



Technical catalogue

Emax

Low voltage air circuit-breakers



Main characteristics

Ranges

Installations

**Overcurrent releases
and relative accessories**

Accessories

Circuit-breakers applications

Overall dimensions

Electrical circuit diagrams

Ordering codes

1

2

3

4

5

6

7

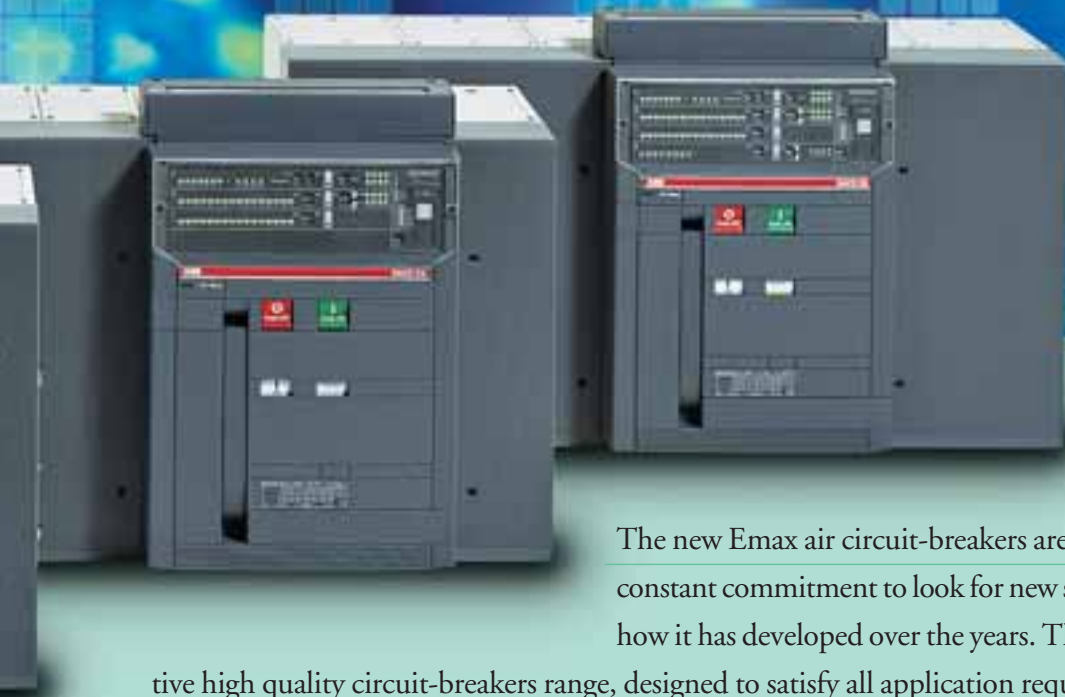
8

9

New Emax.

The evolution continues.





The new Emax air circuit-breakers are the result of ABB SACE's constant commitment to look for new solutions, and of the know-how it has developed over the years. This is an incredibly innovative high quality circuit-breakers range, designed to satisfy all application requirements. The innovation of the new Emax is really outstanding from all points of view: completely re-engineered releases fitted with latest generation electronics, improved performances with the same dimensions and new applications to fulfil the latest market needs. The new electronics open a window on a world of extraordinary solutions, with connectivity options never before seen in the market. Discover the great advantages of ABB SACE's new Emax. The evolution has been going on since 1942.

New Emax.
Lively performances.



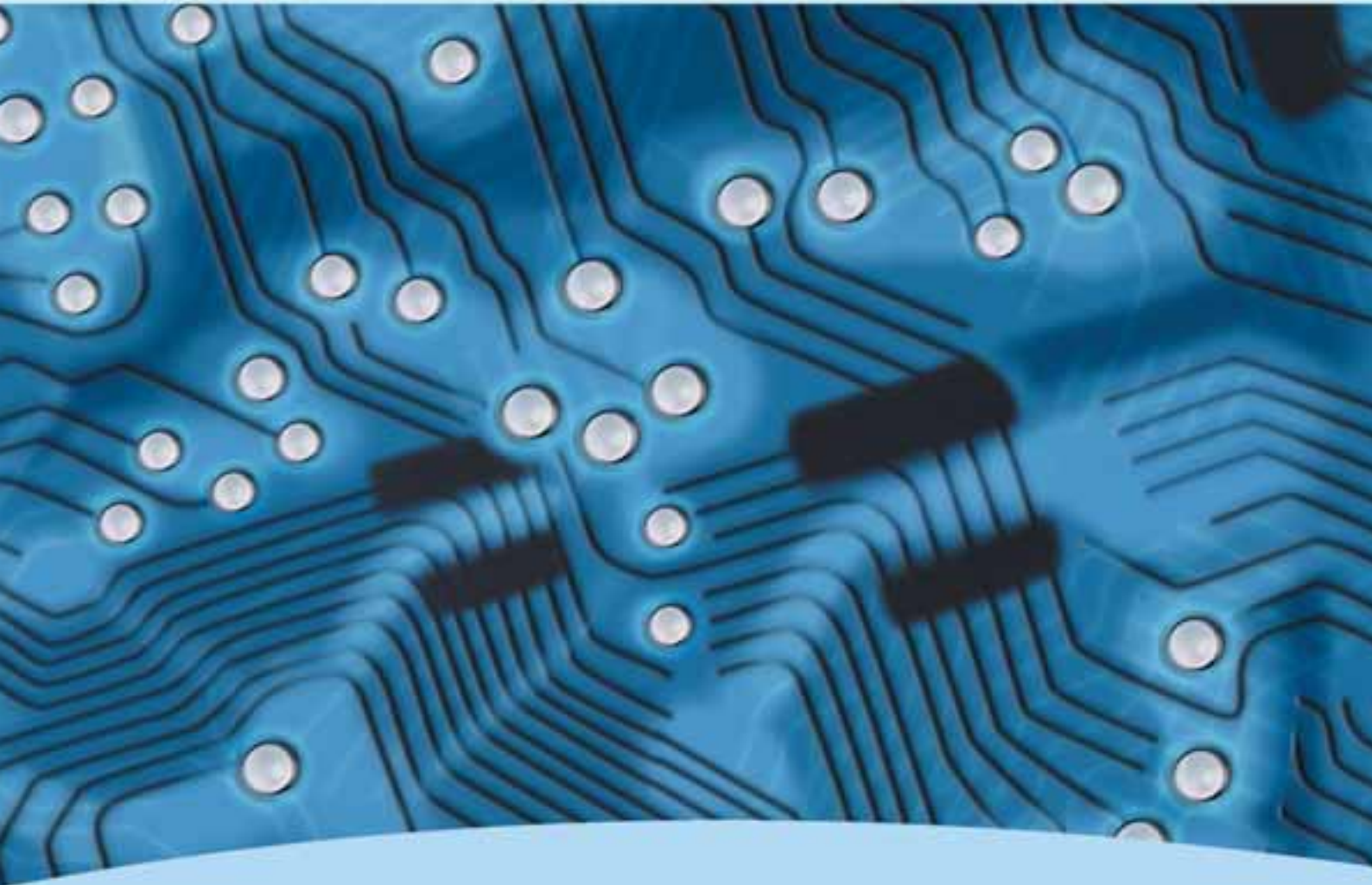


Continuing the tradition of ABB SACE, the new Emax range offers performances at the top of its category. The Emax range offers you a great advantage: with the increased performances, you can use the smaller circuit-breaker frames, obtaining considerable savings both in economic terms and in physical space within the switchgear. Emax E1 now offers current ratings up to 1600A, whilst Emax E3 is enhanced by version V with top of the range performances. Always aware of the rapid changes in the market, ABB SACE has made some specific versions to cover new applications and simplify retrofitting operations.



New Emax. Brilliant intelligence.

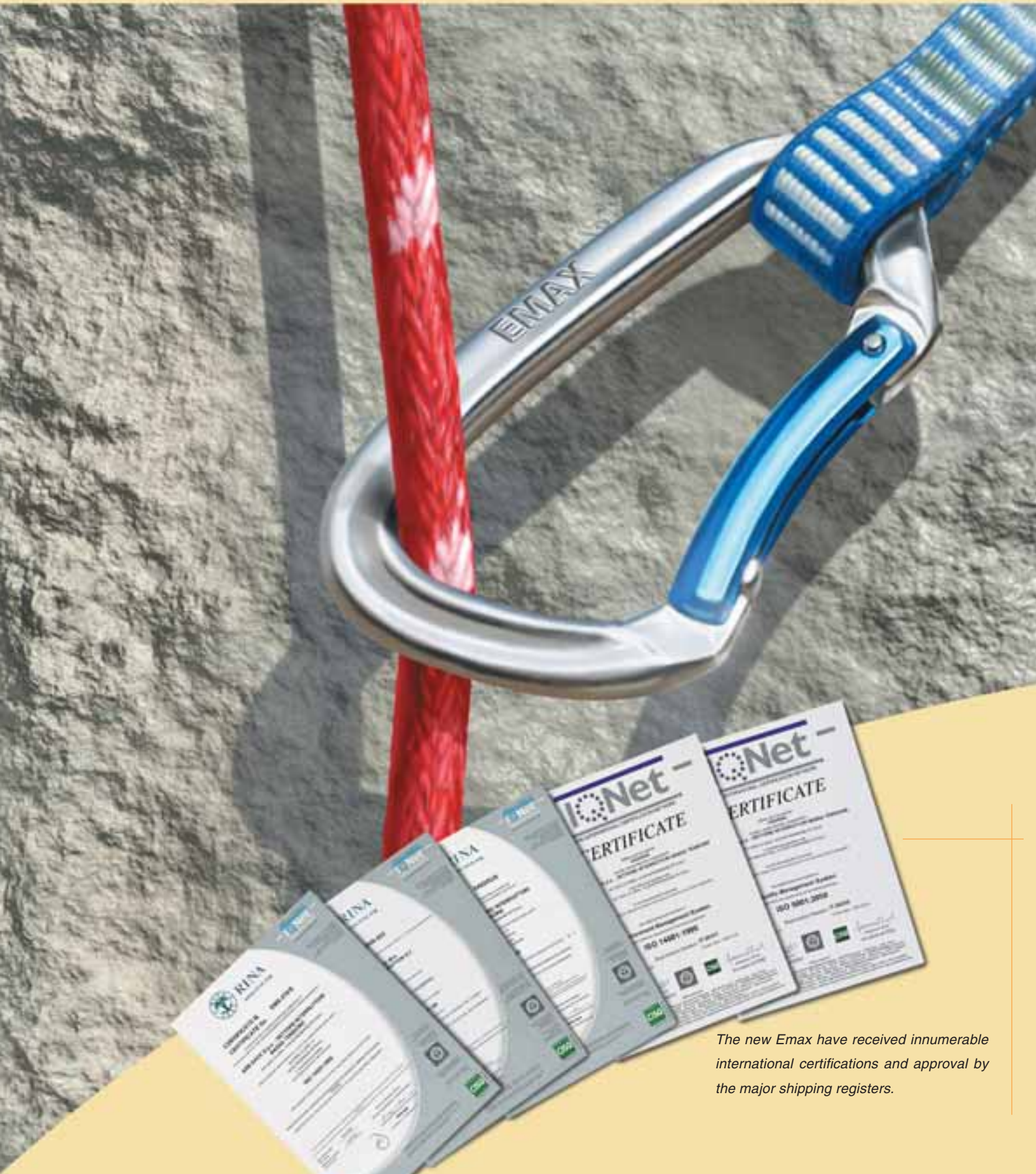




The new Emax range shines like a light from within: the new generation of protection trip units is fitted with the latest advances in electronics, offering individual bespoke solutions for control and protection. The new trip units, which are amazingly versatile and simple to use, offer important innovations, such as the brand-new intuitive operator interface allowing complete control of the system with just a few simple key-strokes. Furthermore, there are new protections, new alarms and connection to handheld and laptop PCs using Bluetooth technology. The re-engineered hardware architecture allows flexible and precise configuration. With the new Emax it is no longer necessary to completely replace the trip unit - simply add the module which satisfies your requirements: a great advantage, both in terms of flexibility and customisation.



New Emax. Ensured reliability.



The new Emax have received innumerable international certifications and approval by the major shipping registers.



Careful selection of materials, meticulous assembly and a rigorous testing stage make the new Emax an extremely reliable and sturdy product, able to withstand high dynamic and thermal stresses for longer than any other circuit-breaker in its category. With the new standardised system of accessories studied and made for the new Emax, work becomes easier, convenient, safe and rapid. Furthermore, ABB SACE puts a highly specialised and rapid customer assistance service at your disposal. The new Emax give you that pleasant feeling of security which only such a reliable product is able to do.



Emax





Contents

Overview of the SACE Emax family

Fields of application 1/2

Construction characteristics

Structure of the circuit-breakers 1/4
Operating mechanism 1/5
Operating and signalling parts 1/6
Fixed parts of withdrawable circuit-breakers 1/7
Utilization category 1/8

Versions and connections 1/9

Electronic trip units

General characteristics 1/10
Versions available 1/12
Rating plugs 1/13

Compliance with Standards

Standards, approvals and certifications 1/14
A design dedicated to Quality and respect for the environment 1/15

Overview of the SACE Emax family

Fields of application

1

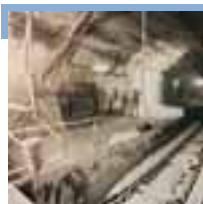


		E1		E2			
		E1B	E1N	E2B	E2N	E2S	E2L
Automatic circuit-breakers							
Poles	[No.]	3 - 4		3 - 4			
4p cb neutral current-carrying capacity	[%]	100					
Size (40 °C)	[A]	800-1000- 1250-1600	800-1000- 1250-1600	1600-2000	1000-1250- 1600-2000	800-1000- 1250-1600- 2000	1250-1600
Ue	[V~]	690	690	690	690	690	690
Icu (220...415V)	[kA]	42	50	42	66	85	130
Ics (220...415V)	[kA]	42	50	42	65	85	130
Icw (1s)	[kA]	42	50	42	55	65	10
Icw (3s)	[kA]	36	36	42	42	50	-

		Standard version		Standard version	
Automatic circuit-breakers with full-size neutral conductor					
Poles	[No.]	Standard version		Standard version	
4p cb neutral current-carrying capacity	[%]				
Size (40 °C)	[A]				
Ue	[V~]				
Icu (220...415V)	[kA]				
Ics (220...415V)	[kA]				
Icw (1s)	[kA]				
Icw (3s)	[kA]				



		E1B/MS	E1N/MS	E2B/MS	E2N/MS	E2S/MS
Switch-disconnectors						
Poles	[No.]	3 - 4	3 - 4	3 - 4	3 - 4	3 - 4
Size (40 °C)	[A]	800-1000- 1250-1600	800-1000- 1250-1600	1600-2000	1000-1250- 1600-2000	1000-1250- 1600-2000
Ue	[V~]	690	690	690	690	690
Icw (1s)	[kA]	42	50	42	55	65
Icw (3s)	[kA]	36	36	42	42	42
Icm (220...440V)	[kA]	88.2	105	88.2	121	143



		E2B/E	E2N/E
Automatic circuit-breakers for applications up to 1150 V AC			
Poles	[No.]	3 - 4	3 - 4
Size (40 °C)	[A]	1600-2000	1250-1600- 2000
Ue	[V~]	1150	1150
Icu (1150V)	[kA]	20	30
Ics (1150V)	[kA]	20	30
Icw (1s)	[kA]	20	30

		E2B/E MS	E2N/E MS
Switch-disconnectors for applications up to 1150 V AC			
Poles	[No.]	3 - 4	3 - 4
Size (40 °C)	[A]	1600-2000	1250-1600- 2000
Ue	[V~]	1150	1150
Icw (1s)	[kA]	20	30
Icm (1000V)	[kA]	40	63

		E1B/E MS	E2N/E MS
Switch-disconnectors for applications up to 1000 V DC			
Poles	[No.]	3 - 4	3 - 4
Size (40 °C)	[A]	800-1250	1250-1600-2000
Ue	[V-]	750 (3p)-1000(4p)	750 (3p)-1000(4p)
Icw (1s)	[kA]	20	25
Icm (750V)	[kA]	42	52.5
Icm (1000V)	[kA]	42	52.5

		E1 CS	E2 CS
Sectionalizing truck			
Size (40 °C)	[A]	1250	2000

		E1 MTP	E2 MTP
Earthing switch with making capacity			
Size (40 °C)	[A]	1250	2000

		E1 MT	E2 MT
Earthing truck			
Size (40 °C)	[A]	1250	2000

(*) The performance at 1000V is 50kA.

E3					E4			E6	
E3N	E3S	E3H	E3V	E3L	E4S	E4H	E4V	E6H	E6V
		3 - 4				3 - 4		3 - 4	
		100				50		50	
2500-3200	1000-1250-1600-2000-2500-3200	800-1000-1250-1600-2000-2500-3200	800-1250-1600-2000-2500-3200	2000-2500	4000	3200-4000	3200-4000	4000-5000-6300	3200-4000-5000-6300
690	690	690	690	690	690	690	690	690	690
66	75	100	130	130	75	100	150	100	150
66	75	85	100	130	75	100	150	100	125
66	75	75	85	15	75	100	100	100	100
66	65	65	65	-	75	75	75	85	85
					E4S/f	E4H/f	E6H/f		
Standard version					4	4	4		
					100	100	100		
					4000	3200-4000	4000-5000-6300		
					690	690	690		
					80	100	100		
					80	100	100		
					80	85	100		
					75	75	100		
E3N/MS	E3S/MS	E3V/MS		E4S/MS	E4S/f MS	E4H/MS	E4H/f MS	E6H/MS	E6H/f MS
3 - 4	3 - 4	3-4		3 - 4	4	3 - 4	4	3-4	4
2500-3200	1000-1250-1600-2000-2500-3200	800-1250-1600-2000-2500-3200		4000	4000	3200-4000	3200-4000	4000-5000-6300	4000-5000-6300
690	690	690		690	690	690	690	690	690
65	75	85		75	75	100	85	100	100
65	65	65		75	75	75	75	85	85
143	165	187		165	165	220	187	220	220
E3H/E					E4H/E		E6H/E		
3 - 4					3 - 4		3 - 4		
1250-1600-2000-2500-3200					3200-4000		4000-5000-6300		
1150					1150		1150		
30 (*)					65		65		
30 (*)					65		65		
30 (*)					65		65		
E3H/E MS					E4H/E MS		E6H/E MS		
3 - 4					3 - 4		3 - 4		
1250-1600-2000-2500-3200					3200-4000		4000-5000-6300		
1150					1150		1150		
50					65		65		
105					143		143		
E3H/E MS					E4H/E MS		E6H/E MS		
3 - 4					3 - 4		3 - 4		
1250-1600-2000-2500-3200					3200-4000		4000-5000-6300		
750 (3p)-1000(4p)					750 (3p) - 1000 (4p)		750 (3p) - 1000 (4p)		
40					65		65		
105					143		143		
105					143		143		
E3 CS					E4 CS		E6 CS		
3200					4000		6300		
E3 MTP					E4 MTP		E6 MTP		
3200					4000		6300		
E3 MT					E4 MT		E6 MT		
3200					4000		6300		



Construction characteristics

Structure of the circuit-breakers

The sheet steel structure of the Emax air circuit-breaker is extremely compact, considerably reducing overall dimensions. Safety is improved by using double insulation of the live parts and total segregation between phases.

The sizes have the same height and depth for all the circuit-breakers in each version.

The depth of the withdrawable version is suitable for installation in switchgear 500 mm deep.

The width of 324 mm (up to 2000 A) in the withdrawable version allows the apparatus to be used in switchgear compartments 400 mm wide. Their compact dimensions also mean they can replace air circuit-breakers of any size from earlier series.

1



1SDC200018F0001



1SDC200018F0001

Construction characteristics

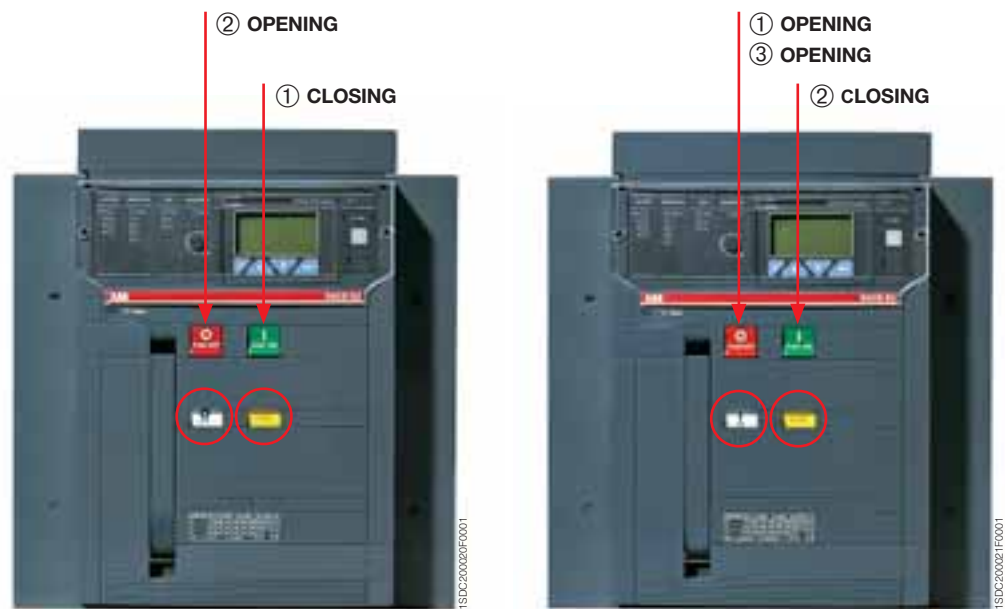
Operating mechanism

The operating mechanism is of the stored energy type, operated using pre-charged springs.

The springs are charged manually by operating the front lever or using a geared motor, supplied on request.

The opening springs are charged automatically during the closing operation.

With the operating mechanism fitted with shunt closing and opening releases and the geared motor for charging the springs, the circuit-breaker can be operated by remote control and, if required, co-ordinated by a supervision and control system.



The following operating cycles are possible without recharging the springs:

- starting with the circuit-breaker open (0) and the springs charged:
closing-opening
- starting with the circuit-breaker closed (I) and the springs charged:
opening-closing-opening.

The same operating mechanism is used for the entire series and is fitted with a mechanical and electrical anti-pumping device.



Construction characteristics

Operating and signalling parts

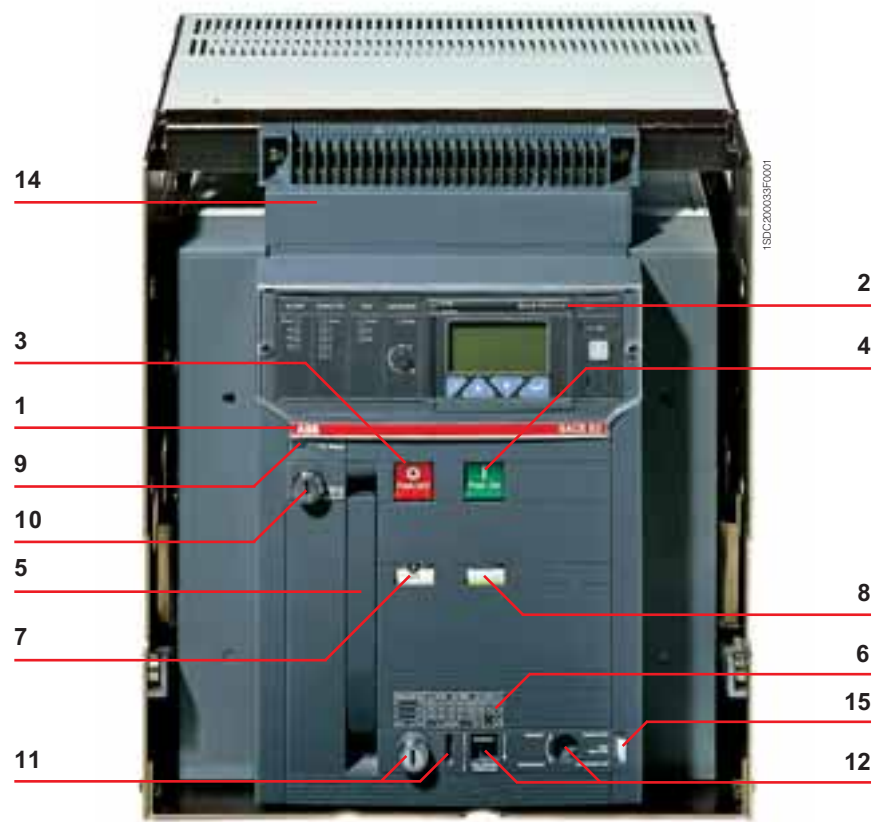
1

Fixed version



Caption	
1	Trademark and size of circuit-breaker
2	SACE PR121, PR122 or PR123 trip unit
3	Pushbutton for manual opening
4	Pushbutton for manual closing
5	Lever to manually charge closing springs
6	Electrical rating plate
7	Mechanical device to signal circuit-breaker open "O" and closed "I"
8	Signal for springs charged or discharged
9	Mechanical signalling of overcurrent release tripped
10	Key lock in open position
11	Key lock and padlock in racked-in/racked-out position (for withdrawable version only)
12	Racking-in/out device (for withdrawable version only)
13	Terminal box (for fixed version only)
14	Sliding contacts (for withdrawable version only)
15	Circuit-breaker position indicator: racked-in/ test isolated /racked-out / connected/test isolated/disconnected (for withdrawable version only)

Withdrawable version



Note:

"Racked-in" refers to the position in which both the power contacts and auxiliary contacts are connected; "racked-out" is the position in which both the power contacts and auxiliary contacts are disconnected; "test isolated" is the position in which the power contacts are disconnected, whereas the auxiliary contacts are connected.

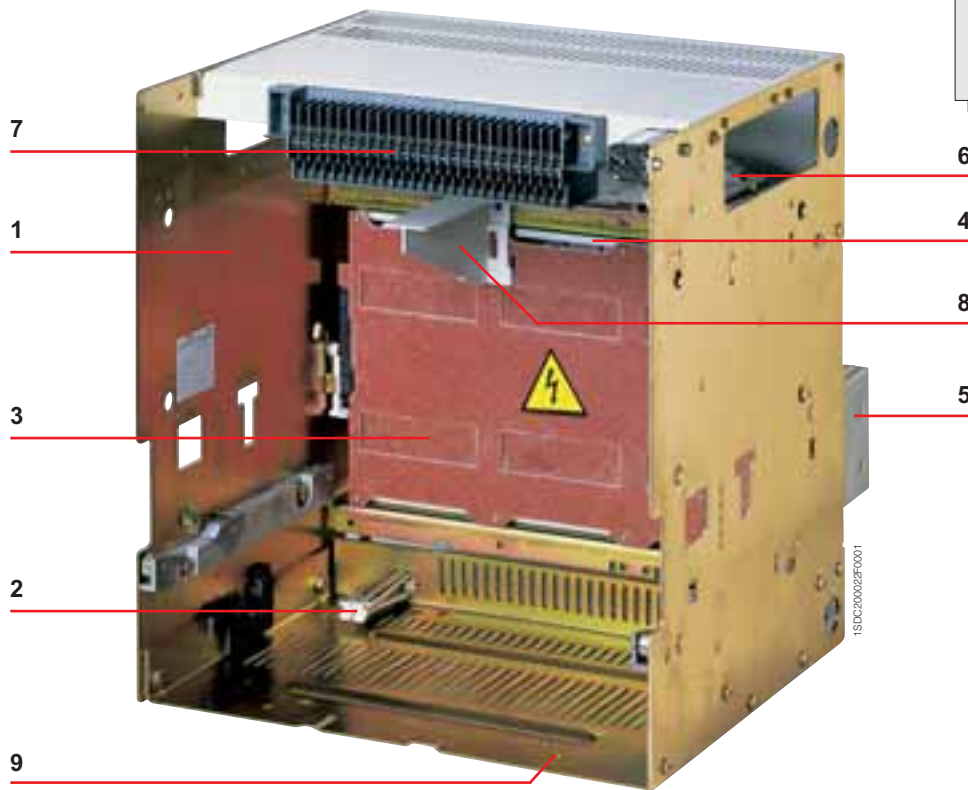
Construction characteristics

Fixed parts of withdrawable circuit-breakers

The fixed parts of withdrawable circuit-breakers have shutters for segregating the fixed contacts when the circuit-breaker is withdrawn from the compartment. These can be locked in their closed position using padlock devices.

Caption

- 1 Sheet steel supporting structure
- 2 Single earthing clamp mounted on the left for E1, E2 and E3, double earthing clamps for E4 and E6
- 3 Safety shutters (protection rating IP20)
- 4 Terminal support base
- 5 Terminals (rear, front or flat)
- 6 Contacts signalling that the circuit-breaker is racked-in, test isolated, racked-out
- 7 Sliding contacts
- 8 Padlock device for safety shutters (on request)
- 9 Fastening points (4 for E1, E2, E3 and 6 for E4, E6)



Construction characteristics

Utilization category

1

Selective and current-limiting circuit-breakers

Selective (non current-limiting) **circuit-breakers** are classified in class B (according to the IEC 60947-2 Standard). It is important to know their I_{cw} values in relation to any possible delayed trips in the event of short-circuits.

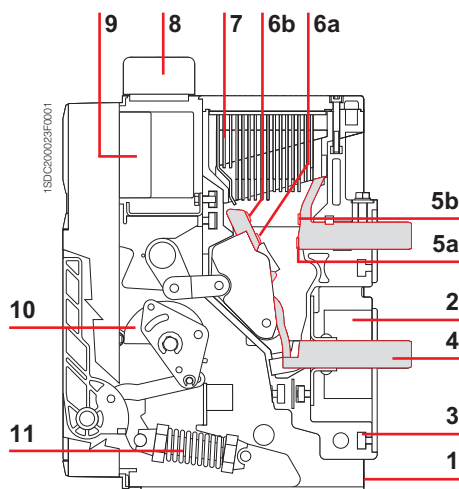
The **current-limiting circuit-breakers** E2L and E3L belong to class A. The short-time withstand current I_{cw} is not very important for these circuit-breakers, and is necessarily low due to the operating principle on which they are based. The fact that they belong to class A does not preclude the possibility of obtaining the necessary selectivity (e.g. current-type or time-type selectivity).

The special advantages of current-limiting circuit-breakers should also be underlined. In fact, they make it possible to:

- significantly reduce the peak current in relation to the prospective value;
- drastically limit specific let-through energy.

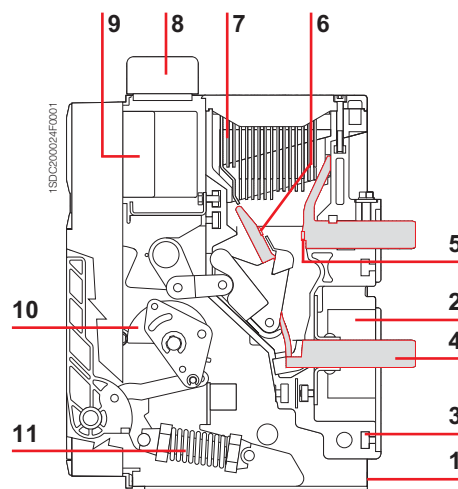
The resulting benefits include:

- reduced electrodynamic stresses;
- reduced thermal stresses;
- savings on the sizing of cables and busbars;
- the possibility of coordinating with other circuit-breakers in the series for back-up or discrimination.



Selective circuit-breaker

E1 B-N, E2 B-N-S, E3 N-S-H-V,
E4 S-H-V, E6 H-V



Current-limiting circuit-breaker

E2 L, E3 L

Caption

1	Sheet steel supporting structure
2	Current transformer for protection trip unit
3	Pole group insulating box
4	Horizontal rear terminals
5-5a	Plates for fixed main contacts
5b	Plates for fixed arcing contacts
6-6a	Plates for main moving contacts
6b	Plates for moving arcing contacts
7	Arcing chamber
8	Terminal box for fixed version - Sliding contacts for withdrawable version
9	Protection trip unit
10	Circuit-breaker closing and opening control
11	Closing springs

Versions and connections

All the circuit-breakers are available in fixed and withdrawable, three-pole or four-pole versions.

Each series of circuit-breakers offers terminals made of silver-plated copper bars, with the same dimensions, regardless of the rated currents of the circuit-breakers.

The fixed parts for withdrawable circuit-breakers are common to each model, regardless of the rated current and breaking capacity of the relative moving parts, except for the E2S circuit-breaker which requires a specific fixed part.

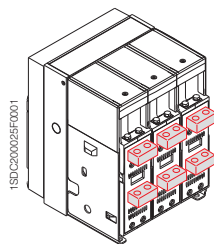
A version with gold-plated terminals is available for special requirements, linked to use of the circuit-breakers in corrosive environments.

The availability of various types of terminals makes it possible to build wall-mounted switchgear, or switchgear to be accessed from behind with rear connections.

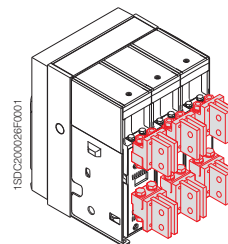
For special installation needs, the circuit-breakers can be fitted with various combinations of top and bottom terminals.

Furthermore new dedicated terminal conversion kits give Emax maximum flexibility, allowing horizontal terminals to be changed to vertical or front ones and vice versa.

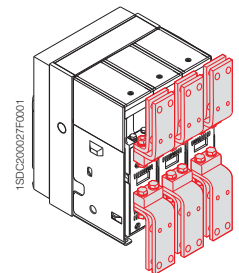
Fixed circuit-breaker



Horizontal rear terminals

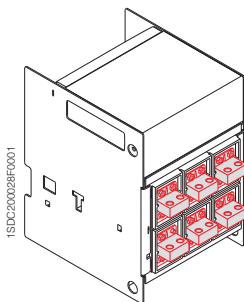


Vertical rear terminals

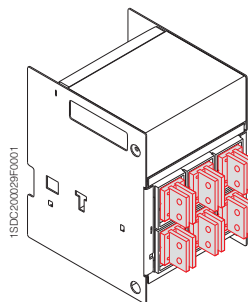


Front terminals

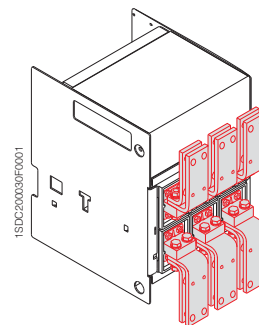
Withdrawable circuit-breaker



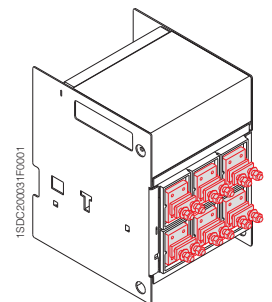
Horizontal rear terminals



Vertical rear terminals



Front terminals



Flat terminals



Electronic trip units

General characteristics

The overcurrent protection for AC installations uses three types of electronic trip unit series: PR121, PR122 and PR123.

The basic series, PR121, offers the whole set of standard protection functions, complete with a user-friendly interface.

It allows discrimination of which fault caused the trip by means of the new led indications.

PR122 and PR123 trip units are of new concept modular architecture. It is now possible to have a complete series of protections, accurate measurements, signalling or dialogue functions, designed and customisable for all application requirements.

The protection system is made up of:

- 3 or 4 new generation current sensors (Rogowsky coil);
- external current sensors (i.e. for external neutral, residual current or source ground return protection);
- a protection unit selected among PR121/P, PR122/P or PR123/P with optional communication module via Modbus or Fieldbus plug network (PR122/P and PR123/P only), as well as via a wireless connection;
- an opening solenoid, which acts directly on the circuit-breaker operating mechanism (supplied with the protection unit).






1SD020034F0001

General specifications of the electronic trip units include:

- operation without the need for an external power supply
- microprocessor technology
- high precision
- sensitivity to the true R.M.S. value of the current
- trip cause indication and trip data recording
- interchangeability among all types of trip units
- setting for neutral configurable:
 - OFF-50%-100%-200% of phase setting for circuit-breakers E1, E2, E3 and E4/f, E6/f full-size versions, and E4-E6 with external neutral protection;
 - OFF-50% for standard E4 and E6.

The main performance features of the trip units are listed below.

PR121				
Protection	PR121/P	PR121/P	PR121/P	
	L I	L S I	L S I G	
PR122				
Protection	PR122/P	PR122/P	PR122/P	PR122/P
	L I	L S I	L S I G	L S I Rc
	For all versions U OT M			
	New modules available:			
	Measuring	opt.	UV OV RV RP UF OF	
	Communication	opt.		
	Signalling	opt.		
	Bluetooth (wireless link)	opt.		
PR123				
Protection	PR123/P	PR123/P		
	L S I	L S I G		
	For all versions OT D U UV OV RV RP M UF OF			
	New modules available:			
	Communication	opt.		
	Signalling	opt.		
	Bluetooth (wireless link)	opt.		

Electronic trip units

Versions available

1

Features

Protection functions	PR121	PR122	PR123
L Protection against overload with inverse long time-delay trip	■	■	■
S Selective protection against short-circuit inverse or definite short time-delay trip	■	■	■
S Second selective protection against short-circuit inverse or definite short time-delay trip			■
I Protection against instantaneous short-circuit with adjustable trip current threshold	■	■	■
G Protection against earth fault	residual	■	■
	source ground return	■	■
Rc Residual current ⁽¹⁾		opt. ⁽²⁾	■
D Protection against directional short-circuit with adjustable time-delay			■
U Protection against phase unbalance		■	■
OT Protection against overtemperature (check)		■	■
UV Protection against undervoltage		opt. ⁽³⁾	■
OV Protection against overvoltage		opt. ⁽³⁾	■
RV Protection against residual voltage		opt. ⁽³⁾	■
RP Protection against reverse active power		opt. ⁽³⁾	■
M Thermal memory for functions L and S		■	■
UF Underfrequency		opt. ⁽³⁾	■
OF Overfrequency		opt. ⁽³⁾	■

Measurements

Currents (phases, neutral, earth fault)		■	■
Voltage (phase-phase, phase-neutral, residual)		opt. ⁽³⁾	■
Power (active, reactive, apparent)		opt. ⁽³⁾	■
Power factor		opt. ⁽³⁾	■
Frequency and peak factor		opt. ⁽³⁾	■
Energy (active, reactive, apparent, meter)		opt. ⁽³⁾	■
Harmonics calculation (display of wave forms and harmonics module)			■

Event marking and maintenance data

Event marking with the instant it occurred	opt. ⁽⁴⁾	■	■
Chronological event storage	opt. ⁽⁴⁾	■	■
Counting the number of operations and contact wear		■	■

Communication with supervision system and centralised control

Remote parameter setting of the protection functions, unit configuration, communication		opt. ⁽⁵⁾	opt. ⁽⁵⁾
Transmission of measurements, states and alarms from circuit-breaker to system		opt. ⁽⁵⁾	opt. ⁽⁵⁾
Transmission of the events and maintenance data from circuit-breaker to system		opt. ⁽⁵⁾	opt. ⁽⁵⁾

Watchdog

Alarm and trip for release overtemperature		■	■
Check of release status	■	■	■

Interface with the user

Presetting parameters by means of dip switches	■		
Presetting parameters by means of keys and LCD viewer		■	■
Alarm signals for functions L, S, I and G	■	■	■
Alarm signal of one of the following protections: undervoltage, overvoltage, residual voltage, active reverse of power, phase unbalance, overtemperature		opt. ⁽³⁾	■
Complete management of pre-alarms and alarms for all the self-control protection functions		■	■
Enabling password for use with consultation in "READ" mode or consultation and setting in "EDIT" mode		■	■

Load control

Load connection and disconnection according to the current passing through the circuit-breaker		■	■
--	--	---	---

Zone selectivity

Can be activated for protection functions S, G and (PR123 only) D		■	■
---	--	---	---

(1) requires a homopolar toroid for residual current protection; (2) the RC function is available with PR122LSIRc or with PR122LSIG and module PR120/V; (3) with PR120/V; (4) with BT030 communication unit; (5) with PR120/D-M

Electronic trip units

Rating plugs

A new concept for setting the current ratings

Rating plugs

Type of circuit-breaker	Max rated uninterrupted current	In [A]											
		400	630	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
E1B	800	■	■	■									
	1000-1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
E1N	800	■	■	■									
	1000-1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
E2B	1600	■	■	■	■	■	■						
	2000	■	■	■	■	■	■	■					
E2N	1000-1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
	2000	■	■	■	■	■	■	■					
E2S	800	■	■	■									
	1000-1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
	2000	■	■	■	■	■	■	■					
E2L	1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
E3N	2500	■	■	■	■	■	■	■	■				
	3200	■	■	■	■	■	■	■	■	■			
E3S	1000-1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
	2000	■	■	■	■	■	■	■					
	2500	■	■	■	■	■	■	■	■				
	3200	■	■	■	■	■	■	■	■	■			
E3H	800	■	■	■									
	1000-1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
	2000	■	■	■	■	■	■	■					
	2500	■	■	■	■	■	■	■	■				
	3200	■	■	■	■	■	■	■	■	■			
E3V	800	■	■	■									
	1250	■	■	■	■	■							
	1600	■	■	■	■	■	■						
	2000	■	■	■	■	■	■	■					
	2500	■	■	■	■	■	■	■	■				
	3200	■	■	■	■	■	■	■	■	■			
E3L	2000	■	■	■	■	■	■	■					
	2500	■	■	■	■	■	■	■	■				
E4S, E4S/f	4000			■	■	■	■	■	■	■	■		
E4H, E4H/f	3200			■	■	■	■	■	■	■	■		
	4000			■	■	■	■	■	■	■	■		
E4V	3200			■	■	■	■	■	■	■	■		
	4000			■	■	■	■	■	■	■	■		
E6H, E6H/f	4000			■	■	■	■	■	■	■	■		
	5000			■	■	■	■	■	■	■	■	■	
	6300			■	■	■	■	■	■	■	■	■	■
E6V	3200			■	■	■	■	■	■	■	■		
	4000			■	■	■	■	■	■	■	■		
	5000			■	■	■	■	■	■	■	■	■	
	6300			■	■	■	■	■	■	■	■	■	■

1

Compliance with Standards

Standards, approvals and certifications

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

- "Low Voltage Directive" (LVD) n° 73/23 EEC
- "Electromagnetic Compatibility Directive" (EMC) nr. 89/336 EEC.

The main versions of the apparatus are approved by the following Shipping Registers:

- RINA (Italian Naval Register)
- Det Norske Veritas
- Bureau Veritas
- Germanischer Lloyd
- Loyd's Register of Shipping
- Polskj Rejestr Statkow
- ABS (American Bureau of Shipping)
- RMRS (Russian Maritime Register of Shipping)
- NK (Nippon Kaiji Kyokai)

The Emax series also has a range which has undergone certification according to the severe American UL 1066 Standards. Furthermore, the Emax series is certified by the Russian GOST (Russia Certificate of Conformity) certification organization, and is certified by China CCC (China Compulsory Certification)

Certification of conformity with the aforementioned product Standards is carried out in compliance with European Standard EN 45011 by the Italian certification body ACAE (Associazione per la Certificazione delle Apparecchiature Elettriche - Association for Certification of Electrical Apparatus), recognized by the European organization LOVAG (Low Voltage Agreement Group), and by Swedish SEMKO certification organization recognized by the International organization IECCE.

Note: Contact ABB SACE for a list of approved types of circuit-breakers, approved performance data and the corresponding validity



Compliance with Standards

A design dedicated to Quality and respect for the environment

Quality, environment, health and safety have always been ABB SACE's major commitment. This commitment involves every function of the company, and has allowed us to achieve prestigious recognition internationally.

The company's quality management system is certified by RINA, one of the most prestigious international certification boards, and complies with ISO 9001-2000 Standards; the ABB SACE test facility is accredited by SINAL; the plant in Frosinone is also certified in compliance with ISO 14001 standard for the environment, OHSAS 18001 for health and safety in the workplace and SA800 for Social Responsibility.

ABB SACE, Italy's first industrial company in the electro-mechanical sector to achieve this, has been able to reduce its raw material consumption and machining scrap by 20% thanks to an ecology-centred revision of its manufacturing process. All of the company's Divisions are involved in streamlining raw material and energy consumption, preventing pollution, limiting noise pollution and reducing scrap resulting from manufacturing processes, as well as in carrying out periodic environmental audits of leading suppliers.

ABB SACE is committed to environmental protection, as is also evidenced by the Life Cycle Assessments (LCA) of products carried out at the Research Centre: this means that assessments and improvements of the environmental performance of products throughout their life cycle are included right from the initial engineering stage. 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.



1SD2C00038F0001



1

Emax





Contents

SACE Emax automatic circuit-breakers	2/2
Automatic circuit-breakers with full-size neutral conductor	2/4
Switch-disconnectors	2/5
Automatic circuit-breakers for applications up to 1150V AC	2/6
Switch-disconnectors for applications up to 1150V AC	2/7
Switch-disconnectors for applications up to 1000V DC	2/8
Sectionalizing truck	2/9
Earthing switch with making capacity	2/10
Earthing truck	2/11
Other versions	2/11



SACE Emax automatic circuit-breakers

Common data

Voltages	
Rated service voltage U_e	[V] 690 ~
Rated insulation voltage U_i	[V] 1000
Rated impulse withstand voltage U_{imp}	[kV] 12
Operating temperature	[°C] -25...+70
Storage temperature	[°C] -40...+70
Frequency f	[Hz] 50 - 60
Number of poles	3 - 4
Versions	Fixed - Withdrawable



2

		E1		E2			
		B	N	B	N	S	L
Performance levels							
Currents: max rated uninterrupted current (at 40 °C)	[A]	800	800	1600	1000	800	1250
	[A]	1000	1000	2000	1250	1000	1600
	[A]	1250	1250		1600	1250	
	[A]	1600	1600		2000	1600	
	[A]				2000		
	[A]						
	[A]						
Neutral pole current-carrying capacity for 4-pole CBs	[%I _u]	100	100	100	100	100	100
Rated ultimate breaking capacity under short-circuit I_{cu}							
220/230/380/400/415 V ~	[kA]	42	50	42	66	85	130
440 V ~	[kA]	42	50	42	66	85	110
500/525 V ~	[kA]	42	50	42	55	65	85
660/690 V ~	[kA]	42	50	42	55	65	85
Rated service breaking capacity under short-circuit I_{cs}							
220/230/380/400/415 V ~	[kA]	42	50	42	65	85	130
440 V ~	[kA]	42	50	42	65	85	110
500/525 V ~	[kA]	42	50	42	55	65	65
660/690 V ~	[kA]	42	50	42	55	65	65
Rated short-time withstand current I_{cw}	(1s) [kA]	42	50	42	55	65	10
	(3s) [kA]	36	36	42	42	50	-
Rated making capacity under short-circuit (peak value) I_{cm}							
220/230/380/400/415 V ~	[kA]	88.2	105	88.2	143	187	286
440 V ~	[kA]	88.2	105	88.2	143	187	242
500/525 V ~	[kA]	88.2	105	88.2	121	143	187
660/690 V ~	[kA]	88.2	105	88.2	121	143	187
Utilisation category (according to CEI EN 60947-2)		B	B	B	B	B	A
Isolation behaviour (according to CEI EN 60947-2)		■	■	■	■	■	■
Overcurrent protection							
Electronic trip units for AC applications		■	■	■	■	■	■
Operating times							
Closing time (max)	[ms]	80	80	80	80	80	80
Breaking time for I < I _{cw} (max) ⁽¹⁾	[ms]	70	70	70	70	70	70
Breaking time for I > I _{cw} (max)	[ms]	30	30	30	30	30	12
Overall dimensions							
Fixed: H = 418 mm - D = 302 mm W (3/4 poles)	[mm]	296/386			296/386		
Withdrawable: H = 461 mm - D = 396.5 mm W (3/4 poles)	[mm]	324/414			324/414		
Weights (circuit-breaker complete with trip units and CS, excluding accessories)							
Fixed 3/4 poles	[kg]	45/54	45/54	50/61	50/61	50/61	52/63
Withdrawable 3/4 poles (including fixed part)	[kg]	70/82	70/82	78/93	78/93	78/93	80/95

(1) Without intentional delays; (2) The performance at 600V is 100kA.

		E1 B-N			E2 B-N-S			E2 L		
		800	1000-1250	1600	800	1000-1250	1600	2000	1250	1600
Max rated uninterrupted current (at 40 °C)	[A]	800	1000-1250	1600	800	1000-1250	1600	2000	1250	1600
Mechanical life with regular ordinary maintenance	[No. operations x 1000]	25	25	25	25	25	25	25	20	20
Operation frequency	[Operations/hour]	60	60	60	60	60	60	60	60	60
Electrical life										
(440 V ~) [No. operations x 1000]		10	10	10	15	15	12	10	4	3
(690 V ~) [No. operations x 1000]		10	8	8	15	15	10	8	3	2
Operation frequency	[Operations/hour]	30	30	30	30	30	30	30	20	20



E3					E4			E6	
N	S	H	V	L	S	H	V	H	V
2500	1000	800	800	2000	4000	3200	3200	4000	3200
3200	1250	1000	1250	2500		4000	4000	5000	4000
	1600	1250	1600					6300	5000
	2000	1600	2000						6300
	2500	2000	2500						
	3200	2500	3200						
		3200							
100	100	100	100	100	50	50	50	50	50
66	75	100	130	130	75	100	150	100	150
66	75	100	130	110	75	100	150	100	150
66	75	100	100	85	75	100	130	100	130
66	75	85 ⁽²⁾	100	85	75	85 ⁽²⁾	100	100	100
66	75	85	100	130	75	100	150	100	125
66	75	85	100	110	75	100	150	100	125
66	75	85	85	65	75	100	130	100	100
66	75	85	85	65	75	85	100	100	100
66	75	75	85	15	75	100	100	100	100
66	65	65	65	-	75	75	75	85	85
143	165	220	286	286	165	220	330	220	330
143	165	220	286	242	165	220	330	220	330
143	165	220	220	187	165	220	286	220	286
143	165	187	220	187	165	187	220	220	220
B	B	B	B	A	B	B	B	B	B
■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■
80	80	80	80	80	80	80	80	80	80
70	70	70	70	70	70	70	70	70	70
30	30	30	30	12	30	30	30	30	30
404/530					566/656			782/908	
432/558					594/684			810/936	
66/80	66/80	66/80	66/80	72/83	97/117	97/117	97/117	140/160	140/160
104/125	104/125	104/125	104/125	110/127	147/165	147/165	147/165	210/240	210/240

E3 N-S-H-V						E3 L		E4 S-H-V		E6 H-V			
800	1000-1250	1600	2000	2500	3200	2000	2500	3200	4000	3200	4000	5000	6300
20	20	20	20	20	20	15	15	15	15	12	12	12	12
60	60	60	60	60	60	60	60	60	60	60	60	60	60
12	12	10	9	8	6	2	1.8	7	5	5	4	3	2
12	12	10	9	7	5	1.5	1.3	7	4	5	4	2	1.5
20	20	20	20	20	20	20	20	10	10	10	10	10	10



Automatic circuit-breakers with full-size neutral conductor

The Emax range of automatic circuit-breakers with full-size neutral conductor is used in special applications where the presence of third harmonics on individual phases can lead to a very high current on the neutral conductor.

Typical applications include installations with loads having high harmonics distortion (computers and electronic devices in general), lighting systems with a large number of fluorescent lamps, systems with inverters and rectifiers, UPS, and systems for adjusting the speed of electric motors.

This range includes standard circuit-breakers with full-size neutral conductor in sizes E1, E2, E3. Models E4 and E6 are available in the "Full size" version up to rated currents of 6300A.

Models E4/f and E6/f are available in fixed and withdrawable four-pole versions. These models can all be fitted with all accessories available for the Emax range, with the exception, on the E6/f model, of the mechanical interlocks made using flexible wires and 15 external auxiliary contacts, which are therefore incompatible.

All the models can be fitted with all the available versions of electronic protection relays, in the standard version.



13DC20068FR001

2

		E4S/f	E4H/f	E6H/f	
Max rated uninterrupted current (at 40 °C)	[A]	4000	3200	4000	
	[A]		4000	5000	
	[A]			6300	
Number of poles		4	4	4	
Rated service voltage U_e	[V ~]	690	690	690	
Rated ultimate breaking capacity under short-circuit I_{cu}					
	220/230/380/400/415 V ~	[kA]	80	100	100
	440 V ~	[kA]	80	100	100
	500/525 V ~	[kA]	75	100	100
	660/690 V ~	[kA]	75	100	100
Rated service breaking capacity under short-circuit I_{cs}					
	220/230/380/400/415 V ~	[kA]	80	100	100
	440 V ~	[kA]	80	100	100
	500/525 V ~	[kA]	75	100	100
	660/690 V ~	[kA]	75	100	100
Rated short-time withstand current I_{cw}					
	(1s)	[kA]	75	85	100
	(3s)	[kA]	75	75	85
Rated making capacity under short-circuit (peak value) I_{cm}					
	220/230/380/400/415 V ~	[kA]	176	220	220
	440 V ~	[kA]	176	220	220
	500/525 V ~	[kA]	165	220	220
	660/690 V ~	[kA]	165	220	220
Utilisation category (according to CEI EN 60947-2)		B	B	B	
Behavior on isolation (according to CEI EN 60947-2)		■	■	■	
Overall dimensions					
	Fixed: H = 418 mm - D = 302 mm W	[mm]	746	746	1034
	Withdrawable: H = 461 mm - D = 396.5 mm W	[mm]	774	774	1062
Weights (circuit-breaker complete with trip units and CS, excluding accessories)					
	Fixed	[kg]	120	120	165
	Withdrawable	[kg]	170	170	250

Switch-disconnectors

The switch-disconnectors are derived from the corresponding circuit-breakers, of which they maintain the overall dimensions and the possibility of mounting accessories.

This version only differs from the circuit-breakers in the absence of overcurrent trip units.

The circuit-breaker is available in both fixed and withdrawable, three-pole and four-pole versions. The switch-disconnectors, identified by the letters "/MS", can be used according to category of use AC-23A (switching motor loads or other highly inductive loads) in accordance with the IEC 60947-3 Standard. The electrical specifications of the switch-disconnectors are listed in the table below.

ISDC00060F0001



2

		E1B/MS	E1N/MS	E2B/MS	E2N/MS	E2S/MS	E3N/MS	E3S/MS	E3V/MS	E4S/MS	E4S/fMS	E4H/MS	E4H/fMS	E6H/MS	E6H/fMS
Max rated uninterrupted current (at 40 °C)	[A]	800	800	1600	1000	1000	2500	1000	800	4000	4000	3200	3200	4000	4000
	[A]	1000	1000	2000	1250	1250	3200	1250	1250			4000	4000	5000	5000
	[A]	1250	1250		1600	1600		1600	1600					6300	6300
	[A]	1600	1600		2000	2000		2000	2000						
	[A]							2500	2500						
	[A]							3200	3200						
Rated service voltage U_e	[V ~]	690	690	690	690	690	690	690	690	690	690	690	690	690	690
	[V -]	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Rated insulation voltage U_i	[V ~]	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated impulse withstand voltage U_{imp}	[kV]	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Rated short-time withstand current I_{cw}	(1s) [kA]	42	50	42	55	65	65	75	85	75	75	100 ⁽¹⁾	85	100	100
	(3s) [kA]	36	36	42	42	50	65	65	65	75	75	75	75	85	85
Rated making capacity under short-circuit (peak value) I_{cm}	220/230/380/400/415/440 V ~ [kA]	88.2	105	88.2	121	143	143	165	187	165	165	220	187	220	220
	500/660/690 V ~ [kA]	88.2	105	88.2	121	143	143	165	187	165	165	220	187	220	220

Note: the breaking capacity I_{cu} , at the maximum rated use voltage, by means of external protection relay, with 500 ms maximum timing, is equal to the value of I_{cw} (1s), except:

(1) $I_{cu} = 85kA @ 690V$



Automatic circuit-breakers for applications up to 1150V AC

SACE Emax circuit-breakers can be supplied in a special version for rated service voltages up to 1150 V in AC.

Circuit-breakers in this version are identified by the letters of the standard range (rated service voltage up to 690 V AC) plus “/E”, and are derived from the corresponding standard SACE Emax circuit-breakers. They offer the same versions and accessories as the latter. The SACE Emax range of circuit-breakers for applications up to 1150V in AC can be either fixed and withdrawable, in both three-pole and four-pole versions. SACE Emax/E circuit-breakers are especially suitable for installation in mines, oil and chemical plants, and for traction. This range of Emax was tested at a voltage of 1250VAC.

The table below shows the electrical specifications of the range.



15DC200061FD001

2

		E2B/E		E2N/E		E3H/E				E4H/E**		E6H/E**				
Max rated uninterrupted current (at 40 °C)	[A]	1600	2000	1250	1600	2000	1250	1600	2000	2500	3200	3200	4000	4000	5000	6300
Rated service voltage U_e	[V~]	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Rated insulation voltage U_i	[V~]	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
Rated ultimate breaking capacity under short-circuit I_{cu}																
	1000 V [kA]	20	20	30	30	30	50	50	50	50	50	65	65	65	65	65
	1150 V [kA]	20	20	30	30	30	30	30	30	30	30	65	65	65	65	65
Rated service breaking capacity under short-circuit I_{cs}																
	1000 V [kA]	20	20	30	30	30	50	50	50	50	50	65	65	65	65	65
	1150 V [kA]	20	20	30	30	30	30	30	30	30	30	65	65	65	65	65
Rated short-time withstand current I_{cw} (1s)	[kA]	20	20	30	30	30	50 (*)	50 (*)	50 (*)	50 (*)	50 (*)	65	65	65	65	65
Rated making capacity under short-circuit (peak value) I_{cm}																
	1000 V [kA]	40	40	63	63	63	105	105	105	105	105	143	143	143	143	143
	1150 V [kA]	40	40	63	63	63	63	63	63	63	63	143	143	143	143	143

(*) 30 kA @ 1150 V.

(**) E4H/E and E6H/E are not available in the full-size version.

Switch-disconnectors for applications up to 1150V AC

The switch-disconnectors complete the range of apparatus for applications at 1150V in alternating current (AC). These circuit-breakers conform with the IEC 60947-3 Standards.

Circuit-breakers in this version are identified by the letters of the standard range, where the rated service voltage is up to 690 V AC, plus “/E”, thus becoming SACE Emax/E MS. They are derived from the corresponding standard SACE Emax switch-disconnectors.

They are available in the three-pole and four-pole, fixed and withdrawable versions in the same sizes, with accessory options and installations as per the corresponding standard circuit-breakers. All the accessories available for the SACE Emax range can be used. Standard fixed parts may also be used for circuit-breakers in the withdrawable version. As per the corresponding automatic version, this range of Emax was tested at a voltage of 1250VAC.

1SDCC0061F0001



2

		E2B/E MS	E2N/E MS	E3H/E MS	E4H/E MS*	E6H/E MS*
Max rated current (at 40 °C)	[A]	1600	1250	1250	3200	4000
	[A]	2000	1600	1600	4000	5000
	[A]		2000	2000		6300
	[A]			2500		
	[A]			3200		
Poles		3/4	3/4	3/4	3/4	3/4
Rated service voltage U_e	[V]	1150	1150	1150	1150	1150
Rated insulation voltage U_i	[V]	1250	1250	1250	1250	1250
Rated impulse withstand voltage U_{imp}	[kV]	12	12	12	12	12
Rated short-time withstand current I_{cw} (1s)	[kA]	20	30	30 ⁽¹⁾	65	65
Rated making capacity I_{cm} 1150V AC (peak value)	[kA]	40	63	63 ⁽²⁾	143	143

Note: The breaking capacity I_{cu}, by means of external protection relay, with 500 ms maximum timing, is equal to the value of I_{cw} (1s).

(1) The performance at 1000V is 50 kA.

(2) The performance at 1000V is 105 kA.

* E4H/E and E6H/E are not available in the full-size version.



Switch-disconnectors for applications up to 1000V DC

ABB SACE has developed the SACE Emax/E MS range of switch-disconnectors for applications in direct current up to 1000V in compliance with the international IEC 60947-3 Standard. These non-automatic circuit-breakers are especially suitable for use as bus ties or main isolators in direct current systems, such as in applications involving electric traction.

The range covers all installation needs up to 1000V DC / 6300A.

They are available in fixed and withdrawable, three-pole and four-pole versions.

By connecting three breaking poles in series, it is possible to achieve a rated voltage of 750V DC, while with four poles in series the limit rises to 1000V DC.

The switch-disconnectors of the SACE Emax/E MS range maintain the overall dimensions and fixing points of the standard range circuit-breakers. They can be fitted with the various terminal kits and all the accessories common to the SACE Emax range. They cannot, of course, be associated with the electronic trip units, CSs and accessories for determining currents and for AC applications.

The withdrawable circuit-breakers should be used together with the special version fixed parts for applications at 750/1000V DC.



15DC0200061FD001

2

		E1B/E MS		E2N/E MS		E3H/E MS		E4H/E MS*		E6H/E MS*	
Max rated current (at 40 °C)	[A]	800		1250		1250		3200		4000	
	[A]	1250		1600		1600		4000		5000	
	[A]			2000		2000				6300	
	[A]					2500					
	[A]					3200					
Poles		3	4	3	4	3	4	3	4	3	4
Rated service voltage U_e	[V]	750	1000	750	1000	750	1000	750	1000	750	1000
Rated insulation voltage U_i	[V]	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated impulse withstand voltage U_{imp}	[kV]	12	12	12	12	12	12	12	12	12	12
Rated short-time withstand current I_{cw} (1s)	[kA]	20	20 ⁽¹⁾	25	25 ⁽¹⁾	40	40 ⁽¹⁾	65	65	65	65
Rated making capacity I_{cm}	750V DC	[kA]	42	42	52.5	52.5	105	105	143	143	143
	1000V DC		–	42	–	52,5	–	105	–	143	–

Note: The breaking capacity I_{cu} , by means of external protection relay, with 500 ms maximum timing, is equal to the value of I_{cw} (1s).

(1) The performances at 750 V are:

- for E1B/E MS I_{cw} = 25 kA,
- for E2N/E MS I_{cw} = 40 kA and
- for E3H/E MS I_{cw} = 50 kA.

* For the dimensions of E4H/E MS and E6H/E MS in four-pole version, please refer to the corresponding automatic circuit-breakers with full-size neutral conductor.

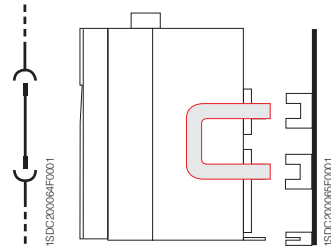


Sectionalizing truck

Sectionalizing truck - CS

This version is derived from the corresponding withdrawable circuit-breaker, with replacement of all the breaking parts and the operating mechanism with simple connections between the top and bottom isolating contacts.

It is used as a no load isolator where this is required by the system.





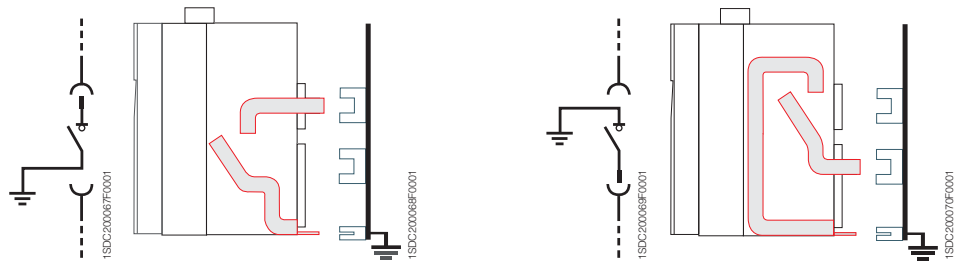
Earthing switch with making capacity

Earthing switch with making capacity - MTP

This version is based on the moving part of the corresponding withdrawable circuit-breaker (without overcurrent trip units) and the top or bottom isolating contacts, which are replaced with connections that short circuit the phases to earth through the circuit-breaker. The earthing switch is available with top or bottom isolating contacts.

The earthing circuit is dimensioned for a short-time withstand current equal to 60% of the maximum Icw of the circuit-breaker from which it is derived (IEC 60439-1).

The earthing switch is inserted in the fixed part of a withdrawable circuit-breaker to earth the top or bottom terminals before carrying out inspection or maintenance operations in safe conditions on the external circuit. It should be used in cases where residual or recovery voltages can occur in the installations to be earthed.





Earthing truck

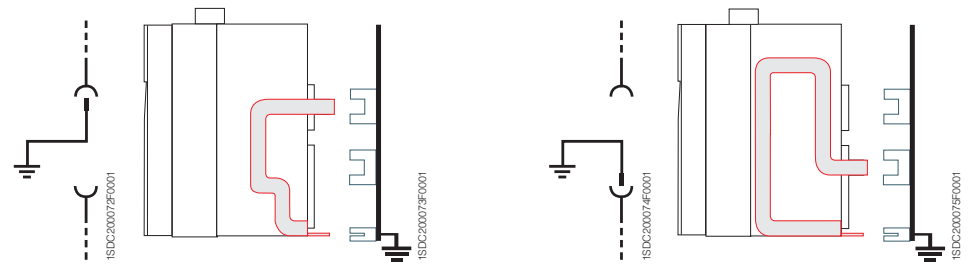
Other versions

Earthing truck- MT

This version is similar to the sectionalizing truck, but with the bottom or top isolating contacts replaced by short-circuited, earthed connections. The earthing truck is available with bottom or top isolating contacts, suitable for the fixed part of the size.

The earthing circuit is dimensioned for a short-time withstand current equal to 60% of the maximum Icw of the circuit-breaker from which it is derived (IEC 60439-1).

The truck is temporarily racked into the fixed part of a withdrawable circuit-breaker to earth the top or bottom terminals before carrying out maintenance operations on the external circuit when no residual voltages are expected to occur.



Other versions

On request, SACE Emax circuit-breakers can be built in special versions designed for particularly aggressive environments ($\text{SO}_2/\text{H}_2\text{S}$), for seismic installations or with the neutral pole on the right side.

Emax



SACE E2V 2P

I _n	I _{tripping}	I _{set}	I _{trip}	I _{max}
125	125	125	125	125
160	160	160	160	160
200	200	200	200	200
250	250	250	250	250
315	315	315	315	315
400	400	400	400	400
500	500	500	500	500
630	630	630	630	630
800	800	800	800	800
1000	1000	1000	1000	1000
1250	1250	1250	1250	1250
1600	1600	1600	1600	1600
2000	2000	2000	2000	2000
2500	2500	2500	2500	2500
3150	3150	3150	3150	3150
4000	4000	4000	4000	4000
5000	5000	5000	5000	5000
6300	6300	6300	6300	6300
8000	8000	8000	8000	8000
10000	10000	10000	10000	10000
12500	12500	12500	12500	12500
16000	16000	16000	16000	16000
20000	20000	20000	20000	20000
25000	25000	25000	25000	25000
31500	31500	31500	31500	31500
40000	40000	40000	40000	40000
50000	50000	50000	50000	50000
63000	63000	63000	63000	63000
80000	80000	80000	80000	80000
100000	100000	100000	100000	100000

CE



Contents

Installation in switchgear

Modular design	3/2
Choosing the type of circuit-breaker	3/3
Current-carrying capacity in switchgear	3/6

Changing the rated uninterrupted current in relation to the temperature

Temperature derating	3/7
----------------------------	-----

Derating at different altitudes 3/12 |

Current-limiting and specific let-through energy curves

for E2L and E3L circuit-breakers	3/13
--	------



Installation in switchgear

Modular design

The circuit-breakers in the SACE Emax series have been built according to modular design criteria for easier installation and integration in low voltage electrical switchgear, thanks to their having the same depth and height for all the sizes, as well as a significant reduction in their overall installation dimensions.

The front shield of the circuit-breaker is also identical for the entire series. This simplifies construction of the switchgear doors since only one type of drilling is required and makes the front of the switchgear the same for all sizes.

SACE Emax circuit-breakers are suitable for Power Center switchgear and make it easy to comply with the segregation requirements of the IEC 60439-1 Standards.



1SDC20082F0001

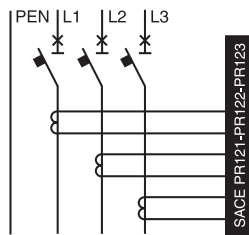
Installation in switchgear

Choosing the type of circuit-breaker

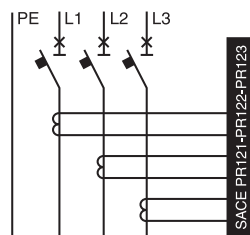
Number of poles

The choice of the number of poles for circuit-breakers that simultaneously provide switching, protection and isolation functions in three-phase installations depends on the type of electrical system (TT, TN-S, TN-C, IT) and the type of user or, more generally, whether it features a distributed or non-distributed neutral.

Three-pole circuit breakers

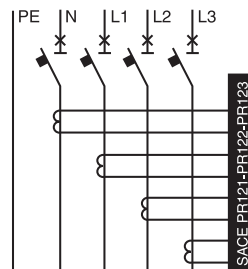


For TN-C systems (the neutral cannot be interrupted because it also acts as the protection conductor).



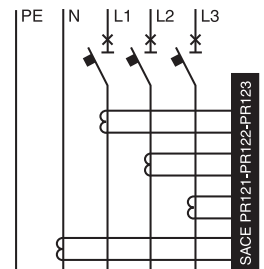
For users that do not use the neutral (e.g.: asynchronous motors) and, for systems with undistributed neutral in general.

Four-pole circuit breakers



In all other instances, with exceptions for the IT system (see CEI 64-8/473.3.2.2 Standards).

Three-pole circuit breakers with external neutral



Current transformers can be installed on the external neutral of five-wire systems (TN-S) with 3-pole circuit-breakers.

3

Fixed or withdrawable version

The fixed version of the circuit-breaker is more compact in size than the withdrawable version. It is recommended for installations that can tolerate service interruptions in the event of faults or programmed maintenance.

The withdrawable version of the circuit-breaker is recommended for:

- applications that can only tolerate brief interruptions due to faults or programmed maintenance;
- dual lines, one of which is a standby for the other, with a single circuit-breaker for each pair.





Installation in switchgear

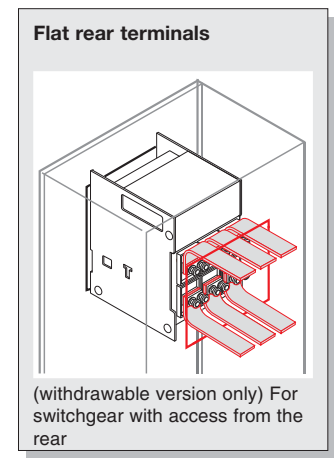
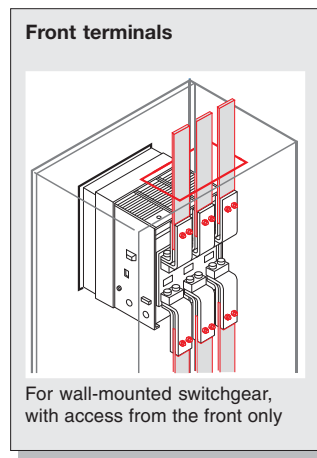
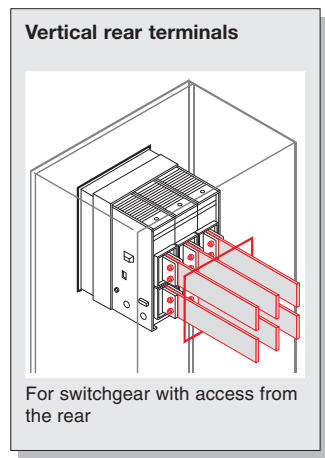
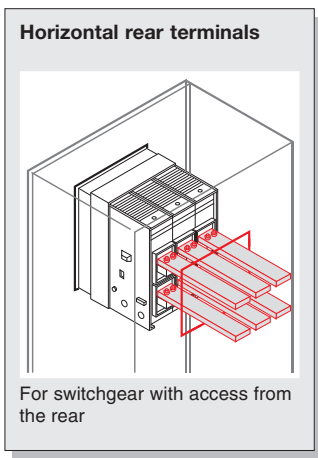
Choosing the type of circuit-breaker

Connecting the main circuit-breaker circuits

When designing switchgear, one must always bear in mind the problem of making the most rational connections between the circuit-breaker and main busbar system and from the busbars to the users. The SACE Emax series offers switchgear manufacturers a range of options to satisfy different circuit-breaker connection requirements.

The figures below give some indications for terminal selection.

3



Degrees of protection

A number of solutions have been adopted on SACE Emax circuit-breakers to achieve IP20 degree of protection for fixed or withdrawable circuit-breakers, excluding the terminals, and IP30 for their front parts using a flange. Automatic shutters have been designed for the fixed parts of withdrawable circuit-breakers which can be locked using padlock devices to allow maintenance on the load side or on the power-supply side of the fixed part.

A transparent protective cover is also available on request, to completely segregate the front of the circuit-breaker, reaching IP54 degree of protection. In any case, the front panel and protection trip unit with the relative indications remain completely visible.

- IP20** Fixed or withdrawable version circuit-breaker, excluding the terminals.
- IP30** Front parts of the circuit-breakers (using a flange).
- IP54** Fixed or withdrawable version circuit-breaker, fitted with transparent protective cover to be fixed onto the front of the switchgear (on request).



Power losses

The IEC 439-1 and CEI EN 60439-1 Standards prescribe calculations for determining the heat dissipation of ANS type switchgear (non-standard), for which the following must be taken into consideration:

- the overall dimensions
- the rated current of the bus-bars and connections and the relative dissipation
- the dissipated power of the apparatus mounted in the switchgear.

For this point, the table beside provides information on the circuit-breakers. For other apparatus, please consult the catalogues of the relative manufacturers.

Total power losses			
Circuit breaker	Size [A]	Fixed Poles 3/4 Poles [W]	Withdrawable 3/4 Poles [W]
E1 B-N	800	65	95
	1000	96	147.2
	1250	150	230
	1600	253	378
E2 B-N-S	800	29	53
	1000	44.8	83.2
	1250	70	130
	1600	115	215
E2 L	2000	180	330
	1250	105	165
	1600	170	265
E3 N-S-H-V	800	22	36
	1000	38.4	57.6
	1250	60	90
	1600	85	150
	2000	130	225
	2500	205	350
E3 L	3200	330	570
	2000	215	330
	2500	335	515
E4 S-H-V	3200	235	425
	4000	360	660
E6 H-V	3200	170	290
	4000	265	445
	5000	415	700
	6300	650	1100

Note

The table values refer to balanced loads, a current flow of Iu, and automatic circuit-breakers.



Note

The same standards prescribe type tests for AS switchboards (standard factory-manufactured switchgear), including those for maximum temperature rise.



Installation in switchgear

Current-carrying capacity in switchgear

As an example, the following table shows the continuous current carrying capacity for circuit-breakers installed in a switchgear with the dimensions indicated below.

These values refer to withdrawable version circuit-breaker installed in non-segregated switchgear with a degree of protection up to IP31, and the following dimensions:

2300x800x900 (HxLxD) for E1 - E2 - E3;

2300x1400x1500 (HxLxD) for E4 - E6.

The values refer to a maximum temperature at the terminals of 120°C.

For withdrawable circuit-breakers with a rated current of 6300A, the use of vertical rear terminals is recommended.

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.

3

Type	Vertical terminals				Horizontal and front terminals			
	Continuous capacity [A]			Busbars section [mm ²]	Continuous capacity [A]			Busbars section [mm ²]
	35°C	45°C	55°C		35°C	45°C	55°C	
E1B/N 08	800	800	800	1x(60x10)	800	800	800	1x(60x10)
E1B/N 10	1000	1000	1000	1x(80x10)	1000	1000	1000	2x(60x8)
E1B/N 12	1250	1250	1250	1x(80x10)	1250	1250	1200	2x(60x8)
E1B/N 16	1600	1600	1500	2x(60x10)	1550	1450	1350	2x(60x10)
E2S 08	800	800	800	1x(60x10)	800	800	800	1x(60x10)
E2N/S 10	1000	1000	1000	1x(60x10)	1000	1000	1000	1x(60x10)
E2N/S 12	1250	1250	1250	1x(60x10)	1250	1250	1250	1x(60x10)
E2B/N/S 16	1600	1600	1600	2x(60x10)	1600	1600	1530	2x(60x10)
E2B/N/S 20	2000	2000	1800	3x(60x10)	2000	2000	1750	3x(60x10)
E2L 12	1250	1250	1250	1x(60x10)	1250	1250	1250	1x(60x10)
E2L 16	1600	1600	1500	2x(60x10)	1600	1500	1400	2x(60x10)
E3H/V 08	800	800	800	1x(60x10)	800	800	800	1x(60x10)
E3S/H 10	1000	1000	1000	1x(60x10)	1000	1000	1000	1x(60x10)
E3S/H/V 12	1250	1250	1250	1x(60x10)	1250	1250	1250	1x(60x10)
E3S/H/V 16	1600	1600	1600	1x(100x10)	1600	1600	1600	1x(100x10)
E3S/H/V 20	2000	2000	2000	2x(100x10)	2000	2000	2000	2x(100x10)
E3N/S/H/V 25	2500	2500	2500	2x(100x10)	2500	2450	2400	2x(100x10)
E3N/S/H/V 32	3200	3100	2800	3x(100x10)	3000	2880	2650	3x(100x10)
E3L 20	2000	2000	2000	2x(100x10)	2000	2000	1970	2x(100x10)
E3L 25	2500	2390	2250	2x(100x10)	2375	2270	2100	2x(100x10)
E4H/V 32	3200	3200	3200	3x(100x10)	3200	3150	3000	3x(100x10)
E4S/H/V 40	4000	3980	3500	4x(100x10)	3600	3510	3150	6x(60x10)
E6V 32	3200	3200	3200	3x(100x10)	3200	3200	3200	3x(100x10)
E6H/V 40	4000	4000	4000	4x(100x10)	4000	4000	4000	4x(100x10)
E6H/V 50	5000	4850	4600	6x(100x10)	4850	4510	4250	6x(100x10)
E6H/V 63	6000	5700	5250	7x(100x10)	-	-	-	-

Changing the rated uninterrupted current in relation to the temperature

Temperature derating

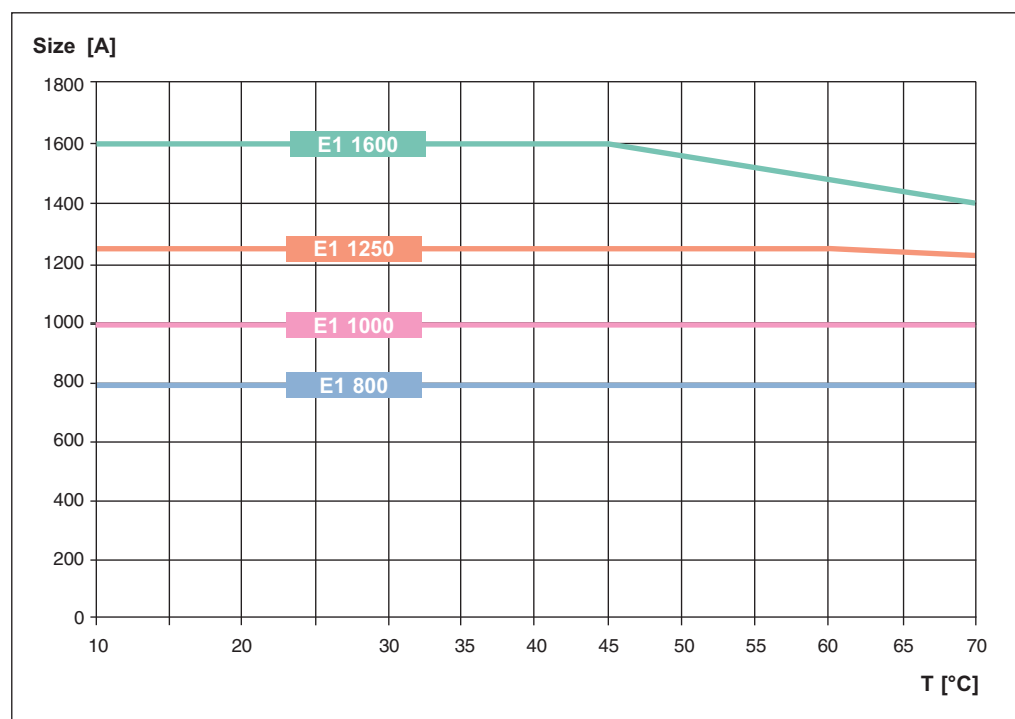
The circuit-breakers can operate at higher temperatures than their reference temperature (40 °C) under certain installation conditions. In these cases the current-carrying capacity of the switchgear should be reduced.

The SACE Emax series of air circuit-breakers uses electronic trip units which offer the benefit of great operating stability when subjected to temperature changes.

The tables below show the current-carrying capacities of the circuit breakers (as absolute values and percentage values) in relation to their rated values at T = 40 °C.

Withdrawable SACE Emax E1

Temperature [°C]	E1 800		E1 1000		E1 1250		E1 1600	
	%	[A]	%	[A]	%	[A]	%	[A]
10	100	800	100	1000	100	1250	100	1600
20	100	800	100	1000	100	1250	100	1600
30	100	800	100	1000	100	1250	100	1600
40	100	800	100	1000	100	1250	100	1600
45	100	800	100	1000	100	1250	98	1570
50	100	800	100	1000	100	1250	96	1530
55	100	800	100	1000	100	1250	94	1500
60	100	800	100	1000	100	1250	92	1470
65	100	800	100	1000	99	1240	89	1430
70	100	800	100	1000	98	1230	87	1400





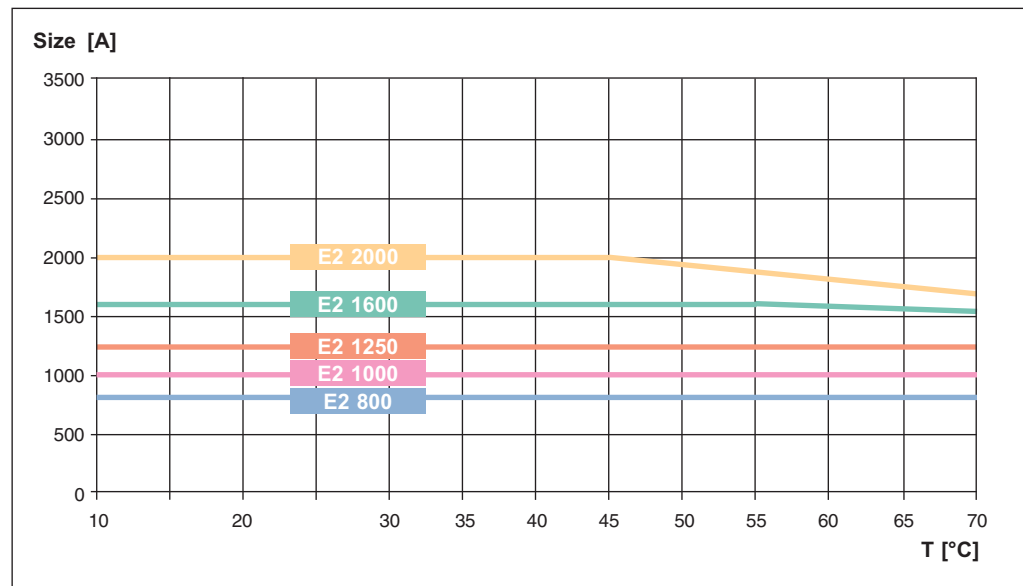
Changing the rated uninterrupted current in relation to the temperature

Temperature derating

Withdrawable SACE Emax E2

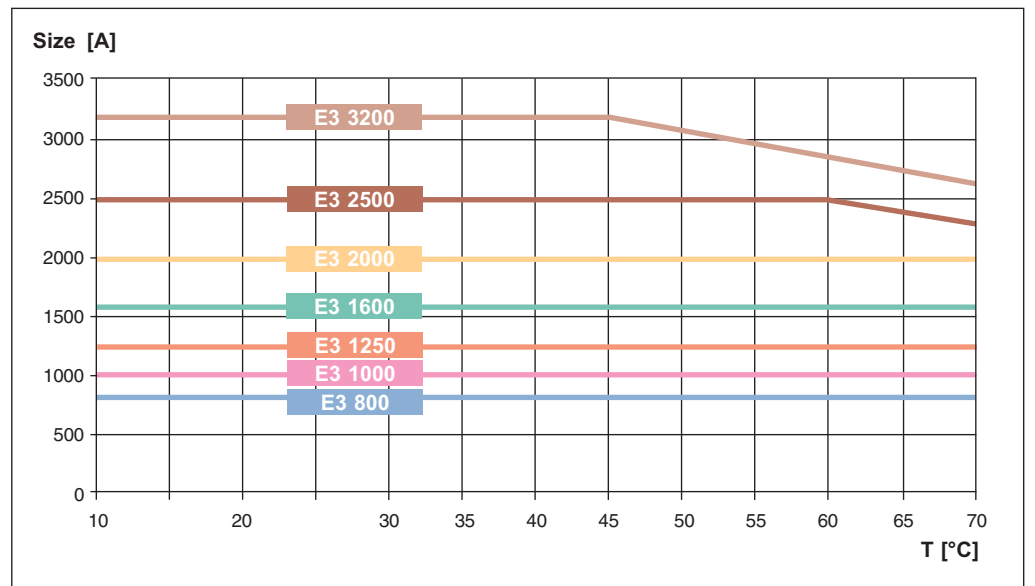
Temperature [°C]	E2 800		E2 1000		E2 1250		E2 1600		E2 2000	
	%	[A]	%	[A]	%	[A]	%	[A]	%	[A]
10	100	800	100	1000	100	1250	100	1600	100	2000
20	100	800	100	1000	100	1250	100	1600	100	2000
30	100	800	100	1000	100	1250	100	1600	100	2000
40	100	800	100	1000	100	1250	100	1600	100	2000
45	100	800	100	1000	100	1250	100	1600	100	2000
50	100	800	100	1000	100	1250	100	1600	97	1945
55	100	800	100	1000	100	1250	100	1600	94	1885
60	100	800	100	1000	100	1250	98	1570	91	1825
65	100	800	100	1000	100	1250	96	1538	88	1765
70	100	800	100	1000	100	1250	94	1510	85	1705

3



Withdrawable SACE Emax E3

Temperature [C°]	E3 800		E3 1000		E3 1250		E3 1600		E3 2000		E3 2500		E3 3200	
	%	[A]	%	[A]	%	[A]	%	[A]	%	[A]	%	[A]	%	[A]
10	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	100	3200
20	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	100	3200
30	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	100	3200
40	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	100	3200
45	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	100	3200
50	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	97	3090
55	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	93	2975
60	100	800	100	1000	100	1250	100	1600	100	2000	100	2500	89	2860
65	100	800	100	1000	100	1250	100	1600	100	2000	97	2425	86	2745
70	100	800	100	1000	100	1250	100	1600	100	2000	94	2350	82	2630



3

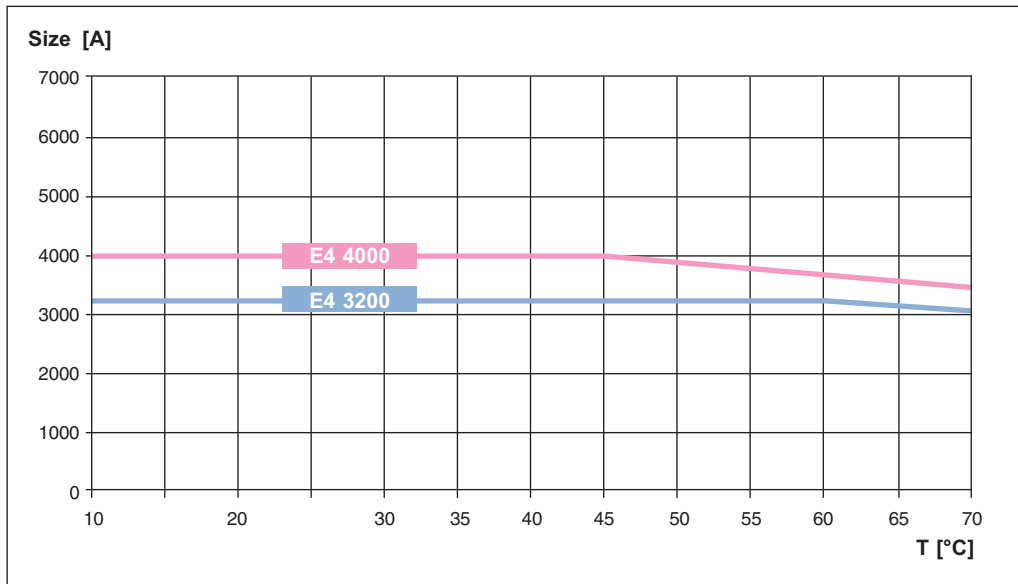


Changing the rated uninterrupted current in relation to the temperature

Temperature derating

Withdrawable SACE Emax E4

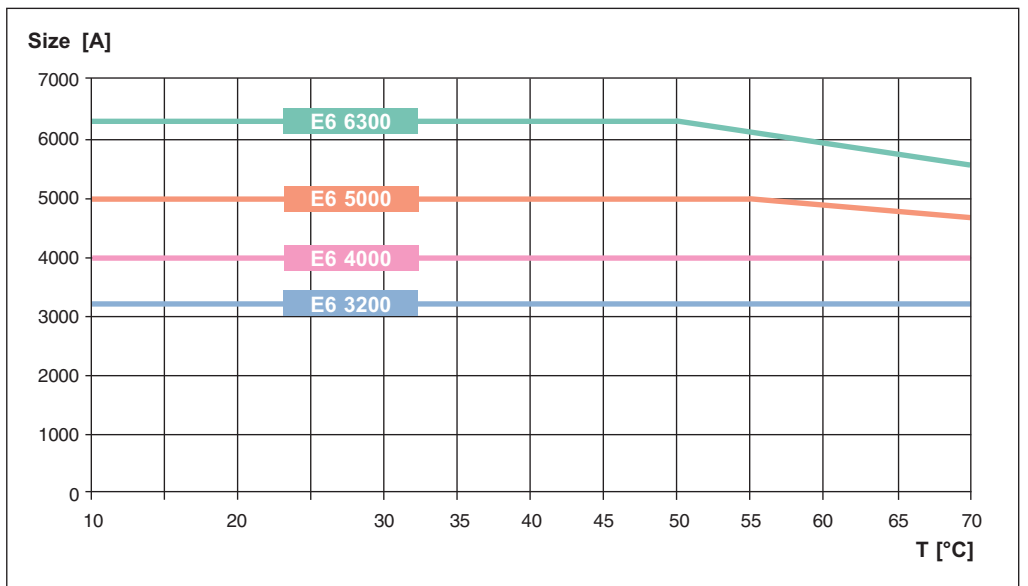
Temperature [°C]	E4 3200		E4 4000	
	%	[A]	%	[A]
10	100	3200	100	4000
20	100	3200	100	4000
30	100	3200	100	4000
40	100	3200	100	4000
45	100	3200	100	4000
50	100	3200	98	3900
55	100	3200	95	3790
60	100	3200	92	3680
65	98	3120	89	3570
70	95	3040	87	3460



3

Withdrawable SACE Emax E6

Temperature [°C]	E6 3200		E6 4000		E6 5000		E6 6300	
	%	[A]	%	[A]	%	[A]	%	[A]
10	100	3200	100	4000	100	5000	100	6300
20	100	3200	100	4000	100	5000	100	6300
30	100	3200	100	4000	100	5000	100	6300
40	100	3200	100	4000	100	5000	100	6300
45	100	3200	100	4000	100	5000	100	6300
50	100	3200	100	4000	100	5000	100	6300
55	100	3200	100	4000	100	5000	98	6190
60	100	3200	100	4000	98	4910	96	6070
65	100	3200	100	4000	96	4815	94	5850
70	100	3200	100	4000	94	4720	92	5600



3



Derating at different altitudes

SACE Emax air circuit-breakers do not undergo any changes in their rated performance up to an altitude of 2000 meters.

As the altitude increases the atmospheric properties alter in terms of composition, dielectric capacity, cooling power and pressure.

The performance of the circuit-breakers therefore undergoes derating which can be measured through the variation in significant parameters such as the maximum operating voltage and the rated uninterrupted current.

The table below shows these values in relation to altitude.

Altitude	H [m]	<2000	3000	4000	5000
Rated service voltage	U_e [V]	690	600	500	440
Rated current	I_n [A]	I _n	0.98xI _n	0.93xI _n	0.90xI _n

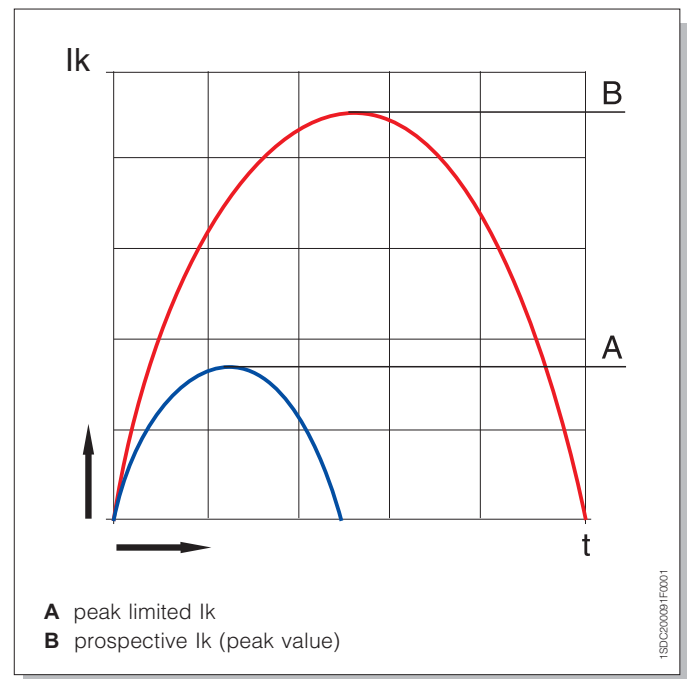
Current-limiting and specific let-through energy curves for E2L and E3L circuit-breakers

The current-limiting capacity of a current-limiting circuit-breaker indicates its greater or lesser capacity, under short-circuit conditions, to let through or make a current lower than the prospective fault current. This characteristic is shown by two different curves which indicate the following, respectively:

- the value of the specific energy " I^2t " (in A^2s) let through by the circuit-breaker in relation to the uninterrupted symmetrical short-circuit current.
- the peak value (in kA) of the limited current in relation to the uninterrupted symmetrical short-circuit current.

The graph shown at the side schematically indicates the trend of the uninterrupted current, with the relative established peak (curve B), and the trend of the limited current with the lowest peak value (curve A).

Comparing the areas beneath the two curves shows how the specific let-through energy is reduced as a result of the limiting effects of the circuit breaker.

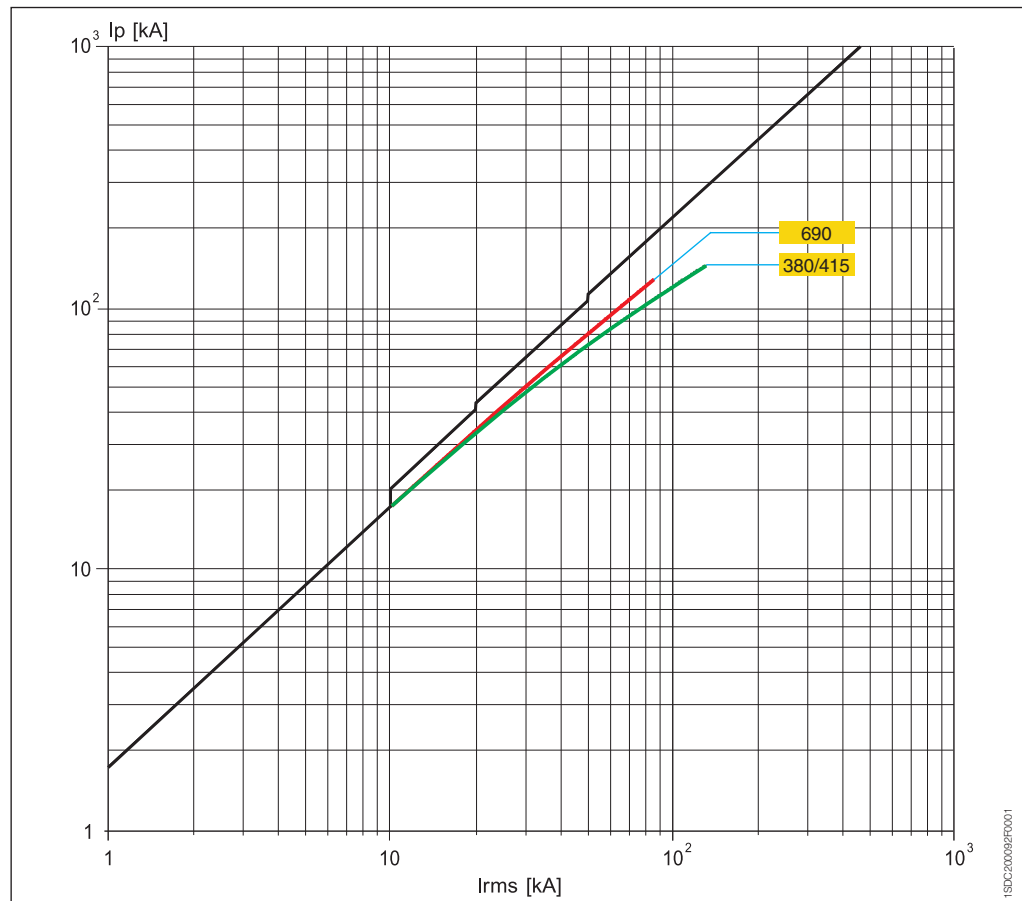




Current-limiting and specific let-through energy curves for E2L and E3L circuit-breakers

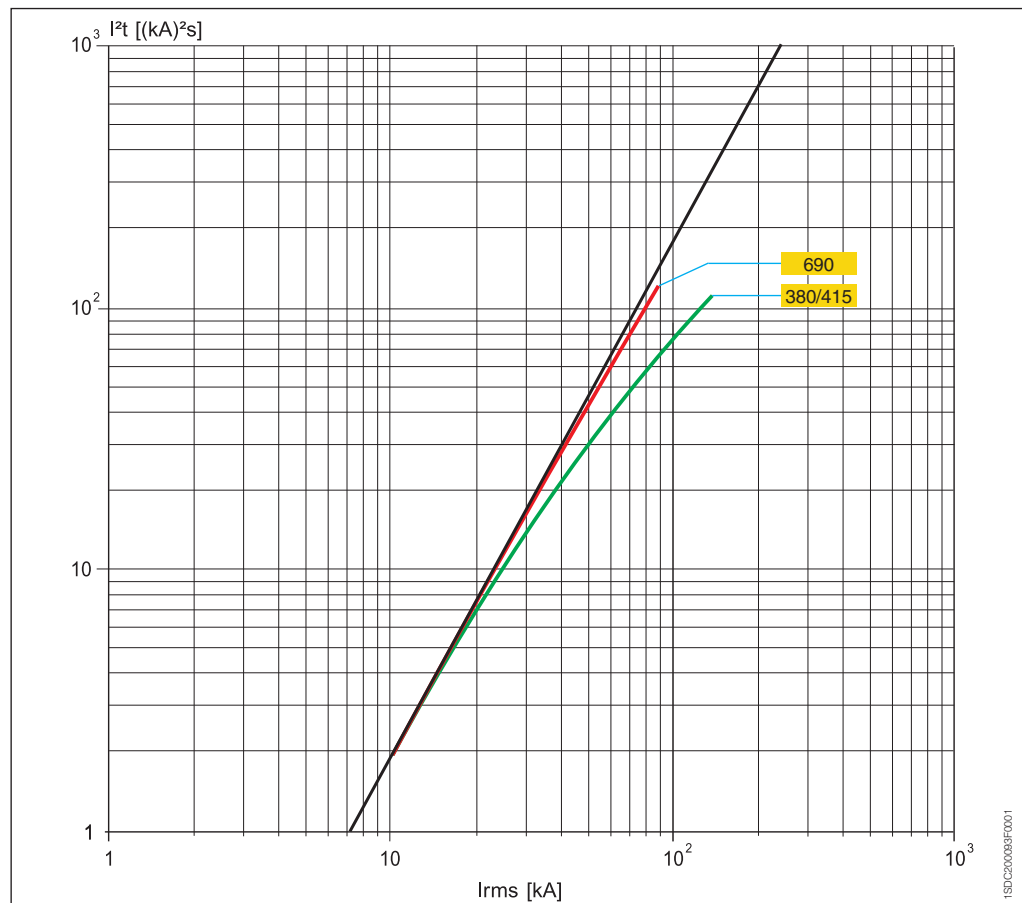
E2L

Current-limiting curves



E2L

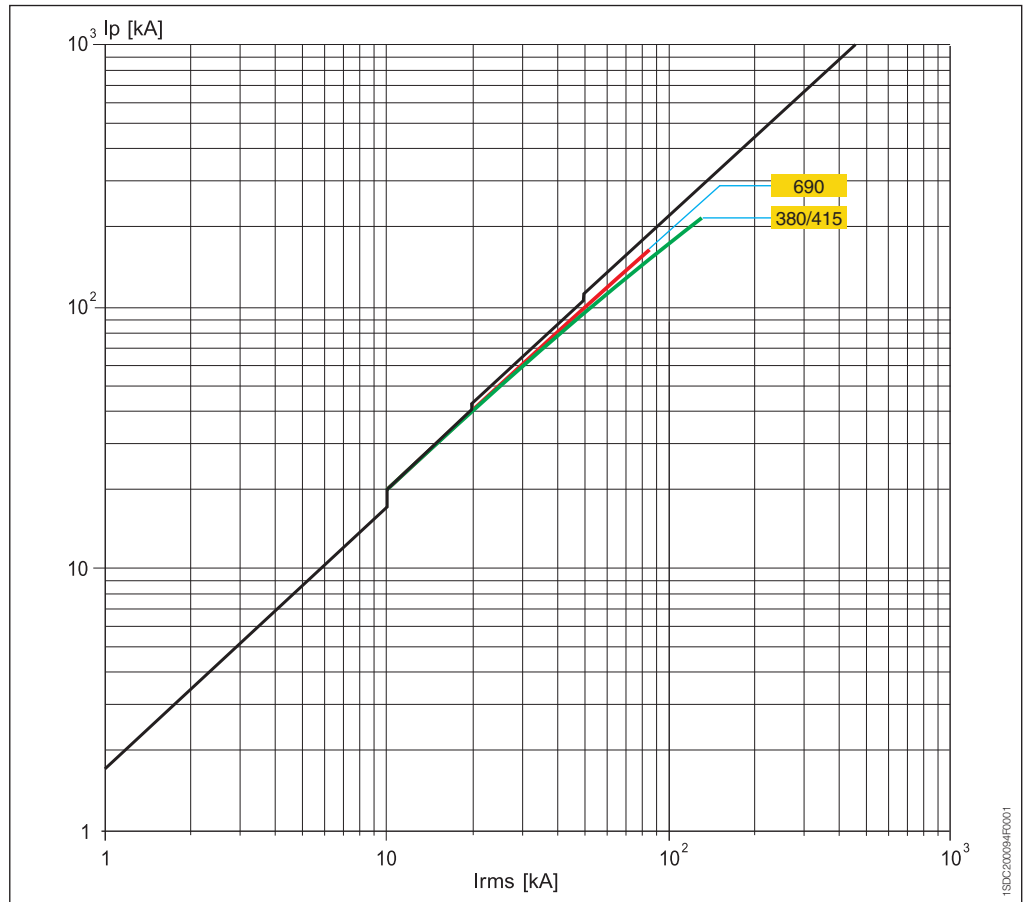
Specific let-through energy curves



Irms prospective symmetrical short-circuit current
Ip peak current
I²t specific let-through energy at the voltages indicated

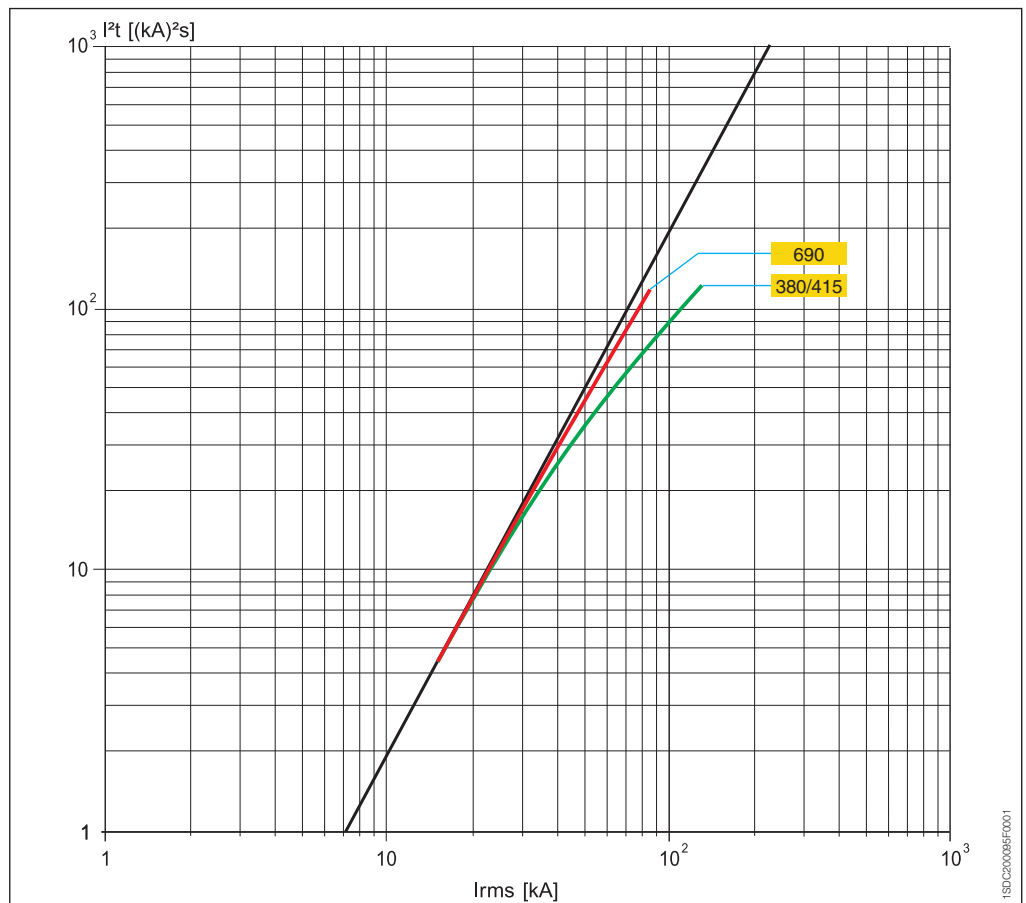
E3L

Current-limiting curves



E3L

Specific let-through energy curves



- I_{rms}** prospective symmetrical short-circuit current
- I_p** peak current
- I^2t** specific let-through energy at the voltages indicated

Emmax





Overcurrent releases and related accessories

Contents

Protection trip units and trip curves

PR121/P	4/2
PR122/P	4/9
PR123/P	4/24

Accessories for protection trip units

PR120/K Internal Module	4/35
PR120/V Measurement Module	4/35
PR120/D-M Communication Module	4/36
PR120/D-BT Wireless Communication Module	4/36
BT030 Communication unit	4/36
PR030/B power supply unit	4/36
Interface from front of HMI030 panel	4/36
SACE PR010/T configuration test unit	4/37
Flex Interface	4/38

Communication devices and systems

Industrial networking and ABB SACE Emax	4/40
PR120/D-M	4/42
BT030	4/42
EP 010 – FBP	4/42
SD-View 2000	4/44
SD-TestBus2	4/46



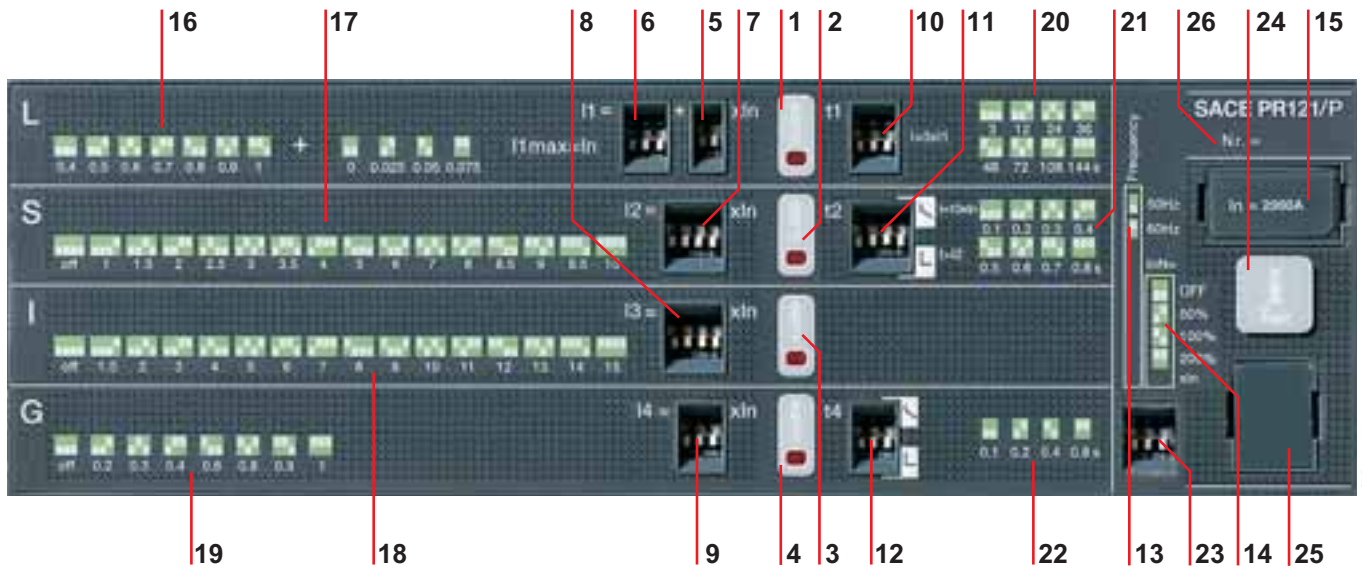
Protection trip units and trip curves

PR121/P

Characteristics

PR121/P is the new basic and complete trip unit for the Emax series. The complete range of protection functions together with the wide combination of thresholds and trip times offered make it suitable for protecting a wide range of alternating current installation. In addition to protection functions the unit is provided with multifunction LED indicators. Furthermore, PR121/P allows connection to external devices enhancing its advanced characteristics like remote signalling and monitoring, or remote supervision display.

4



Caption

- | | | | |
|--|--|---|---|
| <ul style="list-style-type: none"> 1 LED signalling Alarm for protection function L 2 LED signalling Alarm for protection function S 3 LED signalling Alarm for protection function I 4 LED signalling Alarm for protection function G 5 DIP switches for fine setting current threshold I1 6 DIP switches for main setting current threshold I1 7 DIP switches for setting current threshold I2 8 DIP switches for setting current threshold I3 | <ul style="list-style-type: none"> 9 DIP switches for setting current threshold I4 10 DIP switches for setting trip time t1 (type of curve) 11 DIP switches for setting trip time t2 (type of curve) 12 DIP switches for setting trip time t4 (type of curve) 13 Indication of the DIP switch position for network frequency 14 Indication of the DIP switch position for Neutral protection setting 15 Rating plug 16 Indication of the DIP switch positions for the various current thresholds values I1 | <ul style="list-style-type: none"> 17 Indication of the DIP switch positions for the various current threshold values I2 18 Indication of the DIP switch positions for the various current threshold values I3 19 Indication of the DIP switch positions for the various current threshold values I4 20 Indication of DIP switch positions for the various time settings t1 21 Indication of DIP switch positions for the various time settings t2 22 Indication of DIP switch positions for the various time settings t4 23 DIP switch for setting network frequency and neutral protection setting | <ul style="list-style-type: none"> 24 Trip cause indication and trip test pushbutton 25 Test connector for connecting or testing the trip unit through an external device (PR030/B battery unit, BT030 wireless communication unit and SACE PR010/T unit) 26 Serial number of protection trip unit |
|--|--|---|---|

Operation and protection functions

Protection functions

The PR121 trip unit offers the following protection functions:

- overload (L)
- selective short-circuit (S)
- instantaneous short-circuit (I)
- earth fault (G).

Overload (L)

The inverse long time-delay trip overload protection L is type $I^2t = k$; 25 current thresholds and 8 curves are available. Each curve is identified by the trip time in relation to the current $I = 3 \times I_1$ ($I_1 =$ set threshold).

Selective short-circuit (S)

The selective short-circuit protection S can be set with two different types of curves with a trip time independent of the current ($t = k$) or with a constant specific let-through energy ($t = k/I^2$).

15 current thresholds and 8 curves are available, allowing a fine setting. Each curve is identified as follows:

- for curves $t = k$ by the trip time for $I > I_2$
- for curves $t = k/I^2$ by the trip time for $I = 10 \times I_n$ ($I_n =$ rated current of the circuit-breaker).

The function can be excluded by setting the DIP switches to the combination labelled "OFF".

Adjustable instantaneous short-circuit (I)

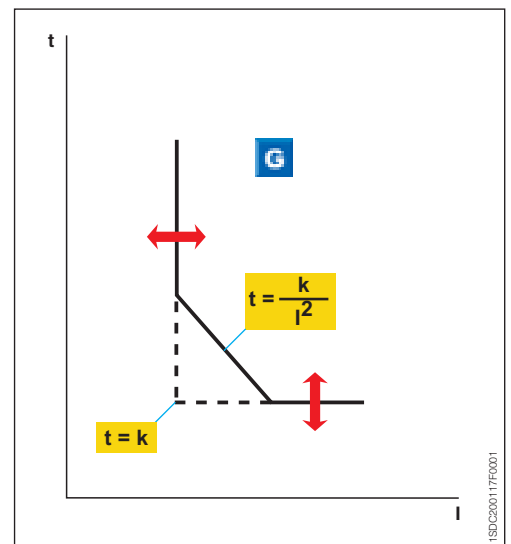
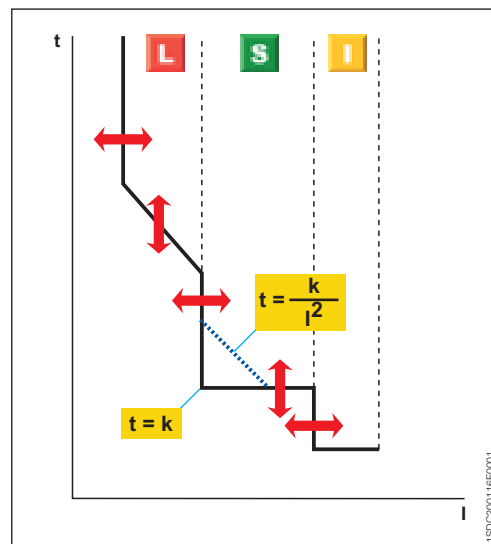
The protection I offers 15 trip thresholds and can be excluded (dip switches in "OFF" position).

Earth fault (G)

The earth fault protection G (which can be excluded) offers 7 current thresholds and

4 curves. Each curve is identified by the time t_4 in relation to current I_4 . As per S protection the trip time can be chosen independent of the current ($t = k$) or with a constant specific let-through energy ($t = k/I^2$).

Note: the current values above which G is disabled are indicated in the installation manual.





Protection trip units and trip curves

PR121/P

User interface

The user communicates directly with the trip unit in the trip parameter preparation stage by means of the dip switches.

Up to four LEDs (according to the version) are also available for signalling.

These LEDs (one for each protection) are active when:

- a protection is timing. For protection L the prealarm status is also shown;
- a protection has tripped (the corresponding LED is activated by pressing the “Info/Test” pushbutton);
- a failure in connection of a current sensor or in the opening solenoid is detected. The indication is active when the unit is powered (through current sensors or an auxiliary power supply)
- wrong rating plug for the circuit-breaker.

The protection tripped indication works even with the circuit-breaker open, without the need for any internal or external auxiliary power supply. This information is available for 48 hours of inactivity after the trip and is still available after reclosing. If the query is made more than 48 hours later it is sufficient to connect a PR030/B battery unit, PR010/T, or a BT030 wireless communication unit.

Communication

By means of the BT030 wireless communication unit, PR121/P can be connected to a pocket PC (PDA) or to a personal computer, extending the range of information available for the user. In fact, by means of ABB SACE's SD-Pocket communication software, it is possible to read the values of the currents flowing through the circuit-breaker, the value of the last 20 interrupted currents, and the protection settings.

PR121 can also be connected to the optional external PR021/K signalling unit, for the remote signalling of protections alarms and trips, and to HMI030, for the remote user interfacing.

Setting the neutral

Protection of the neutral can be set at 50%, 100% or 200% of the phase currents. Settings above 50% can be selected for E1-E2-E3-E4/f and E6/f. In particular, setting the neutral at 200% of phase current requires protection L to be set at $0.5I_n$ in order to respect the current-carrying capacity of the circuit-breaker. The user can also switch the neutral protection OFF. When three-poles circuit-breakers with external neutral current sensor are used, a setting above 100% for the neutral does not require any reduction in the L setting.

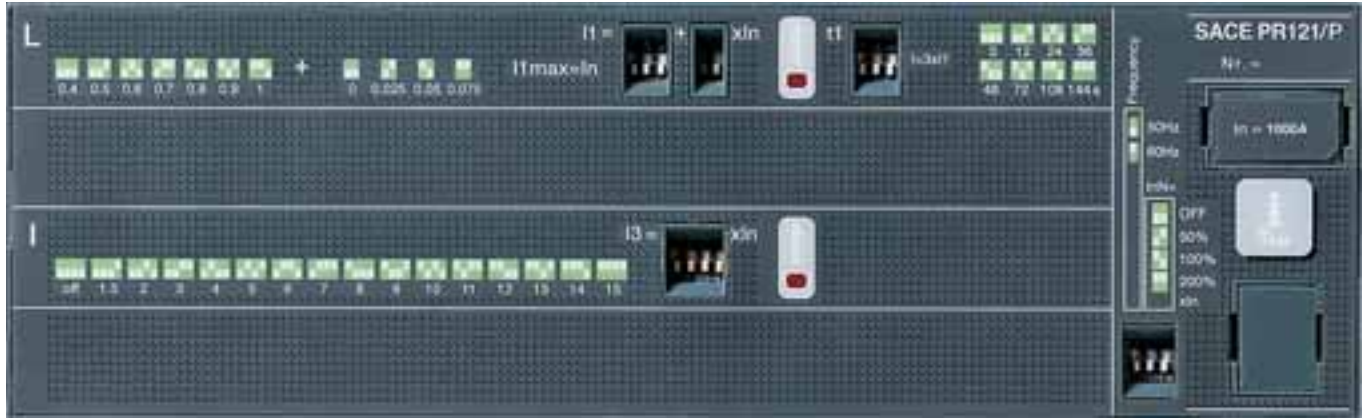
Test Function

The Test function is carried out by means of the info/Test pushbutton and the PR030/B battery unit (or BT030) fitted with a polarized connector housed on the bottom of the box, which allows the device to be connected to the test connector on the front of PR121/P trip units.

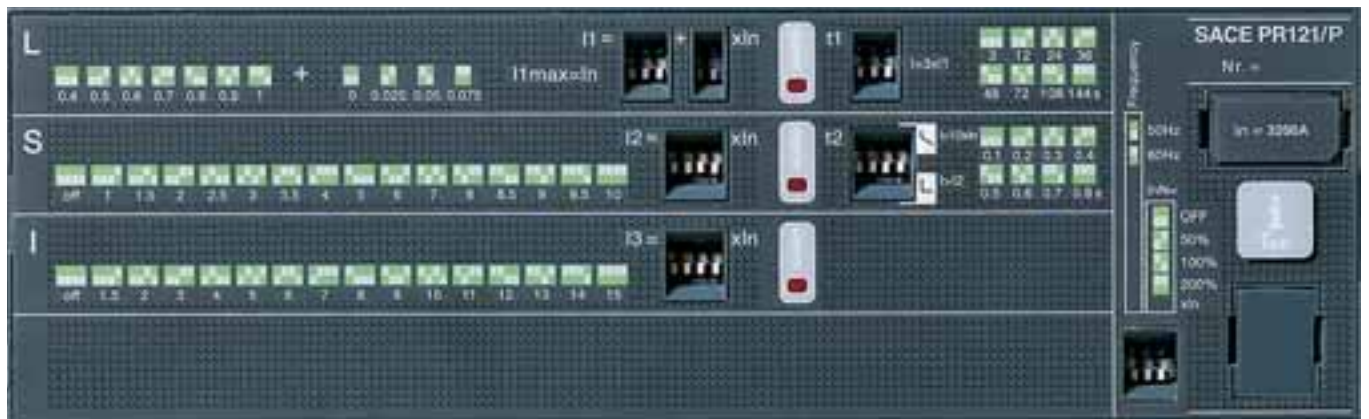
The PR121/P electronic trip unit can be tested by using the SACE PR010/T test and configuration unit by connecting it to the TEST connector.

Versions available

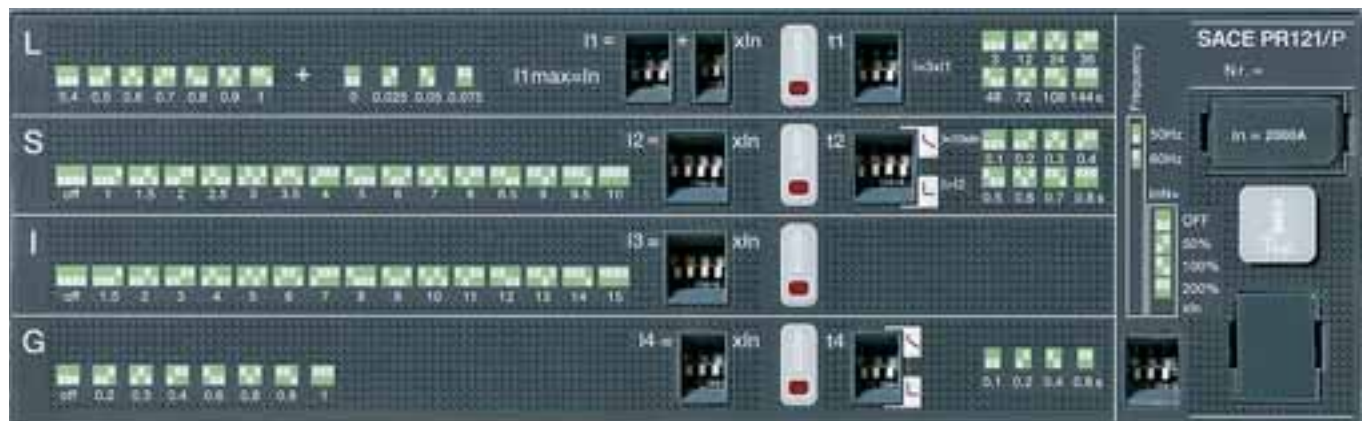
The following versions are available:



PR121/P LI



PR121/P LSI



PR121/P LSIG



Protection trip units and trip curves

PR121/P

Protection functions and setting values - PR121

Function	Trip threshold	Trip time*	Poss. excl.	Relation t=f(I)
L Overload protection	I1= 0.4 - 0.425 - 0.45 - 0.475 - 0.5 - 0.525 - 0.55 - 0.575 - 0.6 - 0.625 - 0.65 - 0.675 - 0.7 - 0.725 - 0.75 - 0.775 - 0.8 - 0.825 - 0.85 - 0.875 - 0.9 - 0.925 - 0.95 - 0.975 - 1 x In	With current If = 3 x I1 t1 = 3 - 12 - 24 - 36 - 48 - 72 - 108 - 144 s ⁽¹⁾	–	t=k/I ²
Tolerance ⁽²⁾	Release between 1.05 and 1.2 x I1	± 10% If ≤ 6 x In ± 20% If > 6 x In		
S Selective short-circuit protection	I2= 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4 - 5 - 6 - 7 - 8 - 8.5 - 9 - 9.5 - 10 x In	With current If > I2 t2 = 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 s	■	t=k
Tolerance ⁽²⁾	± 7% If ≤ 6 x In ± 10% If > 6 x In	The better of the two figures: ± 10% or ± 40 ms		
	I2= 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4 - 5 - 6 - 7 - 8 - 8.5 - 9 - 9.5 - 10 x In	With current If = 10 x In t2 = 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 s	■	t=k/I ²
Tolerance ⁽²⁾	± 7% If ≤ 6 x In ± 10% If > 6 x In	± 15% If ≤ 6 x In ± 20% If > 6 x In		
I Instantaneous short-circuit protection	I3= 1.5 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 x In	Instantaneous	■	t=k
Tolerance ⁽²⁾	± 10%	≤ 30 ms		
G Earth fault protection	I4= 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 0.9 - 1 x In	With current If > I4 t4 = 0.1 - 0.2 - 0.4 - 0.8 s	■	t=k
Tolerance ⁽²⁾	± 7%	The better of the two figures: ± 10% or ± 40 ms		
	I4= 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 0.9 - 1 x In	t4 = 0.1 @ 4.47 I4, t4 = 0.2 @ 3.16 I4, t4 = 0.4 @ 2.24 I4, t4 = 0.8 @ 1.58 I4	■	t=k/I ²
Tolerance ⁽²⁾	± 7%	± 15%		

If = fault current

* Referring to the electronics

(1) The minimum trip time is 1 s, regardless of the type of curve set (self-protection)

(2) These tolerances are valid in the following conditions:

- self-supplied trip unit at full power (without start-up)
- two- or three-phase power supply
- trip time set ≥ 100 ms

The following tolerance values apply in all cases not covered by the above:

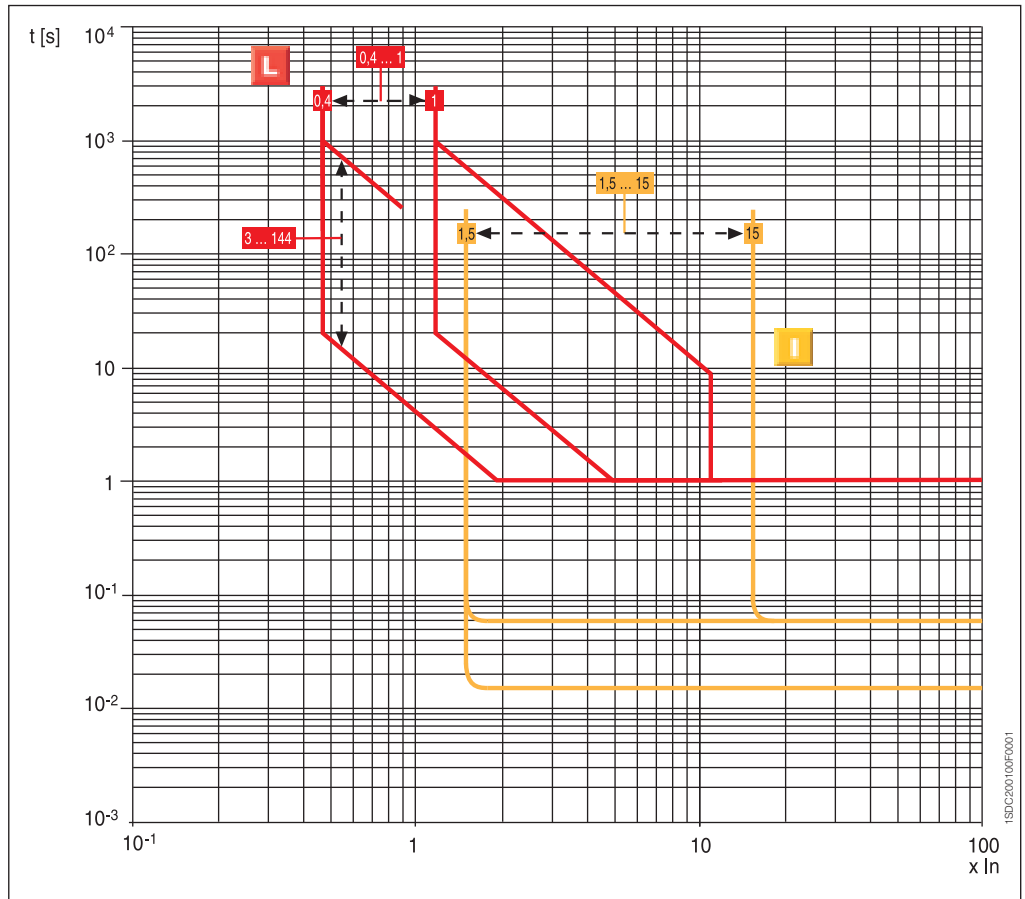
Trip threshold	Trip time
L Release between 1.05 and 1.2 x I1	± 20%
S ± 10%	± 20%
I ± 15%	≤ 60ms
G ± 15%	± 20%

Power supply

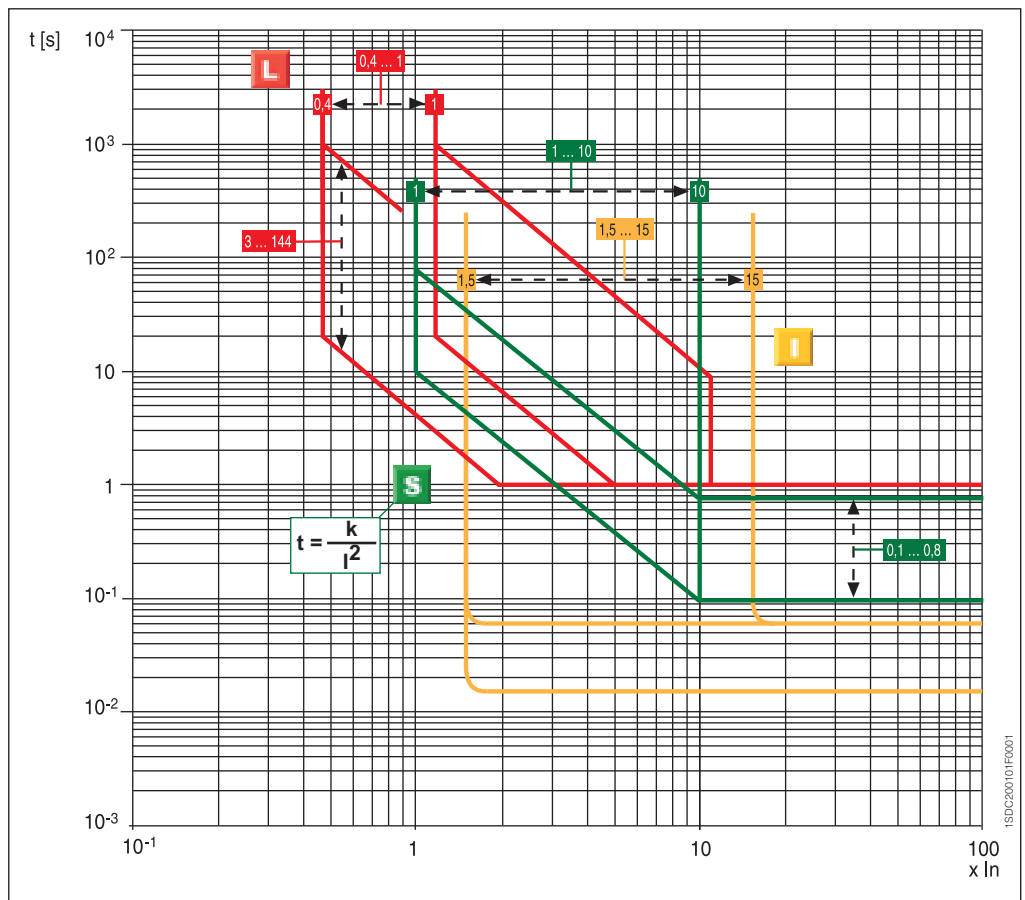
The unit does not require an external power supply either for protection functions or for alarm signalling functions. It is self-supplied by means of the current sensors installed on the circuit-breaker. For it to operate, the three phases must be loaded at 70A for E1, E2 and E3 and at 140A for E4 and E6. An external power supply can be connected in order to activate additional features, and in particular for connection to external devices: HMI030, and PR021/K.

PR121/P	
Auxiliary power supply (galvanically insulated)	24 V DC ± 20%
Maximum ripple	5%
Inrush current @ 24V	~10 A for 5 ms
Rated power @ 24V	~2 W

Functions L-I



Functions L-S-I



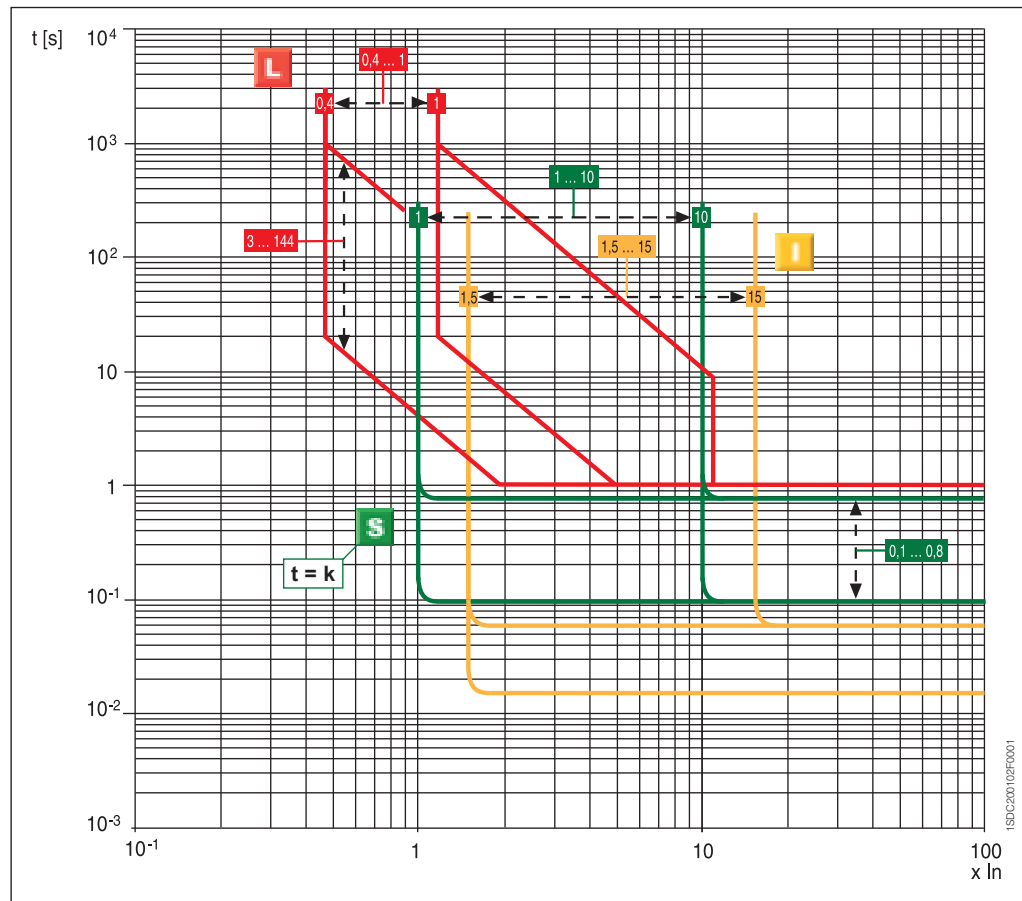
Threshold and trip times tolerances page 4/6



Protection trip units and trip curves

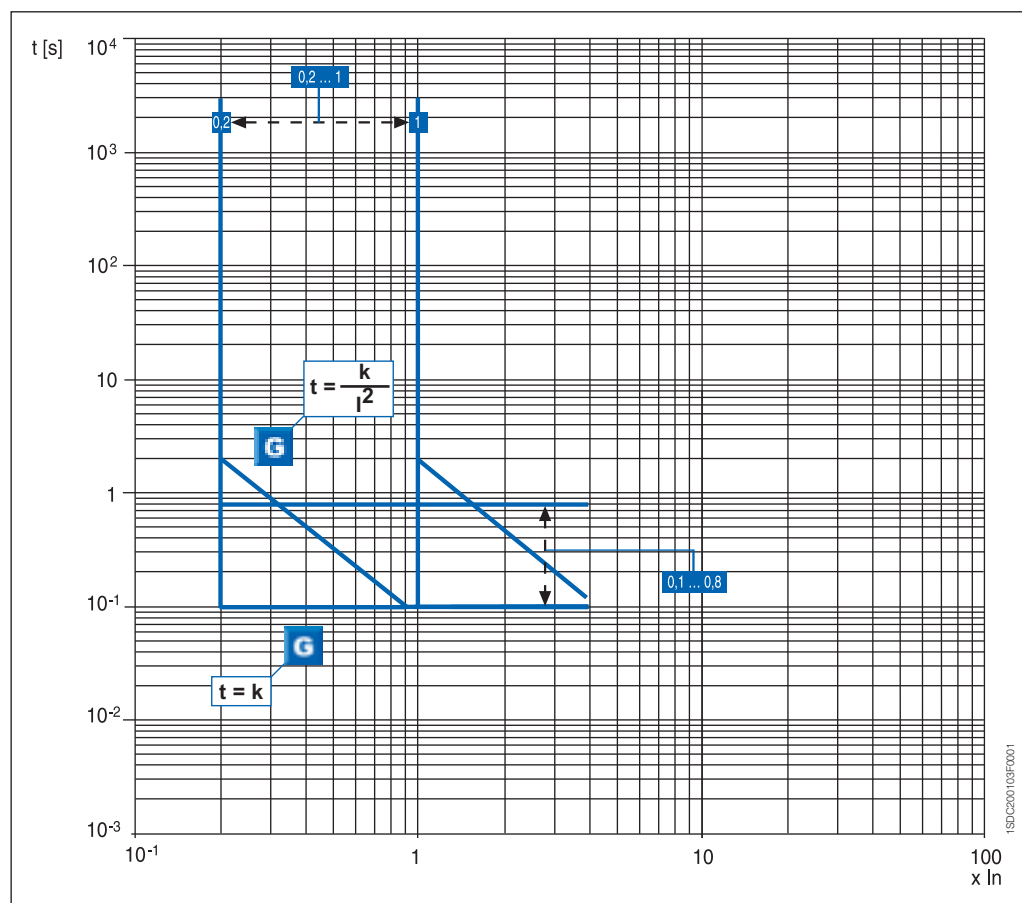
PR121/P

Functions L-S-I



4

Function G



Threshold and trip times tolerances page 4/6

Protection trip units and trip curves

PR122/P

Characteristics

The SACE PR122 trip unit is a sophisticated and flexible protection system based on a state-of-the-art microprocessor and DSP technology. Fitted with the optional internal PR120/D-M dialogue unit, PR122/P turns into an intelligent protection, measurement and communication device, based on the Modbus® protocol. By means of the PR120/D-M, PR122/P can also be connected to the ABB EP010 Fieldbus plug adapter, which makes it possible to choose among several different networks, such as Profibus and DeviceNet.

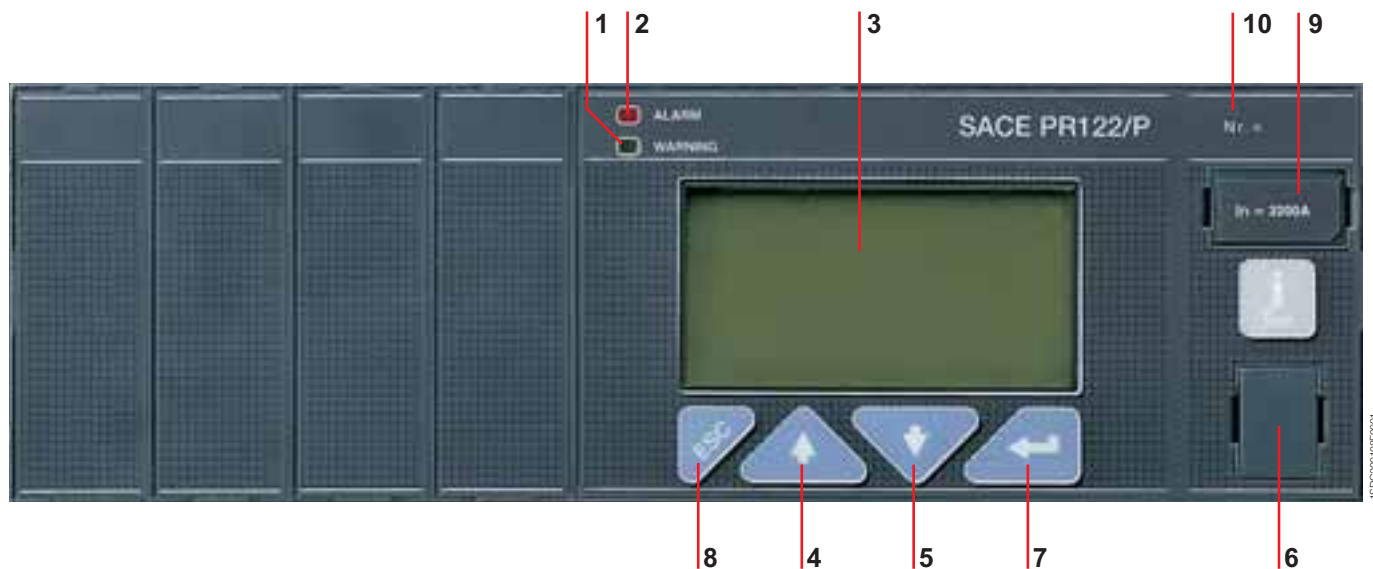
The new PR122/P is the result of ABB SACE's experience in designing protection trip units. The exhaustive range of settings makes this protection unit ideal for general use in any type of installation, from distribution to the protection of motors, transformers, drives and generators. Access to information and programming using a keyboard and graphic liquid crystal display is extremely simple and intuitive. The interface is now common to PR122/P and PR123/P in order to give to the user maximum ease of use.

An integrated ammeter and many other additional features are provided over and above the protection functions. These additional functions can be further increased with addition on board of the dialogue, signalling, measurement, and wireless communication units.

Functions S and G can operate with a time delay independent of the current ($t = k$) or with an inverse time delay (constant specific let-through energy: $I^2t = k$), as required.

Protection against earth faults can also be obtained by connecting the PR122 trip unit to an external toroid located on the conductor that connects the transformer star centre to earth (homopolar toroid).

All the thresholds and trip curve delays of the protection functions are stored in special memories which retain the information even when no power is supplied.



Caption

- | | | |
|----------------------------|---|--|
| 1 LED Warning indicator | 6 Test connector for connecting or testing the trip unit by means of an external device (PR030/B battery unit, BT030 wireless communication unit and SACE PR010/T unit) | change pages |
| 2 Alarm LED | 7 ENTER button to confirm data or | 8 Button to exit submenus or cancel operations (ESC) |
| 3 Rear-lit graphic display | | 9 Rating plug |
| 4 Cursor UP button | | 10 Serial number of protection trip unit |
| 5 Cursor DOWN button | | |



Protection trip units and trip curves

PR122/P

Operation, protection functions and self-test

Basic Protection functions

The PR122 trip unit offers the following protection functions (according to the version):

- overload (L)
- selective short-circuit (S)
- instantaneous short-circuit (I)
- earth fault (G)⁽²⁾
- phase unbalance (U)
- self-protection against over-temperature (OT)
- thermal memory for functions L and S
- zone selectivity for functions S and G
- residual current (Rc) with external toroid
- source ground return with external toroid

sion. The neutral protection can be excluded or set to 100% for E1, E2, E3, E4/f and E6/f. In installations where very high harmonics occur, the resulting current at the neutral can be higher than that of the phases. Therefore it is possible to set the neutral protection at 150% or 200% of the value set for the phases. In this case it is necessary to reduce the setting of protection L accordingly⁽¹⁾.

The table below lists the neutral settings for the various possible combinations between type of circuit-breaker and the threshold I1 setting.

avoids untimely tripping caused by the high inrush currents of certain loads (motors, transformers, lamps).

The start-up phase lasts from 100 ms to 1.5 s, in steps of 0.05 s. It is automatically recognized by the PR122 trip unit as follows:

- when the circuit-breaker closes with the trip unit self-supplied;
- when the peak value of the maximum current exceeds $0.1 \times I_n$. A new start-up becomes possible after the current has fallen below the threshold of $0.1 \times I_n$, if the trip unit is supplied from an external source.

Setting the neutral

In PR122/P, and PR123/P as well, the neutral protection is 50% of the value set for phase protection in the standard ver-

Start-up function

The start-up function allows protections S, I and G to operate with higher trip thresholds during the start-up phase. This

4

Adjustable neutral protection settings

Circuit-breaker model	Threshold I1 settings (overload protection)		
	$0.4 \leq I1 \leq 0.5$	$0.5 < I1 \leq 0.66$	$0.66 < I1 \leq 1^{(*)}$
E1B-N	0-50-100-150-200%	0-50-100-150%	0-50-100%
E2B-N-S-L	0-50-100-150-200%	0-50-100-150%	0-50-100%
E3N-S-H-V-L	0-50-100-150-200%	0-50-100-150%	0-50-100%
E4S-H-V	0-50-100%	0-50%	0-50%
E4S/f-H/f	0-50-100-150-200%	0-50-100-150%	0-50-100%
E6H-V	0-50-100%	0-50%	0-50%
E6H/f	50-100-150-200%	0-50-100-150%	0-50-100%

(*) The setting $I1 = 1$ indicates the maximum overload protection setting. The actual maximum setting allowable must take into account any derating based on temperature, the terminals used and the altitude (see the "Installations" chapter)

(1) When three-pole circuit-breakers with external neutral current sensor are used, a setting above 100% for the neutral does not require any reduction in the L setting up to I_n .

(2) The current values above which G is disabled are indicated in the installation manual.

Phase unbalance protection U

Protection function U against phase unbalance is used in those situations requiring particularly precise control over missing and/or unbalanced phase currents, only giving the pre-alarm signal. This function can be excluded.

Protection against overtemperature

The range of SACE PR122 trip units allows the presence of abnormal temperatures, which could cause temporary or continuous malfunctions of the microprocessor, to be signalled to the user.

The user has the following signals or commands available:

- lighting up of the “Warning” LED when the temperature is higher than 70 °C (temperature at which the microprocessor is still able to operate correctly)
- lighting up of the “Alarm” LED when the temperature is higher than 85 °C (temperature above which the microprocessor can no longer guarantee correct operation) and, when decided during the unit configuration stage, simultaneous opening of the circuit-breaker with indication of the trip directly on the display, as for the other protections.

Zone selectivity for protections S and G

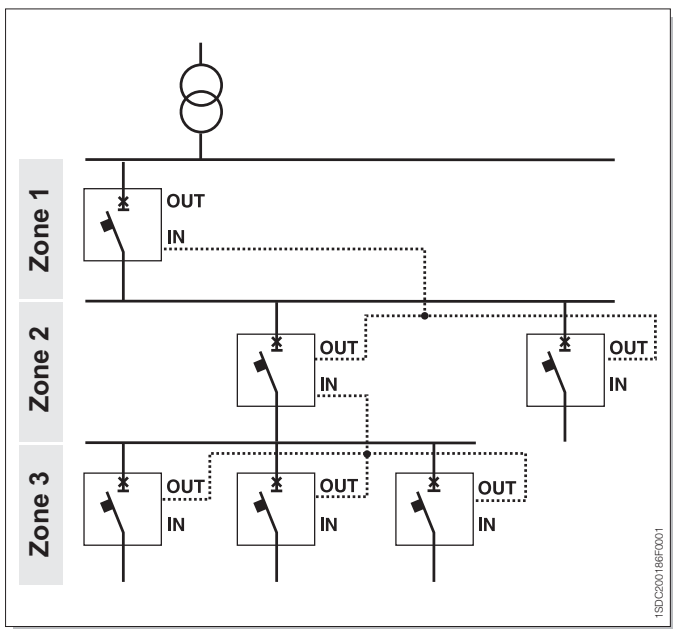
Zone selectivity is one of the most advanced methods for making co-ordination of the protections: by using this protection philosophy, it is possible to reduce the trip times of the protection closest to the fault in relation to the times foreseen by time selectivity, of which zone selectivity is an evolution.

Zone selectivity is applicable to protection functions S and G, even contemporarily and is available as standard on the PR122. The word zone is used to refer to the part of an installation between two circuit-breakers in series (see picture beside). Protection is provided by connecting all of the zone selectivity outputs of the trip units belonging to the same zone together and taking this signal to the zone selectivity input of the trip unit immediately to the supply side.

Each circuit-breaker that detects a fault communicates this to the circuit-breaker on the supply side using a simple connection wire. Therefore the fault zone is the zone immediately to the load side of the circuit-breaker that detects the fault, but does not receive any communication from those on the load side. This circuit-breaker opens without waiting for the set time-delay.

ABB SACE provides important calculation tools to facilitate the work of designers in coordinating protection devices, including the Slide rule kits, DOCWin and CAT software packages and updated coordination charts.

The zone selectivity function S and G can be activated or deactivated using the keyboard.





Protection trip units and trip curves

PR122/P

Self-diagnosis

The PR122 range of trip units contains an electronic circuit which periodically checks the continuity of internal connections (opening solenoid or each current sensor, including the Source Ground Return when present).

In the case of a malfunction an alarm message appears directly on the display. The Alarm is highlighted by the Alarm LED as well.

Residual Current

Different solutions are available for integrated residual current protection. The basic choice is PR122/P-LSIRc, which has all the characteristics of PR122/P-LSI and residual current protection as well. When additional features are required, the solution is PR122/P LSIG with an additional PR120/V module (see next paragraph). Using this configuration, residual current protection is added to a unit, having the features of PR122/P-LSI and all the add-ons described for the PR120/V module, such as voltage protection and advanced measurement functions.

Residual current protection acts by measuring the current from the external dedicated toroid and must be ordered separately. Rc protection can be activated only if the special rating plug for residual current protection is present.

Test Functions

Once enabled from the menu, the “info/Test” pushbutton on the front of the trip unit allows correct operation of the chain consisting of the microprocessor, opening solenoid and circuit-breaker tripping mechanism to be checked.

The control menu also includes the option of testing correct operation of the display, signalling LEDs, and electrical contacts of the PR120/K trip unit.

When the auxiliary power supply is not present, the PR030/B unit can perform the trip test.

By means of the front multi-pin connector it is possible to apply a SACE PR010/T Test unit which allows the functions of the PR121, PR122 and PR123 ranges of trip units to be tested and checked.

User interface

The human-machine interface (HMI) of the device is made up of a wide graphic display, LEDs, and browsing pushbuttons. The interface is designed to provide maximum simplicity.

The language can be selected from among five available options: Italian, English, German, French and Spanish.

As in the previous generation of trip units, a password system is used to manage the “Read” or “Edit” modes. The default password, 0001, can be modified by the user.

The protection parameters (curves and trip thresholds) can be set directly via the HMI of the device. The parameters can only be changed when the trip unit is operating in “Edit” mode, but the information available and the parameter settings can be checked at any time in “Read” mode.

When a communication device (internal PR120/D-M and PR120/D-BT modules or external BT030 device) is connected, it is possible to set parameters simply by downloading them into the unit (over the network for PR120/D-M, by using a PDA or a notebook for PR120/D-BT and BT030). Parameterisation can then be carried out quickly and automatically in an error-free way by transferring data directly from DocWin.

Indicator LEDs

LEDs on the front panel of the trip unit are used to indicate all the pre-alarms (“WARNING”) and alarms (“ALARM”). A message on the display always explicitly indicates the type of event concerned.

Example of events indicated by the “WARNING” LED:

- unbalance between phases;
- pre-alarm for overload ($L1 > 90\%$);
- first temperature threshold exceeded ($70\text{ }^{\circ}\text{C}$);
- contact wear beyond 80%;
- phase rotation reversed (with optional PR120/V)

Example of events indicated by the "ALARM" LED:

- overload (may begin from $1.05 \times I_n < I < 1.3 \times I_n$, in accordance with the standard IEC 60947-2);
- timing of function L;
- timing of function S;
- timing of function G;
- second temperature threshold exceeded (85 °C);
- contact wear 100%;
- timing of Reverse Power flow protection (with optional PR120/V);

Data logger

By default PR122/P, as well as PR123/P, is provided with the Data Logger function, that automatically records in a wide memory buffer the instantaneous values of all the currents and voltages. Data can be easily downloaded from the unit by means of TestBus2 application using a Bluetooth port and can be transferred to any personal computer for elaboration. The function freezes the recording whenever a trip occurs, so that a detailed analysis of faults can be easily performed. SD-Pocket and TestBus2 allow also reading and downloading of all the others trip information.

- Number of channels: 8
- Maximum sampling rate: 4800 Hz
- Maximum sampling time: 27 s (@ sampling rate 600 Hz)
- 64 events tracking

Trip information and opening data

In case a trip occurs PR122/P and PR123/P store all the needed information:

- Protection tripped
- Opening data (current)
- Time stamp (guaranteed with auxiliary supply or self-supply with power failure no longer than 48h)

By pushing the "info/Test" pushbutton the trip unit shows all these data directly on display.

No auxiliary power supply is needed. The information is available to user for 48 hours with the circuit breaker open or without current flowing.

The information of the latest 20 trips are stored in memory.

If the information can be furthermore retrieved more than 48 hours later, it is sufficient to connect a PR030/B battery unit or a BT030 wireless communication unit.

Load control

Load control makes it possible to engage/disengage individual loads on the load side before the overload protection L is tripped, thereby avoiding unnecessary trips of the circuit-breaker on the supply side. This is done by means of contactors or switch-disconnectors (externally wired to the trip unit), controlled by the PR122/P by PR120/K internal contacts, or by PR021/K unit.

Two different Load Control schemes can be implemented:

- disconnection of two separate loads, with different current thresholds
- connection and disconnection of a load, with hysteresis

Current thresholds and trip times are smaller than those available for selection with protection L, so that load control can be used to prevent overload tripping.

Internal PR120/K or external PR021/K accessory unit is required for Load Control. The function is only active when an auxiliary power supply is present.



Protection trip units and trip curves

PR122/P

PR120/V Measurement Module

This optional internal module, installed in PR122 (standard in PR123), allows the trip unit to measure the phase and neutral voltages and to process them in order to achieve a series of features, in terms of protection and measurement.

PR120/V does not normally require any external connection or Voltage Transformer, since it is connected internally to the lower terminals of Emax. When necessary, the connection of voltage pick-ups can be moved to any other points (i.e. upper terminals), by using the alternative connection located in the terminal box. The module is provided with a sealable switch-disconnector for the dielectric test. PR120/V is able to energize the PR122 while line voltage input is above 85V. The use of Voltage Transformers is mandatory for rated voltages higher than 690V.

Voltage transformers shall have burdens equal to 10VA and accuracy class 0.5 or better.



1SDC200114R0001

Additional Protections with PR120/V:

- UnderVoltage (UV) protection
- Overvoltage (OV) protection
- Residual voltage (RV) protection
- Reverse power (RP) protection
- Underfrequency (UF) protection
- Overfrequency (OF) protection

All the above indicated protections can be excluded, although it is possible to leave only the alarm active when required.

With the circuit-breaker closed, these protections also operate when the trip unit is self-supplied. With the circuit-breaker open, they operate when the auxiliary power supply (24V DC or PR120/V) is present: in this case the trip unit will indicate the “ALARM” status.

Voltage protections UV, OV, RV

With the PR120/V module, the PR122/P trip unit is able to provide the undervoltage and overvoltage protection (UV, OV) and the residual voltage protection (RV). The residual voltage protection RV identifies interruptions of the neutral (or of the earthing conductor in systems with earthed neutral) and faults that shift the star centre in systems with insulated neutral (e.g. large earth faults). The star centre shift is calculated as a vectorial sum of the phase voltages.

Reverse power protection RP

Reverse power protection is especially suitable for protecting large machines such as motors and generators. The PR122 with the PR120/V module can analyse the direction of the active power and open the circuit-breaker if the direction is opposite to that of normal operation. The reverse power threshold and the trip time are adjustable.

Frequency protections UF, OF

The frequency protections detect the variation of network frequency above adjustable thresholds, generating an alarm or opening the circuit-breaker. It is a protection typically needed in an isolated network, i.e. powered by a genset.

Measurement function

The current measurement function (ammeter) is present on all versions of the SACE PR122 unit. The display shows histograms showing the currents of the three phases and neutral on the main page. Furthermore, the most loaded phase current is indicated in numerical format. Earth fault current, where applicable, is shown on a dedicated page.

The latter current value takes on two different meanings depending on whether the external toroidal transformer for the “Source Ground Return” function or the internal transformer (residual type) is connected.

The ammeter can operate either with self-supply or with an auxiliary power supply voltage. In the latter case the display is rear-lit and the ammeter is active even at current levels lower than 160A. Accuracy of the ammeter measurement chain (current sensor plus ammeter) is no more than 1.5% in the 30% - 120% current interval of I_n .

- Currents: three phases (L1, L2, L3), neutral (Ne) and earth fault;
- Instantaneous values of currents during a period of time (data logger);
- Maintenance: number of operations, percentage of contact wear, opening data storage (last 20 trips and 80 events).

When the optional PR120/V is connected the following additional measurement function are present:

- Voltage: phase-phase, phase-neutral and residual voltage
- Instantaneous values of voltages during a period of time (data logger);
- Power: active, reactive and apparent
- Power factor
- Frequency and peak factor
- Energy: active, reactive, apparent, counter

Versions available

The following versions are available:



PR122/P LI-LSI-LSIG-LSIRc

1SDC200118F0001



Protection trip units and trip curves

PR122/P

Protection functions and setting values - PR122

Function	Trip threshold	Threshold steps	Trip Time	Time Step	Poss. excl.	Relation t=f(I)	Thermal memory	Zone selectivity
L Overload protection	I1= 0.4...1 x In	0.01 x In	With current If = 3 x I1 t1= 3 s...144 s ± 10% If ≤ 6 x In ± 20% If > 6 x In	3 s ⁽¹⁾	–	t=k/I ²	■	–
	Tolerance ⁽²⁾ Release between 1.05 and 1.2 x I1							
Tolerance ⁽²⁾	I1= 0.4...1 x In	0,01 x In	With If = 3xI1 ⁽⁴⁾ ; t1= 3 s...144 s ± 20% If > 5 x I1 ± 30% 2xI1 ≤ If ≤ 5 x I1 In	3 s ⁽¹⁾	–	t=k(α) ⁽⁵⁾ α = 0.2-1.2	–	–
	Release between 1.05 ... 1.2 x I1							
S Selective short-circuit protection ⁽⁴⁾	I2= 0.6...10 x In	0.1 x In	With current If > I2 t2= 0.05 s...0.8 s t2sel= 0.04 s...0.2 s	0.01 s 0.01 s	■	t=k	–	■
	Tolerance ⁽²⁾ ± 7% If ≤ 6 x In ± 10% If > 6 x In		The better of the two figures: ± 10% or ± 40 ms					
Tolerance ⁽²⁾	I2= 0.6...10 x In	0.1 x In	With current If = 10 x In t2= 0.05 s...0.8 s ± 15% If ≤ 6 x In ± 20% If > 6 x In	0.01 s	■	t=k/I ²	■	–
	± 7% If ≤ 6 x In ± 10% If > 6 x In							
I Instantaneous short-circuit protection	I3= 1.5...15 x In	0.1 x In	Instantaneous	–	■	t=k	–	–
	Tolerance ⁽²⁾ ± 10%		≤ 30 ms					
G Earth fault protection	I4 ⁽⁶⁾ = 0.1*...1 x In	0.02 x In	With current If > I4 t4= 0.1 s...1 s t4sel= 0.04 s...0.2 s	0.05 s 0.01 s	■	t=k	–	■
	Tolerance ⁽²⁾ ± 7%		The better of the two figures: ± 10% or ± 40 ms					
Tolerance ⁽²⁾	I4= 0.1*...1 x In	0.02 x In	t4= 0.1 s...1 s (with If=4xI4) ± 15%	0.05 s	■	t=k/I ²	–	■
	± 7%							
Rc Residual Current protection ⁽⁷⁾	I _d = 3-5-7-10-20-30 A		t _d = 0.06-0.1-0.2-0.3-0.4- 0.5-0.8 s ⁽³⁾		■	t=k	–	–
	Tolerance ⁽²⁾ ± 10%							
OT Protection against overtemperature	may not be set	–	Instantaneous	–	–	temp=k	–	–
U Phase unbalance protection	I ₆ = 5%...90%	5%	t4= 0.5 s...60 s	0.5 s	■	t=k	–	–
	Tolerance ⁽²⁾ ± 10%		The better of the two figures: ± 20% or ± 100 ms					

If = fault current

* G=0.1xIn with auxiliary power supply 24V DC

(1) The minimum trip value is 1 s, regardless of the type of curve set (self-protection)

(2) These tolerances are valid in the following conditions:

- self-supplied trip unit at full power and/or auxiliary power supply (without start-up)
- two- or three-phase power supply
- trip time set ≥ 100 ms

(3) Non intervention time

(4) In accordance with IEC 60255-3

$$(5) t = \frac{(3^\alpha - 1)}{(I/I_1)^\alpha - 1} \cdot t_1$$

(6) The minimum trip threshold for the G ext protection with SRG toroid is 0,1 In

(7) If selected, Rc protection with PR122/LSIG + PR120/V and special rating plug, can replace G protection.

The following tolerance values apply in all cases not covered by the above:

Trip threshold	Trip time
L Release between 1.05 and 1.25 x I1	± 20%
S ± 10%	± 20%
I ± 15%	≤ 60ms
G ± 15%	± 20%
Others	± 20%

Additional Protection functions and setting values - PR122 with PR120/V

Function	Trip threshold	Threshold steps	Trip Time	Time Step	Poss. excl.	Relation t=f(I)
UV Undervoltage protection Tolerance ⁽¹⁾	$I8 = 0.5 \dots 0.95 \times U_n$ $\pm 5\%$	$0.01 \times U_n$	With current $U < U8$ $t8 = 0.1 \text{ s} \dots 5 \text{ s}$ The better of the two figures: $\pm 20\%$ or $\pm 100 \text{ ms}$	0.1 s	■	t=k
OV Overvoltage protection Tolerance ⁽¹⁾	$I9 = 1.05 \dots 1.2 \times U_n$ $\pm 5\%$	$0.01 \times U_n$	With current $U > U9$ $t9 = 0.1 \text{ s} \dots 5 \text{ s}$ The better of the two figures: $\pm 20\%$ or $\pm 100 \text{ ms}$	0.1 s	■	t=k
RV Residual voltage protection Tolerance ⁽¹⁾	$I10 = 0.1 \dots 0.4 \times U_n$ $\pm 5\%$	$0.05 \times U_n$	With current $U_0 > U10$ $t10 = 0.5 \text{ s} \dots 30 \text{ s}$ The better of the two figures: $\pm 10\%$ or $\pm 100 \text{ ms}$	0.5 s	■	t=k
RP Reverse power protection Tolerance ⁽¹⁾	$P11 = -0.3 \dots -0.1 \times P_n$ $\pm 5\%$	$0.02 \times P_n$	With current $P < P11$ $t11 = 0.5 \text{ s} \dots 25 \text{ s}$ The better of the two figures: $\pm 10\%$ or $\pm 100 \text{ ms}$	0.1 s	■	t=k
UF Underfrequency protection Tolerance ⁽¹⁾	$f12 = 0.90 \dots 0.99 \times f_n$ $\pm 5\%$	$0.01 \times f_n$	With current $f < f12$ $t9 = 0.5 \text{ s} \dots 3 \text{ s}$ The better of the two figures: $\pm 10\%$ or $\pm 100 \text{ ms}$	0.1 s	■	t=k
OF Overfrequency protection Tolerance ⁽¹⁾	$f13 = 1.01 \dots 1.10 \times f_n$ $\pm 5\%$	$0.01 \times f_n$	With current $f > f13$ $t10 = 0.5 \text{ s} \dots 3 \text{ s}$ The better of the two figures: $\pm 10\%$ or $\pm 100 \text{ ms}$	0.1 s	■	t=k

(1) These tolerances are valid in the following conditions:
 - self-supplied trip unit at full power and/or auxiliary power supply (without start-up)
 - two- or three-phase power supply

Power supply

The PR122 trip unit does not normally require any external power supplies, being self-supplied from the current sensors (CS): a three-phase 70 A current is sufficient to activate the protection functions and the ammeter, whereas three-phase 160 A are required to turn the display on. Once the display is turned on, the minimum current for visualisation is $I > 5\%$ of the rating plug. The unit ensures fully self-supplied operation. When an auxiliary power supply is present, it is also possible to use the unit with the circuit-breaker either open or closed with very low current flowing through.

It is also possible to use an auxiliary power supply provided by the PR030/B portable battery unit (always supplied), which allows the protection functions to be set when the trip unit is not self-supplied.

PR122/P stores and shows all the information needed after a trip (protection tripped, trip current, time, date). No auxiliary supply is required for this functionality.

	PR122/P	PR120/D-M	PR120/K	PR120/D-BT
Auxiliary power supply (galvanically insulated)	24 V DC $\pm 20\%$	from PR122/PR123	from PR122/PR123	from PR122/PR123
Maximum ripple	5%			
Inrush current @ 24V	~10 A for 5 ms			
Rated power @ 24V	~3 W	+1 W	+1 W	+1 W

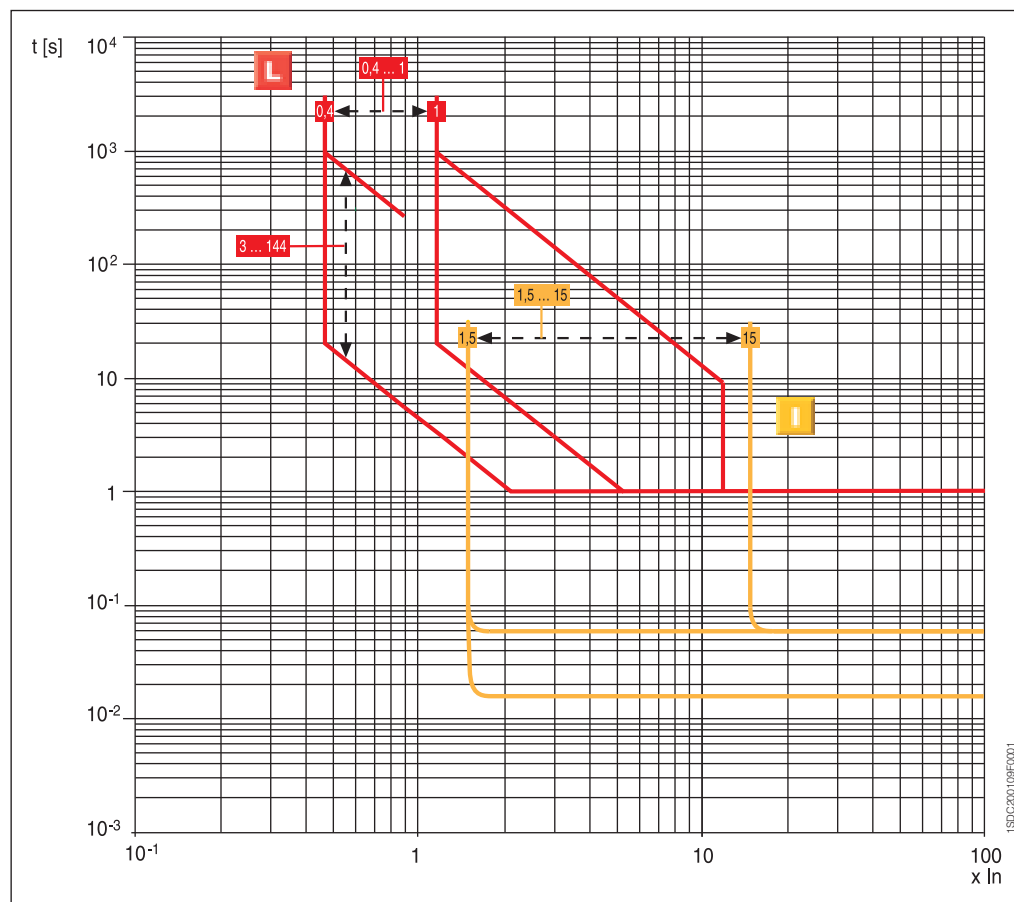
(*) PR120/V can give power supply to the trip unit when at least one line voltage is equal or higher to 85V RMS.



Protection trip units and trip curves

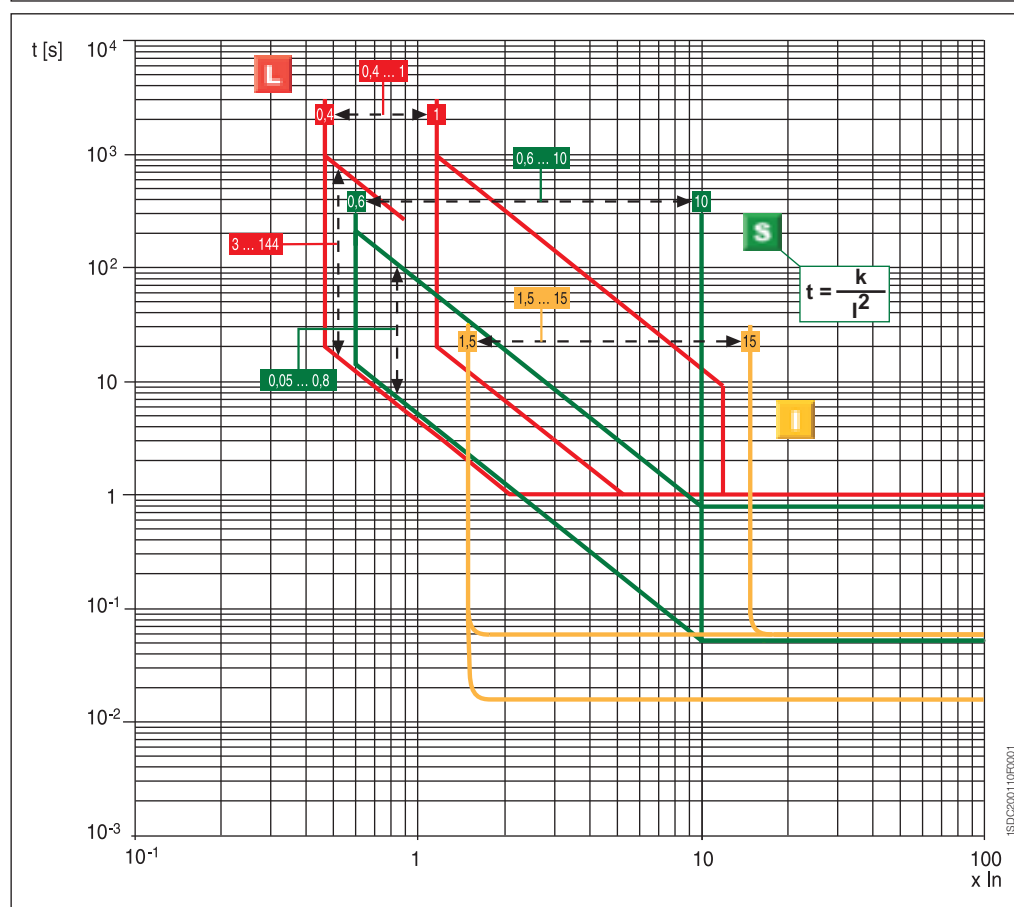
PR122/P

Functions L-I



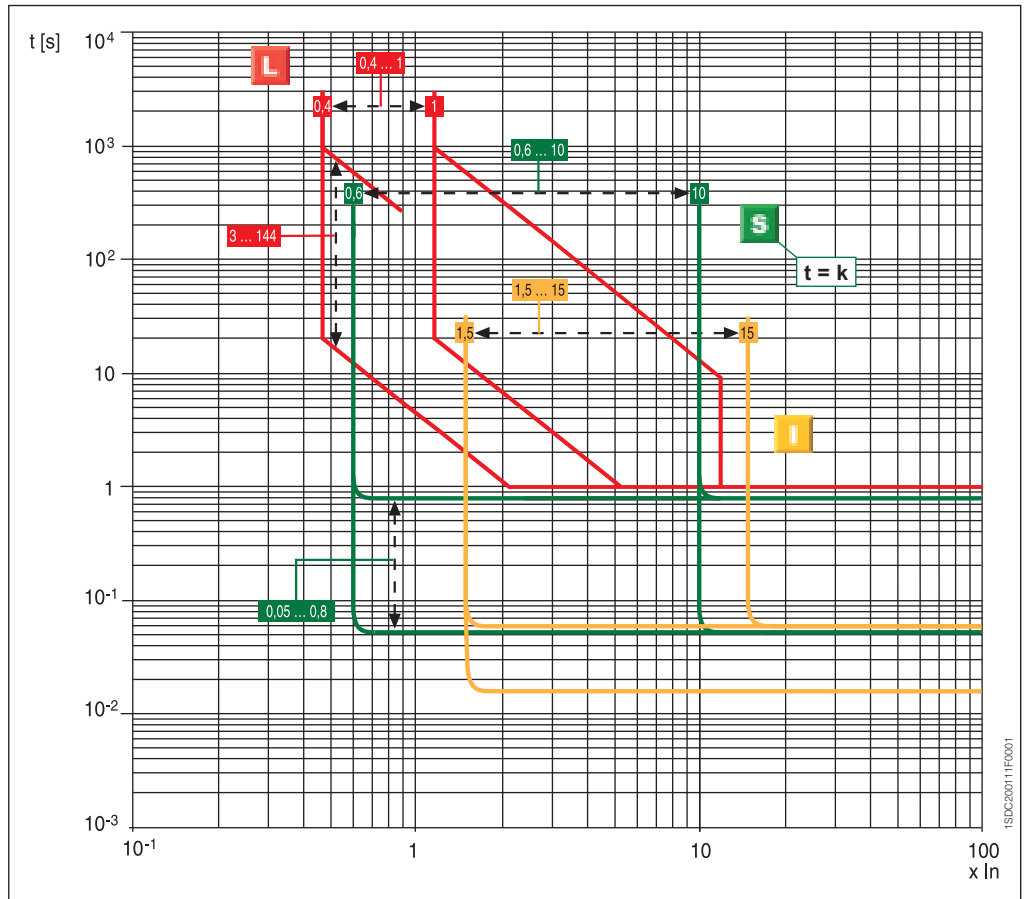
4

Functions L-S-I



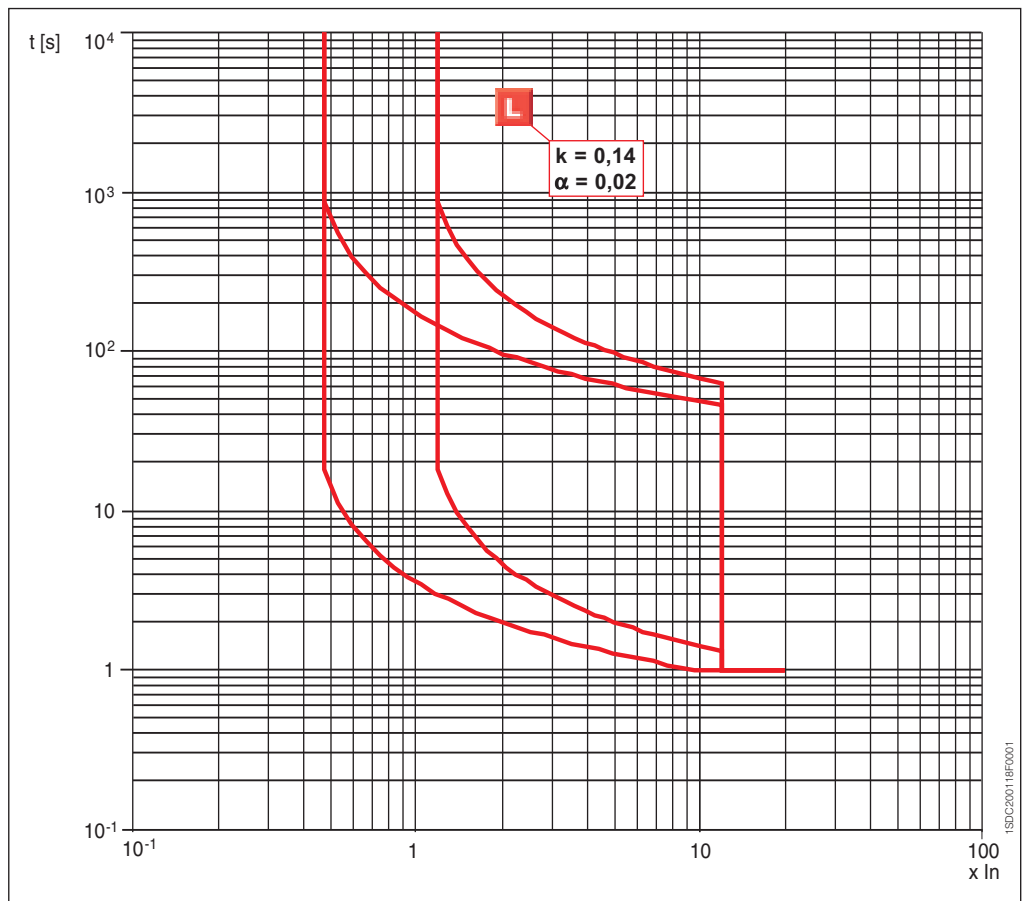
Threshold and trip times tolerances page 4/16

Functions L-S-I



Function L

According to IEC 60255-3



Threshold and trip times tolerances page 4/16



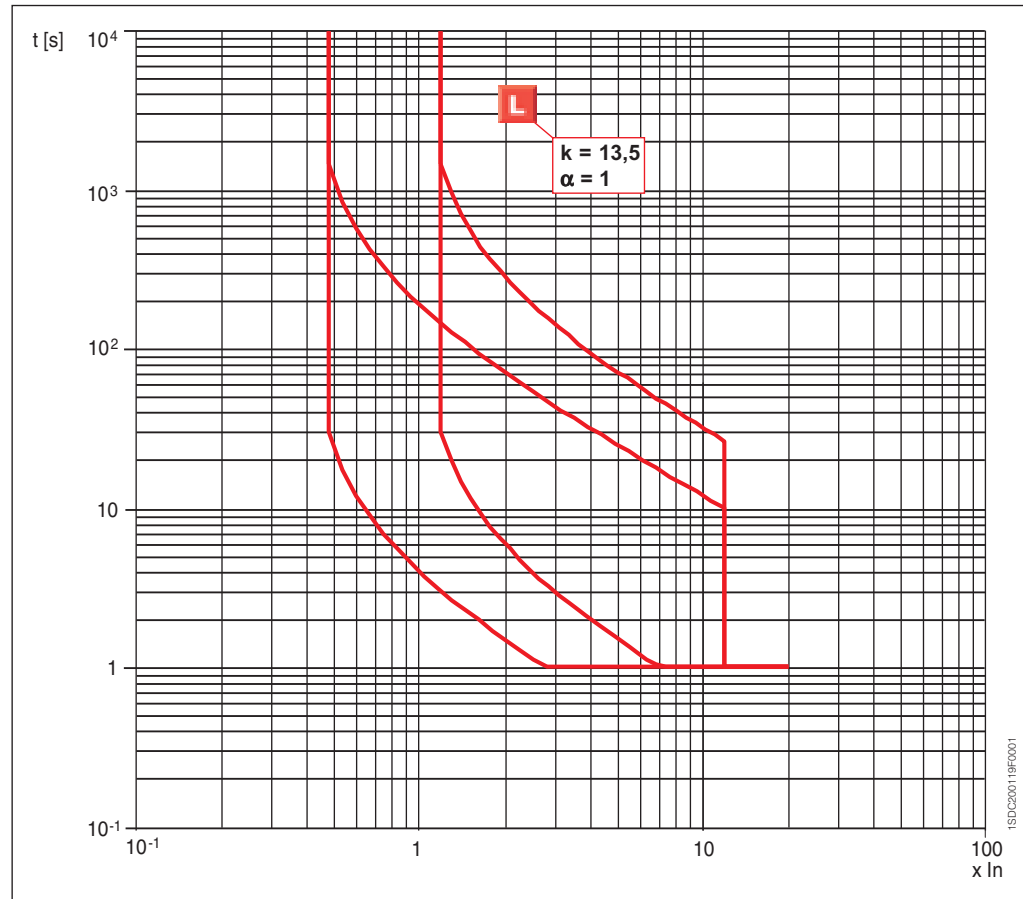
Protection trip units and trip curves

PR122/P

Function L

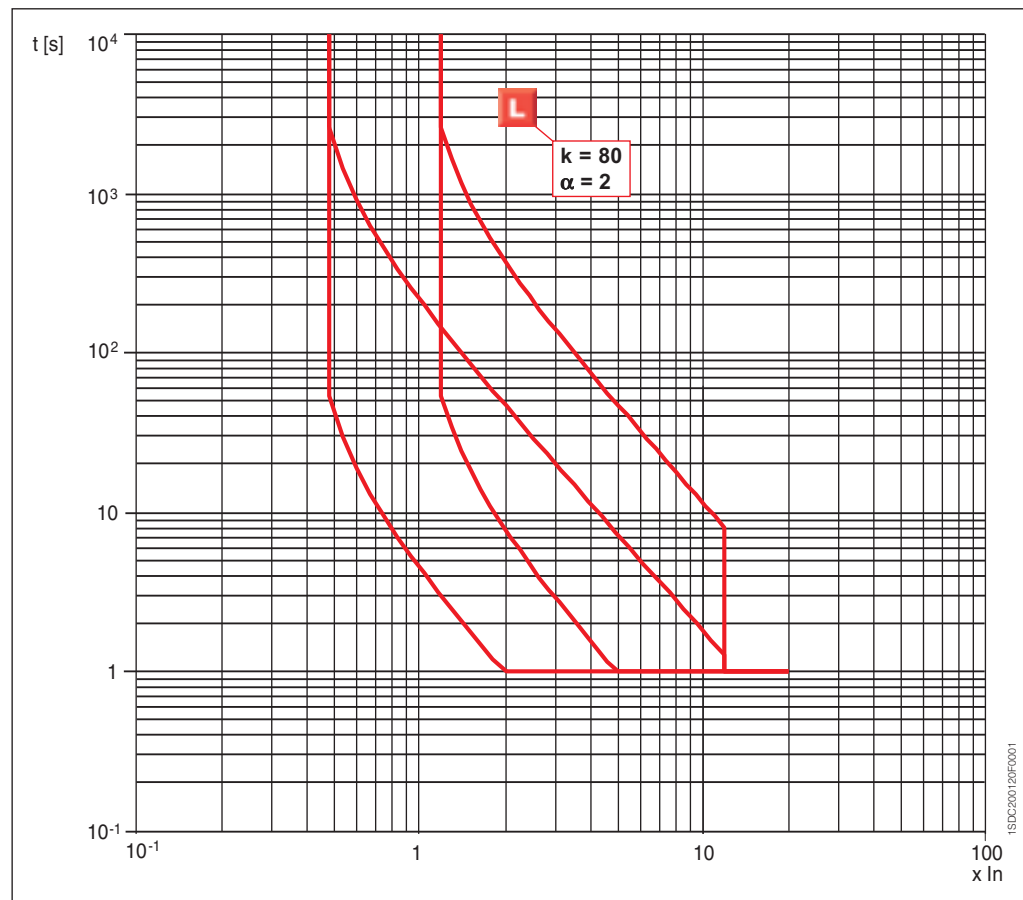
According to IEC 60255-3

4



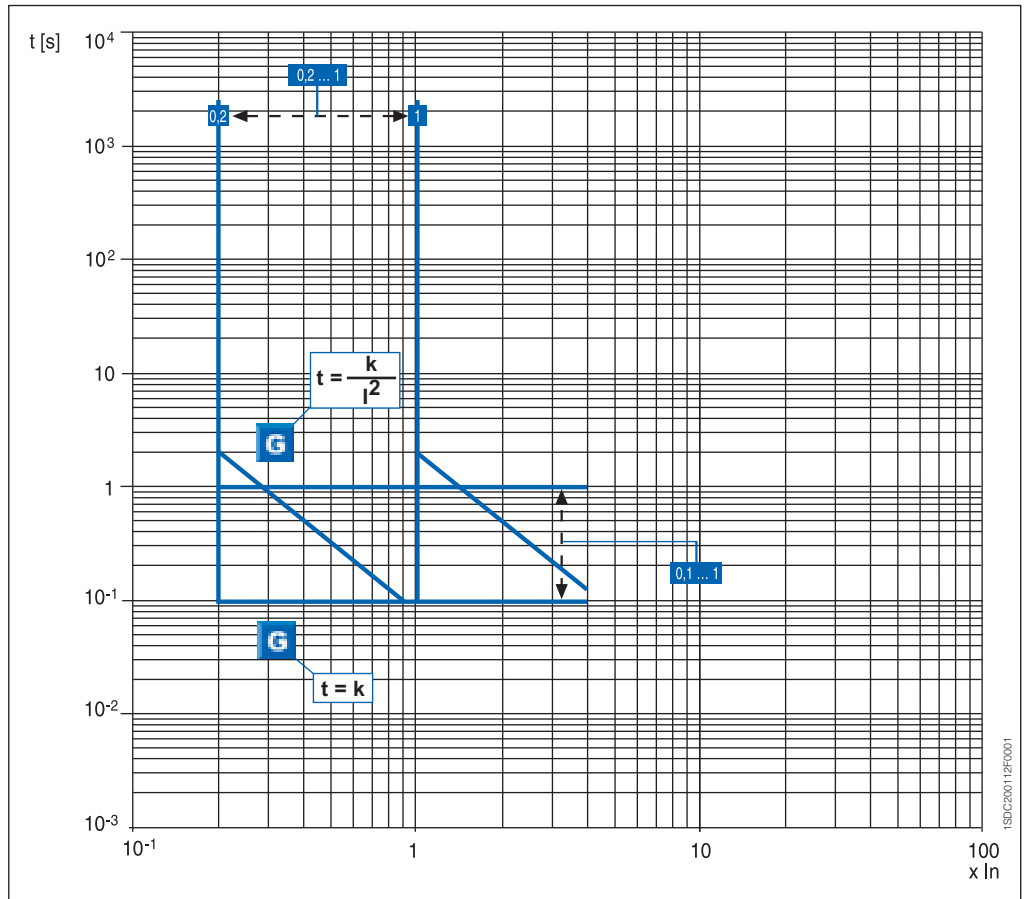
Function L

According to IEC 60255-3

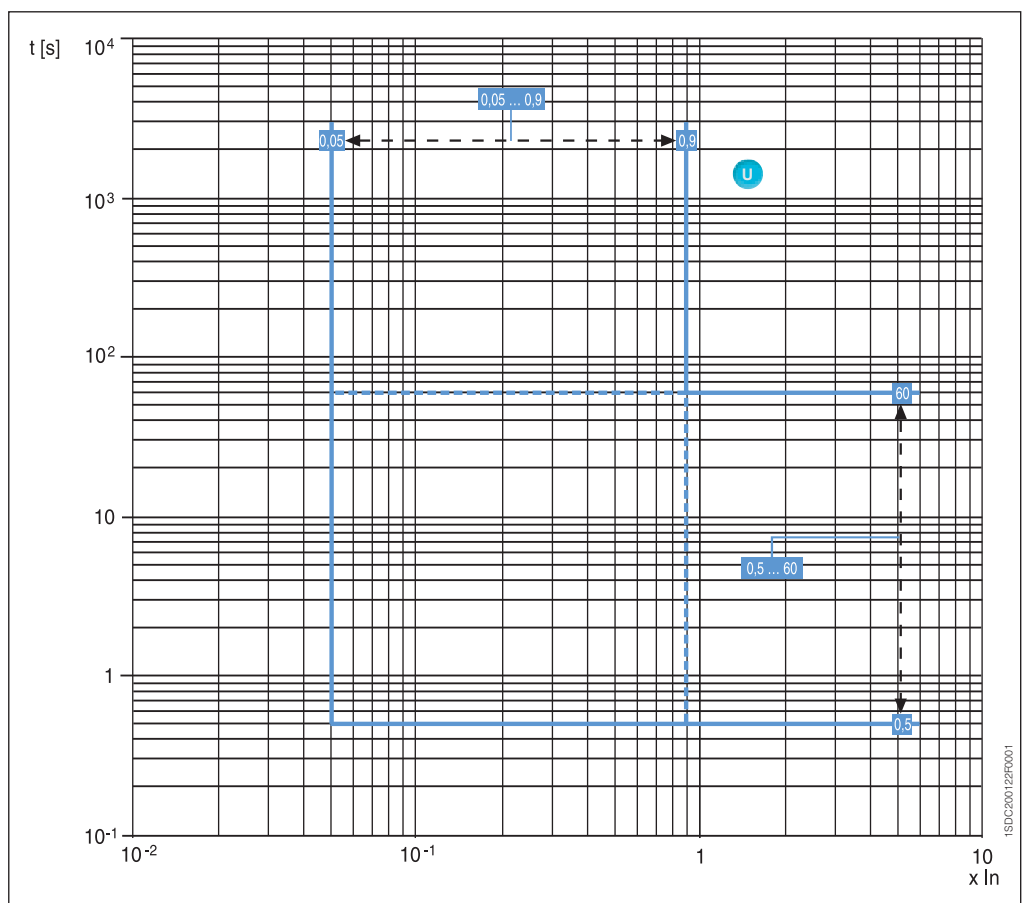


Threshold and trip times tolerances page 4/16

Function G



Function U



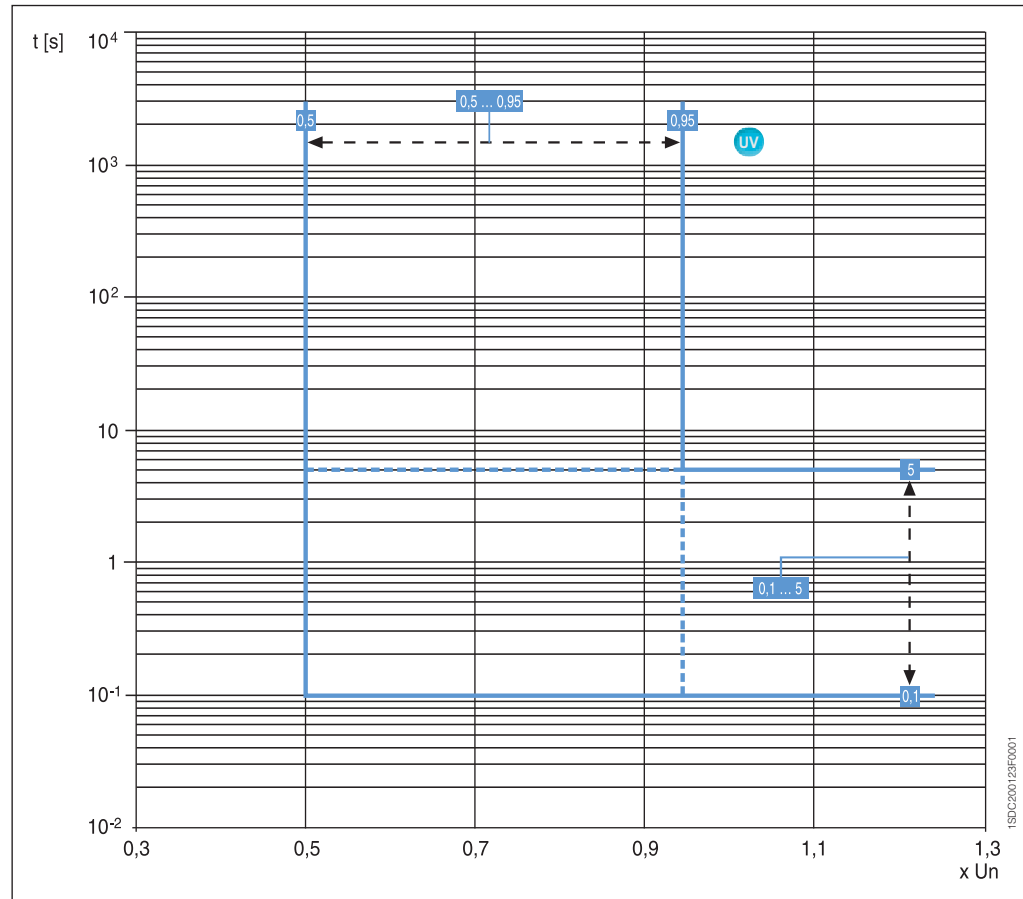
Threshold and trip times tolerances page 4/16



Protection trip units and trip curves

PR122/P

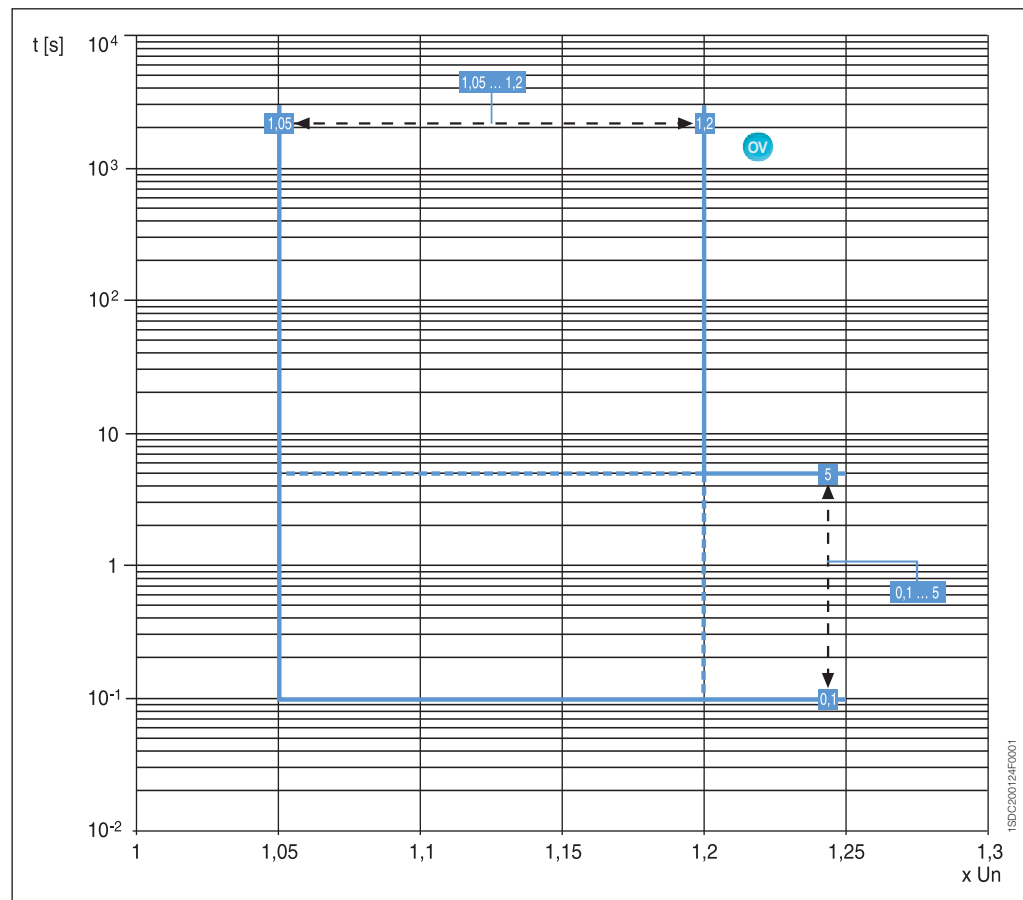
Function UV



1SDC200123F0001

4

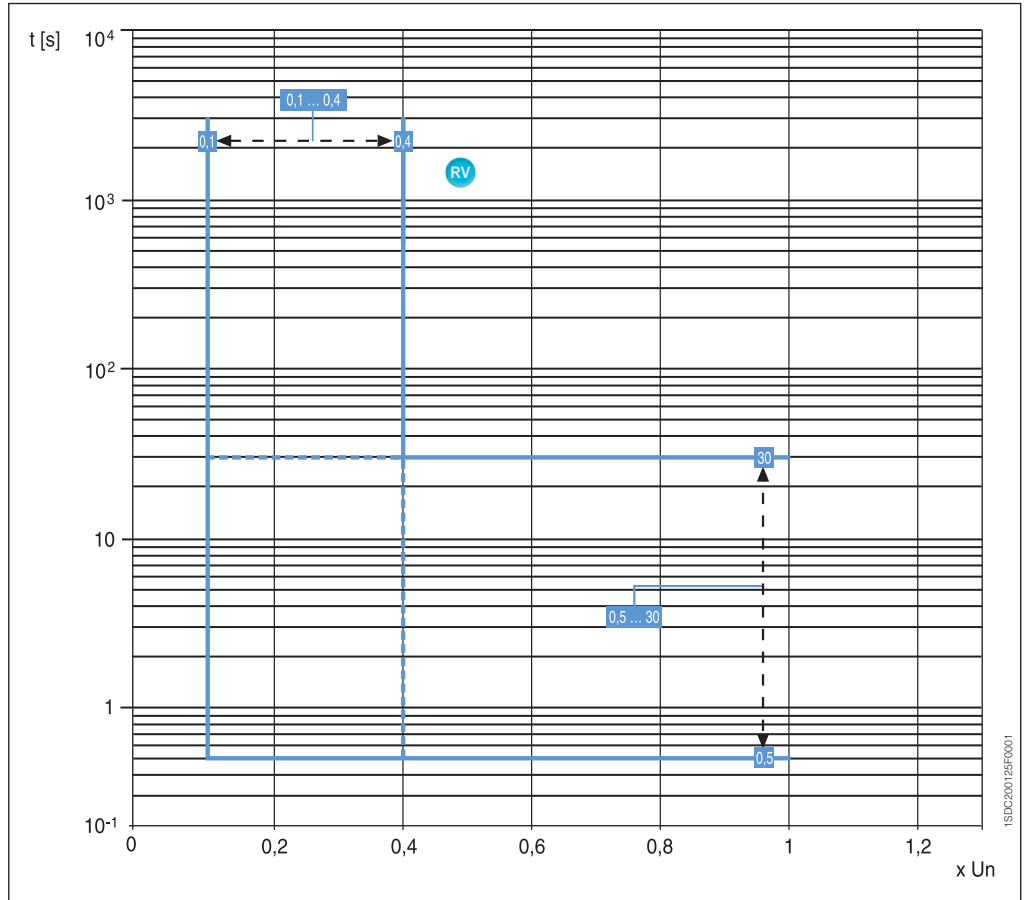
Function OV



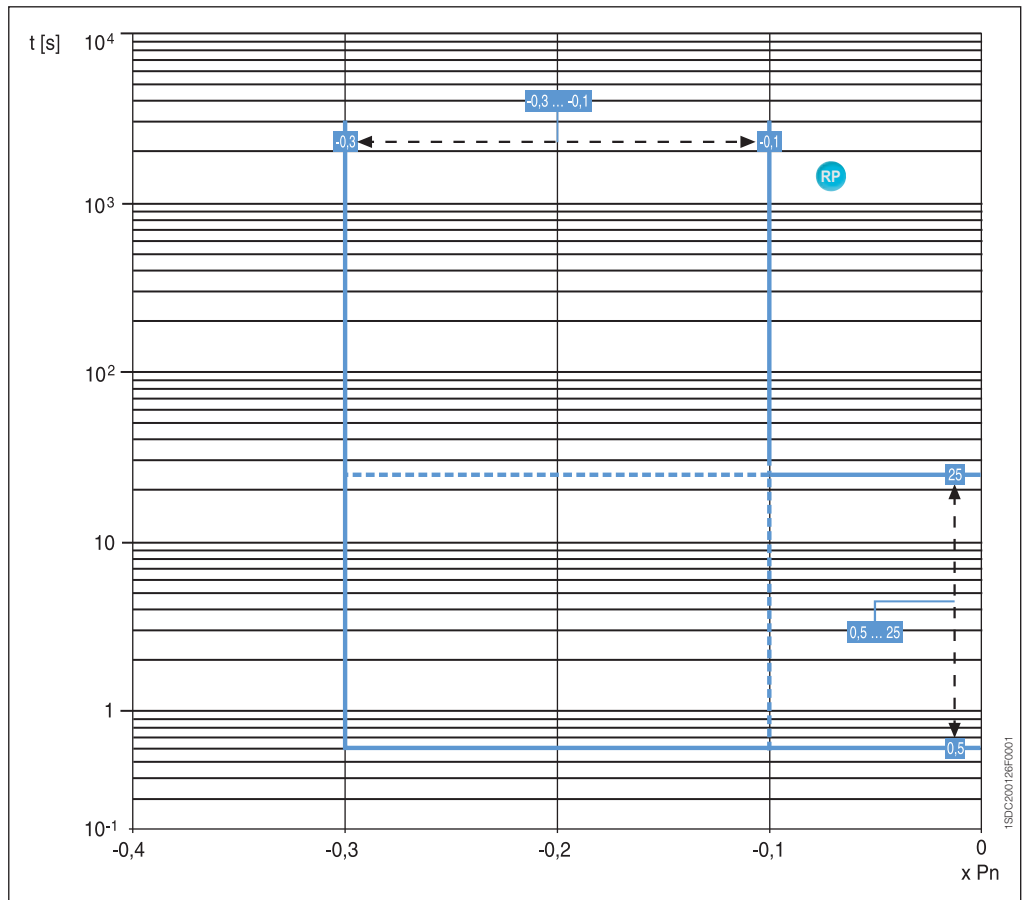
1SDC200124F0001

Threshold and trip times tolerances page 4/16

Function RV



Function RP



Threshold and trip times
tolerances page 4/16



Protection trip units and trip curves

PR123/P

Characteristics

The PR123 protection trip unit completes the range of trip units available for the Emax family of circuit-breakers.

It is a high-performance and extraordinarily versatile trip unit, capable of offering a complete set of functions for protection, measurement, signalling, data storage and control of the circuit-breaker, and it represents the benchmark in low voltage protection units for circuit-breakers.

The front interface of the unit, common to PR122/P, is extremely simple thanks to the aid of the liquid crystal graphics display. It can show diagrams, bar graphs, measurements and sine curves for the various electrical values.

PR123 integrates all the features offered by PR122/P plus a series of evolve functionalities. As well as PR122 it can be integrated with the additional features provided by internal modules and external accessories.

4



Caption

- 1 LED Warning indicator
- 2 Alarm LED
- 3 Rear-lit graphic display
- 4 Cursor UP button
- 5 Cursor DOWN button

- 6 Test connector for connecting or testing the trip unit by means of an external device (PR030/B battery unit, BT030 wireless communication unit and SACE PR010/T unit)
- 7 ENTER button to confirm data or

- change pages
- 8 Button to exit submenus or cancel operations (ESC)
- 9 Rating plug
- 10 Serial number of protection trip unit
- 11 Power LED
- 12 Voltage uptake switch-disconnector

Protection functions

The PR123 trip unit offers the following protection functions:

- overload (L) ⁽¹⁾,
- selective short-circuit (S),
- instantaneous short-circuit (I),
- earth fault with adjustable delay (G) ⁽²⁾,
- directional short-circuit with adjustable delay (D),
- phase unbalance (U),
- protection against overtemperature (OT),
- load control (K),
- undervoltage (UV),
- overvoltage (OV),
- residual voltage (RV),
- reverse power (RP),
- underfrequency (UF),
- overfrequency (OF),
- phase sequence (alarm only).

Notes:

(1) In accordance also with IEC 60255-3 Standard.

(2) The current values above which G is disabled are indicated in the installation manual.

In addition to PR122/P features, the following improvements are available:

Double selective short-circuit protection S

In addition to the standard S protection, PR123/P makes contemporarily available a second time-constant S protection (excludible) that allows two thresholds to be set independently achieving an accurate selectivity even under highly critical conditions.

Double earth fault protection G

While in PR122/P the user must choose among the implementation of G protection through internal current sensors (calculating the vectorial sum of currents) or external toroid (direct earth fault current measuring), PR123/P offers the exclusive feature of the contemporaneous management of both the configuration, by means of two independent earth fault protection curves. The main application of this characteristic is simultaneous activation of restricted and unrestricted earth fault protection. See chapter 6 for details.

Directional short-circuit protection with adjustable delay D

The protection works in a similar way to the fixed-time protection “S”, with the added ability to recognize the direction of the phases current during the fault period.

The current direction makes it possible to determine whether the fault is on the supply or load side of the circuit-breaker. Particularly in ring distribution systems, this makes it possible to identify and disconnect the distribution segment where the fault has occurred, whilst keeping the rest of the installation running. If multiple PR122 or PR123 trip units are used, this protection can be associated with zone selectivity.

Residual current protection Rc

With PR123/P is possible to have the residual current protection only adding the external toroid (1SDA063869).



Protection trip units and trip curves

PR123/P

Notes:

The directional short-circuit protection can be disabled for an adjustable set time ($t = k$), and can either be self-supplied or use the auxiliary power supply. Directional protection is not available on 400A rating.

Dual setting of protections

PR123/P can store an alternative set of all the protection parameters. This second set (set B) can replace, when needed, the default set (set A) by means of an external command. The command can be given typically when network configuration is modified, like when a parallel of incoming lines is closed or when an emergency source is present in the system, changing load capability and short-circuit levels.

The set B can be activated by:

- digital input provided with PR120/K module. For example It can be connected to an auxiliary contact of a bus-tie
- communication network, through PR120/D-M (i.e. when the changeover is scheduled);
- directly from user interface of PR123/P
- an adjustable time interval after closing of the circuit-breaker.

Zone selectivity function

The zone selectivity function allows the fault area to be insulated by segregating the system very rapidly only at the level closest to the fault, whilst leaving the rest of the installation running.

This is done by connecting the trip units together: the trip unit nearest the fault is tripped instantly, sending a block signal to the other trip units affected by the same fault

The zone selectivity function can be enabled if the fixed-time curve has been selected and an auxiliary power supply is present.

Zone selectivity can be applied with protections S and G or, alternatively, with protection D.

Measurement functions

The PR123 trip unit provides a complete set of measurements:

- Currents: three phases (L1, L2, L3), neutral (Ne) and earth fault
- Voltage: phase-phase, phase-neutral and residual voltage
- Power: active, reactive and apparent
- Power factor
- Frequency and peak factor, $\left(\frac{I_p}{I_{rms}}\right)$
- Energy: active, reactive, apparent, counter
- Harmonics calculation: up to the 40th harmonic (waveform and module of the harmonics displayed); up to the 35th for frequency $f = 60\text{Hz}$
- Maintenance: number of operations, percentage of contact wear, opening data storage
- $\cos\phi$: phase sequence (only alarm).

The PR123 unit is able to provide the pattern of measurements for some values over an adjustable period of time P, such as: mean active power, maximum active power, maximum current, maximum voltage and minimum voltage. The last 24 P periods (adjustable from 5 to 120 min.) are stored in a non-volatile memory and displayed in a bar graph.

Other Functions

PR123/P integrates all the features (in terms of protection, measurement, signaling and communication) described for PR122/P equipped with PR120/V. With PR123/P-LSIG, when the special rating plug for residual current protection and the external toroid are activate, the earth fault protection, if selected, can replace Gext protection, while G protection keep on being active.

Protection functions and setting values - PR123

Function	Trip threshold	Threshold steps	Trip Time	Time Step	Can be excluded	Relation t=f(I)	Thermal memory	Zone selectivity
L Overload protection	I1= 0.4...1 x In Release between 1.05 and 1.2 x I1	0.01 x In	With current If = 3xI1 t1= 3 s...144 s ± 10% If ≤ 6 x In ± 20% If > 6 x In	3 s ⁽¹⁾	–	t=k/I ²	■	–
	Tolerance ⁽²⁾							
S Selective short-circuit protection ⁽⁴⁾	I2= 0.6...10 x In	0.1 x In	With current I = 3xI1 ⁽⁶⁾ ; t1=3s...144s t2= 0.05 s...0.8 s t2sel= 0.04 s...0.2 s The better of the two figures: ± 10% or ± 40 ms	0.01 s 0,01 s	■	t=k	–	■
	Tolerance ⁽²⁾							
S+ Selective short-circuit protection	I2= 0.6...10 x In ± 7% If ≤ 6 x In ± 10% If > 6 x In	0.1 x In	With current I = 10xIn; t2=0.05s...0.8s ± 15% If ≤ 6 x In ± 20% If > 6 x In	0.01 s	■	t=k/I ²	■	–
	Tolerance ⁽²⁾							
I Instantaneous short-circuit protection	I3= 1.5...15 x In ± 10%	0.1 x In	Instantaneous ≤ 30 ms	–	■	t=k	–	–
	Tolerance ⁽²⁾							
G Earth fault protection	I4 ⁽⁶⁾ = 0.1*...1 x In ± 7%	0.02 x In	With current If > I4 t4= 0.1 s...1 s t4sel= 0.04 s...0.2 s The better of the two figures: ± 10% or ± 40 ms	0.05 s 0,01 s	■	t=k	–	■
	Tolerance ⁽²⁾							
Rc Residual Current protection ⁽⁷⁾	I _d = 3-5-7-10-20-30 A ± 10%		t _d = 0.06-0.1-0.2-0.3- 0.4-0.5-0.8 s ⁽³⁾		■	t=k	–	–
	Tolerance ⁽²⁾							
D Directional short-circuit protection	I7= 0.6...10 x In ± 10%	0.1 x In	With current If > I7 t7= 0.20 s...0.8 s The better of the two figures: ± 10% or ± 40 ms	0.01 s	■	t=k	–	■
	Tolerance ⁽²⁾							
U Phase unbalance protection	I6= 5%...90% ± 10%	5%	t6= 0.5 s...60 s The better of the two figures: ± 20% or ± 100 ms	0.5 s	■	t=k	–	–
	Tolerance ⁽²⁾							
OT Protection against overtemperature	cannot be set	–	Instantaneous	–	–	temp=k	–	–
UV Undervoltage protection	I8= 0.5...0.95 x Un ± 5%	0.01 x In	With current U < U8; t8=0,1s...5s The better of the two figures: ± 20% or ± 40 ms	0.1 s	■	t=k	–	–
	Tolerance ⁽²⁾							
OV Overvoltage protection	I9= 1.05...1.2 x Un ± 5%	0.01 x In	With current U > U9; t9=0,1s...5s The better of the two figures: ± 20% or ± 40 ms	0.1 s	■	t=k	–	–
	Tolerance ⁽²⁾							
RV Residual voltage protection	I10= 0.1...0.4 x Un ± 5%	0.05 Un	With current U ₀ > U10; t10=0,5s...30s The better of the two figures: ± 10% or ± 100 ms	0.5 s	■	t=k	–	–
	Tolerance ⁽²⁾							
RP Reverse power protection	P11= -0.3...-0.1 x Pn ± 10%	0.02 Pn	With current P < P11 t11= 0.5 s...25 s The better of the two figures: ± 10% or ± 100 ms	0.1 s	■	t=k	–	–
	Tolerance ⁽²⁾							
UF Underfrequency protection	f12 = 0.90...0.99 x fn ± 5%	0.01 fn	With current f < f12; t9=0.5s...3s The better of the two figures: ± 10% or ± 100 ms	0.1 s	■	t=k	–	–
	Tolerance ⁽²⁾							
OF Overfrequency protection	f13 = 1.01...1.10 x fn ± 5%	0.01 fn	With current f > f13; t10=0.5s...3s The better of the two figures: ± 10% or ± 100 ms	0.1 s	■	t=k	–	–
	Tolerance ⁽²⁾							

If = fault current

* G=0.1xIn with auxiliary power supply 24V DC

(1) The minimum trip value is 1 s, regardless of the type of curve set (self-protection)

(2) These tolerances hold in the following conditions:

- self-powered relay at full power and/or auxiliary power supply (without start-up)
- two- or three-phase power supply
- trip time set ≥ 100 ms

(3) Non intervention time

(4) In accordance with IEC 60255-3

(5) $t = \frac{(3^\alpha - 1)}{(I/I1)^\alpha - 1} \cdot t1(3xI1)$

(6) The minimum trip threshold for the G ext protection with SRG toroid is 0,1 In

(7) If selected, Rc protection with PR123/P-LSIG and special rating plug, can replace Gext protection.

The following tolerance values apply in all cases not covered by the above:

Trip threshold	Trip time
L Release between 1.05 and 1.25 x I1	± 20%
S ± 10%	± 20%
I ± 15%	≤ 60ms
G ± 15%	± 20%
Others	± 20%



Protection trip units and trip curves

PR123/P

Power supply

The PR123 trip unit does not normally require any external power supplies, being self-supplied from the current sensors (CS): a three-phase 70 A current is sufficient to activate the protection functions and the ammeter, whereas three-phase 160 A are required to turn the display on. Once the display is turned on, the minimum current for visualisation is $I > 5\%$ of the rating plug. The unit ensures fully self-supplied operation. When an auxiliary power supply is present, it is also possible to use the unit with the circuit-breaker either open or closed with very low current flowing through.

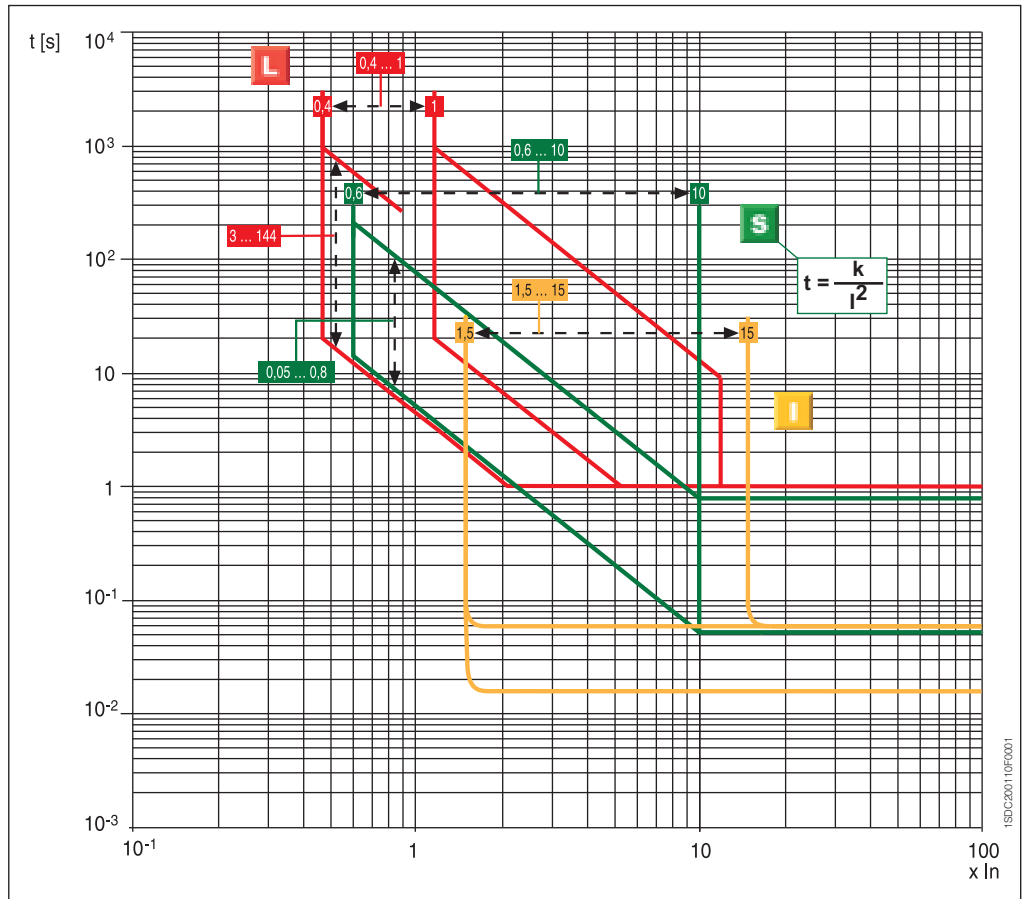
It is also possible to use an auxiliary power supply provided by the PR030/B portable battery unit (always supplied), which allows the protection functions to be set when the trip unit is not self-supplied.

PR123/P stores and shows all the information needed after a trip (protection tripped, trip current, time, date). No auxiliary supply is required for this functionality.

	PR123/P	PR120/D-M	PR120/K	PR120/D-BT
Auxiliary power supply (galvanically insulated)	24 V DC \pm 20%	from PR122/PR123	from PR122/PR123	from PR122/PR123
Maximum ripple	5%			
Inrush current @ 24V	~10 A for 5 ms			
Rated power @ 24V	~3 W	+1 W	+1 W	+1 W

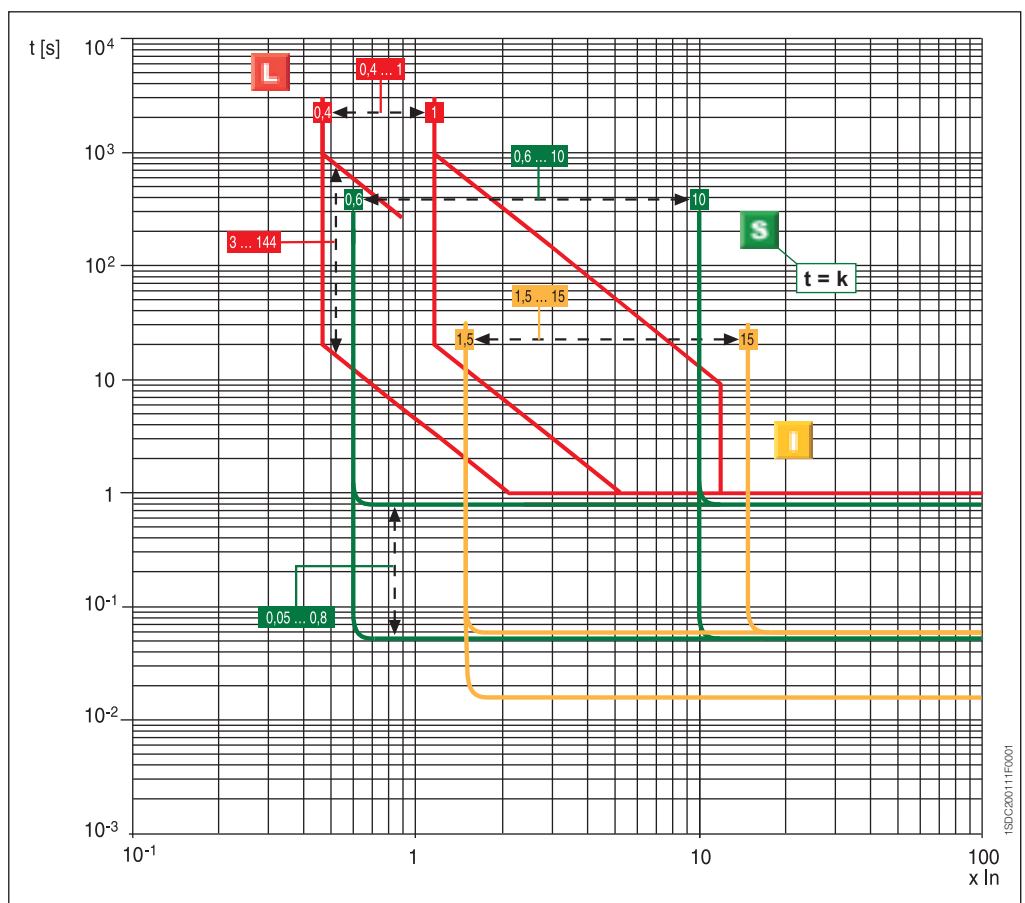
PR120/V can give power supply to the trip unit when at least one line voltage is equal or higher to 85V.

Functions L-S-I



1SDC200110F0001

Functions L-S-I



1SDC200111F0001

Threshold and trip times tolerances page 4/27



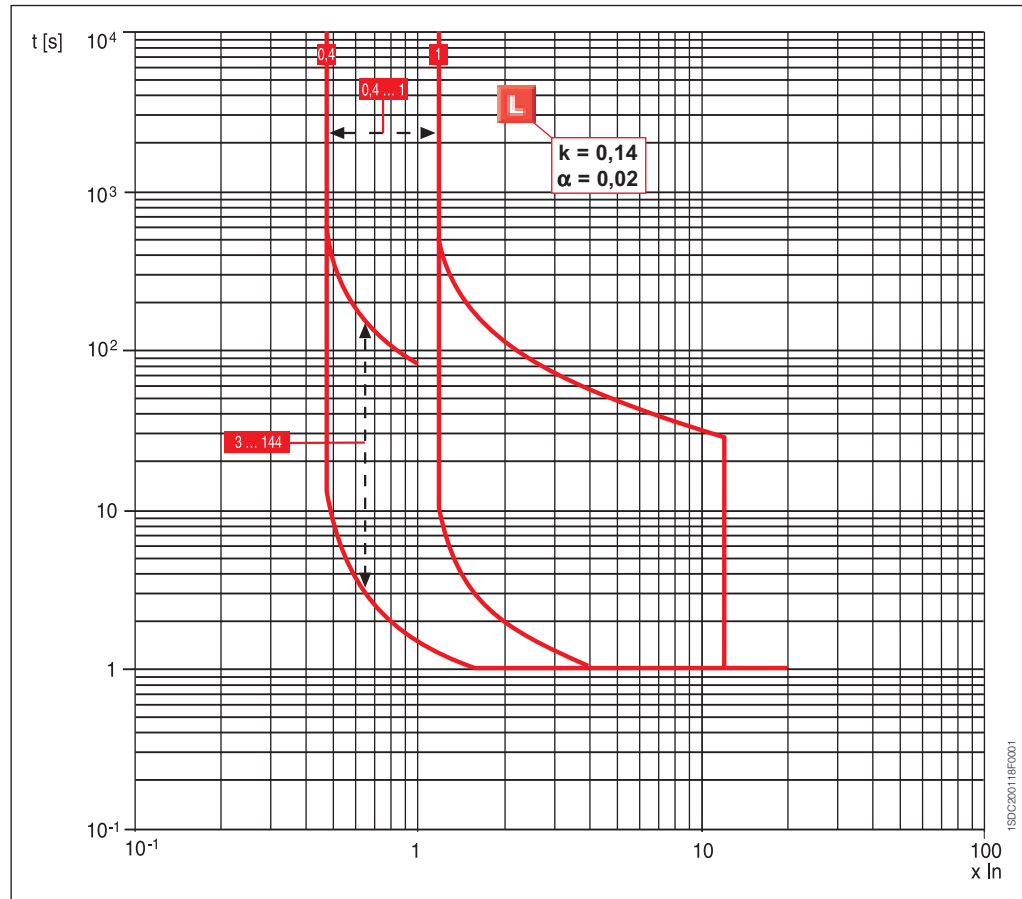
Protection trip units and trip curves

PR123/P

Function L

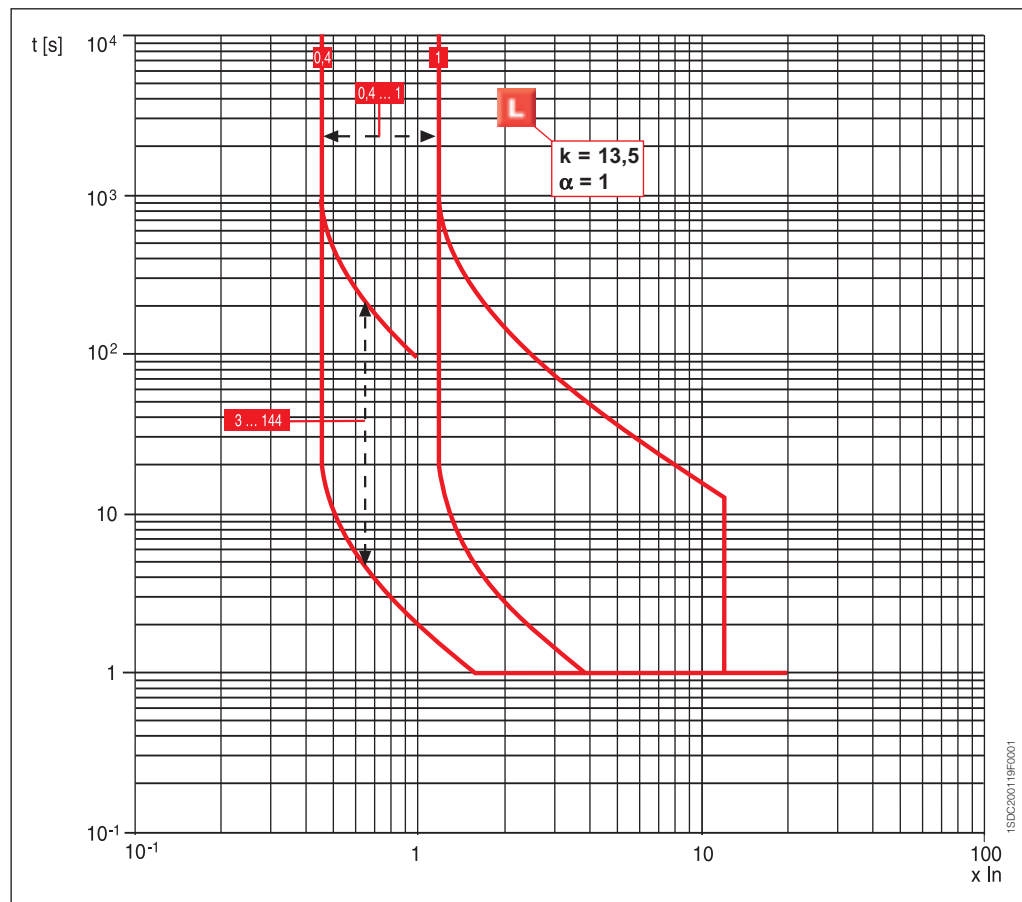
According to IEC 60225-3

4



Function L

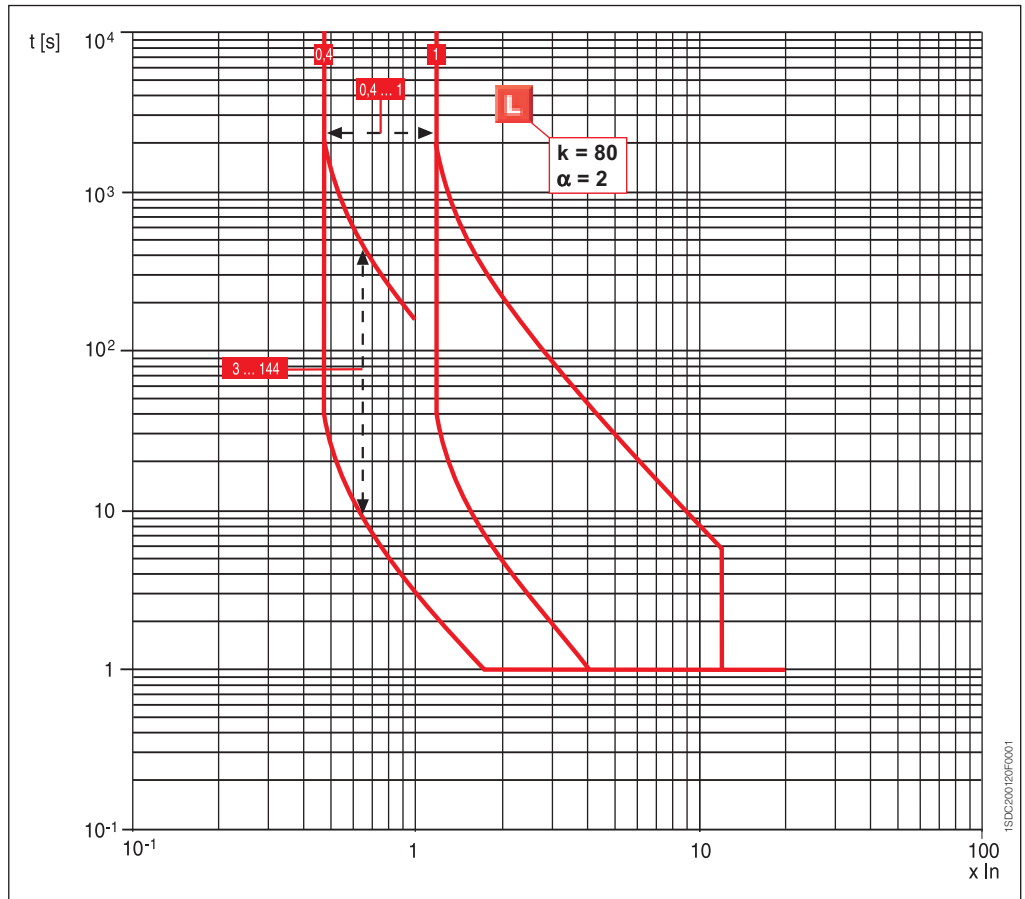
According to IEC 60225-3



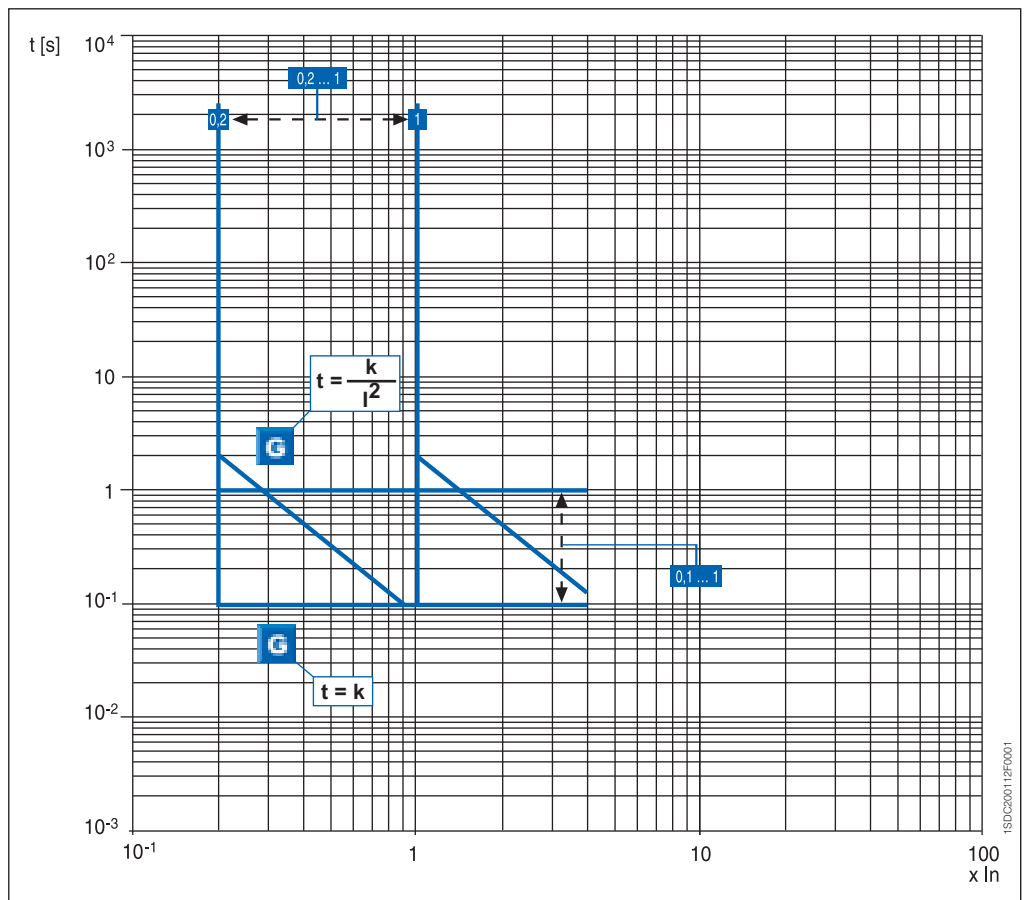
Threshold and trip times tolerances page 4/27

Function L

According to IEC 60225-3



Function G



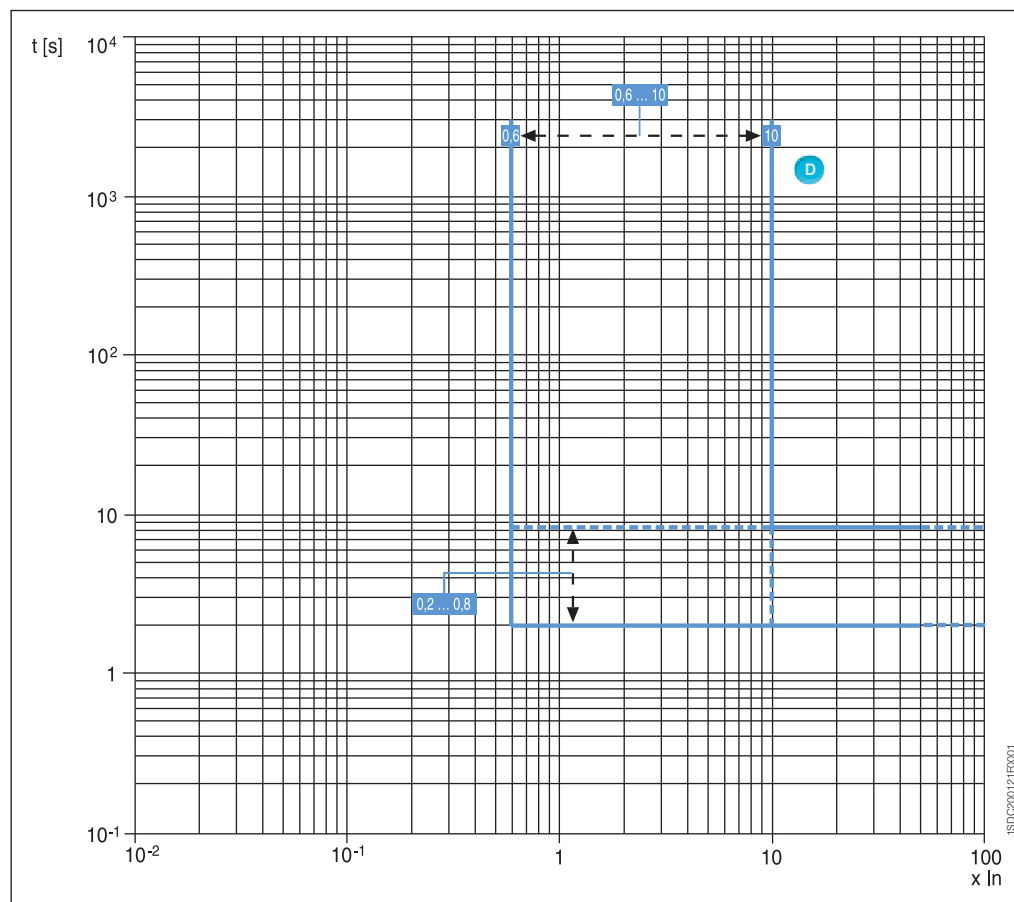
Threshold and trip times tolerances page 4/27



Protection trip units and trip curves

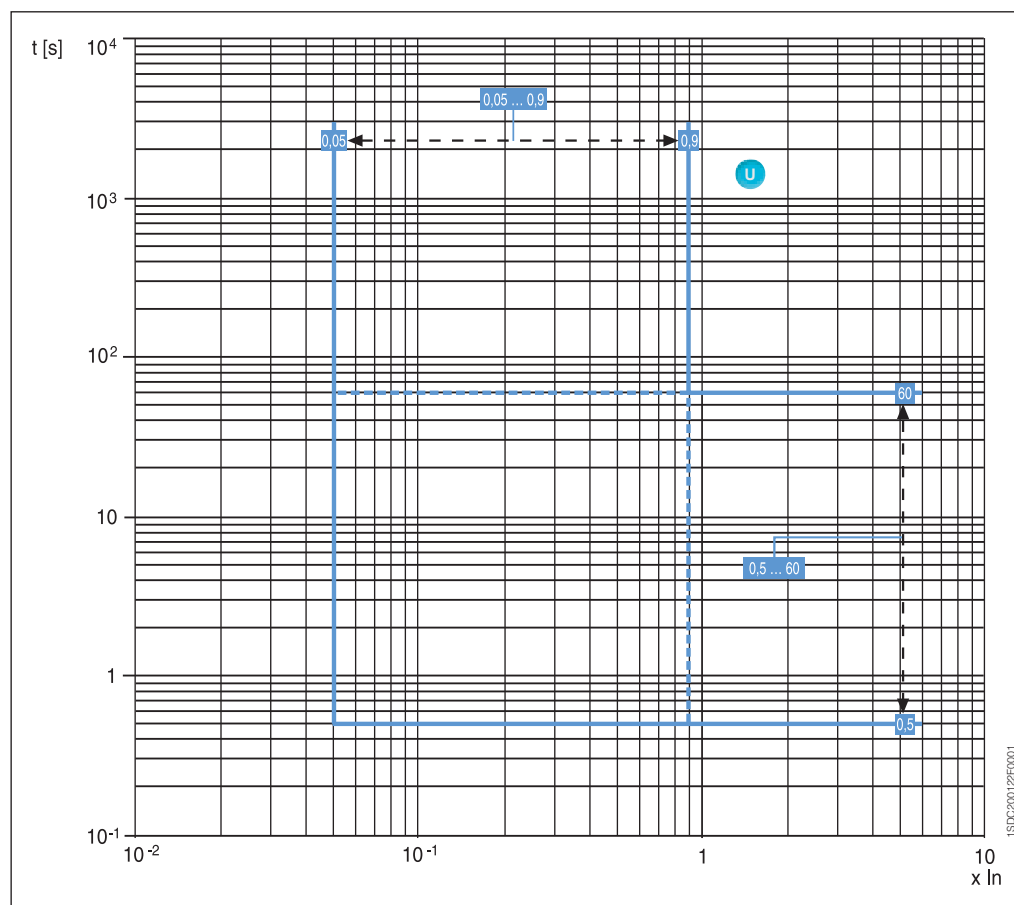
PR123/P

Function D



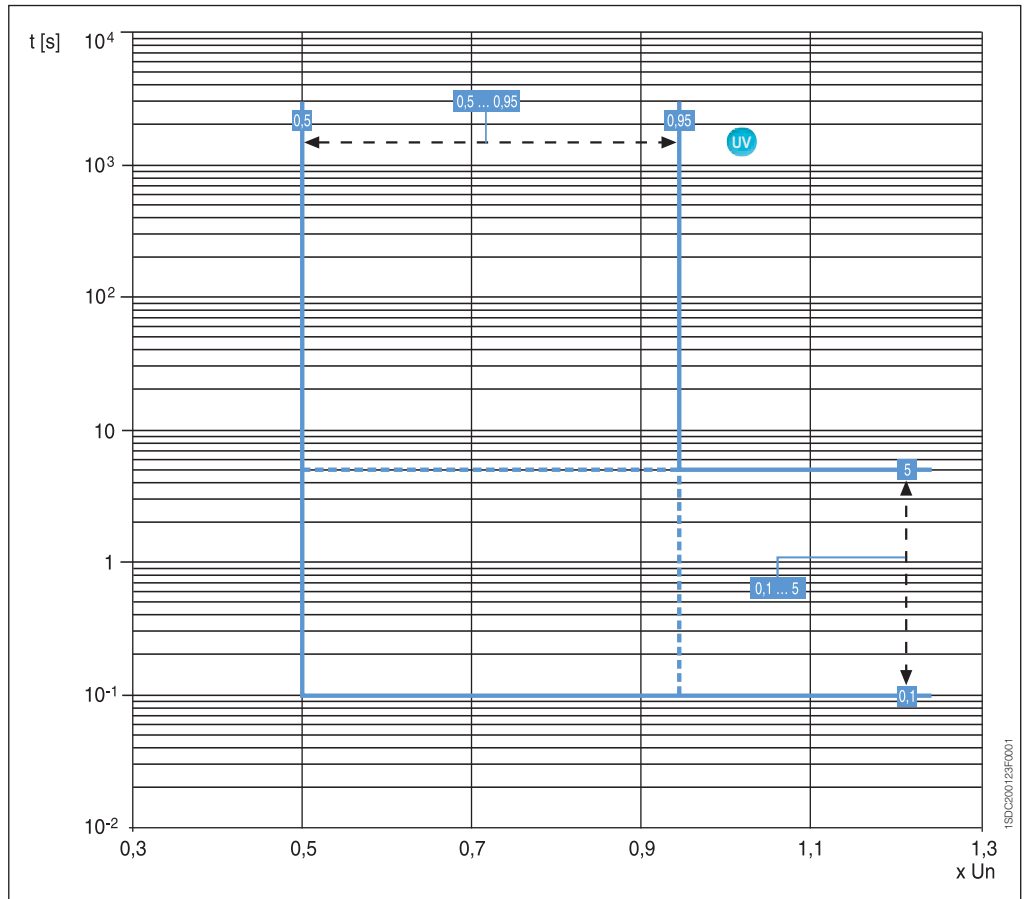
4

Function U

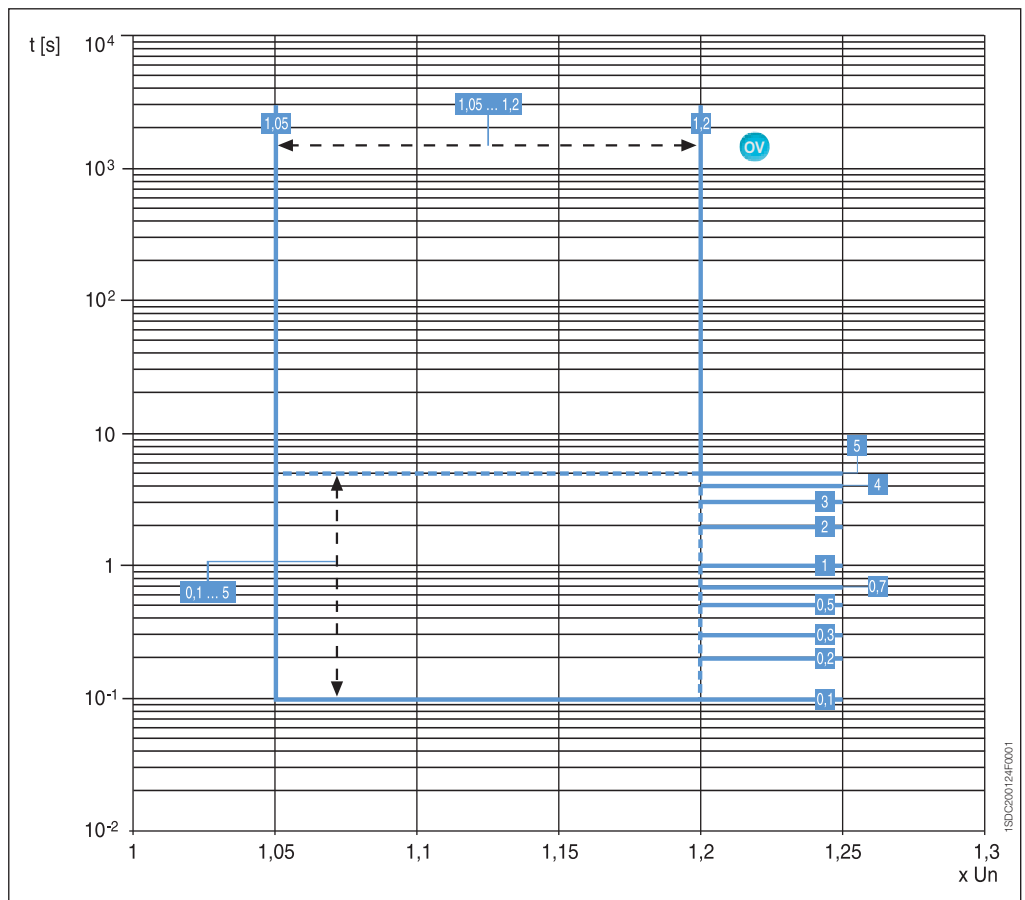


Threshold and trip times tolerances page 4/27

Function UV



Function OV



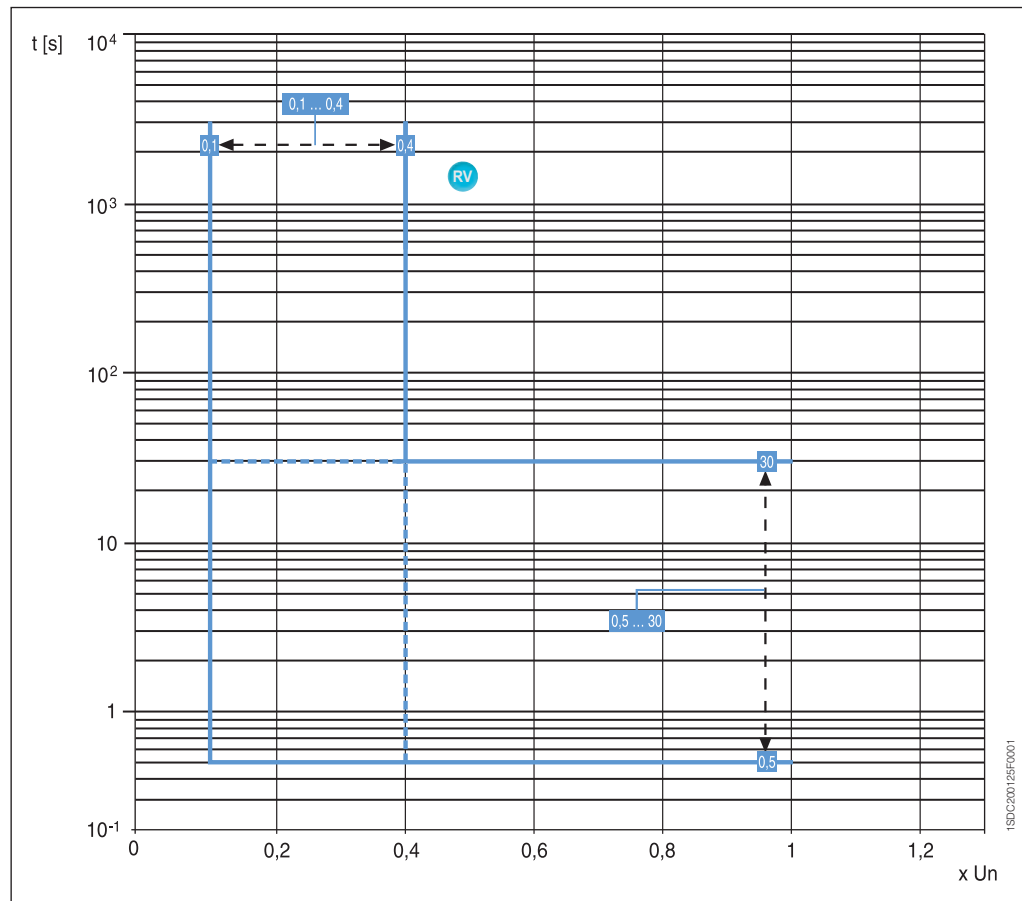
Threshold and trip times tolerances page 4/27



Protection trip units and trip curves

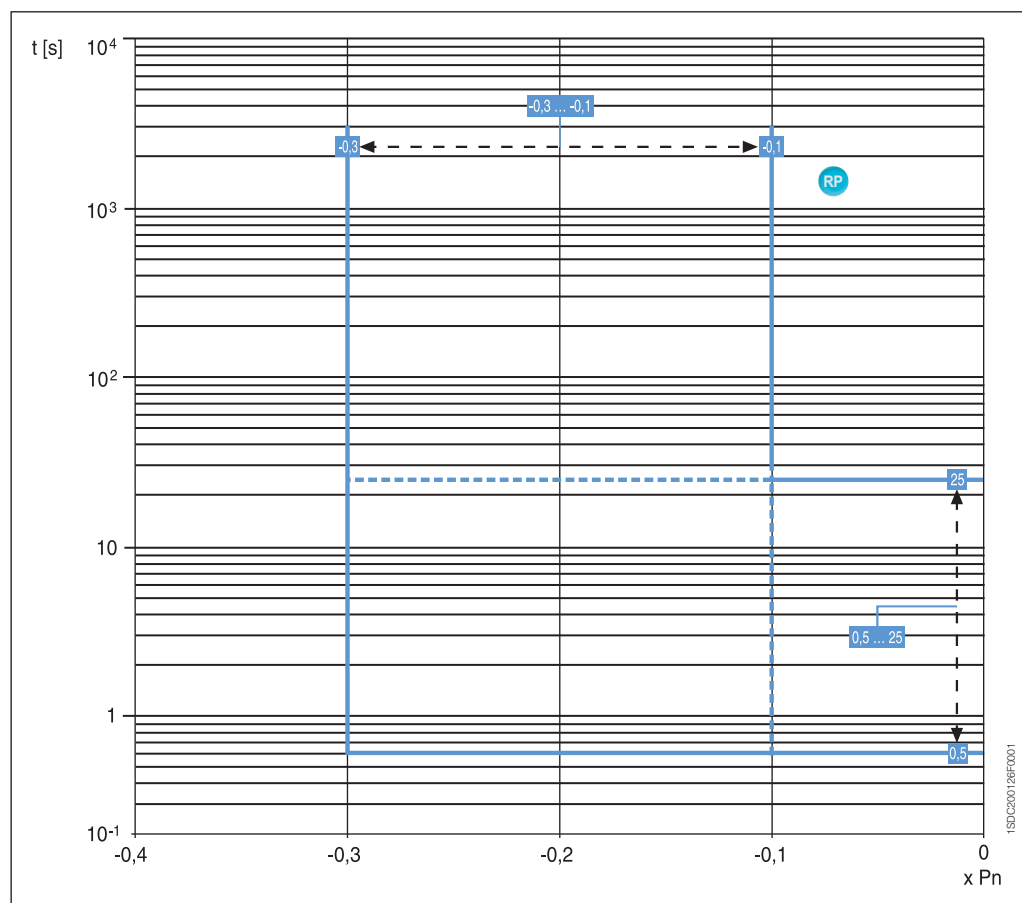
PR123/P

Function RV



4

Function RP



Threshold and trip times tolerances page 4/27

Accessories for protection trip units

Optional modules

PR122 and PR123 can be enriched with additional internal modules, increasing the capacity of the trip unit and making these units highly versatile.

Electrical signalling contacts: PR120/K Internal Module

This unit, internally connected to PR122/P and PR123/P, allows the remote signalling of alarms and trips of the circuit breaker.

Four independent power relays provided on the PR120/K trip unit enable electrical signalling of the following:

- timing for protections L, S, G (and UV, OV, RV, RP, D, U, OF, UF where applicable);
- protections L, S, I, G, OT, (and UV, OV, RV, RP, D, U, OF, UF where applicable) tripped and other events;
- in addition, by using an external device (PR010/T, BT030, PR120/D-BT), the contacts can be freely configured in association with any possible event or alarm.

PR120/K can also be used as actuator for the Load control function.

In addition the unit can be provided with a digital input signal, enabling the following functions:

- activation of alternative set of parameter (PR123/P only);
- external trip command
- trip reset of the trip unit
- reset of PR120/K power relays

When the digital input is required the power relays have a common connection (see circuit diagrams Chapter 8).

This latest kind of connection must be specified in the order when required together with the circuit breaker. When PR120/K is ordered as loose accessory both of the configurations are possible.

The auxiliary 24VDC power supply is needed for the unit (shown by a green Power LED). Four yellow LEDs show the status of each output relay.

The use of Voltage Transformers is mandatory for rated voltages higher than 690V.

The PR120/K can not work with the IO o/c internal contacts.



Specifications of the signalling relays		
Type	Monostable STDP	
Maximum switching power (resistive load)	100 W/1250 VA	
Maximum switching voltage	130 V DC/250 V AC	
Maximum switching current	5 A	
Breaking capacity (resistive load)		
	@ 30V DC	3.3 A
	@ 250V AC	5 A
Contact/coil insulation	2000 V eff (1 min @ 50 Hz)	

PR120/V Measurement Module

This optional internal module can be added to PR122, and it is supplied as standard in PR123. It measures and processes the phase and neutral voltages, are transferring these values to the protection trip unit by means of its internal bus in order to achieve a series of protection and measurement features.

It can be connected at any time to PR122/P, which recognizes it automatically without the need of any configuration.

PR122 does not normally require any external connection or Voltage Transformer, since it is connected internally to the lower terminals of Emax. When necessary, the connection of voltage pick-ups can be moved to any other points (i.e. upper terminals), by using the alternative connection located in the terminal box.

When ordered as a loose accessory, PR122 is provided with all the possible connections, internal or through the terminal box.

The module is provided with a Power LED and a sealable switch-disconnector for the dielectric test.





Accessories for protection trip units



1SDDC200301F0001

PR120/D-M Communication Module

PR120/D-M communication module is the solution for connecting Emax to a Modbus network, allowing the remote supervision and control of the circuit-breaker.

It is suitable for PR122/P and PR123/P trip units. As for PR120/V this module can be added at any time to the protection trip unit and its presence is automatically recognized. When ordered separately from the circuit-breakers it is supplied complete of all the accessories needed for its installation, such as precabled auxiliary switches and cables for signalling the circuit-breaker status (springs, position inserted). Refer to circuit diagram page 8/12 for details about connections. The module can be powered by means of a 24V DC auxiliary supply.

The list of available functions can be found on page 4/42.

It is provided with three LEDs on the front side:

- Power LED
- Rx/Tx LEDs



1SDDC200302F0001

PR120/D-BT Wireless Communication Module

PR120/D-BT is the innovative wireless communication module, based on Bluetooth standard. It allows the communication among the PR122/P and PR123/P Protection trip units and a PDA or a Notebook with a Bluetooth port. This device is dedicated to the use with SD-Pocket application (see in the following the features of this application).

The module can be powered by means of a 24V DC auxiliary supply or by means of PR030/B battery unit.

It is provided with four LEDs on the front side:

- Power LED
- Rx/Tx LEDs
- Bluetooth LED, showing the activity of Bluetooth communication

PR120/D-BT can be connected at any time to the protection trip unit.

BT030 Communication unit

BT030 is a device to be connected on Test connector of PR121/P, PR122/P and PR123/P. It allows Bluetooth communication among the Protection trip unit and a PDA or a Notebook with a Bluetooth port. BT030 can also be used with Tmax circuit breakers equipped with PR222DS/PD. This device is dedicated to the use with SD-Pocket application.

BT030 can provide the power supply needed to energize itself and the protection trip unit by means of a Li-ion rechargeable battery.

PR030/B power supply unit

This accessory, always supplied with the PR122 and PR123 range of trip units, makes it possible to read and configure the parameters of the unit whatever the status of the circuit-breaker (open-closed, in test isolated or racked-in position, with/without auxiliary power supply). PR030/B is also needed for reading trip data if the trip occurred more than 48 hours earlier and the trip unit was no longer powered.

An internal electronic circuit supplies the unit for approximately 3 consecutive hours for the sole purpose of reading and configuring data.

In relation to the amount of use, battery life decreases if the SACE PR030/B accessory is also used to perform the Trip test & Auto test.

Interface from front of HMI030 panel

This accessory, suitable for all protection trip units, is designed for the installation on the front side of the switchboard. It consists of a graphic display where all the measurements and alarms/events of the trip unit are shown. The user can browse the measurements by using the navigation pushbuttons, similarly to PR122/P and PR123/P. Thanks to the high precision level, the same of the protection trip units, the device can replace the traditional instrumentation, without the need for current/voltage transformers. The unit requires only a 24 V DC power supply. In fact HMI030 is connected directly to the protection trip unit via a serial line.



1SD200129F0001

SACE PR010/T configuration test unit

The SACE PR010/T unit is an instrument capable of performing the functions of testing, programming and reading parameters for the protection units equipping SACE Emax low-voltage air circuit-breakers.

In particular, the test function involves the following units:

- PR121 (all versions)
- PR122 (all versions)
- PR123 (all versions)

whereas the parameter programming and reading functions regard the range of PR122 and PR123 trip units.

All of the functions mentioned can be carried out “on board” by connecting the SACE PR010/T unit to the front multi-pin connector on the various protection units. Special interfacing cables supplied with the unit must be used for this connection.

The human-machine interface takes the form of a touchpad and multi-line alphanumeric display.

The unit also has two LEDs to indicate, respectively:

- POWER-ON and STAND BY
- battery charge state.

Two different types of test are available: automatic (for PR121, PR122 and PR123) and manual. By connection to a PC (using the USB 512 MB supplied by ABB SACE), it is also possible to upgrade the software of the SACE PR010/T unit and adapt the test unit to the development of new products.

It is also possible to store the most important test results in the unit itself, and to send a report to the personal computer with the following information:

- type of protection tested
- threshold selected
- curve selected
- phase tested
- test current
- estimated trip time
- measured trip time
- test results.

At least 5 complete tests can be stored in the memory. The report downloaded onto a PC allows creation of an archive of tests carried out on the installation.

In automatic mode, the SACE PR010/T unit is capable of testing the following with the PR122 range:

- protection functions L, S, I,
- G protection function with internal transformer,
- G protection function with toroid on the transformer star centre,
- monitoring of correct microprocessor operation.

The unit can also test the following protections of PR122 equipped with PR120/V:

- overvoltage protection function OV,
- undervoltage protection function UV,
- residual voltage protection function RV,
- phase unbalance protection function U.

The SACE PR010/T unit is portable and runs on rechargeable batteries and/or with an external power supply (always supplied) with a rated voltage of 100-240V AC/12V DC.

The standard version of the SACE PR010/T unit includes:

- SACE PR010/T test unit complete with rechargeable batteries
- SACE TT1 test unit
- 100 - 240V AC/12V DC external power supply with cord
- cables to connect the unit and connector
- cable to connect the unit and computer (RS232 serial)
- user manual and USB 512 MB containing application software
- plastic bag.



Accessories for protection trip units

Flex Interfaces

ABB SACE Flex Interfaces are a range of 10 modular DIN rail electronic devices, thought up for signaling and transmitting information between circuit-breakers and other devices, such as actuators, communication networks and measuring instruments.

Thanks to this function, it is possible to make simple and economic the applications like:

- electrical signalling of events, alarms and circuit-breaker trips;
- transmission of electrical measurements to switchboard instruments, or remote control, by means of 4-20 mA signals;
- additional protection of the plant based on measurements of external values, such as pressure and temperature;
- non-priority load control.

According to the methods of connection to the moulded-case and air circuit-breakers, the devices in the Flex Interface family, are identified in:

- Accessory Devices (ADs) which are connected to the electronic trip unit by means of an interfacing unit.
- System Devices (SDs) which are connected by means of an external communication bus to data managing unit (like a Personal Computer, a PLC or a SCADA).
- Local Device (LD) which is connected directly to the trip unit.

To complete the Flex Interface range, the HMI030 switchboard multimeter is also available, which allows display of all the measurements managed by the trip unit it is connected to.

The dimensions of all Flex Interface devices are four modular units, with simple and immediate cabling, and require an auxiliary power supply at 24 V DC to function.

The Accessory Devices family (ADs) has 3 modular devices AD030DO, AD030AO and AD030MI, able to add analog and/or digital output and input to the circuit breaker's trip unit connected to the interface MM030.

MM030 is able to manage the data exchange with all the Emax trip units.

- AD030 DO: the module periodically receives signals from the trip unit, updates the eight digital outputs and then the associated LEDs;
- AD030 AO: the unit is able to convert the measurement signals which come from the trip unit into 4-20 mA electrical signals, such as currents, voltages, power, peak factor, energy and frequency. Four analog outputs are available;
- AD030 MI: acquiring signals coming from the external field, the device can convert these into two analog and two digital inputs to be sent to the electronic trip unit in order to obtain protections and signalling.
- MM030: this device is always necessary when the Accessory Devices are present. This module is the interface between the circuit-breaker trip unit and the other ADs.

The System Devices are modular devices connected to an external communication bus, to which a device, such as a Personal Computer, PLC or SCADA is connected. It is possible to acquire data in real time with digital and/or analog input and to use some digital and/or analog inputs to activate electro-mechanical devices or to visualize electrical measures remotely. There are 5 devices:

- SD030 DX: the main device in the System Devices family. It manages five digital inputs and three digital outputs. It allows remote supervision and activation of switch-disconnectors and circuit-breakers without the communication function by means of a SCADA or PLC.
- SD030 DO: the module receives data from a PLC and consequently activates the eight digital outputs.
- SD030 DI: the module receives data from the external field and transmits them to a main system connected by means of a system bus. Up to eight digital input signals are available.



-
- SD030 AO: the device acquires data from external devices and then activates the four analog outputs (4-20 mA or 0-20 mA electrical signalling).
 - SD030 MI: the device acquires data from the external field and communicates them to a remote supervision system. Two analog inputs and two digital inputs are available.

The Local Device LD030 DO is a module, fitted with eight digital outputs, which can be connected to all the electronic trip units of Emax circuit-breakers and PR222DS/PD, PR223DS, PR223EF, PR331/P and PR332/P trip units of Tmax circuit-breakers, allowing external signalling of a very wide range of information and events recorded by the trip unit.

The switchboard multimeter HMI030 completes the Flex interfaces family allowing remote display of the electric measurements detected by the trip unit. The module can be configured using different methods: ammeter, voltmeter, wattmeter and, finally, "custom". Apart from allowing display of currents, voltages and powers, the "custom" method allows access to further information, among which frequency, power factor and energy.



Communication devices and systems

Industrial networking and ABB SACE Emax

In addition to providing flexible and safe protection of power installations, ABB SACE Emax electronic trip units have an extended range of communication features, which opens the way for connection of circuit-breakers to the world of industrial communication.

PR122 and PR123 electronic trip units can be fitted with communication modules, which make it possible to exchange data and information with other industrial electronic devices by means of a network.

The basic communication protocol implemented is Modbus RTU, a well-known standard of widespread use in industrial automation and power distribution equipment. A Modbus RTU communication interface can be connected immediately and exchange data with the wide range of industrial devices featuring the same protocol.

ABB products featuring the Modbus RTU protocol include:

- low voltage circuit breakers such as Emax,
- Medium Voltage protection devices
- sensors,
- automation I/O systems,
- power meters and other measurement devices,
- intelligent devices such as PLCs,
- operator interfaces
- supervision and control systems.

And if other communication protocols are required, the ABB Fieldbus Plug system is also available: intelligent field bus protocols such as Profibus-DP and DeviceNet thus become immediately available.

The power of industrial networking

The communication network can be used to read all information available in the protection trip unit, from any location connected to the bus and in real time:

- circuit-breaker status: closed, open, opened by protection trip unit trip
- all values measured by the protection trip unit: RMS currents, voltages, power, power factor and so on
- alarms and prealarms from protection trip unit, e.g., overload protection alarm (timing to trip or prealarm warning)
- fault currents in case of circuit-breaker opening on a protection trip
- number of operations performed by the circuit-breaker, with indication of the number of trips per protection type (short-circuit, overload, etc.)
- complete settings of the protection trip unit
- estimate of the residual life of circuit-breaker contacts, calculated on the basis of interrupted currents

Remote control of circuit-breakers is possible: commands to open, close and reset alarms can be issued to the circuit-breaker and protection trip unit. Close commands are executed only after a security check (e.g., that there are no diagnostic alarms active on the trip unit).

It is also possible to change the settings of the protection trip unit remotely by means of the communication bus.

All remote commands can be disabled by a "local" configuration feature, for safety of operators and installation.



1SDC20008FF0001

Circuit-breakers with communication can easily be integrated with automation and supervision systems. Typical applications include:

- supervision of the installation with continuous data logging (values of currents, voltage, power) and event logging (alarms, faults, trip logs). Supervision can be limited to low voltage devices or include medium voltage and possibly other kinds of industrial apparatus
- predictive maintenance, based on number of operations of each circuit-breaker, interrupted currents and estimate of residual equipment life
- load shedding and demand side management under control of PLC, DCS or computers.

Communication products for ABB SACE Emax

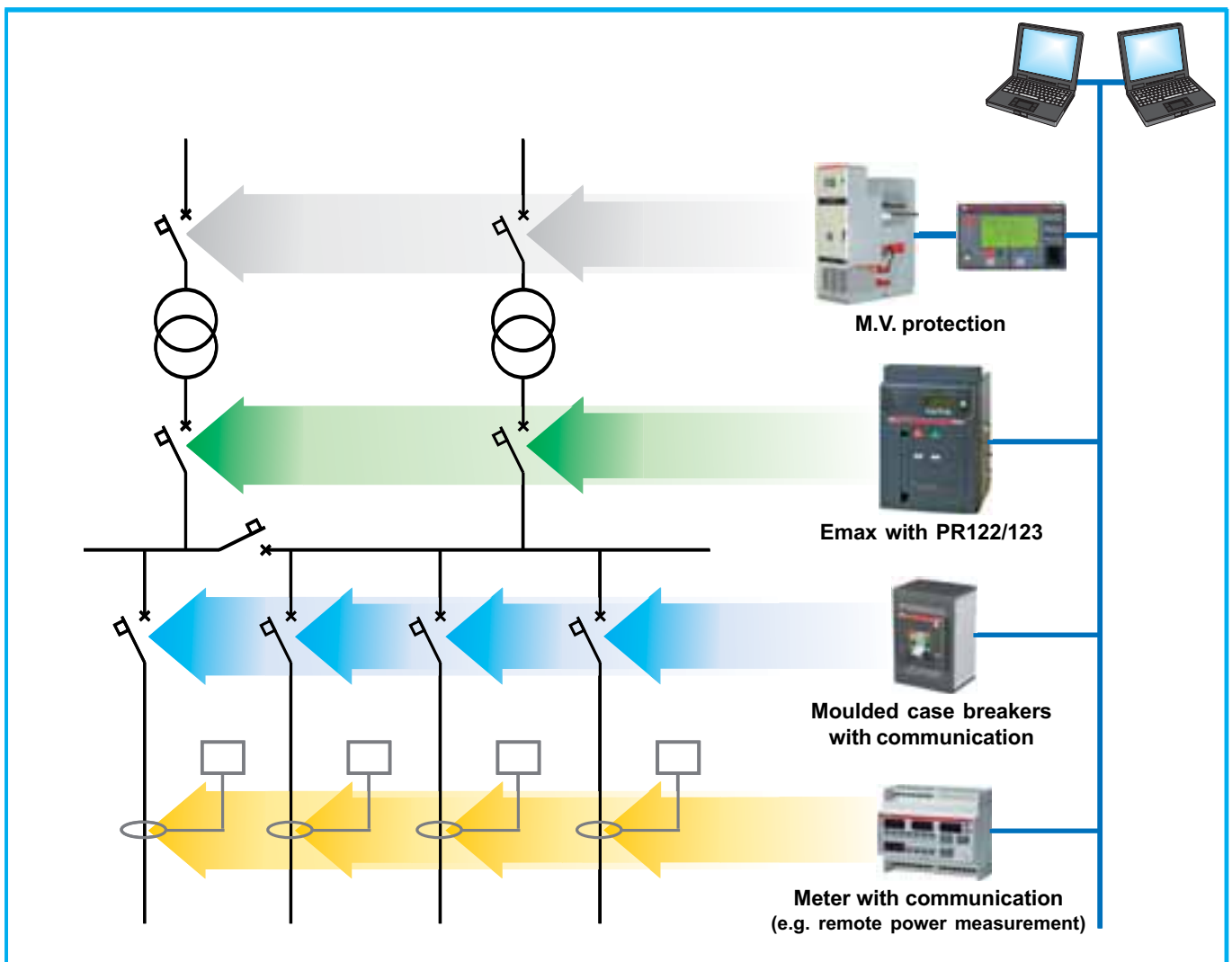
ABB SACE has developed a complete series of accessories for the Emax family of electronic trip units:

- PR120/D-M communication module
- EP010 – FBP.

Furthermore, a new generation of software dedicated to installation, configuration, supervision and control of protection trip units and circuit-breakers is now available:

- SD-View 2000
- SD-Pocket
- SD-TestBus2.

System architecture for plant supervision and control





Communication devices and systems



1SDC200304R0001

PR120/D-M

PR120/D-M is the new communication module for PR122/P and PR123/P protection trip units. It is designed to allow easy integration of the Emax circuit-breakers in a Modbus network. The Modbus RTU protocol is of widespread use in the power as well as the automation industry. It is based on a master/slave architecture, with a bandwidth of up to 19200 Kbytes/sec. A standard Modbus network is easily wired up and configured by means of an RS485 physical layer. ABB SACE trip units work as slaves in the field bus network. All information required for simple integration of PR120/D-M in an industrial communication system are available on the ABB Web page.

BT030-USB

BT030-USB is a device to be connected to the Test connector of PR121/P, PR122/P and PR123/P. It allows Bluetooth communication between the Protection trip unit and a PDA or a Notebook with a Bluetooth port. BT030-USB can also be used with Tmax circuit-breakers equipped with PR222DS/PD. This device is dedicated to use with the Sd-Pocket application. It can provide the auxiliary supply needed to energize the protection trip unit by means of rechargeable batteries.

EP 010 - FBP

EP 010 – FBP is the Fieldbus Plug interface between the Emax protection trip units and the ABB Fieldbus Plug system, allowing connection of Emax Circuit-breakers to a Profibus, DeviceNet, or AS-I field bus network. EP 010 – FBP can be connected to the new Emax PR122 and PR123 protection trip units (the PR120/D dialogue module is required).



1SDC200305R0001

The ABB Fieldbus Plug concept is the latest development in industrial communication systems. All devices feature a standard connection socket, to which a set of interchangeable “smart” connectors can be plugged. Each connector is fitted with advanced electronics implementing the communication interface towards the selected field bus. Selecting a communication system is made as easy as selecting and connecting a plug. Communication systems currently available are Profibus-DP, DeviceNet and AS-i. More are being developed.

Measurement, signalling and available data functions

Details about functions available on PR122/P, PR123/P trip units with PR120/D-M and EP010 – FBP are listed in the table below:

	PR122/P + PR120/D-M	PR123/P + PR120/D-M	PR122/P-PR123/P + PR120/D-M and EP 010
Communication functions			
Protocol	Modbus RTU	Modbus RTU	FBP
Physical layer	RS-485	RS-485	Profibus-DP or DeviceNet cable
Maximum baudrate	19200 bps	19200 bps	115 kbps
Measuring functions			
Phase currents	■	■	■
Neutral current	■	■	■
Ground current	■	■	■
Voltage (phase-phase, phase-neutral, residual)	opt. ⁽¹⁾	■	■
Power (active, reactive, apparent)	opt. ⁽¹⁾	■	■
Power factor	opt. ⁽¹⁾	■	■
Frequency and peak factor	opt. ⁽¹⁾	■	■
Energy (active, reactive, apparent)	opt. ⁽¹⁾	■	■
Harmonic analysis up to the 40th harmonic		■	■ ⁽²⁾
Signalling functions			
LED: auxiliary power supply, warning, alarm	■	■	■
Temperature	■	■	■
Indication for L, S, I, G and other protection	opt. ⁽¹⁾	■	■
Available data			
Circuit-breaker status (open, closed)	■	■	■
Circuit-breaker position (racked-in, racked-out)	■	■	■
Mode (local, remote)	■	■	■
Protection parameters set	■	■	■
Load control parameters	■	■	■
Alarms			
Protection L	■	■	■
Protection S	■	■	■
Protection I	■	■	■
Protection G	■	■	■
Fault release mechanism failure	■	■	■
Undervoltage, overvoltage and residual voltage (timing and trip) protection	opt. ⁽¹⁾	■	■
Reverse power protection (timing and trip)	opt. ⁽¹⁾	■	■
Directional protection (timing and trip)		■	PR123 only
Underfrequency/overfrequency protection (timing and trip)	opt. ⁽¹⁾	■	■
Phases rotation		■	■
Maintenance			
Total number of operations	■	■	■
Total number of trips	■	■	■
Number of trip tests	■	■	■
Number of manual operations	■	■	■
Number of separate trips for each protection function	■	■	■
Contact wear (%)	■	■	■
Record data of last trip	■	■	■
Operating mechanisms			
Circuit-breaker open/closed	■	■	■
Reset alarms	■	■	■
Setting of curves and protection thresholds	■	■	■
Synchronize system time	■	■	■
Events			
Status changes in circuit-breaker, protections and all alarms	■	■	■

(1) with PR120/V

(2) up to 21st harmonic and only with PR123/P



Communication devices and systems

SD-View 2000

SD-View 2000 is a "ready-to-use" system, consisting of software for personal computers, in standard configuration, which allows complete control of the low voltage electrical installation.

Putting the SD-View 2000 system into operation is quick and easy. In fact, the software itself guides the user in recognising and configuring the protection units.

The user only needs knowledge of the installation (such as how many circuit-breakers are installed and how they are connected to each other). No engineering work on the supervision system is required, since all the pages displayed are already configured in the system, ready to be used.

Usage of the software is intuitive and easy to learn for the operator: SD-View 2000 has graphic pages based on Internet Explorer, which make the system as simple to manage as surfing on the Internet.

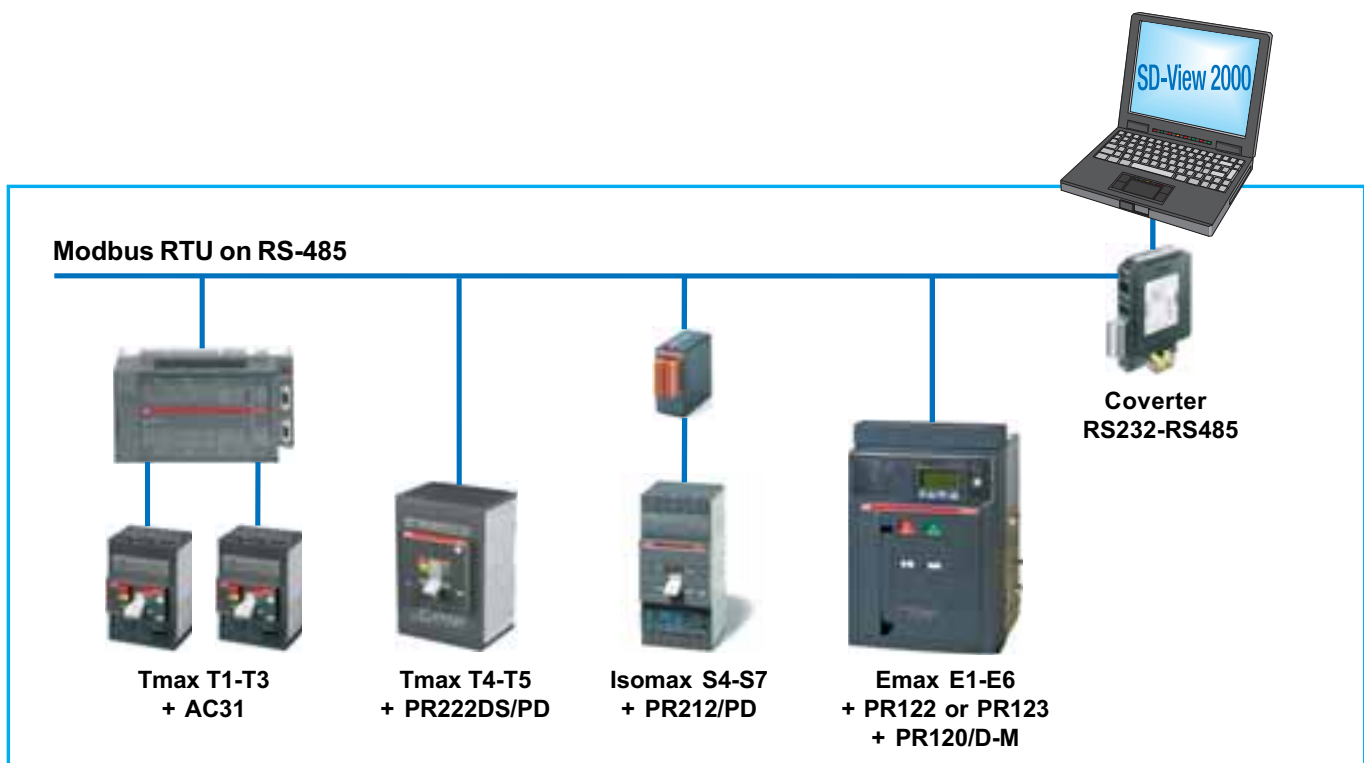
System architecture

System architecture is based on the latest developments in personal computer and industrial communication network technology.

The ABB SACE devices are connected to the serial bus RS485 Modbus. A maximum of 31 devices can be connected to a bus. A maximum of 4 serial bus can lines be connected to a personal computer which works as data server, reading and storing the data received from the devices. The server is also used as the operator station, from where the data can be displayed and printed, commands can be sent to the devices, and all the operations needed to manage the installation can be carried out.

The server can be connected to a local network together with other personal computers which work as additional operator stations (clients). In this way, installation supervision and control can be carried out with total reliability from any station connected to the network on which SD-View 2000 is installed.

4



Complete control of the installation

SD-View 2000 is the ideal tool available to managers, in order to have the situation of the installations under control at all times and to be able to control all the functions easily and in real time.



The SD-View 2000 operator station (personal computer) allows information from the installation to be received and to control the circuit-breakers and relative trip units. In particular, it is possible to:

- Send opening and closing commands to the circuit-breakers
- Read the electrical installation values (current, voltage, power factor, etc.)
- Read and modify the trip characteristics of the protection units
- Determine the status of the apparatus (open, closed, number of operations, trip for fault, etc.)
- Determine abnormal operating situations (e.g. Overload) and, in the case of the trip units tripping, the type of fault (short-circuit, earth fault, value of the uninterrupted currents, etc.)
- Log the history of the installation (energy consumption, most highly loaded phase, any warnings of anomalies or faults, etc.)

- Show the temporal evolution of the installation by means of graphs.
- Access to the various system functions can be enabled by means of secret codes or passwords with different levels of authorisation.

Usage of the system is really simple thanks to the user interface based on Internet explorer. The graphic pages relative to each circuit-breaker are particularly intuitive and easy to use.

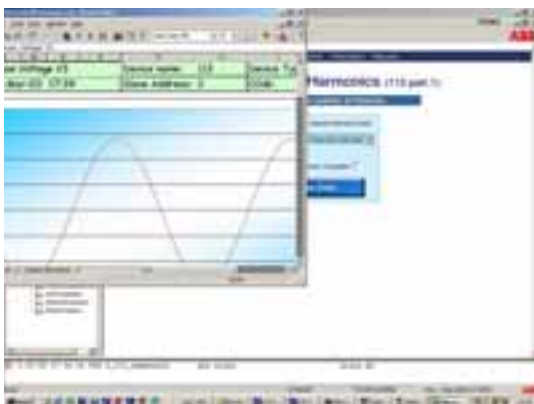
Devices which can be connected

The circuit-breakers with electronic trip units which can be interfaced with SD-View 2000 are:

- Emax LV air circuit-breakers from E1 to E6 fitted with PR122/P or PR123/P trip units with Modbus RTU PR120/D-M communication unit
- Emax LV air circuit-breakers from E1 to E6 fitted with PR112/PD or PR113/PD Modbus trip units
- Tmax LV moulded-case circuit-breakers T4 and T5 fitted with PR222/PD trip unit
- Isomax LV circuit-breakers from S4 to S7 fitted with PR212/P trip unit with Modbus RTU PR212/D-M communication unit.

In addition, SD-View 2000 can acquire current, voltage and power measurements in real time from the MTME-485 multimeters with Modbus communication

Furthermore, it is possible to interface any air or moulded-case circuit-breaker or switch-disconnector, not fitted with electronics, with SD-View 2000 by using a PLC AC31 unit as the communication module. For the circuit-breakers or switch-disconnectors connected in this way, SD-View 2000 shows the conditions of the apparatus (open, closed, tripped, racked-in or racked-out) in real time and allows it to be operated remotely.





Communication devices and systems

All the characteristics of the devices listed are preconfigured in the SD-View 2000 system. The user does not therefore have to carry out any detailed configuration (i.e. insert tables with data to be displayed for each trip unit, or draft ad hoc graphic pages): simply enter the list of devices connected into the system.

Technical characteristics

Up to 4 serial ports
Up to 31 ABB SACE devices for each serial port
9600 or 19200 baud
Modbus® RTU Protocol

Personal computer requirements

Pentium 1 GHz, 256 MB RAM (512 MB recommended), 20 GB hard disk, Windows 2000, Internet Explorer 6, Ethernet card, Printer (optional)

4

SD-TestBus2

SD-TestBus2 is the ABB SACE commissioning and diagnostic software for all Modbus RTU devices. It can be used during system startup, or to troubleshoot an installed network.

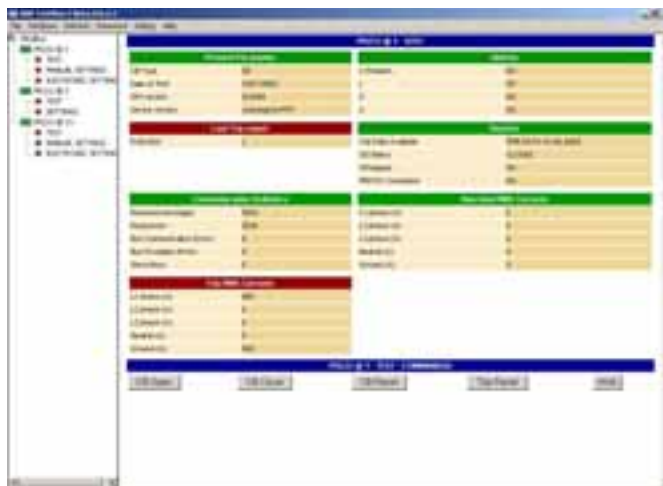
SD-TestBus2 automatically scans the RS-485 bus, detects all connected devices and checks their communication settings. All possible combination of device address, parity and baud rate are checked.

A click on “scan” is enough to spot devices which are not responding, wrong addresses, misconfigured parity bits, and so on. This function is not limited to ABB SACE devices: all standard Modbus RTU devices are detected and their configuration is displayed.

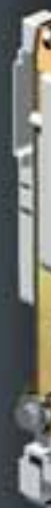
After the scan, the software displays warning messages about potential problems and configuration errors, allowing complete diagnosis of a field bus network.

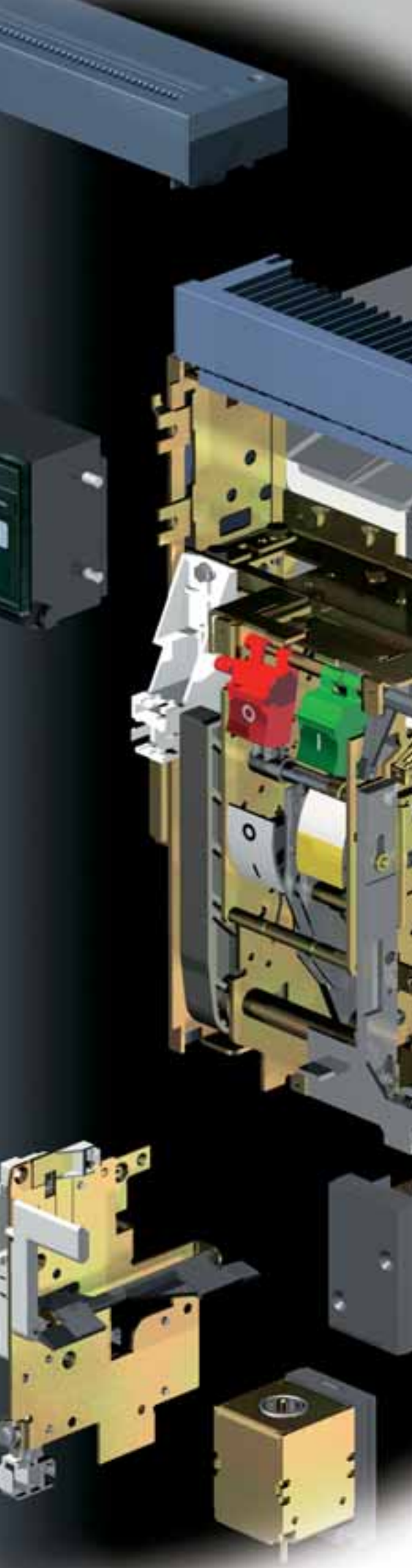
When ABB SACE circuit-breakers are detected, additional functions can be used to check wirings, send open/close/reset commands, and retrieve diagnostic information.

This user-friendly tool makes commissioning of Modbus networks a breeze. SD-TestBus2 is freeware and can be downloaded from the ABB SACE'S website (<http://www.abb.com>).



Emmax





Contents

Functions of the accessories	5/2
Accessories supplied as standard	5/3
Accessories supplied on request	5/4
Shunt opening and closing release	5/6
Undervoltage release	5/8
Geared motor for the automatic charging of closing springs	5/10
Signalling of overcurrent release tripped	5/11
Auxiliary contacts	5/12
Transformers and operation counters	5/15
Mechanical safety locks	5/16
Transparent protective covers	5/18
Interlock between circuit-breakers	5/19
Automatic transfer switches - ATS021 and ATS022	5/22
Spare parts and Retrofitting	5/24



Functions of the accessories

The table below lists a few functions that can be obtained by selecting the appropriate accessories from among those provided. Several of the functions listed may be needed at the same time, depending on how the circuit-breaker is used. See the relative section for a detailed description of the individual accessories.

Function	Components
Remote control	<ul style="list-style-type: none"> • Opening release • Closing release • Geared motor for automatic charging of the closing springs
Remote signalling or actuation of automatic functions depending on the state (open-closed-tripped) or position (<i>racked-in</i> , <i>test isolated</i> , <i>racked-out</i>) of the circuit-breaker.	<ul style="list-style-type: none"> • Circuit-breaker open-closed auxiliary contacts • Circuit-breaker <i>racked-in</i>, <i>test isolated</i>, <i>racked-out</i> auxiliary contacts (withdrawable circuit-breaker only) • Contact for electrical signalling of overcurrent release tripped • Contact for signalling undervoltage release de-energized • Contact for signalling springs charged
Remote opening for various needs, including: – manual emergency control – opening dependent on tripping of other interruption devices or system automation needs ⁽¹⁾ .	<ul style="list-style-type: none"> • Opening or undervoltage release
Automatic opening of the circuit-breaker for undervoltage (for example, when operating asynchronous motors)	<ul style="list-style-type: none"> • Instantaneous or time delay undervoltage release ⁽²⁾ • Contact for signalling undervoltage release energized
Increased degree of protection	<ul style="list-style-type: none"> • IP54 door protection
Mechanical safety locks for maintenance or functional requirements for interlocking two or more circuit-breakers	<ul style="list-style-type: none"> • Key lock in open position • Padlock device in open position • Key lock and padlocks in <i>racked-in</i>, <i>test isolated</i>, <i>racked-out</i> position
Automatic switching of power supplies	<ul style="list-style-type: none"> • Mechanical interlock between two or three circuit-breakers • Automatic transfer switches - ATS021-ATS022

(1) Examples:
– circuit-breakers on Low Voltage side of parallel transformers that must open automatically when the Medium Voltage side device opens.
– automatic opening for control by external relay (undervoltage, residual current, etc.).

(2) The time-delay device is recommended when unwanted operation due to temporary voltage drops, is to be avoided (for functional or safety reasons).



Accessories supplied as standard

The following standard accessories are supplied depending on the circuit-breaker version:

Fixed circuit-breaker:

- flange for switchgear compartment door (IP30)
- support for service trip units
- four auxiliary contacts for electrical signalling of circuit-breaker open/closed (for automatic circuit-breakers only)
- terminal box for connecting outgoing auxiliaries
- mechanical signalling of overcurrent release tripped (*)
- horizontal rear terminals
- lifting plate

Note:

(*) Not supplied with the switch disconnector.

Withdrawable circuit-breaker:

- flange for switchgear compartment door
- support for service trip units
- four auxiliary contacts for electrical signalling of circuit-breaker open/closed (for automatic circuit-breakers only)
- sliding contacts for connecting outgoing auxiliaries
- mechanical signalling of overcurrent release tripped (*)
- horizontal rear terminals
- anti-insertion lock for circuit-breakers with different rated currents
- racking-out crank handle
- lifting plate

Note:

(*) Not supplied with the switch disconnector.



Accessories supplied on request

The ranges	Automatic circuit-breakers	
	Circuit-breakers with full-size neutral	
	Circuit-breakers for applications up to 1150V AC	
Circuit-breaker version	Fixed	Withdrawable
1a) Shunt opening/closing release (YO/YC) and second opening release (YO2)	■	■
1b) SOR release	■	■
2a) Undervoltage release (YU)	■	■
2b) Time-delay device for undervoltage release (D)	■	■
3) Geared motor for the automatic charging of the closing springs (M)	■	■
4a) Electrical signalling of electronic release tripped	■	■
4b) Electrical signalling of electronic release tripped with remote reset command	■	■
5a) Electrical signalling of circuit-breaker open/closed (1)	■	■
5b) External supplementary electrical signalling of circuit-breaker open/closed	■	■
5c) Electrical signalling of circuit-breaker racked-in/test isolated/racked-out		■
5d) Contact signalling closing springs charged	■	■
5e) Contact signalling undervoltage release de-energized (C. Aux YU)	■	■
6a) Current sensor for neutral conductor outside circuit-breaker	■	■
6b) Homopolar toroid for the main power supply earthing conductor (star center of the transformer)	■	■
6c) Homopolar toroid for residual current protection	■	■
7) Mechanical operation counter	■	■
8a) Lock in open position: key	■	■
8b) Lock in open position: padlocks	■	■
8c) Circuit-breaker lock in racked-in/racked-out/test isolated position		■
8d) Accessories for lock in racked-out/test isolated position		■
8e) Accessory for shutter padlock device		■
8f) Mechanical lock for compartment door	■	■
9a) Protection for opening and closing pushbuttons	■	■
9b) IP54 door protection	■	■
10) Mechanical interlock (2)	■	■
11) Lift device	■	■
12) Automatic transfer switch - ATS021 and ATS022 (3)	■	■

CAPTION

- Accessory on request for fixed circuit-breaker or moving part
- Accessory on request for fixed part
- Accessory on request for moving part

	Switch-disconnectors		Isolating truck (CS)	Earthing switch with making capacity (MPT)	Earthing truck (MT)
	Switch-disconnectors for applications up to 1150V AC				
	Fixed	Withdrawable			
Switch-disconnectors for applications up to 1000V DC		Withdrawable	Withdrawable	Withdrawable	
	■	■		■ (YC)	
	■	■			
	■	■			
	■	■			
	■	■		■	
	■	■		■	
	■	■		■	
		■	■	■	■
	■	■		■	
	■	■			
		■			
	■	■		■	
	■	■		■	
	■	■		■	
	■	■			
	■	■	■	■	■
		■	■	■	■
		■	■	■	■
	■	■		■	■
	■	■		■	
	■	■			
	■	■			
	■	■			
	■	■			
	■	■			
	■	■			

(1) For automatic circuit-breakers, four auxiliary contacts to electrically signal circuit-breaker open/closed are included in the supply as standard.
 (2) Incompatible with the E6/f versions with full-size neutral
 (3) Incompatible with the range of circuit-breakers for applications up to 1150V AC



Shunt opening and closing release

1a) Shunt opening and closing release (YO/YC) and second opening release (YO2)

(1) The minimum impulse current duration time in instantaneous service must be 100 ms

(2) If the opening release is permanently connected to the power supply, wait at least 30 ms before sending the command to the shunt closing release.

Allows remote control opening or closing of the apparatus, depending on the installation position and connection of the releases on the support. The release can, in fact, be used for either of these two applications. Given the characteristics of the circuit-breaker operating mechanism, opening (with the circuit-breaker closed) is always possible, whereas closing is only possible when the closing springs are charged. The release can operate with direct current or alternating current. This release provides instantaneous operation ⁽¹⁾, but can be powered permanently ⁽²⁾.

Some installations require very high safety in controlling circuit-breaker opening remotely. In particular, the control and opening release circuits must be duplicated. To meet these needs, SACE Emax circuit-breakers can be equipped with a second shunt opening trip unit, fitted with a special support to hold it, that can house the standard shunt closing and opening releases. The seat of the second shunt opening release is that of the undervoltage release, which is therefore incompatible with this type of installation. The special support, including the second shunt opening release, is installed in place of the standard support.

The technical specifications of the second shunt opening release remain identical to those of the standard shunt opening release.

When used as a permanently powered closing release, it is necessary to momentarily de-energize the shunt closing release in order to close the circuit-breaker again after opening (the circuit-breaker operating mechanism has an anti-pumping device).

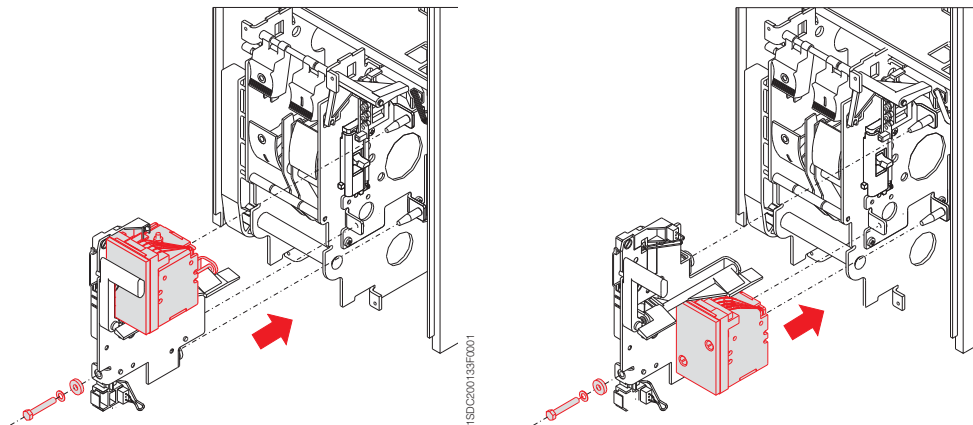
Reference figure in electrical circuit diagrams: YO (4) - YC (2) - YO2 (8)



1SDC200131F0001



1SDC200132F0001



1SDC200133F0001

1SDC200134F0001

Characteristics		
Power supply (Un):	24 V DC	120-127 V AC/DC
	30 V AC/DC	220-240 V AC/DC
	48 V AC/DC	240-250 V AC/DC
	60 V AC/DC	380-400 V AC
	110-120 V AC/DC	440 AC
Operating limits: (IEC EN 60947-2 Standards)	(YO-YO2): 70% ... 110% Un (YC): 85% ... 110% Un	
Inrush power (Ps):	DC = 200 W	
Inrush time ~100 ms	AC = 200 VA	
Continuous power (Pc):	DC = 5 W	
	AC = 5 VA	
Opening time (YO- YO2):	(max) 60 ms	
Closing time (YC):	(max) 80 ms	
Insulation voltage:	2500 V 50 Hz (for 1 min)	



1SD200139F0001

1b) SOR Test Unit

The SOR control and monitoring Test Unit helps ensure that the various versions of SACE Emax opening releases are running smoothly, to guarantee a high level of reliability in controlling circuit-breaker opening.

Under particularly severe operating conditions or simply for remote control of the circuit-breaker, the opening release is widely used as an accessory for the SACE Emax series of air circuit-breakers.

Keeping all the functions of this accessory is a necessary condition to guarantee a high level of safety in the installation: it is therefore necessary to have a device available which cyclically checks correct operation of the release, signalling any malfunctions.

The SOR control and monitoring Test Unit ensures the continuity of opening releases with a rated operating voltage between 24 V and 250 V (AC and DC), as well as the functions of the opening coil electronic circuit are verified.

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 in particular:

- POWER ON: power supply present
- YO TESTING: test in progress
- TEST FAILED: signal following a failed test or lack of auxiliary power supply
- ALARM: signal given following three failed tests.

Two relays with one change-over are also available on board the unit, which allow remote signalling of the following two 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 front of the unit)

There is also a manual RESET button on the front of release.

The SOR Test Unit can not be used with SOR permanently powered.

Reference figure in electrical circuit diagrams: AY (61)

Characteristics

Auxiliary power supply	24 V ... 250 V AC/DC
Maximum interrupted current	6 A
Maximum interrupted voltage	250V AC



Undervoltage release



1SDC200137F0001

2a) Undervoltage release (YU)

The undervoltage release opens the circuit-breaker when there is a significant voltage drop or power failure. It can be used for remote release (using normally-closed pushbuttons), for a lock on closing or for monitoring the voltage in the primary and secondary circuits. The power supply for the trip unit is therefore obtained on the supply side of the circuit-breaker or from an independent source. The circuit-breaker can only be closed when the release is powered (closing is mechanically locked). The release can operate with direct current or alternating current.

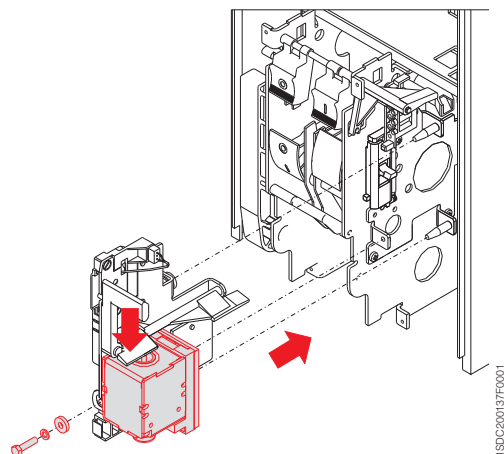
The circuit-breaker is opened with trip unit power supply voltages of 35-70% U_n .

The circuit-breaker can be closed with a trip unit power supply voltage of 85-110% U_n .

It can be fitted with a contact to signal when the undervoltage trip unit is energized (C. aux YU - see accessory 5e).

Reference figure in electrical circuit diagrams: YU (6)

Characteristics		
Power supply (U_n):	24 V DC	120-127 V AC/DC
	30 V AC/DC	220-240 V AC/DC
	48 V AC/DC	240-250 V AC
	60 V AC/DC	380-400 V AC
	110-120 V AC/DC	440 V AC
Operating limits:	CEI EN 60947-2 Standards	
Inrush power (P_s):	DC = 200 W	
	AC = 200 VA	
Continuous power (P_c):	DC = 5 W	
	AC = 5 VA	
Opening time (YU):	30 ms	
Insulation voltage:	2500 V 50 Hz (for 1 min)	



1SDC200137F0001



1SDC200138FC001

2b) Time-delay device for undervoltage release (D)

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

Reference figure in electrical circuit diagrams: YU +D (7)

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



Geared motor for the automatic charging of the closing springs

3) Geared motor for the automatic charging of the closing springs (M)

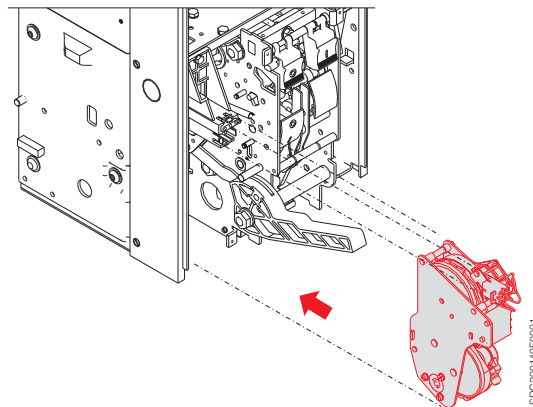


1SDC200138F0001

This automatically charges the closing springs of the circuit-breaker operating mechanism. After circuit-breaker closing, the geared motor immediately recharges the closing springs. The closing springs can, however, be charged manually (using the relative operating mechanism lever) in the event of a power supply failure or during maintenance work. It is always supplied with a limit contact and microswitch for signalling that the closing springs are charged (see accessory 5d).

Reference figure in electrical circuit diagrams: M (1)

Characteristics	
Power supply	24-30 V AC/DC
	48-60 V AC/DC
	100-130 V AC/DC
	220-250 V AC/DC
Operating limits:	85%...110% U_n (CEI EN 60947-2 Standards)
Inrush power (Ps):	DC = 500 W
	AC = 500 VA
Rated power (Pn):	DC = 200 W
	AC = 200 VA
Inrush time	0.2 s
Charging time:	4-5 s
Insulation voltage:	2500 V 50 Hz (for 1 min)



1SDC200140F0001

Signal for overcurrent releases tripped

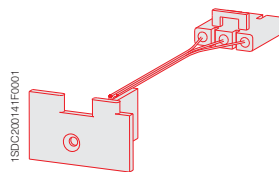
4) Electrical signalling of electronic releases tripped

The following signals are available after the electronic trip unit has tripped:

4a) Electrical signalling of electronic trip units tripped

This allows remote signalling (electrical using switch) that the circuit-breaker is open following operation of the overcurrent releases. The mechanical signalling pushbutton must be rearmed to reset the circuit-breaker.

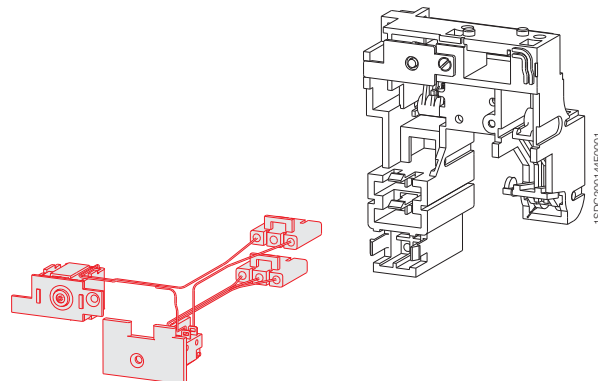
Reference figure in electrical circuit diagrams: S51 (13)



4b) Electrical signalling of electronic releases tripped with remote reset command

This allows remote signalling (electrical using switch) that the circuit-breaker is open following operation of the overcurrent releases. With this accessory, it is possible to reset the mechanical signalling pushbutton via an electrical coil from a remote command, which also allows the circuit-breaker to be reset.

Reference figure in electrical circuit diagrams: S51 (14)



Available reset coils

24-30 V AC/DC
220-240 V AC/DC
110-130 V AC/DC

5



Auxiliary Contacts

5) Auxiliary contacts

Auxiliary contacts are available installed on the circuit-breaker, which enable signalling of the circuit-breaker status. The auxiliary contacts are also available in a special version for application with rated voltages $U_n < 24$ V (digital signals).

Characteristics		
U_n	I_n max	T
125 V DC	0.3 A	10 ms
250 V DC	0.15 A	
U_n	I_n max	cos ϕ
250 V AC	15 A	0.3

The versions available are as follows:

5a-5b) Electrical signalling of circuit-breaker open/closed

It is possible to have electrical signalling of the status (open/closed) of the circuit-breaker using 4, 10 or 15 auxiliary contacts.

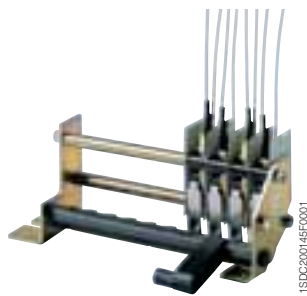
The auxiliary contacts have the following configurations:

- 4 open/closed contacts for PR121 (2 normally open + 2 normally closed)
- 4 open/closed contacts for PR122/PR123 (2 normally open + 2 normally closed + 2 dedicated to trip unit)
- 10 open/closed contacts for PR121 (5 normally open + 5 normally closed)
- 10 open/closed contacts for PR122/PR123 (5 normally open + 5 normally closed + 2 dedicated to trip unit)
- 15 supplementary open/closed contacts for installation outside the circuit-breaker.

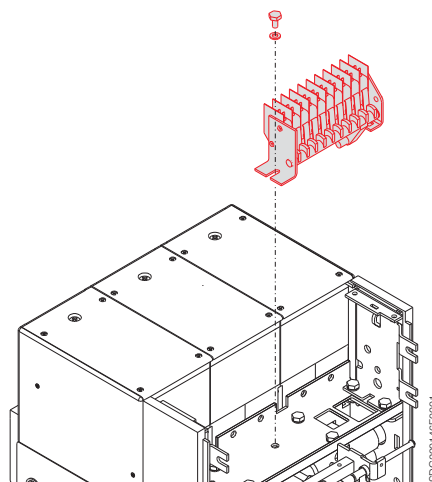
The basic configuration described above can be modified by the user for normally open or normally closed indication by repositioning the faston connector on the microswitch.

When 10 open/closed contacts for PR122/PR123 are required, the zone selectivity and PR120/K unit are not available.

Reference figure in electrical circuit diagrams: Q/1÷10 (21-22)



1SDC200146F0001



1SDC200146F0001

5c) Electrical signalling of circuit-breaker racked-in/test isolated/racked out



In addition to mechanical signalling of the circuit-breaker position, it is also possible to obtain electrical signalling using 5 or 10 auxiliary contacts which are installed on the fixed part.

It is only available for withdrawable circuit-breakers, for installation on the fixed part.

The auxiliary contacts take on the following configurations:

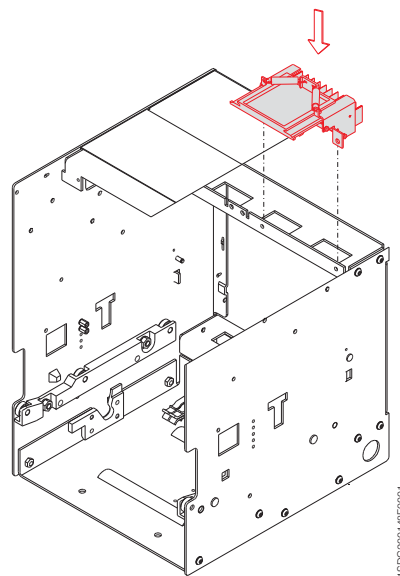
- 5 contacts; set comprising 2 contacts for racked-in signal, 2 contacts for racked-out signal, and 1 contact to signal the test isolated position (main pliers isolated, but sliding contacts connected).
- 10 contacts; set comprising 4 contacts for racked-in signal, 4 contacts for racked-out signal, and 2 contacts to signal the test isolated position (main pliers isolated, but sliding contacts connected).

Reference figure in electrical circuit diagrams:

S75I (31-32)

S75T (31-32)

S75E (31-32)





Auxiliary Contacts

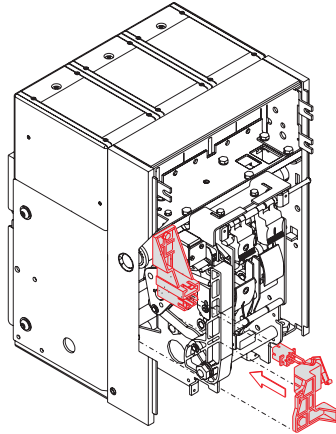


1SDC200149F0001

5d) Contact for signalling closing springs charged

This is made up of a microswitch which allows remote signalling of the state of the circuit-breaker operating mechanism closing springs (always supplied with the spring charging geared motor).

Reference figure in electrical circuit diagrams: S33 M/2 (11)



1SDC200150F0001

5

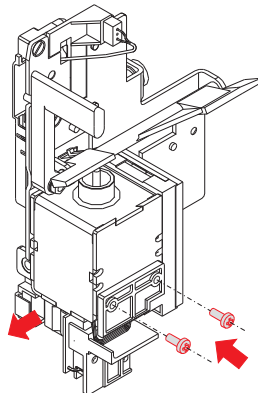


1SDC200151F0001

5e) Contact signalling undervoltage release de-energized (C.aux YU)

The undervoltage releases can be fitted with a contact (normally closed or open, as preferred) for signalling undervoltage release energized, to remotely signal the state of the undervoltage release.

Reference figure in electrical circuit diagrams: (12)



1SDC200152F0001

Transformers and operation counters

6a) Current sensor for neutral conductor outside circuit-breaker



1SDC200159F0001

For three-pole circuit-breakers only, this allows protection of the neutral by connecting it to the overcurrent release. Supplied on request.

Reference figure in electrical circuit diagrams: *UI/N* (page 8/8)

6b) Homopolar toroid for the main power supply earthing conductor (star centre of the transformer)



1SDC200154F0001

SACE PR122 and PR123 electronic trip units can be used in combination with an external toroid located on the conductor, which connects the star centre of the MV/LV transformer (homopolar transformer) to earth. In this case, the earth protection is defined as Source Ground Return. Through two different combinations of connection of its terminals (see chapter 8), the I_n of the same toroid can be set at 100 A, 250 A, 400 A, 800 A.

6c) Homopolar toroid for residual current protection



1SDC200611F0001

SACE PR122/P LSIRc, PR122/P LSIG (with PR120V) and PR123/P may be also used in combination with this accessory, enabling residual current protection. Rc protection can be activated only if the special rating plug for residual current protection and the external toroid are present.

Characteristics

Rated current	3 - 30A
---------------	---------

5

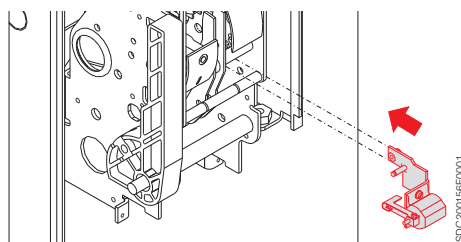
7) Mechanical operation counter



1SDC200155F0001

This is connected to the operating mechanism by means of a simple lever mechanism, and indicates the number of mechanical operations carried out by the circuit-breaker.

The count is shown on the front of the circuit-breaker.





Mechanical safety locks

8) Mechanical safety locks

8a-8b) Lock in open position

Several different mechanisms are available which allow the circuit-breaker to be locked in the open position.

These devices can be controlled by:

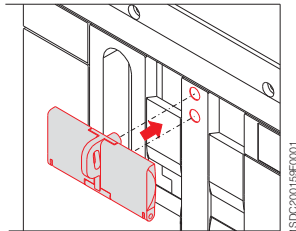
- Key (8a): a special circular lock with different keys (for a single circuit-breaker) or the same keys (for several circuit-breakers). In the latter case, up to four different key numbers are available.
- Padlocks (8b): up to 3 padlocks (not supplied): \varnothing 4 mm.



1SDC200157F0001

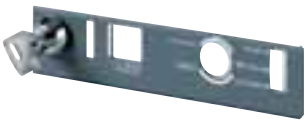


1SDC200158F0001

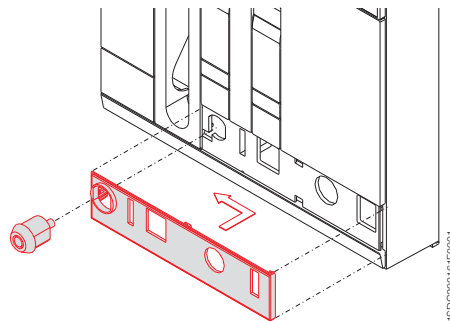


8c) Circuit-breaker lock in racked-in/test isolated/racked-out position

This device can be controlled by a special circular key lock with different keys (for a single circuit-breaker) or the same keys (for several circuit-breakers - up to four different key numbers available) and padlocks (up to 3 padlocks, not supplied - \varnothing 4 mm, \varnothing 6 mm, \varnothing 8 mm). It is only available for withdrawable circuit-breakers, to be installed on the moving part.



1SDC200160F0001



8d) Accessories for lock in test isolated/racked-out position

In addition to the circuit-breaker lock in the racked-in/test isolated/racked-out position, this only allows the circuit-breaker to be locked in the racked-out or test isolated positions.

It is only available for withdrawable circuit-breakers, to be installed on the moving part.

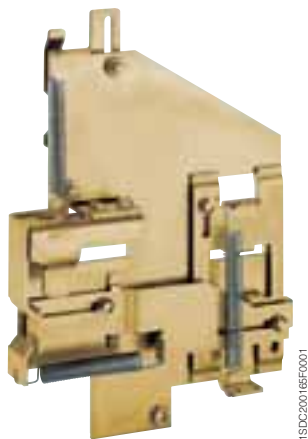
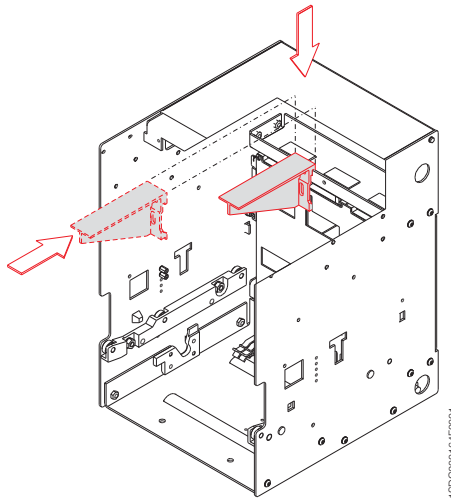


1SDC200162F0001



8e) Accessory for shutter padlock device

This allows the shutters (installed on the fixed part) to be padlocked in their closed position. It is only available for withdrawable circuit-breakers, to be installed on the fixed part.



8f) Mechanical lock for compartment door

This stops the compartment door from being opened when the circuit-breaker is closed (and circuit-breaker racked in for withdrawable circuit-breakers) and prevents the circuit-breaker from being closed when the compartment door is open.

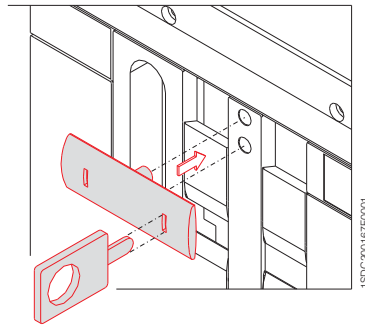


Transparent protective covers

9) Transparent protective covers

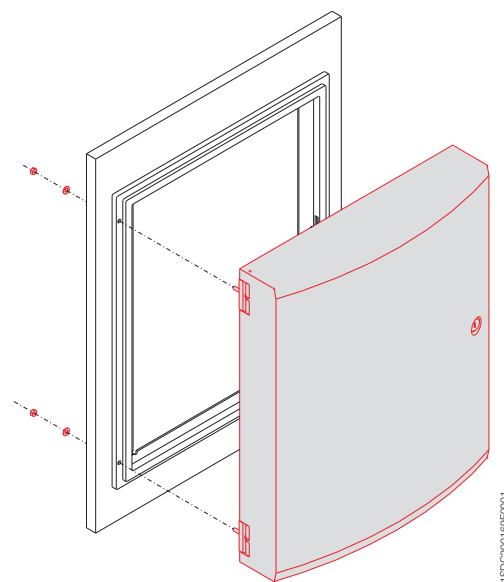
9a) Protective cover for opening and closing pushbuttons

These protections are fitted over the opening and closing pushbuttons, preventing the relative circuit-breaker operations unless a special tool is used.



9b) IP54 door protection

This is a transparent plastic protective cover which completely protects the front panel of the circuit-breaker, with a protection rating of IP54. Mounted on hinges, it is fitted with a key lock (same or different keys).



Interlock between circuit-breakers

10) Mechanical interlock

This mechanism creates a mechanical interlock between two or three circuit-breakers (even different models and different versions, fixed/withdrawable) using a flexible cable. The circuit diagram for electrical switching using a relay (to be installed by the customer) is supplied with the mechanical interlock.

The circuit-breakers can be installed vertically or horizontally. An interlock between an Emax (E1÷E6) and a T7/X1 is possible with dedicated cables.



Four types of mechanical interlocks are available:

Type A: between 2 circuit-breakers (power supply + emergency power supply)

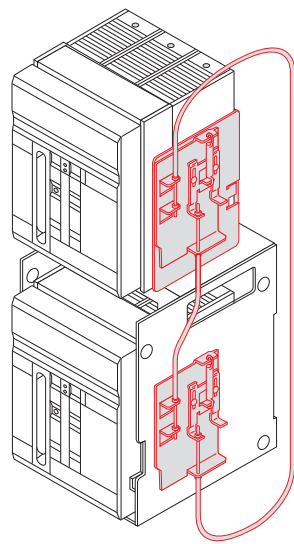
Type B: between 3 circuit-breakers (2 power supplies + emergency power supply)

Type C: between 3 circuit-breakers (2 power supplies + bus-tie)

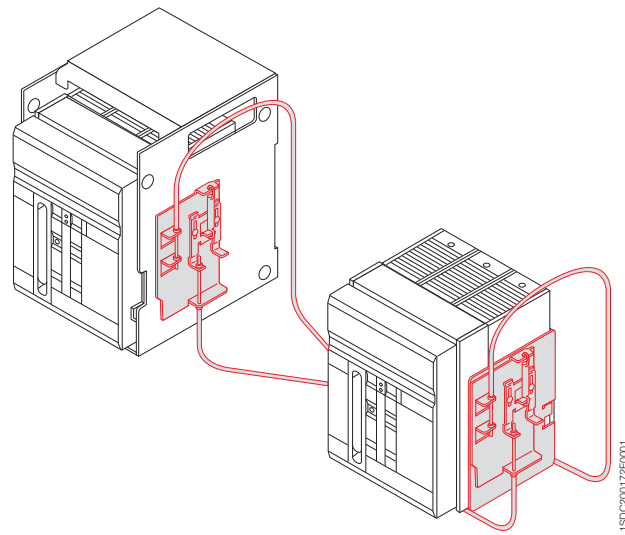
Type D: between 3 circuit-breakers (3 power supplies / one single closed CB)

Note:

See the "Overall dimensions" and "Electrical circuit diagrams" chapters for information about dimensions (fixed and withdrawable versions) and settings.



Vertical interlock



Horizontal interlock

L interlock

It is possible to make the mechanism interlock among three circuit-breakers disposed in "L position".



Interlock between circuit-breakers

The mechanical interlocks possible are shown below, depending on whether 2 or 3 circuit-breakers (any model and in any version) are used in the switching system.

Type of interlock	Typical circuit	Possible interlocks																					
Type A Between two circuit-breakers One normal power supply and one emergency power supply	<p>O = Circuit-breaker open I = Circuit-breaker closed</p>	Circuit-breaker 1 can only be closed if 2 is open, and vice-versa. <table border="1"> <thead> <tr> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> </tr> <tr> <td>O</td> <td>I</td> </tr> </tbody> </table>	1	2	O	O	I	O	O	I													
1	2																						
O	O																						
I	O																						
O	I																						
Type B Between three circuit-breakers Two normal power supplies and one emergency power supply.	<p>O = Circuit-breaker open I = Circuit-breaker closed</p>	Circuit-breakers 1 and 3 can only be closed if 2 is open. Circuit-breaker 2 can only be closed if 1 and 3 are open. <table border="1"> <thead> <tr> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>O</td> </tr> <tr> <td>O</td> <td>O</td> <td>I</td> </tr> <tr> <td>I</td> <td>O</td> <td>I</td> </tr> <tr> <td>O</td> <td>I</td> <td>O</td> </tr> </tbody> </table>	1	2	3	O	O	O	I	O	O	O	O	I	I	O	I	O	I	O			
1	2	3																					
O	O	O																					
I	O	O																					
O	O	I																					
I	O	I																					
O	I	O																					
Type C Between three circuit-breakers The two half-busbars can be powered by a single transformer (bus-tie closed) or by both at the same time (bus-tie open)	<p>O = Circuit-breaker open I = Circuit-breaker closed</p>	One or two circuit-breakers out of three can be closed at the same time. <table border="1"> <thead> <tr> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>O</td> </tr> <tr> <td>O</td> <td>I</td> <td>O</td> </tr> <tr> <td>O</td> <td>O</td> <td>I</td> </tr> <tr> <td>O</td> <td>I</td> <td>I</td> </tr> <tr> <td>I</td> <td>O</td> <td>I</td> </tr> </tbody> </table>	1	2	3	O	O	O	I	O	O	O	I	O	O	O	I	O	I	I	I	O	I
1	2	3																					
O	O	O																					
I	O	O																					
O	I	O																					
O	O	I																					
O	I	I																					
I	O	I																					
Type D Between three circuit-breakers Three power supplies (generators or transformers) on the same busbar, so parallel operation is not allowed	<p>O = Circuit-breaker open I = Circuit-breaker closed</p>	Only one of three circuit-breakers can be closed. <table border="1"> <thead> <tr> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>O</td> </tr> <tr> <td>O</td> <td>I</td> <td>O</td> </tr> <tr> <td>O</td> <td>O</td> <td>I</td> </tr> </tbody> </table>	1	2	3	O	O	O	I	O	O	O	I	O	O	O	I						
1	2	3																					
O	O	O																					
I	O	O																					
O	I	O																					
O	O	I																					

The emergency power supply is usually provided to take over from the normal power supply in two instances:

- to power health and safety services (e.g. hospital installations);
- to power parts of installations which are essential for requirements other than safety (e.g. continuous cycle industrial plants).

The range of accessories for SACE Emax circuit-breakers includes solutions for a wide variety of different plant engineering requirements.

See the specific regulations regarding protections against overcurrents, direct and indirect contacts, and provisions to improve the reliability and safety of emergency circuits.

Switching from the normal to the emergency power supply can either be carried out manually (locally or by remote control) or automatically.

To this end, the circuit-breakers used for switching must be fitted with the accessories required to allow electric remote control and provide the electrical and mechanical interlocks required by the switching logic.

These include:

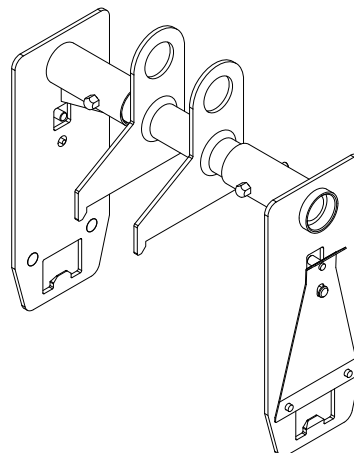
- the shunt opening release
- the shunt closing release
- the motor operator
- the auxiliary contacts.

Switching can be automated by means of a special electronically-controlled relay circuit, installed by the customer (diagrams provided by ABB SACE).

Mechanical interlocks between two or three circuit-breakers are made by using cables which can be used both for circuit-breakers side by side or superimposed.

11) Lift device

This accessory makes safety and easy the lifting of fixed circuit-breaker and mobile part thanks to telescopic plates.





Automatic transfer switch ATS021 and ATS022

12) Automatic transfer switch - ATS021 and ATS022

The ATS (Automatic Transfer Switch) is the network-generator transfer unit used in installations where switching the main power line to an emergency one is required, to ensure power supply to the loads in the case of anomalies in the main line.

The unit is able to manage the entire transfer procedure automatically, and prepares the commands for carrying out the procedure manually as well.

In the case of an anomaly in the main line voltage, in accordance with the parameters set by the user, the opening of the circuit-breaker of the main line, the starting of the generator set (when provided) and the closing of the emergency line are performed. In the same way, in the case of the main line returning, the procedure of reverse transfer is controlled automatically.

The new generation of ATS (ATS021 and ATS022) offers the most advanced and complete solutions to guarantee service continuity. The ATS021 and ATS022 can be used both with all the circuit-breakers in the SACE Tmax XT family and with the switch-disconnectors.

The ATS021 and ATS022 devices have been designed to operate with self-supply. The ATS022 unit also prepares the connection for auxiliary power supply, which allows additional functions to be used.

The ATS021 and ATS022 devices carry out control of both the power supply lines and analyse:

- phase unbalance;
- frequency unbalance;
- phase loss.

Apart from the standard control functions, with the ATS022 unit, the following is possible:

- selecting the priority line;
- controlling a third circuit-breaker;
- incorporating the device in a supervision system with Modbus communication (auxiliary power supply is needed);
- reading and setting the parameters, and displaying the measurements and alarms, by means of a graphic display.

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

For correct configuration, each circuit-breaker connected to the ATS021 or ATS022 must be fitted with the following accessories:

- mechanical interlock;
- motorised control of opening and closing;
- key lock against just manual operation for the motor operator;
- contact for signalling the state (open/closed) and contact for tripped;
- contact for racked-in (in the case of a withdrawable version circuit-breaker).

	ATS021	ATS022
General		
Auxiliary Power Supply	Not Required	Not Required (24-110 Vdc is required only for Modbus dialogue and 16 2/3 Hz system)
Rated Voltage, U_n	[VAC] Max 480	Max 480
Frequency	[Hz] 50, 60	16 2/3, 50, 60, 400
Dimensions (HxLxD)	[mm] 96x144x170	96x144x170
Type of installation	Door mounting DIN-rail mounting	Door mounting DIN-rail mounting
Operating Mode	Auto/Manual	Auto/Manual
Features		
Monitoring of the Normal and Emergency lines	%	%
Controlling CBs of the Normal and Emergency lines	%	%
Generator set startup	%	%
Generator set shutdown with adjustable delay	%	%
Bus-tie	%	%
No-priority Line	%	%
Modbus RS485	%	%
Display	%	%
Ambient conditions		
Operating temperature	-20...+60 °C	-20...+60 °C
Humidity	5% - 90% without condensation	5% - 90% without condensation
Operating thresholds		
Minimum voltage	-30%...-5% U_n	-30%...-5% U_n
Maximum voltage	+5%...+30% U_n	+5%...+30% U_n
Fixed frequency thresholds	-10%...+10% f_n	-10%...+10% f_n
Test		
Test Mode	%	%
Compliance with standards		
Electronic equipment for use in power 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



Spare parts and retrofitting

Spare parts

The following spare parts are available:

- front metal shields and escutcheon plate
- opening solenoid for PR121, PR122 and PR123 overcurrent release
- arcing chamber
- closing springs
- jaw-type isolating contact for the fixed part of the withdrawable circuit-breaker
- earthing sliding contact (for withdrawable version)
- shutters for fixed part
- complete pole
- operating mechanism
- connection cables for trip units and current sensors
- transparent protective cover for trip units
- SACE PR030/B power supply unit
- toolbox
- battery for SACE PR030/B power supply unit
- front escutcheon plate for Ronis key lock

For further details, please request a copy of the ABB SACE spare parts catalogue.

Retrofitting Kits

Special kits have been prepared to replace old SACE Otomax and SACE Novomax G30 circuit-breakers. The kits include SACE Emax circuit-breakers that take advantage of all the components of the existing switchgear. Installing a new circuit-breaker in old switchgear, offers definite technical and economic benefits, and is extremely rapid as there is no need to redo the main switchgear connections.

Emmax





Applications of the circuit-breaker

Contents

Primary and secondary distribution

Selective protection 6/2

Back-up protection 6/13

Directional protection 6/14

Earth fault protection 6/20

Switching and protection of transformers 6/26

Line protection 6/30

Switching and protection of generators 6/32

Switching and protection of asynchronous motors 6/35

Switching and protection of capacitors 6/41

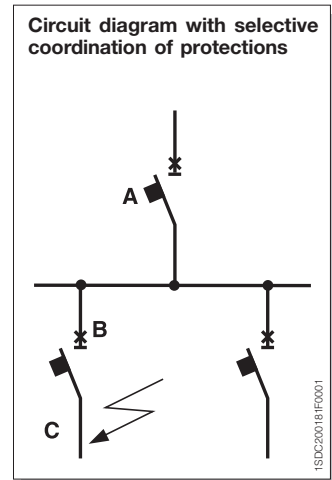


Primary and secondary distribution

Selective protection

Selectivity is normally actuated for tripping overcurrent protection devices in civil and industrial installations to isolate the part affected by a fault from the system, causing only the circuit-breaker immediately on the supply side of the fault to trip. The example in the figure highlights the need to coordinate tripping between the two circuit-breakers A and B so that only circuit-breaker B is tripped in the event of a fault in C, ensuring continuity of service for the rest of the system supplied by circuit-breaker A.

Whereas natural selectivity within the overload current range is normally found due to the difference between the rated currents of the load protection circuit-breaker and the main circuit-breaker on the supply side, selectivity can be obtained in the short-circuit current range by differentiating the current values and, if necessary, the trip times.

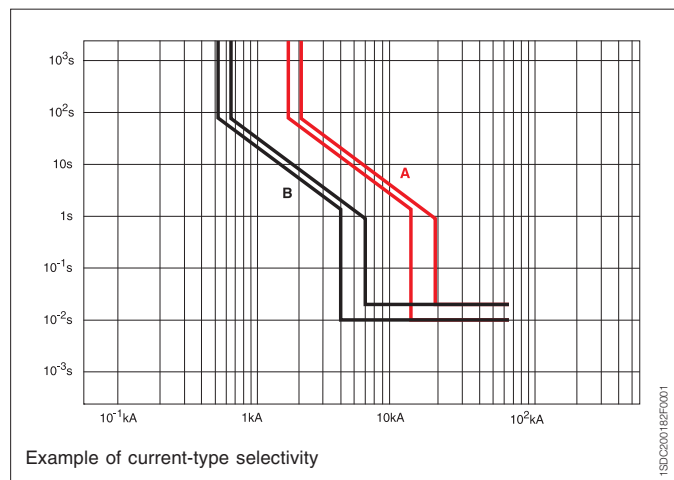


Selectivity can be total or partial:

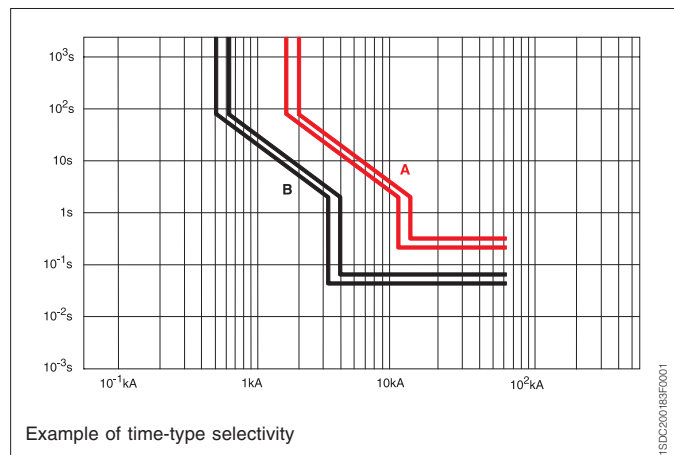
- total selectivity: only circuit-breaker B opens for all current values lesser than or equal to the maximum short-circuit current in C;
- partial selectivity: only circuit-breaker B opens for fault currents below a certain value; A and B are both tripped for greater or equal values.

In principle, the following types of selectivity are possible:

Current selectivity, obtained by setting the instantaneous trip currents of the circuit-breaker chain to different values (higher settings for the circuit-breakers on the supply side). This often results in partial selectivity.



Time selectivity, obtained by intentionally incorporating increasing time-delays in the trip times of the circuit-breakers furthest to the supply side in the chain.



To guarantee selectivity for Emax circuit-breakers, equipped with electronic PR121, PR122 and PR123 type trip units, the following conditions must be verified:

- that there is no intersection between the time-current curves of the two circuit-breakers, tolerances included
- the minimum difference between the trip time t_2 of the circuit-breaker on the supply side and the time t_2 of the circuit-breaker on the load side, whenever it is an Emax circuit-breaker, must be:
 - t_2 supply side $>$ t_2 load side + 100 ms* t = cost
 - t_2 supply side $>$ t_2 load side + 100 ms $i^2t = \text{cost}$ ($<$ 400 ms)
 - t_2 supply side $>$ t_2 load side + 200 ms $i^2t = \text{cost}$ ($>$ 400 ms)

* in auxiliary power supply or in self-supply at full power, it is reduced to 70ms.

When the above conditions are met:

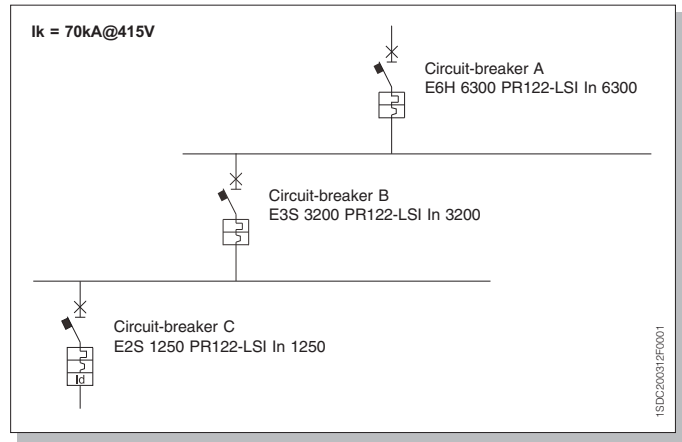
- if function I is active ($I_3=\text{on}$), the maximum short-circuit current guaranteeing selectivity is equal to the setting value I_3 (minus the tolerances)
- if function I is disabled ($I_3=\text{off}$), the maximum short-circuit current for which selectivity is guaranteed must be equal to:
 - the value indicated in the table on page 6/12, if the circuit-breaker on the load side is a moulded-case circuit-breaker (MCCB)
 - the minimum value between the I_{cw} of the circuit-breaker on the supply side and the I_{cu} of the circuit-breaker on the load side, when both the circuit-breakers are Emax type.



Primary and secondary distribution

Selective protection

Here is an example of total selectivity between three Emax circuit-breakers in series in a system with 415 V rated voltage and 70 kA prospective short-circuit current.

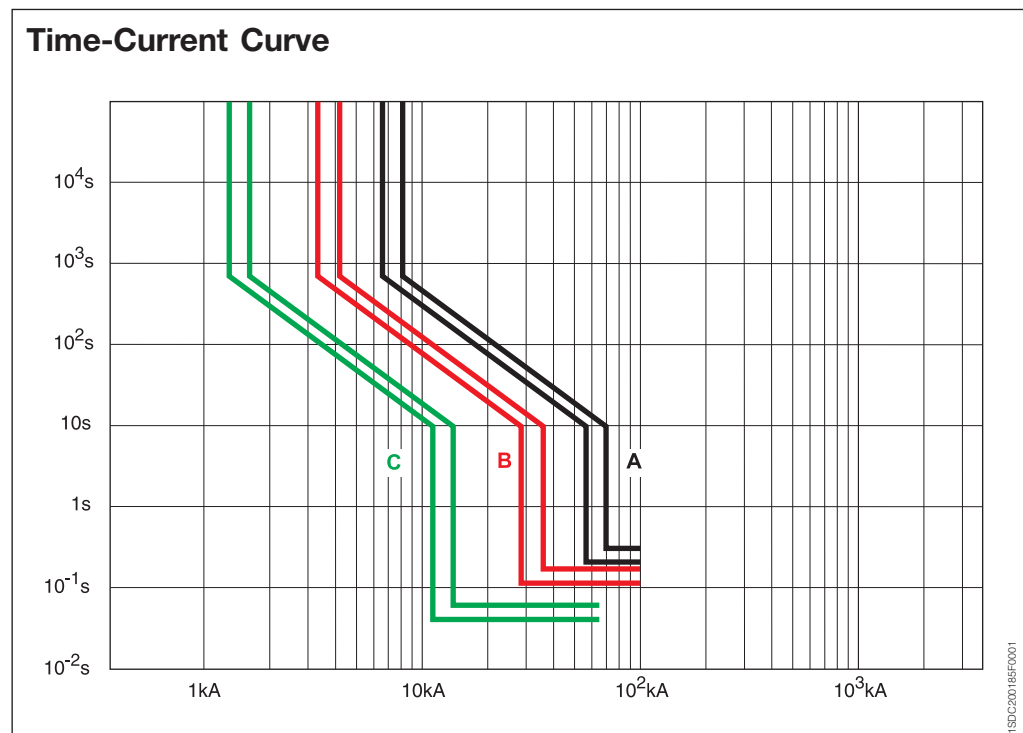


Name	Circuit-breakers			L		S (t=cost)		I
	Type	Icu@415V	Icw	I1	t1	I2	t2	
A	E6H 63	100 kA	100 kA	1	108	10	0,25	off
B	E3S 32	75 kA	75 kA	1	108	10	0,15	off
C	E2S 12	85 kA	65 kA	1	108	10	0,05	off

As shown in the figure below, with the above-mentioned setting there is no intersection between the time-current curves of the different circuit-breakers and the minimum delay of 70 ms defined for the trip thresholds of protection S. Furthermore, exclusion of protection I ($I_3=off$) guarantees selectivity as follows:

- up to 75 kA between A and B
- up to 75 kA between B and C.

So, since the maximum prospective short-circuit current of the system is 70 kA, it is possible to talk of total selectivity.



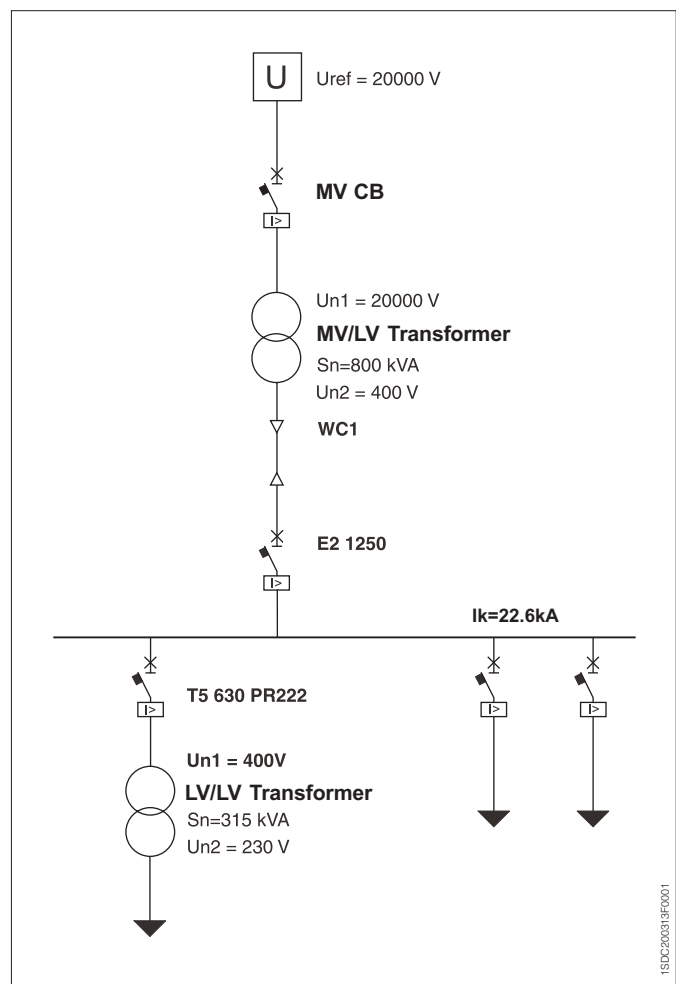
Double S

Thanks to the new PR123 trip unit, which allows two thresholds of protection function S to be set independently and be activated simultaneously, selectivity can also be achieved under highly critical conditions.

Here is an example of how, by using the new trip unit, it is possible to obtain a better selectivity level compared with the use of a trip unit without “double S”.

This is the wiring diagram of the system under examination; in particular, attention must be focussed on:

- the presence, on the supply side, of a MV circuit-breaker, which, for selectivity reasons, imposes low setting values for the Emax circuit-breaker on the LV side
- the presence of a MV/LV transformer which, due to the inrush currents, imposes high setting values for the circuit-breakers on its primary side.

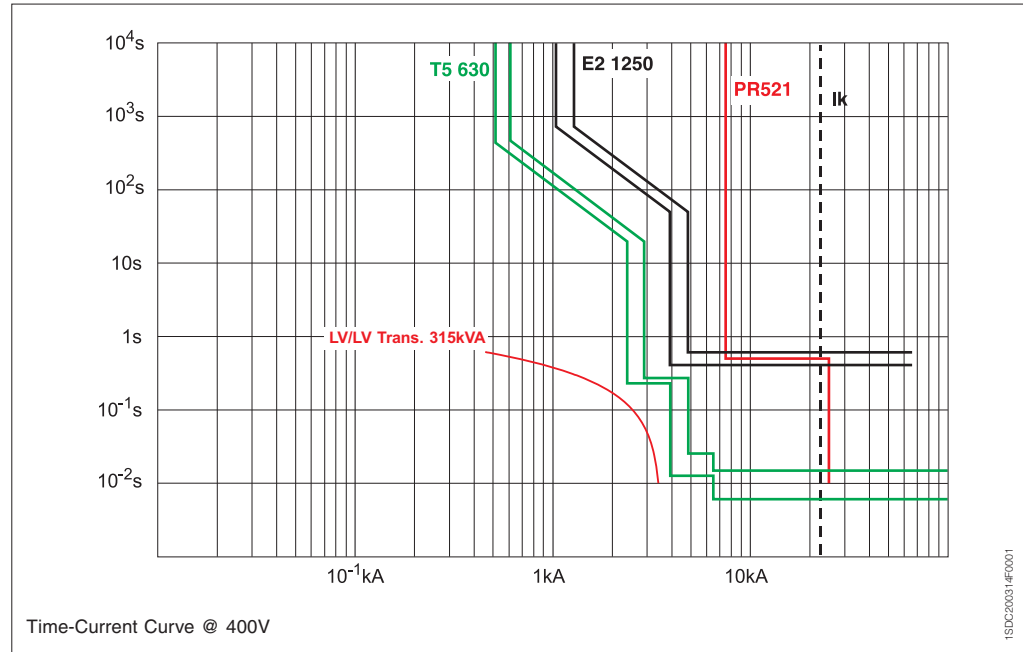




Primary and secondary distribution

Selective protection

Solution with a trip unit without “double S”



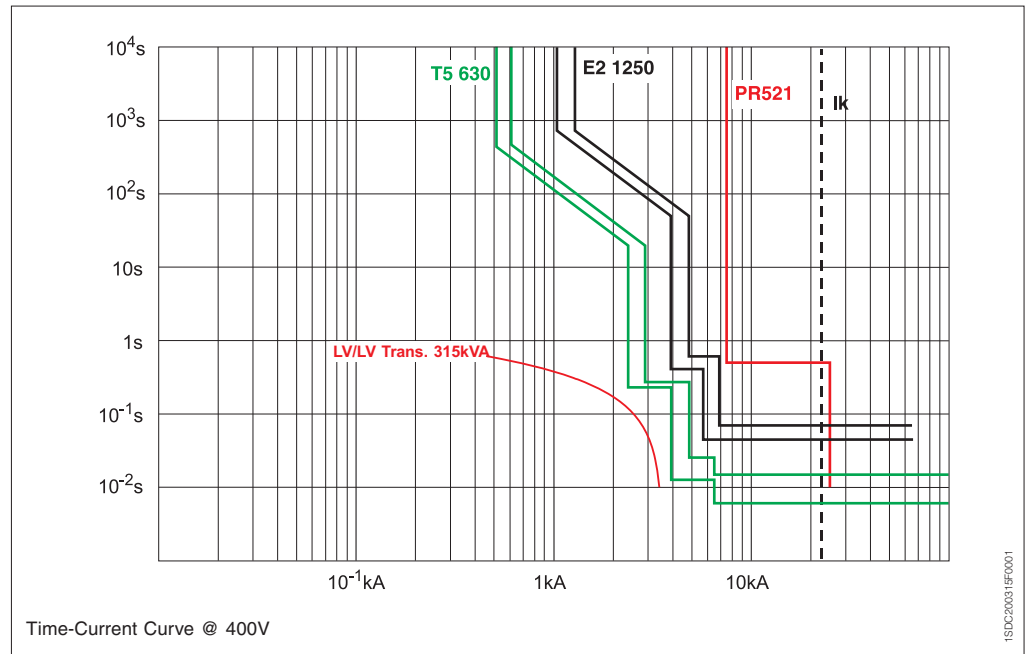
MV CB (PR521)

50 (I>): 50 A	t=0.5s
51 (I>>): 500 A	t=0s

		E2N 1250 PR122 LSIG R1250	T5V 630 PR222DS/P LSIG R630
L	Setting	0.8	0.74
	Curve	108s	12s
S t=constant	Setting	3.5	4.2
	Curve	0.5s	0.25s
I	Setting	OFF	7

In the case of a short-circuit, the Emax E2 circuit-breaker and the MV circuit-breaker will open simultaneously with this solution. Attention must be paid to the fact that, owing to the value I_k , function I of the E2 circuit-breaker has to be disabled ($I_3=OFF$) so that selectivity with the T5 on the load side is granted.

Solution with the PR123 trip unit with “double S”



MV CB (PR521)

50 (I _{>}): 50 A	t=0.5s
51 (I _{>>}): 500 A	t=0s

		E2N 1250 PR123 LSIG R1250	T5V 630 PR222DS/P LSIG R630
L	Setting	0.8	0.74
	Curve	108s	12s
S t=constant	Setting	-	4.2
	Curve	-	0.25s
S1 t=constant	Setting	3.5	-
	Curve	0.5s	-
S2 t=constant	Setting	5	-
	Curve	0.05s	-
I	Setting	OFF	7

As is evident, by means of the “double S” function, selectivity can be achieved both with the T5 circuit-breaker on the load side as well as with the MV circuit-breaker on the supply side. A further advantage obtained by using the “double S” function is the reduction in the time of permanence of high current values under short-circuit conditions, which results in lower thermal and dynamic stresses on the busbars and on the other installation components.



Primary and secondary distribution

Selective protection

Dual Setting

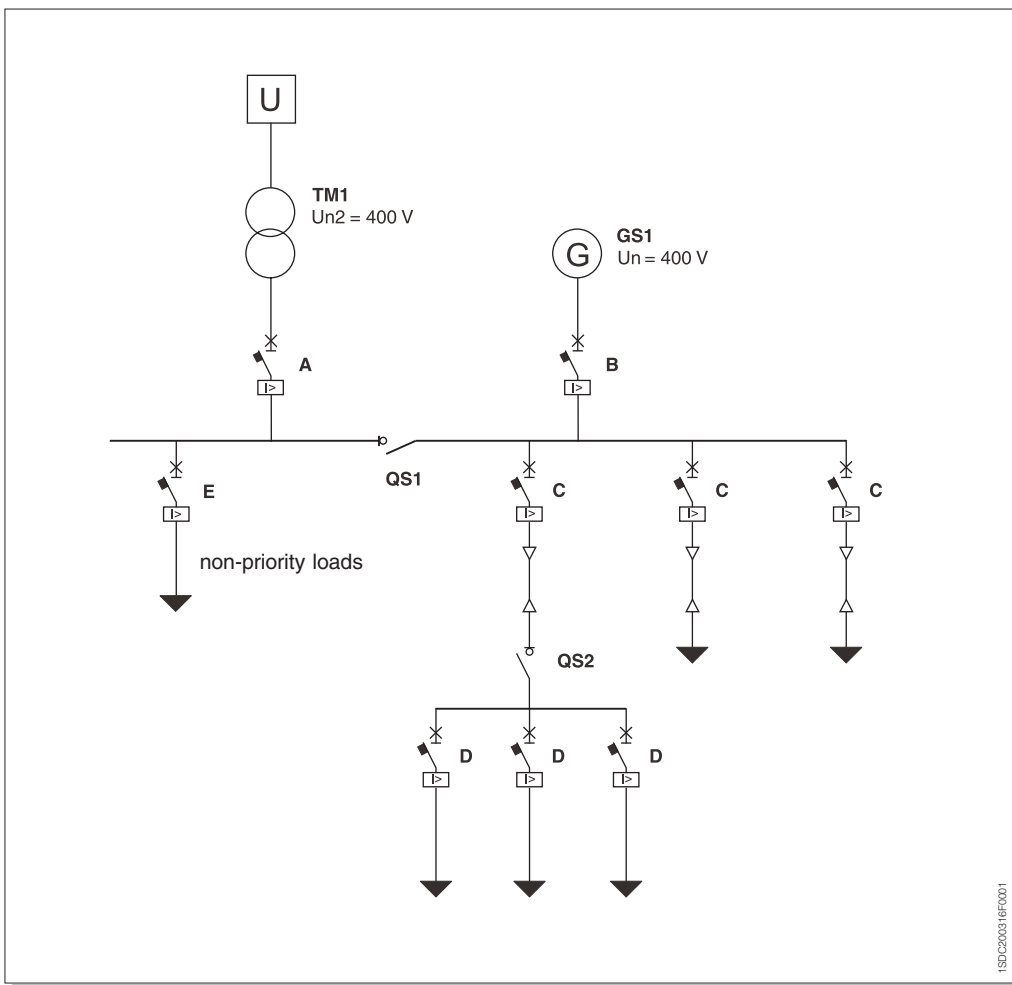
Thanks to the new PR123 trip unit, it is also possible to program two different sets of parameters and, through an external command, to switch from one set to the other.

This function is useful when there is an emergency source (generator) in the system, only supplying voltage in the case of a power loss on the network side.

In the system described below, in the case of a loss of the normal supply on the network side, by means of the ABB SACE ATS010 automatic transfer switch, it is possible to switch the supply from the network to the emergency power unit and to disconnect the non-primary loads by opening the QS1 switch-disconnector.

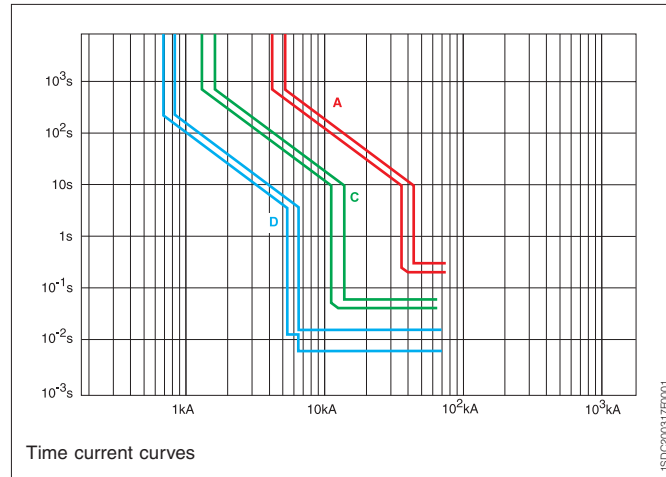
Under normal service conditions of the installation, the circuit-breakers C are set in order to be selective with both circuit-breaker A, on the supply side, as well as with circuit-breakers D on the load side. By switching from the network to the emergency power unit, circuit-breaker B becomes the reference circuit-breaker on the supply side of circuit-breakers C. This circuit-breaker, being the protection of a generator, must be set to trip times shorter than A and therefore the setting values of the circuit-breakers on the load side might not guarantee the selectivity with B.

By means of the “dual setting” function of the PR123 trip unit, it is possible to switch circuit-breakers C from a parameter set which guarantees selectivity with A, to another set which make them selective with B. However, these new settings could make the combination between circuit-breakers C and the circuit-breakers on the load side non-selective.

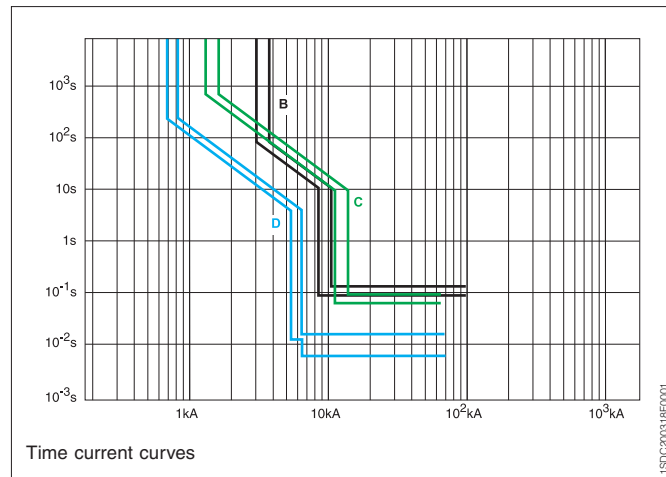


6

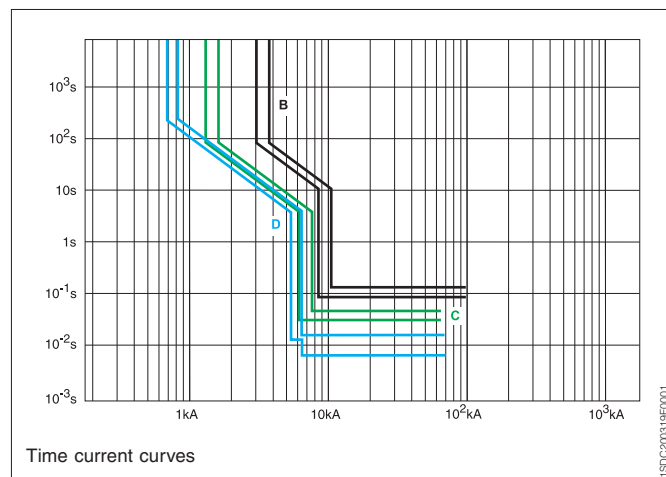
The figure at the side shows the time-current curves of the installation under normal service conditions. The values set allow no intersection of the curves.



The figure at the side shows the situation in which, after switching, the power is supplied by the power unit through circuit-breaker B. If the settings of circuit-breakers C are not modified, there will be no selectivity with the main circuit-breaker B.



This last figure shows how it is possible to switch to a set of parameters which guarantees selectivity of circuit-breakers C with B by means of the “dual setting” function.





Primary and secondary distribution

Selective protection

Zone selectivity

The **zone selectivity**, which is applicable to protection functions S and G, can be enabled in the case where the curve with fixed time is selected and the auxiliary power supply is present. This type of selectivity allows shorter trip times for the circuit-breaker closest to the fault than in the case of time-selectivity. It is a type of selectivity suitable for radial nets.

The word zone is used to refer to the part of an installation between two circuit-breakers in series. The fault zone is the zone immediately on the load side of the circuit-breaker that detects the fault. Each circuit-breaker that detects a fault communicates this to the circuit-breaker on the supply side by using a simple communication wire. The circuit-breaker that does not receive any communication from those on the load side will launch the opening command within the set selectivity time (40÷200ms).

We have to consider that the circuit-breakers receiving a signal from another trip unit will operate according to the set time t_2 .

If, for any reason, after the selectivity time, the circuit-breaker due to trip has not opened yet, it lets the "block signal" fall on the other circuit-breaker, which will trip.

To realize correctly the zone selectivity the following settings are suggested:

S	$t_2 \geq \text{selectivity time} + t_{\text{opening}}^*$
I	$I_3 = \text{OFF}$
G	$t_4 \geq \text{selectivity time} + t_{\text{opening}}^*$
Selectivity time	same setting for each circuit-breaker

* Trip duration for $I < I_{cw}(\text{max}) = 70 \text{ ms}$.

To carry out the cabling, a shielded twisted pair cable (not supplied; ask ABB for information) can be used. The shield should only be earthed on the trip unit of the circuit-breaker on the supply side.

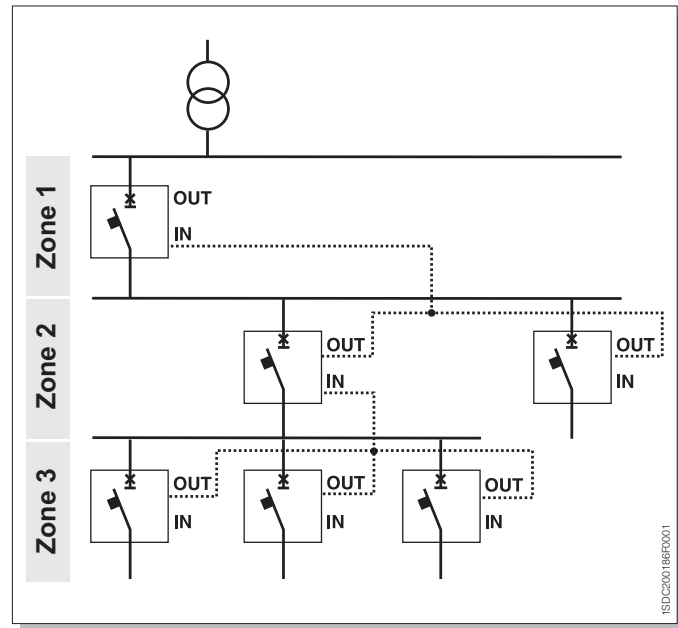
The maximum length of the cabling for zone selectivity, between two units, is 300 meters.

The maximum number of the circuit-breakers which can be connected to the outputs (Z out) of a trip unit is 20.

All Emax circuit-breakers in versions B-N-S-H-V fitted with PR122 and PR123 trip units allow zone selectivity to be realised.

Note

With regard to selectivity in the case of earth faults with circuit-breakers in series, see page 6/20.





Primary and secondary distribution

Selective protection

Selectivity tables

Emax air circuit-breakers with moulded-case circuit-breakers

				Supply-side		E1		E2				E3			E4			E6	
		Version	Trip unit	B	N	B	N	S	L*	N	S	H	V	L*	S	H	V	H	V
				EL		EL				EL			EL			EL			
Load-side	Version	Trip unit	Size [A]	800	800	1600	1000	800	1250	2500	1000	800	800	2000	4000	3200	3200	4000	3200
				1000	1000	2000	1250	1000	1600	3200	1250	1000	1250	2500		4000	4000	5000	4000
				1250	1250		1600	1250			1600	1250	1600					6300	5000
				1600	1600		2000	1600			2000	1600	2000						6300
								2000			2500	2000	2500						
											3200	2500	3200						
T1	B	TM	160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	C			T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	N			T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
T2	N	TM, EL	160	36	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S			36	T	T	55	65	T	T	T	T	T	T	T	T	T	T	T
	H			36	T	T	55	65	T	T	75	T	T	T	T	T	T	T	T
	L																		
T3	N	TM	250	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S			36	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	N			T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
T4	N	TM, EL	250	36	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S		320	36	T	T	55	65	T	T	T	T	T	T	T	T	T	T	T
	H			36	T	T	55	65	100	T	T	75	85	100	T	T	100	T	100
	L			36	T	T	55	65	100	T	T	75	85	100	T	T	100	T	100
	V																		
T5	N	TM, EL	400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S		630	36	T	T	55	65	T	T	T	T	T	T	T	T	T	T	T
	H			36	T	T	55	65	100	T	T	75	85	100	T	T	100	T	100
	L			36	T	T	55	65	100	T	T	75	85	100	T	T	100	T	100
	V																		
S6	N	TM, EL	800	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	S			36	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	H			36	T	T	55	T	T	T	T	T	T	T	T	T	T	T	T
	L			36	T	T	55	65	T	T	75	85	T	T	T	T	T	T	T
	S			-	-	T	T	T	-	T	T	T	T	T	T	T	T	T	T
S7	H	EL	1250	-	-	T	55	T	-	T	T	T	T	T	T	T	T	T	T
	L		1600	-	-	T	55	65	-	T	T	75	85	T	T	T	T	T	T

6

General prescriptions:

- Function I of the electronic PR121, PR122 and PR123 trip units of the supply-side circuit-breakers must be excluded (I_3 in OFF).
- Selectivity is expressed in kA at the supply voltage of 380-415 V AC in accordance with IEC 60947-2 Standards.
- T = total selectivity (the selectivity value is the lowest one between the breaking capacities (Icu) of both the circuit-breaker on the load-side as well of the circuit-breaker on the supply side)
- It is of fundamental importance to verify that the settings chosen by the user for the trip units placed both on the supply as well as on the load side do not result in intersections of the time-current curves for protection against overload (function L) and for protection against short-circuit with time-delayed trip (function S).

* Emax L circuit-breakers with PR122/P and PR123/P trip units only.

Primary and secondary distribution

Back-up protection

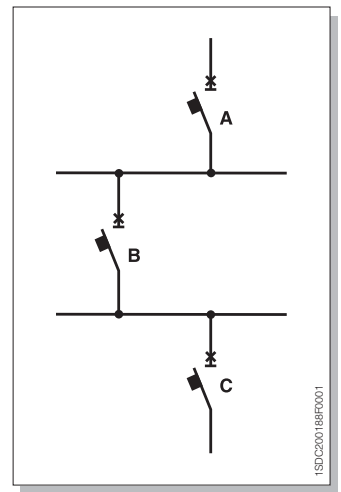
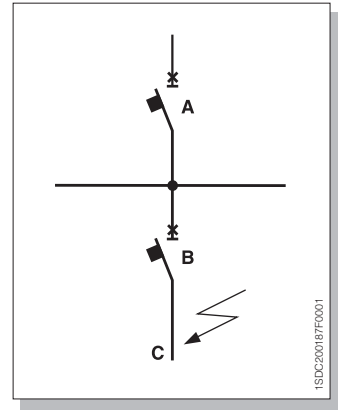
Back-up protection is required by the IEC 60364-4-43 Standards and Annex A of the IEC 60947-2 Standard, which allow the use of a protection device with breaking capacity lower than the prospective short-circuit current at the points where it is installed, provided that there is another protection device on the supply side with the necessary breaking capacity. In this case, the characteristics of the two devices must be coordinated in such a way that the specific energy let through by the combination is not higher than that which can be withstood without damage by the device on the load side, and by the protected conductors. In the diagram in the figure, circuit-breaker B, located on the load side of circuit-breaker A, can have a lower breaking capacity than the prospective short-circuit current in the event of a fault in "C", if circuit-breaker A is able to satisfy both of the following conditions:

- it has a suitable breaking capacity (higher than or equal to the prospective short-circuit current at its point of installation and obviously higher than the short-circuit current in "C")
- in the event of a fault in "C" with short-circuit values higher than the breaking capacity of circuit-breaker B, circuit-breaker A must provide a specific let-through energy limiting function, limiting it to a value that can be withstood by circuit-breaker B and by the protected conductors.

A fault in "C" can therefore cause a double interruption, however the back-up protection must ensure that B always trips within the limits of its breaking capacity.

It is necessary to choose switchgear combinations that have been verified by laboratory tests for this type of protection. The possible combinations are specified in ABB SACE documents and PC programs (Slide rule kits, DOCWin, etc.) and shown here for SACE Emax circuit-breakers.

Back-up protection is used in electrical installations in which there is no essential need for continuous operation: when the supply-side circuit-breaker opens, it also excludes loads that are not affected by the fault. Furthermore, the use of this type of coordination limits the size of the installation and consequently reduces costs.



Note

Back-up protection can also be implemented on more than two levels: the figure above shows an example of coordination on three levels. In this case, the choices are correct if at least one of the two situations below is satisfied:

- the circuit-breaker furthest on the supply side A is coordinated with both circuit-breakers B and C (coordination between circuit-breakers B and C is not necessary);
- each circuit-breaker is coordinated with the circuit-breaker immediately to the load side of it, i.e. the circuit-breaker furthest to the supply side A is coordinated with the next one B, which is in turn coordinated with circuit-breaker C.

Table showing coordination for back-up protection

Supply-side circuit-breaker	Breaking capacity
E2L - E3L	130 [kA] (at 380/415 V)
Load-side circuit-breaker	Back-up value
T4N	65 [kA]
T4S - T5N - S6N - E1B - E2B	85 [kA]
T4H - T5S/H - S6S/H - S7S/H - E1N - E2N	100 [kA]
T4L - T5L	130 [kA]



Directional protection

Directional protection is based on the ability to correlate the circuit-breaker's behavior with the direction of the fault current.

Two different trip times can be set on the PR123 trip unit depending on the current direction:

- a time ($t7Fw$) for a direction of current concordant (Fw) with the reference direction set;
- a time ($t7Bw$) for a direction of current discordant (Bw) with the reference direction set.

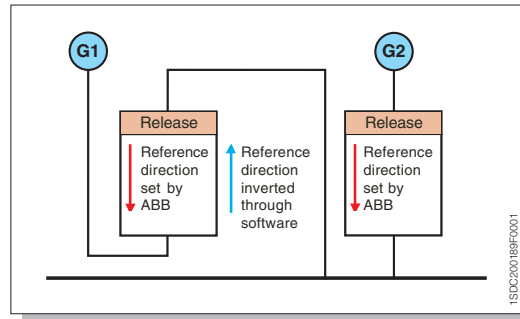
A current threshold only ($I7$) can be set on the PR123 trip unit.

If the fault current is discordant (Bw) with the reference direction, the protection shall intervene when the threshold $I7$ is reached within the set time $t7Bw$ (provided that the functions S and I have not been set as to intervene before function D).

If the fault current is concordant (Fw) with the reference direction, the protection shall intervene when the threshold $I7$ is reached within the set time $t7Fw$ (provided that the functions S and I have not been set as to intervene before function D).

Moreover, if function I is active and the short-circuit current exceeds the set value I_3 , the circuit-breaker will trip instantaneously independently of the direction of the current.

The reference direction set by ABB is from the top of the circuit-breaker (the zone where the trip unit is located) towards the bottom.

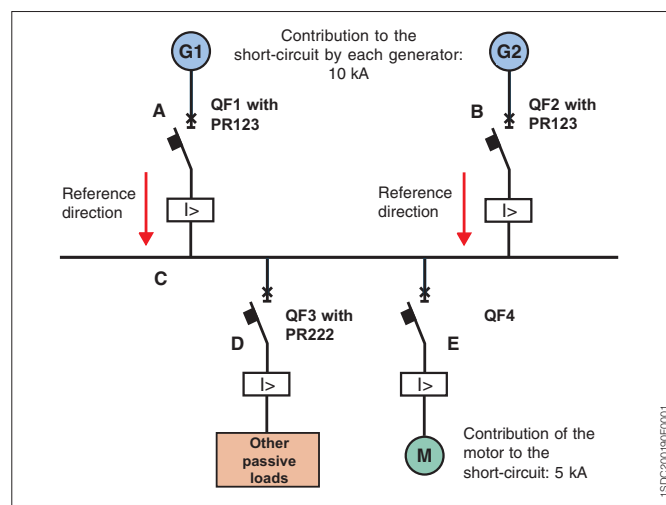


The figure above shows the actual configuration the circuit-breakers have in the system. The red arrow shows the reference direction set by default on the circuit-breaker.

If the power supply direction of the circuit-breaker is from top to bottom (supply from G2), the reference direction must remain the one set by ABB.

If the power supply direction of the circuit-breaker is from bottom to top (supply from G1), the new PR123 trip unit allows the default setting to be inverted by operating on its software.

In this way, all the quantities measured by the PR123 trip unit can be evaluated as they actually flow through the installation. Furthermore, in the wiring diagram of the system, the reference



direction to carry out a selectivity study and consider the tripping directions Bw or Fw correctly still remains from top to bottom.

In the following wiring diagram the reference directions are shown in red. By considering the circuit-breakers supplied as in the figure above, it can be seen that for QF2 this is the default direction, whereas for QF1 the direction has been inverted by means of the software.

By assuming some numerical values for the short-circuit currents, and considering some fault points, the following is the result.

For circuit breaker QF1, if a fault occurs at point B, the current will flow in direction A-B concordant to the reference direction or similarly, for a fault in A, the current direction will be B-A in discordance with the reference direction.

The different configurations can be resumed in the following table:

Circuit-breaker	Location of fault	Measured current [kA]	Direction	Tripping time
QF1	A	15	Discordant	t7Bw
	B, C, D, E	10	Concordant	t7Fw
QF2	B	15	Discordant	t7Bw
	A, C, D, E	10	Concordant	t7Fw

This installation aims at selectivity between QF1, QF2, QF3 and QF4.

On examining the table, we see that the only instance in which the fault current direction is discordant with that set for the circuit-breaker QF1 occurs in case of a fault in point A. The circuit-breaker QF1 must trip more quickly than the other circuit-breakers, since it is the one nearest to the fault. To this purpose, the trip time t7Bw of QF1 must be set at:

- a value below the time t7Fw of the circuit-breaker QF2, since the fault current is concordant with QF2 reference direction
- a value lower than the time “t2” of protection “S”, if available, for the trip unit of the moulded-case circuit-breaker QF4. The instantaneous protection of QF4 shall be set in OFF or shall have a setting value I3 higher of the contribution given by the motor to the short-circuit current.

Moreover, the functions S and I of both QF1 and QF2 have been set so as not to intervene before function D.

Similarly to the process described for circuit-breaker QF1, to ensure selectivity, circuit-breaker QF2 must trip first in the case of a fault in B, and then with a delayed trip in the case of faults anywhere else in the system.

The settings available for directional protection D, both for Fw and Bw, are the following:

$I_r=0.6...10xI_n$	(tolerance $\pm 10\%$)	step 0.1xIn
$t_r=0.20s...0.8s$	(tolerance $\pm 20\%$)	step 0.01s



Directional protection

Zone selectivity D (Directional Zone Selectivity)

Thanks to this function, it is also possible to obtain selectivity in meshed and ring networks. By means of zone selectivity with function D "Zone selectivity D", which can only be set to [On] when zone selectivity "S" and "G" are set to [Off] and there is an auxiliary power supply, it is possible to coordinate the behaviour of the various PR123 devices, by cabling the trip unit buses in a suitable way.

In fact, each trip unit has 4 signals available:

- two input signals (one in a concordant and one in a discordant direction) by means of which the trip unit receives the "block" signal from other trip units
- two output signals (one in a concordant and one in a discordant direction) by means of which the trip unit sends a "block" signal to other trip units.

The circuit-breakers which do not receive a "block" signal (coordinated in the direction of the current) will send the opening command within a time equal to t_{7sel} .

The circuit-breakers which receive the "block" signal will open within the backward or forward time according to the direction of the current.

If function I is activated and the short-circuit current exceeds the set value (I_3), the circuit-breaker will open instantaneously and independently of the directions and of the signals received.

For safety reasons, the maximum duration of the "block" signal is 200ms.

If, after this time and for any reason, the circuit-breakers due to trip have not yet opened, the "block" signal falls on the other circuit-breakers which will command immediate opening. This operation therefore occurs after a maximum time of 200ms.

A shielded twisted pair cable (not supplied; ask ABB for information) can be used to carry out the cabling. The shield should only be earthed on the trip unit of the circuit-breaker on the supply side.

- The maximum length of the cabling for zone direction selectivity, between two units, is 300 metres.
- A maximum number of 20 circuit-breakers can be connected to the outputs (OUT Bw or OUT Fw) of a trip unit.

The figure below shows the connections necessary to activate the "blocks" between the various trip units. In particular:

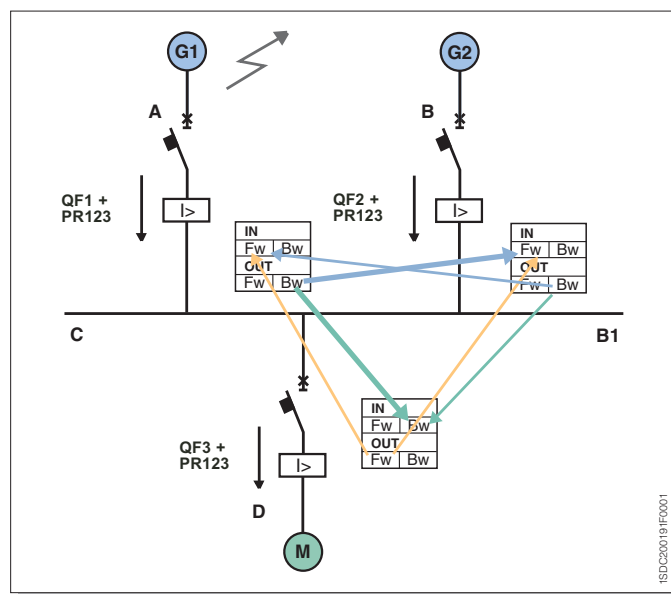
- 1) in the case of a fault in A, circuit-breaker QF1 is passed through by a current from busbar B1; this current flows in a direction discordant with the one set. The OUT Bw bus of QF1 "blocks" the IN Fw bus of circuit-breaker QF2 and the IN Bw bus of circuit-breaker QF3: in fact, the current flows through QF2 in the same direction as the setting, whereas QF3 is passed through by a current discordant with the setting (the active "block" signals are indicated by wider arrows).

the current flows through QF2 in the same direction as the setting, whereas QF3 is passed through by a current discordant with the setting (the active "block" signals are indicated by wider arrows).

6

Direction (OUT-IN)	Arrow
Bw ↔ Bw	
Bw ↔ Fw	
Fw ↔ Fw	

Reference Direction

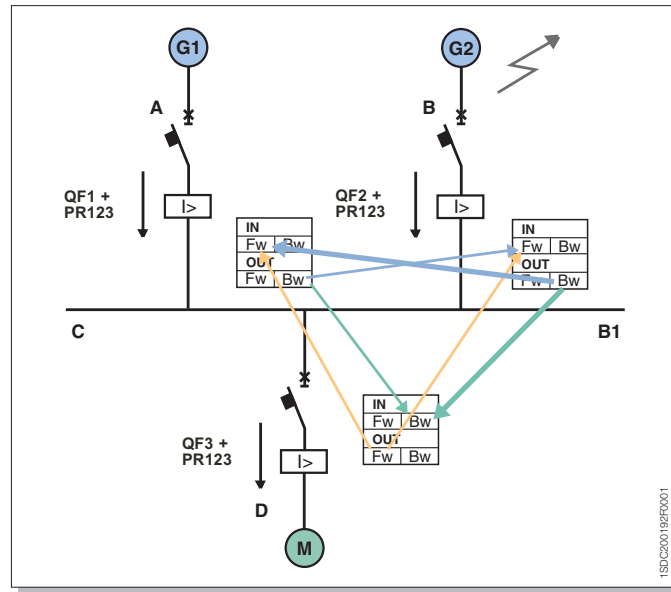


2) in the case of a fault in B, circuit-breaker QF2 is passed through by a current from busbar B1; this current flows in a direction discordant with the one set. The OUT Bw bus of QF2 “blocks” the IN Fw bus of circuit-breaker QF1 and the IN Bw bus of circuit-breaker QF3: in fact, the

current flows through QF1 in the same direction as the setting, whereas QF3 is passed through by a current discordant with the setting (the active “block” signals are indicated by wider arrows).

Direction (OUT-IN)	Arrow
Bw ←##Bw	
Bw ←##Fw	
Fw ←##Fw	

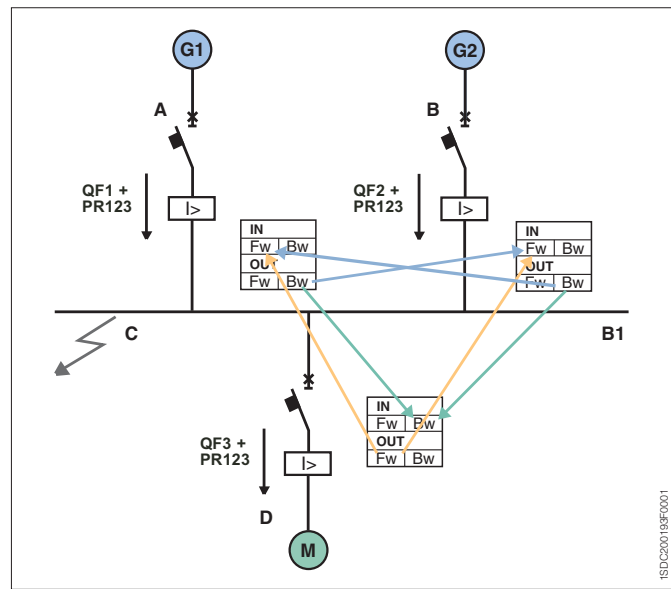
Reference Direction



3) in case of a fault in C, circuit-breakers QF1 and QF2 are passed through by a current flowing in the same direction as the one set, whereas QF3 is passed through by a current with discordant direction. No circuit-breaker is “blocked” and consequently all the circuit-breakers affected by the fault will trip according to the time settings of protections “S” and/or “I”.

Direction (OUT-IN)	Arrow
Bw ←##Bw	
Bw ←##Fw	
Fw ←##Fw	

Reference Direction



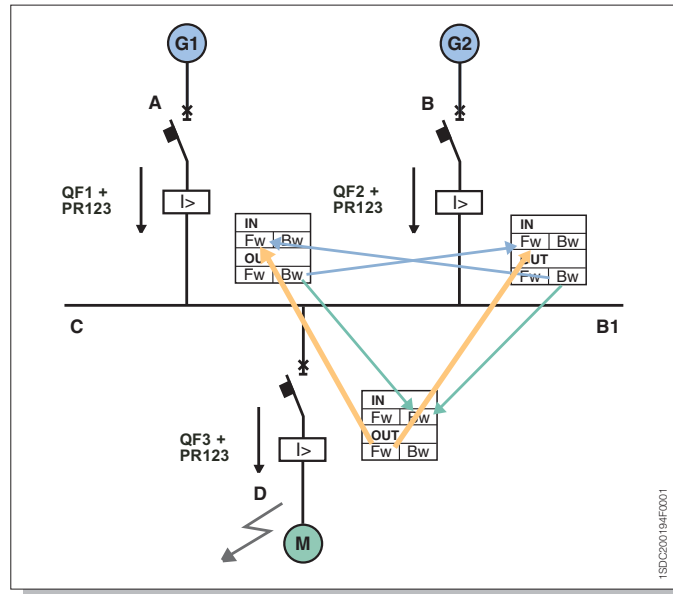


Directional protection

4) in the case of a fault in D, circuit-breaker QF3 is passed through by a current from busbar B1; this current flows in the same direction as the one set. The OUT Fw bus of QF3 "blocks" the IN Fw bus of circuit-breakers QF1 and QF2: in fact, both circuit-breakers are passed through by fault currents concordant with the direction set (the active "block" signals are indicated by wider arrows).

Direction (OUT-IN)	Arrow
Bw ◊##Bw	
Bw ◊##Fw	
Fw ◊##Fw	

Reference Direction



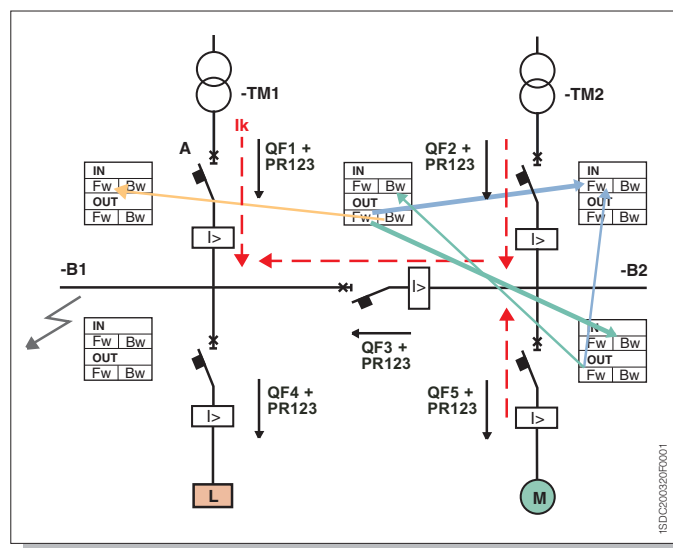
Fw bus of circuit-breakers QF1 and QF2: in fact, both circuit-breakers are passed through by fault currents concordant with the direction set (the active "block" signals are indicated by wider arrows).

The following example analyses a network with a bus-tie and takes the behavior of the protection devices in the presence of faults into consideration:

1) Fault in B1 with the bus-tie closed: only circuit-breakers QF1 and QF3 must interrupt the fault: in particular, circuit-breaker QF3 is passed through by a current from busbar B2 (therefore in the same direction as the one set); the OUT Fw bus sends a "block" signal to the IN Fw bus of circuit-breaker QF2 (passed through by a current flowing from transformer TM2 and consequently in a direction concordant with the one set), and to the IN Bw bus of circuit-breaker QF5 (passed through from a current flowing from the motor and consequently in a direction discordant with the one set).

Direction (OUT-IN)	Arrow
Fw ◊##Fw	
Fw ◊##Bw	
Bw ◊##Fw	

Reference Direction

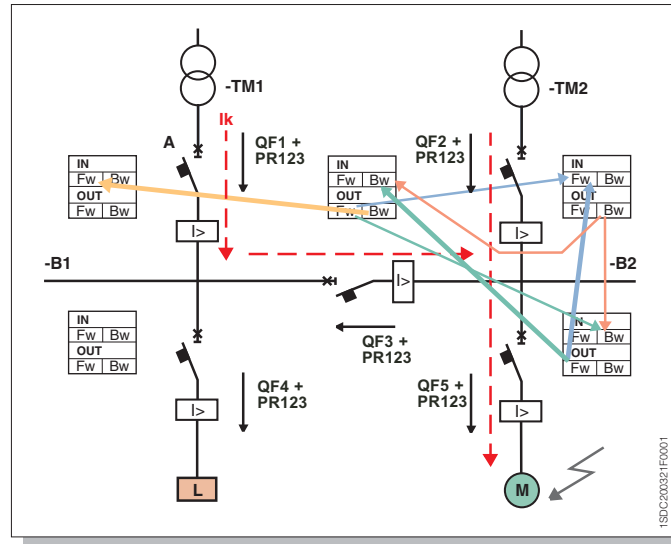
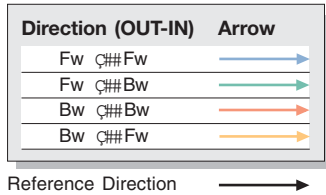


QF2 (passed through by a current flowing from transformer TM2 and consequently in a direction concordant with the one set), and to the IN Bw bus of circuit-breaker QF5 (passed through from a current flowing from the motor and consequently in a direction discordant with the one set).

6

2) Fault in the motor: in this case, only circuit-breaker QF5 must interrupt the fault. Circuit-breaker QF5 is passed through by a current flowing from busbars B1 and B2, in a direction concordant with the one set; therefore, the OUT Fw bus of QF5 “blocks” both the IN Fw bus of QF2 (passed through by a current flowing from TM2 and consequently in a direction concordant with the one set) as well as the IN Bw bus of QF3 (which is passed through by a current flowing from TM1 and consequently in a direction discordant with the one set). Similarly,

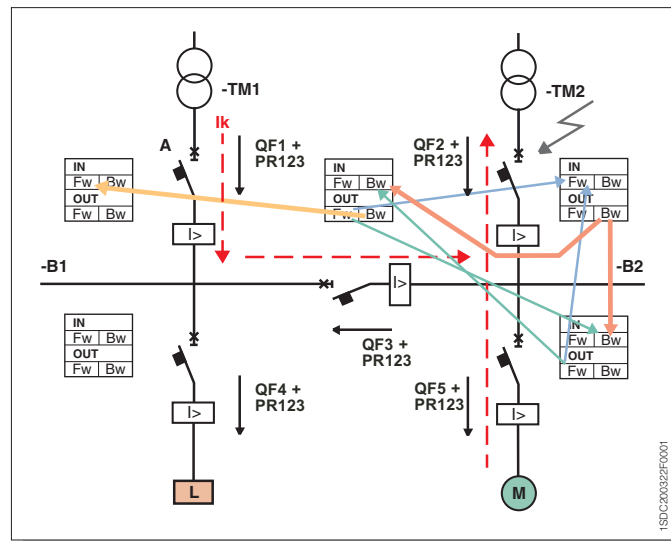
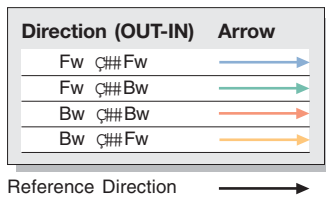
circuit-breaker QF3 is also passed through by a current flowing from TM1 in a direction discordant with the one set: consequently, the OUT Bw bus of QF3 “blocks” the IN Fw bus of QF1 (passed through by a current flowing from TM1 and therefore in a direction concordant with the setting).



3) Fault on the supply side of transformer TM2: in this case, only circuit-breaker QF2 must interrupt the fault. Circuit-breaker QF2 is passed through by a current flowing from TM1 and from the motor, in a direction discordant with the one set; as a consequence the OUT Bw bus of QF2 “blocks”:

- the IN Bw bus of QF5 (passed through by a current flowing from the motor and consequently in a direction discordant with the one set)
- the IN Bw bus of QF3 (passed through by a current flowing from TM1 and consequently in a direction discordant with the one set).

Similarly, circuit-breaker QF3 is also passed through by a current flowing from TM1 in a direction discordant with the one set; therefore its OUT Bw bus “blocks” the IN Fw bus of QF1 (passed through by a current flowing from TM1 and therefore in a direction concordant with the setting).





Earth fault protection

Circuit-breakers with protection G

Circuit-breakers fitted with trip units offering earth fault protection function G are usually used in MV/LV distribution substations to protect both the transformers and the distribution lines.

Protection function G calculates the vectorial sum of the currents detected by the current transformers on the phases and on the neutral conductor. In a sound circuit, this sum, which is called residual current, is equal to zero, whereas in the presence of an earth fault it has a value depending on the fault ring involved.

Function G is effectively used in TT, IT, and TN-S electrical installations and, limited to the section of the installation with a neutral conductor (N) branched and separated from the conductor PE, in TN-CS systems as well (for the TN-S area only).

Function G is not used in TN-C systems, since these provide the neutral and protection functions using a single conductor.

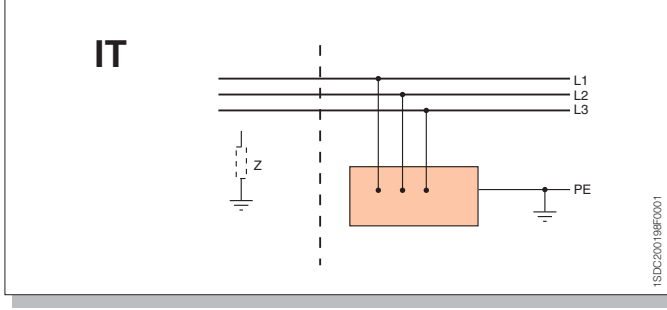
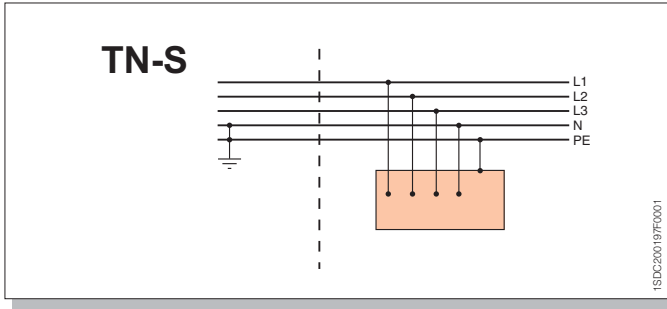
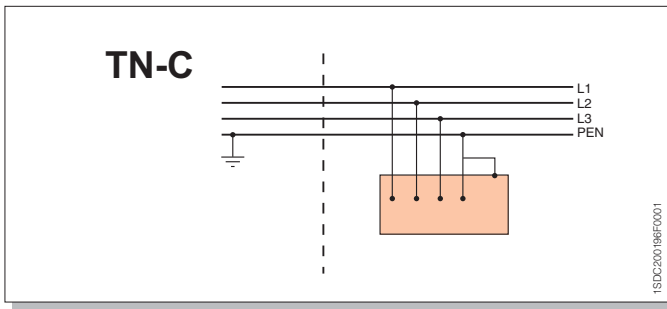
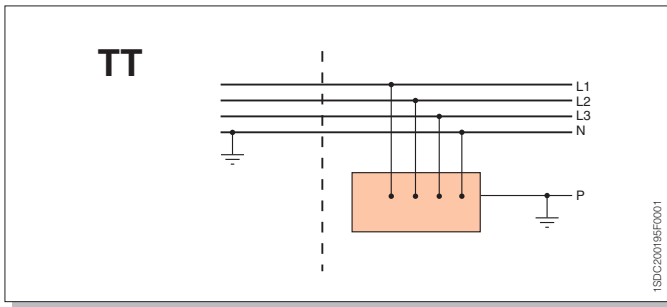
The protection device thresholds and trip times can be selected from a wide range, also making it easy to achieve selectivity for this type of fault with

regard to the protection devices installed on the load side. Selectivity is therefore ensured regarding the residual-current trip units located on the load side.

Function G of the PR121, PR122 and PR123 trip units is provided with specific let-through energy curves ($I^2t=k$) and with independent time-current curves ($t=k$).

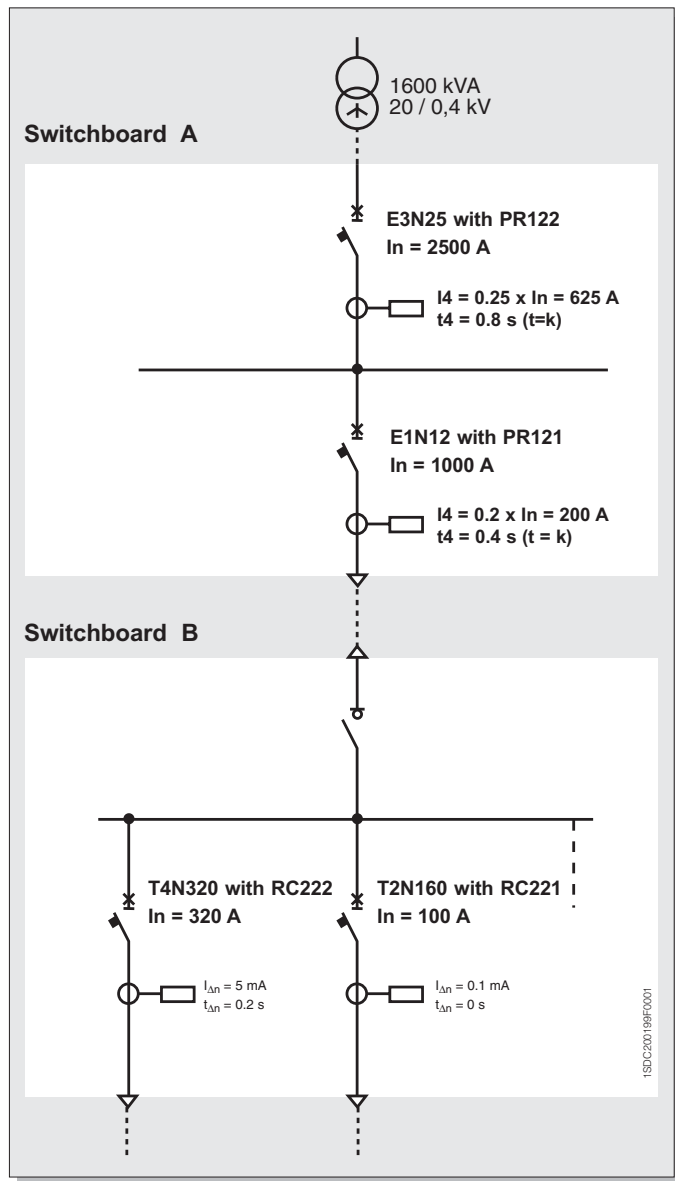
The figure in the following page shows an example of one possible choice of earth fault protection devices and their possible settings.

Protection functions G of the circuit-breakers on the main switchboard A serve to enable them to trip selectively, in relation to each other and to the residual-current protection devices located on the loads of the distribution switchboard B.



absence of fault	fault	trip within t_4
$I_d = I_{L1} + I_{L2} + I_{L3} + I_N = 0$	$I_d = I_{L1} + I_{L2} + I_{L3} + I_N \neq 0$	$I_d \geq I_4$

Example of selection of earth fault protection devices and their relevant settings.





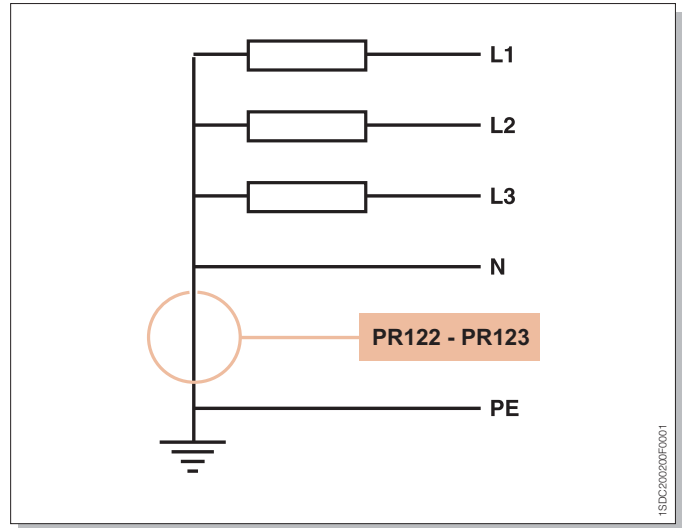
Earth fault protection

Use of the toroid on the star center of the transformer

In the case of circuit-breakers to protect MV/LV transformers, it is possible to install a toroid on the conductor connecting the star centre of the transformer to earth (application allowed with the SACE Emax series fitted with the PR122 and PR123 electronic trip units. This detects the earth fault current.

The figure beside shows the operating principle of the toroid installed on the star centre of the transformer.

The use of this accessory allows the protection threshold against earth fault (function G) to be independent of the size of the primary current transformers installed on the circuit-breaker phases. For the technical characteristics of the toroid see the table at page 6/24.



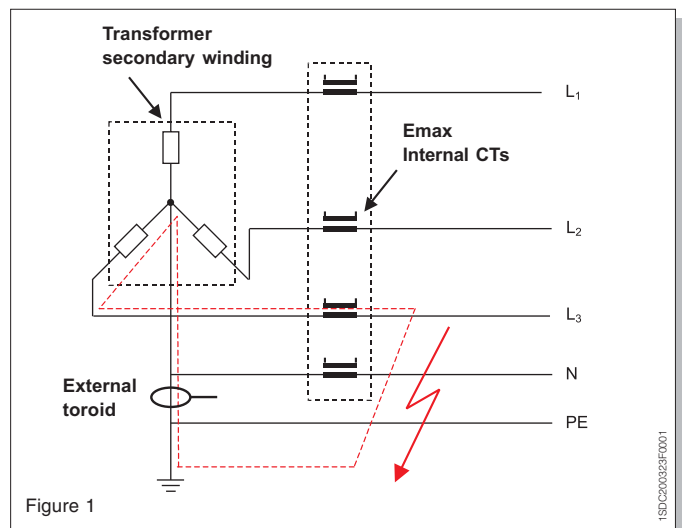
Double G

The Emax type circuit-breakers, equipped with the PR123 electronic trip unit, allow two independent curves for protection G: one for the internal protection (function G without external toroid) and one for the external protection (function G with external toroid, as described in the above paragraph).

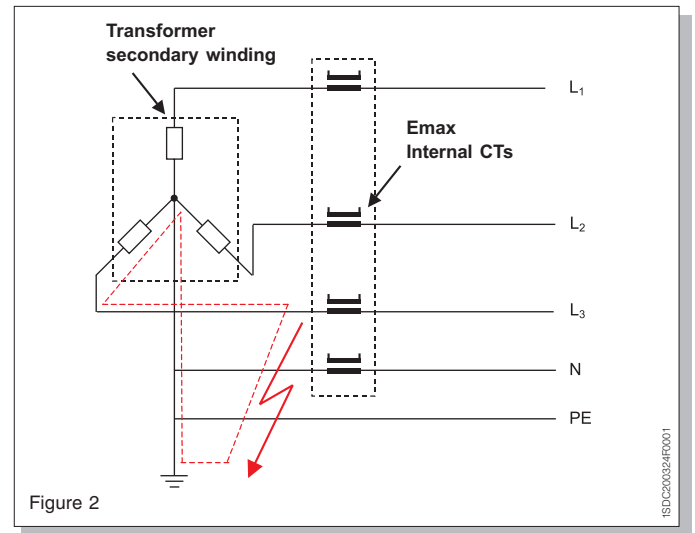
A typical application of function double G consists in simultaneous protection both against earth fault of the secondary of the transformer and of its connection cables to the circuit-breaker terminals (restricted earth fault protection), as well as against earth faults on the load side of the circuit-breaker (outside the restricted earth fault protection).

Example

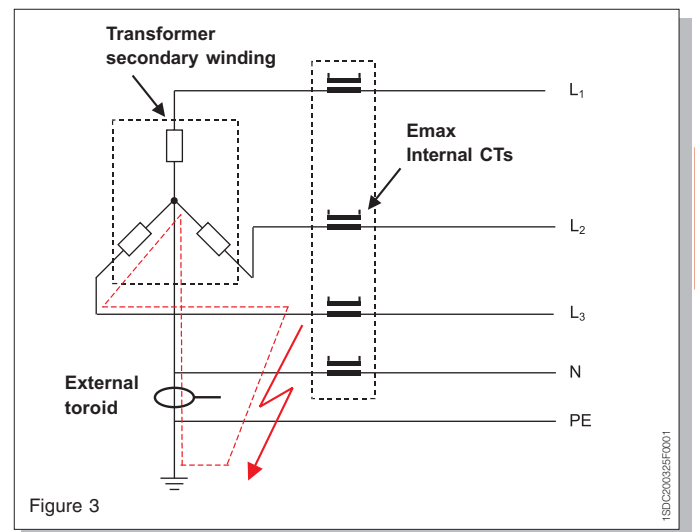
Figure 1 shows a fault on the load side of an Emax circuit-breaker: the fault current flows through one phase only and, if the vectorial sum of the currents detected by the four current transformers (CTs) is to be higher than the set threshold, the electronic trip unit activates function G (and the circuit-breaker trips).



With the same configuration, a fault on the supply side of the circuit-breaker (Figure 2) does not cause intervention of function G since the fault current does not affect either the CT of the phase or that of the neutral.



The use of function “double G” allows installation of an external toroid, as shown in Figure 3, so that earth faults on the supply side of Emax CB can be detected as well. In this case, the alarm contact of the second G is exploited in order to trip the circuit-breaker installed on the primary and to ensure fault disconnection.



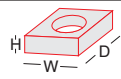


Earth fault protection

If, with the same configuration as Figure 3, the fault occurs on the load side of the Emax circuit-breaker, the fault current would affect both the toroid as well as the current transformers on the phases. To define which circuit-breaker is to trip (MV or LV circuit-breaker), suitable coordination of the trip times is required: in particular, it is necessary to set the times so that the LV circuit-breaker opening due to internal function G is faster than realization of the alarm signal coming from the external toroid. Therefore, thanks to the time-current discrimination between the two G protection functions, before the MV circuit-breaker on the primary of the transformer receives the trip command, the circuit-breaker on the LV side is able to eliminate the earth fault. Obviously, if the fault occurred on the supply side of the LV circuit-breaker, only the circuit-breaker on the MV side would trip.

The table shows the main characteristics of the range of toroids (available only in the closed version).

Characteristics of the toroid ranges

Rated current	up to 2000 A
Outer dimensions of the toroid	
	D = 400 mm
	W = 198 mm
	H = 51 mm

Residual current protection

Emax air circuit-breakers can be equipped with a toroid fitted on the back of the circuit-breaker so as to ensure protection against earth faults.

In particular, the electronic trip unit types able to perform this function are:

- PR122/P L – S – I – Rc
- PR122/P L – S – I – G - with “Measuring” module
- PR123/P L – S – I – G

which can all be provided for the following types of circuit-breakers: E1 and E2, both three and four pole versions, and E3 (three pole version).

Thanks to the wide range of settings, the above mentioned electronic trip units with the residual current function are suitable for applications where a residual current protection system coordinated with the various distribution levels is to be constructed from the main switchboards to the final load.

It is particularly suitable where low-sensitivity residual current protection is required, for example in both partial (current-type) or total (time-type) selectivity chains, and for high-sensitivity applications to protect people against indirect contact.

These electronic trip units with residual current protection are suitable for use in the presence of:

- alternating earth current (Type AC)
- alternating and/or pulsating current with continuous components (Type A)

The table below shows the main technical characteristics of the residual current protection:

Sensitivity I_{an}	[A]	3-5-7-10-20-30 (dip in position 1)
Tripping time	[s]	0.06-0.1-0.2-0.3-0.4-0.5-0.8
Type		AC and A

Using the SACE RCQ switchboard electronic residual current relays

The family of SACE Emax circuit-breakers with a rated current up to 2000A can be combined, if fitted with a shunt opening trip unit, with the SACE RCQ residual current relay for switchboard with a separate toroidal transformer (for installation outside on the line conductors) thereby enabling earth leakage currents to be determined for values between 0.03 and 30A.

Thanks to the wide range of settings, the SACE RCQ switchboard relay is suitable for applications where a residual current protection system coordinated with the various distribution levels is to be constructed from the main switchgear to the final load.

It is particularly suitable, for example, where low-sensitivity residual current protection is required in both partial (current-type) and total (time-type) selective chains, and for high-sensitivity applications to protect people against indirect contact.

When the auxiliary power supply voltage drops, the opening command intervenes after a minimum time of 100ms and after the time set above 100ms.

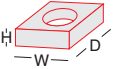
The SACE RCQ relay is only suitable for use in the presence of alternating earth current (Type AC), for alternating and/or pulsating current with continuous components (Type A), and is suitable for achieving residual current selectivity.

The SACE RCQ relay acts indirectly, and works on the trip unit mechanism of the circuit-breaker by means of the circuit-breaker shunt opening trip unit (to be ordered by the customer) to be housed in the circuit-breaker itself.

The table below shows the main characteristics of the SACE RCQ relay.

SACE RCQ residual current switchboard relay			
Power supply voltage	AC	[V]	80 ... 500
	DC	[V]	48 ... 125
Tripping threshold setting	I Δ n		
- 1 st setting range	[A]	0.03 - 0.05 - 0.1 - 0.3 - 0.5	
- 2 nd setting range	[A]	1 - 3 - 5 - 10 - 30	
Trip time settings 1 ^a range	[s]	0 - 0.05 - 0.1 - 0.25	
Trip time settings 2 ^a range	[s]	0.5 - 1 - 2.5 - 5	
Range of use of closed transformers			
- Toroidal transformer \varnothing 60mm	[A]	0.03 ... 30	
- Toroidal transformer \varnothing 110mm	[A]	0.03 ... 30	
Range of use of transformers that can be opened			
- Toroidal transformer \varnothing 110mm	[A]	0.3 ... 30	
- Toroidal transformer \varnothing 180mm	[A]	0.1 ... 30	
- Toroidal transformer \varnothing 230mm	[A]	0.1 ... 30	
Dimensions (D x H x W)	[mm]	96 x 96 x 131.5	
Drilling for assembly on door	[mm]	92 x 92	

Dimensions of the external toroid for SACE RCQ

Outer dimensions of the toroid		Closed			Openable		
	D [mm]	94	165	166	241	297	
	W [mm]	118	160	200	236	292	
	H [mm]	81	40	81	81	81	
Internal diameter \varnothing [mm]		60	110	110	180	230	



Switching and protection of transformers

General information

When choosing circuit-breakers to protect the LV side of MV/LV transformers, the following must basically be taken into account:

- the rated current of the protected transformer on the LV side, on which the circuit-breaker capacity and protection settings both depend;
- the maximum short-circuit current at the point of installation, which determines the minimum breaking capacity that must be offered by the protection device.

MV-LV substation with a single transformer

The rated current of the transformer, LV side, is determined by the following equation

$$I_n = \frac{S_n \times 10^3}{\sqrt{3} \times U_{20}}$$

where

S_n = rated power of the transformer, in kVA

U_{20} = rated secondary voltage (no load) of the transformer, in V

I_n = rated current of the transformer, LV side, in A (rms value)

The three-phase short-circuit current at full voltage, right at the LV terminals of the transformer, can be expressed by the following equation (assuming infinite short-circuit power at the primary):

$$I_k = \frac{I_n \times 100}{U_k\%}$$

where:

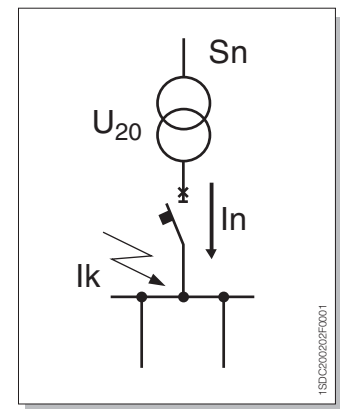
$U_k\%$ = short-circuit voltage of the transformer, in %

I_n = rated current, LV side, in A (rms value)

I_k = rated three-phase short-circuit current, LV side, in A (rms value)

If the circuit-breaker is installed some distance away from the transformer by using a cable or a bus duct connection, the short-circuit current decreases, as a function of the impedance of the connection, in comparison with the values obtained by the equation above.

In practice, the short-circuit value provided by the transformer is also affected by the short-circuit power of the S_k network to which the transformer is connected.



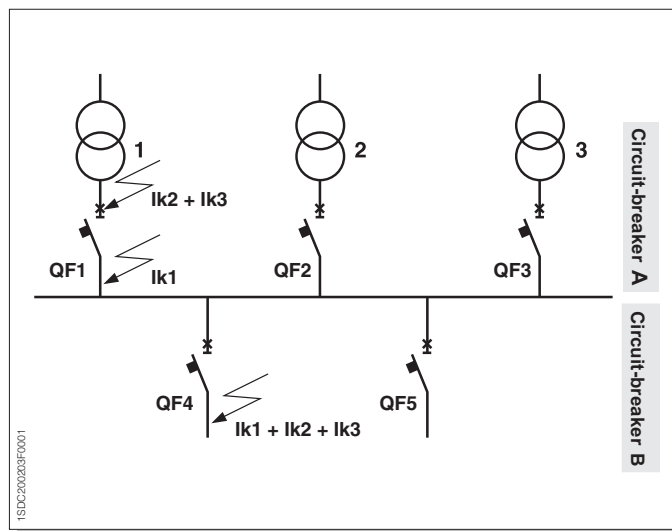
MV-LV substation with multiple transformers in parallel

The rated current of the transformer is calculated following the same procedure outlined in the previous section.

The minimum breaking capacity of each protection circuit-breaker on the LV side must be higher than the highest of the following values (the example is for machine 1 in the figure and applies to three machines in parallel):

- I_{k1} (short-circuit current of transformer 1) in the event of a fault immediately on the load side of circuit-breaker QF1;
- $I_{k2} + I_{k3}$ (I_{k2} and I_{k3} = short-circuit currents of transformers 2 and 3) in the event of a short-circuit on the supply side of circuit-breaker QF1.

Circuit-breakers QF4 and QF5 on the outgoing feeders must have a breaking capacity higher than $I_{k1} + I_{k2} + I_{k3}$; the contribution to the short-circuit current by each transformer obviously depends on the short-circuit power of the network to which it is connected, and on the line connecting the transformer and the circuit-breaker (to be determined on a case-by-case basis).





Switching and protection of transformers

Switching and protection of transformers Sk=750MVA Vn= 400V

Transformer	Circuit-breaker A (LV side)			Circuit-breaker B (Feeder circuit-breaker)														
	S _r	U _k	Transf I _r	Busbar I _b	Transf Feeder I _k	Type	Trip unit	Busbar I _k										
	[kVA]	%	[A]	[A]	[kA]		size	[kA]	800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A		
1x500	4	722	722	17.7	E1B 800	In=800	17.7	E1B08*										
1x630	4	909	909	22.3	E1B 1000	In=1000	22.3	E1B08*										
1x800	5	1155	1155	22.6	E1B 1250	In=1250	22.6	E1B08*										
1x1000	5	1443	1443	28.1	E1B 1600	In=1600	28.1	E1B08*	E1B10*	E1B12*								
1x1250	5	1804	1804	34.9	E2B 2000	In=2000	34.9	E1B08*	E1B10*	E1B12*	E1B16*							
1x1600	6.25	2309	2309	35.7	E3N 2500	In=2500	35.7	E1B08*	E1B10*	E1B12*	E1B16*	E2B20*						
1x2000	6.25	2887	2887	44.3	E3N 3200	In=3200	44.3	E1N08*	E1N10*	E1N12*	E1N16*	E2N20*	E3N25*					
1x2500	6.25	3608	3608	54.8	E4S 4000	In=4000	54.8	E2N10*	E2N10*	E2N12*	E2N16*	E2N20*	E3N25*	E3N32*				
1x3125	6.25	4510	4510	67.7	E6H 5000	In=5000	67.7	E2S08*	E2S10*	E2S12*	E2S16*	E2S20*	E3S25*	E3S32*	E4S40			

Transformer	Circuit-breaker A (LV side)			Circuit-breaker B (Feeder circuit-breaker)														
	S _r	U _k	Transf I _r	Busbar I _b	Transf Feeder I _k	Type	Trip unit	Busbar I _k										
	[kVA]	%	[A]	[A]	[kA]		size	[kA]	800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A		
2x500	4	722	1444	17.5	E1B 800	In=800	35.9	E1B08*										
2x630	4	909	1818	21.8	E1B 1000	In=1000	43.6	E1N08*	E1N10*	E1N12*	E1N16*							
2x800	5	1155	2310	22.1	E1B 1250	In=1250	44.3	E1N08*	E1N10*	E1N12*	E1N16*	E2N20*						
2x1000	5	1443	2886	27.4	E1B 1600	In=1600	54.8	E2N10*	E2N10*	E2N12*	E2N16*	E2N20*	E3N25*					
2x1250	5	1804	3608	33.8	E2B 2000	In=2000	67.7	E2S08*	E2S10*	E2S12*	E2S16*	E2S20*	E3S25*	E3S32*				
2x1600	6.25	2309	4618	34.6	E3N 2500	In=2500	69.2	E2S08*	E2S10*	E2S12*	E2S16*	E2S20*	E3S25*	E3S32*	E4S40			
2x2000	6.25	2887	5774	42.6	E3N 3200	In=3200	85.1	E3H08*	E3H10*	E3H12*	E3H16*	E3H20*	E3H25*	E3H32*	E4H40			

6

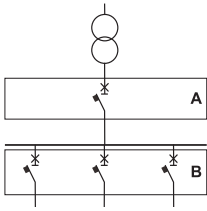
Transformer	Circuit-breaker A (LV side)			Circuit-breaker B (Feeder circuit-breaker)														
	S _r	U _k	Transf I _r	Busbar I _b	Transf Feeder I _k	Type	Trip unit	Busbar I _k										
	[kVA]	%	[A]	[A]	[kA]		size	[kA]	800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A		
3x630	4	909	2727	42.8	E1N 1000	In=1000	64.2	E2N10*	E2N10*	E2N12*	E2N16*	E2N20*	E3N25*					
3x800	5	1155	3465	43.4	E1N 1250	In=1250	65	E2N10*	E2N10*	E2N12*	E2N16*	E2N20*	E3N25*					
3x1000	5	1443	4329	53.5	E2N 1600	In=1600	80.2	E2S08*	E2S10*	E2S12*	E2S16*	E2S20*	E3H25*	E3H32*				
3x1250	5	1804	5412	65.6	E2S 2000	In=2000	98.4	E3H08*	E3H10*	E3H12*	E3H16*	E3H20*	E3H25*	E3H32*	E4H40			
3x1600	6.25	2309	6927	67	E3S 2500	In=2500	100.6	E3V08*	E3V12*	E3V12*	E3V16*	E3V20*	E3V25*	E3V32*	E4V40			

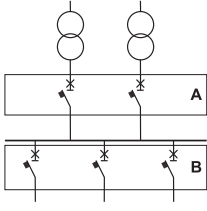
WARNING!

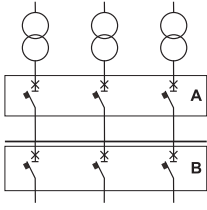
The table refers to the conditions specified on the previous page. The information for selecting the circuit-breakers is provided only in relation to the operating current and prospective short-circuit current. To make the correct selection, other factors such as selectivity, back-up protection, the decision to use current-limiting circuit-breakers, etc. have to be considered. It is therefore essential for designers to carry out precise verification.

The types of circuit-breakers proposed are all from the SACE Emax series. Positions marked by an asterisk (*) are suitable for other possible selections from the Tmax or Isomax series of moulded-case circuit-breakers. One also needs to bear in mind that the short-circuit currents shown in the table have been calculated on the assumption of 750MVA power on the supply side of the transformers and without taking into account the impedances of the busbars and of the connections to the circuit-breakers.

Switching and protection of transformers Sk=750MVA Vn= 690V

Transformer	Circuit-breaker A (LV side)				Circuit-breaker B (Feeder circuit-breaker)														
	S_r	U_k	Transf I_r	Busbar I_b	Transf Feeder I_k	Type	Trip unit	Busbar I_k											
	[kVA]	%	[A]	[A]	[kA]		size	[kA]	400A	630A	800A	1000A	1250A	1600A	2000A	2500A	3200A	4000A	
	1x500	4	418	418	10.3	E1B 800	In=630	10.3	E1B08*										
	1x630	4	527	527	12.9	E1B 800	In=630	12.9	E1B08*										
	1x800	5	669	669	13.1	E1B 800	In=800	13.1	E1B08* E1B08*										
	1x1000	5	837	837	16.3	E1B 1000	In=1000	16.3	E1B08* E1B08* E1B08*										
	1x1250	5	1046	1046	20.2	E1B 1250	In=1250	20.2	E1B08* E1B08* E1B08*										
	1x1600	6.25	1339	1339	20.7	E1B 1600	In=1600	20.7	E1B08* E1B08* E1B08* E1B10* E1B12*										
	1x2000	6.25	1673	1673	25.7	E2B 2000	In=2000	25.7	E1B08* E1B08* E1B08* E1B10* E1B12* E2B16*										
	1x2500	6.25	2092	2092	31.8	E3N 2500	In=2500	31.8	E1B08* E1B08* E1B08* E1B10* E1B12* E2B16*										
	1x3125	6.25	2615	2615	39.2	E3N 3200	In=3200	39.2	E2B16* E2B16* E2B16* E2B16* E2B16* E2B16* E2B20*										

Transformer	Circuit-breaker A (LV side)				Circuit-breaker B (Feeder circuit-breaker)														
	S_r	U_k	Transf I_r	Busbar I_b	Transf Feeder I_k	Type	Trip unit	Busbar I_k											
	[kVA]	%	[A]	[A]	[kA]		size	[kA]	400A	630A	800A	1000A	1250A	1600A	2000A	2500A	3200A	4000A	
	2x500	4	418	837	10.1	E1B800	In=630	20.2	E1B08* E1B08*										
	2x630	4	527	1054	12.6	E1B800	In=630	25.3	E1B08* E1B08* E1B08*										
	2x800	5	669	1339	12.8	E1B800	In=800	25.7	E1B08* E1B08* E1B08* E1B10*										
	2x1000	5	837	1673	15.9	E1B1000	In=1000	31.8	E1B08* E1B08* E1B08* E1B10* E1B12*										
	2x1250	5	1046	2092	19.6	E1B1250	In=1250	39.2	E2B16* E2B16* E2B16* E2B16* E2B16* E2B16*										
	2x1600	6.25	1339	2678	20.1	E1B1600	In=1600	40.1	E2B16* E2B16* E2B16* E2B16* E2B16* E2B16* E2B20*										
	2x2000	6.25	1673	3347	24.7	E2B2000	In=2000	49.3	E2N10* E2N10* E2N10* E2N10* E2N12* E2N16* E2N20* E3N25*										

Transformer	Circuit-breaker A (LV side)				Circuit-breaker B (Feeder circuit-breaker)														
	S_r	U_k	Transf I_r	Busbar I_b	Transf Feeder I_k	Type	Trip unit	Busbar I_k											
	[kVA]	%	[A]	[A]	[kA]		size	[kA]	400A	630A	800A	1000A	1250A	1600A	2000A	2500A	3200A	4000A	
	3x630	4	527	1581	24.8	E1B800	In=630	37.2	E2B16* E2B16* E2B16* E2B16* E2B16*										
	3x800	5	669	2008	25.2	E1B800	In=800	37.7	E2B16* E2B16* E2B16* E2B16* E2B16* E2B16*										
	3x1000	5	837	2510	31.0	E1B1000	In=1000	46.5	E2N10* E2N10* E2N10* E2N10* E2N12* E2N16* E2N20*										
	3x1250	5	1046	3138	38.0	E2B1600	In=1600	57.1	E2S08* E2S08* E2S08 E2S10* E2S12 E2S16 E2S20 E3N25										
	3x1600	6.25	1339	4016	38.9	E2B1600	In=1600	58.3	E2S08* E2S08* E2S08 E2S10* E2S12 E2S16 E2S20 E3N25 E3N32										
	3x2000	6.25	1673	5020	47.5	E2N2000	In=2000	71.2	E3S10* E3S10* E3S10* E3S10* E3S12 E3S16 E3S20 E3S25 E3S32 E4S40										

WARNING!

The table refers to the conditions specified on the previous page. The information for selecting the circuit-breakers is provided only in relation to the operating current and prospective short-circuit current. To make the correct selection, other factors such as selectivity, back-up protection, the decision to use current-limiting circuit-breakers, etc. have to be considered. It is therefore essential for designers to carry out precise verification.

The types of circuit-breakers proposed are all from the SACE Emax series. Positions marked by an asterisk (*) are suitable for other possible selections from the Tmax or Isomax series of moulded-case circuit-breakers. One also needs to bear in mind that the short-circuit currents shown in the table have been calculated on the assumption of 750MVA power on the supply side of the transformers and without taking into account the impedances of the busbars and of the connections to the circuit-breakers.



Line protection

The following main parameters must be known in order to make the correct choice of circuit-breakers for line operation and protection:

- operating current of the line I_b
- permanent current-carrying capacity of the conductor I_z
- section S and cable insulation material, with relative constant K
- short-circuit current I_k at the point of installation of the circuit-breaker.

The protection device selected must offer a breaking capacity (I_{cu} or I_{cs} at the system voltage) higher than or equal to the short-circuit value at the application point. The operating characteristics of the device selected must also meet the following conditions:

Overload protection

$$I_b \leq I_n \leq I_z$$

$$I_f \leq 1.45 I_z$$

where

- I_b is the operating current of the circuit;
- I_z is the permanent current-carrying capacity of the conductor;
- I_n is the adjusted rated current of the protection device;
- I_f is the current that ensures effective operation of the protection device.

The above inequalities are easily respected thanks to the wide setting ranges offered by the PR121-PR122-PR123 trip units.

Short-circuit protection

Assuming that a conductor overheats adiabatically during the passage of the short-circuit current, the following formula must be verified:

$$(I^2t)_{\text{circuit-breaker}} \leq (K^2S^2)_{\text{cable}}$$

therefore the specific let-through energy (I^2t) of the circuit-breaker must be lower than or equal to the specific let-through energy (K^2S^2) withstood by the cable.

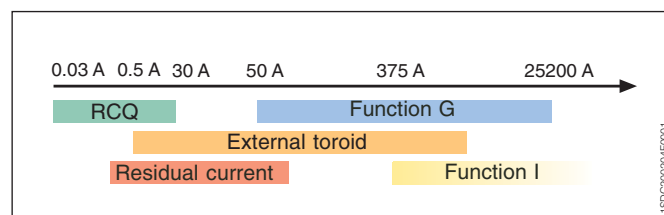
Also make sure that the circuit-breaker trips within the limits prescribed by the international standards regarding the minimum value of the short-circuit current at the end of the line.

The minimum short-circuit current is the current which corresponds to a short-circuit occurring between phase and neutral (or between phase and phase if the neutral conductor is not distributed) at the farthest point of the conductor.

Protection against indirect contacts

In the event of a fault involving a phase and a part of the installation that is not normally live, it is best to make sure that the circuit-breaker trips within the times prescribed by the international standards for current values lower than or equal to the fault current.

Based on the value of this current, it is possible to intervene using function I of the trip unit, function G or, for extremely low values, the RCQ device.



The figure shows which function of the electronic trip unit or device to use on the basis of the fault current.

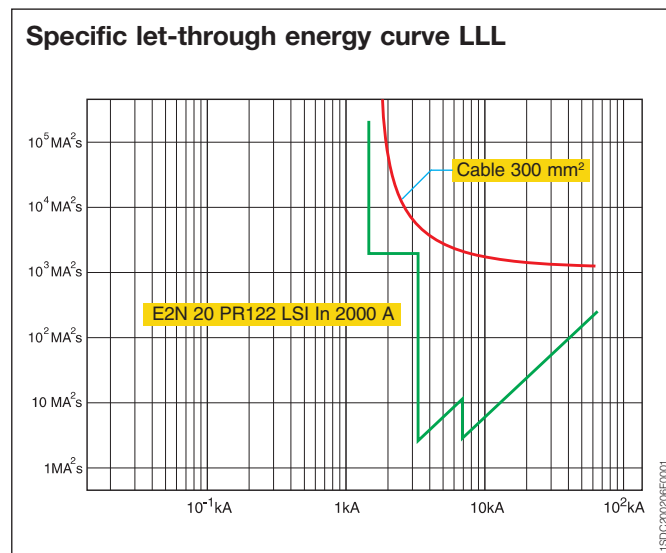
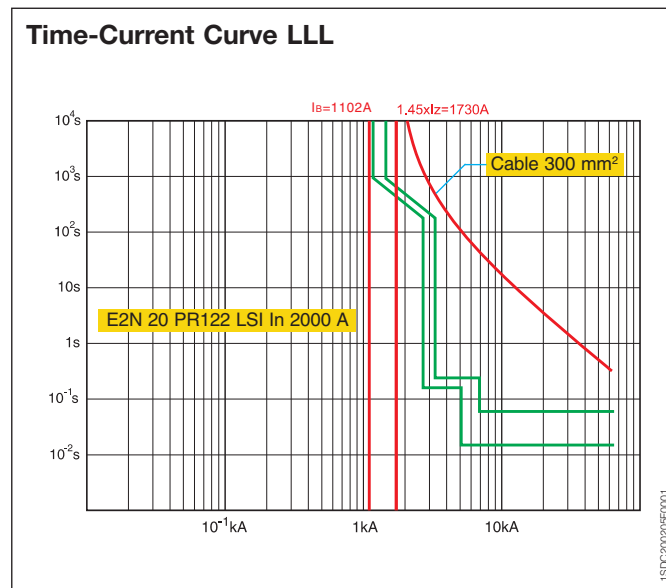
Note

With regard to the verification required by the IEC 60364-4-43 Standards, which prescribe that the overload protection must have a trip current I_z ensuring effective operation of the device at a value lower than $1.45 I_z$ ($I_z < 1.45 I_b$), this is always satisfied since SACE Emax circuit-breakers comply with the CEI EN 60947-2 Standards and this value is $1.3 I_n$.

Example:

In an installation with $U_n=400V$ and $I_k=45kA$, a load with $I_b=1102A$ is supplied with 4 cables in parallel, insulated in EPR of $300mm^2$ and $I_z=1193A$

With appropriate settings, the E2N2000 $I_n=2000A$ circuit-breaker fitted with the PR122 electronic protection trip unit, protects the cable in accordance with the above conditions, as illustrated in the following graphs.



Note

For protection against indirect contacts, it may be necessary to link the setting of the short-circuit protection to the length of the line protected. See the *Slide rule kit* and DOCwin software package for the calculation procedures required. Special attention must be paid to the selective coordination of circuit-breakers in series, to limit disservice in the event of faults to a minimum.



Switching and protection of generators

Emax circuit-breakers are suitable for use with low-voltage generators employed in the following applications:

- A - back-up generators for primary loads
- B - generators disconnected from the supply network
- C - generators for small power stations connected in parallel with other generators and, possibly, with the power supply network.

In cases A and B, the generator does not operate in parallel with the power supply network: the short-circuit current therefore depends on the generator itself and, possibly, on the connected loads.

In case C, the breaking capacity must be determined by assessing the short-circuit current imposed by the network at the point of circuit-breaker installation.

The main points to check for generator protection are:

- the short-circuit current delivered by the generator; this can only be assessed if one is familiar with the machine's typical reactance and time constants. Here one can simply note that low short-circuit protection device settings are normally required (2-4 times I_n);
- the thermal overload limit of the machine. According to the IEC 60034-1 Standard, this value is set at $1.5 \times I_n$ for a period of 30 seconds.

For a detailed assessment, see the DOCWin program or specialized books on the topic.

The wide range of settings offered by electronic trip units:

PR121 Threshold I (1.5 to 15) x I_n Threshold S (1 to 10) x I_n
PR122 Threshold I (1.5 to 15) x I_n Threshold S (0.6 to 10) x I_n
PR123 Threshold I (1.5 to 15) x I_n Threshold S (0.6 to 10) x I_n

makes SACE Emax circuit-breakers perfectly suitable for protecting large generators against short-circuit currents and against thermal overloads.

Table for selecting circuit-breakers to protect generators

The table shows the rated currents of the circuit-breakers, based on the electrical specifications of the generators. The breaking capacity required by the application must be defined in order to select the appropriate circuit-breaker.

The electronic protection trip units available are suitable for all requirements.

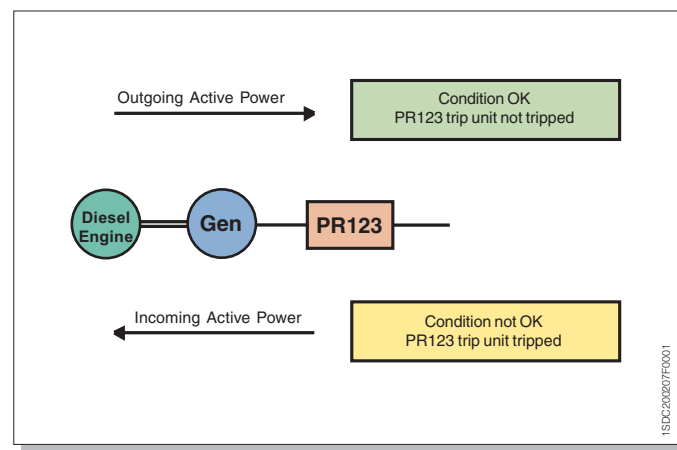
Frequency 50 Hz - Voltage 400 V			Frequency 60 Hz - Voltage 450 V		
Rated power of the generator [kVA]	Rated current of the generator [A]	Rated current of the circuit-breaker [A]	Rated power of the generator [kVA]	Rated current of the generator [A]	Rated current of the circuit-breaker [A]
630	909	1000	760	975	1000
710	1025	1250	850	1091	1250
800	1155	1250	960	1232	1250
900	1299	1600	1080	1386	1600
1000	1443	1600	1200	1540	1600
1120	1617	2000	1344 - 1350	1724 - 1732	2000
1250	1804	2000	1500	1925	2000
1400	2021	2500	1650 - 1680 - 1700	2117 - 2155 - 2181	2500
1600	2309	2500	1920 - 1900	2463 - 2438	2500
1800	2598	3200	2160 - 2150	2771 - 2758	3200
2000	2887	3200	2400	3079	3200
2250	3248	4000	2700	3464	4000
2500	3608	4000	3000	3849	4000
2800	4041	5000	3360	4311	5000
3150	4547	5000	3780	4850	5000
3500	5052	6300	4200	5389	6300



Switching and protection of generators

Reverse power protection RP

The reverse power protection is tripped when active power is incoming to the generator rather than outgoing as it is under normal conditions. Power reversal takes place if the mechanical power supplied by the main motor driving the generator drops sharply. In this condition, the generator acts as a motor, and can cause serious damage to the prime movers, such as overheating in steam turbines, cavitation in hydraulic turbines, or explosions of uncombusted diesel fuel in diesel engines.

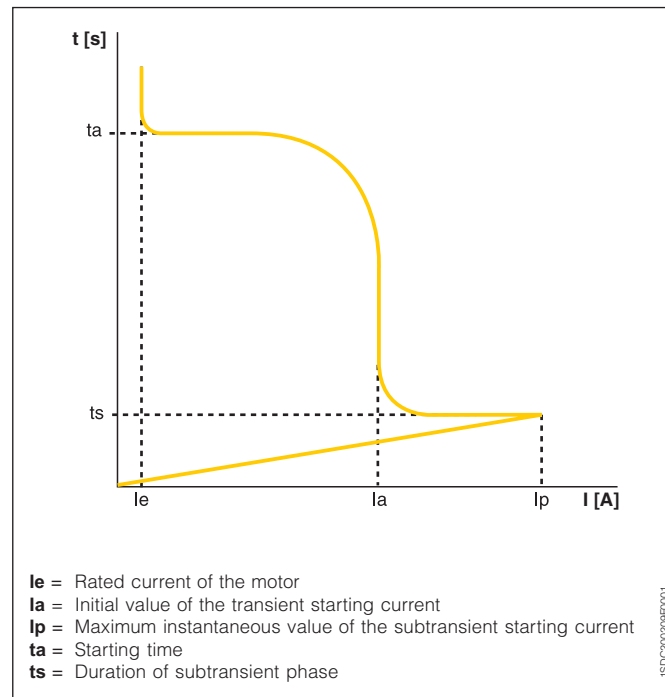


When the power measured by the trip unit falls below zero, the PR123 trip unit trips, opening the circuit-breaker and thereby preventing any damage.

Switching and protection of asynchronous motors

A low voltage automatic air circuit-breaker can, by itself, guarantee the following functions in power supply circuits of three-phase asynchronous motors:

- switching
- overload protection
- short-circuit protection.



Trend of current values in the starting phase of a three-phase asynchronous motor.

This solution is particularly suitable if the switching frequency is not high, as it is normally the case for large motors. In this case, using only the circuit-breaker for motor switching and protection represents a highly advantageous solution thanks to its competitive cost-efficiency, reliability, ease of installation and maintenance, and compact overall dimensions. The circuit-breakers in the SACE Emax selective (not current-limiting) series are able to provide the motor switching and protection function by virtue of their high breaking capacities and the wide range of possible settings offered by the electronic trip units.

SACE Emax circuit-breakers are suitable for use with motors with rated powers within the range between 355 kW and 630 kW. For power ratings up to 355 kW, the moulded-case circuit-breakers in the SACE Isomax and Tmax range are also available. Medium voltage power supplies are normally used for powers above 630 kW.

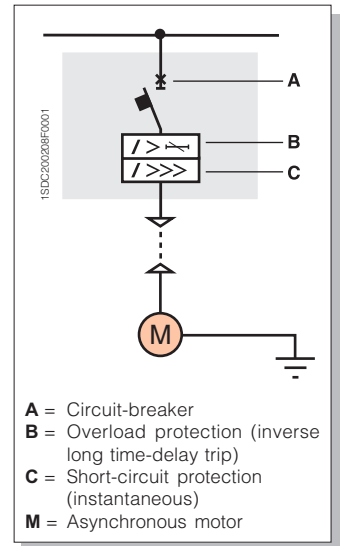


Diagram showing direct starting of an asynchronous motor using just the circuit-breaker fitted with an electronic overcurrent trip unit.



Switching and protection of asynchronous motors

The switching of three-phase asynchronous motors demands considerable attention to the starting operation, since the current during this phase follows the typical behaviour shown in the figure, which must be taken into account when selecting the protection devices.

It is essential to calculate the typical values of the times and currents indicated in the figure in order to select the correct switching and protection devices for the motor. These data are normally provided by the motor manufacturer.

The following ratios generally apply:

- $I_a = 6-10 I_e$ (I_a and I_e : rms values)
- $I_p = 8-15 I_e$ (I_p and I_e : rms values).

The protection trip units must be adjusted so as to:

- prevent unwanted tripping
- ensure that the installation is protected against the overcurrents which might occur at any point on the load side of the circuit-breaker (including internal motor faults).

The inverse long time-delay trip protection and instantaneous short-circuit protection must be set as close as possible to the motor starting curve without, however, interfering with it.

Note

The IEC 60947-4-1 Standard covers motor starters. The following classes are considered for overload protection:

Operating class	Trip time t (s) for $I = 7.2 \times I_1$ ($I_1 =$ release setting current)
10A	$2 < t \leq 10$
10	$4 < t \leq 10$
20	$6 < t \leq 20$
30	$9 < t \leq 30$

The table specifies that the protection device must trip in a time t within the limits for its class when the current flowing through the device to be protected is 7.2 times the trip unit setting current (assumed to be equal to the rated current of the motor).

The overload devices are divided into classes in a manner closely linked to the motor starting time: for example, a motor with a starting time of 5 seconds requires a protection device in class 20.

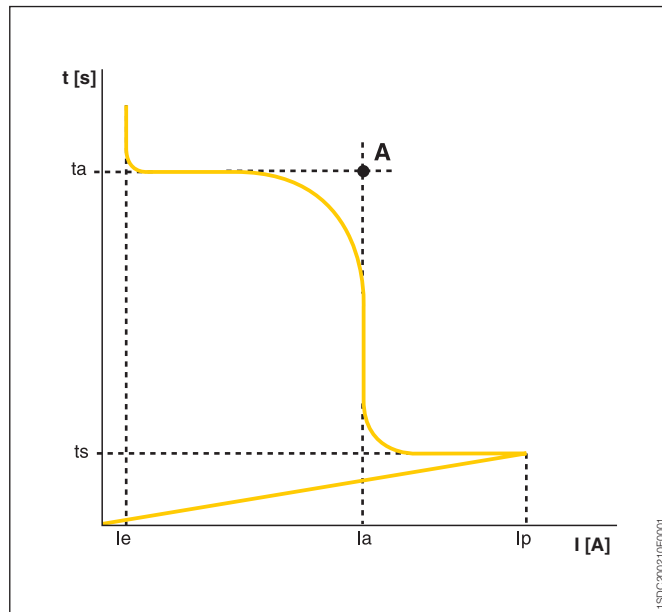
The same standards provide specific prescriptions for the protection device in cases of three-phase operation or with the loss of a phase.

Warning

The curves of the motor and trip units are not directly comparable, since they both express time-current links, but have conceptually different meanings:

- the motor starting curve represents the values taken by the starting current instant by instant;
- the trip unit curve represents the currents and corresponding trip times for the protection device.

The overload trip curve is set correctly when it is immediately above point A (figure below), which identifies the top of the rectangle with sides formed by the starting time “ t_a ” and the current “ I_a ” thermally equivalent to the variable starting current respectively.



Three-phase operation

The overload protection device at 1.05 times the setting current shall not trip in less than 2 hours starting from the cold state.

When the current is 1.2 times the setting current, the tripping shall occur in less than 2 hours, as indicated in the table which follows (page 6/39)



Switching and protection of asynchronous motors

Operation with the loss of a phase

The IEC 60947-4-1 Standard prescribes that a trip unit, with compensated temperature and sensitive to phase losses, must:

- not trip in less than two hours at 20°C, when one phase carries 90% of I_n and the other two carry 100% of I_n
- trip in less than two hours at 20°C, in the event of the loss of a phase when the current in the energized poles reaches 1.15 times the rated current I_n .

With the PR122 and PR123 trip units by activating the Unbalance function it is possible to check the losses of phase.

Selecting the circuit-breakers to be used for motor protection

The tables in the next pages show the rated characteristics for large motors, from 355 to 630 kW, with circuit-breakers in the SACE Emax series for switching and protecting motors in category AC-3 at 415/690 V - 50 Hz.

The tables show the choice of current transformers able to ensure a sufficiently high value for the instantaneous trip threshold setting (I): in the absence of experimental data, it is advisable to verify that the ratio between the threshold of protection device I (I3) and the threshold of protection device L (I1) is:

$$I3/I1 = 12 \dots 15.$$

The PR122 and PR123 electronic trip units conform to the international IEC 60947-4-1 Standard. In particular, the devices ensure protection of class 10A, 10, 20 and 30 of motors. PR122 and PR123 protection trip units are compensated in temperature, and their operation is not negatively affected by the loss of a phase.

Advantages of earth fault protection G

The earth fault protection (G) is recommended in order to:

- improve safety against fire hazards
- improve protection of motors and personnel in the event of machine faults.

Advantages of thermal memory

The advisability of enabling the thermal memory (option offered by PR122 and PR123 trip units) must be evaluated in relation to the type of load. Enabling the thermal memory (which makes the electronic protection similar to the one provided by a thermomagnetic device) increases the protection level of the motor when restarting after tripping due to an overload.

Undervoltage protection

The undervoltage protection device in control systems for asynchronous motors demands special attention, performing, amongst other things, two important functions:

- it prevents simultaneous restarting of all the motors on return of the power supply, with the risk of making the entire installation go out of service by tripping the main circuit-breaker overcurrent protection devices
- it prevents the motor from restarting without a control signal, which could be a hazard for maintenance personnel or could damage the processing cycle.

This protection can be carried out by:

- undervoltage trip unit,
- protection function UV (undervoltage) on the PR123 trip unit.

I/In	1.05	1.2	1.5	7.2	Operating class
Tp	> 2h	< 2h	< 120 s	2 < t ≤ 10s	10A
			< 240 s	4 < t ≤ 10s	10
			< 480 s	6 < t ≤ 20s	20
			< 720 s	9 < t ≤ 30s	30

Direct On Line – Normal Start-Up – 415V – 50Hz

Motor		SACE Emax circuit-breaker			Electronic trip unit	
Pe [kW]	Ie [A]	Operations (AC-3) [No.]	Type	Icu [kA]	Type	In [A]
220	368	10000	E1B08	42	PR122/PR123	630
250	415	10000	E1B08	42	PR122/PR123	630
315	521	10000	E1B10	42	PR122/PR123	800
355	588	10000	E1B10	42	PR122/PR123	800
400	665	10000	E1B12	42	PR122/PR123	800
450	743	10000	E1B12	42	PR122/PR123	1000
500	819	10000	E1B16	42	PR122/PR123	1000
560	916	10000	E1B16	42	PR122/PR123	1250
630	1022	10000	E1B16	42	PR122/PR123	1250
220	368	10000	E1N08	50	PR122/PR123	630
250	415	10000	E1N08	50	PR122/PR123	630
315	521	10000	E1N10	50	PR122/PR123	800
355	588	10000	E1N10	50	PR122/PR123	800
400	665	10000	E1N12	50	PR122/PR123	800
450	743	10000	E1N12	50	PR122/PR123	1000
500	819	10000	E1N16	50	PR122/PR123	1000
560	916	10000	E1N16	50	PR122/PR123	1250
630	1022	10000	E1N16	50	PR122/PR123	1250
220	368	15000	E2N10	65	PR122/PR123	630
250	415	15000	E2N10	65	PR122/PR123	630
315	521	15000	E2N10	65	PR122/PR123	800
355	588	15000	E2N12	65	PR122/PR123	800
400	665	15000	E2N12	65	PR122/PR123	800
450	743	15000	E2N12	65	PR122/PR123	1000
500	819	12000	E2N16	65	PR122/PR123	1000
560	916	12000	E2N16	65	PR122/PR123	1250
630	1022	12000	E2N16	65	PR122/PR123	1250
220	368	12000	E3H08	100	PR122/PR123	630
250	415	12000	E3H08	100	PR122/PR123	630
315	521	12000	E3H10	100	PR122/PR123	800
355	588	12000	E3H10	100	PR122/PR123	800
400	665	12000	E3H12	100	PR122/PR123	800
450	743	12000	E3H12	100	PR122/PR123	1000
500	819	10000	E3H16	100	PR122/PR123	1000
560	916	10000	E3H16	100	PR122/PR123	1250
630	1022	10000	E3H16	100	PR122/PR123	1250



Switching and protection of asynchronous motors

Direct On Line – Normal Start-Up – 690V – 50Hz

Motor		SACE Emax circuit-breaker			Electronic trip unit	
Pe [kW]	Ie [A]	Operations (AC-3) [No.]	Type	Icu [kA]	Type	In [A]
220	221	10000	E1B08	36	PR122/PR123	630
250	249	10000	E1B08	36	PR122/PR123	630
315	313	10000	E1B08	36	PR122/PR123	630
355	354	10000	E1B08	36	PR122/PR123	630
400	400	10000	E1B08	36	PR122/PR123	630
450	447	8000	E1B10	36	PR122/PR123	800
500	493	8000	E1B10	36	PR122/PR123	800
560	551	8000	E1B12	36	PR122/PR123	800
630	615	8000	E1B12	36	PR122/PR123	800
220	221	15000	E2N10	55	PR122/PR123	630
250	249	15000	E2N10	55	PR122/PR123	630
315	313	15000	E2N10	55	PR122/PR123	630
355	354	15000	E2N10	55	PR122/PR123	630
400	400	15000	E2N10	55	PR122/PR123	630
450	447	15000	E2N10	55	PR122/PR123	800
500	493	15000	E2N10	55	PR122/PR123	800
560	551	15000	E2N10	55	PR122/PR123	800
630	615	15000	E2N12	55	PR122/PR123	800
220	221	12000	E3S10	75	PR122/PR123	630
250	249	12000	E3S10	75	PR122/PR123	630
315	313	12000	E3S10	75	PR122/PR123	630
355	354	12000	E3S10	75	PR122/PR123	630
400	400	12000	E3S10	75	PR122/PR123	630
450	447	12000	E3S10	75	PR122/PR123	800
500	493	12000	E3S10	75	PR122/PR123	800
560	551	12000	E3S10	75	PR122/PR123	800
630	615	12000	E3S12	75	PR122/PR123	800
220	221	12000	E3V08	100	PR122/PR123	630
250	249	12000	E3V08	100	PR122/PR123	630
315	313	12000	E3V08	100	PR122/PR123	630
355	354	12000	E3V08	100	PR122/PR123	630
400	400	12000	E3V08	100	PR122/PR123	630
450	447	12000	E3V10	100	PR122/PR123	800
500	493	12000	E3V10	100	PR122/PR123	800
560	551	12000	E3V10	100	PR122/PR123	800
630	615	12000	E3V12	100	PR122/PR123	800

Operating conditions of circuit-breakers during continuous service for capacitor banks

According to the IEC 60831-1 and 60931-1 Standards, capacitors must be able to operate in service conditions with a rated rms current of up to 1.3 times the rated current I_{cn} of the capacitor. This prescription is due to the possible presence of harmonics in the mains voltage.

It should also be kept in mind that a tolerance of +15% is admissible for the capacitance value corresponding to its rated power, so that the circuit-breakers for switching capacitor banks must be selected to permanently carry a maximum current equal to:

$$I_n = 1.3 \times 1.15 \times I_{cn} = 1.5 \times I_{cn}$$

Current for connecting capacitor banks

Connection of a capacitor bank can be compared to a closing operation under short-circuit conditions, where the transient making capacity I_p takes on high peak values, above all when capacitor banks are connected in parallel with others that are already powered. The value of I_p needs to be calculated for each individual situation because it depends on the individual circuit conditions and can in certain cases even have a peak value equal to 100-200 x I_{cn} for a duration of 1-2 ms.

This fact must be taken into account when selecting the circuit-breaker, which must have a suitable making capacity, and when setting the overcurrent release, which must not cause unwanted trips when the bank is connected.

Selecting the circuit-breaker

Using the information on the rating plate of the three-phase capacitor bank

Q_n = rated power in kvar

U_n = rated voltage in V

the rated current of the capacitor bank is determined as follows:

$$I_{cn} = \frac{Q_n \times 10^3}{\sqrt{3} \times U_n} \quad , \text{ in A.}$$

The following conditions must be verified for the circuit-breaker:

Rated current $I_n > 1.5 I_{cn}$

Overload protection setting $I_1 = 1.5 \times I_{cn}$

Short-circuit protection setting $I_3 = \text{OFF}$

Breaking capacity $I_{cu} \geq I_k$, at the point of installation.



Switching and protection of capacitors

Table for selecting the protection and switching circuit-breakers for capacitors

The breaking capacity of the circuit-breaker must take into account the prospective short-circuit current at the point of installation. The available sizes are shown in the table.

Maximum power of the capacitor bank at 50Hz [kvar]				Circuit-breaker Type	Rated current of the current transformer In [A]	Rated current of the capacitor bank Inc [A]	Overload protection setting I1 [A]	Short-circuit protection setting I3 [A]
400V	440V	500V	690V					
578	636	722	997	E1 - E2 - E3	1250	834	1 x In	OFF
739	813	924	1275	E1 - E2 - E3	1600	1067	1 x In	OFF
924	1017	1155	1594	E2 - E3	2000	1334	1 x In	OFF
1155	1270	1444	1992	E3	2500	1667	1 x In	OFF
1478	1626	1848	2550	E3 - E4 - E6	3200	2134	1 x In	OFF

Note

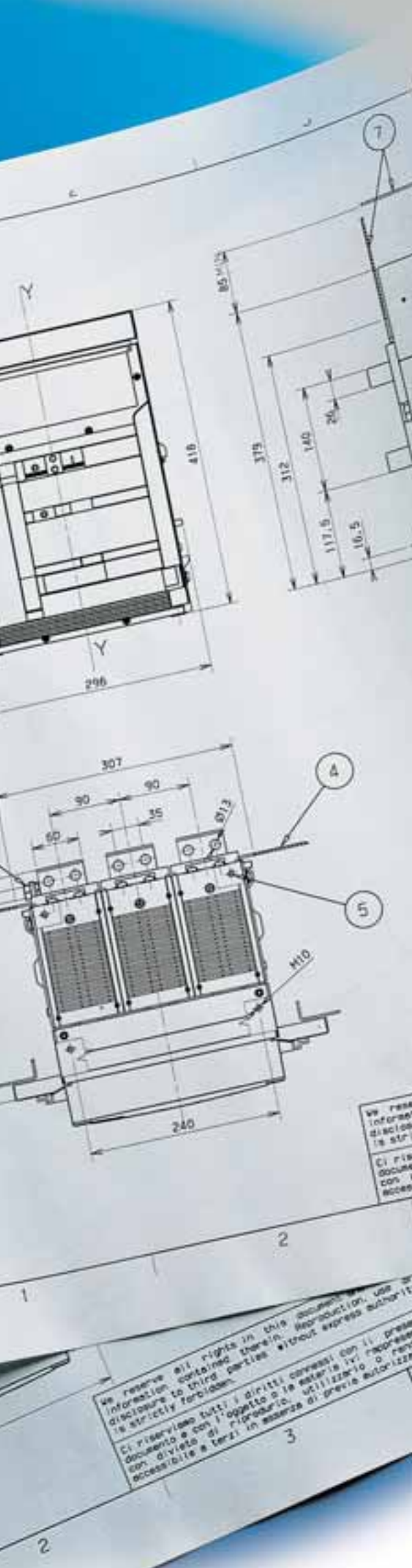
The E2L and E2L circuit-breakers are not suitable for switching capacitor banks.

Emax





Overall dimensions



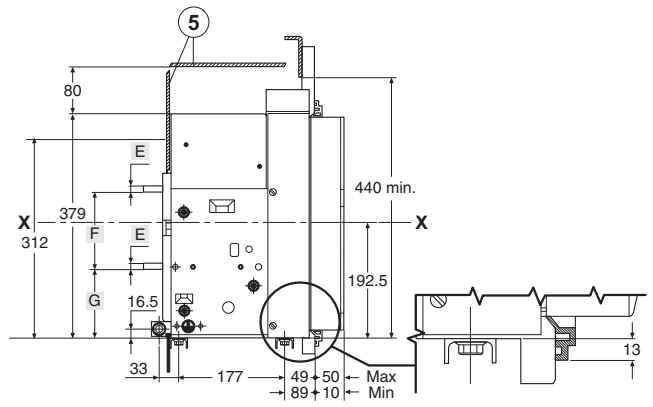
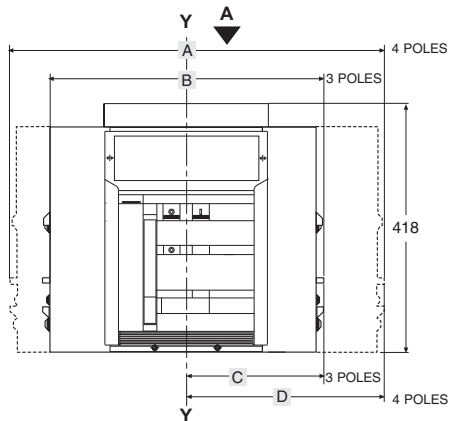
Contents

Fixed circuit-breaker	7/2
Withdrawable circuit-breaker	7/8
Mechanical interlock	7/15
Circuit-breaker accessories	7/17

Overall dimensions

Fixed circuit-breaker

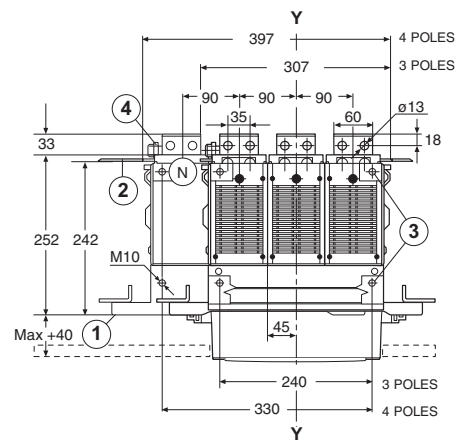
Basic version with horizontal rear terminals



Caption

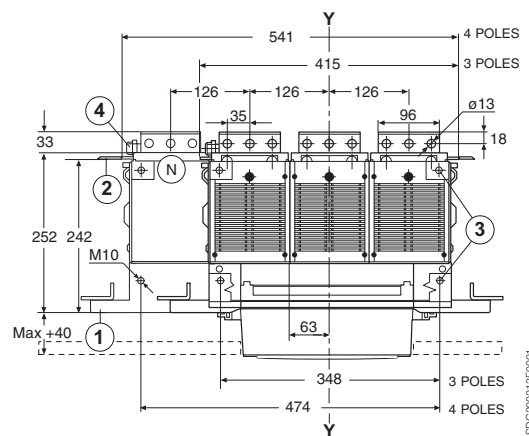
- ① Inside edge of compartment door
- ② Segregation (when provided)
- ③ M10 mounting holes for circuit-breaker (use M10 screws)
- ④ 1xM12 screw (E1, E2, E3) or 2 x M12 screws (E4, E6) for earthing (included in the supply)
- ⑤ Insulating wall or insulated metal wall

E1/E2
View A



E3

View A

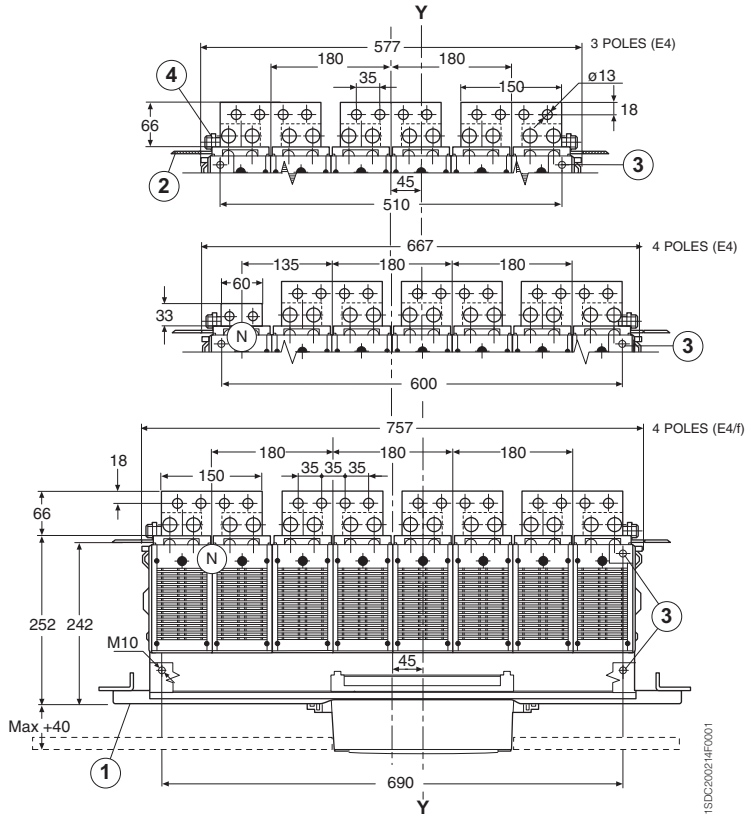


7

	A	B	C	D	E	F	G
E1	386	296	148	148	10	130	117.5
E2	386	296	148	148	26	114	117.5
E3	530	404	202	202	26	114	117.5
E4	656	566	238	328	26	166	91.5
E4/f	746	-	-	328	26	166	91.5
E6	908	782	328	454	26	166	91.5
E6/f	1034	-	-	454	26	166	91.5

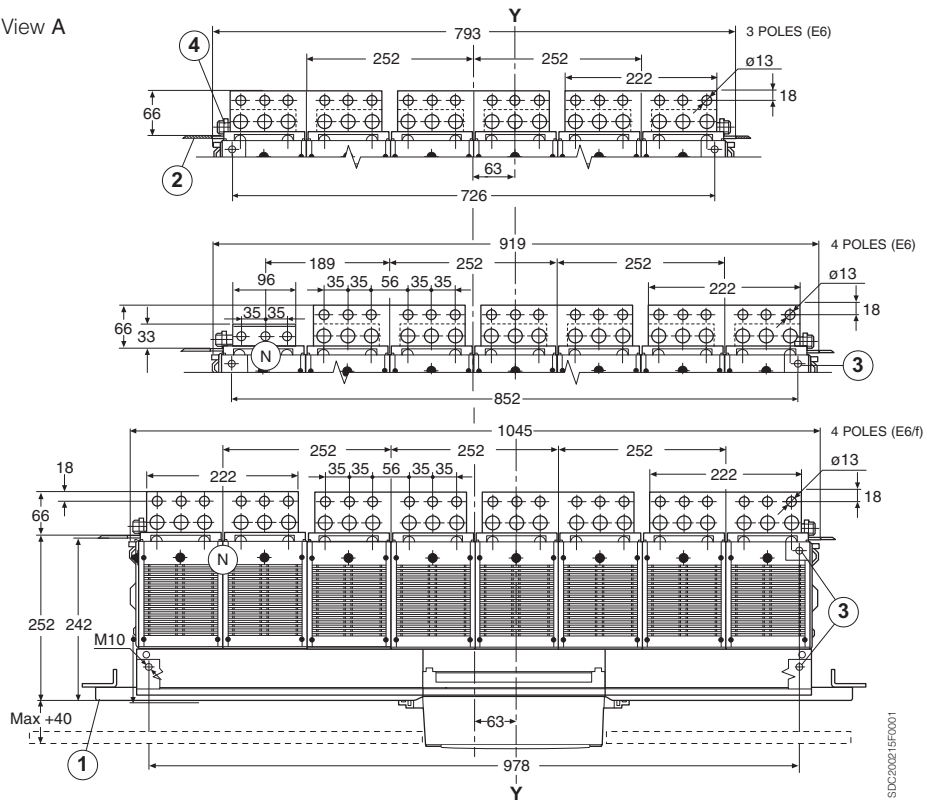
E4

View A



E6

View A



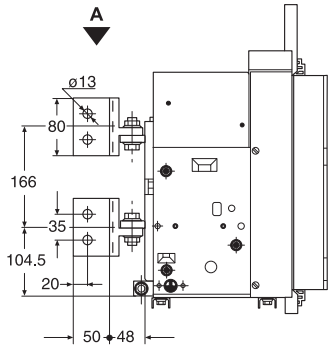


Overall dimensions

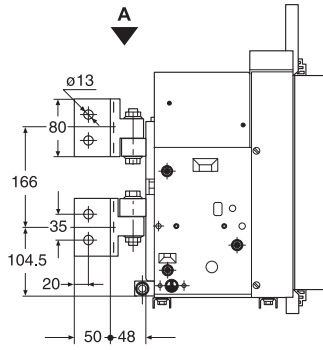
Fixed circuit-breaker

Basic version with vertical rear terminals

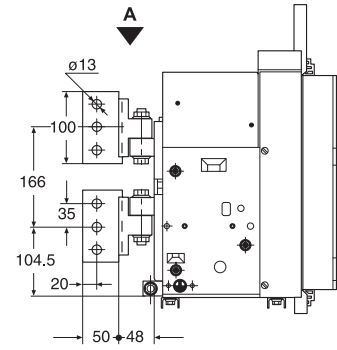
E1



E2/E4

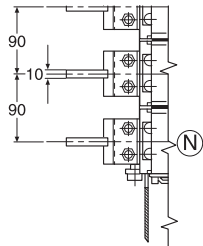


E3/E6



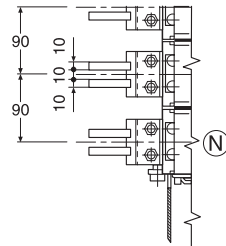
E1

View A



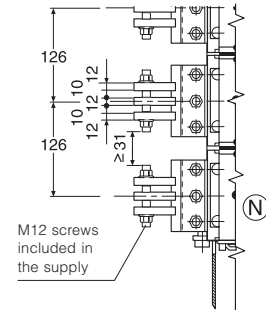
E2

View A



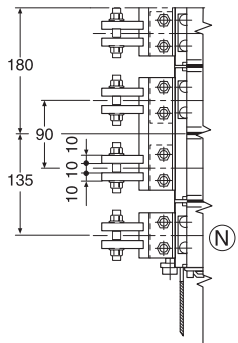
E3

View A



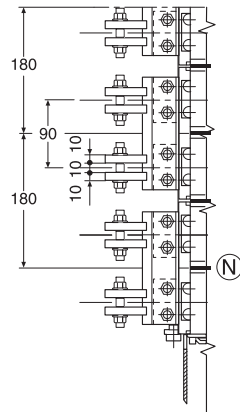
E4

View A



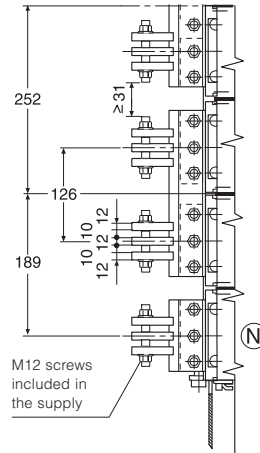
E4/f

View A



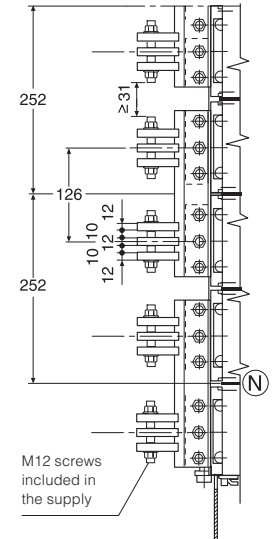
E6

View A



E6/f

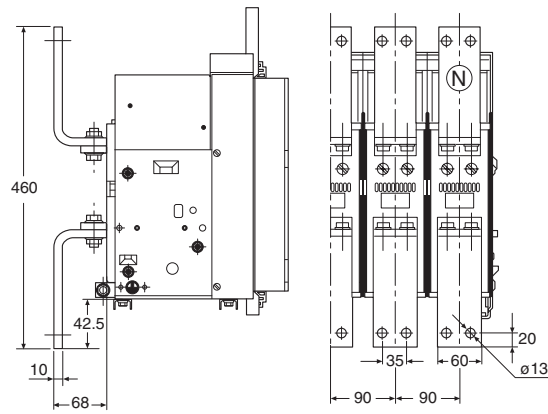
View A



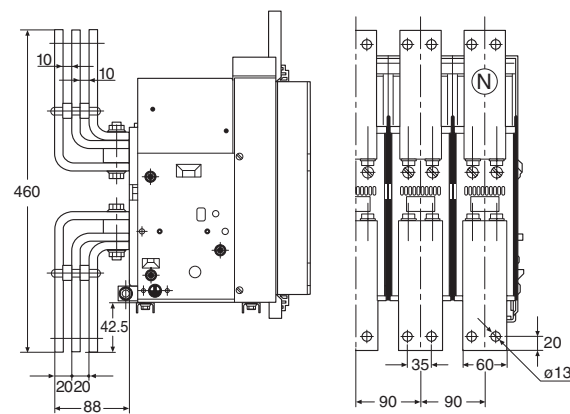
1SDC20021EF0001

**Version with
front terminals**

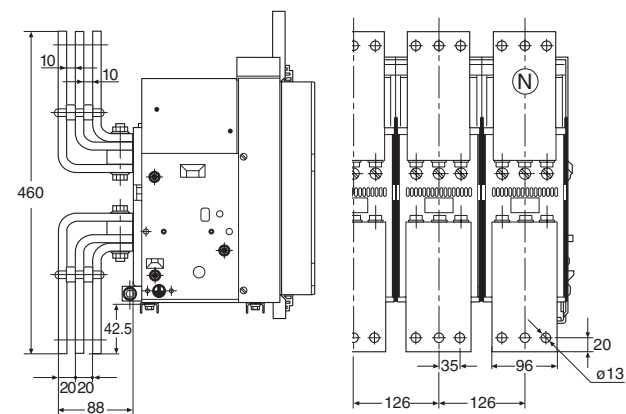
E1



E2



E3



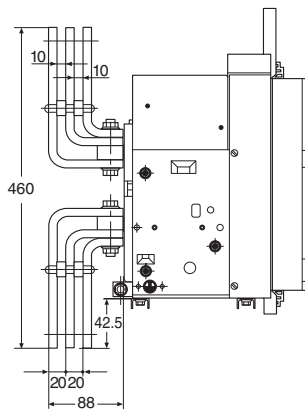
1SDC200217T0001

Overall dimensions

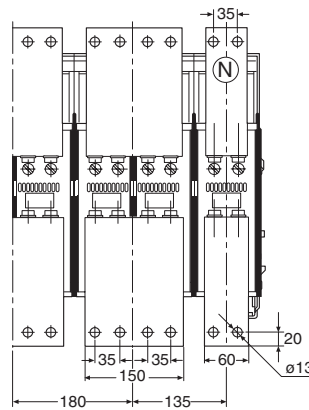
Fixed circuit-breaker

Version with front terminals

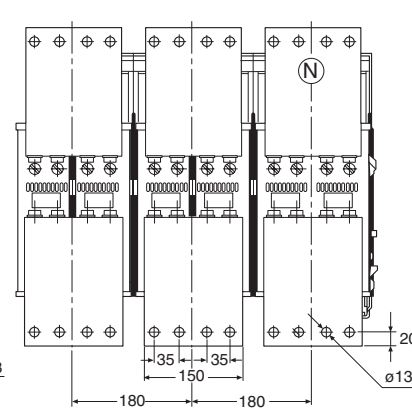
E4



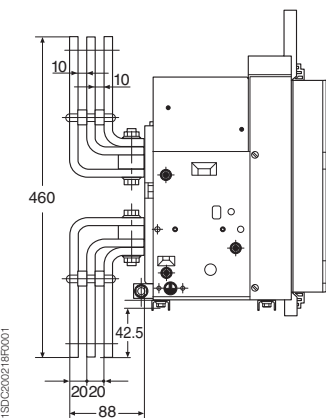
E4



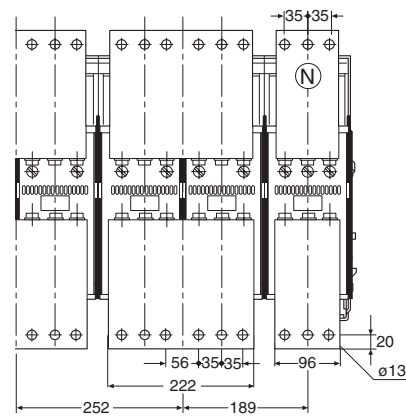
E4/f



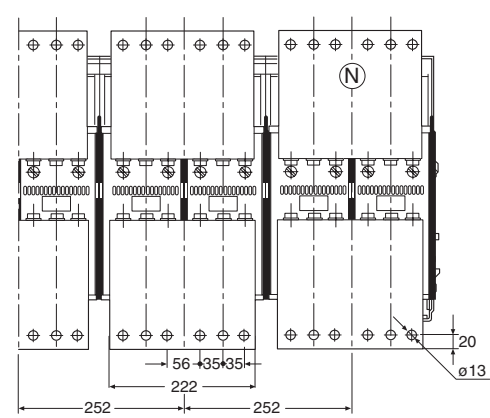
E6



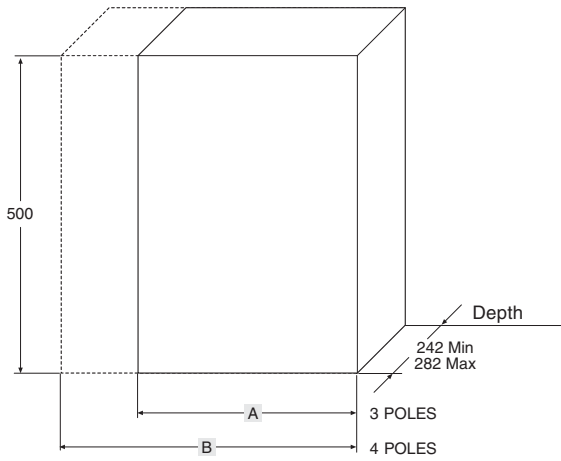
E6



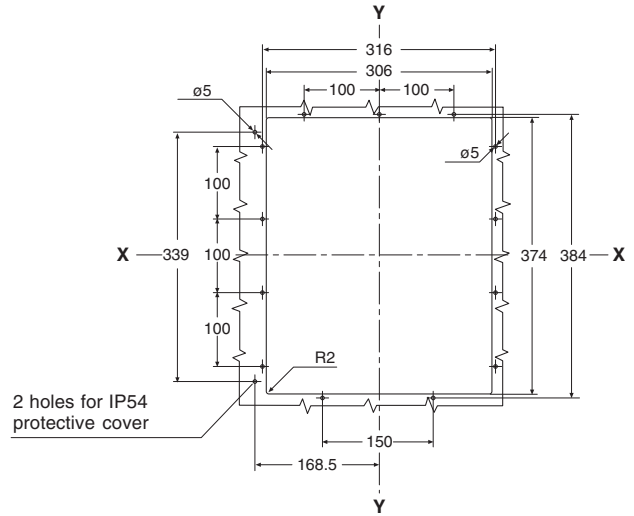
E6/f



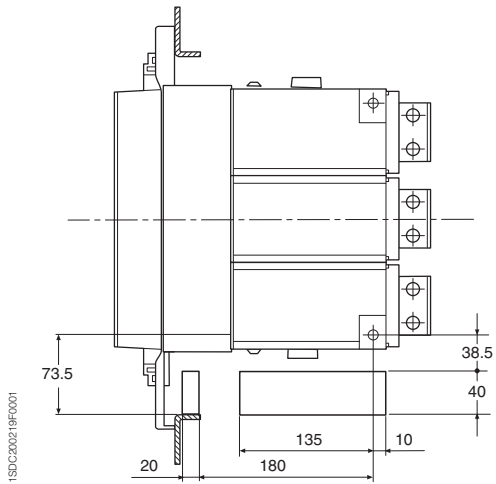
Compartment dimensions



Drilling of compartment door



Through-holes for flexible cables for mechanical interlocks



Tightening torque for main terminals Nm 70 Tightening torque for earthing screw Nm 70

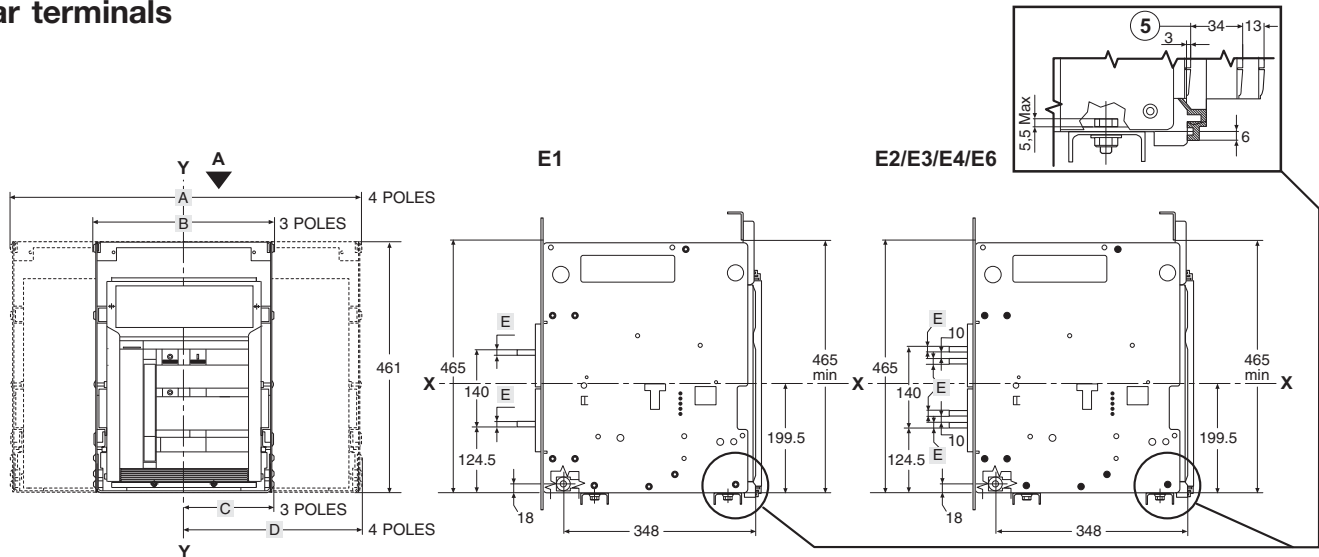
	High strength M12 screw Number per terminal	
	PHASE	NEUTRAL
E1-E2	2	2
E3	3	3
E4-E4/f	4	2-4
E6-E6/f	6	3-6

	A	B
E1	400	490
E2	400	490
E3	500	630
E4	700	790
E4/f	-	880
E6	1000	1130
E6/f	-	1260

Overall dimensions

Withdrawable circuit-breaker

Basic version with horizontal rear terminals

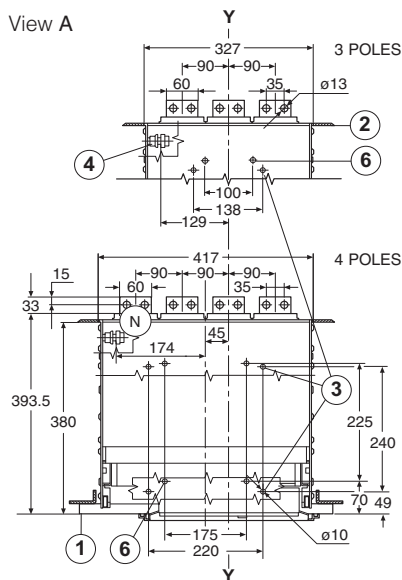


Caption

- ① Inside edge of compartment door
- ② Segregation (when provided)
- ③ $\varnothing 10$ mounting holes for fixed part (use M8 screws)
- ④ 1x M12 screw (E1, E2, E3) or 2xM12 screws (E4, E6) for earthing (included in the supply)
- ⑤ Distance from connected for testing to isolated
- ⑥ Alternative drilling with 25 mm pitch for fixing fixed part
- ⑦ Ventilation drilling on the switchgear

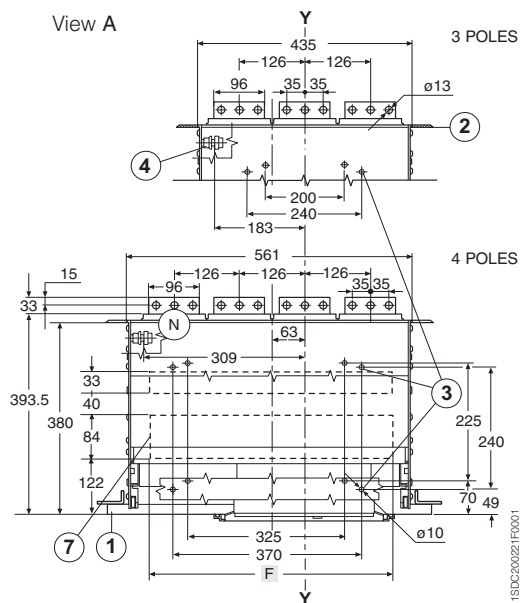
E1/E2

View A



E3

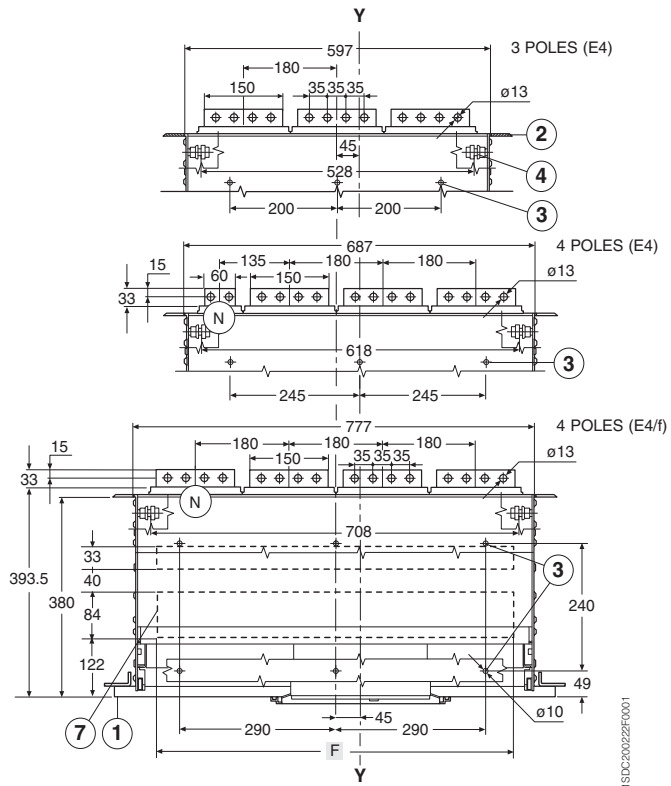
View A



	A	B	C	D	E	F	
					3 poles		4 poles
E1	414	324	162	162	10	-	-
E2	414	324	162	162	8	-	-
E3	558	432	216	216	8	370	490
E4	684	594	252	342	8	530	610
E4/f	774	-	-	342	8	-	700
E6	936	810	342	468	8	750	870
E6/f	1062	-	-	468	8	-	1000

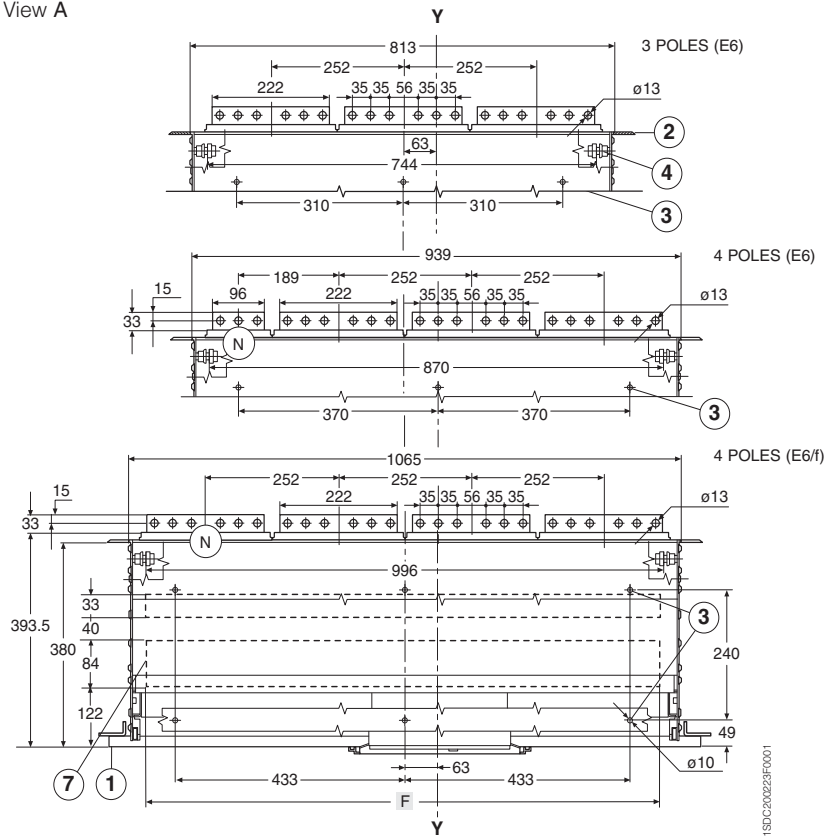
E4

View A



E6

View A

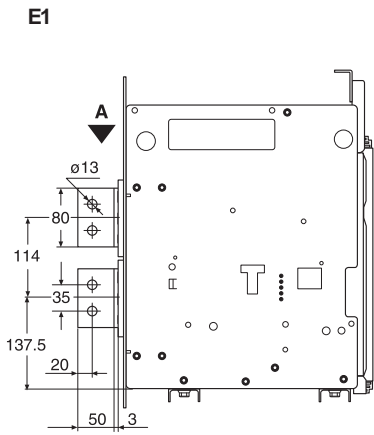




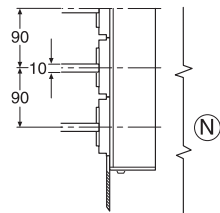
Overall dimensions

Withdrawable circuit-breaker

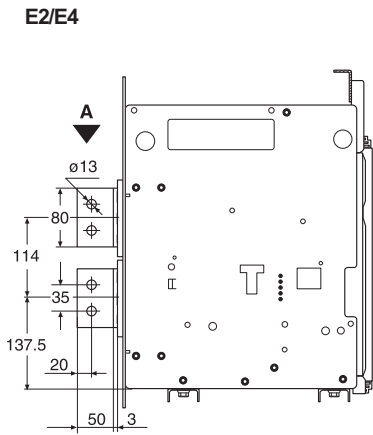
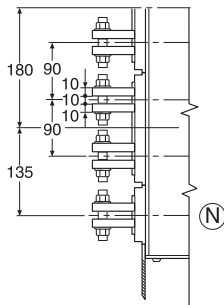
Basic version with vertical rear terminals



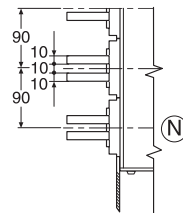
E1
View A



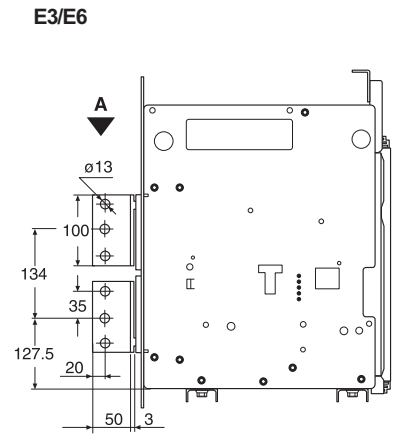
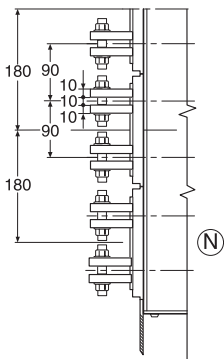
E4
View A



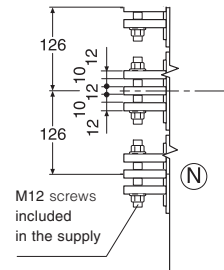
E2
View A



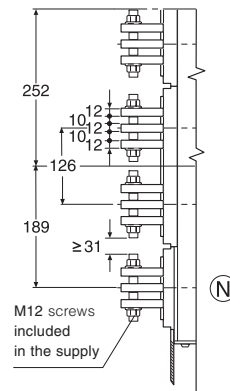
E4/f
View A



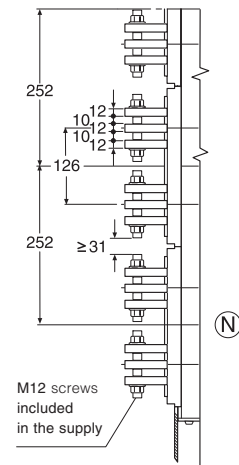
E3
View A



E6
View A



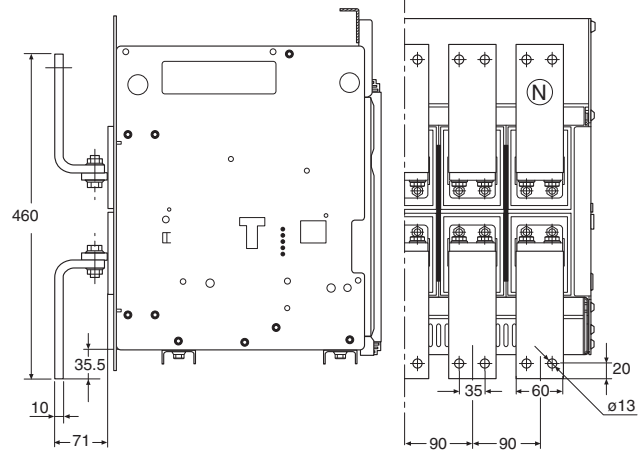
E6/f
View A



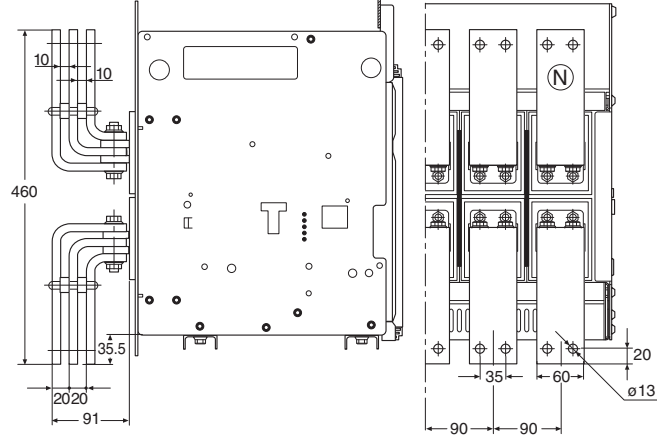
1SDJ200224E0001

**Version with
front terminals**

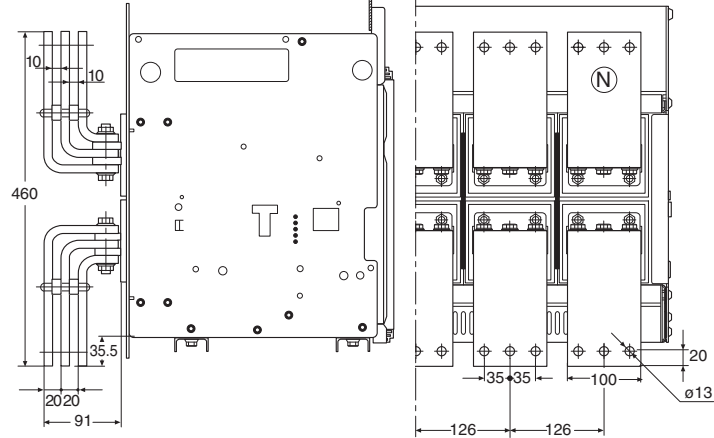
E1



E2



E3



1SDJ200225F0001

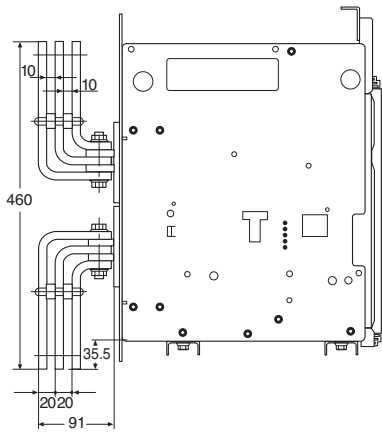


Overall dimensions

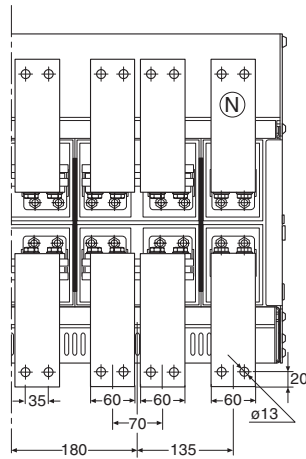
Withdrawable circuit-breaker

Version with front terminals

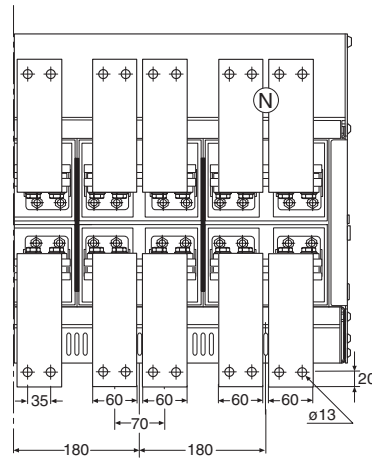
E4



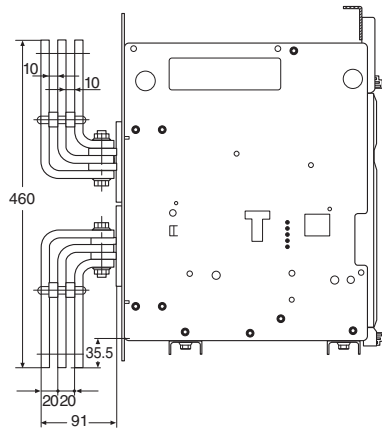
E4



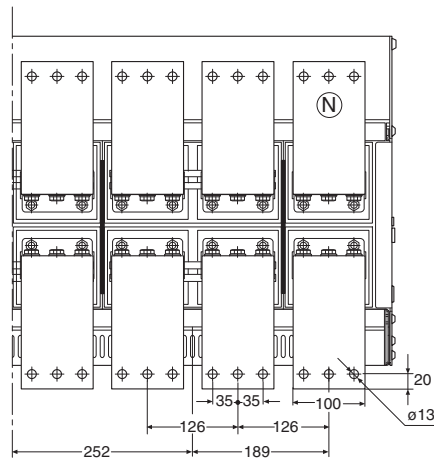
E4/f



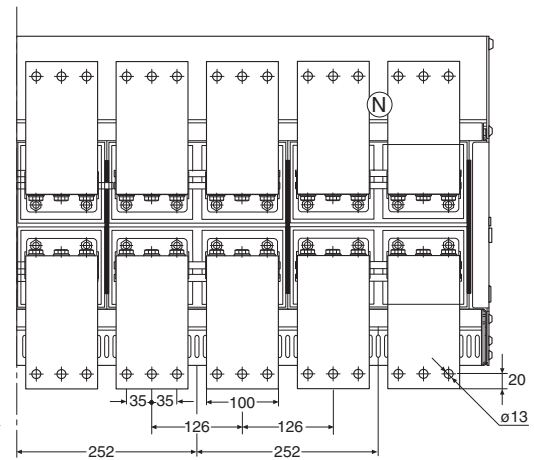
E6



E6

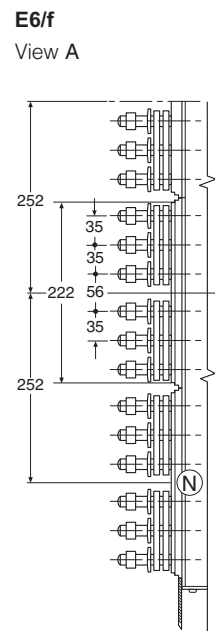
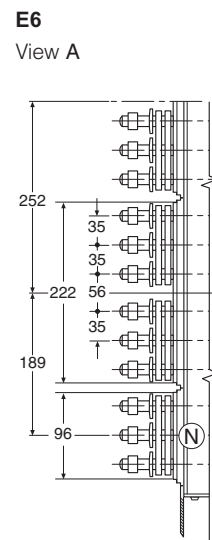
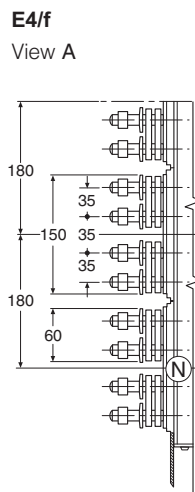
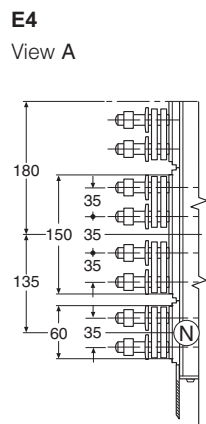
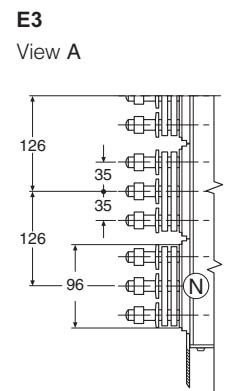
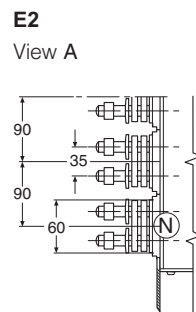
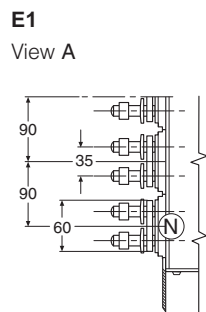
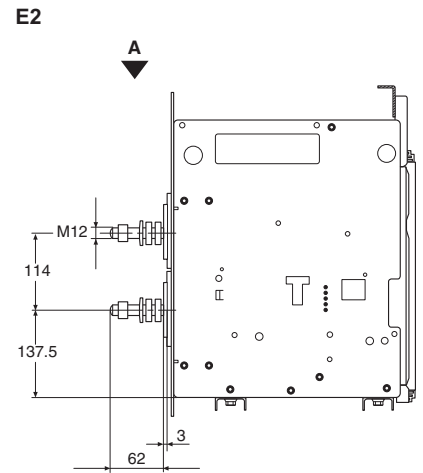
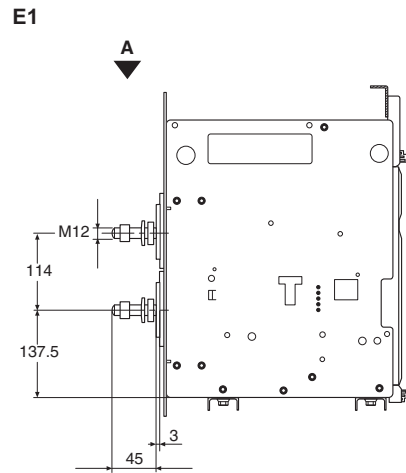


E6/f



15DC20028F0001

**Version with
flat terminals**



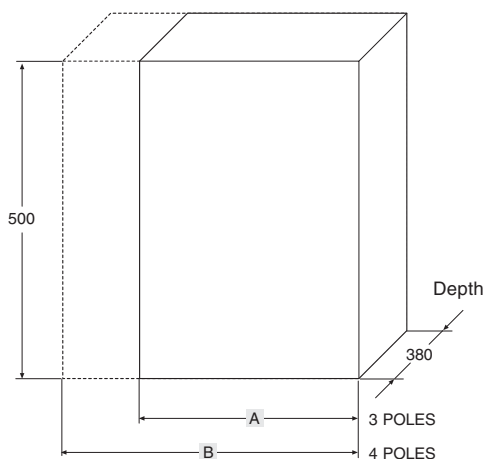
ISDC200227F001



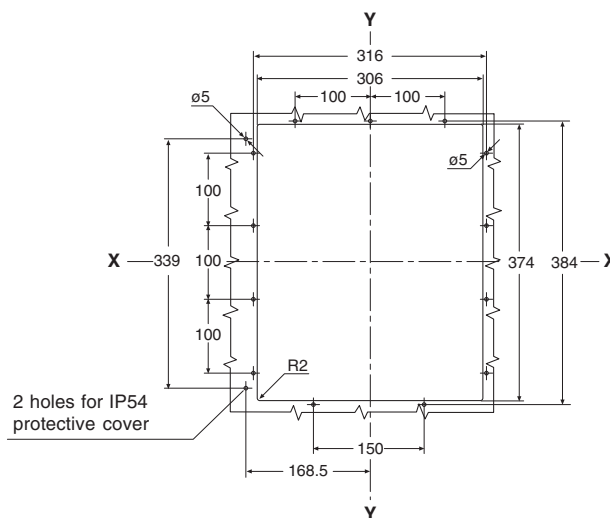
Overall dimensions

Withdrawable circuit-breaker

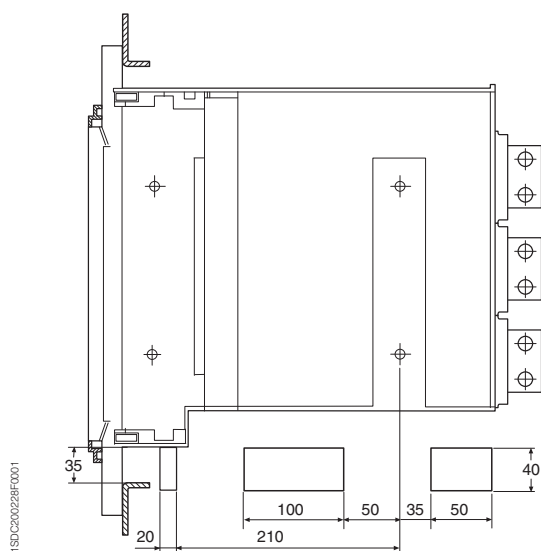
Compartment dimensions



Drilling of compartment door



Through-holes for flexible cables for mechanical interlocks



Tightening torque for fastening screws Nm 20 Tightening torque for main terminals Nm 70 Tightening torque for earthing screw Nm 70

	High strength M12 screw Number per terminal	
	PHASE	NEUTRAL
E1-E2	2	2
E3	3	3
E4-E4/f	4	2-4
E6-E6/f	6	3-6

	A	B
--	---	---

E1	400	490
E2	400	490
E3	500	630
E4	700	790
E4/f	-	880
E6	1000	1130
E6/f	-	1260

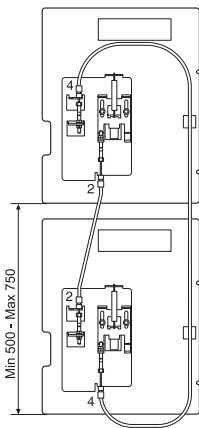
Overall dimensions

Mechanical interlock

Interlock assembly

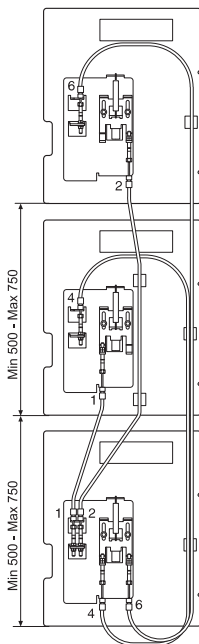
Type A

Horizontal
Vertical



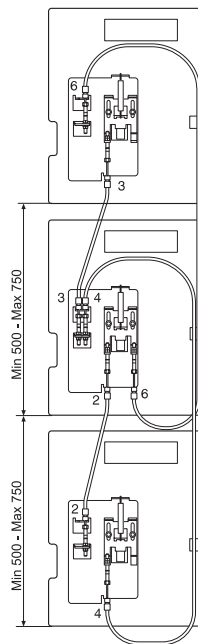
Type B

(emergency interlock below)
Horizontal Vertical



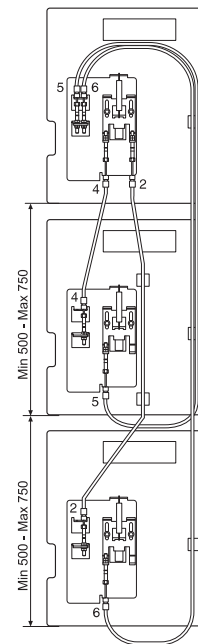
Type B

(emergency interlock in the middle)
Horizontal Vertical



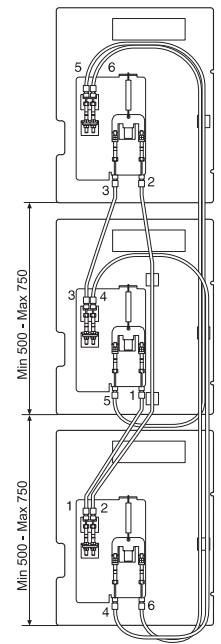
Type B

(emergency interlock above)
Horizontal Vertical



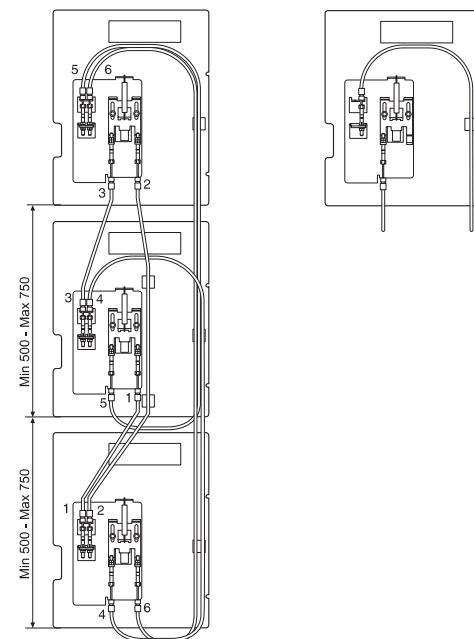
Type C

Horizontal Vertical



Type D

Horizontal Vertical



Notes

- When fitting interlocks between two circuit-breakers, it is necessary to make suitable holes (through the switchboard) in the mounting surface for fixed circuit-breakers or for the fixed part of withdrawable circuit-breakers in order to pass through the flexible cables, observing the measurements shown in the figures on pages 7/7 and 7/14.
- For vertical interlocks, align the right-hand sides vertically and reduce the bends in the flexible cables to a minimum (radius R. 70 mm). All the angle values of the bends which the cable passes through added together must not exceed 720°.
- It is possible to make the mechanical interlock among three circuit-breakers disposed in "L position" by using the cables of three horizontal circuit-breakers interlock. Make sure the distance between the horizontal and vertical circuit-breakers respects the minimum and maximum distance.

Horizontal interlocks

Maximum distance between two interlocks 1200 mm from one interlock to the other. The cables pass under the fixed parts, following the same connection layout shown for vertical circuit-breakers.

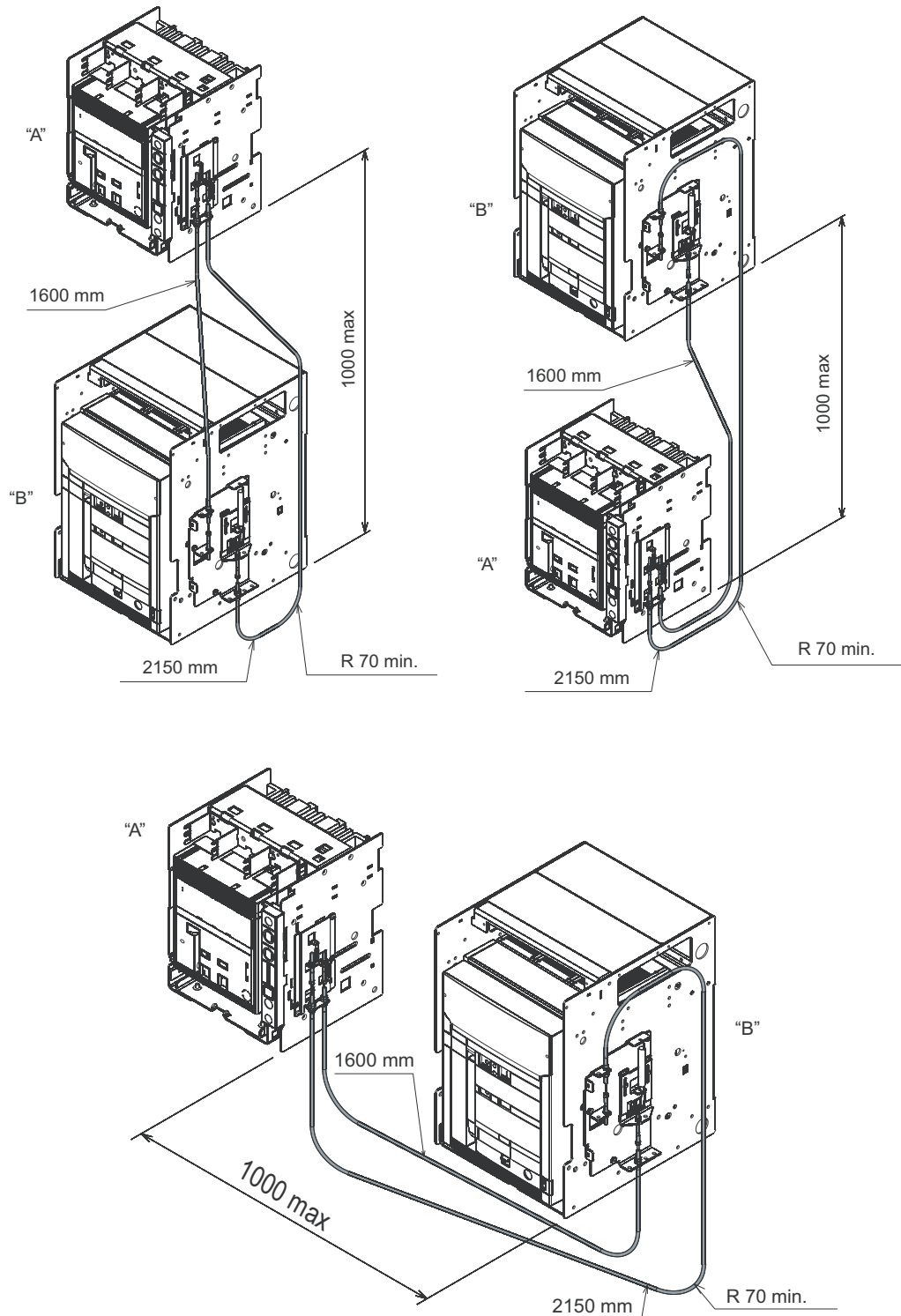
Extended cables are also available

Mechanical Interlock	Standard cables	Extended cables
HR	1200 mm	1200÷1600 mm
VR	500÷750 mm	750÷1000 mm

Overall dimensions

Circuit-breaker accessories

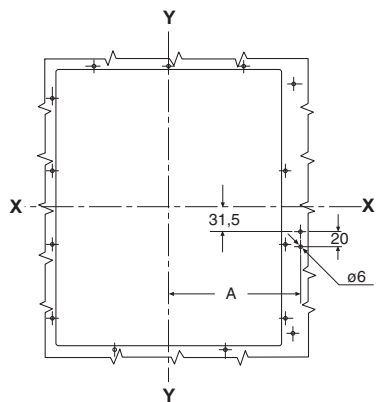
Mechanical interlock between Emax X1 and Emax E1-E6



"A" (SX)	"B" (DX)
T7-T7M-X1	E1-E2-E3
E1-E2-E3-E4-E6	T7-T7M-X1

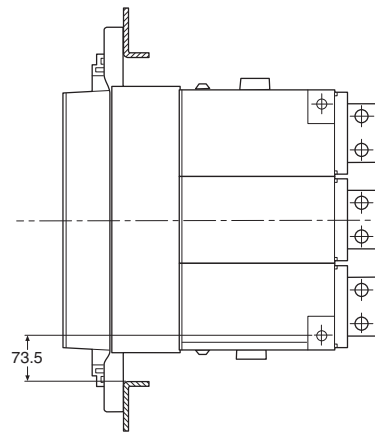
Mechanical compartment door lock

Holes in compartment door

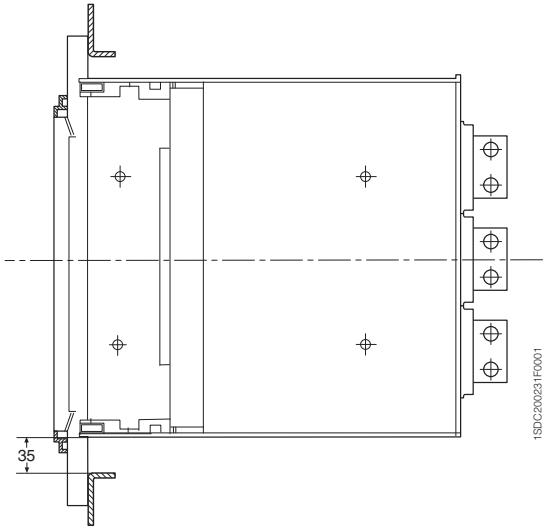


Minimum distance between circuit-breaker and switchboard wall

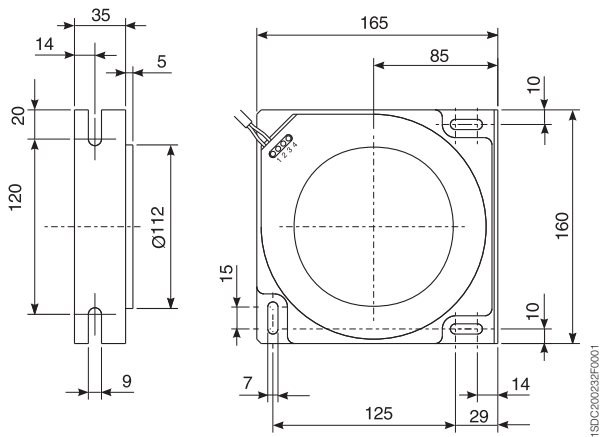
Fixed version



Withdrawable version



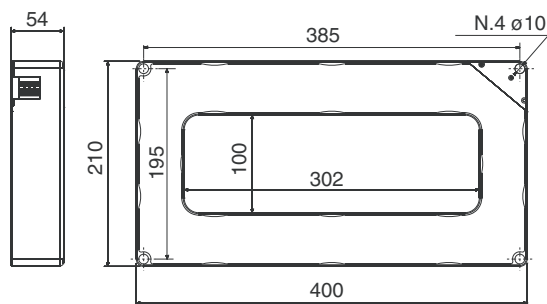
Homopolar toroid



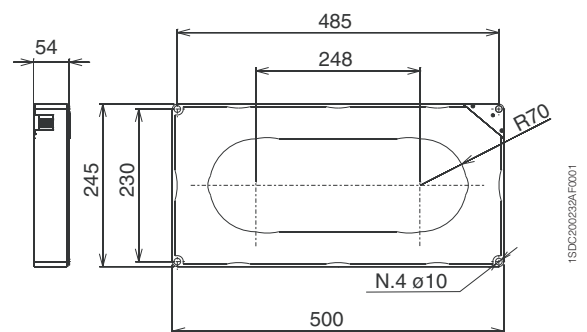
	A	
	3 POLES	4 POLES
E1	180	180
E2	180	180
E3	234	234
E4	270	360
E4/f	-	360
E6	360	486
E6/f	-	486

RC toroid

E1 III - E2 III



E1 IV - E2 IV - E3 III

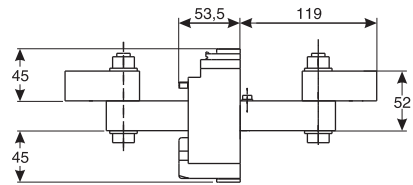
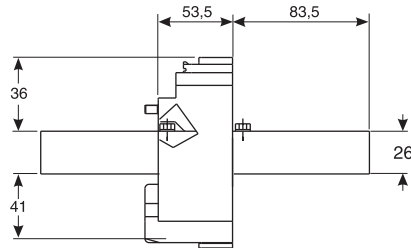




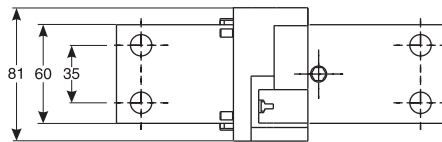
Overall dimensions

Circuit-breaker accessories

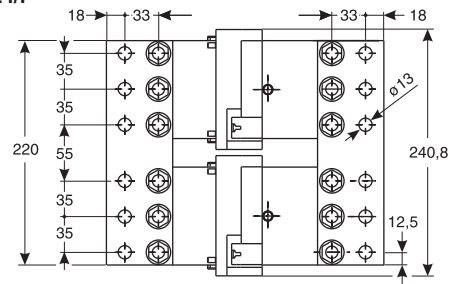
Current sensor for the external neutral



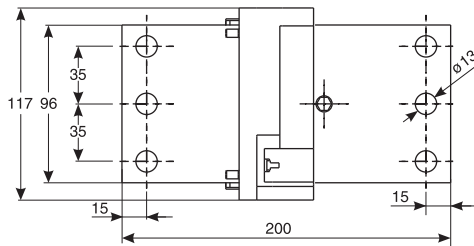
E1 - E2 - E4



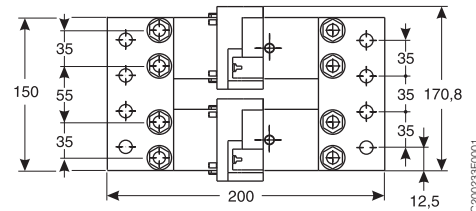
E4/f



E3 - E6



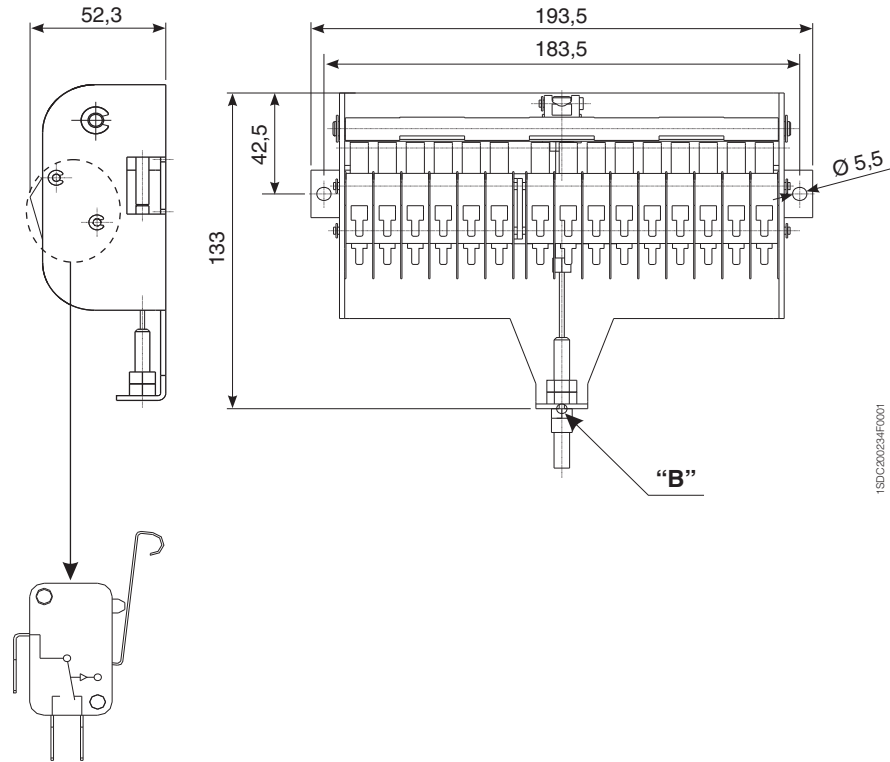
E6/f



1SD200233F0001

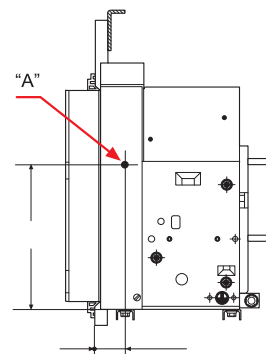
**Electrical signalling
of circuit-breaker
open/closed**

15 supplementary auxiliary contacts

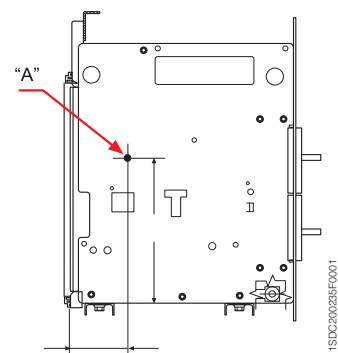


A flexible cable 650 mm long is available from point "A" to point "B".

Fixed version



Withdrawable version

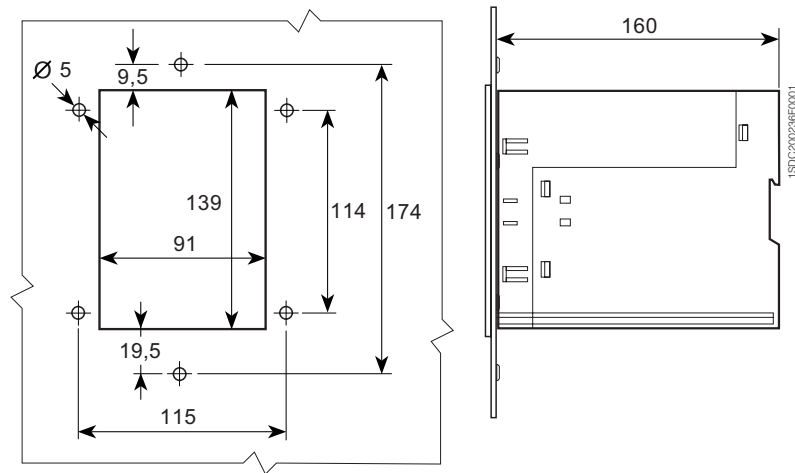




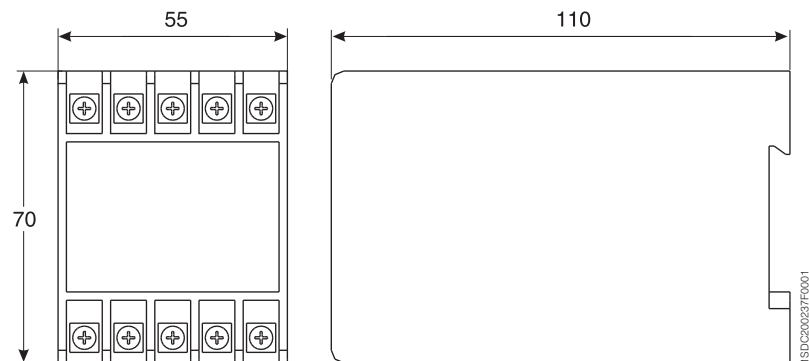
Overall dimensions

Circuit-breaker accessories

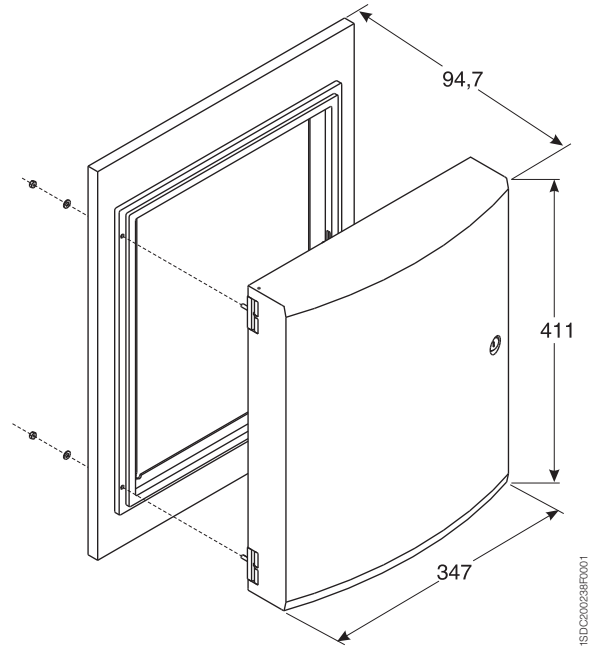
ATS010



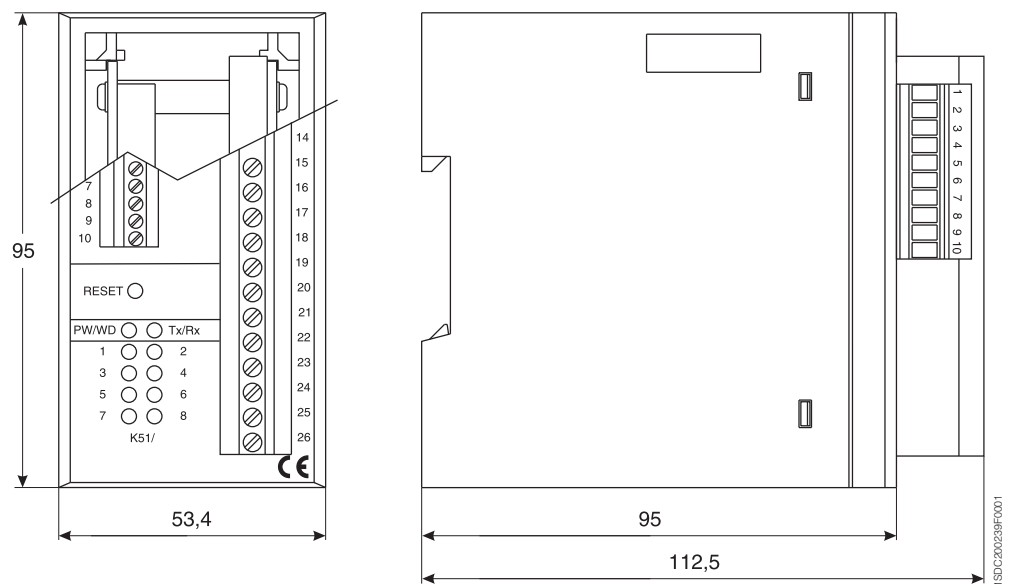
Electronic time-delay device



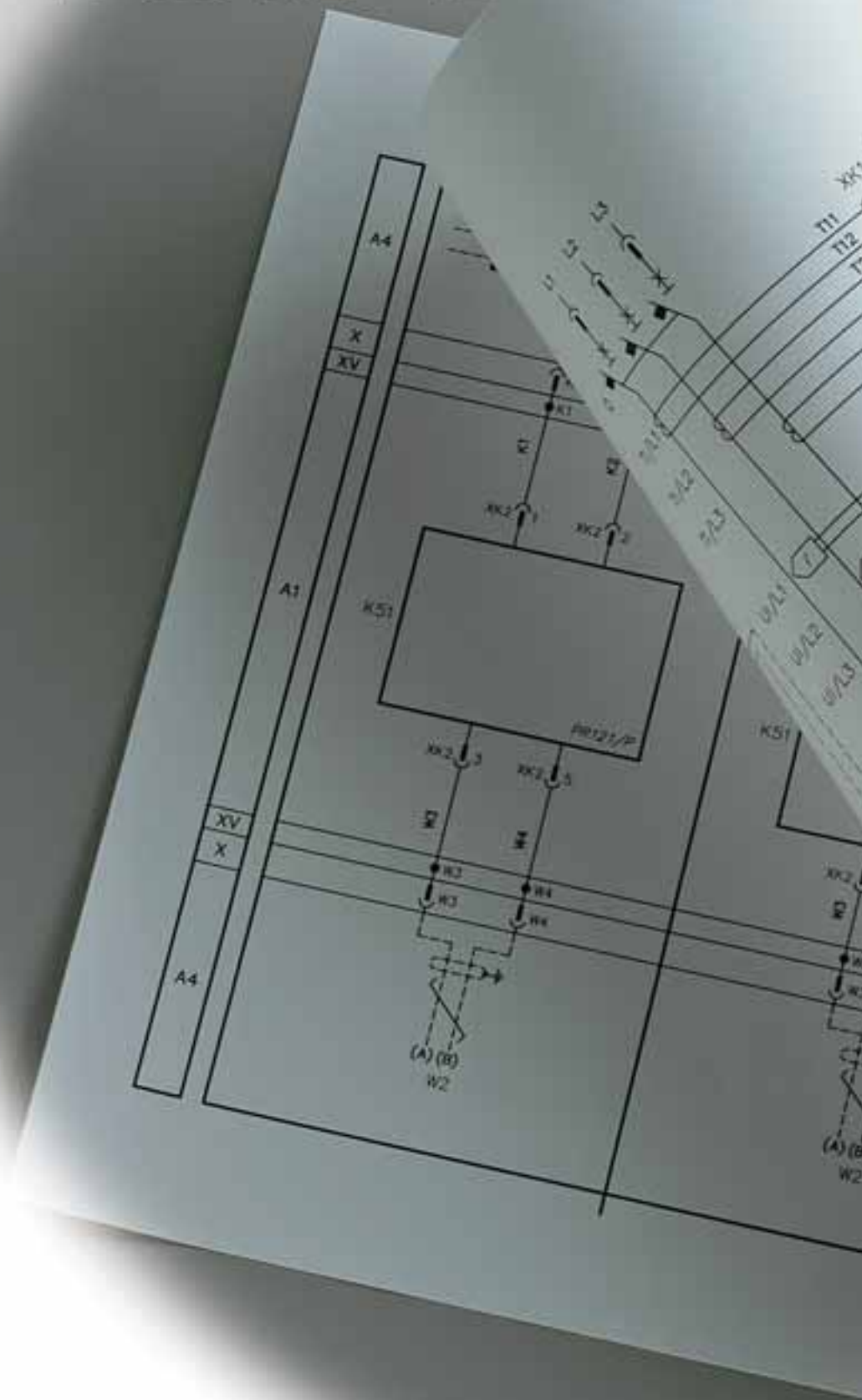
IP54 Protective cover

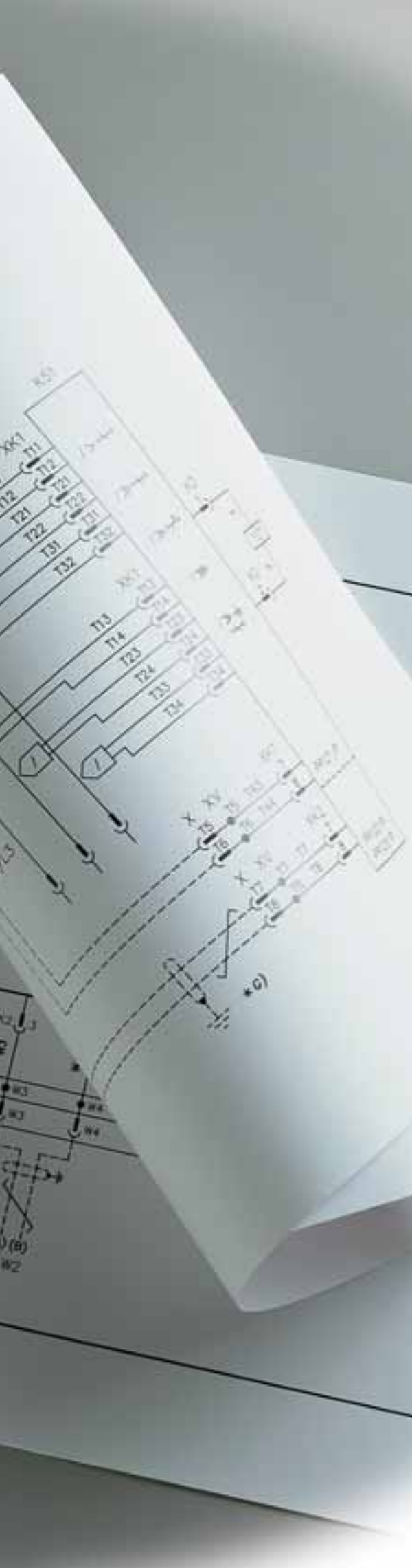


PR021/K Unit



Emax





Contents

Reading information - circuit-breakers	8/2
Reading information - Automatic transfer-switch ATS010	8/6
Circuit diagram symbols (IEC 60617 and CEI 3-14 ... 3-26 Standards)	8/7
Circuit diagrams	
Circuit-breakers	8/8
Electrical accessories	8/9
Automatic transfer-switch ATS010	8/14

Circuit diagrams

Reading information - circuit-breakers

Warning

Before installing the circuit-breaker, carefully read notes F and O on the circuit diagrams.

Operating status shown

- The circuit diagram is for the following conditions:
- withdrawable circuit-breaker, open and racked-in
 - circuits de-energised
 - trip units not tripped
 - motor operating mechanism with springs discharged.

Versions

Though the diagram shows a circuit-breaker in withdrawable version, it can be applied to a fixed version circuit-breaker as well.

Fixed version

The control circuits are fitted between terminals XV (connector X is not supplied).

With this version, the applications indicated in figures 31 and 32 cannot be provided.

Withdrawable version

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

Version without overcurrent release

With this version, the applications indicated in figures 13, 14, 41, 42, 43, 44, 45, 46, 47 cannot be provided.

Version with PR121/P electronic trip unit

With this version, the applications indicated in figures 42, 43, 44, 45, 46, 47 cannot be provided.

Version with PR122/P electronic trip unit

With this version, the applications indicated in figure 41 cannot be provided.

Version with PR123/P electronic trip unit

With this version, the applications indicated in figure 41 cannot be provided.

Caption

- = Circuit diagram figure number
- * = See note indicated by letter
- A1 = Circuit-breaker accessories
- A3 = Accessories applied to the fixed part of the circuit-breaker (for withdrawable version only)
- A4 = Example switchgear and connections for control and signalling, outside the circuit-breaker
- AY = SOR TEST UNIT Test/monitoring Unit (see note R)
- D = Electronic time-delay device of the undervoltage trip unit, outside the circuit-breaker
- F1 = Delayed-trip fuse
- K51 = PR121, PR122/P, PR123/P electronic trip unit with the following protection functions (see note G):
 - L overload protection with inverse long time-delay trip - setting I1
 - S short-circuit protection with inverse or definite short time-delay trip - setting I2
 - I short-circuit protection with instantaneous time-delay trip - setting I3
 - G earth fault protection with inverse short time-delay trip - setting I4
- K51/1...8 = Contacts of the PR021/K signalling unit
- K51/GZin (DBin) = Zone selectivity: input for protection G or "reverse" direction input for protection D (only with Uaux and PR122/P or PR123/P trip unit)
- K51/GZout (DBout) = Zone selectivity: output for protection G or "reverse" direction output for protection D (only with Uaux and PR122/P or PR123/P trip unit)
- K51/IN1 = Digital programmable input (available only with Uaux and PR122/P or PR123/P trip unit with indicator module PR120/K)
- K51/P1...P4 = Programmable electrical signalling (available only with Uaux and PR122/P or PR123/P trip unit with indicator module PR120/K)
- K51/SZin (DFin) = Zone selectivity: input for protection S or "direct" input for protection D (only with Uaux and PR122/P or PR123/P trip unit)
- K51/SZout (DFout) = Zone selectivity: output for protection S or "direct" output for protection D (only with Uaux and PR122/P or PR123/P trip unit)
- K51/YC = Closing control from PR122/P or PR123/P electronic trip unit with communication module PR120/D-M
- K51/YO = Opening control from PR122/P or PR123/P electronic trip unit with communication module PR120/D-M

M	= Motor for charging the closing springs
Q	= Circuit-breaker
Q/1...27	= Circuit-breaker auxiliary contacts
S33M/1...3	= Limit contacts for spring-charging motor
S43	= Switch for setting remote/local control
S51	= Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent trip unit. The circuit-breaker may be closed only after pressing the reset pushbutton, or after energizing the coil for electrical reset (if available).
S75E/1...4	= Contacts for electrical signalling of circuit-breaker in racked-out position (only with withdrawable circuit-breakers)
S75I/1...5	= Contacts for electrical signalling of circuit-breaker in racked-in position (only with withdrawable circuit-breakers)
S75T/1...4	= Contacts for electrical signalling of circuit-breaker in test isolated position (only with withdrawable circuit-breakers)
SC	= Pushbutton or contact for closing the circuit-breaker
SO	= Pushbutton or contact for opening the circuit-breaker
SO1	= Pushbutton or contact for opening the circuit-breaker with delayed trip
SO2	= Pushbutton or contact for opening the circuit-breaker with instantaneous trip
SR	= Pushbutton or contact for electrical circuit-breaker reset
TI/L1	= Current transformer located on phase L1
TI/L2	= Current transformer located on phase L2
TI/L3	= Current transformer located on phase L3
Uaux.	= Auxiliary power supply voltage (see note F)
UI/L1	= Current sensor (Rogowski coil) located on phase L1
UI/L2	= Current sensor (Rogowski coil) located on phase L2
UI/L3	= Current sensor (Rogowski coil) located on phase L3
UI/N	= Current sensor (Rogowski coil) located on neutral
UI/O	= Current sensor (Rogowski coil) located on the conductor connecting to earth the star point of the MV/LV transformer (see note G)
W1	= Serial interface with control system (external bus): EIA RS485 interface (see note E)
W2	= Serial interface with the accessories of PR121/P, PR122/P and PR123/P trip units (internal bus)
X	= Delivery connector for auxiliary circuits of withdrawable version circuit-breaker
X1...X7	= Connectors for the accessories of the circuit-breaker
XF	= Delivery terminal box for the position contacts of the withdrawable circuit-breaker (located on the fixed part of the circuit-breaker)
XK1	= Connector for power circuits of PR121/P, PR122/P, and PR123/P trip units
XK2 - XK3	= Connectors for auxiliary circuits of PR121/P, PR122/P and PR123/P trip units
XK4	= Connector signalling open/closed contact
XK5	= Connector for PR120/V module
XO	= Connector for YO1 release
XV	= Delivery terminal box for the auxiliary circuits of the fixed circuit-breaker
YC	= Shunt closing release
YO	= Shunt opening release
YO1	= Overcurrent shunt opening release
YO2	= Second shunt opening release (see note Q)
YR	= Coil to electrically reset the circuit-breaker
YU	= Undervoltage release (see notes B and Q)

Circuit diagrams

Reading information - circuit-breakers

Description of figures

- Fig. 1 = Motor circuit to charge the closing springs.
Fig. 2 = Circuit of shunt closing release.
Fig. 4 = Shunt opening release.
Fig. 6 = Instantaneous undervoltage release (see notes B and Q).
Fig. 7 = Undervoltage trip unit with electronic time-delay device, outside the circuit-breaker (see notes B and Q).
Fig. 8 = Second shunt opening release (see note Q).
Fig. 11 = Contact for electrical signalling of springs charged.
Fig. 12 = Contact for electrical signalling of undervoltage release energized (see notes B and S).
Fig. 13 = Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release. The circuit-breaker may be closed only after pressing the reset pushbutton.
Fig. 14 = Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release and electrical reset coil. The circuit-breaker may be closed only after pressing the reset pushbutton or energizing the coil.
Fig. 21 = First set of circuit-breaker auxiliary contacts.
Fig. 22 = Second set of circuit-breaker auxiliary contacts (see note V).
Fig. 23 = Third set of supplementary auxiliary contacts outside the circuit-breaker.
Fig. 31 = First set of contacts for electrical signalling of circuit-breaker in racked-in, test isolated, racked-out position.
Fig. 32 = Second set of contacts for electrical signalling of circuit-breaker in racked-in, test isolated, racked-out position.
Fig. 41 = Auxiliary circuits of PR121/P trip unit (see note F).
Fig. 42 = Auxiliary circuits of PR122/P and PR123/P trip units (see notes F, N and V).
Fig. 43 = Circuits of the measuring module PR120/V of the PR122/P and PR123/P trip units internally connected to the circuit-breaker (optional for the trip unit PR122/P) (see notes T and U).
Fig. 44 = Circuits of the measuring module PR120/V of the PR122/P and PR123/P trip units externally connected to the circuit-breaker (optional for the trip unit PR122/P) (see notes O and U).
Fig. 45 = Circuits of the communication module PR120/D-M of the PR122/P and PR123/P trip units (optional) (see note E).
Fig. 46 = Circuits of the indicator module PR120/K of the PR122/P and PR123/P trip units - connection 1 (optional) (see note V).
Fig. 47 = Circuits of the indicator module PR120/K of the PR122/P and PR123/P trip units - connection 2 (optional) (see note V).
Fig. 61 = SOR TEST UNIT Test/monitoring unit (see note R).
Fig. 62 = Circuits of the PR021/K signalling module.

Incompatibilities

The circuits indicated in the following figures cannot be supplied simultaneously on the same circuit-breaker:

- 6 - 7 - 8
- 13 - 14
- 22 - 46 - 47
- 43 - 44

Notes

- A) The circuit-breaker is only fitted with the accessories specified in the ABB SACE order acknowledgement. Consult this catalogue for information on how to make out an order.
- B) The undervoltage release is supplied for operation using a power supply branched on the supply side of the circuit-breaker or from an independent source. The circuit-breaker can only close when the release is energized (there is a mechanical lock on closing).
If the same power supply is used for the closing and undervoltage releases and the circuit-breaker is required to close automatically when the auxiliary power supply comes back on, a 30 ms delay must be introduced between the undervoltage release accept signal and the energizing of the closing trip unit. This may be achieved using an external circuit comprising a permanent make contact, the contact shown in fig. 12 and a time-delay relay.
- E) MODBUS map is available in the 1SDH000556R0001 document
- F) The auxiliary voltage U_{aux} allows actuation of all operations of the PR121/P, PR122/P and PR123/P trip units. Having requested a U_{aux} insulated from earth, one must use "galvanically separated converters" in compliance with IEC 60950 (UL 1950) or equivalent standards that ensure a common mode current or leakage current (see IEC 478/1, CEI 22/3) not greater than 3.5 mA, IEC 60364-41 and CEI 64-8.
- G) Earth fault protection is available with the PR122/P and PR123/P trip units by means of a current sensor located on the conductor connecting to earth the star center of the MV/LV transformer.
The connections between terminals 1 and 2 (or 3) of current transformer UI/O and poles T7 and T8 of the X (or XV) connector must be made with a two-pole shielded and stranded cable (see user manual), no more than 15 m long. The shield must be earthed on the circuit-breaker side and current sensor side.
- N) With PR122/P and PR123/P trip units, the connections to the zone selectivity inputs and outputs must be made with a two-pole shielded and stranded cable (see user manual), no more than 300 m long. The shield must be earthed on the selectivity input side.
- O) Systems with rated voltage of less than 100V or greater than 690V require the use of an insulation voltage transformer to connect to the busbars (connect according to the insertion diagrams provided in the manual).
- P) With PR122/P and PR123/P trip units with communication module PR120/D-M, the power supply for coils YO and YC must not be taken from the main power supply. The coils can be controlled directly from contacts K51/YO and K51/YC with maximum voltages of 110-120 V DC and 240-250 V AC.
- Q) The second opening trip unit may be installed as an alternative to the undervoltage trip unit.
- R) The SACE SOR TEST UNIT + opening release (YO) is guaranteed to operate starting at 75% of the U_{aux} of the opening release itself.
While the YO power supply contact is closing (short-circuit on terminals 4 and 5), the SACE SOR TEST UNIT is unable to detect the opening coil status. Consequently:
- For continuously powered opening coil, the TEST FAILED and ALARM signals will be activated
- If the coil opening command is of the pulsing type, the TEST FAILED signal may appear at the same time. In this case, the TEST FAILED signal is actually an alarm signal only if it remains lit for more than 20s.
- S) Also available in the version with normally-closed contact
- T) The connection between pin 1 of the connector XK5 to the internal neutral conductor is provided by four-pole circuit-breakers, while pin 1 of the connector XK5 is connected to pin T1 of the connector X (or XV) by means of three-pole circuit-breakers.
- U) The measuring module PR120/V is always supplied with relay PR123/P.
- V) If fig. 22 is present (second set of auxiliary contacts) simultaneously as PR122/P or PR123/P trip unit, the contacts for the zone selectivity in fig. 42 (K51/Zin, K51/Zout, K51/Gzin and K51/Gzout) are not wired. In addition, the indicator module PR120/K in figures 46 and 47 cannot be supplied.



Circuit diagrams

Reading information - Automatic transfer switch ATS021 and ATS022

Represented operational state

The diagram represents the following conditions:

- circuit-breakers open and connected #
- circuits de-energised
- closing springs discharged
- overcurrent relays not tripped *

The diagram indicates circuit-breakers in withdrawable version, but it may be applied also to circuit-breakers in fixed version: in this case it's not necessary connect S75/1 contacts on LOGIC ENABLING input.

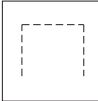
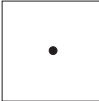
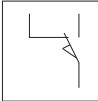
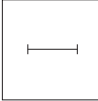
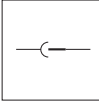
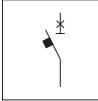

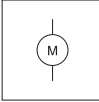
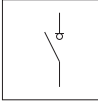
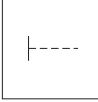
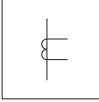
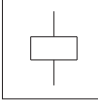
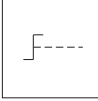
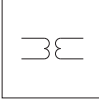
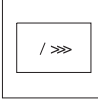

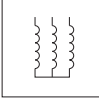
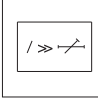
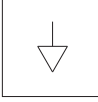
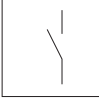
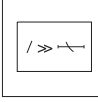
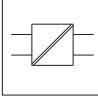
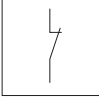
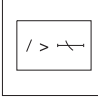
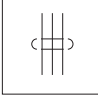
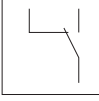
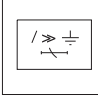
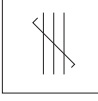
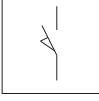
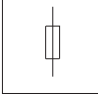



* The diagram indicates circuit-breakers equipped with thermomagnetic overcurrent release but it may be applied also to circuit-breakers without release (switch-disconnectors): in this case it's not necessary connect SY contacts on LOGIC ENABLING input.

Caption

- A = Device type ATS021 and ATS022 for automatic transfer switch of two circuit-breakers
- A16 = Solenoid operating mechanism
- K1 = Auxiliary contact type VB6-30-01 for the emergency supply voltage presence
- K2 = Auxiliary contact type VB6-30-01 for the normal supply voltage presence
- Q/1 = Circuit-breaker auxiliary contact
- Q1 CB2-E = Circuit-breaker for emergency supply line
- Q2 CB1-N = Circuit-breaker for normal supply line
- Q61/1-2 = Miniature circuit-breaker for auxiliary circuits protection
- S75/1 = Contact signalling circuit-breaker in withdrawable version connected #
- SY = Contact signalling circuit-breaker tripped through releases operation (tripped position) *
- X2-XA2 = Connectors for the circuit-breaker auxiliary circuits
- XA10 = Connector for the solenoid operating mechanism circuits
- XV = Terminal boards of the accessories

Circuit diagrams

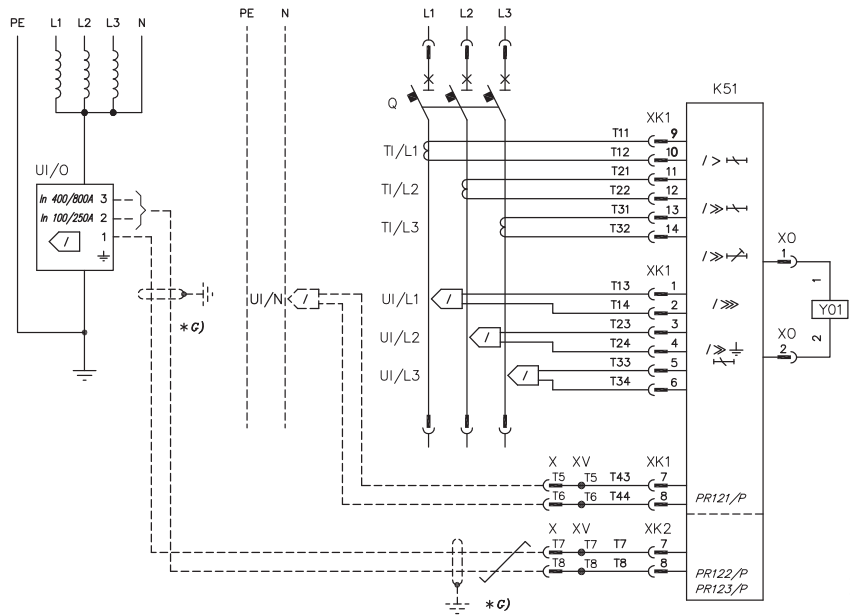
Circuit diagram symbols (IEC 60617 and CEI 3-14 ... 3-26 Standards)

	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		Earth 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

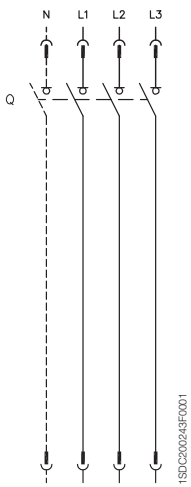
Circuit diagrams

Circuit-breakers

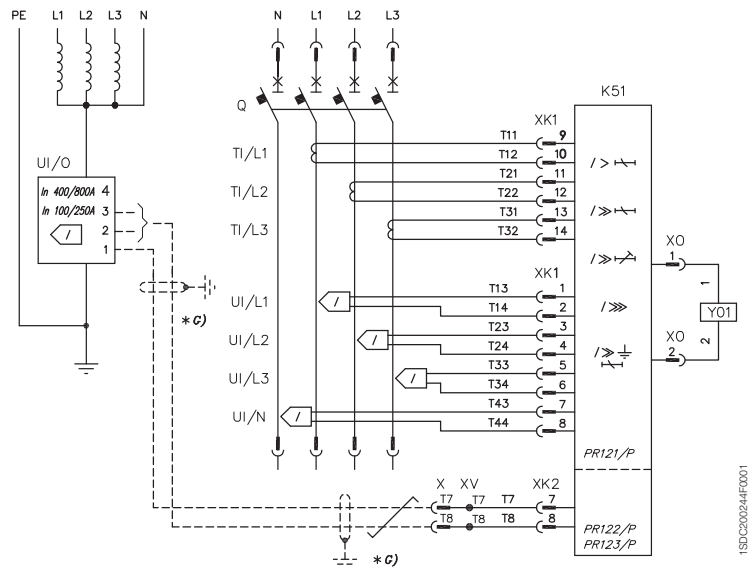
Operating status



Three-pole circuit-breaker with PR121/P, PR122/P or PR123/P electronic trip unit



1SDC200244F0001



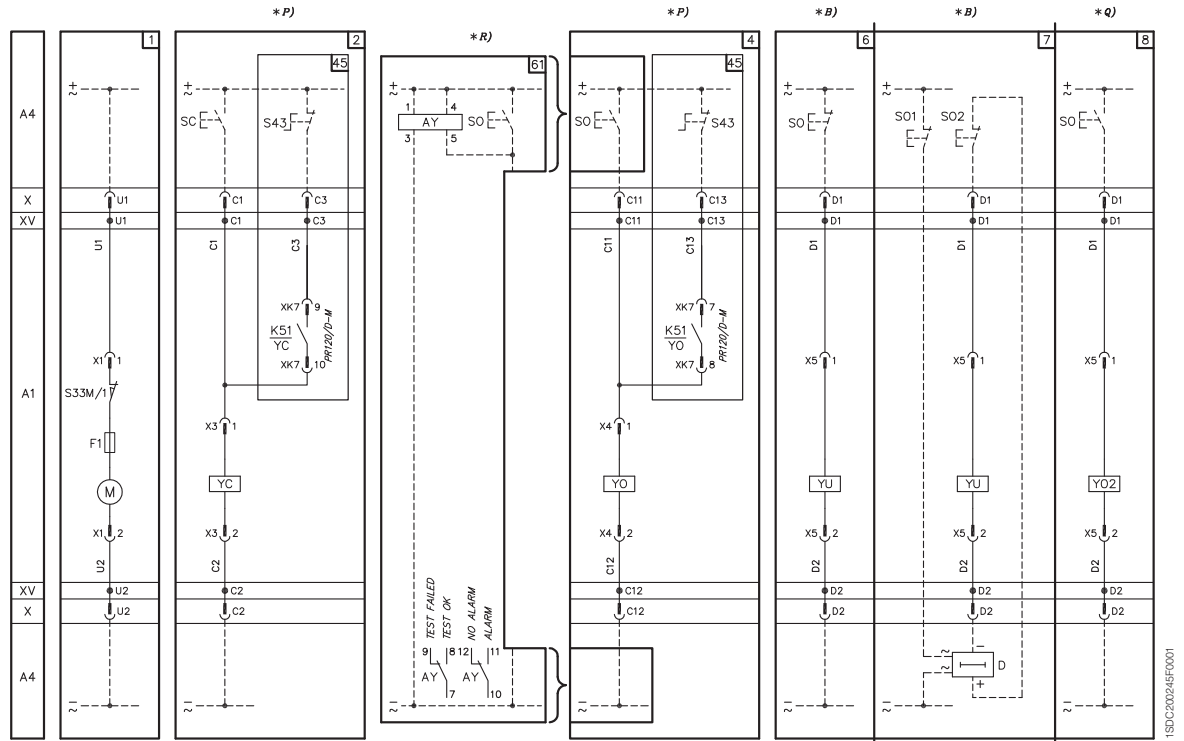
1SDC200244F0001

Four-pole circuit-breaker with PR121/P, PR122/P or PR123/P electronic trip unit

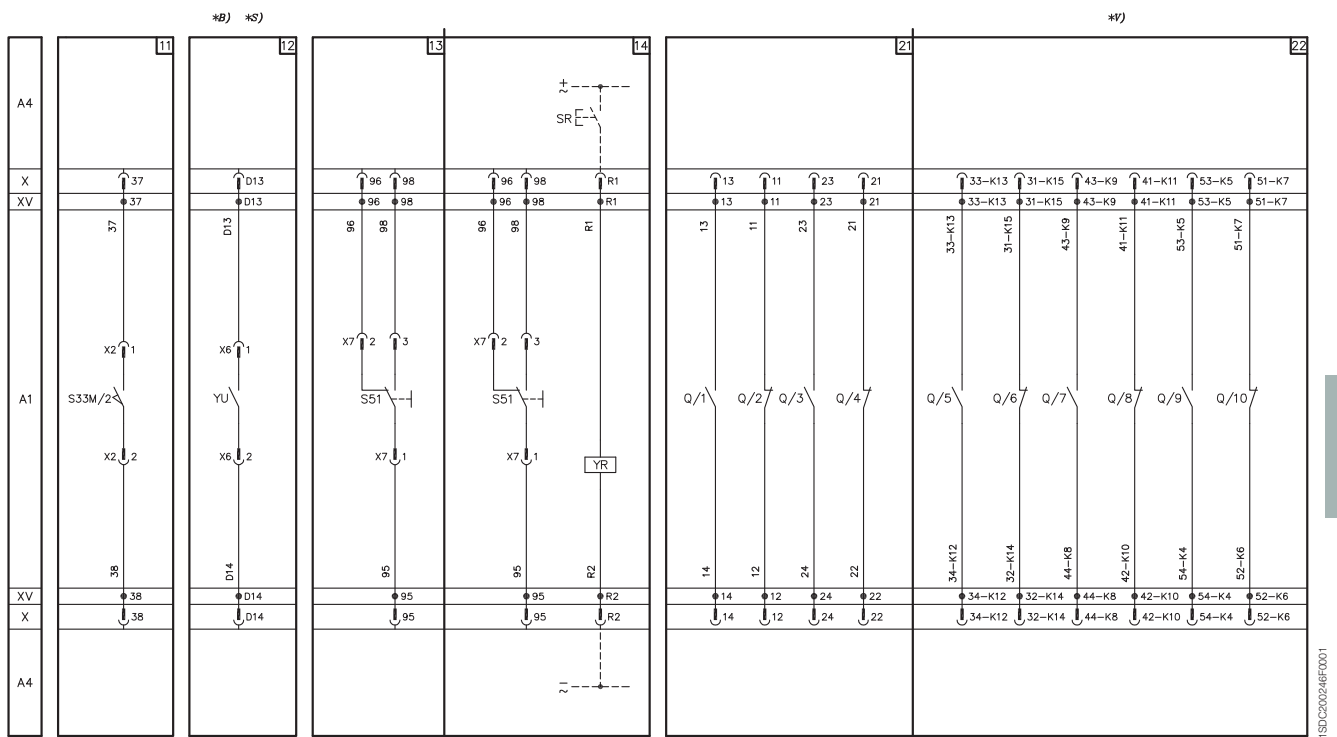
Circuit diagrams

Electrical accessories

Motor operating mechanism, opening, closing and undervoltage releases

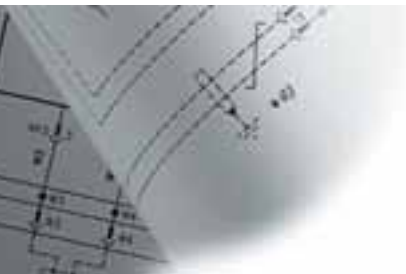


Signalling contacts



1SDC300246F0001

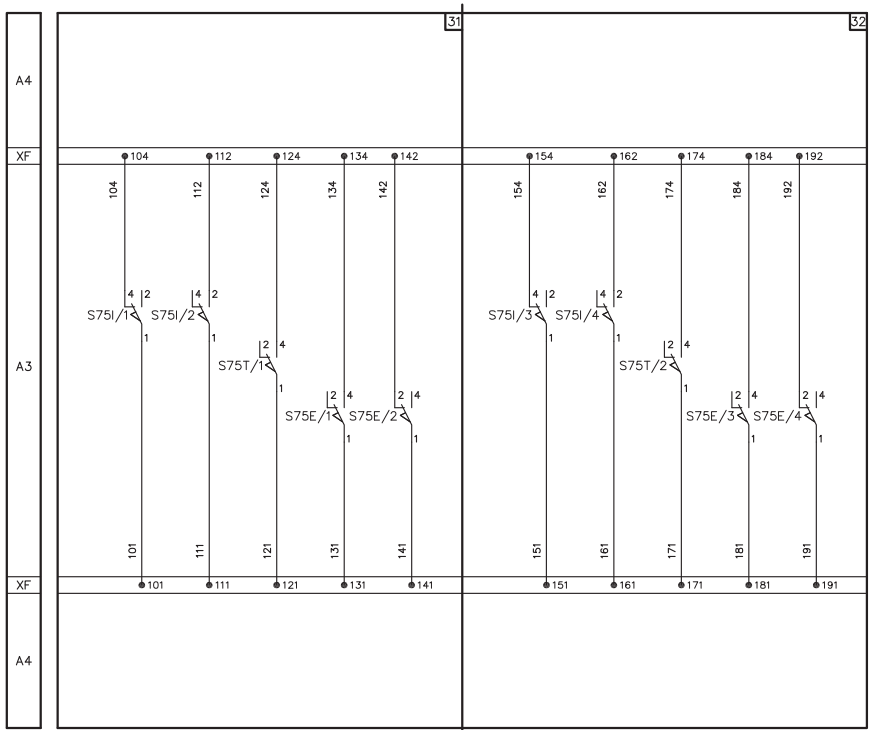
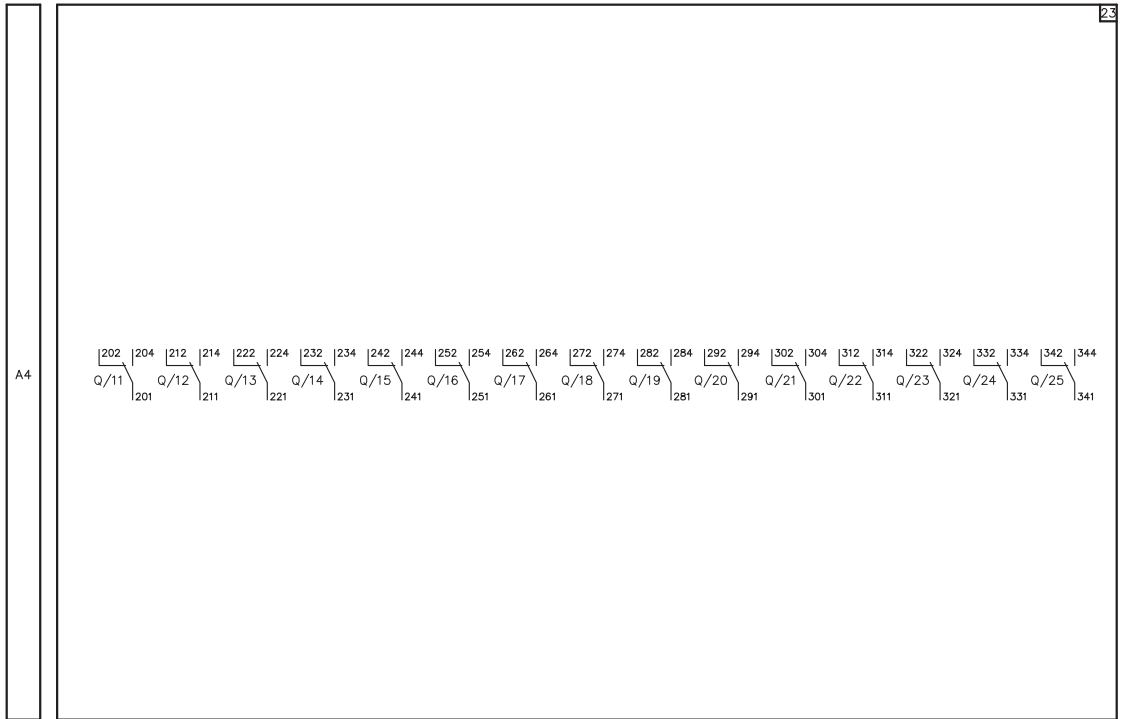
1SDC300246F0001



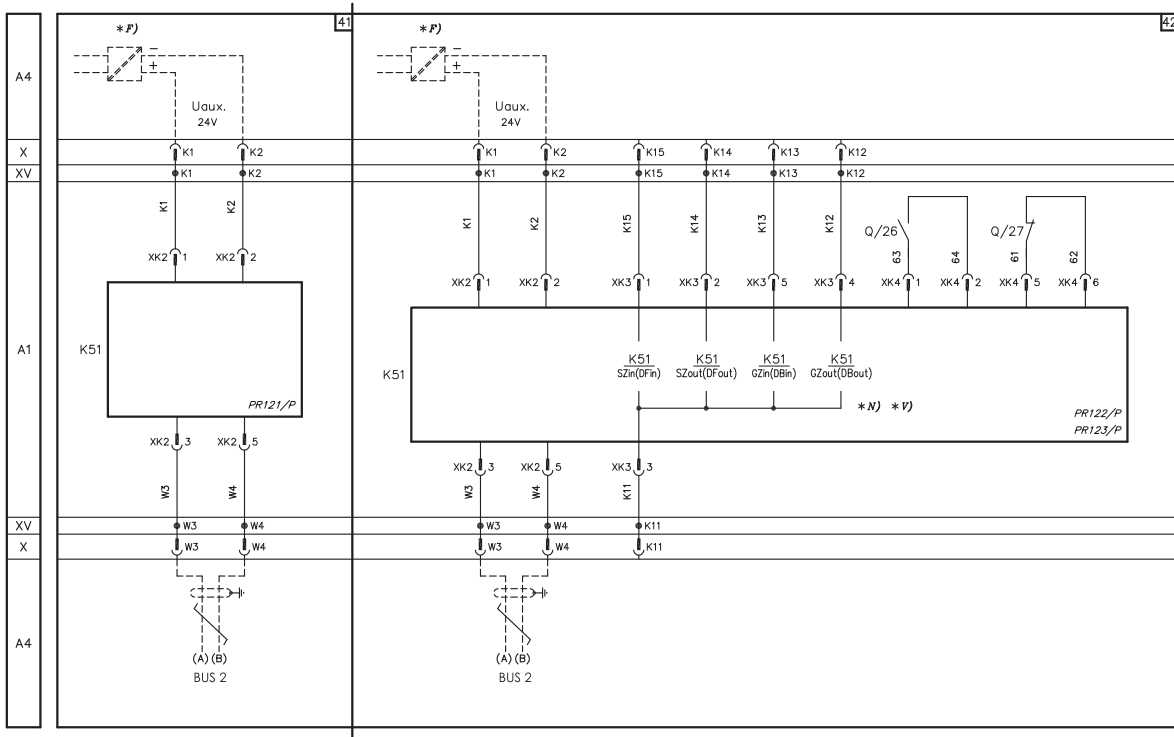
Circuit diagrams

Electrical accessories

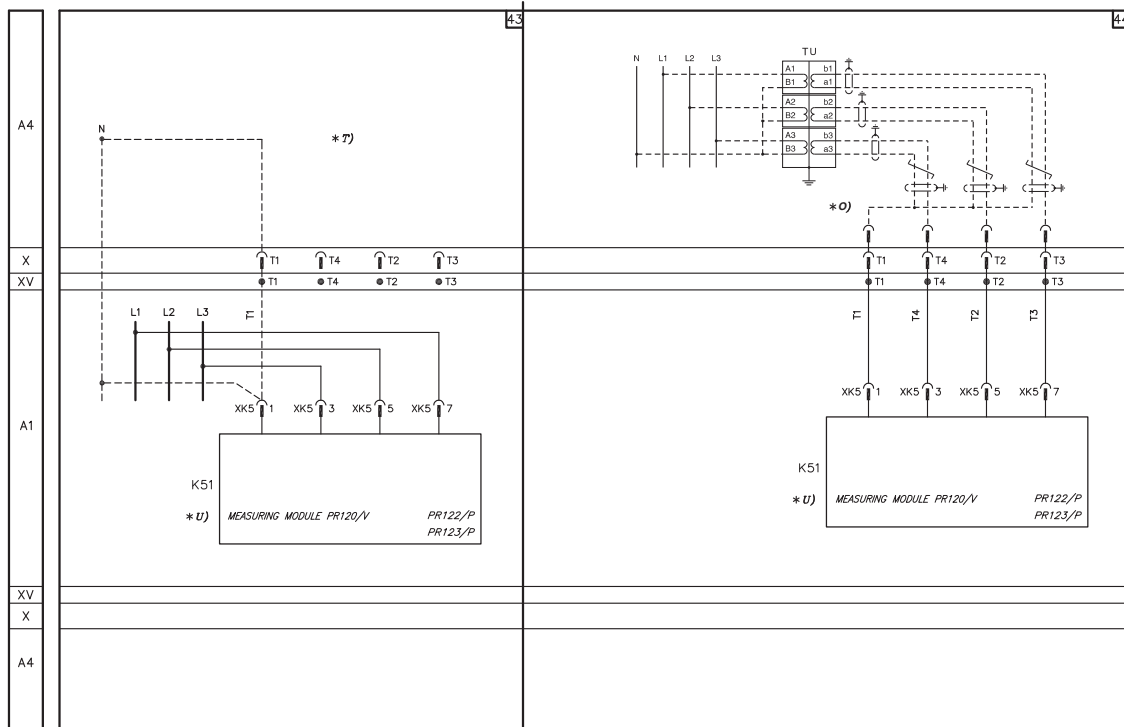
Signalling contacts



Auxiliary circuits of the PR121, PR122 and PR123 trip units



Measuring module PR120/V



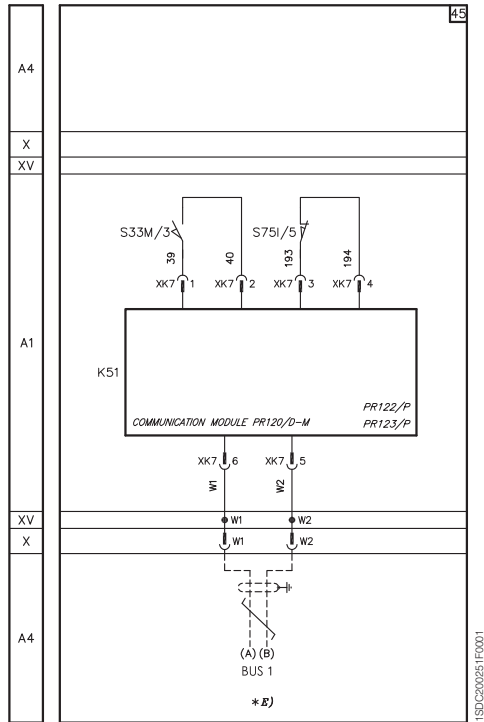
1SDC20226R0001

1SDC20226R0001

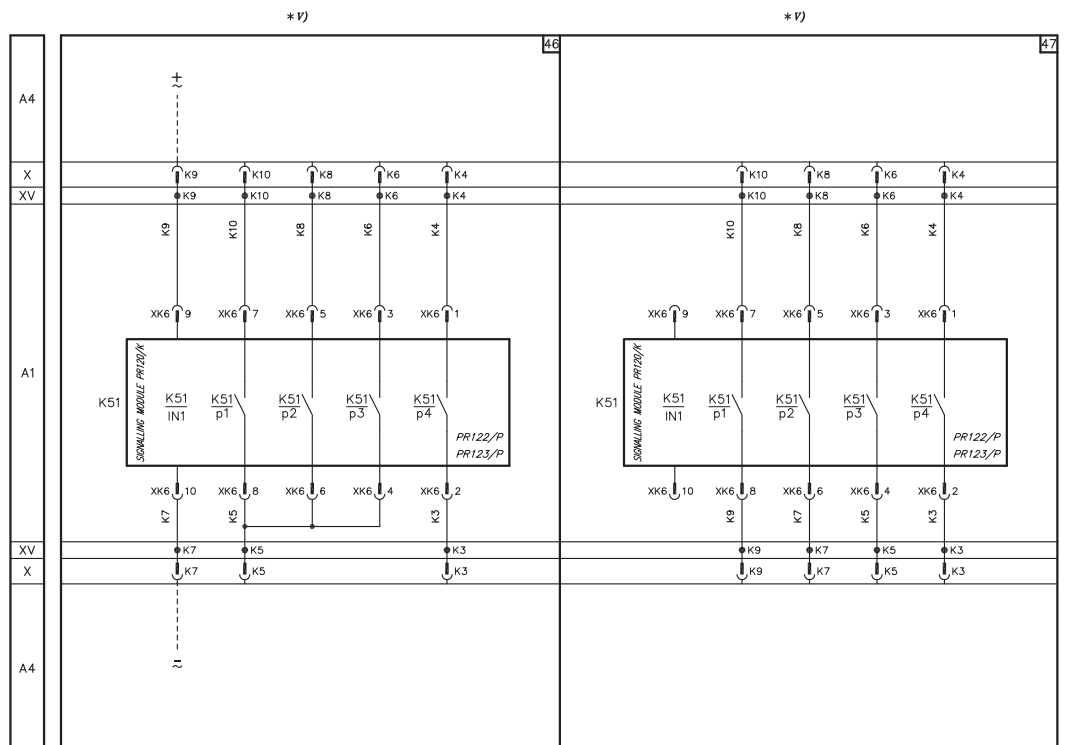
Circuit diagrams

Electrical accessories

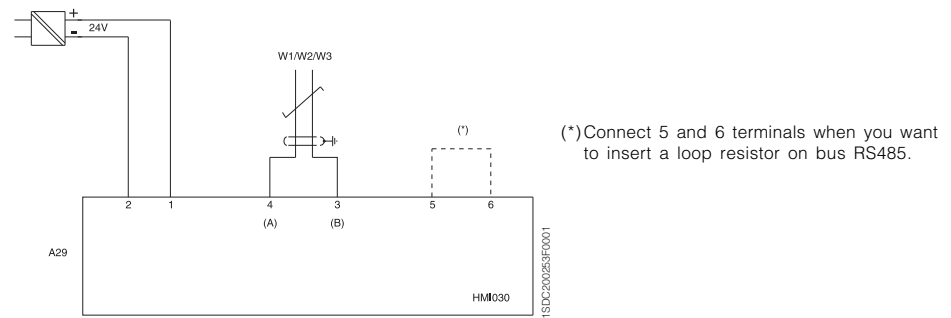
Communication module PR120/D-M



Signalling module PR120/K



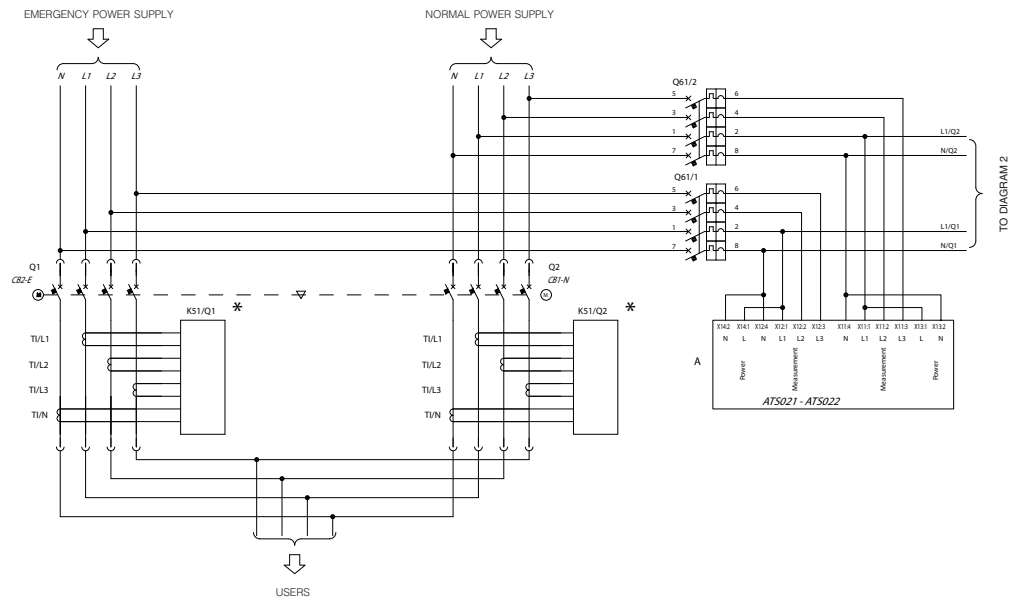
HMI030



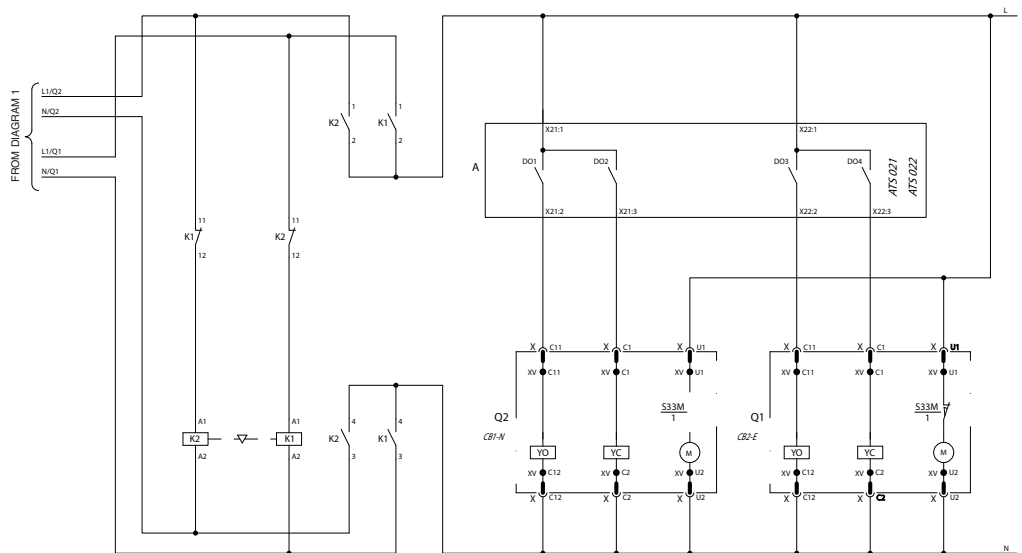
In case of PR222DS/PD and PR223DS/EF, the HMI is connected to the trip unit by means the System bus (W1). When used in association with MM030 as an accessory device, HMI must be connected to accessory bus (W3). Otherwise, local bus (W2) is used.

Circuit diagrams

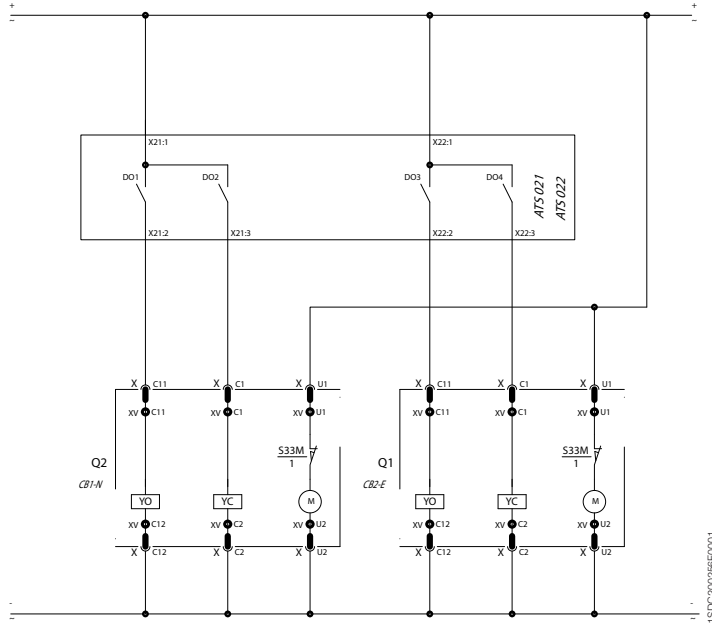
Automatic transfer switch ATS010



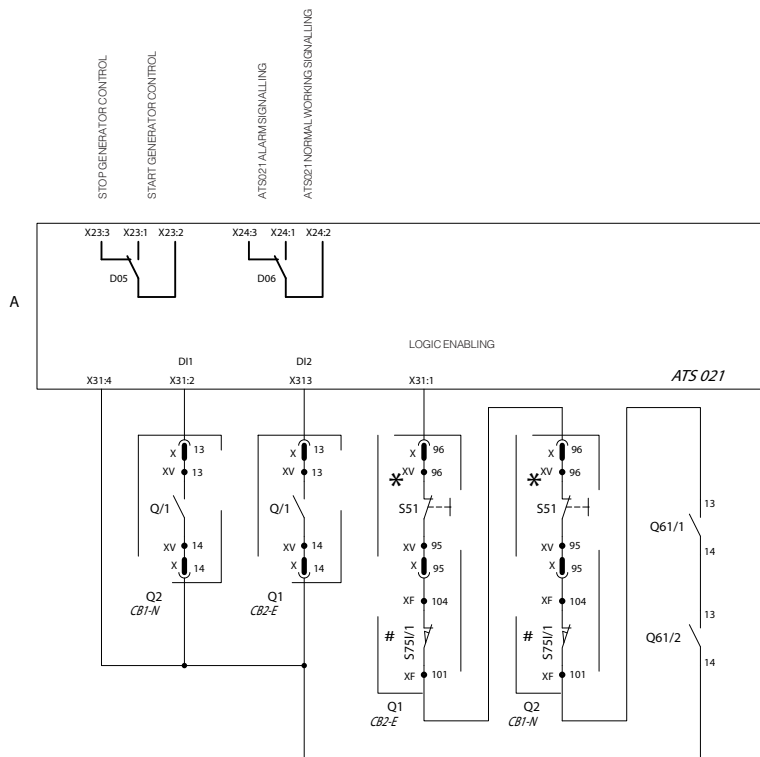
WITHOUT SAFETY AUXILIARY VOLTAGE SUPPLY



WITH SAFETY AUXILIARY VOLTAGE SUPPLY



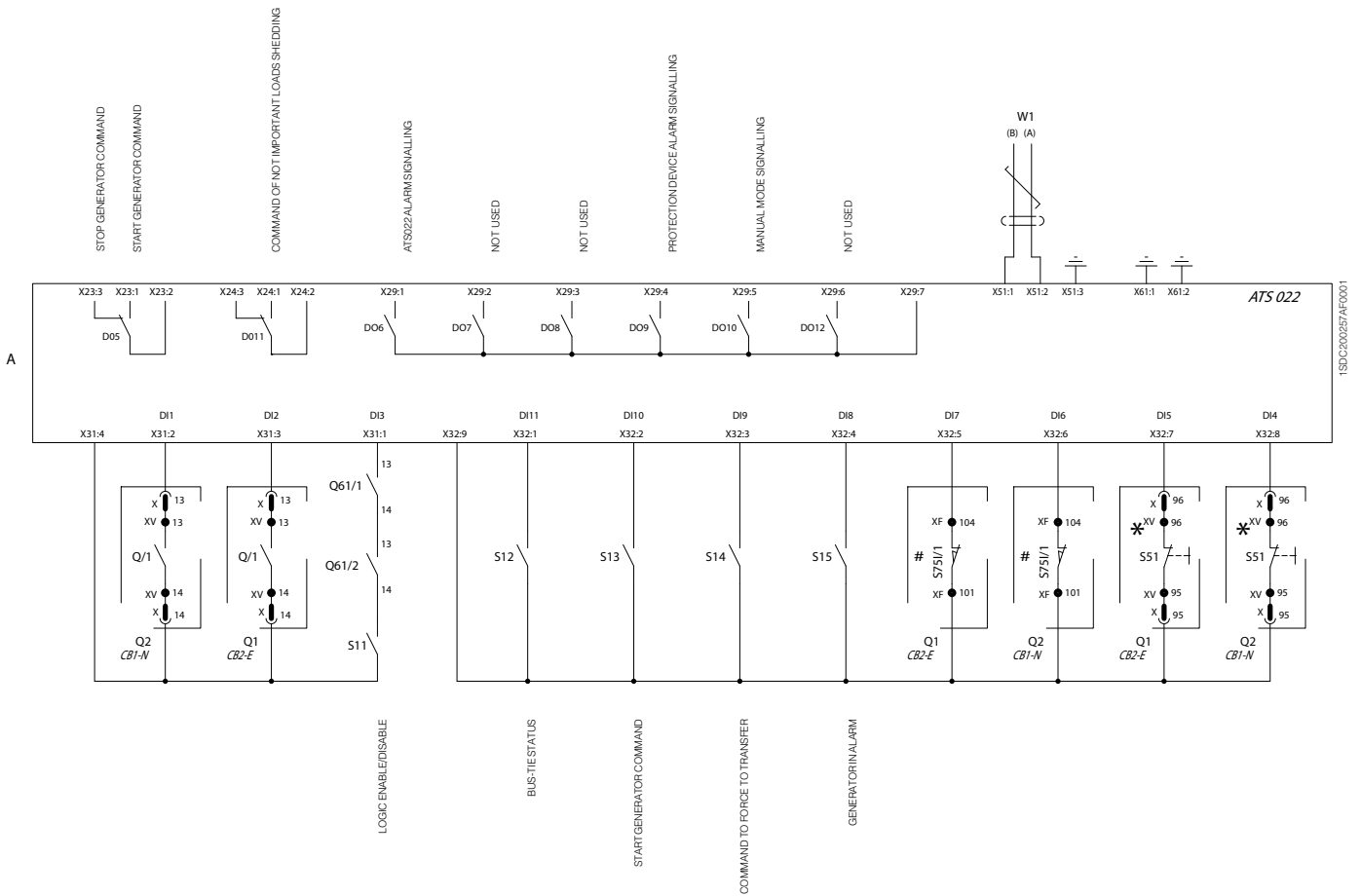
1SDC200257F001



1SDC200257F001

Circuit diagrams

Automatic transfer switch ATS010



Emmax



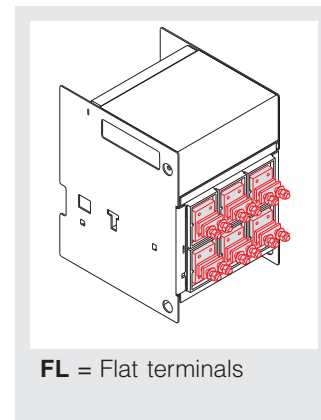
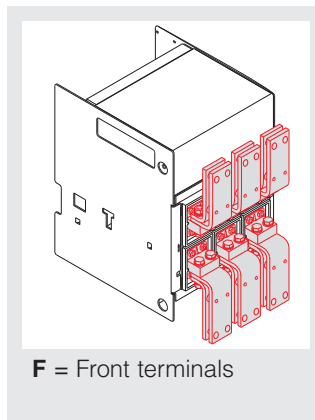
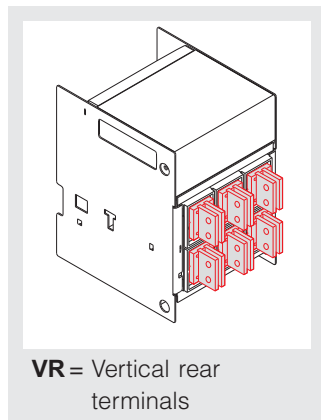
Contents

General information	9/2
SACE Emax automatic circuit-breakers	
SACE Emax E1	9/3
SACE Emax E2	9/7
SACE Emax E3	9/11
SACE Emax E4	9/19
SACE Emax E6	9/21
SACE Emax automatic circuit-breakers with full-size neutral conductor	
SACE Emax E4/f	9/23
SACE Emax E6/f	9/24
SACE Emax switch-disconnectors	
SACE Emax E1/MS	9/25
SACE Emax E2/MS	9/27
SACE Emax E3/MS	9/29
SACE Emax E4/MS	9/32
SACE Emax E6/MS	9/33
SACE Emax switch-disconnectors with full-size neutral conductor	
SACE Emax E4/f MS	9/34
SACE Emax E6/f MS	9/35
SACE Emax automatic circuit-breakers for applications up to 1150V AC	
SACE Emax E2/E	9/36
SACE Emax E3/E	9/37
SACE Emax E4/E	9/38
SACE Emax E6/E	9/38
SACE Emax switch-disconnectors for applications up to 1150V AC	
SACE Emax E2/E MS	9/39
SACE Emax E3/E MS	9/40
SACE Emax E4/E MS	9/42
SACE Emax E6/E MS	9/42
SACE Emax switch-disconnectors for applications up to 1000V DC	
SACE Emax E1/E MS	9/43
SACE Emax E2/E MS	9/44
SACE Emax E3/E MS	9/45
SACE Emax E4/E MS	9/46
SACE Emax E6/E MS	9/47
SACE Emax CS sectionalizing trucks	9/48
SACE Emax MTP earthing switches with making capacity	9/49
SACE Emax MT earthing trucks	9/50
SACE Emax FP fixed parts	9/51
Conversion kit for fixed circuit-breaker and fixed parts	9/53
Extra codes	9/54
SACE Emax accessories	9/55
Electronic trip units and current sensors (for loose supplies)	9/62
Order examples	9/63
ABB SACE	9/1

Ordering codes

General information

Abbreviations used in switchgear descriptions



- F** Fixed
- W** Withdrawable
- MP** Moving part for withdrawable circuit-breakers
- FP** Fixed part for withdrawable circuit-breakers

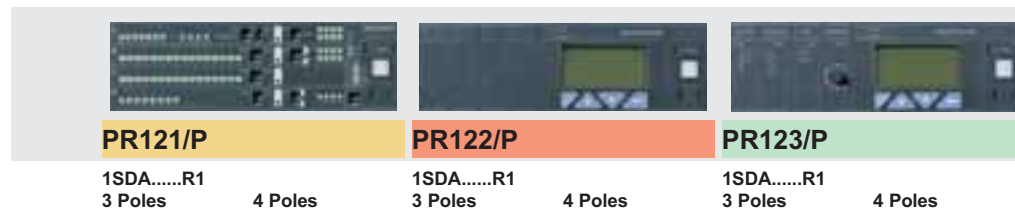
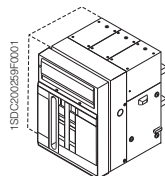
- PR121/P** PR121/P Electronic trip unit (LI, LSI, LSIG functions)
- PR122/P** PR122/P Electronic trip unit (LSI, LSIG, LSIRc functions)
- PR123/P** PR123/P Electronic trip unit (LSIG functions)

Functions:

- L** Protection against overload with long inverse time-delay trip
 - S** Selective protection against short-circuit with short inverse or definite time-delay trip
 - I** Protection against instantaneous short-circuit with adjustable trip current threshold
 - G** Protection against earth faults
 - Rc** Protection against residual current earth faults
-
- I_u** Rated uninterrupted current of the circuit-breaker
 - I_n** Rated current of the electronic release current transformers
 - I_{cu}** Rated ultimate short-circuit breaking capacity
 - I_{cw}** Rated short-time withstand current
 - AC** AC applications
 - DC** DC applications
-
- /MS** Switch-disconnector
 - /E** Automatic circuit-breaker for applications up to 1150 V
 - /E MS** Switch-disconnector for applications up to 1150 V AC and 1000 V DC
 - CS** Sectionalizing truck
 - MTP** Earthing switch
 - MT** Earthing truck

Ordering codes

SACE Emax automatic circuit-breakers



PR121/P **PR122/P** **PR123/P**

1SDA.....R1
3 Poles

4 Poles

1SDA.....R1
3 Poles

4 Poles

1SDA.....R1
3 Poles

4 Poles

E1B 08

Fixed (F)

ICu (415 V) = 42 kA Icw (1 s) = 42 kA

HR = Horizontal rear terminals

LI	055600	055608	055603	055611		
LSI	055601	055609	055604	055612	055606	055614
LSIG	055602	055610	055605	055613	055607	055615
LSIRc*			058553	058555		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E1N 08

Fixed (F)

ICu (415 V) = 50 kA Icw (1 s) = 50 kA

HR = Horizontal rear terminals

LI	055696	055704	055699	055707		
LSI	055697	055705	055700	055708	055702	055710
LSIG	055698	055706	055701	055709	055703	055711
LSIRc*			058577	058579		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E1B 10

Fixed (F)

ICu (415 V) = 42 kA Icw (1 s) = 42 kA

HR = Horizontal rear terminals

LI	059169	059171	059181	059183		
LSI	059173	059175	059185	059187	059197	059199
LSIG	059177	059179	059189	059191	059201	059203

E1N 10

Fixed (F)

ICu (415 V) = 50 kA Icw (1 s) = 50 kA

HR = Horizontal rear terminals

LI	059213	059215	059225	059227		
LSI	059217	059219	059229	059231	059241	059243
LSIG	059221	059223	059233	059235	059245	059247

E1B 12

Fixed (F)

ICu (415 V) = 42 kA Icw (1 s) = 42 kA

HR = Horizontal rear terminals

LI	055632	055640	055635	055643		
LSI	055633	055641	055636	055644	055638	055646
LSIG	055634	055642	055637	055645	055639	055647
LSIRc*			058561	058563		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E1N 12

Fixed (F)

ICu (415 V) = 50 kA Icw (1 s) = 50 kA

HR = Horizontal rear terminals

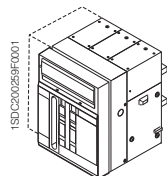
LI	055728	055736	055731	055739		
LSI	055729	055737	055732	055740	055734	055742
LSIG	055730	055738	055733	055741	055735	055743
LSIRc*			058585	058587		


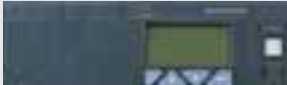

* to be ordered with toroid for residual current protection (see code on page 9/58)



Ordering codes

SACE Emax automatic circuit-breakers



		
PR121/P	PR122/P	PR123/P
1SDA.....R1 3 Poles	1SDA.....R1 3 Poles	1SDA.....R1 3 Poles
4 Poles	4 Poles	4 Poles

E1B 16

Fixed (F)

Icu (415 V) = **42 kA** Icw (1 s) = **42 kA**

HR = Horizontal rear terminals

LI	055664	055672	055667	055675		
LSI	055665	055673	055668	055676	055670	055678
LSIG	055666	055674	055669	055677	055671	055679

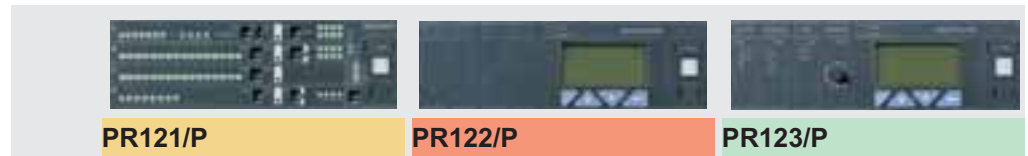
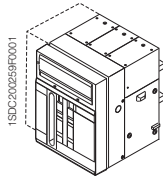
E1N 16

Fixed (F)

Icu (415 V) = **50 kA** Icw (1 s) = **50 kA**

HR = Horizontal rear terminals

LI	055760	055768	055763	055771		
LSI	055761	055769	055764	055772	055766	055774
LSIG	055762	055770	055765	055773	055767	055775



PR121/P

1SDA.....R1
3 Poles 4 Poles

PR122/P

1SDA.....R1
3 Poles 4 Poles

PR123/P

1SDA.....R1
3 Poles 4 Poles

E1B 08

Withdrawable (W) - MP

I_{cu} (415 V) = 42 kA I_{cw} (1 s) = 42 kA

MP = Moving part						
LI	055616	055624	055619	055627		
LSI	055617	055625	055620	055628	055622	055630
LSIG	055618	055626	055621	055629	055623	055631
LSIRc*			058557	058559		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E1N 08

Withdrawable (W) - MP

I_{cu} (415 V) = 50 kA I_{cw} (1 s) = 50 kA

MP = Moving part						
LI	055712	055720	055715	055723		
LSI	055713	055721	055716	055724	055718	055726
LSIG	055714	055722	055717	055725	055719	055727
LSIRc*			058581	058583		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E1B 10

Withdrawable (W) - MP

I_{cu} (415 V) = 42 kA I_{cw} (1 s) = 42 kA

MP = Moving part						
LI	059170	059172	059182	059184		
LSI	059174	059176	059186	059188	059198	059200
LSIG	059178	059180	059190	059192	059202	059204

E1N 10

Withdrawable (W) - MP

I_{cu} (415 V) = 50 kA I_{cw} (1 s) = 50 kA

MP = Moving part						
LI	059214	059216	059226	059228		
LSI	059218	059220	059230	059232	059242	059244
LSIG	059222	059224	059234	059236	059246	059248

E1B 12

Withdrawable (W) - MP

I_{cu} (415 V) = 42 kA I_{cw} (1 s) = 42 kA

MP = Moving part						
LI	055648	055656	055651	055659		
LSI	055649	055657	055652	055660	055654	055662
LSIG	055650	055658	055653	055661	055655	055663
LSIRc*			058565	058567		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E1N 12

Withdrawable (W) - MP

I_{cu} (415 V) = 50 kA I_{cw} (1 s) = 50 kA

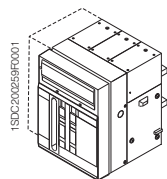
MP = Moving part						
LI	055744	055752	055747	055755		
LSI	055745	055753	055748	055756	055750	055758
LSIG	055746	055754	055749	055757	055751	055759
LSIRc*			058589	058591		


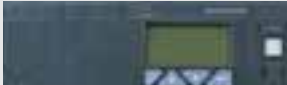

* to be ordered with toroid for residual current protection (see code on page 9/58)



Ordering codes

SACE Emax automatic circuit-breakers



		
PR121/P	PR122/P	PR123/P
1SDA.....R1 3 Poles	1SDA.....R1 3 Poles	1SDA.....R1 3 Poles
4 Poles	4 Poles	4 Poles

E1B 16

Withdrawable (W) - MP

Icu (415 V) = **42 kA** Icw (1 s) = **42 kA**

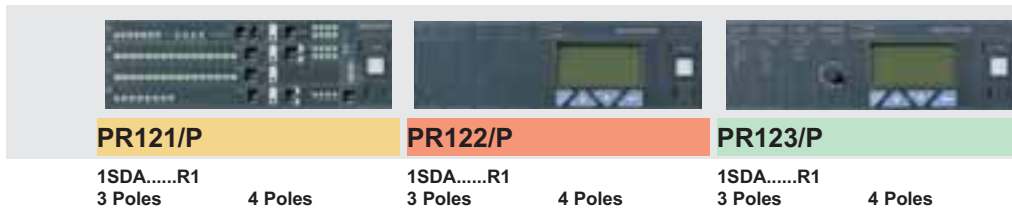
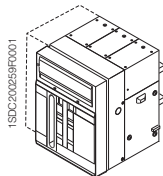
MP = Moving part						
LI	055680	055688	055683	055691		
LSI	055681	055689	055684	055692	055686	055694
LSIG	055682	055690	055685	055693	055687	055695

E1N 16

Withdrawable (W) - MP

Icu (415 V) = **50 kA** Icw (1 s) = **50 kA**

MP = Moving part						
LI	055776	055784	055779	055787		
LSI	055777	055785	055780	055788	055782	055790
LSIG	055778	055786	055781	055789	055783	055791



E2S 08

Fixed (F)

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

HR = Horizontal rear terminals

LI	058282	058290	058285	058293		
LSI	058283	058291	058286	058294	058288	058296
LSIG	058284	058292	058287	058295	058289	058297
LSIRc*			058657	058659		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2N 10

Fixed (F)

Icu (415 V) = 65 kA Icw (1 s) = 55 kA

HR = Horizontal rear terminals

LI	059257	059259	059269	059271		
LSI	059261	059263	059273	059275	059285	059287
LSIG	059265	059267	059277	059279	059289	059291

E2S 10

Fixed (F)

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

HR = Horizontal rear terminals

LI	059301	059303	059313	059315		
LSI	059305	059307	059317	059319	059329	059331
LSIG	059309	059311	059321	059323	059333	059335

E2N 12

Fixed (F)

Icu (415 V) = 65 kA Icw (1 s) = 55 kA

HR = Horizontal rear terminals

LI	055856	055864	055859	055867		
LSI	055857	055865	055860	055868	055862	055870
LSIG	055858	055866	055861	055869	055863	055871
LSIRc*			058633	058635		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2S 12

Fixed (F)

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

HR = Horizontal rear terminals

LI	055952	055960	055955	055963		
LSI	055953	055961	055956	055964	055958	055966
LSIG	055954	055962	055957	055965	055959	055967
LSIRc*			058665	058667		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2L 12

Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 10 kA

HR = Horizontal rear terminals

LI	056048	056056	056051	056059		
LSI	056049	056057	056052	056060	056054	056062
LSIG	056050	056058	056053	056061	056055	056063
LSIRc*			058617	058619		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2B 16

Fixed (F)

Icu (415 V) = 42 kA Icw (1 s) = 42 kA

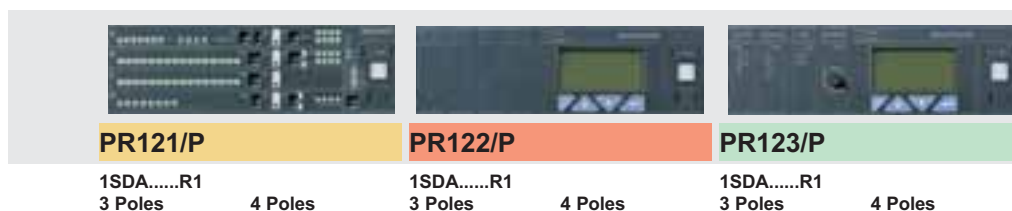
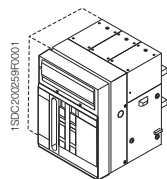
HR = Horizontal rear terminals

LI	055792	055800	055795	055803		
LSI	055793	055801	055796	055804	055798	055806
LSIG	055794	055802	055797	055805	055799	055807



Ordering codes

SACE Emax automatic circuit-breakers



E2N 16

Fixed (F)

Icu (415 V) = **65 kA** Icw (1 s) = **55 kA**

HR = Horizontal rear terminals

LI	055888	055896	055891	055899		
LSI	055889	055897	055892	055900	055894	055902
LSIG	055890	055898	055893	055901	055895	055903

E2S 16

Fixed (F)

Icu (415 V) = **85 kA** Icw (1 s) = **65 kA**

HR = Horizontal rear terminals

LI	055984	055992	055987	055995		
LSI	055985	055993	055988	055996	055990	055998
LSIG	055986	055994	055989	055997	055991	055999

E2L 16

Fixed (F)

Icu (415 V) = **130 kA** Icw (1 s) = **10 kA**

HR = Horizontal rear terminals

LI	056080	056088	056083	056091		
LSI	056081	056089	056084	056092	056086	056094
LSIG	056082	056090	056085	056093	056087	056095

E2B 20

Fixed (F)

Icu (415 V) = **42 kA** Icw (1 s) = **42 kA**

HR = Horizontal rear terminals

LI	055824	055832	055827	055835		
LSI	055825	055833	055828	055836	055830	055838
LSIG	055826	055834	055829	055837	055831	055839
LSIRc*			058609	058611		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2N 20

Fixed (F)

Icu (415 V) = **65 kA** Icw (1 s) = **55 kA**

HR = Horizontal rear terminals

LI	055920	055928	055923	055931		
LSI	055921	055929	055924	055932	055926	055934
LSIG	055922	055930	055925	055933	055927	055935
LSIRc*			058649	058651		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2S 20

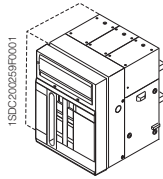
Fixed (F)

Icu (415 V) = **85 kA** Icw (1 s) = **65 kA**

HR = Horizontal rear terminals

LI	056016	056024	056019	056027		
LSI	056017	056025	056020	056028	056022	056030
LSIG	056018	056026	056021	056029	056023	056031
LSIRc*			058681	058683		

* to be ordered with toroid for residual current protection (see code on page 9/58)



Icu (415 V) = 85 kA Icw (1 s) = 65 kA

E2S 08

Withdrawable (W) - MP

MP = Moving part

LI	058298	058306	058301	058309		
LSI	058299	058307	058302	058310	058304	058312
LSIG	058300	058308	058303	058311	058305	058313
LSIRc*			058661	058663		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2N 10

Withdrawable (W) - MP

Icu (415 V) = 65 kA Icw (1 s) = 55 kA

MP = Moving part

LI	059258	059260	059270	059272		
LSI	059262	059264	059274	059276	059286	059288
LSIG	059266	059268	059278	059280	059290	059292

E2S 10

Withdrawable (W) - MP

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

MP = Moving part

LI	059302	059304	059314	059316		
LSI	059306	059308	059318	059320	059330	059332
LSIG	059310	059312	059322	059324	059334	059336

E2N 12

Withdrawable (W) - MP

Icu (415 V) = 65 kA Icw (1 s) = 55 kA

MP = Moving part

LI	055872	055880	055875	055883		
LSI	055873	055881	055876	055884	055878	055886
LSIG	055874	055882	055877	055885	055879	055887
LSIRc*			058637	058639		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2S 12

Withdrawable (W) - MP

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

MP = Moving part

LI	055968	055976	055971	055979		
LSI	055969	055977	055972	055980	055974	055982
LSIG	055970	055978	055973	055981	055975	055983
LSIRc*			058669	058671		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2L 12

Withdrawable (W) - MP

Icu (415 V) = 130 kA Icw (1 s) = 10 kA

MP = Moving part

LI	056064	056072	056067	056075		
LSI	056065	056073	056068	056076	056070	056078
LSIG	056066	056074	056069	056077	056071	056079
LSIRc*			058621	058623		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2B 16

Withdrawable (W) - MP

Icu (415 V) = 42 kA Icw (1 s) = 42 kA

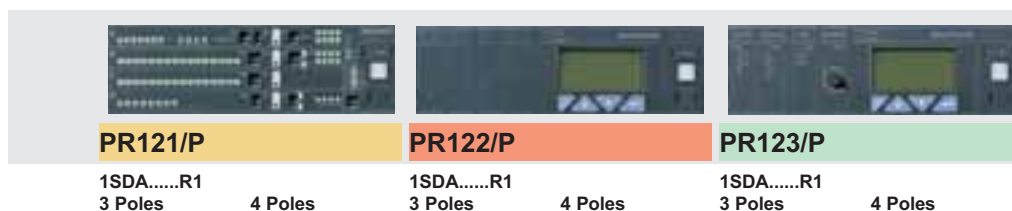
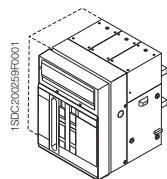
MP = Moving part

LI	055808	055816	055811	055819		
LSI	055809	055817	055812	055820	055814	055822
LSIG	055810	055818	055813	055821	055815	055823



Ordering codes

SACE Emax automatic circuit-breakers



E2N 16

Withdrawable (W) - MP

Icu (415 V) = 65 kA Icw (1 s) = 55 kA

MP = Moving part						
LI	055904	055912	055907	055915		
LSI	055905	055913	055908	055916	055910	055918
LSIG	055906	055914	055909	055917	055911	055919

E2S 16

Withdrawable (W) - MP

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

MP = Moving part						
LI	056000	056008	056003	056011		
LSI	056001	056009	056004	056012	056006	056014
LSIG	056002	056010	056005	056013	056007	056015

E2L 16

Withdrawable (W) - MP

Icu (415 V) = 130 kA Icw (1 s) = 10 kA

MP = Moving part						
LI	056096	056104	056099	056107		
LSI	056097	056105	056100	056108	056102	056110
LSIG	056098	056106	056101	056109	056103	056111

E2B 20

Withdrawable (W) - MP

Icu (415 V) = 42 kA Icw (1 s) = 42 kA

MP = Moving part						
LI	055840	055848	055843	055851		
LSI	055841	055849	055844	055852	055846	055854
LSIG	055842	055850	055845	055853	055847	055855
LSIRc*			058613	058615		

* to be ordered with toroid for residual current protection (see code on page 9/58)

E2N 20

Withdrawable (W) - MP

Icu (415 V) = 65 kA Icw (1 s) = 55 kA

MP = Moving part						
LI	055936	055944	055939	055947		
LSI	055937	055945	055940	055948	055942	055950
LSIG	055938	055946	055941	055949	055943	055951
LSIRc*			058653	058655		

* to be ordered with toroid for residual current protection (see code on page 9/58)

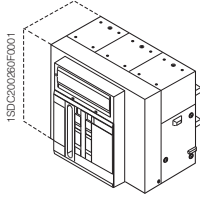
E2S 20

Withdrawable (W) - MP

Icu (415 V) = 85 kA Icw (1 s) = 65 kA

MP = Moving part						
LI	056032	056040	056035	056043		
LSI	056033	056041	056036	056044	056038	056046
LSIG	056034	056042	056037	056045	056039	056047
LSIRc*			058685	058687		

* to be ordered with toroid for residual current protection (see code on page 9/58)



E3H 08

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals						
LI	056336	056344	056339	056347		
LSI	056337	056345	056340	056348	056342	056350
LSIG	056338	056346	056341	056349	056343	056351
LSIRc*	058689					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 08

Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

HR = Horizontal rear terminals						
LI	056528	056536	056531	056539		
LSI	056529	056537	056532	056540	056534	056542
LSIG	056530	056538	056533	056541	056535	056543
LSIRc*	058809					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3S 10

Fixed (F)

Icu (415 V) = 75 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals						
LI	059385	059387	059397	059399		
LSI	059389	059391	059401	059403	059413	059415
LSIG	059393	059395	059405	059407	059417	059419

E3H 10

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals						
LI	059345	059347	059357	059359		
LSI	059349	059351	059361	059363	059373	059375
LSIG	059353	059355	059365	059367	059377	059379

E3S 12

Fixed (F)

Icu (415 V) = 75 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals						
LI	056176	056184	056179	056187		
LSI	056177	056185	056180	056188	056182	056190
LSIG	056178	056186	056181	056189	056183	056191
LSIRc*	058769					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3H 12

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals						
LI	056368	056376	056371	056379		
LSI	056369	056377	056372	056380	056374	056382
LSIG	056370	056378	056373	056381	056375	056383
LSIRc*	058697					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 12

Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

HR = Horizontal rear terminals						
LI	056560	056568	056563	056571		
LSI	056561	056569	056564	056572	056566	056574
LSIG	056562	056570	056565	056573	056567	056575
LSIRc*	058817					

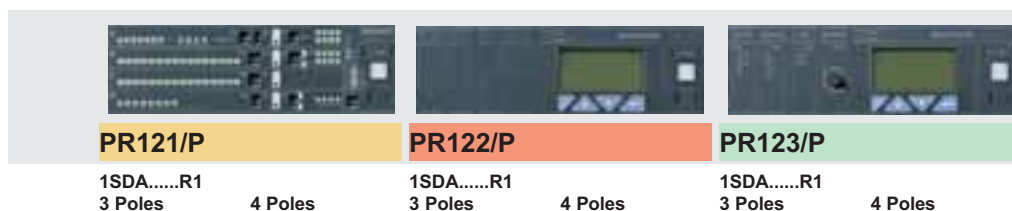
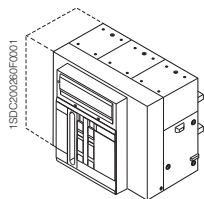
* to be ordered with toroid for residual current protection (see code on page 9/58)

Fixed parts page 9/51 Terminals page 9/53 Extra codes page 9/54



Ordering codes

SACE Emax automatic circuit-breakers



Icu (415 V) = 75 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056208	056216	056211	056219		
LSI	056209	056217	056212	056220	056214	056222
LSIG	056210	056218	056213	056221	056215	056223

E3S 16

Fixed (F)

E3H 16

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056400	056408	056403	056411		
LSI	056401	056409	056404	056412	056406	056414
LSIG	056402	056410	056405	056413	056407	056415

E3V 16

Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

HR = Horizontal rear terminals

LI	056592	056600	056595	056603		
LSI	056593	056601	056596	056604	056598	056606
LSIG	056594	056602	056597	056605	056599	056607

E3S 20

Fixed (F)

Icu (415 V) = 75 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056240	056248	056243	056251		
LSI	056241	056249	056244	056252	056246	056254
LSIG	056242	056250	056245	056253	056247	056255
LSIRc*			058785			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3H 20

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056432	056440	056435	056443		
LSI	056433	056441	056436	056444	056438	056446
LSIG	056434	056442	056437	056445	056439	056447
LSIRc*			058713			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 20

Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

HR = Horizontal rear terminals

LI	056624	056632	056627	056635		
LSI	056625	056633	056628	056636	056630	056638
LSIG	056626	056634	056629	056637	056631	056639
LSIRc*			058833			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3L 20

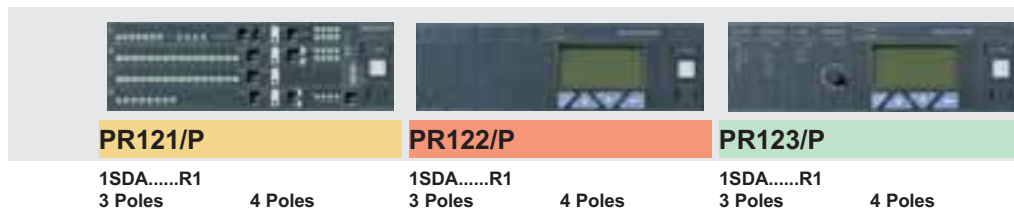
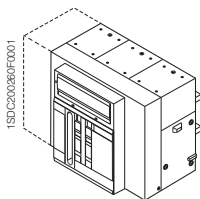
Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 15 kA

HR = Horizontal rear terminals

LI	056720	056728	056723	056731		
LSI	056721	056729	056724	056732	056726	056734
LSIG	056722	056730	056725	056733	056727	056735
LSIRc*			058737			

* to be ordered with toroid for residual current protection (see code on page 9/58)



E3N 25

Fixed (F)

I_{cu} (415 V) = 65 kA I_{cw} (1 s) = 65 kA

HR = Horizontal rear terminals

LI	056112	056120	056115	056123		
LSI	056113	056121	056116	056124	056118	056126
LSIG	056114	056122	056117	056125	056119	056127

E3S 25

Fixed (F)

I_{cu} (415 V) = 75 kA I_{cw} (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056272	056280	056275	056283		
LSI	056273	056281	056276	056284	056278	056286
LSIG	056274	056282	056277	056285	056279	056287

E3H 25

Fixed (F)

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056464	056472	056467	056475		
LSI	056465	056473	056468	056476	056470	056478
LSIG	056466	056474	056469	056477	056471	056479

E3V 25

Fixed (F)

I_{cu} (415 V) = 130 kA I_{cw} (1 s) = 85 kA

HR = Horizontal rear terminals

LI	056656	056664	056659	056667		
LSI	056657	056665	056660	056668	056662	056670
LSIG	056658	056666	056661	056669	056663	056671

E3L 25

Fixed (F)

I_{cu} (415 V) = 130 kA I_{cw} (1 s) = 15 kA

HR = Horizontal rear terminals

LI	056752	056760	056755	056763		
LSI	056753	056761	056756	056764	056758	056766
LSIG	056754	056762	056757	056765	056759	056767

E3N 32

Fixed (F)

I_{cu} (415 V) = 65 kA I_{cw} (1 s) = 65 kA

HR = Horizontal rear terminals

LI	056144	056152	056147	056155		
LSI	056145	056153	056148	056156	056150	056158
LSIG	056146	056154	056149	056157	056151	056159
LSIRc*			058761			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3S 32

Fixed (F)

I_{cu} (415 V) = 75 kA I_{cw} (1 s) = 75 kA

HR = Horizontal rear terminals

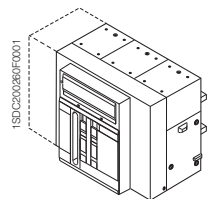
LI	056304	056312	056307	056315		
LSI	056305	056313	056308	056316	056310	056318
LSIG	056306	056314	056309	056317	056311	056319
LSIRc*			058801			




* to be ordered with toroid for residual current protection (see code on page 9/58)



Ordering codes

SACE Emax automatic circuit-breakers



		
PR121/P	PR122/P	PR123/P
1SDA.....R1 3 Poles 4 Poles	1SDA.....R1 3 Poles 4 Poles	1SDA.....R1 3 Poles 4 Poles

E3H 32

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056496	056504	056499	056507		
LSI	056497	056505	056500	056508	056502	056510
LSIG	056498	056506	056501	056509	056503	056511
LSIRc*			058729			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 32

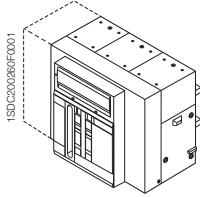
Fixed (F)

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

HR = Horizontal rear terminals


LI	056688	056696	056691	056699		
LSI	056689	056697	056692	056700	056694	056702
LSIG	056690	056698	056693	056701	056695	056703
LSIRc*			058849			

* to be ordered with toroid for residual current protection (see code on page 9/58)



E3H 08

Withdrawable (W) - MP

		
PR121/P	PR122/P	PR123/P
1SDA.....R1 3 Poles	1SDA.....R1 3 Poles	1SDA.....R1 3 Poles
4 Poles	4 Poles	4 Poles

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 75 kA

MP = Moving part						
LI	056352	056360	056355	056363		
LSI	056353	056361	056356	056364	056358	056366
LSIG	056354	056362	056357	056365	056359	056367
LSIRc*	058693					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 08

Withdrawable (W) - MP

I_{cu} (415 V) = 75 kA I_{cw} (1 s) = 75 kA

MP = Moving part						
LI	056544	056552	056547	056555		
LSI	056545	056553	056548	056556	056550	056558
LSIG	056546	056554	056549	056557	056551	056559
LSIRc*	058813					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3S 10

Withdrawable (W) - MP

I_{cu} (415 V) = 75 kA I_{cw} (1 s) = 75 kA

MP = Moving part						
LI	059386	059388	059398	059400		
LSI	059390	059392	059402	059404	059414	059416
LSIG	059394	059396	059406	059408	059418	059420

E3H 10

Withdrawable (W) - MP

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 85 kA

MP = Moving part						
LI	059346	059348	059358	059360		
LSI	059350	059352	059362	059364	059374	059376
LSIG	059354	059356	059366	059368	059378	059380

E3S 12

Withdrawable (W) - MP

I_{cu} (415 V) = 75 kA I_{cw} (1 s) = 75 kA

MP = Moving part						
LI	056192	056200	056195	056203		
LSI	056193	056201	056196	056204	056198	056206
LSIG	056194	056202	056197	056205	056199	056207
LSIRc*	058773					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3H 12

Withdrawable (W) - MP

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 75 kA

MP = Moving part						
LI	056384	056392	056387	056395		
LSI	056385	056393	056388	056396	056390	056398
LSIG	056386	056394	056389	056397	056391	056399
LSIRc*	058701					

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 12

Withdrawable (W) - MP

I_{cu} (415 V) = 130 kA I_{cw} (1 s) = 85 kA

MP = Moving part						
LI	056576	056584	056579	056587		
LSI	056577	056585	056580	056588	056582	056590
LSIG	056578	056586	056581	056589	056583	056591
LSIRc*	058821					

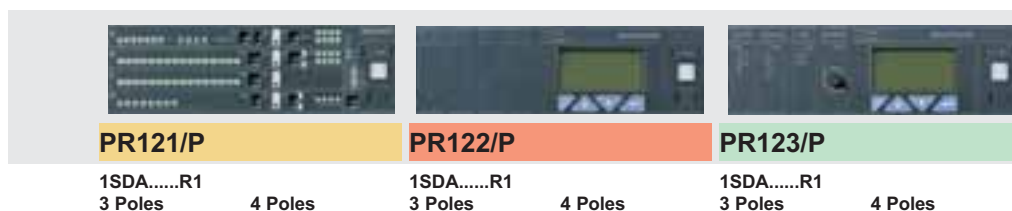
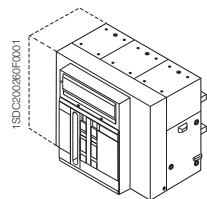
* to be ordered with toroid for residual current protection (see code on page 9/58)

Fixed parts page 9/51 Terminals page 9/53 Extra codes page 9/54



Ordering codes

SACE Emax automatic circuit-breakers



Icu (415 V) = **75 kA** Icw (1 s) = **75 kA**

MP = Moving part						
LI	056224	056232	056227	056235		
LSI	056225	056233	056228	056236	056230	056238
LSIG	056226	056234	056229	056237	056231	056239

E3S 16

Withdrawable (W) - MP

E3H 16

Withdrawable (W) - MP

Icu (415 V) = **100 kA** Icw (1 s) = **75 kA**

MP = Moving part						
LI	056416	056424	056419	056427		
LSI	056417	056425	056420	056428	056422	056430
LSIG	056418	056426	056421	056429	056423	056431

E3V 16

Withdrawable (W) - MP

Icu (415 V) = **130 kA** Icw (1 s) = **85 kA**

MP = Moving part						
LI	056608	056616	056611	056619		
LSI	056609	056617	056612	056620	056614	056622
LSIG	056610	056618	056613	056621	056615	056623

E3S 20

Withdrawable (W) - MP

Icu (415 V) = **75 kA** Icw (1 s) = **75 kA**

MP = Moving part						
LI	056256	056264	056259	056267		
LSI	056257	056265	056260	056268	056262	056270
LSIG	056258	056266	056261	056269	056263	056271
LSIRc*			058789			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3H 20

Withdrawable (W) - MP

Icu (415 V) = **100 kA** Icw (1 s) = **75 kA**

MP = Moving part						
LI	056448	056456	056451	056459		
LSI	056449	056457	056452	056460	056454	056462
LSIG	056450	056458	056453	056461	056455	056463
LSIRc*			058717			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3V 20

Withdrawable (W) - MP

Icu (415 V) = **130 kA** Icw (1 s) = **85 kA**

MP = Moving part						
LI	056640	056648	056643	056651		
LSI	056641	056649	056644	056652	056646	056654
LSIG	056642	056650	056645	056653	056647	056655
LSIRc*			058837			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3L 20

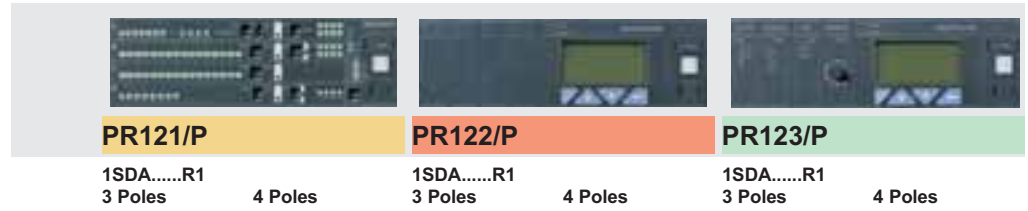
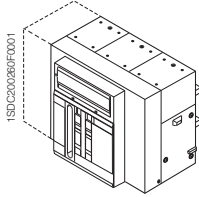
Withdrawable (W) - MP

Icu (415 V) = **130 kA** Icw (1 s) = **15 kA**

MP = Moving part						
LI	056736	056744	056739	056747		
LSI	056737	056745	056740	056748	056742	056750
LSIG	056738	056746	056741	056749	056743	056751
LSIRc*			058741			

* to be ordered with toroid for residual current protection (see code on page 9/58)

Fixed parts page 9/51 Terminals page 9/53 Extra codes page 9/54



PR121/P **PR122/P** **PR123/P**

1SDA.....R1
3 Poles

4 Poles

1SDA.....R1
3 Poles

4 Poles

1SDA.....R1
3 Poles

4 Poles

E3N 25

Withdrawable (W) - MP

Icu (415 V) = 65 kA Icw (1 s) = 65 kA

MP = Moving part

LI	056128	056136	056131	056139		
LSI	056129	056137	056132	056140	056134	056142
LSIG	056130	056138	056133	056141	056135	056143

E3S 25

Withdrawable (W) - MP

Icu (415 V) = 75 kA Icw (1 s) = 75 kA

MP = Moving part

LI	056288	056296	056291	056299		
LSI	056289	056297	056292	056300	056294	056302
LSIG	056290	056298	056293	056301	056295	056303

E3H 25

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

MP = Moving part

LI	056480	056488	056483	056491		
LSI	056481	056489	056484	056492	056486	056494
LSIG	056482	056490	056485	056493	056487	056495

E3V 25

Withdrawable (W) - MP

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

MP = Moving part

LI	056672	056680	056675	056683		
LSI	056673	056681	056676	056684	056678	056686
LSIG	056674	056682	056677	056685	056679	056687

E3L 25

Withdrawable (W) - MP

Icu (415 V) = 130 kA Icw (1 s) = 15 kA

MP = Moving part

LI	056768	056776	056771	056779		
LSI	056769	056777	056772	056780	056774	056782
LSIG	056770	056778	056773	056781	056775	056783

E3N 32

Withdrawable (W) - MP

Icu (415 V) = 65 kA Icw (1 s) = 65 kA

MP = Moving part

LI	056160	056168	056163	056171		
LSI	056161	056169	056164	056172	056166	056174
LSIG	056162	056170	056165	056173	056167	056175
LSIRc*			058765			

* to be ordered with toroid for residual current protection (see code on page 9/58)

E3S 32

Withdrawable (W) - MP

Icu (415 V) = 75 kA Icw (1 s) = 75 kA

MP = Moving part

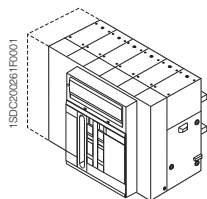
LI	056320	056328	056323	056331		
LSI	056321	056329	056324	056332	056326	056334
LSIG	056322	056330	056325	056333	056327	056335
LSIRc*			058805			


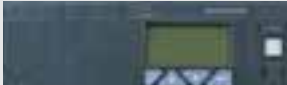

* to be ordered with toroid for residual current protection (see code on page 9/58)



Ordering codes

SACE Emax automatic circuit-breakers



		
PR121/P	PR122/P	PR123/P
1SDA.....R1 3 Poles	1SDA.....R1 3 Poles	1SDA.....R1 3 Poles
4 Poles	4 Poles	4 Poles

E3H 32

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 75 kA

MP = Moving part						
LI	056512	056520	056515	056523		
LSI	056513	056521	056516	056524	056518	056526
LSIG	056514	056522	056517	056525	056519	056527
LSIRc*	058733					

* to be ordered with toroid for residual current protection (see code on page 9/58)

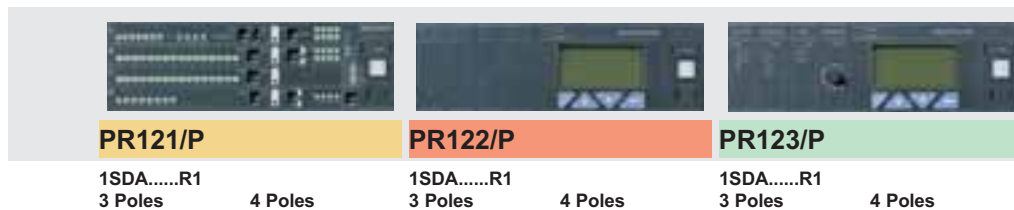
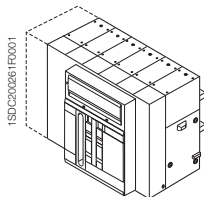
E3V 32

Withdrawable (W) - MP

Icu (415 V) = 130 kA Icw (1 s) = 85 kA

MP = Moving part						
LI	056704	056712	056707	056715		
LSI	056705	056713	056708	056716	056710	056718
LSIG	056706	056714	056709	056717	056711	056719
LSIRc*	058853					

* to be ordered with toroid for residual current protection (see code on page 9/58)



E4H 32

Fixed (F)

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 100 kA

HR = Horizontal rear terminals

LI	056816	056824	056819	056827		
LSI	056817	056825	056820	056828	056822	056830
LSIG	056818	056826	056821	056829	056823	056831

E4V 32

Fixed (F)

I_{cu} (415 V) = 150 kA I_{cw} (1 s) = 100 kA

HR = Horizontal rear terminals

LI	056880	056888	056883	056891		
LSI	056881	056889	056884	056892	056886	056894
LSIG	056882	056890	056885	056893	056887	056895

E4S 40

Fixed (F)

I_{cu} (415 V) = 75 kA I_{cw} (1 s) = 75 kA

HR = Horizontal rear terminals

LI	056784	056792	056787	056795		
LSI	056785	056793	056788	056796	056790	056798
LSIG	056786	056794	056789	056797	056791	056799

E4H 40

Fixed (F)

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 100 kA

HR = Horizontal rear terminals

LI	056848	056856	056851	056859		
LSI	056849	056857	056852	056860	056854	056862
LSIG	056850	056858	056853	056861	056855	056863

E4V 40

Fixed (F)

I_{cu} (415 V) = 150 kA I_{cw} (1 s) = 100 kA

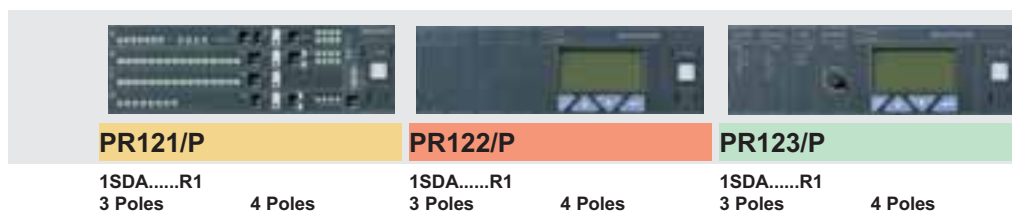
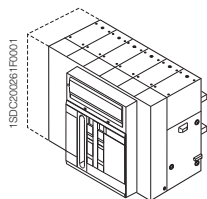
HR = Horizontal rear terminals

LI	056912	056920	056915	056923		
LSI	056913	056921	056916	056924	056918	056926
LSIG	056914	056922	056917	056925	056919	056927



Ordering codes

SACE Emax automatic circuit-breakers



E4H 32

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	056832	056840	056835	056843		
LSI	056833	056841	056836	056844	056838	056846
LSIG	056834	056842	056837	056845	056839	056847

E4V 32

Withdrawable (W) - MP

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	056896	056904	056899	056907		
LSI	056897	056905	056900	056908	056902	056910
LSIG	056898	056906	056901	056909	056903	056911

E4S 40

Withdrawable (W) - MP

Icu (415 V) = 75 kA Icw (1 s) = 75 kA

MP = Moving part						
LI	056800	056808	056803	056811		
LSI	056801	056809	056804	056812	056806	056814
LSIG	056802	056810	056805	056813	056807	056815

E4H 40

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

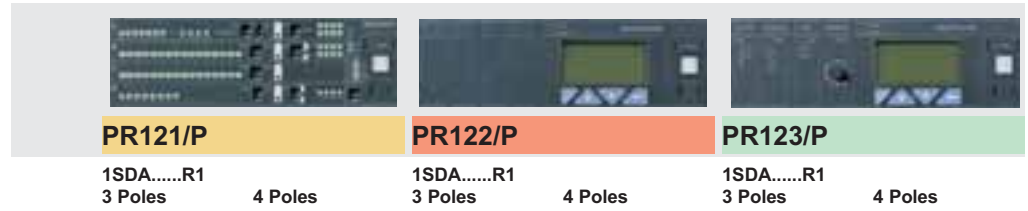
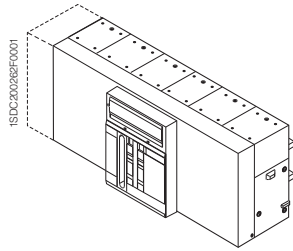
MP = Moving part						
LI	056864	056872	056867	056875		
LSI	056865	056873	056868	056876	056870	056878
LSIG	056866	056874	056869	056877	056871	056879

E4V 40

Withdrawable (W) - MP

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	056928	056936	056931	056939		
LSI	056929	056937	056932	056940	056934	056942
LSIG	056930	056938	056933	056941	056935	056943



E6V 32

Fixed (F)

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	057040	057048	057043	057051		
LSI	057041	057049	057044	057052	057046	057054
LSIG	057042	057050	057045	057053	057047	057055

E6H 40

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	056944	056952	056947	056955		
LSI	056945	056953	056948	056956	056950	056958
LSIG	056946	056954	056949	056957	056951	056959

E6V 40

Fixed (F)

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	057072	057080	057075	057083		
LSI	057073	057081	057076	057084	057078	057086
LSIG	057074	057082	057077	057085	057079	057087

E6H 50

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	056976	056984	056979	056987		
LSI	056977	056985	056980	056988	056982	056990
LSIG	056978	056986	056981	056989	056983	056991

E6V 50

Fixed (F)

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	057104	057112	057107	057115		
LSI	057105	057113	057108	057116	057110	057118
LSIG	057106	057114	057109	057117	057111	057119

E6H 63

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	057008	057016	057011	057019		
LSI	057009	057017	057012	057020	057014	057022
LSIG	057010	057018	057013	057021	057015	057023

E6V 63

Fixed (F)

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

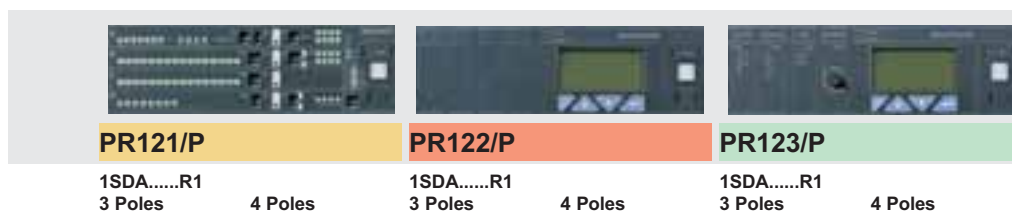
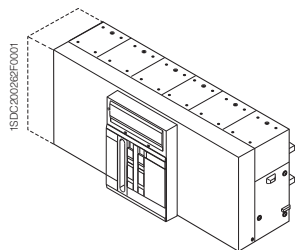
HR = Horizontal rear terminals

LI	057136	057144	057139	057147		
LSI	057137	057145	057140	057148	057142	057150
LSIG	057138	057146	057141	057149	057143	057151



Ordering codes

SACE Emax automatic circuit-breakers



E6V 32

Withdrawable (W) - MP

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	057056	057064	057059	057067		
LSI	057057	057065	057060	057068	057062	057070
LSIG	057058	057066	057061	057069	057063	057071

E6H 40

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	056960	056968	056963	056971		
LSI	056961	056969	056964	056972	056966	056974
LSIG	056962	056970	056965	056973	056967	056975

E6V 40

Withdrawable (W) - MP

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	057088	057096	057091	057099		
LSI	057089	057097	057092	057100	057094	057102
LSIG	057090	057098	057093	057101	057095	057103

E6H 50

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	056992	057000	056995	057003		
LSI	056993	057001	056996	057004	056998	057006
LSIG	056994	057002	056997	057005	056999	057007

E6V 50

Withdrawable (W) - MP

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	057120	057128	057123	057131		
LSI	057121	057129	057124	057132	057126	057134
LSIG	057122	057130	057125	057133	057127	057135

E6H 63

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	057024	057032	057027	057035		
LSI	057025	057033	057028	057036	057030	057038
LSIG	057026	057034	057029	057037	057031	057039

E6V 63

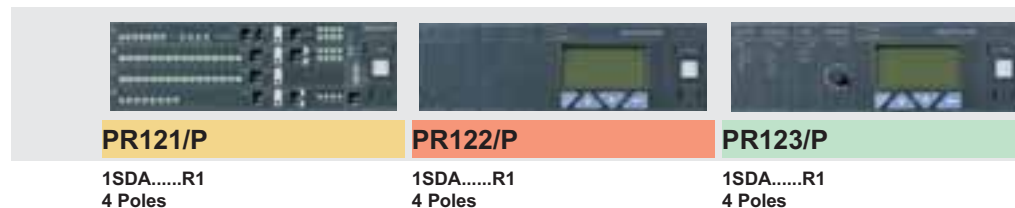
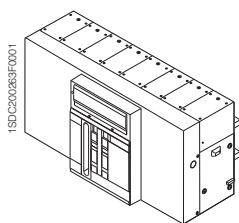
Withdrawable (W) - MP

Icu (415 V) = 150 kA Icw (1 s) = 100 kA

MP = Moving part						
LI	057152	057160	057155	057163		
LSI	057153	057161	057156	057164	057158	057166
LSIG	057154	057162	057157	057165	057159	057167

Ordering codes

SACE Emax automatic circuit-breakers with full-size neutral conductor



PR121/P

1SDA.....R1
4 Poles

PR122/P

1SDA.....R1
4 Poles

PR123/P

1SDA.....R1
4 Poles

E4H/f 32

Fixed (F)

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 85 kA

HR = Horizontal rear terminals

LI	059429	059432	
LSI	059430	059433	059435
LSIG	059431	059434	059436

E4S/f 40

Fixed (F)

I_{cu} (415 V) = 80 kA I_{cw} (1 s) = 80 kA

HR = Horizontal rear terminals

LI	055536	055539	
LSI	055537	055540	055542
LSIG	055538	055541	055543

E4H/f 40

Fixed (F)

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 85 kA

HR = Horizontal rear terminals

LI	055520	055523	
LSI	055521	055524	055526
LSIG	055522	055525	055527

E4H/f 32

Withdrawable (W) -
MP

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 85 kA

MP = Moving part

LI	059437	059440	
LSI	059438	059441	059443
LSIG	059439	059442	059444

E4S/f 40

Withdrawable (W) -
MP

I_{cu} (415 V) = 80 kA I_{cw} (1 s) = 80 kA

MP = Moving part

LI	055544	055547	
LSI	055545	055548	055550
LSIG	055546	055549	055551

E4H/f 40

Withdrawable (W) -
MP

I_{cu} (415 V) = 100 kA I_{cw} (1 s) = 80 kA

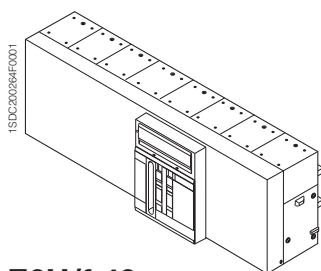
MP = Moving part

LI	055528	055531	
LSI	055529	055532	055534
LSIG	055530	055533	055535



Ordering codes

SACE Emax automatic circuit-breakers with full-size neutral conductor



E6H/f 40

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	055552	055555	
LSI	055553	055556	055558
LSIG	055554	055557	055559

E6H/f 50

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	055568	055571	
LSI	055569	055572	055574
LSIG	055570	055573	055575

E6H/f 63

Fixed (F)

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

HR = Horizontal rear terminals

LI	055584	055587	
LSI	055585	055588	055590
LSIG	055586	055589	055591

E6H/f 40

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part

LI	055560	055563	
LSI	055561	055564	055566
LSIG	055562	055565	055567

E6H/f 50

Withdrawable (W) - MP

Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part

LI	055576	055579	
LSI	055577	055580	055582
LSIG	055578	055581	055583

E6H/f 63

Withdrawable (W) - MP

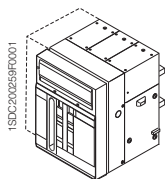
Icu (415 V) = 100 kA Icw (1 s) = 100 kA

MP = Moving part

LI	055592	055595	
LSI	055593	055596	055598
LSIG	055594	055597	055599

Ordering codes

SACE Emax switch-disconnectors



1SDA.....R1
3 Poles

4 Poles

E1B/MS 08

Fixed (F)

I_{cw} (1s) = 42 kA

HR = Horizontal rear terminals

058931

058932

E1N/MS 08

Fixed (F)

I_{cw} (1s) = 50 kA

HR = Horizontal rear terminals

058933

058934

E1B/MS 10

Fixed (F)

I_{cw} (1s) = 42 kA

HR = Horizontal rear terminals

059209

059211

E1N/MS 10

Fixed (F)

I_{cw} (1s) = 50 kA

HR = Horizontal rear terminals

059253

059255

E1B/MS 12

Fixed (F)

I_{cw} (1s) = 42 kA

HR = Horizontal rear terminals

058935

058936

E1N/MS 12

Fixed (F)

I_{cw} (1s) = 50 kA

HR = Horizontal rear terminals

058937

058938

E1B/MS 16

Fixed (F)

I_{cw} (1s) = 42 kA

HR = Horizontal rear terminals

058857

058858

E1N/MS 16

Fixed (F)

I_{cw} (1s) = 50 kA

HR = Horizontal rear terminals

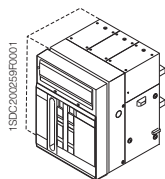
058861

058862



Ordering codes

SACE Emax switch-disconnectors



1SDA.....R1
3 Poles 4 Poles

E1B/MS 08

Withdrawable (W) - MP

Icw (1s) = 42 kA

MP = Moving part

058939 058940

E1N/MS 08

Withdrawable (W) - MP

Icw (1s) = 50 kA

MP = Moving part

058941 058942

E1B/MS 10

Withdrawable (W) - MP

Icw (1s) = 42 kA

MP = Moving part

059210 059212

E1N/MS 10

Withdrawable (W) - MP

Icw (1s) = 50 kA

MP = Moving part

059254 059256

E1B/MS 12

Withdrawable (W) - MP

Icw (1s) = 42 kA

MP = Moving part

058943 058944

E1N/MS 12

Withdrawable (W) - MP

Icw (1s) = 50 kA

MP = Moving part

058945 058946

E1B/MS 16

Withdrawable (W) - MP

Icw (1s) = 42 kA

MP = Moving part

058859 058860

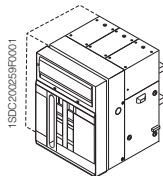
E1N/MS 16

Withdrawable (W) - MP

Icw (1s) = 50 kA

MP = Moving part

058863 058864



1SDA.....R1
3 Poles 4 Poles

E2N/MS 10

Fixed (F)

Icw (1s) = **55 kA**

HR = Horizontal rear terminals

059297 059299

E2S/MS 10

Fixed (F)

Icw (1s) = **65 kA**

HR = Horizontal rear terminals

059341 059343

E2N/MS 12

Fixed (F)

Icw (1s) = **55 kA**

HR = Horizontal rear terminals

058947 058948

E2S/MS 12

Fixed (F)

Icw (1s) = **65 kA**

HR = Horizontal rear terminals

058865 058866

E2B/MS 16

Fixed (F)

Icw (1s) = **42 kA**

HR = Horizontal rear terminals

058949 058950

E2N/MS 16

Fixed (F)

Icw (1s) = **55 kA**

HR = Horizontal rear terminals

058951 058952

E2S/MS 16

Fixed (F)

Icw (1s) = **65 kA**

HR = Horizontal rear terminals

058869 058870

E2B/MS 20

Fixed (F)

Icw (1s) = **42 kA**

HR = Horizontal rear terminals

058953 058954

E2N/MS 20

Fixed (F)

Icw (1s) = **55 kA**

HR = Horizontal rear terminals

058955 058956

E2S/MS 20

Fixed (F)

Icw (1s) = **65 kA**

HR = Horizontal rear terminals

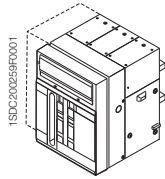
058873 058874

Fixed parts page 9/51 Terminals page 9/53



Ordering codes

SACE Emax switch-disconnectors



1SDA.....R1
3 Poles 4 Poles

E2N/MS 10

Withdrawable (W) - MP

I_{cw} (1s) = 55 kA

MP = Moving part

059298 059300

E2S/MS 10

Withdrawable (W) - MP

I_{cw} (1s) = 65 kA

MP = Moving part

059342 059344

E2N/MS 12

Withdrawable (W) - MP

I_{cw} (1s) = 55 kA

MP = Moving part

058957 058958

E2S/MS 12

Withdrawable (W) - MP

I_{cw} (1s) = 65 kA

MP = Moving part

058867 058868

E2B/MS 16

Withdrawable (W) - MP

I_{cw} (1s) = 42 kA

MP = Moving part

058959 058960

E2N/MS 16

Withdrawable (W) - MP

I_{cw} (1s) = 55 kA

MP = Moving part

058961 058962

E2S/MS 16

Withdrawable (W) - MP

I_{cw} (1s) = 65 kA

MP = Moving part

058871 058872

E2B/MS 20

Withdrawable (W) - MP

I_{cw} (1s) = 42 kA

MP = Moving part

058963 058964

E2N/MS 20

Withdrawable (W) - MP

I_{cw} (1s) = 55 kA

MP = Moving part

058965 058966

E2S/MS 20

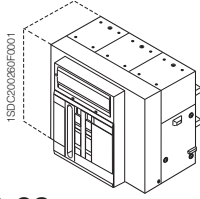
Withdrawable (W) - MP

I_{cw} (1s) = 65 kA

MP = Moving part

058875 058876

Fixed parts page 9/51 Terminals page 9/53



1SDA.....R1
3 Poles 4 Poles

E3V/MS 08

Fixed (F)

Icw (1s) = **85 kA**

HR = Horizontal rear terminals

058877 058878

E3S/MS 10

Fixed (F)

Icw (1s) = **75 kA**

HR = Horizontal rear terminals

059425 059427

E3S/MS 12

Fixed (F)

Icw (1s) = **75 kA**

HR = Horizontal rear terminals

058967 058968

E3V/MS 12

Fixed (F)

Icw (1s) = **85 kA**

HR = Horizontal rear terminals

058881 058882

E3S/MS 16

Fixed (F)

Icw (1s) = **75 kA**

HR = Horizontal rear terminals

058969 058970

E3V/MS 16

Fixed (F)

Icw (1s) = **85 kA**

HR = Horizontal rear terminals

058885 058886

E3S/MS 20

Fixed (F)

Icw (1s) = **75 kA**

HR = Horizontal rear terminals

058971 058972

E3V/MS 20

Fixed (F)

Icw (1s) = **85 kA**

HR = Horizontal rear terminals

058889 058890

E3N/MS 25

Fixed (F)

Icw (1s) = **65 kA**

HR = Horizontal rear terminals

058973 058974

E3S/MS 25

Fixed (F)

Icw (1s) = **75 kA**

HR = Horizontal rear terminals

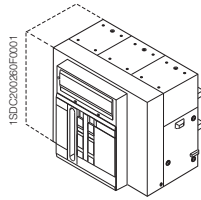
058975 058976

Fixed parts page 9/51 Terminals page 9/53



Ordering codes

SACE Emax switch-disconnectors



1SDA.....R1
3 Poles 4 Poles

E3V/MS 25

Fixed (F)

Icw (1s) = 85 kA

HR = Horizontal rear terminals

058893 058894

E3N/MS 32

Fixed (F)

Icw (1s) = 65 kA

HR = Horizontal rear terminals

058977 058978

E3S/MS 32

Fixed (F)

Icw (1s) = 75 kA

HR = Horizontal rear terminals

058979 058980

E3V/MS 32

Fixed (F)

Icw (1s) = 85 kA

HR = Horizontal rear terminals

058897 058898

E3V/MS 08

Withdrawable (W) - MP

Icw (1s) = 85 kA

MP = Moving part

058879 058880

E3S/MS 10

Withdrawable (W) - MP

Icw (1s) = 75 kA

MP = Moving part

059426 059428

E3S/MS 12

Withdrawable (W) - MP

Icw (1s) = 75 kA

MP = Moving part

058981 058982

E3V/MS 12

Withdrawable (W) - MP

Icw (1s) = 85 kA

MP = Moving part

058883 058884

E3S/MS 16

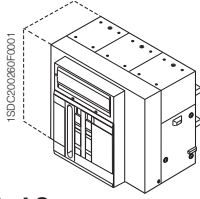
Withdrawable (W) - MP

Icw (1s) = 75 kA

MP = Moving part

058983 058984

Fixed parts page 9/51 Terminals page 9/53



1SDA.....R1
3 Poles 4 Poles

E3V/MS 16

I_{cw} (1s) = 85 kA

Withdrawable (W) - MP

MP = Moving part

058887 058888

E3S/MS 20

I_{cw} (1s) = 75 kA

Withdrawable (W) - MP

MP = Moving part

058985 058986

E3V/MS 20

I_{cw} (1s) = 85 kA

Withdrawable (W) - MP

MP = Moving part

058891 058892

E3N/MS 25

I_{cw} (1s) = 65 kA

Withdrawable (W) - MP

MP = Moving part

058987 058988

E3S/MS 25

I_{cw} (1s) = 75 kA

Withdrawable (W) - MP

MP = Moving part

058989 058990

E3V/MS 25

I_{cw} (1s) = 85 kA

Withdrawable (W) - MP

MP = Moving part

058895 058896

E3N/MS 32

I_{cw} (1s) = 65 kA

Withdrawable (W) - MP

MP = Moving part

058991 058992

E3S/MS 32

I_{cw} (1s) = 75 kA

Withdrawable (W) - MP

MP = Moving part

058993 058994

E3V/MS 32

I_{cw} (1s) = 85 kA

Withdrawable (W) - MP

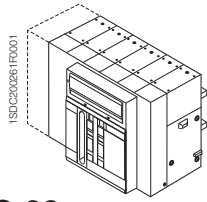
MP = Moving part

058899 058900



Ordering codes

SACE Emax switch-disconnectors



1SDA.....R1
3 Poles 4 Poles

E4H/MS 32

Fixed (F)

Icw (1s) = 100 kA

HR = Horizontal rear terminals

	058995	058996
--	--------	--------

E4S/MS 40

Fixed (F)

Icw (1s) = 75 kA

HR = Horizontal rear terminals

	058997	058998
--	--------	--------

E4H/MS 40

Fixed (F)

Icw (1s) = 100 kA

HR = Horizontal rear terminals

	058999	059000
--	--------	--------

E4H/MS 32

Withdrawable (W) - MP

Icw (1s) = 100 kA

MP = Moving part

	059001	059002
--	--------	--------

E4S/MS 40

Withdrawable (W) - MP

Icw (1s) = 75 kA

MP = Moving part

	059003	059004
--	--------	--------

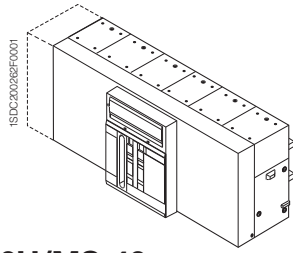
E4H/MS 40

Withdrawable (W) - MP

Icw (1s) = 100 kA

MP = Moving part

	059005	059006
--	--------	--------



1SDA.....R1
3 Poles 4 Poles

E6H/MS 40
Fixed (F)

I_{cw} (1s) = 100 kA

HR = Horizontal rear terminals

058905	058906
--------	--------

E6H/MS 50
Fixed (F)

I_{cw} (1s) = 100 kA

HR = Horizontal rear terminals

059007	059008
--------	--------

E6H/MS 63
Fixed (F)

I_{cw} (1s) = 100 kA

HR = Horizontal rear terminals

059009	059010
--------	--------

E6H/MS 40
Withdrawable (W) - MP

I_{cw} (1s) = 100 kA

MP = Moving part

058907	058908
--------	--------

E6H/MS 50
Withdrawable (W) - MP

I_{cw} (1s) = 100 kA

MP = Moving part

059011	059012
--------	--------

E6H/MS 63
Withdrawable (W) - MP

I_{cw} (1s) = 100 kA

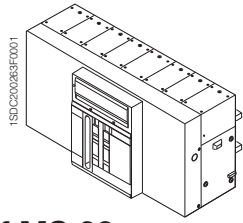
MP = Moving part

059013	059014
--------	--------



Ordering codes

SACE Emax switch-disconnectors with full size neutral conductor



1SDA.....R1
4 Poles

E4H/f MS 32

Fixed (F)

Icw (1s) = **85 kA**

HR = Horizontal rear terminals

058901

E4S/f MS 40

Fixed (F)

Icw (1s) = **80 kA**

HR = Horizontal rear terminals

059015

E4H/f MS 40

Fixed (F)

Icw (1s) = **85 kA**

HR = Horizontal rear terminals

058903

E4H/f MS 32

Withdrawable (W) -
MP

Icw (1s) = **85 kA**

MP = Moving part

058902

E4S/f MS 40

Withdrawable (W) -
MP

Icw (1s) = **80 kA**

MP = Moving part

059016

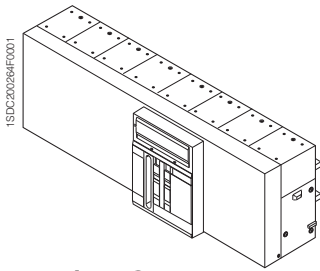
E4H/f MS 40

Withdrawable (W) -
MP

Icw (1s) = **85 kA**

MP = Moving part

058904



1SDA.....R1
4 Poles

E6H/f MS 40

Fixed (F)

I_{cw} (1s) = 100 kA

HR = Horizontal rear terminals

058909

E6H/f MS 50

Fixed (F)

I_{cw} (1s) = 100 kA

HR = Horizontal rear terminals

059017

E6H/f MS 63

Fixed (F)

I_{cw} (1s) = 100 kA

HR = Horizontal rear terminals

059018

E6H/f MS 40

**Withdrawable (W) -
MP**

I_{cw} (1s) = 100 kA

MP = Moving part

058910

E6H/f MS 50

**Withdrawable (W) -
MP**

I_{cw} (1s) = 100 kA

MP = Moving part

059019

E6H/f MS 63

**Withdrawable (W) -
MP**

I_{cw} (1s) = 100 kA

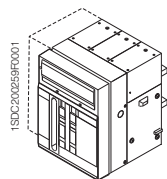
MP = Moving part

059020



Ordering codes

SACE Emax automatic circuit-breakers for applications up to 1150V AC



1SDA.....R1

E2B/E 16

Icu (1150 V AC) = 20 kA

059633

Note: to be specified in addition to the code of the standard version E2B 16 circuit-breaker (Ue=690 V AC). Page 9/7 for fixed circuit-breaker, page 9/9 for withdrawable circuit-breaker.

E2B/E 20

Icu (1150 V AC) = 20 kA

059634

Note: to be specified in addition to the code of the standard version E2B 20 circuit-breaker (Ue=690 V AC). Page 9/8 for fixed circuit-breaker, page 9/10 for withdrawable circuit-breaker.

E2N/E 12

Icu (1150 V AC) = 30 kA

059635

Note: to be specified in addition to the code of the standard version E2N 12 circuit-breaker (Ue=690 V AC). Page 9/7 for fixed circuit-breaker, page 9/9 for withdrawable circuit-breaker.

E2N/E 16

Icu (1150 V AC) = 30 kA

059636

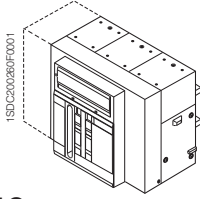
Note: to be specified in addition to the code of the standard version E2N 16 circuit-breaker (Ue=690 V AC). Page 9/8 for fixed circuit-breaker, page 9/10 for withdrawable circuit-breaker.

E2N/E 20

Icu (1150 V AC) = 30 kA

059637

Note: to be specified in addition to the code of the standard version E2N 20 circuit-breaker (Ue=690 V AC). Page 9/8 for fixed circuit-breaker, page 9/10 for withdrawable circuit-breaker.



1SDA.....R1

E3H/E 12

Icu (1150 V AC) = 30 kA

059638

Note: to be specified in addition to the code of the standard version E3H 12 circuit-breaker (Ue=690 V AC). Page 9/11 for fixed circuit-breaker, page 9/15 for withdrawable circuit-breaker.

E3H/E 16

Icu (1150 V AC) = 30 kA

059639

Note: to be specified in addition to the code of the standard version E3H 16 circuit-breaker (Ue=690 V AC). Page 9/12 for fixed circuit-breaker, page 9/16 for withdrawable circuit-breaker.

E3H/E 20

Icu (1150 V AC) = 30 kA

059640

Note: to be specified in addition to the code of the standard version E3H 20 circuit-breaker (Ue=690 V AC). Page 9/12 for fixed circuit-breaker, page 9/16 for withdrawable circuit-breaker.

E3H/E 25

Icu (1150 V AC) = 30 kA

059641

Note: to be specified in addition to the code of the standard version E3H 25 circuit-breaker (Ue=690 V AC). Page 9/13 for fixed circuit-breaker, page 9/17 for withdrawable circuit-breaker.

E3H/E 32

Icu (1150 V AC) = 30 kA

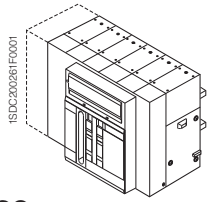
059642

Note: to be specified in addition to the code of the standard version E3H 32 circuit-breaker (Ue=690 V AC). Page 9/14 for fixed circuit-breaker, page 9/18 for withdrawable circuit-breaker.



Ordering codes

SACE Emax automatic circuit-breakers for applications up to 1150V AC



E4H/E 32

Icu (1150 V AC) = **65 kA**

1SDA.....R1

059643

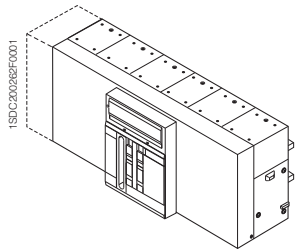
Note: to be specified in addition to the code of the standard version E4H 32 circuit-breaker (Ue=690 V AC). Page 9/19 for fixed circuit-breaker, page 9/20 for withdrawable circuit-breaker.

E4H/E 40

Icu (1150 V AC) = **65 kA**

059644

Note: to be specified in addition to the code of the standard version E4H 40 circuit-breaker (Ue=690 V AC). Page 9/19 for fixed circuit-breaker, page 9/20 for withdrawable circuit-breaker.



E6H/E 40

Icu (1150 V AC) = **65 kA**

1SDA.....R1

058550

Note: to be specified in addition to the code of the standard version E6H 40 circuit-breaker (Ue=690 V AC). Page 9/21 for fixed circuit-breaker, page 9/22 for withdrawable circuit-breaker.

E6H/E 50

Icu (1150 V AC) = **65 kA**

058551

Note: to be specified in addition to the code of the standard version E6H 50 circuit-breaker (Ue=690 V AC). Page 9/21 for fixed circuit-breaker, page 9/22 for withdrawable circuit-breaker.

E6H/E 63

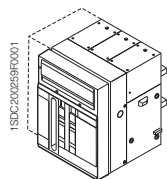
Icu (1150 V AC) = **65 kA**

058552

Note: to be specified in addition to the code of the standard version E6H 63 circuit-breaker (Ue=690 V AC). Page 9/21 for fixed circuit-breaker, page 9/22 for withdrawable circuit-breaker.

Ordering codes

SACE Emax switch-disconnectors
for applications up to 1150V AC



1SDA.....R1

E2B/E MS 16

I_{cw} (1 s) = 20 kA

059633

Note: to be specified with the code of the standard version circuit-breaker ($U_e = 690V$ AC). Page 9/27 for fixed MS, page 9/28 for withdrawable MS.

E2B/E MS 20

I_{cw} (1 s) = 20 kA

059634

Note: to be specified with the code of the standard version circuit-breaker ($U_e = 690V$ AC). Page 9/27 for fixed MS, page 9/28 for withdrawable MS.

E2N/E MS 12

I_{cw} (1 s) = 30 kA

059635

Note: to be specified with the code of the standard version circuit-breaker ($U_e = 690V$ AC). Page 9/27 for fixed MS, page 9/28 for withdrawable MS.

E2N/E MS 16

I_{cw} (1 s) = 30 kA

059636

Note: to be specified with the code of the standard version circuit-breaker ($U_e = 690V$ AC). Page 9/27 for fixed MS, page 9/28 for withdrawable MS.

E2N/E MS 20

I_{cw} (1 s) = 30 kA

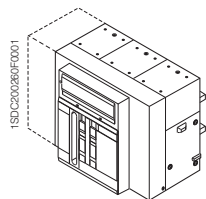
059637

Note: to be specified with the code of the standard version circuit-breaker ($U_e = 690V$ AC). Page 9/27 for fixed MS, page 9/28 for withdrawable MS.



Ordering codes

SACE Emax switch-disconnectors
for applications up to 1150V AC



1SDA.....R1
3 Poles 4 Poles

E3H/E MS 12

Fixed (F)

Icw (1 s) = 30 kA

HR = Horizontal rear terminals

Circuit-breaker code	059021	059022
Additional code to be specified with the circuit-breaker	059638	059638

E3H/E MS 16

Fixed (F)

Icw (1 s) = 30 kA

HR = Horizontal rear terminals

Circuit-breaker code	059023	059024
Additional code to be specified with the circuit-breaker	059639	059639

E3H/E MS 20

Fixed (F)

Icw (1 s) = 30 kA

HR = Horizontal rear terminals

Circuit-breaker code	059025	059027
Additional code to be specified with the circuit-breaker	059640	059640

E3H/E MS 25

Fixed (F)

Icw (1 s) = 30 kA

HR = Horizontal rear terminals

Circuit-breaker code	059026	059028
Additional code to be specified with the circuit-breaker	059641	059641

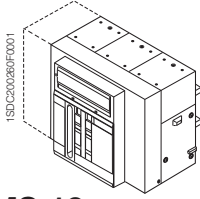
E3H/E MS 32

Fixed (F)

Icw (1 s) = 30 kA

HR = Horizontal rear terminals

Circuit-breaker code	059029	059030
Additional code to be specified with the circuit-breaker	059642	059642



1SDA.....R1
3 Poles 4 Poles

E3H/E MS 12

Withdrawable (W) - MP

I_{cw} (1 s) = 30 kA

MP = Moving part

Circuit-breaker code	059031	059032
Additional code to be specified with the circuit-breaker	059638	059638

E3H/E MS 16

Withdrawable (W) - MP

I_{cw} (1 s) = 30 kA

MP = Moving part

Circuit-breaker code	059033	059034
Additional code to be specified with the circuit-breaker	059639	059639

E3H/E MS 20

Withdrawable (W) - MP

I_{cw} (1 s) = 30 kA

MP = Moving part

Circuit-breaker code	059035	059036
Additional code to be specified with the circuit-breaker	059640	059640

E3H/E MS 25

Withdrawable (W) - MP

I_{cw} (1 s) = 30 kA

MP = Moving part

Circuit-breaker code	059037	059038
Additional code to be specified with the circuit-breaker	059641	059641

E3H/E MS 32

Withdrawable (W) - MP

I_{cw} (1 s) = 30 kA

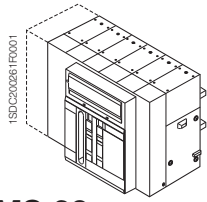
MP = Moving part

Circuit-breaker code	059039	059040
Additional code to be specified with the circuit-breaker	059642	059642



Ordering codes

SACE Emax switch-disconnectors
for applications up to 1150V AC



E4H/E MS 32

I_{cw} (1 s) = 65 kA

1SDA.....R1

059643

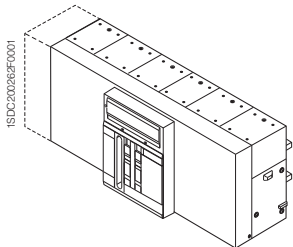
Note: to be specified in addition to the code of the standard version E4H/MS 32 circuit-breaker (U_e=690 V AC) page 9/32

E4H/E MS 40

I_{cw} (1 s) = 65 kA

059644

Note: to be specified in addition to the code of the standard version E4H/MS 40 circuit-breaker (U_e=690 V AC) page 9/32



E6H/E MS 40

I_{cw} (1 s) = 65 kA

1SDA.....R1

058550

Note: to be specified in addition to the code of the standard version E6H/MS 40 circuit-breaker (U_e=690 V AC) page 9/33

E6H/E MS 50

I_{cw} (1 s) = 65 kA

058551

Note: to be specified in addition to the code of the standard version E6H/MS 50 circuit-breaker (U_e=690 V AC) page 9/33

E6H/E MS 63

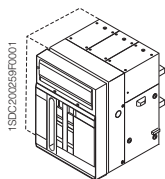
I_{cw} (1 s) = 65 kA

058552

Note: to be specified in addition to the code of the standard version E6H/MS 63 circuit-breaker (U_e=690 V AC) page 9/33

Ordering codes

SACE Emax switch-disconnectors
for applications up to 1000V DC



1SDA.....R1	4 Poles
3 Poles	1000V DC
750V DC	

E1B/E MS 08

Fixed (F)

$I_{cw} (1 s) = 20 \text{ kA}$

HR = Horizontal rear terminals

059041	059042
--------	--------

E1B/E MS 12

Fixed (F)

$I_{cw} (1 s) = 20 \text{ kA}$

HR = Horizontal rear terminals

059043	059044
--------	--------

E1B/E MS 08

Withdrawable (W) -
MP

$I_{cw} (1 s) = 20 \text{ kA}$

MP = Moving part

059045	059046
--------	--------

E1B/E MS 12

Withdrawable (W) -
MP

$I_{cw} (1 s) = 20 \text{ kA}$

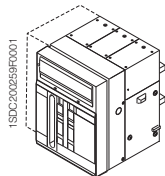
MP = Moving part

059047	059048
--------	--------



Ordering codes

SACE Emax switch-disconnectors
for applications up to 1000V DC



1SDA.....R1	4 Poles
3 Poles	1000V DC
750V DC	

E2N/E MS 12

Fixed (F)

Icw (1 s) = 25 kA

HR = Horizontal rear terminals

059049	059050
--------	--------

E2N/E MS 16

Fixed (F)

Icw (1 s) = 25 kA

HR = Horizontal rear terminals

059051	059052
--------	--------

E2N/E MS 20

Fixed (F)

Icw (1 s) = 25 kA

HR = Horizontal rear terminals

059053	059054
--------	--------

E2N/E MS 12

Withdrawable (W) -
MP

Icw (1 s) = 25 kA

MP = Moving part

059055	059056
--------	--------

E2N/E MS 16

Withdrawable (W) -
MP

Icw (1 s) = 25 kA

MP = Moving part

059057	059058
--------	--------

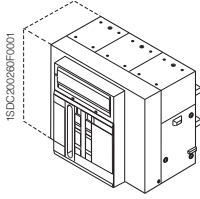
E2N/E MS 20

Withdrawable (W) -
MP

Icw (1 s) = 25 kA

MP = Moving part

059059	059060
--------	--------



1SDA.....R1	
3 Poles	4 Poles
750V DC	1000V DC

E3H/E MS 12

Fixed (F)

I_{cw} (1 s) = 40 kA

HR = Horizontal rear terminals

059061 059062

E3H/E MS 16

Fixed (F)

I_{cw} (1 s) = 40 kA

HR = Horizontal rear terminals

059063 059064

E3H/E MS 20

Fixed (F)

I_{cw} (1 s) = 40 kA

HR = Horizontal rear terminals

059065 059066

E3H/E MS 25

Fixed (F)

I_{cw} (1 s) = 40 kA

HR = Horizontal rear terminals

059067 059068

E3H/E MS 32

Fixed (F)

I_{cw} (1 s) = 40 kA

HR = Horizontal rear terminals

059069 059070

E3H/E MS 12

Withdrawable (W) - MP

I_{cw} (1 s) = 40 kA

MP = Moving part

059071 059072

E3H/E MS 16

Withdrawable (W) - MP

I_{cw} (1 s) = 40 kA

MP = Moving part

059073 059074

E3H/E MS 20

Withdrawable (W) - MP

I_{cw} (1 s) = 40 kA

MP = Moving part

059075 059076

E3H/E MS 25

Withdrawable (W) - MP

I_{cw} (1 s) = 40 kA

MP = Moving part

059077 059078

E3H/E MS 32

Withdrawable (W) - MP

I_{cw} (1 s) = 40 kA

MP = Moving part

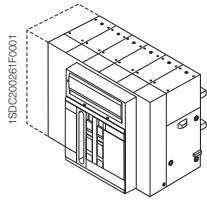
059079 059080

Fixed parts page 9/51 Terminals page 9/53



Ordering codes

SACE Emax switch-disconnectors
for applications up to 1000V DC



1SDA.....R1	4 Poles
3 Poles	1000V DC
750V DC	

E4H/E MS 32

Fixed (F)

Icw (1 s) = 65 kA

HR = Horizontal rear terminals

	059081	058911
--	--------	--------

E4H/E MS 40

Fixed (F)

Icw (1 s) = 65 kA

HR = Horizontal rear terminals

	059082	058913
--	--------	--------

E4H/E MS 32

Withdrawable (W) -
MP

Icw (1 s) = 65 kA

MP = Moving part

	059083	058912
--	--------	--------

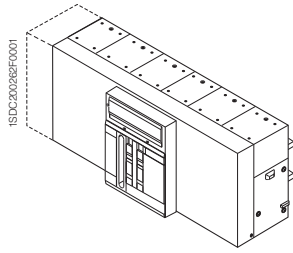
E4H/E MS 40

Withdrawable (W) -
MP

Icw (1 s) = 65 kA

MP = Moving part

	059084	058914
--	--------	--------



1SDA.....R1	
3 Poles	4 Poles
750V DC	1000V DC

E6H/E MS 40

Fixed (F)

I_{cw} (1 s) = 65 kA

HR = Horizontal rear terminals

058915	058921
--------	--------

E6H/E MS 50

Fixed (F)

I_{cw} (1 s) = 65 kA

HR = Horizontal rear terminals

058917	058923
--------	--------

E6H/E MS 63

Fixed (F)

I_{cw} (1 s) = 65 kA

HR = Horizontal rear terminals

058919	058925
--------	--------

E6H/E MS 40

Withdrawable (W) - MP

I_{cw} (1 s) = 65 kA

MP = Moving part

058916	058922
--------	--------

E6H/E MS 50

Withdrawable (W) - MP

I_{cw} (1 s) = 65 kA

MP = Moving part

058918	058924
--------	--------

E6H/E MS 63

Withdrawable (W) - MP

I_{cw} (1 s) = 65 kA

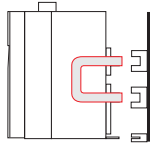
MP = Moving part

058920	058926
--------	--------



Ordering codes

SACE Emax CS sectionalizing trucks



1SDA.....R1
3 Poles 4 Poles

E1/CS 12

**Withdrawable (W) -
MP**

MP = Moving part	
059085	059086

E2/CS 20

**Withdrawable (W) -
MP**

MP = Moving part	
059087	059088

E3/CS 32

**Withdrawable (W) -
MP**

MP = Moving part	
059089	059090

E4/CS 40

**Withdrawable (W) -
MP**

MP = Moving part	
059091	059092

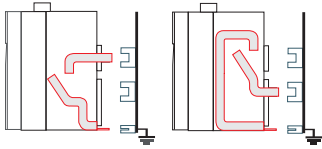
E6/CS 63

**Withdrawable (W) -
MP**

MP = Moving part	
059093	059094

Ordering codes

SACE Emax MTP earthing switches with making capacity



Earthing of upper terminals		Earthing of lower terminals	
-----------------------------	--	-----------------------------	--

1SDA.....R1
3 Poles

4 Poles

1SDA.....R1
3 Poles

4 Poles

E1 MTP 12

Withdrawable (W) - MP

MP = Moving part

059095

059097

059096

059098

E2 MTP 20

Withdrawable (W) - MP

MP = Moving part

059099

059101

059100

059102

E3 MTP 32

Withdrawable (W) - MP

MP = Moving part

059103

059105

059104

059106

E4 MTP 40

Withdrawable (W) - MP

MP = Moving part

059107

059109

059108

059110

E6 MTP 63

Withdrawable (W) - MP

MP = Moving part

059111

059113

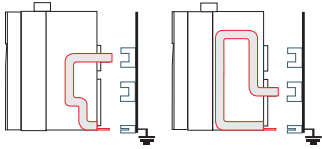
059112

059114



Ordering codes

SACE Emax MT earthing trucks



Earthing of upper terminals

1SDA.....R1
3 Poles 4 Poles

Earthing of lower terminals

1SDA.....R1
3 Poles 4 Poles

E1 MT 12

Withdrawable (W) - MP

MP = Moving part			
059115	059117	059116	059118

E2 MT 20

Withdrawable (W) - MP

MP = Moving part			
059119	059121	059120	059122

E3 MT 32

Withdrawable (W) - MP

MP = Moving part			
059123	059125	059124	059126

E4 MT 40

Withdrawable (W) - MP

MP = Moving part			
059127	059129	059128	059130

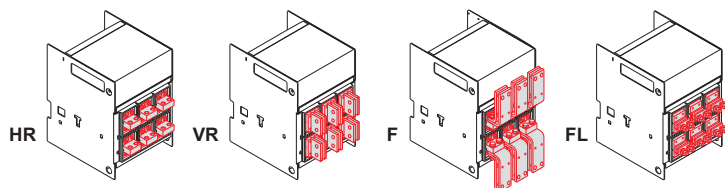
E6 MT 63

Withdrawable (W) - MP

MP = Moving part			
059131	059133	059132	059134

Ordering codes

SACE Emax FP fixed parts



		750 V DC	1000 V DC
1SDA.....R1	3 Poles	1SDA.....R1	3 Poles
	4 Poles		4 Poles

E1

Withdrawable (W) - FP

FP = Fixed part

HR	059666	059762	059890	059902
VR	059672	059770	059894	059905
F	059678	059778		
FL	059684	059786	059898	059908
HR-VR	059690	059794		
VR-HR	059708	059818		

E2

Withdrawable (W) - FP

FP = Fixed part

HR	059667	059763	059891	059903
VR	059673	059771	059895	059906
F	059679	059779		
FL	059685	059787	059899	059909
HR-VR	059691	059795		
VR-HR	059709	059819		

E2S

Withdrawable (W) - FP

FP = Fixed part

HR	059668	059764		
VR	059674	059772		
F	059680	059780		
FL	059686	059788		
HR-VR	059692	059796		
VR-HR	059710	059820		

E3

Withdrawable (W) - FP

FP = Fixed part

HR	059669	059765	059892	059904
VR	059675	059773	059896	059907
F	059681	059781		
FL	059687	059789	059900	059910
HR-VR	059693	059797		
VR-HR	059711	059821		

E4

Withdrawable (W) - FP

FP = Fixed part

HR	059670	059766	059893	059136
VR	059676	059774	059897	059137
F	059682	059782		
FL	059688	059790	059901	059138
HR-VR	059694	059798		
VR-HR	059712	059822		

E4/f

Withdrawable (W) - FP

FP = Fixed part

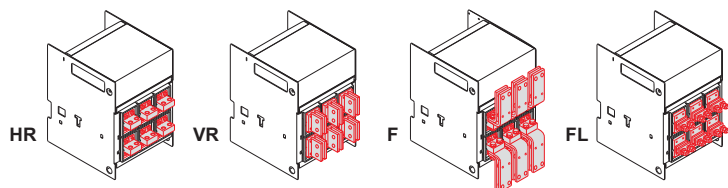
HR		059767		
VR		059775		
F		059783		
FL		059791		
HR-VR		059799		
VR-HR		059823		

Note: HR-VR = Upper HR terminals, lower VR terminals;
VR-HR = Upper VR terminals, lower HR terminals.



Ordering codes

SACE Emax FP fixed parts



		750 V DC	1000 V DC
1SDA.....R1	3 Poles	1SDA.....R1	3 Poles
	4 Poles		4 Poles

E6

Withdrawable (W) - FP

FP = Fixed part				
HR	059671	059768	059139	059142
VR	059677	059776	059140	059143
F	059683	059784		
FL	059689	059792	059141	059144
HR-VR	059695	059800		
VR-HR	059713	059824		

E6/f

Withdrawable (W) - FP

FP = Fixed part	
HR	059769
VR	059777
F	059785
FL	059793
HR-VR	059801
VR-HR	059825

Note: HR-VR = Upper HR terminals, lower VR terminals;
VR-HR = Upper VR terminals, lower HR terminals.

Ordering codes

Conversion kit for fixed circuit-breaker and fixed parts

Conversion kit for fixed circuit- breaker and fixed parts

1SDA.....R1
3 Poles 4 Poles

Kit for converting fixed circuit-breaker with horizontal rear terminals to vertical rear terminals

E1	038052	038057
E2	038053	038058
E3	038054	038059
E4	038055	038060
E6	038056	038061
E4/f	–	048719
E6/f	–	050833

Note: Each kit is prepared for top or bottom application. For conversion of a complete circuit-breaker, order 2 kits.
Extracode 1SDA050230R1 to be specified in case of 1/2 terminal kit (HR) standard.

Kit for converting fixed circuit-breaker with horizontal rear terminals to front terminals

E1	038062	038067
E2	038063	038068
E3	038064	038069
E4	038065	038070
E6	038066	038071
E4/f	–	048720
E6/f	–	050834

Note: Each kit is prepared for top or bottom application. For conversion of a complete circuit-breaker, order 2 kits.
Extracode 1SDA050230R1 to be specified in case of 1/2 terminal kit (HR) standard.

Kit for converting fixed parts with horizontal rear terminals to front terminals

E1	038062	038067
E2	045031	045035
E3	045032	045036
E4	045033	045037
E6	045034	045038
E4/f	–	048718
E6/f	–	050837

Note: Each kit is prepared for top or bottom application. For conversion of a complete fixed part, order 2 kits. To be specified as spare parts.

Kit for converting fixed parts with horizontal rear terminals to vertical rear terminals

E1	055481	055486
E2	055482	055487
E3	055483	055488
E4	055484	055489
E6	055485	055490
E4/f	–	058537
E6/f	–	058538

Note: Each kit is prepared for top or bottom application. For conversion of a complete fixed part, order 2 kits. To be specified as spare parts.

Kit for converting fixed parts with vertical rear terminals to horizontal rear terminals

E1	055491	055496
E2	055492	055497
E3	055493	055498
E4	055494	055499
E6	055495	055500
E4/f	–	058539
E6/f	–	058540

Note: Each kit is prepared for top or bottom application. For conversion of a complete fixed part, order 2 kits. To be specified as spare parts.

Kit for converting fixed part from previous versions to new versions

E1/E6	059645	059645
-------	--------	--------



Ordering codes

Extra codes

1SDA.....R1

Extra codes for rating plug

To be specified with the code of the standard version circuit-breaker

E1-E3	In = 400A	058235
E1-E3	In = 630A	058236
E1-E6	In = 800A	058237
E1-E6	In = 1000A	058238
E1-E6	In = 1250A	058240
E1-E6	In = 1600A	058241
E2-E6	In = 2000A	058242
E3-E6	In = 2500A	058243
E3-E6	In = 3200A	058245
E4-E6	In = 4000A	058247
E6	In = 5000A	058248
E6	In = 6300A	058249
E1-E3	In = 400A for Rc protection *	063895
E1-E3	In = 630A for Rc protection *	063896
E1-E3	In = 800A for Rc protection *	063897
E1-E3	In = 1250A for Rc protection *	063898
E2-E3	In = 2000A for Rc protection *	063899
E2	In = 3200A for Rc protection *	063900

* for PR122/P LSIRc or PR123/P LSIG and toroid for residual current protection.

Extra code for connection of voltage measurement

To be specified with PR122/P and PR123/P when the input for voltage measurement in terminal box/sliding contacts instead of internal connection on the bottom terminals is required

PR120/V	- External measurements	058250
PR120/V	- Internal connection on the upper terminals	058251

Ordering codes

SACE Emax accessories

1SDA....R1

Electrical accessories



Shunt opening release - YO (1a)

E1/6	24V DC	038286
E1/6	30V AC / DC	038287
E1/6	48V AC / DC	038288
E1/6	60V AC / DC	038289
E1/6	110...120V AC / DC	038290
E1/6	120...127V AC / DC	038291
E1/6	220...240V AC / DC	038292
E1/6	240...250V AC / DC	038293
E1/6	380...400V AC	038294
E1/6	440...480V AC	038295

Note: The shunt opening release (YO) and closing release (YC) share the same construction and are therefore interchangeable. Their function is determined by the position in which they are mounted on the circuit-breaker.

Second shunt opening release - YO2 (1a)

E1/6	24V DC	050157
E1/6	30V AC / DC	050158
E1/6	48V AC / DC	050159
E1/6	60V AC / DC	050160
E1/6	110...120V AC / DC	050161
E1/6	120...127V AC / DC	050162
E1/6	220...240V AC / DC	050163
E1/6	240...250V AC / DC	050164
E1/6	380...400V AC	050165
E1/6	440...480V AC	050166

Note: supplied with special release support.

Shunt closing release - YC (1a)

E1/6	24V DC	038296
E1/6	30V AC / DC	038297
E1/6	48V AC / DC	038298
E1/6	60V AC / DC	038299
E1/6	110...120V AC / DC	038300
E1/6	120...127V AC / DC	038301
E1/6	220...240V AC / DC	038302
E1/6	240...250V AC / DC	038303
E1/6	380...400V AC	038304
E1/6	440...480V AC	038305

Note: The shunt opening release (YO) and closing release (YC) share the same construction and are therefore interchangeable. Their function is determined by the position in which they are mounted on the circuit-breaker.

SOR Test Unit - (1b)

E1/6	050228
------	--------



Ordering codes

SACE Emax accessories

1SDA.....R1



Undervoltage release - YU (2a)

E1/6	24V DC	038306
E1/6	30V AC / DC	038307
E1/6	48V AC / DC	038308
E1/6	60V AC / DC	038309
E1/6	110...120V AC / DC	038310
E1/6	120...127V AC / DC	038311
E1/6	220...240V AC / DC	038312
E1/6	240...250V AC / DC	038313
E1/6	380...400V AC	038314
E1/6	440...480V AC	038315



Electronic time-delay device for undervoltage release - D (2b)

E1/6	24...30V DC	038316
E1/6	48V AC / DC	038317
E1/6	60V AC / DC	038318
E1/6	110...127V AC / DC	038319
E1/6	220...250V AC / DC	038320



Geared motor for the automatic charging of the closing springs - M (3)

E1/6	24...30V AC / DC	038321
E1/6	48...60V AC / DC	038322
E1/6	100...130V AC / DC	038323
E1/6	220...250V AC / DC	038324
E1/6	24...30V AC / DC + MC 24Vdc for digital signals	066050
E1/6	48...60V AC / DC + MC 24Vdc for digital signals	066051
E1/6	100...130V AC / DC + MC 24Vdc for digital signals	066052
E1/6	220...250V AC / DC + MC 24Vdc for digital signals	066053

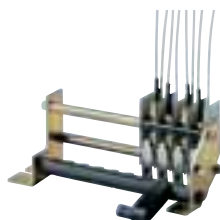
Note: supplied as standard with limit contact and microswitch to signal when the closing springs are charged (accessory 5d).

Electrical signalling of overcurrent releases tripped - (4a)

E1/6	058260
------	--------

Electrical signalling of overcurrent releases tripped with remote reset command - (4b)

E1/6	220...240V AC/DC	058261
E1/6	110...130V AC/DC	058262
E1/6	24...30V AC/DC	058263



Electrical signalling of circuit-breaker open/closed - Q1 ... 10 - (5a)

E1/6 - PR121/P	4 auxiliary contacts	038326 (a)
E1/6 - PR121/P	4 auxiliary contacts for digital signals	050153
E1/6 - PR121/P	10 auxiliary contacts (installed)	046523 (b)
E1/6 - PR121/P	10 auxiliary contacts (not installed)	038327 (c)
E1/6 - PR121/P	10 auxiliary contacts for digital signals	050152
E1/6 - PR122-3/P	4 auxiliary contacts (2NO+2NC+2PR122-3)	058264 (d)
E1/6 - PR122-3/P	4 auxiliary contacts (2NO+2NC+2PR122-3) for digital signals	058265
E1/6 - PR122-3/P	10 auxiliary contacts (5NO+5NC+2PR122-3 - installed)	058267 (b)
E1/6 - PR122-3/P	10 auxiliary contacts (5NO+5NC+2PR122-3 - not installed)	058266 (c)
E1/6 - PR122-3/P	10 auxiliary contacts (5NO+5NC+2PR122-3) for digital signals	058268
E1/6 MS - E1/6 MTP	4 auxiliary contacts	038326
E1/6 MS - E1/6 MTP	4 auxiliary contacts for digital signals	050153
E1/6 MS - E1/6 MTP	10 auxiliary contacts	038327
E1/6 MS - E1/6 MTP	10 auxiliary contacts for digital signals	050152

Note: (a) Already included with automatic circuit-breakers c/w PR121/P. Can be ordered as loose accessories.
 (b) Can only be ordered mounted with automatic circuit-breakers.
 (c) Can only be ordered loose in the case of automatic circuit-breakers.
 (d) Already included for circuit-breakers with PR122/P e PR123/P. Can only be ordered as loose accessories.

External supplementary of circuit-breaker open/closed auxiliary contacts - Q11 ... 25 - (5b)

E1/6	15 supplementary auxiliary contacts (for fixed / withdrawable racked-in)	043475 (a)
E1/6	15 supplementary auxiliary contacts (for withdrawable racked-in / test isolated)	048827
E1/6	15 supplementary auxiliary contacts for digital signals (for fixed / withdrawable racked-in)	050145 (a)
E1/6	15 supplementary auxiliary contacts for digital signals (for withdrawable racked-in / test isolated)	050151

Note: outside the circuit-breaker. Order as an alternative to the various types of mechanical interlocks (accessory 10) and mechanical compartment door lock (accessory 8f).

(a) For mounting on fixed circuit-breaker requires accessory 10.4 as well (Interlock plate for fixed circuit-breaker).



1SDA....R1
3 Poles 4 Poles

Electrical signalling of circuit-breaker racked-in/test isolated/racked-out S75 - (5c)

E1/6	5 auxiliary contacts	038361	038361
E1-E2	10 auxiliary contacts*	038360	043467
E3	10 auxiliary contacts*	043468	043469
E4-E6	10 auxiliary contacts*	043470	043470
E1/6	5 auxiliary contacts for digital signals	050146	050146
E1-E2	10 auxiliary contacts for digital signals*	050147	050148
E4-6	10 auxiliary contacts for digital signals*	050147	050147
E3	10 auxiliary contacts for digital signals*	050149	050150

* unfitting with PR120/K



Contact for signalling closing spring charged S33 M/2- (5d)

E1/6	038325
------	--------

Note: already supplied with the geared motor for automatic closing spring charging.



Contact for signalling undervoltage release de-energized - (5e)

E1/6	1 normally-closed contact	038341
E1/6	1 normally-open contact	038340



Ordering codes

SACE Emax accessories

1SDA.....R1



Current sensor for neutral conductor outside circuit-breaker UI/N - (6a)

E1-E2-E4	Iu N = 2000A	058191
E3-E6	Iu N = 3200A	058218
E4/f ⁽¹⁾	Iu N = 4000A	058216
E6/f ⁽²⁾	Iu N = 6300A	058220

Note: Iu N refers to the maximum neutral conductor capacity.
 (1) also for E1-E2 with setting of the neutral Ne = 200%
 (2) also for E3 with setting of the neutral Ne = 200%



Homopolar toroid for the main power supply earthing conductor (star centre of the transformer) UI/O - (6b)

E1/6	059145
------	--------



Toroid for residual current protection ⁽¹⁾ - (6c)

Rc Toroid for E1-E2 3p	063869
Rc Toroid for E1-E2 4p, E3 3p	064553

Note: (1) see page 4/12 and 4/25.

Mechanical accessories

Mechanical operation counter - (7)

E1/6	038345
------	--------

Lock in open position - (8a-8b)

key locks (8a)

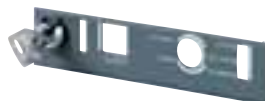
E1/6	for 1 circuit-breaker (different keys)	058271
E1/6	for groups of circuit-breakers (same keys N.20005)	058270
E1/6	for groups of circuit-breakers (same keys N.20006)	058274
E1/6	for groups of circuit-breakers (same keys N.20007)	058273
E1/6	for groups of circuit-breakers (same keys N.20008)	058272
E1/6	for groups of circuit-breakers (same keys N.20009)	064503

padlocks (8b)

E1/6	ø 4 mm	038351 (a)
E1/6	ø 8 mm	064504

Note: (a) To be ordered as alternative to the opening and closing pushbutton protective cover (accessory 9a).





Circuit-breaker lock in racked-in/test isolated/racked-out position - (8c)

E1/6	for 1 circuit-breaker (different keys and padlock Ø 4mm)	058278
E1/6	for groups of circuit-breakers (same keys N.2005 and padlock Ø 4mm)	058277
E1/6	for groups of circuit-breakers (same keys N.2006 and padlock Ø 4mm)	058281
E1/6	for groups of circuit-breakers (same keys N.2007 and padlock Ø 4mm)	058280
E1/6	for groups of circuit-breakers (same keys N.2008 and padlock Ø 4mm)	058279
E1/6	for groups of circuit-breakers (same keys N.2009 and padlock Ø 4mm)	064505
E1/6	for 1 circuit-breaker (different keys N.2009 and padlock Ø 6mm)	064506
E1/6	for groups of circuit-breakers (same keys N.2005 and padlock Ø 6mm)	064507
E1/6	for groups of circuit-breakers (same keys N.2006 and padlock Ø 6mm)	064508
E1/6	for groups of circuit-breakers (same keys N.2007 and padlock Ø 6mm)	064509
E1/6	for groups of circuit-breakers (same keys N.2008 and padlock Ø 6mm)	064510
E1/6	for groups of circuit-breakers (same keys N.2009 and padlock Ø 6mm)	064511

Padlocks

E1/6	Ø 8mm	064512
------	-------	--------

Arrangement for key lock

RONIS

Provided cover	058315
Lock in open position	058276
Lock in racked-in/test isolated/racked-out position	058314

CASTELL

Lock in open position	058275
-----------------------	--------



Accessory for lock in test isolated/racked-out position - (8d)

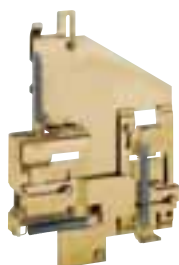
E1/6	038357
------	--------

Note: Must always be ordered to complete the circuit-breaker lock in racked-in/test/racked-out position (accessory 8c)



Accessory for shutter padlock device - (8e)

E1/6	038363
------	--------



Mechanical compartment door lock - (8f)

E1/6	045039
------	--------

Note: – Order with interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker (accessory 10.3)
 – for fixed version, also order the interlock plate 10.4
 – order as an alternative to cable interlocks (accessory 10.1), and to the 15 supplementary auxiliary contacts (accessory 5b).



Ordering codes

SACE Emax accessories

1SDA.....R1



Protective cover for opening and closing pushbuttons - (9a)

E1/6		038343
------	--	--------

Note: Order as an alternative to the padlock device in open position (accessory 8b).



IP54 door protection - (9b)

E1/6	Different keys	038344
E1/6	Same keys	065622

Sealable relay protection - (9c)

E1/6 for PR121		058316
E1/6 for PR122/PR123		058317

Mechanical interlock - (10)

For instructions see pages 9/63 and following.

10.1 Interlock cables for fixed circuit-breakers or fixed parts

E1/6	A - horizontal	038329
E1/6	B - horizontal	038330
E1/6	C - horizontal	038331
E1/6	D - horizontal	038332
E1/6	A - vertical	038333
E1/6	B - vertical	038334
E1/6	C - vertical	038335
E1/6	D - vertical	038336
E1/6	Cables kit for interlock E1/6 - T7/X1	064568

Note: Order one type of cable for each interlock. Order on one of the fixed circuit-breakers or on one of the fixed parts.



Extended interlock cables for fixed circuit-breakers or fixed parts

E1/6	A - horizontal extended cables	066090
E1/6	B - horizontal extended cables	066091
E1/6	C - horizontal extended cables	066092
E1/6	D - horizontal extended cables	066093
E1/6	A - vertical extended cables	066094
E1/6	B - vertical extended cables	066095
E1/6	C - vertical extended cables	066096
E1/6	D - vertical extended cables	066097

1SDA.....R1
3 Poles 4 Poles

10.2 Interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker

E1-E2	038366	038366
E3	038367	038367
E4	038368	043466
E6	043466	038369

Note: Order one accessory for each fixed circuit-breaker/moving part of withdrawable circuit-breaker.

10.3 Interlock for fixed circuit-breaker/fixed part of withdrawable circuit-breaker

E1/6	Interlock A / B / D	038364
E1/6	Interlock C	038365

Note: Order one accessory for each fixed circuit-breaker/fixed part of withdrawable circuit-breaker.

10.4 Interlock plate for fixed circuit-breaker

E1/6		038358
------	--	--------

Note: Order only for fixed circuit-breaker.

Lift device - (11)

E2-E3	Lift device for E2 3/4p and E3 3p	068841
E3-E4	Lift device for E3 4p-E4 3/4p	068842
E4-E6	Lift device for E4/fs 4p-E6 3/4p+fs	068843

Auxiliary units



Automatic transfer switch ATS21 and ATS022 - (12)

E1/6	ATS021	065523
E1/6	ATS022	065524



PR010/T configuration test unit

E1/6	PR010/T	048964
------	---------	--------



PR021/K Signalling unit

E1/6	PR021/K	059146
------	---------	--------



PR120/K Signalling module

E1/6	PR120/K (4 Output with independent terminals)	058255
E1/6	PR120/K (4 Output + 1 Input with a common terminal)	058256

Note: Do not use with 10 electrical signalling of circuit-breaker open/closed.



PR120/V Voltage measuring module

E1/6	PR120/V	058252
------	---------	--------

Note: For the supply of circuit-breakers with connection on the upper terminals or terminal box, please see also the extra codes (page 9/54).



PR120/D-M Communication module (Modbus RTU)

E1/6	PR120/D-M	058254
------	-----------	--------



PR120/D-BT Internal wireless communication module

E1/6	PR120/D-BT	058257
------	------------	--------

BT030 USB External wireless communication module

E1/6	BT030 USB	058259
------	-----------	--------



Ordering codes

SACE Emax accessories



EP010 - ABB Fieldbus plug

E1/6	EP010	060198
------	-------	--------

Note: Do not use with FBP.PDP21, the FBP-PDP22 is required.

PR030/B - Power supply unit

E1/6	PR030/B	058258
------	---------	--------

Note: Standard supply with PR122 and PR123 trip units.

HMI030 - Interface from front of panel

E1/6	HMI030	063143
------	--------	--------



Flex Interface

Accessory Devices

E1/6	MM030	064268
E1/6	AD030 DO	064513
E1/6	AD030 AO	064572
E1/6	AD030 MI	064573

System Devices

E1/6	SD030 DX	064578
E1/6	SD030 D0	064514
E1/6	SD030 DI	064575
E1/6	SD030 AO	064576
E1/6	SD030 MI	064577

Local Devices

E1/6	LD030 DO	064574
------	----------	--------

Multimeter

E1/6	HMI030	063143
------	--------	--------

Ordering codes

Electronic trip units and current sensors (for loose supplies)



PR121/P

1SDA.....R1



PR122/P

1SDA.....R1



PR123/P

1SDA.....R1

Electronic trip units

LI	058189	058196	
LSI	058193	058197	058199
LSIG	058195	058198	058200
LSIRc		058201	

Rating plug



1SDA.....R1

E1-E3	In=400A	058192
E1-E3	In=630A	058221
E1-E6	In=800A	058222
E1-E6	In=1000A	058223
E1-E6	In=1250A	058225
E1-E6	In=1600A	058226
E2-E6	In=2000A	058227
E3-E6	In=2500A	058228
E3-E6	In=3200A	058230
E4-E6	In=4000A	058232
E6	In=5000A	058233
E6	In=6300A	058234
E1-E3	In=400A for Rc protection *	063889
E1-E3	In=630A for Rc protection *	063890
E1-E3	In=800A for Rc protection *	063891
E1-E3	In=1250A for Rc protection *	063892
E2-E3	In=2000A for Rc protection *	063893
E3	In=3200A for Rc protection *	063894

* for PR122/P LSIRc, PR122/P LSIG with PR120/V or PR123/P LSIG and toroid for residual current protection.

Ordering codes

Order examples

1) Extra codes

Instructions for ordering

Standard version Emax series circuit-breakers are identified by means of commercial codes that can be altered by adding the following variables:

- **Codes for Terminal Kits for fixed circuit-breakers (other than horizontal rear)**
- **Extra codes for Current Transformer Settings (for current values below rated)**
- **Extra codes for special Version for rated service voltages up to 1150V AC**

The above types of variables can also be requested simultaneously on the same circuit-breaker. The "Extra codes" indicate variables that are not in addition to, but in replacement of the those found in the basic circuit-breaker.

For this reason, these commercial codes can only be ordered installed on the circuit-breaker and not as loose parts.

For releases (which already include the Dialogue Unit) and Current Transformers for supplies as spare parts for replacement by the customer, please see the coding section "Protection Releases and Current Transformers which can be supplied separately".

Numerical examples

- **Terminal Kit Codes for fixed circuit-breaker (other than horizontal rear)**

The codes indicate 3 or 4 pieces (for mounting on top or bottom terminals).

To convert a complete circuit-breaker, in the order specify 2 identical kits or 2 different kits for mixed terminals.

For mixed solutions, the first code indicates the 3 or 4 terminals to be mounted above, while the second indicates the 3 or 4 terminals to be mounted below.

Example no. 1

Emax E3N 3 poles fixed with Vertical Rear terminals (VR)

1SDA056148R1	E3N 32 PR122/P-LSI-In=3200A 3p F HR
1SDA038054R1	KIT 1/2 3p F HR>F VR E3
1SDA038054R1	KIT 1/2 3p F HR>F VR E3

Example no. 2

Emax E3N 3 poles fixed with top Vertical Rear (VR) and bottom Front (F) terminals

1SDA056148R1	E3N 32 PR122/P-LSI-In=3200A 3p F HR
1SDA038054R1	KIT 1/2 3p F HR>F VR E3
1SDA038064R1	KIT 1/2 3p F HR>F F E3

Example no. 3

Emax E3N 3 poles fixed with top Horizontal Rear terminals (HR) standard and bottom Vertical Rear terminals (VR)

1SDA056148R1	E3N 32 PR122/P-LSI IN=3200A 3p F HR
1SDA050230R1	Kit 1/2 3p F HR
1SDA038054R1	Kit 1/2 3p F HR > F VR E3

- **Extra codes for Current Transformer Settings (for current values below rated)**

Example no. 4

Emax E3N 3200 3 poles fixed In=2000A

1SDA056148R1	E3N 32 PR122/P-LSI-In=3200A 3p F HR
1SDA058242R1	rating plug In=2000A E2-4IEC E3-4UL EX.C

- **Extra codes for Special Version for rated service voltages up to 1150V AC**

Example no. 5

Emax E3H/E 2000 3 poles fixed (version up to 1150V AC)

1SDA056432R1	E3H 20 PR121/P-LI-In=2000A 3p F HR
1SDA048534R1	Special 1150V AC version Emax E3H/E20 circuit-breaker

2) Mechanical interlocks

Instructions for ordering

All the mechanical interlocks for any type of SACE Emax circuit-breaker consist of various components, each of which has been coded to ensure the greatest possible flexibility of the accessory.

The accessory components are described below

- **Cables for interlock** (Ref. 10.1 page 9/59)

One type of cable must be ordered for each interlock.

Flexible cables must be fixed to the fixed circuit-breakers and to the switchgear structures using self-adhesive plates and self-locking bands.

- **Interlock for fixed circuit-breaker/withdrawable circuit-breaker moving part** (Ref. 10.2 page 9/59)

This is the accessory which must be installed on the moving part of the withdrawable circuit-breaker or on the side of the fixed circuit-breaker.

This accessory must be ordered for each fixed circuit-breaker and for each moving part of the withdrawable circuit-breaker.

- **Interlock for fixed circuit-breaker/ withdrawable circuit-breaker fixed part** (Ref. 10.3 page 9/59)

This is the accessory which must be installed on the fixed part of the withdrawable circuit-breaker or on the interlock plate of the fixed circuit-breaker (which simulates the fixed part of the withdrawable circuit-breaker).

This accessory must be ordered for each fixed circuit-breaker and for each fixed part of the withdrawable circuit-breaker.

- **Interlock plate for fixed circuit-breaker** (Ref. 10.4 page 9/59)

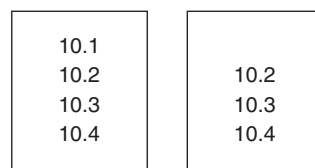
This must be requested for each fixed circuit-breaker present in the interlock.

For each circuit-breaker used in the interlock, depending on the type of circuit-breaker, the accessories listed in the figures below must be ordered (see page 9/55).

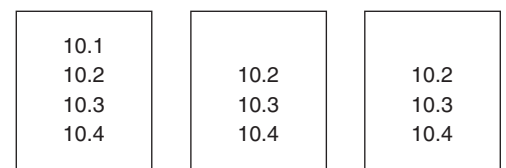
A single group of cables ("Cables for interlock" ref. 10.1) must be ordered **for each interlock**. In particular, either on a fixed circuit-breaker or on one of the fixed parts must be specified.

The examples beside show a general guide to the types of accessories that must be ordered for the various versions of circuit-breakers and type of interlock:

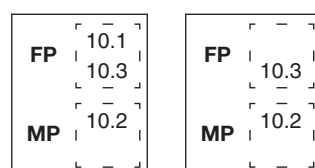
1. Interlock between two fixed circuit-breakers



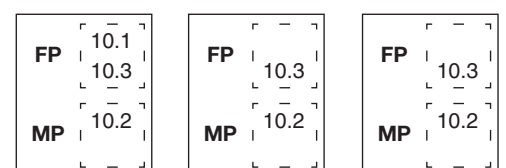
3. Interlock between three fixed circuit-breakers



2. Interlock between two withdrawable circuit-breakers



4. Interlock between three withdrawable circuit-breakers





Ordering codes

Order examples

Numerical examples

Example no. 5

An interlock is to be made between two type A circuit-breakers. In particular, the following are to be interlocked:

- a SACE E3 3-pole fixed circuit-breaker
 - with a SACE E4 4-pole withdrawable circuit-breaker;
- the circuit-breakers are placed horizontally in the switchboard.

The codes to be used when ordering are listed below:

Pos	Code	Description
100	SACE E3 fixed circuit-breaker	
	1SDA038329R1	Type A interlock cables for fixed circuit-breakers or fixed parts - horizontal E1/6
	1SDA038367R1	Interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker E3
	1SDA038364R1	Interlock for fixed circuit-breaker/fixed part of withdrawable circuit-breaker Interlock typeA / B / D E1/6
	1SDA038358R1	Interlock plate for fixed circuit-breaker E1/6
200	SACE E4 moving part of withdrawable circuit-breaker	
	1SDA043466R1	Interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker 4p E4 / 3p E6
300	Fixed part SACE E4	
	1SDA038364R1	Interlock for fixed circuit-breaker/fixed part of withdrawable circuit-breaker Interlock TypeA / B / D E1/6

Example no. 6

Here an interlock is to be made between three Type C vertical circuit-breakers with the following circuit-breakers:

- SACE E2 3-pole withdrawable circuit-breaker
- SACE E3 3-pole fixed circuit-breaker
- SACE E6 4-pole fixed circuit-breaker.

Pos	Code	Description
100	SACE E2 Moving Part of withdrawable circuit-breaker	
	1SDA038366R1	Interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker E1-E2
200	SACE E2 Fixed part	
	1SDA038335R1	Type C interlock cables for fixed circuit-breakers or fixed parts - vertical E1/6
	1SDA038365R1	Interlock for fixed circuit-breaker/fixed part of withdrawable circuit-breaker Type C Interlock E1/6
300	SACE E3 Fixed circuit-breaker	
	1SDA038367R1	Interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker Interlock E3
	1SDA038365R1	Interlock for fixed circuit-breaker/fixed part of withdrawable circuit-breaker Type C Interlock E1/6
	1SDA038358R1	Interlock plate for fixed circuit-breaker E1/6
400	SACE E6 Fixed circuit-breaker	
	1SDA038369R1	Interlock for fixed circuit-breaker/moving part of withdrawable circuit-breaker Interlock 4p E6
	1SDA038365R1	Interlock for fixed circuit-breaker/fixed part of withdrawable circuit-breaker Type C Interlock E1/6
	1SDA038358R1	Interlock plate for fixed circuit-breaker E1/6

Contact us

ABB SACE

A division of ABB S.p.A.

L.V. Breakers

Via Baioni, 35

24123 Bergamo - Italy

Phone: +39 035 395 111

Fax: +39 035 395306-433

www.abb.com

The data and illustrations are not binding. We reserve the right to modify the contents of this document on the basis of technical development of the products, without prior notice.

Copyright 2010 ABB. All rights reserved.

1SDC200006D0207 - 03/2010 - 6.000 - CAL



Technical catalogue - Edition 03.2013 - Preliminary

SACE Emax 2

New low voltage air circuit-breakers

Index

Main characteristics	1
The ranges	2
Protection trip units	3
Communication devices and systems	4
Accessories	5
Installation	6
Overall dimensions	7
Wiring diagrams	8
Ordering codes	9

SACE Emax 2

Consultation guide



Chapter 1

Main characteristics

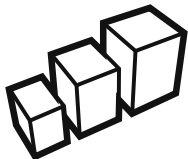
Overview of the SACE Emax 2 family, distinctive features of the series, product conformity and service.



Chapter 5

Accessories

Accessories for SACE Emax 2 circuit-breakers (signaling, control, interlocks, etc..) and for Ekip protection trip units (connectivity, measurements, protection, etc).



Chapter 2

The ranges

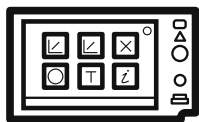
Electrical characteristics of automatic circuit-breakers, switch-disconnectors and derived versions.



Chapter 6

Installation

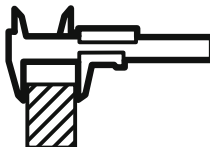
Installation and circuit-breaker performance in switchgear, installation environment, degree of protection and limiting curves.



Chapter 3

Protection trip units

Latest generation Ekip protection trip units for power distribution, generator protection and power control.



Chapter 7

Overall dimensions

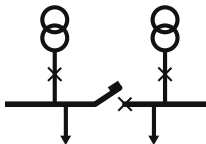
Overall dimensions for fixed circuit-breakers, withdrawable circuit-breakers and accessories.



Chapter 4

Communication devices and systems

Supervision, Energy Management and complete integration in the systems with the possibility of communicating with all the main protocols used in the industrial sector.



Chapter 8

Wiring diagrams

Circuit-breaker and accessories wiring diagrams.



Chapter 9

Ordering codes

Ordering codes with configuration examples.

Main characteristics

Overview of the SACE Emax 2 family

Guide to selection	1/2
--------------------	-----

Distinctive features of the series

Efficiency	1/3
Control	1/4
Connectivity	1/5
Performance	1/6
Ease of use and safety	1/7

Product conformity

Approvals and certifications	1/9
Quality and Sustainability	1/10

ABB SACE Global Service

1/12

Overview of the SACE Emax 2 family

1 Guide to selection

Ranges available

	E1.2	E2.2	E4.2	E6.2
Automatic circuit-breakers @ 690-1150 V AC	•	•	•	•
Switch-disconnectors @ 690-1150 V AC, 1000 V DC	•	•	•	•
Sectionalizing truck		•	•	•
Earthing switch with making capacity		•	•	•
Earthing truck		•	•	•

Automatic circuit-breakers

Icu (440Vac)	Versione	630	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	
200	X												
150	V											E6.2	
100	H		E2.2						E4.2				
85	S		E2.2						E4.2				
66	N		E2.2						E4.2				
50	C	E1.2											
42	B	E1.2											

Switch-disconnectors

Icw (1s)	Version	630	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
120	X											
100	V											E6.2
85	H		E2.2						E4.2			
66	N		E2.2						E4.2			
50	N	E1.2										
42	B	E1.2										

Protection trip units

Version	Application		
	Distribution	Power control	Generators
Ekip Dip	Protection devices	-	-
Ekip Touch	Protection devices and Measurements	Protection devices and Measurements	-
Ekip Hi-Touch	Protection devices, Measurements, Network analyzer	Protection devices, Measurements, Network analyzer	-
Ekip G Touch		Protection devices and Measurements	Protection devices and Measurements
Ekip G Hi-Touch		Protection devices, Measurements, Network analyzer	Protection devices, Measurements, Network analyzer

Distinctive features

SACE Emax 2 is a new series of low voltage air circuit-breakers up to 6300 A. 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.

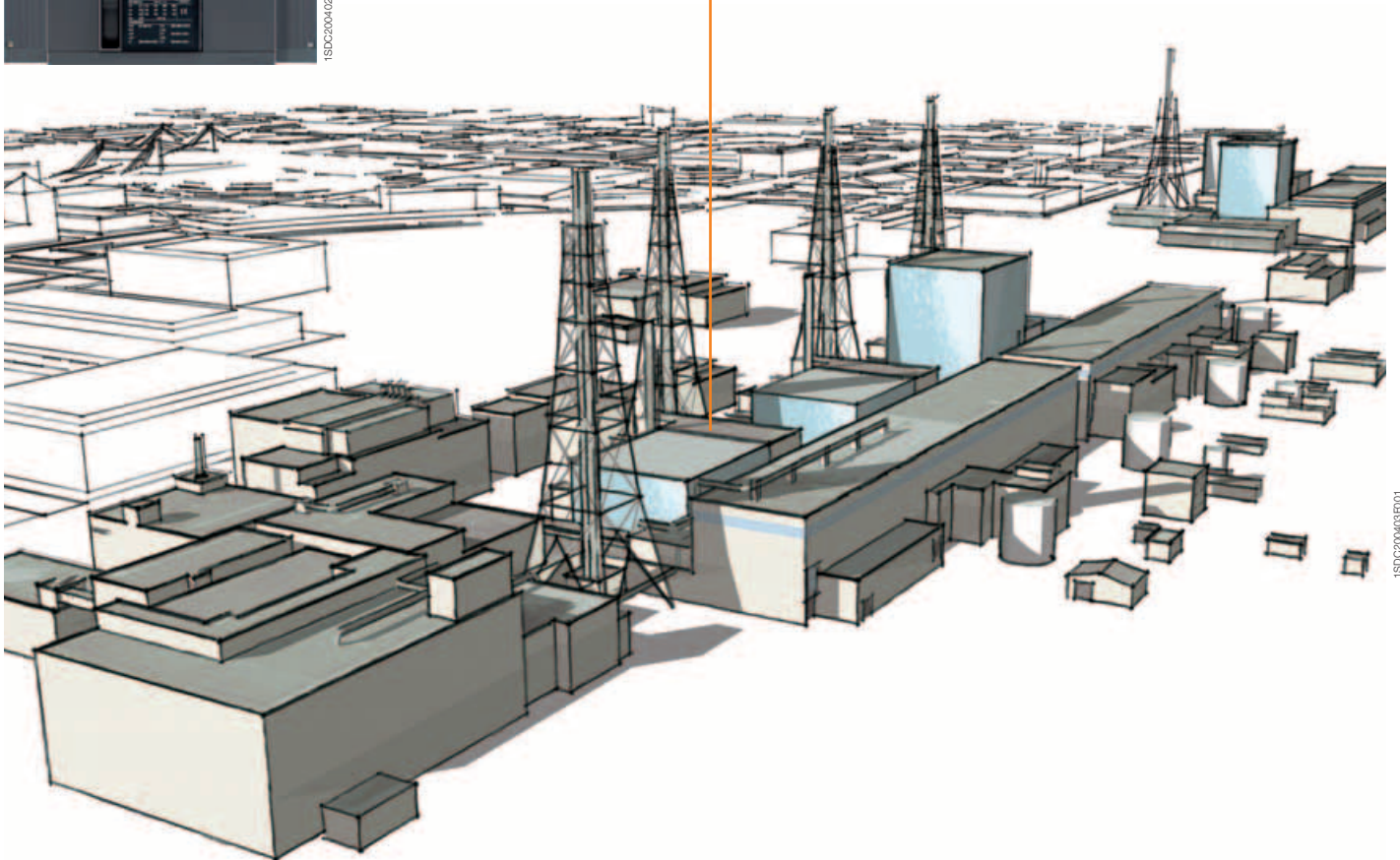
Efficiency

SACE Emax 2 air 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.



1SDC200402FR01



1SDC200403FR01

Distinctive features

1

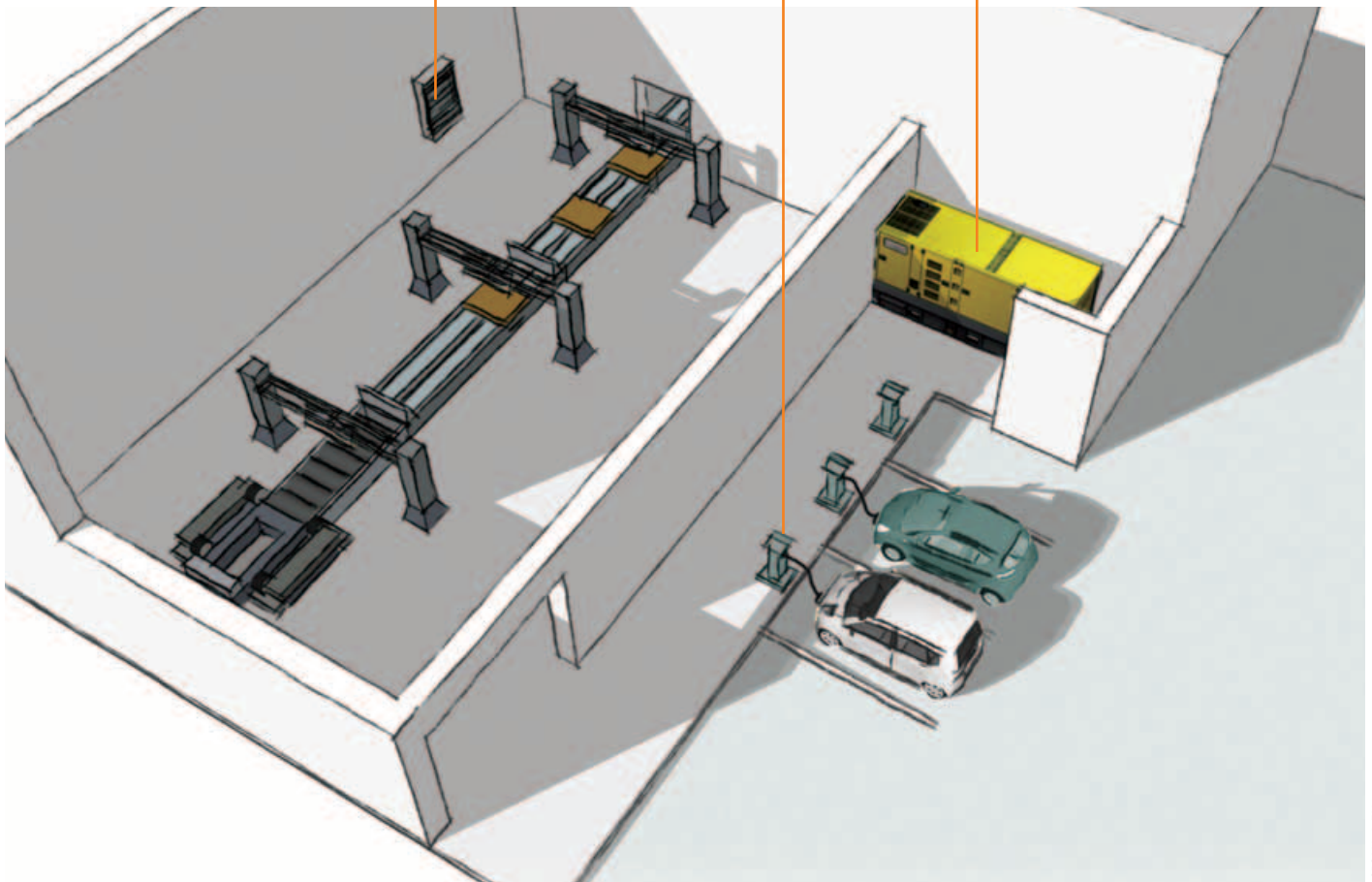
Control

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 programme and read. The Ekip Touch trip units measure power and energy with precision and save the most recent alarms, events and measurements in order to prevent faults to the installation or trip effectively when necessary. On request, the **Network Analyzer** function is also available, which controls the quality of absorbed power in real time and with extreme precision.

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.



1SDC200405F001

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 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 for the most common busbars, while the push-in connections of the auxiliaries ensure immediate and safe wiring.



1SDC200406F001

Distinctive features

1

Performance

The SACE Emax 2 range is made up of 4 sizes: E1.2, E2.2, E4.2 and E6.2 up to 6300A, 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.

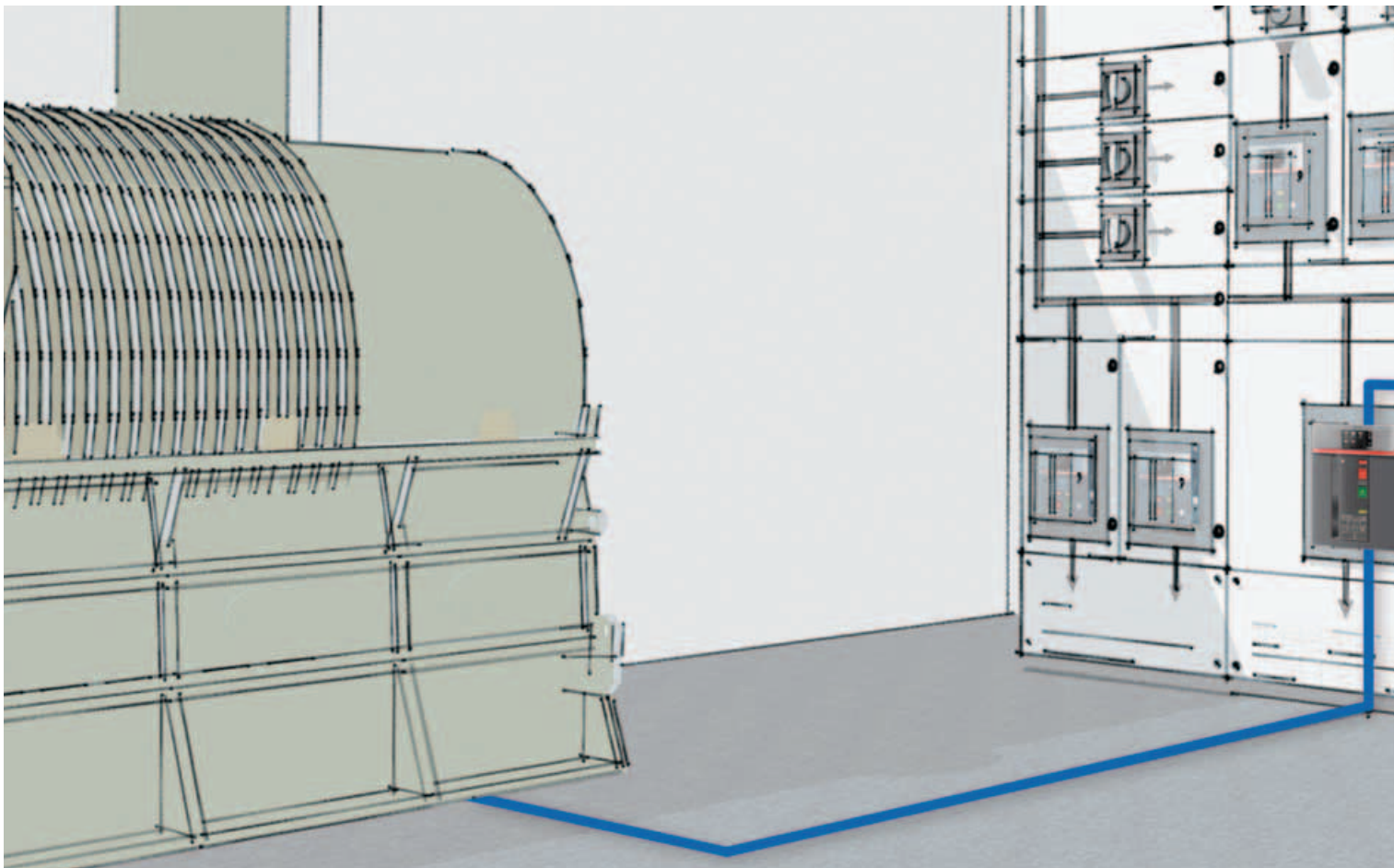
The rating levels are updated and uniform throughout the sizes to meet the demands and needs of today's installations, from 42kA to 200kA, and to standardize switchgear projects.

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

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

In particular:

- **E1.2** offers 1,600A with breaking capacity up to 66kA and withstand current of 50kA for 1 second 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 66kA to be built in units of 400mm, which is indispensable in places where reduced dimensions are essential, such as naval and offshore installations.
- **E2.2** enables in the three pole version ratings of up to 2,500A to be achieved in switchgear with a width of 400mm. In addition, it provides short-circuit currents up to 100kA and 85kA for 1 second.
- **E4.2** is the new 4,000A circuit-breaker designed to withstand high currents with a withstand rating of 100kA for 1 second without the need for particular precautions.
- **E6.2** is the top of the range, with an interrupting rating of 200kA and a structure that allows 6,300A to be reached, even in complex installation conditions.



Ease of use and safety

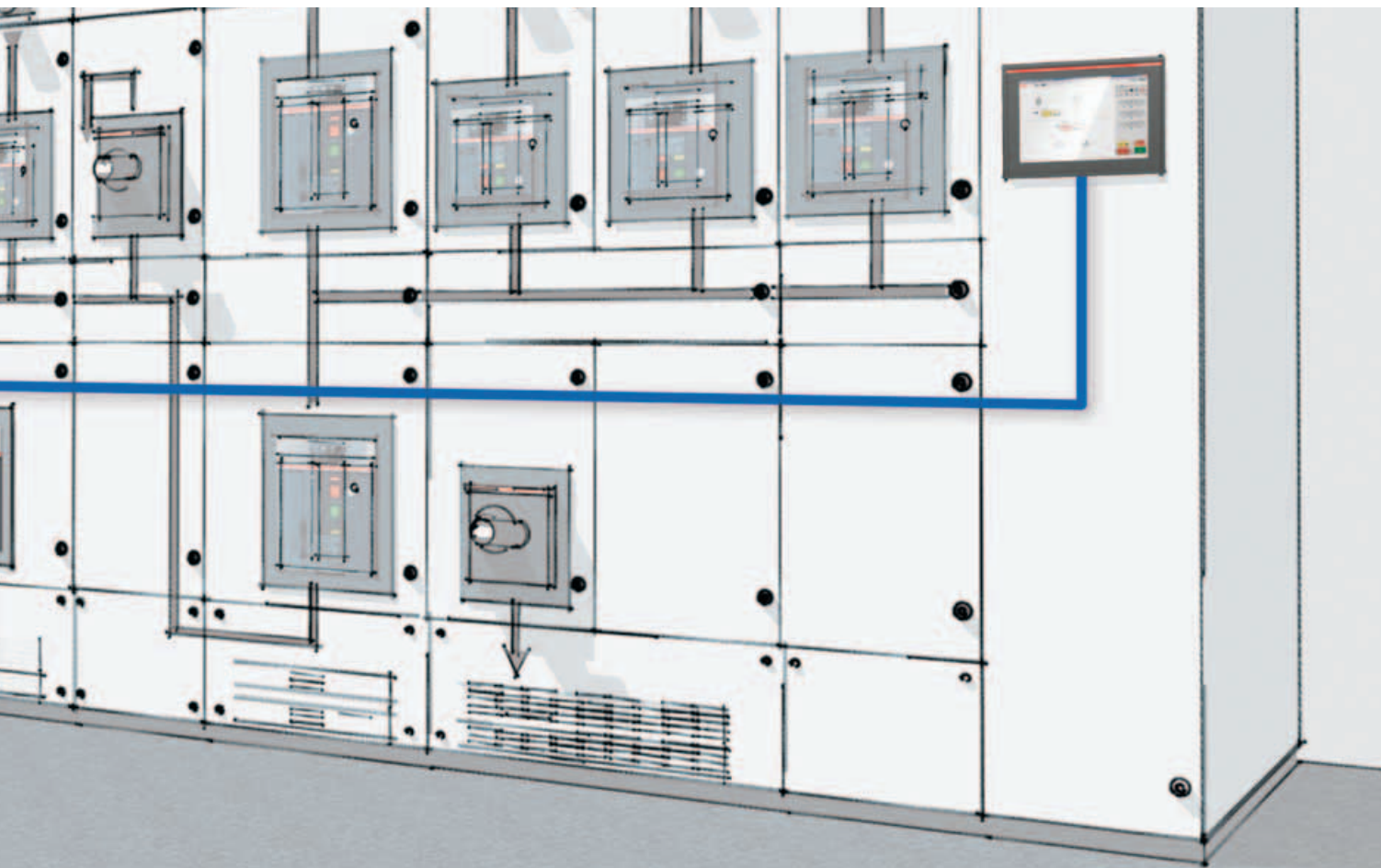
The entire range is available in fixed and withdrawable versions, with double insulation between the front of the switchgear and the live parts to ensure operation in complete safety. The circuit-breakers can be powered indifferently from above or below. All essential information is available in the central area of the front shield and enables immediate identification of the status of the circuit-breaker: open, closed, ready to close, charged and discharged springs.

Maintenance is simply and safe. Thanks to the new front shield, the main accessories can be frontally accessed without completely removing it.

The withdrawable circuit-breaker is inserted and removed via dedicated guide rails that simplify movement. The correct movement from racked-in, test isolated, to racked-out position is guaranteed by a lock in each position. As a further guarantee of safety, the shutters of the fixed part can be locked from the front when the circuit-breaker is removed. The shutters of the upper terminals are independent of those of the lower terminals to facilitate checking and maintenance operations.

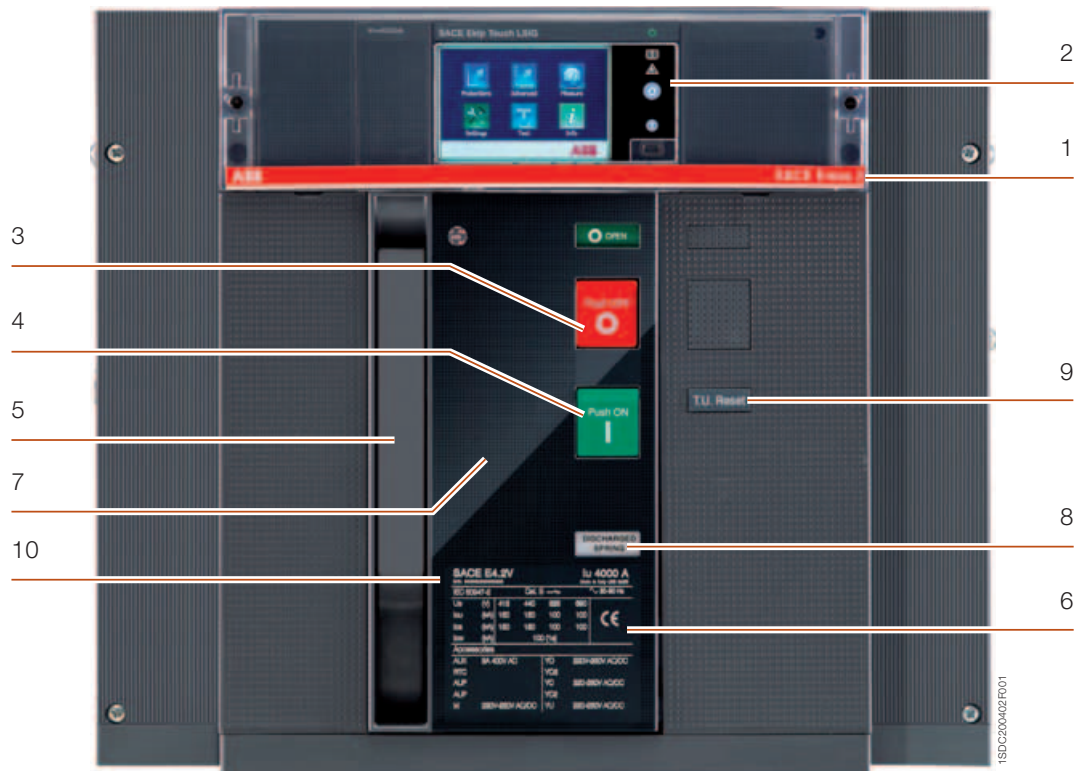
The Ekip Touch protection trip units are equipped with a large colour touch-screen display which enables safe and intuitive operation. Furthermore the Ekip units can be programmed and consulted from a tablet, smart phone or portable PC via the Ekip Connect application, which allows the parameters of the safety devices calculated in the DOC software to be set automatically.

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.



Distinctive features

1



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
- 7 Mechanical device to signal circuit-breaker open "O" and closed "I"
- 8 Signal for springs charged or discharged
- 9 Mechanical signalling of overcurrent release tripped
- 10 Size and serial number

Product conformity

SACE Emax 2 circuit-breakers and their accessories conform to IEC 60947, EN 60947 international Standard

Approvals and certifications

SACE Emax 2 circuit-breakers and their accessories conform to the international IEC 60947, EN 60947 (harmonized in 30 CENELEC countries), CEI EN 60947 and IEC 61000 Standards and comply with the following EC directives:

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

The ABB air circuit-breakers include a range that has been certified according to American UL 1066 Standards; it 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 about to be approved by the following shipping registers



Registro Italiano Navale (RINA): Italian



Germanischer Lloyd (GL): Deutsch



Russian Maritime Register of Shipping (RMRS): Russian



Lloyd's Register of Shipping (LR): English



Bureau Veritas (BV): French



Nippon Kaiji Kyokai (NKK): Japan



American Bureau Shipping (ABS): American



Det Norske Veritas (DNV): Norway

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

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 the company to develop, implement and certify management systems in compliance with international Standards:

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



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

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

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

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



ABB SACE Global Service

1

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

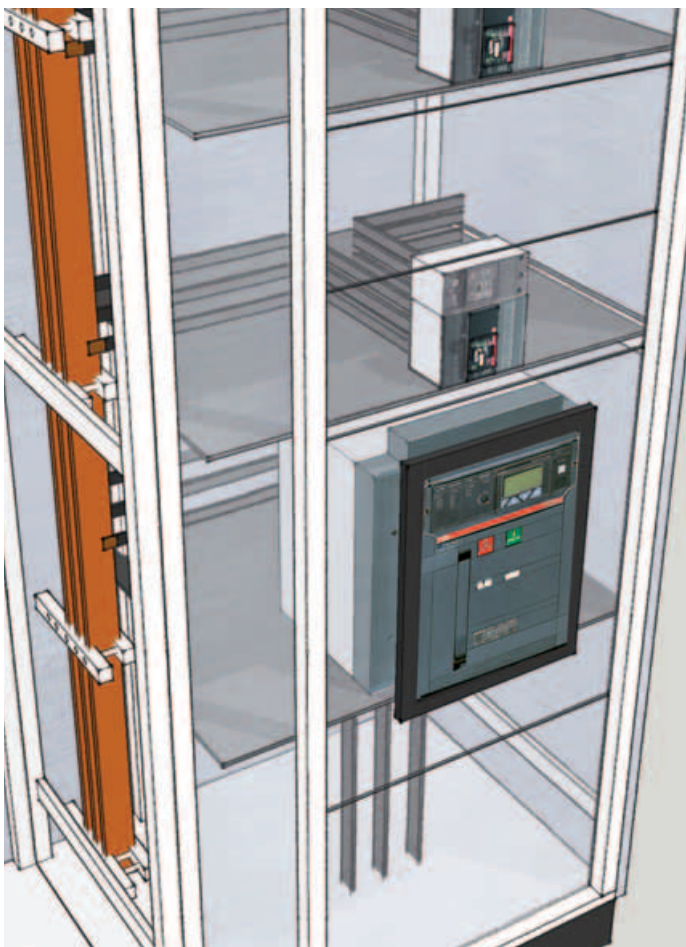
ABB supplies annual updates regarding the evolution of the circuit-breaker ranges (Life Cycle Management) and for each product it provides details of associated services and the level of support available, so that customers can choose the products and spare parts best suited to their needs.

ABB's organisation offers services that include installation and commissioning, technical training on the use and maintenance of products, the supply of original spare parts, corrective and preventive maintenance, equipment diagnostics, modernisation of systems with upgrades and retrofitting kits, consultancy services and personalised maintenance and service contracts. All this is supported by one of the most extensive global sales and service networks.

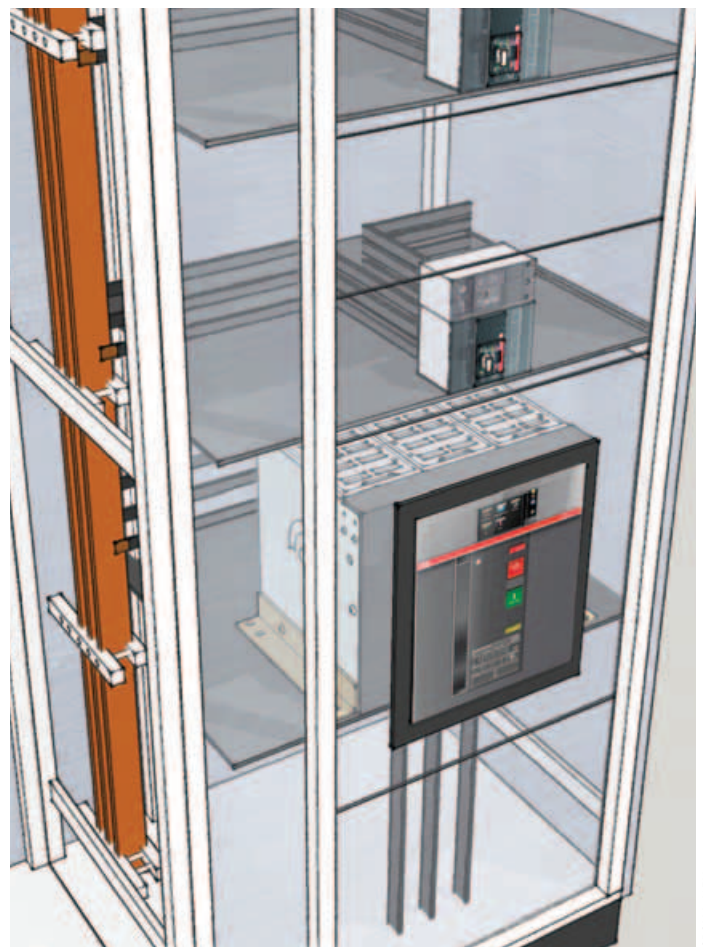
Retrofitting kit

Through continuous research targeted at the needs of the customer, ABB SACE Service has developed innovative retrofitting kits in order to simplify and speed up installation of a new circuit-breaker, updating the customer's investment with the latest technology available and with very limited down times.

The retrofitting kit between Emax2 and Emax is a refill solution: it is therefore possible to replace the withdrawable version of Emax with an equivalent Emax2 model without changing the switchboard busbars, by simply removing the fixed part of Emax replacing it with a fixed part of Emax2 which has been suitably modified with dedicated terminals.



1SDC200422F001



1SDC200422F001

The Ranges

SACE Emax 2 automatic circuit-breakers	2/2
SACE Emax 2 switch-disconnectors	2/4
SACE Emax 2 automatic circuit-breakers for applications up to 1150V AC	2/6
SACE Emax 2 switch-disconnectors for applications up to 1150V AC	2/8
SACE Emax 2 switch-disconnectors for applications up to 1000 V DC	2/10
SACE Emax 2 derived versions	2/12

SACE Emax 2 automatic circuit-breakers

2

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 - Withdrawable
Isolation behaviour		IEC 60947-2



SACE Emax 2

SACE Emax 2			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	60
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	Breaking time for I<Icw		40	40	40	40
	Breaking time for I>Icw		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 FS	[mm]	210/280			
	W - Withdrawable 3p/4p/4p FS	[mm]	278/348			

1) Ics : 50kA for 400V...440V voltage

SACE Emax 2

SACE Emax 2			E1.2			
Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer	[Iu]		≤ 1000	1250	1600	1600 L
	[No.oper.x 1000]		20	20	20	20
	Frequency	[Oper./Hour]	60	60	60	60
Electrical life	440 V	[No.oper.x 1000]	8	8	8	3
	690 V	[No.oper.x 1000]	8	6,5	6,5	1
	Frequency	[Oper./Hour]	30	30	30	30



1SDC200425F001



1SDC200425F001



1SDC200427F001

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	85	100	100	100	
42	66	66	85	66	66	85	100	100	100	120	
42	50	50	66	36	50	66	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			

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

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.

2

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 - Withdrawable
Isolation behaviour		IEC 60947-3



SACE Emax 2

SACE Emax 2			E1.2	
Performance levels			B/MS	N/MS
Rated uninterrupted current I _u @ 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		[%I _u]	100	100
Rated short-time withstand current I _{cw}	(1s)	[kA]	42	50
	(3s)	[kA]	24	36
Rated short-circuit making capacity (peak value) I _{cm}	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 FS	[mm]	210 / 280	
	W - Withdrawable 3p/4p/4p FS		278 / 348	

SACE Emax 2

SACE Emax 2			E1.2		
Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer		[I _u]	< 1000	1000	1600
		[No.oper.x 1000]	20	20	20
	Frequency	[Oper./Hour]	60	60	60
Electrical life	440 V	[No.oper.x 1000]	8	8	8
	690 V	[No.oper.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	X/MS	
1600	800	800	3200	3200	2000	4000	4000	
2000	1000	1000	4000	4000	2500	5000	5000	
	1250	1250			3200	6300	6300	
	1600	1600			4000			
	2000	2000						
	2500	2500						
100	100	100	100	100	100	50-100	50-100	
42	66	85	66	85	100	100	120	
42	50	66	36	66	75	100	100	
88	145	187	145	187	220	220	264	
88	145	187	145	187	220	220	264	
88	145	187	145	187	220	220	264	
88	145	187	145	187	220	220	264	
AC-23A	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	371 / 425	
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		

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 automatic circuit-breakers for applications up to 1150V AC

ABB SACE offers a solution designed for electrical applications with voltages up to 1150V in alternating current. The 1150V AC range, which maintains the same dimensions and accessories as the standard 690V AC range, is identified by the letters “/E”.

2

Common data

Rated service voltage U_e	[V]	1150
Rated insulation voltage U_i	[V]	1250
Rated impulse withstand voltage U_{imp}	[kV]	12
Frequency	[Hz]	50 - 60
Number of poles		3- 4
Version		Fixed - Withdrawable
Isolation behaviour		IEC 60947-2



SACE Emax 2

E1.2

Performance levels

N/E

Rated uninterrupted current I_u @ 40°C		[A]	630
		[A]	800
		[A]	1000
		[A]	1250
		[A]	1600
		[A]	
Neutral pole current-carrying capacity for 4-pole CBs		[% I_u]	100
Rated ultimate short-circuit breaking capacity I_{cu}	1000 V	[kA]	30
	1150 V	[kA]	25
Rated service short-circuit breaking capacity I_{cs}		[% I_{cu}]	100
Rated short-time withstand current I_{cw} (1s)		[kA]	25
	(3s)	[kA]	25
Rated short-circuit making capacity (peak value) I_{cm}	1000 V	[kA]	63
	1150 V	[kA]	53
Utilization category (according to IEC 60947-3)			B

SACE Emax 2

E1.2

Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer		[I_u]	< 1000	1000	1600
		[No.oper.x 1000]	20	20	20
	Frequency	[Oper./Hour]	60	60	60
Electrical life	1150 V	[No.oper.x 1000]	1	1	1
	Frequency	[Oper./Hour]	30	30	30



1SDC200425F001



1SDC200426F001



1SDC200427F001

E2.2			E4.2			E6.2		
H/E			H/E			X/E		
800			3200			4000		
1000			4000			5000		
1250						6300		
1600								
2000								
2500								
100			100			50 - 100		
30			50			65		
30			30			65		
100			100			100		
30			50			65		
30			30			65		
63			105			143		
53			105			143		
B			B			B		

E2.2			E4.2			E6.2			
< 2000	2000	2500	< 3200	3200	4000	4000	5000	6300	
25	25	20	20	20	15	12	12	12	
60	60	60	60	60	60	60	60	60	
2	2	2	1	1	1	1	1	1	
30	30	30	20	20	20	10	10	10	

SACE Emax 2 switch-disconnectors for applications up to 1150V AC

The switch-disconnectors for applications at 1150V, identified by the letters “/E” and “/MS”, are derived from the corresponding standard automatic circuit-breakers, of which maintain the overall dimensions and the possibility of mounting accessories. The switch-disconnectors are not equipped with Ekip protection trip units. By means of external protection relay with 500 ms maximum timing, the Icu breaking capacity is equal to the value of Icw (1s).

2

Common data

Rated service voltage Ue	[V]	1150
Rated insulation voltage Ui	[V]	1250
Rated impulse withstand voltage Uimp	[kV]	12
Frequency	[Hz]	50 - 60
Number of poles		3- 4
Version		Fixed - Withdrawable
Isolation behaviour		IEC 60947-3



SACE Emax 2

E1.2

Performance levels

N/E MS

Rated uninterrupted current Iu @ 40°C		[A]	630
		[A]	800
		[A]	1000
		[A]	1250
		[A]	1600
		[A]	
Neutral pole current-carrying capacity for 4-pole CBs		[%Iu]	100
Rated short-time withstand current Icw	(1s)	[kA]	25
	(3s)	[kA]	25
Rated short-circuit making capacity (peak value) Icm	1000 V	[kA]	53
	1150 V	[kA]	53

SACE Emax 2

E1.2

Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer		[Iu]	< 1000	1000	1600
		[No.oper.x 1000]	20	20	20
	Frequency	[Oper./Hour]	60	60	60
Electrical life	1150 V	[No.oper.x 1000]	1	1	1
		Frequency	[Oper./Hour]	30	30



1SDC200425F001



1SDC200439F001



1SDC200431F001

E2.2			E4.2			E6.2		
H/E MS			H/E MS			X/E MS		
800			3200			4000		
1000			4000			5000		
1250						6300		
1600								
2000								
2500								
100			100			50 - 100		
30			50			65		
30			30			65		
53			105			143		
53			105			143		

E2.2			E4.2			E6.2		
< 2000	2000	2500	< 3200	3200	4000	4000	5000	6300
25	25	20	20	20	15	12	12	12
60	60	60	60	60	60	60	60	60
2	2	2	1	1	1	1	1	1
30	30	30	20	20	20	10	10	10

SACE Emax 2 Switch-disconnectors for applications up to 1000V DC

ABB SACE extends its solutions to applications in direct current with a range of switch-disconnectors for applications up to 1000V, which comply with the international IEC60947-3 standard.

For all applications in which integrated protection is requested in addition to isolation, ABB SACE offers SACE Emax automatic circuit-breakers with PR122/DC and PR123/DC. For further information, please refer to the technical catalogue "SACE Emax DC. Low voltage air circuit-breakers for direct current applications".

2

Common data

Rated service voltage U_e	[V]	750 (3p) / 1000 (4p)
Rated insulation voltage U_i	[V]	1000
Rated impulse withstand voltage U_{imp}	[kV]	12
Number of poles		3- 4
Version		Fixed - Withdrawable
Isolation behaviour		IEC 60947-3



SACE Emax 2

Performance levels

				E1.2		
				N/DC MS		
Rated uninterrupted current I_u @ 40°C		[A]		800		
		[A]		1250		
		[A]				
		[A]				
		[A]				
		[A]				
Poles			3	4	4	
Rated service voltage U_e			750	750	1000	
Rated insulation voltage U_i			1000	1000	1000	
Rated short-time withstand current I_{cw}	(1s)	[kA]	20	25	20	
Rated short-circuit making capacity (peak value) I_{cm}	750 V	[kA]	40	53	40	
	1000 V	[kA]			40	
Utilization category (according to IEC 60947-3)						

SACE Emax 2

				E1.2	
Mechanical and electrical life with regular ordinary maintenance prescribed by the manufacturer		[l_u]		< 1000	1250
		[No.oper.x 1000]		20	20
	Frequency	[Oper./Hour]		60	60
Electrical life	1000 V	[No.oper.x 1000]		1	1
	Frequency	[Oper./Hour]			

Note: by means of external protection relay with 500 ms maximum timing, the breaking capacity I_{cu} at the maximum rated use voltage is equal to the value of I_{cw} (1s).



1SDC200425F001



1SDC200439F001



1SDC200431F001

E2.2			E4.2			E6.2		
S/DC MS			H/DC MS			X/DC MS		
1250			1250			4000		
1600			1600			5000		
2000			2000			6300		
2500			2500					
			3200					
			4000					
3	4	4	3	4	4	3	4	4
750	750	1000	750	750	1000	750	750	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000
25	40	25	40	50	40	65	65	65
53	84	53	84	105	84	143	143	143
		53			84			143

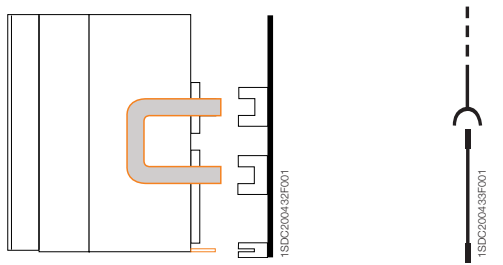
E2.2			E4.2			E6.2		
< 2000	2000	2500	< 3200	3200	4000	4000	5000	6300
25	25	20	20	20	15	12	12	12
60	60	60	60	60	60	60	60	60
2	2	2	1	1	1	1	1	1

SACE Emax 2 derived versions

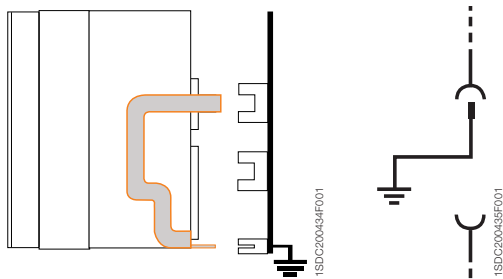
Safety is an indispensable requirement that must always be guaranteed in electrical installations. In this regard, ABB SACE offers devices developed to further increase safety standards during inspection and maintenance activities on electrical installations.

2

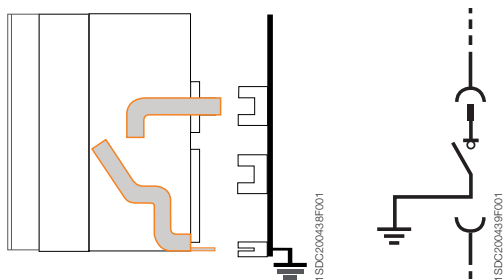
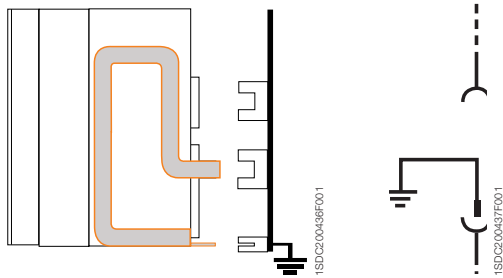
In particular, in a withdrawable version, ABB SACE Emax 2 offers:



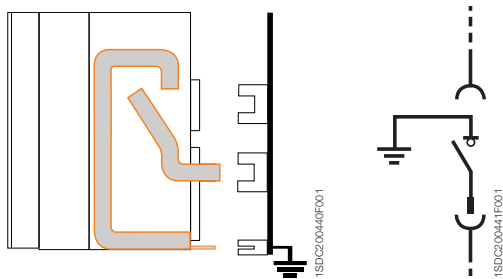
- **Sectionalizing truck CS:** in normal operating conditions of the electrical circuit, this device is inserted in the fixed part and short-circuits the upper and lower terminals of the power circuit. When maintenance activities need to be carried out, the sectionalizing truck is removed and the part of the system involved is isolated. The device can be accessorised with a keylock and padlocks for locking in the withdrawn position.



- **Earthing truck MT:** this device enables all phases of the electrical circuit in which maintenance needs to be performed to be earthed ¹⁾. The earthing truck is available in two versions: for earth connection from the upper or lower terminals.



- **Earthing switch with making capacity MTP:** similar to the MT device, this differs due to the presence of a mechanical stored energy control which allows the circuit to be opened and closed. Two versions of this earthing switch are also available: for earth connection from the upper or lower terminals. It can also be accessorised with a keylock or padlocks for locking in the open position.



¹⁾ The earthing circuit is dimensioned for a short-time current equal to 60% of the maximum low of the circuit-breaker from which it is derived (IEC 60439-1)

Common data

Rated service voltage U _e	[V]	690
Rated insulation voltage U _i	[V]	1000
Rated impulse withstand voltage U _{imp}	[kV]	12
Frequency	[Hz]	50 - 60
Number of poles		3 - 4
Version		Withdrawable

SACE Emax 2	E2.2			E4.2			E6.2		
Performance levels	CS	MT	MTP	CS	MT	MTP	CS	MT	MTP
Rated uninterrupted current I _u @ 40°C	2500	2500	2500	4000	4000	4000	6300	6300	6300
Neutral pole current-carrying capacity for 4-pole CBs	100	100	100	100	100	100	50-100	50-100	50-100
Rated short-time withstand current I _{cw} (1s) [kA]	-	30	30	-	50	50	-	50	50

Other versions

Corrosive substances, vibrations, shocks or very low temperatures can be present in particular applications. In this regard, SACE Emax 2 circuit-breakers offer specific solutions developed precisely for:

- **Aggressive environments**, such as industrial processes for paper production, oil refining or water treatment, which are subject to high levels of sulphur dioxide (SO₂) and hydrogen sulphide (H₂S) contamination.
- **Antiseismic installations**, for areas with seismic risk where industrial and civil activities take place and where the continuity of critical processes must be guaranteed even in the case of particular natural events.

For further detail, please contact ABB SACE.

Protection trip units

Introduction	3/2
---------------------	------------

Architecture	3/4
---------------------	------------

Protection trip units for power distribution

Ekip Dip	3/6
Ekip Touch	3/10
Ekip Hi-Touch	3/20

Protection trip units for generators

Ekip G Touch	3/24
Ekip G Hi-Touch	3/29

Protection trip units for power control

Ekip Power Controller	3/32
-----------------------	------

Technical characteristics for protection trip units

Protection functions	3/38
Measurement functions	3/46

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.

3

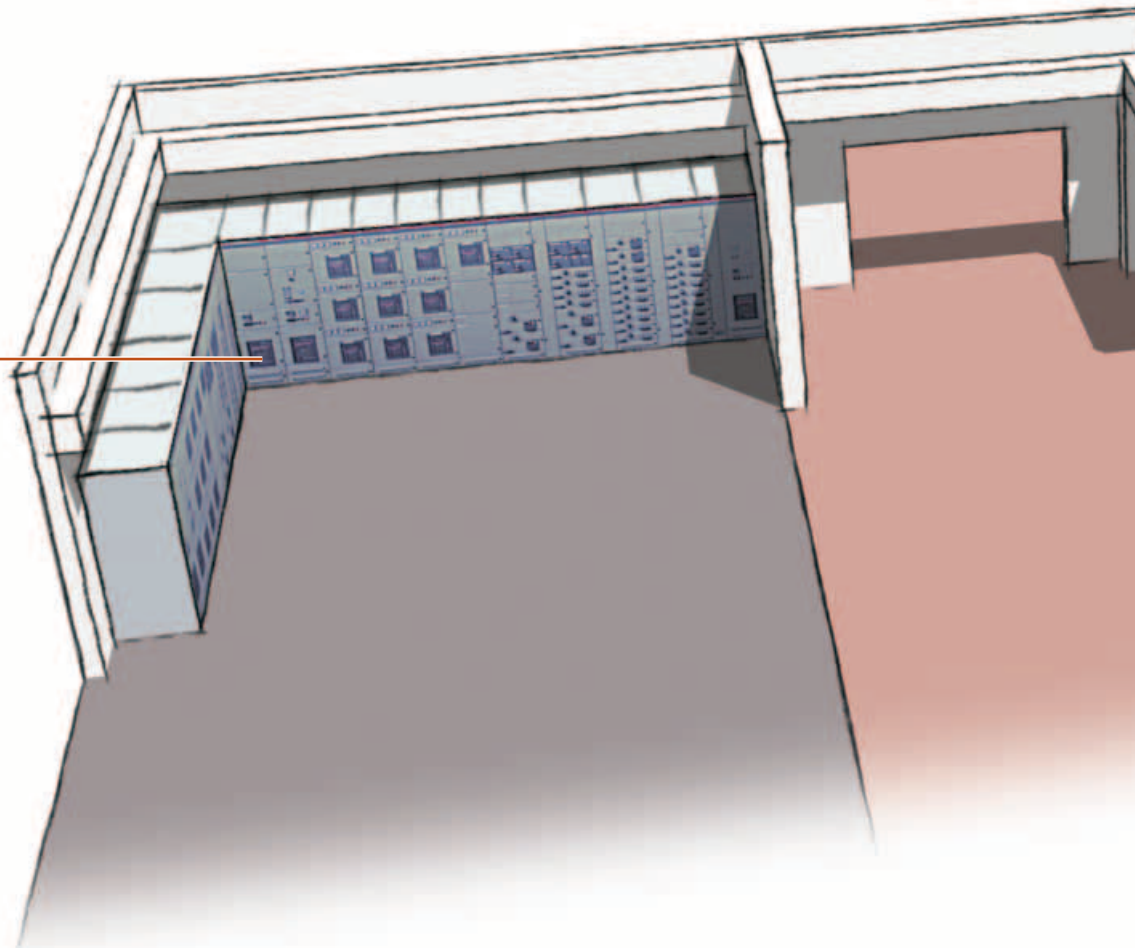
The protection units are divided into two families: Ekip for distribution protection and Ekip G for generator protection. The range of trip units is available with three levels of performance, Dip, Touch and Hi-Touch, to satisfy simple to advanced applications. Exclusive functions such as the Ekip Power 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.

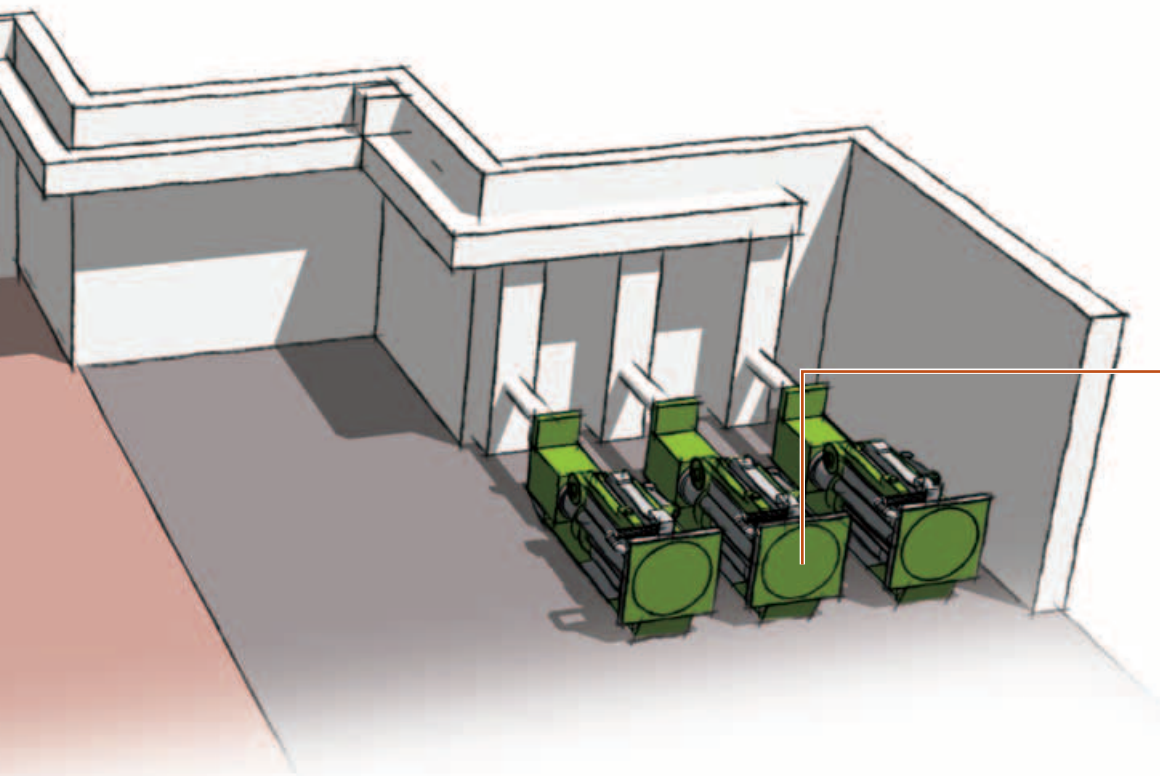


The **protection units for power distribution**, available in the LI, LSI and LSI^G versions, are suited to all distribution systems. The Ekip trip units are designed to protect a vast range of applications, such as use with transformers, motors and drives. Ekip Dip, Ekip Touch or Ekip Hi-Touch can be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

Ekip G enables the **protection of generators** without the use of external devices that require dedicated relays and wiring. Ekip G increases efficiency from the design stage to installation, minimizing the time needed for realization and commissioning of the system, and ensuring high levels of accuracy and reliability of all protection devices required for running generators in applications such as naval, GenSet or cogeneration.

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, without the use of complex external automation logic, loads and generators in order to optimize the power consumed.

Thanks to the **Network Analyzer** function integrated in all Hi-Touch versions, the quality of energy in terms of harmonics, micro-interruptions or voltage dips is monitored without the need for dedicated instrumentation. This allows effective preventive and corrective action to be implemented through accurate analysis of the faults, thereby improving the efficiency of the system.



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 dangerous 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:

3

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



All protection trip units of the SACE Emax 2 family are self-powered by current that crosses the circuit-breaker. They guarantee excellent reliability thanks to a system of self-control of internal connections. The setting, testing and downloading of reports can be carried out directly from a Smartphone, Tablet or PC.

In addition, the commissioning stage can be further accelerated, minimizing the possibility of errors, by directly configuring the protection trip unit with the DOC design software settings.

Cartridge-type modules that are easily installed on-board enable the units to be integrated into the most complex systems. Additional functions can be created, such as:

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



Protection trip units for power distribution

Ekip Dip

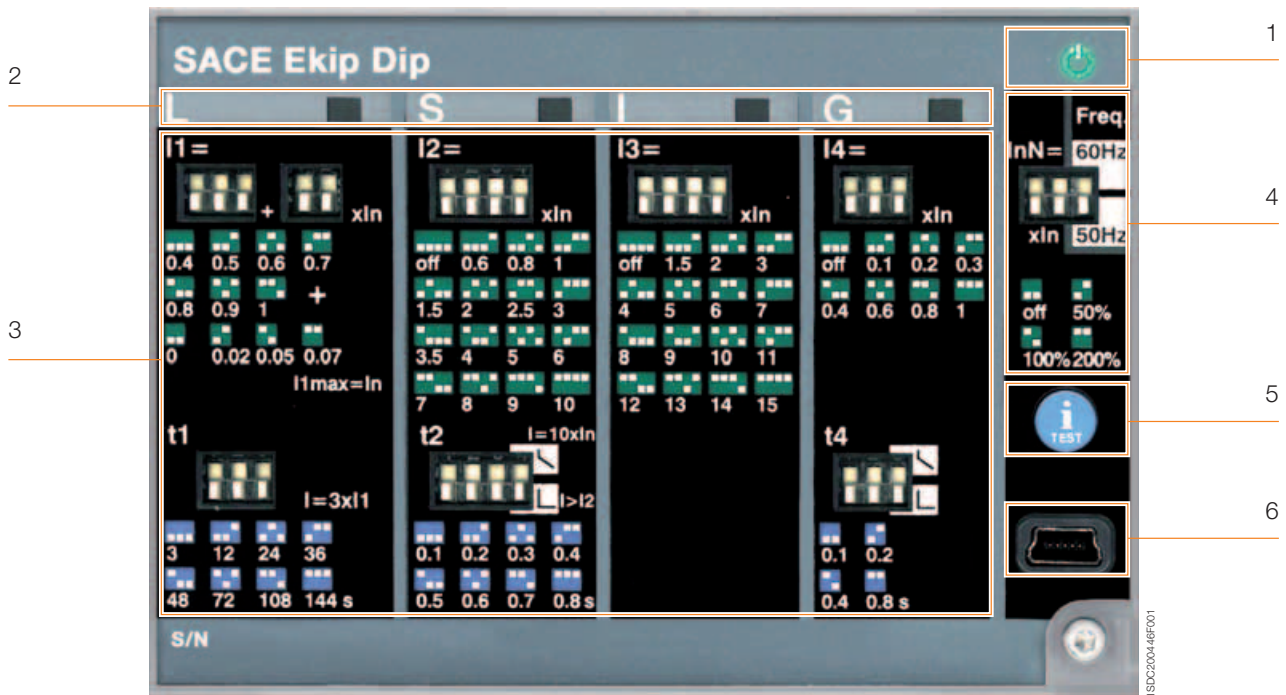
Characteristics

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.

3

The unit is available in the following versions:

- Ekip Dip LI
- Ekip Dip LSI
- Ekip Dip LSIG

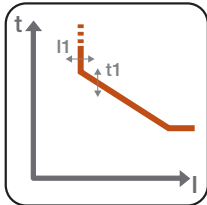


Key:

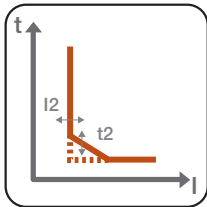
- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Power-on LED for signalling correct operation (watchdog) 2. LEDs for alarm signalling of L, S, I and G protection functions and diagnostics 3. Dip switches for setting the protection functions | <ol style="list-style-type: none"> 4. Dip switches 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

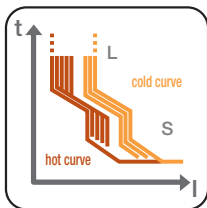
Ekip Dip offers overcurrent protection functions and, in the event of tripping, controls the opening of the circuit-breaker, preventing it from closing again unless it has been reset by the operator (lockout device – code ANSI 86).



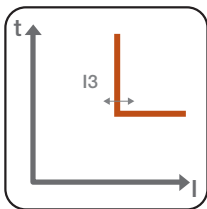
Overload (L - ANSI 49): with inverse long-time delay trip of the type $t = k/I^2$ available with 25 current thresholds and 8 curves, it provides effective protection of all systems. A pre-alarm warning is also available on reaching 90% of the threshold set.



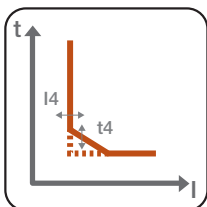
Time-delayed overcurrent (S - ANSI 51 & 50TD): with constant tripping time ($t = k$), or with constant specific let-through energy ($t = k/I^2$), it provides 15 current thresholds and 8 curves, for fine adjustment. The function can be excluded by setting the dip switch combination to “OFF”.



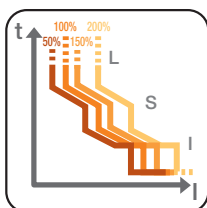
Thermal memory: for L and S protection functions, this is used to protect components, such as transformers, from overheating following an overload. The function, which can be enabled by the Ekip Connect software, adjusts the protection tripping time according to the length of time that has elapsed since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



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



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

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 by the display on the front of the Ekip Multimeter and Ekip Control Panel.

Ekip Dip also records the characteristics of the circuit-breaker, to enable a rapid analysis in the event of maintenance:

- Maximum and average current values per phase;
- Date, time, fault current per phase and type of protection tripped over the last 30 trips;
- Date, time and type of operation of the last 200 events (for example: opening/closing of circuit-breaker, pre-alarms, editing settings);
- Number of mechanical and electric operations of the circuit-breaker;
- Total operating time;
- Contact wear;
- Date and time of the last maintenance carried out, in addition to the estimate of the next maintenance required;
- Circuit-breaker identifying data: type, serial number, firmware version, name of the device as assigned by the user.

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

Watchdog

All the protection trip units of the SACE Emax 2 family ensure high reliability owing to an electronic circuit that periodically controls the continuity of the internal connections (trip coil, rating plug and current sensors). 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 and alarm status and information on the circuit-breaker or maintenance to be displayed. It is also possible to set parameters such as date, time and thermal memory and for the records to be reset.

Test function

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

- Ekip TT 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.

Protection trip units for power distribution

Ekip Touch

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.

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

The unit is available in the versions:

- Ekip Touch LI
- Ekip Touch LSI
- Ekip Touch LSIG

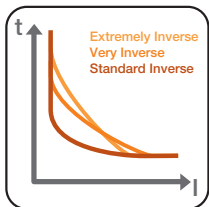


Key:

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

Protection functions

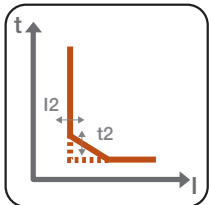
Ekip Touch enables all the protection functions to be set with a few simple steps directly from the wide touchscreen display. If the circuit breaker is tripped it must be reset manually or electrically by the operator (lockout relay – code ANSI 86).



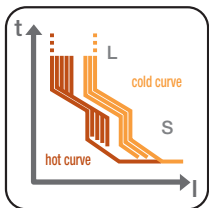
Overload (L - ANSI 49): available with three different types of trip curve:

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.

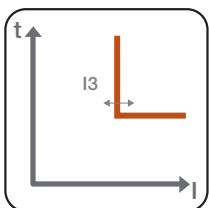
The thresholds can be fine tuned (for example 1A for circuit-breaker E1.2 1000A) and the timings to the second can be set directly from the display. The settable pre-alarm indicates the set threshold is reached before the protection is tripped. The protection can be disabled by rating plug L=off.



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

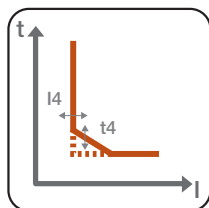


Thermal memory: for protections L and S it is used to protect the components, such as transformers, against overheating following overloads. The protection adjusts the trip time of the protection according to how much time has elapsed after the first overload, taking account of the overheating caused.



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.

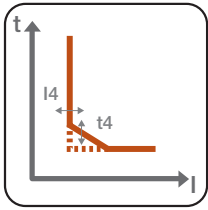


Earth fault (G - ANSI 51N & 50NTD): with trip time independent of the current ($t = k$) or with constant specific let-through energy ($t = k/I^2$). A pre-alarm indication is also available when 90% of the threshold is reached to activate corrective measures before the protection is tripped. The function 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.

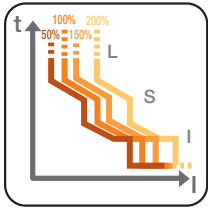
Protection trip units for power distribution

Ekip Touch

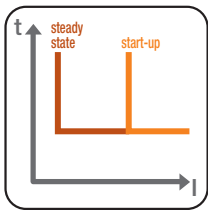
3



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

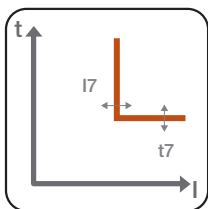


Neutral protection: available at 50%, 100%, 150% or 200% of the phase currents, or disabled, it is applied to the overcurrent protections L, S and I.

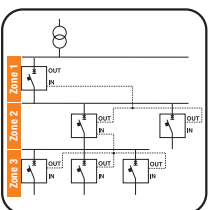


Start-up function: enables protections S, I and G to operate with higher trip thresholds during the starting phase, avoiding untimely trips due to high inrush currents of certain loads (motors, transformers, lamps). The starting phase lasts 100 ms to 30 s and is recognized automatically by the trip unit:

- 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 ($0.1 \dots 10 \times I_n$) with an externally supplied trip unit; a new start-up is possible after the current falls below the threshold.



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



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

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 Signalling.

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

Protection functions with Ekip Measuring Pro



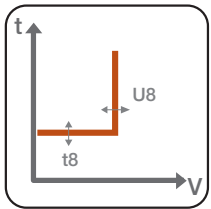
1SDC200467F001

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.

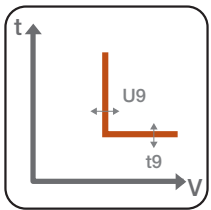
A different operating mode can be chosen for each protection function:

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.

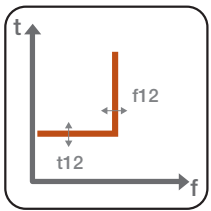
Furthermore, when the voltage and frequency protections are activated, they indicate an alarm status even when the circuit-breaker is open so that a fault can be identified before the circuit-breaker closes.



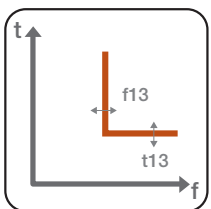
Undervoltage (UV - ANSI 27): with constant trip time ($t = k$), function is tripped when phase voltage falls below set threshold.



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.

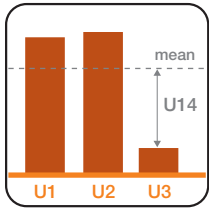


Overfrequency (OF - ANSI 81H): with constant trip time ($t = k$), function is tripped when network frequency exceeds the set threshold.

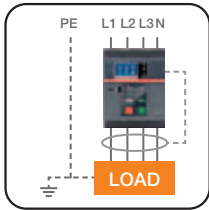
Protection trip units for power distribution

Ekip Touch

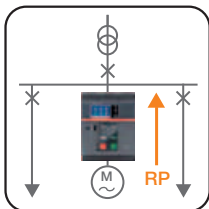
3



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

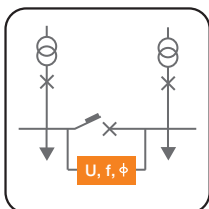


Residual current (Rc – ANSI 64 & 50NDT): with constant temperature ($t=k$) protects against indirect contacts and is integrated into Ekip Touch by a dedicated residual current rating plug and external toroid. The protection is an alternative to the functions G and Gext.



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

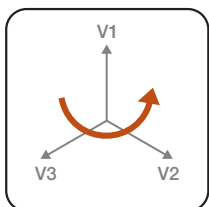
In addition to the protection functions, the following indication and control functions are available to warn the user that a given condition has been reached. The active indications are always shown on the display and are also available by communication on the system bus (with Ekip Com modules) or electrical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



Synchrocheck (SC - ANSI 25): the synchronism control function compares the voltages in the 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 U_{live} 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 $\Delta \Phi$
 5. desirable time for synchronism condition t_{syn}
 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 t_{ref} set time:
 1. voltage of the active half-busbar above threshold U_{live}
 2. voltage of the dead half-busbar below threshold U_{dead}
 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.

Measurements



Measurements and meters

All versions of the Ekip Touch unit measure the RMS value of the currents of the three phases (L1, L2, L3) and of neutral (Ne) with 1% accuracy in the 0.2 to 1.2 In range (class 1 in accordance with IEC 61557-12). The complete range of measurement is from 0.03 to 16x In, where In is the value of the rating plug. The display shows the current of the most loaded phase both in numeric and analogue format on an ammeter with a 0-125% In scale for rapid identification of the load of the circuit-breaker.



Alternatively, bar graphs that show the currents of the three phases and of neutral on a 0-125% In scale in addition to the numeric value of the most loaded phase can be selected as the default page. The bar graphs are yellow in the event of a pre-alarm and red in the event of an overload to enable an irregular condition to be identified immediately.

Where applicable, the measurement of the earth fault current is shown on a dedicated page. The ammeter can operate both in self-supplied mode and with auxiliary voltage. In the latter case, the display always has back lighting and the ammeter is also active at currents below 100A.



Adding the Ekip Measuring or Ekip Measuring Pro module to Ekip Touch enables Ekip Touch to be used as a multimeter to measure the values of:

- Voltage: phase-phase, phase-neutral (accuracy 0.5%);
- Power: active, reactive, apparent (accuracy 2%);
- Energy: active, reactive, apparent (accuracy 2%);
- Frequency (accuracy 0.2%);
- Power factor by phase and total;
- Peak factor.

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.

Protection trip units for power distribution

Ekip Touch

3

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 (date, time and consecutive opening number)

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



Maintenance indicators

A complete set of information about the circuit-breaker and its operation is available for effective fault analysis and preventive scheduling of maintenance. All the information can be seen from the display or from a PC using a communication unit. In particular:

- Date, time, fault current by phase and type of protection tripped over the last 30 trips;
- Date, time and type of operation of the last 200 events (example: opening/closing of circuit-breaker, pre-alarms, editing of settings, ect.);
- Number of operations of the circuit-breaker: divided into mechanical operations (no current), electrical operations (with current) and protection function (trip);
- Contact wear estimated 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 (trip coil, rating plug and each current sensor). 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 -20°C or above +70 °C, at which the trip unit operates correctly with the display switched off
- "Alarm" LED for temperature outside the operating range, at which the trip unit commands the opening of the circuit-breaker (if set during the configuration phase).

User interface



All Ekip Touch operations are simple and intuitive due to the wide graphic colour touchscreen display. For example, all the main information is listed on one page (settable by default), thus enabling the state of the installation to be identified rapidly: maximum current, maximum voltage, 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, 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 and test.

As in the previous generation of trip units, a password system is used to manage "Read" or "Edit" modes. The default password, 00001, can be edited by the user. The protection parameters (curve and trip thresholds) are settable in "Edit" mode whereas it is always possible to consult the information in "Read" mode.



On the front of the trip unit there are also two LEDs: a pre-alarm LED (square yellow LED) and an alarm LED (red triangular LED); a message on the display always accompanies the flashing of the LEDs for clear identification of the type of event. The list of all the alarms active at that moment can be viewed by simply touching the display on the white strip in the bottom left of the alarms zone.

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

Protection trip units for power distribution

Ekip Touch

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

3

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 circuit-breaker testing it is possible to use the test port and the iTest key positioned on the front of the protection trip unit. The available functions are:

- trip test, test of the display and of the LEDs and check of absence of alarms detected by the watchdog function using Ekip TT (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 Signalling and Ekip Com;
- connection to external devices such as Ekip Multimeter and Ekip Control Panel;
- recording the number of operations;
- G protection with values below 100A or below 0.2 In;
- zone selectivity;
- Gext and MCR protection functions.

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

The Ekip Supply module allows the cartridge modules to be used in the terminal box area. Otherwise, the trip unit can be supplied by means of a galvanically isolated 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.

Protection trip units for power distribution

Ekip Hi-Touch

Characteristics

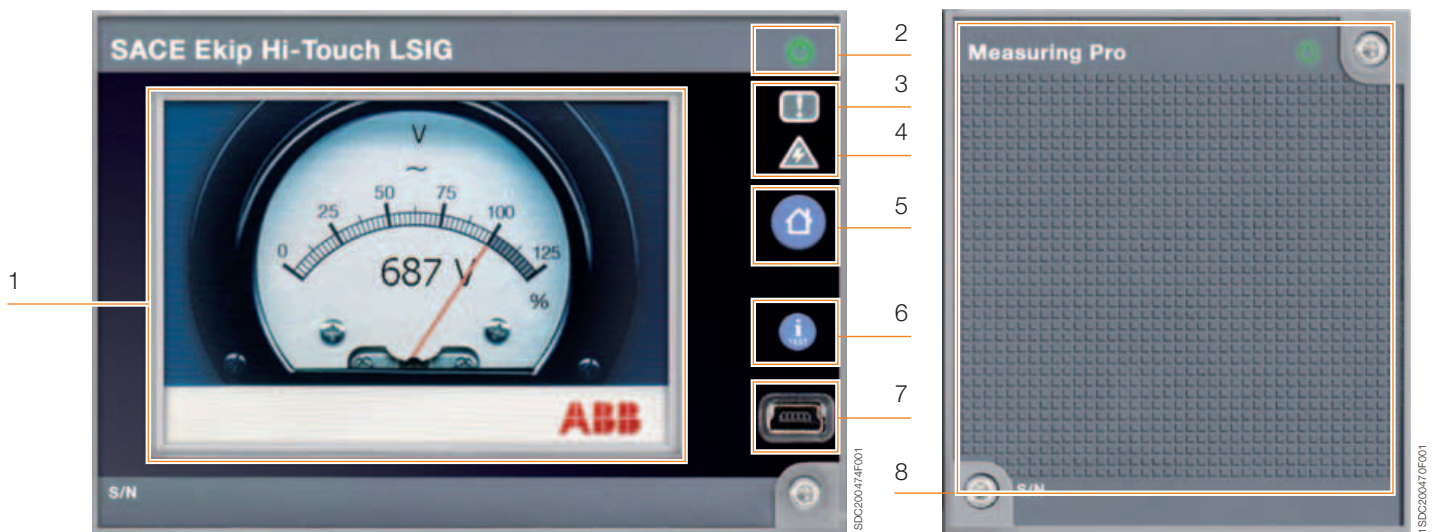
The Ekip Hi-Touch of SACE Emax 2 is a high-performance multifunction unit that is extraordinarily versatile and can be used in even the most complex installations. Ekip Hi-Touch, in fact, features exclusive functions such as: directional protection, restricted earth fault and dual setting of the protections.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

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

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

The unit is available in the versions:

- Ekip Hi-Touch LSI
- Ekip Hi-Touch LSI G



Key:

1. Wide high-resolution colour 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 LED power on

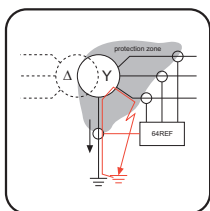
Protection functions

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

- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Closing on short-circuit (MCR);
- Earth fault (G – ANSI 51N & 50NTD);
- Earth fault on toroid (G ext – ANSI 51G & 50GTD)
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Current unbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Voltage unbalance (VU – ANSI 47);
- Residual current (Rc – ANSI 64 & 50NTD);
- Reverse active power (RP – ANSI 32R);
- Synchrocheck (SC – ANSI 25, optional);
- Cyclical direction of the phases (ANSI 47);
- Power factor (ANSI 78);
- Current thresholds;
- Power Controller function (optional).

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.



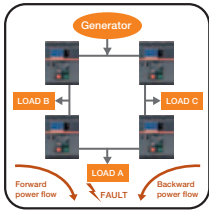
Second protection against earth fault (ANSI 50GTD/51G & 64REF): whereas with Ekip Touch the user has to choose between implementation of the protection G by internal current sensors (calculating the vector sum of the currents) or G ext external toroids (direct measurement of the earth fault current),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

Another possible configuration is with the residual current protection replacing the Gext protection, whilst the G protection remains active. The residual current protection is activated in the presence of the residual current rating-plug and of the toroid.

Protection trip units for power distribution

Ekip Hi-Touch

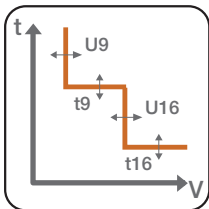
3



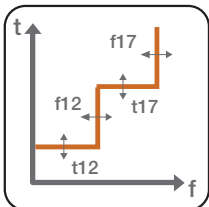
Directional overcurrent (D – ANSI 67): the protection is able to recognize the direction of the current during the fault period and thus detect if the fault is upstream or downstream of the circuit-breaker. The protection, with fixed time trip curve ($t=k$), intervenes with two different time delays (t_{7bw} and t_{7fw}), 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 87L 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 Signalling module;
- Communication network, by means of one of the Ekip Com communication modules;
- Directly from the Ekip Hi-Touch display;
- By a settable internal time, after the circuit-breaker has closed.

Measurements

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

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

Ekip Hi-Touch integrates the exclusive **Network Analyzer** function, which analyzes the quality of energy consumed by the installation, in accordance with the provisions of international standards EN50160 and IEC 61000-4-30, in terms of harmonic content, average value and long or short term changes in voltage. These events 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 signalling event. The quantity of these events is stored in a suitable counter. The counter values are available for each of last 7 days, as well as the total. The measures available are the positive and negative sequence voltages and positive and negative sequence currents of the last interval monitored. The time of the calculation of the average values can be set between 5 minutes and 2 hours.
- **Interruptions / short dips in voltage** (voltage interruptions / voltage dip): if the voltage remains below the threshold for more than 40ms, Ekip Hi-Touch generates an event that is counted in a dedicated log. The voltage is monitored on all lines.
- **Short voltage spikes** (voltage transients, spikes): if the voltage exceeds the threshold for 40ms, 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 unbalances:** if the voltages are not equal or the phase displacements between them are not exactly 120°, an unbalance 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:

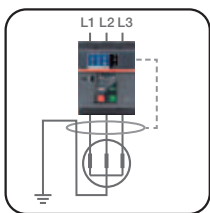
1. Wide, high resolution touchscreen display
2. Power-on LED indicating correct operation
3. Pre-alarm LED
4. Alarm LED
5. Home pushbutton to return to home page
6. Pushbutton for test and for indicating cause of the trip
7. Test and programming connector
8. Ekip Measuring Pro module with relative power-on 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 is tripped, it opens the circuit-breaker and prevents it from closing again until it has been reset manually or electrically by the operator (lockout relay – code ANSI 86).

The trip unit is provided with the following protection functions:

- Overload (L – ANSI 49);
- Time-delayed overcurrent (S – ANSI 51 & 50TD);
- Thermal memory;
- Instantaneous overcurrent (I – ANSI 50);
- Closing on short circuit (MCR);
- Earth fault (G – ANSI 51N & 50NTD);
- Earth fault on toroid (G ext – ANSI 51G & 50GTD)
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Current unbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Voltage unbalance (VU – ANSI 47);
- Differential ground fault (Rc – ANSI 87N);
- Reverse active power (RP – ANSI 32R);
- Synchrocheck (SC – ANSI 25, optional);
- Cyclical direction of phases (ANSI 47);
- Power factor (ANSI 78);
- Current thresholds;
- Power Controller function (optional).



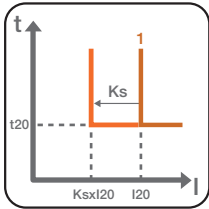
Differential ground fault (Rc - ANSI 87N): protects against internal earth fault on generator winding. It is required that the toroid hugs the active conductors and the ground conductor. Rc protection is integrated by a dedicated residual current rating plug and the external toroid.

Protection trip units for generators

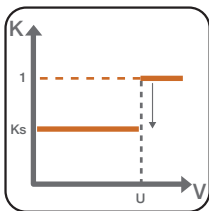
Ekip G Touch

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.

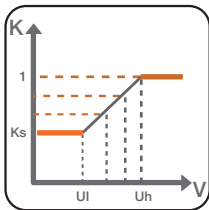
3



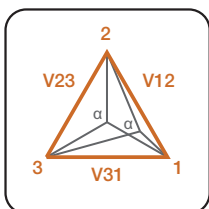
Voltage controlled overcurrent protection (S(V) - ANSI 51V): protection from maximum current with constant trip time ($t = k$) that is sensitive to the voltage value. The set current threshold, following a voltage drop, decreases by steps or linearly.



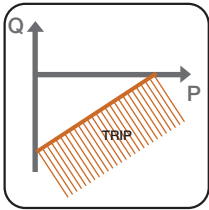
In step mode (controlled mode) the protection is tripped at the set threshold (I_{20}) if the voltage is above U , whereas it is tripped at the lower threshold of the factor K_s ($I_{20} * K_s$) if the voltage is below U .



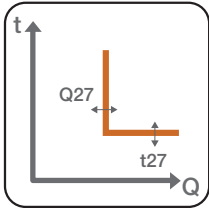
On the other hand, in linear mode (restrained mode) two voltage limits are selected within which the protection is tripped at the set threshold (I_{20}) reduced by the factor K corresponding to the measured voltage. The variation of the factor K is proportional to the voltage, and for voltages greater than the upper threshold (U_h) the threshold I_{20} works, whereas for voltages below the lower threshold (U_l) the minimum threshold ($I_{20} * K_s$) applies.



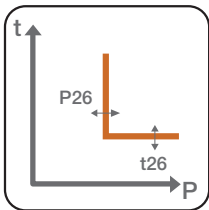
Residual overvoltage (RV - ANSI 59N): with constant trip time ($t = k$), protects against insulation loss in systems with insulated neutral or with neutral earthed with impedance.



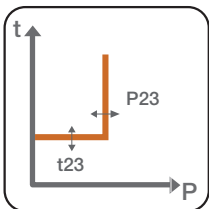
Loss of field or reverse reactive power (RQ – ANSI 40 or 32RQ): with constant trip time ($t = k$), is tripped when the total reactive power absorbed by the generator exceeds the set threshold. It is possible to select the constant threshold ($k=0$) or a function of the delivered active power of the generator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



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.

3

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

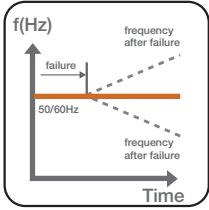
Ekip G Hi-Touch

Protection functions

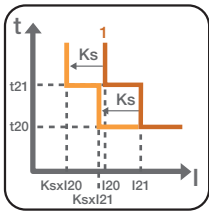
The Ekip G Hi-Touch trip unit is provided with the following protection functions, common to Ekip Hi-Touch:

- 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);
- Earth fault (G – ANSI 51N & 50NTD);
- Second protection against earth fault (ANSI 50GTD/51G & 64REF);
- Earth fault on toroid (Gext – ANSI 51G & 50GTD);
- Neutral protection;
- Start-up function;
- Zone selectivity for functions S and G (ANSI 68);
- Zone selectivity for directional protection D (ANSI 68)
- Start-up function for protection D;
- Current unbalance (IU – ANSI 46);
- Undervoltage (UV – ANSI 27);
- Undervoltage, second threshold (UV2 – ANSI 27);
- Overvoltage (OV – ANSI 59);
- Overvoltage, second threshold (OV2 – ANSI 59);
- Underfrequency (UF – ANSI 81L);
- Underfrequency, second threshold (UF2 – ANSI 81L);
- Overfrequency (OF – ANSI 81H);
- Overfrequency, second threshold (OF2 – ANSI 81H);
- Voltage unbalance (VU – ANSI 47);
- Residual overvoltage (RV – ANSI 59N);
- Differential ground fault (Rc – ANSI 87N);
- Loss of field or reverse reactive power (RQ – ANSI 40 or 32R);
- Reverse active power (RP – ANSI 32R);
- Reactive overpower (OQ – ANSI 32OF);
- Active overpower (OP – ANSI 32OF);
- Active underpower (UP - ANSI 32LF);
- Synchrocheck (SC – ANSI 25, optional);
- Cyclical direction of phases (ANSI 47);
- Power factor (ANSI 78);
- Current thresholds;
- Dual setting of protections;
- Power Controller function (optional).

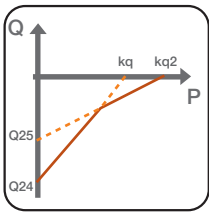
In addition, the following protections are also available:



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

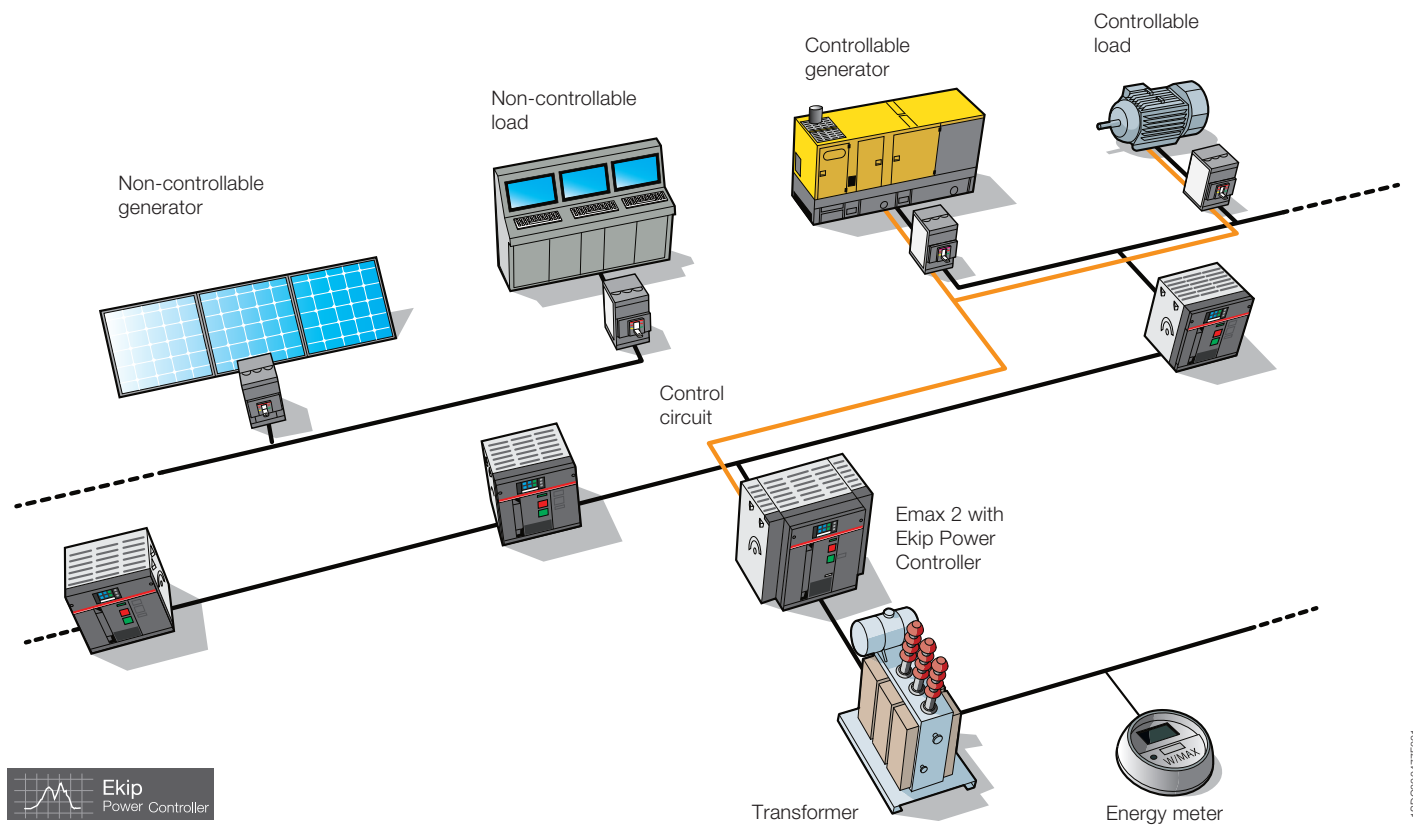
Ekip Power Controller

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.

3

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.



1SDC200477F001

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.

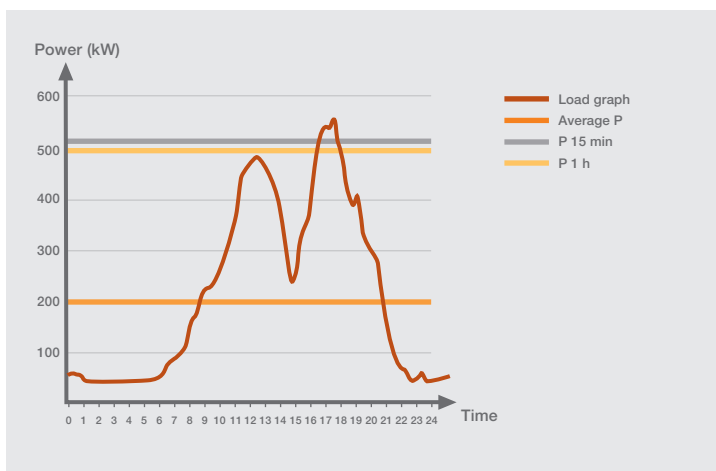
Power limited only when necessary. Ekip Power Controller manages up to four different time bands: it is therefore possible to respect a particular power limit according to whether it is during the day (peak) or night (off peak). In this way, consumption during the day when rates are at their highest 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 programmes for PLC or computer because the logic has already been implemented in the protection unit and is ready to use; it is sufficient to set the installation parameters from a smartphone or directly from the 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 favour of base load power plants with greater efficiency.

Graph of daily load



Perfect integration into intelligent networks. Thanks to 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-essential 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.

Protection trip units for power control

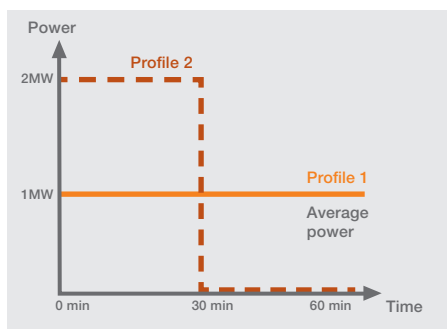
Ekip Power Controller

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 extensive part possible of the installation. 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, for example, 15 minutes, or even 1 hour. The user therefore pays the same bill both in the event 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 respect 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 later 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 affecting 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.

Protection trip units for power control

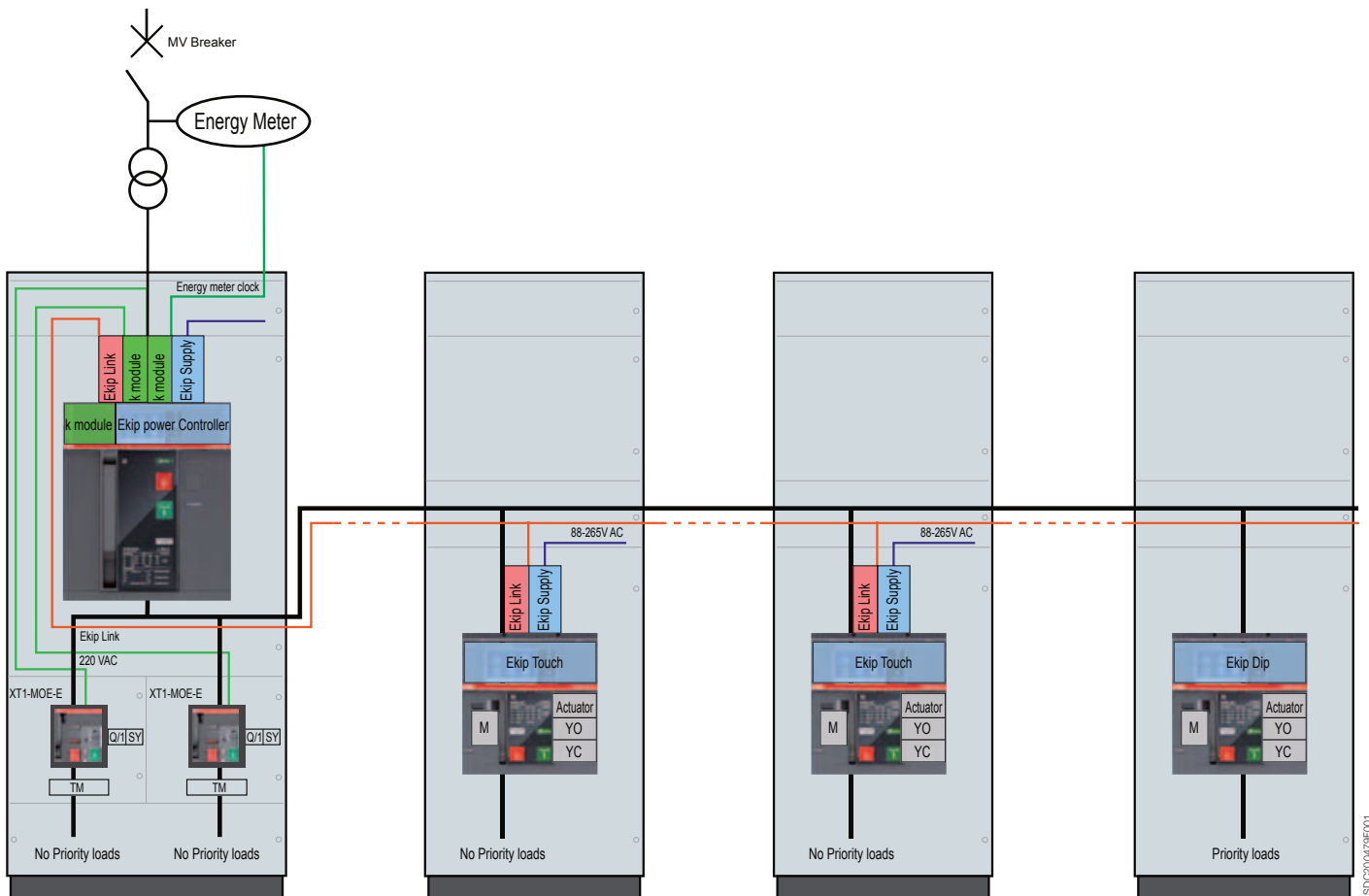
Ekip Power Controller

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 and 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 Signalling 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 thanks to an input that receives feedback on the state of the device.
 - with Ekip Signalling modules by acting on the generator starting circuit or on the control circuit of the loads. This allows, for example, 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 to the use of 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 thanks to 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 canteen 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	- moulded-case and air 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

3

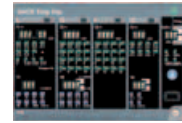
ABB Code	ANSI/IEEE C37.2 Code	Function	Threshold
L	49	Overload protection	I1 = 0.4 - 0.42 - 0.45 - 0.47 - 0.5 - 0.52 - 0.55 - 0.57 - 0.6 - 0.62 - 0.65 - 0.67 - 0.7 - 0.72 - 0.75 - 0.77 - 0.8 - 0.82 - 0.85 - 0.87 - 0.9 - 0.92 - 0.95 - 0.97 - 1 x In
		Thermal memory	
		Tolerance	tripping between 1.05 and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

(1) G protection below 100A or below 0.2 In available with auxiliary supply

(2) The minimum trip time is 1s, regardless of the type of curve set (self-protection)

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

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



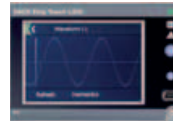
Trip time	Excludibility	Pre Alarm	Trip curve	Ekip Dip
with I = 3 I _n , t ₁ = 3 - 12 - 24 - 36 - 48 - 72 - 108 - 144 s ⁽²⁾	No	50 ... 90 I _n Step 1%	t = k / I ²	●
	Yes			●
± 10% If ≤ 6 x I _n ± 20% If > 6 x I _n				
t ₂ = 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8s	Yes	No	t = k	●
The better of the two data: ± 10% or ± 40 ms				
with I = 10 I _n , t ₂ = 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8s	Yes	No	t = k / I ²	●
	Yes	No		
± 15% If ≤ 6 x I _n ± 20% If > 6 x I _n				
Instantaneous	Yes	No	t = k	●
≤ 30 ms				
t ₄ = 0.1 - 0.2 - 0.4 - 0.8s	Yes	No	t = k	●
The better of the two data: ± 10% or ± 40 ms				
t ₄ = 0.1 - 0.2 - 0.4 - 0.8s	Yes	No	t = k / I ²	●
± 15%				

Technical characteristics for protection trip units

Protection functions

3

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	Time Step
L	49	Overload Protection	$I1 = 0.4 \dots 1 \times I_n$	$0.001 \times I_n$	with $I = 3 I1$, $t1 = 3 \dots 144 \text{ s}$	1s
		Thermal Memory Tolerance	tripping between 1.05 and $1.2 \times I1$		$\pm 10\% I \leq 6 \times I_n$ $\pm 20\% I > 6 \times I_n$	
	49	Overload Protection	$I1 = 0.4 \dots 1 \times I_n$	$0.001 \times I_n$	with $I = 3 I1$, $t1 = 3 \dots 144 \text{ s}$ Standard inverse SI: $k=0.14 \alpha=0.02$ Very Inverse VI: $k=13.5 \alpha=1$ Extremely Inverse EI: $k=80 \alpha=2$ $t=k/14$; $k=80 \alpha=4$	1s
		Thermal Memory Tolerance	tripping between 1.05 and $1.2 \times I1$		$\pm 10\% I \leq 6 \times I_n$ $\pm 20\% I > 6 \times I_n$	
S	50TD	Time-delayed overcurrent protection	$I2 = 0.6 \dots 10 \times I_n$	$0.1 \times I_n$	$t2 = 0.05 \dots 0.8 \text{ s}$	0.01s
	68	Zone selectivity			$t2\text{sel} = 0.04 \dots 0.2 \text{ s}$	0.01s
		Start up Tolerance	Activation: $0.1 \dots 10 \times I_n$	$0.1 \times I_n$	Range: $0.1 \dots 30 \text{ s}$	0.01s
	51	Time-delayed overcurrent protection	$I2 = 0.6 \dots 10 \times I_n$	$0.1 \times I_n$	with $I = 10 I_n$, $t2 = 0.05 \dots 0.8 \text{ s}$	0.01s
Thermal Memory Tolerance		$\pm 7\% I2 \leq 6 \times I_n$ $\pm 10\% I2 > 6 \times I_n$		$\pm 15\% I \leq 6 \times I_n$ $\pm 20\% I > 6 \times I_n$		
S2	50TD	Time-delayed overcurrent protection	$I5 = 0.6 \dots 10 \times I_n$	$0.1 \times I_n$	$t5 = 0.05 \dots 0.8 \text{ s}$	0.01s
		Start up	Activation: $0.1 \dots 10 \times I_n$	$0.1 \times I_n$	Range: $0.1 \dots 30 \text{ s}$	0.01s
		Tolerance	$\pm 7\% I5 \leq 6 \times I_n$ $\pm 10\% I5 > 6 \times I_n$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$	
S(V)	51V	Voltage controlled overcurrent protection	$I20 = 0.6 \dots 10 \times I_n$	$0.1 \times I_n$	$t20 = 0.05 \dots 30 \text{ s}$	0.01s
		Step mode (controlled mode)	$UI = 0.2 \dots 1 \times U_n$ $Ks = 0.1 \dots 1$	$0.01 \times U_n$ 0.01		
		Linear mode (restrained mode)	$UI = 0.2 \dots 1 \times U_n$ $Uh = 0.2 \dots 1 \times U_n$ $Ks = 0.1 \dots 1$	$0.01 \times U_n$ $0.01 \times U_n$ 0.01		
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$	
S2(V)	51V	Voltage controlled overcurrent protection	$I21 = 0.6 \dots 10 \times I_n$	$0.1 \times I_n$	$t21 = 0.05 \dots 30 \text{ s}$	0.01s
		Step mode (controlled mode)	$UI2 = 0.2 \dots 1 \times U_n$ $Ks2 = 0.1 \dots 1$	$0.01 \times U_n$ 0.01		
		Linear mode (restrained mode)	$UI2 = 0.2 \dots 1 \times U_n$ $Uh2 = 0.2 \dots 1 \times U_n$ $Ks2 = 0.1 \dots 1$	$0.01 \times U_n$ $0.01 \times U_n$ 0.01		
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40 \text{ ms}$	
I	50	Instantaneous overcurrent protection	$I3 = 1.5 \dots 15 \times I_n$	$0.1 \times I_n$	Instantaneous	-
		Start up	Activation: $0.1 \dots 10 \times I_n$	$0.1 \times I_n$	Range: $0.1 \dots 30 \text{ s}$	0.01s
		Tolerance	$\pm 10\%$		$\leq 30 \text{ ms}$	
MCR		Closing on short-circuit protection	$I3 = 1.5 \dots 15 \times I_n$	$0.1 \times I_n$	Instantaneous Activation range: $40 \dots 500 \text{ ms}$	0.01s
		Tolerance	$\pm 10\%$		$\leq 30 \text{ ms}$	



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

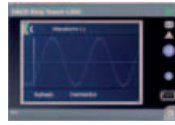
Table continued on next page

Technical characteristics for protection trip units

Protection functions

3

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	Time Step
G	50N TD	Earth fault protection	$I_4^{(1)} = 0.1 \dots 1 \times I_n$	$0.001 \times I_n$	with $I > I_4$, $t_4 = 0.1 \dots 1s$	0.05s
	68	Zone selectivity			$t_{4sel} = 0.04 \dots 0.2s$	0.01s
		Start up	Activation: $0.1 \dots 10 \times I_n$	$0.1 \times I_n$	range: $0.1 \dots 30s$	0.01s
		Tolerance	$\pm 7\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
51N	Earth fault protection	$I_4^{(1)} = 0.1 \dots 1 \times I_n$	$0.001 \times I_n$	with $I = 4 I_n$, $t_4 = 0.1 \dots 1s$	0.01s	
	Tolerance	$\pm 7\%$		$\pm 15\%$		
Gext	50G TD	Earth fault protection	$I_4^{(1)} = 0.1 \dots 1 \times I_n$ Toroid	$0.001 \times I_n$ Toroid	$t_4 = 0.1 \dots 1s$	0.05s
		Start up	Activation: $0.1 \dots 10 \times I_n$	$0.1 \times I_n$	range: $0.1 \dots 30s$	0.01s
		Tolerance	$\pm 7\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
	51G	Earth fault protection	$I_4^{(1)} = 0.1 \dots 1 \times I_n$	$0.001 \times I_n$	with $I = 4 I_n$, $t_4 = 0.1 \dots 1s$	0.01s
		Tolerance	$\pm 7\%$		$\pm 15\%$	
D	67	Directional overcurrent protection	$I_7 = 0.6 \dots 10 \times I_n$	$0.1 \times I_n$	$t_7 = 0.2 \dots 0.8s$	0.01s
	68	Zone selectivity			$t_{7sel} = 0.13 \dots 0.5s$	0.01s
		Start up	Activation: $0.1 \dots 10 \times I_n$	$0.1 \times I_n$	range: $0.1 \dots 30s$	0.01s
	Tolerance	$\pm 7\%$ $I_7 \leq 6 \times I_n$ $\pm 10\%$ $I_7 > 6 \times I_n$		The better of the two data: $\pm 10\%$ or $\pm 40ms$		
IU	46	Current unbalance protection	$I_6 = 2 \dots 90\% I_n$ unbalance	$1\% I_n$	$t_6 = 0.5 \dots 60s$	0.5s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
Rc	64 50N TD	Residual current protection Differential ground fault protection	$I_{\Delta n} = 3 - 5 - 7 - 10 - 20 - 30A$		$t_{\Delta n} = 0.06 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.8s$	
	87N		Tolerance	$-20\% \div 0\%$		0.06s
UV	27	Undervoltage Protection	$U_8 = 0.5 \dots 0.98 \times U_n$	$0.001 \times U_n$	$t_8 = 0.05 \dots 60s$	0.05s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
UV2	27	Undervoltage Protection	$U_{15} = 0.5 \dots 0.98 \times U_n$	$0.001 \times U_n$	$t_{15} = 0.05 \dots 60s$	0.05s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
OV	59	Overvoltage protection	$U_9 = 1.02 \dots 1.5 \times U_n$	$0.001 \times U_n$	$t_9 = 0.05 \dots 60s$	0.05s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
OV2	59	Overvoltage protection	$U_{16} = 1.02 \dots 1.5 \times U_n$	$0.001 \times U_n$	$t_{16} = 0.05 \dots 60s$	0.05s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
RV	59N	Residual overvoltage protection	$U_{22} = 0.1 \dots 0.5 \times U_n$	$0.001 \times U_n$	$t_{22} = 0.5 \dots 60s$	0.05s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
VU	47	Voltage unbalance protection	$U_{14} = 2 \dots 90\% U_n$ unbalance	$1\% U_n$	$t_{14} = 0.5 \dots 60s$	0.5s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
UF	81L	Underfrequency protection	$f_{12} = 0.9 \dots 0.99 \times f_n$	$0.01 \times f_n$	$t_{12} = 0.2 \dots 60s$	0.1s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
UF2	81L	Underfrequency protection	$f_{17} = 0.9 \dots 0.99 \times f_n$	$0.01 \times f_n$	$t_{17} = 0.2 \dots 60s$	0.1s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
OF	81H	Overfrequency protection	$f_{13} = 1.01 \dots 1.1 \times f_n$	$0.01 \times f_n$	$t_{13} = 0.5 \dots 60s$	0.1s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	



Excludibility	Excludibility trip	Pre-alarm	Trip curve	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
yes	yes	90% I4	t = k	●	●	●	●
yes				●	●	●	●
yes				●	●	●	●
yes	yes	90% I4	t = k / I ²	●	●	●	●
yes	yes	90% I4	t = k	●	●	●	●
yes				●	●	●	●
yes	yes	90% I4	t = k / I ²	●	●	●	●
yes	yes	no	t = k		●		●
yes					●		●
yes					●		●
yes	yes	no	t = k	●	●	●	●
Attivabile with rating plug Rc	no	no	t = k	●	●	●	●
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k		●		●
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k		●		●
yes	yes	no	t = k			●	●
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k	○	●	●	●
yes	yes	no	t = k		●		●
yes	yes	no	t = k	○	●	●	●

Table continued on next page

Technical characteristics for protection trip units

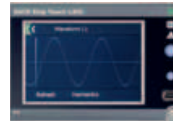
Protection functions

3

ABB Code	ANSI Code	Function	Threshold	Threshold step	Tripping time	Time Step
OF2	81H	Overfrequency protection	$f_{18} = 1.01 \dots 1.1 \times f_n$	$0.01 \times f_n$	$t_{18} = 0.5 \dots 60s$	0.1s
		Tolerance	$\pm 5\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
ROCOF	81R	Rate of change of frequency protection	$f_{28} = 0.4 \dots 10 \text{ Hz/s}$	0.2 Hz/s	with $f > f_{28}$ $t_{28} = 0.4 \dots 10s$ with $f_{28} = 0.4 \dots 1.0 \text{ Hz/s}$ $t_{28} = 0.25 \dots 10s$ with $f_{28} = 1.2 \dots 5.0 \text{ Hz/s}$ $t_{28} = 0.15 \dots 10s$ with $f_{28} > 5.2 \text{ Hz/s}$	0.1s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
RP	32R	Reverse active power protection	$P_{11} = -1 \dots -0.08 S_n$	$0.001 S_n$	$t_{11} = 0.5 \dots 100s$	0.1s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
RQ	40/32R	Loss of field or reverse reactive power protection	$Q_{24} = -1 \dots -0.1 S_n$	$0.001 S_n$	$t_{24} = 0.5 \dots 100s$	0.1s
			$K_{q1} = -2 \dots 2$	0.01		
		Loss of field or reverse reactive power protection	$Q_{25} = -1 \dots -0.1 S_n$	$0.001 S_n$	$t_{24} = 0.5 \dots 100s$	0.1s
		$K_{q2} = -2 \dots 2$	0.01			
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
OP	320F	Active overpower protection	$P_{26} = 0.4 \dots 2 S_n$	$0.001 S_n$	$t_{26} = 0.5 \dots 100s$	0.5s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
OQ	320F	Reactive overpower protection	$Q_{27} = 0.4 \dots 2 S_n$	$0.001 S_n$	$t_{27} = 0.5 \dots 100s$	0.5s
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
UP	32LF	Active underpower protection	$P_{23} = 0.1 \dots 1 \times I_n$	$0.001 \times S_n$	$t_{23} = 0.5 \dots 100s$	0.5s
		Temporary deactivation			range from closing: $0.1 \dots 30s$ o with digital input	
		Tolerance	$\pm 10\%$		The better of the two data: $\pm 10\%$ or $\pm 40ms$	
Synchrocheck SC	25	Synchrocheck (Live busbars)	$U_{live} = 0.5 \dots 1.1 U_n$ $\Delta U = 0.02 \dots 0.12 U_n$ $\Delta f = 0.1 \dots 1 \text{ Hz}$ $\Delta \Phi = 5 \dots 50^\circ \text{ elt}$ $t_{syn} = 0.1 \dots 3s$	$0.01 U_n$ $0.01 U_n$ 0.1 Hz 5° elt $0.1s$	$t_{ref} = 0.1 \dots 30s$	0.1s
		Tolerance	$\pm 10\%$			
		Synchrocheck (Live, Dead busbars)	$U_{live} = 0.5 \dots 1.1 U_n$ $U_{dead} = 0.02 \dots 0.2 U_n$	$0.01 U_n$ $0.01 U_n$	$t_{ref} = 0.1 \dots 30s$	
			Tolerance	$\pm 10\%$		
	47	Cyclical direction of the phases	1-2-3 or 3-2-1			
78	3phase Power factor	$PF_3 = 0.2 \dots 0.95$	0.01			
	Current threshold	$LC_1 = 50\% \dots 100\% I_1$ $LC_2 = 50\% \dots 100\% I_1$ $I_w = 0.3 \dots 10 I_n$	1% 1% $0.01 \times I_n$			
		Tolerance	$\pm 10\%$			

1) G protection below 100A or $0.2 \times I_n$ available with auxiliary supply.
The tolerances above apply to trip units already powered by the main circuit with current flowing in at least two-phases or an auxiliary power supply.
In all other cases the following tolerance values apply:

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



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

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

Technical characteristics for protection trip units

Measurement functions

3

Instantaneous measurements		Displayed with Ekip Multimeter	Parameters
Currents (RMS)	[A]	•	I1, I2, I3, neutral
Earth fault current (RMS)	[A]	•	Ig
Record of values: of the parameter for each interval with time-stamping			Parameters
Current: minimum and maximum	[A]	•	I1, I2, I3, neutral
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 connections		•	Alarm due to disconnection: rating plug, sensors, trip coil
Failure of circuit-breaker to open (ANSI 50BF)		•	Alarm following non-tripping of protection functions
Temperature (OT)		•	Pre-alarm and alarm for abnormal temperature

⁽¹⁾ with auxiliary supply present



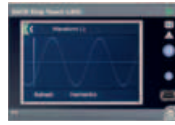
Precision	Standard di riferimento	Ekip Dip
1%	Class 1 IEC 61557-12	●
2%		●
Window	Intervals	
Fixed, synchronizable by remote	Duration: 5...120min Number of intervals: 24	●
		●
		●
		●
		●
		●
		●
		●
		●
		●
		●
		●
Note: Opening of circuit-breaker can be set in the event of alarm		●
		●
		●

Technical characteristics for protection trip units

Measurement functions

3

Instantaneous measurements		Parameters
Currents (RMS)	[A]	I1, I2, I3, neutral
Earth fault current (RMS)	[A]	I _g
Phase-phase voltage (RMS)	[V]	V12, V23, V31
Phase-neutral voltage (RMS)	[V]	V1n, V2n, V3n
Phase sequence		
Frequency	[Hz]	f
Active power	[kW]	P1, P2, P3, P _{tot}
Reactive power	[kVAR]	Q1, Q2, Q3, Q _{tot}
Apparent power	[kVA]	S1, S2, S3, S _{tot}
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 absorbed, Ep consumed
Reactive energy	[kVARh]	Eq total, Ep absorbed, Ep consumed
Apparent energy	[KVAh]	Es total
Network Analyzer		Parameters
Hourly average voltage value	[V] [no]	- U _{min} = 0.75...0.95 x U _n - U _{max} = 1.05...1.25 x U _n - 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]	- U _{min} = 0.75...0.95 x U _n - 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]	- U _{max} = 1.05...1.25 x U _n - 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]	- U _{min1} = 0.75...0.95 x U _n - U _{min2} = 0.75...0.95 x U _n - U _{min3} = 0.75...0.95 x U _n - U _{max1} = 1.05...1.25 x U _n - U _{max2} = 1.05...1.25 x U _n - Events counter (nr. of events day by day in the last year plus the total events in the breaker's lifetime)
Voltage unbalance	[V] [no]	- U neg. seq.= 0.02...0.10 x U _n - 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



	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
Precision				
1%	●	●	●	●
2%	●	●	●	●
0.5%	○	●	●	●
0.5%	○	●	●	●
	○	●	●	●
0.2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
2%	○	●	●	●
	○	●	●	●
Precision				
2%				
2%				
2%				
Intervals				
t = 5...120min	-	●	-	●
t <40ms	-	●	-	●
t <40ms	-	●	-	●
t = 0.04ms...60s	-	●	-	●
t = 5...120min	-	●	-	●
	-	●	-	●

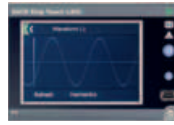
Technical characteristics for protection trip units

Measurement functions

3

Record of values: of the parameter for each interval with time-stamping		Parameters
Current: minimum and maximum	[A]	I1, I2, I3, neutral
Phase-phase voltage: minimum and maximum	[V]	V12, V23, V31
Active power: average and maximum	[kW]	Ptot
Reactive power: average and maximum	[kVAR]	Qtot
Apparent power: average and maximum	[KVA]	Stot
Data logger: record of high sampling rate parameters		Parameters
Currents	[A]	I1, I2, I3, neutral, 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 connections		Alarm due to disconnection: rating plug, sensors, trip coil
Failure of circuit-breaker to open (ANSI 50BF)		Alarm following non-tripping of protection functions
Temperature (OT)		Prealarm and alarm for abnormal temperature

(1) with auxiliary supply present



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

Key:
 - not available
 ● available
 ○ available with Ekip Measuring Pro

Communication devices and systems

Introduction 4/2

Supervision and control

Supervision of the switchgear compartment	4/4
Supervision of the electrical switchgear	4/6
Supervision of the electrical installation	4/8

Software

Ekip Connect	4/10
Ekip View	4/12
Ekip T&P Interface	4/14

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 rapid spread of systems for the supervision and control of low voltage electrical distribution plants is determined 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.

4

Typical sector	Industrial	Hospital	OEMs	Naval
				
Level of supervision and control in low voltage systems	Switchgear compartment			
Solution with SACE Emax 2	<ul style="list-style-type: none"> - Ekip Touch trip units with high resolution display 	<ul style="list-style-type: none"> - Ekip trip units - Ekip Multimeter display on the front of switchgear 		
Benefit of the ABB solution	<ul style="list-style-type: none"> - simple and intuitive use - does not require an auxiliary power supply for safety 	<ul style="list-style-type: none"> - 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 the 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

- Ekip trip units
- Ekip link modules
- Ekip Control Panel operator panel colour touch screen
- Standardized EtherNet components

- centralized control from front of switchgear
- access via web to the installation
- rapid installation
- ease of use
- system ready to use

Electrical installation

- Ekip Touch trip units
- Ekip com communication modules
- Ekip View supervision software

- 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, therefore, the ideal solution for supervision and control of the compartments in switchgear. In particular:

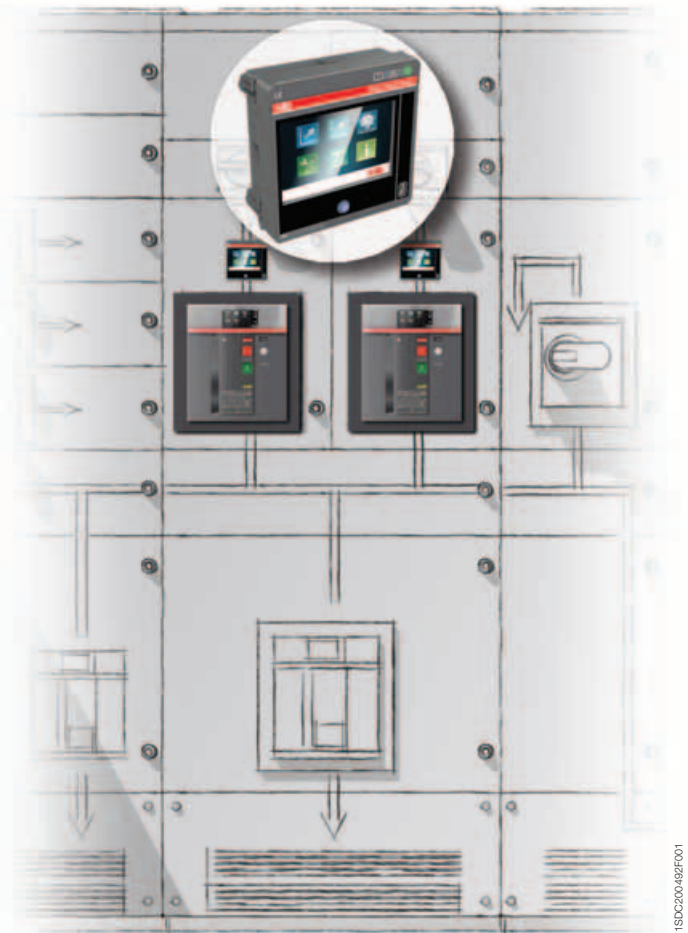
- their use is simple and intuitive thanks to a large, high resolution, colour touch screen;
- they do not require an auxiliary power supply for safety; the Ekip Touch trip units are directly supplied by the current sensors integrated in the circuit-breaker, thereby avoiding the use of external power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

4

Ekip Touch



Ekip Multimeter



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

Solution with Ekip Multimeter Display on switchgear front

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

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 distance from the trip unit, enabling access to information from the most convenient point.
- Simultaneous reading of the various electrical values; the advanced connection system used allows several Ekip Multimeter devices to be connected to the same protection trip unit.

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

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

1) Circuit-breakers equipped with auxiliary contacts to indicate position

Communication devices and systems

Supervision of the electrical switchgear

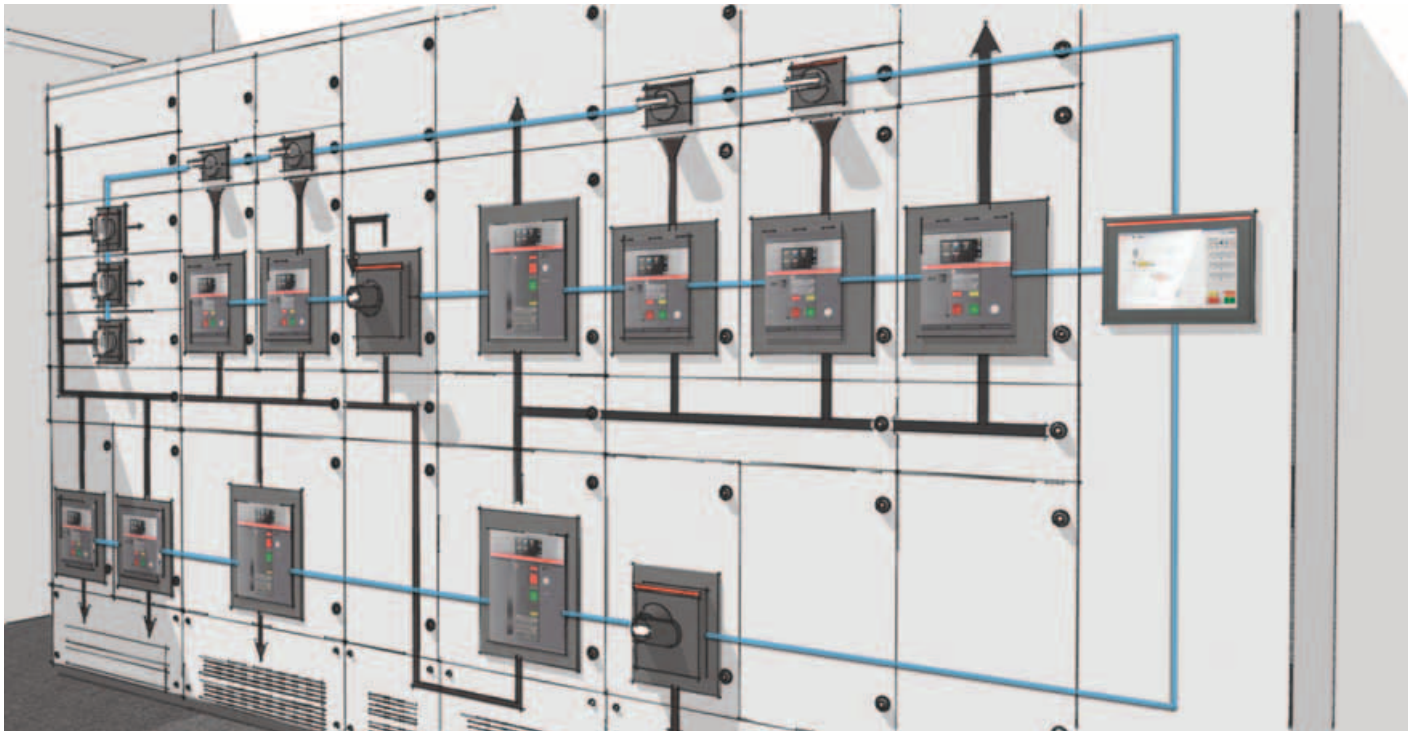
Ekip Link is a flexible and efficient solution for controlling and supervising low voltage electrical switchgear; it is a system that enables SACE Emax 2 circuit-breakers to be connected to the Ekip Control Panel operator panel by means of Ekip Link interface modules.

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 displayed, and all circuit-breakers connected directly to the front of the switchgear can be inspected.
- **adaptation to real requirements**; when the electrical values to be monitored are limited to currents only, the Ekip Dip trip unit can be connected to the Ekip Link without having to use circuit-breakers equipped with communication modules.
- **access via the Internet** 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**; thanks to the Ekip Control Panel operator panel in front of the switchgear with colour touch screen, the system mimic panel can be displayed so that the entire installation can be controlled rapidly and intuitively.
- **ready to use**; Ekip Control Panel is supplied with pre-configured software that requires no programming. It is only necessary to start scanning the Ekip Link system from the operator panel and in a few seconds communication with the connected devices is active.

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



1SDC200023D0201

	Supervision of switchgear compartment			
Electronic trip unit	Ekip Dip	Ekip Touch	Ekip Touch + Ekip measuring module Ekip G Touch	Ekip Hi Touch Ekip Hi-G Touch
Solution	Ekip protection trip units equipped with Ekip link module + Ekip Control Panel operator panel + standard EtherNet components			
Type of trip units connectable	Ekip protection trip units			
Number of trip units connectable to the Ekip link system	up to 30 ¹⁾			
Data exchange rate of Ekip link system	100 Mbit/sec			
Supervision and control functions				
Opening and Closing of circuit-breakers ²⁾	•			
Electrical value trends			I,V,P	I,V,P
Log of electrical value trends			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⁾			
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			
Transmission of alarms via e-mail	optional			
Maintenance				
Number of operations	•			
Number of trips	•			
Wear of contacts	•			
Other data				
Status of circuit-breaker	•			
Circuit-breaker position ⁴⁾	•			
Local/remote mode	•			

1) Ekip Control Panel is available in two versions that can manage a maximum of 10 or 30 circuit-breakers. The number of circuit-breakers may vary depending on their type.

For details, ask ABB SACE

2) Circuit-breakers equipped with actuation module, electric accessories, opening and closing releases and spring charging motor

3) Two client web accesses included in the licence

4) Circuit-breakers equipped with auxiliary contacts to indicate position

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 centres and intelligent electricity networks, better known as smart grids.

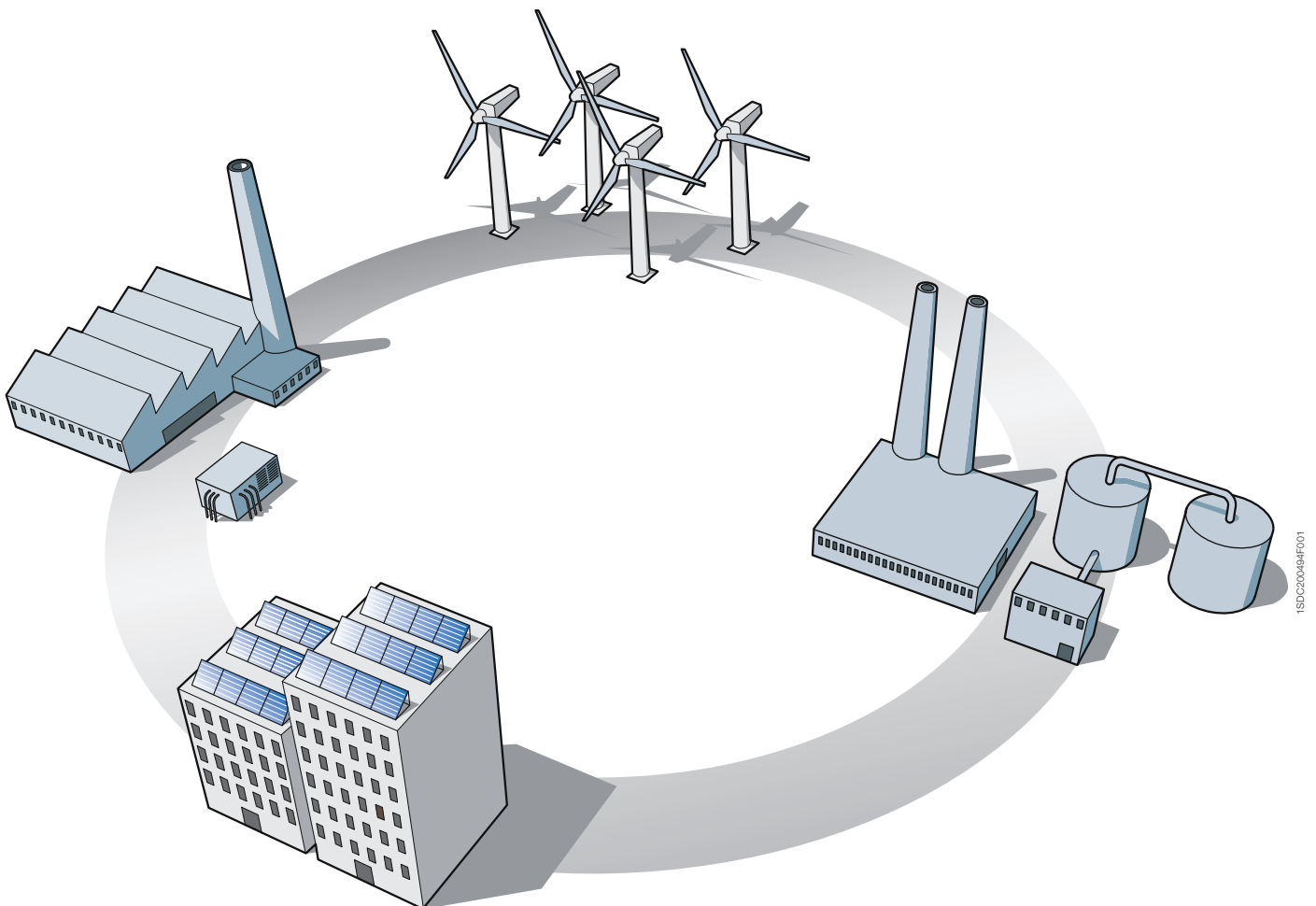
Ekip Com Modules

Thanks to the wide range of communication protocols supported, SACE Emax 2 circuit-breakers equipped with Ekip Touch electronic trip units can be integrated into communication networks without the need for external interface devices.

4

The distinctive characteristics of the SACE Emax 2 circuit-breakers offering for industrial communication are:

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



1SDC200023D0201

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

1) Circuit-breakers equipped with Ekip Com Actuator module, electrical accessories, opening and closing releases and spring charging motor

2) Circuit-breakers equipped with auxiliary contacts to indicate position

Communication devices and systems

Supervision and control software

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

Overview of the software

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

Software	Functions	Distinctive characteristics
Ekip Connect	<ul style="list-style-type: none"> - commissioning of circuit-breakers - analysis of faults - testing of communication bus 	<ul style="list-style-type: none"> - simple and intuitive use - integrated with DOC electrical design software - useable via EtherNet - automatic updating from Internet - off-line mode - multi-media (smart phone, tablet or PC)
Ekip View	<ul style="list-style-type: none"> - supervision and control of communication networks - analysis of electrical value trends - condition monitoring 	<ul style="list-style-type: none"> - engineering free - analysis of past trends - customizable reports - access via Internet to the installation - possibility of integrating third party devices
Ekip T&P interface	<ul style="list-style-type: none"> - testing of protection functions - ordinary maintenance of trip units 	<ul style="list-style-type: none"> - 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 commissioning of the system;** all system parameters and the protection thresholds can be set rapidly in the Ekip trip units thanks 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 the tripping of the trip units, 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;** the adjustments and settings calculated by the DOC software can be downloaded directly into the protection trip units, thereby reducing commissioning times and the probability of errors.
- **Ease of connection:** the 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 site;** if connected to an Internet site, 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	•	-	-	-	-
Opening and closing of circuit-breakers ¹⁾	•	•	•	•	•
Setting of thresholds	•	•	•	•	•
Resetting of alarms	•	•	•	•	•
Reading of electrical measurements	•	•	•	•	•
Displaying of time-current curve	•	•	•	•	•
Reading of past records	•	•	•	•	•
DataLogger download	•	•	•	-	-
Other functions					
Generating of Reports	•	•	•	•	•
Automatic updating from Internet	•	•	•	•	•
Integration with DOC	•	•	•	•	•
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 the Modbus RTU or Modbus TCP protocol.

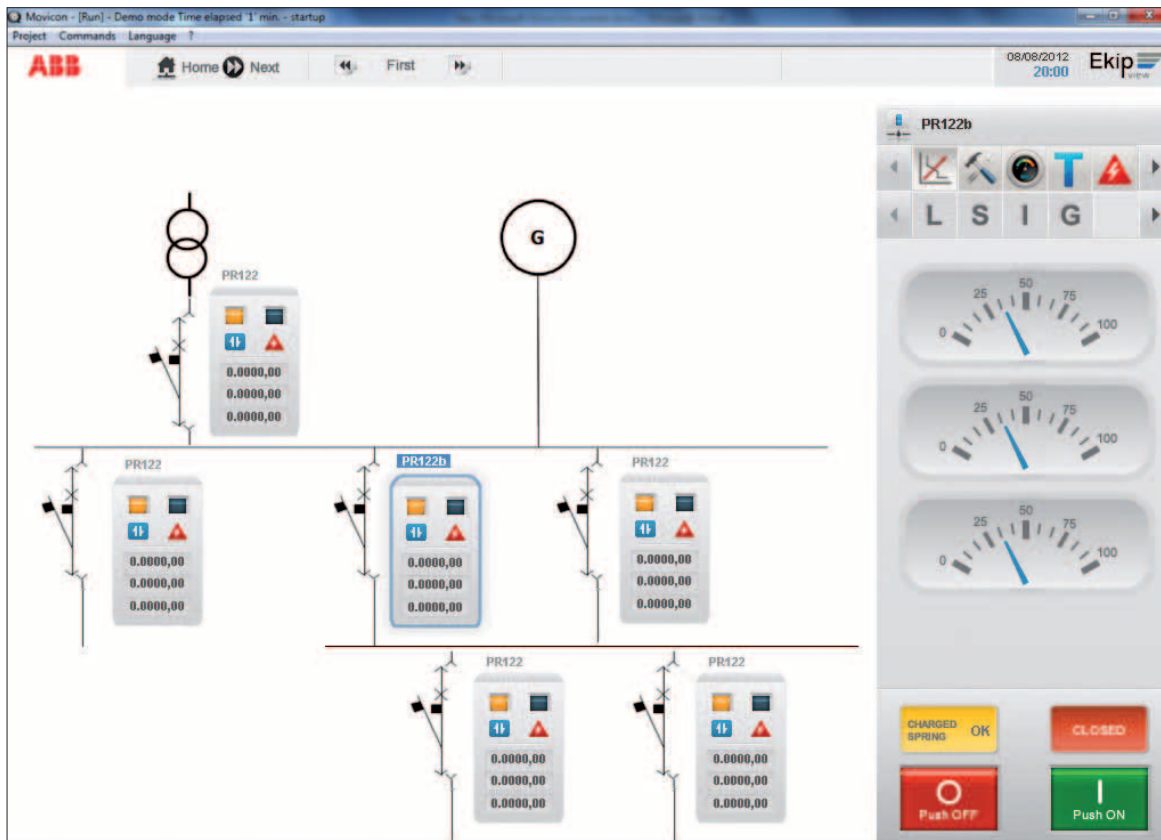
It is the ideal tool for all applications that require:

- remote control of the system,
- monitoring of power consumption,
- fault detection of the system,
- allocation of energy consumption to the different processes and departments,
- preventative planning of maintenance.

4

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, thanks 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⁾	
Licences available	<ul style="list-style-type: none"> - up to 30 ²⁾ controllable devices - up to 60 ²⁾ controllable devices - unlimited number ³⁾ controllable devices 	
Supervision and control functions		
Opening and Closing of circuit-breakers ⁴⁾	•	
Electrical value trends	•	
Log of electrical value trends	•	
Dynamic installation mimic panel	•	
Automatic scanning	•	
Centralized synchronizing of time	•	
Web server function	• ⁵⁾	
Redundancy	optional	
OPC server-client	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	•	
Generation of Reports	•	
Transmission of alarms via SMS	optional	
Transmission of alarms via e-mail	optional	
Maintenance		
Number of operations	•	
Number of trips	•	
Wear of contacts	•	
Other data		
Status of circuit-breaker	•	
Circuit-breaker position ⁷⁾	•	
local/remote mode	•	

1) Contact ABB SACE to integrate other devices in the Ekip View software

2) can be increased

3) within the physical limit of the protocol used

4) circuit-breakers equipped with Ekip com Actuator module and electrical accessories

5) two client web accesses included in the licence, optional up to 5 accesses

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

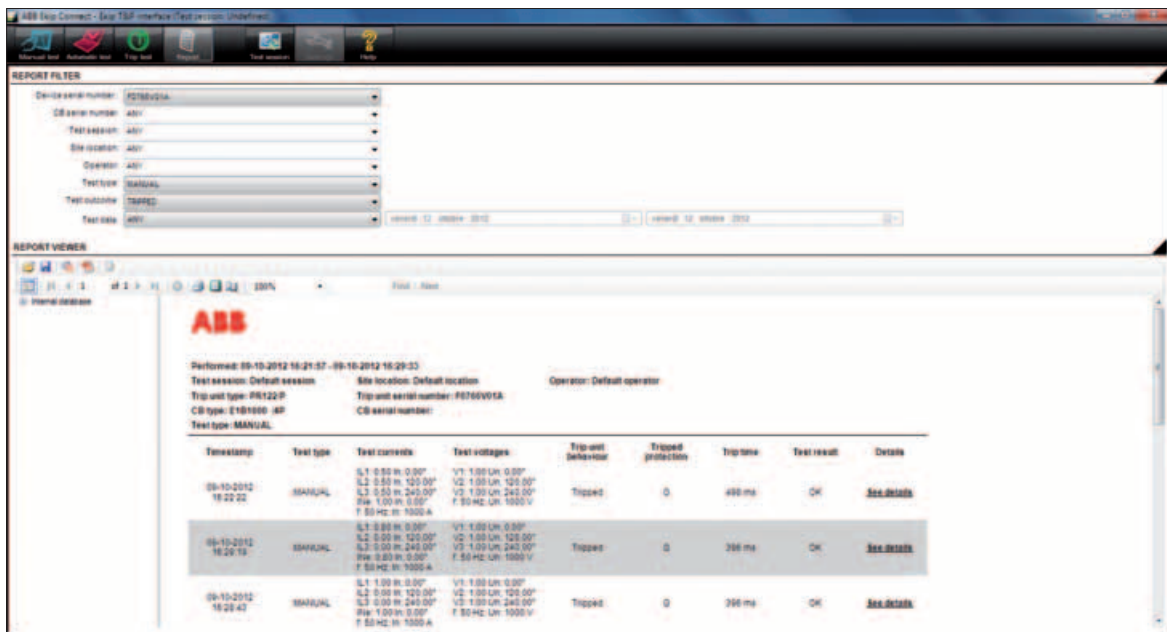
Ekip T&P Interface

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.

Thanks to 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.



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.



Accessories

Functional areas 5/2

Standard supply 5/4

Accessories for circuit-breakers 5/6

Signalling	5/7
Control	5/10
Safety	5/15
Protection devices	5/16
Connections	5/18
Interlocks and switching devices	5/20

Accessories for Ekip trip units 5/23

Power supply	5/25
Connectivity	5/25
Signalling	5/27
Measurements and protection	5/28
Displaying and supervision	5/32
Testing and programming	5/33

Spare parts 5/34

Accessories

Functional areas

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

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

- **Accessories area** for the installation of accessories inside the circuit-breaker and Ekip trip unit. The areas dedicated to accessories can be accessed by removing the flange and the accessories covers. On removal, the operating mechanism area remains segregated and protected, providing safety for operators.
- **Safety area**, which delimits the housing of the stored energy operating mechanism of the circuit-breaker. To carry out maintenance on the operating mechanism, the covers of the accessories and safety area must be removed.

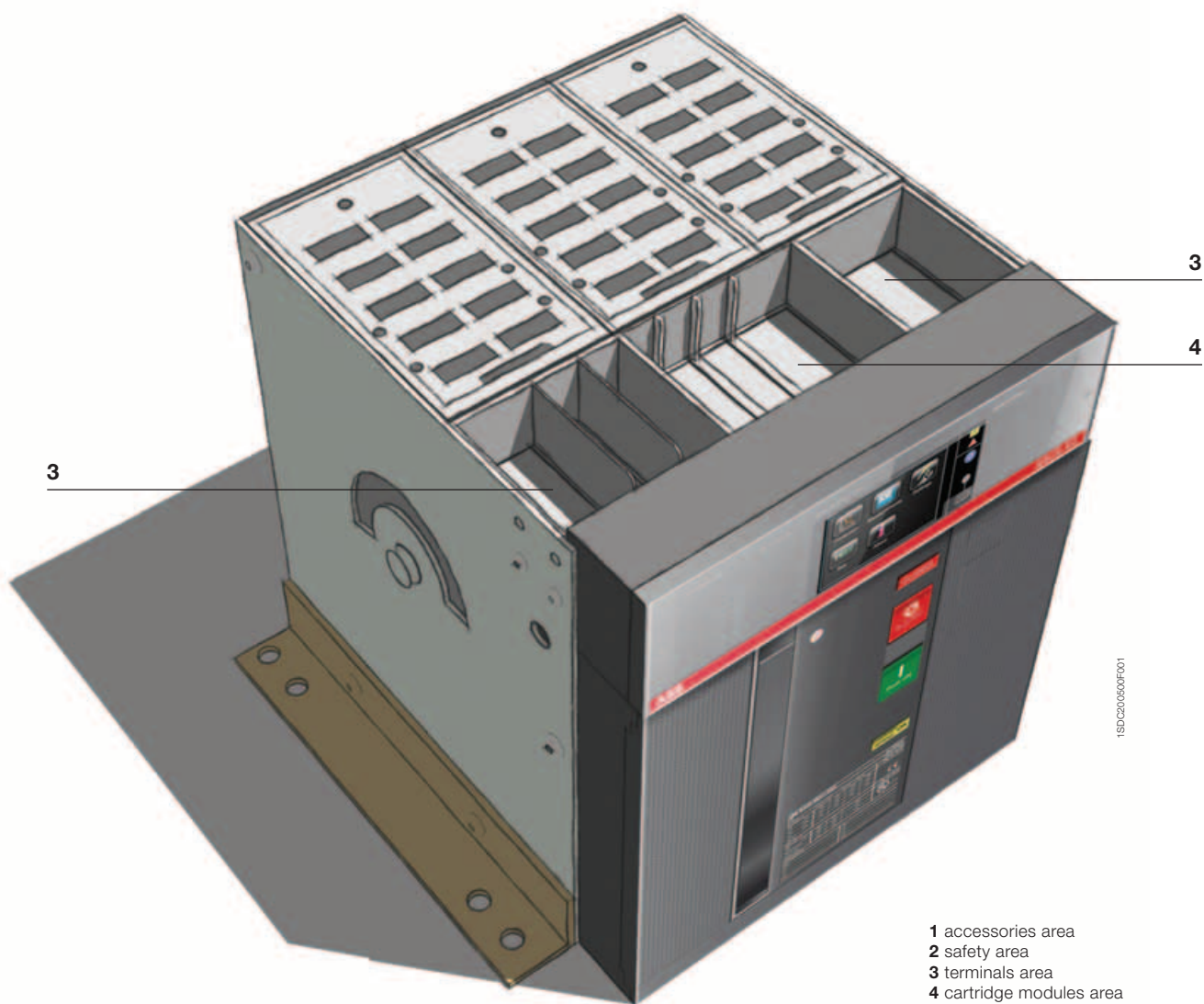
5



As a result of 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:

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



Accessories

Standard supply

The fixed versions of SACE Emax 2 automatic circuit-breakers and switch-disconnectors are always supplied as standard with the following accessories:

- IP30 protection for switchgear door
- lifting plates for E2.2 ... E6.2 circuit-breaker
- front terminals for E1.2 circuit-breaker
- adjustable rear terminals for E2.2 ... E6.2 circuit-breaker, mounted in HR – HR configuration
- screws for securing in the switchgear

In addition, for fixed automatic circuit-breakers only:

- four standard open/closed auxiliary contacts - AUX 4Q
- four terminals for auxiliary connections
- mechanical signalling of the tripping of the protection trip unit - TU Reset
- Ekip TT power supply and test unit, when a protection trip unit is present with display
- contact signalling tripping of Ekip protection trip unit S51.

5



The withdrawable versions of automatic circuit-breakers and switch-disconnectors are always supplied as standard with the following accessories:

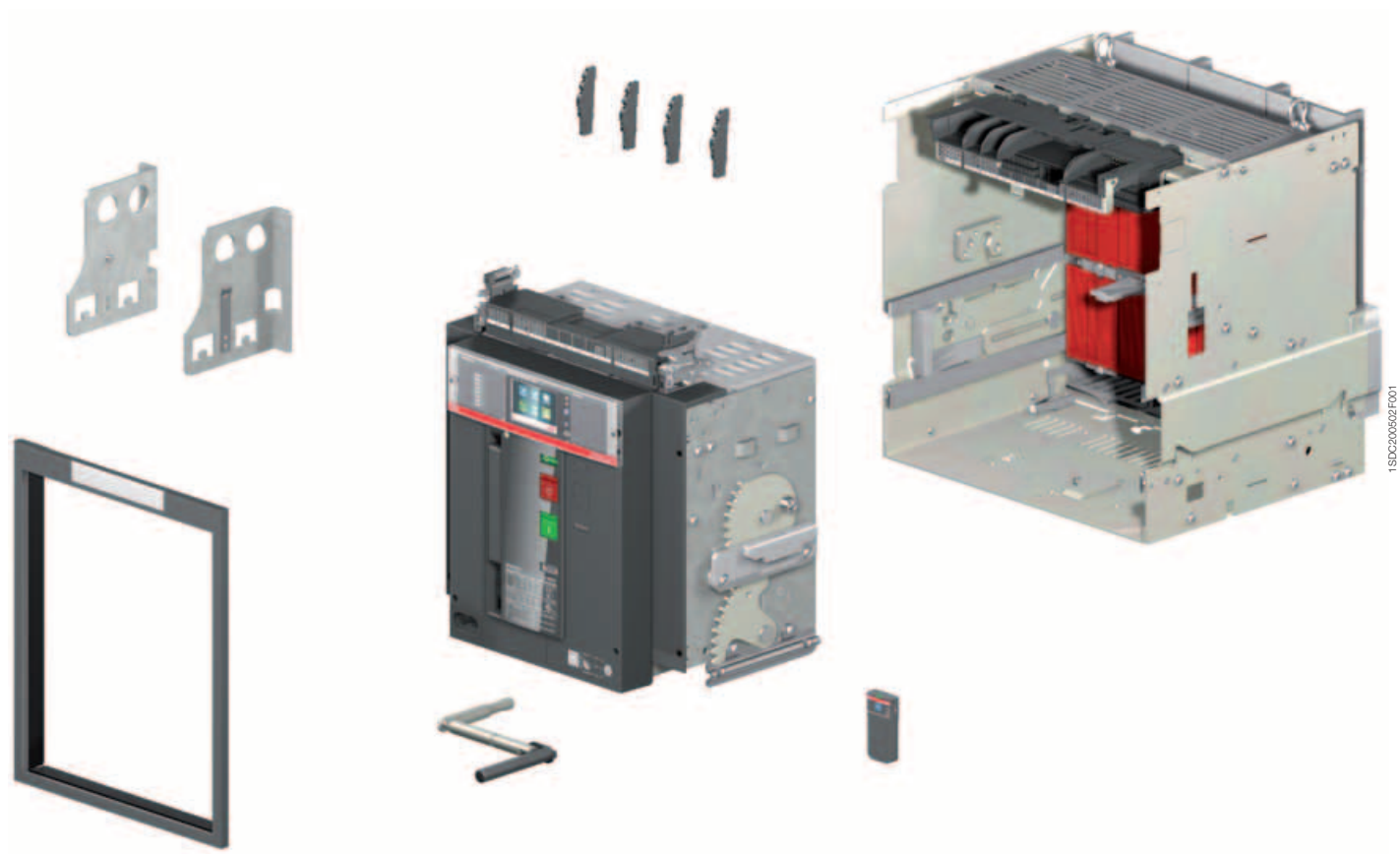
- closed circuit-breaker racked-out mechanism lock
- lifting plates for E2.2 ... E2.6 circuit-breakers
- lever for racking in and racking out
- anti-insertion lock

In addition, for withdrawable automatic circuit-breakers only:

- four standard open/closed auxiliary contacts - AUX 4Q
- four terminals for auxiliary connections
- mechanical signalling of the tripping of the protection trip unit - TU Reset
- Ekip TT power supply and test unit, when a protection trip unit is present with display.

The fixed parts feature:

- IP30 protection for switchgear door
- anti-insertion lock
- standard shutter lock – SL
- screws for securing to the floor
- adjustable rear terminals, mounted in HR – HR configuration



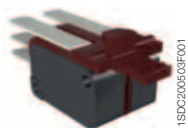
Accessories

Accessories for circuit-breakers

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

	Automatic circuit-breaker		Switch-disconnector		Derived versions		
	E1.2	E2.2 - E4.2 - E6.2	E1.2	E2.2 - E4.2 - E6.2	CS E2.2 - E4.2 - E6.2	MT	MTP
Signalling							
Standard open/closed auxiliary contacts - AUX 4Q	● / ●●	● / ●●	○ / ○○	○ / ○○	-	-	-
Open/closed auxiliary contacts - AUX 6Q	-	○ / ○○	-	○ / ○○	-	-	-
Open/closed auxiliary contacts- AUX 15Q	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Auxiliary position contacts - AUP	●	●	●	●	●	●	●
Ready to close signalling contact - RTC	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
TU Reset mechanical signalling of the tripping of protection trip unit - TU Reset	● / ●●	● / ●●	-	-	-	-	-
Contact signalling tripping of Ekip protection trip unit - S51	● / ●●	● / ●●	-	-	-	-	-
Contact signalling loaded springs – S33 M/2 (supplied with Motor)	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Control							
Opening and closing release - YO/YC	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Second opening and closing release - YO2/YC2	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Undervoltage release - YU	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Electronic time-delay device for undervoltage release - UVD	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Motor - M	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Remote reset - YR	○ / ○○	○ / ○○	-	-	-	-	-
Opening and closing release test unit - YO/YC Test Unit	○ / ●	○ / ●	○ / ●	○ / ●	-	-	●
Safety							
Key lock and padlock in open position - KLC and PLC	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	-
Key lock and padlock in racked-in / test / racked-out position - KLP and PLP	●	○○	●	○○	○○	○○	○○
Shutter lock - SL	●	●	●	●	●	●	●
External shutter lock - SLE	-	●	-	●	-	-	-
Lock for racking-out mechanism with circuit-breaker in closed position	●	●●	●	●●	-	-	●●
Lock for racking in / racking out the mobile part when the door is open - DLR	-	●	-	●	-	-	○○
Lock to prevent door opening when circuit-breaker is in racked-in / test position - DLP	-	●	-	●	-	-	●
Lock to prevent door opening when circuit-breaker is in closed position - DLC	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	○○
Anti-insertion lock	● / ●●	● / ●●	● / ●●	● / ●●	-	-	●●
Mechanical operation counter - MOC	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	○○
Protection devices							
Protection device for opening and closing pushbuttons - PBC	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	○○
IP30 Protection	● / ●	● / ●	● / ●	● / ●	-	-	● / ●
IP54 Protection	○ / ●	○ / ●	○ / ●	○ / ●	-	-	●
Terminal covers - HTC / LTC	○ / ○○	-	-	-	-	-	-
Separators - PB	○ / ○○	-	-	-	-	-	-
Connections							
Orientable rear terminal - HR/VR	○	●	○	●	-	-	●
Front terminal - F	●	○	●	○	-	-	○
Other configurations	○ / ●	○ / ●	○ / ●	○ / ●	-	-	●
Interlocks and switching devices							
Mechanical interlock - MI	○ / ○○ / ●	○ / ○○ / ●	○ / ○○ / ●	○ / ○○ / ●	-	-	○○
Automatic transfer switches - ATS	○ / ○○	○ / ○○	○ / ○○	○ / ○○	-	-	○○

- Standard accessory for fixed circuit-breaker
- Accessory on request for fixed circuit-breaker
- Standard accessory for mobile part
- Accessory on request for mobile part
- Standard accessory for fixed part
- Accessory on request for fixed part



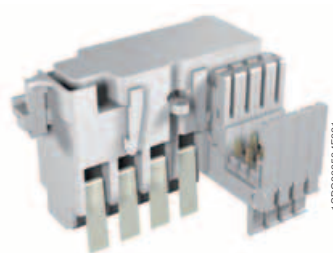
1SDC20023D0201

Signalling

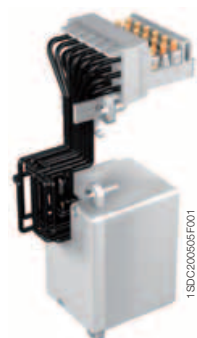
Open / closed auxiliary contacts - AUX

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:

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



1SDC200504F001



1SDC200505F001

	Standard contact	Contact for digital signals
Type	changeover contacts	changeover contacts
Minimum load	100mA @ 24V	1mA @ 5V
Breaking capacity		
DC	24V	-
	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 is an alternative to the Ekip Signalling 4K module. AUX 15Q is an alternative to the mechanical interlock (MI) and the DLP and DLC locks.

Accessories

Accessories for circuit-breakers



1SDC200060F001

Auxiliary position contacts - AUP

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

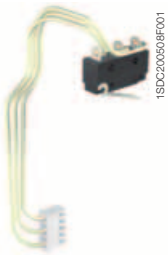
Auxiliary position contacts (AUP)		E1.2	E2.2 ... E6.2
6 auxiliary contacts	standard	•	-
	digital signals	•	-
5 auxiliary contacts	standard	-	•
	digital signals	-	•
5 supplementary auxiliary contacts	standard	-	•
	digital signals	-	•
Maximum number of auxiliary position contacts that can be installed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



1SDC2000507F001

		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



1SDC200060F001

Ready to close signalling contact - RTC

The ready to close signalling contact – RTC – indicates that the circuit-breaker is ready to receive the closing command. The circuit-breaker is ready to close in the following conditions:

- 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



1SDC200023D0201

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

Contact signalling tripping of protection trip unit Ekip – S51

The contact signals the opening of the circuit-breaker after the Ekip protection trip unit has tripped. The circuit-breaker can only be closed after the “TU Reset” tripped trip unit mechanical signalling pushbutton has been restored to its normal operating position. The switching contact, which is always supplied with the standard version of the automatic circuit-breakers, is also available on request in a version for digital signals (for electrical characteristics, please refer to the RTC contact). It can also be associated to an optional accessory for resetting by remote control - YR. For electromechanical characteristics, please refer to the RTC contact.

Electrical diagram reference: figure 11

Contact signalling loaded springs – S33 M/2

This contact is always supplied with a geared motor; it remotely signals the spring status of the circuit-breaker operating mechanism. It is available in both standard version and version for digital signals.

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

Electrical diagram reference: figure 12

Accessories

Accessories for circuit-breakers



Control

Opening and closing release- YO/YC

The opening and closing releases enable the circuit-breaker to be controlled remotely. Opening is always possible, while closing is available only when the closing springs of the operating mechanism are loaded and the circuit-breakers is ready to close.

The releases operate by means of minimum impulse current duration time of 100 ms.

Furthermore, they can operate in permanent service. In this case, if opening command is given by means of the opening release, the circuit-breaker can be closed by de-energizing the opening release and, after a time of at least 30 ms, by controlling the closing.

Electrical diagram reference: figure 75, 77

Second opening and closing release - YO2/YC2

For certain installations the redundancy of mechanisms and circuit-breaker operating circuits is often requested. To answer these needs, the SACE Emax 2 circuit-breakers can be equipped with double opening release and double closing release. The technical characteristics of the second opening release remain the same as those of the first opening and closing release.

A double opening release can be used for E2.2, E4.2 and E6.2 circuit-breakers; an undervoltage release cannot be used in this case.

Electrical diagram reference: figure 72, 79

General characteristics

Power supply (Un)	AC	DC
24V	•	•
30V	•	•
48V	•	•
60V	•	•
110V...120V	•	•
220V...240V	•	•
240V...250V	•	•
380V...400V	•	-
415V...440V	•	-
480V...500V	•	-
Operating limits (IEC60947-2 standards)	YO/YO2: 70%...110% Un YC/YC2: 85%...110% Un	
Inrush power (Ps)	300VA	300W
Continuous power (Pc)	3.5VA	3.5W
Opening time (YO/YO2)		
E1.2	20 ms	
E2.2 ... E6.2	35 ms	
Closing time (YC/YC2)		
E1.2	50 ms	
E2.2 ... E6.2	50 ms	

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

The opening and closing releases test unit helps ensure that the various version of releases are running smoothly, to guarantee a high level of reliability in controlling circuit-breaker opening. The test unit ensures the continuity of the opening and closing releases with a rated operating voltage between 24V and 250V (AC and DC), as well as verifies the functions of the opening and closing coil electronic circuit.

Continuity is checked cyclically with an interval of 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 auxiliary 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 signalling of the following events:

Failure of a test - resetting takes place automatically when the alarm stops

Failure of three tests - resetting occurs only by pressing the manual RESET on the unit.

Characteristics of device

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

Accessories

Accessories for circuit-breakers



1SDC200310F001

Undervoltage release – YU

The undervoltage release opens the circuit-breaker when there is a significant voltage drop or power failure. It can be used for safe remote tripping, for locking on 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.

General characteristics

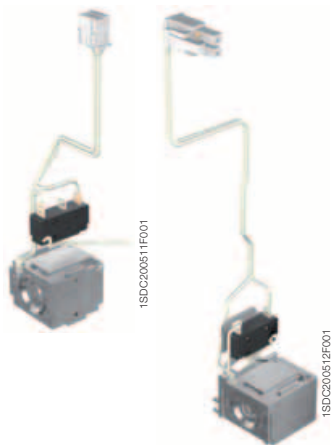
Power supply (Un)	AC	DC
24V	•	•
30V	•	•
48V	•	•
60V	•	•
110V...120V	•	•
220V...240V	•	•
240V...250V	•	-
380V...400V	•	-
415V...440V	•	-
480V...500V	•	-
Operating limits (IEC60947-2 standards)	70%...110% Un	
Inrush power (Ps)	300VA	300W
Continuous power (Pc)	3.5VA	3.5W
Opening time (YU)		
E1.2	30 ms	
E2.2 ... E6.2	50 ms	

Electrical diagram reference: figure 73

Time-delay device for undervoltage release (UVD)

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

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



Resetting remotely- YR

The reset coil YR permits remote resetting of the circuit-breaker after a release has tripped due to an overcurrent condition.

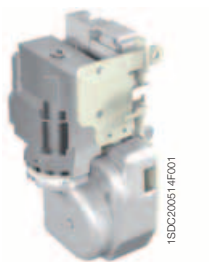
It is available, for all automatic circuit-breakers, with different voltage supply:

General characteristics		
Power supply (Un)	AC	DC
24V	•	•
110V	•	•
250V	•	•
Operating limits	90%...110% Un	

Electrical diagram reference: figure 12 and 13

Accessories

Accessories for circuit-breakers



5

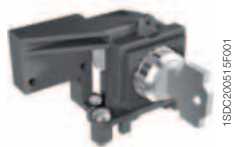
Motor – M

The motor automatically loads the closing springs of the circuit-breaker. The device, which can be installed from the front, automatically reloads the springs of the operating device when they are unloaded and power is present. In the event no power is present, the springs can be manually loaded by a dedicated lever on the operating device. The motor is always supplied with 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	•	•
380V...400V	•	-
440V...480V (E2.2 ... E6.2)	•	-
Operating limits (IEC60947-2 standards)	85%...110% Un	
Inrush power (Ps)	300VA	500W
Continuous power (Pc)	100VA	100W
Loading time		
E1.2	8 sec	
E2.2 ... E6.2	7 sec	

Electrical diagram reference: figure 12 and 13



1SDC200518F001



1SDC200518F001

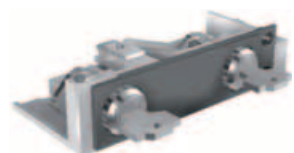


1SDC200517F001

1SDC200518F001



1SDC200518F001



1SDC200520F001



1SDC200521F001

Safety

Key lock in open position - KLC

Thanks to these safety devices, the SACE Emax 2 circuit-breaker can be locked in the open position. The lock can also be used during maintenance activities when the shield of the accessories area is removed. The device is available with lock with different keys – KLC-D (for only one circuit-breaker) or with the same keys – KLC-S (for several circuit-breakers). In this latter case, four different key numbers are available.

SACE Emax 2 also allows additional key locks to be installed. With the KLC-A type, the following key locks can be used:

- Ronis
- Profalux
- Kirk
- Castell

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

Padlocks - PLC

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

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

The padlocks are always supplied by the customer.

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. Each circuit-breaker can be equipped with a maximum of two key locks.

Locking in the racked-in, test and racked-out positions can be achieved by using other key locks – KLP-A. This device is made for Ronis, Profalux, Kirk and Castell keys, 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.

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

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

Shutter lock – SL

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

Accessories

Accessories for circuit-breakers



1SDC200022F001

Protection devices

External shutter lock - SLE

This accessory is optional and, using padlocks of 4 mm, 6 mm or 8 mm, allows the shutters to be locked directly from the outside of the fixed part, avoiding the need to work inside. For both lock versions, the padlocks are supplied by the customer.

Lock for racking-out mechanism with circuit-breaker in closed position

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

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

This accessory, which is mounted on the fixed part, prevents the mobile part from being racked in or out when the switchgear door is open.

Lock to prevent door opening when 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 withdrawable version of the circuit-breaker is in the racked-in or test position. The circuit-breaker can be racked in when the door is open, which is then closed. This accessory can be installed on both the right-hand or left-hand side of the fixed part. It is available for circuit-breakers E2.2, E4.2 and E6.2. It is an alternative to the mechanical interlock.



1SDC200522F001

Lock to prevent door opening when circuit-breaker is in 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 withdrawable circuit-breakers). It also locks circuit-breaker closed when the compartment door is open.

Anti-insertion lock

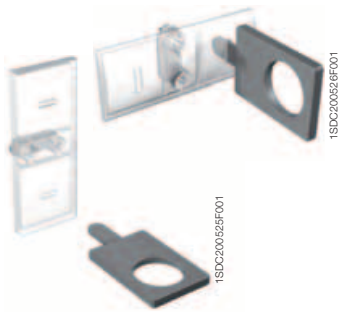
The withdrawable circuit-breakers are equipped with special locks that allow the mobile part to be inserted only into the corresponding fixed part.

Mechanical operation counter - MOC

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



1SDC200524F001



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 prevents operations on both opening and closing pushbuttons unless the special key is used.
- Padlockable pushbutton protection device, which inhibits one or both of the circuit-breaker switching pushbuttons.
- PBC is not compatible with PLC padlocks.



IP30 Protection

Always supplied with the circuit-breaker, the cover frame is applied to the door of the switchgear to achieve IP30 degree of protection on the front part of the circuit-breaker.



IP54 Protection

This transparent cover completely protects the front of the circuit-breaker, enabling 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 applied in the terminal area, thereby reducing the risk of direct contact with the live parts of the circuit-breaker. Two versions are available for E1.2: HTC high terminal covers and LTC low terminal covers.



Separators - PB

These protection devices increase the insulation distance between adjacent phases. They are available for E1.2.

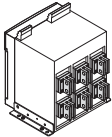
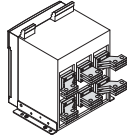
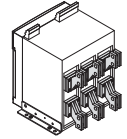
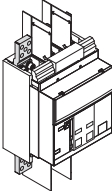
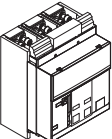
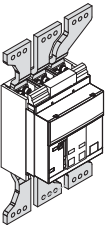
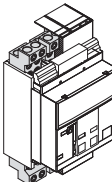
Accessories

Accessories for circuit-breakers

Connections

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

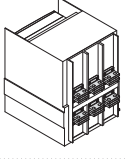
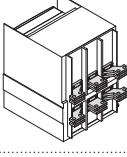
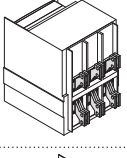
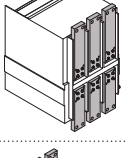
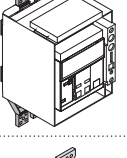
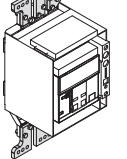
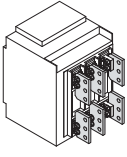
Solution for fixed circuit-breakers

Type	Abbreviation		E1.2	E2.2	E4.2	E6.2
Rear orientable terminal *	HR VR		Single stab design			
			○	● Iu = 2000A	● Iu = 3200A	● Iu = 5000A
Horizontal rear spread terminal	SHR		Multiple stab design			
				● Iu = 2500A	● Iu = 4000A	● Iu = 6300A
Vertical rear spread terminal	SVR			○		
Extended front terminal	EF		○			
Front terminal	F		●	○	○	○
Front spread terminal	ES		○			
Terminal for cable FcCuAl 4x240mm ²	FcCuAl		○			

- Standard configuration
- Configuration on request

(*) The orientable terminals are supplied as standard in the HR – HR configuration.

Solutions for fixed parts, withdrawable circuit-breakers

Type	Abbreviation		E1.2	E2.2	E4.2	E6.2
Rear orientable terminal *	HR VR		Single stab design			
			●	● Iu = 2000A	● Iu = 3200A	● Iu = 5000A
Horizontal rear terminal	SHR		Multiple stab design			
				● Iu = 2500A	● Iu = 4000A ○ Iu = 3200A**	● Iu = 6300A or X performance
Vertical rear spread terminal	SVR			○		
Front terminal	F			○	○	○
Extended front terminal	EF		○			
Front spread terminal	ES		○			
Terminal for cable FcCuAl 4x240mm ²	Fc CuAl		○			
Flat terminal	FL			○	○	○

● Standard configuration

○ Configuration on request

(*) The orientable terminals are supplied as standard in the HR – HR configuration.

(**) Fixed parts with Iu 3200A accessorized with rear orientable terminals with multiple stabs guarantee higher performances in switchboard installations.

Accessories

Accessories for circuit-breakers

Interlocks and switching devices

Mechanical interlocks

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

Types of interlock	Possible application	Logic	Circuit-breakers																					
Type A Excludes the possibility of having two circuit-breakers in the closed position at the same time.	Main line power supply and emergency power supply. 	<table border="1"> <tr> <td>1</td> <td>2</td> </tr> <tr> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> </tr> <tr> <td>O</td> <td>I</td> </tr> </table>	1	2	O	O	I	O	O	I	Available between circuit-breakers of different sizes and with any fixed / withdrawable version													
1	2																							
O	O																							
I	O																							
O	I																							
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. 	<table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>O</td> </tr> <tr> <td>O</td> <td>O</td> <td>I</td> </tr> <tr> <td>I</td> <td>O</td> <td>I</td> </tr> <tr> <td>O</td> <td>I</td> <td>O</td> </tr> </table>	1	2	3	O	O	O	I	O	O	O	O	I	I	O	I	O	I	O	Available between E2.2, E4.2 and E6.2 circuit-breakers and with any fixed / withdrawable version			
1	2	3																						
O	O	O																						
I	O	O																						
O	O	I																						
I	O	I																						
O	I	O																						
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). 	<table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>O</td> </tr> <tr> <td>O</td> <td>I</td> <td>O</td> </tr> <tr> <td>O</td> <td>O</td> <td>I</td> </tr> <tr> <td>I</td> <td>I</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>I</td> </tr> </table>	1	2	3	O	O	O	I	O	O	O	I	O	O	O	I	I	I	O	I	O	I	Available between E2.2, E4.2 and E6.2 circuit-breakers and with any fixed / withdrawable version
1	2	3																						
O	O	O																						
I	O	O																						
O	I	O																						
O	O	I																						
I	I	O																						
I	O	I																						
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. 	<table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>I</td> <td>O</td> <td>O</td> </tr> <tr> <td>O</td> <td>I</td> <td>O</td> </tr> <tr> <td>O</td> <td>O</td> <td>I</td> </tr> </table>	1	2	3	O	O	O	I	O	O	O	I	O	O	O	I	Available between E2.2, E4.2 and E6.2 circuit-breakers and with any fixed / withdrawable version						
1	2	3																						
O	O	O																						
I	O	O																						
O	I	O																						
O	O	I																						

The mechanical interlocks offer multiple solutions for installation that simplify their integration into the switchgear. The interlocks can be mounted:

- vertically **VR**
- horizontally **HR**
- mixed **L**

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

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

For B, C and D types, the maximum distance between the two furthest breakers is 3200mm for horizontal configurations and 2000mm for vertical configurations. All cables can be cut to guarantee easy installation in switchboards. Mechanical interlocks are not compatible with AUX 15Q or DLP and DLC locks.

Automatic Transfer Switches ATS

The ATS (Automatic Transfer Switch) is a network-unit transfer device used in installations where switching from the main power line to an emergency line is required in order to ensure that power is supplied to the loads in the case of power 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 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 be used with all automatic circuit-breakers and switch-disconnectors of the Tmax XT family.

The ATS021 and ATS022 devices have been designed to be self-powered. ATS022 is also designed for the connection of an auxiliary supply, which enables the use of further functions.

The ATS021 and ATS022 devices carry out control of both power supply lines and analyze:

- phase imbalance;
- frequency imbalance;
- phase loss.

In addition to the standard control functions, the ATS022 unit also permits:

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

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

For correct configuration, each circuit-breaker connected to the ATS021 or ATS022 device must be fitted with the following accessories:


- mechanical interlock;
- motorized control of opening and closing ;
- contact for signalling status (open / closed) and contact for signalling tripping;
- contact for signalling circuit-breaker racked in (for withdrawable circuit-breaker).

Accessories

Accessories for circuit-breakers



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 480 VAC	Max 480 VAC	
	Frequency, fn	50, 60 Hz	16 2/3, 50, 60, 400 Hz	
	Dimensions 	H mm	96	96
		L mm	144	144
		D mm	170	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	Grado di protezione	IP20	IP20	
	Operating temperature	-20 ... +60 °C	-20 ... +60 °C	
	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

Accessories for Ekip trip units

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

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

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

Accessories

Accessories for Ekip trip units

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 Fan Ekip Synchrocheck	- The Ekip Supply module enables the trip units to be supplied with several line voltage
		- If the Ekip Supply module is present, the other cartridge modules can be installed
5	Ekip LCD Ekip Com Actuator Ekip RTC Ekip AUP Ekip Measuring Ekip Signalling 4K Rating Plug Battery for Ekip	- 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
		- In addition to the Ekip Supply module, up to 2 modules can be installed on E1.2, and up to 3 on E2.2, E4.2 and E6.2
Accessorizing area	Ekip LCD Ekip Com Actuator Ekip RTC Ekip AUP Ekip Measuring Ekip Signalling 4K Rating Plug Battery for Ekip	- Ekip fan module is available for E2.2, E4.2 and E6.2 as an alternative to Ekip supply module
		- These are installed in specific housings from the front of the circuit-breaker
Ekip trip unit test connector	Ekip T&P Ekip TT Ekip Bluetooth	- For all the trip units with a touch screen interface, the LCD interface is available with any adjustment in the protection and measurements functions
		- Thanks to the optional modules Ekip RTC and Ekip AUP, all the Ekip trip units can acquire and monitor the ready to close state and the racked-in/ test isolated/racked-out position of the circuit-breaker. The module to acquire the open/closed position is supplied as standard for all Ekip trip units.
External	Ekip T&P Ekip TT Ekip Bluetooth	- The Ekip Signalling 4k module increases the remote signalling possibilities for E2.2, E4.2 and E6.2
		- These are connected to the front test connector of the trip units even with the device in operation
External	Ekip Multimeter Ekip Control Panel Ekip 10K	- Compatible also with the SACE Tmax XT range
		- Ekip Multimeter can supply the trip unit to which it is connected
External	External neutral sensor Homopolar toroid Differential toroid	- Several Ekip Multimeter units and / or Ekip Signalling 10K can be connected at the same time to the same Ekip trip unitsganciatore Ekip
		- These are connected to the trip unit by the terminal box of the circuit-breaker



Power supply

Ekip Supply Power Supply module

The Ekip Supply module enables all Ekip trip units and modules present on the terminal box to be supplied with several auxiliary power in AC or DC available in the switchgear.

The module can be mounted at any time on the circuit-breaker terminal box and permits installation of the cartridge modules; it is an alternative to the Ekip Fan module.

Two versions are available according to the primary voltage used:

- Ekip Supply 110-240V AC/DC
- Ekip Supply 24-48V DC

Electrical diagram reference: figures 31, 32



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 it is mounted to 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 and Profibus module are equipped with a dip switch that allows the introduction of a 120Ω resistor to terminate a Modbus RTU network.

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	

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

Accessories

Accessories for Ekip trip units



Ekip Link Module

The Ekip Link module enables the SACE Emax 2 circuit-breaker to be connected to ABB communication system for locally supervising switchgear by means of the Ekip Control Panel and to act as Power Controller. It is suitable for all Ekip trip units and can be fitted at any time to the circuit-breaker terminal box, even when Ekip Com communication modules are present. In this way, it is possible to have both local supervision of the control panel by means of the Ekip Control Panel and supervision of the system by means of the Ekip Com modules connected to the communication network.

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

Electrical diagram reference: figure 58

5



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

Signalling

Ekip 2K Signalling modules

The Ekip 2K Signalling modules supply two input and two output contacts for control and remote signalling of alarms and circuit-breaker trips. They can be programmed from the trip unit's display. Furthermore, by means of the Ekip Connect software, 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 different Ekip 2K Signalling modules are available: Ekip 2K-1, Ekip 2K-2, Ekip 2K-3. In this way, a maximum of three modules for E2.2, E4.2, E6.2, and two for E1.2 can be installed at the same time.

Electrical diagram reference: figures 41, 42, 43



Ekip 4K signalling module

The Ekip 4K Signalling module, available for E2.2 – E4.2 – E6.2, supplies four input contacts and four output contacts for control and remote signalling. It can be programmed from the trip unit's display. Furthermore, by means of the Ekip Connect software, 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.

Electrical diagram reference: figure 2



Ekip 10K signalling unit

Ekip 10K Signalling is a signalling unit on a DIN rail for SACE Emax 2 automatic circuit-breakers. The unit provides ten contacts for electrical signalling of timing and tripping of protection devices.

If connected via the Ekip Connect software, the contacts can be freely configured in association with any event and alarm or combination of both.

Several Ekip 10K Signalling (max 4) can be installed at the same time on the same Ekip trip unit. The Ekip 10K Signalling module can be powered both in direct current and in the 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

Accessories for Ekip trip units

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 signalling unit power supply

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

Signalling contacts for Ekip trip units

Ekip trip units can acquire the status of circuit-breaker ready to close (RTC) and the racked-in, test, or racked-out position through the optional signalling contacts Ekip RTC and Ekip AUP. These contacts, housed in the accessories area of the circuit-breakers, are available with Ekip Dip, Ekip Touch and Ekip Hi-Touch.

Ekip COM communication modules and Ekip Link modules are always supplied with Ekip AUP and Ekip RTC contacts.



1SDC200647R01

Measurement and protection

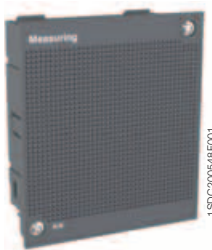
Ekip Measuring module

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.

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 voltmeter 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



1SDC200648R01



1SDC200549R001



1SDC200550R001

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 has:

- Protection devices based on the voltage and power values
- Ekip trip unit power supply from busbar voltage (for line voltages greater than 85V)
- LED signalling voltage on main busbars.

The Ekip Hi-Touch, Ekip G Touch and Ekip G-Hi Touch trip units are provided as standard with the Ekip Measuring Pro module.

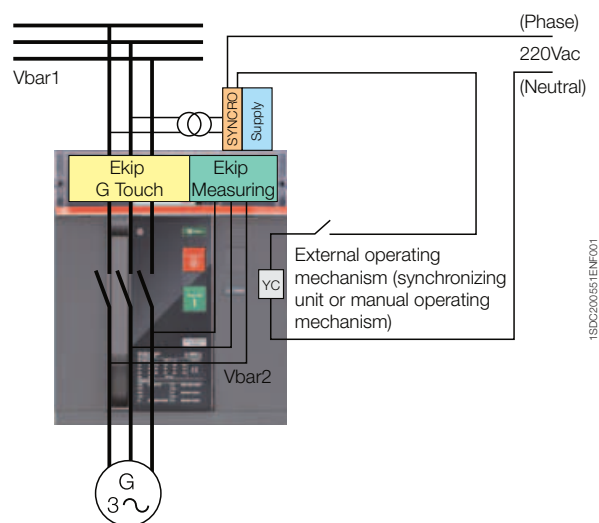
Electrical diagram reference: figures 20, 21, 22, 23

Ekip Synchrocheck

This module enables the control of the synchronism condition for 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 Synchrocheck acquires the voltages of two phases of one line through an external transformer and, through the Ekip Measuring Pro module, the voltages of another line. 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 release.

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	3A	
50V DC	1A	
150V DC	0.3A	
250V DC	4A	
Contact/coil insulation	2000 Vrms (1min @50Hz)	



1SDC200510ENR001

Electrical diagram reference: figure 48

Accessories

Accessories for Ekip trip units



Ekip LCD display interface

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

5



Ekip Fan cooling module

The Ekip Fan cooling module continuously monitors the temperature inside the fixed parts of E2.2, E4.2 and E6.2 that are equipped with cooling fans and activates them in the event of overheating.

It is an alternative to the Ekip Supply module and enables the protection trip unit to be supplied with DC auxiliary power available in the switchgear. Ekip Fan can be used with Ekip Touch and Ekip Hi-Touch trip units.

The Ekip Fan 24V DC is available. If an Ekip Fan 24V DC module is installed, another two cartridge modules can also be installed.

Electrical diagram reference: figure 33



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. There is a matching L OFF version for each standard version of rating plug.

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

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

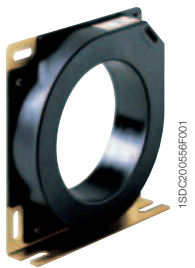
Circuit-breaker	Rating plug available for Rc protection
E1.2	400-630-800-1000-1250-1600
E1.2 250	100-200-250
E2.2	400-630-800-1000-1250-1600-2000-2500
E2.2 250	100-200-250
E4.2	400-630-800-1000-1250-1600-2000-2500-3200-4000



Current sensor for neutral conductor outside the circuit-breaker

This is only for three-pole circuit-breakers; it enables protection of the neutral conductor to be achieved through connection to the Ekip trip unit. It is supplied on request.

Electrical diagram reference: figure 27



Homopolar toroid for the earthing conductor of main power supply

The distribution and generator protection versions of the Ekip Touch and Hi-Touch trip units can be used with an external toroid positioned, for example, on the conductor that connects the star centre of the MV/LV transformer to earth (homopolar transformer): in this case, the earth protection is called Source Ground Return. Through two different combinations of connections of its terminals, the In of the toroid can be set at 100 A, 250 A, 400 A, 800 A.

Electrical diagram reference: figure 25



Toroid for differential protection

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

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

Electrical diagram reference: figure 24

Accessories

Accessories for Ekip trip units



Displaying and supervision

Ekip Multimeter Display on 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, 96mmx96mm sized, is equipped with a large touch screen display and enables measurements to be displayed with the same levels of precision. If connected to trip units with a display, Ekip Multimeter enables the adjustment of parameters and protection thresholds.

Several 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	19.2-60V DC, 105-265V AC/DC
Rated Power	8W

5



Ekip Control Panel on front of switchgear

The Ekip Control Panel enables the SACE Emax 2 circuit-breakers connected to the Ekip Link system to be controlled and monitored.

The panel is supplied already equipped with supervision software and requires no programming. Ekip Control Panel requires a 24V DC power supply and is equipped with:

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



Testing and programming

Ekip TT testing and power supply unit

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 connector 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 setting.



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 is connected on one side to the USB port of a PC and on the other, by means of the cable provided, to a protection trip unit of the SACE Emax 2 series.

The Ekip T&P unit performs the automatic testing, manual testing and trip testing of the device to which it is connected and generates reports.

These functions are managed via the Ekip T&P Interface, which is activated directly by Ekip Connect only in the presence of the Ekip T&P connected to a PC.

Accessories

Spare parts

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 fixed part of withdrawable circuit-breaker
- Shutters for fixed part
- Trip units - current transformers wires
- Transparent protection for trip unit
- Mainboard for protection trip units
- Terminal box and e sliding contacts
- Grease and oil.

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

Installation

Circuit-breaker	6/2
Sizes	6/3
Versions	6/4
Poles	6/5
Terminals	6/6
Degree of protection	6/7
Power losses	6/7
Temperature derating	6/8
Current-limiting curves	6/9

Installation environment	
Temperature	6/10
Environmental conditions	6/10
Vibration	6/10
Electromagnetic compatibility	6/10

Installation in switchgear	6/11
Position	6/12
Power supply	6/12
Insulation distances and connection	6/12
Busbar types	6/14
Accessories	6/14

Performance in switchgear	6/15
----------------------------------	-------------

Installation

Circuit-breaker

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

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

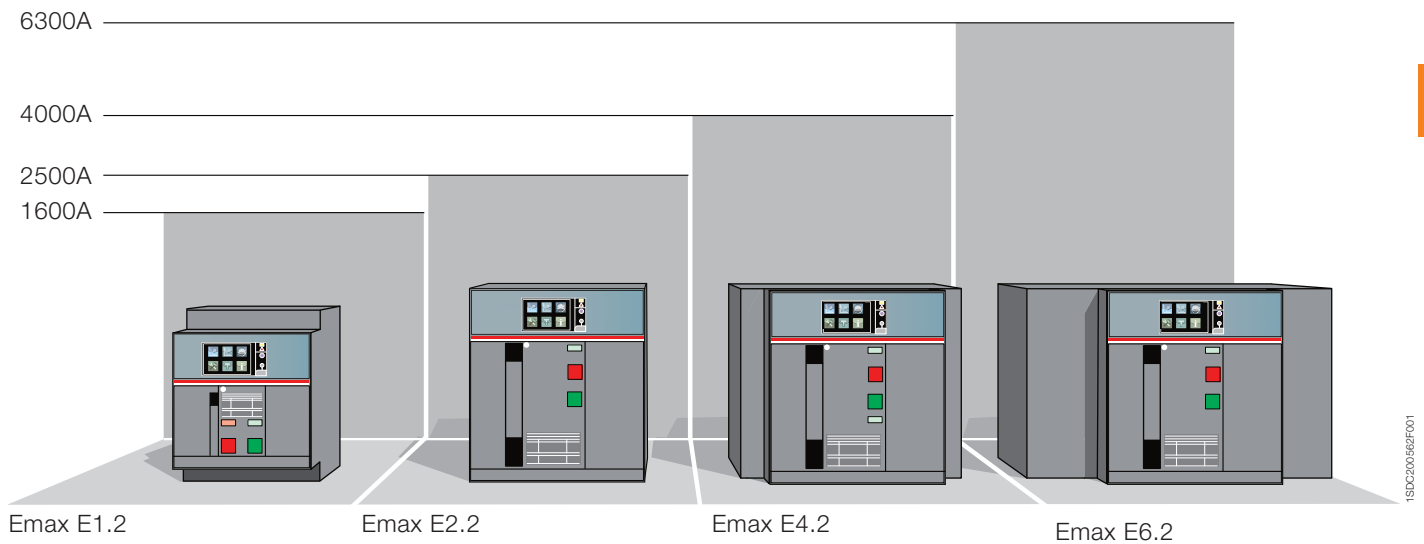
Safety is guaranteed thanks to the double insulation of the live parts and total segregation of the phases. Furthermore, the new functional design of the SACE Emax2 circuit-breakers has been developed with the purpose of improving installation operations and use of the devices and accessories; making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

	Distinctive characteristics	Benefits
6 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
	- 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	Increased level of safety
	- Horizontal or vertical rear connections can be modified on-site by turning 90°	
	- Accessorizing logic common to the entire family of circuit-breakers	
	- Accessory cabinet and terminal box are stamped with accessory codes for easy identification	
	- Accessories area is separated functionally from the safety area	
	- Mechanical safety locks in open position are active when the shield is removed	
- Guided racking in and out of the mobile part		

Sizes

The SACE Emax2 circuit-breakers, available in 4 sizes up to 6300A, provide:

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



Installation

Circuit-breaker

Versions

The SACE Emax2 circuit-breakers are available in both fixed and withdrawable versions. The withdrawable version is recommended in applications in which service continuity is a fundamental requirement: replacement of the moving part with a new device does not require any intervention on power connections or on auxiliary connections, thus permitting reset in the shortest time possible.

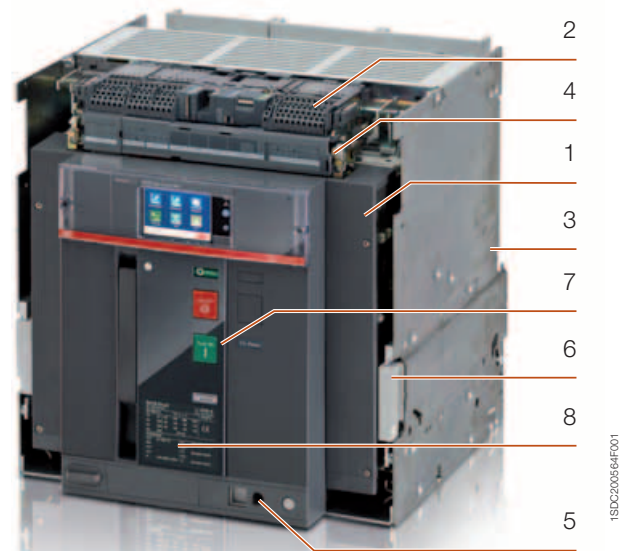
The fixed version, which is connected directly to power system through the circuit-breaker terminals, is recommended in applications in which the need for space means that compact products are required without compromising the performance and possibility of fitting accessories.

6

Fixed



Withdrawable



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

Poles

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

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

The apparatus supplied as standard 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.

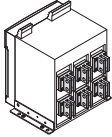
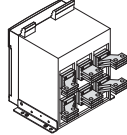
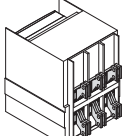
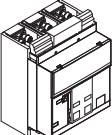
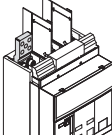
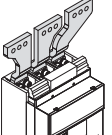
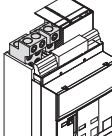
Circuit-breaker	Standard version		Optional version with neutral on the right
	Three-pole	Four-pole	Four-pole
Emax E1.2			
Emax E2.2			
Emax E4.2			
Emax E6.2			

Installation

Circuit-breaker

Terminals

The integration of the circuit-breaker in the electrical system is simplified thanks to 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 orientated terminal ⁽¹⁾	HR VR		F, W	F, W	F, W	F, W
6 Horizontal rear spread terminal	SHR		W	F, W		
Vertical rear spread terminal	SVR			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 4x240mm ²	Fc CuAl		F, W			
Flat terminal	FL			W	W	W

(1) The rear orientated terminals are supplied as standard in the HR-HR configuration.

Degree of protection

The SACE Emax2 circuit-breakers guarantee the following degrees of protection:

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

These power losses are measured according to IEC 60947 product standard, 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 "I_u" at 50/60Hz.

Circuit-breaker type		I _u	630A	800A	1000A	1250A	1600A	2000A	2500A	3200A	4000A	5000A	6300A
Fixed	E1.2 B/C/N	[W]	31	50	78	122	201	-	-	-	-	-	-
	E2.2 B/N/S/H	[W]	-	34	53	83	136	212	267	-	-	-	-
	E4.2 N/S/H/V	[W]	-	-	-	-	-	-	-	425	465	-	-
	E6.2 H/V/X	[W]	-	-	-	-	-	-	-	-	309	483	767
Withdrawable	E1.2 B/C/N	[W]	62	100	156	244	400	-	-	-	-	-	-
	E2.2 B/N/S/H	[W]	-	72	113	176	288	450	550	-	-	-	-
	E4.2 N/S/H/V	[W]	-	-	-	-	-	-	-	743	900	-	-
	E6.2 H/V/X	[W]	-	-	-	-	-	-	-	-	544	850	1350

Installation

Circuit-breaker

Temperature derating

Under certain installation conditions, the circuit-breakers can operate at higher temperatures than the reference temperature of 40°C. In this case the current-carrying capacity of the circuit-breaker may be lower than the rated current-carrying capacity at the reference temperature: therefore the derating coefficients shown in the table must be applied. Percentage values refer to withdrawable circuit breakers.

E1.2 E1.2	Temperature [°C]						
	<40	45	50	55	60	65	70
E1.2 250	100%	100%	100%	100%	100%	100%	100%
E1.2 630	100%	100%	100%	100%	100%	100%	100%
E1.2 800	100%	100%	100%	100%	100%	100%	100%
E1.2 1000	100%	100%	100%	100%	100%	100%	100%
E1.2 1250	100%	100%	100%	100%	100%	100%	100%
E1.2 1600	100%	100%	100%	98%	95%	93%	90%

6

E2.2 E2.2	Temperature [°C]						
	<40	45	50	55	60	65	70
E2.2 250	100%	100%	100%	100%	100%	100%	100%
E2.2 800	100%	100%	100%	100%	100%	100%	100%
E2.2 1000	100%	100%	100%	100%	100%	100%	100%
E2.2 1250	100%	100%	100%	100%	100%	100%	100%
E2.2 1600	100%	100%	100%	100%	100%	100%	98%
E2.2 2000	100%	100%	100%	100%	95%	91%	87%
E2.2 2500	100%	100%	100%	100%	98%	94%	90%

E4.2 E4.2	Temperature [°C]						
	<40	45	50	55	60	65	70
E4.2 2000	100%	100%	100%	100%	100%	100%	100%
E4.2 2500	100%	100%	100%	100%	100%	100%	100%
E4.2 3200	100%	100%	97%	93%	89%	86%	82%
E4.2 4000	100%	100%	94%	90%	86%	83%	80%

E6.2 E6.2	Temperature [°C]						
	<40	45	50	55	60	65	70
E6.2 4000	100%	100%	100%	100%	100%	100%	100%
E6.2 5000	100%	100%	100%	100%	100%	98%	95%
E6.2 6300	100%	100%	95%	91%	87%	84%	81%

Current-limiting curves

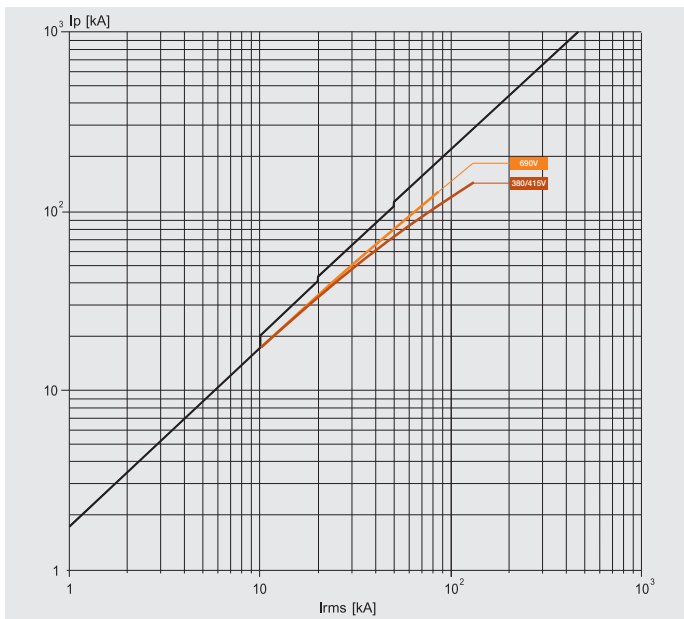
The SACE Emax2 series features a series of current-limiting circuit-breakers in sizes E1.2 up to 1600A. These circuit-breakers are distinguished constructively by:

- Dedicated stored energy operating mechanism, which reduces opening times.
- Specific main contacts which, utilizing the electrodynamic forces generated by the short-circuit current, accelerate opening of the main contacts.

These features ensure rapid interruption which consequently reduces electromechanical and thermal stress on the system during a short-circuit. The current-limiting circuit-breakers are distinguished by short-time withstand currents I_{cw} that are not particularly high and therefore not indicated for applications in which chronoamperometric selectivity is required with several downstream devices or in which devices are present with high inrush current in the start-up stage.

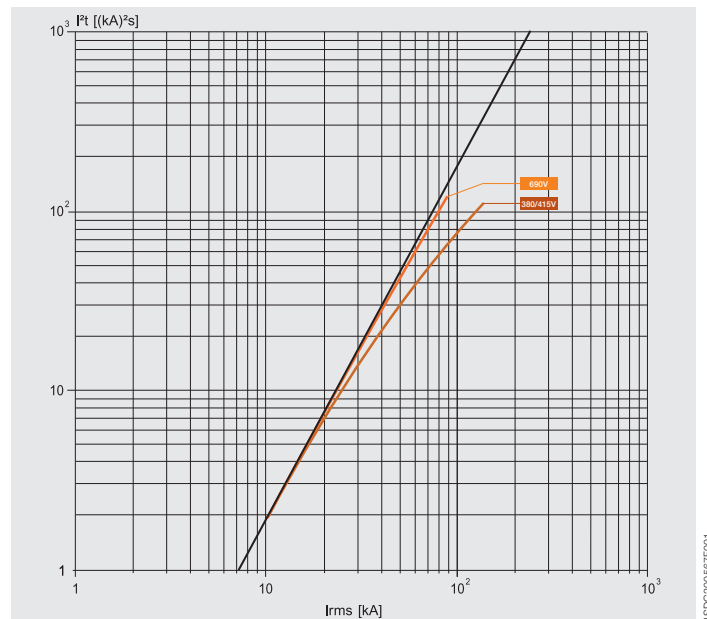
Current-limiting curves

E1.2 L



Current-limiting curves of specific let-through energy

E1.2 L



Installation

Installation environment

SACE Emax 2 circuit-breakers have been designed and tested in accordance with major international Standards to manage with maximum reliability the electrical plant. The installation requirements prescribed by the international Standards are listed below. In addition, ABB provides instructions for the use of circuit-breakers in nonstandard environments, as for example personalized maintenance program or installation solutions aimed at increasing performances and extending the lifecycle of the circuit-breaker.

Temperature

SACE Emax2 circuit-breakers can operate in the following environmental conditions:

	Temperature (°C)		
	Operating	Active Display	Storage
Emax 2 with Ekip DIP	-25°C ... +70°C	-	-40°C ... +70°C
Emax 2 with Ekip Touch	-25°C ... +70°C	-20°C ... +70°C	-30°C ... +70°C
Emax 2 with LCD	-25°C ... +70°C	-25°C ... +70°C	-40°C ... +70°C
Emax 2 swith-disconnectors	-25°C ... +70°C	-	-40°C ... +70°C

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
- IEC60721-3-2 class 3C2

Altitude

SACE Emax2 air circuit-breakers do not undergo changes in rated performance up to 2000 metres. Beyond this altitude, the properties of the atmosphere in terms of composition, dielectric capacitance, cooling power and pressure 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		[m]	2000	3000	4000	5000
Rated service voltage - Ue	Versions 690V	[V]	690	607	538	470
	Versions 1150V	[V]	1150	1012	897	782
Rated current		[% In]	100	98	93	90

An installation at 3000 m of a 690 V AC rated service voltage can be an explicative example. The altitude, as shown in the table, may cause a derating which precludes the use of a standard automatic circuit-breaker. To grant the use of a circuit-breaker at 690 V AC rated service voltage is therefore required a 1150V AC version that – despite the derating – fulfill the necessary rated service voltage. In addition, the selection of the circuit-breakers has to be based on the short -circuit performance required by the application.

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

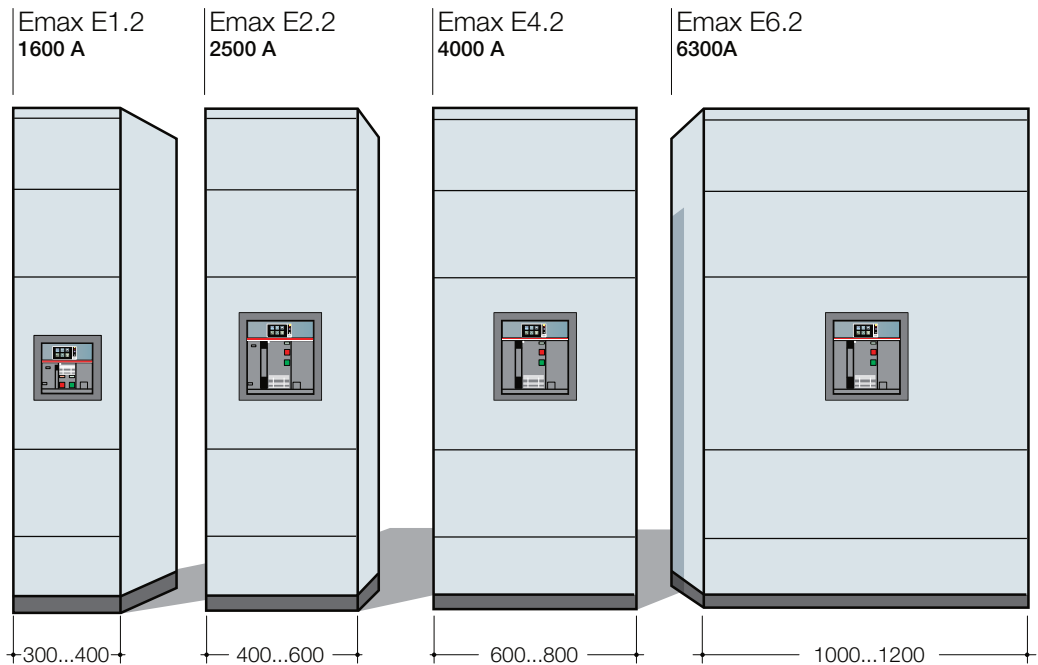
Electromagnetic compatibility

The use of specific devices in industrial installations may cause electromagnetic interference in the electrical system. SACE Emax2 circuit-breakers have been developed and tested for electromagnetic compatibility in accordance with IEC 60947-2, Appendices J and F.

Installation

Installation in switchgear

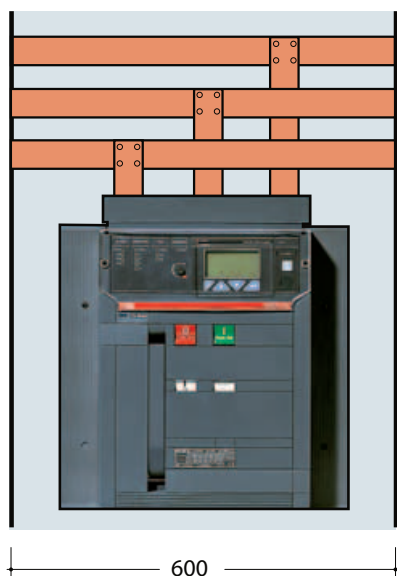
Thanks to the four construction sizes and the reduced insulation distances required, SACE Emax2 circuit-breakers enable the installation spaces of the compartments of electrical switchgear to be optimized, thereby providing a rational solution to the customers' application needs.



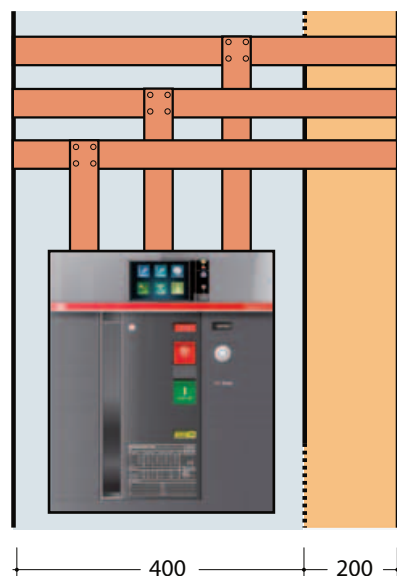
SACE Emax2 circuit-breakers enable the design of electrical switchgear to be improved, allowing it to be optimized not just in terms of performance, but also in the use of the main materials:

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

Traditional circuit-breaker 3p lu 2500A



Emax E2.2 3p lu 2500A



Efficiencies with Emax 2:

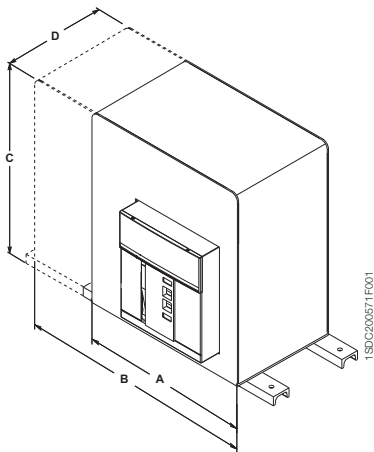
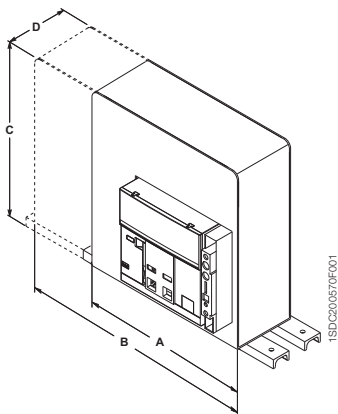
- ▶ Possibility of saving in copper
- ▶ Possibility of saving in metal frame, segregation and plates
- ▶ Possibility of saving in the installation surface

1SDC200668F001

Installation

Installation in switchgear

6



Position

All SACE Emax2 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.

Power supply

The Emax2 circuit-breakers can be supplied, indifferently, from either upper or lower terminals. In the event a measurement module is present, in order to make use of all information when the circuit-breaker is in the open position, the voltage sockets must be installed on the power supply side.

Insulation distances and connection

The circuit-breakers can be connected to the main power system using the most common configurations and dimensions of copper bars. Installation of live parts must ensure:

– Minimum insulation distances between the phases

Rated insulation voltage U_i	Minimum distance [mm]
1000V	14mm according to IEC 61439; ABB suggests 25mm

– Insulation distance of installation cubicle

Fixed circuit-breakers

[mm]	A	B	C	D
E1.2	3p	4P		
	250	322	382.5*	130
E2.2	400	490	500	221
E4.2	500	600	500	221
E6.2	900	1000	500	221
E6.2/f	-	1200	500	221

* 332.5mm for voltage less \leq 440V AC

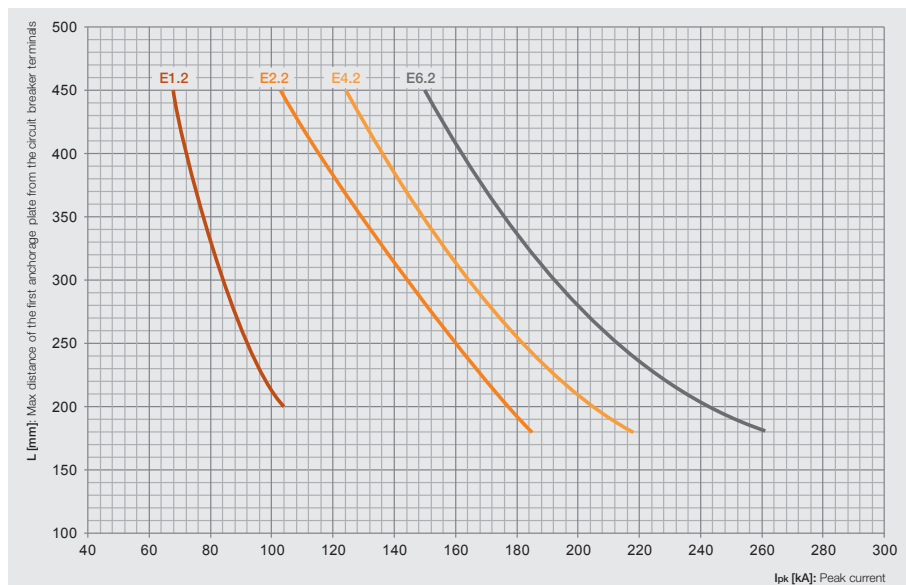
Withdrawable circuit-breakers

[mm]	A	B	C	D
E1.2	3p	4P		
	280	350	440*	252
E2.2	400	490	500	355
E4.2	500	600	500	355
E6.2	900	1000	500	355
E6.2/f	-	1200	500	355

* 390mm for voltage less \leq 440V AC

– 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
Modifiable HR/VR rear	40 Nm	70 Nm
Spread rear	40 Nm	70 Nm
Front	40 Nm	70 Nm
Extended front	40 Nm	70 Nm
Spread front	70 Nm	70 Nm
Front for cables	43 Nm	70 Nm

– Segregation plates and separator plates

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

Earthing connection

To achieve continuity and equipotentiality of earthing between the Emax 2 circuit-breaker and the protection circuit of the switchboard, customers can do either of the options below:

- Connect the Emax 2 fixed circuit-breaker or the fixed part of the withdrawable circuit-breaker to the protective circuit by means of a cable with suitable cross-sectional area to fulfil the requirements of clause 10.5.2 for the Standard IEC 61439-1.
- If the continuity of the circuit-breaker frame with the switchboard earthing is guaranteed by the metal contact (support) between the circuit-breaker and the metal structure of the switchboard (which is a part of the protective circuit) no connection is necessary (provided that no panels of insulating material are interposed between the circuit-breaker and the metal frame of the switchboard). Emax E1.2, fixed version, does not require any earthing connection.

Installation

Installation in switchgear

Busbar types

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

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

Accessories

The 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 interlock 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
- External lock of shutters
- Flange for switchgear door IP30 and IP54

For further information of the operation of accessories, see chapter 5.



Installation

Performance in switchgear

The many types of switchgear that can be created and the installation and environmental conditions can considerably influence the performance of the circuit-breaker. In this regard, SACE Emax 2 circuit-breakers offer the best solution for improving the capacity in switchgear.

The following application situations have been assessed by taking into consideration the main factors that can influence the performance of the circuit-breaker in switchgear:

- Type of switchgear
- Switchgear degree of protection
- Segregation form 3
- Size of circuit-breaker
- Number of devices connected at the same time in the unit
- Type of terminal and connection
- Ambient temperature T_a (IEC61439-1)
- Withdrawable circuit-breakers
- Maximum withstand temperature for the terminal 120° C

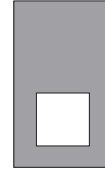
Installation

Performance in switchgear

The following tables provide an indication of the performance of the apparatus inside the switchgear. The data shown are a summary of software model simulations and real tests.

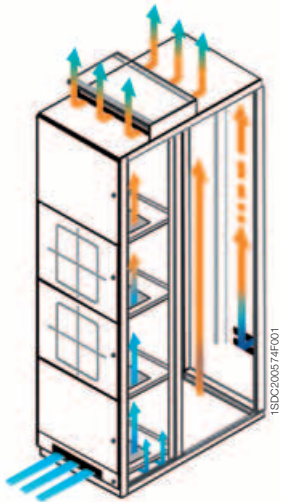
SACE Emax 2 E1.2 B C N Circuit-breaker
Switchgear dimensions 2200x400x600 (HxLxD)

HR Terminal
One circuit-breaker in the column

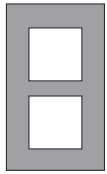
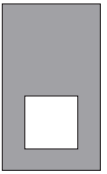
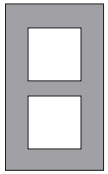


Environment temperature

IP	Iu	Connection [mm]	Compartment	Environment temperature		
				35 °C	45 °C	55 °C
IP31	630	2x40x5	2			
			1	630	630	630
	800	2x50x5	2			
			1	800	800	800
	1000	2x50x10	2			
			1	1000	1000	1000
	1250	2x50x8	2			
			1			
	1250	2x50x10	2			
			1	1250	1250	1200
	1600	3x50x8	2			
			1	1440	1360	1290
1600	2x50x10	2				
		1				



Performances with EF, SHR and F terminals can be compared, with the same connection sections, to the performances of circuit-breaker with HR terminal.
 Performances with ES terminals can be compared to the VR terminals.
 Performances with FC CuAl terminals, with cables in the prescribed sections, can be compared to HR performances.

HR Terminal Two circuit-breakers in the column			VR Terminal One circuit-breaker in the column			VR Terminal Two circuit-breakers in the column		
								
Environment temperature			Environment temperature			Environment temperature		
35 °C	45 °C	55 °C	35 °C	45 °C	55 °C	35 °C	45 °C	55 °C
630	630	630				630	630	630
630	630	630	630	630	630	630	630	630
800	800	800				800	800	800
800	800	800	800	800	800	800	800	800
970	930	900						
1000	960	920						
						1000	1000	950
			1000	1000	1000	1000	1000	970
1200	1150	1100						
1250	1200	1140						
						1250	1250	1150
			1250	1250	1250	1250	1250	1200
1330	1260	1220						
1370	1315	1262						
						1430	1355	1265
			1520	1440	1330	1475	1415	1310

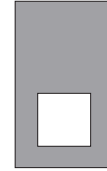
Installation

Performance in switchgear

The following tables provide an indication of the performance of the apparatus inside the switchgear. The data shown are a summary of software model simulations and real tests.

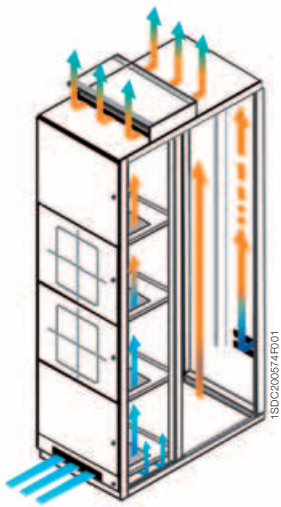
SACE Emax 2 E2.2 B N S H Circuit-breaker
Switchgear dimensions 2200x600xx900 (HxLxD)

HR Terminal
One circuit-breaker in the column



Environment temperature

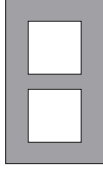
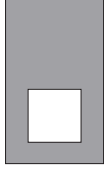
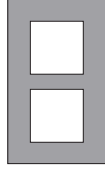
IP	Iu	Connection [mm]	Compartment	Environment temperature		
				35 °C	45 °C	55 °C
IP31	800	1x50x10	2			
			1	800	800	800
	1000	2x50x5	2			
			1	1000	1000	1000
	1250	2x50x10	2			
			1	1250	1250	1250
	1600	2x60x10	2			
			1	1600	1540	1480
		1x100x10	2			
			1			
	2000	3x60x10	2			
			1	2000	1940	1850
		2x80x10	2			
			1			
		3x60x10 *	2			
			1	2000	2000	1940
	2x80x10 *	2				
		1				
2500	3x60x10	2				
		1	2500	2350	2200	
	4x100x5	2				
		1				
	3x60x10 *	2				
		1	2500	2460	2320	
4x100x5 *	2					
	1					



6

* Performances refer to SHR and SVR terminals.

Performances with F and FL terminals can be compared to the performance of circuit-breakers with HR terminals.

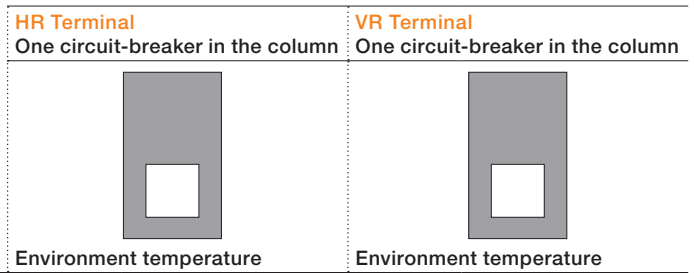
HR Terminal Two circuit-breakers in the column			VR Terminal One circuit-breaker in the column			VR Terminal Two circuit-breakers in the column		
								
Environment temperature			Environment temperature			Environment temperature		
35 °C	45 °C	55 °C	35 °C	45 °C	55 °C	35 °C	45 °C	55 °C
800	800	800				800	800	800
800	800	800	800	800	800	800	800	800
1000	1000	1000				1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000
1250	1250	1250				1250	1250	1250
1250	1250	1250	1250	1250	1250	1250	1250	1250
1470	1410	1360						
1550	1490	1430						
						1500	1470	1400
			1600	1600	1520	1580	1550	1475
1920	1810	1720						
1950	1850	1760						
						1950	1860	1760
			2000	2000	1920	2000	1920	1810
2000	1900	1810						
2000	1945	1850						
			2000	2000	2000	2000	1950	1850
						2000	2000	1900
2280	2200	2100						
2400	2310	2170						
						2400	2270	2160
			2500	2450	2350	2500	2380	2270
2394	2310	2205						
2500	2430	2280						
						2500	2390	2270
			2500	2500	2460	2500	2500	2380

Installation

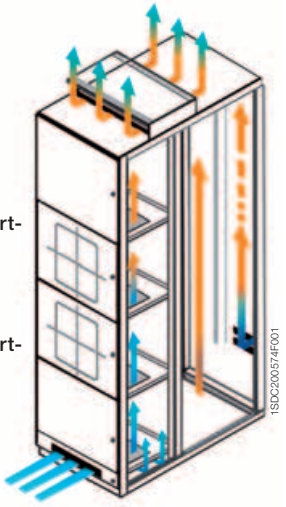
Performance in switchgear

The following tables provide an indication of the performance of the apparatus inside the switchgear. The data shown are a summary of software model simulations and real tests.

SACE Emax 2 E4.2 N S H V Circuit-breaker Switchgear dimensions 2200x800xx900 (HxLxD)



IP	Iu	Connection [mm]	Compartment	Environment temperature			Environment temperature		
				35 °C	45 °C	55 °C	35 °C	45 °C	55 °C
IP31	2000	2x80x10	1	2000	2000	2000	2000	2000	2000
	2500	2x100x10	1	2500	2450	2400	2500	2500	2500
	3200	3x100x10	1	3050	2900	2755	3200	3080	2920
	3200	3x100x10*	1	3200	3050	2850	3200	3200	3020
	4000	4x100x10	1	3450	3200	2970	3650	3400	3200

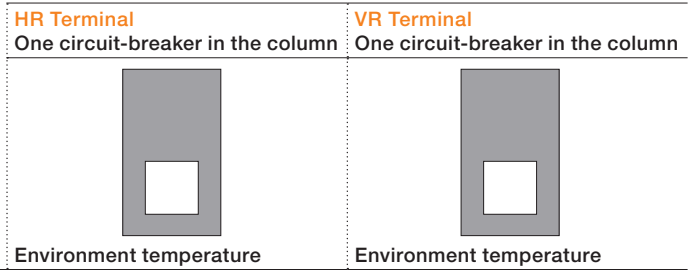


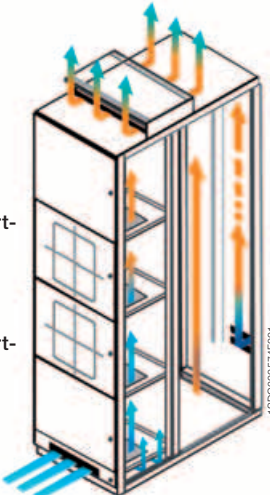
6

* Performances refer to withdrawable circuit-breakers with a fixed part accessorized with three stab rear terminals for 4000A (Example: 1SDA074021R1 - KIT VR 4000A)
Performances with F and FL terminals can be compared to the performances of circuit-breaker with HR terminal.

The following tables provide an indication of the performance of the apparatus inside the switchgear. The data shown are a summary of software model simulations and real tests.

SACE Emax 2 E6.2 H V X Circuit-breaker
Switchgear dimensions 2200x1200x900 (HxLxD)



IP	lu	Connection [mm]	Compartment	Environment temperature			Environment temperature		
				35 °C	45 °C	55 °C	35 °C	45 °C	55 °C
IP31 	4000	4x100x10	1	4000	4000	4000	4000	4000	4000
	5000	5x100x10	1	5000	5000	4900	5000	5000	5000
	6300	7x100x10	1	5650	5350	4850	6000	5700	5250

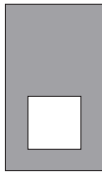
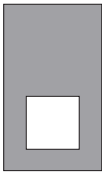
Performances with F and FL terminals can be compared to the performances of circuit-breaker with HR terminal.

Installation

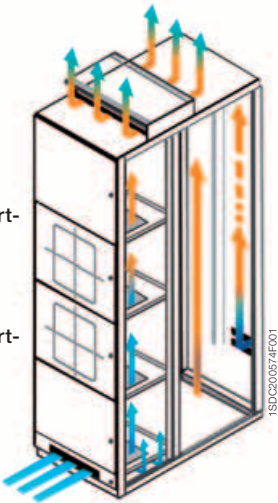
Performance in switchgear

The following tables provide an indication of the performance of the apparatus inside the switchgear. The data shown are a summary of software model simulations and real tests.

SACE Emax 2 E1.2 L Circuit-breaker Switchgear dimensions 2200x400x600 (HxLxD)

HR Terminal One circuit-breaker in the column	VR Terminal One circuit-breaker in the column
	
Environment temperature	

IP	Iu	Connection [mm]	Compartment	Environment temperature			Environment temperature		
				35 °C	45 °C	55 °C	35 °C	45 °C	55 °C
IP31	630	2x40x5	1	630	630	630	630	630	630
	800	2x50x5	1	800	800	800	800	800	800
	1000	2x50x10	1	1000	1000	950			
		2x50x8					1000	1000	1000
	1250	2x50x10	1	1250	1125	955			
		2x50x8	1				1250	1205	1050



6

Performances with EF, SHR and F terminals can be compared, with the same connection sections, to the performances of circuit-breaker with HR terminal.
 Performances with ES terminals can be compared to the VR terminals.
 Performances with FC CuAl terminals, with cables in the prescribed sections, can be compared to HR performances

Dimensions

Fixed circuit-breaker	7/2
------------------------------	------------

E1.2	7/4
E2.2	7/8
E4.2	7/12
E6.2	7/14

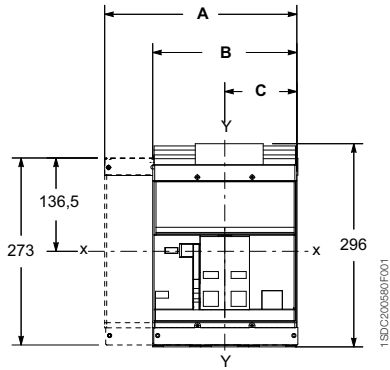
Withdrawable circuit-breaker	7/18
-------------------------------------	-------------

E1.2	7/20
E2.2	7/24
E4.2	7/28
E6.2	7/30

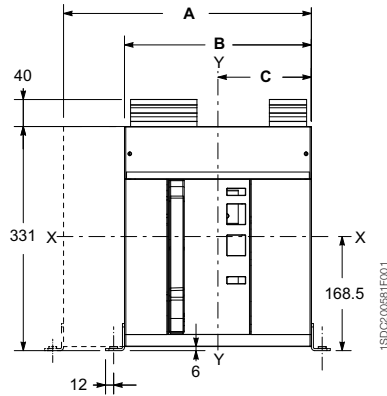
Dimensions

Fixed circuit-breaker

E1.2



E2.2 - E4.2 - E6.2

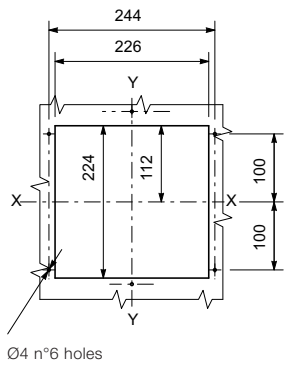


	A	B	C	
[mm]	4p	3p	3p	4p
E1.2	280	210	103.6	103.6
E2.2	366	276	138	138
E4.2	510	384	192	192
E6.2	888	762	318	444
E6.2/f	1014	-	-	444

7

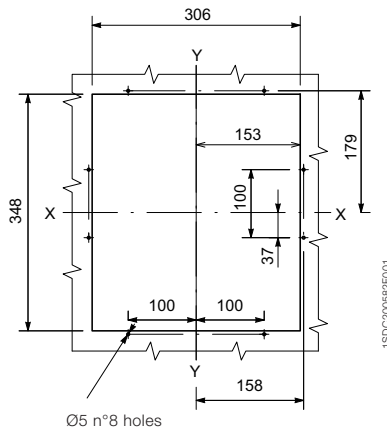
Compartment door drilling

E1.2



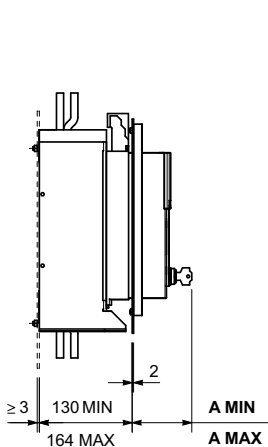
Ø4 n°6 holes

E2.2 - E4.2 - E6.2

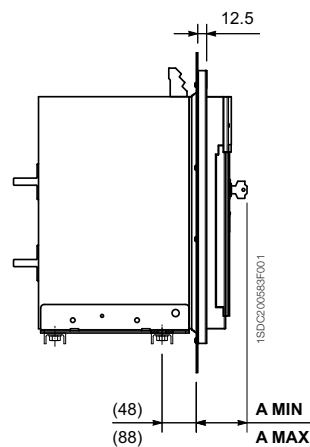


Ø5 n°8 holes

E1.2



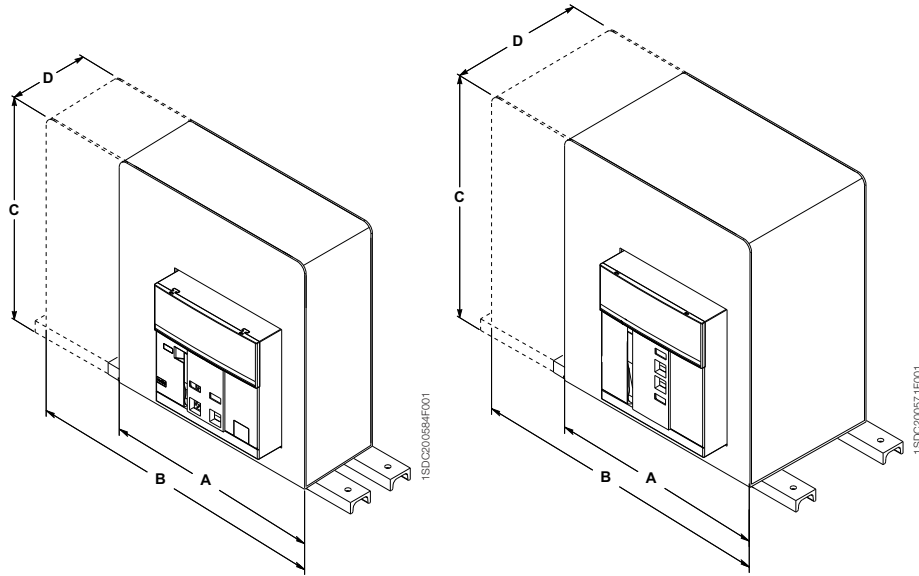
E2.2 - E4.2 - E6.2



E1.2	Standard	Ronis/Profalux	Kirk	Castell
A MIN [mm]	49.5	63.5	63.5	83.5
A MAX [mm]	83.5	97.5	97.5	117.5

E2.2-E4.2-E6.2	Standard	Ronis/Profalux	Kirk	Castell
A MIN [mm]	31	41.5	45.5	-
A MAX [mm]	71	81.5	85.5	-

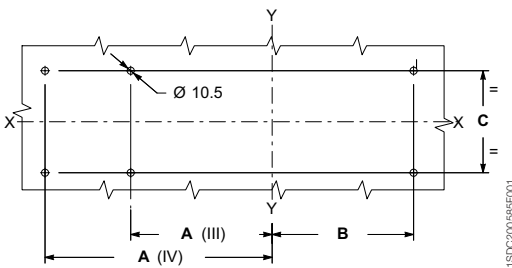
Dimensions of the compartment



[mm]	A	B	C	D
E1.2	250	322	382.5 *	130
E2.2	400	490	500	221
E4.2	500	600	500	221
E6.2	900	1000	500	221
E6.2/f	-	1200	500	221

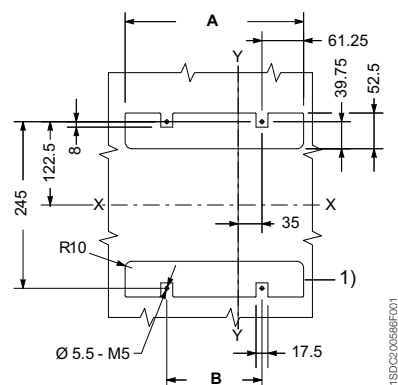
* 332.5 for voltages ≤ 440V AC

Floor fixing



[mm]	A	B	C
E1.2	117	187	80
E2.2	154	244	150
E4.2	208	334	150
E6.2	460	460	150
E6.2/f	-	586	150

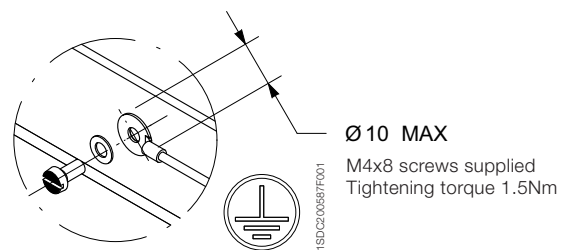
Wall fixing (only for E1.2)



[mm]	3 p	4 p
A	192.5	262.5
B	70	140

1) for fixing with rear terminals

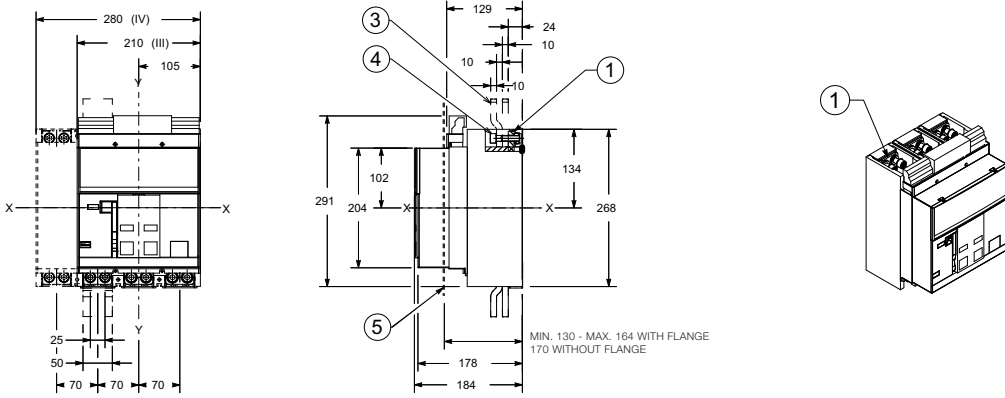
Earthing device E2.2 - E4.2 - E6.2



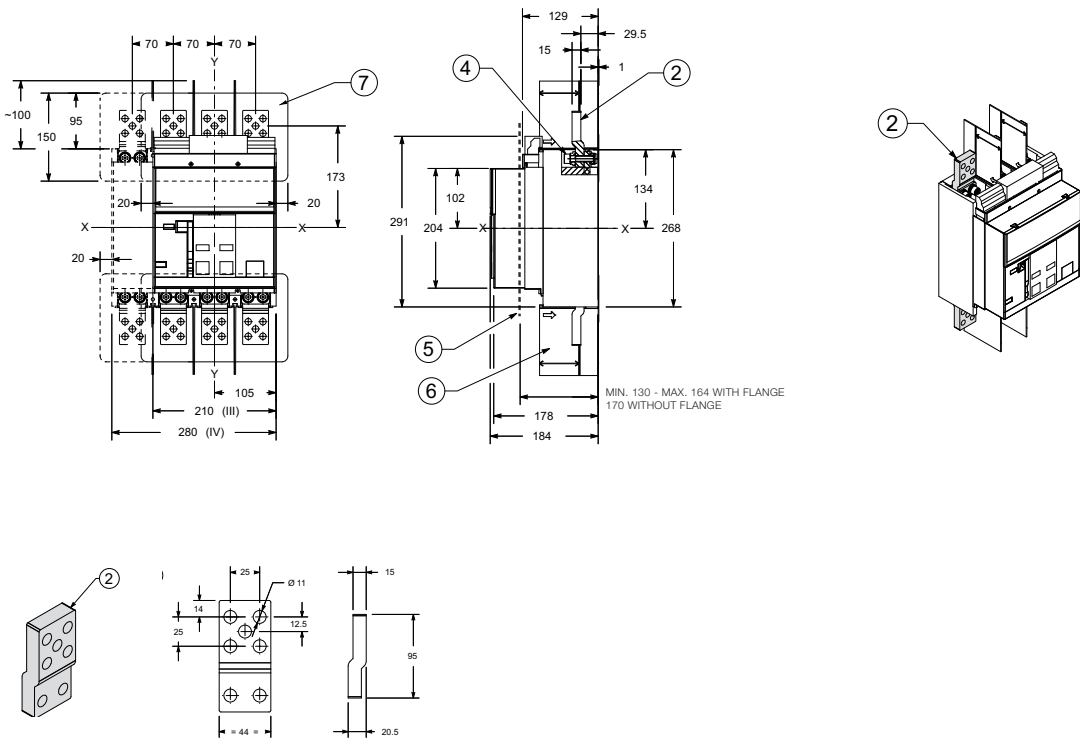
Dimensions

Fixed circuit-breaker - E1.2

Front terminals - F



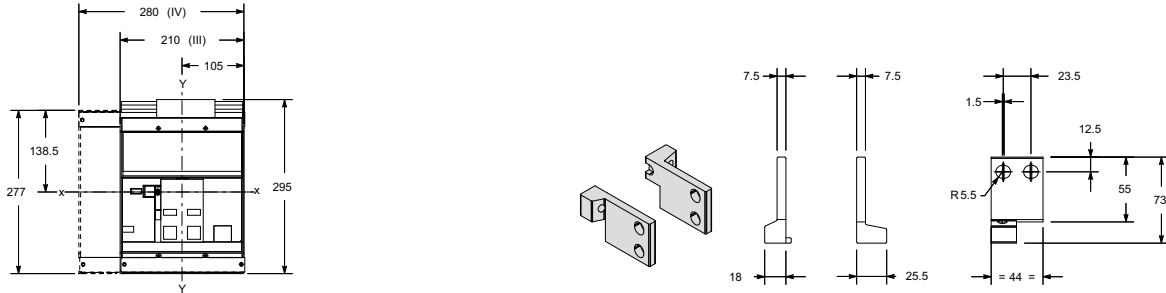
Extended front terminals - EF



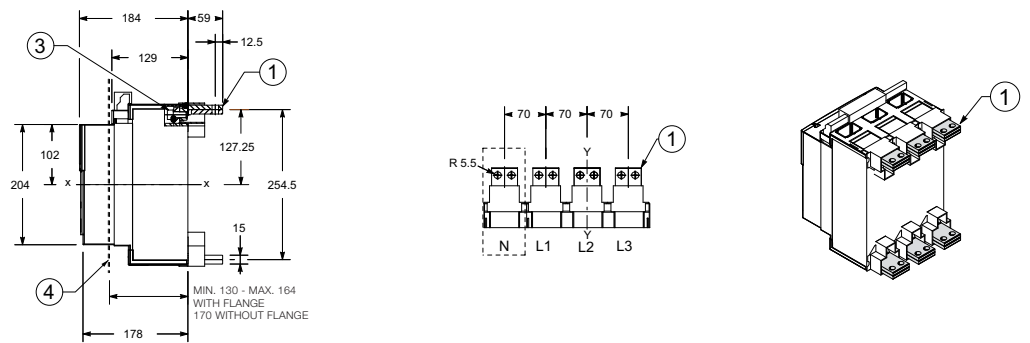
Key

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

Orientable rear terminals - HR/VR

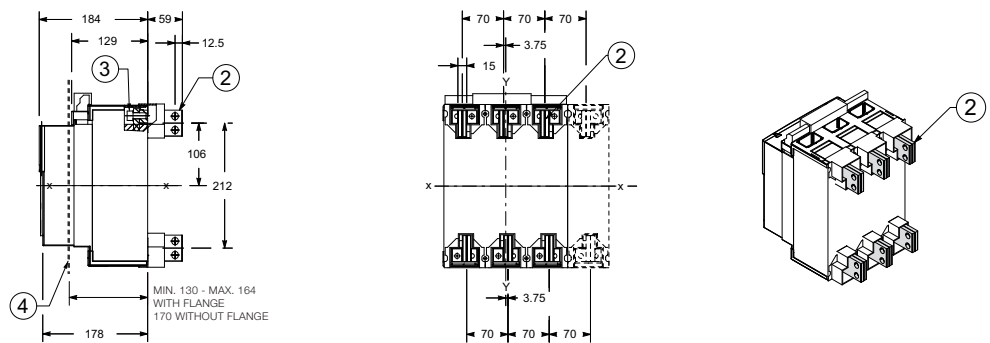


Terminals HR



7

Terminals VR



Key

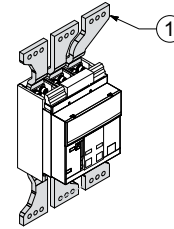
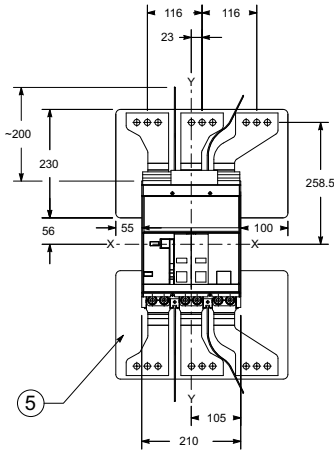
- 1 Horizontal orientable terminals HR
- 2 Vertical orientable terminals VR
- 3 Tightening torque 20Nm
- 4 Door position - Ref. page 7/2

1SDC200595F001

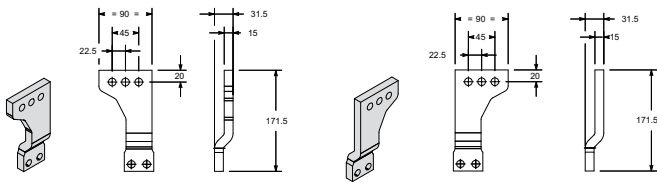
Dimensions

Fixed circuit-breaker - E1.2

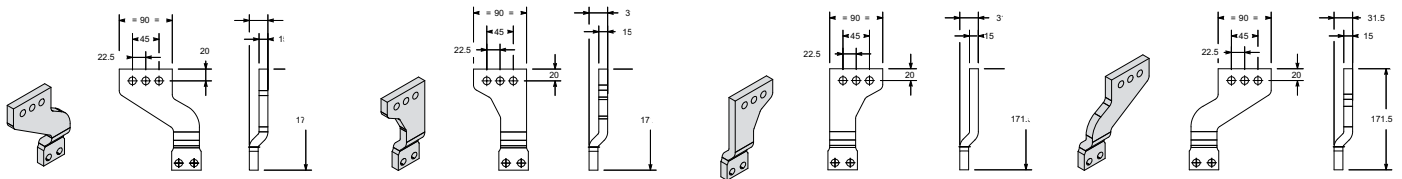
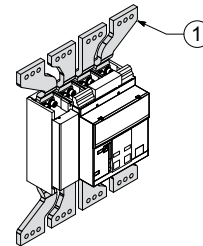
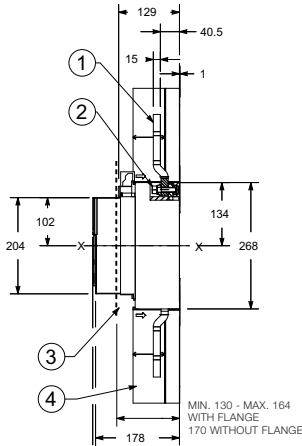
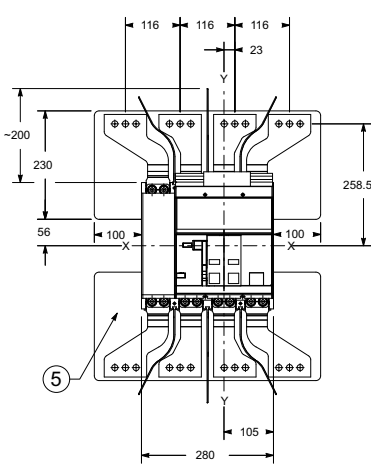
Splayed extended front terminals - ES 3-pole version



7



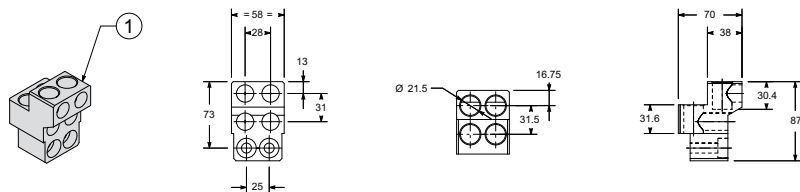
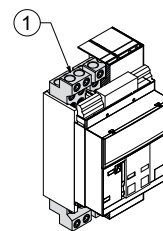
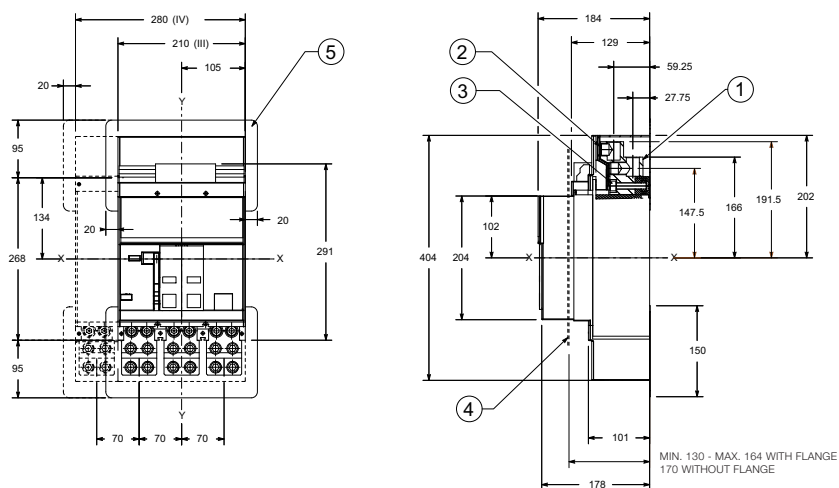
4-pole version



Key

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

Front terminals for cables – FcCuAl



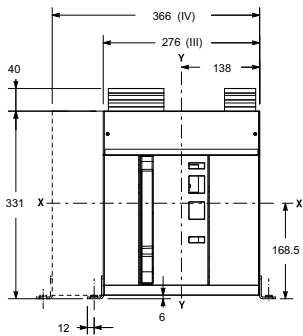
Key

- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Front terminals for cables FC CU AL 2 Tightening torque 43Nm 3 Tightening torque 18Nm | <ul style="list-style-type: none"> 4 Door position - Ref. page 7/2 5 Obligatory insulating plate to be supplied by the customer |
|---|---|

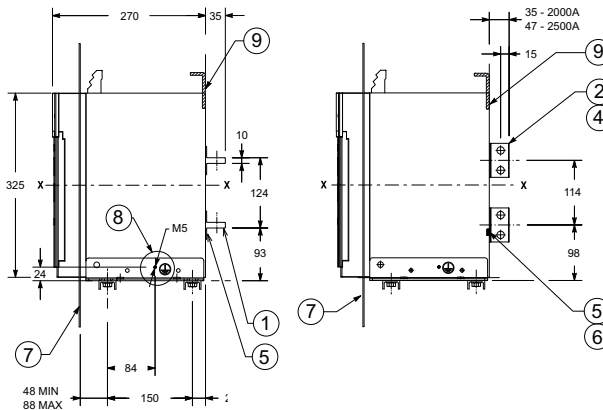
Dimensions

Fixed circuit-breaker - E2.2

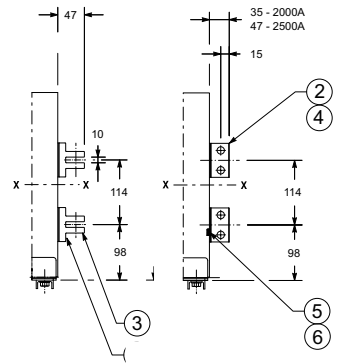
Orientable rear terminals - HR/VR



E2.2 B/N/S/H 2000A

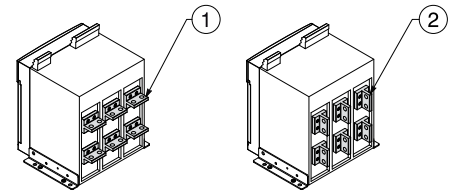
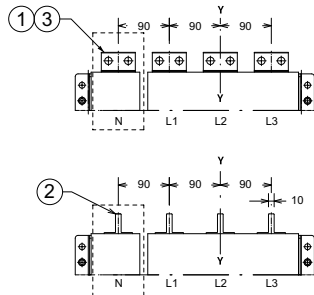
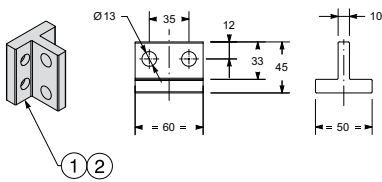


E2.2 N/S/H 2500A

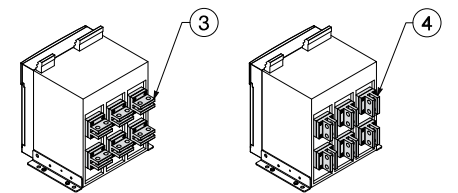
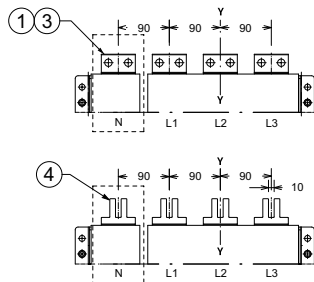
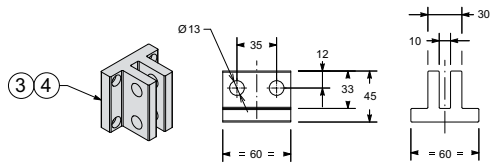


E2.2 B/N/S/H 2000A

7



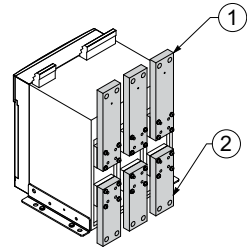
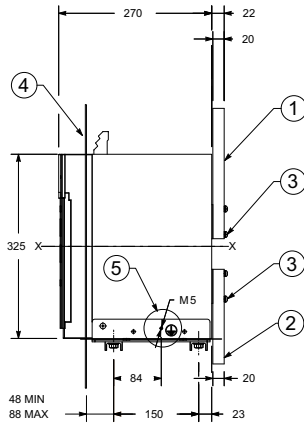
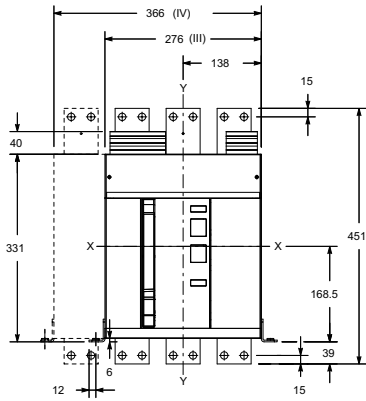
E2.2 N/S/H 2500A



Key

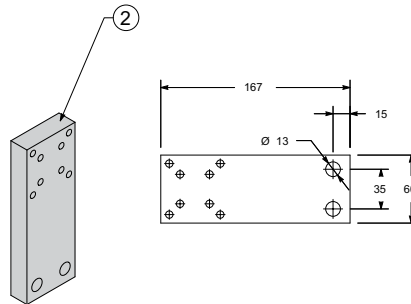
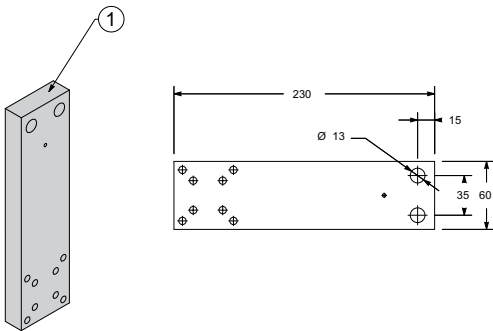
- | | | |
|------------------------------|---------------------------------|-----------------------------------|
| 1 Horizontal terminals 2000A | 4 Vertical terminals 2500A | 7 Door position - Ref. page 7/2 |
| 2 Vertical terminals 2000A | 5 Tightening torque 2000A 8.6Nm | 8 Earthing device - Ref. page 7/3 |
| 3 Horizontal terminals 2500A | 6 Tightening torque 2500A 8.6Nm | 9 Insulating wall |

Front terminals – F



Upper front terminals – F

Lower front terminals – F



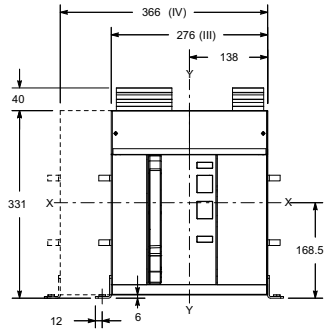
Key

- 1 Upper front terminals
- 2 Lower front terminals
- 3 Tightening torque 8.6Nm
- 4 Door position - Ref. page 7/2
- 5 Earthing device - Ref. page 7/3

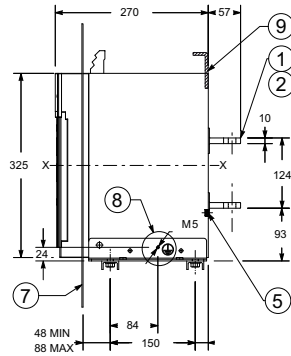
Dimensions

Fixed circuit-breaker - E2.2

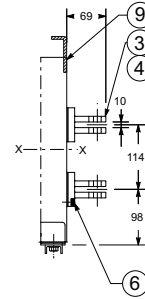
Horizontal spread terminals – SHR



E2.2 B/N/S/H 2000A

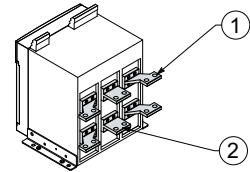
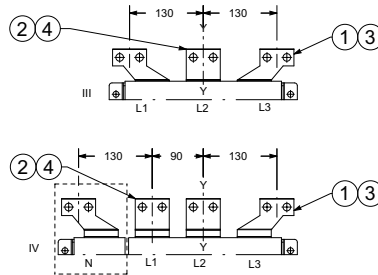
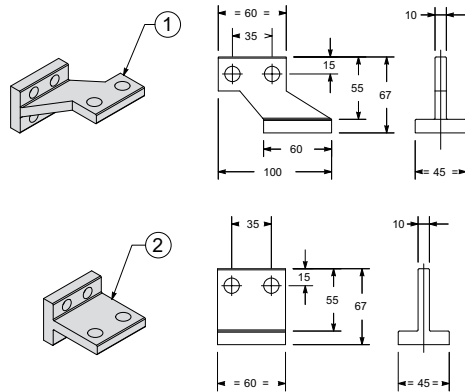


E2.2 N/S/H 2500A

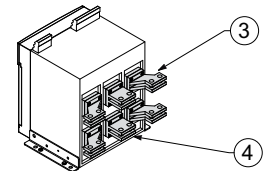
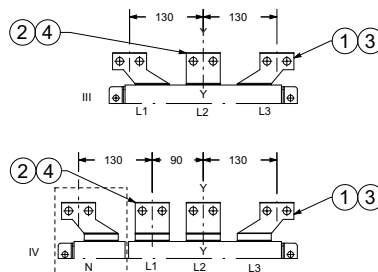
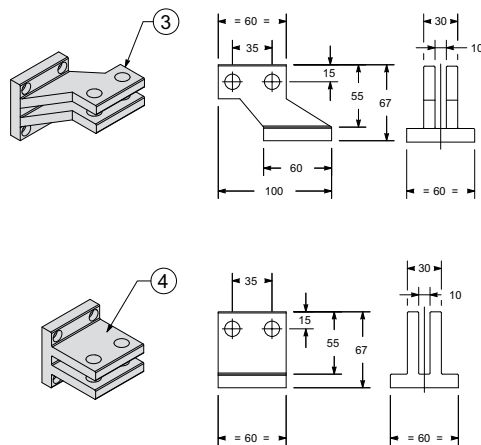


E2.2 B/N/S/H 2000A

7



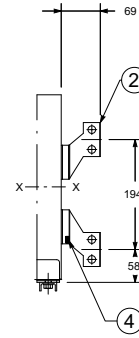
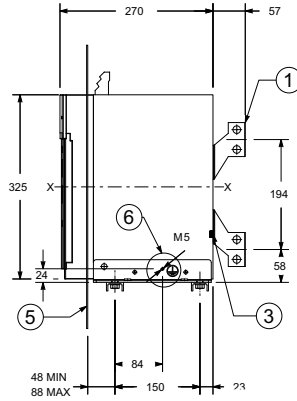
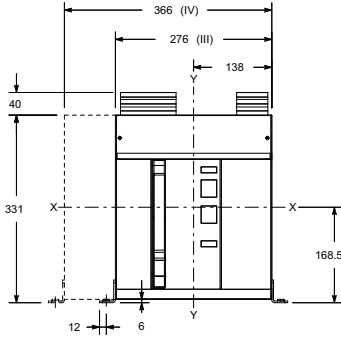
E2.2 N/S/H 2500A



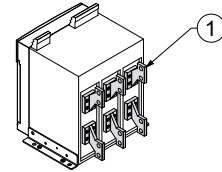
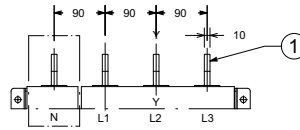
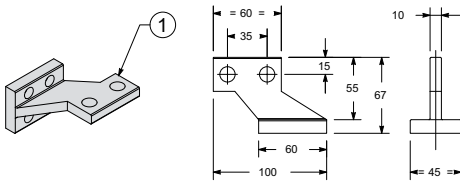
Key

- | | | |
|--|--|-----------------------------------|
| 1 Side horizontal splayed terminals 2000A | 4 Central horizontal splayed terminals 2500A | 7 Door position - Ref. page 7/2 |
| 2 Central horizontal splayed terminals 2000A | 5 Tightening torque 2000A 8.6Nm | 8 Earthing device - Ref. page 7/3 |
| 3 Side horizontal splayed terminals 2500A | 6 Tightening torque 2500A 8.6Nm | 9 Insulating wall |

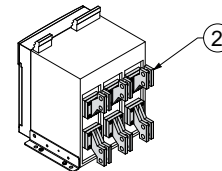
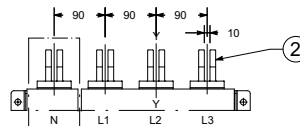
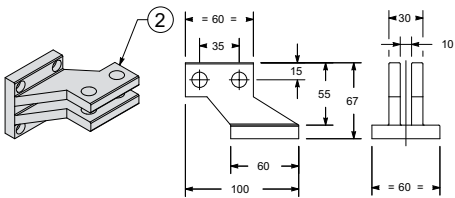
Vertical spread terminals – SVR



E2.2 B/N/S/H 2000A



E2.2 N/S/H 2500A



Key

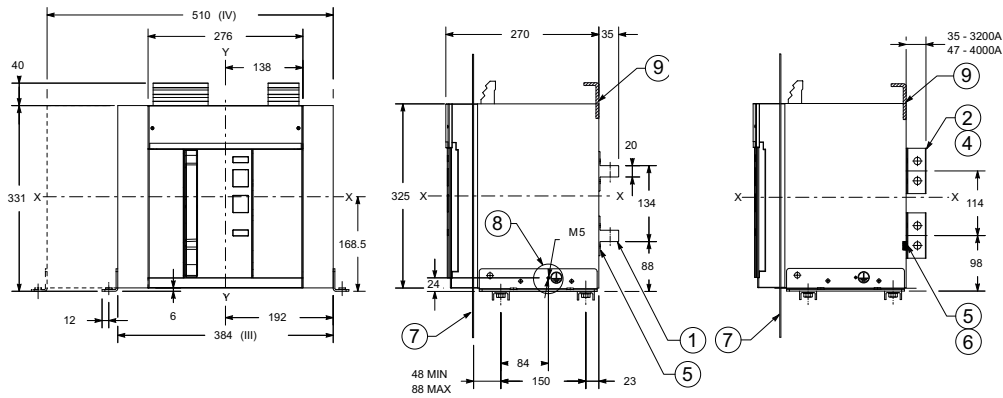
- | | |
|------------------------------------|-----------------------------------|
| 1 Vertical splayed terminals 2000A | 4 Tightening torque 2500A 8.6Nm |
| 2 Vertical splayed terminals 2500A | 5 Door position - Ref. page 7/2 |
| 3 Tightening torque 2000A 8.6Nm | 6 Earthing device - Ref. page 7/3 |

Dimensions

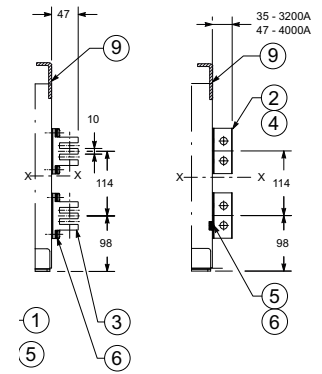
Fixed circuit-breaker - E4.2

Orientable rear terminals - HR/VR

E4.2 N/S/H/V 3200A

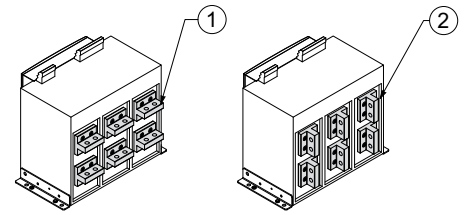
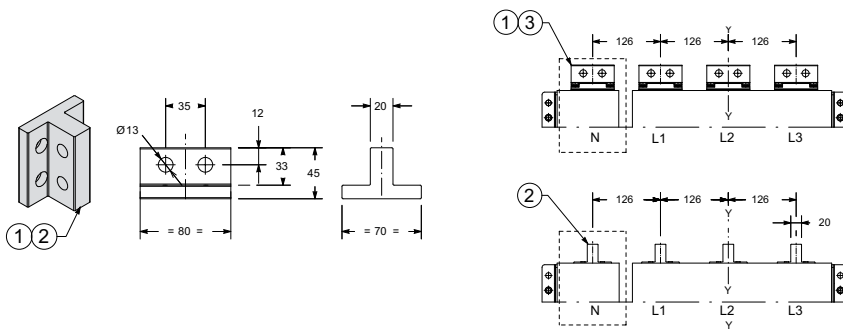


E4.2 N/S/H/V 4000A

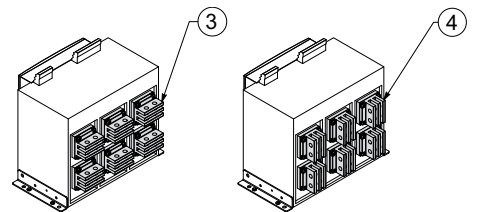
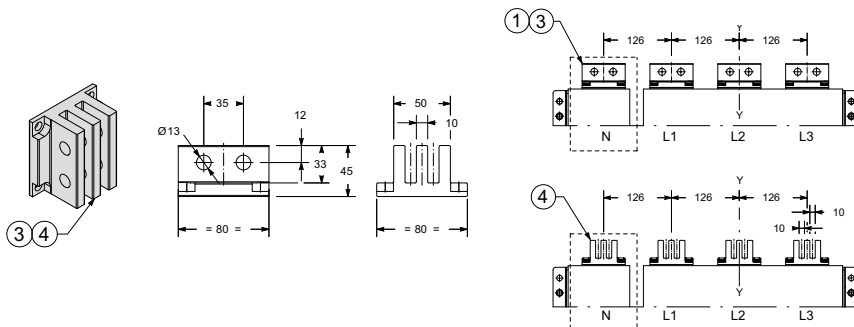


E4.2 N/S/H/V 3200A

7



E4.2 N/S/H/V 4000A



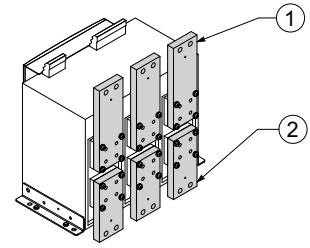
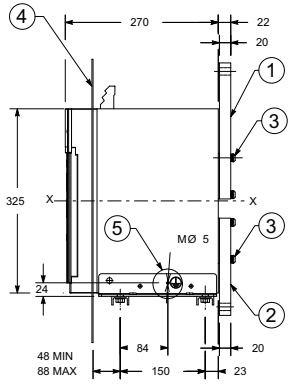
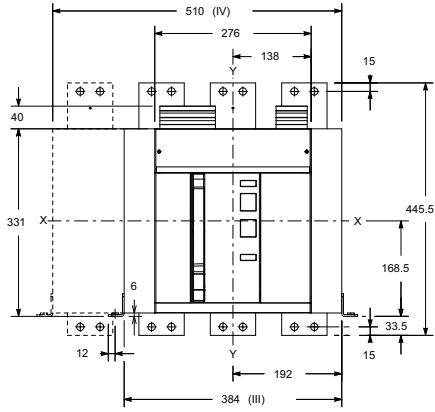
Key

- 1 Horizontal terminals 3200A
- 2 Vertical terminals 3200A
- 3 Horizontal terminals 4000A

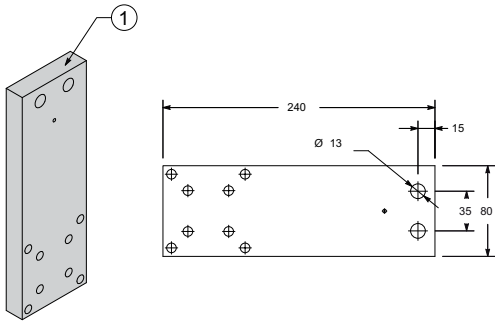
- 4 Vertical terminals 4000A
- 5 Tightening torque 3200A 20Nm
- 6 Tightening torque 4000A 20Nm

- 7 Door position - Ref. page 7/2
- 8 Earthing device - Ref. page 7/3
- 9 Insulating wall

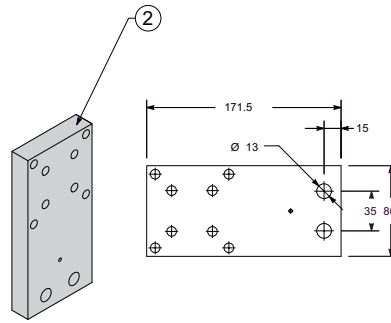
Front terminals – F



Upper front terminals



Lower front terminals



Key

- 1 Upper front terminals
- 2 Lower front terminals
- 3 Tightening torque 20Nm
- 4 Door position - Ref. page 7/2
- 5 Earthing device - Ref. page 7/3

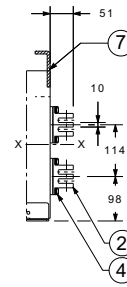
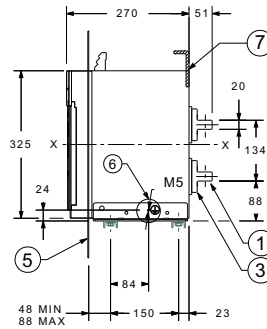
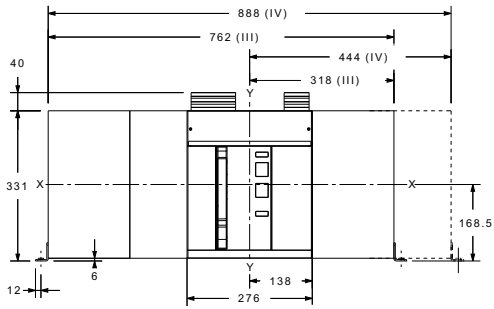
Dimensions

Fixed circuit-breaker - E6.2

Horizontal rear terminals – HR

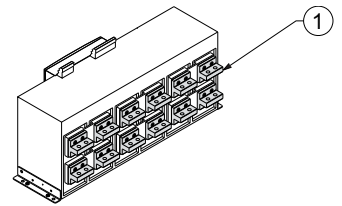
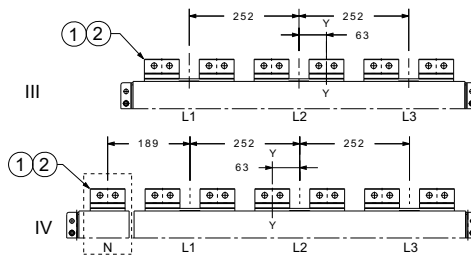
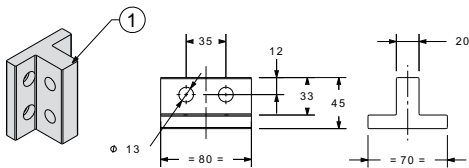
E6.2 H/V/X 5000A

E6.2 H/V/X 6300A

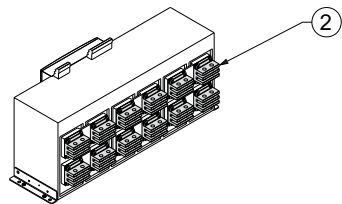
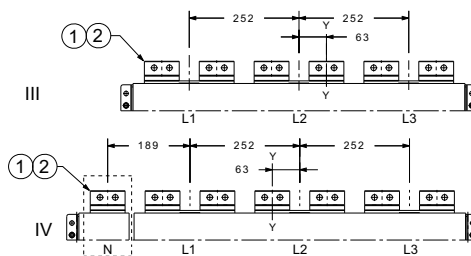
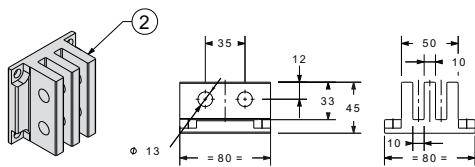


E6.2 H/V/X 5000A

7



E6.2 H/V/X 6300A

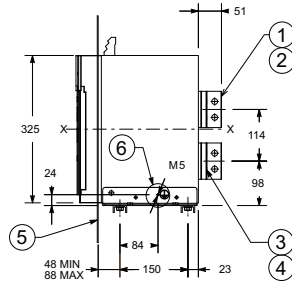
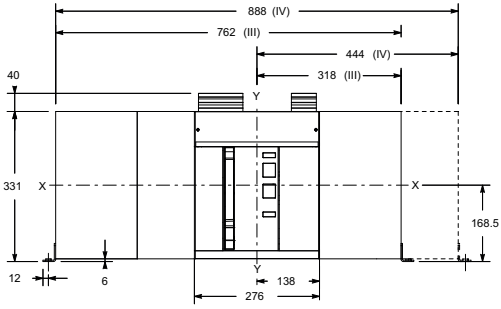


Key

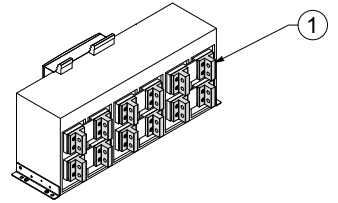
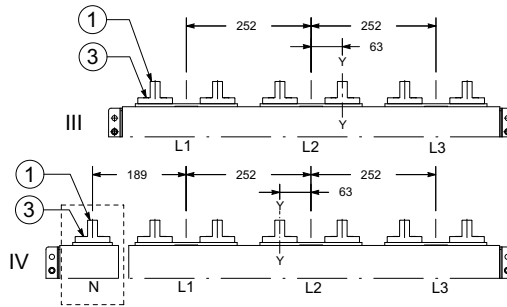
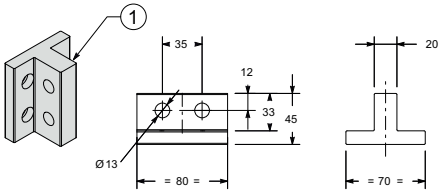
- | | |
|--------------------------------|-----------------------------------|
| 1 Horizontal terminals 5000A | 5 Door position - Ref. page 7/2 |
| 2 Horizontal terminals 6300A | 6 Earthing device - Ref. page 7/3 |
| 3 Tightening torque 5000A 20Nm | 7 Insulating wall |
| 4 Tightening torque 6300A 20Nm | |

Vertical rear terminals – VR

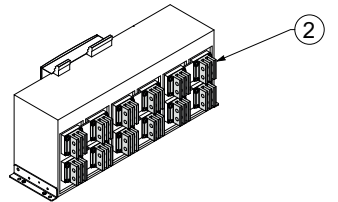
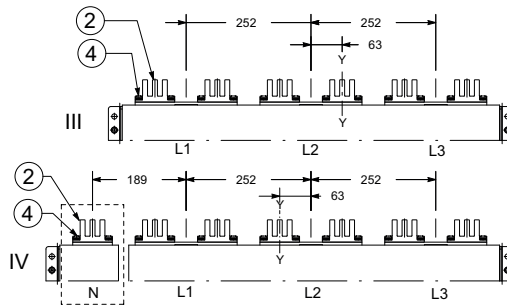
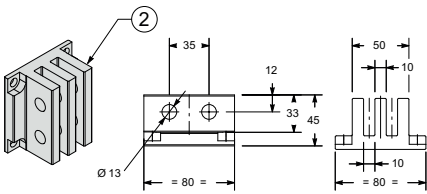
E6.2 H/V/X 5000...6300A



E6.2 H/V/X 5000A



E6.2 H/V/X 6300A



Key

- 1 Vertical terminals 5000A
- 2 Vertical terminals 6300A
- 3 Tightening torque 5000A 20Nm
- 4 Tightening torque 6300A 20Nm
- 5 Door position - Ref. page 7/2
- 6 Earthing device - Ref. page 7/3

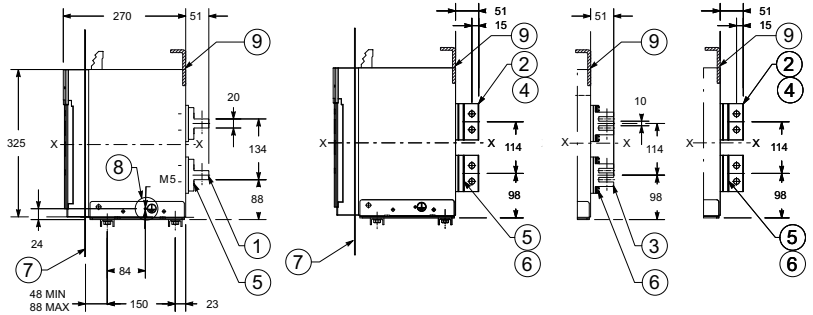
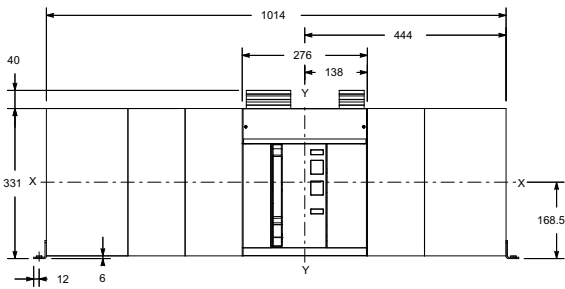
Dimensions

Fixed circuit-breaker - E6.2

Orientable rear terminals - HR/VR full size

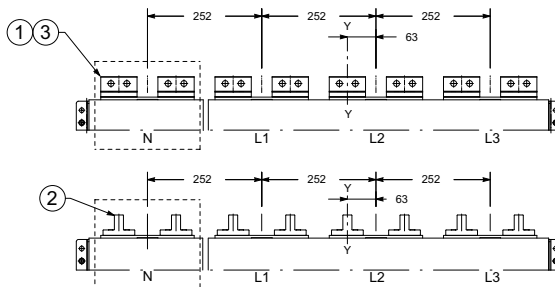
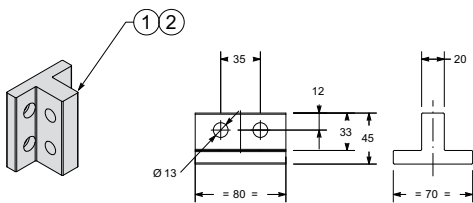
E6.2 H/V/X 5000A

E6.2 H/V/X 6300A

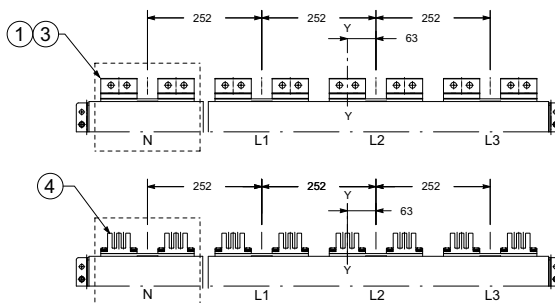
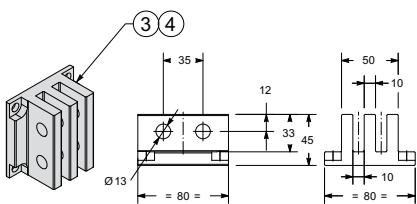


E6.2 H/V/X 5000A

7



E6.2 H/V/X 6300A



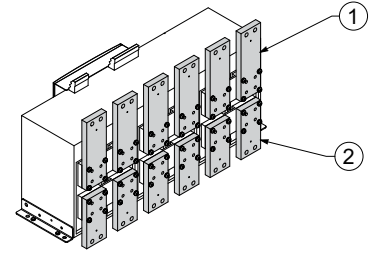
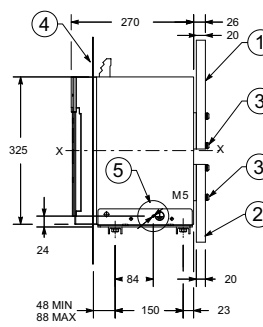
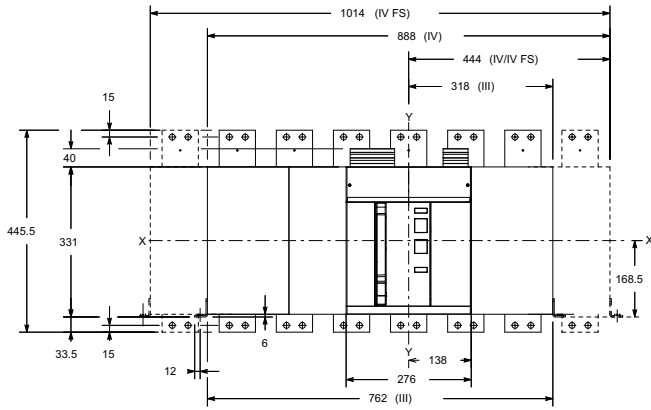
Key

- 1 Horizontal terminals 5000A
- 2 Vertical terminals 5000A
- 3 Horizontal terminals 6300A

- 4 Vertical terminals 6300A
- 5 Tightening torque 5000A 20Nm
- 6 Tightening torque 6300A 20Nm

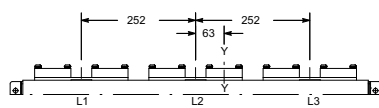
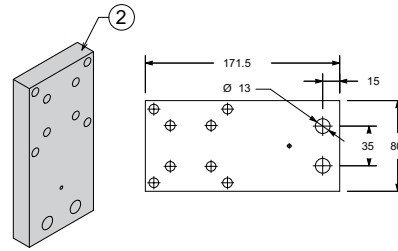
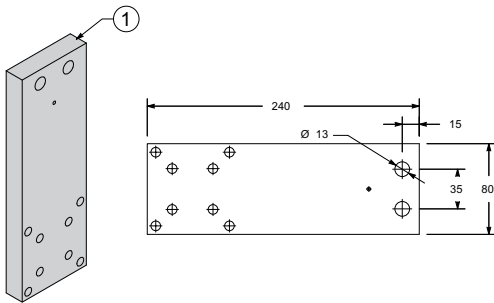
- 7 Door position - Ref. page 7/2
- 8 Earthing device - Ref. page 7/3
- 9 Insulating wall

Front terminals – F

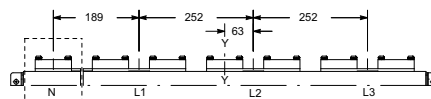


Upper front terminals

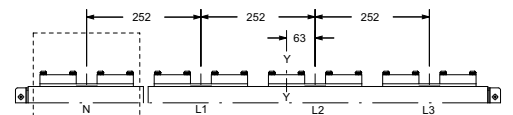
Lower front terminal



3-pole



4-pole



4-pole full size

Key

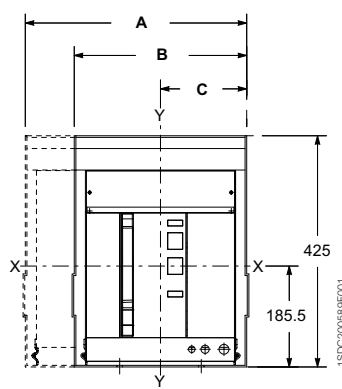
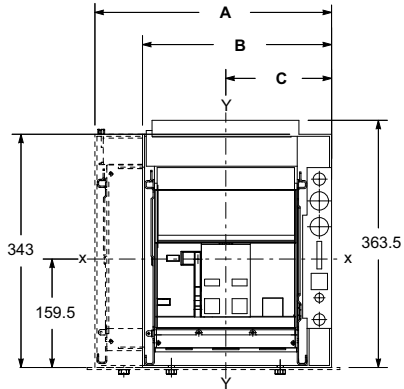
- 1 Upper front terminals
- 2 Lower front terminals
- 3 Tightening torque 20Nm
- 4 Door position - Ref. page 7/2
- 5 Earthing device - Ref. page 7/3

Dimensions

Withdrawable circuit-breaker

E1.2

E2.2 - E4.2 - E6.2



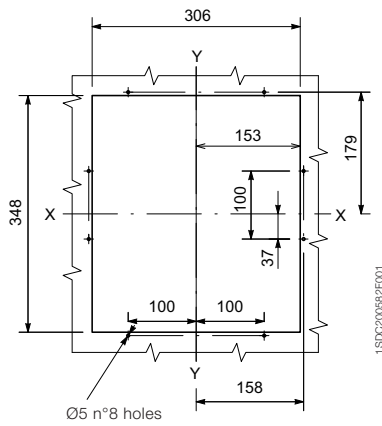
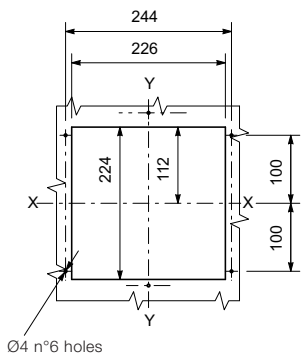
[mm]	A	B	C	
	4p	3p	3p	4p
E1.2	348	278	155.5	155.5
E2.2	407	317	158.5	158.5
E4.2	551	425	212.5	212.5
E6.2	929	803	338.5	464.5
E6.2/f	1055	-	-	464.5

7

Compartment door drilling

E1.2

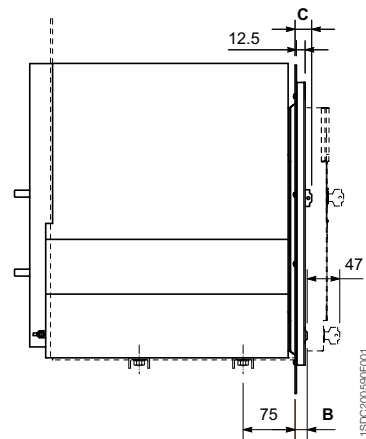
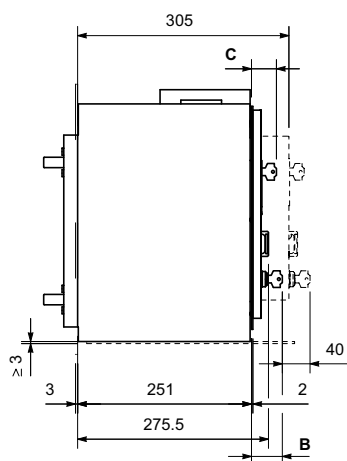
E2.2 - E4.2 - E6.2



Distance from connected to isolated position

E1.2

E2.2 - E4.2 - E6.2

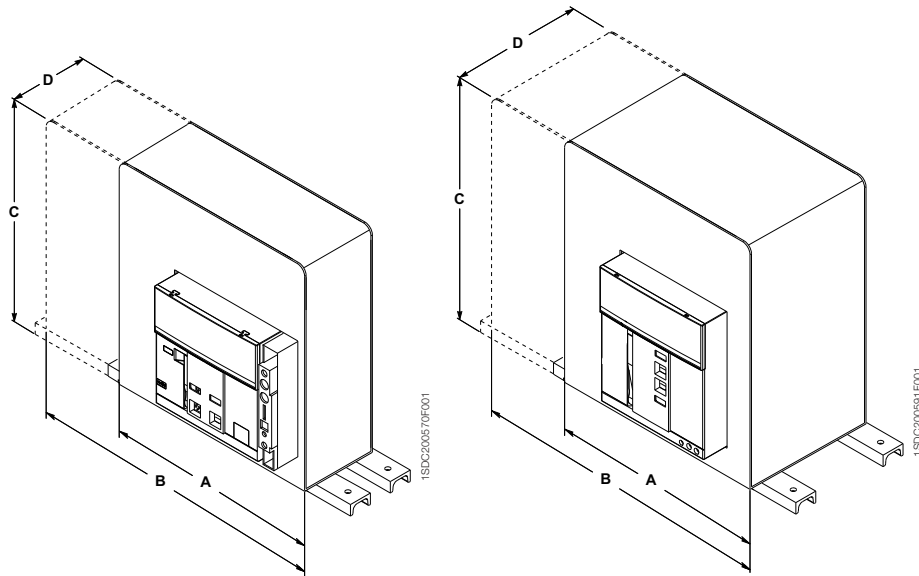


E1.2	Standard	Ronis/Profalux	Kirk	Castell
B [mm]	44.5	55	55	85
C [mm]	36	46.5	46.5	76.5

E2.2-E4.2-E6.2	Standard	Ronis/Profalux	Kirk	Castell
C [mm]	17.5	28	32	-
B [mm]	24	34.5	38.5	-

B refers to KLC; C refers to KLP

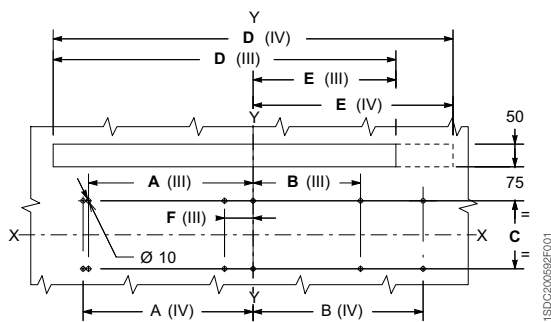
Dimensions of the compartment



[mm]	A	B	C	D
	3p	4p		
E1.2	280	350	440*	252
E2.2	400	490	500	355
E4.2	500	600	500	355
E6.2	900	1000	500	355
E6.2/f	-	1200	500	355

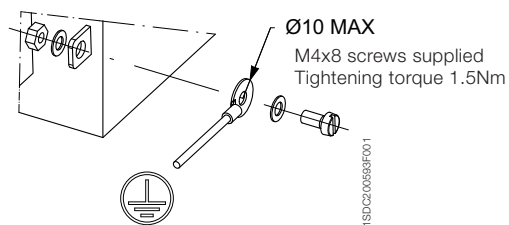
* 390 for voltages ≤ 440V AC

Floor fixing

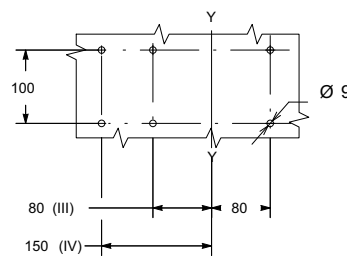


[mm]	A		B		C	D		E		F
	3p	4p	3p	4p		3p	4p	3p	4p	
E1.2	80	150	80	80	100	-	-	-	-	-
E2.2	75	170	75	80	150	270	360	135	135	-
E4.2	100	225	100	100	150	378	504	189	189	-
E6.2	363	375	237	375	150	756	882	315	441	63
E6.2/f	-	375	-	375	150	-	1008	-	441	0

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



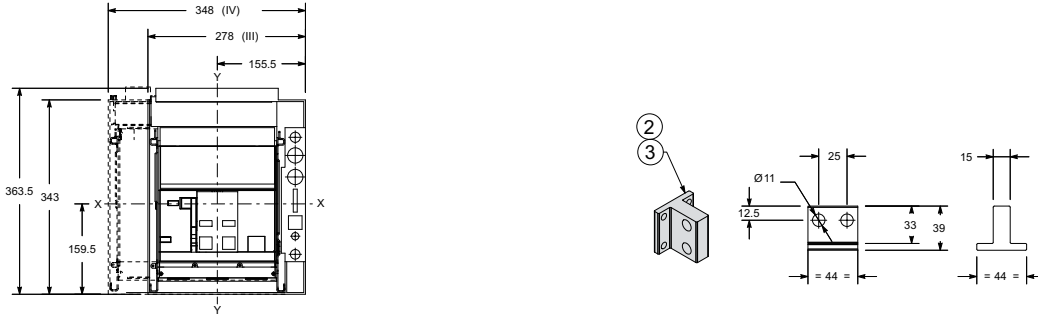
Fixing on support sheet (only for E1.2)



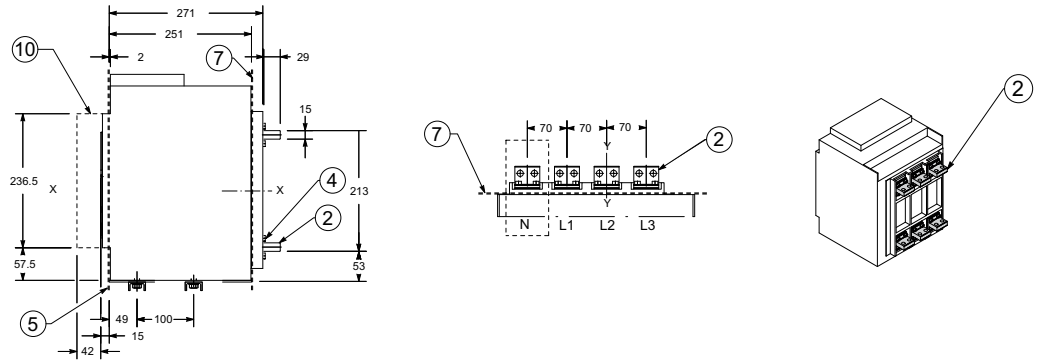
Dimensions

Withdrawable circuit-breaker - E1.2

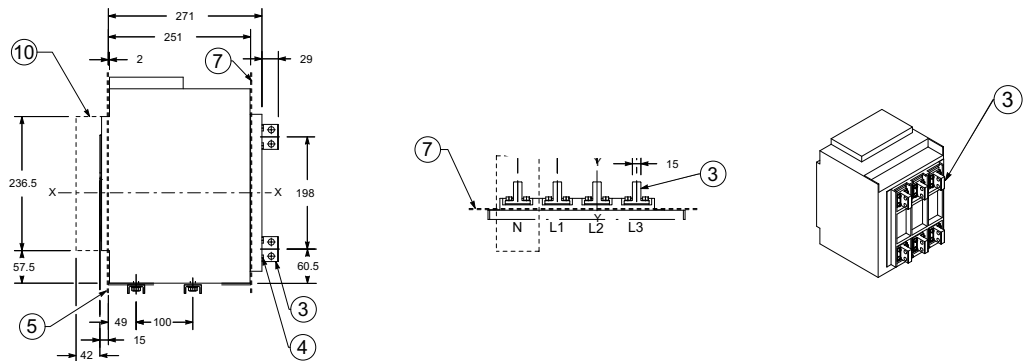
Rear orientable terminals - HR/VR



Terminals HR



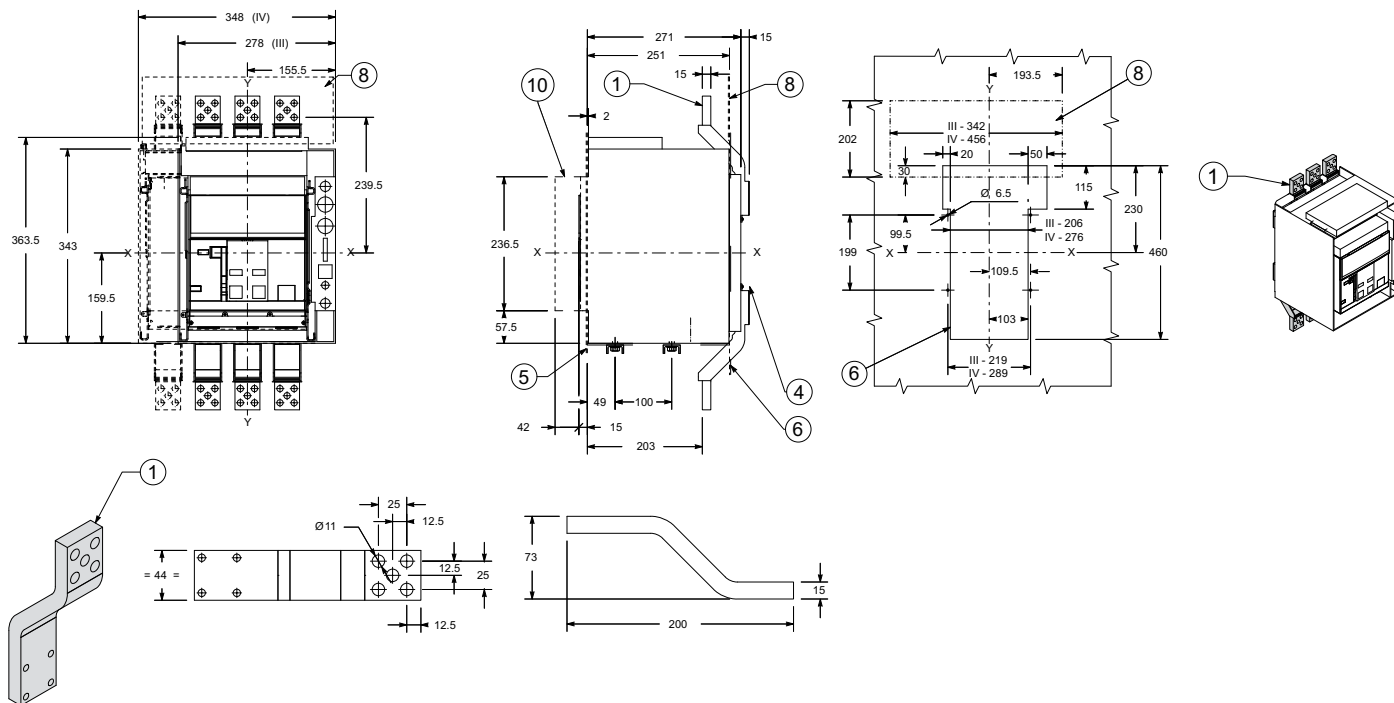
Terminals VR



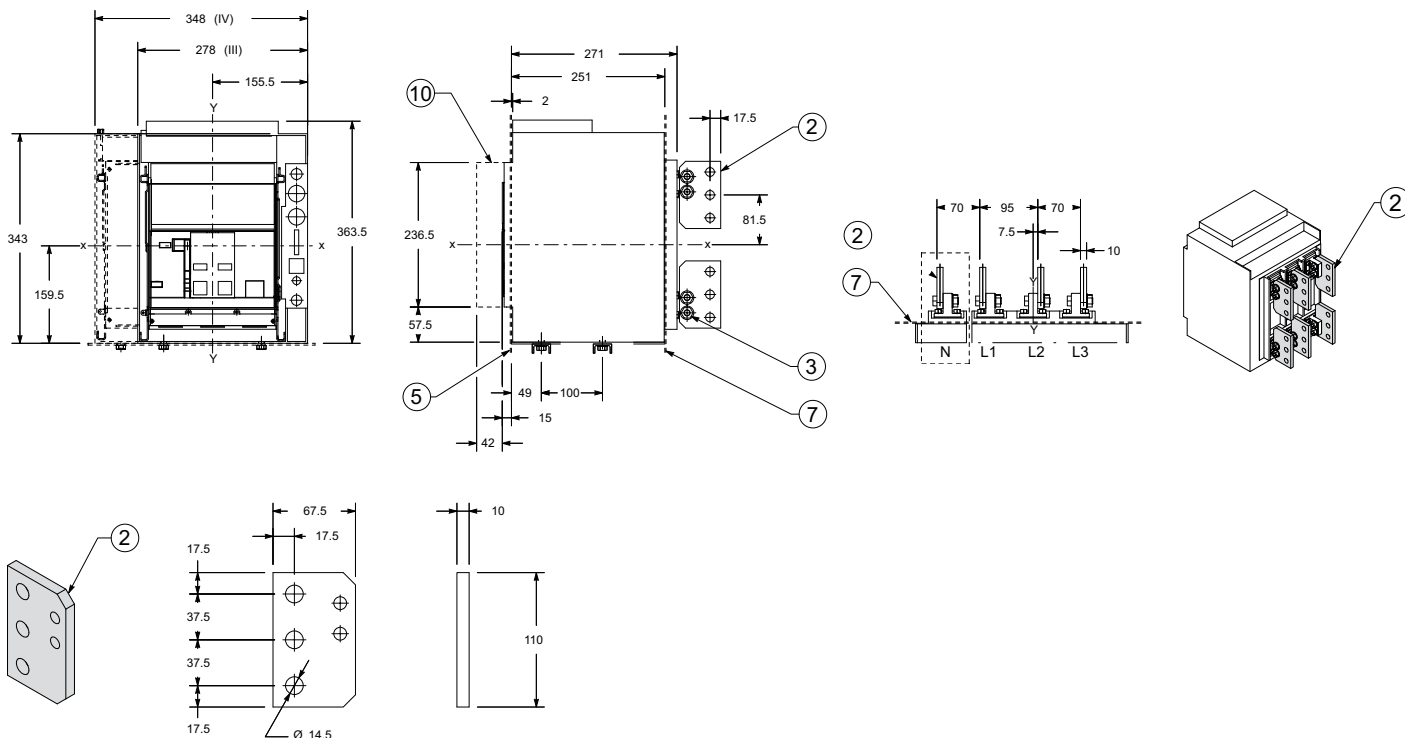
Key

- 2 Horizontal rear terminals
- 3 Vertical rear terminals
- 4 Tightening torque 12 Nm
- 5 Door position - Ref. page 7/18
- 7 Rear segregation for rear terminals
- 10 Isolating distance

Extended front terminals – EF



Rear terminals for cables – FcCuAl



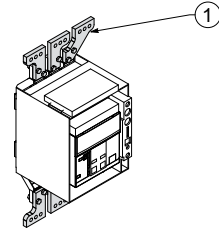
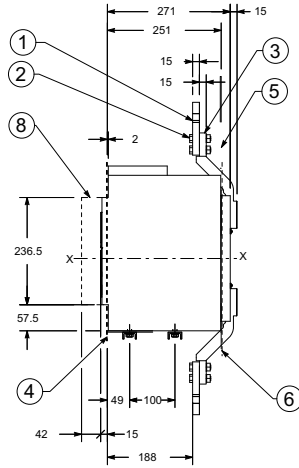
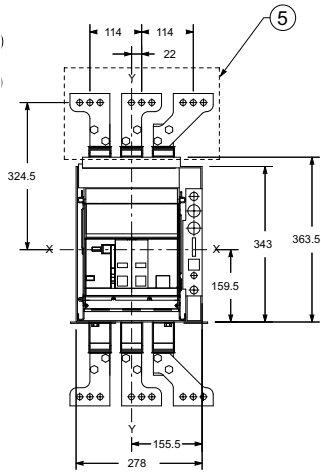
Key

- | | | |
|-----------------------------|--|---------------------------------------|
| 1 Front terminals | 4 Tightening torque 12 Nm | 7 Rear segregation for rear terminals |
| 2 Rear terminals for cables | 5 Door position - Ref. page 7/18 | 8 Insulating protection |
| 3 Tightening torque 48 Nm | 6 Rear segregation for front terminals | 10 Isolating distance |

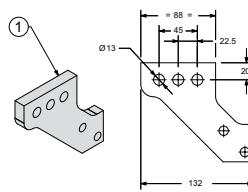
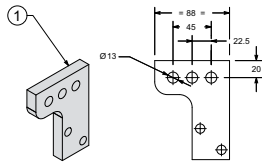
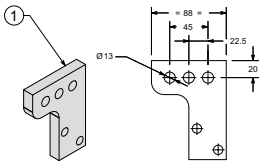
Dimensions

Withdrawable circuit-breaker - E1.2

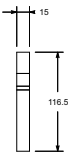
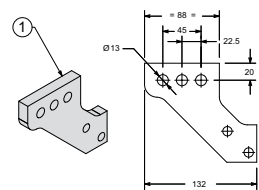
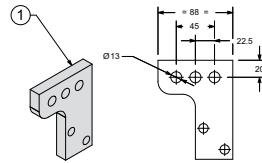
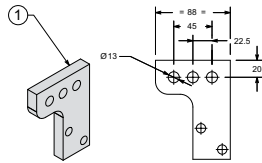
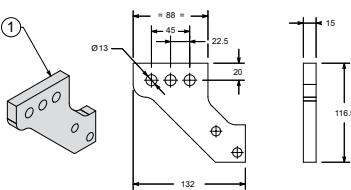
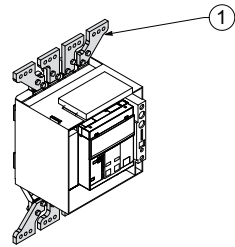
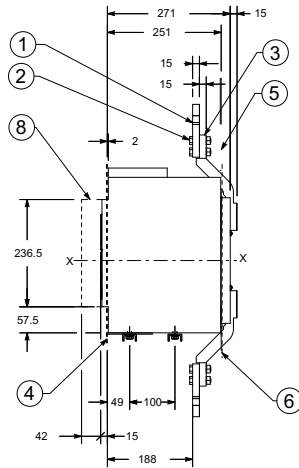
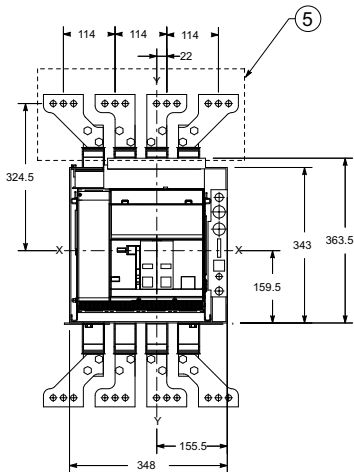
Front spread terminals - ES 3-pole version



7



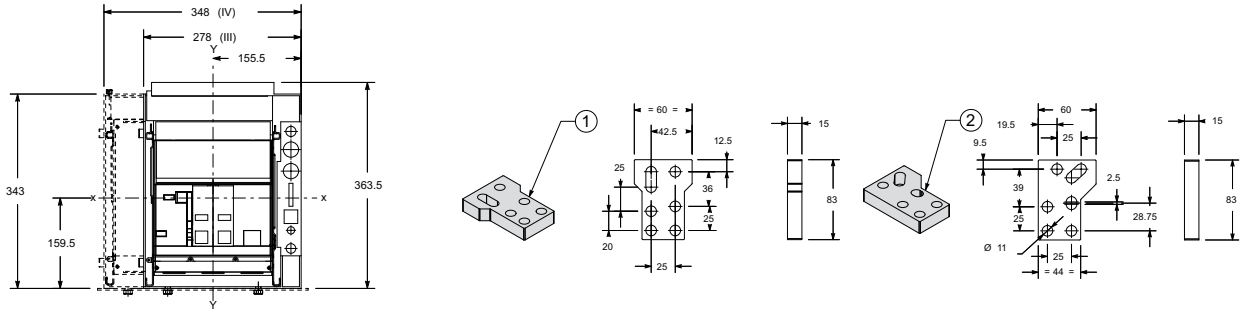
4-pole version



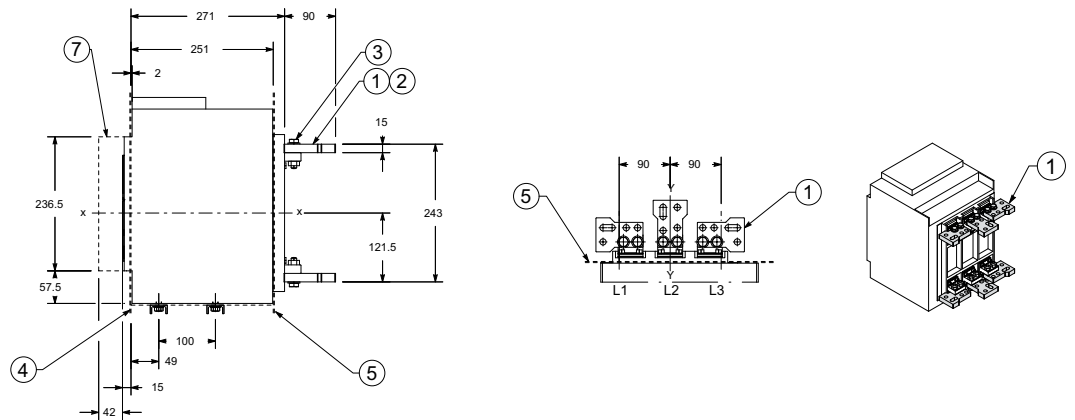
Key

- 1 Splayed terminal
- 2 Tightening torque 40 Nm
- 3 Front terminal
- 4 Door position - Ref. page 7/18
- 5 Insulating protection (refer to front terminals page 7/21)
- 6 Rear segregation for front terminals
- 8 Isolating distance

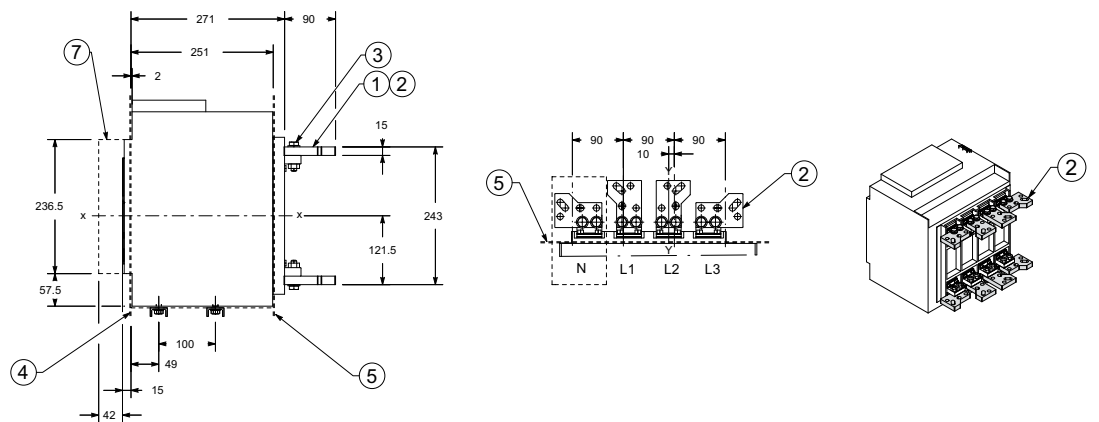
Horizontal rear spread terminals – SHR



3-pole version



4-pole version



Key

- | | |
|---|--------------------------------------|
| 1 Splayed rear terminals for 3-pole version | 4 Door position - Ref. page 7/18 |
| 2 Splayed rear terminals for 4-pole version | 5 Rear segregation of rear terminals |
| 3 Tightening torque 18 Nm | 7 Isolating distance |

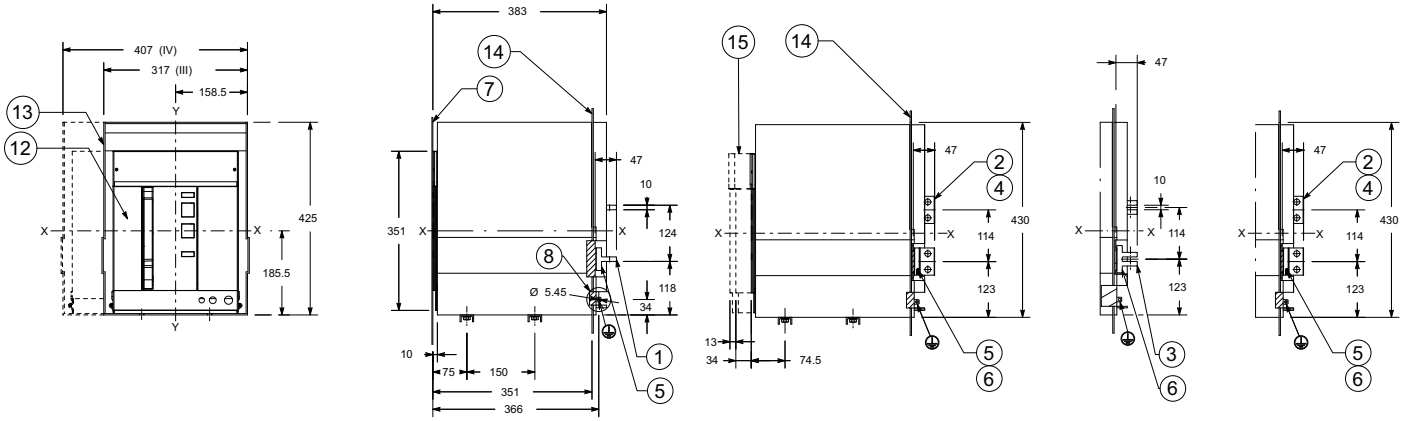
Dimensions

Withdrawable circuit-breaker - E2.2

Rear orientable terminals - HR/VR

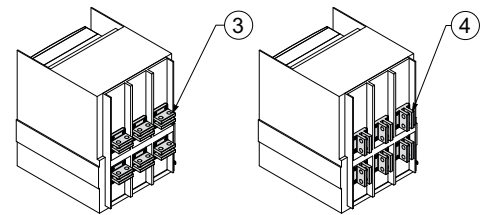
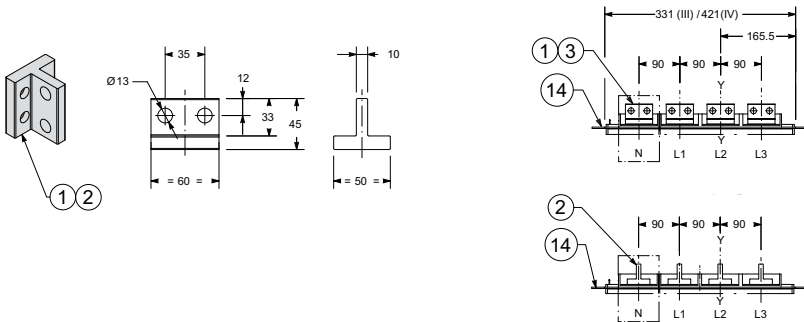
E2.2 B/N/S/H 2000A

E2.2 N/S/H 2500A

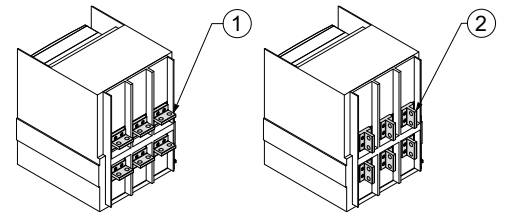
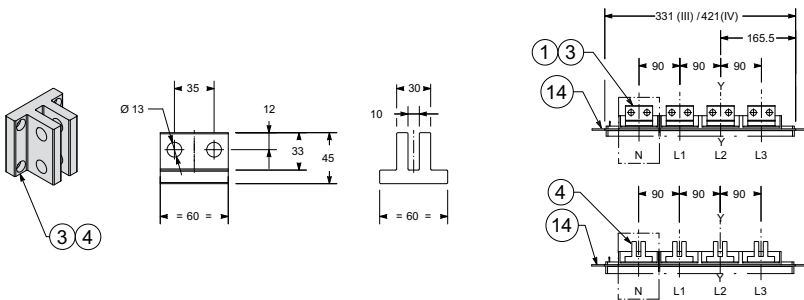


7

E2.2 B/N/S/H 2000A



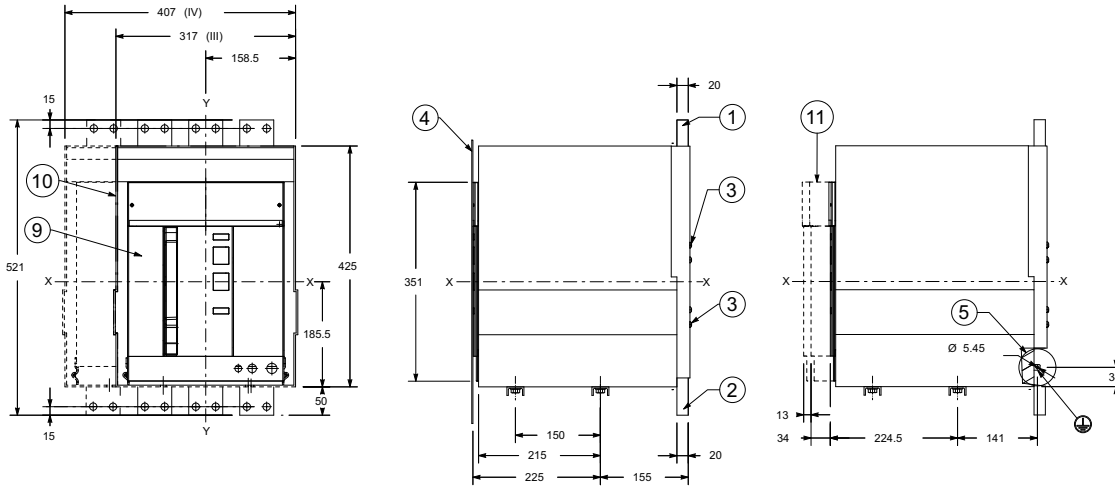
E2.2 N/S/H 2500A



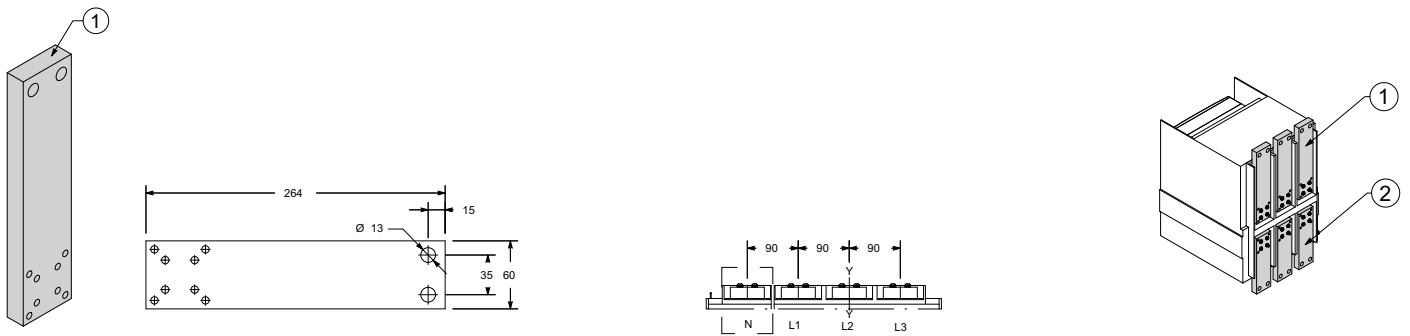
Key

- | | | |
|------------------------------|----------------------------------|--|
| 1 Horizontal terminals 2000A | 5 Tightening torque 2000A 8.6Nm | 12 Mobile part |
| 2 Vertical terminals 2000A | 6 Tightening torque 2500A 8.6Nm | 13 Fixed part |
| 3 Horizontal terminals 2500A | 7 Door position - Ref. page 7/19 | 14 Segregation (where envisaged) |
| 4 Vertical terminals 2500A | 8 Earthing device | 15 Distance from connected for testing to isolated |

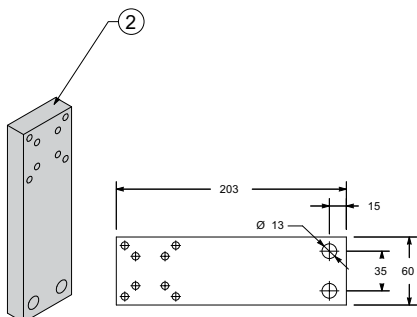
Front terminals – F



Upper front terminals



Lower front terminals

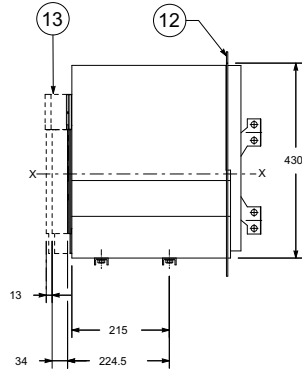
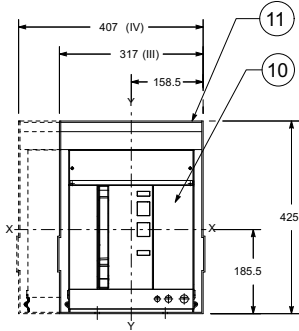


Key

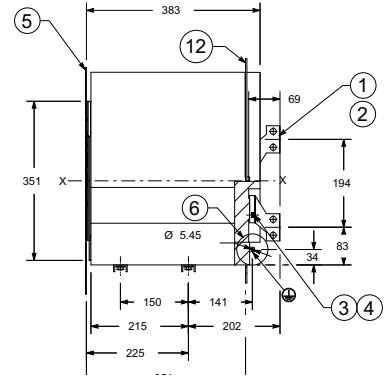
- | | |
|----------------------------------|--|
| 1 Upper front terminals | 5 Earthing device |
| 2 Lower front terminals | 9 Mobile part |
| 3 Tightening torque 8.6Nm | 10 Fixed part |
| 4 Door position - Ref. page 7/19 | 11 Distance from connected for testing to isolated |

Vertical rear spread terminals – SVR

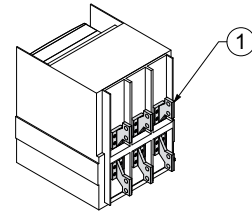
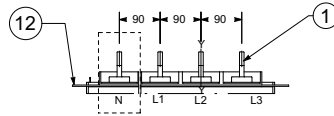
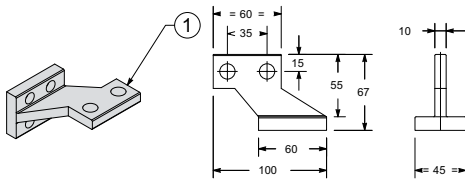
E2.2 B/N/S/H 2000A



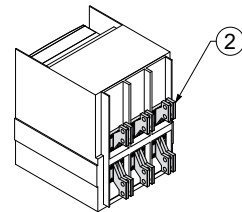
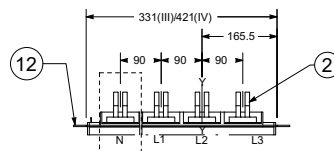
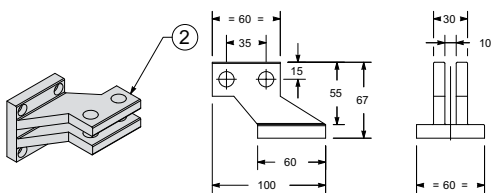
E2.2 N/S/H 2500A



E2.2 B/N/S/H 2000A



E2.2 N/S/H 2500A



Key

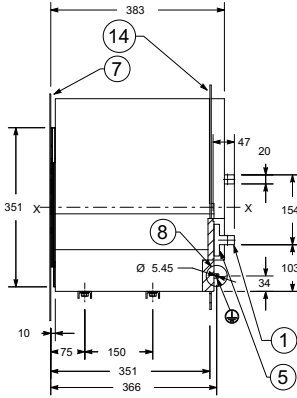
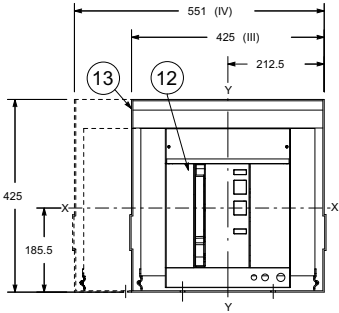
- 1 Vertical splayed terminals 2000A
- 2 Vertical splayed terminals 2500A
- 3 Tightening torque 2000A 8.6Nm
- 4 Tightening torque 2500A 8.6Nm
- 5 Door position - Ref. page 7/19
- 6 Earthing device
- 10 Mobile part
- 11 Fixed part
- 12 Segregation (where envisaged)
- 13 Distance from connected for testing to isolated

Dimensions

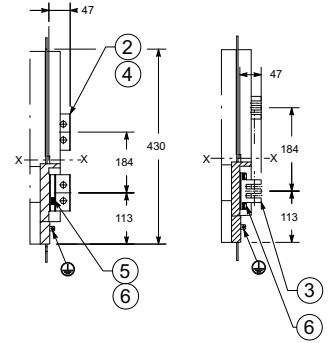
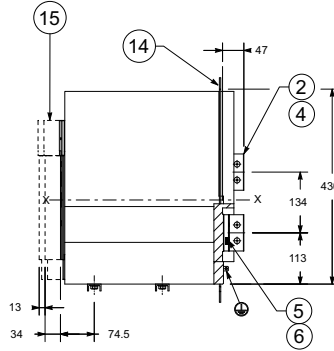
Withdrawable circuit-breaker - E4.2

Rear orientable terminals - HR/VR

E4.2 N/S/H 3200A

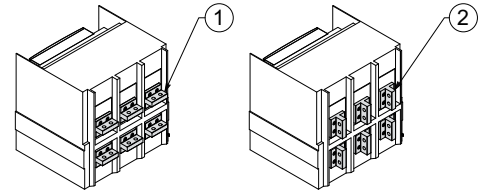
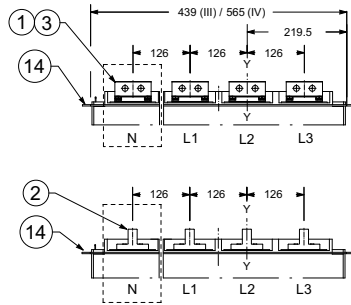
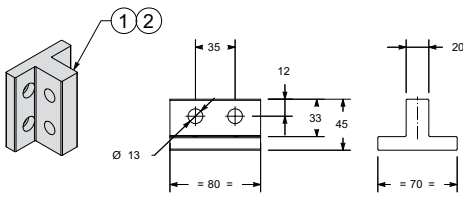


E4.2 N/S/H 4000A
E4.2 V 2000...4000A



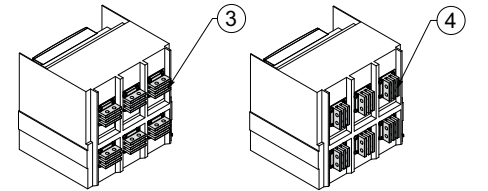
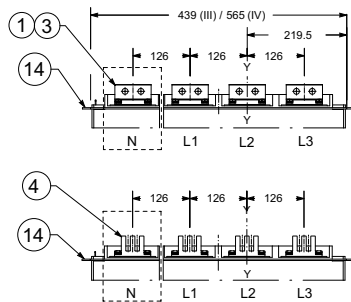
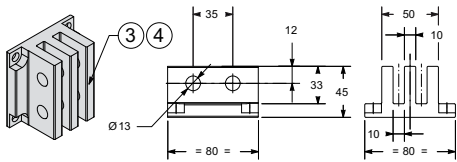
E4.2 N/S/H 3200A

7



E4.2 N/S/H 4000A

E4.2 V 2000...4000A



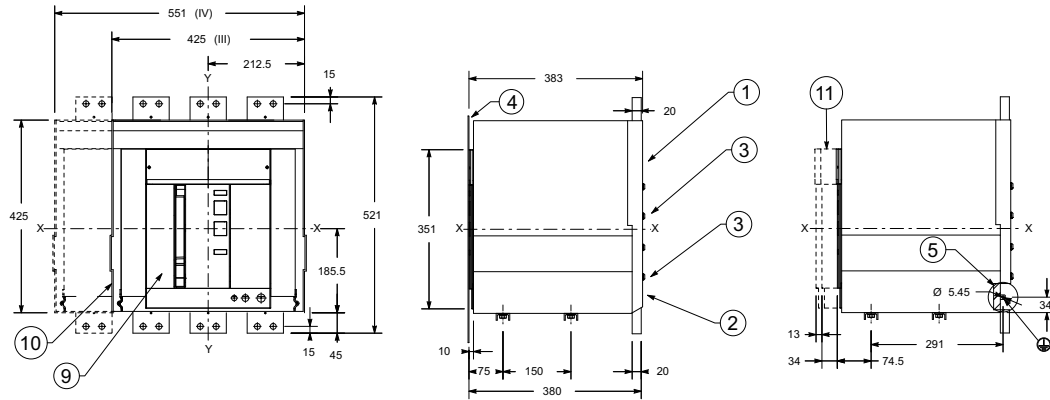
Key

- 1 Horizontal terminals 3200A
- 2 Vertical terminals 3200A
- 3 Horizontal terminals 4000A
- 4 Vertical terminals 4000A

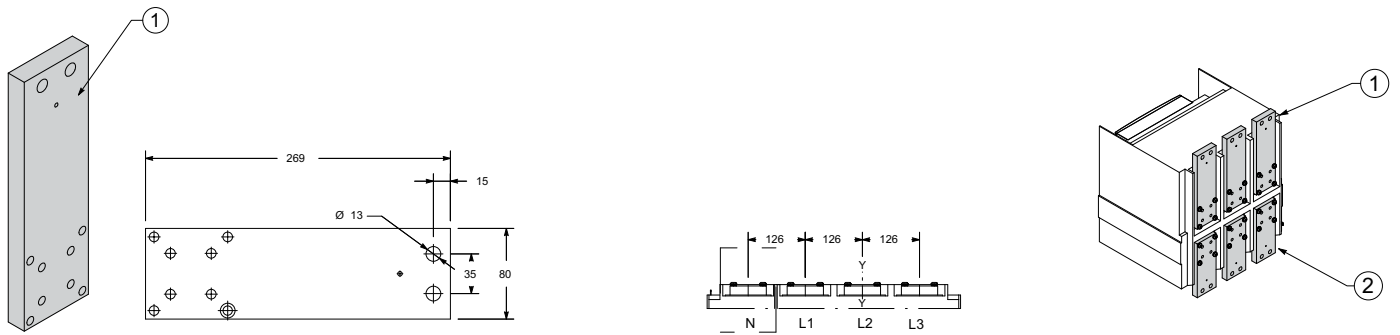
- 5 Tightening torque 3200A 20Nm
- 6 Tightening torque 4000A 20Nm
- 7 Door position - Ref. page 7/19
- 8 Earthing device

- 12 Mobile part
- 13 Fixed part
- 14 Segregation (where envisaged)
- 15 Distance from connected for testing to isolated

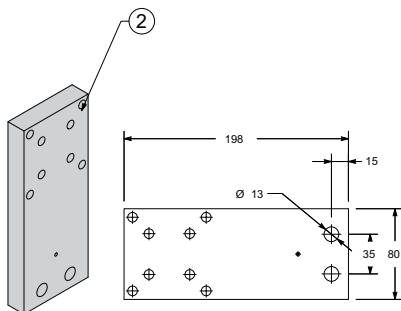
Front terminals – F



Upper front terminals



Lower front terminals



- Key**
- 1 Upper front terminals
 - 2 Lower front terminals
 - 3 Tightening torque 20Nm
 - 4 Door position - Ref. page 7/19
 - 5 Earthing device
 - 9 Mobile part
 - 10 Fixed part
 - 11 Distance from connected for testing to isolated

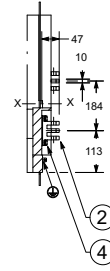
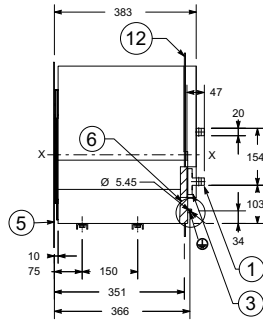
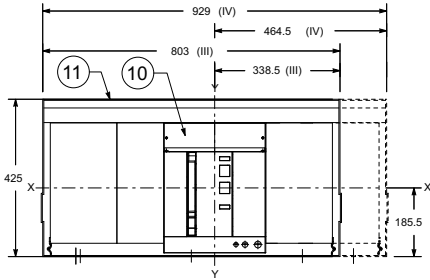
Dimensions

Withdrawable circuit-breaker - E6.2

Horizontal rear terminals – HR

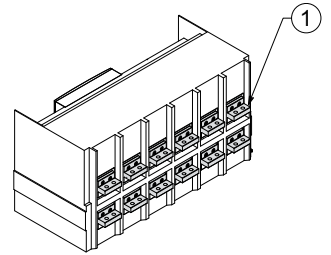
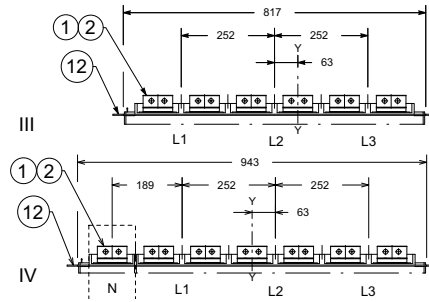
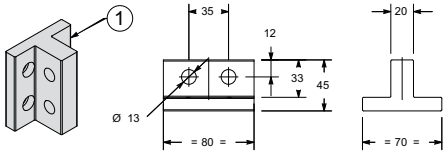
E6.2 H/V 5000A

E6.2 H/V 6300A
E6.2 X 5000...6300A



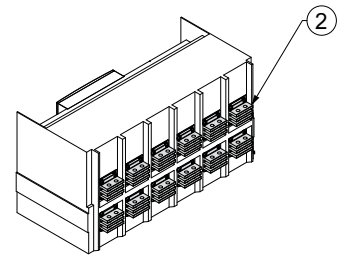
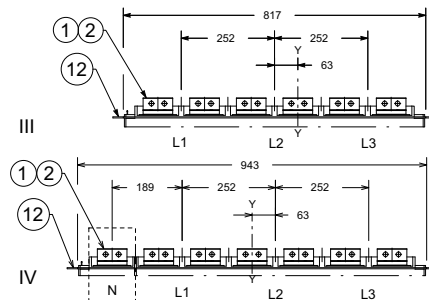
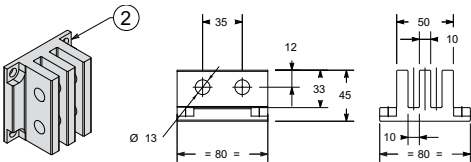
E6.2 H/V 5000A

7



E6.2 H/V 6300A

E6.2 X 5000...6300A



Key

- 1 Horizontal terminals 5000A
- 2 Horizontal terminals 6300A
- 3 Tightening torque 5000A 20Nm
- 4 Tightening torque 6300A 20Nm

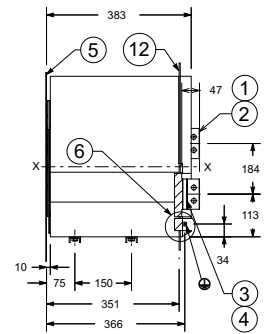
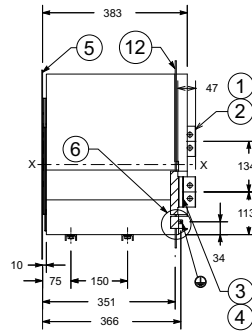
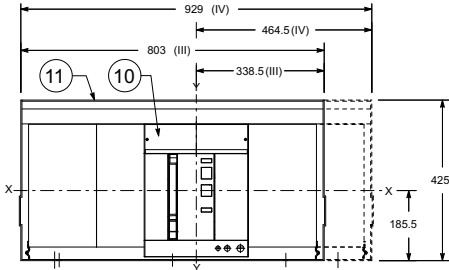
- 5 Door position - Ref. page 7/19
- 6 Earthing device
- 10 Mobile part

- 11 Fixed part
- 12 Segregation (where envisaged)
- 13 Distance from connected for testing to isolated

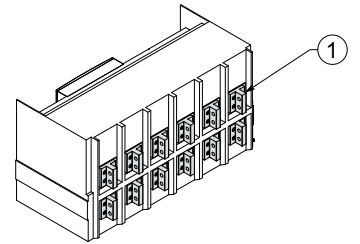
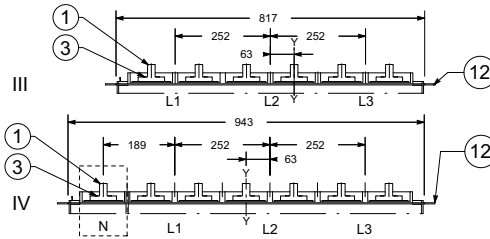
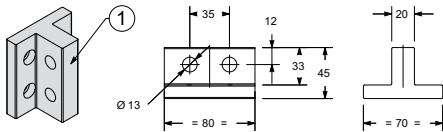
Vertical rear terminals – VR

E6.2 H/V 5000A

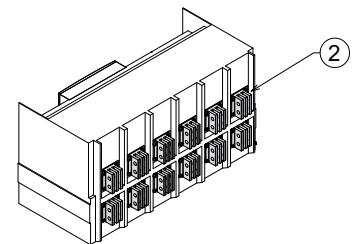
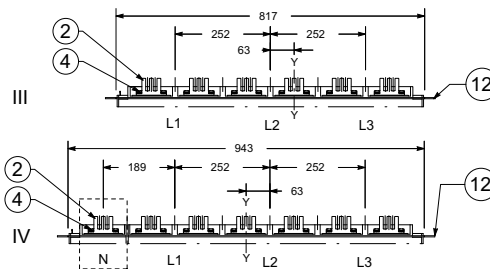
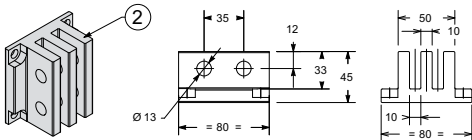
E6.2 H/V 6300A
E6.2 X 5000...6300A



E6.2 H/V 5000A



E6.2 H/V 6300A
E6.2 X 5000...6300A



Key

- 1 Vertical terminals 5000A
- 2 Vertical terminals 6300A
- 3 Tightening torque 5000A 20Nm
- 4 Tightening torque 6300A 20Nm
- 5 Door position - Ref. page 7/19
- 6 Earthing device
- 10 Mobile part
- 11 Fixed part
- 12 Segregation (where envisaged)
- 13 Distance from connected for testing to isolated

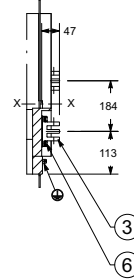
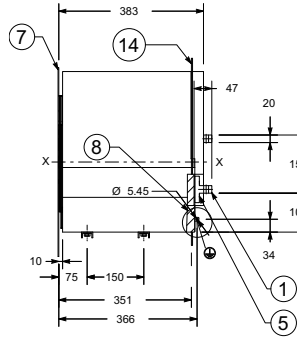
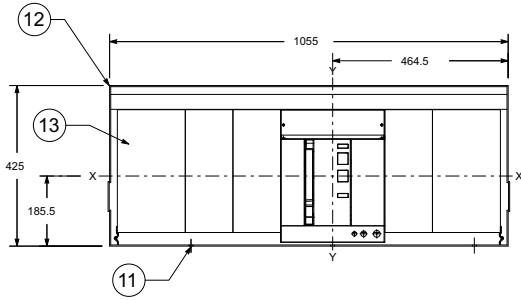
Dimensions

Withdrawable circuit-breaker - E6.2

Rear orientable terminals - HR/VR full size

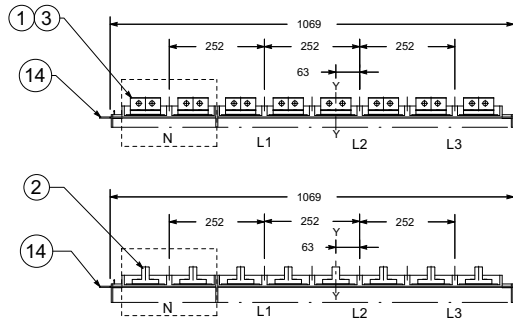
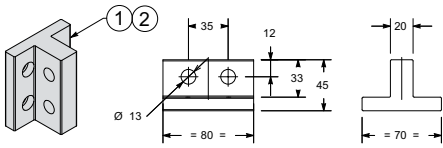
E6.2 H/V 5000A

E6.2 H/V 6300A
E6.2 X 5000...6300A



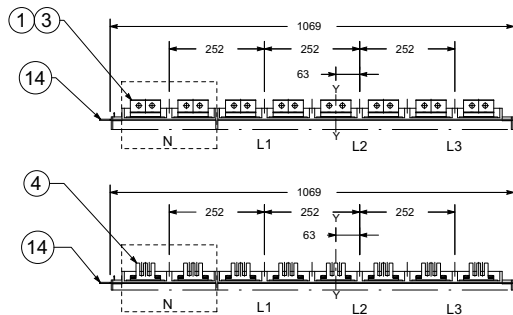
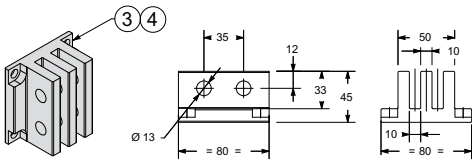
E6.2 H/V 5000A

7



E6.2 H/V 6300A

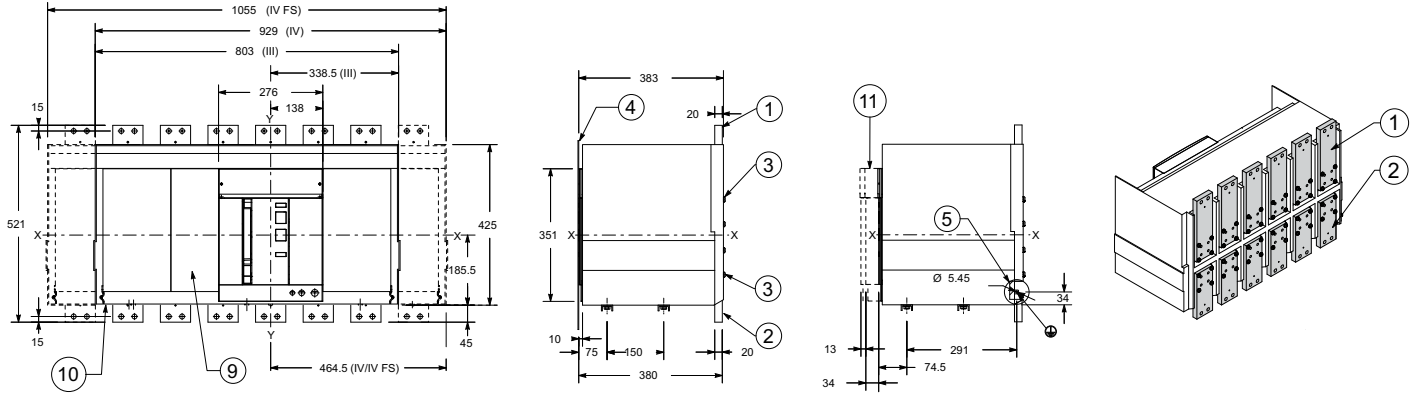
E6.2 X 5000...6300A



Key

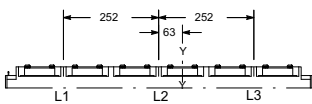
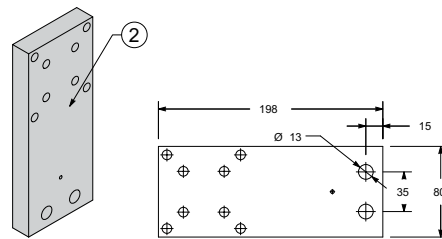
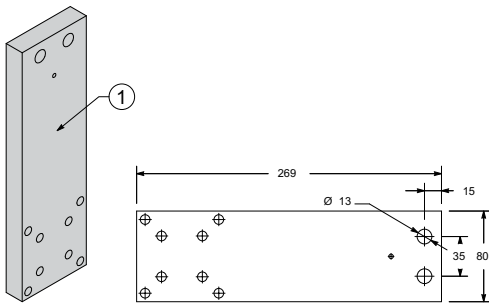
- | | | |
|------------------------------|----------------------------------|----------------------------------|
| 1 Horizontal terminals 5000A | 5 Tightening torque 5000A 20Nm | 12 Mobile part |
| 2 Vertical terminals 5000A | 6 Tightening torque 6300A 20Nm | 13 Fixed part |
| 3 Horizontal terminals 6300A | 7 Door position - Ref. page 7/19 | 14 Segregation (where envisaged) |
| 4 Vertical terminals 6300A | 8 Earthing device | |

Front terminals – F

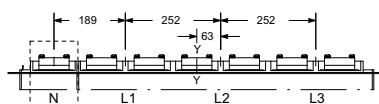


Upper front terminals

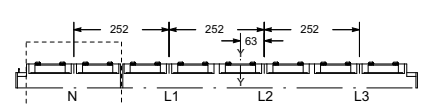
Lower front terminals



3-pole



4-pole



4-pole full size

Key

- | | | |
|--------------------------|----------------------------------|--|
| 1 Upper front terminals | 4 Door position - Ref. page 7/19 | 10 Fixed part |
| 2 Lower front terminals | 5 Earthing device | 11 Distance from connected for testing to isolated |
| 3 Tightening torque 20Nm | 9 Mobile part | |

Electrical diagrams

Reading information

Circuit-breakers	8/2
ATS021 and ATS022	8/7
Power controller	8/8

Circuit-breakers	8/9
------------------	-----

Terminal box E1.2	8/10
-------------------	------

Terminal box E2.2 - E4.2 - E6.2	8/11
---------------------------------	------

Electrical accessories	8/12
------------------------	------

ATS021 and ATS022	8/38
-------------------	------

Electrical diagrams

Reading information – Circuit-breakers

Operating state shown

The diagram is shown in the following conditions:

- withdrawable version circuit-breaker, open and racked-in
- with de-energized circuits
- trip units not tripped
- motor operator with unloaded springs.

Versions

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

Fixed version

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

Withdrawable version

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

Description of figures

- 1) Supplementary open/closed auxiliary contacts of the circuit-breaker (second set)
- 2) Ekip Signalling 4K
- 11) Trip signalling contact
- 12) Contact for signalling position of loaded springs
- 13) Motor for loading closing springs- M
- 14) Trip 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 for external neutral
- 22) Ekip Measuring Pro for residual voltage protection (for Ekip G only)
- 23) Ekip Measuring/Measuring Pro with external voltage socket
- 24) Rc residual current protection sensor input
- 25) Transformer star centre sensor input
- 26) Zone selectivity
- 27) Current sensor input on external neutral (only for 3-pole circuit-breakers)
- 31) Direct auxiliary supply 24V DC and local bus
- 32) Auxiliary supply through module 110-240V AC/DC or 24-48V DC and local bus
- 33) Ekip Fan 24V DC
- 41) Ekip signalling 2K-1
- 42) Ekip signalling 2K-2
- 43) Ekip signalling 2K-3
- 48) Ekip sinchrocheck
- 51) Ekip COM Modbus RS-485
- 52) Ekip COM Modbus TCP
- 53) Ekip COM Profibus
- 54) Ekip COM Profinet
- 55) Ekip COM DeviceNet
- 56) Ekip COM EtherNet IP
- 57) Ekip COM IEC61850
- 58) Ekip LINK
- 61) Ekip COM R Modbus RS-485 Redundant
- 62) Ekip COM R Modbus TCP Redundant
- 63) Ekip COM R Profibus Redundant

- 64) Ekip COM R Profinet Redundant
- 65) Ekip COM R DeviceNet Redundant
- 66) Ekip COM R EtherNet IP Redundant
- 71) Contact ready to close - 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) External supplementary open/closed auxiliary contacts of circuit-breaker
- 95) Contacts for signalling circuit-breakers in racked-in, test, racked-out position
- 96) Contacts for signalling circuit-breakers in racked-in, test, racked-out position (first set)
- 97) Supplementary contacts for signalling circuit-breakers in racked-in, test, racked-out position (second set)
- 98) Circuit-breakers without auxiliary safety voltage
- 99) Circuit-breakers with auxiliary safety voltage in direct and alternating current
- 100) ATS021
- 101) ATS022
- 102) Third circuit-breaker controlling with ATS022
- 103) Ekip Signalling 10K
- 104) Ekip Multimeter
- 105) Application diagram for Ekip Touch, Hi-Touch, G Touch, G Hi-Touch with Power Controller function.

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 signalling, outside the circuit-breaker
BUS1	= Serial interface with external bus
D	= Electronic time-lag device of YU undervoltage coil, outside the circuit-breaker
F1	= Time-delayed trip fuse
GZi(DBi)	= Zone selectivity input for G protection or input in “reverse” direction for D protection
GZo(DBo)	= Zone selectivity output for G protection or output in “reverse” direction for D protection
I O1...32	= Programmable digital inputs of the EKIP protection trip unit
K51	= Electronic overcurrent protection trip unit of the types: EKIP DIP, EKIP TOUCH, EKIP LCD, EKIP HI-TOUCH , EKIP HI-LCD, EKIP G TOUCH, EKIP G LCD, EKIP G HI-TOUCH , EKIP G HI-LCD
K51/COM	= Communication module
K51/FAN	= Ventilation supply module
K51/MEAS	= Measurement module
K51/SIGN	= Signalling module
K51/SUPPLY	= Optional auxiliary supply module (110-220VAC/DC and 24-48VDC)
K51/SYNC	= Synchronization module
K51/YC	= Closing control from the EKIP protection trip unit
K51/YO	= Opening control from the EKIP protection trip unit
M	= Motor for loading closing springs
M2	= Motor for fans
O 01...32	= Programmable signalling contacts of the EKIP protection trip unit
O SC	= EKIP protection trip unit contact for synchronism control
Q	= Circuit-breaker
Q/1...Q/25	= Auxiliary contacts of circuit-breaker
Q/26...Q/27	= Auxiliary open/close contacts used internally by the trip unit
RC	= RC (residual current) protection sensor
RT1...RT3	= Temperature sensors
RTC EKIP	= Auxiliary ready to close contact of circuit-breaker, used internally by the trip unit
RTC	= Contact for signalling circuit-breaker is ready to close
S33M/1...2	= Limit contacts of spring loading motor
S43	= Switch for presetting remote/local control
S51	= Trip signalling contact
S75E/1...4	= Contacts for signalling circuit-breaker in racked-out position (provided only with withdrawable version)
S75I/1...5	= Contacts for signalling circuit-breaker in racked-in position (provided only with withdrawable version)
S75T/1...2	= Contact for signalling circuit-breaker in test position (provided only with withdrawable version)
SC	= Pushbutton or contact for closing the circuit-breaker
SO	= Pushbutton or contact for immediate opening of the circuit-breaker
SO1	= Pushbutton or contact for opening the circuit-breaker with time-delayed trip
SR	= Pushbutton or contact for electrical resetting of S51 trip contact
SZi(DFi)	= Input for zone selectivity for S protection or input in “direct” direction for S protection
SZo(DFo)	= Output for zone selectivity for S protection or output in “direct” direction for D protection
TI/L1	= Current transformer phase L1
TI/L2	= Current transformer phase L2
TI/L3	= Current transformer phase L3
TI/N	= Current transformer on neutral
TU1...TU2	= Insulation voltage transformer (outside circuit-breaker)

Uaux	= Auxiliary supply voltage
UI/L1	= Current sensor phase L1
UI/L2	= Current sensor phase L2
UI/L3	= Current sensor on phase L3
UI/N	= Current sensor on neutral
UI/O	= Single-pole current sensor
W2	= Serial interface with internal bus (local bus)
W9...W13	= RJ45 connector for communication modules
W9R.W11R	= RJ45 connector for redundant communication modules
X	= Delivery connector for auxiliary circuits for withdrawable version of circuit-breaker
XB1...XB7	= Connectors for circuit-breaker applications
XF	= Delivery terminal board for position contacts of withdrawable version of circuit-breaker
XF1...XF2	= Contact of the EKIP protection trip unit for activating fans
XK1...XK3	= Connectors for auxiliary circuits of the EKIP protection trip unit
XK7	= Connector for auxiliary circuits of communication module
XV	= Delivery terminal box for auxiliary circuits of fixed version circuit-breaker
YC	= Closing coil
YC2	= Second closing coil
YO	= Opening coil
YO1	= Opening coil for overcurrent
YO2	= Second opening coil
YR	= Coil for electrical resetting of trip contact S51
YU	= Undervoltage coil

Electrical diagrams

Reading information – Circuit-breakers

Notes

- A) Auxiliary supply for Ekip trip unit is mandatory (refer to diagram 1SDM00009R0001 figures 31 - 32- 33 - 34).
- C) Always supplied with Ekip Com module.
- D) Always supplied with motor for loading closing springs in Fig. 13.
- E) Obligatory voltage transformer in the case of external sockets. Obligatory external sockets for systems with rated voltage greater than 690V.
- F) The connections between the RC residual current protection sensor and the poles of the X connector (or XV) of the circuit-breaker must be made with 4-pole shielded cable with conductors interwoven in pairs (type BELDEN 9696 paired or equivalent), of a length no greater than 10 m. The shield should be earthed on circuit-breaker side.
- G) With all electronic protection trip units equipped with display interface with LSIG protections, protection against an earth fault is available (Gext) by means of current sensor positioned on the star centre of the MV/LV transformer.
The connection between terminals 1 and 2 of the UI/O current transformer and Ge+ and Ge- poles of the X connector (or XV) must be made with shielded and stranded 2-pole cable (type BELDEN 8762/8772 or equivalent) of length no greater than a 15 m. The shield should be earthed on the circuit-breaker side and current sensor side.
- H) The connection between the terminal box and external neutral sensor must be made with the 2m cable provided. The Ne+ and Ne- poles of the X connector (or XV) must be short-circuited if no sensor is present on the external neutral conductor.
- I) Obligatory in the case of the presence of any Ekip module.
- J) Only for E2.2, E4.2 and E6.2 withdrawable version circuit-breakers as an alternative to Fig. 31-32-34.
N.B.: Ekip Fan 24VDC occupies in the terminal box the space of the Ekip Supply and one slot Module.
- K) Only for E2.2, E4.2 and E6.2 withdrawable version circuit-breakers as an alternative to Fig. 31-32-33.
- K) Only for E2.2, E4.2 and E6.2 withdrawable version circuit-breakers as an alternative to Fig. 31-32-33.
N.B.: Ekip Fan 220VAC occupies in the terminal box the space of the Ekip Supply and two slot Modules.
- L) In the presence of Fig. 32, for E2.2, E4.2 and E6.2 circuit-breakers up to three applications between Fig. 41...58 taken only once can be supplied, instead for E1.2 circuit-breakers, up to two applications between Fig. 41...58 taken only once can be supplied. The Ekip Com module selected can be duplicated if required, by choosing between Fig. 61...66.
- M) In the presence of Fig. 33, for E2.2, E4.2 and E6.2 circuit-breakers, up to two applications between Fig. 41...58 taken only once can be supplied. The Ekip Com module selected can be duplicated if required, by choosing between Fig. 61...66.
- N) In the presence of Fig. 34, for E2.2, E4.2 and E6.2 circuit-breakers, a single application between Fig. 41...58 can be supplied.
- O) In the presence of several Ekip Com modules with withdrawable version circuit-breakers, the contact S75I/5 should be connected only once to a single module.
- P) The auxiliary voltage Uaux. enables activation of all the functions of the EKIP electronic protection trip units. Since an earth insulated Uaux was requested, it is necessary to use “galvanically separated convertors” which comply with the standards IEC 60950 (UL 1950) or equivalent, which guarantee a common mode current or leakage current (refer to IEC 478/1, CEI 22/3) no greater than 3.5mA, IEC 60364-41 and CEI 64-8.
- Q) Regarding local bus the maximum cable length is 15m.

Electrical diagrams

Reading information – ATS021 and ATS022

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 for the closing of the circuit-breakers
KO1-KO2	=	Auxiliary contactors type AL__-30 for the opening of the circuit-breakers
M	=	Motor for loading the closing springs
Q/1	=	Auxiliary contact of the circuit-breaker
Q60	=	Thermal relay for isolating and protecting the auxiliary circuits of safety auxiliary voltage
Q61/1-2	=	Thermal relays for isolating and protecting the auxiliary circuits of the lines
S11	=	Contact for enabling automatic switching of the ATS021 device
S11...S15	=	Signalling contacts for the inputs of the ATS022 device
S1-S2	=	Contacts controlled by the cam of the motor operator
S3	=	Changeover contact for electrical signalling of local/remote selector state
S33M/1	=	Limit contacts of spring loading motor
S51	=	Contact for electrical signalling of circuit-breaker open due to tripping of overcurrent trip unit
S75I/1	=	Contact for signalling 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 withdrawable 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	=	Shunt closing release
YO	=	Shunt opening release

This diagram shows the withdrawable 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 overcurrent release but it is also valid for circuit-breakers without release (switch-disconnectors). If the S51 contact is not present, the S51 contacts 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.

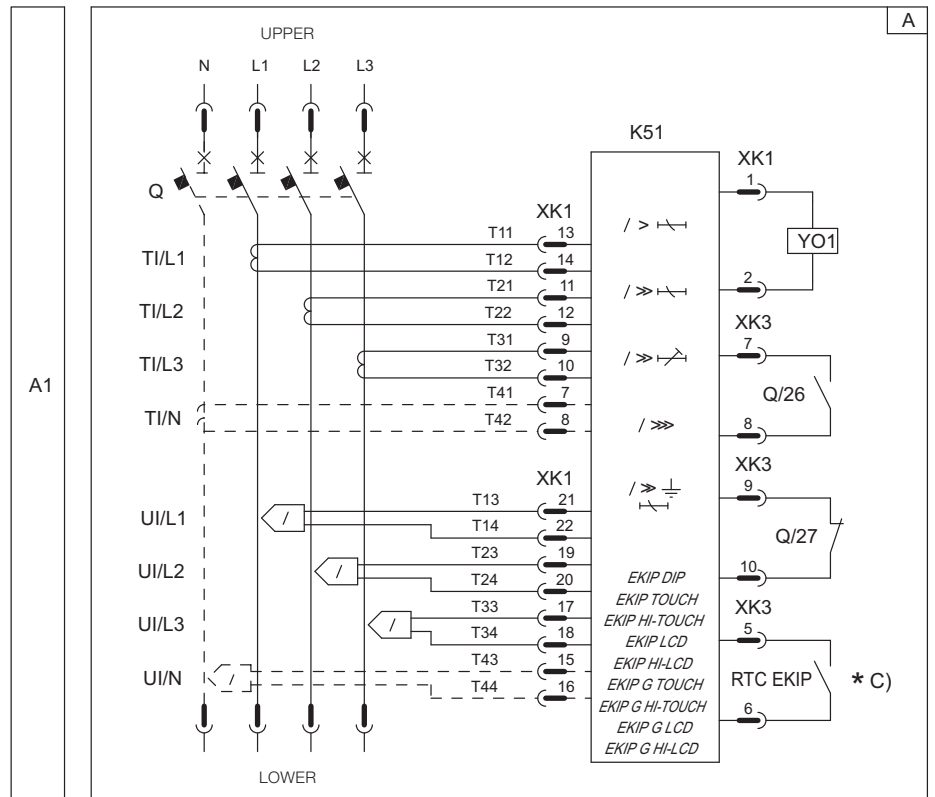
Key

A13	=	EKIP SIGNALLING 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 withdrawable version
K51	=	Electronic overcurrent protection trip unit type EKIP for EMAX 2 circuit-breaker type
K51/COM	=	Communication module for the EKIP trip unit
K51/SIGN	=	Signalling 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 type
M	=	Motor for opening the circuit-breaker and for loading closing springs for TMAX XT circuit-breaker type
O 01 ... 12	=	Programmable signalling 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 signalling contact
S751/5	=	Contacts for signalling Emax 2 circuit-breaker in racked-in position (provided only for withdrawable version)
W13	=	RJ45 connector for communication modules
X	=	Delivery connector for auxiliary circuits for withdrawable version of Emax 2 circuit-breaker
XV	=	Delivery terminal box for auxiliary circuits of fixed version circuit-breaker
YC	=	Closing coil
YO	=	Opening coil

Electrical diagrams

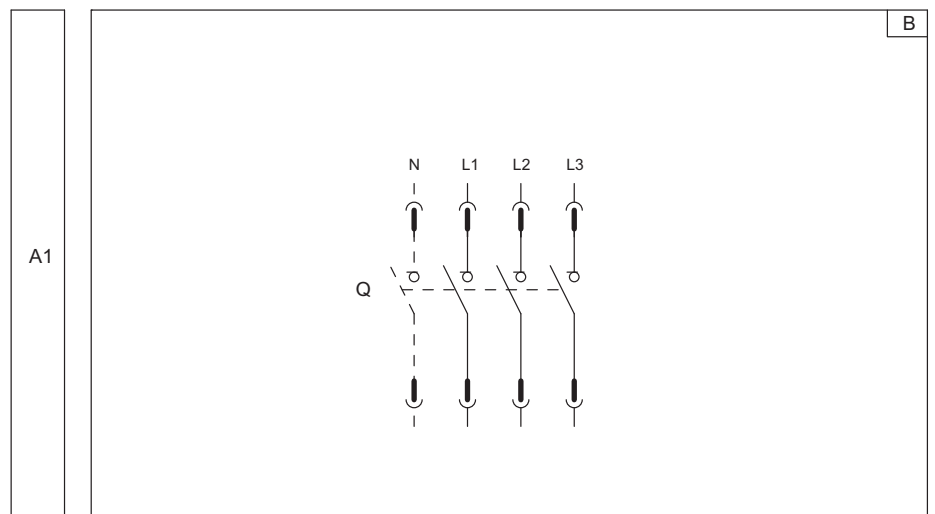
Circuit-breakers

3-pole or 4-pole circuit-breaker



8

3-pole or 4-pole switch-disconnector



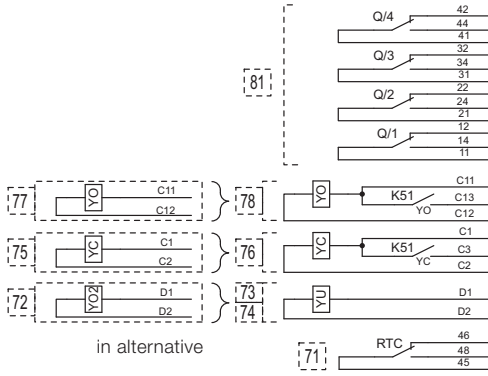
1SDC200622F001

Electrical diagrams

Terminal box E1.2

Diagram figure number

n



in alternative

42	44	41	41	41	Q4
32	34	31	31	31	Q3
22	24	21	21	21	Q2
12	14	11	11	11	Q1
C11	C13	C12	C12	YO	YO
C1	C3	C2	C2	YC	YC
D1	D2	YU	YU	YO2	YO2
45	46	48	RTC		
Ne-	Ne+	Rca	TU	I/O	
W3	W4	K1	K2		
W3	W4				
V3	V2	V1			
R1	R2	U1	U2	M	
95	96	98	S51	S33	

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

81

First opening coil

77 78

First closing coil

75 76

Second opening coil or undervoltage coil

72

Ready to close contact

73 74

Current sensor input on external neutral

71

Auxiliary supply and local bus

31 32

Signalling modules

41 42 43

and/or Ekip synchro check

48

and/or communication modules

51 ... 58

and/or redundant communication modules

61 ... 66

Zone selectivity

27

Transformer star centre sensor input

26

RC residual current protection sensor input

25

Ekip Measuring voltage sockets

24

20 21 22 23

YR reset trip coil

14

Closing springs loading motor

13

Contact for signalling position of loaded springs

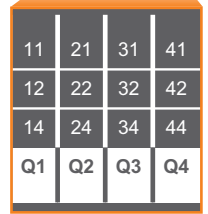
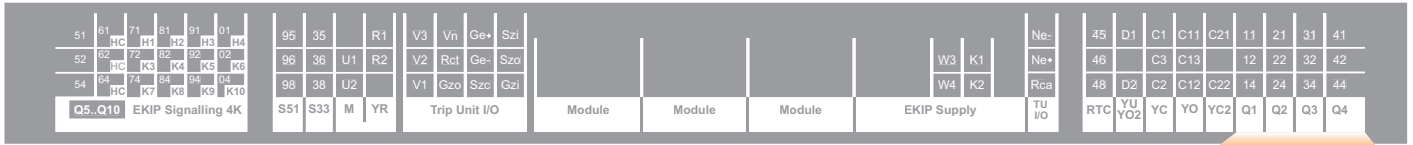
12

Trip signalling contact

11

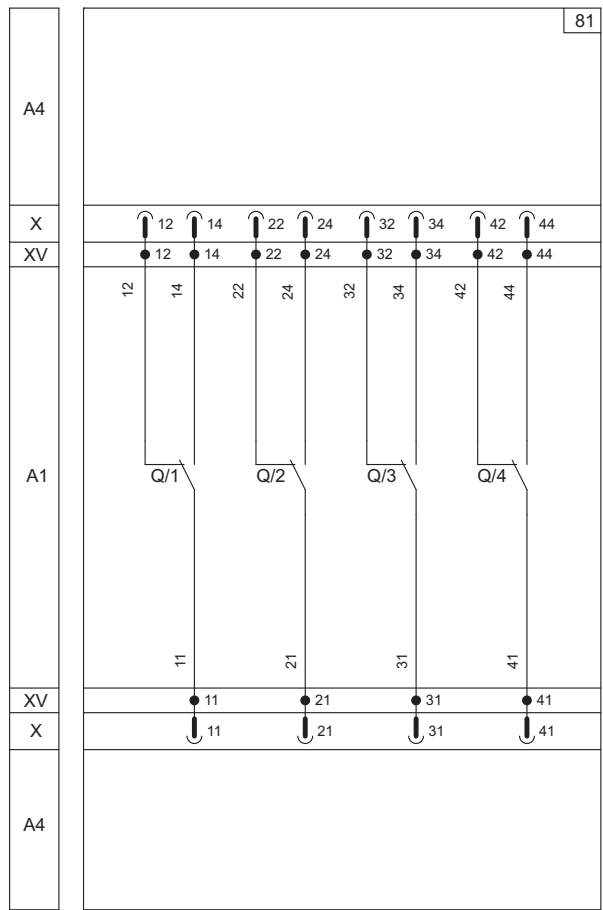
Electrical diagrams

Electrical accessories



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

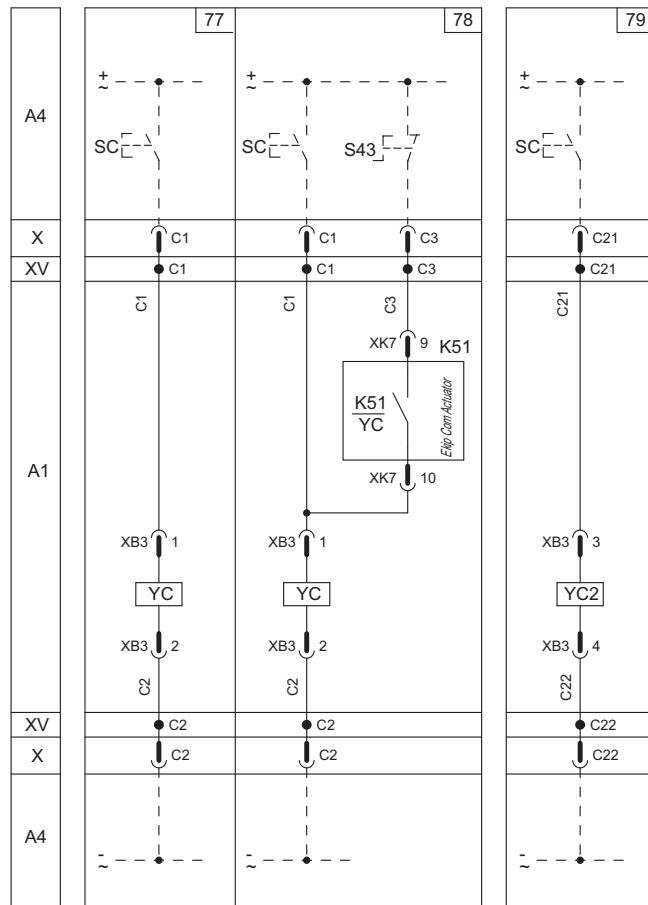
8



51	61	71	81	91	01	95	35	R1	V3	Vn	Ge+	Szi	Ne-	45	D1	C1	C11	C21	11	21	31	41					
52	62	72	82	92	02	96	36	U1	R2	V2	Rct	Ge-	Szo	Ne+	46		C3	C13		12	22	32	42				
54	64	74	84	94	04	98	38	U2		V1	Gzo	Szc	Gzi	Rca	48	D2	C2	C12	C22	14	24	34	44				
Q5..Q10 EKIP Signalling 4K						S51	S33	M	YR	Trip Unit I/O			Module	Module	Module	W3	K1	Ne+	RTC	YU	YC	YO	YC2	Q1	Q2	Q3	Q4
												EKIP Supply			TU	I/O											

45	D1	C1	C11	C21
46		C3	C13	
48	D2	C2	C12	C22
RTC	YU	YC	YO	YC2

- 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

Electrical diagrams

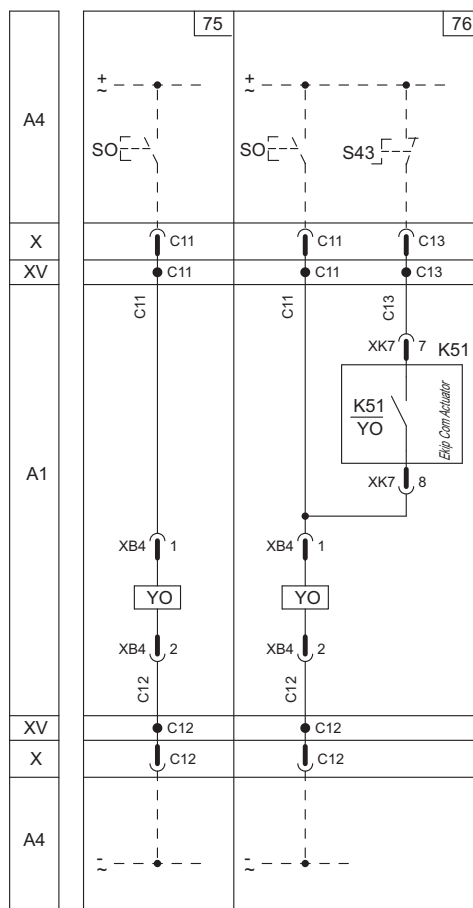
Electrical accessories

51	61	71	81	91	01	95	35	R1	V3	Vn	Ge+	Szi	Ne-	45	D1	C1	C11	C21	11	21	31	41				
52	62	72	82	92	02	96	36	U1	R2	V2	Rct	Ge-	Szo	Ne+	46		C3	C13		12	22	32	42			
54	64	74	84	94	04	98	38	U2		V1	Gzo	Szc	Gzi	Rca	48	D2	C2	C12	C22	14	24	34	44			
Q5..Q10 Ekip Signalling 4K						S51	S33	M	YR	Trip Unit I/O			Module	Module	Module	Ekip Supply	TU I/O	RTC	YU YO2	YC	YO	YC2	Q1	Q2	Q3	Q4
												W3	K1													
												W4	K2													

45	D1	C1	C11	C21
46		C3	C13	
48	D2	C2	C12	C22
RTC	YU YO2	YC	YO	YC2

75) First opening coil - YO

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

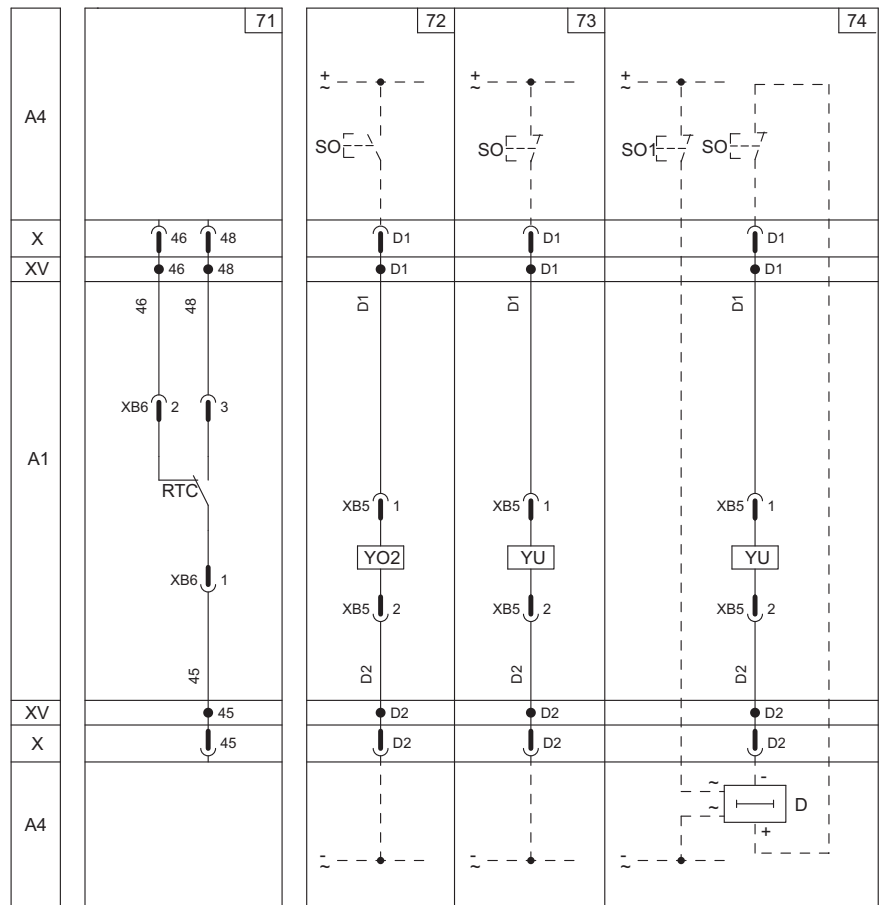


75-76 as an alternative to each other

51	61	71	81	91	01	95	35	R1	V3	Vn	Ge+	Sz1	Ne-	45	D1	C1	C11	C21	11	21	31	41					
52	62	72	82	92	02	96	36	U1	R2	V2	Rct	Ge-	Szo	Ne+	46		C3	C13		12	22	32	42				
54	64	74	84	94	04	98	38	U2		V1	Gzo	Szc	Gz1	Rca	48	D2	C2	C12	C22	14	24	34	44				
Q5..Q10 EKIP Signalling 4K						S51	S33	M	YR	Trip Unit I/O			Module	Module	Module	W3	K1	Ne+	RTC	YU	YC	YO	YC2	Q1	Q2	Q3	Q4
									Module			EKIP Supply			TU I/O												

45	D1	C1	C11	C21
46		C3	C13	
48	D2	C2	C12	C22
RTC	YU	YC	YO	YC2

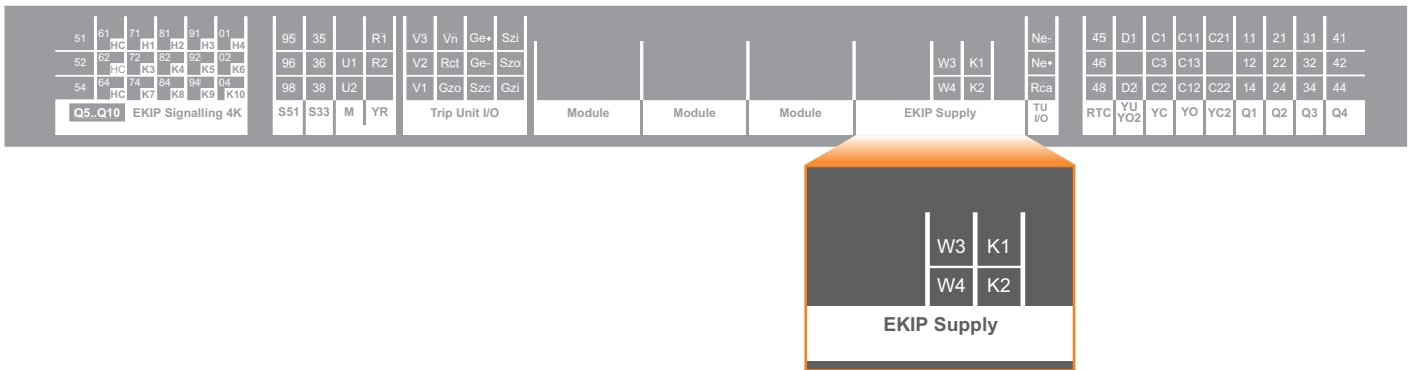
- 71) Contact ready to close - RTC
- 72) Second opening coil - YO2
- 73) Undervoltage coil - YU
- 74) Undervoltage coil with external time-lag device - YU, D



72-73 or 74 as an alternative to each other

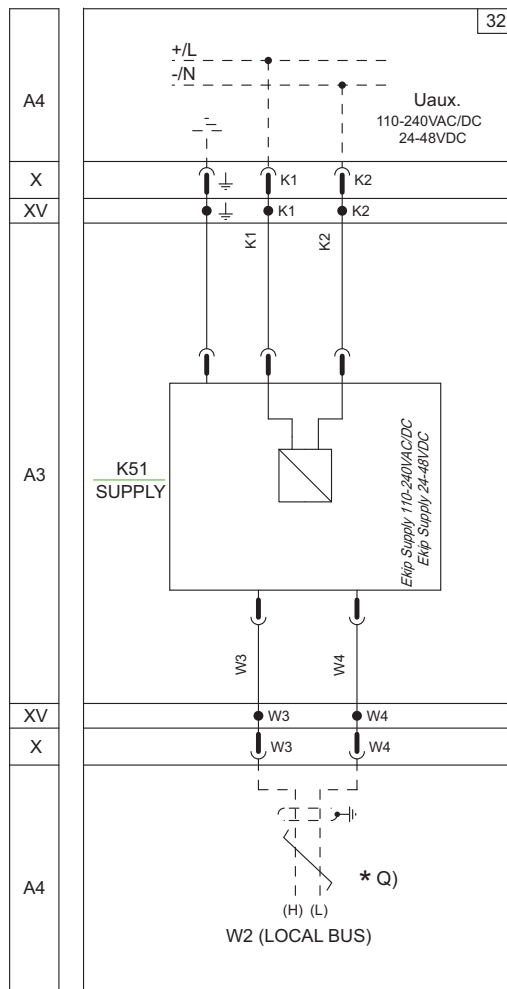
Electrical diagrams

Electrical accessories



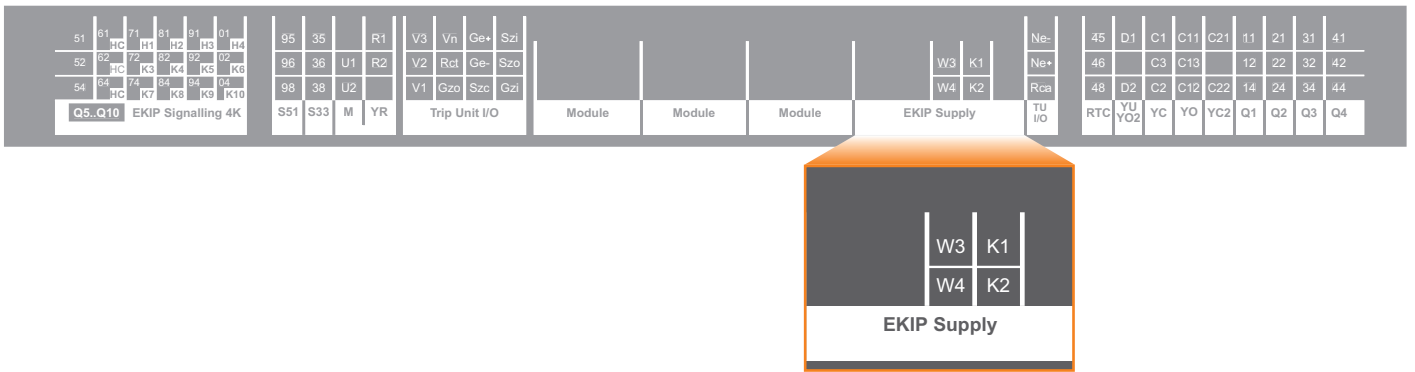
32) Auxiliary supply through module 110-240V AC/DC or 24-48V DC and local bus

8

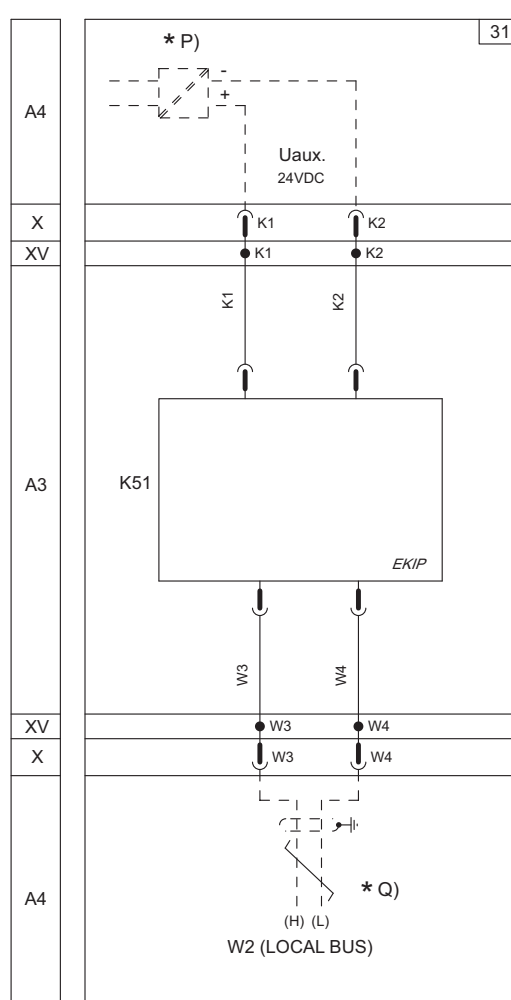


* 1)

As an alternative to figures 31-33



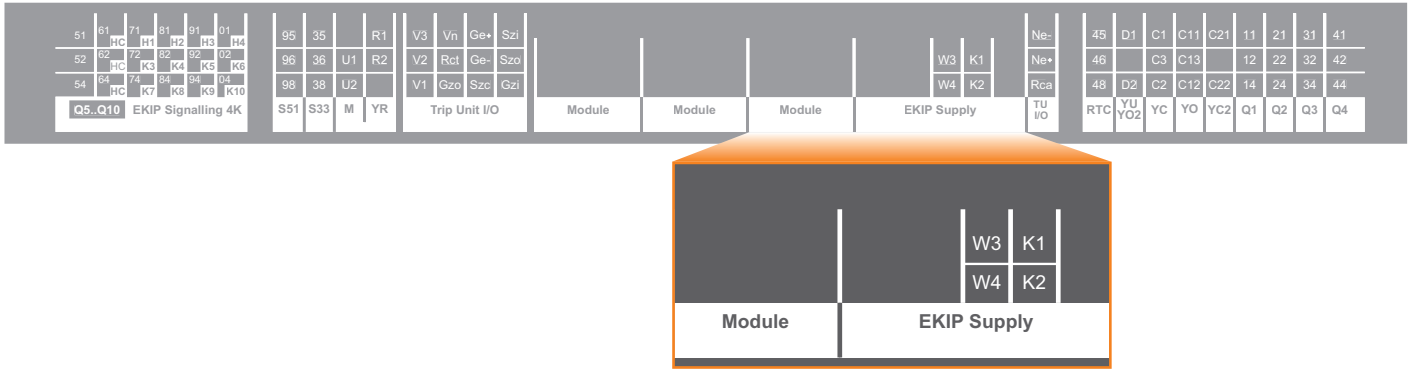
31) Direct auxiliary supply 24V DC and local bus



As an alternative to figures 32-33

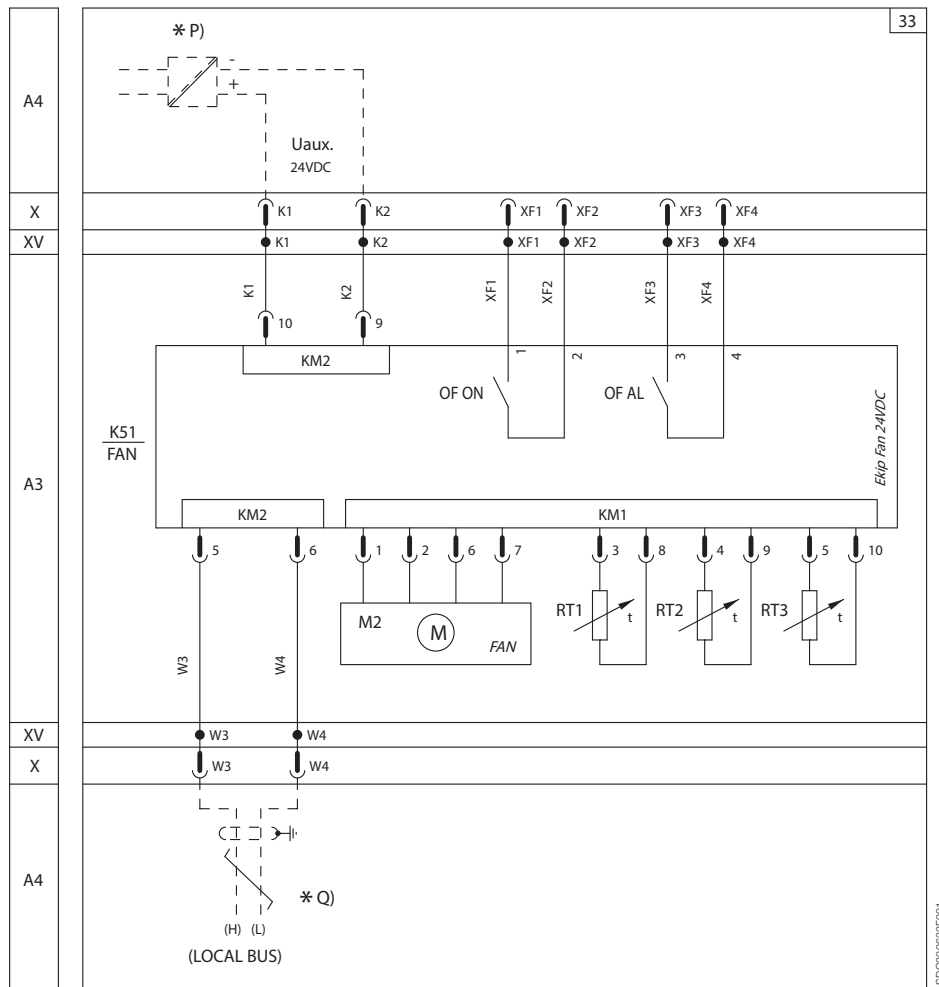
Electrical diagrams

Electrical accessories

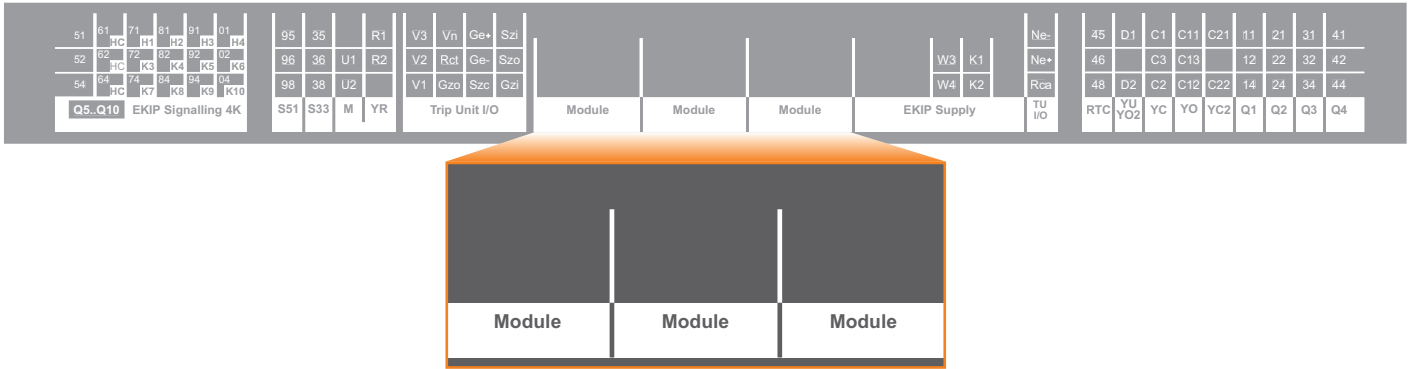


33) Ekip Fan 24V DC

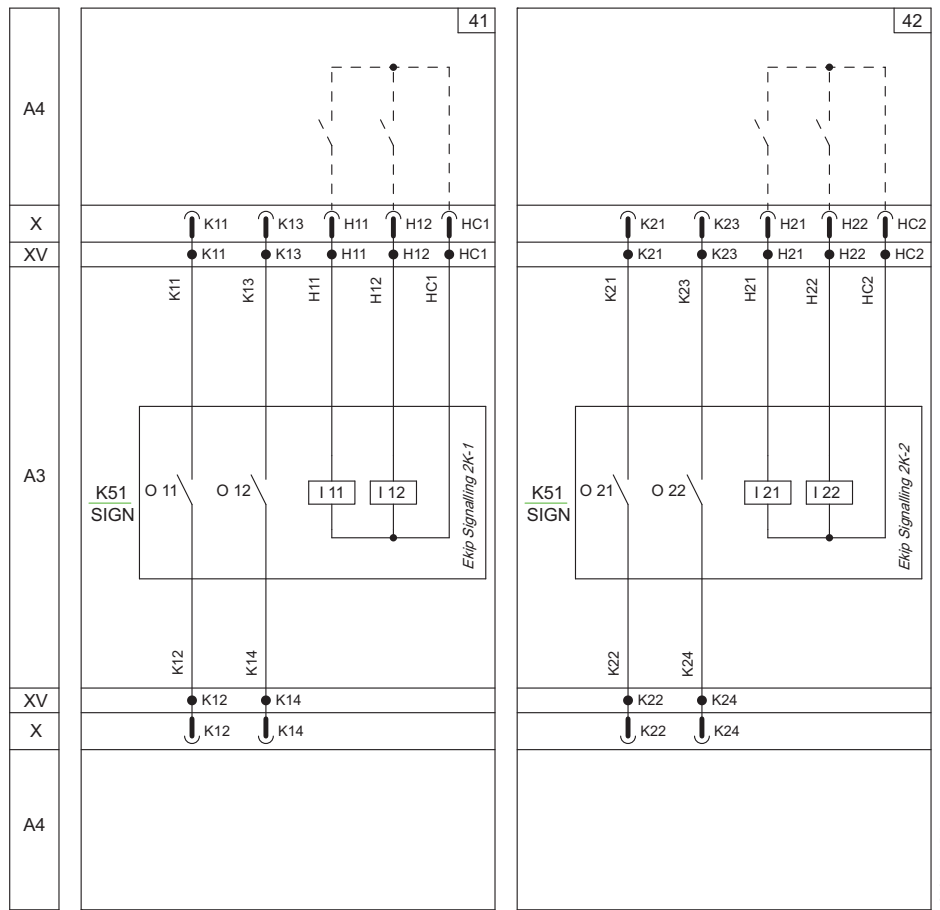
8



As an alternative to figures 31-32



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

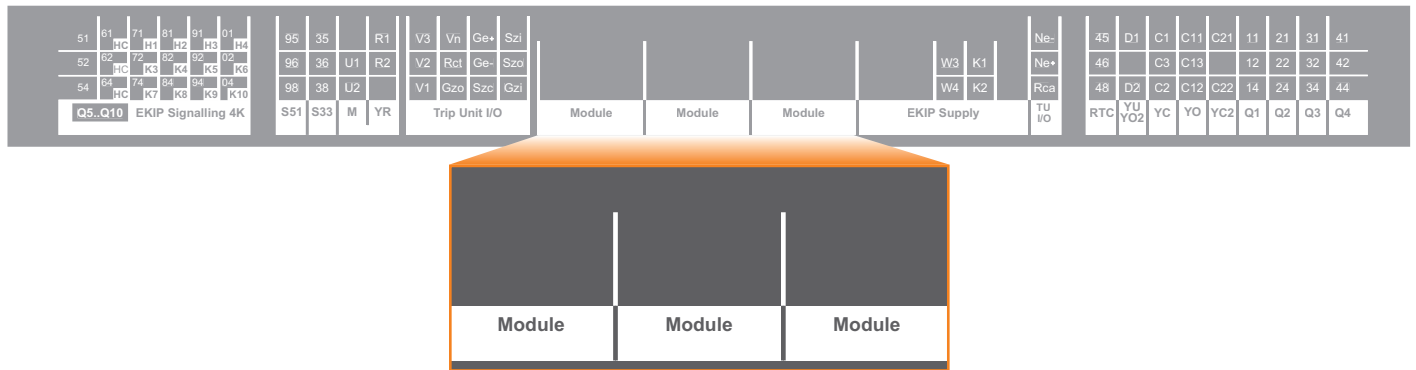


* L), * M), * N)

* L), * M), * N)

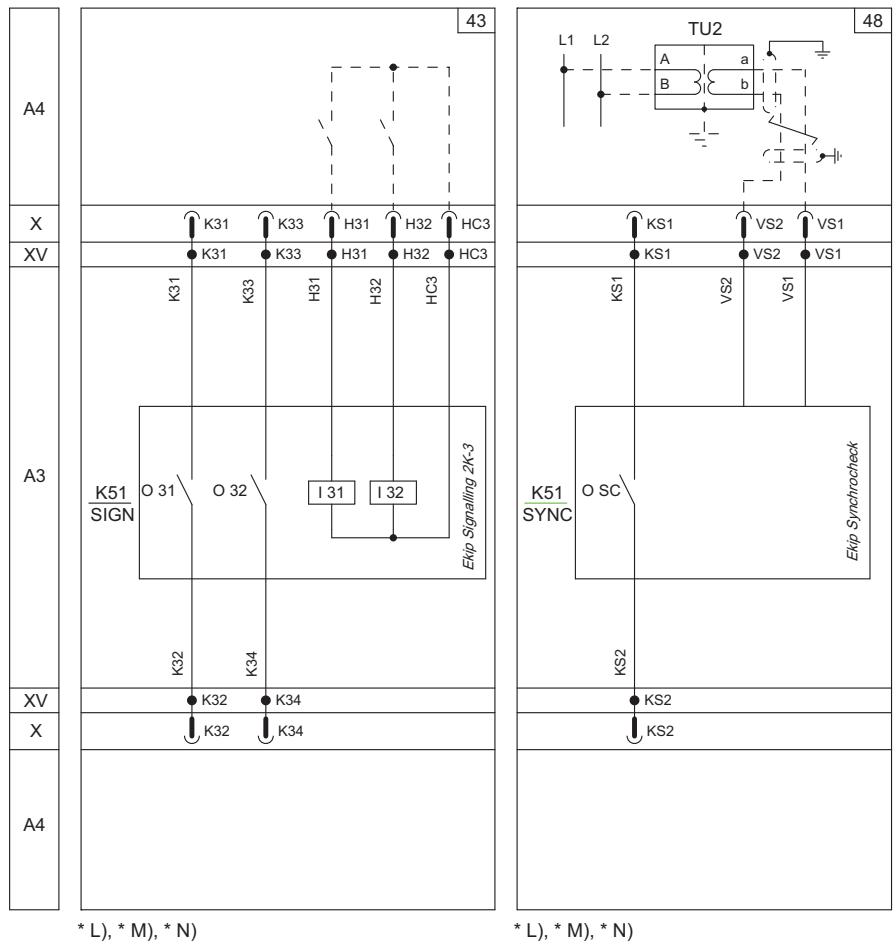
Electrical diagrams

Electrical accessories

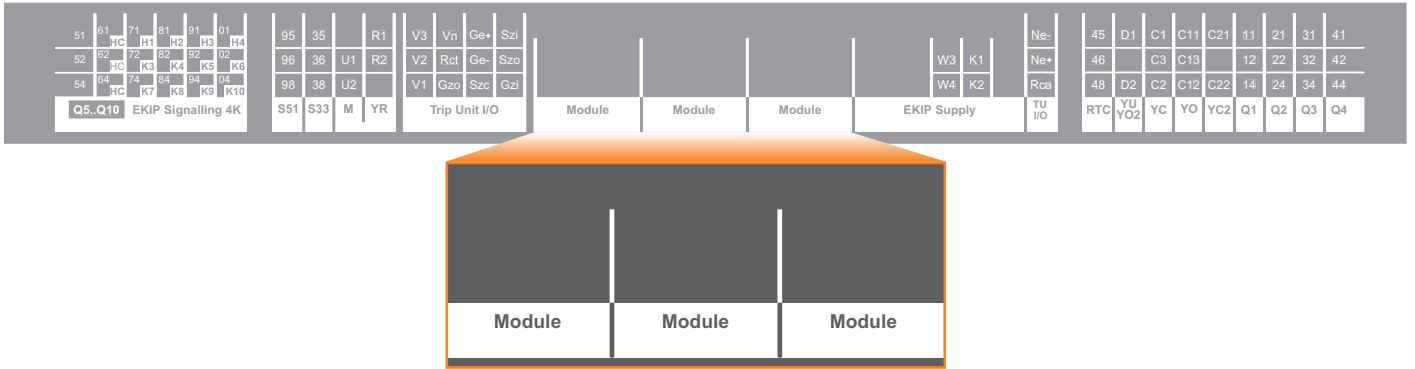


- 43) Ekip signalling 2K-3
- 48) Ekip sinchrocheck

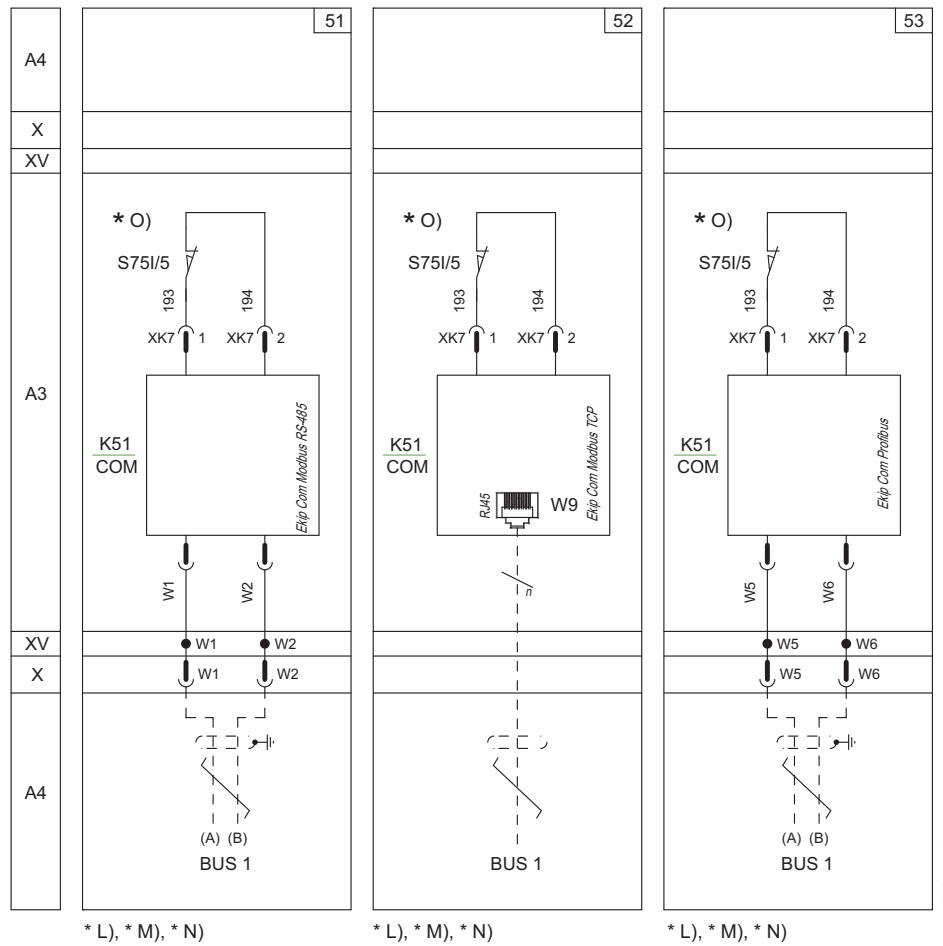
8



1SD2000634F001

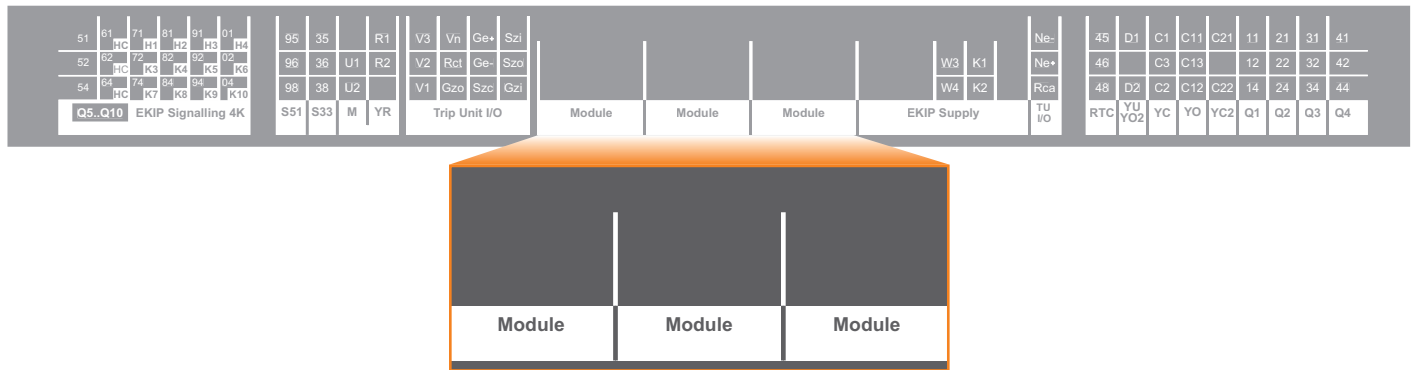


- 51) Ekip COM Modbus RS-485
- 52) Ekip COM Modbus TCP
- 53) Ekip COM Profibus

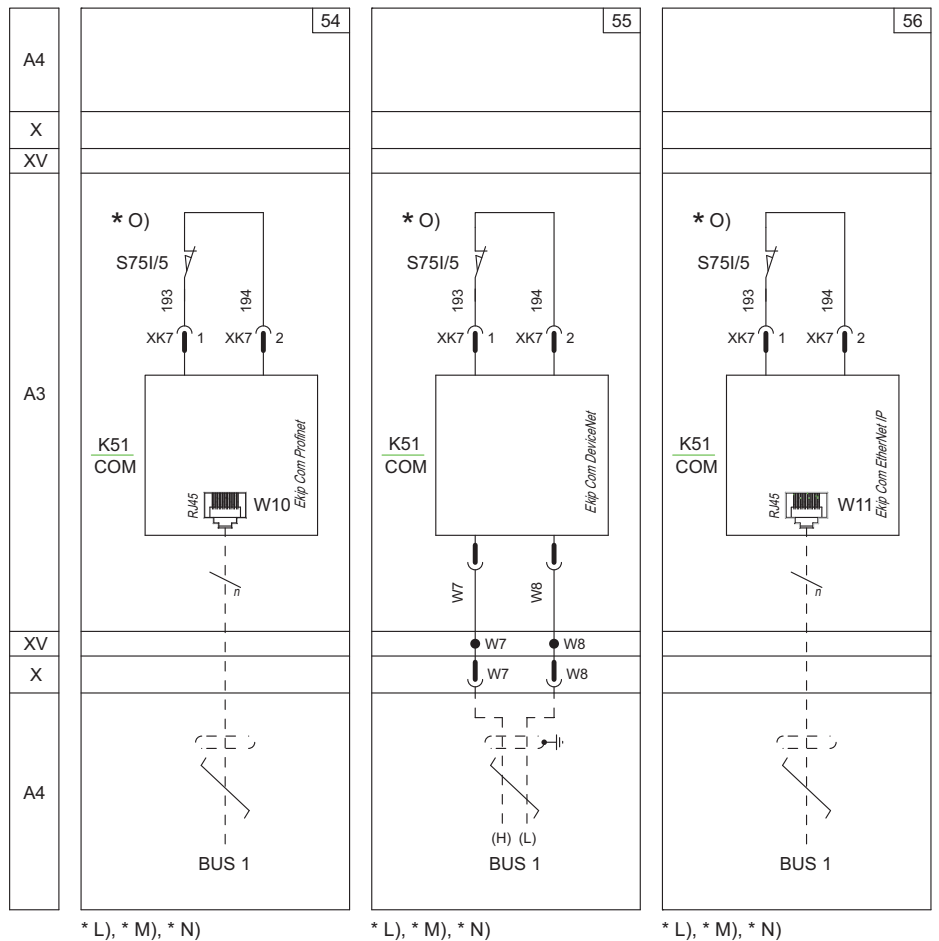


Electrical diagrams

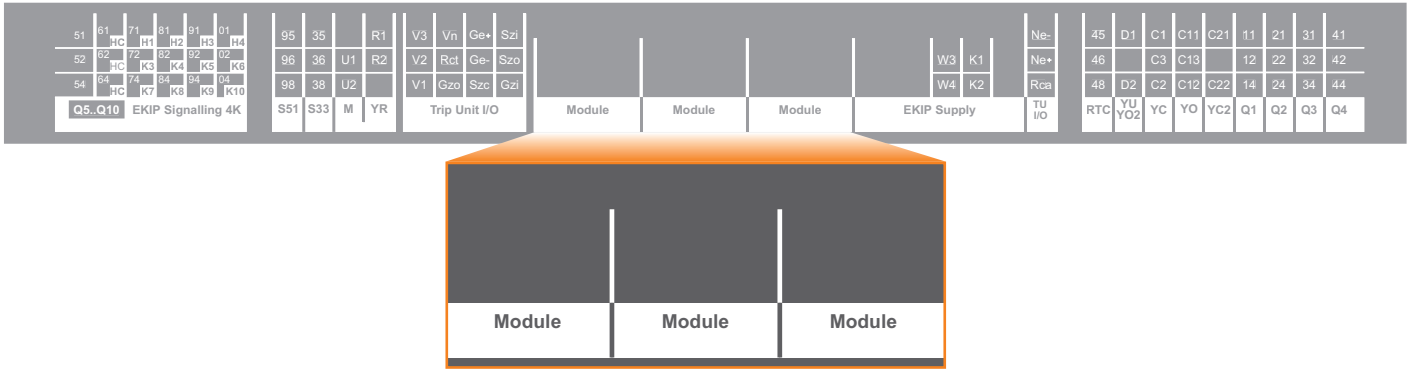
Electrical accessories



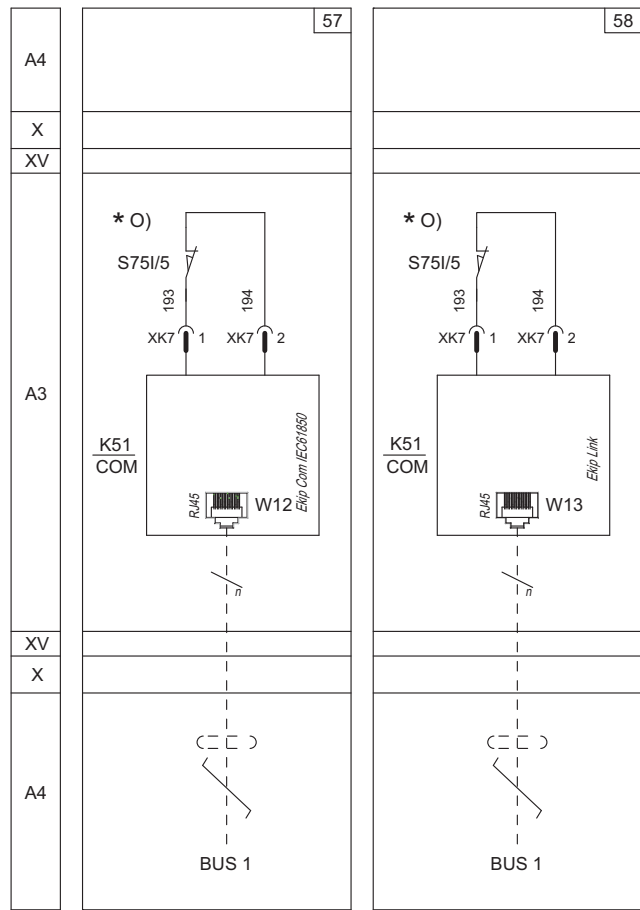
- 54) Ekip COM Profinet
- 55) Ekip COM DeviceNet
- 56) Ekip COM EtherNet IP



1SDC200386F001



- 57) Ekip COM IEC61850
- 58) Ekip LINK



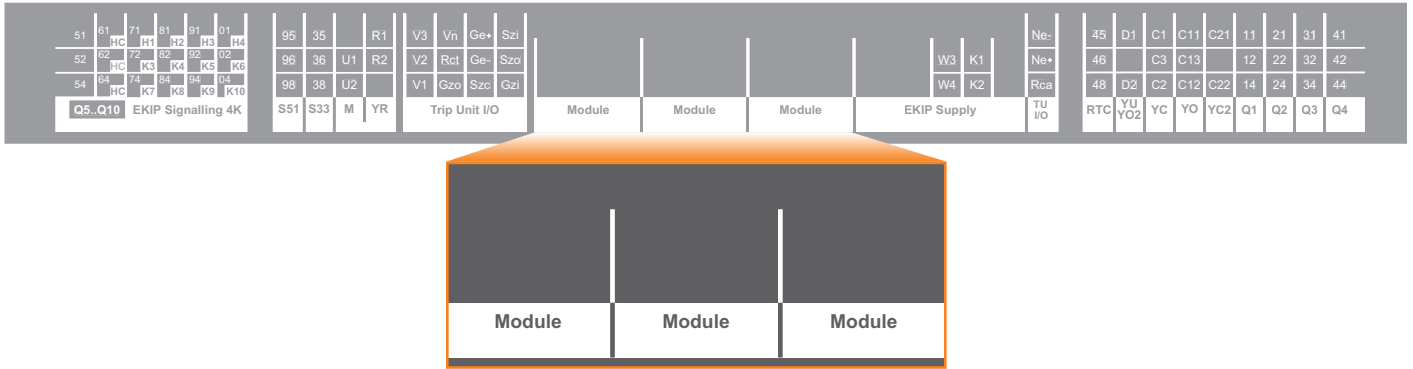
* L), * M), * N)

* L), * M), * N)

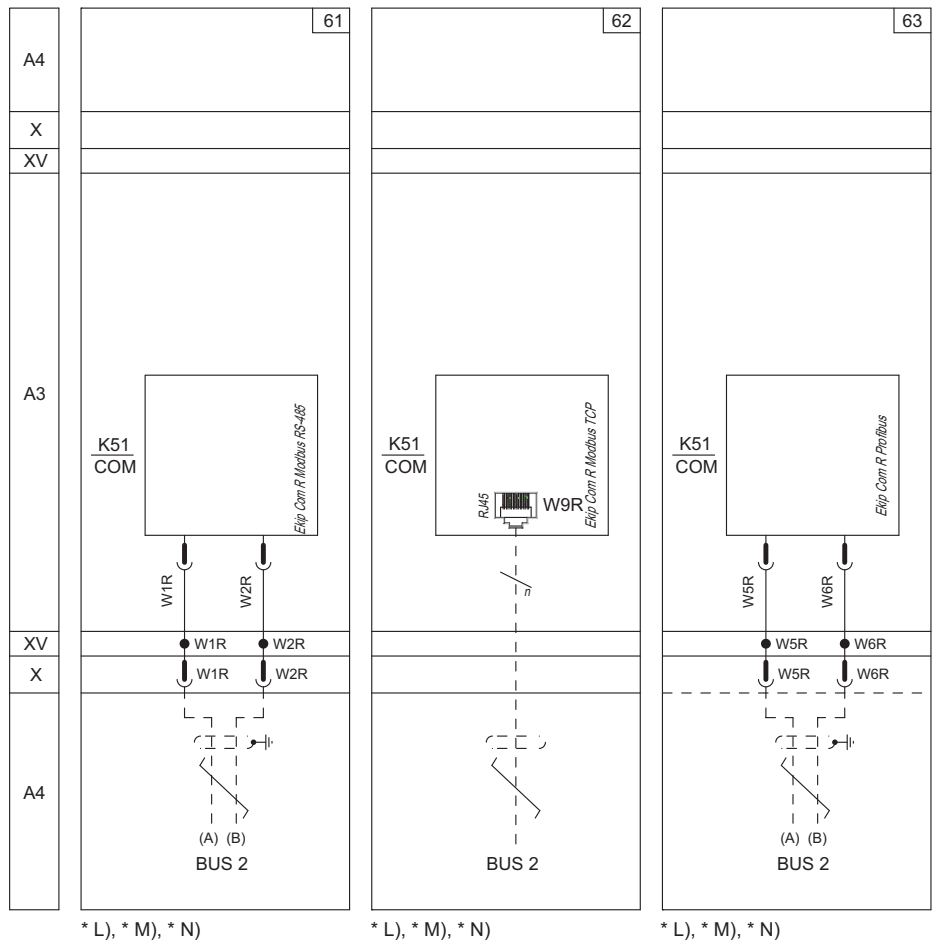
1SDC2000637F001

Electrical diagrams

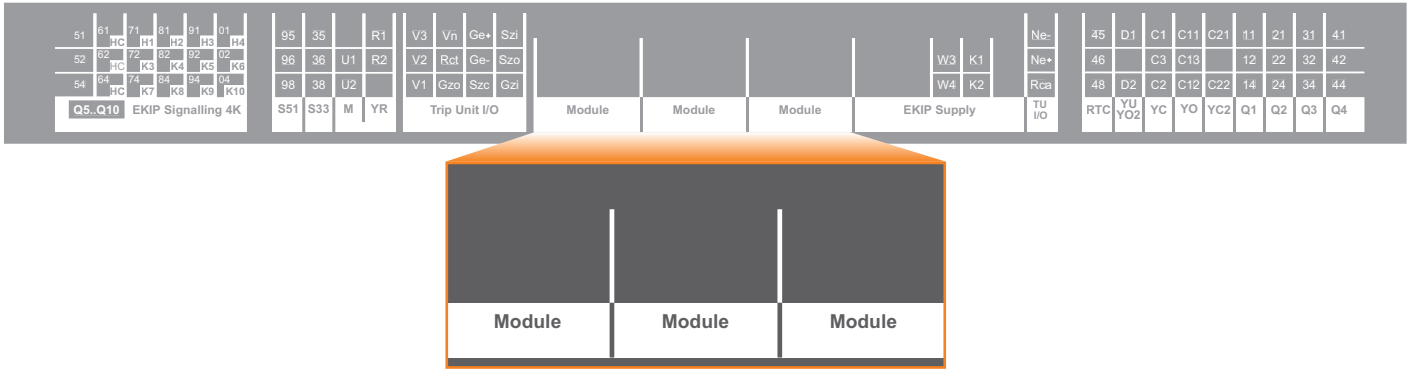
Electrical accessories



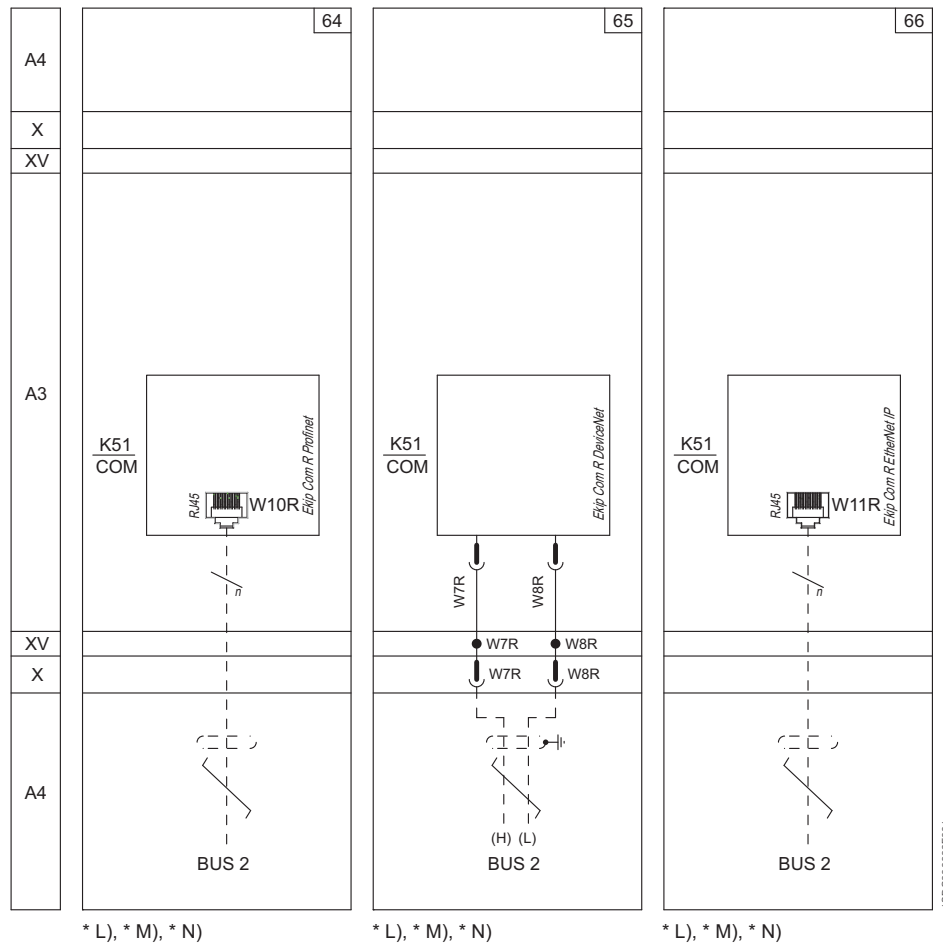
- 61) Ekip COM R Modbus RS-485 Redundant
- 62) Ekip COM R Modbus TCP Redundant
- 63) Ekip COM R Profibus Redundant



1SDC200038F001



- 64) Ekip COM R Profinet Redundant
- 65) Ekip COM R DeviceNet Redundant
- 66) Ekip COM R EtherNet IP Redundant



* L), * M), * N)

* L), * M), * N)

* L), * M), * N)

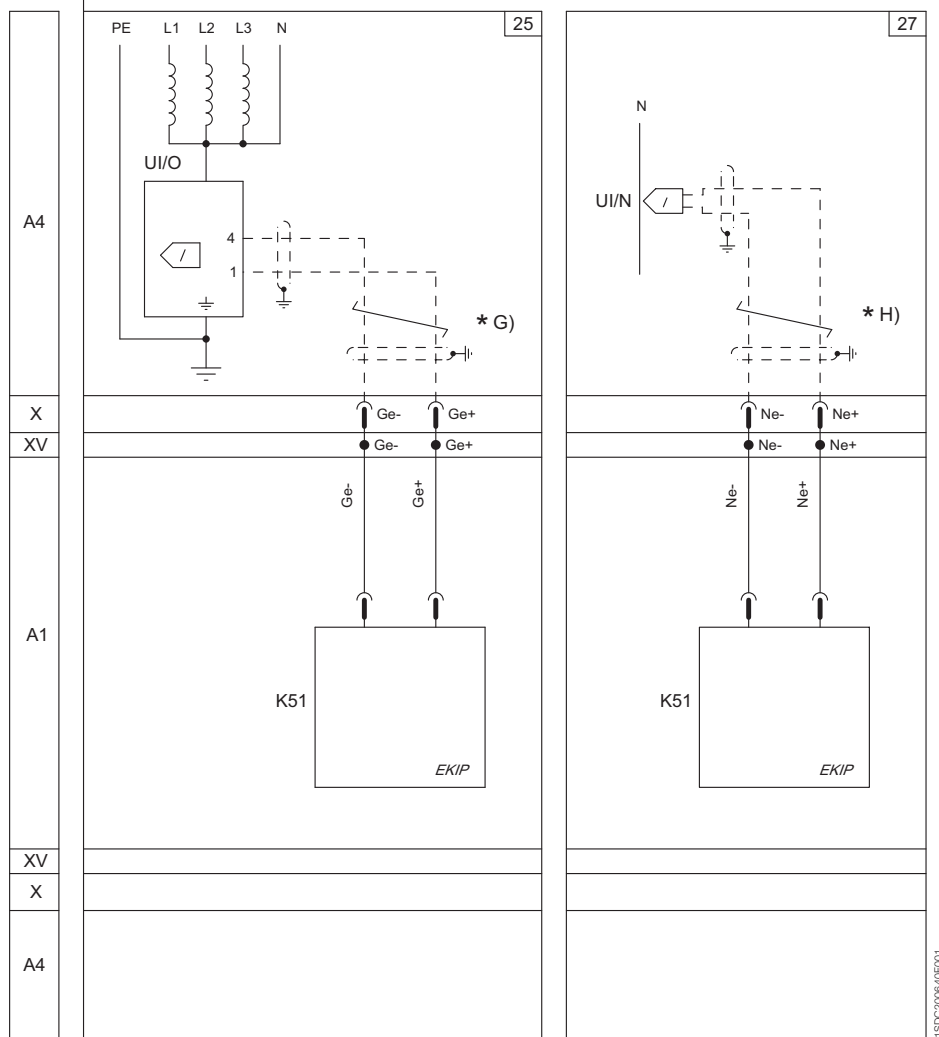
Electrical diagrams

Electrical accessories



25) Transformer star centre sensor input

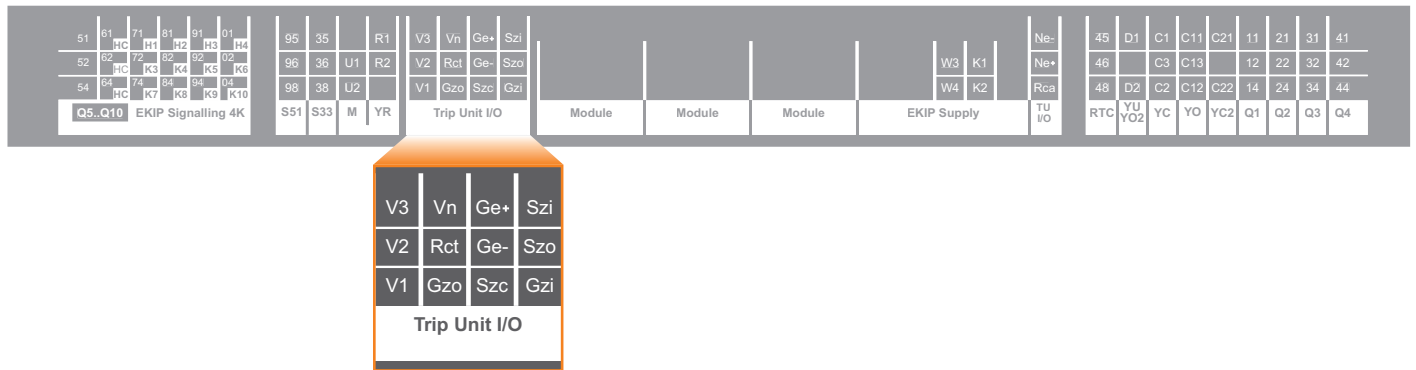
27) Current sensor input on external neutral (only for 3-pole circuit-breakers)



As an alternative to figure 24

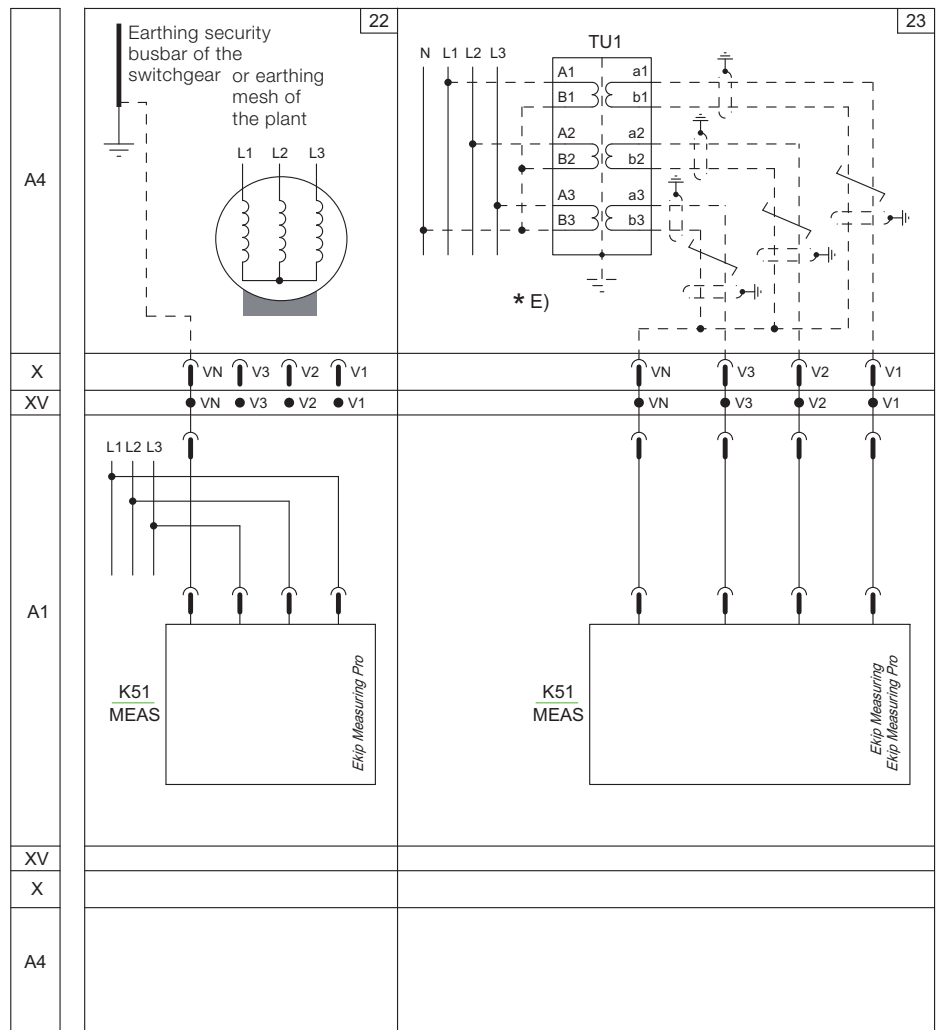
Electrical diagrams

Electrical accessories

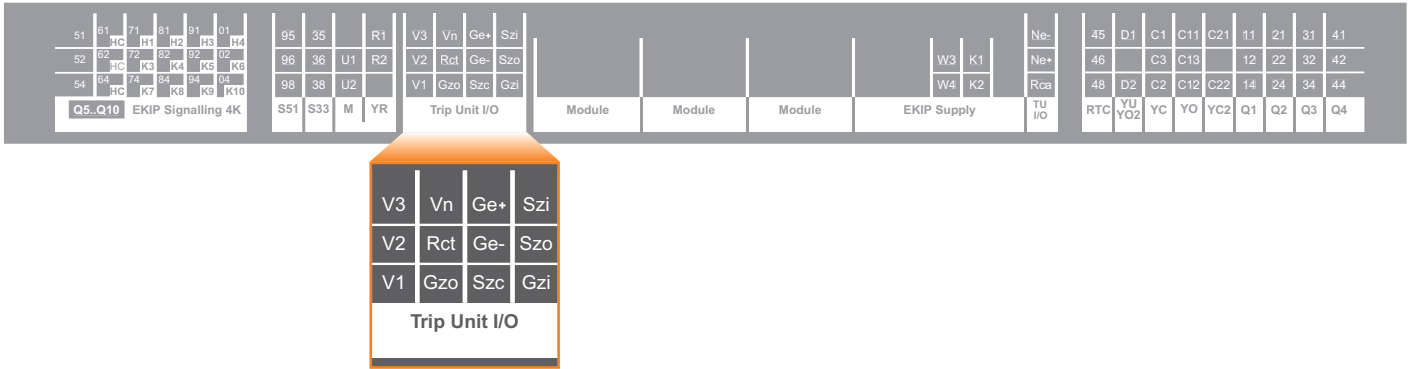


22) Ekip Measuring Pro for residual voltage protection (for Ekip G only)

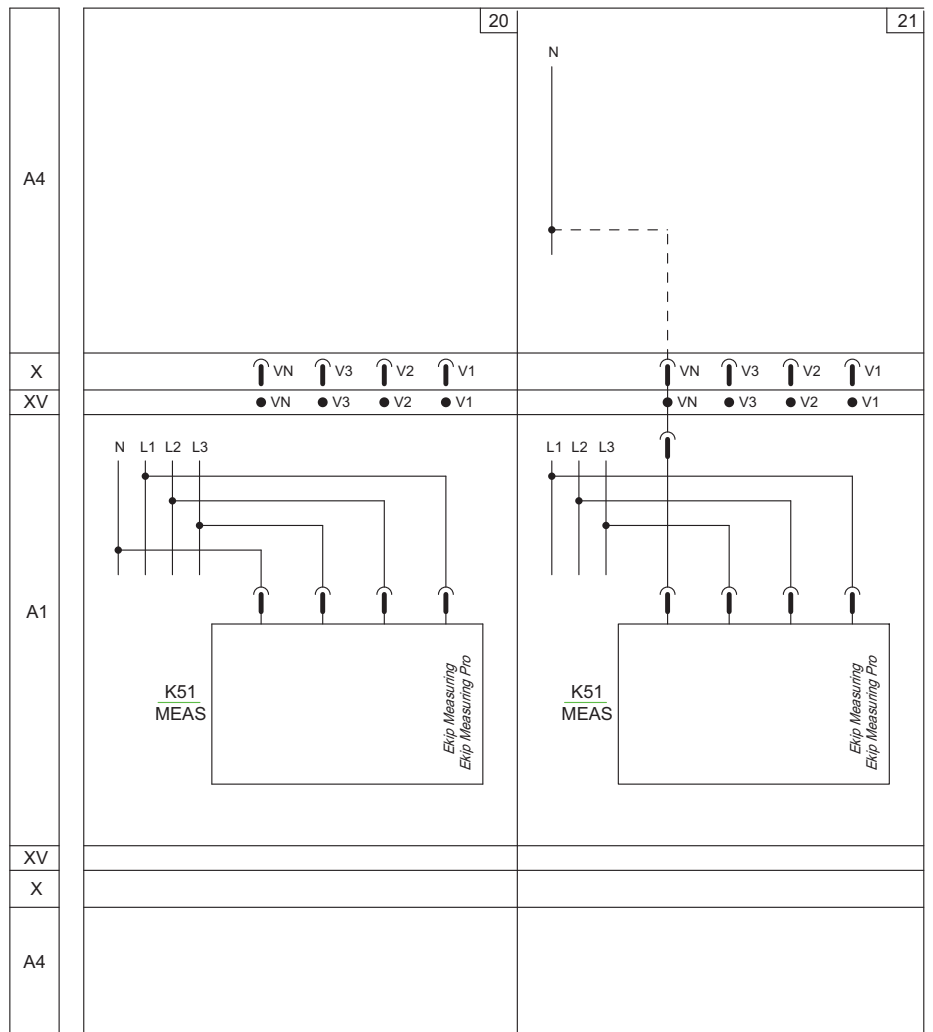
23) Ekip Measuring/Measuring Pro with external voltage socket



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



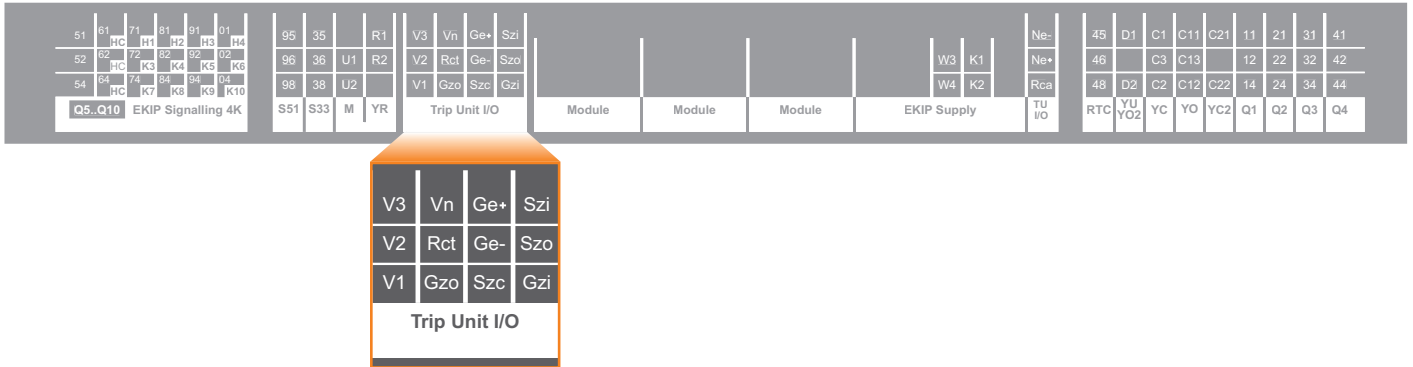
- 20) Ekip Measuring/Measuring Pro with voltage socket inside the four pole circuit-breaker
- 21) Ekip Measuring/Measuring Pro with voltage sockets inside the three-pole circuit-breaker and connection to the external neutral



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

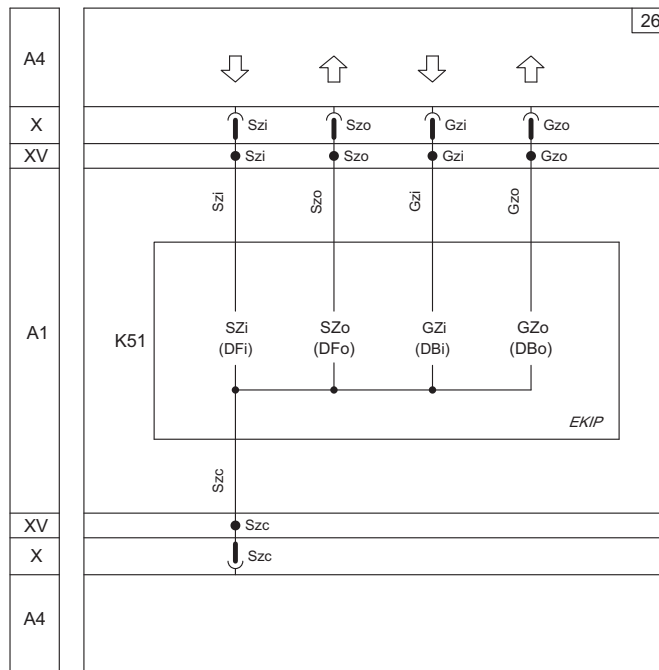
Electrical diagrams

Electrical accessories

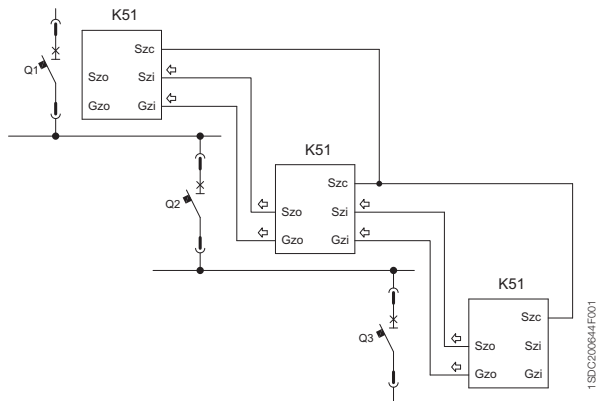


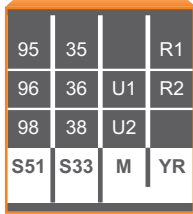
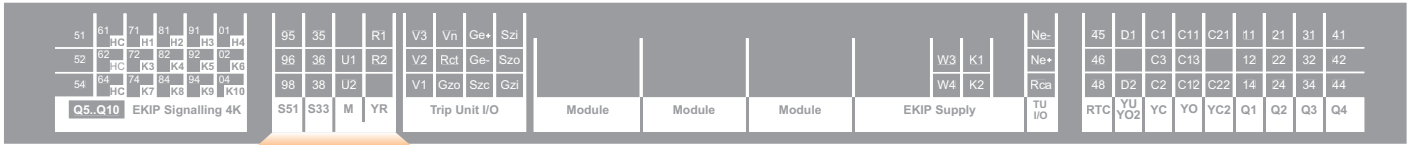
26) Zone selectivity

8

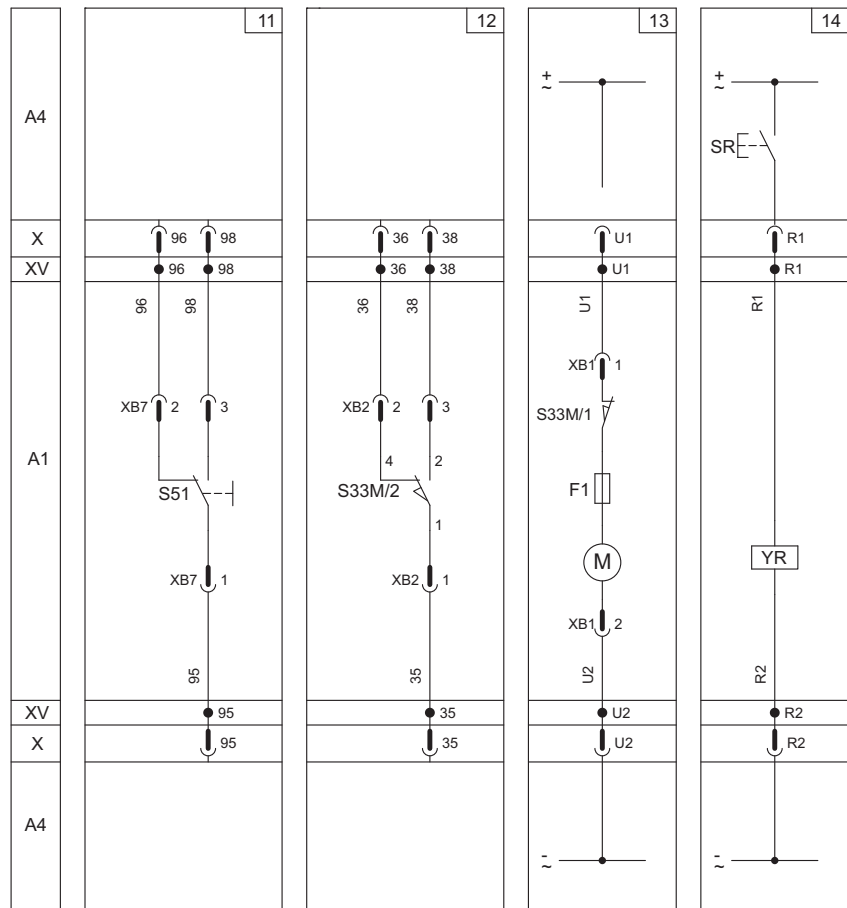


Example for application diagram (among 3 circuit-breakers)





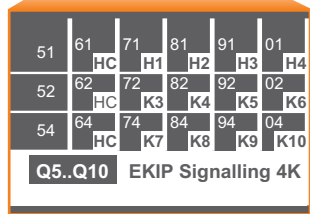
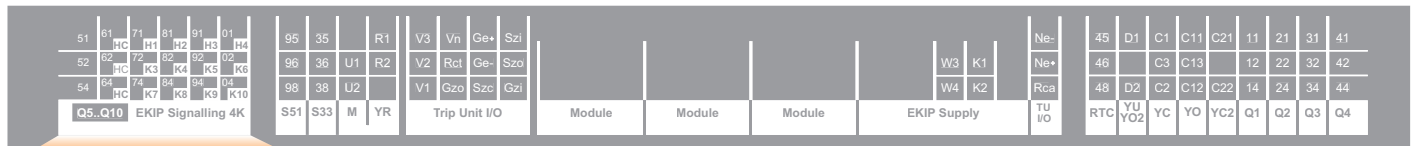
- 11) Trip signalling contact - S51
- 12) Contact for signalling position of loaded springs - S33
- 13) Motor for loading closing springs - M
- 14) Trip contact reset coil – YR



* D)

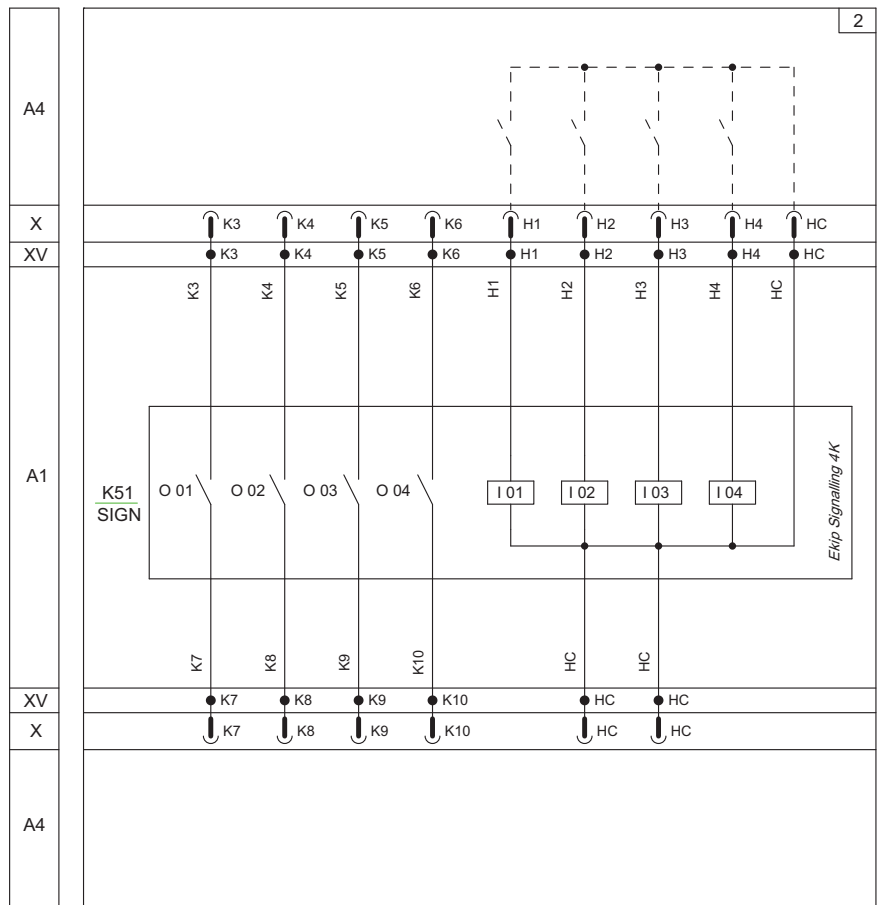
Electrical diagrams

Electrical accessories

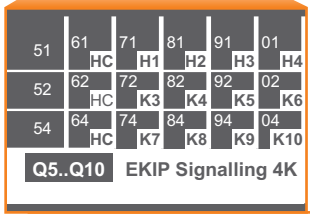
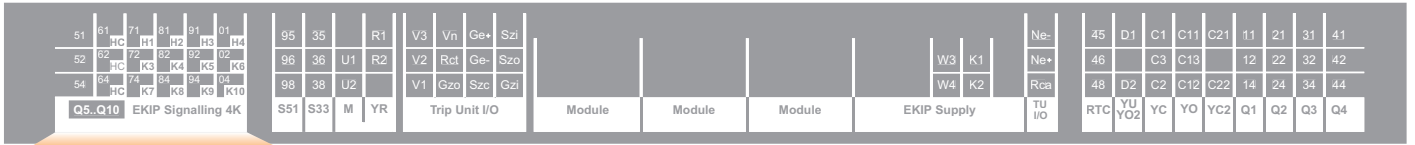


2) Ekip Signalling 4K

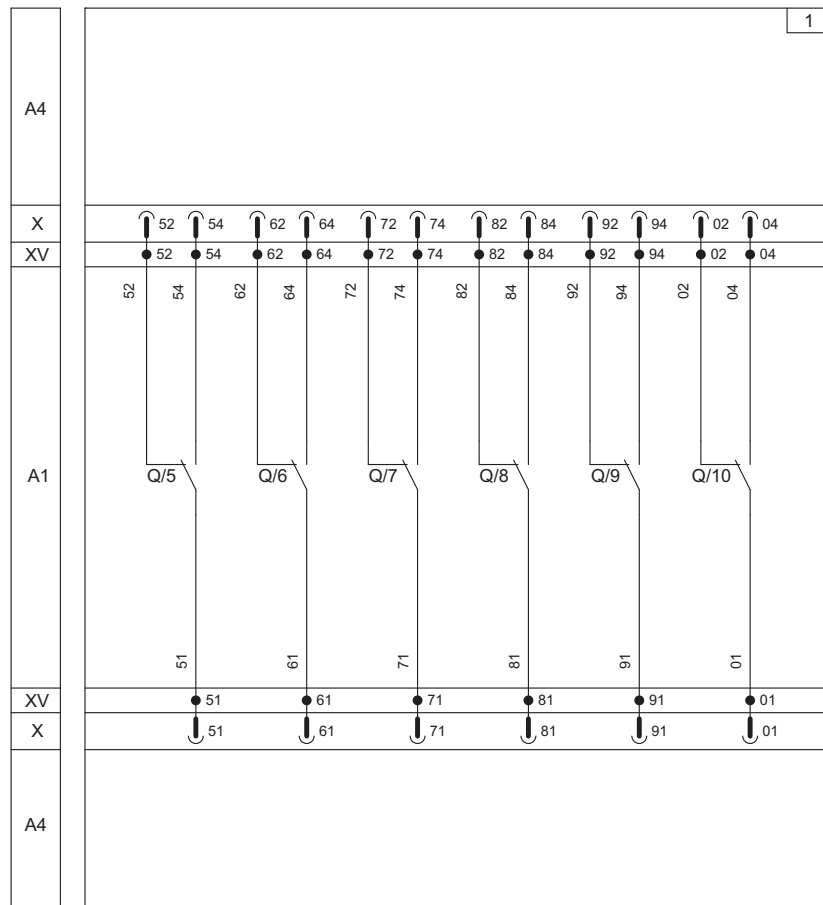
8



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)

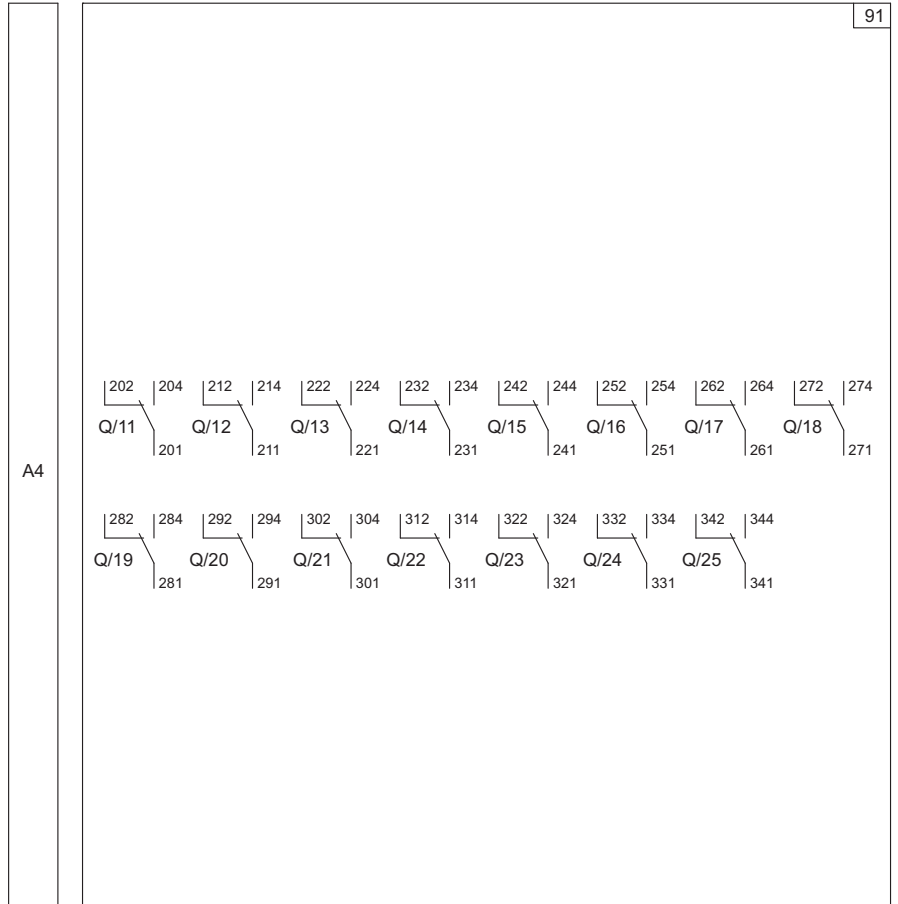


Only for circuit-breakers E2.2, E4.2, E6.2 (as an alternative to figure 2)

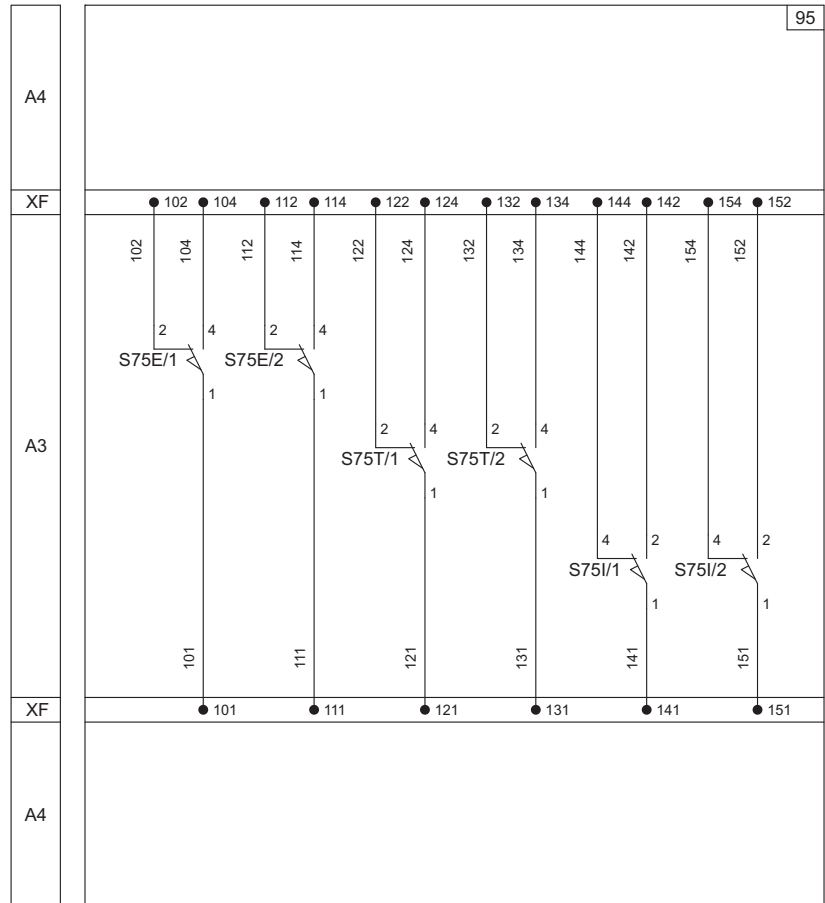
Electrical diagrams

Electrical accessories

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



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

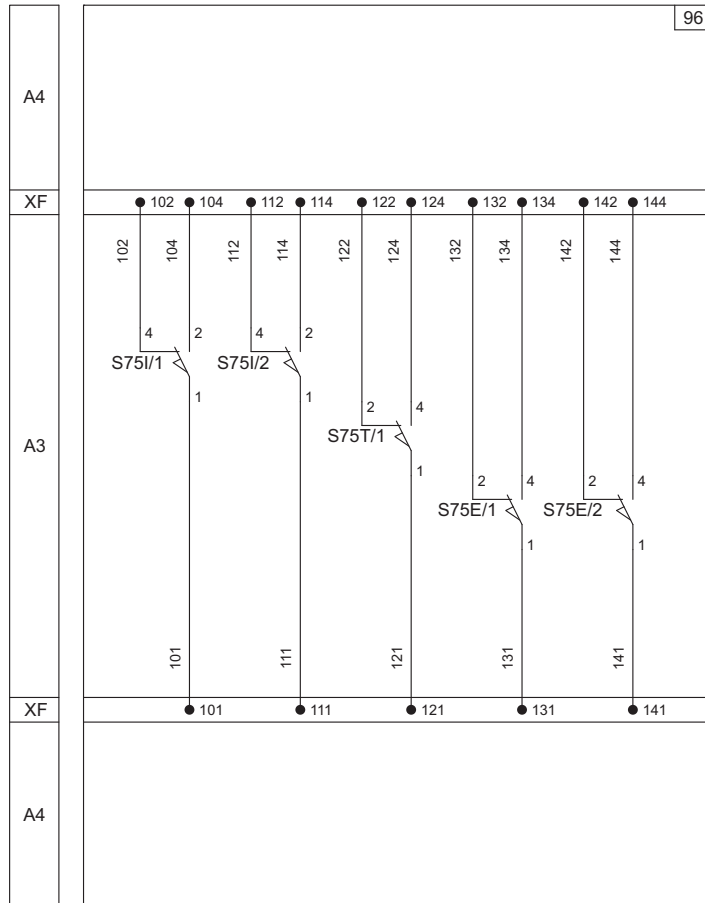


Only for circuit-breakers E1.2 in withdrawable version

Electrical diagrams

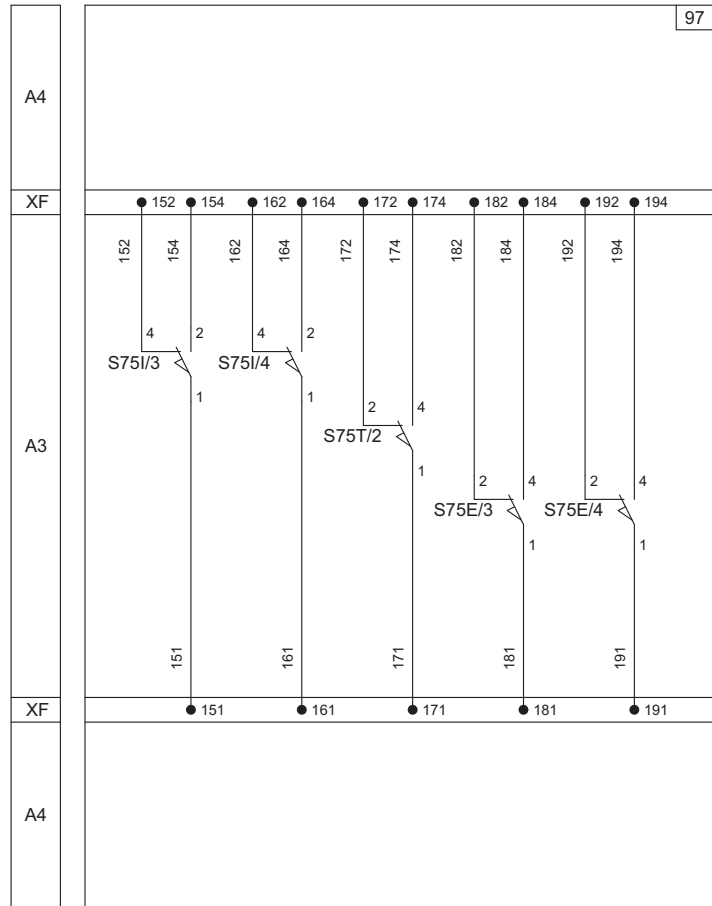
Electrical accessories

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



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

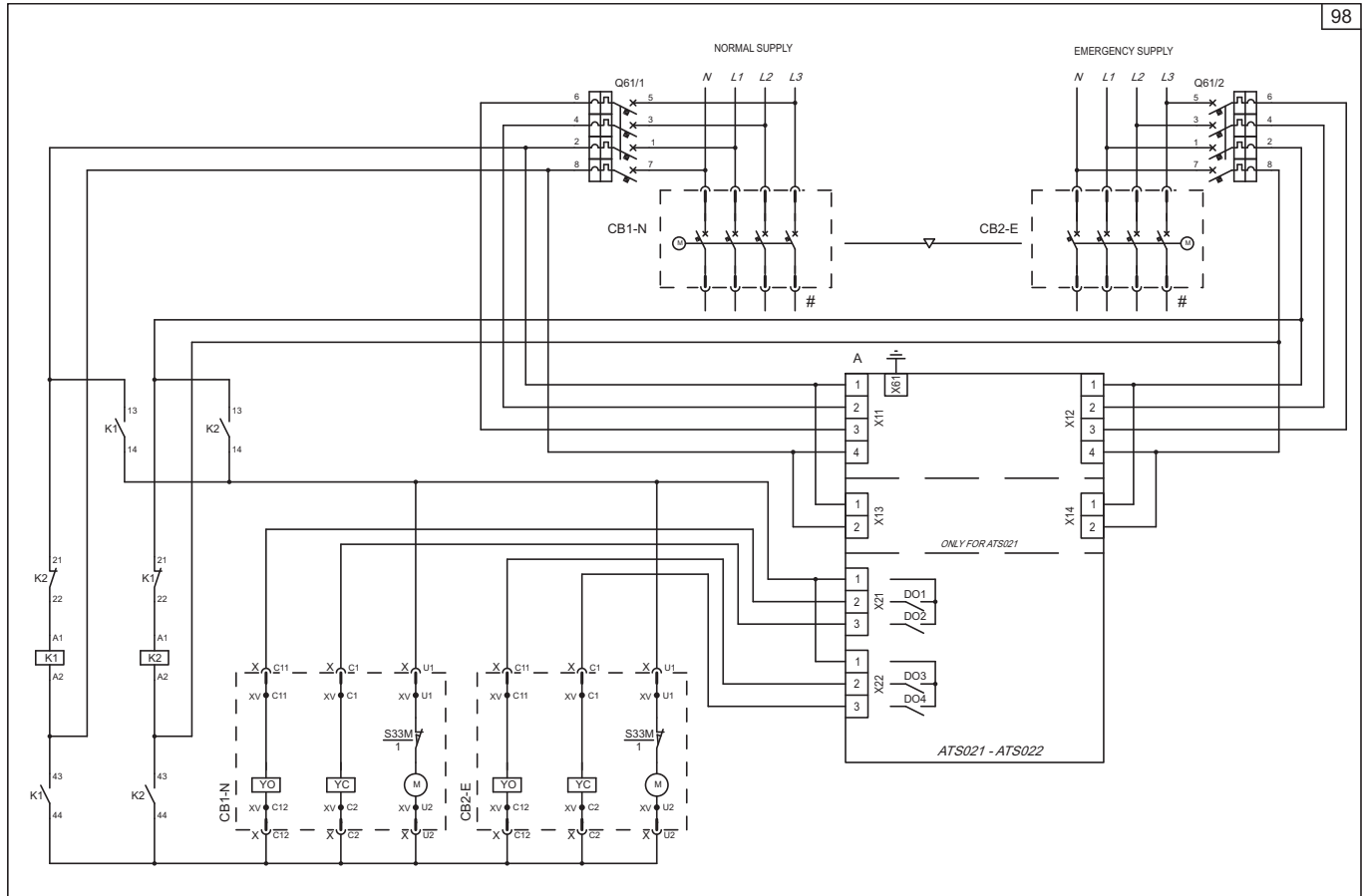
97) Supplementary contacts for signalling circuit-breakers in racked-in, test, racked-out position (second set)



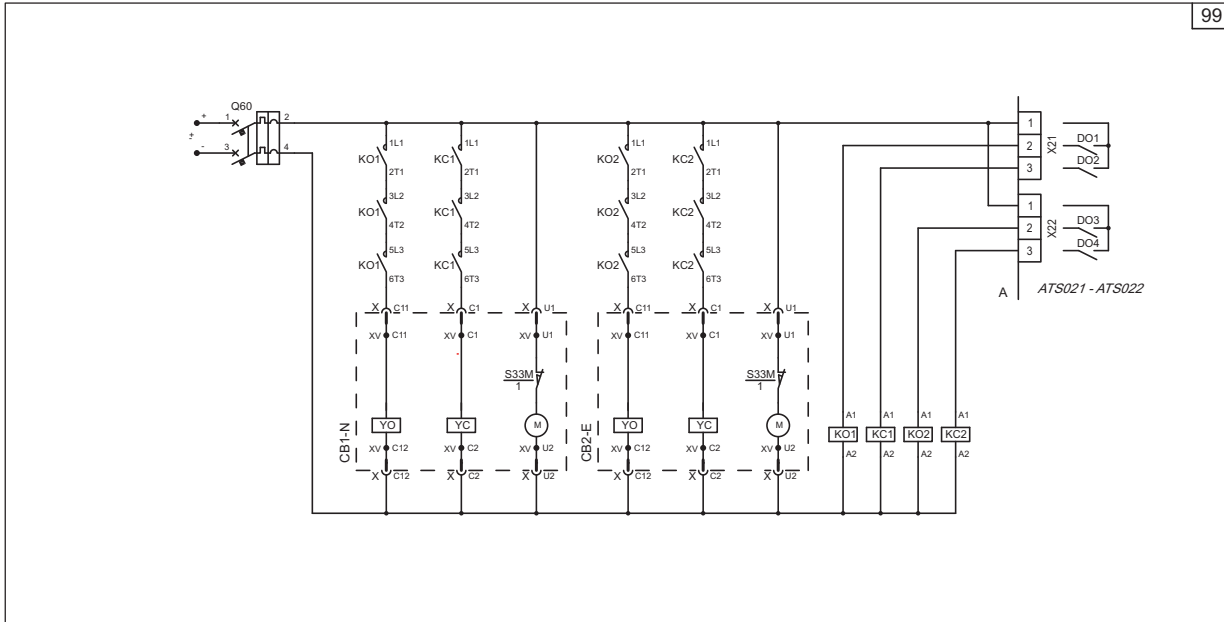
Only for circuit-breakers E2.2, E4.2, E6.2 in withdrawable version

Electrical diagrams ATS021 and ATS022

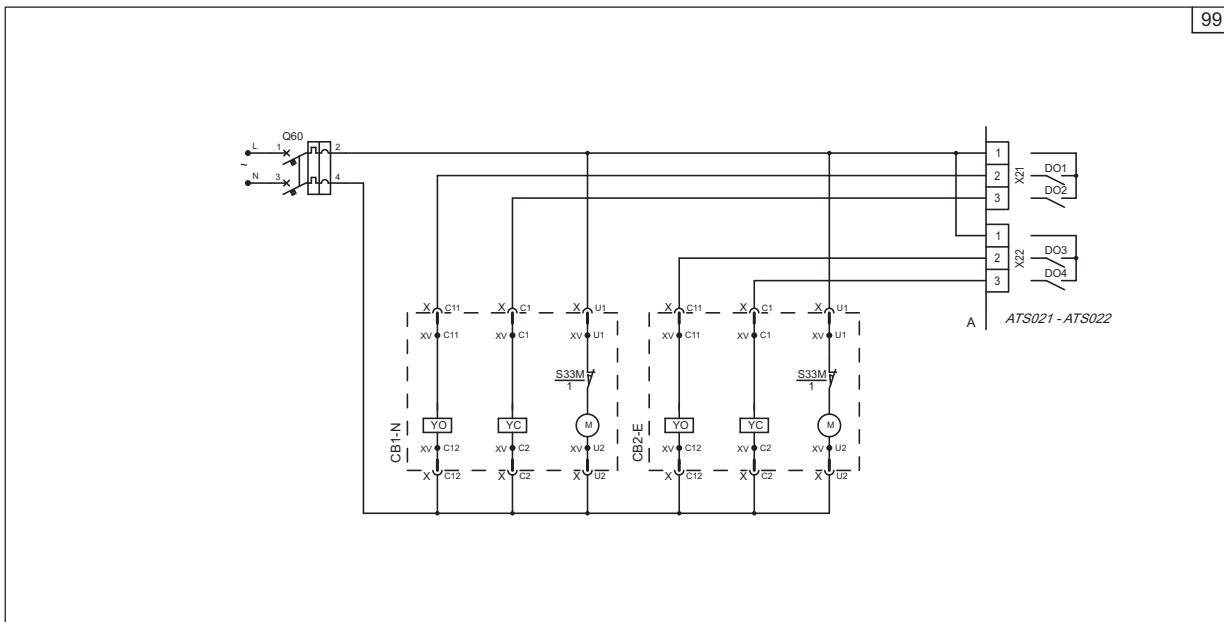
98) Circuit-breakers without auxiliary safety voltage



99) Circuit-breakers with auxiliary safety voltage in direct current



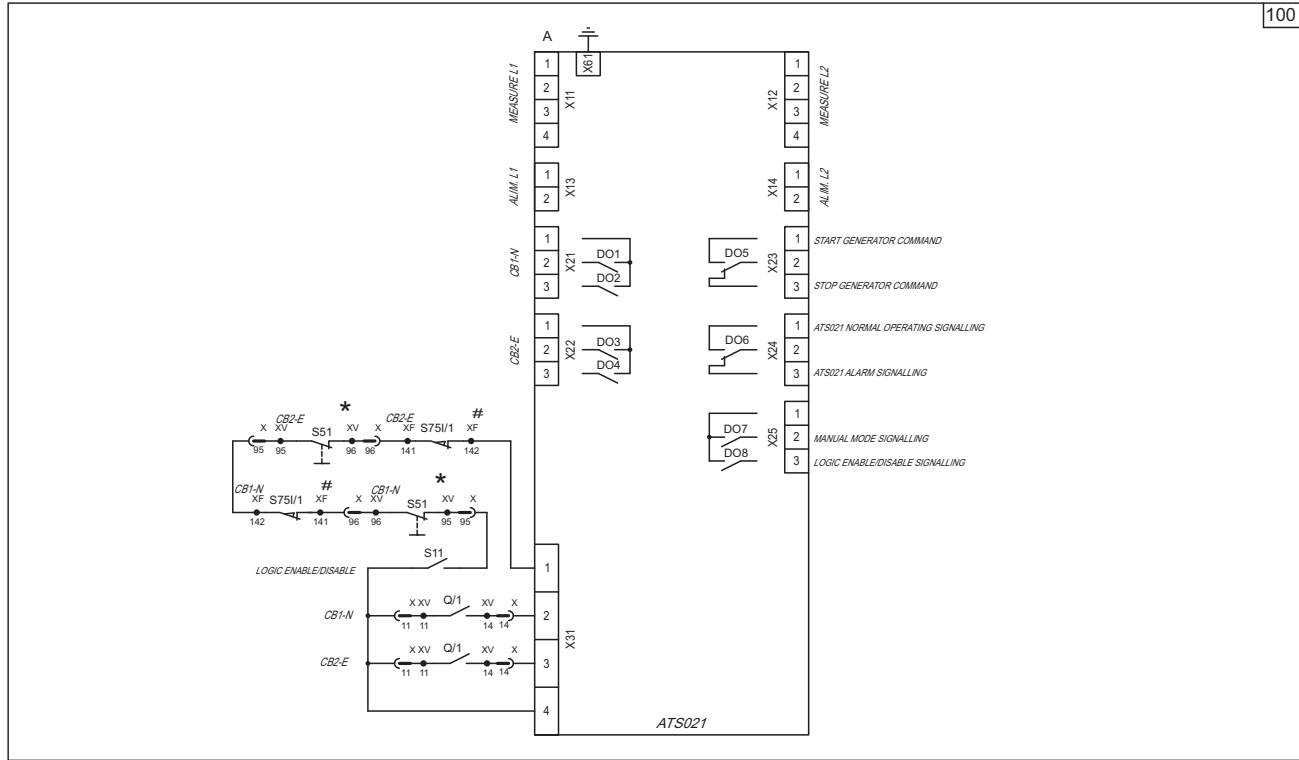
99) Circuit-breakers with auxiliary safety voltage in alternating current



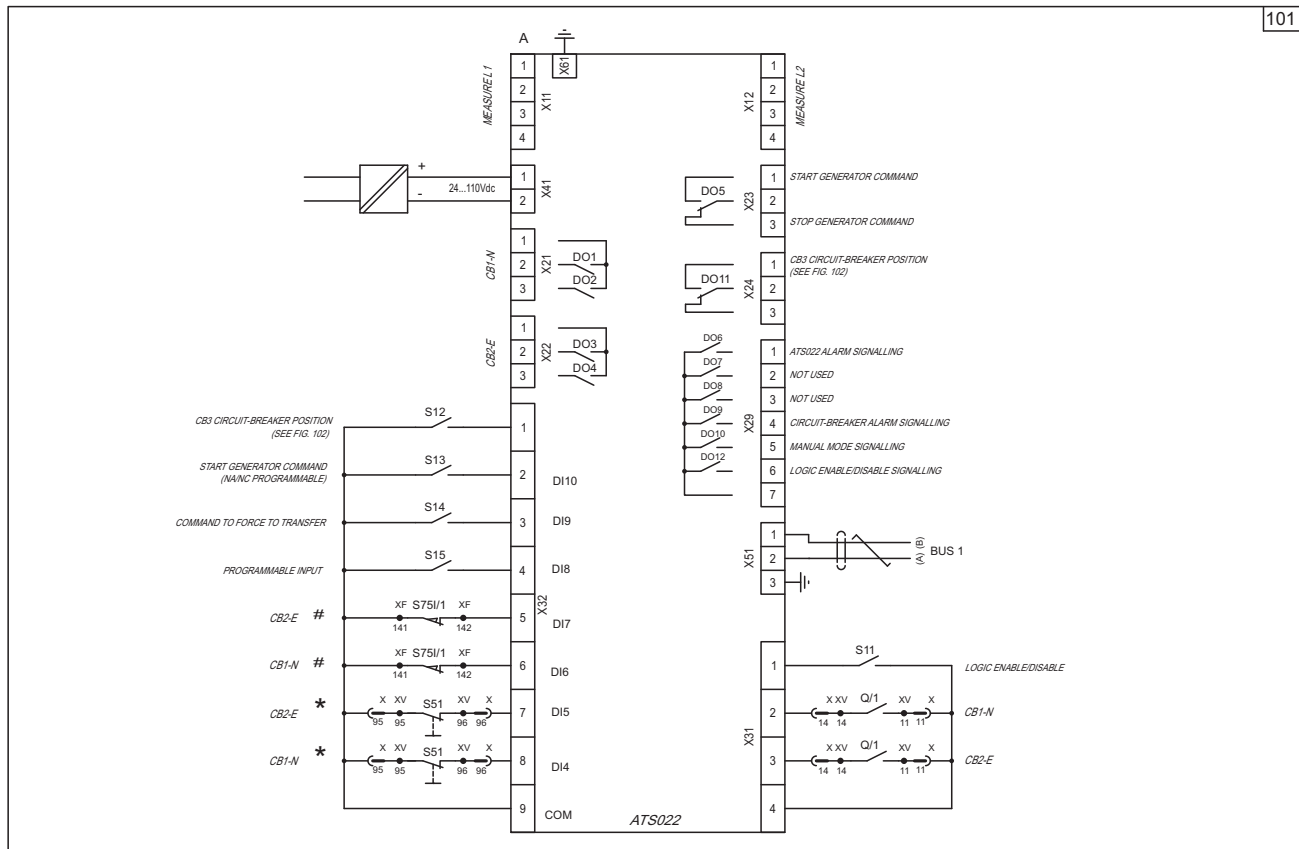
Electrical diagrams

ATS021 and ATS022

100) ATS021

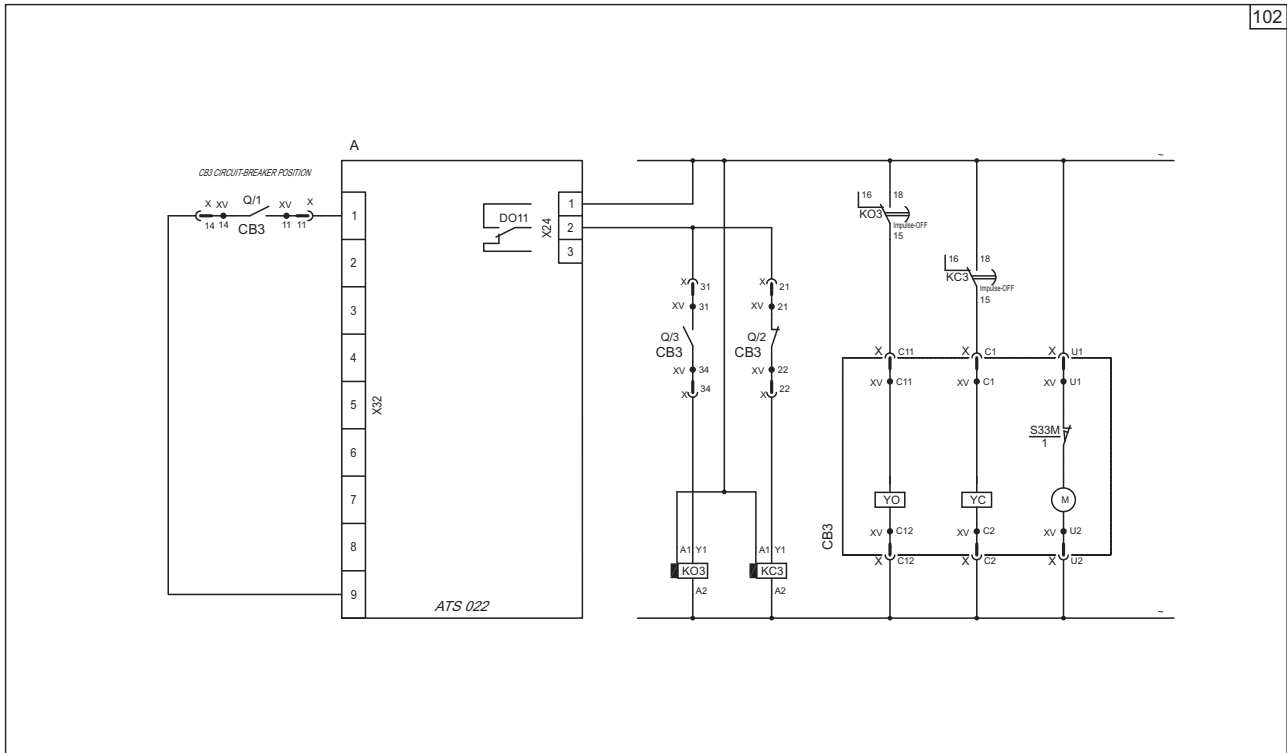


101) ATS022

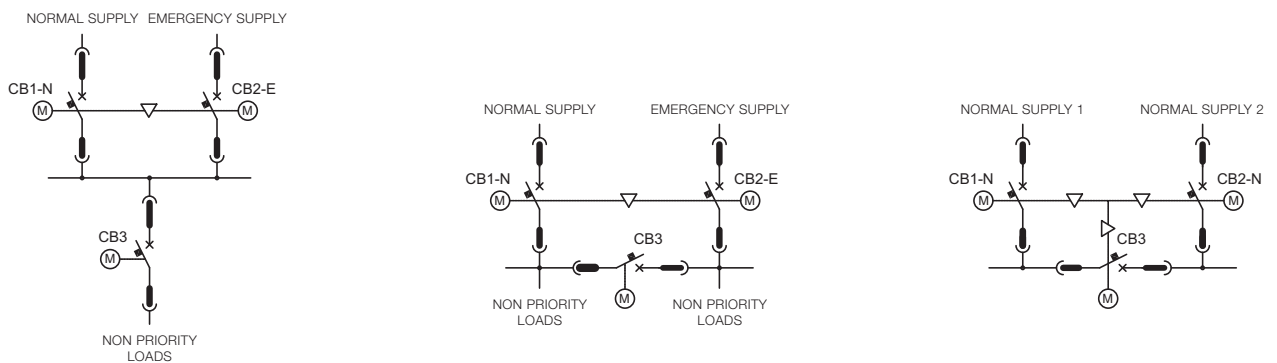


1SDC200063EN001

102) Third circuit-breaker control with ATS022



Possible configurations - ATS022 with three circuit-breakers

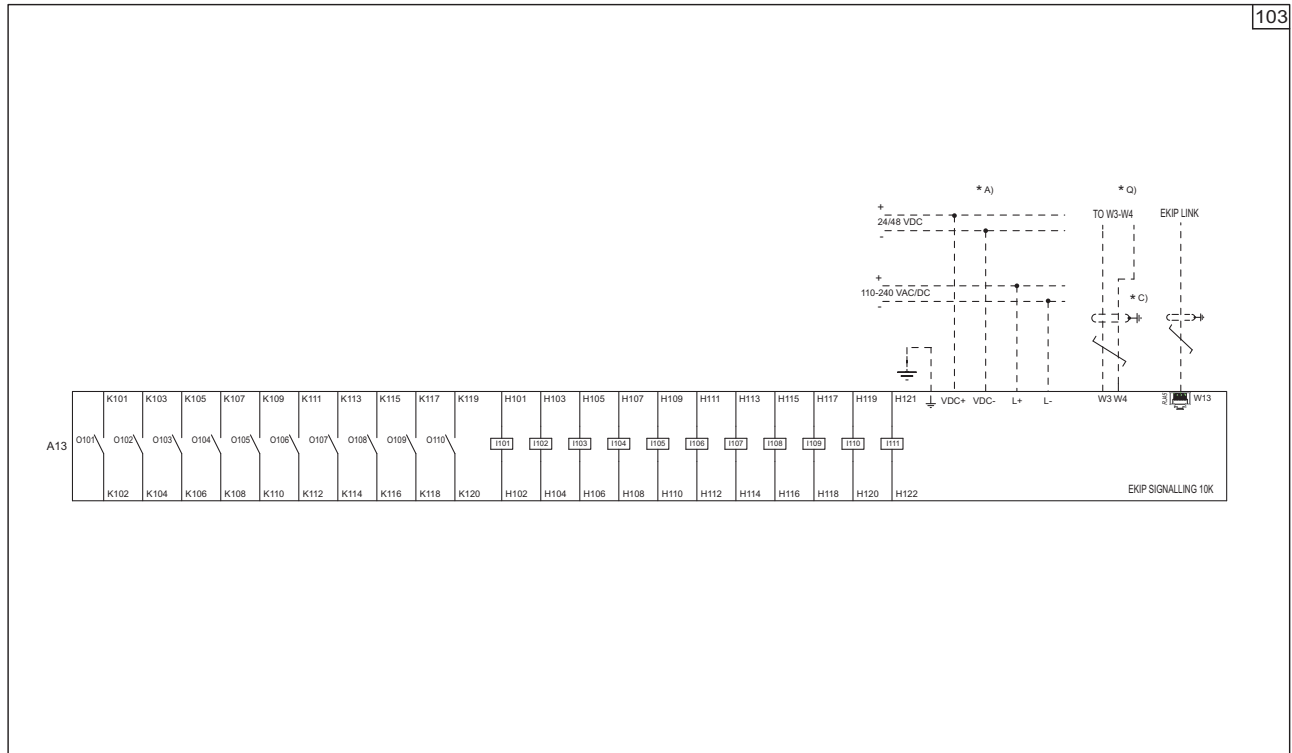


Note: Use auxiliary voltage of 110-130V AC or 220-240V AC.

Electrical diagrams

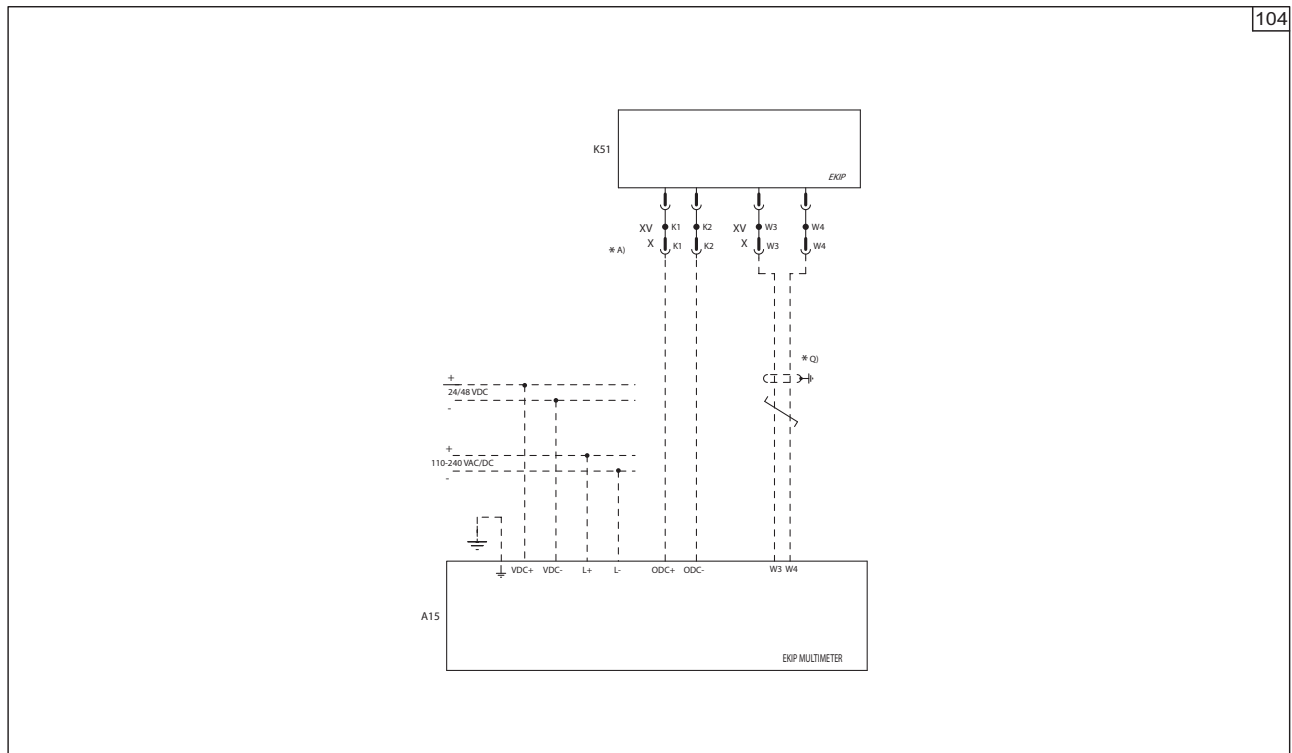
Power Controller

103) Ekip Signalling 10K

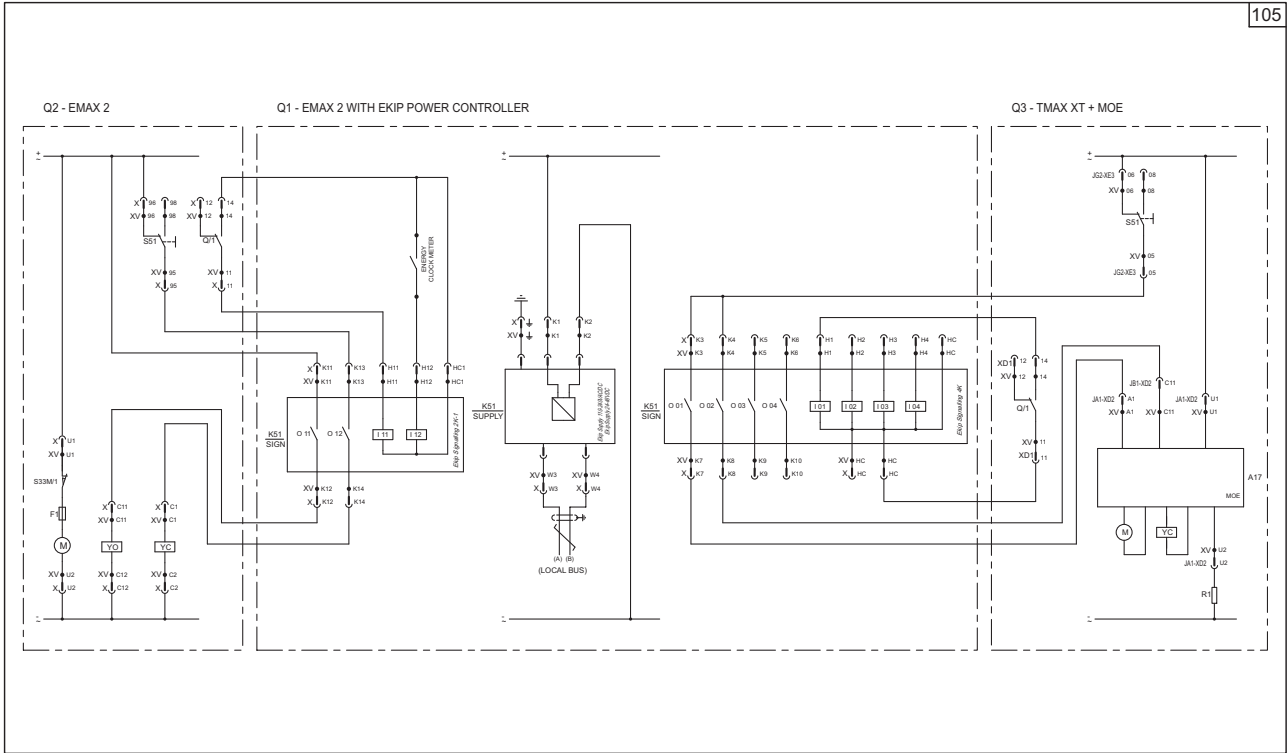


8

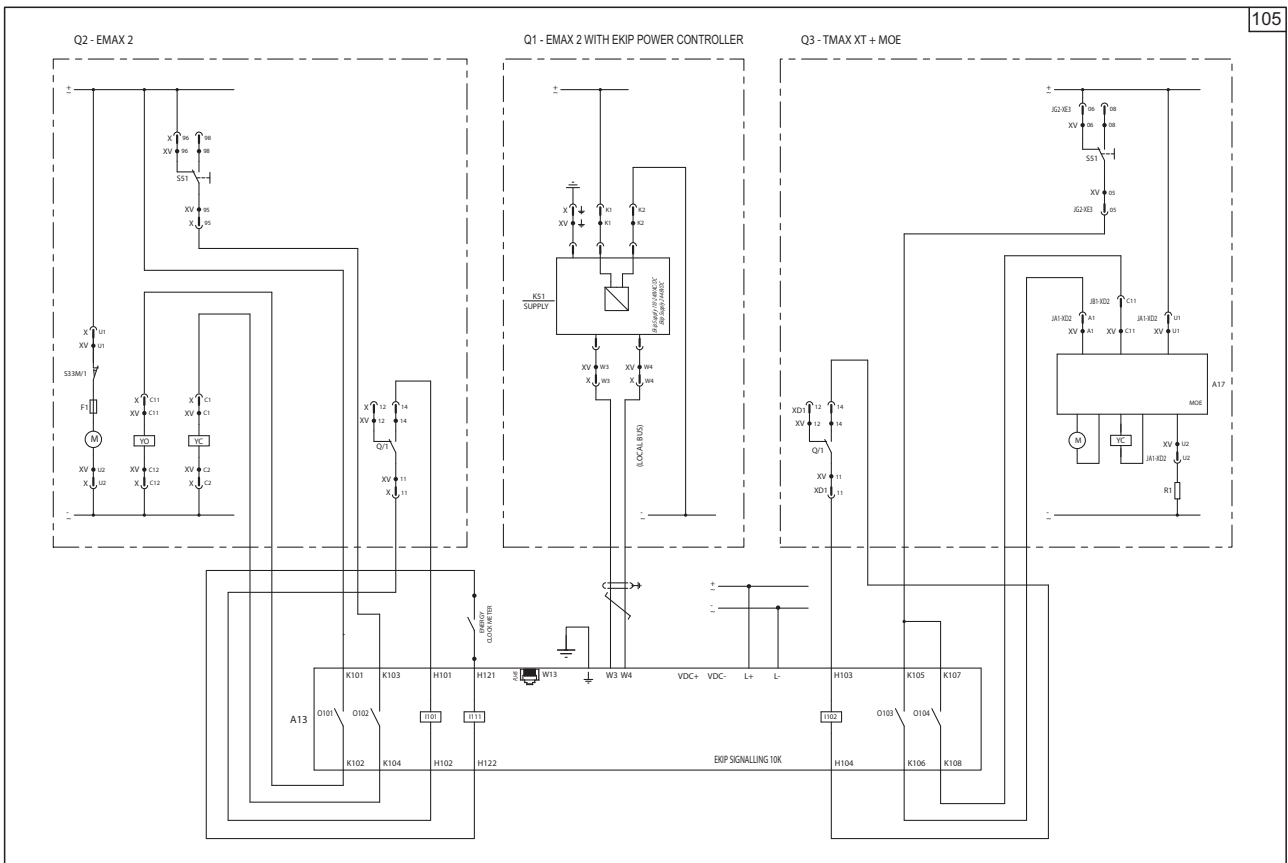
104) Ekip Multimeter



105) Application diagram for Ekip Touch, Hi-Touch, G Touch, G Hi-Touch with Power Controller function



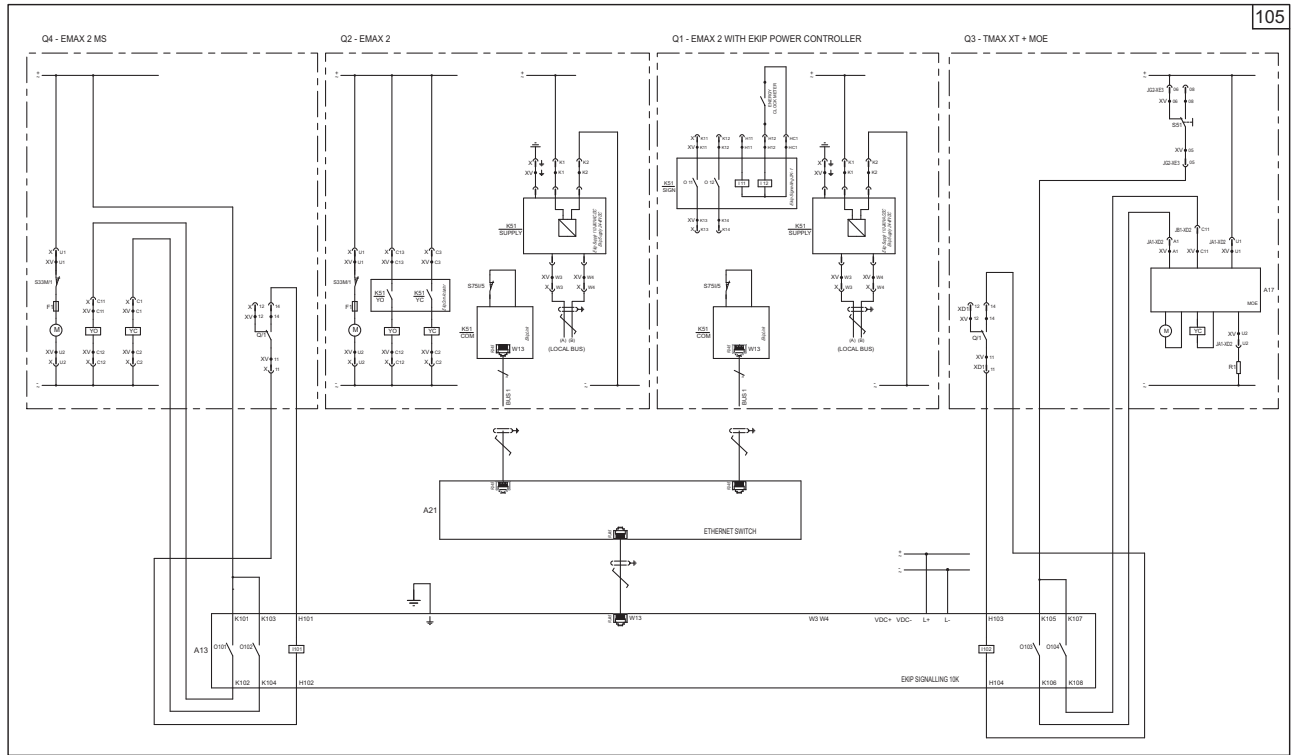
1SDC20003TENF001



1SDC20003BENF001

Electrical diagrams

Power Controller



105

1SDC200698EN001

Ordering codes

Instructions for ordering

Ordering examples	9/2
-------------------	-----

General information

9/5

Automatic circuit-breakers

Fixed version for power distribution	9/6
Withdrawable version for power distribution	9/21
Fixed version for generators	9/35
Withdrawable version for generators	9/40

Switch-disconnectors

Fixed version	9/45
Withdrawable version	9/48
Version for applications up to 1150V AC	9/50
Fixed version for applications up to 1000V DC	9/51
Withdrawable version for applications up to 1000V DC	9/52

Derived versions

Sectionalizing truck	9/53
Earthing truck	9/53
Earthing switch with making capacity	9/53

Fixed parts

9/54

Accessories

Electrical accessories	9/55
Mechanical accessories	9/58
Mechanical interlock	9/61
Ekip modules	9/62
Terminals	9/65

Instructions for ordering

Ordering examples

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

Ordering examples

- **Terminal kit codes** (other than standard supply) for fixed circuit-breaker or for fixed part of withdrawable circuit-breaker. The codes refer to 3 or 4 pieces (for mounting on top or bottom terminals). To convert a complete circuit-breaker, 1 kit for upper terminals and 1 kit for lower terminals must be specified in the order.

Example no. 1

Emax E2.2N 3 poles fixed with vertical rear terminals (VR)

1SDA071066R1	E2.2N 2500 Ekip Touch LSIG 3p F HR
1SDA074009R1	Kit VR Sup E2.2 lu=2500 3pcs INST
1SDA074011R1	Kit VR Inf E2.2 lu=2500 3pcs INST

Example no. 2

Emax E1.2N 4 poles fixed with upper vertical rear (VR) and front (F) terminals (standard supply)

1SDA071513R1	E1.2N 1600 Ekip Dip LSIG 4p F F
1SDA073986R1	Kit VR Upper E1.2 F 4pcs INST

Example no. 3

Emax E4.2H 3 poles fixed with upper front terminals (F) and adjustable rear bottom vertical (VR) terminals

1SDA071169R1	E4.2H 3200 Ekip Hi-Touch LSIG 3p F HR
1SDA074126R1	Kit F upper E4.2 F 3pcs INST
1SDA074017R1	Kit VR lower E4.2 lu=3200 3pcs INST

Example no. 4

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

1SDA073909R1	E2.2 W FP lu=2000 3p HR HR
1SDA074057R1	Kit SVR upper E2.2 lu=2000 3pcs INST

- **Rating Plug for lower values than rated current.**

Rating plug installed on the circuit-breaker enables to obtain lower current values than rated current.

Example no. 5

Emax E2.2S 2500 4 poles fixed In=1600A

1SDA071706R1	E2.2S 2500 Ekip Touch LSIG 4p F HR
1SDA074266R1	Rating Plug 1600 E1.2..E6.2 INST

- **Special version for rated service voltages up to 1150V AC.**

Upgrade kits for SACE Emax 2 circuit-breakers enables the version for applications up to 1150V AC.

Example no. 6

Emax E6.2X 6300 4 poles fixed for applications up to 1150V AC

1SDA071949R1	E6.2X 6300 Ekip HI-Touch LSIG 4p F HR
1SDA074347R1	E6.2X/E lu=6300 Upgrade Kit 1150V AC 4p

– Ordering for Ekip modules.

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

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

Ekip Fan module can be installed as an alternative of Ekip Supply only on withdrawable version of E2.2, E4.2 and E6.2.

In addition to Ekip Fan, up to 2 modules can be installed.

Example no. 7

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

1SDA071169R1	E4.2H 3200 Ekip Hi-Touch LSIG 3p F HR
1SDA074173R1	Ekip Supply 24-48V DC E1.2..E6.2
1SDA074151R1	Ekip Com Modbus TCP E1.2..E6.2
1SDA074158R1	Ekip Com R Modbus TCP E1.2..E6.2
1SDA074167R1	Ekip Sign. 2K-1 E1.2..E6.2
1SDA074170R1	Ekip Sign. 4K E2.2..E6.2

Example no. 8

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

1SDA071166R1	E4.2H 3200 Ekip Touch LSIG 3p F HR
1SDA074174R1	Ekip Fan 24VDC E2.2..E6.2
1SDA074155R1	Ekip Com EtherNet/IP E1.2..E6.2
1SDA074150R1	Ekip Com Modbus RS-485 E1.2..E6.2
1SDA074189R1	Ekip Measuring Pro E4.2

Example no. 9

Emax E1.2N 4 poles fixed with modules: Ekip Supply, Ekip Link

1SDA071513R1	E1.2N 1600 Ekip Dip LSIG 4p F F
1SDA074172R1	Ekip Supply 110-240V AC/DC E1.2..E6.2
1SDA074163R1	Ekip Link E1.2..E6.2

– Ordering for electrical accessories.

All the accessories are available. In particular, up to 3 coils can be ordered for E1.2, whereas up to 4 coils for E2.2, E4.2 and E6.2.

Example no. 10

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

1SDA072395R1	E2.2S 2000 Ekip Touch LSi LSIG 3p WMP
1SDA073674R1	YO E1.2..E6.2 220-240V AC/DC
1SDA073687R1	YC E1.2..E6.2 220-240V AC/DC
1SDA073725R1	M E2.2..E6.2 220-250V AC/DC
1SDA073674R1	YO E1.2..E6.2 220-240V AC/DC

– Ordering for key locks.

Example no. 11

Emax E2.2N 3 poles with double key lock in racked-in / test / racked-out position, using different keys

1SDA071066R1	E2.2N 2500 Ekip Touch LSIG 3p F HR
1SDA073806R1	KLP-D Bl. Racked in/out E2.2..E6.2 1st key
1SDA073812R1	KLP-D Bl. Racked in/out E2.2...E6.2 2nd key

Instructions for ordering

Ordering examples

– Ordering for mechanical Interlocks.

Interlocks have several strategy configuration, suitable for fixed circuit-breakers and withdrawable circuit-breakers.

Each configuration requires different groups:

- **Cables**, select one Kit for strategy A / B / C / D. The cables must be ordered on fixed circuit-breaker or fixed part of withdrawable circuit-breaker.
- **Lever**, required only for E2.2, E4.2 and E6.2. These lever must be mounted on fixed circuit-breaker or on mobile part of withdrawable circuit-breaker.
- **Support**, installed on fixed circuit-breaker or on fixed part of withdrawable circuit-breaker. This support is mounted on the external right side of the circuit-breaker.

Example no. 12

Interlock between two fixed circuit-breakers: E1.2 and E2.2

E1.2 Fixed circuit-breaker	E2.2 Fixed circuit-breaker
Cables [Group 1]: 1 Item	Lever [Group 2]: 1 Item
Support [Group 3]: 1 Item	Support [Group 3]: 1 Item

Example no. 13

Interlock between three fixed circuit-breakers: one E2.2 and two E4.2

E2.2 Fixed circuit-breaker	E4.2 Fixed circuit-breaker	E4.2 Fixed circuit-breaker
Cables [Group 1]: 1 Item	Lever [Group 2]: 1 Item	Lever [Group 2]: 1 Item
Lever [Group 2]: 1 Item	Support [Group 3]: 1 Item	Support [Group 3]: 1 Item
Support [Group 3]: 1 Item		

Example no. 14

Interlock between two withdrawable circuit-breakers: E1.2 and E2.2

E1.2 Fixed Part	E2.2 Mobile Part
Cables [Group 1]: 1 Item	Lever [Group 2]: 1 Item
Support [Group 4]: 1 Item	+
	E2.2 Fixed Part
	Support [Group 4]: 1 Item

Example no. 15

Interlock between three withdrawable circuit-breakers: one E2.2 and two E4.2

E2.2 Mobile Part	E4.2 Mobile Part	E4.2 Mobile Part
Lever [Group 2]: 1 Item	Lever [Group 2]: 1 Item	Lever [Group 2]: 1 Item
+		
E2.2 Fixed Part	E4.2 Fixed Part	E4.2 Fixed Part
Cables [Group 1]: 1 Item	Support [Group 4]: 1 Item	Support [Group 4]: 1 Item
Support [Group 4]: 1 Item		

General informations

Abbreviations used for the description of the product

Versions and terminals

F	Fixed circuit-breaker
W	Withdrawable circuit-breaker
MP	Mobile part of withdrawable circuit-breaker
FP	Fixed part of withdrawable circuit-breaker
Iu	Rated uninterrupted current
In	Rated current of the rating plug
Icu	Rated ultimate short-circuit breaking capacity
Icw	Rated short-time withstand current
/MS	Switch-disconnector
/E	Circuit-breakers for 1150V applications
/f	Four-pole circuit-breakers with neutral pole at 100%
CS	Sectionalizing truck
MT	Earthing truck
MTP	Earthing switch with making capacity
HR VR	Rear orientable terminals
SHR	Horizontal rear spread terminals
VHR	Vertical rear spread terminals
F	Front terminals
FL	Flat terminals
EF	Extended front terminals
ES	Front spread terminals
Fc CuAl	Terminals for cables

Protection trip units and functions

Ekip Dip	Protection trip unit for power distribution
Ekip Touch	Measurement and protection trip unit for power distribution
Ekip Hi Touch	Measurement and protection trip unit and network analyzer for power distribution
Ekip G Touch	Measurement and protection trip unit for generators
Ekip G Hi-Touch	Measurement and protection trip unit and protection network analyzer for generators
L	Overload protection
S	Protection against selective short circuit
I	Protection against instantaneous short circuit
G	Earth fault protection
Rc	Residual current protection
Power Controller	Load management function

Automatic circuit-breakers

Fixed version for power distribution



SACE Emax E1.2B • Front terminals (F)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2B	630	42	42	E1.2B 630 Ekip Dip LI	1SDA070701R1		1SDA071331R1	
				E1.2B 630 Ekip Dip LSI	1SDA070702R1		1SDA071332R1	
				E1.2B 630 Ekip Dip LSIG	1SDA070703R1		1SDA071333R1	
				E1.2B 630 Ekip Touch LI	1SDA070704R1		1SDA071334R1	
				E1.2B 630 Ekip Touch LSI	1SDA070705R1		1SDA071335R1	
				E1.2B 630 Ekip Touch LSIG	1SDA070706R1		1SDA071336R1	
				E1.2B 630 Ekip Hi-Touch LSI	1SDA070708R1		1SDA071338R1	
				E1.2B 630 Ekip Hi-Touch LSIG	1SDA070709R1		1SDA071339R1	
	800	42	42	E1.2B 800 Ekip Dip LI	1SDA070741R1		1SDA071371R1	
				E1.2B 800 Ekip Dip LSI	1SDA070742R1		1SDA071372R1	
				E1.2B 800 Ekip Dip LSIG	1SDA070743R1		1SDA071373R1	
				E1.2B 800 Ekip Touch LI	1SDA070744R1		1SDA071374R1	
				E1.2B 800 Ekip Touch LSI	1SDA070745R1		1SDA071375R1	
				E1.2B 800 Ekip Touch LSIG	1SDA070746R1		1SDA071376R1	
				E1.2B 800 Ekip Hi-Touch LSI	1SDA070748R1		1SDA071378R1	
				E1.2B 800 Ekip Hi-Touch LSIG	1SDA070749R1		1SDA071379R1	
	1000	42	42	E1.2B 1000 Ekip Dip LI	1SDA070781R1		1SDA071411R1	
				E1.2B 1000 Ekip Dip LSI	1SDA070782R1		1SDA071412R1	
				E1.2B 1000 Ekip Dip LSIG	1SDA070783R1		1SDA071413R1	
				E1.2B 1000 Ekip Touch LI	1SDA070784R1		1SDA071414R1	
				E1.2B 1000 Ekip Touch LSI	1SDA070785R1		1SDA071415R1	
				E1.2B 1000 Ekip Touch LSIG	1SDA070786R1		1SDA071416R1	
				E1.2B 1000 Ekip Hi-Touch LSI	1SDA070788R1		1SDA071418R1	
				E1.2B 1000 Ekip Hi-Touch LSIG	1SDA070789R1		1SDA071419R1	
	1250	42	42	E1.2B 1250 Ekip Dip LI	1SDA070821R1		1SDA071451R1	
				E1.2B 1250 Ekip Dip LSI	1SDA070822R1		1SDA071452R1	
				E1.2B 1250 Ekip Dip LSIG	1SDA070823R1		1SDA071453R1	
				E1.2B 1250 Ekip Touch LI	1SDA070824R1		1SDA071454R1	
E1.2B 1250 Ekip Touch LSI				1SDA070825R1		1SDA071455R1		
E1.2B 1250 Ekip Touch LSIG				1SDA070826R1		1SDA071456R1		
E1.2B 1250 Ekip Hi-Touch LSI				1SDA070828R1		1SDA071458R1		
E1.2B 1250 Ekip Hi-Touch LSIG				1SDA070829R1		1SDA071459R1		
1600	42	42	E1.2B 1600 Ekip Dip LI	1SDA070861R1		1SDA071491R1		
			E1.2B 1600 Ekip Dip LSI	1SDA070862R1		1SDA071492R1		
			E1.2B 1600 Ekip Dip LSIG	1SDA070863R1		1SDA071493R1		
			E1.2B 1600 Ekip Touch LI	1SDA070864R1		1SDA071494R1		
			E1.2B 1600 Ekip Touch LSI	1SDA070865R1		1SDA071495R1		
			E1.2B 1600 Ekip Touch LSIG	1SDA070866R1		1SDA071496R1		
			E1.2B 1600 Ekip Hi-Touch LSI	1SDA070868R1		1SDA071498R1		
			E1.2B 1600 Ekip Hi-Touch LSIG	1SDA070869R1		1SDA071499R1		



1SDC20061F001

SACE Emax E1.2C • Front terminals (F)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2C	630	50	42	E1.2C 630 Ekip Dip LI	1SDA070711R1		1SDA071341R1	
				E1.2C 630 Ekip Dip LSI	1SDA070712R1		1SDA071342R1	
				E1.2C 630 Ekip Dip LSIG	1SDA070713R1		1SDA071343R1	
				E1.2C 630 Ekip Touch LI	1SDA070714R1		1SDA071344R1	
				E1.2C 630 Ekip Touch LSI	1SDA070715R1		1SDA071345R1	
				E1.2C 630 Ekip Touch LSIG	1SDA070716R1		1SDA071346R1	
				E1.2C 630 Ekip Hi-Touch LSI	1SDA070718R1		1SDA071348R1	
				E1.2C 630 Ekip Hi-Touch LSIG	1SDA070719R1		1SDA071349R1	
	800	50	42	E1.2C 800 Ekip Dip LI	1SDA070751R1		1SDA071381R1	
				E1.2C 800 Ekip Dip LSI	1SDA070752R1		1SDA071382R1	
				E1.2C 800 Ekip Dip LSIG	1SDA070753R1		1SDA071383R1	
				E1.2C 800 Ekip Touch LI	1SDA070754R1		1SDA071384R1	
				E1.2C 800 Ekip Touch LSI	1SDA070755R1		1SDA071385R1	
				E1.2C 800 Ekip Touch LSIG	1SDA070756R1		1SDA071386R1	
				E1.2C 800 Ekip Hi-Touch LSI	1SDA070758R1		1SDA071388R1	
				E1.2C 800 Ekip Hi-Touch LSIG	1SDA070759R1		1SDA071389R1	
	1000	50	42	E1.2C 1000 Ekip Dip LI	1SDA070791R1		1SDA071421R1	
				E1.2C 1000 Ekip Dip LSI	1SDA070792R1		1SDA071422R1	
				E1.2C 1000 Ekip Dip LSIG	1SDA070793R1		1SDA071423R1	
				E1.2C 1000 Ekip Touch LI	1SDA070794R1		1SDA071424R1	
				E1.2C 1000 Ekip Touch LSI	1SDA070795R1		1SDA071425R1	
				E1.2C 1000 Ekip Touch LSIG	1SDA070796R1		1SDA071426R1	
				E1.2C 1000 Ekip Hi-Touch LSI	1SDA070798R1		1SDA071428R1	
				E1.2C 1000 Ekip Hi-Touch LSIG	1SDA070799R1		1SDA071429R1	
	1250	50	42	E1.2C 1250 Ekip Dip LI	1SDA070831R1		1SDA071461R1	
				E1.2C 1250 Ekip Dip LSI	1SDA070832R1		1SDA071462R1	
				E1.2C 1250 Ekip Dip LSIG	1SDA070833R1		1SDA071463R1	
				E1.2C 1250 Ekip Touch LI	1SDA070834R1		1SDA071464R1	
E1.2C 1250 Ekip Touch LSI				1SDA070835R1		1SDA071465R1		
E1.2C 1250 Ekip Touch LSIG				1SDA070836R1		1SDA071466R1		
E1.2C 1250 Ekip Hi-Touch LSI				1SDA070838R1		1SDA071468R1		
E1.2C 1250 Ekip Hi-Touch LSIG				1SDA070839R1		1SDA071469R1		
1600	50	42	E1.2C 1600 Ekip Dip LI	1SDA070871R1		1SDA071501R1		
			E1.2C 1600 Ekip Dip LSI	1SDA070872R1		1SDA071502R1		
			E1.2C 1600 Ekip Dip LSIG	1SDA070873R1		1SDA071503R1		
			E1.2C 1600 Ekip Touch LI	1SDA070874R1		1SDA071504R1		
			E1.2C 1600 Ekip Touch LSI	1SDA070875R1		1SDA071505R1		
			E1.2C 1600 Ekip Touch LSIG	1SDA070876R1		1SDA071506R1		
			E1.2C 1600 Ekip Hi-Touch LSI	1SDA070878R1		1SDA071508R1		
			E1.2C 1600 Ekip Hi-Touch LSIG	1SDA070879R1		1SDA071509R1		

Automatic circuit-breakers

Fixed version for power distribution



SACE Emax E1.2N • Front terminals (F)

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2N	250	66	50	E1.2N 250 Ekip Dip LI	1SDA070691R1		1SDA071321R1	
				E1.2N 250 Ekip Dip LSI	1SDA070692R1		1SDA071322R1	
				E1.2N 250 Ekip Dip LSIG	1SDA070693R1		1SDA071323R1	
				E1.2N 250 Ekip Touch LI	1SDA070694R1		1SDA071324R1	
				E1.2N 250 Ekip Touch LSI	1SDA070695R1		1SDA071325R1	
				E1.2N 250 Ekip Touch LSIG	1SDA070696R1		1SDA071326R1	
				E1.2N 250 Ekip Hi-Touch LSI	1SDA070698R1		1SDA071328R1	
				E1.2N 250 Ekip Hi-Touch LSIG	1SDA070699R1		1SDA071329R1	
	630	66	50	E1.2N 630 Ekip Dip LI	1SDA070721R1		1SDA071351R1	
				E1.2N 630 Ekip Dip LSI	1SDA070722R1		1SDA071352R1	
				E1.2N 630 Ekip Dip LSIG	1SDA070723R1		1SDA071353R1	
				E1.2N 630 Ekip Touch LI	1SDA070724R1		1SDA071354R1	
				E1.2N 630 Ekip Touch LSI	1SDA070725R1		1SDA071355R1	
				E1.2N 630 Ekip Touch LSIG	1SDA070726R1		1SDA071356R1	
				E1.2N 630 Ekip Hi-Touch LSI	1SDA070728R1		1SDA071358R1	
				E1.2N 630 Ekip Hi-Touch LSIG	1SDA070729R1		1SDA071359R1	
	800	66	50	E1.2N 800 Ekip Dip LI	1SDA070761R1		1SDA071391R1	
				E1.2N 800 Ekip Dip LSI	1SDA070762R1		1SDA071392R1	
				E1.2N 800 Ekip Dip LSIG	1SDA070763R1		1SDA071393R1	
				E1.2N 800 Ekip Touch LI	1SDA070764R1		1SDA071394R1	
				E1.2N 800 Ekip Touch LSI	1SDA070765R1		1SDA071395R1	
				E1.2N 800 Ekip Touch LSIG	1SDA070766R1		1SDA071396R1	
				E1.2N 800 Ekip Hi-Touch LSI	1SDA070768R1		1SDA071398R1	
				E1.2N 800 Ekip Hi-Touch LSIG	1SDA070769R1		1SDA071399R1	
	1000	66	50	E1.2N 1000 Ekip Dip LI	1SDA070801R1		1SDA071431R1	
				E1.2N 1000 Ekip Dip LSI	1SDA070802R1		1SDA071432R1	
				E1.2N 1000 Ekip Dip LSIG	1SDA070803R1		1SDA071433R1	
				E1.2N 1000 Ekip Touch LI	1SDA070804R1		1SDA071434R1	
E1.2N 1000 Ekip Touch LSI				1SDA070805R1		1SDA071435R1		
E1.2N 1000 Ekip Touch LSIG				1SDA070806R1		1SDA071436R1		
E1.2N 1000 Ekip Hi-Touch LSI				1SDA070808R1		1SDA071438R1		
E1.2N 1000 Ekip Hi-Touch LSIG				1SDA070809R1		1SDA071439R1		
1250	66	50	E1.2N 1250 Ekip Dip LI	1SDA070841R1		1SDA071471R1		
			E1.2N 1250 Ekip Dip LSI	1SDA070842R1		1SDA071472R1		
			E1.2N 1250 Ekip Dip LSIG	1SDA070843R1		1SDA071473R1		
			E1.2N 1250 Ekip Touch LI	1SDA070844R1		1SDA071474R1		
			E1.2N 1250 Ekip Touch LSI	1SDA070845R1		1SDA071475R1		
			E1.2N 1250 Ekip Touch LSIG	1SDA070846R1		1SDA071476R1		
			E1.2N 1250 Ekip Hi-Touch LSI	1SDA070848R1		1SDA071478R1		
			E1.2N 1250 Ekip Hi-Touch LSIG	1SDA070849R1		1SDA071479R1		
1600	66	50	E1.2N 1600 Ekip Dip LI	1SDA070881R1		1SDA071511R1		
			E1.2N 1600 Ekip Dip LSI	1SDA070882R1		1SDA071512R1		
			E1.2N 1600 Ekip Dip LSIG	1SDA070883R1		1SDA071513R1		
			E1.2N 1600 Ekip Touch LI	1SDA070884R1		1SDA071514R1		
			E1.2N 1600 Ekip Touch LSI	1SDA070885R1		1SDA071515R1		
			E1.2N 1600 Ekip Touch LSIG	1SDA070886R1		1SDA071516R1		
			E1.2N 1600 Ekip Hi-Touch LSI	1SDA070888R1		1SDA071518R1		
			E1.2N 1600 Ekip Hi-Touch LSIG	1SDA070889R1		1SDA071519R1		



1SDC20023D0201

SACE Emax E1.2L • Front terminals (F)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2L	630	130	15	E1.2L 630 Ekip Dip LI	1SDA070731R1		1SDA071361R1	
				E1.2L 630 Ekip Dip LSI	1SDA070732R1		1SDA071362R1	
				E1.2L 630 Ekip Dip LSIG	1SDA070733R1		1SDA071363R1	
				E1.2L 630 Ekip Touch LI	1SDA070734R1		1SDA071364R1	
				E1.2L 630 Ekip Touch LSI	1SDA070735R1		1SDA071365R1	
				E1.2L 630 Ekip Touch LSIG	1SDA070736R1		1SDA071366R1	
				E1.2L 630 Ekip Hi-Touch LSI	1SDA070738R1		1SDA071368R1	
				E1.2L 630 Ekip Hi-Touch LSIG	1SDA070739R1		1SDA071369R1	
	800	130	15	E1.2L 800 Ekip Dip LI	1SDA070771R1		1SDA071401R1	
				E1.2L 800 Ekip Dip LSI	1SDA070772R1		1SDA071402R1	
				E1.2L 800 Ekip Dip LSIG	1SDA070773R1		1SDA071403R1	
				E1.2L 800 Ekip Touch LI	1SDA070774R1		1SDA071404R1	
				E1.2L 800 Ekip Touch LSI	1SDA070775R1		1SDA071405R1	
				E1.2L 800 Ekip Touch LSIG	1SDA070776R1		1SDA071406R1	
				E1.2L 800 Ekip Hi-Touch LSI	1SDA070778R1		1SDA071408R1	
				E1.2L 800 Ekip Hi-Touch LSIG	1SDA070779R1		1SDA071409R1	
	1000	130	15	E1.2L 1000 Ekip Dip LI	1SDA070811R1		1SDA071441R1	
				E1.2L 1000 Ekip Dip LSI	1SDA070812R1		1SDA071442R1	
				E1.2L 1000 Ekip Dip LSIG	1SDA070813R1		1SDA071443R1	
				E1.2L 1000 Ekip Touch LI	1SDA070814R1		1SDA071444R1	
				E1.2L 1000 Ekip Touch LSI	1SDA070815R1		1SDA071445R1	
				E1.2L 1000 Ekip Touch LSIG	1SDA070816R1		1SDA071446R1	
				E1.2L 1000 Ekip Hi-Touch LSI	1SDA070818R1		1SDA071448R1	
				E1.2L 1000 Ekip Hi-Touch LSIG	1SDA070819R1		1SDA071449R1	
	1250	130	15	E1.2L 1250 Ekip Dip LI	1SDA070851R1		1SDA071481R1	
				E1.2L 1250 Ekip Dip LSI	1SDA070852R1		1SDA071482R1	
				E1.2L 1250 Ekip Dip LSIG	1SDA070853R1		1SDA071483R1	
				E1.2L 1250 Ekip Touch LI	1SDA070854R1		1SDA071484R1	
E1.2L 1250 Ekip Touch LSI				1SDA070855R1		1SDA071485R1		
E1.2L 1250 Ekip Touch LSIG				1SDA070856R1		1SDA071486R1		
E1.2L 1250 Ekip Hi-Touch LSI				1SDA070858R1		1SDA071488R1		
E1.2L 1250 Ekip Hi-Touch LSIG				1SDA070859R1		1SDA071489R1		

Automatic circuit-breakers

Fixed version for power distribution



SACE Emax E2.2B • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E2.2B	1600	42	42	E2.2B 1600 Ekip Dip LI	1SDA070981R1		1SDA071611R1	
				E2.2B 1600 Ekip Dip LSI	1SDA070982R1		1SDA071612R1	
				E2.2B 1600 Ekip Dip LSIG	1SDA070983R1		1SDA071613R1	
				E2.2B 1600 Ekip Touch LI	1SDA070984R1		1SDA071614R1	
				E2.2B 1600 Ekip Touch LSI	1SDA070985R1		1SDA071615R1	
				E2.2B 1600 Ekip Touch LSIG	1SDA070986R1		1SDA071616R1	
				E2.2B 1600 Ekip Hi-Touch LSI	1SDA070988R1		1SDA071618R1	
				E2.2B 1600 Ekip Hi-Touch LSIG	1SDA070989R1		1SDA071619R1	
	2000	42	42	E2.2B 2000 Ekip Dip LI	1SDA071021R1		1SDA071651R1	
				E2.2B 2000 Ekip Dip LSI	1SDA071022R1		1SDA071652R1	
				E2.2B 2000 Ekip Dip LSIG	1SDA071023R1		1SDA071653R1	
				E2.2B 2000 Ekip Touch LI	1SDA071024R1		1SDA071654R1	
				E2.2B 2000 Ekip Touch LSI	1SDA071025R1		1SDA071655R1	
				E2.2B 2000 Ekip Touch LSIG	1SDA071026R1		1SDA071656R1	
				E2.2B 2000 Ekip Hi-Touch LSI	1SDA071028R1		1SDA071658R1	
				E2.2B 2000 Ekip Hi-Touch LSIG	1SDA071029R1		1SDA071659R1	



1SDC20002D2001

SACE Emax E2.2N • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E2.2N	800	66	66	E2.2N 800 Ekip Dip LI	1SDA070891R1		1SDA071521R1	
				E2.2N 800 Ekip Dip LSI	1SDA070892R1		1SDA071522R1	
				E2.2N 800 Ekip Dip LSIG	1SDA070893R1		1SDA071523R1	
				E2.2N 800 Ekip Touch LI	1SDA070894R1		1SDA071524R1	
				E2.2N 800 Ekip Touch LSI	1SDA070895R1		1SDA071525R1	
				E2.2N 800 Ekip Touch LSIG	1SDA070896R1		1SDA071526R1	
				E2.2N 800 Ekip Hi-Touch LSI	1SDA070898R1		1SDA071528R1	
				E2.2N 800 Ekip Hi-Touch LSIG	1SDA070899R1		1SDA071529R1	
	1000	66	66	E2.2N 1000 Ekip Dip LI	1SDA070921R1		1SDA071551R1	
				E2.2N 1000 Ekip Dip LSI	1SDA070922R1		1SDA071552R1	
				E2.2N 1000 Ekip Dip LSIG	1SDA070923R1		1SDA071553R1	
				E2.2N 1000 Ekip Touch LI	1SDA070924R1		1SDA071554R1	
				E2.2N 1000 Ekip Touch LSI	1SDA070925R1		1SDA071555R1	
				E2.2N 1000 Ekip Touch LSIG	1SDA070926R1		1SDA071556R1	
				E2.2N 1000 Ekip Hi-Touch LSI	1SDA070928R1		1SDA071558R1	
				E2.2N 1000 Ekip Hi-Touch LSIG	1SDA070929R1		1SDA071559R1	
	1250	66	66	E2.2N 1250 Ekip Dip LI	1SDA070951R1		1SDA071581R1	
				E2.2N 1250 Ekip Dip LSI	1SDA070952R1		1SDA071582R1	
				E2.2N 1250 Ekip Dip LSIG	1SDA070953R1		1SDA071583R1	
				E2.2N 1250 Ekip Touch LI	1SDA070954R1		1SDA071584R1	
				E2.2N 1250 Ekip Touch LSI	1SDA070955R1		1SDA071585R1	
				E2.2N 1250 Ekip Touch LSIG	1SDA070956R1		1SDA071586R1	
				E2.2N 1250 Ekip Hi-Touch LSI	1SDA070958R1		1SDA071588R1	
				E2.2N 1250 Ekip Hi-Touch LSIG	1SDA070959R1		1SDA071589R1	
	1600	66	66	E2.2N 1600 Ekip Dip LI	1SDA070991R1		1SDA071621R1	
				E2.2N 1600 Ekip Dip LSI	1SDA070992R1		1SDA071622R1	
				E2.2N 1600 Ekip Dip LSIG	1SDA070993R1		1SDA071623R1	
				E2.2N 1600 Ekip Touch LI	1SDA070994R1		1SDA071624R1	
E2.2N 1600 Ekip Touch LSI				1SDA070995R1		1SDA071625R1		
E2.2N 1600 Ekip Touch LSIG				1SDA070996R1		1SDA071626R1		
E2.2N 1600 Ekip Hi-Touch LSI				1SDA070998R1		1SDA071628R1		
E2.2N 1600 Ekip Hi-Touch LSIG				1SDA070999R1		1SDA071629R1		
2000	66	66	E2.2N 2000 Ekip Dip LI	1SDA071031R1		1SDA071661R1		
			E2.2N 2000 Ekip Dip LSI	1SDA071032R1		1SDA071662R1		
			E2.2N 2000 Ekip Dip LSIG	1SDA071033R1		1SDA071663R1		
			E2.2N 2000 Ekip Touch LI	1SDA071034R1		1SDA071664R1		
			E2.2N 2000 Ekip Touch LSI	1SDA071035R1		1SDA071665R1		
			E2.2N 2000 Ekip Touch LSIG	1SDA071036R1		1SDA071666R1		
			E2.2N 2000 Ekip Hi-Touch LSI	1SDA071038R1		1SDA071668R1		
			E2.2N 2000 Ekip Hi-Touch LSIG	1SDA071039R1		1SDA071669R1		
2500	66	66	E2.2N 2500 Ekip Dip LI	1SDA071061R1		1SDA071691R1		
			E2.2N 2500 Ekip Dip LSI	1SDA071062R1		1SDA071692R1		
			E2.2N 2500 Ekip Dip LSIG	1SDA071063R1		1SDA071693R1		
			E2.2N 2500 Ekip Touch LI	1SDA071064R1		1SDA071694R1		
			E2.2N 2500 Ekip Touch LSI	1SDA071065R1		1SDA071695R1		
			E2.2N 2500 Ekip Touch LSIG	1SDA071066R1		1SDA071696R1		
			E2.2N 2500 Ekip Hi-Touch LSI	1SDA071068R1		1SDA071698R1		
			E2.2N 2500 Ekip Hi-Touch LSIG	1SDA071069R1		1SDA071699R1		

Automatic circuit-breakers

Fixed version for power distribution



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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E2.2S	250	85	66	E2.2S 250 Ekip Dip LI	1SDA073628R1		1SDA073638R1	
				E2.2S 250 Ekip Dip LSI	1SDA073629R1		1SDA073639R1	
				E2.2S 250 Ekip Dip LSIG	1SDA073630R1		1SDA073640R1	
				E2.2S 250 Ekip Touch LI	1SDA073631R1		1SDA073641R1	
				E2.2S 250 Ekip Touch LSI	1SDA073632R1		1SDA073642R1	
				E2.2S 250 Ekip Touch LSIG	1SDA073633R1		1SDA073643R1	
				E2.2S 250 Ekip Hi-Touch LSI	1SDA073635R1		1SDA073645R1	
				E2.2S 250 Ekip Hi-Touch LSIG	1SDA073636R1		1SDA073646R1	
	800	85	66	E2.2S 800 Ekip Dip LI	1SDA070901R1		1SDA071531R1	
				E2.2S 800 Ekip Dip LSI	1SDA070902R1		1SDA071532R1	
				E2.2S 800 Ekip Dip LSIG	1SDA070903R1		1SDA071533R1	
				E2.2S 800 Ekip Touch LI	1SDA070904R1		1SDA071534R1	
				E2.2S 800 Ekip Touch LSI	1SDA070905R1		1SDA071535R1	
				E2.2S 800 Ekip Touch LSIG	1SDA070906R1		1SDA071536R1	
E2.2S 800 Ekip Hi-Touch LSI				1SDA070908R1		1SDA071538R1		
E2.2S 800 Ekip Hi-Touch LSIG				1SDA070909R1		1SDA071539R1		
1000	85	66	E2.2S 1000 Ekip Dip LI	1SDA070931R1		1SDA071561R1		
			E2.2S 1000 Ekip Dip LSI	1SDA070932R1		1SDA071562R1		
			E2.2S 1000 Ekip Dip LSIG	1SDA070933R1		1SDA071563R1		
			E2.2S 1000 Ekip Touch LI	1SDA070934R1		1SDA071564R1		
			E2.2S 1000 Ekip Touch LSI	1SDA070935R1		1SDA071565R1		
			E2.2S 1000 Ekip Touch LSIG	1SDA070936R1		1SDA071566R1		
			E2.2S 1000 Ekip Hi-Touch LSI	1SDA070938R1		1SDA071568R1		
			E2.2S 1000 Ekip Hi-Touch LSIG	1SDA070939R1		1SDA071569R1		
1250	85	66	E2.2S 1250 Ekip Dip LI	1SDA070961R1		1SDA071591R1		
			E2.2S 1250 Ekip Dip LSI	1SDA070962R1		1SDA071592R1		
			E2.2S 1250 Ekip Dip LSIG	1SDA070963R1		1SDA071593R1		
			E2.2S 1250 Ekip Touch LI	1SDA070964R1		1SDA071594R1		
			E2.2S 1250 Ekip Touch LSI	1SDA070965R1		1SDA071595R1		
			E2.2S 1250 Ekip Touch LSIG	1SDA070966R1		1SDA071596R1		
			E2.2S 1250 Ekip Hi-Touch LSI	1SDA070968R1		1SDA071598R1		
			E2.2S 1250 Ekip Hi-Touch LSIG	1SDA070969R1		1SDA071599R1		



1SDC200023D0201

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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles	4 Poles
					Code	Code
E2.2S	1600	85	66	E2.2S 1600 Ekip Dip LI	1SDA071001R1	1SDA071631R1
				E2.2S 1600 Ekip Dip LSI	1SDA071002R1	1SDA071632R1
				E2.2S 1600 Ekip Dip LSIG	1SDA071003R1	1SDA071633R1
				E2.2S 1600 Ekip Touch LI	1SDA071004R1	1SDA071634R1
				E2.2S 1600 Ekip Touch LSI	1SDA071005R1	1SDA071635R1
				E2.2S 1600 Ekip Touch LSIG	1SDA071006R1	1SDA071636R1
				E2.2S 1600 Ekip Hi-Touch LSI	1SDA071008R1	1SDA071638R1
				E2.2S 1600 Ekip Hi-Touch LSIG	1SDA071009R1	1SDA071639R1
				2000	85	66
	E2.2S 2000 Ekip Dip LSI	1SDA071042R1	1SDA071672R1			
	E2.2S 2000 Ekip Dip LSIG	1SDA071043R1	1SDA071673R1			
	E2.2S 2000 Ekip Touch LI	1SDA071044R1	1SDA071674R1			
	E2.2S 2000 Ekip Touch LSI	1SDA071045R1	1SDA071675R1			
	E2.2S 2000 Ekip Touch LSIG	1SDA071046R1	1SDA071676R1			
	E2.2S 2000 Ekip Hi-Touch LSI	1SDA071048R1	1SDA071678R1			
	E2.2S 2000 Ekip Hi-Touch LSIG	1SDA071049R1	1SDA071679R1			
	2500	85	66			
				E2.2S 2500 Ekip Dip LSI	1SDA071072R1	1SDA071702R1
				E2.2S 2500 Ekip Dip LSIG	1SDA071073R1	1SDA071703R1
				E2.2S 2500 Ekip Touch LI	1SDA071074R1	1SDA071704R1
				E2.2S 2500 Ekip Touch LSI	1SDA071075R1	1SDA071705R1
E2.2S 2500 Ekip Touch LSIG				1SDA071076R1	1SDA071706R1	
E2.2S 2500 Ekip Hi-Touch LSI				1SDA071078R1	1SDA071708R1	
E2.2S 2500 Ekip Hi-Touch LSIG				1SDA071079R1	1SDA071709R1	

Automatic circuit-breakers

Fixed version for power distribution



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

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E2.2H	800	100	85	E2.2H 800 Ekip Dip LI	1SDA070911R1		1SDA071541R1	
				E2.2H 800 Ekip Dip LSI	1SDA070912R1		1SDA071542R1	
				E2.2H 800 Ekip Dip LSIG	1SDA070913R1		1SDA071543R1	
				E2.2H 800 Ekip Touch LI	1SDA070914R1		1SDA071544R1	
				E2.2H 800 Ekip Touch LSI	1SDA070915R1		1SDA071545R1	
				E2.2H 800 Ekip Touch LSIG	1SDA070916R1		1SDA071546R1	
				E2.2H 800 Ekip Hi-Touch LSI	1SDA070918R1		1SDA071548R1	
				E2.2H 800 Ekip Hi-Touch LSIG	1SDA070919R1		1SDA071549R1	
	1000	100	85	E2.2H 1000 Ekip Dip LI	1SDA070941R1		1SDA071571R1	
				E2.2H 1000 Ekip Dip LSI	1SDA070942R1		1SDA071572R1	
				E2.2H 1000 Ekip Dip LSIG	1SDA070943R1		1SDA071573R1	
				E2.2H 1000 Ekip Touch LI	1SDA070944R1		1SDA071574R1	
				E2.2H 1000 Ekip Touch LSI	1SDA070945R1		1SDA071575R1	
				E2.2H 1000 Ekip Touch LSIG	1SDA070946R1		1SDA071576R1	
				E2.2H 1000 Ekip Hi-Touch LSI	1SDA070948R1		1SDA071578R1	
				E2.2H 1000 Ekip Hi-Touch LSIG	1SDA070949R1		1SDA071579R1	
	1250	100	85	E2.2H 1250 Ekip Dip LI	1SDA070971R1		1SDA071601R1	
				E2.2H 1250 Ekip Dip LSI	1SDA070972R1		1SDA071602R1	
				E2.2H 1250 Ekip Dip LSIG	1SDA070973R1		1SDA071603R1	
				E2.2H 1250 Ekip Touch LI	1SDA070974R1		1SDA071604R1	
				E2.2H 1250 Ekip Touch LSI	1SDA070975R1		1SDA071605R1	
				E2.2H 1250 Ekip Touch LSIG	1SDA070976R1		1SDA071606R1	
				E2.2H 1250 Ekip Hi-Touch LSI	1SDA070978R1		1SDA071608R1	
				E2.2H 1250 Ekip Hi-Touch LSIG	1SDA070979R1		1SDA071609R1	
1600	100	85	E2.2H 1600 Ekip Dip LI	1SDA071011R1		1SDA071641R1		
			E2.2H 1600 Ekip Dip LSI	1SDA071012R1		1SDA071642R1		
			E2.2H 1600 Ekip Dip LSIG	1SDA071013R1		1SDA071643R1		
			E2.2H 1600 Ekip Touch LI	1SDA071014R1		1SDA071644R1		
			E2.2H 1600 Ekip Touch LSI	1SDA071015R1		1SDA071645R1		
			E2.2H 1600 Ekip Touch LSIG	1SDA071016R1		1SDA071646R1		
			E2.2H 1600 Ekip Hi-Touch LSI	1SDA071018R1		1SDA071648R1		
			E2.2H 1600 Ekip Hi-Touch LSIG	1SDA071019R1		1SDA071649R1		
2000	100	85	E2.2H 2000 Ekip Dip LI	1SDA071051R1		1SDA071681R1		
			E2.2H 2000 Ekip Dip LSI	1SDA071052R1		1SDA071682R1		
			E2.2H 2000 Ekip Dip LSIG	1SDA071053R1		1SDA071683R1		
			E2.2H 2000 Ekip Touch LI	1SDA071054R1		1SDA071684R1		
			E2.2H 2000 Ekip Touch LSI	1SDA071055R1		1SDA071685R1		
			E2.2H 2000 Ekip Touch LSIG	1SDA071056R1		1SDA071686R1		
			E2.2H 2000 Ekip Hi-Touch LSI	1SDA071058R1		1SDA071688R1		
			E2.2H 2000 Ekip Hi-Touch LSIG	1SDA071059R1		1SDA071689R1		
2500	100	85	E2.2H 2500 Ekip Dip LI	1SDA071081R1		1SDA071711R1		
			E2.2H 2500 Ekip Dip LSI	1SDA071082R1		1SDA071712R1		
			E2.2H 2500 Ekip Dip LSIG	1SDA071083R1		1SDA071713R1		
			E2.2H 2500 Ekip Touch LI	1SDA071084R1		1SDA071714R1		
			E2.2H 2500 Ekip Touch LSI	1SDA071085R1		1SDA071715R1		
			E2.2H 2500 Ekip Touch LSIG	1SDA071086R1		1SDA071716R1		
			E2.2H 2500 Ekip Hi-Touch LSI	1SDA071088R1		1SDA071718R1		
			E2.2H 2500 Ekip Hi-Touch LSIG	1SDA071089R1		1SDA071719R1		



1SDC200663R001

SACE Emax E4.2N-S • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E4.2N	3200	66	66	E4.2N 3200 Ekip Dip LI	1SDA071141R1		1SDA071771R1	
				E4.2N 3200 Ekip Dip LSI	1SDA071142R1		1SDA071772R1	
				E4.2N 3200 Ekip Dip LSIG	1SDA071143R1		1SDA071773R1	
				E4.2N 3200 Ekip Touch LI	1SDA071144R1		1SDA071774R1	
				E4.2N 3200 Ekip Touch LSI	1SDA071145R1		1SDA071775R1	
				E4.2N 3200 Ekip Touch LSIG	1SDA071146R1		1SDA071776R1	
				E4.2N 3200 Ekip Hi-Touch LSI	1SDA071148R1		1SDA071778R1	
				E4.2N 3200 Ekip Hi-Touch LSIG	1SDA071149R1		1SDA071779R1	
	4000	66	66	E4.2N 4000 Ekip Dip LI	1SDA071191R1		1SDA071821R1	
				E4.2N 4000 Ekip Dip LSI	1SDA071192R1		1SDA071822R1	
				E4.2N 4000 Ekip Dip LSIG	1SDA071193R1		1SDA071823R1	
				E4.2N 4000 Ekip Touch LI	1SDA071194R1		1SDA071824R1	
				E4.2N 4000 Ekip Touch LSI	1SDA071195R1		1SDA071825R1	
				E4.2N 4000 Ekip Touch LSIG	1SDA071196R1		1SDA071826R1	
				E4.2N 4000 Ekip Hi-Touch LSI	1SDA071198R1		1SDA071828R1	
				E4.2N 4000 Ekip Hi-Touch LSIG	1SDA071199R1		1SDA071829R1	
E4.2S	3200	85	66	E4.2S 3200 Ekip Dip LI	1SDA071151R1		1SDA071781R1	
				E4.2S 3200 Ekip Dip LSI	1SDA071152R1		1SDA071782R1	
				E4.2S 3200 Ekip Dip LSIG	1SDA071153R1		1SDA071783R1	
				E4.2S 3200 Ekip Touch LI	1SDA071154R1		1SDA071784R1	
				E4.2S 3200 Ekip Touch LSI	1SDA071155R1		1SDA071785R1	
				E4.2S 3200 Ekip Touch LSIG	1SDA071156R1		1SDA071786R1	
				E4.2S 3200 Ekip Hi-Touch LSI	1SDA071158R1		1SDA071788R1	
				E4.2S 3200 Ekip Hi-Touch LSIG	1SDA071159R1		1SDA071789R1	
	4000	85	66	E4.2S 4000 Ekip Dip LI	1SDA071201R1		1SDA071831R1	
				E4.2S 4000 Ekip Dip LSI	1SDA071202R1		1SDA071832R1	
				E4.2S 4000 Ekip Dip LSIG	1SDA071203R1		1SDA071833R1	
				E4.2S 4000 Ekip Touch LI	1SDA071204R1		1SDA071834R1	
				E4.2S 4000 Ekip Touch LSI	1SDA071205R1		1SDA071835R1	
				E4.2S 4000 Ekip Touch LSIG	1SDA071206R1		1SDA071836R1	
				E4.2S 4000 Ekip Hi-Touch LSI	1SDA071208R1		1SDA071838R1	
				E4.2S 4000 Ekip Hi-Touch LSIG	1SDA071209R1		1SDA071839R1	

Automatic circuit-breakers

Fixed version for power distribution



1SDC200663F001

SACE Emax E4.2H-V • Orientable rear terminals (HR)

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E4.2H	3200	100	85	E4.2H 3200 Ekip Dip LI	1SDA071161R1		1SDA071791R1	
				E4.2H 3200 Ekip Dip LSI	1SDA071162R1		1SDA071792R1	
				E4.2H 3200 Ekip Dip LSIG	1SDA071163R1		1SDA071793R1	
				E4.2H 3200 Ekip Touch LI	1SDA071164R1		1SDA071794R1	
				E4.2H 3200 Ekip Touch LSI	1SDA071165R1		1SDA071795R1	
				E4.2H 3200 Ekip Touch LSIG	1SDA071166R1		1SDA071796R1	
				E4.2H 3200 Ekip Hi-Touch LSI	1SDA071168R1		1SDA071798R1	
	E4.2H 3200 Ekip Hi-Touch LSIG	1SDA071169R1		1SDA071799R1				
	4000	100	85	E4.2H 4000 Ekip Dip LI	1SDA071211R1		1SDA071841R1	
				E4.2H 4000 Ekip Dip LSI	1SDA071212R1		1SDA071842R1	
				E4.2H 4000 Ekip Dip LSIG	1SDA071213R1		1SDA071843R1	
				E4.2H 4000 Ekip Touch LI	1SDA071214R1		1SDA071844R1	
				E4.2H 4000 Ekip Touch LSI	1SDA071215R1		1SDA071845R1	
				E4.2H 4000 Ekip Touch LSIG	1SDA071216R1		1SDA071846R1	
E4.2H 4000 Ekip Hi-Touch LSI				1SDA071218R1		1SDA071848R1		
E4.2H 4000 Ekip Hi-Touch LSIG	1SDA071219R1		1SDA071849R1					
E4.2V	2000	150	100	E4.2V 2000 Ekip Dip LI	1SDA071101R1		1SDA071731R1	
				E4.2V 2000 Ekip Dip LSI	1SDA071102R1		1SDA071732R1	
				E4.2V 2000 Ekip Dip LSIG	1SDA071103R1		1SDA071733R1	
				E4.2V 2000 Ekip Touch LI	1SDA071104R1		1SDA071734R1	
				E4.2V 2000 Ekip Touch LSI	1SDA071105R1		1SDA071735R1	
				E4.2V 2000 Ekip Touch LSIG	1SDA071106R1		1SDA071736R1	
				E4.2V 2000 Ekip Hi-Touch LSI	1SDA071108R1		1SDA071738R1	
	E4.2V 2000 Ekip Hi-Touch LSIG	1SDA071109R1		1SDA071739R1				
	2500	150	100	E4.2V 2500 Ekip Dip LI	1SDA071121R1		1SDA071751R1	
				E4.2V 2500 Ekip Dip LSI	1SDA071122R1		1SDA071752R1	
				E4.2V 2500 Ekip Dip LSIG	1SDA071123R1		1SDA071753R1	
				E4.2V 2500 Ekip Touch LI	1SDA071124R1		1SDA071754R1	
				E4.2V 2500 Ekip Touch LSI	1SDA071125R1		1SDA071755R1	
				E4.2V 2500 Ekip Touch LSIG	1SDA071126R1		1SDA071756R1	
				E4.2V 2500 Ekip Hi-Touch LSI	1SDA071128R1		1SDA071758R1	
	E4.2V 2500 Ekip Hi-Touch LSIG	1SDA071129R1		1SDA071759R1				
	3200	150	100	E4.2V 3200 Ekip Dip LI	1SDA071171R1		1SDA071801R1	
				E4.2V 3200 Ekip Dip LSI	1SDA071172R1		1SDA071802R1	
				E4.2V 3200 Ekip Dip LSIG	1SDA071173R1		1SDA071803R1	
				E4.2V 3200 Ekip Touch LI	1SDA071174R1		1SDA071804R1	
				E4.2V 3200 Ekip Touch LSI	1SDA071175R1		1SDA071805R1	
				E4.2V 3200 Ekip Touch LSIG	1SDA071176R1		1SDA071806R1	
				E4.2V 3200 Ekip Hi-Touch LSI	1SDA071178R1		1SDA071808R1	
	E4.2V 3200 Ekip Hi-Touch LSIG	1SDA071179R1		1SDA071809R1				
	4000	150	100	E4.2V 4000 Ekip Dip LI	1SDA071221R1		1SDA071851R1	
				E4.2V 4000 Ekip Dip LSI	1SDA071222R1		1SDA071852R1	
				E4.2V 4000 Ekip Dip LSIG	1SDA071223R1		1SDA071853R1	
				E4.2V 4000 Ekip Touch LI	1SDA071224R1		1SDA071854R1	
E4.2V 4000 Ekip Touch LSI				1SDA071225R1		1SDA071855R1		
E4.2V 4000 Ekip Touch LSIG				1SDA071226R1		1SDA071856R1		
E4.2V 4000 Ekip Hi-Touch LSI				1SDA071228R1		1SDA071858R1		
E4.2V 4000 Ekip Hi-Touch LSIG	1SDA071229R1		1SDA071859R1					



1SDC200664F001

SACE Emax E6.2H-V • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E6.2H	4000	100	100	E6.2H 4000 Ekip Dip LI	1SDA071231R1		1SDA071861R1	
				E6.2H 4000 Ekip Dip LSI	1SDA071232R1		1SDA071862R1	
				E6.2H 4000 Ekip Dip LSIG	1SDA071233R1		1SDA071863R1	
				E6.2H 4000 Ekip Touch LI	1SDA071234R1		1SDA071864R1	
				E6.2H 4000 Ekip Touch LSI	1SDA071235R1		1SDA071865R1	
				E6.2H 4000 Ekip Touch LSIG	1SDA071236R1		1SDA071866R1	
				E6.2H 4000 Ekip Hi-Touch LSI	1SDA071238R1		1SDA071868R1	
				E6.2H 4000 Ekip Hi-Touch LSIG	1SDA071239R1		1SDA071869R1	
	5000	100	100	E6.2H 5000 Ekip Dip LI	1SDA071261R1		1SDA071891R1	
				E6.2H 5000 Ekip Dip LSI	1SDA071262R1		1SDA071892R1	
				E6.2H 5000 Ekip Dip LSIG	1SDA071263R1		1SDA071893R1	
				E6.2H 5000 Ekip Touch LI	1SDA071264R1		1SDA071894R1	
				E6.2H 5000 Ekip Touch LSI	1SDA071265R1		1SDA071895R1	
				E6.2H 5000 Ekip Touch LSIG	1SDA071266R1		1SDA071896R1	
				E6.2H 5000 Ekip Hi-Touch LSI	1SDA071268R1		1SDA071898R1	
				E6.2H 5000 Ekip Hi-Touch LSIG	1SDA071269R1		1SDA071899R1	
	6300	100	100	E6.2H 6300 Ekip Dip LI	1SDA071291R1		1SDA071921R1	
				E6.2H 6300 Ekip Dip LSI	1SDA071292R1		1SDA071922R1	
				E6.2H 6300 Ekip Dip LSIG	1SDA071293R1		1SDA071923R1	
				E6.2H 6300 Ekip Touch LI	1SDA071294R1		1SDA071924R1	
				E6.2H 6300 Ekip Touch LSI	1SDA071295R1		1SDA071925R1	
				E6.2H 6300 Ekip Touch LSIG	1SDA071296R1		1SDA071926R1	
				E6.2H 6300 Ekip Hi-Touch LSI	1SDA071298R1		1SDA071928R1	
				E6.2H 6300 Ekip Hi-Touch LSIG	1SDA071299R1		1SDA071929R1	
E6.2V	4000	150	100	E6.2V 4000 Ekip Dip LI	1SDA071241R1		1SDA071871R1	
				E6.2V 4000 Ekip Dip LSI	1SDA071242R1		1SDA071872R1	
				E6.2V 4000 Ekip Dip LSIG	1SDA071243R1		1SDA071873R1	
				E6.2V 4000 Ekip Touch LI	1SDA071244R1		1SDA071874R1	
				E6.2V 4000 Ekip Touch LSI	1SDA071245R1		1SDA071875R1	
				E6.2V 4000 Ekip Touch LSIG	1SDA071246R1		1SDA071876R1	
				E6.2V 4000 Ekip Hi-Touch LSI	1SDA071248R1		1SDA071878R1	
				E6.2V 4000 Ekip Hi-Touch LSIG	1SDA071249R1		1SDA071879R1	
	5000	150	100	E6.2V 5000 Ekip Dip LI	1SDA071271R1		1SDA071901R1	
				E6.2V 5000 Ekip Dip LSI	1SDA071272R1		1SDA071902R1	
				E6.2V 5000 Ekip Dip LSIG	1SDA071273R1		1SDA071903R1	
				E6.2V 5000 Ekip Touch LI	1SDA071274R1		1SDA071904R1	
				E6.2V 5000 Ekip Touch LSI	1SDA071275R1		1SDA071905R1	
				E6.2V 5000 Ekip Touch LSIG	1SDA071276R1		1SDA071906R1	
				E6.2V 5000 Ekip Hi-Touch LSI	1SDA071278R1		1SDA071908R1	
				E6.2V 5000 Ekip Hi-Touch LSIG	1SDA071279R1		1SDA071909R1	
	6300	150	100	E6.2V 6300 Ekip Dip LI	1SDA071301R1		1SDA071931R1	
				E6.2V 6300 Ekip Dip LSI	1SDA071302R1		1SDA071932R1	
				E6.2V 6300 Ekip Dip LSIG	1SDA071303R1		1SDA071933R1	
				E6.2V 6300 Ekip Touch LI	1SDA071304R1		1SDA071934R1	
				E6.2V 6300 Ekip Touch LSI	1SDA071305R1		1SDA071935R1	
				E6.2V 6300 Ekip Touch LSIG	1SDA071306R1		1SDA071936R1	
				E6.2V 6300 Ekip Hi-Touch LSI	1SDA071308R1		1SDA071938R1	
				E6.2V 6300 Ekip Hi-Touch LSIG	1SDA071309R1		1SDA071939R1	

Automatic circuit-breakers

Fixed version for power distribution



1SDC200064F001

SACE Emax E6.2X • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E6.2X	4000	200	120	E6.2X 4000 Ekip Dip LI	1SDA071251R1		1SDA071881R1	
				E6.2X 4000 Ekip Dip LSI	1SDA071252R1		1SDA071882R1	
				E6.2X 4000 Ekip Dip LSIG	1SDA071253R1		1SDA071883R1	
				E6.2X 4000 Ekip Touch LI	1SDA071254R1		1SDA071884R1	
				E6.2X 4000 Ekip Touch LSI	1SDA071255R1		1SDA071885R1	
				E6.2X 4000 Ekip Touch LSIG	1SDA071256R1		1SDA071886R1	
				E6.2X 4000 Ekip Hi-Touch LSI	1SDA071258R1		1SDA071888R1	
				E6.2X 4000 Ekip Hi-Touch LSIG	1SDA071259R1		1SDA071889R1	
	5000	200	120	E6.2X 5000 Ekip Dip LI	1SDA071281R1		1SDA071911R1	
				E6.2X 5000 Ekip Dip LSI	1SDA071282R1		1SDA071912R1	
				E6.2X 5000 Ekip Dip LSIG	1SDA071283R1		1SDA071913R1	
				E6.2X 5000 Ekip Touch LI	1SDA071284R1		1SDA071914R1	
				E6.2X 5000 Ekip Touch LSI	1SDA071285R1		1SDA071915R1	
				E6.2X 5000 Ekip Touch LSIG	1SDA071286R1		1SDA071916R1	
				E6.2X 5000 Ekip Hi-Touch LSI	1SDA071288R1		1SDA071918R1	
				E6.2X 5000 Ekip Hi-Touch LSIG	1SDA071289R1		1SDA071919R1	
	6300	200	120	E6.2X 6300 Ekip Dip LI	1SDA071311R1		1SDA071941R1	
				E6.2X 6300 Ekip Dip LSI	1SDA071312R1		1SDA071942R1	
				E6.2X 6300 Ekip Dip LSIG	1SDA071313R1		1SDA071943R1	
				E6.2X 6300 Ekip Touch LI	1SDA071314R1		1SDA071944R1	
				E6.2X 6300 Ekip Touch LSI	1SDA071315R1		1SDA071945R1	
				E6.2X 6300 Ekip Touch LSIG	1SDA071316R1		1SDA071946R1	
				E6.2X 6300 Ekip Hi-Touch LSI	1SDA071318R1		1SDA071948R1	
				E6.2X 6300 Ekip Hi-Touch LSIG	1SDA071319R1		1SDA071949R1	



SACE Emax E6.2H-V/f Full size • Orientable rear terminals (HR)

Size	Iu	Icu (440V)	Icw (1s)	Type	4 Poles Code
E6.2H/f	4000	100	100	E6.2H/f 4000 Ekip Dip LI	1SDA071951R1
				E6.2H/f 4000 Ekip Dip LSI	1SDA071952R1
				E6.2H/f 4000 Ekip Dip LSIG	1SDA071953R1
				E6.2H/f 4000 Ekip Touch LI	1SDA071954R1
				E6.2H/f 4000 Ekip Touch LSI	1SDA071955R1
				E6.2H/f 4000 Ekip Touch LSIG	1SDA071956R1
				E6.2H/f 4000 Ekip Hi-Touch LSI	1SDA071958R1
				E6.2H/f 4000 Ekip Hi-Touch LSIG	1SDA071959R1
	5000	100	100	E6.2H/f 5000 Ekip Dip LI	1SDA071981R1
				E6.2H/f 5000 Ekip Dip LSI	1SDA071982R1
				E6.2H/f 5000 Ekip Dip LSIG	1SDA071983R1
				E6.2H/f 5000 Ekip Touch LI	1SDA071984R1
				E6.2H/f 5000 Ekip Touch LSI	1SDA071985R1
				E6.2H/f 5000 Ekip Touch LSIG	1SDA071986R1
				E6.2H/f 5000 Ekip Hi-Touch LSI	1SDA071988R1
				E6.2H/f 5000 Ekip Hi-Touch LSIG	1SDA071989R1
	6300	100	100	E6.2H/f 6300 Ekip Dip LI	1SDA072011R1
				E6.2H/f 6300 Ekip Dip LSI	1SDA072012R1
				E6.2H/f 6300 Ekip Dip LSIG	1SDA072013R1
				E6.2H/f 6300 Ekip Touch LI	1SDA072014R1
				E6.2H/f 6300 Ekip Touch LSI	1SDA072015R1
				E6.2H/f 6300 Ekip Touch LSIG	1SDA072016R1
				E6.2H/f 6300 Ekip Hi-Touch LSI	1SDA072018R1
				E6.2H/f 6300 Ekip Hi-Touch LSIG	1SDA072019R1
E6.2V/f	4000	150	100	E6.2V/f 4000 Ekip Dip LI	1SDA071961R1
				E6.2V/f 4000 Ekip Dip LSI	1SDA071962R1
				E6.2V/f 4000 Ekip Dip LSIG	1SDA071963R1
				E6.2V/f 4000 Ekip Touch LI	1SDA071964R1
				E6.2V/f 4000 Ekip Touch LSI	1SDA071965R1
				E6.2V/f 4000 Ekip Touch LSIG	1SDA071966R1
				E6.2V/f 4000 Ekip Hi-Touch LSI	1SDA071968R1
				E6.2V/f 4000 Ekip Hi-Touch LSIG	1SDA071969R1
	5000	150	100	E6.2V/f 5000 Ekip Dip LI	1SDA071991R1
				E6.2V/f 5000 Ekip Dip LSI	1SDA071992R1
				E6.2V/f 5000 Ekip Dip LSIG	1SDA071993R1
				E6.2V/f 5000 Ekip Touch LI	1SDA071994R1
				E6.2V/f 5000 Ekip Touch LSI	1SDA071995R1
				E6.2V/f 5000 Ekip Touch LSIG	1SDA071996R1
				E6.2V/f 5000 Ekip Hi-Touch LSI	1SDA071998R1
				E6.2V/f 5000 Ekip Hi-Touch LSIG	1SDA071999R1
	6300	150	100	E6.2V/f 6300 Ekip Dip LI	1SDA072021R1
				E6.2V/f 6300 Ekip Dip LSI	1SDA072022R1
				E6.2V/f 6300 Ekip Dip LSIG	1SDA072023R1
				E6.2V/f 6300 Ekip Touch LI	1SDA072024R1
				E6.2V/f 6300 Ekip Touch LSI	1SDA072025R1
				E6.2V/f 6300 Ekip Touch LSIG	1SDA072026R1
				E6.2V/f 6300 Ekip Hi-Touch LSI	1SDA072028R1
				E6.2V/f 6300 Ekip Hi-Touch LSIG	1SDA072029R1

Automatic circuit-breakers

Fixed version for power distribution



1SDC20068-4F001

SACE Emax E6.2X/f Full size • Orientable rear terminals (HR)

Size	Iu	Icu (440V)	Icw (1s)	Type	4 Poles Code
E6.2X/f	4000	200	120	E6.2X/f 4000 Ekip Dip LI	1SDA071971R1
				E6.2X/f 4000 Ekip Dip LSI	1SDA071972R1
				E6.2X/f 4000 Ekip Dip LSIG	1SDA071973R1
				E6.2X/f 4000 Ekip Touch LI	1SDA071974R1
				E6.2X/f 4000 Ekip Touch LSI	1SDA071975R1
				E6.2X/f 4000 Ekip Touch LSIG	1SDA071976R1
				E6.2X/f 4000 Ekip Hi-Touch LSI	1SDA071978R1
				E6.2X/f 4000 Ekip Hi-Touch LSIG	1SDA071979R1
				5000	200
	E6.2X/f 5000 Ekip Dip LSI	1SDA072002R1			
	E6.2X/f 5000 Ekip Dip LSIG	1SDA072003R1			
	E6.2X/f 5000 Ekip Touch LI	1SDA072004R1			
	E6.2X/f 5000 Ekip Touch LSI	1SDA072005R1			
	E6.2X/f 5000 Ekip Touch LSIG	1SDA072006R1			
	6300	200	120	E6.2X/f 6300 Ekip Dip LI	1SDA072031R1
E6.2X/f 6300 Ekip Dip LSI				1SDA072032R1	
E6.2X/f 6300 Ekip Dip LSIG				1SDA072033R1	
E6.2X/f 6300 Ekip Touch LI				1SDA072034R1	
E6.2X/f 6300 Ekip Touch LSI				1SDA072035R1	
E6.2X/f 6300 Ekip Touch LSIG				1SDA072036R1	
E6.2X/f 6300 Ekip Hi-Touch LSI				1SDA072038R1	
E6.2X/f 6300 Ekip Hi-Touch LSIG				1SDA072039R1	

Automatic circuit-breakers

Withdrawable version for power distribution



SACE Emax E1.2B • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles	4 Poles
					Code	Code
E1.2B	630	42	42	E1.2B 630 Ekip Dip LI	1SDA072051R1	1SDA072681R1
				E1.2B 630 Ekip Dip LSI	1SDA072052R1	1SDA072682R1
				E1.2B 630 Ekip Dip LSIG	1SDA072053R1	1SDA072683R1
				E1.2B 630 Ekip Touch LI	1SDA072054R1	1SDA072684R1
				E1.2B 630 Ekip Touch LSI	1SDA072055R1	1SDA072685R1
				E1.2B 630 Ekip Touch LSIG	1SDA072056R1	1SDA072686R1
	800	42	42	E1.2B 800 Ekip Dip LI	1SDA072091R1	1SDA072721R1
				E1.2B 800 Ekip Dip LSI	1SDA072092R1	1SDA072722R1
				E1.2B 800 Ekip Dip LSIG	1SDA072093R1	1SDA072723R1
				E1.2B 800 Ekip Touch LI	1SDA072094R1	1SDA072724R1
				E1.2B 800 Ekip Touch LSI	1SDA072095R1	1SDA072725R1
				E1.2B 800 Ekip Touch LSIG	1SDA072096R1	1SDA072726R1
	1000	42	42	E1.2B 1000 Ekip Dip LI	1SDA072131R1	1SDA072761R1
				E1.2B 1000 Ekip Dip LSI	1SDA072132R1	1SDA072762R1
				E1.2B 1000 Ekip Dip LSIG	1SDA072133R1	1SDA072763R1
				E1.2B 1000 Ekip Touch LI	1SDA072134R1	1SDA072764R1
				E1.2B 1000 Ekip Touch LSI	1SDA072135R1	1SDA072765R1
				E1.2B 1000 Ekip Touch LSIG	1SDA072136R1	1SDA072766R1
1250	42	42	E1.2B 1250 Ekip Dip LI	1SDA072171R1	1SDA072801R1	
			E1.2B 1250 Ekip Dip LSI	1SDA072172R1	1SDA072802R1	
			E1.2B 1250 Ekip Dip LSIG	1SDA072173R1	1SDA072803R1	
			E1.2B 1250 Ekip Touch LI	1SDA072174R1	1SDA072804R1	
			E1.2B 1250 Ekip Touch LSI	1SDA072175R1	1SDA072805R1	
			E1.2B 1250 Ekip Touch LSIG	1SDA072176R1	1SDA072806R1	
1600	42	42	E1.2B 1250 Ekip Hi-Touch LSI	1SDA072178R1	1SDA072808R1	
			E1.2B 1250 Ekip Hi-Touch LSIG	1SDA072179R1	1SDA072809R1	
			E1.2B 1600 Ekip Dip LI	1SDA072211R1	1SDA072841R1	
			E1.2B 1600 Ekip Dip LSI	1SDA072212R1	1SDA072842R1	
			E1.2B 1600 Ekip Dip LSIG	1SDA072213R1	1SDA072843R1	
			E1.2B 1600 Ekip Touch LI	1SDA072214R1	1SDA072844R1	
				E1.2B 1600 Ekip Touch LSI	1SDA072215R1	1SDA072845R1
				E1.2B 1600 Ekip Touch LSIG	1SDA072216R1	1SDA072846R1
				E1.2B 1600 Ekip Hi-Touch LSI	1SDA072218R1	1SDA072848R1
				E1.2B 1600 Ekip Hi-Touch LSIG	1SDA072219R1	1SDA072849R1

Automatic circuit-breakers

Withdrawable version for power distribution



SACE Emax E1.2C • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2C	630	50	42	E1.2C 630 Ekip Dip LI	1SDA072061R1		1SDA072691R1	
				E1.2C 630 Ekip Dip LSI	1SDA072062R1		1SDA072692R1	
				E1.2C 630 Ekip Dip LSIG	1SDA072063R1		1SDA072693R1	
				E1.2C 630 Ekip Touch LI	1SDA072064R1		1SDA072694R1	
				E1.2C 630 Ekip Touch LSI	1SDA072065R1		1SDA072695R1	
				E1.2C 630 Ekip Touch LSIG	1SDA072066R1		1SDA072696R1	
				E1.2C 630 Ekip Hi-Touch LSI	1SDA072068R1		1SDA072698R1	
	E1.2C 630 Ekip Hi-Touch LSIG	1SDA072069R1		1SDA072699R1				
	800	50	42	E1.2C 800 Ekip Dip LI	1SDA072101R1		1SDA072731R1	
				E1.2C 800 Ekip Dip LSI	1SDA072102R1		1SDA072732R1	
				E1.2C 800 Ekip Dip LSIG	1SDA072103R1		1SDA072733R1	
				E1.2C 800 Ekip Touch LI	1SDA072104R1		1SDA072734R1	
				E1.2C 800 Ekip Touch LSI	1SDA072105R1		1SDA072735R1	
				E1.2C 800 Ekip Touch LSIG	1SDA072106R1		1SDA072736R1	
E1.2C 800 Ekip Hi-Touch LSI				1SDA072108R1		1SDA072738R1		
E1.2C 800 Ekip Hi-Touch LSIG	1SDA072109R1		1SDA072739R1					
1000	50	42	E1.2C 1000 Ekip Dip LI	1SDA072141R1		1SDA072771R1		
			E1.2C 1000 Ekip Dip LSI	1SDA072142R1		1SDA072772R1		
			E1.2C 1000 Ekip Dip LSIG	1SDA072143R1		1SDA072773R1		
			E1.2C 1000 Ekip Touch LI	1SDA072144R1		1SDA072774R1		
			E1.2C 1000 Ekip Touch LSI	1SDA072145R1		1SDA072775R1		
			E1.2C 1000 Ekip Touch LSIG	1SDA072146R1		1SDA072776R1		
			E1.2C 1000 Ekip Hi-Touch LSI	1SDA072148R1		1SDA072778R1		
E1.2C 1000 Ekip Hi-Touch LSIG	1SDA072149R1		1SDA072779R1					
1250	50	42	E1.2C 1250 Ekip Dip LI	1SDA072181R1		1SDA072811R1		
			E1.2C 1250 Ekip Dip LSI	1SDA072182R1		1SDA072812R1		
			E1.2C 1250 Ekip Dip LSIG	1SDA072183R1		1SDA072813R1		
			E1.2C 1250 Ekip Touch LI	1SDA072184R1		1SDA072814R1		
			E1.2C 1250 Ekip Touch LSI	1SDA072185R1		1SDA072815R1		
			E1.2C 1250 Ekip Touch LSIG	1SDA072186R1		1SDA072816R1		
			E1.2C 1250 Ekip Hi-Touch LSI	1SDA072188R1		1SDA072818R1		
E1.2C 1250 Ekip Hi-Touch LSIG	1SDA072189R1		1SDA072819R1					
1600	50	42	E1.2C 1600 Ekip Dip LI	1SDA072221R1		1SDA072851R1		
			E1.2C 1600 Ekip Dip LSI	1SDA072222R1		1SDA072852R1		
			E1.2C 1600 Ekip Dip LSIG	1SDA072223R1		1SDA072853R1		
			E1.2C 1600 Ekip Touch LI	1SDA072224R1		1SDA072854R1		
			E1.2C 1600 Ekip Touch LSI	1SDA072225R1		1SDA072855R1		
			E1.2C 1600 Ekip Touch LSIG	1SDA072226R1		1SDA072856R1		
			E1.2C 1600 Ekip Hi-Touch LSI	1SDA072228R1		1SDA072858R1		
E1.2C 1600 Ekip Hi-Touch LSIG	1SDA072229R1		1SDA072859R1					



1SDC200665F001

SACE Emax E1.2N • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles	4 Poles
					Code	Code
E1.2N	250	66	50	E1.2N 250 Ekip Dip LI	1SDA072041R1	1SDA072671R1
				E1.2N 250 Ekip Dip LSI	1SDA072042R1	1SDA072672R1
				E1.2N 250 Ekip Dip LSIG	1SDA072043R1	1SDA072673R1
				E1.2N 250 Ekip Touch LI	1SDA072044R1	1SDA072674R1
				E1.2N 250 Ekip Touch LSI	1SDA072045R1	1SDA072675R1
				E1.2N 250 Ekip Touch LSIG	1SDA072046R1	1SDA072676R1
				E1.2N 250 Ekip Hi-Touch LSI	1SDA072048R1	1SDA072678R1
				E1.2N 250 Ekip Hi-Touch LSIG	1SDA072049R1	1SDA072679R1
	630	66	50	E1.2N 630 Ekip Dip LI	1SDA072071R1	1SDA072701R1
				E1.2N 630 Ekip Dip LSI	1SDA072072R1	1SDA072702R1
				E1.2N 630 Ekip Dip LSIG	1SDA072073R1	1SDA072703R1
				E1.2N 630 Ekip Touch LI	1SDA072074R1	1SDA072704R1
				E1.2N 630 Ekip Touch LSI	1SDA072075R1	1SDA072705R1
				E1.2N 630 Ekip Touch LSIG	1SDA072076R1	1SDA072706R1
				E1.2N 630 Ekip Hi-Touch LSI	1SDA072078R1	1SDA072708R1
				E1.2N 630 Ekip Hi-Touch LSIG	1SDA072079R1	1SDA072709R1
	800	66	50	E1.2N 800 Ekip Dip LI	1SDA072111R1	1SDA072741R1
				E1.2N 800 Ekip Dip LSI	1SDA072112R1	1SDA072742R1
				E1.2N 800 Ekip Dip LSIG	1SDA072113R1	1SDA072743R1
				E1.2N 800 Ekip Touch LI	1SDA072114R1	1SDA072744R1
				E1.2N 800 Ekip Touch LSI	1SDA072115R1	1SDA072745R1
				E1.2N 800 Ekip Touch LSIG	1SDA072116R1	1SDA072746R1
				E1.2N 800 Ekip Hi-Touch LSI	1SDA072118R1	1SDA072748R1
				E1.2N 800 Ekip Hi-Touch LSIG	1SDA072119R1	1SDA072749R1
	1000	66	50	E1.2N 1000 Ekip Dip LI	1SDA072151R1	1SDA072781R1
				E1.2N 1000 Ekip Dip LSI	1SDA072152R1	1SDA072782R1
				E1.2N 1000 Ekip Dip LSIG	1SDA072153R1	1SDA072783R1
				E1.2N 1000 Ekip Touch LI	1SDA072154R1	1SDA072784R1
E1.2N 1000 Ekip Touch LSI				1SDA072155R1	1SDA072785R1	
E1.2N 1000 Ekip Touch LSIG				1SDA072156R1	1SDA072786R1	
E1.2N 1000 Ekip Hi-Touch LSI				1SDA072158R1	1SDA072788R1	
E1.2N 1000 Ekip Hi-Touch LSIG				1SDA072159R1	1SDA072789R1	
1250	66	50	E1.2N 1250 Ekip Dip LI	1SDA072191R1	1SDA072821R1	
			E1.2N 1250 Ekip Dip LSI	1SDA072192R1	1SDA072822R1	
			E1.2N 1250 Ekip Dip LSIG	1SDA072193R1	1SDA072823R1	
			E1.2N 1250 Ekip Touch LI	1SDA072194R1	1SDA072824R1	
			E1.2N 1250 Ekip Touch LSI	1SDA072195R1	1SDA072825R1	
			E1.2N 1250 Ekip Touch LSIG	1SDA072196R1	1SDA072826R1	
			E1.2N 1250 Ekip Hi-Touch LSI	1SDA072198R1	1SDA072828R1	
			E1.2N 1250 Ekip Hi-Touch LSIG	1SDA072199R1	1SDA072829R1	
1600	66	50	E1.2N 1600 Ekip Dip LI	1SDA072231R1	1SDA072861R1	
			E1.2N 1600 Ekip Dip LSI	1SDA072232R1	1SDA072862R1	
			E1.2N 1600 Ekip Dip LSIG	1SDA072233R1	1SDA072863R1	
			E1.2N 1600 Ekip Touch LI	1SDA072234R1	1SDA072864R1	
			E1.2N 1600 Ekip Touch LSI	1SDA072235R1	1SDA072865R1	
			E1.2N 1600 Ekip Touch LSIG	1SDA072236R1	1SDA072866R1	
			E1.2N 1600 Ekip Hi-Touch LSI	1SDA072238R1	1SDA072868R1	
			E1.2N 1600 Ekip Hi-Touch LSIG	1SDA072239R1	1SDA072869R1	

Automatic circuit-breakers

Withdrawable version for power distribution



SACE Emax E1.2L-B • Mobile part of withdrawable circuit-breaker (MP)

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles		
					Code		Code		
E1.2L	630	130	15	E1.2L 630 Ekip Dip LI	1SDA072081R1		1SDA072711R1		
				E1.2L 630 Ekip Dip LSI	1SDA072082R1		1SDA072712R1		
				E1.2L 630 Ekip Dip LSIG	1SDA072083R1		1SDA072713R1		
				E1.2L 630 Ekip Touch LI	1SDA072084R1		1SDA072714R1		
				E1.2L 630 Ekip Touch LSI	1SDA072085R1		1SDA072715R1		
				E1.2L 630 Ekip Touch LSIG	1SDA072086R1		1SDA072716R1		
				E1.2L 630 Ekip Hi-Touch LSI	1SDA072088R1		1SDA072718R1		
				E1.2L 630 Ekip Hi-Touch LSIG	1SDA072089R1		1SDA072719R1		
	800	130	15	E1.2L 800 Ekip Dip LI	1SDA072121R1		1SDA072751R1		
				E1.2L 800 Ekip Dip LSI	1SDA072122R1		1SDA072752R1		
				E1.2L 800 Ekip Dip LSIG	1SDA072123R1		1SDA072753R1		
				E1.2L 800 Ekip Touch LI	1SDA072124R1		1SDA072754R1		
				E1.2L 800 Ekip Touch LSI	1SDA072125R1		1SDA072755R1		
				E1.2L 800 Ekip Touch LSIG	1SDA072126R1		1SDA072756R1		
				E1.2L 800 Ekip Hi-Touch LSI	1SDA072128R1		1SDA072758R1		
				E1.2L 800 Ekip Hi-Touch LSIG	1SDA072129R1		1SDA072759R1		
	1000	130	15	E1.2L 1000 Ekip Dip LI	1SDA072161R1		1SDA072791R1		
				E1.2L 1000 Ekip Dip LSI	1SDA072162R1		1SDA072792R1		
				E1.2L 1000 Ekip Dip LSIG	1SDA072163R1		1SDA072793R1		
				E1.2L 1000 Ekip Touch LI	1SDA072164R1		1SDA072794R1		
				E1.2L 1000 Ekip Touch LSI	1SDA072165R1		1SDA072795R1		
				E1.2L 1000 Ekip Touch LSIG	1SDA072166R1		1SDA072796R1		
				E1.2L 1000 Ekip Hi-Touch LSI	1SDA072168R1		1SDA072798R1		
				E1.2L 1000 Ekip Hi-Touch LSIG	1SDA072169R1		1SDA072799R1		
	1250	130	15	E1.2L 1250 Ekip Dip LI	1SDA072201R1		1SDA072831R1		
				E1.2L 1250 Ekip Dip LSI	1SDA072202R1		1SDA072832R1		
				E1.2L 1250 Ekip Dip LSIG	1SDA072203R1		1SDA072833R1		
				E1.2L 1250 Ekip Touch LI	1SDA072204R1		1SDA072834R1		
				E1.2L 1250 Ekip Touch LSI	1SDA072205R1		1SDA072835R1		
				E1.2L 1250 Ekip Touch LSIG	1SDA072206R1		1SDA072836R1		
				E1.2L 1250 Ekip Hi-Touch LSI	1SDA072208R1		1SDA072838R1		
				E1.2L 1250 Ekip Hi-Touch LSIG	1SDA072209R1		1SDA072839R1		
	E2.2B	1600	42	42	E2.2B 1600 Ekip Dip LI	1SDA072331R1		1SDA072961R1	
					E2.2B 1600 Ekip Dip LSI	1SDA072332R1		1SDA072962R1	
					E2.2B 1600 Ekip Dip LSIG	1SDA072333R1		1SDA072963R1	
					E2.2B 1600 Ekip Touch LI	1SDA072334R1		1SDA072964R1	
E2.2B 1600 Ekip Touch LSI					1SDA072335R1		1SDA072965R1		
E2.2B 1600 Ekip Touch LSIG					1SDA072336R1		1SDA072966R1		
E2.2B 1600 Ekip Hi-Touch LSI					1SDA072338R1		1SDA072968R1		
E2.2B 1600 Ekip Hi-Touch LSIG					1SDA072339R1		1SDA072969R1		
2000		42	42	E2.2B 2000 Ekip Dip LI	1SDA072371R1		1SDA073001R1		
				E2.2B 2000 Ekip Dip LSI	1SDA072372R1		1SDA073002R1		
				E2.2B 2000 Ekip Dip LSIG	1SDA072373R1		1SDA073003R1		
				E2.2B 2000 Ekip Touch LI	1SDA072374R1		1SDA073004R1		
				E2.2B 2000 Ekip Touch LSI	1SDA072375R1		1SDA073005R1		
				E2.2B 2000 Ekip Touch LSIG	1SDA072376R1		1SDA073006R1		
				E2.2B 2000 Ekip Hi-Touch LSI	1SDA072378R1		1SDA073008R1		
				E2.2B 2000 Ekip Hi-Touch LSIG	1SDA072379R1		1SDA073009R1		



1SDC200066F001

SACE Emax E2.2N • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles	4 Poles
					Code	Code
E2.2N	800	66	66	E2.2N 800 Ekip Dip LI	1SDA072241R1	1SDA072871R1
				E2.2N 800 Ekip Dip LSI	1SDA072242R1	1SDA072872R1
				E2.2N 800 Ekip Dip LSIG	1SDA072243R1	1SDA072873R1
				E2.2N 800 Ekip Touch LI	1SDA072244R1	1SDA072874R1
				E2.2N 800 Ekip Touch LSI	1SDA072245R1	1SDA072875R1
				E2.2N 800 Ekip Touch LSIG	1SDA072246R1	1SDA072876R1
				E2.2N 800 Ekip Hi-Touch LSI	1SDA072248R1	1SDA072878R1
				E2.2N 800 Ekip Hi-Touch LSIG	1SDA072249R1	1SDA072879R1
	1000	66	66	E2.2N 1000 Ekip Dip LI	1SDA072271R1	1SDA072901R1
				E2.2N 1000 Ekip Dip LSI	1SDA072272R1	1SDA072902R1
				E2.2N 1000 Ekip Dip LSIG	1SDA072273R1	1SDA072903R1
				E2.2N 1000 Ekip Touch LI	1SDA072274R1	1SDA072904R1
				E2.2N 1000 Ekip Touch LSI	1SDA072275R1	1SDA072905R1
				E2.2N 1000 Ekip Touch LSIG	1SDA072276R1	1SDA072906R1
				E2.2N 1000 Ekip Hi-Touch LSI	1SDA072278R1	1SDA072908R1
				E2.2N 1000 Ekip Hi-Touch LSIG	1SDA072279R1	1SDA072909R1
	1250	66	66	E2.2N 1250 Ekip Dip LI	1SDA072301R1	1SDA072931R1
				E2.2N 1250 Ekip Dip LSI	1SDA072302R1	1SDA072932R1
				E2.2N 1250 Ekip Dip LSIG	1SDA072303R1	1SDA072933R1
				E2.2N 1250 Ekip Touch LI	1SDA072304R1	1SDA072934R1
				E2.2N 1250 Ekip Touch LSI	1SDA072305R1	1SDA072935R1
				E2.2N 1250 Ekip Touch LSIG	1SDA072306R1	1SDA072936R1
				E2.2N 1250 Ekip Hi-Touch LSI	1SDA072308R1	1SDA072938R1
				E2.2N 1250 Ekip Hi-Touch LSIG	1SDA072309R1	1SDA072939R1
	1600	66	66	E2.2N 1600 Ekip Dip LI	1SDA072341R1	1SDA072971R1
				E2.2N 1600 Ekip Dip LSI	1SDA072342R1	1SDA072972R1
				E2.2N 1600 Ekip Dip LSIG	1SDA072343R1	1SDA072973R1
				E2.2N 1600 Ekip Touch LI	1SDA072344R1	1SDA072974R1
E2.2N 1600 Ekip Touch LSI				1SDA072345R1	1SDA072975R1	
E2.2N 1600 Ekip Touch LSIG				1SDA072346R1	1SDA072976R1	
E2.2N 1600 Ekip Hi-Touch LSI				1SDA072348R1	1SDA072978R1	
E2.2N 1600 Ekip Hi-Touch LSIG				1SDA072349R1	1SDA072979R1	
2000	66	66	E2.2N 2000 Ekip Dip LI	1SDA072381R1	1SDA073011R1	
			E2.2N 2000 Ekip Dip LSI	1SDA072382R1	1SDA073012R1	
			E2.2N 2000 Ekip Dip LSIG	1SDA072383R1	1SDA073013R1	
			E2.2N 2000 Ekip Touch LI	1SDA072384R1	1SDA073014R1	
			E2.2N 2000 Ekip Touch LSI	1SDA072385R1	1SDA073015R1	
			E2.2N 2000 Ekip Touch LSIG	1SDA072386R1	1SDA073016R1	
			E2.2N 2000 Ekip Hi-Touch LSI	1SDA072388R1	1SDA073018R1	
			E2.2N 2000 Ekip Hi-Touch LSIG	1SDA072389R1	1SDA073019R1	
2500	66	66	E2.2N 2500 Ekip Dip LI	1SDA072411R1	1SDA073041R1	
			E2.2N 2500 Ekip Dip LSI	1SDA072412R1	1SDA073042R1	
			E2.2N 2500 Ekip Dip LSIG	1SDA072413R1	1SDA073043R1	
			E2.2N 2500 Ekip Touch LI	1SDA072414R1	1SDA073044R1	
			E2.2N 2500 Ekip Touch LSI	1SDA072415R1	1SDA073045R1	
			E2.2N 2500 Ekip Touch LSIG	1SDA072416R1	1SDA073046R1	
			E2.2N 2500 Ekip Hi-Touch LSI	1SDA072418R1	1SDA073048R1	
			E2.2N 2500 Ekip Hi-Touch LSIG	1SDA072419R1	1SDA073049R1	

Automatic circuit-breakers

Withdrawable version for power distribution



1SDC200023D0201

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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E2.2S	250	85	66	E2.2S 250 Ekip Dip LI	1SDA073648R1		1SDA073658R1	
				E2.2S 250 Ekip Dip LSI	1SDA073649R1		1SDA073659R1	
				E2.2S 250 Ekip Dip LSIG	1SDA073650R1		1SDA073660R1	
				E2.2S 250 Ekip Touch LI	1SDA073651R1		1SDA073661R1	
				E2.2S 250 Ekip Touch LSI	1SDA073652R1		1SDA073662R1	
				E2.2S 250 Ekip Touch LSIG	1SDA073653R1		1SDA073663R1	
				E2.2S 250 Ekip Hi-Touch LSI	1SDA073655R1		1SDA073665R1	
				E2.2S 250 Ekip Hi-Touch LSIG	1SDA073656R1		1SDA073666R1	
	800	85	66	E2.2S 800 Ekip Dip LI	1SDA072251R1		1SDA072881R1	
				E2.2S 800 Ekip Dip LSI	1SDA072252R1		1SDA072882R1	
				E2.2S 800 Ekip Dip LSIG	1SDA072253R1		1SDA072883R1	
				E2.2S 800 Ekip Touch LI	1SDA072254R1		1SDA072884R1	
				E2.2S 800 Ekip Touch LSI	1SDA072255R1		1SDA072885R1	
				E2.2S 800 Ekip Touch LSIG	1SDA072256R1		1SDA072886R1	
E2.2S 800 Ekip Hi-Touch LSI				1SDA072258R1		1SDA072888R1		
E2.2S 800 Ekip Hi-Touch LSIG				1SDA072259R1		1SDA072889R1		
1000	85	66	E2.2S 1000 Ekip Dip LI	1SDA072281R1		1SDA072911R1		
			E2.2S 1000 Ekip Dip LSI	1SDA072282R1		1SDA072912R1		
			E2.2S 1000 Ekip Dip LSIG	1SDA072283R1		1SDA072913R1		
			E2.2S 1000 Ekip Touch LI	1SDA072284R1		1SDA072914R1		
			E2.2S 1000 Ekip Touch LSI	1SDA072285R1		1SDA072915R1		
			E2.2S 1000 Ekip Touch LSIG	1SDA072286R1		1SDA072916R1		
			E2.2S 1000 Ekip Hi-Touch LSI	1SDA072288R1		1SDA072918R1		
			E2.2S 1000 Ekip Hi-Touch LSIG	1SDA072289R1		1SDA072919R1		
1250	85	66	E2.2S 1250 Ekip Dip LI	1SDA072311R1		1SDA072941R1		
			E2.2S 1250 Ekip Dip LSI	1SDA072312R1		1SDA072942R1		
			E2.2S 1250 Ekip Dip LSIG	1SDA072313R1		1SDA072943R1		
			E2.2S 1250 Ekip Touch LI	1SDA072314R1		1SDA072944R1		
			E2.2S 1250 Ekip Touch LSI	1SDA072315R1		1SDA072945R1		
			E2.2S 1250 Ekip Touch LSIG	1SDA072316R1		1SDA072946R1		
			E2.2S 1250 Ekip Hi-Touch LSI	1SDA072318R1		1SDA072948R1		
			E2.2S 1250 Ekip Hi-Touch LSIG	1SDA072319R1		1SDA072949R1		



1SDC200666F001

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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles	4 Poles
					Code	Code
E2.2S	1600	85	66	E2.2S 1600 Ekip Dip LI	1SDA072351R1	1SDA072981R1
				E2.2S 1600 Ekip Dip LSI	1SDA072352R1	1SDA072982R1
				E2.2S 1600 Ekip Dip LSIG	1SDA072353R1	1SDA072983R1
				E2.2S 1600 Ekip Touch LI	1SDA072354R1	1SDA072984R1
				E2.2S 1600 Ekip Touch LSI	1SDA072355R1	1SDA072985R1
				E2.2S 1600 Ekip Touch LSIG	1SDA072356R1	1SDA072986R1
				E2.2S 1600 Ekip Hi-Touch LSI	1SDA072358R1	1SDA072988R1
				E2.2S 1600 Ekip Hi-Touch LSIG	1SDA072359R1	1SDA072989R1
				2000	85	66
	E2.2S 2000 Ekip Dip LSI	1SDA072392R1	1SDA073022R1			
	E2.2S 2000 Ekip Dip LSIG	1SDA072393R1	1SDA073023R1			
	E2.2S 2000 Ekip Touch LI	1SDA072394R1	1SDA073024R1			
	E2.2S 2000 Ekip Touch LSI	1SDA072395R1	1SDA073025R1			
	E2.2S 2000 Ekip Touch LSIG	1SDA072396R1	1SDA073026R1			
	E2.2S 2000 Ekip Hi-Touch LSI	1SDA072398R1	1SDA073028R1			
	E2.2S 2000 Ekip Hi-Touch LSIG	1SDA072399R1	1SDA073029R1			
	2500	85	66	E2.2S 2500 Ekip Dip LI	1SDA072421R1	1SDA073051R1
				E2.2S 2500 Ekip Dip LSI	1SDA072422R1	1SDA073052R1
				E2.2S 2500 Ekip Dip LSIG	1SDA072423R1	1SDA073053R1
				E2.2S 2500 Ekip Touch LI	1SDA072424R1	1SDA073054R1
				E2.2S 2500 Ekip Touch LSI	1SDA072425R1	1SDA073055R1
E2.2S 2500 Ekip Touch LSIG				1SDA072426R1	1SDA073056R1	
E2.2S 2500 Ekip Hi-Touch LSI				1SDA072428R1	1SDA073058R1	
E2.2S 2500 Ekip Hi-Touch LSIG				1SDA072429R1	1SDA073059R1	

Automatic circuit-breakers

Withdrawable version for power distribution



1SDC200023D0201

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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E2.2H	800	100	85	E2.2H 800 Ekip Dip LI	1SDA072261R1		1SDA072891R1	
				E2.2H 800 Ekip Dip LSI	1SDA072262R1		1SDA072892R1	
				E2.2H 800 Ekip Dip LSIG	1SDA072263R1		1SDA072893R1	
				E2.2H 800 Ekip Touch LI	1SDA072264R1		1SDA072894R1	
				E2.2H 800 Ekip Touch LSI	1SDA072265R1		1SDA072895R1	
				E2.2H 800 Ekip Touch LSIG	1SDA072266R1		1SDA072896R1	
				E2.2H 800 Ekip Hi-Touch LSI	1SDA072268R1		1SDA072898R1	
				E2.2H 800 Ekip Hi-Touch LSIG	1SDA072269R1		1SDA072899R1	
	1000	100	85	E2.2H 1000 Ekip Dip LI	1SDA072291R1		1SDA072921R1	
				E2.2H 1000 Ekip Dip LSI	1SDA072292R1		1SDA072922R1	
				E2.2H 1000 Ekip Dip LSIG	1SDA072293R1		1SDA072923R1	
				E2.2H 1000 Ekip Touch LI	1SDA072294R1		1SDA072924R1	
				E2.2H 1000 Ekip Touch LSI	1SDA072295R1		1SDA072925R1	
				E2.2H 1000 Ekip Touch LSIG	1SDA072296R1		1SDA072926R1	
				E2.2H 1000 Ekip Hi-Touch LSI	1SDA072298R1		1SDA072928R1	
				E2.2H 1000 Ekip Hi-Touch LSIG	1SDA072299R1		1SDA072929R1	
	1250	100	85	E2.2H 1250 Ekip Dip LI	1SDA072321R1		1SDA072951R1	
				E2.2H 1250 Ekip Dip LSI	1SDA072322R1		1SDA072952R1	
				E2.2H 1250 Ekip Dip LSIG	1SDA072323R1		1SDA072953R1	
				E2.2H 1250 Ekip Touch LI	1SDA072324R1		1SDA072954R1	
				E2.2H 1250 Ekip Touch LSI	1SDA072325R1		1SDA072955R1	
				E2.2H 1250 Ekip Touch LSIG	1SDA072326R1		1SDA072956R1	
				E2.2H 1250 Ekip Hi-Touch LSI	1SDA072328R1		1SDA072958R1	
				E2.2H 1250 Ekip Hi-Touch LSIG	1SDA072329R1		1SDA072959R1	
	1600	100	85	E2.2H 1600 Ekip Dip LI	1SDA072361R1		1SDA072991R1	
				E2.2H 1600 Ekip Dip LSI	1SDA072362R1		1SDA072992R1	
				E2.2H 1600 Ekip Dip LSIG	1SDA072363R1		1SDA072993R1	
				E2.2H 1600 Ekip Touch LI	1SDA072364R1		1SDA072994R1	
				E2.2H 1600 Ekip Touch LSI	1SDA072365R1		1SDA072995R1	
				E2.2H 1600 Ekip Touch LSIG	1SDA072366R1		1SDA072996R1	
				E2.2H 1600 Ekip Hi-Touch LSI	1SDA072368R1		1SDA072998R1	
				E2.2H 1600 Ekip Hi-Touch LSIG	1SDA072369R1		1SDA072999R1	
	2000	100	85	E2.2H 2000 Ekip Dip LI	1SDA072401R1		1SDA073031R1	
				E2.2H 2000 Ekip Dip LSI	1SDA072402R1		1SDA073032R1	
				E2.2H 2000 Ekip Dip LSIG	1SDA072403R1		1SDA073033R1	
				E2.2H 2000 Ekip Touch LI	1SDA072404R1		1SDA073034R1	
				E2.2H 2000 Ekip Touch LSI	1SDA072405R1		1SDA073035R1	
				E2.2H 2000 Ekip Touch LSIG	1SDA072406R1		1SDA073036R1	
				E2.2H 2000 Ekip Hi-Touch LSI	1SDA072408R1		1SDA073038R1	
				E2.2H 2000 Ekip Hi-Touch LSIG	1SDA072409R1		1SDA073039R1	
	2500	100	85	E2.2H 2500 Ekip Dip LI	1SDA072431R1		1SDA073061R1	
				E2.2H 2500 Ekip Dip LSI	1SDA072432R1		1SDA073062R1	
				E2.2H 2500 Ekip Dip LSIG	1SDA072433R1		1SDA073063R1	
				E2.2H 2500 Ekip Touch LI	1SDA072434R1		1SDA073064R1	
				E2.2H 2500 Ekip Touch LSI	1SDA072435R1		1SDA073065R1	
				E2.2H 2500 Ekip Touch LSIG	1SDA072436R1		1SDA073066R1	
				E2.2H 2500 Ekip Hi-Touch LSI	1SDA072438R1		1SDA073068R1	
				E2.2H 2500 Ekip Hi-Touch LSIG	1SDA072439R1		1SDA073069R1	



1SDC200867F001

SACE Emax E4.2N-S-H • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E4.2N	3200	66	66	E4.2N 3200 Ekip Dip LI	1SDA072491R1		1SDA073121R1	
				E4.2N 3200 Ekip Dip LSI	1SDA072492R1		1SDA073122R1	
				E4.2N 3200 Ekip Dip LSIG	1SDA072493R1		1SDA073123R1	
				E4.2N 3200 Ekip Touch LI	1SDA072494R1		1SDA073124R1	
				E4.2N 3200 Ekip Touch LSI	1SDA072495R1		1SDA073125R1	
				E4.2N 3200 Ekip Touch LSIG	1SDA072496R1		1SDA073126R1	
				E4.2N 3200 Ekip Hi-Touch LSI	1SDA072498R1		1SDA073128R1	
	E4.2N 3200 Ekip Hi-Touch LSIG	1SDA072499R1		1SDA073129R1				
	4000	66	66	E4.2N 4000 Ekip Dip LI	1SDA072541R1		1SDA073171R1	
				E4.2N 4000 Ekip Dip LSI	1SDA072542R1		1SDA073172R1	
				E4.2N 4000 Ekip Dip LSIG	1SDA072543R1		1SDA073173R1	
				E4.2N 4000 Ekip Touch LI	1SDA072544R1		1SDA073174R1	
				E4.2N 4000 Ekip Touch LSI	1SDA072545R1		1SDA073175R1	
				E4.2N 4000 Ekip Touch LSIG	1SDA072546R1		1SDA073176R1	
E4.2N 4000 Ekip Hi-Touch LSI				1SDA072548R1		1SDA073178R1		
E4.2N 4000 Ekip Hi-Touch LSIG	1SDA072549R1		1SDA073179R1					
E4.2S	3200	85	66	E4.2S 3200 Ekip Dip LI	1SDA072501R1		1SDA073131R1	
				E4.2S 3200 Ekip Dip LSI	1SDA072502R1		1SDA073132R1	
				E4.2S 3200 Ekip Dip LSIG	1SDA072503R1		1SDA073133R1	
				E4.2S 3200 Ekip Touch LI	1SDA072504R1		1SDA073134R1	
				E4.2S 3200 Ekip Touch LSI	1SDA072505R1		1SDA073135R1	
				E4.2S 3200 Ekip Touch LSIG	1SDA072506R1		1SDA073136R1	
				E4.2S 3200 Ekip Hi-Touch LSI	1SDA072508R1		1SDA073138R1	
	E4.2S 3200 Ekip Hi-Touch LSIG	1SDA072509R1		1SDA073139R1				
	4000	85	66	E4.2S 4000 Ekip Dip LI	1SDA072551R1		1SDA073181R1	
				E4.2S 4000 Ekip Dip LSI	1SDA072552R1		1SDA073182R1	
				E4.2S 4000 Ekip Dip LSIG	1SDA072553R1		1SDA073183R1	
				E4.2S 4000 Ekip Touch LI	1SDA072554R1		1SDA073184R1	
				E4.2S 4000 Ekip Touch LSI	1SDA072555R1		1SDA073185R1	
				E4.2S 4000 Ekip Touch LSIG	1SDA072556R1		1SDA073186R1	
E4.2S 4000 Ekip Hi-Touch LSI				1SDA072558R1		1SDA073188R1		
E4.2S 4000 Ekip Hi-Touch LSIG	1SDA072559R1		1SDA073189R1					
E4.2H	3200	100	85	E4.2H 3200 Ekip Dip LI	1SDA072511R1		1SDA073141R1	
				E4.2H 3200 Ekip Dip LSI	1SDA072512R1		1SDA073142R1	
				E4.2H 3200 Ekip Dip LSIG	1SDA072513R1		1SDA073143R1	
				E4.2H 3200 Ekip Touch LI	1SDA072514R1		1SDA073144R1	
				E4.2H 3200 Ekip Touch LSI	1SDA072515R1		1SDA073145R1	
				E4.2H 3200 Ekip Touch LSIG	1SDA072516R1		1SDA073146R1	
				E4.2H 3200 Ekip Hi-Touch LSI	1SDA072518R1		1SDA073148R1	
	E4.2H 3200 Ekip Hi-Touch LSIG	1SDA072519R1		1SDA073149R1				
	4000	100	85	E4.2H 4000 Ekip Dip LI	1SDA072561R1		1SDA073191R1	
				E4.2H 4000 Ekip Dip LSI	1SDA072562R1		1SDA073192R1	
				E4.2H 4000 Ekip Dip LSIG	1SDA072563R1		1SDA073193R1	
				E4.2H 4000 Ekip Touch LI	1SDA072564R1		1SDA073194R1	
				E4.2H 4000 Ekip Touch LSI	1SDA072565R1		1SDA073195R1	
				E4.2H 4000 Ekip Touch LSIG	1SDA072566R1		1SDA073196R1	
E4.2H 4000 Ekip Hi-Touch LSI				1SDA072568R1		1SDA073198R1		
E4.2H 4000 Ekip Hi-Touch LSIG	1SDA072569R1		1SDA073199R1					

Automatic circuit-breakers

Withdrawable version for power distribution



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

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E4.2V	2000	150	100	E4.2V 2000 Ekip Dip LI	1SDA072451R1		1SDA073081R1	
				E4.2V 2000 Ekip Dip LSI	1SDA072452R1		1SDA073082R1	
				E4.2V 2000 Ekip Dip LSIG	1SDA072453R1		1SDA073083R1	
				E4.2V 2000 Ekip Touch LI	1SDA072454R1		1SDA073084R1	
				E4.2V 2000 Ekip Touch LSI	1SDA072455R1		1SDA073085R1	
				E4.2V 2000 Ekip Touch LSIG	1SDA072456R1		1SDA073086R1	
				E4.2V 2000 Ekip Hi-Touch LSI	1SDA072458R1		1SDA073088R1	
				E4.2V 2000 Ekip Hi-Touch LSIG	1SDA072459R1		1SDA073089R1	
	2500	150	100	E4.2V 2500 Ekip Dip LI	1SDA072471R1		1SDA073101R1	
				E4.2V 2500 Ekip Dip LSI	1SDA072472R1		1SDA073102R1	
				E4.2V 2500 Ekip Dip LSIG	1SDA072473R1		1SDA073103R1	
				E4.2V 2500 Ekip Touch LI	1SDA072474R1		1SDA073104R1	
				E4.2V 2500 Ekip Touch LSI	1SDA072475R1		1SDA073105R1	
				E4.2V 2500 Ekip Touch LSIG	1SDA072476R1		1SDA073106R1	
E4.2V 2500 Ekip Hi-Touch LSI				1SDA072478R1		1SDA073108R1		
E4.2V 2500 Ekip Hi-Touch LSIG				1SDA072479R1		1SDA073109R1		
3200	150	100	E4.2V 3200 Ekip Dip LI	1SDA072521R1		1SDA073151R1		
			E4.2V 3200 Ekip Dip LSI	1SDA072522R1		1SDA073152R1		
			E4.2V 3200 Ekip Dip LSIG	1SDA072523R1		1SDA073153R1		
			E4.2V 3200 Ekip Touch LI	1SDA072524R1		1SDA073154R1		
			E4.2V 3200 Ekip Touch LSI	1SDA072525R1		1SDA073155R1		
			E4.2V 3200 Ekip Touch LSIG	1SDA072526R1		1SDA073156R1		
			E4.2V 3200 Ekip Hi-Touch LSI	1SDA072528R1		1SDA073158R1		
			E4.2V 3200 Ekip Hi-Touch LSIG	1SDA072529R1		1SDA073159R1		
4000	150	100	E4.2V 4000 Ekip Dip LI	1SDA072571R1		1SDA073201R1		
			E4.2V 4000 Ekip Dip LSI	1SDA072572R1		1SDA073202R1		
			E4.2V 4000 Ekip Dip LSIG	1SDA072573R1		1SDA073203R1		
			E4.2V 4000 Ekip Touch LI	1SDA072574R1		1SDA073204R1		
			E4.2V 4000 Ekip Touch LSI	1SDA072575R1		1SDA073205R1		
			E4.2V 4000 Ekip Touch LSIG	1SDA072576R1		1SDA073206R1		
			E4.2V 4000 Ekip Hi-Touch LSI	1SDA072578R1		1SDA073208R1		
			E4.2V 4000 Ekip Hi-Touch LSIG	1SDA072579R1		1SDA073209R1		



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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles	4 Poles
					Code	Code
E6.2H	4000	100	100	E6.2H 4000 Ekip Dip LI	1SDA072581R1	1SDA073211R1
				E6.2H 4000 Ekip Dip LSI	1SDA072582R1	1SDA073212R1
				E6.2H 4000 Ekip Dip LSIG	1SDA072583R1	1SDA073213R1
				E6.2H 4000 Ekip Touch LI	1SDA072584R1	1SDA073214R1
				E6.2H 4000 Ekip Touch LSI	1SDA072585R1	1SDA073215R1
				E6.2H 4000 Ekip Touch LSIG	1SDA072586R1	1SDA073216R1
				E6.2H 4000 Ekip Hi-Touch LSI	1SDA072588R1	1SDA073218R1
				E6.2H 4000 Ekip Hi-Touch LSIG	1SDA072589R1	1SDA073219R1
	5000	100	100	E6.2H 5000 Ekip Dip LI	1SDA072611R1	1SDA073241R1
				E6.2H 5000 Ekip Dip LSI	1SDA072612R1	1SDA073242R1
				E6.2H 5000 Ekip Dip LSIG	1SDA072613R1	1SDA073243R1
				E6.2H 5000 Ekip Touch LI	1SDA072614R1	1SDA073244R1
				E6.2H 5000 Ekip Touch LSI	1SDA072615R1	1SDA073245R1
				E6.2H 5000 Ekip Touch LSIG	1SDA072616R1	1SDA073246R1
				E6.2H 5000 Ekip Hi-Touch LSI	1SDA072618R1	1SDA073248R1
				E6.2H 5000 Ekip Hi-Touch LSIG	1SDA072619R1	1SDA073249R1
	6300	100	100	E6.2H 6300 Ekip Dip LI	1SDA072641R1	1SDA073271R1
				E6.2H 6300 Ekip Dip LSI	1SDA072642R1	1SDA073272R1
				E6.2H 6300 Ekip Dip LSIG	1SDA072643R1	1SDA073273R1
				E6.2H 6300 Ekip Touch LI	1SDA072644R1	1SDA073274R1
				E6.2H 6300 Ekip Touch LSI	1SDA072645R1	1SDA073275R1
				E6.2H 6300 Ekip Touch LSIG	1SDA072646R1	1SDA073276R1
				E6.2H 6300 Ekip Hi-Touch LSI	1SDA072648R1	1SDA073278R1
				E6.2H 6300 Ekip Hi-Touch LSIG	1SDA072649R1	1SDA073279R1
E6.2V	4000	150	100	E6.2V 4000 Ekip Dip LI	1SDA072591R1	1SDA073221R1
				E6.2V 4000 Ekip Dip LSI	1SDA072592R1	1SDA073222R1
				E6.2V 4000 Ekip Dip LSIG	1SDA072593R1	1SDA073223R1
				E6.2V 4000 Ekip Touch LI	1SDA072594R1	1SDA073224R1
				E6.2V 4000 Ekip Touch LSI	1SDA072595R1	1SDA073225R1
				E6.2V 4000 Ekip Touch LSIG	1SDA072596R1	1SDA073226R1
				E6.2V 4000 Ekip Hi-Touch LSI	1SDA072598R1	1SDA073228R1
				E6.2V 4000 Ekip Hi-Touch LSIG	1SDA072599R1	1SDA073229R1
	5000	150	100	E6.2V 5000 Ekip Dip LI	1SDA072621R1	1SDA073251R1
				E6.2V 5000 Ekip Dip LSI	1SDA072622R1	1SDA073252R1
				E6.2V 5000 Ekip Dip LSIG	1SDA072623R1	1SDA073253R1
				E6.2V 5000 Ekip Touch LI	1SDA072624R1	1SDA073254R1
				E6.2V 5000 Ekip Touch LSI	1SDA072625R1	1SDA073255R1
				E6.2V 5000 Ekip Touch LSIG	1SDA072626R1	1SDA073256R1
				E6.2V 5000 Ekip Hi-Touch LSI	1SDA072628R1	1SDA073258R1
				E6.2V 5000 Ekip Hi-Touch LSIG	1SDA072629R1	1SDA073259R1
	6300	150	100	E6.2V 6300 Ekip Dip LI	1SDA072651R1	1SDA073281R1
				E6.2V 6300 Ekip Dip LSI	1SDA072652R1	1SDA073282R1
				E6.2V 6300 Ekip Dip LSIG	1SDA072653R1	1SDA073283R1
				E6.2V 6300 Ekip Touch LI	1SDA072654R1	1SDA073284R1
				E6.2V 6300 Ekip Touch LSI	1SDA072655R1	1SDA073285R1
				E6.2V 6300 Ekip Touch LSIG	1SDA072656R1	1SDA073286R1
				E6.2V 6300 Ekip Hi-Touch LSI	1SDA072658R1	1SDA073288R1
				E6.2V 6300 Ekip Hi-Touch LSIG	1SDA072659R1	1SDA073289R1

Automatic circuit-breakers

Withdrawable version for power distribution



1SDC20023D0201

SACE Emax E6.2X • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E6.2X	4000	200	120	E6.2X 4000 Ekip Dip LI	1SDA072601R1		1SDA073231R1	
				E6.2X 4000 Ekip Dip LSI	1SDA072602R1		1SDA073232R1	
				E6.2X 4000 Ekip Dip LSIG	1SDA072603R1		1SDA073233R1	
				E6.2X 4000 Ekip Touch LI	1SDA072604R1		1SDA073234R1	
				E6.2X 4000 Ekip Touch LSI	1SDA072605R1		1SDA073235R1	
				E6.2X 4000 Ekip Touch LSIG	1SDA072606R1		1SDA073236R1	
				E6.2X 4000 Ekip Hi-Touch LSI	1SDA072608R1		1SDA073238R1	
				E6.2X 4000 Ekip Hi-Touch LSIG	1SDA072609R1		1SDA073239R1	
	5000	200	120	E6.2X 5000 Ekip Dip LI	1SDA072631R1		1SDA073261R1	
				E6.2X 5000 Ekip Dip LSI	1SDA072632R1		1SDA073262R1	
				E6.2X 5000 Ekip Dip LSIG	1SDA072633R1		1SDA073263R1	
				E6.2X 5000 Ekip Touch LI	1SDA072634R1		1SDA073264R1	
				E6.2X 5000 Ekip Touch LSI	1SDA072635R1		1SDA073265R1	
				E6.2X 5000 Ekip Touch LSIG	1SDA072636R1		1SDA073266R1	
E6.2X 5000 Ekip Hi-Touch LSI				1SDA072638R1		1SDA073268R1		
E6.2X 5000 Ekip Hi-Touch LSIG				1SDA072639R1		1SDA073269R1		
6300	200	120	E6.2X 6300 Ekip Dip LI	1SDA072661R1		1SDA073291R1		
			E6.2X 6300 Ekip Dip LSI	1SDA072662R1		1SDA073292R1		
			E6.2X 6300 Ekip Dip LSIG	1SDA072663R1		1SDA073293R1		
			E6.2X 6300 Ekip Touch LI	1SDA072664R1		1SDA073294R1		
			E6.2X 6300 Ekip Touch LSI	1SDA072665R1		1SDA073295R1		
			E6.2X 6300 Ekip Touch LSIG	1SDA072666R1		1SDA073296R1		
			E6.2X 6300 Ekip Hi-Touch LSI	1SDA072668R1		1SDA073298R1		
			E6.2X 6300 Ekip Hi-Touch LSIG	1SDA072669R1		1SDA073299R1		



SACE Emax E6.2H-V/f Full size • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	4 Poles	
					Code	
E6.2H/f	4000	100	100	E6.2H/f 4000 Ekip Dip LI	1SDA073301R1	
				E6.2H/f 4000 Ekip Dip LSI	1SDA073302R1	
				E6.2H/f 4000 Ekip Dip LSIG	1SDA073303R1	
				E6.2H/f 4000 Ekip Touch LI	1SDA073304R1	
				E6.2H/f 4000 Ekip Touch LSI	1SDA073305R1	
				E6.2H/f 4000 Ekip Touch LSIG	1SDA073306R1	
				E6.2H/f 4000 Ekip Hi-Touch LSI	1SDA073308R1	
				E6.2H/f 4000 Ekip Hi-Touch LSIG	1SDA073309R1	
				5000	100	100
	E6.2H/f 5000 Ekip Dip LSI	1SDA073332R1				
	E6.2H/f 5000 Ekip Dip LSIG	1SDA073333R1				
	E6.2H/f 5000 Ekip Touch LI	1SDA073334R1				
	E6.2H/f 5000 Ekip Touch LSI	1SDA073335R1				
	E6.2H/f 5000 Ekip Touch LSIG	1SDA073336R1				
	E6.2H/f 5000 Ekip Hi-Touch LSI	1SDA073338R1				
	E6.2H/f 5000 Ekip Hi-Touch LSIG	1SDA073339R1				
	6300	100	100			
				E6.2H/f 6300 Ekip Dip LSI	1SDA073362R1	
				E6.2H/f 6300 Ekip Dip LSIG	1SDA073363R1	
				E6.2H/f 6300 Ekip Touch LI	1SDA073364R1	
				E6.2H/f 6300 Ekip Touch LSI	1SDA073365R1	
				E6.2H/f 6300 Ekip Touch LSIG	1SDA073366R1	
				E6.2H/f 6300 Ekip Hi-Touch LSI	1SDA073368R1	
				E6.2H/f 6300 Ekip Hi-Touch LSIG	1SDA073369R1	
				E6.2V/f	4000	150
	E6.2V/f 4000 Ekip Dip LSI	1SDA073312R1				
	E6.2V/f 4000 Ekip Dip LSIG	1SDA073313R1				
E6.2V/f 4000 Ekip Touch LI	1SDA073314R1					
E6.2V/f 4000 Ekip Touch LSI	1SDA073315R1					
E6.2V/f 4000 Ekip Touch LSIG	1SDA073316R1					
E6.2V/f 4000 Ekip Hi-Touch LSI	1SDA073318R1					
E6.2V/f 4000 Ekip Hi-Touch LSIG	1SDA073319R1					
5000	150	100	E6.2V/f 5000 Ekip Dip LI			
			E6.2V/f 5000 Ekip Dip LSI		1SDA073342R1	
			E6.2V/f 5000 Ekip Dip LSIG		1SDA073343R1	
			E6.2V/f 5000 Ekip Touch LI		1SDA073344R1	
			E6.2V/f 5000 Ekip Touch LSI		1SDA073345R1	
			E6.2V/f 5000 Ekip Touch LSIG		1SDA073346R1	
			E6.2V/f 5000 Ekip Hi-Touch LSI		1SDA073348R1	
			E6.2V/f 5000 Ekip Hi-Touch LSIG		1SDA073349R1	
			6300		150	100
E6.2V/f 6300 Ekip Dip LSI	1SDA073372R1					
E6.2V/f 6300 Ekip Dip LSIG	1SDA073373R1					
E6.2V/f 6300 Ekip Touch LI	1SDA073374R1					
E6.2V/f 6300 Ekip Touch LSI	1SDA073375R1					
E6.2V/f 6300 Ekip Touch LSIG	1SDA073376R1					
E6.2V/f 6300 Ekip Hi-Touch LSI	1SDA073378R1					
E6.2V/f 6300 Ekip Hi-Touch LSIG	1SDA073379R1					

Automatic circuit-breakers

Withdrawable version for power distribution



SACE Emax E6.2X/f Full size • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	4 Poles Code
E6.2X/f	4000	200	120	E6.2X/f 4000 Ekip Dip LI	1SDA073321R1
				E6.2X/f 4000 Ekip Dip LSI	1SDA073322R1
				E6.2X/f 4000 Ekip Dip LSIG	1SDA073323R1
				E6.2X/f 4000 Ekip Touch LI	1SDA073324R1
				E6.2X/f 4000 Ekip Touch LSI	1SDA073325R1
				E6.2X/f 4000 Ekip Touch LSIG	1SDA073326R1
				E6.2X/f 4000 Ekip Hi-Touch LSI	1SDA073328R1
				E6.2X/f 4000 Ekip Hi-Touch LSIG	1SDA073329R1
	5000	200	120	E6.2X/f 5000 Ekip Dip LI	1SDA073351R1
				E6.2X/f 5000 Ekip Dip LSI	1SDA073352R1
				E6.2X/f 5000 Ekip Dip LSIG	1SDA073353R1
				E6.2X/f 5000 Ekip Touch LI	1SDA073354R1
				E6.2X/f 5000 Ekip Touch LSI	1SDA073355R1
				E6.2X/f 5000 Ekip Touch LSIG	1SDA073356R1
6300	200	120	E6.2X/f 6300 Ekip Dip LI	1SDA073381R1	
			E6.2X/f 6300 Ekip Dip LSI	1SDA073382R1	
			E6.2X/f 6300 Ekip Dip LSIG	1SDA073383R1	
			E6.2X/f 6300 Ekip Touch LI	1SDA073384R1	
			E6.2X/f 6300 Ekip Touch LSI	1SDA073385R1	
			E6.2X/f 6300 Ekip Touch LSIG	1SDA073386R1	
			E6.2X/f 6300 Ekip Hi-Touch LSI	1SDA073388R1	
			E6.2X/f 6300 Ekip Hi-Touch LSIG	1SDA073389R1	

Automatic circuit-breakers

Fixed version for generators



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

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles		
					Code		Code		
E1.2B	630	42	42	E1.2B 630 Ekip G Touch LSIG	1SDA070707R1		1SDA071337R1		
				E1.2B 630 Ekip G Hi-Touch LSIG	1SDA070710R1		1SDA071340R1		
	800	42	42	E1.2B 800 Ekip G Touch LSIG	1SDA070747R1		1SDA071377R1		
				E1.2B 800 Ekip G Hi-Touch LSIG	1SDA070750R1		1SDA071380R1		
	1000	42	42	E1.2B 1000 Ekip G Touch LSIG	1SDA070787R1		1SDA071417R1		
				E1.2B 1000 Ekip G Hi-Touch LSIG	1SDA070790R1		1SDA071420R1		
	1250	42	42	E1.2B 1250 Ekip G Touch LSIG	1SDA070827R1		1SDA071457R1		
				E1.2B 1250 Ekip G Hi-Touch LSIG	1SDA070830R1		1SDA071460R1		
	1600	42	42	E1.2B 1600 Ekip G Touch LSIG	1SDA070867R1		1SDA071497R1		
				E1.2B 1600 Ekip G Hi-Touch LSIG	1SDA070870R1		1SDA071500R1		
	E1.2C	630	50	42	E1.2C 630 Ekip G Touch LSIG	1SDA070717R1		1SDA071347R1	
					E1.2C 630 Ekip G Hi-Touch LSIG	1SDA070720R1		1SDA071350R1	
800		50	42	E1.2C 800 Ekip G Touch LSIG	1SDA070757R1		1SDA071387R1		
				E1.2C 800 Ekip G Hi-Touch LSIG	1SDA070760R1		1SDA071390R1		
1000		50	42	E1.2C 1000 Ekip G Touch LSIG	1SDA070797R1		1SDA071427R1		
				E1.2C 1000 Ekip G Hi-Touch LSIG	1SDA070800R1		1SDA071430R1		
1250		50	42	E1.2C 1250 Ekip G Touch LSIG	1SDA070837R1		1SDA071467R1		
				E1.2C 1250 Ekip G Hi-Touch LSIG	1SDA070840R1		1SDA071470R1		
1600		50	42	E1.2C 1600 Ekip G Touch LSIG	1SDA070877R1		1SDA071507R1		
				E1.2C 1600 Ekip G Hi-Touch LSIG	1SDA070880R1		1SDA071510R1		
E1.2N		250	66	50	E1.2N 250 Ekip G Touch LSIG	1SDA070697R1		1SDA071327R1	
					E1.2N 250 Ekip G Hi-Touch LSIG	1SDA070700R1		1SDA071330R1	
	630	66	50	E1.2N 630 Ekip G Touch LSIG	1SDA070727R1		1SDA071357R1		
				E1.2N 630 Ekip G Hi-Touch LSIG	1SDA070730R1		1SDA071360R1		
	800	66	50	E1.2N 800 Ekip G Touch LSIG	1SDA070767R1		1SDA071397R1		
				E1.2N 800 Ekip G Hi-Touch LSIG	1SDA070770R1		1SDA071400R1		
	1000	66	50	E1.2N 1000 Ekip G Touch LSIG	1SDA070807R1		1SDA071437R1		
				E1.2N 1000 Ekip G Hi-Touch LSIG	1SDA070810R1		1SDA071440R1		
	1250	66	50	E1.2N 1250 Ekip G Touch LSIG	1SDA070847R1		1SDA071477R1		
				E1.2N 1250 Ekip G Hi-Touch LSIG	1SDA070850R1		1SDA071480R1		
	1600	66	50	E1.2N 1600 Ekip G Touch LSIG	1SDA070887R1		1SDA071517R1		
				E1.2N 1600 Ekip G Hi-Touch LSIG	1SDA070890R1		1SDA071520R1		
E1.2L	630	130	15	E1.2L 630 Ekip G Touch LSIG	1SDA070737R1		1SDA071367R1		
				E1.2L 630 Ekip G Hi-Touch LSIG	1SDA070740R1		1SDA071370R1		
	800	130	15	E1.2L 800 Ekip G Touch LSIG	1SDA070777R1		1SDA071407R1		
				E1.2L 800 Ekip G Hi-Touch LSIG	1SDA070780R1		1SDA071410R1		
	1000	130	15	E1.2L 1000 Ekip G Touch LSIG	1SDA070817R1		1SDA071447R1		
				E1.2L 1000 Ekip G Hi-Touch LSIG	1SDA070820R1		1SDA071450R1		
	1250	130	15	E1.2L 1250 Ekip G Touch LSIG	1SDA070857R1		1SDA071487R1		
				E1.2L 1250 Ekip G Hi-Touch LSIG	1SDA070860R1		1SDA071490R1		

Automatic circuit-breakers

Fixed version for generators



1SDC200023D0201

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

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles		
					Code		Code		
E2.2B	1600	42	42	E2.2B 1600 Ekip G Touch LSIG	1SDA070987R1		1SDA071617R1		
				E2.2B 1600 Ekip G Hi-Touch LSIG	1SDA070990R1		1SDA071620R1		
	2000	42	42	E2.2B 2000 Ekip G Touch LSIG	1SDA071027R1		1SDA071657R1		
				E2.2B 2000 Ekip G Hi-Touch LSIG	1SDA071030R1		1SDA071660R1		
E2.2N	800	66	66	E2.2N 800 Ekip G Touch LSIG	1SDA070897R1		1SDA071527R1		
				E2.2N 800 Ekip G Hi-Touch LSIG	1SDA070900R1		1SDA071530R1		
	1000	66	66	E2.2N 1000 Ekip G Touch LSIG	1SDA070927R1		1SDA071557R1		
				E2.2N 1000 Ekip G Hi-Touch LSIG	1SDA070930R1		1SDA071560R1		
	1250	66	66	E2.2N 1250 Ekip G Touch LSIG	1SDA070957R1		1SDA071587R1		
				E2.2N 1250 Ekip G Hi-Touch LSIG	1SDA070960R1		1SDA071590R1		
	1600	66	66	E2.2N 1600 Ekip G Touch LSIG	1SDA070997R1		1SDA071627R1		
				E2.2N 1600 Ekip G Hi-Touch LSIG	1SDA071000R1		1SDA071630R1		
	2000	66	66	E2.2N 2000 Ekip G Touch LSIG	1SDA071037R1		1SDA071667R1		
				E2.2N 2000 Ekip G Hi-Touch LSIG	1SDA071040R1		1SDA071670R1		
	2500	66	66	E2.2N 2500 Ekip G Touch LSIG	1SDA071067R1		1SDA071697R1		
				E2.2N 2500 Ekip G Hi-Touch LSIG	1SDA071070R1		1SDA071700R1		
	E2.2S	250	85	66	E2.2S 250 Ekip G Touch LSIG	1SDA073634R1		1SDA073644R1	
					E2.2S 250 Ekip G Hi-Touch LSIG	1SDA073637R1		1SDA073647R1	
800		85	66	E2.2S 800 Ekip G Touch LSIG	1SDA070907R1		1SDA071537R1		
				E2.2S 800 Ekip G Hi-Touch LSIG	1SDA070910R1		1SDA071540R1		
1000		85	66	E2.2S 1000 Ekip G Touch LSIG	1SDA070937R1		1SDA071567R1		
				E2.2S 1000 Ekip G Hi-Touch LSIG	1SDA070940R1		1SDA071570R1		
1250		85	66	E2.2S 1250 Ekip G Touch LSIG	1SDA070967R1		1SDA071597R1		
				E2.2S 1250 Ekip G Hi-Touch LSIG	1SDA070970R1		1SDA071600R1		
1600		85	66	E2.2S 1600 Ekip G Touch LSIG	1SDA071007R1		1SDA071637R1		
				E2.2S 1600 Ekip G Hi-Touch LSIG	1SDA071010R1		1SDA071640R1		
2000		85	66	E2.2S 2000 Ekip G Touch LSIG	1SDA071047R1		1SDA071677R1		
				E2.2S 2000 Ekip G Hi-Touch LSIG	1SDA071050R1		1SDA071680R1		
2500		85	66	E2.2S 2500 Ekip G Touch LSIG	1SDA071077R1		1SDA071707R1		
				E2.2S 2500 Ekip G Hi-Touch LSIG	1SDA071080R1		1SDA071710R1		
E2.2H	800	100	85	E2.2H 800 Ekip G Touch LSIG	1SDA070917R1		1SDA071547R1		
				E2.2H 800 Ekip G Hi-Touch LSIG	1SDA070920R1		1SDA071550R1		
	1000	100	85	E2.2H 1000 Ekip G Touch LSIG	1SDA070947R1		1SDA071577R1		
				E2.2H 1000 Ekip G Hi-Touch LSIG	1SDA070950R1		1SDA071580R1		
	1250	100	85	E2.2H 1250 Ekip G Touch LSIG	1SDA070977R1		1SDA071607R1		
				E2.2H 1250 Ekip G Hi-Touch LSIG	1SDA070980R1		1SDA071610R1		
	1600	100	85	E2.2H 1600 Ekip G Touch LSIG	1SDA071017R1		1SDA071647R1		
				E2.2H 1600 Ekip G Hi-Touch LSIG	1SDA071020R1		1SDA071650R1		
	2000	100	85	E2.2H 2000 Ekip G Touch LSIG	1SDA071057R1		1SDA071687R1		
				E2.2H 2000 Ekip G Hi-Touch LSIG	1SDA071060R1		1SDA071690R1		
	2500	100	85	E2.2H 2500 Ekip G Touch LSIG	1SDA071087R1		1SDA071717R1		
				E2.2H 2500 Ekip G Hi-Touch LSIG	1SDA071090R1		1SDA071720R1		



1SDC200693R001

SACE Emax E4.2N-S-H-V • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E4.2N	3200	66	66	E4.2N 3200 Ekip G Touch LSIG	1SDA071147R1		1SDA071777R1	
				E4.2N 3200 Ekip G Hi-Touch LSIG	1SDA071150R1		1SDA071780R1	
	4000	66	66	E4.2N 4000 Ekip G Touch LSIG	1SDA071197R1		1SDA071827R1	
				E4.2N 4000 Ekip G Hi-Touch LSIG	1SDA071200R1		1SDA071830R1	
E4.2S	3200	85	66	E4.2S 3200 Ekip G Touch LSIG	1SDA071157R1		1SDA071787R1	
				E4.2S 3200 Ekip G Hi-Touch LSIG	1SDA071160R1		1SDA071790R1	
	4000	85	66	E4.2S 4000 Ekip G Touch LSIG	1SDA071207R1		1SDA071837R1	
				E4.2S 4000 Ekip G Hi-Touch LSIG	1SDA071210R1		1SDA071840R1	
E4.2H	3200	100	85	E4.2H 3200 Ekip G Touch LSIG	1SDA071167R1		1SDA071797R1	
				E4.2H 3200 Ekip G Hi-Touch LSIG	1SDA071170R1		1SDA071800R1	
	4000	100	85	E4.2H 4000 Ekip G Touch LSIG	1SDA071217R1		1SDA071847R1	
				E4.2H 4000 Ekip G Hi-Touch LSIG	1SDA071220R1		1SDA071850R1	
E4.2V	2000	150	100	E4.2V 2000 Ekip G Touch LSIG	1SDA071107R1		1SDA071737R1	
				E4.2V 2000 Ekip G Hi-Touch LSIG	1SDA071110R1		1SDA071740R1	
	2500	150	100	E4.2V 2500 Ekip G Touch LSIG	1SDA071127R1		1SDA071757R1	
				E4.2V 2500 Ekip G Hi-Touch LSIG	1SDA071130R1		1SDA071760R1	
	3200	150	100	E4.2V 3200 Ekip G Touch LSIG	1SDA071177R1		1SDA071807R1	
				E4.2V 3200 Ekip G Hi-Touch LSIG	1SDA071180R1		1SDA071810R1	
	4000	150	100	E4.2V 4000 Ekip G Touch LSIG	1SDA071227R1		1SDA071857R1	
				E4.2V 4000 Ekip G Hi-Touch LSIG	1SDA071230R1		1SDA071860R1	

Automatic circuit-breakers

Fixed version for generators



1SDC20066-4F001

SACE Emax E6.2H-V-X • Orientable rear terminals (HR)

Size	I _u	I _{cu} (440 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E6.2H	4000	100	100	E6.2H 4000 Ekip G Touch LSiG	1SDA071237R1		1SDA071867R1	
				E6.2H 4000 Ekip G Hi-Touch LSiG	1SDA071240R1		1SDA071870R1	
	5000	100	100	E6.2H 5000 Ekip G Touch LSiG	1SDA071267R1		1SDA071897R1	
				E6.2H 5000 Ekip G Hi-Touch LSiG	1SDA071270R1		1SDA071900R1	
	6300	100	100	E6.2H 6300 Ekip G Touch LSiG	1SDA071297R1		1SDA071927R1	
				E6.2H 6300 Ekip G Hi-Touch LSiG	1SDA071300R1		1SDA071930R1	
E6.2V	4000	150	100	E6.2V 4000 Ekip G Touch LSiG	1SDA071247R1		1SDA071877R1	
				E6.2V 4000 Ekip G Hi-Touch LSiG	1SDA071250R1		1SDA071880R1	
	5000	150	100	E6.2V 5000 Ekip G Touch LSiG	1SDA071277R1		1SDA071907R1	
				E6.2V 5000 Ekip G Hi-Touch LSiG	1SDA071280R1		1SDA071910R1	
	6300	150	100	E6.2V 6300 Ekip G Touch LSiG	1SDA071307R1		1SDA071937R1	
				E6.2V 6300 Ekip G Hi-Touch LSiG	1SDA071310R1		1SDA071940R1	
E6.2X	4000	200	120	E6.2X 4000 Ekip G Touch LSiG	1SDA071257R1		1SDA071887R1	
				E6.2X 4000 Ekip G Hi-Touch LSiG	1SDA071260R1		1SDA071890R1	
	5000	200	120	E6.2X 5000 Ekip G Touch LSiG	1SDA071287R1		1SDA071917R1	
				E6.2X 5000 Ekip G Hi-Touch LSiG	1SDA071290R1		1SDA071920R1	
	6300	200	120	E6.2X 6300 Ekip G Touch LSiG	1SDA071317R1		1SDA071947R1	
				E6.2X 6300 Ekip G Hi-Touch LSiG	1SDA071320R1		1SDA071950R1	



1SDC2000684FC01

SACE Emax E6.2H-V-X/f Full size • Orientable rear terminals (HR)

Size	Iu	Icu (440 V)	Icw (1s)	Type	4 Poles	
					Code	
E6.2H/f	4000	100	100	E6.2H/f 4000 Ekip G Touch LSIG	1SDA071957R1	
				E6.2H/f 4000 Ekip G Hi-Touch LSIG	1SDA071960R1	
	5000	100	100	E6.2H/f 5000 Ekip G Touch LSIG	1SDA071987R1	
				E6.2H/f 5000 Ekip G Hi-Touch LSIG	1SDA071990R1	
	6300	100	100	E6.2H/f 6300 Ekip G Touch LSIG	1SDA072017R1	
				E6.2H/f 6300 Ekip G Hi-Touch LSIG	1SDA072020R1	
E6.2V/f	4000	150	100	E6.2V/f 4000 Ekip G Touch LSIG	1SDA071967R1	
				E6.2V/f 4000 Ekip G Hi-Touch LSIG	1SDA071970R1	
	5000	150	100	E6.2V/f 5000 Ekip G Touch LSIG	1SDA071997R1	
				E6.2V/f 5000 Ekip G Hi-Touch LSIG	1SDA072000R1	
	6300	150	100	E6.2V/f 6300 Ekip G Touch LSIG	1SDA072027R1	
				E6.2V/f 6300 Ekip G Hi-Touch LSIG	1SDA072030R1	
E6.2X/f	4000	200	120	E6.2X/f 4000 Ekip G Touch LSIG	1SDA071977R1	
				E6.2X/f 4000 Ekip G Hi-Touch LSIG	1SDA071980R1	
	5000	200	120	E6.2X/f 5000 Ekip G Touch LSIG	1SDA072007R1	
				E6.2X/f 5000 Ekip G Hi-Touch LSIG	1SDA072010R1	
	6300	200	120	E6.2X/f 6300 Ekip G Touch LSIG	1SDA072037R1	
				E6.2X/f 6300 Ekip G Hi-Touch LSIG	1SDA072040R1	

Automatic circuit-breakers

Withdrawable version for generators



SACE Emax E1.2B-C-N-L • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles		
					Code		Code		
E1.2B	630	42	42	E1.2B 630 Ekip G Touch LSIG	1SDA072057R1		1SDA072687R1		
				E1.2B 630 Ekip G Hi-Touch LSIG	1SDA072060R1		1SDA072690R1		
	800	42	42	E1.2B 800 Ekip G Touch LSIG	1SDA072097R1		1SDA072727R1		
				E1.2B 800 Ekip G Hi-Touch LSIG	1SDA072100R1		1SDA072730R1		
	1000	42	42	E1.2B 1000 Ekip G Touch LSIG	1SDA072137R1		1SDA072767R1		
				E1.2B 1000 Ekip G Hi-Touch LSIG	1SDA072140R1		1SDA072770R1		
	1250	42	42	E1.2B 1250 Ekip G Touch LSIG	1SDA072177R1		1SDA072807R1		
				E1.2B 1250 Ekip G Hi-Touch LSIG	1SDA072180R1		1SDA072810R1		
	1600	42	42	E1.2B 1600 Ekip G Touch LSIG	1SDA072217R1		1SDA072847R1		
				E1.2B 1600 Ekip G Hi-Touch LSIG	1SDA072220R1		1SDA072850R1		
	E1.2C	630	50	42	E1.2C 630 Ekip G Touch LSIG	1SDA072067R1		1SDA072697R1	
					E1.2C 630 Ekip G Hi-Touch LSIG	1SDA072070R1		1SDA072700R1	
800		50	42	E1.2C 800 Ekip G Touch LSIG	1SDA072107R1		1SDA072737R1		
				E1.2C 800 Ekip G Hi-Touch LSIG	1SDA072110R1		1SDA072740R1		
1000		50	42	E1.2C 1000 Ekip G Touch LSIG	1SDA072147R1		1SDA072777R1		
				E1.2C 1000 Ekip G Hi-Touch LSIG	1SDA072150R1		1SDA072780R1		
1250		50	42	E1.2C 1250 Ekip G Touch LSIG	1SDA072187R1		1SDA072817R1		
				E1.2C 1250 Ekip G Hi-Touch LSIG	1SDA072190R1		1SDA072820R1		
1600		50	42	E1.2C 1600 Ekip G Touch LSIG	1SDA072227R1		1SDA072857R1		
				E1.2C 1600 Ekip G Hi-Touch LSIG	1SDA072230R1		1SDA072860R1		
E1.2N		250	66	50	E1.2N 250 Ekip G Touch LSIG	1SDA072047R1		1SDA072677R1	
					E1.2N 250 Ekip G Hi-Touch LSIG	1SDA072050R1		1SDA072680R1	
	630	66	50	E1.2N 630 Ekip G Touch LSIG	1SDA072077R1		1SDA072707R1		
				E1.2N 630 Ekip G Hi-Touch LSIG	1SDA072080R1		1SDA072710R1		
	800	66	50	E1.2N 800 Ekip G Touch LSIG	1SDA072117R1		1SDA072747R1		
				E1.2N 800 Ekip G Hi-Touch LSIG	1SDA072120R1		1SDA072750R1		
	1000	66	50	E1.2N 1000 Ekip G Touch LSIG	1SDA072157R1		1SDA072787R1		
				E1.2N 1000 Ekip G Hi-Touch LSIG	1SDA072160R1		1SDA072790R1		
	1250	66	50	E1.2N 1250 Ekip G Touch LSIG	1SDA072197R1		1SDA072827R1		
				E1.2N 1250 Ekip G Hi-Touch LSIG	1SDA072200R1		1SDA072830R1		
	1600	66	50	E1.2N 1600 Ekip G Touch LSIG	1SDA072237R1		1SDA072867R1		
				E1.2N 1600 Ekip G Hi-Touch LSIG	1SDA072240R1		1SDA072870R1		
E1.2L	630	130	15	E1.2L 630 Ekip G Touch LSIG	1SDA072087R1		1SDA072717R1		
				E1.2L 630 Ekip G Hi-Touch LSIG	1SDA072090R1		1SDA072720R1		
	800	130	15	E1.2L 800 Ekip G Touch LSIG	1SDA072127R1		1SDA072757R1		
				E1.2L 800 Ekip G Hi-Touch LSIG	1SDA072130R1		1SDA072760R1		
	1000	130	15	E1.2L 1000 Ekip G Touch LSIG	1SDA072167R1		1SDA072797R1		
				E1.2L 1000 Ekip G Hi-Touch LSIG	1SDA072170R1		1SDA072800R1		
	1250	130	15	E1.2L 1250 Ekip G Touch LSIG	1SDA072207R1		1SDA072837R1		
				E1.2L 1250 Ekip G Hi-Touch LSIG	1SDA072210R1		1SDA072840R1		



1SDC20066F001

SACE Emax E2.2B-N-S-H • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles		
					Code		Code		
E2.2B	1600	42	42	E2.2B 1600 Ekip G Touch LSIG	1SDA072337R1		1SDA072967R1		
				E2.2B 1600 Ekip G Hi-Touch LSIG	1SDA072340R1		1SDA072970R1		
	2000	42	42	E2.2B 2000 Ekip G Touch LSIG	1SDA072377R1		1SDA073007R1		
				E2.2B 2000 Ekip G Hi-Touch LSIG	1SDA072380R1		1SDA073010R1		
E2.2N	800	66	66	E2.2N 800 Ekip G Touch LSIG	1SDA072247R1		1SDA072877R1		
				E2.2N 800 Ekip G Hi-Touch LSIG	1SDA072250R1		1SDA072880R1		
	1000	66	66	E2.2N 1000 Ekip G Touch LSIG	1SDA072277R1		1SDA072907R1		
				E2.2N 1000 Ekip G Hi-Touch LSIG	1SDA072280R1		1SDA072910R1		
	1250	66	66	E2.2N 1250 Ekip G Touch LSIG	1SDA072307R1		1SDA072937R1		
				E2.2N 1250 Ekip G Hi-Touch LSIG	1SDA072310R1		1SDA072940R1		
	1600	66	66	E2.2N 1600 Ekip G Touch LSIG	1SDA072347R1		1SDA072977R1		
				E2.2N 1600 Ekip G Hi-Touch LSIG	1SDA072350R1		1SDA072980R1		
	2000	66	66	E2.2N 2000 Ekip G Touch LSIG	1SDA072387R1		1SDA073017R1		
				E2.2N 2000 Ekip G Hi-Touch LSIG	1SDA072390R1		1SDA073020R1		
	2500	66	66	E2.2N 2500 Ekip G Touch LSIG	1SDA072417R1		1SDA073047R1		
				E2.2N 2500 Ekip G Hi-Touch LSIG	1SDA072420R1		1SDA073050R1		
	E2.2S	250	85	66	E2.2S 250 Ekip G Touch LSIG	1SDA073654R1		1SDA073664R1	
					E2.2S 250 Ekip G Hi-Touch LSIG	1SDA073657R1		1SDA073667R1	
		800	85	66	E2.2S 800 Ekip G Touch LSIG	1SDA072257R1		1SDA072887R1	
					E2.2S 800 Ekip G Hi-Touch LSIG	1SDA072260R1		1SDA072890R1	
1000		85	66	E2.2S 1000 Ekip G Touch LSIG	1SDA072287R1		1SDA072917R1		
				E2.2S 1000 Ekip G Hi-Touch LSIG	1SDA072290R1		1SDA072920R1		
1250		85	66	E2.2S 1250 Ekip G Touch LSIG	1SDA072317R1		1SDA072947R1		
				E2.2S 1250 Ekip G Hi-Touch LSIG	1SDA072320R1		1SDA072950R1		
1600		85	66	E2.2S 1600 Ekip G Touch LSIG	1SDA072357R1		1SDA072987R1		
				E2.2S 1600 Ekip G Hi-Touch LSIG	1SDA072360R1		1SDA072990R1		
2000		85	66	E2.2S 2000 Ekip G Touch LSIG	1SDA072397R1		1SDA073027R1		
				E2.2S 2000 Ekip G Hi-Touch LSIG	1SDA072400R1		1SDA073030R1		
2500		85	66	E2.2S 2500 Ekip G Touch LSIG	1SDA072427R1		1SDA073057R1		
				E2.2S 2500 Ekip G Hi-Touch LSIG	1SDA072430R1		1SDA073060R1		
E2.2H		800	100	85	E2.2H 800 Ekip G Touch LSIG	1SDA072267R1		1SDA072897R1	
					E2.2H 800 Ekip G Hi-Touch LSIG	1SDA072270R1		1SDA072900R1	
	1000	100	85	E2.2H 1000 Ekip G Touch LSIG	1SDA072297R1		1SDA072927R1		
				E2.2H 1000 Ekip G Hi-Touch LSIG	1SDA072300R1		1SDA072930R1		
	1250	100	85	E2.2H 1250 Ekip G Touch LSIG	1SDA072327R1		1SDA072957R1		
				E2.2H 1250 Ekip G Hi-Touch LSIG	1SDA072330R1		1SDA072960R1		
	1600	100	85	E2.2H 1600 Ekip G Touch LSIG	1SDA072367R1		1SDA072997R1		
				E2.2H 1600 Ekip G Hi-Touch LSIG	1SDA072370R1		1SDA073000R1		
	2000	100	85	E2.2H 2000 Ekip G Touch LSIG	1SDA072407R1		1SDA073037R1		
				E2.2H 2000 Ekip G Hi-Touch LSIG	1SDA072410R1		1SDA073040R1		
	2500	100	85	E2.2H 2500 Ekip G Touch LSIG	1SDA072437R1		1SDA073067R1		
				E2.2H 2500 Ekip G Hi-Touch LSIG	1SDA072440R1		1SDA073070R1		

Automatic circuit-breakers

Withdrawable version for generators



SACE Emax E4.2N-S-H-V • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E4.2N	3200	66	66	E4.2N 3200 Ekip G Touch LSIG	1SDA072497R1		1SDA073127R1	
				E4.2N 3200 Ekip G Hi-Touch LSIG	1SDA072500R1		1SDA073130R1	
	4000	66	66	E4.2N 4000 Ekip G Touch LSIG	1SDA072547R1		1SDA073177R1	
				E4.2N 4000 Ekip G Hi-Touch LSIG	1SDA072550R1		1SDA073180R1	
E4.2S	3200	85	66	E4.2S 3200 Ekip G Touch LSIG	1SDA072507R1		1SDA073137R1	
				E4.2S 3200 Ekip G Hi-Touch LSIG	1SDA072510R1		1SDA073140R1	
	4000	85	66	E4.2S 4000 Ekip G Touch LSIG	1SDA072557R1		1SDA073187R1	
				E4.2S 4000 Ekip G Hi-Touch LSIG	1SDA072560R1		1SDA073190R1	
E4.2H	3200	100	85	E4.2H 3200 Ekip G Touch LSIG	1SDA072517R1		1SDA073147R1	
				E4.2H 3200 Ekip G Hi-Touch LSIG	1SDA072520R1		1SDA073150R1	
	4000	100	85	E4.2H 4000 Ekip G Touch LSIG	1SDA072567R1		1SDA073197R1	
				E4.2H 4000 Ekip G Hi-Touch LSIG	1SDA072570R1		1SDA073200R1	
E4.2V	2000	150	100	E4.2V 2000 Ekip G Touch LSIG	1SDA072457R1		1SDA073087R1	
				E4.2V 2000 Ekip G Hi-Touch LSIG	1SDA072460R1		1SDA073090R1	
	2500	150	100	E4.2V 2500 Ekip G Touch LSIG	1SDA072477R1		1SDA073107R1	
				E4.2V 2500 Ekip G Hi-Touch LSIG	1SDA072480R1		1SDA073110R1	
	3200	150	100	E4.2V 3200 Ekip G Touch LSIG	1SDA072527R1		1SDA073157R1	
				E4.2V 3200 Ekip G Hi-Touch LSIG	1SDA072530R1		1SDA073160R1	
	4000	150	100	E4.2V 4000 Ekip G Touch LSIG	1SDA072577R1		1SDA073207R1	
				E4.2V 4000 Ekip G Hi-Touch LSIG	1SDA072580R1		1SDA073210R1	



1SDC200689F001

SACE Emax E6.2H-V-X • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E6.2H	4000	100	100	E6.2H 4000 Ekip G Touch LSIG	1SDA072587R1		1SDA073217R1	
				E6.2H 4000 Ekip G Hi-Touch LSIG	1SDA072590R1		1SDA073220R1	
	5000	100	100	E6.2H 5000 Ekip G Touch LSIG	1SDA072617R1		1SDA073247R1	
				E6.2H 5000 Ekip G Hi-Touch LSIG	1SDA072620R1		1SDA073250R1	
	6300	100	100	E6.2H 6300 Ekip G Touch LSIG	1SDA072647R1		1SDA073277R1	
				E6.2H 6300 Ekip G Hi-Touch LSIG	1SDA072650R1		1SDA073280R1	
E6.2V	4000	150	100	E6.2V 4000 Ekip G Touch LSIG	1SDA072597R1		1SDA073227R1	
				E6.2V 4000 Ekip G Hi-Touch LSIG	1SDA072600R1		1SDA073230R1	
	5000	150	100	E6.2V 5000 Ekip G Touch LSIG	1SDA072627R1		1SDA073257R1	
				E6.2V 5000 Ekip G Hi-Touch LSIG	1SDA072630R1		1SDA073260R1	
	6300	150	100	E6.2V 6300 Ekip G Touch LSIG	1SDA072657R1		1SDA073287R1	
				E6.2V 6300 Ekip G Hi-Touch LSIG	1SDA072660R1		1SDA073290R1	
E6.2X	4000	200	120	E6.2X 4000 Ekip G Touch LSIG	1SDA072607R1		1SDA073237R1	
				E6.2X 4000 Ekip G Hi-Touch LSIG	1SDA072610R1		1SDA073240R1	
	5000	200	120	E6.2X 5000 Ekip G Touch LSIG	1SDA072637R1		1SDA073267R1	
				E6.2X 5000 Ekip G Hi-Touch LSIG	1SDA072640R1		1SDA073270R1	
	6300	200	120	E6.2X 6300 Ekip G Touch LSIG	1SDA072667R1		1SDA073297R1	
				E6.2X 6300 Ekip G Hi-Touch LSIG	1SDA072670R1		1SDA073300R1	

Automatic circuit-breakers

Withdrawable version per generators



SACE Emax E6.2H-V-X/f Full size • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icu (440 V)	Icw (1s)	Type	4 Poles Code
E6.2H/f	4000	100	100	E6.2H/f 4000 Ekip G Touch LSIG	1SDA073307R1
				E6.2H/f 4000 Ekip G Hi-Touch LSIG	1SDA073310R1
	5000	100	100	E6.2H/f 5000 Ekip G Touch LSIG	1SDA073337R1
				E6.2H/f 5000 Ekip G Hi-Touch LSIG	1SDA073340R1
	6300	100	100	E6.2H/f 6300 Ekip G Touch LSIG	1SDA073367R1
				E6.2H/f 6300 Ekip G Hi-Touch LSIG	1SDA073370R1
E6.2V/f	4000	150	100	E6.2V/f 4000 Ekip G Touch LSIG	1SDA073317R1
				E6.2V/f 4000 Ekip G Hi-Touch LSIG	1SDA073320R1
	5000	150	100	E6.2V/f 5000 Ekip G Touch LSIG	1SDA073347R1
				E6.2V/f 5000 Ekip G Hi-Touch LSIG	1SDA073350R1
	6300	150	100	E6.2V/f 6300 Ekip G Touch LSIG	1SDA073377R1
				E6.2V/f 6300 Ekip G Hi-Touch LSIG	1SDA073380R1
E6.2X/f	4000	200	120	E6.2X/f 4000 Ekip G Touch LSIG	1SDA073327R1
				E6.2X/f 4000 Ekip G Hi-Touch LSIG	1SDA073330R1
	5000	200	120	E6.2X/f 5000 Ekip G Touch LSIG	1SDA073357R1
				E6.2X/f 5000 Ekip G Hi-Touch LSIG	1SDA073360R1
	6300	200	120	E6.2X/f 6300 Ekip G Touch LSIG	1SDA073387R1
				E6.2X/f 6300 Ekip G Hi-Touch LSIG	1SDA073390R1

Switch-disconnectors

Fixed version



1SDC200468R001

SACE Emax E1.2B-N/MS • Fixed terminals (F)

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E1.2B/MS	630	42	E1.2B/MS 630	1SDA073392R1		1SDA073431R1	
	800	42	E1.2B/MS 800	1SDA073394R1		1SDA073433R1	
	1000	42	E1.2B/MS 1000	1SDA073396R1		1SDA073435R1	
	1250	42	E1.2B/MS 1250	1SDA073398R1		1SDA073437R1	
	1600	42	E1.2B/MS 1600	1SDA073400R1		1SDA073439R1	
E1.2N/MS	250	50	E1.2N/MS 250	1SDA073391R1		1SDA073430R1	
	630	50	E1.2N/MS 630	1SDA073393R1		1SDA073432R1	
	800	50	E1.2N/MS 800	1SDA073395R1		1SDA073434R1	
	1000	50	E1.2N/MS 1000	1SDA073397R1		1SDA073436R1	
	1250	50	E1.2N/MS 1250	1SDA073399R1		1SDA073438R1	
	1600	50	E1.2N/MS 1600	1SDA073401R1		1SDA073440R1	



1SDC200670F001

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

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E2.2B/MS	1600	42	E2.2B/MS 1600	1SDA073408R1		1SDA073447R1	
	2000	42	E2.2B/MS 2000	1SDA073411R1		1SDA073450R1	
E2.2N/MS	800	66	E2.2N/MS 800	1SDA073402R1		1SDA073441R1	
	1000	66	E2.2N/MS 1000	1SDA073404R1		1SDA073443R1	
	1250	66	E2.2N/MS 1250	1SDA073406R1		1SDA073445R1	
	1600	66	E2.2N/MS 1600	1SDA073409R1		1SDA073448R1	
	2000	66	E2.2N/MS 2000	1SDA073412R1		1SDA073451R1	
	2500	66	E2.2N/MS 2500	1SDA073414R1		1SDA073453R1	
E2.2H/MS	800	85	E2.2H/MS 800	1SDA073403R1		1SDA073442R1	
	1000	85	E2.2H/MS 1000	1SDA073405R1		1SDA073444R1	
	1250	85	E2.2H/MS 1250	1SDA073407R1		1SDA073446R1	
	1600	85	E2.2H/MS 1600	1SDA073410R1		1SDA073449R1	
	2000	85	E2.2H/MS 2000	1SDA073413R1		1SDA073452R1	
	2500	85	E2.2H/MS 2500	1SDA073415R1		1SDA073454R1	

Switch-disconnectors

Fixed version



SACE Emax E4.2N-H-V/MS • Orientable rear terminals (HR)

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E4.2N/MS	3200	66	E4.2N/MS 3200	1SDA073418R1		1SDA073457R1	
	4000	66	E4.2N/MS 4000	1SDA073421R1		1SDA073460R1	
E4.2H/MS	3200	85	E4.2H/MS 3200	1SDA073419R1		1SDA073458R1	
	4000	85	E4.2H/MS 4000	1SDA073422R1		1SDA073461R1	
E4.2V/MS	2000	100	E4.2V/MS 2000	1SDA073416R1		1SDA073455R1	
	2500	100	E4.2V/MS 2500	1SDA073417R1		1SDA073456R1	
	3200	100	E4.2V/MS 3200	1SDA073420R1		1SDA073459R1	
	4000	100	E4.2V/MS 4000	1SDA073423R1		1SDA073462R1	



SACE Emax E6.2H-X/MS • Orientable rear terminals (HR)

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E6.2H/MS	4000	100	E6.2H/MS 4000	1SDA073424R1		1SDA073463R1	
	5000	100	E6.2H/MS 5000	1SDA073426R1		1SDA073465R1	
	6300	100	E6.2H/MS 6300	1SDA073428R1		1SDA073467R1	
E6.2X/MS	4000	120	E6.2X/MS 4000	1SDA073425R1		1SDA073464R1	
	5000	120	E6.2X/MS 5000	1SDA073427R1		1SDA073466R1	
	6300	120	E6.2X/MS 6300	1SDA073429R1		1SDA073468R1	



1SDC200672R001

SACE Emax E6.2H-X/MS/f Full size • Orientable rear terminals (HR)

Size	Iu	Icw (1s)	Type	4 Poles	
				Code	
E6.2H/MS/f	4000	100	E6.2H/MS/f 4000	1SDA073469R1	
	5000	100	E6.2H/MS/f 5000	1SDA073471R1	
	6300	100	E6.2H/MS/f 6300	1SDA073473R1	
E6.2X/MS/f	4000	120	E6.2X/MS/f 4000	1SDA073470R1	
	5000	120	E6.2X/MS/f 5000	1SDA073472R1	
	6300	120	E6.2X/MS/f 6300	1SDA073474R1	

Switch-disconnectors

Withdrawable version



1SDC200673F001

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

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E1.2B/MS	630	42	E1.2B/MS 630	1SDA073476R1		1SDA073515R1	
	800	42	E1.2B/MS 800	1SDA073478R1		1SDA073517R1	
	1000	42	E1.2B/MS 1000	1SDA073480R1		1SDA073519R1	
	1250	42	E1.2B/MS 1250	1SDA073482R1		1SDA073521R1	
	1600	42	E1.2B/MS 1600	1SDA073484R1		1SDA073523R1	
E1.2N/MS	250	50	E1.2N/MS 250	1SDA073475R1		1SDA073514R1	
	630	50	E1.2N/MS 630	1SDA073477R1		1SDA073516R1	
	800	50	E1.2N/MS 800	1SDA073479R1		1SDA073518R1	
	1000	50	E1.2N/MS 1000	1SDA073481R1		1SDA073520R1	
	1250	50	E1.2N/MS 1250	1SDA073483R1		1SDA073522R1	
	1600	50	E1.2N/MS 1600	1SDA073485R1		1SDA073524R1	



1SDC200674F001

SACE Emax E2.2B-N-H/MS • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E2.2B/MS	1600	42	E2.2B/MS 1600	1SDA073492R1		1SDA073531R1	
	2000	42	E2.2B/MS 2000	1SDA073495R1		1SDA073534R1	
E2.2N/MS	800	66	E2.2N/MS 800	1SDA073486R1		1SDA073525R1	
	1000	66	E2.2N/MS 1000	1SDA073488R1		1SDA073527R1	
	1250	66	E2.2N/MS 1250	1SDA073490R1		1SDA073529R1	
	1600	66	E2.2N/MS 1600	1SDA073493R1		1SDA073532R1	
	2000	66	E2.2N/MS 2000	1SDA073496R1		1SDA073535R1	
	2500	66	E2.2N/MS 2500	1SDA073498R1		1SDA073537R1	
E2.2H/MS	800	85	E2.2H/MS 800	1SDA073487R1		1SDA073526R1	
	1000	85	E2.2H/MS 1000	1SDA073489R1		1SDA073528R1	
	1250	85	E2.2H/MS 1250	1SDA073491R1		1SDA073530R1	
	1600	85	E2.2H/MS 1600	1SDA073494R1		1SDA073533R1	
	2000	85	E2.2H/MS 2000	1SDA073497R1		1SDA073536R1	
	2500	85	E2.2H/MS 2500	1SDA073499R1		1SDA073538R1	



1SDC200675F001

SACE Emax E4.2N-H-V/MS • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E4.2N/MS	3200	66	E4.2N/MS 3200	1SDA073502R1		1SDA073541R1	
	4000	66	E4.2N/MS 4000	1SDA073505R1		1SDA073544R1	
E4.2H/MS	3200	85	E4.2H/MS 3200	1SDA073503R1		1SDA073542R1	
	4000	85	E4.2H/MS 4000	1SDA073506R1		1SDA073545R1	
E4.2V/MS	2000	100	E4.2V/MS 2000	1SDA073500R1		1SDA073539R1	
	2500	100	E4.2V/MS 2500	1SDA073501R1		1SDA073540R1	
	3200	100	E4.2V/MS 3200	1SDA073504R1		1SDA073543R1	
	4000	100	E4.2V/MS 4000	1SDA073507R1		1SDA073546R1	



1SDC200678F001

SACE Emax E6.2H-X/MS • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icw (1s)	Type	3 Poles		4 Poles	
				Code		Code	
E6.2H/MS	4000	100	E6.2H/MS 4000	1SDA073508R1		1SDA073547R1	
	5000	100	E6.2H/MS 5000	1SDA073510R1		1SDA073549R1	
	6300	100	E6.2H/MS 6300	1SDA073512R1		1SDA073551R1	
E6.2X/MS	4000	120	E6.2X/MS 4000	1SDA073509R1		1SDA073548R1	
	5000	120	E6.2X/MS 5000	1SDA073511R1		1SDA073550R1	
	6300	120	E6.2X/MS 6300	1SDA073513R1		1SDA073552R1	

SACE Emax E6.2H-X/MS/f Full size • Mobile part of withdrawable circuit-breaker (MP)

Size	Iu	Icw (1s)	Type	4 Poles	
				Code	
E6.2H/MS/f	4000	100	E6.2H/MS/f 4000	1SDA073553R1	
	5000	100	E6.2H/MS/f 5000	1SDA073555R1	
	6300	100	E6.2H/MS/f 6300	1SDA073557R1	
E6.2X/MS/f	4000	120	E6.2X/MS/f 4000	1SDA073554R1	
	5000	120	E6.2X/MS/f 5000	1SDA073556R1	
	6300	120	E6.2X/MS/f 6300	1SDA073558R1	

Automatic circuit-breakers and switch-disconnectors

Version for applications up to 1150V AC

Size	I _u	I _{cu} (1150 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2N/E	630	25	25	E1.2N/E 630 Upgrade Kit 1150V AC	1SDA074316R1		1SDA074321R1	
E1.2N/E	800	25	25	E1.2N/E 800 Upgrade Kit 1150V AC	1SDA074317R1		1SDA074322R1	
E1.2N/E	1000	25	25	E1.2N/E 1000 Upgrade Kit 1150V AC	1SDA074318R1		1SDA074323R1	
E1.2N/E	1250	25	25	E1.2N/E 1250 Upgrade Kit 1150V AC	1SDA074319R1		1SDA074324R1	
E1.2N/E	1600	25	25	E1.2N/E 1600 Upgrade Kit 1150V AC	1SDA074320R1		1SDA074325R1	
E2.2H/E	800	30	30	E2.2H/E 800 Upgrade Kit 1150V AC	1SDA074326R1		1SDA074332R1	
E2.2H/E	1000	30	30	E2.2H/E 1000 Upgrade Kit 1150V AC	1SDA074327R1		1SDA074333R1	
E2.2H/E	1250	30	30	E2.2H/E 1250 Upgrade Kit 1150V AC	1SDA074328R1		1SDA074334R1	
E2.2H/E	1600	30	30	E2.2H/E 1600 Upgrade Kit 1150V AC	1SDA074329R1		1SDA074335R1	
E2.2H/E	2000	30	30	E2.2H/E 2000 Upgrade Kit 1150V AC	1SDA074330R1		1SDA074336R1	
E2.2H/E	2500	30	30	E2.2H/E 2500 Upgrade Kit 1150V AC	1SDA074331R1		1SDA074337R1	
E4.2H/E	3200	50	50	E4.2H/E 3200 Upgrade Kit 1150V AC	1SDA074338R1		1SDA074340R1	
E4.2H/E	4000	50	50	E4.2H/E 4000 Upgrade Kit 1150V AC	1SDA074339R1		1SDA074341R1	
E6.2X/E	4000	65	65	E6.2X/E 4000 Upgrade Kit 1150V AC	1SDA074342R1		1SDA074345R1	
E6.2X/E	5000	65	65	E6.2X/E 5000 Upgrade Kit 1150V AC	1SDA074343R1		1SDA074346R1	
E6.2X/E	6300	65	65	E6.2X/E 6300 Upgrade Kit 1150V AC	1SDA074344R1		1SDA074347R1	

Switch-disconnectors

Fixed version for applications up to 1000V DC

Size	Iu	Icu (1000 V)	Icw (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2N/DC/MS	800			E1.2N/DC/MS 800A 750-1000V DC	1SDA074381R1		1SDA074382R1	
E1.2N/DC/MS	1250			E1.2N/DC/MS 1250A 750-1000V DC	1SDA074383R1		1SDA074384R1	
E2.2S/DC/MS	1250			E2.2S/DC/MS 1250A 750-1000V DC	1SDA074389R1		1SDA074390R1	
E2.2S/DC/MS	1600			E2.2S/DC/MS 1600A 750-1000V DC	1SDA074391R1		1SDA074392R1	
E2.2S/DC/MS	2000			E2.2S/DC/MS 2000A 750-1000V DC	1SDA074393R1		1SDA074394R1	
E2.2S/DC/MS	2500			E2.2S/DC/MS 2500A 750-1000V DC	1SDA074395R1		1SDA074396R1	
E4.2H/DC/MS	1250			E4.2H/DC/MS 1250A 750-1000V DC	1SDA074405R1		1SDA074406R1	
E4.2H/DC/MS	1600			E4.2H/DC/MS 1600A 750-1000V DC	1SDA074407R1		1SDA074408R1	
E4.2H/DC/MS	2000			E4.2H/DC/MS 2000A 750-1000V DC	1SDA074409R1		1SDA074410R1	
E4.2H/DC/MS	2500			E4.2H/DC/MS 2500A 750-1000V DC	1SDA074411R1		1SDA074412R1	
E4.2H/DC/MS	3200			E4.2H/DC/MS 3200A 750-1000V DC	1SDA074413R1		1SDA074414R1	
E4.2H/DC/MS	4000			E4.2H/DC/MS 4000A 750-1000V DC	1SDA074415R1		1SDA074416R1	
E6.2X/DC/MS	4000			E6.2X/DC/MS 4000A 750-1000V DC	1SDA074429R1		1SDA074430R1	
E6.2X/DC/MS	5000			E6.2X/DC/MS 5000A 750-1000V DC	1SDA074431R1		1SDA074432R1	
E6.2X/DC/MS	6300			E6.2X/DC/MS 6300A 750-1000V DC	1SDA074433R1		1SDA074434R1	

Switch-disconnectors

Withdrawable version for applications up to 1000V DC

Withdrawable version - Mobile part

Size	I _u	I _{cu} (1000 V)	I _{cw} (1s)	Type	3 Poles		4 Poles	
					Code		Code	
E1.2N/DC/MS	800			E1.2N/DC/MS 800A 750-1000VDC	1SDA074385R1		1SDA074386R1	
E1.2N/DC/MS	1250			E1.2N/DC/MS 1250A 750-1000VDC	1SDA074387R1		1SDA074388R1	
E2.2S/DC/MS	1250			E2.2S/DC/MS 1250A 750-1000VDC	1SDA074397R1		1SDA074398R1	
E2.2S/DC/MS	1600			E2.2S/DC/MS 1600A 750-1000VDC	1SDA074399R1		1SDA074400R1	
E2.2S/DC/MS	2000			E2.2S/DC/MS 2000A 750-1000VDC	1SDA074401R1		1SDA074402R1	
E2.2S/DC/MS	2500			E2.2S/DC/MS 2500A 750-1000VDC	1SDA074403R1		1SDA074404R1	
E4.2H/DC/MS	1250			E4.2H/DC/MS 1250A 750-1000VDC	1SDA074417R1		1SDA074418R1	
E4.2H/DC/MS	1600			E4.2H/DC/MS 1600A 750-1000VDC	1SDA074419R1		1SDA074420R1	
E4.2H/DC/MS	2000			E4.2H/DC/MS 2000A 750-1000VDC	1SDA074421R1		1SDA074422R1	
E4.2H/DC/MS	2500			E4.2H/DC/MS 2500A 750-1000VDC	1SDA074423R1		1SDA074424R1	
E4.2H/DC/MS	3200			E4.2H/DC/MS 3200A 750-1000VDC	1SDA074425R1		1SDA074426R1	
E4.2H/DC/MS	4000			E4.2H/DC/MS 4000A 750-1000VDC	1SDA074427R1		1SDA074428R1	
E6.2X/DC/MS	4000			E6.2X/DC/MS 4000A 750-1000VDC	1SDA074435R1		1SDA074436R1	
E6.2X/DC/MS	5000			E6.2X/DC/MS 5000A 750-1000VDC	1SDA074437R1		1SDA074438R1	
E6.2X/DC/MS	6300			E6.2X/DC/MS 6300A 750-1000VDC	1SDA074439R1		1SDA074440R1	

Withdrawable version - Fixed part

Size	I _u	Type of terminal	Type	3 Poles		4 Poles	
				Code		Code	
E1.2	1600	HR - HR	E1.2DC W FP I _u =1600 HR HR	1SDA073923R1		1SDA073924R1	
E2.2	2000	HR - HR	E2.2DC W FP I _u =2000 HR HR	1SDA073925R1		1SDA073926R1	
E2.2	2500	HR - HR	E2.2DC W FP I _u =2500 HR HR	1SDA073927R1		1SDA073928R1	
E4.2	3200	HR - HR	E4.2DC W FP I _u =3200 HR HR	1SDA073929R1		1SDA073930R1	
E4.2 / E4.2V	4000	HR - HR	E4.2DC W FP I _u =4000 or V HR HR version	1SDA073931R1		1SDA073932R1	
E6.2	5000	HR - HR	E6.2DC W FP I _u =5000 HR HR	1SDA073933R1			
E6.2/f	5000	HR - HR	E6.2DC W FP I _u =5000 HR HR			1SDA073935R1	
E6.2 / E6.2X	6300	HR - HR	E6.2DC W FP I _u =6300 HR HR	1SDA073936R1			
E6.2/f / E6.2X/f	6300	HR - HR	E6.2DC W FP I _u =6300 HR HR			1SDA073938R1	

Derived versions

Sectionalizing truck - CS

Size	lu	Type	3 poles	4 poles
			Code	Code
E2.2/CS	2500	E2.2/CS 2500 MP 3p	1SDA074348R1	1SDA074349R1
E4.2/CS	4000	E4.2/CS 4000 MP 3p	1SDA074350R1	1SDA074351R1
E6.2/CS	6300	E6.2/CS 6300 MP 3p	1SDA074352R1	1SDA074353R1

Earthing truck - MT

Size	lu	Type	3 poles	4 poles
			Code	Code
E2.2 MT	2500	E2.2MT 2500 MP Earth connection from upper terminals	1SDA074354R1	1SDA074355R1
E4.2 MT	4000	E4.2MT 4000 MP Earth connection from upper terminals	1SDA074356R1	1SDA074357R1
E6.2 MT	6300	E6.2MT 6300 MP Earth connection from upper terminals	1SDA074358R1	1SDA074359R1
E2.2 MT	2500	E2.2MT 2500 MP Earth connection from lower terminals	1SDA074360R1	1SDA074361R1
E4.2 MT	4000	E4.2MT 4000 MP Earth connection from lower terminals	1SDA074362R1	1SDA074363R1
E6.2 MT	6300	E6.2MT 6300 MP Earth connection from lower terminals	1SDA074364R1	1SDA074365R1

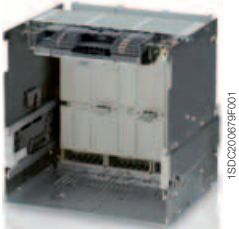
Earthing switch with making capacity - MTP

Size	lu	Type	3 poles	4 poles
			Code	Code
E2.2 MTP	2500	E2.2MTP 2500 MP Earth connection from upper terminals	1SDA074366R1	1SDA074367R1
E4.2 MTP	4000	E4.2MTP 4000 MP Earth connection from upper terminals	1SDA074368R1	1SDA074369R1
E6.2 MTP	6300	E6.2MTP 6300 MP Earth connection from upper terminals	1SDA074370R1	1SDA074371R1
E2.2 MTP	2500	E2.2MTP 2500 MP Earth connection from lower terminals	1SDA074372R1	1SDA074373R1
E4.2 MTP	4000	E4.2MTP 4000 MP Earth connection from lower terminals	1SDA074374R1	1SDA074375R1
E6.2 MTP	6300	E6.2MTP 6300 MP Earth connection from lower terminals	1SDA074376R1	1SDA074377R1

Accessories for MT and MTP

Size	Type	Code
E2.2	Grounding clamp PF E2.2 for MT/MTP	1SDA074378R1
E4.2	Grounding clamp PF E4.2 for MT/MTP	1SDA074379R1
E6.2	Grounding clamp PF E6.2 for MT/MTP	1SDA074380R1

Fixed parts



Size	Performance	Iu	Type of terminal	Type	3 Poles		4 Poles	
					Code		Code	
E1.2	B, C, N, L	1600	HR - HR	E1.2 W FP Iu=1600 HR HR	1SDA073907R1		1SDA073908R1	
E2.2	B, N, S, H	2000	HR - HR	E2.2 W FP Iu=2000 HR HR	1SDA073909R1		1SDA073910R1	
E2.2	N, S, H	2500	HR - HR	E2.2 W FP Iu=2500 HR HR	1SDA073911R1		1SDA073912R1	
E4.2	N, S, H	3200	HR - HR	E4.2 W FP Iu=3200 HR HR	1SDA073913R1		1SDA073914R1	
E4.2	N, S, H, V	4000	HR - HR	E4.2 W FP Iu=4000 or V HR HR version	1SDA073915R1		1SDA073916R1	
E6.2	H, V	5000	HR - HR	E6.2 W FP Iu=5000 HR HR	1SDA073917R1		1SDA073918R1	
E6.2/f	H, V	5000	HR - HR	E6.2 W FP Iu=5000 HR HR			1SDA073919R1	
E6.2	H, V, X	6300	HR - HR	E6.2X W FP Iu=6300 or X HR HR version	1SDA073920R1		1SDA073921R1	
E6.2/f	H, V, X	6300	HR - HR	E6.2 W FP Iu=6300 or X HR HR version			1SDA073922R1	

Accessories

Electrical accessories



First and second opening release - YO

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

First and second closing release- YC

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

YO/YC test unit

Size	Type	Code
E1.2...E6.2	YO/YC test unit E1.2...E6.2	1SDA073707R1

Undervoltage release - YU

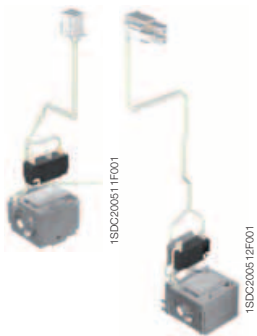
Size	Type	Code
E1.2..E6.2	YU E1.2..E6.2 24V AC/DC	1SDA073694R1
E1.2..E6.2	YU E1.2..E6.2 30V AC/DC	1SDA073695R1
E1.2..E6.2	YU E1.2..E6.2 48V AC/DC	1SDA073696R1
E1.2..E6.2	YU E1.2..E6.2 60V AC/DC	1SDA073697R1
E1.2..E6.2	YU E1.2..E6.2 110-120V AC/DC	1SDA073698R1
E1.2..E6.2	YU E1.2..E6.2 120-127V AC/DC	1SDA073699R1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

Electronic time-delay device for undervoltage release - UVD

Size	Type	Code
E1.2...E6.2	24...30V DC	1SDA074623R1
E1.2...E6.2	48V AC/DC	1SDA074624R1
E1.2...E6.2	60V AC/DC	1SDA074625R1
E1.2...E6.2	110...127V AC/DC	1SDA074626R1
E1.2...E6.2	220...250V AC/DC	1SDA074627R1

Accessories

Electrical accessories



Remote Reset - YR

Size	Type	Code
E1.2	YR 24V DC E1.2	1SDA073744R1
E1.2	YR 110V AC/DC E1.2	1SDA073745R1
E1.2	YR 250V AC/DC E1.2	1SDA073746R1
E2.2...E6.2	YR 24V DC E2.2...E6.2	1SDA073747R1
E2.2...E6.2	YR 110V AC/DC E2.2...E6.2	1SDA073748R1
E2.2...E6.2	YR 250V AC/DC E2.2...E6.2	1SDA073749R1



Motor - M

Size	Type	Code
E1.2	M E1.2 24-30V AC/DC	1SDA073708R1
E1.2	M E1.2 48-60V AC/DC	1SDA073709R1
E1.2	M E1.2 100-130V AC/DC	1SDA073710R1
E1.2	M E1.2 220-250V AC/DC	1SDA073711R1
E1.2	M E1.2 380-415V AC	1SDA073713R1
E1.2	M E1.2 440-480V AC	1SDA073714R1
E2.2...E6.2	M E2.2...E6.2 24-30V AC/DC	1SDA073722R1
E2.2...E6.2	M E2.2...E6.2 48-60V AC/DC	1SDA073723R1
E2.2...E6.2	M E2.2...E6.2 100-130V AC/DC	1SDA073724R1
E2.2...E6.2	M E2.2...E6.2 220-250V AC/DC	1SDA073725R1
E2.2...E6.2	M E2.2...E6.2 380-415V AC	1SDA073727R1
E2.2...E6.2	M E2.2...E6.2 440-480V AC	1SDA073728R1
E1.2	M E1.2 24-30V AC/DC + S33 M/2 24V DC	1SDA073715R1
E1.2	M E1.2 48-60V AC/DC + S33 M/2 24V DC	1SDA073716R1
E1.2	M E1.2 100-130V AC/DC + S33 M/2 24V DC	1SDA073717R1
E1.2	M E1.2 220-250V AC/DC + S33 M/2 24V DC	1SDA073718R1
E1.2	M E1.2 380-415V AC + S33 M/2 24V DC	1SDA073720R1
E1.2	M E1.2 440-480V AC + S33 M/2 24V DC	1SDA073721R1
E2.2...E6.2	M E2.2...E6.2 24-30V AC/DC + S33 M/2 24V DC	1SDA073729R1
E2.2...E6.2	M E2.2...E6.2 48-60V AC/DC + S33 M/2 24V DC	1SDA073730R1
E2.2...E6.2	M E2.2...E6.2 100-130V AC/DC + S33 M/2 24V DC	1SDA073731R1
E2.2...E6.2	M E2.2...E6.2 220-250V AC/DC + S33 M/2 24V DC	1SDA073732R1
E2.2...E6.2	M E2.2...E6.2 380-415V AC + S33 M/2 24V DC	1SDA073734R1
E2.2...E6.2	M E2.2...E6.2 440-480V AC + S33 M/2 24V DC	1SDA073735R1

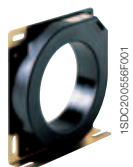


9



Current sensor for neutral conductor outside the circuit-breaker

Size	Type	Code
E1.2	Ext CS N E1.2 E2.2 2000A	1SDA073736R1
E2.2	Ext CS N E2.2 2500A	1SDA073737R1
E4.2	Ext CS N E4.2 3200A	1SDA073738R1
E6.2	Ext CS N E4.2 4000A E6.2 50%	1SDA073739R1
E6.2	Ext CS N E6.2	1SDA073740R1



Homopolar toroid for the earthing conductor of main power supply

Size	Type	Code
E1.2..E6.2	Homopolar toroid E1.2 ... E6.2	1SDA073743R1



Toroid for differential protection

Size	Type	Code
E1.2 - E2.2 3p	Toroid RC E1.2, E2.2 3p	1SDA073741R1
E2.2 4p - E4.2	Toroid RC E2.2 4p, E4.2	1SDA073742R1



1SDC200503F001



1SDC200504F001



1SDC200505F001



1SDC200506F001



1SDC200507F001



1SDC200508F001



1SDC200881F001

Open/closed auxiliary contacts - AUX

Size	Type	Code
E1.2	AUX 4Q 400V E1.2	1SDA073750R1
E1.2	AUX 4Q 24V E1.2	1SDA073751R1
E1.2	AUX 2Q 400V + 2Q 24V E1.2	1SDA073752R1
E2.2...E6.2	AUX 4Q 400V E2.2...E6.2	1SDA073753R1
E2.2...E6.2	AUX 4Q 24V E2.2...E6.2	1SDA073754R1
E2.2...E6.2	AUX 2Q 400V + 2Q 24V E2.2...E6.2	1SDA073755R1
E2.2...E6.2	AUX 6Q 400V E2.2...E6.2	1SDA073756R1
E2.2...E6.2	AUX 6Q 24V E2.2...E6.2	1SDA073757R1
E2.2...E6.2	AUX 3Q 400V AC + 3Q 24V DC E2.2...E6.2	1SDA075973R1
E1.2	AUX 15Q 400V E1.2 *	1SDA073758R1
E1.2	AUX 15Q 24V E1.2 *	1SDA073759R1
E2.2...E6.2	AUX 15Q 400V E2.2...E6.2 *	1SDA073760R1
E2.2...E6.2	AUX 15Q 24V E2.2...E6.2 *	1SDA073761R1

* not compatible with mechanical locks on compartment doors or mechanical interlocks; must be ordered with interlock support.

Auxiliary position contacts - AUP

Size	Type	Code
E1.2	AUP 6 contacts 400V E1.2	1SDA073762R1
E1.2	AUP 6 contacts 24V E1.2	1SDA073763R1
E2.2...E6.2	AUP 5 contacts 400V E2.2...E6.2 - left set	1SDA073764R1
E2.2...E6.2	AUP 5 contacts 24V E2.2...E6.2 - left set	1SDA073765R1
E2.2...E6.2	AUP 5 suppl. contacts 400V E2.2...E6.2 - right set	1SDA073766R1
E2.2...E6.2	AUP 5 suppl. contacts 24V E2.2...E6.2 - right set	1SDA073767R1
E1.2	AUP Ekip aux. contacts position E1.2	1SDA073768R1
E2.2...E6.2	AUP Ekip aux. contacts position E2.2...E6.2	1SDA073769R1

Ready to close signalling contact- RTC

Size	Type	Code
E1.2	RTC 250V E1.2	1SDA073770R1
E1.2	RTC 24V E1.2	1SDA073771R1
E1.2	RTC Ekip 24V E1.2	1SDA073772R1
E2.2...E6.2	RTC 250V E2.2...E6.2	1SDA073773R1
E2.2...E6.2	RTC 24V E2.2...E6.2	1SDA073774R1
E2.2...E6.2	RTC Ekip 24V E2.2...E6.2	1SDA073775R1

Contact signalling tripping of Ekip protection trip unit - S51

Size	Type	Code
E1.2	S51 250V E1.2	1SDA073776R1
E1.2	S51 24V E1.2	1SDA073777R1
E2.2...E6.2	S51 250V E2.2...E6.2	1SDA073778R1
E2.2...E6.2	S51 24V E2.2...E6.2	1SDA073779R1

Terminals for auxiliary connection

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

Accessories

Mechanical accessories



1SDC200524F001



1SDC200516F001



1SDC200516F001

Mechanical operation counter - MOC

Size	Type	Code
E1.2	MOC Mechanical operation counter	1SDA073780R1
E2.2...E6.2	MOC Mechanical operation counter	1SDA073781R1

Key lock in open position - KLC

Size	Type	Code
E1.2	KLC-D BI. Key lock open E1.2	1SDA073782R1
E1.2	KLC-S BI. Key lock open N.20005 E1.2	1SDA073783R1
E1.2	KLC-S BI. Key lock open N.20006 E1.2	1SDA073784R1
E1.2	KLC-S BI. Key lock open N.20007 E1.2	1SDA073785R1
E1.2	KLC-S BI. Key lock open N.20008 E1.2	1SDA073786R1
E1.2	KLC-S BI. Key lock open N.20009 E1.2	1SDA073787R1
E1.2	KLA BI. Castell key lock open E1.2	1SDA073788R1
E1.2	KLA BI. Kirk key lock open E1.2	1SDA073789R1
E1.2	KLA BI. Ronis Profalux key lock open E1.2	1SDA073790R1
E2.2...E6.2	KLC-D BI. Key lock open E2.2...E6.2	1SDA073791R1
E2.2...E6.2	KLC-S BI. key lock AP N.20005 E2.2...E6.2	1SDA073792R1
E2.2...E6.2	KLC-S BI. key lock AP N.20006 E2.2...E6.2	1SDA073793R1
E2.2...E6.2	KLC-S BI. key lock AP N.20007 E2.2...E6.2	1SDA073794R1
E2.2...E6.2	KLC-S BI. key lock AP N.20008 E2.2...E6.2	1SDA073795R1
E2.2...E6.2	KLC-S BI. key lock AP N.20009 E2.2...E6.2	1SDA073796R1
E2.2...E6.2	KLA BI. Castell key lock open E2.2...E6.2	1SDA073797R1
E2.2...E6.2	KLA BI. AP Castell Kirk key lock E2.2...E6.2	1SDA073798R1
E2.2...E6.2	KLA BI. AP Ronis Profalux key lock E2.2...E6.2	1SDA073799R1

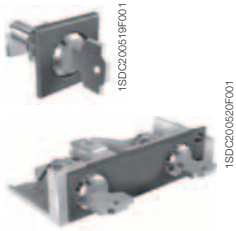
Padlocks in open position - PLC

Size	Type	Code
E1.2	PLC E1.2 BI. Padlocks in open position D=4mm	1SDA073800R1
E1.2	PLC E1.2 BI. Padlocks in open position D=7mm	1SDA073801R1
E1.2	PLC E1.2 BI. Padlocks in open position D=8mm	1SDA073802R1
E2.2...E6.2	PLC E2.2..E6.2 BI. Padlocks in open position D=4mm	1SDA073803R1
E2.2...E6.2	PLC E2.2..E6.2 BI. Padlocks in open position D=7mm	1SDA073804R1
E2.2...E6.2	PLC E2.2..E6.2 BI. Padlocks in open position D=8mm	1SDA073805R1



1SDC200517F001

1SDC200518F001



1SDC200519F001

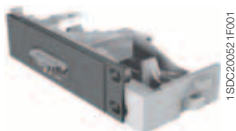
1SDC200520F001

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

Size	Type	Code
E1.2	KLP-D Bl. Racked in/out E1.2 1st key	1SDA073822R1
E1.2	KLP-S Bl. Racked in/out N.20005 E1.2 1st key	1SDA073823R1
E1.2	KLP-S Bl. Racked in/out N.20006 E1.2 1st key	1SDA073824R1
E1.2	KLP-S Bl. Racked in/out N.20007 E1.2 1st key	1SDA073825R1
E1.2	KLP-S Bl. Racked in/out N.20008 E1.2 1st key	1SDA073826R1
E1.2	KLP-S Bl. Racked in/out N.20009 E1.2 1st key	1SDA073827R1
E1.2	KLP-D Bl. Racked in/out E1.2 2nd key	1SDA073828R1
E1.2	KLP-S Bl. Racked in/out N.20005 E1.2 2nd key	1SDA073829R1
E1.2	KLP-S Bl. Racked in/out N.20006 E1.2 2nd key	1SDA073830R1
E1.2	KLP-S Bl. Racked in/out N.20007 E1.2 2nd key	1SDA073831R1
E1.2	KLP-S Bl. Racked in/out N.20008 E1.2 2nd key	1SDA073832R1
E1.2	KLP-S Bl. Racked in/out N.20009 E1.2 2nd key	1SDA073833R1
E1.2	KLP-A Bl. Racked in/out RonProf Kirk E1.2 1st key	1SDA073834R1
E1.2	KLP-A Bl. Racked in/out RonProf Kirk E1.2 2nd key	1SDA073835R1
E1.2	KLP-A Bl. Racked in/out Castell E1.2 1st key	1SDA073836R1
E1.2	KLP-A Bl. Racked in/out Castell E1.2 2nd key	1SDA073837R1
E2.2...E6.2	KLP-D Bl. Racked in/out E2.2...E6.2 1st key	1SDA073806R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20005 E2.2...E6.2 1st key	1SDA073807R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20006 E2.2...E6.2 1st key	1SDA073808R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20007 E2.2...E6.2 1st key	1SDA073809R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20008 E2.2...E6.2 1st key	1SDA073810R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20009 E2.2...E6.2 1st key	1SDA073811R1
E2.2...E6.2	KLP-D Bl. Racked in/out E2.2...E6.2 2nd key	1SDA073812R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20005 E2.2...E6.2 2nd key	1SDA073813R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20006 E2.2...E6.2 2nd key	1SDA073814R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20007 E2.2...E6.2 2nd key	1SDA073815R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20008 E2.2...E6.2 2nd key	1SDA073816R1
E2.2...E6.2	KLP-S Bl. Racked in/out N.20009 E2.2...E6.2 2nd key	1SDA073817R1
E2.2...E6.2	KLP-A Bl. Racked in/out RoProKirk E2.2...E6.2 1st key	1SDA073818R1
E2.2...E6.2	KLP-A Bl. Racked in/out RoProKirk E2.2...E6.2 2nd key	1SDA073819R1
E2.2...E6.2	KLP-A Bl. Racked in/out Castell E2.2...E6.2 1st key	1SDA073820R1
E2.2...E6.2	KLP-A Bl. Racked in/out Castell E2.2...E6.2 2nd key	1SDA073821R1

Accessory for supplementary lock in racked-out position

Size	Type	Code
E1.2	Suppl. locks in racked-out E1.2	1SDA073838R1
E2.2...E6.2	Suppl. locks in racked-out E2.2...E6.2	1SDA073839R1



1SDC200521F001

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

Size	Type	Code
E1.2	PLP Bl. padlocks Racked in/out D=4/6/8mm E1.2	1SDA073840R1
E2.2...E6.2	PLP Bl. padlocks Racked in/out D=4/6/8mm E2.2...E6.2	1SDA073841R1

External shutter lock- SLE

Size	Type	Code
E2.2	SLE Bl. shutter lock D=4/6/8mm E2.2	1SDA073842R1
E4.2	SLE Bl. shutter lock D=4/6/8mm E4.2	1SDA073843R1
E6.2	SLE Bl. shutter lock D=4/6/8mm E6.2	1SDA073844R1



1SDC200522F001

Accessories

Mechanical accessories

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

Size	Type	Code
E2.2	DLR E2.2	1SDA073845R1
E4.2	DLR E4.2	1SDA073846R1
E6.2	DLR E6.2	1SDA073847R1

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

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

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

Size	Type	Code
E1.2	DLC Interlock cable door E1.2	1SDA073850R1
E1.2	DLC Interlock direct door E1.2	1SDA073851R1
E2.2...E6.2	DLC Interlock cable door E2.2...E6.2	1SDA073852R1
E2.2...E6.2	DLC Interlock direct door E2.2...E6.2	1SDA073853R1

Protection device for opening and closing pushbuttons - PBC

Size	Type	Code
E1.2	PBC Prot. Pushbuttons AP/CH E1.2	1SDA073854R1
E1.2	PBC Prot. Pushbuttons AP/CH D=4mm E1.2	1SDA073855R1
E1.2	PBC Prot. Pushbuttons AP/CH D=7mm E1.2	1SDA073856R1
E1.2	PBC Prot. Pushbuttons AP/CH D=8mm E1.2	1SDA073857R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH E2.2...E6.2	1SDA073858R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH D=4mm E2.2...E6.2	1SDA073859R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH D=7mm E2.2...E6.2	1SDA073860R1
E2.2...E6.2	PBC Prot. Pushbuttons AP/CH D=8mm E2.2...E6.2	1SDA073861R1

Circuit-breaker flange

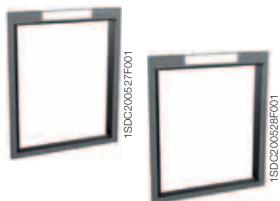
Size	Type	Code
E1.2	IP30 Flange E1.2 F	1SDA073862R1
E1.2	IP30 Flange E1.2 W	1SDA073863R1
E2.2...E6.2	IP30 Flange E2.2...E6.2 F	1SDA073864R1
E2.2...E6.2	IP30 Flange E2.2...E6.2 W	1SDA073865R1
E1.2	IP54 Flange different keys E1.2	1SDA073866R1
E2.2...E6.2	IP54 Flange different keys E2.2...E6.2	1SDA073867R1
E1.2	IP54 Flange key No. 20005 E1.2	1SDA073868R1
E2.2...E6.2	IP54 Flange key No. 20005 E2.2...E6.2	1SDA073869R1
E2.2...E6.2	Sealable trip unit cover	1SDA073870R1

High or low terminal covers- HTC/LTC

Size	Type	3 poles		4 poles	
		Code		Code	
E1.2	HTC high terminal covers E1.2 2pcs	1SDA073871R1		1SDA073872R1	
E1.2	LTC low terminal covers E1.2 F 2pcs	1SDA073873R1		1SDA073874R1	
E1.2	LTC low terminal covers E1.2 W 2pcs	1SDA073875R1		1SDA073876R1	

Separators - PB

Size	Type	Code
E1.2	PB Separators H=100mm 4pz E1.2 3P	1SDA073877R1
E1.2	PB Separators H=100mm 6pz E1.2 4P	1SDA073878R1
E1.2	PB Separators H=200mm 4pz E1.2 3P	1SDA073879R1
E1.2	PB Separators H=200mm 6pz E1.2 4P	1SDA073880R1



Accessories

Mechanical interlock

Cables for mechanical interlock [Group 1]

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

Order one type of cable for each interlock. The cable must be ordered on the fixed circuit-breaker or on the fixed part of withdrawable circuit-breaker.

Lever for mechanical interlock of fixed circuit-breaker or mobile part [Group 2]

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

The lever for 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	1SDA073893R1
E1.2	Type A - Installed on bottom plate	1SDA073894R1
E2.2 ... E6.2	Type A / B / D	1SDA073895R1
E2.2 ... E6.2	Type C	1SDA073897R1

Support for mechanical interlock of fixed part [Group 4]

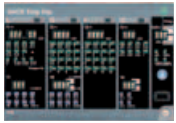
Size	Type	Code
E1.2	Type A	1SDA073896R1
E2.2 ... E6.2	Type A / B / D	1SDA073895R1
E2.2 ... E6.2	Type C	1SDA073897R1

Automatic transfer switch

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

Accessories

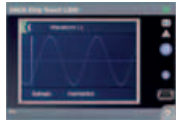
Ekip modules



1SDC200446F001



1SDC200466F001



1SDC200486F001



1SDC200475F001



1SDC200476F001

Ekip electrical trip units - loose supply

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

Options for Ekip electrical trip units

Size	Type	Code
E1.2..E6.2	Ekip LCD Installed	1SDA074211R1
E1.2..E6.2	Ekip Power Controller	1SDA074212R1
E1.2..E6.2	Upper internal installed voltage outlets	1SDA074216R1
E1.2..E6.2	External installed voltage outlets	1SDA074217R1
E1.2..E6.2	Arrangement for cables with lower internal voltage outlets	1SDA074213R1
E1.2..E6.2	Arrangement for cables with upper internal voltage outlets	1SDA074214R1
E1.2..E6.2	Arrangement for cables with external voltage outlets	1SDA074215R1

Power Supply modules

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

Connectivity modules

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



1SDC200539F001



1SDC200540F001



1SDC200541F001



1SDC200544F001



1SDC200548F001



1SDC200559F001



1SDC200559F001

Signalling modules

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

Measuring and protection modules

Size	Type	Code
E1.2	Ekip Measuring	1SDA074184R1
E1.2	Ekip Measuring Pro	1SDA074185R1
E2.2	Ekip Measuring	1SDA074186R1
E2.2	Ekip Measuring Pro	1SDA074187R1
E4.2	Ekip Measuring	1SDA074188R1
E4.2	Ekip Measuring Pro	1SDA074189R1
E6.2	Ekip Measuring	1SDA074190R1
E6.2	Ekip Measuring Pro	1SDA074191R1
E1.2..E6.2	Ekip Synchrocheck	1SDA074183R1
E2.2..E6.2	Ekip Fan 24V DC	1SDA074174R1
E2.2	Fan module for three-pole circuit-breaker	1SDA074176R1
E2.2	Fan module for four-pole circuit-breaker	1SDA074177R1
E4.2	Fan module for three-pole circuit-breaker	1SDA074178R1
E4.2	Fan module for four-pole circuit-breaker	1SDA074179R1
E6.2	Fan module for three-pole circuit-breaker	1SDA074180R1
E6.2	Fan module for four-pole circuit-breaker	1SDA074181R1
E6.2	Fan module for four-pole circuit-breaker with full size neutral	1SDA074182R1

Displaying and supervision systems

Size	Type	Code
E1.2..E6.2	Ekip Multimeter Display on front of switchgear	1SDA074192R1
E1.2..E6.2	Ekip Control Panel for 10 circuit-breakers	1SDA074311R1
E1.2..E6.2	Ekip control panel for 30 circuit-breakers	1SDA074312R1
E1.2..E6.2	Ekip Control Panel license extension to 30 circuit-breakers	1SDA074313R1
E1.2..E6.2	Ekip Control Panel alarm dispatcher option	1SDA074314R1
E1.2..E6.2	Ekip Control Panel option 5 access web client	1SDA074315R1
E1.2..E6.2	Ekip View Software for 30 circuit-breakers	1SDA074298R1
E1.2..E6.2	Ekip View software for 60 circuit-breakers	1SDA074299R1
E1.2..E6.2	Ekip View software for unlimited circuit-breakers	1SDA074300R1
E1.2..E6.2	Ekip View license extension to 60 circuit-breakers	1SDA074301R1
E1.2..E6.2	Ekip View license extension for an unlimited number of circuit-breakers	1SDA074302R1
E1.2..E6.2	Ekip View alarm dispatcher option for 30 circuit-breakers	1SDA074303R1
E1.2..E6.2	Ekip View alarm dispatcher option for 60 circuit-breakers	1SDA074304R1
E1.2..E6.2	Ekip View alarm dispatcher option for an unlimited number of circuit-breakers	1SDA074305R1
E1.2..E6.2	Ekip View 5 web access client option license of 30 circuit-breakers	1SDA074306R1
E1.2..E6.2	Ekip View 5 web access client option license of 60 circuit-breakers	1SDA074307R1
E1.2..E6.2	Ekip View 5 web access client option license for an unlimited number of circuit-breakers	1SDA074308R1
E1.2..E6.2	Ekip View redundancy option	1SDA074309R1
E1.2..E6.2	Ekip View OPC server-client option	1SDA074310R1

Accessories

Ekip modules

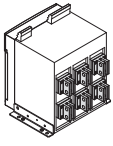


Rating plug for Ekip trip units

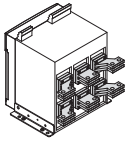
Size	Type	Code (loose supply)	Code (installed)
E1.2..E6.2	Rating Plug 100A	1SDA074218R1	1SDA074258R1
E1.2..E6.2	Rating Plug 200A	1SDA074219R1	1SDA074259R1
E1.2..E6.2	Rating Plug 250A	1SDA074220R1	1SDA074260R1
E1.2..E6.2	Rating Plug 400A	1SDA074221R1	1SDA074261R1
E1.2..E6.2	Rating Plug 630A	1SDA074222R1	1SDA074262R1
E1.2..E6.2	Rating Plug 800A	1SDA074223R1	1SDA074263R1
E1.2..E6.2	Rating Plug 1000A	1SDA074224R1	1SDA074264R1
E1.2..E6.2	Rating Plug 1250A	1SDA074225R1	1SDA074265R1
E1.2..E6.2	Rating Plug 1600A	1SDA074226R1	1SDA074266R1
E1.2..E6.2	Rating Plug 2000A	1SDA074227R1	1SDA074267R1
E1.2..E6.2	Rating Plug 2500A	1SDA074228R1	1SDA074268R1
E1.2..E6.2	Rating Plug 3200A	1SDA074229R1	1SDA074269R1
E1.2..E6.2	Rating Plug 4000A	1SDA074230R1	1SDA074270R1
E1.2..E6.2	Rating Plug 5000A	1SDA074231R1	1SDA074271R1
E1.2..E6.2	Rating Plug 6300A	1SDA074232R1	1SDA074272R1
E1.2..E6.2	Rating Plug 100A L OFF	1SDA074233R1	1SDA074273R1
E1.2..E6.2	Rating Plug 200A L OFF	1SDA074234R1	1SDA074274R1
E1.2..E6.2	Rating Plug 250A L OFF	1SDA074235R1	1SDA074275R1
E1.2..E6.2	Rating Plug 400A L OFF	1SDA074236R1	1SDA074276R1
E1.2..E6.2	Rating Plug 630A L OFF	1SDA074237R1	1SDA074277R1
E1.2..E6.2	Rating Plug 800A L OFF	1SDA074238R1	1SDA074278R1
E1.2..E6.2	Rating Plug 1000A L OFF	1SDA074239R1	1SDA074279R1
E1.2..E6.2	Rating Plug 1250A L OFF	1SDA074240R1	1SDA074280R1
E1.2..E6.2	Rating Plug 1600A L OFF	1SDA074241R1	1SDA074281R1
E1.2..E6.2	Rating Plug 2000A L OFF	1SDA074242R1	1SDA074282R1
E1.2..E6.2	Rating Plug 2500A L OFF	1SDA074243R1	1SDA074283R1
E1.2..E6.2	Rating Plug 3200A L OFF	1SDA074244R1	1SDA074284R1
E1.2..E6.2	Rating Plug 4000A L OFF	1SDA074245R1	1SDA074285R1
E1.2..E6.2	Rating Plug 5000A L OFF	1SDA074246R1	1SDA074286R1
E1.2..E6.2	Rating Plug 6300A L OFF	1SDA074247R1	1SDA074287R1
E1.2..E6.2	Rating Plug RC 100A	1SDA074248R1	1SDA074288R1
E1.2..E6.2	Rating Plug RC 200A	1SDA074249R1	1SDA074289R1
E1.2..E6.2	Rating Plug RC 250A	1SDA074250R1	1SDA074290R1
E1.2..E6.2	Rating Plug RC 400A	1SDA074251R1	1SDA074291R1
E1.2..E6.2	Rating Plug RC 630A	1SDA074252R1	1SDA074292R1
E1.2..E6.2	Rating Plug RC 800A	1SDA074253R1	1SDA074293R1
E1.2..E6.2	Rating Plug RC 1250A	1SDA074254R1	1SDA074294R1
E1.2..E6.2	Rating Plug RC 2000A	1SDA074255R1	1SDA074295R1
E1.2..E6.2	Rating Plug RC 3200A	1SDA074256R1	1SDA074296R1
E1.2..E6.2	Rating Plug RC 4000A	1SDA074257R1	1SDA074297R1

Accessories

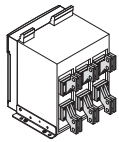
Terminals



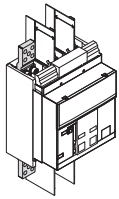
Rear orientable terminal - HR VR



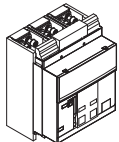
Horizontal rear spread terminal - SHR



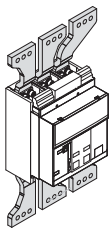
Vertical rear spread terminal - SVR



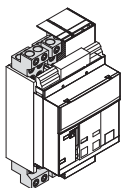
Extended front terminal - EF



Front terminal - F



Front spread terminal - ES

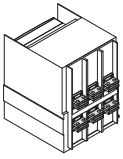


Terminal for cable FcCuAl
4x240mm² - Fc CuAl

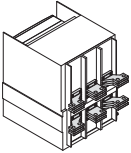
Kit for terminals - installed for fixed circuit-breaker

Size	Version	lu max	Type	3 Poles	4 Poles
				Code	Code
E1.2	F	1600	Kit EF Upper	1SDA073963R1	1SDA073964R1
E1.2	F	1600	Kit EF Lower	1SDA073965R1	1SDA073966R1
E1.2	F	1600	Kit ES Upper	1SDA073975R1	1SDA073976R1
E1.2	F	1600	Kit ES Lower	1SDA073977R1	1SDA073978R1
E1.2	F	1600	Kit HR Upper	1SDA073981R1	1SDA073982R1
E1.2	F	1600	Kit HR Lower	1SDA073983R1	1SDA073984R1
E1.2	F	1600	Kit VR Upper	1SDA073985R1	1SDA073986R1
E1.2	F	1600	Kit VR Lower	1SDA073987R1	1SDA073988R1
E1.2	F	1600	Kit FC CuAl 4x240 mm ² Upper	1SDA073997R1	1SDA073998R1
E1.2	F	1600	Kit FC CuAl 4x240 mm ² Lower	1SDA073999R1	1SDA074000R1
E2.2	F	2000	Kit VR Upper	1SDA074003R1	1SDA074004R1
E2.2	F	2000	Kit VR Lower	1SDA074005R1	1SDA074006R1
E2.2	F	2500	Kit VR Upper	1SDA074009R1	1SDA074010R1
E2.2	F	2500	Kit VR Lower	1SDA074011R1	1SDA074012R1
E2.2	F	2000	Kit SHR Upper	1SDA074045R1	1SDA074046R1
E2.2	F	2000	Kit SHR Lower	1SDA074047R1	1SDA074048R1
E2.2	F	2500	Kit SHR Upper	1SDA074051R1	1SDA074052R1
E2.2	F	2500	Kit SHR Lower	1SDA074053R1	1SDA074054R1
E2.2	F	2000	Kit SVR Upper	1SDA074057R1	1SDA074058R1
E2.2	F	2000	Kit SVR Lower	1SDA074059R1	1SDA074060R1
E2.2	F	2500	Kit SVR Upper	1SDA074063R1	1SDA074064R1
E2.2	F	2500	Kit SVR Lower	1SDA074065R1	1SDA074066R1
E2.2	F	2500	Kit F Upper	1SDA074118R1	1SDA074119R1
E2.2	F	2500	Kit F Lower	1SDA074120R1	1SDA074121R1
E4.2	F	3200	Kit VR Upper	1SDA074015R1	1SDA074016R1
E4.2	F	3200	Kit VR Lower	1SDA074017R1	1SDA074018R1
E4.2	F	4000	Kit VR Upper	1SDA074021R1	1SDA074022R1
E4.2	F	4000	Kit VR Lower	1SDA074023R1	1SDA074024R1
E4.2	F	4000	Kit F Upper	1SDA074126R1	1SDA074127R1
E4.2	F	4000	Kit F Lower	1SDA074128R1	1SDA074129R1
E6.2	F	5000	Kit VR Upper	1SDA074027R1	1SDA074028R1
E6.2	F	5000	Kit VR Lower	1SDA074030R1	1SDA074031R1
E6.2/f	F	5000	Kit VR Upper		1SDA074029R1
E6.2/f	F	5000	Kit VR Lower		1SDA074032R1
E6.2	F	6300	Kit F Upper	1SDA074134R1	1SDA074135R1
E6.2	F	6300	Kit F Lower	1SDA074137R1	1SDA074138R1
E6.2/f	F	6300	Kit F Upper		1SDA074136R1
E6.2/f	F	6300	Kit F Lower		1SDA074139R1
E6.2	F	6300	Kit VR Upper	1SDA074036R1	1SDA074037R1
E6.2	F	6300	Kit VR Lower	1SDA074039R1	1SDA074040R1
E6.2/f	F	6300	Kit VR Upper		1SDA074038R1
E6.2/f	F	6300	Kit VR Lower		1SDA074041R1

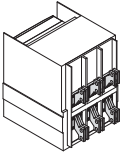
Accessories Terminals



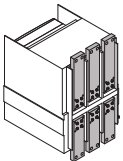
Rear orientable terminal - HR VR



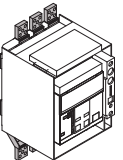
Horizontal rear terminal - SHR



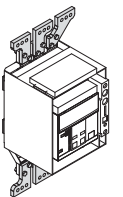
Vertical rear spread terminal - SVR



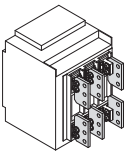
Front terminal - F



Extended front terminal - EF



Front spread terminal - ES

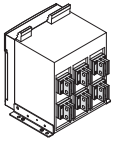


Terminal for cable FcCuAl
4x240mm² - Fc CuAl

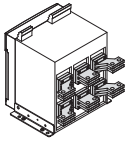
Kit for terminals - installed for fixed part of withdrawable circuit-breaker

Size	Version	Iu max	Type	3 Poles		4 Poles	
				Code	Code	Code	Code
E1.2	W	1600	Kit EF Upper	1SDA073939R1		1SDA073940R1	
E1.2	W	1600	Kit EF Lower	1SDA073941R1		1SDA073942R1	
E1.2	W	1600	Kit VR Upper	1SDA073945R1		1SDA073946R1	
E1.2	W	1600	Kit VR Lower	1SDA073947R1		1SDA073948R1	
E1.2	W	1600	Kit ES Upper *	1SDA073951R1		1SDA073952R1	
E1.2	W	1600	Kit ES Lower *	1SDA073953R1		1SDA073954R1	
E1.2	W	1600	Kit SHR Upper	1SDA073957R1		1SDA073958R1	
E1.2	W	1600	Kit SHR Lower	1SDA073959R1		1SDA073960R1	
E1.2	W	1600	Kit FC CuAl 4x240 mm ² Upper	1SDA073991R1		1SDA073993R1	
E1.2	W	1600	Kit FC CuAl 4x240 mm ² Lower	1SDA073992R1		1SDA073994R1	
E2.2	W	2000	Kit VR Upper	1SDA074577R1		1SDA074578R1	
E2.2	W	2000	Kit VR Lower	1SDA074579R1		1SDA074580R1	
E2.2	W	2500	Kit VR Upper	1SDA074581R1		1SDA074582R1	
E2.2	W	2500	Kit VR Lower	1SDA074583R1		1SDA074584R1	
E2.2	W	2000	Kit SHR Upper	1SDA074585R1		1SDA074586R1	
E2.2	W	2000	Kit SHR Lower	1SDA074587R1		1SDA074588R1	
E2.2	W	2500	Kit SHR Upper	1SDA074589R1		1SDA074590R1	
E2.2	W	2500	Kit SHR Lower	1SDA074591R1		1SDA074592R1	
E2.2	W	2000	Kit SVR Upper	1SDA074593R1		1SDA074594R1	
E2.2	W	2000	Kit SVR Lower	1SDA074595R1		1SDA074596R1	
E2.2	W	2500	Kit SVR Upper	1SDA074597R1		1SDA074598R1	
E2.2	W	2500	Kit SVR Lower	1SDA074599R1		1SDA074600R1	
E2.2	W	2500	Kit FL Upper	1SDA074069R1		1SDA074070R1	
E2.2	W	2500	Kit FL Lower	1SDA074071R1		1SDA074072R1	
E2.2	W	2500	Kit F Upper	1SDA074090R1		1SDA074091R1	
E2.2	W	2500	Kit F Lower	1SDA074092R1		1SDA074093R1	
E4.2	W	3200	Kit VR Upper	1SDA074601R1		1SDA074602R1	
E4.2	W	3200	Kit VR Lower	1SDA074603R1		1SDA074604R1	
E4.2	W	4000	Kit VR Upper	1SDA074605R1		1SDA074606R1	
E4.2	W	4000	Kit VR Lower	1SDA074607R1		1SDA074608R1	
E4.2	W	4000	Kit F Upper	1SDA074098R1		1SDA074099R1	
E4.2	W	4000	Kit F Lower	1SDA074100R1		1SDA074101R1	
E4.2	W	4000	Kit FL Upper	1SDA074075R1		1SDA074076R1	
E4.2	W	4000	Kit FL Lower	1SDA074077R1		1SDA074078R1	
E6.2	W	5000	Kit VR Upper	1SDA074609R1		1SDA074610R1	
E6.2	W	5000	Kit VR Lower	1SDA074612R1		1SDA074613R1	
E6.2/f	W	5000	Kit VR Upper			1SDA074611R1	
E6.2/f	W	5000	Kit VR Lower			1SDA074614R1	
E6.2	W	6300	Kit VR Upper	1SDA074615R1		1SDA074616R1	
E6.2	W	6300	Kit VR Lower	1SDA074618R1		1SDA074619R1	
E6.2/f	W	6300	Kit VR Upper			1SDA074617R1	
E6.2/f	W	6300	Kit VR Lower			1SDA074620R1	
E6.2	W	6300	Kit F Upper	1SDA074106R1		1SDA074107R1	
E6.2	W	6300	Kit F Lower	1SDA074109R1		1SDA074110R1	
E6.2/f	W	6300	Kit F Upper			1SDA074108R1	
E6.2/f	W	6300	Kit F Lower			1SDA074111R1	
E6.2	W	6300	Kit FL Upper	1SDA074081R1		1SDA074082R1	
E6.2	W	6300	Kit FL Lower	1SDA074084R1		1SDA074085R1	
E6.2/f	W	6300	Kit FL Upper			1SDA074083R1	
E6.2/f	W	6300	Kit FL Lower			1SDA074086R1	

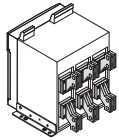
* can be ordered only if the fixed part has EF terminals.



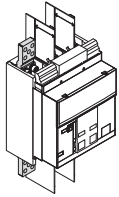
Rear orientable terminal - HR VR



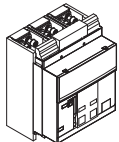
Horizontal rear spread terminal - SHR



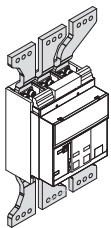
Vertical rear spread terminal - SVR



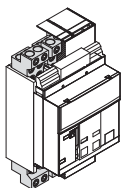
Extended front terminal - EF



Front terminal - F



Front spread terminal - ES



Terminal for cable FcCuAl
4x240mm² - Fc CuAl

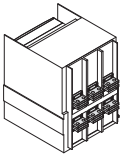
Kit for terminals - loose supply for fixed circuit-breaker

Size	Version	lu max	Type	3 Poles	4 Poles
				Code	Code
E1.2	F	1600	Kit EF	1SDA073967R1	1SDA073968R1
E1.2	F	1600	Kit F	1SDA073973R1	1SDA073974R1
E1.2	F	1600	Kit ES	1SDA073979R1	1SDA073980R1
E1.2	F	1600	Kit Adjustable HR/VR	1SDA073989R1	1SDA073990R1
E1.2	F	1600	Kit FC CuAl 4x240 mm ²	1SDA074001R1	1SDA074002R1
E2.2	F	2000	Kit Adjustable HR/VR	1SDA074007R1	1SDA074008R1
E2.2	F	2500	Kit Adjustable HR/VR	1SDA074013R1	1SDA074014R1
E2.2	F	2000	Kit SHR	1SDA074049R1	1SDA074050R1
E2.2	F	2500	Kit SHR	1SDA074055R1	1SDA074056R1
E2.2	F	2000	Kit SVR	1SDA074061R1	1SDA074062R1
E2.2	F	2500	Kit SVR	1SDA074067R1	1SDA074068R1
E4.2	F	3200	Kit Adjustable HR/VR	1SDA074019R1	1SDA074020R1
E4.2	F	4000	Kit Adjustable HR/VR	1SDA074025R1	1SDA074026R1
E4.2	F	4000	Kit F Upper	1SDA074130R1	1SDA074131R1
E4.2	F	4000	Kit F Lower	1SDA074132R1	1SDA074133R1
E6.2	F	5000	Kit Adjustable HR/VR	1SDA074033R1	1SDA074034R1
E6.2/f	F	5000	Kit Adjustable HR/VR		1SDA074035R1
E6.2	F	6300	Kit Adjustable HR/VR	1SDA074042R1	1SDA074043R1
E6.2/f	F	6300	Kit Adjustable HR/VR		1SDA074044R1
E6.2	F	6300	Kit F Upper	1SDA074140R1	1SDA074141R1
E6.2	F	6300	Kit F Lower	1SDA074143R1	1SDA074144R1
E6.2/f	F	6300	Kit F Upper		1SDA074142R1
E6.2/f	F	6300	Kit F Lower		1SDA074145R1

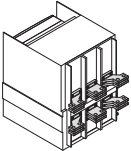
Adapter plate for terminals - loose supply for fixed circuit-breaker

Size	Version	lu	Type	3 Poles	4 Poles
				Code	Code
E2.2	F	2500	Kit Terminal Adapter Plate	1SDA074146R1	1SDA074147R1
E4.2	F	4000	Kit Terminal Adapter Plate	1SDA074148R1	1SDA074149R1

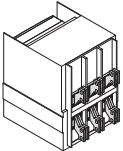
Accessories Terminals



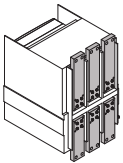
Rear orientable terminal - HR VR



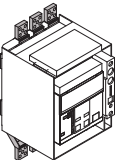
Horizontal rear terminal - SHR



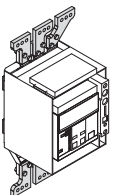
Vertical rear spread terminal - SVR



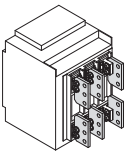
Front terminal - F



Extended front terminal - EF



Front spread terminal - ES



Terminal for cable FcCuAl
4x240mm² - Fc CuAl

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

Size	Version	Iu max	Type	3 Poles		4 Poles	
				Code		Code	
E1.2	W	1600	Kit EF	1SDA073943R1		1SDA073944R1	
E1.2	W	1600	Kit Adjustable HR/VR	1SDA073949R1		1SDA073950R1	
E1.2	W	1600	Kit ES	1SDA073955R1		1SDA073956R1	
E1.2	W	1600	Kit SHR	1SDA073961R1		1SDA073962R1	
E1.2	W	1600	Kit FC CuAl 4x240 mm ²	1SDA073995R1		1SDA073996R1	
E2.2	W	2000	Kit Adjustable HR/VR	1SDA074007R1		1SDA074008R1	
E2.2	W	2500	Kit Adjustable HR/VR	1SDA074013R1		1SDA074014R1	
E2.2	W	2000	Kit SHR	1SDA074049R1		1SDA074050R1	
E2.2	W	2500	Kit SHR	1SDA074055R1		1SDA074056R1	
E2.2	W	2000	Kit SVR	1SDA074061R1		1SDA074062R1	
E2.2	W	2500	Kit SVR	1SDA074067R1		1SDA074068R1	
E2.2	W	2500	Kit FL	1SDA074073R1		1SDA074074R1	
E4.2	W	3200	Kit Adjustable HR/VR	1SDA074019R1		1SDA074020R1	
E4.2	W	4000	Kit Adjustable HR/VR	1SDA074025R1		1SDA074026R1	
E4.2	W	4000	Kit F Upper	1SDA074102R1		1SDA074103R1	
E4.2	W	4000	Kit F Lower	1SDA074104R1		1SDA074105R1	
E4.2	W	4000	Kit FL	1SDA074079R1		1SDA074080R1	
E6.2	W	5000	Kit Adjustable HR/VR	1SDA074033R1		1SDA074034R1	
E6.2/f	W	5000	Kit Adjustable HR/VR			1SDA074035R1	
E6.2	W	6300	Kit Adjustable HR/VR	1SDA074042R1		1SDA074043R1	
E6.2/f	W	6300	Kit Adjustable HR/VR			1SDA074044R1	
E6.2	W	6300	Kit F Upper	1SDA074112R1		1SDA074113R1	
E6.2	W	6300	Kit F Lower	1SDA074115R1		1SDA074116R1	
E6.2/f	W	6300	Kit F Upper			1SDA074114R1	
E6.2/f	W	6300	Kit F Lower			1SDA074117R1	
E6.2	W	6300	Kit FL	1SDA074087R1		1SDA074088R1	
E6.2/f	W	6300	Kit FL			1SDA074089R1	

Contact us

ABB SACE

A division of ABB S.p.A.

L.V. Breakers

Via Baioni, 35

24123 Bergamo

Phone: +39 035 395.111

Fax: +39 035 395.306-433

www.abb.com

The data and illustrations are not binding. We reserve the right to modify the contents of this document on the basis of technical development of the products, without prior notice.

Copyright 2013 ABB. All rights reserved.

1SDC200023D0201 - 03/2013 - 6.000 - CAL - Preliminary