Technical catalog - March 2017

SACE Emax 2
New low voltage power circuit breakers to ANSI C37 / UL 1066 standards

Index

SACE Emax 2
Consultation guide

Main characteristics

Overview of the SACE Emax 2 family

1

Guide to selection

UL 1066 Automatic circuit breakers

IR @ 508VAC	Version	800	1200	1600	2000	2500	3200	4000	5000	6000[1]
100	V-A					E4.2		E6.2		
85	H-A			E2.2						
65	S-A									
50	N-A	E1.2								
42	B-A									

[1] Version not yet available. Contact ABB.

UL 1066 Switch disconnectors

Withstand	Version	800	1200	1600	2000	2500	3200	4000	5000	6000[1]
100	V-A					E4.2		E6.2		
85	H-A			E2.2						
65	S-A									
50	N-A	E1.2								
42	B-A									

[1] Version not yet available. Contact ABB.

Protection trip units

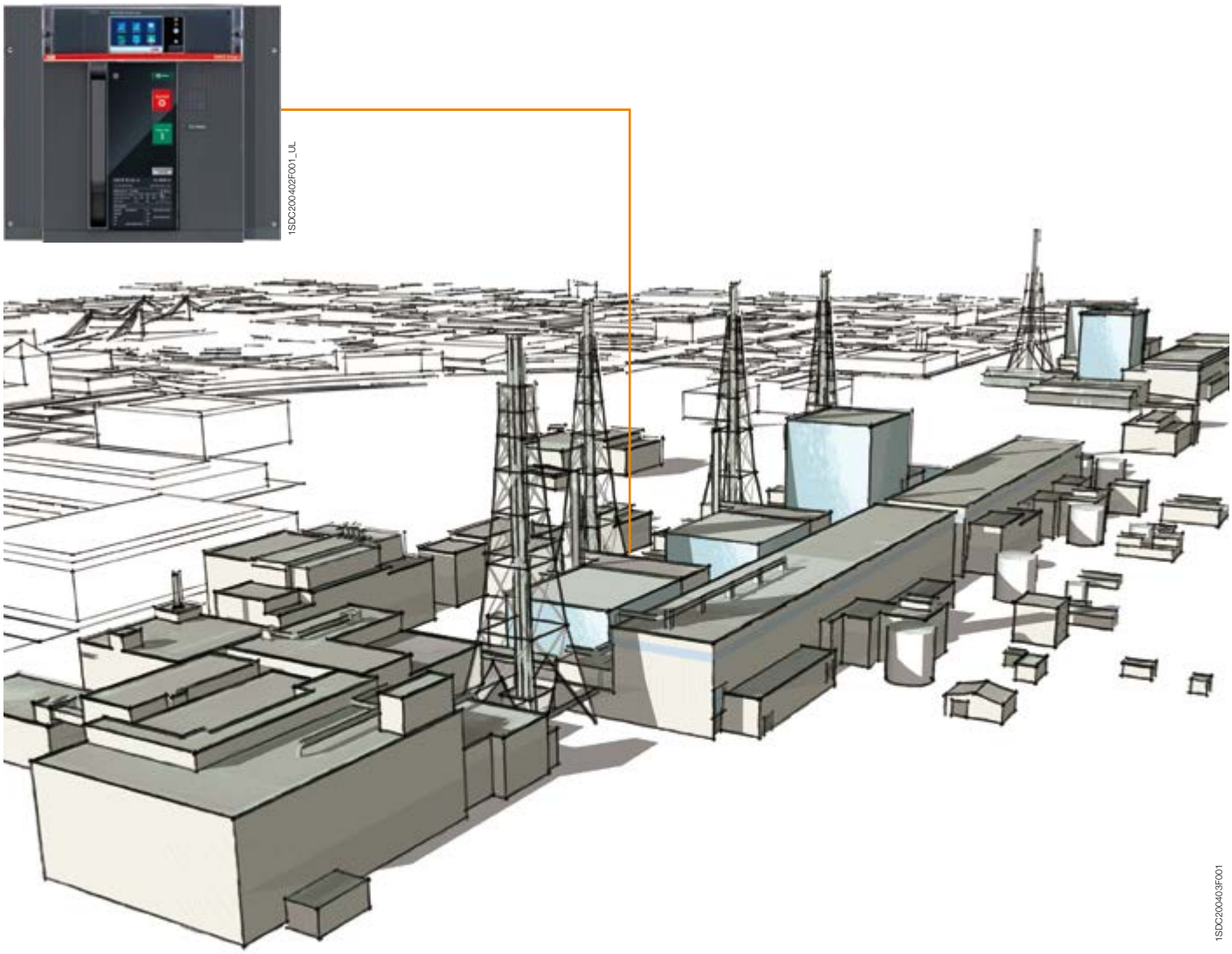
Version	Application		
	Distribution	**Power control**	**Generators**
Ekip Dip	Protection	-	-
Ekip Touch	Protection and Measurement	Protection, Measurement and Load control	-
Ekip Hi-Touch	Protection, Measurement and Network Analyzer	Protection, Measurement, Network Analyzer and Load control	-
Ekip G Touch	-	Protection, Measurement and Load control	Protection and Measurement
Ekip G Hi-Touch	-	Protection, Measurement, Network Analyzer and Load control	Protection, Measurements and Network Analyzer

Distinctive features

SACE Emax 2 is a new series of low voltage power circuit breakers available up to 6000A[1)] and certified to ANSI C37 standards under UL 1066. With the ability to efficiently and simply control electrical installations – from the traditional to the more complex – with minimum impact, the new SACE Emax 2 circuit breakers represent the evolution of a circuit breaker into a Power Manager.

Efficiency

SACE Emax 2 power circuit breakers have been designed to manage, with maximum efficiency, all low voltage electrical installations: from industrial plants, naval applications, traditional and renewable power generation installations to buildings, shopping centres, data centres and communication networks.
Achieving maximum efficiency of an electrical installation in order to reduce consumption and waste 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.



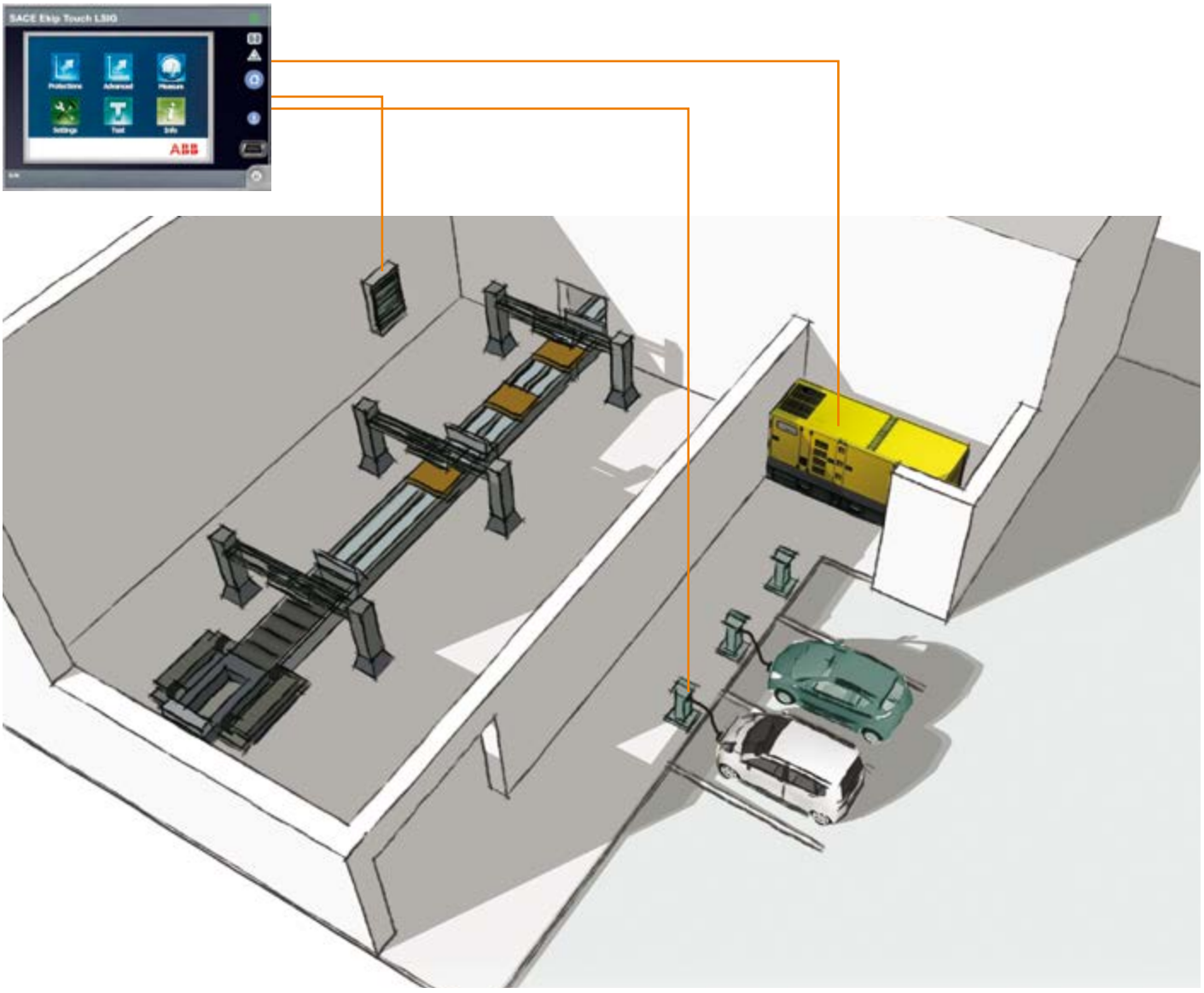
[1)] Version not yet available. Contact ABB.

Distinctive features

1

Control

The exclusive **Power Controller** function available on the new SACE Emax 2 circuit breakers monitors the power managed by the circuit breaker, 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 monitoring system is required: it is sufficient to set the required load limit on Emax 2, which can control any circuit breaker located downstream, even if it is not equipped with a measurement function. In installations that are already equipped with energy management systems, the load limit can also be modified remotely.
SACE Emax 2 circuit breakers are equipped with a new generation of protection trip units that are easy to program and read. The Ekip Touch trip units measure power and energy with precision and store the most recent alarms, events and measurements, in order to prevent faults to the installation or trip effectively when necessary. The Ekip Hi-Touch does the same and also features the **Network Analyzer** function, which controls the quality of absorbed power in real time and with extreme precision and …. it is in agreement with *IEEE 1159 Recommended Practice for Monitoring Electric Power Quality* and IEEE 1250; *Guide for Identifying and Improving Voltage Quality in Power Systems*. In addition, the innovative Ekip Touch and Hi-Touch trip units in the G version include all the functions of generator protection switchgear, offering a safe control solution that is ready to use. No external devices, wiring or inspections are required. The Ekip G trip unit functions are in agreement with the parameters and settings detailed in IEEE 242; *IEEE Recommended Practice for Protection and Coordination of Industrial and Power Systems and IEEE C37.102; IEEE Guide for AC Generator Protection*.



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 available for direct use with Modbus, Profibus, and DeviceNet protocols as well as the modern Modbus TCP, Profinet and EtherNet IP protocols. 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).
Accurate measurements of current, voltage, power and energy are all available by means of the communication modules.
The trip units themselves can be used as multimeters that display the measurements available, or the Ekip Multimeter can be connected in the front of the switchgear without the need for external instruments and bulky transformers.
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 operator panel.
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 to easily mount to the most common busbar arangements without modification, while the push-in connections of the auxiliaries ensure immediate and safe wiring.

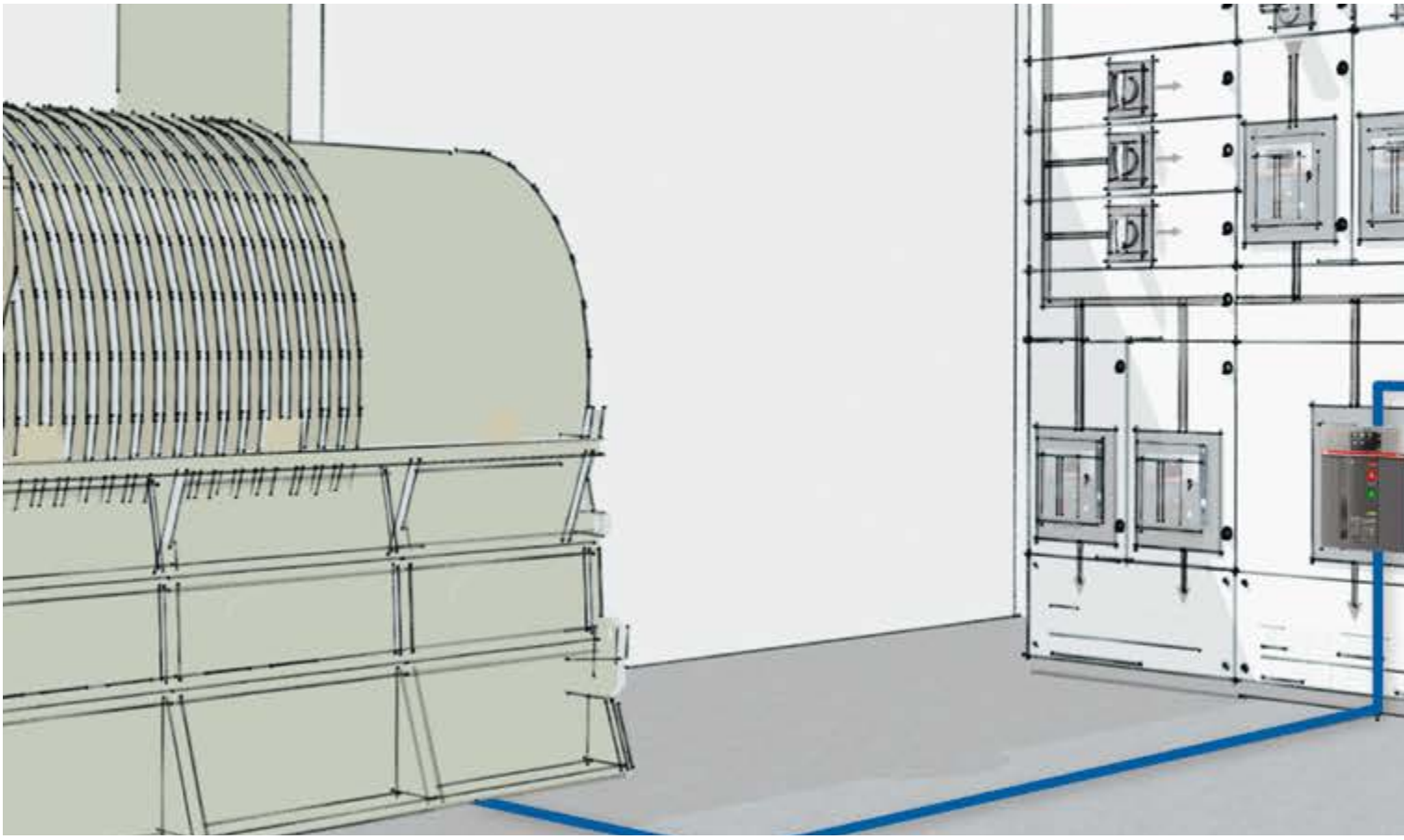
1SDC200406F001

Performance

The SACE Emax 2 for UL 1066 range is made up of 4 sizes: E1.2, E2.2, E4.2 and E6.2 up to 6000A[1)], 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 uniform throughout the sizes to meet the demands and needs of today's installations, from 42kA to 150kA at 508V and to standardize switchgear projects.
High short-time withstand 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.

In particular:

- **E1.2** offers 1200A with an interrupting rating of up to 65kA and a short-time withstand current of 50kA in an extremely compact structure. In the three and four pole version, it offers the sturdiness of SACE Emax with reduced dimensions and enables switchgear of 65kA to be built in units of 16 inches, which is indispensable in places where reduced dimensions are essential, such as naval and offshore installations.
- **E2.2** enables ratings of up to 2000A to be achieved in switchgear with a width of 16 inches when the three pole version is used. In addition, it provides an interrupting rating of up to 100kA and withstand current of up to 85kA.
- **E4.2** is the new standard for circuit breakers up to 3200A. It is designed for interrupting ratings up to 100kA at 508V and short-time withstand currents of up to 100kA without the need for particular precautions.
- **E6.2** is the top of the range, with an interrupting rating of 100kA, a withstand rating of up to 100kA and a structure that allows 6000A[1)] to be reached, even in complex installation conditions.

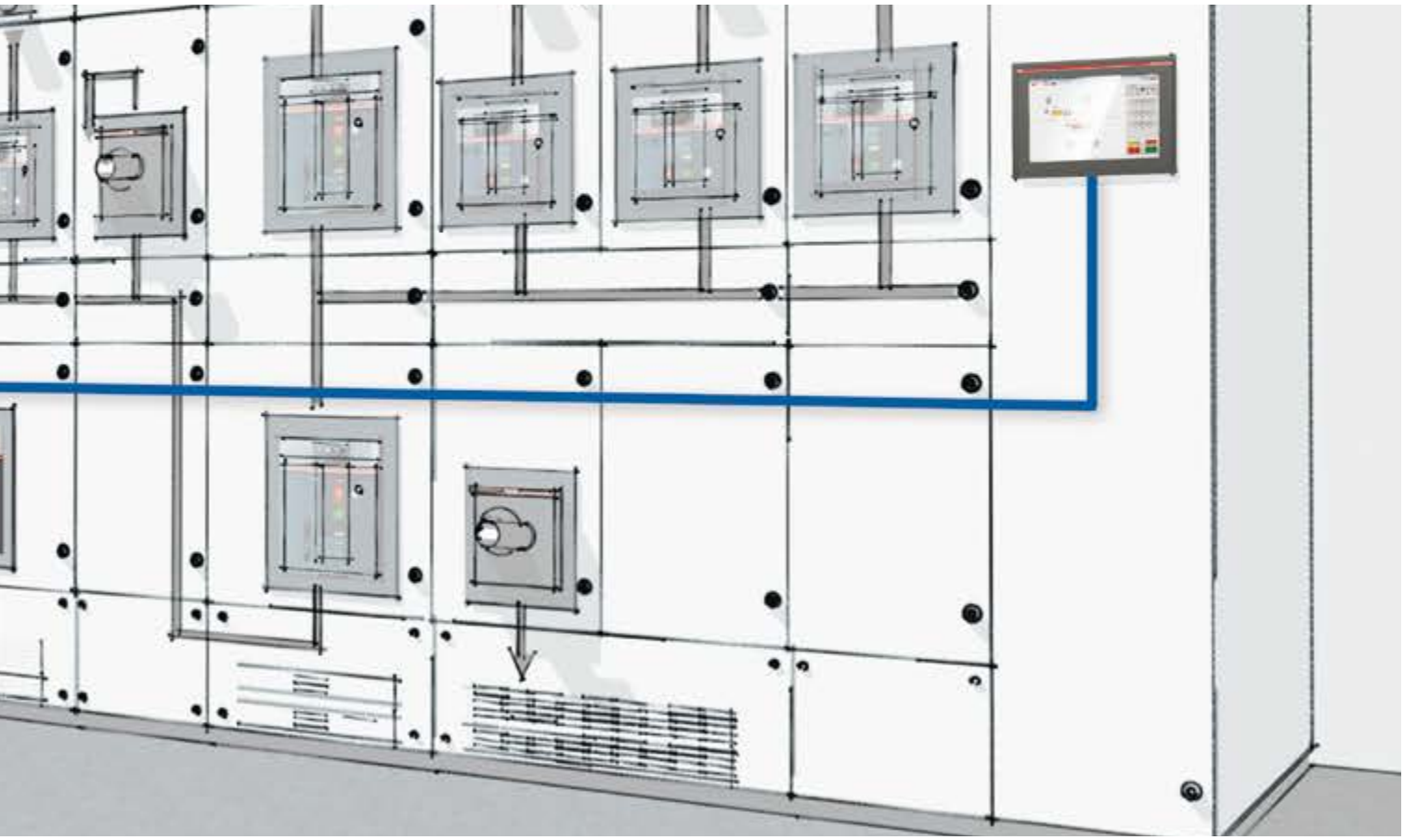


[1)] Version not yet available. Contact ABB.

Ease of use and safety

The entire range is available in fixed and drawout 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 either from above or below.
All essential information is available in the central area of the front cover 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 cover, the main accessories can be frontally accessed without exposing the operating mechanism or other components.
The drawout circuit breaker is inserted and removed via dedicated guide rails that can be fully extened outward and 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 cradle 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 and Hi-Touch protection trip units are equipped with a large, color touch-screen display that 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.

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.



1SDC200407F001

Distinctive features

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 signaling of overcurrent trip unit 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

1SDC200408F001

Registro Italiano Navale (RINA): Italian


1SDC200411F001

Germanischer Lloyd (GL): Deutsch


1SDC200414R001

Russian Maritime Register of Shipping (RMRS): Russian

1SDC200409F001

Lloyd’s Register of Shipping (LR): English

1SDC200412F001

Bureau Veritas (BV): French

1SDC200415F001

Nippon Kaiji Kyokai (NKK): Japan

1SDC200410R001

American Bureau Shipping (ABS): American

1SDC200413F001

Det Norske Veritas (DNV): Norway

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

Product conformity

1

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.

1SDC200416F001

1SDC200417F001

1SDC200418F001

1SDC200419F001

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.

1SDC200420F001

1SDC200421F001

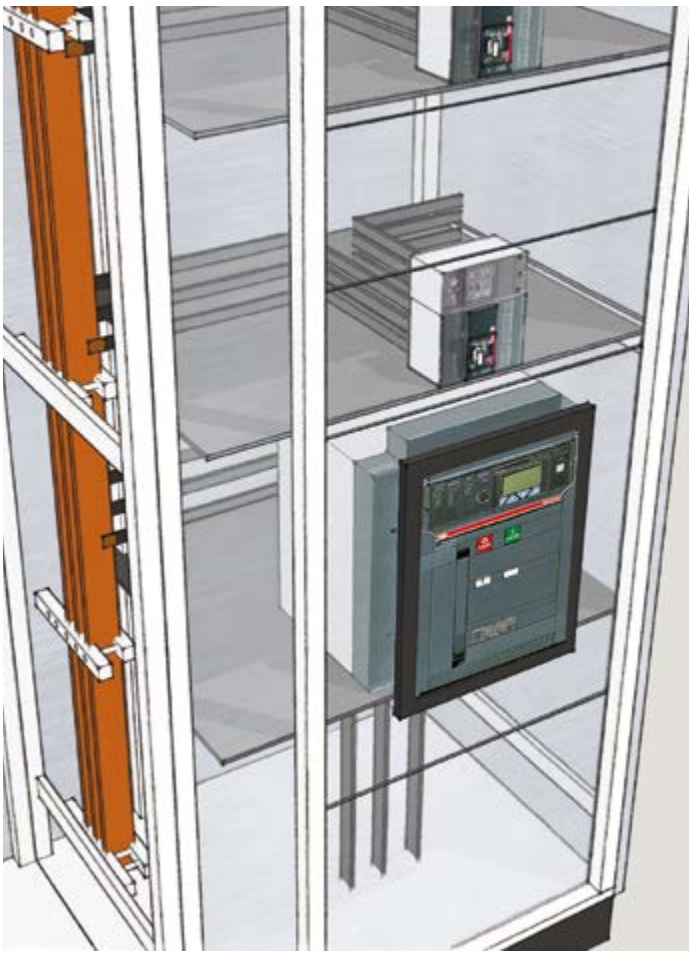
ABB SACE Global Service

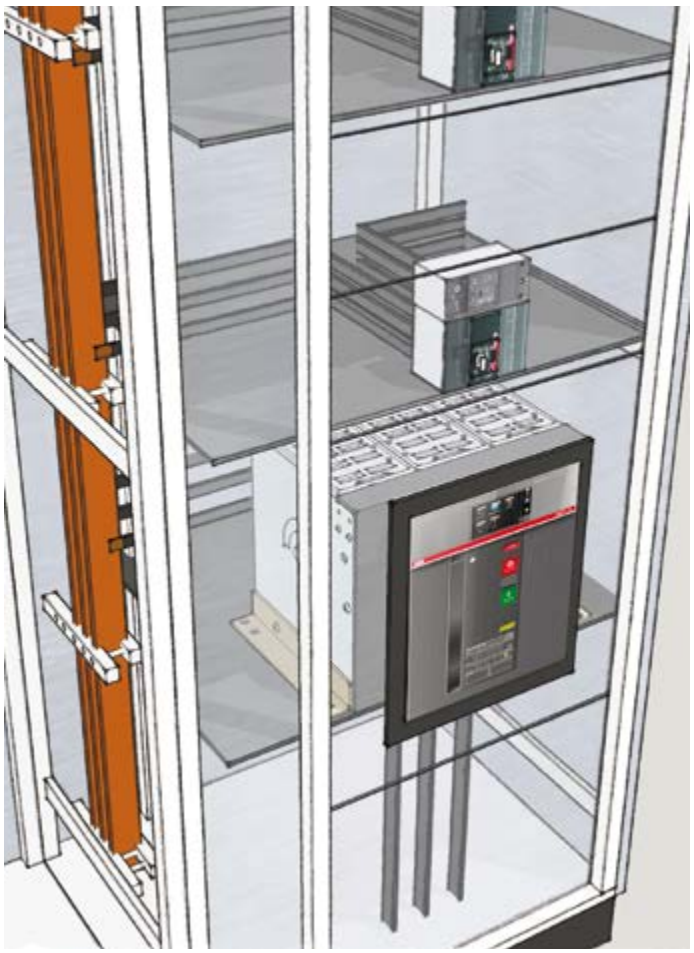
1

ABB's technical assistance service offers solutions aimed at supporting customers 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 Emax 2 and Emax is a retrofill solution: it is therefore possible to replace the drawout version of Emax with an equivalent Emax 2 model without changing the switchboard busbars, by simply removing the cradle of Emax replacing it with a cradle of Emax 2 which has been suitably modified with dedicated terminals.


1SDC200422F001


1SDC200423F001

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		

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

[1] Version not yet available. Contact ABB.


1SDC200425F001_UL


1SDC200426F001_UL


1SDC200427F001_UL

	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			2000	6000[1)]	6000[1)]
			2000	2000	1200			2500		
					1600			3200		
					2000					
	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			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			486/554/620 lbs 220/251/281 kg	

	E2.2			E4.2			E6.2		
	< 1600	1600	2000	< 2500	2500	3200	4000	5000	6000[1)]
	25	25	25	20	20	20	12	12	12
	60	60	60	60	60	60	60	60	60
	15	12	10	10	8	7	4	3	2
	15	10	8	10	8	7	4	2	2
	30	30	30	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]			
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	

1) Version not yet available. Contact ABB.

	E2.2			E4.2			E6.2	
	N-A	**S-A**	**V-A**	**S-A**	**H-A**	**V-A**	**L-A**	
	1600	800	800	2500	2500	800	4000	
	2000	1600	1600	3200	3200	1600	5000	
		2000	2000			2000	6000[1)]	
						2500		
						3200		
	100	100	100	100	100	100	50-100	50-100
	50	65	85	65	85	100	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	4000	5000	6000
	25	25	25	20	20	20	12	12	12
	60	60	60	60	60	60	60	60	60
	15	12	10	10	8	7	4	3	2
	15	10	8	10	8	7	4	2	2
	30	30	30	20	20	20	10	10	10

SACE Emax 2 power circuit breakers IEC 60947

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

SACE Emax 2 for IEC 60947			E1.2			
Performance levels			**B**	**C**	**N**	**L**
Rated uninterrupted current Iu @ 40°C		[A]	630	630	250	630
		[A]	800	800	630	800
		[A]	1000	1000	800	1000
		[A]	1250	1250	1000	1250
		[A]	1600	1600	1250	
		[A]			1600	
		[A]				
Neutral pole current-carrying capacity for 4-pole CBs		[%Iu]	100	100	100	100
Rated ultimate short-circuit breaking capacity Icu	400-415 V	[kA]	42	50	66	150
	440 V	[kA]	42	50	66	130
	500-525 V	[kA]	42	42	50	100
	690 V	[kA]	42	42	50	45
Rated service short-circuit breaking capacity Ics		[%Icu]	100	100	100[1)]	100
Rated short-time withstand current Icw	(1s)	[kA]	42	42	50	15
	(3s)	[kA]	24	24	36	-
Rated short-circuit making capacity (peak value) Icm	400-415 V	[kA]	88	105	145	330
	440 V	[kA]	88	105	145	286
	500-525 V	[kA]	88	88	105	220
	690 V	[kA]	88	88	105	132
Utilization category (according to IEC 60947-2)			B	B	B	A
Breaking time	I<Icw	[ms]	40	40	40	40
	I>Icw	[ms]	25	25	25	10
Dimensions	H - Fixed/Withdrawable	[mm]	296/363.5	296/363.5	296/363.5	296/363.5
	D - Fixed/Withdrawable	[mm]	183/271	183/271	183/271	183/271
	W - Fixed 3p/4p/4p full size	[mm]	210/280			
	W - Withdrawable 3p/4p/4p full size	[mm]	278/348			
Weights (CB with trip unit and current sensor)	Fixed 3p/4p	kg	14/16			
	Withdrawable 3p/4p/4p full size including fixed part	kg	38/43			

1) Ics: 50kA for 400V...440V voltage; 2) Ics: 125kA for 400V...440V voltage; 3) E4.2H 3200A: 66kA Icw (3s)

SACE Emax 2 for IEC 60947			E1.2			
Mechanical life with regular ordinary maintenance prescribed by the manufacturer		[Iu]	≤ 1000	1250	1600	1250 L
		[No. cycles x 1000]	20	20	20	20
	Frequency	[Oper./Hour]	60	60	60	60
Electrical life with regular ordinary maintenance prescribed by the manufacturer	440 V	[No. cycles x 1000]	8	8	8	3
	690 V	[No. cycles x 1000]	8	6.5	6.5	1
	Frequency	[Oper./Hour]	30	30	30	30


1SDC200425F001_UL


1SDC200426F001_UL


1SDC200427F001_UL

	E2.2				E4.2				E6.2		
	B	**N**	**S**	**H**	**N**	**S**	**H**	**V**	**H**	**V**	**X**
	1600	800	250	800	3200	3200	3200	2000	4000	4000	4000
	2000	1000	800	1000	4000	4000	4000	2500	5000	5000	5000
		1250	1000	1250				3200	6300	6300	6300
		1600	1250	1600				4000			
		2000	1600	2000							
		2500	2000	2500							
			2500								
	100	100	100	100	100	100	100	100	50-100	50-100	50-100
	42	66	85	100	66	85	100	150	100	150	200
	42	66	85	100	66	85	100	150	100	150	200
	42	66	66	85	66	66	85	100	100	130	130
	42	66	66	85	66	66	85	100	100	100	120
	100	100	100	100	100	100	100	100[2)]	100	100	100
	42	66	66	85	66	66	85	100	100	100	120
	42	50	50	66	50	66	75[3)]	75	100	100	100
	88	145	187	220	145	187	220	330	220	330	440
	88	145	187	220	145	187	220	330	220	330	440
	88	145	145	187	145	145	187	220	220	286	286
	88	145	145	187	145	145	187	220	220	220	264
	B	B	B	B	B	B	B	B	B	B	B
	40	40	40	40	40	40	40	40	40	40	40
	25	25	25	25	25	25	25	25	25	25	25
	371/425	371/425	371/425	371/425	371/425	371/425	371/425	371/425	371/425	371/425	371/425
	270/383	270/383	270/383	270/383	270/383	270/383	270/383	270/383	270/383	270/383	270/383
	276/366				384/510				762/888/1014		
	317/407				425/551				803/929/1069		
	41/53				56/70				109/125/140		
	54/99				110/136				207/234/260		

	E2.2				E4.2				E6.2		
	< 1600	1600	2000	2500	< 2500	2500	3200	4000	4000	5000	6300
	25	25	25	20	20	20	20	15	12	12	12
	60	60	60	60	60	60	60	60	60	60	60
	15	12	10	8	10	8	7	5	4	3	2
	15	10	8	7	10	8	7	4	4	2	2
	30	30	30	30	20	20	20	20	10	10	10

SACE Emax 2 switch disconnectors IEC 60947

Switch disconnectors, identified with the abbreviation "/MS", are devices that satisfy the isolating specifications provided by the IEC 60947-3 Standard. The switch disconnectors are derived from the corresponding automatic circuit breakers, and they have the same dimensions and accessory options. This version differs from the automatic circuit breakers only because of the absence of protection trip units.

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 60947-3

SACE Emax 2 for IEC 60947			E1.2		
Performance levels			**B/MS**	**N/MS**	
Rated uninterrupted current Iu @ 40°C		[A]	630	250	
		[A]	800	630	
		[A]	1000	800	
		[A]	1250	1000	
		[A]	1600	1250	
		[A]		1600	
Neutral pole current-carrying capacity for 4-pole CBs		[%Iu]	100	100	
Rated short-time withstand current Icw	(1s)	[kA]	42	50	
	(3s)	[kA]	24	36	
Rated short-circuit making capacity (peak value) Icm	400-415 V	[kA]	88	105	
	440 V	[kA]	88	105	
	500-525 V	[kA]	88	105	
	690 V	[kA]	88	105	
Utilization category (according to IEC 60947-3)			AC-23A	AC-23A	
Dimensions	H - Fixed / Withdrawable	[mm]	296 / 363.5	296 / 363.5	
	D - Fixed / Withdrawable	[mm]	183 / 271	183 / 271	
	W - Fixed 3p/4p/4p full size	[mm]	210 / 280		
	W - Withdrawable 3p/4p/4p full size	[mm]	278 / 348		

SACE Emax 2 for IEC 60947			E1.2		
Mechanical life with regular ordinary maintenance prescribed by the manufacturer		[Iu]	< 1000	1000	1600
		[No. cycles x 1000]	20	20	20
	Frequency	[Oper./Hour]	60	60	60
Electrical life with regular ordinary maintenance prescribed by the manufacturer	440 V	[No. cycles x 1000]	8	8	8
	690 V	[No. cycles x 1000]	8	6.5	6.5
	Frequency	[Oper./Hour]	30	30	30

The device, when in the open position, guarantees an isolating distance between the main contacts of the circuit breaker that is sufficient to ensure that the installation downstream is not live.
Furthermore the switch disconnectors, if used with an external protection relay with maximum delay of 500ms, enable a breaking capacity at a maximum rated operating voltage (Ue) equal to the value of rated short-time withstand current (Icw) for one second.

	E2.2			E4.2			E6.2
	B/MS	**N/MS**	**H/MS**	**N/MS**	**H/MS**	**V/MS**	**H/MS**
	1600	800	800	3200	3200	2000	4000
	2000	1000	1000	4000	4000	2500	5000
		1250	1250			3200	6300
		1600	1600			4000	
		2000	2000				
		2500	2500				
	100	100	100	100	100	100	50-100
	42	66	85	66	85	100	100
	42	50	66	36	66	75	100
	88	145	187	145	187	220	220
	88	145	187	145	187	220	220
	88	145	187	145	187	220	220
	88	145	187	145	187	220	220
	AC-23A	AC-23A	AC-23A	AC-23A	AC-23A	AC-23A	AC-23A
	371 / 425	371 / 425	371 / 425	371 / 425	371 / 425	371 / 425	371 / 425
	270 / 383	270 / 383	270 / 383	270 / 383	270 / 383	270 / 383	270 / 383
	276 / 366			384 / 510			762 / 888 / 1014
	317 / 407			425 / 551			803 / 929 / 1069

	E2.2				E4.2				E6.2		
	< 1600	1600	2000	2500	< 2500	2500	3200	4000	4000	5000	6300
	25	25	25	20	20	20	20	15	12	12	12
	60	60	60	60	60	60	60	60	60	60	60
	15	12	10	8	10	8	7	5	4	3	2
	15	10	8	7	10	8	7	4	4	2	2
	30	30	30	30	20	20	20	20	10	10	10

2

Protection trip units

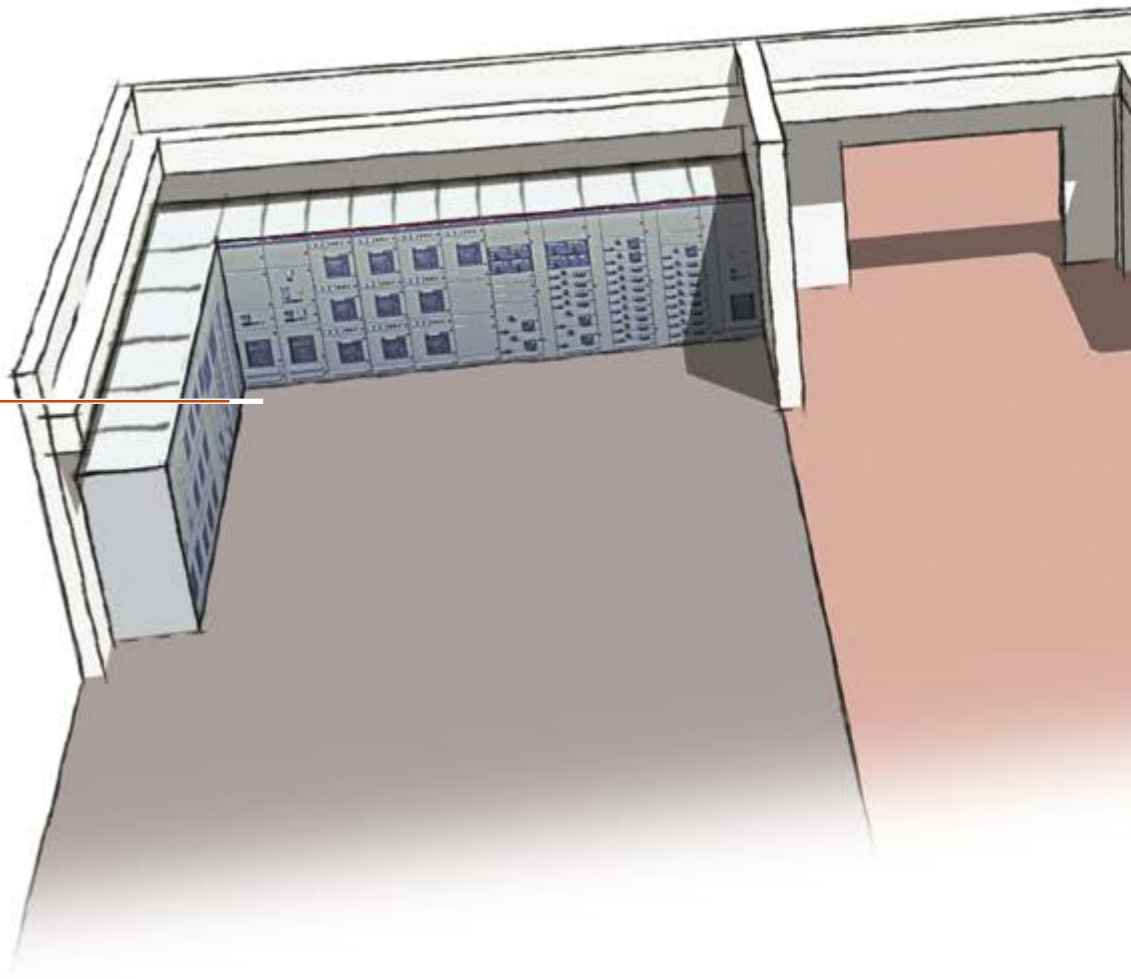
Protection trip units
Introduction

The SACE Emax 2 Ekip protection trip units are the new benchmark for the protection, measurement and control of low voltage electrical systems. The result of ABB SACE's experience and research, they make Emax 2 not only a circuit breaker, but an actual Power Manager with all the functions necessary for optimal management of the system without the need for external devices.

The protection units are divided into two families: Ekip for distribution protection and Ekip G for generator protection. The trip unit range is available with three levels of performance, Dip, Touch and Hi-Touch, to satisfy simple to advanced applications. Exclusive functions such as the Ekip Power Controller and Network Analyzer complete the range, enabling power management and analysis of energy quality.
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	Power Control
Ekip Dip	Distribution	with Ekip Multimeter	–	–	–	–
Ekip Touch		•	with Ekip Measuring	with Ekip Measuring Pro	–	with Ekip Power Controller
Ekip Hi-Touch		•	•	•	•	
Ekip G Touch	Generators	•	•	•	–	with Ekip Power Controller
Ekip G Hi-Touch		•	•	•	•	

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

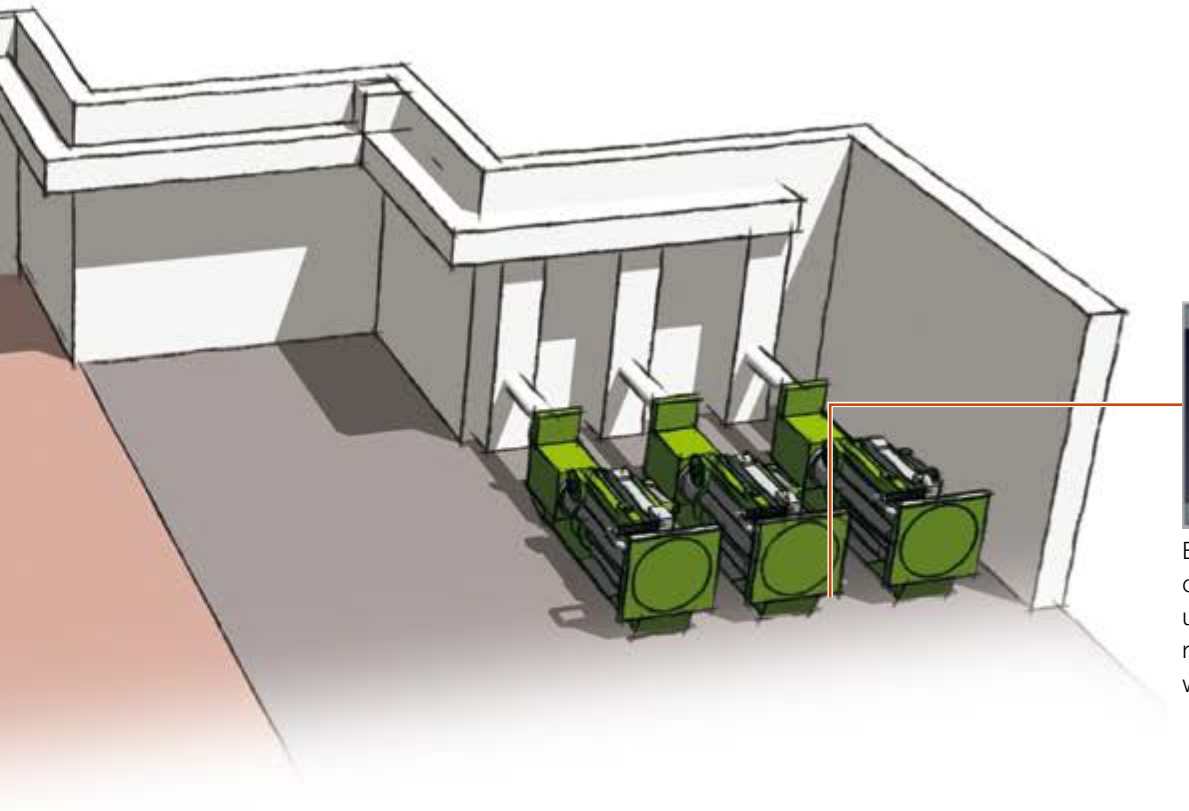


The **trip units for power distribution**, available in the LI, LSI and LSIG versions, are suited to all distribution systems. The Ekip trip units are designed to protect a vast range of applications, such as use with transformers, motors and drives. Ekip Dip, Ekip Touch or Ekip Hi-Touch can be selected,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

The Ekip G range of trip units enables the **protection of generators** without the use of external devices that require dedicated relays and wiring. It was was created to respect the parameters and settings detailed in IEEE 242; *IEEE Recommended Practice for Protection and Coordination of Industrial and Power Systems* and IEEE C37.102; *IEEE Guide for AC Generator Protection*, and offers a safe control solution that is ready to use. 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.

Ekip Power Controller is the new function that controls the power absorbed, thereby increasing the efficiency of the system. This ABB SACE patented function measures power and energy but also controls, loads and generators in order to optimize the power consumed, without the use of complex external automation logic.

Thanks to the **Network Analyzer** function integrated into all Hi-Touch versions, the quality of energy in terms of harmonics, micro-interruptions or voltage dips is monitored with no dedicated instrumentation required. The Network Analyzer function is in agreement with IEEE 1159; *Recommended Practice for Monitoring Electric Power Quality* and IEEE 1250; *Guide for Identifying and Improving Voltage Quality in Power Systems*. It not only acts as an Event Indicator, but provides recordings and statistics that allow effective preventive and corrective action to be implemented through accurate fault analysis, thereby improving the system's efficiency.



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

1SDC200442F001

Protection trip units
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 main board and protection trip unit 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 of the SACE Emax 2 family are self-powered by current that flows through the circuit breaker. They guarantee excellent reliability due to a system of self-controlled internal connections. The setting, testing and downloading of reports can be carried out directly from a Smartphone, Tablet or PC.

Easily installed cartridge type modules enable the units to be integrated into the most complex systems. Additional functions can be created, such as:

- **Synchrocheck**, checks the synchronization between two busbar systems before enabling circuit breaker closing;
- Communication with all **supervision systems** is available in the Modbus, Profibus and DeviceNet protocols as well as the modern Modbus TCP, Profinet and EtherNet/IP protocols;
- **Integration into Smart Grids** according to the IEC61850 standard (used to communicate with high and medium voltage substation automation systems), without the need for an external converter;
- 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 Signaling** modules that make a high number of electrical input and output contacts available;
- Logical interlocks between circuit breakers, which can be made with the **Ekip Link** proprietary communication protocol, avoiding complex wiring because of the transmission of all signals via bus.

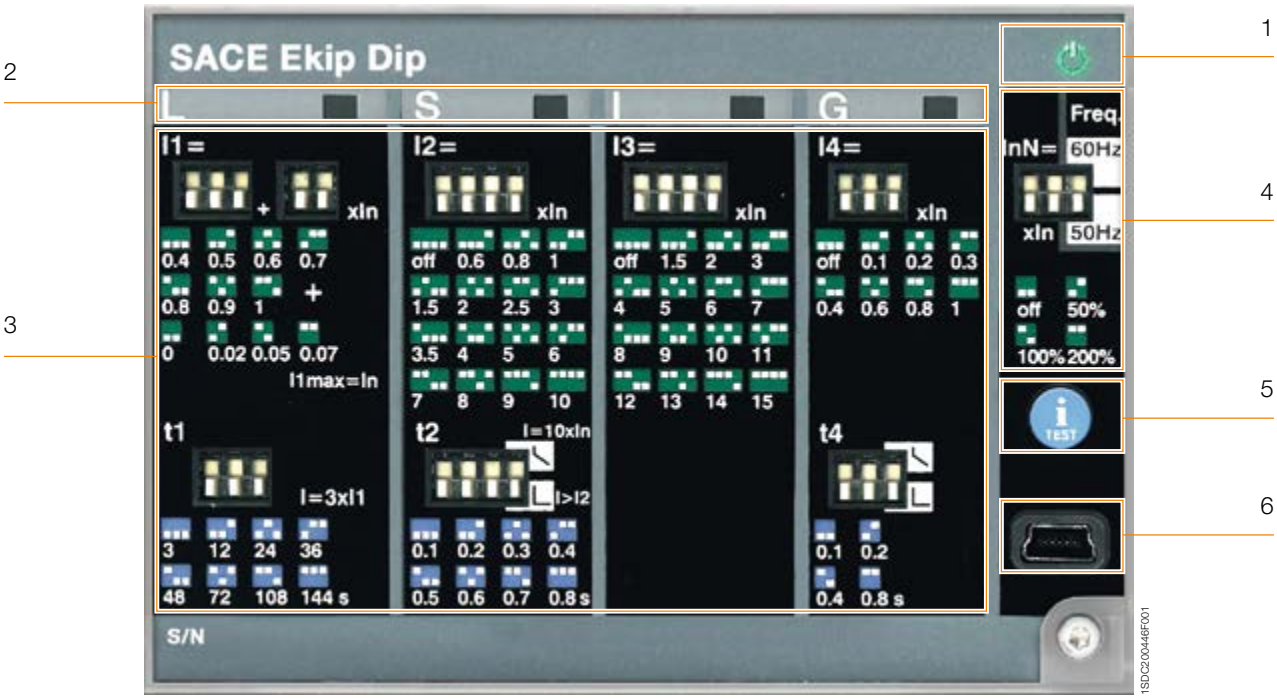
1SDC200445F001

Characteristics

Ekip Dip is the new protection trip unit of the SACE Emax 2 family for all applications in which high accuracy and reliable protection against overcurrent are required. 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**

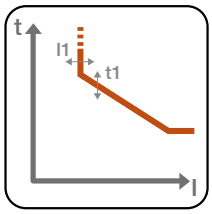


Key:

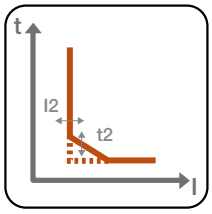
1. Power-on LED for Signaling correct operation (watchdog)
2. LEDs for alarm Signaling of L, S, I and G protection functions and diagnostics
3. Dip switches for setting the protection functions
4. Dip switches for setting the network frequency and neutral protection device
5. Pushbutton for test and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

Protection functions

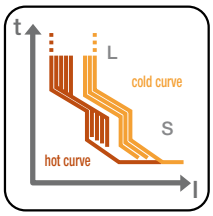
Ekip Dip offers overcurrent protection functions and, in the event of tripping, controls the opening of the circuit breaker, preventing it from closing again unless it has been reset by the operator (lockout device – code ANSI 86).



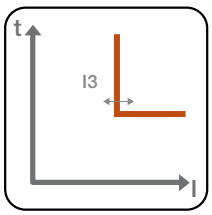
Overload (L - ANSI 49): with inverse long-time delay trip of the type t = k/I² available with 25 current thresholds and 8 curves, it provides effective protection of all systems. A pre-alarm warning is also available on reaching 90% of the threshold set.



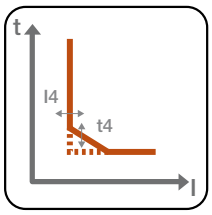
Time-delayed overcurrent (S - ANSI 51 & 50TD): with constant tripping time (t = k), or with constant specific let-through energy (t = k/I²), it provides 15 current thresholds and 8 curves, for fine adjustment. The function can be excluded by setting the dip switch combination to “OFF”.



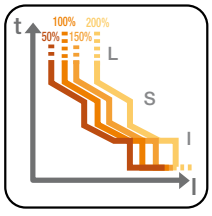
Thermal memory: for L and S protection functions, this is used to protect components, such as transformers, from overheating following an overload. The function, which can be enabled by the Ekip Connect software, adjusts the protection tripping time according to the length of time that has elapsed since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



Ground fault (G - ANSI 51N & 50NTD): with tripping time independent of current (t = k) or constant specific let-through energy (t = k/I²). 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.

Protection trip units for power distribution
Ekip Dip

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 from 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 during troubleshooting or 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 the circuit breaker, pre-alarms, editing settings);
– Number of mechanical and electric operations of the circuit breaker;
– Total operating time;
– Contact wear (endurance);
– 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 controls 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 preserve 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, the protections 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-control 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 of an external power supply because a battery is installed inside the unit.

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 along with alarm status and information from the circuit breaker to be displayed. It is also possible to set parameters such as date, time and thermal memory and for records to be reset.

Test function

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

– Ekip TT to run the trip test, the LEDs test and check absence of alarms detected by the watchdog function;
– Ekip T&P to permit not only the trip test and LEDs test but also to run the test of the individual protection functions and save the relative report;
– ITest key that is 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 (24-48VDC or 110-240VDC) and an alternating current (110-240VAC) 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	~10 A for 5 ms	~10 A for 5 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.

Characteristics

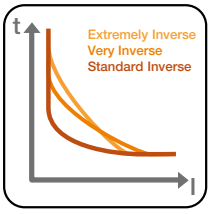
Ekip Touch is the new protection trip unit for SACE Emax 2 that provides a complete series of protections and high accuracy measurements of all electric parameters and can be integrated perfectly with the most common automation and supervision systems.
The simple and intuitive touch screen interface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

Key:
1. Wide high-resolution color 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

Protection functions

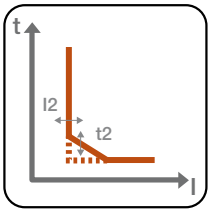
Ekip Touch enables all the protection functions to be set with a few simple steps directly from the wide touchscreen display. If the circuit breaker is tripped it must be reset manually or electrically by the operator (lockout relay – code ANSI 86).



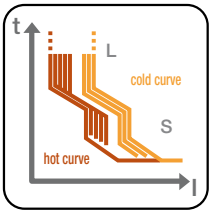
Overload (L - ANSI 49): available with three different types of trip curve:

1. $t = k/I^2$ with inverse long time;
2. IDMT in accordance with IEC 60255-3 for coordination with medium voltage protections, that are available according to the Standard Inverse (SI), Very Inverse (VI) and Extremely Inverse (EI) curves;
3. with $t = k/I^4$ curve for better coordination with upstream circuit breakers or with fuses.

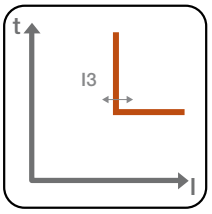
The thresholds can be fine tuned (for example 1A for circuit breaker E1.2 1000A) and the timings to the second can be set directly from the display. The settable pre-alarm indicates the set threshold is reached before the protection is tripped. The protection can be disabled by rating plug L=off.



Time-delayed overcurrent (S - ANSI 51 & 50TD): with constant trip time (t = k), or constant specific let-through energy ($t = k/I^2$).

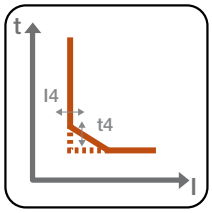


Thermal memory: for protections L and S it is used to protect the components, such as transformers, against overheating following overloads. The protection adjusts the trip time of the protection according to how much time has elapsed after the first overload, taking account of the overheating caused.

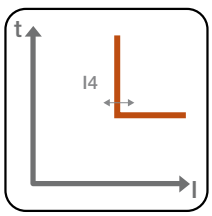


Instantaneous overcurrent (I - ANSI 50): with trip curve without intentional delay.

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.

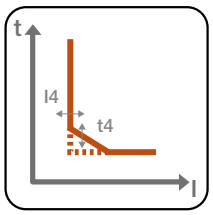


Ground fault (G - ANSI 51N & 50NTD): with trip time independent of the current (t = k) or with constant specific let-through energy ($t = k/I^2$). A pre-alarm indication is also available when 90% of the threshold is reached to activate corrective measures before the protection is tripped. The function also enables the trip to be excluded so that only the alarm is indicated, for use in installations where continuity of service is an essential requirement.

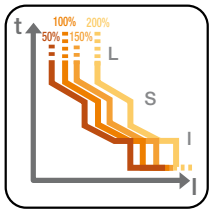


Instantaneous ground fault (G - ANSI 50N): with trip curve without intentional delay.

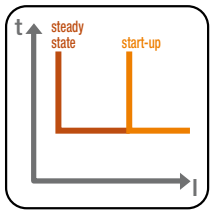
Protection trip units for power distribution
Ekip Touch



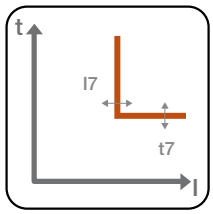
Ground fault on toroid (CT) (G ext - ANSI 51G & 50GTD): with trip time independent of the current (t = k) or with constant specific let-through energy (t = k/I²). Pre-alarm that 90% threshold has been reached permit the fault to be reported to supervision systems without interruption of continuity. The protection uses the external toroid (CT) 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.



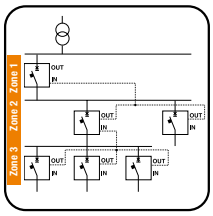
Neutral protection: available at 50%, 100%, 150% or 200% of the phase currents, or disabled, it is applied to the overcurrent protections L, S and I.



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.



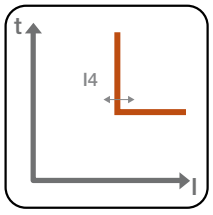
Current imbalance (IU – ANSI 46): with constant trip time (t = k), protects from an imbalance between the currents of the single phases protected by the circuit breaker.



Zone selectivity for S and G protection (ANSI 68): can be used to minimize circuit breaker trip times closest to the fault. The protection is provided by connecting all the zone selectivity outputs of the trip units belonging to the same zone and feeding 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 that detects the fault but does not receive any communication from those downstream 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.

Current thresholds: this function enables the realization of 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 Signaling.

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



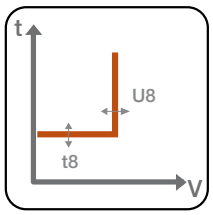
Second protection against instantaneous overcurrent (2I): the function is supplied as standard on all Ekip Touch and Hi-Touch versions. It is an instantaneous protection that permits opening of the circuit breaker faster than the standard I protection. It is independant from ANSI 50, with predetermined thresholds and is a temporarily activation. It can be activated for different uses in three ways:
– locally, directly on the input on the Ekip display unit
– remotely, via any Ekip Com module connected to the circuit breaker
– remotely, via a switch wired through an Ekip Signaling module.
When active, the Ekip display unit will show a confirmation of the activation and a red LED alarm will flash on the diagnosis bar.

Protection functions with Ekip Measuring Pro

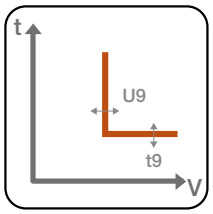
The Ekip Touch protection functions can be further increased by using the Ekip Measuring Pro measuring and protection module. With this module, all the protection functions linked to voltage, frequency and power can be enabled, thus making Ekip Touch a multifunction unit that can measure, control and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

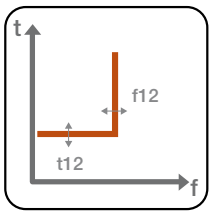
Furthermore, when the voltage and frequency protections are activated, they indicate an alarm status even when the circuit breaker is open so that a fault can be identified before the circuit breaker closes.



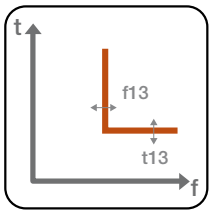
Undervoltage (UV - ANSI 27): with constant trip time (t = k), function is tripped when phase voltage falls below set threshold.



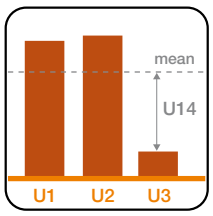
Overvoltage (OV - ANSI 59): with constant trip time (t = k), function is tripped when phase voltage exceeds the set threshold.



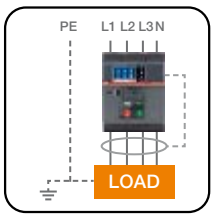
Underfrequency (UF - ANSI 81L): with constant trip time (t = k), function is tripped when network frequency falls below set threshold.



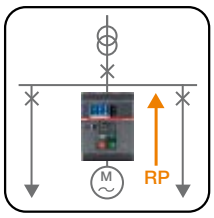
Overfrequency (OF - ANSI 81H):): with constant trip time (t = k), function is tripped when network frequency exceeds the set threshold.



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

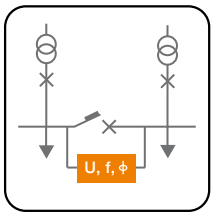


Residual current (Rc – ANSI 64 & 50NDT): with constant temperature (t=k) protects against indirect contacts and is integrated into Ekip Touch LSIG with Ekip Measuring Pro by a dedicated residual current rating plug and external toroid (CT). The protection is an alternative to the functions G and Gext.



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.

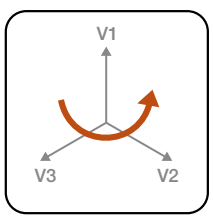
In addition to the protection functions, the following indication and control functions are available to warn the user that a given condition has been reached. The active indications are always shown on the display and are also available by communication on the system bus (with Ekip Com modules) or electrical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



Synchrocheck (SC - ANSI 25): the synchronism control function compares the voltages in the module, the frequency and phase of the two circuits 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 of the frequency of the two voltages below the threshold Δf
  4. difference of the phase of the two voltages below the threshold ΔΦ
  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 Synchrocheck 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.

1SDC200468F001

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.

1SDC200469F001

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 ground 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.

1SDC200470F001

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.

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.

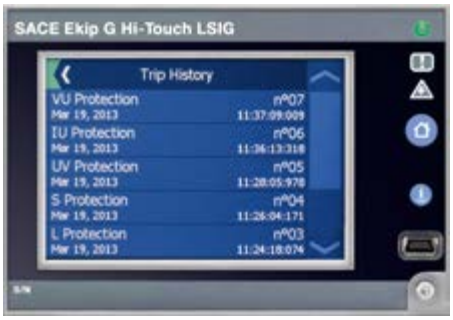
Data logger

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.

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.



1SDC200471F001

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 the 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 (enduarnce) estimated in 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.

Watchdog

All of the trip units in the SACE Emax 2 family ensure high reliability because of an electronic circuit that periodically controls continuity of the internal connections, such as 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 preserves the correct operation of the unit against abnormal temperatures (OT) inside the protection trip unit. The user disposes of the following indications or controls:

– "Warning" LED for temperature below -4°F/-20°C or above 158°F/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

1SDC200472F001

All Ekip Touch operations are simple and intuitive due to the wide graphic color 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, 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 you to return, at any moment, to the main page and the iTest key enables the information to be viewed after a circuit breaker trip or 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.

1SDC200473F001

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).

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

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 of the same protocol can be inserted by use of the redundant version that enables two different addresses to communicate on the same bus.

Test function

For testing the circuit breaker, 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 (always supplied with Ekip Touch);
- 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.

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 Signaling 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 24 VDC auxiliary voltage.

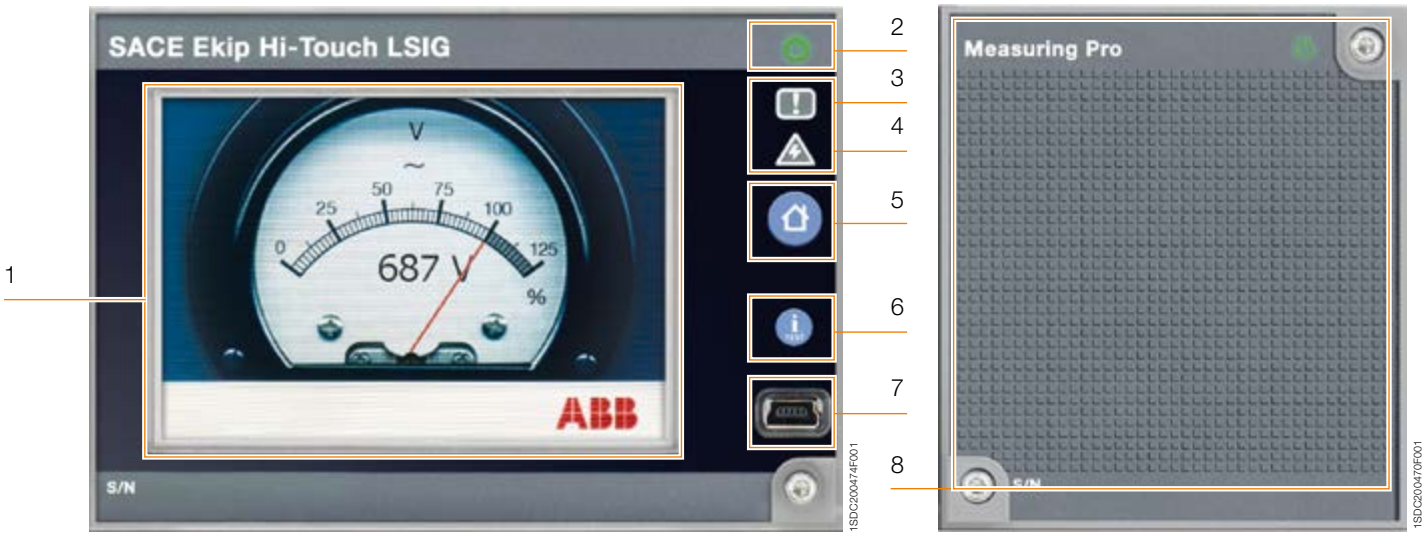
The Ekip Measuring Pro module can supply the Ekip Touch trip unit with line voltage above 85V. In addition, if the module is installed with voltage pick-ups on the supply side, the trip unit can be used even if the circuit breaker is open.
The Ekip Touch protection trip unit is also supplied with a battery 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.

Characteristics

The Ekip Hi-Touch of SACE Emax 2 is a high-performance multifunction unit that is extraordinarily versatile and can be used in even the most complex installations. Ekip Hi-Touch, in fact, features exclusive functions such as: directional protection, restricted ground 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 IEEE 1159 and IEEE 1250.

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 simple to use because of the touchscreen color 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



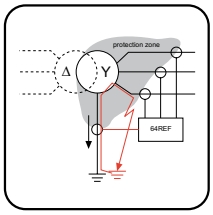
Key:

1. Wide high-resolution color 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

Protection functions

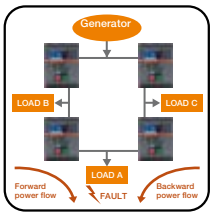
The Ekip Hi-Touch trip unit shares the following protection functions with Ekip Touch:
- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Closing on short-circuit (MCR);
- Ground fault (G – ANSI 51N & 50NTD);
- Instantaneous ground fault (G - ANSI 50N);
- Ground fault on toroid (CT) (G ext – ANSI 51G & 50GTD)
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Current imbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Voltage imbalance (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 protection against instantaneous overcurrent (2I).

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



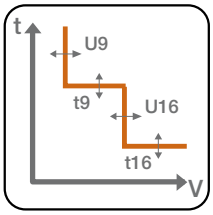
Second protection against ground fault (ANSI 50GTD/51G & 64REF): whereas with Ekip Touch the user has to choose between implementation of the protection G by internal current sensors (calculating the vector sum of the currents) or G ext external toroids (CTs) (direct measurement of the ground fault current),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

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.

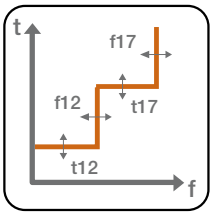


Zone selectivity for protection D (ANSI 68): enables the possibility to connect circuit breakers among them, that in case of fault rapidly isolate the fault area, disconnecting the installation only at the level nearest to the fault, maintaining the operation of the rest of the installation. The function 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.

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 control. The control 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 Signaling 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.

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, IEC 61000-4-30, IEEE 1159 and IEEE 1250, in terms of harmonic content, average value and long or short term changes in voltage. Changes in the quality of energy can cause malfunctions in the switchgear and a reduction in their lifespan, as well as increasing losses and reducing the 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 quality of energy, and shows all results through 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 Signaling event. The quantity of these events is stored in a counter. The counter values are available for each of last 7 days, as well as the total. The measures availabe are the positive and negative sequence voltages and positive and negative sequence currents of the last interval monitored. The interval calculation time 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, set 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 to 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 imbalances:** if the voltages are not equal or the phase displacements between them are not exactly 120°, an imbalance occurs, which is manifested with 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

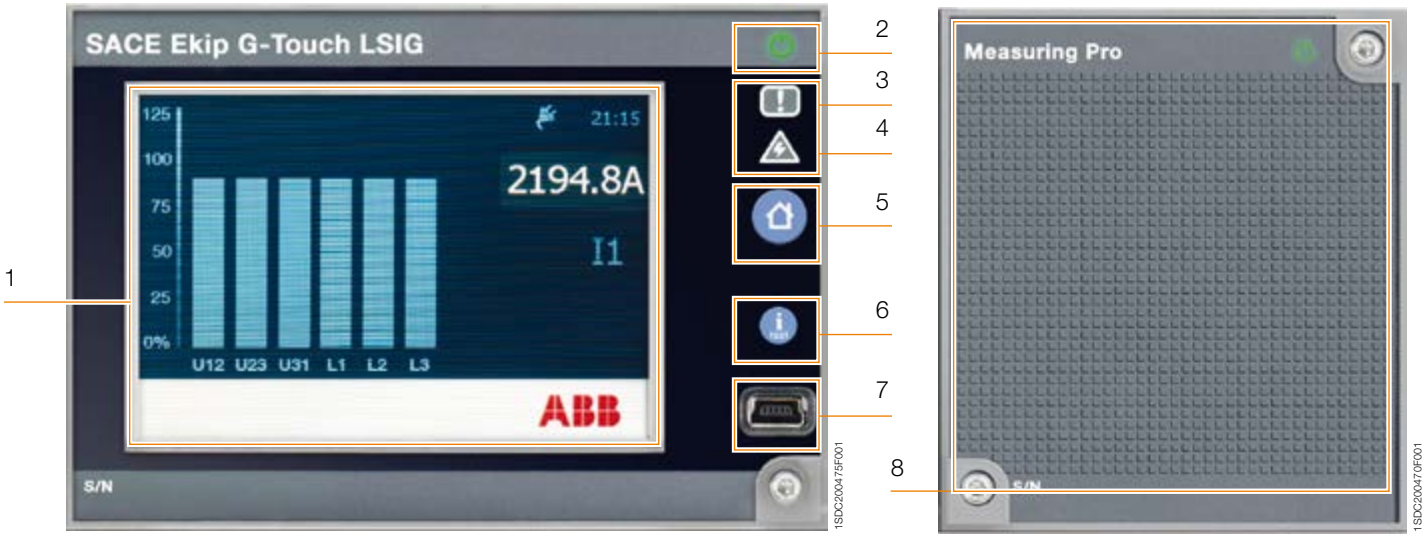
Ekip Hi-Touch integrates all the features in terms of user interface, communication, test and supply described for Ekip Touch equipped with Ekip Measuring Pro.

Protection trip units for generators
Ekip G Touch

Characteristics

Ekip G Touch by SACE Emax 2 is the new protection trip unit designed for use in applications with generators, such as Genset, cogeneration and marine applications, in conformity to international standards IEC 60034-1 and IEEE C37.102. Ekip G Touch has been approved by the main shipping registers and enables the number of components installed, such as external protection devices, current sensors, voltage transformers and the relative cabling, to be reduced. The reductions allow the installation to be significantly simplified. In addition, all the protection functions can be tested individually, using the Ekip T&P device that enables the function to be tested before commissioning.

The unit is available in the Ekip G Touch LSIG version and features all the characteristics provided by Ekip Touch. The Ekip Measuring Pro measuring and protection module is supplied as standard and, like Ekip Touch; the functions can be increased further using the internal modules and the external accessories.
The front interface of the unit, which is common to the Ekip Touch family, is characterised by a wide, high resolution touchscreen display that is simple to use and displays measurements and alarms clearly and accurately.



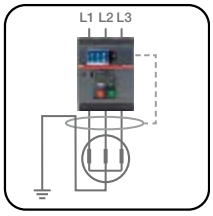
Key:

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

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 G 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:

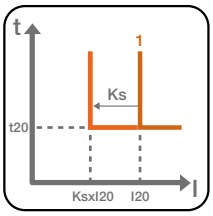
- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Closing on short circuit (MCR);
- Ground fault (G – ANSI 51N & 50NTD);
- Instantaneous ground fault (G - ANSI 50N);
- Ground fault on toroid (CT) (G ext – ANSI 51G & 50GTD);
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Current imbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Voltage imbalance (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);
- Second protection against instantaneous overcurrent (2I).



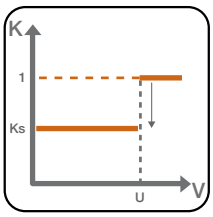
The following protection is also available:
Differential ground fault (Rc - ANSI 87N): protects against internal ground fault on generator winding. It is required that the toroid (CT) hugs the active conductors and the ground conductor. Rc protection is integrated by a dedicated residual current rating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

Protection trip units for generators
Ekip G Touch

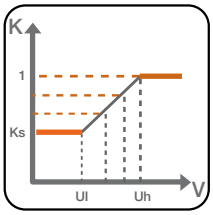
The specific functions for generator protections are described below, for each of which it is possible to choose the operating mode: active, only alarm or deactivated. All the voltage and frequency protections also operate when the circuit breaker is open, enabling the fault to be identified before the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



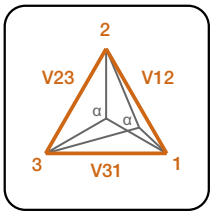
Voltage controlled overcurrent protection (S(V) - ANSI 51V): protection from maximum current with constant trip time (t = k) that is sensitive to the voltage value. The set current threshold, following a voltage drop, decreases by steps or linearly.



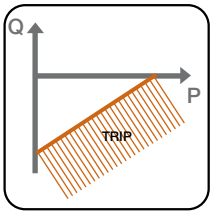
In step mode (controlled mode) the protection is tripped at the set threshold (I20) if the voltage is above U, whereas it is tripped at the lower threshold of the factor Ks (I20 * Ks) if the voltage is below U.



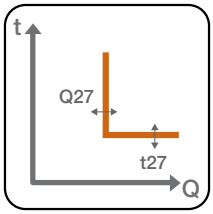
On the other hand, in linear mode (restrained mode) two voltage limits are selected within which the protection is tripped at the set threshold (I20) reduced by the factor K corresponding to the measured voltage. The variation of the factor K is proportional to the voltage, and for voltages greater than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



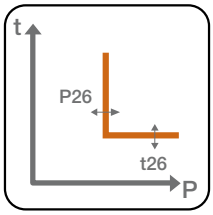
Residual overvoltage (RV – ANSI 59N): with constant trip time (t = k), protects against insulation loss in systems with insulated neutral or with neutral ground with impedance.



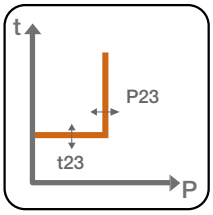
Loss of field or reverse reactive power (RQ – ANSI 40 or 32RQ): with constant trip time (t = k), is tripped when the total reactive power absorbed by the generator exceeds the set threshold. It is possible to select the constant threshold (k=0) or a function of the delivered active power of the generator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



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 electric signal or via incoming communication to a relay.

Protection trip units for generators
Ekip G Touch

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 from 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.

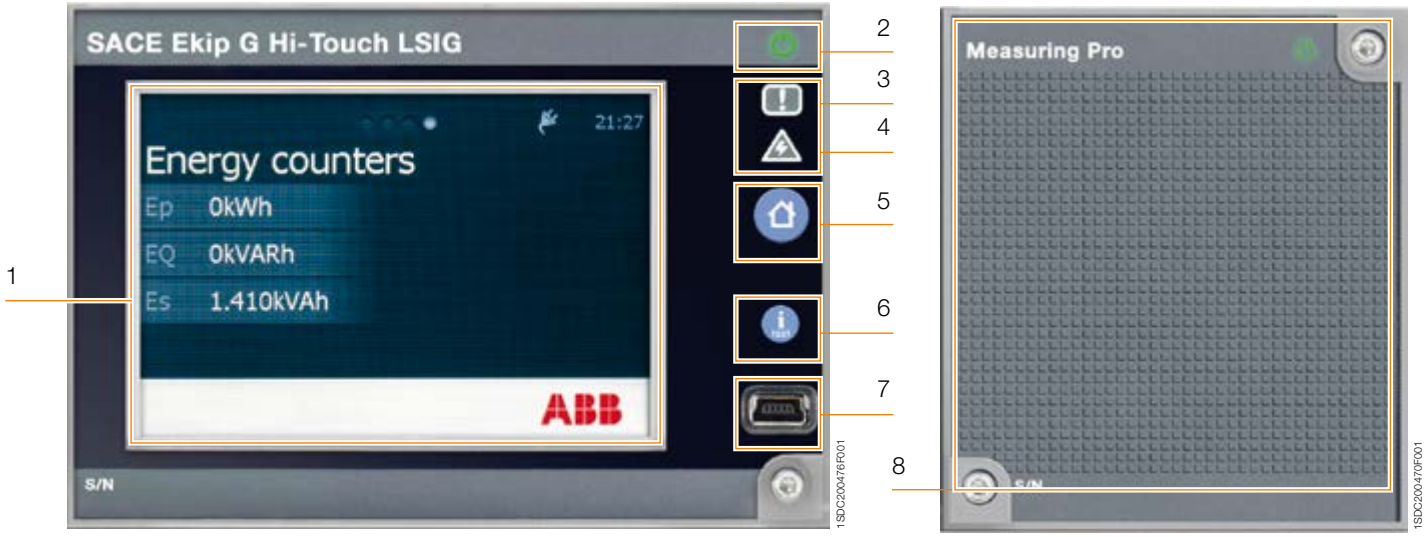
Protection trip units for generators
Ekip G Hi-Touch

Characteristics

SACE Emax 2's Ekip G Hi-Touch is the new benchmark for the protection of low voltage electric generators. It provides optimum protection, even in complex installations, due to exclusive functions such as protection against frequency creep and maximum directional current.

Ekip G Hi-Touch, like all Hi-Touch trip units, is supplied as standard with the Ekip Measuring Pro measuring and protection module and enables an independent second set of protections to be set. In addition, the Network Analyzer function enables it to monitor the quality of the power delivered by the generator.

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



Key:

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

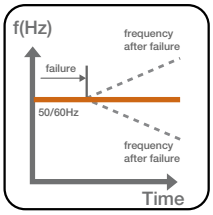
Protection trip units for generators
Ekip G Hi-Touch

Protection functions

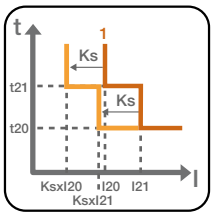
The Ekip G Hi-Touch trip unit is provided with the following protection functions, common to Ekip Hi-Touch:

– 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);
– Ground fault (G – ANSI 51N & 50NTD);
– Instantaneous ground fault (G - ANSI 50N);
– Second protection against ground fault (ANSI 50GTD/51G & 64REF);
– Ground fault on toroid (CT) (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 imbalance (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 imbalance (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);
– Second protection against instantaneous overcurrent (2I).

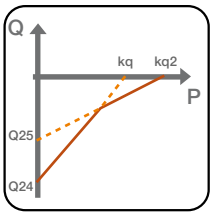
In addition, the following protections are also available:



Rate of change of frequency (ROCOF – ANSI 81R): enables both positive and negative frequency variations to be detected rapidly. 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.

Measurements

The Ekip G Hi-Touch trip unit provides all the measurements available with Ekip Hi-Touch:
- Network Analyzer, in conformity to 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.

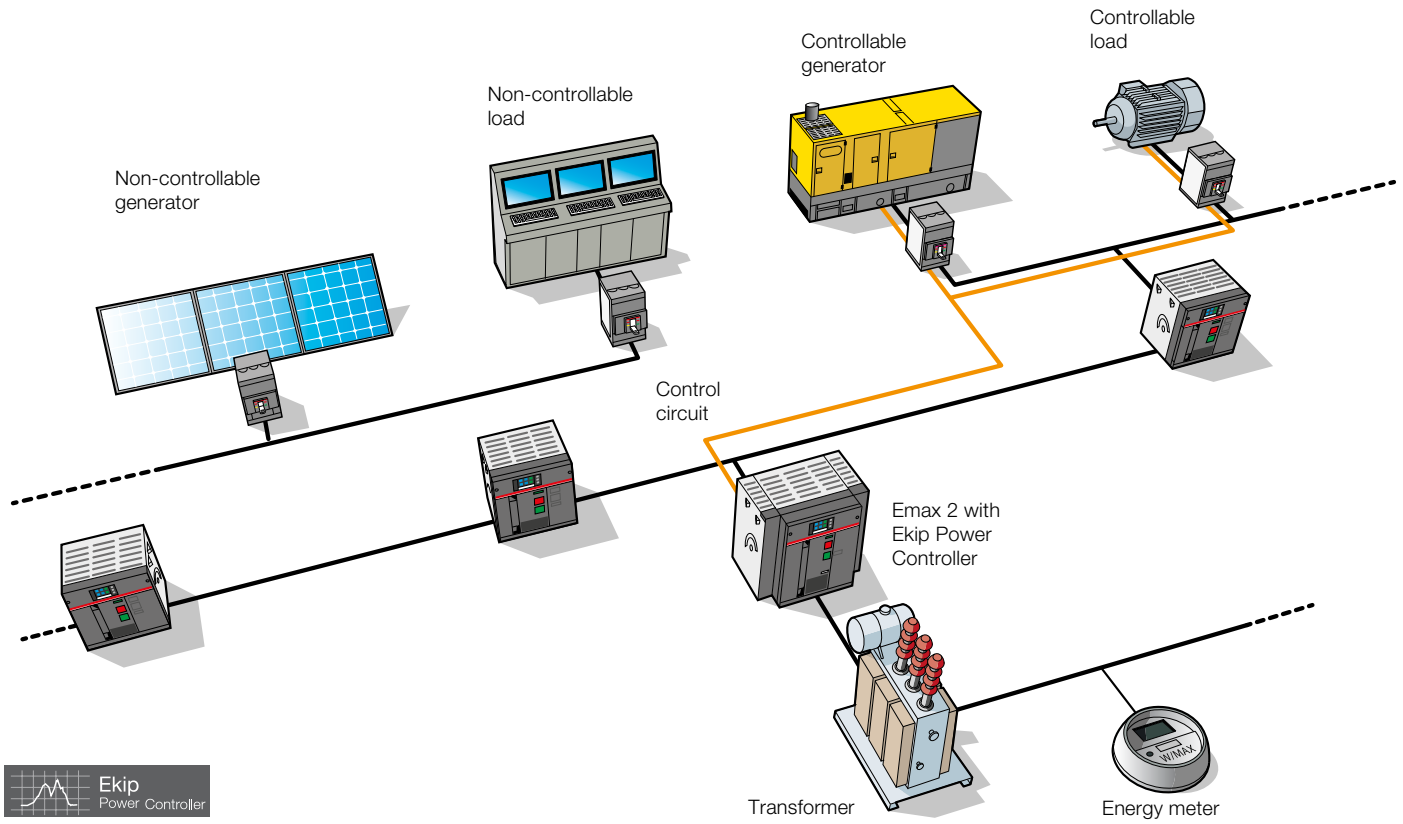
Other functions

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.

Protection trip units for power control
Ekip Power Controller

The exclusive Ekip Power Controller function, patented by ABB and available on new SACE Emax 2 circuit breakers, monitors installation loads and generators, permitting the power consumed to be limited and allowing savings on electricity bills.

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.



Distinctive features

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.

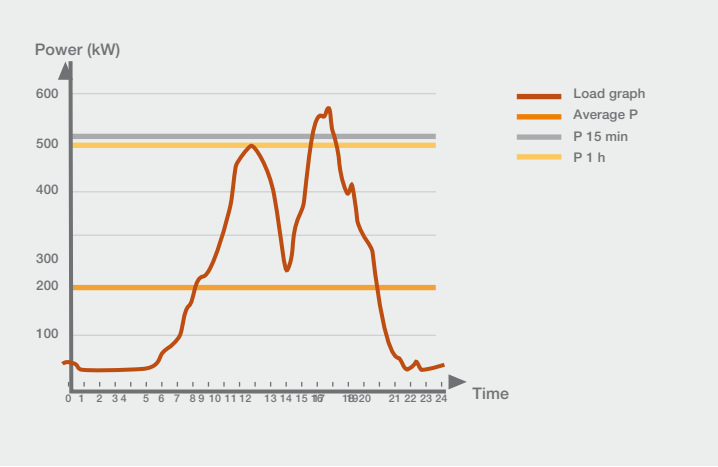
Power limited only when necessary. Ekip Power Controller manages up to four different time bands: it is therefore possible to respect a particular power limit according to whether it is during the day (peak) or night (off peak). In this way, consumption during the day when rates are at their highest can be limited.

Simple to install. Ekip Power Controller 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.

Ready to use. Ekip Power Controller does not require the writing, implementation and testing of complicated programs for PLCs or computers 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 circuit breaker display.

Improvement of the efficiency of the electrical system. Ekip Power Controller significantly helps to flatten the load curve, limiting the use of peaking power plants in favor of base load power plants with greater efficiency.

Graph of daily load



Perfect integration into intelligent networks. Because of integrated communication modules, Ekip 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. Ekip Power Controller 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, Ekip Power Controller will disconnect the necessary loads to respect the consumption limit set.

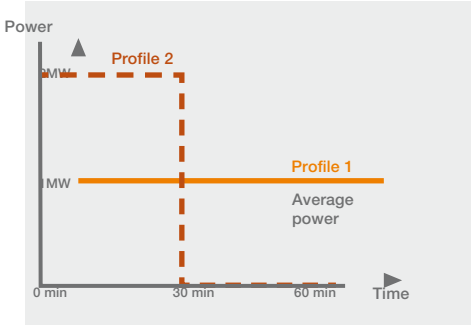
Perfect integration in self-generation systems. This benefit is used, for example, in installations with a system of cogeneration. Ekip Power Controller controls the total consumption drawn from the electrical network, interrupting non-indispensable loads when production is reduced and reconnecting them 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.

Operating principle

Ekip Power Controller is an advanced system of control in real time that limits the average power consumed in each time range to a maximum, pre-determined value. This is achieved by delaying, only when necessary, the operation of controllable loads, which are then put back into operation as soon as possible without exceeding the limits of power set. In each instance, Ekip Power Controller optimizes the number of deactivated loads on the basis of a determined order of priority, constantly seeking to supply the most necessary part of the installation possible. If controllable generators are present such as, for example, diesel generators, Ekip Power Controller controls their switching on and off to limit the peak of power consumed. The types of loads that can be interrupted for a few minutes with a limited impact are many and vary according to the application, for example:

– industrial ovens, fridges;
– ventilation or air compression systems;
– electric car charging systems;
– electrical air conditioning/heating of corridors, stairways and passageways;
– electric kitchens in hotels/hospitals;
– swimming pool heating systems and circulation pumps.

The method of calculation



Ekip Power Controller controls the maximum power consumed by the installation, utilizing the same method as that used for fiscal metering, thereby achieving savings on the component connected to maximum power ($/kW) on electricity bills. The power consumed is calculated by the energy meter as an average value over pre-determined time periods such as, 15 minutes, or even 1 hour.
The user therefore pays the same bill both in the event that he consumes 1MW continuously (profile 1) or 2MW for 50% of the time and 0MW for the remaining 50% (profile 2), since the average power is the same.

Estimation of consumption

Ekip Power Controller uses this principle together with a predictive algorithm that estimates, moment by moment, power at the end of the period in order to decide whether to disconnect or connect loads and generators. This enables brief transient requests for high power to be tolerated, such as, for example, the starting up of motors, without causing the disconnection of loads as soon as the power exceeds the threshold set.

The operations of connection and disconnection therefore depend on the consumption from the beginning of the period up to the present moment: for example, if during the first few minutes of the period of reference consumption was very high, Ekip Power Controller will disconnect a greater number of loads in the minutes after; if, on the other hand, the initial consumption was low, it will leave a greater number of loads in operation.

Management of loads

According to the consumption estimate at the end of the period, Ekip Power Controller will take different actions:

– if the value estimated is greater than the power set as a target, Ekip Power Controller makes the decision to disconnect one of the loads controlled from the power supply, or to connect a generator;
– if the value estimated is equal or slightly less than the average power set as a target, Ekip Power Controller makes the decision to leave the conditions of the controlled loads and generators unchanged;
– if the value estimated is significantly lower than the average power set as a target, Ekip Power Controller makes the decision to reconnect one of the loads controlled to the power supply, or switch off a generator if one or more of these have been switched on previously.

This operation is carried out cyclically each time by calculating a new estimate: therefore, if the estimate of power consumed continues to be too high despite the fact that a load has been disconnected, Ekip Power Controller will proceed to disconnect another and so on, until the power limit is respected. In this way, the number of connected or disconnected loads varies dynamically, and always with the guarantee that only the minimum number needed to maintain the power limit are disconnected.

Priority of loads

If the decision made is to disconnect or re-connect one of the loads controlled, Ekip Power Controller proceeds according to an established order: the load indicated as the first will be that of least importance, or that for which a temporary period of deactivation is acceptable; the load indicated as the second will be the next one in order of importance, and so on. The loads that have been disconnected in that order will be re-connected in the reverse order, beginning with the load that is most important for the installation. In this way, the impact on the production process can be minimized, limiting the disconnection time for loads of the highest priority. Furthermore, by gradually connecting and disconnecting the loads in order of priority, voltage imbalances and consumption peaks that can affect the network are avoided.

Protection of the installation

Ekip Power Controller can be integrated perfectly into the installation’s protection devices. In fact, if one of the controlled circuit breakers opens due to an overcurrent or by manual operation, Ekip Power Controller considers the load unavailable until the operator resets it, making it available again. In this way, safe operation of the installation is always guaranteed.

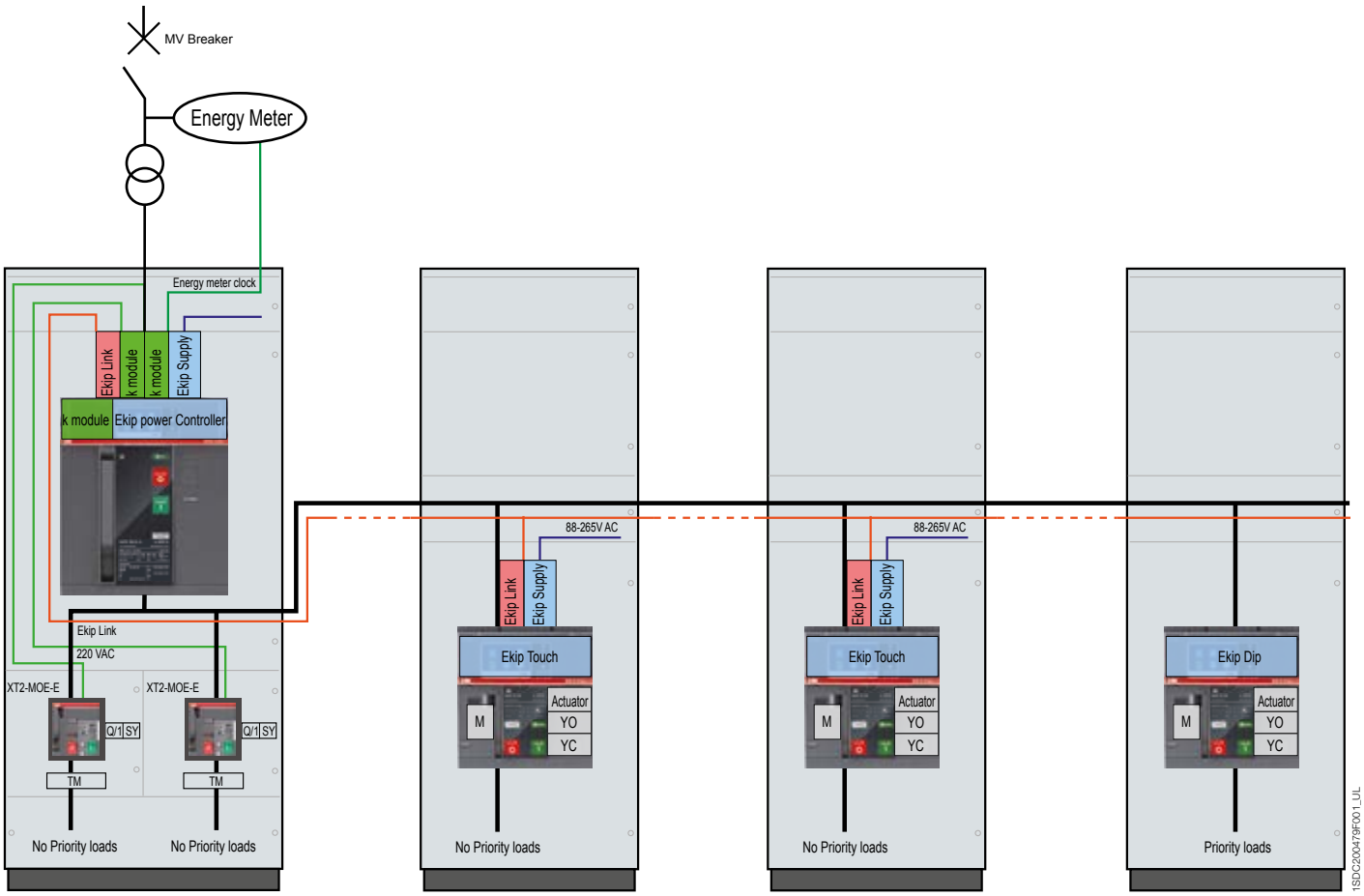
Architecture

Ekip Power Controller is installed on the main low voltage circuit breaker, immediately downstream of the transformer and energy meter. By using the high precision current and voltage sensors located inside the SACE Emax 2, it is able to measure the average power consumed by the installation, using the same method as that used for fiscal metering, over an established time period. To control this average power, Ekip Power Controller performs controlled opening and closing of the switching devices.

A Power Controller system consists of:

– a SACE Emax 2 circuit breaker with Ekip Touch protection trip unit equipped with Ekip Power Controller and Ekip Measuring. This circuit breaker is the power controller and meter, which implements the Power Controller function, determining the connection and disconnection of loads;

– up to 15 controlled loads and/or generators. The connection between Ekip Power Controller and users can be achieved:
  - with Ekip Signaling modules for connections inside the same switchboard. This allows circuit breakers or contactors installed on the power circuit to be commanded directly through available outputs. The opening and closing operations are always carried out in safety due to an input that receives feedback on the state of the controlled device.
  - with Ekip Signaling modules acting on the generator starting circuit or on the control circuit of the loads. This allows, the consumption of motors powered by drives to be reduced without interrupting the production cycle.
  - with Ekip Link communication modules for installations with circuit breakers in different switchboards. This enables wiring between switchboards to be simplified, requiring only one EtherNet cable.



In the event that the installation is constructed with a single medium voltage delivery point and two or more transformers in parallel, Ekip Power Controller can acquire, via Ekip Link, the power measurement carried out by the other Emax 2 devices present. In this way the power limit can be respected at the medium voltage measuring point, without having to duplicate the control circuit of the loads.

Installation

Ekip Power Controller is not only simple to implement and use, it is also very flexible because of parameters which have been specially developed to satisfy the needs of all applications.

Installation parameters:

– Power limit: this is the average power that Ekip Power Controller respects, which can be selected in kW directly from the display.
– Evaluation window: this is the period in which the distributor of electrical energy evaluates the maximum power, which can be selected within a wide range to respect the local needs of each country.
– Synchronization input: this is used to synchronize the clock inside Ekip with that of the meter. It can also be used to signal a change in band.

Parameters of the user:

– Type of user: can be selected from among load and generator.
– Minimum disconnection time (T off min): this is the minimum time for which a load or generator is not supplied with power following disconnection. This is useful when you wish to avoid frequent operations on users that are at the top of the priority list. Ekip Power Controller reconnects the load or generator only after the time set has passed.
– Maximum disconnection time (T off max): this is the maximum time for which no power is permitted. It is required, for example, in the case of an oven to keep the temperature within the established limits. When the time has passed, Ekip Power Controller reactivates it automatically, disconnecting, if necessary, a load of a higher priority.
– Minimum connection time (T on min): minimum time for which a load or generator is kept powered following reconnection. It is useful in the event the generator has a minimum time for which it must remain connected. Until the time set has passed, Ekip Power Controller will not disconnect the load, connecting, if necessary, loads of a higher priority.
– Time window: this is the hours in the day when a load or generator can be operated. It is useful, for example, in the case of a cafeteria that cannot be disconnected during meal times, or a diesel generator that can not be operated at night due to noise pollution.
– Temporary unavailability: a user can be temporarily deactivated, for example, because it is undergoing maintenance, through the circuit breaker display or digital input connected to a manual/automatic selector. The digital input can also be used, for example, in the case of a fridge, to manage its interruptability: with active input the fridge cannot be disconnected as it is above the minimum temperature, with inactive input, on the other hand, it can be disconnected.

Power limit	can be set directly in kW
Time bands	up to 4
Synchronization with contactor	•
Evaluation time	5…120 min
Number of loads/generators	up to 15
Priority	from 1 to 15
t on min	1…360 min
t off min	1…360 min
t off max	1…360 min
Temporary disabling input	1 for each device
Controllable devices	load/generator
Type of control	- molded case or power circuit breaker
	- modular circuit breakers
	- contactors
	- control circuit of load/generator
Type of connections	- wired
	- with Ekip Link communication for ACB

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	Ground fault protection	I4 (1)(2) = 0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1 x In
		Tolerance	± 7%
	51N	Ground 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	yes, with rating plug L=off	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	Ground 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	Ground 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	
Gext	50G TD	Ground fault protection	I41[(1)(2)] = 0,1...1 x In Toroid (CT)	0,001 x In Toroid (CT)	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	Ground 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)	




	Excludibility	Excludibility trip	Block	Pre-allarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
	yes, with rating plug L=off	no	no	50...90% I1 step 1%	t = k / I^2	●	●	●	●
	yes					●	●	●	●
	yes	yes	yes	no	t = k	●	●	●	●
	yes					●	●	●	●
	yes					●	●	●	●
	yes	yes	yes	no	t = k / I^2	●	●	●	●
	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 / I^2	●	●	●	●
	yes	yes	no	no	t = k	●	●	●	●
	yes	no	no		t = k	●	●	●	●
	yes	no	yes	no	t = k	●	●	●	●
	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	●	●	●	●

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
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)	
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	




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

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
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)	
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)	




	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	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								

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
RQ	40/32R	Loss of field or reverse reactive power protection	Q24= -1…-0,1 Sn	0,001 Sn	Q > Q24 t24 = 0,5…100s	0,1s
			Kq= -2…2	0,01		
		Loss of field or reverse reactive power protection	Q25= -1…-0,1 Sn	0,001 Sn	Q > Q25	0,5s
			Kq2= -2…2	0,01		
		Voltage minimum threshold	Vmin= 0.5….1,2	0,01		
		Tolerance	± 10%		The better of the two data: ± 10 % o ± 40 ms (for t < 5 s) / ± 100 ms (for t ≥ 5 s)	
S2(V)	51V	Voltage controlled overcurrent protection	I21 = 0,6...10 x In	0,1 x In	with I > I21 t21 = 0,05…30s	0,01s
		Step Mode	UI2= 0,2…1 x Un	0,01 x Un		
			Ks2= 0,1…1	0,01		
		Linear Mode	UI2= 0,2…1 x Un	0,01 x Un		
			Uh2= 0,2…1 x Un	0,01 x Un		
			Ks2= 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)	
ROCOF	81R	Rate of change of frequency protection	f28= 0,4….10 Hz/s	0,2 Hz/s	with f > f28 t28 = 0,5...10s	0,01s
		Trip direction	Up & down			
		Tolerance	± 5%		The better of the two data: ± 20% o ± 200 ms	
Synchrocheck SC	25	Synchrocheck (Live busbars)	Ulive=0,5…1,1 Un ΔU=0,02…0,12 Un Δf= 0,1…1Hz Δϕ= 5…50° elt	0,001 Un 0,001 Un 0,1Hz 5° elt	Stability voltage time for live state = 100…30000s Minimum matching Time = 100…3000s	1s 10s
		Tolerance	± 10%			
		Synchrocheck (Live,Dead busbars)	Ulive=0,5…1,1 Un Udead=0,02…0,2 Un	0,001 Un 0,001 Un	Tref= 0,1…30s	0,1s
		Frequency check off				
		Fase check off				
		Dead bar configuration	Reversed/standard			
		Primary voltage	100……..1150	100, 115, 120, 190, 208, 220, 230, 240, 277, 347, 380, 400, 415,440, 480, 500, 550, 600, 660, 690, 910, 950, 1000, 1150		
		Secondary voltage	100……..120	100, 110, 115, 120		
		Tolerance	± 10%			

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		no	t = k				●
	yes								
	yes	yes	yes	no	t = k				●
									●
									●
	yes	yes	yes	no	t = k				●
	yes	only Signaling	no	no	-	○ ○○	○○	○○	○○
	yes	only Signaling		no	-				
	yes								
	yes								
	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		●	●	●	●
			●	●	●	●
			●	●	●	●

Communication devices and systems

Communication devices and systems
Introduction

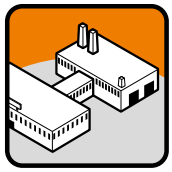
SACE Emax 2 circuit breakers provide a complete and flexible offering that can be adapted to the actual level of supervision and control required.

The rising need of systems that provide supervision and control for low voltage electrical distribution plants is being driven by the growing need to:
- optimize energy efficiency by analyzing energy consumption;
- ensure service continuity, minimizing the time needed to identify and rectify faults;
- guarantee efficient planning of maintenance activities.

Typical sector	Industrial	Hospital	OEMs	Naval
				

Level of supervision and control in low voltage systems	Switchgear compartment	
Sulution with SACE Emax 2	- Ekip Touch trip units with high resolution display	- Ekip trip units - Ekip Multimeter display on the front of switchgear
Benefit of the ABB solution	- simple and intuitive use - does not require an auxiliary power supply for safety	- reduced dimensions - flexible installation - simultaneous reading of various electrical values

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. It provides a general but precise indication of the level of absorption of the system (main circuit breaker) and the individual utilities (outgoing feeder circuit breakers).
- **electrical switchgear:** to display the data of all circuit breakers installed in the switchgear from a single point: in local mode via the operator panel on the front of the switchgear, or remotely via an Internet connection.
- **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.

Industries of medium dimensions	Shopping centres	Office buildings	Oil & gas	Automated industrial processes	Data centers	Smart grids
						

	Electrical switchgear	Electrical installation
	- Ekip trip units - Ekip Link module - Ekip Control Panel operator panel with color touch screen - Standardized EtherNet components	- Ekip Touch trip units - Ekip Com communication modules - Ekip View supervision software
	- centralized control from front of the switchgear - access to the installation via the web - rapid installation - ease of use - ready to use system	- wide range of protocols supported - installation times reduced to a minimum - redundancy of communication - ready to smart grid circuit breakers - complete network supervision

Communication devices and systems
Supervision of the switchgear compartment

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, color 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.

Ekip Touch

Ekip Multimeter

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

Solution with Ekip Multimeter Display on the front of the switchgear

The Ekip Multimeter is a display unit to be installed on the front of the switchgear for SACE Emax 2 power circuit breakers equipped with Ekip electronic trip units.
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 up to 49 feet (15 meters) 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 a display, the Ekip Multimeter enables adjustment of the parameters and protection thresholds.

	Supervision of switchgear compartment			
Electronic trip unit	**Ekip Dip**	**Ekip Touch**	**Ekip Touch + Ekip measuring module**	**Ekip Hi Touch**
			Ekip G Touch	**Ekip G Hi-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	•	•	•	•
Contact wear (endurance)	•	•	•	•
Other data				
Status of circuit breaker	•	•	•	•
Circuit breaker position [1]	•	•	•	•
Local/remote mode	•	•	•	•

1) Circuit breakers equipped with auxiliary contacts to indicate position

Communication devices and systems
Switchgear supervision

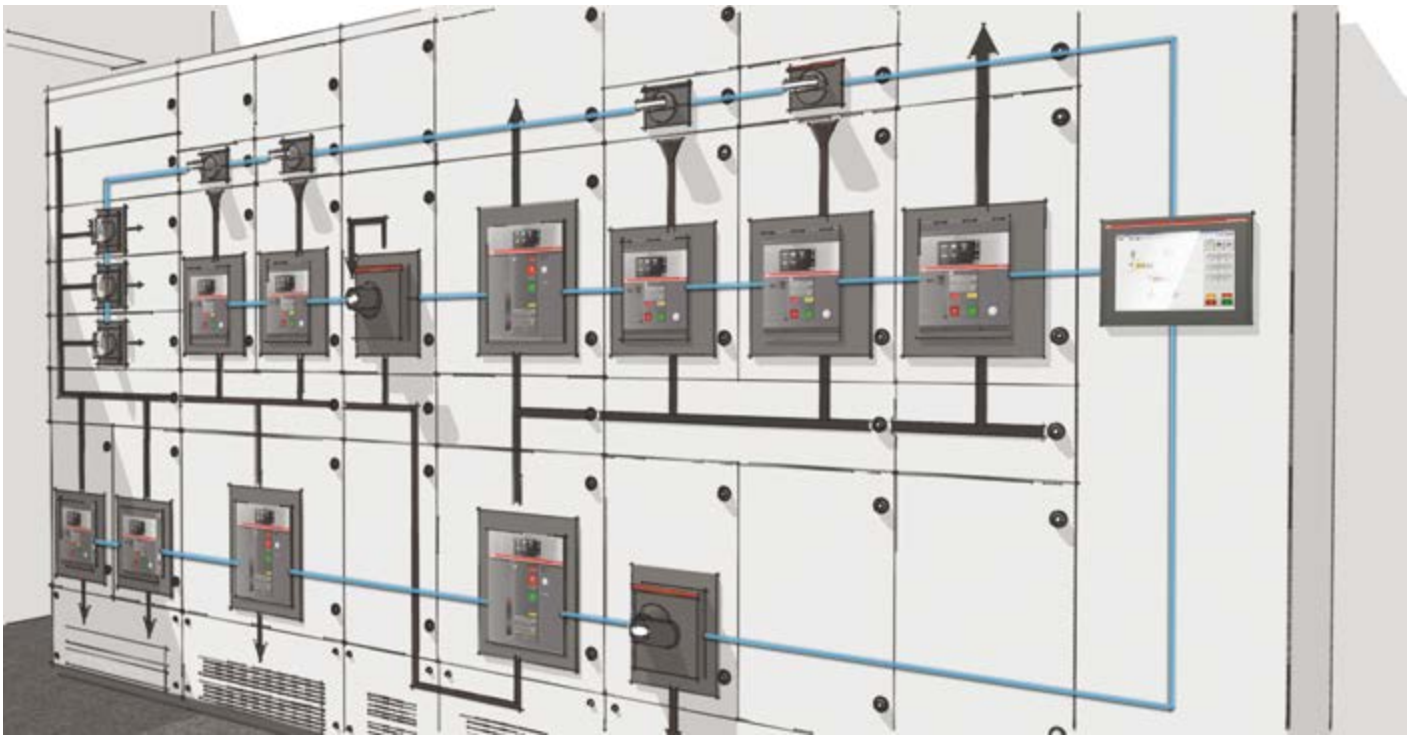
Ekip Link is a flexible and efficient solution for controlling and supervising low voltage electrical switchgear; it is a system that enables SACE Emax 2 circuit breakers to be connected to the Ekip Control Panel operator panel by means of Ekip Link interface modules.

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 only current needs to be monitored, the economic Ekip Dip trip unit can be connected to Ekip Link without having to use circuit breakers equipped with communication modules.
- **access via the Internet** to the installation by 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 color 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 switchboard or switchgear containing up to 30 SACE Emax 2 circuit breakers. 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.



1SDC200439F001

	Switchgear supervision			
Electronic trip unit	**Ekip Dip**	**Ekip Touch**	**Ekip Touch + Ekip measuring module**	**Ekip Hi-Touch**
			Ekip G Touch	**Ekip G Hi-Touch**
Solution	Ekip protection trip units equipped with the 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				
Circuit breaker opening and closing [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 SMS	optional	optional	optional	optional
Transmission of alarms via e-mail	optional	optional	optional	optional
Maintenance				
Number of operations	•	•	•	•
Number of trips	•	•	•	•
Contact wear (endurance)	•	•	•	•
Other data				
Circuit breaker status	•	•	•	•
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, contact ABB.
2) Circuit breakers equipped with actuation module, electric accessories, shunt coil and closing coil and spring charging motor
3) Two client web accesses included in the licence
4) Circuit breakers equipped with auxiliary contacts to indicate position

Communication devices and systems
Supervision of the electrical installation

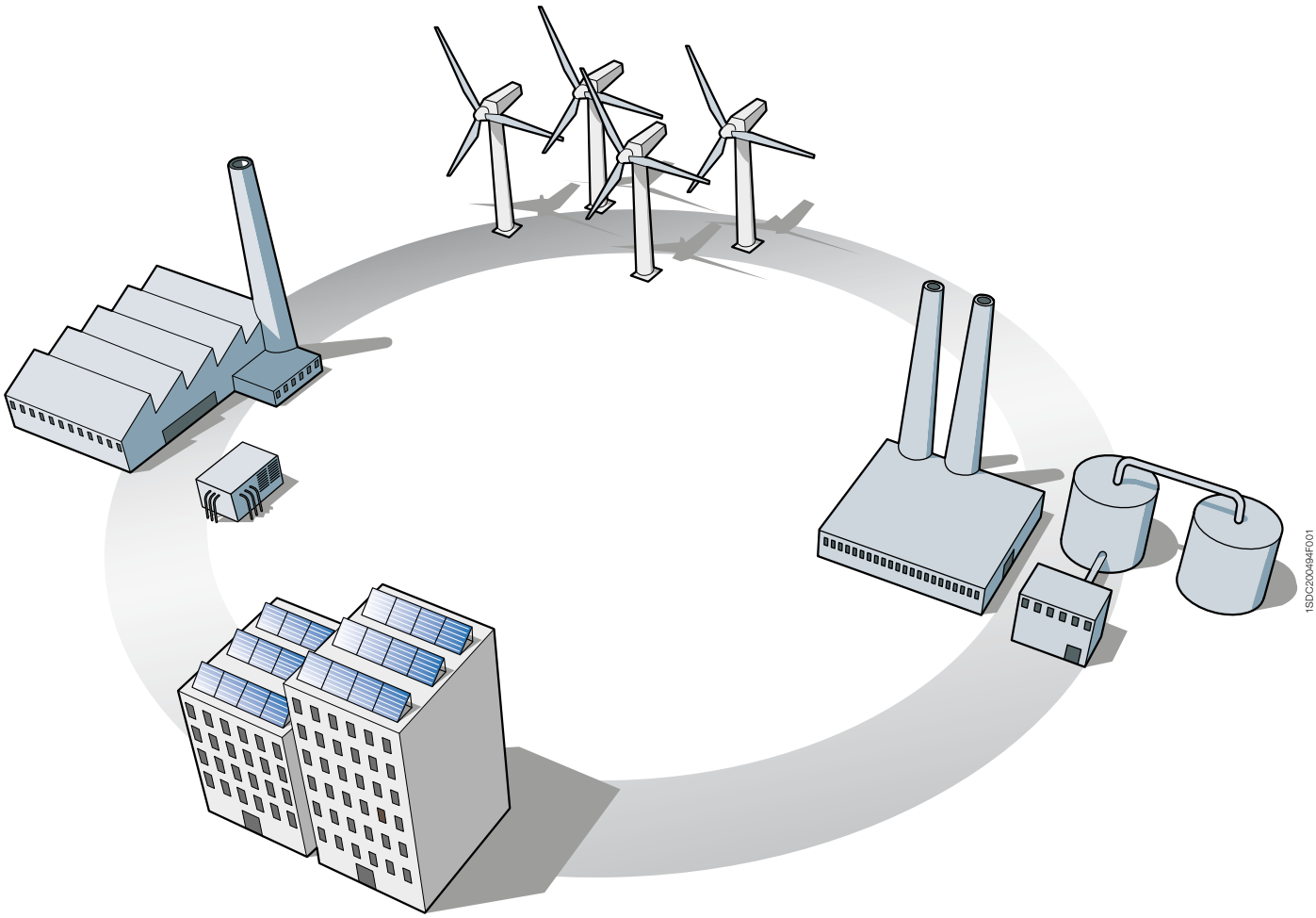
The integration of low voltage devices in communication networks is required in particular for: automated industrial processes, industrial and petrochemical sites, modern data centers and intelligent electricity networks, better known as smart grids.

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 directly integrated into communication networks without the need for external interface devices.

The distinctive characteristics of the SACE Emax 2 circuit breaker 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.
- **Reduced installation times;** the plug & play technology of the communication modules enable them to be snapped directly into the terminal box, without needing 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 into the automated systems of electrical substations without the need for complex external devices.
- **Complete supervision** of Modbus RTU or Modbus TCP/IP networks via the Ekip View software for PCs.



	Supervision of the electrical installation		
Electronic trip unit	Ekip Touch	Ekip Touch + Ekip Measuring module Ekip G Touch	Ekip Hi-Touch Ekip G Hi-Touch
Solution	Ekip Touch trip units + Ekip Com modules		
Protocols supported:			
Modbus RTU	Ekip Com Modbus RS-485		
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/IP		
IEC61850	Ekip Com IEC61850		
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	•	•	•
Contact wear (endurance)	•	•	•
Other data			
Circuit breaker status	•	•	•
Circuit breaker position [2]	•	•	•
Local/remote mode	•	•	•

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

Communication devices and systems
Supervision and control software

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

Overview of the software

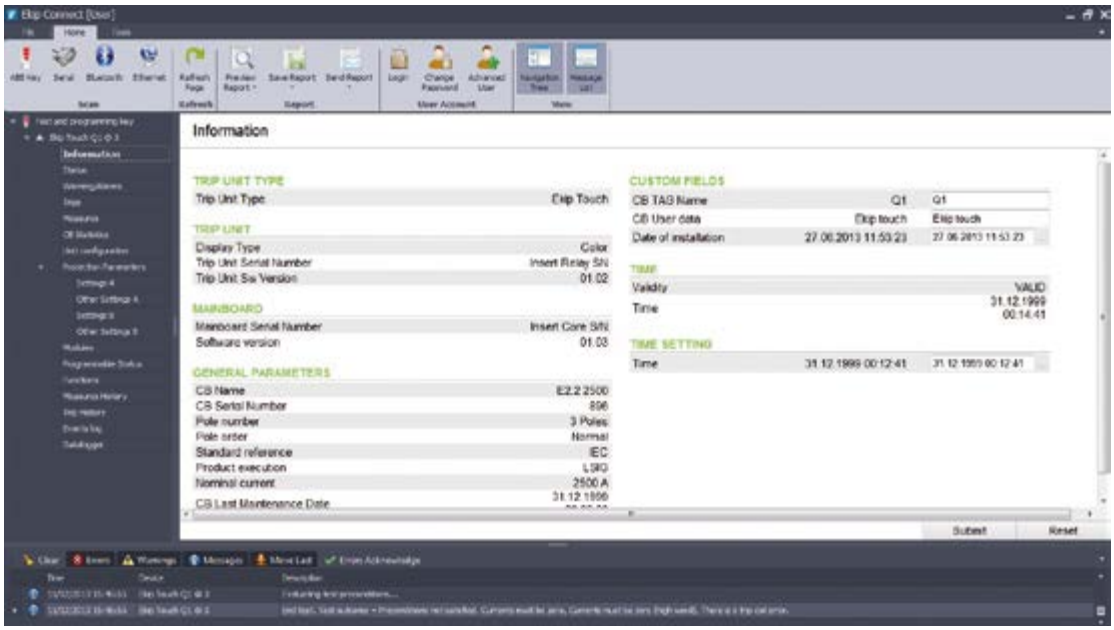
An overview of the software available and their main characteristics are given below:

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 (IEC)
		- useable via EtherNet
		- automatic updating from the 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 to the installation via the Internet
		- possibility of integrating third party devices
Ekip T&P interface	- testing of protection functions - ordinary maintenance of trip units	- test signals can be pre-set or configured as desired
		- advanced graphical interface
		- generation of test reports

Ekip Connect

Ekip Connect enables data to be exchanged with one or more protection trip units, which:

- **Assists with system commissioning;** all system parameters and the protection thresholds can be set rapidly in the Ekip trip units because of to the easy and intuitive navigation pages of the software.
- **Permits rapid access to diagnostics;** it is possible to consult and download the records of events, alarms and trip history, thereby facilitating the identification and understanding of the anomalies.



- **Enables testing of the communication network;** Ekip Connect performs an automatic scan of the Modbus RS-485 or Modbus TCP network and determines whether the circuit breakers have been correctly connected and, when necessary, signals incorrect configurations of the communication parameters (addresses, baud rate, parity).

The distinctive characteristics of the software are:
- **Integration with DOC electrical design software (IEC only);** the adjustments and settings calculated by the DOC software can be downloaded directly into the protection trip units, thereby reducing commissioning times and the potential for errors.
- **Ease of connection:** Ekip trip units equipped with Modbus TCP Ekip Com modules can be controlled directly by the EtherNet network.
- **Multi-media;** Ekip Connect is designed to operate on a PC or on the more modern tablet PCs and smart phones.
- **Automatic updating from the Internet;** if connected to the Internet, the software is able to constantly control the availability of any updates.

The software is available free of charge on the ABB website www.abb.com/lowvoltage.

Media	Ekip Connect Software				
	Personal PC			Smartphone/Tablet	iPhone/iPad
Operating system	**Windows XP, Windows 7, Windows Vista**			**Android**	**iOS**
Method of connection to the trip units	**Communication network**	**Test connector**	**Wireless communication**	**Wireless communication**	**Wireless communication**
SACE Emax 2 trip units	Ekip Com Modbus RS485 or TCP	Ekip T&P	Ekip Bluetooth	Ekip Bluetooth	Ekip Bluetooth
SACE Tmax XT trip units	Ekip Com	Ekip T&P	Ekip Bluetooth	-	-
SACE Emax,T7,X1,T8 trip units	PR120/D-M, PR330/D-M	Ekip T&P or BT030	BT030	-	-
SACE Tmax T trip units	PR222DS/PD, PR223DS; PR223/EF	Ekip T&P or BT030	BT030	-	-
Functions of reading and control					
Automatic network scan	•	-	-	-	-
Circuit breaker opening and closing[1)]	•	•	•	•	•
Setting of thresholds	•	•	•	•	•
Resetting of alarms	•	•	•	•	•
Reading of electrical measurements	•	•	•	•	•
Displaying of time-current curve	•	•	•	•	•
Reading of past records	•	•	•	•	•
DataLogger download	•	•	•	-	-
Other functions					
Report generation	•	•	•	•	•
Automatic updating from Internet	•	•	•	•	•
Integration with DOC (IEC)	•	•	•	•	•
Enabling of Ekip T&P Interface	•	•	•	•	•
Use via EtherNet	•[2)]	-	-	-	-

1) Circuit breakers equipped with auxiliary contacts to indicate position
2) only in the presence of Modbus TCP Ekip Com modules

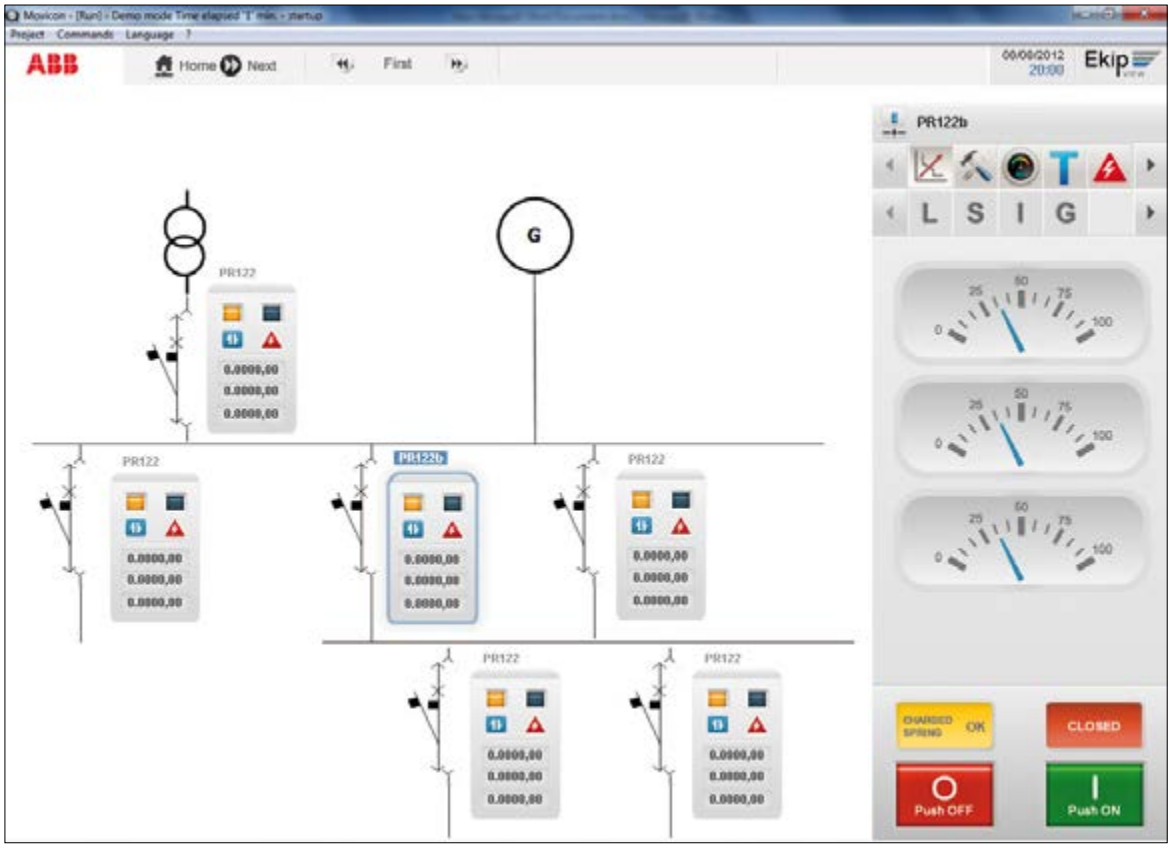
Communication devices and systems
Supervision and control software

Ekip View

Ekip View is the software for supervising devices connected to a communication network that uses a 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.



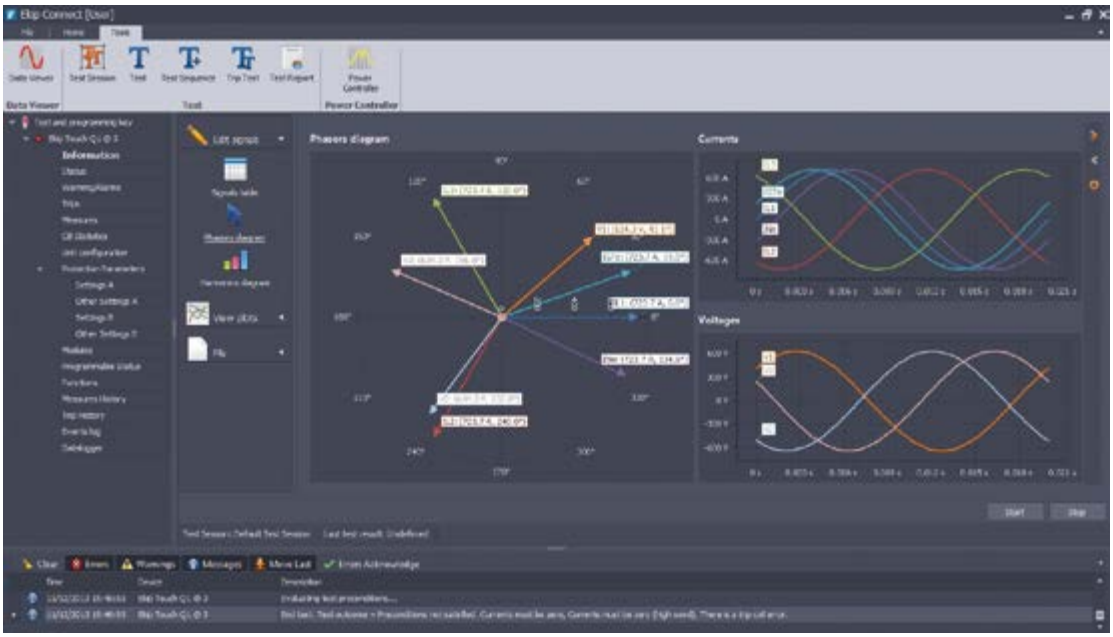
	Ekip View Software	
Communication characteristics		
Protocol Supported	Modbus RTU	Modbus TCP
Physical layer	RS 485	EtherNet
Maximum data exchange rate	19200 bps	100 Mbps
Operating system	Windows XP, Windows 7, Windows Vista	
Devices supported		
SACE Emax 2 trip units	Ekip com Modbus RS485	Ekip com Modbus 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 60 [2] controllable devices - unlimited number [3] of controllable devices	
Supervision and control functions		
Circuit breaker opening and closing [4]	•	•
Electrical value trends	•	•
Log of electrical value trends	•	•
Dynamic installation mimic panel	•	•
Automatic scanning	•	•
Centralized synchronizing of time	•	•
Web server function	• [5]	• [5]
Redundancy	optional	optional
OPC server-client	optional	optional
Measurement functions [6]		
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	•	•
Report generation	•	•
Transmission of alarms via SMS	optional	optional
Transmission of alarms via e-mail	optional	optional
Maintenance		
Number of operations	•	•
Number of trips	•	•
Contact wear (endurance)	•	•
Other data		
Circuit breaker status	•	•
Circuit breaker position [7]	•	•
local/remote mode	•	•

1) Contact ABB 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, optional accesses for up to 5
6) according to the values supported by the trip units
7) circuit breakers equipped with auxiliary contacts for position indication

Communication devices and systems
Supervision and control software

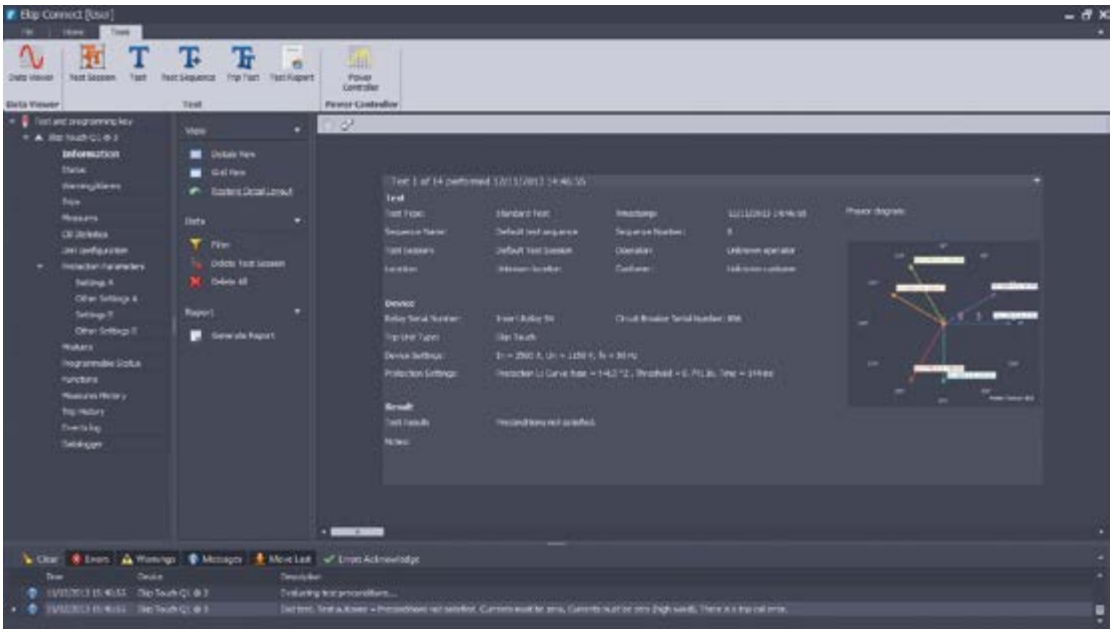
Ekip T&P Interface

The Ekip T&P Interface software, used together with the Ekip T&P device, enables the electronic protection trip units to be tested for correct operation during the stages of commissioning and system maintenance.
As a result of advanced graphical interfaces, the user can simply select the test to perform: from simple current and voltage signals to more complex wave forms with the presence of harmonic distortion.



1SDC200497F001

The software creates and stores all reports, keeping a record of the tests carried out and essential information such as the operator name, date, serial number of the circuit breaker, type of test and the result.



1SDC200498F001

ABB Ability™ Electrical Distribution Control System Overview

ABB Ability™ Electrical Distribution Control System enables the collection of relevant information from the ABB devices installed in the low-voltage power distribution system.

These devices can be connected, plug & play, to the cloud-computing platform by sharing data either with Emax 2 (equipped with Ekip Com Hub) or with Ekip E-Hub via Modbus RS-485, Modbus TCP and Ekip Link.

ABB Ability EDCS Provides the ability to:

Monitor
Discover plant performances anytime, everywhere

Optimize
Collect thousands of data, analyze information and take your decision

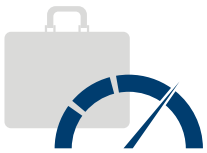
Control
Implement your strategy and reach the goal

giving you the benefits of:

Energy savings
Save up to 30% on operational costs

Easy to install
Connect the panel to the cloud in 10 minutes

Continuous operations
Take action in 1 minute, anywhere, anytime



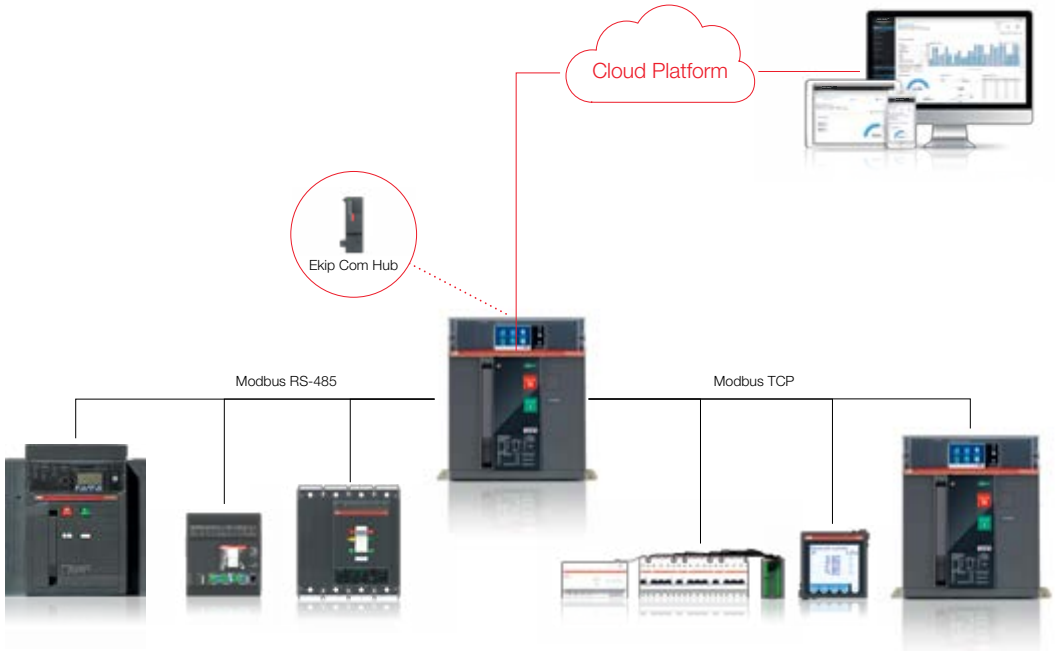
Speed up your projects
Increase the value of your projects by 15%

by providing the power of understanding at the tips of your fingers, from anywhere, at any time.

ABB Ability™ Electrical Distribution Control System (EDCS)
Plug and play installation

Ekip Com Hub Module

Installs into an Emax 2 power circuit breaker to give it the ability connect to the cloud. It can be quickly and easily inserted into the terminal box and connected to the Internet to collect data on the entire switchgear system.



Ekip Com Hub Module

The Ekip E-Hub unit is a stand-alone solution for connecting to the cloud. It mounts 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.

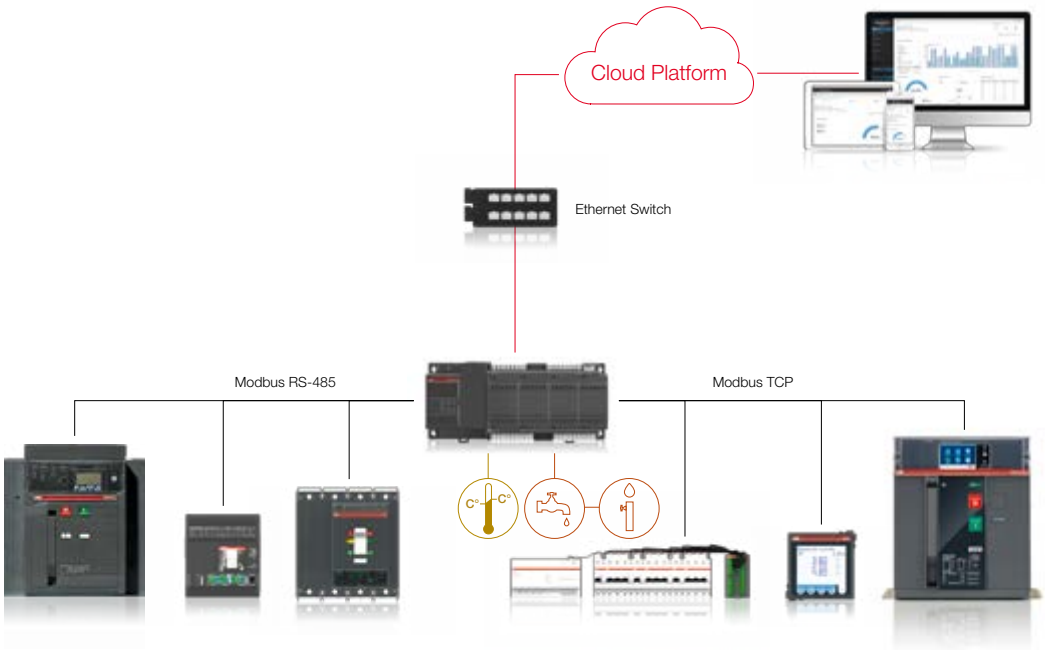


ABB Ability™ Electrical Distribution Control System (EDCS)
The power of an ABB System

This chart illustrates the information available from which device, with the use of the ABB Ability™ EDCS system, and the communication protocal listed, in the diagrams shown on the previous page.

Information														Communication
Family	Device	State	Current	Voltage	Power	Energy	Power Factor	Alarms	Maintenance & Diagnostics	Power Quality	Load management	Environmental parameters	General Info	Protocol
Quality	Load	•	•	•	•	•	•	•	•	•	•		•	Modbus RS-485, Modbus TCP, Ekip Link"
Management	Environmental parameters	•	•	•	•	•	•	•	•				•	Modbus RS-485
info	Protocol	•	•	•	•	•	•	•	•				•	Modbus RS-485
MCCB	Tmax XT (*)	•	•	•	•	•	•	•	•				•	Modbus RS-485
Metering device	M2M		•	•	•	•	•			•			•	Modbus RS-485, Modbus TCP
Metering device	CMS 700		•	•	•	•	•						•	Modbus RS-485, Modbus TCP
Fusegear	Slimline XR ITS 2	•	•	•	•	•	•	•	•				•	Modbus RS-485
Signaling module for digital inputs (e.g. for MCBs)	Ekip Signaling Modbus TCP	•											•	Modbus TCP
Digital Meters/ Sensor	Pulse meter (**)											•	•	Digital I/O
Analog Meters/ Sensor	Analog meter (**)											•	•	Analog I/O
Arc guard	TVOC-2	•						•					•	Modbus RS-485

And many others to come... * Provided the product with dedicated accessories for communication and metering functions ** only with Ekip E-Hub module

A simple shopping list

Hardware

OR

- Ekip Com Hub
  - Emax 2 embedded communication module for cloud-connectivity

OR

- Ekip E-Hub
  - DIN-rail mounted communication module for cloud-connectivity

Commissioning tool

- Ekip Connect 3 Software available via free download

Services

- ABB Ability™ Electrical Distribution Control System
  - 12-months subscription to monitor, optimize and control your systems
  - Each license for one site, up to 10 users' access

By purchasing the hardware component, you will get free access to the ABB Ability™ Electrical Distribution Control System services for your site for 6 months since the setup.

What happens, once the 6 months are over?

In a few steps, you can renew the license for the next 12 months directly online according to the number of connected devices in your site. ABB Ability™ Electrical Distribution Control System automatically calculates the due fee.

Emax 2
Embedded ATS system

General introduction

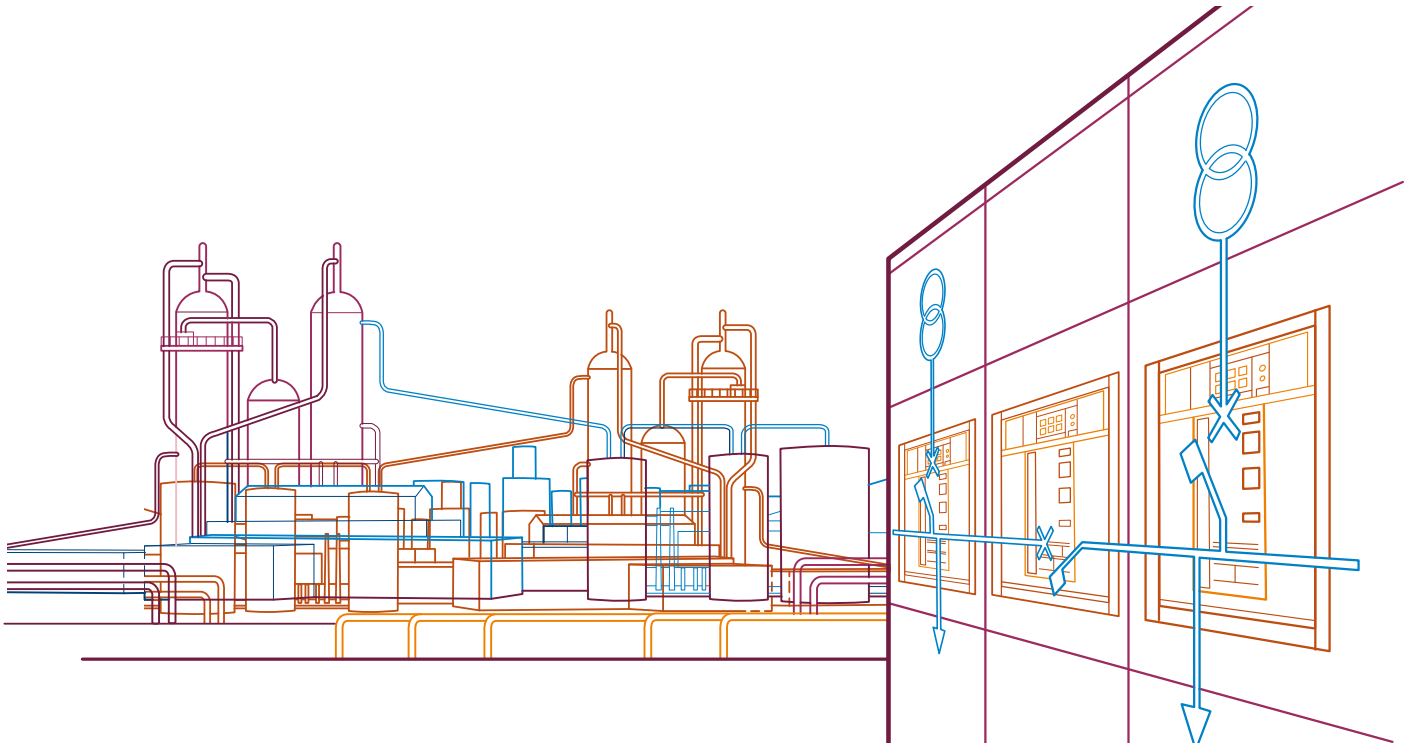
ABB's embedded ATS system makes it easy to monitor, control and communicate in power networks

Over the past few years, service continuity in low voltage electrical installations has played an increasingly leading role. In actual fact, this requirement is a fundamental characteristic if economically and functionally efficient installations are to be created. A system able to switch the supply from the main line to an emergency line reduces problems caused by faulty conditions in the public network to the minimum. These operations, commonly known as "automatic switching", comprise sequences that automatically control the installation components (the circuit-breakers play a fundamental role) without interventions from the operator. To guarantee that power is supplied to the loads, a fundamental requirement in an installation is to have a redundancy in supply sources type N+1, usually consisting of a transformer and emergency generator (or, as an alternative, a second transformer).

An installation with an automatic switching system:
- Maximizes the service continuity of any process
- Provides a power supply with high quality voltage if the main network is out of service
- Manages microgrids connection and disconnection form main grid.
- Reduces the effects caused by network faults on parts of the installation (voltage reduction leads to loss of stability in the rotating machines, a higher voltage drop, faults in the equipment, etc…)
- Achieves a good compromise amongst reliability, simplicity and cost-effectiveness
- Provides the maintenance staff and managing system with a power source able to supply the installation or part of it when the transformer is being serviced

The ATS solution

The Embedded ATS is a high-performances energy automation system, easy to install and program. In a world where digital communication is the predominant agent responsible for improved efficiencies and performances in industrial and power applications, ABB is moving to re-invent how digital systems are embedded. ABB's ATS system takes advantage of the new capabilities provided by the new Ekip Connect 3 Software and the intelligent circuit breaker such as Emax 2 to deliver compact and reliable solution.



Emax 2
Embedded ATS system

SACE Emax 2 all-in-one innovation improves efficiency in any electrical plant thanks to its unique features. It offers the highest short circuit performance in the most compact size and, for the first time, Emax 2 and its intelligent protection units integrate in one single device protection features and automatic transfer switching programmable logics. 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. So, where are you going to use ABB's ATS and why?

Where can ATS be applied?

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 microgrid, can be disconnected from main grid.

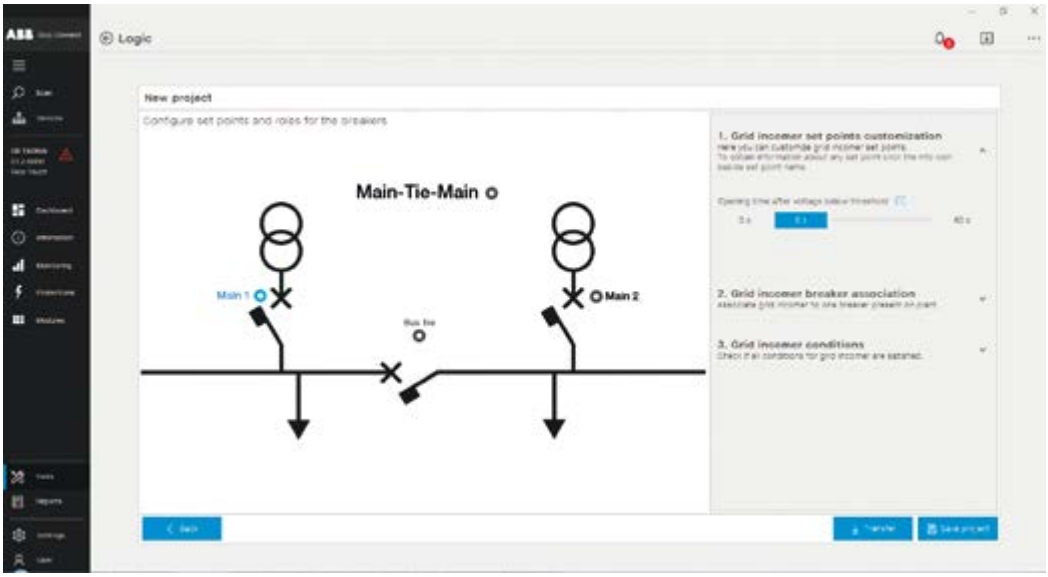
The benefits

ABB's ATS solution - ready-to-go

If you have ever programmed a power automation switchboard, you know that it requires PLC programming skills and electrical knowledge. Moreover, every custom-engineered system demands individual effort and personal responsibility. Moreover, if a setting needs to be changed the engineer may have to re-open the project, which has associated time and money costs. ABB's ATS now cuts this long story short by giving you general templates - tested and ready-to-go - that you can personalize by changing some basic settings via a graphical interface. When you are satisfied with how things look, a simple tool allows you to upload the template to the devices. And that is it. The system is up and running.

And if you need to change a parameter, just connect your laptop and do the changes with the same easy graphical interface.

Estimated time and cost savings on the ATS engeenering on the low voltage project: 95%



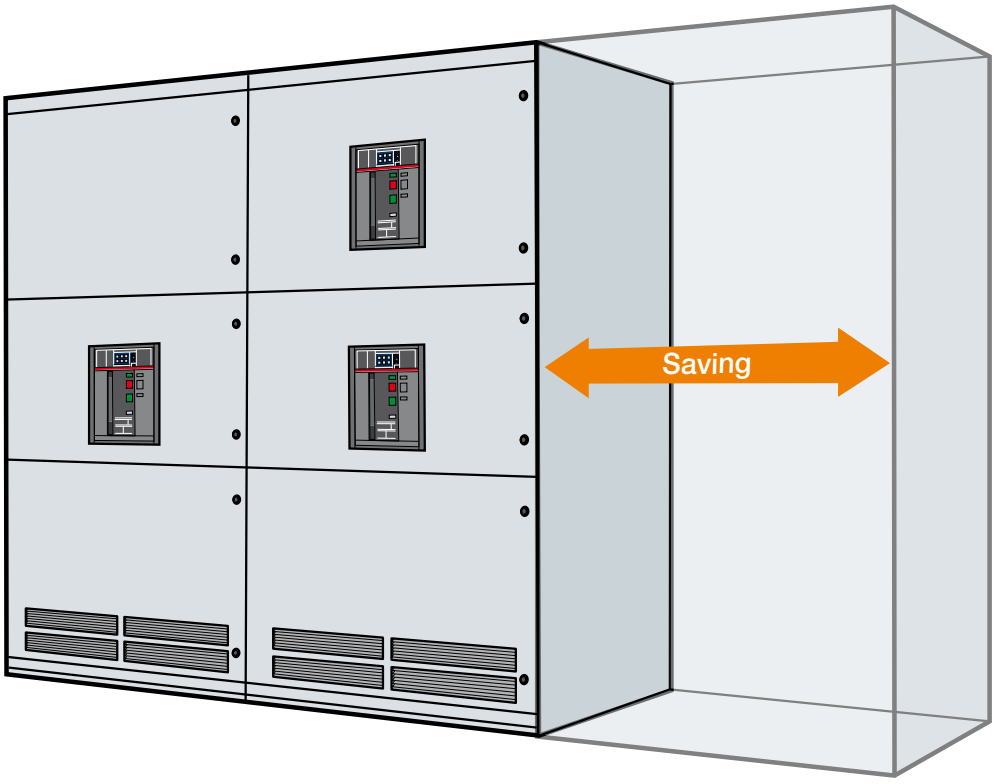
Emax 2 compactness

Emax 2, all-in-one solution, is the most compact air circuit breaker on the market, and it packs in a lot of functionality:

– Breaker
– HMI (human-machine interface)
– Protections
– Measurement (including the measurement transformers)
– Interlocking communication (horizontal) between devices
– Communication to the supervision system (SCADA)
– Communication to a cloud energy monitoring platform

The embedded ATS solution is as compact as the Emax 2 is. Nothing needs to be added.

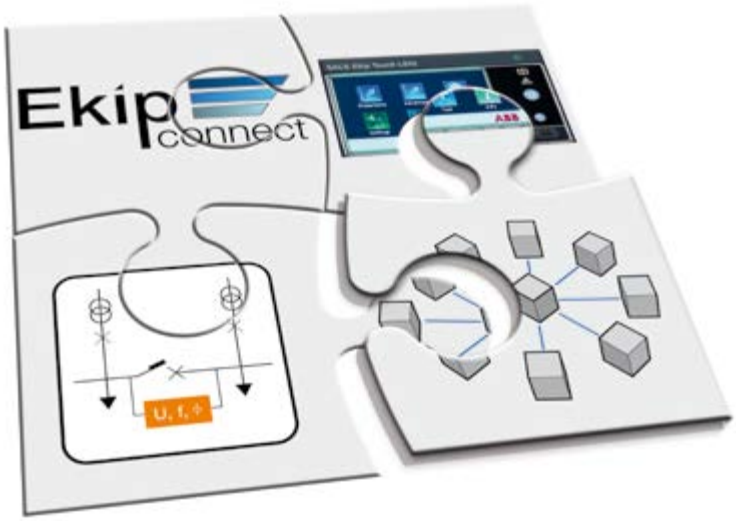
Space saving on the power switchboard: up to 30%



Emax 2
Embedded ATS system

How it works

ABB's embedded ATS solution is based on four main elements:
– Ekip trip units that enable logic operations
– Ekip Link
– Ekip Synchrocheck (only in case of closed transition systems)
– The Ekip Connect 3 tool for ATS

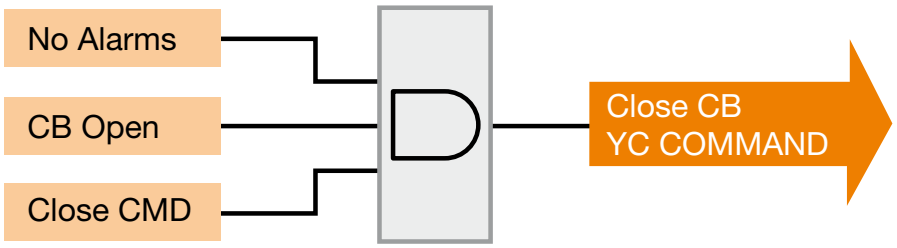


Logic operations with Ekip trip units

The capabilities of ATS can be achieved thanks to a variety of Emax 2 components. Two examples of these are the Ekip Touch and Ekip Hi-Touch trip units. Ekip Touch/Hi-Touch represent a new generation of protection trip units that are easy to program and read. They can be programmed via their HMI or by using Ekip Connect 3 software (see below) running on a laptop or mobile device. The Ekip Touch/Hi-Touch trip units measure power and energy with precision and save the most recent alarms, events and measurements to prevent faults to the installation and trip effectively when necessary. It is access to this type of data that makes ATS so powerful.

The Ekip Touch/Hi-Touch trip units (also in Generator Protection versions) have the capability of managing complex Boolean logic, rather like a PLC. Moreover, every physical, electrical and digital condition of the breaker is digitally mapped. This means that you have at your disposal thousands of parameters and statuses that can be shared with other devices and used to monitor the entire system. You can use this capability to automate the response of the system according to any circuit breaker status or event – and precisely this is the essence of what ATS does.

Let's show an example. Here you can see a very simple logic:



The basic elements are the input statuses (No Alarms, Circuit Breaker Open, Close Command), the Boolean AND operator and the output, which is active when all the input conditions are satisfied (this is the logic of the AND function). In other words, only if the breaker is open and it shows no alarms, will it close when a Close command is sent. This type of logic - and logic much more complex - is well within the capabilities of ABB's ATS.

Technical specification Main-Tie-Main Closed Transition

ATS automatic transfer switch

The ATS logic works as follows:

Starting from a TT configuration (-CB-A and -CB-B closed, -CB-C open)

– In case of undervoltage (ANSI27) [set point] or Ekip Signaling 4K Digital Input 1, 2 or 3 activated on one line (A or B), the relevant CB opens within the set time [set point].
– After the pre–set time and checking for Ready to Close status, checking for dead busbar (under 10 percent of Un), checking that no electric protection element caused the line to open, checking that the other line is available and healthy (Over 90 percent of Un), -CB-C closes.

The ATS shall operate under the following conditions:

– ATS Emergency latching push–button not pressed
– Bus–tie open and RTC
– Other bus bar voltage level > 90 percent of Un

The automatic changeover shall be locked in case of:

– Any protection trip or alarm (The protections activation and settings must be carried out by the customer)
– Emergency push–button pressed

After a current protection trip of any circuit breaker, the ATS logic is locked. The lock shall be removed by resetting the circuit–breaker locally or remotely.

When the “ATS Logic Disabled” normally closed pushbutton is pressed:

– The ATS logic is deactivated
  - The line breakers CB A and CB B can open for ANSI27
  - The bus–tie breaker CB C does NOT close after the opening by ANSI27 of one line
– The MTS logic is deactivated

When the “ATS Logic Disabled” normally closed pushbutton is reset after being pressed:

– If no events occurred (ANSI27 or digital input) the ATS system is restored and ready to operate
– If one line breaker opened for ANSI27 while the pushbutton was pressed:
  - If the line voltage is still absent, the ATS system starts the bus–tie closing procedure after the preset time.
  - If the line voltage is back over 90 percent of Un, the system keeps the previous status (line breaker open, bus tie open) and the operator shall manually restore the desired condition.

Starting from an L configuration (-CB-A and -CB-C closed, -CB-B open / -CB-B and -CB-C closed, -CB-A open)

– In the case of undervoltage (ANSI27) on the healthy line, the relevant breaker and the bus–tie open. The system shall be manually restored.
– In the case of return of voltage (over 90 percent of Un) on the previously faulty line, the system is locked. The operator shall activate the MTS operating mode to change the status of the system.

If the ATS system is working properly, the CB-A 4K Output 1 is lit. You can connect the output to a switchboard Signaling system or you can communicate the contact status to the IPCS.

Emax 2
Embedded ATS system

MTS manual transfer switch

MTS mode can:
– Restore the normal operating condition (TT) without loss of supply after an ATS operation
– Transfer the load from one transformer to another without loss of supply
– Change the system configuration from TT to L without loss of supply

The ANSI25 Syncrocheck function prevents the parallelling of out-of-synch sources.

The “A-C-B” Selector has three positions. Each position acts as follow:
– Position A : -CB-C or -CB-B will close and -CB-A will open
– Position C: -CB-A or -CB-B will close and -CB-C will open
– Position B: -CB-A or -CB-C will close and -CB-B will open

The manual transfer shall be locked in case of:
– Emergency push-button S4 pressed
– The two power sources are out of sync as stated by ANSI25
– ANSI27 alarm on closing breaker
– Closing breaker not RTC
– Any alarm or timing protection on the opening line
– Any Loc/Rem selector on local

The manual transfer will happen if the operator follows the sequence:
1. Select the “Manual” mode with the “Auto/Manual” Switch S1
2. Select which breaker shall open with the “A-C-B” Selector S2
3. Press the “Open” pushbutton S3

And if:
– The two power sources are in sync as stated by the ANSI25
– There is no ANSI27 alarm on closing breaker
– The closing breaker is RTC
– There is no alarm or timing protection on the opening line
– All Loc/Rem selectors are on Rem

Technical specification Main-Tie-Main Closed Transition

Available setting points

CB-A

Name	Description	Threshold	Step
Set point A	Opening time after a voltage drop below the ANSI27 threshold	[0 s…60 s]	1s
Set point B	Parallel time	[300 ms…10 s]	[300 ms, 500 ms, 800 ms, 1 s, 3 s, 5 s, 10 s]
Set point C	SOS opening sequence	[1 s – 1.1 s – 1.2 s]	
UV (ANSI 27)	Undervoltage protection	U8=0.5....0.98xUn	0.001xUn

UV setting available at the "Protection" section of Ekip Connect 3.

CB-B

Name	Description	Threshold	Step
Set point A	Opening time after a voltage drop below the ANSI27 threshold	[0 s…60 s]	1s
Set point B	Parallel time	[300 ms…10 s]	[300 ms, 500 ms, 800 ms, 1 s, 3 s, 5 s, 10 s]
Set point C	SOS opening sequence	[1 s – 1.1 s – 1.2 s]	
UV (ANSI 27)	Undervoltage protection	U8=0.5....0.98xUn	0.001xUn

UV setting available at the "Protection" section of Ekip Connect 3.

CB-C

Name	Description	Threshold	Step
Set point A1	Time elapsed before the bus-tie closes in ATS mode	[2 s…10 s]	1s
Set point A2	Time elapsed before the bus-tie closes in ATS mode	[2 s…10 s]	1s
Set point B	Parallel time	[300 ms…10 s]	[300 ms, 500 ms, 800 ms, 1 s, 3 s, 5 s, 10 s]
Set point C	SOS opening sequence	[1 s – 1.1 s – 1.2 s]	

Fixed settings

Synchrocheck	ΔU threshold	voltage difference module	10%
	Δf threshold	frequency difference	0.2 Hz
	Δ_{φ} threshold	phase angle difference	10°
	Dead busbar Threshold		0.1 x Un
	Live busbar threshold		0.8 x Un
	Synchro voltage	Reference voltage for the synchronism check	U12
	Synchro Primary voltage		400 V
	Synchro Secondary voltage		100 V

Emax 2
Embedded ATS system

Breakers configuration

Each Emax 2 CB involved shall be an E2.2 / E4.2 /E6.2 of the withdrawable type and equipped with the following accessories:

- Ekip Hi-Touch or Touch + Measuring Pro
- Ekip Supply
- Ekip Link
- Ekip Synchrocheck
- Ekip Signaling 4K
- Ekip Com Actuator
- Spring charger Motor
- YO
- YC

The Ekip Connect 3 commissioning tool for ATS has an auto/manual system that check the correct configuration of the circuit breakers. The commissioning succeed only if the configurations are correct.

Compatibility

The Embedded ATS tool is compatible with all the Emax 2 electronic trip units starting from version v02.20.08 of the Ekip Mainboard firmware.

To check the firmware version of your device you can:

1) use the "Information" section of Ekip Connect 3, Nominal Data field.

2) press the "i" button on the front of the trip unit until the page "Protection Unit" appears.

Notes on Ekip Sinchrocheck module

Insulation transformer

Between the external contacts of the circuit-breaker and the inputs of the module, an isolation transformer must always be installed that has the characteristics listed in the following table:

Characteristics	Description
Mechanical	– Mounting: EN 50022 DIN43880 guide. – Material: self-extinguishing thermoplastic. – Protection class: IP30. – Electrostatic protection: with screen to be connected to earth.
Electrical	– Precision class: ≤ 0.5. – Performance: ≥ 5 VA. – Overload: 20 % permanent. – Insulations: 4 kV between inputs and outputs, 4 kV between screen and outputs, 4 kV between screen and inputs. – Frequency: 45…66 Hz.

The standard Fixed Setting of the module is:

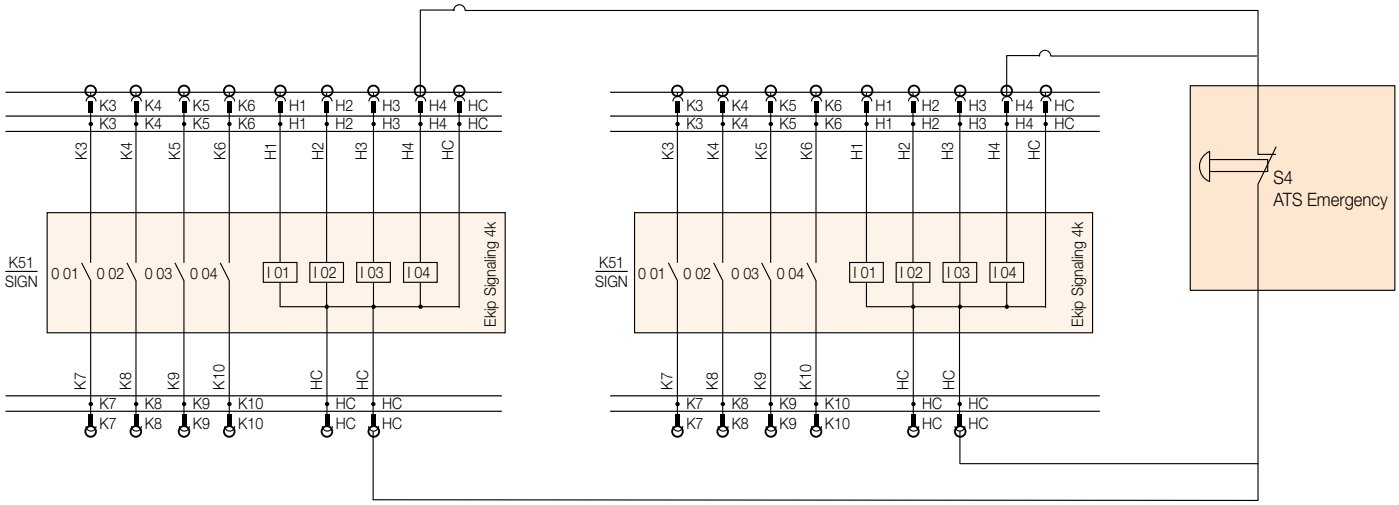
– Primary voltage 400 V

– Secondary voltage 100 V

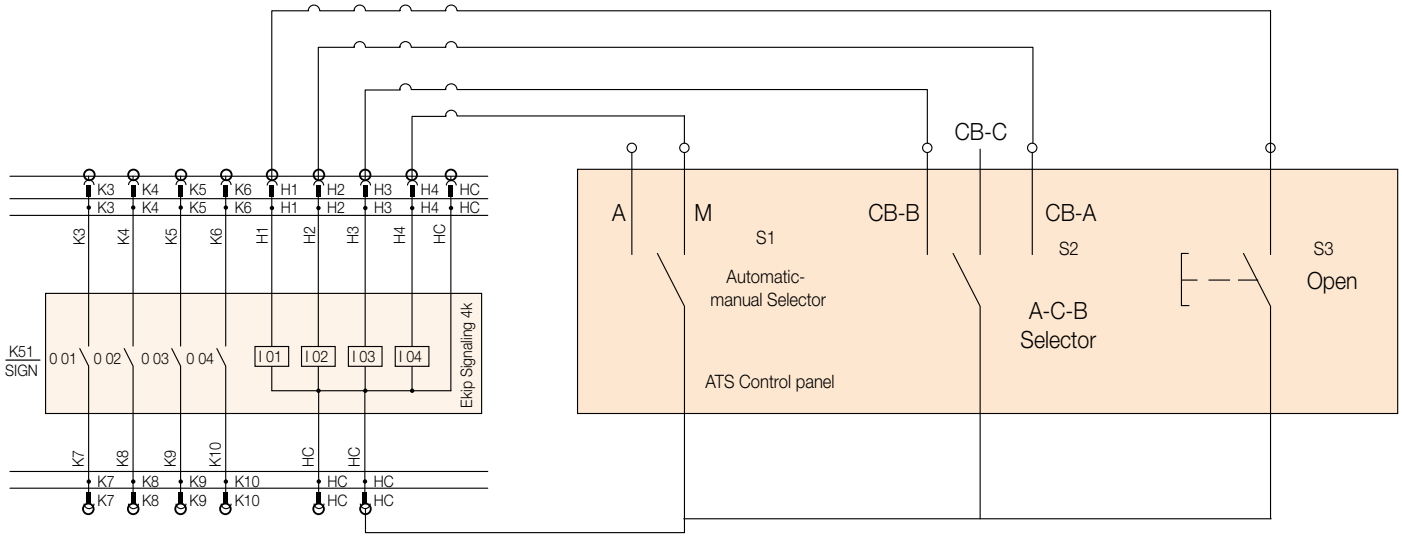
For more information about the Ekip Sychrocheck Module, please refer to the Emax 2 instruction manual.

Technical specification Main-Tie-Main Closed Transition

Ekip Signaling 4K CB-A/CB-B



Ekip Signaling 4K CB-C



Emax 2
Load Shedding innovation

Emax 2, all-in-one innovation

ABB Emax 2, the all-in-one smart circuit breaker, integrates innovative algorithms to safeguard the Microgrids and manage their resources maximizing the efficiency. It embeds patented functions based on load shedding which reduces the Microgrid stress in all situations.

Emax 2 is the main circuit breaker of the low voltage Microgrid located at the interface point with the medium voltage grid, able to control the plant in every circumstances.

1) Microgrid in islanding operation

After the Emax 2 circuit breaker opening, 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 embedded voltage 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:

a) **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.

b) **Adaptive Load Shedding** – The advanced algorithm available with Emax 2 as an enhancement of the basic version. The intelligent software embedded in the circuit breaker sheds very quickly the not priority loads according to the Microgrid power consumption and frequency measurements. Moreover, such software has a dedicated configuration for backup generation related to ATS and the software itself is even able to estimate the energy produced by a solar plant based on plant-geography settings.

2) Microgrid in grid-connected operation

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

a) **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.

The scope of this White Paper is to explain how Emax 2 manages the Microgrid transition from on-grid to off-grid, based on fast load shedding logics. For Microgrid connected case, please refer to 1SDC007410G0202. In the Emax 2 commissioning SW - Ekip Connect 3.0 - there is a dedicated tool where it is possible to enable the Predictive Load Shedding thanks to the SW license available with this commercial code 1SDA082922R1.

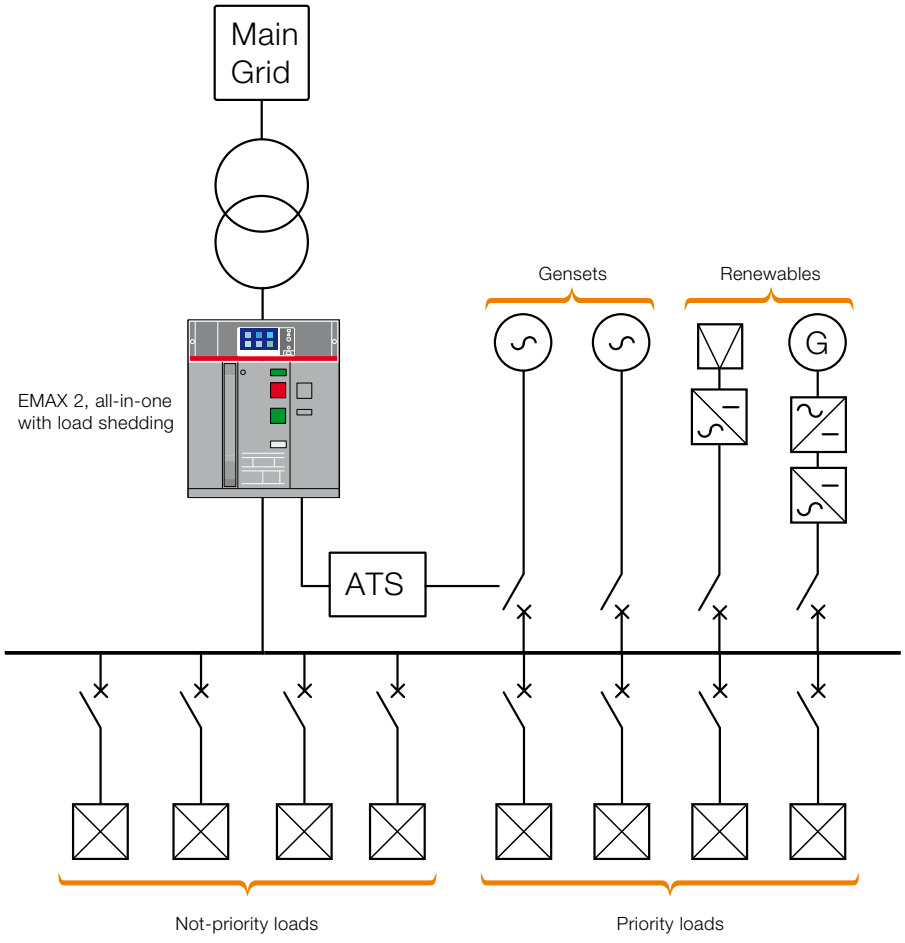
How it works

Load Shedding functions are adopted to protect Microgrids during islanding operation. The application scenarios with just one smart circuit breaker are:

- 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 need redundancy and continuous operation, so it is important to avoid blackouts when the emergency GenSets join the plant.

Example of plant layout with Emax 2, Load Shedding



Even if Microgrids with diesel GenSets are the most common, they can be replaced with energy storage systems where the inertia of the plant remains guaranteed.

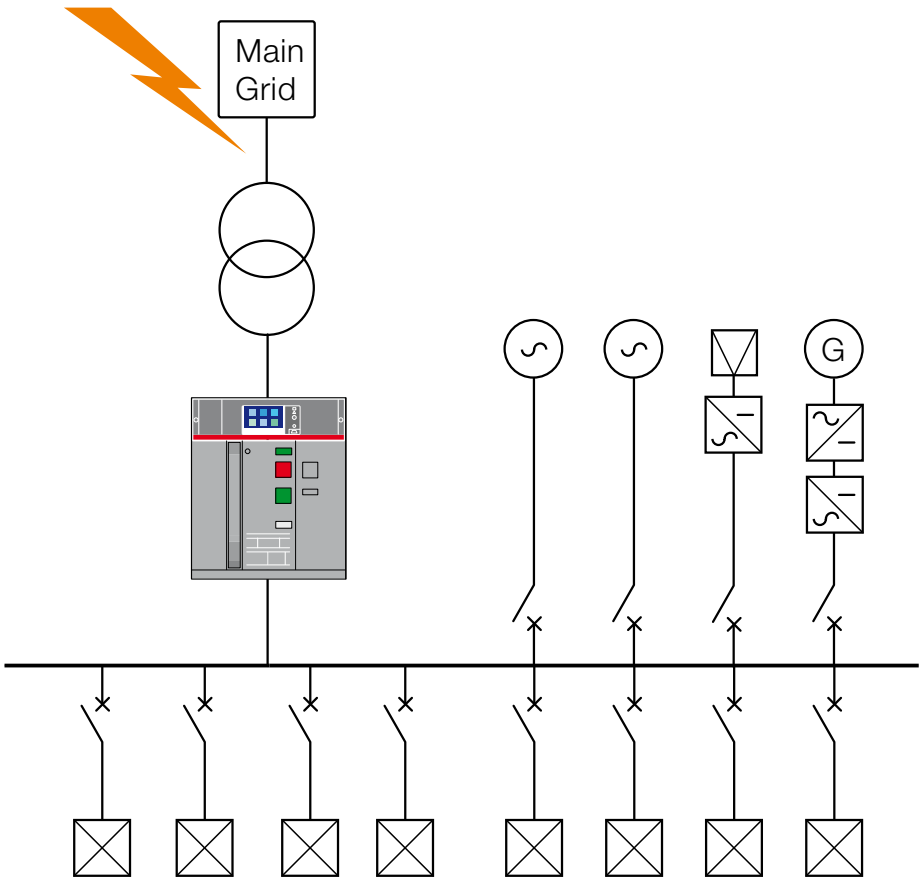
As an extension situation, also standalone Microgrids are suitable to adopt load shedding logics embedded in Emax 2, which becomes the main generator protection circuit breaker. In that scenario, like in marine applications, the generator is the main power source instead of the distribution-grid.

Emax 2
Load Shedding innovation

Basic Load Shedding

The diagram below shows the circuit breaker at the point of common coupling (PCC): when the circuit breaker opens, the Microgrid is disconnected. Because of this, an unwanted balance condition generally occurs, so Emax 2 realizes the load shedding of a group of non priority loads to restore power balance and, consequently, avoid a frequency reduction with the consequent downtime due to generator protection tripping. When the Microgrid reconnects to the medium voltage grid, Emax 2 returns in closed position, and the loads can be automatically closed again in a cyclical loop.

Possible situation of fault that disconnects the Microgrid



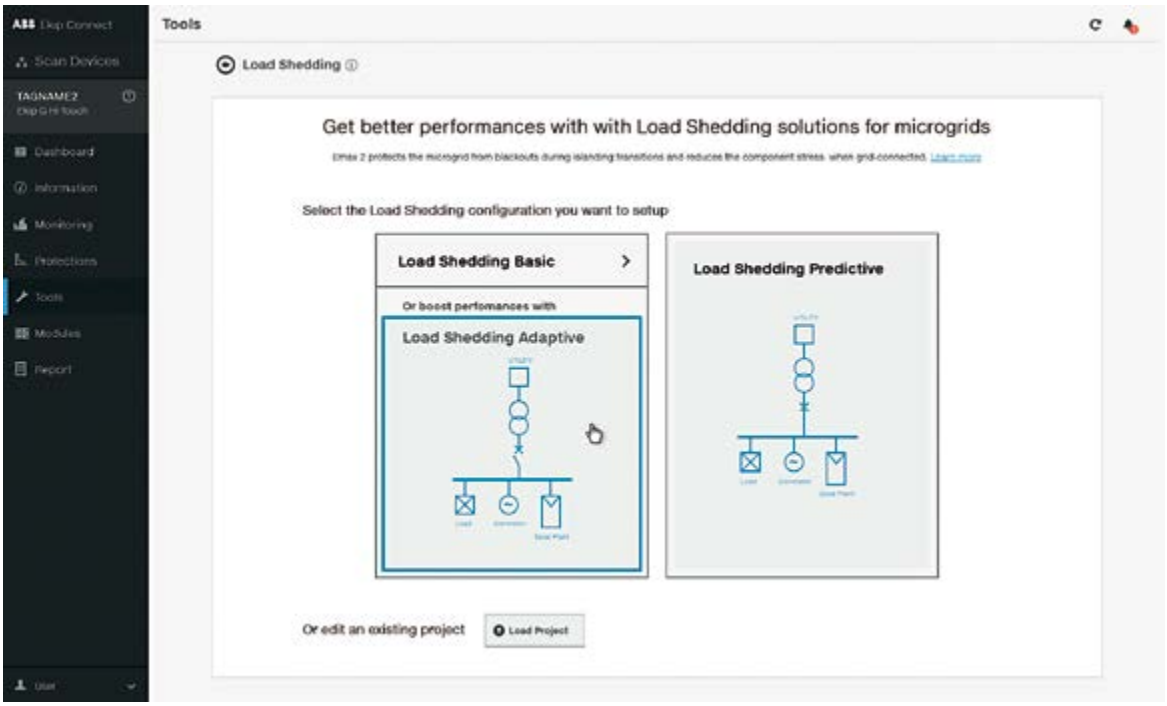
Ekip Connect 3.0 commissioning tool

Ekip Connect 3.0 simplifies complex programming, which is an emblematic barrier for the adoption of advanced functions with other devices.

The user can find load shedding functions inside the “Tools section” and select the desidered setup. It is possible to configure the load shedding function even if the SW license has not been already bought, so as to let the user make practice and see if the algorithm fits with the requirements prescribed for the Microgrid. On the other side, there is the chance to save projects in dedicated files and upload them for other people and in other plants, leaving the greater flexibility for every application.

Basic Load Shedding is available with in Emax 2 circuit breaker, so it is possible to boost performances with Adaptive Load Shedding.

Select load shedding function



Application example of Adaptive Load Shedding

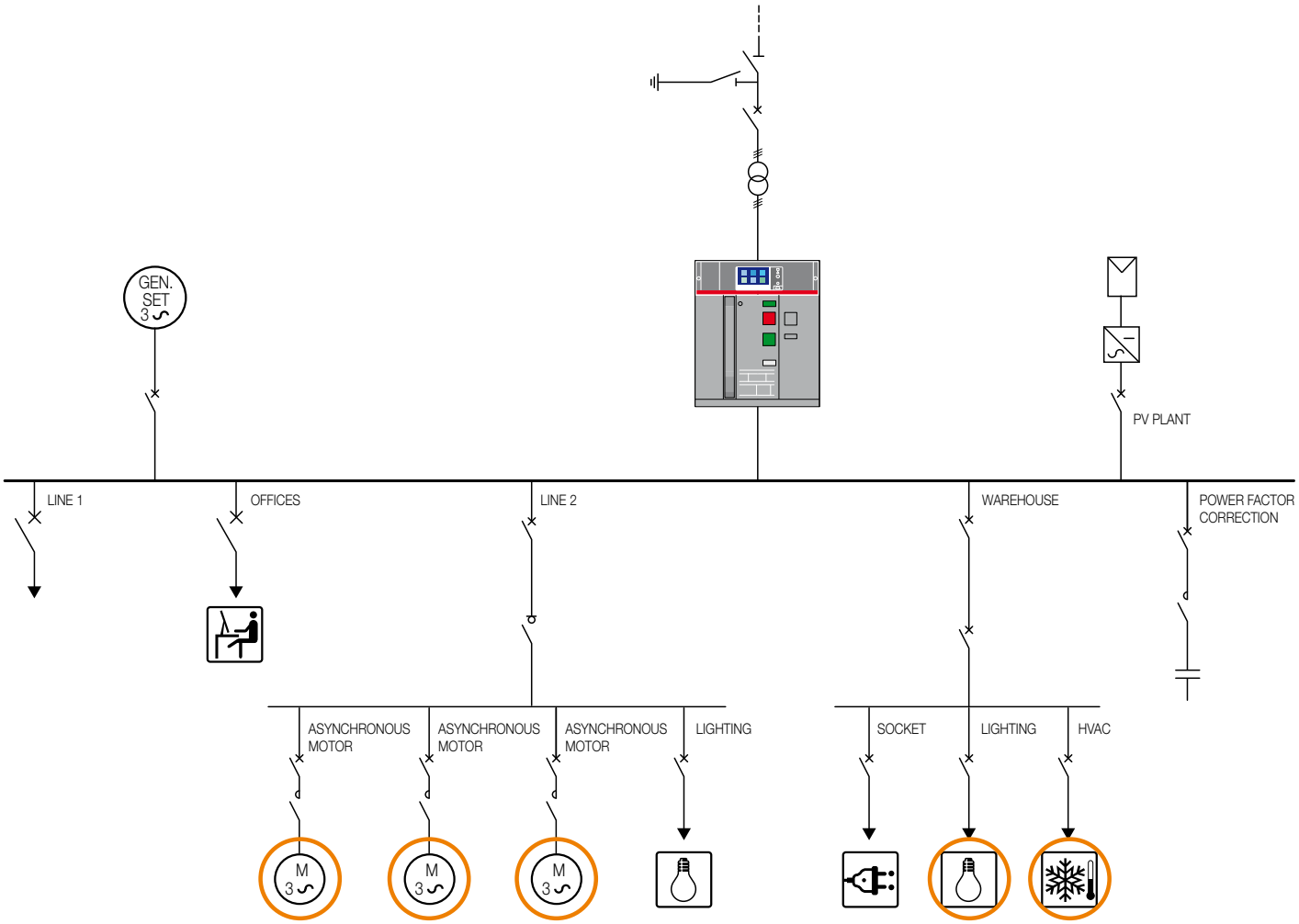
Industry

This application example refers to an industry connected to the MV Utility through a MV/LV transformer (15kV/400V). As shown in Figure 24, in such plant there are a GenSet (An = 625 kVA, Pn = 500 kW) and a PV plant (Pn = 100 kW) which are in parallel with the Utility during the grid-connected operation. The total active power consumed by the loads is 1000kW, so the power absorbed from the grid in a sunny day is equal to 400kW. As a result, the total power of the non-priority loads must be at least 500 kW (sum of the power flowing from the grid with the PV plant nominal power[4]).

The main circuit breaker Emax 2 - installed immediately downstream of the MV/LV transformer and equipped with Interface Protection System feature – is an E1.2C Iu = 800 A.

There are two production lines: Line 1 and 2. Line 1 feeds the priority loads belonging to a continuous production process, so they cannot be controlled by the Load Shedding during islanding operation. Instead, Line 2 feeds non-priority loads which can be managed by the Load Shedding by means of contactors, installed on the power circuit of the corresponding asynchronous motors. Moreover, in the warehouse, there are several loads (e.g lighting and HVAC) that can be controlled by the Load Shedding by means of circuit breakers.

[4] As said before, it is assumed that the PV plant stops its power delivering during islanding operation due to the inverter stand-by self-protection.



The reconnection priority and the controlled devices chosen by the Customer are shown in Table 1:

Table 1

Reconnection Priority	Load	Nominal Power [kW]	Load Factor	Total Power [kW]	Controlled device
1	HVAC	3 x 50	0.8	120	MCCB
2	Lighting	3 x 30	1	90	MCB
3	Conveyor belt – Asynchronous motor	100	0.9	90	Contactor
4	Air compressor 1 – Asynchronous motor	140	0.8	112	Contactor
5	Air compressor 2 – Asynchronous motor	120	0.8	96	Contactor
				508	

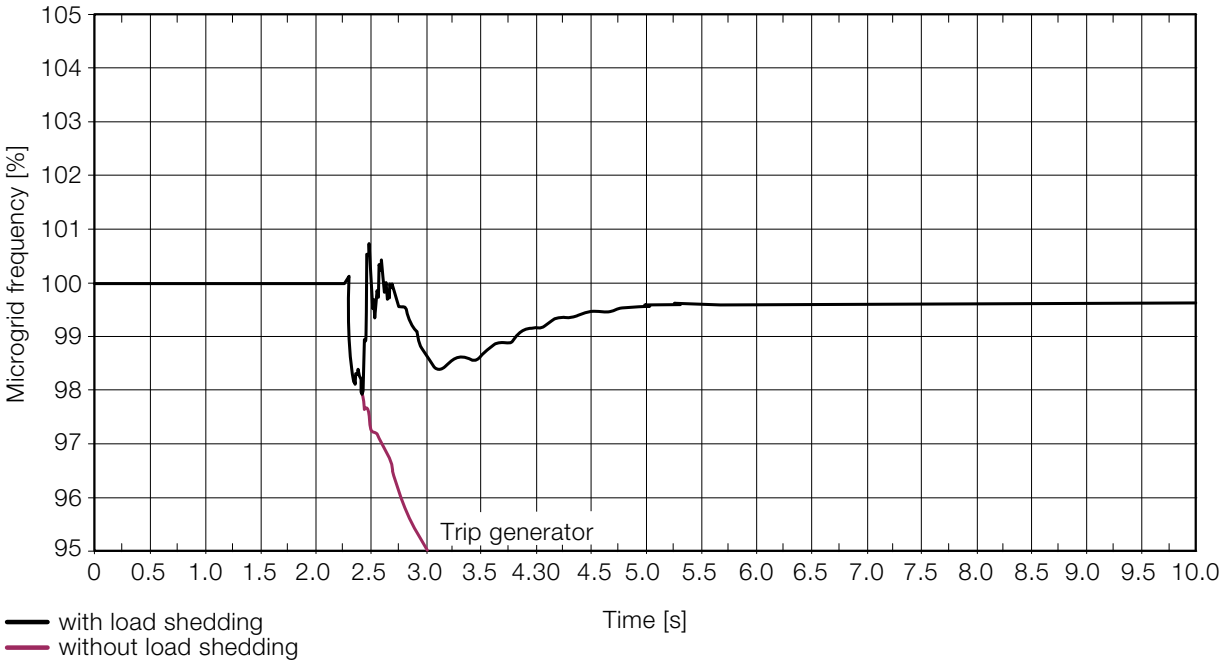
The diagram below shows the frequency variation diagrams during the islanding operation in the following two cases:

- without load shedding feature (Red Line)
- with load shedding feature (Blue Line)

Insert space above the line As it can be seen, in the first case, moving from grid-connected to islanding operation, there is a frequency reduction due to a power absorption by the passive loads higher than the power produced by the GenSet. As a result, as soon as the frequency reaches the undervoltage threshold of the circuit breaker installed on the generator feeder, there will be a shutdown of the whole microgrid.

Instead, in the second case and thanks to the Load Shedding feature, as soon as the main circuit breaker Emax 2 opens, the algorithm disconnects a number of non-priority in order to have a power balance between the power absorbed and local generated. As a result, the frequency decrease is reduced and stopped to a value higher than in the previous case. Hence, the frequency protection does not trip and the Microgrid remains live.

Then, when the main circuit breaker Emax 2 recloses, the Load Shedding feature will reconnect all the loads according to the priority list.

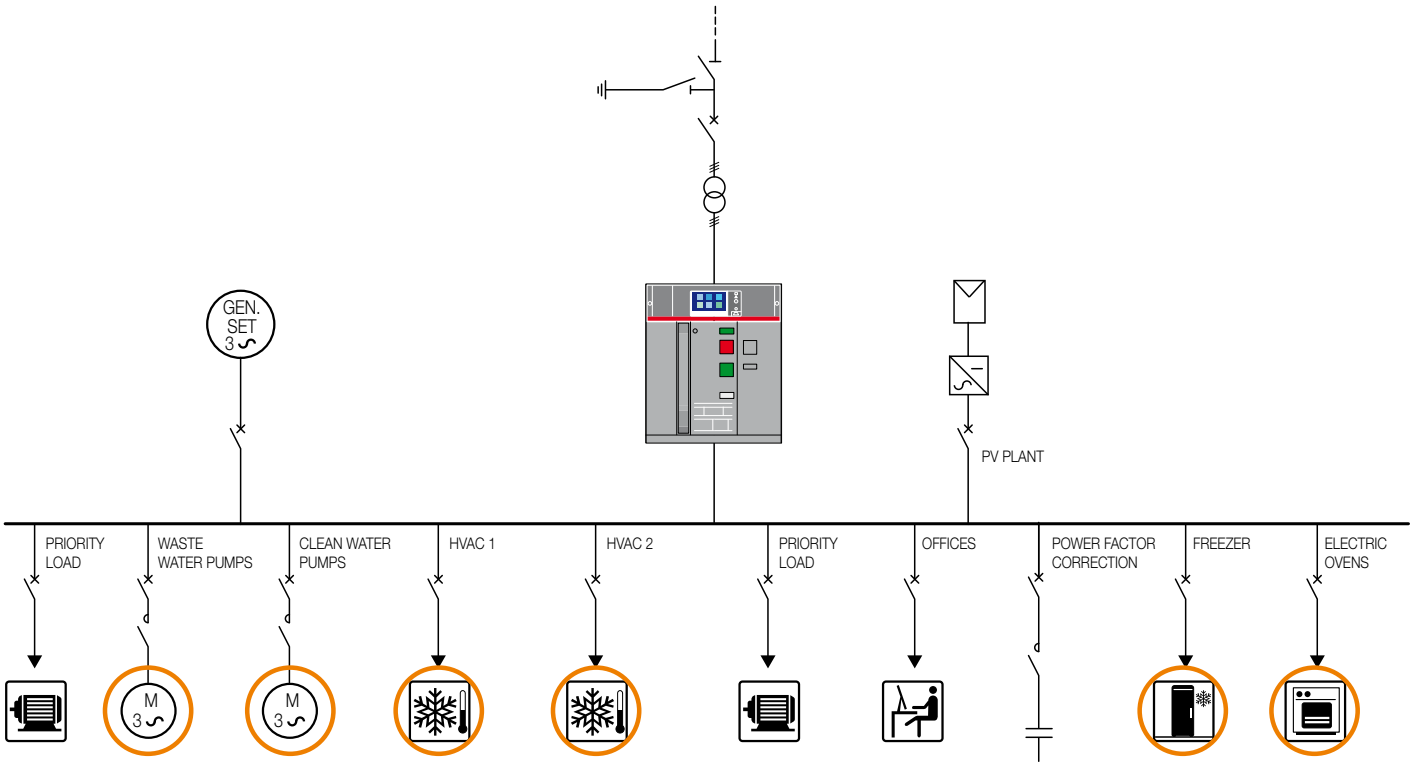


Emax 2
Load Shedding innovation

Building

This application example refers to an office building connected to the MV Utility through a MV/LV transformer (15kV/400V). As shown on the previous page, in such plant there is a PV plant (Pn = 100 kW) connected in parallel with the Utility during the grid-connected operation. There is also a GenSet (An = 625 kVA, Pn = 500 kW) which is connected by the ATS when the main circuit breaker Emax 2, installed immediately downstream of the MV/LV transformer, opens. The total active power adsorbed by the loads is 1000kW; therefore, the power adsorbed from the grid in a sunny day is equal to 900kW. As a result, the total power of the non-priority loads must be at least 500 kW (difference between the total power of the loads and the nominal generator power[5]).

[5] Even in this case, it is assumed that the PV plant stops power delivering during islanding operation due to the inverter stand-by.



The reconnection priority of the non-priority loads and the controlled devices chosen by the Customer are shown in Table 2.

Table 2

Reconnection Priority	Load	Nominal Power [kW]	Load Factor	Total Power [kW]	Controlled device
1	HVAC1	3 x 50	0.7	105	MCCB
2	HVAC2	3 x 50	0.7	105	MCCB
3	Clean water pumps – Asynchronous motor	170	0.8	136	Contactor
4	Waste water pumps – Asynchronous motor	170	0.8	136	Contactor
5	Freezer	12	0.9	10.8	MCB
6	Electric ovens	12	0.9	10.8	MCB
				503.6	

Electrical diagrams

In the algorithm architecture, Emax 2 sends inputs to the non-priority load devices to realize the load shedding and outputs to each one for their reconnection. From the other side, it receives the load status and tripped indication, where available, from the load devices.

The connection among Emax 2 and the load devices is realized by traditional wiring using Ekip Signaling modules. The number of Ekip Signaling depends on the number of loads controlled. The load devices that can be shed are those of the Table 3, either if ABB product or not.

Table 3: load device controlled

Product family	Accessory required	Emax 2 I/O used
Molded case circuit breaker ABB example: Tmax XT, Tmax T equipped with MOD or MOE	Motor operator, open/closed contact, released tripped contact	2
Air circuit breaker ABB example: Emax, Emax 2	Charging coil motor, opening/closing coil, status contact, release tripped contact	2
Contactors ABB example: AF	Auxiliary contact	1
Switches ABB example:: OTM	Motor operator, auxiliary contact	1
Miniature circuit breaker ABB example:: S200 equipped with S2C-CM, DS200 equipped with DS2C-CM, S800 equipped with S800-RSU-H	Auxiliary power supply, motor operator, open/closed contact (if not included in the motor).	1
I/O interface Example: drives	Digital input contact	1

If the loads under control are many and therefore the integrated I/O are not enough or if they are far from the Emax 2 cabinet, it is possible to connect them through Ekip Signaling 10K. This Din-rail module is connected to Emax 2 either by the local bus for short distance or by Ekip Link, using standardized Ethernet cable in case of long distances.

Shopping List

The load shedding algorithms can be easily used Emax 2 thanks to a plug&play business model.

The Basic Load Shedding is always available in the circuit breaker equipped with the right hardware and can be configured directly by Ekip Connect.

The Adaptive Load Shedding can be ordered directly for new breaker or uploaded for upgrade switchgear already commissioned. In this case, the SW license present in the USB key unlocks the settings transfer to the breaker by Ekip Connect 3.0.

Table 4: shopping list for Emax 2 Load Shedding

Description	Product	Commercial Codes	Notes[6]
Trip unit	Ekip G Hi Touch trip unit family	Embedded in Emax 2 circuit breaker	
Power supply	Ekip Supply 110-240V AC/DC	1SDA074172R1	As an alternative Ekip Supply 24-48V DC (1SDA074173R1)
I/O contacts	Ekip Signaling 10k	1SDA074171R1	As an alternative, depending on the number of I/O required in the architecture, Ekip Signaling 4k (1SDA074170R1)[7] or Ekip Signaling 2k[8] (1SDA074167R1, 1SDA074168R1, 1SDA074169R1)
Ethernet communication	Ekip Link	1SDA074163R1	Optional if used with Ekip Signaling 10k with Ekip Link interface
SW license USB key	Basic Load Shedding	Already installed in Emax 2	
SW license USB key	Adaptive Load Shedding	1SDA082921R1	

[6] For every commercial codes, see 1SDC200023D0204 for IEC and 1SDC200039D0201 for UL.
[7] Available for E2.2-E6-2 frames.
[8] Up to 2 modules for frame E1.2, up to 3 modules for frame E2.2-E6.2.

Ekip UP
Retrofit your current system

With the fourth industrial revolution upon us, new grid architectures and the power of data are reshaping the traditional way to manage the electrical distribution plants. However, in the past ten years, more than 5 million power circuit breakers and 30 million molded case circuit breakers have been installed worldwide without digital output capability for monitoring, protection and control.

To stay competitive, it is critical to be able to understand resource consumption and allocation to maximize uptime and boost productivity. This requires the ability to measure and monitor resources, ensure proper system protection and have the ability to quickly diagnosis an issue and control and manage resources.

Ekip Up provides the ability to:
– Stay competitive by maintaining plant electrical resources without the need of upgrading all of the electrical devices which can be expensive
– Engineer a custom system which requires significant engineering, integration and training

Ekip UP - The low voltage multifunction unit
– **Up-date** your old facility with the latest innovation in the fastest way
– **Up-grade** your plant and get more functionalities in order to cover all the opportunities
– **Up-load** measures and enable a true energy management function
– Maximize **Up-time** thanks an easy commissioning without impact on switchboard design

Panel builders and OEMs
UP-date basic switchboard
100% applicable for every low-voltage scenario

End users
UP-grade your facility
30% operational cost saving

Design institutes
UP-load your electrical system
Electrical system data to the cloud in less than 10 minutes

System integrators
Maximize UP-time
50% time savings when retrofitting

Ekip UP
Product range

Ekip UP can upgrade a standard analog system and provide the digital output. There are five models availabe to give you the capability you need:

– Ekip UP Monitor
– Ekip UP Protect
– Ekip UP Protect+
– Ekip UP Control
– Ekip UP Control+

Ekip UP model capabilities

	Metering				**Network analyzer**	**Data logger**	**Protections**				**Advanced protections**				**Advanced functions**	
	Current	Voltages	Power	Energy	Power quality	Fault analysis	Current	Voltages	Power	Frequency	Restricted earth fault	Directional	ROCOF	Generator protection	Dual setting	Power management
Monitor	√	√	√	√	√	√										
Protect	√	√	√	√	√	√	√									
Protect+	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Control	√	√	√	√	√	√										√
Control+	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Ekip UP Monitor

Ekip UP Monitor is a multi-meter for energy measurement with embedded network analyser, data loggers, advanced connectivity and gateway for cloud communication.

Main energy parameters metering is guaranteed by Ekip UP open or closed rogowski coils, with or without external voltage sensors depending on specification required. The entire measurement chain enables:
– Current class 1
– Voltages class 0,5
– Power class 2

Ekip UP Monitor understands the quality of power detecting the values according to IEC61000-4-30 by an integrated network analyzer:
– Average voltage value
– Short voltage interruptions and spikes
– Slow voltage sags and swells
– Voltage unbalance
– Harmonic analysis

Data loggers with two independent memory buffers support quick diagnosis after a triggered event

Down load the Ekip Connect 3.0 for free at http://new.abb.com/low-voltage/products/circuit-breakers/tmax-xt/software.

Full connectivity for system integration and power automation can be achieved in the same unit with up to 4 protocols that can be chosen among fieldbus protocol, with possible redundancy:

– Modbus TCP, Modbus RTU, Profinet, Profibus, DeviceNet, IEC 61850, Ethernet/IP, openADR, Ekip Link

Embedded gateway for the plant integration into the cloud-based platform ABB Ability Electrical Distribution Control System for remote monitoring everywhere by any laptop or tablet

Ekip UP Protect and Protect+

Ekip UP Protect and Protect+ are the versatile protective relays. Besides monitoring capabilities, they offer a comprehensive list of ANSI protections for power distribution and generation.

As it is possible to be interfaced with every switching device, Ekip UP Protect ensures feeder protection sending opening and closing commands for trips or manual operations. Using it with switch disconnector, it is possible to guarantee the breaking capacity equal to the value of rated short-time withstand current (Icw) for one second. If it works on an existing circuit breaker, it is possible to maintain its short-circuit breaking capacity, excluding current based protection on Ekip UP, and upgrade it with more functions.

– Overload, short-circuit instantaneous or delayed, differential and ground fault, current unbalance
– Under-over voltage, under-over frequency, synchrocheck, reverse power

Ekip UP Protect+ includes generator protections based on active and reactive power, adaptive settings and directional protections for power distribution grids:

– Under-over active power, under-over reactive power, rate of change of frequency

Besides, installing Ekip Protect+ is possible to get digital selectivity, plus distinguish restricted from unrestricted earth fault in medium voltage – low voltage substations.

Both the two versions can be equipped with the sw-based innovations from the all-in-one electronics platform. These advanced features ensure service continuity and energy efficiency in the plants, reducing the complexity of programming thanks to the tools built-in Ekip Connect 3.0 commissioning software:

ATS (automatic transfer switch), fast load shedding, synchro reclosing capability, certified interface protection system.

Ekip Up also has the same HMI and function configuration as the Emax 2 circuit breaker for consistent training for new and retrofitted systems.

Download the Ekip Connect 3.0 for free at http://new.abb.com/low-voltage/products/circuit-breakers/tmax-xt/software.

Ekip UP Control and Control+

Ekip UP Control and Control+ are the power management unit for demand response and microgrid control applications.

Ekip UP Control simply introduces load and generation management in the plant, cutting power billing for end-users and making the electrical system ready for demand response programs, leveraging on dedicate protocols like openADR. Utilities or load aggregators can set the power flow at the point of common coupling, sending specific signals to Ekip UP Control, based on grid ancillary service, weather forecasts or pricing strategies.

Ekip UP Control+ leverages the demand control capability plus protections, ensuring a complete solution. It is the best digital product in the family, satisfying plug&play commissioning in comparison with complex PLCs (programmable logic controller) or scada systems.

Ekip UP Control+ upload the software solutions from all-in-one, as it is the way to turn on existing plants in low voltage microgrids

Download the Ekip Connect 3.0 for free at http://new.abb.com/low-voltage/products/circuit-breakers/tmax-xt/software.

Ekip UP

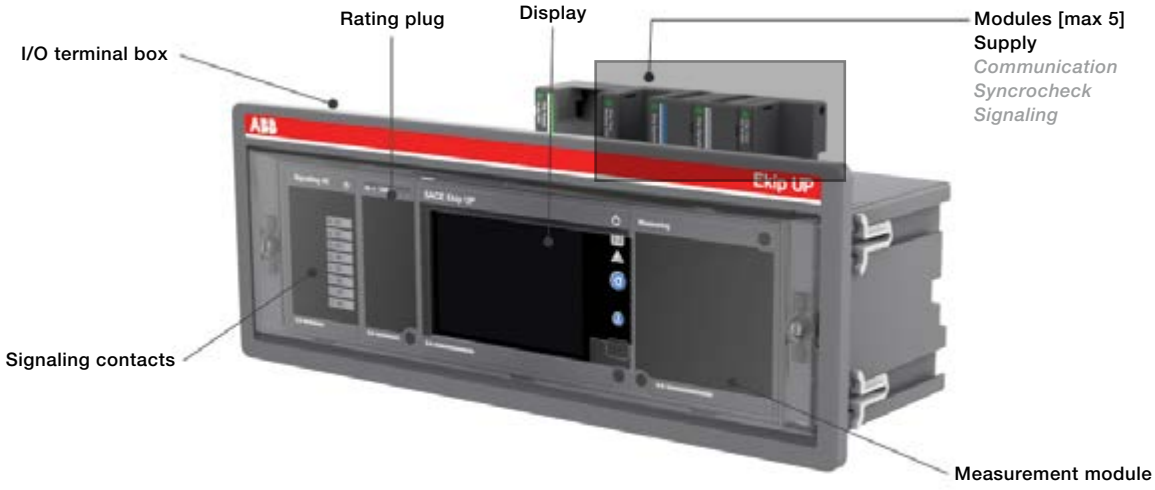
Performance

Monitor
Protect
Protect+
Control
Control+

4

– IEC 60255 - Measuring relays and protection equipment standard
– Operating voltages: 220V…690V
– Operating currents: 100A…4000A
– Operating temperature:
  – Min -25 °C , Max +85 °C
– Measurement accuracy:
  – Current, class 1
  – Voltage, class 0,5
  – Power, class 2
  – Harmonics up to 50t
– Power quality: IEC 61000-4-30
– Color touch screen
– LED Alive and LED Power
– Removable battery for time stamp
– Front mini USB test connector
– Sealable transparent protection cover
– Protection degree: IP40
– Browsing menu like «Emax 2»
– Ten languages available

Standard configuration (with recommended additional modules)



Ekip UP
Accessories

Accessorizing

Communiction:
Modbus RTU
Modbus TCP/IP
Ethernet/IP
Profibus, Profinet
Devicenet
IEC61850
Link
Cloud

Signaling:
Signaling 2k-1
Signaling 2k-2
Signaling 2k-1

Others:
Synchrocheck
Bluethooth
GPRS

Rating plug
100... 4000A
630...4000A Rc

Sensors:
Current, Type A and B in 3p and 4p kit
Voltage, in 3p and 4p Kit
Residual Current and Homopolar

Software package:
Load Shedding
ATS logics
Synchro Reclosing

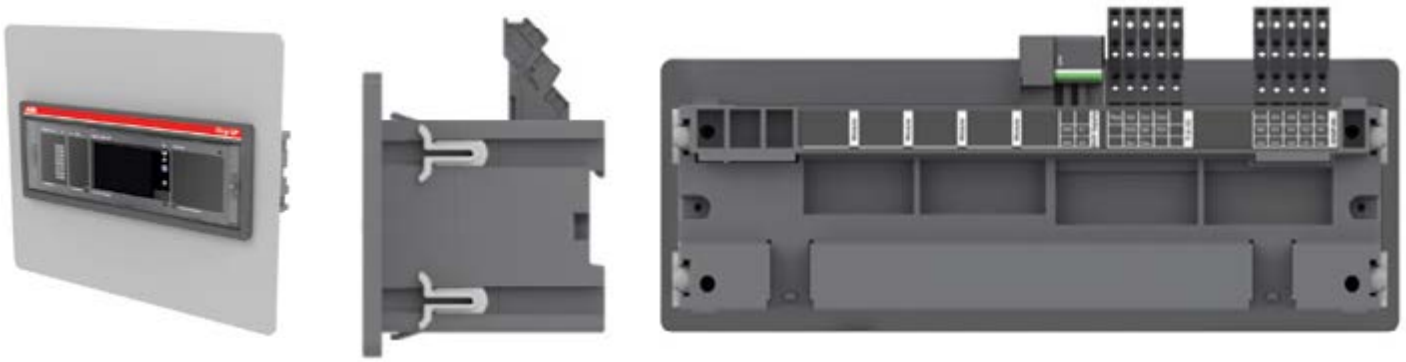
4

Current Sensors

Type A – residual current		Type B – homopolar	
	Iu: 1600 Busbars: 2x60x10mm Kit: 3p / 4p		Iu: 400A Busbars : 1x30x10 Cables: 1x240mm2 Kit: 3p / 4p
	Iu: 4000 Busbars : 4x100x10mm Kit: 3p / 4p		Iu: 1600A Busbars : 2x60x10mm Kit: 3p / 4p

Ekip UP
Flexible installation

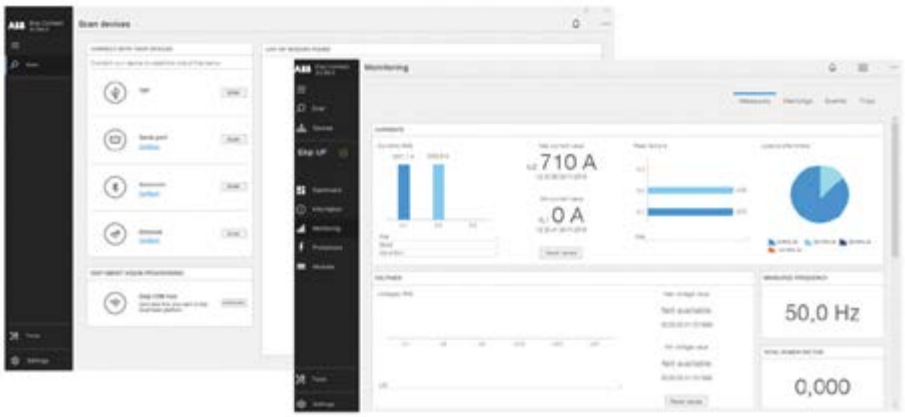
1. Door mounted



2. DIN mounted

Commissioning

Easy and fast commissioning by Ekip Connect



Download the Ekip Connect 3.0 for free at http://new.abb.com/low-voltage/products/circuit-breakers/tmaxxt/software.

Accessories

Accessories
Functional areas

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

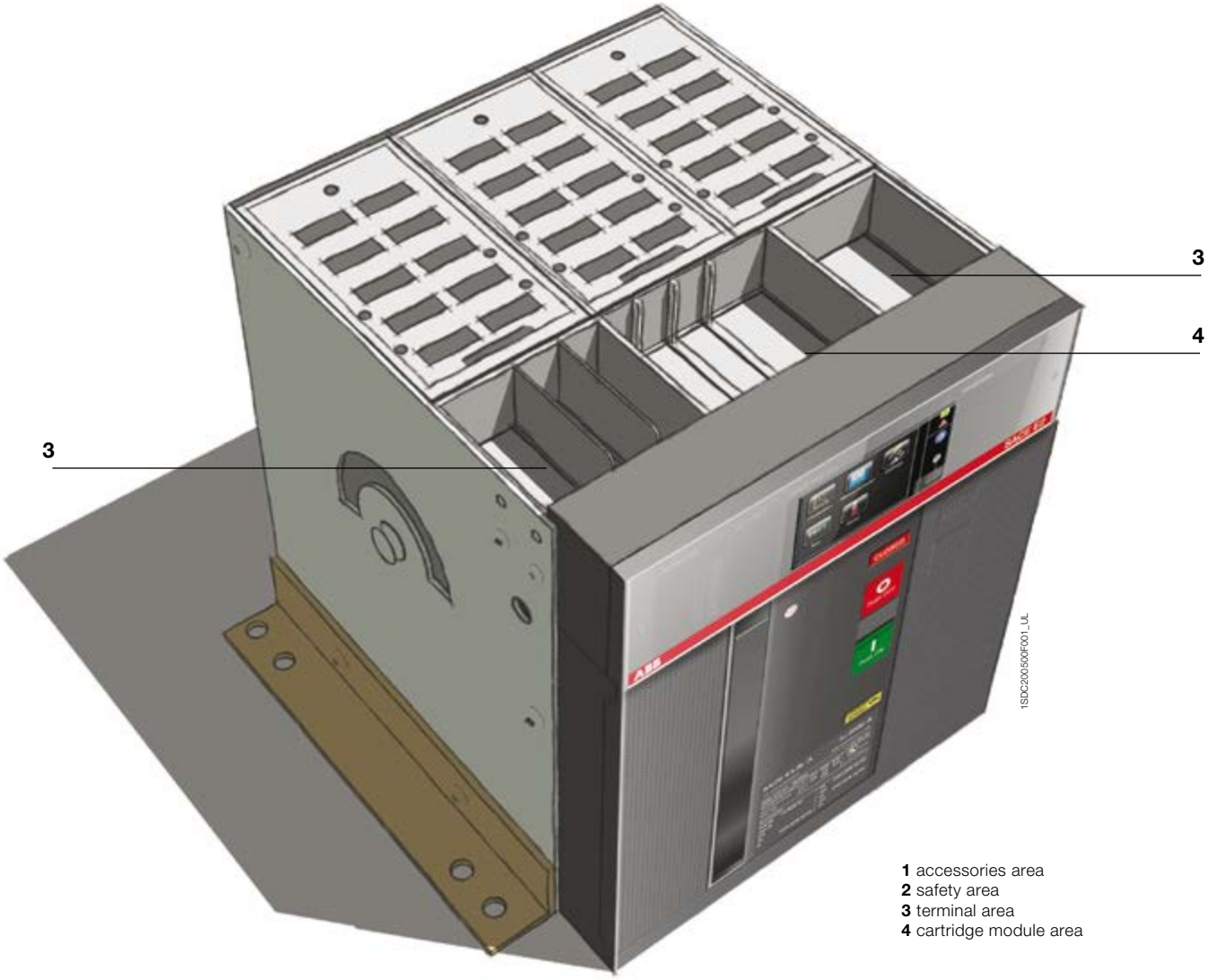
The front of the circuit breaker features two functional areas, which are protected by separate covers:

- **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 cover. On removal, the operating mechanism area remains segregated and protected, providing safety for operators.
- **Safety area**, for housing the stored energy operating mechanism of the circuit breaker. To carry out maintenance on the operating mechanism, the cover of the accessories and safety area must be removed.

As a result of two distinct functional areas that determine the operating spaces, the accessorizing logic of the circuit breakers has been considerably simplified.

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 in the circuit breaker terminal box, thereby facilitating cable connection for the operator.
- **Cartridge module area** for housing for the Ekip modules. These are installed directly on the upper part of the circuit breaker or of the cradle without having to remove the Ekip electronic trip unit, thereby minimizing the time required for the installation and commissioning of accessories.

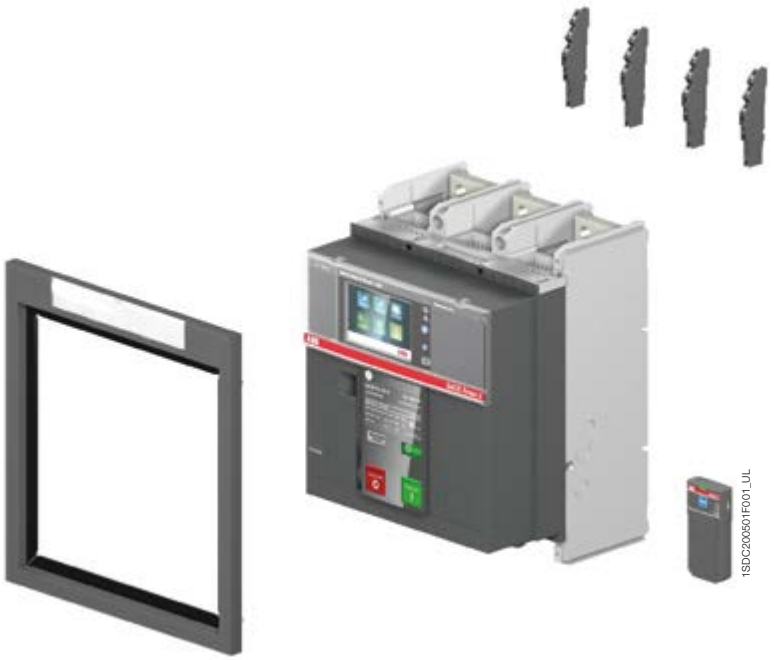


1 accessories area
2 safety area
3 terminal area
4 cartridge module area

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 (door escutcheon)
- lifting plates for E2.2 through E6.2 circuit breakers
- front terminals for E1.2 circuit breaker
- adjustable rear terminals for E2.2 through E6.2 circuit breakers, mounted in HR – HR configuration, with exception for E4.2 L version, E4.2 3200A and E6.2 6000A[1)] in which they are supplied in VR - VR configuration.

In addition, for fixed automatic circuit breakers only:
- four standard open/closed auxiliary contacts - AUX 4Q (4 Form C)
- four terminal blocks for auxiliary connections
- mechanical Signaling of the tripping of the protection trip unit - TU Reset
- Ekip TT power supply and test unit, for displayed trip units
- trip Signaling contact (S51 / bell alarm).

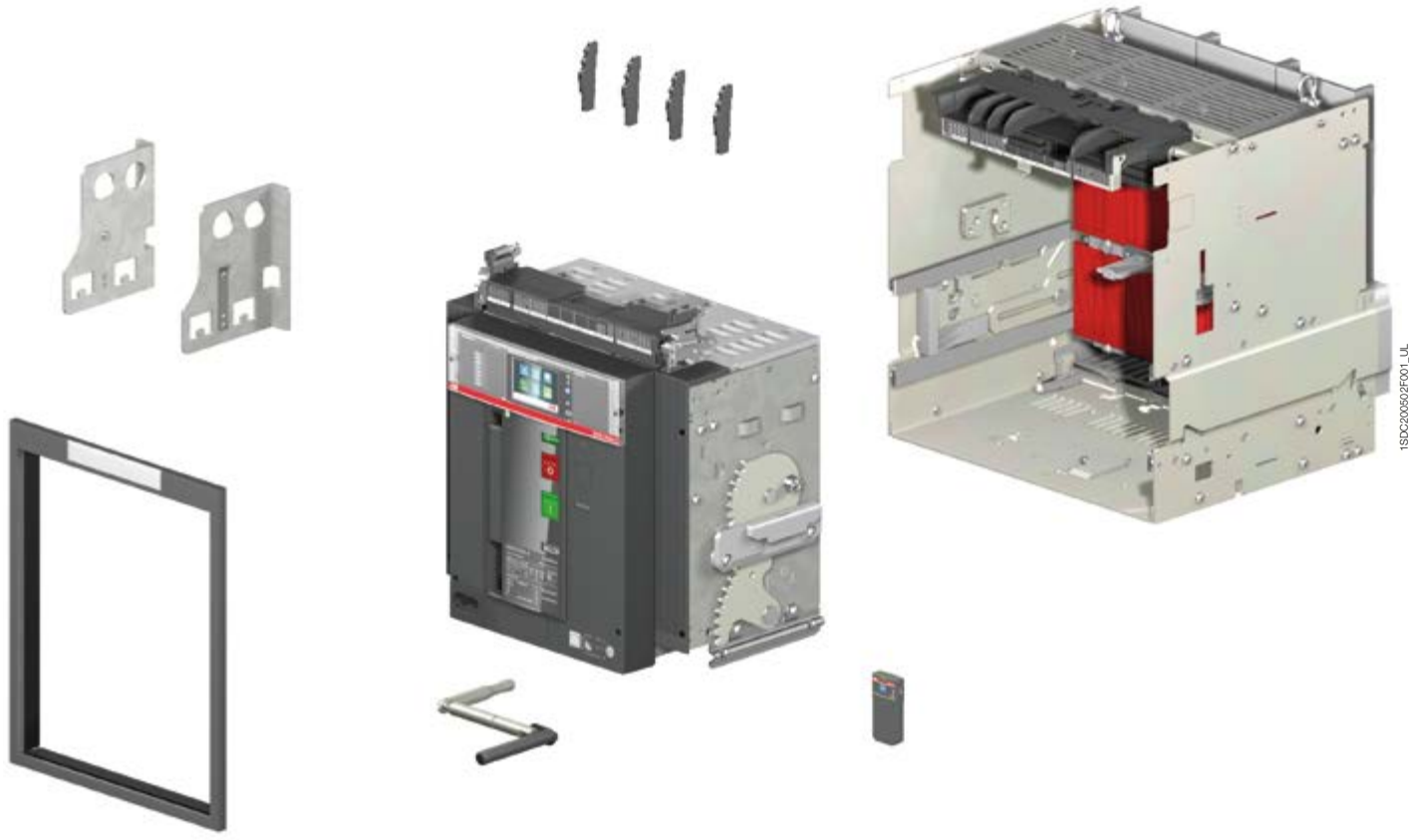


[1)] Version not yet available. Contact ABB.

The drawout versions of 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 through E2.6 circuit breakers
- lever for racking in and racking out
- anti-insertion lock
- anti-racking out device (fail safe).

In addition, for drawout circuit breakers only:
- four standard open/closed auxiliary contacts - AUX 4Q (4 Form C)
- four terminal blocks for auxiliary connections
- mechanical Signaling of the tripping of the protection trip unit - TU Reset
- Ekip TT power supply and test unit, for displayed trip units
- trip Signaling contact (S51 / bell alarm).

The cradles feature:
- IP30 protection for switchgear door (door escutcheon)
- anti-insertion lock
- standard shutter lock – SL
- adjustable rear terminals, mounted in HR – HR configuration, with exception for E4.2 L version, E4.2 3200A and E6.2 6000A[1)] in which they are supplied in VR - VR configuration..



[1)] Version not yet available. Contact ABB.

Accessories
Circuit breaker accessories

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
Signaling				
Standard open/closed auxiliary contacts - AUX 4Q (4 Form C)	● / ●●	● / ●●	○ / ○○	○ / ○○
Open/closed auxiliary contacts - AUX 6Q (6 Form C)	-	○ / ○○	-	○ / ○○
Open/closed auxiliary contacts- AUX 15Q (15 Form C)	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Auxiliary position contacts - AUP	●	●	●	●
Ready to close Signaling contact - RTC	○ / ○○	○ / ○○	○ / ○○	○ / ○○
TU Reset mechanical Signaling of the tripping of protection trip unit - TU Reset	● / ●●	● / ●●	-	-
Trip Signaling contact - S51 / bell alarm	● / ●●	● / ●●	-	-
Contact Signaling loaded springs – S33 M/2 (supplied with Motor)	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Control				
Shunt coil / closing coil - YO/YC	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Second shunt coil / closing coil - YO2/YC2	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Undervoltage coil - YU	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Electronic time-delay device for undervoltage coil - UVD (IEC only)	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Motor - M	○ / ○○	○ / ○○	○ / ○○	○ / ○○
Remote reset - YR	○ / ○○	○ / ○○	-	-
Shunt coil and closing coil test unit - YO/YC Test Unit (IEC only)	○ / ●	○ / ●	○ / ●	○ / ●
Safety				
Anti-racking out device (fail safe) - FS	●●	●●	●●	●●
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 (door escutcheon)	● / ●	● / ●	● / ●	● / ●
IP54 Protection (door escutcheon)	○ / ●	○ / ●	○ / ●	○ / ●
Terminal covers - HTC / LTC	○ / ○○	-	-	-
Phase barriers - PB	○ / ○○	-	-	-
Connections				
Adjustable rear terminal - HR/VR	○	●	○	●
Front terminal - F	●	○	●	○
Other configurations	○ / ●	-	○ / ●	-
Interlocks and switching devices				
Mechanical interlock - MI	○ / ○○ / ●	○ / ○○ / ●	○ / ○○ / ●	○ / ○○ / ●
Automatic transfer switches - ATS (IEC only)	○ / ○○	○ / ○○	○ / ○○	○ / ○○

- ● 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 cradle
- ● Accessory on request for cradle


1SDC200503F001

Signaling

Open / closed auxiliary contacts - AUX

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:


1SDC200504F001

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


1SDC200505F001

		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 1, 81, 91

Aux 6Q (6 Form C) is an alternative to the Ekip Signaling 4K module. AUX 15Q (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) if mounted on the right side.


1SDC200506F001


1SDC200507F001

Auxiliary position contacts - AUP

When the circuit breaker is a drawout version, the position of the mobile part can be signaled electrically by accessorizing the cradle with one of the following Signaling 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: figure 95, 96, 97


1SDC200508F001

Ready to close Signaling contact - RTC

The ready to close Signaling 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

1SDC200509F001

Mechanical Signaling of the tripping of the protection trip unit - TU Reset

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 Signaling device clearly indicates the tripping status on the front of the circuit breaker. The circuit breaker can be reset only after the Signaling pushbutton has been restored to its normal operating position. The device conforms to the ANSI 86T standard.


1SDC200685F001

Trip Signaling contact - S51 / bell alarm

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 Signaling 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. It can also be associated with an optional accessory for resetting by remote control - YR. For electromechanical characteristics, please refer to the RTC contact.

Electrical diagram reference: figure 11

Contact Signaling loaded springs – S33 M/2

This contact is always supplied with a geared motor in its standard (250V) format. It remotely signals the spring status of the circuit breaker operating mechanism. It is available in both a standard version and a 24V 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

Control

Shunt coil / closing coil - YO/YC

The shunt coil and closing coil 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 a minimum impulse current duration time of 100 ms. Furthermore, they can operate in permanent service. In this case, if an opening command is given by means of the shunt coil, the circuit breaker can be closed by de-energizing the shunt coil and (after a time of at least 30ms) by supplying a closing command.

Electrical diagram reference: figure 75, 77

Second shunt coil / closing coil - YO2/YC2

For certain installations the redundancy of mechanisms and circuit breaker operating circuits is often requested. To answer these needs, SACE Emax 2 circuit breakers can be equipped with double shunt coils and double closing coils. The technical characteristics of the second accessories remain the same as those of the first.
A second closing coil can be used for E2.2, E4.2 and E6.2 circuit breakers. A second shunt coil can be used as an alternative to the undervoltage coils or anti-racking out device on any breaker.

Electrical diagram reference: figure 72, 79

General characteristics		
Power supply (Un)	**AC**	**DC**
24V	•	•
30V	•	•
48V	•	•
60V	•	•
110V...120V	•	•
120V...127V	•	•
220V...240V	•	•
240V...250V	•	•
277V	•	-
380V...400V	•	-
415V...440V	•	-
480V...500V	•	-
Operating limits	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	50 ms	

Shunt coil and closing coil test unit - YO/YC Test Unit (IEC only)
The shunt coil and closing coil test unit helps ensure that the various versions 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 shunt coils and closing coils with a rated operating voltage between 24V and 250V (AC and DC), as well as verifies the functions of the electronic circuit.
Continuity is checked cyclically with an interval of 20s between tests. The unit has optic signals via LEDs on the front, which provide the following information:
POWER ON: power supply present
TESTING: testing in progress
TEST FAILED: signal following a failed test or lack of auziliary power supply
ALARM: signal given following three failed tests.

Two relays with one change-over area also available on board the unit, to allow remote Signaling 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.

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

Undervoltage coil – YU

The undervoltage coil opens the circuit breaker when there is a significant voltage drop or power failure to its control signal. 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 coil is an alternative to a second shunt coil or the anti-racking out device.

General characteristics

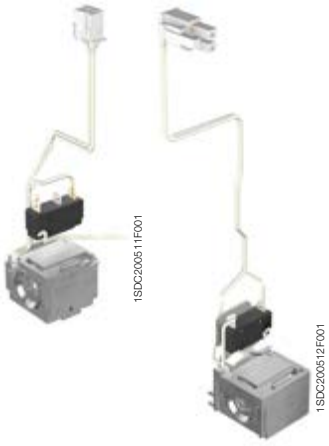
Power supply (Un)	**AC**	**DC**
24V	•	•
30V	•	•
48V	•	•
60V	•	•
110V…120V	•	•
120V…127V	•	•
220V…240V	•	•
240V…250V	•	-
277V	•	-
380V…400V	•	-
415V…440V	•	-
480V…500V	•	-
Operating limits	70%...110% Un	
Inrush power (Ps)	300VA	300W
Continuous power (Pc)	3.5VA	3.5W
Opening time (YU)		
E1.2	30 ms	
E2.2 … E6.2	50 ms	

Electrical diagram reference: figure 73

Time-delay device for undervoltage coil - UVD (IEC only)

The undervoltage coil can be combined with an external electronic time-delay device for the circuit breaker, allowing for delayed 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 coil 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	



Remote reset - 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 supplies:

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

Electrical diagram reference: figure 14

Motor – M

The spring charge 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 that 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.

General characteristics

Power supply (Un)	**AC**	**DC**
24V-30V	•	•
48V-60V	•	•
100V…130V	•	•
220V…250V	•	•
277V [1]	•	-
380V…415V	•	-
440V…480V (E2.2 … E6.2)	•	-
Operating limits	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	8 sec	

1) A 277V motor is available for E2.2 through E6.2
Electrical diagram reference: figure 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

Due to these safety devices, the SACE Emax 2 circuit breakers 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 as a 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 locks to be installed. The following key lock adapters are also available:

– Ronis
– Profalux
– Kirk
– Castell

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

Padlocks - PLC

The 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 4mm/0.15"
– Locking device with metal structure for up to a maximum of two padlocks of 8mm/0.31"
– Locking device with metal structure for one padlock of 7mm/0.27" or for padlock hasps

The padlocks must be supplied by the customer. This device is an alternative to the protection device for opening and closing pushbuttons (PBC).

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

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, Profalux, 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 lock in racked out position accessory.

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

This device can hold up to three padlocks of 8mm/0.31" in diameter. The structure housing the padlocks can also be used in combination with the 2nd key 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 of a drawout unit is in the test position, the shutters of the cradle 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 cradle of the SACE Emax 2 circuit breakers and locks the shutters, using a maximum of three padlocks of 4mm/0.15", 6mm/0.23" or 8mm/0.31". The padlocks are supplied by the customer.

Accessories
Circuit breaker accessories

Protection devices

Lock for racking out mechanism with circuit breaker in closed position
SACE Emax 2 drawout 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 cradle, prevents the mobile part from being racked in or out when the switchgear door is open.

Lock to prevent door opening when the circuit breaker is in racked in / test position - DLP
This safety device prevents the switchgear door from being opened when the mobile part of the drawout 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. This accessory can be installed on either the right or left side of the cradle. 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.

Lock to prevent door opening when the circuit breaker is in the closed position - DLC
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 drawout circuit breakers).
It also blocks the circuit breaker from closing when the compartment door is open. It is an alternative to the mechanical interlock, the AUX 15Q (15 Form C) or the DLP if mounted on the right side.

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

Mechanical operation counter - MOC
The number of mechanical operations is often one of the elements that determines the frequency of ordinary maintenance operations on circuit breakers. With the 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.

Protection device for opening and closing pushbuttons - PBC

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.
– This device is an alternative to PLC padlocks.

IP30 Protection (door escutcheon)

Supplied with every circuit breaker, the cover frame is installed on the door of the switchgear to achieve an IP30 degree of protection on the front part of the circuit breaker.

IP54 Protection (door escutcheon)

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

These accessories are installed over 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.

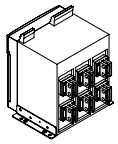
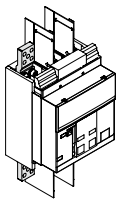
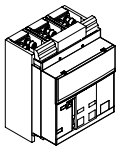
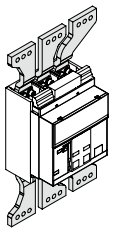
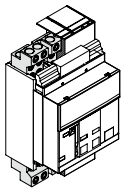
Phase barriers - PB

These protection devices increase the insulation distance between adjacent phases. They are available for all the frames.

Connections

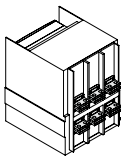
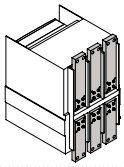
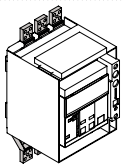
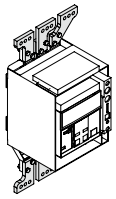
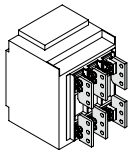
The SACE Emax 2 circuit breakers to ANSI C37 / UL 1066 offer a wide variety of terminals, thereby always guaranteeing an optimal solution for connection to the power circuit.

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**			
				●	●	●
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 and E6.2 6000A in which they are supplied in VR - VR configuration.
(**) Not UL listed

Solutions for cradles, drawout circuit breakers

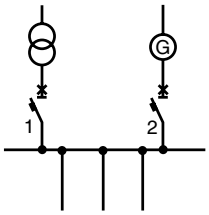
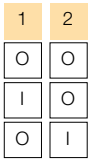
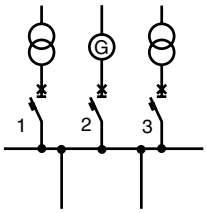
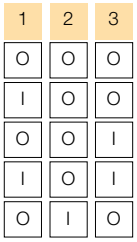
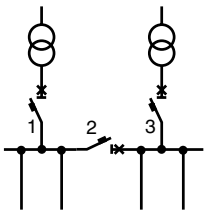
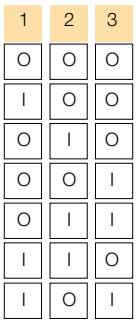
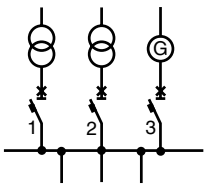
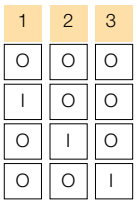
Type	Abbreviation		E1.2	E2.2	E4.2	E6.2
Rear adjustable terminal *	HR VR		Single stab design ●			
			Multiple stab design	●	●	●
Front terminal	F **			○	○	○
Extended front terminal	EF **		○			
Front spread terminal	ES **		○			
Terminal for cable FcCuAl 4x500kcmil / 240mm²	Fc CuAl **		○			

● 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

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. 		Available between circuit breakers of different sizes and with any fixed / drawout 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. 		Available between E2.2, E4.2 and E6.2 circuit breakers and with any fixed / drawout 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). 		Available between E2.2, E4.2 and E6.2 circuit breakers and with any fixed / drawout 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. 		Available between E2.2, E4.2 and E6.2 circuit breakers and with any fixed / drawout 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		9ft/2750mm	5.25ft/1600mm
Vertical		3.25ft/1000mm	3.25ft/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 10.5ft/3200mm for horizontal configurations and 6.5ft/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 respect the minimum and maximum distance. All cables can be cut to guarantee easy installation in switchboards. Mechanical interlocks are not compatible with AUX 15Q (15 Form C), the locks 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.

Automatic Transfer Switches ATS (IEC only)
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. In the event of loss or anomalies in the main line voltage, the opening of the main line circuit breaker, the starting of the generator set (if present) and the closing of the emergency line are activated according to the parameters set by the user. In the same way, when the main line returns to normal, the reverse transfer procedure is performed automatically.
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 can control 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 requiring 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 Signaling status (open / closed) and contact for Signaling tripping;
– contact for Signaling circuit breaker racked in (for drawout circuit breaker).

Accessories
Circuit breaker accessories

Technical characteristics

			ATS021	ATS022
General	Auxiliary supply voltage		Not required	Not required (24-110V DC is required only for Modbus communication and systems of 16 2/3 Hz)
	Supply voltage, Un		Max 480V AC	Max 480V AC
	Frequency, fn		50, 60 Hz	16 2/3, 50, 60, 400 Hz
	Dimensions 	H in/mm	3.78/96	3.78/96
		W in/mm	5.67/144	5.67/144
		D in/mm	6.79/170	6.79/170
	Type of installation		Installation on front of switchgear Installation on DIN rail	Installation on front of switchgear Installation on DIN rail
	Operating mode		Automatic/Manual	Automatic/Manual
Characteristics	Monitoring of normal and emergency line		•	•
	Control of circuit breakers on normal and emergency line		•	•
	Setting start-up of generator		•	•
	Setting switch-off of generator with settable time delay		•	•
	Third circuit breaker		-	•
	Selection priority line		-	•
	Modbus Rs485 communication		-	•
	Display		-	•
Environmental conditions	Protection degree		IP20	IP20
	Operating temperature		-20 … +60 °C / -4...+140°F	-20 … +60 °C / -4...+140°F
	Humidity		5% - 90% without condensation	5% - 90% without condensation
Operating thresholds	Undervoltage		-30% … -5% Un	-30% … -5% Un
	Overvoltage		+5% …+30% Un	+5% …+30% Un
	Frequency thresholds		-10% / +10% fn	-10% … +10% fn
Tests	Test Mode		•	•
	Mode Test Gen set		•	•
Standards	Electronic devices for use in electrical installations		EN-IEC 50178	EN-IEC 50178
	Electromagnetic compatibility		EN 50081-2	EN 50081-2
			EN 50082-2	EN 50082-2
	Environmental conditions		IEC 68-2-1	IEC 68-2-1
			IEC 68-2-2	IEC 68-2-2
			IEC 68-2-3	IEC 68-2-3

Electrical diagram reference: figures 100,101 and 102.

Accessories
Ekip trip unit accessories

The electronic trip unit accessories enable utilization of all the potential of Ekip protection trip units in terms of Signaling, 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	○	○	○	○	○
Signaling					
Ekip Signaling 2K		○	○	○	○
Ekip Signaling 4K [1]		○	○	○	○
Ekip Signaling 10K	○	○	○	○	○
Ekip Power Controller		○	○	○	○
Measurement and Protection					
Ekip Measuring Pro		○	●	●	●
Ekip Measuring		○			
Ekip AUP	○	○	○	○	○
Ekip RTC	○	○	○	○	○
Ekip Synchrocheck		○	○	○	○
Ekip LCD		○	○	○	○
Rating Plug	○	○	○	○	○
Homopolar toroid (CT)		○	○	○	○
Toroid (CT) for differential protection (IEC only)		○	○	○	○
Current sensor for external neutral	○	○	○	○	○
Displaying and Supervision					
Ekip Multimeter	○	○	○	○	○
Ekip Control Panel	○	○	○	○	○
Testing and Programming					
Ekip TT	○	●	●	●	●
Ekip T&P	○	○	○	○	○
Ekip Programming	○	○	○	○	○

● Standard accessory
○ Accessory on request
[1] not available for E1.2

Accessories
Ekip trip unit accessories

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 Signaling 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 without 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 Ekip Signaling 4k module increases the remote Signaling 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 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 Signaling 10K can be connected at the same time to the same Ekip trip unit
	External neutral sensor Homopolar toroid (CT) Differential toroid (CT) (IEC only)	- These are connected to the trip unit by the terminal box of the circuit breaker


1SDC200539F001

Power supply

Ekip Supply Power Supply module

The Ekip Supply module supplies all Ekip trip units and modules present on the terminal box and of the circuit breaker with 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

Electrical diagram reference: figures 31, 32


1SDC200540F001

Connectivity

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 are supplied complete with auxiliary position contacts Ekip AUP and ready to close circuit breaker contacts Ekip RTC.
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.
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.

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.

Accessories
Ekip trip unit accessories

Ekip Link module

The Ekip Link module enables a SACE Emax 2 circuit breaker to be connected to the 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 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 switchgear by means of the Ekip Control Panel and supervision of the electrical 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

Ekip Com Actuator module

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: figure 76, 78

Ekip Bluetooth wireless communication unit

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 port found on all Ekip trip units of SACE Emax 2 and SACE Tmax XT circuit breakers and supplies power by means of a rechargeable Li-ion battery.

Signaling

Ekip 2K Signaling modules

The Ekip 2K Signaling modules supply two input and two output contacts for control and remote Signaling 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 Signaling 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

Ekip 4K Signaling module

The Ekip 4K Signaling module, available for E2.2, E4.2 and E6.2, supplies four input contacts and four output contacts for control and remote Signaling. 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 (6 Form C) auxiliary contacts unit..

Electrical diagram reference: figure 2

Ekip 10K Signaling unit

Ekip 10K Signaling is an external Signaling unit designed for DIN rail installation for SACE Emax 2 automatic circuit breakers. The unit provides ten contacts for electrical Signaling 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 Signaling (max 4) can be installed at the same time on the same Ekip trip unit.
The Ekip 10K Signaling module can be powered either by direct or alternating current and can be connected to Ekip Touch and Hi-Touch trip units via internal bus or Ekip Link modules.

Electrical diagram reference: figure 103

Accessories
Ekip trip unit accessories

Characteristics of output contacts		Number of contacts		
Type	**Monostable**	**Ekip 2K**	**Ekip 4K**	**Ekip 10K**
Maximum switching power (resistive load)	1250VA	2 output + 2 input	4 output + 4 input	10 output + 11 input
Maximum switching voltage	150V DC / 250V AC			
Maximum switching current				
30V DC	2A			
50V DC	0.8A			
150V DC	0.2A			
250V AC	4A			
Contact/coil insulation	2000 Vrms (1min @50Hz)			

Ekip 10K Signaling unit power supply	
Auxiliary supply	24-48V DC, 110-240V AC/DC
Voltage range	21.5-53V DC, 105-265V AC/DC
Rated power	8W

Signaling 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 Signaling 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.

Measurement and protection

Ekip Measuring module

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.

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

Ekip Measuring Pro module

The module has the same connection and installation characteristics as the Ekip Measuring module. In addition, the Ekip Measuring Pro version offers:

– Protection features for voltage and power values
– Ekip trip unit power supply from busbar voltage (for line voltages greater than 85V)
– LED Signaling 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.

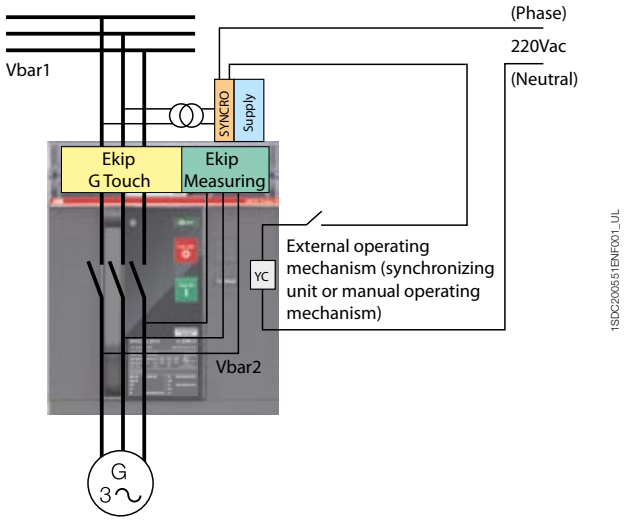
Electrical diagram reference: figures 20, 21, 22, 23

Ekip Synchrocheck

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.

Characteristics of output contacts		Number of contacts
Type	**Monostable**	**Ekip Synchrocheck**
Maximum switching power (resistive load)	120W /1250VA	1 output
Maximum switching voltage	150V DC / 250V AC	
Maximum switching current		
30V DC	2A	
50V DC	0.8A	
150V DC	0.2A	
250V AC	4A	
Contact/coil insulation	2000 Vrms (1min @50Hz)	



Electrical diagram reference: figure 48

Accessories
Ekip trip unit accessories

1SDC200552F001

Ekip LCD display interface

For installations in particularly aggressive environments, such as low temperatures, high humidity or the 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 the same accessories available on the color touch screen versions.

1SDC200554F001

Rating Plug

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. The L OFF versions of the rating plugs are IEC rated only.

Circuit-breaker	Rating plugs available (both in standard and L OFF [1] versions)
E1.2	400-600[2]-630[1]-800-1000-1200[2]-1250[1]-1600[1]
E1.2 250	100-200-250
E2.2	400-600[2]-630[1]-800-1000-1200[2]-1250[1]-1600-2000-2500[1]
E2.2 250	100-200-250
E4.2	400-600[2]-630[1]-800-1000-1200[2]-1250[1]-1600-2000-2500--3200-4000[1]
E6.2	400-600[2]-630[1]-800-1000-1200[2]-1250[1]-1600-2000-2500-3200-4000-5000-6000[2]-6300[1]

1) IEC rated; 2) UL rated (no L OFF version available)

Special rating plugs are also available for differential protection (residual current) against grounding faults in combination with a suitable toroid (CT) to be installed externally. These rating plugs are IEC rated only.

Circuit-breaker	Rating plug available for Rc protection (IEC rated)
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	400-630-800-1250-2000-3200-4000

Current sensor for external neutral

Intended for use with three-pole circuit breakers; it enables protection of the neutral phase to be achieved through connection to the Ekip trip unit. It is supplied on request.

Electrical diagram reference: figure 27

Homopolar toroid (CT) for the grounding conductor of main power supply (transformer star center sensor input)

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

Electrical diagram reference: figure 25

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

Connected to the Ekip Touch LSIG and Hi-Touch LSIG trip units equipped with a rating plug for differential protection, this toroid (CT) enables ground fault currents of 3…30A to be monitored.

To be installed on the busbar system, it is an alternative to the homopolar toroid (CT).

Electrical diagram reference: figure 24

Accessories
Ekip trip unit accessories

Displaying and supervision

Ekip Multimeter Display on the front of switchgear

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, 3.78"x3.78" / 96mmx96mm in size, is equipped with a large touch screen display and enables measurements to be displayed with the same levels of precision as the trip unit itself. 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	8W

Ekip Control Panel on the front of switchgear

The Ekip Control Panel enables SACE Emax 2 circuit breakers connected to the Ekip Link system to be controlled and monitored. It offers a 15" color LCD touchscreen display in a package that is 15.08"/383mm wide, 12.09"/307mm high and 3.09"/78.5mm deep.
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 circuit breakers of the Tmax series
- 4 USB ports for downloading data.


1SDC200688F001

Testing and programming

Ekip TT testing and power supply unit (battery pack)

Ekip TT is a device that allows you to verify that the circuit breaker trip mechanism is functioning correctly (trip test).

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.

The device can be connected to the front test port of any Ekip trip unit of SACE Emax 2; it is supplied as standard with the versions for distribution and generator protection of the Ekip Touch, Hi-Touch trip units to set protection functions.


1SDC200561F001

Ekip T&P testing kit

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 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.


1SDC200561F001

Ekip Programming Module

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).

Spare parts

The following original and guaranteed spare parts are available:
– Front shield and lateral covers
– Opening solenoid for Ekip protection trip unit
– Arc chamber
– Complete pole
– Operating mechanism and closing springs
– Loading lever for closing springs
– Racking out lever
– Racking out handle and plates
– Jaw isolating contact for the cradle of a drawout circuit breaker
– Shutters for the cradles
– Trip units - current transformers wires
– Transparent protection for trip unit
– Mainboard for protection trip units
– Terminal box and sliding contacts
– Grease and oil.

For further details, please refer to the ABB SACE Spare Parts Catalog.

Installation

Installation
Circuit breaker

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

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

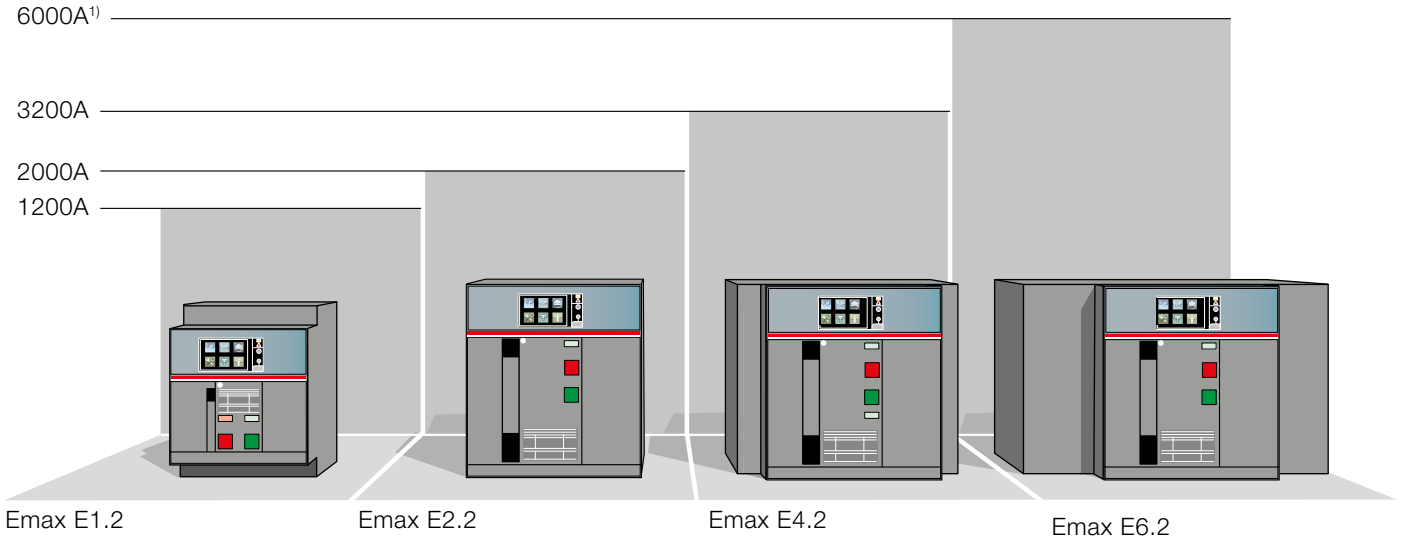
Safety is guaranteed because of double insulation of the live parts and total segregation of the phases. Furthermore, the new functional design of SACE Emax2 circuit breakers has been developed with the purpose of improving installation operations and the use of the devices and accessories; making them 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

SACE Emax 2 circuit breakers, available in 4 sizes up to 6000A[1)], provide:

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



[1)] Version not yet available. Contact ABB.

Installation
Circuit breaker

Versions

SACE Emax 2 circuit breakers are available in both fixed and drawout versions. The drawout 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 where the need for space means that compact products are required without compromising the performance and possibility of fitting accessories.

Fixed

Drawout

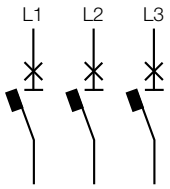
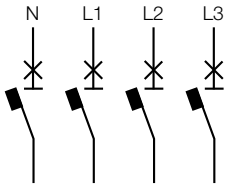
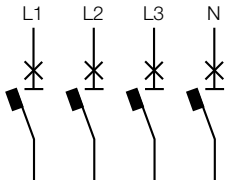
1. Moving part
2. Sliding contacts
3. Cradle
4. Terminal box
5. Racking out mechanism
6. Racking out guide rails
7. Pushbuttons
8. Data label and accessories

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.

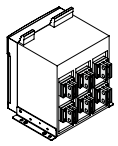
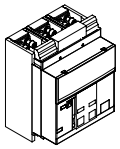
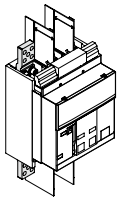
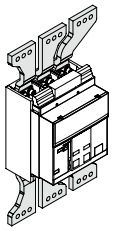
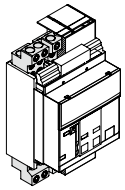
The four-pole circuit breakers E1.2, E2.2 and E4.2 are always provided with a full-size neutral pole with rated uninterrupted current-carrying capacity identical to the phase poles. The E6.2 circuit breakers, due to thier modular construction, are available with the neutral set at 50% - normal supply – and with a full-size neutral, so that the customer does not need to oversize the neutral unless it is strictly necessary.

The standard supplied circuit breakers are suitable for connection of phases in the sequence L1, L2, L3 for three-pole circuit breakers 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.

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**			

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
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 S-A, H-A, V-A	W			42	81	132	193	280	445			
	E6.2 H-A, V-A	W								323	395	476	700
	E6.2 L-A	W										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
	E6.2 L-A	W										646	950

Temperature derating

Under certain installation conditions, the circuit breakers can operate at higher temperatures than the reference temperature of 40°C (104°F). 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 drawout and fixed circuit breakers. Values in accordance with ANSI/IEEE C37.50.

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	**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	**2500**	100%	98%	96%	92%	87%	81%	75%
E4.2	**3200**	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**	Consult factory						

Installation
Installation environment

SACE Emax 2 circuit breakers have been designed and tested in accordance with major international standards to manage with the electrical plant with maximum reliability. 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, for example personalized maintenance programs or installation solutions aimed at increasing performances and extending the lifecycle of the circuit breaker.

Temperature

SACE Emax2 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

Environmental conditions

The devices can be installed in industrial environments with pollution level 3, IEC 60947. 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

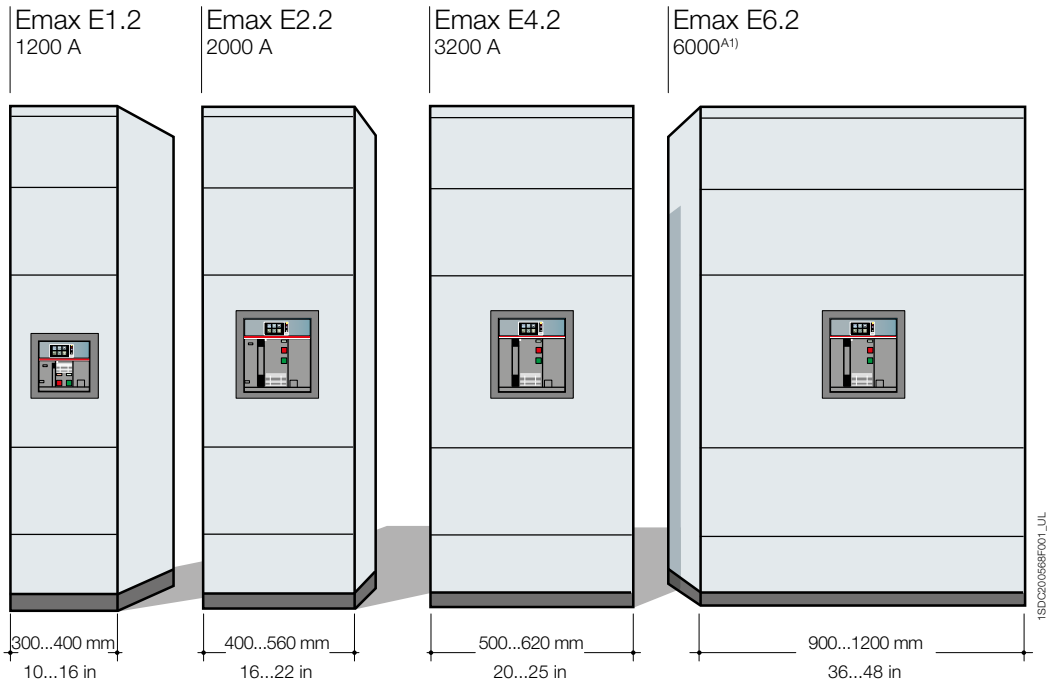
The circuit breakers have been tested according to:
– IEC60068-2-6
  - From 1 to 13 Hz with amplitude 1mm
  - From 13 to 100 Hz with constant acceleration 0.7g
– IEC60721-3-1
  - Storage: 1M3
– IEC60721-3-2
  - Transport: 2M2
– IEC60721-3-3
  - Operational conditions: 3M2
– Shipping registers or certifications

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.

Installation
Installation in switchgear

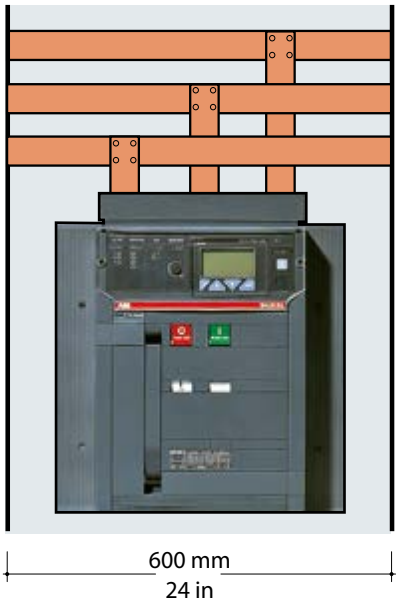
Due to the four construction sizes and the reduced insulation distances required, SACE Emax 2 circuit breakers optimize the installation spaces of the compartments of electrical switchgear, thereby providing a rational solution to application needs.



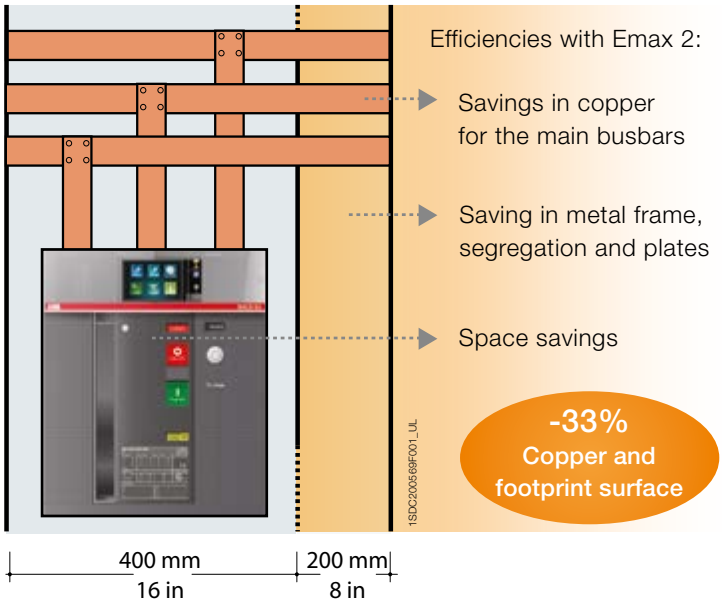
SACE Emax 2 circuit breakers enable the design of electrical switchgear to be improved, allowing optimization in terms of performance, and also in terms of materials used.

- **Copper:** because of the possibility of developing compact units, the length of the distribution system/busbar can be minimized.
- **Metal frame and structure:** reduced volume means less metal 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 space.

Traditional circuit breaker 3p Iu 2000A



Emax E2.2 3p Iu 2000A



[1] Version not yet available. Contact ABB.

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, indifferently, 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

The use of phase barriers is recommended for fixed version circuit breakers used in voltages over 480V.

– Minimum enclosure dimensions

Up to four Emax 2 at 100kA in one column!

Fixed circuit breakers

		Width 3p	Width 4P	C - Height	D - Depth
E1.2	[mm]	250	322	382.5	130
	[inch]	9.84	12.67	15.05	5.11
E2.2	[mm]	400	490	500	221
	[inch]	15.74	19.29	19.68	8.7
E4.2	[mm]	500	620	500	221
	[inch]	19.68	24.41	19.68	8.7
E6.2	[mm]	900	1020	500	221
	[inch]	35.43	40.16	19.68	8.7
E6.2/f	[mm]	-	1200	500	221
	[inch]	-	47.24	19.68	8.7

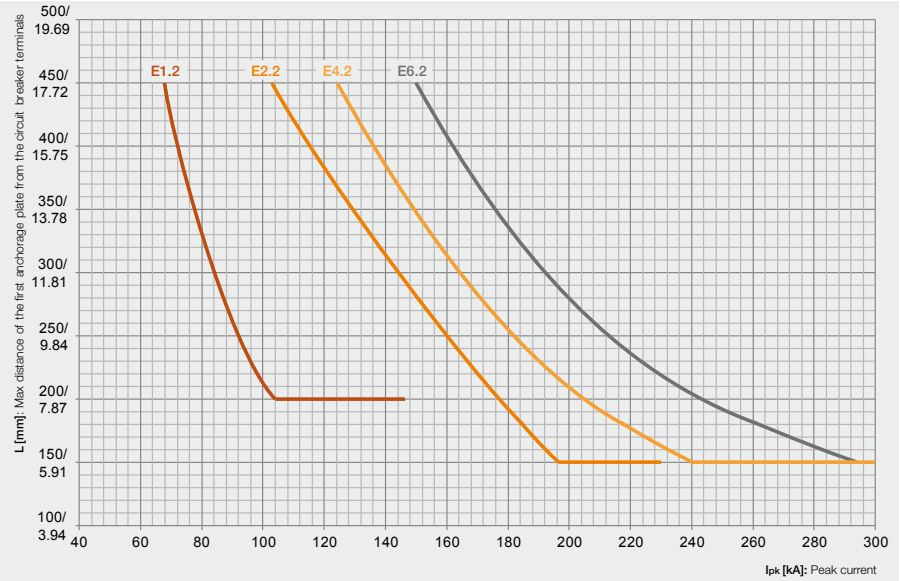
Drawout circuit breakers

		Width 3p	Width 4P	C - Height	D - Depth
E1.2	[mm]	280	350	440	252
	[inch]	11.02	13.77	17.32	9.92
E2.2	[mm]	400	490	440	355
	[inch]	15.74	19.29	17.32	13.97
E4.2	[mm]	500	620	440	355
	[inch]	19.68	24.41	17.32	13.97
E6.2	[mm]	900	1020	440	355
	[inch]	35.43	40.16	17.32	13.97
E6.2/f	[mm]	-	1200	440	355
	[inch]	-	47.24	17.32	13.97

- For Emax 2 "X" versions ask to ABB.

– **Anchorage plates**

The electrodynamic force released during a short-circuit can cause high levels of mechanical stress to 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 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.

Grounding connection

To achieve continuity and equal potential of grounding 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 grounding 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 grounding connection.

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	3200	5	1/4 x 3	6.35 x 76.2	-	-	-
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

Note: 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.


1SDC200691F001

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.

Accessories

SACE Emax 2 circuit breakers offer a wide range of accessories that improve safety levels for technicians working on the switchgear and circuit breakers. Furthermore, thanks to the different types of mechanical interlocks available, pre-determined coordination strategies can be achieved between the circuit breakers. In detail:

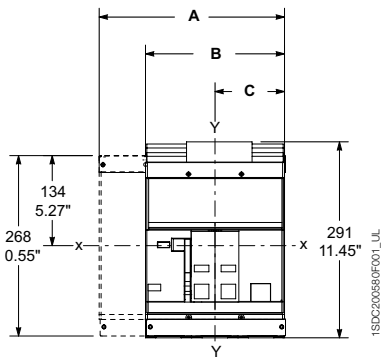
– Horizontal and vertical interlocks between circuit breakers
– Door lock with circuit breaker in closed position
– Switchgear door lock in racked in/out position
– Lock of racked out mechanism with door open
– Flange for switchgear door IP30 and IP54

For further accessory information, see chapter 5.

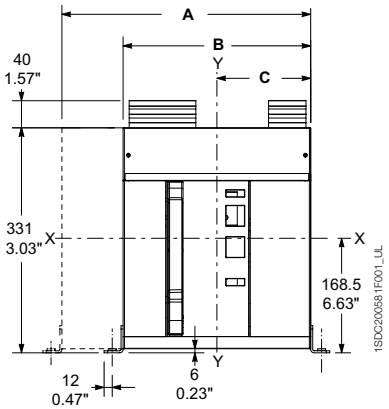
Dimensions

Dimensions
Fixed circuit breaker

E1.2



E2.2 - E4.2 - E6.2

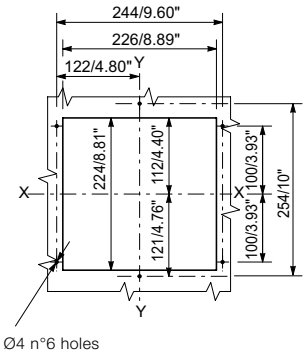


[mm/in]	A	B	C	
	4p	3p	3p	4p
E1.2	284/11.18	214/8.42	107/4.21	107/4.21
E2.2	366/14.40	276/10.86	138/5.43	138/5.43
E4.2	510/20.07	384/15.11	192/7.55	192/7.55
E6.2	888/34.96	762/30	318/12.42	444/17.48
E6.2/f	1014/39.92	-	-	444/17.48

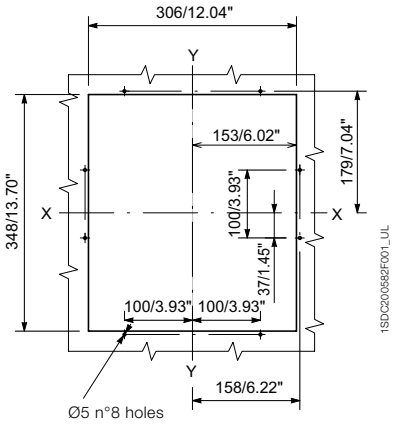
7

Compartment door drilling

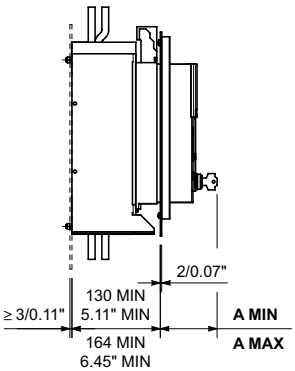
E1.2



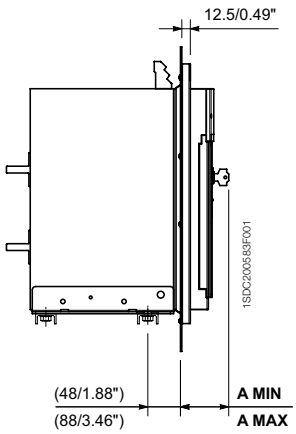
E2.2 - E4.2 - E6.2



E1.2



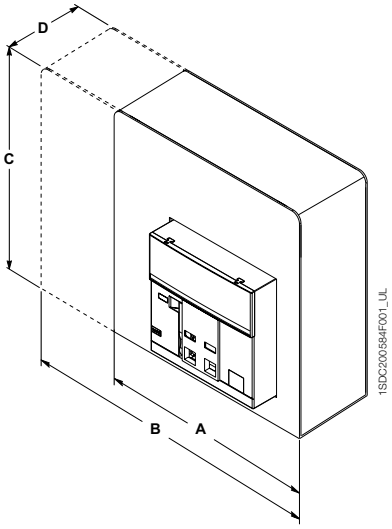
E2.2 - E4.2 - E6.2

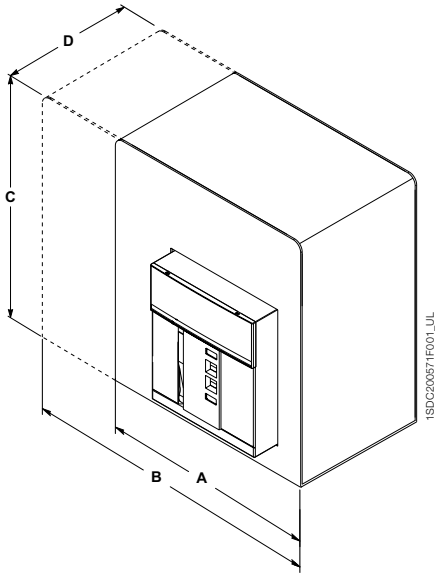


E1.2		Standard	Ronis/Profalux	Kirk	Castell
A MIN	[mm/in]	49.5/ 1.94"	63.5/ 2.5"	63.5/ 2.5"	83.5/ 3.28"
A MAX	[mm/in]	83.5/ 3.28"	97.5/ 3.83"	97.5/ 3.83"	117.5/ 4.62"

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

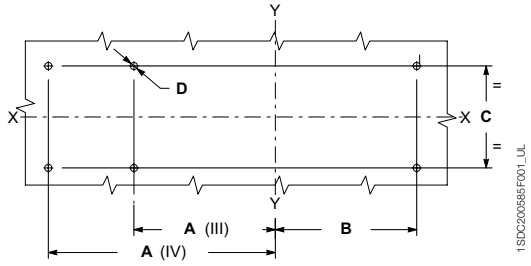




[mm/in]	A 3p	B 4p	C	D
E1.2	250/9.84	322/12.67	382.5/15.05	130/5.11
E2.2	400/15.74	490/19.29	500/19.68	221/8.70
E4.2	500/19.68	620/24.41	500/19.68	221/8.70
E6.2	900/35.43	1020/40.16	500/19.68	221/8.70
E6.2/f	-	1200/47.24	500/19.68	221/8.70

7

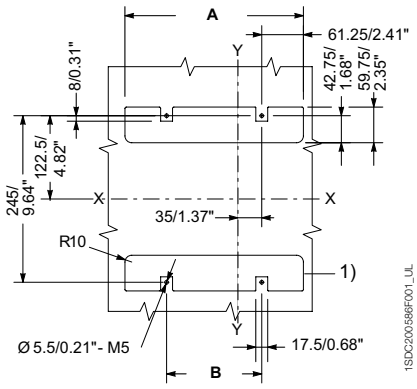
Floor mounting



[mm/in]	A 3p	A 4p	B 3p	B 4p	C	D
E1.2 (1)	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

1) Mounting plate for an E1.2 fixed breaker must be ordered separately.

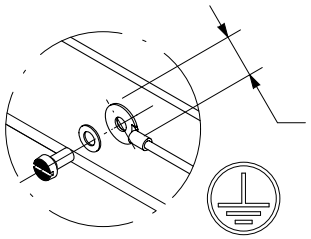
Wall mounting (only for E1.2)



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

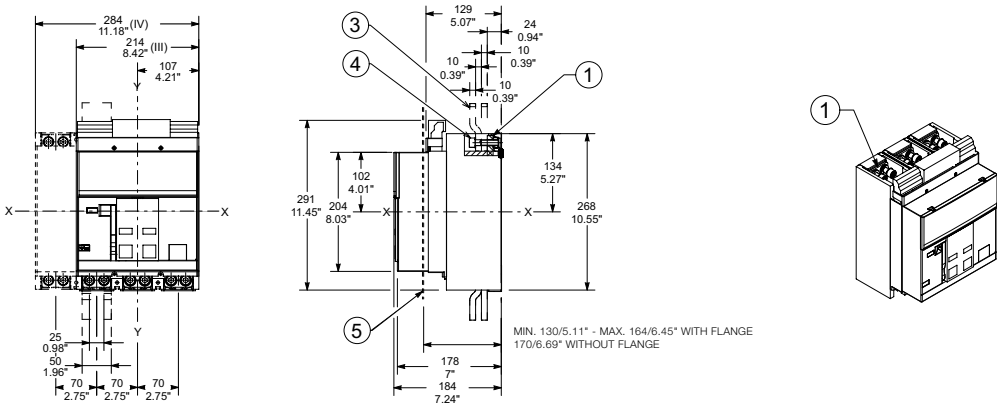
1) for mounting with rear terminals

Grounding device E2.2 - E4.2 - E6.2

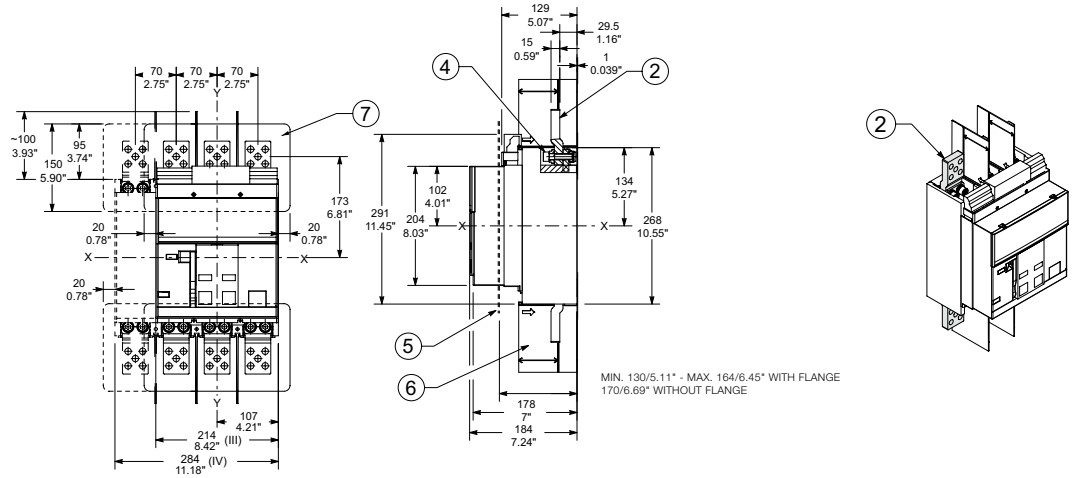


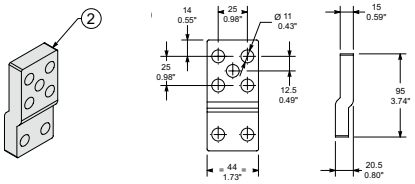
Dimensions
Fixed circuit breaker - E1.2

Front terminals – F



Extended front terminals – EF



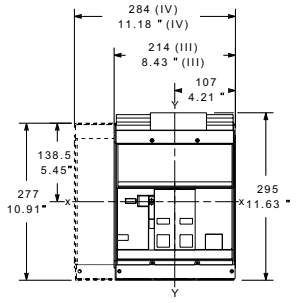


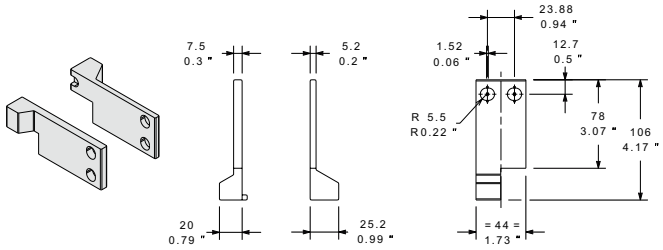
Key

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

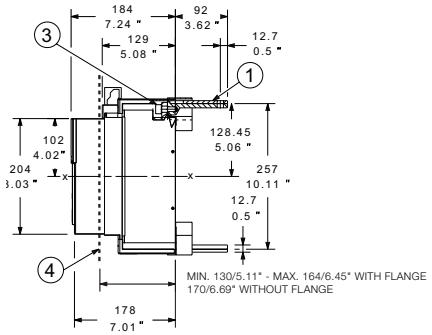
1SDC200594F001_UL

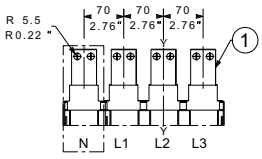
Orientable rear terminals - HR/VR

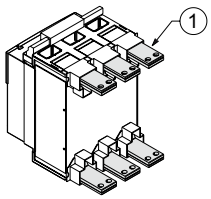




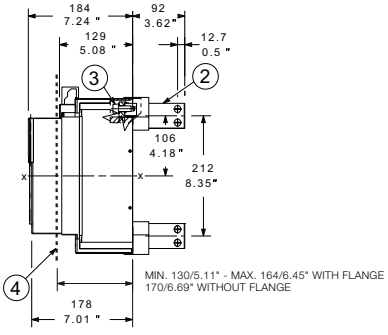
Terminals HR

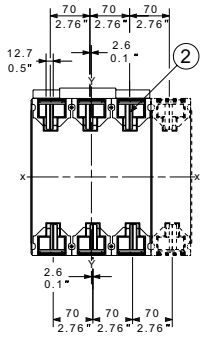


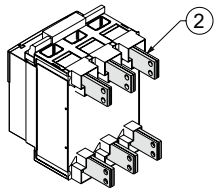




Terminals VR







Key

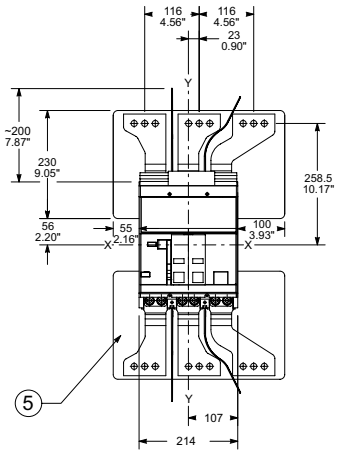
1 Horizontal orientable terminals HR
2 Vertical orientable terminals VR
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2

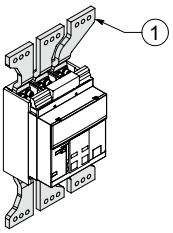
1SDC200595F001_UL

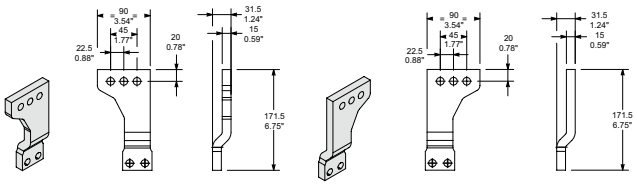
Dimensions
Fixed circuit breaker - E1.2

Spread extended front terminals - ES

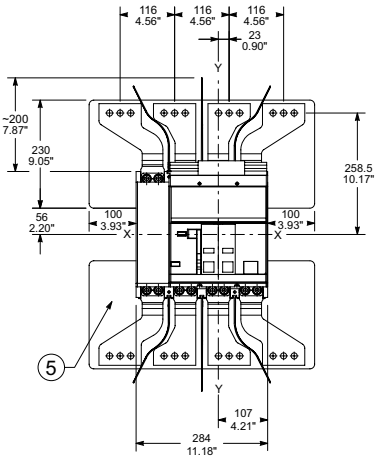
3-pole version

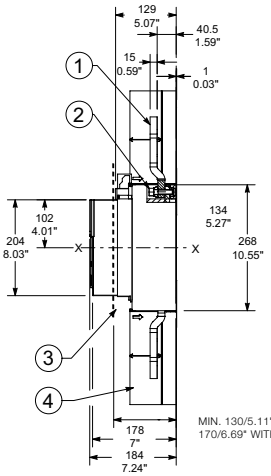


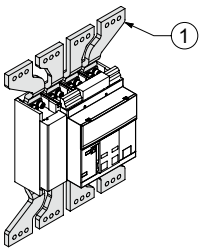


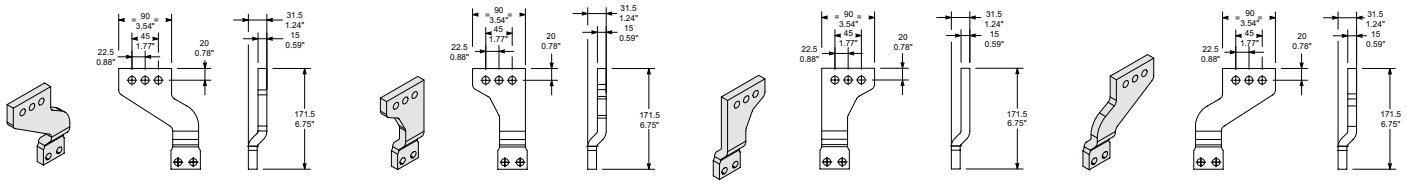


4-pole version









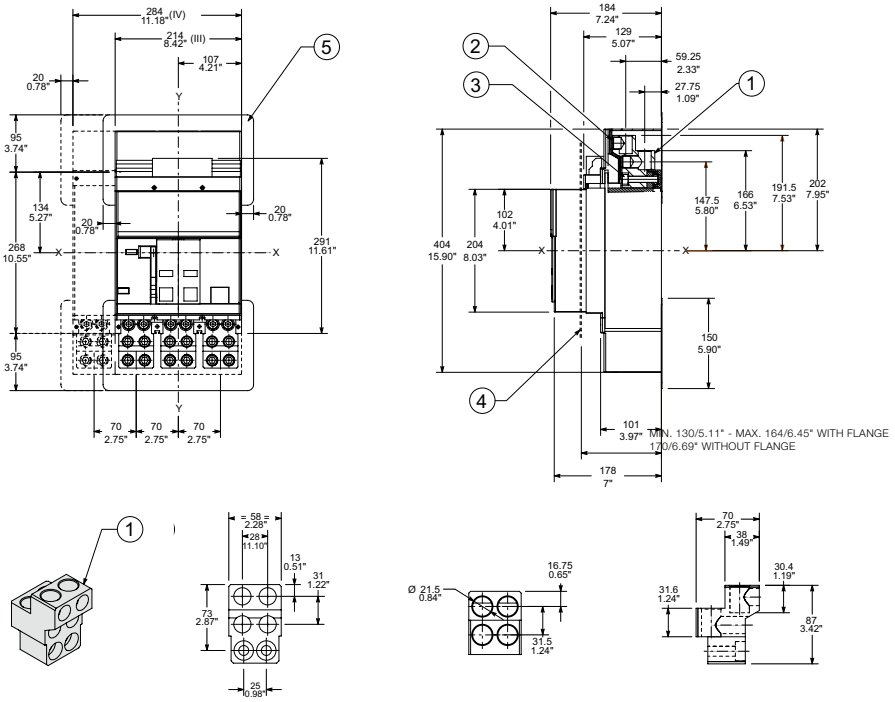
Key

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

1SDC200596F001.UL

8.6Nm - 76lb in

Front terminals for cables – FcCuAl



Key

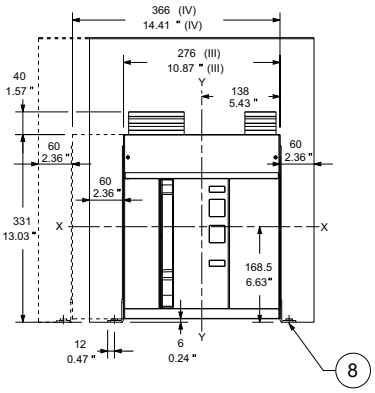
1 Front terminals for cables FC CU AL
2 Tightening torque 43Nm - 379lb in
3 Tightening torque 18Nm - 159lb in
4 Door position - Ref. page 7/2
5 Obligatory insulating plate to be supplied by the customer

1SDC200597F001_UL

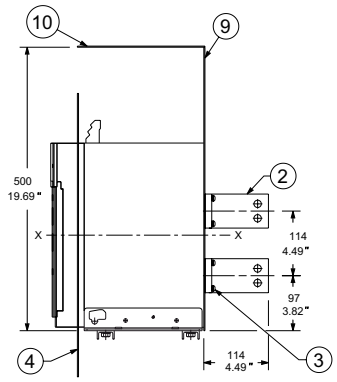
Dimensions
Fixed circuit breaker - E2.2

Orientable rear terminals - HR/VR

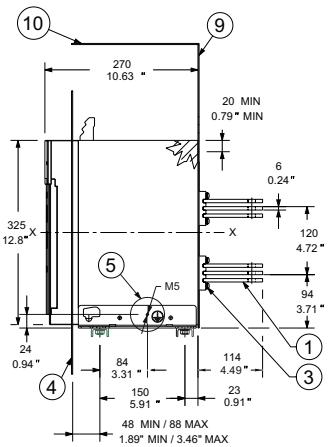
E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A

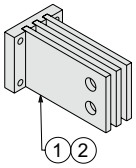


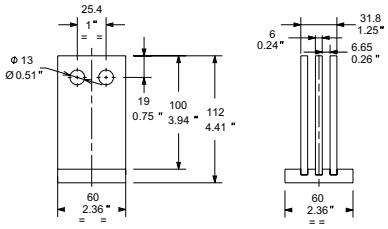
VR adjustment

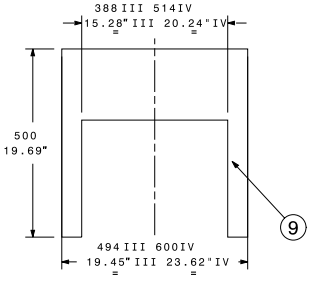


HR adjustment

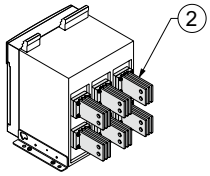


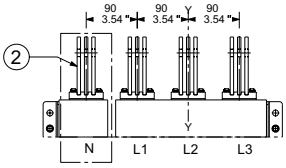




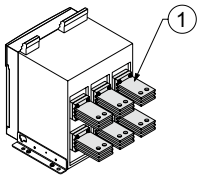


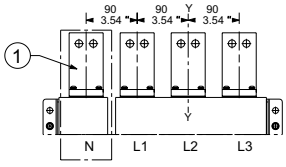
VR adjustment





HR adjustment





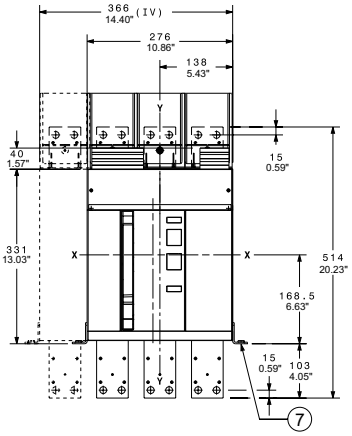
Key

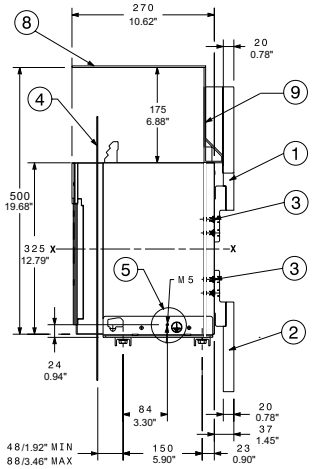
1 Horizontal terminals 1600A-2000A
2 Vertical terminals 1600A-2000A
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/2
5 Grounding
8 Mounting outside feet
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

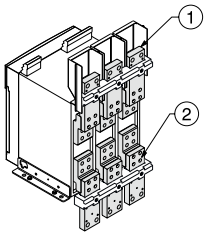
1SDC200598F001_UL

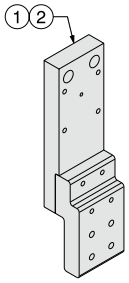
Front terminals – F

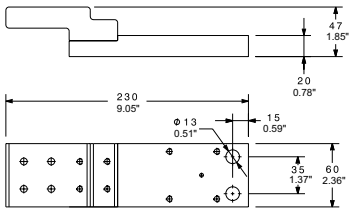
E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A

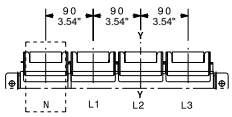












Key

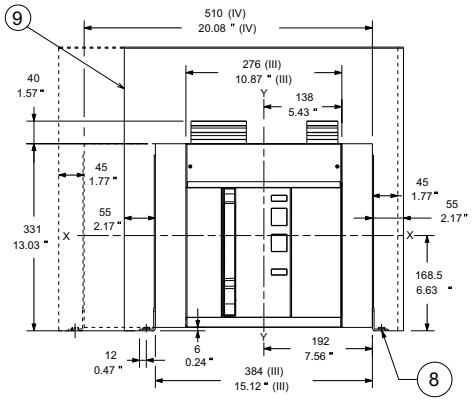
1 Upper front terminals
2 Lower front terminals
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/2
8 External mounting point.
Reccomended screws M10x25 high class

1SDC200599F001_UL

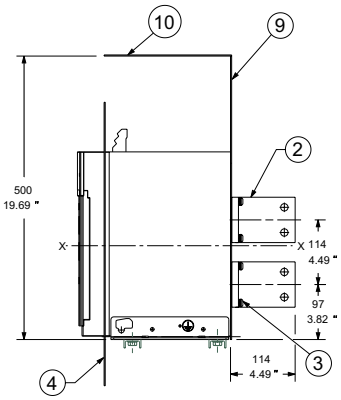
Dimensions
Fixed circuit breaker - E4.2

Orientable rear terminals - HR/VR

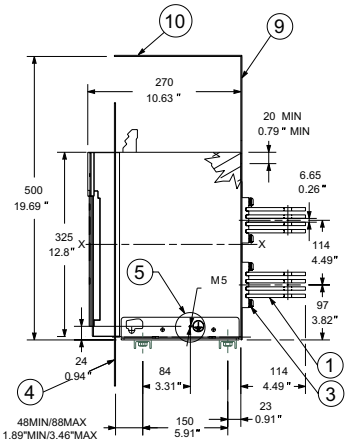
E4.2 S-A, H-A, V-A, L-A 800A - 2500A

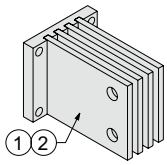


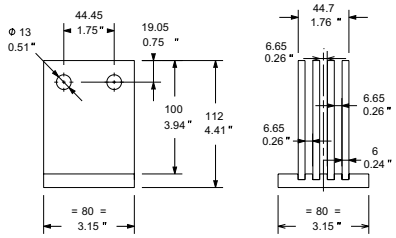
VR adjustment

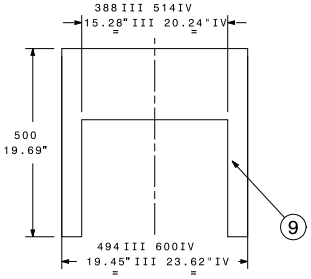


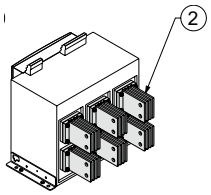
HR adjustment



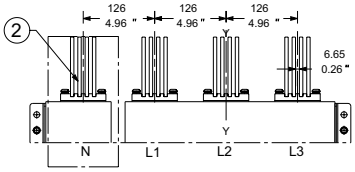


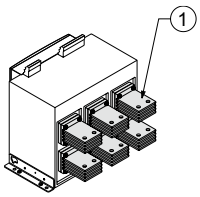




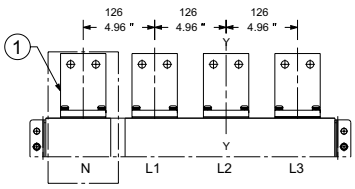


VR adjustment





HR adjustment



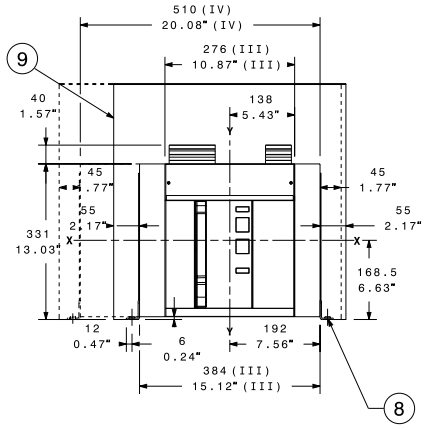
Key

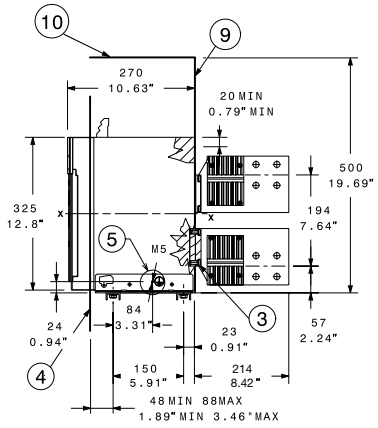
1 Horizontal terminals 2500A
2 Vertical terminals 2500A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
5 Grounding
8 Mounting outside feet
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

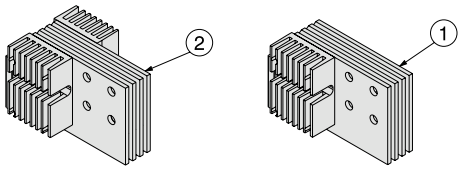
1SDC200602F001.UL

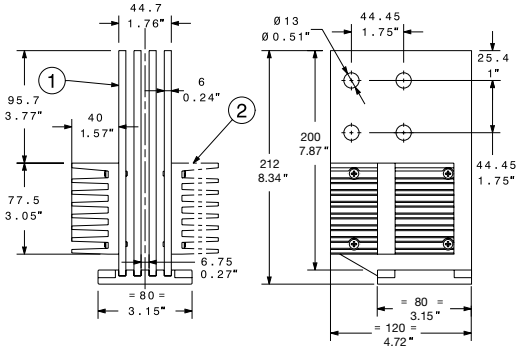
Vertical rear terminals - VR

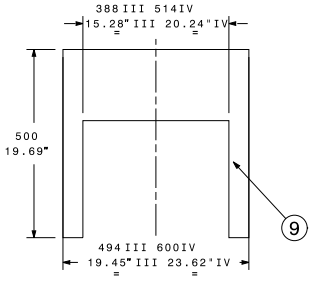
E4.2 S-A, H-A, V-A, L-A 3200A

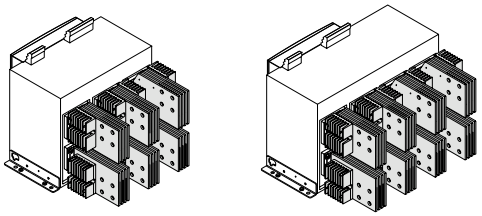


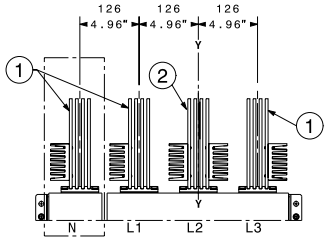












Key

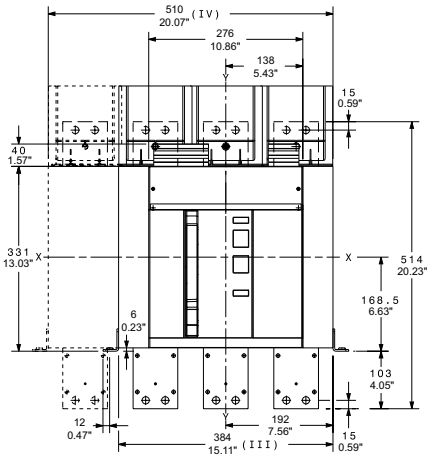
1 Lateral vertical terminals 3200A
2 Central vertical terminals 3200A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
8 Mounting outside feet.
Reccomended screws M10x25 high class
9 Insulating sheet or insulated metallic sheet
10 Metallic sheet

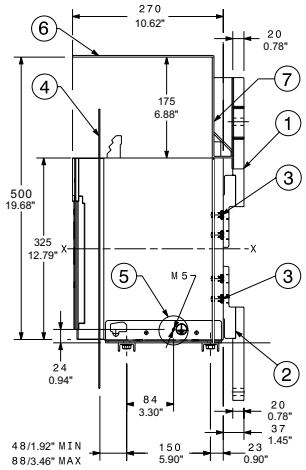
1SDC200602AF001_UL

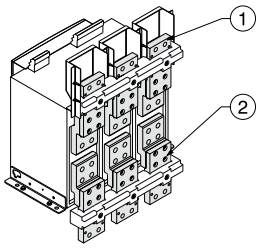
Dimensions
Fixed circuit breaker - E4.2

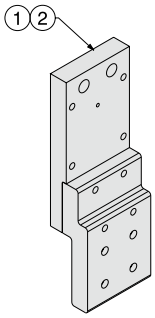
Front terminals – F

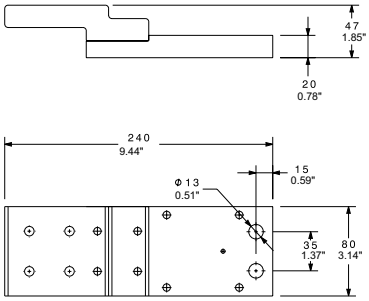
E4.2 S-A, H-A, V-A, L-A 800A - 3200A

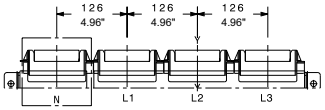












Key

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

1SDC200603F001

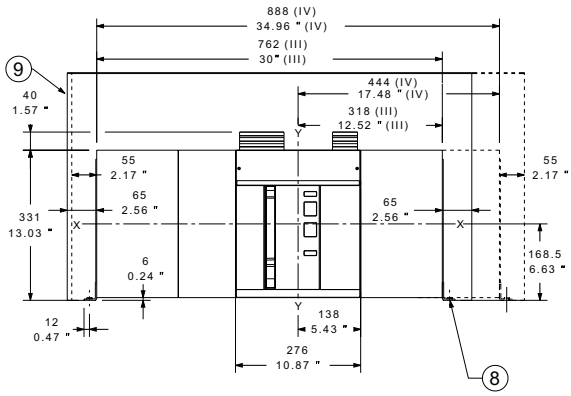
Dimensions
Fixed circuit breaker - E6.2

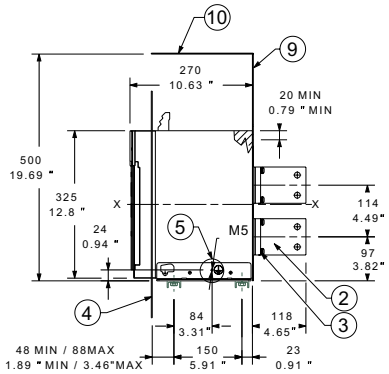
Orientable rear terminals - HR/VR

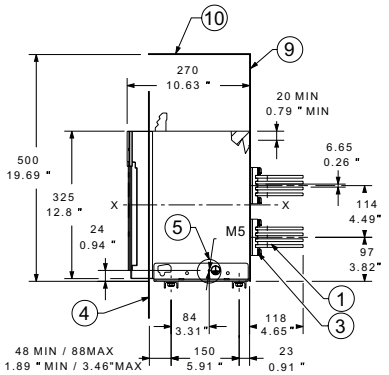
E6.2 H-A, V-A, L-A 4000A - 5000A

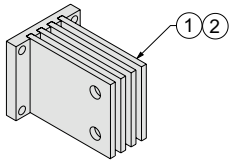
VR adjustment

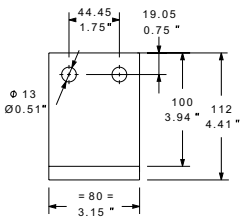
HR adjustment

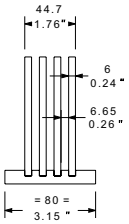




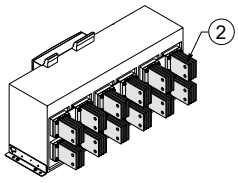


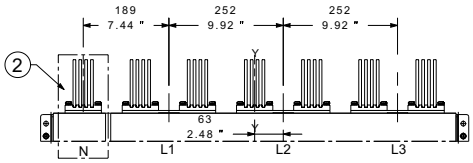


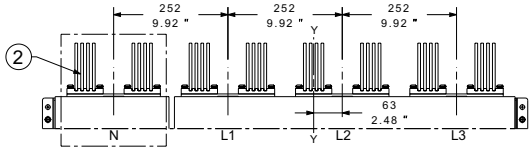




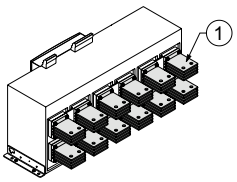
VR adjustment

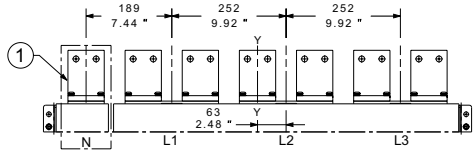


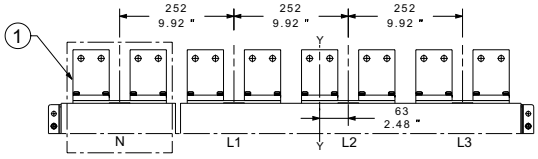




HR adjustment







Key

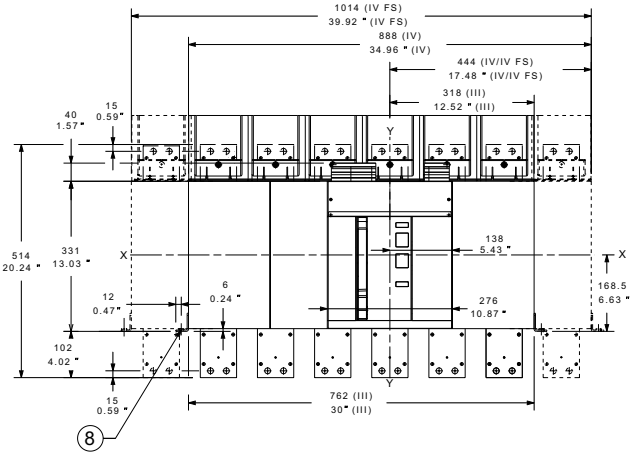
1 Horizontal terminals 5000A
2 Vertical terminals 5000A
3 Tightening torque 20Nm - 177lb in
4 Door position
5 Grounding
6 Ferrule for grounding
7 Screws M5x8 provided
Tightening torque 3Nm - 26lb in
8 Mounting outside feet
9 Insulating sheet or
insulated metallic sheet
10 Metallic sheet

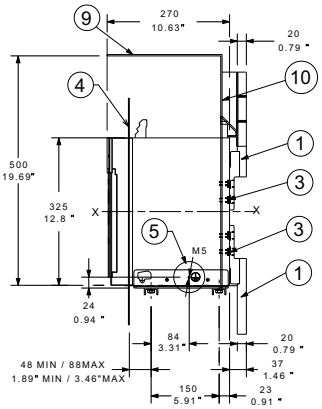
1SDC200620AF001_UL

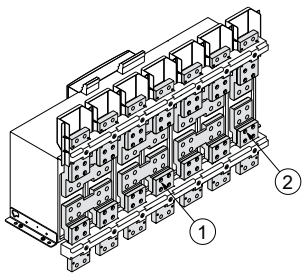
Dimensions
Fixed circuit breaker - E6.2

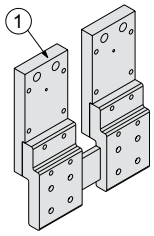
Front terminals – F

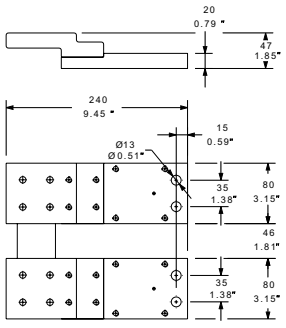
E6.2 H-A, V-A, L-A 4000A - 5000A

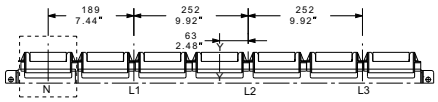


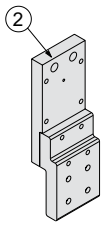


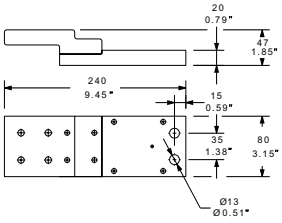












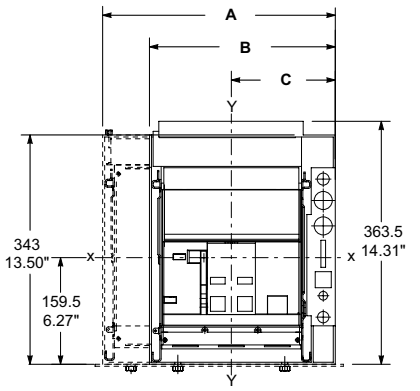
Key

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

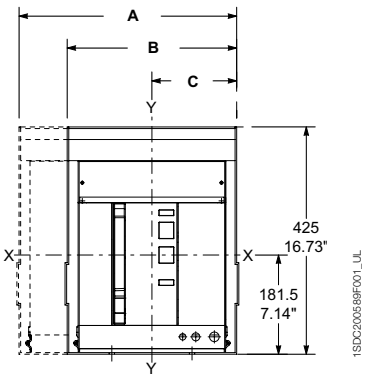
1SDC200621F001

Dimensions
Withdrawable circuit breaker

E1.2



E2.2 - E4.2 - E6.2

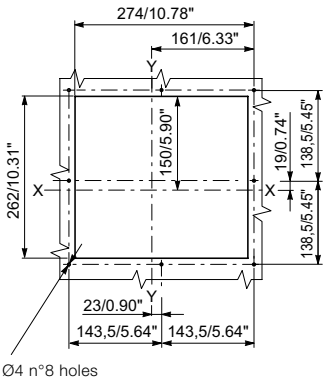


[mm/in]	A 4p	B 3p	C 3p	 4p
E1.2	348/13.70	278/10.94	155.5/6.12	155.5/6.12
E2.2	407/16.02	317/12.48	158.5/6.24	158.5/6.24
E4.2	551/21.69	425/16.73	212.5/8.36	212.5/8.36
E6.2	929/36.57	803/31.61	338.5/13.32	464.5/18.28
E6.2/f	1055/41.53	-	-	464.5/18.28

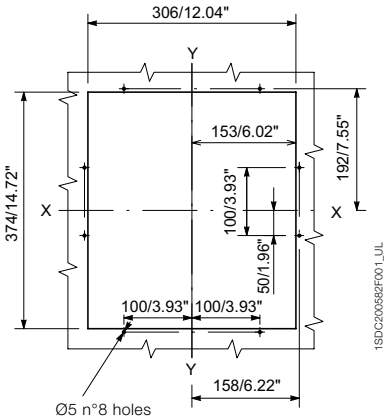
7

Compartment door drilling

E1.2

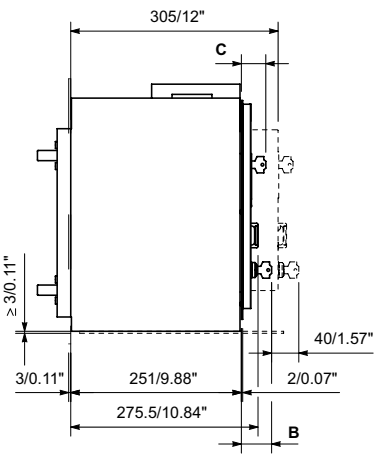


E2.2 - E4.2 - E6.2

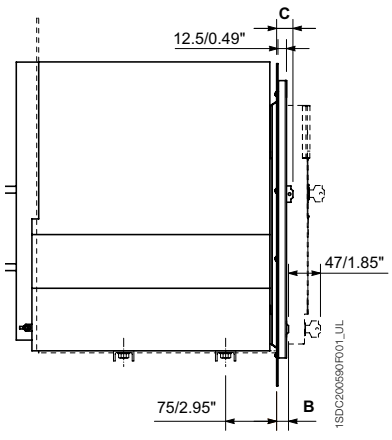


Distance from connected to isolated position

E1.2



E2.2 - E4.2 - E6.2



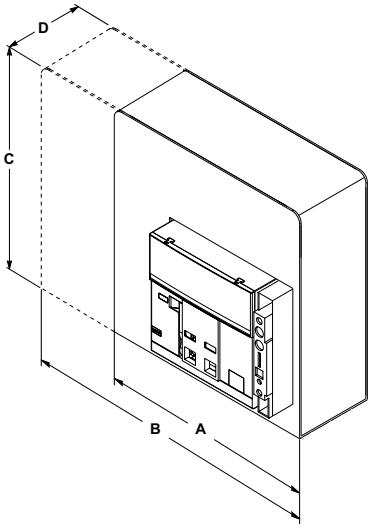
E1.2		Standard	Ronis/Profalux	Kirk	Castell
B	[mm/in]	44.5/1.75	55/2.16	55/2.16	85
C	[mm/in]	36/1.41	46.5/1.83	46.5/1.83	76.5

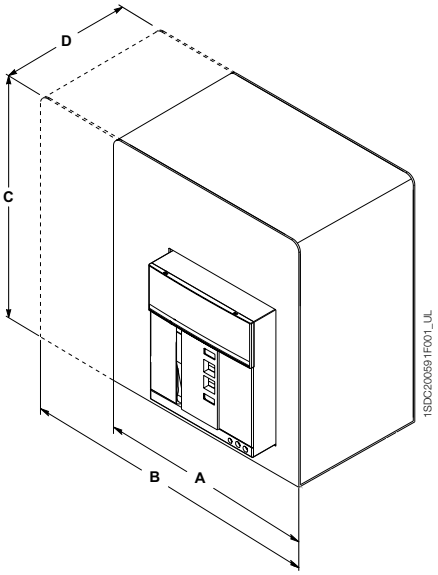
E2.2-E4.2		Standard	Ronis/Profalux	Kirk	Castell
B	[mm/in]	22/0.86	34/1.33	39/1.53	57.5/2.26
C	[mm/in]	23/0.90	35/1.37	40/1.57	58.5/2.30

B refers to KLC; C refers to KLP

Dimensions
Withdrawable circuit breaker

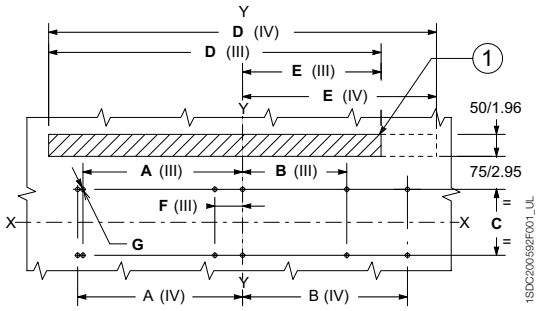
Dimensions of the compartment





[mm/in]	A 3p	B 4p	C	D
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 mounting

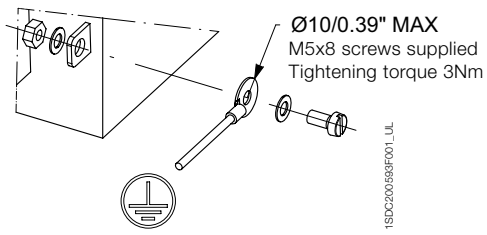


[mm/in]	A		B		C	D		E		F	G
	3p	4p	3p	4p		3p	4p	3p	4p		
E1.2	80/3.14	150/5.90	80/3.14	80/3.14	100/3.93	-	-	-	-	-	9/0.35
E2.2	75/2.95	175/6.88	75/2.95	75/2.95	150/5.90	270/10.62	360/14.17	135/5.31	135/5.31	-	10/0.39
E4.2	100/3.93	225/8.85	100/3.93	100/3.93	150/5.90	378/14.88	504/19.84	189/7.44	189/7.44	-	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

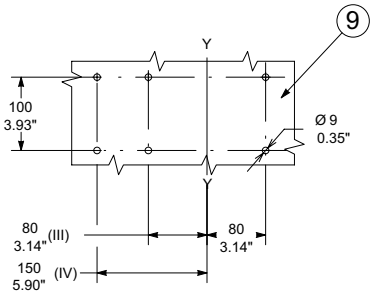
Key

1 Ventilation drilling on the switchgear

Grounding device E2.2 - E4.2 - E6.2



Mounting on support sheet (only for E1.2)

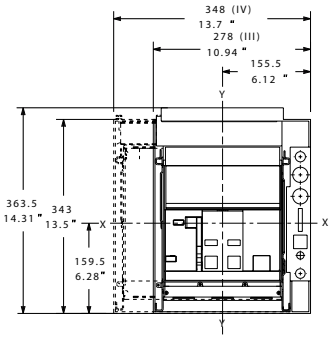


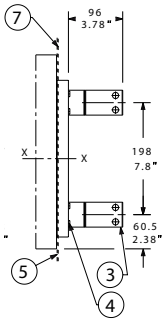
Dimensions
Withdrawable circuit breaker - E1.2

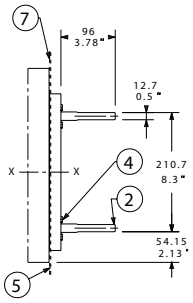
Orientable rear terminals - HR/VR

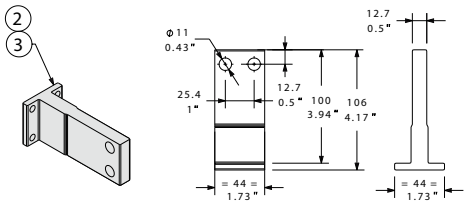
VR adjustment

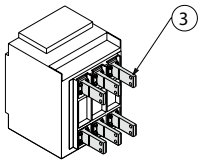
HR adjustment



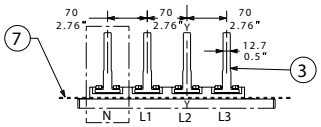


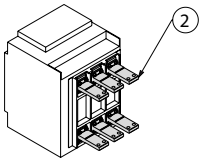




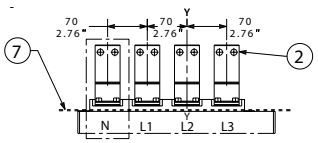


VR adjustment





HR adjustment

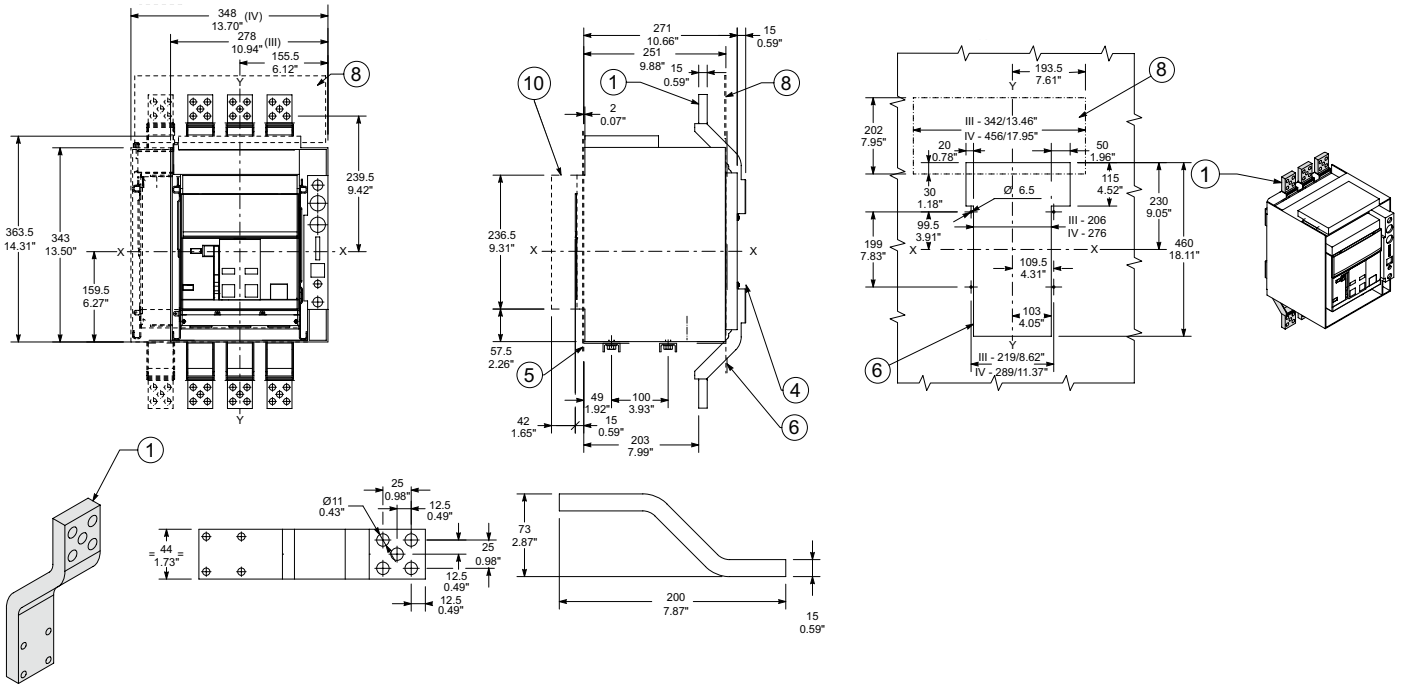


Key

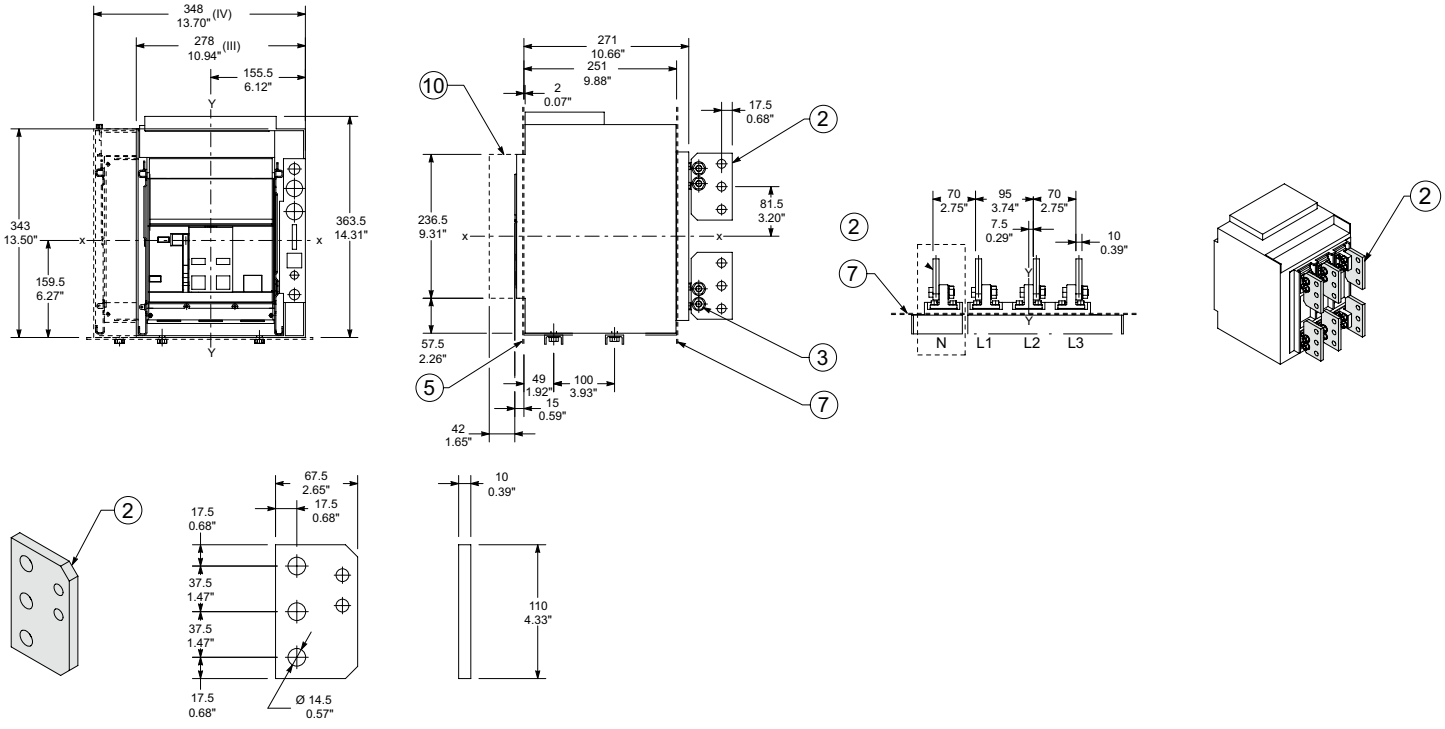
2 Horizontal rear terminals
3 Vertical rear terminals
3 Tightening torque 12 Nm - 106lb in
5 Door position - Ref. page 7/12
7 Rear segregation for rear terminals
8 Insulating Protection

1SDC200608F001_UL

Extended front terminals – EF



Rear terminals for cables – FcCuAl



Key

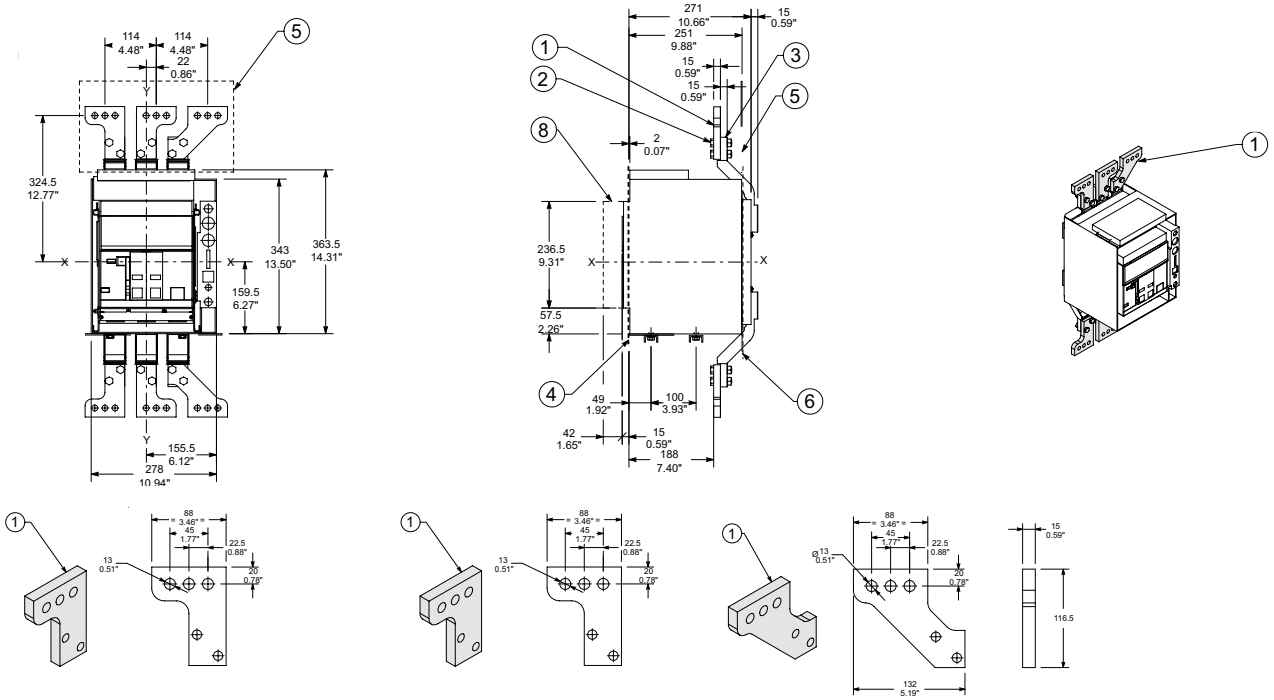
1 Front terminals
2 Rear terminals for cables
3 Tightening torque 48 Nm - 424lb in
4 Tightening torque 12 Nm - 106lb in
5 Door position - Ref. page 7/12
6 Rear segregation for front terminals
7 Rear segregation for rear terminals - Ref. page 7/15
8 Insulating protection
10 Sectioning run

1SDC200609F001_UL

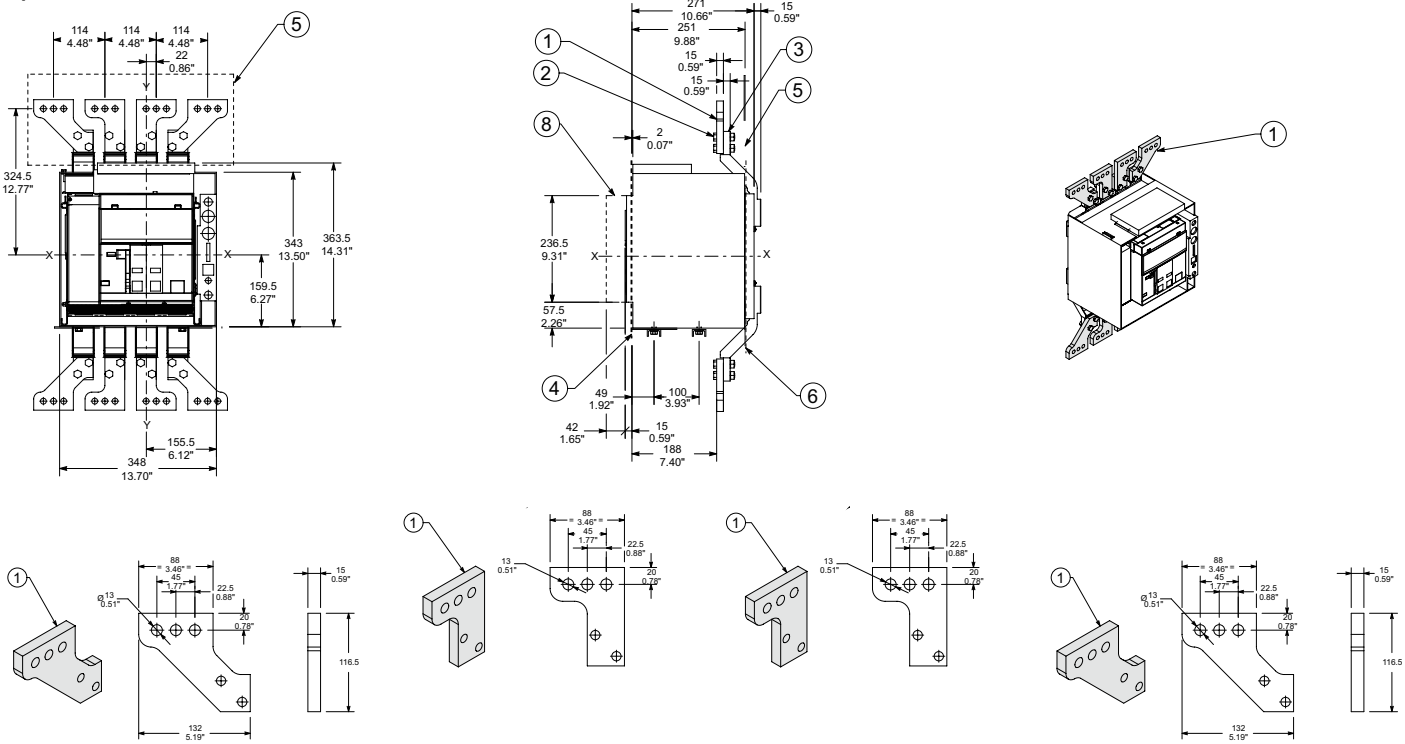
Dimensions
Withdrawable circuit breaker - E1.2

Front spread terminals - ES

3-pole version



4-pole version



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

1SDC200610F001_UL

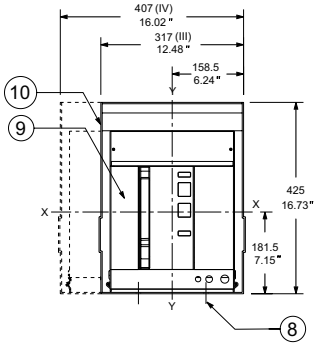
Dimensions
Withdrawable circuit breaker - E2.2

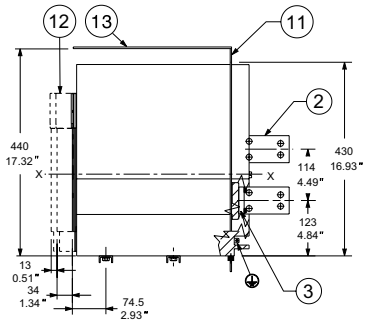
Orientable rear terminals - HR/VR

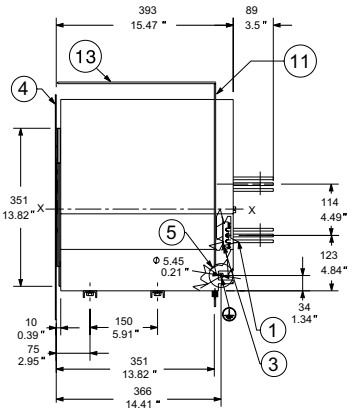
E2.2 B-A, N-A, S-A, H-A, V-A 250A - 2000A

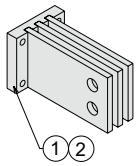
VR adjustment

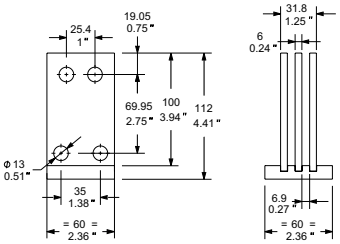
HR adjustment

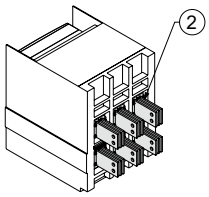




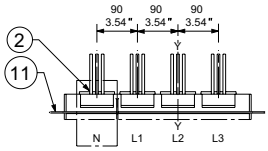




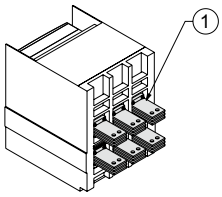


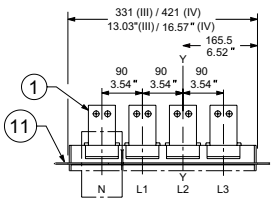


VR adjustment



HR adjustment





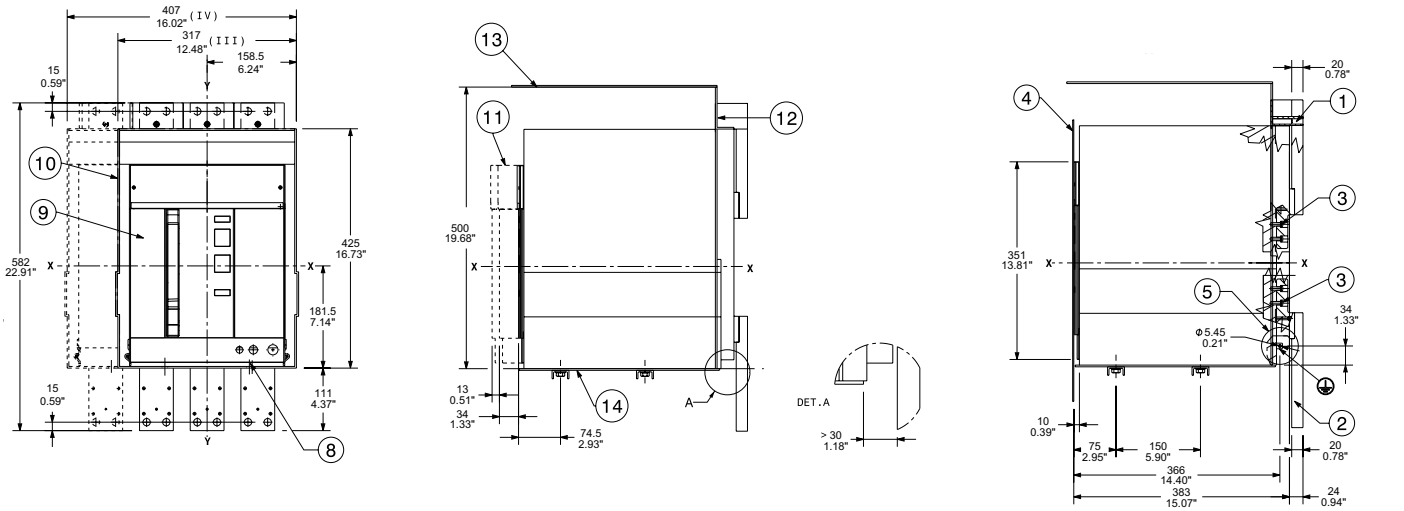
Key

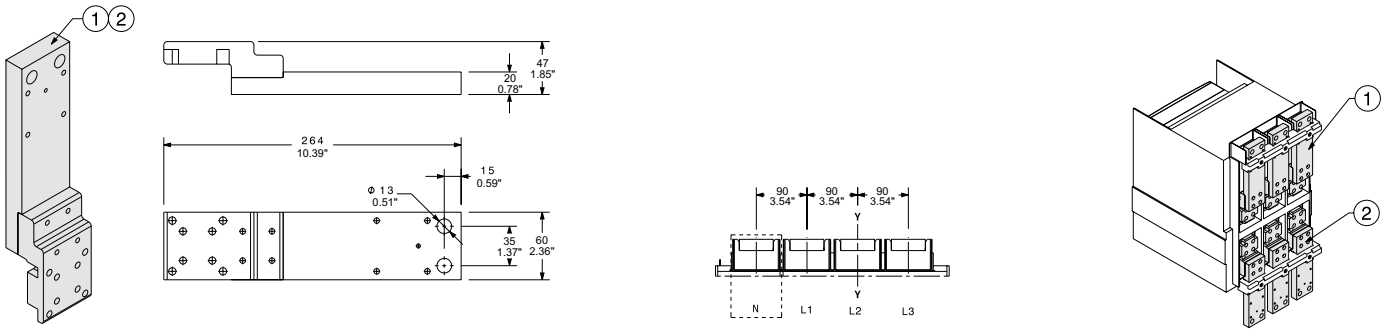
1 Horizontal terminals 1600A-2000A
2 Vertical terminals 1600A-2000A
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/13
5 Grounding
8 Mounting fixed part screws
9 Moving part
10 Fixed part
11 Segregation
12 Connected, test, disconnected distances
13 Roof insulation or insulated metal

1SDC200612F001.UL

Front terminals – F

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





Key

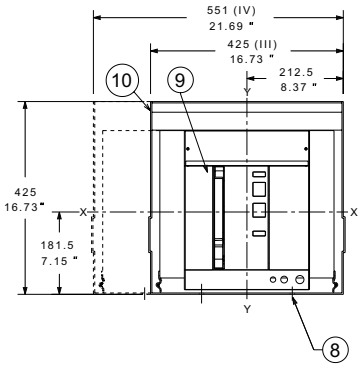
1 Upper front terminals
2 Lower front terminals
3 Tightening torque 8.6Nm - 76lb in
4 Door position - Ref. page 7/13
5 Grounding device
8 External mounting point. Reccomended screws M10x25 high class
9 Moving part
10 Fixed part
11 Connected, test, disconnected distances
12 Insulating sheet or insulated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

1SDC200613F001_UL

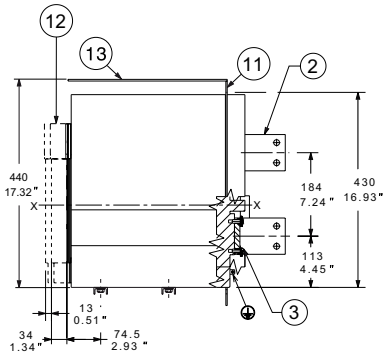
Dimensions
Withdrawable circuit breaker - E4.2

Orientable rear terminals - HR/VR

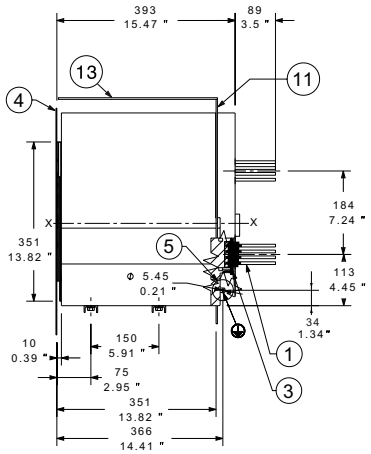
E4.2 S-A, H-A, V-A 800A - 2500A

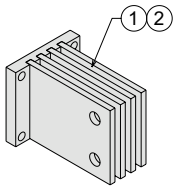


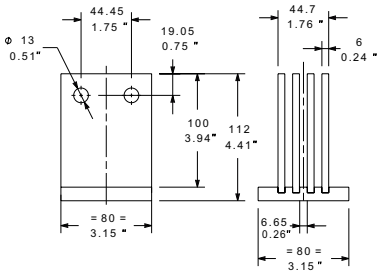
VR adjustment

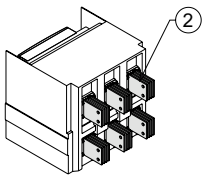


HR adjustment

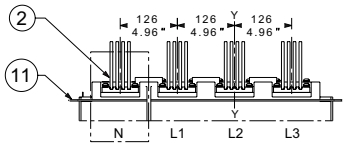




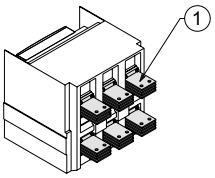


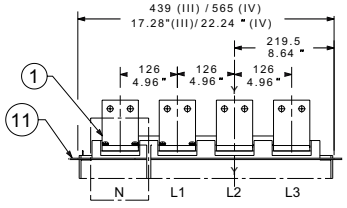


VR adjustment



HR adjustment





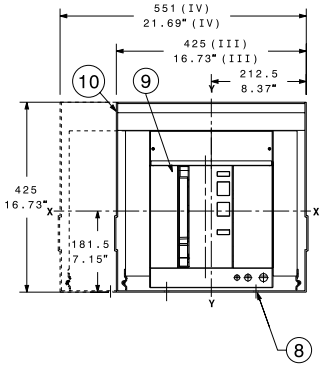
Key

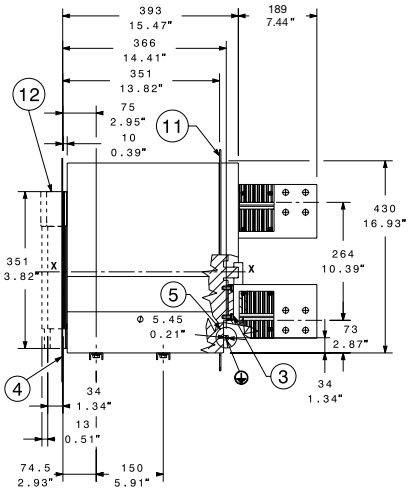
1 Horizontal terminals 2500A
2 Vertical terminals 2500A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/13
5 Grounding
8 Mounting fixed part screws
9 Moving part
10 Fixed part
11 Segregation
12 Connected, test, disconnected distances
13 Roof insulation or insulated metal

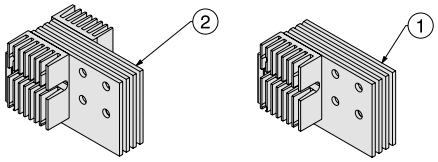
1SDC200616AF001_UL

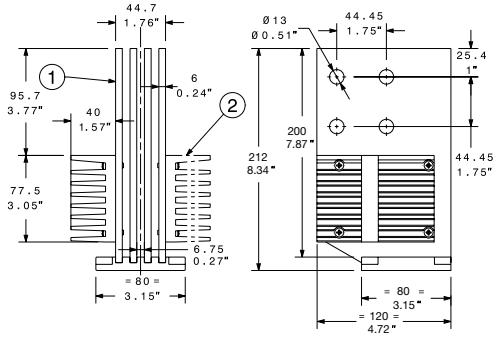
Rear terminals VR

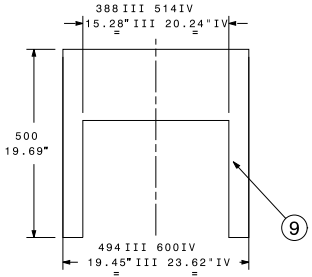
E4.2 S-A, H-A, V-A, L-A 3200A

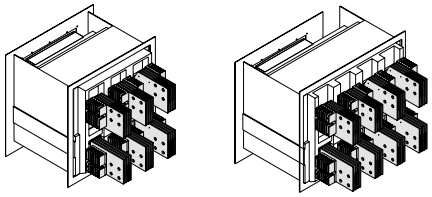


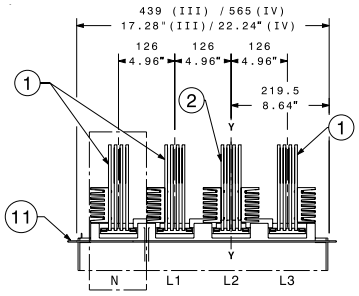












Key

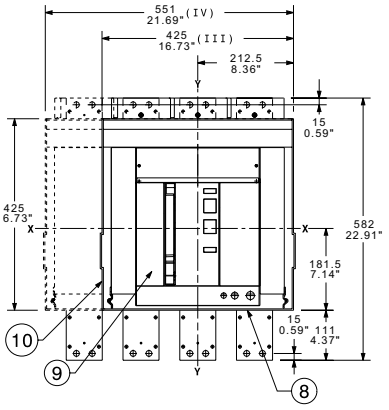
1 Lateral vertical terminals 3200A
2 Central vertical terminals 3200A
3 Tightening torque 20Nm - 177lb in
4 Door position - Ref. page 7/2
8 Mounting outside feet.
Reccomended screws M10x25 high class
9 Insulating sheet or
insulated metallic sheet
10 Metallic sheet
11 Segregation
13 Roof insulation or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

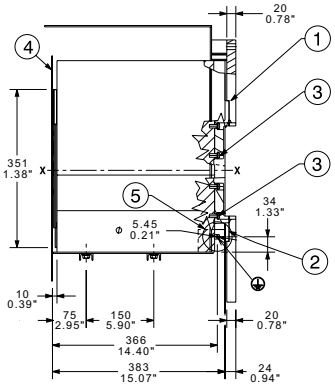
1SDC200617AF001_UL

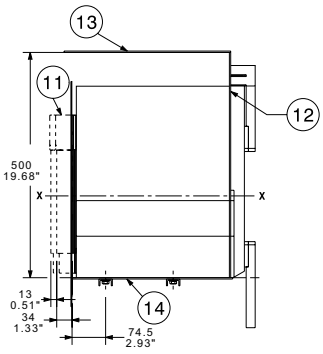
Dimensions
Withdrawable circuit breaker - E4.2

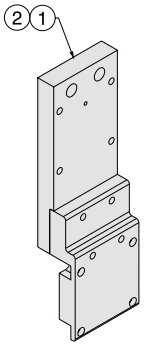
Front terminals – F

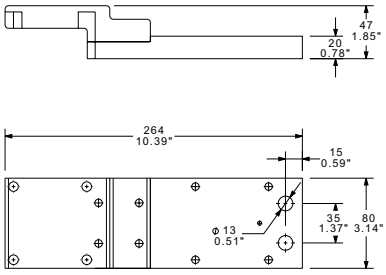
E4.2 S-A, H-A, V-A, L-A 800 - 3200A

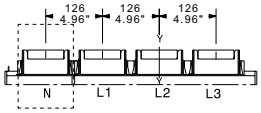


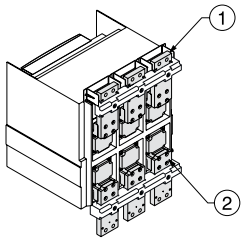












Key

1 Upper front terminals
2 Lower front terminals
3 Tightening torque 20Nm - 176lb in
4 Door position - Ref. page 7/13
5 Grounding device
8 External mounting 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 Mounting plate

1SDC210617F001_UL

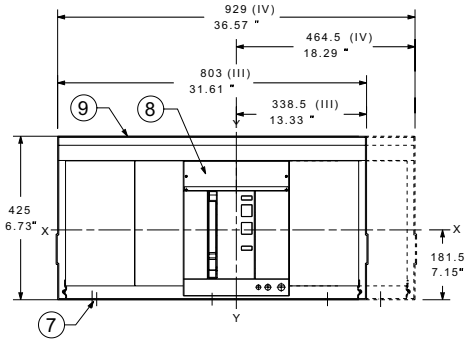
Dimensions
Withdrawable circuit breaker - E6.2

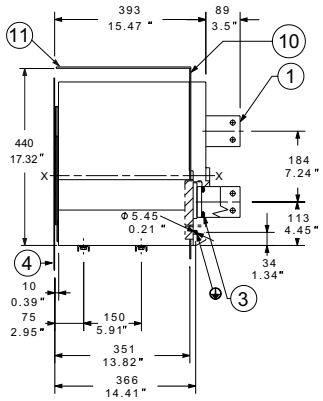
Orientable rear terminals - HR/VR

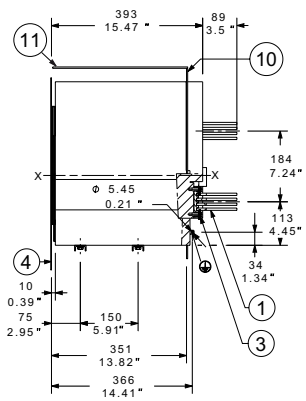
E6.2 H-A, V-A, L-A 4000A - 5000A

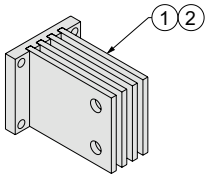
VR adjustment

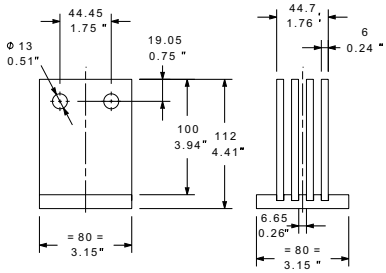
HR adjustment



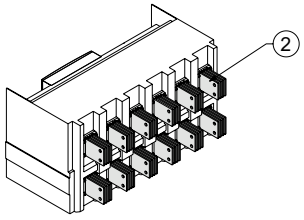


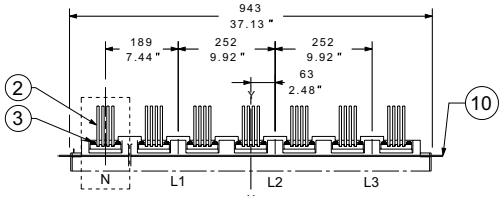


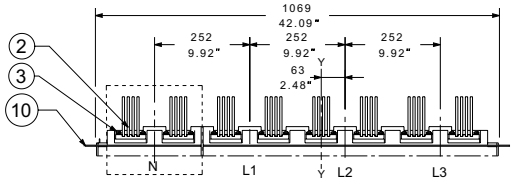




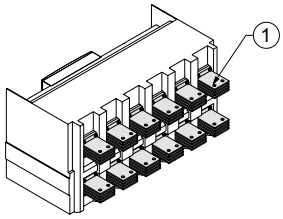
VR adjustment

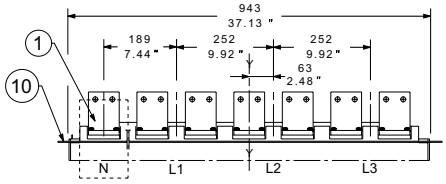


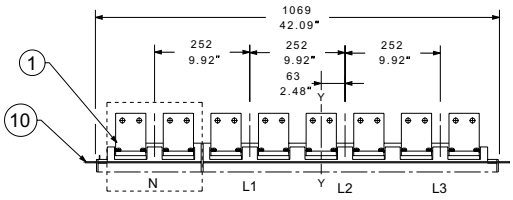




HR adjustment







Key

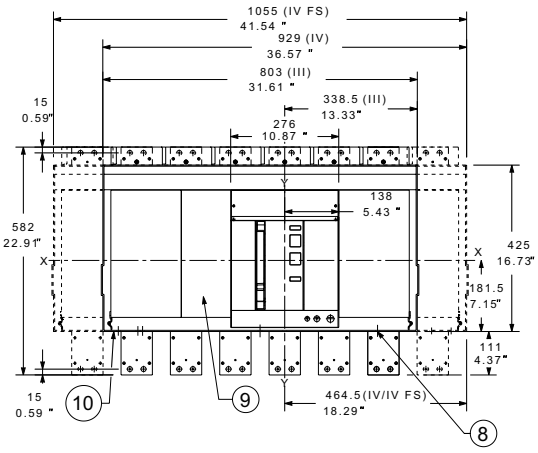
1 Horizontal terminals 5000A
2 Vertical terminals 5000A
3 Tightening torque 20Nm - 177lb in
4 Door position
7 Mounting fixed part screws M8x25 provided Tightening torque 20Nm - 177lb in
8 Moving part
9 Fixed part
10 Segregation
11 Roof insulation or insulated metal

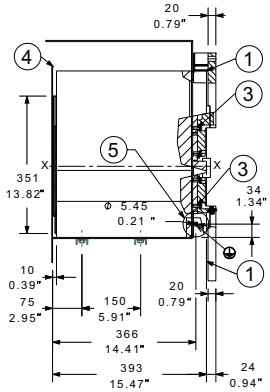
1SDC200622F001_UL

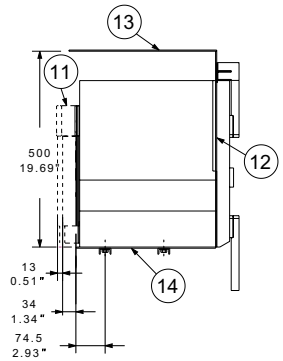
Dimensions
Withdrawable circuit breaker - E6.2

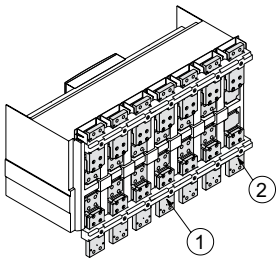
Front terminals – F

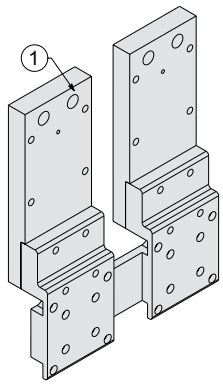
E6.2 H-A, V-A, L-A 4000A - 5000A

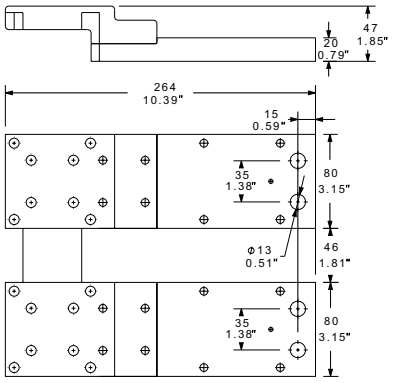


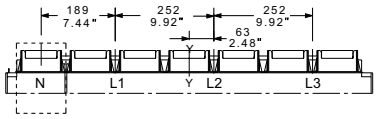


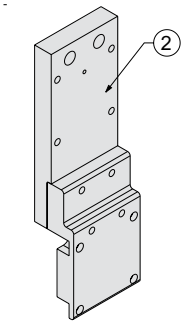


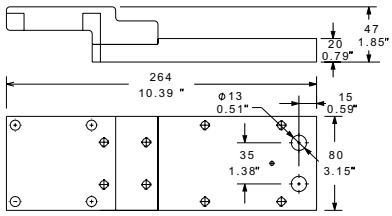












Key

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 Mounting plate

1SDC200623F0001

Electrical diagrams

Electrical diagrams
Reading information – Circuit breakers

Operating state shown

The diagram is shown in the following conditions:
- drawout 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 drawout 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).

Drawout 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 (second set)
2) Ekip Signaling 4K
11) Trip Signaling contact S51
12) Contact for Signaling position of loaded springs - S33
13) Motor for loading closing springs- M
14) Trip contact reset coil - 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 to the external neutral
22) Ekip Measuring Pro for residual voltage protection (for Ekip G only)
23) Ekip Measuring/Measuring Pro with external voltage transformer
24) Rc residual current protection sensor input (ANSI 64 & 50NTD)
24A) Rc differential ground fault protection (ANSI 87N)
25) Transformer star center sensor input
26) Zone selectivity
27) Current sensor input for 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 Signaling 2K-1
42) Ekip Signaling 2K-2
43) Ekip Signaling 2K-3
48) Ekip Synchrocheck
51) Ekip Com Modbus RTU
52) Ekip Com Modbus TCP
53) Ekip Com Profibus DP
54) Ekip Com ProfiNet
55) Ekip Com DeviceNet
56) Ekip Com EtherNet/IP
57) Ekip Com IEC61850
58) Ekip Link

61) Ekip Com Redundant Modbus RTU
62) Ekip Com Redundant Modbus TCP
63) Ekip Com Redundant Profibus DP
64) Ekip Com Redundant ProfiNet
65) Ekip Com Redundant DeviceNet
66) Ekip Com Redundant EtherNet/IP
67) Ekip Com Redundant IEC61850
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 (first set)
91) Supplementary open/closed auxiliary contacts outside the circuit breaker
95) Contacts for Signaling of circuit breaker in racked-in, test, racked-out position
96) Contacts for Signaling of circuit breaker in racked-in, test, racked-out position (first set)
97) Contacts for Signaling of circuit breaker in racked-in, test, racked-out position (second set)
103) Ekip Signaling 10K
104A) Ekip Multimeter
104B) Ekip Multimeter

Electrical diagrams
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 Signaling, outside the circuit breaker
BUS1	= Serial interface with external bus
BUS2	= Redundant serial interface with external bus
LINK BUS	= Interface with the external Link 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
K51	= Electronic overcurrent protection trip unit of the types: EKIP DIP, EKIP TOUCH, EKIP HI-TOUCH , EKIP G TOUCH, EKIP G HI-TOUCH
K51/COM	= Communication module
K51/MEAS	= Measurement module
K51/SIGN	= Signaling module
K51/SUPPLY	= Auxiliary supply module (110-240VAC/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 Signaling contacts
O SC	= Contact for synchronism control
Q	= Circuit breaker
Q/1…Q/25	= Auxiliary open/close contacts of circuit breaker
Q/26…Q/27	= Auxiliary open/close contacts used internally by the trip unit
RC	= RC (residual current) protection sensor
RTC EKIP	= Auxiliary ready to close contact of circuit breaker, used internally by the trip unit
RTC	= Contact for Signaling circuit breaker is ready to close
S33M/1…2	= Limit contacts of spring loading motor
S43	= Switch for presetting remote/local control
S51	= Trip Signaling contact
S75E/1…4	= Contacts for Signaling circuit breaker in racked-out position (provided only with withdrawable version)
S75I/1…5	= Contacts for Signaling circuit breaker in racked-in position (provided only with withdrawable version)
S75T/1…2	= Contact for Signaling 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 S51 trip contact
SZi(DFi)	= Zone selectivity input for S protection or input in “direct” direction for D protection
SZo(DFo)	= Zone selectivity output for S protection or output in “direct” direction for D protection
TI/L1-L2-L3	= Current transformer phase L1-L2-L3
TI/N	= Current transformer on neutral
TU1…TU2	= Insulation voltage transformer (outside circuit breaker)
Uaux	= Auxiliary supply voltage
UI/L1-L2-L3	= Current sensor phase L1-L2-L3
UI/N	= Current sensor on neutral

UI/O	= Homopolar 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 board for auxiliary circuits of fixed version circuit breaker
YC	= Closing coil
YC2	= Second closing coil
YO	= Shunt coil
YO1	= Opening coil for overcurrent
YO2	= Second shunt coil
YR	= Release for electrical resetting of trip contact S51
YU	= Undervoltage coil

Electrical diagrams
Reading information – Circuit breakers

Notes

A) For the zone selectivity and local bus function is required the presence of auxiliary power supply (refer to diagram 1SDM000091R0001 figures 31 - 32).
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 X connector (or XV) of the circuit breaker must be made with 4-pole shielded cable with conductors interwoven in pairs (type BELDEN 9696 paired or equivalent), of length no greater than 10m.
G) With all electronic protection trip units equipped with display interface with LSIG protections, protection against an ground 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 a 15m.
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) are short-circuited if no sensor is present on the external neutral conductor. If no present, insert the short-circuit.
I) Obligatory in the case of the presence of any Ekip module.
L) In the presence of Fig. 32, for E2.2, E4.2 and E6.2 circuit breakers up to 3 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) The opening and closing commands from modul Ekip Actuator are available with YO an YC releases maximum voltage of 110-120 Vdc and 240-250Vac.
N) Use cables type BELDEN 3105A or equivalent.
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 ground insulated Uaux was requested, it is necessary to use “galvanically separated convertors” which comply with the standards IEC 60950 (UL 1950) or equivalent.
Q) Use cables type BELDEN 3105A or equivalent, with maximum lenght 15m.
R) Suggested RJ45 cable: CAT6 STP.
S) For the serial line connection EIA RS 485, refer to "Technical Applications Paper QT9: Bus Communication with ABB Circuit Breakers)".
T) Connect terminals 120Ω on if you want to insert a termination resistance on the Local Bus.
U) Use cables type BELDEN 3079A or equivalent. For further details see White Paper 1SDC007412G0201 "Communication with SACE Emax2 Circuit Breakers".
V) Use cables type BELDEN 3084A or equivalent. For further details see White Paper 1SDC007412G0201 "Communication with SACE Emax2 Circuit Breakers".
Z) For direct supply to the electronic trip unit by terminals K1 and K2 Ekip Supply can not be used.
AA)For connection of W3 and W4 see Fig. 31 and 32.

Electrical diagrams
Reading information – ATS021 and ATS022 (IEC only)

Operating state shown

The diagram is shown in the following conditions:
- circuit breakers open and racked in #
- with de-energized circuits
- trip units not tripped *
- unloaded closing springs.

Key

A	=	ATS021 and ATS022 devices for automatic switching of two circuit breakers
CB1-N	=	Normal supply line circuit breaker
CB2-E	=	Emergency supply line circuit breaker
K1	=	Auxiliary contactor type NF22E for voltage presence of normal power supply
K2	=	Auxiliary contactor type NF22E for voltage presence of emergency power supply
KC1-KC2	=	Auxiliary contactors type AL__-30 circuit breaker closing
KO1-KO2	=	Auxiliary contactors type AL__-30 circuit breaker opening
M	=	Motor for loading the closing springs
Q/1	=	Auxiliary contact of the circuit breaker
Q60	=	Thermal protection for isolating and protecting the auxiliary circuits of safety auxiliary voltage
Q61/1-2	=	Thermal protection for isolating and protecting the auxiliary circuits of the lines
S11	=	Contact for enabling automatic switching of the ATS021 device
S11...S15	=	Signaling contacts for the inputs of the ATS022 device
S1-S2	=	Contacts controlled by the cam of the motor operator
S3	=	Changeover contact for electrical Signaling of local/remote selector state
S33M/1	=	Limit contacts of spring charging motor
S51	=	Contact for electrical Signaling of circuit breaker open due to tripping of overcurrent trip unit (bell alarm)
S75I/1	=	Contact for Signaling circuit breaker racked in #
BUS 1	=	Serial interface with control system (MODBUS EIA RS485 interface) available with the device ATS022
X	=	Connector for auxiliary circuits of drawout version circuit breakers
XF	=	Delivery terminal box for the position contacts of the circuit breaker
XV	=	Delivery terminal box for the auxiliary circuits of the fixed version circuit breakers
YC	=	Closing coil
YO	=	Shunt coil

This diagram shows the drawout version circuit breakers, but it is also valid for the fixed version circuit breakers. In this case, it is not necessary to connect the S75I/1 contacts on the X31:1 input of the ATS021 device otherwise it is necessary to connect the X32:5 and X32:6 terminals with the terminal X32:9 of the ATS022 device.

* This diagram shows circuit breakers with an overcurrent trip unit but it is also valid for circuit breakers without a trip unit (switch disconnectors). If the S51 (bell alarm) contact is not present, the S51contacts on the X31:1 input of the ATS021 device should not be considered, while it is necessary to connect the X32:7 and X32:8 terminals with the X32:9 terminal of the ATS022 device.

Electrical diagrams
Reading information – Power Controller

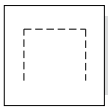
Operating state shown

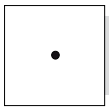
The diagram is shown in the following conditions:
- circuit breaker, open and racked in #
- with de-energized circuits
- trip units not tripped *
- motor operator with unloaded springs.

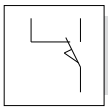
Key

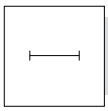
A13	=	Ekip Signaling 10K unit
A17	=	MOE actuator unit for stored energy operating mechanism for the Tmax XT circuit breaker
A21	=	EtherNet Switch device
FI	=	Time-delayed trip fuse
I 01 ... 12	=	Programmable digital inputs of the Ekip protection trip unit
J ..	=	Connectors for auxiliary circuits of the Tmax XT circuit breaker in the drawout version
K51	=	Ekip electronic overcurrent protection trip unit for Emax 2 circuit breaker
K51/COM	=	Communication module for the Ekip trip unit
K51/SIGN	=	Signaling module for Ekip trip unit
K51/SUPPLY	=	Optional auxiliary supply module for the Ekip trip unit
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 for Emax 2 circuit breaker
M	=	Motor for opening the circuit breaker and for loading closing springs for Tmax XT circuit breakers
O 01 ... 12	=	Programmable Signaling contacts of the EKIP protection trip unit
Q/1	=	Auxiliary contacts of circuit breaker
Q1	=	Emax 2 circuit breaker equipped with Ekip Power Controller
Q2	=	Emax 2 circuit breaker
Q3	=	Tmax XT circuit breaker equipped with MOE actuator unit
Q4	=	Emax 2 MS switch-disconnector
R1	=	Resistor
S33M/1	=	Limit contacts of spring loading motor
S51	=	Trip Signaling contact (bell alarm)
S75I/5	=	Contacts for Signaling Emax 2 circuit breaker in racked in position (provided only for drawout version)
W13	=	RJ45 connector for communication modules
X	=	Delivery connector for auxiliary circuits for drawout version of Emax 2 circuit breaker
XV	=	Delivery terminal box for auxiliary circuits of fixed version circuit breaker
YC	=	Closing coil
YO	=	Shunt coil

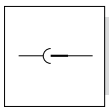
Electrical diagrams
Circuit diagram symbols (IEC 60617 standards)

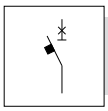

Shield
(may be drawn in any shape)

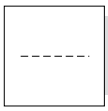

Terminal

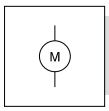

Position switch
(limit switch) change-over
break before make contact


Delay

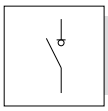

Plug and socket
(male and female)

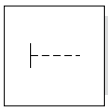

Circuit breaker-
disconnector with
automatic trip unit

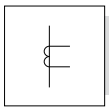

Mechanical connection
(link)

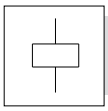


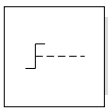
Motor
(general symbol)

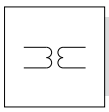

Switch disconnector
(on-load isolating switch)

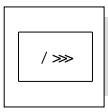

Manually operated control
(general case)

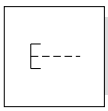

Current transformer

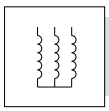

Operating device
(general symbol)

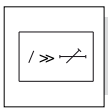

Operated by turning

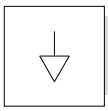

Voltage transformer

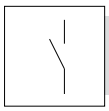

Instantaneous
overcurrent or
rate-of-rise relay

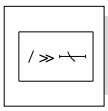

Operated by pushing

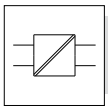

Winding of three-phase
transformer, connection star

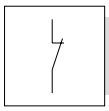

Overcurrent relay with
adjustable short time-lag
characteristic

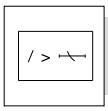

Equipotentiality

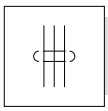

Make contact

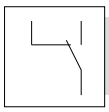

Overcurrent relay with
inverse short time-lag
characteristic

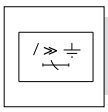

Converter with galvanic
separator


Break contact

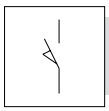

Overcurrent relay with
inverse long time-lag
characteristic

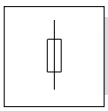

Conductors in a screened
cable (i.e., 3 conductors
shown)

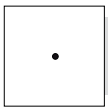

Change-over break before
make contact

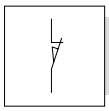

Ground fault overcurrent
relay with inverse
short time-lag characteristic

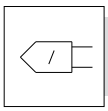

Twisted conductors
(i.e., 3 conductors shown)


Position switch (limit switch),
make contact


Fuse
(general symbol)

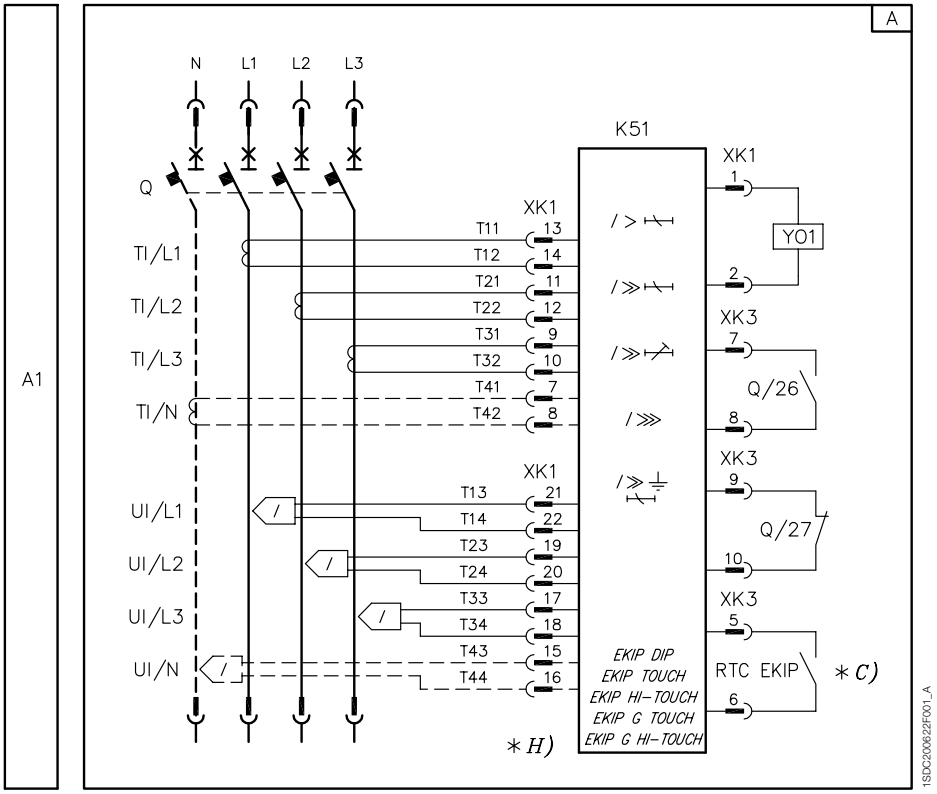

Connection of conductors


Position switch (limit switch),
break contact

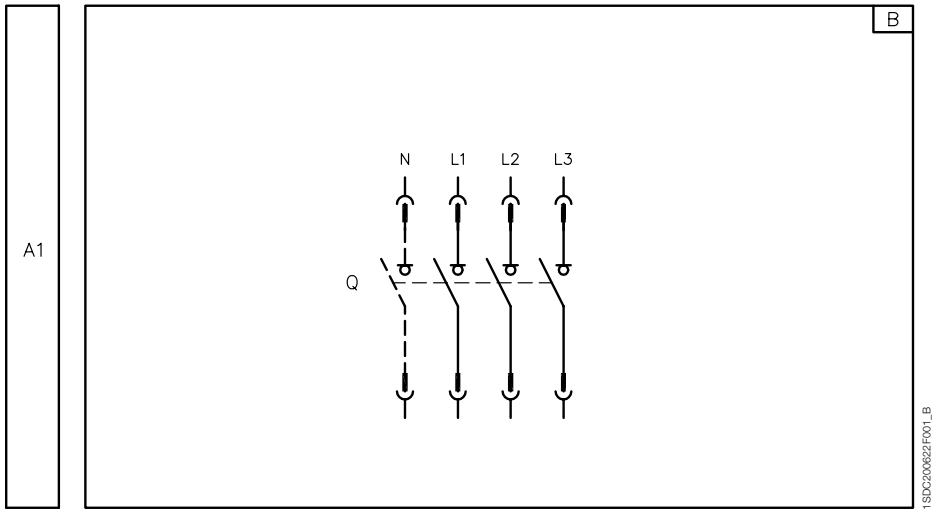

Current sensing
element

Electrical diagrams
Circuit breakers

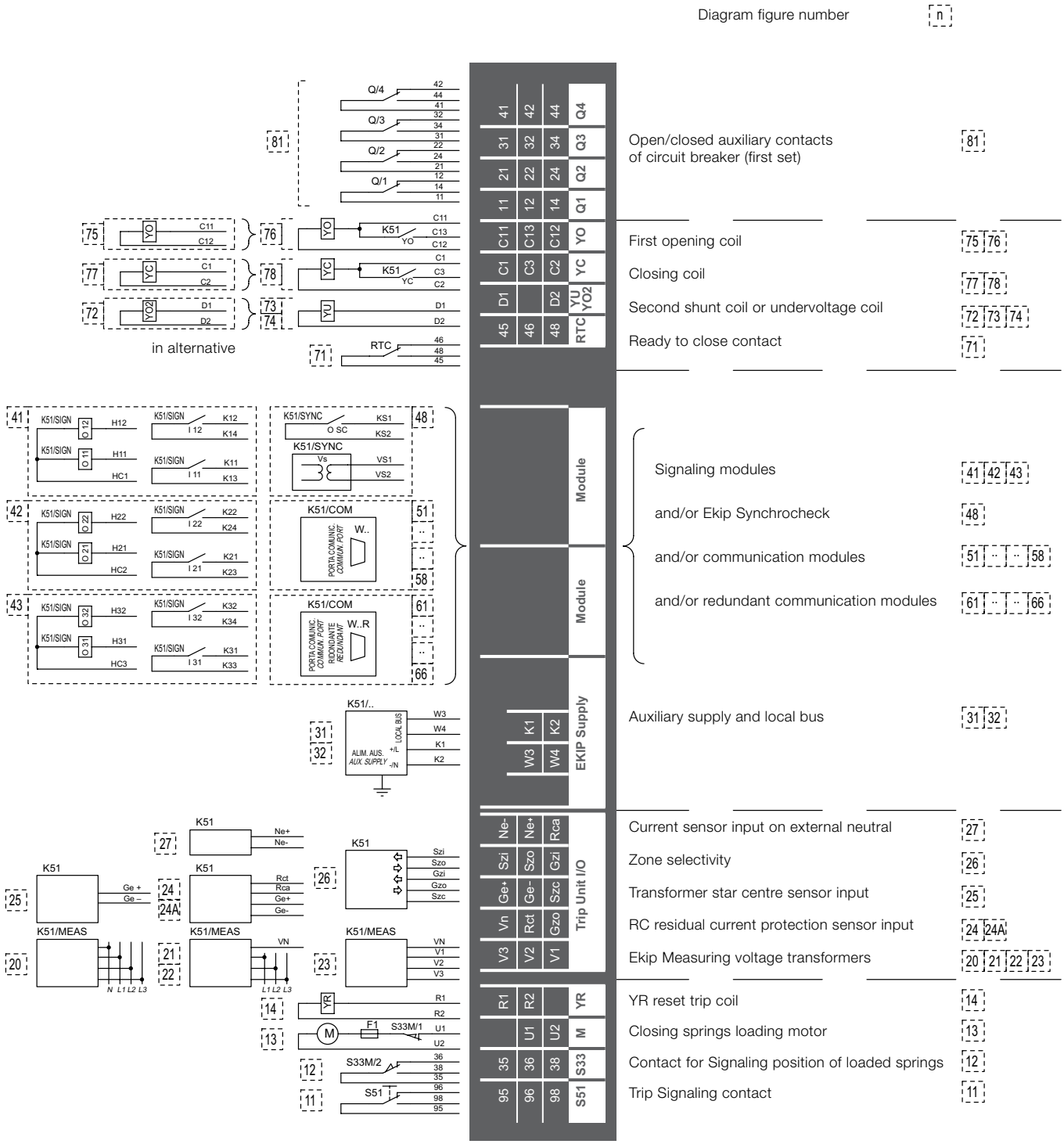
3-pole or 4-pole circuit breaker



3-pole or 4-pole switch disconnector



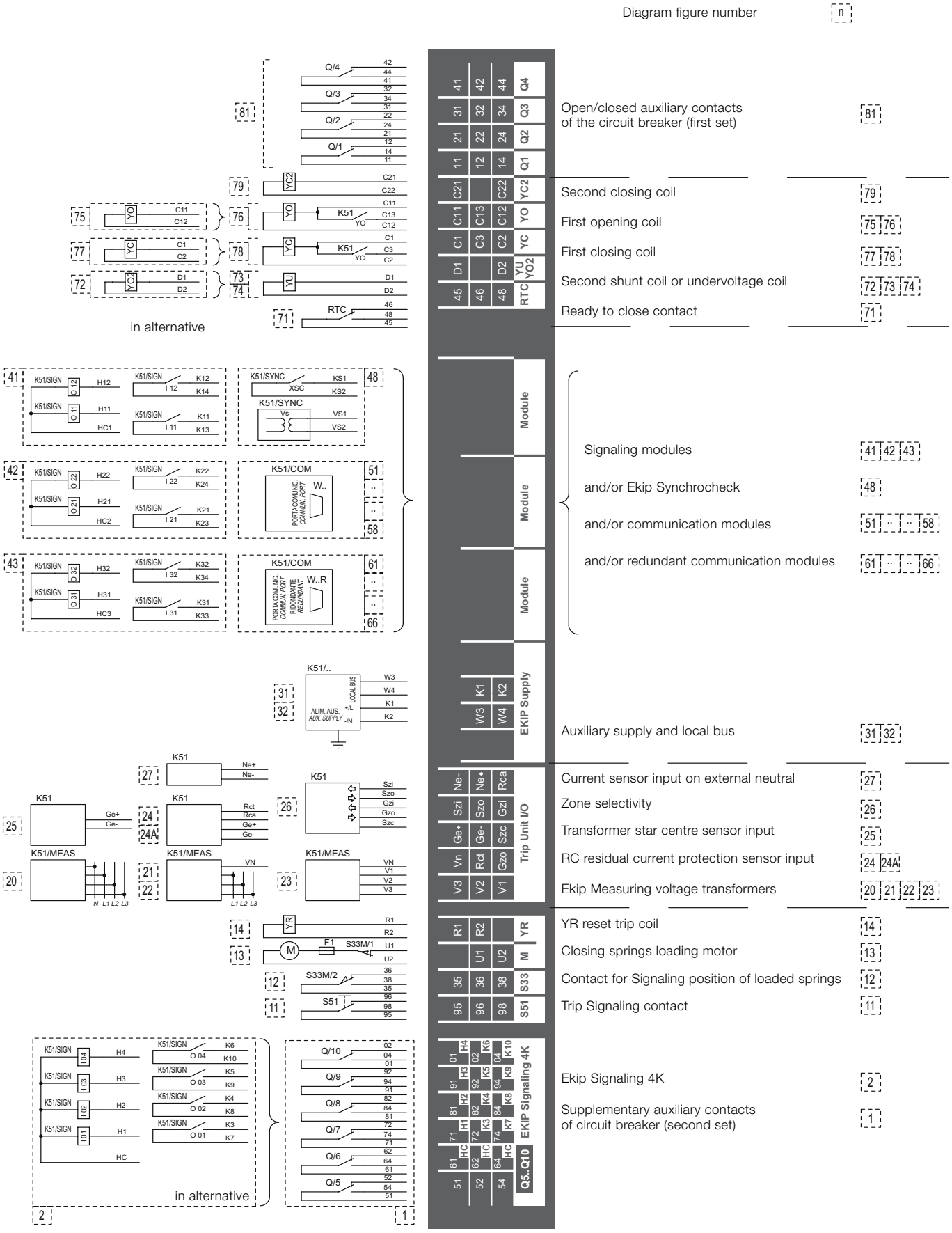
Electrical diagrams
Terminal box E1.2



1SDC200623F0001_A

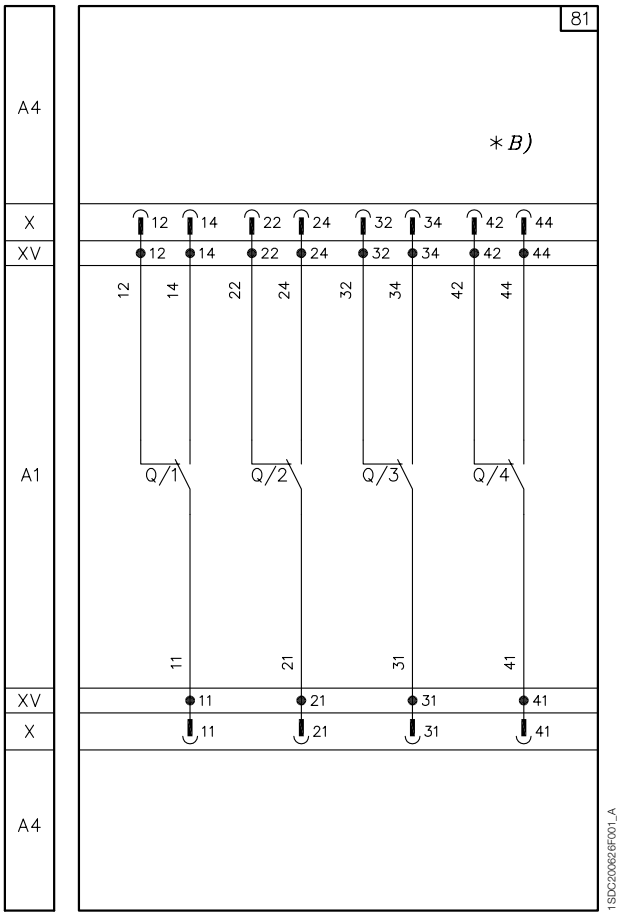
8

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

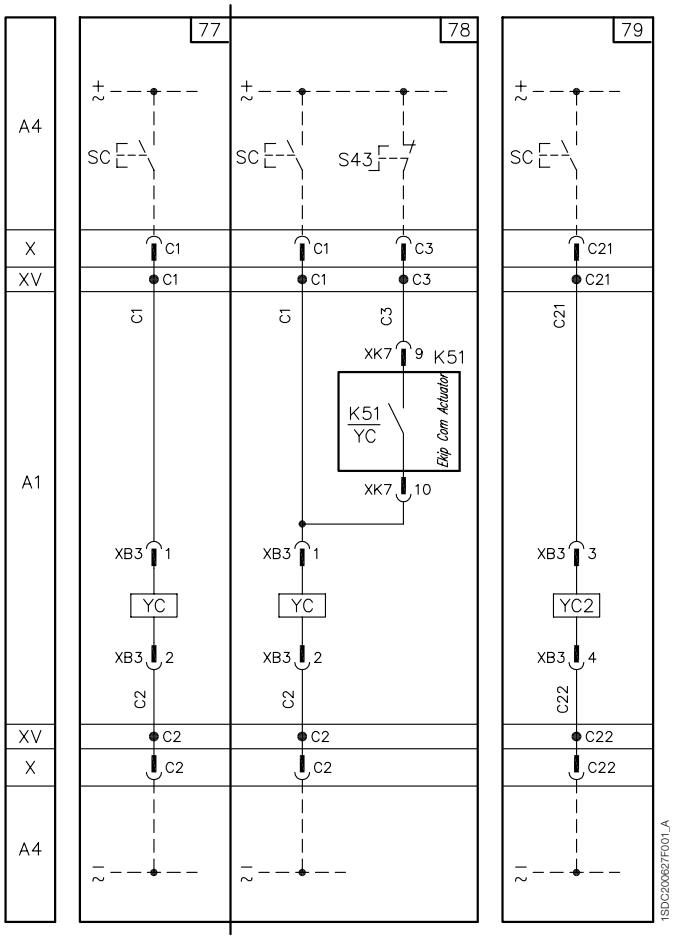


Electrical diagrams
Electrical accessories

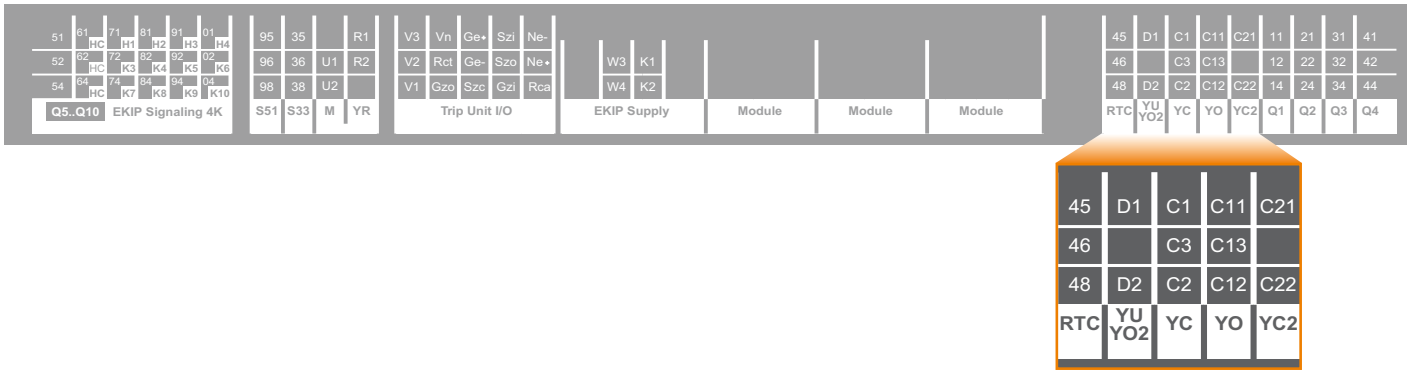
81) Open/closed auxiliary contacts of circuit breaker (first set)



77) First closing coil - YC
78) First closing coil with control from protection trip unit - YC, Ekip Com Actuator
79) Second closing coil - YC2

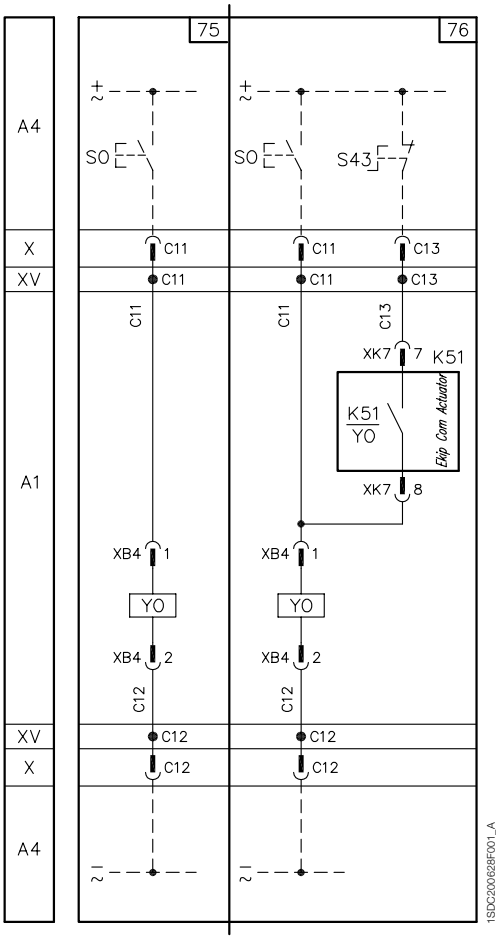


77- 78 as an alternative to each other
79 valid only for E2.2 - E4.2 - E6.2



75) First opening coil - YO

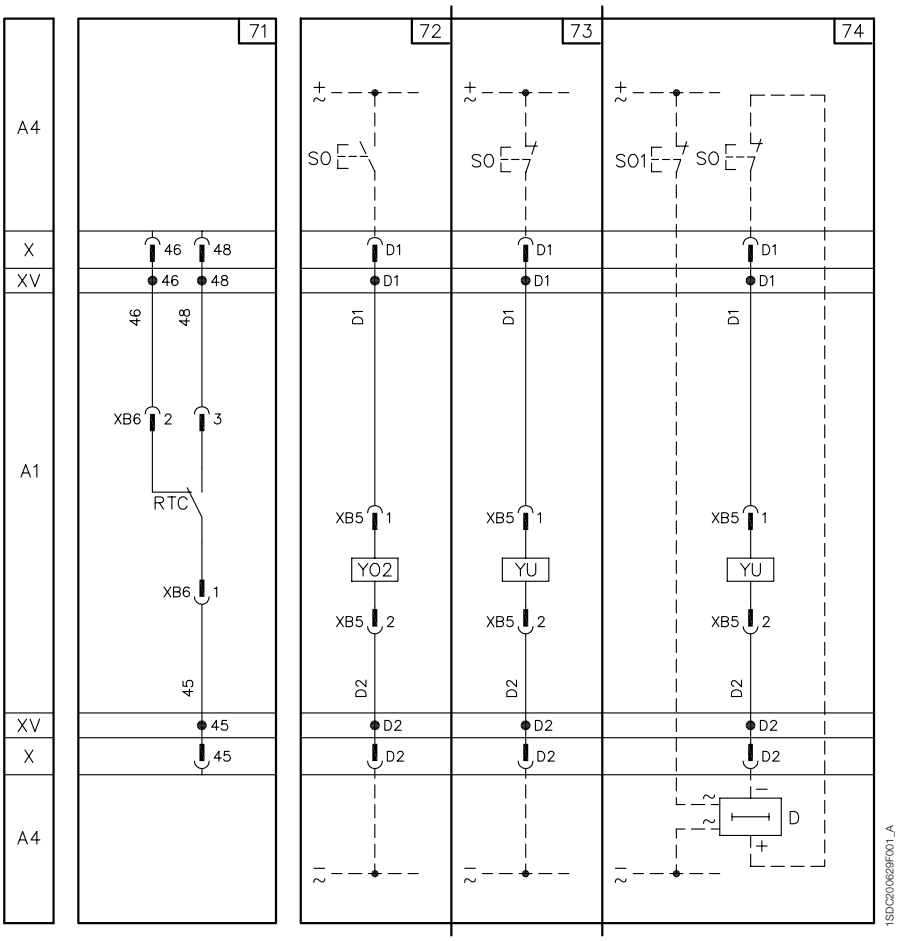
76) First opening coil with control from protection trip unit - YO, Ekip Com Actuator



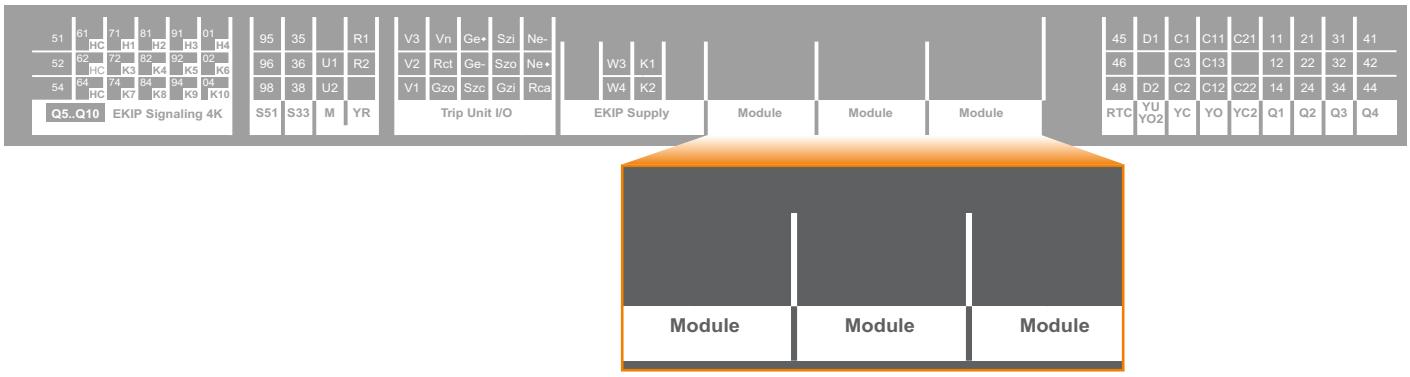
75-76 as an alternative to each other

Electrical diagrams
Electrical accessories

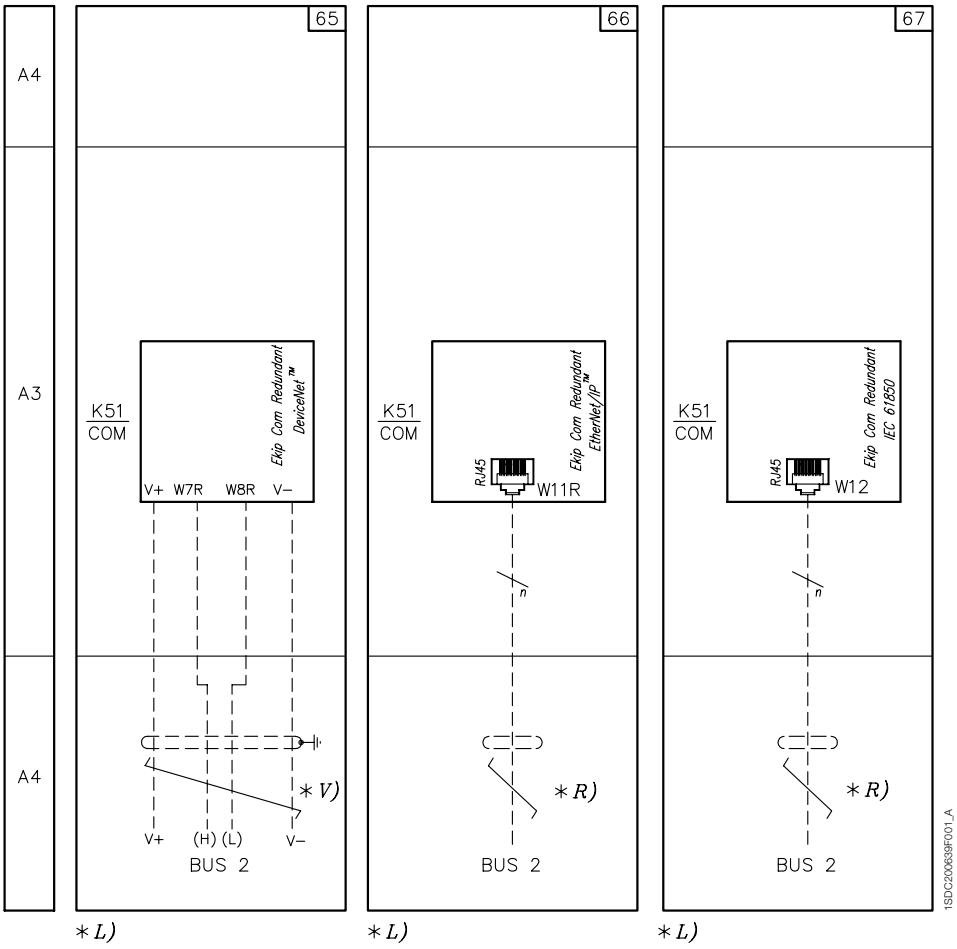
71) Ready to close contact - RTC
72) Second opening coil - YO2
73) Undervoltage coil - YU
74) Undervoltage coil with external time-delay device - YU, D



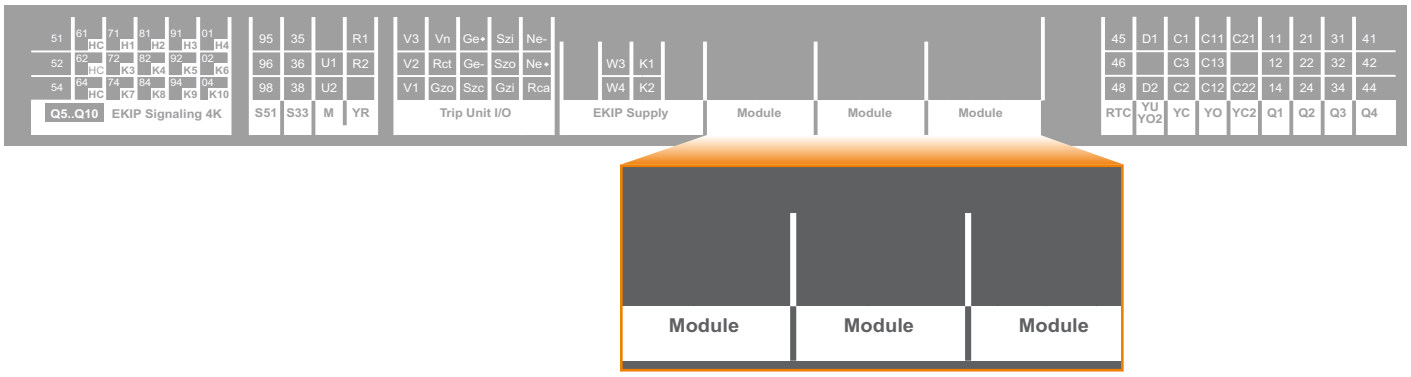
72-73 or 74 as an alternative to each other



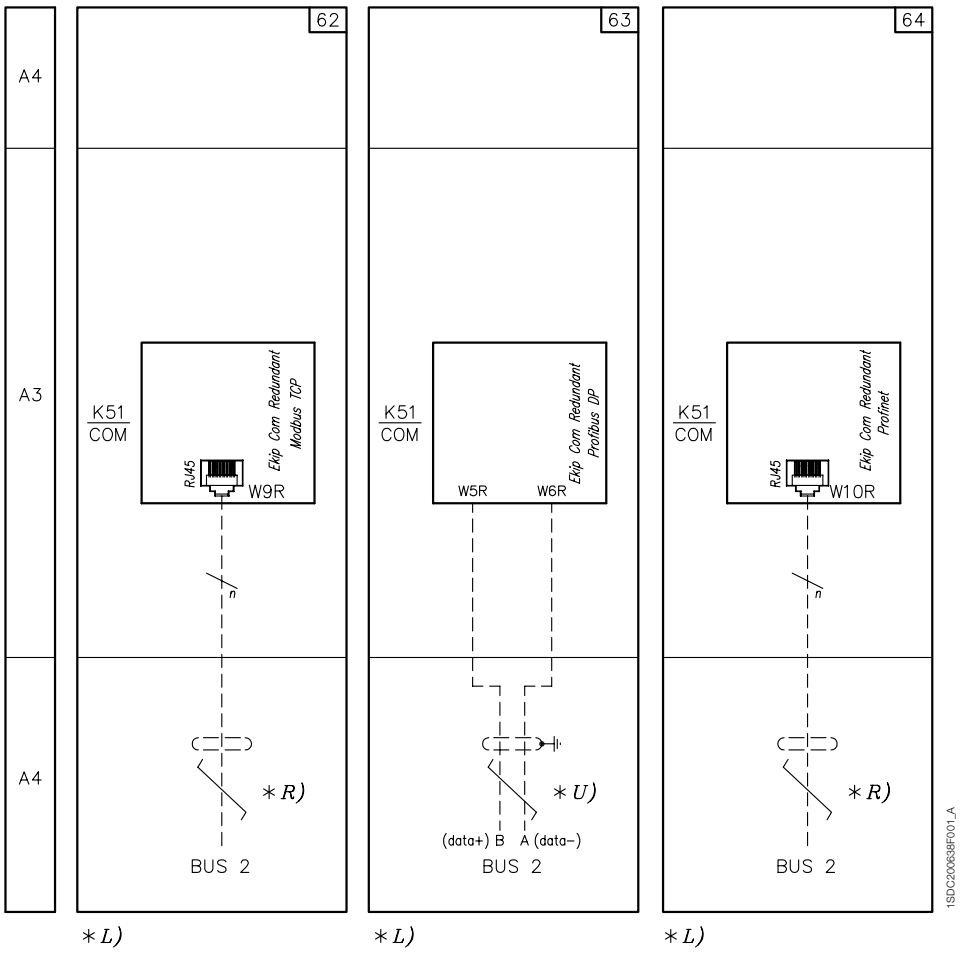
65) Ekip Com Redundant DeviceNet
66) Ekip Com Redundant EtherNet/IP
67) Ekip Com Redundant IEC61850

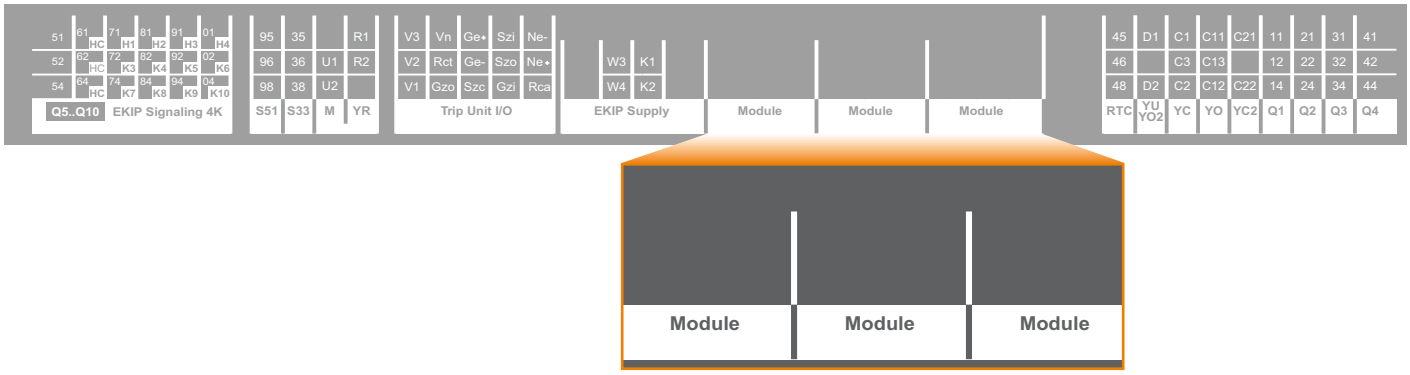


8

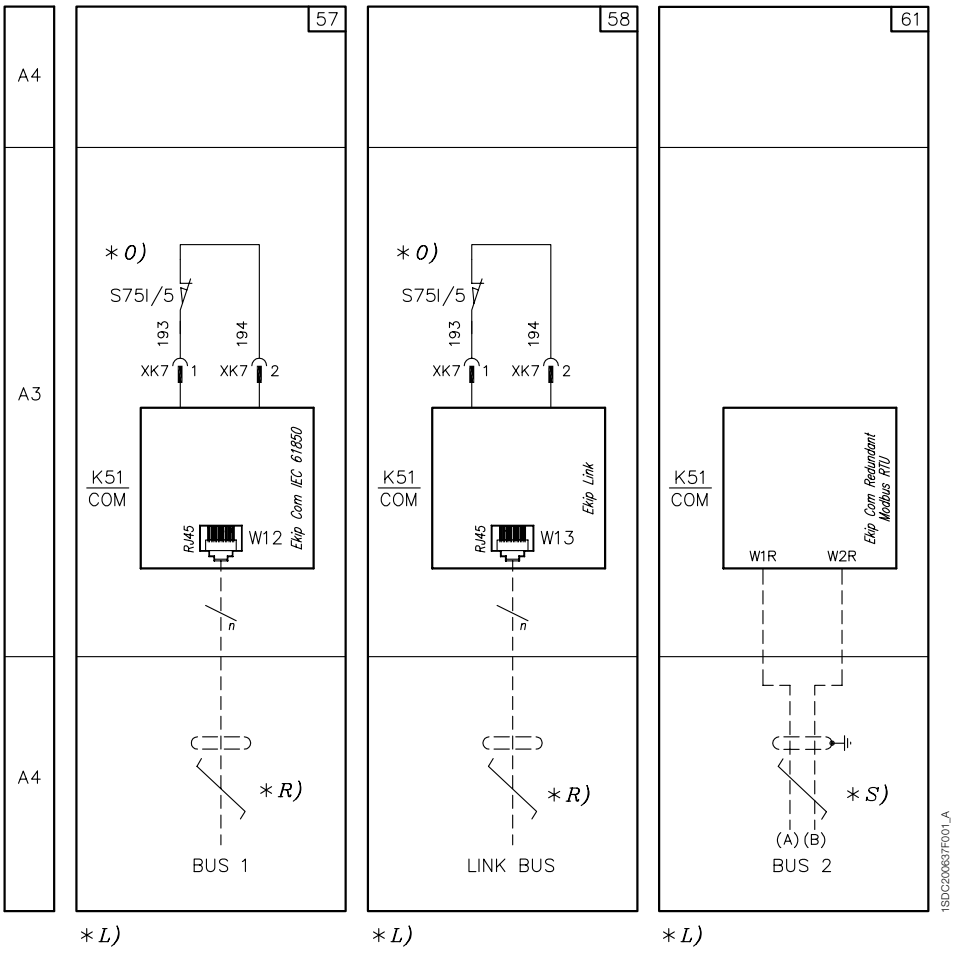


62) Ekip Com Redundant Modbus TCP
63) Ekip Com Redundant Profibus DP
64) Ekip Com Redundant ProfiNet

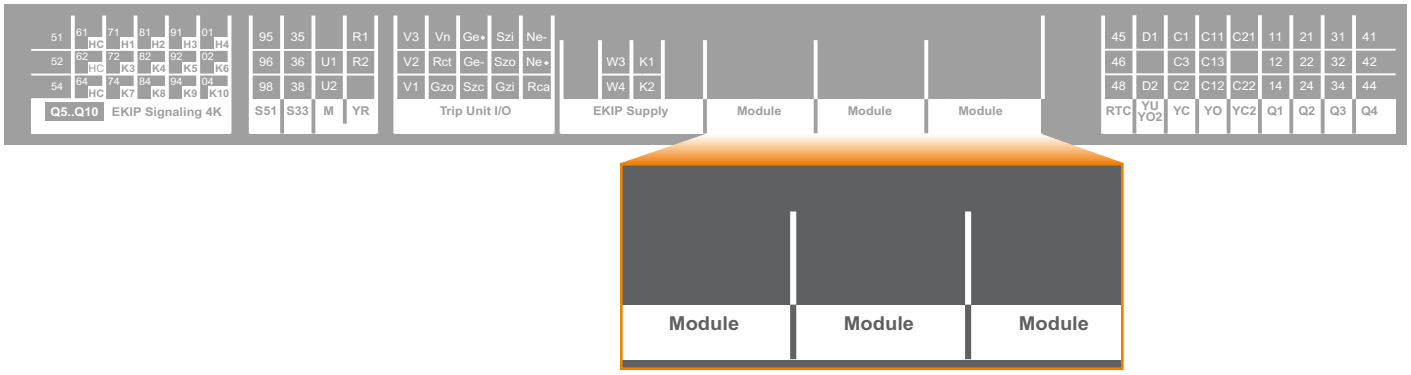




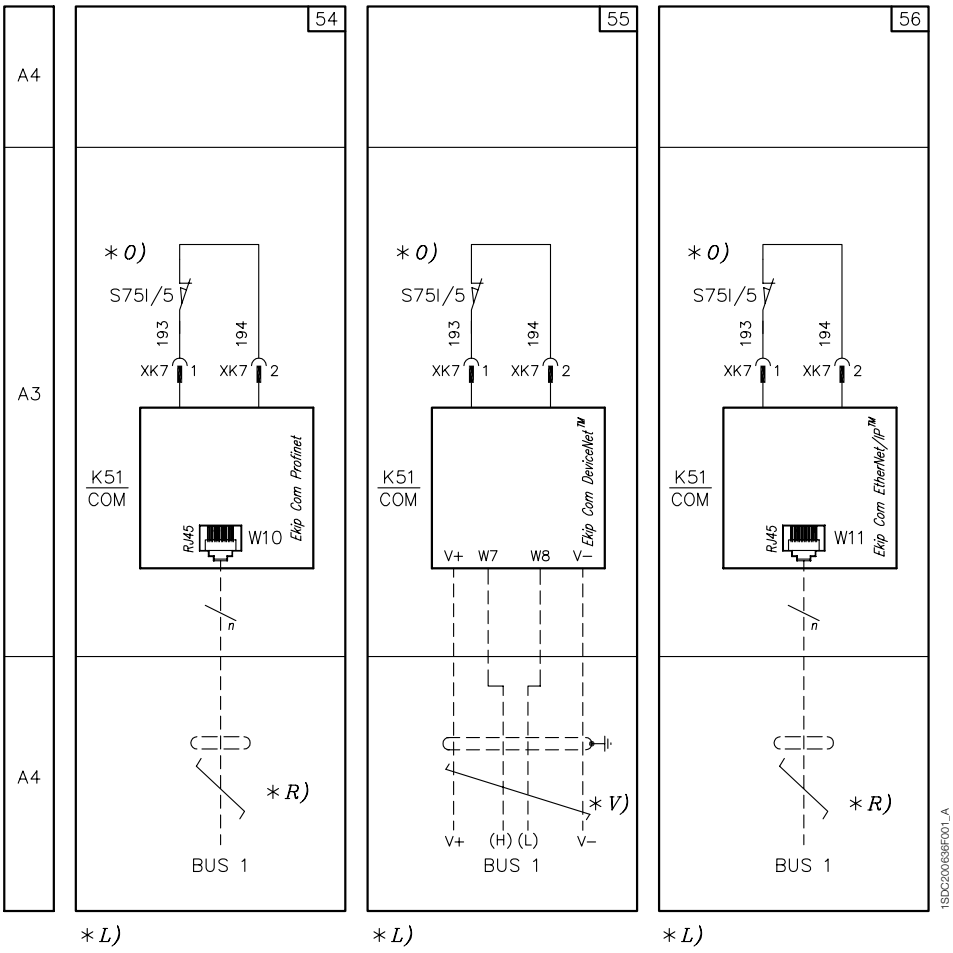
57) Ekip Com IEC61850
58) Ekip Link
61) Ekip Com Redundant Modbus RTU

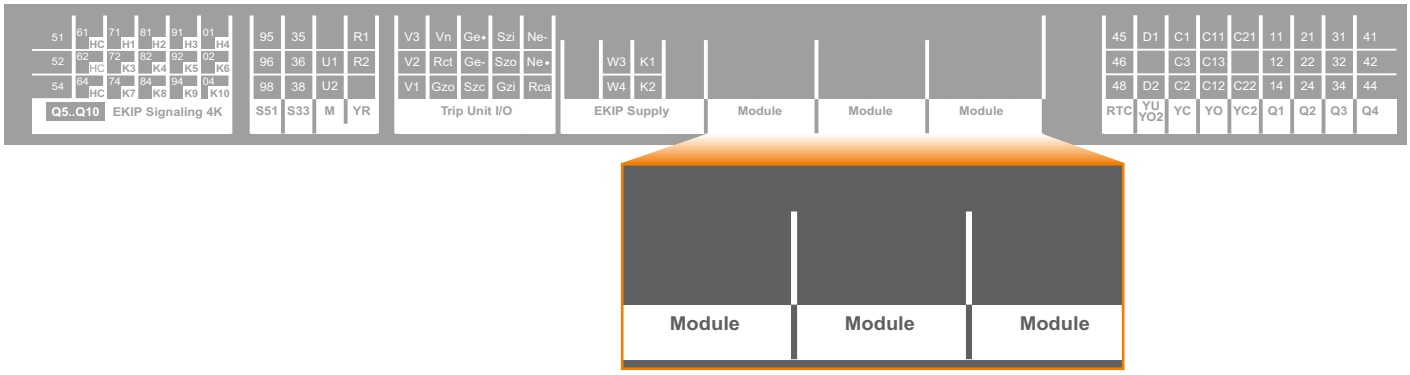


8

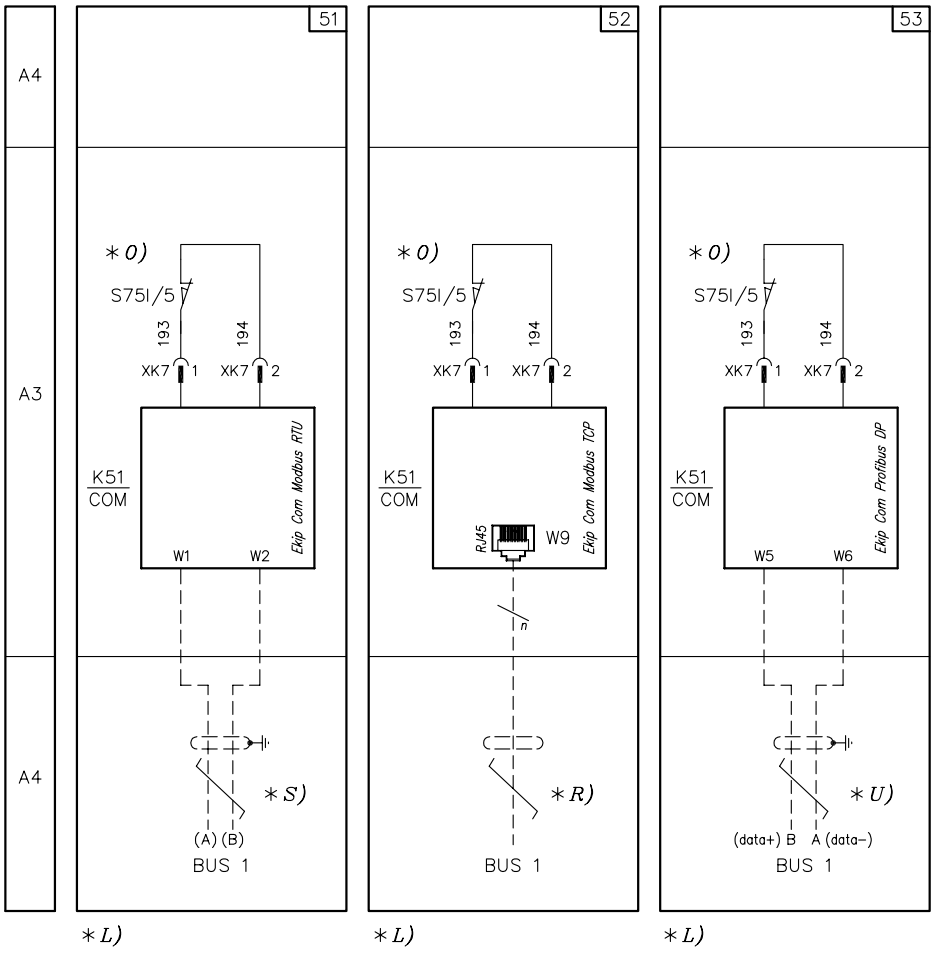


54) Ekip Com ProfiNet
55) Ekip Com DeviceNet
56) Ekip Com EtherNet/IP

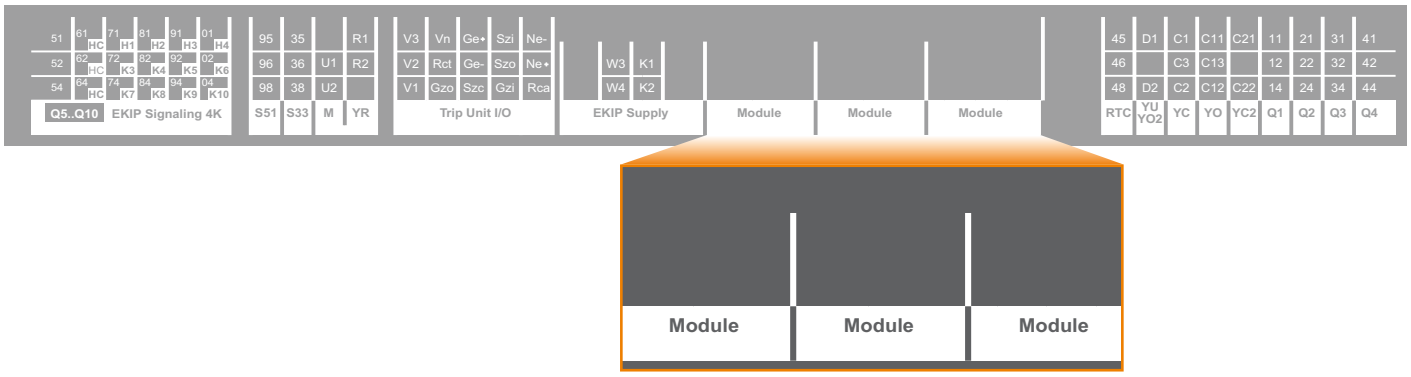




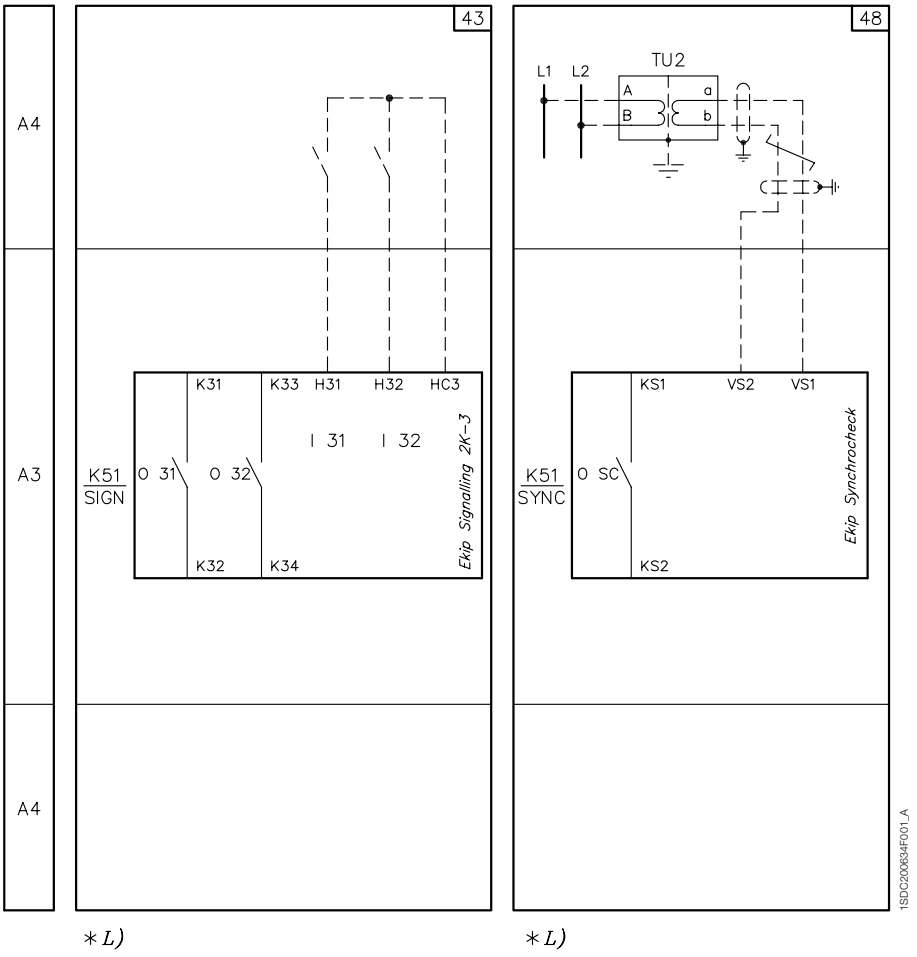
51) Ekip Com Modbus RTU
52) Ekip Com Modbus TCP
53) Ekip Com Profibus DP



Electrical diagrams
Electrical accessories

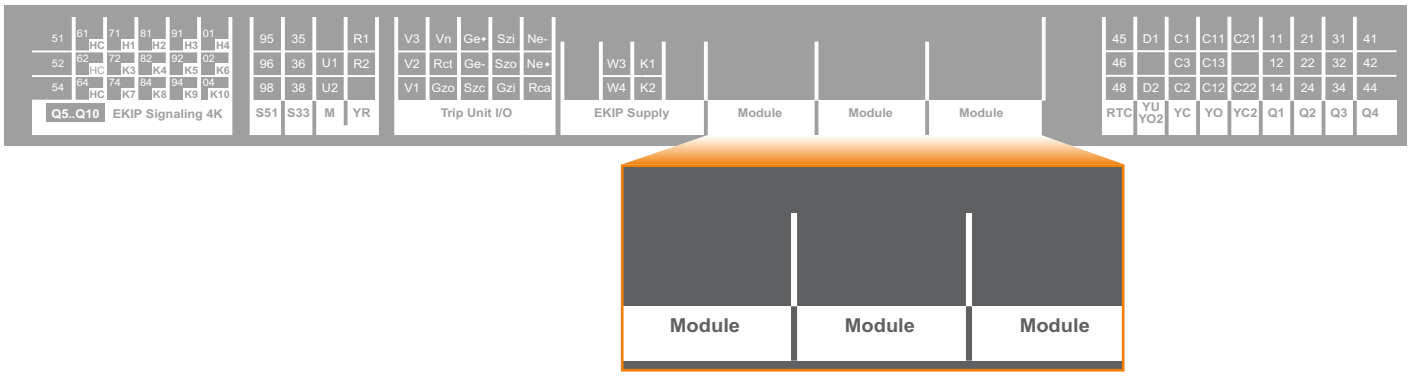


43) Ekip Signaling 2K-3
48) Ekip Synchrocheck

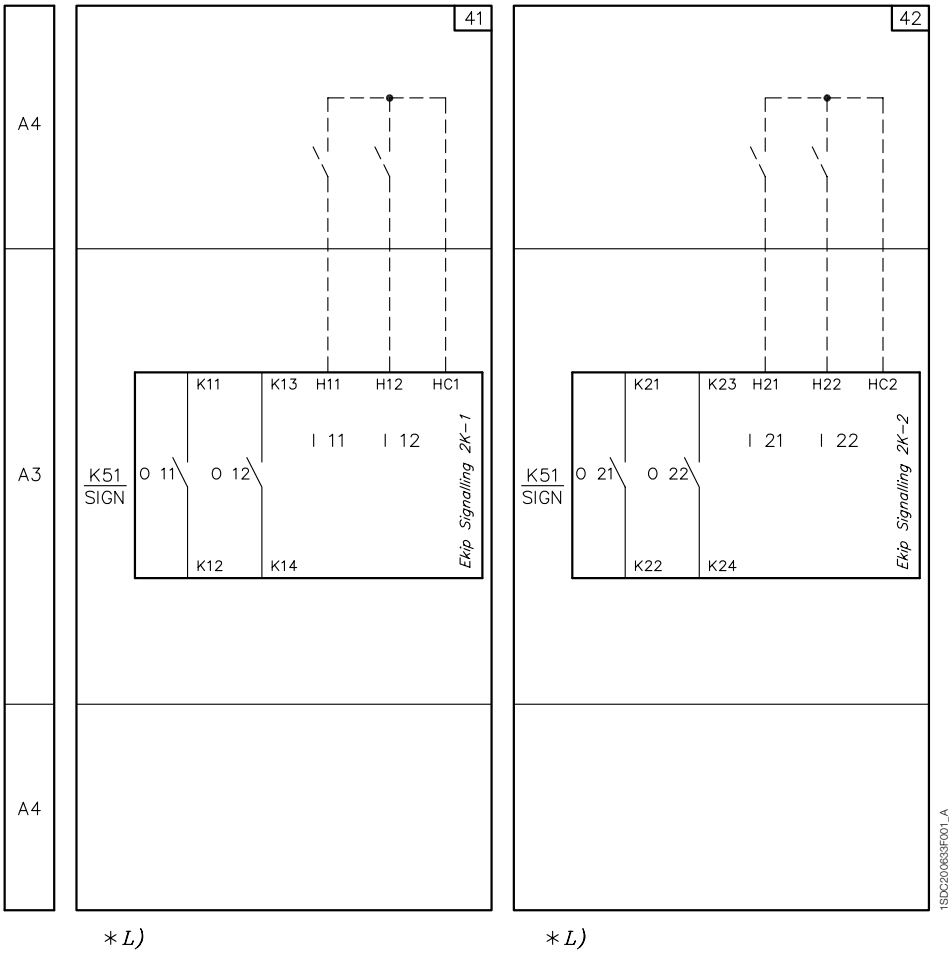


∗L)

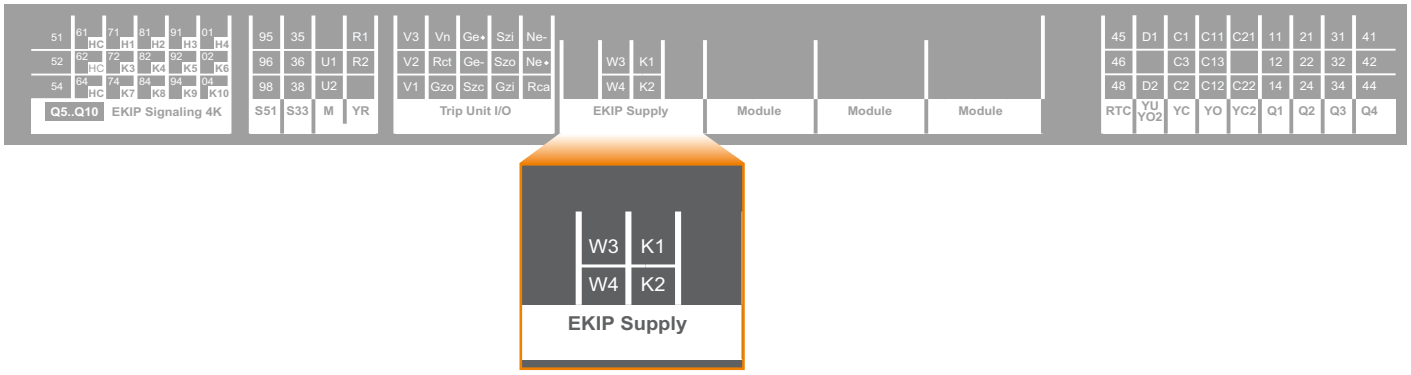
∗L)



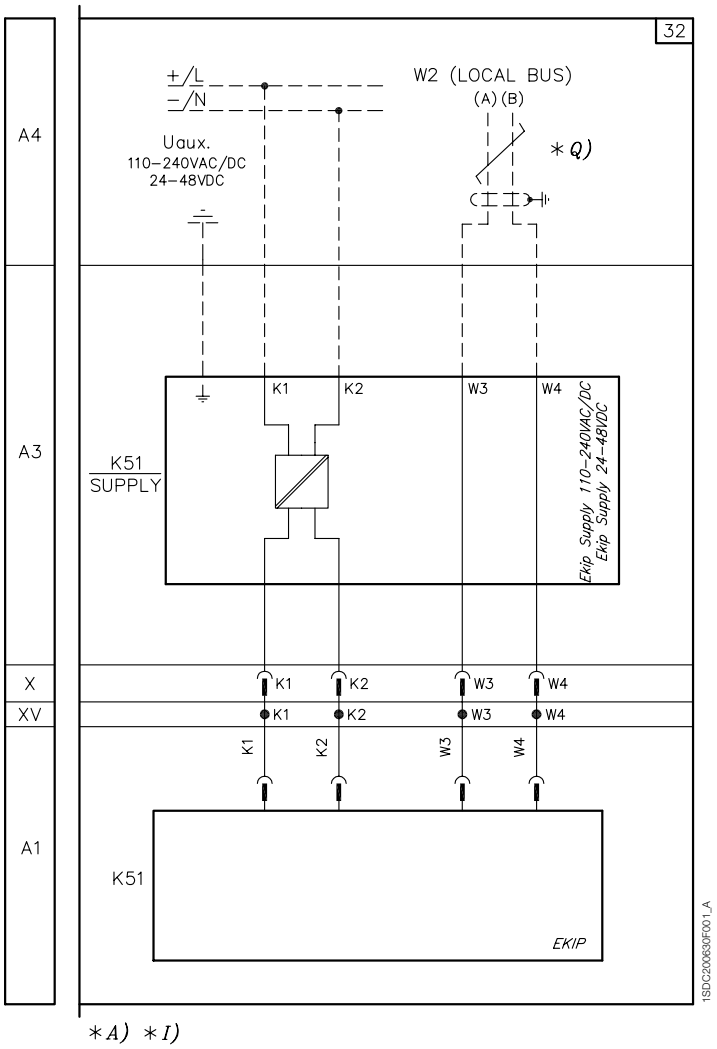
41) Ekip Signaling 2K-1
42) Ekip Signaling 2K-2



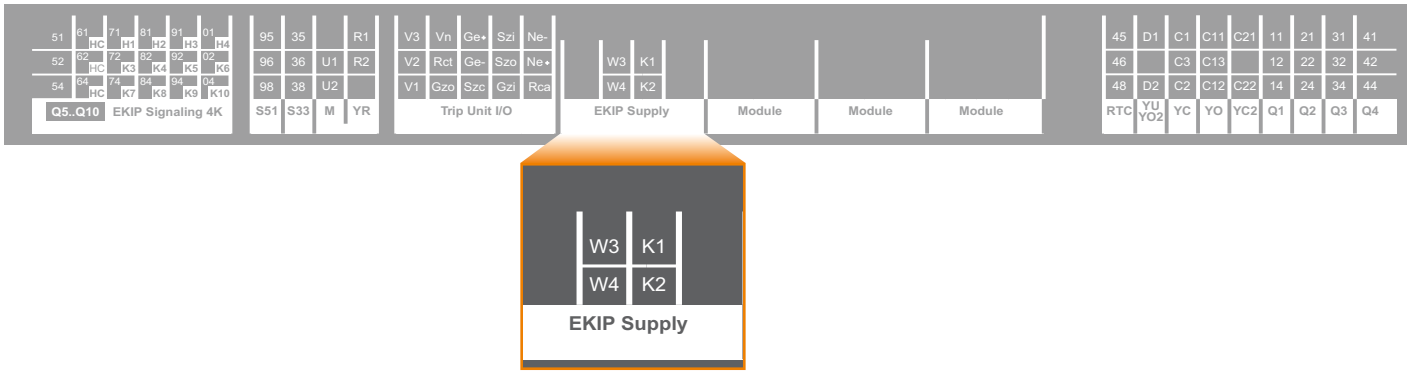
∗L) ∗L)



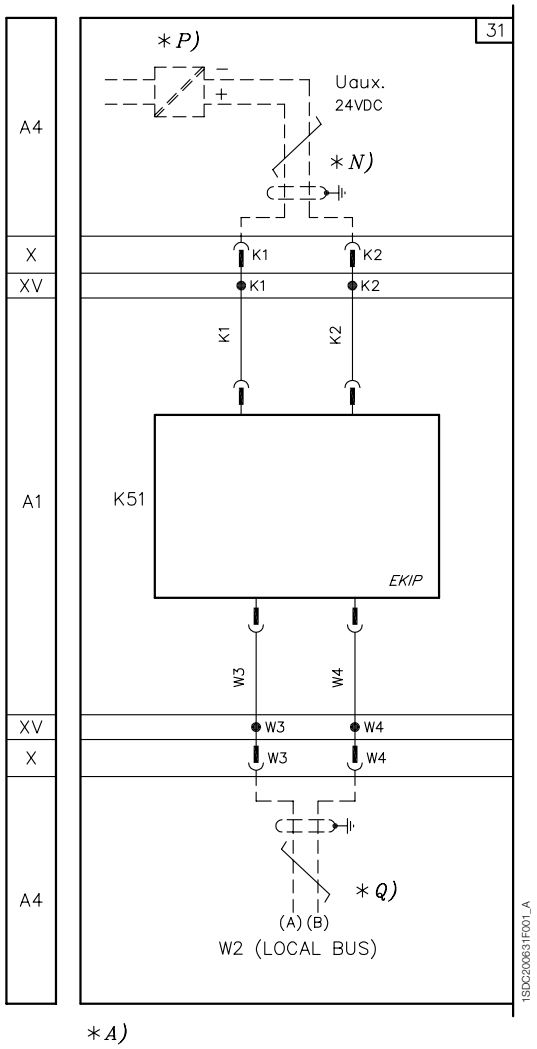
32) Auxiliary supply through module 110-240V AC/DC or 24-48V DC and local bus - Ekip Supply



As an alternative to figures 31

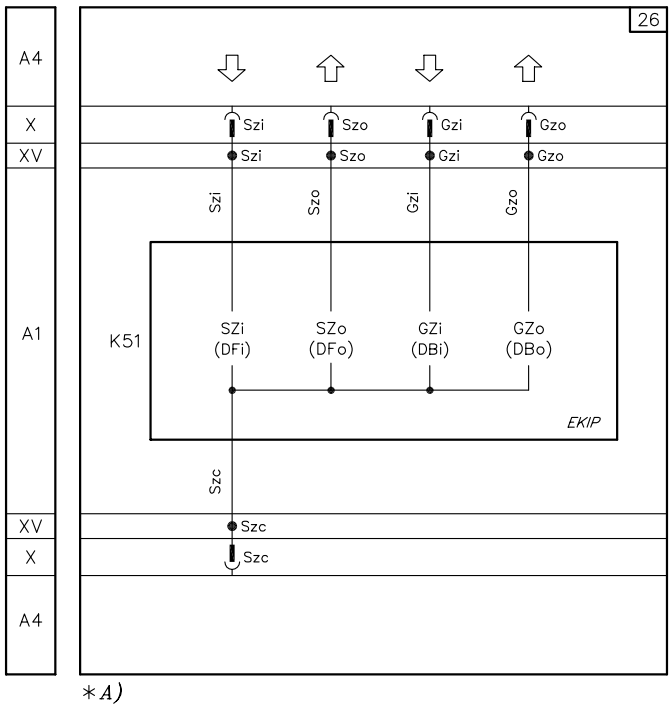


31) Direct auxiliary supply 24V DC and local bus - Ekip Supply

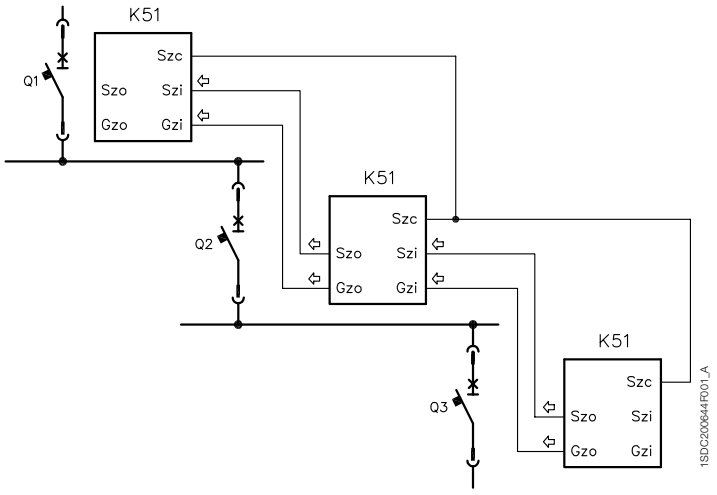


As an alternative to figures 32

26) Zone selectivity

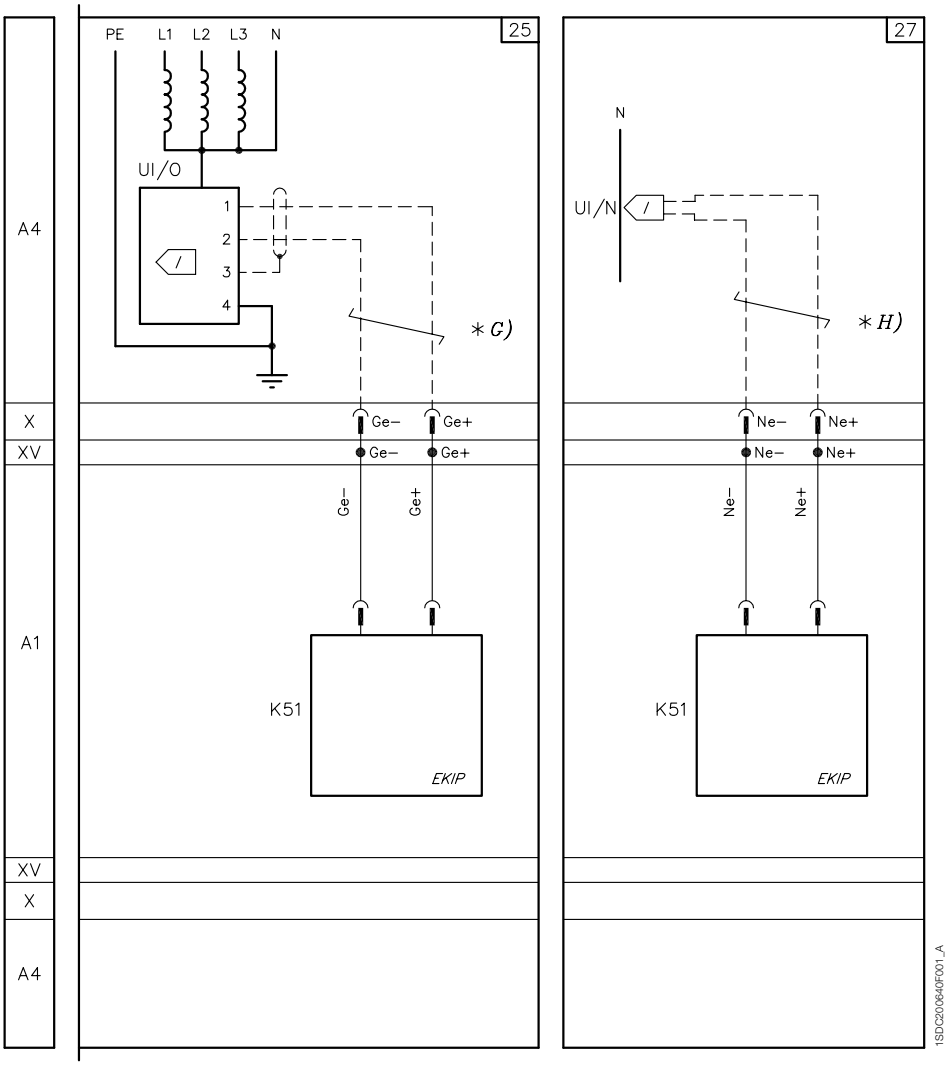


Example for application diagram (among 3 circuit breakers)



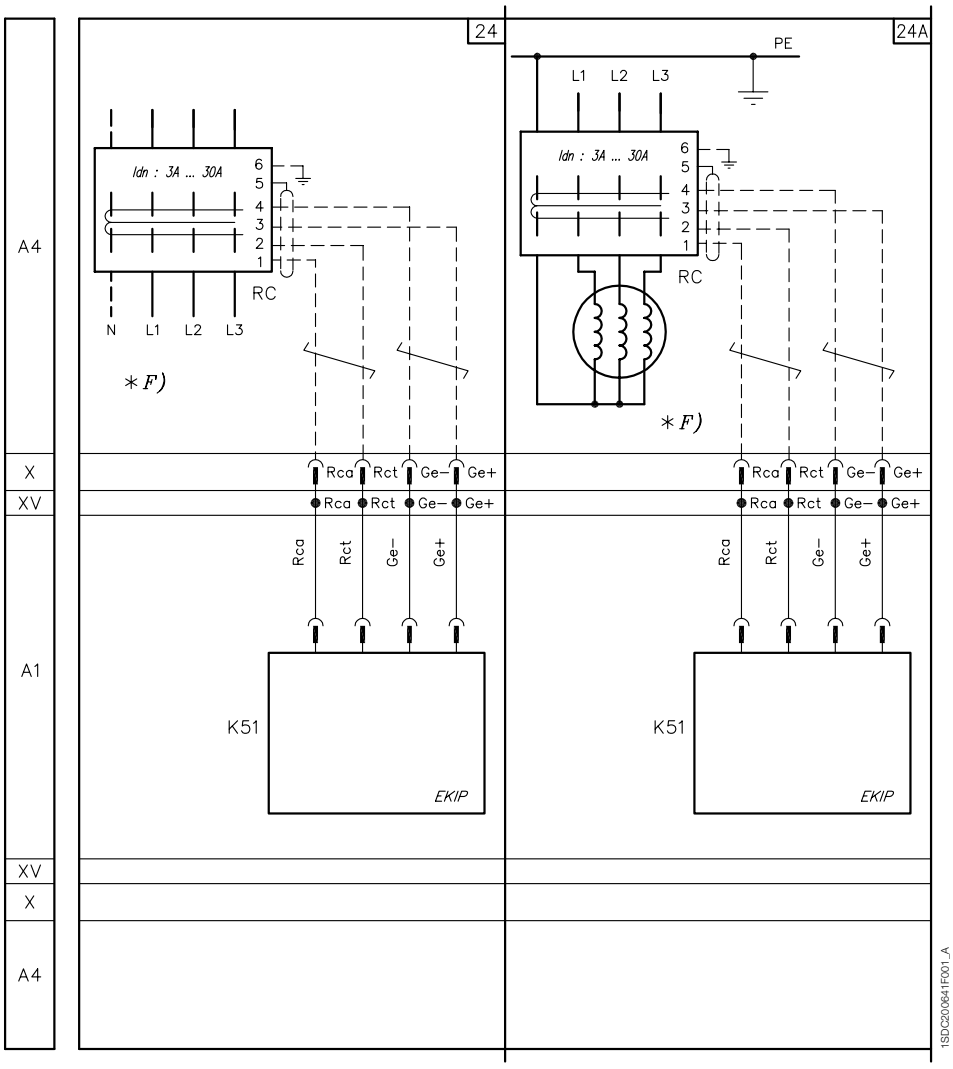
25) Transformer star center sensor input

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



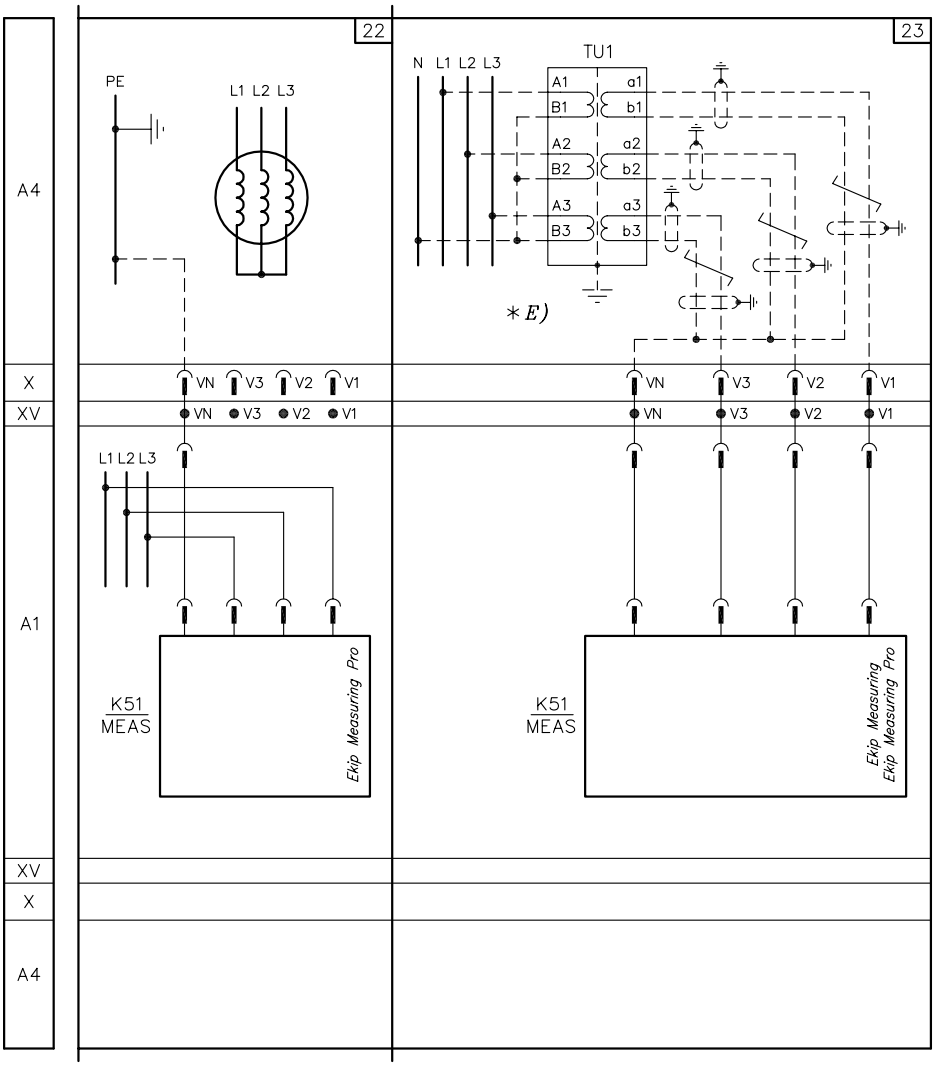
As an alternative to figure 24-24A

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



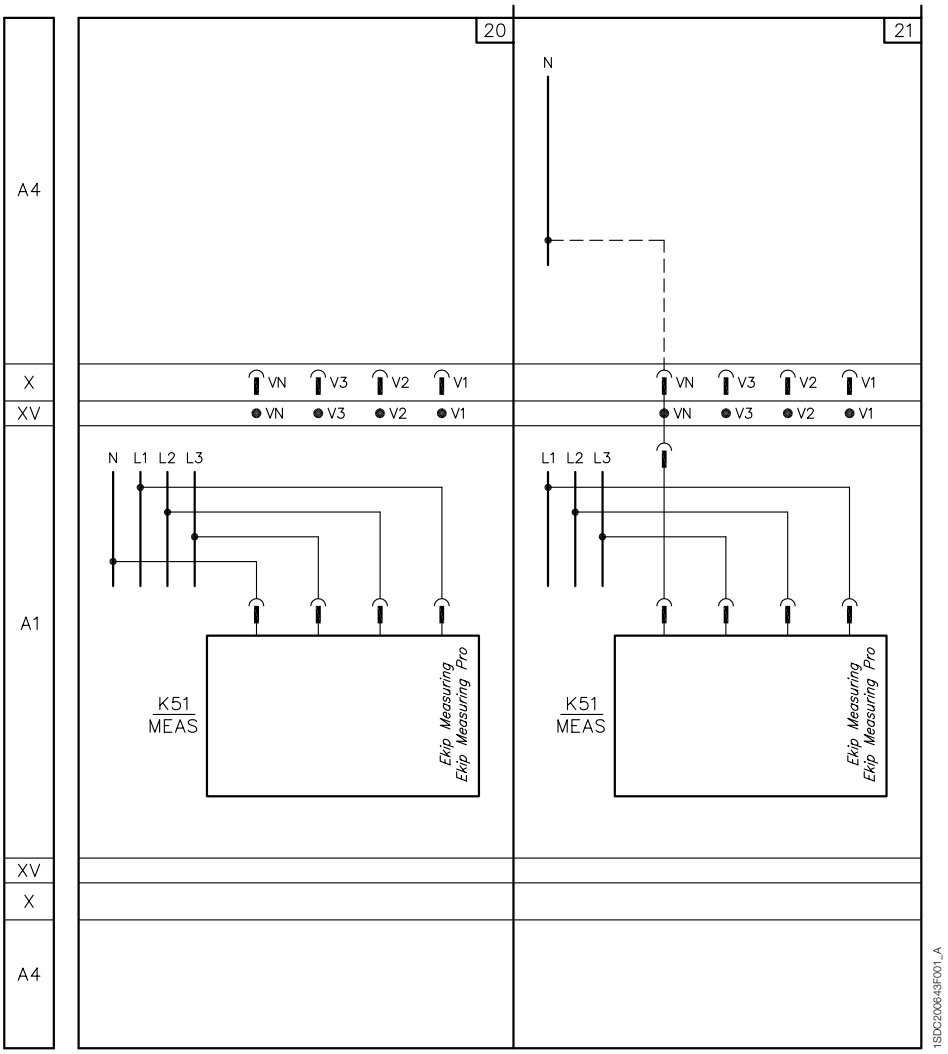
As an alternative to figure 25

22) Ekip Measuring Pro for residual voltage protection (for Ekip G only)
23) Ekip Measuring/Measuring Pro with external voltage transformer

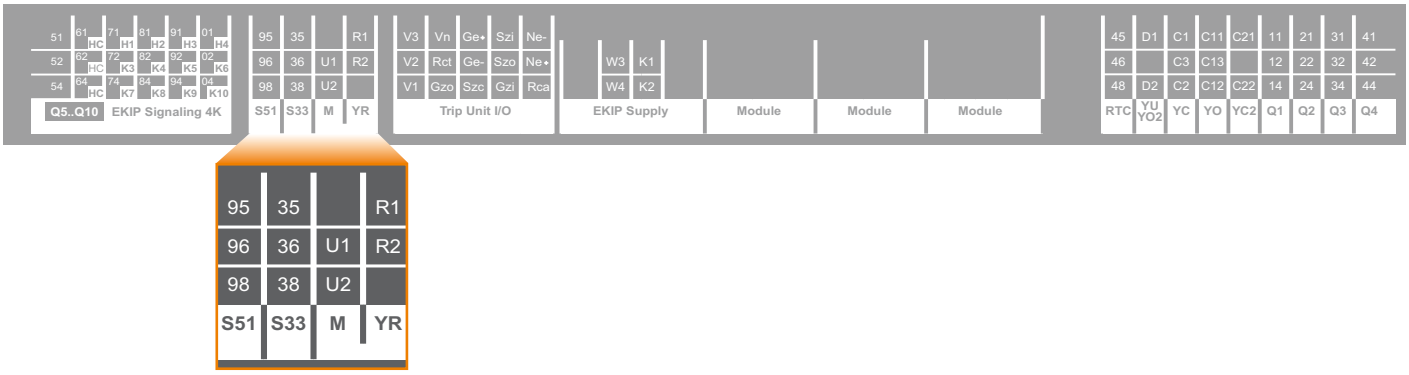


As an alternative to each other or to 20-21 diagram

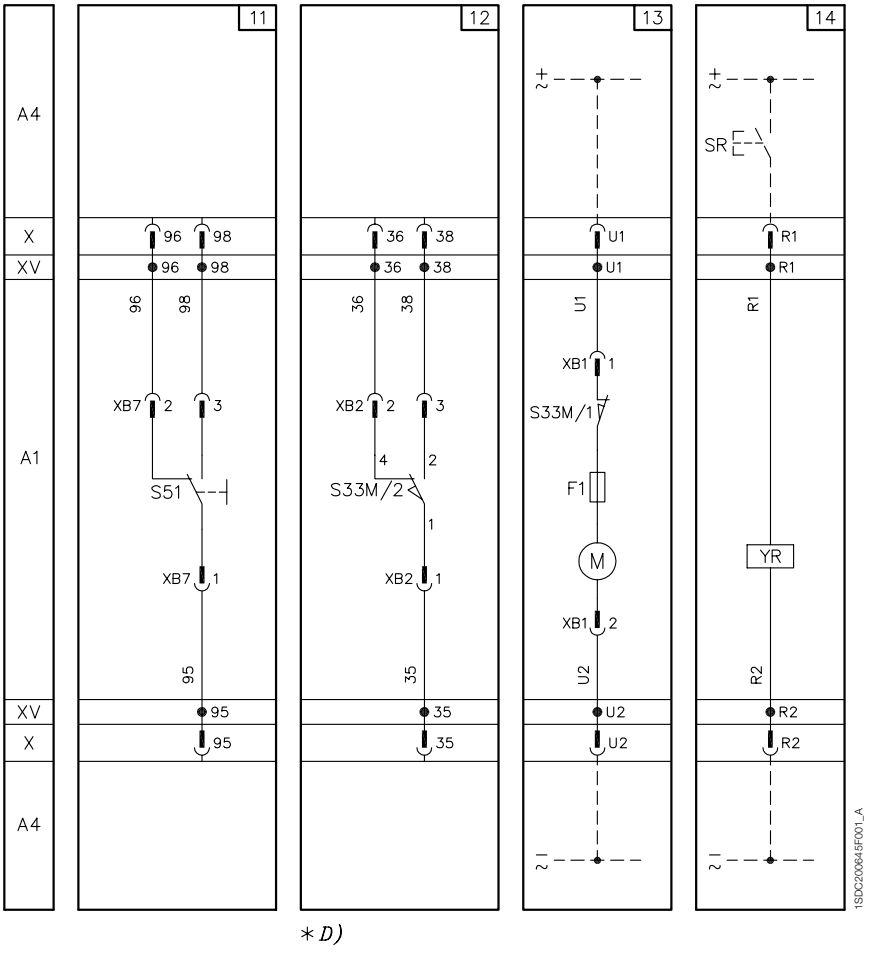
20) Ekip Measuring/Measuring Pro with voltage socket inside the four pole circuit breaker
21) Ekip Measuring/Measuring Pro with voltage sockets inside the three-pole circuit breaker and connection to the external neutral



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



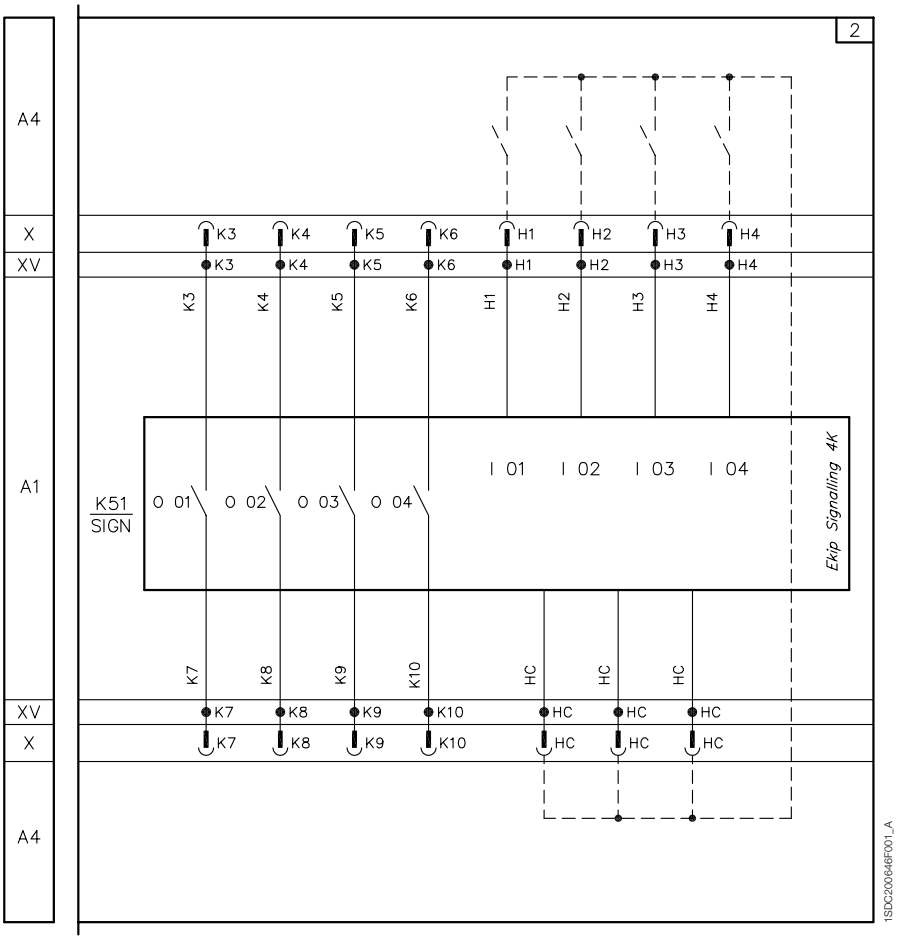
11) Trip Signaling contact - S51
12) Contact for Signaling position of loaded springs - S33
13) Motor for loading closing springs - M
14) Trip contact reset coil - YR



∗ D)

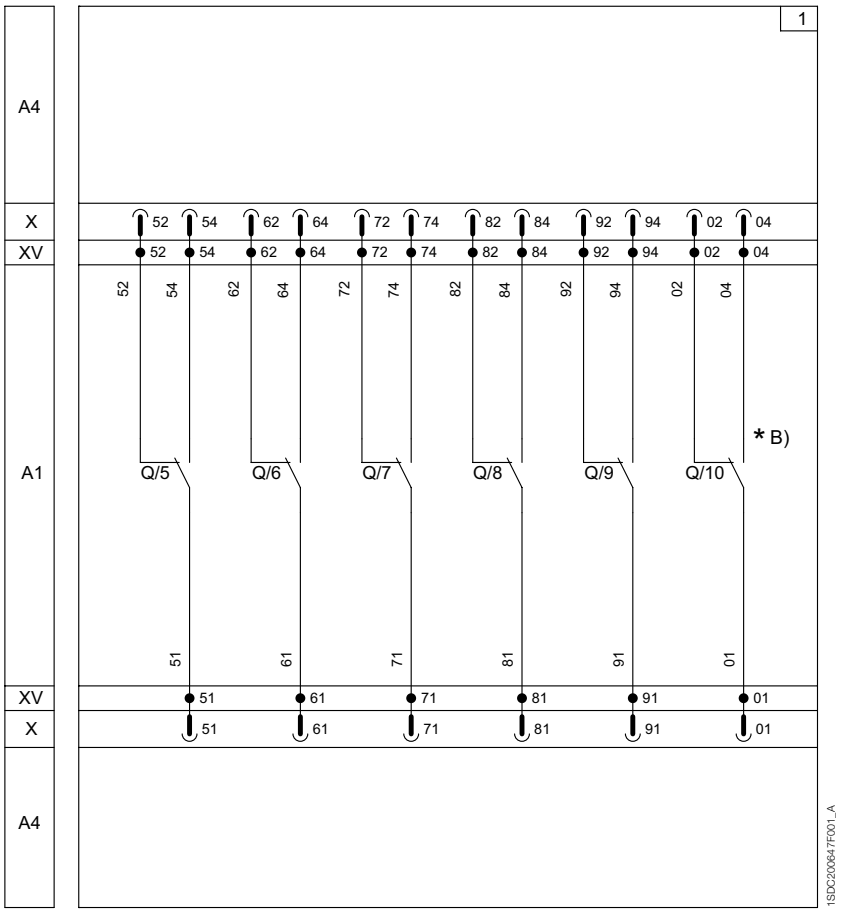
8

2) Ekip Signaling 4K



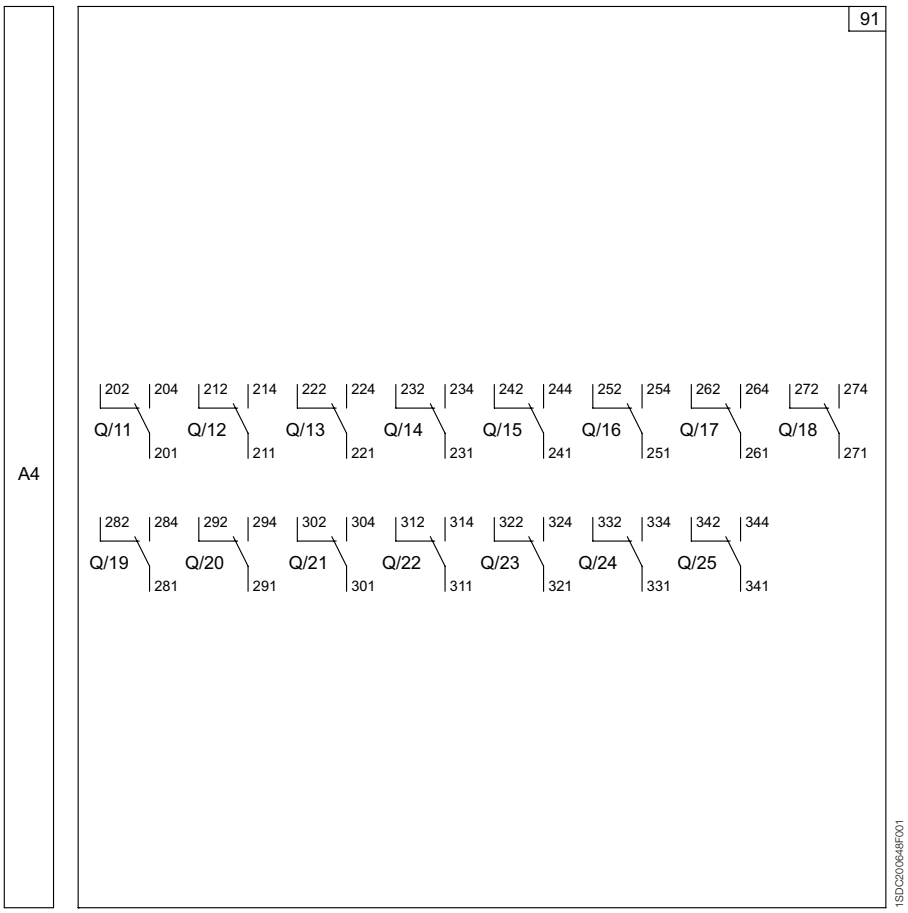
Only for circuit breakers E2.2, E4.2, E6.2 (as an alternative to figure 1)

1) Supplementary open/closed auxiliary contacts of the circuit breaker (second set)

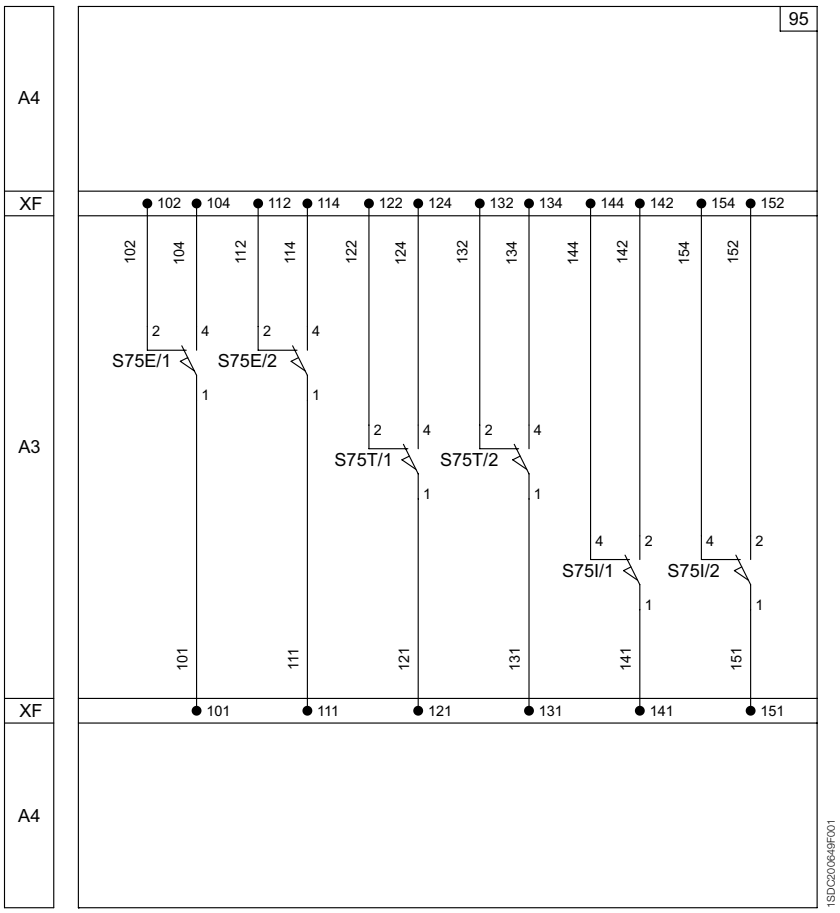


Only for E2.2, E4.2 and E6.2 circuit breakers (as an alternative to figure 2)

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

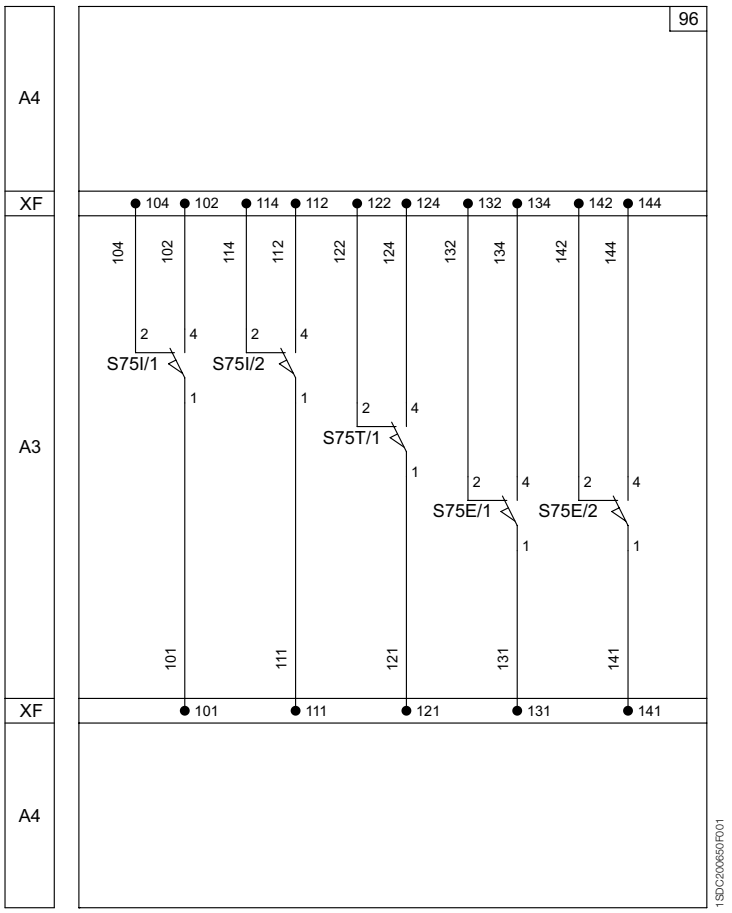


95) Contacts for Signaling of circuit breakers in racked-in, test, racked-out position



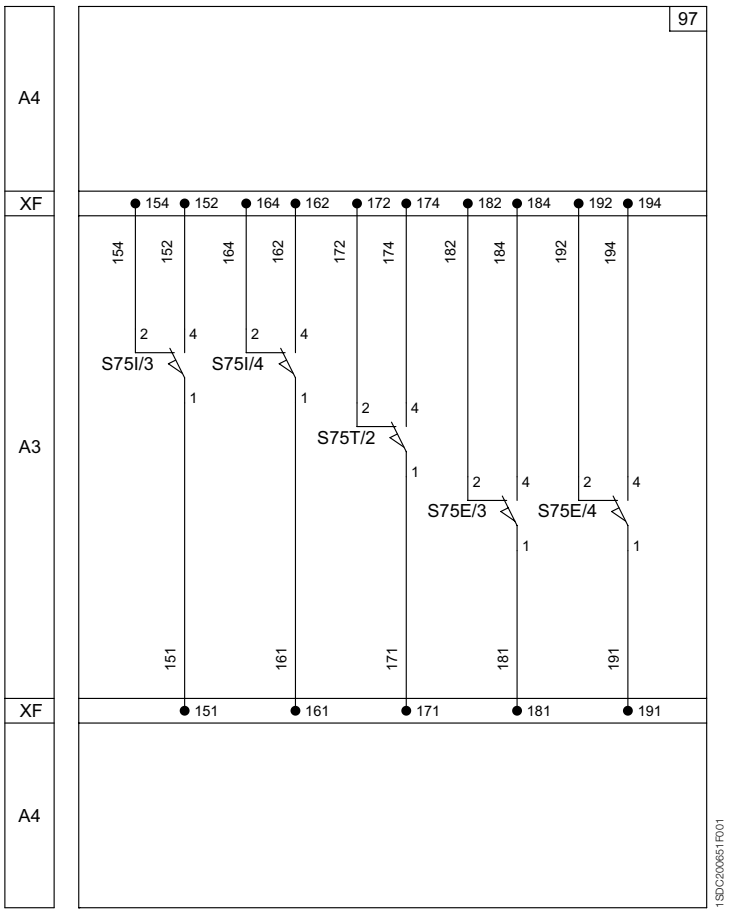
Only for E1.2 circuit breakers in withdrawable version

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



Only for E2.2, E4.2 and E6.2 circuit breakers in withdrawable version

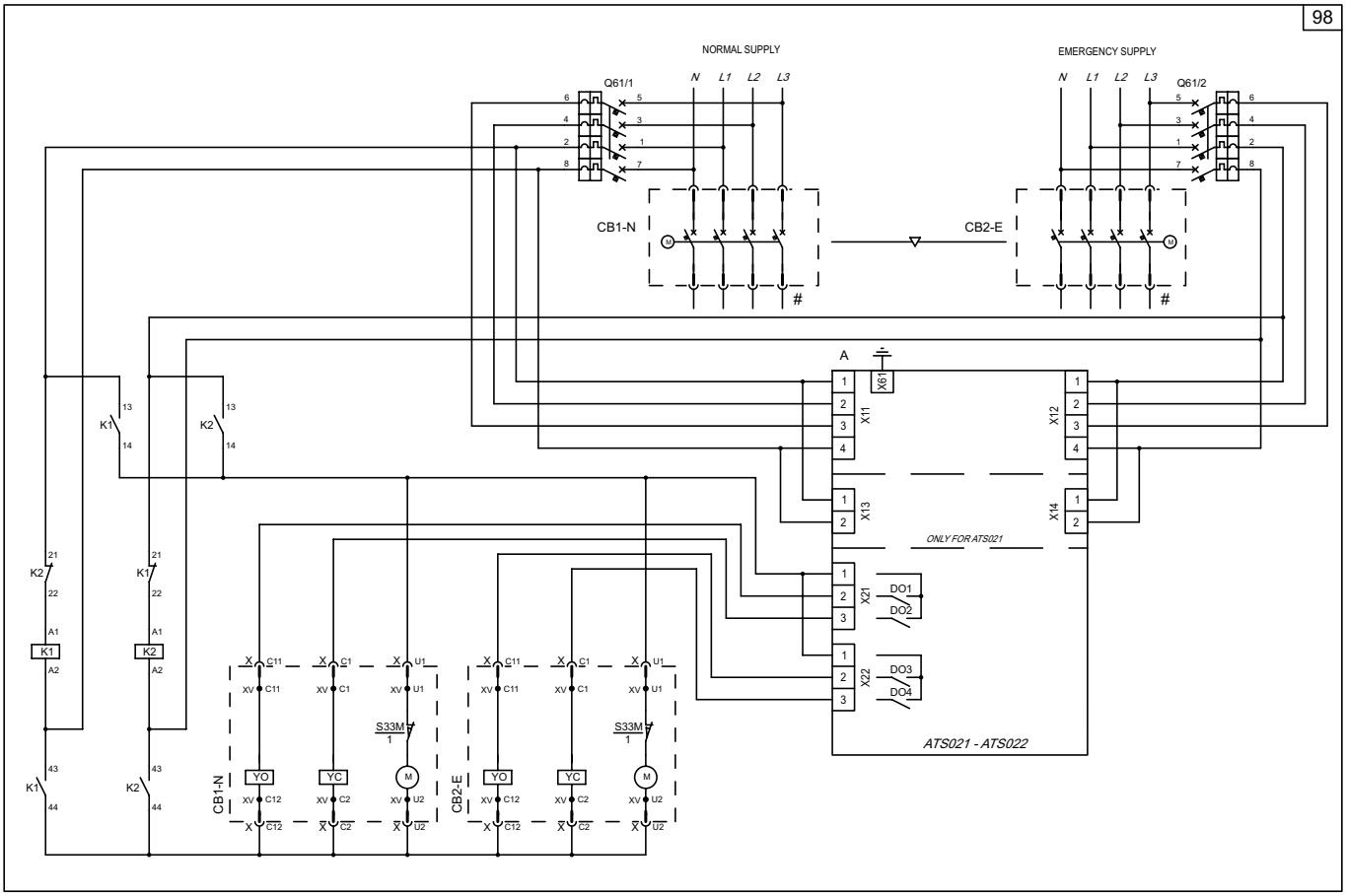
97) Contacts for Signaling of circuit breakers in racked-in, test, racked-out position (second set)



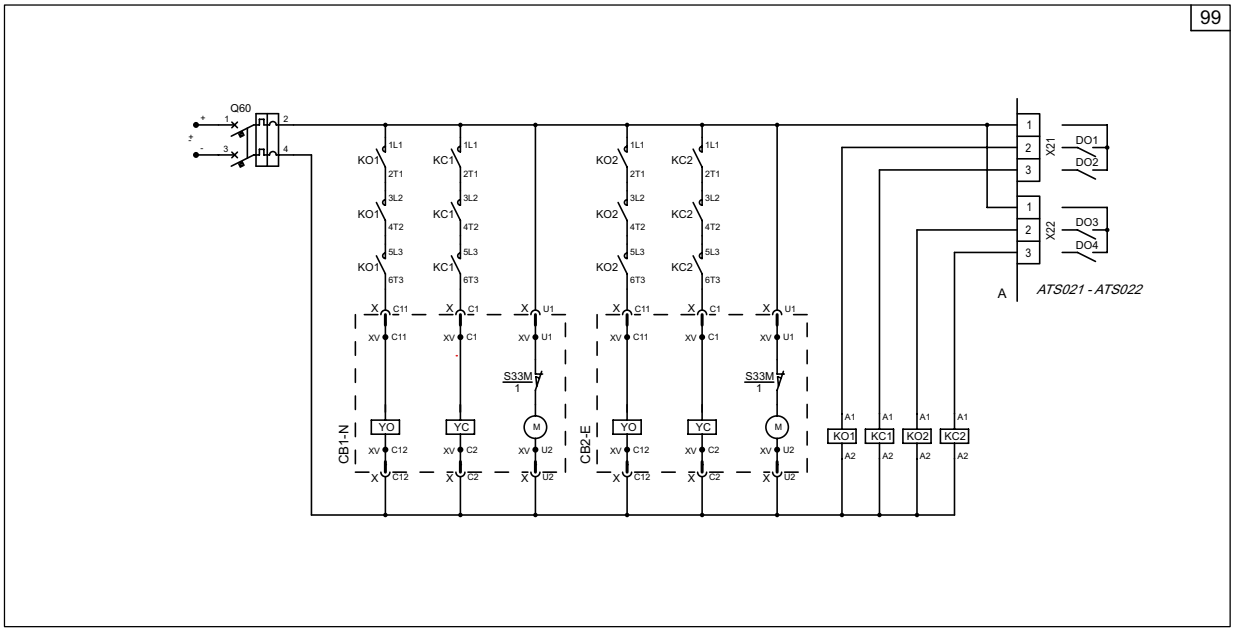
Only for E2.2, E4.2 and E6.2 circuit breakers in withdrawable version

Electrical diagrams
ATS021 and ATS022 (IEC only)

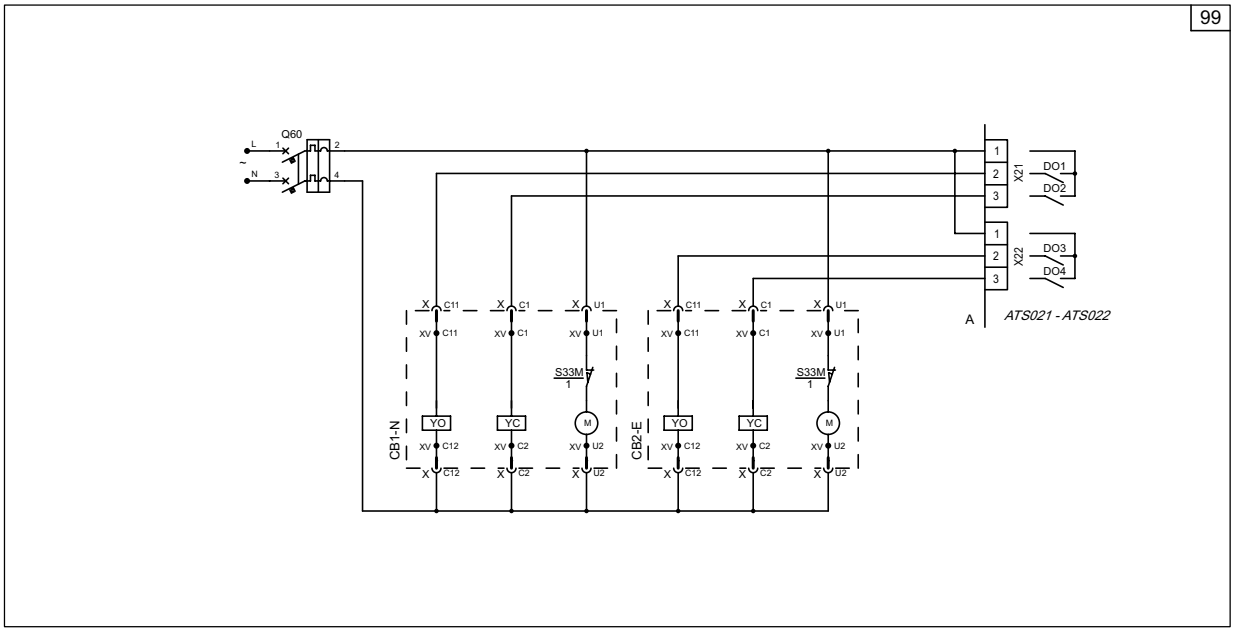
98) ATS wiring with no auxiliary power supply



99) Circuit breakers with auxiliary safety voltage in direct current



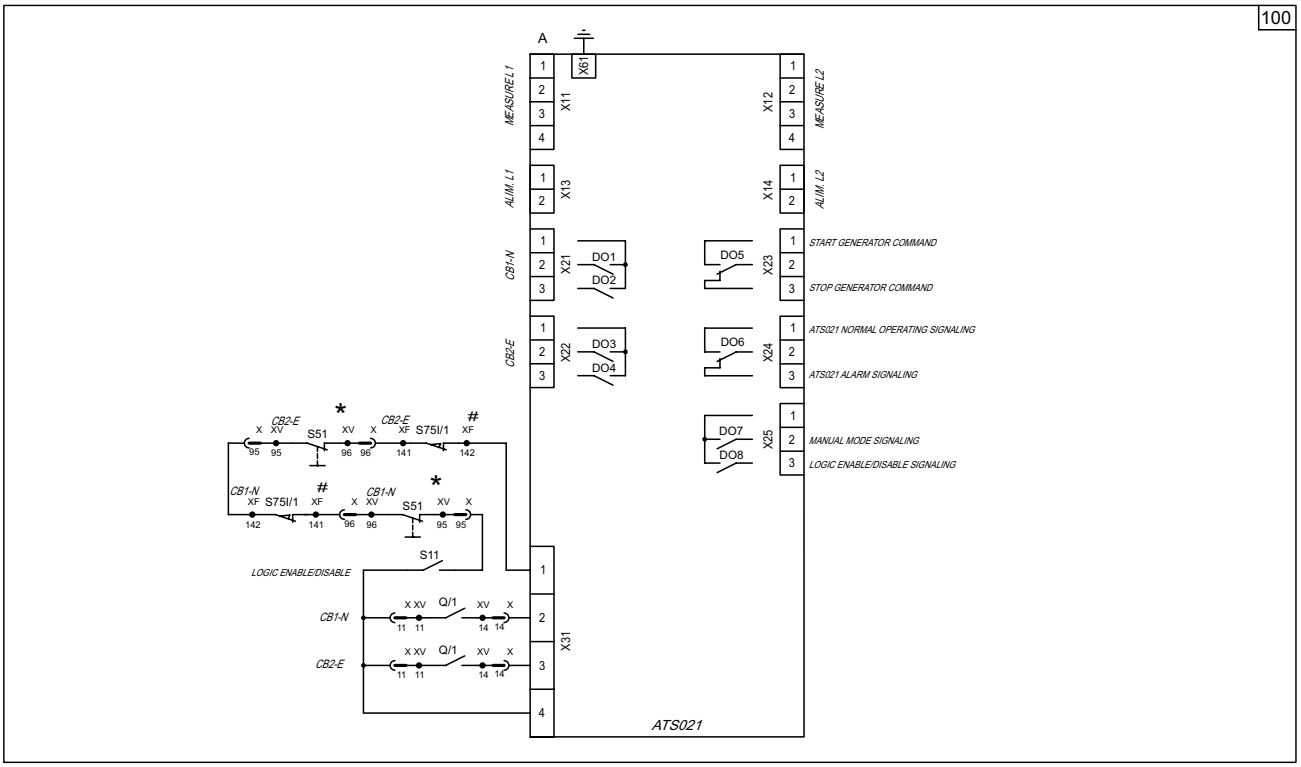
99) Circuit breakers with auxiliary safety voltage in alternating current



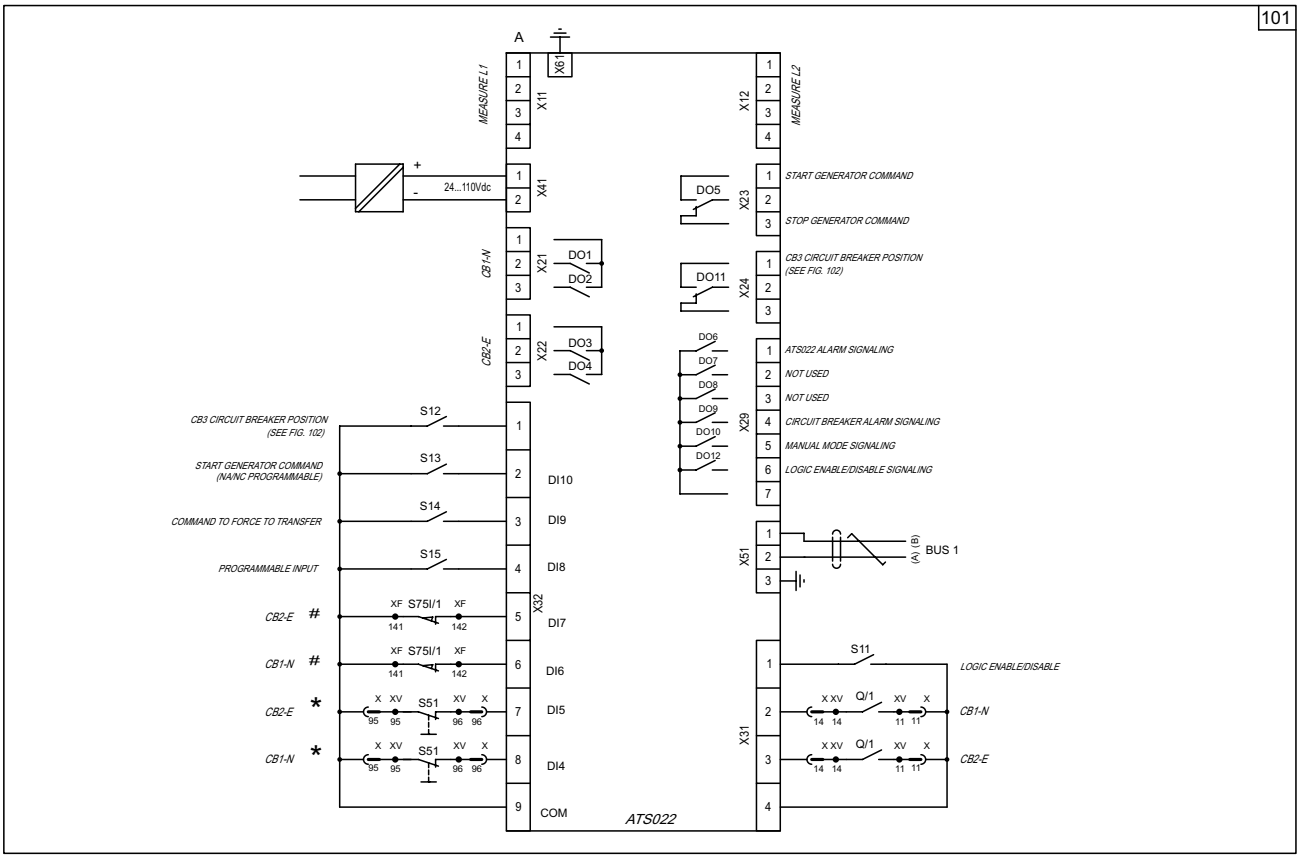
8

Electrical diagrams
ATS021 and ATS022 (IEC only)

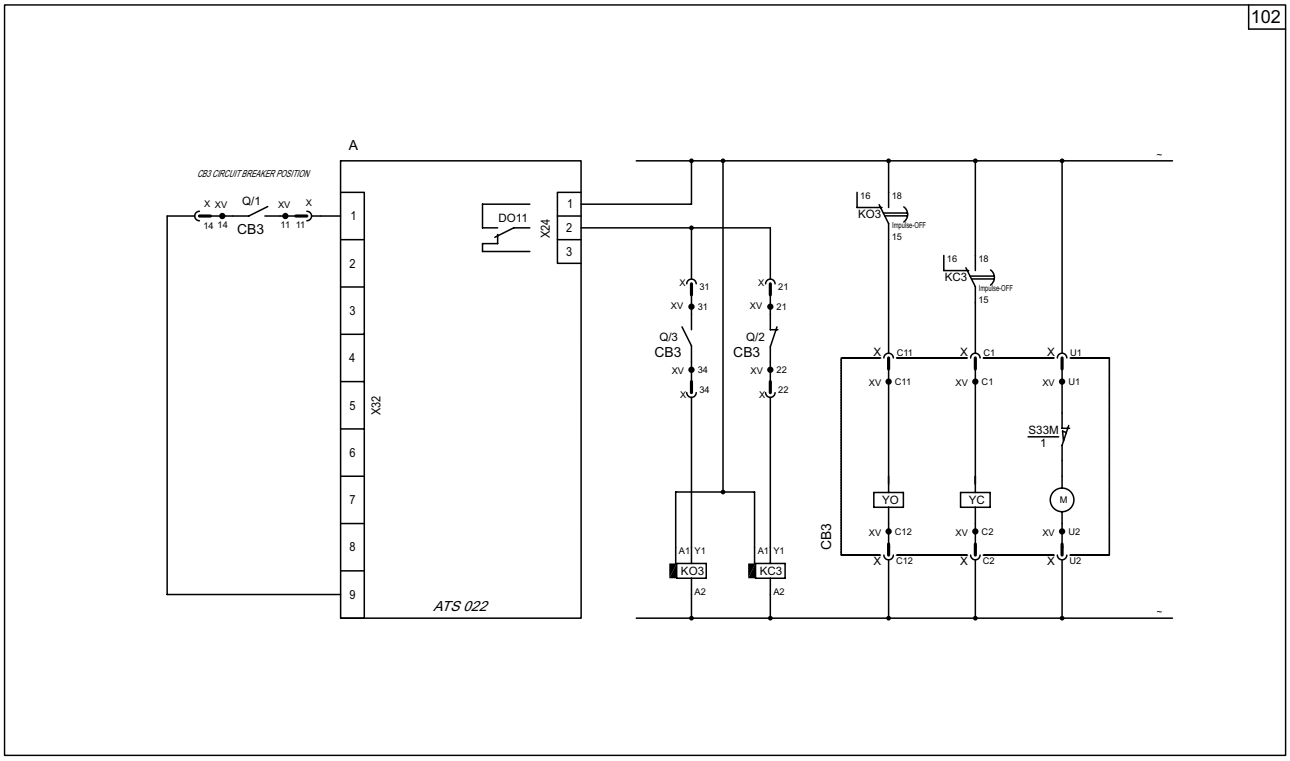
100) ATS021 (IEC only)



101) ATS022 (IEC only)

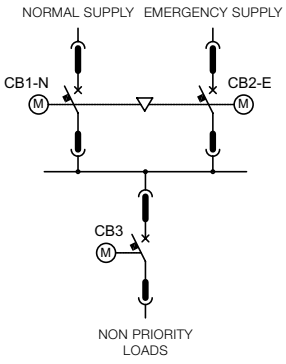


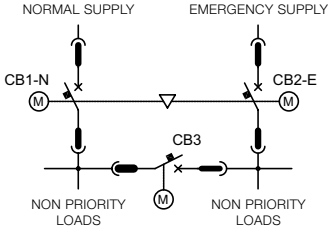
102) Controlling a third circuit breaker with ATS022 (IEC only)

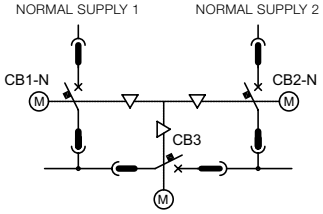


8

Possible configurations - ATS022 (IEC only) with three circuit breakers

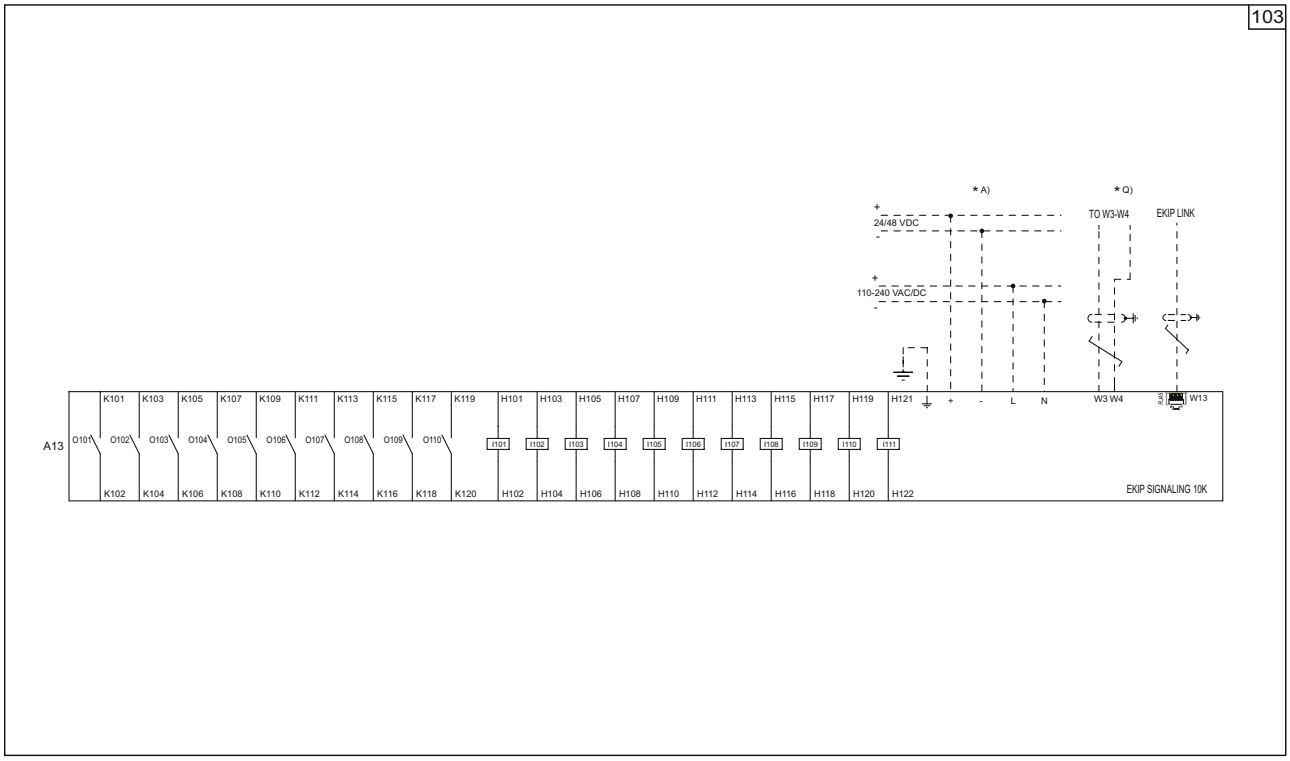




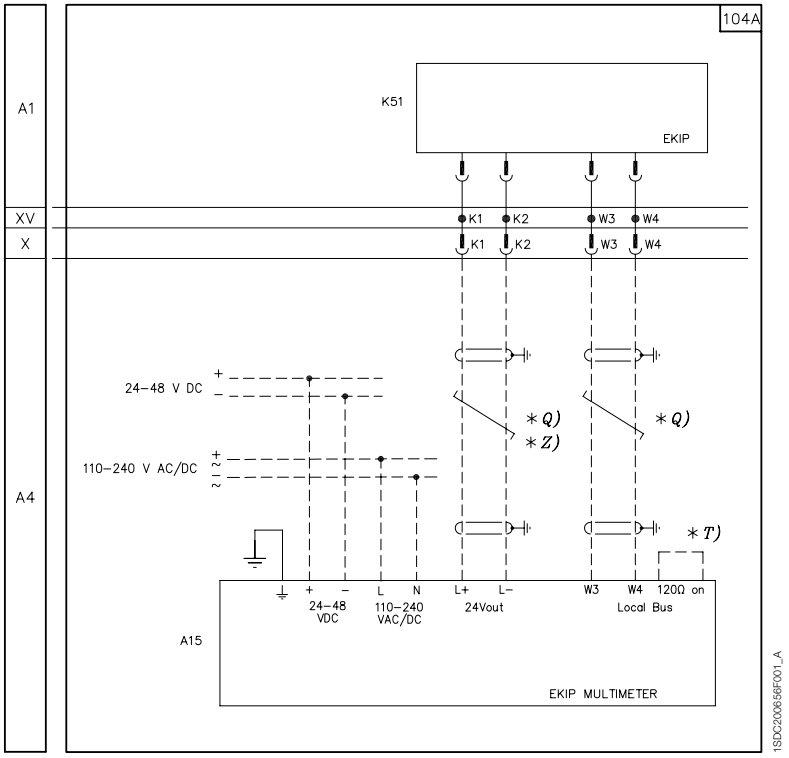


Note: Use auxiliary voltage of 110-130V AC or 220-240V AC.

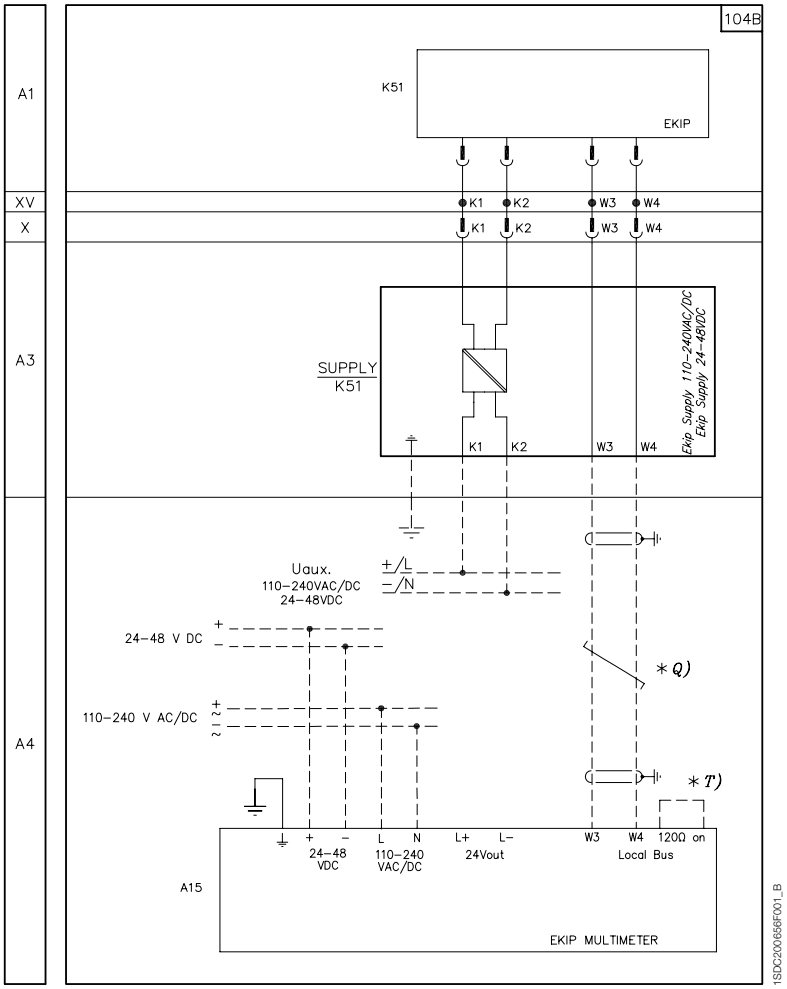
103) Ekip Signaling 10K



104A) Ekip Multimeter



104B) Ekip Multimeter



Ordering codes

Instructions for ordering
Emax 2 order code explanation

Emax 2 circuit breaker order code explanation

Z	2	H	F	UJ	A	E	4	8	N	B	E	A	A	0	0	C	E	A
1	2	3	4	5&6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

1 — Emax 2 Prefix

Z

2 — Frame

	E1.2	E2.2	E4.2	E6.2	E6.2 100%N
3p	1	2	4	6	—
4p — N Left	A	B	C	D	E
4p — N Right	F	G	H	J	K

3 — Breaking Capacity

	B	C	N	S	H	V			
UL kA @ 508VAC	42	—	50	65	85	100			—
UL kA @ 635VAC	42	—	50[1]	65[1]	85	85/100[4]			—
IEC kA @ 440VAC	42	50	66	85	100	150			
IEC kA @ 690VAC	42	42	66[2]	66	85/100[3]	100			

[1] E1.2 has 42kA
[2] E1.2 has 50kA
[3] 85kA for E2.2 and E4.2, 100kA for E6.2
[4] 85kA for E2.2 and E4.2, 100kA for E6.2
[5] 125kA for E4.2, 150kA for E6.2
[6] E1.2 available in N, E2.2 and E4.2 in H and E6.2 in X versions.

4 — Frame Rating (A)

UL	**250**	**400**	**800**	**1200**	**1600**	**2000**	**2500**	**3200**	**4000**	**5000**	**6000[7]**	—
	A	B	C	D	E	F	G	H	J	K	L	—
IEC	**250**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3200**	**4000**	**5000**	**6300**
	M	N	P	Q	R	S	T	U	V	W	X	Y

9

5&6 — Rating Plug

Switch Disconnector	00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
UL Rating Plug (A)	**100**	**200**	**250**	**400**	**600**	**800**	**1000**	**1200**	**1600**	**2000**	**2500**	**3000**	**3200**	**3600**	**4000**	**5000**	**6000**
	UA	UB	UC	UD	UE	UF	UG	UH	UJ	UK	UL	UM	UN	UQ	UR	US	UT
IEC Rating Plug (A)	**100**	**200**	**250**	**400**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3200**	**4000**	**5000**	**6300**	—	—
	EA	EB	EC	ED	EE	EF	EG	EH	EJ	EK	EL	EN	ER	ES	ET	—	—
IEC "L-Off" Rating Plug (A)	**100**	**200**	**250**	**400**	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3200**	**4000**	**5000**	**6300**	—	—
	LA	LB	LC	LD	LE	LF	LG	LH	LJ	LK	LL	LN	LR	LS	LT	—	—
IEC RC Rating Plug (A)	**100**	**200**	**250**	**400**	**630**	**800**	**1250**	**2000**	**3200**	**4000**	—	—	—	—	—	—	—
	RA	RB	RC	RD	RE	RF	RH	RK	RN	RR	—	—	—	—	—	—	—

7 — Version

Drawout (Less Cradle)	A	—	—	—	—	—	—	—
Fixed W/Std Term	B[1]	—	—	—	—	—	—	—
Fixed W/Alternative	—	**Upper Terminals**						
	—	**Rear Horiz[2]**	**Rear Vert**	**Front[8]**	**Ext Front[3][8]**	**FcCuAl Cable[3][8]**	**Spread Rear Horiz[6][8]**	**Spread Rear Vert[6][8]**
Lower Terminals	**Rear Horiz[2]**	C[3]	D	E	F	G	—	—
	Rear Vert	H	J[4]	K	L	M	—	—
	Front[8]	N	P	Q[5]	R	S	—	—
	Ext Front[3][8]	T	U	V	W	X	—	—
	FcCuAl Cable[3][8]	2	3	4	5	6	—	—
	Spread Rear Horiz[6][8]	—	—	—	—	—	7	—
	Spread Rear Vert[6][8]	—	—	—	—	—	—	8

[1] Standard terminals for E1.2 fixed are Front. Standard terminals for E2.2 - E6.2 are Rear Horizontal except for UL E4.2 3200A and E6.2 6000A, which are Rear Vertical
[2] Not available for UL E4.2 3200A or UL E6.2 6000A. Not UL listed.
[3] Available for E1.2 only
[4] Not available for UL E4.2 3200A or E6.2 6000A, it is their standard termination
[5] Available for E2.2 - E6.2 only
[6] Available for E2.2 IEC only; not available as factory installed with other terminal combinations
[7] Not yet available. Contact ABB
[8] Not UL listed.
Note: Additional, non-factory installed options are available.

Z	2	H	F	UJ	A	E	4	8	N	B	E	A	A	0	Q	C	E	A
1	2	3	4	5&6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

8 — Trip Unit

Switch Disconnector	0	—	—	—
W/Std 250V Bell Alarm	—	**LI**	**LSI**	**LSIG**
	DIP	A	B	C
	Touch	D	E	F
	Touch + Power Controller [1]	G	H	I
	Hi-Touch	—	J	K
	Hi-Touch + Power Controller [1]	—	L	M
	G Touch	—	—	N
	G Touch + Power Controller [1]	—	—	P
	G Hi-Touch	—	—	Q
	G Hi-Touch + Power Controller [1]	—	—	R
W/24V Digital Bell Alarm	—	**LI**	**LSI**	**LSIG**
	Dip	S	T	U
	Touch	V	W	X
	Touch + Power Controller [1]	Y	Z	1
	Hi-Touch	—	2	3
	Hi-Touch + Power Controller [1]	—	4	5
	G Touch	—	—	6
	G Touch + Power Controller [1]	—	—	7
	G Hi-Touch	—	—	8
	G Hi-Touch + Power Controller [1]	—	—	9

Note: An LCD screen version trip unit is available as a separate item for Ekip Touch, Ekip Hi-touch and Ekip G versions

[1] The Ekip Power Controller requires the use of either the Ekip Measuring or the Ekip Measuring Pro module

9 — Measuring and Power Supply

	None	0	—	—
	—	**Measuring**	**Measuring Pro**	**Future Arrangement**
	—	1	2	N
Pwr Sply 24-48VDC	3	4	5	P
Pwr Sply 110-240VAC/DC	6	7	8	Q
UTMO	—	A	B	R
EMO	—	C	D	S
UTMO + Pwr Sply 24-48VDC	—	E	F	T
UTMO + Pwr Sply 110-240VAC/DC	—	G	H	U
EMO + Pwr Sply 24-48VDC	—	J	K	V
EMO + Pwr Sply 110-240VAC/DC	—	L	M	W

Note: Ekip Hi-Touch and all Ekip G trip units are supplied with Measuring Pro as standard.
Note: Voltage outlets are installed on the bottom terminals as standard.
UTMO = Upper terminal mounting option of voltage outlets
EMO = External mounting option of voltage outlets
Future Arangement is the pre-wiring for the ability to easily add a measuring module at a future date

10 — Communication Modules

		None	0	—	—	—	—
Single	**MOD-RS-485**	**MOD-TCP**	**Profibus**	**Profinet**	**DeviceNet**	**Ethernet/IP**	**IEC 61850**
	2	3	4	5	6	7	8
Combos	**MOD-RS-485 + MOD-TCP**	**MOD-TCP + Profibus**	**Profibus + Profinet**	**Profinet + DeviceNet**	**DeviceNet + Ethernet/IP**	**Ethernet/IP + IEC 61850**	—
	A	B	C	D	E	F	—
	MOD-RS-485 + Profibus	**MOD-TCP + Profinet**	**Profibus + DeviceNet**	**Profinet + Ethernet/IP**	**DeviceNet + IEC 61850**	—	—
	G	H	J	K	L	—	—
	MOD-RS-485 + Profinet	**MOD-TCP + DeviceNet**	**Profibus + Ethernet/IP**	**Profinet + IEC 61850**	—	—	—
	M	N	P	Q	—	—	—
	MOD-RS-485 + DeviceNet	**MOD-TCP + Ethernet/IP**	**Profibus + IEC 61850**	—	—	—	—
	R	S	T	—	—	—	—
	MOD-RS-485 + Ethernet/IP	**MOD-TCP + IEC 61850**	—	—	—	—	—
	U	V	—	—	—	—	—
	MOD-RS-485 + IEC 61850	—	—	—	—	—	—
	W	—	—	—	—	—	—

Note: Communication modules are not usable with Ekip Dip trip units or for Switch Disconnectors.

continued

Instructions for ordering
Emax 2 order code explanation *(cont.)*

Emax 2 circuit breaker order code explanation

Z	2	H	F	UJ	A	E	4	8	N	B	E	A	A	0	Q	C	E	A
1	2	3	4	5&6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

11 — Redundant Communication & Other Modules

		None	0	—	—	—
Redundant Com.	**MOD-RS-485**	**MOD-TCP**	**Profibus**	**Profinet**	**DeviceNet**	**Ethernet/IP**
	2	3	4	5	6	7
Other Modules	**Ekip Link**	**Synchrocheck**[1]	**Signaling 2K**	—	—	—
	A	B	C	—	—	—
Combos	**Rdt Com + Link**	**Redun Com + Sync**[1]	**Redun Com + 2K**	—	—	—
	D	E	F	—	—	—
	Link + Sync[1]	**Sync**[1] **+ 2K**	**2K+2K**	—	—	—
	G	H	J	—	—	—
	Link + Sync[1] **+ 2K**	**Sync**[1] **+ 2K + 2K**	**2K+2K+2K**	—	—	—
	K	L	M	—	—	—
	Link + 2K	—	—	—	—	—
	N	—	—	—	—	—
	Link + 2K + 2K	—	—	—	—	—
	P	—	—	—	—	—

[1] Ekip Synchrocheck requires the use of the Ekip Measuring Pro module.
Note: Communication, Ekip 2K and Ekip Synchrocheck modules are not usable with Ekip Dip trip units or for Switch Disconnectors. Ekip Link is compatible with all trip units, but not with switch disconnectors.
If the redundant communication plus another module is selected (D-F), the redundant module will automatically match the selected communication type of digit 10.
If two communication options are selected in digit 10, then the specific redundant module required is needed (2-7).
The maximum number of modules allowed for the combination of digit 10 and 11 is 3 for E2.2-E6.2 and 2 for E1.2.

12 — Auxiliary Contacts & Signaling

	None	0	—	—
	—	**4 AUX (400V)**	**4 AUX (24V)**	**4 AUX (2-400V & 2-24V)**
	—	A	B	C
6 AUX (400V)[1]	D	E	F	G
6 AUX (24V)[1]	H	J	K	L
6 AUX (3 400V & 3-24V)[1]	M	N	P	Q
4-K Signaling [1] [2]	—	R	S	T

Note: Circuit breakers include the standard 400V 4 AUX as a standard item, but the 24V or mix options can be selected in its place.
Note: Options 0, D, H and M are available for use with switch disconnectors only.
[1] Not available for the E1.2.
[2] Not compatible with Ekip Dip trip units or switch disconnectors.

13 — Remote Reset (YR) & Ready to Close (RTC)

	None	0	—	—
	—	**YR 24VAC/DC**	**YR 110VAC/DC**	**YR 220V AC/DC**
	—	A	B	C
RTC 24VDC	D	E	F	G
RTC 250VAC/DC	H	J	K	L

14 — Closing Coil (YC) & Redundant Closing Coil (YC2)

	—	**None**	0	—	—	—	—	—	—	—	—	—
	24VAC/DC	**30VAC/DC**	**48VAC/DC**	**60VAC/DC**	**110-120VAC/DC**	**120-127V AC/DC**	**220-240VAC/DC**	**240-250VAC/DC**	**277VAC**	**380-400VAC**	**415-440VAC**	**480-500VAC**
YC Only	A	B	C	D	E	F	G	H	J	K	L	M
YC + YC2 (equal V)[1]	N	P	Q	R	S	T	U	V	W	X	Y	Z

[1] Not available for E1.2

15 — Shunt Trip — YO

—	**None**	0	—	—	—	—	—	—	—	—	—
24VAC/DC	**30VAC/DC**	**48VAC/DC**	**60VAC/DC**	**110-120VAC/DC**	**120-127V AC/DC**	**220-240VAC/DC**	**240-250VAC/DC**	**277VAC**	**380-400VAC**	**415-440VAC**	**480-500VAC**
A	B	C	D	E	F	G	H	J	K	L	M

Z	2	H	F	UJ	A	E	4	8	N	B	E	A	A	Q	Q	C	E	A
1	2	3	4	5&6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

16 — Undervoltage (YU) & Redundant Shunt Trip (YO2)

	—	None	0	—	—	—	—	—	—	—	—	—
	24VAC/DC	30VAC/DC	48VAC/DC	60VAC/DC	110-120VAC/DC	120-127V AC/DC	220-240VAC/DC	240-250VAC/DC	277VAC	380-400VAC	415-440VAC	480-500VAC
YU Only	A	B	C	D	E	F	G	H	J	K	L	M
YO2 Only	N	P	Q	R	S	T	U	V	W	X	Y	Z

17 — Spring Charge Motor (M) and Ekip Communication Actuator

	—	None	0	—	—	—	—
Actuator Only	1	—	—	—	—	—	—
	24-30VAC/DC	48-60VAC/DC	100-130VAC/DC	220-250VAC/DC	277VAC	380-415VAC	440-480VAC[1]
M W/ Std Aux	2	3	4	5	6	7	8
M W/ 24VDC Aux	A	B	C	D	E	F	G
M W/ Std Aux + Actuator	H	J	K	L	M	N	P
M W/ 24VDC Aux + Actuator	Q	R	S	T	U	V	W

Note: Standard AUX contact for motors are 250V for E1.2 and 400V for E2.2-E6.2
[1] Not available for E1.2

18 — Push Button Lock Options

	None	0	—	—	—	—	—	—
	—	Push Button Covers				Padlocks in Open Positions		
	—	PBC Sp Key	PBC PL - 4mm	PBC PL - 7mm	PBC PL - 8mm	PLC - 4mm	PLC - 7mm	PLC - 8mm
	—	2	3	4	5	6	7	8
Key Lock in Open Pos. — Diff Keys	A	D	E	F	G	H	J	K
Key Lock in Open Pos — Same Keys[1]	B	L	M	N	P	Q	R	S
Key Lock in Open Pos. — Kirk Key	C	T	U	V	W	X	Y	Z

[1] Standard key for Same Key option is #20005. Locks with keys #20006, #20007, #20008 and #20009 are available as separate items.
Note: Key lock options for Castell and Ronis/Profalux are available for order as separate items.

19 — 1st Racking Lock Options

	None	X	—	—	—
	—	1st KLP-Same Keys[1]	1st KLP-Diff Keys	1st KLP-Kirk/Ron/Prof	1st KLP - Castell[2]
	—	A	B	C	D
PLP Padlock	E	F	G	H	J

[1] Standard key for Same Key option is #20005. Locks with keys #20006, #20007, #20008 and #20009 are available as separate items.
[2] Two Castell adapters cannot be used together, but a Castell adapter can be used in either position with another style lock.
Note: The racking locks above are for E2.2-E6.2 only; for E1.2 they are located on the cradle. The supplement for locking in racked out only is located on the cradle for all breaker sizes.

20 — 2nd Racking Lock Options & Mechanical Operation Counter

	None	X	—	—	—
	—	2nd KLP-Same Keys[1]	2nd KLP-Diff Keys	2nd KLP-Kirk/Ron/Prof	2nd KLP - Castell[2]
	—	B	C	D	E
MEC OP CTR	A	F	G	H	J

[1] Standard key for Same Key option is #20005. Locks with keys #20006, #20007, #20008 and #20009 are available as separate items.
[2] Two Castell adapters cannot be used together, but a Castell adapter can be used in either position with another style lock.
Note: The racking locks above are for E2.2-E6.2 only; for E1.2 they are located on the cradle.

Instructions for ordering
Emax 2 order code explanation

Emax 2 cradle order code explanation

Z	2	A	20	A	D	X	X
1	2	3	4	5&6	7	8	9

1 — Emax 2 Prefix

Z

2 — Frame

	E1.2	E2.2	E4.2	E6.2	E6.2 100%N
3p	1	2	4	6	—
4p	A	B	C	D	E

3 — Version

UL 1066	A
IEC	C

4 & 5 — Type

UL	E1.2 to 1200A	E2.2 to 2000A	E4.2 to 2500A	E4.2 3200A	E6.2 to 5000A	E6.2 6000A[7]	—
	12	20	25	32	50	60	—
IEC	E1.2 to 1600A	E2.2 to 2000A	E2.2 to 2500A	E4.2 to 3200A N, S, H	E4.2 to 4000A N, S, H or any V Vers.	E6.2 to 5000A H, V	E6.2 6300A or any X Vers.
	16	20	25	32	40	50	6X

6 — Terminals

Standard Terminals	A[1]	—	—	—	—	—	—	—
	—	Upper Terminals						
	—	Rear Horiz[2]	Rear Vert	Front[3]	Ext Front[4]	FcCuAl Cable [4]	Spread Rear Horiz [6]	Spread Rear Vert [6]
Lower Terminals	Rear Horiz[2]	—	D	E	F	G	—	—
	Rear Vert	H	J[5]	K	L	M	—	—
	Front[3]	N	P	Q	—	—	—	—
	Ext Front[4]	T	U	—	W	X	—	—
	FcCuAl Cable [4]	2	3	—	5	6	—	—
	Spread Rear Horiz [6]	—	—	—	—	—	7	—
	Spread Rear Vert [6]	—	—	—	—	—	—	8

[1] Standard terminals for cradles are Rear Horrizontal except for UL E4.2 3200A and E6.2 6000A, which are Rear Vertical
[2] Not available for UL E4.2 3200A or E6.2 6000A
[3] Not available for E1.2
[4] Available for E1.2 only
[5] Not available for UL E4.2 3200A or UL E6.2 6000A, it is their standard termination
[6] Available for E2.2 IEC only; not available as factory installed with other terminal combinations
[7] Not yet available. Contact ABB
Note: Additional, non-factory installed options are available: Front extended spread for all E1.2, Multi-stab HR/VR IEC E4.2 3200A, Horizontal Rear Spread individual terminal kitsfor IEC E1.2 and IEC E2.2, Vertical Rear Spread individual terminal kits for IEC E2.2 and Flat for IEC E2.2-E6.2

Z	2	A	20	A	D	X	X
1	2	3	4	5&6	7	8	9

7 — Auxiliary Position Contacts

	None	0	—	—	—
	6 AUP (400V)	**6 AUP (24V)**	**5 AUP (400V)**	**5 AUP (24V)**	—
E1.2	A	B	—	—	—
E2.2 - E6.2 - Left Set	—	—	C	D	—
E2.2 - E6.2 - Right Set	—	—	E	F	—
E2.2 - E6.2 - Left & Right Sets	—	—	G	H	J[1]

[1] Includes one 400V set (left) and one 24V set (right)

8 — 1st Racking Lock Options

	None	X	—	—	—
	—	**1st KLP-Same Keys**[1]	**1st KLP-Diff Keys**	**1st KLP-Kirk/Ron/Prof**	**1st KLP - Castell**[2]
	—	A	B	C	D
PLP Padlock	E	F	G	H	J
Racked Out Position Lock	K[3]	L	M	N	P
PLP + Racked Out Position Lock	Q	R	S	T	U

[1] Standard key for Same Key option is #20005. Locks with keys #20006, #20007, #20008 and #20009 are available as separate items.
[2] Two Castell adapters cannot be used together, but a Castell adapter can be used in either position with another style lock.
[3] Available for E2.2-E6.2 only and only if a racking lock option has been selected for the circuit breaker.
Note: The racking locks above are for E1.2 only; for E2.2-E6-2 they are located on the circuit breaker.

9 — 2nd Racking Lock Options

None	X	—	—
2nd KLP-Same Keys[1]	**2nd KLP-Diff Keys**	**2nd KLP-Kirk/Ron/Prof**	**2nd KLP - Castell**[2]
B	C	D	E

[1] Standard key for Same Key option is #20005. Locks with keys #20006, #20007, #20008 and #20009 are available as separate items.
[2] Two Castell adapters cannot be used together, but a Castell adapter can be used in either position with another style lock.
Note: The racking locks above are for E1.2 only; for E2.2-E6-2 they are located on the circuit breaker.

Abbreviations used to describe 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	Grounding truck
MTP	Grounding 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
FcCuAl	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	Ground fault protection
Rc	Residual current protection
Power Controller	Load management function

Automatic circuit breakers
Fixed version for power distribution

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip Dip LI	Z1BCUFBA000A000000XX	ZABCUFBA000A000000XX
				E1.2B-A 800 Ekip Dip LSI	Z1BCUFBB000A000000XX	ZABCUFBB000A000000XX
				E1.2B-A 800 Ekip Dip LSIG	Z1BCUFBC000A000000XX	ZABCUFBC000A000000XX
				E1.2B-A 800 Ekip Touch LI	Z1BCUFBD000A000000XX	ZABCUFBD000A000000XX
				E1.2B-A 800 Ekip Touch LSI	Z1BCUFBE000A000000XX	ZABCUFBE000A000000XX
				E1.2B-A 800 Ekip Touch LSIG	Z1BCUFBF000A000000XX	ZABCUFBF000A000000XX
				E1.2B-A 800 Ekip Hi-Touch LSI	Z1BCUFBJ200A000000XX	ZABCUFBJ200A000000XX
				E1.2B-A 800 Ekip Hi-Touch LSIG	Z1BCUFBK200A000000XX	ZABCUFBK200A000000XX
	1200	42	42	E1.2B-A 1200 Ekip Dip LI	Z1BDUHBA000A000000XX	ZABDUHBA000A000000XX
				E1.2B-A 1200 Ekip Dip LSI	Z1BDUHBB000A000000XX	ZABDUHBB000A000000XX
				E1.2B-A 1200 Ekip Dip LSIG	Z1BDUHBC000A000000XX	ZABDUHBC000A000000XX
				E1.2B-A 1200 Ekip Touch LI	Z1BDUHBD000A000000XX	ZABDUHBD000A000000XX
				E1.2B-A 1200 Ekip Touch LSI	Z1BDUHBE000A000000XX	ZABDUHBE000A000000XX
				E1.2B-A 1200 Ekip Touch LSIG	Z1BDUHBF000A000000XX	ZABDUHBF000A000000XX
				E1.2B-A 1200 Ekip Hi-Touch LSI	Z1BDUHBJ200A000000XX	ZABDUHBJ200A000000XX
				E1.2B-A 1200 Ekip Hi-Touch LSIG	Z1BDUHBK200A000000XX	ZABDUHBK200A000000XX

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E1.2N-A	800	50	50	E1.2N-A 800 Ekip Dip LI	Z1NCUFBA000A000000XX	ZANCUFBA000A000000XX
				E1.2N-A 800 Ekip Dip LSI	Z1NCUFBB000A000000XX	ZANCUFBB000A000000XX
				E1.2N-A 800 Ekip Dip LSIG	Z1NCUFBC000A000000XX	ZANCUFBC000A000000XX
				E1.2N-A 800 Ekip Touch LI	Z1NCUFBD000A000000XX	ZANCUFBD000A000000XX
				E1.2N-A 800 Ekip Touch LSI	Z1NCUFBE000A000000XX	ZANCUFBE000A000000XX
				E1.2N-A 800 Ekip Touch LSIG	Z1NCUFBF000A000000XX	ZANCUFBF000A000000XX
				E1.2N-A 800 Ekip Hi-Touch LSI	Z1NCUFBJ200A000000XX	ZANCUFBJ200A000000XX
				E1.2N-A 800 Ekip Hi-Touch LSIG	Z1NCUFBK200A000000XX	ZANCUFBK200A000000XX
	1200	50	50	E1.2N-A 1200 Ekip Dip LI	Z1NDUHBA000A000000XX	ZANDUHBA000A000000XX
				E1.2N-A 1200 Ekip Dip LSI	Z1NDUHBB000A000000XX	ZANDUHBB000A000000XX
				E1.2N-A 1200 Ekip Dip LSIG	Z1NDUHBC000A000000XX	ZANDUHBC000A000000XX
				E1.2N-A 1200 Ekip Touch LI	Z1NDUHBD000A000000XX	ZANDUHBD000A000000XX
				E1.2N-A 1200 Ekip Touch LSI	Z1NDUHBE000A000000XX	ZANDUHBE000A000000XX
				E1.2N-A 1200 Ekip Touch LSIG	Z1NDUHBF000A000000XX	ZANDUHBF000A000000XX
				E1.2N-A 1200 Ekip Hi-Touch LSI	Z1NDUHBJ200A000000XX	ZANDUHBJ200A000000XX
				E1.2N-A 1200 Ekip Hi-Touch LSIG	Z1NDUHBK200A000000XX	ZANDUHBK200A000000XX

Automatic circuit breakers
Fixed version for power distribution

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E1.2S-A	250	65	50	E1.2S-A 250 Ekip Dip LI	Z1SAUCBA000A000000XX	ZASAUCBA000A000000XX
				E1.2S-A 250 Ekip Dip LSI	Z1SAUCBB000A000000XX	ZASAUCBB000A000000XX
				E1.2S-A 250 Ekip Dip LSIG	Z1SAUCBC000A000000XX	ZASAUCBC000A000000XX
				E1.2S-A 250 Ekip Touch LI	Z1SAUCBD000A000000XX	ZASAUCBD000A000000XX
				E1.2S-A 250 Ekip Touch LSI	Z1SAUCBE000A000000XX	ZASAUCBE000A000000XX
				E1.2S-A 250 Ekip Touch LSIG	Z1SAUCBF000A000000XX	ZASAUCBF000A000000XX
				E1.2S-A 250 Ekip Hi-Touch LSI	Z1SAUCBJ200A000000XX	ZASAUCBJ200A000000XX
				E1.2S-A 250 Ekip Hi-Touch LSIG	Z1SAUCBK200A000000XX	ZASAUCBK200A000000XX
	400	65	50	E1.2S-A 400 Ekip Dip LI	Z1SBUDBA000A000000XX	ZASBUDBA000A000000XX
				E1.2S-A 400 Ekip Dip LSI	Z1SBUDBB000A000000XX	ZASBUDBB000A000000XX
				E1.2S-A 400 Ekip Dip LSIG	Z1SBUDBC000A000000XX	ZASBUDBC000A000000XX
				E1.2S-A 400 Ekip Touch LI	Z1SBUDBD000A000000XX	ZASBUDBD000A000000XX
				E1.2S-A 400 Ekip Touch LSI	Z1SBUDBE000A000000XX	ZASBUDBE000A000000XX
				E1.2S-A 400 Ekip Touch LSIG	Z1SBUDBF000A000000XX	ZASBUDBF000A000000XX
				E1.2S-A 400 Ekip Hi-Touch LSI	Z1SBUDBJ200A000000XX	ZASBUDBJ200A000000XX
				E1.2S-A 400 Ekip Hi-Touch LSIG	Z1SBUDBK200A000000XX	ZASBUDBK200A000000XX
	800	65	50	E1.2S-A 800 Ekip Dip LI	Z1SCUFBA000A000000XX	ZASCUFBA000A000000XX
				E1.2S-A 800 Ekip Dip LSI	Z1SCUFBB000A000000XX	ZASCUFBB000A000000XX
				E1.2S-A 800 Ekip Dip LSIG	Z1SCUFBC000A000000XX	ZASCUFBC000A000000XX
				E1.2S-A 800 Ekip Touch LI	Z1SCUFBD000A000000XX	ZASCUFBD000A000000XX
				E1.2S-A 800 Ekip Touch LSI	Z1SCUFBE000A000000XX	ZASCUFBE000A000000XX
				E1.2S-A 800 Ekip Touch LSIG	Z1SCUFBF000A000000XX	ZASCUFBF000A000000XX
				E1.2S-A 800 Ekip Hi-Touch LSI	Z1SCUFBJ200A000000XX	ZASCUFBJ200A000000XX
				E1.2S-A 800 Ekip Hi-Touch LSIG	Z1SCUFBK200A000000XX	ZASCUFBK200A000000XX
	1200	65	50	E1.2S-A 1200 Ekip Dip LI	Z1SDUHBA000A000000XX	ZASDUHBA000A000000XX
				E1.2S-A 1200 Ekip Dip LSI	Z1SDUHBB000A000000XX	ZASDUHBB000A000000XX
				E1.2S-A 1200 Ekip Dip LSIG	Z1SDUHBC000A000000XX	ZASDUHBC000A000000XX
				E1.2S-A 1200 Ekip Touch LI	Z1SDUHBD000A000000XX	ZASDUHBD000A000000XX
				E1.2S-A 1200 Ekip Touch LSI	Z1SDUHBE000A000000XX	ZASDUHBE000A000000XX
				E1.2S-A 1200 Ekip Touch LSIG	Z1SDUHBF000A000000XX	ZASDUHBF000A000000XX
				E1.2S-A 1200 Ekip Hi-Touch LSI	Z1SDUHBJ200A000000XX	ZASDUHBJ200A000000XX
				E1.2S-A 1200 Ekip Hi-Touch LSIG	Z1SDUHBK200A000000XX	ZASDUHBK200A000000XX

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip Dip LI	Z2BEUJBA000A000000XX	ZBBEUJBA000A000000XX
				E2.2B-A 1600 Ekip Dip LSI	Z2BEUJBB000A000000XX	ZBBEUJBB000A000000XX
				E2.2B-A 1600 Ekip Dip LSIG	Z2BEUJBC000A000000XX	ZBBEUJBC000A000000XX
				E2.2B-A 1600 Ekip Touch LI	Z2BEUJBD000A000000XX	ZBBEUJBD000A000000XX
				E2.2B-A 1600 Ekip Touch LSI	Z2BEUJBE000A000000XX	ZBBEUJBE000A000000XX
				E2.2B-A 1600 Ekip Touch LSIG	Z2BEUJBF000A000000XX	ZBBEUJBF000A000000XX
				E2.2B-A 1600 Ekip Hi-Touch LSI	Z2BEUJBJ200A000000XX	ZBBEUJBJ200A000000XX
				E2.2B-A 1600 Ekip Hi-Touch LSIG	Z2BEUJBK200A000000XX	ZBBEUJBK200A000000XX
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip Dip LI	Z2NEUJBA000A000000XX	ZBNEUJBA000A000000XX
				E2.2N-A 1600 Ekip Dip LSI	Z2NEUJBB000A000000XX	ZBNEUJBB000A000000XX
				E2.2N-A 1600 Ekip Dip LSIG	Z2NEUJBC000A000000XX	ZBNEUJBC000A000000XX
				E2.2N-A 1600 Ekip Touch LI	Z2NEUJBD000A000000XX	ZBNEUJBD000A000000XX
				E2.2N-A 1600 Ekip Touch LSI	Z2NEUJBE000A000000XX	ZBNEUJBE000A000000XX
				E2.2N-A 1600 Ekip Touch LSIG	Z2NEUJBF000A000000XX	ZBNEUJBF000A000000XX
				E2.2N-A 1600 Ekip Hi-Touch LSI	Z2NEUJBJ200A000000XX	ZBNEUJBJ200A000000XX
				E2.2N-A 1600 Ekip Hi-Touch LSIG	Z2NEUJBK200A000000XX	ZBNEUJBK200A000000XX
	2000	50	50	E2.2N-A 2000 Ekip Dip LI	Z2NFUKBA000A000000XX	ZBNFUKBA000A000000XX
				E2.2N-A 2000 Ekip Dip LSI	Z2NFUKBB000A000000XX	ZBNFUKBB000A000000XX
				E2.2N-A 2000 Ekip Dip LSIG	Z2NFUKBC000A000000XX	ZBNFUKBC000A000000XX
				E2.2N-A 2000 Ekip Touch LI	Z2NFUKBD000A000000XX	ZBNFUKBD000A000000XX
				E2.2N-A 2000 Ekip Touch LSI	Z2NFUKBE000A000000XX	ZBNFUKBE000A000000XX
				E2.2N-A 2000 Ekip Touch LSIG	Z2NFUKBF000A000000XX	ZBNFUKBF000A000000XX
				E2.2N-A 2000 Ekip Hi-Touch LSI	Z2NFUKBJ200A000000XX	ZBNFUKBJ200A000000XX
				E2.2N-A 2000 Ekip Hi-Touch LSIG	Z2NFUKBK200A000000XX	ZBNFUKBK200A000000XX

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2S-A	800	65	65	E2.2S-A 800 Ekip Dip LI	Z2SCUFBA000A000000XX	ZBSCUFBA000A000000XX
				E2.2S-A 800 Ekip Dip LSI	Z2SCUFBB000A000000XX	ZBSCUFBB000A000000XX
				E2.2S-A 800 Ekip Dip LSIG	Z2SCUFBC000A000000XX	ZBSCUFBC000A000000XX
				E2.2S-A 800 Ekip Touch LI	Z2SCUFBD000A000000XX	ZBSCUFBD000A000000XX
				E2.2S-A 800 Ekip Touch LSI	Z2SCUFBE000A000000XX	ZBSCUFBE000A000000XX
				E2.2S-A 800 Ekip Touch LSIG	Z2SCUFBF000A000000XX	ZBSCUFBF000A000000XX
				E2.2S-A 800 Ekip Hi-Touch LSI	Z2SCUFBJ200A000000XX	ZBSCUFBJ200A000000XX
				E2.2S-A 800 Ekip Hi-Touch LSIG	Z2SCUFBK200A000000XX	ZBSCUFBK200A000000XX
	1200	65	65	E2.2S-A 1200 Ekip Dip LI	Z2SDUHBA000A000000XX	ZBSDUHBA000A000000XX
				E2.2S-A 1200 Ekip Dip LSI	Z2SDUHBB000A000000XX	ZBSDUHBB000A000000XX
				E2.2S-A 1200 Ekip Dip LSIG	Z2SDUHBC000A000000XX	ZBSDUHBC000A000000XX
				E2.2S-A 1200 Ekip Touch LI	Z2SDUHBD000A000000XX	ZBSDUHBD000A000000XX
				E2.2S-A 1200 Ekip Touch LSI	Z2SDUHBE000A000000XX	ZBSDUHBE000A000000XX
				E2.2S-A 1200 Ekip Touch LSIG	Z2SDUHBF000A000000XX	ZBSDUHBF000A000000XX
				E2.2S-A 1200 Ekip Hi-Touch LSI	Z2SDUHBJ200A000000XX	ZBSDUHBJ200A000000XX
				E2.2S-A 1200 Ekip Hi-Touch LSIG	Z2SDUHBK200A000000XX	ZBSDUHBK200A000000XX
	1600	65	65	E2.2S-A 1600 Ekip Dip LI	Z2SEUJBA000A000000XX	ZBSEUJBA000A000000XX
				E2.2S-A 1600 Ekip Dip LSI	Z2SEUJBB000A000000XX	ZBSEUJBB000A000000XX
				E2.2S-A 1600 Ekip Dip LSIG	Z2SEUJBC000A000000XX	ZBSEUJBC000A000000XX
				E2.2S-A 1600 Ekip Touch LI	Z2SEUJBD000A000000XX	ZBSEUJBD000A000000XX
				E2.2S-A 1600 Ekip Touch LSI	Z2SEUJBE000A000000XX	ZBSEUJBE000A000000XX
				E2.2S-A 1600 Ekip Touch LSIG	Z2SEUJBF000A000000XX	ZBSEUJBF000A000000XX
				E2.2S-A 1600 Ekip Hi-Touch LSI	Z2SEUJBJ200A000000XX	ZBSEUJBJ200A000000XX
				E2.2S-A 1600 Ekip Hi-Touch LSIG	Z2SEUJBK200A000000XX	ZBSEUJBK200A000000XX
	2000	65	65	E2.2S-A 2000 Ekip Dip LI	Z2SFUKBA000A000000XX	ZBSFUKBA000A000000XX
				E2.2S-A 2000 Ekip Dip LSI	Z2SFUKBB000A000000XX	ZBSFUKBB000A000000XX
				E2.2S-A 2000 Ekip Dip LSIG	Z2SFUKBC000A000000XX	ZBSFUKBC000A000000XX
				E2.2S-A 2000 Ekip Touch LI	Z2SFUKBD000A000000XX	ZBSFUKBD000A000000XX
				E2.2S-A 2000 Ekip Touch LSI	Z2SFUKBE000A000000XX	ZBSFUKBE000A000000XX
				E2.2S-A 2000 Ekip Touch LSIG	Z2SFUKBF000A000000XX	ZBSFUKBF000A000000XX
				E2.2S-A 2000 Ekip Hi-Touch LSI	Z2SFUKBJ200A000000XX	ZBSFUKBJ200A000000XX
				E2.2S-A 2000 Ekip Hi-Touch LSIG	Z2SFUKBK200A000000XX	ZBSFUKBK200A000000XX

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Poles	4 Poles
E2.2H-A	800	85	85	E2.2H-A 800 Ekip Dip LI	Z2HCUFBA000A000000XX	ZBHCUFBA000A000000XX
				E2.2H-A 800 Ekip Dip LSI	Z2HCUFBB000A000000XX	ZBHCUFBB000A000000XX
				E2.2H-A 800 Ekip Dip LSIG	Z2HCUFBC000A000000XX	ZBHCUFBC000A000000XX
				E2.2H-A 800 Ekip Touch LI	Z2HCUFBD000A000000XX	ZBHCUFBD000A000000XX
				E2.2H-A 800 Ekip Touch LSI	Z2HCUFBE000A000000XX	ZBHCUFBE000A000000XX
				E2.2H-A 800 Ekip Touch LSIG	Z2HCUFBF000A000000XX	ZBHCUFBF000A000000XX
				E2.2H-A 800 Ekip Hi-Touch LSI	Z2HCUFBJ200A000000XX	ZBHCUFBJ200A000000XX
				E2.2H-A 800 Ekip Hi-Touch LSIG	Z2HCUFBK200A000000XX	ZBHCUFBK200A000000XX
	1200	85	85	E2.2H-A 1200 Ekip Dip LI	Z2HDUHBA000A000000XX	ZBHDUHBA000A000000XX
				E2.2H-A 1200 Ekip Dip LSI	Z2HDUHBB000A000000XX	ZBHDUHBB000A000000XX
				E2.2H-A 1200 Ekip Dip LSIG	Z2HDUHBC000A000000XX	ZBHDUHBC000A000000XX
				E2.2H-A 1200 Ekip Touch LI	Z2HDUHBD000A000000XX	ZBHDUHBD000A000000XX
				E2.2H-A 1200 Ekip Touch LSI	Z2HDUHBE000A000000XX	ZBHDUHBE000A000000XX
				E2.2H-A 1200 Ekip Touch LSIG	Z2HDUHBF000A000000XX	ZBHDUHBF000A000000XX
				E2.2H-A 1200 Ekip Hi-Touch LSI	Z2HDUHBJ200A000000XX	ZBHDUHBJ200A000000XX
				E2.2H-A 1200 Ekip Hi-Touch LSIG	Z2HDUHBK200A000000XX	ZBHDUHBK200A000000XX
	1600	85	85	E2.2H-A 1600 Ekip Dip LI	Z2HEUJBA000A000000XX	ZBHEUJBA000A000000XX
				E2.2H-A 1600 Ekip Dip LSI	Z2HEUJBB000A000000XX	ZBHEUJBB000A000000XX
				E2.2H-A 1600 Ekip Dip LSIG	Z2HEUJBC000A000000XX	ZBHEUJBC000A000000XX
				E2.2H-A 1600 Ekip Touch LI	Z2HEUJBD000A000000XX	ZBHEUJBD000A000000XX
				E2.2H-A 1600 Ekip Touch LSI	Z2HEUJBE000A000000XX	ZBHEUJBE000A000000XX
				E2.2H-A 1600 Ekip Touch LSIG	Z2HEUJBF000A000000XX	ZBHEUJBF000A000000XX
				E2.2H-A 1600 Ekip Hi-Touch LSI	Z2HEUJBJ200A000000XX	ZBHEUJBJ200A000000XX
				E2.2H-A 1600 Ekip Hi-Touch LSIG	Z2HEUJBK200A000000XX	ZBHEUJBK200A000000XX
	2000	85	85	E2.2H-A 2000 Ekip Dip LI	Z2HFUKBA000A000000XX	ZBHFUKBA000A000000XX
				E2.2H-A 2000 Ekip Dip LSI	Z2HFUKBB000A000000XX	ZBHFUKBB000A000000XX
				E2.2H-A 2000 Ekip Dip LSIG	Z2HFUKBC000A000000XX	ZBHFUKBC000A000000XX
				E2.2H-A 2000 Ekip Touch LI	Z2HFUKBD000A000000XX	ZBHFUKBD000A000000XX
				E2.2H-A 2000 Ekip Touch LSI	Z2HFUKBE000A000000XX	ZBHFUKBE000A000000XX
				E2.2H-A 2000 Ekip Touch LSIG	Z2HFUKBF000A000000XX	ZBHFUKBF000A000000XX
				E2.2H-A 2000 Ekip Hi-Touch LSI	Z2HFUKBJ200A000000XX	ZBHFUKBJ200A000000XX
				E2.2H-A 2000 Ekip Hi-Touch LSIG	Z2HFUKBK200A000000XX	ZBHFUKBK200A000000XX

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2V-A	250	100	85	E2.2V-A 250 Ekip Dip LI	Z2VAUCBA000A000000XX	ZBVAUCBA000A000000XX
				E2.2V-A 250 Ekip Dip LSI	Z2VAUCBB000A000000XX	ZBVAUCBB000A000000XX
				E2.2V-A 250 Ekip Dip LSIG	Z2VAUCBC000A000000XX	ZBVAUCBC000A000000XX
				E2.2V-A 250 Ekip Touch LI	Z2VAUCBD000A000000XX	ZBVAUCBD000A000000XX
				E2.2V-A 250 Ekip Touch LSI	Z2VAUCBE000A000000XX	ZBVAUCBE000A000000XX
				E2.2V-A 250 Ekip Touch LSIG	Z2VAUCBF000A000000XX	ZBVAUCBF000A000000XX
				E2.2V-A 250 Ekip Hi-Touch LSI	Z2VAUCBJ200A000000XX	ZBVAUCBJ200A000000XX
				E2.2V-A 250 Ekip Hi-Touch LSIG	Z2VAUCBK200A000000XX	ZBVAUCBK200A000000XX
	400	100	85	E2.2V-A 400 Ekip Dip LI	Z2VBUDBA000A000000XX	ZBVBUDBA000A000000XX
				E2.2V-A 400 Ekip Dip LSI	Z2VBUDBB000A000000XX	ZBVBUDBB000A000000XX
				E2.2V-A 400 Ekip Dip LSIG	Z2VBUDBC000A000000XX	ZBVBUDBC000A000000XX
				E2.2V-A 400 Ekip Touch LI	Z2VBUDBD000A000000XX	ZBVBUDBD000A000000XX
				E2.2V-A 400 Ekip Touch LSI	Z2VBUDBE000A000000XX	ZBVBUDBE000A000000XX
				E2.2V-A 400 Ekip Touch LSIG	Z2VBUDBF000A000000XX	ZBVBUDBF000A000000XX
				E2.2V-A 400 Ekip Hi-Touch LSI	Z2VBUDBJ200A000000XX	ZBVBUDBJ200A000000XX
				E2.2V-A 400 Ekip Hi-Touch LSIG	Z2VBUDBK200A000000XX	ZBVBUDBK200A000000XX
	800	100	85	E2.2V-A 800 Ekip Dip LI	Z2VCUFBA000A000000XX	ZBVCUFBA000A000000XX
				E2.2V-A 800 Ekip Dip LSI	Z2VCUFBB000A000000XX	ZBVCUFBB000A000000XX
				E2.2V-A 800 Ekip Dip LSIG	Z2VCUFBC000A000000XX	ZBVCUFBC000A000000XX
				E2.2V-A 800 Ekip Touch LI	Z2VCUFBD000A000000XX	ZBVCUFBD000A000000XX
				E2.2V-A 800 Ekip Touch LSI	Z2VCUFBE000A000000XX	ZBVCUFBE000A000000XX
				E2.2V-A 800 Ekip Touch LSIG	Z2VCUFBF000A000000XX	ZBVCUFBF000A000000XX
				E2.2V-A 800 Ekip Hi-Touch LSI	Z2VCUFBJ200A000000XX	ZBVCUFBJ200A000000XX
				E2.2V-A 800 Ekip Hi-Touch LSIG	Z2VCUFBK200A000000XX	ZBVCUFBK200A000000XX
	1200	100	85	E2.2V-A 1200 Ekip Dip LI	Z2VDUHBA000A000000XX	ZBVDUHBA000A000000XX
				E2.2V-A 1200 Ekip Dip LSI	Z2VDUHBB000A000000XX	ZBVDUHBB000A000000XX
				E2.2V-A 1200 Ekip Dip LSIG	Z2VDUHBC000A000000XX	ZBVDUHBC000A000000XX
				E2.2V-A 1200 Ekip Touch LI	Z2VDUHBD000A000000XX	ZBVDUHBD000A000000XX
				E2.2V-A 1200 Ekip Touch LSI	Z2VDUHBE000A000000XX	ZBVDUHBE000A000000XX
				E2.2V-A 1200 Ekip Touch LSIG	Z2VDUHBF000A000000XX	ZBVDUHBF000A000000XX
				E2.2V-A 1200 Ekip Hi-Touch LSI	Z2VDUHBJ200A000000XX	ZBVDUHBJ200A000000XX
				E2.2V-A 1200 Ekip Hi-Touch LSIG	Z2VDUHBK200A000000XX	ZBVDUHBK200A000000XX
	1600	100	85	E2.2V-A 1600 Ekip Dip LI	Z2VEUJBA000A000000XX	ZBVEUJBA000A000000XX
				E2.2V-A 1600 Ekip Dip LSI	Z2VEUJBB000A000000XX	ZBVEUJBB000A000000XX
				E2.2V-A 1600 Ekip Dip LSIG	Z2VEUJBC000A000000XX	ZBVEUJBC000A000000XX
				E2.2V-A 1600 Ekip Touch LI	Z2VEUJBD000A000000XX	ZBVEUJBD000A000000XX
				E2.2V-A 1600 Ekip Touch LSI	Z2VEUJBE000A000000XX	ZBVEUJBE000A000000XX
				E2.2V-A 1600 Ekip Touch LSIG	Z2VEUJBF000A000000XX	ZBVEUJBF000A000000XX
				E2.2V-A 1600 Ekip Hi-Touch LSI	Z2VEUJBJ200A000000XX	ZBVEUJBJ200A000000XX
				E2.2V-A 1600 Ekip Hi-Touch LSIG	Z2VEUJBK200A000000XX	ZBVEUJBK200A000000XX
	2000	100	85	E2.2V-A 2000 Ekip Dip LI	Z2VFUKBA000A000000XX	ZBVFUKBA000A000000XX
				E2.2V-A 2000 Ekip Dip LSI	Z2VFUKBB000A000000XX	ZBVFUKBB000A000000XX
				E2.2V-A 2000 Ekip Dip LSIG	Z2VFUKBC000A000000XX	ZBVFUKBC000A000000XX
				E2.2V-A 2000 Ekip Touch LI	Z2VFUKBD000A000000XX	ZBVFUKBD000A000000XX
				E2.2V-A 2000 Ekip Touch LSI	Z2VFUKBE000A000000XX	ZBVFUKBE000A000000XX
				E2.2V-A 2000 Ekip Touch LSIG	Z2VFUKBF000A000000XX	ZBVFUKBF000A000000XX
				E2.2V-A 2000 Ekip Hi-Touch LSI	Z2VFUKBJ200A000000XX	ZBVFUKBJ200A000000XX
				E2.2V-A 2000 Ekip Hi-Touch LSIG	Z2VFUKBK200A000000XX	ZBVFUKBK200A000000XX


1SDC200663F001_UL

SACE Emax 2 E4.2S-A/H-A - Adjustable rear terminals (HR) up to 2500A, vertical rear terminals for 3200A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip Dip LI	Z4SGULBA000A000000XX	ZCSGULBA000A000000XX
				E4.2S-A 2500 Ekip Dip LSI	Z4SGULBB000A000000XX	ZCSGULBB000A000000XX
				E4.2S-A 2500 Ekip Dip LSIG	Z4SGULBC000A000000XX	ZCSGULBC000A000000XX
				E4.2S-A 2500 Ekip Touch LI	Z4SGULBD000A000000XX	ZCSGULBD000A000000XX
				E4.2S-A 2500 Ekip Touch LSI	Z4SGULBE000A000000XX	ZCSGULBE000A000000XX
				E4.2S-A 2500 Ekip Touch LSIG	Z4SGULBF000A000000XX	ZCSGULBF000A000000XX
				E4.2S-A 2500 Ekip Hi-Touch LSI	Z4SGULBJ200A000000XX	ZCSGULBJ200A000000XX
				E4.2S-A 2500 Ekip Hi-Touch LSIG	Z4SGULBK200A000000XX	ZCSGULBK200A000000XX
	3200[1)]	65	65	E4.2S-A 3200 Ekip Dip LI	Z4SHUNBA000A000000XX	ZCSHUNBA000A000000XX
				E4.2S-A 3200 Ekip Dip LSI	Z4SHUNBB000A000000XX	ZCSHUNBB000A000000XX
				E4.2S-A 3200 Ekip Dip LSIG	Z4SHUNBC000A000000XX	ZCSHUNBC000A000000XX
				E4.2S-A 3200 Ekip Touch LI	Z4SHUNBD000A000000XX	ZCSHUNBD000A000000XX
				E4.2S-A 3200 Ekip Touch LSI	Z4SHUNBE000A000000XX	ZCSHUNBE000A000000XX
				E4.2S-A 3200 Ekip Touch LSIG	Z4SHUNBF000A000000XX	ZCSHUNBF000A000000XX
				E4.2S-A 3200 Ekip Hi-Touch LSI	Z4SHUNBJ200A000000XX	ZCSHUNBJ200A000000XX
				E4.2S-A 3200 Ekip Hi-Touch LSIG	Z4SHUNBK200A000000XX	ZCSHUNBK200A000000XX

[1)] 3200A frames with rear terminals are supplied as vertical only

SACE Emax 2 E4.2S-A/H-A - Adjustable rear terminals (HR) up to 2500A, vertical rear terminals for 3200A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip Dip LI	Z4HGULBA000A000000XX	ZCHGULBA000A000000XX
				E4.2H-A 2500 Ekip Dip LSI	Z4HGULBB000A000000XX	ZCHGULBB000A000000XX
				E4.2H-A 2500 Ekip Dip LSIG	Z4HGULBC000A000000XX	ZCHGULBC000A000000XX
				E4.2H-A 2500 Ekip Touch LI	Z4HGULBD000A000000XX	ZCHGULBD000A000000XX
				E4.2H-A 2500 Ekip Touch LSI	Z4HGULBE000A000000XX	ZCHGULBE000A000000XX
				E4.2H-A 2500 Ekip Touch LSIG	Z4HGULBF000A000000XX	ZCHGULBF000A000000XX
				E4.2H-A 2500 Ekip Hi-Touch LSI	Z4HGULBJ200A000000XX	ZCHGULBJ200A000000XX
				E4.2H-A 2500 Ekip Hi-Touch LSIG	Z4HGULBK200A000000XX	ZCHGULBK200A000000XX
	3200[1)]	85	85	E4.2H-A 3200 Ekip Dip LI	Z4HHUNBA000A000000XX	ZCHHUNBA000A000000XX
				E4.2H-A 3200 Ekip Dip LSI	Z4HHUNBB000A000000XX	ZCHHUNBB000A000000XX
				E4.2H-A 3200 Ekip Dip LSIG	Z4HHUNBC000A000000XX	ZCHHUNBC000A000000XX
				E4.2H-A 3200 Ekip Touch LI	Z4HHUNBD000A000000XX	ZCHHUNBD000A000000XX
				E4.2H-A 3200 Ekip Touch LSI	Z4HHUNBE000A000000XX	ZCHHUNBE000A000000XX
				E4.2H-A 3200 Ekip Touch LSIG	Z4HHUNBF000A000000XX	ZCHHUNBF000A000000XX
				E4.2H-A 3200 Ekip Hi-Touch LSI	Z4HHUNBJ200A000000XX	ZCHHUNBJ200A000000XX
				E4.2H-A 3200 Ekip Hi-Touch LSIG	Z4HHUNBK200A000000XX	ZCHHUNBK200A000000XX

[1)] 3200A frames with rear terminals are supplied as vertical only

SACE Emax 2 E4.2V-A - Adjustable rear terminals (HR) up to 2500A, vertical rear terminals for 3200A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2V-A	800	100	85	E4.2V-A 800 Ekip Dip LI	Z4VCUFBA000A000000XX	ZCVCUFBA000A000000XX
				E4.2V-A 800 Ekip Dip LSI	Z4VCUFBB000A000000XX	ZCVCUFBB000A000000XX
				E4.2V-A 800 Ekip Dip LSIG	Z4VCUFBC000A000000XX	ZCVCUFBC000A000000XX
				E4.2V-A 800 Ekip Touch LI	Z4VCUFBD000A000000XX	ZCVCUFBD000A000000XX
				E4.2V-A 800 Ekip Touch LSI	Z4VCUFBE000A000000XX	ZCVCUFBE000A000000XX
				E4.2V-A 800 Ekip Touch LSIG	Z4VCUFBF000A000000XX	ZCVCUFBF000A000000XX
				E4.2V-A 800 Ekip Hi-Touch LSI	Z4VCUFBJ200A000000XX	ZCVCUFBJ200A000000XX
				E4.2V-A 800 Ekip Hi-Touch LSIG	Z4VCUFBK200A000000XX	ZCVCUFBK200A000000XX
	1600	100	85	E4.2V-A 1600 Ekip Dip LI	Z4VEUJBA000A000000XX	ZCVEUJBA000A000000XX
				E4.2V-A 1600 Ekip Dip LSI	Z4VEUJBB000A000000XX	ZCVEUJBB000A000000XX
				E4.2V-A 1600 Ekip Dip LSIG	Z4VEUJBC000A000000XX	ZCVEUJBC000A000000XX
				E4.2V-A 1600 Ekip Touch LI	Z4VEUJBD000A000000XX	ZCVEUJBD000A000000XX
				E4.2V-A 1600 Ekip Touch LSI	Z4VEUJBE000A000000XX	ZCVEUJBE000A000000XX
				E4.2V-A 1600 Ekip Touch LSIG	Z4VEUJBF000A000000XX	ZCVEUJBF000A000000XX
				E4.2V-A 1600 Ekip Hi-Touch LSI	Z4VEUJBJ200A000000XX	ZCVEUJBJ200A000000XX
				E4.2V-A 1600 Ekip Hi-Touch LSIG	Z4VEUJBK200A000000XX	ZCVEUJBK200A000000XX
	2000	100	85	E4.2V-A 2000 Ekip Dip LI	Z4VFUKBA000A000000XX	ZCVFUKBA000A000000XX
				E4.2V-A 2000 Ekip Dip LSI	Z4VFUKBB000A000000XX	ZCVFUKBB000A000000XX
				E4.2V-A 2000 Ekip Dip LSIG	Z4VFUKBC000A000000XX	ZCVFUKBC000A000000XX
				E4.2V-A 2000 Ekip Touch LI	Z4VFUKBD000A000000XX	ZCVFUKBD000A000000XX
				E4.2V-A 2000 Ekip Touch LSI	Z4VFUKBE000A000000XX	ZCVFUKBE000A000000XX
				E4.2V-A 2000 Ekip Touch LSIG	Z4VFUKBF000A000000XX	ZCVFUKBF000A000000XX
				E4.2V-A 2000 Ekip Hi-Touch LSI	Z4VFUKBJ200A000000XX	ZCVFUKBJ200A000000XX
				E4.2V-A 2000 Ekip Hi-Touch LSIG	Z4VFUKBK200A000000XX	ZCVFUKBK200A000000XX
	2500	100	85	E4.2V-A 2500 Ekip Dip LI	Z4VGULBA000A000000XX	ZCVGULBA000A000000XX
				E4.2V-A 2500 Ekip Dip LSI	Z4VGULBB000A000000XX	ZCVGULBB000A000000XX
				E4.2V-A 2500 Ekip Dip LSIG	Z4VGULBC000A000000XX	ZCVGULBC000A000000XX
				E4.2V-A 2500 Ekip Touch LI	Z4VGULBD000A000000XX	ZCVGULBD000A000000XX
				E4.2V-A 2500 Ekip Touch LSI	Z4VGULBE000A000000XX	ZCVGULBE000A000000XX
				E4.2V-A 2500 Ekip Touch LSIG	Z4VGULBF000A000000XX	ZCVGULBF000A000000XX
				E4.2V-A 2500 Ekip Hi-Touch LSI	Z4VGULBJ200A000000XX	ZCVGULBJ200A000000XX
				E4.2V-A 2500 Ekip Hi-Touch LSIG	Z4VGULBK200A000000XX	ZCVGULBK200A000000XX
	3200[1)]	100	85	E4.2V-A 3200 Ekip Dip LI	Z4VHUNBA000A000000XX	ZCVHUNBA000A000000XX
				E4.2V-A 3200 Ekip Dip LSI	Z4VHUNBB000A000000XX	ZCVHUNBB000A000000XX
				E4.2V-A 3200 Ekip Dip LSIG	Z4VHUNBC000A000000XX	ZCVHUNBC000A000000XX
				E4.2V-A 3200 Ekip Touch LI	Z4VHUNBD000A000000XX	ZCVHUNBD000A000000XX
				E4.2V-A 3200 Ekip Touch LSI	Z4VHUNBE000A000000XX	ZCVHUNBE000A000000XX
				E4.2V-A 3200 Ekip Touch LSIG	Z4VHUNBF000A000000XX	ZCVHUNBF000A000000XX
				E4.2V-A 3200 Ekip Hi-Touch LSI	Z4VHUNBJ200A000000XX	ZCVHUNBJ200A000000XX
				E4.2V-A 3200 Ekip Hi-Touch LSIG	Z4VHUNBK200A000000XX	ZCVHUNBK200A000000XX

[1)] 3200A frames with rear terminals are supplied as vertical only

SACE Emax 2 E6.2H-A/V-A - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip Dip LI	Z6HJURBA000A000000XX	ZDHJURBA000A000000XX
				E6.2H-A 4000 Ekip Dip LSI	Z6HJURBB000A000000XX	ZDHJURBB000A000000XX
				E6.2H-A 4000 Ekip Dip LSIG	Z6HJURBC000A000000XX	ZDHJURBC000A000000XX
				E6.2H-A 4000 Ekip Touch LI	Z6HJURBD000A000000XX	ZDHJURBD000A000000XX
				E6.2H-A 4000 Ekip Touch LSI	Z6HJURBE000A000000XX	ZDHJURBE000A000000XX
				E6.2H-A 4000 Ekip Touch LSIG	Z6HJURBF000A000000XX	ZDHJURBF000A000000XX
				E6.2H-A 4000 Ekip Hi-Touch LSI	Z6HJURBJ200A000000XX	ZDHJURBJ200A000000XX
				E6.2H-A 4000 Ekip Hi-Touch LSIG	Z6HJURBK200A000000XX	ZDHJURBK200A000000XX
	5000	85	85	E6.2H-A 5000 Ekip Dip LI	Z6HKUSBA000A000000XX	ZDHKUSBA000A000000XX
				E6.2H-A 5000 Ekip Dip LSI	Z6HKUSBB000A000000XX	ZDHKUSBB000A000000XX
				E6.2H-A 5000 Ekip Dip LSIG	Z6HKUSBC000A000000XX	ZDHKUSBC000A000000XX
				E6.2H-A 5000 Ekip Touch LI	Z6HKUSBD000A000000XX	ZDHKUSBD000A000000XX
				E6.2H-A 5000 Ekip Touch LSI	Z6HKUSBE000A000000XX	ZDHKUSBE000A000000XX
				E6.2H-A 5000 Ekip Touch LSIG	Z6HKUSBF000A000000XX	ZDHKUSBF000A000000XX
				E6.2H-A 5000 Ekip Hi-Touch LSI	Z6HKUSBJ200A000000XX	ZDHKUSBJ200A000000XX
				E6.2H-A 5000 Ekip Hi-Touch LSIG	Z6HKUSBK200A000000XX	ZDHKUSBK200A000000XX
	6000[1)]	85	85	E6.2H-A 6000 Ekip Dip LI	Z6HLUTBA000A000000XX	ZDHLUTBA000A000000XX
				E6.2H-A 6000 Ekip Dip LSI	Z6HLUTBB000A000000XX	ZDHLUTBB000A000000XX
				E6.2H-A 6000 Ekip Dip LSIG	Z6HLUTBC000A000000XX	ZDHLUTBC000A000000XX
				E6.2H-A 6000 Ekip Touch LI	Z6HLUTBD000A000000XX	ZDHLUTBD000A000000XX
				E6.2H-A 6000 Ekip Touch LSI	Z6HLUTBE000A000000XX	ZDHLUTBE000A000000XX
				E6.2H-A 6000 Ekip Touch LSIG	Z6HLUTBF000A000000XX	ZDHLUTBF000A000000XX
				E6.2H-A 6000 Ekip Hi-Touch LSI	Z6HLUTBJ200A000000XX	ZDHLUTBJ200A000000XX
				E6.2H-A 6000 Ekip Hi-Touch LSIG	Z6HLUTBK200A000000XX	ZDHLUTBK200A000000XX

[1)] 6000A frames with rear terminals are supplied as vertical only. Contact ABB for the availability of this product

SACE Emax 2 E6.2V-A - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip Dip LI	Z6VJURBA000A000000XX	ZDVJURBA000A000000XX
				E6.2V-A 4000 Ekip Dip LSI	Z6VJURBB000A000000XX	ZDVJURBB000A000000XX
				E6.2V-A 4000 Ekip Dip LSIG	Z6VJURBC000A000000XX	ZDVJURBC000A000000XX
				E6.2V-A 4000 Ekip Touch LI	Z6VJURBD000A000000XX	ZDVJURBD000A000000XX
				E6.2V-A 4000 Ekip Touch LSI	Z6VJURBE000A000000XX	ZDVJURBE000A000000XX
				E6.2V-A 4000 Ekip Touch LSIG	Z6VJURBF000A000000XX	ZDVJURBF000A000000XX
				E6.2V-A 4000 Ekip Hi-Touch LSI	Z6VJURBJ200A000000XX	ZDVJURBJ200A000000XX
				E6.2V-A 4000 Ekip Hi-Touch LSIG	Z6VJURBK200A000000XX	ZDVJURBK200A000000XX
	5000	100	100	E6.2V-A 5000 Ekip Dip LI	Z6VKUSBA000A000000XX	ZDVKUSBA000A000000XX
				E6.2V-A 5000 Ekip Dip LSI	Z6VKUSBB000A000000XX	ZDVKUSBB000A000000XX
				E6.2V-A 5000 Ekip Dip LSIG	Z6VKUSBC000A000000XX	ZDVKUSBC000A000000XX
				E6.2V-A 5000 Ekip Touch LI	Z6VKUSBD000A000000XX	ZDVKUSBD000A000000XX
				E6.2V-A 5000 Ekip Touch LSI	Z6VKUSBE000A000000XX	ZDVKUSBE000A000000XX
				E6.2V-A 5000 Ekip Touch LSIG	Z6VKUSBF000A000000XX	ZDVKUSBF000A000000XX
				E6.2V-A 5000 Ekip Hi-Touch LSI	Z6VKUSBJ200A000000XX	ZDVKUSBJ200A000000XX
				E6.2V-A 5000 Ekip Hi-Touch LSIG	Z6VKUSBK200A000000XX	ZDVKUSBK200A000000XX
	6000[1)]	100	100	E6.2V-A 6000 Ekip Dip LI	Z6VLUTBA000A000000XX	ZDVLUTBA000A000000XX
				E6.2V-A 6000 Ekip Dip LSI	Z6VLUTBB000A000000XX	ZDVLUTBB000A000000XX
				E6.2V-A 6000 Ekip Dip LSIG	Z6VLUTBC000A000000XX	ZDVLUTBC000A000000XX
				E6.2V-A 6000 Ekip Touch LI	Z6VLUTBD000A000000XX	ZDVLUTBD000A000000XX
				E6.2V-A 6000 Ekip Touch LSI	Z6VLUTBE000A000000XX	ZDVLUTBE000A000000XX
				E6.2V-A 6000 Ekip Touch LSIG	Z6VLUTBF000A000000XX	ZDVLUTBF000A000000XX
				E6.2V-A 6000 Ekip Hi-Touch LSI	Z6VLUTBJ200A000000XX	ZDVLUTBJ200A000000XX
				E6.2V-A 6000 Ekip Hi-Touch LSIG	Z6VLUTBK200A000000XX	ZDVLUTBK200A000000XX

[1)] 6000A frames with rear terminals are supplied as vertical only. Contact ABB for the availability of this product

SACE Emax 2 E6.2H-A/f/V-A/f full size - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Pole Code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip Dip LI	ZEHJURBA000A000000XX
				E6.2H-A/f 4000 Ekip Dip LSI	ZEHJURBB000A000000XX
				E6.2H-A/f 4000 Ekip Dip LSIG	ZEHJURBC000A000000XX
				E6.2H-A/f 4000 Ekip Touch LI	ZEHJURBD000A000000XX
				E6.2H-A/f 4000 Ekip Touch LSI	ZEHJURBE000A000000XX
				E6.2H-A/f 4000 Ekip Touch LSIG	ZEHJURBF000A000000XX
				E6.2H-A/f 4000 Ekip Hi-Touch LSI	ZEHJURBJ200A000000XX
				E6.2H-A/f 4000 Ekip Hi-Touch LSIG	ZEHJURBK200A000000XX
	5000	85	85	E6.2H-A/f 5000 Ekip Dip LI	ZEHKUSBA000A000000XX
				E6.2H-A/f 5000 Ekip Dip LSI	ZEHKUSBB000A000000XX
				E6.2H-A/f 5000 Ekip Dip LSIG	ZEHKUSBC000A000000XX
				E6.2H-A/f 5000 Ekip Touch LI	ZEHKUSBD000A000000XX
				E6.2H-A/f 5000 Ekip Touch LSI	ZEHKUSBE000A000000XX
				E6.2H-A/f 5000 Ekip Touch LSIG	ZEHKUSBF000A000000XX
				E6.2H-A/f 5000 Ekip Hi-Touch LSI	ZEHKUSBJ200A000000XX
				E6.2H-A/f 5000 Ekip Hi-Touch LSIG	ZEHKUSBK200A000000XX
	6000[1)]	85	85	E6.2H-A/f 6000 Ekip Dip LI	ZEHLUTBA000A000000XX
				E6.2H-A/f 6000 Ekip Dip LSI	ZEHLUTBB000A000000XX
				E6.2H-A/f 6000 Ekip Dip LSIG	ZEHLUTBC000A000000XX
				E6.2H-A/f 6000 Ekip Touch LI	ZEHLUTBD000A000000XX
				E6.2H-A/f 6000 Ekip Touch LSI	ZEHLUTBE000A000000XX
				E6.2H-A/f 6000 Ekip Touch LSIG	ZEHLUTBF000A000000XX
				E6.2H-A/f 6000 Ekip Hi-Touch LSI	ZEHLUTBJ200A000000XX
				E6.2H-A/f 6000 Ekip Hi-Touch LSIG	ZEHLUTBK200A000000XX

[1)] 6000A frames with rear terminals are supplied as vertical only. Contact ABB for the availability of this product

SACE Emax 2 E6.2H-A/f/V-A/f full size - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Pole Code
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip Dip LI	ZEVJURBA000A000000XX
				E6.2V-A/f 4000 Ekip Dip LSI	ZEVJURBB000A000000XX
				E6.2V-A/f 4000 Ekip Dip LSIG	ZEVJURBC000A000000XX
				E6.2V-A/f 4000 Ekip Touch LI	ZEVJURBD000A000000XX
				E6.2V-A/f 4000 Ekip Touch LSI	ZEVJURBE000A000000XX
				E6.2V-A/f 4000 Ekip Touch LSIG	ZEVJURBF000A000000XX
				E6.2V-A/f 4000 Ekip Hi-Touch LSI	ZEVJURBJ200A000000XX
				E6.2V-A/f 4000 Ekip Hi-Touch LSIG	ZEVJURBK200A000000XX
	5000	100	100	E6.2V-A/f 5000 Ekip Dip LI	ZEVKUSBA000A000000XX
				E6.2V-A/f 5000 Ekip Dip LSI	ZEVKUSBB000A000000XX
				E6.2V-A/f 5000 Ekip Dip LSIG	ZEVKUSBC000A000000XX
				E6.2V-A/f 5000 Ekip Touch LI	ZEVKUSBD000A000000XX
				E6.2V-A/f 5000 Ekip Touch LSI	ZEVKUSBE000A000000XX
				E6.2V-A/f 5000 Ekip Touch LSIG	ZEVKUSBF000A000000XX
				E6.2V-A/f 5000 Ekip Hi-Touch LSI	ZEVKUSBJ200A000000XX
				E6.2V-A/f 5000 Ekip Hi-Touch LSIG	ZEVKUSBK200A000000XX
	6000[1)]	100	100	E6.2V-A/f 6000 Ekip Dip LI	ZEVLUTBA000A000000XX
				E6.2V-A/f 6000 Ekip Dip LSI	ZEVLUTBB000A000000XX
				E6.2V-A/f 6000 Ekip Dip LSIG	ZEVLUTBC000A000000XX
				E6.2V-A/f 6000 Ekip Touch LI	ZEVLUTBD000A000000XX
				E6.2V-A/f 6000 Ekip Touch LSI	ZEVLUTBE000A000000XX
				E6.2V-A/f 6000 Ekip Touch LSIG	ZEVLUTBF000A000000XX
				E6.2V-A/f 6000 Ekip Hi-Touch LSI	ZEVLUTBJ200A000000XX
				E6.2V-A/f 6000 Ekip Hi-Touch LSIG	ZEVLUTBK200A000000XX

[1)] 6000A frames with rear terminals are supplied as vertical only. Contact ABB for the availability of this product

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 Pole Code	4 Pole Code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip Dip LI	Z1BCUFAA000A000000XX	ZABCUFAA000A000000XX
				E1.2B-A 800 Ekip Dip LSI	Z1BCUFAB000A000000XX	ZABCUFAB000A000000XX
				E1.2B-A 800 Ekip Dip LSIG	Z1BCUFAC000A000000XX	ZABCUFAC000A000000XX
				E1.2B-A 800 Ekip Touch LI	Z1BCUFAD000A000000XX	ZABCUFAD000A000000XX
				E1.2B-A 800 Ekip Touch LSI	Z1BCUFAE000A000000XX	ZABCUFAE000A000000XX
				E1.2B-A 800 Ekip Touch LSIG	Z1BCUFAF000A000000XX	ZABCUFAF000A000000XX
				E1.2B-A 800 Ekip Hi-Touch LSI	Z1BCUFAJ200A000000XX	ZABCUFAJ200A000000XX
				E1.2B-A 800 Ekip Hi-Touch LSIG	Z1BCUFAK200A000000XX	ZABCUFAK200A000000XX
	1200	42	42	E1.2B-A 1200 Ekip Dip LI	Z1BDUHAA000A000000XX	ZABDUHAA000A000000XX
				E1.2B-A 1200 Ekip Dip LSI	Z1BDUHAB000A000000XX	ZABDUHAB000A000000XX
				E1.2B-A 1200 Ekip Dip LSIG	Z1BDUHAC000A000000XX	ZABDUHAC000A000000XX
				E1.2B-A 1200 Ekip Touch LI	Z1BDUHAD000A000000XX	ZABDUHAD000A000000XX
				E1.2B-A 1200 Ekip Touch LSI	Z1BDUHAE000A000000XX	ZABDUHAE000A000000XX
				E1.2B-A 1200 Ekip Touch LSIG	Z1BDUHAF000A000000XX	ZABDUHAF000A000000XX
				E1.2B-A 1200 Ekip Hi-Touch LSI	Z1BDUHAJ200A000000XX	ZABDUHAJ200A000000XX
				E1.2B-A 1200 Ekip Hi-Touch LSIG	Z1BDUHAK200A000000XX	ZABDUHAK200A000000XX
E1.2N-A	800	50	50	E1.2N-A 800 Ekip Dip LI	Z1NCUFAA000A000000XX	ZANCUFAA000A000000XX
				E1.2N-A 800 Ekip Dip LSI	Z1NCUFAB000A000000XX	ZANCUFAB000A000000XX
				E1.2N-A 800 Ekip Dip LSIG	Z1NCUFAC000A000000XX	ZANCUFAC000A000000XX
				E1.2N-A 800 Ekip Touch LI	Z1NCUFAD000A000000XX	ZANCUFAD000A000000XX
				E1.2N-A 800 Ekip Touch LSI	Z1NCUFAE000A000000XX	ZANCUFAE000A000000XX
				E1.2N-A 800 Ekip Touch LSIG	Z1NCUFAF000A000000XX	ZANCUFAF000A000000XX
				E1.2N-A 800 Ekip Hi-Touch LSI	Z1NCUFAJ200A000000XX	ZANCUFAJ200A000000XX
				E1.2N-A 800 Ekip Hi-Touch LSIG	Z1NCUFAK200A000000XX	ZANCUFAK200A000000XX
	1200	50	50	E1.2N-A 1200 Ekip Dip LI	Z1NDUHAA000A000000XX	ZANDUHAA000A000000XX
				E1.2N-A 1200 Ekip Dip LSI	Z1NDUHAB000A000000XX	ZANDUHAB000A000000XX
				E1.2N-A 1200 Ekip Dip LSIG	Z1NDUHAC000A000000XX	ZANDUHAC000A000000XX
				E1.2N-A 1200 Ekip Touch LI	Z1NDUHAD000A000000XX	ZANDUHAD000A000000XX
				E1.2N-A 1200 Ekip Touch LSI	Z1NDUHAE000A000000XX	ZANDUHAE000A000000XX
				E1.2N-A 1200 Ekip Touch LSIG	Z1NDUHAF000A000000XX	ZANDUHAF000A000000XX
				E1.2N-A 1200 Ekip Hi-Touch LSI	Z1NDUHAJ200A000000XX	ZANDUHAJ200A000000XX
				E1.2N-A 1200 Ekip Hi-Touch LSIG	Z1NDUHAK200A000000XX	ZANDUHAK200A000000XX

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 (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E1.2S-A	250	65	50	E1.2S-A 250 Ekip Dip LI	Z1SAUCAA000A000000XX	ZASAUCAA000A000000XX
				E1.2S-A 250 Ekip Dip LSI	Z1SAUCAB000A000000XX	ZASAUCAB000A000000XX
				E1.2S-A 250 Ekip Dip LSIG	Z1SAUCAC000A000000XX	ZASAUCAC000A000000XX
				E1.2S-A 250 Ekip Touch LI	Z1SAUCAD000A000000XX	ZASAUCAD000A000000XX
				E1.2S-A 250 Ekip Touch LSI	Z1SAUCAE000A000000XX	ZASAUCAE000A000000XX
				E1.2S-A 250 Ekip Touch LSIG	Z1SAUCAF000A000000XX	ZASAUCAF000A000000XX
				E1.2S-A 250 Ekip Hi-Touch LSI	Z1SAUCAJ200A000000XX	ZASAUCAJ200A000000XX
				E1.2S-A 250 Ekip Hi-Touch LSIG	Z1SAUCAK200A000000XX	ZASAUCAK200A000000XX
	400	65	50	E1.2S-A 400 Ekip Dip LI	Z1SBUDAA000A000000XX	ZASBUDAA000A000000XX
				E1.2S-A 400 Ekip Dip LSI	Z1SBUDAB000A000000XX	ZASBUDAB000A000000XX
				E1.2S-A 400 Ekip Dip LSIG	Z1SBUDAC000A000000XX	ZASBUDAC000A000000XX
				E1.2S-A 400 Ekip Touch LI	Z1SBUDAD000A000000XX	ZASBUDAD000A000000XX
				E1.2S-A 400 Ekip Touch LSI	Z1SBUDAE000A000000XX	ZASBUDAE000A000000XX
				E1.2S-A 400 Ekip Touch LSIG	Z1SBUDAF000A000000XX	ZASBUDAF000A000000XX
				E1.2S-A 400 Ekip Hi-Touch LSI	Z1SBUDAJ200A000000XX	ZASBUDAJ200A000000XX
				E1.2S-A 400 Ekip Hi-Touch LSIG	Z1SBUDAK200A000000XX	ZASBUDAK200A000000XX
	800	65	50	E1.2S-A 800 Ekip Dip LI	Z1SCUFAA000A000000XX	ZASCUFAA000A000000XX
				E1.2S-A 800 Ekip Dip LSI	Z1SCUFAB000A000000XX	ZASCUFAB000A000000XX
				E1.2S-A 800 Ekip Dip LSIG	Z1SCUFAC000A000000XX	ZASCUFAC000A000000XX
				E1.2S-A 800 Ekip Touch LI	Z1SCUFAD000A000000XX	ZASCUFAD000A000000XX
				E1.2S-A 800 Ekip Touch LSI	Z1SCUFAE000A000000XX	ZASCUFAE000A000000XX
				E1.2S-A 800 Ekip Touch LSIG	Z1SCUFAF000A000000XX	ZASCUFAF000A000000XX
				E1.2S-A 800 Ekip Hi-Touch LSI	Z1SCUFAJ200A000000XX	ZASCUFAJ200A000000XX
				E1.2S-A 800 Ekip Hi-Touch LSIG	Z1SCUFAK200A000000XX	ZASCUFAK200A000000XX
	1200	65	50	E1.2S-A 1200 Ekip Dip LI	Z1SDUHAA000A000000XX	ZASDUHAA000A000000XX
				E1.2S-A 1200 Ekip Dip LSI	Z1SDUHAB000A000000XX	ZASDUHAB000A000000XX
				E1.2S-A 1200 Ekip Dip LSIG	Z1SDUHAC000A000000XX	ZASDUHAC000A000000XX
				E1.2S-A 1200 Ekip Touch LI	Z1SDUHAD000A000000XX	ZASDUHAD000A000000XX
				E1.2S-A 1200 Ekip Touch LSI	Z1SDUHAE000A000000XX	ZASDUHAE000A000000XX
				E1.2S-A 1200 Ekip Touch LSIG	Z1SDUHAF000A000000XX	ZASDUHAF000A000000XX
				E1.2S-A 1200 Ekip Hi-Touch LSI	Z1SDUHAJ200A000000XX	ZASDUHAJ200A000000XX
				E1.2S-A 1200 Ekip Hi-Touch LSIG	Z1SDUHAK200A000000XX	ZASDUHAK200A000000XX


1SDC200666F001_UL

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip Dip LI	Z2BEUJAA000A000000XX	ZBBEUJAA000A000000XX
				E2.2B-A 1600 Ekip Dip LSI	Z2BEUJAB000A000000XX	ZBBEUJAB000A000000XX
				E2.2B-A 1600 Ekip Dip LSIG	Z2BEUJAC000A000000XX	ZBBEUJAC000A000000XX
				E2.2B-A 1600 Ekip Touch LI	Z2BEUJAD000A000000XX	ZBBEUJAD000A000000XX
				E2.2B-A 1600 Ekip Touch LSI	Z2BEUJAE000A000000XX	ZBBEUJAE000A000000XX
				E2.2B-A 1600 Ekip Touch LSIG	Z2BEUJAF000A000000XX	ZBBEUJAF000A000000XX
				E2.2B-A 1600 Ekip Hi-Touch LSI	Z2BEUJAJ200A000000XX	ZBBEUJAJ200A000000XX
				E2.2B-A 1600 Ekip Hi-Touch LSIG	Z2BEUJAK200A000000XX	ZBBEUJAK200A000000XX

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip Dip LI	Z2NEUJAA000A000000XX	ZBNEUJAA000A000000XX
				E2.2N-A 1600 Ekip Dip LSI	Z2NEUJAB000A000000XX	ZBNEUJAB000A000000XX
				E2.2N-A 1600 Ekip Dip LSIG	Z2NEUJAC000A000000XX	ZBNEUJAC000A000000XX
				E2.2N-A 1600 Ekip Touch LI	Z2NEUJAD000A000000XX	ZBNEUJAD000A000000XX
				E2.2N-A 1600 Ekip Touch LSI	Z2NEUJAE000A000000XX	ZBNEUJAE000A000000XX
				E2.2N-A 1600 Ekip Touch LSIG	Z2NEUJAF000A000000XX	ZBNEUJAF000A000000XX
				E2.2N-A 1600 Ekip Hi-Touch LSI	Z2NEUJAJ200A000000XX	ZBNEUJAJ200A000000XX
				E2.2N-A 1600 Ekip Hi-Touch LSIG	Z2NEUJAK200A000000XX	ZBNEUJAK200A000000XX
	2000	50	50	E2.2N-A 2000 Ekip Dip LI	Z2NFUKAA000A000000XX	ZBNFUKAA000A000000XX
				E2.2N-A 2000 Ekip Dip LSI	Z2NFUKAB000A000000XX	ZBNFUKAB000A000000XX
				E2.2N-A 2000 Ekip Dip LSIG	Z2NFUKAC000A000000XX	ZBNFUKAC000A000000XX
				E2.2N-A 2000 Ekip Touch LI	Z2NFUKAD000A000000XX	ZBNFUKAD000A000000XX
				E2.2N-A 2000 Ekip Touch LSI	Z2NFUKAE000A000000XX	ZBNFUKAE000A000000XX
				E2.2N-A 2000 Ekip Touch LSIG	Z2NFUKAF000A000000XX	ZBNFUKAF000A000000XX
				E2.2N-A 2000 Ekip Hi-Touch LSI	Z2NFUKAJ200A000000XX	ZBNFUKAJ200A000000XX
				E2.2N-A 2000 Ekip Hi-Touch LSIG	Z2NFUKAK200A000000XX	ZBNFUKAK200A000000XX

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 (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2S-A	800	65	65	E2.2S-A 800 Ekip Dip LI	Z2SCUFAA000A000000XX	ZBSCUFAA000A000000XX
				E2.2S-A 800 Ekip Dip LSI	Z2SCUFAB000A000000XX	ZBSCUFAB000A000000XX
				E2.2S-A 800 Ekip Dip LSIG	Z2SCUFAC000A000000XX	ZBSCUFAC000A000000XX
				E2.2S-A 800 Ekip Touch LI	Z2SCUFAD000A000000XX	ZBSCUFAD000A000000XX
				E2.2S-A 800 Ekip Touch LSI	Z2SCUFAE000A000000XX	ZBSCUFAE000A000000XX
				E2.2S-A 800 Ekip Touch LSIG	Z2SCUFAF000A000000XX	ZBSCUFAF000A000000XX
				E2.2S-A 800 Ekip Hi-Touch LSI	Z2SCUFAJ200A000000XX	ZBSCUFAJ200A000000XX
				E2.2S-A 800 Ekip Hi-Touch LSIG	Z2SCUFAK200A000000XX	ZBSCUFAK200A000000XX
	1200	65	65	E2.2S-A 1200 Ekip Dip LI	Z2SDUHAA000A000000XX	ZBSDUHAA000A000000XX
				E2.2S-A 1200 Ekip Dip LSI	Z2SDUHAB000A000000XX	ZBSDUHAB000A000000XX
				E2.2S-A 1200 Ekip Dip LSIG	Z2SDUHAC000A000000XX	ZBSDUHAC000A000000XX
				E2.2S-A 1200 Ekip Touch LI	Z2SDUHAD000A000000XX	ZBSDUHAD000A000000XX
				E2.2S-A 1200 Ekip Touch LSI	Z2SDUHAE000A000000XX	ZBSDUHAE000A000000XX
				E2.2S-A 1200 Ekip Touch LSIG	Z2SDUHAF000A000000XX	ZBSDUHAF000A000000XX
				E2.2S-A 1200 Ekip Hi-Touch LSI	Z2SDUHAJ200A000000XX	ZBSDUHAJ200A000000XX
				E2.2S-A 1200 Ekip Hi-Touch LSIG	Z2SDUHAK200A000000XX	ZBSDUHAK200A000000XX
	1600	65	65	E2.2S-A 1600 Ekip Dip LI	Z2SEUJAA000A000000XX	ZBSEUJAA000A000000XX
				E2.2S-A 1600 Ekip Dip LSI	Z2SEUJAB000A000000XX	ZBSEUJAB000A000000XX
				E2.2S-A 1600 Ekip Dip LSIG	Z2SEUJAC000A000000XX	ZBSEUJAC000A000000XX
				E2.2S-A 1600 Ekip Touch LI	Z2SEUJAD000A000000XX	ZBSEUJAD000A000000XX
				E2.2S-A 1600 Ekip Touch LSI	Z2SEUJAE000A000000XX	ZBSEUJAE000A000000XX
				E2.2S-A 1600 Ekip Touch LSIG	Z2SEUJAF000A000000XX	ZBSEUJAF000A000000XX
				E2.2S-A 1600 Ekip Hi-Touch LSI	Z2SEUJAJ200A000000XX	ZBSEUJAJ200A000000XX
				E2.2S-A 1600 Ekip Hi-Touch LSIG	Z2SEUJAK200A000000XX	ZBSEUJAK200A000000XX
	2000	65	65	E2.2S-A 2000 Ekip Dip LI	Z2SFUKAA000A000000XX	ZBSFUKAA000A000000XX
				E2.2S-A 2000 Ekip Dip LSI	Z2SFUKAB000A000000XX	ZBSFUKAB000A000000XX
				E2.2S-A 2000 Ekip Dip LSIG	Z2SFUKAC000A000000XX	ZBSFUKAC000A000000XX
				E2.2S-A 2000 Ekip Touch LI	Z2SFUKAD000A000000XX	ZBSFUKAD000A000000XX
				E2.2S-A 2000 Ekip Touch LSI	Z2SFUKAE000A000000XX	ZBSFUKAE000A000000XX
				E2.2S-A 2000 Ekip Touch LSIG	Z2SFUKAF000A000000XX	ZBSFUKAF000A000000XX
				E2.2S-A 2000 Ekip Hi-Touch LSI	Z2SFUKAJ200A000000XX	ZBSFUKAJ200A000000XX
				E2.2S-A 2000 Ekip Hi-Touch LSIG	Z2SFUKAK200A000000XX	ZBSFUKAK200A000000XX


1SDC200666F001_UL

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2H-A	800	85	85	E2.2H-A 800 Ekip Dip LI	Z2HCUFAA000A000000XX	ZBHCUFAA000A000000XX
				E2.2H-A 800 Ekip Dip LSI	Z2HCUFAB000A000000XX	ZBHCUFAB000A000000XX
				E2.2H-A 800 Ekip Dip LSIG	Z2HCUFAC000A000000XX	ZBHCUFAC000A000000XX
				E2.2H-A 800 Ekip Touch LI	Z2HCUFAD000A000000XX	ZBHCUFAD000A000000XX
				E2.2H-A 800 Ekip Touch LSI	Z2HCUFAE000A000000XX	ZBHCUFAE000A000000XX
				E2.2H-A 800 Ekip Touch LSIG	Z2HCUFAF000A000000XX	ZBHCUFAF000A000000XX
				E2.2H-A 800 Ekip Hi-Touch LSI	Z2HCUFAJ200A000000XX	ZBHCUFAJ200A000000XX
				E2.2H-A 800 Ekip Hi-Touch LSIG	Z2HCUFAK200A000000XX	ZBHCUFAK200A000000XX
	1200	85	85	E2.2H-A 1200 Ekip Dip LI	Z2HDUHAA000A000000XX	ZBHDUHAA000A000000XX
				E2.2H-A 1200 Ekip Dip LSI	Z2HDUHAB000A000000XX	ZBHDUHAB000A000000XX
				E2.2H-A 1200 Ekip Dip LSIG	Z2HDUHAC000A000000XX	ZBHDUHAC000A000000XX
				E2.2H-A 1200 Ekip Touch LI	Z2HDUHAD000A000000XX	ZBHDUHAD000A000000XX
				E2.2H-A 1200 Ekip Touch LSI	Z2HDUHAE000A000000XX	ZBHDUHAE000A000000XX
				E2.2H-A 1200 Ekip Touch LSIG	Z2HDUHAF000A000000XX	ZBHDUHAF000A000000XX
				E2.2H-A 1200 Ekip Hi-Touch LSI	Z2HDUHAJ200A000000XX	ZBHDUHAJ200A000000XX
				E2.2H-A 1200 Ekip Hi-Touch LSIG	Z2HDUHAK200A000000XX	ZBHDUHAK200A000000XX
	1600	85	85	E2.2H-A 1600 Ekip Dip LI	Z2HEUJAA000A000000XX	ZBHEUJAA000A000000XX
				E2.2H-A 1600 Ekip Dip LSI	Z2HEUJAB000A000000XX	ZBHEUJAB000A000000XX
				E2.2H-A 1600 Ekip Dip LSIG	Z2HEUJAC000A000000XX	ZBHEUJAC000A000000XX
				E2.2H-A 1600 Ekip Touch LI	Z2HEUJAD000A000000XX	ZBHEUJAD000A000000XX
				E2.2H-A 1600 Ekip Touch LSI	Z2HEUJAE000A000000XX	ZBHEUJAE000A000000XX
				E2.2H-A 1600 Ekip Touch LSIG	Z2HEUJAF000A000000XX	ZBHEUJAF000A000000XX
				E2.2H-A 1600 Ekip Hi-Touch LSI	Z2HEUJAJ200A000000XX	ZBHEUJAJ200A000000XX
				E2.2H-A 1600 Ekip Hi-Touch LSIG	Z2HEUJAK200A000000XX	ZBHEUJAK200A000000XX
	2000	85	85	E2.2H-A 2000 Ekip Dip LI	Z2HFUKAA000A000000XX	ZBHFUKAA000A000000XX
				E2.2H-A 2000 Ekip Dip LSI	Z2HFUKAB000A000000XX	ZBHFUKAB000A000000XX
				E2.2H-A 2000 Ekip Dip LSIG	Z2HFUKAC000A000000XX	ZBHFUKAC000A000000XX
				E2.2H-A 2000 Ekip Touch LI	Z2HFUKAD000A000000XX	ZBHFUKAD000A000000XX
				E2.2H-A 2000 Ekip Touch LSI	Z2HFUKAE000A000000XX	ZBHFUKAE000A000000XX
				E2.2H-A 2000 Ekip Touch LSIG	Z2HFUKAF000A000000XX	ZBHFUKAF000A000000XX
				E2.2H-A 2000 Ekip Hi-Touch LSI	Z2HFUKAJ200A000000XX	ZBHFUKAJ200A000000XX
				E2.2H-A 2000 Ekip Hi-Touch LSIG	Z2HFUKAK200A000000XX	ZBHFUKAK200A000000XX

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 (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2V-A	250	100	85	E2.2V-A 250 Ekip Dip LI	Z2VAUCAA000A000000XX	ZBVAUCAA000A000000XX
				E2.2V-A 250 Ekip Dip LSI	Z2VAUCAB000A000000XX	ZBVAUCAB000A000000XX
				E2.2V-A 250 Ekip Dip LSIG	Z2VAUCAC000A000000XX	ZBVAUCAC000A000000XX
				E2.2V-A 250 Ekip Touch LI	Z2VAUCAD000A000000XX	ZBVAUCAD000A000000XX
				E2.2V-A 250 Ekip Touch LSI	Z2VAUCAE000A000000XX	ZBVAUCAE000A000000XX
				E2.2V-A 250 Ekip Touch LSIG	Z2VAUCAF000A000000XX	ZBVAUCAF000A000000XX
				E2.2V-A 250 Ekip Hi-Touch LSI	Z2VAUCAJ200A000000XX	ZBVAUCAJ200A000000XX
				E2.2V-A 250 Ekip Hi-Touch LSIG	Z2VAUCAK200A000000XX	ZBVAUCAK200A000000XX
	400	100	85	E2.2V-A 400 Ekip Dip LI	Z2VBUDAA000A000000XX	ZBVBUDAA000A000000XX
				E2.2V-A 400 Ekip Dip LSI	Z2VBUDAB000A000000XX	ZBVBUDAB000A000000XX
				E2.2V-A 400 Ekip Dip LSIG	Z2VBUDAC000A000000XX	ZBVBUDAC000A000000XX
				E2.2V-A 400 Ekip Touch LI	Z2VBUDAD000A000000XX	ZBVBUDAD000A000000XX
				E2.2V-A 400 Ekip Touch LSI	Z2VBUDAE000A000000XX	ZBVBUDAE000A000000XX
				E2.2V-A 400 Ekip Touch LSIG	Z2VBUDAF000A000000XX	ZBVBUDAF000A000000XX
				E2.2V-A 400 Ekip Hi-Touch LSI	Z2VBUDAJ200A000000XX	ZBVBUDAJ200A000000XX
				E2.2V-A 400 Ekip Hi-Touch LSIG	Z2VBUDAK200A000000XX	ZBVBUDAK200A000000XX
	800	100	85	E2.2V-A 800 Ekip Dip LI	Z2VCUFAA000A000000XX	ZBVCUFAA000A000000XX
				E2.2V-A 800 Ekip Dip LSI	Z2VCUFAB000A000000XX	ZBVCUFAB000A000000XX
				E2.2V-A 800 Ekip Dip LSIG	Z2VCUFAC000A000000XX	ZBVCUFAC000A000000XX
				E2.2V-A 800 Ekip Touch LI	Z2VCUFAD000A000000XX	ZBVCUFAD000A000000XX
				E2.2V-A 800 Ekip Touch LSI	Z2VCUFAE000A000000XX	ZBVCUFAE000A000000XX
				E2.2V-A 800 Ekip Touch LSIG	Z2VCUFAF000A000000XX	ZBVCUFAF000A000000XX
				E2.2V-A 800 Ekip Hi-Touch LSI	Z2VCUFAJ200A000000XX	ZBVCUFAJ200A000000XX
				E2.2V-A 800 Ekip Hi-Touch LSIG	Z2VCUFAK200A000000XX	ZBVCUFAK200A000000XX
	1200	100	85	E2.2V-A 1200 Ekip Dip LI	Z2VDUHAA000A0000000XX	ZBVDUHAA000A0000000XX
				E2.2V-A 1200 Ekip Dip LSI	Z2VDUHAB000A0000000XX	ZBVDUHAB000A0000000XX
				E2.2V-A 1200 Ekip Dip LSIG	Z2VDUHAC000A0000000XX	ZBVDUHAC000A0000000XX
				E2.2V-A 1200 Ekip Touch LI	Z2VDUHAD000A0000000XX	ZBVDUHAD000A0000000XX
				E2.2V-A 1200 Ekip Touch LSI	Z2VDUHAE000A0000000XX	ZBVDUHAE000A0000000XX
				E2.2V-A 1200 Ekip Touch LSIG	Z2VDUHAF000A0000000XX	ZBVDUHAF000A0000000XX
				E2.2V-A 1200 Ekip Hi-Touch LSI	Z2VDUHAJ200A0000000XX	ZBVDUHAJ200A0000000XX
				E2.2V-A 1200 Ekip Hi-Touch LSIG	Z2VDUHAK200A0000000XX	ZBVDUHAK200A0000000XX
	1600	100	85	E2.2V-A 1600 Ekip Dip LI	Z2VEUJAA000A0000000XX	ZBVEUJAA000A0000000XX
				E2.2V-A 1600 Ekip Dip LSI	Z2VEUJAB000A0000000XX	ZBVEUJAB000A0000000XX
				E2.2V-A 1600 Ekip Dip LSIG	Z2VEUJAC000A0000000XX	ZBVEUJAC000A0000000XX
				E2.2V-A 1600 Ekip Touch LI	Z2VEUJAD000A0000000XX	ZBVEUJAD000A0000000XX
				E2.2V-A 1600 Ekip Touch LSI	Z2VEUJAE000A0000000XX	ZBVEUJAE000A0000000XX
				E2.2V-A 1600 Ekip Touch LSIG	Z2VEUJAF000A0000000XX	ZBVEUJAF000A0000000XX
				E2.2V-A 1600 Ekip Hi-Touch LSI	Z2VEUJAJ200A0000000XX	ZBVEUJAJ200A0000000XX
				E2.2V-A 1600 Ekip Hi-Touch LSIG	Z2VEUJAK200A0000000XX	ZBVEUJAK200A0000000XX
	2000	100	85	E2.2V-A 2000 Ekip Dip LI	Z2VFUKAA000A0000000XX	ZBVFUKAA000A0000000XX
				E2.2V-A 2000 Ekip Dip LSI	Z2VFUKAB000A0000000XX	ZBVFUKAB000A0000000XX
				E2.2V-A 2000 Ekip Dip LSIG	Z2VFUKAC000A0000000XX	ZBVFUKAC000A0000000XX
				E2.2V-A 2000 Ekip Touch LI	Z2VFUKAD000A0000000XX	ZBVFUKAD000A0000000XX
				E2.2V-A 2000 Ekip Touch LSI	Z2VFUKAE000A0000000XX	ZBVFUKAE000A0000000XX
				E2.2V-A 2000 Ekip Touch LSIG	Z2VFUKAF000A0000000XX	ZBVFUKAF000A0000000XX
				E2.2V-A 2000 Ekip Hi-Touch LSI	Z2VFUKAJ200A0000000XX	ZBVFUKAJ200A0000000XX
				E2.2V-A 2000 Ekip Hi-Touch LSIG	Z2VFUKAK200A0000000XX	ZBVFUKAK200A0000000XX

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip Dip LI	Z4SGULAA000A000000XX	ZCSGULAA000A000000XX
				E4.2S-A 2500 Ekip Dip LSI	Z4SGULAB000A000000XX	ZCSGULAB000A000000XX
				E4.2S-A 2500 Ekip Dip LSIG	Z4SGULAC000A000000XX	ZCSGULAC000A000000XX
				E4.2S-A 2500 Ekip Touch LI	Z4SGULAD000A000000XX	ZCSGULAD000A000000XX
				E4.2S-A 2500 Ekip Touch LSI	Z4SGULAE000A000000XX	ZCSGULAE000A000000XX
				E4.2S-A 2500 Ekip Touch LSIG	Z4SGULAF000A000000XX	ZCSGULAF000A000000XX
				E4.2S-A 2500 Ekip Hi-Touch LSI	Z4SGULAJ200A000000XX	ZCSGULAJ200A000000XX
				E4.2S-A 2500 Ekip Hi-Touch LSIG	Z4SGULAK200A000000XX	ZCSGULAK200A000000XX
	3200	65	65	E4.2S-A 3200 Ekip Dip LI	Z4SHUNAA000A000000XX	ZCSHUNAA000A000000XX
				E4.2S-A 3200 Ekip Dip LSI	Z4SHUNAB000A000000XX	ZCSHUNAB000A000000XX
				E4.2S-A 3200 Ekip Dip LSIG	Z4SHUNAC000A000000XX	ZCSHUNAC000A000000XX
				E4.2S-A 3200 Ekip Touch LI	Z4SHUNAD000A000000XX	ZCSHUNAD000A000000XX
				E4.2S-A 3200 Ekip Touch LSI	Z4SHUNAE000A000000XX	ZCSHUNAE000A000000XX
				E4.2S-A 3200 Ekip Touch LSIG	Z4SHUNAF000A000000XX	ZCSHUNAF000A000000XX
				E4.2S-A 3200 Ekip Hi-Touch LSI	Z4SHUNAJ200A000000XX	ZCSHUNAJ200A000000XX
				E4.2S-A 3200 Ekip Hi-Touch LSIG	Z4SHUNAK200A000000XX	ZCSHUNAK200A000000XX

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip Dip LI	Z4HGULAA000A000000XX	ZCHGULAA000A000000XX
				E4.2H-A 2500 Ekip Dip LSI	Z4HGULAB000A000000XX	ZCHGULAB000A000000XX
				E4.2H-A 2500 Ekip Dip LSIG	Z4HGULAC000A000000XX	ZCHGULAC000A000000XX
				E4.2H-A 2500 Ekip Touch LI	Z4HGULAD000A000000XX	ZCHGULAD000A000000XX
				E4.2H-A 2500 Ekip Touch LSI	Z4HGULAE000A000000XX	ZCHGULAE000A000000XX
				E4.2H-A 2500 Ekip Touch LSIG	Z4HGULAF000A000000XX	ZCHGULAF000A000000XX
				E4.2H-A 2500 Ekip Hi-Touch LSI	Z4HGULAJ200A000000XX	ZCHGULAJ200A000000XX
				E4.2H-A 2500 Ekip Hi-Touch LSIG	Z4HGULAK200A000000XX	ZCHGULAK200A000000XX
	3200	85	85	E4.2H-A 3200 Ekip Dip LI	Z4HHUNAA000A000000XX	ZCHHUNAA000A000000XX
				E4.2H-A 3200 Ekip Dip LSI	Z4HHUNAB000A000000XX	ZCHHUNAB000A000000XX
				E4.2H-A 3200 Ekip Dip LSIG	Z4HHUNAC000A000000XX	ZCHHUNAC000A000000XX
				E4.2H-A 3200 Ekip Touch LI	Z4HHUNAD000A000000XX	ZCHHUNAD000A000000XX
				E4.2H-A 3200 Ekip Touch LSI	Z4HHUNAE000A000000XX	ZCHHUNAE000A000000XX
				E4.2H-A 3200 Ekip Touch LSIG	Z4HHUNAF000A000000XX	ZCHHUNAF000A000000XX
				E4.2H-A 3200 Ekip Hi-Touch LSI	Z4HHUNAJ200A000000XX	ZCHHUNAJ200A000000XX
				E4.2H-A 3200 Ekip Hi-Touch LSIG	Z4HHUNAK200A000000XX	ZCHHUNAK200A000000XX

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 (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2V-A	800	100	85	E4.2V-A 800 Ekip Dip LI	Z4VCUFAA000A000000XX	ZCVCUFAA000A000000XX
				E4.2V-A 800 Ekip Dip LSI	Z4VCUFAB000A000000XX	ZCVCUFAB000A000000XX
				E4.2V-A 800 Ekip Dip LSIG	Z4VCUFAC000A000000XX	ZCVCUFAC000A000000XX
				E4.2V-A 800 Ekip Touch LI	Z4VCUFAD000A000000XX	ZCVCUFAD000A000000XX
				E4.2V-A 800 Ekip Touch LSI	Z4VCUFAE000A000000XX	ZCVCUFAE000A000000XX
				E4.2V-A 800 Ekip Touch LSIG	Z4VCUFAF000A000000XX	ZCVCUFAF000A000000XX
				E4.2V-A 800 Ekip Hi-Touch LSI	Z4VCUFAJ200A000000XX	ZCVCUFAJ200A000000XX
				E4.2V-A 800 Ekip Hi-Touch LSIG	Z4VCUFAK200A000000XX	ZCVCUFAK200A000000XX
	1600	100	85	E4.2V-A 1600 Ekip Dip LI	Z4VEUJAA000A000000XX	ZCVEUJAA000A000000XX
				E4.2V-A 1600 Ekip Dip LSI	Z4VEUJAB000A000000XX	ZCVEUJAB000A000000XX
				E4.2V-A 1600 Ekip Dip LSIG	Z4VEUJAC000A000000XX	ZCVEUJAC000A000000XX
				E4.2V-A 1600 Ekip Touch LI	Z4VEUJAD000A000000XX	ZCVEUJAD000A000000XX
				E4.2V-A 1600 Ekip Touch LSI	Z4VEUJAE000A000000XX	ZCVEUJAE000A000000XX
				E4.2V-A 1600 Ekip Touch LSIG	Z4VEUJAF000A000000XX	ZCVEUJAF000A000000XX
				E4.2V-A 1600 Ekip Hi-Touch LSI	Z4VEUJAJ200A000000XX	ZCVEUJAJ200A000000XX
				E4.2V-A 1600 Ekip Hi-Touch LSIG	Z4VEUJAK200A000000XX	ZCVEUJAK200A000000XX
	2000	100	85	E4.2V-A 2000 Ekip Dip LI	Z4VFUKAA000A000000XX	ZCVFUKAA000A000000XX
				E4.2V-A 2000 Ekip Dip LSI	Z4VFUKAB000A000000XX	ZCVFUKAB000A000000XX
				E4.2V-A 2000 Ekip Dip LSIG	Z4VFUKAC000A000000XX	ZCVFUKAC000A000000XX
				E4.2V-A 2000 Ekip Touch LI	Z4VFUKAD000A000000XX	ZCVFUKAD000A000000XX
				E4.2V-A 2000 Ekip Touch LSI	Z4VFUKAE000A000000XX	ZCVFUKAE000A000000XX
				E4.2V-A 2000 Ekip Touch LSIG	Z4VFUKAF000A000000XX	ZCVFUKAF000A000000XX
				E4.2V-A 2000 Ekip Hi-Touch LSI	Z4VFUKAJ200A000000XX	ZCVFUKAJ200A000000XX
				E4.2V-A 2000 Ekip Hi-Touch LSIG	Z4VFUKAK200A000000XX	ZCVFUKAK200A000000XX
	2500	100	85	E4.2V-A 2500 Ekip Dip LI	Z4VGULAA000A000000XX	ZCVGULAA000A000000XX
				E4.2V-A 2500 Ekip Dip LSI	Z4VGULAB000A000000XX	ZCVGULAB000A000000XX
				E4.2V-A 2500 Ekip Dip LSIG	Z4VGULAC000A000000XX	ZCVGULAC000A000000XX
				E4.2V-A 2500 Ekip Touch LI	Z4VGULAD000A000000XX	ZCVGULAD000A000000XX
				E4.2V-A 2500 Ekip Touch LSI	Z4VGULAE000A000000XX	ZCVGULAE000A000000XX
				E4.2V-A 2500 Ekip Touch LSIG	Z4VGULAF000A000000XX	ZCVGULAF000A000000XX
				E4.2V-A 2500 Ekip Hi-Touch LSI	Z4VGULAJ200A000000XX	ZCVGULAJ200A000000XX
				E4.2V-A 2500 Ekip Hi-Touch LSIG	Z4VGULAK200A000000XX	ZCVGULAK200A000000XX
	3200	100	85	E4.2V-A 3200 Ekip Dip LI	Z4VHUNAA000A000000XX	ZCVHUNAA000A000000XX
				E4.2V-A 3200 Ekip Dip LSI	Z4VHUNAB000A000000XX	ZCVHUNAB000A000000XX
				E4.2V-A 3200 Ekip Dip LSIG	Z4VHUNAC000A000000XX	ZCVHUNAC000A000000XX
				E4.2V-A 3200 Ekip Touch LI	Z4VHUNAD000A000000XX	ZCVHUNAD000A000000XX
				E4.2V-A 3200 Ekip Touch LSI	Z4VHUNAE000A000000XX	ZCVHUNAE000A000000XX
				E4.2V-A 3200 Ekip Touch LSIG	Z4VHUNAF000A000000XX	ZCVHUNAF000A000000XX
				E4.2V-A 3200 Ekip Hi-Touch LSI	Z4VHUNAJ200A000000XX	ZCVHUNAJ200A000000XX
				E4.2V-A 3200 Ekip Hi-Touch LSIG	Z4VHUNAK200A000000XX	ZCVHUNAK200A000000XX

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip Dip LI	Z6HJURAA000A000000XX	ZDHJURAA000A000000XX
				E6.2H-A 4000 Ekip Dip LSI	Z6HJURAB000A000000XX	ZDHJURAB000A000000XX
				E6.2H-A 4000 Ekip Dip LSIG	Z6HJURAC000A000000XX	ZDHJURAC000A000000XX
				E6.2H-A 4000 Ekip Touch LI	Z6HJURAD000A000000XX	ZDHJURAD000A000000XX
				E6.2H-A 4000 Ekip Touch LSI	Z6HJURAE000A000000XX	ZDHJURAE000A000000XX
				E6.2H-A 4000 Ekip Touch LSIG	Z6HJURAF000A000000XX	ZDHJURAF000A000000XX
				E6.2H-A 4000 Ekip Hi-Touch LSI	Z6HJURAJ200A000000XX	ZDHJURAJ200A000000XX
				E6.2H-A 4000 Ekip Hi-Touch LSIG	Z6HJURAK200A000000XX	ZDHJURAK200A000000XX
	5000	85	85	E6.2H-A 5000 Ekip Dip LI	Z6HKUSAA000A000000XX	ZDHKUSAA000A000000XX
				E6.2H-A 5000 Ekip Dip LSI	Z6HKUSAB000A000000XX	ZDHKUSAB000A000000XX
				E6.2H-A 5000 Ekip Dip LSIG	Z6HKUSAC000A000000XX	ZDHKUSAC000A000000XX
				E6.2H-A 5000 Ekip Touch LI	Z6HKUSAD000A000000XX	ZDHKUSAD000A000000XX
				E6.2H-A 5000 Ekip Touch LSI	Z6HKUSAE000A000000XX	ZDHKUSAE000A000000XX
				E6.2H-A 5000 Ekip Touch LSIG	Z6HKUSAF000A000000XX	ZDHKUSAF000A000000XX
				E6.2H-A 5000 Ekip Hi-Touch LSI	Z6HKUSAJ200A000000XX	ZDHKUSAJ200A000000XX
				E6.2H-A 5000 Ekip Hi-Touch LSIG	Z6HKUSAK200A000000XX	ZDHKUSAK200A000000XX
	6000[1)]	85	85	E6.2H-A 6000 Ekip Dip LI	Z6HLUTAA000A000000XX	ZDHLUTAA000A000000XX
				E6.2H-A 6000 Ekip Dip LSI	Z6HLUTAB000A000000XX	ZDHLUTAB000A000000XX
				E6.2H-A 6000 Ekip Dip LSIG	Z6HLUTAC000A000000XX	ZDHLUTAC000A000000XX
				E6.2H-A 6000 Ekip Touch LI	Z6HLUTAD000A000000XX	ZDHLUTAD000A000000XX
				E6.2H-A 6000 Ekip Touch LSI	Z6HLUTAE000A000000XX	ZDHLUTAE000A000000XX
				E6.2H-A 6000 Ekip Touch LSIG	Z6HLUTAF000A000000XX	ZDHLUTAF000A000000XX
				E6.2H-A 6000 Ekip Hi-Touch LSI	Z6HLUTAJ200A000000XX	ZDHLUTAJ200A000000XX
				E6.2H-A 6000 Ekip Hi-Touch LSIG	Z6HLUTAK200A000000XX	ZDHLUTAK200A000000XX

[1)] Contact ABB for the availability of this product

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip Dip LI	Z6VJURAA000A000000XX	ZDVJURAA000A000000XX
				E6.2V-A 4000 Ekip Dip LSI	Z6VJURAB000A000000XX	ZDVJURAB000A000000XX
				E6.2V-A 4000 Ekip Dip LSIG	Z6VJURAC000A000000XX	ZDVJURAC000A000000XX
				E6.2V-A 4000 Ekip Touch LI	Z6VJURAD000A000000XX	ZDVJURAD000A000000XX
				E6.2V-A 4000 Ekip Touch LSI	Z6VJURAE000A000000XX	ZDVJURAE000A000000XX
				E6.2V-A 4000 Ekip Touch LSIG	Z6VJURAF000A000000XX	ZDVJURAF000A000000XX
				E6.2V-A 4000 Ekip Hi-Touch LSI	Z6VJURAJ200A000000XX	ZDVJURAJ200A000000XX
				E6.2V-A 4000 Ekip Hi-Touch LSIG	Z6VJURAK200A000000XX	ZDVJURAK200A000000XX
	5000	100	100	E6.2V-A 5000 Ekip Dip LI	Z6VKUSAA000A000000XX	ZDVKUSAA000A000000XX
				E6.2V-A 5000 Ekip Dip LSI	Z6VKUSAB000A000000XX	ZDVKUSAB000A000000XX
				E6.2V-A 5000 Ekip Dip LSIG	Z6VKUSAC000A000000XX	ZDVKUSAC000A000000XX
				E6.2V-A 5000 Ekip Touch LI	Z6VKUSAD000A000000XX	ZDVKUSAD000A000000XX
				E6.2V-A 5000 Ekip Touch LSI	Z6VKUSAE000A000000XX	ZDVKUSAE000A000000XX
				E6.2V-A 5000 Ekip Touch LSIG	Z6VKUSAF000A000000XX	ZDVKUSAF000A000000XX
				E6.2V-A 5000 Ekip Hi-Touch LSI	Z6VKUSAJ200A000000XX	ZDVKUSAJ200A000000XX
				E6.2V-A 5000 Ekip Hi-Touch LSIG	Z6VKUSAK200A000000XX	ZDVKUSAK200A000000XX
	6000[1)]	100	100	E6.2V-A 6000 Ekip Dip LI	Z6VLUTAA000A000000XX	ZDVLUTAA000A000000XX
				E6.2V-A 6000 Ekip Dip LSI	Z6VLUTAB000A000000XX	ZDVLUTAB000A000000XX
				E6.2V-A 6000 Ekip Dip LSIG	Z6VLUTAC000A000000XX	ZDVLUTAC000A000000XX
				E6.2V-A 6000 Ekip Touch LI	Z6VLUTAD000A000000XX	ZDVLUTAD000A000000XX
				E6.2V-A 6000 Ekip Touch LSI	Z6VLUTAE000A000000XX	ZDVLUTAE000A000000XX
				E6.2V-A 6000 Ekip Touch LSIG	Z6VLUTAF000A000000XX	ZDVLUTAF000A000000XX
				E6.2V-A 6000 Ekip Hi-Touch LSI	Z6VLUTAJ200A000000XX	ZDVLUTAJ200A000000XX
				E6.2V-A 6000 Ekip Hi-Touch LSIG	Z6VLUTAK200A000000XX	ZDVLUTAK200A000000XX

[1)] Contact ABB for the availability of this product

Automatic circuit breakers
Drawout version for power distribution

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	4 Pole Code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip Dip LI	ZEHJURAA000A000000XX
				E6.2H-A/f 4000 Ekip Dip LSI	ZEHJURAB000A000000XX
				E6.2H-A/f 4000 Ekip Dip LSIG	ZEHJURAC000A000000XX
				E6.2H-A/f 4000 Ekip Touch LI	ZEHJURAD000A000000XX
				E6.2H-A/f 4000 Ekip Touch LSI	ZEHJURAE000A000000XX
				E6.2H-A/f 4000 Ekip Touch LSIG	ZEHJURAF000A000000XX
				E6.2H-A/f 4000 Ekip Hi-Touch LSI	ZEHJURAJ200A000000XX
				E6.2H-A/f 4000 Ekip Hi-Touch LSIG	ZEHJURAK200A000000XX
	5000	85	85	E6.2H-A/f 5000 Ekip Dip LI	ZEHKUSAA000A000000XX
				E6.2H-A/f 5000 Ekip Dip LSI	ZEHKUSAB000A000000XX
				E6.2H-A/f 5000 Ekip Dip LSIG	ZEHKUSAC000A000000XX
				E6.2H-A/f 5000 Ekip Touch LI	ZEHKUSAD000A000000XX
				E6.2H-A/f 5000 Ekip Touch LSI	ZEHKUSAE000A000000XX
				E6.2H-A/f 5000 Ekip Touch LSIG	ZEHKUSAF000A000000XX
				E6.2H-A/f 5000 Ekip Hi-Touch LSI	ZEHKUSAJ200A000000XX
				E6.2H-A/f 5000 Ekip Hi-Touch LSIG	ZEHKUSAK200A000000XX
	6000[1)]	85	85	E6.2H-A/f 6000 Ekip Dip LI	ZEHLUTAA000A000000XX
				E6.2H-A/f 6000 Ekip Dip LSI	ZEHLUTAB000A000000XX
				E6.2H-A/f 6000 Ekip Dip LSIG	ZEHLUTAC000A000000XX
				E6.2H-A/f 6000 Ekip Touch LI	ZEHLUTAD000A000000XX
				E6.2H-A/f 6000 Ekip Touch LSI	ZEHLUTAE000A000000XX
				E6.2H-A/f 6000 Ekip Touch LSIG	ZEHLUTAF000A000000XX
				E6.2H-A/f 6000 Ekip Hi-Touch LSI	ZEHLUTAJ200A000000XX
				E6.2H-A/f 6000 Ekip Hi-Touch LSIG	ZEHLUTAK200A000000XX

[1)] Contact ABB for the availability of this product

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

Size	Frame Amps	Int. Rating (508V)	Withstand (kA)	Type	4 Pole Code
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip Dip LI	ZEVJURAA000A000000XX
				E6.2V-A/f 4000 Ekip Dip LSI	ZEVJURAB000A000000XX
				E6.2V-A/f 4000 Ekip Dip LSIG	ZEVJURAC000A000000XX
				E6.2V-A/f 4000 Ekip Touch LI	ZEVJURAD000A000000XX
				E6.2V-A/f 4000 Ekip Touch LSI	ZEVJURAE000A000000XX
				E6.2V-A/f 4000 Ekip Touch LSIG	ZEVJURAF000A000000XX
				E6.2V-A/f 4000 Ekip Hi-Touch LSI	ZEVJURAJ200A000000XX
				E6.2V-A/f 4000 Ekip Hi-Touch LSIG	ZEVJURAK200A000000XX
	5000	100	100	E6.2V-A/f 5000 Ekip Dip LI	ZEVKUSAA000A000000XX
				E6.2V-A/f 5000 Ekip Dip LSI	ZEVKUSAB000A000000XX
				E6.2V-A/f 5000 Ekip Dip LSIG	ZEVKUSAC000A000000XX
				E6.2V-A/f 5000 Ekip Touch LI	ZEVKUSAD000A000000XX
				E6.2V-A/f 5000 Ekip Touch LSI	ZEVKUSAE000A000000XX
				E6.2V-A/f 5000 Ekip Touch LSIG	ZEVKUSAF000A000000XX
				E6.2V-A/f 5000 Ekip Hi-Touch LSI	ZEVKUSAJ200A000000XX
				E6.2V-A/f 5000 Ekip Hi-Touch LSIG	ZEVKUSAK200A000000XX
	6000[1)]	100	100	E6.2V-A/f 6000 Ekip Dip LI	ZEVLUTAA000A000000XX
				E6.2V-A/f 6000 Ekip Dip LSI	ZEVLUTAB000A000000XX
				E6.2V-A/f 6000 Ekip Dip LSIG	ZEVLUTAC000A000000XX
				E6.2V-A/f 6000 Ekip Touch LI	ZEVLUTAD000A000000XX
				E6.2V-A/f 6000 Ekip Touch LSI	ZEVLUTAE000A000000XX
				E6.2V-A/f 6000 Ekip Touch LSIG	ZEVLUTAF000A000000XX
				E6.2V-A/f 6000 Ekip Hi-Touch LSI	ZEVLUTAJ200A000000XX
				E6.2V-A/f 6000 Ekip Hi-Touch LSIG	ZEVLUTAK200A000000XX

[1)] Contact ABB for the availability of this product

Automatic circuit breakers
Fixed version for generators

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip G Touch LSIG	Z1BCUFBN200A000000XX	ZABCUFBN200A000000XX
				E1.2B-A 800 Ekip G Hi-Touch LSIG	Z1BCUFBQ200A000000XX	ZABCUFBQ200A000000XX
	1200	42	42	E1.2B-A 1200 Ekip G Touch LSIG	Z1BDUHBN200A000000XX	ZABDUHBN200A000000XX
				E1.2B-A 1200 Ekip G Hi-Touch LSIG	Z1BDUHBQ200A000000XX	ZABDUHBQ200A000000XX
E1.2N-A	800	50	50	E1.2N-A 800 Ekip G Touch LSIG	Z1NCUFBN200A000000XX	ZANCUFBN200A000000XX
				E1.2N-A 800 Ekip G Hi-Touch LSIG	Z1NCUFBQ200A000000XX	ZANCUFBQ200A000000XX
	1200	50	50	E1.2N-A 1200 Ekip G Touch LSIG	Z1NDUHBN200A000000XX	ZANDUHBN200A000000XX
				E1.2N-A 1200 Ekip G Hi-Touch LSIG	Z1NDUHBQ200A000000XX	ZANDUHBQ200A000000XX
E1.2S-A	250	65	50	E1.2S-A 250 Ekip G Touch LSIG	Z1SAUCBN200A000000XX	ZASAUCBN200A000000XX
				E1.2S-A 250 Ekip G Hi-Touch LSIG	Z1SAUCBQ200A000000XX	ZASAUCBQ200A000000XX
	400	65	50	E1.2S-A 400 Ekip G Touch LSIG	Z1SBUDBN200A000000XX	ZASBUDBN200A000000XX
				E1.2S-A 400 Ekip G Hi-Touch LSIG	Z1SBUDBQ200A000000XX	ZASBUDBQ200A000000XX
	800	65	50	E1.2S-A 800 Ekip G Touch LSIG	Z1SCUFBN200A000000XX	ZASCUFBN200A000000XX
				E1.2S-A 800 Ekip G Hi-Touch LSIG	Z1SCUFBQ200A000000XX	ZASCUFBQ200A000000XX
	1200	65	50	E1.2S-A 1200 Ekip G Touch LSIG	Z1SDUHBN200A000000XX	ZASDUHBN200A000000XX
				E1.2S-A 1200 Ekip G Hi-Touch LSIG	Z1SDUHBQ200A000000XX	ZASDUHBQ200A000000XX

Automatic circuit breakers
Fixed version for generators

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip G Touch LSIG	Z2BEUJBN200A000000XX	ZBBEUJBN200A000000XX
				E2.2B-A 1600 Ekip G Hi-Touch LSIG	Z2BEUJBQ200A000000XX	ZBBEUJBQ200A000000XX
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip G Touch LSIG	Z2NEUJBN200A000000XX	ZBNEUJBN200A000000XX
				E2.2N-A 1600 Ekip G Hi-Touch LSIG	Z2NEUJBQ200A000000XX	ZBNEUJBQ200A000000XX
	2000	50	50	E2.2N-A 2000 Ekip G Touch LSIG	Z2NFUKBN200A000000XX	ZBNFUKBN200A000000XX
				E2.2N-A 2000 Ekip G Hi-Touch LSIG	Z2NFUKBQ200A000000XX	ZBNFUKBQ200A000000XX
E2.2S-A	800	65	65	E2.2S-A 800 Ekip G Touch LSIG	Z2SCUFBN200A000000XX	ZBSCUFBN200A000000XX
				E2.2S-A 800 Ekip G Hi-Touch LSIG	Z2SCUFBQ200A000000XX	ZBSCUFBQ200A000000XX
	1200	65	65	E2.2S-A 1200 Ekip G Touch LSIG	Z2SDUHBN200A000000XX	ZBSDUHBN200A000000XX
				E2.2S-A 1200 Ekip G Hi-Touch LSIG	Z2SDUHBQ200A000000XX	ZBSDUHBQ200A000000XX
	1600	65	65	E2.2S-A 1600 Ekip G Touch LSIG	Z2SEUJBN200A000000XX	ZBSEUJBN200A000000XX
				E2.2S-A 1600 Ekip G Hi-Touch LSIG	Z2SEUJBQ200A000000XX	ZBSEUJBQ200A000000XX
	2000	65	65	E2.2S-A 2000 Ekip G Touch LSIG	Z2SFUKBN200A000000XX	ZBSFUKBN200A000000XX
				E2.2S-A 2000 Ekip G Hi-Touch LSIG	Z2SFUKBQ200A000000XX	ZBSFUKBQ200A000000XX
E2.2H-A	800	85	85	E2.2H-A 800 Ekip G Touch LSIG	Z2HCUFBN200A000000XX	ZBHCUFBN200A000000XX
				E2.2H-A 800 Ekip G Hi-Touch LSIG	Z2HCUFBQ200A000000XX	ZBHCUFBQ200A000000XX
	1200	85	85	E2.2H-A 1200 Ekip G Touch LSIG	Z2HDUHBN200A000000XX	ZBHDUHBN200A000000XX
				E2.2H-A 1200 Ekip G Hi-Touch LSIG	Z2HDUHBQ200A000000XX	ZBHDUHBQ200A000000XX
	1600	85	85	E2.2H-A 1600 Ekip G Touch LSIG	Z2HEUJBN200A000000XX	ZBHEUJBN200A000000XX
				E2.2H-A 1600 Ekip G Hi-Touch LSIG	Z2HEUJBQ200A000000XX	ZBHEUJBQ200A000000XX
	2000	85	85	E2.2H-A 2000 Ekip G Touch LSIG	Z2HFUKBN200A000000XX	ZBHFUKBN200A000000XX
				E2.2H-A 2000 Ekip G Hi-Touch LSIG	Z2HFUKBQ200A000000XX	ZBHFUKBQ200A000000XX
E2.2V-A	250	100	85	E2.2V-A 250 Ekip G Touch LSIG	Z2VAUCBN200A000000XX	ZBVAUCBN200A000000XX
				E2.2V-A 250 Ekip G Hi-Touch LSIG	Z2VAUCBQ200A000000XX	ZBVAUCBQ200A000000XX
	400	100	85	E2.2V-A 400 Ekip G Touch LSIG	Z2VBUDBN200A000000XX	ZBVBUDBN200A000000XX
				E2.2V-A 400 Ekip G Hi-Touch LSIG	Z2VBUDBQ200A000000XX	ZBVBUDBQ200A000000XX
	800	100	85	E2.2V-A 800 Ekip G Touch LSIG	Z2VCUFBN200A000000XX	ZBVCUFBN200A000000XX
				E2.2V-A 800 Ekip G Hi-Touch LSIG	Z2VCUFBQ200A000000XX	ZBVCUFBQ200A000000XX
	1200	100	85	E2.2V-A 1200 Ekip G Touch LSIG	Z2VDUHBN200A000000XX	ZBVDUHBN200A000000XX
				E2.2V-A 1200 Ekip G Hi-Touch LSIG	Z2VDUHBQ200A000000XX	ZBVDUHBQ200A000000XX
	1600	100	85	E2.2V-A 1600 Ekip G Touch LSIG	Z2VEUJBN200A000000XX	ZBVEUJBN200A000000XX
				E2.2V-A 1600 Ekip G Hi-Touch LSIG	Z2VEUJBQ200A000000XX	ZBVEUJBQ200A000000XX
	2000	100	85	E2.2V-A 2000 Ekip G Touch LSIG	Z2VFUKBN200A000000XX	ZBVFUKBN200A000000XX
				E2.2V-A 2000 Ekip G Hi-Touch LSIG	Z2VFUKBQ200A000000XX	ZBVFUKBQ200A000000XX

SACE Emax 2 E4.2 S-A, H-A, V-A, X-A - Adjustable rear terminals (HR) up to 2500A, vertical rear terminals for 3200A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip G Touch LSIG	Z4SGULBN200A000000XX	ZCSGULBN200A000000XX
				E4.2S-A 2500 Ekip G Hi-Touch LSIG	Z4SGULBQ200A000000XX	ZCSGULBQ200A000000XX
	3200[1)]	65	65	E4.2S-A 3200 Ekip G Touch LSIG	Z4SHUNBN200A000000XX	ZCSHUNBN200A000000XX
				E4.2S-A 3200 Ekip G Hi-Touch LSIG	Z4SHUNBQ200A000000XX	ZCSHUNBQ200A000000XX
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip G Touch LSIG	Z4HGULBN200A000000XX	ZCHGULBN200A000000XX
				E4.2H-A 2500 Ekip G Hi-Touch LSIG	Z4HGULBQ200A000000XX	ZCHGULBQ200A000000XX
	3200[1)]	85	85	E4.2H-A 3200 Ekip G Touch LSIG	Z4HHUNBN200A000000XX	ZCHHUNBN200A000000XX
				E4.2H-A 3200 Ekip G Hi-Touch LSIG	Z4HHUNBQ200A000000XX	ZCHHUNBQ200A000000XX
E4.2V-A	800	100	85	E4.2V-A 800 Ekip G Touch LSIG	Z4VCUFBN200A000000XX	ZCVCUFBN200A000000XX
				E4.2V-A 800 Ekip G Hi-Touch LSIG	Z4VCUFBQ200A000000XX	ZCVCUFBQ200A000000XX
	1600	100	85	E4.2V-A 1600 Ekip G Touch LSIG	Z4VEUJBN200A000000XX	ZCVEUJBN200A000000XX
				E4.2V-A 1600 Ekip G Hi-Touch LSIG	Z4VEUJBQ200A000000XX	ZCVEUJBQ200A000000XX
	2000	100	85	E4.2V-A 2000 Ekip G Touch LSIG	Z4VFUKBN200A000000XX	ZCVFUKBN200A000000XX
				E4.2V-A 2000 Ekip G Hi-Touch LSIG	Z4VFUKBQ200A000000XX	ZCVFUKBQ200A000000XX
	2500	100	85	E4.2V-A 2500 Ekip G Touch LSIG	Z4VGULBN200A000000XX	ZCVGULBN200A000000XX
				E4.2V-A 2500 Ekip G Hi-Touch LSIG	Z4VGULBQ200A000000XX	ZCVGULBQ200A000000XX
	3200[1)]	100	85	E4.2V-A 3200 Ekip G Touch LSIG	Z4VHUNBN200A000000XX	ZCVHUNBN200A000000XX
				E4.2V-A 3200 Ekip G Hi-Touch LSIG	Z4VHUNBQ200A000000XX	ZCVHUNBQ200A000000XX

[1)] 3200A frames with rear terminals are supplied as vertical only

Automatic circuit breakers
Fixed version for generators


1SDC200664F001_UL

SACE Emax 2 E6.2 H-A, V-A - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip G Touch LSIG	Z6HJURBN200A000000XX	ZDHJURBN200A000000XX
				E6.2H-A 4000 Ekip G Hi-Touch LSIG	Z6HJURBQ200A000000XX	ZDHJURBQ200A000000XX
	5000	85	85	E6.2H-A 5000 Ekip G Touch LSIG	Z6HKUSBN200A000000XX	ZDHKUSBN200A000000XX
				E6.2H-A 5000 Ekip G Hi-Touch LSIG	Z6HKUSBQ200A000000XX	ZDHKUSBQ200A000000XX
	6000[1)2)]	85	85	E6.2H-A 6000 Ekip G Touch LSIG	Z6HLUTBN200A000000XX	ZDHLUTBN200A000000XX
				E6.2H-A 6000 Ekip G Hi-Touch LSIG	Z6HLUTBJ200A000000XX	ZDHLUTBQ200A000000XX
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip G Touch LSIG	Z6VJURBN200A000000XX	ZDVJURBN200A000000XX
				E6.2V-A 4000 Ekip G Hi-Touch LSIG	Z6VJURBQ200A000000XX	ZDVJURBQ200A000000XX
	5000	100	100	E6.2V-A 5000 Ekip G Touch LSIG	Z6VKUSBN200A000000XX	ZDVKUSBN200A000000XX
				E6.2V-A 5000 Ekip G Hi-Touch LSIG	Z6VKUSBQ200A000000XX	ZDVKUSBQ200A000000XX
	6000[1)2)]	100	100	E6.2V-A 6000 Ekip G Touch LSIG	Z6VLUTBN200A000000XX	ZDVLUTBN200A000000XX
				E6.2V-A 6000 Ekip G Hi-Touch LSIG	Z6VLUTBQ200A000000XX	ZDVLUTBQ200A000000XX

[1)] Contact ABB for the availability of this product
[2)] 6000A frames with rear terminals are supplied as vertical only


1SDC200864F001_UL

SACE Emax 2 E6.2 H-A/f, V-A/f full size - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Pole Code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip G Touch LSIG	ZEHJURBN200A000000XX
				E6.2H-A/f 4000 Ekip G Hi-Touch LSIG	ZEHJURBQ200A000000XX
	5000	85	85	E6.2H-A/f 5000 Ekip G Touch LSIG	ZEHKUSBN200A000000XX
				E6.2H-A/f 5000 Ekip G Hi-Touch LSIG	ZEHKUSBQ200A000000XX
	6000[1)2)]	85	85	E6.2H-A/f 6000 Ekip G Touch LSIG	ZEHLUTBN200A000000XX
				E6.2H-A/f 6000 Ekip G Hi-Touch LSIG	ZEHLUTBQ200A000000XX
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip G Touch LSIG	ZEVJURBN200A000000XX
				E6.2V-A/f 4000 Ekip G Hi-Touch LSIG	ZEVJURBQ200A000000XX
	5000	100	100	E6.2V-A/f 5000 Ekip G Touch LSIG	ZEVKUSBN200A000000XX
				E6.2V-A/f 5000 Ekip G Hi-Touch LSIG	ZEVKUSBQ200A000000XX
	6000[1)2)]	100	100	E6.2V-A/f 6000 Ekip G Touch LSIG	ZEVLUTBN200A000000XX
				E6.2V-A/f 6000 Ekip G Hi-Touch LSIG	ZEVLUTBQ200A000000XX

[1)] Contact ABB for the availability of this product
[2)] 6000A frames with rear terminals are supplied as vertical only

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 Pole Code	4 Pole Code
E1.2B-A	800	42	42	E1.2B-A 800 Ekip G Touch LSIG	Z1BCUFAN200A000000XX	ZABCUFAN200A000000XX
				E1.2B-A 800 Ekip G Hi-Touch LSIG	Z1BCUFAQ200A000000XX	ZABCUFAQ200A000000XX
	1200	42	42	E1.2B-A 1200 Ekip G Touch LSIG	Z1BDUHAN200A000000XX	ZABDUHAN200A000000XX
				E1.2B-A 1200 Ekip G Hi-Touch LSIG	Z1BDUHAQ200A000000XX	ZABDUHAQ200A000000XX
E1.2N-A	800	50	50	E1.2N-A 800 Ekip G Touch LSIG	Z1NCUFAN200A000000XX	ZANCUFAN200A000000XX
				E1.2N-A 800 Ekip G Hi-Touch LSIG	Z1NCUFAQ200A000000XX	ZANCUFAQ200A000000XX
	1200	50	50	E1.2N-A 1200 Ekip G Touch LSIG	Z1NDUHAN200A000000XX	ZANDUHAN200A000000XX
				E1.2N-A 1200 Ekip G Hi-Touch LSIG	Z1NDUHAQ200A000000XX	ZANDUHAQ200A000000XX
E1.2S-A	250	65	50	E1.2S-A 250 Ekip G Touch LSIG	Z1SAUCAN200A000000XX	ZASAUCAN200A000000XX
				E1.2S-A 250 Ekip G Hi-Touch LSIG	Z1SAUCAQ200A000000XX	ZASAUCAQ200A000000XX
	400	65	50	E1.2S-A 400 Ekip G Touch LSIG	Z1SBUDAN200A000000XX	ZASBUDAN200A000000XX
				E1.2S-A 400 Ekip G Hi-Touch LSIG	Z1SBUDAQ200A000000XX	ZASBUDAQ200A000000XX
	800	65	50	E1.2S-A 800 Ekip G Touch LSIG	Z1SCUFAN200A000000XX	ZASCUFAN200A000000XX
				E1.2S-A 800 Ekip G Hi-Touch LSIG	Z1SCUFAQ200A000000XX	ZASCUFAQ200A000000XX
	1200	65	50	E1.2S-A 1200 Ekip G Touch LSIG	Z1SDUHAN200A000000XX	ZASDUHAN200A000000XX
				E1.2S-A 1200 Ekip G Hi-Touch LSIG	Z1SDUHAQ200A000000XX	ZASDUHAQ200A000000XX

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 Pole Code	4 Pole Code
E2.2B-A	1600	42	42	E2.2B-A 1600 Ekip G Touch LSIG	Z2BEUJAN200A000000XX	ZBBEUJAN200A000000XX
				E2.2B-A 1600 Ekip G Hi-Touch LSIG	Z2BEUJAQ200A000000XX	ZBBEUJAQ200A000000XX
E2.2N-A	1600	50	50	E2.2N-A 1600 Ekip G Touch LSIG	Z2NEUJAN200A000000XX	ZBNEUJAN200A000000XX
				E2.2N-A 1600 Ekip G Hi-Touch LSIG	Z2NEUJAQ200A000000XX	ZBNEUJAQ200A000000XX
	2000	50	50	E2.2N-A 2000 Ekip G Touch LSIG	Z2NFUKAN200A000000XX	ZBNFUKAN200A000000XX
				E2.2N-A 2000 Ekip G Hi-Touch LSIG	Z2NFUKAQ200A000000XX	ZBNFUKAQ200A000000XX
E2.2S-A	800	65	65	E2.2S-A 800 Ekip G Touch LSIG	Z2SCUFAN200A000000XX	ZBSCUFAN200A000000XX
				E2.2S-A 800 Ekip G Hi-Touch LSIG	Z2SCUFAQ200A000000XX	ZBSCUFAQ200A000000XX
	1200	65	65	E2.2S-A 1200 Ekip G Touch LSIG	Z2SDUHAN200A000000XX	ZBSDUHAN200A000000XX
				E2.2S-A 1200 Ekip G Hi-Touch LSIG	Z2SDUHAQ200A000000XX	ZBSDUHAQ200A000000XX
	1600	65	65	E2.2S-A 1600 Ekip G Touch LSIG	Z2SEUJAN200A000000XX	ZBSEUJAN200A000000XX
				E2.2S-A 1600 Ekip G Hi-Touch LSIG	Z2SEUJAQ200A000000XX	ZBSEUJAQ200A000000XX
	2000	65	65	E2.2S-A 2000 Ekip G Touch LSIG	Z2SFUKAN200A000000XX	ZBSFUKAN200A000000XX
				E2.2S-A 2000 Ekip G Hi-Touch LSIG	Z2SFUKAQ200A000000XX	ZBSFUKAQ200A000000XX
E2.2H-A	800	85	85	E2.2H-A 800 Ekip G Touch LSIG	Z2HCUFAN200A000000XX	ZBHCUFAN200A000000XX
				E2.2H-A 800 Ekip G Hi-Touch LSIG	Z2HCUFAQ200A000000XX	ZBHCUFAQ200A000000XX
	1200	85	85	E2.2H-A 1200 Ekip G Touch LSIG	Z2HDUHAN200A000000XX	ZBHDUHAN200A000000XX
				E2.2H-A 1200 Ekip G Hi-Touch LSIG	Z2HDUHAQ200A000000XX	ZBHDUHAQ200A000000XX
	1600	85	85	E2.2H-A 1600 Ekip G Touch LSIG	Z2HEUJAN200A000000XX	ZBHEUJAN200A000000XX
				E2.2H-A 1600 Ekip G Hi-Touch LSIG	Z2HEUJAQ200A000000XX	ZBHEUJAQ200A000000XX
	2000	85	85	E2.2H-A 2000 Ekip G Touch LSIG	Z2HFUKAN200A000000XX	ZBHFUKAN200A000000XX
				E2.2H-A 2000 Ekip G Hi-Touch LSIG	Z2HFUKAQ200A000000XX	ZBHFUKAQ200A000000XX
E2.2V-A	250	100	85	E2.2V-A 250 Ekip G Touch LSIG	Z2VAUCAN200A000000XX	ZBVAUCAN200A000000XX
				E2.2V-A 250 Ekip G Hi-Touch LSIG	Z2VAUCAQ200A000000XX	ZBVAUCAQ200A000000XX
	400	100	85	E2.2V-A 400 Ekip G Touch LSIG	Z2VBUDAN200A000000XX	ZBVBUDAN200A000000XX
				E2.2V-A 400 Ekip G Hi-Touch LSIG	Z2VBUDAQ200A000000XX	ZBVBUDAQ200A000000XX
	800	100	85	E2.2V-A 800 Ekip G Touch LSIG	Z2VCUFAN200A000000XX	ZBVCUFAN200A000000XX
				E2.2V-A 800 Ekip G Hi-Touch LSIG	Z2VCUFAQ200A000000XX	ZBVCUFAQ200A000000XX
	1200	100	85	E2.2V-A 1200 Ekip G Touch LSIG	Z2VDUHAN200A000000XX	ZBVDUHAN200A000000XX
				E2.2V-A 1200 Ekip G Hi-Touch LSIG	Z2VDUHAQ200A000000XX	ZBVDUHAQ200A000000XX
	1600	100	85	E2.2V-A 1600 Ekip G Touch LSIG	Z2VEUJAN200A000000XX	ZBVEUJAN200A000000XX
				E2.2V-A 1600 Ekip G Hi-Touch LSIG	Z2VEUJAQ200A000000XX	ZBVEUJAQ200A000000XX
	2000	100	85	E2.2V-A 2000 Ekip G Touch LSIG	Z2VFUKAN200A000000XX	ZBVFUKAN200A000000XX
				E2.2V-A 2000 Ekip G Hi-Touch LSIG	Z2VFUKAQ200A000000XX	ZBVFUKAQ200A000000XX

Automatic circuit breakers
Drawout version for generators

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2S-A	2500	65	65	E4.2S-A 2500 Ekip G Touch LSIG	Z4SGULAN200A000000XX	ZCSGULAN200A000000XX
				E4.2S-A 2500 Ekip G Hi-Touch LSIG	Z4SGULAQ200A000000XX	ZCSGULAQ200A000000XX
	3200	65	65	E4.2S-A 3200 Ekip G Touch LSIG	Z4SHUNAN200A000000XX	ZCSHUNAN200A000000XX
				E4.2S-A 3200 Ekip G Hi-Touch LSIG	Z4SHUNAQ200A000000XX	ZCSHUNAQ200A000000XX
E4.2H-A	2500	85	85	E4.2H-A 2500 Ekip G Touch LSIG	Z4HGULAN200A000000XX	ZCHGULAN200A000000XX
				E4.2H-A 2500 Ekip G Hi-Touch LSIG	Z4HGULAQ200A000000XX	ZCHGULAQ200A000000XX
	3200	85	85	E4.2H-A 3200 Ekip G Touch LSIG	Z4HHUNAN200A000000XX	ZCHHUNAN200A000000XX
				E4.2H-A 3200 Ekip G Hi-Touch LSIG	Z4HHUNAQ200A000000XX	ZCHHUNAQ200A000000XX
E4.2V-A	800	100	85	E4.2V-A 800 Ekip G Touch LSIG	Z4VCUFAN200A000000XX	ZCVCUFAN200A000000XX
				E4.2V-A 800 Ekip G Hi-Touch LSIG	Z4VCUFAQ200A000000XX	ZCVCUFAQ200A000000XX
	1600	100	85	E4.2V-A 1600 Ekip G Touch LSIG	Z4VEUJAN200A000000XX	ZCVEUJAN200A000000XX
				E4.2V-A 1600 Ekip G Hi-Touch LSIG	Z4VEUJAQ200A000000XX	ZCVEUJAQ200A000000XX
	2000	100	85	E4.2V-A 2000 Ekip G Touch LSIG	Z4VFUKAN200A000000XX	ZCVFUKAN200A000000XX
				E4.2V-A 2000 Ekip G Hi-Touch LSIG	Z4VFUKAQ200A000000XX	ZCVFUKAQ200A000000XX
	2500	100	85	E4.2V-A 2500 Ekip G Touch LSIG	Z4VGULAN200A000000XX	ZCVGULAN200A000000XX
				E4.2V-A 2500 Ekip G Hi-Touch LSIG	Z4VGULAQ200A000000XX	ZCVGULAQ200A000000XX
	3200	100	85	E4.2V-A 3200 Ekip G Touch LSIG	Z4VHUNAN200A000000XX	ZCVHUNAN200A000000XX
				E4.2V-A 3200 Ekip G Hi-Touch LSIG	Z4VHUNAQ200A000000XX	ZCVHUNAQ200A000000XX

[1] Contact ABB for the availability of this product


1SDC200668F001_UL

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2H-A	4000	85	85	E6.2H-A 4000 Ekip G Touch LSIG	Z6HJURAN200A000000XX	ZDHJURAN200A000000XX
				E6.2H-A 4000 Ekip G Hi-Touch LSIG	Z6HJURAQ200A000000XX	ZDHJURAQ200A000000XX
	5000	85	85	E6.2H-A 5000 Ekip G Touch LSIG	Z6HKUSAN200A000000XX	ZDHKUSAN200A000000XX
				E6.2H-A 5000 Ekip G Hi-Touch LSIG	Z6HKUSAQ200A000000XX	ZDHKUSAQ200A000000XX
	6000[1)]	85	85	E6.2H-A 6000 Ekip G Touch LSIG	Z6HLUTAN200A000000XX	ZDHLUTAN200A000000XX
				E6.2H-A 6000 Ekip G Hi-Touch LSIG	Z6HLUTAQ200A000000XX	ZDHLUTAQ200A000000XX
E6.2V-A	4000	100	100	E6.2V-A 4000 Ekip G Touch LSIG	Z6VJURAN200A000000XX	ZDVJURAN200A000000XX
				E6.2V-A 4000 Ekip G Hi-Touch LSIG	Z6VJURAQ200A000000XX	ZDVJURAQ200A000000XX
	5000	100	100	E6.2V-A 5000 Ekip G Touch LSIG	Z6VKUSAN200A000000XX	ZDVKUSAN200A000000XX
				E6.2V-A 5000 Ekip G Hi-Touch LSIG	Z6VKUSAQ200A000000XX	ZDVKUSAJ200A000000XX
	6000[1)]	100	100	E6.2V-A 6000 Ekip G Touch LSIG	Z6VLUTAN200A000000XX	ZDVLUTAN200A000000XX
				E6.2V-A 6000 Ekip G Hi-Touch LSIG	Z6VLUTAQ200A000000XX	ZDVLUTAQ200A000000XX

[1)] Contact ABB for the availability of this product

Automatic circuit breakers
Drawout version for generators


1SDC200668F001_UL

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

Size	Frame Amps	Int. Rating (kA@508V)	Withstand (kA)	Type	4 Pole Code
E6.2H-A/f	4000	85	85	E6.2H-A/f 4000 Ekip G Touch LSIG	ZEHJURAN200A000000XX
				E6.2H-A/f 4000 Ekip G Hi-Touch LSIG	ZEHJURAQ200A000000XX
	5000	85	85	E6.2H-A/f 5000 Ekip G Touch LSIG	ZEHKUSAN200A000000XX
				E6.2H-A/f 5000 Ekip G Hi-Touch LSIG	ZEHKUSAQ200A000000XX
	6000[1)]	85	85	E6.2H-A/f 6000 Ekip G Touch LSIG	ZEHLUTAN200A000000XX
				E6.2H-A/f 6000 Ekip G Hi-Touch LSIG	ZEHLUTAQ200A000000XX
E6.2V-A/f	4000	100	100	E6.2V-A/f 4000 Ekip G Touch LSIG	ZEVJURAN200A000000XX
				E6.2V-A/f 4000 Ekip G Hi-Touch LSIG	ZEVJURAQ200A000000XX
	5000	100	100	E6.2V-A/f 5000 Ekip G Touch LSIG	ZEVKUSAN200A000000XX
				E6.2V-A/f 5000 Ekip G Hi-Touch LSIG	ZEVKUSAQ200A000000XX
	6000[1)]	100	100	E6.2V-A/f 6000 Ekip G Touch LSIG	ZEVLUTAN200A000000XX
				E6.2V-A/f 6000 Ekip G Hi-Touch LSIG	ZEVLUTAQ200A000000XX

[1)] Contact ABB for the availability of this product

Switch disconnectors
Fixed version


1SDC200669F001_UL

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

Size	Frame Amps	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E1.2B-A/MS	800	42	E1.2B-A/MS 800	Z1BC00B000000000000XX	ZABC00B000000000000XX
	1200	42	E1.2B-A/MS 1200	Z1BD00B000000000000XX	ZABD00B000000000000XX
E1.2N-A/MS	800	50	E1.2N-A/MS 800	Z1NC00B000000000000XX	ZANC00B000000000000XX
	1200	50	E1.2N-A/MS 1200	Z1ND00B000000000000XX	ZAND00B000000000000XX


1SDC200670F001_UL

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

Size	Frame Amps	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E2.2N-A/MS	1600	50	E2.2N-A/MS 1600	Z2NE00B000000000000XX	ZBNE00B000000000000XX
	2000	50	E2.2N-A/MS 2000	Z2NF00B000000000000XX	ZBNF00B000000000000XX
E2.2S-A/MS	800	65	E2.2S-A/MS 800	Z2SC00B000000000000XX	ZBSC00B000000000000XX
	1600	65	E2.2S-A/MS 1600	Z2SE00B000000000000XX	ZBSE00B000000000000XX
	2000	65	E2.2S-A/MS 2000	Z2SF00B000000000000XX	ZBSF00B000000000000XX
E2.2V-A/MS	800	85	E2.2V-A/MS 800	Z2VC00B000000000000XX	ZBVC00B000000000000XX
	1600	85	E2.2V-A/MS 1600	Z2VE00B000000000000XX	ZBVE00B000000000000XX
	2000	85	E2.2V-A/MS 2000	Z2VF00B000000000000XX	ZBVF00B000000000000XX


1SDC200671F001_UL

SACE Emax 2 E4.2 S-A/MS, H-A/MS, V-A/MS - Adjustable rear terminals (HR) up to 2500A, vertical rear terminals for 3200A

Size	Frame Amps	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E4.2S-A/MS	2500	65	E4.2S-A/MS 2500	Z4SG00B000000000000XX	ZCSG00B000000000000XX
	3200[1)]	65	E4.2S-A/MS 3200	Z4SH00B000000000000XX	ZCSH00B000000000000XX
E4.2H-A/MS	2500	85	E4.2H-A/MS 2500	Z4HG00B000000000000XX	ZCHG00B000000000000XX
	3200[1)]	85	E4.2H-A/MS 3200	Z4HH00B000000000000XX	ZCHH00B000000000000XX
E4.2V-A/MS	800	100	E4.2V-A/MS 800	Z4VC00B000000000000XX	ZCVC00B000000000000XX
	1600	100	E4.2V-A/MS 1600	Z4VE00B000000000000XX	ZCVE00B000000000000XX
	2000	100	E4.2V-A/MS 2000	Z4VF00B000000000000XX	ZCVF00B000000000000XX
	2500	100	E4.2V-A/MS 2500	Z4VG00B000000000000XX	ZCVG00B000000000000XX
	3200[1)]	100	E4.2V-A/MS 3200	Z4VH00B000000000000XX	ZCVH00B000000000000XX

[1)] 3200A frames with rear terminals are supplied as vertical only

Switch disconnectors
Fixed version


1SDC200672F001_UL

SACE Emax 2 E6.2 L-A/MS - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2L-A/MS	4000	100	E6.2L-A/MS 4000	Z6LJ00B000000000000XX	ZDLJ00B000000000000XX
	5000	100	E6.2L-A/MS 5000	Z6LK00B000000000000XX	ZDLK00B000000000000XX
	6000[1)]	100	E6.2L-A/MS 6000	Z6LL00B000000000000XX	ZDLL00B000000000000XX

[1)] 6000A frames with rear terminals are supplied as vertical only. Contact ABB for the availability of this product

SACE Emax 2 E6.2 L-A/f/MS full size - Adjustable rear terminals (HR) up to 5000A, vertical rear terminals for 6000A

Size	Frame Amps	Withstand (kA)	Type	4 Pole Code
E6.2L-A/f/MS	4000	100	E6.2L-A/f/MS 4000	ZELJ00B000000000000XX
	5000	100	E6.2L-A/f/MS 5000	ZELK00B000000000000XX
	6000[1)]	100	E6.2L-A/f/MS 6000	ZELL00B000000000000XX

[1)] 6000A frames with rear terminals are supplied as vertical only. Contact ABB for the availability of this product

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 Pole Code	4 Pole Code
E1.2B-A/MS	800	42	E1.2B-A/MS 800	Z1BC00A000000000000XX	ZABC00A000000000000XX
	1200	42	E1.2B-A/MS 1200	Z1BD00A000000000000XX	ZABD00A000000000000XX
E1.2N-A/MS	800	50	E1.2N-A/MS 800	Z1NC00A000000000000XX	ZANC00A000000000000XX
	1200	50	E1.2N-A/MS 1200	Z1ND00A000000000000XX	ZAND00A000000000000XX

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 Pole Code	4 Pole Code
E2.2N-A/MS	1600	50	E2.2N-A/MS 1600	Z2NE00A000000000000XX	Z2NE00A000000000000XX
	2000	50	E2.2N-A/MS 2000	Z2NF00A000000000000XX	Z2NF00A000000000000XX
E2.2S-A/MS	800	65	E2.2S-A/MS 800	Z2SC00A000000000000XX	Z2SC00A000000000000XX
	1600	65	E2.2S-A/MS 1600	Z2SE00A000000000000XX	Z2SE00A000000000000XX
	2000	65	E2.2S-A/MS 2000	Z2SF00A000000000000XX	Z2SF00A000000000000XX
E2.2V-A/MS	800	85	E2.2V-A/MS 800	Z2VC00A000000000000XX	Z2VC00A000000000000XX
	1600	85	E2.2V-A/MS 1600	Z2VE00A000000000000XX	Z2VE00A000000000000XX
	2000	85	E2.2V-A/MS 2000	Z2VF00A000000000000XX	Z2VF00A000000000000XX

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 Pole Code	4 Pole Code
E4.2S-A/MS	2500	65	E4.2S-A/MS 2500	Z4SG00A000000000000XX	ZCSG00A000000000000XX
	3200	65	E4.2S-A/MS 3200	Z4SH00A000000000000XX	ZCSH00A000000000000XX
E4.2H-A/MS	2500	85	E4.2H-A/MS 2500	Z4HG00A000000000000XX	ZCHG00A000000000000XX
	3200	85	E4.2H-A/MS 3200	Z4HH00A000000000000XX	ZCHH00A000000000000XX
E4.2V-A/MS	800	100	E4.2V-A/MS 800	Z4VC00A000000000000XX	ZCVC00A000000000000XX
	1600	100	E4.2V-A/MS 1600	Z4VE00A000000000000XX	ZCVE00A000000000000XX
	2000	100	E4.2V-A/MS 2000	Z4VF00A000000000000XX	ZCVF00A000000000000XX
	2500	100	E4.2V-A/MS 2500	Z4VG00A000000000000XX	ZCVG00A000000000000XX
	3200	100	E4.2V-A/MS 3200	Z4VH00A000000000000XX	ZCVH00A000000000000XX

Switch disconnectors
Drawout version

SACE Emax 2 E6.2 L-A/MS - Mobile part of switch disconnector (MP)

Size	Frame Amps	Withstand (kA)	Type	3 Pole Code	4 Pole Code
E6.2L-A/MS	4000	100	E6.2L-A/MS 4000	Z6LJ00A000000000000XX	ZDLJ00A000000000000XX
	5000	100	E6.2L-A/MS 5000	Z6LK00A000000000000XX	ZDLK00A000000000000XX
	6000[1)]	100	E6.2L-A/MS 6000	Z6LL00A000000000000XX	ZDLL00A000000000000XX

[1)] Contact ABB for the availability of this product

SACE Emax 2 E6.2 L-A/f/MS full size - Mobile part of switch disconnector (MP)

Size	Frame Amps	Withstand (kA)	Type	4 Pole Code
E6.2L-A/f/MS	4000	100	E6.2L-A/f/MS 4000	ZELJ00A000000000000XX
	5000	100	E6.2L-A/f/MS 5000	ZELK00A000000000000XX
	6000[1)]	100	E6.2L-A/f/MS 6000	ZELL00A000000000000XX

[1)] Contact ABB for the availability of this product

Cradles

SACE Emax 2 for UL 1066 cradles

Size	Performance	Amperage range	Terminal type	Type	3 Pole Code	4 Pole Code
E1.2	B-A, N-A, S-A	250 - 1200	HR - HR	E1.2-A W FP Iu=1200 HR HR UL	Z1A12A0XX	ZAA12A0XX
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	Z2A20A0XX	ZBA20A0XX
E4.2	S-A, H-A, V-A, L-A	800 - 2500	HR - HR	E4.2-A W FP Iu=2500 HR HR UL	Z4A25A0XX	ZCA25A0XX
	S-A, H-A, V-A, L-A	3200	VR - VR	E4.2-A W FP Iu=3200 VR VR UL	Z4A32A0XX	ZCA32A0XX
E6.2	H-A, V-A, L-A	4000 - 5000	HR - HR	E6.2-A W FP Iu=5000 VR VR UL	Z6A50A0XX	ZDA50A0XX
	H-A, V-A, L-A	6000[1)]	VR - VR	E6.2-A W FP Iu=6000 3p VR VR UL	Z6A60A0XX	ZDA60A0XX
E6.2/f	H-A, V-A, L-A	4000 - 5000	HR - HR	E6.2-A W FP Iu=5000 HR HR UL	—	ZEA50A0XX
	H-A, V-A, L-A	6000[1)]	VR - VR	E6.2-A W FP Iu=6000 VR VR UL	—	ZEA60A0XX

[1)] Contact ABB for the availability of this product
* Contact ABB for the availability of X-A version cradles

Accessories
Electrical accessories

First and second shunt trip - YO

Size	Type	Code
E1.2..E6.2	YO E1.2..E6.2 24 VAC/DC	ZEASA
E1.2..E6.2	YO E1.2..E6.2 30 VAC/DC	ZEASB
E1.2..E6.2	YO E1.2..E6.2 48 VAC/DC	ZEASC
E1.2..E6.2	YO E1.2..E6.2 60 VAC/DC	ZEASD
E1.2..E6.2	YO E1.2..E6.2 110-120 VAC/DC	ZEASE
E1.2..E6.2	YO E1.2..E6.2 120-127 VAC/DC	ZEASF
E1.2..E6.2	YO E1.2..E6.2 220-240 VAC/DC	ZEASG
E1.2..E6.2	YO E1.2..E6.2 240-250 VAC/DC	ZEASH
E1.2..E6.2	YO E1.2..E6.2 277 VAC	ZEASJ
E1.2..E6.2	YO E1.2..E6.2 380-400 VAC	ZEASK
E1.2..E6.2	YO E1.2..E6.2 415-440 VAC	ZEASL
E1.2..E6.2	YO E1.2..E6.2 480-500 VAC	ZEASM

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

First and second closing coil - YC

Size	Type	Code
E1.2..E6.2	YC E1.2..E6.2 24 VAC/DC	ZEACA
E1.2..E6.2	YC E1.2..E6.2 30 VAC/DC	ZEACB
E1.2..E6.2	YC E1.2..E6.2 48 VAC/DC	ZEACC
E1.2..E6.2	YC E1.2..E6.2 60 VAC/DC	ZEACD
E1.2..E6.2	YC E1.2..E6.2 110-120 VAC/DC	ZEACE
E1.2..E6.2	YC E1.2..E6.2 120-127 VAC/DC	ZEACF
E1.2..E6.2	YC E1.2..E6.2 220-240 VAC/DC	ZEACG
E1.2..E6.2	YC E1.2..E6.2 240-250 VAC/DC	ZEACH
E1.2..E6.2	YC E1.2..E6.2 277 VAC	ZEACJ
E1.2..E6.2	YC E1.2..E6.2 380-400 VAC	ZEACK
E1.2..E6.2	YC E1.2..E6.2 415-440 VAC	ZEACL
E1.2..E6.2	YC E1.2..E6.2 480-500 VAC	ZEACM

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

Size	Type	Code
E1.2..E6.2	YO/YC test unit E1.2...E6.2	ZEAYOYCT

Undervoltage release - YU

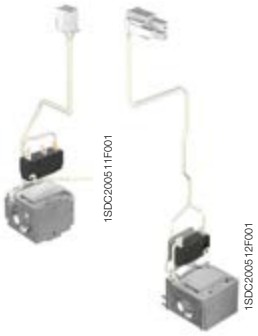
Size	Type	Code
E1.2..E6.2	YU E1.2..E6.2 24 VAC/DC	ZEAUA
E1.2..E6.2	YU E1.2..E6.2 30 VAC/DC	ZEAUB
E1.2..E6.2	YU E1.2..E6.2 48 VAC/DC	ZEAUC
E1.2..E6.2	YU E1.2..E6.2 60 VAC/DC	ZEAUD
E1.2..E6.2	YU E1.2..E6.2 110-120 VAC/DC	ZEAUE
E1.2..E6.2	YU E1.2..E6.2 120-127 VAC/DC	ZEAUF
E1.2..E6.2	YU E1.2..E6.2 220-240 VAC/DC	ZEAUG
E1.2..E6.2	YU E1.2..E6.2 240-250 VAC/DC	ZEAUH
E1.2..E6.2	YU E1.2..E6.2 277 VAC	ZEAUJ
E1.2..E6.2	YU E1.2..E6.2 380-400 VAC	ZEAUK
E1.2..E6.2	YU E1.2..E6.2 415-440 VAC	ZEAUL
E1.2..E6.2	YU E1.2..E6.2 440-500 VAC	ZEAUM

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

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

Size	Type	Code
E1.2..E6.2	24-30 VDC	ZEATL9
E1.2..E6.2	48 VAC/DC	ZEATL8
E1.2..E6.2	60 VAC/DC	ZEATL7
E1.2..E6.2	110…127 VAC/DC	ZEATL5
E1.2..E6.2	220…250 VAC/DC	ZEATL3

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



Remote reset - YR

Size	Type	Code
E1.2	YR 24 VDC E1.2	ZE1YRA
E1.2	YR 110 VAC/DC E1.2	ZE1YRB
E1.2	YR 220 VAC/DC E1.2	ZE1YRC
E2.2..E6.2	YR 24 VDC E2.2...E6.2	ZEBYRA
E2.2..E6.2	YR 110 VAC/DC E2.2...E6.2	ZEBYRB
E2.2..E6.2	YR 220 VAC/DC E2.2...E6.2	ZEBYRC

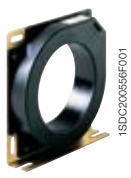
* When the remote reset is used in DC, its activation must be done with a maximum impluse time of 50ms. It cannot be powered permanently.

Motor - M

Size	Type	Code
E1.2	M E1.2 24-30 VAC/DC + MC 250V	ZE1M2
E1.2	M E1.2 48-60 VAC/DC + MC 250V	ZE1M3
E1.2	M E1.2 100-130 VAC/DC + MC 250V	ZE1M4
E1.2	M E1.2 220-250 VAC/DC + MC 250V	ZE1M5
E1.2	M E1.2 220-250 VAC/DC + MC 250V	ZE1M6
E1.2	M E1.2 277 VAC + MC 250V	ZE1M7
E2.2..E6.2	M E2.2...E6.2 24-30 VAC/DC + MC 400V	ZEBM2
E2.2..E6.2	M E2.2...E6.2 48-60 VAC/DC + MC 400V	ZEBM3
E2.2..E6.2	M E2.2...E6.2 100-130 VAC/DC + MC 400V	ZEBM4
E2.2..E6.2	M E2.2...E6.2 220-250 VAC/DC + MC 400V	ZEBM5
E2.2..E6.2	M E2.2...E6.2 277 VAC + MC 400V	ZEBM6
E2.2..E6.2	M E2.2...E6.2 380-415 VAC + MC 400V	ZEBM7
E2.2..E6.2	M E2.2...E6.2 440-480 VAC + MC 400V	ZEBM8
E1.2	M E1.2 24-30 VAC/DC + MC 24V	ZE1MA
E1.2	M E1.2 48-60 VAC/DC + MC 24V	ZE1MB
E1.2	M E1.2 100-130 VAC/DC + MC 24V	ZE1MC
E1.2	M E1.2 220-250 VAC/DC + MC 24V	ZE1MD
E1.2	M E1.2 227 VAC + MC 24V	ZEBME
E1.2	M E1.2 380-415 VAC + MC 24V	ZE1MF
E2.2..E6.2	M E2.2...E6.2 24-30 VAC/DC + MC 24V	ZEBMA
E2.2..E6.2	M E2.2...E6.2 48-60 VAC/DC + MC 24V	ZEBMB
E2.2..E6.2	M E2.2...E6.2 100-130 VAC/DC + MC 24V	ZEBMC
E2.2..E6.2	M E2.2...E6.2 220-250 VAC/DC + MC 24V	ZEBMD
E2.2..E6.2	M E2.2...E6.2 380-415 VAC + MC 24V	ZEBMF
E2.2..E6.2	M E2.2...E6.2 440-480 VAC + MC 24V	ZEBMG

Current sensor for external neutral

Size	Type	Code
E1.2, E2.2	Ext CS N E1.2, E2.2 2000A	ZE1NCT
E2.2	Ext CS N E2.2	ZE2NCT
E4.2	Ext CS N E4.2	ZE4NCT
E4.2, E6.2	Ext CS N E4.2 3200A, E6.2 50%	ZE6NCT
E6.2	Ext CS N E6.2	ZE6NCTF



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

Size	Type	Code
E1.2..E6.2	Homopolar toroid E1.2...E6.2 100A	ZEAHT100
E1.2..E6.2	Homopolar toroid E1.2...E6.2 250A	ZEAHT250
E1.2..E6.2	Homopolar toroid E1.2...E6.2 400A	ZEAHT400
E1.2..E6.2	Homopolar toroid E1.2...E6.2 800A	ZEAHT800

* The homopolar toroid is an alternative to the toroid for differential protection

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

Size	Type	Code
E1.2 & E2.2 3p	Toroid RC E1.2, E2.2 3p	ZE12RCT1
E2.2 4p & E4.2	Toroide RC E2 4p, E4.2	ZE24RCT2

* The toroid for differential protection is an alternative to the homopolar toroid for the grounding conductor of the main power supply


1SDC200503F001


1SDC200504F001


1SDC200505F001


1SDC200506F001


1SDC200507F001


1SDC200685F001


1SDC200681F001

Open closed auxiliary contacts - AUX

Size	Type	Code
E1.2	AUX 4Q (4 Form C) 400V E1.2	ZE1AUX4
E1.2	AUX 4Q (4 Form C) 24V E1.2	ZE1AUX4D
E1.2	AUX 2Q (2 Form C) 400V + 2Q (2 Form C) 24V E1.2	ZE1AUX2-2D
E2.2..E6.2	AUX 4Q (4 Form C) 400V E2.2...E6.2	ZEBAUX4
E2.2..E6.2	AUX 4Q (4 Form C) 24V E2.2...E6.2	ZEBAUX4D
E2.2..E6.2	AUX 2Q (2 Form C) 400V + 2Q (2 Form C) 24V E2.2...E6.2	ZEBAUX2-2D
E2.2..E6.2	AUX 6Q 400V E2.2...E6.2 [1]	ZEBAUX6
E2.2..E6.2	AUX 6Q 24V E2.2...E6.2 [1]	ZEBAUX6D
E2.2..E6.2	AUX 3Q (3 Form C) 400V + 3Q (3 Form C) 24V E2.2...E6.2 [1]	ZEBAUX3-3D
E1.2	AUX 15Q (15 Form C) 400V E1.2 [2]	ZE1AUX15
E1.2	AUX 15Q (15 Form C) 24V E1.2 [2]	ZE1AUX15D
E1.2	Mounting plate for fixed	ZE1AUXM
E1.2	Mounting plate for fixed - on bottom	ZE1AUXMB
E1.2	Mounting plate for drawout	ZE1AUXMD
E2.2..E6.2	AUX 15Q (15 Form C) 400V (for fixed/drawout with Signaling in racked in) E2.2...E6.2 [2]	ZEBAUX15
E2.2..E6.2	AUX 15Q (15 Form C) 24V (for fixed/drawout with Signaling in racked in) E2.2...E6.2 [2]	ZEBAUX15D
E2.2..E6.2	AUX 15Q (15 Form C) 400V (for fixed/drawout with Signaling in racked in/test isolated) E2.2...E6.2 [2]	ZEBAUX15RT
E2.2..E6.2	AUX 15Q (15 Form C) 24V (for fixed/drawout with Signaling in racked in/test isolated) E2.2...E6.2 [2]	ZEBAUX15DRT

[1] AUX 6Q (6 Form C) is an alternative to the Ekip Signaling 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.

Auxiliary position contacts - AUP

Size	Type	Code
E1.2	AUP 6 contacts 400V E1.2	ZE1AUP
E1.2	AUP 6 contacts 24V E1.2	ZE1AUPD
E2.2...E6.2	AUP 5 contacts 400V E2.2...E6.2 . Left set	ZEBAUP-L
E2.2...E6.2	AUP 5 contacts 24V E2.2...E6.2 - left set	ZEBAUPD-L
E2.2...E6.2	AUP 5 suppl. contacts 400V E2.2...E6.2 - right set	ZEBAUP-R
E2.2...E6.2	AUP 5 suppl. contacts 24V E2.2...E6.2 - right set	ZEBAUPD-R
E1.2...E6.2	AUP Ekip auxiliary position contact E1.2…E6.2	ZEAAUPE

Ready to close signaling contact - RTC

Size	Type	Code
E1.2	RTC 250V E1.2	ZE1RTC
E1.2	RTC 24V E1.2	ZE1RTCD
E1.2	RTC Ekip 24V E1.2	ZE1RTCDE
E2.2...E6.2	RTC 250V E2.2...E6.2	ZEBRTC
E2.2...E6.2	RTC 24V E2.2...E6.2	ZEBRTCD
E2.2...E6.2	RTC Ekip 24V E2.2...E6.2	ZEBRTCDE

Trip signaling contact - S51 / bell alarm

Size	Type	Code
E1.2	S51 / bell alarm 250V E1.2	ZE1BA
E1.2	S51 / bell alarm 24V E1.2	ZE1BAD
E2.2...E6.2	S51 / bell alarm 250V E2.2...E6.2	ZEBBA
E2.2...E6.2	S51 / bell alarm 24V E2.2...E6.2	ZEBBAD

Terminal blocks for auxiliary connection

Size	Type	Code
E1.2…E6.2	Terminal blocks 10 pcs	ZEATB10

Accessories
Mechanical accessories

1SDC200524F001

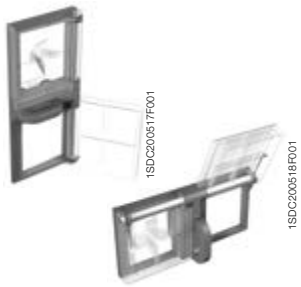
Mechanical operation counter - MOC

Size	Type	Code
E1.2	MOC mechanical operation counter	ZE1MOC
E2.2…E6.2	MOC mechanical operation counter	ZEBMOC


1SDC200515F001

Key lock in open position - KLC

Size	Type	Code
E1.2	KLC-D Key lock open E1.2	ZE1KLCD
E1.2	KLC-S Key lock open N.20005 E1.2	ZE1KLCS5
E1.2	KLC-S Key lock open N.20006 E1.2	ZE1KLCS6
E1.2	KLC-S Key lock open N.20007 E1.2	ZE1KLCS7
E1.2	KLC-S Key lock open N.20008 E1.2	ZE1KLCS8
E1.2	KLC-S Key lock open N.20009 E1.2	ZE1KLCS9
E1.2	KLA Key lock open Castell E1.2 (arrangement)	ZE1KLAC
E1.2	KLA Key lock open Kirk E1.2 (arrangement)	ZE1KLAK
E1.2	KLA Key lock open Ronis Profalux E1.2 (arrangement)	ZE1KLAR
E2.2…E6.2	KLC-D Key lock open E2.2...E6.2	ZEBKLCD
E2.2…E6.2	KLC-S Key lock open N.20005 E2.2..E6.2	ZEBKLCS5
E2.2…E6.2	KLC-S Key lock open N.20006 E2.2..E6.2	ZEBKLCS6
E2.2…E6.2	KLC-S Key lock open N.20007 E2.2..E6.2	ZEBKLCS7
E2.2…E6.2	KLC-S Key lock open N.20008 E2.2..E6.2	ZEBKLCS8
E2.2…E6.2	KLC-S Key lock open N.20009 E2.2..E6.2	ZEBKLCS9
E2.2…E6.2	KLA Key lock open Castell E2.2...E6.2 (arrangement)	ZEBKLAC
E2.2…E6.2	KLA Key lock open Kirk E2.2..E6.2 (arrangement)	ZEBKLAK
E2.2…E6.2	KLA Key lock open Ronis Profalux E2.2..E6.2 (arrangement)	ZEBKLAR


1SDC200516F001

Padlock in open position - PLC

Size	Type	Code
E1.2	PLC E1.2 Padlock open D=4mm/0.15"	ZE1PLC4
E1.2	PLC E1.2 Padlock open D=7mm/0.27"	ZE1PLC7
E1.2	PLC E1.2 Padlock open D=8mm/0.31"	ZE1PLC8
E2.2…E6.2	PLC E2.2..E6.2 Padlock open D=4mm/0.15"	ZEBPLC4
E2.2…E6.2	PLC E2.2..E6.2 Padlock open D=7mm/0.27"	ZEBPLC7
E2.2…E6.2	PLC E2.2..E6.2 Padlock open D=8mm/0.31"	ZEBPLC8

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

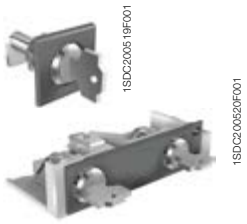
1SDC200517F001

1SDC200518F001

Floor mounting plate - F

Size	Type	Code
E1.2	Floor mounting plate for fixed unit	ZE1FFPF
E2.2 to E6.2	Floor mounting plate for fixed unit	ZEA26LPL

Accessories
Mechanical accessories



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

Size	Type	Code
E1.2	KLP-D Key lock racked in/out E1.2 1st key	ZE1KLPD
E1.2	KLP-S Key lock racked in/out N.20005 E1.2 1st key	ZE1KLPS5
E1.2	KLP-S Key lock racked in/out N.20006 E1.2 1st key	ZE1KLPS6
E1.2	KLP-S Key lock racked in/out N.20007 E1.2 1st key	ZE1KLPS7
E1.2	KLP-S Key lock racked in/out N.20008 E1.2 1st key	ZE1KLPS8
E1.2	KLP-S Key lock racked in/out N.20009 E1.2 1st key	ZE1KLPS9
E1.2	KLP-D Key lock racked in/out E1.2 2nd key	ZE1KLPD-2
E1.2	KLP-S Key lock racked in/out N.20005 E1.2 2nd key	ZE1KLPS5-2
E1.2	KLP-S Key lock racked in/out N.20006 E1.2 2nd key	ZE1KLPS6-2
E1.2	KLP-S Key lock racked in/out N.20007 E1.2 2nd key	ZE1KLPS7-2
E1.2	KLP-S Key lock racked in/out N.20008 E1.2 2nd key	ZE1KLPS8-2
E1.2	KLP-S Key lock racked in/out N.20009 E1.2 2nd key	ZE1KLPS9-2
E1.2	KLP-A Key lock racked in/out RonProfKirk E1.2 1st key (arrangement)	ZE1KLPR
E1.2	KLP-A Key lock racked in/out RonProfKirk E1.2 2nd key (arrangement)	ZE1KLPR-2
E1.2	KLP-A Key lock racked in/out Castell E1.2 1st key (arrangement)(1)	ZE1KLPC
E1.2	KLP-A Key lock racked in/out Castell E1.2 2nd key (arrangement)(1)	ZE1KLPC-2
E2.2…E6.2	KLP-D Key lock racked in/out E2.2...E6.2 1st key	ZEBKLPD
E2.2…E6.2	KLP-S Key lock racked in/out N.20005 E2.2...E6.2 1st key	ZEBKLPS5
E2.2…E6.2	KLP-S Key lock racked in/out N.20006 E2.2...E6.2 1st key	ZEBKLPS6
E2.2…E6.2	KLP-S Key lock racked in/out N.20007 E2.2...E6.2 1st key	ZEBKLPS7
E2.2…E6.2	KLP-S Key lock racked in/out N.20008 E2.2...E6.2 1st key	ZEBKLPS8
E2.2…E6.2	KLP-S Key lock racked in/out N.20009 E2.2...E6.2 1st key	ZEBKLPS9
E2.2…E6.2	KLP-D Key lock racked in/out E2.2...E6.2 2nd key	ZEBKLPD-2
E2.2…E6.2	KLP-S Key lock racked in/out N.20005 E2.2...E6.2 2nd key	ZEBKLPS5-2
E2.2…E6.2	KLP-S Key lock racked in/out N.20006 E2.2...E6.2 2nd key	ZEBKLPS6-2
E2.2…E6.2	KLP-S Key lock racked in/out N.20007 E2.2...E6.2 2nd key	ZEBKLPS7-2
E2.2…E6.2	KLP-S Key lock racked in/out N.20008 E2.2...E6.2 2nd key	ZEBKLPS8-2
E2.2…E6.2	KLP-S Key lock racked in/out N.20009 E2.2...E6.2 2nd key	ZEBKLPS9-2
E2.2…E6.2	KLP-A Key lock racked in/out RonProfKirk E2.2...E6.2 1st key (arrangement)	ZEBKLPR
E2.2…E6.2	KLP-A Key lock racked in/out RonProfKirk E2.2...E6.2 2nd key (arrangement)	ZEBKLPR-2
E2.2…E6.2	KLP-A Key lock racked in/out Castell E2.2...E6.2 1st key (arrangement)(1)	ZEBKLPC
E2.2…E6.2	KLP-A Key lock racked in/out Castell E2.2...E6.2 2nd key (arrangement)(1)	ZEBKLPC-2

* 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 cannot be used together

Supplementary lock in racked out position accessory

Size	Type	Code
E1.2	Suppl. lock in racked out E1.2	ZE1SUP
E2.2…E6.2	Suppl. lock in racked out E2.2…E6.2	ZEBSUP

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

Size	Type	Code
E1.2	PLP Padlock racked in/out E1.2	ZE1PLP
E2.2…E6.2	PLP Padlock racked in/out E2.2…E6.2	ZEBPLP

* 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	Code
E1.2	Fail Safe E1.2	ZEA3000RP
E2.2…E6.2	Fail Safe E2.2…E6.2	ZEA3000RP

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	ZEBDLR

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

Size	Type	Code
E2.2…E6.2	DLP E2.2…E6.2	ZEBDLP

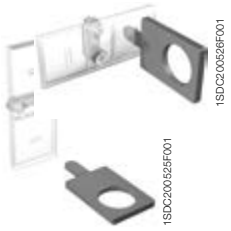
* If mounted on the right side, the DLP is an alternative to the mechanical interlock, AUX 15Q (15 Form C) or Lock to prevent door opening when the circuit breaker is in a closed position (DLC)

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 E1.2	ZE1DLCCD
E1.2	DLC Interlock direct door E1.2	ZE1DLCDD
E2.2...E6.2	DLC Interlock cable door E2.2...E6.2 [1)]	ZEBDLCCD
E2.2...E6.2	DLC Interlock direct door E2.2…E6.2[1)]	ZEBDLCDD

* 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)

[1)] To be ordered with lever for interlock (group 2) and support for interlock Type A, B, D (group 3)



Protection device for opening and closing pushbuttons - PBC

Size	Type	Code
E1.2	PBC Op/Cl BP protection sp. key E1.2	ZE1PBC
E1.2	PBC Op/Cl BP protection PL D=4mm/0.15" E1.2	ZE1PBC4
E1.2	PBC Op/Cl BP protection PL D=7mm/0.27" E1.2	ZE1PBC7
E1.2	PBC Op/Cl BP protection PL D=8mm/0.31" E1.2	ZE1PBC8
E2.2…E6.2	PBC Op/Cl BP protection sp. key E2.2...E6.2	ZEBPBC
E2.2…E6.2	PBC Op/Cl BP protection PL D=4mm/0.15" E2.2...E6.2	ZEBPBC4
E2.2…E6.2	PBC Op/Cl BP protection PL D=7mm/0.27" E2.2...E6.2	ZEBPBC7
E2.2…E6.2	PBC Op/Cl BP protection PL D=8mm/0.31" E2.2...E6.2	ZEBPBC8

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

Circuit breaker flange / door escutcheon

Size	Type	Code
E1.2	IP30 flange E1.2 Fixed	ZE1FLG30F
E1.2	IP30 flange E1.2 Drawout	ZE1FLG30D
E2.2…E6.2	IP30 flange E2.2...E6.2 Fixed	ZEBFLG30F
E2.2…E6.2	IP30 flange E2.2...E6.2 Drawout	ZEBFLG30D
E1.2	IP54 flange, different keys E1.2	ZE1FLG54DK
E2.2…E6.2	IP54 flange, different keys E2.2...E6.2	ZEBFLG54DK
E1.2	IP54 flange, key N.20005 E1.2	ZE1FLG54SK
E2.2…E6.2	IP54 flange, key N.20005 E2.2...E6.2	ZEBFLG54SK
E2.2…E6.2	Sealable trip unit cover E2.2…E6.2	ZEBSTUC

High or low terminal covers - HTC/LTC

Size	Type	3 Pole Code	4 Pole Code
E1.2	HTC high terminal covers E1.2 2pcs	ZE1HTC	ZE1HTC-4
E1.2	LTC low terminal covers E1.2 2pcs	ZE1LTC	ZE1LTC-4

Phase barriers - PB

Size	Type	Code
E1.2	PB H=100mm/3.94" 4pcs E1.2 Fixed 3P	ZE1PBF100
E1.2	PB H=100mm/3.94" 6pcs E1.2 Fixed 4P	ZE1PBF100-4
E1.2	PB H=200mm/7.87" 4pcs E1.2 Fixed 3P	ZE1PBF200
E1.2	PB H=200mm/7.87" 6pcs E1.2 Fixed 4P	ZE1PBF200-4
E1.2	PB 2pcs E1.2 Drawout 3P	ZE1PBW
E1.2	PB 3pcs E1.2 Drawout 4P	ZE1PBW-4
E2.2…E6.2	PB 2pcs E2.2…E6.2 Fixed 3P	ZEBPBF
E2.2…E6.2	PB 3pcs E2.2…E6.2 Fixed 4P	ZEBPBF-4
E2.2…E6.2	PB 2pcs E2.2…E6.2 Drawout 3P	ZEBPBW
E2.2…E6.2	PB 3pcs E2.2…E6.2 Drawout 4P	ZEBPBW-4

Accessories
Mechanical interlock

Cables for mechanical interlock [Group 1]

Size	Type	Code
E1.2…E6.2	Type A horizontal	ZEACBLAHR
E2.2…E6.2	Type B, C, D horizontal	ZEACBLBHR
E1.2…E6.2	Type A vertical	ZEACBLAVR
E2.2…E6.2	Type B, C, D vertical	ZEA6CBLBVR

* One 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 breakers or cradles (Group 2)

Size	Type	3 Pole Code	4 Pole Code
E2.2	Lever for mechanical interlock	ZE2LEV	ZE2LEV
E4.2	Lever for mechanical interlock	ZE4LEV	ZE4LEV
E6.2	Lever for mechanical interlock	ZE6LEV	ZE6LEV-4

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

Support for mechanical interlock of fixed circuit breaker (Group 3)

Size	Type	Code
E1.2	Type A	ZE1SPA
E1.2	Type A - installed on the bottom plate	ZE1SPAFM
E2.2…E6.2	Type A, B, D	ZEBSPB
E2.2…E6.2	Type C	ZEBSPC

Support for mechanical interlock of cradle (Group 4)

Size	Type	Code
E1.2	Type A	ZE1SPCRDA
E2.2…E6.2	Type A, B, D	ZEBSPB
E2.2…E6.2	Type C	ZEBSPC


1SDC200537F001


1SDC200538F001

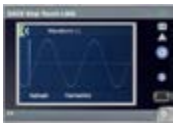
Automatic transfer switch (IEC only)

Size	Type	Code
E2.1…E6.2	ATS021	ATS021
E2.1…E6.2	ATS022	ATS022

Accessories
Ekip modules


1SDC200446F001


1SDC200466F001


1SDC200480F001


1SDC200475F001


1SDC200476F001

Ekip trip units - loose supply

Size	Type	Code
E1.2..E6.2	Ekip Dip LI	ZEAEDLI
E1.2..E6.2	Ekip Dip LSI	ZEAEDLSI
E1.2..E6.2	Ekip Dip LSIG	ZEAEDLSIG
E1.2..E6.2	Ekip Touch LI[1)]	ZEAETLI
E1.2..E6.2	Ekip Touch LSI[1)]	ZEAETLSI
E1.2..E6.2	Ekip Touch LSIG[1)]	ZEAETLSIG
E1.2..E6.2	Ekip G Touch LSIG[1)]	ZEAEGTLSIG
E1.2..E6.2	Ekip Hi-Touch LSI[1)]	ZEAEHTLSI
E1.2..E6.2	Ekip Hi-Touch LSIG[1)]	ZEAEHTLSIG
E1.2..E6.2	Ekip G Hi-Touch LSIG[1)]	ZEAEGHTLSIG
E1.2..E6.2	Ekip LCD LI[1)]	ZEAELCDLI
E1.2..E6.2	Ekip LCD LSI[1)]	ZEAELCDLSI
E1.2..E6.2	Ekip LCD LSIG[1)]	ZEAELCDLSIG
E1.2..E6.2	Ekip G LCD LSIG[1)]	ZEAEGLCDLSIG
E1.2..E6.2	Ekip Hi-LCD LSI[1)]	ZEAEHLCDLSI
E1.2..E6.2	Ekip Hi-LCD LSIG[1)]	ZEAEHLCDLSIG
E1.2..E6.2	Ekip G Hi-LCD LSIG[1)]	ZEAEGHLCDLSIG
E1.2..E6.2	Battery for Ekip trip units	ZEAEKIPBAT

[1)] Supplied with Ekip TT testing and power supply unit

Power Supply modules

Size	Type	Code
E1.2..E6.2	Ekip Supply 110-240VAC/DC	ZEAPWRS
E1.2..E6.2	Ekip Supply 24-48VDC	ZEAPWRSD


1SDC200539F001


1SDC200540F001


1SDC200541F001

Connectivity modules

Size	Type	Code
E1.2..E6.2	Ekip Com Modbus RS-485	ZEAMOD485
E1.2..E6.2	Ekip Com Modbus TCP	ZEAMODTCP
E1.2..E6.2	Ekip Com Profibus	ZEAPRFIBUS
E1.2..E6.2	Ekip Com Profinet	ZEAPRFINET
E1.2..E6.2	Ekip Com DeviceNet	ZEADEVICNET
E1.2..E6.2	Ekip Com Ethernet/IP	ZEAETHRNT
E1.2..E6.2	Ekip Com IEC61850	ZEAIEC61820
E1.2..E6.2	Ekip Com R Modbus RS-485	ZEAMOD485R
E1.2..E6.2	Ekip Com R Modbus TCP	ZEAMODTCPR
E1.2..E6.2	Ekip Com R Profibus	ZEAProfibusR
E1.2..E6.2	Ekip Com R Profinet	ZEAProfinetR
E1.2..E6.2	Ekip Com R DeviceNet	ZEADeviceNetR
E1.2..E6.2	Ekip Com R Ethernet/IP	ZEAIPR
E1.2..E6.2	Ekip Link	ZEALINK
E1.2..E6.2	Ekip Bluetooth	ZEABT
E1.2..E6.2	Ekip Com GPRS-M	ZEAGPRSM
E1.2..E6.2	Ekip Com Actuator	ZEACACT

Accessories
Ekip modules


1SDC200544F001


1SDC200548F001


1SDC200688F001


1SDC200558F001


1SDC200559F001

Signaling modules

Size	Type	Code
E1.2..E6.2	Ekip 2K-1	ZEA2K1
E1.2..E6.2	Ekip 2K-2	ZEA2K2
E1.2..E6.2	Ekip 2K-3	ZEB2K3
E2.2..E6.2	Ekip 4K [1)]	ZEA4K
E1.2..E6.2	Ekip 10K	ZEA10K

[1)] Ekip 4k is not available for the E1.2. It is an alternative to the AUX 6Q (6 Form C) auziliary contacts unit on other frames.

Measuring and Measuring Pro modules

Size	Type	Code
E1.2	Ekip Measuring	ZE1MEAS
E1.2	Ekip Measuring Pro	ZE1MEASPRO
E2.2	Ekip Measuring	ZE2MEAS
E2.2	Ekip Measuring Pro	ZE2MEASPRO
E4.2	Ekip Measuring	ZE4MEAS
E4.2	Ekip Measuring Pro	ZE4MEASPRO
E6.2	Ekip Measuring	ZE6MEAS
E6.2	Ekip Measuring Pro	ZE6MEASPRO
E1.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E1.2(*)	ZE1VSNRT
E2.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E2.2(*)	ZE2VSNRT
E4.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E4.2(*)	ZE4VSNRT
E6.2	Voltage socket for neutral on the right side L1 L2 L3 L3 N - E6.2(*)	ZE6VSNRT

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

Synchrocheck module

Size	Type	Code
E1.2…E6.2	Ekip Synchrocheck	ZEASYNCHK

Displaying and monitoring systems

Size	Type	Code
E1.2..E6.2	Ekip T&P - Programming and Test unit	ZEAEKPTP
E1.2..E6.2	Ekip TT - Trip Test	ZEAEKPTT
E1.2..E6.2	Ekip Programming	ZEAEKPPGM
E1.2..E6.2	Ekip Multimeter Display for the frot of switchgear	ZEAMM
E1.2..E6.2	Ekip Control Panel for 10 circuit breakers	ZEAEKPCP10
E1.2..E6.2	Ekip Control Panel for 30 circuit breakers	ZEAEKPCP30
E1.2..E6.2	Ekip Control Panel license extension to 30 circuit breakers	ZEAEKPCPL30
E1.2..E6.2	Ekip Control Panel alarm dispatcher option	ZEAEKPCPAL
E1.2..E6.2	Ekip Control Panel option 5 web client accesses	ZEAEKPCP5
E1.2..E6.2	Ekip View Software for 30 circuit breakers	ZEAEKPS30
E1.2..E6.2	Ekip View Software for 60 circuit breakers	ZEAEKPS60
E1.2..E6.2	Ekip View Software for unlimited circuit breakers	ZEAEKPSU
E1.2..E6.2	Ekip View license extension to 60 circuit breakers	ZEAEKPLE60
E1.2..E6.2	Ekip View license extension to unlimited circuit breakers	ZEAEKPLEU
E1.2..E6.2	Ekip View alarm dispatcher option for 30 circuit breakers	ZEAEKPVAL30
E1.2..E6.2	Ekip View alarm dispatcher option for 60 circuit breakers	ZEAEKPAL60
E1.2..E6.2	Ekip View alarm dispatcher option for unlimited circuit breakers	ZEAEKPALU
E1.2..E6.2	Ekip View 5 web client accesses license for 30 circuit breakers	ZEAEKPWCL30
E1.2..E6.2	Ekip View 5 web client accesses license for 60 circuit breakers	ZEAEKPWCL60
E1.2..E6.2	Ekip View 5 web client accesses license for of unlimited circuit breakers	ZEAEKPWCLU
E1.2..E6.2	Ekip View redundancy option	ZEAEKPRO
E1.2..E6.2	Ekip View OPC server client option	ZEAEKPOPC

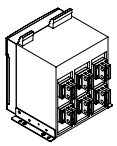
1SDC200554F001

Rating plugs for Ekip trip units

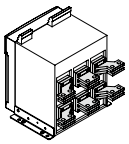
Size	Type	Loose Supply Code
E1.2..E6.2	Rating Plug 630A[1]	ZEA0630RP
E1.2..E6.2	Rating Plug 800A	ZEA0800RP
E1.2..E6.2	Rating Plug 1000A	ZEA1000RP
E1.2..E6.2	Rating Plug 1200A[2]	ZEA1200RP
E1.2..E6.2	Rating Plug 1250A[1]	ZEA1250RP
E1.2..E6.2	Rating Plug 1600A[3]	ZEA1600RP
E2.2…E6.2	Rating Plug 2000A	ZEA2000RP
E2.2…E6.2	Rating Plug 2500A[4]	ZEA2500RP
E4.2…E6.2	Rating Plug 3200A	ZEA3200RP
E4.2…E6.2	Rating Plug 3600A[2]	ZEA3600RP
E4.2…E6.2	Rating Plug 4000A[5]	ZEA4000RP
E6.2	Rating Plug 5000A	ZEA5000RP
E6.2	Rating Plug 6000A[2]	ZEA6000RP
E6.2	Rating Plug 6300A[1]	ZEA6300RP
E1.2..E2.2	Rating Plug 100A L OFF[1]	ZEA0100LRP
E1.2..E2.2	Rating Plug 200A L OFF[1]	ZEA0200LRP
E1.2..E2.2	Rating Plug 250A L OFF[1]	ZEA0250LRP
E1.2..E6.2	Rating Plug 400A L OFF[1]	ZEA0400LRP
E1.2..E6.2	Rating Plug 630A L OFF[1]	ZEA0630LRP
E1.2..E6.2	Rating Plug 800A L OFF[1]	ZEA0800LRP
E1.2..E6.2	Rating Plug 1000A L OFF[1]	ZEA1000LRP
E1.2..E6.2	Rating Plug 1250A L OFF[1]	ZEA1250LRP
E1.2..E6.2	Rating Plug 1600A L OFF[1]	ZEA1600LRP
E2.2..E6.2	Rating Plug 2000A L OFF[1]	ZEA2000LRP
E2.2..E6.2	Rating Plug 2500A L OFF[1]	ZEA2500LRP
E4.2..E6.2	Rating Plug 3200A L OFF[1]	ZEA3200LRP
E4.2..E6.2	Rating Plug 4000A L OFF[1]	ZEA4000LRP
E6.2	Rating Plug 5000A L OFF[1]	ZEA5000LRP
E6.2	Rating Plug 6300A L OFF[1]	ZEA6300LRP
E1.2..E2.2	Rating Plug RC 100A[1]	ZEA0100RCRP
E1.2..E2.2	Rating Plug RC 200A[1]	ZEA0200RCRP
E1.2..E2.2	Rating Plug RC 250A[1]	ZEA0250RCRP
E1.2..E6.2	Rating Plug RC 400A[1]	ZEA0400RCRP
E1.2..E6.2	Rating Plug RC 630A[1]	ZEA0630RCRP
E1.2..E6.2	Rating Plug RC 800A[1]	ZEA0800RCRP
E1.2..E6.2	Rating Plug RC 1250A[1]	ZEA1250RCRP
E2.2..E6.2	Rating Plug RC 2000A[1]	ZEA2000RCRP
E4.2..E6.2	Rating Plug RC 3200A[1]	ZEA3200RCRP
E4.2..E6.2	Rating Plug RC 4000A[1]	ZEA4000RCRP

[1] IEC only
[2] UL only
[3] IEC only for E1.2, both UL and IEC for all other frames
[4] IEC only for E2.2, both UL and IEC for E4.2 and E6.2
[5] IEC only for E4.2, both UL and IEC for E6.2
[6] Contact ABB for the availability of this product

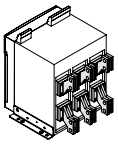
Accessories
Terminals



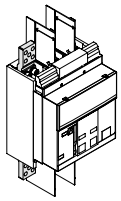
Rear orientable terminal - HR VR



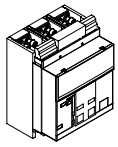
Horizontal rear spread terminal - SHR



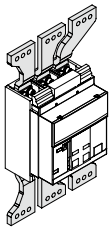
Vertical rear spread terminal - SVR



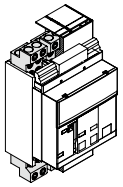
Extended front terminal - EF



Front terminal - F



Front spread terminal - ES



Terminal for cable FcCuAl 4x240mm² - FcCuAl

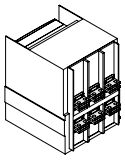
Terminal kit - loose supply for one side of a fixed circuit breaker

Size	Version	Max amperage	Type	3 Pole Code	4 Pole Code
E1.2	F	1200	Kit EF[1)]	ZE1EFF	ZE1EFF-4
E1.2	F	1200	Kit F	ZE1FF	ZE1FF
E1.2	F	1200	Kit ES[1)]	ZE1ESF	ZE1ESF-4
E1.2	F	1200	Kit Adjustable HR/VR	ZE1HRVRF	ZE2HRVRF-4
E1.2	F	1200	Kit FcCuAl 4x 500kcmil/240mm2[1)]	ZE1LUGF	ZE1LUGF-4
E2.2	F	2000	Kit F Upper[1)]	ZE2FUF	ZE2FUF-4
E2.2	F	2000	Kit F Lower[1)]	ZE2FLF	ZE2FLF-4
E2.2	F	2000	Kit Adjustable HR/VR	ZE2HRVRFW	ZE2HRVRFW-4
E4.2	F	3200	Kit F Upper[1)]	ZE4FUF	ZE4FUF-4
E4.2	F	3200	Kit F Lower[1)]	ZE4FLF	ZE4FLF-4
E4.2	F	2500	Kit Adjustable HR/VR	ZE4HRVRFW25	ZE4HRVRFW25-4
E4.2	F	3200	Kit VR	ZE4VRFW32	ZE4VRFW32-4
E6.2	F	6000	Kit F Upper[1)]	ZE6FUF	ZE6FU-4
E6.2	F	6000	Kit F Lower[1)]	ZE6FLF	ZE6FLF-4
E6.2	F	5000	Kit Adjustable HR/VR	ZE6HRVRFW50	ZE6HRVRFW50-4
E6.2	F	6000	Kit VR	ZE6VRFW60	ZE6VRFW60-4
E6.2/f	F	6000	Kit F Upper[1)]	—	ZE6FUF-4F
E6.2/f	F	6000	Kit F Lower[1)]	—	ZE6FLF-4F
E6.2/f	F	5000	Kit Adjustable HR/VR	—	ZE6HRVRFW50-4F
E6.2/f	F	6000	Kit VR	—	ZE6VRFW60-4F

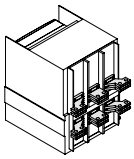
[1)] Not UL Listed.

Adapter plate for terminals - loose supply for one side of a fixed circuit breaker

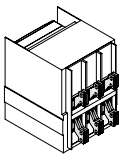
Size	Version	Max amperage	Type	3 Pole Code	4 Pole Code
E2.2	F	2000	Kit Terminal Adapter Plate	ZE2TAPF	ZE2TAPF-4
E4.2	F	3200	Kit Terminal Adapter Plate	ZE4TAPF	ZE4TAPF-4



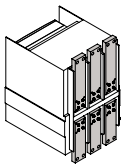
Rear orientable terminal - HR VR



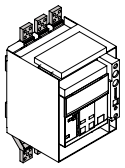
Horizontal rear terminal - SHR



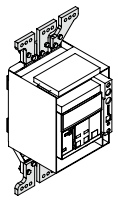
Vertical rear spread terminal - SVR



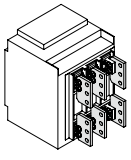
Front terminal - F



Extended front terminal - EF



Front spread terminal - ES



Terminal for cable FcCuAl 4x240mm² - FcCuAl

Terminal kit - loose supply for one side of a cradle

Size	Version	Max amperage	Type	3 Pole Code	4 Pole Code
E1.2	W	1200	Kit EF[2]	ZE1EFW	ZE1EFW-4
E1.2	W	1200	Kit ES[1] [2]	ZE1ESW	ZE1ESW-4
E1.2	W	1200	Kit Adjustable HR/VR	ZE1HRVRW	ZE1HRVRW-4
E1.2	W	1200	Kit FcCuAl 4x 500kcmil/240mm2[2]	ZE1LUGW	ZE1LUGW-4
E2.2	W	2000	Kit F Upper[2]	ZE2FUW	ZE2FUW-4
E2.2	W	2000	Kit F Lower[2]	ZE2FLW	ZE2FLW-4
E2.2	W	2000	Kit Adjustable HR/VR	ZE2HRVRFW	ZE2HRVRFW-4
E4.2	W	3200	Kit F Upper[2]	ZE4FUW	ZE4FUW-4
E4.2	W	3200	Kit F Lower[2]	ZE4FLW	ZE4FLW-4
E4.2	W	2500	Kit Adjustable HR/VR	ZE4HRVRFW25	ZE4HRVRFW25-4
E4.2	W	3200	Kit VR	ZE4VRFW32	ZE4VRFW32-4
E6.2	W	6000	Kit F Upper[2]	ZE6FUW	ZE6FUW-4
E6.2	W	6000	Kit F Lower[2]	ZE6FLW	ZE6FLW-4
E6.2	W	5000	Kit Adjustable HR/VR	ZE6HRVRFW50	ZE6HRVRFW50-4
E6.2	W	6000	Kit VR	ZE6VRFW60	ZE6VRFW60-4
E6.2/f	W	6000	Kit F Upper[2]	—	ZE6FUW-4F
E6.2/f	W	6000	Kit F Lower[2]	—	ZE6FLW-4F
E6.2/f	W	5000	Kit Adjustable HR/VR	—	ZE6HRVRFW50-4F
E6.2/f	W	6000	Kit VR	—	ZE6VRFW60-4F

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

Ekip Up

ZEAEkipUP	1SDA083359R1	Ekip UP module - Monitor
ZEAEkUPPR	1SDA083360R1	Ekip UP module - PROTECT
ZEAEkUPPRP	1SDA083361R1	Ekip UP module - PROTECT PLUS
ZEAEkUPCO	1SDA083362R1	Ekip UP module - CONTROL
ZEAEkUPCOP	1SDA083363R1	Ekip UP module - CONTROL PLUS
ZEAIPSPRO	1SDA082919R1	Ekip UP module - INTERFACE PROTECTION
ZEASYNREC	1SDA082923R1	Ekip UP module - SYNCHRO RECLOSING
**	**	Ekip Up - Residual current sensors
**	**	Ekip Up - Homopolar current sensors

** Contact ABB Technical Services for ordering codes

Ekip Hub

ZEAEKIPHUB	1SDA082894R1	EKIP COM HUB

Load Shedding software

ZEALSHEDA	1SDA082921R1	ADAPTIVE LOAD SHEDDING
ZEALSHEDP	1SDA082922R1	PREDICTIVE LOAD SHEDDING

ATS software licenses

ZEAMTMLIC	1SDA082886R1	Emax 2 ATS Main Tie Main closed software license

Notes

Notes

Notes

Contact us

ABB
Electrification Products
8155 T&B Boulevard
Memphis, TN 38125
www.abb.us/lowvoltage

Customer Service: 800-816-7809
7:00 a.m. - 5:30 p.m., CST, Monday-Friday
elec_custserv@tnb.com
Technical Support: 888-385-1221, Option 1
7:00 a.m. - 5:00 p.m., CST, Monday-Friday
lvps.support@us.abb.com

Stay tuned. Discover more by visiting the webpages reserved to Emax 2 UL and be always up-to-date with the latest edition of the catalog.

1SXU200040C0201, March 2017