

Low voltage switch-disconnectors
and automatic circuit-breakers for
Direct Current Applications

1SDC200012D0201





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SACE Emax DC automatic circuit-breakers

The SACE Emax range of low voltage automatic circuit-breakers is being enriched by the new series SACE Emax DC of automatic circuit-breakers for direct current applications in compliance with the international standard IEC60947-2.

Thanks to the exclusive technology of the new electronic SACE PR123/DC e PR122/DC the SACE Emax DC range allows to cover all installation and automatic protection needs up to 1000V / 5000A DC. 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 1000V DC.

The automatic circuit-breakers of SACE Emax DC 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 accessories common to the SACE Emax range.

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

Common data		
Voltages		
Rated service voltage Ue	[V-]	000
Rated insulation voltage Ui	[V]	000
Rated impulse withstand voltage Uimp	[kV]	2
Operating temperature	[°C]	-25...+70
Storage temperature	[°C]	-40...+70
Number of poles		3-4
Versions	Fixed -	



		E2		E3		E4		E6
Performance levels		B	N	N	H	S	H	H
Rated uninterrupted current (at 40 °C) Iu	[A]	800		800				
	[A]	1000		1000				
	[A]	1250		1250				
	[A]	1600	1600	1600	1600	1600		
	[A]			2000	2000	2000		
	[A]			2500	2500	2500		
	[A]					3200	3200	3200
Rated ultimate breaking capacity under short-circuit Icu	[A]							4000
	[A]							5000
	@ 500 V DC (III)	[kA]	35	50	60	85	75	00
	@ 750 V DC (III)	[kA]	25	25	40	40	65	65
	@ 750 V DC (IV)	[kA]	25	40	50	50	65	65
	@ 1000 V DC (IV)	[kA]	25	25	35	40	50	65
	@ 1000 V DC (IV)	[kA]	25	25	35	40	50	65
Rated service breaking capacity under short-circuit Ics	[%Icu] [kA]	00%	00%	00%	00%	00%	00%	00%
Rated short-time withstand current Icw (0.5s)								
@ 500 V DC (III)	[kA]	35	50	60	65	75	00	00
@ 750 V DC (III)	[kA]	25	25	40	40	65	65	65
@ 750 V DC (IV)	[kA]	25	40	50	50	65	65	65
@ 1000 V DC (IV)	[kA]	25	25	35	40	50	65	65
Rated making capacity under short-circuit Icm	[%Icu] [kA]	00%	00%	00%	00%	00%	00%	00%
Utilization category (according to CEI EN 60947-2)		B	B	B	B	B	B	B
Isolation behaviour (according to CEI EN 60947-2)		■	■	■	■	■	■	■
Overcurrent protection								
Electronic trip units for DC applications		■	■	■	■	■	■	■
Operating times								
Closing time (max)	[ms]	80	80	80	80	80	80	80
Breaking time for I<Icw (max) (1)	[ms]	70	70	70	70	70	70	70
Breaking time for I>Icw (max)	[ms]	30	30	30	30	30	30	30
Overall dimensions								
Fixed: H = 48 mm - D = 302 mm - W (3/4 poles)	[mm]	296/386	296/386	404/530	404/530	566/656	566/656	782/908
Withdrawable: H = 46 mm - D = 396.5 mm - W (3/4 poles)	[mm]	324/444	324/444	432/558	432/558	594/684	594/684	800/936
Weights								
Fixed 3/4 poles	[kg]	50/6	50/6	66/80	66/80	97/117	97/117	40/60
Withdrawable 3/4 poles (including fixed part)	[kg]	50/6	50/6	66/80	66/80	47/65	47/65	20/240

(1) Without intentional delays.

SACE Emax 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 no-automatic circuit-breakers are specially 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.

		E1B/E MS		E2N/E MS		E3H/E MS		E4H/E MS*		E6H/E MS*	
Rated current (at 40 °C) Iu	[A]	800		1250		1250		3200		5000	
	[A]	1250		1600		1600		4000		6300	
	[A]	2000		2000		2000		2500		2500	
	[A]	3200		3200		3200		3200		3200	
Poles		3	4	3	4	3	4	3	4	3	4
Rated service voltage Ue	[V]	750	750	750	750	750	750	750	750	750	750
Rated insulation voltage Ui	[V]	000	000	000	000	000	000	000	000	000	000
Rated impulse withstand voltage Uimp	[kV]	2	2	2	2	2	2	2	2	2	2
Rated short-time withstand current Icw (1s)	[kA]	20	20*	25	25*	40	40*	65	65	65	65
Rated making capacity Icm											
750 V DC	[kA]	42	42	52.5	52.5	05	05	43	43	43	43
1000 V DC	[kA]		42		52.5		05		43		43

Note: the breaking capacity Icu, by means of external protection relay, with 500 ms maximum timing, is equal to the value of Icw (1s).

* The performances at 750 V are:

for E1B/E MS Icw=25kA

for E2N/E MS Icw=40kA

for E3H/E MS Icw=50kA

SACE Emax DC: Direct Current Applications

The main applications of direct current are:

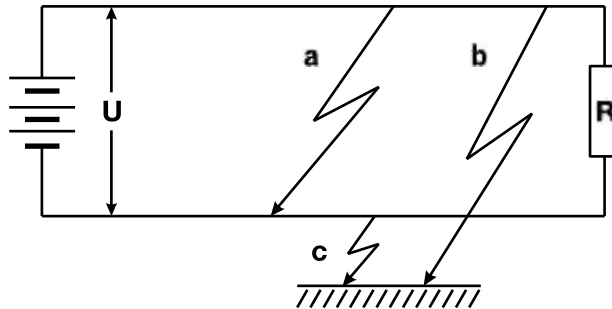
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1. Emergency supply or auxiliary services: the use of direct current is due to the need to employ a back-up energy source which allows the supply of essential services such as protection services, emergency lighting, alarm systems, hospital and industrial services, data-processing centres etc., using accumulator batteries
 2. Electrical traction: the advantages offered by the use of dc motors in terms of regulation and of single supply lines lead to the widespread use of direct current for railways, underground railways, trams, lifts and public transport in general
 3. Particular industrial installations: there are some electrolytic process plants and applications which have a particular need for the use of electrical machinery
 4. Navy, Alternative Energy Conversion, ...

SACE Emax DC: Direct Current Applications

Direct Current Network Typology

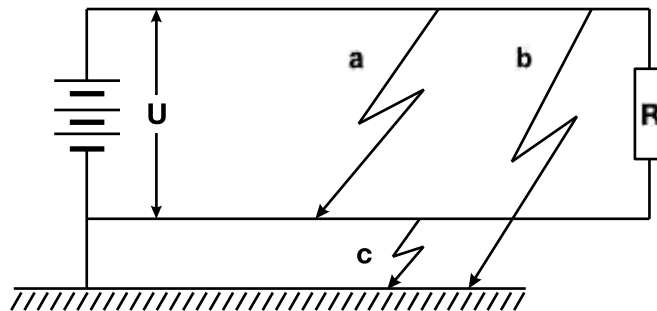
Here below the typical distribution systems used in direct current are described:

Both Polarities Insulated from Earth



- **Fault a:** the fault, without negligible impedance, between the two polarities sets up a short-circuit current to which both polarities contribute to the full voltage, according to which the breaking capacity of the breaker must be selected.
- **Fault b, c:** the fault between the polarity and earth has no consequences from installation functioning point of view.

One polarity connected to earth



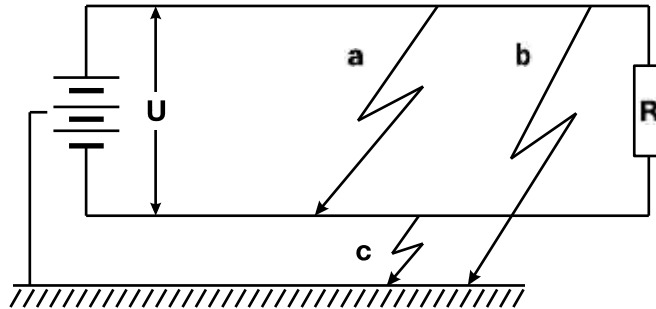
- **Fault a:** the fault between the two polarities sets up a short-circuit current to which both polarities contribute to the full voltage U , according to which the breaking capacity of the breaker is selected.
- **Fault b:** the fault on the polarity not connected to earth sets up a current which involves the over-current protection according to the resistance of the ground.
- **Fault c:** the fault between the polarity connected to earth and earth has no consequences from the point of view of the function of the installation.

All the poles of the breaker necessary for protection must be connected in series on the non-earthed polarity.

SACE Emax DC: Direct Current Applications

Direct Current Network Typology

Median Point connected to Earth



- **Fault a:** the fault between the two polarities sets up a short-circuit current to which both polarities contribute to the full voltage U , according to which the breaking capacity of the breaker is selected.
- **Fault b:** the fault between the polarity and earth sets up a short-circuit current less than that of a fault between the two polarities, as it is supplied by a voltage equal to $0.5 U$.
- **Fault c:** the fault in this case is analogous to the previous case, but concerns the negative polarity.

The breaker must be inserted on both polarities.

SACE Emax DC: Direct Current Applications





Circuit Breaker Selection

To correctly select the devices for the protection of a direct current network the following factors must be considered:





- The type of network - earthing connection
- Rated Current
- Voltage Current
- The prospective short-circuit current at the point of installation

Here below the rating plate of an Emax DC air circuit-breaker for direct current application:

INCOMING POWER FROM UPPER TERMINALS

SACE E2B/E 800				$I_u=800A$	$U_e=750V$	Upper Supply		
U_e	(V)	500	750					IEC 60947-2 Made in Italy by ABB SACE 
$I_{cu}=I_{cs}$	(KA)	35	25					
I_{cw} (0.5s)	(KA)	35	25					
Cat. B		3P						

INCOMING POWER FROM BOTTOM TERMINALS

SACE E2B/E 800				$I_u=800A$	$U_e=750V$	Lower Supply		
U_e	(V)	500	750					IEC 60947-2 Made in Italy by ABB SACE 
$I_{cu}=I_{cs}$	(KA)	35	25					
I_{cw} (0.5s)	(KA)	35	25					
Cat. B		3P						

Protection trip units and trip curves

PR 22/DC

Characteristics





The PR122/DC is the new electronic protection trip unit for the SACE Emax DC series suitable for direct current installation wherein the basic protections are enough.

The PR122/DC offers the following protection functions:

- Overload (L);
- Selective short-circuit (S);
- Thermal memory for S and L (cable protection);
- Instantaneous short-circuit (I);
- Overtemperature protection (OT);
- Zone selectivity for S;
- Load Control (K).



Protection functions and setting values - PR122/DC

Function	Trip threshold	Threshold steps	Trip Time	Time Step	Poss. excl.	Relation $t=f(I)$	Thermal memory	Zone selectivity
 Overload protection Tolerance ⁽²⁾	$I = 0.4 \dots x \times I_n$ Release between $.05$ and $.2 \times I$	$0.0 \times I_n$	With current $I = 3 \times I$ $t = 3 \text{ s} \dots 0.2 \text{ s}$ $\pm 0\%$ If $\delta 6 \times I_n$ $\pm 20\%$ If $> 6 \times I_n$	$3 \text{ s}^{(1)}$	—	IEC60255-8	■	—
 Selective short-circuit protection Tolerance ⁽²⁾	$I_2 = 0.6 \dots 0 \times I_n$ $\pm 7\%$ If $\delta 6 \times I_n$ $\pm 0\%$ If $> 6 \times I_n$	$0. \times I_n$	With current $I > I_2$ $t_2 = 0.05 \text{ s} \dots 0.35 \text{ s}$ $t_{2\text{sel}} = 0.04 \text{ s} \dots 0.2 \text{ s}$ The better of the two figures: $\pm 0\%$ or $\pm 40 \text{ ms}$	0.0 s 0.0 s	■	$t=k$	—	■
Tolerance ⁽²⁾	$I_2 = 0.6 \dots 0 \times I_n$ $\pm 7\%$ If $\delta 6 \times I_n$ $\pm 0\%$ If $> 6 \times I_n$	$0. \times I_n$	With current $I = 0 \times I_n$ $t_2 = 0.05 \text{ s} \dots 0.35 \text{ s}$ $\pm 5\%$ If $\delta 6 \times I_n$ $\pm 20\%$ If $> 6 \times I_n$	0.0 s	■	$t=k/I_2$	■	—
 Instantaneous short-circuit protection Tolerance ⁽²⁾	$I_3 = .5 \dots 0 \times I_n$ $\pm 0\%$	$0. \times I_n$	Instantaneous $\delta 30 \text{ ms}$	—	■	$t=k$	—	—
 Protection against overtemperature	May not be set	—	Instantaneous	—	—	$\text{temp}=k$	—	—

(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:

- fully powered release by voltage module and/or auxiliary power supply (without start-up)
- trip time set $\leq 100 \text{ ms}$

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

Trip threshold	Trip time
I Release between $.05$ and $.25 \times I$	$\pm 20\%$
S $\pm 0\%$	$\pm 20\%$
I $\pm 5\%$	$\delta 60 \text{ ms}$
Others	$\pm 20\%$

Protection trip units and trip curves

PR 22/DC

Power Supply

The PR122/DC trip unit does not normally require an auxiliary power supply being self-supplied from the measurement module PR120/V always supplied as standard in PR122/DC (only for power supply, no voltage and power based protection/measurements available in PR122/DC).

On request it is possible to supply the PR122/DC with a special version of measurements module suitable for very low DC rated voltage 24/48V DC, called PR120/LV, typically railway and mine installations.

An external auxiliary power supply is however required in case of the PR120/LV module is present.

Power supply from Measurement Module	Minimum Voltage Threshold Enabling Unit PR122/DC
PR 20/V	70 V

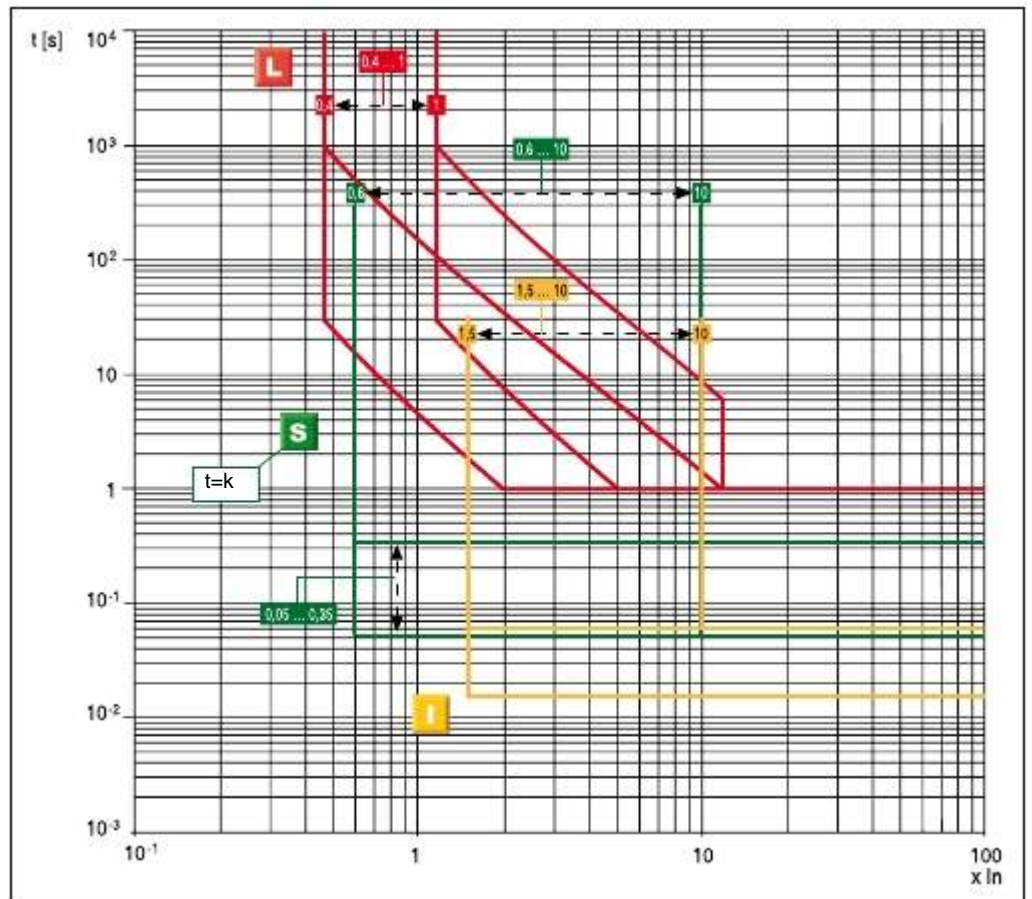
When an auxiliary power supply is present, refer to the below table for the overall electronic power consumption.

	PR122/DC	PR120/D-M	PR120/K
Auxiliary power supply (galvanically insulated)	24 V DC \pm 20%	from PR 22/DC	from PR 22/DC
Maximum ripple	5%		
Inrush current @ 24V	~ 0 A for 5 ms		
Rated power @ 24V	~3 W	+ W	+ W

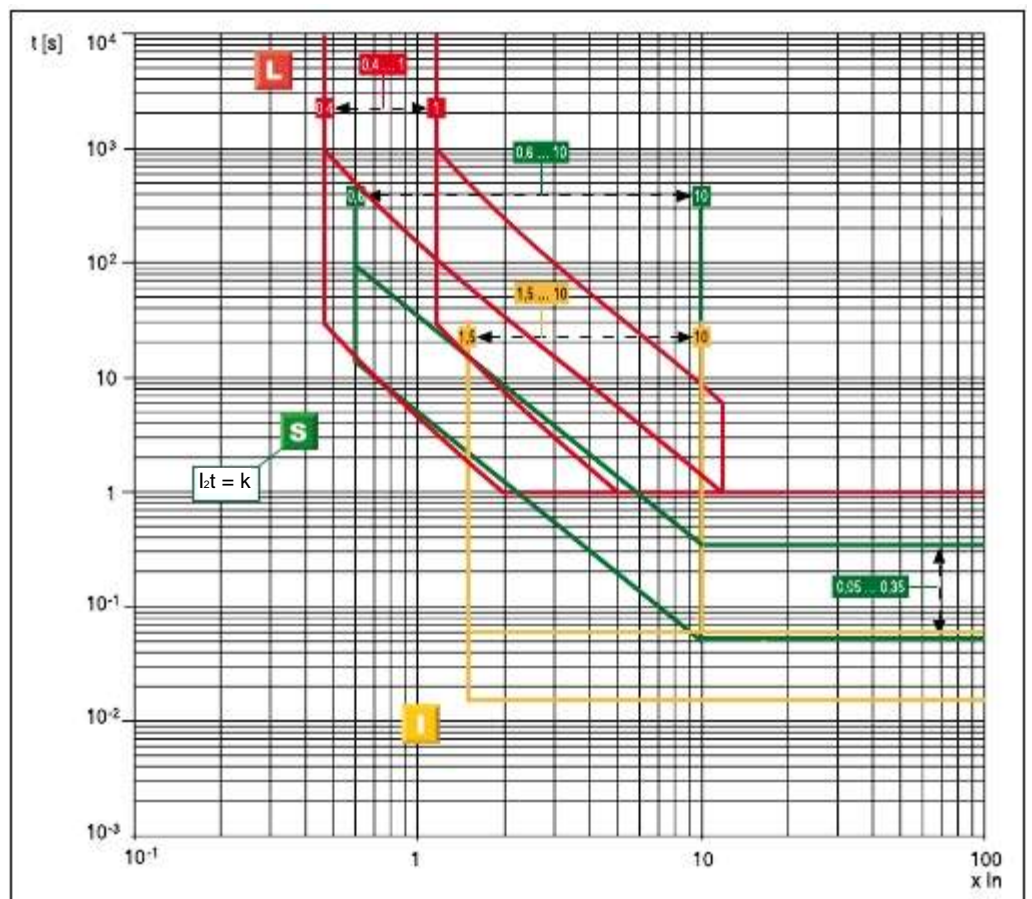
The Emax DC is supplied as standard for incoming power from the bottom terminals: PR120/V - PR120/LV internal connection on bottom terminals – “U rear connection kit” mounted on upper terminals.

Refer to **Ordering Codes Section** for incoming power from the upper terminals.

Functions L-S-I



Functions L-S-I



Protection trip units and trip curves

PR 23/DC

Characteristics











The PR123/DC is the new electronic protection trip unit for the SACE Emax DC 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 direct current installation.

The PR123/DC offers the following protection functions:

- Overload (L);
- Selective short-circuit (S);
- Thermal memory for L and S (cable protection);
- Instantaneous short-circuit (I);
- Earth fault with adjustable delay (G);
- Poles unbalance (U);
- Overtemperature protection (OT);
- Load control (K);
- Undervoltage (UV);
- Overvoltage (OV);
- Reverse power (RP);
- Dual setting;
- Zone selectivity for S, G;
- Start-up thresholds for protection S and I.



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
 Overload protection Tolerance (2)	$I = 0.4 \dots x I_n$ Release between .05 and .2 x I	0.0 x I_n	With current $I = 3xI$ $t = 3 s \dots 0.2 s$ $\pm 0\%$ If $\delta 6 x I_n$ $\pm 20\%$ If $> 6 x I_n$	3 s (1)	—	IEC60255-8	■	—
Tolerance	$I = 0.4 \dots x I_n$ Release between .052 x I	0.0 x I_n	With current $I = 3xI$; $t_1 = 3 s \dots 144 s$ $\pm 20\%$ If $> 5 x I$ $\pm 30\%$ 2xI δ If $\delta 5 x I$	3s	—	$t=k()$ (= 0.2- -2		
 Selective short-circuit protection Tolerance (2)	$I_2 = 0.6 \dots 0 x I_n$ $\pm 7\%$ If $\delta 6 x I_n$ $\pm 0\%$ If $> 6 x I_n$	0. x I_n	With current $I > I_2$ $t_2 = 0.05 s \dots 0.35 s$ $t_{2sel} = 0.04 s \dots 0.2 s$ The better of the two figures: $\pm 0\%$ or $\pm 40 ms$	0.0 s 0.0 s	■	$t=k$	—	■
Tolerance (2)	$I_2 = 0.6 \dots 0 x I_n$ $\pm 7\%$ If $\delta 6 x I_n$ $\pm 0\%$ If $> 6 x I_n$	0. x I_n	With current $I = 10xI_n$; $t_2 = 0.05 s \dots 0.35 s$ $\pm 5\%$ If $\delta 6 x I_n$ $\pm 20\%$ If $> 6 x I_n$	0.0 s	■	$t=k/I_2$	■	—
 Selective short-circuit protection Tolerance (2)	$I_2 = 0.6 \dots 0 x I_n$ $\pm 7\%$ If $\delta 6 x I_n$ $\pm 0\%$ If $> 6 x I_n$	0. x I_n	With current $I > I_2$ $t_2 = 0.05 s \dots 0.35 s$ The better of the two figures: $\pm 0\%$ or $\pm 40 ms$	0.0 s	■	$t=k$	—	■
 Instantaneous short-circuit protection Tolerance (2)	$I_3 = .5 \dots 0 x I_n$ $\pm 0\%$	0. x I_n	Instantaneous $\delta 30 ms$	—	■	$t=k$	—	—
 Earth fault protection Tolerance (2)	$I_4 = 0.2 \dots x I_n$ $\pm 7\%$	0.02 x I_n	With current $I > I_4$ $t_4 = 0. s \dots s$ $t_{4sel} = 0.04 s \dots 0.2 s$ The better of the two figures: $\pm 0\%$ or $\pm 40 ms$	0.05 s 0.0 s	■	$t=k$	—	■
Tolerance (2)	$I_4 = 0.2 \dots x I_n$ $\pm 7\%$	0.02 x I_n	$t_4 = 0. s \dots s$ (with $I = 4xI_4$) $\pm 5\%$	0.05 s	■	$t=k/I_2$	—	—
 Phase unbalance protection Tolerance (2)	$I_6 = 5\% \dots 90\%$ $\pm 0\%$	5%	$t_6 = 0.5 s \dots 60 s$ The better of the two figures: $\pm 20\%$ or $\pm 00 ms$	0.5 s	■	$t=k$	—	—
 Protection against overtemperature	cannot be set	—	Instantaneous	—	—	$temp=k$	—	—
 Undervoltage protection Tolerance (2)	$I_8 = 0.5 \dots 0.95 x U_n$ $\pm 5\%$	0.0 x I_n	With current $U < U_8$; $t_8 = 0. s \dots 5 s$ The better of the two figures: $\pm 20\%$ or $\pm 40 ms$	0. s	■	$t=k$	—	—
 Overvoltage protection Tolerance (2)	$I_9 = .05 \dots .2 x U_n$ $\pm 5\%$	0.0 x I_n	With current $U > U_9$; $t_9 = 0. s \dots 5 s$ The better of the two figures: $\pm 20\%$ or $\pm 40 ms$	0. s	■	$t=k$	—	—
 Reverse power protection Tolerance (2)	$P = -0.3 \dots -0. x P_n$ 0.02 P_n $\pm 0\%$		With current $P < P$ $t = 0.5 s \dots 25 s$ The better of the two figures: $\pm 0\%$ or $\pm 00 ms$	0. s	■	$t=k$	—	—

(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:

- fully powered release by voltage module and/or auxiliary power supply (without start-up)
- trip time set $\leq 100 ms$

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

Trip threshold	Trip time
I Release between .05 and .25 x I	$\pm 20\%$
δ $\pm 0\%$	$\pm 20\%$
I $\pm 5\%$	$\delta 60ms$
δ $\pm 5\%$	$\pm 20\%$
Others	$\pm 20\%$

Protection trip units and trip curves

PR 23/DC

Power Supply

The PR123/DC trip unit does not normally require an auxiliary power supply being self-supplied from the measurement module PR120/V always supplied as standard in PR123/DC.

On request it is possible to supply the PR123/DC with a special version of measurements module suitable for very low DC rated voltage 24/48V DC, called PR120/LV, typically railway and mine installations.

An external auxiliary power supply is however required in case of the PR120/LV module is present.

Power supply from Measurement Module	Minimum Voltage Threshold Enabling Unit PR123/DC
PR 20/V	70 V

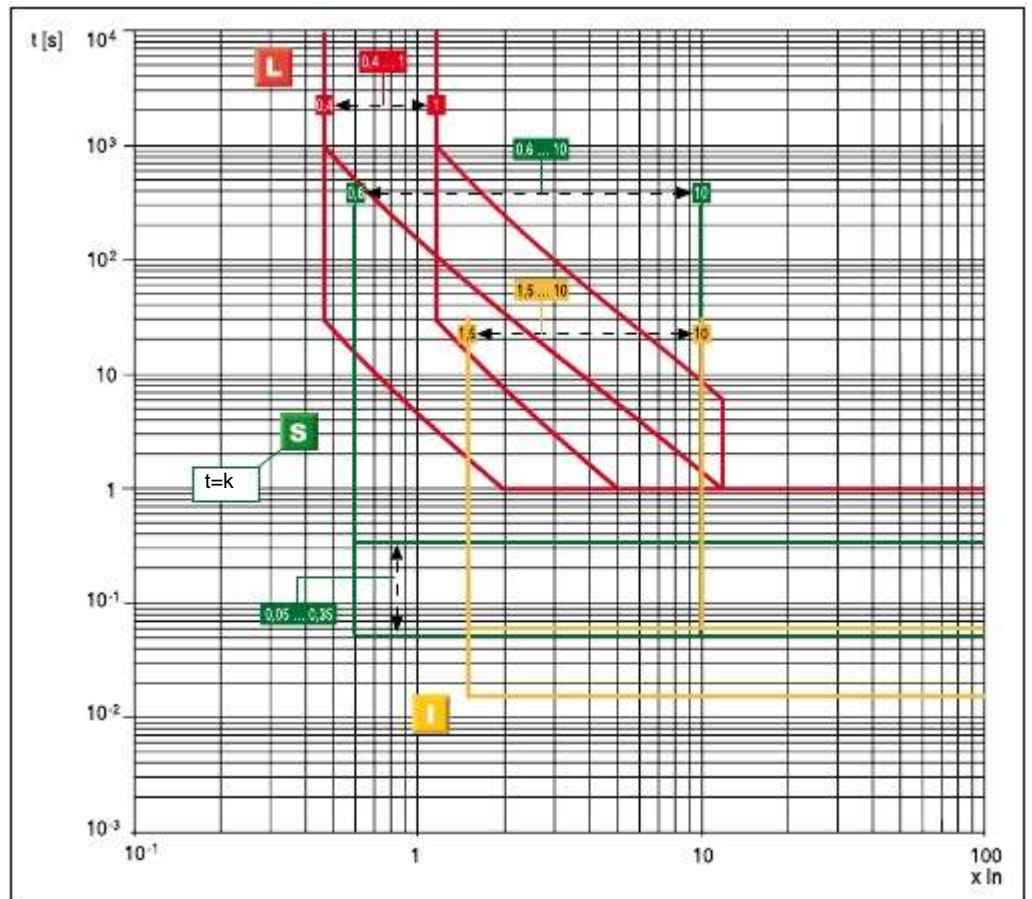
When an auxiliary power supply is present, refer to the below table for the overall electronic power consumption.

	PR123/DC	PR120/D-M	PR120/K
Auxiliary power supply (galvanically insulated)	24 V DC \pm 20%	from PR 22/DC	from PR 22/DC
Maximum ripple	5%		
Inrush current @ 24V	~ 0 A for 5 ms		
Rated power @ 24V	~3 W	+ W	+ W

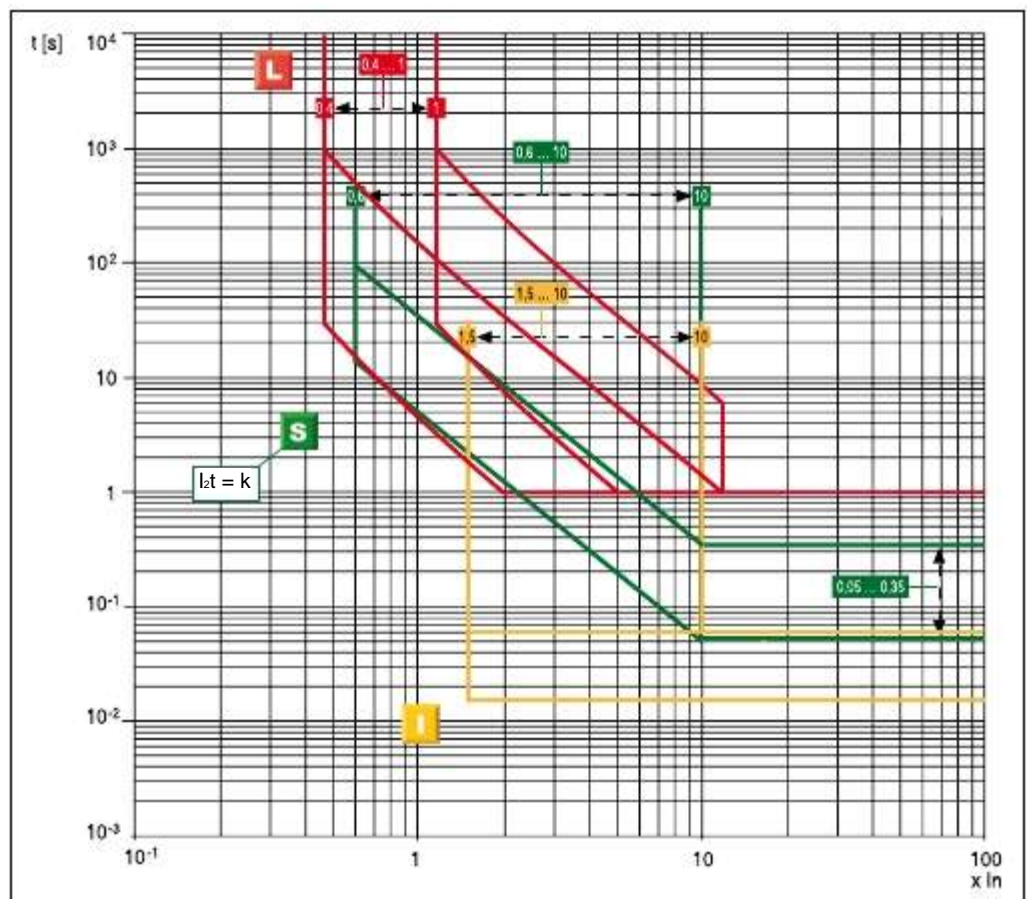
The Emax DC is supplied as standard for incoming power from the bottom terminals: PR120/V - PR120/LV internal connection on bottom terminals – “U rear connection kit” mounted on upper terminals.

Refer to **Ordering Codes Section** for incoming power from the upper terminals.

Functions L-S-I



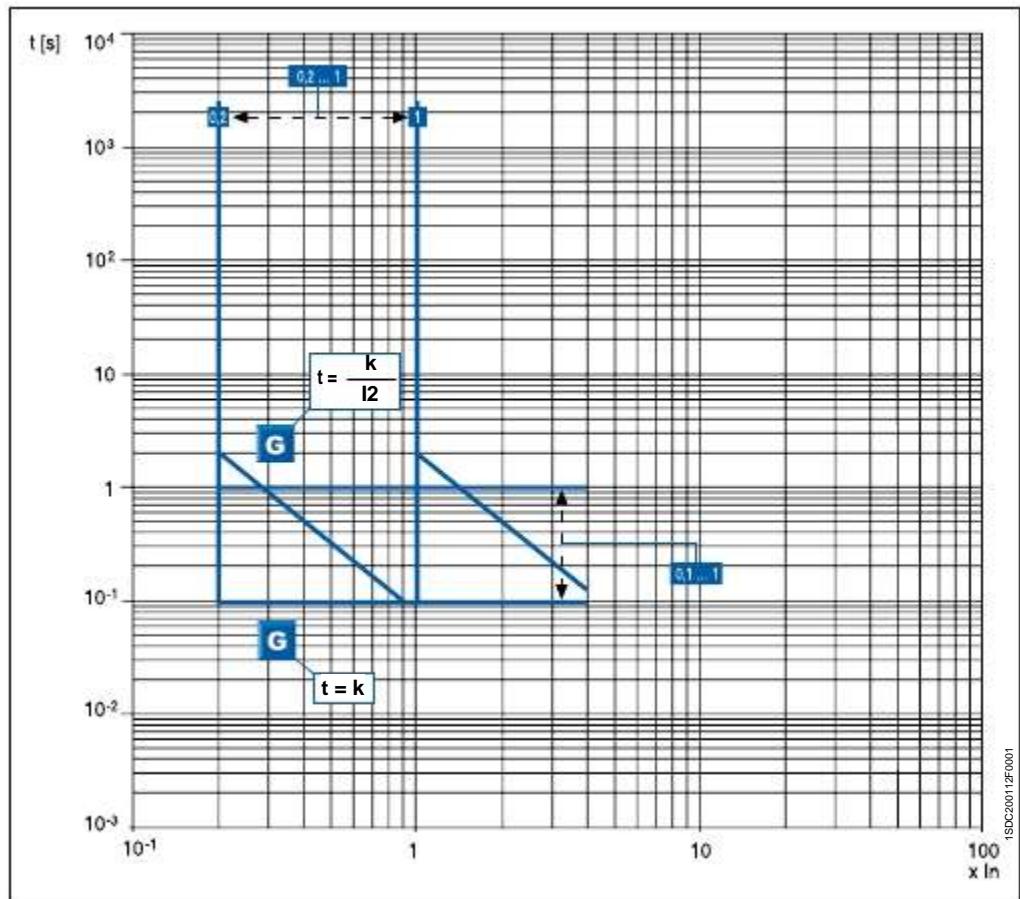
Functions L-S-I



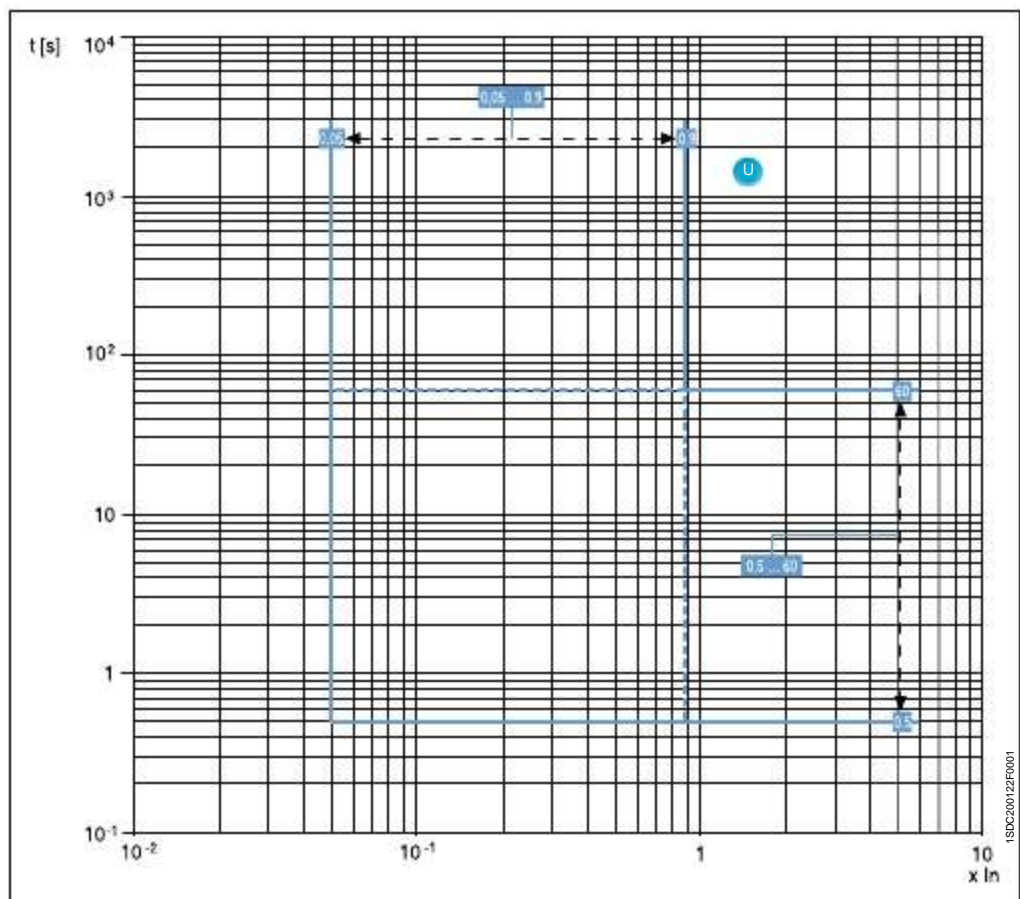
Protection trip units and trip curves

PR 23/DC

Function G



Function U

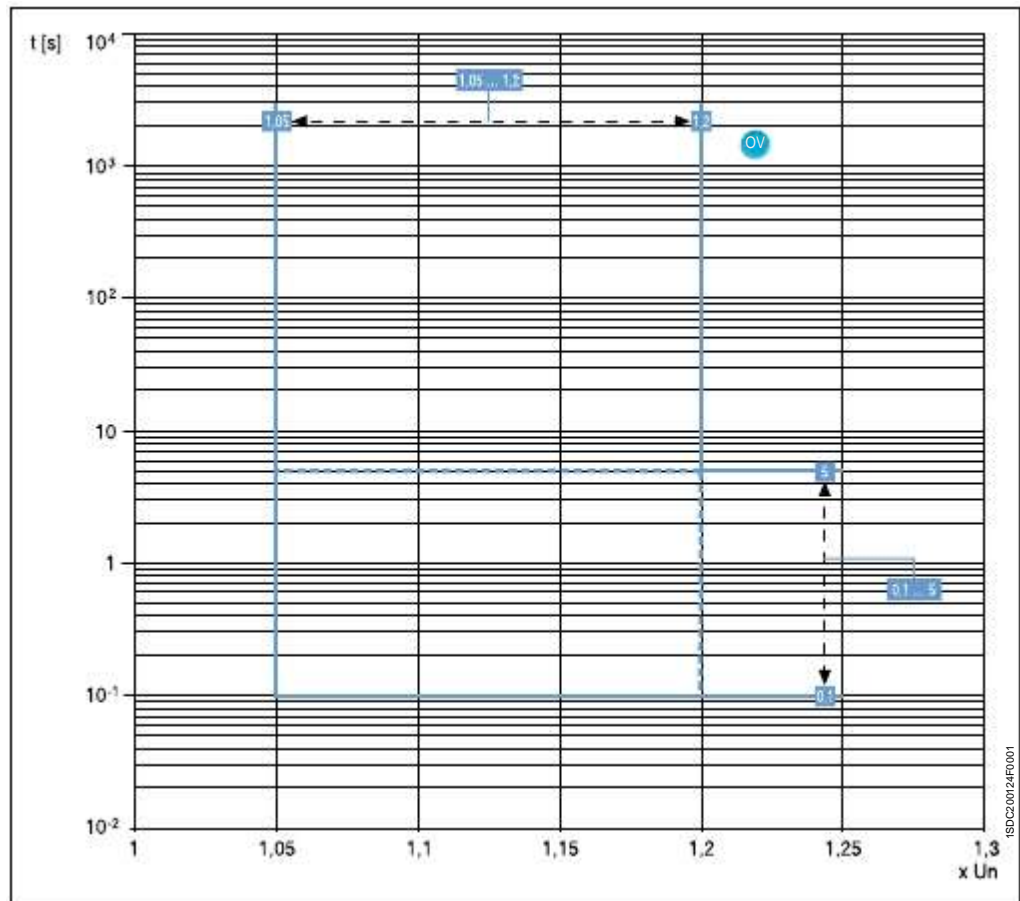




Protection trip units and trip curves

PR 23/DC

Function OV



Protection trip units and trip curves

Override Protection

The automatic circuit-breakers of SACE Emax DC range are supplied of an internal back-up protection called **Override Protection** made by the Module PR120/DC always supplied with the PR122/DC and PR123/DC electronic trip units.

The Override Protection ensures the protection of the electrical plant against instantaneous short-circuit in case of any loss of power supply of the protection unit PR122/DC and PR123/DC.

The Override protection threshold depends on the circuit breaker size; as standard neither connections nor settings are in user' care.



Protection trip units and trip curves

PR 23/DC

Optional Modules for Electronic Trip units

The electronic trip units PR122/DC and PR123/DC can be equipped with the same internal optional modules already available on the electronic devices PR122/P and PR123/P for alternative current application.

Code	Internal	Description	PR123/DC
SDA058255R	PR 20/K	Internal signalling module (4 output with independent terminals)	■
SDA058256R	PR 20/K	Internal signalling module (4 output + input with a common terminal)	■
SDA058254R	PR 20/D-M	Modbus RTU communication module	■
SDA058252R ⁽¹⁾	PR 20/LV	Measurements module	■
SDA065223R ⁽²⁾	PR 20/LV	Measurements module - low voltage	■
⁽³⁾	PR 20/DC	Override protection module	■

(1) PR120/V Measurements Module always supplied with the trip units PR123/DC and PR122/DC

(2) Extracode to be specified with the circuit-breaker code to have the low voltage measuring module PR120/LV

(3) Not to be specified, always supplied with the electronic trip unit

Code	External	Description	PR123/DC
SDA058258R	PR030/B	Power supply unit	■
SDA058259R	BT030	External communication wireless unit	■
SDA063 43R	HMI030	Interface from front of panel	■
SDA048964R	PR0 0/T	External test unit	■
SDA059 46R	PR02 /K	External signalling unit	■
SDA052927R	ATS0 0	Automatic transfer switch	■
SDA060 98R	EP0 0	ABB Fieldbus plug	■

Protection trip units and trip curves

Measurements

PR122/DC

The following measurements are available

- Current;
- Instantaneous current value over a given time interval;
- Maintenance: number of operations, percentage of contact wears, opening data storage (latest 20 trips and 80 events);
- The protection records the historical data of the maximum current read.

PR123/DC

- Current;
- Maintenance: number of operations, percentage of contact wears, opening data storage (latest 20 trips and 80 events);
- Voltage;
- Instantaneous current/voltage value over a given time interval (data logger);
- Power;
- Energy;
- The protection records the historical data of the maximum current read, the maximum and minimum voltage, the total maximum and mean value of power.

Protection trip units and trip curves

Measurements

Measurement Functions

The measurements available on electronic trip units PR122/DC and PR123/DC fitted by the Modbus Communication module PR120/D-M and the protocol converter for Profibus and DeviceNet FieldBus EP010-FBP are listed on the following table.

	PR122/DC + PR120/D-M	PR123/DC + PR120/D-M	PR122/DC-PR123/DC + PR120/D-M and EP010
Communication functions			
Protocol	Modbus RTU	Modbus RTU	FBP
Physical layer	RS-485	RS-485	Profibus-DP or DeviceNet cable
Maximum baudrate	9200 bps	9200 bps	5 kbps
Measuring functions			
Currents	■	■	■
Ground current	■	■	■
Voltage		■	on demand (1)
Power		■	on demand (1)
Energy		■	on demand (1)
Signalling from functions			
LED: auxiliary power supply, warning, alarm	■	■	■
Temperature	■	■	■
Indication for L, S, I, G and other protection	■	■	■
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 (timing and trip) protection		■	on demand (1)
Reverse power protection (timing and trip)		■	on demand (1)
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/close	■	■	■
Reset alarms	■	■	■
Setting of curves and protection thresholds	■	■	■
Synchronize system time	■	■	■
Events			
Status changes in circuit-breaker, protections and all alarms	■	■	■

(1) please ask ABB for further details

Accessories

Electrical and Mechanical Accessories

Accessories

The SACE Emax DC family can be fitted by the same electrical and mechanical accessories already available on the standard alternative current family.

The ranges	Automatic circuit-breakers		Switch-disconnectors		Isolating truck (CS)	Earthing switch with making capacity (MPT)	Earthing truck (MT)
	Circuit-breakers with full-size neutral		Switch-disconnectors for applications up to 1150V AC				
	Circuit-breakers for applications up to 1150V AC		Switch-disconnectors for applications up to 1000V DC				
Circuit-breaker version	Fixed	Withdrawable	Fixed	Withdrawable	Withdrawable	Withdrawable	Withdrawable
a) Shunt opening/closing release (YO/YC) and second opening release (YO2)	■	■	■	■		■ (YC)	
b) SOR test unit	■	■	■	■			
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 releases tripped	■	■					
4b) Electrical signalling of electronic releases tripped with remote reset command		■	■				
5a) Electrical signalling of circuit-breaker open/closed ()	■	■	■	■		■	
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 transformer 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	■	■	■	■		■	
0) Interlock between circuit-breakers (2)	■	■	■	■			
) Automatic transfer switch - ATS0 0 (3)	■	■	■	■			

CAPTION

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

- (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

For Emax DC circuit-breakers accessories please refer to the same accessories codes of standard Emax AC circuit-breakers.

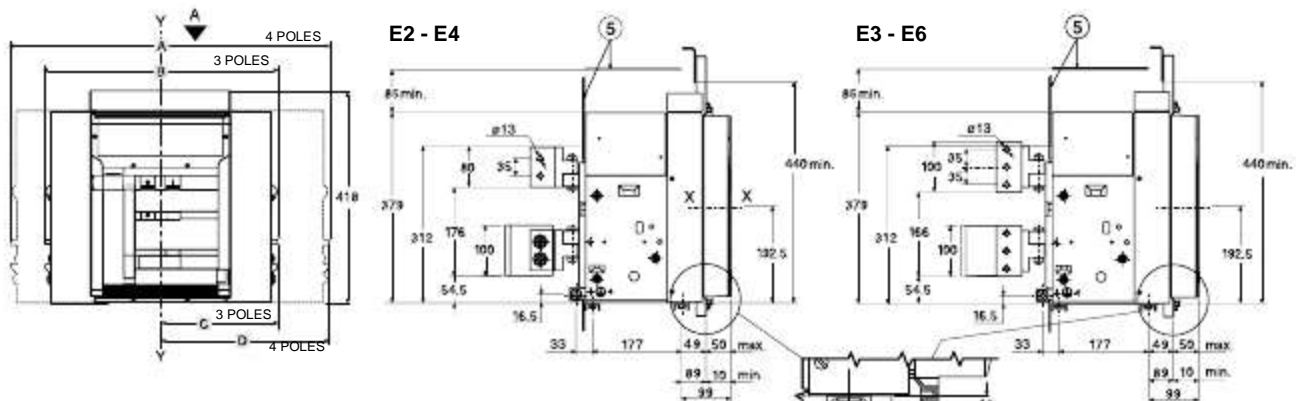
Overall dimensions

Fixed circuit-breaker

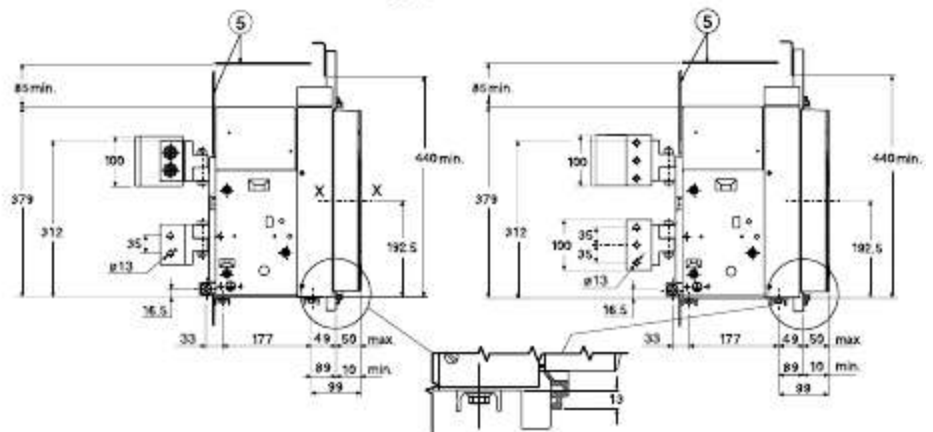
Basic version

with rear terminals

INCOMING POWER FROM UPPER TERMINALS 6



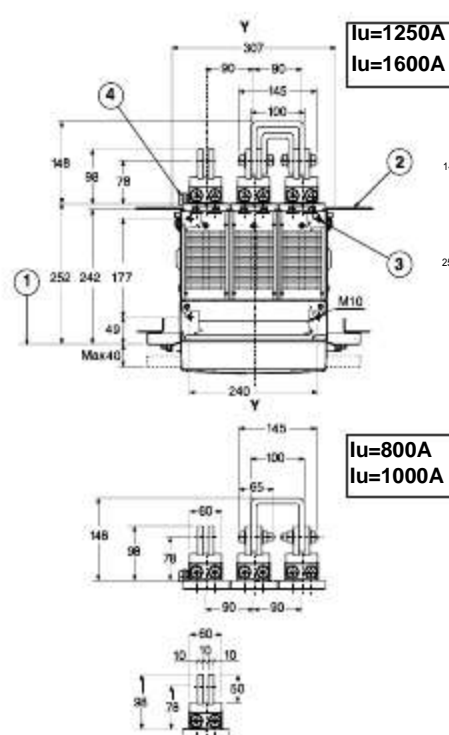
INCOMING POWER FROM BOTTOM TERMINALS 7



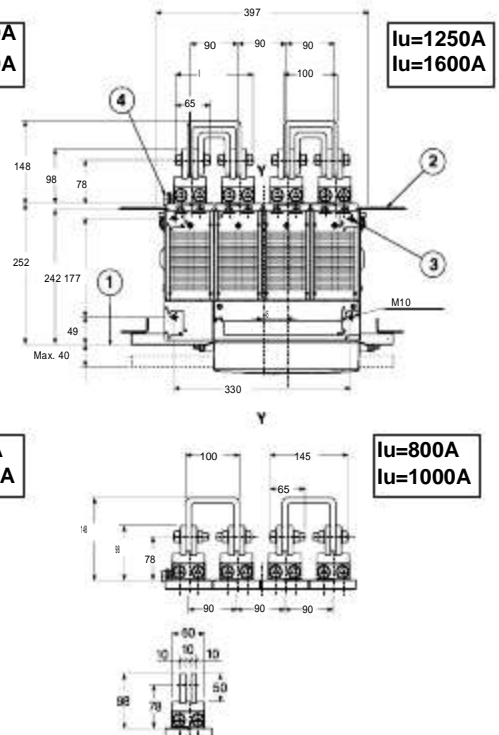
Caption

- 1 Inside edge of compartment door
- 2 Segregation (when provided)
- 3 M 0 mounting holes for circuit-breakers (use M 0 screws)
- 4 xM 2 screw (E , E2, E3) or 2xM 2 screws (E4, E6) for earthing (included in the supply)
- 5 Insulating wall or insulated metal wall
- 6 In case of incoming power from UPPER terminals – PR 20/V internal connection on upper terminals and U rear connection kits on bottom terminals
- 7 In case of incoming power from BOTTOM terminals – PR 20/V internal connection on bottom terminals and U rear connection kits on upper terminals

E2 III
View A

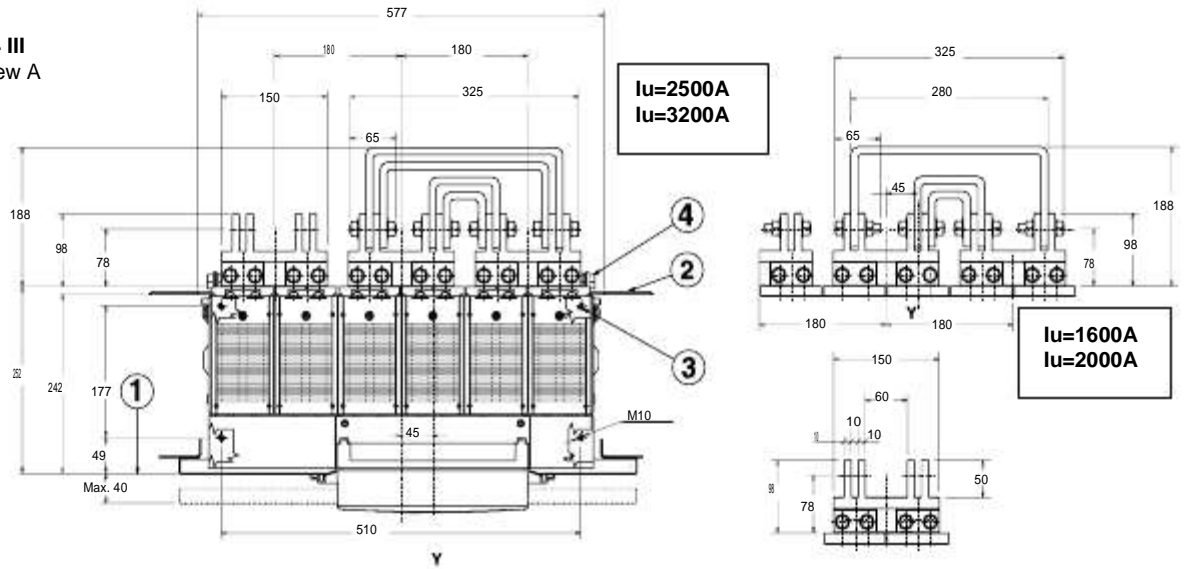


E2 IV
View A

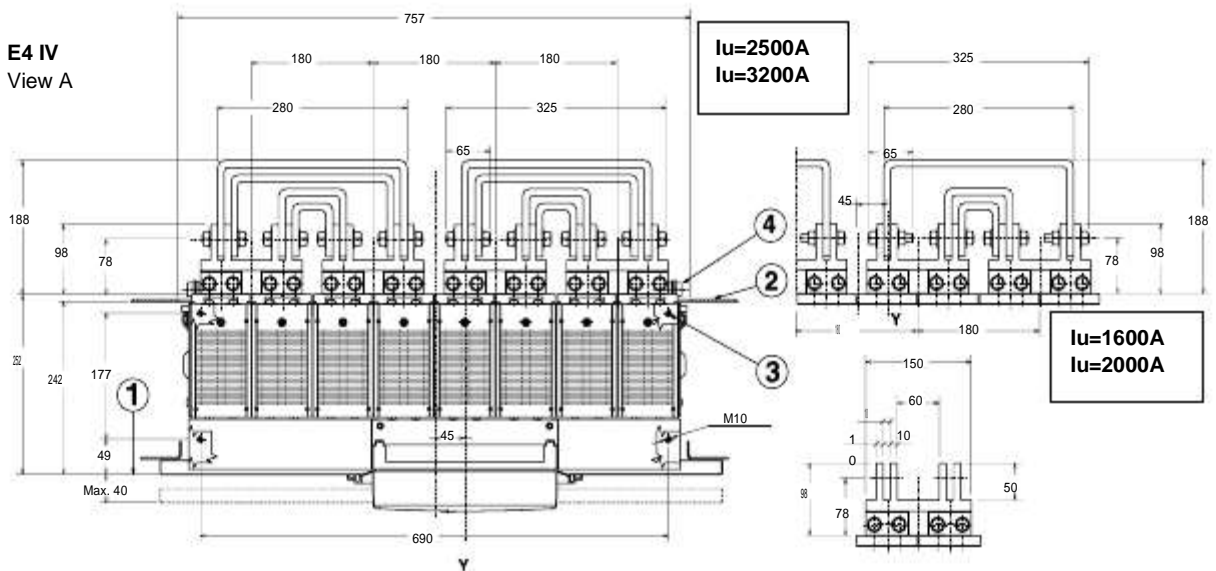


	A	B	C	D
E2	386	296	48	48
E3	530	404	202	202
E4	746	566	238	328
E6	034	782	328	454

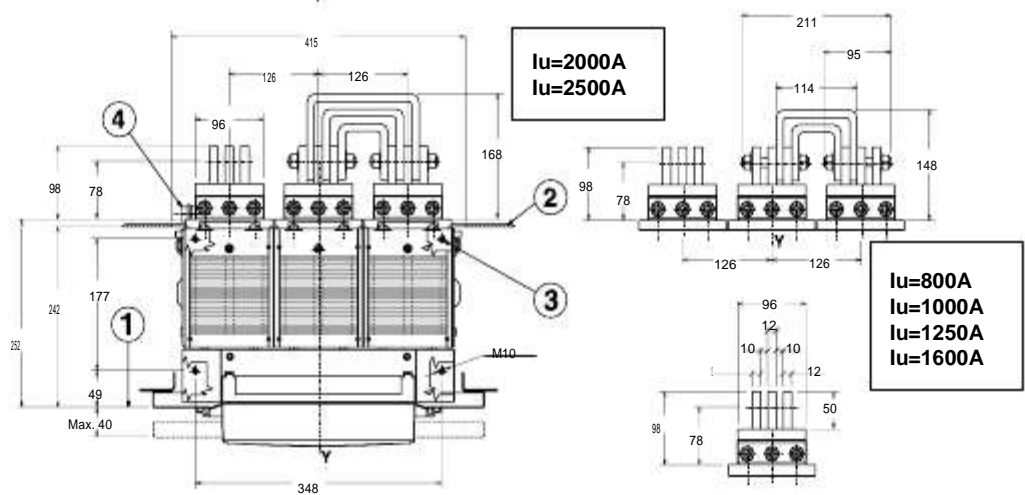
E4 III
View A



E4 IV
View A



E3 III
View A

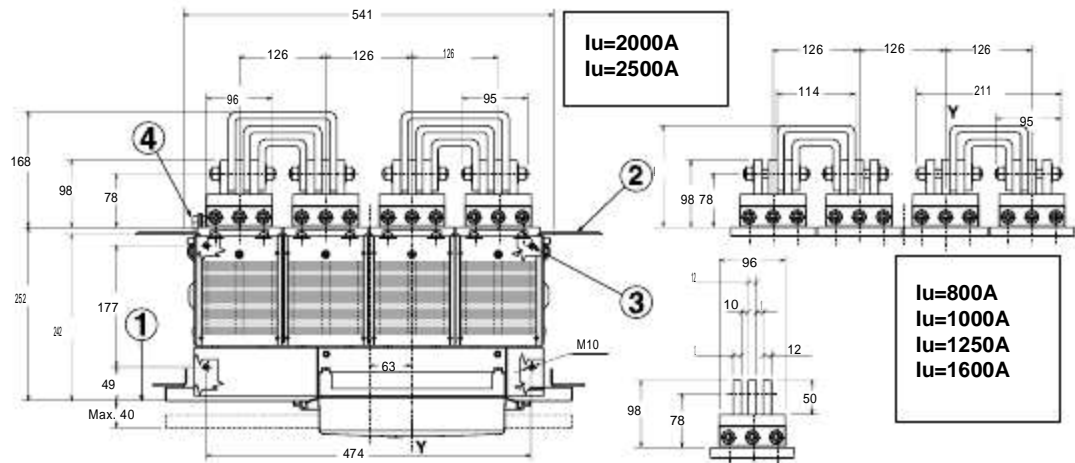


Overall dimensions

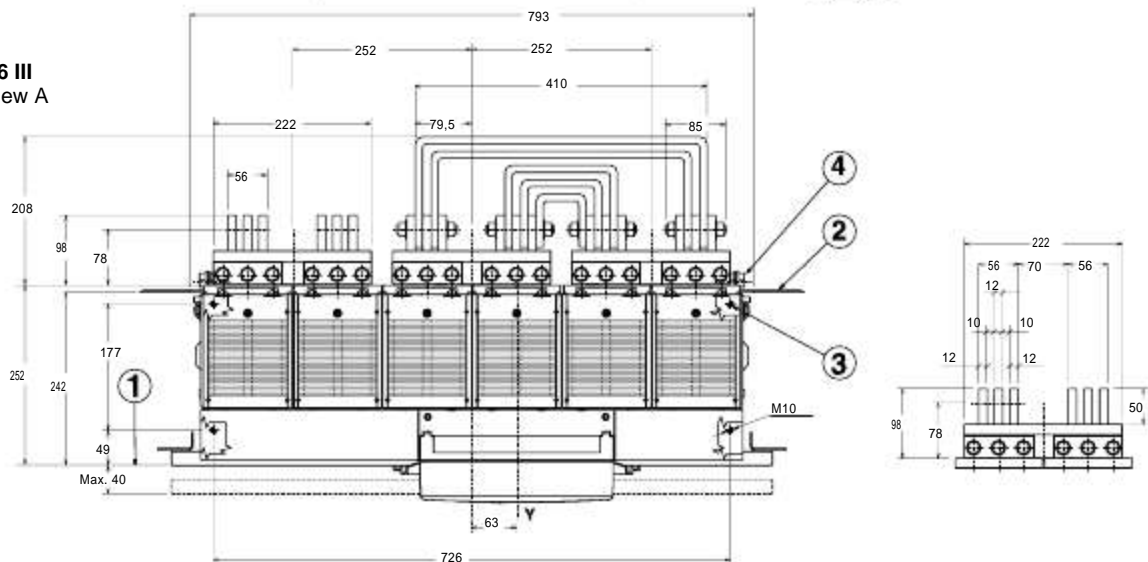
Fixed circuit-breaker

Basic version with rear terminals

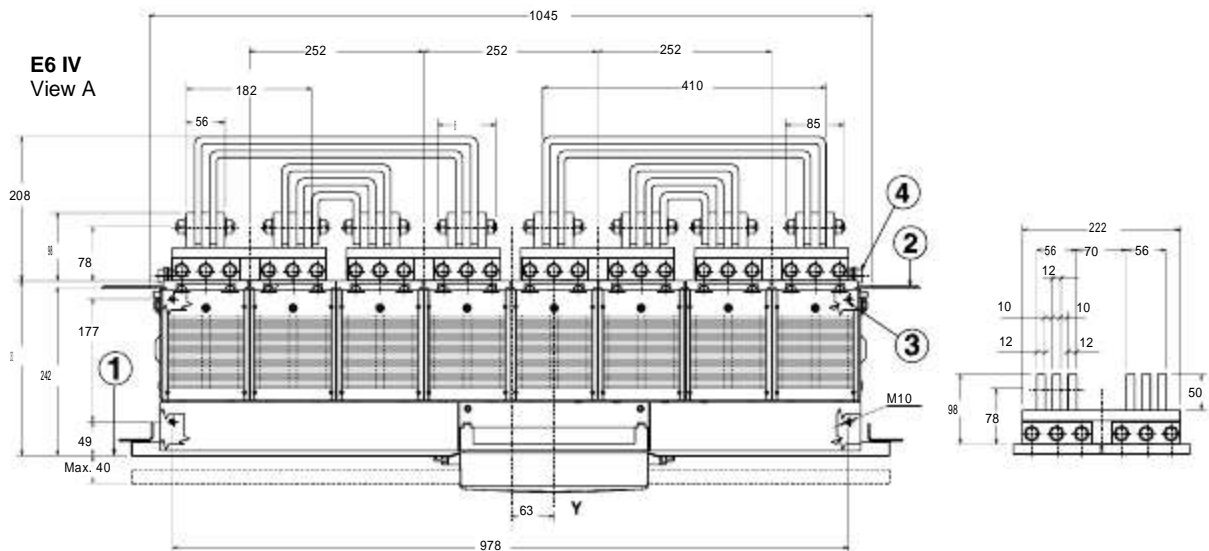
E3 IV
View A

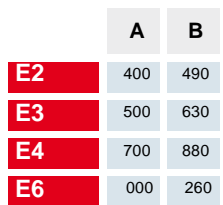


E6 III
View A

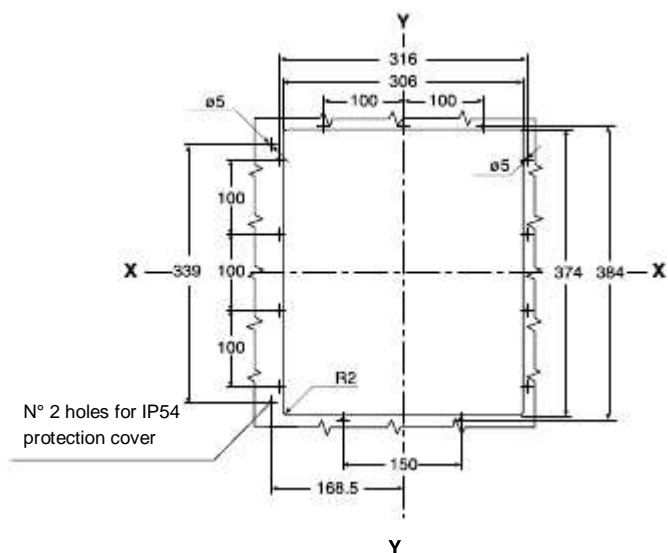


E6 IV
View A





Drilling of compartment door

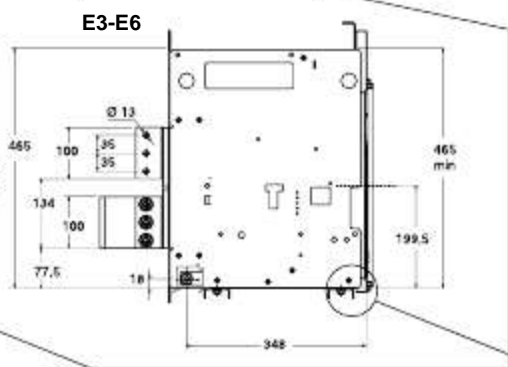
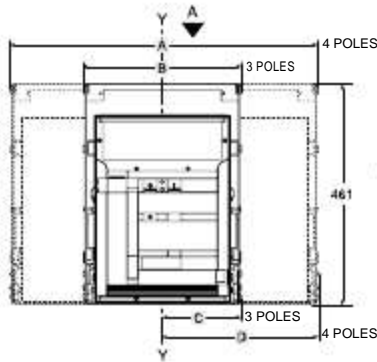


Overall dimensions

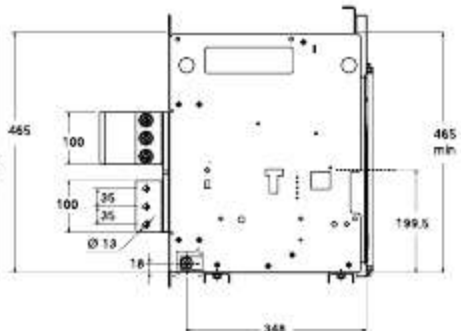
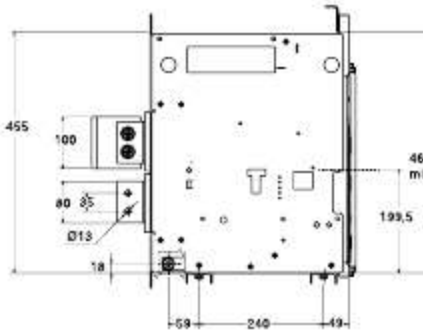
Withdrawable circuit-breaker

Basic version with rear terminals

INCOMING POWER FROM UPPER TERMINALS 6



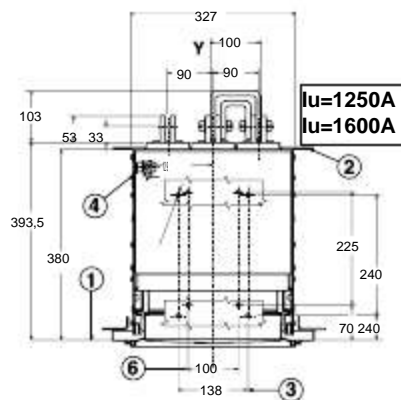
INCOMING POWER FROM BOTTOM TERMINALS 7



Caption

- ① Inside edge of compartment door
- ② Segregation (when provided)
- ③ M 0 mounting holes for circuit-breakers (use M 0 screws)
- ④ xM 2 screw (E , E2, E3) or 2xM 2 screws (E4, E6) for earthing (included in the supply)
- ⑤ Insulating wall or insulated metal wall
- ⑥ In case of incoming power from UPPER terminals – PR 20/V internal connection on upper terminals and U rear connection kits on bottom terminals
- ⑦ In case of incoming power from BOTTOM terminals – PR 20/V internal connection on bottom terminals and U rear connection kits on upper terminals

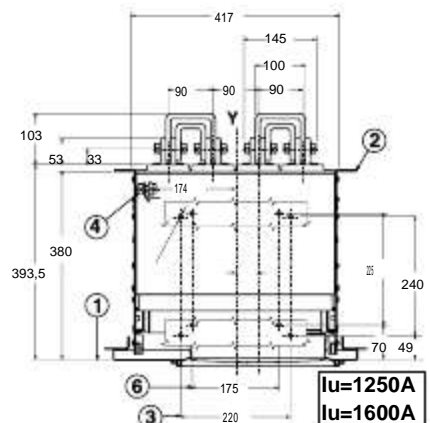
E2 III
View A



Iu=1250A
Iu=1600A

Iu=800A
Iu=1000A

E2 IV
View A

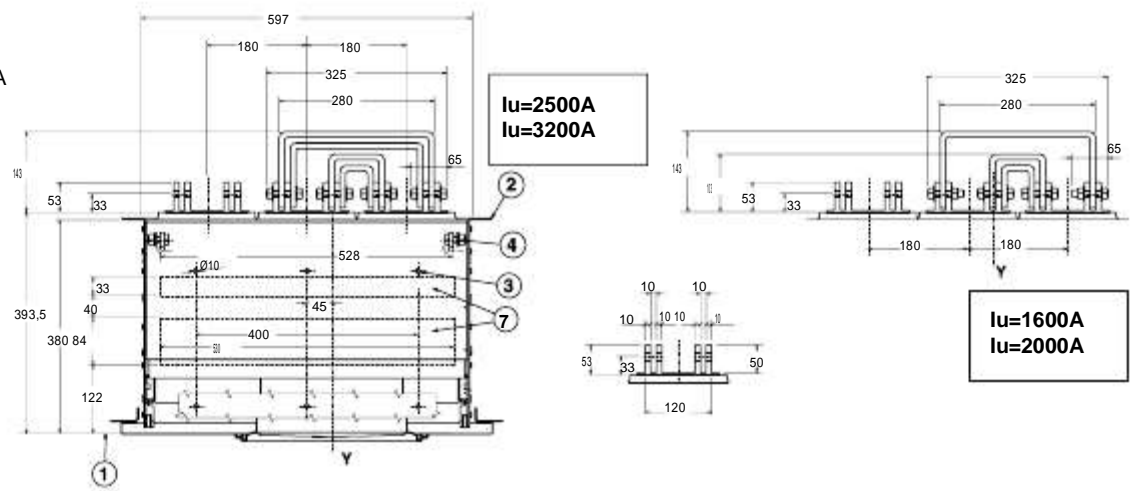


Iu=1250A
Iu=1600A

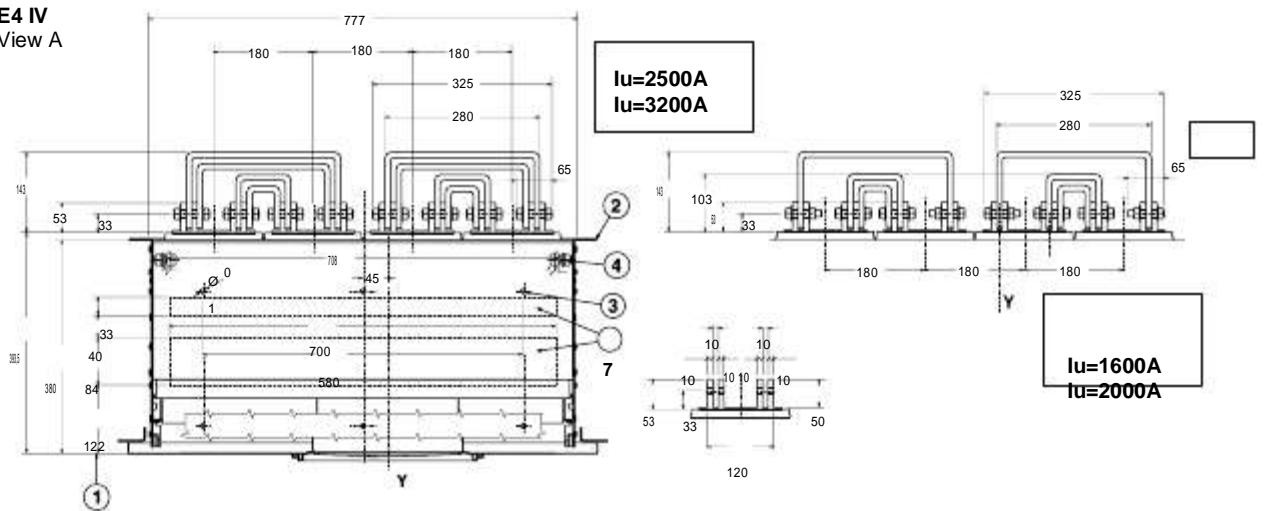
Iu=800A
Iu=1000A

	A	B	C	D
E2	44	324	62	62
E3	558	432	26	26
E4	774	594	252	342
E6	1062	800	342	468

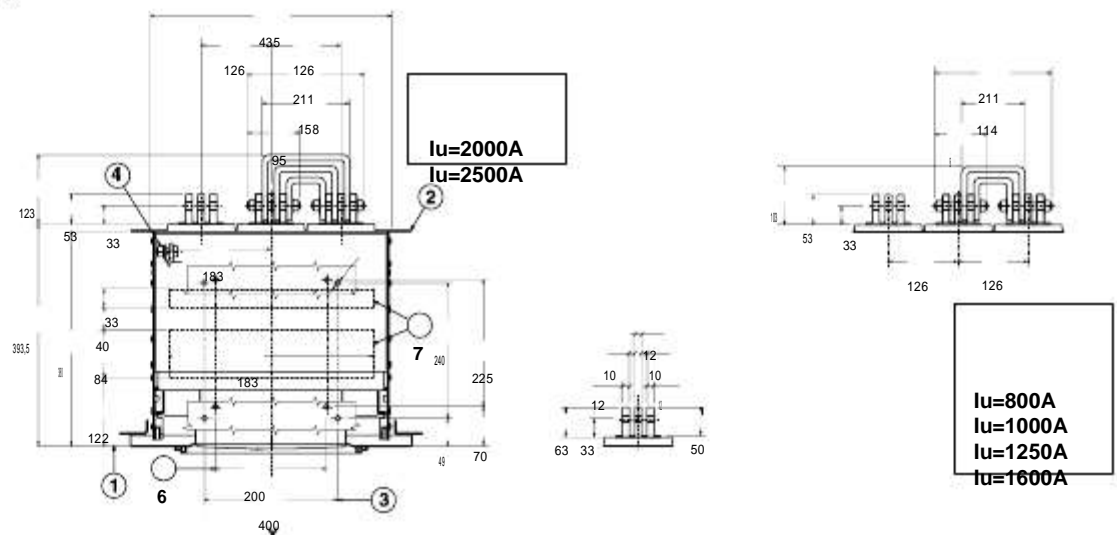
E4 III
View A



E4 IV
View A



E3 III
View A

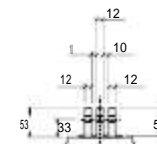
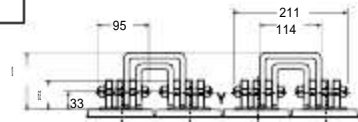
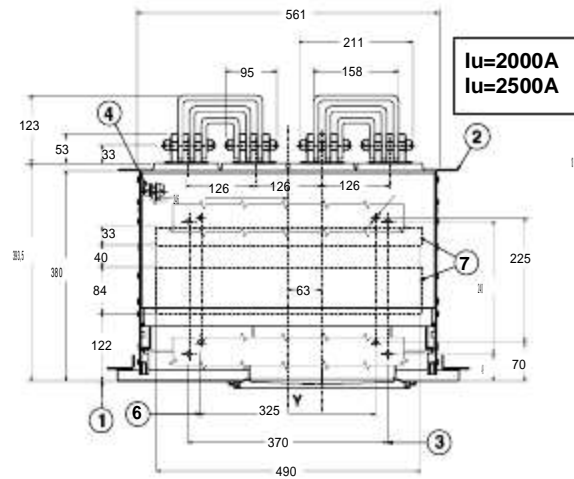


Overall dimensions

Withdrawable circuit-breaker

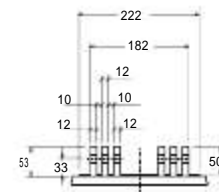
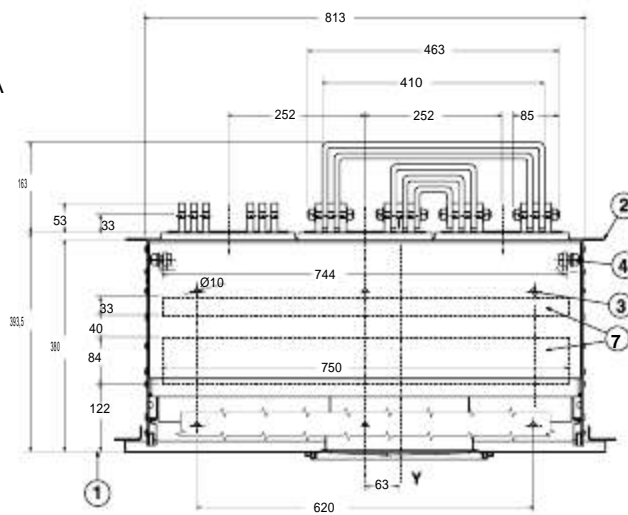
Basic version with rear terminals

E3 IV
View A

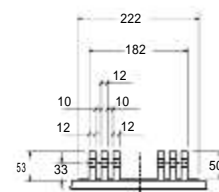
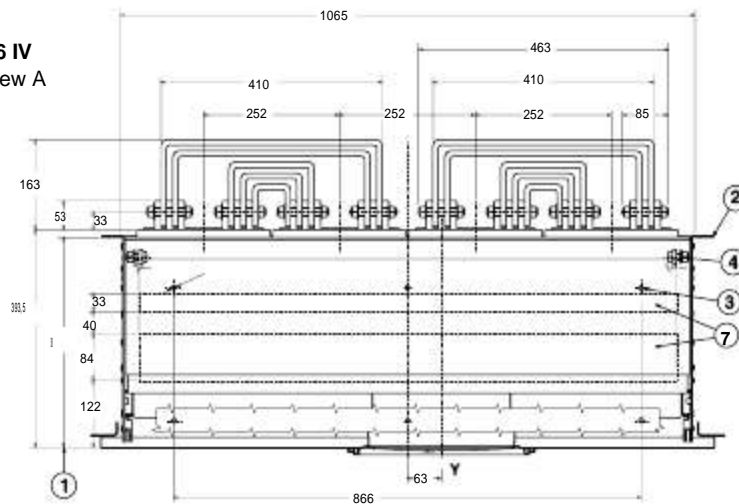


Iu=800A
Iu=1000A
Iu=1250A
Iu=1600A

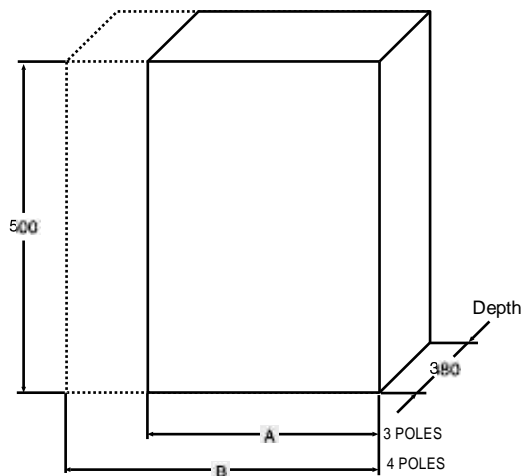
E6 III
View A



E6 IV
View A

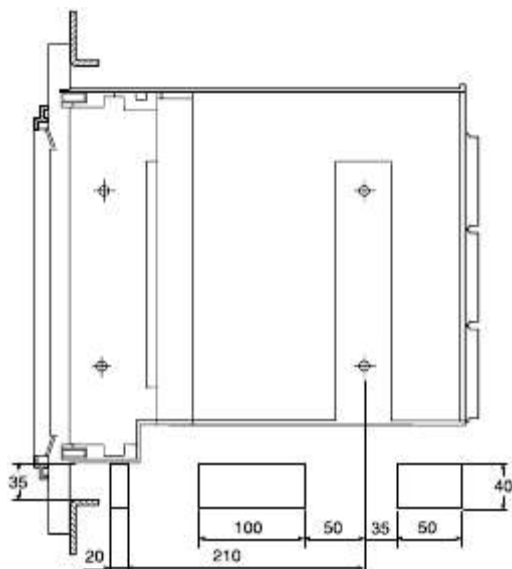


Compartment dimensions

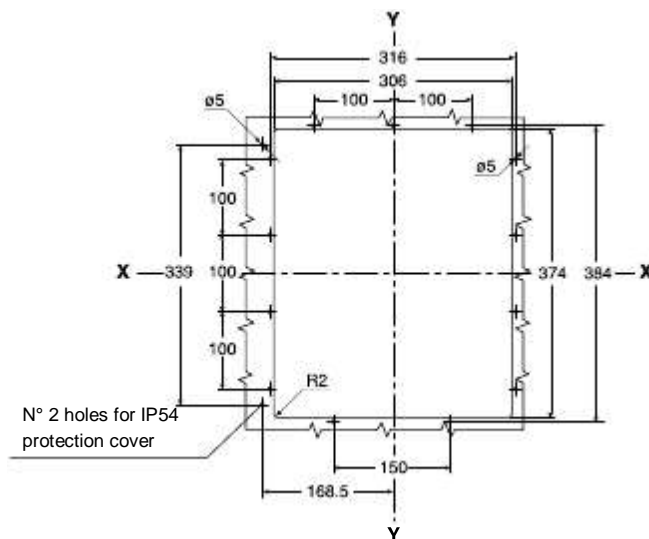


	A	B
E2	400	490
E3	500	630
E4	700	880
E6	000	260

Through-holes for flexible cables for mechanical interlocks



Drilling of compartment door



Overall dimensions

Circuit-breaker accessories

Mechanical

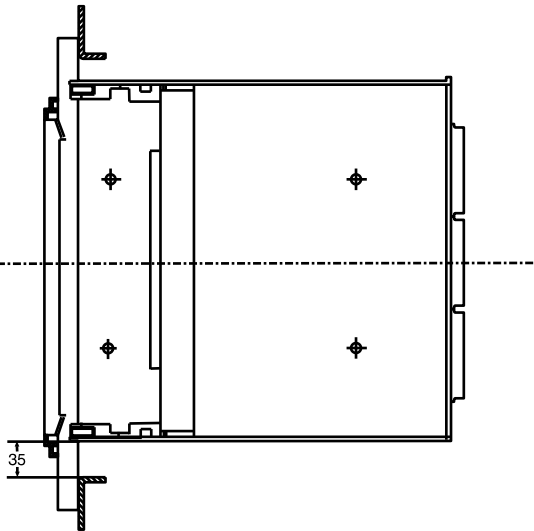
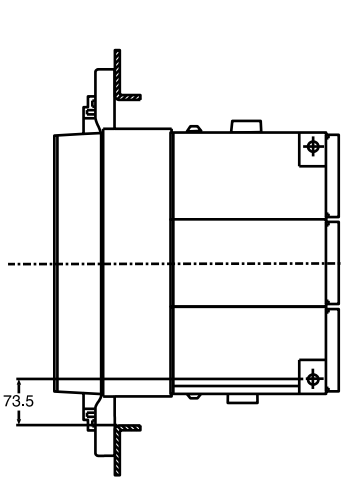
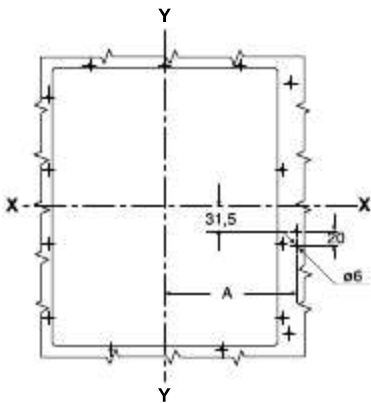
compartment door lock

Holes in compartment door

Minimum distance between circuit-breakers and switchboard wall

Fixed version

Withdrawable version



	A	
	3 POLES	4 POLES
E2	80	80
E3	234	234
E4	270	360
E6	360	486

Circuit diagrams

Reading information

Warning

Before installing the circuit-breaker, carefully read note F 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
- releases 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 with PR122/DC electronic trip unit

Version with PR123/DC electronic trip unit

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
D	= Electronic time-delay device of the undervoltage release, outside the circuit-breaker
F1	= Delayed-trip fuse
K51	= PR122/DC, PR123/DC electronic trip unit with the following protection functions: <ul style="list-style-type: none">- 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	= Zone selectivity: input for protection G (only with Uaux. and PR123/DC trip unit)
K51/GZout	= Zone selectivity: output for protection G (only with Uaux. and PR123/DC trip unit)
K51/IN1	= Digital programmable input (available only with Uaux and PR122/DC or PR123/DC trip unit with indicator module PR120/K)
K51/P1...P4	= Programmable electrical signalling (available only with Uaux and PR122/DC or PR123/DC trip unit with indicator module PR120/K)
K51/SZin	= Zone selectivity: input for protection S (only with Uaux. And PR123/DC trip unit)
K51/SZout	= Zone selectivity: output for protection S (only with Uaux. And PR123/DC trip unit)
K51/YC	= Closing control from PR122/DC or PR123/DC electronic trip unit with communication module PR120/D-M
K51/YO	= Opening control from PR122/DC or PR123/DC 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 release. 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

Circuit diagrams

Reading information

W1	= Serial interface with control system (external bus): EIA RS485 interface (see note E)
W2	= Serial interface with the accessories of PR122/DC and PR123/DC 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 PR122/DC and PR123/DC trip units
XK2 - XK3	= Connectors for auxiliary circuits of PR122/DC and PR123/DC 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)

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 release 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. 42	= Auxiliary circuits of PR122/DC and PR123/DC trip units (see notes F, M and V).
Fig. 45	= Circuits of the communication module PR120/D-M of the PR122/DC and PR123/DC trip units (optional, see note E).
Fig. 46	= Circuits of the indicator module PR120/K of the PR122/DC and PR123/DC trip units - connection 1 (optional; see note V).
Fig. 47	= Circuits of the indicator module PR120/K of the PR122/DC and PR123/DC trip units - connection 2 (optional; see note V).
Fig. 62	= Circuits of the PR021/K signalling module (outside the circuit-breaker)

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

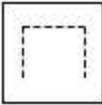



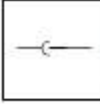
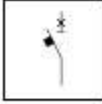

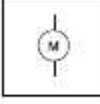



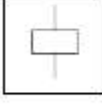

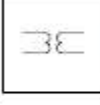
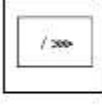
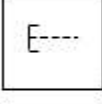
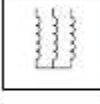
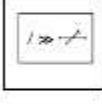
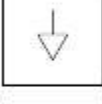
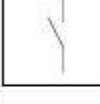

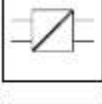


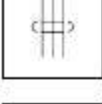

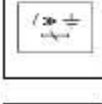
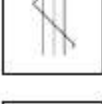

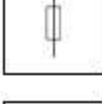
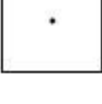

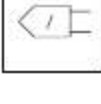
Notes

- 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 release. 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 RE1134001 document
- F) The auxiliary voltage U_{aux} allows actuation of all operations of the PR122/DC and PR123/DC 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.
- N) With PR122/DC and PR123/DC 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.
- P) With PR122/DC and PR123/DC 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 release may be installed as an alternative to the undervoltage release.
- S) Also available in the version with normally-closed contact
- V) If fig. 22 is present (second set of auxiliary contacts) simultaneously as PR122/DC or PR123/DC release, 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

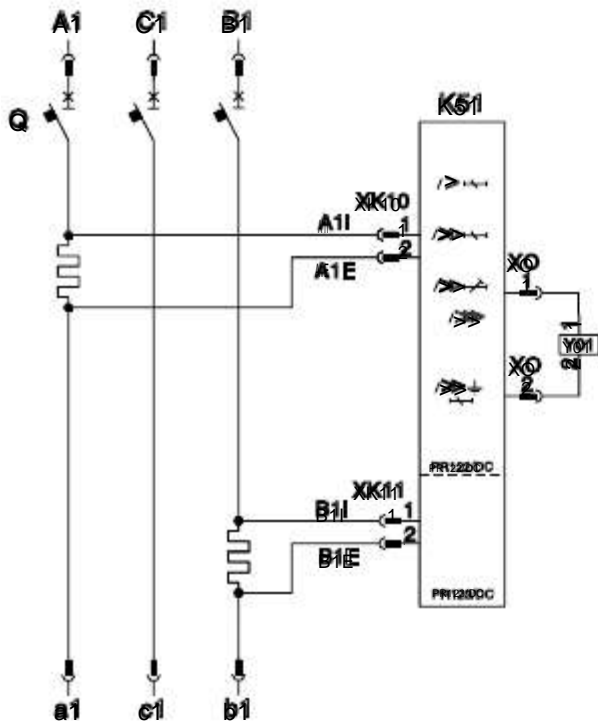
Circuit diagram symbols (IEC 606 7 and CEI 3- 4 ... 3-26 Standards)

	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 release
	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

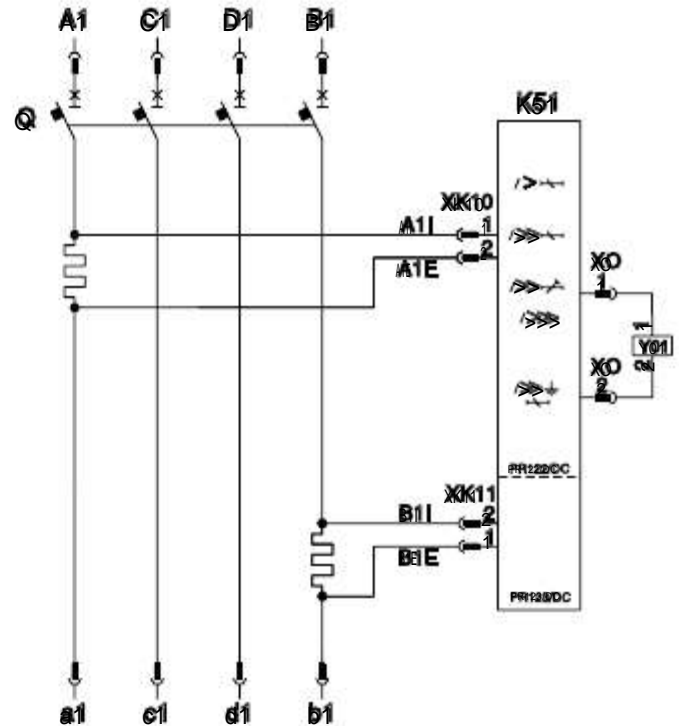
Circuit diagrams

Circuit-breakers

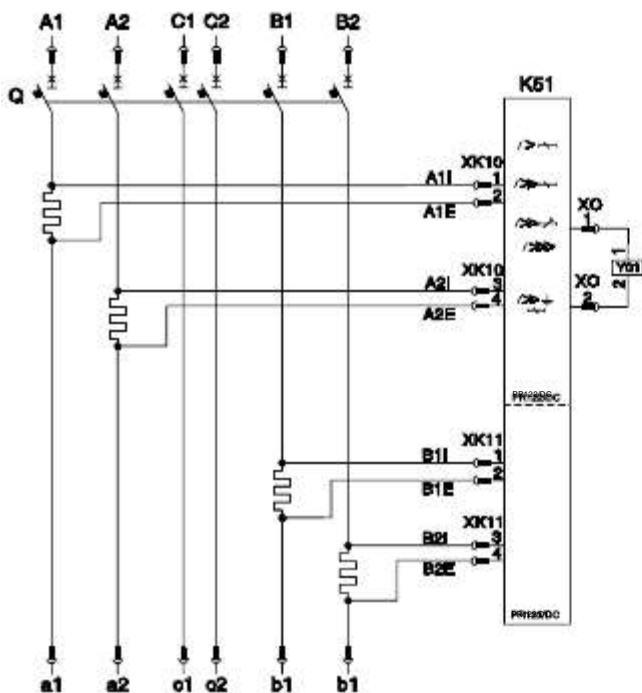
Operating status



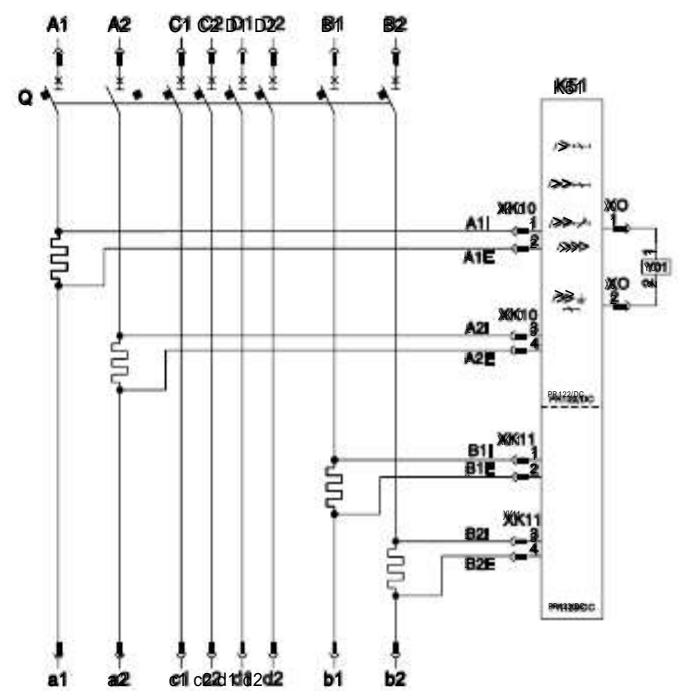
Three-pole circuit-breaker with PR122/DC or PR123/DC electronic trip units



Four-pole circuit-breaker with PR 22/DC or PR 23/DC electronic trip units



Three-pole circuit-breaker with PR 22/DC or PR 23/DC electronic trip units

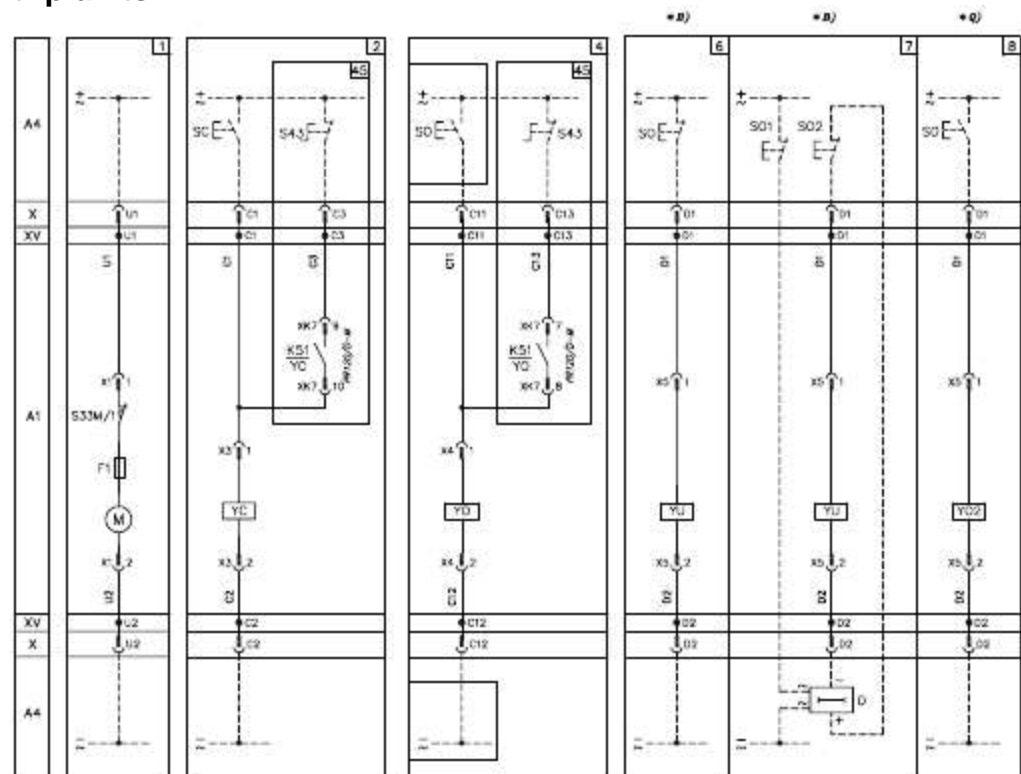


Four-pole circuit-breaker with PR 22/DC or PR 23/DC electronic trip units

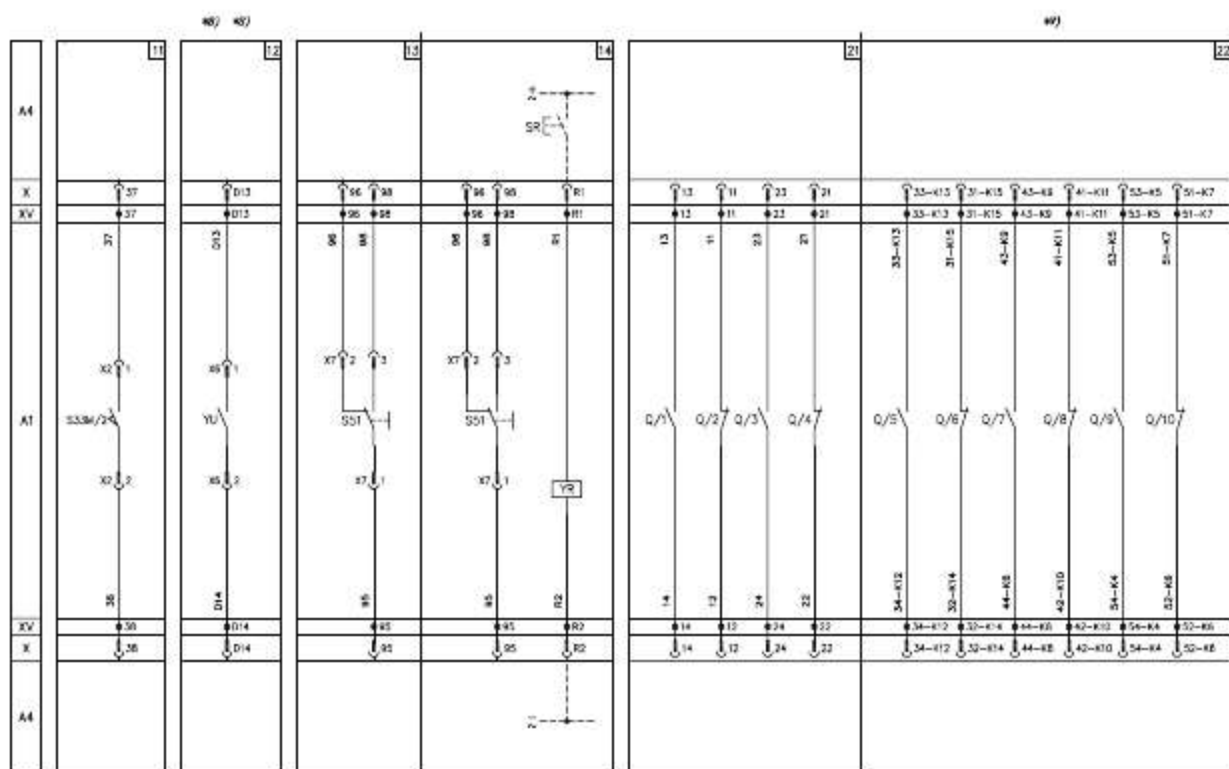
Circuit diagrams

Circuit-breakers

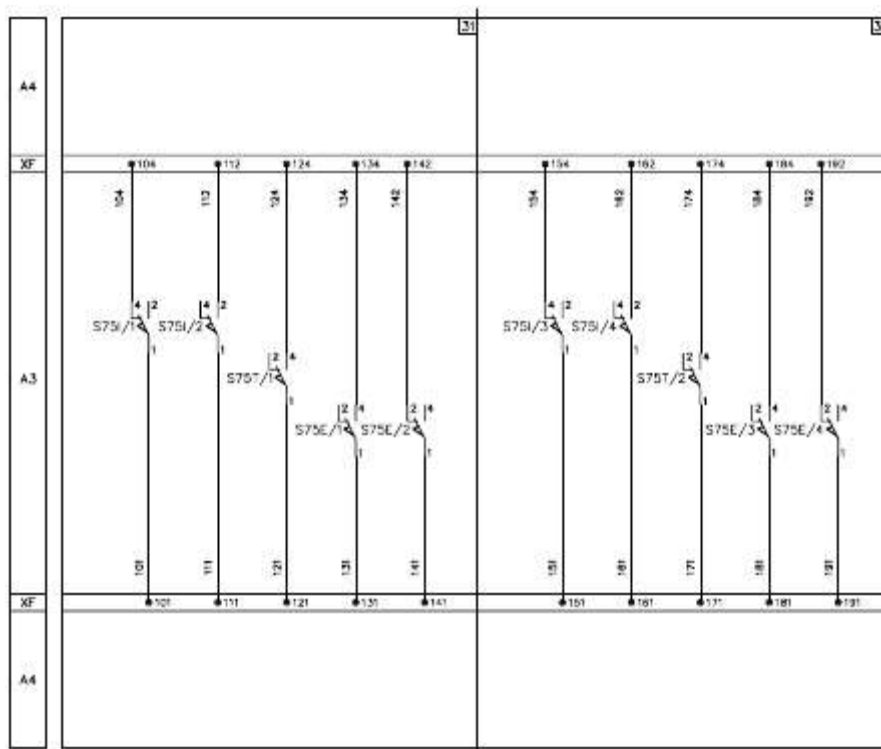
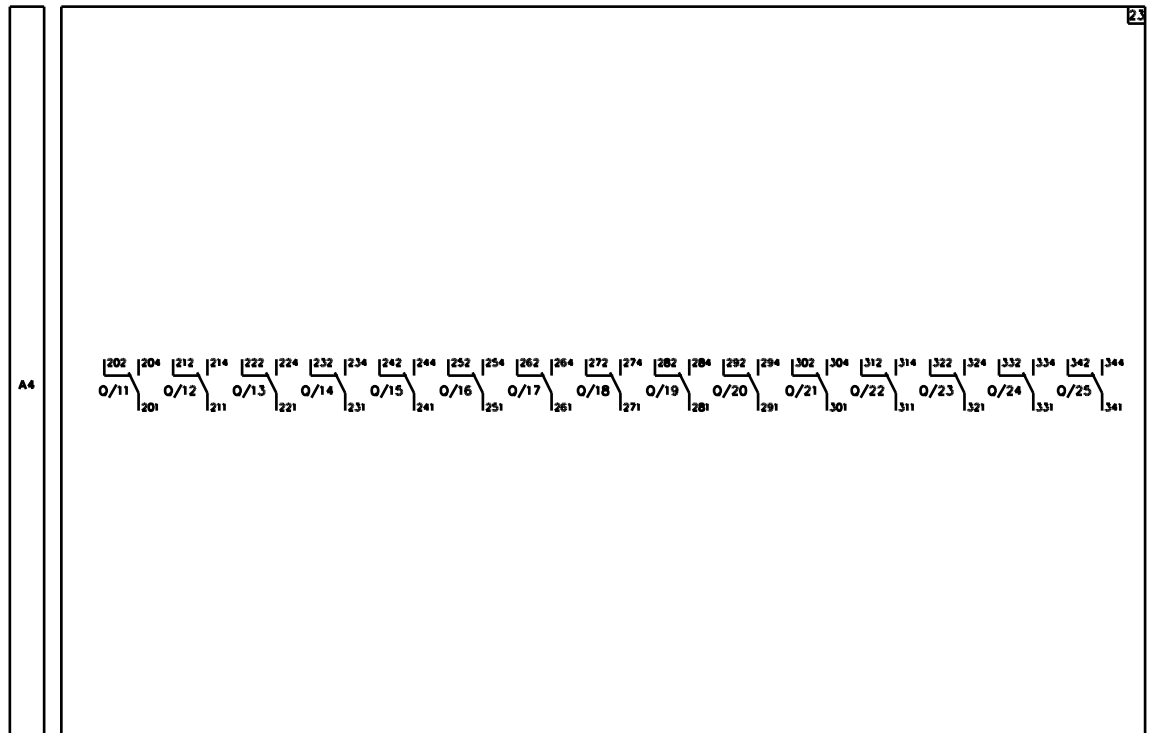
Motor operating mechanism, opening, closing and undervoltage trip units



Signalling contacts



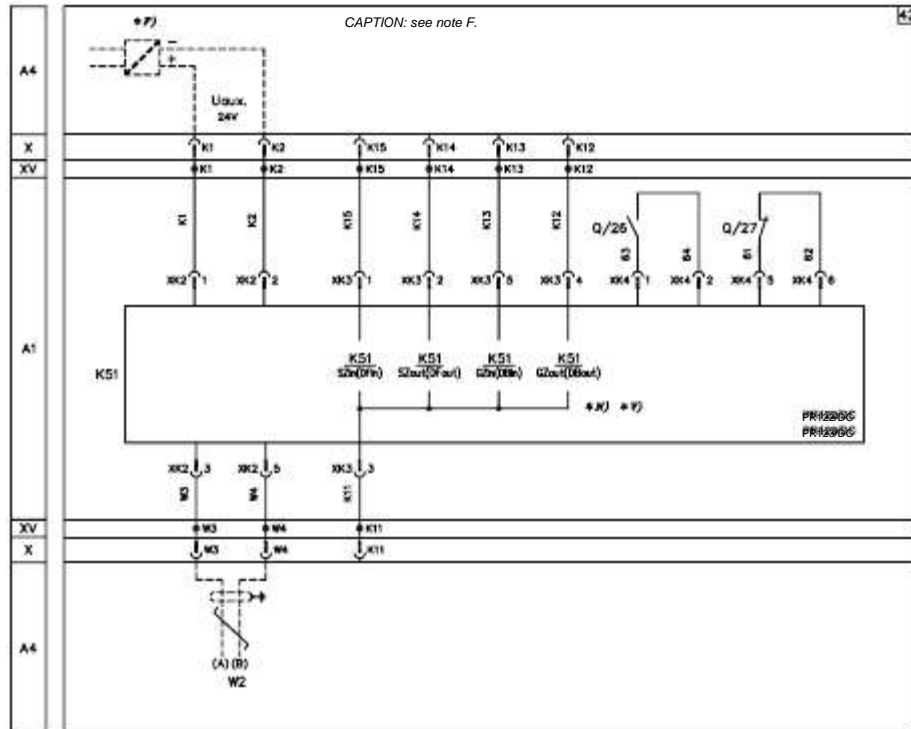
Signalling contacts



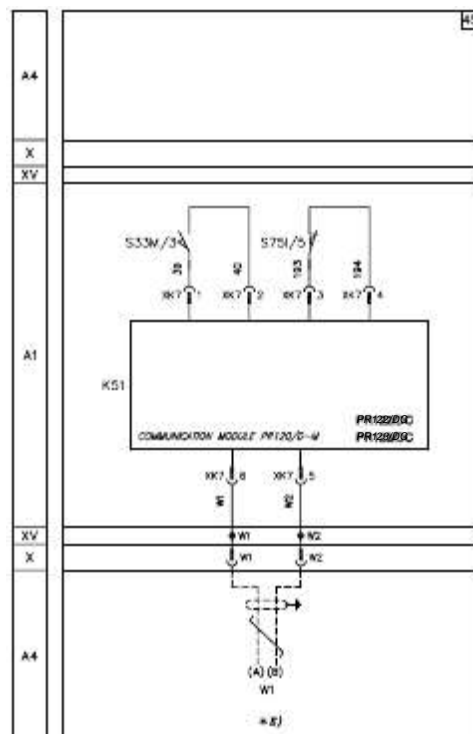
Circuit diagrams

Circuit-breakers

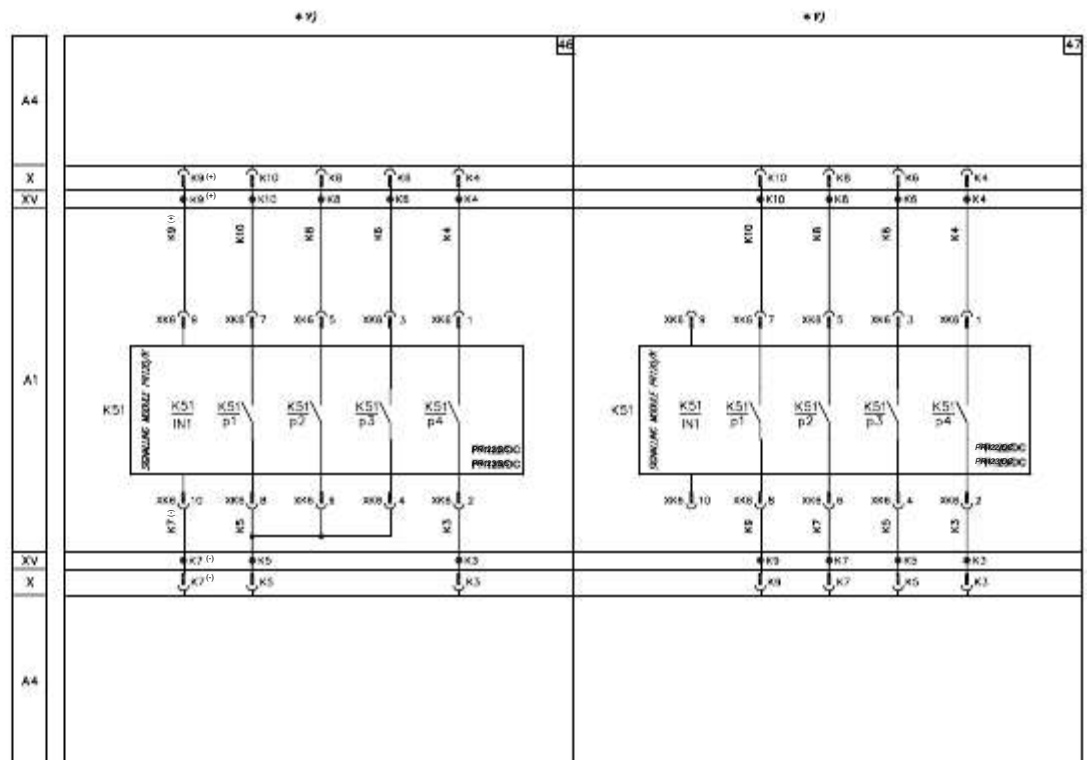
Auxiliary circuits of the PR122/DC and PR123/DC trip units



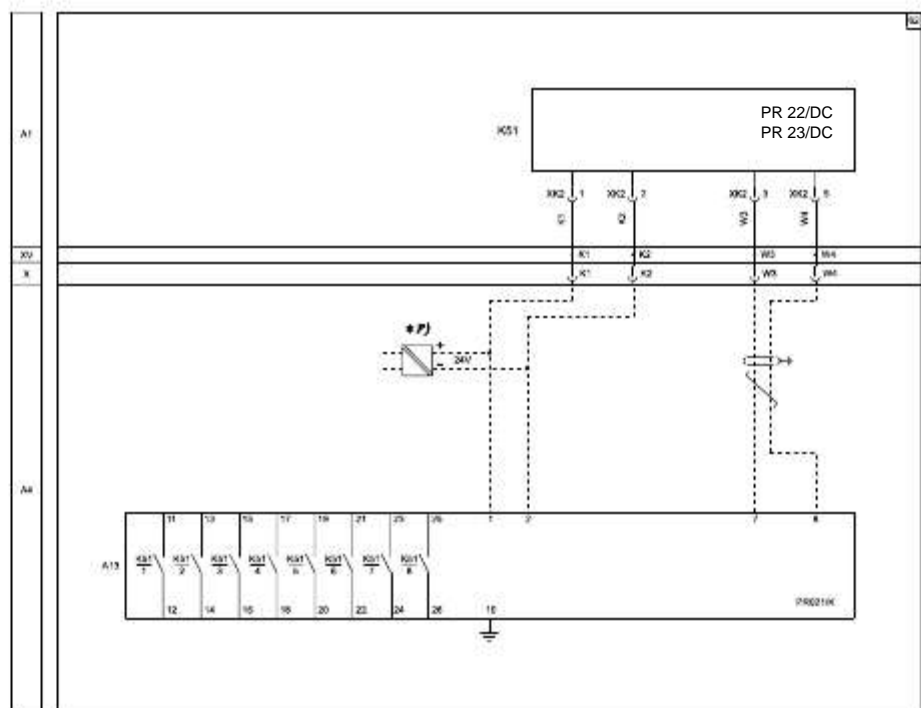
Communication module PR120/D-M



Signalling module PR120/K



PR021/K Signalling unit



Ordering codes

SACE Emax DC automatic circuit-breakers for application
up to 000 V DC



PR122/DC

SDA.....R
3 Poles

4 Poles

PR123/DC

SDA.....R
3 Poles

4 Poles

E2 08

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 800\text{ A}$

VR = Vertical rear terminals

B	064580	064585	064668	064673
---	--------	--------	--------	--------

E2 10

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 1000\text{ A}$

VR = Vertical rear terminals

B	06458	064586	064669	064674
---	-------	--------	--------	--------

E2 12

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 1250\text{ A}$

VR = Vertical rear terminals

B	064582	064587	064670	064675
---	--------	--------	--------	--------

E2 16

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 1600\text{ A}$

VR = Vertical rear terminals

B	064583	064588	06467	064676
N	064584	064589	064672	064677

E3 08

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 800\text{ A}$

VR = Vertical rear terminals

N	064600	064609	064688	064697
---	--------	--------	--------	--------

E3 10

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 1000\text{ A}$

VR = Vertical rear terminals

N	06460	0646 0	064689	064698
---	-------	--------	--------	--------

E3 12

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 1250\text{ A}$

VR = Vertical rear terminals

N	064602	0646	064690	064699
---	--------	------	--------	--------

E3 16

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 1600\text{ A}$

VR = Vertical rear terminals

N	064603	0646 2	06469	064700
H	064606	0646 5	064694	064703

E3 20

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 2000\text{ A}$

VR = Vertical rear terminals

N	064604	0646 3	064692	06470
H	064607	0646 6	064695	064704

E3 25

Fixed (F)

$I_u (40\text{ }^{\circ}\text{C}) = 2500\text{ A}$

VR = Vertical rear terminals

N	064605	0646 4	064693	064702
H	064608	0646 7	064696	064705



E4 16

Fixed (F)

I_u (40 °C) = 1600 A

VR = Vertical rear terminals

S	064636	06464	064724	064729
---	--------	-------	--------	--------

E4 20

Fixed (F)

I_u (40 °C) = 2000 A

VR = Vertical rear terminals

S	064637	064642	064725	064730
---	--------	--------	--------	--------

E4 25

Fixed (F)

I_u (40 °C) = 2500 A

VR = Vertical rear terminals

S	064638	064643	064726	06473
---	--------	--------	--------	-------

E4 32

Fixed (F)

I_u (40 °C) = 3200 A

VR = Vertical rear terminals

S	064639	064644	064727	064732
H	064640	064645	064728	064733

E6 32

Fixed (F)

I_u (40 °C) = 3200 A

VR = Vertical rear terminals

H	064656	064659	064744	064747
---	--------	--------	--------	--------

E6 40

Fixed (F)

I_u (40 °C) = 4000 A

VR = Vertical rear terminals

H	064657	064660	064745	064748
---	--------	--------	--------	--------

E6 50

Fixed (F)

I_u (40 °C) = 5000 A

VR = Vertical rear terminals

H	064658	06466	064746	064749
---	--------	-------	--------	--------

1SDA.....R1

Extracode

PR120/LV	Low Voltage measuring module 24-48 V DC	065223*
PR120/V - PR120/LV	Internal connection on upper terminals	05825 **

* extracode to be specified with the circuit breaker code to have the low voltage measuring module PR120/LV

** The Emax DC is supplied ad standard for incoming power from the bottom terminals (PR120/V internal connection on bottom terminals – "U rear connection kit" mounted on upper terminals).

In case of incoming power from the upper terminals an extracode must be specified: 1SDA058251R1 (PR120/V internal connection on upper terminals – "U rear connection kit" mounted on bottom terminals).

Ordering codes

SACE Emax DC automatic circuit-breakers for application
up to 000 V DC



SDA.....R
3 Poles

4 Poles

PR123/DC

SDA.....R
3 Poles

4 Poles

E2 08

I_u (40 °C) = **800 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

B	064590	064595	064678	064683
---	--------	--------	--------	--------

E2 10

I_u (40 °C) = **1000 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

B	06459	064596	064679	064684
---	-------	--------	--------	--------

E2 12

I_u (40 °C) = **1250 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

B	064592	064597	064680	064685
---	--------	--------	--------	--------

E2 16

I_u (40 °C) = **1600 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

B	064593	064598	06468	064686
N	064594	064599	064682	064687

E3 08

I_u (40 °C) = **800 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

N	0646 8	064627	064706	0647 5
---	--------	--------	--------	--------

E3 10

I_u (40 °C) = **1000 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

N	0646 9	064628	064707	0647 6
---	--------	--------	--------	--------

E3 12

I_u (40 °C) = **1250 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

N	064620	064629	064708	0647 7
---	--------	--------	--------	--------

E3 16

I_u (40 °C) = **1600 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

N	06462	064630	064709	0647 8
H	064624	064633	0647 2	06472

E3 20

I_u (40 °C) = **2000 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

N	064622	06463	0647 0	0647 9
H	064625	064634	0647 3	064722

E3 25

I_u (40 °C) = **2500 A**

Withdrawable (W) - MP

VR = Vertical rear terminals

N	064623	064632	0647	064720
H	064626	064635	0647 4	064723



E4 16

Withdrawable (W) - MP

Iu (40 °C) = 1600 A

VR = Vertical rear terminals

S	064646	06465	064734	064739
---	--------	-------	--------	--------

E4 20

Withdrawable (W) - MP

Iu (40 °C) = 2000 A

VR = Vertical rear terminals

S	064647	064652	064735	064740
---	--------	--------	--------	--------

E4 25

Withdrawable (W) - MP

Iu (40 °C) = 2500 A

VR = Vertical rear terminals

S	064648	064653	064736	06474
---	--------	--------	--------	-------

E4 32

Withdrawable (W) - MP

Iu (40 °C) = 3200 A

VR = Vertical rear terminals

S	064649	064654	064737	064742
H	064650	064655	064738	064743

E6 32

Withdrawable (W) - MP

Iu (40 °C) = 3200 A

VR = Vertical rear terminals

H	064662	064665	064750	064753
---	--------	--------	--------	--------

E6 40

Withdrawable (W) - MP

Iu (40 °C) = 4000 A

VR = Vertical rear terminals

H	064663	064666	06475	064754
---	--------	--------	-------	--------

E6 50

Withdrawable (W) - MP

Iu (40 °C) = 5000 A

VR = Vertical rear terminals

H	064664	064667	064752	064755
---	--------	--------	--------	--------

1SDA.....R1

Extracode

PR120/LV	Low Voltage measuring module 24-48 V DC	065223*
PR120/V - PR120/LV	Internal connection on upper terminals	05825 **

* extracode to be specified with the circuit breaker code to have the low voltage measuring module PR120/LV

** The Emax DC withdrawable mobile part is supplied ad standard for incoming power from the bottom terminals (PR120/V internal connection on bottom terminals).

In case of incoming power from the upper terminals an extracode must be specified: 1SDA058251R1 (PR120/V internal connection on upper terminals).

Ordering codes

SACE Emax FP fixed parts

	750 V DC	1000 V DC
	SDA.....R	
	3 Poles	4 Poles

E2

Withdrawable (W) - FP

FP = Fixed part		
VR	059895	059906

E3

Withdrawable (W) - FP

FP = Fixed part		
VR	059896	059907

E4

Withdrawable (W) - FP

FP = Fixed part		
VR	059897	059 37

E6

Withdrawable (W) - FP

FP = Fixed part		
VR	059 40	059 43

1SDA.....R1

Extracode*

U rear Connection kit FP E2-E6 DC on upper terminals	065 69**
U rear Connection kit FP E2-E6 DC on upper terminals	065 69***

* extracode to be specified with the fixed part whenever used with Emax DC to include the mandatory U rear connection kits
** extracode to be specified for incoming power from the bottom terminals
*** extracode to be specified for incoming power from the upper terminals