthed with impedance.



Loss of field or reverse reactive power (RQ – ANSI 40 or 32RQ): with constant trip time (t = k), the circuit breaker tripped when the total reactive power absorbed by the generator exceeds the set threshold. It is possible to select the constant threshold (k=0) or a function of the delivered active power of the generator (k≠0).

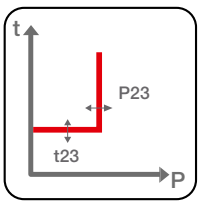


Reactive overpower (OQ – ANSI 32OF): with constant trip time (t = k), the function is tripped when reactive power exceeds the set threshold in the generator to network direction.

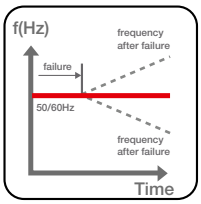


Active overpower (OP – ANSI 32OF): with constant trip time (t = k), the function is tripped when the active power exceeds the threshold set in the delivering direction of the generator.

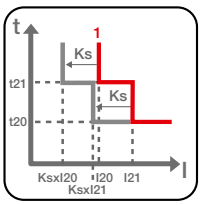
Description of protection functions



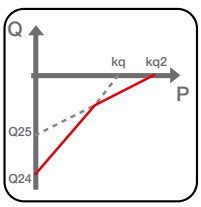
Active underpower (UP – ANSI 32LF): with constant trip time (t = k), the function is tripped when the active power delivered by the generator is lower than the set threshold. It is possible to disable the protection temporarily, to manage the start-up phase, by setting a time window from the closing of the circuit breaker, by using an electrical signal or via incoming communication to a relay.



Rate of change of frequency (ROCOF – ANSI 81R): enables both positive and negative frequency variations to be rapidly detected . The protection is constant and is tripped when the frequency variation in Hz/s is greater than the set threshold.



Second protection against voltage controlled overcurrent protection (S2(V) - ANSI 51V): available in addition to the protection S(V), enables total selectivity to be achieved in all installations.



Second protection against loss of field or reverse reactive power (RQ – ANSI 40 or 32R): enables the generator's de-energization curve to be followed very accurately, thereby avoiding any unnecessary disconnection.

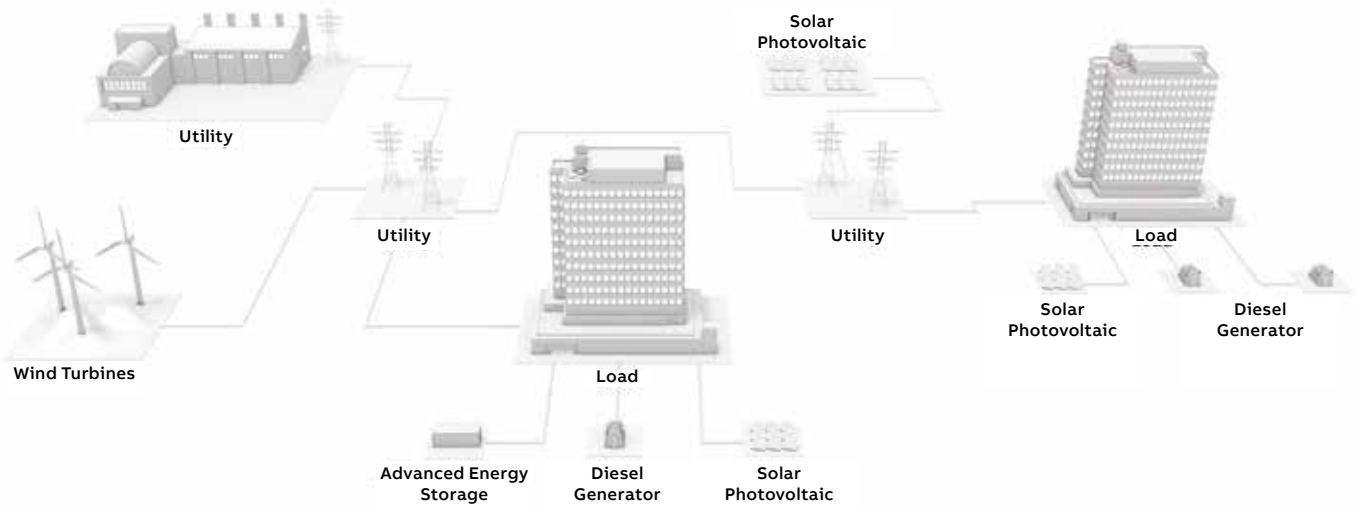
CHAPTER 4

Software functions

Introduction

Renewables have been growing during the last 10 years reducing the polluting emission for a greenest world. Due to environmental changes, people has started to think about ecology and sustainability, increasing their awareness of energy self-consumption in a perspective of energy efficiency.

Emax 2 is the first smart circuit breaker enabling all-in-one solutions that combine advanced protection, programmable logic, full connectivity, easy integration and comprehensive energy management in a single revolutionary device or at the local generation side.
Installed downstream the MV/LV transformer, Emax 2 works like a certified **Interface Protection System** 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 local standard.
Emax 2 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.



In order to maximize the service continuity, local generation starts to supply the islanded User's plant. Emax 2 is the first circuit breaker able to integrate in one device protection features and **Automatic Transfer Switching (ATS)** programmable logics. This unique integrated solution avoids the usage of other external control unit, guaranteeing switchgear footprint and commissioning time saving.
Strong reduction of wiring connection simplify the installation and commissioning phase.
The **Load Shedding** embedded algorithm is able to manage power system for the comprehensive microgrid energy management.
Before the transfer from the main grid to local line, selected loads are shed to support power balance.
Emax 2 using slope of frequency disconnects loads only in case of emergency unbalance condition.

When the main grid comes back stable, thanks to **Synchro Reclosing** logics, synchronizes the plant voltage and frequency to reconnect it. in grid-connected operation, Emax 2 manages the **Power Controller** algorithm to shave peaks and shift loads in order to optimize system performance and productivity.
Emax 2 advanced features are easily customized thanks to commissioning software tools which do not require high level engineering competencies.
Ready to use templates enable the download of all the logics directly into the trip unit. The solutions become plug & play, increasing modularization and standardization for design and installation.
Here following the description of the several Adanced functionalities wich have been developed and integrated in Emax 2 follows the below compatibility table.

	Interface Protection	Load Shedding	Automatic Transfer Switch	Synchro Reclosing	Power Controller
Interface Protection	●	●			●
Load Shedding	●		●	●	●
Automatic Transfer Switch		●	●	●	●
Synchro Reclosing		●	●	●	●
Power Controller	●	●	●	●	●

Interface Protection System

Emax 2 embeds in a single device both the functions of Interface Protection System and Interface Device.

Purpose
The connection of Active Users to the Utility is subject to the satisfaction of the Standard requirements. The Interface Protection System is a relay with dedicated protections able to satisfy such requirements. In particular, the generating units installed in the User's plant shall be disconnected from the grid whenever voltage and frequency values of the grid itself are out of the ranges prescribed by the standard. Such a disconnection is usually carried out by means of an Interface Device that trips after receiving an opening command provided by an external Interface Protection System. ABB has developed an integrated solution which embeds in a single device both the functions of Interface Protection System and Interface Device. This advanced feature is possible thanks to the integration of the several interface protections into the Ekip Hi-Touch trip unit installed on board Emax 2. Today Emax 2 is suitable for Standard CEI 0-16, the most important Standard for the connection of Active Users. A lot of local Standards take CEI 0-16 as reference.

Application examples
ABB has been able to integrate in a single device the following functions to be used in the scenarios described below. Thanks to these embedded functions, the number of devices to be installed is reduced, with consequent space saving inside the switchboard. Emax 2 with embedded Interface Protection System have been tested and certified in compliance with the Standard CEI 0-16 and are suitable for the following scenarios.

Emax 2 as Microgrid Main protection unit
In such scenario, Emax 2 with embedded Interface Protection System can fulfill the function of Interface Protection System (IPS). In case of IPS tripping, microgrid, downstream Emax 2 main unit, remains active thanks to both the local generation and the load shedding feature also embedded in the main unit.

Emax 2 as local generation protection unit
In such scenario, there are loads non-operating in islanding condition, so, when there is an Utility outage, Emax 2 detects that voltage and frequency values are out of the range prescribed. According to the standard the local generation must be disconnected from the Utility, so Emax 2 opens, acting as interface device, thanks to the IPS embedded. In this condition loads are not operating as there is no voltage on the secondary of the MV/LV transformer and no local generation connected.

Benefits
Thanks to Emax 2 with embedded Interface Protection System, the following benefits are guaranteed:
- Emax 2 performs interface protections with every possible switching device, ensuring also reclosing operation.
- If the Emax 2 is installed on the generator feeder, the unit will be able to perform the triple function of Interface Protection System and Generator Device thanks to the Interface Protection System integrated also in the Ekip G Hi-Touch trip unit.
- Ease of use, thanks to Ekip Connect software which allows an immediate and intuitive commissioning phase.

For further information, please refer to the White Paper "Emax 2, all-in-one innovation – Interface Protection System and Interface Device" (1SDC007117G0201).

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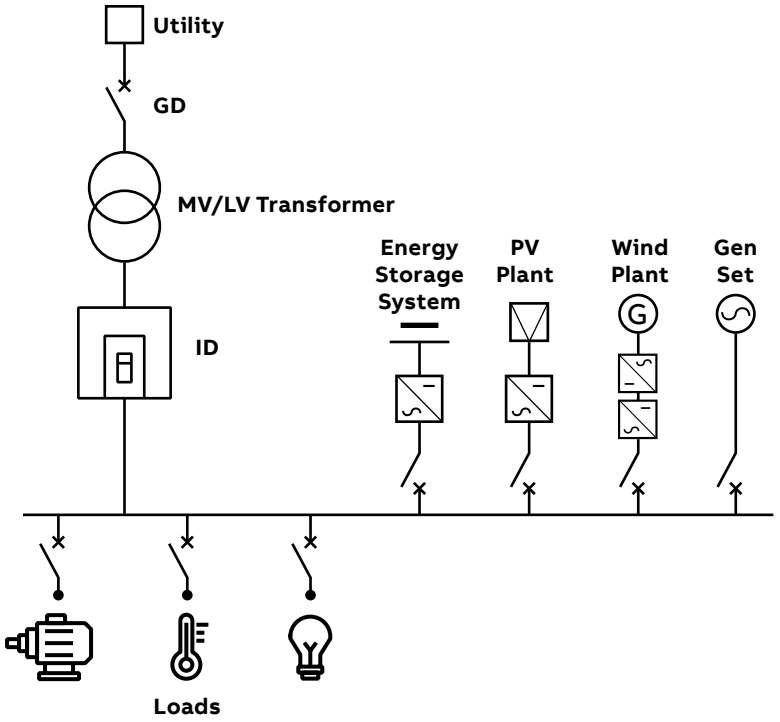
Emax 2 as Microgrid Main protection unit



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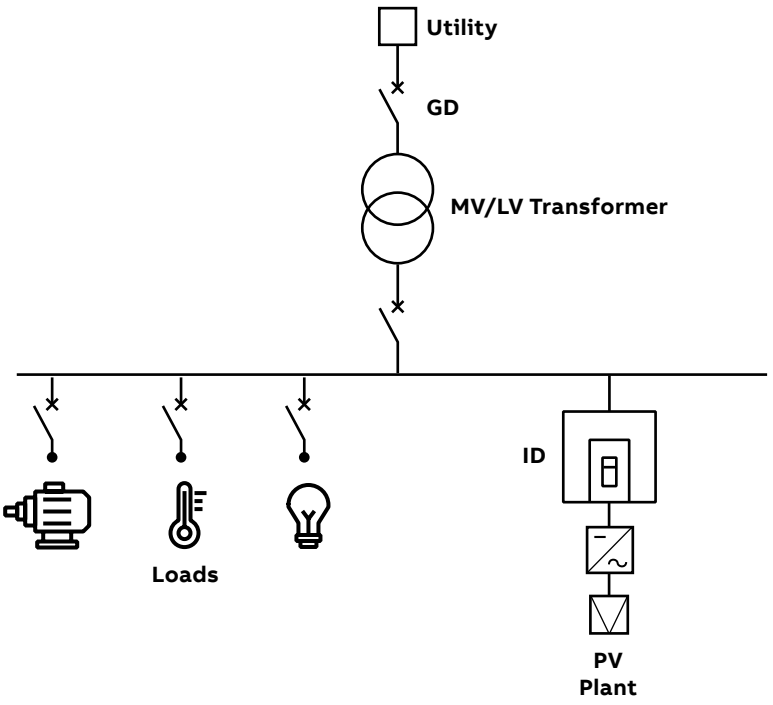
Emax 2 as local generation protection unit



Adaptive Protections

Emax 2 adds dual setting capability to switching device to ensure continuous coordination

Purpose

User's plants can work as a LV Microgrid thanks to the energy produced by renewable and local power sources, in particular as a consequence of lacking of the Utility power supply, e.g. due to a fault on the MV voltage side. In order to still guarantee a high level of selectivity and continuity of service, it is important to take into account the variation of the short circuit power when moving from. Indeed, during grid connected condition the fault current on a microgrid feeder is supplied by the Utility, so it is higher than the one supplied only by the local generation during islanded condition.
As a result, it is desirable that the several protection thresholds of the units can be automatically changed during the transition to the islanding condition.

Application example

We have a plant connected to the MV Utility by means of a MV/LV transformer. If the Utility shuts down, the plant will become a Microgrid supplied by the local generator G, which will feed the priority loads by using the loads shedding feature of Emax 2.
In grid-connected condition, the generator G is disconnected. With reference to fig.1:

- Circuit breaker A is closed
- Circuit breaker B is open
- Circuit breakers C are closed. The protections of the one that supplies loads D are upgraded using "Set A" of Emax 2 unit.
- Circuit breakers D are closed
- Circuit breaker E is closed
- Circuit breaker QS1 is closed
- All loads supplied.

The circuit breakers C are selectively coordinated with the upstream main circuit breaker A, supplied by the Utility, and the downstream load circuit breakers D (fig. 2).

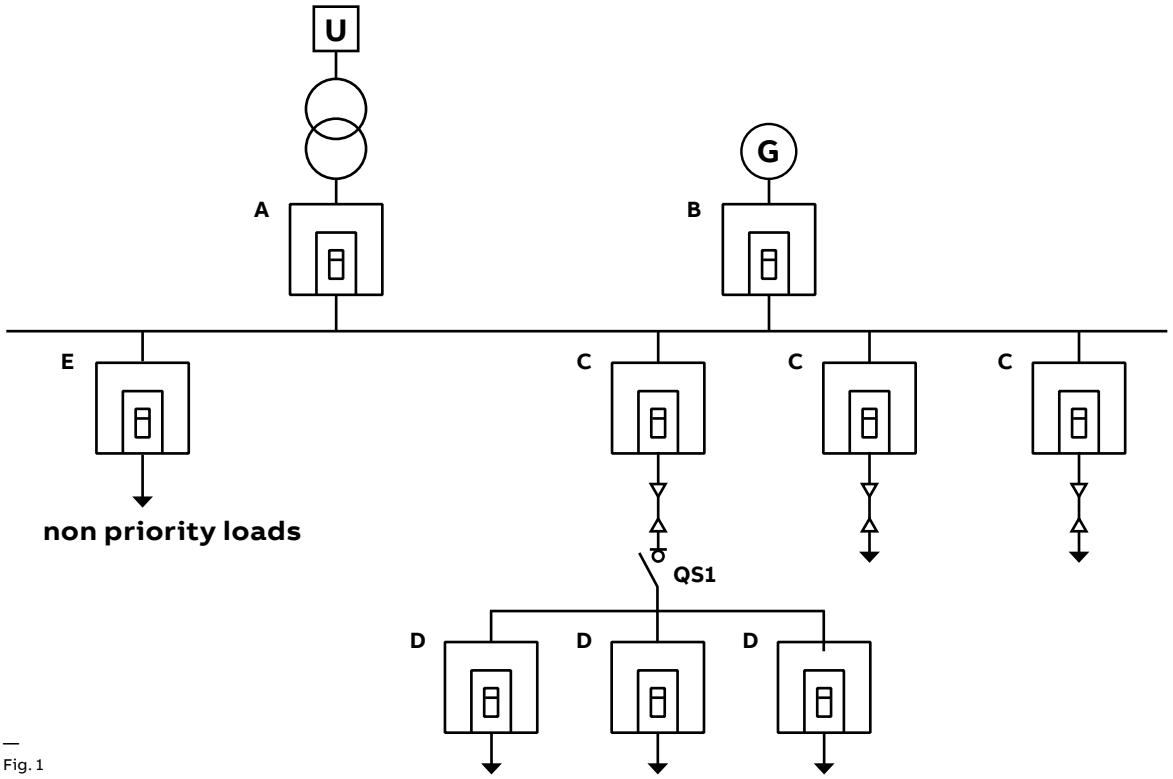
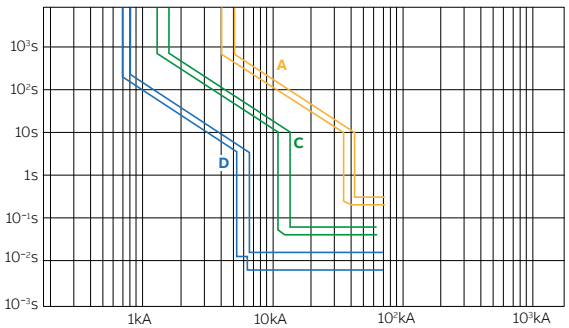


Fig. 1

With Adaptive protections when there is a Utility outage, circuit breaker A opens and B closes in order to have operation in islanded condition. In order to still guarantee selectivity, an alternate set of protection settings is required. Adding Emax 2 adaptive protections to circuit breaker C ensure this behaviour. The second protection setting is optimized for the characteristics of the local generator ensuring the incoming supply and load side switching devices will remain selectively coordinated.
With reference to Figure 1:

- Circuit breaker A is open
- Circuit breaker B is closed
- Circuit breakers C are closed and the protection thresholds move automatically to “Set B”
- Circuit breakers D are closed
- Circuit breaker E is open
- Circuit breaker QS1 is closed
- No priority loads can be disconnected using another functionality of Emax 2 units (see next paragraph).

The following Figure shows how it is possible to switch to a set of parameters which guarantees selective coordination between circuit breakers C and B by means of the “Adaptive protections“ function embedded in the trip unit of the circuit- breaker C.



Time-Current curves

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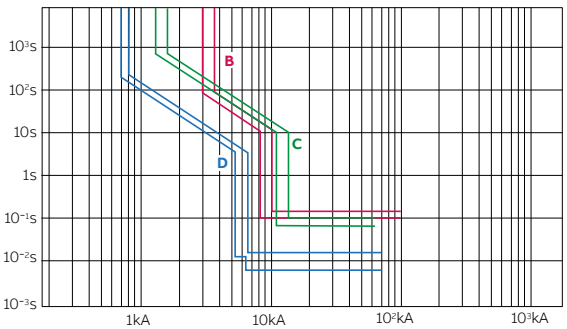
Fig. 2



Time-Current curves

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Fig. 3

Benefits
Thanks to Emax 2 it is possible to have two sets of settings implemented in a single device. As a result, the following benefits are guaranteed:

- Overcurrent protection and selectivity 100% guaranteed both in grid-connected and islanded condition
- The service continuity is is granted just adding a single unit in the switchboard in every plant condition
- Ease of use, thanks to the Ekip Connect software which allows an immediate and intuitive commissioning phase.

For further information, please refer to the White Paper “Emax 2, all-in-one innovation – Adaptive protections” (1SDC007116G0201).

Load Shedding

Emax 2 has many load shedding algorithms to avoid power unbalance in the low voltage plant and stress for all the components.

Purpose
ABB Emax 2 embeds patented functions based on load shedding which reduces the Microgrid stress in all situations. Typically it is the main protection relay of the low voltage Microgrid located at the interface point with the medium voltage grid, able to control the plant in every circumstances.

Microgrid in islanding operation
After the Emax 2 circuit breaker opens, because of interface protection systems intervention or external command, the Microgrid should transit from on-grid to off-grid state with bumpless transition. When it is standalone, the power absorption from the main grid ceases, so that the Microgrid loads remains supplied by the local generation, like diesel GenSet or energy storage systems. This Microgrid generation can be always active or started up by an automatic transfer switching (ATS) logic after the disconnection from the main grid, depending on the plant configuration. During the islanding transition, it is very important to avoid the frequency drop, otherwise the generation protections could trip jeopardizing the Microgrid stability with consequently a long downtime. Emax 2, employing the current and voltage measurements, integrates two different fast load shedding logics to reduce this blackout risk, protecting the Microgrid during the intentional or unintentional islanding operation:

- 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 unit 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 a solar plant based on plant geography settings.

Microgrid in grid-connected operation
Under normal circumstances, the microgrid point is generally connected to the Utility in order to inject/adsorb the surplus or the lacking energy. In this situation, with Emax 2 as main circuit breaker installed immediately downstream the MV/LV transformer in closed status, power overload should be avoided so as not to excessively stress plant elements. In order to do this, the circuit-breaker embeds a patented load shedding algorithm:

- Predictive Load Shedding, slow disconnection of loads based on the limit of the average power flow towards the Microgrid according to the transformer size designed for the power peak profile.

All the versions are available on Emax 2 platform for both the Microgrid situations, sharing some information about the loads under control in the plant.

Application examples

- **Grid-connected plants with running GenSets**, which contribute to the self-consumption together with potential renewable sources and support the load power supply in emergency conditions. It is the case of hybrid PV-diesel remote communities connected to weak distribution-grids where there are a lot of daily faults, or of facilities located in geographical areas where there are frequent environmental events, for example hurricanes or earthquakes.
- **Grid-connected plants with back-up GenSets** started up after main - gen transfer switching logics that require high reliability. For example, hospitals, banks or data centers.

Benefits

Thanks to Emax 2 with embedded Load Shedding innovation, the following benefits are guaranteed:

Service continuity

When a plant remain disconnected from the main grid, even if local production is present, 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 live.

Space saving

- No other Programmable Logic Controllers (PLC) are needed as Emax 2 has embedded the intelligence to realize the load shedding logics, taking advantage of the current and voltage sensors for electrical parameter measurements.
- In addition, static converters for low voltage photovoltaic production have typically anti-islanding protections: this implies another power deficit to be added to the main grid contribution during the Microgrid islanding. Emax 2 is the first circuit breaker that estimates solar production without additional sensors.
- Load Shedding is suitable with ATS architectures like Main-BusTie-Gen used to distinguish priority/ not priority loads.
  Where feasible, BusTie switching device is not required anymore and this means:
  - Significant space and material saving up to 50% in the power distribution switchgear for panel builders.
  - Load Shedding is self-tuned with the specific power unbalance identification and dynamically choses the controllable loads to be shed, reducing constraints for consultants during plant design.
  - ATS unit manages only two sources, without interlock, logic programming and wiring connections for the third circuitbreaker with less time required for installation.

Load Shedding

Ease of use

- Load shedding logics are generally set with high engineering skills and customization effort with devices as programmable logic controllers.
- 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).

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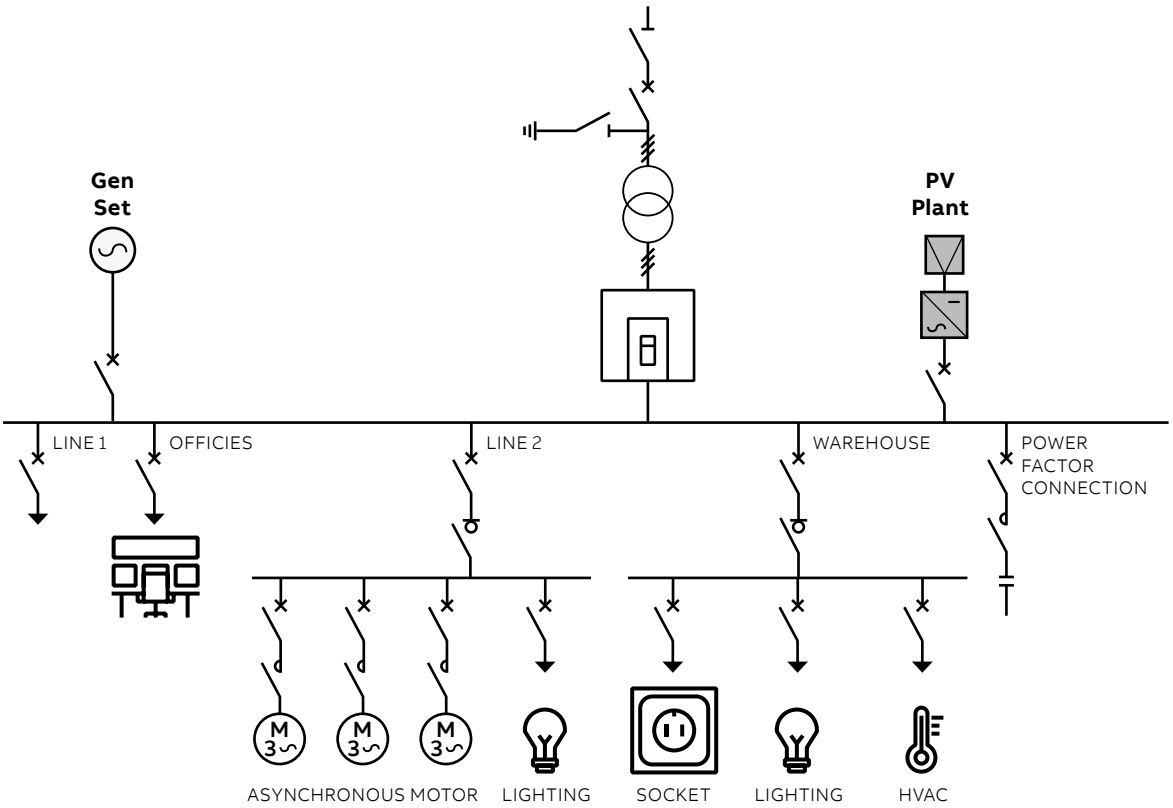
Typical load shedding application



Automatic Transfer Switch

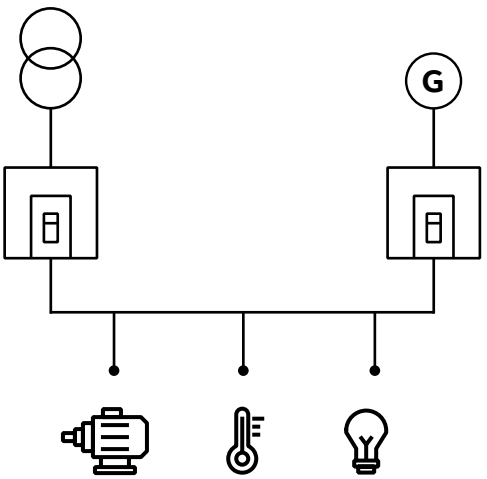
Emax 2 is ready for transfer switching applications reducing time for logics programming and commissioning.

The ATS solution
ABB's Automatic Switching (ATS) system takes advantage of the new capabilities provided by the new Ekip Connect 3 Software and the intelligent digital unit such as Emax 2 to deliver versatile and reliable solution.

Application example
Automatic Transfer Switch systems is common in all application where service continuity is essential and where there are multi source supplies.

The main applications are:
- Power supplies of UPS groups in general
- Oil & Gas
- Operating theatres and primary hospital services
- Emergency power supplies for civil building, hotels and airports
- Data banks and telecommunication systems
- Power supply of industrial line for continuous processes.

Another case of use of ATS is in all cases where a portion of grid with local generation, called micro-grid, can be disconnected from main grid.



Automatic Transfer Switch

The ATS is a high-performances energy automation system, easy to install and program.

Benefits
Ready-to-go Programming
Estimated time and cost savings on the ATS Engineering on the low voltage project 95%.

Emax 2 compactness
Space saving on the power switchboard: up to 30%.

Simplify the connections
Estimated time and cost savings on cabling and commissioning of the power switchboard: 50%.

Top rate reliability
With watchdog functions and fewer installed components.

For more info check out the white paper "Emax 2, all in one innovation: Embedded ATS system" (1SDC007115G0201).
SACE Emax 2 is suitable for UL 1008 equipment.

Synchro Reclosing

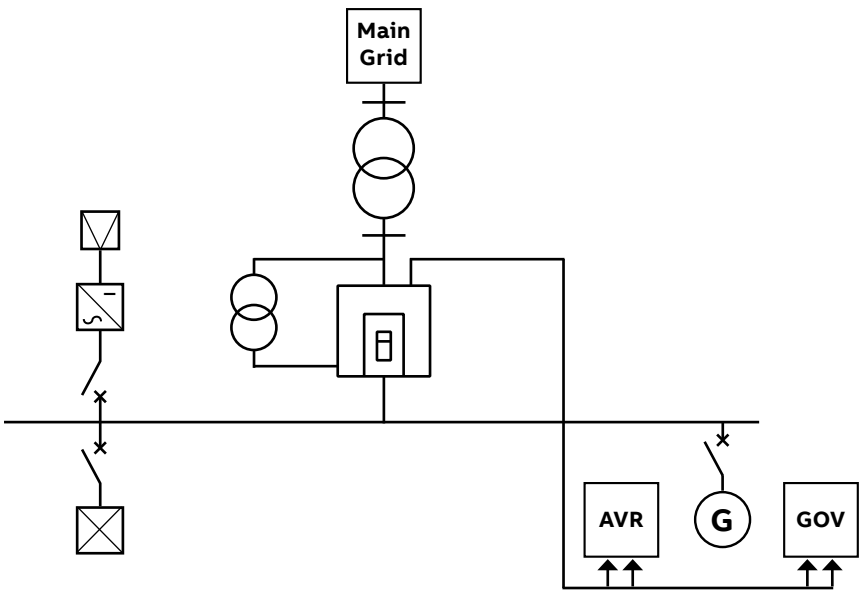
Emax 2 is able to synchronize voltage waveforms from different power sources.

Purpose
Thanks to its advanced electronics, Emax 2 is the first smart unit able to island the Microgrid from disturbances such as in the presence of faults or power quality events and reconnect it to the distribution network, when there are the right conditions.
This last feature mentioned is the Synchro Reclosing function. It consists in synchronization support of the Microgrid reconnection operation or generator paralleling procedure as prescribed by Std. ANSI 25A, with additional automatic re-closing capabilities based on the synchronism status detection.

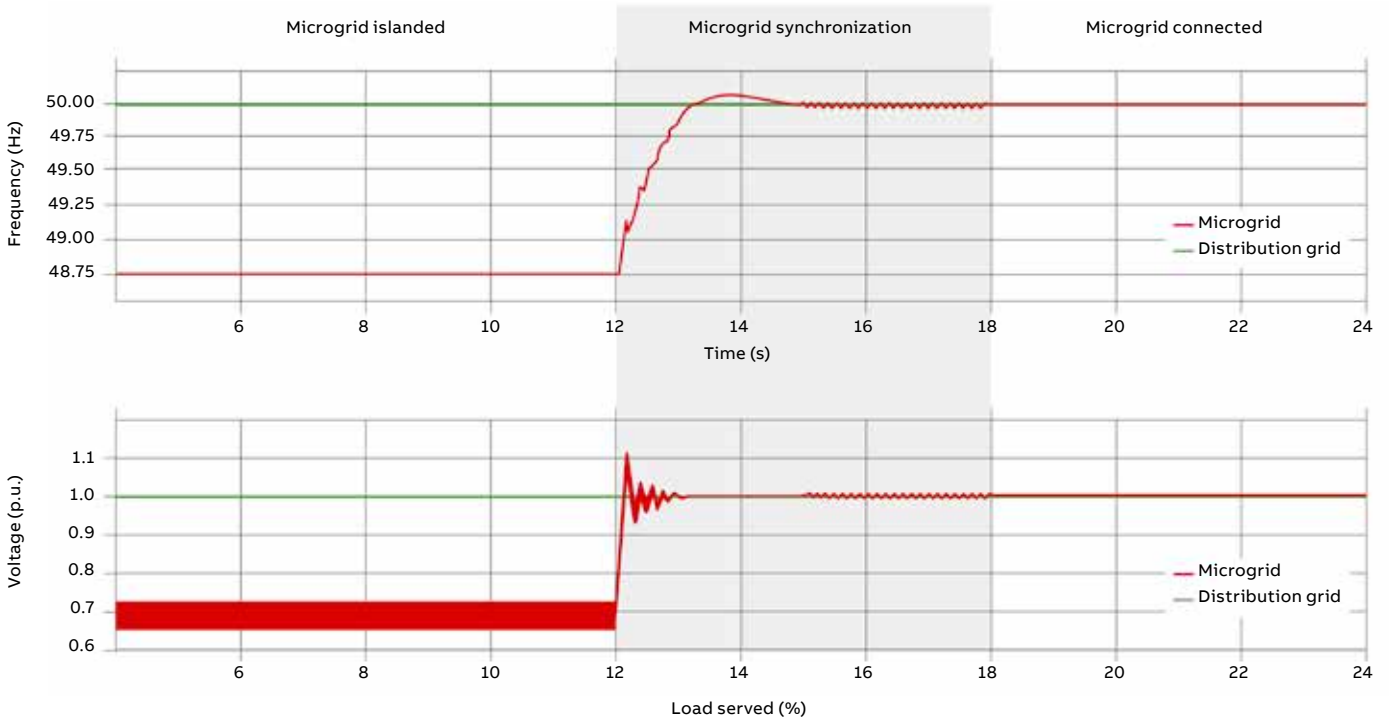
Using the Ekip Synchrocheck cartridge module, Emax 2 monitors the voltage amplitude, the frequencies and the phase displacement and realizes simple logics to adapt the Microgrid voltage and frequency to the main grid ones. This regulation based on up and down signals sent to the local generator controllers is realized by Ekip Signalling contacts in order to reach synchronization. The circuit breaker automatically recloses when it understands that the synchronism is achieved using Ekip Synchrocheck and the integrated closing coil.

Sometimes this operation can be very critical, because the current following during the transient of the reconnection must not reach values that can potentially cause the Microgrid shut down. With the aim to avoid complex analysis and customizations, Ekip Connect 3.0 commissioning tool completes the Synchro Reclosing functionality, recommending the right settings according to the plant configuration.

Application examples
Synchro Reclosing function is useful in the following plant-engineering situations:
- During the Microgrid reconnection to the main grid, speeding up the paralleling procedure between two systems with different steady states. This scenario comes after the islanding Microgrid operation.
- When there is the closed transition of an automatic transfer switch, the main grid should be connected to the same busbar with the backup Microgrid generation in order to guarantee continuos load operation, with or without a bus-tie switching device.
- Besides Microgrid cases, it is possible to adopt this solution also for single GenSet paralleling operation.



Synchro Reclosing



Benefits

Thanks to Emax 2 with embedded Synchro Reclosing, the following benefits are guaranteed:

- Space Savings
  - Components reduction with no external synchronizer and less voltage transformers required if compared with traditional approaches.
  - Increased reliability & time saving during the installation having less cabling and related installation complexity.

Ease of use

- The logics are embedded in the trip unit so there is no need of programming and engineering skills .
- Simplified configuration with Ekip Connect software that offers predefined configuration templates with suggested values and a clear user interface for customizations.

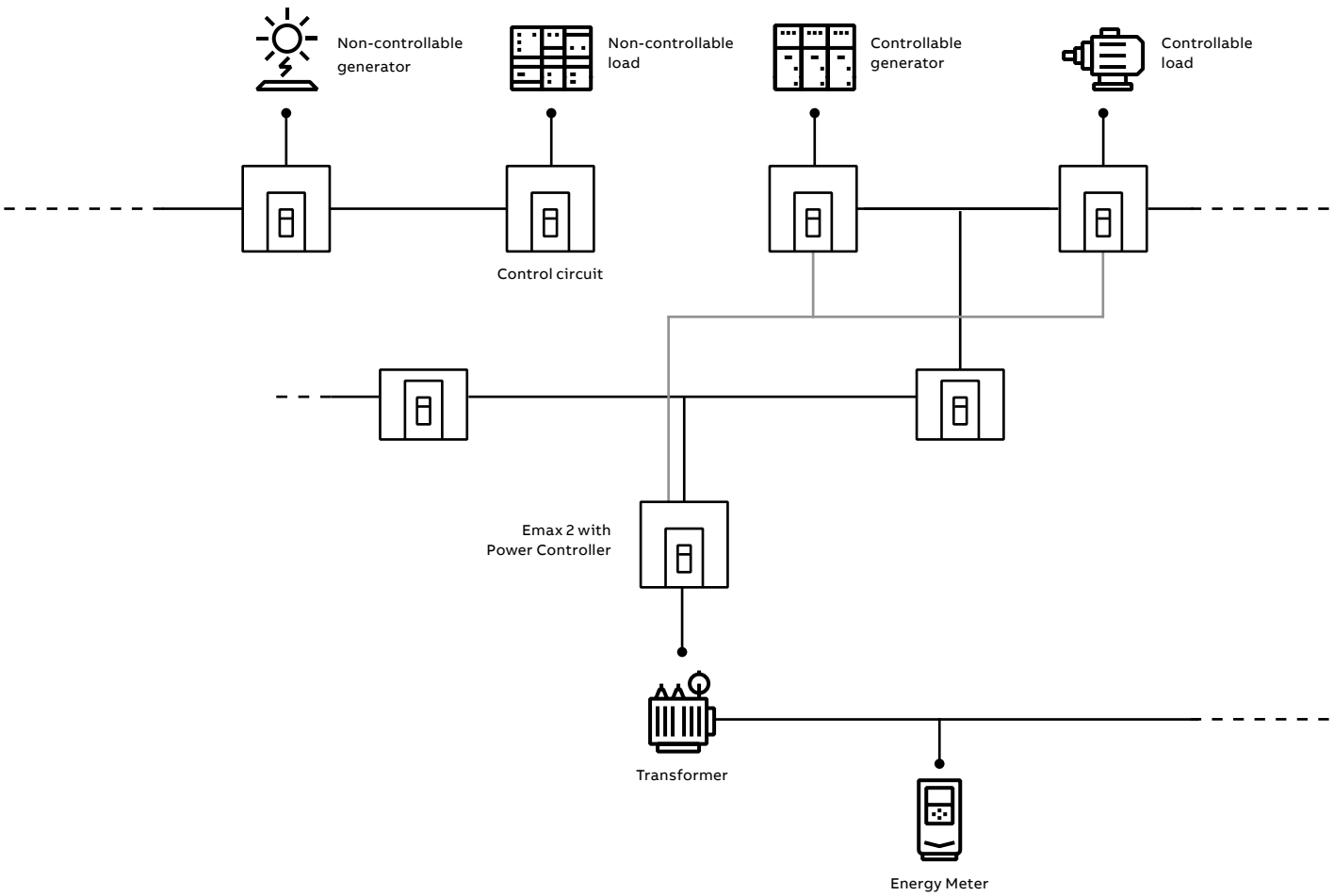
For further information, please refer to the White Paper “Emax 2, all-in-one innovation – Synchro Reclosing” (1SDC007118G0201).

Power Controller

Emax 2 is able to control loads and generator to ensure bill savings and enable demand response applications according to power management strategies.

Purpose
Thanks to Power Controller software, Emax 2 manages the power to shave the peaks and shift the loads. In this way, it possible to cut electricity bills, increase energy efficiency up to 20% and be ready for demand response programs. Power Controller function is based on a patented calculation algorithm that allows a load list to be controlled through the remote command of relevant switching device (like switching device, switching device, contactor, drive) or control circuit according to a priority defined locally by the user ore remotely by a load aggregator or utility, based on his own requirements and types of load.

The algorithm is designed on a foreseen average power absorption which can be set by the user over a determined time interval. Whenever this value exceeds the fixed power, Power Controller function intervenes to bring it back within the limits.
This system can be realized with a single Emax 2 Control or Emax 2 Control+ standard equipped with this function and installed as the low voltage plant controller.
Furthermore, the control unit, shall not only command the passive loads, but it can also manage a reserve generator.



Power Controller

Ekip Power Controller, which can be used with all Ekip Touch trip units of the Emax 2 series, effectively helps to improve energy efficiency by managing the entire low-voltage electrical system. It is, in fact, able to adapt the demand for power according to the availability of the energy source, the time of day and the costs indicated in the current pricing plan.
In this way Ekip Power Controller is able to maintain power consumption within the limits defined, thereby optimizing the costs of managing the installation and reducing emissions.

The command sent to the downstream devices can be performed in two different ways:
- through the wired solution, by commanding the shunt opening/closing releases or acting on the motor operators of the loads to be managed;
- through a dedicated communication system.

The ability to control the loads according to a list of priorities already defined provides significant advantages from both economic as well as technical points of view:
- economical: energy consumption optimization is focused on the control of the costs linked in particular to the penalties that are levied when the contractual power is exceeded or when the contractual power is increased by the Distribution System Operator (DSO) as a consequence of exceeding the limit repeatedly.
- technical: the possibility of power absorption over the contractual limits for shorter periods and, as well as, the management and the control of the power consumption over long periods of time. Thus it is possible to reduce the likelihood of malfunctioning due to overloads, or worse, complete inefficiency of the entire plant due to tripping ofthe LV main switching device.

The exclusive Power Controller function available on the new Emax 2 units monitors the power, keeping it below the limit set by the user. As a result of this more effective use, the peak of power consumed can be limited allowing savings on electricity bills.

The Power Controller, patented by ABB, disconnects non-priority utilities, such as electric car charging stations, lighting or refrigeration units, during the times when consumption limits need to be respected, and connects them again as soon as it is appropriate. When required, it automatically activates auxiliary power supplies such as generator sets. No other supervision and control system is required: it is sufficient to set the required load limit on Emax 2, which can control any switching device located downstream, even if it is not equipped with a measurement function.

Application examples
Electricity bill savings, demand response, avoiding power overload are the typical scenarios where Power Controller is adopted.
As it operates on not critical loads, it is common of office building, shopping malls, hotels, campuses, waste and water industries or every plant that works like a low voltage microgrid.

Benefits
Thanks to Emax 2 with embedded Power Controller, the following benefits are guaranteed:

- **Reduction of energy costs with minimum impact.**
  The loads are disconnected from the power supply for short periods, in the minimum number necessary and in a fixed order of priority, enabling power consumption peaks to be limited. This allows the contract drawn up with the energy provider to be renegotiated, reducing the power allocated, with a consequent reduction in total energy costs.
- **Power limited only when necessary.**
  Power Controller function manages up to four different time bands, it is therefore possible to respect a particular power limit according to whether it is during the day (peak) or night (off peak). In this way, consumption during the day when rates are at their highest can be limited.
- **Easy of use**
  Power Controller function allows the installation to be managed efficiently with a simple architecture. Thanks to a patented design, it is sufficient to measure the total power of the installation without having to measure the power consumed by each load. Installation costs and times are thereby reduced to a minimum.
  Power Controller function does not require the writing, implementation and testing of complicated programmes for PLC or computer because the logic has already been implemented in the protection unit and is ready to use; it is sufficient to set the installation parameters from a smartphone or directly from the switching device display.
  Power Controller significantly helps to flatten the load curve, limiting the use of peaking power plants in favour of base load power plants with greater efficiency.
- Thanks to integrated communication modules, Power Controller can receive the maximum absorbable power directly from the medium voltage control system, determining consumption for the next 15 minutes. Ekip Power Controller, according to the information received, manages the switching off of non-priority loads or the switching on of reserve generators. The software gives maximum priority to non-programmable preferred energy sources, such as wind and solar, and they are therefore considered uninterruptable. In the event the production of internal power to the controlled network is reduced, due, for example, to decreased production of solar power, Power Controller will disconnect the necessary loads to respect the consumption limit set.
- This benefit is used, for example, in installations with a system of cogeneration. Indeed Power Controller controls the total consumption drawn from the electrical network, interrupting non-indispensable loads when production is reduced and reconnecting them when generator power is sufficient to not exceed limits. There are multiple advantages: reduction in energy costs, maximum use of local production and greater overall energy efficiency.

For further information, please refer to the White Paper “Load management with Ekip Power Controller for SACE Emax 2” (1SDC007410G0202).

CHAPTER 5

Supervision and connectivity

Introduction

SACE Emax 2 circuit breakers provide a complete and flexible offering that can be adapted to the actual level of supervision and control required.

According to their complexity, the supervision of low-voltage systems may involve different levels:

- **switchgear compartment:** for control of the main electrical values of the circuit breaker, thanks to Ekip Touch trip units with high resolution display and the Ekip Multimeter display.
- **electrical switchgear:** to display the data of all circuit breakers installed in the switchgear from a single point: in local mode via control panel on the front of the switchgear, or remotely via several communication protocol.
- **electrical system:** to manage complex systems in which devices must be integrated with automated industrial processes or in intelligent electrical networks, better known as smart grids. The system can be supervised by the Ekip View software or via Internet with the ABB Ability™ Electrical Distribution Control System webapp.

Supervision and control
Supervision of the switchgear compartment

For the list of information available for each trip unit, consult chapter 3.

The SACE Emax 2 circuit breakers equipped with Ekip electronic trip units enable electrical measurements and diagnostic data to be displayed on the front of the switchgear.

Solution with Ekip Touch trip units
The Ekip Touch electronic trip units are the ideal solution for supervision and control of the compartments in switchgear. In particular:

- their use is simple and intuitive thanks to a large, high resolution, colour touch screen;
- they do not require an auxiliary power supply for safety; the Ekip Touch trip units are directly supplied by the current sensors integrated in the circuit breaker, thereby avoiding the use of external power supplies.

The Ekip Multimeter is a display unit to be installed on the front of the switchgear for SACE Emax 2 air circuit breakers equipped with Ekip electronic trip units.

Solution with Ekip Multimeter Display on the front of the switchgear
This device remotely displays the information about the system that is available in the trip unit to which it is connected.
The main characteristics of the Ekip Multimeter unit are:

- **Graphical and functional uniformity with the Ekip Touch trip units**; Ekip Multimeter uses the same display as the trip unit to which it is connected, ensuring perfect continuity between the graphic display and the menu items.
- **Reduced dimensions**; the Ekip Multimeter guarantees the precision of the trip unit to which it is connected and performs the function of a measuring instrument without requiring the installation of external current and voltage transformers.
- **Flexible installation**; the Ekip Multimeter can be installed at a distance from the trip unit, enabling access to information from the most convenient point.
- **Simultaneous reading of the various electrical values**; the advanced connection system used allows several Ekip Multimeter devices to be connected to the same protection trip unit.

Furthermore, if connected to trip units equipped with display, the Ekip Multimeter enables adjustment of the parameters and protection thresholds.

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01

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02

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01 Ekip Touch

—
02 Ekip Multimeter

Electronic trip unit	Ekip Dip	Ekip Touch	Ekip Touch + Ekip measuring module	Ekip Hi Touch
			Ekip G Touch	Ekip Hi-G Touch
Solution	Ekip trip units + Ekip Multimeter			
Type of trip units connectable to Ekip Multimeter	Ekip trip units			
Number of trip units connectable to Ekip Multimeter	1			
Measurement functions				
Currents	●	●	●	●
Voltages	-	-	●	●
Powers	-	-	●	●
Energies	-	-	●	●
Harmonics	-	-	-	●
Network analyzer	-	-	-	●
Adjustment functions				
Setting of thresholds	-	●	●	●
Setting of thresholds second set	-	-	-	●
Resetting of alarms	●	●	●	●
Diagnostics				
Protection function alarms	●	●	●	●
Device alarms	●	●	●	●
Protection unit tripping details	●	●	●	●
Events log	●	●	●	●
Protection unit tripping log	●	●	●	●
Maintenance				
Number of operations	●	●	●	●
Number of trips	●	●	●	●
Wear of contacts	●	●	●	●
Other data				
Status of circuit breaker	●	●	●	●
Circuit breaker position [1)]	●	●	●	●
Local/remote mode	●	●	●	●

1) Circuit breakers equipped with auxiliary contacts to indicate position

Supervision and control
Switchgear supervision

Ekip Link is a flexible and efficient solution for controlling and supervising low-voltage electrical switchgear.

It is a system that enables SACE Emax 2 circuit-breakers to be connected to the Ekip Control Panel operator panel by means of Ekip Link interface modules.

Ekip Link system
The main characteristics of the Ekip Link System are:
- **centralized control;** from the Ekip Control Panel operator panel, all the main values of the installation (electrical measurements, system diagnostics, trends…) can be monitored and controlled.
- **adaptation to real requirements**; when the electrical values to be monitored are limited to currents only, the Ekip Dip trip unit can be connected to the Ekip Link without having to use circuit breakers equipped with communication modules.
- **access via the Internet** with any Internet browser using the web server function performed by the Ekip Control Panel.
- **rapid installation**, through the use of standardized EtherNet™ components such as STP cables and RJ45 type connectors.
- **ease of use**; due to the Ekip Control Panel operator panel in front of the switchgear with colour touch screen, the system mimic panel can be displayed so that the entire installation can be controlled rapidly and intuitively.
- **ready to use**; Ekip Control Panel is supplied with pre-configured software that requires no programming. It is only necessary to start scanning the Ekip Link system from the operator panel and in a few seconds communication with the connected devices is active.

Ekip Link enables supervision of electrical switchgear on which up to 30 ABB SACE circuit breakers have been installed. Tmax T and Tmax XT series circuit breakers equipped with Modbus RTU communication can also be easily integrated into the Ekip Link system using the multi-serial port fitted on the Ekip Control Panel.

Electronic trip unit	Ekip Dip	Ekip Touch	Ekip Touch + Ekip measuring module	Ekip Hi Touch
			Ekip G Touch	Ekip Hi-G Touch
Solution	Ekip protection trip units equipped with Ekip link module + Ekip Control Panel operator panel + standard EtherNet™ components			
Type of trip units connectable	Ekip protection trip units			
Number of trip units connectable to the Ekip link system	up to 30 [1]			
Data exchange rate of Ekip link system	100 Mbit/sec			
Supervision and control functions				
Opening and Closing of circuit breakers [2]	●	●	●	●
Electrical value trends	I	I	I,V,P	I,V,P
Log of electrical value trends	I	I	I,V,P	I,V,P
Dynamic installation mimic panel	•	•	●	●
Automatic scanning of the Ekip link system	•	•	●	●
Centralized synchronizing of time	•	•	●	●
Web server function	● [3]	● [3]	● [3]	● [3]
Measurement functions				
Currents	●	●	●	●
Voltages	-	-	●	●
Powers	-	-	●	●
Energies	-	-	●	●
Harmonics	-	-	-	●
Network analyzer	-	-	-	●
Data logger	-	●	●	●
Adjustment functions				
Setting of thresholds	-	●	●	●
Resetting of alarms	●	●	●	●
Diagnostics				
Protection function alarms	●	●	●	●
Device alarms	●	●	●	●
Protection unit tripping details	●	●	●	●
Events log	●	●	●	●
Protection unit tripping log	●	●	●	●
Transmission of alarms via text message	optional	optional	optional	optional
Transmission of alarms via e-mail	optional	optional	optional	optional
Maintenance				
Number of operations	●	●	●	●
Number of trips	●	●	●	●
Wear of contacts	●	●	●	●
Other data				
Status of circuit breaker	●	●	●	●
Circuit breaker position [4]	●	●	●	●
Local/remote mode	●	●	●	●

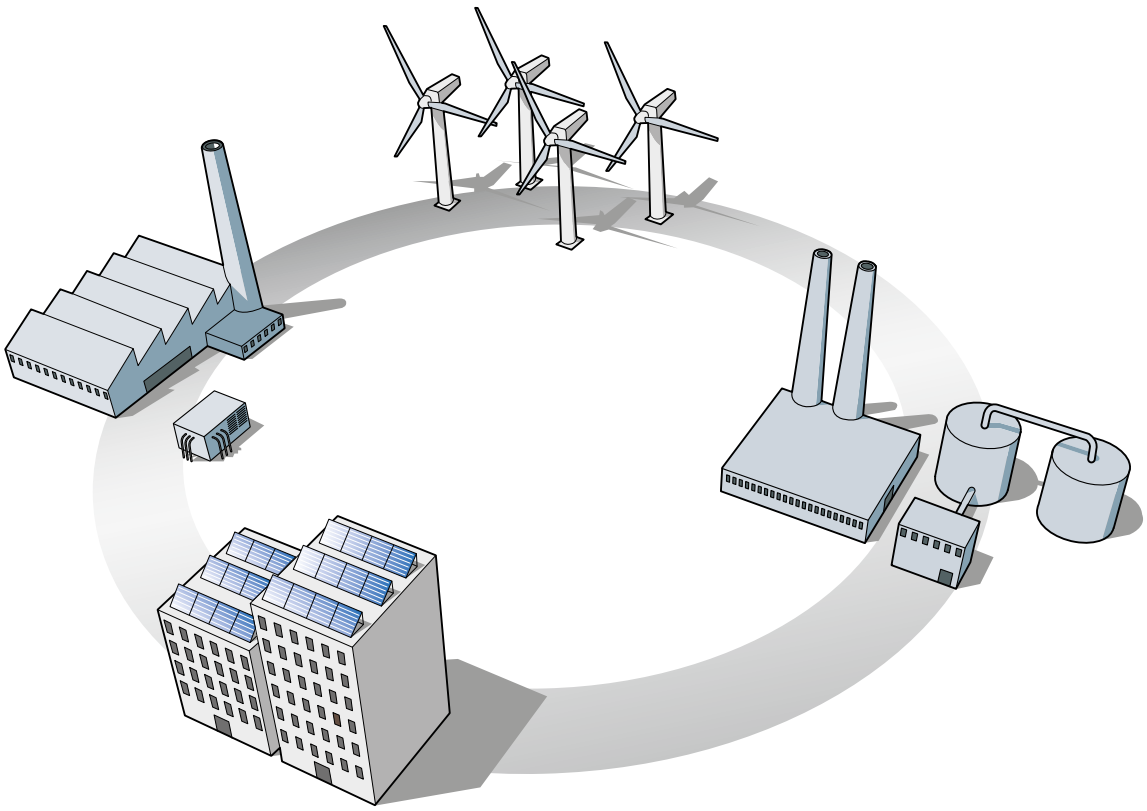
1) Ekip Control Panel is available in two versions that can manage a maximum of 10 or 30 circuit breakers. The number of circuit breakers may vary depending on their type. For details, ask ABB SACE
2) Circuit breakers equipped with actuation module, electric accessories, opening and closing releases and spring charging motor
3) Two client web accesses included in the licence
4) Circuit breakers equipped with auxiliary contacts to indicate position

Supervision and control
Supervision of the elettrical installation

The integration of low-voltage devices in communication networks is required in particular for: automated industrial processes, industrial and petrochemical sites, modern data centres and intelligent electricity networks, better known as smart grids.

Ekip Com Modules
Thanks to the wide range of communication protocols supported, SACE Emax 2 circuit breakers equipped with Ekip Touch electronic trip units can be integrated into communication networks without the need for external interface devices.
The distinctive characteristics of the SACE Emax 2 circuit breakers offering for industrial communication are:

- **Wide range of protocols supported;** the Ekip Com communication modules enable integration with the most common communication protocols based on RS485 serial lines and the most modern communication systems based on EtherNet™ infrastructures, which guarantee an exchange of data in the order of 100 Mbit/s.
- **Installation times reduced to a minimum** due to the plug & play technology of the communication modules, which are connected directly to the circuit breaker terminal box without having to remove the electronic trip unit.
- **Repetition of communication for greater reliability of the system**; the circuit breaker can be equipped with two communication modules at the same time, allowing the information on two buses to be exchanged simultaneously.
- **Ready to smart grid**; the Ekip Com 61850 module is the solution for integrating SACE Emax 2 circuit breakers into the automated systems of electrical substations based on the IEC 61850 standard without the need for complex external devices.
- **Complete supervision** of Modbus RTU or Modbus TCP/IP networks via the software for PC Ekip View.



	Supervision of the electrical installation		
Electronic trip unit	**Ekip Touch**	**Ekip Touch + Ekip measuring module**	**Ekip Hi Touch**
		Ekip G Touch	**Ekip Hi-G Touch**
Solution	Ekip Touch trip units + Ekip com modules		
Protocols supported:			
Modbus RTU	Ekip com Modbus RTU		
Profibus-DP	Ekip com Profibus		
DeviceNet™	Ekip com DeviceNet™		
Modbus TCP/IP	Ekip com Modbus TCP		
Profinet	Ekip com Profinet		
EtherNet/IP™	Ekip com EtherNet™		
IEC61850	Ekip com IEC61850		
Open ADR	Ekip com OpenADR		
Hub	Ekip com Hub		
Control functions			
Circuit breakers opening and closing [1]	●	●	●
Measurement functions			
Currents	●	●	●
Voltages	-	●	●
Powers	-	●	●
Energies	-	●	●
Harmonics	-	-	●
Network analyzer	-	-	●
Data logger	●	●	●
Adjustment functions			
Setting of thresholds	●	●	●
Resetting of alarms	●	●	●
Diagnostic			
Protection function alarms	●	●	●
Device alarms	●	●	●
Protection unit tripping details	●	●	●
Events log	●	●	●
Protection unit tripping log	●	●	●
Maintenance			
Number of operations	●	●	●
Number of trips	●	●	●
Wear of contacts	●	●	●
Other data			
Status of circuit breaker	●	●	●
Circuit breaker position [2]	●	●	●
Local/remote mode	●	●	●

1) Circuit breakers equipped with Ekip Com Actuator module, electrical accessories, opening and closing releases and spring charging motor
2) Circuit breakers equipped with auxiliary contacts to indicate position

Ekip E-Hub
This is a DIN-rail mounted communication module for cloud-connectivity. Ekip E-Hub can collect data throughout the system from ACBs to MCCBs, multimeter, miniature CBs. Moreover, it is possible to connect sensors for environmental parameters (temperature, water, gas) via both analog and digital I/O. Modules for Wi-Fi or GPRS connection are provided as optional features.

Software and web application
Ekip connect

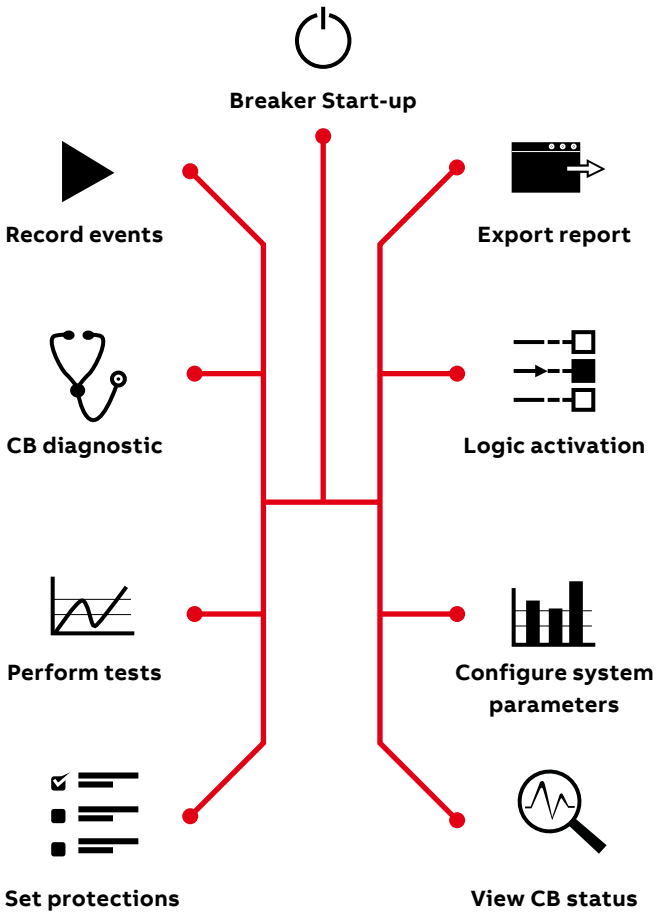
ABB SACE offers software applications that allow the potential of the Ekip electronic trip units to be utilized in the best possible way in terms of the management of power, acquisition and analysis of the electrical values, and testing of the protection, maintenance and diagnostic functions.

Overview of the software
An overview of the software available and their main characteristics are given below:

Software	Functions	Distinctive characteristics
Ekip Connect	- commissioning of circuit breakers - analysis of faults - testing of communication bus	- simple and intuitive use - integrated with DOC electrical design software - useable via EtherNet™ - automatic updating from Internet - off-line mode - multi-media (smart phone, tablet or PC)
Ekip View	- supervision and control of communication networks - analysis of electrical value trends - condition monitoring	- engineering free - analysis of past trends - customizable reports - access via Internet to the installation - possibility of integrating third party devices
ABB Ability™ Electrical Distribution Control System	- monitoring of plants - optimization of the plant - control center	- alerts notification via mail - automatic report for energy efficiency - asset management

Ekip Connect
The ABB programming and commissioning software tool that allows the user to unlock the full potential of circuit breakers, improving the efficiency of the electrical plant.
A circuit breaker is an essential part of any electrical system that guarantees that the day-by-day processes can be performed safely and continuously. For this reason, it is vital that the installation and use of the circuit breaker is made as error-free and simple as possible.
From commissioning to implementation, through monitoring, testing and analysis, Ekip Connect is the perfect tool for guiding the user in the management of ABB circuit breakers throughout the whole product life cycle.

Ekip Connect is the ABB commissioning and programming software that allows the potential of Ekip electronic trip units to be fully realized. Using Ekip Connect, the user can manage power, acquire and analyze electrical values, and test protection, maintenance and diagnostic functions.
Just as Emax 2 has evolved into a true power manager that has simplified the electrical plant, so too has Ekip Connect software become the user's key to access the full capability of the breaker.



Software and web application
Ekip connect

—
Panel builders
- 50% commissioning time

Ease of use
Imagine you are a panel builder. You have to commission a circuit breaker and you need to save time. You can! Using Ekip Connect it is possible to cut commissioning time by up to 50%. Providing a stress-free interaction with the device complexity, Ekip Connect 's easy-to-use software has all the answers.
Ekip Connect’s simple and intuitive interface means that, from the very start, it is possible to easily navigate through the tool and access every circuit breaker operation. At a glance, the user can see all the information he needs, giving him the possibility to quickly and effectively assess any situation.

—
Facility manager
100% full exploitation
of your device

Full exploitation
Imagine you are a facility manager. You need to perform fast and precise diagnosis in order to have everything under control and avoid failures. You can! Using Ekip Connect you can exploit the full capabilities of your device and thanks to the
customizable dashboard you can organize the functions displayed, just the way you want it. It is possible to manage all the CB settings and specifications directly with Ekip Connect, making it the perfect instrument for exploring and using the breaker.
Diagnostics are easy too: It is possible to consult and download the log of events, alarms and unit trips, thereby facilitating the identification and understanding of any anomalies.
This software able to manage all ABB low-voltage circuit breakers equipped with an electronic trip unit, giving a full integration of air and molded case circuit breakers.

—
Consultant/system
integrator
Complex logic at your
fingertips

Product enhancement
Imagine you are a consultant or a system integrator and you want to implement advanced features while avoiding the risk of errors. You can! Using Ekip Connect it’s possible to implement complex logic with a few clicks of your mouse.
To add, set and manage advanced functions has never been so easy. Automatic transfer switch logic, load shedding, advanced protection and demand management can be managed and
easily set through the Ekip Connect software.
Expand software features by purchasing and downloading software packages for advanced functions directly using Ekip Connect.

Accessing the full potential of the circuit breaker is finally possible. Thanks to Ekip Connect software, you can achieve complete utilization of the breaker and more with a few clicks of your mouse.

Configuration
- Set protections
- Configure system and communication parameters
- Breaker start-up

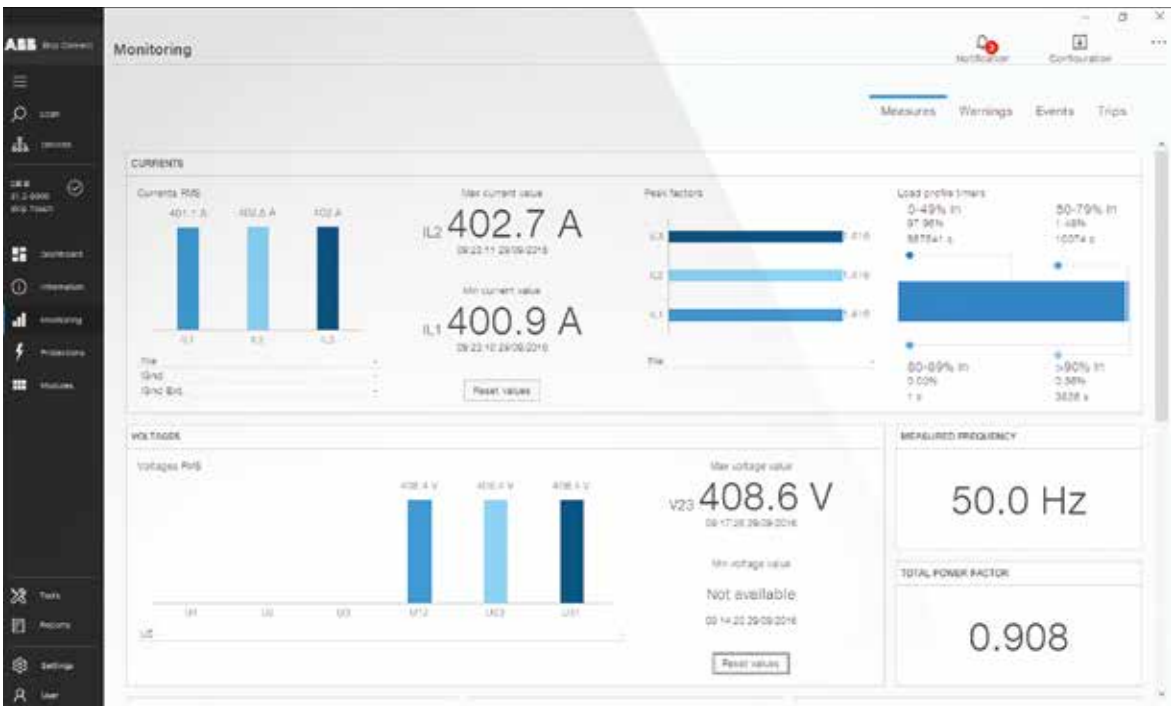
Monitoring & analysis
- View CB status and measure
- Read events list
- CB diagnostic

Product implementation
- Set advanced protections
- Logic activation
- Enable advanced functions

Test

Testing & reporting
Check correct functionality
Perform tests
Export report

Ekip Connect is available for free download at http://www.abb.com/abblibrary/Download-Center/

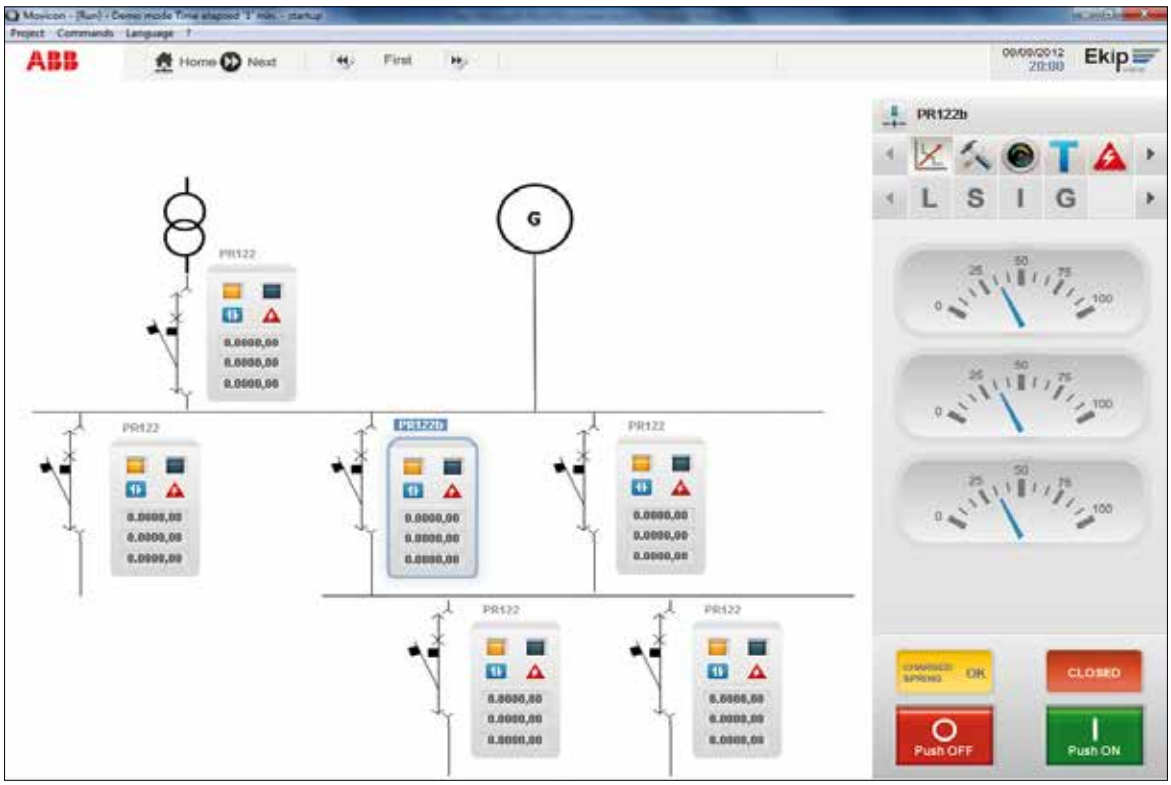


Software and web application
Ekip View

Ekip View is the software for supervising devices connected to a communication network that uses the Modbus RTU or Modbus TCP protocol.

It is the ideal tool for all applications that require:
- remote control of the system,
- monitoring of power consumption,
- fault detection of the system,
- allocation of energy consumption to the different processes and departments,
- preventative planning of maintenance.

The main characteristics of Ekip View are:
- **Engineering free** and ready to use **software** which guides the user in the recognition and configuration of the protection units without the need for any supervision system engineering activities.
- **Dynamic mimic panel;** after automatic scanning of the network, for each of the devices found, Ekip View proposes a dynamic symbol that summarizes the most important information (status, electrical measurements, alarms). The extensive library of electrical symbols enables the entire electrical system to be depicted in detail.
- **Analysis of trends;** the instantaneous and past trends of currents, powers and power factors are represented graphically and can be exported into Microsoft Excel for detailed analysis.
- **Reports;** advanced reports can be created regarding system and communication network diagnostics. Using the Alarm Dispatcher option, the user can receive the most important indications via SMS or e-mail.
- **Access via web** to the installation, due to the Web Server function of Ekip View.



	Ekip View Software	
Communication characteristics		
Protocol Supported	Modbus RTU	Modbus TCP
Physical layer	RS 485	EtherNet™
Maximum data exchange rate	19200 bps	100 Mbps
Operating system	Windows XP, Windows 7, Windows Vista	
Devices supported		
SACE Emax 2 trip units	Ekip com Modbus RS485	Ekip com Modbus TCP
SACE Emax,T7,X1,T8 trip units	PR120/D-M, PR330/D-M	-
SACE Tmax T trip units	PR222DS/PD, PR223DS	-
SACE Tmax XT trip units	Ekip com	-
Third party devices	optional [1]	optional [1]
Licences available	- up to 30 [2] controllable devices	- up to 30 [2] controllable devices
	- up to 60 [2] controllable devices	- up to 60 [2] controllable devices
	- unlimited number [3] controllable devices	- unlimited number [3] controllable devices
Supervision and control functions		
Opening and Closing of circuit breakers [4]	●	●
Electrical value trends	●	●
Log of electrical value trends	●	●
Dynamic installation mimic panel	●	●
Automatic scanning	●	●
Centralized synchronizing of time	●	●
Web server function [6]	● [5]	● [5]
Measurement functions		
Currents	●	●
Voltages	●	●
Powers	●	●
Energies	●	●
Harmonics	●	●
Network analyzer	●	●
Data logger	●	●
Adjustment functions		
Setting of thresholds	●	●
Resetting of alarms	●	●
Diagnostics		
Protection function alarms	●	●
Device alarms	●	●
Communication system alarms	●	●
Protection unit tripping details	●	●
Events log	●	●
Protection unit tripping log	●	●
Generation of Reports	●	●
Maintenance		
Number of operations	●	●
Number of trips	●	●
Wear of contacts	●	●
Other data		
Status of circuit breaker	●	●
Circuit breaker position [7]	●	●
local/remote mode	●	●

1) Contact ABB SACE to integrate other devices in the Ekip View software
2) can be increased
3) within the physical limit of the protocol used
4) circuit breakers equipped with Ekip com Actuator module and electrical accessories
5) two client web accesses included in the licence
6) according to the values supported by the trip units
7) circuit breakers equipped with auxiliary contacts for position indication

Software and web application
ABB Ability Electrical Distribution Control System

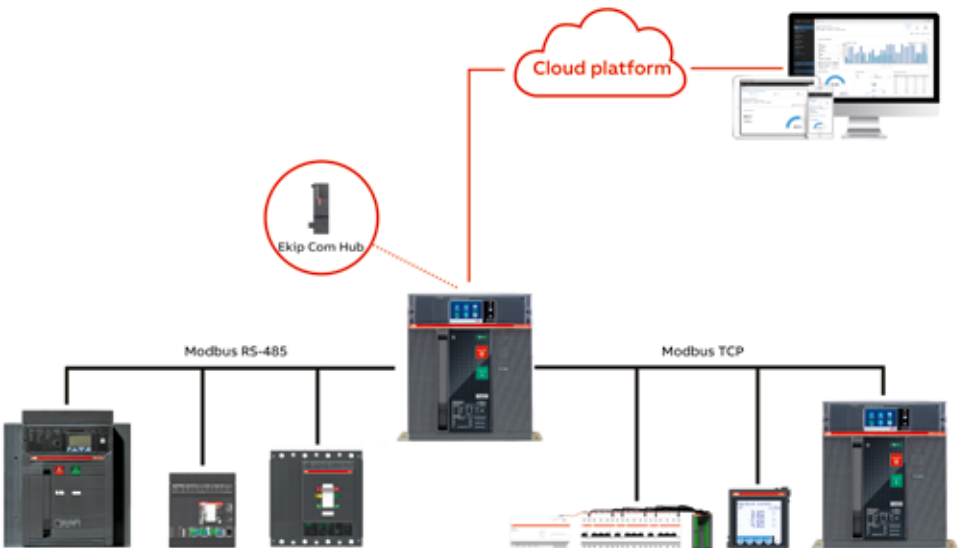
ABB Ability™ Electrical Distribution Control System is the innovative cloudcomputing platform designed to monitor, optimize and control the electrical system.

Part of the ABB Ability™ offering, ABB Ability™ Electrical Distribution Control System is built on a state-of-the-art cloud architecture for data collection, processing and storage. This cloud architecture has been developed together with Microsoft in order to enhance performance and guarantee the highest reliability and security. Through a compelling web app interface, ABB Ability™ Electrical Distribution Control System assists anytime and anywhere via smartphone, tablet or personal computer so the user can:

- **Monitor**
  Discover plant performance, supervise the electrical system and allocate costs.
- **Optimize**
  Schedule and analyze automatic reports, improve the use of assets and take the right business decision.
- **Control**
  Set up alerts and notify key personnel, and remotely implement an effective power management strategy to achieve energy savings in a simple way.

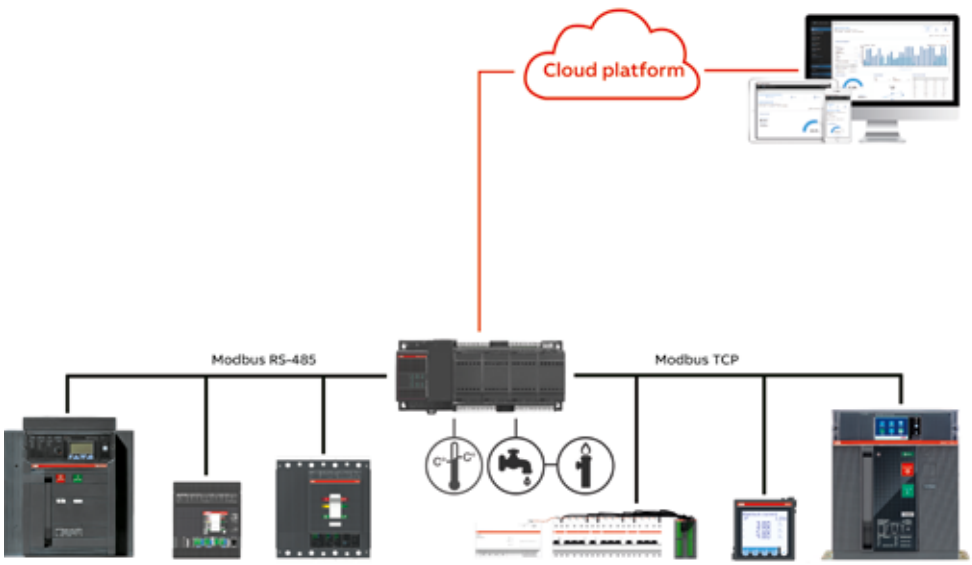
ABB Ability™ Electrical Distribution Control System also provides access on a multi-site level - monitoring and comparing the performances of different facilities at the same time. In addition, it allows profiling of the users' experience according to the level of access they require. According to the customer needs and application, the user can choose between two configurations to connect the system to ABB Ability™ Electrical Distribution Control System: embedded or external.The first, just a cartridge-type module, the innovative Ekip Com Hub, has to be provided to Emax 2 circuit breaker.
The second, the Ekip E-Hub module has to be mounted on DIN-rail.

Embedded solution with Ekip Com Hub
Emax 2 equipped with the new Ekip Com Hub establishes the cloud connection for the whole switchboard. This dedicated cartridge type communication module just needs to be inserted into the terminal box and connected to the internet.



External solution with Ekip E-Hub
The Ekip E-Hub module can be mounted on DIN rail to collect data throughout the system.
Moreover, it is possible to connect sensors for environmental parameters (temperature, water, gas) via both analog and digital I/O.
Modules for Wi-Fi or GPRS connection are provided as optional features.

For any further information please visit our website : http://new.abb.com/low-voltage/launches/abb-ability-edcs.



CHAPTER 6

Accessories

Functional areas

The new SACE Emax 2 circuit-breakers have been designed to optimize the installation and commissioning of accessories.

The front of the circuit-breaker features two functional areas, which are protected by separate covers:

Accessories area for the installation of accessories inside the circuit-breaker and Ekip trip unit. The areas dedicated to accessories can be accessed by removing the flange and the accessories covers. On removal, the operating mechanism area remains segregated and protected, providing safety for operators.

- **Safety area**, which delimits the housing of the stored energy operating mechanism of the circuit-breaker. To carry out maintenance on the operating mechanism, the covers of the accessories and safety area must be removed.

The auxiliary connection terminal box also features two areas:

- **Terminal area** for housing and inserting the terminals for wiring the auxiliary connections. The terminals can be wired first and then installed on the circuit-breaker terminal box, thereby facilitating cable connection for the operator.
- **Cartridge module area**, housing for the Ekip modules. These are installed directly on the upper part of the circuit-breaker or of the fixed part without having to remove the Ekip electronic trip unit, thereby minimizing the time required for the installation and commissioning of accessories.

Standard supply

The fixed versions of SACE Emax 2 automatic circuit-breakers and switch-disconnectors are always supplied as standard with the following accessories:
- IP30 protection for switchgear door
- lifting plates for E2.2 … E6.2 circuit-breaker
- front terminals for E1.2 circuit-breaker
- adjustable rear terminals for E2.2 … E6.2 circuit-breaker, mounted in HR – HR configuration.

In addition, for **fixed automatic circuit-breakers** only:
- four standard open/closed auxiliary contacts - AUX 4Q 400V
- four terminals for auxiliary connections
- mechanical signalling of the tripping of the protection trip unit - TU Reset
- contact signalling tripping of Ekip protection trip unit S51 250V.

The withdrawable versions of automatic circuit-breakers and switch-disconnectors are always supplied as standard with the following accessories:
- closed circuit-breaker racked-out mechanism lock
- lifting plates for E2.2 ... E2.6 circuit-breakers
- lever for racking in and racking out
- anti-insertion lock
- anti-racking out device (fail safe).

In addition, for **withdrawable automatic circuit-breakers** only:
- four standard open/closed auxiliary contacts - AUX 4Q 400V
- four terminals for auxiliary connections
- mechanical signalling of the tripping of the protection trip unit - TU Reset
- contact signalling tripping of Ekip protection trip unit S51 250V.

The fixed parts feature:
- IP30 protection for switchgear door
- anti-insertion lock
- standard shutter lock – SL
- adjustable rear terminals, mounted in HR – HR configuration.

Accessories for circuit breakers

SACE Emax 2 circuit-breakers offer a wide range of accessories developed to satisfy the application and installation requirements of every customer.

	Automatic circuit-breaker		Switch-disconnector	
	E1.2	E2.2 - E4.2 - E6.2	E1.2	E2.2 - E4.2 - E6.2
Signalling				
Standard open/closed auxiliary contacts - AUX 4Q	● / ●●	● / ●●	○ / ○○	○ / ○○
Open/closed auxiliary contacts - AUX 6Q	-	○ / ○○	-	○ / ○○
Open/closed auxiliary contacts- AUX 15Q	○ / △	○ / △	○ / △	○ / △
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	● / ●●	● / ●●	-	-
Second contact signalling tripping of Ekip protection trip unit - S51/2	-	○ / ○○	-	-
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 and padlock in open position - KLC and PLC	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Key lock and padlock in racked-in / test / racked-out position - KLP and PLP	△	○○	△	○○
Shutter lock - SL	▲	▲	▲	▲
Lock for racking-out mechanism with circuit-breaker in closed position	▲	●●	▲	●●
Lock for racking in / racking out the mobile part when the door is open - DLR	-	△	-	△
Lock to prevent door opening when circuit-breaker is in racked-in / test position - DLP	-	△	-	△
Lock to prevent door opening when circuit-breaker is in closed position - DLC	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Anti-insertion lock	● / ●●	● / ●●	● / ●●	● / ●●
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	○ / △	○ / △	○ / △	○ / △
Interlocks and switching devices				
Mechanical interlock - MI	○ / ○○ / △	○ / ○○ / △	○ / ○○ / △	○ / ○○ / △
Automatic transfer switches - ATS **	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Fail Safe	●	●	●	●

● Standard accessory for fixed circuit-breaker
○ Accessory on request for fixed circuit-breaker
●● 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
** IEC only

Signalling

Open / closed auxiliary contacts - AUX (Fig. 01A/B/C)

SACE Emax 2 circuit-breakers can be equipped with auxiliary contacts that signal the open or closed status of the circuit-breaker. The first block of four standard contacts is always provided with the automatic circuit-breakers. The switching contacts are available in the following configurations:

Fig. 01-A

Fig. 01-B

Fig. 01-C

Open / closed auxiliary contacts (AUX 4Q)		E1.2	E2.2 ... E6.2
4 auxiliary contacts	standard	●	●
	digital signals	●	●
	mixed	●	●
Open / closed supplementary auxiliary contacts (AUX 6Q)			
6 auxiliary contacts	standard	-	●
	digital signals	-	●
	mixed	-	●
Open / closed external supplementary auxiliary contacts (AUX 15Q)			
15 auxiliary contacts	standard	●	●
	digital signals	●	●
Maximum number of open / closed auxiliary contacts that can be installed		19	25

		Standard contact	Contact for digital signals
Type		changeover contacts	changeover contacts
Minimum load		100mA @ 24V	1mA @ 5V
Breaking capacity			
DC	24V	-	0.1A
	125V	0.3A @ 10ms	-
	250V	0.15A @ 10ms	-
AC	250V	5A @ cosφ 1	-
		5A @ cosφ 0.7	-
		5A @ cosφ 0.3	-
	400V	3A @ cosφ 1	-
		2A @ cosφ 0.7	-
		1A @ cosφ 0.3	-

Electrical diagram reference: figures 1, 81, 91

Aux 6Q is an alternative to the Ekip Signalling 4K module. AUX 15Q is an alternative to the mechanical interlock (MI), the DLC for E1.2 lock or the DLP lock if mounted on the right side.

Accessories for circuit breakers

Fig. 02-A

Fig. 02-B

Auxiliary position contacts - AUP (Fig. 02A/B)

When the circuit breaker is a withdrawable version, the position of the mobile part can be signalled electrically by accessorizing the fixed part with one of the following signalling contact units:

Auxiliary position contacts (AUP)		**E1.2**	**E2.2 ... E6.2**
6 auxiliary contacts	standard	●	-
	digital signals	●	-
5 auxiliary contacts	standard	-	●
	digital signals	-	●
5 supplementary auxiliary contacts	standard	-	●
	digital signals	-	
Maximum number of auxiliary position contacts that can be installed		6	10

		Standard contact	**Contact for digital signals**
Type		changeover contacts	changeover contacts
Minimum load		100mA @ 24V	1mA @ 5V
Breaking capacity			
DC	24V	-	0.1A
	125V	0.3A @ 0ms	-
	250V	0.15A @ 0ms	-
AC	250V	5A @ cosφ 1	-
		5A @ cosφ 0.7	-
		5A @ cosφ 0.3	-
	400V	3A @ cosφ 1	-
		2A @ cosφ 0.7	-
		1A @ cosφ 0.3	-

Electrical diagram reference: figures 95, 96, 97

Fig. 03

Ready to close signalling contact - RTC (Fig. 03)

The ready to close signalling contact – RTC – indicates that the circuit breaker is ready to receive the closing command. The circuit breaker is ready to close when the following conditions have been met:

- circuit breaker open
- springs loaded
- no opening command or locks on the opening command
- circuit breaker reset following tripping of Ekip protection trip unit.

		Standard contact	**Contact for digital signals**
Type		Switching	
Minimum load		100mA @ 24V	1mA @ 5V
Breaking capacity			
DC	24V	-	0.1
	250V	0.5A @ 0ms / 0.2A 10ms	-
AC	250V	3A @ cosφ 0.7	-

Electrical diagram reference: figure 71

Fig. 04

Mechanical signalling of the tripping of protection trip unit - TU Reset (Fig. 04)
The automatic circuit breakers are always equipped with a mechanical device that signals the tripping status of the protection trip units. After the Ekip trip unit has tripped due to an electrical fault, the signalling device clearly indicates the tripping status on the front of the circuit- breaker. The circuit breaker can be reset only after the signalling pushbutton has been restored to its normal operating position. The device conforms to the Ansi 86T standard.
Emax 2 is fitted with the anti-pumping function. With the anti-pumping function the opening order always takes priority over a closing order. Moreover, when the Circuit Breaker is in open position due to a trip, the anti-pumping function allows the reclosing of the operating mechanism only after a reset of the trip, avoiding improper or accidental closing.

Fig. 05

Contact signalling tripping of protection trip unit Ekip – S51 (Fig. 05)
The contact signals the opening of the circuit- breaker after the Ekip protection trip unit has tripped. The circuit breaker can only be closed after the “TU Reset” tripped trip unit mechanical signalling pushbutton has been restored to its normal operating position.
The switching contact, which is always supplied with the standard version of the automatic circuit breakers, is also available on request in a version for digital signals (for electrical characteristics, please refer to the RTC contact). It can also be associated with an optional accessory for resetting by remote control - YR. For electromechanical characteristics, please refer to the RTC contact.
For E2.2, E4.2 and E6.2 it is possible to double the signal for the tripping of the Ekip Trip Unit specifying the dedicated code for the S51/2. The S51/2 is an alternative of the YR contact.

Electrical diagram reference: figure 11

Contact signalling loaded springs – S33 M/2
This contact is always supplied with a geared motor; it remotely signals the spring status of the circuit-breaker operating mechanism. It is available in both standard version and version for digital signals.

		Standard contact	Contact for digital signals
Type		changeover contacts	changeover contacts
Minimum load		100mA @ 24V	1mA @ 5V
Breaking capacity			
DC	24V	-	0.1A
	125V	0.3A @ 0ms	-
	250V	0.15A @ 0ms	-
AC	250V	5A @ cosφ 1	-
		5A @ cosφ 0.7	-
		5A @ cosφ 0.3	-
	400V	3A @ cosφ 1	-
		2A @ cosφ 0.7	-
		1A @ cosφ 0.3	-

Electrical diagram reference: figure 12

Accessories for circuit breakers

Control

Opening and closing release- YO/YC (Fig. 06)
The opening and closing releases enable the circuit breaker to be controlled remotely. Opening is always possible, while closing is available only when the closing springs of the operating mechanism are loaded and the circuit breakers is ready to close. The releases operate by means of minimum impulse current duration time of 100 ms.
Furthermore, they can operate in permanent service. In this case, if opening command is given by means of the opening release, the circuit breaker can be closed by de-energizing the opening release and, after a time of at least 30 ms, by controlling the closing.
The circuit breaker operating mechanism has an anti-pumping function that ensures safety and reliability.

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Electrical diagram reference: figures 75, 77

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Fig. 06

Second opening and closing release - YO2/YC2
For certain installations the redundancy of mechanisms and circuit breaker operating circuits is often requested. To answer these needs, the SACE Emax 2 circuit breakers can be equipped with double opening release and double closing release. The technical characteristics of the second opening release remain the same as those of the first opening and closing release. A double closing release can be used for E2.2, E4.2 and E6.2 circuit breakers; a second open release in an alternative to undervoltage release.

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Electrical diagram reference: figures 72, 79

General characteristics			
Power supply (Un)		**AC**	**DC**
	24V	●	●
	30V	●	●
	48V	●	●
	60V	●	●
	110V...120V	●	●
	120V...127V	●	●
	220V...240V	●	●
	240V...250V	●	●
	380V...400V	●	-
	415V...440V	●	-
	480V...500V	●	-
Operating limits (IEC60947-2 standards)		YO/YO2: 70%...110% Un YC/YC2: 85%...110% Un	
Inrush power (Ps)		300VA	300W
Continuous power (Pc)		3.5VA	3.5W
Opening time (YO/YO2)			
	E1.2	35 ms	
	E2.2 ... E6.2	35 ms	
Closing time (YC/YC2)			
	E1.2	50 ms	
	E2.2 ... E6.2	70 ms	

Opening and closing release test unit - YO/YC Test Unit

The opening and closing releases test unit helps ensure that the various version of releases are running smoothly, to guarantee a high level of reliability in controlling circuit breaker opening.
The test unit ensures the continuity of the opening and closing releases with a rated operating voltage between 24V and 250V (AC and DC), as well as verifies the functions of the opening and closing coil electronic circuit. Continuity is checked cyclically with an interval of 30s between tests. The unit has optic signals via LEDs on the front, which provide the following information:
POWER ON: correct power supply of the YO/YC Test Unit
OPEN ON: coil switch absent, power supply absent or insufficient, interrupted cables
SHORT ON: coil switch failure, short-circuited cables
OPEN and SHORT FLASHING: faulty coil switch or incorrect supply
OPEN and SHORT OFF: correct operation of the coil switch.
Two relays with one change-over area also available on board the unit, to allow remote signalling of the following events:
Failure of a test - resetting takes place automatically when the alarm stops
Failure of three tests - resetting occurs only by pressing the manual RESET on the unit.

Characteristics of device		
Auxiliary power supply		24V...250V AC/DC
Specification of the signalling relays		
	Maximum interruped current	6A
	Maximum interrupted voltage	250V AC

Undervoltage release – YU (Fig. 07)

The undervoltage release opens the circuit- breaker when there is a significant voltage drop or power failure. It can be used for safe remote tripping, for blocking closing or to control the voltage in the primary and secondary circuits. The power supply for the release is therefore obtained on the supply side of the circuit breaker or from an independent source. Circuit breaker closing is permitted only when the release is powered. The undervoltage release is an alternative to as second shunt trip or the anti-racking out device. The circuit breaker is opened with trip unit power supply voltages of 35-70% Un. The circuit breaker can be closed with a trip unit power supply voltage of 85-110% Un.

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Fig. 07

General characteristics			
Power supply (Un)		AC	DC
	24V	●	●
	30V	●	●
	48V	●	●
	60V	●	●
	110V...120V	●	●
	120V...127V	●	●
	220V...240V	●	●
	240V...250V	●	-
	380V...400V	●	-
	415V...440V	●	-
	480V...500V	●	-
Inrush power (Ps)		300VA	300W
Continuous power (Pc)		3.5VA	3.5W
Opening time (YU)			
	E1.2	30 ms	
	E2.2 ... E6.2	50 ms	

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Electrical diagram reference: figure 73

Accessories for circuit breakers

Fig. 08

Time-delay device for undervoltage release (UVD) (Fig. 08)

The undervoltage release can be combined with an electronic time-delay device for the circuitbreaker, allowing for delayed external tripping with adjustable preset times. Use of the delayed undervoltage trip unit is recommended to prevent tripping when the power supply network for the trip unit is subject to brief voltage drops or power supply failures. Circuit-breaker closing is inhibited when it is not powered. The time-delay device must be used with an undervoltage release with the same voltage.

General characteristics			
Power supply (UVD)		AC	DC
	24-30V	-	●
	48V	●	●
	60V	●	●
	110-127V	●	●
	220-250V	●	●
Adjustable opening time (YU + D):		0.5-1-1.5-2-3 s	

Resetting remotely- YR

The reset coil YR permits remote resetting of the circuit-breaker after a release has tripped due to an overcurrent condition. It is available for all automatic circuit-breakers, in different voltage supply:

General characteristics			
Power supply (Un)		AC	DC
	24V	●	●
	110V	●	●
	220V	●	●
Operating limits		90%...110% Un	

Electrical diagram reference: figure 4

Motor – M (Fig. 09A/B)

The motor automatically loads the closing springs of the circuit-breaker. The device, which can be installed from the front, automatically reloads the springs of the operating device when they are unloaded and power is present. In the event no power is present, the springs can be manually loaded by a dedicated lever on the operating device. The motor is always supplied with the limit switch contact S33 M/2 which signals the status of the springs.

Fig. 09A

Fig. 09B

General characteristics			
Power supply (Un)		AC	DC
	24V-30V	●	●
	48V-60V	●	●
	100V...130V	●	●
	220V...250V	●	●
	380V...415V	●	-
	440V...480V (E2.2 ... E6.2)	●	-
Operating limits (IEC60947-2 standards)		85%...110% Un	
Inrush power (Ps)		300VA E1.2 500VA E2.2 ... E6.2	300W E1.2 500W E2.2 ... E6.2
Inrush time		200ms	
Continuous power (Pc)		100VA E1.2 150VA E2.2 ... E6.2	100W E1.2 150W E2.2 ... E6.2
Charging time			
	E1.2	8 sec	
	E2.2 ... E6.2	7 sec	

Electrical diagram reference: figure 13

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Fig. 10

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Fig. 11

—
Fig. 12

—
Fig. 13

Safety

Anti-racking out device / Fail safe - FS

The anti-racking out, or fail safe device prevents the moving part of a drawout circuit breaker from being racked out of the cradle when the springs are charged. It is always supplied with the moving part of a UL version drawout circuit breaker or switch and is an alternative to the undervoltage coil or second shunt coil.

Key lock in open position - KLC (Fig. 10)

Due to these safety devices, the SACE Emax 2 circuit-breaker can be locked in the open position. The lock can also be used during maintenance activities when the shield of the accessories area is removed. The device is available with lock with different keys – KLC-D (for only one circuit- breaker) or with the same keys – KLC-S (for several circuit-breakers). Four different key numbers are available for the KLC-S. SACE Emax 2 also allows alternative key lock to be installed. The following key lock set-ups are also available:

- Ronis
- STI
- Kirk
- Castell

In this case, the key locks must be supplied by the customer.

Padlocks - PLC (Fig. 11)

These padlock options allow the circuit-breaker to be kept open by acting directly on the mechanical operating device (opening pushbutton). Three different padlock versions are available:

- Locking device with plastic structure for up to a maximum of three padlocks of 4 mm
- Locking device with metal structure for up to a maximum of two padlocks of 8 mm
- Locking device with metal structure for one padlock of 7 mm or for padlock holders

The padlocks must be supplied by the customer. This device is an alternative to the PBC.

Key lock in racked-in / test / racked-out position - KLP (Fig. 12)

This device enables the mobile part to be locked in one of the three positions: racked-in, test and racked-out. This device can be supplied with locks with different keys – KLP-D or with the same keys – KLP-S.

A second key lock option can be added for a maximum of two key locks per breaker. Locking in the racked-in, test and racked-out positions can be achieved by using other key locks – KLP-A.

Adapters are offered for acceptance of Ronis, STI, Kirk and Castell locks, which are to be provided by the customer. With the exception of the Castell version, every circuit-breaker can accept up to two key locks. Moreover, it is possible to allow locking only when in the racked-out position with a supplementary accessory.

Padlock in racked-in / test / racked-out position - PLP (Fig. 13)

This device can hold up to three padlocks of 8 mm in diameter. The structure housing the padlocks can also be used in combination with the 2 lock KLP keylock option. Furthermore, it enables the lock of the moving part in the racked-out position only by means of the supplementary lock in racked-out position.

Shutter lock – SL

When the mobile part is in the test position, the shutters of the fixed part close, maintaining the insulation distance and physically segregating the live parts of the of the cradle from the internal breaker compartment of the cradle. Using two dedicated mechanisms, the upper and lower shutters can be locked independently of one another. The shutter lock is always supplied with the fixed part of the SACE Emax 2 circuit-breakers and locks the shutters, using a maximum of three padlocks of 4 mm, 6 mm or 8 mm.

Accessories for circuit breakers

Fig. 14

Protection devices

Lock for racking-out mechanism with circuit- breaker in closed position (Fig. 14)
All SACE Emax 2 withdrawable circuit breakers are always supplied with a lock that prevents the mobile part from being racked in and racked out when the circuit- breaker is in the closed position. To rack in the mobile part, the circuit breaker must be in the open position.

Lock for racking in / racking out the mobile part when the door is open - DLR
This accessory, which is mounted on the fixed part, prevents the mobile part from being racked in or out when the switchgear door is open.

Fig. 15

Lock to prevent door opening when the circuit- breaker is in racked-in / test position - DLP (Fig. 15)
This safety device prevents the switchgear door from being opened when the mobile part of the withdrawable version of the circuit breaker is in the racked-in or test position.
The circuit breaker can only be racked in when the door is open, which is then closed. This accessory can be installed on either the right-hand or left-hand side of the fixed part. It is available for circuit breakers E2.2, E4.2 and E6.2.
If mounted on the right side, it is an alternative to the mechanical interlock, the AUX 15Q or the DLC.

Fig. 16

Lock to prevent door opening when the circuit- breaker is in the closed position - DLC (Fig. 16)
This prevents the compartment door from being opened when the circuit breaker is in the closed position (and with the circuit breaker racked in for withdrawable circuit breakers).
It also blocks the circuit breaker from closing when the compartment door is open. DLC for E1.2 is an alternative to the mechanical interlock and the AUX 15Q. DLC direct door for E2.2...E6.2 is compatible with mechanical interlocks type A-B-D and the AUX 15Q. DLC cable door for E2.2...E6.2 is not compatible with mechanical interlock. DLC cable door for E2.2... E6.2 is compatible with the AUX 15Q.

Anti-insertion lock
The withdrawable circuit breakers are equipped with special locks that allow the mobile part to be inserted only into the corresponding fixed part.

Mechanical operation counter - MOC (Fig. 17)
The number of mechanical operations is often one of the elements that determines the frequency of ordinary maintenance operations on circuit breakers. With this mechanical operation counter, which is always visible on the front of the circuit breaker, the user knows how many mechanical operations the device has performed.

Fig. 17

Protection device for opening and closing pushbuttons - PBC (Fig. 18)
This accessory is applied to the safety cover of the circuit breaker and is available in two versions:
- Pushbutton protection device, which blocks operations on both the opening and closing pushbuttons unless the special key is used.
- Padlockable pushbutton protection device, which makes it possible to block either or both pushbuttons and lock the covers in place. It does not trip the breaker as a standard "Padlock device" would.
- PBC is an alternative to PLC padlocks.

Fig. 18

IP30 Protection (Fig. 19)
Supplied with every circuit breaker, the cover frame is installed on the door of the switchgear to achieve IP30 degree of protection on the front part of the circuit breaker.

IP54 Protection (Fig. 20)
This transparent cover completely protects the front of the circuit breaker, enabling an IP54 degree of protection to be achieved. This accessory is provided with double key lock (same or different keys).

Terminal covers – HTC / LTC (Fig. 21)
These accessories are installed over in the terminal area, thereby reducing the risk of direct contact with the live parts of the circuit breaker. Two versions are available for E1.2: HTC high terminal covers and LTC low terminal covers.

Fig. 19

Separators - PB (Fig. 22)
These protection devices increase the insulation distance between adjacent phases. They are available for all the frames.

0-ARC Distance top cover
This accessory allows the circuit breakers to reach the 0-arc distance performance. Installable on the fixed part of E2.2, E4.2 and E6.2 gives the possibility to dimension the cubicle at the same height of the fixed part. The 0-arc distance top cover is not compatible with the AUP auxiliary contacts IEC version, but alternatively it is possible to install the AUP auxiliary contacts UL version.

Fig. 20

Fig. 21

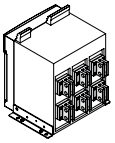
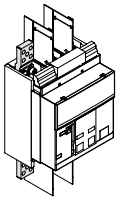
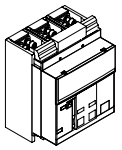
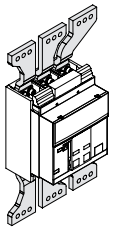
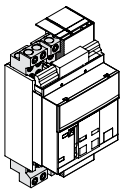
Fig. 22

Accessories for circuit breakers

Connections

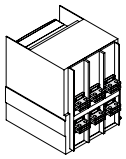
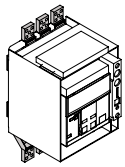
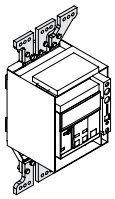
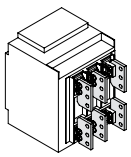
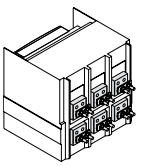
The SACE Emax 2 circuit breakers offer a wide variety of terminals, thereby always guaranteeing an optimal solution for connection to the power circuit.

Solution for fixed circuit breakers

Type	Abbreviation		E1.2	E2.2	E4.2	E6.2
Rear adjustable terminal *	HR VR		Single stab design ○ Multiple stab design			
				● Iu = 2000A	● Iu = 3600A *	● Iu = 6000A
Extended front terminal **	EF		○			
Front terminal **	F		●	○	○	○
Front spread terminal **	ES		○			
Terminal for cable FcCuAl 4x500kcmil / 240mm2 **	FcCuAl		○			

● Standard configuration
○ Configuration on request
(*) The adjustable terminals are supplied as standard in the HR – HR configuration, with exception for E4.2 L version, E4.2 3200A/3600A and E6.2 6000A in which they are supplied in VR - VR configuration.
(**) Not UL listed

Solutions for fixed parts, withdrawable circuit breakers

Type	Abbreviation		E1.2	E2.2	E4.2	E6.2
Rear adjustable terminal *	HR VR		Single stab design ●			
			Multiple stab design	● Iu = 2000A	● Iu = 3200A *	● Iu = 6000A
Extended front terminal **	EF		○			
Front spread terminal **	ES		○			
Terminal for cable FcCuAl 4x240mm² **	Fc CuAl		○			
Flat terminal **	FL			○	○	○

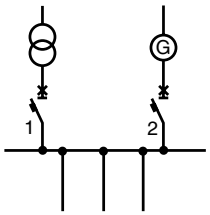
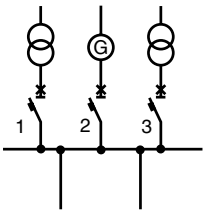
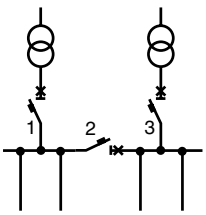
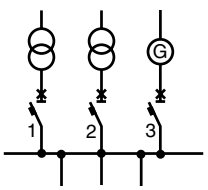
● Standard configuration
○ Configuration on request
(*) The adjustable terminals are supplied as standard in the HR – HR configuration, with exception for E4.2 L version, E4.2 3200A and E6.2 6000A in which they are supplied in VR - VR configuration.
(**) Not UL listed

Accessories for circuit breakers

Interlocks and switching devices

Mechanical interlocks

These interlock systems enable various opening and closing configurations to be obtained between two or three circuit breakers. Four types of interlock configuration are available:

Types of interlock	Possible application	Logic	Circuit breakers
Type A			
Excludes the possibility of having two circuit breakers in the closed position at the same time.	Main line power supply and emergency power supply. 	1 2 O O I O O I	Available between circuit breakers of different sizes and with any fixed / withdrawable version
Type B			
Permits a pair of circuit breakers to be closed if the third is open. The latter can only be closed when the pair is open.	Two power supplies from transformers and one emergency power supply. 	1 2 3 O O O I O O O O I I O I O I O	Available between E2.2, E4.2 and E6.2 circuit breakers and with any fixed / withdrawable version
Type C			
Permits two out of three circuit breakers to be closed at the same time.	Two half-busbars can be powered by a single transformer (bus-tie closed) or by both at the same time (bus-tie open). 	1 2 3 O O O I O O O I O O O I O I I I I O I O I	Available between E2.2, E4.2 and E6.2 circuit breakers and with any fixed / withdrawable version
Type D			
Permits one out of three interlocked circuit breakers to be closed.	Three power supplies on the same busbar that must not operate in parallel. 	1 2 3 O O O I O O O I O O O I	Available between E2.2, E4.2 and E6.2 circuit breakers and with any fixed / withdrawable version

The mechanical interlocks offer multiple solutions for installation that simplify their integration into the switchgear. The interlocks can be mounted:
- vertically VR
- horizontally HR
- mixed L

Different types of interlocks can be supplied according to the maximum distance between two interlocked breakers:

Configuration		Type A	Type B, C, D
Horizontal		2750mm	1600mm
Vertical		1000mm	1000mm
Breakers	E1.2	●	-
	E2.2	●	●
	E4.2	●	●
	E6.2	●	●

For B, C and D types, the maximum distance between the two furthest breakers is 3200mm for horizontal configurations and 2000mm for vertical configurations. It is possible to make the mechanical interlock among three circuit breakers disposed in 'L position' by using the cables of three horizontal circuit breakers interlock. Make sure the distance between the horizontal and vertical circuit-breakers respects the minimum and maximum distance. All cables can be cut to guarantee easy installation in switchboards.
Mechanical interlocks are not compatible with AUX 15Q, the lock for preventing door opening when the circuit breaker is in the closed position (DLC) or when the circuit breaker is in the racked in or test position (DLP). if mounted on the right side.

External Automatic Transfer Switches ATS
The ATS (Automatic Transfer Switch) is a network-unit transfer device used in installations where switching from the main power line to an emergency line is required in order to ensure that power is supplied to the loads in the case of power loss or abnormalities from the main line. These devices are able to control the entire transfer procedure automatically, but also offer commands for performing the procedure manually.
The new generation of ATSs (ATS021 and ATS022) offers the most advanced and complete solution for ensuring service continuity. The ATS021 and ATS022 devices can also be used with all automatic circuit breakers and switch-disconnectors of the Tmax XT family. The ATS021 and ATS022 devices have been designed to be self-powered. ATS022 is also designed for the connection of an auxiliary supply, which enables the use of further functions. The ATS021 and ATS022 devices carry out control of both power supply lines and also analyze:
- phase imbalance;
- frequency imbalance;
- phase loss.

In addition to the standard control functions, the ATS022 unit also permits:
- the priority line to be selected;
- a third circuit breaker to be controlled;
- the device to be integrated into a supervision system with Modbus communication (auxiliary supply needed);
- parameters to be read and set, and measurements and alarms to be displayed by means of a graphical display.

Typical applications are: supply of UPS (Uninterrupted Power Supply) units, operating rooms and primary hospital services, emergency power for civil buildings, airports, hotels, databases and telecommunication systems and power supply of industrial lines in continuous processes.

For correct configuration, each circuit breaker connected to the ATS021 or ATS022 device must be fitted with the following accessories:
- mechanical interlock;
- motorized control of opening and closing;
- contact for signalling status (open / closed) and contact for signalling tripping;
- contact for signalling circuit breaker racked in (for withdrawable circuit breaker).

Accessories for Ekip trip units

The electronic trip unit accessories enable utilization of all the potential of Ekip protection trip units in terms of signalling, connectivity, protection functions and testing.

	Electronic trip unit				
	Ekip DIP	**Ekip Touch**	**Ekip Hi-Touch**	**Ekip G Touch**	**Ekip G Hi-Touch**
Power supply					
Ekip Supply	○	○	○	○	○
Battery for Ekip trip units	○	○	○	○	○
Connectivity					
Ekip Com		○	○	○	○
Ekip Com Redundant		○	○	○	○
Ekip Com Actuator	○	○	○	○	○
Ekip Link	○	○	○	○	○
Ekip Bluetooth	○	○	○	○	○
Signalling					
Ekip Signalling 2K		○	○	○	○
Ekip Signalling 4K [(1)]		○	○	○	○
Ekip Signalling 10K	○	○	○	○	○
Ekip Power Controller		○	○	○	○
Measurement and Protection					
Ekip Measuring Pro		○	●	●	●
Ekip Measuring		○			
Ekip AUP	○	○	○	○	○
Ekip RTC	○	○	○	○	○
Ekip Synchrocheck		○	○	○	○
Ekip LCD		○	○	○	○
Rating Plug	○	○	○	○	○
Homopolar toroid		○	○	○	○
Toroid for differential protection		○	○	○	○
Current sensor for neutral conductor outside the circuit breaker	○	○	○	○	○
Displaying and Supervision					
Ekip Multimeter	○	○	○	○	○
Ekip Control Panel	○	○	○	○	○
Testing and Programming					
Ekip TT	○	○	●	●	●
Ekip T&P	○	○	○	○	○
Ekip T&P: Ekip Programming	○	○	○	○	○

● Standard accessory
○ Accessory on request
(1) not available for E1.2

All accessories are automatically recognized by the Ekip units without the need for any specific configuration. Based on the installation method and connection of the trip units, the electronic accessories can be divided into:

Installation	Modules	Highlights
Terminal box	Cartridge modules: - Ekip Com - Ekip Link - Ekip 2K - Ekip Supply - Ekip Synchrocheck	- The Ekip Supply module enables the trip units to be supplied with a wide range of control voltages
		- The Ekip supply module must be present for the other modules to be used
		- The Ekip Supply module has a dedicated position in the installation area in the terminal box; the other modules can be installed as desired in the positions available
		- When fitted with the Ekip Supply module, up to 2 additional modules can be installed on E1.2, and up to 3 on E2.2, E4.2 and E6.2
Accessorizing area	Ekip LCD Ekip Com Actuator Ekip RTC Ekip AUP Ekip Measuring Ekip Signalling 4K Rating Plug Battery for Ekip	- These are installed in specific housings from the front of the circuit breaker
		- For all the trip units with a touch screen interface, an LCD version is available with any adjustment in the protection and measurements functions
		- Thanks to the optional modules Ekip RTC and Ekip AUP, all the Ekip trip units can acquire and monitor the ready to close state and the racked-in/test isolated/racked-out position of the circuit breaker. The module to acquire the open/closed position is supplied as standard for all Ekip trip units.
		- The Ekip Signalling 4k module increases the remote signalling possibilities for E2.2, E4.2 and E6.2 and can be installed if the Ekip Supply module or another 24V auxiliary power supply is present
Ekip trip unit test port	Ekip T&P Ekip TT Ekip Bluetooth	- These can be connected to the front test port of the trip units even with the device in operation
		- Compatible also with the SACE Tmax XT range
External	Ekip Multimeter Ekip Control Panel Ekip 10K	- Ekip Multimeter can supply a 24V DC output to the trip unit it is connected to
		- Several Ekip units and / or Ekip Signalling 10K can be connected at the same time to the same Ekip trip unit
	External neutral sensor Homopolar toroid Differential toroid	- These are connected to the trip unit by the terminal box of the circuit breaker

Accessories for Ekip trip units

Power supply

Ekip Supply Power Supply module (Fig. 23)
The Ekip Supply module supplies all Ekip trip units and modules present on the terminal box and of the circuit breaker with several auxiliary power (in AC or DC) available in the switchgear.
The module is mounted in the terminal box and permits the installation of the other advanced modules.
It can be field installed at any time.
Two versions are available according to the control voltage available:
- Ekip Supply 110-240V AC/DC
- Ekip Supply 24-48V DC

Fig. 23

Connectivity (Fig. 24)

The Ekip Com modules enable all SACE Emax 2 circuit breakers to be integrated in an industrial communication network for remote supervision and control of the circuit breaker. They are suitable for all distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units. Since they are mounted in the terminal box, communication can be maintained with withdrawable circuit breakers, even while in the racked-out position. Several Ekip Com modules can be installed at the same time, thereby enabling connection to communication systems that use different protocols.
The Ekip Com modules for Modbus RTU, Profibus-DP and DeviceNet™ contain a terminating resistor and dip switch for optional activation to terminate the serial network or bus.
The Profibus-DP module also contains a polarization resistor and dip switch for its activation.
The Ekip Com modules are supplied complete with auxiliary position contacts Ekip AUP and ready to close circuit breaker contacts Ekip RTC.
For industrial applications where superior reliability of the communication network is required, the Ekip Com R communication modules, installed together with the corresponding Ekip Com modules, guarantee redundant connection to the network.

Fig. 24

The Ekip Com modules enable Ekip trip units to be connected to networks that use the following protocols:

Protocol	Ekip Com Module	Ekip Com Redundant Module
Modbus RTU	Ekip Com Modbus RS-485	Ekip Com R Modbus RS-485
Modbus TCP	Ekip Com Modbus TCP	Ekip com R Modbus TCP
Profibus-DP	Ekip Com Profibus	Ekip Com R Profibus
Profinet	Ekip Com Profinet	Ekip Com R Profinet
EtherNet/IP™	Ekip Com EtherNet/IP™	Ekip Com R EtherNet/IP™
DeviceNet™	Ekip Com DeviceNet™	Ekip Com R DeviceNet™
IEC61850	Ekip Com IEC61850	Ekip Com R IEC61850

Electrical diagram reference: figures from 51 to 57. Redundant version from 61 to 66.

Ekip Link Module (Fig. 25)
The Ekip Link module enables the SACE Emax 2 circuit breaker to be connected to ABB communication system for locally supervising switchgear by means of the Ekip Control Panel and to act as Power Controller. It is suitable for all Ekip trip units and can be factory or field installed in time to the circuit breaker terminal box, even when Ekip Com communication modules are present. In this way, it is possible to have both local supervision of the control panel by means of the Ekip Control Panel and supervision of the system by means of the Ekip Com modules connected to the communication network.
The Ekip Link modules are supplied complete with auxiliary position contacts Ekip AUP and ready to close circuit breaker contacts Ekip RTC.

—
Electrical diagram reference: figure 58

—
Fig. 25

Ekip Com Hub (Fig. 26)
Ekip Com Hub is the new communication module for Emax 2 cloud-connectivity.
Emax 2 equipped with Ekip Com Hub can establish the connection to Ekip SmartVision for the whole low-voltage power distribution panel. This dedicated cartridge-type communication module just needs to be inserted into the terminal box and connected to the internet.
For further information related to Ekip SmartVision, please visit the dedicated website http://new.abb.com/low-voltage/launches/ekip-smartvision.

—
Fig. 26

Ekip Com Actuator module (Fig. 27)
The Ekip Com Actuator module enables the SACE Emax 2 circuit breakers to be opened and closed remotely. The Ekip com Actuator is optional and can be ordered for all Ekip trip units equipped with Ekip Com or Ekip Link modules; it is installed on the front of the circuit breaker in the right-hand accessories area.

—
Electrical diagram reference: figures 76, 78

—
Fig. 27

Ekip Bluetooth wireless communication unit (Fig. 28)
Ekip Bluetooth permits remote connection with the trip unit by portable PC, tablet or smart phone on which Ekip Connect software has been installed. The device is connected to the front test connector found on all Ekip trip units in SACE Emax 2 and SACE Tmax XT circuitbreakers and supplies power by means of a rechargeable Li-ion battery.

—
Fig. 28

Accessories for Ekip trip units

Signalling

Ekip 2K Signalling modules (Fig. 29)
The Ekip 2K Signalling modules supply two input and two output contacts for control and remote signalling of alarms and circuit breaker trips. They can be programmed from the trip unit's display or through the Ekip Connect software. Furthermore, when using Ekip Connect, combinations of events can be freely configured. They are suitable for all distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units. Three versions of the Ekip 2K Signalling modules are available: Ekip 2K-1, Ekip 2K-2, Ekip 2K-3. In this way, a maximum of three modules for E2.2, E4.2, E6.2, and two for E1.2 can be installed at the same time.

—
Electrical diagram reference: figures 41, 42, 43

—
Fig. 29

Ekip 3T Signalling modules (Fig. 29A)
The Ekip 3T Signalling modules supply three analog inputs for thermo-resistances PT1000 and one analog input 4-20mA for external sensors. Through the Ekip Connect software is possible to set different thresholds and link them to a digital signal. The Ekip 3T Signalling modules are suitable for all distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units. Two versions of the Ekip 3T Signalling modules are available: Ekip 3T-1, Ekip 3T-2.

Ekip 4K signalling module (Fig.30)
The Ekip 4K Signalling module, available for E2.2 – E4.2 – E6.2, supplies four input contacts and four output contacts for control and remote signalling. It can be programmed from the trip unit's display or through the Ekip Connect software. Furthermore, when using Ekip Connect, combinations of events can be freely configured.
It is installed in the housing provided in the front left of distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units, without having to remove the trip unit itself and is an alternative to the AUX 6Q auxiliary contacts unit.

—
Electrical diagram reference: figure 2

—
Fig. 30

Ekip 10K signalling unit (Fig. 31)
Ekip 10K Signalling is an external signalling unit designed for DIN rail installation for SACE Emax 2 automatic circuit breakers. The unit provides ten contacts for electrical signalling of timing and tripping of protection devices.
If connected via the Ekip Connect software, the contacts can be freely configured in association with any event and alarm or combination of both.
Several Ekip 10K Signalling (max 4) can be installed at the same time on the same Ekip trip unit.
The Ekip 10K Signalling module can be powered either by direct or alternating current and can be connected to all the trip units via internal bus or Ekip Link modules.

—
Electrical diagram reference: figure 103

—
Fig. 31

Ekip Signalling Modbus TCP (Fig. 32)
It is an external signalling unit designed for DIN rail installation. Function of the signalling module is to share, via an Ethernet network with Modbus TCP communication protocol, information about the state of circuit breakers that might not have the ability to provide such information via Ethernet, and also to allow these circuit breakers to be operated via remote control.

Fig. 32

Characteristics of output contacts			Number of contacts		
Type		**Monostable**	**Ekip 2K**	**Ekip 4K**	**Ekip 10K**
Maximum switching voltage		150V DC / 250V AC	2 output + 2 input	4 output + 4 input	10 output + 11 input
Maximum switching current					
	30V DC	2A			
	50V DC	0.8A			
	150V DC	0.2A			
	250V AC	4A			
Contact/coil insulation		1000 Vrms (1min @50Hz)			

Fig. 33

Ekip 10K signalling unit power supply	
Auxiliary supply	24-48V DC, 110-240V AC/DC
Voltage range	21.5-53V DC, 105-265V AC/DC
Rated power	10VA/W
Inrush current	1A for 10ms

Signalling contacts for Ekip trip units (Ekip RTC and Ekip AUP) Ekip trip units can acquire the status of circuit breaker ready to close (RTC) and the racked-in, test, or racked-out position though the optional signalling contacts Ekip RTC and Ekip AUP. These contacts, housed in the accessories area of the circuit breakers, are available with Ekip Dip, Ekip Touch and Ekip Hi-Touch.
Ekip COM communication modules and Ekip Link modules are always supplied with Ekip AUP and Ekip RTC contacts. **(Fig. 33)**

Measurement and protection

Ekip Measuring module (Fig. 34)
The Ekip Measuring module enables the trip unit to measure the phase and neutral voltages, powers and energy.
The Ekip Measuring module is installed on the front, right housing of the distribution protection versions of the Ekip Touch trip units, without having to remove the trip unit itself. The voltage connections are installed by default on the lower terminals, but can be altered to the upper terminals on request. The measuring module requires no external connection since it is connected internally to the lower or upper terminals of Emax 2. If necessary, the voltage outlet connection can be moved outside the circuit breaker by using voltmetric transformers and the alternative connection positioned in the terminal box. The use of external connections is obligatory for rated voltages that are higher than 690V. The module must be disconnected for dielectric strength tests on the main busbars.

Fig. 34

Electrical diagram reference: figures 20, 21, 22, 23

Accessories for Ekip trip units

Ekip Measuring Pro module (Fig. 35)
The module has the same connection and installation characteristics as the Ekip Measuring module. In addition, the Ekip Measuring Pro version offers:
- Protection features voltage and power values
- Ekip trip unit power supply from busbar voltage (for line voltages greater than 85V)
- LED signalling when voltage is detected on the main busbars.

The Ekip Measurement Pro module comes standard with the Ekip Hi-Touch, Ekip G Touch and Ekip G-Hi Touch trip units.

Fig. 35

Ekip Synchrocheck (Fig. 36)
This module enables the control of the synchronism condition when placing two lines in parallel. The module can be used with distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units equipped with the Ekip Measuring Pro module.
Ekip Synchrochek measures the voltages from two phases of one line through an external transformer and, compares them to the measured voltages at the breaker utilizing the Ekip Measuring Pro Module. An output contact is available, which is activated upon reaching synchronism, and enables the circuit breaker to be closed by means of wiring with the closing coil.

Fig. 36

Characteristics of output contacts			**Number of contacts**
Type		**Monostable**	**Ekip Synchrocheck**
Maximum switching voltage		150V DC / 250V AC	1 output
Maximum switching current			
	30V DC	2A	
	50V DC	0.8A	
	150V DC	0.2A	
	250V AC	4A	
Contact/coil insulation		1000 Vrms (1min @50Hz)	

Electrical diagram reference: figure 48

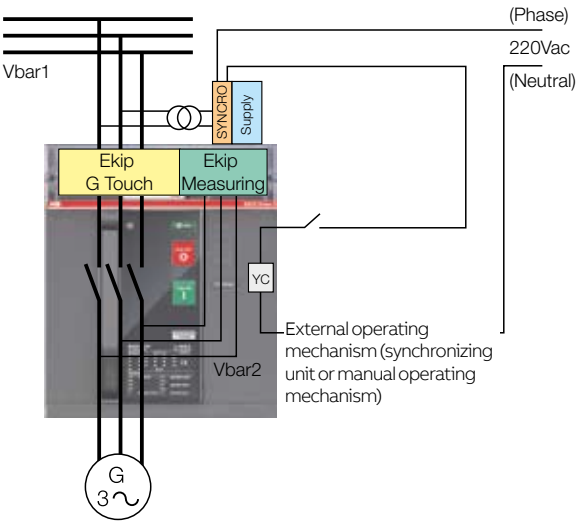


Fig. 37

Ekip LCD display interface (Fig. 37)
For installations in particularly aggressive environments, as low temperatures, high humidity or presence of dust or chemical agents, the Ekip protection trip units can be requested with an LCD black and white display interface with pushbuttons for navigation. This version guarantees excellent immunity by integrating all functions, with regard to protection devices, measuring devices and the possibility of introducing accessories, available on the colour touch screen.

Fig. 38

Rating Plug (Fig. 38)
The rating plugs are field interchangeable from the front on all trip units and enable the protection thresholds to be adjusted according to the actual rated current of the system.
This function is particularly advantageous in installations that may require future expansion or in cases in which the power supplied needs to be limited temporarily (e.g. mobile Gen Set). The Overload (L) protection function can be disabled at any time by using an L OFF version of the rating plug. There is a matching L OFF version for each standard version of rating plug. The L OFF versions of the rating plugs are IEC rated only.

Circuit breaker	Rating plugs available (both in standard and L OFF versions) - IEC only
E1.2	400-600-800-1000-1200
E1.2 250	100-200-250
E2.2	400-600-800-1000-1200-2000
E2.2 250	100-200-250
E4.2	400-600-800-1000-1200-2000-2500-3200
E6.2	400-600-800-1000-1200-2000-2500-3200-4000-5000-6000

Special rating plugs are also available for differential protection against earthing faults in combination with a suitable toroid to be installed externally. These rating plugs are IEC rated only.

Circuit breaker	Rating plug available for Rc protection
E1.2	400-630-800-1250
E1.2 250	100-200-250
E2.2	400-630-800-1250-2000
E2.2 250	100-200-250
E4.2	400-630-800-1250-2000-3200-3600-4000

Accessories for Ekip trip units

Fig. 39

Current sensor for neutral conductor outside the circuit breaker (Fig. 39)
This is only for three-pole circuit breakers; it enables protection of the neutral conductor to be achieved through connection to the Ekip trip unit. It is supplied on request.

Electrical diagram reference: figure 27

Fig. 40

Homopolar toroid for the earthing conductor of main power supply (Fig.40) - IEC only
The distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units can be used with an external toroid positioned, for example, on the conductor that connects the star centre of the MV/LV transformer to earth (homopolar transformer): in this case, the earth protection is called Source Ground Return. There are four sizes of the toroid: 100A, 250A, 400A, 800A. The homopolar toroid is an alternative to the toroid for differential protection.

Electrical diagram reference: figure 25

Fig. 41

Toroid for differential protection (Fig. 41) - IEC only
Connected to the Ekip Touch and Hi-Touch LSIG trip units equipped with a rating plug for differential protection, this toroid enables earth fault currents of 3...30A to be monitored.
To be installed on the busbar system, it is an alternative to the homopolar toroid.

Electrical diagram reference: figure 24

Displaying and supervision

Fig. 42

Ekip Multimeter Display on front of switchgear (Fig. 42)
Ekip Multimeter is a display unit to be installed on the front of the switchgear for SACE Emax 2 circuit breakers equipped with Ekip electronic trip units. The device, 96mmx96mm sized, is equipped with a large touch screen display and enables measurements to be displayed with the same levels of precision. If connected to trip units with a display, Ekip Multimeter enables the adjustment of parameters and protection thresholds. Up to 4 Ekip Multimeter devices can be connected at the same time to the same Ekip protection trip unit to display currents, voltage, powers and energy.

Ekip Multimeter can be powered either in direct current (24-48V DC or 110-240V DC) or in alternating current (110-240V AC). It is equipped with a 24V DC output that supplies the trip unit to which it is connected.

Power supply	24-48V DC, 110-240V AC/DC
Tolerance	21.5-53V DC, 105-265V AC/DC
Rated Power	10VA/W
Inrush current	2A for 20ms

Fig. 43

Ekip Control Panel on front of switchgear (Fig. 43)
The Ekip Control Panel enables the SACE Emax 2 circuit breakers connected to the Ekip Link system to be controlled and monitored.
The panel is supplied already equipped with supervision software and requires no programming. Ekip Control Panel requires a 24V DC power supply and is equipped with:

- 2 RJ45 EtherNet ports for connection to the Ekip Link system and to the local network for remote control via web server option
- 1 RS485 serial port for integration of the Modbus network if it is to be used with circuitbreakers of the Tmax series
- 4 USB ports for downloading data.

Accessories for Ekip trip units

Testing and programming

Fig. 44

Ekip TT testing and power supply unit (Fig. 44)
It also allows a trip unit not provided with auxiliary power supply to be supplied with power so that the last protection device tripped can be displayed directly on the screen or by the lighting up of corresponding LEDs. Ekip TT is a device that allows you to verify that the circuit breaker trip mechanism is functioning correctly (trip test).
The device can be connected to the front test connector of any Ekip trip unit of SACE Emax 2 to set protection functions setting.

Fig. 45

Ekip T&P testing kit (Fig. 45)
Ekip T&P is a kit that includes different components for programming and testing the electronic protection trip units.
The kit includes:
- Ekip T&P unit;
- Ekip TT unit;
- adaptors for Emax and Tmax trip units;
- USB cable to connect the T&P unit to the Ekip trip units;
- installation CD for Ekip Connect and Ekip T&P interface software.

The Ekip T&P unit is easily connects from your PC (via USB) to the trip unit (via mini USB) with the cable provided.
The Ekip T&P unit can perform simple manual or automatic tests on the trip unit functions. The Ekip T&P will also provide the ability to conduct more advanced function testing that allows the addition of harmonics and the shifting of phases to more accurately represent the real conditions of an application. Thus, leading to more concise protection function parameters that may be required for critical applications. It can also generate a test report as well as help you to monitor maintenance schedules.

Fig. 46

Ekip Programming Module (Fig. 46)
The Ekip Programming module is used for programming Ekip trip units via USB to a PC using the Ekip Connect software that can be downloaded on-line. This can be useful for uploading/downloading entire sets of parameters for multiple breakers both for set-up as well as for maintenance (for periodic cataloging breaker parameters in case of a catastrophic situation).

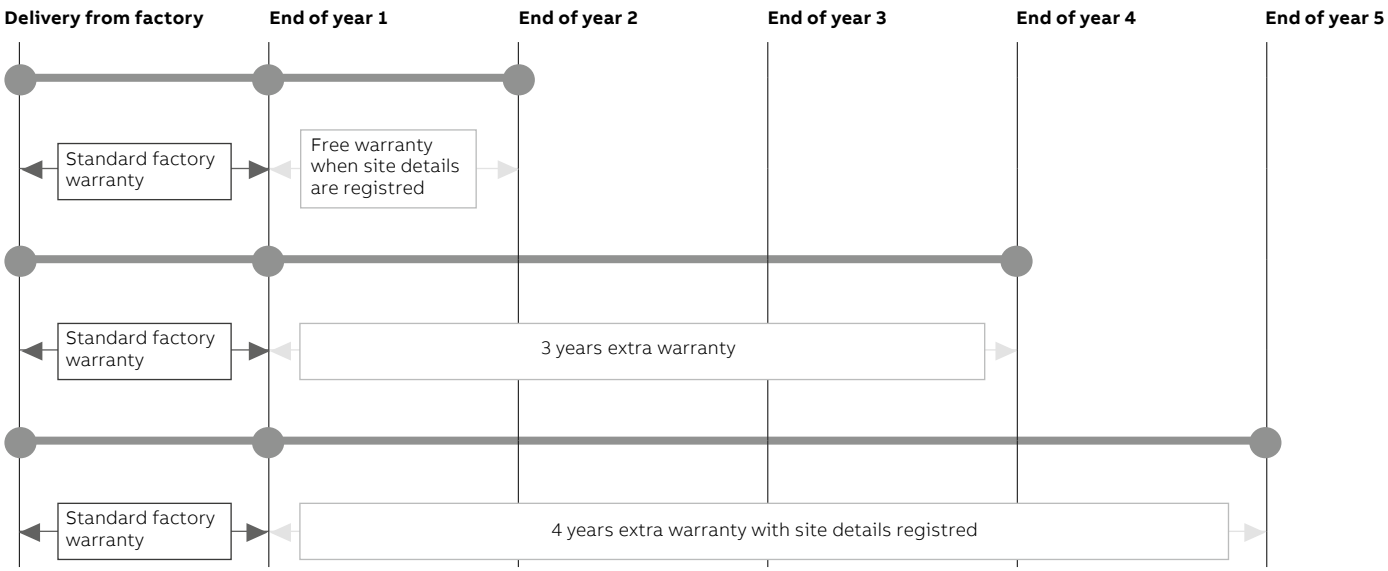
Service

Extended warranty

For ABB Low Voltage circuit breakers, extending the 1-year standard factory warranty to up to 5 years has never been so simple.
Extended warranty activation can be requested after the online registration in the Extended Warranty tool. This web-tool verifies that the application of the circuit breaker is within the recommended guidelines, and grant the registration of the circuit breaker.
When end users details are registered, one year of extra warranty is offered free-of-charge.
Extended Warranty can be ordered by following the steps:

1) Registration in the online tool (Extended Warranty Tool) to verify the application.
2) Extended Warranty part number(s) and registration code received by email
3) Place the order of the circuit breaker(s) together with:
   - Extended warranty part number(s)
   - Unique registration code

Warranty coverage:
- Any possible issues related to circuit breaker quality for the complete extra warranty time
- Accessories mounted by the factory only.



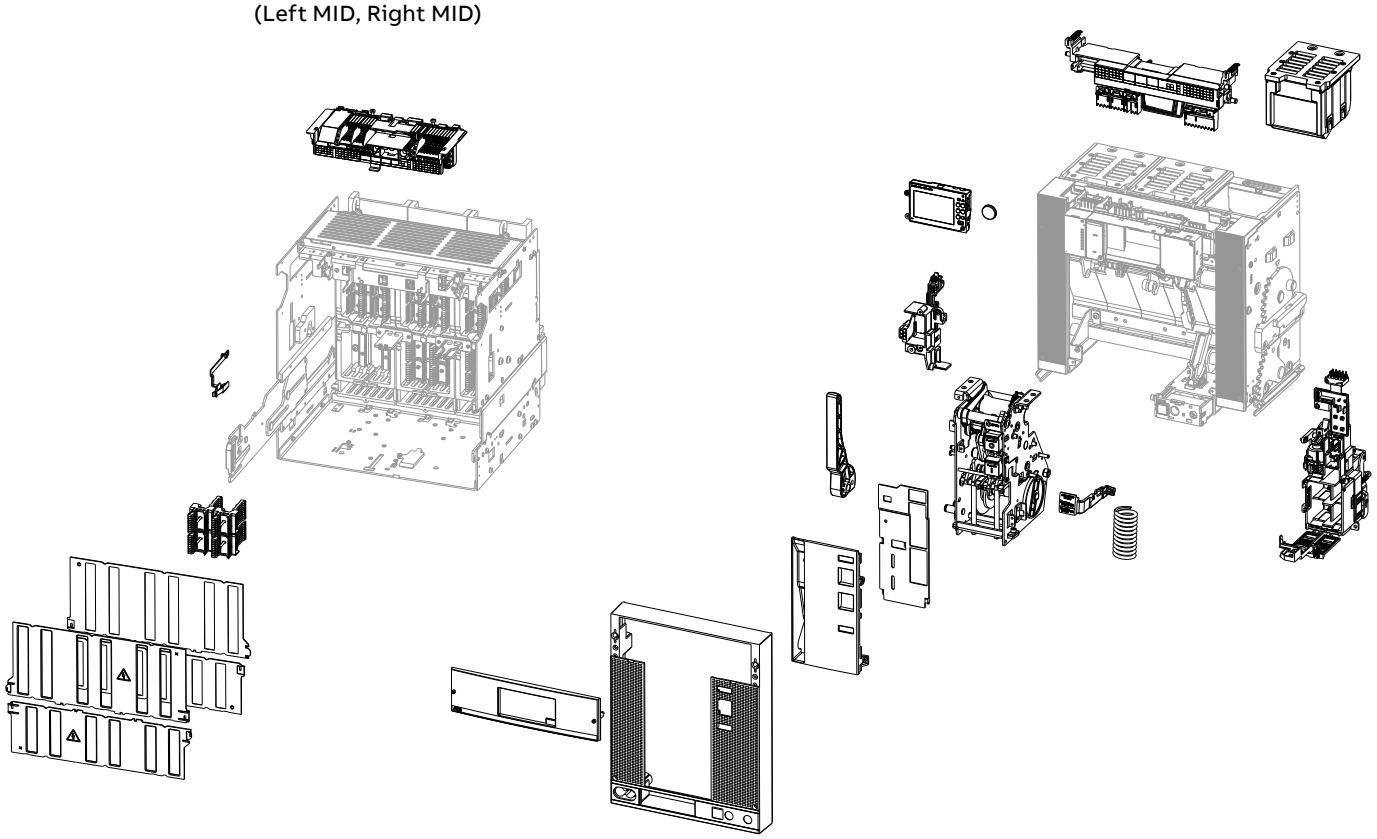
Service

Spare parts

The following original and guaranteed spare parts are available:

- Accessories and Safety Covers
- Closed Door lock lever
- Closing Spring
- Conversion kit from Fixed to Moving part
- Conversion kit from Moving Part into Fixed version
- Conversion kit into Switch Disconnector MS
- Earth sliding contacts
- Fixing screws kit
- Arching chambers
- Jaw contacts
- Moving part Terminals
- Poles
- Kit front cover plugs
- Lateral guides for Fixed and Moving part
- Left and Right plates for accessories (Left MID, Right MID)
- Main board
- Lifting plates
- Main board + Sensors + cables
- Operating mechanism
- Racked in and out device
- Racking in and out lever
- Safety shutters for fixed part
- Side walls
- Sliding contacts/ Terminal Box
- Transparent cover
- Trip coil
- Trip Unit Battery
- Tripping mechanism
- Spring charging device
- Spring Charging lever.

For further details, please refer to ABB SACE Spare Parts Catalog (1SDC001007D0203).



CHAPTER 7

Installation

Circuit breaker

The new SACE Emax 2 family maintains the characteristics of strength and reliability that have always distinguished the tradition of ABB SACE air circuit breakers.

The new SACE Emax 2 circuit breakers, available in four sizes, are extremely compact due to their new dimensions: with reduced depths and heights, combined with standarized widths, they provide the answer to the most stringent installation requirements.

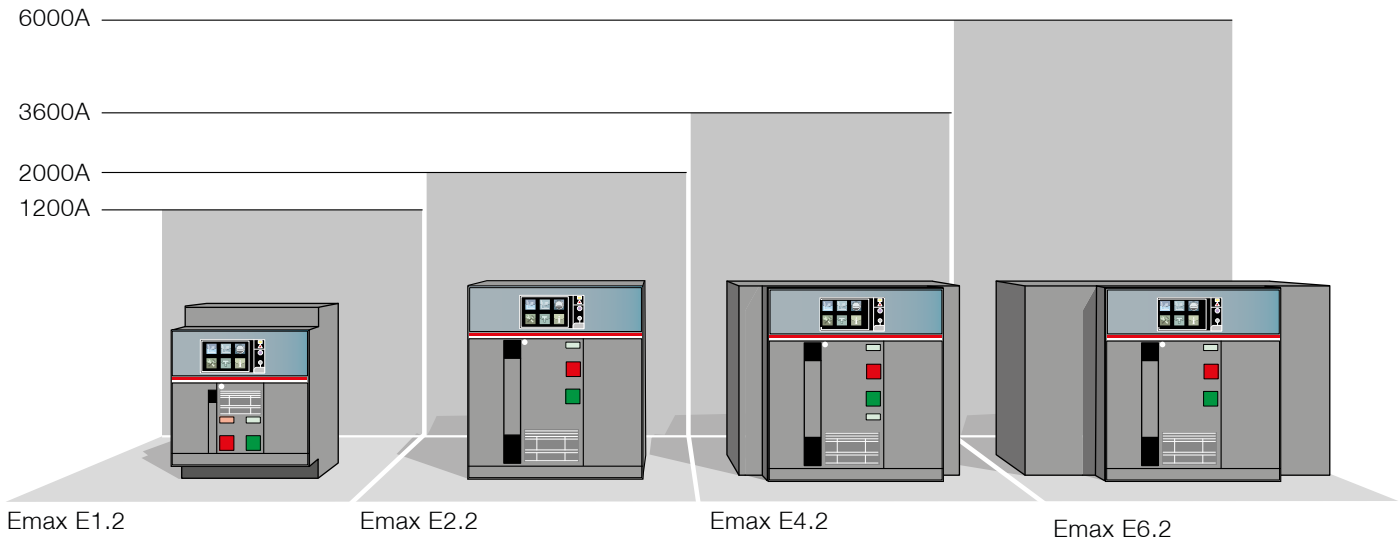
Safety is guaranteed thanks to the double insulation of the live parts and total segregation of the phases. Furthermore, the new functional design of the SACE Emax 2 circuit breakers has been developed with the purpose of improving installation operations and use of the devices and accessories; making them simple, intuitive and safe.

Distinctive characteristics		**Benefits**
Simplicity of use and safety	- Ekip protection trip units are interchangeable from front of circuit breaker	Reduced times during the stages of: - installation - wiring - configuration - commissioning - maintenance Increased level of safety
	- Rapid configuration of the Ekip trip units	
	- Electronic modules can be installed on terminal box without removing the electronic trip units and protection shield	
	- Electrical plug-in accessories can be installed from the front of circuit breaker	
	- New push-in terminal box allows rapid auxiliary connections	
	- Horizontal or vertical rear connections can be modified on-site by turning 90°	
	- Accessorizing logic common to the entire family of circuit breakers	
	- Accessory cabinet and terminal box are stamped with accessory codes for easy identification	
	- Accessories area is separated functionally from the safety area	
	- Mechanical safety locks in open position are active when the shield is removed	
	- Guided racking in and out of the mobile part	

Sizes

The SACE Emax 2 circuit breakers, available in 4 sizes up to 6000A, provide:

- **Versatility**, where installation space is a critical and influential factor, such as naval applications, wind turbine towers or switchgear
- **Opportunities**, optimization of the dimensions of the electrical switchgear results in a potential reduction in the consumption of the materials used.



Circuit breaker

Versions

The SACE Emax 2 circuit breakers are available in both fixed and withdrawable versions. The withdrawable version is recommended in applications in which service continuity is a fundamental requirement.
Replacement of the moving part with a new device does not require any intervention on power connections or on auxiliary connections, thus permitting reset in the shortest time possible.

The fixed version, which is connected directly to power system through the circuit breaker terminals, is recommended in applications in which the need for space means that compact products are required without compromising the performance and possibility of fitting accessories.

Fixed

Withdrawable

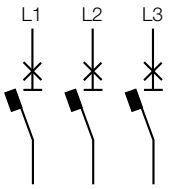
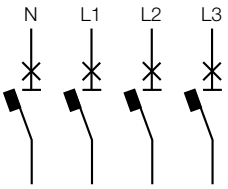
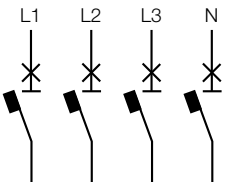
1. Moving part
2. Sliding contacts
3. Fixed part
4. Terminal box
5. Racking-out mechanism
6. Racking-out guide rails
7. Pushbuttons
8. Data label and accessories

Poles

SACE Emax 2 circuit breakers are available in three-pole and four-pole versions and can be used in all types of distribution systems. Furthermore, with the possibility of connecting the external current sensor, three-pole circuit breakers can be used efficiently even in systems in which the neutral conductor cannot be isolated.

The four-pole circuit breakers E1.2, E2.2 and E4.2 are always provided with full-size neutral pole with rated uninterrupted current-carrying capacity identical to the phase poles. The E6.2 circuit- breakers, thanks to their construction modularity, are available with neutral set at 50 percent of normal supply and with full-sized neutral, so that the customer does not need to oversize the neutral unless strictly necessary.

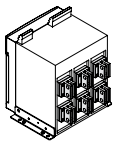
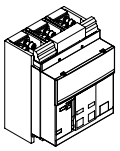
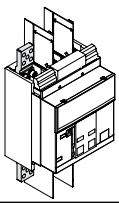
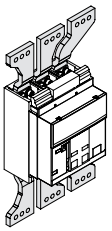
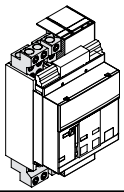
The standard supplied circuit breakers are suitable for connection of phases in the sequence L1, L2, L3 for three-pole circuitbreakers, or N, L1, L2 and L3 for four-pole circuit breakers with neutral on the left; a special optional kit enables the position of the circuit breaker neutral to be changed to the right, making the sequence L1, L2, L3, N available (refer to page 9/53 for the commercial codes).

Circuit breaker	Standard version		Optional version with neutral on the right
	Three-pole	Four-pole	Four-pole
Emax E1.2 Emax E2.2 Emax E4.2 Emax E6.2			

Circuit breaker

Terminals

The integration of the circuit breaker into an electrical system is simplified because of the connection terminals of the circuit breakers. The silver-plated copper terminals are designed to assist installation of connecting bars according to the change in the rated capacity of the circuit breaker. Each terminal has been created to the standard width of busbar for that amperage and is equipped with one, two or three terminal stabs for easy connection to multiple bus runs that may be required for the application. For particular installation requirements, the circuit breakers can be equipped with different combinations of terminals for the upper and lower part.

Type	Abbreviation		E1.2	E2.2	E4.2	E6.2
Rear adjustable terminal (1)	HR VR		F, W	F, W	F, W	F, W
Front terminal	F		F	F, W **	F, W **	F, W **
Extended front terminal	EF **		F, W			
Front spread terminal	ES **		F, W			
Terminal for cable FcCuAl 4x500kcmil / 240mm2	Fc CuAl **		F			

(1) The rear adjustable terminals are supplied as sandard in the HR-HR configuration, with exception for E4.2 L version, E4.2 3200A and E6.2 6000A in which they are supplied in VR - VR configuration.
(**) Not UL listed

Degree of protection

SACE Emax 2 circuit breakers guarantee the following degrees of protection:

- IP20 for circuit breakers in fixed or drawout versions, excluding the terminals.
- IP30 for the front parts of the circuit breaker when installed in switchgear with the IP30 flange mounted on the door.
- IP54 for circuit breakers equipped with optional IP54 transparent flange fixed on the door on the front of the switchgear.

Power losses

To guarantee the performance of the electrical switchgear in terms of rated uninterrupted current-carrying capacity, the design of the electrical switchgear must take into consideration the power losses by the circuit breaker and by live parts installed.

The values given in the table refer to total power for three and four pole circuit breakers with balanced loads with a current flow equal to rated uninterrupted current "Iu" at 60Hz.

Circuit breaker type		**[W]/[A]**	**250**	**400**	**800**	**1200**	**1600**	**2000**	**2500**	**3200**	**3600**	**4000**	**5000**	**6000**
Fixed	**E1.2 B-A, N-A, S-A**	W	7	17	59	125								
	E2.2 B-A, N-A, S-A	W		15	48	100	170							
	E2.2 H-A, V-A / E2.2 2000A B-A, N-A, S-A	W		15	48	99	167	250						
	E4.2 S-A, H-A, V-A	W			44	86	143	211	310					
	E4.2 L-A / E4.2 3200A/3600A S-A, H-A, V-A	W			42	81	132	193	280	445	578			
	E6.2 H-A, V-A	W								323	395	476	700	
Drawout	**E1.2 B-A, N-A, S-A**	W	14	35	118	250								
	E2.2 B-A, N-A, S-A	W		22	73	152	260							
	E2.2 H-A, V-A / E2.2 2000A B-A, N-A, S-A	W		22	68	138	233	350						
	E4.2 S-A, H-A, V-A	W			58	114	189	279	410					
	E4.2 L-A / E4.2 3200A S-A, H-A, V-A	W			49	111	181	264	384	610				
	E6.2 H-A, V-A	W								438	536	646	950	1484

Circuit breaker

Temperature derating

Under certain installation conditions, the circuit-breakers can operate at higher temperatures than the reference temperature of 40 °C. In this case the current-carrying capacity of the circuit- breaker may be lower than the rated current-carrying capacity at the reference temperature: therefore the derating coefficients shown in the table must be applied. Percentage values refer to with-drawable and fixed circuit breaker.
If not specified, all data refer to a copper according to IEC60947.

Emax 2 E1.2		**Temperature [°C/°F]**						
		<40/104	**45/113**	**50/122**	**55/131**	**60/140**	**65/149**	**70/158**
E1.2	**250**	100%	100%	100%	100%	100%	100%	100%
E1.2	**400**	100%	100%	100%	100%	100%	100%	100%
E1.2	**800**	100%	100%	100%	100%	100%	100%	100%
E1.2	**1000**	100%	100%	100%	100%	100%	100%	100%
E1.2	**1200**	100%	98%	96%	94%	91%	88%	84%

Emax 2 E2.2		**Temperature [°C/°F]**						
		<40/104	**45/113**	**50/122**	**55/131**	**60/140**	**65/149**	**70/158**
E2.2	**250**	100%	100%	100%	100%	100%	100%	100%
E2.2	**400**	100%	100%	100%	100%	100%	100%	100%
E2.2	**800**	100%	100%	100%	100%	100%	100%	100%
E2.2	**1200**	100%	100%	100%	100%	100%	100%	100%
E2.2	**1600**	100%	100%	98%	94%	90%	84%	78%
E2.2	**2000**	100%	100%	97%	93%	88%	82%	76%

Emax 2 E4.2		**Temperature [°C/°F]**						
		<40/104	**45/113**	**50/122**	**55/131**	**60/140**	**65/149**	**70/158**
E4.2	**800**	100%	100%	100%	100%	100%	100%	100%
E4.2	**1600**	100%	100%	100%	100%	100%	100%	100%
E4.2	**2000**	100%	100%	100%	100%	100%	100%	100%
E4.2	**3200**	100%	98%	96%	92%	87%	81%	75%
E4.2	**3600**	100%	98%	95%	92%	88%	85%	81%

Emax 2 E6.2		**Temperature [°C/°F]**						
		<40/104	**45/113**	**50/122**	**55/131**	**60/140**	**65/149**	**70/158**
E6.2	**4000**	100%	100%	100%	100%	100%	100%	100%
E6.2	**5000**	100%	98%	96%	91%	86%	80%	74%
E6.2	**6000**	100%	97%	94%	91%	88%	84%	81%

Installation environment

SACE Emax 2 circuit breakers have been designed and tested in accordance with major international Standards to manage the electrical plant.

The installation requirements prescribed by the international Standards are listed below.

In addition, ABB provides instructions for the use of circuit breakers in nonstandard environments, as for example personalized maintenance program or installation solutions aimed at increasing performances and extending the lifecycle of the circuit breaker.

Temperature

SACE Emax 2 circuit breakers can operate in the following environmental conditions:

	Temperature		
	Operating	**Active Display**	**Storage**
Emax 2 with Ekip DIP	-25°C ... +70°C -13°F...+158°F	-	-40°C ... +70°C -40°F...+158°F
Emax 2 with Ekip Touch, Hi-Touch	-25°C ... +70°C -13°F...+158°F	-20°C ... +70°C -4°F...+158°F	-30°C ... +70°C -22°F...+158°F
Emax 2 with LCD	-25°C ... +70°C -13°F...+158°F	-25°C ... +70°C -13°F...+158°F	-40°C ... +70°C -40°F...+158°F
Emax 2 swith-disconnectors	-25°C ... +70°C -13°F...+158°F	-	-40°C ... +70°C -40°F...+158°F

Installation environment

Environmental conditions

The devices can be installed in industrial environments with pollution level 3, IEC60947. SACE Emax 2 circuit breakers also comply with:

- IEC60721-3-6 class 6C3
- IEC60721-3-3 class 3C2

Altitude

SACE Emax 2 air circuit breakers do not undergo changes in rated performance up to 6600 feet. Beyond this altitude, the properties of the atmosphere in terms of composition, dielectric capacitance, cooling power and pressure can vary and, therefore, the performance of the circuit breakers is subject to derating, which can be measured by means of the variation in maximum rated service voltage and rated uninterrupted current.

Altitude	**[ft]**	**6600**	**9900**	**13200**	**16500**
	[m]	**2000**	**3000**	**4000**	**5000**
Rated service voltage - Ue	[V]	600	600	500	440
Rated current	[% In]	100	98	93	90

Vibration

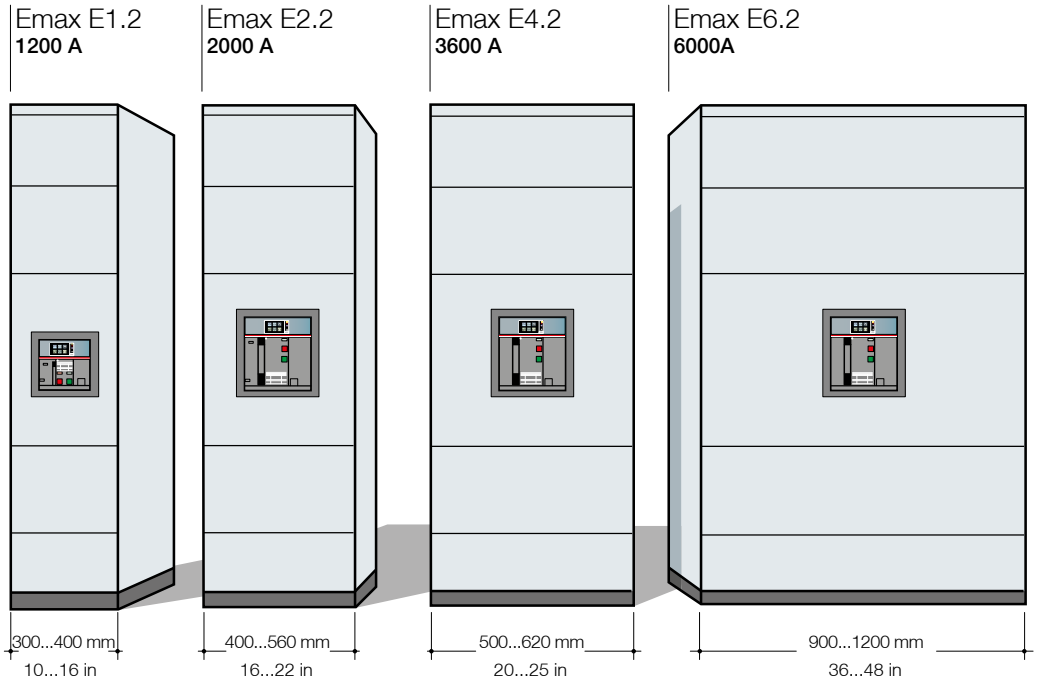
The circuit breakers have been tested according to:

- IEC60068-2-6
- From 1 to 13 Hz with amplitude 1mm
- From 13 to 100 Hz with constant acceleration 0.7g
- IEC60721-3-1
- Storage: 1M3
- IEC60721-3-2
- Transport: 2M2
- IEC60721-3-3
- Operational conditions: 3M2
- Shipping registers or certifications

Electromagnetic compatibility

The use of specific devices in industrial installations may cause electromagnetic interference in the electrical system. SACE Emax 2 circuit breakers have been developed and tested for electromagnetic compatibility in accordance with IEC 60947-2; Appendices J and F, ANSI C37.90.1 and C37.90.2.

Due to the four construction sizes and the reduced insulation distances required, SACE Emax 2 circuit breakers optimize the installation spaces of the compartments of electrical switchgear, thereby providing a rational solution to the customers' application needs.

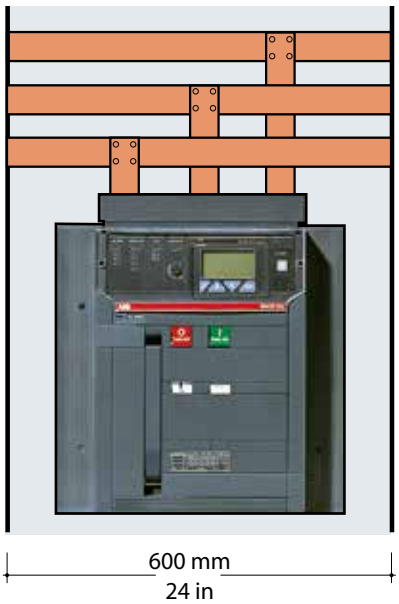


Installation environment

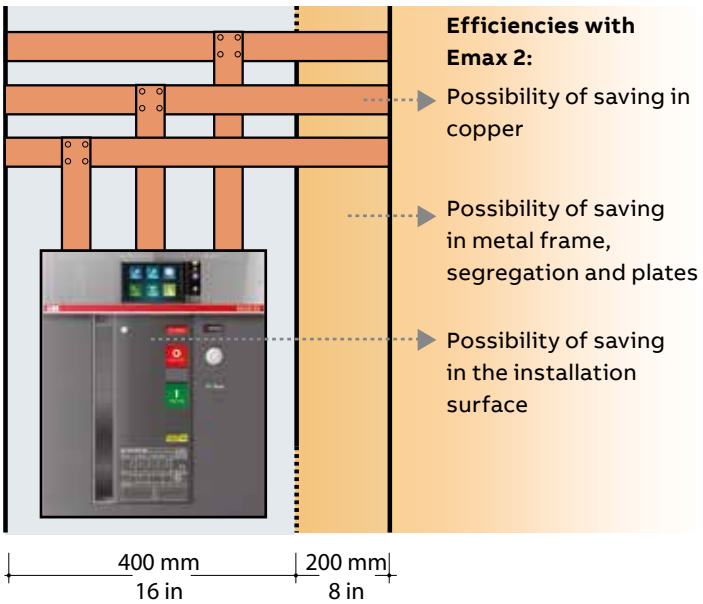
SACE Emax 2 circuit breakers enable the design of electrical switchgear to be improved, optimization in terms of performance and also in the use of the main materials:

- **Copper**: thanks to the possibility of developing compact units, the length of the distribution system / busbar can be minimized.
- **Metal frame and structure**: reduced volumes also mean less surface space is used for panels and internal structures.
- **Space**: the optimization of the individual units benefits the entire switchgear, which is more compact and can therefore be installed taking up less surface space.

Traditional circuit breaker 3p Iu 2000A



Emax E2.2 3p Iu 2000A



Installation in switchgear

Position

All SACE Emax 2 circuit breakers can be floor mounted in a vertical position inside the switchgear compartment.
The E1.2 circuit breaker can also be installed in a horizontal position and wall mounted. Conveniently, the screens of the Ekip Touch and Hi-Touch versions rotate to a horizontal view for key data when the E1.2 is installed horizontally.

Power supply

The Emax 2 circuit breakers can be supplied, from either the upper or lower terminals. In the event a measurement module is present, in order to make use of all information when the circuit breaker is in the open position, the voltage sockets must be installed on the power supply side.

Insulation distances and connection

The circuit breakers can be connected to the main power system using the most common configurations and dimensions of copper bars.

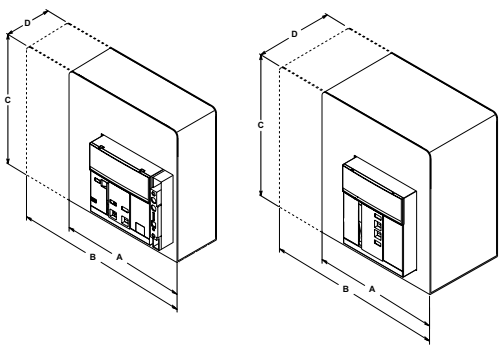
Installation of live parts must ensure:

- **Minimum insulation distances between the phases**

Rated insulation voltage Ui	Minimum distance [mm]
1000V	The use of phase barriers is recommended for fixed version circuit breakers used in voltages over 480V.

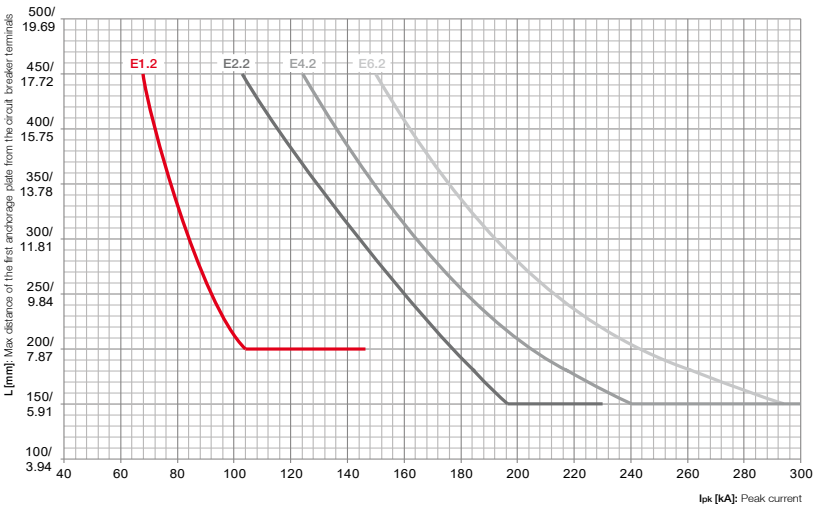
- **Insulation distance of installation cubicle**

Fixed circuit breakers						Drawout circuit breakers			
		Width		C - Height	D - Depth	Width		C - Height	D - Depth
		3p	4P			3p	4P		
E1.2	[mm]	250	322	382.5	130	280	350	440	252
	[inch]	9.84	12.67	15.05	5.11	11.02	13.77	17.32	9.92
E2.2	[mm]	400	490	500	221	400	490	440	355
	[inch]	15.74	19.29	19.68	8.7	15.74	19.29	17.32	13.97
E4.2	[mm]	500	620	500	221	500	620	440	355
	[inch]	19.68	24.41	19.68	8.7	19.68	24.41	17.32	13.97
E6.2	[mm]	900	1020	500	221	900	1020	440	355
	[inch]	35.43	40.16	19.68	8.7	35.43	40.16	17.32	13.97
E6.2/f	[mm]	-	1200	500	221	-	1200	440	355
	[inch]	-	47.24	19.68	8.7	-	47.24	17.32	13.97



Installation in switchgear

- **Anchorage plates**
  The electrodynamic force released during a short-circuit can cause high levels of mechanical stress on the devices and structures of the switchgear. To minimize this, fastening plates must be positioned near the circuit breaker terminals.



- **Tightening torques**
  The following table indicates the values required for connecting the circuit breaker terminal and the connecting bars.

Terminals	E1.2	E2.2 / E4.2 / E6.2
Adjustable HR/VR rear	40 Nm / 354.03 lb-in	70 Nm / 619.55 lb-in
Spread rear	40 Nm / 354.03 lb-in	–
Front	40 Nm / 354.03 lb-in	70 Nm / 619.55 lb-in
Extended front	40 Nm / 354.03 lb-in	–
Spread front	70 Nm / 619.55 lb-in	–
Front for cables	43 Nm / 380.58 lb-in	–

- **Segregation plates and separator plates**
  The rear part of the circuit breaker has been designed with specific slots in which insulating walls can be housed to facilitate segregation of live parts. In addition, phase barriers are available as an optional accessory for E1.2.

Earthing connection

To achieve continuity and equal potential of earthing between the Emax 2 circuit breaker and the protection circuit of the switchgear, customers can use either option below:

- Connect the Emax 2 fixed circuit breaker or the cradle of the drawout circuit breaker to the protective circuit by means of a cable with suitable cross-sectional area to fulfil the switchgear requirements.
- If the continuity of the circuit breaker frame with the switchboard earthing is guaranteed by the metal contact (support) between the circuit breaker and the metal structure of the switchboard (which is a part of the protective circuit) no connection is necessary (provided that no panels of insulating material are interposed between the circuit breaker and the metal frame of the switchboard).

Emax E1.2, fixed version, does not require any earthing connection.

Installation in switchgear

Busbar types

The circuit breakers, via the terminals, can be connected to the main distribution system by busbars of different types: copper, silver-plated copper and tinned aluminium when the main distribution system is made of aluminium.

The circuit breakers can be connected directly with copper or aluminium cables in the case of E1.2 circuit breakers, or indirectly by cable-carrying bars in the case of E2.2, E4.2 and E6.2.

Bars recommendation

		Vertical			Horizontal		
Frame	**Iu**	**Qty**	**Size (in)**	**Size (mm)**	**Qty**	**Size (in)**	**Size (mm)**
E1.2	800	1	1/4 x 3	6.35 x 76.2	2	1/4 x 2	6.35 x 50.8
E1.2	1200	2	1/4 x 3	6.35 x 76.2	4	1/4 x 2	6.35 x 50.8
E2.2	1600	2	1/4 x 3	6.35 x 76.2	3	1/4 x 2.5	6.35 x 63.5
E2.2	1600	3	1/4 x 2	6.35 x 50.8	4	1/4 x 2	6.35 x 50.8
E2.2	2000	4	1/4 x 2	6.35 x 50.8	4	1/4 x 2.5	6.35 x 63.5
E4.2	2000	4	1/4 x 2	6.35 x 50.8	4	1/4 x 2.5	6.35 x 63.5
E4.2	2500	3	1/4 x 4	6.35 x 101.6	4	1/4 x 4	6.35 x 101.6
E4.2	3200	4	1/4 x 4	6.35 x 101.6	-	-	-
E4.2	3600	4	1/4 x 5	6.35 x 127	-	-	-
E6.2	4000	4	1/4 x 5	6.35 x 127	6	1/4 x 4	6.35 x 101.6
E6.2	5000	6	1/4 x 5	6.35 x 127	10	1/4 x 4	6.35 x 101.6
E6.2	6000	6	1/4 x 6	6.35 x 152.4	-	-	-

The tables should be used solely as a general guideline for selecting products. Due to the extensive variety of switchgear construction shapes and conditions that can affect the behavior of the apparatus, the solution used must always be verified.

Bars connection

The Emax 2 terminal design maximizes the thermal performance into the switchgear. Thanks to the busbar friendly, single to multiple stab design, it is possible to connect bars easily and smartly:

- a wide contact surface between terminals and bars improves the current carrying capacity;
- a spacing between stabs and multi bars increase the ventilation efficacy on E2.2, E4.2 and E6.2;
- a ¼” spacing eliminates the need to bend bars and allows for an easier connection to the main busbars.

Auxiliary connection

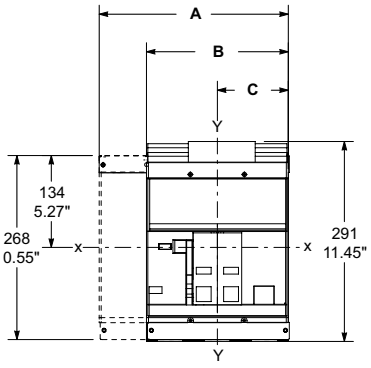
The new terminal box uses spring clamp technology. All cables can be connected to each terminal without tools, guaranteeing time saving during the wiring activities.

CHAPTER 8

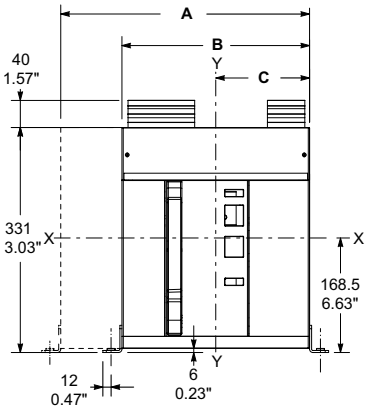
Dimensions

Fixed circuit breaker

E1.2



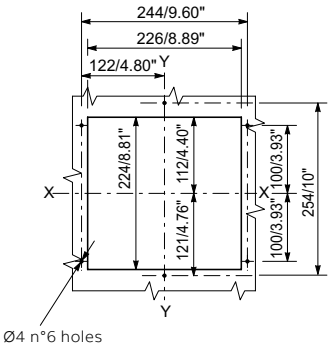
E2.2 - E4.2 - E6.2



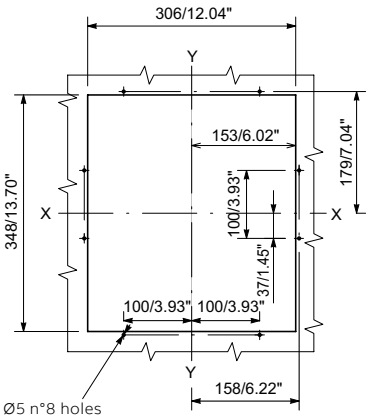
[mm/in]	A	B	C	
	4p	3p	3p	4p
E1.2	284/ 11.18	214/ 8.42	107/ 4.21	107/ 4.21
E2.2	366/ 14.40	276/ 10.86	138/ 5.43	138/ 5.43
E4.2	510/ 20.07	384/ 15.11	192/ 7.55	192/ 7.55
E6.2	888/ 34.96	762/ 30	318/ 12.42	444/ 17.48
E6.2/f	1014/ 39.92	-	-	444/ 17.48

Compartment door drilling

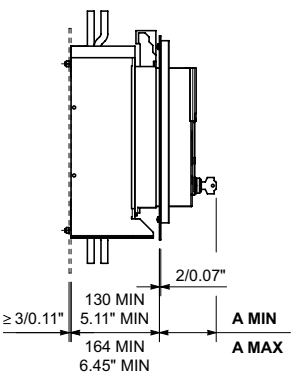
E1.2



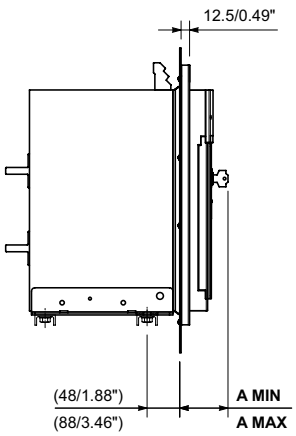
E2.2 - E4.2 - E6.2



E1.2



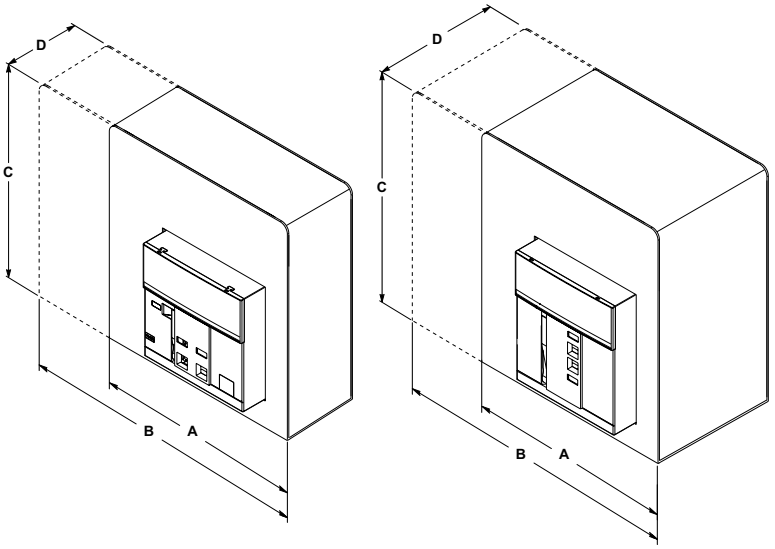
E2.2 - E4.2 - E6.2



E1.2		Standard	Ronis/ Profalux	Kirk	Castell
A MIN	[mm/ in]	49.5/ 1.94"	63.5/ 2.5"	63.5/ 2.5"	83.5/ 3.28"
A MAX	[mm/ in]	83.5/ 3.28"	97.5/ 3.83"	97.5/ 3.83"	117.5/ 4.62"

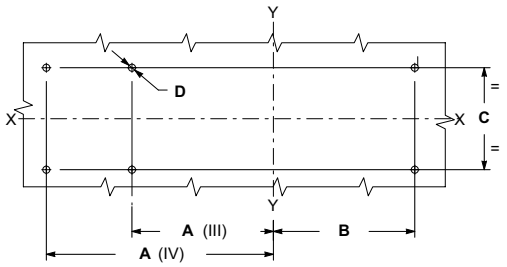
E2.2-E4.2-E6.2		Standard	Ronis/ Profalux	Kirk	Castell
A MIN	[mm/ in]	29.5/ 1.16"	41.5/ 1.63"	46.5/ 1.83"	65/ 2.55"
A MAX	[mm/ in]	69.5/ 2.73"	81.5/ 3.20"	86.5/ 3.40"	105/ 4.13"

Dimensions of the compartment



[mm/in]	A	B	C	D
	3p	4p		
E1.2	250/ 9.84	322/ 12.67	382.5/ 15.05	130/ 5.11
E2.2	400/ 15.74	490/ 19.29	500/ 19.68	221/ 8.70
E4.2	500/ 19.68	620/ 24.41	500/ 19.68	221/ 8.70
E6.2	900/ 35.43	1020/ 40.16	500/ 19.68	221/ 8.70
E6.2/f	-	1200/ 47.24	500/ 19.68	221/ 8.70

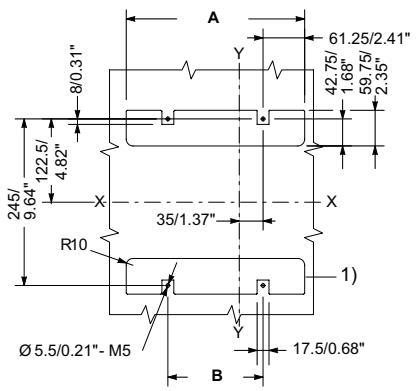
Floor fixing



Floor fixing plate required for E1.2 in order to floor mount.
Ordering code 1SDA076020R1

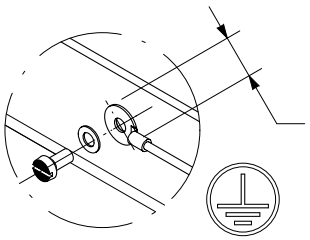
[mm/in]	A		B		C	D
	3p	4p	3p	4p		
E1.2	117/ 4.60	187/ 7.36	117/ 4.60	117/ 4.60	80/ 3.14	5.5/ 0.21
E2.2	154/ 6.06	244/ 9.60	154/ 6.06	154/ 6.06	150/ 5.90	10.5/ 0.41
E4.2	208/ 8.18	334/ 13.14	208/ 8.18	208/ 8.18	150/ 5.90	10.5/ 0.41
E6.2	460/ 18.11	460/ 18.11	334/ 13.14	460/ 18.11	150/ 5.90	10.5/ 0.41
E6.2/f	-	586/ 23.07	-	460/ 18.11	150/ 5.90	10.5/ 0.41

Wall fixing (only for E1.2)



[mm]	3 p	4 p
A	192.5/7.57"	262.5/10.33"
B	70/2.75"	140/5.51"

Earthing device E2.2 - E4.2 - E6.2

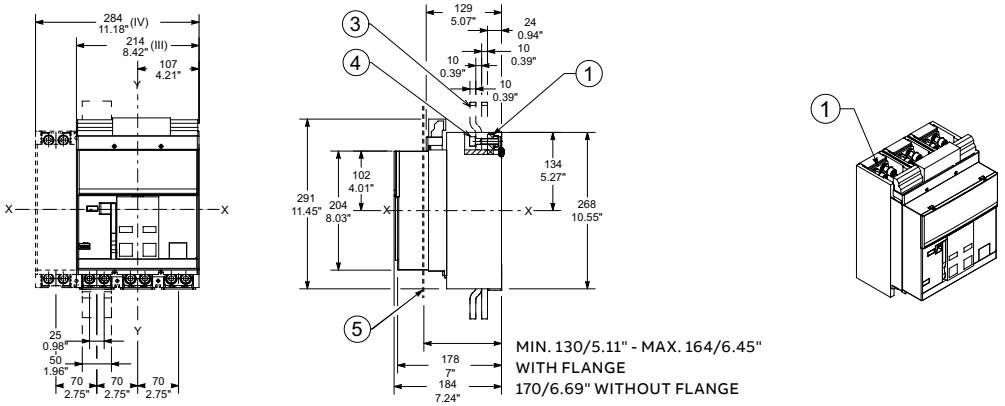


M5x8 screws supplied
Tightening torque 3Nm

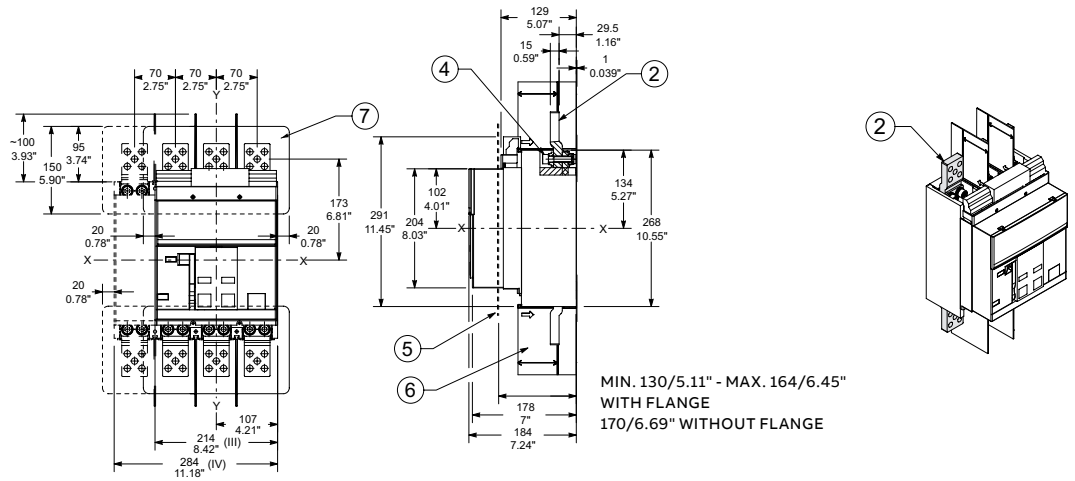
—
1) for fixing with rear terminals

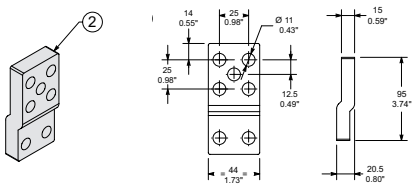
Fixed circuit breaker - E1.2

Front terminals – F



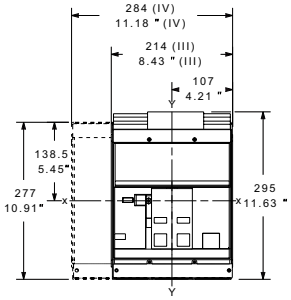
Extended front terminals – EF

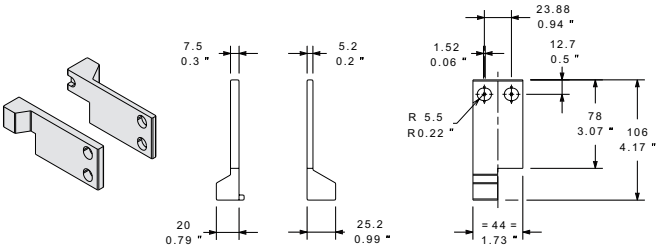




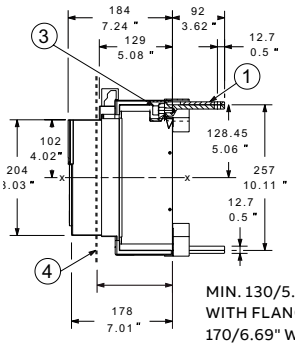
Key
1 Front terminals for flat connection
2 Extended front terminals
3 To be supplied by the customer
4 Tightening torque 18Nm - 159lb in
5 Door position - Ref. page 7/2
6 Obligatory phase separators 100mm/3.93in
7 Obligatory insulating plate to be supplied by the customer

Orientable rear terminals - HR/VR

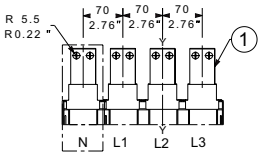


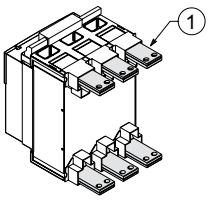


Terminals HR

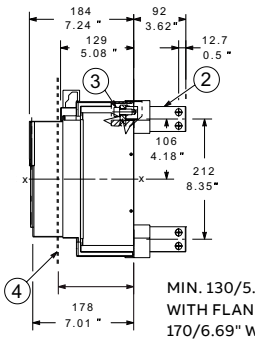


MIN. 130/5.11" - MAX. 164/6.45"
WITH FLANGE
170/6.69" WITHOUT FLANGE

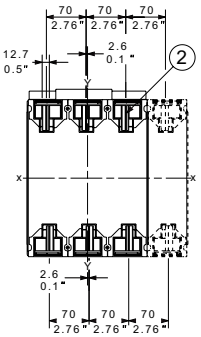


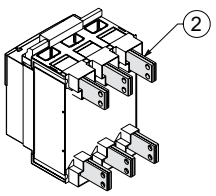


Terminals VR



MIN. 130/5.11" - MAX. 164/6.45"
WITH FLANGE
170/6.69" WITHOUT FLANGE



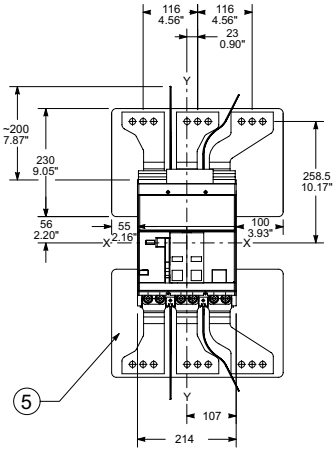


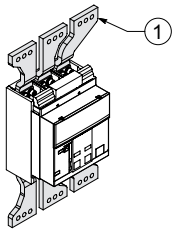
—
Key
1 Horizontal orientable terminals HR
2 Vertical orientable terminals VR
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2

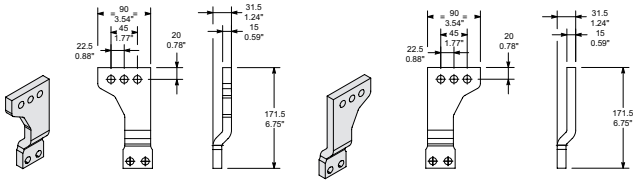
Fixed circuit breaker - E1.2

Splayed extended front terminals - ES

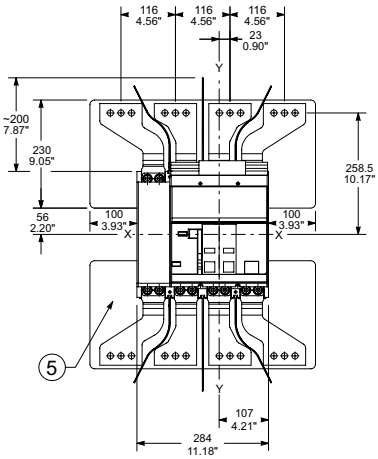
3-pole version (not UL listed)

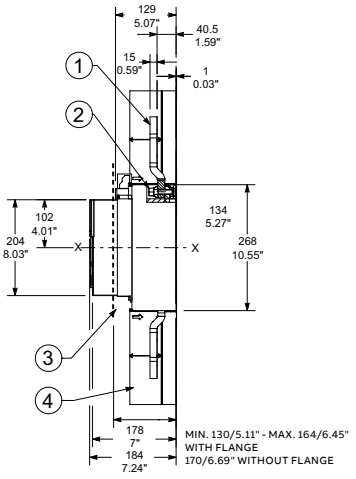


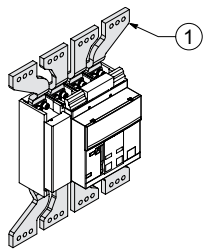


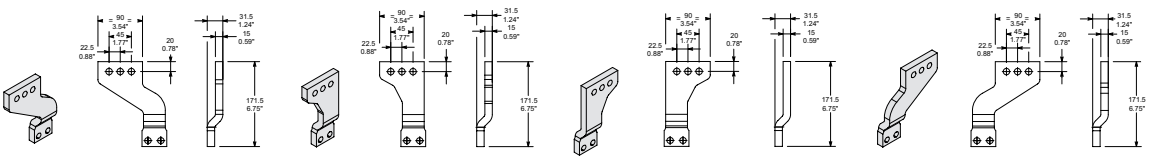


4-pole version









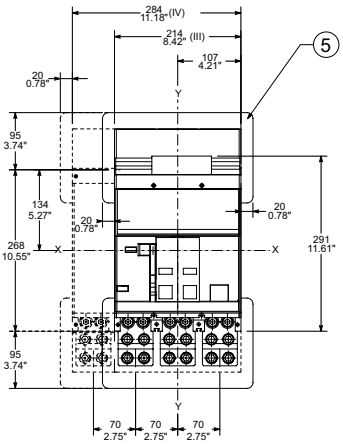
—

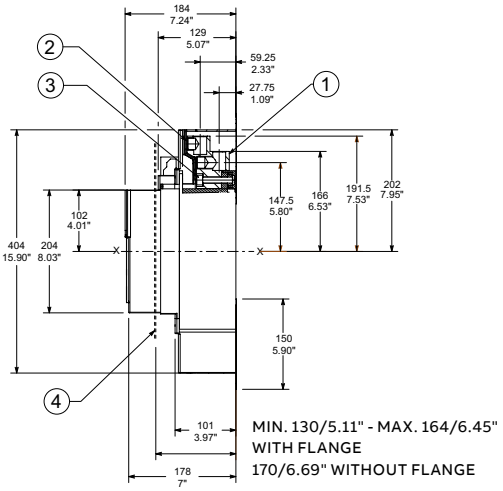
Key

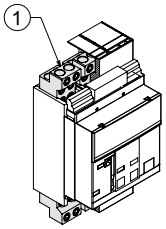
1 Splayed extended front terminals
2 Tightening torque 18Nm - 159lb in
3 Door position - Ref. page 7/2
4 Obligatory phase separators 200mm/7.87in
5 Obligatory insulating plate to be supplied by the customer

—
Not UL Listed

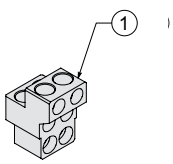
Front terminals for cables – FcCuAl

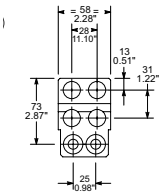


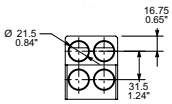


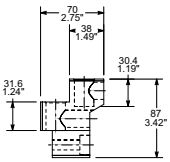


MIN. 130/5.11" - MAX. 164/6.45"
WITH FLANGE
170/6.69" WITHOUT FLANGE







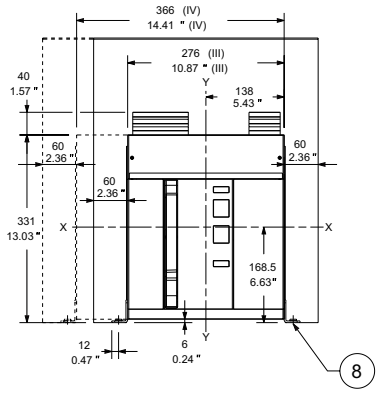


—
Key
1 Front terminals for cables FC CU AL
2 Tightening torque 43Nm - 379lb in
3 Tightening torque 18Nm - 159lb in
4 Door position - Ref. page 7/2
5 Obligatory insulating plate to be supplied by the customer

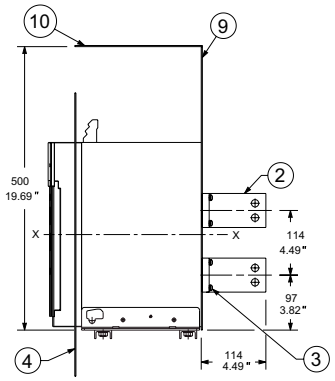
Fixed circuit breaker - E2.2

Orientable rear terminals - HR/VR

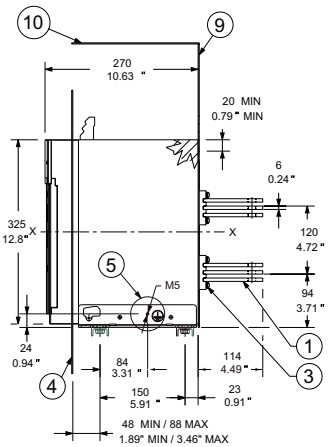
E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A

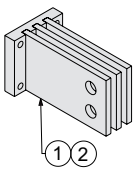


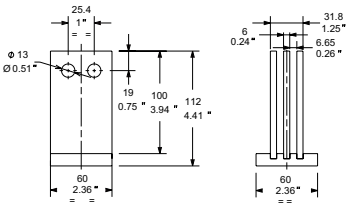
VR adjustment

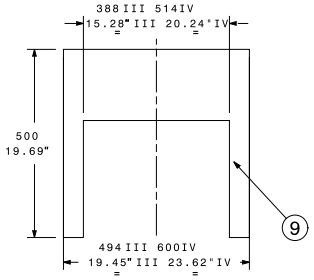


HR adjustment

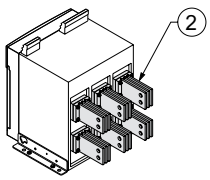


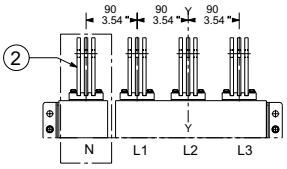




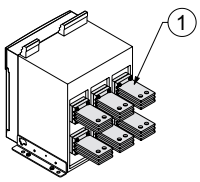


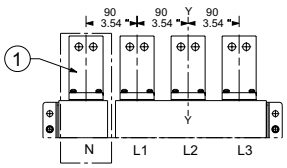
VR adjustment





HR adjustment





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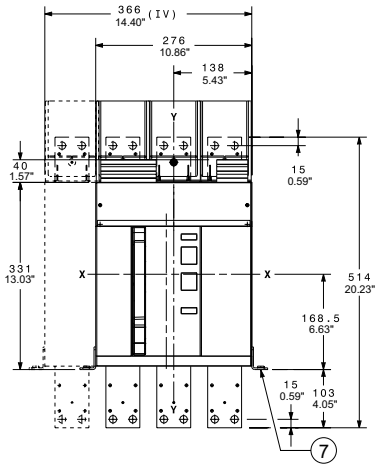
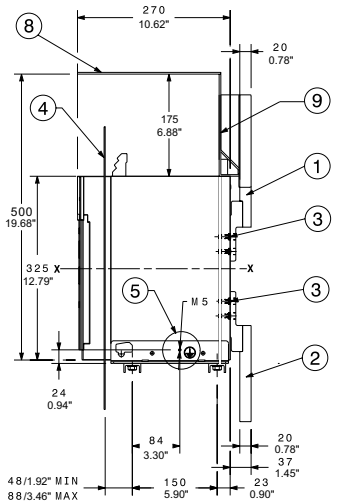
Key

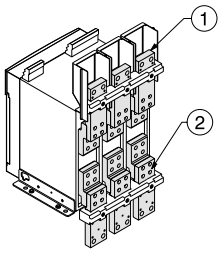
1 Horizontal terminals 1600A-2000A
2 Vertical terminals 1600A-2000A
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/2
5 Grounding
8 Mounting outside feet
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

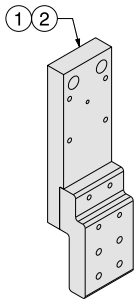
Front terminals – F

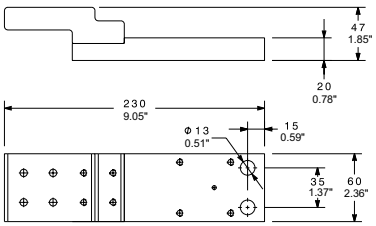
E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A (not UL listed)

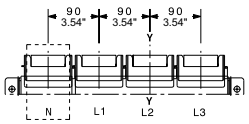












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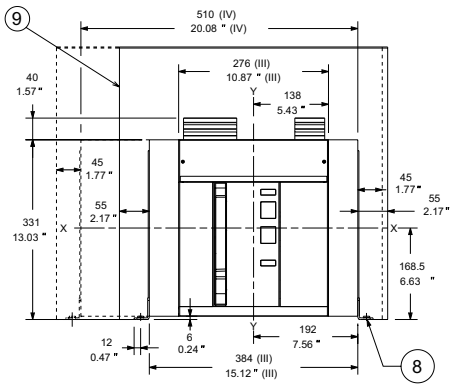
Key

1 Upper front terminals
2 Lower front terminals
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/2
8 External fixing point. Reccomended screws M10x25 high class

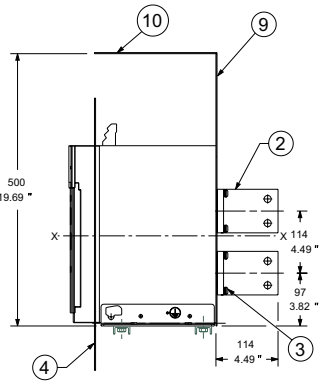
Fixed circuit breaker - E4.2

Orientable rear terminals - HR/VR

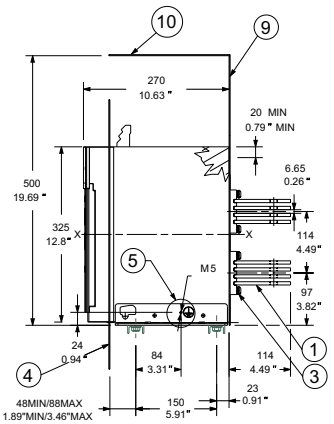
E4.2 S-A, H-A, V-A, L-A 800A - 2500A

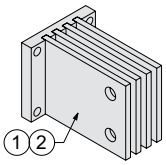


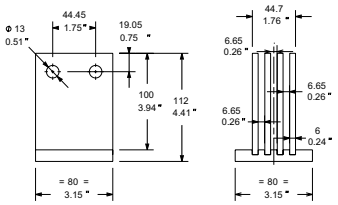
VR adjustment

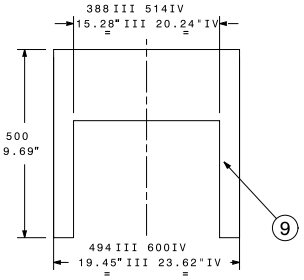


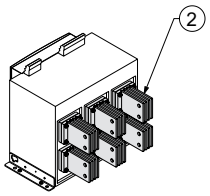
HR adjustment



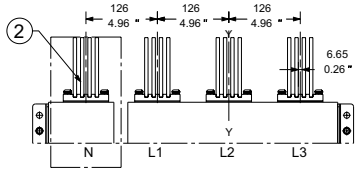


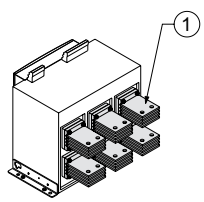




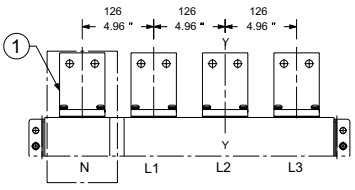


VR adjustment





HR adjustment



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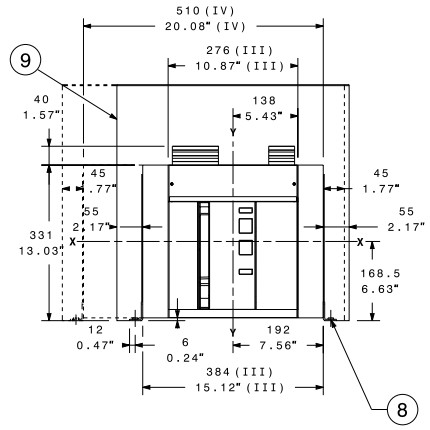
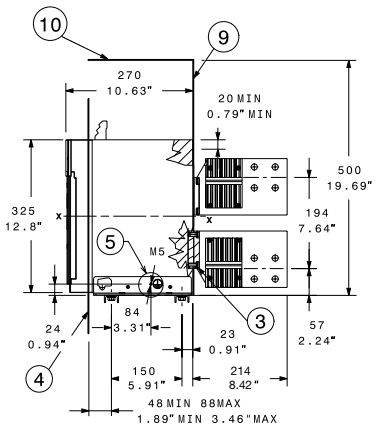
Key

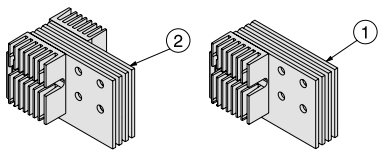
1 Horizontal terminals 2500A
2 Vertical terminals 2500A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
5 Grounding
8 Mounting outside feet
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

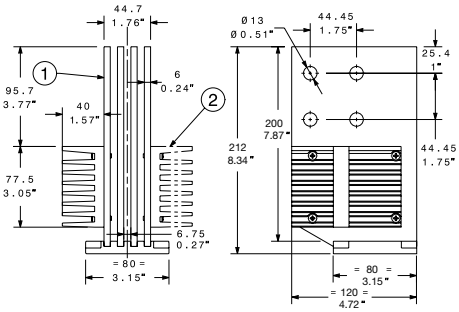
Vertical rear terminals - VR

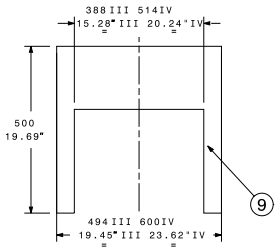
E4.2 S-A, H-A, V-A, L-A 3200A

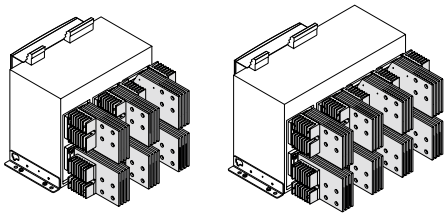


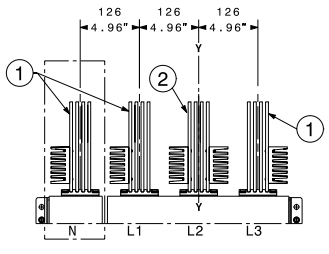












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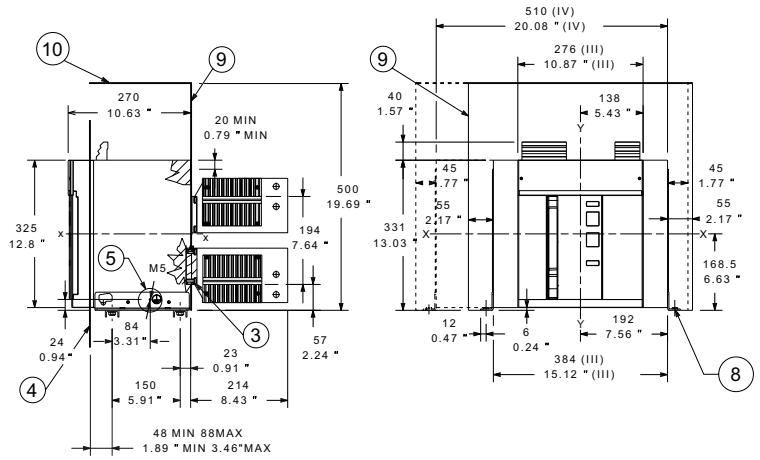
Key

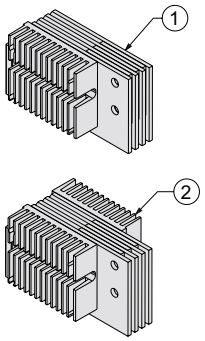
1 Lateral vertical terminals 3200A
2 Central vertical terminals 3200A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
8 Mounting outside feet. Reccomended screws M10x25 high class
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

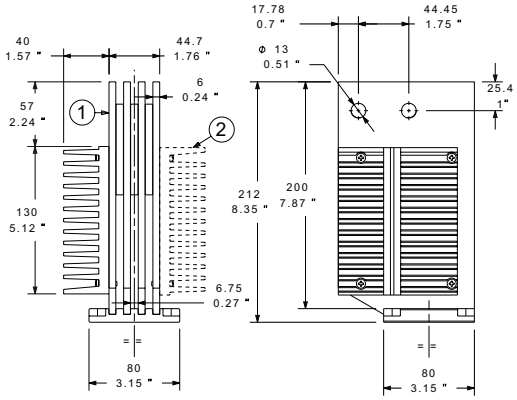
Fixed circuit breaker - E4.2

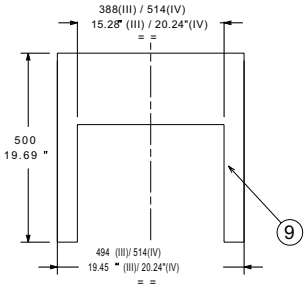
Vertical rear terminals - VR

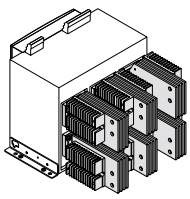
E4.2 S-A, H-A, V-A, L-A 3600A

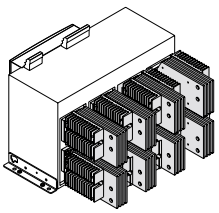


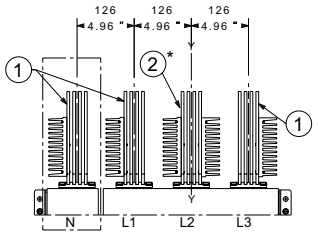












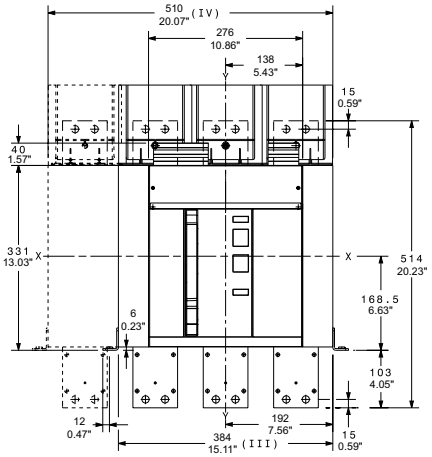
Key

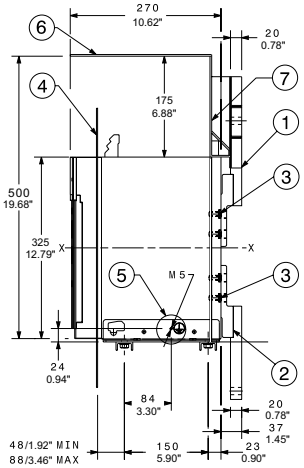
1 Lateral vertical terminal 3600A (*)
2 Central vertical terminal 3600A (*)
3 Tightening torque 20 Nm - 177 lb in
4 Door position- Ref. page 7/2
5 Grounding
8 Mounting outside feet screws reccomend m10x25 high class 8.8 or couple superior tightening torque 40 nm - 354 lb in compulsory fixing screws from top
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

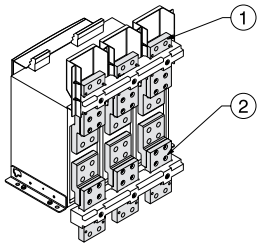
(*) for applications with neutral pole on the right, terminals with double radiator must be installed at the left of y-y axis

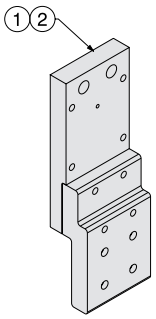
Front terminals – F

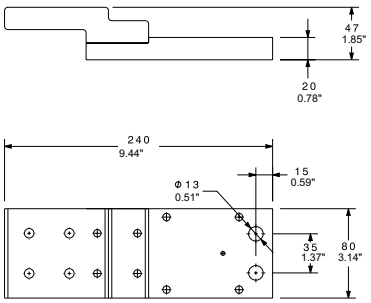
E4.2 S-A, H-A, V-A, L-A 800A - 3200A (not UL listed)

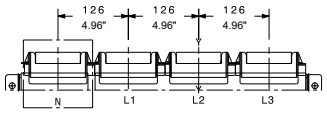












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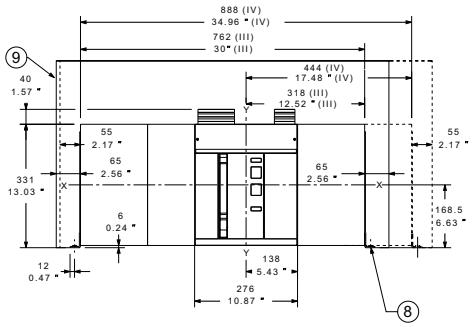
Key

1 Upper front terminals
2 Lower front terminals
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/2
5 Earthing device - Ref. page 7/3
6 Metallic sheet
7 Insulating sheet or insulated metallic sheet

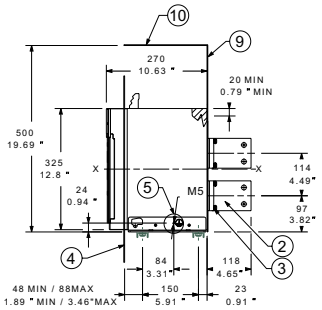
Fixed circuit breaker - E6.2

Orientable rear terminals - HR/VR

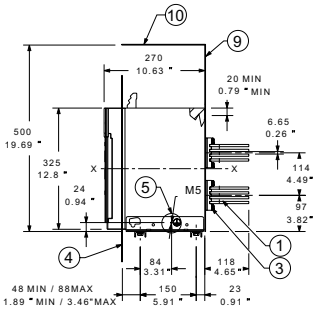
E6.2 H-A, V-A, L-A 4000A - 5000A

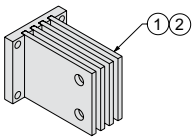


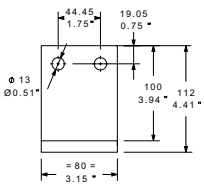
VR adjustment

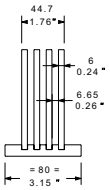


HR adjustment

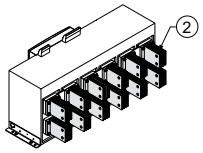


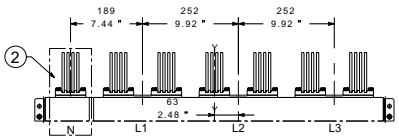


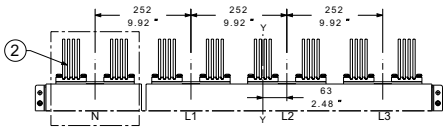




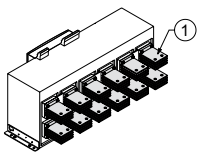
VR adjustment

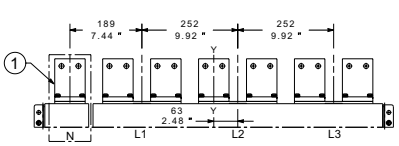


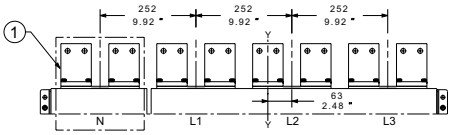




HR adjustment







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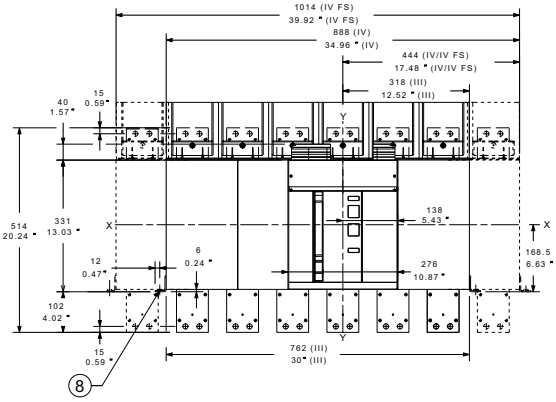
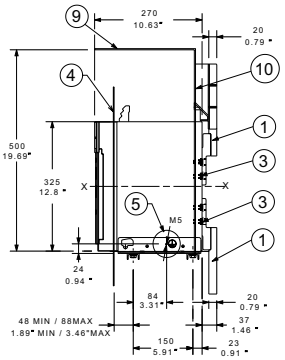
Key

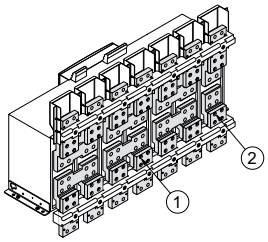
1 Horizontal terminals 5000A
2 Vertical terminals 5000A
3 Tightening torque 20Nm - 177lb in
4 Door position
5 Grounding
6 Ferrule for grounding
7 Screws M5x8 provided Tightening torque 3Nm - 26lb in
8 Mounting outside feet
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

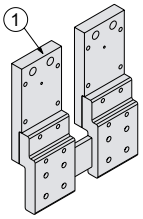
Front terminals – F

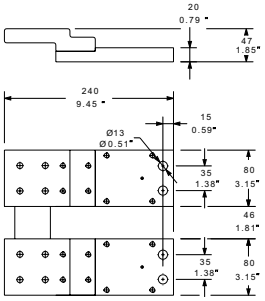
E6.2 H-A, V-A, L-A 4000A - 5000A (not UL listed)

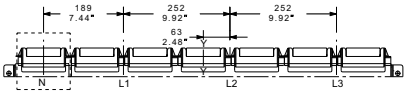


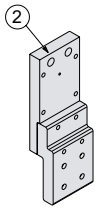


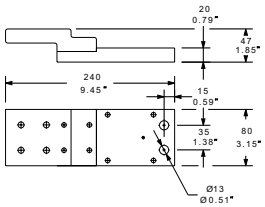












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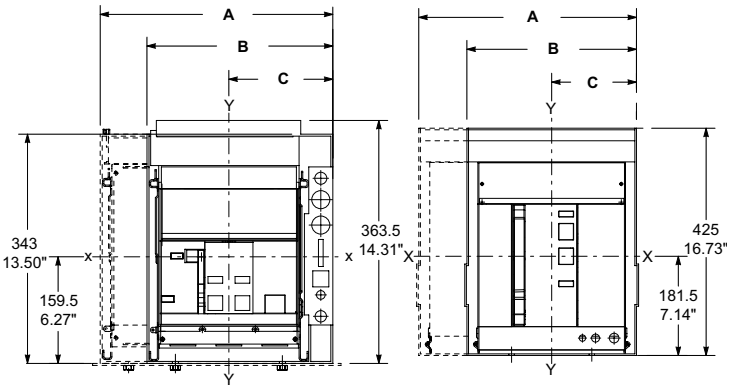
Key

1 Upper and lower front terminals
2 Single front terminals
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
5 Grounding
8 Mounting outside feet
9 Metallic sheet
10 Insulating sheet or insulated metallic sheet

Withdrawable circuit breaker

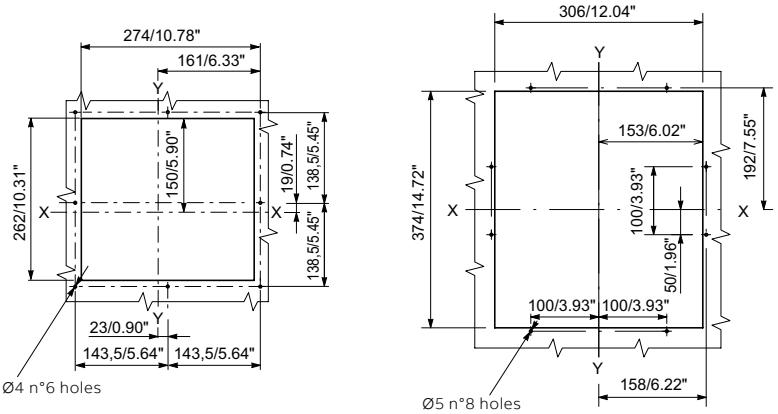
E1.2 **E2.2 - E4.2 - E6.2**



[mm/in]	A	B	C	
	4p	3p	3p	4p
E1.2	348/ 13.70	278/ 10.94	155.5/ 6.12	155.5/ 6.12
E2.2	407/ 16.02	317/ 12.48	158.5/ 6.24	158.5/ 6.24
E4.2	551/ 21.69	425/1 6.73	212.5/ 8.36	212.5/ 8.36
E6.2	929/ 36.57	803/ 31.61	338.5/ 13.32	464.5/ 18.28
E6.2/f	1055/ 41.53	-	-	464.5/ 18.28

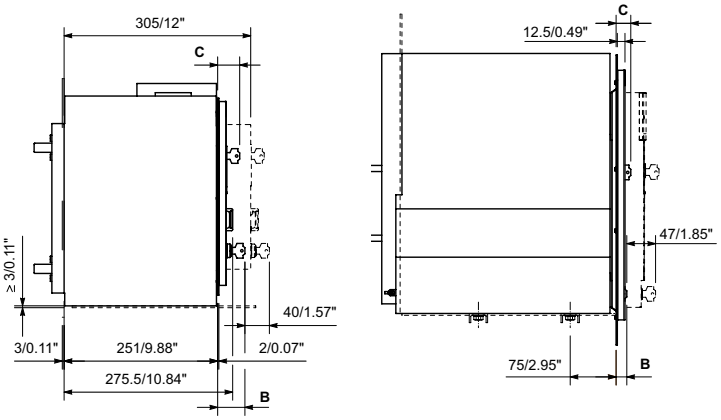
Compartment door drilling

E1.2 **E2.2 - E4.2 - E6.2**



Distance from connected to isolated position

E1.2 **E2.2 - E4.2 - E6.2**

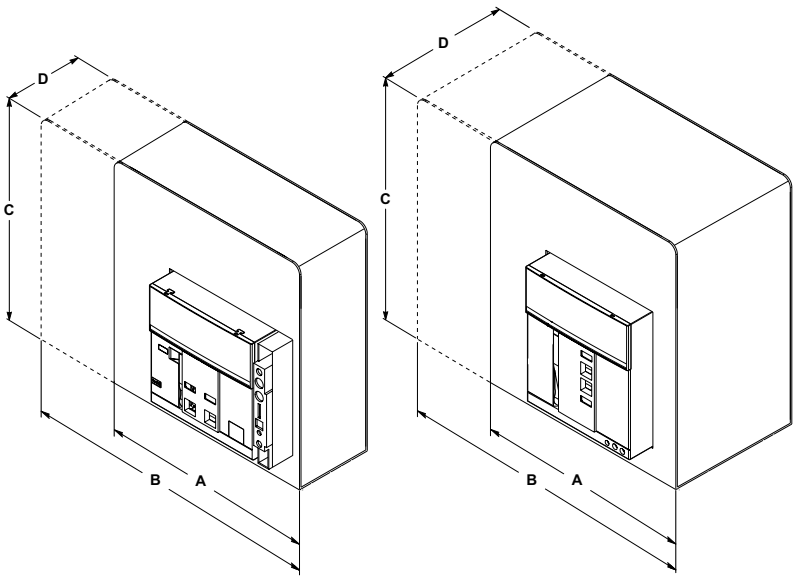


E1.2		Standard	Ronis/ Profalux	Kirk	Castell
A MIN	[mm/ in]	44.5/ 1.75	55/ 2.16	55/ 2.16	85
A MAX	[mm/ in]	36/ 1.41	46.5/ 1.83	46.5/ 1.83	76.5

E2.2-E4.2-E6.2		Standard	Ronis/ Profalux	Kirk	Castell
A MIN	[mm/ in]	22/ 0.86"	34/ 1.33"	39/ 1.53"	57.5/ 2.26"
A MAX	[mm/ in]	23/ 0.90"	35/ 1.37"	40/ 1.57"	58.5/ 2.30"

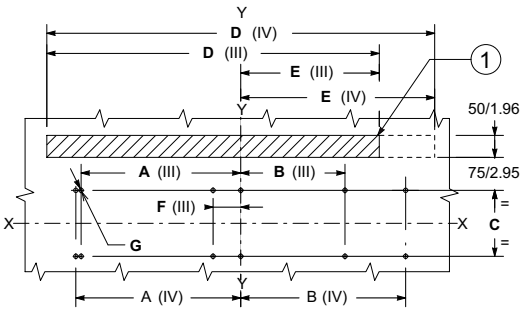
B refers to KLC; C refers to KLP

Dimensions of the compartment



[mm/in]	A	B	C	D
	3p	4p		
E1.2	280/ 11.02	350/ 13.77	440/ 17,32	252/ 9.92
E2.2	400/ 15.74	490/ 19.29	440/ 17,32	355/ 13.97
E4.2	500/ 19.68	620/ 24.41	440/ 17,32	355/ 13.97
E6.2	900/ 35.43	1020/ 40.16	440/ 17,32	355/ 13.97
E6.2/f	-	1200/ 47.24	440/ 17,32	355/ 13.97

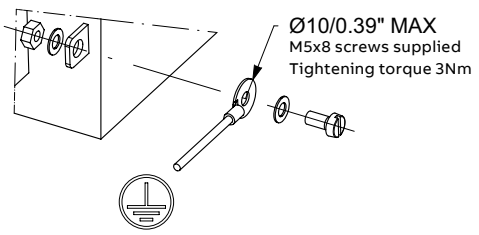
Floor fixing



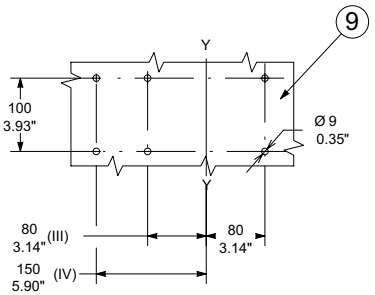
Key
1 Ventilation drilling on the switchgear

	A		B		C	D		E		F	G
[mm/in]	3p	4p	3p	4p		3p	4p	3p	4p		
E1.2	80/3.14	150/5.90	80/3.14	80/3.14	100/3.93	-	-	-	-	-	9/0.35
E2.2	75/2.95	175/6.88	75/2.95	75/2.95	150/5.90	270/10.62	360/14.17	135/5.31	135/5.31	-	10/0.39
E4.2	100/3.93	225/8.85	100/3.93	100/3.93	150/5.90	378/14.88	504/19.84	189/7.44	189/7.44	-	10/0.39
E6.2	363/14.29	375/14.76	237/9.33	375/14.76	150/5.90	756/29.76	882/34.72	315/12.40	441/17.36	63/2.48	10/0.39
E6.2/f	-	425/16.73	-	425/16.73	150/5.90	-	1008/39.68	-	441/17.36	-	10/0.39

Earthing device E2.2 - E4.2 - E6.2

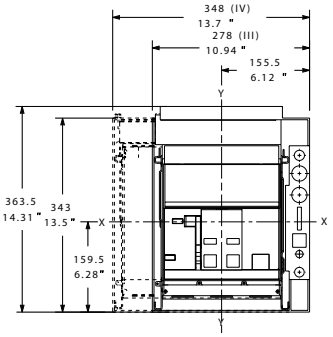


Fixing on support sheet (only for E1.2)

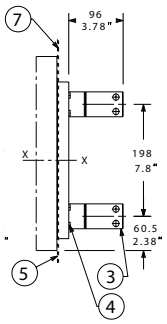


Withdrawable circuit breaker - E1.2

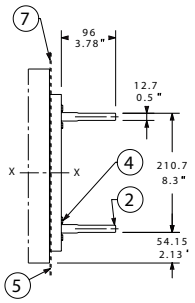
Orientable rear terminals - HR/VR

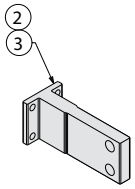


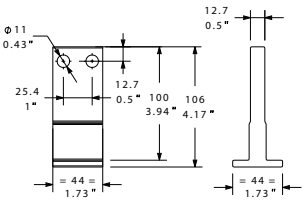
VR adjustment

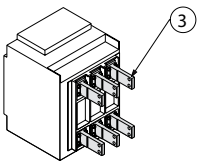


HR adjustment

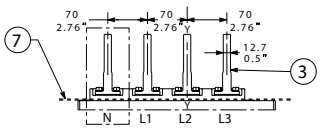


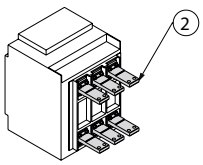




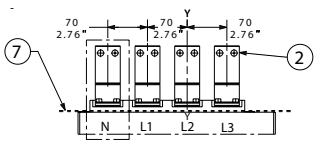


VR adjustment





HR adjustment



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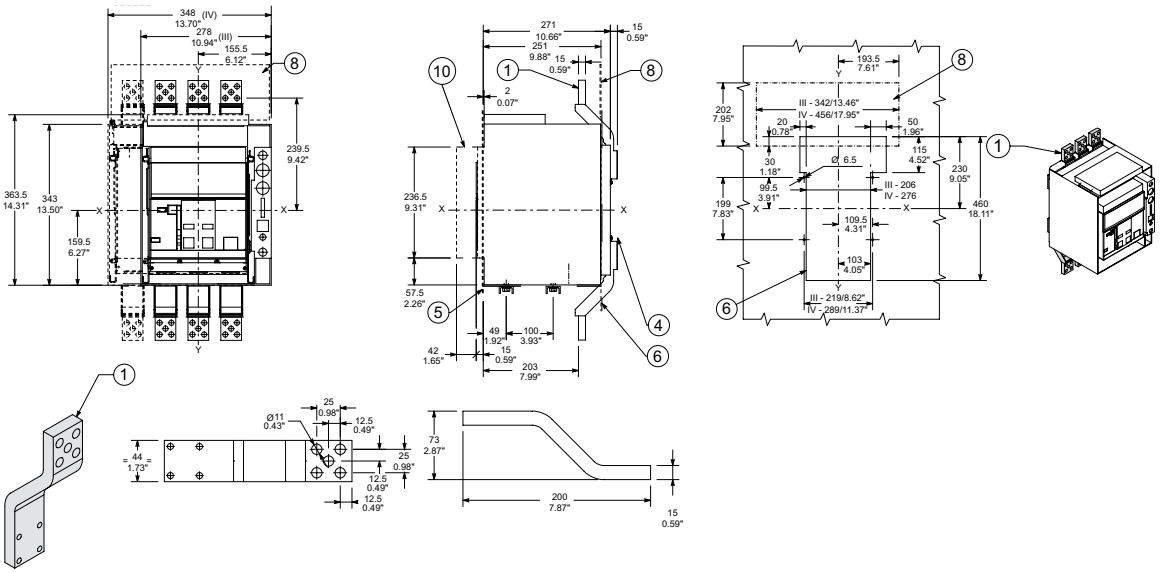
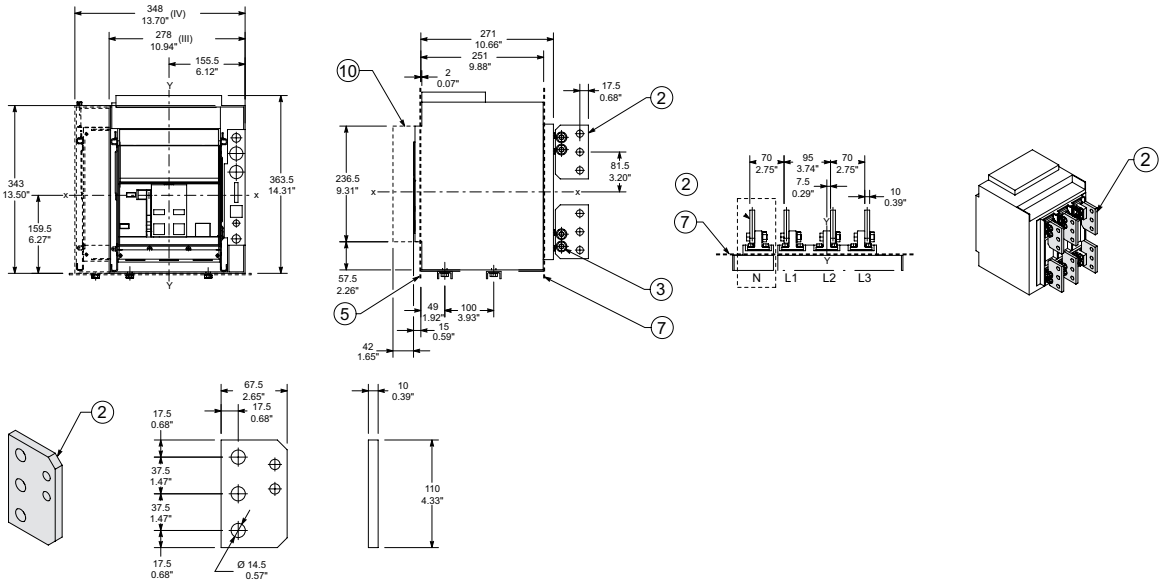
Key

2 Horizontal rear terminals
3 Vertical rear terminals
3 Tightening torque 12 Nm - 106lb in
5 Door position - Ref. page 7/12
7 Rear segregation for rear terminals
8 Insulating Protection

Extended front terminals – EF (not UL listed)



Rear terminals for cables – FcCuAl



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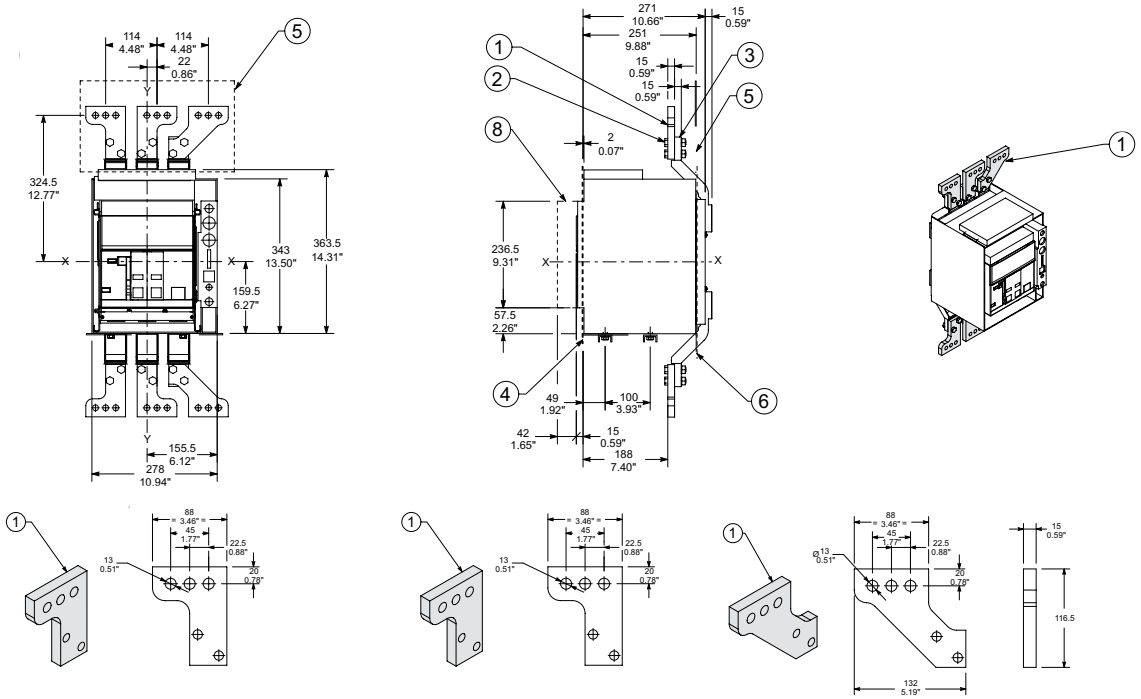
Key

1 Front terminals
2 Rear terminals for cables
3 Tightening torque 48 Nm - 424lb in
4 Tightening torque 12 Nm - 106lb in
5 Door position - Ref. page 7/12
6 Rear segregation for front terminals
7 Rear segregation for rear terminals - Ref. page 7/15
8 Insulating protection
10 Sectioning run

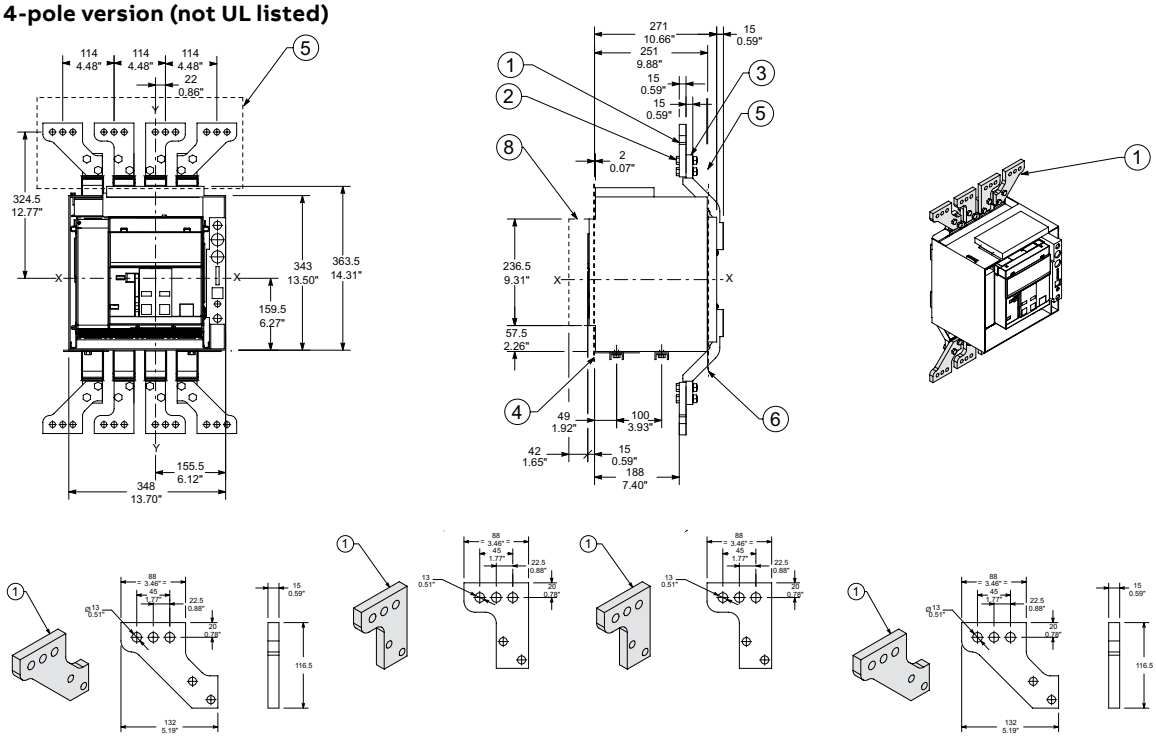
Withdrawable circuit breaker - E1.2

Front spread terminals - ES

3-pole version (not UL listed)



4-pole version (not UL listed)

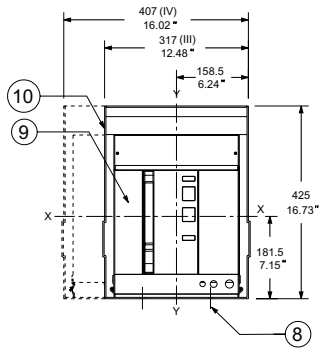


Key
1 Spread terminal
2 Tightening torque 40 Nm - 353lb in
3 Front terminal
4 Door position - Ref. page 7/12
5 Insulating protection (refer to front terminals page 7/15)
6 Rear segregation for front terminals - Ref. page 7/15
8 Sectioning run

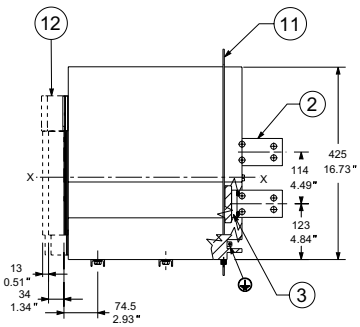
Withdrawable circuit breaker - E2.2

Orientable rear terminals - HR/VR

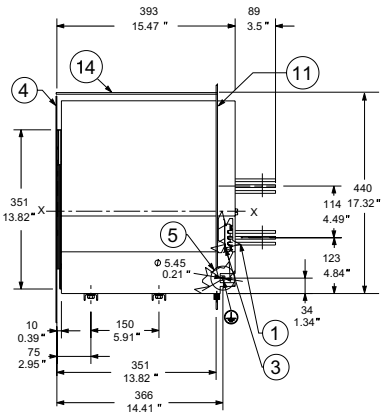
E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A

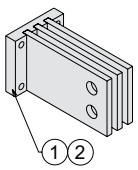


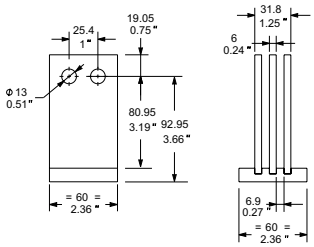
VR adjustment

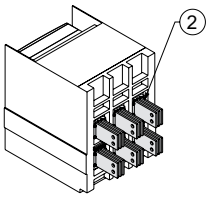


HR adjustment

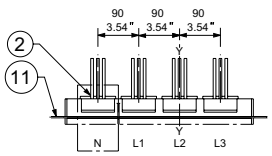


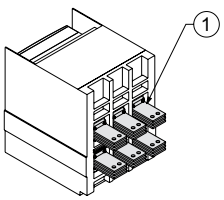




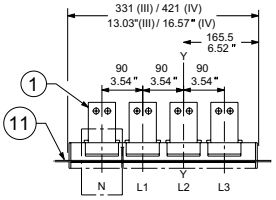


VR adjustment





HR adjustment



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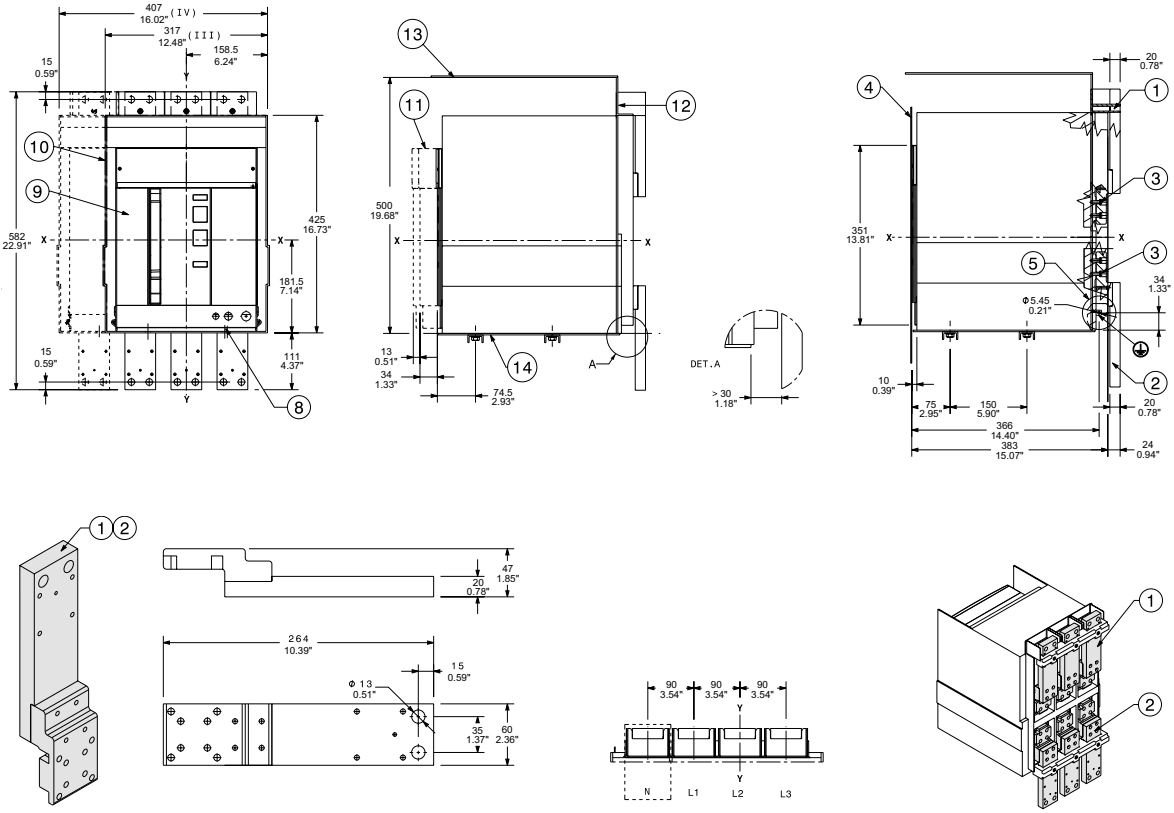
Key

1 Horizontal terminals 1600A-2000A
2 Vertical terminals 1600A-2000A
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/13
5 Grounding
8 Mounting fixed part screws
9 Moving part
10 Fixed part
11 Segregation
12 Connected, test, disconnected distances
14 Metallic sheet

Withdrawable circuit breaker - E2.2

Front terminals – F

E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A (not UL listed)



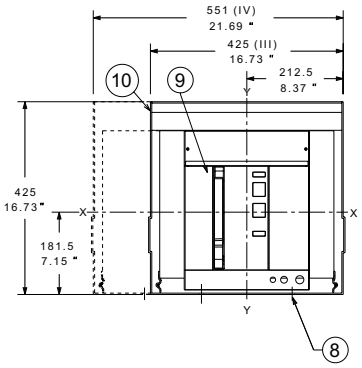
Key

1 Upper front terminals
2 Lower front terminals
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/13
5 Earthing device
8 External fixing point. Reccomended screws M10x25 high class
9 Moving part
10 Fixed part
11 Connected, test, disconnected distances
12 Insulating sheet or insulated metallic sheet
13 Roof insulation or insulated metal
14 Fixing plate

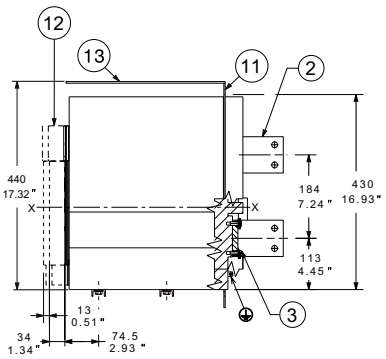
Withdrawable circuit breaker - E4.2

Orientable rear terminals - HR/VR

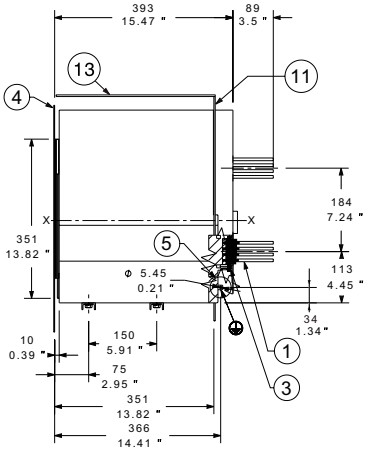
E4.2 S-A, H-A, V-A 800A - 2500A

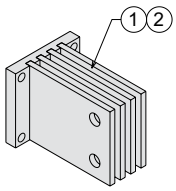


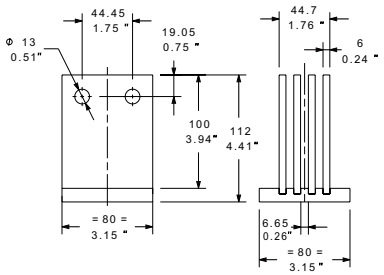
VR adjustment

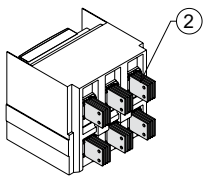


HR adjustment

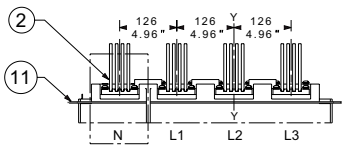


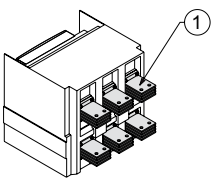




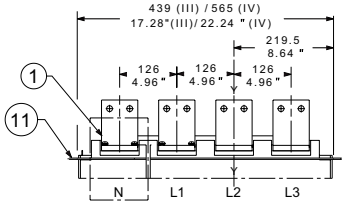


VR adjustment





HR adjustment



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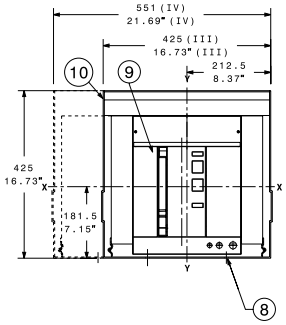
Key

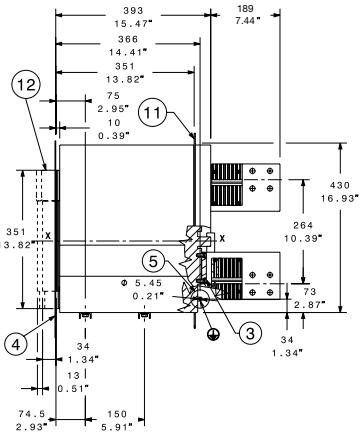
1 Horizontal terminals 2500A
2 Vertical terminals 2500A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/13
5 Grounding
8 Mounting fixed part screws
9 Moving part
10 Fixed part
11 Segregation
12 Connected, test, disconnected distances
13 Roof insulation or insulated metal

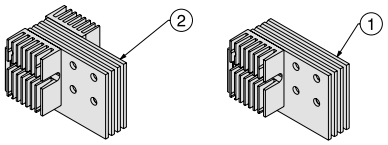
Withdrawable circuit breaker - E4.2

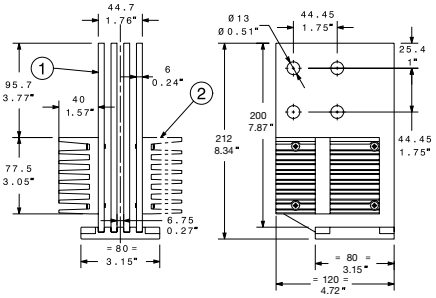
Rear terminals VR

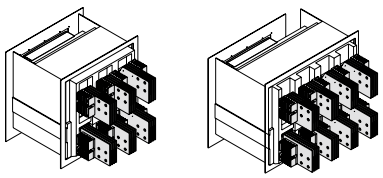
E4.2 S-A, H-A, V-A, L-A 3200A

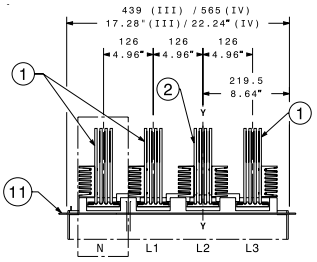






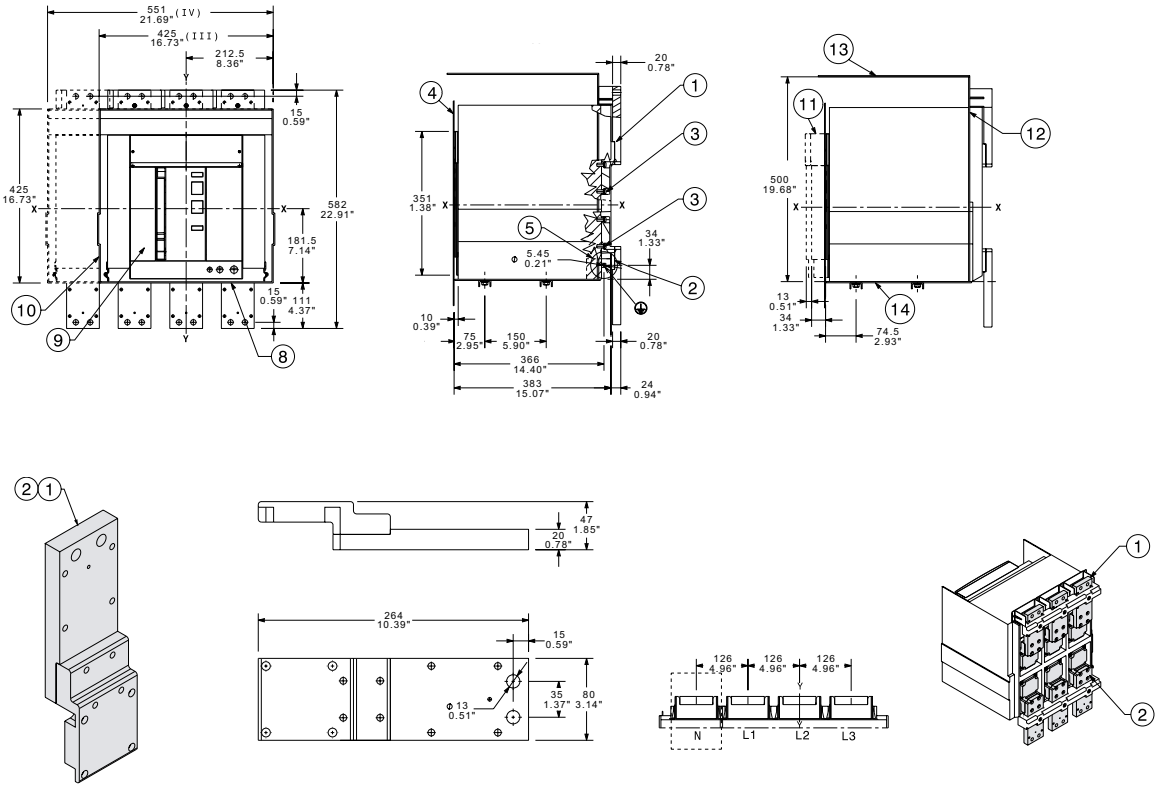






Front terminals – F

E4.2 S-A, H-A, V-A, L-A 800 - 3200A (not UL listed)



—

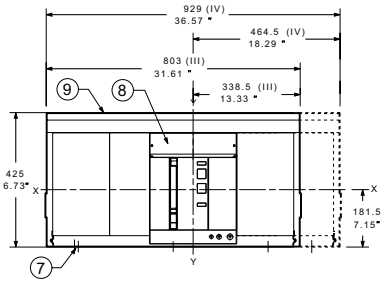
Key

1 Upper front terminals
2 Lower front terminals
3 Tightening torque 20Nm - 176lb in
4 Door position - Ref. page 7/13
5 Earthing device
8 External fixing point. Reccomended screws M10x25 high class
9 Moving part
10 Fixed part
11 Connected, test, disconnected distances
12 Insulating sheet or insulated metallic sheet
13 Roof insulation or insulated metal
14 Fixing plate

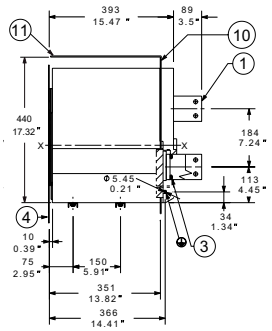
Withdrawable circuit breaker - E6.2

Orientable rear terminals - HR/VR

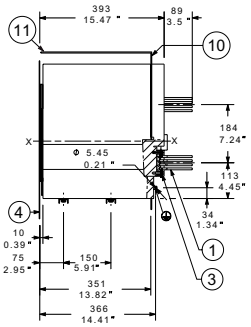
E6.2 H-A, V-A, L-A 4000A - 5000A

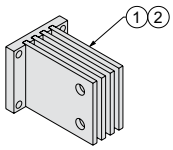


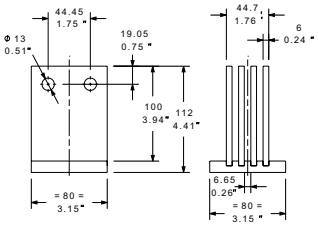
VR adjustment



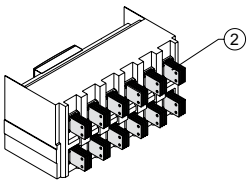
HR adjustment

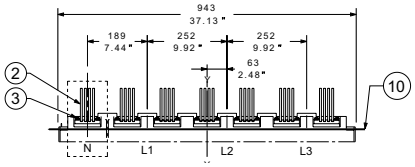


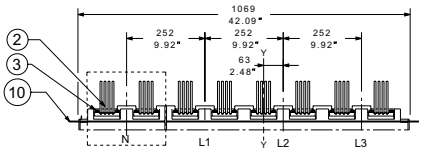




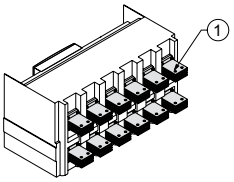
VR adjustment

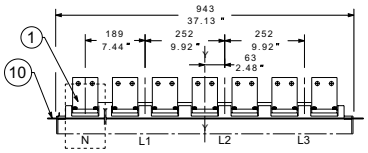


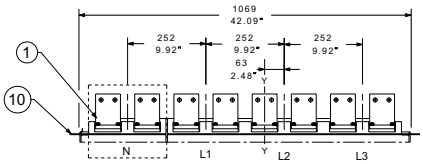




HR adjustment







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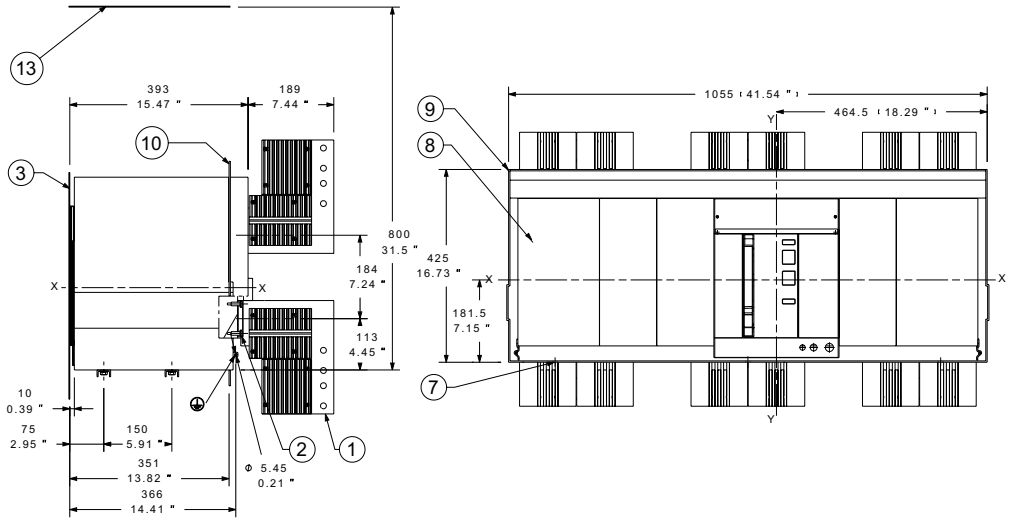
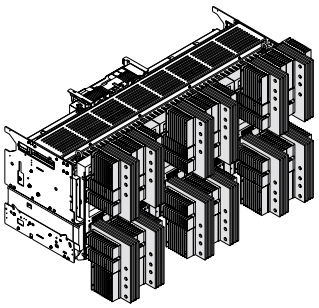
Key

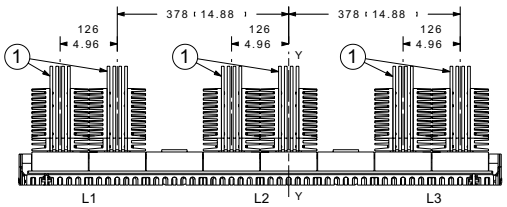
1 Horizontal terminals 5000A
2 Vertical terminals 5000A
3 Tightening torque 20Nm - 177lb in
4 Door position
7 Mounting fixed part screws M8x25 provided Tightening torque 20Nm - 177lb in
8 Moving part
9 Fixed part
10 Segregation
11 Roof insulation or insulated metal

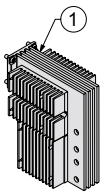
Vertical terminals – F

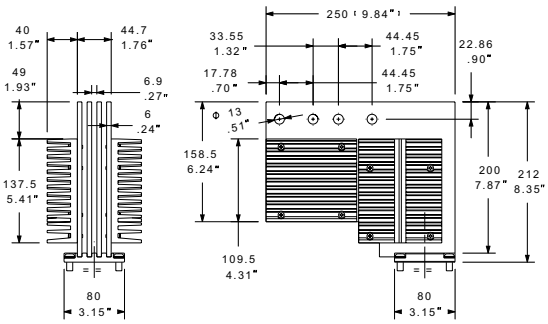
E6.2 H-A, V-A, L-A 6000A











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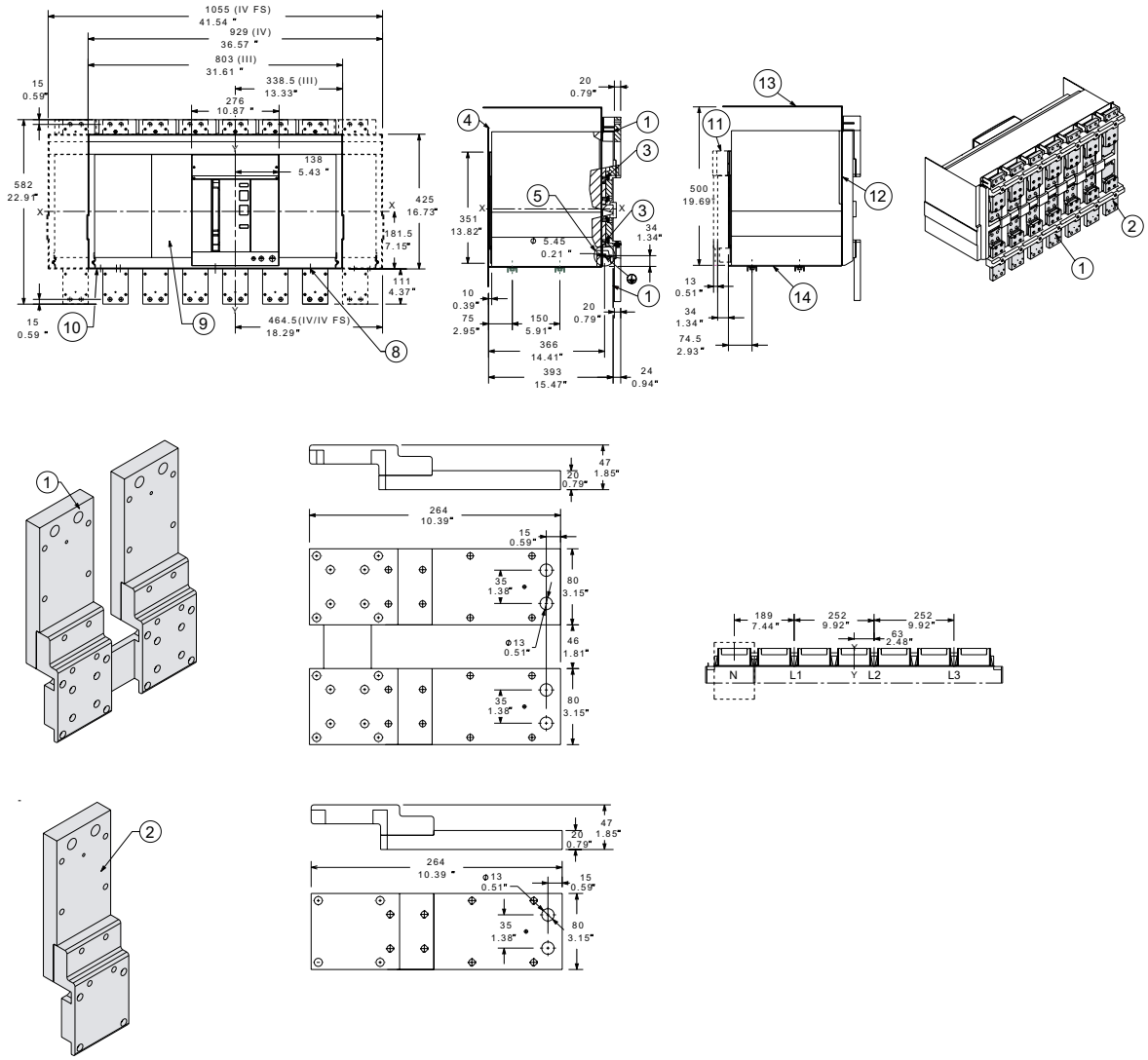
Key

1 Terminal 6000A
2 Tightening Torque 20 Nm - 177 Lb In
3 Door position
7 Mounting fixed part screws M8x25 provided Tightening torque 20Nm - 177lb in
8 Moving part
9 Fixed part
10 Segregation (When Provided)
13 Metallic Sheet

Withdrawable circuit breaker - E6.2

Front terminals – F

E6.2 H-A, V-A, L-A 4000A - 5000A (not UL listed)



Key

1 Upper and lower front terminals
2 Single front terminals
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
5 Grounding
8 Mounting fixed part
9 Moving part
10 Fixed part
11 Connected, test, disconnected distance
12 Insulating sheet or insulated metallic sheet
13 Roof insulation or insulated metal
14 Fixing plate

CHAPTER 9

Electrical diagrams

Reading information
Circuit breakers

Operating state shown
The diagram is shown in the following conditions:
- withdrawable version circuit breaker, open and racked-in
- with de-energized circuits
- trip units not tripped
- motor operator with unloaded springs.

Versions
The diagram shows a withdrawable version circuit breaker, but it is also valid for fixed version circuit breakers.

Fixed version
The control circuits are included between the XV terminals (the X connector is not supplied).

Withdrawable version
The control circuits are included between the poles of the X connector (the XV terminal box is not supplied).

Description of figures
1) Supplementary open/closed auxiliary contacts of the circuit breaker - AUX 6Q (6 Form C)
2) Ekip Signalling 4K
11) Trip signalling contact
12) Contact for signalling position of loaded springs - S33 M/2
13) Motor for loading closing springs- M
14) Remote reset - YR
20) Ekip Measuring/Measuring Pro with voltage socket inside the four pole circuit breaker
21) Ekip Measuring/Measuring Pro with voltage sockets inside the three-pole circuit breaker and connection for external neutral
22) Ekip Measuring Pro for residual voltage protection (for Ekip G only)
23) Ekip Measuring/Measuring Pro with external voltage socket
24) Rc residual current protection sensor input
25) Transformer star center sensor input
26) Zone selectivity
27) Current sensor input on external neutral (only for 3-pole circuit breakers)
31) Direct auxiliary supply 24V DC and local bus - Ekip Supply
32) Auxiliary supply through module 110-240V AC/DC or 24-48V DC and local bus - Ekip Supply
41) Ekip signalling 2K-1
42) Ekip signalling 2K-2
43) Ekip signalling 2K-3
48) Ekip sinchrocheck
51) Ekip COM Modbus RS-485
52) Ekip COM Modbus TCP
53) Ekip COM Profibus
54) Ekip COM Profinet
55) Ekip COM EtherNet/IP™
56) Ekip COM EtherNet/IP™
57) Ekip COM IEC61850
58) Ekip LINK
59) Ekip Com Hub
60) Ekip Com Open ADR
61) Ekip COM R Modbus RS-485 Redundant
62) Ekip COM R Modbus TCP Redundant
63) Ekip COM R Profibus Redundant
64) Ekip COM R Profinet Redundant
65) Ekip COM R DeviceNet™ Redundant
66) Ekip COM R EtherNet/IP™ Redundant
71) Ready to close contact - RTC
72) Second opening coil - YO2
73) Undervoltage coil - YU
74) Undervoltage coil with external time-lag device - YU, D
75) First opening coil - YO
76) First opening coil with control from protection trip unit - YO, Ekip Com Actuator

77) First closing coil - YC
78) First closing coil with control from protection trip unit - YC, Ekip Com Actuator
79) Second closing coil - YC2
81) Open/closed auxiliary contacts of circuit-breaker - AUX 4Q (4 Form C)
91) External supplementary open/closed auxiliary contacts of circuit breaker - AUX 15Q (15 Form C)
95) Contacts for signalling of circuit breaker in racked-in, test, racked-out position
96) Contacts for signalling of circuit breaker in racked-in, test, racked-out position (first set)
97) Contacts for signalling of circuit breaker in racked-in, test, racked-out position (second set)
97A) Contacts for signalling of circuit breaker in racked-in, test, racked-out position (second set)

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Reading information
Circuit breakers

Key

*	= See the note indicated by the letter
A1	= Applications located on the mobile part of the circuit breaker
A3	= Applications located on the fixed part of the circuit breaker
A4	= Indicative devices and connections for control and signalling, outside the circuit breaker
BUS1	= Serial interface with external bus
D	= Electronic time-lag device of YU undervoltage coil, outside the circuit breaker
F1	= Time-delayed trip fuse
GZi(DBi)	= Zone selectivity input for G protection or input in “reverse” direction for D protection
GZo(DBo)	= Zone selectivity output for G protection or output in “reverse” direction for D protection
I O1…32	= Programmable digital inputs of the EKIP protection trip unit
K51	= Electronic overcurrent protection trip unit of the types: EKIP DIP, EKIP TOUCH, EKIP LCD, EKIP HI-TOUCH , EKIP HI-LCD, EKIP G TOUCH, EKIP G LCD, EKIP G HI-TOUCH , EKIP G HI-LCD
K51/COM	= Communication module
K51/MEAS	= Measurement module
K51/SIGN	= Signalling module
K51/SUPPLY	= Optional auxiliary supply module (110-220VAC/DC and 24-48VDC)
K51/SYNC	= Synchronization module
K51/YC	= Closing control from the EKIP protection trip unit
K51/YO	= Opening control from the EKIP protection trip unit
M	= Motor for loading closing springs
O 01...32	= Programmable signalling contacts of the EKIP protection trip unit
O SC	= EKIP protection trip unit contact for synchronism control
Q	= Circuit breaker
Q/1...Q/25	= Auxiliary contacts of circuit- breaker
Q/26...Q/27	= Auxiliary open/close contacts used internally by the trip unit
RC	= RC (residual current) protection sensor
RT1…RT3	= Temperature sensors
RTC EKIP	= Auxiliary ready to close contact of circuit breaker, used internally by the trip unit
RTC	= Contact for signalling circuit-breaker is ready to close
S33M/1…2	= Limit contacts of spring loading motor
S43	= Switch for presetting remote/local control
S51	= Trip signalling contact
S75E/1…4	= Contacts for signalling circuit- breaker in racked-out position (provided only with withdrawable version)
S75I/1…5	= Contacts for signalling circuit- breaker in racked-in position (provided only with withdrawable version)
S75T/1…2	= Contact for signalling circuit-breaker in test position (provided only with withdrawable version)
SC	= Pushbutton or contact for closing the circuit-breaker
SO	= Pushbutton or contact for immediate opening of the circuit-breaker
SO1	= Pushbutton or contact for opening the circuit-breaker with time-delayed trip
SR	= Pushbutton or contact for electrical resetting of S51trip contact

SZi(DFi) = Input for zone selectivity for S protection or input in “direct” direction for S protection
SZo(DFo) = Output for zone selectivity for S protection or output in “direct” direction for D protection
TI/L1 = Current transformer phase L1
TI/L2 = Current transformer phase L2
TI/L3 = Current transformer phase L3
TI/N = Current transformer on neutral
TU1…TU2 = Insulation voltage transformer (outside circuit breaker)
Uaux = Auxiliary supply voltage
UI/L1 = Current sensor phase L1
UI/L2 = Current sensor phase L2
UI/L3 = Current sensor on phase L3
UI/N = Current sensor on neutral
UI/O = Single-pole current sensor
W2 = Serial interface with internal bus (local bus)
W9…W13 = RJ45 connector for communication modules
W9R.W11R = RJ45 connector for redundant communication modules
X = Delivery connector for auxiliary circuits for withdrawable version of circuit breaker
XB1...XB7 = Connectors for circuit breaker applications
XF = Delivery terminal board for position contacts of withdrawable version of circuit breaker
XK1…XK3 = Connectors for auxiliary circuits of the EKIP protection trip unit
XK7 = Connector for auxiliary circuits of communication module
XV = Delivery terminal box for auxiliary circuits of fixed version circuit-breaker
YC = Closing coil
YC2 = Second closing coil
YO = Opening coil
YO1 = Opening coil for overcurrent
YO2 = Second opening coil
YR = Coil for electrical resetting of trip contact S51
YU = Undervoltage coil

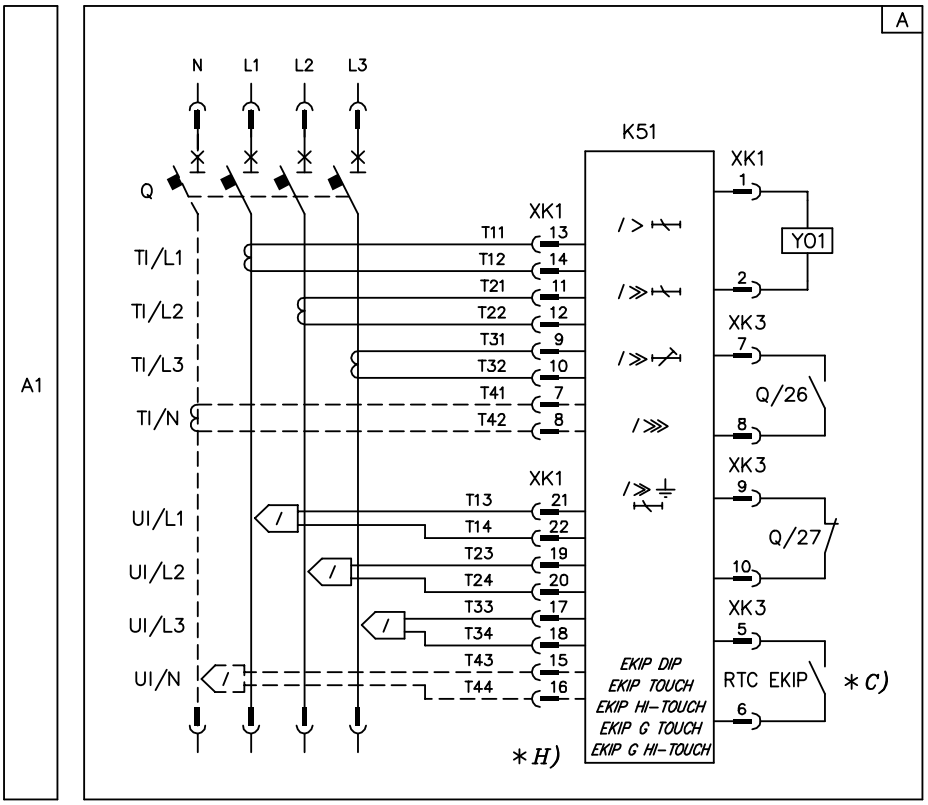
Reading information
Circuit breakers

Notes

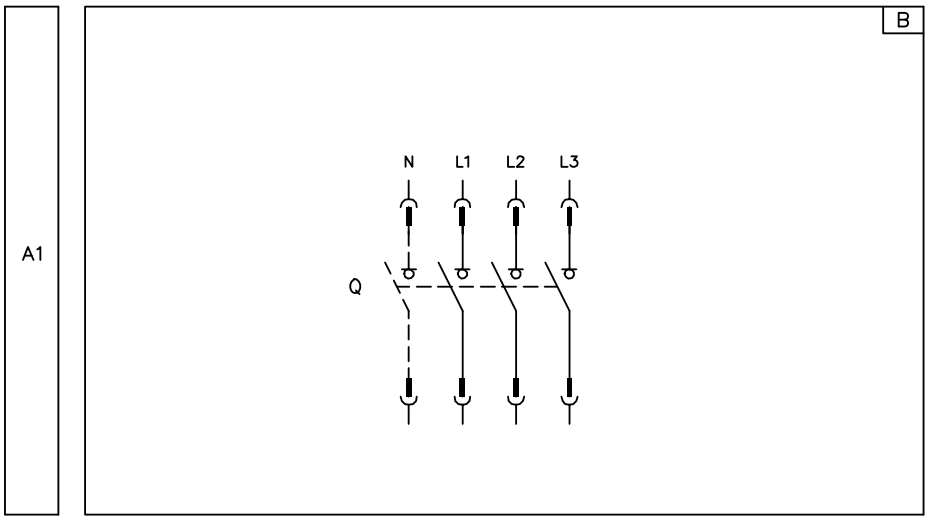
A) Auxiliary supply for Ekip trip unit is mandatory (refer to diagram 1SDM00009R0001 figures 31 - 32- 33 - 34).
B) When there are mixed auxiliary contacts Q1 and Q2 are 400V, while Q3 and Q4 are 24V. Then Q5, Q6, Q7 are 400V, while Q8, Q9, Q10 are 24V.
C) Always supplied with Ekip Com module.
D) Always supplied with motor for loading closing springs in Fig. 13.
E) Obligatory voltage transformer in the case of external sockets. Obligatory external sockets for systems with rated voltage greater than 690V.
F) The connections between the RC residual current protection sensor and the poles of the X connector (or XV) of the circuitbreaker must be made with 4-pole shielded cable with conductors interwoven in pairs (type BELDEN 9696 paired or equivalent), of a length no greater than 10 m. The shield should be earthed on circuit-breaker side.
G) With all electronic protection trip units equipped with display interface with LSIG protections, protection against an earth fault is available (Gext) by means of current sensor positioned on the star centre of the MV/LV transformer. The connection between terminals 1 and 2 of the UI/O current transformer and Ge+ and Ge- poles of the X connector (or XV) must be made with shielded and stranded 2-pole cable (type BELDEN 9841 or equivalent) of length no greater than 15 m.
H) The connection between the terminal box and external neutral sensor must be made with the 2m cable provided. For three pole circuit-breakers, the Ne+ and Ne- poles of the X connector (or XV) must be short-circuited if no sensor is present on the external neutral conductor.
I) Obligatory in the case of the presence of any Ekip module.
J) Only for E2.2, E4.2 and E6.2 withdrawable version circuit-breakers as an alternative to Fig. 31-32-34.
K) Only for E2.2, E4.2 and E6.2 withdrawable version circuit-breakers as an alternative to Fig. 31-32-33.
K) Only for E2.2, E4.2 and E6.2 withdrawable version circuit-breakers as an alternative to Fig. 31-32-33.
L) In the presence of Fig. 32, for E2.2, E4.2 and E6.2 circuit-breakers up to three applications between Fig. 41…58 taken only once can be supplied, instead for E1.2 circuit-breakers, up to two applications between Fig. 41…58 taken only once can be supplied. The Ekip Com module selected can be duplicated if required, by choosing between Fig. 61…66.
M) In the presence of Fig. 33, for E2.2, E4.2 and E6.2 circuit-breakers, up to two applications between Fig. 41…58 taken only once can be supplied. The Ekip Com module selected can be duplicated if required, by choosing between Fig. 61…66.
N) In the presence of Fig. 34, for E2.2, E4.2 and E6.2 circuit-breakers, a single application between Fig. 41…58 can be supplied.
O) In the presence of several Ekip Com modules with withdrawable version circuit-breakers, the contact S75I/5 should be connected only once to a single module.
P) The auxiliary voltage Uaux. enables activation of all the functions of the EKIP electronic protection trip units. Since an earth insulated Uaux was requested, it is necessary to use “galvanically separated convertors” which comply with the standards IEC 60950 (UL 1950) or equivalent, which guarantee a common mode current or leakage current (refer to IEC 478/1, CEI 22/3) no greater than 3.5mA, IEC 60364-41 and CEI 64-8.
Q) Regarding local bus the maximum cable lenght is 15m.
R) Suggested RJ45 cable: CAT6 STP.
T) Connect terminals 120 Ω on if you want to insert a termination resistance on the Local Bus.

Circuit-breakers (IEC60617 standards)

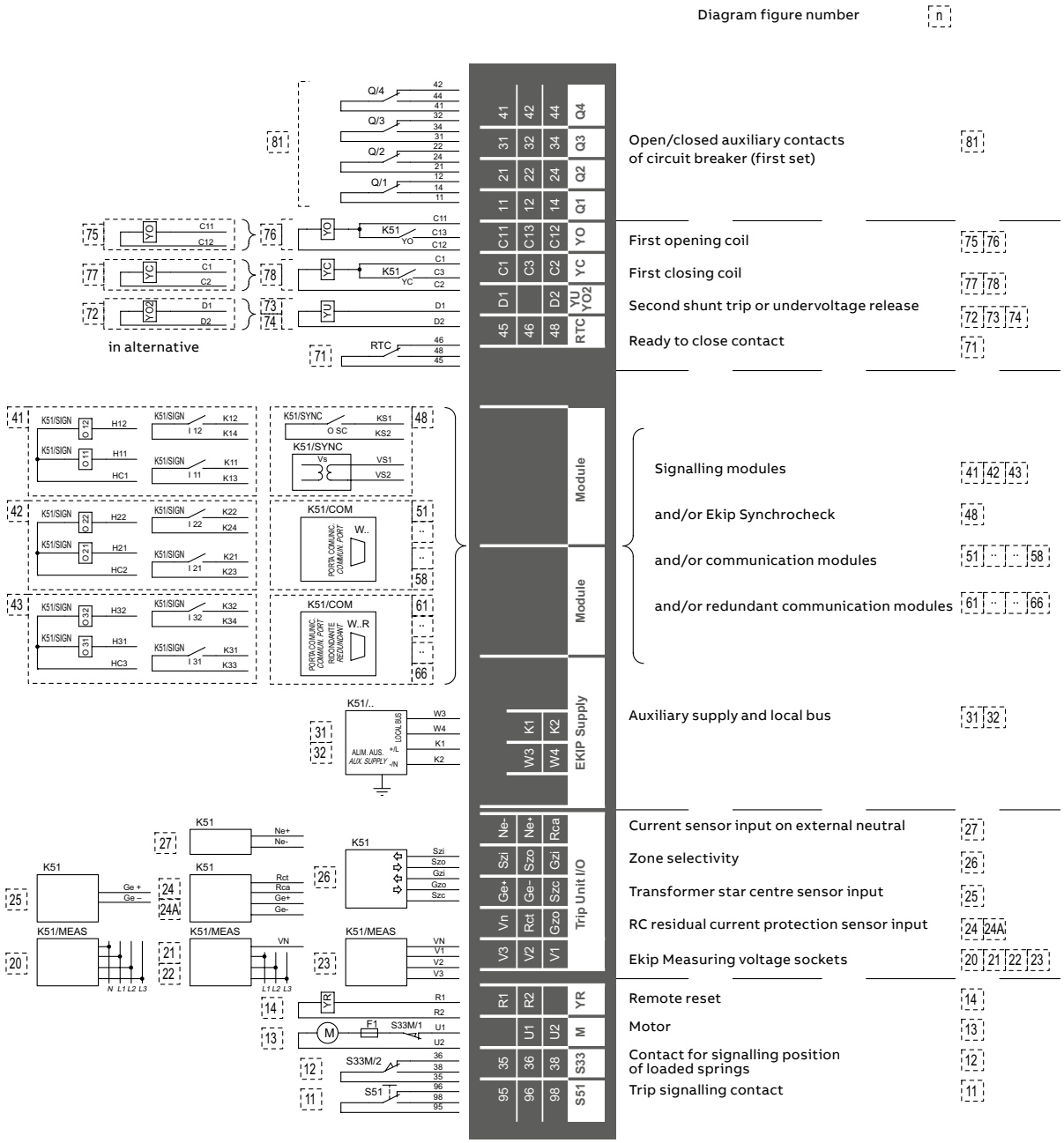
3-pole or 4-pole circuit breaker



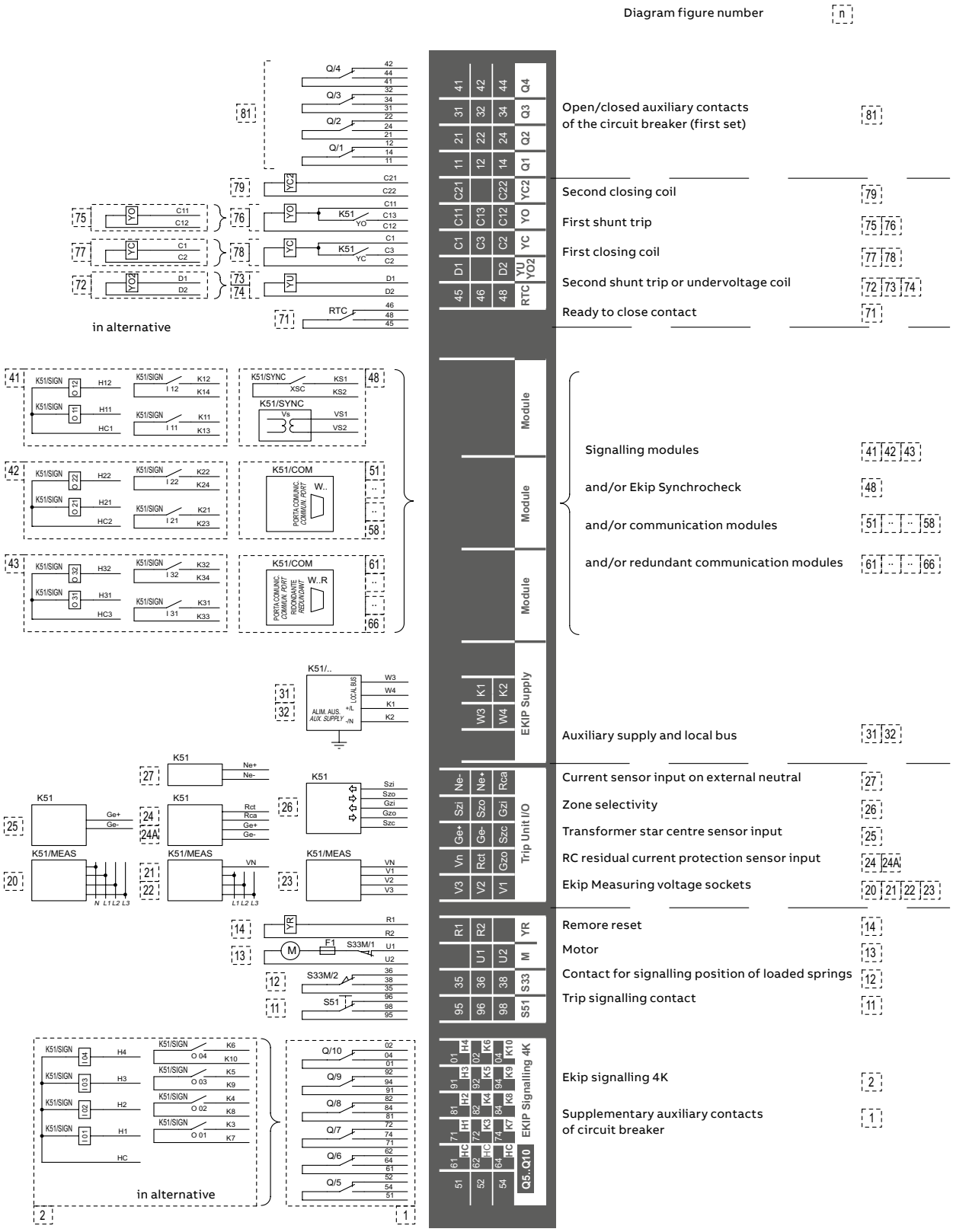
3-pole or 4-pole switch-disconnector



Terminal box E1.2

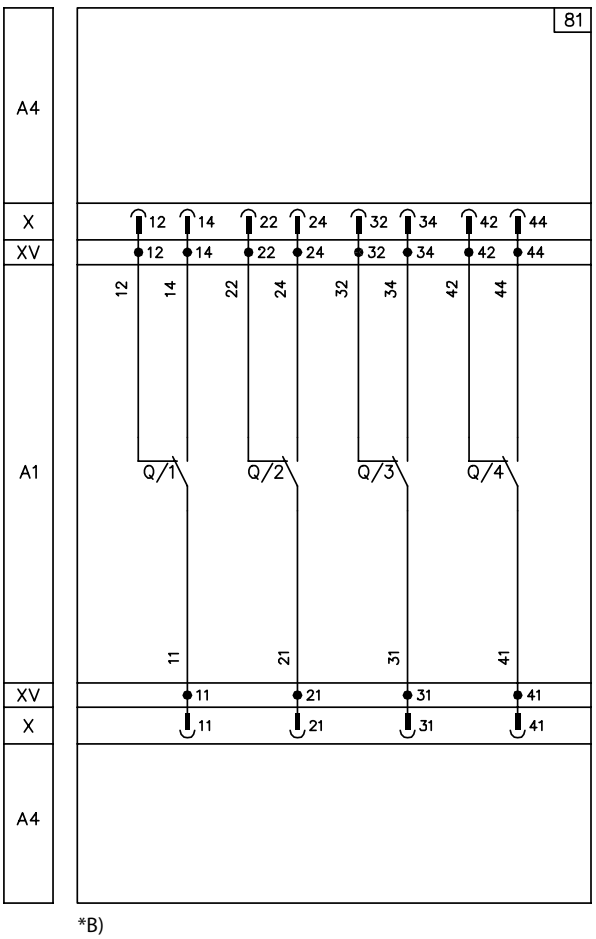


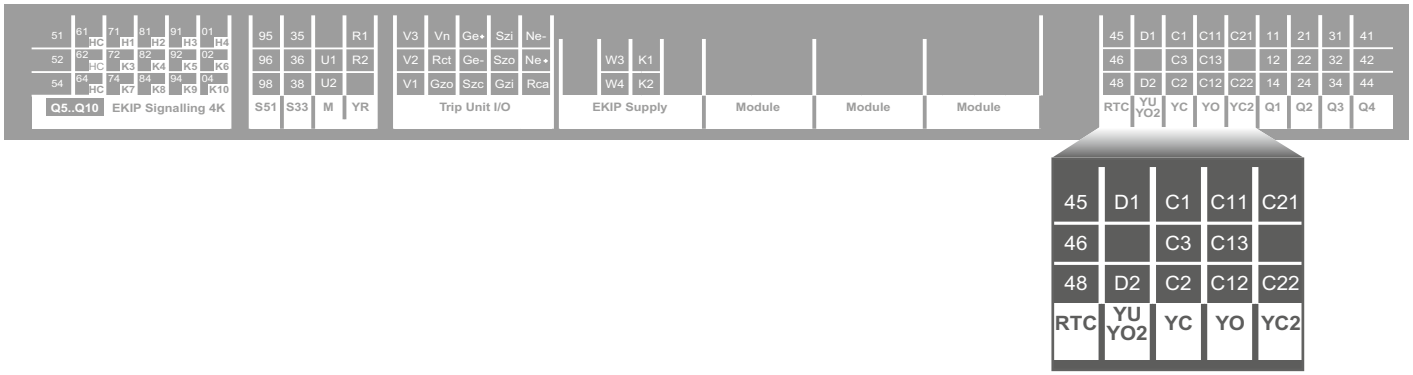
Terminal box E2.2 - E4.2 - E6.2



Electrical accessories

81) Open/closed auxiliary contacts of circuit-breaker - AUX 4Q (4 Form C)





77) First closing coil - YC

78) First closing coil with control from protection trip unit - YC, Ekip Com Actuator

79) Second closing coil - YC2

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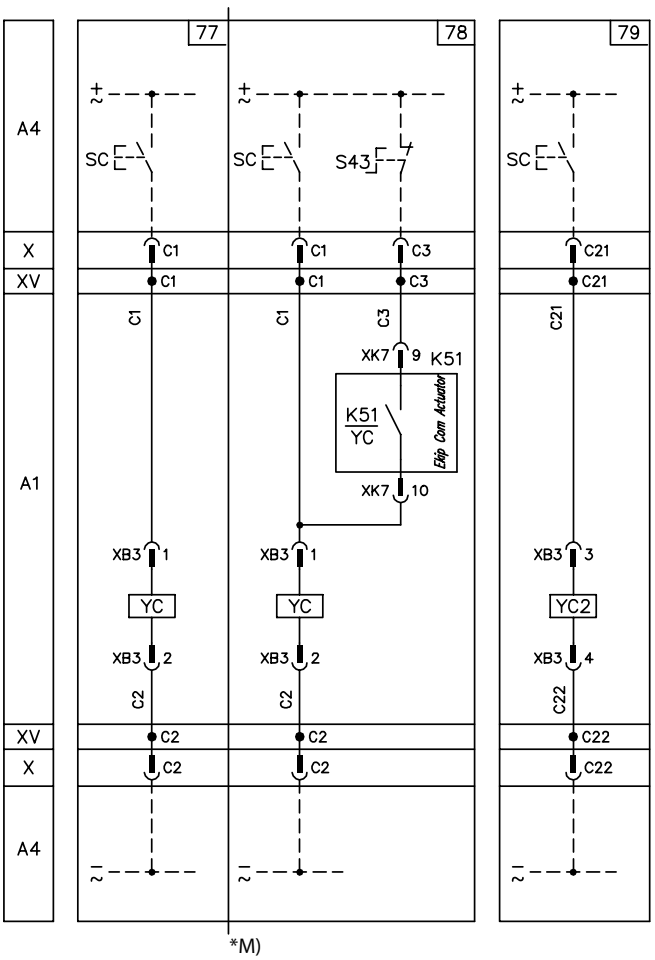
77- 78 as an alternative to each other

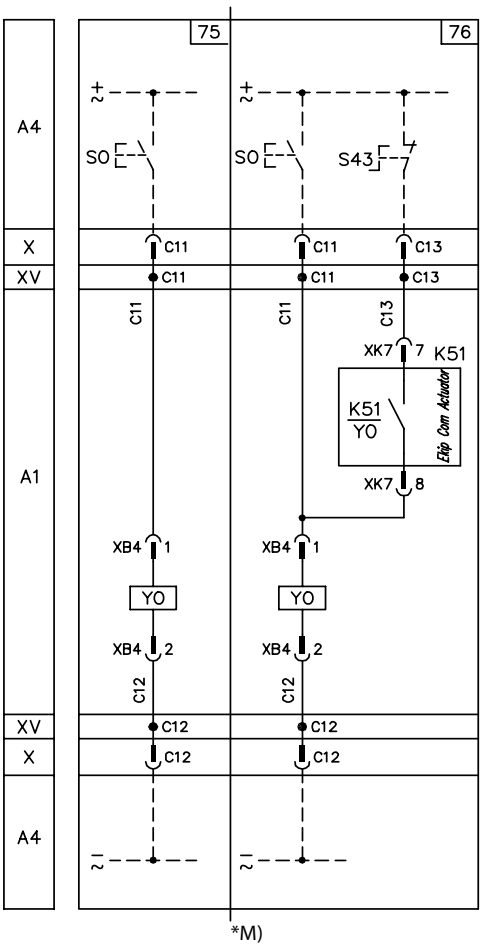
79 valid only for E2.2 - E4.2 - E6.2

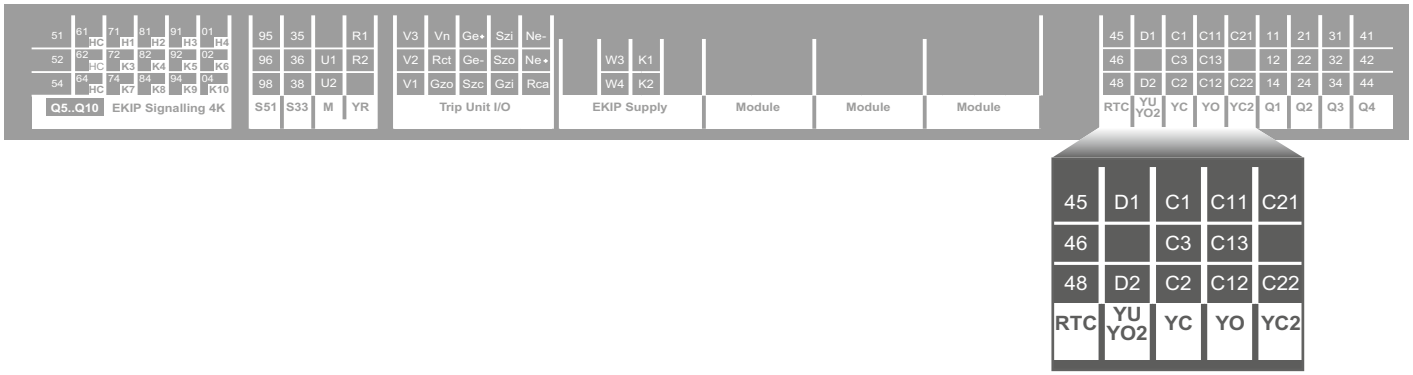


Electrical accessories

75) First opening coil - YO
76) First opening coil with control from protection trip unit - YO, Ekip Com Actuator

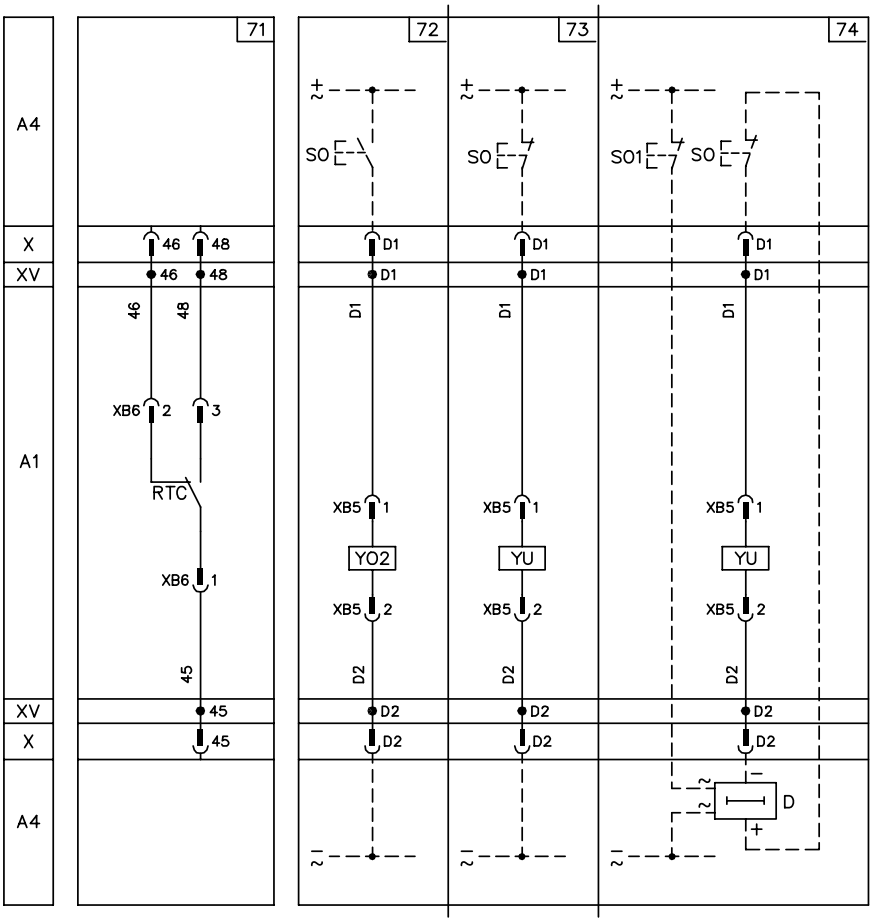
—
75-76 as an alternative to each other



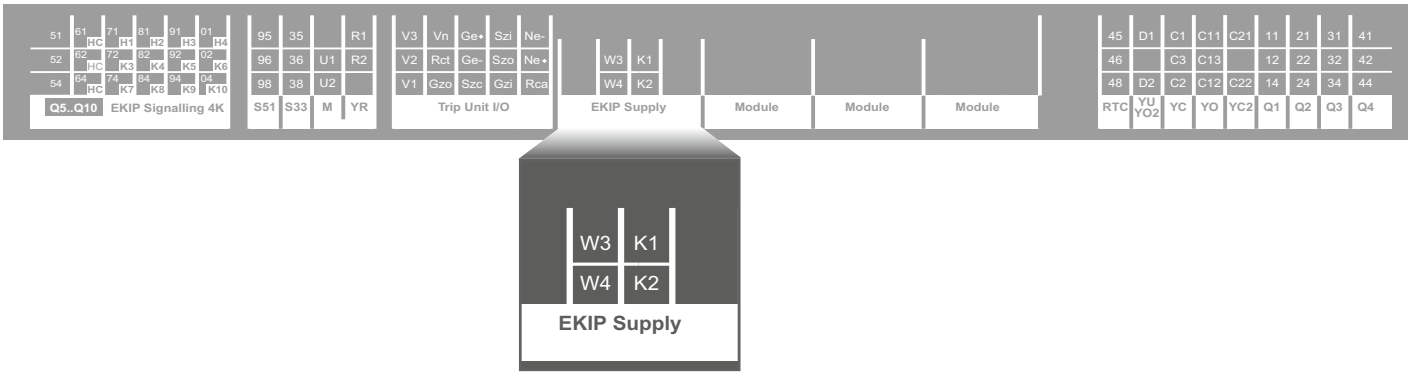


71) Ready to close signalling contact - RTC
72) Second opening coil - YO2
73) Undervoltage coil - YU
74) Undervoltage coil with external time-lag device - YU, D

—
72-73 or 74 as an alternative to each other

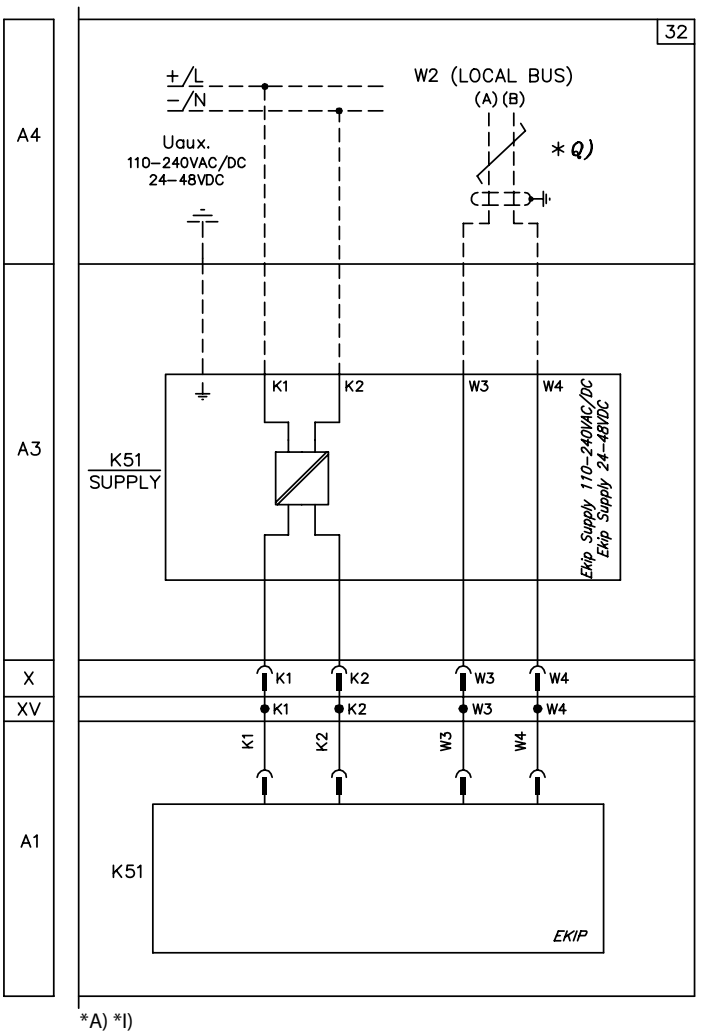


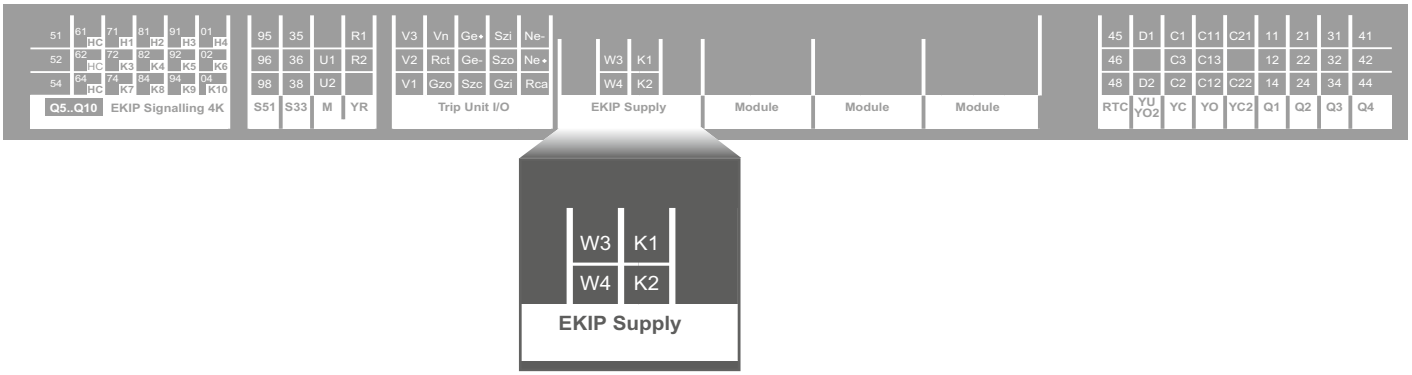
Electrical accessories



32) Auxiliary supply through module 110-240V AC/DC or 24-48V DC and local bus - Ekip Supply

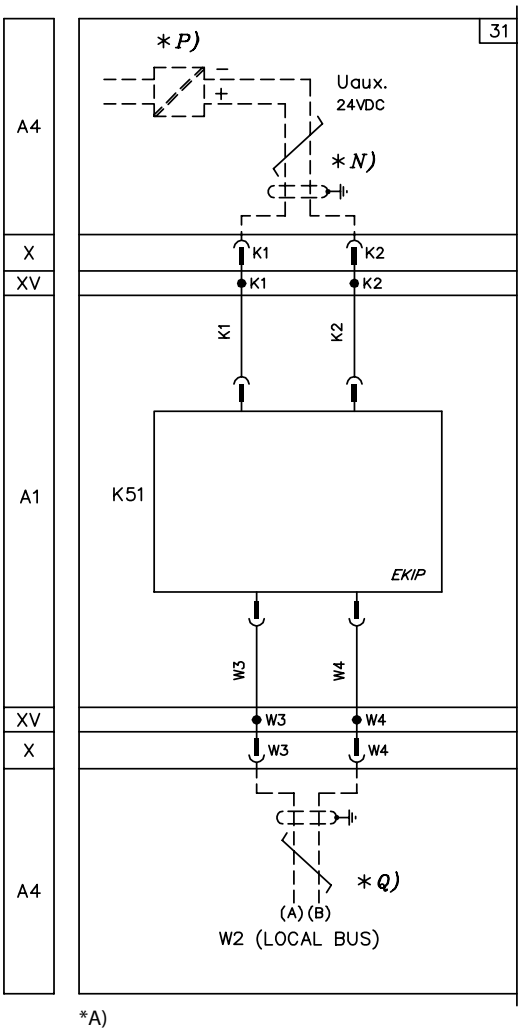
—
As an alternative to figure 31





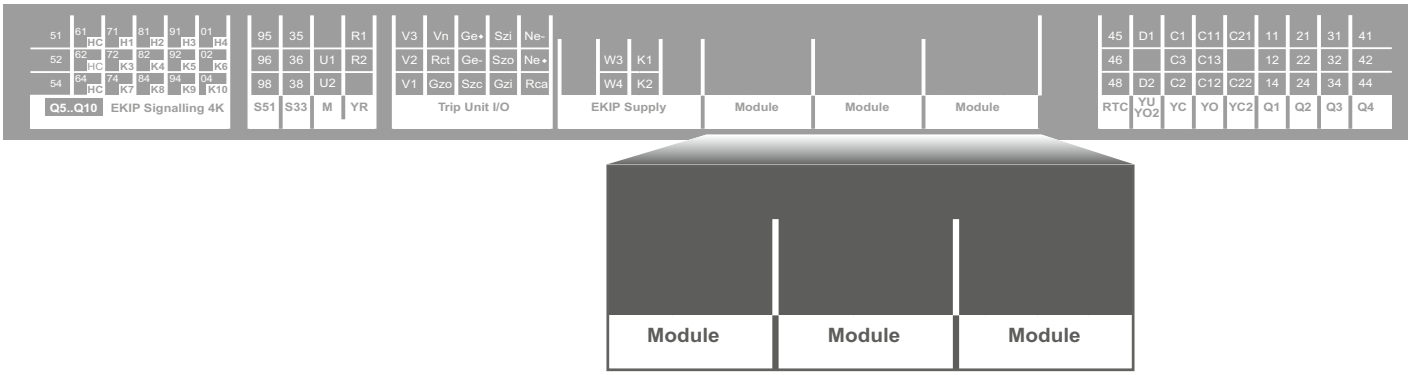
31) Direct auxiliary supply 24V DC and local bus - Ekip Supply

—
As an alternative to figure 32

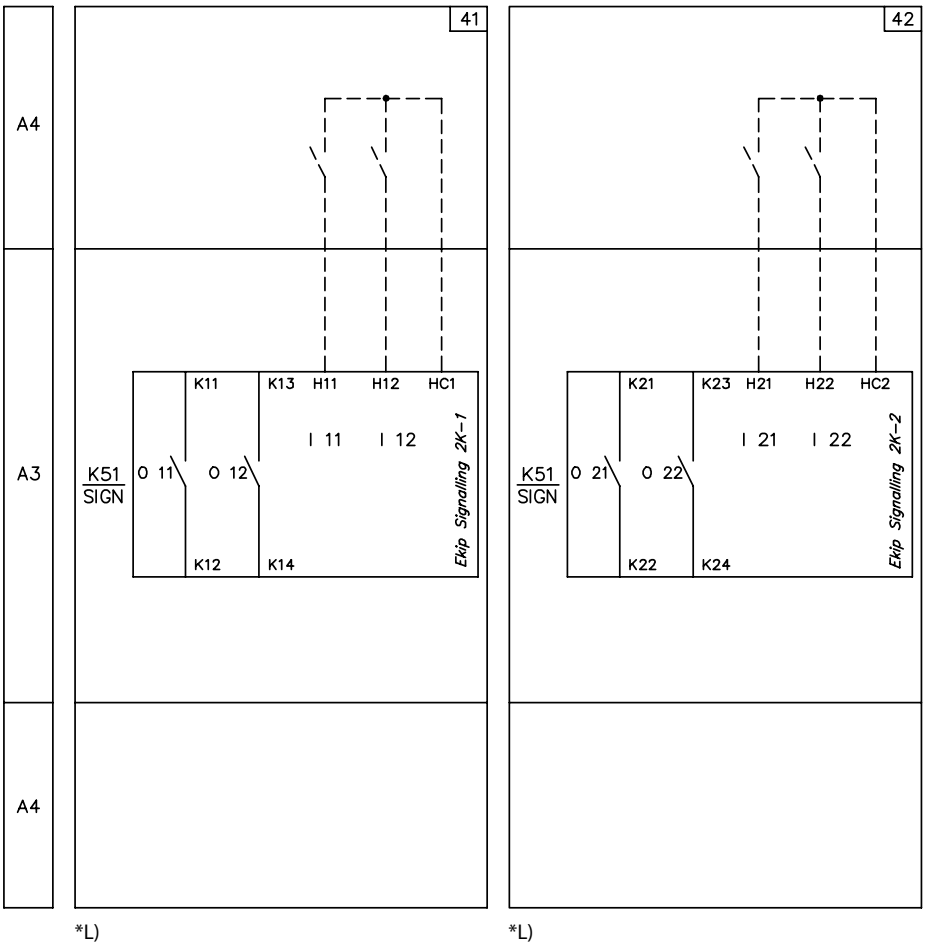


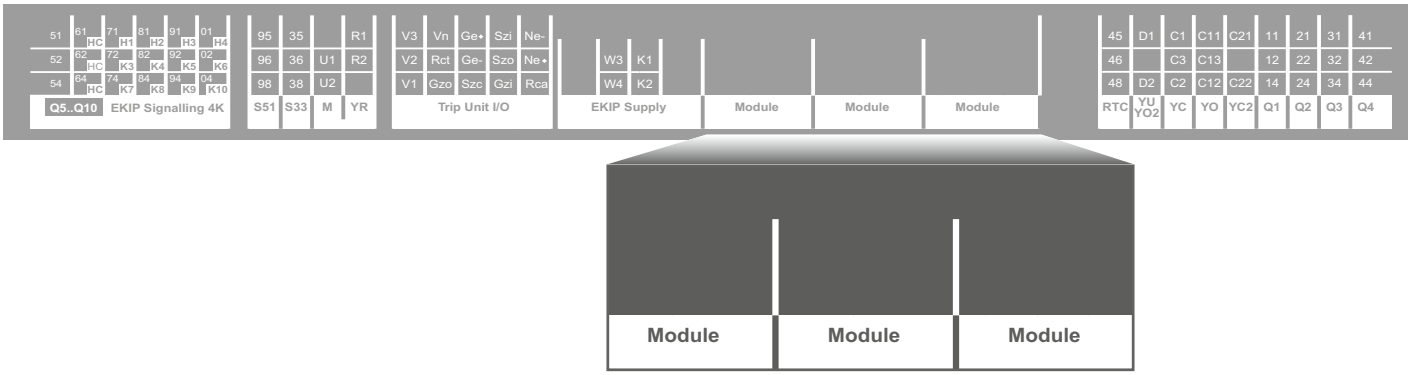
*A)

Electrical accessories

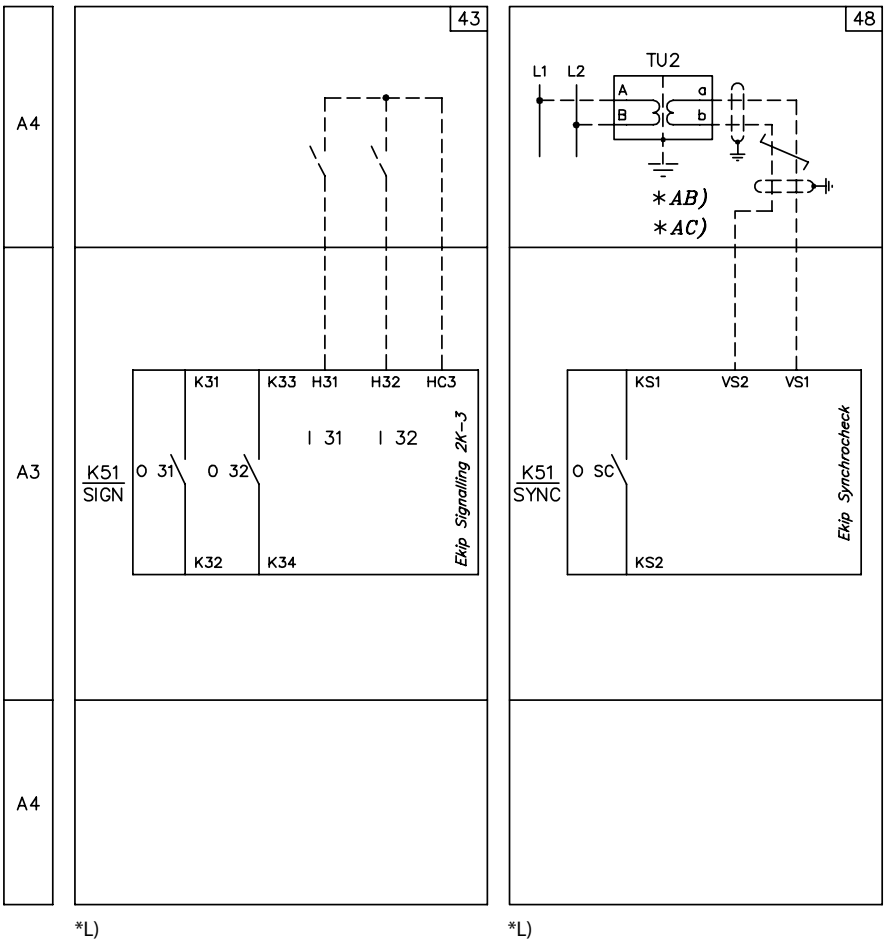


41) Ekip signalling 2K-1
42) Ekip signalling 2K-2

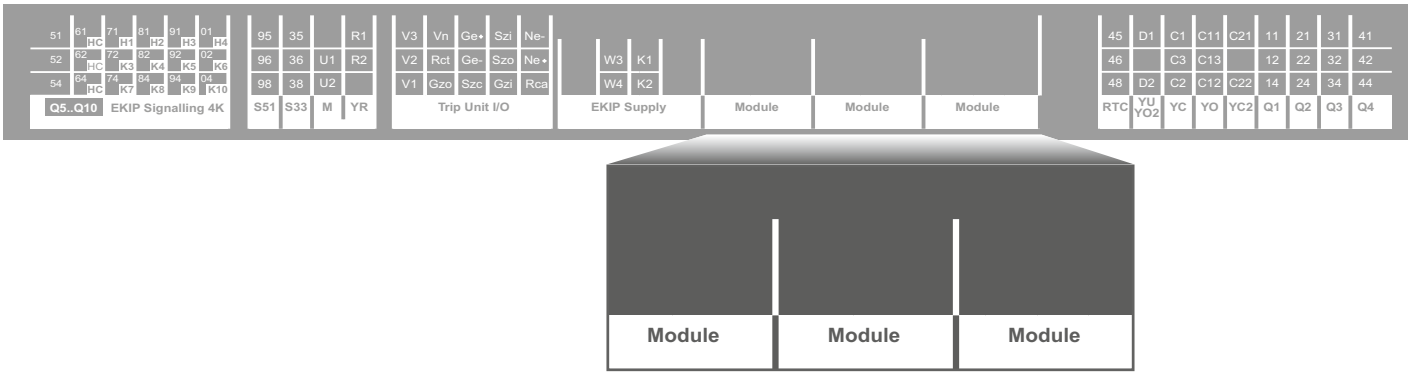




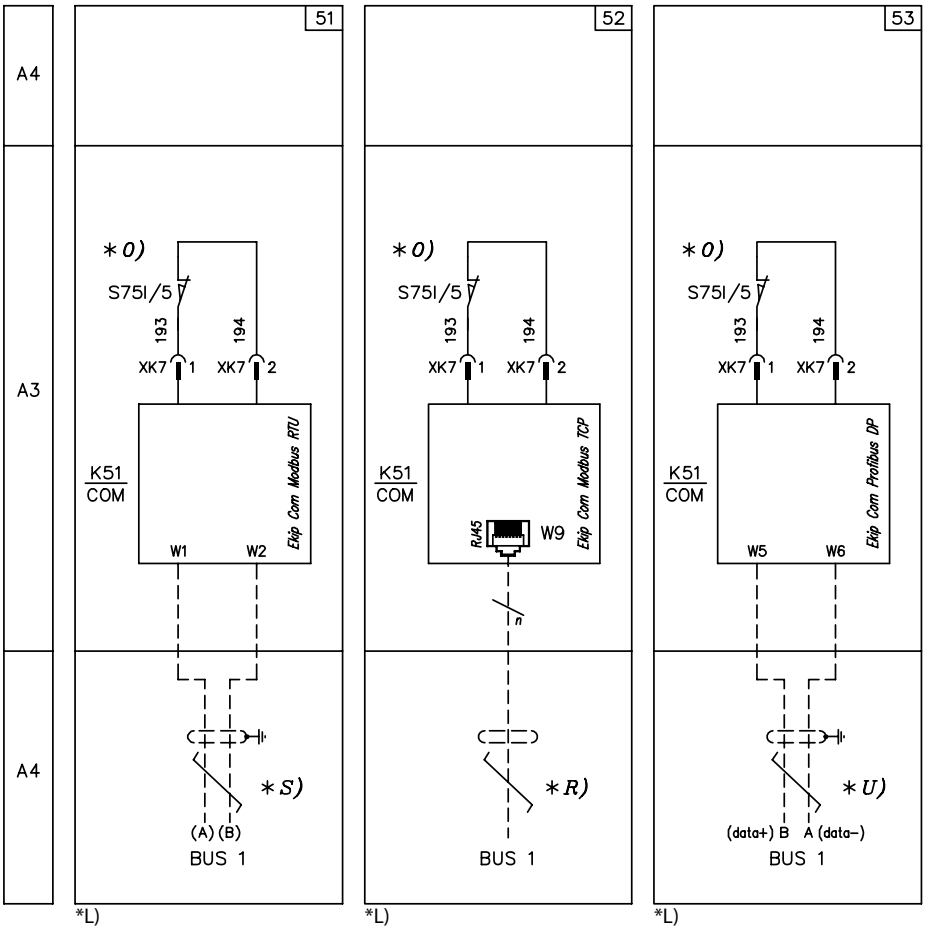
43) Ekip signalling 2K-3
48) Ekip Synchrocheck

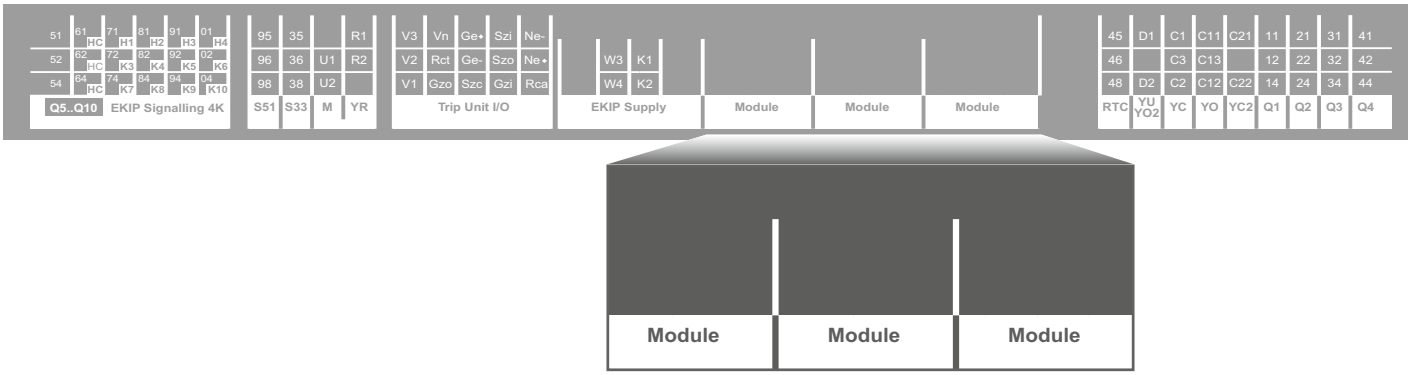


Electrical accessories

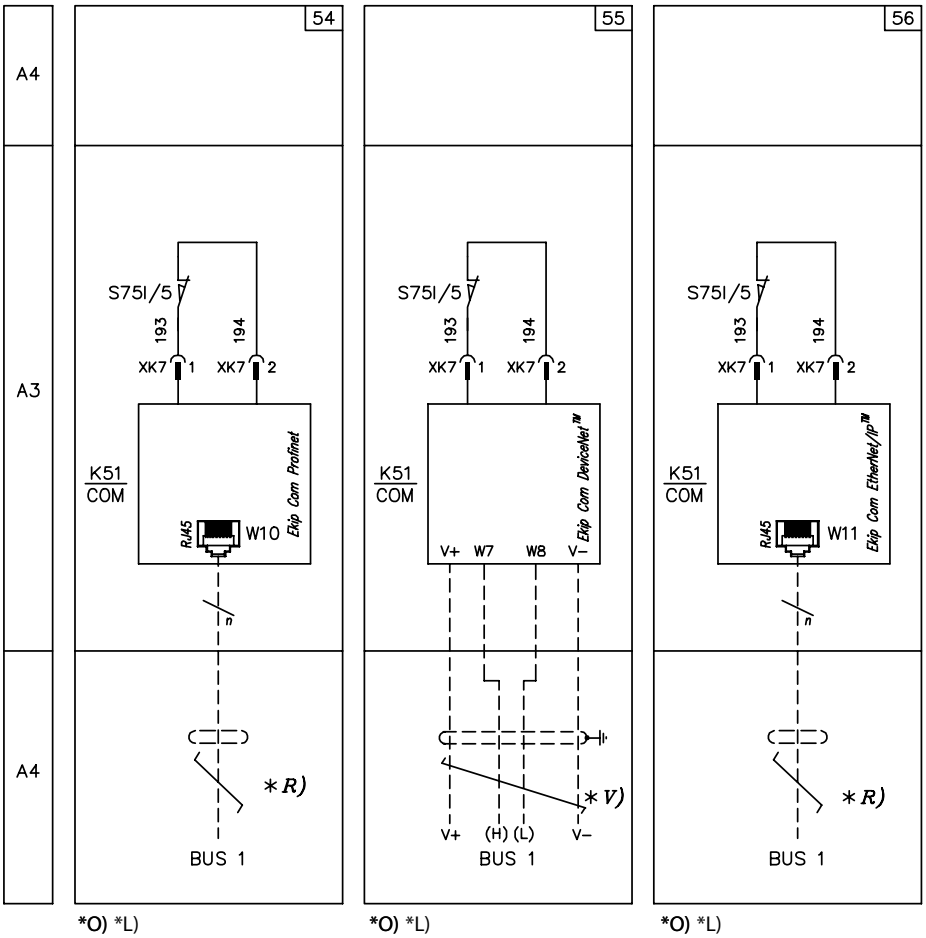


51) Ekip COM Modbus RS-485
52) Ekip COM Modbus TCP
53) Ekip COM Profibus

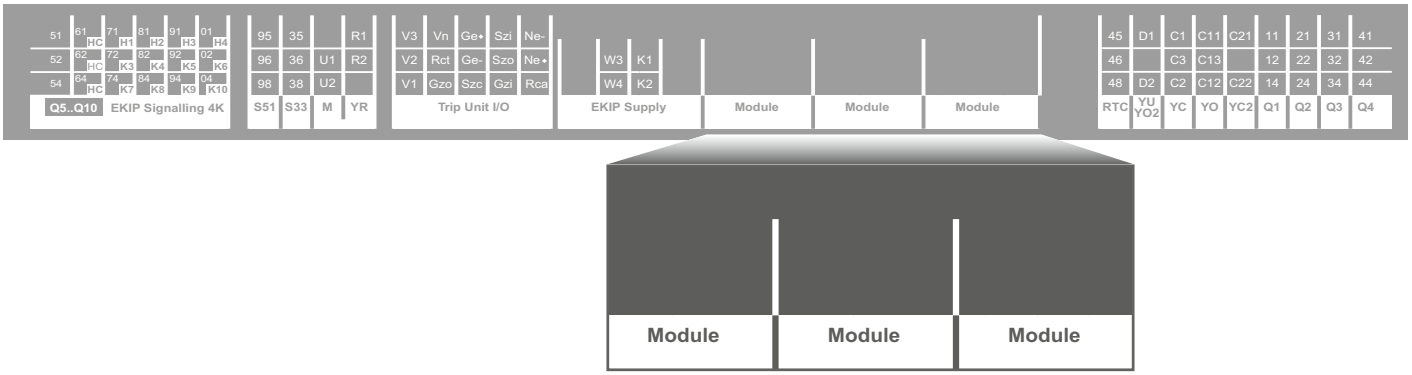




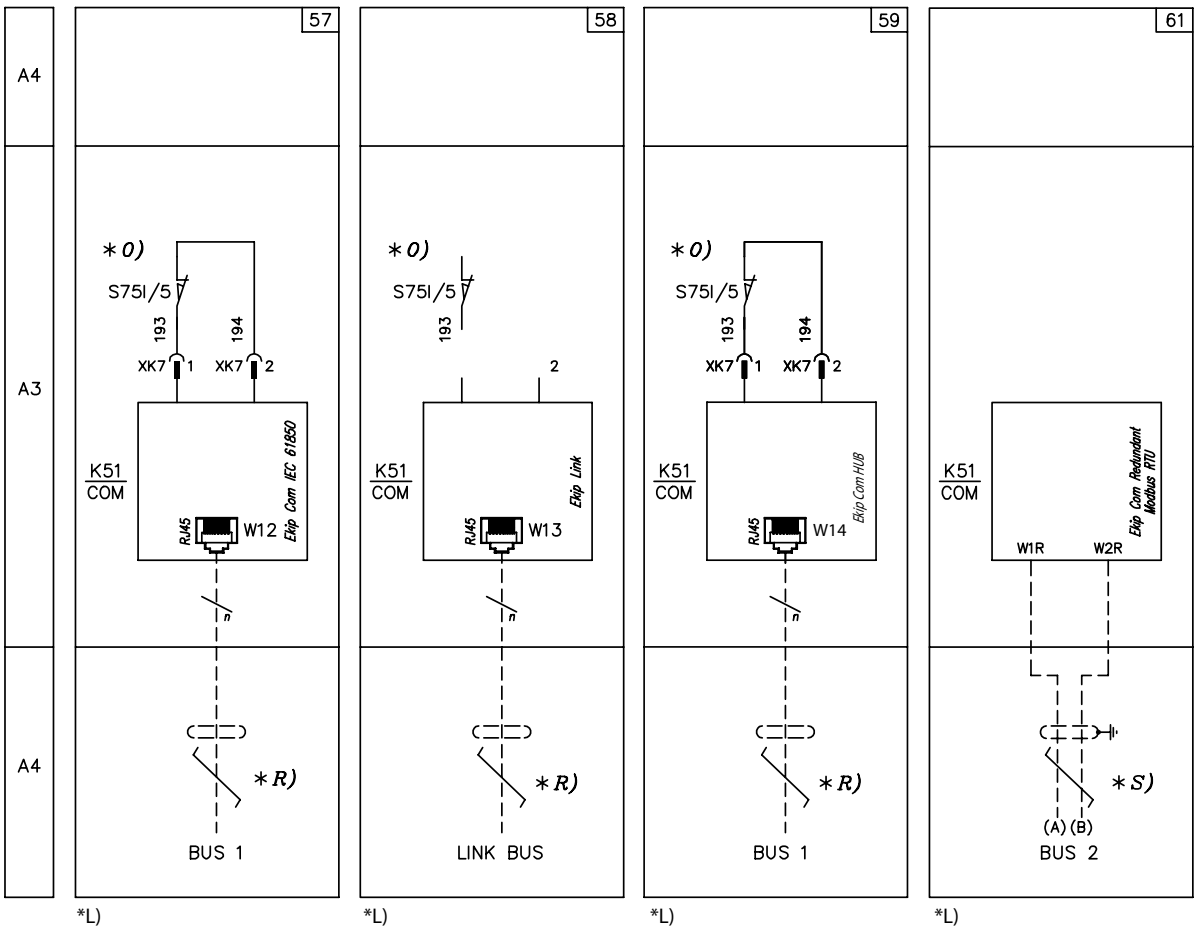
54) Ekip COM Profinet
55) Ekip COM DeviceNet™
56) Ekip COM EtherNet/IP™

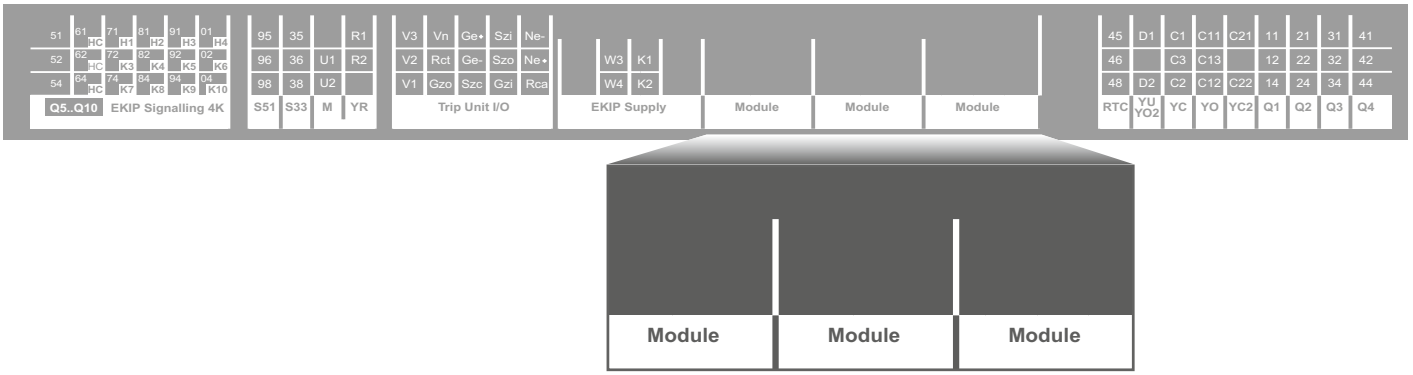


Electrical accessories

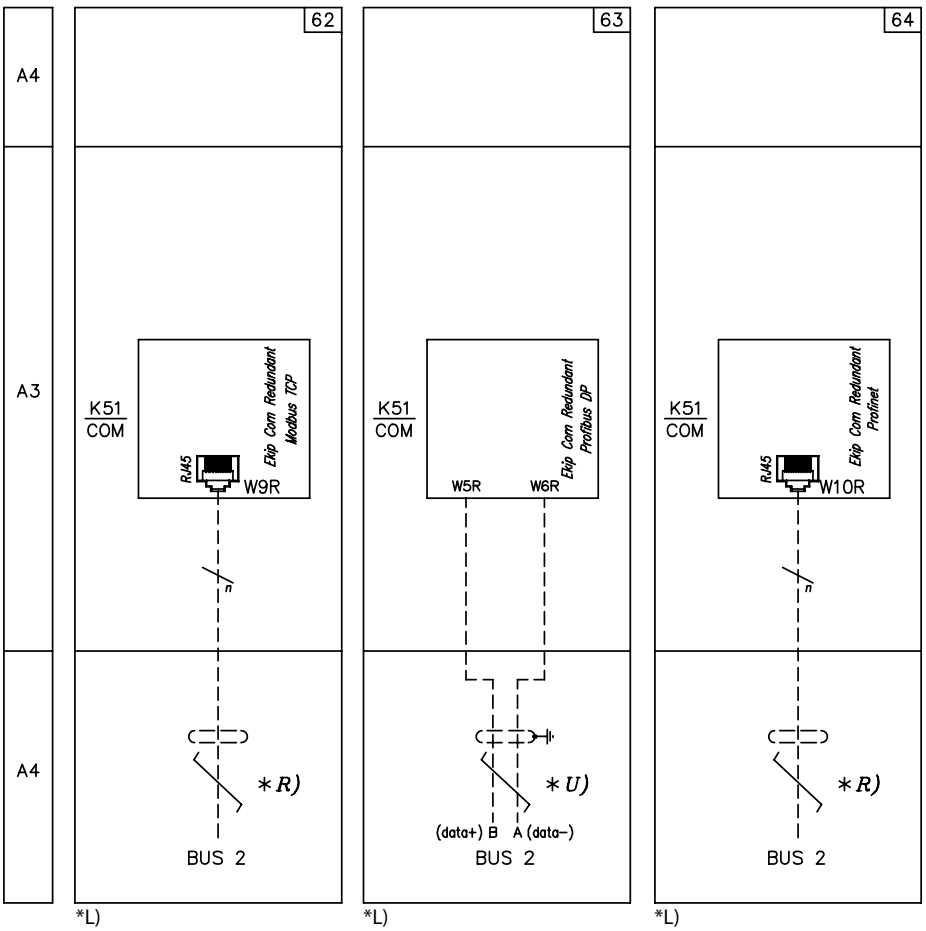


57) Ekip COM IEC61850
58) Ekip LINK
59) Ekip Com Hub
61) Ekip COM R Modbus RS-485 Redundant

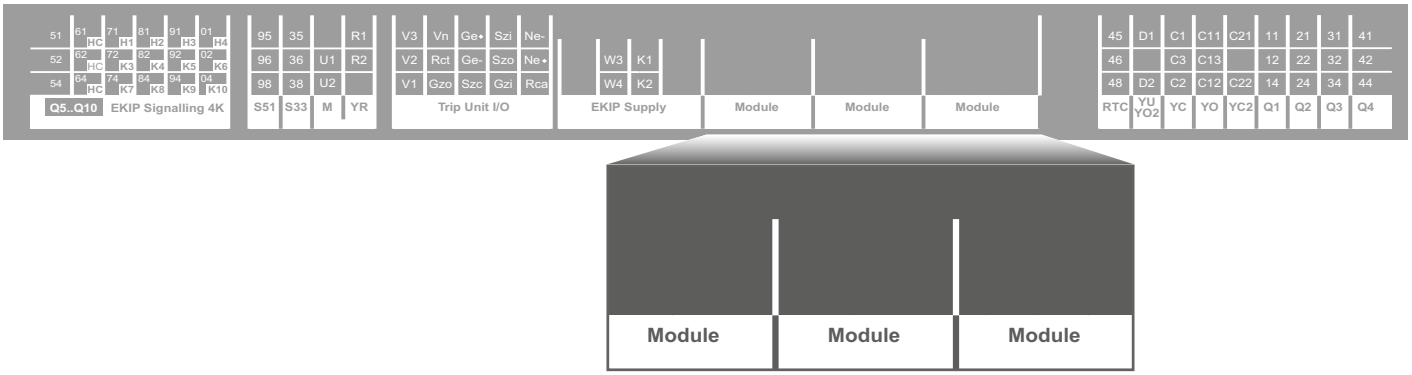




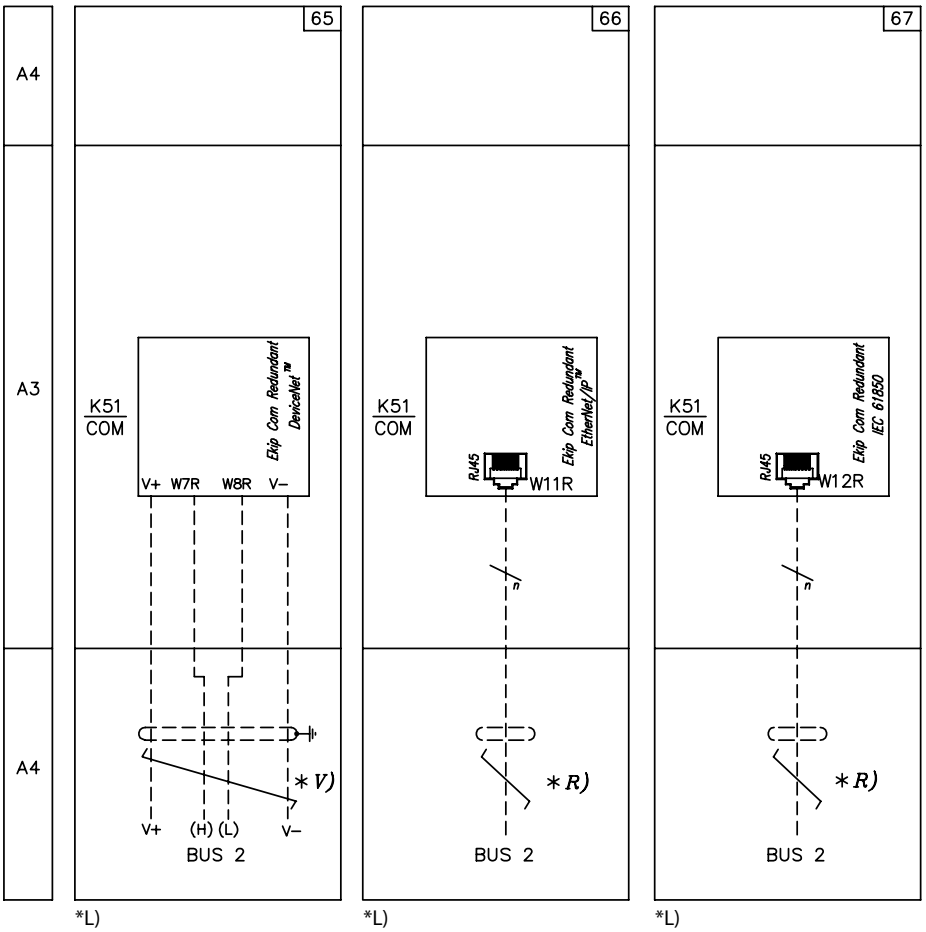
62) Ekip COM R Modbus TCP Redundant
63) Ekip COM R Profibus Redundant
64) Ekip COM R ProfiNet Redundant

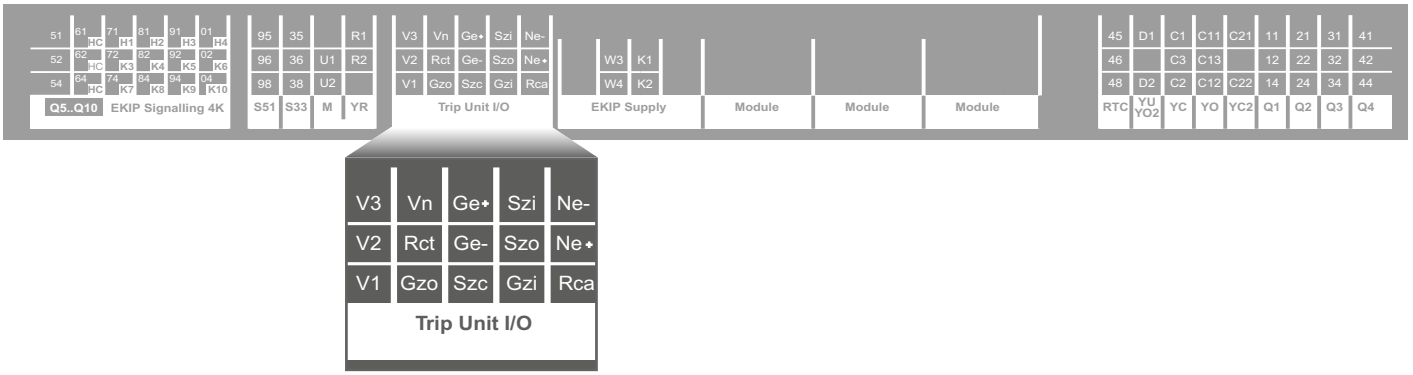


Electrical accessories



65) Ekip COM R DeviceNet™ Redundant
66) Ekip COM R EtherNet/IP™ Redundant
66) Ekip COM R IEC 61850 Redundant

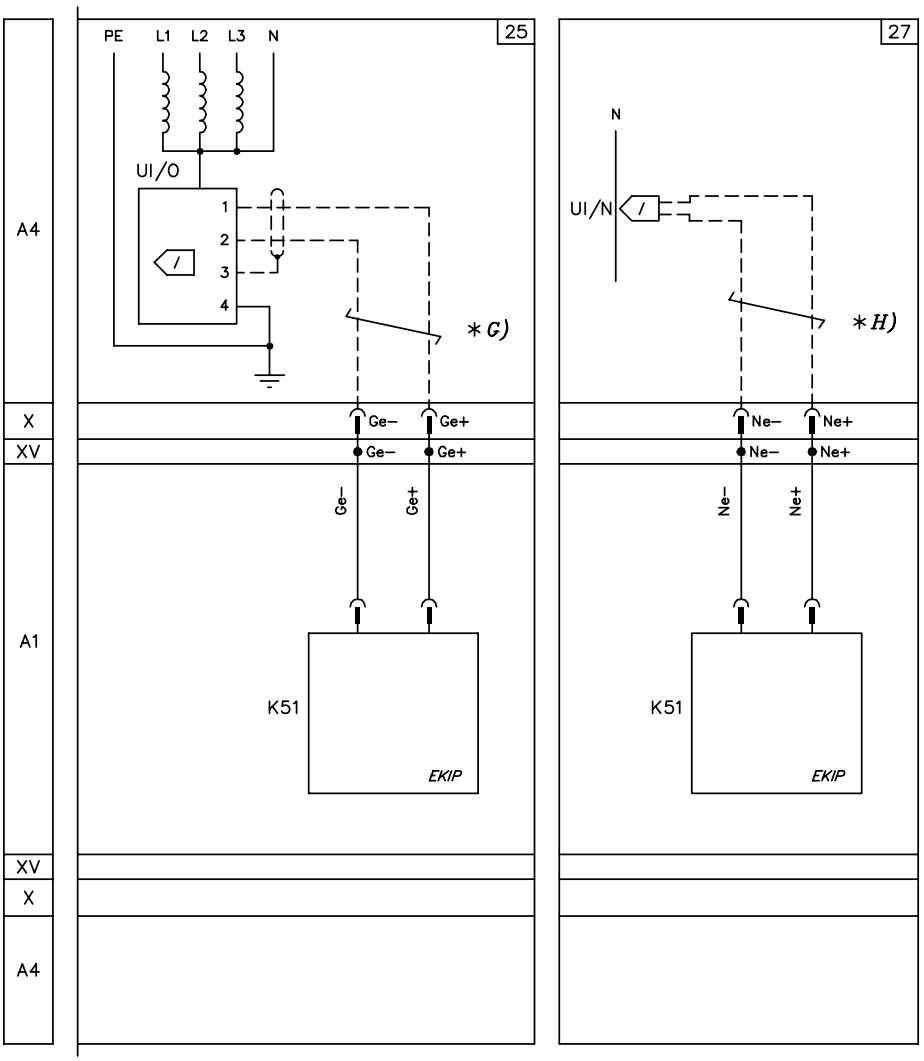




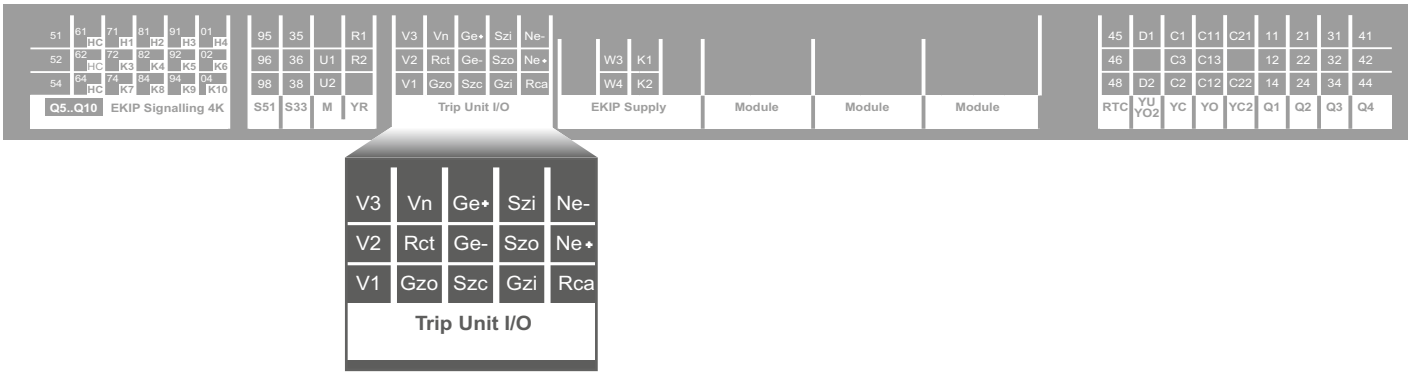
25) Transformer star center sensor input (homopolar toroid for the earthing conductor of main power suppy)

27) Current sensor input on external neutral (only for 3-pole circuit-breakers)

—
As an alternative to figure 24-24A

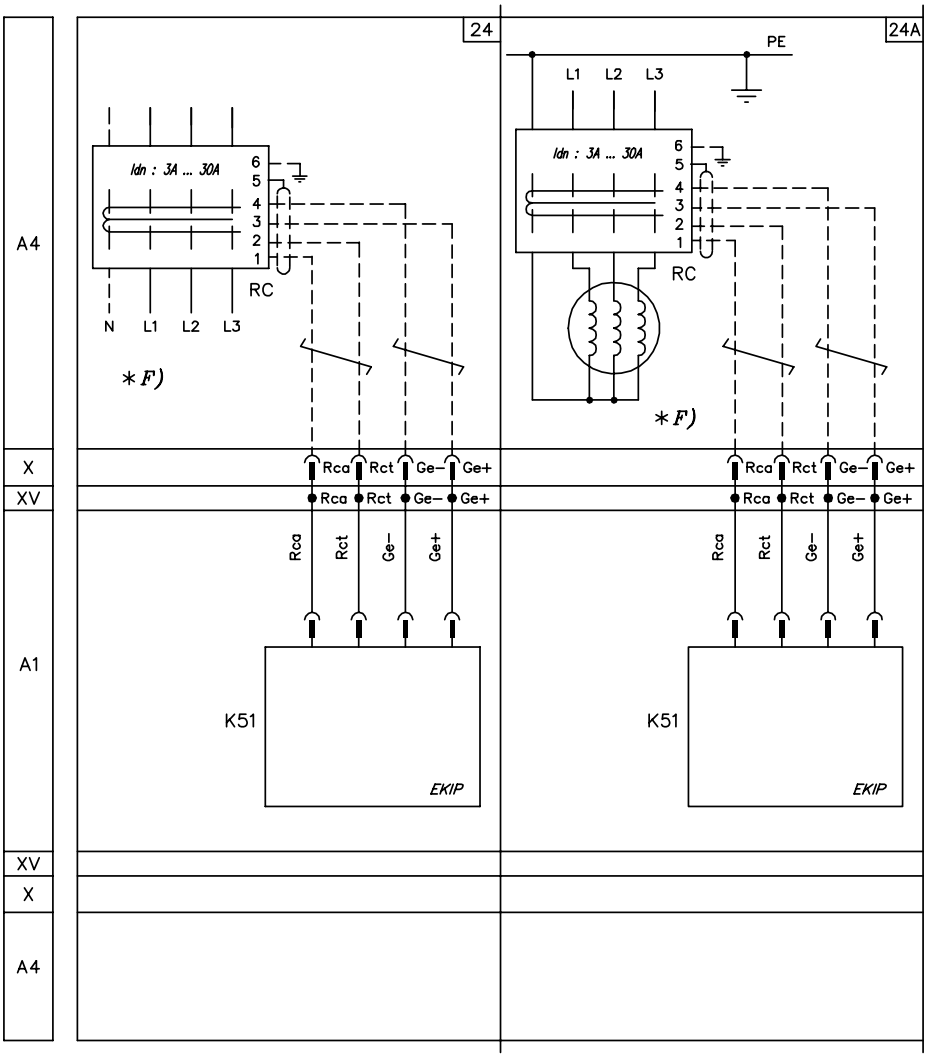


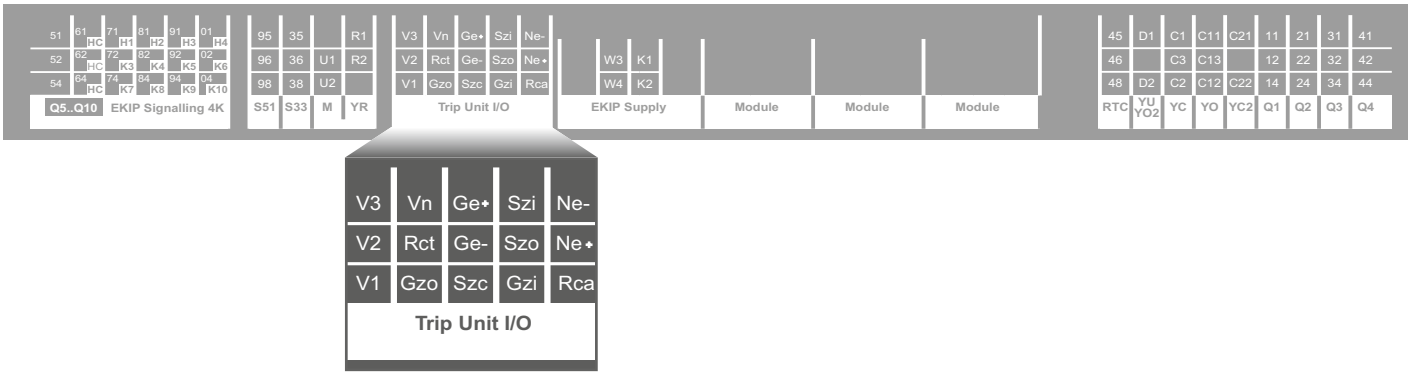
Electrical accessories



24) Rc residual current protection sensor input (ANSI 64 & 50NTD)
24a) Rc differential ground fault protection (ANSI 87N)

—
As an alternative to figure 25

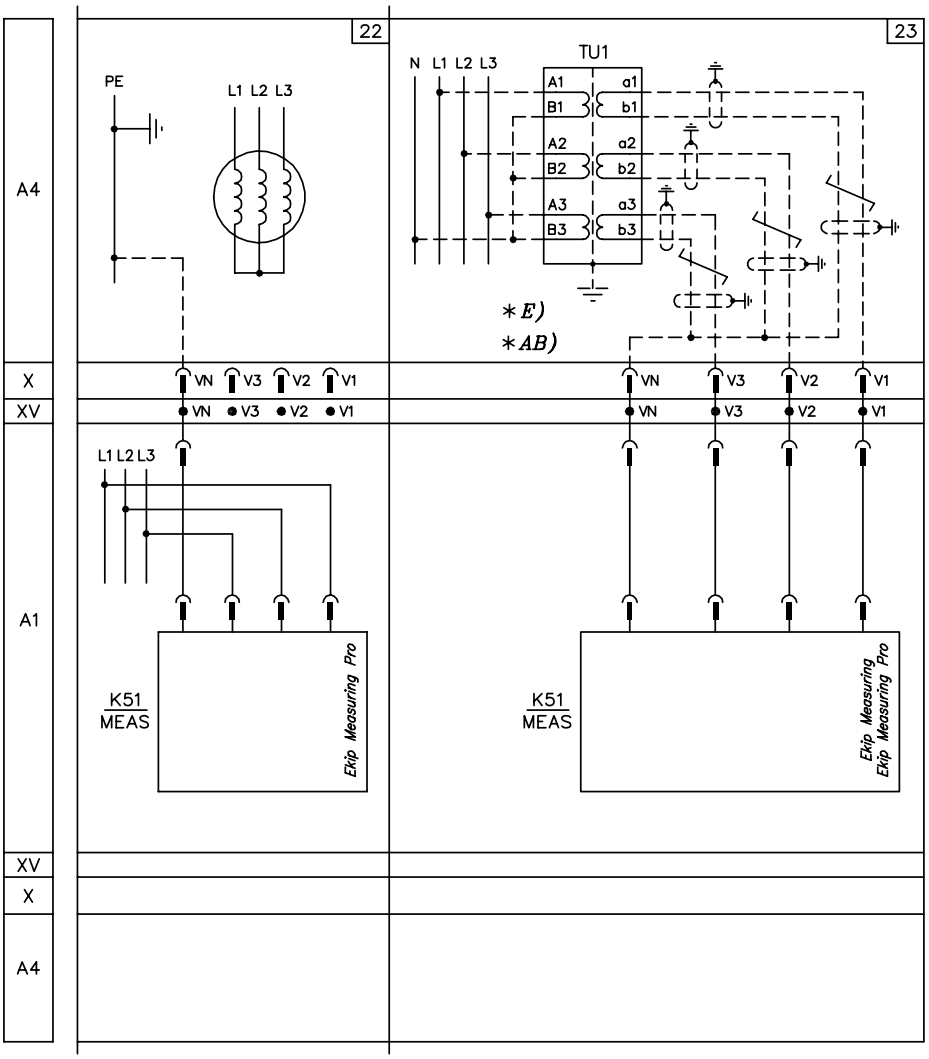




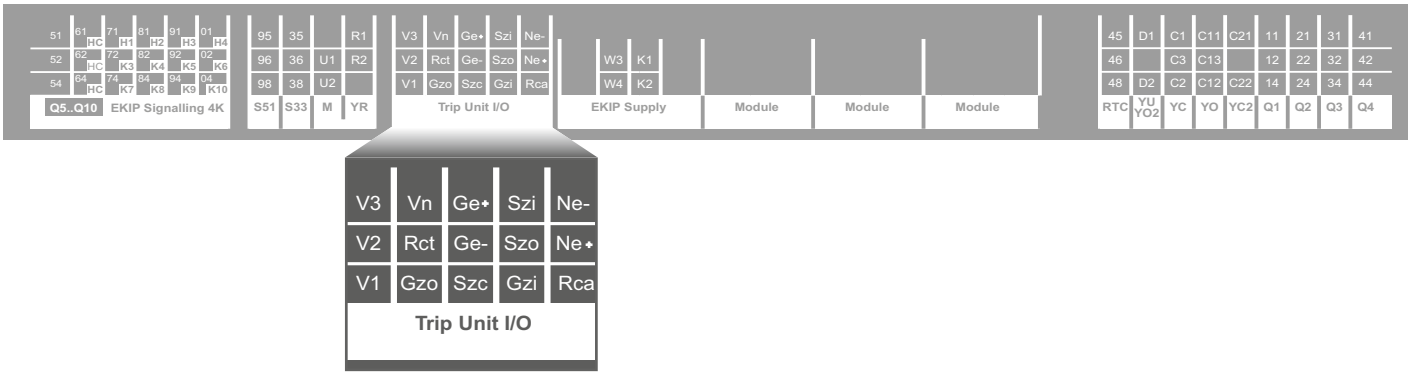
22) Ekip Measuring Pro for residual voltage protection (for Ekip G only)

23) Ekip Measuring/Measuring Pro with external voltage socket

—
As an alternative to each other or to 20-21 diagram



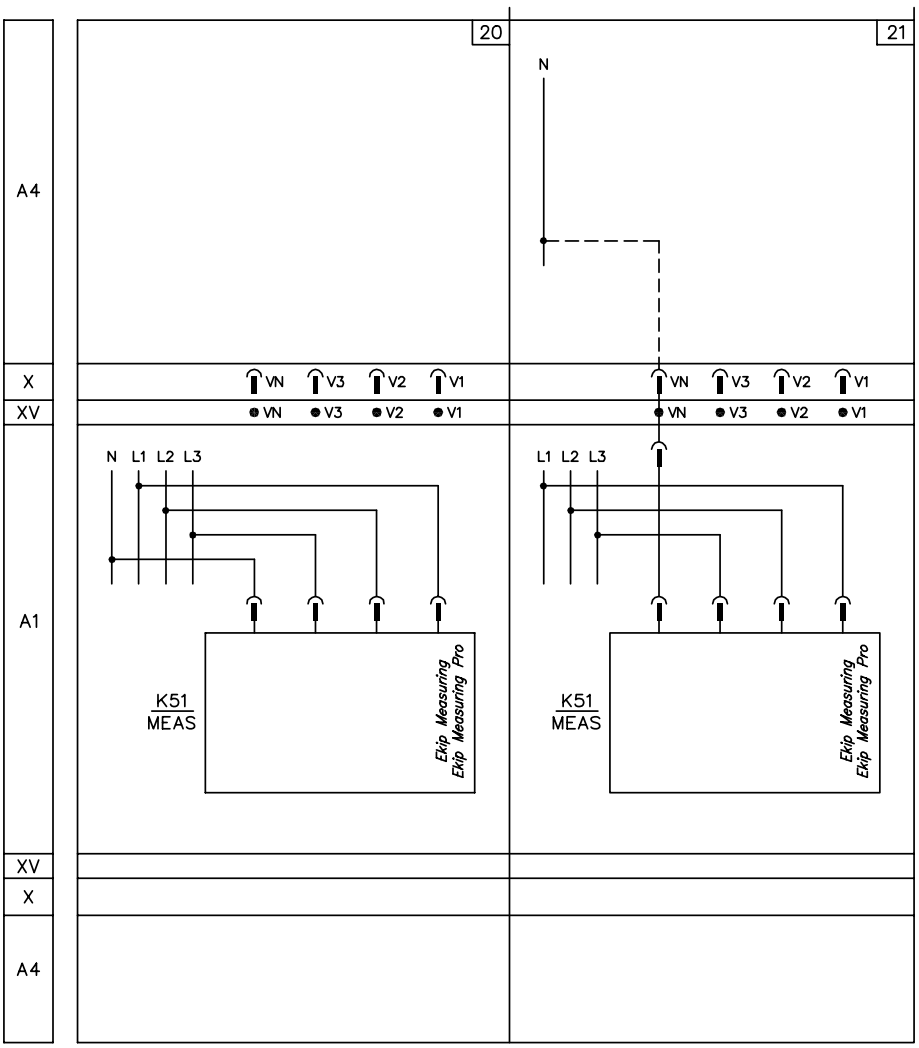
Electrical accessories

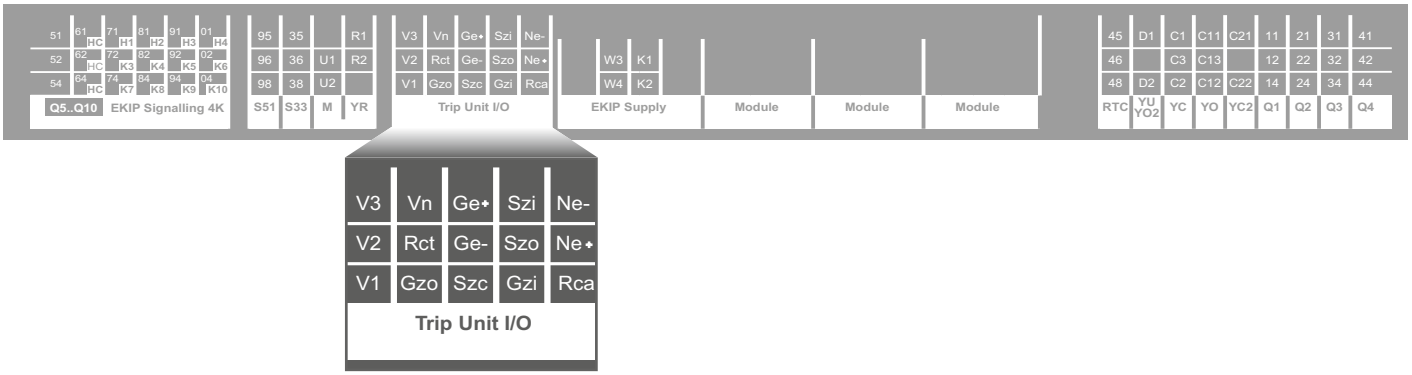


20) Ekip Measuring/Measuring Pro with voltage socket inside the four pole circuit-breaker

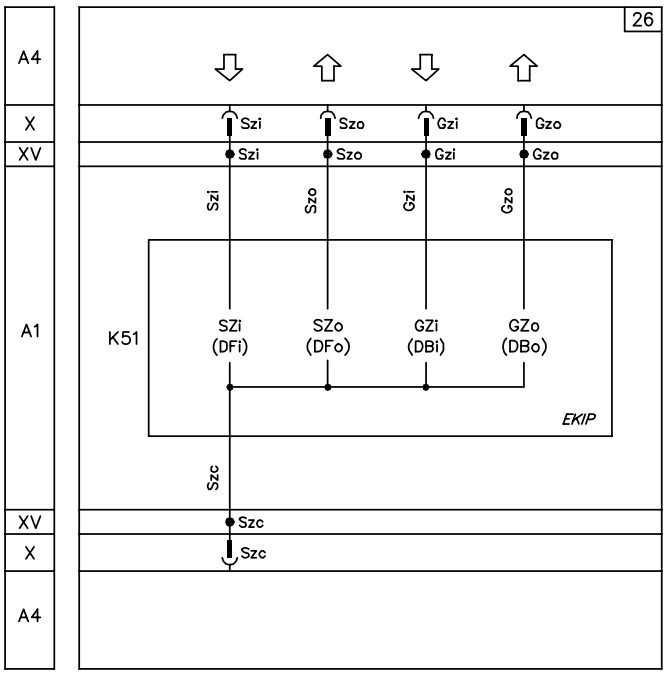
21) Ekip Measuring/Measuring Pro with voltage sockets inside the three-pole circuit-breaker and connection to the external neutral

—
As an alternative to each other or to 22-23 diagram

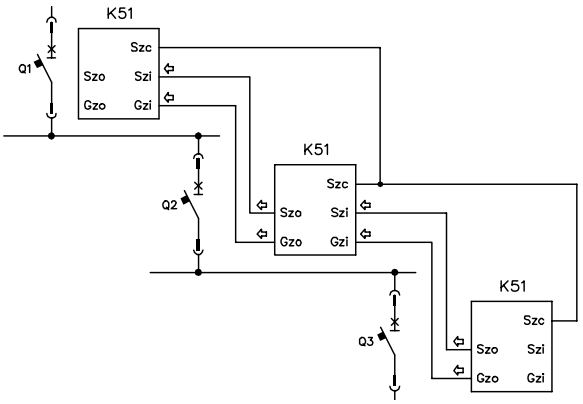




26) Zone selectivity

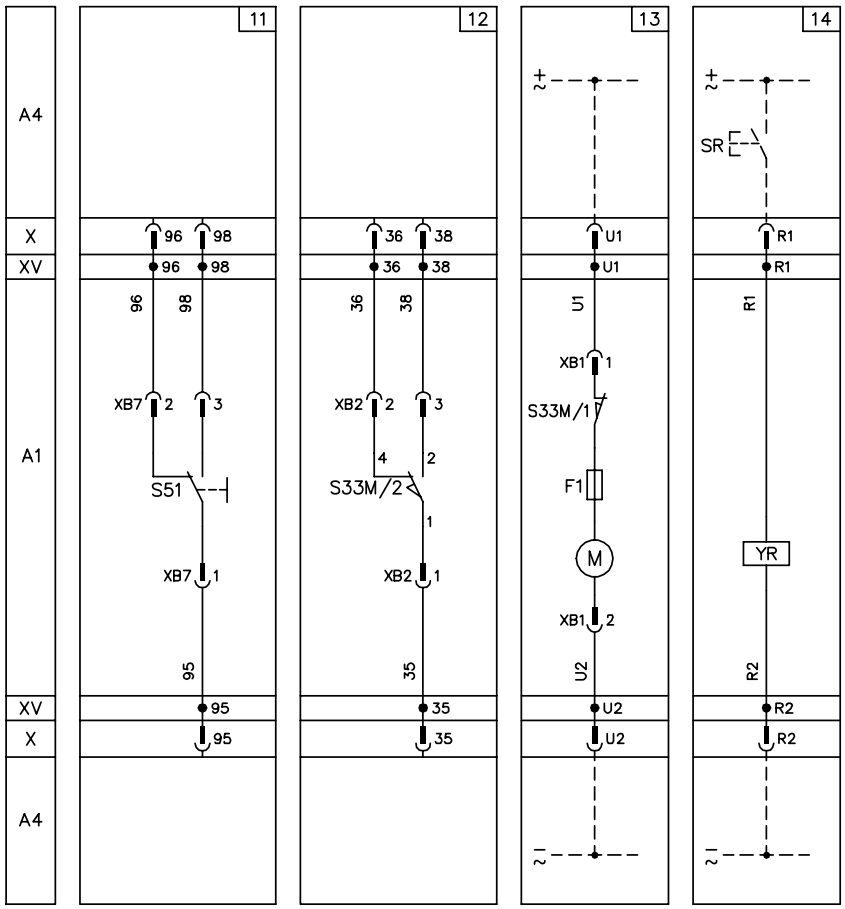


Example for application diagram (among 3 circuit breakers)

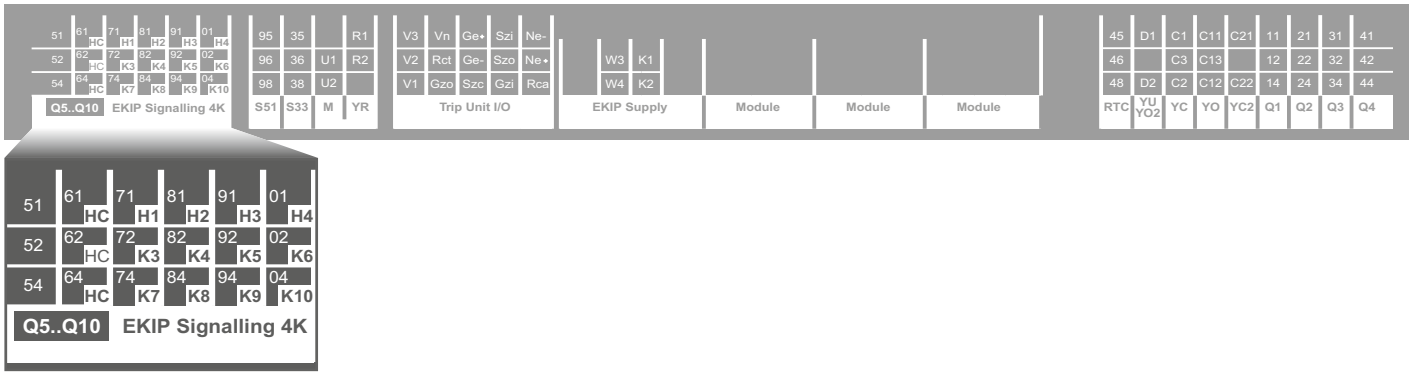


Electrical accessories

11) Trip signalling contact - S51
12) Contact for signalling position of loaded springs - S33 M/2
13) Motor for loading closing springs - M
14) Trip contact reset coil – YR

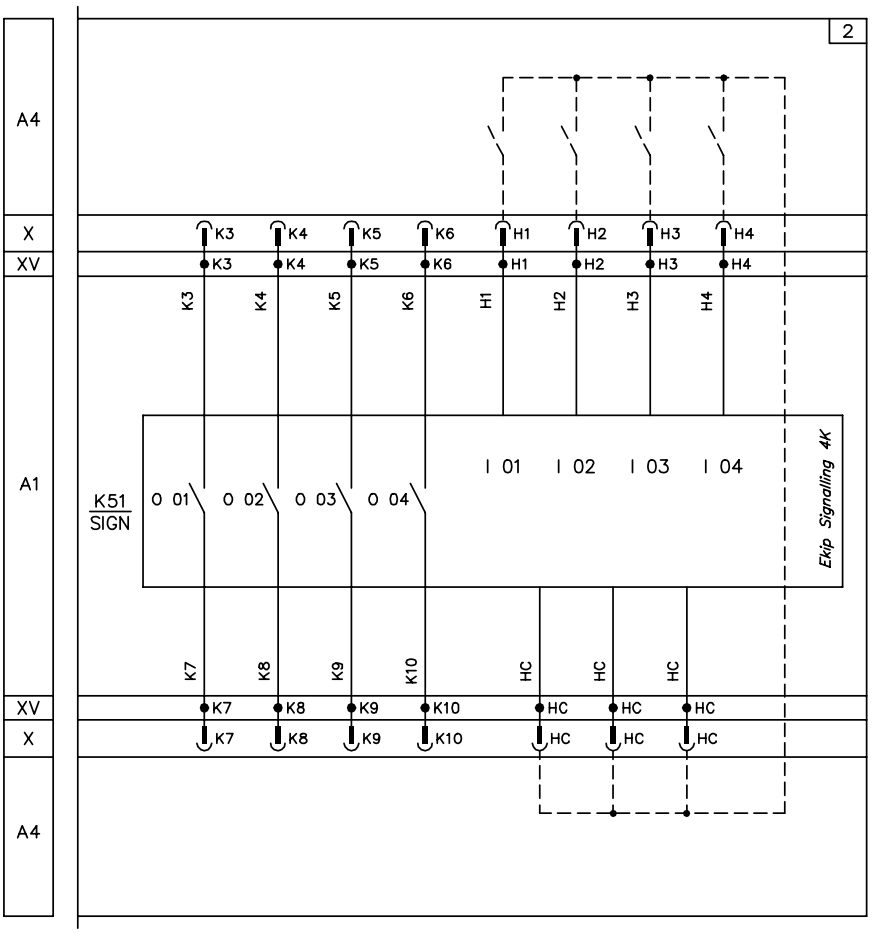


*D)



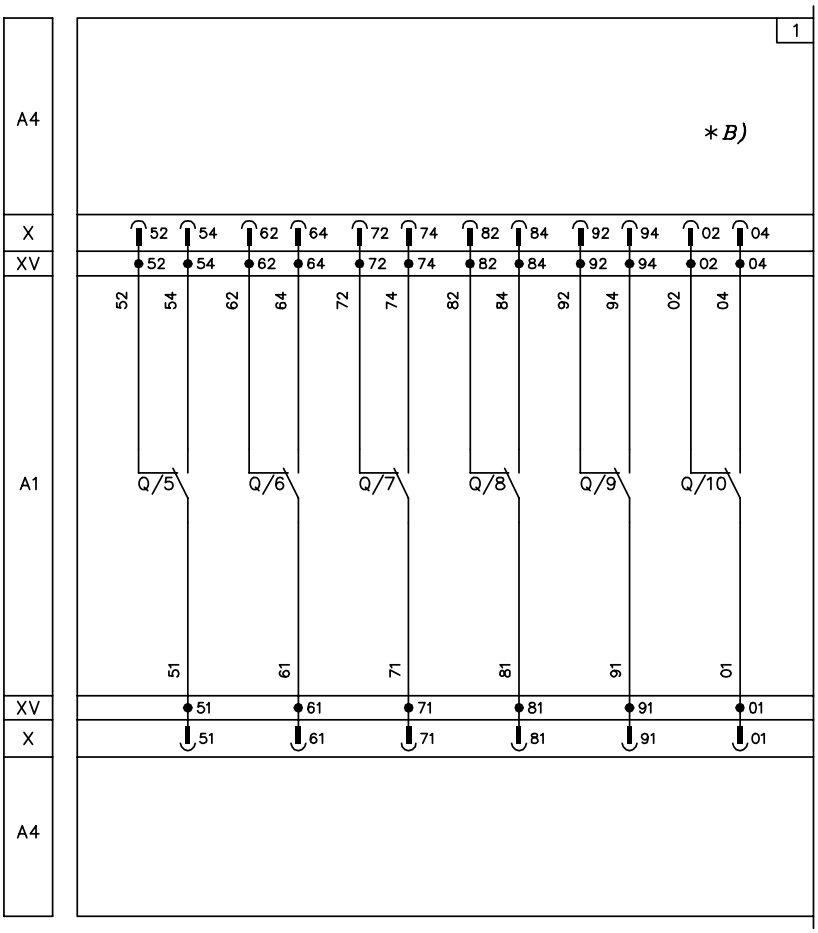
51 61 HC 71 H1 81 H2 91 H3 01 H4
52 62 HC 72 K3 82 K4 92 K5 02 K6
54 64 HC 74 K7 84 K8 94 K9 04 K10
Q5..Q10 EKIP Signalling 4K

2) Ekip Signalling 4K

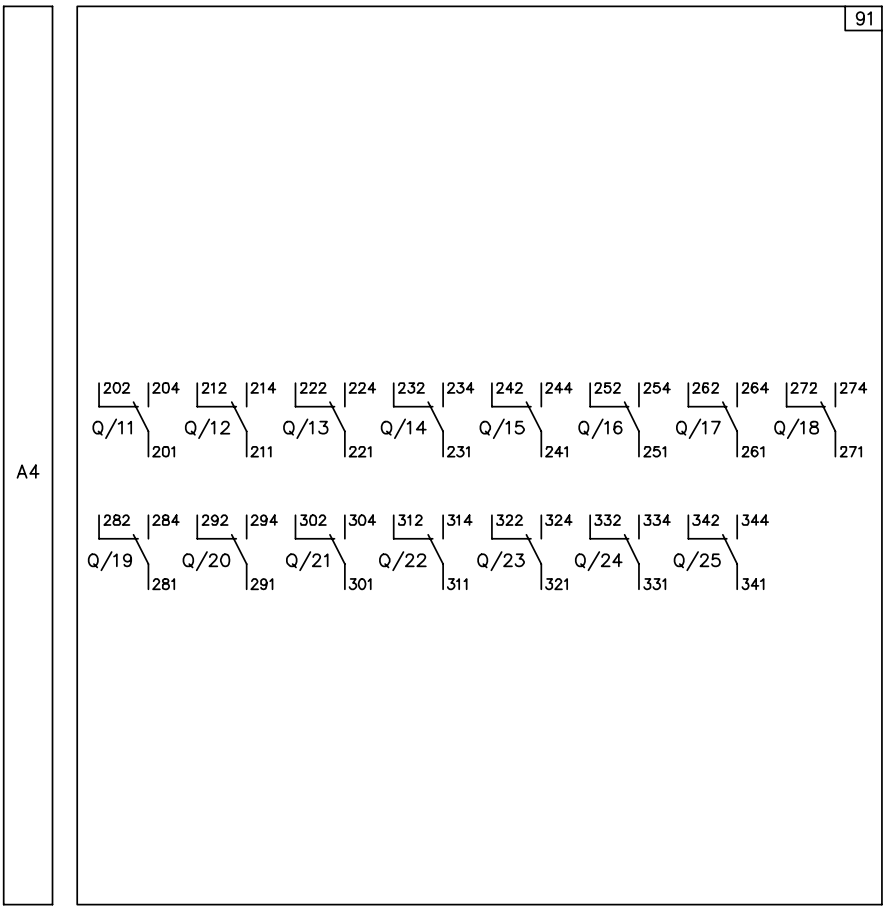


Electrical accessories

1) Supplementary open/closed auxiliary contacts of the circuit-breaker - AUX 6Q (6 Form C)

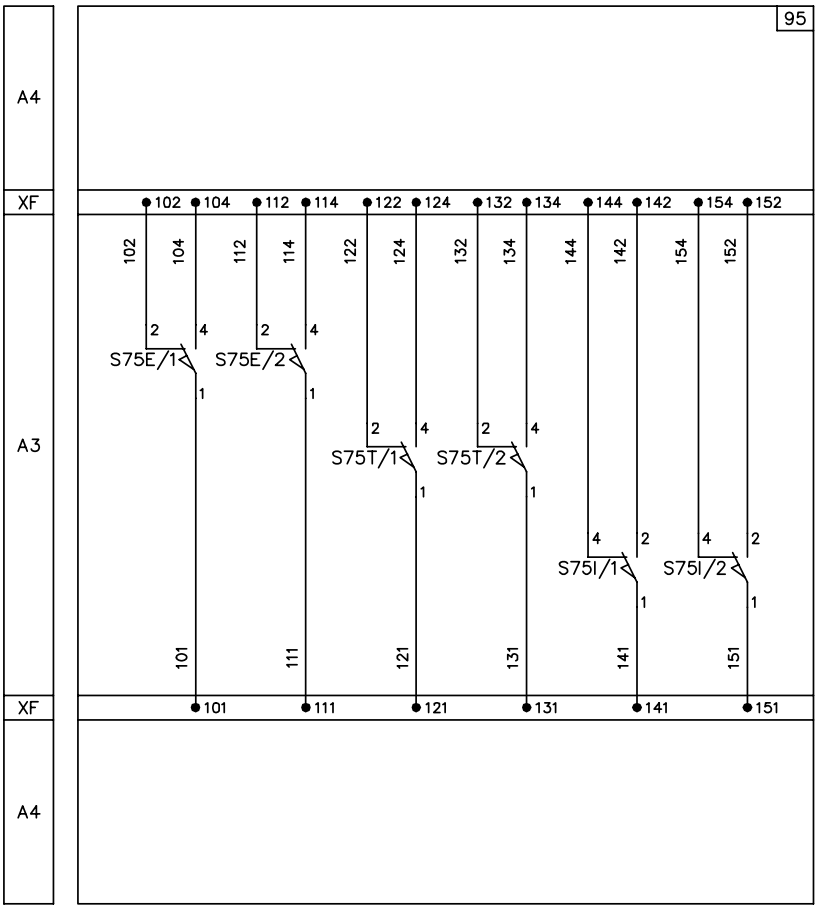


91) Supplementary open/closed auxiliary contacts outside the circuit breaker

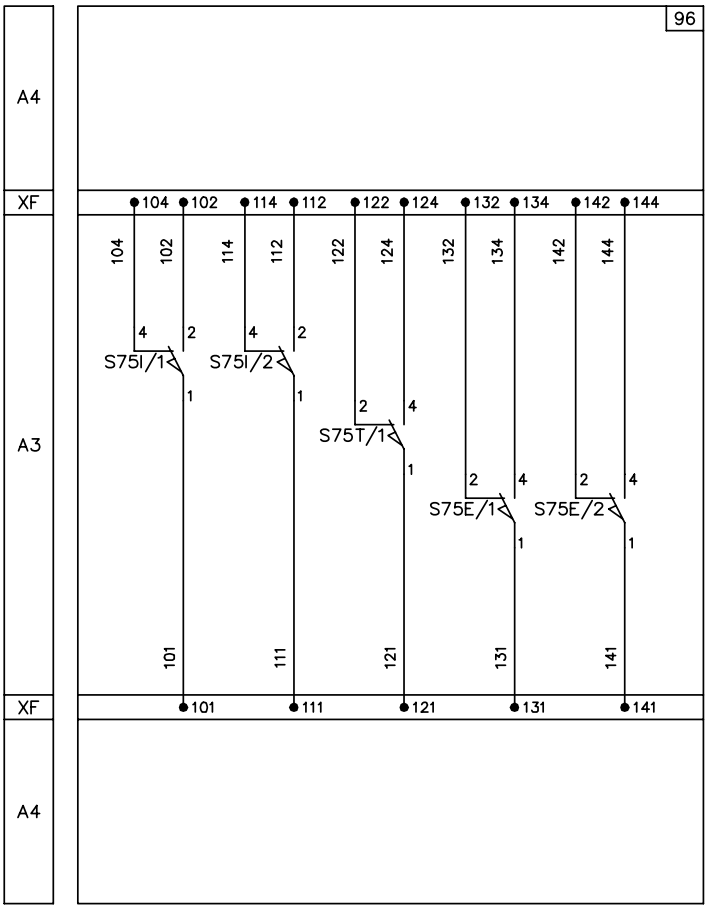


Electrical accessories

95) Contacts for signalling of circuit-breaker in racked-in, test, racked-out position

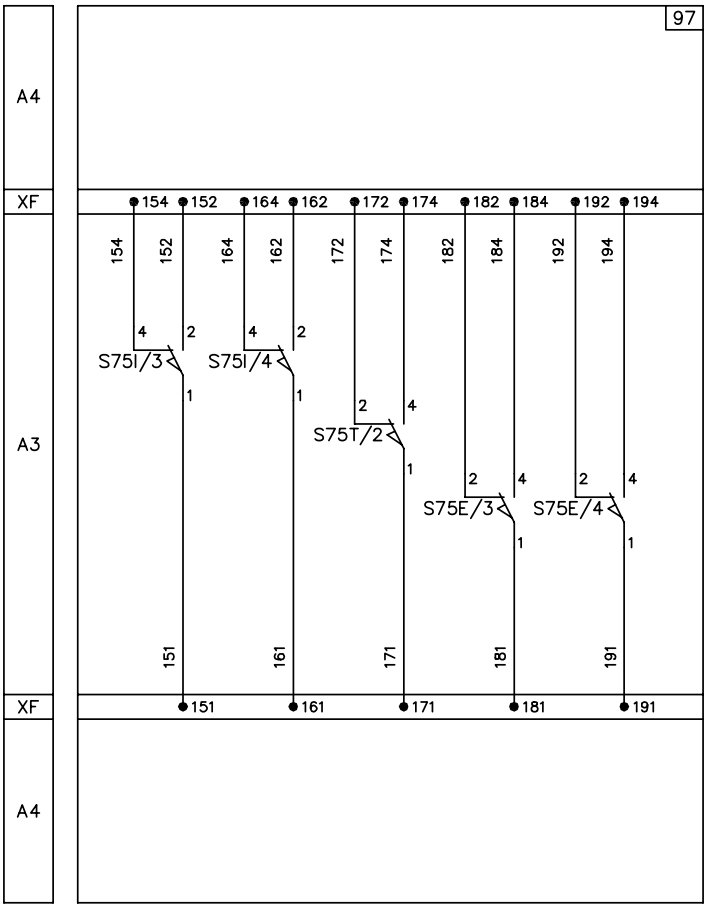


96) Contacts for signalling of circuit-breaker in racked-in, test, racked-out position (first set)

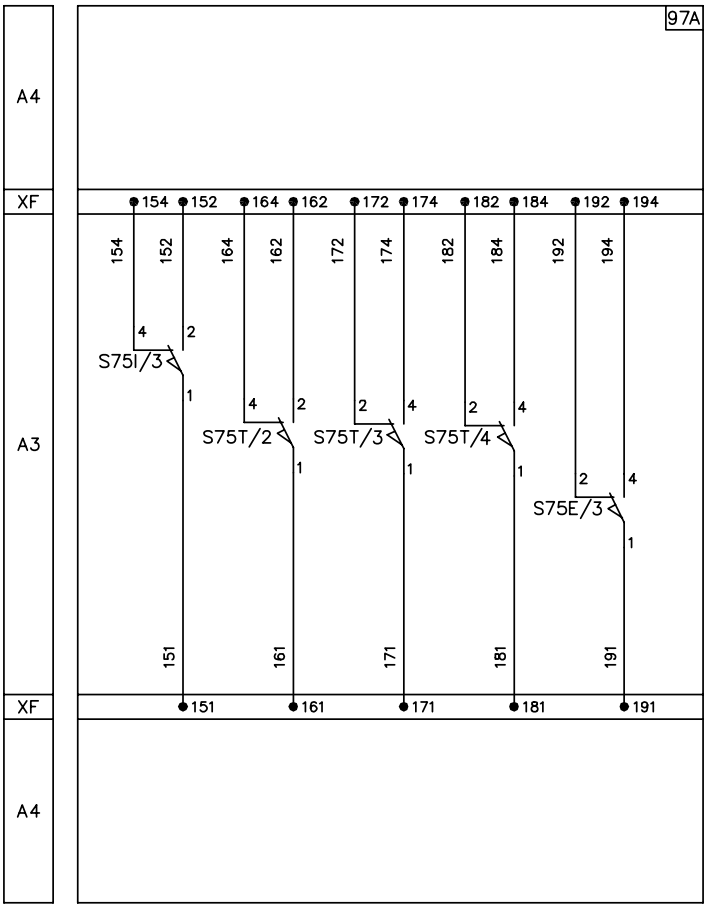


Electrical accessories

97) Contacts for signalling of circuit breakers in racked-in, test, racked-out position (second set)



97A) Contacts for signalling of circuit-breaker in racked-in, test, racked-out position (second set)



CHAPTER 10

Ordering codes

Instructions for ordering
Ordering examples

Standard version Emax 2 series circuit breakers are identified by codes that can be accessorized.

Ordering examples

- **Terminal kit codes** (other than standard supply) for fixed circuit breakers or cradles.
  The codes refer to 3 or 4 pieces for mounting on either the top or bottom terminals.

To convert a complete circuit breaker, 1 kit for upper terminals and 1 kit for lower terminals must be specified on the order.

Example no. 1

Emax E2.2N 3 poles fixed with vertical rear terminals (VR)	
1SDA077293R1	E2.2N-A 2000 Ekip Touch LSIG 3p F HR
1SDA079852R1	Kit VR Upper E2.2 Iu=2000 3pcs INST
1SDA079854R1	Kit VR Lower E2.2 Iu=2000 3pcs INST

Example no. 2

Emax E1.2N 4 poles fixed with upper vertical rear (VR) and lower front (F) terminals (standard supply)	
1SDA077020R1	E1.2N-A 1200 Ekip Dip LSIG 4p F F
1SDA079837R1	Kit VR Upper E1.2 Iu=1200 4pcs INST

- **Rating plug for lower rated current values.**
  Rating plugs installed on the circuit breaker allow for rated current values that are lower than the rated current of the circuit breaker.

Example no. 3

Emax E2.2S 2000 3 poles fixed In=1000A	
1SDA077333R1	E2.2S-A 2000 Ekip Touch LSIG 3p F HR
1SDA074264R1	Rating Plug 1000A E1.2...E6.2 INST

- **Ordering Ekip modules.**
  The Ekip Supply module enables Ekip Com, Ekip Link, Ekip 2K and Ekip Synchrocheck modules to be installed.

In addition to the Ekip Supply module, up to 3 additional modules can be installed on E2.2, E4.2 and E6.2 and up to 2 additional modules on E1.2.

Example no. 4

Emax E4.2H 3 poles fixed with modules: Ekip Supply, Ekip Com Modbus TCP, Ekip Signalling 2K, Ekip Com Modbus RCP Redundant and Ekip Signalling 4K	
1SDA077926R1	E4.2H-A 3200 Ekip Hi-Touch LSIG 3p F HR
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. 5

Emax E4.2H 3 poles fixed with modules: Ekip Supply, Ekip Com EtherNet/IP, Ekip Com Modbus RS-485 and Ekip Measuring Pro	
1SDA077923R1	E4.2H-A 3200 Ekip Touch LSIG 3p F HR
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

Example no. 6

Emax E1.2N 4 poles fixed with modules: Ekip Supply and Ekip Link	
1SDA077020R1	E1.2N-A 1200 Ekip Dip LSIG 4p F F
1SDA074172R1	Ekip Supply 110-240V AC/DC E1.2..E6.2
1SDA074163R1	Ekip Link E1.2..E6.2

- Ordering for electrical accessories.

Example no. 7

Emax E2.2S 3 poles drawout with acessories: shunt coil, closing coil, motor and second shunt coil	
1SDA077662R1	E2.2S-A 1600 Ekip Touch LSI 3p WMP
1SDA073674R1	YO E1.1..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

- Ordering for locks.

Example no. 8

Emax E2.2N 3 poles with double key lock in racked in / test / racked out position, using different keys	
1SDA077293R1	E2.2N-A 2000 Ekip Touch LSIG 3p F HR
1SDA073806R1	KLP-D Bl. Racked in/out E2.2..E6.2 1st key
1SDA073812R1	KLP-D Bl. Racked in/out E2.2..E6.2 2nd key

General informations

Abbreviations used for the description of the product

Versions and terminals	
F	Fixed circuit breaker
W	Drawout circuit breaker
MP	Mobile part of drawout circuit breaker
FP	Fixed part (Cradle) of drawout circuit breaker

Iu	Rated uninterrupted current
In	Rated current of the rating plug
Icu	Rated ultimate short-circuit breaking capacity
Icw	Rated short-time withstand current

/MS	Switch disconnector
/E	Circuit breakers for 1150V applications
/f	Four-pole circuit breakers with neutral pole at 100%
CS	Sectionalizing truck
MT	Earthing truck
MTP	Earthing switch with making capacity

HR VR	Rear orientable terminals
SHR	Horizontal rear spread terminals
SVR	Vertical rear spread terminals
F	Front terminals
FL	Flat terminals
EF	Extended front terminals
ES	Front spread terminals
Fc CuAl	Terminals for cables

Protection trip units and functions	
Ekip Dip	Protection trip unit for power distribution
Ekip Touch	Measurement and protection trip unit for power distribution
Ekip Hi Touch	Measurement and protection trip unit and network analyzer for power distribution
Ekip G Touch	Measurement and protection trip unit for generators
Ekip G Hi-Touch	Measurement and protection trip unit and protection network analyzer for generators

L	Overload protection
S	Protection against selective short circuit
I	Protection against instantaneous short circuit
G	Earth fault protection
Rc	Residual current protection
Power Controller	Load management function

Automatic circuit breakers
Fixed version for power distribution

SACE Emax E1.2B-A/N-A • Front terminals (F)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip Dip LI	1SDA076908R1	1SDA076988R1
				E1.2B-A 800 Ekip Dip LSI	1SDA076909R1	1SDA076989R1
				E1.2B-A 800 Ekip Dip LSIG	1SDA076910R1	1SDA076990R1
				E1.2B-A 800 Ekip Touch LI	1SDA076911R1	1SDA076991R1
				E1.2B-A 800 Ekip Touch LSI	1SDA076912R1	1SDA076992R1
				E1.2B-A 800 Ekip Touch LSIG	1SDA076913R1	1SDA076993R1
				E1.2B-A 800 Ekip Hi-Touch LSI	1SDA076915R1	1SDA076995R1
				E1.2B-A 800 Ekip Hi-Touch LSIG	1SDA076916R1	1SDA076996R1
	1200	42	42	E1.2B-A 1200 Ekip Dip LI	1SDA076918R1	1SDA076998R1
				E1.2B-A 1200 Ekip Dip LSI	1SDA076919R1	1SDA076999R1
				E1.2B-A 1200 Ekip Dip LSIG	1SDA076920R1	1SDA077000R1
				E1.2B-A 1200 Ekip Touch LI	1SDA076921R1	1SDA077001R1
				E1.2B-A 1200 Ekip Touch LSI	1SDA076922R1	1SDA077002R1
				E1.2B-A 1200 Ekip Touch LSIG	1SDA076923R1	1SDA077003R1
				E1.2B-A 1200 Ekip Hi-Touch LSI	1SDA076925R1	1SDA077005R1
				E1.2B-A 1200 Ekip Hi-Touch LSIG	1SDA076926R1	1SDA077006R1
E1.2N-A	800	50	50	E1.2N-A 800 Ekip Dip LI	1SDA076928R1	1SDA077008R1
				E1.2N-A 800 Ekip Dip LSI	1SDA076929R1	1SDA077009R1
				E1.2N-A 800 Ekip Dip LSIG	1SDA076930R1	1SDA077010R1
				E1.2N-A 800 Ekip Touch LI	1SDA076931R1	1SDA077011R1
				E1.2N-A 800 Ekip Touch LSI	1SDA076932R1	1SDA077012R1
				E1.2N-A 800 Ekip Touch LSIG	1SDA076933R1	1SDA077013R1
				E1.2N-A 800 Ekip Hi-Touch LSI	1SDA076935R1	1SDA077015R1
				E1.2N-A 800 Ekip Hi-Touch LSIG	1SDA076936R1	1SDA077016R1
	1200	50	50	E1.2N-A 1200 Ekip Dip LI	1SDA076938R1	1SDA077018R1
				E1.2N-A 1200 Ekip Dip LSI	1SDA076939R1	1SDA077019R1
				E1.2N-A 1200 Ekip Dip LSIG	1SDA076940R1	1SDA077020R1
				E1.2N-A 1200 Ekip Touch LI	1SDA076941R1	1SDA077021R1
				E1.2N-A 1200 Ekip Touch LSI	1SDA076942R1	1SDA077022R1
				E1.2N-A 1200 Ekip Touch LSIG	1SDA076943R1	1SDA077023R1
				E1.2N-A 1200 Ekip Hi-Touch LSI	1SDA076945R1	1SDA077025R1
				E1.2N-A 1200 Ekip Hi-Touch LSIG	1SDA076946R1	1SDA077026R1

Automatic circuit breakers
Fixed version for power distribution

SACE Emax E1.2S-A • Front terminals (F)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E1.2S-A	250	65	50	E1.2S-A 250 Ekip Dip LI	1SDA076948R1	1SDA077028R1
				E1.2S-A 250 Ekip Dip LSI	1SDA076949R1	1SDA077029R1
				E1.2S-A 250 Ekip Dip LSIG	1SDA076950R1	1SDA077030R1
				E1.2S-A 250 Ekip Touch LI	1SDA076951R1	1SDA077031R1
				E1.2S-A 250 Ekip Touch LSI	1SDA076952R1	1SDA077032R1
				E1.2S-A 250 Ekip Touch LSIG	1SDA076953R1	1SDA077033R1
				E1.2S-A 250 Ekip Hi-Touch LSI	1SDA076955R1	1SDA077035R1
				E1.2S-A 250 Ekip Hi-Touch LSIG	1SDA076956R1	1SDA077036R1
	400	65	50	E1.2S-A 400 Ekip Dip LI	1SDA076958R1	1SDA077038R1
				E1.2S-A 400 Ekip Dip LSI	1SDA076959R1	1SDA077039R1
				E1.2S-A 400 Ekip Dip LSIG	1SDA076960R1	1SDA077040R1
				E1.2S-A 400 Ekip Touch LI	1SDA076961R1	1SDA077041R1
				E1.2S-A 400 Ekip Touch LSI	1SDA076962R1	1SDA077042R1
				E1.2S-A 400 Ekip Touch LSIG	1SDA076963R1	1SDA077043R1
				E1.2S-A 400 Ekip Hi-Touch LSI	1SDA076965R1	1SDA077045R1
				E1.2S-A 400 Ekip Hi-Touch LSIG	1SDA076966R1	1SDA077046R1
	800	65	50	E1.2S-A 800 Ekip Dip LI	1SDA076968R1	1SDA077048R1
				E1.2S-A 800 Ekip Dip LSI	1SDA076969R1	1SDA077049R1
				E1.2S-A 800 Ekip Dip LSIG	1SDA076970R1	1SDA077050R1
				E1.2S-A 800 Ekip Touch LI	1SDA076971R1	1SDA077051R1
				E1.2S-A 800 Ekip Touch LSI	1SDA076972R1	1SDA077052R1
				E1.2S-A 800 Ekip Touch LSIG	1SDA076973R1	1SDA077053R1
				E1.2S-A 800 Ekip Hi-Touch LSI	1SDA076975R1	1SDA077055R1
				E1.2S-A 800 Ekip Hi-Touch LSIG	1SDA076976R1	1SDA077056R1
	1200	65	50	E1.2S-A 1200 Ekip Dip LI	1SDA076978R1	1SDA077058R1
				E1.2S-A 1200 Ekip Dip LSI	1SDA076979R1	1SDA077059R1
				E1.2S-A 1200 Ekip Dip LSIG	1SDA076980R1	1SDA077060R1
				E1.2S-A 1200 Ekip Touch LI	1SDA076981R1	1SDA077061R1
				E1.2S-A 1200 Ekip Touch LSI	1SDA076982R1	1SDA077062R1
				E1.2S-A 1200 Ekip Touch LSIG	1SDA076983R1	1SDA077063R1
				E1.2S-A 1200 Ekip Hi-Touch LSI	1SDA076985R1	1SDA077065R1
				E1.2S-A 1200 Ekip Hi-Touch LSIG	1SDA076986R1	1SDA077066R1

SACE Emax 2 E2.2B-A/N-A • Orientable rear terminals (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip Dip LI	1SDA077228R1	1SDA077398R1
				E2.2B-A 1600 Ekip Dip LSI	1SDA077229R1	1SDA077399R1
				E2.2B-A 1600 Ekip Dip LSIG	1SDA077230R1	1SDA077400R1
				E2.2B-A 1600 Ekip Touch LI	1SDA077231R1	1SDA077401R1
				E2.2B-A 1600 Ekip Touch LSI	1SDA077232R1	1SDA077402R1
				E2.2B-A 1600 Ekip Touch LSIG	1SDA077233R1	1SDA077403R1
				E2.2B-A 1600 Ekip Hi-Touch LSI	1SDA077235R1	1SDA077405R1
				E2.2B-A 1600 Ekip Hi-Touch LSIG	1SDA077236R1	1SDA077406R1
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip Dip LI	1SDA077278R1	1SDA077448R1
				E2.2N-A 1600 Ekip Dip LSI	1SDA077279R1	1SDA077449R1
				E2.2N-A 1600 Ekip Dip LSIG	1SDA077280R1	1SDA077450R1
				E2.2N-A 1600 Ekip Touch LI	1SDA077281R1	1SDA077451R1
				E2.2N-A 1600 Ekip Touch LSI	1SDA077282R1	1SDA077452R1
				E2.2N-A 1600 Ekip Touch LSIG	1SDA077283R1	1SDA077453R1
				E2.2N-A 1600 Ekip Hi-Touch LSI	1SDA077285R1	1SDA077455R1
				E2.2N-A 1600 Ekip Hi-Touch LSIG	1SDA077286R1	1SDA077456R1
	2000	50	50	E2.2N-A 2000 Ekip Dip LI	1SDA077288R1	1SDA077458R1
				E2.2N-A 2000 Ekip Dip LSI	1SDA077289R1	1SDA077459R1
				E2.2N-A 2000 Ekip Dip LSIG	1SDA077290R1	1SDA077460R1
				E2.2N-A 2000 Ekip Touch LI	1SDA077291R1	1SDA077461R1
				E2.2N-A 2000 Ekip Touch LSI	1SDA077292R1	1SDA077462R1
				E2.2N-A 2000 Ekip Touch LSIG	1SDA077293R1	1SDA077463R1
				E2.2N-A 2000 Ekip Hi-Touch LSI	1SDA077295R1	1SDA077465R1
				E2.2N-A 2000 Ekip Hi-Touch LSIG	1SDA077296R1	1SDA077466R1

Automatic circuit breakers
Fixed version for power distribution

SACE Emax 2 E2.2S-A • Orientable rear terminals (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2S-A	800	65	65	E2.2S-A 800 Ekip Dip LI	1SDA077298R1	1SDA077468R1
				E2.2S-A 800 Ekip Dip LSI	1SDA077299R1	1SDA077469R1
				E2.2S-A 800 Ekip Dip LSIG	1SDA077300R1	1SDA077470R1
				E2.2S-A 800 Ekip Touch LI	1SDA077301R1	1SDA077471R1
				E2.2S-A 800 Ekip Touch LSI	1SDA077302R1	1SDA077472R1
				E2.2S-A 800 Ekip Touch LSIG	1SDA077303R1	1SDA077473R1
				E2.2S-A 800 Ekip Hi-Touch LSI	1SDA077305R1	1SDA077475R1
				E2.2S-A 800 Ekip Hi-Touch LSIG	1SDA077306R1	1SDA077476R1
	1200	65	65	E2.2S-A 1200 Ekip Dip LI	1SDA077308R1	1SDA077478R1
				E2.2S-A 1200 Ekip Dip LSI	1SDA077309R1	1SDA077479R1
				E2.2S-A 1200 Ekip Dip LSIG	1SDA077310R1	1SDA077480R1
				E2.2S-A 1200 Ekip Touch LI	1SDA077311R1	1SDA077481R1
				E2.2S-A 1200 Ekip Touch LSI	1SDA077312R1	1SDA077482R1
				E2.2S-A 1200 Ekip Touch LSIG	1SDA077313R1	1SDA077483R1
				E2.2S-A 1200 Ekip Hi-Touch LSI	1SDA077315R1	1SDA077485R1
				E2.2S-A 1200 Ekip Hi-Touch LSIG	1SDA077316R1	1SDA077486R1
	1600	65	65	E2.2S-A 1600 Ekip Dip LI	1SDA077318R1	1SDA077488R1
				E2.2S-A 1600 Ekip Dip LSI	1SDA077319R1	1SDA077489R1
				E2.2S-A 1600 Ekip Dip LSIG	1SDA077320R1	1SDA077490R1
				E2.2S-A 1600 Ekip Touch LI	1SDA077321R1	1SDA077491R1
				E2.2S-A 1600 Ekip Touch LSI	1SDA077322R1	1SDA077492R1
				E2.2S-A 1600 Ekip Touch LSIG	1SDA077323R1	1SDA077493R1
				E2.2S-A 1600 Ekip Hi-Touch LSI	1SDA077325R1	1SDA077495R1
				E2.2S-A 1600 Ekip Hi-Touch LSIG	1SDA077326R1	1SDA077496R1
	2000	65	65	E2.2S-A 2000 Ekip Dip LI	1SDA077328R1	1SDA077498R1
				E2.2S-A 2000 Ekip Dip LSI	1SDA077329R1	1SDA077499R1
				E2.2S-A 2000 Ekip Dip LSIG	1SDA077330R1	1SDA077500R1
				E2.2S-A 2000 Ekip Touch LI	1SDA077331R1	1SDA077501R1
				E2.2S-A 2000 Ekip Touch LSI	1SDA077332R1	1SDA077502R1
				E2.2S-A 2000 Ekip Touch LSIG	1SDA077333R1	1SDA077503R1
				E2.2S-A 2000 Ekip Hi-Touch LSI	1SDA077335R1	1SDA077505R1
				E2.2S-A 2000 Ekip Hi-Touch LSIG	1SDA077336R1	1SDA077506R1

SACE Emax 2 E2.2H-A • Orientable rear terminals (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2H-A	800	85	85	E2.2H-A 800 Ekip Dip LI	1SDA077238R1	1SDA077408R1
				E2.2H-A 800 Ekip Dip LSI	1SDA077239R1	1SDA077409R1
				E2.2H-A 800 Ekip Dip LSIG	1SDA077240R1	1SDA077410R1
				E2.2H-A 800 Ekip Touch LI	1SDA077241R1	1SDA077411R1
				E2.2H-A 800 Ekip Touch LSI	1SDA077242R1	1SDA077412R1
				E2.2H-A 800 Ekip Touch LSIG	1SDA077243R1	1SDA077413R1
				E2.2H-A 800 Ekip Hi-Touch LSI	1SDA077245R1	1SDA077415R1
				E2.2H-A 800 Ekip Hi-Touch LSIG	1SDA077246R1	1SDA077416R1
	1200	85	85	E2.2H-A 1200 Ekip Dip LI	1SDA077248R1	1SDA077418R1
				E2.2H-A 1200 Ekip Dip LSI	1SDA077249R1	1SDA077419R1
				E2.2H-A 1200 Ekip Dip LSIG	1SDA077250R1	1SDA077420R1
				E2.2H-A 1200 Ekip Touch LI	1SDA077251R1	1SDA077421R1
				E2.2H-A 1200 Ekip Touch LSI	1SDA077252R1	1SDA077422R1
				E2.2H-A 1200 Ekip Touch LSIG	1SDA077253R1	1SDA077423R1
				E2.2H-A 1200 Ekip Hi-Touch LSI	1SDA077255R1	1SDA077425R1
				E2.2H-A 1200 Ekip Hi-Touch LSIG	1SDA077256R1	1SDA077426R1
	1600	85	85	E2.2H-A 1600 Ekip Dip LI	1SDA077258R1	1SDA077428R1
				E2.2H-A 1600 Ekip Dip LSI	1SDA077259R1	1SDA077429R1
				E2.2H-A 1600 Ekip Dip LSIG	1SDA077260R1	1SDA077430R1
				E2.2H-A 1600 Ekip Touch LI	1SDA077261R1	1SDA077431R1
				E2.2H-A 1600 Ekip Touch LSI	1SDA077262R1	1SDA077432R1
				E2.2H-A 1600 Ekip Touch LSIG	1SDA077263R1	1SDA077433R1
				E2.2H-A 1600 Ekip Hi-Touch LSI	1SDA077265R1	1SDA077435R1
				E2.2H-A 1600 Ekip Hi-Touch LSIG	1SDA077266R1	1SDA077436R1
	2000	85	85	E2.2H-A 2000 Ekip Dip LI	1SDA077268R1	1SDA077438R1
				E2.2H-A 2000 Ekip Dip LSI	1SDA077269R1	1SDA077439R1
				E2.2H-A 2000 Ekip Dip LSIG	1SDA077270R1	1SDA077440R1
				E2.2H-A 2000 Ekip Touch LI	1SDA077271R1	1SDA077441R1
				E2.2H-A 2000 Ekip Touch LSI	1SDA077272R1	1SDA077442R1
				E2.2H-A 2000 Ekip Touch LSIG	1SDA077273R1	1SDA077443R1
				E2.2H-A 2000 Ekip Hi-Touch LSI	1SDA077275R1	1SDA077445R1
				E2.2H-A 2000 Ekip Hi-Touch LSIG	1SDA077276R1	1SDA077446R1

Automatic circuit breakers
Fixed version for power distribution

SACE Emax 2 E2.2V-A • Orientable rear terminals (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2V-A	250	100	85	E2.2V-A 250 Ekip Dip LI	1SDA077338R1	1SDA077508R1
				E2.2V-A 250 Ekip Dip LSI	1SDA077339R1	1SDA077509R1
				E2.2V-A 250 Ekip Dip LSIG	1SDA077340R1	1SDA077510R1
				E2.2V-A 250 Ekip Touch LI	1SDA077341R1	1SDA077511R1
				E2.2V-A 250 Ekip Touch LSI	1SDA077342R1	1SDA077512R1
				E2.2V-A 250 Ekip Touch LSIG	1SDA077343R1	1SDA077513R1
				E2.2V-A 250 Ekip Hi-Touch LSI	1SDA077345R1	1SDA077515R1
				E2.2V-A 250 Ekip Hi-Touch LSIG	1SDA077346R1	1SDA077516R1
	400	100	85	E2.2V-A 400 Ekip Dip LI	1SDA077348R1	1SDA077518R1
				E2.2V-A 400 Ekip Dip LSI	1SDA077349R1	1SDA077519R1
				E2.2V-A 400 Ekip Dip LSIG	1SDA077350R1	1SDA077520R1
				E2.2V-A 400 Ekip Touch LI	1SDA077351R1	1SDA077521R1
				E2.2V-A 400 Ekip Touch LSI	1SDA077352R1	1SDA077522R1
				E2.2V-A 400 Ekip Touch LSIG	1SDA077353R1	1SDA077523R1
				E2.2V-A 400 Ekip Hi-Touch LSI	1SDA077355R1	1SDA077525R1
				E2.2V-A 400 Ekip Hi-Touch LSIG	1SDA077356R1	1SDA077526R1
	800	100	85	E2.2V-A 800 Ekip Dip LI	1SDA077358R1	1SDA077528R1
				E2.2V-A 800 Ekip Dip LSI	1SDA077359R1	1SDA077529R1
				E2.2V-A 800 Ekip Dip LSIG	1SDA077360R1	1SDA077530R1
				E2.2V-A 800 Ekip Touch LI	1SDA077361R1	1SDA077531R1
				E2.2V-A 800 Ekip Touch LSI	1SDA077362R1	1SDA077532R1
				E2.2V-A 800 Ekip Touch LSIG	1SDA077363R1	1SDA077533R1
				E2.2V-A 800 Ekip Hi-Touch LSI	1SDA077365R1	1SDA077535R1
				E2.2V-A 800 Ekip Hi-Touch LSIG	1SDA077366R1	1SDA077536R1
	1200	100	85	E2.2V-A 1200 Ekip Dip LI	1SDA077368R1	1SDA077538R1
				E2.2V-A 1200 Ekip Dip LSI	1SDA077369R1	1SDA077539R1
				E2.2V-A 1200 Ekip Dip LSIG	1SDA077370R1	1SDA077540R1
				E2.2V-A 1200 Ekip Touch LI	1SDA077371R1	1SDA077541R1
				E2.2V-A 1200 Ekip Touch LSI	1SDA077372R1	1SDA077542R1
				E2.2V-A 1200 Ekip Touch LSIG	1SDA077373R1	1SDA077543R1
				E2.2V-A 1200 Ekip Hi-Touch LSI	1SDA077375R1	1SDA077545R1
				E2.2V-A 1200 Ekip Hi-Touch LSIG	1SDA077376R1	1SDA077546R1
	1600	100	85	E2.2V-A 1600 Ekip Dip LI	1SDA077378R1	1SDA077548R1
				E2.2V-A 1600 Ekip Dip LSI	1SDA077379R1	1SDA077549R1
				E2.2V-A 1600 Ekip Dip LSIG	1SDA077380R1	1SDA077550R1
				E2.2V-A 1600 Ekip Touch LI	1SDA077381R1	1SDA077551R1
				E2.2V-A 1600 Ekip Touch LSI	1SDA077382R1	1SDA077552R1
				E2.2V-A 1600 Ekip Touch LSIG	1SDA077383R1	1SDA077553R1
				E2.2V-A 1600 Ekip Hi-Touch LSI	1SDA077385R1	1SDA077555R1
				E2.2V-A 1600 Ekip Hi-Touch LSIG	1SDA077386R1	1SDA077556R1
	2000	100	85	E2.2V-A 2000 Ekip Dip LI	1SDA077388R1	1SDA077558R1
				E2.2V-A 2000 Ekip Dip LSI	1SDA077389R1	1SDA077559R1
				E2.2V-A 2000 Ekip Dip LSIG	1SDA077390R1	1SDA077560R1
				E2.2V-A 2000 Ekip Touch LI	1SDA077391R1	1SDA077561R1
				E2.2V-A 2000 Ekip Touch LSI	1SDA077392R1	1SDA077562R1
				E2.2V-A 2000 Ekip Touch LSIG	1SDA077393R1	1SDA077563R1
				E2.2V-A 2000 Ekip Hi-Touch LSI	1SDA077395R1	1SDA077565R1
				E2.2V-A 2000 Ekip Hi-Touch LSIG	1SDA077396R1	1SDA077566R1

SACE Emax 2 E4.2S-A/H-A • Orientable rear terminals up to 2500 A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip Dip LI	1SDA077998R1	1SDA078228R1
				E4.2S-A 2500 Ekip Dip LSI	1SDA077999R1	1SDA078229R1
				E4.2S-A 2500 Ekip Dip LSIG	1SDA078000R1	1SDA078230R1
				E4.2S-A 2500 Ekip Touch LI	1SDA078001R1	1SDA078231R1
				E4.2S-A 2500 Ekip Touch LSI	1SDA078002R1	1SDA078232R1
				E4.2S-A 2500 Ekip Touch LSIG	1SDA078003R1	1SDA078233R1
				E4.2S-A 2500 Ekip Hi-Touch LSI	1SDA078005R1	1SDA078235R1
				E4.2S-A 2500 Ekip Hi-Touch LSIG	1SDA078006R1	1SDA078236R1
	3200 (*)	65	65	E4.2S-A 3200 Ekip Dip LI	1SDA078008R1	1SDA078238R1
				E4.2S-A 3200 Ekip Dip LSI	1SDA078009R1	1SDA078239R1
				E4.2S-A 3200 Ekip Dip LSIG	1SDA078010R1	1SDA078240R1
				E4.2S-A 3200 Ekip Touch LI	1SDA078011R1	1SDA078241R1
				E4.2S-A 3200 Ekip Touch LSI	1SDA078012R1	1SDA078242R1
				E4.2S-A 3200 Ekip Touch LSIG	1SDA078013R1	1SDA078243R1
				E4.2S-A 3200 Ekip Hi-Touch LSI	1SDA078015R1	1SDA078245R1
				E4.2S-A 3200 Ekip Hi-Touch LSIG	1SDA078016R1	1SDA078246R1
	3600 (*)	65	65	E4.2S-A 3600 Ekip Dip LI	1SDA078018R1	-
				E4.2S-A 3600 Ekip Dip LSI	1SDA078019R1	-
				E4.2S-A 3600 Ekip Dip LSIG	1SDA078020R1	-
				E4.2S-A 3600 Ekip Touch LI	1SDA078021R1	-
				E4.2S-A 3600 Ekip Touch LSI	1SDA078022R1	-
				E4.2S-A 3600 Ekip Touch LSIG	1SDA078023R1	-
				E4.2S-A 3600 Ekip Hi-Touch LSI	1SDA078025R1	-
				E4.2S-A 3600 Ekip Hi-Touch LSIG	1SDA078026R1	-
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip Dip LI	1SDA077908R1	1SDA078138R1
				E4.2H-A 2500 Ekip Dip LSI	1SDA077909R1	1SDA078139R1
				E4.2H-A 2500 Ekip Dip LSIG	1SDA077910R1	1SDA078140R1
				E4.2H-A 2500 Ekip Touch LI	1SDA077911R1	1SDA078141R1
				E4.2H-A 2500 Ekip Touch LSI	1SDA077912R1	1SDA078142R1
				E4.2H-A 2500 Ekip Touch LSIG	1SDA077913R1	1SDA078143R1
				E4.2H-A 2500 Ekip Hi-Touch LSI	1SDA077915R1	1SDA078145R1
				E4.2H-A 2500 Ekip Hi-Touch LSIG	1SDA077916R1	1SDA078146R1
	3200 (*)	85	85	E4.2H-A 3200 Ekip Dip LI	1SDA077918R1	1SDA078148R1
				E4.2H-A 3200 Ekip Dip LSI	1SDA077919R1	1SDA078149R1
				E4.2H-A 3200 Ekip Dip LSIG	1SDA077920R1	1SDA078150R1
				E4.2H-A 3200 Ekip Touch LI	1SDA077921R1	1SDA078151R1
				E4.2H-A 3200 Ekip Touch LSI	1SDA077922R1	1SDA078152R1
				E4.2H-A 3200 Ekip Touch LSIG	1SDA077923R1	1SDA078153R1
				E4.2H-A 3200 Ekip Hi-Touch LSI	1SDA077925R1	1SDA078155R1
				E4.2H-A 3200 Ekip Hi-Touch LSIG	1SDA077926R1	1SDA078156R1
	3600 (*)	65	65	E4.2H-A 3600 Ekip Dip LI	1SDA077928R1	-
				E4.2H-A 3600 Ekip Dip LSI	1SDA077929R1	-
				E4.2H-A 3600 Ekip Dip LSIG	1SDA077930R1	-
				E4.2H-A 3600 Ekip Touch LI	1SDA077931R1	-
				E4.2H-A 3600 Ekip Touch LSI	1SDA077932R1	-
				E4.2H-A 3600 Ekip Touch LSIG	1SDA077933R1	-
				E4.2H-A 3600 Ekip Hi-Touch LSI	1SDA077935R1	-
				E4.2H-A 3600 Ekip Hi-Touch LSIG	1SDA077936R1	-

* 3200A/3600A ratings only with rear vertical terminals

Automatic circuit breakers
Fixed version for power distribution

SACE Emax 2 E4.2V-A • Orientable rear terminals up to 2500 A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E4.2V-A	800	100	85	E4.2V-A 800 Ekip Dip LI	1SDA078028R1	1SDA078258R1
				E4.2V-A 800 Ekip Dip LSI	1SDA078029R1	1SDA078259R1
				E4.2V-A 800 Ekip Dip LSIG	1SDA078030R1	1SDA078260R1
				E4.2V-A 800 Ekip Touch LI	1SDA078031R1	1SDA078261R1
				E4.2V-A 800 Ekip Touch LSI	1SDA078032R1	1SDA078262R1
				E4.2V-A 800 Ekip Touch LSIG	1SDA078033R1	1SDA078263R1
				E4.2V-A 800 Ekip Hi-Touch LSI	1SDA078035R1	1SDA078265R1
				E4.2V-A 800 Ekip Hi-Touch LSIG	1SDA078036R1	1SDA078266R1
	1600	100	85	E4.2V-A 1600 Ekip Dip LI	1SDA078038R1	1SDA078268R1
				E4.2V-A 1600 Ekip Dip LSI	1SDA078039R1	1SDA078269R1
				E4.2V-A 1600 Ekip Dip LSIG	1SDA078040R1	1SDA078270R1
				E4.2V-A 1600 Ekip Touch LI	1SDA078041R1	1SDA078271R1
				E4.2V-A 1600 Ekip Touch LSI	1SDA078042R1	1SDA078272R1
				E4.2V-A 1600 Ekip Touch LSIG	1SDA078043R1	1SDA078273R1
				E4.2V-A 1600 Ekip Hi-Touch LSI	1SDA078045R1	1SDA078275R1
				E4.2V-A 1600 Ekip Hi-Touch LSIG	1SDA078046R1	1SDA078276R1
	2000	100	85	E4.2V-A 2000 Ekip Dip LI	1SDA078048R1	1SDA078278R1
				E4.2V-A 2000 Ekip Dip LSI	1SDA078049R1	1SDA078279R1
				E4.2V-A 2000 Ekip Dip LSIG	1SDA078050R1	1SDA078280R1
				E4.2V-A 2000 Ekip Touch LI	1SDA078051R1	1SDA078281R1
				E4.2V-A 2000 Ekip Touch LSI	1SDA078052R1	1SDA078282R1
				E4.2V-A 2000 Ekip Touch LSIG	1SDA078053R1	1SDA078283R1
				E4.2V-A 2000 Ekip Hi-Touch LSI	1SDA078055R1	1SDA078285R1
				E4.2V-A 2000 Ekip Hi-Touch LSIG	1SDA078056R1	1SDA078286R1
	2500	100	85	E4.2V-A 2500 Ekip Dip LI	1SDA078058R1	1SDA078288R1
				E4.2V-A 2500 Ekip Dip LSI	1SDA078059R1	1SDA078289R1
				E4.2V-A 2500 Ekip Dip LSIG	1SDA078060R1	1SDA078290R1
				E4.2V-A 2500 Ekip Touch LI	1SDA078061R1	1SDA078291R1
				E4.2V-A 2500 Ekip Touch LSI	1SDA078062R1	1SDA078292R1
				E4.2V-A 2500 Ekip Touch LSIG	1SDA078063R1	1SDA078293R1
				E4.2V-A 2500 Ekip Hi-Touch LSI	1SDA078065R1	1SDA078295R1
				E4.2V-A 2500 Ekip Hi-Touch LSIG	1SDA078066R1	1SDA078296R1
	3200 (*)	100	85	E4.2V-A 3200 Ekip Dip LI	1SDA078068R1	1SDA078298R1
				E4.2V-A 3200 Ekip Dip LSI	1SDA078069R1	1SDA078299R1
				E4.2V-A 3200 Ekip Dip LSIG	1SDA078070R1	1SDA078300R1
				E4.2V-A 3200 Ekip Touch LI	1SDA078071R1	1SDA078301R1
				E4.2V-A 3200 Ekip Touch LSI	1SDA078072R1	1SDA078302R1
				E4.2V-A 3200 Ekip Touch LSIG	1SDA078073R1	1SDA078303R1
				E4.2V-A 3200 Ekip Hi-Touch LSI	1SDA078075R1	1SDA078305R1
				E4.2V-A 3200 Ekip Hi-Touch LSIG	1SDA078076R1	1SDA078306R1
	3600 (*)	100	85	E4.2V-A 3600 Ekip Dip LI	1SDA078078R1	-
				E4.2V-A 3600 Ekip Dip LSI	1SDA078079R1	-
				E4.2V-A 3600 Ekip Dip LSIG	1SDA078080R1	-
				E4.2V-A 3600 Ekip Touch LI	1SDA078081R1	-
				E4.2V-A 3600 Ekip Touch LSI	1SDA078082R1	-
				E4.2V-A 3600 Ekip Touch LSIG	1SDA078083R1	-
				E4.2V-A 3600 Ekip Hi-Touch LSI	1SDA078085R1	-
				E4.2V-A 3600 Ekip Hi-Touch LSIG	1SDA078086R1	-

* 3200A/3600A ratings only with rear vertical terminals

SACE Emax 2 E6.2H-A/V-A • Orientable rear terminals up to 5000A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip Dip LI	1SDA078828R1	1SDA078948R1
				E6.2H-A 4000 Ekip Dip LSI	1SDA078829R1	1SDA078949R1
				E6.2H-A 4000 Ekip Dip LSIG	1SDA078830R1	1SDA078950R1
				E6.2H-A 4000 Ekip Touch LI	1SDA078831R1	1SDA078951R1
				E6.2H-A 4000 Ekip Touch LSI	1SDA078832R1	1SDA078952R1
				E6.2H-A 4000 Ekip Touch LSIG	1SDA078833R1	1SDA078953R1
				E6.2H-A 4000 Ekip Hi-Touch LSI	1SDA078835R1	1SDA078955R1
				E6.2H-A 4000 Ekip Hi-Touch LSIG	1SDA078836R1	1SDA078956R1
	5000	85	85	E6.2H-A 5000 Ekip Dip LI	1SDA078838R1	1SDA078958R1
				E6.2H-A 5000 Ekip Dip LSI	1SDA078839R1	1SDA078959R1
				E6.2H-A 5000 Ekip Dip LSIG	1SDA078840R1	1SDA078960R1
				E6.2H-A 5000 Ekip Touch LI	1SDA078841R1	1SDA078961R1
				E6.2H-A 5000 Ekip Touch LSI	1SDA078842R1	1SDA078962R1
				E6.2H-A 5000 Ekip Touch LSIG	1SDA078843R1	1SDA078963R1
				E6.2H-A 5000 Ekip Hi-Touch LSI	1SDA078845R1	1SDA078965R1
				E6.2H-A 5000 Ekip Hi-Touch LSIG	1SDA078846R1	1SDA078966R1
	6000 (*)	85	85	E6.2H-A 6000 Ekip Dip LI	1SDA078848R1	1SDA078968R1
				E6.2H-A 6000 Ekip Dip LSI	1SDA078849R1	1SDA078969R1
				E6.2H-A 6000 Ekip Dip LSIG	1SDA078850R1	1SDA078970R1
				E6.2H-A 6000 Ekip Touch LI	1SDA078851R1	1SDA078971R1
				E6.2H-A 6000 Ekip Touch LSI	1SDA078852R1	1SDA078972R1
				E6.2H-A 6000 Ekip Touch LSIG	1SDA078853R1	1SDA078973R1
				E6.2H-A 6000 Ekip Hi-Touch LSI	1SDA078855R1	1SDA078975R1
				E6.2H-A 6000 Ekip Hi-Touch LSIG	1SDA078856R1	1SDA078976R1
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip Dip LI	1SDA078888R1	1SDA079008R1
				E6.2V-A 4000 Ekip Dip LSI	1SDA078889R1	1SDA079009R1
				E6.2V-A 4000 Ekip Dip LSIG	1SDA078890R1	1SDA079010R1
				E6.2V-A 4000 Ekip Touch LI	1SDA078891R1	1SDA079011R1
				E6.2V-A 4000 Ekip Touch LSI	1SDA078892R1	1SDA079012R1
				E6.2V-A 4000 Ekip Touch LSIG	1SDA078893R1	1SDA079013R1
				E6.2V-A 4000 Ekip Hi-Touch LSI	1SDA078895R1	1SDA079015R1
				E6.2V-A 4000 Ekip Hi-Touch LSIG	1SDA078896R1	1SDA079016R1
	5000	100	100	E6.2V-A 5000 Ekip Dip LI	1SDA078898R1	1SDA079018R1
				E6.2V-A 5000 Ekip Dip LSI	1SDA078899R1	1SDA079019R1
				E6.2V-A 5000 Ekip Dip LSIG	1SDA078900R1	1SDA079020R1
				E6.2V-A 5000 Ekip Touch LI	1SDA078901R1	1SDA079021R1
				E6.2V-A 5000 Ekip Touch LSI	1SDA078902R1	1SDA079022R1
				E6.2V-A 5000 Ekip Touch LSIG	1SDA078903R1	1SDA079023R1
				E6.2V-A 5000 Ekip Hi-Touch LSI	1SDA078905R1	1SDA079025R1
				E6.2V-A 5000 Ekip Hi-Touch LSIG	1SDA078906R1	1SDA079026R1
	6000 (*)	100	100	E6.2V-A 6000 Ekip Dip LI	1SDA078908R1	1SDA079028R1
				E6.2V-A 6000 Ekip Dip LSI	1SDA078909R1	1SDA079029R1
				E6.2V-A 6000 Ekip Dip LSIG	1SDA078910R1	1SDA079030R1
				E6.2V-A 6000 Ekip Touch LI	1SDA078911R1	1SDA079031R1
				E6.2V-A 6000 Ekip Touch LSI	1SDA078912R1	1SDA079032R1
				E6.2V-A 6000 Ekip Touch LSIG	1SDA078913R1	1SDA079033R1
				E6.2V-A 6000 Ekip Hi-Touch LSI	1SDA078915R1	1SDA079035R1
				E6.2V-A 6000 Ekip Hi-Touch LSIG	1SDA078916R1	1SDA079036R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB

Automatic circuit breakers
Fixed version for power distribution

SACE Emax 2 E6.2H-A/f/V-A/f full size • Orientable rear terminals up to 5000A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Poles
					Global code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip Dip LI	1SDA079308R1
				E6.2H-A/f 4000 Ekip Dip LSI	1SDA079309R1
				E6.2H-A/f 4000 Ekip Dip LSIG	1SDA079310R1
				E6.2H-A/f 4000 Ekip Touch LI	1SDA079311R1
				E6.2H-A/f 4000 Ekip Touch LSI	1SDA079312R1
				E6.2H-A/f 4000 Ekip Touch LSIG	1SDA079313R1
				E6.2H-A/f 4000 Ekip Hi-Touch LSI	1SDA079315R1
				E6.2H-A/f 4000 Ekip Hi-Touch LSIG	1SDA079316R1
	5000	85	85	E6.2H-A/f 5000 Ekip Dip LI	1SDA079318R1
				E6.2H-A/f 5000 Ekip Dip LSI	1SDA079319R1
				E6.2H-A/f 5000 Ekip Dip LSIG	1SDA079320R1
				E6.2H-A/f 5000 Ekip Touch LI	1SDA079321R1
				E6.2H-A/f 5000 Ekip Touch LSI	1SDA079322R1
				E6.2H-A/f 5000 Ekip Touch LSIG	1SDA079323R1
				E6.2H-A/f 5000 Ekip Hi-Touch LSI	1SDA079325R1
				E6.2H-A/f 5000 Ekip Hi-Touch LSIG	1SDA079326R1
	6000 (*)	85	85	E6.2H-A/f 6000 Ekip Dip LI	1SDA079328R1
				E6.2H-A/f 6000 Ekip Dip LSI	1SDA079329R1
				E6.2H-A/f 6000 Ekip Dip LSIG	1SDA079330R1
				E6.2H-A/f 6000 Ekip Touch LI	1SDA079331R1
				E6.2H-A/f 6000 Ekip Touch LSI	1SDA079332R1
				E6.2H-A/f 6000 Ekip Touch LSIG	1SDA079333R1
				E6.2H-A/f 6000 Ekip Hi-Touch LSI	1SDA079335R1
				E6.2H-A/f 6000 Ekip Hi-Touch LSIG	1SDA079336R1
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip Dip LI	1SDA079368R1
				E6.2V-A/f 4000 Ekip Dip LSI	1SDA079369R1
				E6.2V-A/f 4000 Ekip Dip LSIG	1SDA079370R1
				E6.2V-A/f 4000 Ekip Touch LI	1SDA079371R1
				E6.2V-A/f 4000 Ekip Touch LSI	1SDA079372R1
				E6.2V-A/f 4000 Ekip Touch LSIG	1SDA079373R1
				E6.2V-A/f 4000 Ekip Hi-Touch LSI	1SDA079375R1
				E6.2V-A/f 4000 Ekip Hi-Touch LSIG	1SDA079376R1
	5000	100	100	E6.2V-A/f 5000 Ekip Dip LI	1SDA079378R1
				E6.2V-A/f 5000 Ekip Dip LSI	1SDA079379R1
				E6.2V-A/f 5000 Ekip Dip LSIG	1SDA079380R1
				E6.2V-A/f 5000 Ekip Touch LI	1SDA079381R1
				E6.2V-A/f 5000 Ekip Touch LSI	1SDA079382R1
				E6.2V-A/f 5000 Ekip Touch LSIG	1SDA079383R1
				E6.2V-A/f 5000 Ekip Hi-Touch LSI	1SDA079385R1
				E6.2V-A/f 5000 Ekip Hi-Touch LSIG	1SDA079386R1
	6000 (*)	100	100	E6.2V-A/f 6000 Ekip Dip LI	1SDA079388R1
				E6.2V-A/f 6000 Ekip Dip LSI	1SDA079389R1
				E6.2V-A/f 6000 Ekip Dip LSIG	1SDA079390R1
				E6.2V-A/f 6000 Ekip Touch LI	1SDA079391R1
				E6.2V-A/f 6000 Ekip Touch LSI	1SDA079392R1
				E6.2V-A/f 6000 Ekip Touch LSIG	1SDA079393R1
				E6.2V-A/f 6000 Ekip Hi-Touch LSI	1SDA079395R1
				E6.2V-A/f 6000 Ekip Hi-Touch LSIG	1SDA079396R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB

Automatic circuit breakers
Drawout version for power distribution

SACE Emax 2 E1.2B-A/N-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip Dip LI	1SDA077068R1	1SDA077148R1
				E1.2B-A 800 Ekip Dip LSI	1SDA077069R1	1SDA077149R1
				E1.2B-A 800 Ekip Dip LSIG	1SDA077070R1	1SDA077150R1
				E1.2B-A 800 Ekip Touch LI	1SDA077071R1	1SDA077151R1
				E1.2B-A 800 Ekip Touch LSI	1SDA077072R1	1SDA077152R1
				E1.2B-A 800 Ekip Touch LSIG	1SDA077073R1	1SDA077153R1
				E1.2B-A 800 Ekip Hi-Touch LSI	1SDA077075R1	1SDA077155R1
				E1.2B-A 800 Ekip Hi-Touch LSIG	1SDA077076R1	1SDA077156R1
	1200	42	42	E1.2B-A 1200 Ekip Dip LI	1SDA077078R1	1SDA077158R1
				E1.2B-A 1200 Ekip Dip LSI	1SDA077079R1	1SDA077159R1
				E1.2B-A 1200 Ekip Dip LSIG	1SDA077080R1	1SDA077160R1
				E1.2B-A 1200 Ekip Touch LI	1SDA077081R1	1SDA077161R1
				E1.2B-A 1200 Ekip Touch LSI	1SDA077082R1	1SDA077162R1
				E1.2B-A 1200 Ekip Touch LSIG	1SDA077083R1	1SDA077163R1
				E1.2B-A 1200 Ekip Hi-Touch LSI	1SDA077085R1	1SDA077165R1
				E1.2B-A 1200 Ekip Hi-Touch LSIG	1SDA077086R1	1SDA077166R1
E1.2N-A	800	50	50	E1.2N-A 800 Ekip Dip LI	1SDA077088R1	1SDA077168R1
				E1.2N-A 800 Ekip Dip LSI	1SDA077089R1	1SDA077169R1
				E1.2N-A 800 Ekip Dip LSIG	1SDA077090R1	1SDA077170R1
				E1.2N-A 800 Ekip Touch LI	1SDA077091R1	1SDA077171R1
				E1.2N-A 800 Ekip Touch LSI	1SDA077092R1	1SDA077172R1
				E1.2N-A 800 Ekip Touch LSIG	1SDA077093R1	1SDA077173R1
				E1.2N-A 800 Ekip Hi-Touch LSI	1SDA077095R1	1SDA077175R1
				E1.2N-A 800 Ekip Hi-Touch LSIG	1SDA077096R1	1SDA077176R1
	1200	50	50	E1.2N-A 1200 Ekip Dip LI	1SDA077098R1	1SDA077178R1
				E1.2N-A 1200 Ekip Dip LSI	1SDA077099R1	1SDA077179R1
				E1.2N-A 1200 Ekip Dip LSIG	1SDA077100R1	1SDA077180R1
				E1.2N-A 1200 Ekip Touch LI	1SDA077101R1	1SDA077181R1
				E1.2N-A 1200 Ekip Touch LSI	1SDA077102R1	1SDA077183R1
				E1.2N-A 1200 Ekip Touch LSIG	1SDA077103R1	1SDA077182R1
				E1.2N-A 1200 Ekip Hi-Touch LSI	1SDA077105R1	1SDA077185R1
				E1.2N-A 1200 Ekip Hi-Touch LSIG	1SDA077106R1	1SDA077186R1

Automatic circuit breakers

Drawout version for power distribution

SACE Emax 2 E1.2S-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E1.2S-A	250	65	50	E1.2S-A 250 Ekip Dip LI	1SDA077108R1	1SDA077188R1
				E1.2S-A 250 Ekip Dip LSI	1SDA077109R1	1SDA077189R1
				E1.2S-A 250 Ekip Dip LSIG	1SDA077110R1	1SDA077190R1
				E1.2S-A 250 Ekip Touch LI	1SDA077111R1	1SDA077191R1
				E1.2S-A 250 Ekip Touch LSI	1SDA077112R1	1SDA077192R1
				E1.2S-A 250 Ekip Touch LSIG	1SDA077113R1	1SDA077193R1
				E1.2S-A 250 Ekip Hi-Touch LSI	1SDA077115R1	1SDA077195R1
				E1.2S-A 250 Ekip Hi-Touch LSIG	1SDA077116R1	1SDA077196R1
	400	65	50	E1.2S-A 400 Ekip Dip LI	1SDA077118R1	1SDA077198R1
				E1.2S-A 400 Ekip Dip LSI	1SDA077119R1	1SDA077199R1
				E1.2S-A 400 Ekip Dip LSIG	1SDA077120R1	1SDA077200R1
				E1.2S-A 400 Ekip Touch LI	1SDA077121R1	1SDA077201R1
				E1.2S-A 400 Ekip Touch LSI	1SDA077122R1	1SDA077202R1
				E1.2S-A 400 Ekip Touch LSIG	1SDA077123R1	1SDA077203R1
				E1.2S-A 400 Ekip Hi-Touch LSI	1SDA077125R1	1SDA077205R1
				E1.2S-A 400 Ekip Hi-Touch LSIG	1SDA077126R1	1SDA077206R1
	800	65	50	E1.2S-A 800 Ekip Dip LI	1SDA077128R1	1SDA077208R1
				E1.2S-A 800 Ekip Dip LSI	1SDA077129R1	1SDA077209R1
				E1.2S-A 800 Ekip Dip LSIG	1SDA077130R1	1SDA077210R1
				E1.2S-A 800 Ekip Touch LI	1SDA077131R1	1SDA077211R1
				E1.2S-A 800 Ekip Touch LSI	1SDA077132R1	1SDA077212R1
				E1.2S-A 800 Ekip Touch LSIG	1SDA077133R1	1SDA077213R1
				E1.2S-A 800 Ekip Hi-Touch LSI	1SDA077135R1	1SDA077215R1
				E1.2S-A 800 Ekip Hi-Touch LSIG	1SDA077136R1	1SDA077216R1
	1200	65	50	E1.2S-A 1200 Ekip Dip LI	1SDA077138R1	1SDA077218R1
				E1.2S-A 1200 Ekip Dip LSI	1SDA077139R1	1SDA077219R1
				E1.2S-A 1200 Ekip Dip LSIG	1SDA077140R1	1SDA077220R1
				E1.2S-A 1200 Ekip Touch LI	1SDA077141R1	1SDA077221R1
				E1.2S-A 1200 Ekip Touch LSI	1SDA077142R1	1SDA077222R1
				E1.2S-A 1200 Ekip Touch LSIG	1SDA077143R1	1SDA077223R1
				E1.2S-A 1200 Ekip Hi-Touch LSI	1SDA077145R1	1SDA077225R1
				E1.2S-A 1200 Ekip Hi-Touch LSIG	1SDA077146R1	1SDA077226R1

SACE Emax 2 E2.2B-A/N-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip Dip LI	1SDA077568R1	1SDA077738R1
				E2.2B-A 1600 Ekip Dip LSI	1SDA077569R1	1SDA077739R1
				E2.2B-A 1600 Ekip Dip LSIG	1SDA077570R1	1SDA077740R1
				E2.2B-A 1600 Ekip Touch LI	1SDA077571R1	1SDA077741R1
				E2.2B-A 1600 Ekip Touch LSI	1SDA077572R1	1SDA077742R1
				E2.2B-A 1600 Ekip Touch LSIG	1SDA077573R1	1SDA077743R1
				E2.2B-A 1600 Ekip Hi-Touch LSI	1SDA077575R1	1SDA077745R1
				E2.2B-A 1600 Ekip Hi-Touch LSIG	1SDA077576R1	1SDA077746R1
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip Dip LI	1SDA077618R1	1SDA077788R1
				E2.2N-A 1600 Ekip Dip LSI	1SDA077619R1	1SDA077789R1
				E2.2N-A 1600 Ekip Dip LSIG	1SDA077620R1	1SDA077790R1
				E2.2N-A 1600 Ekip Touch LI	1SDA077621R1	1SDA077791R1
				E2.2N-A 1600 Ekip Touch LSI	1SDA077622R1	1SDA077792R1
				E2.2N-A 1600 Ekip Touch LSIG	1SDA077623R1	1SDA077793R1
				E2.2N-A 1600 Ekip Hi-Touch LSI	1SDA077625R1	1SDA077795R1
				E2.2N-A 1600 Ekip Hi-Touch LSIG	1SDA077626R1	1SDA077796R1
	2000	50	50	E2.2N-A 2000 Ekip Dip LI	1SDA077628R1	1SDA077798R1
				E2.2N-A 2000 Ekip Dip LSI	1SDA077629R1	1SDA077799R1
				E2.2N-A 2000 Ekip Dip LSIG	1SDA077630R1	1SDA077800R1
				E2.2N-A 2000 Ekip Touch LI	1SDA077631R1	1SDA077801R1
				E2.2N-A 2000 Ekip Touch LSI	1SDA077632R1	1SDA077802R1
				E2.2N-A 2000 Ekip Touch LSIG	1SDA077633R1	1SDA077803R1
				E2.2N-A 2000 Ekip Hi-Touch LSI	1SDA077635R1	1SDA077805R1
				E2.2N-A 2000 Ekip Hi-Touch LSIG	1SDA077636R1	1SDA077806R1

Automatic circuit breakers
Drawout version for power distribution

SACE Emax 2 E2.2S-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2S-A	800	65	65	E2.2S-A 800 Ekip Dip LI	1SDA077638R1	1SDA077808R1
				E2.2S-A 800 Ekip Dip LSI	1SDA077639R1	1SDA077809R1
				E2.2S-A 800 Ekip Dip LSIG	1SDA077640R1	1SDA077810R1
				E2.2S-A 800 Ekip Touch LI	1SDA077641R1	1SDA077811R1
				E2.2S-A 800 Ekip Touch LSI	1SDA077642R1	1SDA077812R1
				E2.2S-A 800 Ekip Touch LSIG	1SDA077643R1	1SDA077813R1
				E2.2S-A 800 Ekip Hi-Touch LSI	1SDA077645R1	1SDA077815R1
				E2.2S-A 800 Ekip Hi-Touch LSIG	1SDA077646R1	1SDA077816R1
	1200	65	65	E2.2S-A 1200 Ekip Dip LI	1SDA077648R1	1SDA077818R1
				E2.2S-A 1200 Ekip Dip LSI	1SDA077649R1	1SDA077819R1
				E2.2S-A 1200 Ekip Dip LSIG	1SDA077650R1	1SDA077820R1
				E2.2S-A 1200 Ekip Touch LI	1SDA077651R1	1SDA077821R1
				E2.2S-A 1200 Ekip Touch LSI	1SDA077652R1	1SDA077822R1
				E2.2S-A 1200 Ekip Touch LSIG	1SDA077653R1	1SDA077823R1
				E2.2S-A 1200 Ekip Hi-Touch LSI	1SDA077655R1	1SDA077825R1
				E2.2S-A 1200 Ekip Hi-Touch LSIG	1SDA077656R1	1SDA077826R1
	1600	65	65	E2.2S-A 1600 Ekip Dip LI	1SDA077658R1	1SDA077828R1
				E2.2S-A 1600 Ekip Dip LSI	1SDA077659R1	1SDA077829R1
				E2.2S-A 1600 Ekip Dip LSIG	1SDA077660R1	1SDA077830R1
				E2.2S-A 1600 Ekip Touch LI	1SDA077661R1	1SDA077831R1
				E2.2S-A 1600 Ekip Touch LSI	1SDA077662R1	1SDA077832R1
				E2.2S-A 1600 Ekip Touch LSIG	1SDA077663R1	1SDA077833R1
				E2.2S-A 1600 Ekip Hi-Touch LSI	1SDA077665R1	1SDA077835R1
				E2.2S-A 1600 Ekip Hi-Touch LSIG	1SDA077666R1	1SDA077836R1
	2000	65	65	E2.2S-A 2000 Ekip Dip LI	1SDA077668R1	1SDA077838R1
				E2.2S-A 2000 Ekip Dip LSI	1SDA077669R1	1SDA077839R1
				E2.2S-A 2000 Ekip Dip LSIG	1SDA077670R1	1SDA077840R1
				E2.2S-A 2000 Ekip Touch LI	1SDA077671R1	1SDA077841R1
				E2.2S-A 2000 Ekip Touch LSI	1SDA077672R1	1SDA077842R1
				E2.2S-A 2000 Ekip Touch LSIG	1SDA077673R1	1SDA077843R1
				E2.2S-A 2000 Ekip Hi-Touch LSI	1SDA077675R1	1SDA077845R1
				E2.2S-A 2000 Ekip Hi-Touch LSIG	1SDA077676R1	1SDA077846R1

SACE Emax 2 E2.2H-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2H-A	800	85	85	E2.2H-A 800 Ekip Dip LI	1SDA077578R1	1SDA077748R1
				E2.2H-A 800 Ekip Dip LSI	1SDA077579R1	1SDA077749R1
				E2.2H-A 800 Ekip Dip LSIG	1SDA077580R1	1SDA077750R1
				E2.2H-A 800 Ekip Touch LI	1SDA077581R1	1SDA077751R1
				E2.2H-A 800 Ekip Touch LSI	1SDA077582R1	1SDA077752R1
				E2.2H-A 800 Ekip Touch LSIG	1SDA077583R1	1SDA077753R1
				E2.2H-A 800 Ekip Hi-Touch LSI	1SDA077585R1	1SDA077755R1
				E2.2H-A 800 Ekip Hi-Touch LSIG	1SDA077586R1	1SDA077756R1
	1200	85	85	E2.2H-A 1200 Ekip Dip LI	1SDA077588R1	1SDA077758R1
				E2.2H-A 1200 Ekip Dip LSI	1SDA077589R1	1SDA077759R1
				E2.2H-A 1200 Ekip Dip LSIG	1SDA077590R1	1SDA077760R1
				E2.2H-A 1200 Ekip Touch LI	1SDA077591R1	1SDA077761R1
				E2.2H-A 1200 Ekip Touch LSI	1SDA077592R1	1SDA077762R1
				E2.2H-A 1200 Ekip Touch LSIG	1SDA077593R1	1SDA077763R1
				E2.2H-A 1200 Ekip Hi-Touch LSI	1SDA077595R1	1SDA077765R1
				E2.2H-A 1200 Ekip Hi-Touch LSIG	1SDA077596R1	1SDA077766R1
	1600	85	85	E2.2H-A 1600 Ekip Dip LI	1SDA077598R1	1SDA077768R1
				E2.2H-A 1600 Ekip Dip LSI	1SDA077599R1	1SDA077769R1
				E2.2H-A 1600 Ekip Dip LSIG	1SDA077600R1	1SDA077770R1
				E2.2H-A 1600 Ekip Touch LI	1SDA077601R1	1SDA077771R1
				E2.2H-A 1600 Ekip Touch LSI	1SDA077602R1	1SDA077772R1
				E2.2H-A 1600 Ekip Touch LSIG	1SDA077603R1	1SDA077773R1
				E2.2H-A 1600 Ekip Hi-Touch LSI	1SDA077605R1	1SDA077775R1
				E2.2H-A 1600 Ekip Hi-Touch LSIG	1SDA077606R1	1SDA077776R1
	2000	85	85	E2.2H-A 2000 Ekip Dip LI	1SDA077608R1	1SDA077778R1
				E2.2H-A 2000 Ekip Dip LSI	1SDA077609R1	1SDA077779R1
				E2.2H-A 2000 Ekip Dip LSIG	1SDA077610R1	1SDA077780R1
				E2.2H-A 2000 Ekip Touch LI	1SDA077611R1	1SDA077781R1
				E2.2H-A 2000 Ekip Touch LSI	1SDA077612R1	1SDA077782R1
				E2.2H-A 2000 Ekip Touch LSIG	1SDA077613R1	1SDA077783R1
				E2.2H-A 2000 Ekip Hi-Touch LSI	1SDA077615R1	1SDA077785R1
				E2.2H-A 2000 Ekip Hi-Touch LSIG	1SDA077616R1	1SDA077786R1

Automatic circuit breakers
Drawout version for power distribution

SACE Emax 2 E2.2V-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2V-A	250	100	85	E2.2V-A 250 Ekip Dip LI	1SDA077678R1	1SDA077848R1
				E2.2V-A 250 Ekip Dip LSI	1SDA077679R1	1SDA077849R1
				E2.2V-A 250 Ekip Dip LSIG	1SDA077680R1	1SDA077850R1
				E2.2V-A 250 Ekip Touch LI	1SDA077681R1	1SDA077851R1
				E2.2V-A 250 Ekip Touch LSI	1SDA077682R1	1SDA077852R1
				E2.2V-A 250 Ekip Touch LSIG	1SDA077683R1	1SDA077853R1
				E2.2V-A 250 Ekip Hi-Touch LSI	1SDA077685R1	1SDA077855R1
				E2.2V-A 250 Ekip Hi-Touch LSIG	1SDA077686R1	1SDA077856R1
	400	100	85	E2.2V-A 400 Ekip Dip LI	1SDA077688R1	1SDA077858R1
				E2.2V-A 400 Ekip Dip LSI	1SDA077689R1	1SDA077859R1
				E2.2V-A 400 Ekip Dip LSIG	1SDA077690R1	1SDA077860R1
				E2.2V-A 400 Ekip Touch LI	1SDA077691R1	1SDA077861R1
				E2.2V-A 400 Ekip Touch LSI	1SDA077692R1	1SDA077862R1
				E2.2V-A 400 Ekip Touch LSIG	1SDA077693R1	1SDA077863R1
				E2.2V-A 400 Ekip Hi-Touch LSI	1SDA077695R1	1SDA077865R1
				E2.2V-A 400 Ekip Hi-Touch LSIG	1SDA077696R1	1SDA077866R1
	800	100	85	E2.2V-A 800 Ekip Dip LI	1SDA077698R1	1SDA077868R1
				E2.2V-A 800 Ekip Dip LSI	1SDA077699R1	1SDA077869R1
				E2.2V-A 800 Ekip Dip LSIG	1SDA077700R1	1SDA077870R1
				E2.2V-A 800 Ekip Touch LI	1SDA077701R1	1SDA077871R1
				E2.2V-A 800 Ekip Touch LSI	1SDA077702R1	1SDA077872R1
				E2.2V-A 800 Ekip Touch LSIG	1SDA077703R1	1SDA077873R1
				E2.2V-A 800 Ekip Hi-Touch LSI	1SDA077705R1	1SDA077875R1
				E2.2V-A 800 Ekip Hi-Touch LSIG	1SDA077706R1	1SDA077876R1
	1200	100	85	E2.2V-A 1200 Ekip Dip LI	1SDA077708R1	1SDA077878R1
				E2.2V-A 1200 Ekip Dip LSI	1SDA077709R1	1SDA077879R1
				E2.2V-A 1200 Ekip Dip LSIG	1SDA077710R1	1SDA077880R1
				E2.2V-A 1200 Ekip Touch LI	1SDA077711R1	1SDA077881R1
				E2.2V-A 1200 Ekip Touch LSI	1SDA077712R1	1SDA077882R1
				E2.2V-A 1200 Ekip Touch LSIG	1SDA077713R1	1SDA077883R1
				E2.2V-A 1200 Ekip Hi-Touch LSI	1SDA077715R1	1SDA077885R1
				E2.2V-A 1200 Ekip Hi-Touch LSIG	1SDA077716R1	1SDA077886R1
	1600	100	85	E2.2V-A 1600 Ekip Dip LI	1SDA077718R1	1SDA077888R1
				E2.2V-A 1600 Ekip Dip LSI	1SDA077719R1	1SDA077889R1
				E2.2V-A 1600 Ekip Dip LSIG	1SDA077720R1	1SDA077890R1
				E2.2V-A 1600 Ekip Touch LI	1SDA077721R1	1SDA077891R1
				E2.2V-A 1600 Ekip Touch LSI	1SDA077722R1	1SDA077892R1
				E2.2V-A 1600 Ekip Touch LSIG	1SDA077723R1	1SDA077893R1
				E2.2V-A 1600 Ekip Hi-Touch LSI	1SDA077725R1	1SDA077895R1
				E2.2V-A 1600 Ekip Hi-Touch LSIG	1SDA077726R1	1SDA077896R1
	2000	100	85	E2.2V-A 2000 Ekip Dip LI	1SDA077728R1	1SDA077898R1
				E2.2V-A 2000 Ekip Dip LSI	1SDA077729R1	1SDA077899R1
				E2.2V-A 2000 Ekip Dip LSIG	1SDA077730R1	1SDA077900R1
				E2.2V-A 2000 Ekip Touch LI	1SDA077731R1	1SDA077901R1
				E2.2V-A 2000 Ekip Touch LSI	1SDA077732R1	1SDA077902R1
				E2.2V-A 2000 Ekip Touch LSIG	1SDA077733R1	1SDA077903R1
				E2.2V-A 2000 Ekip Hi-Touch LSI	1SDA077735R1	1SDA077905R1
				E2.2V-A 2000 Ekip Hi-Touch LSIG	1SDA077736R1	1SDA077906R1

SACE Emax 2 E4.2S-A/H-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip Dip LI	1SDA078458R1	1SDA078688R1
				E4.2S-A 2500 Ekip Dip LSI	1SDA078459R1	1SDA078689R1
				E4.2S-A 2500 Ekip Dip LSIG	1SDA078460R1	1SDA078690R1
				E4.2S-A 2500 Ekip Touch LI	1SDA078461R1	1SDA078691R1
				E4.2S-A 2500 Ekip Touch LSI	1SDA078462R1	1SDA078692R1
				E4.2S-A 2500 Ekip Touch LSIG	1SDA078463R1	1SDA078693R1
				E4.2S-A 2500 Ekip Hi-Touch LSI	1SDA078465R1	1SDA078695R1
				E4.2S-A 2500 Ekip Hi-Touch LSIG	1SDA078466R1	1SDA078696R1
	3200	65	65	E4.2S-A 3200 Ekip Dip LI	1SDA078468R1	1SDA078698R1
				E4.2S-A 3200 Ekip Dip LSI	1SDA078469R1	1SDA078699R1
				E4.2S-A 3200 Ekip Dip LSIG	1SDA078470R1	1SDA078700R1
				E4.2S-A 3200 Ekip Touch LI	1SDA078471R1	1SDA078701R1
				E4.2S-A 3200 Ekip Touch LSI	1SDA078472R1	1SDA078702R1
				E4.2S-A 3200 Ekip Touch LSIG	1SDA078473R1	1SDA078703R1
				E4.2S-A 3200 Ekip Hi-Touch LSI	1SDA078475R1	1SDA078705R1
				E4.2S-A 3200 Ekip Hi-Touch LSIG	1SDA078476R1	1SDA078706R1
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip Dip LI	1SDA078368R1	1SDA078598R1
				E4.2H-A 2500 Ekip Dip LSI	1SDA078369R1	1SDA078599R1
				E4.2H-A 2500 Ekip Dip LSIG	1SDA078370R1	1SDA078600R1
				E4.2H-A 2500 Ekip Touch LI	1SDA078371R1	1SDA078601R1
				E4.2H-A 2500 Ekip Touch LSI	1SDA078372R1	1SDA078602R1
				E4.2H-A 2500 Ekip Touch LSIG	1SDA078373R1	1SDA078603R1
				E4.2H-A 2500 Ekip Hi-Touch LSI	1SDA078375R1	1SDA078605R1
				E4.2H-A 2500 Ekip Hi-Touch LSIG	1SDA078376R1	1SDA078606R1
	3200	85	85	E4.2H-A 3200 Ekip Dip LI	1SDA078378R1	1SDA078608R1
				E4.2H-A 3200 Ekip Dip LSI	1SDA078379R1	1SDA078609R1
				E4.2H-A 3200 Ekip Dip LSIG	1SDA078380R1	1SDA078610R1
				E4.2H-A 3200 Ekip Touch LI	1SDA078381R1	1SDA078611R1
				E4.2H-A 3200 Ekip Touch LSI	1SDA078382R1	1SDA078612R1
				E4.2H-A 3200 Ekip Touch LSIG	1SDA078383R1	1SDA078613R1
				E4.2H-A 3200 Ekip Hi-Touch LSI	1SDA078385R1	1SDA078615R1
				E4.2H-A 3200 Ekip Hi-Touch LSIG	1SDA078386R1	1SDA078616R1

Contact local sales for availability for L version

Automatic circuit breakers

Drawout version for power distribution

SACE Emax 2 E4.2V-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E4.2V-A	800	100	85	E4.2V-A 800 Ekip Dip LI	1SDA078488R1	1SDA078718R1
				E4.2V-A 800 Ekip Dip LSI	1SDA078489R1	1SDA078719R1
				E4.2V-A 800 Ekip Dip LSIG	1SDA078490R1	1SDA078720R1
				E4.2V-A 800 Ekip Touch LI	1SDA078491R1	1SDA078721R1
				E4.2V-A 800 Ekip Touch LSI	1SDA078492R1	1SDA078722R1
				E4.2V-A 800 Ekip Touch LSIG	1SDA078493R1	1SDA078723R1
				E4.2V-A 800 Ekip Hi-Touch LSI	1SDA078495R1	1SDA078725R1
				E4.2V-A 800 Ekip Hi-Touch LSIG	1SDA078496R1	1SDA078726R1
	1600	100	85	E4.2V-A 1600 Ekip Dip LI	1SDA078498R1	1SDA078728R1
				E4.2V-A 1600 Ekip Dip LSI	1SDA078499R1	1SDA078729R1
				E4.2V-A 1600 Ekip Dip LSIG	1SDA078500R1	1SDA078730R1
				E4.2V-A 1600 Ekip Touch LI	1SDA078501R1	1SDA078731R1
				E4.2V-A 1600 Ekip Touch LSI	1SDA078502R1	1SDA078732R1
				E4.2V-A 1600 Ekip Touch LSIG	1SDA078503R1	1SDA078733R1
				E4.2V-A 1600 Ekip Hi-Touch LSI	1SDA078505R1	1SDA078735R1
				E4.2V-A 1600 Ekip Hi-Touch LSIG	1SDA078506R1	1SDA078736R1
	2000	100	85	E4.2V-A 2000 Ekip Dip LI	1SDA078508R1	1SDA078738R1
				E4.2V-A 2000 Ekip Dip LSI	1SDA078509R1	1SDA078739R1
				E4.2V-A 2000 Ekip Dip LSIG	1SDA078510R1	1SDA078740R1
				E4.2V-A 2000 Ekip Touch LI	1SDA078511R1	1SDA078741R1
				E4.2V-A 2000 Ekip Touch LSI	1SDA078512R1	1SDA078742R1
				E4.2V-A 2000 Ekip Touch LSIG	1SDA078513R1	1SDA078743R1
				E4.2V-A 2000 Ekip Hi-Touch LSI	1SDA078515R1	1SDA078745R1
				E4.2V-A 2000 Ekip Hi-Touch LSIG	1SDA078516R1	1SDA078746R1
	2500	100	85	E4.2V-A 2500 Ekip Dip LI	1SDA078518R1	1SDA078748R1
				E4.2V-A 2500 Ekip Dip LSI	1SDA078519R1	1SDA078749R1
				E4.2V-A 2500 Ekip Dip LSIG	1SDA078520R1	1SDA078750R1
				E4.2V-A 2500 Ekip Touch LI	1SDA078521R1	1SDA078751R1
				E4.2V-A 2500 Ekip Touch LSI	1SDA078522R1	1SDA078752R1
				E4.2V-A 2500 Ekip Touch LSIG	1SDA078523R1	1SDA078753R1
				E4.2V-A 2500 Ekip Hi-Touch LSI	1SDA078525R1	1SDA078755R1
				E4.2V-A 2500 Ekip Hi-Touch LSIG	1SDA078526R1	1SDA078756R1
	3200	100	85	E4.2V-A 3200 Ekip Dip LI	1SDA078528R1	1SDA078758R1
				E4.2V-A 3200 Ekip Dip LSI	1SDA078529R1	1SDA078759R1
				E4.2V-A 3200 Ekip Dip LSIG	1SDA078530R1	1SDA078760R1
				E4.2V-A 3200 Ekip Touch LI	1SDA078531R1	1SDA078761R1
				E4.2V-A 3200 Ekip Touch LSI	1SDA078532R1	1SDA078762R1
				E4.2V-A 3200 Ekip Touch LSIG	1SDA078533R1	1SDA078763R1
				E4.2V-A 3200 Ekip Hi-Touch LSI	1SDA078535R1	1SDA078765R1
				E4.2V-A 3200 Ekip Hi-Touch LSIG	1SDA078536R1	1SDA078766R1

SACE Emax 2 E6.2H-A/V-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip Dip LI	1SDA079068R1	1SDA079188R1
				E6.2H-A 4000 Ekip Dip LSI	1SDA079069R1	1SDA079189R1
				E6.2H-A 4000 Ekip Dip LSIG	1SDA079070R1	1SDA079190R1
				E6.2H-A 4000 Ekip Touch LI	1SDA079071R1	1SDA079191R1
				E6.2H-A 4000 Ekip Touch LSI	1SDA079072R1	1SDA079192R1
				E6.2H-A 4000 Ekip Touch LSIG	1SDA079073R1	1SDA079193R1
				E6.2H-A 4000 Ekip Hi-Touch LSI	1SDA079075R1	1SDA079195R1
				E6.2H-A 4000 Ekip Hi-Touch LSIG	1SDA079076R1	1SDA079196R1
	5000	85	85	E6.2H-A 5000 Ekip Dip LI	1SDA079078R1	1SDA079198R1
				E6.2H-A 5000 Ekip Dip LSI	1SDA079079R1	1SDA079199R1
				E6.2H-A 5000 Ekip Dip LSIG	1SDA079080R1	1SDA079200R1
				E6.2H-A 5000 Ekip Touch LI	1SDA079081R1	1SDA079201R1
				E6.2H-A 5000 Ekip Touch LSI	1SDA079082R1	1SDA079202R1
				E6.2H-A 5000 Ekip Touch LSIG	1SDA079083R1	1SDA079203R1
				E6.2H-A 5000 Ekip Hi-Touch LSI	1SDA079085R1	1SDA079205R1
				E6.2H-A 5000 Ekip Hi-Touch LSIG	1SDA079086R1	1SDA079206R1
	6000 (*)	85	85	E6.2H-A 6000 Ekip Dip LI	1SDA079088R1	1SDA079208R1
				E6.2H-A 6000 Ekip Dip LSI	1SDA079089R1	1SDA079209R1
				E6.2H-A 6000 Ekip Dip LSIG	1SDA079090R1	1SDA079210R1
				E6.2H-A 6000 Ekip Touch LI	1SDA079091R1	1SDA079211R1
				E6.2H-A 6000 Ekip Touch LSI	1SDA079092R1	1SDA079212R1
				E6.2H-A 6000 Ekip Touch LSIG	1SDA079093R1	1SDA079213R1
				E6.2H-A 6000 Ekip Hi-Touch LSI	1SDA079095R1	1SDA079215R1
				E6.2H-A 6000 Ekip Hi-Touch LSIG	1SDA079096R1	1SDA079216R1
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip Dip LI	1SDA079128R1	1SDA079248R1
				E6.2V-A 4000 Ekip Dip LSI	1SDA079129R1	1SDA079249R1
				E6.2V-A 4000 Ekip Dip LSIG	1SDA079130R1	1SDA079250R1
				E6.2V-A 4000 Ekip Touch LI	1SDA079131R1	1SDA079251R1
				E6.2V-A 4000 Ekip Touch LSI	1SDA079132R1	1SDA079252R1
				E6.2V-A 4000 Ekip Touch LSIG	1SDA079133R1	1SDA079253R1
				E6.2V-A 4000 Ekip Hi-Touch LSI	1SDA079135R1	1SDA079255R1
				E6.2V-A 4000 Ekip Hi-Touch LSIG	1SDA079136R1	1SDA079256R1
	5000	100	100	E6.2V-A 5000 Ekip Dip LI	1SDA079138R1	1SDA079258R1
				E6.2V-A 5000 Ekip Dip LSI	1SDA079139R1	1SDA079259R1
				E6.2V-A 5000 Ekip Dip LSIG	1SDA079140R1	1SDA079260R1
				E6.2V-A 5000 Ekip Touch LI	1SDA079141R1	1SDA079261R1
				E6.2V-A 5000 Ekip Touch LSI	1SDA079142R1	1SDA079262R1
				E6.2V-A 5000 Ekip Touch LSIG	1SDA079143R1	1SDA079263R1
				E6.2V-A 5000 Ekip Hi-Touch LSI	1SDA079145R1	1SDA079265R1
				E6.2V-A 5000 Ekip Hi-Touch LSIG	1SDA079146R1	1SDA079266R1
	6000 (*)	100	100	E6.2V-A 6000 Ekip Dip LI	1SDA079148R1	1SDA079268R1
				E6.2V-A 6000 Ekip Dip LSI	1SDA079149R1	1SDA079269R1
				E6.2V-A 6000 Ekip Dip LSIG	1SDA079150R1	1SDA079270R1
				E6.2V-A 6000 Ekip Touch LI	1SDA079151R1	1SDA079271R1
				E6.2V-A 6000 Ekip Touch LSI	1SDA079152R1	1SDA079272R1
				E6.2V-A 6000 Ekip Touch LSIG	1SDA079153R1	1SDA079273R1
				E6.2V-A 6000 Ekip Hi-Touch LSI	1SDA079155R1	1SDA079275R1
				E6.2V-A 6000 Ekip Hi-Touch LSIG	1SDA079156R1	1SDA079276R1

* Version not yet available. Contact ABB

Automatic circuit breakers

Drawout version for power distribution

SACE Emax 2 E6.2H-A/f/V-A/f • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Poles
					Global code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip Dip LI	1SDA079428R1
				E6.2H-A/f 4000 Ekip Dip LSI	1SDA079429R1
				E6.2H-A/f 4000 Ekip Dip LSIG	1SDA079430R1
				E6.2H-A/f 4000 Ekip Touch LI	1SDA079431R1
				E6.2H-A/f 4000 Ekip Touch LSI	1SDA079432R1
				E6.2H-A/f 4000 Ekip Touch LSIG	1SDA079433R1
				E6.2H-A/f 4000 Ekip Hi-Touch LSI	1SDA079435R1
				E6.2H-A/f 4000 Ekip Hi-Touch LSIG	1SDA079436R1
	5000	85	85	E6.2H-A/f 5000 Ekip Dip LI	1SDA079438R1
				E6.2H-A/f 5000 Ekip Dip LSI	1SDA079439R1
				E6.2H-A/f 5000 Ekip Dip LSIG	1SDA079440R1
				E6.2H-A/f 5000 Ekip Touch LI	1SDA079441R1
				E6.2H-A/f 5000 Ekip Touch LSI	1SDA079442R1
				E6.2H-A/f 5000 Ekip Touch LSIG	1SDA079443R1
				E6.2H-A/f 5000 Ekip Hi-Touch LSI	1SDA079445R1
				E6.2H-A/f 5000 Ekip Hi-Touch LSIG	1SDA079446R1
	6000 (*)	85	85	E6.2H-A/f 6000 Ekip Dip LI	1SDA079448R1
				E6.2H-A/f 6000 Ekip Dip LSI	1SDA079449R1
				E6.2H-A/f 6000 Ekip Dip LSIG	1SDA079450R1
				E6.2H-A/f 6000 Ekip Touch LI	1SDA079451R1
				E6.2H-A/f 6000 Ekip Touch LSI	1SDA079452R1
				E6.2H-A/f 6000 Ekip Touch LSIG	1SDA079453R1
				E6.2H-A/f 6000 Ekip Hi-Touch LSI	1SDA079455R1
				E6.2H-A/f 6000 Ekip Hi-Touch LSIG	1SDA079456R1
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip Dip LI	1SDA079488R1
				E6.2V-A/f 4000 Ekip Dip LSI	1SDA079489R1
				E6.2V-A/f 4000 Ekip Dip LSIG	1SDA079490R1
				E6.2V-A/f 4000 Ekip Touch LI	1SDA079491R1
				E6.2V-A/f 4000 Ekip Touch LSI	1SDA079492R1
				E6.2V-A/f 4000 Ekip Touch LSIG	1SDA079493R1
				E6.2V-A/f 4000 Ekip Hi-Touch LSI	1SDA079495R1
				E6.2V-A/f 4000 Ekip Hi-Touch LSIG	1SDA079496R1
	5000	100	100	E6.2V-A/f 5000 Ekip Dip LI	1SDA079498R1
				E6.2V-A/f 5000 Ekip Dip LSI	1SDA079499R1
				E6.2V-A/f 5000 Ekip Dip LSIG	1SDA079500R1
				E6.2V-A/f 5000 Ekip Touch LI	1SDA079501R1
				E6.2V-A/f 5000 Ekip Touch LSI	1SDA079502R1
				E6.2V-A/f 5000 Ekip Touch LSIG	1SDA079503R1
				E6.2V-A/f 5000 Ekip Hi-Touch LSI	1SDA079505R1
				E6.2V-A/f 5000 Ekip Hi-Touch LSIG	1SDA079506R1
	6000 (*)	100	100	E6.2V-A/f 6000 Ekip Dip LI	1SDA079508R1
				E6.2V-A/f 6000 Ekip Dip LSI	1SDA079509R1
				E6.2V-A/f 6000 Ekip Dip LSIG	1SDA079510R1
				E6.2V-A/f 6000 Ekip Touch LI	1SDA079511R1
				E6.2V-A/f 6000 Ekip Touch LSI	1SDA079512R1
				E6.2V-A/f 6000 Ekip Touch LSIG	1SDA079513R1
				E6.2V-A/f 6000 Ekip Hi-Touch LSI	1SDA079515R1
				E6.2V-A/f 6000 Ekip Hi-Touch LSIG	1SDA079516R1

* Version not yet available. Contact ABB

Automatic circuit breakers
Fixed version for generators

SACE Emax E1.2B-N-S • Front terminals (F)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip G Touch LSIG	1SDA076914R1	1SDA076994R1
				E1.2B-A 800 Ekip G Hi-Touch LSIG	1SDA076917R1	1SDA076997R1
	1200	42	42	E1.2B-A 1200 Ekip G Touch LSIG	1SDA076924R1	1SDA077004R1
				E1.2B-A 1200 Ekip G Hi-Touch LSIG	1SDA076927R1	1SDA077007R1
E1.2N-A	800	50	50	E1.2N-A 800 Ekip G Touch LSIG	1SDA076934R1	1SDA077014R1
				E1.2N-A 800 Ekip G Hi-Touch LSIG	1SDA076937R1	1SDA077017R1
	1200	50	50	E1.2N-A 1200 Ekip G Touch LSIG	1SDA076944R1	1SDA077024R1
				E1.2N-A 1200 Ekip G Hi-Touch LSIG	1SDA076947R1	1SDA077027R1
E1.2S-A	250	65	50	E1.2S-A 250 Ekip G Touch LSIG	1SDA076954R1	1SDA077034R1
				E1.2S-A 250 Ekip G Hi-Touch LSIG	1SDA076957R1	1SDA077037R1
	400	65	50	E1.2S-A 400 Ekip G Touch LSIG	1SDA076964R1	1SDA077044R1
				E1.2S-A 400 Ekip G Hi-Touch LSIG	1SDA076967R1	1SDA077047R1
	800	65	50	E1.2S-A 800 Ekip G Touch LSIG	1SDA076974R1	1SDA077054R1
				E1.2S-A 800 Ekip G Hi-Touch LSIG	1SDA076977R1	1SDA077057R1
	1200	65	50	E1.2S-A 1200 Ekip G Touch LSIG	1SDA076984R1	1SDA077064R1
				E1.2S-A 1200 Ekip G Hi-Touch LSIG	1SDA076987R1	1SDA077067R1

Automatic circuit breakers
Fixed version for generators

SACE Emax 2 E2.2 B-A, N-A, S-A, H-A, V-A • Orientable rear terminals (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip G Touch LSIG	1SDA077234R1	1SDA077404R1
				E2.2B-A 1600 Ekip G Hi-Touch LSIG	1SDA077237R1	1SDA077407R1
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip G Touch LSIG	1SDA077284R1	1SDA077454R1
				E2.2N-A 1600 Ekip G Hi-Touch LSIG	1SDA077287R1	1SDA077457R1
	2000	50	50	E2.2N-A 2000 Ekip G Touch LSIG	1SDA077294R1	1SDA077464R1
				E2.2N-A 2000 Ekip G Hi-Touch LSIG	1SDA077297R1	1SDA077467R1
E2.2S-A	800	65	65	E2.2S-A 800 Ekip G Touch LSIG	1SDA077304R1	1SDA077474R1
				E2.2S-A 800 Ekip G Hi-Touch LSIG	1SDA077307R1	1SDA077477R1
	1200	65	65	E2.2S-A 1200 Ekip G Touch LSIG	1SDA077314R1	1SDA077484R1
				E2.2S-A 1200 Ekip G Hi-Touch LSIG	1SDA077317R1	1SDA077487R1
	1600	65	65	E2.2S-A 1600 Ekip G Touch LSIG	1SDA077324R1	1SDA077494R1
				E2.2S-A 1600 Ekip G Hi-Touch LSIG	1SDA077327R1	1SDA077497R1
	2000	65	65	E2.2S-A 2000 Ekip G Touch LSIG	1SDA077334R1	1SDA077504R1
				E2.2S-A 2000 Ekip G Hi-Touch LSIG	1SDA077337R1	1SDA077507R1
E2.2H-A	800	85	85	E2.2H-A 800 Ekip G Touch LSIG	1SDA077244R1	1SDA077414R1
				E2.2H-A 800 Ekip G Hi-Touch LSIG	1SDA077247R1	1SDA077417R1
	1200	85	85	E2.2H-A 1200 Ekip G Touch LSIG	1SDA077254R1	1SDA077424R1
				E2.2H-A 1200 Ekip G Hi-Touch LSIG	1SDA077257R1	1SDA077427R1
	1600	85	85	E2.2H-A 1600 Ekip G Touch LSIG	1SDA077264R1	1SDA077434R1
				E2.2H-A 1600 Ekip G Hi-Touch LSIG	1SDA077267R1	1SDA077437R1
	2000	85	85	E2.2H-A 2000 Ekip G Touch LSIG	1SDA077274R1	1SDA077444R1
				E2.2H-A 2000 Ekip G Hi-Touch LSIG	1SDA077277R1	1SDA077447R1
E2.2V-A	250	100	85	E2.2V-A 250 Ekip G Touch LSIG	1SDA077344R1	1SDA077514R1
				E2.2V-A 250 Ekip G Hi-Touch LSIG	1SDA077347R1	1SDA077517R1
	400	100	85	E2.2V-A 400 Ekip G Touch LSIG	1SDA077354R1	1SDA077524R1
				E2.2V-A 400 Ekip G Hi-Touch LSIG	1SDA077357R1	1SDA077527R1
	800	100	85	E2.2V-A 800 Ekip G Touch LSIG	1SDA077364R1	1SDA077534R1
				E2.2V-A 800 Ekip G Hi-Touch LSIG	1SDA077367R1	1SDA077537R1
	1200	100	85	E2.2V-A 1200 Ekip G Touch LSIG	1SDA077374R1	1SDA077544R1
				E2.2V-A 1200 Ekip G Hi-Touch LSIG	1SDA077377R1	1SDA077547R1
	1600	100	85	E2.2V-A 1600 Ekip G Touch LSIG	1SDA077384R1	1SDA077554R1
				E2.2V-A 1600 Ekip G Hi-Touch LSIG	1SDA077387R1	1SDA077557R1
	2000	100	85	E2.2V-A 2000 Ekip G Touch LSIG	1SDA077394R1	1SDA077564R1
				E2.2V-A 2000 Ekip G Hi-Touch LSIG	1SDA077397R1	1SDA077567R1

SACE Emax 2 E4.2 S-A, H-A, V-A, L-A • Orientable rear terminals up to 2500A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip G Touch LSIG	1SDA078004R1	1SDA078234R1
				E4.2S-A 2500 Ekip G Hi-Touch LSIG	1SDA078007R1	1SDA078237R1
	3200 (*)	65	65	E4.2S-A 3200 Ekip G Touch LSIG	1SDA078014R1	1SDA078244R1
				E4.2S-A 3200 Ekip G Hi-Touch LSIG	1SDA078017R1	1SDA078247R1
	3600 (*)	65	65	E4.2S-A 3600 Ekip G Touch LSIG	1SDA078024R1	-
				E4.2S-A 3600 Ekip G Hi-Touch LSIG	1SDA078027R1	-
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip G Touch LSIG	1SDA077914R1	1SDA078144R1
				E4.2H-A 2500 Ekip G Hi-Touch LSIG	1SDA077917R1	1SDA078147R1
	3200 (*)	85	85	E4.2H-A 3200 Ekip G Touch LSIG	1SDA077924R1	1SDA078154R1
				E4.2H-A 3200 Ekip G Hi-Touch LSIG	1SDA077927R1	1SDA078157R1
	3600 (*)	85	85	E4.2H-A 3600 Ekip G Touch LSIG	1SDA077934R1	-
				E4.2H-A 3600 Ekip G Hi-Touch LSIG	1SDA077937R1	-
E4.2V-A	800	100	85	E4.2V-A 800 Ekip G Touch LSIG	1SDA078034R1	1SDA078264R1
				E4.2V-A 800 Ekip G Hi-Touch LSIG	1SDA078037R1	1SDA078267R1
	1600	100	85	E4.2V-A 1600 Ekip G Touch LSIG	1SDA078044R1	1SDA078274R1
				E4.2V-A 1600 Ekip G Hi-Touch LSIG	1SDA078047R1	1SDA078277R1
	2000	100	85	E4.2V-A 2000 Ekip G Touch LSIG	1SDA078054R1	1SDA078284R1
				E4.2V-A 2000 Ekip G Hi-Touch LSIG	1SDA078057R1	1SDA078287R1
	2500	100	85	E4.2V-A 2500 Ekip G Touch LSIG	1SDA078064R1	1SDA078294R1
				E4.2V-A 2500 Ekip G Hi-Touch LSIG	1SDA078067R1	1SDA078297R1
	3200 (*)	100	85	E4.2V-A 3200 Ekip G Touch LSIG	1SDA078074R1	1SDA078304R1
				E4.2V-A 3200 Ekip G Hi-Touch LSIG	1SDA078077R1	1SDA078307R1
	3600 (*)	100	85	E4.2V-A 3600 Ekip G Touch LSIG	1SDA078084R1	-
				E4.2V-A 3600 Ekip G Hi-Touch LSIG	1SDA078087R1	-

* 3200A/3600A ratings only with rear vertical terminals
Contact local sales for availability for L version

Automatic circuit breakers
Fixed version for generators

SACE Emax 2 E6.2 H-A, V-A, L-A • Orientable rear terminals up to 5000A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip G Touch LSIG	1SDA078834R1	1SDA078954R1
				E6.2H-A 4000 Ekip G Hi-Touch LSIG	1SDA078837R1	1SDA078957R1
	5000	85	85	E6.2H-A 5000 Ekip G Touch LSIG	1SDA078844R1	1SDA078964R1
				E6.2H-A 5000 Ekip G Hi-Touch LSIG	1SDA078847R1	1SDA078967R1
	6000 (*)	85	85	E6.2H-A 6000 Ekip G Touch LSIG	1SDA078854R1	1SDA078974R1
				E6.2H-A 6000 Ekip G Hi-Touch LSIG	1SDA078855R1	1SDA078977R1
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip G Touch LSIG	1SDA078894R1	1SDA079014R1
				E6.2V-A 4000 Ekip G Hi-Touch LSIG	1SDA078897R1	1SDA079017R1
	5000	100	100	E6.2V-A 5000 Ekip G Touch LSIG	1SDA078904R1	1SDA079024R1
				E6.2V-A 5000 Ekip G Hi-Touch LSIG	1SDA078907R1	1SDA079027R1
	6000 (*)	100	100	E6.2V-A 6000 Ekip G Touch LSIG	1SDA078914R1	1SDA079034R1
				E6.2V-A 6000 Ekip G Hi-Touch LSIG	1SDA078917R1	1SDA079037R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB
Contact local sales for availability for L version

SACE Emax 2 E6.2 H-A/f, V-A/f, L-A/f full size • Orientable rear terminals up to 5000A (HR)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Poles
					Global code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip G Touch LSIG	1SDA079314R1
				E6.2H-A/f 4000 Ekip G Hi-Touch LSIG	1SDA079317R1
	5000	85	85	E6.2H-A/f 5000 Ekip G Touch LSIG	1SDA079324R1
				E6.2H-A/f 5000 Ekip G Hi-Touch LSIG	1SDA079327R1
	6000 (*)	85	85	E6.2H-A/f 6000 Ekip G Touch LSIG	1SDA079334R1
				E6.2H-A/f 6000 Ekip G Hi-Touch LSIG	1SDA079337R1
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip G Touch LSIG	1SDA079374R1
				E6.2V-A/f 4000 Ekip G Hi-Touch LSIG	1SDA079377R1
	5000	100	100	E6.2V-A/f 5000 Ekip G Touch LSIG	1SDA079384R1
				E6.2V-A/f 5000 Ekip G Hi-Touch LSIG	1SDA079387R1
	6000 (*)	100	100	E6.2V-A/f 6000 Ekip G Touch LSIG	1SDA079394R1
				E6.2V-A/f 6000 Ekip G Hi-Touch LSIG	1SDA079397R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB
Contact local sales for availability for L version

Automatic circuit breakers
Drawout version for generators

SACE Emax 2 E1.2 B-A, N-A, S-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip G Touch LSIG	1SDA077074R1	1SDA077154R1
				E1.2B-A 800 Ekip G Hi-Touch LSIG	1SDA077077R1	1SDA077157R1
	1200	42	42	E1.2B-A 1200 Ekip G Touch LSIG	1SDA077084R1	1SDA077164R1
				E1.2B-A 1200 Ekip G Hi-Touch LSIG	1SDA077087R1	1SDA077167R1
E1.2N-A	800	50	50	E1.2N-A 800 Ekip G Touch LSIG	1SDA077094R1	1SDA077174R1
				E1.2N-A 800 Ekip G Hi-Touch LSIG	1SDA077097R1	1SDA077177R1
	1200	50	50	E1.2N-A 1200 Ekip G Touch LSIG	1SDA077104R1	1SDA077184R1
				E1.2N-A 1200 Ekip G Hi-Touch LSIG	1SDA077107R1	1SDA077187R1
E1.2S-A	250	65	50	E1.2S-A 250 Ekip G Touch LSIG	1SDA077114R1	1SDA077194R1
				E1.2S-A 250 Ekip G Hi-Touch LSIG	1SDA077117R1	1SDA077197R1
	400	65	50	E1.2S-A 400 Ekip G Touch LSIG	1SDA077124R1	1SDA077204R1
				E1.2S-A 400 Ekip G Hi-Touch LSIG	1SDA077127R1	1SDA077207R1
	800	65	50	E1.2S-A 800 Ekip G Touch LSIG	1SDA077134R1	1SDA077214R1
				E1.2S-A 800 Ekip G Hi-Touch LSIG	1SDA077137R1	1SDA077217R1
	1200	65	50	E1.2S-A 1200 Ekip G Touch LSIG	1SDA077144R1	1SDA077224R1
				E1.2S-A 1200 Ekip G Hi-Touch LSIG	1SDA077147R1	1SDA077227R1

Automatic circuit breakers
Drawout version for generators

SACE Emax 2 E2.2 B-A, N-A, S-A, H-A, V-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip G Touch LSIG	1SDA077574R1	1SDA077744R1
				E2.2B-A 1600 Ekip G Hi-Touch LSIG	1SDA077577R1	1SDA077747R1
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip G Touch LSIG	1SDA077624R1	1SDA077794R1
				E2.2N-A 1600 Ekip G Hi-Touch LSIG	1SDA077627R1	1SDA077797R1
	2000	50	50	E2.2N-A 2000 Ekip G Touch LSIG	1SDA077634R1	1SDA077804R1
				E2.2N-A 2000 Ekip G Hi-Touch LSIG	1SDA077637R1	1SDA077807R1
E2.2S-A	800	65	65	E2.2S-A 800 Ekip G Touch LSIG	1SDA077644R1	1SDA077814R1
				E2.2S-A 800 Ekip G Hi-Touch LSIG	1SDA077647R1	1SDA077817R1
	1200	65	65	E2.2S-A 1200 Ekip G Touch LSIG	1SDA077654R1	1SDA077824R1
				E2.2S-A 1200 Ekip G Hi-Touch LSIG	1SDA077657R1	1SDA077827R1
	1600	65	65	E2.2S-A 1600 Ekip G Touch LSIG	1SDA077664R1	1SDA077834R1
				E2.2S-A 1600 Ekip G Hi-Touch LSIG	1SDA077667R1	1SDA077837R1
	2000	65	65	E2.2S-A 2000 Ekip G Touch LSIG	1SDA077674R1	1SDA077844R1
				E2.2S-A 2000 Ekip G Hi-Touch LSIG	1SDA077677R1	1SDA077847R1
E2.2H-A	800	85	85	E2.2H-A 800 Ekip G Touch LSIG	1SDA077584R1	1SDA077754R1
				E2.2H-A 800 Ekip G Hi-Touch LSIG	1SDA077587R1	1SDA077757R1
	1200	85	85	E2.2H-A 1200 Ekip G Touch LSIG	1SDA077594R1	1SDA077764R1
				E2.2H-A 1200 Ekip G Hi-Touch LSIG	1SDA077597R1	1SDA077767R1
	1600	85	85	E2.2H-A 1600 Ekip G Touch LSIG	1SDA077604R1	1SDA077774R1
				E2.2H-A 1600 Ekip G Hi-Touch LSIG	1SDA077607R1	1SDA077777R1
	2000	85	85	E2.2H-A 2000 Ekip G Touch LSIG	1SDA077614R1	1SDA077784R1
				E2.2H-A 2000 Ekip G Hi-Touch LSIG	1SDA077617R1	1SDA077787R1
E2.2V-A	250	100	85	E2.2V-A 250 Ekip G Touch LSIG	1SDA077684R1	1SDA077854R1
				E2.2V-A 250 Ekip G Hi-Touch LSIG	1SDA077687R1	1SDA077857R1
	400	100	85	E2.2V-A 400 Ekip G Touch LSIG	1SDA077694R1	1SDA077864R1
				E2.2V-A 400 Ekip G Hi-Touch LSIG	1SDA077697R1	1SDA077867R1
	800	100	85	E2.2V-A 800 Ekip G Touch LSIG	1SDA077704R1	1SDA077874R1
				E2.2V-A 800 Ekip G Hi-Touch LSIG	1SDA077707R1	1SDA077877R1
	1200	100	85	E2.2V-A 1200 Ekip G Touch LSIG	1SDA077714R1	1SDA077884R1
				E2.2V-A 1200 Ekip G Hi-Touch LSIG	1SDA077717R1	1SDA077887R1
	1600	100	85	E2.2V-A 1600 Ekip G Touch LSIG	1SDA077724R1	1SDA077894R1
				E2.2V-A 1600 Ekip G Hi-Touch LSIG	1SDA077727R1	1SDA077897R1
	2000	100	85	E2.2V-A 2000 Ekip G Touch LSIG	1SDA077734R1	1SDA077904R1
				E2.2V-A 2000 Ekip G Hi-Touch LSIG	1SDA077737R1	1SDA077907R1

SACE Emax 2 E4.2 S-A, H-A, V-A, L-A • Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip G Touch LSIG	1SDA078464R1	1SDA078694R1
				E4.2S-A 2500 Ekip G Hi-Touch LSIG	1SDA078467R1	1SDA078697R1
	3200	65	65	E4.2S-A 3200 Ekip G Touch LSIG	1SDA078474R1	1SDA078704R1
				E4.2S-A 3200 Ekip G Hi-Touch LSIG	1SDA078477R1	1SDA078707R1
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip G Touch LSIG	1SDA078374R1	1SDA078604R1
				E4.2H-A 2500 Ekip G Hi-Touch LSIG	1SDA078377R1	1SDA078607R1
	3200 (*)	85	85	E4.2H-A 3200 Ekip G Touch LSIG	1SDA078384R1	1SDA078614R1
				E4.2H-A 3200 Ekip G Hi-Touch LSIG	1SDA078387R1	1SDA078617R1
E4.2V-A	800	100	85	E4.2V-A 800 Ekip G Touch LSIG	1SDA078494R1	1SDA078724R1
				E4.2V-A 800 Ekip G Hi-Touch LSIG	1SDA078497R1	1SDA078727R1
	1600	100	85	E4.2V-A 1600 Ekip G Touch LSIG	1SDA078504R1	1SDA078734R1
				E4.2V-A 1600 Ekip G Hi-Touch LSIG	1SDA078507R1	1SDA078737R1
	2000	100	85	E4.2V-A 2000 Ekip G Touch LSIG	1SDA078514R1	1SDA078744R1
				E4.2V-A 2000 Ekip G Hi-Touch LSIG	1SDA078517R1	1SDA078747R1
	2500	100	85	E4.2V-A 2500 Ekip G Touch LSIG	1SDA078524R1	1SDA078754R1
				E4.2V-A 2500 Ekip G Hi-Touch LSIG	1SDA078527R1	1SDA078757R1
	3200 (*)	100	85	E4.2V-A 3200 Ekip G Touch LSIG	1SDA078534R1	1SDA078764R1
				E4.2V-A 3200 Ekip G Hi-Touch LSIG	1SDA078537R1	1SDA078767R1

* 3200A ratings only with rear vertical terminals
Contact local sales for availability for L version

Automatic circuit breakers
Drawout version for generators

SACE Emax 2 E6.2 H-A, V-A, L-A - Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
					Global code	Global code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip G Touch LSIG	1SDA079074R1	1SDA079194R1
				E6.2H-A 4000 Ekip G Hi-Touch LSIG	1SDA079077R1	1SDA079197R1
	5000	85	85	E6.2H-A 5000 Ekip G Touch LSIG	1SDA079084R1	1SDA079204R1
				E6.2H-A 5000 Ekip G Hi-Touch LSIG	1SDA079087R1	1SDA079207R1
	6000 (*)	85	85	E6.2H-A 6000 Ekip G Touch LSIG	1SDA079094R1	1SDA079214R1
				E6.2H-A 6000 Ekip G Hi-Touch LSIG	1SDA079097R1	1SDA079217R1
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip G Touch LSIG	1SDA079134R1	1SDA079254R1
				E6.2V-A 4000 Ekip G Hi-Touch LSIG	1SDA079137R1	1SDA079257R1
	5000	100	100	E6.2V-A 5000 Ekip G Touch LSIG	1SDA079144R1	1SDA079264R1
				E6.2V-A 5000 Ekip G Hi-Touch LSIG	1SDA079147R1	1SDA079265R1
	6000 (*)	100	100	E6.2V-A 6000 Ekip G Touch LSIG	1SDA079154R1	1SDA079274R1
				E6.2V-A 6000 Ekip G Hi-Touch LSIG	1SDA079157R1	1SDA079277R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB
Contact local sales for availability for L version

SACE Emax 2 E6.2 H-A/f, V-A/f, L-A/f full size - Mobile part of drawout circuit breaker (MP)

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Poles
					Global code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip G Touch LSIG	1SDA079434R1
				E6.2H-A/f 4000 Ekip G Hi-Touch LSIG	1SDA079437R1
	5000	85	85	E6.2H-A/f 5000 Ekip G Touch LSIG	1SDA079444R1
				E6.2H-A/f 5000 Ekip G Hi-Touch LSIG	1SDA079447R1
	6000 (*)	85	85	E6.2H-A/f 6000 Ekip G Touch LSIG	1SDA079454R1
				E6.2H-A/f 6000 Ekip G Hi-Touch LSIG	1SDA079457R1
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip G Touch LSIG	1SDA079494R1
				E6.2V-A/f 4000 Ekip G Hi-Touch LSIG	1SDA079497R1
	5000	100	100	E6.2V-A/f 5000 Ekip G Touch LSIG	1SDA079504R1
				E6.2V-A/f 5000 Ekip G Hi-Touch LSIG	1SDA079507R1
	6000 (*)	100	100	E6.2V-A/f 6000 Ekip G Touch LSIG	1SDA079514R1
				E6.2V-A/f 6000 Ekip G Hi-Touch LSIG	1SDA079517R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB
Contact local sales for availability for L version

Switch disconnectors
Fixed version

SACE Emax 2 E1.2 B-A/MS, N-A/MS • Front terminals (F)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E1.2B-A/MS	800	42	E1.2B-A/MS 800	1SDA079548R1	1SDA079552R1
	1200	42	E1.2B-A/MS 1200	1SDA079549R1	1SDA079553R1
E1.2N-A/MS	800	50	E1.2N-A/MS 800	1SDA079550R1	1SDA079554R1
	1200	50	E1.2N-A/MS 1200	1SDA079551R1	1SDA079555R1

SACE Emax 2 E2.2 N-A/MS, S-A/MS, V-A/MS • Orientable rear terminals (HR)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E2.2N-A/MS	1600	50	E2.2N-A/MS 1600	1SDA079570R1	1SDA079578R1
	2000	50	E2.2N-A/MS 2000	1SDA079571R1	1SDA079579R1
E2.2S-A/MS	800	65	E2.2S-A/MS 800	1SDA079564R1	1SDA079572R1
	1600	65	E2.2S-A/MS 1600	1SDA079565R1	1SDA079573R1
	2000	65	E2.2S-A/MS 2000	1SDA079566R1	1SDA079574R1
E2.2V-A/MS	800	85	E2.2V-A/MS 800	1SDA079567R1	1SDA079575R1
	1600	85	E2.2V-A/MS 1600	1SDA079568R1	1SDA079576R1
	2000	85	E2.2V-A/MS 2000	1SDA079569R1	1SDA079577R1

SACE Emax 2 E4.2 S-A/MS, H-A/MS, V-A/MS • Orientable rear terminals up to 2500A (HR)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E4.2S-A/MS	2500	65	E4.2S-A/MS 2500	1SDA079596R1	1SDA079612R1
	3200 (*)	65	E4.2S-A/MS 3200	1SDA079597R1	1SDA079613R1
	3600 (*)	65	E4.2S-A/MS 3600	1SDA079598R1	-
E4.2H-A/MS	2500	85	E4.2H-A/MS 2500	1SDA081867R1	1SDA081872R1
	3200 (*)	85	E4.2H-A/MS 3200	1SDA081868R1	1SDA081873R1
	3600 (*)	85	E4.2H-A/MS 3600	1SDA079611R1	-
E4.2V-A/MS	800	100	E4.2V-A/MS 800	1SDA081864R1	1SDA081869R1
	1600	100	E4.2V-A/MS 1600	1SDA081865R1	1SDA081870R1
	2000	100	E4.2V-A/MS 2000	1SDA081866R1	1SDA081871R1
	2500	100	E4.2V-A/MS 2500	1SDA079602R1	1SDA079618R1
	3200 (*)	100	E4.2V-A/MS 3200	1SDA079603R1	1SDA079619R1
	3600 (*)	100	E4.2V-A/MS 3600	1SDA079604R1	-

* 3200/3600A ratings only with rear vertical terminals

Switch disconnectors
Fixed version

SACE Emax 2 E6.2 L-A/MS • Orientable rear terminals up to 5000A (HR)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E6.2L-A/MS	4000	100	E6.2L-A/MS 4000	1SDA079660R1	1SDA079666R1
	5000	100	E6.2L-A/MS 5000	1SDA079661R1	1SDA079667R1
	6000 (*)	100	E6.2L-A/MS 6000	1SDA079662R1	1SDA079668R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB

SACE Emax 2 E6.2 L-A/f/MS • Orientable rear terminals up to 5000A (HR)

Size	Frame Amps	Withstand (kA)	Type	4 Poles
				Global code
E6.2L-A/f/MS	4000	100	E6.2L-A/f/MS 4000	1SDA079684R1
	5000	100	E6.2L-A/f/MS 5000	1SDA079685R1
	6000 (*)	100	E6.2L-A/f/MS 6300	1SDA079686R1

* 6000A ratings only with rear vertical terminals. Version not yet available. Contact ABB

Switch disconnectors
Drawout version

SACE Emax 2 E1.2 B-A/MS, N-A/MS • Mobile part of switch disconnector (MP)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E1.2B-A/MS	800	42	E1.2B-A/MS 800	1SDA079556R1	1SDA079560R1
	1200	42	E1.2B-A/MS 1200	1SDA079557R1	1SDA079561R1
E1.2N-A/MS	800	50	E1.2N-A/MS 800	1SDA079558R1	1SDA079562R1
	1200	50	E1.2N-A/MS 1200	1SDA079559R1	1SDA079563R1

SACE Emax 2 E2.2 N-A/MS, S-A/MS, V-A/MS • Mobile part of switch disconnector (MP)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E2.2N-A/MS	1600	50	E2.2N-A/MS 1600	1SDA079586R1	1SDA079594R1
	2000	50	E2.2N-A/MS 2000	1SDA079587R1	1SDA079595R1
E2.2S-A/MS	800	65	E2.2S-A/MS 800	1SDA079580R1	1SDA079588R1
	1600	65	E2.2S-A/MS 1600	1SDA079581R1	1SDA079589R1
	2000	65	E2.2S-A/MS 2000	1SDA079582R1	1SDA079590R1
E2.2V-A/MS	800	85	E2.2V-A/MS 800	1SDA079583R1	1SDA079591R1
	1600	85	E2.2V-A/MS 1600	1SDA079584R1	1SDA079592R1
	2000	85	E2.2V-A/MS 2000	1SDA079585R1	1SDA079593R1

SACE Emax 2 E4.2 S-A/MS, H-A/MS, V-A/MS • Mobile part of switch disconnector (MP)

Size	Frame Amps	Withstand (kA)	Type	3 Poles	4 Poles
				Global code	Global code
E4.2S-A/MS	2500	65	E4.2S-A/MS 2500	1SDA079628R1	1SDA079644R1
	3200	65	E4.2S-A/MS 3200	1SDA079629R1	1SDA079645R1
E4.2H-A/MS	2500	85	E4.2H-A/MS 2500	1SDA081877R1	1SDA081882R1
	3200	85	E4.2H-A/MS 3200	1SDA081878R1	1SDA081883R1
E4.2V-A/MS	800	100	E4.2V-A/MS 800	1SDA081874R1	1SDA081879R1
	1600	100	E4.2V-A/MS 1600	1SDA081875R1	1SDA081880R1
	2000	100	E4.2V-A/MS 2000	1SDA081876R1	1SDA081881R1
	2500	100	E4.2V-A/MS 2500	1SDA079634R1	1SDA079650R1
	3200	100	E4.2V-A/MS 3200	1SDA079635R1	1SDA079651R1

Circuit breakers

Multi-Standard: IEC 60947 / UL1066 / CSA / CCC

Size	Performance	Description	3 Poles	4 Poles
			Global code	Global code
E2.2	B	Triple certific: UL/IEC/CCC E2.2B-A EXT	1SDA083020R1	1SDA083020R1
E2.2	N	Triple certific: UL/IEC/CCC E2.2N-A EXT	1SDA083021R1	1SDA083021R1
E2.2	S	Triple certific: UL/IEC/CCC E2.2S-A EXT	1SDA083022R1	1SDA083022R1
E2.2	H	Triple certific: UL/IEC/CCC E2.2H-A EXT	1SDA083023R1	1SDA083023R1
E2.2	V	Triple certific: UL/IEC/CCC E2.2V-A EXT	1SDA083024R1	1SDA083024R1
E4.2	S	Triple certific: UL/IEC/CCC E4.2S-A EXT	1SDA083025R1	1SDA083025R1
E4.2	H	Triple certific: UL/IEC/CCC E4.2H-A EXT	1SDA083026R1	1SDA083026R1
E4.2	V	Triple certific: UL/IEC/CCC E4.2V-A EXT	1SDA083027R1	1SDA083027R1
E6.2	V	Triple certific: UL/IEC/CCC E6.2V-A EXT	1SDA083028R1	1SDA083028R1

The multiple-standard Emax2 can be ordered Iin the same way you accessories are ordered:
1. Select the right UL circuit breaker you need;
2. Like an accessory configuration, upgrade the circuit breaker with multi-standard performance by adding the code shown above.

Cradles

Size	Performance	Amperage range	Terminal type	Type	3 Poles	4 Poles
					Global code	Global code
E1.2	B-A, N-A, S-A	250 - 1200	HR - HR	E1.2-A W FP Iu=1200 HR HR UL	1SDA079696R1	1SDA079697R1
E2.2	B-A, N-A, S-A, H-A, V-A	250 - 2000	HR - HR	E2.2-A W FP Iu=2000 HR HR UL	1SDA079698R1	1SDA079699R1
E4.2	S-A, H-A, V-A, L-A	800 - 2500	HR - HR	E4.2-A W FP Iu=2500 HR HR UL	1SDA079700R1	1SDA079701R1
	S-A, H-A, V-A, L-A	3200	VR-VR	E4.2-A W FP Iu=3200 VR VR UL	1SDA079702R1	1SDA079703R1
E6.2	H-A, V-A, L-A	4000 - 5000	HR - HR	E6.2-A W FP Iu=5000 HR HR UL	1SDA079706R1	1SDA079707R1
	H-A, V-A, L-A	6000 (*)	VR - VR	E6.2-A W FP Iu=6000 3p VR VR UL	1SDA079709R1	1SDA079710R1
E6.2/f	H-A, V-A, L-A	4000 - 5000	HR - HR	E6.2-A W FP Iu=5000 HR HR UL	-	1SDA079708R1
	H-A, V-A, L-A	6000 (*)	VR - VR	E6.2-A W FP Iu=6000 VR VR UL	-	1SDA079711R1

* Version not yet available. Contact ABB

Accessories

Electrical accessories

First and second shunt coil - YO

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

Second shunt coils are an alternative to a UVR or anti-racking out device (fail safe)

First and second closing coil - YC

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

Shunt coil and closing coil test unit - YO/YC Test Unit (IEC only)

Size	Type	Global code
E1.2..E6.2	YO/YC test unit E1.2...E6.2	1SDA082751R1

Undervoltage coil - YU

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

The undervoltage coil is an alternative to a second shunt coil or anti-racking out device (fail safe)

Electronic time-delay device for undervoltage coil - UVD (IEC only)

Size	Type	Global code
E1.2..E6.2	24-30 Vdc	1SDA038316R1
E1.2..E6.2	48 Vac/dc	1SDA038317R1
E1.2..E6.2	60 Vac/dc	1SDA038318R1
E1.2..E6.2	110...127 Vac/dc	1SDA038319R1
E1.2..E6.2	220...250 Vac/dc	1SDA038320R1

The electronic time-delay device must be used with an undervoltage coil with the same voltage

Remote reset - YR

Size	Type	Global code
E1.2	YR 24 Vdc E1.2	1SDA073744R1
E1.2	YR 110 Vac/dc E1.2	1SDA073745R1
E1.2	YR 220 Vac/dc E1.2	1SDA073746R1
E2.2..E6.2	YR 24 Vdc E2.2...E6.2	1SDA073747R1
E2.2..E6.2	YR 110 Vac/dc E2.2...E6.2	1SDA073748R1
E2.2..E6.2	YR 220 Vac/Dc E2.2...E6.2	1SDA073749R1

When the remote reset is used in DC, its activation must be done with a maximum impluse time of 50ms. It can not be powered permanently.

Accessories

Electrical accessories

Motor - M

Size	Type	Global code
E1.2	M E1.2 24-30 Vac/dc + MC 250V	1SDA073708R1
E1.2	M E1.2 48-60 Vac/dc + MC 250V	1SDA073709R1
E1.2	M E1.2 100-130 Vac/dc + MC 250V	1SDA073710R1
E1.2	M E1.2 220-250 Vac/dc + MC 250V	1SDA073711R1
E1.2	M E1.2 380-415 Vac + MC 250V	1SDA073713R1
E2.2..E6.2	M E2.2...E6.2 24-30 Vac/dc + MC 400V	1SDA073722R1
E2.2..E6.2	M E2.2...E6.2 48-60 Vac/dc + MC 400V	1SDA073723R1
E2.2..E6.2	M E2.2...E6.2 100-130 Vac/dc + MC 400V	1SDA073724R1
E2.2..E6.2	M E2.2...E6.2 220-250 Vac/dc + MC 400V	1SDA073725R1
E2.2..E6.2	M E2.2...E6.2 380-415 Vac + MC 400V	1SDA073727R1
E1.2	M E1.2 24-30 Vac/dc + MC 24V	1SDA073715R1
E1.2	M E1.2 48-60 Vac/dc + MC 24V	1SDA073716R1
E1.2	M E1.2 100-130 Vac/dc + MC 24V	1SDA073717R1
E1.2	M E1.2 220-250 Vac/dc + MC 24V	1SDA073718R1
E1.2	M E1.2 380-415 Vac + MC 24V	1SDA073720R1
E2.2..E6.2	M E2.2...E6.2 24-30 Vac/dc + MC 24V	1SDA073729R1
E2.2..E6.2	M E2.2...E6.2 48-60 Vac/dc + MC 24V	1SDA073730R1
E2.2..E6.2	M E2.2...E6.2 100-130 Vac/dc + MC 24V	1SDA073731R1
E2.2..E6.2	M E2.2...E6.2 220-250 Vac/dc + MC 24V	1SDA073732R1
E2.2..E6.2	M E2.2...E6.2 380-415 Vac + MC 24V	1SDA073734R1

Current sensor for external neutral

Size	Type	Global code
E1.2-E2.2	Ext CS N E1.2 - E2.2 (*)	1SDA082134R1
E4.2-E6.2	Ext CS N E4.2-E6.2 50% (*)	1SDA082135R1
E6.2 FS	Ext CS N E6.2 100% (*)	1SDA082136R1

* Only as loose part

Homopolar toroid for the earthing conductor of the main power supply (Transformer star center sensor input) (IEC only)

Size	Type	Global code
E1.2..E6.2	Homopolar toroid E1.2...E6.2 100A (*)	1SDA073743R1
E1.2..E6.2	Homopolar toroid E1.2...E6.2 250A (*)	1SDA076248R1
E1.2..E6.2	Homopolar toroid E1.2...E6.2 400A (*)	1SDA076249R1
E1.2..E6.2	Homopolar toroid E1.2...E6.2 800A (*)	1SDA076250R1

The homopolar toroid is an alternative to the toroid for differential protection; (*) Only as loose part

Toroid for differential protection (Rc residual current protection sensor input) (IEC only)

Size	Type	Global code
E1.2 & E2.2 3p	Toroid RC E1.2, E2.2 3p (*)	1SDA073741R1
E2.2 4p & E4.2	Toroide RC E2 4p, E4.2 (*)	1SDA073742R1

The toroid for differential protection is an alternative to the homopolar toroid for the earthing conductor of the main power supply;
(*) Only as loose part

Open closed auxiliary contacts - AUX

Size	Type	Global code
E1.2 (**)	AUX 4Q (4 Form C) 400V E1.2	1SDA073750R1
E1.2	AUX 4Q (4 Form C) 24V E1.2	1SDA073751R1
E1.2	AUX 2Q (2 Form C) 400V + 2Q (2 Form C) 24V E1.2	1SDA073752R1
E2.2..E6.2 (**)	AUX 4Q (4 Form C) 400V E2.2...E6.2	1SDA073753R1
E2.2..E6.2	AUX 4Q (4 Form C) 24V E2.2...E6.2	1SDA073754R1
E2.2..E6.2	AUX 2Q (2 Form C) 400V + 2Q (2 Form C) 24V E2.2...E6.2	1SDA073755R1
E2.2..E6.2	AUX 6Q 400V E2.2...E6.2 1)	1SDA073756R1
E2.2..E6.2	AUX 6Q 24V E2.2...E6.2 1)	1SDA073757R1
E2.2..E6.2	AUX 3Q (3 Form C) 400V + 3Q (3 Form C) 24V E2.2...E6.2 1)	1SDA075973R1
E1.2	AUX 15Q (15 Form C) 400V E1.2 2) (*)	1SDA073758R1
E1.2	AUX 15Q (15 Form C) 24V E1.2 2) (*)	1SDA073759R1
E2.2..E6.2	AUX 15Q (15 Form C) 400V (for fixed/drawout with signalling in racked in) E2.2...E6.2 2) (*)	1SDA073760R1
E2.2..E6.2	AUX 15Q (15 Form C) 24V (for fixed/drawout with signalling in racked in) E2.2...E6.2 2) (*)	1SDA073761R1
E2.2..E6.2	AUX 15Q (15 Form C) 400V (for fixed/drawout with signalling in racked in/test isolated) E2.2...E6.2 2) (*)	1SDA073846R1
E2.2..E6.2	AUX 15Q (15 Form C) 24V (for fixed/drawout with signalling in racked in/test isolated) E2.2...E6.2 2) (*)	1SDA073847R1

1) AUX 6Q (6 Form C) is an alternative to the Ekip Signalling 4k module
2) Aux 15 Q (15 Form C) is an alternative to the Mechanical interlock (MI), the lock to prevent door opening when the circuit breaker is in the closed position (DLC) or the lock to prevent door opening when the circuit breaker is in the racked in or test position (DCP) when mounted on the right side. For E1.2 one of the mounting plates is also needed.
For E1.2 you need to order also one of the following items:
Plate for fixed - floor mounted 1SDA079783R1
Plate for fixed - wall mounted 1SDA079782R1
Plate for withdrawable 1SDA079784R1
* Not compatible with mechanical locks on compartment doors or mechanical interlocks
** Standard supply with automatic circuit-breakers

Auxiliary position contacts - AUP

Size	Type	Global code
E1.2	AUP 6 contacts 400V E1.2	1SDA073762R1
E1.2	AUP 6 contacts 24V E1.2	1SDA073763R1
E2.2...E6.2	AUP 5 contacts 400V E2.2...E6.2 - left set	1SDA080373R1
E2.2...E6.2	AUP 5 contacts 24V E2.2...E6.2 - left set	1SDA080374R1
E2.2...E6.2	AUP 5 suppl. contacts 400V E2.2...E6.2 - right set	1SDA080375R1
E2.2...E6.2	AUP 5 suppl. contacts 24V E2.2...E6.2 - right set	1SDA080376R1
E1.2...E6.2	AUP Ekip auxiliary position contact E1.2...E6.2	1SDA073768R1

Ready to close signalling contact - RTC

Size	Type	Global code
E1.2	RTC 250V E1.2	1SDA073770R1
E1.2	RTC 24V E1.2	1SDA073771R1
E1.2	RTC Ekip 24V E1.2	1SDA073772R1
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

Accessories
Electrical accessories

Trip signalling contact - S51 / bell alarm

Size	Type	Global code
E1.2	S51 / bell alarm 250V E1.2	1SDA073776R1
E1.2	S51 / bell alarm 24V E1.2	1SDA073777R1
E2.2...E6.2	S51 / bell alarm 250V E2.2...E6.2	1SDA073778R1
E2.2...E6.2	S51 / bell alarm 24V E2.2...E6.2	1SDA073779R1

Terminal blocks for auxiliary connection

Size	Type	Global code
E1.2..E6.2	Terminal blocks 10 pcs	1SDA073906R1

Accessories
Mechanical accessories

Mechanical operation counter - MOC

Size	Type	Global code
E1.2	MOC mechanical operation counter (*)	1SDA073780R1
E2.2...E6.2	MOC mechanical operation counter	1SDA073781R1

* Only available with motor

Key lock in open position - KLC

Size	Type	Global code
E1.2	KLC-D Key lock open E1.2	1SDA073782R1
E1.2	KLC-S Key lock open N.20005 E1.2	1SDA073783R1
E1.2	KLC-S Key lock open N.20006 E1.2	1SDA073784R1
E1.2	KLC-S Key lock open N.20007 E1.2	1SDA073785R1
E1.2	KLC-S Key lock open N.20008 E1.2	1SDA073786R1
E1.2	KLC-S Key lock open N.20009 E1.2	1SDA073787R1
E1.2	KLC-A Key lock open Castell E1.2 1) 2)	1SDA073788R1
E1.2	KLC-A Key lock open Kirk E1.2 1)	1SDA073789R1
E1.2	KLC-A Key lock open Ronis Profalux E1.2 1)	1SDA073790R1
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
E2.2...E6.2	KLC-A Key lock open Castell E2.2...E6.2 1) 2)	1SDA073797R1
E2.2...E6.2	KLC-A Key lock open Kirk E2.2..E6.2 1)	1SDA073798R1
E2.2...E6.2	KLC-A Key lock open Ronis Profalux E2.2..E6.2 1)	1SDA073799R1

1) Arrangement only: 2) Only mounted. For loose supply contact ABB SACE.

Padlocks in open position - PLC

Size	Type	Global code
E1.2	PLC E1.2 Padlock open D=4mm/0.15"	1SDA073800R1
E1.2	PLC E1.2 Padlock open D=7mm/0.27"	1SDA073801R1
E1.2	PLC E1.2 Padlock open D=8mm/0.31"	1SDA073802R1
E2.2...E6.2	PLC E2.2..E6.2 Padlock open D=4mm/0.15"	1SDA073803R1
E2.2...E6.2	PLC E2.2..E6.2 Padlock open D=7mm/0.27"	1SDA073804R1
E2.2...E6.2	PLC E2.2..E6.2 Padlock open D=8mm/0.31"	1SDA073805R1

The PLC is an alternative to the protection device for opening and closing pushbuttons (PBC)

Fixed or Mobile Part with neutral on right side

Size	Type	Global code
E1.2...E6.2	Installation with neutral on right side sequence L1, L2, L3, N	1SDA076153R1

Floor fixing plate - F

Size	Type	Global code
E1.2	Floor fixing plate for fixed unit	1SDA076020R1

Accessories

Mechanical accessories

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

Size	Type	Global code
E1.2	KLP-D Key lock racked in/out E1.2 1st key	1SDA073822R1
E1.2	KLP-S Key lock racked in/out N.20005 E1.2 1st key	1SDA073823R1
E1.2	KLP-S Key lock racked in/out N.20006 E1.2 1st key	1SDA073824R1
E1.2	KLP-S Key lock racked in/out N.20007 E1.2 1st key	1SDA073825R1
E1.2	KLP-S Key lock racked in/out N.20008 E1.2 1st key	1SDA073826R1
E1.2	KLP-S Key lock racked in/out N.20009 E1.2 1st key	1SDA073827R1
E1.2	KLP-D Key lock racked in/out E1.2 2nd key	1SDA073828R1
E1.2	KLP-S Key lock racked in/out N.20005 E1.2 2nd key	1SDA073829R1
E1.2	KLP-S Key lock racked in/out N.20006 E1.2 2nd key	1SDA073830R1
E1.2	KLP-S Key lock racked in/out N.20007 E1.2 2nd key	1SDA073831R1
E1.2	KLP-S Key lock racked in/out N.20008 E1.2 2nd key	1SDA073832R1
E1.2	KLP-S Key lock racked in/out N.20009 E1.2 2nd key	1SDA073833R1
E1.2	KLP-A Key lock racked in/out RonProfKirk E1.2 1st key [2)]	1SDA073834R1
E1.2	KLP-A Key lock racked in/out RonProfKirk E1.2 2nd key [2)]	1SDA073835R1
E1.2	KLP-A Key lock racked in/out Castell E1.2 1st key [1) 2)]	1SDA073836R1
E1.2	KLP-A Key lock racked in/out Castell E1.2 2nd key [1) 2)]	1SDA073837R1
E2.2...E6.2	KLP-D Key lock racked in/out E2.2...E6.2 1st key	1SDA073806R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20005 E2.2...E6.2 1st key	1SDA073807R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20006 E2.2...E6.2 1st key	1SDA073808R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20007 E2.2...E6.2 1st key	1SDA073809R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20008 E2.2...E6.2 1st key	1SDA073810R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20009 E2.2...E6.2 1st key	1SDA073811R1
E2.2...E6.2	KLP-D Key lock racked in/out E2.2...E6.2 2nd key	1SDA073812R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20005 E2.2...E6.2 2nd key	1SDA073813R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20006 E2.2...E6.2 2nd key	1SDA073814R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20007 E2.2...E6.2 2nd key	1SDA073815R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20008 E2.2...E6.2 2nd key	1SDA073816R1
E2.2...E6.2	KLP-S Key lock racked in/out N.20009 E2.2...E6.2 2nd key	1SDA073817R1
E2.2...E6.2	KLP-A Key lock racked in/out RonProfKirk E2.2...E6.2 1st key [2)]	1SDA073818R1
E2.2...E6.2	KLP-A Key lock racked in/out RonProfKirk E2.2...E6.2 2nd key [2)]	1SDA073819R1
E2.2...E6.2	KLP-A Key lock racked in/out Castell E2.2...E6.2 1st key [1) 2)]	1SDA073820R1
E2.2...E6.2	KLP-A Key lock racked in/out Castell E2.2...E6.2 2nd key [1) 2)]	1SDA073821R1

To have 2 keys, one each of a 1st key and 2nd key option must be ordered. When the Padlock in racked in/test/racked out (PLP) is also present, the 2nd key option must be ordered.
1) Two Castell key options can not be used together; 2) Arrangement only

Supplementary lock in racked out position accessory

Size	Type	Global code
E1.2	Suppl. lock in racked out E1.2	1SDA073838R1
E2.2...E6.2	Suppl. lock in racked out E2.2...E6.2	1SDA073839R1

Padlock in racked in / test / racked out position - PLP

Size	Type	Global code
E1.2	PLP Padlock racked in/out E1.2	1SDA073840R1
E2.2...E6.2	PLP Padlock racked in/out E2.2...E6.2	1SDA073841R1

Can also be used with the key lock in racked in/test/racked out device when the 2nd key option is ordered.

Anti-racking out device (fail safe) - FS

Size	Type	Global code
E1.2	Fail Safe E1.2	1SDA079898R1
E2.2...E6.2	Fail Safe E2.2...E6.2	1SDA079899R1

Standard for CBs UL, not compatible with YU

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

Size	Type	Global code
E1.2...E6.2	DLR E2.2...E6.2 (*)	1SDA073845R1

(*) Only as loose part

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

Size	Type	Global code
E2.2...E6.2	DLR E2.2...E6.2 (*)	1SDA073849R1

If mounted on the right side, the DLP is an alternative to the mechanical interlock, AUX 15Q (15 Form C) or Lock to prevent door opening when the circuit breaker is in a closed position (DLC); (*) Only as loose part

Lock to prevent door opening when the circuit breaker is in a closed position - DLC

Size	Type	Global code
E1.2	DLC Interlock cable door for fixed to wall E1.2	1SDA081032R1
E1.2	DLC Interlock cable door for fixed to floor E1.2	1SDA081033R1
E1.2	DLC Interlock cable door for fixed part withdrawable E1.2	1SDA081034R1
E1.2	DLC Interlock direct door for fixed to wall E1.2	1SDA079779R1
E1.2	DLC Interlock direct door for fixed to floor E1.2	1SDA079780R1
E1.2	DLC Interlock direct door for fixed part withdrawable E1.2	1SDA079781R1
E2.2...E6.2	DLC Interlock cable door E2.2...E6.2 (*)	1SDA073852R1
E2.2...E6.2	DLC Interlock direct door E2.2...E6.2 (*)	1SDA073853R1

If mounted on the right side, the DLP is an alternative to the mechanical interlock, AUX 15Q (15 Form C) or Lock to prevent door opening when the circuit breaker is in racked in / test position (DLP); * To be ordered with lever for interlock [group 2] and support for interlock [1SDA073895R1]

Protection device for opening and closing pushbuttons - PBC

Size	Type	Global code
E1.2	PBC Op/Cl BP protection sp. key E1.2	1SDA073854R1
E1.2	PBC Op/Cl BP protection PL D=4mm/0.15" E1.2	1SDA073855R1
E1.2	PBC Op/Cl BP protection PL D=7mm/0.27" E1.2	1SDA073856R1
E1.2	PBC Op/Cl BP protection PL D=8mm/0.31" E1.2	1SDA073857R1
E2.2...E6.2	PBC Op/Cl BP protection sp. key E2.2...E6.2	1SDA073858R1
E2.2...E6.2	PBC Op/Cl BP protection PL D=4mm/0.15" E2.2...E6.2	1SDA073859R1
E2.2...E6.2	PBC Op/Cl BP protection PL D=7mm/0.27" E2.2...E6.2	1SDA073860R1
E2.2...E6.2	PBC Op/Cl BP protection PL D=8mm/0.31" E2.2...E6.2	1SDA073861R1

* The PBC is an alternative to the Padlock in open position (PLC)

Accessories

Mechanical accessories

Circuit breaker flange / door escutcheon

Size	Type	Global code
E1.2	IP30 flange E1.2 Fixed	1SDA073862R1
E1.2	IP30 flange E1.2 Drawout	1SDA073863R1
E2.2...E6.2	IP30 flange E2.2...E6.2 Fixed	1SDA073864R1
E2.2...E6.2	IP30 flange E2.2...E6.2 Drawout	1SDA073865R1
E1.2	IP54 flange, different keys E1.2 (*)	1SDA073866R1
E2.2...E6.2	IP54 flange, different keys E2.2...E6.2 (*)	1SDA073867R1
E1.2	IP54 flange, key N.20005 E1.2 (*)	1SDA073868R1
E2.2...E6.2	IP54 flange, key N.20005 E2.2...E6.2 (*)	1SDA073869R1
E2.2...E6.2	Sealable trip unit cover E2.2...E6.2	1SDA073870R1

* Only as loose part

High or low terminal covers - HTC/LTC

Size	Type	3 poles	4 poles
		Global code	**Global code**
E1.2	HTC high terminal covers E1.2 2pcs	1SDA073871R1	1SDA073872R1
E1.2	LTC low terminal covers E1.2 2pcs	1SDA073873R1	1SDA073874R1

Separators - PB

Size	Type	Global code
E1.2	PB H=100mm/3.94" 4pcs E1.2 Fixed 3P	1SDA073877R1
E1.2	PB H=100mm/3.94" 6pcs E1.2 Fixed 4P	1SDA073878R1
E1.2	PB H=200mm/7.87" 4pcs E1.2 Fixed 3P	1SDA073879R1
E1.2	PB H=200mm/7.87" 6pcs E1.2 Fixed 4P	1SDA073880R1
E1.2	PB 2pcs E1.2 Drawout 3P	1SDA076164R1
E1.2	PB 3pcs E1.2 Drawout 4P	1SDA076165R1
E2.2...E6.2	PB 2pcs E2.2...E6.2 Fixed 3P	1SDA076166R1
E2.2...E6.2	PB 3pcs E2.2...E6.2 Fixed 4P	1SDA076167R1
E2.2...E6.2	PB 2pcs E2.2...E6.2 Drawout 3P	1SDA076168R1
E2.2...E6.2	PB 3pcs E2.2...E6.2 Drawout 4P	1SDA076169R1
E4.2	PB Separators E4.2 3200A/3600A UL Fixed 3P	1SDA107410R1
E4.2	PB Separators E4.2 3200A UL Fixed 4P	1SDA107411R1
E4.2	PB Separators E4.2 3200A UL Drawout 3P	1SDA107412R1
E4.2	PB Separators E4.2 3200A UL Drawout 4P	1SDA107413R1

Accessories
Mechanical interlock

Cables for mechanical interlock [Group 1]

Size	Type	Global code
E1.2..E6.2	Type A horizontal	1SDA073881R1
E2.2..E6.2	Type B,C,D horizontal	1SDA073882R1
E1.2..E6.2	Type A vertical	1SDA073885R1
E2.2..E6.2	Type B,C,D vertical	1SDA073886R1

On type of cable must be ordered for each interlock. The cable must be ordered with the fixed circuit breaker or the cradle of a drawout circuit breaker.

Lever for mechanical interlock of fixed circuit breaker or cradle [Group 2]

Size	Type	3 Poles	4 Poles
		Global code	Global code
E2.2	Lever for mechanical interlock	1SDA073889R1	1SDA073889R1
E4.2	Lever for mechanical interlock	1SDA073890R1	1SDA073890R1
E6.2	Lever for mechanical interlock	1SDA073891R1	1SDA073892R1

The lever for the mechanical interlock is not required for E1.2

Support for mechanical interlock of fixed circuit breaker [Group 3]

Size	Type	Global code
E1.2	Type A - floor mounted	1SDA073893R1
E1.2	Type A - wall mounted	1SDA073894R1
E2.2 ... E6.2	Type A / B / D	1SDA073895R1
E2.2 ... E6.2	Type C	1SDA073897R1

Support for mechanical interlock of fixed part [Group 4]

Size	Type	Global code
E1.2	Type A	1SDA073896R1
E2.2 ... E6.2	Type A / B / D	1SDA073895R1
E2.2 ... E6.2	Type C	1SDA073897R1

Automatic transfer switch

Size	Type	Global code
E1.2..E6.2	ATS021	1SDA065523R1
E1.2..E6.2	ATS022	1SDA065524R1

Accessories
Ekip modules

Ekip trip units - loose supply

Size	Type	Global 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

Options for Ekip trip units

Size	Type	Global code
E1.2..E6.2	Ekip LCD installed	1SDA074211R1
E1.2..E6.2	Ekip Power Controller	1SDA074212R1
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 externalvoltage outlets	1SDA074215R1

Power Supply modules

Size	Type	Global code
E1.2..E6.2	Ekip Supply 110-240VAC/DC	1SDA074172R1
E1.2..E6.2	Ekip Supply 24-48VDC	1SDA074173R1

Connectivity modules

Size	Type	Global 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 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 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	Global code
E1.2..E6.2	Ekip 2K-1	1SDA074167R1
E1.2..E6.2	Ekip 2K-2	1SDA074168R1
E1.2..E6.2	Ekip 2K-3	1SDA074169R1
E2.2..E6.2	Ekip 4K [1)]	1SDA074170R1
E1.2..E6.2	Ekip 10K [2)]	1SDA074171R1
E1.2..E6.2 *	Ekip Signalling 3T-1 AI-Temp PT1000	1SDA085693R1
E1.2..E6.2 *	Ekip Signalling 3T-2 AI-Temp PT1000	1SDA085694R1

1) Ekip 4k is not available for the E1.2. It is an alternative to the AUX 6Q (6 Form C) auxiliary contacts unit on other frames; 2) only as loose part;
* 1 pcs and for busbar mounting

Measuring and Measuring Pro modules

Size	Type	Global code
E1.2	Ekip Measuring	1SDA074184R1
E1.2	Ekip Measuring Pro	1SDA074185R1
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
E1.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E1.2[(*)]	1SDA076244R1
E2.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E2.2[(*)]	1SDA076245R1
E4.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E4.2[(*)]	1SDA076246R1
E6.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E6.2[(*)]	1SDA076247R1

* use only with circuit breakers with neutral on right side L1 L2 L3 N

Accessories
Ekip modules

Synchrocheck module

Size	Type	Global code
E1.2..E6.2	Ekip Synchrocheck	1SDA074183R1

Displaying and supervision systems

Size	Type	Global code
E1.2..E6.2	Ekip T&P - Programming and Test unit	1SDA066989R1
E1.2..E6.2	Ekip TT - Trip Test	1SDA066988R1
E1.2..E6.2	Ekip Programming	1SDA076154R1
E1.2..E6.2	Ekip Multimeter Display for the frot 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

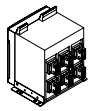
* only as loose part

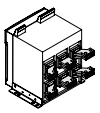
Rating plugs for Ekip trip units

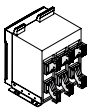
Size	Type	Global code (loose supply)	Global code (installed)
E1.2...E2.2	Rating Plug 100A	1SDA074218R1	1SDA074258R1
E1.2...E2.2	Rating Plug 200A	1SDA074219R1	1SDA074259R1
E1.2...E2.2	Rating Plug 250A	1SDA074220R1	1SDA074260R1
E1.2..E6.2	Rating Plug 400A	1SDA074221R1	1SDA074261R1
E1.2..E6.2	Rating Plug 600A [1)]	1SDA082038R1	1SDA079826R1
E1.2..E6.2	Rating Plug 800A	1SDA074223R1	1SDA074263R1
E1.2..E6.2	Rating Plug 1000A	1SDA074224R1	1SDA074264R1
E1.2..E6.2	Rating Plug 1200A [1)]	1SDA079730R1	1SDA079828R1
E1.2..E6.2	Rating Plug 1600A [2)]	1SDA074226R1	1SDA074266R1
E2.2...E6.2	Rating Plug 2000A	1SDA074227R1	1SDA074267R1
E2.2...E6.2	Rating Plug 2500A [3)]	1SDA074228R1	1SDA074268R1
E4.2...E6.2	Rating Plug 3200A	1SDA074229R1	1SDA074269R1
E4.2...E6.2	Rating Plug 4000A [4)]	1SDA074230R1	1SDA074270R1
E6.2	Rating Plug 5000A	1SDA074231R1	1SDA074271R1
E6.2	Rating Plug 6000A [1)]	1SDA079731R1	-

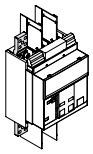
1) UL only
2) IEC only for E1.2, both UL and IEC for all other frames
3) IEC only for E2.2, both UL and IEC for E4.2 and E6.2
4) IEC only for E4.2, both UL and IEC for E6.2

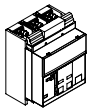
Accessories
Terminals

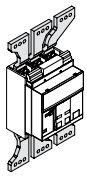

Rear orientable terminal - HR VR

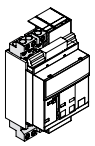

Horizontal rear spread terminal - SHR


Vertical rear spread terminal - SVR


Extended front terminal - EF


Front terminal - F

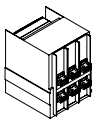

Front spread terminal - ES


Terminal for cable FcCuAl 4x240mm² - Fc CuAl

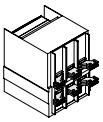
Kit for terminals - installed on fixed circuit breaker

Size	Version	Max amperage	Type	3 Poles	4 Poles
				Global code	Global code
E1.2	F	1200	Kit EF Upper [1]	1SDA073963R1	1SDA073964R1
E1.2	F	1200	Kit EF Lower [1]	1SDA073965R1	1SDA073966R1
E1.2	F	1200	Kit ES Upper [1]	1SDA073975R1	1SDA073976R1
E1.2	F	1200	Kit ES Lower [1]	1SDA073977R1	1SDA073978R1
E1.2	F	1200	Kit HR Upper	1SDA079840R1	1SDA079841R1
E1.2	F	1200	Kit HR Lower	1SDA079842R1	1SDA079843R1
E1.2	F	1200	Kit VR Upper	1SDA079836R1	1SDA079837R1
E1.2	F	1200	Kit VR Lower	1SDA079838R1	1SDA079839R1
E1.2	F	1200	Kit FcCuAl 4x 500kcmil/240mm² Upper [1]	1SDA073997R1	1SDA073998R1
E1.2	F	1200	Kit FcCuAl 4x 500kcmil/240mm² Lower [1]	1SDA073999R1	1SDA074000R1
E2.2	F	2000	Kit F Upper 1)	1SDA074118R1	1SDA074119R1
E2.2	F	2000	Kit F Lower 1)	1SDA074120R1	1SDA074121R1
E2.2	F	2000	Kit VR Upper	1SDA079852R1	1SDA079853R1
E2.2	F	2000	Kit VR Lower	1SDA079854R1	1SDA079855R1
E4.2	F	3200	Kit F Upper [1]	1SDA074126R1	1SDA074127R1
E4.2	F	3200	Kit F Lower [1]	1SDA074128R1	1SDA074129R1
E4.2	F	2500	Kit VR Upper	1SDA079862R1	1SDA079863R1
E4.2	F	2500	Kit VR Lower	1SDA079864R1	1SDA079865R1
E6.2	F	6000	Kit F Upper [1]	1SDA074134R1	1SDA074135R1
E6.2	F	6000	Kit F Lower [1]	1SDA074137R1	1SDA074138R1
E6.2	F	5000	Kit VR Upper	1SDA079891R1	1SDA079892R1
E6.2	F	5000	Kit VR Lower	1SDA079893R1	1SDA079894R1
E6.2/f	F	6000	Kit F Upper [1]	-	1SDA074136R1
E6.2/f	F	6000	Kit F Lower [1]	-	1SDA074138R1

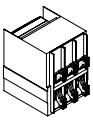
1) Not UL listed



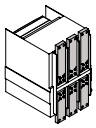
Rear orientable terminal - HR VR



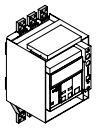
Horizontal rear terminal - SHR



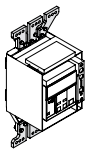
Vertical rear spread terminal - SVR



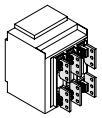
Front terminal - F



Extended front terminal - EF



Front spread terminal - ES



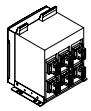
Terminal for cable FcCuAl 4x240mm² - Fc CuAl

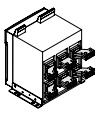
Kit for terminals - installed on cradle

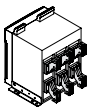
Size	Version	Max amperage	Type	3 Poles	4 Poles
				Global code	Global code
E1.2	W	1200	Kit EF Upper [3]	1SDA073939R1	1SDA073940R1
E1.2	W	1200	Kit EF Lower [3]	1SDA073941R1	1SDA073942R1
E1.2	W	1200	Kit ES Upper [1] [3]	1SDA073951R1	1SDA073952R1
E1.2	W	1200	Kit ES Lower [1] [3]	1SDA073953R1	1SDA073954R1
E1.2	W	1200	Kit VR Upper	1SDA079830R1	1SDA079831R1
E1.2	W	1200	Kit VR Lower	1SDA079832R1	1SDA079833R1
E1.2	W	1200	Kit FcCuAl 4x 500kcmil/240mm² Upper [3]	1SDA073991R1	1SDA073993R1
E1.2	W	1200	Kit FcCuAl 4x 500kcmil/240mm² Lower [3]	1SDA073992R1	1SDA073994R1
E2.2	W	2000	Kit F Upper [3]	1SDA074090R1	1SDA074091R1
E2.2	W	2000	Kit F Lower [3]	1SDA074092R1	1SDA074093R1
E2.2	W	2000	Kit VR Upper	1SDA079846R1	1SDA079847R1
E2.2	W	2000	Kit VR Lower	1SDA079848R1	1SDA079849R1
E4.2	W	3200	Kit F Upper [3]	1SDA074098R1	1SDA074099R1
E4.2	W	3200	Kit F Lower [3]	1SDA074100R1	1SDA074101R1
E4.2	W	2500	Kit VR Upper	1SDA079856R1	1SDA079857R1
E4.2	W	2500	Kit VR Lower	1SDA079858R1	1SDA079859R1
E6.2	W	6000	Kit F Upper [3]	1SDA074106R1	1SDA074107R1
E6.2	W	6000	Kit F Lower [3]	1SDA074109R1	1SDA074110R1
E6.2	W	5000	Kit VR Upper	1SDA079882R1	1SDA079883R1
E6.2	W	5000	Kit VR Lower	1SDA079885R1	1SDA079886R1
E6.2/f	W	5000	Kit VR Upper	-	1SDA079884R1
E6.2/f	W	5000	Kit VR Lower	-	1SDA079887R1

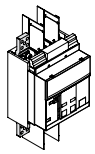
1) ES terminals can be ordered only if the cradle also has EF terminals.
2) Vertical terminals are supplied as standard for E4.2, 3200A. For this size and amperage, HR is not possible.
3) Not UL listed

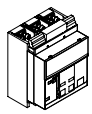
Accessories
Terminals

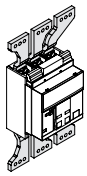

Rear orientable terminal - HR VR

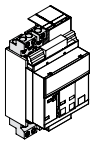

Horizontal rear spread terminal - SHR


Vertical rear spread terminal - SVR


Extended front terminal - EF


Front terminal - F

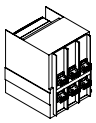

Front spread terminal - ES

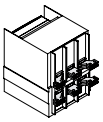

Terminal for cable FcCuAl 4x240mm² - Fc CuAl

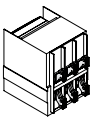
Kit for terminals - loose supply for one side of fixed circuit breaker

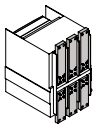
Size	Version	Max amperage	Type	3 pieces	4 pieces
				Global code	Global code
E1.2	F	1200	Kit EF [1)]	1SDA073967R1	1SDA073968R1
E1.2	F	1200	Kit F	1SDA073973R1	1SDA073973R1
E1.2	F	1200	Kit ES [1)]	1SDA073979R1	1SDA073980R1
E1.2	F	1200	Kit Adjustable HR/VR	1SDA079844R1	1SDA079845R1
E1.2	F	1200	Kit FcCuAl 4x500kcmil/240mm² [1)]	1SDA074001R1	1SDA074002R1
E2.2	F	2000	Kit F Upper [1)]	1SDA074122R1	1SDA074123R1
E2.2	F	2000	Kit F Lower [1)]	1SDA074124R1	1SDA074125R1
E2.2	F	2000	Adjustable HR/VR	1SDA079850R1	1SDA079851R1
E4.2	F	3200	Kit F Upper [1)]	1SDA074130R1	1SDA074131R1
E4.2	F	3200	Kit F Lower [1)]	1SDA074132R1	1SDA074133R1
E4.2	F	2500	Kit Adjustable HR/VR	1SDA079860R1	1SDA079861R1
E4.2	F	3200	Kit VR	1SDA079866R1	1SDA079867R1
E6.2	F	6000	Kit F Upper [1)]	1SDA074140R1	1SDA074141R1
E6.2	F	6000	Kit F Lower [1)]	1SDA074143R1	1SDA074144R1
E6.2	F	5000	Kit Adjustable HR/VR	1SDA079888R1	1SDA079889R1
E6.2	F	6000	Kit VR	1SDA079895R1	
E6.2/f	F	5000	Kit Adjustable HR/VR	-	1SDA079890R1

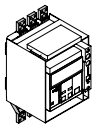
1) Not UL listed

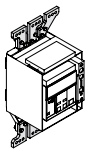

Rear orientable terminal - HR VR

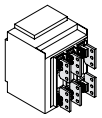

Horizontal rear terminal - SHR


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 one side of cradle

Size	Version	Max amperage	Type	3 pieces	4 pieces
				Global code	Global code
E1.2	W	1200	Kit EF [2]	1SDA073943R1	1SDA073944R1
E1.2	W	1200	Kit ES [1] [2]	1SDA073955R1	1SDA073956R1
E1.2	W	1200	Kit Adjustable HR/VR	1SDA079834R1	1SDA079835R1
E1.2	W	1200	Kit FcCuAl 4x 500kcmil/240mm^2 [2]	1SDA073995R1	1SDA073996R1
E2.2	W	2000	Kit F Upper [2]	1SDA074094R1	1SDA074095R1
E2.2	W	2000	Kit F Lower [2]	1SDA074096R1	1SDA074097R1
E2.2	W	2000	Kit Adjustable HR/VR	1SDA079850R1	1SDA079851R1
E4.2	W	3200	Kit F Upper [2]	1SDA074102R1	1SDA074103R1
E4.2	W	3200	Kit F Lower [2]	1SDA074104R1	1SDA074105R1
E4.2	W	2500	Kit Adjustable HR/VR	1SDA079860R1	1SDA079861R1
E4.2	W	3200	Kit VR	1SDA079866R1	1SDA079867R1
E6.2	W	6000	Kit F Upper [2]	1SDA074112R1	1SDA074113R1
E6.2	W	6000	Kit F Lower [2]	1SDA074115R1	1SDA074116R1
E6.2	W	5000	Kit Adjustable HR/VR	1SDA079888R1	1SDA079889R1
E6.2	W	6000	Kit VR	1SDA079895R1	
E6.2/f	W	5000	Kit Adjustable HR/VR	-	1SDA079890R1

1) ES terminals can be ordered only if the cradle also has EF terminals.
2) Not UL listed

Accessories
Service

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

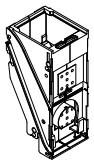
Extended warranty

Size	Type	Code[c)]
E1.2...E6.2	Warranty 2 years E1.2...E6.2[a)]	1SDA082413R1
E1.2	Warranty 4 years E1.2[b)]	1SDA082414R1
E2.2	Warranty 4 years E2.2[b)]	1SDA082415R1
E4.2	Warranty 4 years E4.2[b)]	1SDA082416R1
E6.2	Warranty 4 years E6.2[b)]	1SDA082417R1
E1.2	Warranty 5 years E1.2[b)]	1SDA082418R1
E2.2	Warranty 5 years E2.2[b)]	1SDA082419R1
E4.2	Warranty 5 years E4.2[b)]	1SDA082420R1
E6.2	Warranty 5 years E6.2[b)]	1SDA082421R1

The registration in the Extended Warranty online tool is mandatory
a) Free-of-charge with site details entered
b) 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

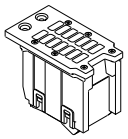
c) Order only with the circuit breaker. Specify Registration code in the order to activate the warranty.

Accessories
Spare parts



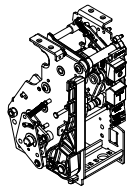
Single phase pole

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2 - Iu≤2000A	3p; 4p	IEC	F; W (MP)	1SDA081187R1	A	3 or 4
E2.2 - Iu=2500A	3p; 4p	IEC	F; W (MP)	1SDA081188R1	A	3 or 4
E4.2	3p; 4p	IEC	F; W (MP)	1SDA081189R1	A	3 or 4
E6.2 - Half phase	3p; 4p; 4p/f	IEC	F; W (MP)	1SDA081190R1	A	6 or 7 or 8



Arching chamber

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2	3p; 4p	IEC	F; W (MP)	1SDA081430R1		3 or 4
E4.2; E6.2	3p; 4p	IEC	F; W (MP)	1SDA081431R1		3 or 4 for E4.2, 6 or 7 or 8 for E6.2



Operating mechanism [a)]

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081191R1	A	1
E4.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081192R1	A	1
E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081193R1	A	1
E6.2	4p/f	IEC/UL	F; W (MP)	1SDA081194R1	A	1

a) Add closing spring

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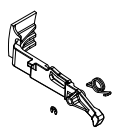
Min quantity = min quantity to complete a circuit-breaker: The quantity is related to the number of phases (3 or 4 polese) of the cirucit-breaker (E6.2 has half phases so quantities are double).
Type A Spare part = only for ABB L3 technicians

Closing Spring

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2 - Iu≤2000A	3p	IEC/UL	F; W (MP)	1SDA081207R1	A	1
E2.2 - Iu≤2000A	4p	IEC/UL	F; W (MP)	1SDA081208R1	A	1
E2.2 - Iu=2500A; E4.2	3p	IEC/UL	F; W (MP)	1SDA081208R1	A	1
E2.2 - Iu=2500A; E4.2	4p	IEC/UL	F; W (MP)	1SDA081209R1	A	1
E6.2	3p	IEC/UL	F; W (MP)	1SDA081210R1	A	1
E6.2	4p; 4p/f	IEC/UL	F; W (MP)	1SDA081211R1	A	1

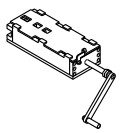
Spring Charging lever

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081217R1	A	1



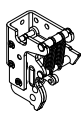
Signalling charged spring lever

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081242R1	A	1



Spring charging device

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC	F; W(MP)	1SDA082230R1	A	1



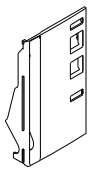
Tripping mechanism

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC	F; W (MP)	1SDA082187R1	A	1

Accessories
Spare parts

Fixing screws kit - 50 pcs

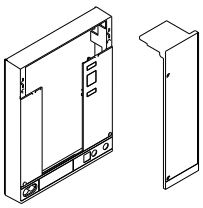
Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2 - wall mounted	3p; 4p	IEC/UL	F	1SDA081179R1		1
E1.2 - floor mounted	3p; 4p	IEC/UL	F	1SDA081413R1		1
E1.2 - floor mounted	3p; 4p	IEC/UL	W (FP)	1SDA081414R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (FP)	1SDA081467R1		1



Safety cover

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081402R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081432R1		1

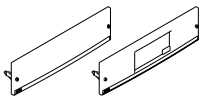
For each part ordered, specify the Serial number of the circuit-breaker it is intended for.



Accessories cover [b)]

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p	IEC/UL	F; W (MP)	1SDA081403R1		1
E1.2	4p	IEC/UL	F; W (MP)	1SDA081404R1		1
E2.2	3p	IEC/UL	F	1SDA081433R1		1
E2.2	4p	IEC/UL	F	1SDA081434R1		1
E2.2	3p	IEC/UL	W (MP)	1SDA081435R1		1
E2.2	4p	IEC/UL	W (MP)	1SDA081436R1		1
E4.2	3p	IEC/UL	F	1SDA081437R1		1
E4.2	4p	IEC/UL	F	1SDA081438R1		1
E4.2	3p	IEC/UL	W (MP)	1SDA081439R1		1
E4.2	4p	IEC/UL	W (MP)	1SDA081440R1		1
E6.2	3p	IEC/UL	F	1SDA081441R1		1
E6.2	4p	IEC/UL	F	1SDA081442R1		1
E6.2	3p	IEC/UL	W (MP)	1SDA081443R1		1
E6.2	4p	IEC/UL	W (MP)	1SDA081444R1		1
E6.2	4p/f	IEC/UL	F	1SDA081445R1		1
E6.2	4p/f	IEC/UL	W (MP)	1SDA081446R1		1
E1.2 - Castell[a)]	3p; 4p	IEC	F; W (MP)	1SDA082145R1		1
E2.2...E6.2 - Castell[a)]	3p; 4p	IEC	F	1SDA082146R1		1
E2.2...E6.2 - Castell[a)] KLC	3p; 4p	IEC	W (MP)	1SDA082149R1		1
E2.2...E6.2 - Castell[a)] KLC+ KLP	3p; 4p	IEC	W (MP)	1SDA082150R1		1
E2.2...E6.2 - Castell[a)] KLP	3p; 4p	IEC	W (MP)	1SDA082151R1		1

a) The lock is not included; b) TU Reset not included. Use the existing one.



Transparent cover for trip unit

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2 DIP	3p; 4p	IEC/UL	F; W (MP)	1SDA081405R1		1
E1.2 Touch	3p; 4p	IEC/UL	F; W (MP)	1SDA081406R1		1
E2.2; E4.2; E6.2 DIP	3p; 4p	IEC/UL	F; W (MP)	1SDA081447R1		1
E2.2; E4.2; E6.2 Touch	3p; 4p	IEC/UL	F; W (MP)	1SDA081448R1		1

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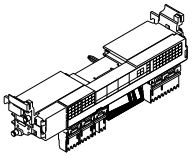
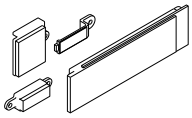
Type A Spare part = only for ABB L3 technicians



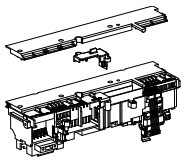
Sliding contact for Moving Part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p	IEC/UL	W (MP)	1SDA081167R1		1
E1.2	4p	IEC/UL	W (MP)	1SDA081168R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (MP)	1SDA081212R1		1
E2.2; E4.2; E6.2 - MS	3p; 4p	IEC/UL	W (MP)	1SDA081213R1		1



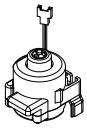
Kit front cover plugs

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081415R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081471R1		1



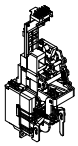
Terminal box connection interface

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	F	1SDA081409R1	A	1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081451R1	A	1
E2.2; E4.2; E6.2 - MS	3p; 4p	IEC/UL	F; W (MP)	1SDA081452R1	A	1



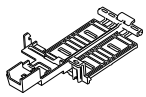
Trip coil

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081407R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081449R1		1



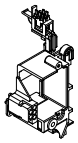
Right plate for accessories (Right MID)

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081214R1	A	1
E2.2; E4.2; E6.2 - MS	3p; 4p	IEC/UL	F; W (MP)	1SDA081215R1	A	1



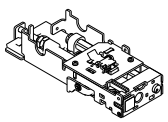
Cover for right plate for accessories (Right MID Cover)

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081466R1		1



Left plate for accessories (Left MID)

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081170R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081453R1		1



Racked in and out device (CD)

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (MP)	1SDA081216R1	A	1

CD lock lever

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (MP)	1SDA081256R1	A	1

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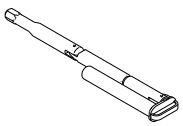
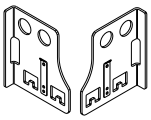
Type A Spare part = only for ABB L3 technicians

Accessories
Spare parts



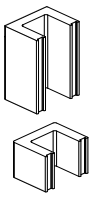
Racking in and out lever

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	W (MP)	1SDA081410R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (MP)	1SDA081455R1		1



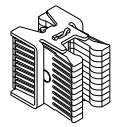
Lifting plates

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081454R1		1



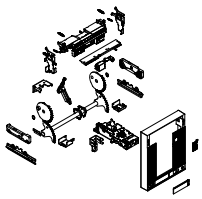
Moving part terminals

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2 - Iu≤2000A	3p; 4p	IEC	W (MP)	1SDA081243R1	A	3 or 4
E2.2 - Iu=2500A	3p; 4p	IEC	W (MP)	1SDA081244R1	A	3 or 4
E4.2 - Iu≤3200A	3p; 4p	IEC	W (MP)	1SDA081245R1	A	3 or 4
E4.2 - Iu=4000A	3p; 4p	IEC	W (MP)	1SDA081246R1	A	3 or 4
E6.2	3p; 4p/f	IEC	W (MP)	1SDA081247R1	A	6 or 7 or 8



Jaw contacts

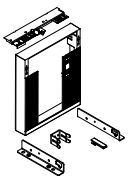
Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC	W (FP)	1SDA081164R1	A	3 or 4
E2.2 - Iu≤2000A	3p; 4p	IEC	W (FP)	1SDA081195R1	A	3 or 4
E2.2 - Iu=2500A	3p; 4p	IEC	W (FP)	1SDA081196R1	A	3 or 4
E4.2 - Iu≤3200A	3p; 4p	IEC	W (FP)	1SDA081197R1	A	3 or 4
E4.2 - Iu=4000A	3p; 4p	IEC	W (FP)	1SDA081198R1	A	3 or 4
E6.2	3p; 4p; 4p/f	IEC	W (FP)	1SDA081199R1	A	6 or 7 or 8



Conversion kit from Fixed to Moving part *

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p	IEC	F	1SDA081176R1	A	1
E1.2	4p	IEC	F	1SDA081177R1	A	1
E2.2	3p	IEC	F	1SDA081234R1	A	1
E2.2	4p	IEC	F	1SDA081235R1	A	1
E4.2	3p	IEC	F	1SDA081236R1	A	1
E4.2	4p	IEC	F	1SDA081237R1	A	1
E6.2	3p	IEC	F	1SDA081238R1	A	1
E6.2	4p	IEC	F	1SDA081239R1	A	1
E6.2	4p/f	IEC	F	1SDA081240R1	A	1

For each part ordered, specify the Serial number of the circuit-breaker it is intended for; * moving part terminals not included



Conversion kit from Moving Part into Fixed version *

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2 - wall mounted	3p; 4p	IEC/UL	W (MP)	1SDA081178R1	A	1
E1.2 - floor mounted	3p; 4p	IEC/UL	W (MP)	1SDA082303R1	A	1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (MP)	1SDA081241R1	A	1

For each part ordered, it is mandatory to specify the Serial number of the circuit-breaker it is intended for; * Standard terminals not included

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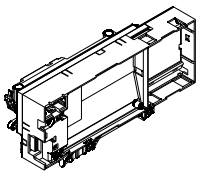
Type A Spare part = only for ABB L3 technicians



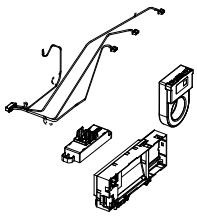
Main board

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081408R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081450R1		1

For each part ordered, it is mandatory to specify the Serial number of the circuit-breaker it is intended for.

Trip Unit Battery

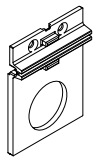
Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2; E2.2; E4.2; E6.2	3p; 4p	IEC/UL	F; W (MP)	1SDA074193R1		1



Main board + Sensors + cables

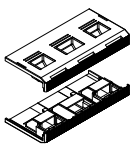
Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2	3p	IEC/UL	F; W (MP)	1SDA081200R1	A	1
E2.2	4p	IEC/UL	F; W (MP)	1SDA081201R1	A	1
E4.2	3p	IEC/UL	F; W (MP)	1SDA081202R1	A	1
E4.2	4p	IEC/UL	F; W (MP)	1SDA081203R1	A	1
E6.2	3p	IEC/UL	F; W (MP)	1SDA081204R1	A	1
E6.2	4p	IEC/UL	F; W (MP)	1SDA081205R1	A	1
E6.2	4p/f	IEC/UL	F; W (MP)	1SDA081206R1	A	1

For each part ordered, it is mandatory to specify the Serial number of the circuit-breaker it is intended for.



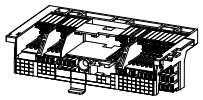
Sensors plastic covers

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081468R1		1
E4.2	3p; 4p	IEC/UL	F; W (MP)	1SDA081469R1		1
E6.2	3p; 4p; 4p/f	IEC/UL	F; W (MP)	1SDA081470R1		1



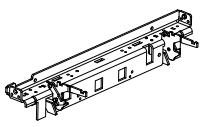
Terminal covers

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p	IEC/UL	W (MP)	1SDA081182R1		1
E1.2	4p	IEC/UL	W (MP)	1SDA081183R1		1



Terminal box fixed part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC/UL	W (FP)	1SDA081180R1	A	1
E2.2; E4.2	3p; 4p	IEC	W (FP)	1SDA082152R1	A	1
E6.2	3p; 4p; 4p/f	IEC	W (FP)	1SDA082153R1	A	1



Support for terminal box of Fixed Part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p	IEC/UL	W (FP)	1SDA082237R1	A	1
E1.2	4p	IEC/UL	W (FP)	1SDA082238R1	A	1
E2.2	3p	IEC/UL	W (FP)	1SDA081249R1	A	1
E2.2	4p	IEC/UL	W (FP)	1SDA081250R1	A	1
E4.2	3p	IEC/UL	W (FP)	1SDA081251R1	A	1
E4.2	4p	IEC/UL	W (FP)	1SDA081252R1	A	1
E6.2	3p	IEC/UL	W (FP)	1SDA081253R1	A	1
E6.2	4p	IEC/UL	W (FP)	1SDA081254R1	A	1
E6.2	4p/f	IEC/UL	W (FP)	1SDA081255R1	A	1

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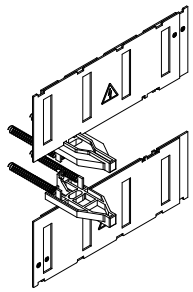
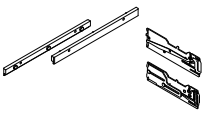
Type A Spare part = only for ABB L3 technicians

Accessories
Spare parts



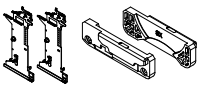
Safety shutters for fixed part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p	IEC	W (FP)	1SDA081411R1		1
E1.2	4p	IEC	W (FP)	1SDA081412R1		1
E2.2	3p	IEC	W (FP)	1SDA081457R1		1
E2.2	4p	IEC	W (FP)	1SDA081458R1		1
E4.2	3p	IEC	W (FP)	1SDA081459R1		1
E4.2	4p	IEC	W (FP)	1SDA081460R1		1
E6.2	3p	IEC	W (FP)	1SDA081461R1		1
E6.2	4p	IEC	W (FP)	1SDA081462R1		1
E6.2	4p/f	IEC	W (FP)	1SDA081463R1		1



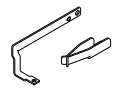
Lateral guides for fixed part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC	W (FP)	1SDA082154R1	A	1



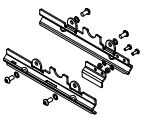
Lateral guides for Moving part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E1.2	3p; 4p	IEC	W (MP)	1SDA082188R1		1
E2.2; E4.2; E6.2	3p; 4p	IEC	W (MP)	1SDA082302R1		1



Earth sliding contact for Fixed Part

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (FP)	1SDA081465R1		1



Safety cover

Size	Poles	IEC/UL	Version	Code	Type spare	Min quantity
E2.2; E4.2; E6.2	3p; 4p	IEC/UL	W (MP)	1SDA081464R1		1

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Type A Spare part = only for ABB L3 technicians

The complete ordering codes for original and guaranteed spare parts are available in the ABB SACE Spare Parts Catalog – 1SDC001007D0204.

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