



Technical catalogue / May 2016

# SACE Tmax. T Generation

## Low voltage moulded-case circuit-breakers from 250 A up to 1600 A

Power and productivity  
for a better world™





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# Main characteristics

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# Overview of the Tmax family

1



## Circuit-breakers for AC-DC distribution

Size	[A]	
In	[A]	
Poles	[Nr]	
Ue	[V]	(AC) 50 - 60 Hz
	[V]	(DC)
Icu (380-415 V AC)	[kA]	N
	[kA]	S
	[kA]	H
	[kA]	L
	[kA]	V
	[kA]	X

(1) T4 250A L, V version; (2) T6V: 630A and 800A only; (3) T7X: 800A only



## Circuit-breakers for zone selectivity

Size	[A]	
Poles	[Nr]	
Ue	[V]	(AC) 50 - 60 Hz
EFDP zone selectivity		
ZS zone selectivity		



## Circuit-breakers for motor protection

Size	[A]	
Poles	[Nr]	
Ue	[V]	(AC) 50 - 60 Hz
Magnetic only trip unit, IEC 60947-2		
PR221DS-I trip unit, IEC 60947-2		
Ekip M-LRIU trip unit, IEC 60947-4-1		
PR231/P-I trip unit, IEC 60947-2		



## Circuit-breakers for use up to 1150 V AC and 1000 V DC

Size	[A]	
Poles	[Nr]	
Icu max	[KA]	1000 V AC
	[KA]	1150 V AC
	[KA]	1000 V DC 4 poles in series



## Switch-disconnectors

Ith	[A]	
Ie	[A]	
Poles	[Nr]	
Ue	[V]	(AC) 50 - 60 Hz
	[V]	(DC)
Icm	[kA]	
Icw	[kA]	

Note: ABB SACE's moulded-case circuit-breakers are also available in the versions according to UL Standards (see catalogue "ABB SACE molded case circuit-breakers - UL 489 and CSA C22.2 Standard").

T4	T5	T6	T7
250 <sup>(1)</sup> /320	400/630	630/800/1000	800/1000/1250/1600
20...320	320...630	630...1000	200...1600
3/4	3/4	3/4	3/4
690	690	690	690
750	750	750	
36	36	36	
50	50	50	50
70	70	70	70
120	120	100	120
200	200	150 <sup>(2)</sup>	150
			170 <sup>(3)</sup>

T4	T5	T6	T7
250/320	400/630	630/800/1000	800/1000/1250/1600
3/4	3/4	3/4	3/4
690/1000	690/1000	690	690
■	■	■	■

T4	T5	T6	T7
250/320	400/630	800	800/1000/1250
3	3	3	3
690	690	690	690
■			
■	■	■	
■	■	■	
			■

T4	T5	T6	
250	400/630	630/800	
3/4	3/4	3/4	
20	20	12	
12	12		
40	40	40	

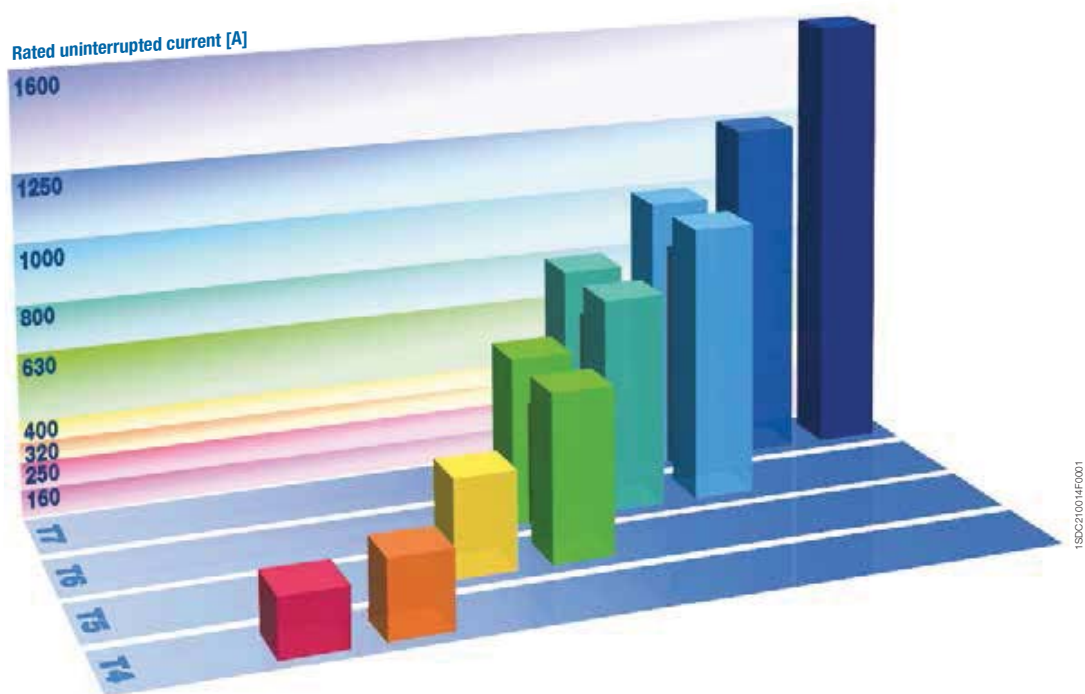
T4D	T5D	T6D	T7D
250/320	400/630	630/800/1000	1000/1250/1600
250/320	400/630	630/800/1000	1000/1250/1600
3/4	3/4	3/4	3/4
690	690	690	690
750	750	750	750
5.3	11	30	52.2
3.6	6	15	20

# General

1

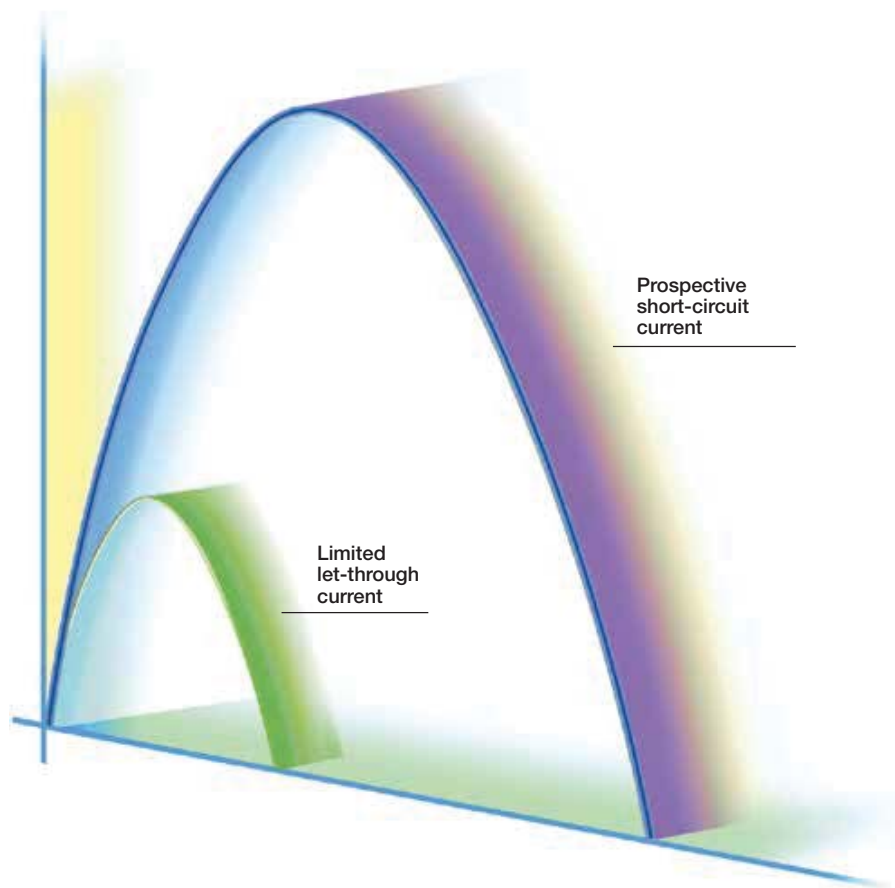
Tmax family is now available as a complete range of moulded case circuit-breakers up to 1600 A. All the circuit-breakers, both three-pole and four-pole, are available in the fixed version; the sizes T4 and T5 in the plug-in version and T4, T5, T6 and T7 in the withdrawable one as well.

With the same frame size, the circuit-breakers in the Tmax family, are available with different breaking capacities and different rated uninterrupted currents.





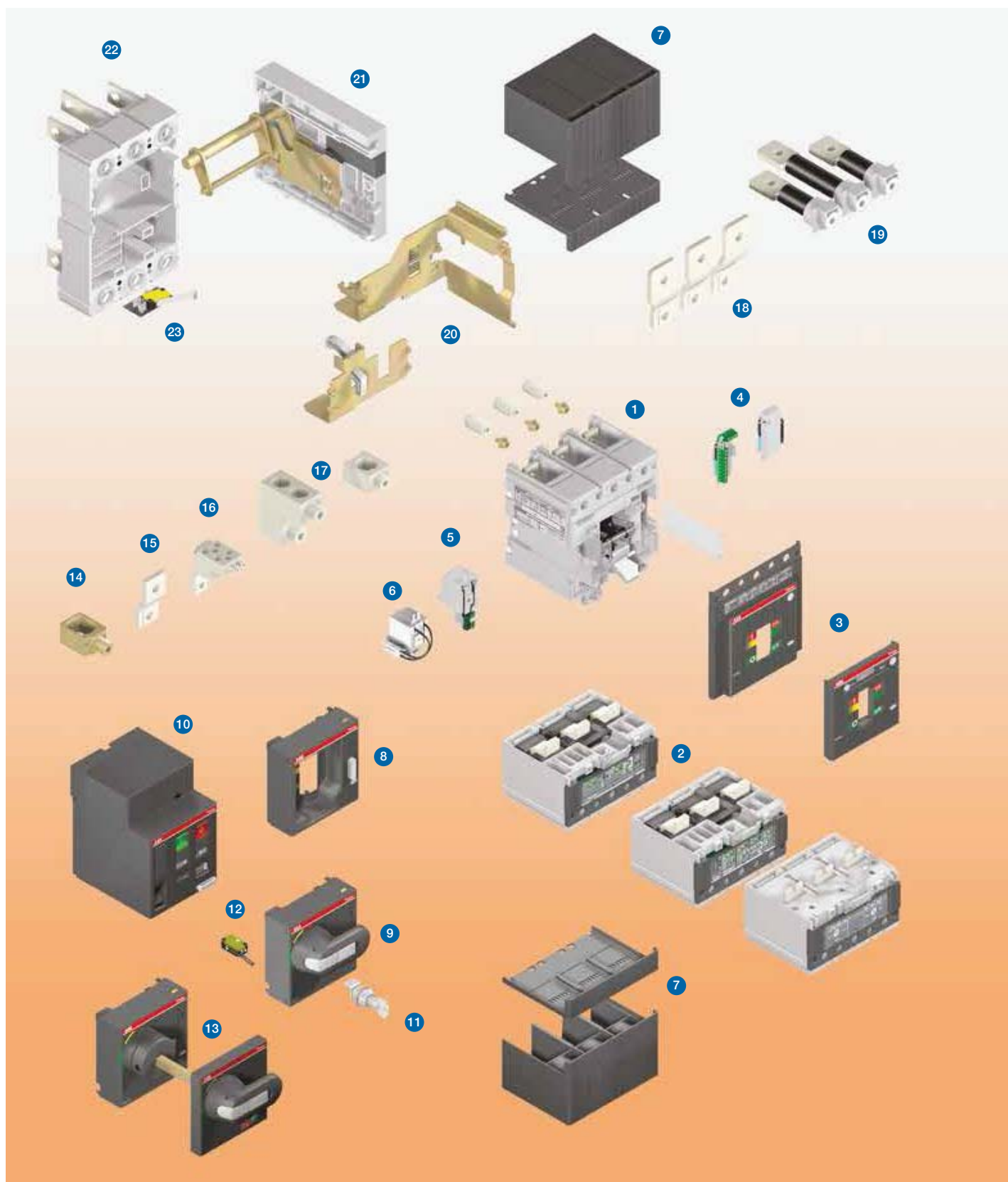
The electric arc interruption system used on Tmax circuit-breakers allows the short-circuit currents of very high value to be interrupted extremely rapidly. The considerable opening speed of the contacts, the dynamic blasting action carried out by the magnetic field and the structure of the arcing chamber contribute to extinguishing the arc in the shortest possible time, notably limiting the value of the specific let-through energy  $I^2t$  and the current peak.

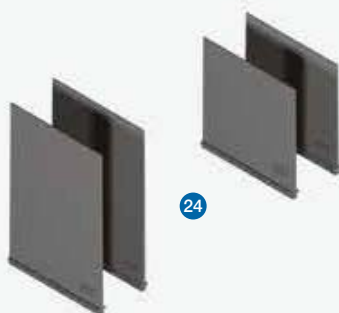


# Construction characteristics

## Modularity of the series

1





Starting from the fixed version circuit-breaker, all the other versions are obtained by means of mounting conversion kits.

The following are available:

- kit for converting a fixed circuit-breaker into the moving part of a plug-in and withdrawable one
- circuit-breaker fixed parts for plug-in and withdrawable circuit-breakers
- conversion kit for the connection terminals.

Various accessories are also available:

1. Breaking unit
2. Trip units
3. Front
4. Auxiliary contacts - AUX and AUX-E
5. Undervoltage release - UVR
6. Shunt opening release - SOR and P-SOR
7. Terminal covers
8. Front for lever operating mechanism - FLD
9. Direct rotary handle - RHD
10. Stored energy motor operator - MOE
11. Key lock - KLF
12. Early auxiliary contact - AUE
13. Transmitted rotary handle - RHE
14. Front terminal for copper cable - FC Cu
15. Front extended terminal - EF
16. Multi-cable terminal (only for T4) - MC
17. Front terminal for copper-aluminium - FC CuAl
18. Front extended spread terminal - ES
19. Rear orientated terminal - R
20. Conversion kit for plug-in/withdrawable versions
21. Guide of fixed part in the withdrawable version
22. Fixed part - FP
23. Auxiliary position contact - AUP
24. Phase separators
26. Racking out crank handle
27. Residual current release.



# Construction characteristics

## Distinguishing features of the series

1

### Double insulation

Tmax has double insulation between the live power parts (excluding the terminals) and the front parts of the apparatus where the operator works during normal operation. The seat of each electrical accessory is completely segregated from the power circuit, thereby preventing any risk of contact with live parts, and, in particular, the operating mechanism is completely insulated in relation to the powered circuits.

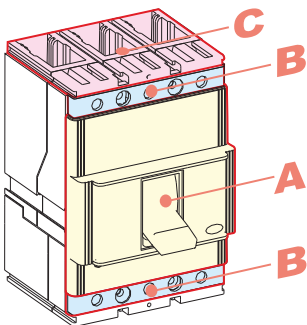
Furthermore, the circuit-breaker has oversized insulation, both between the live internal parts and in the area of the connection terminals. In fact, the distances exceed those required by the IEC Standards and comply with what is prescribed by the UL 489 Standard.

### Positive operation

The operating lever always indicates the precise position of the moving contacts of the circuit-breaker, thereby guaranteeing safe and reliable signals, in compliance with the prescriptions of the IEC 60073 and IEC 60417-2 Standard (I = Closed; O = Open; yellow-green line = Open due to protection trip). The circuit-breaker operating mechanism has free release regardless of the pressure on the lever and the speed of the operation. Protection tripping automatically opens the moving contacts: to close them again, the operating mechanism must be reset by pushing the operating lever from the intermediate position into the lowest open position.

### Isolation behaviour

In the open position, the circuit-breaker guarantees circuit in compliance with the IEC 60947-2 Standard. The oversized insulation distances guarantee there are no leakage currents and dielectric resistance to any overvoltages between input and output.



### Degrees of protection

The table indicates the degrees of protection guaranteed by Tmax circuit-breakers according to the prescriptions of the IEC 60529 Standard:

	With front	Without front <sup>(2)</sup>	Without terminal covers	With high terminal covers	With low terminal covers	With IP40 protection kit on the front
A	IP 40 <sup>(3)</sup>	IP 20	–	–	–	–
B <sup>(4)</sup>	IP 20	IP 20	IP 20	IP 40	IP 40	IP 40
C	–	–	–	IP 40 <sup>(1)</sup>	IP 30 <sup>(1)</sup>	–

<sup>(1)</sup> After correct installation

<sup>(2)</sup> During installation of the electrical accessories

<sup>(3)</sup> Also for front for lever operating mechanism and direct rotary handle

<sup>(4)</sup> Only for T1...T6

The fixed parts are always preset with IP20 degree of protection. IP54 degree of protection can be obtained with the circuit-breaker installed in a switchboard fitted with a rotary handle operating mechanism transmitted on the compartment door and special kit (RHE – IP54).

## Operating temperature

The Tmax circuit-breakers can be used in environmental conditions where the ambient air temperature varies between -25 °C and +70 °C, and stored in ambients with temperatures between -40 °C and +70 °C.

The circuit-breakers fitted with thermomagnetic trip units have their thermal element set for a reference temperature of +40 °C. For temperatures other than +40 °C, with the same setting, there is a thermal trip threshold variation as shown in the table on page 4/50 and following.

The electronic trip units do not undergo any variations in performance as the temperature varies but, in the case of temperatures exceeding +40 °C, the maximum setting for protection against overloads L must be reduced, as indicated in the derating graph on page 4/37 and following, to take into account the heating phenomena which occur in the copper parts of the circuit-breaker passed through by the phase current.

For temperatures above +70 °C the circuit-breaker performances are not guaranteed.

To ensure service continuity of the installations, the way to keep the temperature within acceptable levels for operation of the various devices and not only of the circuit-breakers must be carefully assessed, such as using forced ventilation in the switchboards and in their installation room.

## Altitude

Up to an altitude of 2000 m Tmax circuit-breakers do not undergo any alterations in their rated performances. As the altitude increases, the atmospheric properties are altered in terms of composition, dielectric resistance, cooling capacity and pressure. Therefore the circuit-breaker performances undergo derating, which can basically be measured by means of the variation in significant parameters such as the maximum rated operating voltage and the rated uninterrupted current.

Altitude	[m]	2000	2600	3000	3900	4000	5000
Derating on service voltage, Ue	[%]	100	93	88	79	78	68
Derating on uninterrupted current	[%]	100	99	98	94	93	90

# Construction characteristics

## Distinguishing features of the series

1

### Electromagnetic compatibility

Operation of the protections is guaranteed in the presence of interferences caused by electronic apparatus, atmospheric disturbances or electrical discharges by using the electronic trip units and the electronic residual current releases. No interference with other electronic apparatus near the place of installation is generated either. This is in compliance with the IEC 60947-2 Appendix B + Appendix F Standards and European Directive No. 89/336 regarding EMC - electromagnetic compatibility.

### Tropicalisation

Circuit-breakers and accessories in the Tmax series are tested in compliance with the IEC 60068-2-30 Standard, carrying out 2 cycles at 55 °C with the "variant 1" method (clause 7.3.3). The suitability of the Tmax series for use under the most severe environmental conditions is therefore ensured with the hot-humid climate defined in the climatograph 8 of the IEC 60721-2-1 Standards thanks to:

- moulded insulating cases made of synthetic resins reinforced with glass fibres;
- anti-corrosion treatment of the main metallic parts;
- Fe/Zn 12 zinc-plating (ISO 2081) protected by a conversion layer, free from hexavalent-chromium (ROHS-compliant), with the same corrosion resistance guaranteed by ISO 4520 class 2c;
- application of anti-condensation protection for electronic overcurrent releases and relative accessories.

### Resistance to shocks and vibrations

Tmax T circuit-breakers are unaffected by vibrations generated mechanically and due to electromagnetic effects, in compliance with the IEC 60068-2-6 Standards and the regulations of the major shipping registers<sup>(1) (2)</sup>:

- RINA
- Det Norske Veritas
- Bureau Veritas
- Lloyd's register of shipping
- Germanischer Lloyd
- ABS
- Russian Maritime Register of Shipping
- Nippon Kaiji Kyokai.

The T4-T7 Tmax circuit-breakers are also tested, according to the IEC 60068-2-27 Standard, to resist shocks up to 12g for 11 ms. Please ask ABB SACE for higher performances in terms of resistance to shocks.



<sup>(1)</sup> Ask ABB for specific certifications

<sup>(2)</sup> Except for T6V



1SDC210A4F0001



1SDC210A4F0001

## Versions and types

All the Tmax circuit breakers are available in fixed versions, T4 and T5 in the plug-in version and T4, T5, T6<sup>(1)</sup> and T7 also in the withdrawable one.

All the circuit breakers can be manually operated, by the operating lever or the rotary handle (direct or transmitted), and electrically operated. For this issue different solutions are available:

- the stored energy motor operator for T4, T5 and T6
- T7 with the stored energy operating mechanism, gear motor for the automatic charging of the closing springs and shunt opening and closing releases.

## Installation

Tmax circuit-breakers can be installed in the switchboards, mounted in any horizontal, vertical or lying down position on the back plate or on rails, without undergoing any derating of their rated characteristics. Tmax circuit-breakers can be installed easily in all types of switchboards, above all thanks to the possibility of being supplied either by top or bottom terminals, without jeopardizing the apparatus functionality<sup>(2)</sup>.

<sup>(1)</sup> Not available on the 1000 A version.

<sup>(2)</sup> For uses at a voltage of 1000 V, T4V250 and T5V400 in the fixed version, and T4L250 and T5L400 in the plug-in version must be supplied from above.

# Construction characteristics

## Distinguishing features of the series

1

### Racking-out with the door closed

With Tmax T4, T5, T6 and T7 circuit-breakers, in the withdrawable version, the circuit-breaker can be racked-in and out with the compartment door closed, thereby increasing operator safety and allowing rationalization of low voltage arc proof switchboards.

Racking out can only be carried out with the circuit-breaker open (for obvious safety reasons), using a special racking-out crank handle supplied with the conversion kit from fixed circuit-breaker to moving part of withdrawable circuit-breaker.



### Range of accessories

The completeness and installation rationality of the Tmax series is also achieved thanks to innovative design solutions of the accessories:

- single range of accessories for T4, T5 and T6, and one for T7, characterised by completeness and simplicity for installation. Harmonisation of the accessories allows reduction in stocks and greater service flexibility, offering increasing advantages for users of the Tmax series;
- new system of rapid assembly for internal electrical accessories of Tmax T7 without cables for the connections to the terminal box;
- moreover, Tmax offers a wide choice of residual current releases:
  - RC222 placed below, four-pole up to 500 A for T4 and T5;
  - RC223 (type B) also sensitive to currents with continuous slowly variable components (IEC 60947-2 Annex M), four-pole for T4 up to 250 A;
  - integrated residual current protection for PR332/P-LSIRc trip unit available for Tmax T7.





Hologram

## Conformity with Standards

Tmax T circuit-breakers and their accessories are constructed in conformity with:

- Standard:
  - IEC 60947-2;
- Directives:
  - EC “Low Voltage Directive” (LVD) N° 2006/95/EC (in replacement of 73/23/EEC and subsequent amendments);
  - EC “Electromagnetic Compatibility Directive” (EMC) 2004/108/CE;
- Shipping Registers (ask ABB SACE for the versions available):
  - Lloyd’s Register of Shipping, Germanischer Lloyd, Bureau Veritas, Rina, Det Norske Veritas, Russian Maritime Register of Shipping, ABS.

Certification of conformity with the product Standards is carried out in the ABB SACE tests laboratory (accredited by SINAL) in respect of the EN 45011 European Standard, by the Italian certification body ACAE (Association for Certification of Electrical Apparatus), member of the European LOVAG organisation (Low Voltage Agreement Group) and by the Swedish certification body SEMKO belonging to the international IECEE organisation.

Tmax T series has a hologram on the front, obtained using special anti-forgery techniques, a guarantee of the quality and genuineness of the circuit-breaker as an ABB SACE product.



Naval Registers

## Company Quality System

The ABB SACE Quality System conforms with the following Standards:

- ISO 9001 international Standard;
- EN ISO 9001 (equivalent) European Standards;
- UNI EN ISO 9001 (equivalent) Italian Standards;
- IRIS International Railway Industry Standard.

The ABB SACE Quality System attained its first certification with the RINA certification body in 1990.

## Environmental Management System, Social Responsibility and Ethics

Attention to protection of the environment is a priory commitment for ABB SACE. Confirmation of this is the realisation of an Environmental Management System certified by RINA (ABB SACE was the first industry in the electromechanical sector in Italy to obtain this recognition) in conformity with the International ISO14001 Standard. In 1999 the Environmental Management System was integrated with the Occupational Health and Safety Management System according to the OHSAS 18001 Standard and later, in 2005, with the SA 8000 (Social Accountability 8000) Standard, committing itself to respect of business ethics and working conditions.

The commitment to environmental protection becomes concrete through:

- selection of materials, processes and packaging which optimise the true environmental impact of the product;
- use of recyclable materials;
- voluntary respect of the RoHS directive.

ISO 14001, 18001 and SA8000 recognitions together with ISO 9001 made it possible to obtain RINA BEST FOUR CERTIFICATION.



# The ranges

## Tmax circuit-breakers for power distribution

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## Circuit-breaker for zone selectivity

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ZS Zone selectivity: PR332/P	2/39

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## Tmax circuit-breakers for use up to 1150 V AC and 1000 V DC

Electrical characteristics	2/51
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## Switch-disconnectors

Electrical characteristics	2/54
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# Circuit-breakers for power distribution

## Electrical characteristics

2

			Tmax T4 <sup>(12)</sup>				
Rated uninterrupted current	[A]		250/320				
Poles	[No.]		3/4				
Rated service voltage, <b>Ue</b>	(AC) 50-60 Hz [V]		690				
	(DC) [V]		750				
Rated impulse withstand voltage, <b>Uimp</b>	[kV]		8				
Rated insulation voltage, <b>Ui</b>	[V]		1000				
Test voltage at industrial frequency for 1 min.	[V]		3500				
Rated ultimate short-circuit breaking capacity, <b>Icu</b>			<b>N</b>	<b>S</b>	<b>H</b>	<b>L</b>	<b>V</b>
(AC) 50-60 Hz 220/230 V	[kA]		70	85	100	200	200
(AC) 50-60 Hz 380/400/415 V	[kA]		36	50	70	120	200
(AC) 50-60 Hz 440 V	[kA]		30	40	65	100	180
(AC) 50-60 Hz 500 V	[kA]		25	30	50	85	150
(AC) 50-60 Hz 690 V	[kA]		20	25	40	70	80
(DC) 250 V - 2 poles in series	[kA]		36	50	70	100	150
(DC) 250 V - 3 poles in series	[kA]		—	—	—	—	—
(DC) 500 V - 2 poles in series	[kA]		25	36	50	70	100
(DC) 500 V - 3 poles in series	[kA]		—	—	—	—	—
(DC) 750 V - 3 poles in series	[kA]		16	25	36	50	70
Rated service short-circuit breaking capacity, <b>Ics</b>							
(AC) 50-60 Hz 220/230 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 380/400/415 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 440 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 500 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 690 V	[%Icu]		100%	100%	100%	100%	100%
Rated short-circuit making capacity, <b>Icm</b>							
(AC) 50-60 Hz 220/230 V	[kA]		154	187	220	440	660
(AC) 50-60 Hz 380/400/415 V	[kA]		75.6	105	154	264	440
(AC) 50-60 Hz 440 V	[kA]		63	84	143	220	396
(AC) 50-60 Hz 500 V	[kA]		52.5	63	105	187	330
(AC) 50-60 Hz 690 V	[kA]		40	52.5	84	154	176
Opening time (415 V)	[ms]		5	5	5	5	5
Utilisation category (IEC 60947-2)			A				
Reference Standard			IEC 60947-2				
Isolation behaviour			■				
Trip units:	thermomagnetic						
T fixed, M fixed	TMF		—				
T adjustable, M fixed	TMD		■ (up to 50 A)				
T adjustable, M adjustable (5...10 x In)	TMA		■ (up to 250 A)				
T adjustable, M fixed (3 x In)	TMG		—				
T adjustable, M adjustable (2.5...5 x In)	TMG		—				
magnetic only	MA		■				
electronic	PR221DS		■				
	PR221GP/PR221MP		—				
	PR222DS		■				
	PR223DS		■				
	PR231/P		—				
	PR232/P		—				
	PR331/P		—				
	PR332/P		—				
Interchangeability			■				
Versions			F-P-W				
Terminals	fixed		F-FC Cu-FC CuAl-EF-ES-R-MC				
	plug-in		EF-ES-HR-VR-FC Cu-FC CuAl				
	withdrawable		EF-ES-HR-VR-FC Cu-FC CuAl				
Fixing on DIN rail			—				
Mechanical life	[No. operations]		20000				
	[No. Hourly operations]		240				
Electrical life @ 415 V AC	[No. operations]		8000 (250 A) - 6000 (320 A)				
	[No. Hourly operations]		120				
Basic dimensions - fixed version	3 poles	W [mm]	105				
	4 poles	W [mm]	140				
		D [mm]	103.5				
		H [mm]	205				
Weight	fixed	3/4 poles [kg]	2.35/3.05				
	plug-in	3/4 poles [kg]	3.6/4.65				
	withdrawable	3/4 poles [kg]	3.85/4.9				


















TERMINAL CAPTION

F = Front  
EF = Front extended  
ES = Front extended spread

FC Cu = Front for copper cables  
FC CuAl = Front for copper-aluminium cables  
R = Rear orientated  
HR = Rear flat horizontal

VR = Rear flat vertical  
HR/VR = Rear flat orientated  
MC = Multicable  
F = Fixed circuit-breakers

P = Plug-in circuit-breakers  
W = Withdrawable circuit-breakers

Tmax T5						Tmax T6 <sup>(9)</sup>					Tmax T7					
400/630						630/800/1000					800/1000/1250/1600					
3/4						3/4					3/4					
690						690					690					
750						750					–					
8						8					8					
1000						1000					1000					
3500						3500					3500					
N	S	H	L	V		N	S	H	L	V	S	H	L	V <sup>(6)</sup>	X <sup>(10)</sup>	
70	85	100	200	200		70	85	100	200	200	85	100	200	200	170	
36	50	70	120	200		36	50	70	100	150	50	70	120	150	170	
30	40	65	100	180		30	45	50	80	120	50	65	100	130	170	
25	30	50	85	150		25	35	50	65	85	40	50	85	100	170	
20	25	40	70	80		20	22	25	30	40	30	42	50	60	75	
36	50	70	100	150		36	50	70	100	–	–	–	–	–	–	
–	–	–	–	–		–	–	–	–	–	–	–	–	–	–	
25	36	50	70	100		20	35	50	65	70	–	–	–	–	–	
–	–	–	–	–		–	–	–	–	–	–	–	–	–	–	
16	25	36	50	70		16	20	36	50	50	–	–	–	–	–	
100%	100%	100%	100%	100%		100%	100%	100%	75%	100%	100%	100%	100%	100%	100%	
100%	100%	100%	100%	100%		100%	100%	100%	75%	75% (120)	100%	100%	100%	100%	100%	
100%	100%	100%	100%	100%		100%	100%	100%	75%	75% (100)	100%	100%	100%	100%	100%	
100%	100%	100%	100% <sup>(1)</sup>	100% <sup>(2)</sup>		100%	100%	100%	75%	75% (65)	100%	100%	75%	100%	100%	
100%	100%	100% <sup>(1)</sup>	100% <sup>(2)</sup>	100% <sup>(2)</sup>		75%	75%	75%	75%	75%	100%	75%	75%	75%	100%	
154	187	220	440	660		154	187	220	440	440	187	220	440	440	374	
75.6	105	154	264	440		75.6	105	154	220	330	105	154	264	330	374	
63	84	143	220	396		63	94.5	105	176	264	105	143	220	286	374	
52.5	63	105	187	330		52.5	73.5	105	143	187	84	105	187	220	374	
40	52.5	84	154	176		40	46	52.5	63	84	63	88.2	105	132	165	
6	6	6	6	6		10	9	8	7	7	15	10	8	8	8	
B (400 A) <sup>(3)</sup> - A (630 A)						B (630A - 800A) <sup>(3)</sup> - A (1000A)					B <sup>(7)</sup> - A (T7X)					
IEC 60947-2						IEC 60947-2					IEC 60947-2					
																
–						–					–					
–						–					–					
 (up to 500 A)						 (up to 800 A) <sup>(4)</sup>					–					
–						–					–					
 (up to 500 A)						–					–					
–						–					–					
											–					
–						–					–					
											–					
–						–					 <sup>(11)</sup>					
–						–					 <sup>(11)</sup>					
–						–										
–						–										
																
F-P-W						F-W <sup>(4)</sup>					F-W <sup>(11)</sup>					
F-FC CuAl-EF-ES-R-RC						F-FC CuAl-EF-ES-R-RC					F-EF-ES <sup>(11)</sup> -FC CuAl-HR/VR					
EF-ES-HR-VR-FC Cu-FC CuAl						–					–					
EF-ES-HR-VR-FC Cu-FC CuAl						EF-HR-VR					EF-HR/VR-RS-ES					
–						–					–					
20000						20000					10000					
120						120					60					
7000 (400 A) - 5000 (630 A)						7000 (630A) - 5000 (800A) - 4000 (1000A)					2000 (S, H, L versions) / 3000 (V, X versions)					
60						60					60					
140						210					210					
186						280					280					
103.5						103.5					154 (manual) /178 (motorizable)					
205						268					268					
3.25/4.15						9.5/12					9.7/12.5 (manual) - 11/14 (motorizable)					
5.15/6.65						–					–					
5.4/6.9						12.1/15.1					29.7/39.6 (manual) - 32/42.6 (motorizable)					

# Circuit-breakers for power distribution

## General characteristics

2

The series of Tmax moulded-case circuit-breakers - complying with the IEC 60947-2 Standard - is divided into seven basic sizes, with an application range from 20 A to 1600 A and breaking capacities from 36 kA to 200 kA (at 380/415 V AC). For protection of alternating current networks, the following are available:

- T4 (up to 50 A) circuit-breakers equipped with TMD thermomagnetic trip units with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and fixed magnetic threshold ( $I_3 = 10 \times I_n$ );
- T5 circuit-breakers, fitted with TMG trip units for long cables and generator protection with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and adjustable magnetic threshold ( $I_3 = 2.5 \dots 5 \times I_n$ ) for T5;
- T4, T5 and T6 circuit-breakers with TMA thermomagnetic trip units with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and adjustable magnetic threshold ( $I_3 = 5 \dots 10 \times I_n$ );
- T4, T5 and T6 with PR221DS, PR222DS/P, PR222DS/PD and PR223DS electronic trip units;
- the T7 circuit-breaker, which completes the Tmax family up to 1600 A, fitted with PR231/P, PR232/P, PR331/P and PR332/P electronic trip units. The T7 circuit-breaker is available in the two versions: with manual operating mechanism or motorizable with stored energy operating mechanism<sup>(1)</sup>.

The field of application in alternating current of the Tmax series varies from 20 A to 1600 A with voltages up to 690 V. The Tmax T4, T5 and T6 circuit-breakers equipped with TMF, TMD and TMA thermomagnetic trip units can also be used in direct current plants, with a range of application from 20 A to 800 A and a minimum operating voltage of 24 V DC, according to the appropriate connection diagrams.

The three-pole T4 circuit-breaker can also be fitted with MF and MA adjustable magnetic only trip units, both for applications in alternating current and in direct current, in particular for motor protection (see page 2/40 and following). For all the circuit-breakers in the series, fitted with thermomagnetic and electronic trip units, the single-phase trip current is defined (see page 4/57).

<sup>(1)</sup> For motorisation, the T7 circuit-breaker with stored energy operating mechanism must be ordered, complete with geared motor for automatic spring charging, opening coil and closing coil.

## Interchangeability

The Tmax T4, T5 and T6 circuit-breakers can be equipped either with TMF, TMD, TMG or TMA thermomagnetic trip units, MA magnetic only trip units or PR221DS, PR222DS/P, PR222DS/PD, Ekip M-LRIU and PR223DS electronic trip units.

Similarly, Tmax T7 can also mount the latest generation PR231/P, PR232/P, PR331/P<sup>(1)</sup> and PR332/P<sup>(1)</sup> electronic trip units.

Thanks to their simplicity of assembly, the end customer can change the type of trip unit extremely rapidly, according to their own requirements and needs: in this case, correct assembly is the customer's responsibility. Above all, this means into increased flexibility of use of the circuit-breakers with considerable savings in terms of costs thanks to better rationalisation of stock management.

## Trip units

Circuit-breakers	TMD			TMA											TMG			MA							
In [A]	20	32	50	80	100	125	160	200	250	320	400	500	630	800	320	400	500	10	25	52	80	100	125	160	200
T4 250	■	■	■	■	■	■	■	■	■									■	■	■	■	■	■	■	■
T4 320	▲	▲	▲	▲	▲	▲	▲	▲	▲									▲	▲	▲	▲	▲	▲	▲	▲
T5 400										■	■					▲	▲								
T5 630										▲	▲	■				▲	▲	▲							
T6 630													■												
T6 800														■											
T6 1000																									
T7 800																									
T7 1000																									
T7 1250																									
T7 1600																									

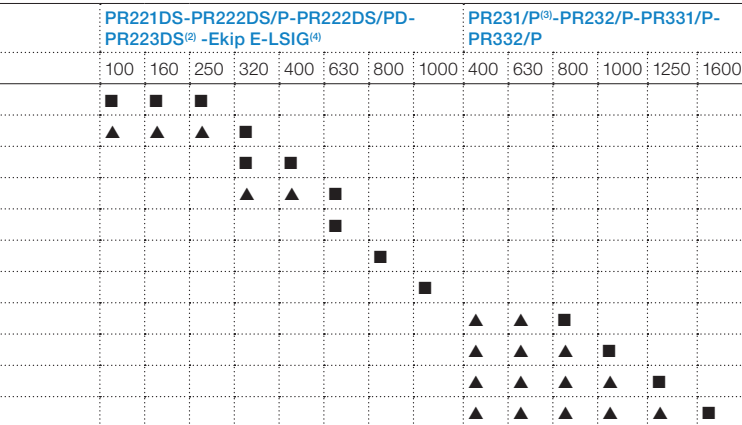
■ = Complete circuit-breaker already coded  
▲ = Circuit-breaker to be assembled

<sup>(1)</sup> If ordered loose PR331/P and PR332/P must be completed with the "trip unit adapters" (see page 3/48)

Range of application of the circuit-breakers in alternating current and in direct current

AC	Trip unit	Range [A]
T4 250/320	TMD	20...50
	TMA	80...250
	MA	10...200
	PR221DS	100...320
	PR222DS/P-PR222DS/PD	100...320
	PR223DS	160...320
T5 400/630	TMG	320...500
	TMA	320...500
	PR221DS	320...630
	PR222DS/P-PR222DS/PD	320...630
	Ekip E-LSIG	320...630
T6 630/800/1000	TMA	630...800
	PR221DS	630...1000
	PR222DS/P-PR222DS/PD	630...1000
	PR223DS	630...1000
T7 800/1000/1250/1600	PR231/P-PR232/P	400...1600
	PR331/P-PR332/P	400...1600
DC		
T4 250/320	TMD	20...50
	TMA	80...250
	MA	10...200
T5 400/630	TMA/TMG	320...500
T6 630/800/1000	TMA	630...800

MF = magnetic only trip unit with fixed magnetic thresholds  
MA = magnetic only trip unit with adjustable magnetic thresholds  
TMD = thermomagnetic trip unit with adjustable thermal and fixed magnetic thresholds  
TMA = thermomagnetic trip unit with adjustable thermal and magnetic thresholds  
TMG = thermomagnetic trip unit for generator protection  
PR22\_, PR23\_, PR33\_, Ekip\_ = electronic trip units



(2) PR223DS, minimum In = 160 A.  
(3) Interchangeability of PR231/P can be requested by means of the dedicated ordering code 1SDA063140R1  
(4) Ekip E-LSIG only on T5.

# Circuit-breakers for power distribution

## Thermomagnetic trip units

2

The Tmax T4, T5 and T6 circuit-breakers can be fitted with thermomagnetic trip units and are used in protection of alternating and direct current networks with a range of use from 20 A to 800 A. They allow the protection against overload with a thermal device realised using the bimetal technique, and protection against short-circuit with a magnetic device.

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

### Thermomagnetic trip units TMD/TMA and TMG (for T4, T5 and T6)

#### Thermal threshold

Adjustable

#### Thermal threshold



Adjustable from 0.7 to 1 x  $I_n$





TMA = thermomagnetic trip unit with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and adjustable magnetic threshold ( $I_2 = 5 \dots 10 \times I_n$ )  
 TMG (for T5) = thermomagnetic trip unit with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and adjustable magnetic threshold ( $I_3 = 2.5 \dots 5 \times I_n$ )





## TMD/TMA - T4

	In [A]	20	32	50	80	100	125	160	200	250
	Neutral [A] - 100%	20	32	50	80	100	125	160	200	250
	Neutral [A] - 50%	–	–	–	–	–	80	100	125	160
<b><math>I_1 = 0.7...1 \times I_n</math></b>										
	$I_3 = 10 \times I_n$ [A]	320	320	500						
	$I_3 = 5...10 \times I_n$ [A]				400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500
	Neutral [A] - 100%	320	320	500	400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500
<b><math>I_3 = 5...10 \times I_n</math></b>										
	Neutral [A] - 50%	–	–	–	–	–	400...800	500...1000	625...1250	800...1600



## TMA - T5

	In [A]	320	400	500
	Neutral [A] - 100%	320	400	500
	Neutral [A] - 50%	200	250	320
<b><math>I_1 = 0.7...1 \times I_n</math></b>				
	$I_3$ [A]	1600...3200	2000...4000	2500...5000
	Neutral [A] - 100%	1600...3200	2000...4000	2500...5000
	Neutral [A] - 50%	1000...2000	1250...2500	1600...3200
<b><math>I_3 = 5...10 \times I_n</math></b>				

## TMG - T5

	In [A]	320	400	500
	Neutral [A] - 100%	320	400	500
<b><math>I_1 = 0.7...1 \times I_n</math></b>				
	$I_3$ [A]	800...1600	1000...2000	1250...2500
	Neutral [A] - 100%	800...1600	1000...2000	1250...2500
<b><math>I_3 = 2.5...5 \times I_n</math></b>				

## TMA - T6

	In [A]	630	800
	Neutral [A] - 100%	630	800
	Neutral [A] - 50%	400	500
<b><math>I_1 = 0.7...1 \times I_n</math></b>			
	$I_3$ [A]	3150...6300	4000...8000
	Neutral [A] - 100%	3150...6300	4000...8000
	Neutral [A] - 50%	2000...4000	2500...5000
<b><math>I_3 = 5...10 \times I_n</math></b>			

## Notes

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

# Circuit-breakers for power distribution

## Electronic trip units

2

Tmax T4, T5, T6 and T7 circuit-breakers, for use in alternating current, can be equipped with overcurrent releases constructed using electronic technology. This allows protection functions to be obtained which guarantee high reliability, tripping precision and insensitivity to temperature and to the electromagnetic components in conformity with the standards on the matter.

The power supply needed for correct operation is supplied directly by the current sensors of the release, and tripping is always guaranteed, even under single-phase load conditions and in correspondence with the minimum setting.

For Tmax T4, T5 and T6 the protection trip unit consists of:

- 3 or 4 current sensors (current transformers)
- external current sensors (e.g. for the external neutral), when available
- a trip unit
- a trip coil integrated in the electronic trip unit.

For Tmax T7 the protection trip unit consists of:

- 3 or 4 current sensors (Rogowski coils and current transformers)
- external current sensors (e.g. for the external neutral)
- interchangeable rating plug
- a trip unit
- a trip coil housed in the body of the circuit-breaker.

## Characteristics of the Tmax electronic trip units

Operating temperature	-25 °C ... +70 °C
Relative humidity	98%
Self-supply	0.2 x In (single phase)
Auxiliary power supply (where applicable)	24 V DC
Operating frequency	45...66 Hz
Electromagnetic compatibility (LF and HF)	IEC 60947-2 Annex F

## Current sensors

	In [A]	100	160	250	320	400	630	800	1000	1250	1600
PR221DS	T4	■	■	■	■						
	T5				■	■	■				
	T6						■	■	■		
PR222DS/P, PR222DS/PD, PR223DS <sup>(1)</sup> , Ekip E-LSIG <sup>(2)</sup>	T4	■	■	■	■						
	T5				■	■	■				
	T6						■	■	■		
PR231/P, PR232/P, PR331/P, PR332/P	T7					■	■	■	■	■	■

<sup>(1)</sup> For PR223DS, the minimum rated current is In = 160 A; <sup>(2)</sup> T5 only

When a protection function trips, the circuit-breaker opens by means of the trip coil, which changes over a contact (AUX-SA, supplied on request, see chapter "Accessories" at page 3/21 and following) to signal trip unit tripped. Signalling reset is of mechanical type and takes place with resetting of the circuit-breaker.

## Basic protection functions



### (L) Protection against overload

This protection function trips when there is an overload with inverse long-time delay trip according to the IEC 60947-2 Standard ( $I^2t=k$ ). The protection cannot be excluded.



### (S) Protection against short-circuit with time delay

This protection function trips when there is a short-circuit, with long inverse time-delay trip ( $I^2t=k$  ON) or a constant trip time ( $I^2t=k$  OFF). The protection can be excluded.



### (I) Instantaneous protection against short-circuit

This protection function trips instantaneously in case of a short-circuit. The protection can be excluded.



### (G) Protection against earth fault

The protection against earth fault trips when the vectorial sum of the currents passing through the current sensors exceeds the set threshold value, with long inverse time-delay trip ( $I^2t=k$  ON) or a constant trip time ( $I^2t=k$  OFF). The protection can be excluded.

## Advanced protection functions

The PR332/P trip unit makes it possible to carry out highly developed protection against the most varied types of fault.

In fact, it adds the following advanced protection functions to the basic protection functions.



IEC 60255-3

### (L) Protection against overload (IEC 60255-3)

This protection trips in case of an overload with inverse long-time delay according to IEC 60255-3 Standard, for the coordination with fuses and MV protections. The protection can be excluded.



### (U) Protection against unbalanced phase

The protection function against unbalanced phase U can be used in those cases where a particularly precise control is needed regarding missing and/or unbalance of the phase currents. The trip time is instantaneous. The protection can be excluded.



### (OT) Protection against overtemperature

The protection against overtemperature trips instantaneously when the temperature inside the trip unit exceeds 85 °C, in order to prevent any temporary or continual malfunction of the microprocessor. The protection cannot be excluded.



### (Rc) Protection against residual current <sup>(1)</sup>

This integrated protection is based on current measurements made by an external toroid and is alternative to protection against earth fault G. The protection can be excluded.



### (ZS) Zone selectivity <sup>(2)</sup>

ZS zone selectivity is an advanced method for carrying out coordination of the protections in order to reduce the trip times of the protection closest to the fault in relation to the time foreseen by time selectivity. Zone selectivity can be applied to the protection functions S and G, with constant time-delay trip. The protection can be excluded.



### (UV, OV, RV) Protections against voltage

The three protections trip with a constant time-delay in the case of undervoltage, overvoltage and residual voltage respectively. The latter allows to detect interruptions of the neutral (or of the earthing conductor in systems with earthed neutral) and faults which cause movement of the star centre in systems with isolated neutral (e.g. large earth faults) to be identified. Movement of the star centre is calculated by vectorially summing the phase voltages. The protections can be excluded.



### (RP) Protection against reversal of power

The protection against reversal power causes tripping of the breaker, with constant time-delay trip, when the flow of power reverses sign and exceeds, as an absolute value, the set threshold. It is particularly suitable for protection of large machines such as generators. The protection can be excluded.



### (UF, OF) Protections of frequency

The two protections detect the variation in network frequency above or below the adjustable thresholds, opening the circuit-breaker, with constant time-delay trip. The protection can be excluded.

<sup>(1)</sup> It is not suitable for human protection.

<sup>(2)</sup> For further information about zone selectivity, please see the section: "Circuit-breakers for zone selectivity".

# Circuit-breakers for power distribution

## Electronic trip units

### Electronic trip units for power distribution

2

#### SACE PR221DS



	PR221DS	PR221DS
Protection functions	<div>L</div> <div>S</div> <div>I</div>	<div>I</div>

#### SACE PR222DS/P



	PR222DS/P	PR222DS/P
Protection functions	<div>L</div> <div>S</div> <div>I</div>	<div>L</div> <div>S</div> <div>I</div> <div>G</div>

#### SACE PR222DS/PD



	PR222DS/PD	PR222DS/PD
Protection functions	<div>L</div> <div>S</div> <div>I</div>	<div>L</div> <div>S</div> <div>I</div> <div>G</div>

#### SACE PR223DS



	PR223DS
Protection functions	<div>L</div> <div>S</div> <div>I</div> <div>G</div>

#### SACE Ekip E-LSIG



	Ekip E-LSIG
Protection functions	<div>L</div> <div>S</div> <div>I</div> <div>G</div>

SACE PR231/P



	PR231/P	PR231/P
Protection functions	<div>L S / I</div>	<div>I</div>

SACE PR232/P



	PR232/P
Protection functions	<div>L S I</div>

SACE PR331/P



	PR331/P
Protection functions	<div>L S I G</div>

SACE PR332/P



	PR332/P	PR332/P	PR332/P	PR332/P
Protection functions	<div>L I</div>	<div>L S I</div>	<div>L S I G<sup>(1)</sup></div>	<div>L S I R<sub>d</sub></div>
Advanced protection function <sup>(2)</sup>	<div>L<sup>(*)</sup> U OT</div>	<div>L<sup>(*)</sup> U OT</div>	<div>L<sup>(*)</sup> U OT</div>	<div>L<sup>(*)</sup> U OT</div>
Opt. <sup>(3)</sup>	<div>UV OV RV RP UF OF</div>	<div>UV OV RV RP UF OF</div>	<div>UV OV RV RP UF OF</div>	<div>UV OV RV RP UF OF</div>

<sup>(1)</sup> In alternative to Rc (with external toroid).  
<sup>(2)</sup> For all versions.  
<sup>(\*)</sup> Available with PR330/V. Measurement module.  
<sup>(3)</sup> According to IEC 60255-3.

# Circuit-breakers for power distribution

## Electronic trip units

### PR221DS

The PR221DS trip unit, available for T4, T5 and T6, provides protection functions against overload L and short-circuit S/I (version PR221DS-LS/I): with this version, by moving the dedicated dip-switch, you can choose whether to have inverse time-delay S or instantaneous I protection against short-circuit. Alternatively, the version with only the protection function against instantaneous short-circuit I is available (version PR221DS-I, also see page 2/40 and following). There is a single adjustment for the phases and the neutral.

For T4, T5 and T6 it is possible to select the protection threshold OFF, 50% or 100% directly from the front of the trip unit by means of the specific dip switch.

For Tmax T4, T5 and T6, the opening solenoid is housed internally and therefore, by not using the right-hand slot of the circuit-breaker, all the auxiliary contacts available can be used.

### PR221DS-LS/I

#### Protection S

Against short-circuit with delayed trip

#### Protection L

Against overload



Dip-switch for neutral setting (only for T4, T5 and T6)

Socket for Ekip TT test unit

Protection I  
Against short-circuit with instantaneous trip

### Protection functions and parameterisations

Protection functions <sup>(1)</sup>	Trip threshold	Trip curves	Excludability	Relation $t=f(I)$
<b>L</b> Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve ( $I^2t=k$ ) according to IEC 60947-2 Standard	$I_1 = 0.40 - 1 \times I_n$ step = $0.04 \times I_n$ Trip between $1.1...1.30 \times I_1$ (T4,T5,T6)	at $6 \times I_1$ $t_1 = 12s$ (only for T4,T5,T6) Tolerance: $\pm 10\%$ up to $6 \times I_n$ (T4,T5,T6) $\pm 20\%$ above $6 \times I_n$ (T4,T5,T6)	—	$t = k/I^2$
<b>S</b> Against short-circuit with inverse short time delay trip and trip characteristic with inverse time ( $I^2t=k$ ) (selectable as an alternative to protection function I)	$I_2 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 \times I_n^{(2)}$ Tolerance: $\pm 10\%$ (T4,T5,T6)	at $8 \times I_n$ $t_2 = 0.1 - 0.25s$ Tolerance: $\pm 10\%$ up to $6 \times I_n$ (T4,T5,T6) $\pm 20\%$ above $6 \times I_n$ (T4,T5,T6) $\pm 20\%$ (T2)	■	$t = k/I^2$
<b>I</b> Against short-circuit with instantaneous trip (selectable as an alternative to protection function S)	$I_3 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 \times I_n^{(2)}$ Tolerance: $\pm 10\%$ (T4,T5,T6)	instantaneous	■	$t = k$

<sup>(1)</sup> These tolerances hold in the following conditions:  
– self-powered trip unit at full power (without start-up)  
– two or three-phase power supply  
In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	$\pm 20\%$	$\pm 20\%$
I	$\pm 20\%$	$\leq 40ms$

<sup>(2)</sup> For T4  $I_n = 320$  A, T5  $I_n = 630$  A and T6  $I_n = 1000$  A  $\Rightarrow I_{2,max} = 9.5 \times I_n$ ,  
 $I_{3,max} = 9.5 \times I_n$ .

The setting at  $10 \times I_n$  corresponds to  $9.5 \times I_n$ .

### PR222DS/P

The PR222DS/P trip unit, available for T4, T5 and T6, has protection functions against overload L, delayed S and instantaneous I short-circuit (version PR222DS/P-LSI). Alternatively, as well as the functions L, S, I, it also has protection against earth fault G (version PR222DS/P-LSIG). Setting of the PR222DS trip unit can be carried out by means of dip switches on the front of the circuit-breaker or electronically, using the Ekip T&P programming and control unit or the Ekip Bluetooth wireless communication unit. There is a single setting for the phases and neutral, for which one can decide whether to set the threshold of the protection functions to OFF, to 50% or to 100% that of the phases by means of two dedicated dip switches. Furthermore, on the front of the PR222DS/P (or PR222DS/PD) trip units, signalling of pre-alarm and alarm of protection L is available. The pre-alarm threshold value, signalled by the red LED fixed, is equal to  $0.9 \times I_n$ . It is also possible to transmit remotely the alarm of protection L, simply connecting connector X3 to the dedicated contact.

### PR222DS/PD

Apart from the protection functions available for the PR222DS/P trip unit (for the settings see page 2/20), the PR222DS/PD trip unit, available for T4, T5 and T6 also has the dialogue unit integrated with Modbus® RTU protocol. The Modbus® RTU protocol has been known and used worldwide for many years and is now a market standard thanks to its simplicity of installation, configuration and to its integration in the various different supervision, control and automation systems, as well as good level performances. The PR222DS/PD trip units allow the Tmax T4, T5 and T6 circuit-breakers to be integrated in a communication network based on the Modbus® RTU protocol. Modbus® RTU provides a Master-Slave system architecture where a Master (PLC, PC...) cyclically interrogates several Slaves (field devices). The devices use the EIA RS485 standard as the physical means for data transmission at a maximum transmission speed of 19.2 kbps.

Again for this trip unit, the power supply needed for correct operation of the protection functions is supplied directly by the current transformers of the trip unit, and tripping is always guaranteed, even under conditions of single-phase load down. Nevertheless, communication is only possible with an auxiliary power supply of 24 V DC.

#### PR222DS/PD - Electrical characteristics

Auxiliary power supply (galvanically insulated)	24 V DC $\pm$ 20%
Maximum ripple	$\pm$ 5%
Inrush current @ 24 V	1 A for 30 ms
Rated current @ 24 V	100 mA
Rated power @ 24 V	2.5 W

The PR222DS/PD release, with integrated communication and control functions, allows a wide range of information to be acquired and transmitted remotely, opening and closing commands to be carried out by means of the electronic version motor operator, the configuration and programming parameters of the unit to be stored, such as the current thresholds of the protection functions and the protection curves. All the information can be consulted both locally, directly on the front of the circuit-breaker with the front display unit FDU or on the HMI030 switchgear multi-meter, and remotely by means of supervision and control systems. Moreover, by means of the Ekip Bluetooth external module, to be connected to the test connector of the PR222DS/PD trip unit, wireless communication to a PDA or Notebook is possible through a Bluetooth port. The PR222DS/PD trip units can be associated with the AUX-E auxiliary contacts in electronic version, to know the state of the circuit-breaker (open/closed), and with MOE-E motor operator (the AUX-E are compulsory when MOE-E is to be used) to remotely control circuit-breaker opening and closing as well. If the circuit-breaker fitted with the PR222DS/PD trip unit is inserted in a supervision system, during the test phases with the Ekip T&P unit, communication is automatically abandoned and starts again on completion of this operation.

# Circuit-breakers for power distribution

## Electronic trip units

2

Communication functions	PR222DS/P	PR222DS/PD	Ekip E-LSIG, PR223DS
Protocol		Modbus RTU standard	Modbus RTU standard
Physical medium		EIA RS485	EIA RS485
Speed (maximum)		19.2 kbps	19.2 kbps
<b>Measurement functions</b>			
Phase currents	■ <sup>(1)</sup>	■	■
Neutral current	■ <sup>(1)</sup>	■	■
Ground current	■ <sup>(1)</sup>	■	■
Voltages (phase to phase, phase to earth)			■ <sup>(6)</sup>
Powers (active, reactive, apparent)			■ <sup>(6)</sup>
Power factors			■ <sup>(6)</sup>
Energies			■ <sup>(6)</sup>
Peak factor			■
Frequency			■ <sup>(6)</sup>
Harmonics			■
<b>Signalling functions</b>			
L pre-alarm and alarm LED	■ <sup>(5)</sup>	■ <sup>(5)</sup>	■
L alarm output contact <sup>(2)</sup>	■	■	■
<b>Available data</b>			
Circuit-breaker status (open, closed) <sup>(3)</sup>		■	■
Mode (local, remote)		■	■
Protection parameters set	■ <sup>(1)</sup>	■	■
<b>Alarms</b>			
Protections: L, S, I, G	■ <sup>(1)</sup>	■	■
Failed tripping under fault conditions	■ <sup>(1)</sup>	■	■
<b>Maintenance</b>			
Total number of operations <sup>(3)</sup>		■	■
Total number of trips		■	■
Number of trip tests		■	■
Number of manual operations		■	■
Number of trips for each individual protection function		■	■
Record of last trip data		■	■
<b>Commands</b>			
Circuit-breaker opening/closing (with motor operator)		■	■
Alarm reset	■ <sup>(1)</sup>	■	■
Circuit-breaker reset (with motor operator)		■	■
Setting the curves and protection thresholds	■ <sup>(1)</sup>	■	■
<b>Safety function</b>			
Automatic opening in the case of failed Trip command fail (with motor operator) <sup>(4)</sup>		■	■
<b>Events</b>			
Changes in circuit-breaker state, in the protections and all the alarms		■	■

<sup>(1)</sup> With Ekip T&P or Ekip Bluetooth

<sup>(2)</sup> Typical contact: MOS photo Vmax: 48 V DC/30 V AC

Rmax = 35 ohm

<sup>(3)</sup> Available with AUX-E electronic auxiliary contacts

<sup>(4)</sup> The motor operator must be in electronic version (MOE-E) and electronic auxiliary contacts (AUX-E) have to be used

<sup>(5)</sup> Signals: – Pre-alarm L - permanently lit

– Alarm L - flashing (0.5 s ON / 0.5 s OFF)

– Incongruent manual setting (L > S / S > I) - flashing (1 s ON / 2 s OFF)

– WINK (remote control to identify the relay) - flashing (0.125 s ON / 0.125 s OFF)

<sup>(6)</sup> With VM210 on PR223DS



## PR222DS/P

### Protection S

Against short-circuit  
with delayed trip

### Protection L

Against overload

Socket for Ekip TT  
test unit

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



**Protection I**  
Against short-circuit  
with instantaneous trip

2

Dip-switch for  
neutral setting

Selection for electronic  
or manual setting

1SDC210B06F0001

## PR222DS/PD

### Protection S

Against short-circuit  
with delayed trip

### Protection L

Against overload

Socket for Ekip TT  
test unit

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



**Protection I**  
Against short-circuit  
with instantaneous trip

Dip-switch for  
neutral setting

Enablement of  
remote operations

Selection for  
electronic or  
manual setting

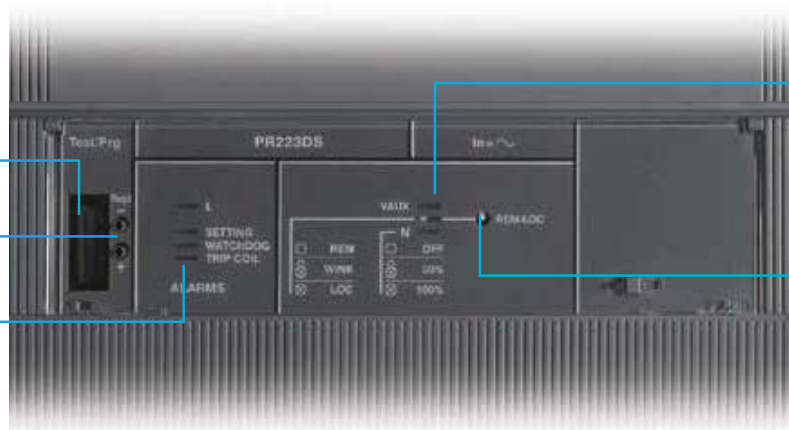
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## PR223DS

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

Socket for Ekip TT  
test unit

LED signalling alarm  
of the circuit-breaker



LED signalling  
the status of the  
circuit-breaker

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

1SDC210B08F0001

# Circuit-breakers for power distribution

## Electronic trip units

### PR222DS/P, PR222DS/PD and PR223DS<sup>(5)</sup> - Protection functions and parameterisations

Protection functions	Trip threshold	Trip curves <sup>(1)</sup>	Excludability	Relation $t = f(I)$
<div>2</div> <div>L</div>	<b>Manual setting</b> $I_1 = 0.40 \dots 1 \times I_n$ step = $0.02 \times I_n$	<b>Manual setting</b> at $6 \times I_1$ $t_1 = 3 - 6 - 9/12 - \text{MAX}^{(2)}$	—	$t = k/I^2$
	<b>Electronic setting</b> $I_1 = 0.40 \dots 1 \times I_n$ step $0.01 \times I_n$ Trip between $1.1 \dots 1.3 \times I_1$	<b>Electronic setting</b> at $6 \times I_1$ $t_1 = 3 \dots 18\text{s}$ step $0.5\text{s}^{(2)}$ Tolerance: $\pm 10\%$		
<div>S</div>	<b>Manual setting</b> $I_2 = 0.6 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5.8 - 6.4 - 7 - 7.6 - 8.2 - 8.8 - 9.4 - 10 \times I_n^{(3)}$	<b>Manual setting</b> at $8 \times I_n$ $t_2 = 0.05 - 0.1 - 0.25 - 0.5\text{s}$	■	$t = k/I^2$
	<b>Electronic setting</b> $I_2 = 0.60 \dots 10 \times I_n$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$	<b>Electronic setting</b> at $8 \times I_n$ $t_2 = 0.05 \dots 0.5\text{s}$ step $0.01\text{s}$ Tolerance: $\pm 10\%^{(4)}$		
	<b>Manual setting</b> $I_2 = 0.6 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5.8 - 6.4 - 7 - 7.6 - 8.2 - 8.8 - 9.4 - 10 \times I_n^{(3)}$	<b>Manual setting</b> $t_2 = 0.05 - 0.1 - 0.25 - 0.5\text{s}$	■	$t = k$
	<b>Electronic setting</b> $I_2 = 0.60 \dots 10 \times I_n$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$	<b>Electronic setting</b> $t_2 = 0.05 \dots 0.5\text{s}$ step $0.01\text{s}$ Tolerance: $\pm 10\%^{(4)}$		
<div>I</div>	<b>Manual setting</b> $I_3 = 1.5 - 2.5 - 3 - 4 - 4.5 - 5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 9 - 9.5 - 10.5 - 12 \times I_n^{(3)}$	instantaneous	■	$t = k$
	<b>Electronic setting</b> $I_3 = 1.5 \dots 12 \times I_n^{(3)}$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$			
<div>G</div>	<b>Manual setting</b> $I_4 = 0.2 - 0.25 - 0.45 - 0.55 - 0.75 - 0.8 - 1 \times I_n$	<b>Manual setting</b> up to $3.15 \times I_4$ up to $2.25 \times I_4$ up to $1.6 \times I_4$ up to $1.10 \times I_4$ $t_4 = 0.1\text{s}$ $t_4 = 0.2\text{s}$ $t_4 = 0.4\text{s}$ $t_4 = 0.80\text{s}$	■	$t = k/I^2^{(6)}$
	<b>Electronic setting</b> $I_4 = 0.2 \dots 1 \times I_n$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$	<b>Electronic setting</b> $t_4 = 0.1 \dots 0.8\text{s}$ step $0.01\text{s}$ Tolerance: $\pm 15\%$		

<sup>(1)</sup> These tolerances hold in the following conditions:  
 – self-powered trip unit at full power and/or auxiliary supply  
 – two or three-phase power supply  
 In conditions other than those considered, the following tolerances hold:

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

<sup>(2)</sup>  $t_1$  values for MAX setting:

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

<sup>(3)</sup> For T4  $I_n = 320\text{ A}$  and T5  $I_n = 630\text{ A}$ . T6  $I_n = 1000\text{ A} \Rightarrow I_{2\text{max}} = 9.5 \times I_n$  and  $I_{3\text{max}} = 9.5 \times I_n$   
 For T6  $I_n = 800\text{ A} \Rightarrow I_{3\text{max}} = 10.5 \times I_n$

<sup>(4)</sup> Tolerance:  $\pm 10\text{ ms}$

<sup>(5)</sup> PR223DS only available on T4 and T6. The setting of the PR223DS trip unit is electronic only (local/remote).  
 The L protection can be set at  $I_1 = 0.18 \dots 1 \times I_n$ . For  $I_1 < 0.4 \times I_n$  the neutral setting must be at 100% of that of the phases

<sup>(6)</sup>  $t = k/I^2$  up to the current value indicated,  $t = k$  (equating to the chosen setting) beyond the current value indicated

### PR223DS

Apart from the traditional L, S, I, and G protection functions, the PR223DS release, available on T4 and T6, also offers the possibility of measuring the main electrical values. In fact, using the accessory VM210, and without using any voltage transformers, the user has access not only to the current values but also to the voltage, power and energy values, both locally, directly on the front of the circuit-breaker with the front display unit FDU, or on the interface for the front of the switchboard HMI030, and remotely via a supervisor and control system.

Setting the PR223DS release can only be carried out electronically, using the Ekip T&P (setting in local mode) or the dialogue (setting in remote mode). For the protection function adjustments, see page 2/20.

For the neutral, it is possible to set the protection threshold of the functions to OFF, to 50% and to 100% of that of the phases (for protection L settings below  $0.4 \times I_n$ , it is obligatory to set the neutral to 100%). The pre-alarm and alarm signalling of protection L are also available by means of a dedicated LED on the front of the release. The pre-alarm threshold value is equal to  $0.9 \times I_n$ .

Still on the front of the release, the LEDs signalling the following information are available: state of the connection to the opening solenoid, use of the default parameters, mode (local or remote), presence of auxiliary power supply and setting the neutral.

#### Measurements

Measurements	With distributed N	Without distributed N
Effective current values	$I_1, I_2, I_3, I_{n0}$	$I_1, I_2, I_3$
Effective voltage values	$V_1, V_2, V_3, V_{12}, V_{23}, V_{31}$	$V_{12}, V_{23}, V_{31}$
Apparent powers	$S_{tot}, S_1, S_2, S_3$	$S_{tot}$
Active powers	$P_{tot}, P_1, P_2, P_3$	$P_{tot}$
Reactive powers	$Q_{tot}, Q_1, Q_2, Q_3$	$Q_{tot}$
Power factors	$\cos \varphi$	$\cos \varphi$
Energies	$E_{TOT}$	$E_{TOT}$
Phase peak factor	■	■
Frequency	$f$	$f$

The PR223DS trip unit, with integrated ModBus RTU protocol based dialogue unit, allows a wide range of information to be acquired and transmitted remotely and to carry out opening and closing commands.

The PR223DS trip unit can be associated with the AUX-E auxiliary contacts, to know the state of the circuit-breaker (open, closed), and with MOE-E motor operator (the AUX-E are compulsory when MOE-E is to be used) to remotely control circuit-breaker opening and closing as well. If the PR223DS trip unit is inserted in a supervision system, during the test and configuration with the PR010/T unit, communication is automatically abandoned and starts again on completion of these operations.

The unit is self-supplied by means of current sensors housed in the electronic release. Operation of the electronic release is also guaranteed when there is a single-phase load and in correspondence with the minimum setting. An external power supply must be connected to activate the dialogue function and the measurement functions.

#### Auxiliary power supply - Electrical characteristics

	PR223DS
Auxiliary power supply (galvanically insulated)	24 V DC $\pm$ 20%
Maximum ripple	$\pm$ 5%
Inrush current @ 24 V	$\sim$ 4 A for 0.5 ms
Rated current @ 24 V	$\sim$ 80 mA
Rated power @ 24 V	$\sim$ 2 W

# Circuit-breakers for power distribution

## Electronic trip units

### Ekip E-LSIG

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

2

#### Protections:

- against overloads (L):  $0.18...1 \times I_n$  adjustable protection threshold, with adjustable time trip curve;
- against short-circuits with delay (S):  $0.6...10 \times I_n$  adjustable protection threshold, with adjustable time trip curve;
- against instantaneous short-circuits (I):  $1.5...12 \times I_n$  adjustable protection threshold, with instantaneous trip curve;
- of the neutral in four-pole circuit-breakers.

#### Measurements:

- available from  $0.1 \times I_n$  in Vaux mode;
- Currents: three phases ( $L_1$ ,  $L_2$ ,  $L_3$ ), neutral (Ne) and earth fault;
- Voltage: phase-phase, phase-neutral;
- Power: active, reactive and apparent;
- Power factor;
- Frequency and peak factor;
- Energy: active, reactive, apparent, counter.

#### Setting:

- manual setting using the relative dip-switches on the front of the trip unit, which allow the settings to be made even when the trip unit is off;
- electronic setting, made both locally using Ekip T&P accessory and also via remote control, with version of trip unit with communication function. The electronic setting have a wider range and a thicker regulation step. Use of electronic setting allows other functions to be activated:
  - function for protection against earth faults (G);
  - over voltage protection;
  - under voltage protection.

#### LED:

- LED on with steady green light indicating that the trip unit is supplied correctly. The LED comes on when the current exceeds  $0.2 \times I_n$ ;
- red LED for each protection:
  - L: LED with steady red light, indicates pre-alarm for current exceeding  $0.9 \times I_n$ ;
  - L: LED with flashing red light, indicates alarm for current exceeding setted threshold;
  - fixed LED MAN/ELT show the kind of active parameters;
  - LSI: LED with steady red light, shows that the protection has tripped. After the circuit-breaker has opened, connect the Ekip TT or Ekip T&P accessory to find out which protection function tripped the trip unit;
- the trip unit is equipped with a device that detects the eventual opening solenoid disconnection thanks to the simultaneous blinking of all the LED.



Test connector on the front of the release:

- to connect the Ekip TT trip test unit, which allows trip test, LED test and signalling about the latest trip happened;
- to connect the Ekip T&P unit, which allows the measurements to be read, the trip test to be conducted, the protection functions test to be carried out, electronic setting of the protection functions of the trip unit and of the communication parameters;

Self-supply from a minimum current of  $0.2 \times I_n$  up.

With version of trip unit with communication function, you can:

- acquire and transmit a wide range of information via remote control;
- accomplish the circuit-breaker opening and closing commands by means of the motor operator in the electronic version (MOE-E);
- know the state of the circuit-breaker (open/closed/trip) via remote control;
- setting the configuration and programming the unit, such as the current thresholds and the protection function curves.

The three-pole version can be accessorized with external neutral current transformer and, in order to measure also phase powers, with external neutral voltage connection kit.

The new solution

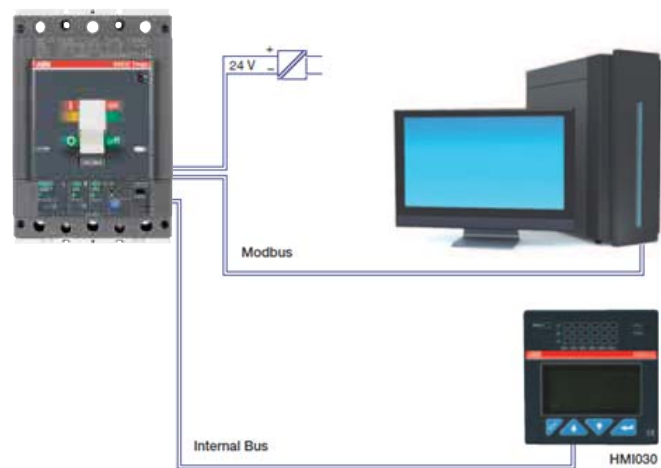
With this new electrical trip unit, ABB offers an optimal solution for energy and power measurements without the usage of external accessories, as the device VM210

This new trip unit will have the following ratings:

Ratings IEC			
In (A)	320	400	630
T5 400	•	•	-
T5 630	•	•	•

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

- Indeed for any ratings will be offered two versions:
- with MODBUS communication function
  - without MODBUS communication function.



# Circuit-breakers for power distribution

## Electronic trip units

### Protection function Ekip E-LSIG

2

Protection function	Trip threshold	Trip curve <sup>(1)</sup>	Excludability	Relation	Thermal memory
<b>L</b> Against overloads with long inverse time delay trip according to IEC 60947-2	Manual setting: $I_1 = 0.4...1 \times I_n$ step 0.04 Tolerance: trip between $1.1...1.3 I_1$ (IEC 60947-2)	Manual setting: $t_1 = 12-60s$ <sup>(4)</sup> at $I = 3 \times I_1$ Tolerance: $\pm 10\%$	–	$t = k/I^2$	–
	Electronic setting: $I_1 = 0.18...1 \times I_n$ step 0.01 Tolerance: trip between $1.1...1.3 I_1$ (IEC 60947-2)	Electronic setting: $t_1 = 3...72s$ <sup>(4)</sup> at $I = 3 \times I_1$ step 0.5 Tolerance: $\pm 10\%$	–	$t = k/I^2$	Yes
<b>S</b> Against short-circuits with inverse short ( $t=k/I^2$ ) or independent ( $t=k$ ) time delay trip	Manual setting: $I_2 = \text{OFF } 3-6-9$ Tolerance: $\pm 10\%$	Manual setting: $t_2 = 0.25-0.50s$ Tolerance: $\pm 10\%$	Yes	$t = k$	–
	Electronic setting: $I_2 = 0.6...10 \times I_n$ step 0.1 Tolerance: $\pm 10\%$	Electronic setting: $t_2 = 0.05...0.5s$ step 0.01 Tolerance: $\pm 10\%$	Yes	$t = k$	–
	Electronic setting: $I_2 = 0.6...10 \times I_n$ <sup>(3)</sup> step 0.1 Tolerance: $\pm 10\%$	Electronic setting: $t_2 = 0.05...0.4s$ step 0.01 at $10 \times I_n$ Tolerance: $\pm 10\%$	Yes	$t = k/I^2$	–
<b>I</b> Against short-circuits with adjustable threshold and instantaneous trip time	Manual setting: $I_3 = \text{OFF } 1.5-4-5.5-6-7.5-10-11.5$ <sup>(3)</sup> In Tolerance: $\pm 10\%$	$\leq 40ms$	Yes	$t = k$	–
	Electronic setting: $I_3 = 1.5...12 \times I_n$ <sup>(3)</sup> step 0.1 Tolerance: $\pm 10\%$	$\leq 40ms$	Yes	$t = k$	–
<b>G</b> Against earth fault with independent time delay trip <sup>(2)</sup>	Electronic setting: $I_4 = 0.2...1 \times I_n$ step 0.02 Tolerance: $\pm 10\%$	Electronic setting: $t_4 = 0.1...0.8s$ step 0.01s Tolerance: $\pm 15\%$	Yes	$t = k$	–
<b>UV</b> Standard adjustable constant time	Electronic setting: $U_8 = 0.5...0.95 \times U_n$ step $= 0.01 \times U_n$ Tolerance: $\pm 5\%$	Electronic setting: $t_8 = 0.1...5s$ step 0.1s Tolerance: min ( $\pm 10\% \pm 100ms$ )	Yes	$t = k$	–
<b>OV</b> Against overvoltage with adjustable constant time	Electronic setting: $U_9 = 1.05...1.2 \times U_n$ step $= 0.01 \times U_n$ Tolerance: $\pm 5\%$	Electronic setting: $t_9 = 0.1...5s$ step 0.1s Tolerance: min ( $\pm 10\% \pm 100ms$ )	Yes	$t = k$	–
Neutral	Electronic setting: OFF, 50% and 100%	For $I1 < 0.4 In$ mandatory neutral Setting 100%			

<sup>(1)</sup> Tolerances in case of:  
– self-powered trip unit at full power;  
– 2 or 3 phase power supply.  
In conditions other than those considered, the following tolerance hold:

Protection	Trip threshold	Trip time
<b>L</b>	release between $1.1$ and $1.3 \times I_1$	$\pm 20\%$
<b>S</b>	$\pm 10\%$	$\pm 20\%$
<b>I</b>	$\pm 15\%$	$\leq 60ms$
<b>G</b>	$\pm 15\%$	$\pm 20\%$

<sup>(2)</sup> Protection G is inhibited for currents higher than  $4 I_n$ .

<sup>(3)</sup> T5 630 I2 max = I3 max =  $9.5 I_n$ .

<sup>(4)</sup> T5 630 t1 max = 42s.

## Measurements

		Value	Range	Accuracy	Specified measuring range
Current		Phase current (I1, I2, I3, IN)	0.1 ... 12 In	Cl 1	0.2 ... 1.2 In
		Phase current minimum value			
		Phase current maximum value			
		Ground current (Ig)	0 ... 4 In	–	–
Voltage		Phase voltage runtime, max and min (V1N, V2N, V3N) <sup>(3)</sup>	5 ... 480 V	±0.5%	30 ... 400 V
		Line voltage runtime, max and min (U12, U23, U31)	10 ... 828 V	±0.5%	50 ... 690 V
Power	Active	Phase power runtime, max and min (P1, P2, P3) <sup>(3)</sup>	-5.76 In kW ... 5.76 In kW	Cl 2	-480In W ... -6In W 6In W ... 480In W <sup>(1)</sup>
		Total power runtime, max and min	-17.28 In kW ... 17.28 In kW	Cl2	-1.44In kW ... -18In W 18In W ... 1.44In kW <sup>(1)</sup>
	Reactive	Phase power runtime, max and min (Q1, Q2, Q3) <sup>(3)</sup>	-5.76 In kvar ... 5.76 In kvar	Cl 2	-480In var ... -6In var 6In var ... 4.80In var <sup>(1)</sup>
		Total power runtime, max and min	-17.28 In kvar ... 17.28 In kvar	Cl2	-1.44In kvar ... -18In var 18In var ... 1.44In kvar <sup>(1)</sup>
	Apparent	Phase power runtime, max and min (S1, S2, S3) <sup>(3)</sup>	In VA ... 5.76 In kVA	Cl 2	6In VA ... 480In VA
		Total power runtime, max and min	3 In VA ... 17.28 In kVA	Cl 2	18In VA ... 1.44In kVA
	Active	Total energy	1 kWh ... 214.75 GWh	Cl 2	1 kWh ... 214.75 GWh
		Incoming energy			
		Outgoing energy			
Energy	Reactive	Total energy	1 kvarh ... 214.75 Gvarh	Cl 2	1 kvarh ... 214.75 Gvarh
		Incoming energy			
		Outgoing energy			
	Apparent	Total energy	1 kVAh ... 214.75 GVAh	Cl 2	1 kVAh ... 214.75 GVAh
Power quality		Harmonic analysis <sup>(2)</sup>	11th (50 - 60Hz)	–	–
		THD of phase L1, L2, L3 <sup>(2)</sup>	0 ... 1000%	±10%	0 ... 500%
		Frequency runtime, max, min	44 ... 440 Hz	±0.2%	45 ... 66 Hz
		PF of phase L1, L2, L3 <sup>(3)</sup>	-1 ... 1	±2%	-1 ... -0.5 0.5 ... 1

<sup>(1)</sup> For:  $0.2\text{In} < I_i < 1.2\text{In}$  and  $30\text{V} < V_i < 400\text{V}$

<sup>(2)</sup> Available on demand by sending a Modbus command

<sup>(3)</sup> Not available if Neutral is not connected

# Circuit-breakers for power distribution

## Electronic trip units

### PR231/P

The PR231/P trip unit is the basic trip unit for Tmax T7. It provides protection functions against overload L and short-circuit S/I (version PR231/P-LS/I): with this version, by moving the dedicated dip-switch, you can choose whether to have protection S or protection I. Alternatively the version with only the protection function against instantaneous short-circuit I is available (version PR231/P-I see also page 2/45 and following). Setting the trip parameters of the PR231/P trip unit is made directly on the front of the circuit-breaker by means of dip

switches, and there is only one for the phases and the neutral, so it is possible to set the protection threshold, at 50% or at 100% of the phase protection.

To guarantee protection of the installation by means of the PR231/P protection trip unit, it is necessary to select the rated network frequency (50/60 Hz), by means of the special dip-switch.

Interchangeability of PR231/P can be requested by means of the dedicated ordering code 1SDA063140R1.

#### Protection L

Against overload

Socket for Ekip TT test unit

Rating Plug

Dip-switch for network frequency



#### Protection S

Against short-circuit with delayed trip

Dip-switch for neutral setting

#### Protection I

Against short-circuit with instantaneous trip

### Protection functions and parameterisations

Protection function	Trip threshold	Trip curves <sup>(1)</sup>	Excludability	Relation t=f(I)
<b>L</b>	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve ( $I^2t=k$ ) according to IEC 60947-2 Standard $I_1 = 0.40...1 \times I_n$ step = $0.04 \times I_n$ Trip between $1.1...1.3 \times I_1$	at $6 \times I_1$ at $6 \times I_1$ $t_1 = 3 - 12s$ Tolerance: $\pm 10\%$	—	$t = k/I^2$
<b>S</b>	Against short-circuit with long inverse time delay trip and trip characteristic with inverse time ( $I^2t = k$ ) (selectable as an alternative to protection function I) $I_2 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 \times I_n$ Tolerance: $\pm 10\%$	at $10 \times I_n$ at $10 \times I_n$ $t_2 = 0.1 - 0.25s$ Tolerance: $\pm 10\%$	■	$t = k/I^2$
<b>I</b>	Against short-circuit with instantaneous trip (selectable as an alternative to protection function S) $I_3 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 \times I_n$ Tolerance: $\pm 10\%$	instantaneous	—	$t = k$

<sup>(1)</sup> These tolerances hold in the following conditions:  
 — self-powered trip unit at full power  
 — two or three-phase power supply  
 In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
<b>S</b>	$\pm 10\%$	$\pm 20\%$
<b>I</b>	$\pm 15\%$	$\leq 60ms$

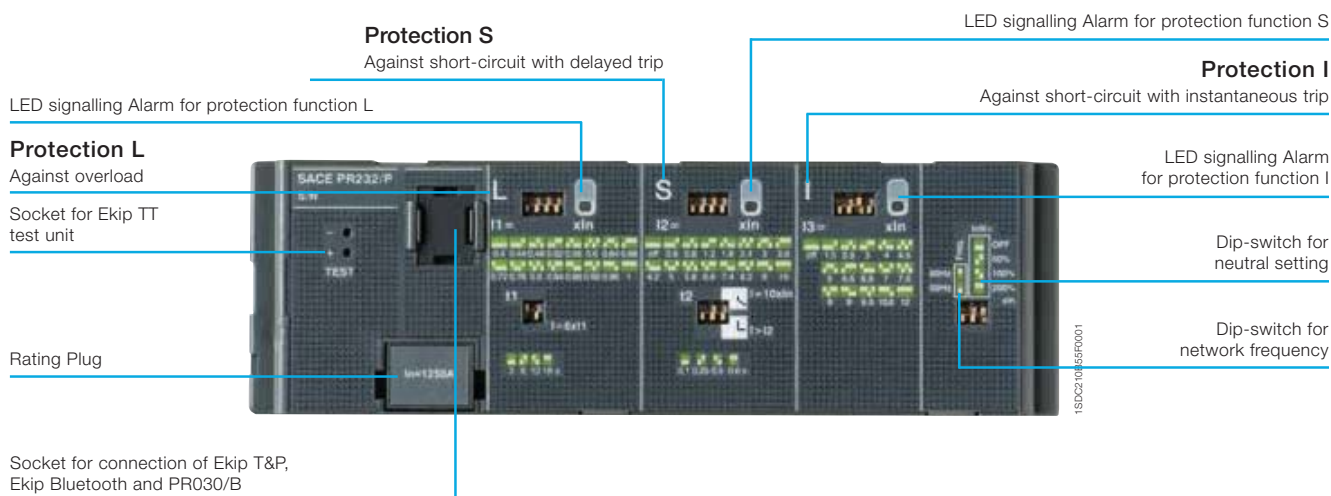


## PR232/P

The PR232/P release, available for T7, provides protection functions against overload L, delayed short-circuit S and instantaneous short-circuit I (version PR232/P-LSI). Setting the trip parameters (see table) of the PR232/P release can be carried out by means of the dip-switches, and is unique for the phases and the neutral, for which it is possible to set the protection threshold to OFF, to 50%, 100% or 200% of the threshold of the phases directly from the front

of the release by means of a special dip-switch. In particular, adjustment of the neutral to 200% of the phase current requires setting protection L to respect the current-carrying capacity of the circuit-breaker.

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



### Protection functions and parameterisations

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

<sup>(1)</sup> These tolerances hold in the following conditions:  
 — self-powered trip unit at full power (without start-up)  
 — two or three-phase power supply.  
 In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
<b>S</b>	$\pm 10\%$	$\pm 20\%$
<b>I</b>	$\pm 15\%$	$\leq 60ms$

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




# Circuit-breakers for power distribution

## Electronic trip units

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There are three red LEDs available on the front of the PR232/P trip unit dedicated to signalling alarm of protections L, S, and I. Furthermore, a yellow flashing LED allows the state of pre-alarm of function L to be signalled, which is activated when 90% of the set trip threshold is reached. The yellow flashing LED every 3s indicates the normal operation.

PR232/P - Alarm and Pre-alarm LED

Protection	Colour	Pre-alarm	Alarm	Last trip
	Yellow	■	—	—
	Red	—	■	■
	Red	—	■	■
	Red	—	■	■

Following circuit-breaker opening, it is possible to know which protection function made the release trip by connecting the PR030/B battery unit onto the front of the release. This is also possible thanks to the Ekip T&P test and configuration unit. By means of the Ekip Bluetooth wireless communication unit the PR232/P can be connected to a PDA or to a personal computer, extending the range of information available for the user. Infact, by means of the 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.

## PR331/P

The PR331/P, available for Tmax T7 in the PR331/P-LSIG version, with its complete range of protection functions together with the wide combination of thresholds and trip times offered is it suitable for protecting a wide range of alternating current installations. In addition to protection

functions the unit is provided with multifunction LED indicators. Furthermore, PR331/P allows connection to external devices enhancing its advanced characteristics like remote signalling and monitoring, or interface from front of HMI030 panel.

### Protection S

Against short-circuit with delayed trip

LED signalling Alarm and prealarm for protection function L

### Protection L

Against overload

Dip-switch for neutral setting

Dip-switch for network frequency

Rating Plug

Socket for connection of Ekip T&P, Ekip Bluetooth and PR030/B



### Protection I

Against short-circuit with instantaneous trip

LED signalling Alarm for protection function I

LED signalling Alarm for protection function G

### Protection G

Against earth fault

Info/test push button

LED signalling Alarm for protection function S

## Protection functions and parameterisations

Protection functions	Trip threshold	Trip curves <sup>(1)</sup>	Excludability	Relation $t = f(I)$
<b>L</b> Against overload with long inverse time-delay trip and trip characteristic according to an inverse time curve ( $I^2t=k$ ) according to the IEC 60947-2 Standard	$I_1 = 0.40 \dots 1 \times I_n$ step = $0.025 \times I_n$ Trip between $1.05 \dots 1.2 \times I_1$	at $3 \times I_1$ $t_1 = 3 - 12 - 24 - 36 - 48 - 72 - 108 - 144s$ Tolerance: $\pm 10\%$ up to $6 \times I_n$ $\pm 20\%$ above $6 \times I_n$	—	$t = k/I^2$
<b>S</b> Against short-circuit with short inverse time-delay trip and trip characteristic with inverse time ( $I^2t=k$ ) or with definite time	$I_2 = 0.6 - 0.8 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5 - 5.8 - 6.6 - 7.4 - 8.2 - 9 - 10 \times I_n$ Tolerance: $\pm 7\%$ up to $6 \times I_n$ $\pm 10\%$ above $6 \times I_n$	at $10 \times I_n$ $t_2 = 0.1 \dots 0.8s$ step = $0.1s$ Tolerance: min ( $\pm 10\%$ , $\pm 40ms$ )	■	$t = k/I^2$
<b>I</b> Against short-circuit with adjustable instantaneous trip	$I_3 = 1.5 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 \times I_n$ <sup>(2)</sup> Tolerance: $\pm 10\%$	$I > I_3$ $t_3 = 0.1 \dots 0.8s$ step = $0.1s$ Tolerance: $\pm 15\%$ up to $6 \times I_n$ $\pm 20\%$ above $6 \times I_n$	■	$t = k$
<b>G</b> Against earth fault with short inverse time-delay trip and trip characteristic according to an inverse time curve ( $I^2t=k$ ) or with definite time	$I_4 = 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 0.9 - 1 \times I_n$ Tolerance: $\pm 7\%$	$4.47 \times I_4$ $3.16 \times I_4$ $2.24 \times I_4$ $1.58 \times I_4$ $t_4 = 0.1s$ $t_4 = 0.2s$ $t_4 = 0.4s$ $t_4 = 0.80s$ Tolerance: $\pm 15\%$	■	$t = k/I^2$ <sup>(3)</sup>
	$I_4 = 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 0.9 - 1 \times I_n$ Tolerance: $\pm 7\%$	$t_4 = 0.1s$ $t_4 = 0.2s$ $t_4 = 0.4s$ $t_4 = 0.80s$ Tolerance: min ( $\pm 10\%$ , $\pm 40ms$ )	■	$t = k$

<sup>(1)</sup> These tolerances hold in the following conditions:  
– self-powered trip unit at full power and/or auxiliary supply  
– two or three-phase power supply  
In conditions other than those considered, the following tolerances hold:

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

<sup>(2)</sup> For  $T7 I_n = 1250 A/1600 A \Rightarrow I_{n,max} = 12 \times I_n$   
<sup>(3)</sup>  $t = k/I^2$  up to the current value indicated,  $t = k$  equating to the chosen setting) beyond the current value indicated

# Circuit-breakers for power distribution

## Electronic trip units

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### User interface

The user communicates directly with the trip unit 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 pre-alarm 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 trip coil 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, Ekip T&P, or a Ekip Bluetooth wireless communication unit.

### Setting the neutral

Protection of the neutral can be set at 50%, 100% or 200% of the phase currents. In particular, adjustment of the neutral at 200% of the phase current is possible if the following inequality is respected:  $I_1 \times I_n \times \%N_e \leq I_u$ . The user can also switch the neutral protection OFF.

### Test function

The Test function is carried out by means of the Info/Test pushbutton and the PR030/B battery unit (or Ekip Bluetooth) 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 PR331/P trip units. The PR331/P electronic trip unit can be tested by using the Ekip T&P test and configuration unit by connecting it to the TEST connector.

### 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 operation, it is required for the three phases to be passed through by a current of 70 A. An external power supply can be connected in order to activate additional features, and in particular for connection to external devices: HMI030 and LD030 DO.

### PR331/P - Electrical characteristics

Auxiliary power supply (galvanically insulated)	24 V DC $\pm$ 20%
Maximum ripple	5%
Inrush current @ 24 V	3 A for 5 ms
Rated power @ 24 V	1 W

### Communication

By means of the Ekip Bluetooth wireless communication unit, PR331/P can be connected to a 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. PR331/P can also be connected to the optional external LD030 DO signalling unit, for the remote signalling of protections alarms and trips, and to HMI030, for the remote user interfacing.

## PR332/P

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

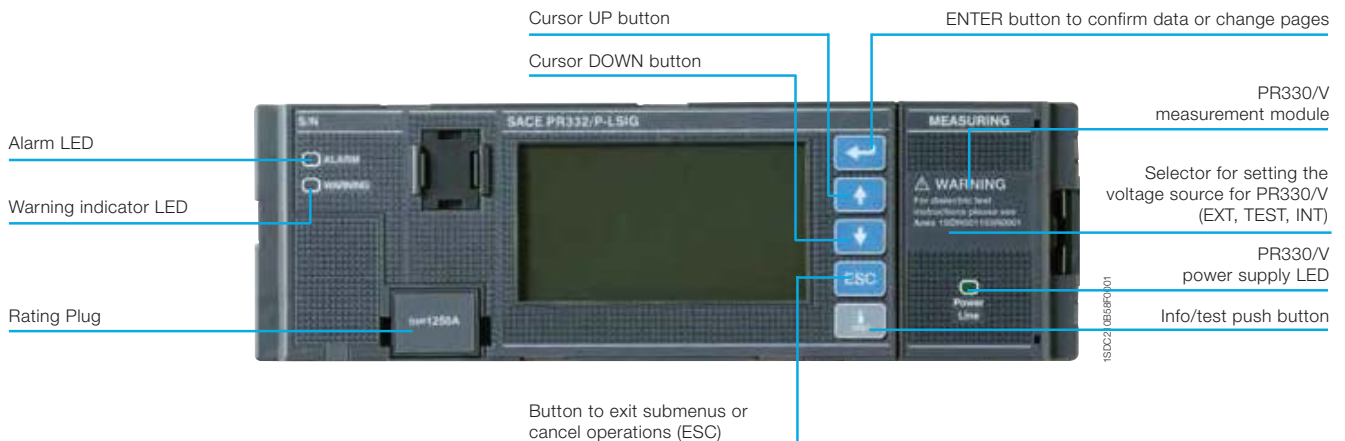
in designing protection trip units. The exhaustive range of settings makes this protection unit ideal for general use in power distribution.

Access to information and programming using a keyboard and graphic liquid crystal display is extremely simple and intuitive. An integrated ammeter and many other additional features are provided over and above the protection functions. These additional functions can be further increased with addition on board of the dialogue, signalling, measurement, and wireless communication units. All the thresholds and trip curve delays of the protection functions are stored in special memories which retain the information even when no power is supplied.

### PR332/P










### PR332/P with PR330/V









# Circuit-breakers for power distribution

## Electronic trip units

### PR332/P - Protection functions and parameterisations

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

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

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

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

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

<sup>(2)</sup> Active with 24V auxiliary power supply

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

<sup>(4)</sup> For  $T7\text{ In} = 1250\text{ A}/1600\text{ A} \Rightarrow I_{y\text{ max}} = 12 \times I_n$

<sup>(5)</sup>  $k = (2s) \cdot (I_y)^2$

### Setting the neutral

In PR332/P, the neutral protection is 50% of the value set for phase protection in the standard version. The neutral protection can be excluded or set to 100%. 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. The table below lists the neutral settings for the various possible combinations between type of circuit-breaker and the threshold  $I_1$  setting.

### Adjustable neutral protection settings

#### Threshold $I_1$ settings (overload protection)

Circuit-breaker model	$0.4 < I_1 < 0.5$	$0.5 < I_1 < 0.66$	$0.66 < I_1 < 1^{(1)}$
T7	0-50-100-150-200%	0-50-100-150%	0-50-100%

<sup>(1)</sup> The setting  $I_1 = 1$  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)

### 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 avoids untimely tripping caused by the high inrush currents of certain loads (motors, transformers, lamps). The start-up phase lasts from 100 ms to 30 s, in steps of 0.01 s. It is automatically recognized by the PR332/P trip unit when the peak value of the maximum current exceeds the threshold that can be set by the user. A new start-up becomes possible after the current has fallen down to  $0.1 \times I_n$ , if the trip unit is supplied from an external source.

### Protection against overtemperature

The user has the following signals or commands available for the protection against overtemperature:

- lighting up of the "Warning" LED when the temperature is higher than 70 °C or lower than -20 °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 or lower than -25 °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.

### Self-diagnosis

The PR332/P range of trip units contains an electronic circuit which periodically checks the continuity of internal connections (trip coil and 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 PR332/P-LSIRc, which has all the characteristics of PR332/P-LSI and residual current protection as well. When additional features are required, the solution is PR332/P-LSIG with an additional PR330/V module (see next paragraph). Using this configuration, residual current protection is added to a powerful unit, having the features of PR332/P-LSI and all the add-ons described for the PR330/V module, such as voltage protection and advanced measurement functions.

Residual current protection acts by measuring the current by means the external dedicated toroid.

### 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, trip coil and circuit-breaker tripping mechanism to be checked. The control menu also includes the option of testing correct operation of the display, signalling LEDs. By means of the front multi-pin connector it is possible to apply a SACE Ekip T&P Test unit which allows the functions of the PR222DS/P, PR222DS/PD, PR223DS, PR223EF, PR232/P, PR331/P and PR332/P 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 PR330/D-M module or external Ekip Bluetooth device) is connected, it is possible to set parameters simply by downloading them into the unit (over the network for PR330/D-M, by using the SD-Pocket software and a PDA or a notebook for Ekip Bluetooth). Parameterisation can then be carried out quickly and automatically in an error-free way by transferring data directly from DocWin.



# Circuit-breakers for power distribution

## Electronic trip units

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### 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 ( $L1 > 90\% \times I_n$ );
- first temperature threshold exceeded (70 °C);
- contact wear beyond 80%;
- phase rotation reversed (with optional PR330/V).

Example of events indicated by the "ALARM" LED:

- 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 PR330/V).

### Data logger

By default PR332/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 SD-Pocket or SD-TestBus2 applications and can be transferred to any personal computer for elaboration. The function freezes the recording whenever a trip occurs or in case of other events, so that a detailed analysis of faults can be easily performed. SD-Pocket and SD-TestBus2 allow also reading and downloading of all the others trip information.

- Number of analog 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 PR332/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 Ekip Bluetooth 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 PR332/P through LD030 DO 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. External LD030 DO accessory unit is required for Load Control. The function is only active when an auxiliary power supply is available.

### PR330/V Measurement Module

This optional internal module, installed in PR332/P, 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.

PR330/V module, when is ordered mounted on the circuit-breaker, does not require any external connection or voltage transformers since it is connected internally to the upper terminals of Tmax T7 (selector in "INT" position) through the internal voltage sockets. When necessary, the connection of voltage pick-ups can be moved to any other point (i.e. lower terminals), by using the alternative connection located in the terminal box and switching the selector to the "EXT" position. For the dielectric test of the circuit-breaker the selector must be switched to the "Insulating TEST" position. PR330/V is able to energize the PR332/P while line voltage input is above 85 V. The use of Voltage Transformers is mandatory for rated voltages higher than 690 V.

Voltage transformers shall have burdens between 5 VA and 10 VA and accuracy class 0.5 or better.

Additional Protections with PR330/V:

- Undervoltage (UV) protection
- Overvoltage (OV) protection
- Residual voltage (RV) protection
- Reversal of 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: in this case the trip unit will indicate the "ALARM" status. 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 (24 V DC or PR330/V) is present.



### Measurement function

The current measurement function (ammeter) is present on all versions of the PR332/P trip 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. The display is rear-lit and the ammeter is active even at current levels lower than 160 A. Accuracy of the ammeter measurement chain (current sensor plus ammeter) is no more than 1.5% in the 0.3-6 x  $I_n$  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 20 events).

When the optional PR330/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.

### Communication

PR332/P electronic trip unit can be fitted with communication modules, which make 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 SACE has developed

a complete series of accessories for electronic trip unit PR332/P:

- PR330/D-M is the communication module for PR332/P protection trip units. It is designed to allow easy integration of the Tmax 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 bandrate of up to 19.2 kbps. 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 PR330/D-M in an industrial communication system are available on the ABB Web page.
- Ekip Bluetooth is a device to be connected to the Test connector of PR222DS/P, PR222DS/PD, Ekip E-LSIG, PR223DS, PR223EF, PR232/P, PR331/P and PR332/P trip units. It permits remote connection with the trip unit by portable PC, tablet or smartphone on which Ekip Connect software has been installed.
- EP010-FBP-PDP22 is the Fieldbus Plug interface allows connection of ABB SACE trip units with Modbus communication to a Profibus, DeviceNet, or AS-I field bus network.

All information required for simple integration of PR330/D-M in an industrial communication system are available on the ABB Web page <http://new.abb.com>.

# Circuit-breakers for power distribution

## Electronic trip units

### Measurement, signalling and available data functions

Details about functions available on PR332/P, trip units with PR330/D-M and EP010 - FBP - PDP22 are listed in the table below:

2

Communication functions	PR332/P+PR330/D-M	PR332/P+PR330/D-M and EP010
Protocol	Modbus RTU standard	FBP-PDP22
Physical means	RS485	Profibus-DP or DeviceNet cable
Speed (maximum)	19.2 kbps	115 kbps
<b>Measurement functions</b>		
Phase currents	■	■
Neutral current	■	■
Ground current	■	■
Voltage (phase-phase, phase-neutral, residual)	opt. <sup>(1)</sup>	opt. <sup>(1) (2)</sup>
Power (active, reactive, apparent)	opt. <sup>(1)</sup>	opt. <sup>(1) (3)</sup>
Power factor	opt. <sup>(1)</sup>	(4)
Frequency and peak factor	opt. <sup>(1)</sup>	(4)
Energy (active, reactive, apparent)	opt. <sup>(1)</sup>	(4)
Harmonic analysis	—	—
<b>Signalling functions</b>		
LED: auxiliary power supply, pre-alarm, alarm, transmission, reception	■	■
Temperature	■	■
Indication for L, S, I, G and other protection	■	■
<b>Available data</b>		
Circuit-breaker status (open, closed)	■	■
Circuit-breaker position (racked-in, racked-out)	■	■
Mode (local, remote)	■	■
Protection parameters set	■	■
Load control parameters	■	■
<b>Alarms</b>		
Protections: L, S, I, G	■	■
Undervoltage, overvoltage and residual voltage protection (timing and trip)	opt. <sup>(1)</sup>	opt. <sup>(1)</sup>
Reverse power protection (timing and trip)	opt. <sup>(1)</sup>	opt. <sup>(1)</sup>
Directional protection (timing and trip)	—	—
Underfrequency/overfrequency protection (timing and trip)	opt. <sup>(1)</sup>	opt. <sup>(1)</sup>
Phases rotation	—	—
Failed tripping under fault conditions	■	■
<b>Maintenance</b>		
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	■	■
<b>Commands</b>		
Circuit-breaker open/close	■	■
Alarms reset	■	■
Setting of curves and protection thresholds	■	■
Synchronize system time	■	■
<b>Events</b>		
Status changes in circuit-breaker, protections and all alarms	■	■

<sup>(1)</sup> with PR330/V

<sup>(2)</sup> no residual voltage

<sup>(3)</sup> no apparent power available

<sup>(4)</sup> please ask ABB for further details

### Power supply

The PR332/P trip unit does not normally require any external power supplies, being self-supplied from the current sensors (CS): to activate the protection and ammeter functions, it is sufficient for at least one phase to have a current load higher than 80 A.

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 (<80 A).

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.

PR332/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.

	PR332/P	PR330/D-M
Auxiliary power supply (galvanically insulated)	24 V DC $\pm$ 20%	from PR332/P
Maximum ripple	5%	$\pm$ 5%
Inrush current @ 24 V	3 A for 5 ms	~0.5 A for 5 ms
Rated power @ 24 V	2 W	+1 W
Inrush current @ 24 V when modules connected	5 A for 5 ms	
Rated power @ 24 V when modules connected	3 W	

PR330/V can give power supply to the trip unit when at least one line voltage is equal or higher to 85V RMS.

# Circuit-breaker for zone selectivity

## Electrical characteristics

### Zone selectivity

2

			T4	T5	T6	T7
Rated uninterrupted current	[A]		250/320	400/630	630/800/1000	800/1000/1250/1600
Poles	[No.]		3/4	3/4	3/4	3/4
Rated service voltage, <b>Ue</b>	(AC) 50-60 Hz	[V]	690	690	690	690
	(DC)	[V]	750	750	750	750
Rated impulse withstand voltage, <b>Uimp</b>	[kV]		8	8	8	8
Rated insulation voltage, <b>Ui</b>	[V]		1000	1000	1000	1000
Test voltage at industrial frequency for 1 min.	[V]		3500	3500	3500	3500
Rated ultimate short-circuit breaking capacity, <b>Icu</b>			<b>L</b>	<b>L</b>	<b>L</b>	<b>S</b> <b>H</b> <b>L</b> <b>V<sup>(1)</sup></b>
(AC) 50-60 Hz 220/230 V	[kA]		200	200	200	85 100 200 200
(AC) 50-60 Hz 380/415 V	[kA]		120	120	100	50 70 120 150
(AC) 50-60 Hz 440 V	[kA]		100	100	80	50 65 100 130
(AC) 50-60 Hz 500 V	[kA]		85	85	65	40 50 85 100
(AC) 50-60 Hz 690 V	[kA]		70	70	30	30 42 50 60
(AC) 50-60 Hz 1000 V	[kA]		16	16	–	– – – –
Rated service short-circuit breaking capacity, <b>Ics</b>						
(AC) 50-60 Hz 220/230 V	[%Icu]		100%	100%	75%	100% 100% 100% 100%
(AC) 50-60 Hz 380/415 V	[%Icu]		100%	100%	75%	100% 100% 100% 100%
(AC) 50-60 Hz 440 V	[%Icu]		100%	100%	75%	100% 100% 100% 100%
(AC) 50-60 Hz 500 V	[%Icu]		100%	100% <sup>(2)</sup>	75%	100% 100% 75% 100%
(AC) 50-60 Hz 690 V	[%Icu]		100%	100% <sup>(3)</sup>	75%	100% 75% 75% 75%
(AC) 50-60 Hz 1000 V	[%Icu]		50%	25%	–	– – – –
Rated short-circuit making capacity, <b>Icm</b>						
(AC) 50-60 Hz 220/230 V	[kA]		440	440	440	187 220 440 440
(AC) 50-60 Hz 380/415 V	[kA]		264	264	220	105 154 264 330
(AC) 50-60 Hz 440 V	[kA]		220	220	176	105 143 220 286
(AC) 50-60 Hz 500 V	[kA]		187	187	143	84 105 187 220
(AC) 50-60 Hz 690 V	[kA]		154	154	63	63 88.2 105 132
(AC) 50-60 Hz 1000 V	[kA]		32	32	–	– – – –
Utilisation category (IEC 60947-2)			A	B (400A) <sup>(4)</sup> - A (630A)	B (630A - 800A) <sup>(5)</sup> - A (1000A)	B <sup>(6)</sup>
Isolation behaviour			■	■	■	■
Reference Standard			IEC 60947-2	IEC 60947-2	IEC 60947-2	IEC 60947-2
Trip unit:	electronic PR223EF		■	■	■	–
	PR332/P		–	–	–	■
Versions			F-P-W <sup>(7)</sup>	F-P-W <sup>(7)</sup>	F-W	F-W
Terminals	fixed		F-FC Cu-FC CuAl-EF-ES-R-MC <sup>(8)</sup>	F-FC Cu-FC CuAl-EF-ES-R <sup>(8)</sup>	F-FC CuAl-EF-ES-R-RC	F-EF-ES-FC CuAl-HR/VR
	plug-in		EF-ES-HR-VR-FC Cu-FC CuAl	EF-ES-HR-VR-FC Cu-FC CuAl	–	–
	withdrawable		EF-ES-HR-VR-FC Cu-FC CuAl	EF-ES-HR-VR-FC Cu-FC CuAl	EF-HR-VR	EF-HR/VR-ES-RS
Mechanical life	[No. operations]		20000	20000	20000	10000
	[No. Hourly operations]		240	120	120	60
Electrical life @ 415 V AC	[No. operations]		8000 (250A) - 6000 (320A)	7000 (630A) - 5000 (800A)	7000 (630A) - 5000 (800A) - 4000 (1000A)	2000 (S, H, L versions) - 3000 (V version)
	[No. Hourly operations]		120	60	60	60
Basic dimensions - fixed version	3 poles	W [mm]	105	140	210	210
	4 poles	W [mm]	140	184	280	280
		D [mm]	103.5	103.5	103.5	154 (manual)/ 178 (motorizable)
		H [mm]	205	205	268	268
Weight	fixed	3/4 poles	[kg]	2.35/3.05	3.24/4.15	9.5/12
	plug-in	3/4 poles	[kg]	3.6/4.65	5.15/6.65	–
	withdrawable	3/4 poles	[kg]	3.85/4.9	5.4/6.9	12.1/15.1
						29.7/39.6 (manual)/ 32/42.6 (motorizable)

TERMINAL CAPTION  
 EF = Front extended  
 F = Front  
 ES = Front extended spread  
 R = Rear orientated  
 MC = Multi-cable  
 HR = Rear flat horizontal  
 VR = Rear flat vertical  
 HR/VR = Rear flat horizontal/vertical  
 F = Fixed circuit-breaker  
 P = Plug-in circuit-breaker  
 W = Withdrawable circuit-breaker

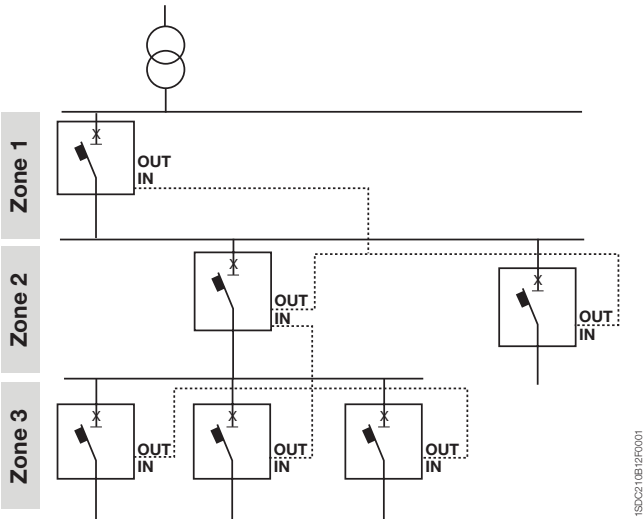
<sup>(1)</sup> Only for T7 800/1000/1250 A  
<sup>(2)</sup> 75% for T5 630  
<sup>(3)</sup> 50% for T5 630  
<sup>(4)</sup> Only up to 630 V, I<sub>cw</sub> = 5 kA  
<sup>(5)</sup> I<sub>cw</sub> = 7.6 kA (630 A) - 10 kA (800 A)

<sup>(6)</sup> I<sub>cw</sub> = 20 kA (S, H, L versions) - 15 kA (V version)  
<sup>(7)</sup> For applications at 1000 V, only available in the fixed version  
<sup>(8)</sup> For applications at 1000 V, only available with Fc Cu terminals

Note: in the plug-in/withdrawable version of T5 630 the maximum rated current is derated by 10% at 40 °C.

# Circuit-breaker for zone selectivity

## General characteristics



This type of coordination, a development of time coordination, is made by means of logic connections between current measuring devices which, once the set threshold having been exceeded is detected, allow just the fault area to be identified and to have its power supply cut off.

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

Making the protection is done by connecting all the zone selectivity outputs of the trip units belonging to the same zone to each other and taking this signal to the zone selectivity input of the trip unit immediately to the supply side. By means

of a simple shielded twisted-pairwire (maximum length of 200 m), each circuit-breaker which detects a fault communicates this to the one on the supply side sending a timed locking signal. The circuit-breaker which does not receive any communication from those on the load side, sends the opening command within the set selectivity time. Zone selectivity can be activated for Tmax circuit-breakers in the case where:

- there is a source of 24 V auxiliary power supply;
- the Tmax T4, T5 or T6 circuit-breaker is equipped with the PR223EF trip unit (EFDP zone selectivity) or Tmax T7 equipped with the PR332/P trip unit (ZS zone selectivity).

### Current sensors

	In [A]	160	250	320	400	630	800	1000	1250	1600
PR223EF	T4 250	■	■							
	T4 320			■						
	T5 400			■	■					
	T5 630					■				
	T6 630					■				
	T6 800						■			
	T6 1000							■		
PR332/P	T7 800				▲	▲	■			
	T7 1000				▲	▲	▲	■		
	T7 1250				▲	▲	▲	▲	■	
	T7 1600				▲	▲	▲	▲	▲	■

■ = Complete circuit-breaker already coded  
 ▲ = Circuit-breaker to be assembled

For further information on zone selectivity, please consult the section: “Characteristic curves and technical information” on page 4/74.

# Circuit-breaker for zone selectivity

## EFDP Zone selectivity: PR223EF

2

The PR223EF electronic trip unit available on T4, T5 and T6 in the L version (120 kA @ 380/415 V) for use in alternating current, is able to isolate a fault present in extremely rapid times.

This performance is made possible thanks to the EFDP (Early Fault Detection and Prevention) algorithm, which is able to detect the short-circuit at its onset, exploiting analysis of the trend of the shunted current in relation to the current. The PR223EF trip unit therefore offers two performances simultaneously which, until today, were antithetic: selectivity and trip rapidity.

Thanks to extremely rapid detection and quenching of the short-circuit, the MCCB equipped with this trip unit are totally selective up to over 100 kA, and are not subject to any limits regarding the number of hierarchical levels of the installation. Trip rapidity, together with just as rapid transmission of the order to wait, allow a high number of circuit-breakers to be interlocked, making a global selectivity chain in the installation: by using the PR223EF no limitation in topological terms is introduced, with distances between interlocked circuit-breakers reaching up to 1 Km, thereby making the protection system highly flexible.

EFDP zone selectivity is carried out by means of a logic interlocking protocol (Interlock Bus IL). The connection is made by means of a simple screened-twisted-pair cable which connects the circuit-breakers fitted with the PR223EF. In the case of a fault, the circuit-breaker immediately to the supply side sends a locking signal to the hierarchically higher circuit-breaker by means of the bus and, before intervening, checks that a similar locking signal has not been reached by the circuit-breakers on the load side.

The soundness of the system is controlled by a monitoring function of the interlock channel, guaranteeing the system a very high level of safety.

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

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

In the presence of an auxiliary power supply:

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

If it is under self-supply conditions:

- the trip unit disables the EF, implementing the classic protection functions which also characterize the PR223/DS trip unit: L, S, I and G
- EFDP zone selectivity is not enabled.

### Auxiliary power supply - Electrical characteristics

	PR223EF
Auxiliary power supply (galvanically insulated)	24 V DC $\pm 20\%$
Maximum ripple	$\pm 5\%$
Inrush current @ 24 V	$\sim 4$ A for 0.5 ms
Rated current @ 24 V	$\sim 80$ mA
Rated power @ 24 V	$\sim 2$ W

Connection of the logic interlock and auxiliary power supply is made by means of the X3 and X4 connectors located on the back of the trip unit.

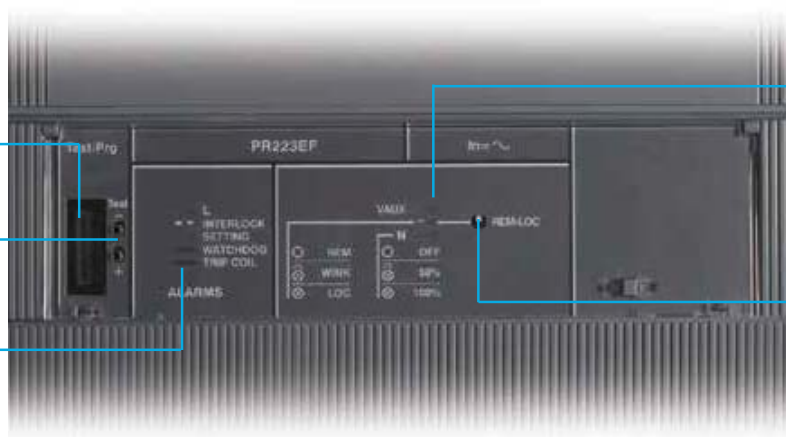
For the neutral, it is possible set the protection threshold of the functions to OFF, at 50% and at 100% that of the phase, by means of the dialogue function or Ekip T&P. Furthermore, pre-alarm and alarm signalling of protection L is available on the front of the trip units. The pre-alarm threshold value is  $0.9 \times I_n$ .

The PR223EF trip unit, just like the PR223DS one, allows storage and display of information regarding a trip unit trip. The information is saved permanently and up to 20 trip events are recorded, which can be acquired by a supervision system using the Modbus protocol or can be displayed locally by means of the FDU or Ekip T&P unit.

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

Socket for TT1 test unit

LED signalling alarm of the circuit-breaker



LED signalling the status of the circuit-breaker

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

1SDC210015F1002

## Protection functions and parameterisations

Protection functions	Trip threshold	Trip curves <sup>(1)</sup>	Excludability	Relation $t = f(I)$	EFDP zone selectivity
<b>L</b>	Against overload with long inverse time-delay trip and trip characteristic according to an inverse time curve ( $I^2t=k$ ) according to the IEC 60947-2 Standard	<b>Electronic setting</b> $I_1 = 0.18 \dots 1 \times I_n^{(5)}$ step $0.01 \times I_n$ Trip between $1.1 \dots 1.3 \times I_1$ (IEC 60947-2)	<b>Electronic setting</b> at $6 \times I_1$ $t_1 = 3 \dots 18s^{(2)}$ (step 0.5s) Tolerance: $\pm 10\%$	—	$t = k/I^2$ —
<b>S</b>	Against short-circuit with short inverse time-delay trip and trip characteristic with inverse time ( $I^2t=k$ ) or with definite time	<b>Electronic setting</b> $I_2 = 0.60 \dots 10 \times I_n^{(3)}$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$	<b>Electronic setting</b> at $8 \times I_n$ $t_2 = 0.05 \dots 0.5s$ (step 0.01s) Tolerance: $\pm 10\%$	■	$t = k/I^2$ ■
<b>EF</b>	Against short-circuit with ultra rapid trip <sup>(4)</sup>	<b>Electronic setting</b> $I_2 = 0.60 \dots 10 \times I_n^{(3)}$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$	<b>Electronic setting</b> $t_2 = 0.05 \dots 0.5s$ (step 0.01s) Tolerance: $\pm 10\%$	■	$t = k$ ■
<b>I</b>	Against short-circuit with instantaneous trip with adjustable threshold	<b>Electronic setting</b> $I_3 = 1.5 \dots 12 \times I_n^{(3)}$ step $0.1 \times I_n$ Tolerance: $\pm 10\%$	instantaneous	■	$t = k$ —
<b>G</b>	Against earth fault with inverse short time delay trip and trip characteristic with inverse time ( $I^2t=k$ )	<b>Electronic setting</b> $I_4 = 0.2 \dots 1 \times I_n$ (step $0.1 \times I_n$ ) Tolerance: $\pm 10\%$	<b>Electronic setting</b> $t_4 = 0.1 \dots 0.8s$ (step 0.01s) Tolerance: $\pm 15\%$	■	$t = k/I^2$ ■

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

	Trip threshold	Trip curves
<b>S</b>	$\pm 20\%$	$\pm 20\%$
<b>I</b>	$\pm 20\%$	$\leq 50ms$
<b>G</b>	$\pm 20\%$	$\pm 20\%$

<sup>(2)</sup> For T4.  $I_n = 320$  A and T5.  $I_n = 630$  A  $\Rightarrow t_1 = 10.5s$

<sup>(3)</sup> For T4  $I_n = 320$  A, T5  $I_n = 630$  A and T6  $I_n = 1000$  A  $\Rightarrow I_2 \max = 9.5 \times I_n$ ,  $I_3 \max = 9.5 \times I_n$   
For T6  $I_n = 800$  A  $\Rightarrow I_3 \max = 10.5 \times I_n$

<sup>(4)</sup> Active in auxiliary power supply (24 V DC)

<sup>(5)</sup> For  $I_1 < 0.4 \times I_n$  the neutral setting must be at 100% of that of the phases

# Circuit-breaker for zone selectivity

## EFDP Zone selectivity: PR223EF

2

The information recorded when the protection release trips is:

- Currents (L1, L2, L3, N) which caused opening
- Events
- States
- Alarms
- Trips
- Tripped protection
- Parameters of the tripped protection.

When there is an auxiliary power supply, providing it is complete with the VM210 module, the PR223EF enables you to see not only the currents but also the voltages in the system, both locally via the FDU or HMI030, and remotely via a supervisor system using the Modbus protocol. In addition, up to 20 trip events can be recorded, even in self-supply mode.

### PR223EF - Measurements

Measurements	With distributed N	Without distributed N
Effective current values	$I_1, I_2, I_3, I_N$	$I_1, I_2, I_3$
Effective voltage values	$V_1, V_2, V_3, V_{12}, V_{23}, V_{31}$	$V_1, V_2, V_3$
Phase peak factor	■	■
Frequency	$f$	$f$

The PR223EF trip unit is an integral part of the circuit-breaker and is therefore not interchangeable with the other protection trip units available on T4, T5 and on T6.



# Circuit-breaker for zone selectivity

## ZS Zone selectivity: PR332/P

With the PR332/P trip unit (see chapter: “Tmax circuit-breakers for power distribution”, page 2/27 and following) it is now possible to extend the ZS zone selectivity function, already available on ABB SACE Emax air circuit-breakers to the Tmax moulded-case circuit-breakers.

The ZS zone selectivity, which is applicable to protection functions S and G, can be enabled in the case where the curve with fixed time is selected and the auxiliary power supply is present.

To realize correctly the ZS zone selectivity the following settings are suggested for the upstream circuit-breaker:

<b>S</b>	$t_2 \geq t_{2, \text{ set time}} + 70 \text{ ms}^*$
<b>I</b>	$I_3 = \text{OFF}$
<b>G</b>	$t_4 \geq t_{4, \text{ set time}} + 70 \text{ ms}^*$
<b>Selectivity time</b>	same setting for each circuit-breaker

\* At minimum between the trip times of two CBs in series, with auxiliary power supply  
 \*\* See page 2/28 for  $t_{2, \text{ set}}$  and  $t_{4, \text{ set}}$  settings

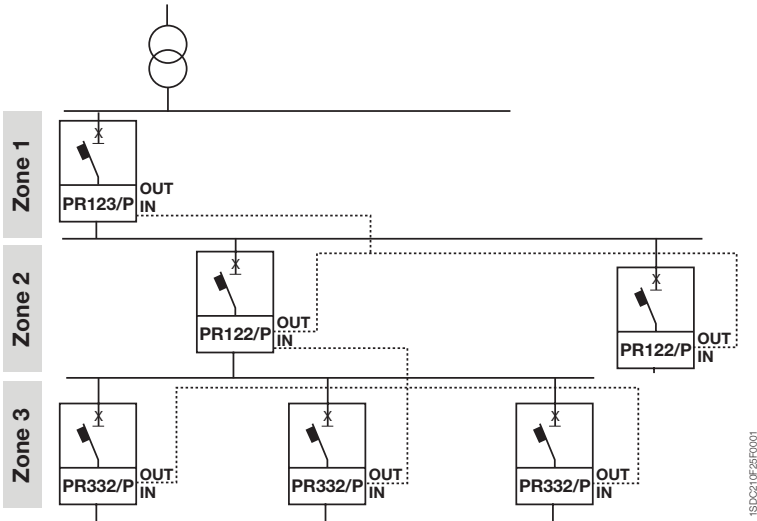
To carry out cabling, a shielded twisted pair cable (not supplied with the trip unit; ask ABB for information) can be used. The shield should only be earthed on the trip unit of the circuit-breaker on the supply side.

The maximum length of the cabling for zone selectivity, between two units, is 200 meters.

The maximum number of the circuit-breakers which can be connected to the outputs (Z out) of a trip unit is 16.

The ZS of selectivity is identical to that which can be obtained through the trip units type PR333/P (for Emax X1) and PR122/P- PR123/P (for Emax). Tmax T7 circuit-breaker equipped with PR332/P can be connected directly without external accessories on the load side of a zone selectivity chain created through the other devices (PR333/P, PR122/P and PR123/P).

For example:



1SDC210015D0001

# Circuit-breakers for motor protection

## Electrical characteristics

2

Motor Protection			Tmax T4				
Rated uninterrupted current		[A]	250/320				
Rated service current, <b>I<sub>n</sub></b>		[A]	10...320				
Poles		[No.]	3				
Rated service current, <b>U<sub>e</sub></b>	(AC) 50-60 Hz	[V]	690				
	(DC)	[V]	750				
Rated impulse withstand voltage, <b>U<sub>imp</sub></b>		[kV]	8				
Rated insulation voltage, <b>U<sub>i</sub></b>		[V]	1000				
Test voltage at industrial frequency for 1 min.		[V]	3500				
Rated ultimate short-circuit breaking capacity, <b>I<sub>cu</sub></b>			<b>N</b>	<b>S</b>	<b>H</b>	<b>L</b>	<b>V</b>
(AC) 50-60 Hz 220/230 V		[kA]	70	85	100	200	200
(AC) 50-60 Hz 380/415 V		[kA]	36	50	70	120	200
(AC) 50-60 Hz 440 V		[kA]	30	40	65	100	180
(AC) 50-60 Hz 500 V		[kA]	25	30	50	85	150
(AC) 50-60 Hz 690 V		[kA]	20	25	40	70	80
Rated service short-circuit breaking capacity, <b>I<sub>cs</sub></b>							
(AC) 50-60 Hz 220/230 V		[%I <sub>cu</sub> ]	100%	100%	100%	100%	100%
(AC) 50-60 Hz 380/415 V		[%I <sub>cu</sub> ]	100%	100%	100%	100%	100%
(AC) 50-60 Hz 440 V		[%I <sub>cu</sub> ]	100%	100%	100%	100%	100%
(AC) 50-60 Hz 500 V		[%I <sub>cu</sub> ]	100%	100%	100%	100%	100%
(AC) 50-60 Hz 690 V		[%I <sub>cu</sub> ]	100%	100%	100%	100%	100%
Rated short-circuit making capacity, <b>I<sub>cm</sub></b>							
(AC) 50-60 Hz 220/230 V		[kA]	154	187	220	440	660
(AC) 50-60 Hz 380/415 V		[kA]	75.6	105	154	264	440
(AC) 50-60 Hz 440 V		[kA]	63	84	143	220	396
(AC) 50-60 Hz 500 V		[kA]	52.5	63	105	187	330
(AC) 50-60 Hz 690 V		[kA]	40	52.5	84	154	176
Opening time (415 V)		[ms]	5	5	5	5	5
Utilisation category (IEC 60947-2)					A		
Isolation behaviour			■				
Reference Standard			IEC 60947-2/IEC 60947-4				
Protection against short-circuit							
Magnetic only trip unit	MA		■				
Electronic trip unit	PR221DS-I		■				
	PR231/P-I		-				
Integrated protection (IEC 60947-4-1)							
Electronic trip unit	Ekip M-LRIU		■				
Interchangeability			■				
Versions			F - P - W				
Terminals	fixed		F - FC Cu - FC CuAl - EF - ES - R - MC - HR - VR				
	plug-in		EF - ES - R - FC Cu - FC CuAl - HR - VR				
	withdrawable		EF - ES - FC Cu - FC CuAl				
Fixing on DIN rail			-				
Mechanical life		[No. operations]	20000				
		[No. Hourly operations]	240				
Electrical life @ 415 V AC		[No. operations]	8000				
		[No. Hourly operations]	120				
Basic fixed version dimensions		W [mm]	105				
		D [mm]	103.5				
		H [mm]	205				
Weight	fixed	[kg]	2.35				
	plug-in	[kg]	3.6				
	withdrawable	[kg]	3.85				

TERMINAL CAPTION  
 F = Front  
 EF = Front extended  
 ES = Front extended spread  
 FC Cu = Front for copper cables  
 R = Rear orientated

FC CuAl = Front for CuAl cables  
 MC = Multicable  
 HR = Rear flat horizontal  
 VR = Rear flat vertical  
 HR/VR = Rear flat orientated

<sup>(1)</sup> 75% for T5 630  
<sup>(2)</sup> 50% for T5 630  
<sup>(3)</sup> I<sub>cw</sub> = 5 kA  
<sup>(4)</sup> I<sub>cw</sub> = 10 kA  
<sup>(5)</sup> I<sub>cw</sub> = 20 kA (S, H, L versions) - 15 kA (V version)

Note: in the plug-in version of T5 630, and in the withdrawable version of T5 630 the maximum rated current is derated by 10% at 40 °C.

Tmax T5						Tmax T6				Tmax T7			
400/630						630/800				800/1000/1250			
320, 400, 630						630, 800				–			
3						3				3			
690						690				690			
–						–				–			
8						8				8			
1000						1000				1000			
3500						3500				3500			
N	S	H	L	V		N	S	H	L	S	H	L	V
70	85	100	200	200		70	85	100	200	85	100	200	200
36	50	70	120	200		36	50	70	100	50	70	120	150
30	40	65	100	180		30	45	50	80	50	65	100	130
25	30	50	85	150		25	35	50	65	40	50	85	100
20	25	40	70	80		20	22	25	30	30	42	50	60
100%	100%	100%	100%	100%		100%	100%	100%	75%	100%	100%	100%	100%
100%	100%	100%	100%	100%		100%	100%	100%	75%	100%	100%	100%	100%
100%	100%	100%	100%	100%		100%	100%	100%	75%	100%	100%	100%	100%
100%	100%	100%	100% <sup>(1)</sup>	100% <sup>(2)</sup>		100%	100%	100%	75%	100%	100%	75%	100%
100%	100%	100% <sup>(1)</sup>	100% <sup>(2)</sup>	100% <sup>(2)</sup>		75%	75%	75%	75%	100%	75%	75%	75%
154	187	220	440	660		154	187	220	440	187	220	440	440
75.6	105	154	264	440		75.6	105	154	220	105	154	264	330
63	84	143	220	396		63	94.5	105	176	105	143	220	286
52.5	63	105	187	330		52.5	73.5	105	143	84	105	187	220
40	52.5	84	154	176		40	46	52.5	63	63	88.2	105	132
6	6	6	6	6		10	9	8	7	15	10	8	8
B (400 A) <sup>(4)</sup> - A (630 A)						B <sup>(4)</sup>				B <sup>(5)</sup>			
■						■				■			
IEC 60947-2/IEC 60947-4						IEC 60947-2/IEC 60947-4				IEC 60947-2			
–						–				–			
■						■				–			
–						–				■			
■						■				–			
■						■				■			
F - P - W						F - W				F - W			
F - FC Cu - FC CuAl - EF - ES - R - HR - VR						F - FC CuAl - EF - ES - R - RC				F - EF - ES - FC CuAl - HR/VR			
EF - ES - R - FC Cu - FC CuAl - HR - VR						–				–			
EF - ES - FC Cu - FC CuAl						EF - HR - VR				EF - HR/VR - ES - RS			
–						–				–			
20000						20000				10000			
120						120				60			
7000						5000				2000 (S, H, L versions) / 3000 (V version)			
60						60				60			
140						210				210			
103.5						103.5				154 (manual) / 178 (motorizable)			
205						268				268			
3.25						9.5/12				9.7/12.5 (manual) - 11/14 (motorizable)			
5.15						–				–			
5.4						12.1/15.1				29.7/39.6 (manual) - 32/42.6(motorizable)			

# Circuit-breakers for motor protection

## General characteristics

2

Starting, switching and protection of three-phase asynchronous motors are basic operations for their correct use. ABB SACE proposes two different solutions for this type of application:

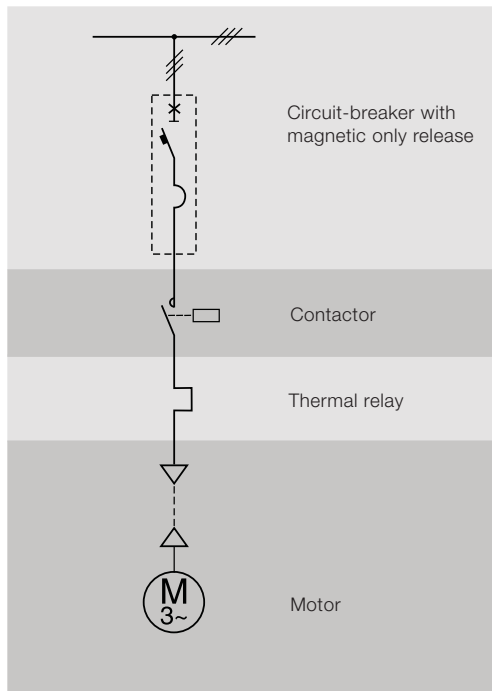
- **a traditional system**, which foresees a circuit-breaker for protection against short-circuit, a thermal relay for protection against overload and missing or unbalanced phase and a contactor for motor switching;
- **a system of integrated protection** thanks to the Ekip M-LRIU trip unit, which ensures both protection against short-circuit, and against overload, as well as that against

missing or unbalanced phase and that against the rotor block.

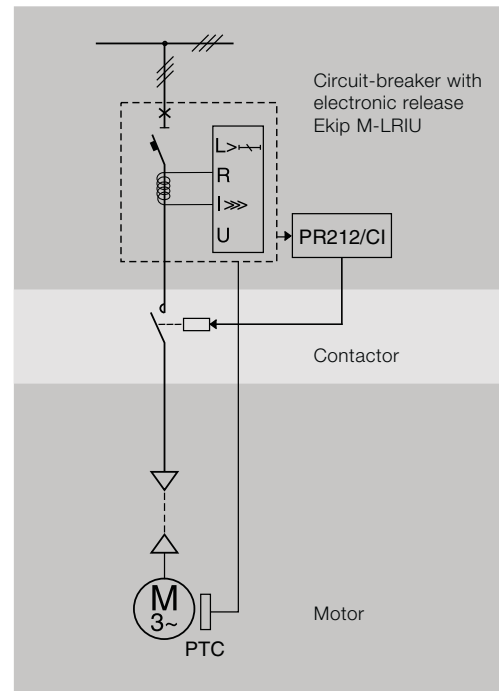
All this must necessarily take into account the problems which arise at the moment of starting.

In particular, when selecting these devices, different factors must be taken into consideration, such as:

- the motor power
- the diagram and type of starting
- the type of motor: with cage rotor or with wound rotor
- the fault current at the point of the network where the motor is installed.



Protection against short-circuit



Integrated protection

# Circuit-breakers for motor protection

## Protection against short-circuit

With the new series of Tmax moulded-case circuit-breakers, ABB SACE proposes a range up to 400 A, which implementing exclusively the protection against short-circuit, is suitable for use inside protected starters of traditional type.

Tmax T4 circuit-breaker in the three-pole version with adjustable thresholds between 6 and 14 times, stand out for their compactness and exceptional performances in terms of breaking capacity and limitation of the specific let-through energy. Furthermore, thanks to the great flexibility given by the wide range of magnetic threshold settings, they allow optimal motor protection.

They can be used in a wide range of start-ups, up to 250 kW for T5 (at 400 V).

Finally, thanks to their wide setting range of protection against short-circuit, T4, T5 and T6, in the three-pole version equipped with PR221DS-I electronic trip units and T7, in three-pole version equipped with PR231/P-I electronic trip units, allow the most suitable trip value to be selected for any type of motor for rated currents up to 1250 A and 560 kW (at 400 V).

2



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# Circuit-breakers for motor protection

## Protection against short-circuit

### MA – Adjustable magnetic only trip units

Tmax T4

2



In [A]	10	20	25	32	52	80	100	125	160	200
Tmax T4	■		■		■	■	■	■	■	■
Tmax T4 $I_3 = 6...14 \times I_n$	60...140	–	150...350	–	312...728	480...1120	600...1400	750...1750	960...2240	1200...2800


### Current sensors

	In [A]	100	160	250	320	400	630	800	1000	1250	1600
PR221DS-I	T4 250	■	■	■							
	T4 320	▲	▲	▲	■						
	T5 400				■	■					
	T5 630				▲	▲	■				
	T6 630						■				
	T6 800							■			
PR231/P-I	T7 800						▲	■			
	T7 1000						▲	▲	■		
	T7 1250						▲	▲	▲	■	
	T7 1600						▲	▲	▲	▲	■
	$I_3$ [A]	100...1000	160...1600	250...2500	320...3200	400...4000	630...6300	800...8000	1000...10000	1250...12500	1600...16000

■ = Complete circuit-breaker already coded

▲ = Circuit-breaker to be assembled

## PR221DS-I


Protection function	Trip threshold	Excludability	Relation $t = f(I)$
 Against short-circuit with adjustable instantaneous trip	$I_3 = 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4.5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 8.5 - 9 - 10 \times I_n$ Tolerance: $\pm 10\%$ (T4-T5, T6)	■	$t = k$

2

**Note:** The tolerances are valid under the following hypotheses:  
 – relay self-supplied on running and/or auxiliary power supply (without start up)  
 – two-phase or three-phase power supply  
 In all the cases not foreseen by the above-mentioned hypotheses, the following tolerance values are valid:

	Trip threshold	Trip time
I	$\pm 20\%$	$\leq 40\text{ms}$

## PR231P-I

Protection function	Trip threshold	Excludability	Relation $t = f(I)$
 Against short-circuit with adjustable instantaneous trip	$I_3 = 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4.5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 8.5 - 9 - 10 \times I_n$ Tolerance: $\pm 10\%$	–	$t = k$

**Note:** The tolerances are valid under the following hypotheses:  
 – relay self-supplied on running and/or auxiliary power supply (without start up)  
 – two-phase or three-phase power supply  
 In all the cases not foreseen by the above-mentioned hypotheses, the following tolerance values are valid:

	Trip threshold	Trip time
I	$\pm 15\%$	$\leq 60\text{ms}$

# Circuit-breakers for motor protection

## Integrated protection: Ekip M-LRIU

2

Circuit-breakers T4, T5 and T6 for motor protection are perfectly integrated with the ABB range of contactors-thermal relays, thereby allowing extremely simple and compact protected start-ups to be obtained.

The best combinations as to performance, compactness and reliability are given in: <http://applications.it.abb.com/SOC/Page/Selection.aspx>.

The three-pole version of T4, T5 and T6 circuit-breakers can be equipped with electronic release Ekip M-LRIU. This allows a large number of specific protections to be obtained, ensuring high trip precision, extremely reliable operation and insensitivity to temperature changes.

The Ekip M-LRIU release guarantees complete motor protection fully integrated into the circuit-breaker. This means that there is no need for an external relay to protect the motor against overloads. Use of the PR212/CI module allows optimized interaction with a contactor, which can be made to open in more frequent fault cases (see Normal / Heavy setting). The breaking capacity of a contactor is definitely lower than the one of a circuit-breaker, but with a number of possible operations consistently higher than those of the breaker (approx. 1,000,000): motor protection and operation are thus optimized when these two devices are used in conjunction with each other.

Protection tripping is guaranteed from single-phase current at 20% of the rated value, while a 24 VDC auxiliary supply must be provided for remote monitoring and supervision of the installation via the modbus communication line.

If the circuit-breaker is not integrated into a supervision system, information and settings of the release can still be accessed via the Ekip T&P test and configuration unit.

To ensure the motor starts in the best possible way, the electronic release identifies a "start-up" stage from the moment the current exceeds  $0.25 \times I_n$  to when the minimum time of the selected trip class is reached.

### User interface

Steady green LEDs:

- **Power on:** it indicates that the release is being energized correctly. The LED comes on when the current exceeds  $0.2 \times I_n$
- **Protections settings:** it indicates which type of parameters is active (MAN/ELT)

Red LEDs for each LRIU protection:

- **L:** Steady red LED: indicates prealarm for current exceeding  $0.9 \times I_1$ ;
- **LRIU:** Flashing red LED: indicates alarm for current exceeding the threshold setting;

- **LRIU:** Steady red LED after trip: shows that the protection has tripped. After the circuit-breaker has opened, you can find out which protection function tripped the release by connecting the Ekip TT or Ekip T&P accessories.

The Ekip M-LRIU release is able to detect whether the opening solenoid is disconnected. Disconnection is signalled by all the LEDs flashing at once.

A socket for connection is available:

- for connecting the Ekip TT trip test unit, which allows the trip and LED tests to be conducted and signals the last trip to have occurred;
- for connecting Ekip T&P which, by means of Ekip Connect software, allows the measurements to be read, the trip test to be performed, conduction of the protection function test and electronic setting of the protection functions of the release and communication parameters

### Communication

Ekip M-LRIU trip unit is enabled for Modbus communication with no need for additional accessories. Connection of 24V DC auxiliary supply is needed to activate the communication function.

Use of the System bus allows you to:

- acquire and transmit a wide range of information by remote control;
- enter the configuration parameter settings (such as current thresholds and protection function curves) and program the unit itself.

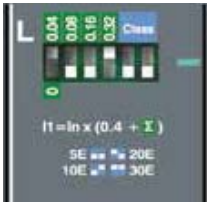
### Protection functions

The Ekip M-LRIU protection release handles two sets of protection settings at the same time, i.e. a set of electronic parameters (ELT) and a set of manual parameters (MAN). The ELT push-button is used to establish which of the two sets must be used by the release. If the indicator light is on, it means that the protection unit is using the set of electronic parameters, adjustable via the communication system or Ekip T&P unit. If the indicator light is off, it means that the protection unit is using the set of manual parameters, which can be adjusted using the selectors on the front of the relay.

The set of manual parameters allows the basic protection functions to be controlled in a very simple way, while the set of electronic parameters allows the more sophisticated protections to be activated and to fine-tune their settings.



## Protection functions - Manual Settings



### (L) Protection against overload

The L function protects the motor against overloads in accordance with the indications and classes defined by Standard IEC 60947-4-1 and the relative Annex 2.

The trip time is established by choosing the appropriate trip class, which depends on the motor that must be protected. Besides the protection, the thermal memory function (implemented in accordance with Standard IEC60255-8 and the standard mentioned above) is permanently activated. After Ekip M-LRIU trips, the thermal memory is active for a time that depends on the trip class selected (see table). The release will trip faster than the time established for a cold fault condition if a new overload occurs before the thermal memory automatically resets (hot trip condition).

Trip Class	CLASS min	CLASS max	Tmem resetting time
5E	3s	5s	5 min
10E	5s	10s	10 min
20E	10s	20s	20 min
30E	20s	30s	33 min



### (R) Protection against rotor blockage

It protects the motor in two different ways, depending on whether the fault occurs on start-up or during the normal operation of an already activated installation. Behaviour in the two operating conditions is defined by Standard IEC 947-4-1 Annex 2.

In the first case (Jam), operation of R protection is designed to protect the motor against rotor jamming during normal operation. So R (Jam) protection function works in conjunction with L protection to ensure motor start-up phase is completed. R (Jam) protection is inhibited during startup for the same time as the minimum time in the selected overload protection trip class. Once this time has elapsed, R protection is activated and causes the circuit-breaker to trip if the current remains above the current threshold setting (I5) for longer than the time (t5) setting of this protection.

In the second case (Stall), the protection is designed to operate in order to protect the motor against rotor jamming upon start-up. If activated by means of the electronic settings, Rstall protection is not inhibited during start-up and causes the circuit-breaker to release if the current remains above the current threshold setting (I8) for longer than the time setting (t8) of that protection.



### (U) Protection against phase lack and/or unbalance

It can be implemented when the motor must be promptly protected owing to the absence of a phase. The protection trips if the r.m.s. value of at least one of the phase currents drops below the level equal to 0.1 times the rated current of the release and a second phase exceeds 0.25 times the rated current. The circuit-breaker is opened if the current value fails to rise above this level within 2 sec. During start-up, the tripping time of the protection is either 2 sec or half the minimum time of the start-up class, whichever value is lower.



### (I) Protection against short-circuit

It guarantees an immediate trip if a short-circuit occurs. It cannot be excluded and its minimum setting is 6 times the rated current of the release. It only needs one phase to exceed the threshold setting for the circuit-breaker to immediately open. To ensure the motor starting sequence terminates correctly, it is inhibited for 0.04 seconds during the start-up phase.

# Circuit-breakers for motor protection

## Integrated protection: Ekip M-LRIU

2

### PTC

In its initial configuration, the release is set-up to receive an incoming signal from a PTC sensor installed on the motor. The operating thresholds of the protection are defined in accordance with Standard IEC 60947-8. If the threshold is exceeded, the release opens the circuit-breaker after 1 sec. time-delay. The release has circuits allowing short-circuits in the connection cables of the sensor and open circuit to be detected and signalled. Failure to detect the temperature sensor will automatically inhibit the protection.

### Additional Electronic Settings

The settings of further functions is possible in ELT mode only and it can be accessed via Modbus communication or the Ekip T&P test and programming device.

#### (UN) Protection against phase Unbalance

Used when the motor must be accurately protected against differences among the currents circulating in the phases. Threshold setting I7 defines the maximum level of difference between each phase and the mean value of the three phases. If a phase differs more than its set level from the mean value, the protection opens the circuit-breaker once its time-delay setting (t7) has elapsed. The protection is activated only if all three phase currents exceed  $0.25 \times I_1$ . In start-up phase tripping time is either t7 or half the minimum time of the start-up class, whichever value is lower.

#### (G) Earth fault protection

Protection function G is designed to trip if faults occur between the phases and earthing conductor. The protection opens the circuit-breaker if the result of the summation of currents circulating in the three phases exceeds threshold setting I4 and remains above this level for time-delay setting t4. G protection is inhibited in start-up phase for the same time as the minimum time in the selected overload protection trip class.

#### (Uc) Undercurrent protection

This protection function protects the motor from operating in conditions where the load is reduced or null. The circuit-breaker is opened if all the phases remain below threshold setting I9 for delay-time t9.

### Interface to contactor

In its initial configuration, the release is set for operation in the Normal mode, activating the contactor by means of the PR212CI module if one of the protections trip (with the exception of protections I and G). If the configuration is changed from Normal to Heavy, the release opens the circuit-breaker directly without having first transmitted the command to the contactor.

Auto-reset function allows the actuation status of the PR212/CI to reset automatically after the contactor has tripped owing to the L function, once an adjustable time from 1 to 1000s has elapsed. Auto-reset can occur only in Normal mode and in presence of auxiliary voltage.

BACK UP function is available and deals with situations whereby an opening command transmitted to the contactor via module PR212CI has not been successful. In this case, the EKIP M-LRIU release sends an opening command to the circuit-breaker after having waited set time Tx.

The actuation time of the contactor given by the manufacturer must be considered when time-delay setting Tx is entered.

## Protection R

Against rotor block

## Protection L

Against motor overload

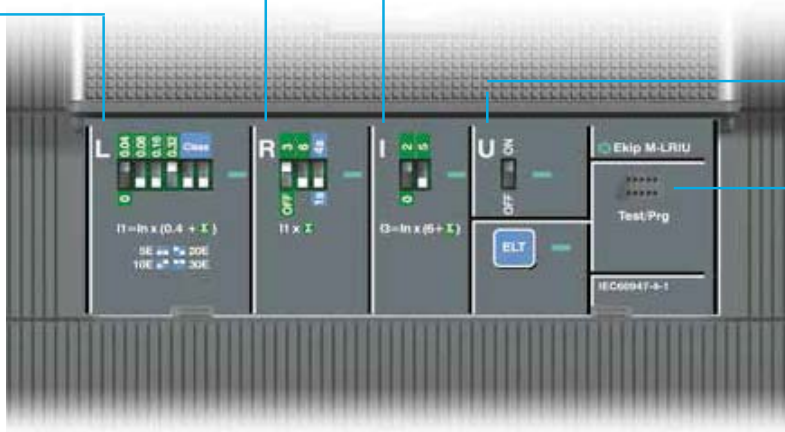
## Protection I

Against short-circuit with instantaneous trip

## Protection U

Against phase  
current unbalance or  
loss of phase

Socket for connection  
of Ekip T&P testing and  
programming unit and  
Ekip TT testing unit











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2

# Circuit-breakers for motor protection

## Integrated protection: Ekip M-LRIU

### Protection functions and parameterisation

Protection functions		Trip threshold	Trip curves <sup>(1)</sup>	Excludability	t = f(I)	Thermal memory
	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve according to IEC 60947-4-1 Standard	<b>Manual setting</b> I1 = 0.4...1 x In step = 0.04 x In Tolerance: trip between 1.05...1.2xI1	<b>Manual setting</b> Trip classes: 5E - 10E - 20E - 30E Tolerance: ± 10% up to 4 x In	–	t = k/I²	according to Standard
		<b>Electronic setting</b> I1 = 0.4...1 x In step = 0.01 x In Tolerance: trip between 1.05...1.2xI1	<b>Electronic setting</b> Trip classes: 5E - 10E - 20E - 30E Tolerance: ± 10% up to 4 x In	–	t = k/I²	according to Standard
	Against rotor block with delayed trip and trip characteristic with definite time (JAM)	<b>Manual setting</b> I5 = OFF - 3 - 6 - 9 x I1 Tolerance: ± 15%	<b>Manual setting</b> t5 = 1 - 4 s Tolerance: ± 10%	yes	t = k	–
		<b>Electronic setting</b> I5 = OFF - 2...10 x I1 step =1 x I1 Tolerance: ± 15%	<b>Electronic setting</b> t5 = 1...10s step = 0.5s Tolerance: ± 10%	yes	t = k	–
	Against rotor block with delayed trip and trip characteristic with definite time (STALL)	<b>Electronic setting</b> I5 = OFF - 1...10 x I1 step =1 x I1 Tolerance: ± 15%	<b>Electronic setting</b> t8 = 2...10s step = 0.5s Tolerance: ± 10%	yes	t = k	–
	Against short-circuit with instantaneous trip	<b>Manual setting</b> I3 = 6 - 8 - 11 - 13 x In Tolerance: ± 15%	≤ 40ms	–	t = k	–
		<b>Electronic setting</b> I3 = 1...13 x In step = 0.5 x In Tolerance: ± 15%	≤ 40ms	–	t = k	–
	Against loss of phase with delayed trip and trip characteristic with definite time	<b>Manual setting</b> I6 = ON - OFF Tolerance: ± 15%	<b>Manual setting</b> t6 = min 2 s Tolerance: ± 20%	yes	t = k	–
		<b>Electronic setting</b> I6 = ON - OFF Tolerance: ± 15%	<b>Electronic setting</b> t6 = 1...10s step 0.5s Tolerance: ± 20%	yes	t = k	–
	Against earth fault with independent time delay trip	<b>Electronic setting</b> I4 = OFF – 0.2 ... 1 In step 0.1 InTolerance: ± 10%	<b>Electronic setting</b> t4 = 0.1 ... 0.8 s step 0.1 s Tolerance: ± 10%	yes	t = k	–
	Against phase current unbalance with an independent time delay trip	<b>Electronic setting</b> I7 = OFF – 20 ... 50% step 10%	<b>Electronic setting</b> t7 = 1 ... 10 s step 0.5 s Tolerance: ± 10%	yes	t = k	–
	Against undercurrent with an independent time delay triptic	<b>Electronic setting</b> I9 = OFF – 50 ... 90% x I1 step 10%	<b>Electronic setting</b> t9 = 1 ... 20 s step 0.5 s Tolerance: ± 10%	yes	t = k	–
	Against overtemperature on the motor detected by means of a PTC sensor	<b>Electronic setting</b> OFF-ON	<b>Electronic setting</b> 1s Tolerance: ± 10%	yes	t = k	–

<sup>(1)</sup> These tolerances hold in the following conditions:  
 – self-powered trip unit at full power and/or auxiliary supply (without start-up);  
 In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
R	$\pm 20\%$	$\pm 20\%$
I	$\pm 20\%$	$\leq 50 \text{ ms}$
U	$\pm 20\%$	$\pm 20\%$

# Circuit-breakers for use up to 1150 V AC and 1000 V DC

## Electrical characteristics

The range of T4, T5 and T6 circuit-breakers for applications in direct current at 1000 V or in alternating current up to 1150 V (T6 up to 1000 V) also comes into the panorama of the Tmax proposals.

The typical sectors of use are installations in mines, road and railway tunnels, electrical transport and industrial applications in general.

The circuit-breakers are available in the three-pole and four-pole version with TMD or TMA adjustable thermomagnetic releases or with PR221DS, PR222DS/P, PR222DS/PD, Ekip

M-LRIU and PR223EF electronic trip units (see the dedicated section on page 2/34).

The dimensions of these circuit-breakers are the same as the standard one. The Tmax circuit-breakers for these applications are available in the fixed, plug-in and withdrawable version (for which the use of the 1000 V fixed parts supplied only by upper terminals is mandatory) and they are compatible with all the accessories except for the residual current release.

2

### T4-T5 circuit-breakers for use up to 1150 V AC and T6 circuit-breakers for use up to 1000 V AC

				Tmax T4		Tmax T5		Tmax T6
Rated uninterrupted current				250		400/630		630/800
Poles				3, 4		3, 4		3, 4
Rated service voltage, <b>U<sub>e</sub></b> (AC) 50-60 Hz				1000		1000		1000
Rated impulse withstand voltage, <b>U<sub>imp</sub></b>				8		8		8
Rated insulation voltage, <b>U<sub>i</sub></b>				1000		1000		1000
Test voltage at power frequency for 1 min.				3500		3500		3500
Rated ultimate short-circuit breaking capacity, <b>I<sub>cu</sub></b>				<b>L</b>	<b>V<sup>(1)</sup></b>	<b>L</b>	<b>V<sup>(1)</sup></b>	<b>L<sup>(1)</sup></b>
(AC) 50-60 Hz 1000 V				12		12		12
(AC) 50-60 Hz 1150 V				12		12		
Rated service short-circuit breaking capacity, <b>I<sub>cs</sub></b>				12		10		6
(AC) 50-60 Hz 1000 V				12		10		6
(AC) 50-60 Hz 1150 V				6		6		
Rated short-circuit making capacity, <b>I<sub>cm</sub></b>				24		24		24
(AC) 50-60 Hz 1000 V				24		24		24
(AC) 50-60 Hz 1150 V				24		24		
Category of use (IEC 60947-2)				A		B (400 A) <sup>(2)</sup> - A (630 A)		B <sup>(3)</sup>
Behaviour on isolation				■		■		■
Reference Standards				IEC 60947-2		IEC 60947-2		IEC 60947-2
Thermomagnetic releases				TMD		■		
				TMA		■		■
Electronic trip units				PR221DS/LS/I		■		■
				PR221DS/I		■		■
				PR222DS/P_LSI		■		■
				PR222DS/P_LSIG		■		■
				PR222DS/PD_LSI		■		■
				PR222DS/PD_LSIG		■		■
				Ekip M-LRIU		■		
				PR223EF		■		■
Terminals				FC Cu - F* - EF*		FC Cu - F* - EF*		F - FC CuAl** - R - EF* - ES*
Version				F, P, W		F, P, W <sup>(4)</sup>		F <sup>(5)</sup>
Mechanical life				[No. operations]		20000		20000
				[No. hourly operations]		240		120
Basic fixed dimensions <sup>(6)</sup>				3 poles		105		140
				4 poles		140		184
				W [mm]		103.5		103.5
				D [mm]		205		268
				H [mm]		205		268
Weight				fixed 3/4 poles		2.35 / 3.05		2.35 / 3.05
				plug-in 3/4 poles		3.6 / 4.65		3.25 / 4.15
				withdrawable 3/4 poles		3.85 / 4.9		5.15 / 6.65
								9.5 / 12

TERMINAL CAPTION

F = Front

FC Cu = Front for copper cables

FC CuAl = Front for copper cables CuAl

R = Rear

F = Fixed circuit-breakers

P = Plug-in circuit-breakers

W = Withdrawable circuit-breakers

<sup>(1)</sup> Power supply only from the top

<sup>(2)</sup> I<sub>cu</sub> = 5 kA

<sup>(3)</sup> I<sub>cu</sub> = 7.6 kA (630 A) - 10 kA (800 A)

<sup>(4)</sup> Tmax T5 630 is only available in the fixed version

<sup>(5)</sup> For T6 in the withdrawable version, please ask ABB SACE

<sup>(6)</sup> Circuit-breaker without high terminal covers

\* Ordering extracodes

\*\* Ordering standard 1SDA0 codes

# Circuit-breakers for use up to 1150 V AC and 1000 V DC

## Electrical characteristics

### PR221DS and PR222DS for use up to 1150 V AC - Current sensor

#### Tmax T4-T5-T6

In [A]	100	250	320	400	630	800
T4 250	■	■				
T5 400			■	■		
T5 630					■	
T6 630 <sup>(1)</sup>					■	
T6 800 <sup>(1)</sup>						■

**Note:** For the Ekip M-LRIU setting, please see page 2/56

<sup>(1)</sup> up to 1000 V

### Circuit-breakers for use at 1000 V DC

			Tmax T4	Tmax T5	Tmax T6
Rated uninterrupted current	[A]		250	400/630	630/800
Poles			4	4	4
Rated service voltage, <b>Ue</b>	[V]		1000	1000	1000
Rated impulse withstand voltage, <b>Uimp</b>	[kV]		8	8	8
Rated insulation voltage, <b>Ui</b>	[V]		1150	1150	1000
Test voltage at power frequency for 1 min.	[V]		3500	3500	3500
Rated ultimate short-circuit breaking capacity, <b>Icu</b>			V <sup>(2)</sup>	V <sup>(2)</sup>	L <sup>(2)</sup>
(DC) 4 poles in serie <sup>(1)</sup>	[kA]		40	40	50
Rated service short-circuit breaking capacity, <b>Ics</b>					
(DC) 4 poles in serie	[kA]		20	10	12.5
Category of use (IEC 60947-2)			A	B (400 A) <sup>(3)</sup> - A (630 A)	B <sup>(4)</sup>
Behaviour on isolation			■	■	■
Reference Standards			IEC 60947-2	IEC 60947-2	IEC 60947-2
Thermomagnetic releases	TMD		■	—	—
	TMA		■	■	■
Terminals			FC Cu	FC Cu	F - FC CuAl - R
Interchangeability			■	■	■
Version			F	F	F(5)
Mechanical life	[No. operations]		20000	20000	20000
	[No. hourly operations]		240	120	120
Basic fixed dimensions	4 poles	W [mm]	140	184	280
		D [mm]	103.5	103.5	103.5
		H [mm]	205	205	268
Weight	fixed	4 poles [kg]	3.05	4.15	12

#### TERMINAL CAPTION

F = Front

FC Cu = Front for copper cables

FC CuAl = Front for copper cables CuAl

R = Rear

F = Fixed circuit-breakers

<sup>(1)</sup> See the wiring diagrams on page 4/65 diagram D

<sup>(2)</sup> Power supply only from above

<sup>(3)</sup> Icw = 5 kA



<sup>(4)</sup> Icw = 7.6 kA (630 A) - 10 kA (800 A)

<sup>(5)</sup> For T6 in the withdrawable version, please ask ABB SACE

### Circuit-breakers for use at 1000 V DC with jumpers for connection of poles

				Tmax T4	Tmax T5	Tmax T6
Rated uninterrupted current		[A]		80..250	400/630	630/800
Poles				4	4	4
Rated service voltage, <b>U<sub>e</sub></b> (DC) 2 poles + 2 poles in series		[V]		1000	1000	1000
Rated impulse withstand voltage, <b>U<sub>imp</sub></b>		[kV]		8	8	8
Rated insulation voltage, <b>U<sub>i</sub></b> (AC) 50-60 Hz		[V]		1150	1150	1000
Test voltage at power frequency for 1 min.		[V]		3500	3500	3500
Rated ultimate short-circuit breaking capacity in DC, <b>I<sub>cu</sub></b> (DC) 2 poles + 2 poles in series		[kA]		20	20	20
Rated service short-circuit breaking capacity in DC, <b>I<sub>cs</sub></b> (DC) 2 poles + 2 poles in series		[kA]				
				10	10	10
Category of use (IEC 60947-2)				A	B (400A) - A(630 A)	B
Behaviour on isolation				■	■	■
Reference Standards				IEC 60947-2	IEC 60947-2	IEC 60947-2
Thermomagnetic releases	TMD			■	—	—
	TMA			■	■	■
Terminals				F	F	F
Version				F	F	F
Mechanical life		[No. operations]		7500	7500	7500
		[No. hourly operations]		240	120	120
Dimensions	4 poles	W [mm]		140	184	280
		D [mm]		103.5	103.5	103.5
		H [mm]		205	205	268
Weight	fixed	4 poles	[kg]	3.05	4.15	12

### Thermomagnetic trip unit for use up to 1150 V AC and 1000 V DC - TMD and TMA

 <b>I<sub>t</sub> = 0.7...1xI<sub>n</sub></b>	In [A]	32	50	80	100	125	160	200	250	320	400	500	630	800
	Neutral [A] - 100%	32	50	80	100	125	160	200	250	320	400	500	630	800
	T4 250	■	■	■	■	■	■	■	■					
	T5 400									■	■			
	T5 630											■		
	T6 630												■	
	T6 800													■
 <b>I<sub>2</sub> = 10xI<sub>n</sub></b> <b>I<sub>3</sub> = 5...10xI<sub>n</sub></b>	I <sub>2</sub> = 10 x I <sub>n</sub> [A]	320	500											
	I <sub>3</sub> = 5...10 x I <sub>n</sub> [A]	—	—	400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500	1600...3200	2000...4000	2500...5000	3150...6300	4000...8000

# Switch-disconnectors

## Electrical characteristics

The Tmax switch-disconnectors derive from the corresponding circuit-breakers, of which they keep the overall dimensions, versions, fixing systems and the possibility of mounting accessories unchanged.

This version only differs from the circuit-breakers in the absence of the protection trip units. They are characterised by a rated voltage of 690 V in alternating current and 750 V in direct current.

2

### Switch-disconnectors

					Tmax T4D	
Conventional thermal current, <b>I<sub>th</sub></b>			[A]		250/320	
Rated service current in category AC22, <b>I<sub>e</sub></b>			[A]		250/320	
Rated service current in category AC23, <b>I<sub>e</sub></b>			[A]		250	
Rated service current in category DC22, <b>I<sub>e</sub></b>			[A]		250/320	
Rated service current in category DC23, <b>I<sub>e</sub></b>			[A]		250	
Poles			[No.]		3/4	
Rated service voltage, <b>U<sub>e</sub></b>	(AC) 50-60 Hz		[V]		690	
	(DC)		[V]		750	
Rated impulse withstand voltage, <b>U<sub>imp</sub></b>			[kV]		8	
Rated insulation voltage, <b>U<sub>i</sub></b>			[V]		1000	
Test voltage at industrial frequency for 1 minute			[V]		3500	
Rated short-circuit making capacity, <b>I<sub>cm</sub></b>	(min) switch-disconnector only		[kA]		5.3	
	(max) with circuit-breaker on supply side		[kA]		440	
Rated short-time withstand current for 1s, <b>I<sub>cw</sub></b>			[kA]		3.6	
Reference Standard					IEC 60947-3	
Versions					F - P - W	
Terminals					F-FC CuAl-FC Cu-EF-ES-R-MC-HR-VR	
Mechanical life			[No. operations]		20000	
			[No. Hourly operations]		120	
Basic dimensions, fixed	3 poles	W [mm]			105	
		4 poles	W [mm]		140	
	4 poles	D [mm]			103.5	
		H [mm]			205	
Weight	fixed	3/4 poles	[kg]		2.35/3.05	
	plug-in	3/4 poles	[kg]		3.6/4.65	
	withdrawable	3/4 poles	[kg]		3.85/4.9	

<sup>(1)</sup> Withdrawable version not available for T6 1000 A.

	T4 250		T4 320		T5 400						T5 630						T6 630						
	L	V	N	S	H	L	V	N	S	H	L	V	N	S	H	L	V	N	S	H	L	V	
Icu [kA] at 415Vac	120	200	36	50	70	120	200	36	50	70	120	200	36	50	70	120	200	36	50	70	100	150	
T4D 250	120	200																					
T4D 320	120	200	36	50	70	120	200																
T5D 400	120	200	36	50	70	120	200	36	50	70	120	200											
T5D 630	120	200	36	50	70	120	200	36	50	70	120	200	36	50	70	120	200						
T6D 630	100	100	36	50	70	100	100	36	50	70	100	100	36	50	70	100	100	36	50	70	100	100	
T6D 800	100	100	36	50	70	100	100	36	50	70	100	100	36	50	70	100	100	36	50	70	100	100	
T6D 1000	100	100	36	50	70	100	100	36	50	70	100	100	36	50	70	100	100	36	50	70	100	100	
T7D 1000	120	120	36	50	70	120	120	36	50	70	120	120	36	50	70	120	120	36	50	70	100	100	
T7D 1250	120	120	36	50	70	120	120	36	50	70	120	120	36	50	70	120	120	36	50	70	100	100	
T7D 1600	120	120	36	50	70	120	120	36	50	70	120	120	36	50	70	120	120	36	50	70	100	100	



Tmax T5D	Tmax T6D	Tmax T7D
400/630	630/800/1000 <sup>(1)</sup>	1000/1250/1600
400/500	630/800/1000	1000/1250/1600
400/400	630/800/800	1000/1250/1250
400/500	630/800/1000	
400/400	630/800/800	
3/4	3/4	3/4
690	690	690
750	750	750
8	8	8
1000	1000	1000
3500	3500	3000
11	30	40
440	220	252
6	15	20
IEC 60947-3	IEC 60947-3	IEC 60947-3
F - P - W	F - W	F - W
F-FC CuAl-FC Cu-EF-ES-R-HR-VR	F-FC CuAl-EF-ES-R-RC	F-EF-ES-FC CuAl-HR/VR
20000	20000	10000
120	120	60
140	210	210
184	280	280
103.5	268	154(manual)/178(motorizable)
205	103.5	268
3.25/4.15	9.5/12	9.7/12.5(manual)/11/14(motorizable)
5.15/6.65	—	—
5.4/6.9	12.1/15.1	29.7/39.6(manual)/32/42.6(motorizable)

	T6 800					T6 1000				T7 800					T7 1000				T7 1250				T7 1600		
	N	S	H	L	V	N	S	H	L	S	H	L	V	X	S	H	L	V	S	H	L	V	S	H	L
	36	50	70	100	150	36	50	70	100	50	70	120	150	170	50	70	120	150	50	70	120	150	50	70	120
	36	50	70	100	100																				
	36	50	70	100	100	36	50	70	100																
	36	50	70	100	100	36	50	70	100	50	70	120	120	120	50	70	120	120							
	36	50	70	100	100	36	50	70	100	50	70	120	120	120	50	70	120	120	50	70	120	120			
	36	50	70	100	100	36	50	70	100	50	70	120	120	120	50	70	120	120	50	70	120	120	50	70	120

# Switch-disconnectors

## Electrical characteristics

2

### Applications

They can be used as general circuit-breakers in sub-switchboards as switching and isolation parts for lines, busbars or groups of apparatus, or as bus-ties. They can be part of general isolation devices of groups of machines or of complexes for motor switching and protection.

### Isolation

The main function carried out by this apparatus consists of isolation of the circuit they are inserted in. Once the contacts are open they are at a distance which prevents an arc from striking, in accordance with the prescriptions in the standards regarding isolation behaviour. The position of the operating lever corresponds definitely with that of the contacts (positive operation).

### Protection

Each switch-disconnector must be protected on the supply side by a coordinated device which safeguards it against short-circuits. The coordination table below indicates the Tmax circuit-breaker which can carry out the protection function for each switch-disconnector. These are always pieces of apparatus of a size corresponding to or smaller than that of the switch disconnector.

### Making capacity

The making capacity  $I_{cm}$  is a performance of notable importance since a switch-disconnector must be able to withstand the dynamic, thermal and current stresses which can occur during closure without being destroyed, up to the short-circuit closing conditions.

# Accessories

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## Accessories

### Versions and types

3

Starting from the fixed version with front terminals, the Tmax circuit-breakers can be converted into the various versions (plug-in for T4 and T5; withdrawable for T4, T5, T6 and T7), using the conversion kits. This makes management of the product, its versions and stocks as a whole very flexible. In any case, it is always possible to request the circuit-breaker in the desired version completely preset in the factory, by ordering, on the same line, the fixed circuit-breaker and the conversion kit, to which must be added the fixed part.

T7 is available in two different versions: the lever operating mechanism version similar to the other sizes in the Tmax family, and the new motorizable version.



#### Fixed

The Tmax FIXED three-pole or four-pole version circuit-breakers foresee:

- circuit-breakers characterised by just two depths up to 1000 A: 103.5 mm for Tmax T4, T5 and T6. For T7 the depth varies according to the type of operating mechanism (with lever or spring charging motor)
- flange for compartment door
- thermomagnetic (on Tmax T4, T5 and T6) or electronic (on Tmax T4, T5, T6 and T7) trip units
- standard F type (front) on all the Tmax family sizes.



#### Plug-in

The PLUG-IN version of the circuit-breaker (Tmax T4 and T5) consists of:

- fixed part to be installed directly on the back plate of the unit
- moving part obtained from the fixed circuit-breaker with addition of the isolating contacts (near the connection terminals), of the rear frame (for fixing to the fixed part) and of the terminal covers.

The circuit-breaker is racked out by unscrewing the top and bottom fixing screws. A special lock prevents circuit-breaker racking in and racking out with the contacts in the closed position.

In the case where the circuit-breaker has electrical accessories mounted (SOR, UVR, MOE, MOE-E, AUX, AUX-E, AUE, RC222), the socket-plug connectors or the adapters for isolation of the relative auxiliary circuits must also be ordered (see page 3/30).



Withdrawable

The circuit-breakers in the WITHDRAWABLE version (Tmax T4, T5, T6<sup>(\*)</sup> and T7) are made up of:

- fixed part to be installed directly on the back plate of the unit fitted with lateral guides to allow the moving part racking-in and racking-out operation to be carried out easily, and a dedicated flange for the compartment door to replace the one provided with the circuit-breaker in the fixed version;
- moving part obtained from the fixed circuit-breaker with addition of the relative conversion kit from fixed to withdrawable moving part;
- mandatory accessory to be applied onto the front of the circuit-breaker selected between front for lever operating mechanism (standard supply for circuit-breakers fitted with accessories in the factory, excluding T7) motor operator and rotary handle operating mechanism. Application of one of these accessories allows the racking-in and racking-out of the moving part with the compartment door closed (on T7 no accessory is required to have racking-out with the door closed).

Racking-in and racking-out of the moving part is carried out by means of the special operating lever always supplied with the fixed part. This particular device allows the circuit-breaker to be placed in the isolated position (with power and auxiliary circuits disconnected) with the compartment door closed, to the great advantage of operator safety. The handle can only be inserted with the circuit-breaker open. Once removed or racked-out, the circuit-breaker can be operated in open/closed and, by means of special connection extensions, blank tests can be carried out of the auxiliary control circuit functions.

The T4, T5 and T6 circuit-breakers in the withdrawable version can only be fitted with pre-wired electrical accessories, provided with the appropriate ADP adapters for isolation of the relative auxiliary circuits (see page 3/30).



Motorizable

The T7 circuit-breaker in the motorizable version can be equipped with the spring charging motor. To allow a complete remote control with T7 motorizable, the circuit-breaker must be fitted with:

- shunt opening release;
- shunt closing release;
- spring charging motor.

Versions available

	F Fixed	P Plug-in	W Withdrawable
T4	■	■	■
T5	■	■	■
T6	■		■
T7	■		■
T7M	■		■

<sup>(\*)</sup> Not available on the 1000 A version.

## Accessories

### Versions and types

3

#### Fixed part - FP

The fixed part, available for all the sizes of the Tmax family, allows the circuit-breaker to be made in the plug-in or withdrawable version. Different positions of the circuit-breaker are possible:

- plug-in: connected, removed;
- withdrawable: connected, removed, racked-out for test (only for T7), racked-out.

With Tmax T4, T5, T6 and T7, fixed parts with dedicated front and rear terminals are available. Moreover, the fixed parts of T4 and T5 with front terminals can also be fitted with the special ES, FC Cu and FC CuAl terminals.

The rear flat terminals of the fixed parts of Tmax T7 are orientated (horizontally or vertically). Factory assembly is horizontal as standard. By means of the extra code 1SDA063571R1, it is possible to ask for the fixed part with vertical terminals. This extra code can be associated either with the top terminals or with the bottom ones (in the case of asking for assembly of both the terminals vertically, the extra code must be repeated twice). The anti-racking-in locks, to be mounted on the left side of the fixed part, and which prevent racking-in of incorrect moving parts are supplied as standard fitting of the fixed parts of Tmax T7. In detail, it is possible to define the different ways of combination between the fixed part and the moving part according to: T7 with lever or which can be motorised, breaking capacity and rated uninterrupted current.



#### Kit for conversion of fixed part of plug-in into fixed part of withdrawable version

For Tmax T4 and T5 is available a conversion kit which is made up by a guide to prepare the fixed part of the circuit-breaker in the plug-in version in the fixed part of the circuit-breaker in the withdrawable version, a racking-out crank handle and by the flange for the compartment door to replace the one supplied with the fixed or plug-in circuit-breaker version.



#### Racking-out crank handle

This allows racking-out and racking-in of the circuit-breaker in the withdrawable version into the fixed part, with the door closed. The crank handle is the same for the whole range of circuit-breakers and is automatically supplied with the fixed part of withdrawable circuit-breakers or with the conversion kit for fixed part of plug-in into fixed part of withdrawable version.



1SDC210D18F0001

### Sliding contacts blocks

The sliding contacts blocks are required for Tmax T7 in withdrawable version equipped with electrical accessories or with an electronic trip unit. Their function is to realize the electrical connections of the secondary circuits between the mobile part and the fixed part and these blocks work in pairs: one block is to be mounted on the mobile part and the respective one on the fixed part. The following table combines the types of sliding contacts blocks and the electrical accessories.

Left block	Central block	Right block
Spring charging motor	PR331	Auxiliary contacts (Q or SY)
Spring charged contact (AUX-SC)	PR332	Shunt opening release
Ready to close contact (AUX-RTC)		Shunt closing release
Early auxiliary contacts (AUE)		Under voltage release
Contact for signalling trip coil release trip (AUX-SA)		
Trip reset		

If at least one of the electrical accessories listed in the previous table is fitted on the circuit breaker the respective pair of blocks must be mounted on the mobile part and on the fixed part.



1SDC210C09F0001

T4-T5



1SDC210C18F0001

T4-T5-T6



1SDC210D17F0001

T7

### Kit for conversion into moving part of plug-in version for T4 - T5

Allows the fixed circuit-breaker with front terminals to be converted into the moving part of a plug-in circuit-breaker. The kit consists of:

- isolating contacts
- anti-racking out safety device
- assembly screws and nuts
- low terminal covers for the moving part.

The fixed part for plug-in version is necessary to complete the circuit-breaker.

### Kit for conversion into moving part of withdrawable version for T4 - T5 - T6 - T7

Allows the fixed circuit-breaker with front terminals to be converted into the moving part of a withdrawable circuit-breaker. The kit consists of:

- isolating contacts
- frame
- assembly screws and nuts
- low terminal covers for the moving part.

The circuit-breakers in the withdrawable version must always be completed either with the front for lever operating mechanism (standard supply for circuit-breakers fitted with accessories in the factory, excluding T7), rotary handle operating mechanism or motor operator.

The fixed part for withdrawable version is necessary to complete the circuit-breaker. The kit for converting a fixed CB into a withdrawable version is not available for the T6 1000 A circuit-breaker.

#### Kit for conversion of fixed part into plug-in version for RC222 and RC223 residual current releases

With the dedicated conversion kit, the RC222 and RC223 residual current releases for T4 and T5 as well can be converted from the fixed to the plug-in version. The kit consists of four copper busbars which make the connection between the terminals of the residual current relay and the isolating contacts mounted on the circuit-breaker terminals.

Therefore, to obtain a circuit-breaker fitted with the residual current release accessory in the plug-in version, the two kits for conversion of circuit-breakers and for residual current release must be ordered.

The power circuit is connected to the connection terminals of the fixed part.

#### Kit for conversion of plug-in into withdrawable version for RC222 and RC223 residual current releases

The RC222 and RC223 residual current releases for T4 and T5 can be converted from the plug-in to withdrawable version by adding the special kit consisting of a bellows to be applied on the front of the residual current release to allow racking-out of the circuit-breaker and of the residual current release with the switchgear door closed.

This kit can also be mounted on the fixed version circuit-breaker when there is the front for locks or the direct rotary handle operating mechanism, therefore widening the range of use of the residual current releases.



## Accessories

### Connection terminals

The basic version circuit-breaker is supplied with front terminals (F).

Different types of terminals, which can be combined together in different ways, are also available (top of one type, bottom of a different type), thereby allowing the circuit-breaker to be connected to the plant in the most suitable way in relation to installation requirements.

The following can be distinguished:

- **front terminals** which allow connection of cables or busbars working directly from the front of the circuit-breaker
- **orientated rear terminals** which allow installation of the circuit-breakers in switchboards with rear access to both the cable and busbar connections.

Terminals are available for direct connection of bare copper or aluminium cables and terminals for connection of busbars or cables with cable lugs.

On page 3/9 and following, the information needed to make the connections for each type of terminal is summarised. For connection with bare cables, the minimum and maximum cross-sections of the cables, which can be clamped in the terminals, the type of cables (rigid or flexible) and the diameter of the terminal are indicated. For connections with busbars, flat terminals of different sizes and composition are recommended.

The torque values to be applied to the tightening screws of the terminals for cables and to the screws used to connect the busbars to the flat terminals are indicated.

The circuit-breakers can be ordered complete with the terminals required (mounted directly in the factory), by associating the terminal kit codes with the code of the standard version circuit-breaker, or the terminals can be ordered individually in packs of 3 - 4 - 6 or 8 pieces.

To receive the circuit-breaker with mixed terminals, the two terminal half-kits must be specified, loading the one to be mounted on top as the first half-kit and then the one to be mounted below.

If the top terminals are the same as the bottom ones, it is compulsory to order the complete kit (6 or 8 pieces) and not the two half-kits: the configuration would not be accepted by the system.

3



1SDC210C11F001



1SDC210C12F001

### Insulating terminal covers

The terminal covers are applied to the circuit-breaker to prevent accidental contact with live parts and thereby guarantee protection against direct contacts. The following are available:

- low terminal covers (LTC): these guarantee IP30 degree of protection for fixed circuit-breakers with rear terminals and for moving parts of plug-in and withdrawable circuit-breakers
- high terminal covers (HTC): these guarantee IP40 degree of protection, for fixed circuit-breakers with front, front extended, front for cables terminals.

For fixed parts of T4 and T5, the proper terminal covers (TC-FP) are available.

The degrees of protection indicated at page 1/8 are valid for the circuit-breaker installed in a switchboard.

# Accessories

## Connection terminals

3



### Phase separators

These allow the insulation characteristics between the phases at the connections to be increased. They are mounted from the front, even with the circuit-breaker already installed, inserting them into the corresponding slots and they are available in two versions:

- 100 mm high
- 200 mm high.

The H=100 mm phase separators are supplied as compulsory with front extended type terminals (EF) except for T4 P-W and T6, whereas the ones with height H=200 mm are compulsory with front extended spread type terminals (ES).

The phase separating partitions are incompatible with both the high and low insulating terminal covers.

The fixed parts can use the same phase separating partitions as the corresponding fixed circuit breakers.

It is possible to mount the phase separating partitions between two circuit-breakers or fixed parts side by side.



### Screws for sealing the terminal covers

These are applied to the terminal covers of fixed circuit-breakers or to the moving parts of plug-in or withdrawable circuit-breakers. They prevent removal of both the high and low terminal covers and can be locked with a wire and lead seal.









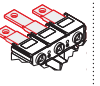

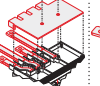



### Kit for taking up the auxiliary power supply

Special kits are available with the fixed version of Tmax T2, T3, T4 and T5 circuit-breakers for taking up the auxiliary power supply directly from the connection terminals. They can only be combined with the front terminals for copper cables (FC Cu) for T2, T3 and T4 or with the front terminals (F) for T4-T5.

## Connection terminals

### Circuit-breaker

	F	EF	ES	FC Cu	FC CuAl	FC CuAl	MC	RC CuAl	HR	VR	HR for RC221/222	R
												
	Front terminals	Front extended terminals	Front extended spread terminals	Front terminals for copper cables	Front terminals for CuAl cables	Front terminals for CuAl cables <sup>(1)</sup>	Multi-cable terminals	Rear terminals for CuAl cables	Rear flat horizontal terminals	Rear flat vertical terminals	Rear flat horizontal terminals	Rear horizontal terminals
T4	F <sup>(2)</sup>	F	F	F	F	F	F					F
T5	F <sup>(2)</sup>	F	F	F	F	F						F
T6 630	F <sup>(2)</sup>	F	F		F			F				F
T6 800	F <sup>(2)</sup>	F	F			F		F				F
T6 1000	F <sup>(2)</sup>	F <sup>(2)(3)</sup>	F <sup>(3)</sup>			F <sup>(3)</sup>						F <sup>(3)</sup>
T7	F <sup>(2)</sup>	F	F <sup>(4)</sup>			F			F	F		F

<sup>(1)</sup> Housed externally

<sup>(2)</sup> Standard supply

<sup>(3)</sup> A type of terminal among those indicated in the table must necessarily be mounted on the T6 1000 A circuit-breaker (complete circuit-breaker, breaking part and loose protection trip unit)

<sup>(4)</sup> Not available on Tmax T7X

F = Fixed

3

### Fixed part

	F	EF	ES	FC Cu	FC CuAl	FC CuAl	R	RS	HR	VR	HR/VR
	Front terminals	Front extended terminals	Front extended spread terminals	Front terminals for copper cables	Front terminals for CuAl cables	Front terminals for CuAl cables <sup>(1)</sup>	Rear horizontal terminals	Rear spreaded terminals	Rear flat horizontal terminals	Rear flat vertical terminals	Rear flat terminals
T4		P-W		P-W	P-W				P-W	P-W	
T5		P-W	P <sup>(2)</sup> -W <sup>(2)</sup>	P-W	P-W				P-W	P-W	
T6		W							W	W	
T7		W	W					W			W

<sup>(1)</sup> Housed externally

<sup>(2)</sup> For T5 630 only

P = Plug-in

W = Withdrawable

# Accessories

## Connection terminals

### Front terminals - F

Allow connection of busbars or cables terminated with cable terminal.



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3

Type	Version	Pieces	Busbars/cable terminal [mm]				Tightening [Nm]	Terminal covers			Phase separators
			W	H	D	Ø		high	low	fixed part	
T4	F	1	25	9.5	8	8.5	18	R	R	–	R
T5	F	1	35	11	10 <sup>(1)</sup>	10.5	28	R	R	–	R
T6 630	F	2	40	12	5	2x7	9	R	R	–	R
T6 800	F	2	40	12	5	2x7	9	R	R	–	R
T7 1250 <sup>(2)</sup>	F	2	50	20	8	2x11	18	–	R	–	R
T7 1600	F	2	50	20	10	2x11	18	–	R	–	R

<sup>(1)</sup> minimum 5 mm

<sup>(2)</sup> up to 1250 A



1SDC210C2BF0001



1SDC210C2BF0001

### Front extended terminals - EF

Allow connection of busbars or cables terminated with cable terminal.



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Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers			Phase separators
			W	D	Ø	W	Ø	A	B <sup>(1)</sup>	high	low	fixed part	
T4	F	1	20	10	10	20	10	18	18	R	–	–	S
	P-W	1	20	10	8	20	8	–	9	–	–	R	R
T5	F	2	30	7	11	30	11	28	18	R	–	–	S
	P-W	2	30	15	10	30	10	–	18	–	–	R	R <sup>(7)</sup>
T6 630	F-W	2	40	5	11 <sup>(2)</sup>	40	11 <sup>(2)</sup>	9	18	R	R	R	R
T6 800	F-W	2	50	5	14	50	14	9	30	–	R	R	R
T6 1000	F	2	50	6	14	50	14	9	30	–	–	–	–
T7 1250 <sup>(3)</sup>	F-W	2	50	8	4x11 <sup>(4)</sup>	–	–	18 <sup>(5)</sup>	40 <sup>(6)</sup>	–	R	–	S
T7 1600	F-W	2	50	10	4x11 <sup>(4)</sup>	–	–	18 <sup>(5)</sup>	40 <sup>(6)</sup>	–	R	–	S

<sup>(1)</sup> class 4.8 screws (not supplied)

<sup>(2)</sup> 14 mm for W

<sup>(3)</sup> up to 1250 A, not available on Tmax T7X

<sup>(4)</sup> only use two holes diagonally

<sup>(5)</sup> 12 Nm onto fixed part of withdrawable circuit-breaker

<sup>(6)</sup> class 8.8 screws (not supplied)

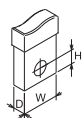
<sup>(7)</sup> Standard for T5 630



1SDC210C31F0001



1SDC210C31F0001



A = Tightening the terminal onto the circuit-breaker

B = Tightening the cable/busbar onto the terminal

R = On request

S = Standard

Pieces = Number of busbars, cables or cable terminals

Front extended spread terminals - ES

Allow connection of busbars or cables terminated with cable terminal.



Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers			Phase separators
			W	P	Ø	W	Ø	A	B <sup>(1)</sup>	high	low	fixed part	
T4	F	1	30	6	10.5	30	10.5	18	18	–	–	–	S
T5	F-P <sup>(2)</sup> -W <sup>(2)</sup>	1	40	10	11	11	11	28	18	–	–	–	S
T6	F	1	80	5	3x13	3x45	13	9	30	–	–	–	–
T7	F	2	50	10	3x13	4x45	13	18	40	–	–	–	S
	W	2	80	6	3x13	4x45	13	40	40	–	–	–	–

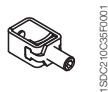
<sup>(1)</sup> class 4.8 screws (not supplied)

<sup>(2)</sup> for T5 630 only



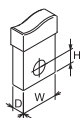
Front terminals for copper cables - FC Cu

Allow connection of bare copper cables directly to the circuit-breaker.



Type	Assembly	Version	Pieces	Cable [mm <sup>2</sup> ]		Flexible busbars W x S x N <sup>(1)</sup>	Tightening [Nm]		Ø [mm]	Terminal covers			Phase separators
				rigid	flexible		A	B		high	low	fixed part	
T4	standard	F-P-W	1	2.5...185	2.5...120	15.5x0.8x10	–	10	18	R	R	S	R
	standard	F-P-W	2	–	2.5...95	–	–	10	18	R	R	S	R
T5	standard	F-P-W	1	16...300	16...240	24x1x10	–	25	28	R	R	S	R
	external	F	2	120...240	–	–	18	25	–	S	–	–	–

<sup>(1)</sup> W = width; S = thickness; N = n. of bars



A = Tightening the terminal onto the circuit-breaker  
B = Tightening the cable/busbar onto the terminal  
R = On request  
S = Standard  
Pieces = Number of busbars, cables or cable terminals

# Accessories

## Connection terminals

### Front terminals for copper/aluminium cables - FC CuAl

Allow connection of bare copper or aluminium cables directly to the circuit-breaker (solid aluminium cables cannot be used).



T4-T5  
Standard

1SDC210C45F0001



T4-T5  
External

1SDC210C45F0001



T6-T7

1SDC210C38F0001

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Type	Assembly	Version	Pieces	Cable [mm²]	Tightening [Nm]		Ø [mm]	Terminal covers			Phase separators
					A	B		high	low	fixed part	
T4	standard	F-P-W	1	6...185	9	31	18	R	R	S	R
	external	F	2	35...150	18	16	18	S	–	S	–
	external	F	1	150...240	18	40	24	S	–	–	–
	standard	F	1	2.5...50	9	5.6	9.9	R	R	R	R
T5	external	F-P-W	1	120...240	18	43	21.5	R	R	R	S
	standard	F-P-W	1	185...300	18	43	24.5	R	R	S	R
	external	F	2	95...240	18	31	24.5	S	–	S	–
	external	F	2	95...120	18	31	–	S	–	–	R
T6 630	standard	F	2	120...240	5	31	21.5	R	–	–	R
T6 800	external	F	3	70...185	9	43	19	S	–	–	–
T6 1000	external	F	4	70...150	9	43	19	S	–	–	–
T7 630	standard	F	2	185...240	18	43	21.5	–	S	–	R
T7 1250 <sup>(1)</sup>	external	F	4	70...240	18	43	21.5	S	–	–	–

<sup>(1)</sup> up to 1250 A, not available on Tmax T7X



1SDC210C45F0001



1SDC210C45F0001

### Multi-cable terminals - MC

Allow connection of cables directly to the circuit-breaker.

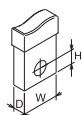


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Type	Version	Pieces	Cable [mm²]		Tightening [Nm]		Terminal covers			Phase separators
		max	flexible	rigid	A	B	high	low	fixed part	
T4	F	6	2.5...25	2.5...35	18	7	S	–	–	–
T5	F	6	–	16...50	18	5	S	–	–	–



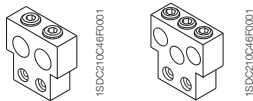
1SDC210C45F0001



A = Tightening the terminal onto the circuit-breaker  
 B = Tightening the cable/busbar onto the terminal  
 R = On request  
 S = Standard  
 Pieces = Number of busbars, cables or cable terminals

### Rear terminals for copper/aluminium cables - RC CuAl

Allow connection of bare copper or aluminium cables directly to the circuit-breaker.



Type	Version	Pieces	Cable rigid	Tightening [Nm]		Ø [mm]	Terminal covers	
				A	B		high	low
T6 630	F	2	150...240	9	43	21	S	–
T6 800	F	3	70...185	9	31	17.5	S	–

### Rear flat horizontal terminals - HR

Allow connection of busbars or cable terminal at the rear.  
They can only be installed horizontally.

Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers		Phase separators
			W	D	Ø	W	Ø	A	B <sup>(1)</sup>	high	low	
T7 1250 <sup>(2)</sup>	F	2	50	8	2x11	–	–	20	40	–	S	–
T7 1600	F	2	50	10	2x11	–	–	20	40	–	S	–

<sup>(1)</sup> class 8.8 screws (not supplied)

<sup>(2)</sup> up to 1250 A

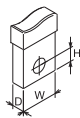
### Rear flat vertical terminals - VR

Allow connection of busbars or cable terminal at the rear.  
They can only be installed vertically.

Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers		Phase separators
			W	D	Ø	W	Ø	A	B <sup>(1)</sup>	high	low	
T7 1250 <sup>(2)</sup>	F	2	50	8	2x11	–	–	20	40	–	S	–
T7 1600	F	2	50	10	2x11	–	–	20	40	–	S	–

<sup>(1)</sup> class 8.8 screws (not supplied)

<sup>(2)</sup> up to 1250 A



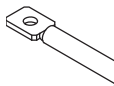
A = Tightening the terminal onto the circuit-breaker  
B = Tightening the cable/busbar onto the terminal  
R = On request  
S = Standard  
Pieces = Number of busbars, cables or cable terminals

# Accessories

## Connection terminals

### Rear terminals - R

Allow connection of busbars or cable terminal at the rear. They can be installed in 4 different positions to facilitate connection to cable/busbars.



1SDC210C49R0001

Type	Version	Pieces	Busbars [mm]			Tightening [Nm]		Terminal covers		Phase separators
			W	D	Ø	A	B <sup>(1)</sup>	high	low	
T4	F	1	20	10	8.5	6	9	–	S	–
T5	F	2	30	7	11	18	18	–	S	–
T6 630	F	2	40	5	14	18	30	–	S	–
T6 800	F	2	50	5	14	18	30	–	S	–
T6 1000	F	2	50	6	14	18	30	–	S	–
T7 1250 <sup>(2)</sup>	F	2	50	8	2x11	20	40	–	S	–
T7 1600	F	2	50	10	2x11	20	40	–	S	–

<sup>(1)</sup> class 8.8 screws (not supplied)

<sup>(2)</sup> up to 1250 A

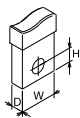


1SDC210C30R0001

### Rear spreaded terminals - RS

Allow connection of busbars and cable terminal at the rear.

Type	Version	Pieces	Busbars [mm]			Tightening [Nm]		Terminal covers			Phase separators
			W	D	Ø	A	B	high	low	fixed part	
T7	W	2	60	10	2x11	18	40	–	–	–	–

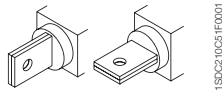


A = Tightening the terminal onto the circuit-breaker  
 B = Tightening the cable/busbar onto the terminal  
 R = On request  
 S = Standard  
 Pieces = Number of busbars, cables or cable terminals



Rear flat horizontal and vertical terminals for fixed parts - HR/VR

These allow connection of busbars or cable terminals at the rear.  
There are rear horizontal or vertical terminals.



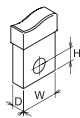
Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers			Phase separators
			W	D	Ø	W	Ø	A	B <sup>(1)</sup>	high	low	fixed part	
T4	P - W	1	20	10	9	20	9	6	18	–	–	–	–
T5 400	P - W	1	25	10	11	25	11	9	18	–	–	–	–
T5 630	P - W	2	40	15	11	40	11	–	18	–	–	–	–
T6 630	W	2	40	5	14	40	14	–	30	–	–	–	–
T6 800	W	2	50	5	14	50	14	–	30	–	–	–	–
T7 1250 <sup>(2)(3)</sup>	W	2	50	8	2x11	–	–	12	40	–	–	–	–
T7 1600 <sup>(3)</sup>	W	2	50	10	2x11	–	–	12	40	–	–	–	–

<sup>(1)</sup> class 4.8 screws (not supplied)      <sup>(2)</sup> up to 1250 A      <sup>(3)</sup> for vertical assembly directly in the factory, use extra code 1SDA063571R1



60 mm fixed parts for connection of Tmax to 60mm busbars distribution system.

Fixed parts for circuit-breakers up to 520A have been designed to adapt to all busbar systems on the market with 60 mm centre-to-centre distance. The new fixed parts are available for two frames in the Tmax family: T4 250/320 A and T5 400/630A in the three-pole type, both in the fixed and plug-in version (not available for T5 630A). On the fixed version 60 mm fixed part is installed directly on the busbars and Tmax circuit-breaker is mounted on 60mm fixed part. On the plug-in version 60mm fixed part is installed directly on the busbars and moving part of Tmax plug-in circuit breaker is mounted on 60mm fixed part.



A = Tightening the terminal onto the circuit-breaker  
B = Tightening the cable/busbar onto the terminal  
R = On request  
S = Standard  
Pieces = Number of busbars, cables or cable terminals

## Accessories

### Service releases

3

The Tmax family of circuit-breakers can be fitted with service releases (shunt opening release, shunt closing release and undervoltage release). These are available in the pre-cabled version, depending on the size of the circuit-breaker fitted with 1 m long free cables, with a connector with 1 m cables or with a simple pin connector and two terminals to be mounted in the terminal board, or in the uncabled version, with cabling to be carried out by the customer.

Assembly is carried out for all the releases by pressing into the special seat in the left part of the circuit-breaker (right for T7) and fixing with the screw provided.

For T4, T5 and T6 in the four-pole version the shunt opening release (not possible with PS-SOR) and the undervoltage release can be housed at the same time, as long as they are in the wired version and with the shunt opening release necessarily mounted in the slot of the third pole. T4, T5, T6 circuit-breakers in the withdrawable version can be equipped only with pre-cabled accessories; the T4-T5-T6 circuit-breakers complete with motorized controls can only be fitted with prewired undervoltage and shunt opening releases.

The T7 circuit-breaker allows simultaneous mounting of all three service releases. These two possibilities are available on the three-pole version as well. Moreover Tmax T7 can be equipped with two shunt opening releases instead of the undervoltage release to facilitate some specific applications where a very high safety level of the remote circuit-breaker opening command is required.

If there is only a service release installed in a T4, T5 or T6 in four poles version, the dedicated slot is the one on the left hand side, close to the operating toggle.



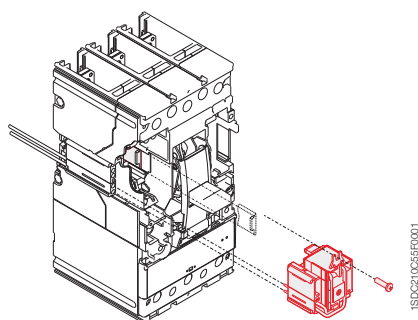
T4-T5-T6



T7

### Shunt opening release – SOR

Allows circuit-breaker opening by means of an electric command. Operation of the release is guaranteed for a voltage between 70% and 110% of the rated power supply voltage value  $U_n$ , both in alternating current and in direct current. For Tmax T1, T2, T3, T4, T5 and T6, the SOR shunt opening release is fitted with a limit contact for cutting off the power supply in the open position and with the release tripped.



T4-T5-T6

## SOR - Electrical characteristics

Version	Inrush power consumption			
	Tmax T4, T5, T6		Tmax T7	
	AC [VA]	DC [W]	AC [VA]	DC [W]
12 V DC		150		
24 V AC/DC			430	430
24...30 V AC/DC	150	150		
30 V AC/DC			300	300
48 V AC/DC			300	300
48...60 V AC/DC	150	150		
60 V AC/DC			300	300
110...120 V AC/DC			300	300
120...127 V AC/DC			300	300
110...127 V AC - 110...125 V DC	150	150		
220...240 V AC/DC			300	300
220...240 V AC - 220...250 V DC	150	150		
240...250 V AC/DC			300	300
380...400 V AC			300	
380...440 V AC	150			
415...440 V AC			300	
480...525 V AC	150			
Opening times [ms]	15	15	50	50

3

## Shunt opening release with permanent service – PS-SOR

Furthermore, for T4, T5 and T6, opening coils with permanent service (PS-SOR) are available, with much lower power consumption and which can be supplied continuously: in this case, in fact, they are not fitted with auxiliary limit contact. The pre-cabled or uncabled version can be chosen for these coils as well.

## PS-SOR - Electrical characteristics

Version	Tmax T4, T5, T6	
	AC [VA]	DC [W]
24 V AC/DC	4	4
110...120 V AC	4	–

# Accessories

## Service releases

3



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

On Tmax the opening and closing release 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 and closing (T7 only). The test unit ensures the continuity of the opening and closing (T7 only) 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. YO/YC test unit is not compatible with permanently supplied releases. Continuity is checked cyclically with an interval of 20s. 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 are 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 devices

Auxiliary power supply	24 V...250 V AC / DC
------------------------	----------------------

#### Specifications of the signalling relays

Maximum interrupted current	6 A
Maximum interrupted voltage	250 V AC



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T7

### Shunt closing release – SCR

The shunt closing release - only available on the motorizable versions of Tmax T7 - allows remote closure of the circuit-breaker when the circuit-breaker closing springs are charged. The technical characteristics and the service voltages of the shunt closing release are identical to those of the shunt opening release available on T7. The closing time of the circuit-breaker by means of SCR is 50 ms.

Thanks to the anti-surge system, the closure of the circuit-breaker is not possible before the opening operation has entirely been performed. Thus a delay of at least 30 ms between the opening and closing command is required.

### Undervoltage release – UVR

Opens the circuit-breaker due to lack of release power supply voltage or to drops to values under  $0.7 \times U_n$  with a trip range from  $0.7$  to  $0.35 \times U_n$ . After tripping, the circuit-breaker can be closed again starting from a voltage higher than  $0.85 \times U_n$ . With the undervoltage release de-energised, it is not possible to close the circuit-breaker or the main contacts.



T4-T5-T6

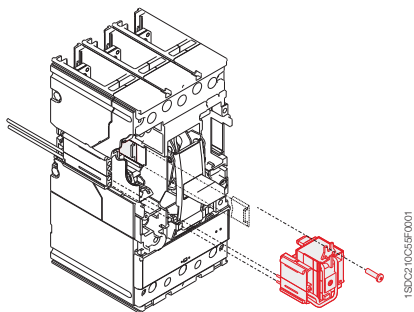


T7

## UVR - Electrical characteristics UVR T4...T6

Power consumption during permanent operation		
Version	Tmax T4, T5, T6	
	AC [VA]	DC [W]
24 V AC/DC		
24...30 V AC/DC	6	3
30 V AC/DC		
48 V AC/DC	6	3
60 V AC/DC	6	3
110...127 V AC - 110...125 V DC	6	3
220...240 V AC - 220...250 V DC	6	3
380...440 V AC	6	
480...525 V AC	6	
Opening times [ms]	≤ 30	≤ 30

3



T4-T5-T6

## UVR - Electrical characteristics UVR T7

Characteristics		
Power supply (Un)	24 V AC/DC	240-250 V AC/DC
	30 V AC/DC	380-400 V AC
	48 V AC/DC	415-440 V AC
	60 V AC/DC	
	110-120 V AC/DC	
	120...127 V AC/DC	
	220...240 V AC/DC	
Operating limits	IEC EN 60947-2 Standards	
Inrush power (Ps)	DC = 300 W	
Inrush time ~ 100 ms	AC = 300 VA	
Continuous power (Pc)	DC = 3.5 W	
	AC = 3.5 VA	
Opening time (UVR)	30 ms	
Insulation voltage	2500 V 50 Hz (for 1 min)	

# Accessories

## Service releases

3



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### Time delay device for undervoltage release – UVD

The undervoltage release (UVR) can be combined with an external electronic power supply time delay device, which allows circuit-breaker opening to be delayed in the case of a drop or failure in the power supply voltage of the release itself, according to preset and adjustable delays, in order to prevent unwarranted trips caused by temporary malfunctions. The delay device must be combined with an undervoltage release with the same corresponding voltage. Two time delay devices with the same characteristics are available. For T4-T6 a time delay device which can be combined also with Tmax T1-T2-T3 circuit-breakers is available. The time delay device for Tmax T7 is the one already available on the Emax ranges.

#### UVD

Circuit-breaker	Power supply voltage [V AC/DC]
T4...T6	24...30
T4...T6	48...60
T4...T6	110...125
T4...T6	220...250
Delay which can be set [s]	0.25 - 0.5 - 0.75 - 1 - 1.25 - 2 - 2.5 - 3
Trip time tolerance	± 15%

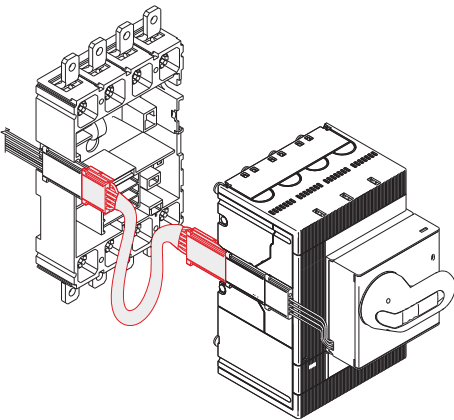
Circuit-breaker	Power supply voltage [V AC/DC]
T7	24...30
T7	48
T7	60
T7	110...125
T7	220...250
Delay which can be set [s]	0.5 - 1 - 1.5 - 2 - 3



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### Testing extension for service releases

Available for Tmax T4, T5 and T6, this allows the service releases to be supplied with the circuit-breaker in the removed position. With the circuit-breaker in safe conditions, i.e. isolated in relation to the power circuits, this makes it possible to carry out blank tests of the circuit-breaker functionality.



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# Accessories

## Electrical signals

3

These allow information on the operating state of the circuit-breaker to be taken outside. Installation of these accessories is carried out directly from the front of the circuit-breaker in special slots placed on the right-hand side of the circuit-breaker, completely segregated from the live parts - all to the benefit of user safety. The auxiliary contacts can be supplied (depending on the type) either in the version with cabling to be carried out by the customer by means of connection to the terminals integrated in the auxiliary contacts, or with cabling directly on the circuit-breaker terminal board or in the pre-cabled version, depending on the size of the circuit-breaker fitted with free cables 1 m long, with a connector with 1 m long cables. The pre-cabled version is mandatory on the T4, T5 and T6 circuit-breakers in the withdrawable version. The auxiliary contacts for T7 are always fitted with three terminals to be mounted in the terminal board to carry out the cabling. The auxiliary contacts are available for use both in direct and alternating current at various voltages. The signals are reset when the circuit-breaker is reset.



AUX - 250 V AC/DC



AUX-C - 250 V AC/DC

### T4-T7 (AUX)

Available both in the pre-cabled and uncabled version, they supply the following electrical signalling:

- open/closed: indicates the position of the circuit-breaker contacts (Q)
- release trip: signals circuit-breaker opening due to overcurrent release trip (for overload or short circuit), trip of the residual current release, of the opening coil or of the undervoltage release, of the emergency opening pushbutton of the motor operator or two to operation of the test pushbutton (SY)
- contact for signalling electronic trip unit tripped: signals intervention of one of the protection functions of the electronic trip unit (S51).

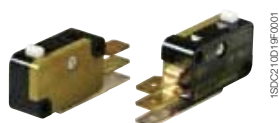
The auxiliary contacts for T7 are always fitted with terminals to be mounted in the terminal box to carry out wiring.

### T4, T5, T6 and T7 with electronic trip units (AUX-SA)

There is a contact for signalling electronic trip units tripped, only available in the pre-cabled version for use at 250 V AC.

### T4, T5 and T6 (AUX-MO)

This auxiliary contact, only in the cabled version, must necessarily be combined with the motor operator and indicates the motor operation mode (manual or remote).



T7

### T7 (AUX-RTC)

The “circuit-breaker ready to close” auxiliary contact is available with wiring directly on the terminal box of the T7 circuit-breaker with stored energy operating mechanism and signals that the circuit-breaker is ready to accept a closing command if there are the following five conditions:

- circuit-breaker open
- closing springs charged
- any opening coil de-energised
- any undervoltage coil energised
- opening solenoid armed.

# Accessories

## Electrical signals

3

### T7 (AUX-SC)

Indicates the state of the circuit-breaker operating mechanism closing springs remotely (supplied only with the spring charging motor).

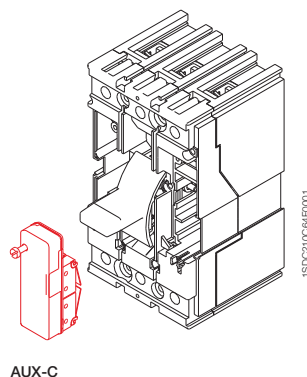
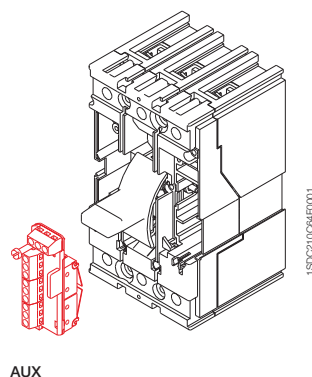
### T4, T5 and T6 with PR222DS/PD, PR223DS and PR223EF electronic trip unit (AUX-E)

Only available in the pre-cabled version, the auxiliary contacts AUX-E (also called electronic version contacts) communicate the state of the circuit-breaker to the electronic trip unit and make an open/closed signal available to the outside and another one for electronic trip unit tripped.

They can only be combined with the PR222DS/PD, PR223DS or PR223EF electronic trip unit and only function when there is a 24 V DC auxiliary power supply to the trip unit for the communication functions.

The AUX-E contacts can, moreover, be directly connected to the MOE-E motor operator (see page 3/28).

The “traditional” version of the auxiliary contacts can also be combined with the protection trip units with dialogue; in this case, only electrical signalling of the state of the circuit-breaker will be provided and it will not be possible to communicate remotely or control the motor.





AUX - Electrical characteristics

AUX 250 V - T4...T6		
Power supply voltage	Service current	
	Category of utilisation (IEC 60947-5-1)	
	AC 14	DC 13
125 V	6 A	0.3 A
250 V	5 A	0.15 A
Protection with gG 10x38 type fuse (I <sub>max</sub> 6 A)		

AUX 400 V - T4...T7		
Power supply voltage	Service current In [A]	
	AC	DC
125 V	–	0.3
250 V	12 <sup>(1)</sup>	0.15
400 V	3	–

<sup>(1)</sup> 5 A for T<sub>max</sub> T7

AUX 24 V - T4...T7		
Power supply voltage	Service current In [A]	
	AC	DC
24 V	–	≥ 0.75 mA
5 V	–	≥ 1 mA

AUX-E - T4...T6	
Typical contact	Mosfet
V <sub>max</sub>	48 V DC/30 V AC
R <sub>max</sub>	35 ohm
P <sub>max</sub> (resistive load)	200 mW
System contact/earth insulation	2000 V AC (1 min. @ 50 Hz)
Contact/contact insulation	400 V DC

Table of the possible combinations of the T7-T7M auxiliary contacts

T7	SY	Q1			1Q + 1SY	T7M			Q2	Q3	2Q
			Q2	Q3	2Q		Q4	Q1			2Q
	SY	Q1	Q2	Q3	3Q + 1SY		Q4	Q1	Q2	Q3	4Q

# Accessories

## Electrical signals

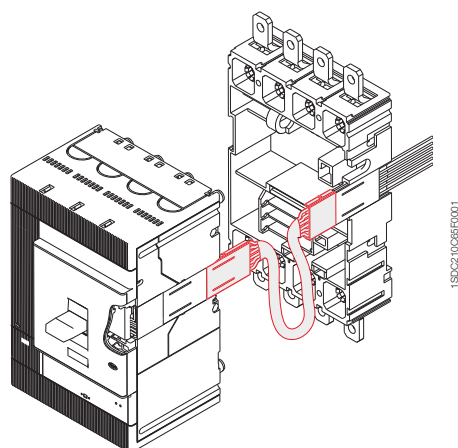
### Types of auxiliary contacts

		Version	T4	T5	T6	T7
AUX 400 V AC	1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled	■	■	■	■
AUX 400 V AC	2 open/closed changeover contacts	pre-cabled	■	■	■	■
AUX 24 V DC	1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled				■
AUX 24 V DC	2 open/closed changeover contacts	pre-cabled				■
AUX 24 V DC	3 open/closed changeover contacts + 1 release tripped changeover contact	pre-cabled/ not cabled	■	■	■	
AUX-SA 250 V AC	1 SA electronic release trip contact	pre-cabled	■	■	■	■
AUX-MO	1 contact signalling manual/remote	not cabled	■	■	■	
AUX-RTC 24 V DC	1 contact signalling ready to close	pre-cabled				■
AUX-RTC 250 V AC/DC	1 contact signalling ready to close	pre-cabled				■
AUX-SC 24 V DC	1 contact signalling closing springs charged	pre-cabled				■
AUX-SC 250 V AC/DC	1 contact signalling closing springs charged	pre-cabled				■
AUX-E	1 open/closed contact + 1 release tripped contact (only with PR222DS/PD, Ekip E and PR223DS)	pre-cabled	■	■	■	



### Testing extension for auxiliary contacts

Available for Tmax T4, T5 and T6 circuit-breakers, this allows the auxiliary contacts to be connected to the relative power supply circuit with the circuit-breaker in the removed position. With the circuit-breaker in a safe position, i.e. isolated in relation to the power circuits, it is possible to carry out blank function tests of the circuit-breaker.

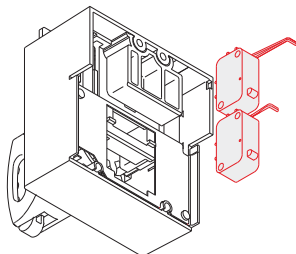




## Early auxiliary contacts – AUE

Normally open contacts, advanced in relation to closing (2 contacts for all the sizes, except for T7 where there are 3). They allow the undervoltage release to be supplied in advance, in relation to closing of the main contacts, in compliance with the IEC 60204-1 and VDE 0113 Standards. They are mounted inside the direct and transmitted rotary handle operating mechanism, whereas on T7 with lever operating mechanism, they are mounted directly on the circuit-breaker. The early contacts are only supplied in the cabled version with 1 m long cables, with socket-plug connectors with 1 m. cables for T4, T5 and T6. It is necessary to bear in mind that the connectors for T4, T5 and T6, once inserted in the special slot on the left-hand side of the circuit-breaker, extend in relation to the outline of the circuit-breaker itself. The early auxiliary contacts for T7 are always fitted with 3 terminals to be mounted in the terminal board to carry out the cabling.

3



## Auxiliary position contacts – AUP

With Tmax circuit-breakers, auxiliary position contacts which provide electrical signalling of the circuit-breaker position in relation to the fixed part are available. The following auxiliary position contacts are available:

### T4 - T5 - T6

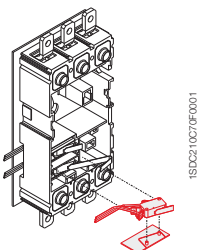
- circuit-breaker racked-in signalling contacts for plug-in and withdrawable versions
- circuit-breaker racked-out signalling contacts only for withdrawable version
- circuit-breaker racked-in signalling contacts for plug-in and withdrawable versions 24 V DC
- circuit-breaker racked-out signalling contacts only for withdrawable version 24 V DC.

### T7

- contacts for signalling circuit-breaker racked-in
- contacts for signalling circuit-breaker in isolated-test
- contacts for signalling circuit-breaker racked-out.



T7



T4-T5

# Accessories

## Electrical signals

3

A maximum of three contacts can be installed on the fixed part of T2, T3, T4 and T5, whereas up to five auxiliary contacts can be mounted on the fixed part of T6 in all the combinations (for T4 and T5, in the withdrawable version, only one contact for signalling circuit-breaker racked-out can be housed in the compartment closest to the bottom terminals).  
The auxiliary contacts for T7 are inserted in a single block consisting of two contacts for signalling racked-in, two for isolated-test and two for racked-out.



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### Trip reset

Available on T7 in the version with possibility of motorisation, this is a coil which allows remote circuit-breaker resetting following a trip of the overcurrent releases. It is available with two power supply voltages: 24...30 V AC/DC, 110...127 V AC/DC and 200...240 V AC/DC.

Version	Inrush power consumption	
	AC [VA]	DC [W]
24...30 V	90	90
110...127 V	70	70
200...240 V	65	65



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### Mechanical operation counter

Available on T7 motorizable, it is connected to the operating mechanism by means of a simple lever mechanism. It indicates the number of circuit-breaker mechanical operations. The indication is visible from the outside on the front of the circuit-breaker.

## Accessories

### Remote control



#### Stored energy motor operator for T4, T5 and T6 – MOE and MOE-E

With the stored energy motor operator, it is possible to control both opening and closing of the circuit-breaker on which it is installed. During opening of the circuit-breaker, the spring system is recharged automatically: the stored energy is exploited in this way to close the circuit-breaker.

The motor operator is always supplied with socket-plug connectors with 1 m long cables and is always fitted with a padlock in the open position, which prevents any command, either locally or remotely. The connectors, once inserted in the special slot on the left-hand side of the circuit-breaker, extend in relation to the outline of the circuit-breaker itself and are only compatible with pre-wired electrical accessories. A selector allows passage from automatic to manual operation and it is also available a block (supplied as standard) for the operating mode of the motor.

The motor operator can be fitted both with a key lock in the open position (with the same MOL-S keys for groups of circuit-breakers or different MOL-D keys) and with an MOL-M key lock against manual operation: in the former case, the lock in the open position is both of electrical and mechanical type, in the latter case, only of mechanical type, i.e. only closing from the front of the circuit-breaker (remote closing is allowed).

In the case of interlocked circuit-breakers, for safety reasons the key lock against manual operation is required.

The motor operator is always fitted with a contact to signal “auto” or “manual” (not on changeover).

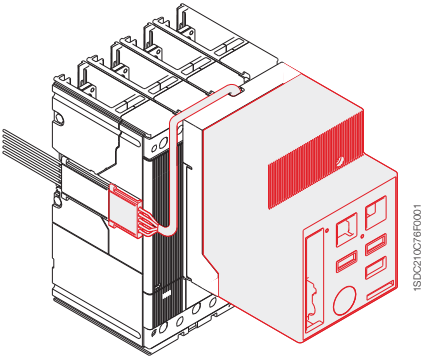
On request, it can also be fitted with an AUX-MO auxiliary contact (on changeover), which provides a signal of its state of service: “auto” (remote control of the circuit-breaker) or “manual”.

If the circuit-breaker is fitted with PR222DS/PD, Ekip E-LSIG and PR223DS electronic trip unit, instead of the MOE motor operator, it is possible to use the MOE-E motor operator: for its use, the circuit-breaker must also be fitted with the AUX-E auxiliary contacts (standard supply with MOE-E). The MOE-E allows use of the digital signals coming from the supervision and control system, by means of the PR222DS/PD, Ekip E-LSIG, PR223DS and PR223EF trip unit and the AUX-E contacts, and to convert these into power signals to operate the motor operator. All the characteristics indicated above for the MOE motor operator are also valid for the MOE-E. The motor operator functions are also guaranteed thanks to permanent opening/closing electric power.

The main parameters relative to the stored energy motor operator are indicated in the table.

MOE and MOE-E

		Tmax T4-T5		Tmax T6	
Rated voltage, Un		AC [V]	DC [V]	AC [V]	DC [V]
		–	24	–	24
		–	48...60	–	48...60
		110...125	110...125	110...125	110...125
		220...250	220...250	220...250	220...250
		380	–	380	–
Operating voltage	[% Un]	85...110	85...110	85...110	85...110
Power consumption on inrush Ps		≤ 300 VA	≤ 300 W	≤ 400 VA	≤ 400 W
Power consumption in service Pc		≤ 150 VA	≤ 150 W	≤ 150 VA	≤ 150 W
Duration	opening [s]	1.5		3	
	closing [s]	< 0.1		< 0.1	
	resetting [s]	3		5	
Mechanical life	[No. operations]	20000		10000	
Degree of protection, on the front		IP30		IP30	
Minimum control impulse time on opening and closing	[ms]	150		150	



Testing extension for motor operators

Available for circuit-breakers Tmax T4, T5 and T6, this allows the motor operator to be connected to the relative power supply circuit with the circuit-breaker in the removed position. With the circuit-breaker in a safe position, i.e. isolated in relation to the power circuits, it is possible to carry out blank tests of the circuit-breaker functions.



## Spring charging motor for T7 motorizable

Only available on Tmax T7 in the motorizable version, it automatically charges the circuit-breaker operating mechanism springs. This operation is carried out automatically immediately after closure of the circuit-breaker.

When there is no power supply or during maintenance work, the closing springs can, in any case, be charged manually by means of the special operating mechanism lever. It is always fitted with limit contact.

The spring charging motor can be fitted with a terminal to be mounted in the terminal board to carry out the cabling.

3

### Spring charging motor

		Tmax T7	
Rated voltage, Un		AC [V]	DC [V]
		24...30	24...30
		48...60	48...60
		100...130	100...130
		220...250	220...250
		380...415	
Opening voltage	[% Un]	85...110	85...110
Inrush power consumption (Ps)		≤ 300 VA	≤ 300 W
Inrush time 200ms			
Rated power (Pn)		100 VA	100 W
Charging time	[s]	8 - 10	8 - 10

**Note:** To allow a complete remote control with T7 motorizable, the circuit-breaker must be fitted with:

- shunt opening release;
- shunt closing release;
- spring charging motor.

## Accessories

### Remote control

3

### Adapters – ADP

For the SOR, PS-SOR, UVR, AUX, MOE or MOE-E and AUE pre-wired electrical accessories, used with Tmax T4, T5 and T6 in the plug-in or withdrawable version, it is necessary to use the adapters to be coupled with the plug, which will then be connected to the socket on the fixed part, for the moving parts.

According to the electrical accessories required, one or two adapters will be needed to be mounted on the left and/or right side of the moving part.

There are four types adapters available:

- 5-way adapters
- 6-way adapters
- 10-way adapters
- 12-way adapters.

The table below indicates the adapters which have to be used for the various possible combinations of electrical accessories:

#### Adapters ADP for T4, T5 and T6 wired accessories

	5- way	6- way	10- way	12- way
<b>left side</b>				
SOR	■			
UVR	■			
SA for residual current release RC222	■			
SOR or UVR + SA for residual current release RC222	■			
MOE (MOE-E)			■	
MOE (MOE-E) + SOR or UVR			■	
MOE (MOE-E) + SOR or UVR + SA for residual current release RC222			■	
AUE			■	
AUE + SOR or UVR			■	
AUE + SOR or UVR + SA for residual current release RC222			■	
<b>right side</b>				
AUX 1Q + 1SY 1 open/closed changeover contact + 1 trip unit tripped changeover contact		■		
AUX 2Q 2 open/closed changeover contacts		■		
AUX 3Q + 1SY 3 open/closed changeover contacts + 1 trip unit tripped changeover contact				■

### Socket plug connectors

In order to allow the racking-in and racking-out operations of the moving part of the plug-in circuit-breaker, the unwired electrical accessories of Tmax T4, T5 and T6 must be fitted with one or more socket plug connectors, as per the table below.

#### Socket plug connectors

	3 poles	6 poles	12 poles
<b>T4-T5-T6</b>			
SOR	■		
UVR	■		
AUX 1Q +1SY 1 open/closed changeover contact + 1 trip unit tripped changeover contact		■	
AUX 2Q 2 open/closed changeover contacts		■	
AUX 3Q + 1SY 3 open/closed changeover contacts + 1 trip unit tripped changeover contact			■



# Accessories

## Operating installation mechanism and locks



T4-T6

### Rotary handle operating mechanism – RHD/RHE

Thanks to its ergonomic grip, the rotary handle facilitates the circuit-breaker closing and opening operations.

It is always fitted with a padlock-lock in the open position which prevents circuit-breaker closing. The opening in the padlock-lock can take up to 3 padlocks - 7 mm Ø stem (not supplied). It is always fitted with a compartment door lock and on request it can be supplied with a key lock in the open position. Application of the rotary handle operating mechanism is an alternative to the motor operator and to the front for lever operating mechanism for T4, T5 and T6. The rotary handle operating mechanism is available in either the direct version or in the transmitted version on the compartment door and the rotary handle operating mechanism in the emergency version, complete with red on yellow background handle, suitable for controlling machine tools, is available in both the versions.

The rotary handle operating mechanism is available on T7 with lever operating mechanism and, only for the direct version, is characterised by an articulated grip which allows the switchgear door to be opened in case of an emergency with the circuit-breaker closed. The release settings and nameplate data remain accessible to the user.

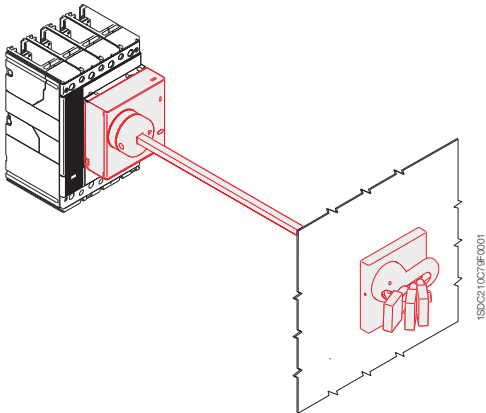
The transmitted rotary handle operating mechanisms can be ordered by building up the following three devices:

- rotary handle on the compartment door
- transmission rod (500 mm)
- base for circuit-breaker or, alternatively, by using the code of the ready-configured version.

### Type of RH\_ operating mechanism

		T4, T5			T6		T7 <sup>(1)</sup>	
		F	P	W	F	W	F	W
RHD	Direct	■	■	■	■	■	■	■
RHD_EM	Emergency direct	■	■	■	■	■	■	■
RHE	Transmitted with adjustable distance	■	■	■	■	■	■	■
RHE_EM	Emergency transmitted with adjustable distance	■	■	■	■	■	■	■
RHE_B	Base for circuit-breaker	■	■	■	■	■	■	■
RHE_S	Rod for transmitted adjustable hadle	■	■	■	■	■	■	■
RHE_H	Handle for transmitted RH with adjustable distance	■	■	■	■	■	■	■
RHE_H_EM	Emergency handle for transmitted RH with adjustable distance	■	■	■	■	■	■	■

<sup>(1)</sup> The rotary handle operating mechanism is only available for T7 with lever operating mechanism and it is as an alternative to the key lock mounted on the circuit-breaker.



T4-T6

## Accessories

### Operating installation mechanism and locks



3

#### IP54 protection for rotary handle

Allows IP54 degree of protection to be obtained.

It is available for the transmitted rotary handle operating mechanism on the compartment door (RHE) for all the Tmax circuit-breakers.

#### IP44 protection for circuit breaker toggle

It is installed directly on the front of the circuit breaker and it allows IP44 degree of protection.



#### Front for lever operating mechanism – FLD

This can be installed on fixed, plug-in or withdrawable Tmax T4, T5 and T6 circuit-breakers. In the case of withdrawable circuit-breakers, installed in a switchboard, it allows the IP40 degree of protection to be maintained for the whole isolation run of the circuit-breaker.

It is always fitted with a padlock in the open position (6 mm Ø stem up to three padlocks - not supplied) which prevents closing of the circuit-breaker and of the compartment door, and with compartment door lock. On request, it can be fitted with a key lock in the open position.

It is available in the following versions:

- for fixed or plug-in circuit-breaker
- for withdrawable circuit-breaker.

The front for lever operating mechanism is always an alternative to the motor operator and to the rotary handle and to the display FDU.

The same flange for the compartment door already supplied with the circuit-breaker or the one supplied with the conversion kit for withdrawable version can be used.

#### Padlock for operating lever – PLL

The padlock in open position for T7 is directly mounted on the circuit-breaker cover.



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### Key lock on the circuit-breaker for T7 – KLC

On T7 the key lock in the open position is mounted directly on the circuit-breaker cover both in the version with different keys and with the same keys. Arrangements for Ronis and Profalux key locks are also available.



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### Key lock for T4, T5, T6 and T7 – KLF-D and KLF-S

This allows mechanical operation of the circuit-breaker to be locked. This lock can be used with the direct or transmitted rotary handle operating mechanism mounted on the base for circuit-breaker or with the front for lever operating mechanism.

The lock of the circuit-breaker in the open position ensures isolation of the circuit in accordance with the IEC 60947-2 Standard. For T4, T5, T6 and T7 in the lever operating mechanism version key locks in the open position are available either with different keys (KLF-D) or with the same keys (KLF-S): in this case, up to four different key numbering codes are available (n. 2005-2006-2007-2008).

### Lock in the racked-out position for fixed part (T4, T5 and T6)

For T4, T5 and T6 withdrawable circuit-breakers, key or padlocks locks are available to be applied onto the rail of the fixed part, to prevent racking-in of the plug-in part.

Selection can be made among the following:

- key lock with different keys (KLF-D FP)
- key lock with the same keys for groups of circuit-breakers (KLF-S FP)
- Ronis type key lock (KLF-D Ronis FP)
- padlock, which can take up to three padlocks with 6 mm stem Ø, not supplied (PLL FP).



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### Lock in racked-in – isolated – racked-out position for fixed part of T7

This device allows the moving part of a withdrawable version T7 circuit-breaker to be locked in the racked-in, isolated-test or racked-out position in the relative fixed part. Thanks to mounting an additional accessory, the lock can be limited just to the racked-out position.

The fixed part can be equipped with 1 or 2 of these key locks.

## Accessories

### Operating mechanism and locks



3

#### Mechanical lock of compartment door

Available on T7 both for the lever operating mechanism and for the motorizable version. It does not allow the compartment door to be opened with the circuit-breaker closed (and circuit-breaker racked-in for circuit-breakers in the withdrawable version) and locks the circuit-breaker closing with the compartment door open.

Two versions are available: a door lock made by means of cables and a second type fixed directly on the side of the circuit-breaker or of the relative fixed part. The cable door lock must also be fitted with the interlock cable kit and the interlocking plate corresponding to the combined circuit-breaker.

#### Overview of the available locks

	T4	T5	T6	T7
<b>FDL</b> Front for lever operating mechanism	■	■	■	
<b>PLL_</b> Padlock for operating lever				■
<b>KLC_</b> Key lock on the circuit-breaker				■
<b>KLF-D</b> and <b>KLF-S</b> Key lock for front for lever and rotary handle	■	■	■	
<b>MOL-D</b> and <b>MOL-S_</b> Key lock in open position for MOE and MOE_E	■	■	■	
<b>MOL-M_</b> Key lock against manual operation for MOE and MOE_E	■	■	■	
<b>KLF-FP</b> and <b>PLL FP_</b> Locks in open position for fixed part	■	■	■	■
Mechanical lock on compartment door				■

### Mechanical interlock



T4-T5-T6

#### T4-T5-T6

The mechanical interlock for T4, T5 and T6 allows installation of two circuit-breakers on a single support and, by means of special lever mechanisms, makes them mechanically interdependent.

For Tmax T4 and T5 this is a rear interlock consisting of a vertical or horizontal frame group (MIR-HR or MIR-VR) and of a pair of metal plates for fixing the circuit-breakers (MIR-P). The frame group is made up of metal frame and of the lever mechanism interlock. The metal plates are of different type according to the sizes of circuit-breakers to be interlocked.

For Tmax T6 this is a rear interlock consisting of a vertical or horizontal support.

The following interlocking combinations can be made: IO-OI-OO.

Please advise that remote closing commands sent to interlocked CB in open position must be prevented in order to ensure correct functioning of mechanical interlock. If it is not possible to prevent them, key lock in open position for MOE is necessary.

#### Interlock

Type			
<b>A</b>	T4 (F-P-W)	+	T4 (F-P-W)
<b>B</b>	T4 (F-P-W)	+	T5 400 (F-P-W) or T5 630 (F)
<b>C</b>	T4 (F-P-W)	+	T5 630 (P-W)
<b>D</b>	T5 400 (F-P-W) or T5 630 (F)	+	T5 400 (F-P-W) or T5 630 (F)
<b>E</b>	T5 400 (F-P-W) or T5 630 (F)	+	T5 630 (P-W)
<b>F</b>	T5 630 (P-W)	+	T5 630 (P-W)



There are no limitations on the versions to be interlocked, therefore, for example, a fixed circuit-breaker can be interlocked with a withdrawable version switch-disconnector. Since this is a rear interlock, all the front accessories which are compatible with the circuit-breakers installed can be used.

In the vertical interlock the bottom terminals of the upper circuit-breaker and the top terminals of the lower circuit-breaker must be of rear type.

To be able to receive the circuit-breakers mounted directly on the interlocking plate, code “1SDA050093R1” must be specified as the accessory of the second circuit-breaker (or fixed part) you want to interlock.

The following interlocking combinations can be made: IO-OI-OO.

3



### T7

This mechanism makes the mechanical interlock between two T7 circuit-breakers by means of flexible cables, which are connected on a plate mounted on the side of the circuit-breaker preventing simultaneous closing of the two circuit-breakers. The plates to be mounted on the circuit-breaker differ according to whether the circuit-breaker is in the fixed or withdrawable version.

The interlock is available both for the manual operating mechanism version and for the motor operator one.

The following interlocking combinations can be made: IO-OI-OO.



## Transparent pushbutton protection – TCP

A transparent protection for the circuit-breaker opening and closing pushbuttons is available in two different versions on T7 with stored energy operating mechanism: one which protects both the pushbuttons and the other which alternatively protects either the opening or the closing pushbutton.

There is the possibility of putting a padlock, which adds the lock function to the protection. In the closed position this lock does not prevent release of the mechanism following a fault or a remote command.

## IP54 door protection

Available with T7 motorizable, it is made by means of a transparent plastic cover which completely protects the front of the circuit-breaker and allows IP54 degree of protection to be reached. Mounted on hinges, it is provided with a key lock.

## Accessories

### Residual current releases

3

Four poles version of Tmax T4 and T5, both circuit breaker and switch-disconnector can be combined with RC222 and RC223.

The T6 and T7 circuit-breakers can be combined with the RCQ residual current switchgear release. Apart from the protection against overloads and short-circuits typical of automatic circuit-breakers, the residual current circuit-breakers derived from them also guarantee protection of people and protection against earth fault currents, thereby ensuring protection against direct contacts, indirect contacts and fire hazards. The residual current releases can also be mounted on Tmax T4D and T5D switch-disconnectors. In that case, the derived apparatus is a “pure” residual current circuit-breaker, i.e. one which only guarantees residual current protection and not the protections typical of circuit-breakers. “Pure” residual current circuit-breakers are only sensitive to the earth fault current and are generally applied as main switch-disconnectors in small distribution switchboards towards end users.

The use of “pure” and “impure” residual current circuit-breakers allows continual monitoring of the state of plant insulation, ensuring efficient protection against fire and explosion hazards and, when the devices have  $I_{\Delta n} \leq 30$  mA, ensure protection of people against indirect and direct earth contacts to fulfil the compulsory measures foreseen by the accident prevention regulations and prescriptions.

The residual current releases are constructed in compliance with the following Standards:

- IEC 60947-2 appendix B
- IEC 61000: for protection against unwarranted release.

They are constructed using electronic technology and act directly on the circuit-breaker by means of a trip coil, supplied with the residual current release, to be housed in the special slot made in the left-hand pole area.

They do not require an auxiliary power supply as they are supplied directly by the network and their operation is guaranteed even with only a single phase plus neutral or only two phases supplied with voltage and in the presence of unidirectional pulsating currents with direct components. All the possible connection combinations are allowed, except for guaranteeing, in the four-pole version, connection of the neutral to the first pole on the left.

RC222 residual current releases can either be supplied from above or from below.

The operating conditions of the apparatus can be continually controlled by means of the electronic circuit test pushbutton and the magnetic indicator of residual current trip.

A disconnection device of the power supply during the insulation test is available.

The four-pole circuit-breaker complete with residual current release can be fitted with the electrical accessories normally available for the circuit-breaker. The shunt opening and undervoltage releases are housed in the special slot made in the neutral pole for the four-pole circuit-breakers.

The residual current releases are supplied complete with:

- a trip coil to be housed in the area of the third pole, complete with an auxiliary contact signalling residual current release trip
- dedicated flange.

A changeover contact for signalling residual current protection trip is always supplied for Tmax circuit-breakers, combined with residual current releases. Two changeover contacts for signalling pre-alarm and alarm are also available with the RC222 release.

The opening solenoid for RC222 and RC223 residual current releases is available as a spare part.

A circuit-breaker cannot have the residual current release and the rotary handle or the motor operator mounted at the same time.



T4-T5

## RC222 residual current release for T4 and T5

The RC222 release for T4 and T5 is available in the four-pole version and is mounted below the circuit-breaker.

The release is supplied with standard front terminals, but it can also be combined with all the terminals available for the corresponding circuit-breaker.

The RC222 residual current release, in the fixed version, can easily be converted into plug-in and into withdrawable by adding the special conversion kit and applying a derating of the performances as indicated in the table on the next page.

A circuit-breaker cannot have the residual current release and the motor operator mounted at the same time.

3

## RC223 (B type) residual current release for T4 250 A

The RC223 residual current trip unit (of type B), can be combined with Tmax T4 250 A four-pole fixed, plug-in or withdrawable version circuit-breakers.

The RC223, which can only be used in plants with 50/60 Hz frequency, must be supplied from a primary line voltage between 110 V and 500 V. Operation is guaranteed starting from 55 V phase-neutral.

It features the same types of reference as the RC222 release (type S and AE), but can also claim conformity with type B operation, which guarantees sensitivity to residual current faults with alternating, alternating pulsating components and with direct current.

The reference Standards are: IEC 60947-1, IEC 60947-2 Annex B, and IEC/TR 60755.

Apart from the signals and adjustments typical of the RC222 residual current release, by means of a three-position 400-700-1000 Hz selector, the RC223 also allows the maximum frequency band of the residual current fault read to be defined. It is therefore possible to adapt the residual current device to the various industrial plant requirements according to the frequency of prospective faults generated on the load side of the release.

Typical installations which may require fault frequency thresholds other than the standard ones (50-60 Hz) are welding plants for the automobile industry (1000 Hz), textile industry (700 Hz), airports and three-phase drives (400 Hz).

A circuit-breaker cannot have the residual current release and the motor operator mounted at the same time.

# Accessories

## Residual current releases

3

		RC222	RC223
Circuit-breakers size		T4 and T5 (4p version only)	T4 (4p version only)
Type		Placed below	Placed below
Technology		microprocessor-based	microprocessor-based
Action		with trip coil	with trip coil
Primary service voltage <sup>(1)</sup>	[V]	85...690 <sup>(3)</sup>	110...500
Operating frequency	[Hz]	50-60 <sup>(4)</sup>	50-60 <sup>(3)</sup>
Fault frequency	[Hz]	–	0...400 - 0...700 - 0...1000
Self-supply		■	■
Test operation range <sup>(1)</sup>	[V]	85...500	110...500
Rated service current	[A]	up to 500 A	up to 250 A (225 A for T3)
Rated residual current trip	[A]	0.03 - 0.05 - 0.1 0.3 - 0.5 - 1 - 3 - 5 - 10	0.03 - 0.05 - 0.1 0.3 - 0.5 - 1
Time limit for non-trip	[s]	instantaneous - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3	instantaneous - 0 - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3
Tolerance over trip times		± 20%	± 20%
Power consumption <sup>(2)</sup>		< 10 W at 400 V AC	< 10 W at 400 V AC
Local trip signalling		■	■
Trip coil with changeover contact for trip signalling		■	■
Input for remote opening		■	■
NO contact for pre-alarm signalling		■	■
NO contact for alarm signalling		■	■
Indication of pre-alarm from 25% I <sub>Δn</sub> (tolerance ±3%)		■	■
Indication of alarm timing at 75% I <sub>Δn</sub> (tolerance ±3%)		■	■
"A" type for pulsating alternating current, AC for alternating current		■	■
"AE" type for remote release device		■	■
Type B for pulsed current and direct current		■	■
Selective "S" type		■	■
Switch for insulation test		■	■
Power supply from above and below		■	■
Assembly with three-pole circuit-breakers		■	■
Assembly with four-pole circuit-breakers		■	■
Kit for conversion of circuit-breaker with residual current release from fixed to plug-in		■	■

<sup>(1)</sup> Operation up to 50 V Phase-Neutral (55 V for RC223)

<sup>(2)</sup> The values of power consumption can be inferior at lower supply voltage

<sup>(3)</sup> V > 500V available only for "RC HV 415-690V"

<sup>(4)</sup> Tolerance 45...66 Hz

RC222-RC223 T4-T5 Performances	Maximum withstand current	
	Fixed	Plug-in/Withdrawable
T4 250	250 A	250 A
T4 320 <sup>(2)</sup>	320 A	280 A
T5 400 <sup>(2)</sup>	400 A	400 A
T5 630 <sup>(2)</sup>	500 A	–

<sup>(1)</sup> 225 A with RC223

<sup>(2)</sup> Available with RC222 only





Toroid

## SACE RCQ020 panel type residual current release (type A)

Tmax circuit-breakers can also be used in conjunction with RCQ020 panel type residual current relays with separate toroid to be installed on the line conductors ("A" for auxiliary power supply; "/P" for power supply derived from busbars).

Thanks to its wide range of settings, the panel relay is suitable for:

- applications where the installation conditions are particularly restrictive, such as circuit-breakers already installed or limited space in the circuit-breaker compartment;
- creating a residual current protection system coordinated at various distribution levels, from the main switchboard to the end user;
- where residual current protection with low sensitivity is required, e.g. in partial (current) or total (time) selective chains;
- highly sensitive applications (physiological sensitivity) for protecting people against direct contacts.

The RCQ020 panel-type residual current device is able to detect current leakage from 30 mA to 30 A and to act with a trip time that can be adjusted from instantaneous to delayed by 5s. The opening mechanism is the indirect action type and acts on the circuit-breaker release mechanism by means of the shunt opening or undervoltage release of the circuit-breaker itself. The opening command to the circuit-breaker (Trip delay) can be temporarily inhibited, and the circuit-breaker can be opened by remote control by means of the RCQ020 device.

The following equipment must be requested when ordering:

- the RCQ020 device;
- an opening coil (SOR) or an undervoltage release (UVR) of the circuit-breaker to be housed in the relative slot made in the left pole of the circuit-breaker itself;
- a closed toroid, that can be used for cables and busbars, chosen from amongst those available, with a diameter from 60 mm to 185 mm.

Signals available:

- LED to indicate the status of the residual current device (supplied or not supplied). RCQ020 is equipped with the positive safety function thanks to which the RCQ020 commands automatic circuit-breaker opening in the absence of auxiliary voltage;
- LED for signalling faults;
- LED for signalling tripping of the residual current device;
- pre-alarm/alarm/trip electrical signals.



## Accessories

### Residual current releases

3

Power supply Voltage	/A	AC [V]	115-230...415
	/P	AC [V]	110...690
	/P	DC [V]	110...125
Operating frequency		[Hz]	45-66
Inrush current	/A	@115 V AC	500 mA for 50 ms
	/A	@230 V AC	150 mA for 50 ms
	/A	@415 V AC	100 mA for 50 ms
	/P	@110 V AC	300 mA for 50 ms
	/P	@690 V AC	2 A for 50 ms
	/P	@125 V DC	500 mA for 50 ms
Rated Power	/A		2 [VA] / 2 [W]
	/P	@115 V AC	max 3 W
	/P	@230 V AC	max 3 W
	/P	@690 V AC	max 4 W
	/P	@125 V DC	max 2 W
Trip threshold adjustment $I_{\Delta n}$		[A]	0.03-0.05-0.1-0.3-0.5-1-3-5-10-30
No trip time adjustment		[s]	instantaneous 0.1-0.2-0.3-0.5-0.7-1-2-3-5
Pre-alarm threshold		x $I_{\Delta n}$	25%
A type for pulsing alternate current			■
<b>Signals</b>			
Device powered visual signalling			■
Visual signalling of device not functioning / not configured			■
Visual signalling of residual current protection			■
Electrical alarm/pre-alarm signal			■
Electric trip signal			■
<b>Controls</b>			
Remotely controlled opening command			■
Remotely controlled reset command			■
<b>Operating range of closed transformers</b>			
Ø 60 [mm] toroidal transformer		[A]	In max = 250 A - Use 0.03...30 A
Ø 110 [mm] toroidal transformer		[A]	In max = 400 A - Use 0.03...30 A
Ø 185 [mm] toroidal transformer		[A]	In max = 800 A - Use 0.1...30 A
Connection to toroidal transformer			By means of 4 shielded or twisted conductors. Maximum tolerated length: 15 m
Dimensions W x H x D		[mm]	96 x 96 x 77
Drilling for assembly on door		[mm]	92 x 92
Standard			IEC 60947-2 annex M

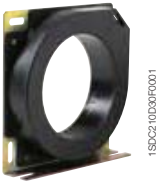


### Homopolar toroid for residual current protection

The electronic PR332/P LSIRc and PR332/P LSIG (with PR330/V and rating plug RC) trip units can be used combined with the homopolar toroid for residual current protection, which allows activation of the residual current protection. If used with PR332 LSIG, the G protection is no longer available.

This accessory must be mounted on the busbars and is available in a single size up to 1600 A. This accessory is alternative to the homopolar sensor. The PR332/P LSIRc electronic trip unit can be used combined with this accessory, which allow the activation of the residual current protection.

3



### Homopolar sensor for the main power supply earthing conductor (star centre of the transformer)

SACE PR332/P electronic trip units can be used in combination with an external sensor 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, the In of the same toroid can be set at 100 A, 250 A, 400 A, 800 A.

This is alternative to the homopolar toroid for residual current protection.

## Accessories

### Accessories for electronic trip units

3



#### Front display unit – FDU

The front display is a display unit of the setting currents, alarms and parameters of the PR222DS/P, PR222DS/PD, PR223DS and PR223EF electronic trip units of T4, T5 and T6. The display unit can operate correctly with self-supply with  $I \geq 0.35 \times I_n$  on at least one phase. If the display is used in combination with the PR222DS/PD, PR223DS or PR223EF trip units, and therefore with an auxiliary power supply, it is also possible to detect the protection, which has caused the release trip and the fault current.

Connection of the display to the PR223DS and PR223EF trip units must, compulsorily, pass through the AUX-E auxiliary contacts in electronic version, whereas with the PR222DS/P trip unit it can be made directly.

It is not compatible with the front accessories: rotary handle operating mechanism, motor operator and front for lever operating mechanism.

When combined with PR223DS trip unit with VM210 device, the FDU is able to display a wide range of measurements, as shown in the table.

Measurement	With N	Without N
Effective current values	$I_1, I_2, I_3, I_0$	$I_1, I_2, I_3$
Effective voltage values	$V_1, V_2, V_3, V_{12}, V_{23}, V_{31}$	$V_{12}, V_{23}, V_{31}$
Apparent powers	$S_1, S_2, S_3, S_0$	$S_{tot}$
Active powers	$P_{tot}, P_1, P_2, P_3$	$P_{tot}$
Reactive powers	$Q_{tot}, Q_1, Q_2, Q_3$	$Q_{tot}$
Power factors	$\cos$	$\cos$
Active energy	■	■
Reactive energy	■	■
Apparent energy	■	■
Frequency	■	■
Peak factors	■	■
Circuit-breaker state		
Protection function parameters	■	■
Trip warnings and alarms (only with Vaux)	■	■
Phase 1, 2, 3 and N trip current	■	■
Protection tripped (L, S, EF <sup>(1)</sup> , I, G)	■	■
Current levels and trip times (L, S, EF <sup>(1)</sup> , I, G)	■	■

<sup>(1)</sup> Only PR223EF



## VM210

The VM210 accessory, combined with the PR223DS and PR223EF trip units for T4, T5 and T6, is able to provide the various measurements of the electrical values of the plant. The VM210 can provide the measurements relative to a maximum of 5 PR223DS or PR223EF trip units. The maximum connection distance between the module and the trip unit is 15 meters. For distances longer than 1 meters, a shielded multi-core cable must be used.

VM210 Conditions of use	Values
Power supply	24 V DC $\pm 20\%$
Ripple	$\pm 5\%$
Operating temperature	$-25\text{ }^{\circ}\text{C} \dots +70\text{ }^{\circ}\text{C}$
Relative humidity	5%...98%
<b>Certifications</b>	
Product	IEC 60068
Electromagnetic compatibility	IEC 61000

3

## HMI030 interface on the front of switchgear

This accessory, which can be used with all the protection trip units fitted with dialogue, is designed for installation on the front of the switchgear. It consists of a graphic display where all the trip unit measurements and alarms/events are displayed. The user can navigate in a simple and intuitive way among the measurements by using the navigation pushbuttons. The device can replace the traditional multimeters without the need for current/voltage transformers. The HMI030 is connected directly to the protection trip unit by means of a serial line and requires a 24 V DC power supply.

## Optional modules

The PR332/P trip unit for T7 can be enriched with additional internal modules, thereby increasing the capacity of the trip units and making these units highly versatile.

## Accessories

### Accessories for electronic trip units

3



#### PR330/V voltage measuring module

The PR330/V module measures and processes the phase and neutral voltages, transferring these data to the protection trip unit so that a series of protection and measurement functions can be implemented.

PR330/V is available for two different connection configurations:

1. Internal socket version of the module: connected straight to the upper terminals of the circuit breaker for network with voltage up to 690V;
2. External socket version of the module: connected to the terminal box by means of a Voltage Transformer for connection to the lower terminals of the circuit breaker or for network with voltage higher than 690V.

The new module will only be available mounted inside the circuit-breaker.

The PR332/P LSIRc protection trip unit is supplied as standard with the internal voltage sockets; the external voltage sockets can be requested by specifying the relative extracode together with the circuit-breaker code.



#### PR330/D-M communication module (Modbus RTU)

The PR330/D-M communication module is the solution for connecting Tmax to a Modbus network for remote supervision and control of the circuit-breaker.

It is suitable for the PR332/P trip unit for T7. As for the PR330/V, this module can be added to the protection trip unit and its presence is recognised automatically.

The electronic trip unit is supplied with three LEDs on the front:

- “Power” power supply LED, which indicates the presence of auxiliary power supply to the PR330/ D-M module
- “Tx” data transmission LED
- “Rx” data reception LED.



#### PR330/R – Actuator module

The PR330/R actuator module is fitted in the right slot of T7 and it is used for opening (for T7 with lever operating mechanism it is allowed only the opening operation), and closing the circuit-breaker by means of the shunt opening and closing releases by remote control. It is suitable for the PR332/P and must be compulsory ordered with the PR330/D-M communication module.



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### 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 Tmax trip units by means of a dedicated additional connector. It supplies power by means of a rechargeable Li-ion battery.



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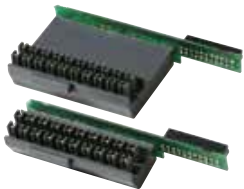
### PR030/B power supply unit

With this accessory, which is always supplied with the PR332/P range of trip units, it is possible to read and configure the parameters of the unit whatever the state of the circuit-breaker is (open-closed, in the isolated for test position or racked-in, with/without auxiliary power supply).

PR030/B is needed for readout of the data relative to trips if the trip occurred more than 48 hours previously and the trip unit was no longer supplied.

An electronic circuit inside it allows power supply to the unit for about 3 hours continuously to carry out just the data reading and configuration operations.

The life of the battery decreases if the SACE PR030/B is also used to carry out the Trip test and the Auto test.



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### Trip unit adapter

In order to allow all the connections between the electronic trip unit type PR33x and the terminal board on the circuit-breaker, the circuit-breaker it self must be fitted with a trip unit adapter.

Two different trip unit adapters are available: one is suitable with T7 level operating mechanism, the other with T7 motorizable.

# Accessories

## Accessories for electronic trip units



### Rating plug

Available on the electronic trip units which can be mounted on T7, it must be applied on the front of the trip unit itself and provides information about the current sensor settings. It is therefore no longer necessary to change the circuit-breaker current sensors, but is sufficient just to replace the rating plug to obtain modification of the rated current of the circuit-breaker.

3

Type of circuit-breaker	Rated current I <sub>n</sub>	In (A)					
		400	630	800	1000	1250	1600
T7	800	■	■	■			
	1000	■	■	■	■		
	1250	■	■	■	■	■	
	1600	■	■	■	■	■	■



### EP010 - FBP

It is the “E-plug” interface which can connect T4, T5 and T6, equipped with the PR222DS/PD electronic trip unit, to the field bus plug system, allowing user to choose among several field bus system (ASI, Device Net, Profibus). This must be connected to the PR222DS/PD trip unit by means of the specific X3 connector. It can be used with T7 with PR332/P electronic trip unit equipped with PR330/D-M communication module.

When using EP010 for profibus, the PDP22 Fieldbus Plug must be used. The PDP21 Fieldbus Plug cannot be used with EP010.



### SACE PR212/CI contactor control unit

The SACE PR212/CI accessory unit can be associated with Ekip M-LRIU for Tmax.

When the special dip switch on the front of the PR222/MP is positioned on “Normal mode” working mode, it is possible to control contactor opening in the case of a fault due to overload L, locked rotor R or missing/unbalance of phase U.

The SACE PR212/CI unit can be installed either on a DIN rail or on the rear of the door.

### LD030 DO

LD030 DO is a signalling unit to be connected to PR222DS/PD, PR223DS, PR223EF, PR331 and PR332 trip units. Eight different digital outputs can be retrieved from the connected trip units. LD030 DO is a master device and must be connected on the system or the local bus



### Current sensor for external neutral

This is applied to the external neutral conductor and allows protection G against earth faults to be carried out with external neutral three-pole circuit-breakers.

The current sensor must be connected to the trip unit by means of the specific connectors X4 for T4, T5 and T6 or with a direct connection in the terminal board for T7. The combination is not possible with electronic trip unit PR221, PR231 and PR232.

T4 [A]	T5 [A]	T6 [A]	T7 [A]
100	320	630	400...1600
160	400	800	
250	630	1000	
320			

### Connectors

Connectors X3 and X4 allow connection of the electronic trip units with external plant units or components. In fact, they are used to make the L alarm signal available outside, connection of the external neutral, connection to the LD030 DO signalling unit, to the PR212/CI contactor control unit or to the temperature sensor of the PTC motor and allows two-way communication from the circuit-breaker fitted with dialogue towards the outside and vice versa.

Both the connectors are available both for fixed version circuit-breakers and for plug-in or withdrawable version circuit-breakers.

Connector	Function	Trip unit
X3	LD030 DO	PR222DS/PD, PR223DS and PR223EF
	L alarm signal	PR222DS/P, PR222DS/PD, PR223DS, PR223EF and Ekip E-LSIG
	Auxiliary supply	PR222DS/PD, PR223DS, PR223EF, Ekip M-LRIU and Ekip E-LSIG
	Connection to load side circuit-breaker	PR223EF
	EP 010	PR222DS/PD, PR223DS, PR223EF and Ekip E-LSIG
X4	External neutral	PR222DS/P, PR222DS/PD, PR223DS and Ekip E-LSIG
	VM210	PR223DS and PR223EF
	PR212/CI	Ekip M-LRIU
	PTC generic contact 0/1	Ekip M-LRIU
	Connection to supply side circuit-breaker	PR223EF

X3 and X4 connectors are always supplied with PR223DS and PR223EF while X3 connector is always supplied with Ekip E-LSIG.

# Accessories

## Accessories for electronic trip units

### Accessories for trip units

Circuit-breakers	T4-T5-T6					T7			
	PR222DS/P	PR222DS/PD	Ekip M-LRIU	PR223DS	PR223EF	PR231/P	PR232/P	PR331/P	PR332/P
<b>Trip units</b>									
<b>Accessories</b>									
LD030 DO <sup>(1)</sup> - Signalling unit		■	■	■	■			■	■
FDU <sup>(2)</sup> - Front display unit	■	■		■	■				
HMI030 <sup>(1)</sup> - Interface on the front of switchgear		■		■	■			■	■
VM210 - Voltage measuring unit				■	■				
X3 - Connectors	■	■ <sup>(3)</sup>	■	■ <sup>(3)</sup>	■ <sup>(3)</sup>				
X4 - Connectors	■	■	■	■ <sup>(3)</sup>	■ <sup>(3)</sup>				
X13 - Connectors SHORT/LONG	■	■	■	■	■			■	■
BT030 - Wireless Ekip Bluetooth	■	■		■	■		■	■	■
MOE-E (AUX-E included) <sup>(2)</sup> - Motor operator		■		■	■				
AUX-E - Auxiliary contacts		■		■	■				
EP010 <sup>(1)</sup> - Field Bus plug		■		■	■				■
CT - Current transformers	■	■	■	■	■				
PR212/CI - Contactor control unit			■						
Extracode for interchangeability						■			
Rating plugs						■	■	■	■
PR030/B - Power supply unit							■	■	■
PR330/D-M - Communication module									■
PR330/V - Voltage measuring module									■
PR330/R - Actuator module									■
CT Sensor - Current sensors								■	■

<sup>(1)</sup> Accessories not compatible

<sup>(2)</sup> Accessories not compatible

<sup>(3)</sup> Compulsory



### Ekip Control Panel on front of the switchgear front

The Ekip Control Panel enables the SACE Emax 2 circuit-breakers connected to the Ekip Link System and Tmax T or XT connected to a Modbus network to be controlled and monitored.

The panel is supplied already equipped with supervision software and requires no programming. Ekip Control Panel requires a 24V DC power supply and is equipped with:

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

## Ekip View

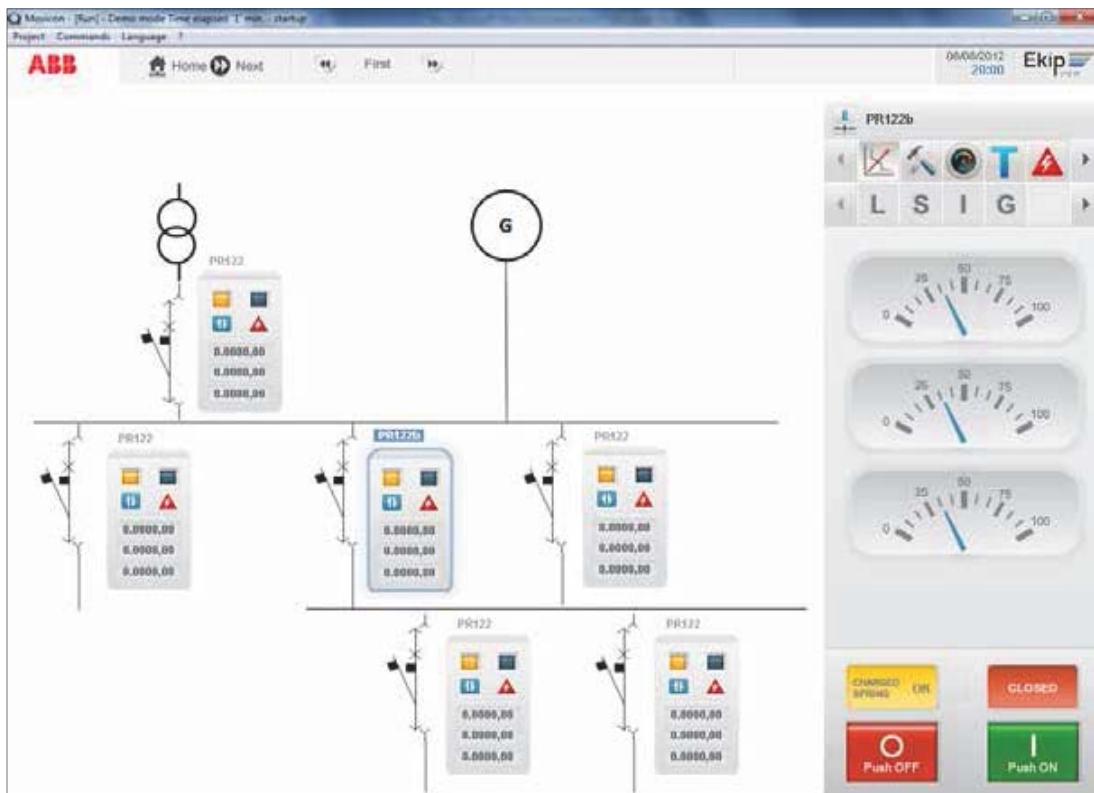
Ekip View is the software for supervising devices connected to a communication network that uses the Modbus RTU or Modbus TCP protocol.

It is the ideal tool for all applications that require:

- remote control of the system,
- monitoring of power consumption,
- fault detection of the system,
- allocation of energy consumption to the different processes and departments,
- preventative planning of maintenance.

The main characteristics of Ekip View are:

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



# Accessories

## Accessories for electronic trip units

### 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 <sup>1)</sup>	optional <sup>1)</sup>
Licences available	- up to 30 <sup>2)</sup> controllable devices - up to 60 <sup>2)</sup> controllable devices - unlimited number <sup>3)</sup> controllable devices	- up to 30 <sup>2)</sup> controllable devices - up to 60 <sup>2)</sup> controllable devices - unlimited number <sup>3)</sup> controllable devices

#### Supervision and control functions

Opening and Closing of circuit-breakers <sup>4)</sup>	■	■
Electrical value trends	■	■
Log of electrical value trends	■	■
Dynamic installation mimic panel	■	■
Automatic scanning	■	■
Centralized synchronizing of time	■	■
Web server function	■ <sup>5)</sup>	■ <sup>5)</sup>
Redundancy	optional	optional
OPC server-client	optional	optional

#### Measurement functions <sup>6)</sup>

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	optional
Transmission of alarms via e-mail	optional	optional

#### Maintenance

Number of operations	■	■
Number of trips	■	■
Wear of contacts	■	■

#### Other data

Status of circuit-breaker	■	■
Circuit-breaker position <sup>7)</sup>	■	■
local/remote mode	■	■

<sup>1)</sup> Contact ABB SACE to integrate other devices in the Ekip View software

<sup>2)</sup> can be increased

<sup>3)</sup> within the physical limit of the protocol used

<sup>4)</sup> circuit-breakers equipped with Ekip com Actuator module and electrical accessories



## Ekip TT

The Ekip TT accessory is supplied with a special connector which makes connection between the electronic trip unit and the Ekip TT unit easier. The kit also include an adaptor which allows use with the current Tmax breakers.

Ekip TT is a device which allows:

- verify the correct functioning of the electronic trip unit's opening solenoid and the trip mechanism of circuit-breaker (trip test);
- testing of the LEDs on the electronic trip unit it is connected to;
- (in case of intervention by electronic trip unit) to supply the trip unit powered by auxiliary power to show the latest intervened protection. Simply linking Ekip TT to the electronic trip unit, the LED light on the latest protection intervened.

Its reduced dimension make it pocket size.



## Ekip T&P

Ekip T&P is a kit purpose studied to supervise, configure and testing electronic protection trip units. The kit is composed by:

- Ekip T&P unit;
- Ekip TT unit;
- Adaptors for Emax and Tmax trip units;
- USB cable for connecting the Ekip T&P unit to the electronic trip unit;
- CD for installing Ekip Connect and the Ekip T&P driver.

The Ekip T&P unit is connected on one side to the USB port of the PC and on the other, by means of a cable, to the protection trip unit of the SACE Tmax series. The Ekip T&P unit allows automatic, manual test and the trip test of the device it is connected to. These functions are managed by means of the Ekip T&P Interface which can only be activated directly by the Ekip Connect when the Ekip T&P is present and connected to the PC.

	Ekip T&P functions						Ekip TT functions		
	Trip Test	Protection function test	Parameter reading	Protection parameter programming	Communication parameter programming	Thermal memory enabling/disabling	Trip Test	LED test	Latest trip detection
<b>Distribution protection</b>									
PR221DS LS/I	Not compatible						■	-	-
PR221DS I	Not compatible						■	-	-
PR222DS/P LSI	■	■	■	■	-	-	■	-	-
PR222DS/P LSIG	■	■	■	■	-	-	■	-	-
PR222DS/PD LSI	■	■	■	■	■	-	■	-	-
PR222DS/PD LSIG	■	■	■	■	■	-	■	-	-
PR223EF LSIG	■	■	■	■	■	-	■	-	-
Ekip E-LSIG	■	■	■	■	■	■	■	■	■
PR223DS LSIG	■	■	■	■	■	-	■	-	-
PR231/P LS/I	Not compatible						■	-	-
PR231/P I	Not compatible						■	-	-
PR232/P LSI	■	■	■	-	-	■	■	-	-
PR331/P LSIG	■	■	■	-	■	■	■	-	-
PR332/P LI	■	■	■	■	■	■	■	-	-
PR332/P LSI	■	■	■	■	■	■	■	-	-
PR332/P LSIG	■	■	■	■	■	■	■	-	-
PR332/P LSIRc	■	■	■	■	■	■	■	-	-
<b>Motor protection</b>									
PR221DS I	Not compatible						■	-	-
PR231/P I	Not compatible						■	-	-
EKIP M-LRIU	■	■	■	■	■	-	■	■	■

## Accessories

### Automatic transfer switch - ATS021-ATS022

3



ATS021

1SDC21082CF0001



ATS022

1SDC21083CF0001

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 and Emax families 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
<b>General</b>		
Auxiliary Power Supply	Not Required	Not Required (24-110 V DC is required only for Modbus dialogue and 16 2/3 Hz system)
Rated Voltage, Un [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
<b>Features</b>		
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	—	■
Selection priority Line	—	■
Modbus RS485	—	■
Display	—	■
<b>Ambient conditions</b>		
Operating temperature	-20...+60 °C	-20...+60 °C
Humidity	5% - 90% without condensation	5% - 90% without condensation
<b>Operating thresholds</b>		
Minimum voltage	-30%...-5%Un	-30%...-5%Un
Maximum voltage	+5%...+30%Un	+5%...+30%Un
Frequency thresholds	-10% / +10%fn	-10%...+10%fn
<b>Test</b>		
Test Mode	■	■
<b>Compliance with standards</b>		
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

## Accessories

### Installation accessories and spare parts

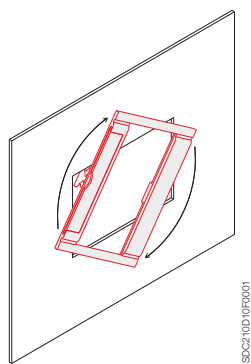
3



#### Flange for compartment door

This is always supplied with the Tmax circuit-breakers. All the flanges in the Tmax series are of new design and do not require the use of screws for installation: fixing is greatly simplified by just a simple coupling operation. When a rotary handle operating mechanism or residual current releases is used, a dedicated flange is supplied to be used instead of the one supplied with the circuit-breaker.

For T4, T5, T6 and T7 withdrawable circuit-breakers, the flange supplied with the fixed part must be used instead of the one supplied with the fixed circuit-breaker.



#### Spare parts

A wide range of spare parts is available for the Tmax family of circuit-breakers. For further details about the complete range of spare parts available, please ask for the "Spare Parts Catalogue" from the Service Division of ABB SACE.



# Accessories

## Compatibility of internal accessories

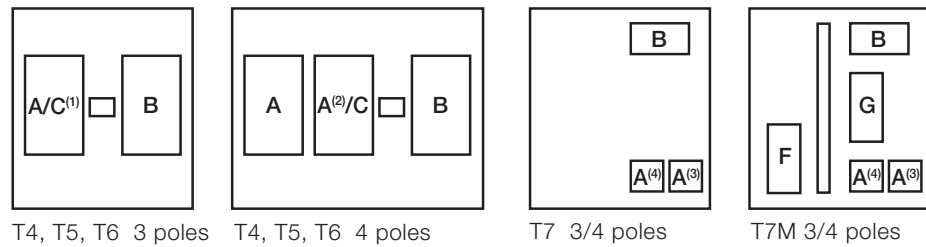
### Compatibility

An overview of the assembly compatibility of (internal) accessories with the Tmax Series circuit-breakers can be found in this section.

#### Possible combination among the internal accessories

The drawing represents the internal slot of the circuit-breakers. A, C and F are housed in the slots on the left of the operating lever, while B, D, E and G in the right one.

3



<sup>(2)</sup> only SOR-C for T4-T5-T6. Order also the 3-way connector for second SOR-C 1SDA055273R1

<sup>(3)</sup> position for assembly of the SOR

<sup>(4)</sup> position for assembly of the UVR

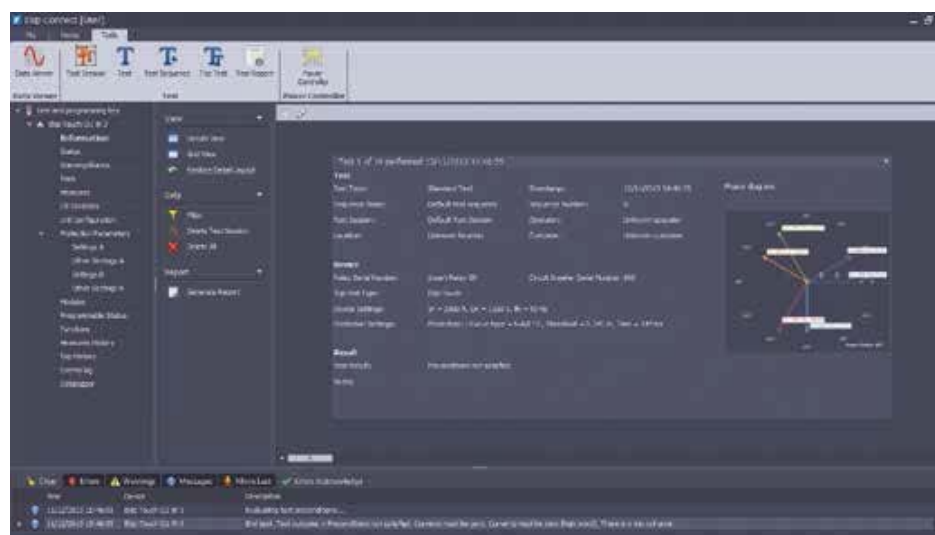
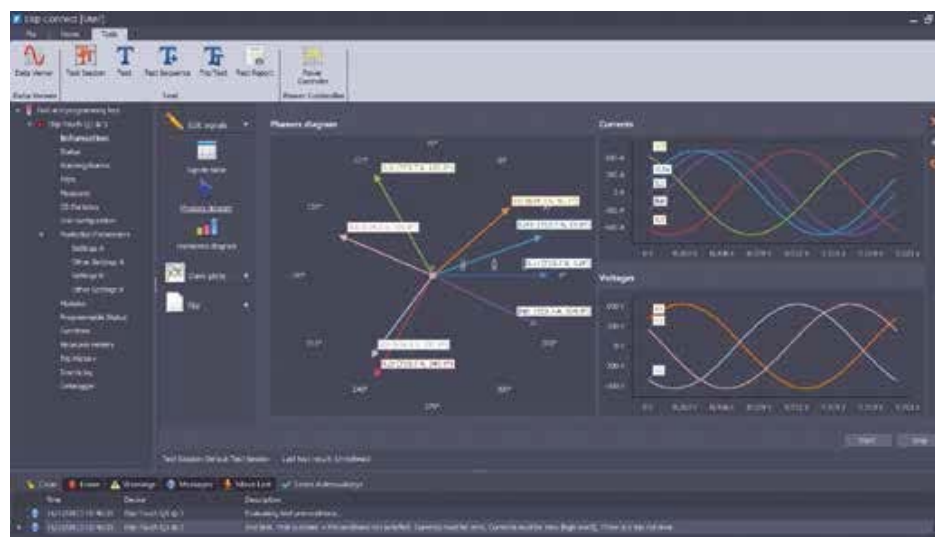
- A = Shunt opening release (SOR) or Undervoltage release (UVR)
- B = Auxiliary contacts
- C = Trip coil of the residual current
- D = Trip coil of the electronic trip unit PR221DS
- E = Auxiliary contacts for T2 with electronic trip unit PR221DS
- F = Spring charging motor
- G = Shunt closing release (SCR)

## Accessories

### Communication devices and systems

#### Ekip Connect

Installation and diagnosis software for ABB SACE products with Modbus RTU communication. The software can be used during the commissioning stage, or for troubleshooting in an up and running communication network.



Ekip Connect automatically scans the RS-485 bus, detects all the devices connected and checks their configuration, checking all the possible address, parity and baud rate combinations. A simple click over SCAN will highlight:

- devices that fail to respond;
- configuration errors;
- incorrect addresses and parity;
- any wiring errors (with the SACE electronic trip unit);

thus achieving a complete diagnosis of the communication network.

Thanks to this user-friendly program, the Modbus communication network installation is very easy. Ekip Connect is distributed free of charge and can be downloaded from ABB web site <http://www.new.abb.com>.

1SDC200497001

1SDC200498001

# Characteristic curves and technical information

## Examples of curve readout 4/2

### Trip curves for power distribution

Circuit-breakers with thermomagnetic trip units	4/3
Circuit-breakers with electronic trip units	4/5

### Trip curves for zone selectivity

Circuit-breakers with PR223EF trip unit	4/11
---	------

### Trip curves for motor protection

Circuit-breakers with magnetic only trip units	4/12
Circuit-breakers with PR221DS and PR231/P electronic trip unit	4/13
Circuit-breakers with Ekip M-LRIU electronic trip unit	4/14

4

### Specific let-through energy curves

230 V	4/15
400-440 V	4/16
500 V	4/17
690 V	4/18
1000 V	4/20
1150 V	4/21

### Limitation curves

230 V	4/22
400-440 V	4/23
500 V	4/24
690 V	4/25
1000-1150 V	4/27

### Temperature performances

Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors	4/29
Circuit-breakers with thermomagnetic trip units	4/44

## Power losses 4/45

## Magnetic trip values 4/46

### Special applications

Use of apparatus at 16 2/3Hz	4/47
Use of apparatus at 400 Hz	4/50

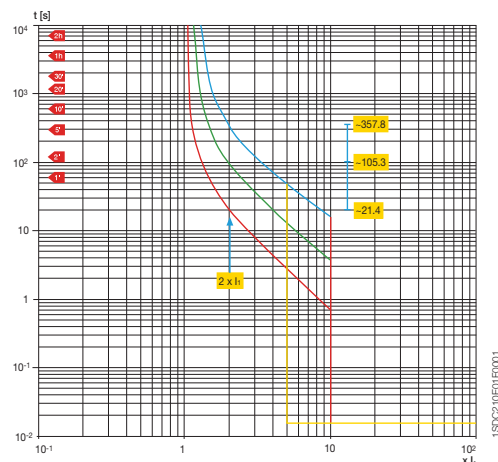
# Examples of curve readout

## Example 1 - T4N 250

### Trip curves for power distribution (thermomagnetic trip unit)

Considering a T4N 250  $I_n = 250$  A circuit-breaker. By means of the thermal adjustment trimmer, the current threshold  $I_1$  is selected, for example at  $0.9 \times I_n$  (225 A); the magnetic trip threshold  $I_3$ , adjustable from  $5$  to  $10 \times I_n$ , we select at  $10 \times I_n$ , equal to 2500 A. It can be noted that, on the basis of the conditions in which the overload is presented, i.e. with the circuit-breaker at thermal running or not, the thermal relay trip varies considerably. For example, for an overload current of  $2 \times I_1$ , the trip time is between 21.4 and 105.3 s for hot trip, and between 105.3 and 357.8 s for cold trip.

For fault current values higher than 2500 A, the circuit-breaker trips instantaneously with the magnetic protection.

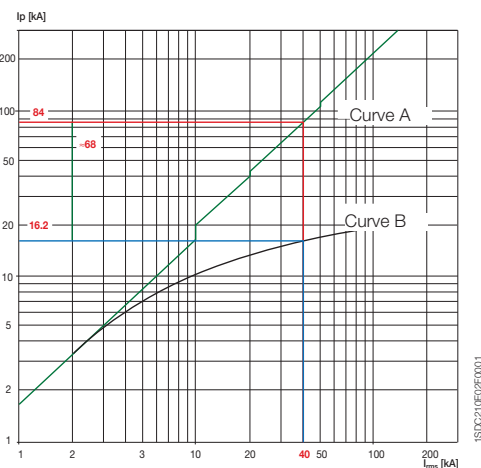


## Example 2

### Limitation curves

The following figure shows the trend of a Tmax circuit-breaker current-limiting curve. The r.m.s. of the prospective symmetrical short-circuit current is indicated on the abscissa of the diagram, whereas the peak short-circuit current value is indicated on the ordinates. The current-limiting effect can be assessed by comparing - at the same symmetrical short-circuit current value, the corresponding peak value at the prospective short-circuit current (curve A) with the limited peak value (curve B).

The circuit-breaker with thermomagnetic trip unit at a voltage of 400 V limits the short-circuit current to 16.2 kA for a fault current of 40 kA, with a reduction of about 68 kA compared with the peak value of the 84 kA prospective short-circuit current.



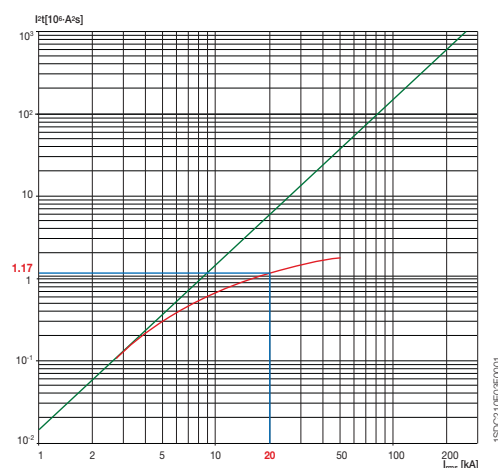
## Example 3

### Specific let-through energy curves

An example of how to read the graph of the specific let-through energy curve of a Tmax circuit-breaker at a voltage of 400 V is given below.

The prospective symmetrical short-circuit current is indicated on the abscissa of the diagram, whereas the ordinates show the specific let-through energy values expressed in  $A^2s$ .

In correspondence with a short-circuit current of 20 kA, the circuit-breaker lets through a value of  $I^2t$  equal to  $1.17 \cdot 10^6 \cdot A^2s$ .



#### Abbreviations used

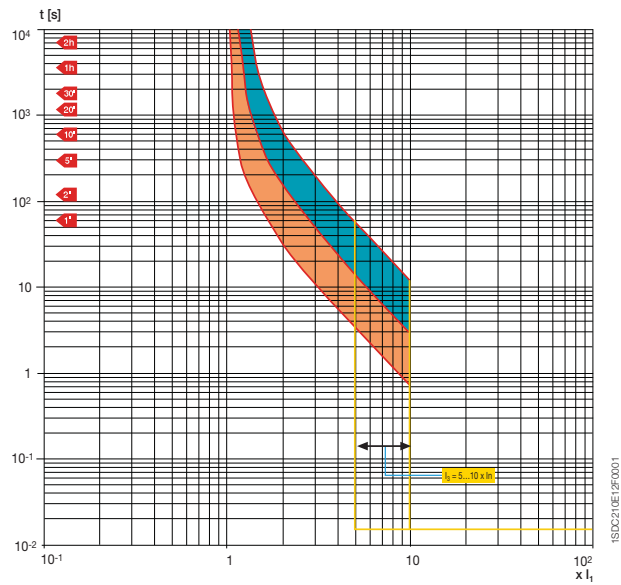
$I_n$  = rated current of the thermomagnetic or electronic trip unit  
 $I_1$  = set trip current for overload  
 $I_3$  = trip current for short-circuit  
 $I_{rms}$  = prospective symmetrical short-circuit current

# Trip curves for power distribution

## Circuit-breakers with thermomagnetic trip units

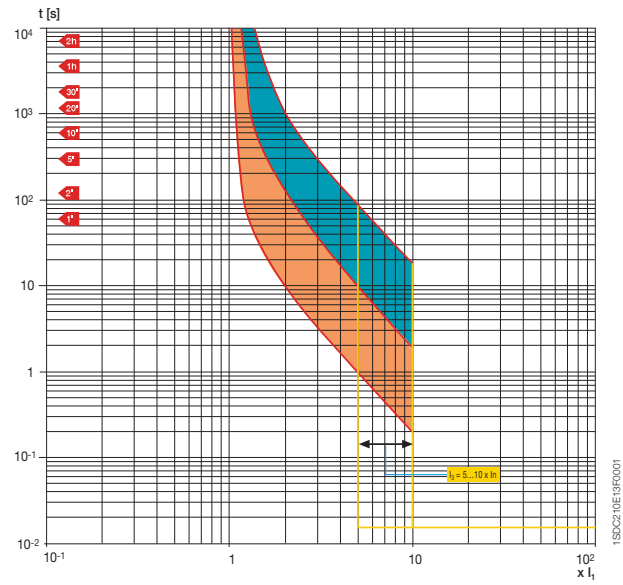
### T4 250 – TMA

$I_n = 80 \div 250 \text{ A}$



### T5 400/630 – TMA

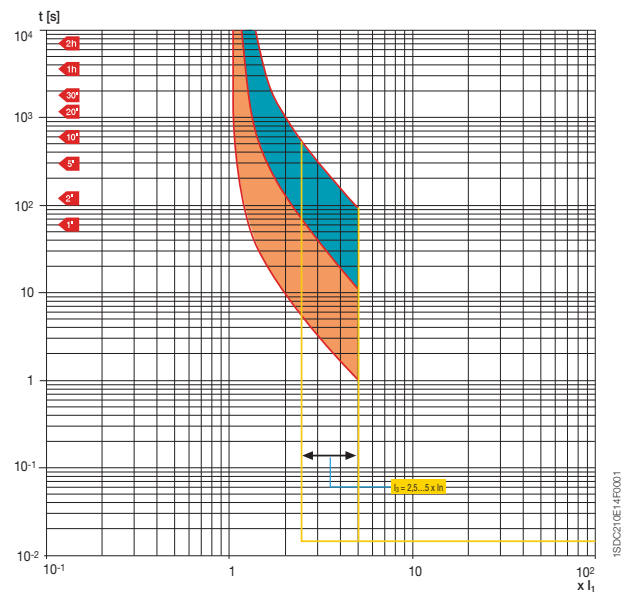
$I_n = 320 \div 500 \text{ A}$



4

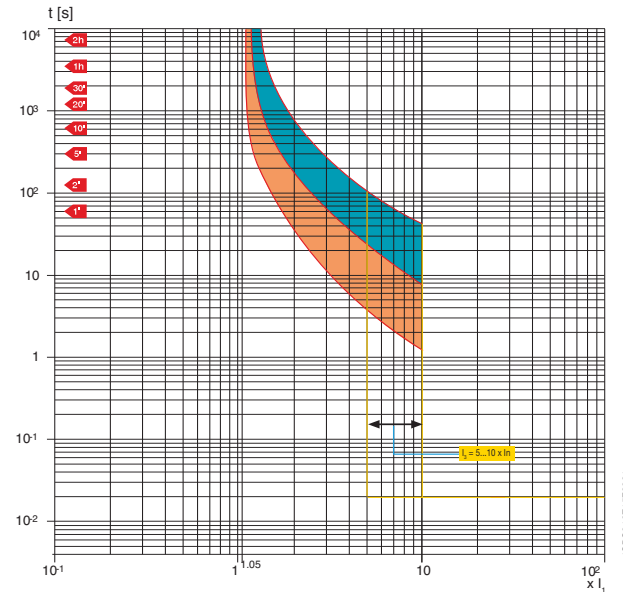
### T5 400/630 – TMG

$I_n = 320 \div 500 \text{ A}$



### T6 630 – TMA

$I_n = 630 \text{ A}$



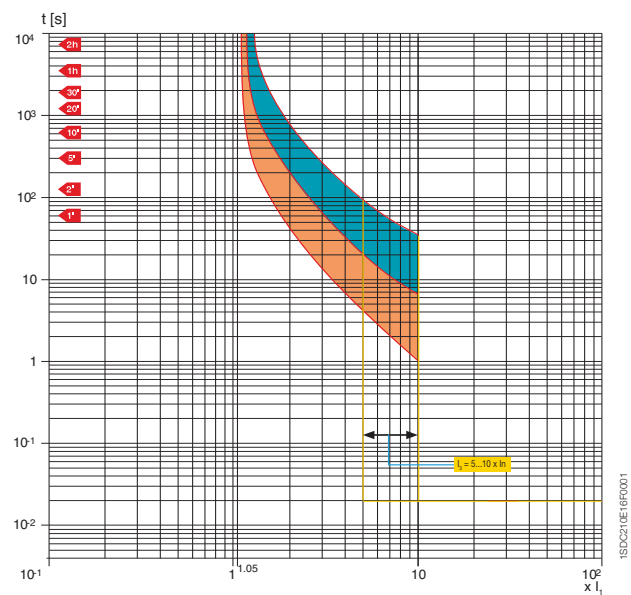
# Trip curves for power distribution

## Circuit-breakers with thermomagnetic trip units

T6 800 – TMA

$I_n = 800 \text{ A}$

4



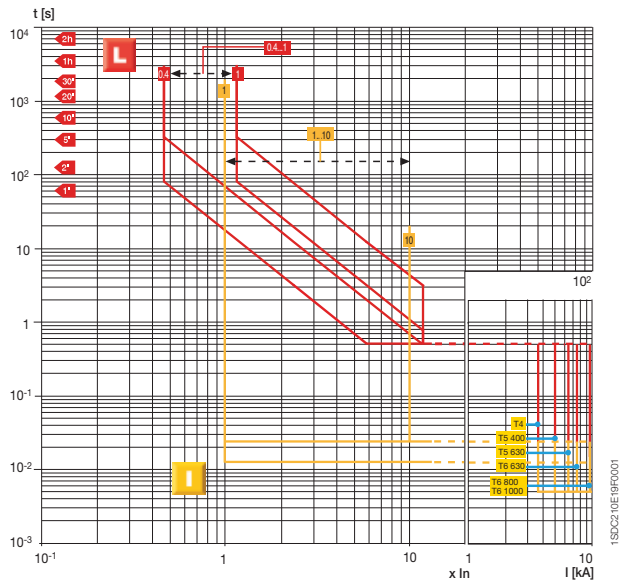
# Trip curves for power distribution

## Circuit-breakers with electronic trip units

T4 250/320 - T5 400/630 - T6 630/800/1000  
PR221DS

### L-I Functions

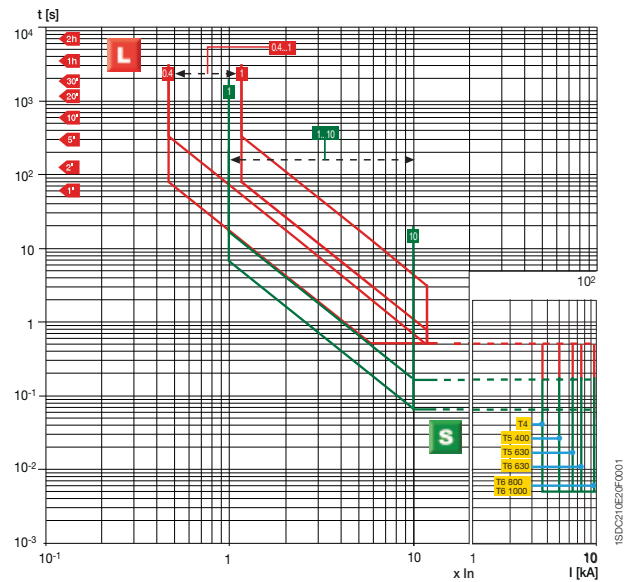
**Note:** For T4 In = 320 A, T5 In = 630 A and T6 In = 1000 A  $\Rightarrow I_{2max} = 9.5 \times I_n$



T4 250/320 - T5 400/630 - T6 630/800/1000  
PR221DS

### L-S Functions

**Note:** For T4 In = 320 A, T5 In = 630 A and T6 In = 1000 A  $\Rightarrow I_{2max} = 9.5 \times I_n$

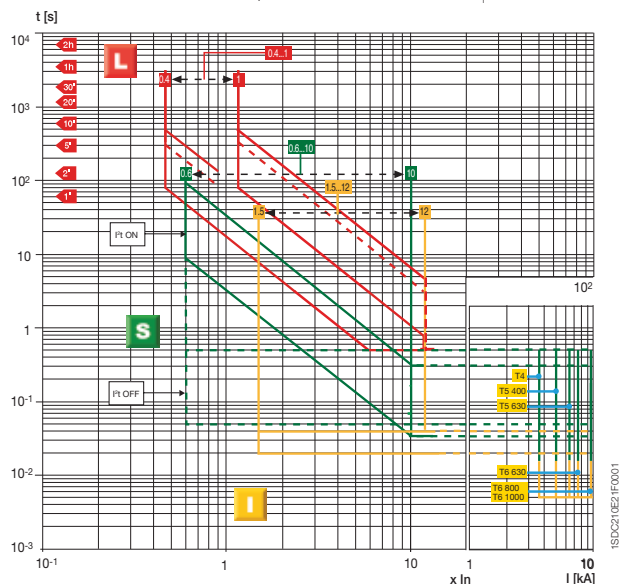


4

T4 250/320 - T5 400/630 - T6 630/800/1000  
PR222DS - PR222DS/PD - PR223DS

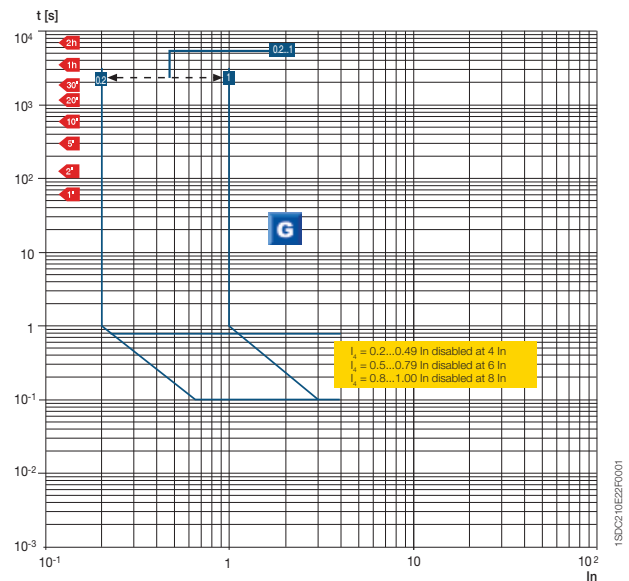
### L-S-I Functions

**Note:** The dotted curve of function L corresponds to the maximum delay ( $t_1$ ) which can be set at  $6 \times I_{1n}$  in the case where 320 A CTs are used for T4 and 630 A for T5. For all the CT sizes  $t_1 = 18s$  except with 320 A CT (T4), 630 A CT (T5) and 1000 A CT (T6) where  $t_1 = 10.5s$ . For T4 In = 320 A, T5 In = 630 A and T6 In = 1000 A  $\Rightarrow I_{2max} = 9.5 \times I_n$ ,  $I_{1max} = 9.5 \times I_n$ . For T6 In = 800 A  $\Rightarrow I_{2max} = 10.5 \times I_n$ . For PR223DS the L protection function can be set to  $I_1 = 0.18...1 \times I_n$ .



T4 250/320 - T5 400/630 - T6 630/800/1000  
PR222DS - PR222DS/PD - PR223DS

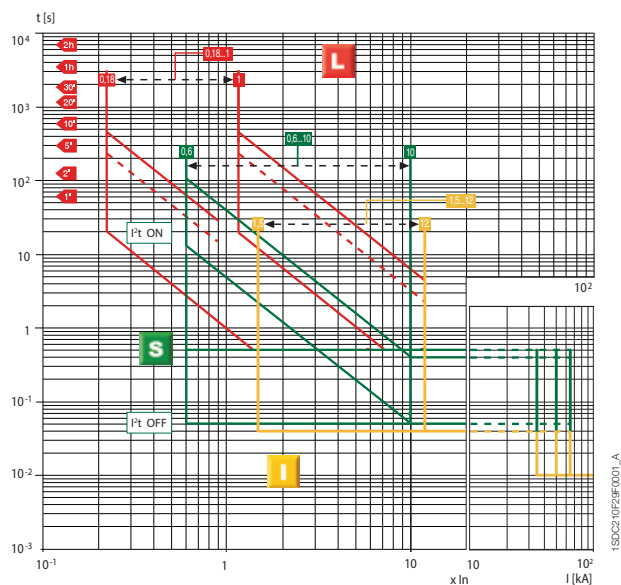
### G Function



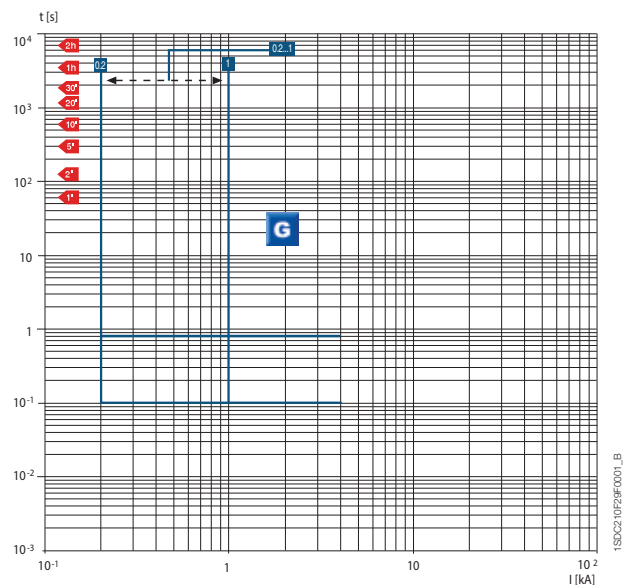
# Trip curves for power distribution

## Circuit-breakers with electronic trip units

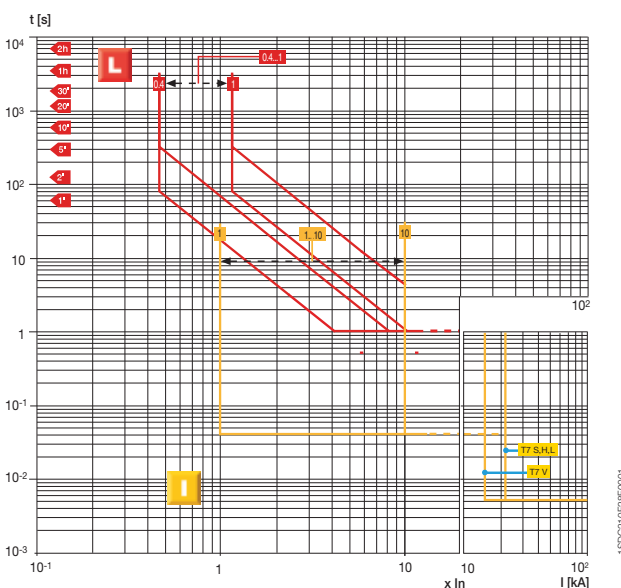
**Tmax T5 Ekip E**  
**L-S-I Functions**



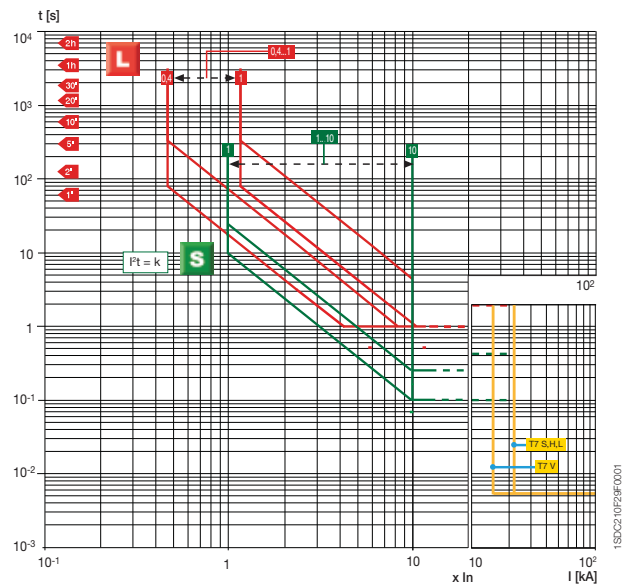
**Tmax T5 Ekip E**  
**L-S-I Functions**



**T7 800/1000/1250/1600 – PR231/P**  
**L-I Functions**

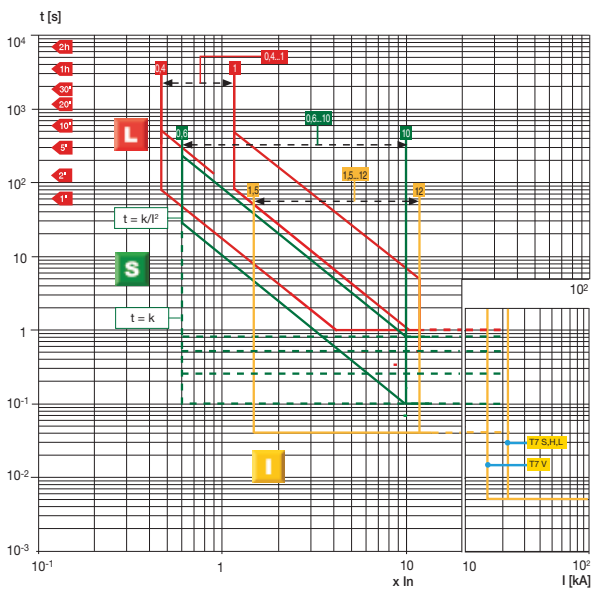


**T7 800/1000/1250/1600 – PR231/P**  
**L-S Functions**



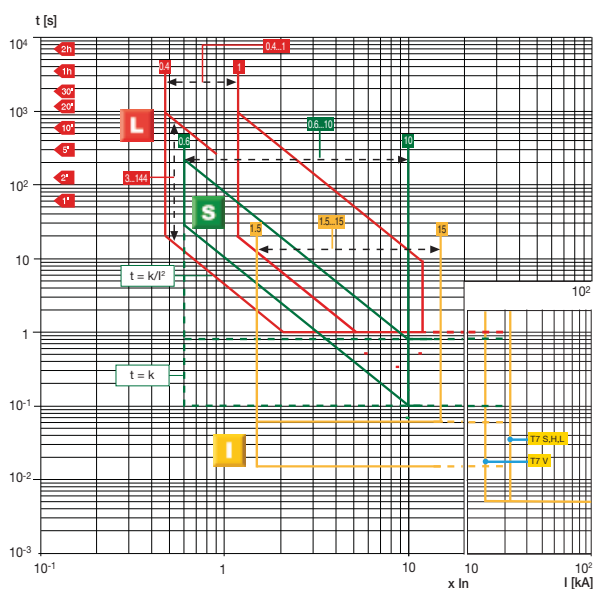


## T7 800/1000/1250/1600 – PR232/P

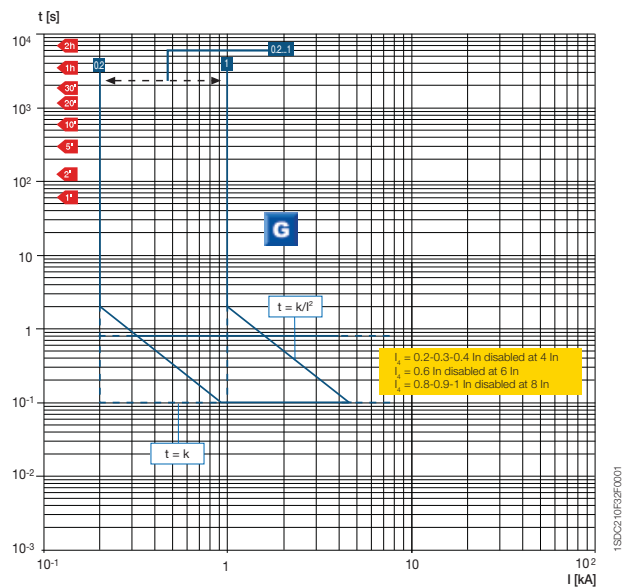


## T7 800/1000/1250/1600 – PR331/P

**Note:** For T7  $I_n = 1250 \text{ A}$ ,  $1600 \text{ A} \Rightarrow I_{3\text{max}} = 12 \times I_n$

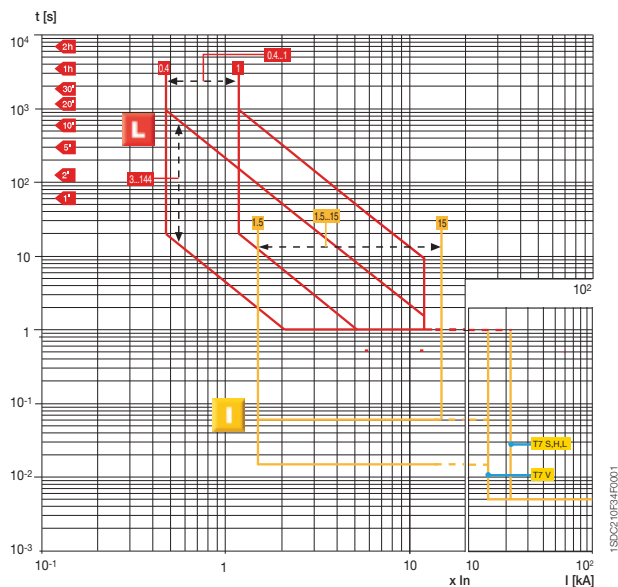


## T7 800/1000/1250/1600 – PR331/P G Function



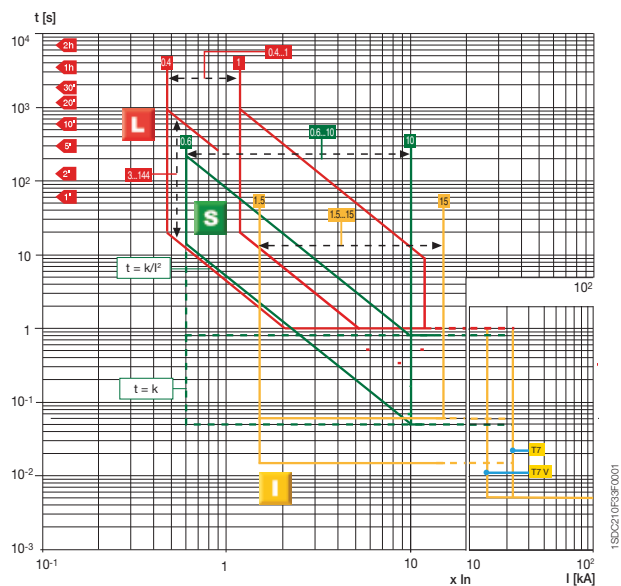
## T7 800/1000/1250/1600 – PR332/P

**Note:** For T7  $I_n = 1250 \text{ A}$ ,  $1600 \text{ A} \Rightarrow I_{2\text{max}} = 12 \times I_n$

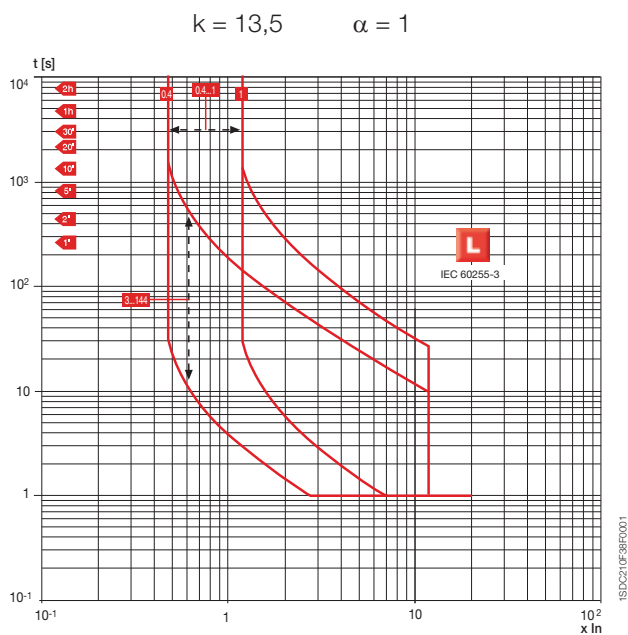


## 4

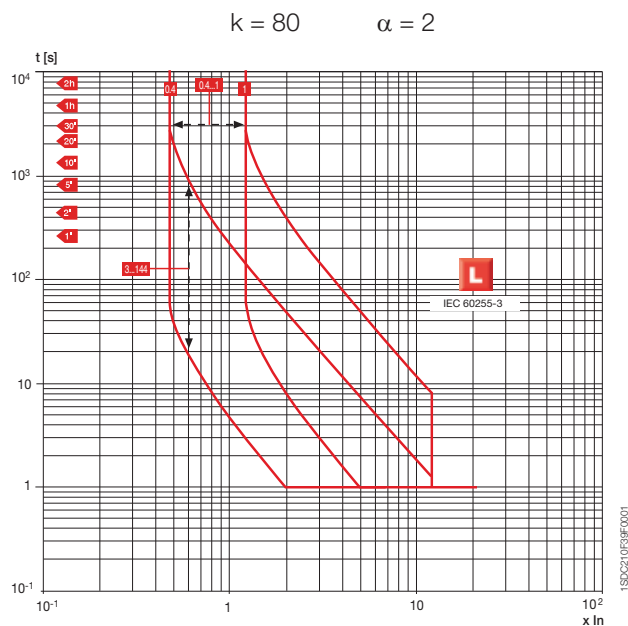
**Note:** For T7  $I_n = 1250 \text{ A}, 1600 \text{ A} \Rightarrow I_{3\text{max}} = 12 \times I_n$



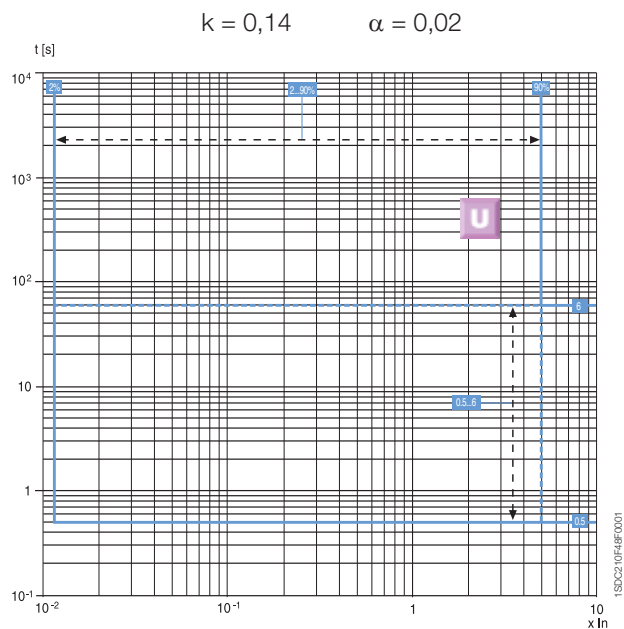
T7 800/1000/1250/1600 – PR332/P  
L Function according to IEC 60255-3



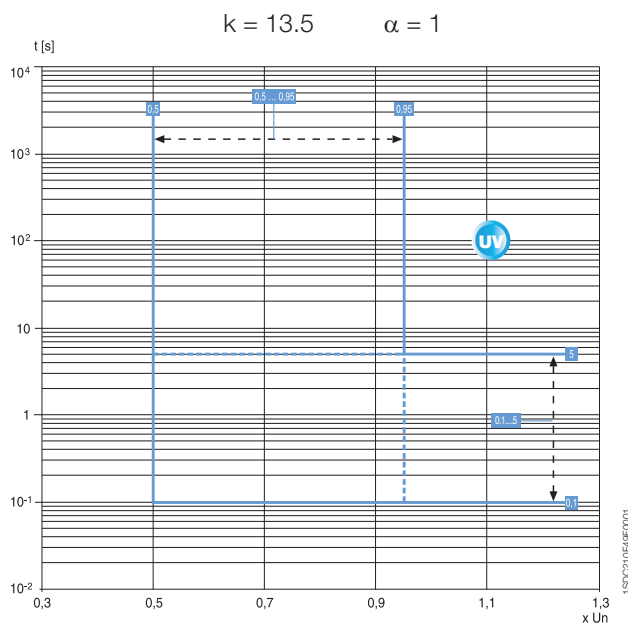
T7 800/1000/1250/1600 – PR332/P  
L Function according to IEC 60255-3



T7 800/1000/1250/1600 – PR332/P  
U Function



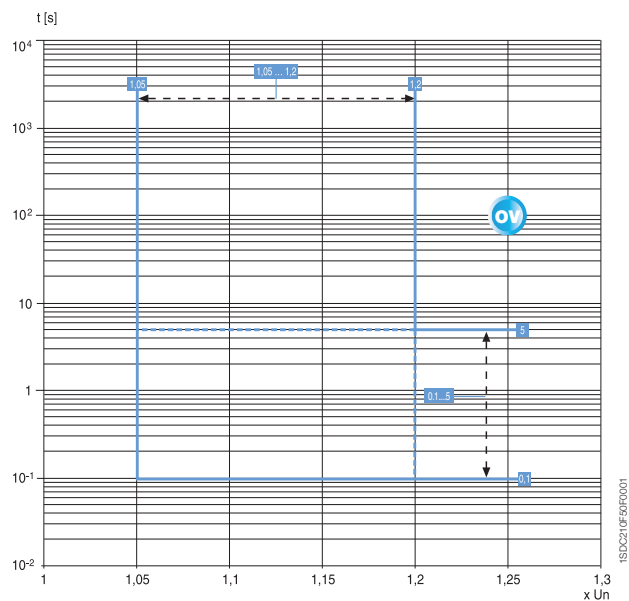
T7 800/1000/1250/1600  
PR332/P with PR330/V  
UV Function



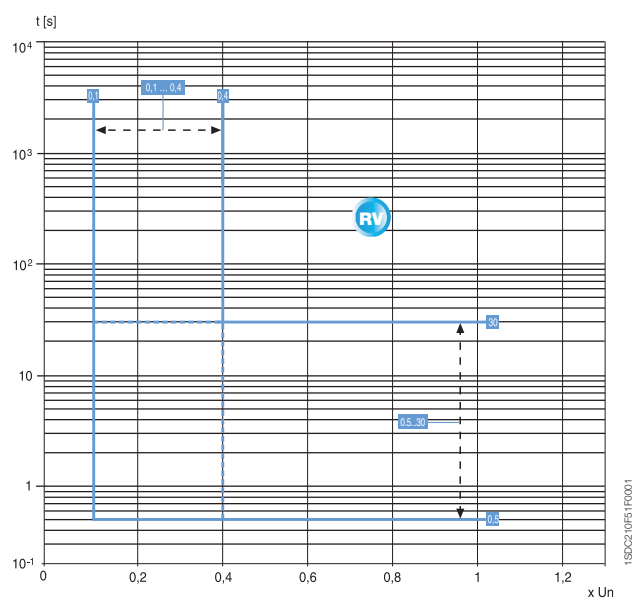
# Trip curves for power distribution

## Circuit-breakers with electronic trip units

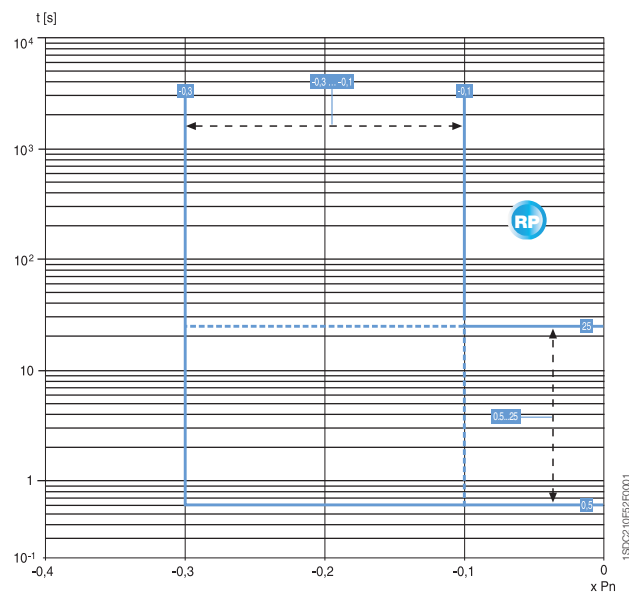
T7 800/1000/1250/1600  
PR332/P with PR330/V  
OV Function



T7 800/1000/1250/1600  
PR332/P with PR330/V  
RV Function



T7 800/1000/1250/1600  
PR332/P with PR330/V  
RP Function



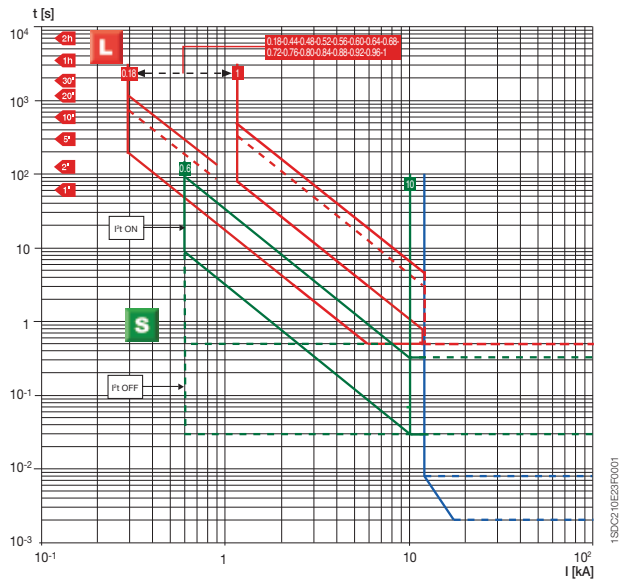
# Trip curves for zone selectivity

## Circuit-breakers with PR223EF trip unit

T4L 250/320 - T5L 400/630 - T6L 630/800/1000  
PR223EF - Vaux ON

### L-S-EF Functions

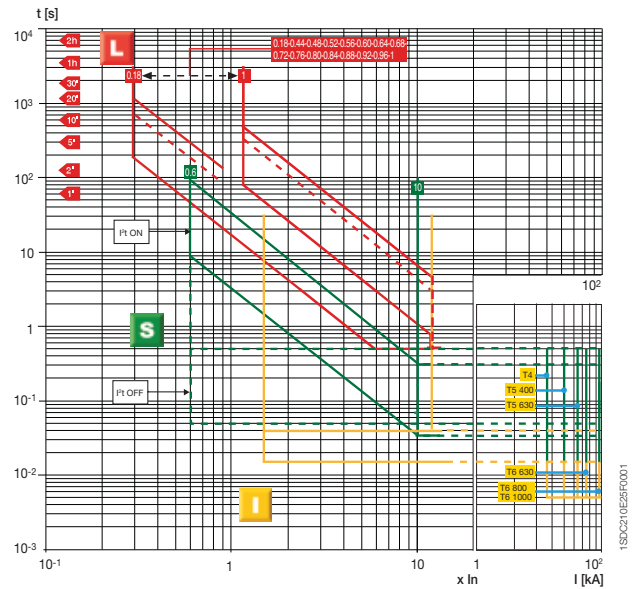
**Note:** The dotted curve of function L corresponds to the maximum delay ( $t_d$ ) which can be set at  $6 \times I_n$  in the case where 320 A CTs are used for T4 and 630 A for T5. For all the CT sizes  $t_d = 18$  s except with 320 A CT (T4), 630 A CT (T5) and 1000 A CT (T6) where  $t_d = 10.5$  s. For T4  $I_n = 320$  A, T5  $I_n = 630$  A and T6  $I_n = 1000$  A  $\Rightarrow I_{dmax} = 9.5 \times I_n$  and  $I_{dmax} = 9.5 \times I_n$ . For T6  $I_n = 800$  A  $\Rightarrow I_{dmax} = 10.5 \times I_n$ .



T4L 250/320 - T5L 400/630 - T6L 630/800/1000  
PR223EF - Vaux OFF

### L-S-I Functions

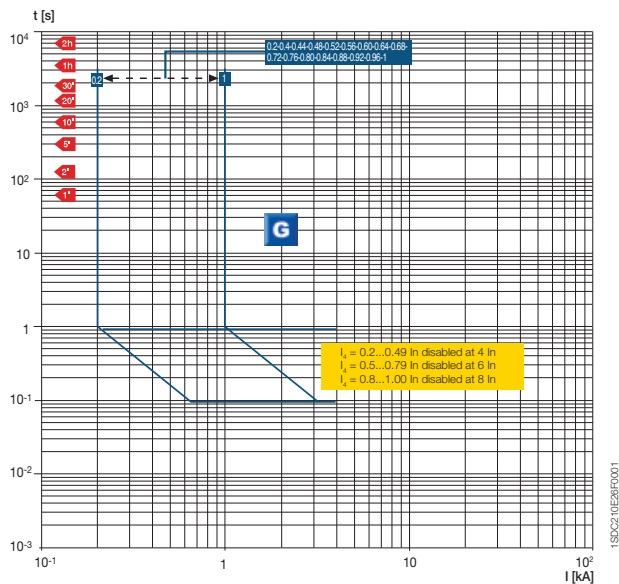
**Note:** The dotted curve of function L corresponds to the maximum delay ( $t_d$ ) which can be set at  $6 \times I_n$  in the case where 320 A CTs are used for T4 and 630 A for T5. For all the CT sizes  $t_d = 18$  s except with 320 A CT (T4), 630 A CT (T5) and 1000 A CT (T6) where  $t_d = 10.5$  s. For T4  $I_n = 320$  A, T5  $I_n = 630$  A and T6  $I_n = 1000$  A  $\Rightarrow I_{dmax} = 9.5 \times I_n$  and  $I_{dmax} = 9.5 \times I_n$ . For T6  $I_n = 800$  A  $\Rightarrow I_{dmax} = 10.5 \times I_n$ .



4

T4L 250/320 - T5L 400/630 - T6L 630/800/1000  
PR223EF - Vaux ON/OFF

### G Function



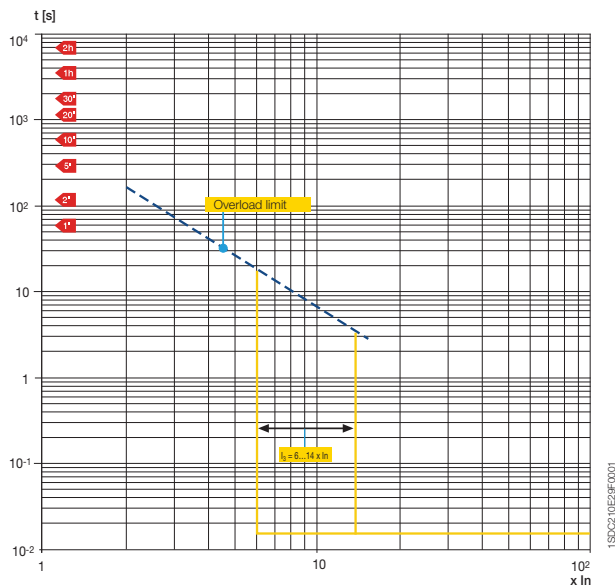
# Trip curves for motor protection

## Circuit-breakers with magnetic only trip units

T4 250 – MA

$$I_3 = 6 \dots 14 \times I_n$$

4



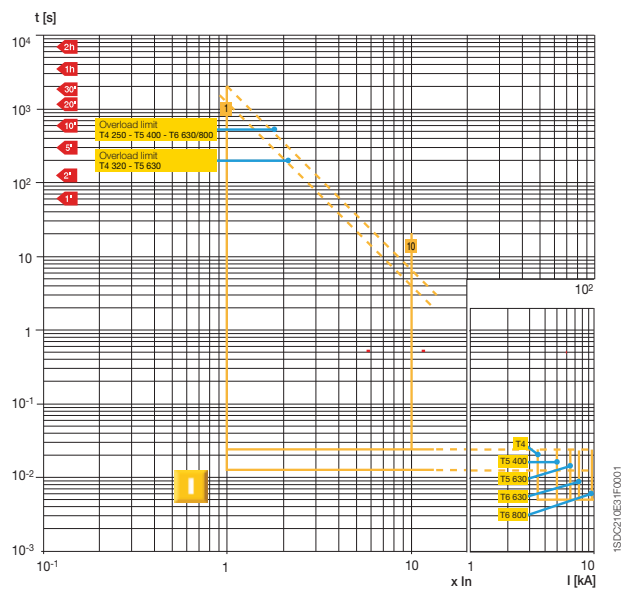
# Trip curves for motor protection

## Circuit-breakers with PR221DS and PR231/P electronic trip unit

T4 250/320 - T5 400/630 - T6 630/800

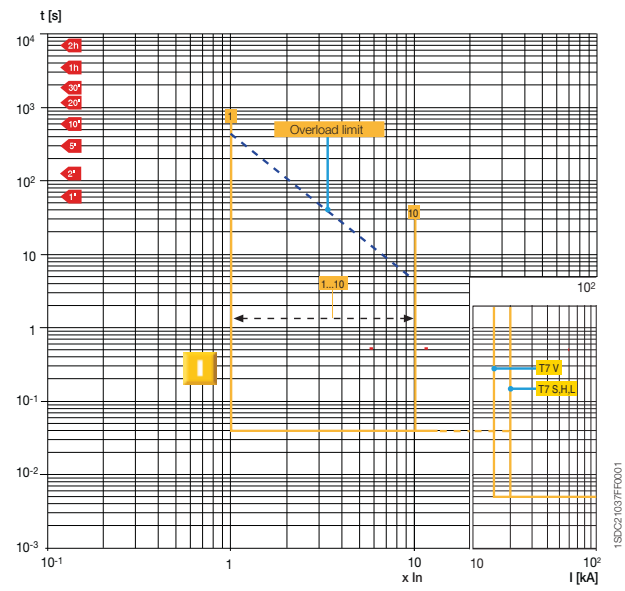
PR221DS-I

I Function



T7 800/1000/1250 - PR231/P-I

I Function



# Trip curves for motor protection

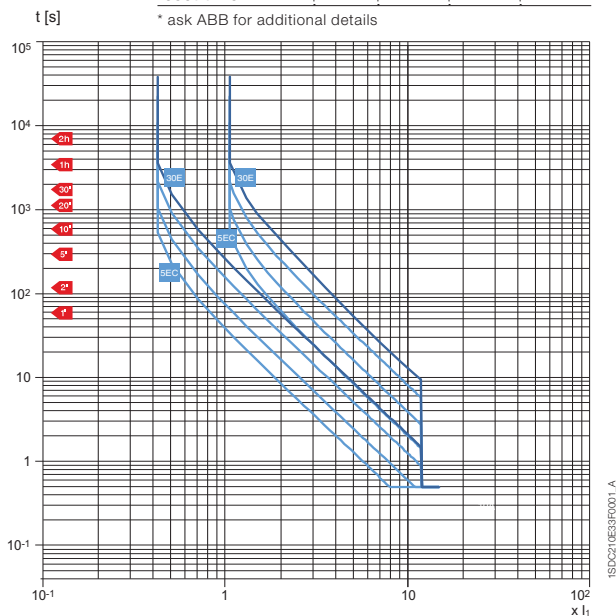
## Circuit-breakers with Ekip M-LRIU electronic trip unit

T4 250 - T5 400 - T6 800 – Ekip M-LRIU

L Function (cold trip)

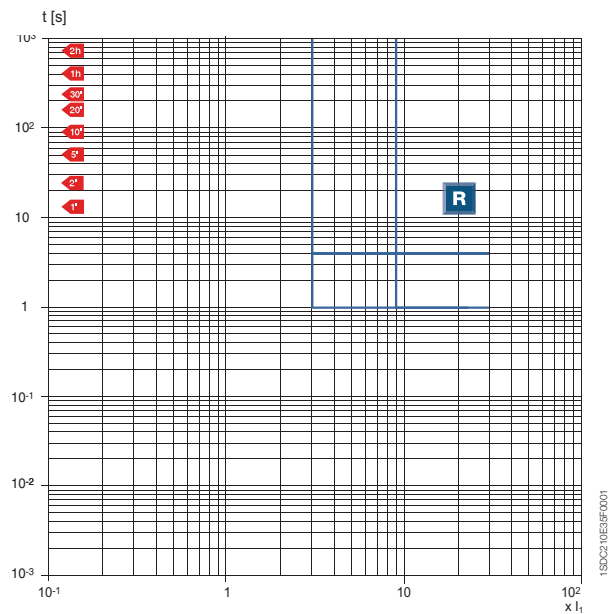
Hot trip *	5E	10E	20E	30E
Thermal memory reset time	320s	600s	1200s	2000s

\* ask ABB for additional details



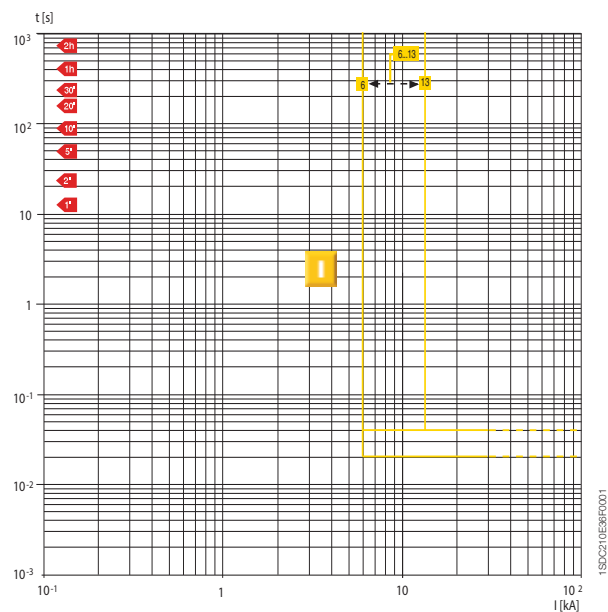
T4 250 - T5 400 - T6 800 – Ekip M-LRIU

R Function



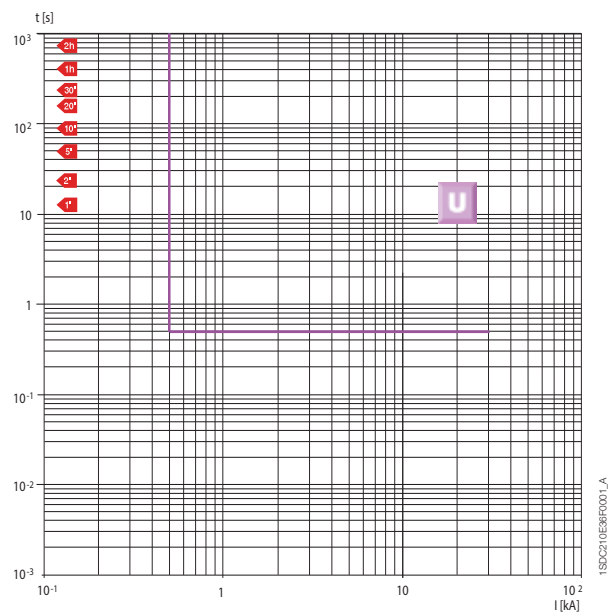
T4 250 - T5 400 - T6 800 – Ekip M-LRIU

I Function



T4 250 - T5 400 - T6 800 – Ekip M-LRIU

U Function

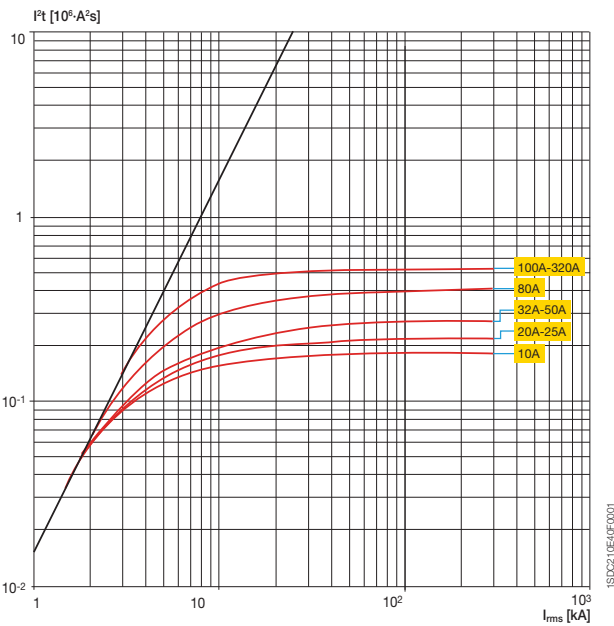




# Specific let-through energy curves

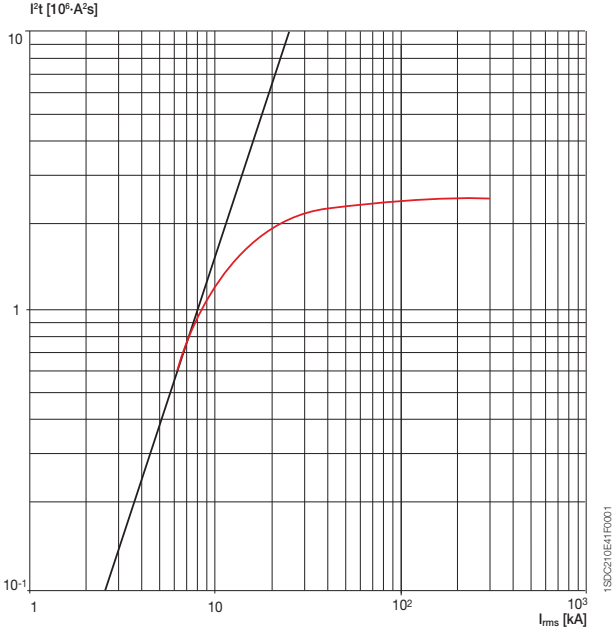
T4 250/320

230 V



T5 400/630

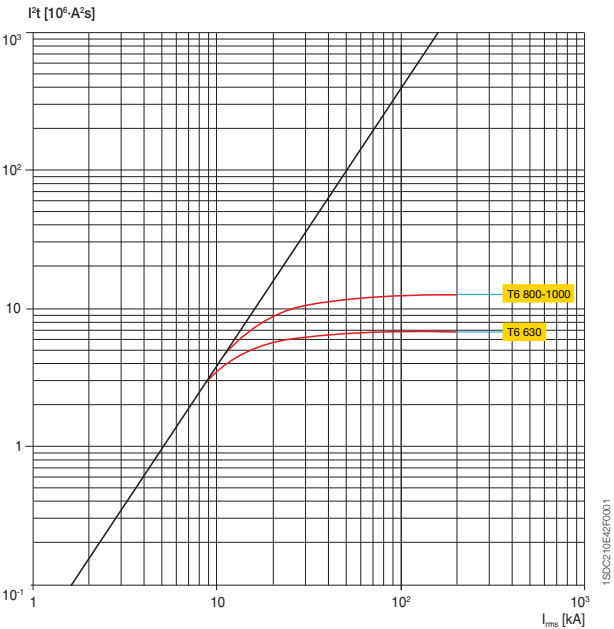
230 V



4

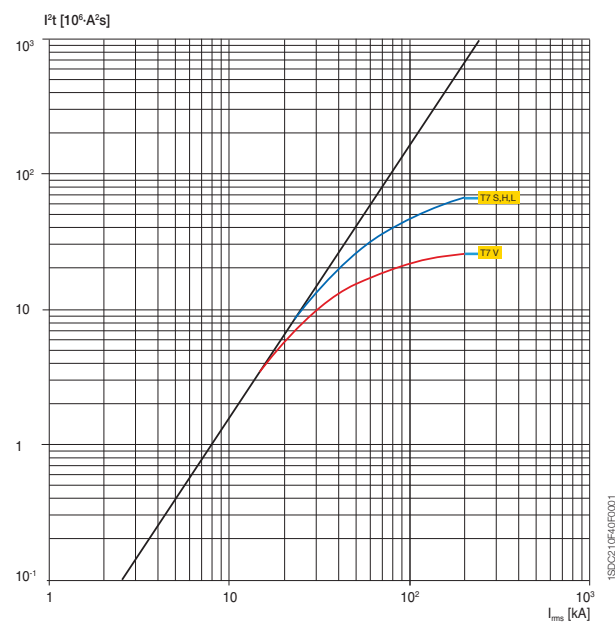
T6 630/800/1000

230 V



T7 800/1000/1250/1600

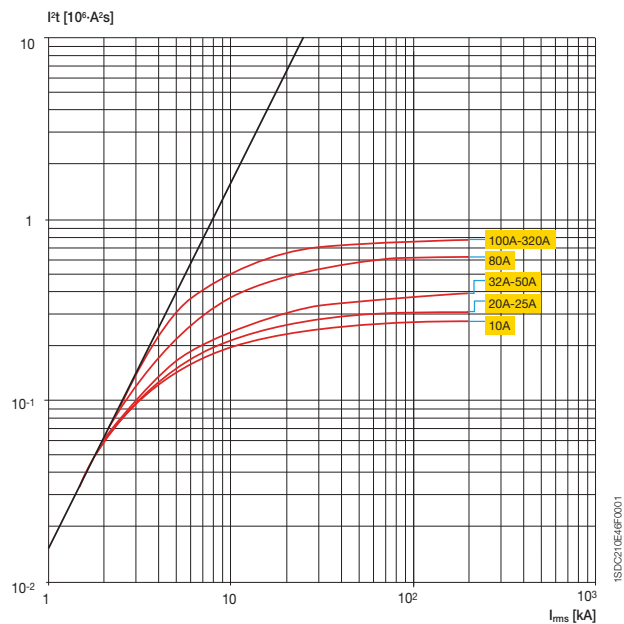
230 V



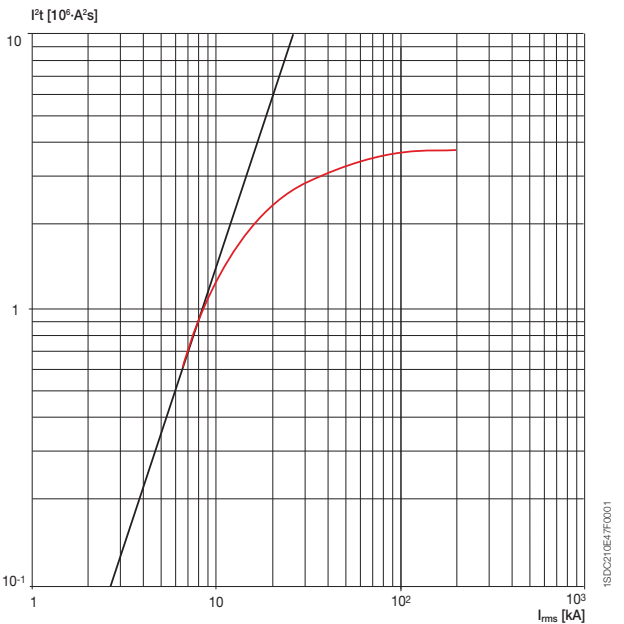
# Specific let-through energy curves

**T4 250/320**  
400-440 V

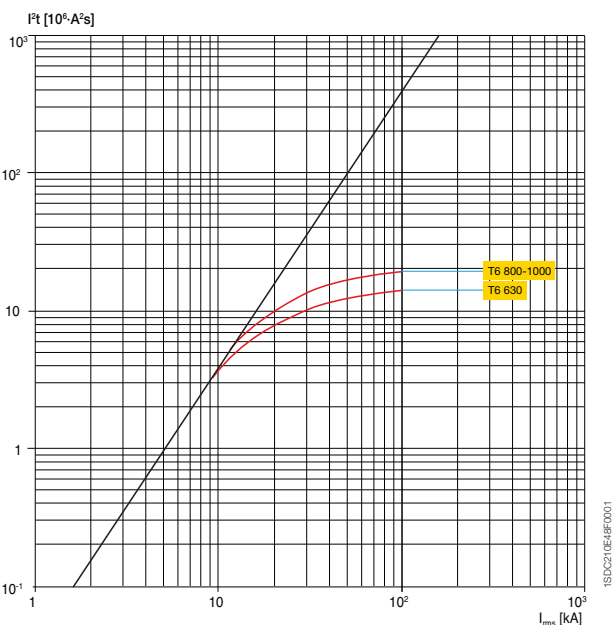
4



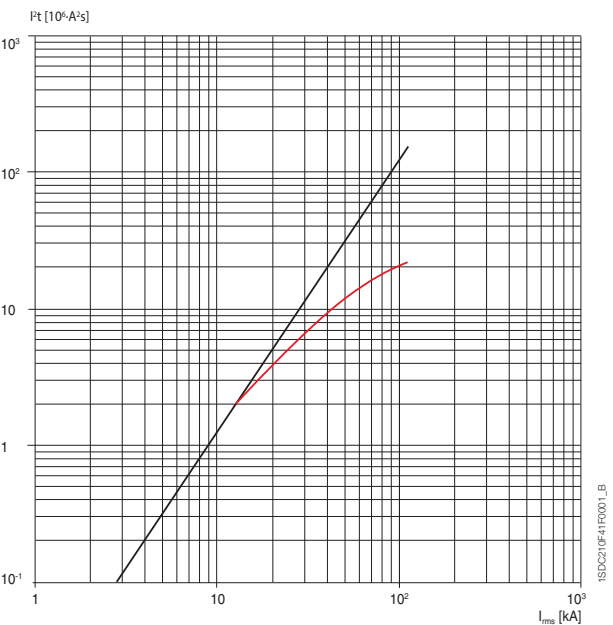
**T5 400/630**  
400-440 V



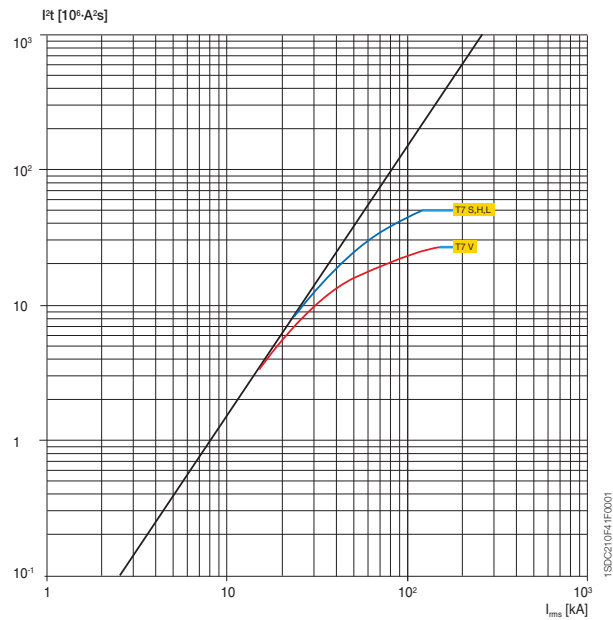
**T6 630/800/1000**  
400-440 V



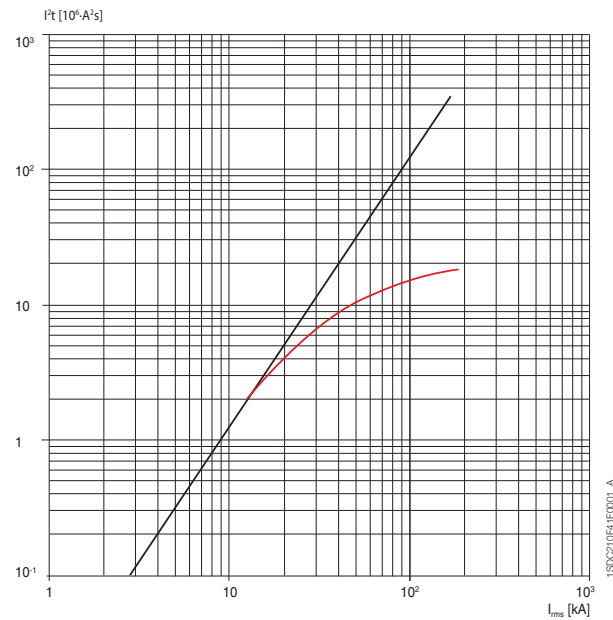
**T6 V 630/800**  
400-440 V



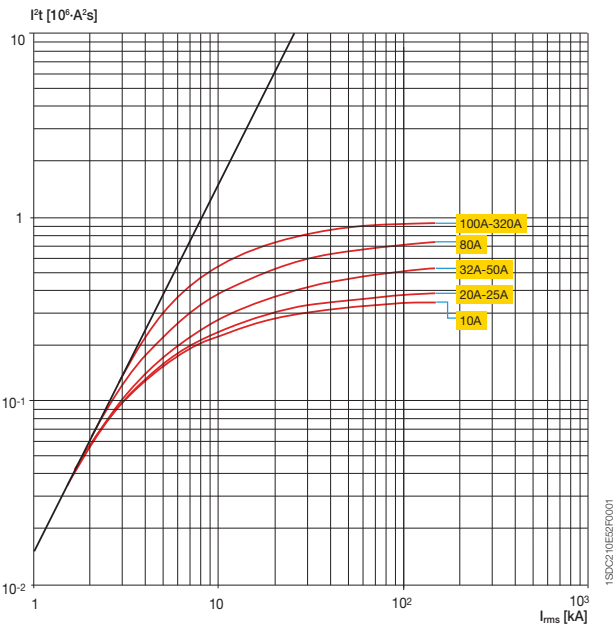
**T7 800/1000/1250/1600**  
**400-440 V**



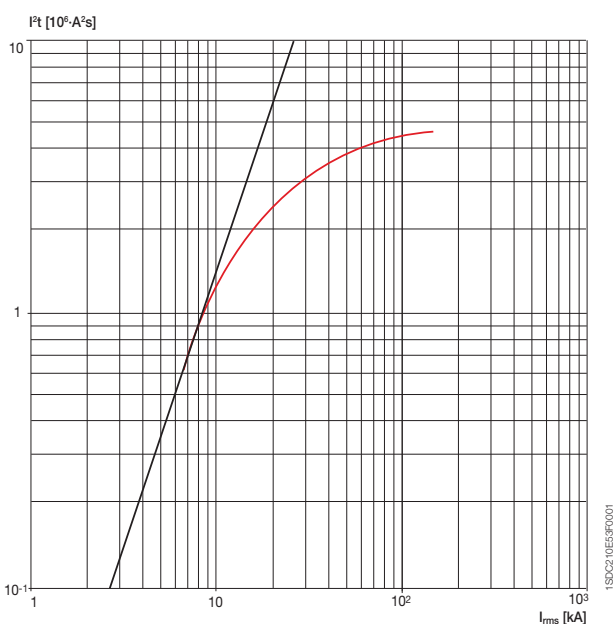
**T7 X 800**  
**400-440 V**



**T4 250/320**  
**500 V**



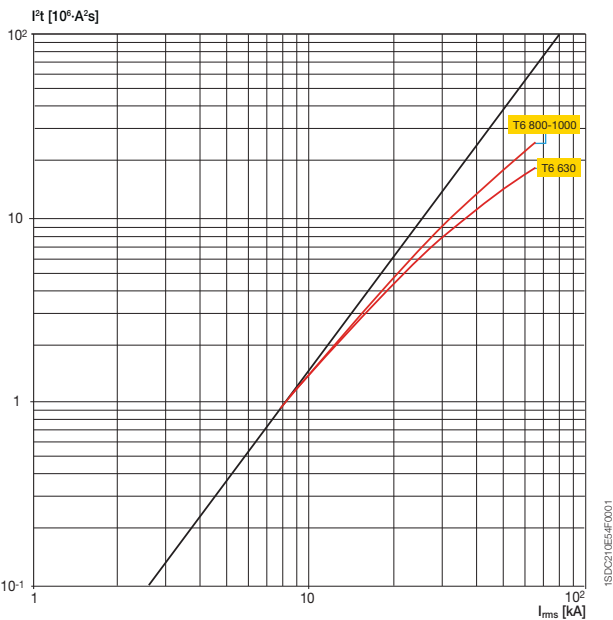
**T5 400/630**  
**500 V**



# Specific let-through energy curves

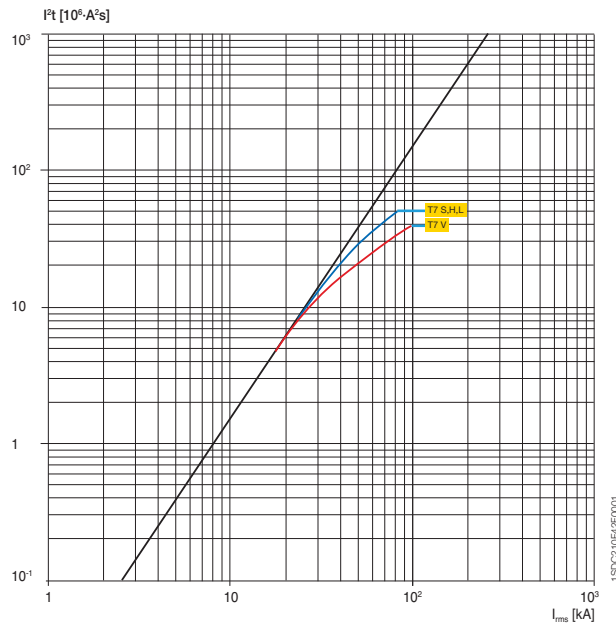
T6 630/800/1000

500 V



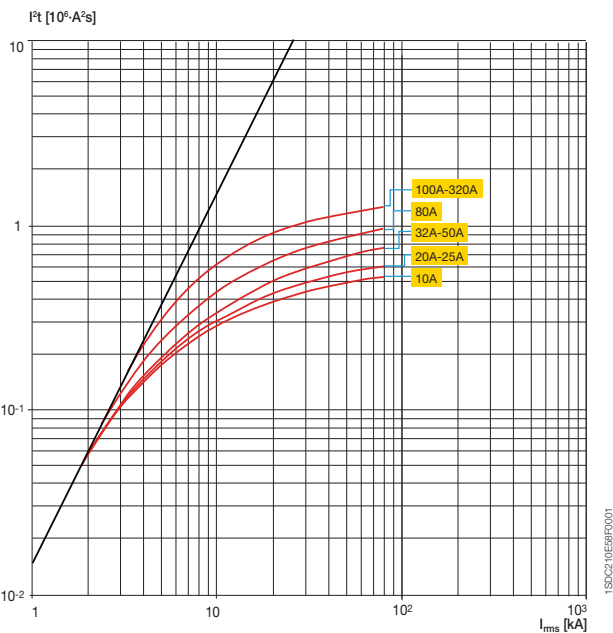
T7 800/1000/1250/1600

500 V



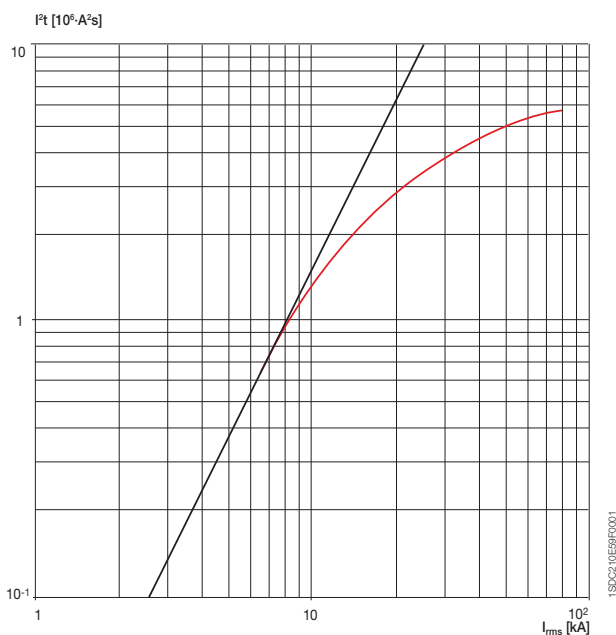
T4 250/320

690 V

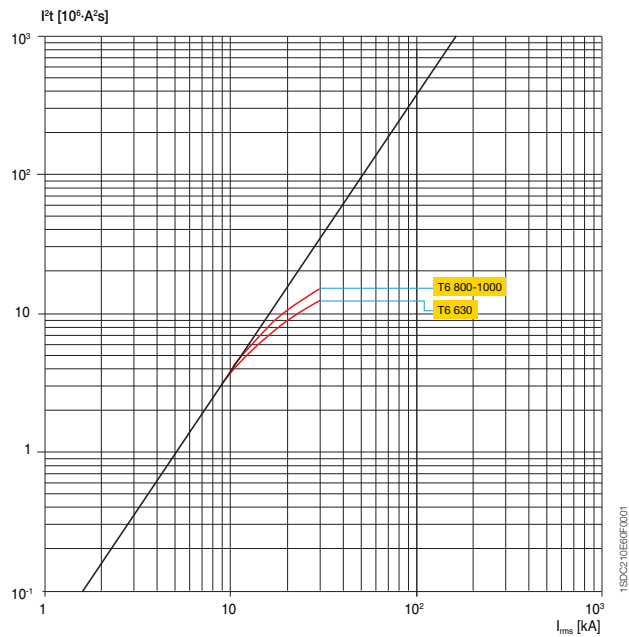


T5 400/630

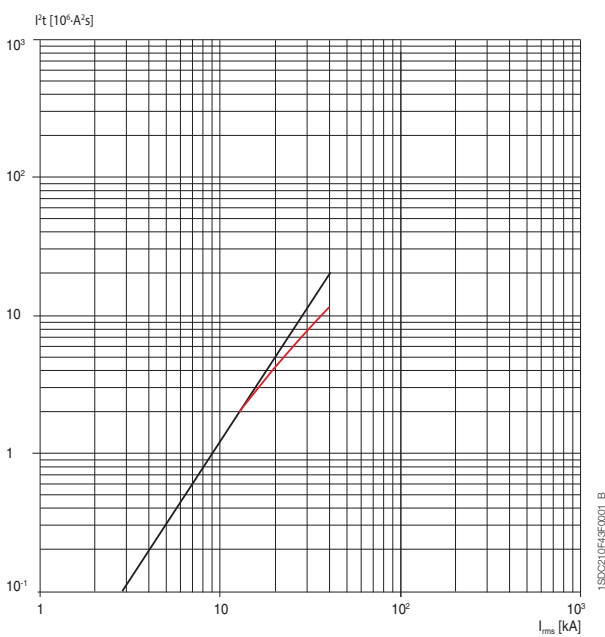
690 V



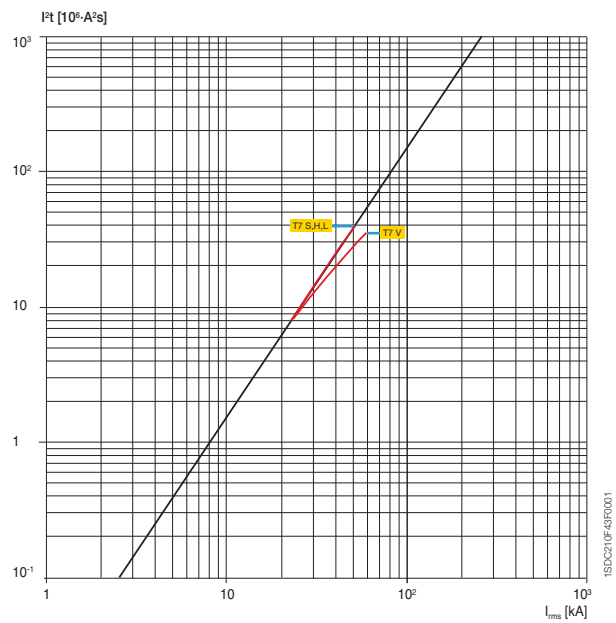
**T6 630/800/1000**  
**690 V**



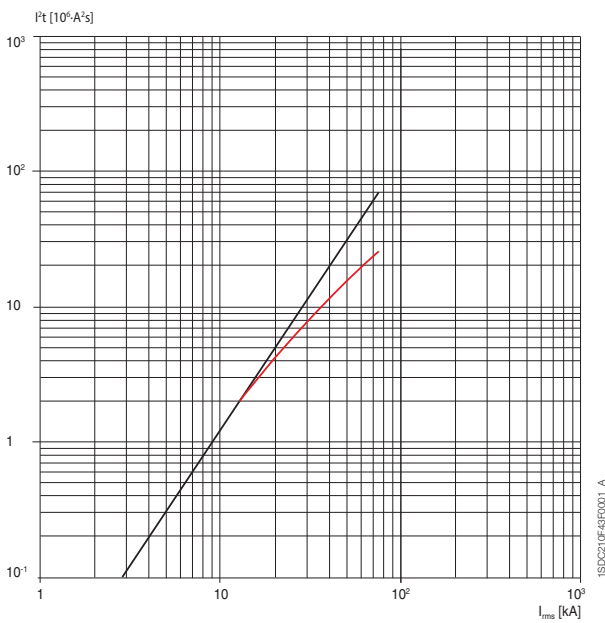
**T6 V 630/800**  
**690 V**



**T7 800/1000/1250/1600**  
**690 V**



**T7 X 800**  
**690 V**

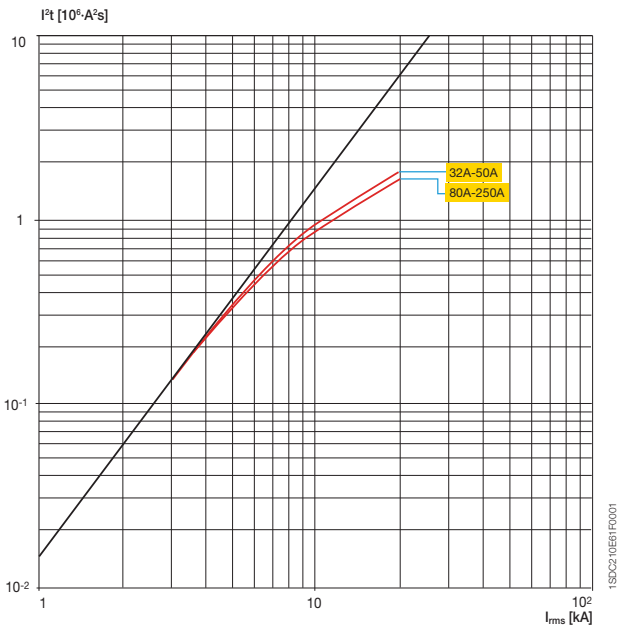


# Specific let-through energy curves

T4 250

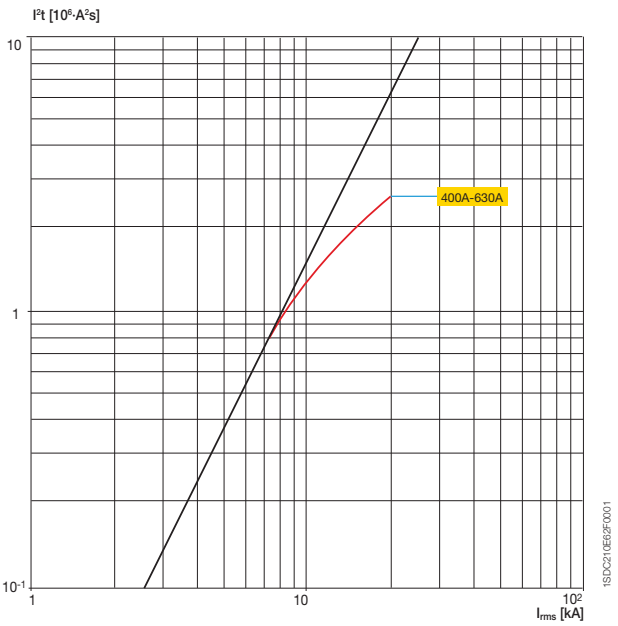
1000 V

4



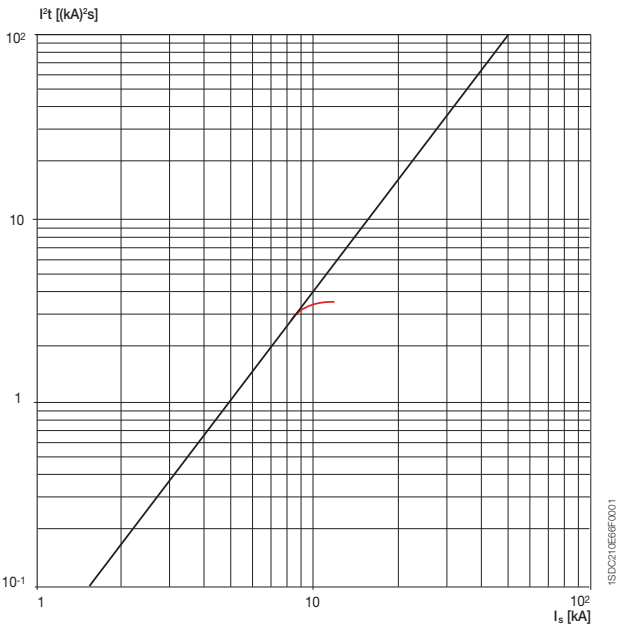
T5 400/630

1000 V



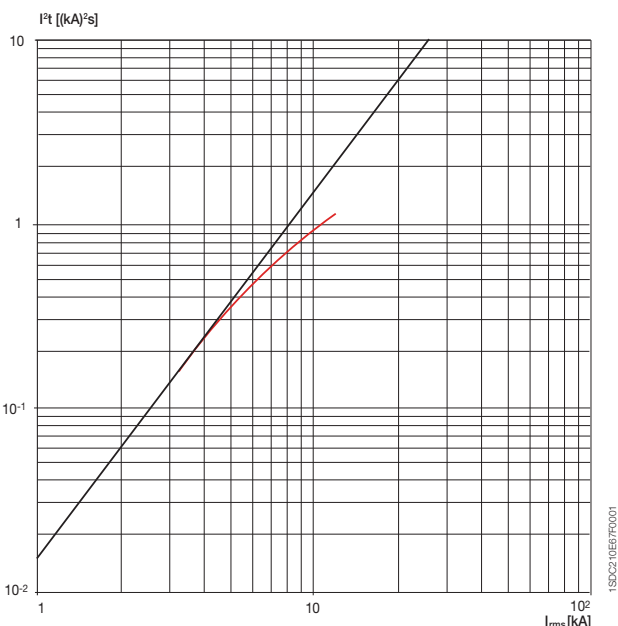
T6

1000 V

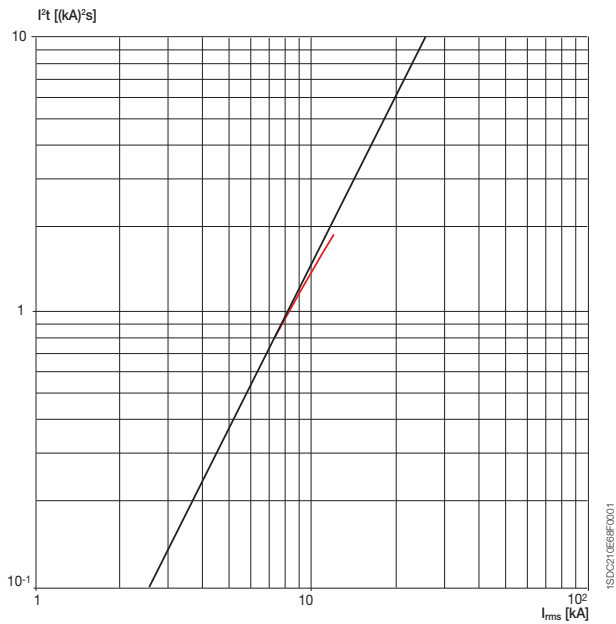


T4 250

1150 V



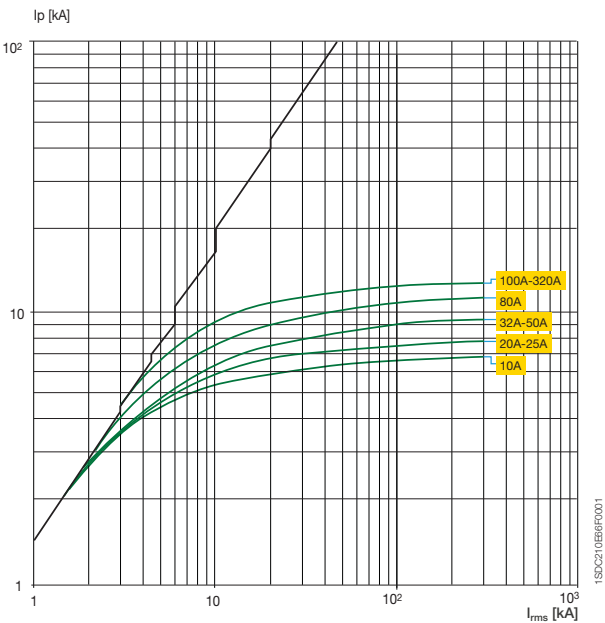
T5 400/630  
1150 V



# Limitation curves

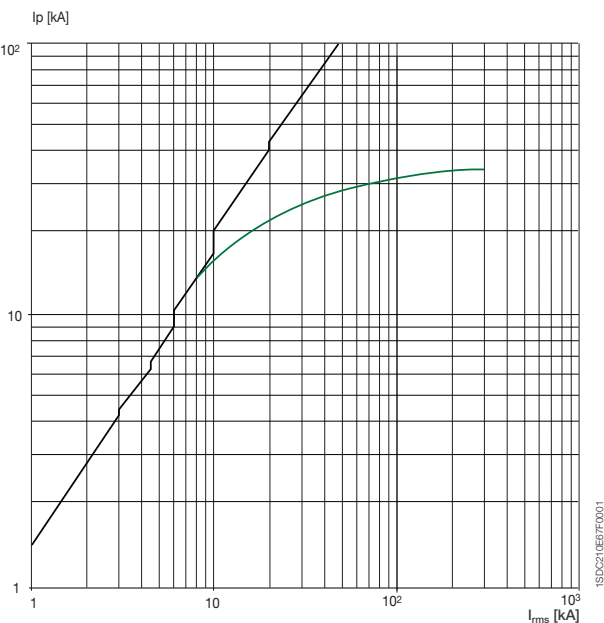
## T4 250/320

230 V



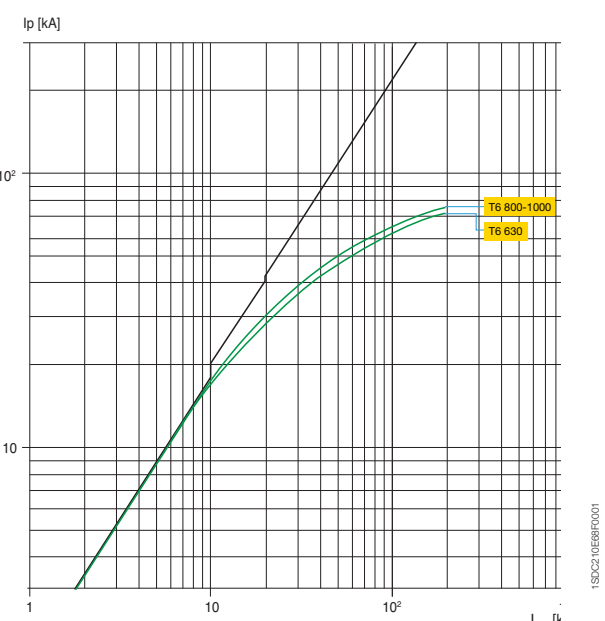
## T5 400/630

230 V



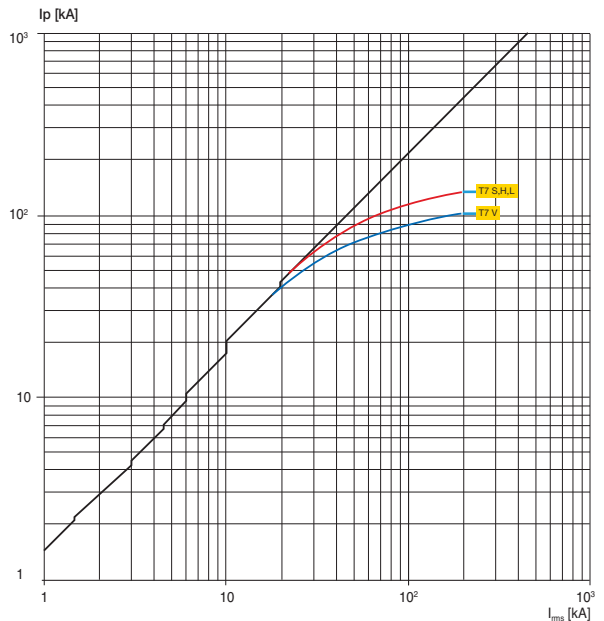
## T6 630/800/1000

230 V



## T7 800/1000/1250/1600

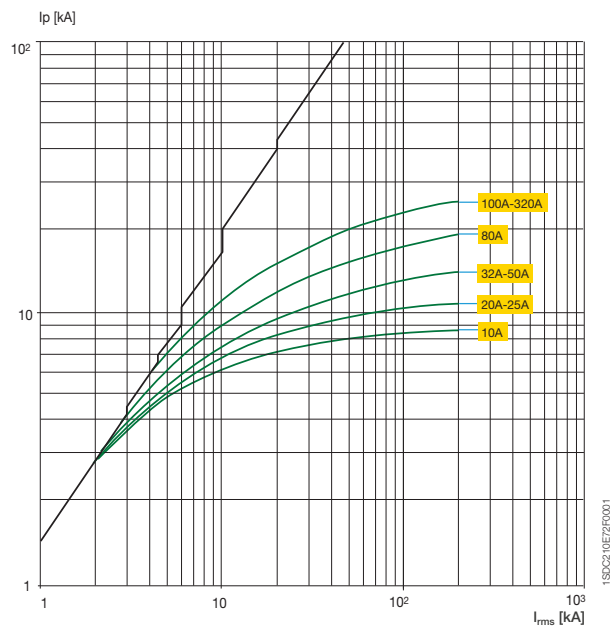
230 V





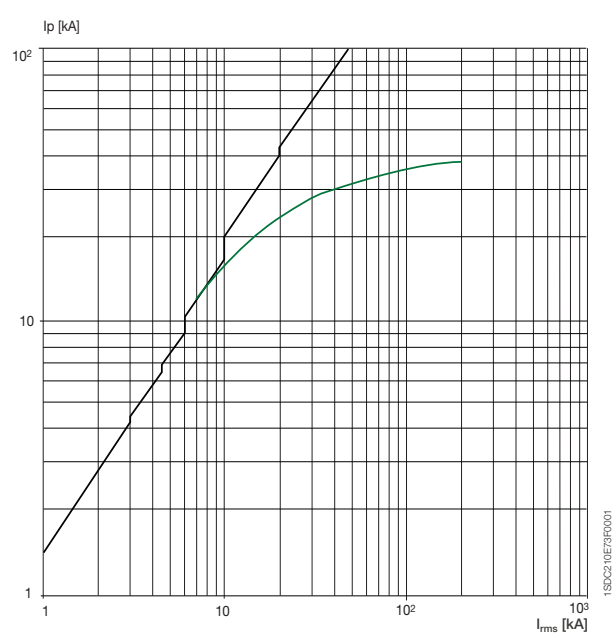
### T4 250/320

400-440 V



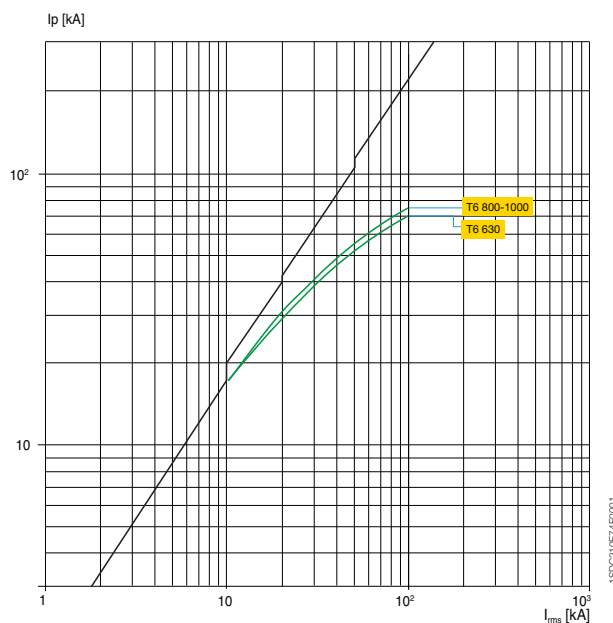
### T5 400/630

400-440 V



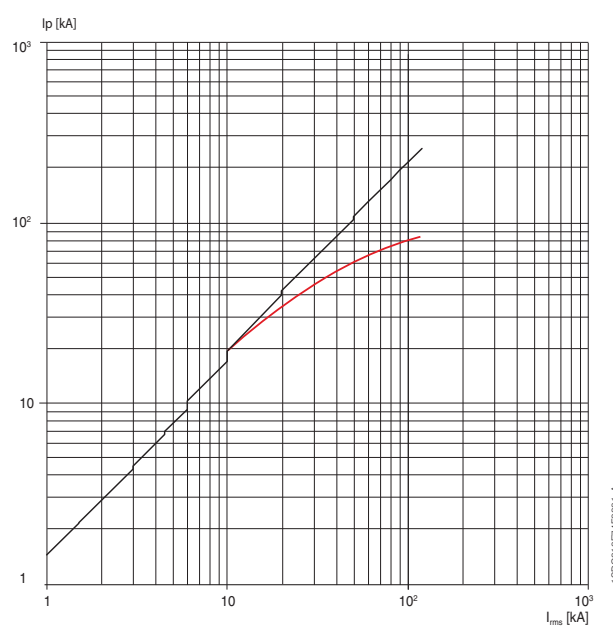
### T6 630/800/1000

400-440 V



### T6 V 630/800

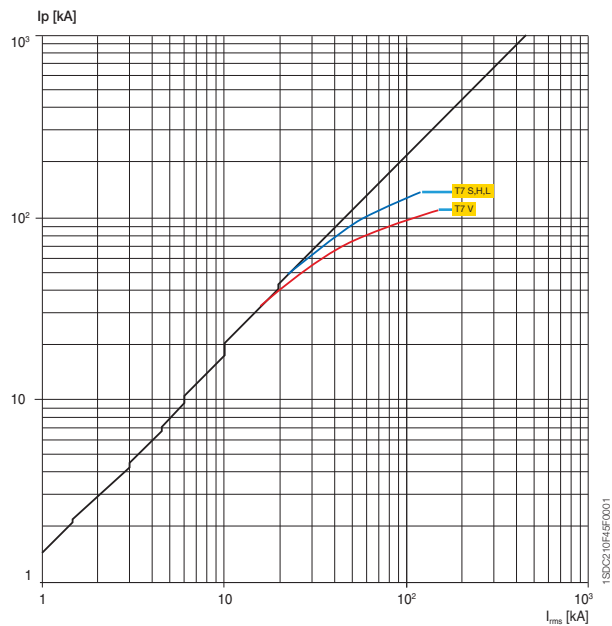
400-440 V



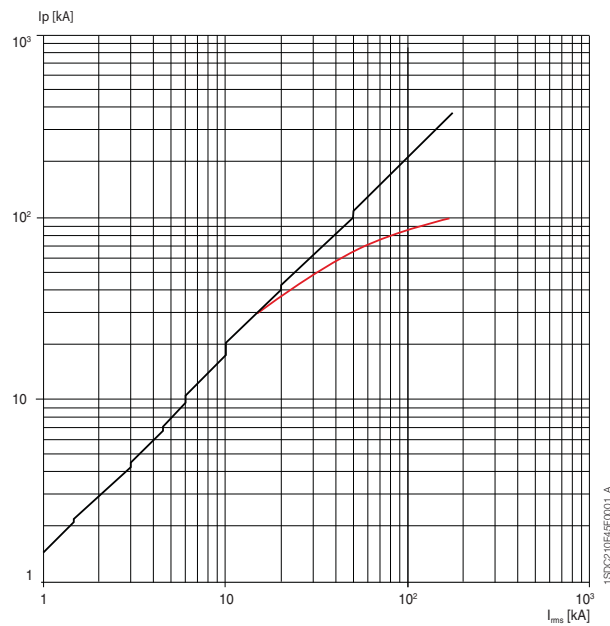
# Limitation curves

T7 800/1000/1250/1600  
400-440 V

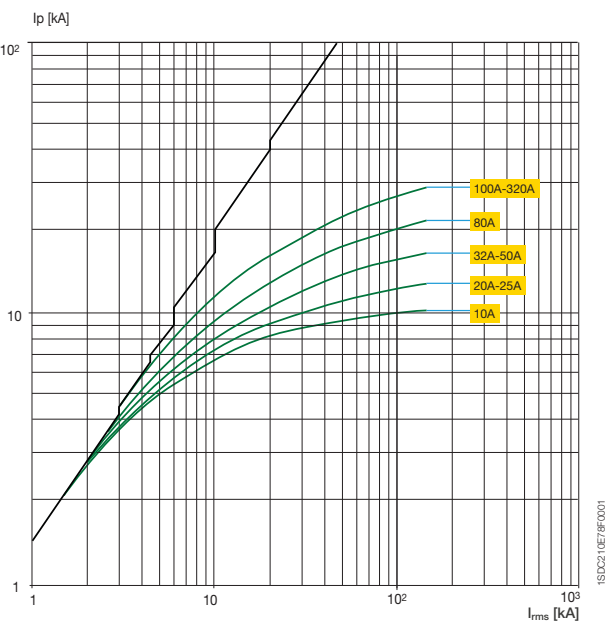
4



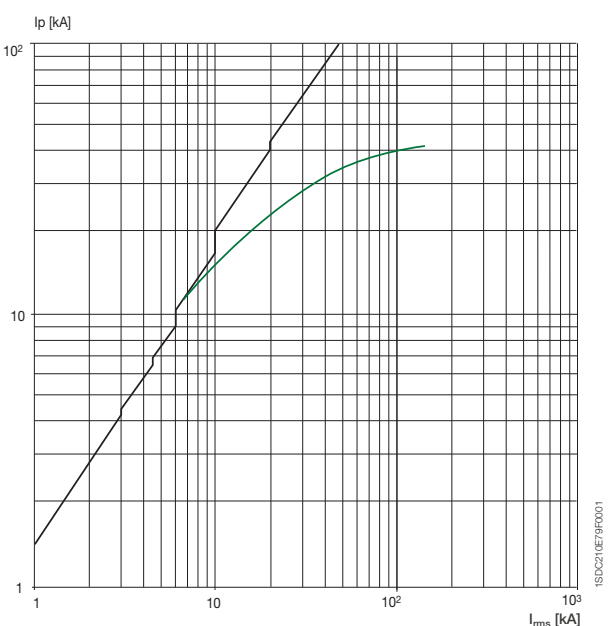
T7 X 800  
400-440 V



T4 250/320  
500 V

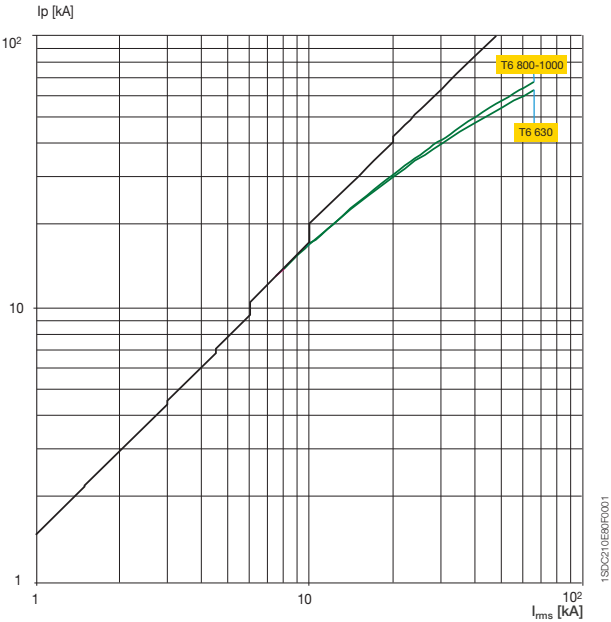


T5 400/630  
500 V



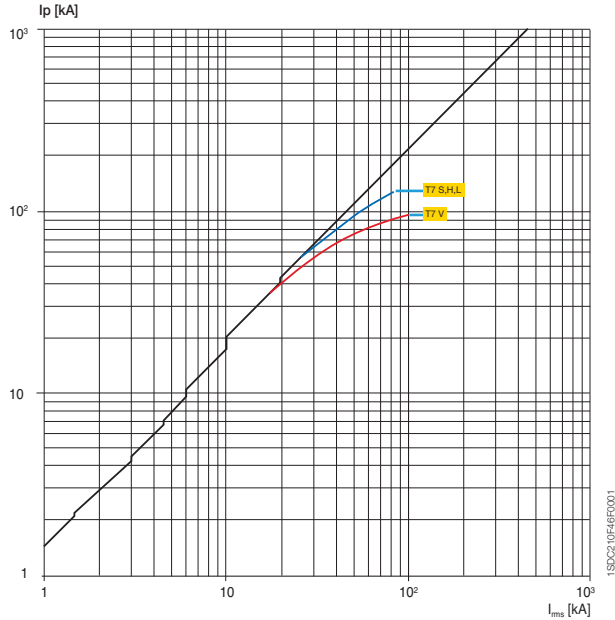
T6 630/800/1000

500 V



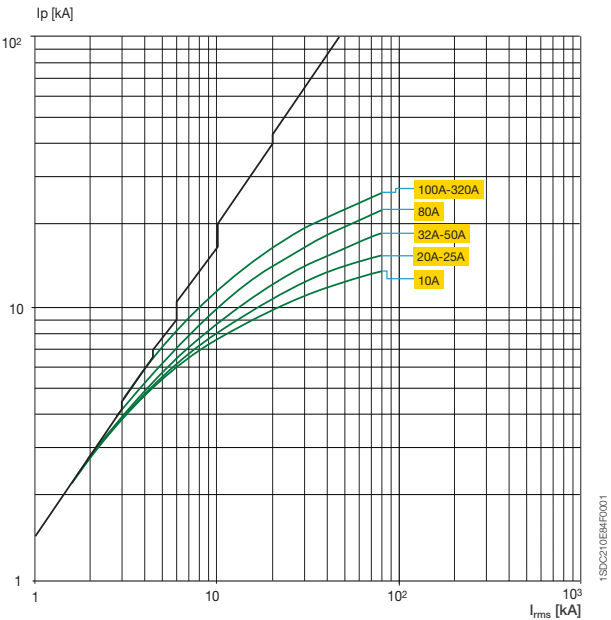
T7 800/1000/1250/1600

500 V



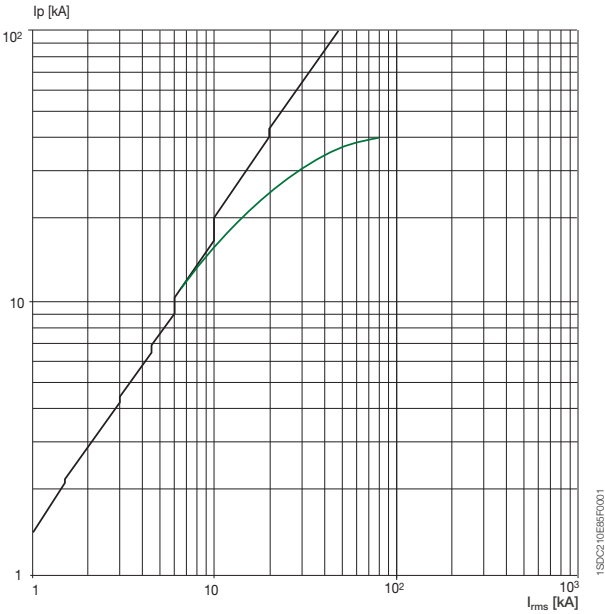
T4 250/320

690 V

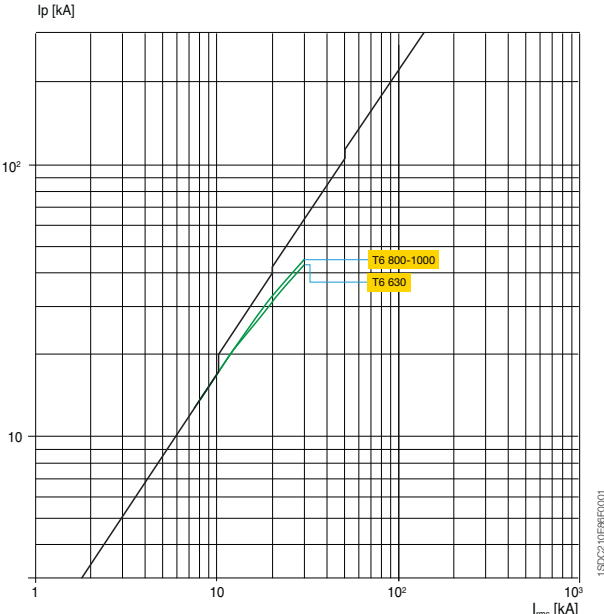


# Limitation curves

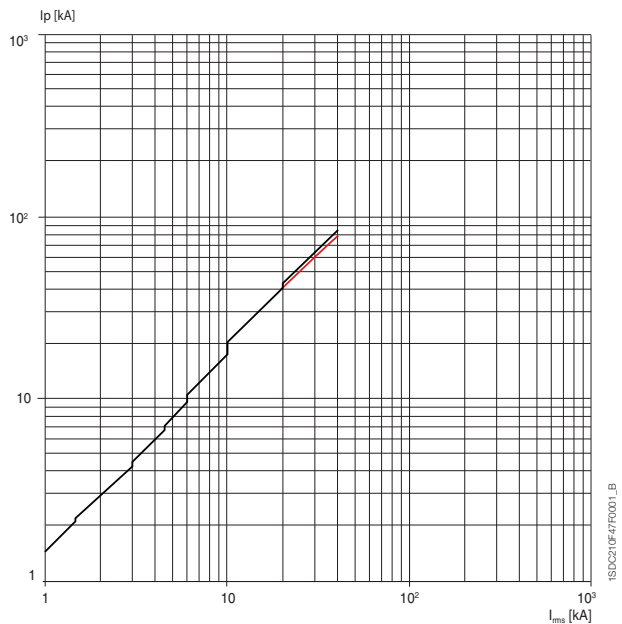
T5 400/630  
690 V



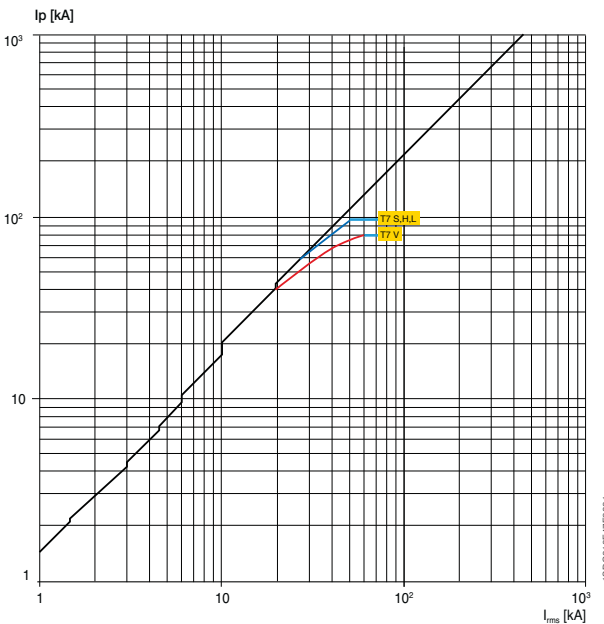
T6 630/800/1000  
690 V



T6 V 630/800  
690 V

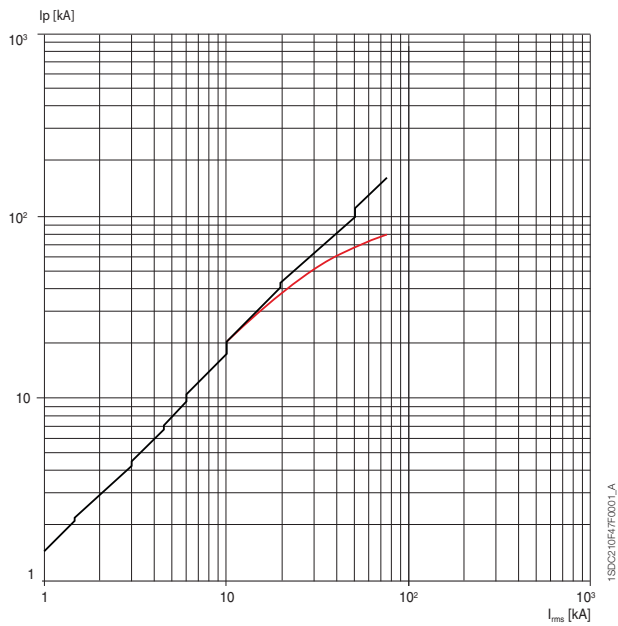


T7 800/1000/1250/1600  
690 V



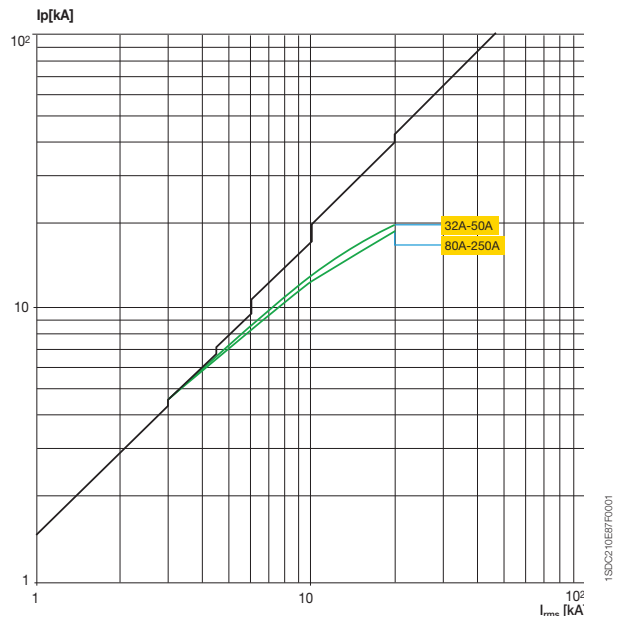
### T7 X 800

690 V



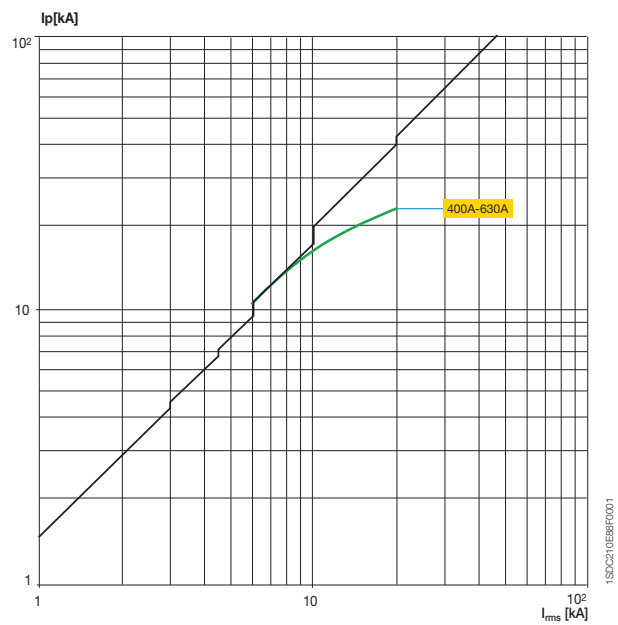
### T4 250

1000 V



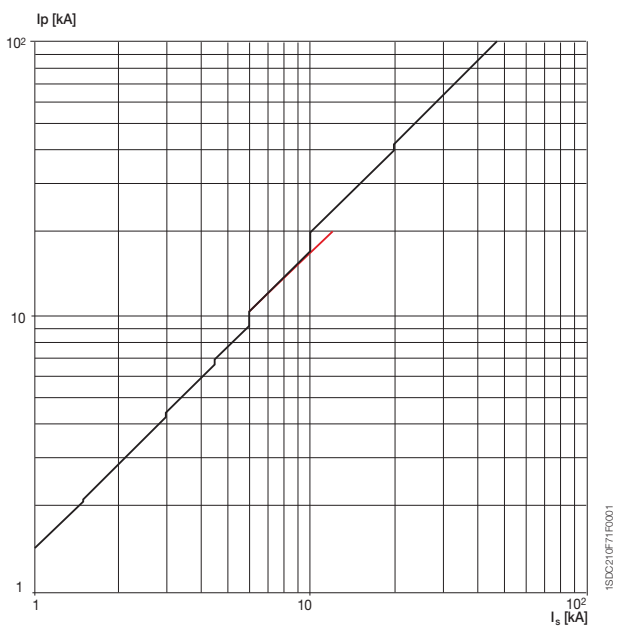
### T5 400/630

1000 V



### T6

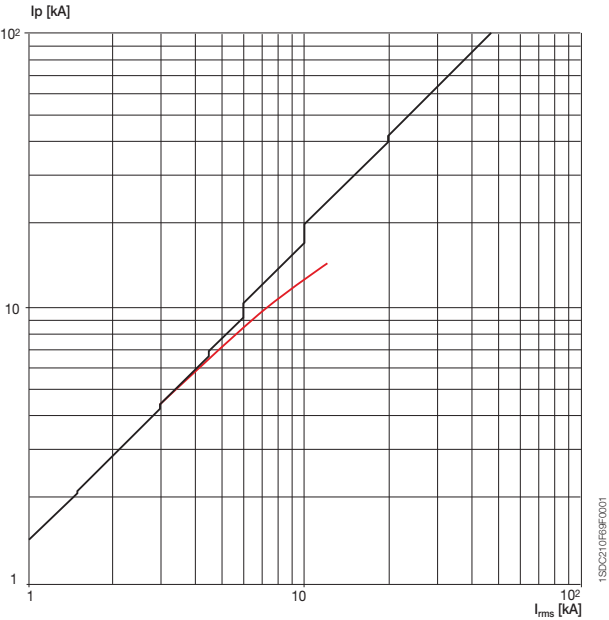
1000 V



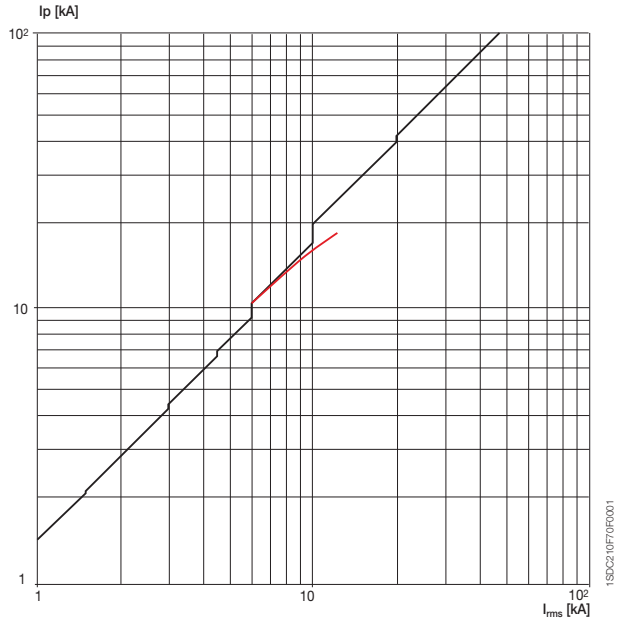
# Limitation curves

T4 250  
1150 V

4



T5 400/630  
1150 V



# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

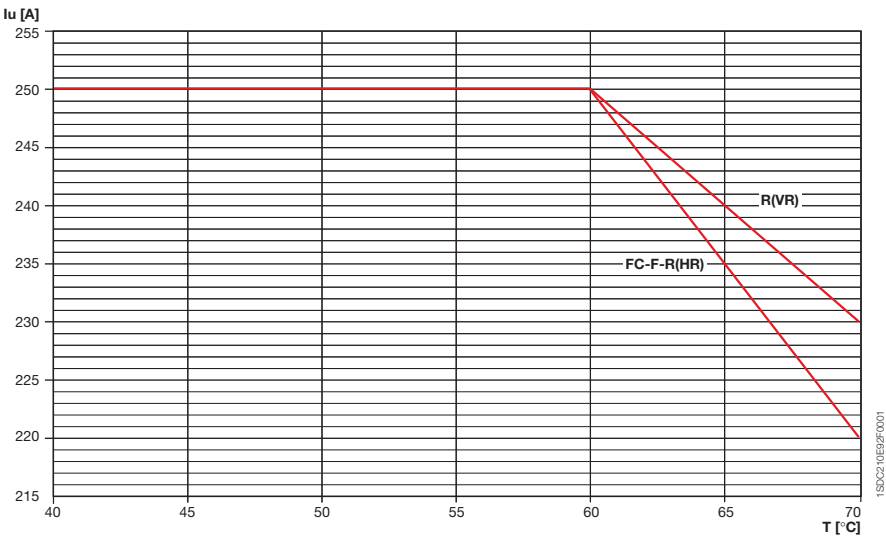
T4 250 and T4D 250  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
FC	250	1	250	1	250	1	220	0.88
F	250	1	250	1	250	1	220	0.88
R (HR)	250	1	250	1	250	1	220	0.88
R (VR)	250	1	250	1	250	1	230	0.92

FC = Front cables terminals  
R (VR) = Rear terminals (vertical)

F = Front flat terminals

R (HR) = Rear terminals (horizontal)



4

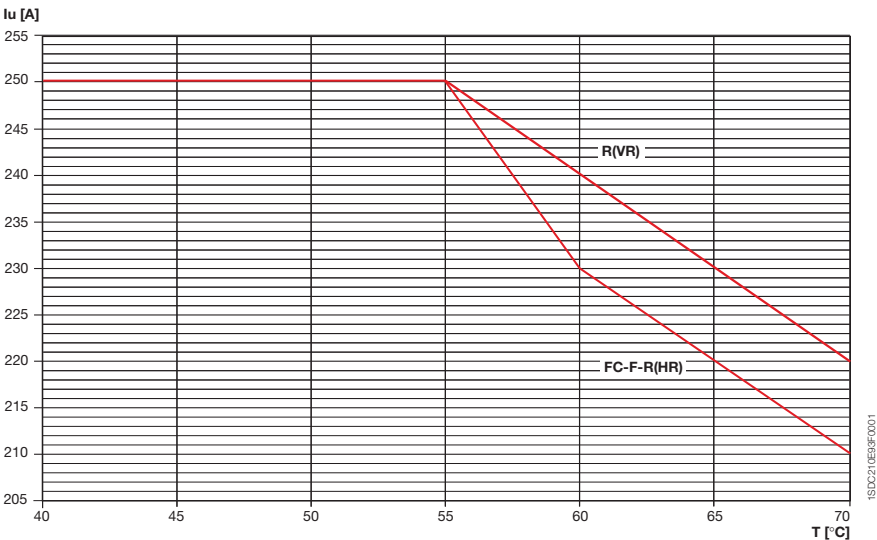
T4 250 and T4D 250  
Plug-in /  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
FC	250	1	250	1	230	0.92	210	0.84
F	250	1	250	1	230	0.92	210	0.84
HR	250	1	250	1	230	0.92	210	0.84
VR	250	1	250	1	240	0.96	220	0.88

FC = Front cables terminals  
VR = Rear flat vertical terminals

F = Front flat terminals

HR = Rear flat horizontal terminals



# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

### T4 320 and T4D 320

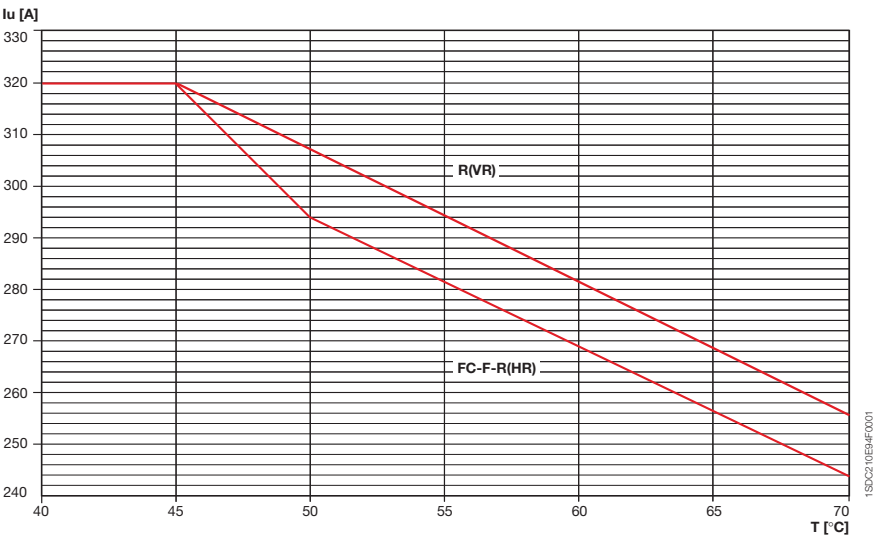
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$
FC	320	1	294	0.92	269	0.84	243	0.76
F	320	1	294	0.96	269	0.84	243	0.76
R (HR)	320	1	294	0.92	269	0.84	243	0.76
R (VR)	320	1	307	0.96	281	0.88	256	0.80

FC = Front cables terminals  
R (VR) = Rear terminals (vertical)

F = Front flat terminals

R (HR) = Rear terminals (horizontal)



1SDC210B94F0001

### T4 320 and T4D 320

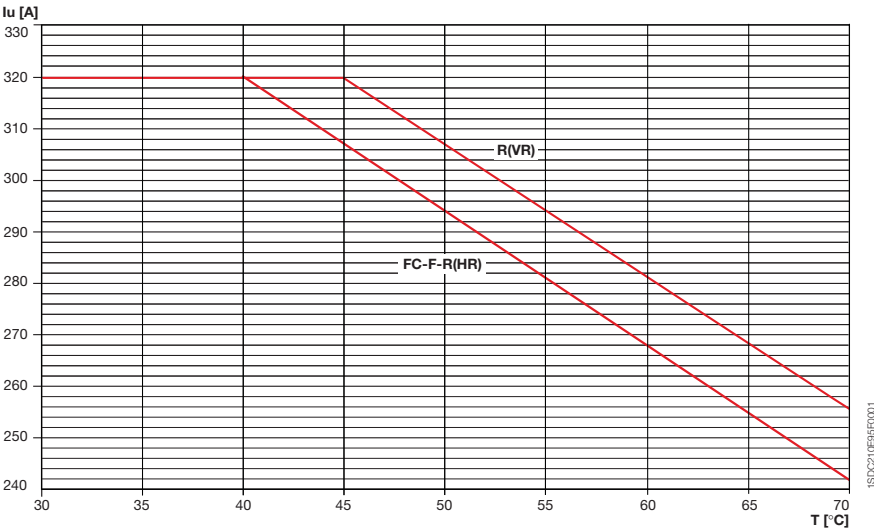
Plug-in /  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$
FC	320	1	294	0.92	268	0.84	242	0.76
F	320	1	294	0.92	268	0.84	242	0.76
HR	320	1	294	0.92	268	0.84	242	0.76
VR	320	1	307	0.96	282	0.88	256	0.80

FC = Front cables terminals  
VR = Rear flat vertical terminals

F = Front flat terminals

HR = Rear flat horizontal terminals



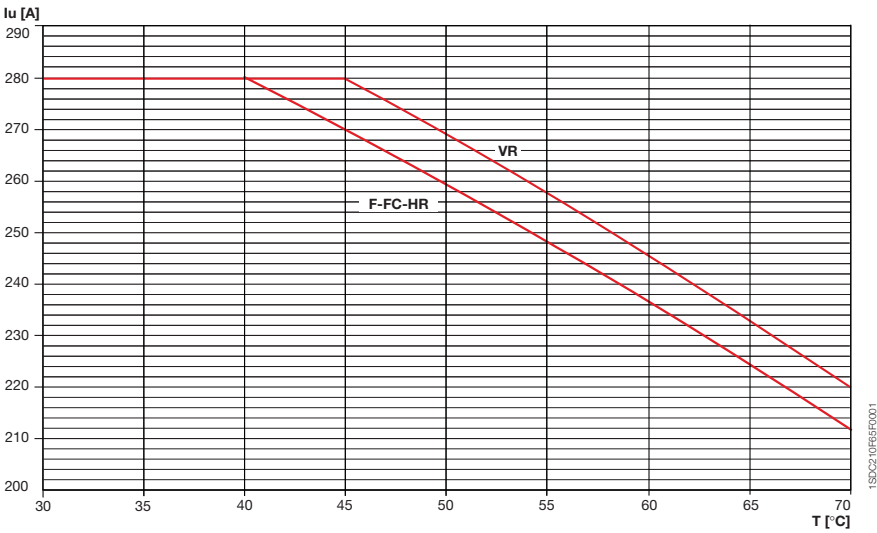
1SDC210B94F0001



T4 320 and T4D 320  
 Plug-in /  
 Withdrawable  
 with RC222

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
FC	282	0.88	262	0.82	230	0.72	212	0.66
F	282	0.88	262	0.82	230	0.72	212	0.66
HR	282	0.88	262	0.82	230	0.72	212	0.66
VR	282	0.88	269	0.82	250	0.78	224	0.70

FC = Front cables terminals  
 VR = Rear flat vertical terminals  
 F = Front flat terminals  
 HR = Rear flat horizontal terminals



# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

### T5 400 and T5D 400

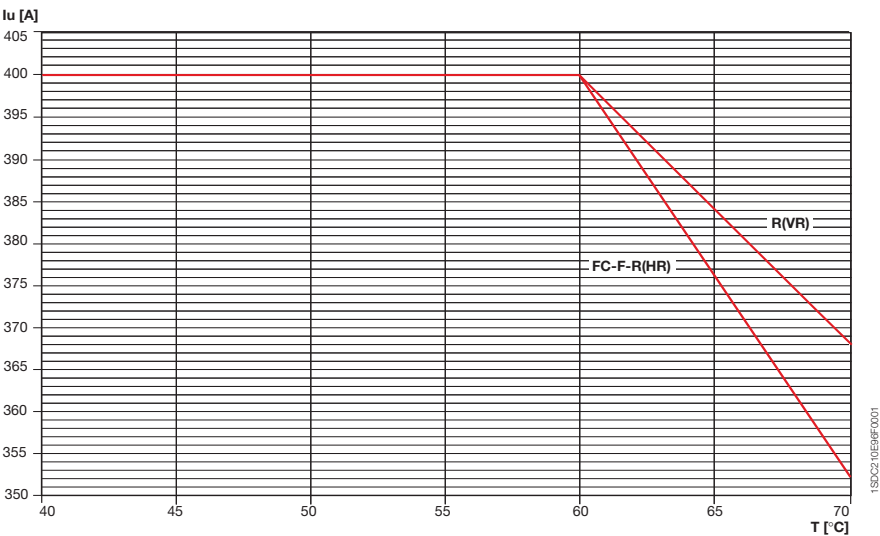
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$
FC	400	1	400	1	400	1	352	0.88
F	400	1	400	1	400	1	352	0.88
R (HR)	400	1	400	1	400	1	352	0.88
R (VR)	400	1	400	1	400	1	368	0.92

FC = Front cables terminals  
R (VR) = Rear terminals (vertical)

F = Front flat terminals

R (HR) = Rear terminals (horizontal)



### T5 400 and T5D 400

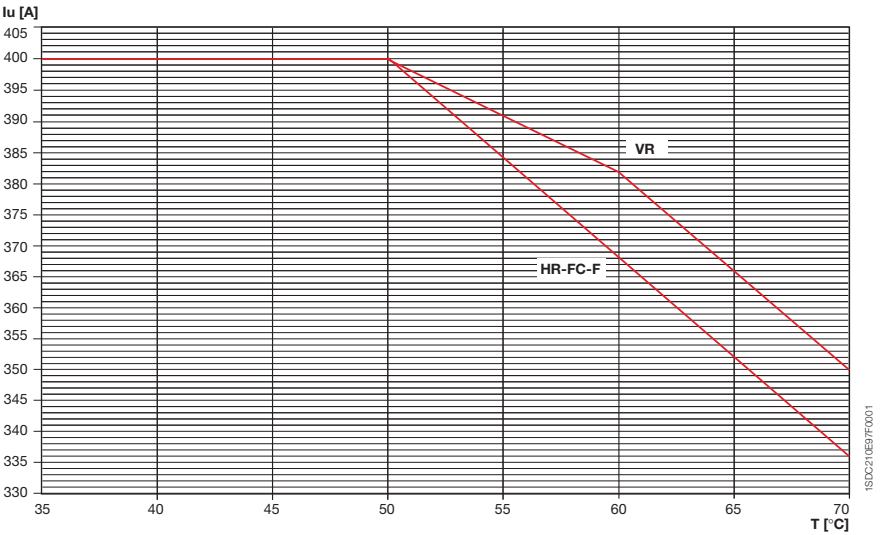
Plug-in /  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$
FC	400	1	400	1	368	0.92	336	0.84
F	400	1	400	1	368	0.92	336	0.84
HR	400	1	400	1	368	0.92	336	0.84
VR	400	1	400	1	382	0.96	350	0.88

FC = Front cables terminals  
VR = Rear flat vertical terminals

F = Front flat terminals

HR = Rear flat horizontal terminals



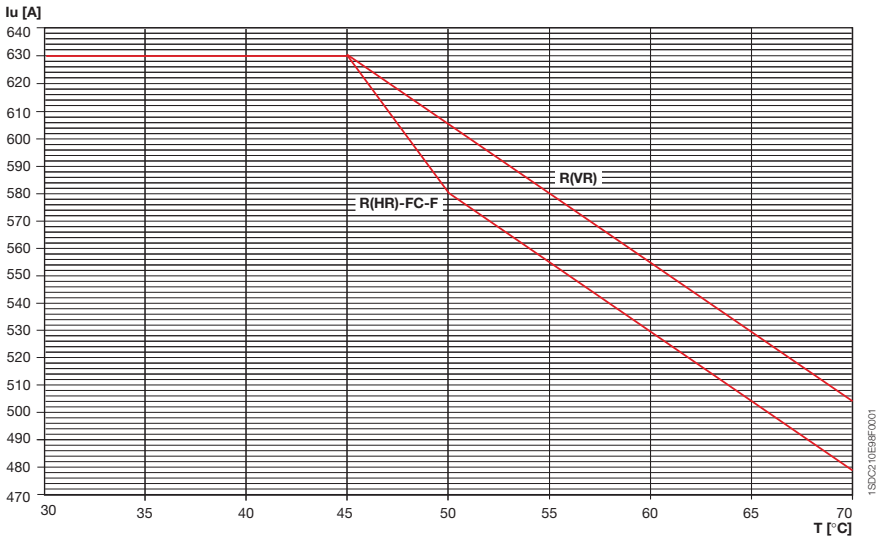
T5 630 and T5D 630  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
FC	630	1	580	0.92	529	0.84	479	0.76
F	630	1	580	0.92	529	0.84	479	0.76
R (HR)	630	1	580	0.92	529	0.84	479	0.76
R (VR)	630	1	605	0.96	554	0.88	504	0.80

FC = Front cables terminals  
R (VR) = Rear terminals (vertical)

F = Front flat terminals

R (HR) = Rear terminals (horizontal)



4

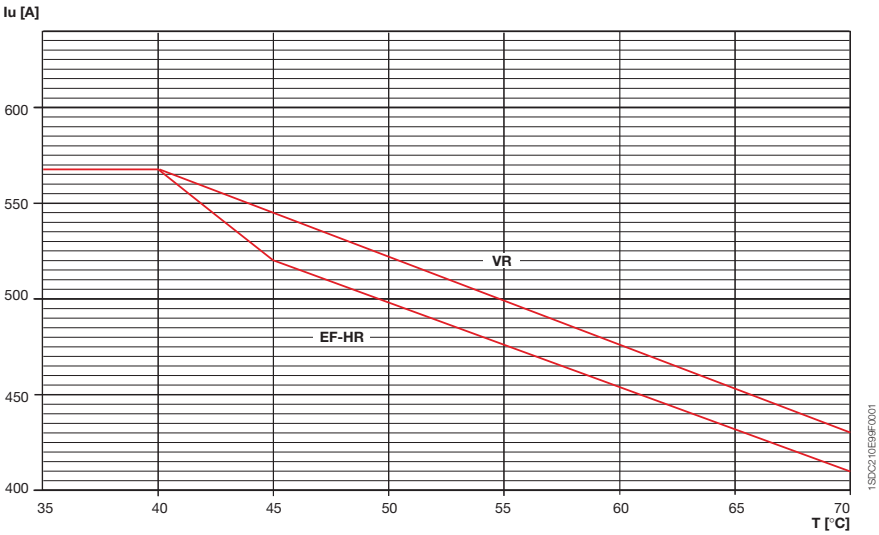
T5 630 and T5D 630  
Plug-in /  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
EF	567	0.9	502	0.80	458	0.72	409	0.64
HR	567	0.9	502	0.80	458	0.72	409	0.64
VR	567	0.9	526	0.82	480	0.76	429	0.68

EF = Front extended terminals

HR = Rear flat horizontal terminals

VR = Rear flat vertical terminals



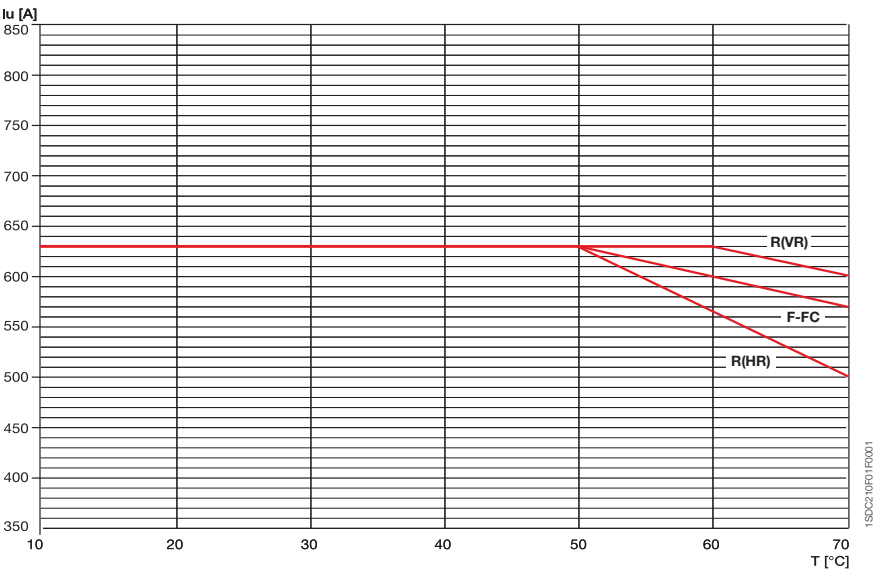
# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

T6 630 and T6D 630  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
FC - F	630	1	630	1	598.5	0.95	567	0.9
R (VR)	630	1	630	1	630	1	598.5	0.95
R (HR)	630	1	630	1	567	0.9	504	0.8

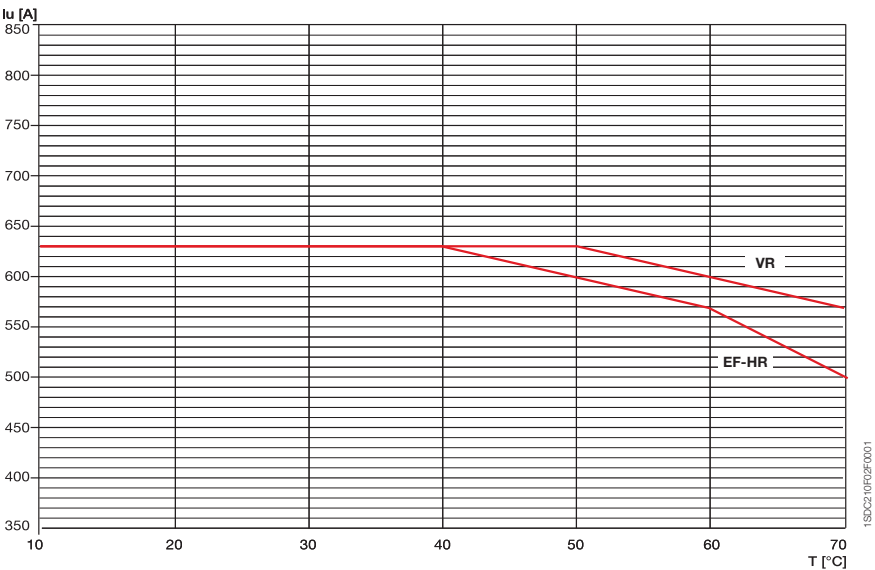
FC = Front cables terminals      F = Front flat terminals      R (HR) = Rear terminals (horizontal)  
R (VR) = Rear terminals (vertical)



T6 630 and T6D 630  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
EF	630	1	598.5	0.95	567	0.9	504	0.8
VR	630	1	630	1	598.5	0.95	567	0.9
HR	630	1	598.5	0.95	567	0.9	504	0.8

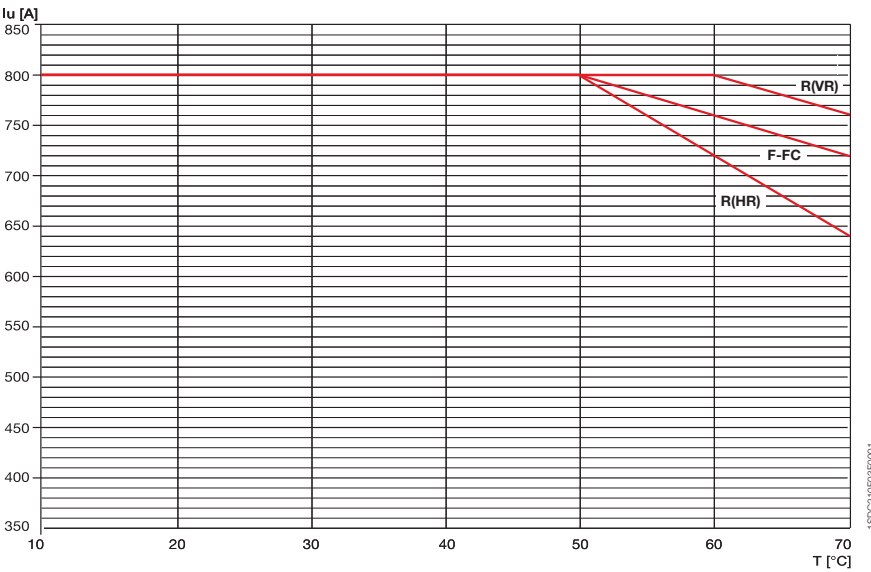
EF = Front extended terminals      HR = Rear flat horizontal terminals      VR = Rear flat vertical terminals



T6 800 and T6D 800  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
FC - F	800	1	800	1	760	0.95	720	0.9
R (VR)	800	1	800	1	800	1	760	0.95
R (HR)	800	1	800	1	720	0.9	640	0.8

FC = Front cables terminals      F = Front flat terminals      R (HR) = Rear terminals (horizontal)  
R (VR) = Rear terminals (vertical)

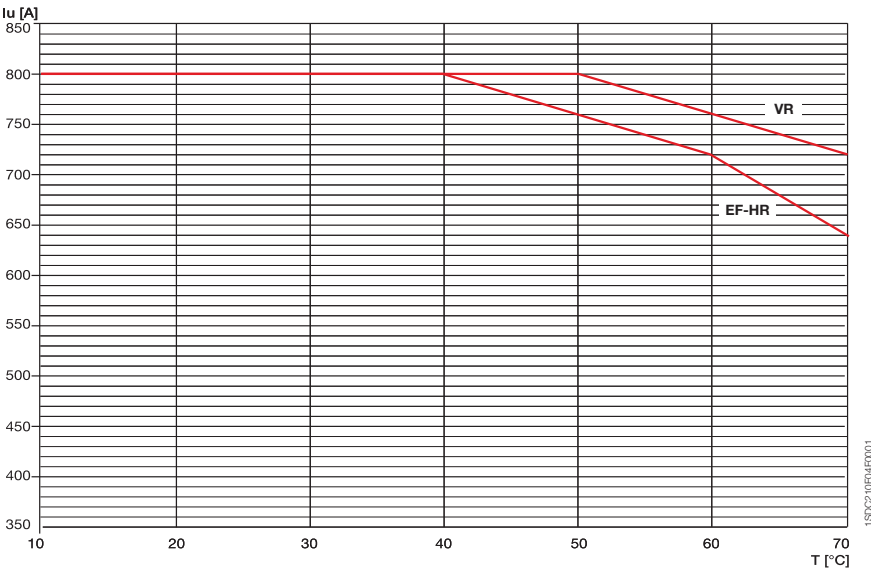


4

T6 800 and T6D 800  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
EF	800	1	760	0.95	720	0.9	640	0.8
VR	800	1	800	1	760	0.95	720	0.9
HR	800	1	760	0.95	720	0.9	640	0.8

EF = Front extended terminals      HR = Rear flat horizontal terminals      VR = Rear flat vertical terminals



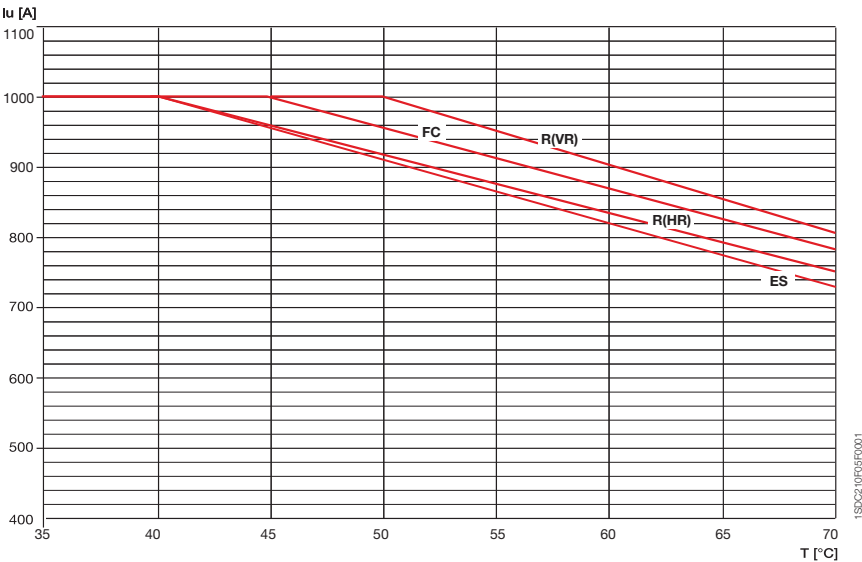
# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

T6 1000 and  
T6D 1000  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
FC	1000	1	960	0.96	877	0.88	784	0.78
R (HR)	1000	1	926	0.93	845	0.85	756	0.76
R (VR)	1000	1	1000	1	913	0.91	817	0.82
ES	1000	1	900	0.90	820	0.82	720	0.72

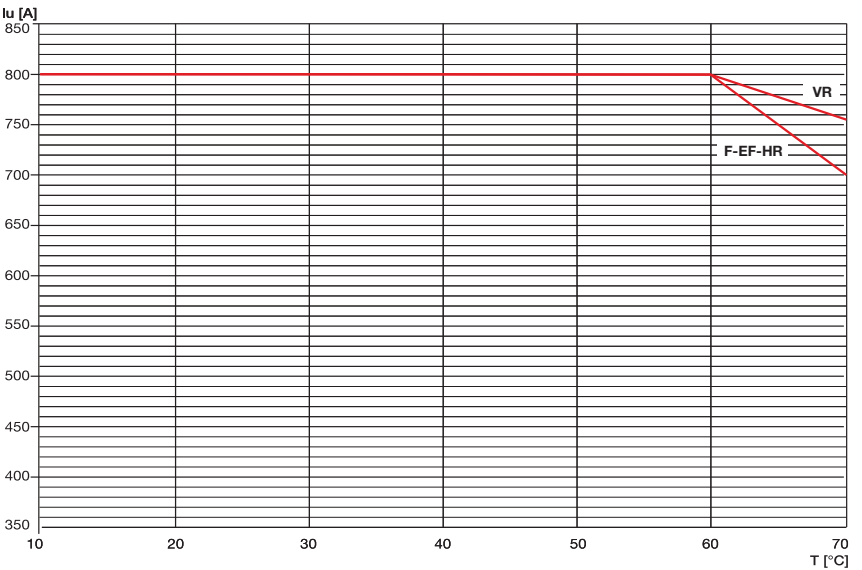
FC = Front cables terminals  
ES = Front extended spread terminals  
R (HR) = Rear terminals (horizontal)  
R (VR) = Rear terminals (vertical)



T7 S, H, L 800  
and T7D 800  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
VR	800	1	800	1	800	1	755	0.94
F-EF-HR	800	1	800	1	800	1	700	0.87

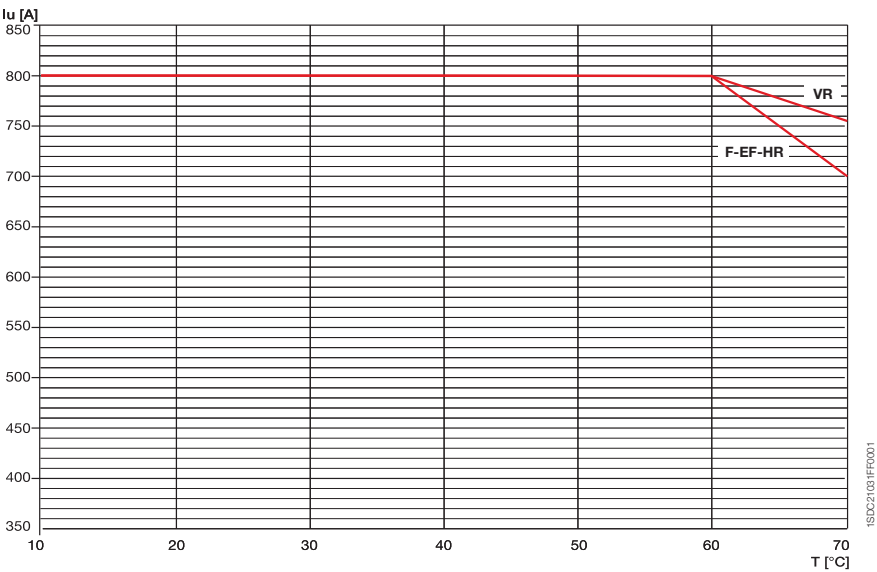
VR = Rear flat vertical  
HR = Rear flat horizontal  
F = Front flat terminals  
EF = Extended front



T7 V 800  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>f</sub>	I <sub>max</sub> [A]	I <sub>f</sub>	I <sub>max</sub> [A]	I <sub>f</sub>	I <sub>max</sub> [A]	I <sub>f</sub>
VR	800	1	800	1	800	1	755	0.94
F-EF-HR	800	1	800	1	800	1	700	0.87

VR = Rear flat vertical  
HR = Rear flat horizontal  
F = Front flat terminals  
EF = Extended front

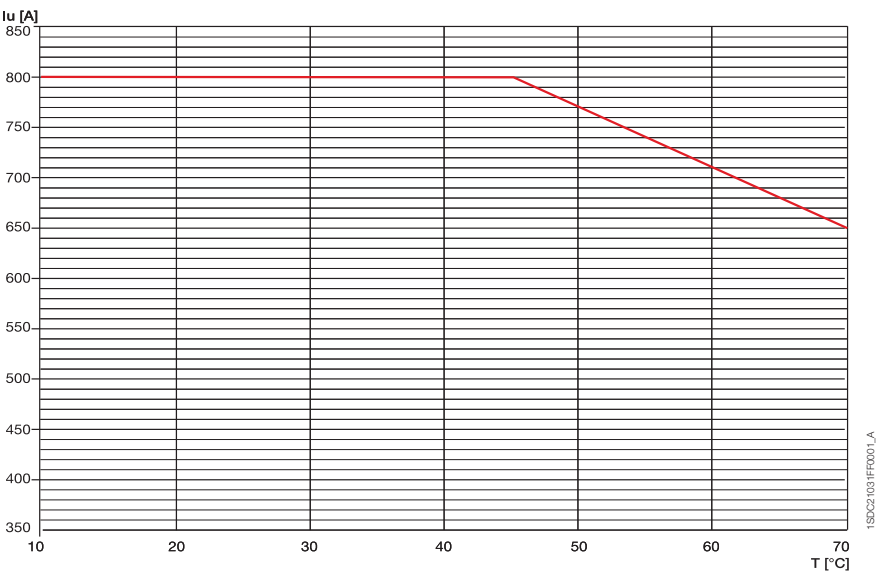


4

T7 X 800  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>f</sub>	I <sub>max</sub> [A]	I <sub>f</sub>	I <sub>max</sub> [A]	I <sub>f</sub>	I <sub>max</sub> [A]	I <sub>f</sub>
F-EF-FC-HR-VR	800	1	773	0.97	716	0.90	653	0.82

F = Front terminals  
HR=Rear flat horizontal  
EF = Extended front terminals  
VR=Rear flat vertical  
FC = Front cable terminals



# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

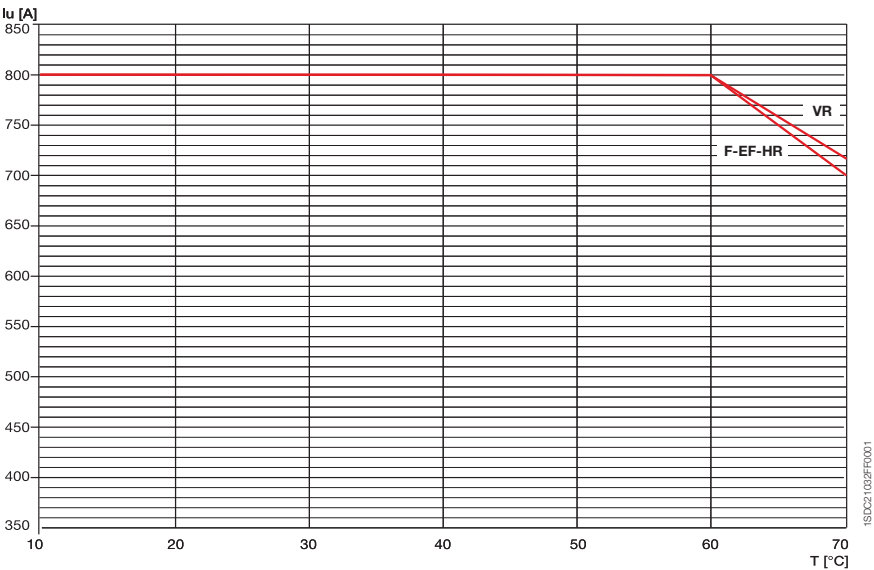
T7 S, H, L 800  
and T7D 800  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
VR	800	1	800	1	800	1	718	0.89
F-EF-HR	800	1	800	1	800	1	700	0.87

VR = Rear flat vertical  
HR = Rear flat horizontal

F = Front flat terminals

EF = Extended front



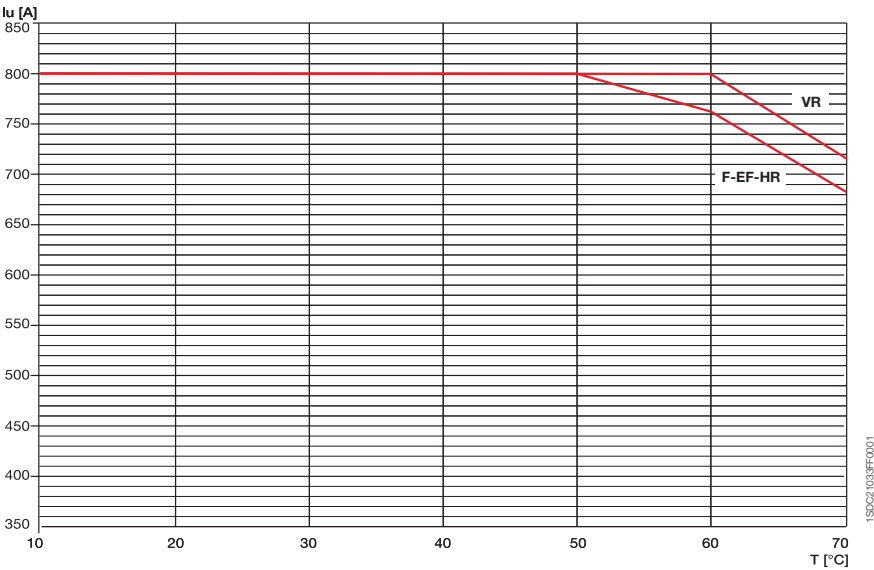
T7 V 800  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>	I <sub>max</sub> [A]	I <sub>n</sub>
VR	800	1	800	1	800	1	716	0.89
F-EF-HR	800	1	800	1	763	0.95	682	0.85

VR = Rear flat vertical  
HR = Rear flat horizontal

F = Front flat terminals

EF = Extended front





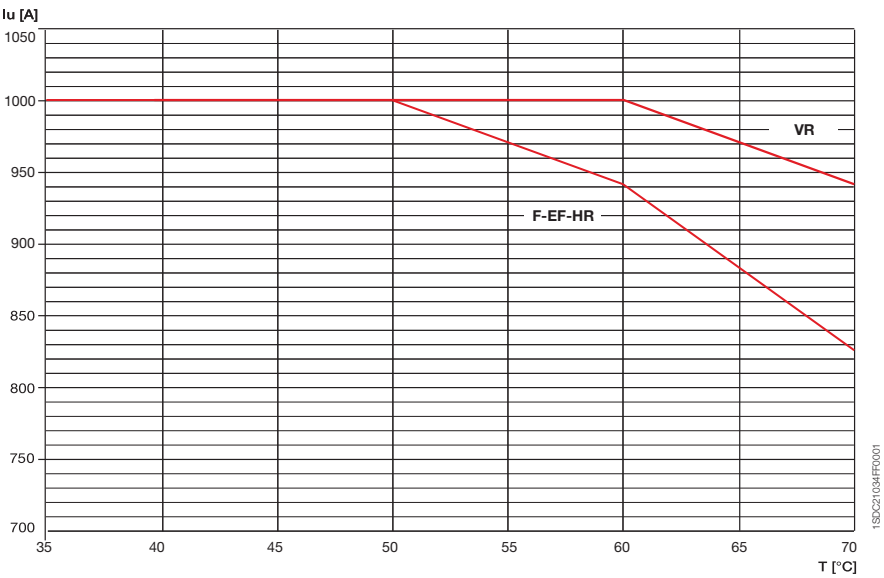
T7 S, H, L 1000  
and T7D 1000  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
VR	1000	1	1000	1	1000	1	942	0.94
F-EF-HR	1000	1	1000	1	942	0.94	827	0.83

VR = Rear flat vertical  
HR = Rear flat horizontal

F = Front flat terminals

EF = Extended front



4

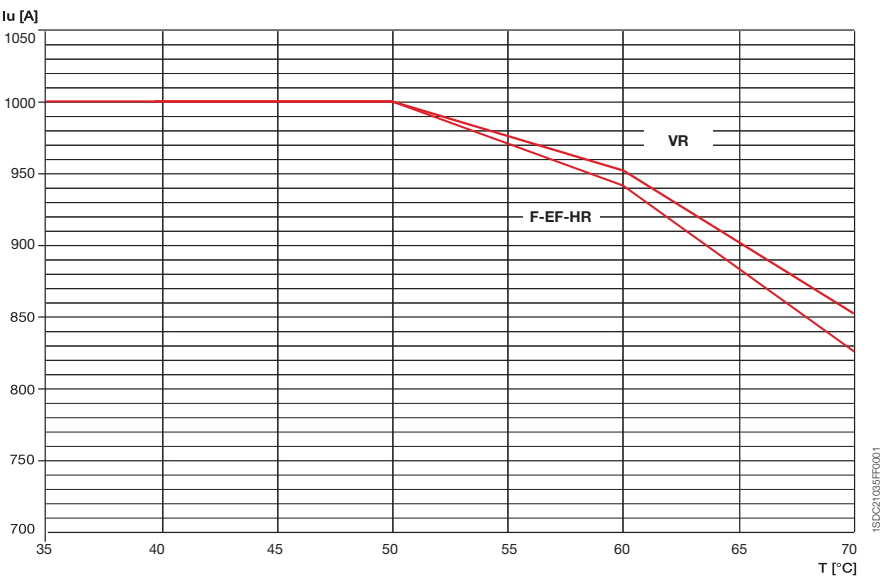
T7 S, H, L 1000  
and T7D 1000  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
VR	1000	1	1000	1	952	0.95	852	0.85
F-EF-HR	1000	1	1000	1	942	0.94	827	0.83

VR = Rear flat vertical  
HR = Rear flat horizontal

F = Front flat terminals

EF = Extended front



# Temperature performances

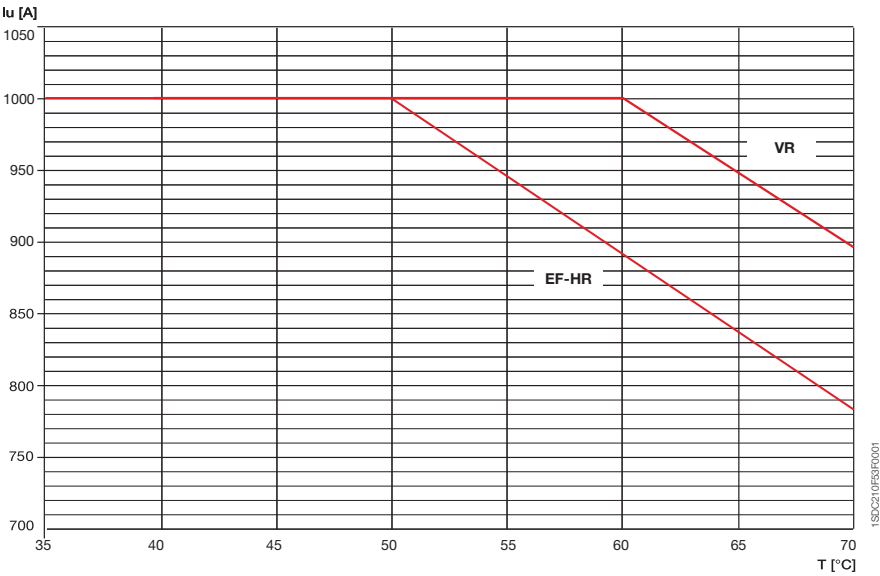
## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

T7 V 1000  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$
VR	1000	1	1000	1.00	1000	1.00	894	0.89
EF-HR	1000	1	1000	1.00	895	0.89	784	0.78

EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal

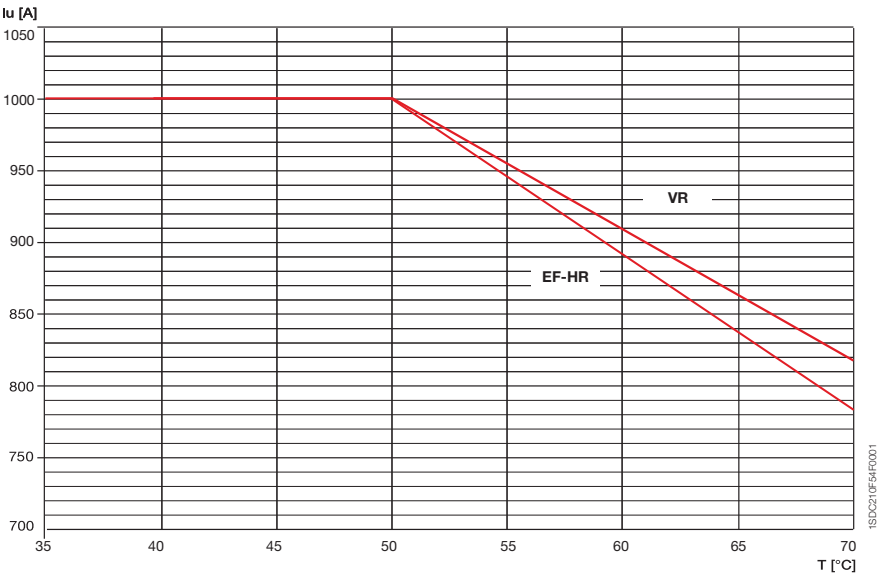
**Note:** For ratings below 1000 A T<sub>max</sub> T7 does not undergo any thermal derating.



T7 V 1000  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$	$I_{max}$ [A]	$I_n$
VR	1000	1	1000	1.00	913	0.91	816	0.82
EF-HR	1000	1	1000	1.00	895	0.89	784	0.78

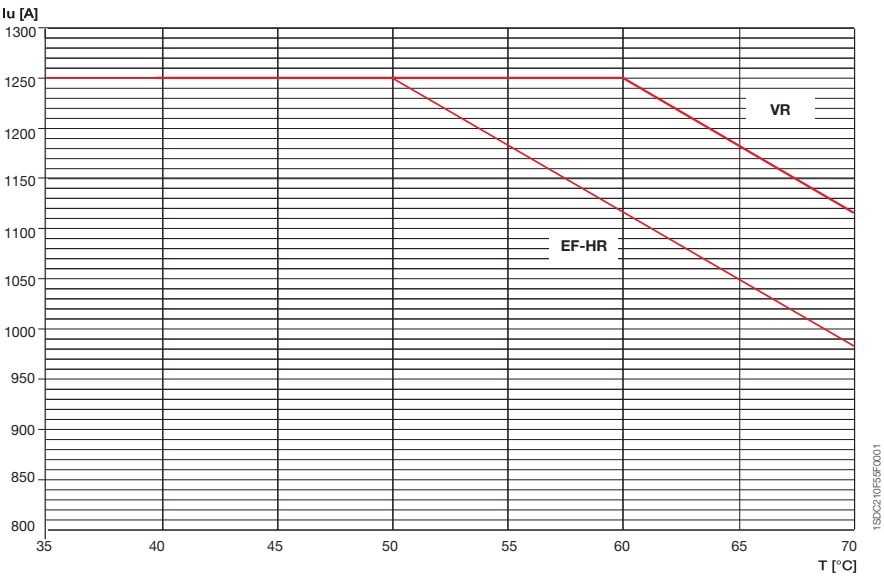
EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal



T7 S, H, L 1250  
and T7D 1250  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
VR	1250	1	1250	1.00	1250	1.00	1118	0.89
EF-HR	1250	1	1250	1.00	1118	0.89	980	0.78

EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal

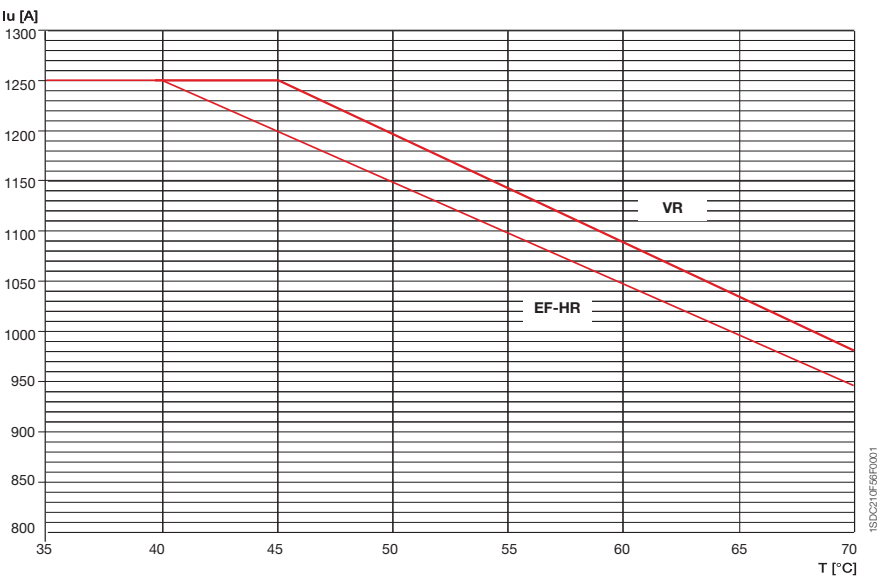


4

T7 V 1250  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>	I <sub>max</sub> [A]	I <sub>L</sub>
VR	1250	1	1201	0.96	1096	0.88	981	0.78
EF-HR	1250	1	1157	0.93	1056	0.85	945	0.76

EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal



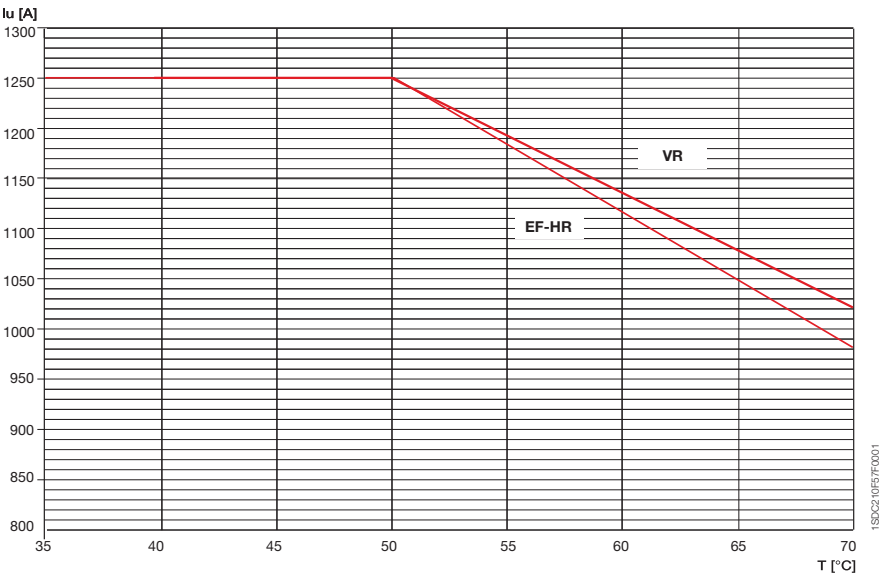
# Temperature performances

## Circuit-breakers with magnetic only or electronic trip units and switch-disconnectors

T7 S, H, L 1250  
and T7D 1250  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_t$	$I_{max}$ [A]	$I_t$	$I_{max}$ [A]	$I_t$	$I_{max}$ [A]	$I_t$
VR	1250	1	1250	1.00	1141	0.91	1021	0.82
EF-HR	1250	1	1250	1.00	1118	0.89	980	0.78

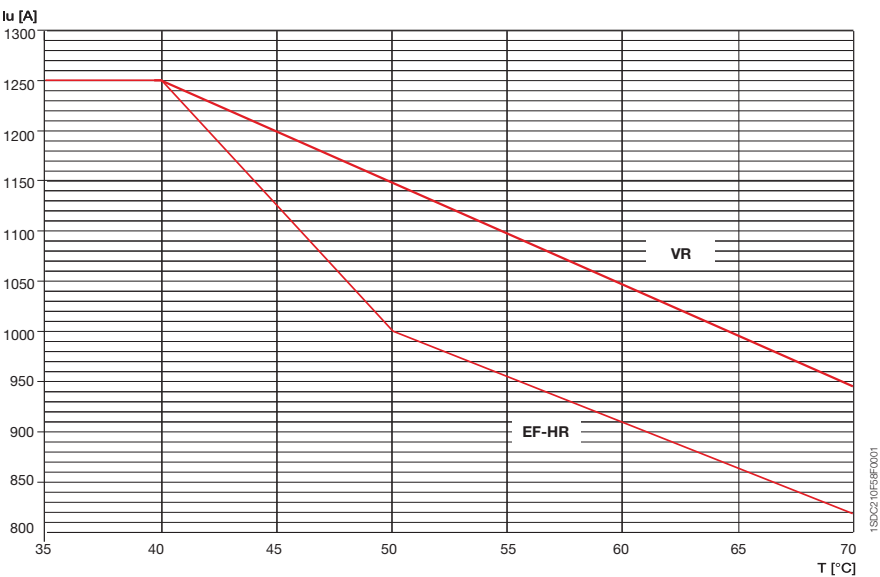
EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal



T7 V 1250  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	$I_{max}$ [A]	$I_t$	$I_{max}$ [A]	$I_t$	$I_{max}$ [A]	$I_t$	$I_{max}$ [A]	$I_t$
VR	1250	1	1157	0.93	1056	0.85	945	0.76
EF-HR	1250	1	1000	0.80	913	0.73	816	0.65

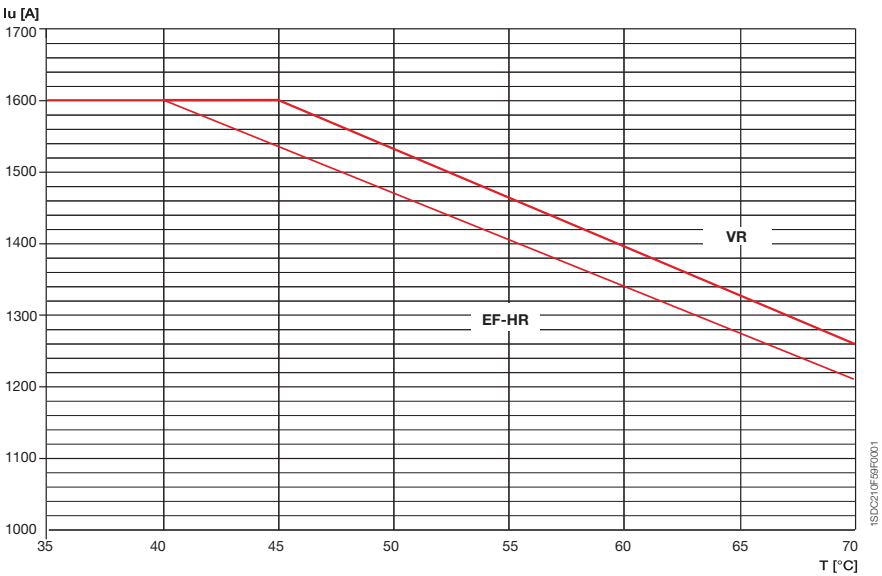
EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal



T7 S, H, L 1600  
and T7D 1600  
Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>t</sub>	I <sub>max</sub> [A]	I <sub>t</sub>	I <sub>max</sub> [A]	I <sub>t</sub>	I <sub>max</sub> [A]	I <sub>t</sub>
VR	1600	1	1537	0.96	1403	0.88	1255	0.78
EF-HR	1600	1	1481	0.93	1352	0.85	1209	0.76

EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal

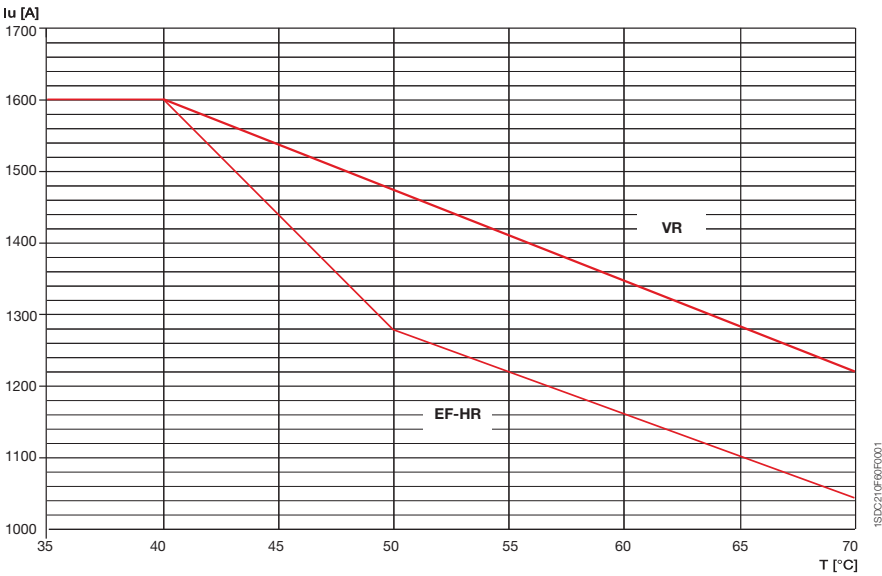


4

T7 S, H, L 1600  
and T7D 1600  
Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	I <sub>max</sub> [A]	I <sub>t</sub>	I <sub>max</sub> [A]	I <sub>t</sub>	I <sub>max</sub> [A]	I <sub>t</sub>	I <sub>max</sub> [A]	I <sub>t</sub>
VR	1600	1	1481	0.93	1352	0.85	1209	0.76
EF-HR	1600	1	1280	0.80	1168	0.73	1045	0.65

EF = Extended front                      VR = Rear flat vertical                      HR = Rear flat horizontal



# Temperature performances

## Circuit-breakers with thermomagnetic trip units

### Tmax T4

	10 °C		20 °C		30 °C		40 °C		50 °C		60 °C		70 °C	
In [A]	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
20	19	27	18	24	16	23	13	20	12	17	10	15	8	13
32	26	43	24	39	22	36	20	32	16	27	14	24	11	21
50	37	62	35	58	33	54	32	50	27	46	25	42	22	39
80	59	98	55	92	52	86	50	80	44	74	40	66	32	58
100	83	118	80	113	74	106	70	100	66	95	59	85	49	75
125	103	145	100	140	94	134	88	125	80	115	73	105	63	95
160	130	185	124	176	118	168	112	160	106	150	100	140	90	130
200	162	230	155	220	147	210	140	200	133	190	122	175	107	160
250	200	285	193	275	183	262	175	250	168	240	160	230	150	220

### Tmax T5

	10 °C		20 °C		30 °C		40 °C		50 °C		60 °C		70 °C	
In [A]	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
320	260	368	245	350	234	335	224	320	212	305	200	285	182	263
400	325	465	310	442	295	420	280	400	265	380	250	355	230	325
500	435	620	405	580	380	540	350	500	315	450	280	400	240	345

### Tmax T6

	10 °C		20 °C		30 °C		40 °C		50 °C		60 °C		70 °C	
In [A]	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
630	520	740	493	705	462	660	441	630	405	580	380	540	350	500
800	685	965	640	905	605	855	560	800	520	740	470	670	420	610

# Power losses

Power [W/pole]	In [A]	T4		T5		T6		T7 S, H, L		T7 V		T7 x
		F	P/W	F	P/W	F	W	F	W	F	W	F
TMD	20	3.6	3.6									
TMA	25											
TMG	32	3.7	3.7									
MF	40											
MA	50	3.9	4.1									
	63											
	80	4.6	5									
	100	5.2	5.8									
	125	6.2	7.2									
	160	7.4	9									
	200	9.9	12.4									
	250	13.7	17.6									
	320			13.6	20.9							
	400			19.5	31							
	500			28.8	36.7							
	630					30.6	39					
	800					31	39.6					
PR22..	100	1.7	2.3									
PR23..	160	4.4	6									
PR33..	250	10.7	14.6									
	320	17.6	24	10.6	17.9							
	400			16.5	28			5	9	8	12	
	630			41	53.6	30	38.5	12	22	20	30	
	800					32	41.6	19.3	35.3	32	48	35
	1000					50		30	55	50	75	
	1250							47	86	78.3	117.3	
	1600							77	141			

# Magnetic trip values

4

	Release	$I_n$ [A]	$I_3$ [A]	Single-phase trip current (% $I_3$ ) <sup>(1)</sup>
<b>T4 250/320</b>	TMD	20...50	320...500	150%
	TMA	80...250	400...2500	150%
	MA	10...200	60...2800	150%
	PR221DS	100...320	1...10 x $I_n$	100%
	PR222DS/P-PR222DS/PD	100...320	1...12 x $I_n$	100%
	PR223DS	100...320	1.5...12 x $I_n$	100%
<b>T5 400/630</b>	TMG	320...500	1600...2500	150%
	TMA	320...500	3200...5000	150%
	PR221DS	320...630	1...10 x $I_n$	100%
	PR222DS/P-PR222DS/PD	320...630	1...12 x $I_n$	100%
	PR223DS	320...630	1.5...12 x $I_n$	100%
<b>T6 630/800/1000</b>	TMA	630...800	3150...8000	150%
	PR221DS	630...1000	1...10 x $I_n$	100%
	PR222DS/P-PR222DS/PD	630...1000	1...12 x $I_n$	100%
	PR223DS	630...1000	1.5...12 x $I_n$	100%
<b>T7 800/1000/1250/1600</b>	PR231/P-PR232/P	400...1600	1.5...12 x $I_n$	100%
	PR331/P-PR332/P	400...1600	1.5...15 x $I_n$	100%

$I_3$  = instantaneous trip current  
 TMD = thermomagnetic release with adjustable thermal and fixed magnetic threshold  
 TMA = thermomagnetic release with adjustable thermal and magnetic threshold  
 TMG = thermomagnetic release for generator protection  
 PR22\_, PR23\_, PR33\_ = electronic releases

<sup>(1)</sup> Requirements of the IEC 60947-2 Standard, section 8.3.3.1.2



# Special applications

## Use of apparatus at 16 2/3 Hz

Single phase distribution with a frequency of 16 2/3 Hz was developed for electrical traction systems as an alternative to three phase 50 Hz systems, and to direct current systems. At low frequencies the thermal tripping threshold is not subject to any derating, while the magnetic threshold requires a correction coefficient  $k_m$ .

The Tmax series thermomagnetic moulded-case circuit-breakers are suitable for use with frequencies of 16 2/3 Hz; the electrical performance and the relevant connection diagrams are shown below.

Breaking capacity [kA]					
Circuit-breaker	Rated current	Breaking capacity [kA]			
	[A]	250 V	500 V	750 V	1000 V <sup>(1)</sup>
TT4N250/320	20 ÷ 250	36 (2P)	25 (2P)	16 (3P)	-
T4S250/320	20 ÷ 250	50 (2P)	36 (2P)	25 (3P)	-
T4H250/320	20 ÷ 250	70 (2P)	50 (2P)	36 (3P)	-
T4L250/320	20 ÷ 250	100 (2P)	70 (2P)	50 (3P)	-
T4V250/320	20 ÷ 250	150 (2P)	100 (2P)	70 (3P)	-
T4V250	32 ÷ 250				40 (4P)
T5N400/630	320 ÷ 500	36 (2P)	25 (2P)	16 (3P)	-
T5S400/630	320 ÷ 500	50 (2P)	36 (2P)	25 (3P)	-
T5H400/630	320 ÷ 500	70 (2P)	50 (2P)	36 (3P)	-
T5L400/630	320 ÷ 500	100 (2P)	70 (2P)	50 (3P)	-
T5V400/630	320 ÷ 500	150 (2P)	100 (2P)	70 (3P)	-
T5V400/630	400 ÷ 500				40 (4P)
T6N630/800	630 ÷ 800	36 (2P)	20 (2P)	16 (3P)	-
T6S630/800	630 ÷ 800	50 (2P)	35 (2P)	20 (3P)	-
T6H630/800	630 ÷ 800	70 (2P)	50 (2P)	36 (3P)	-
T6L630/800	630 ÷ 800	100 (2P)	70 (2P)	50 (3P)	40 (4P)
T6V630/500	630 ÷ 500	100 (2P)	70 (2P)	50 (3P)	40 (4P)

<sup>(1)</sup> 1000V version circuit-breakers in dc, with neutral at 100%.

<sup>(2)</sup> Circuit-breakers with neutral at 100%.

$k_m$ factor			
	Diagram A	Diagram B-C	Diagram D-E-F
T4	0.9	0.9	0.9
T5	0.9	0.9	0.9
T6	0.9	0.9	0.9

### Possible connections according to the voltage, the type of distribution and the type of fault

	Neutral not grounded	Neutral grounded*	
		L-N fault	L-E fault
250 V 2 poles in series	A1	A2	B2
500 V 2 poles in series	A1	A2, B2	B2, C
750 V 3 poles in series	B1	B2, C	C
1000 V 4 poles in series	E-F	E1, C3	E1

\* In the case of the only possible faults being L-N or L-E (E=Earth) with non-significant impedance, use the diagrams shown. If both faults are possible, use the diagrams valid for L-E fault.

# Special applications

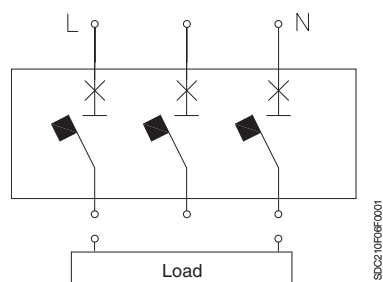
## Use of apparatus at 16 2/3 Hz

### Connection diagrams

**Diagram A1**

Configuration with two poles in series (without neutral connected to earth)

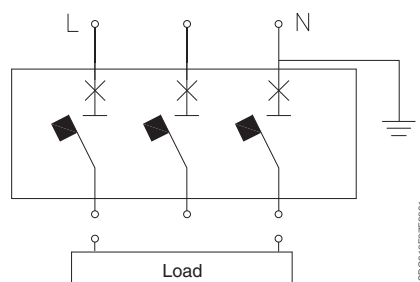
- Interruption for phase to neutral fault: 2 poles in series
- Interruption for phase to earth fault: not considered (The installation method must be such as to make the probability of a second earth fault negligible)



**Diagram B1**

Configuration with three poles in series (without neutral connected to earth)

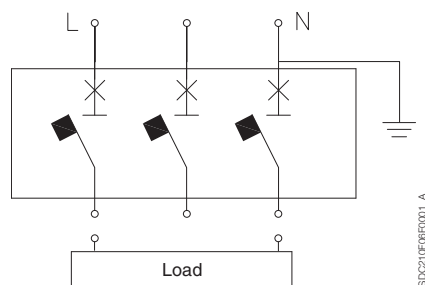
- Interruption for phase to neutral fault: 3 poles in series
- Interruption for phase to earth fault: not considered (The installation method must be such as to make the probability of a second earth fault negligible)



**Diagram A2**

Configuration with two poles in series (with neutral connected to earth)

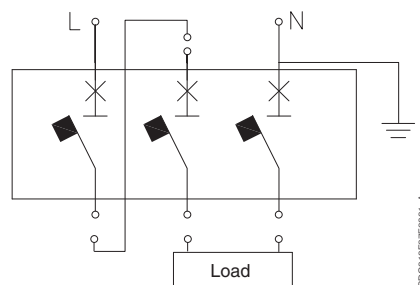
- Interruption for phase to neutral fault: 2 poles in series
- Interruption for phase to earth fault: single pole (same capacity as two poles in series, but limited to 125V)



**Diagram B2**

Configuration with three poles in series (with neutral connected to earth and interrupted)

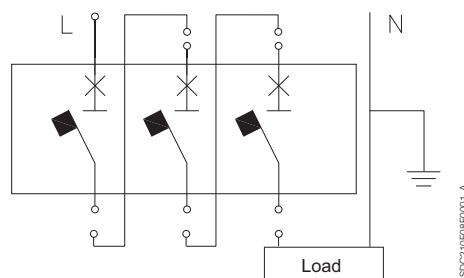
- Interruption for phase to neutral fault: 3 poles in series
- Interruption for phase to earth fault: 2 poles in series



**Diagram C**

Configuration with three poles in series (with neutral connected to earth but not interrupted)

- Interruption for phase to neutral fault: 3 poles in series
- Interruption for phase to earth fault: 3 poles in series

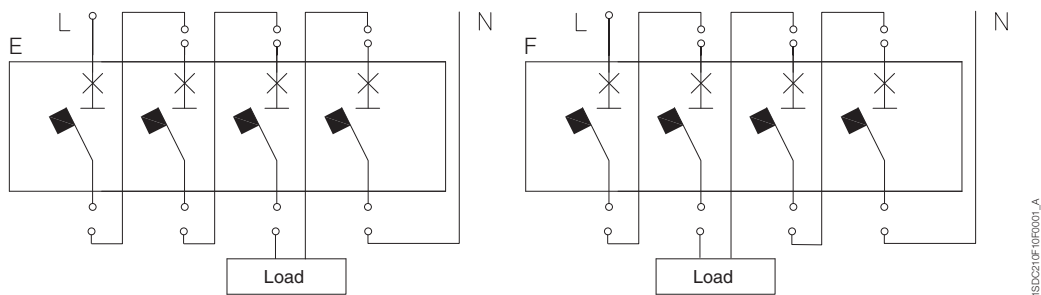


### Diagram E-F

Configuration with four poles in series (without neutral connected to earth)

- Interruption for phase to neutral fault: 4 poles in series
- Interruption for phase to earth fault: not considered

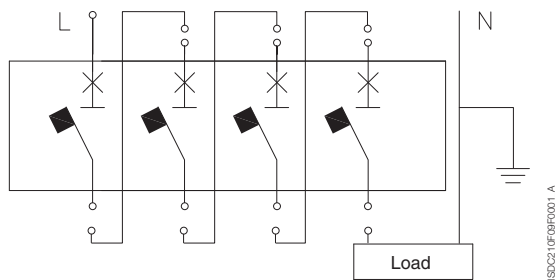
(The installation method must be such as to make the probability of a second earth fault negligible)



### Diagram D

Configuration with four poles in series, on one polarity (with neutral connected to earth and not interrupted)

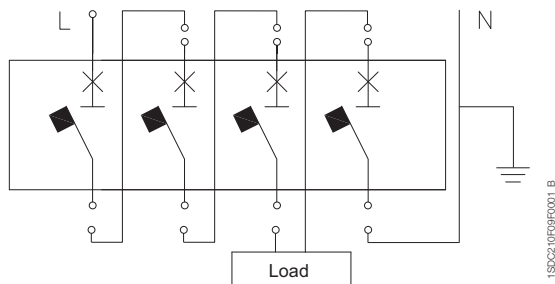
- Interruption for phase to neutral fault: 4 poles in series
- Interruption for phase to earth fault: 4 poles in series



### Diagram E1

Interruption with four poles in series (with neutral connected to earth and interrupted)

- Interruption for phase to neutral fault: 4 poles in series
- Interruption for phase to earth fault: 3 poles in series



## Special applications

### Use of apparatus at 400 Hz

4

At high frequencies, the performances of the circuit-breakers are reclassified to take the following phenomena into account:

- the increase in the skin effect and increase in the inductive reactance, in a way directly proportional to the frequency, cause overheating of the conductor or of the copper components which normally carry the current in the circuit-breaker;
- the elongation of the hysteresis ring and the reduction in the magnetic saturation value, with consequent variation in the forces associated with the magnetic field at a given current value.

In general, these phenomena have effects on the behaviour of both the thermomagnetic releases and of the elements of the circuit-breaker for interrupting the current.

The following tables refer to circuit-breakers with thermomagnetic releases, with a breaking capacity of less than 36 kA. This value is normally more than sufficient for protection of 400 Hz plants, normally characterised by fairly low short-circuit currents.

As can be seen from the data indicated, the trip threshold of the thermal component ( $I_n$ ) decreases as the frequency increases due to the reduced conductivity of the materials and to the increase in associated thermal phenomena. In general, derating of this performance is equal to 10%.

Vice versa, the magnetic threshold ( $I_s$ ) increases as the frequency increases: for this reason, use of a 5· $I_n$  version is recommended. In these tables,  $K_m$  is the multiplication factor of  $I_s$  due to the induced magnetic fields.

#### T4 250 - TMD 20÷50 A

	$I_n$	$I_t$ (400 Hz)			$I_s$		
		MIN	MED	MAX	$I_s$ (50 Hz)	$K_m$	$I_s$ (400 Hz)
T4N 250	20	12	15	18	320	1.7	544
	32	20	24.5	29	320	1.7	544
	50	31	38	45	500	1.7	850

#### T4 250/320 - TMA 80÷250 A

	$I_n$	$I_t$ (400 Hz)			$I_s$ settings (MIN=5× $I_n$ )		
		MIN	MED	MAX	$I_s$ (50 Hz)	$K_m$	$I_s$ (400 Hz)
T4N 250/320	80	50	61	72	400	1.7	680
	100	63	76.5	90	500	1.7	850
	125	79	96	113	625	1.7	1060
	160	100	122	144	800	1.7	1360
	200	126	153	180	1000	1.7	1700
	250	157	191	225	1250	1.7	2125

#### T5 400/630 - TMA 320÷500 A

	$I_n$	$I_t$ (400 Hz)			$I_s$ settings (MIN=5× $I_n$ )		
		MIN	MED	MAX	$I_s$ (50 Hz)	$K_m$	$I_s$ (400 Hz)
T5N 400/630	320	201	244	288	1600	1.5	2400
	400	252	306	360	2000	1.5	3000
	500	315	382	450	2500	1.5	3750

### T5 400/630 - TMG 320÷500 A

	In	I <sub>1</sub> (400 Hz)			I <sub>3</sub> settings (MIN=5xIn)		
		MIN	MED	MAX	I <sub>3</sub> (50 Hz)	Km	I <sub>3</sub> (400 Hz)
T5N	320	201	244	288	800...1600	1.5	1200...2400
400/630	400	252	306	360	1000...2000	1.5	1500...3000
	500	315	382	450	1250...2500	1.5	1875...3750

### T6 630/800 - TMA

	In	I <sub>1</sub> (400 Hz)			I <sub>3</sub> settings (MIN=5xIn)		
		MIN	MED	MAX	I <sub>3</sub> (50 Hz)	Km	I <sub>3</sub> (400 Hz)
T6N 630	630	397	482	567	3150	1.5	4725
T6N 800	800	504	602	720	4000	1.5	6000

### Example

Network data:

- rated voltage 400 V AC
- rated frequency 400 Hz
- load current 240 A (I<sub>b</sub>)
- current carrying capacity of cable 260 A (I<sub>z</sub>)
- short circuit current 32 kA

To decide which circuit-breaker is suitable for this application, the two fundamental conditions for correct use of the circuit-breaker at 400 Hz must be remembered:

- derating of the thermal protection equal to 10%;
- increase in the magnetic threshold according to the Km coefficient.

Should the installation be at power frequency (50/60 Hz), a T4N 250 TMA In = 250 circuit-breaker would be adequate, based on the rated load current (240 A) and on the installation short-circuit current.

However, since the circuit-breaker must be sized for an application at 400 Hz, it is necessary to consider the prescriptions listed above and, in particular, the derating of the thermal protection means a maximum adjustment of:

$$I_{1 \text{ max } 400 \text{ Hz}} = 250 - \left( \frac{250 \cdot 10}{100} \right) = 225 \text{ A}$$

As can be noted, this value is less than the load current and the circuit-breaker with In = 250 A is not adequate. It is therefore necessary to use a T4N 320 TMA In = 320 circuit-breaker, since by adjusting the thermomagnetic release to the median value (0.85) and considering the derating of 10%, the following magnetic trip threshold is obtained:

$$I_{1 \text{ med } 400 \text{ Hz}} = 0.85 \cdot \left[ 320 - \left( \frac{320 \cdot 10}{100} \right) \right] \cong 244 \text{ A}$$

This value is higher than the rated load current and lower than the current-carrying capacity of the cable and therefore the circuit-breaker is adequate for 400 Hz application. With regard to the magnetic threshold, an adjustment at the minimum of the settings available is recommended (5 x In for a TMA) so as not to have too high a trip value:

$$I_3 = 5 \cdot In \cdot Km = 5 \cdot 320 \cdot 1.7 = 2720 \text{ A}$$



# Wiring diagrams

<a href="#">Information for reading - Circuit-breakers T4...T6</a>	<a href="#">5/2</a>
<a href="#">Information for reading - Circuit-breakers T7</a>	<a href="#">5/6</a>
<a href="#">Information for reading - ATS021-ATS022 for T4-T5-T6-T7</a>	<a href="#">5/10</a>
<a href="#">Graphic symbols (IEC 60617 and CEI 3-14...3-26 Standards)</a>	<a href="#">5/11</a>
<a href="#">Wiring diagram of the T4...T6 circuit-breakers</a>	<a href="#">5/12</a>
<a href="#">Wiring diagram of the T7 circuit-breakers</a>	<a href="#">5/14</a>
<a href="#">Electrical accessories for T4...T6</a>	<a href="#">5/16</a>
<a href="#">Electrical accessories for T7</a>	<a href="#">5/25</a>
<a href="#">Automatic transfer-switch ATS021-ATS022 for T4-T5-T6</a>	<a href="#">5/29</a>
<a href="#">Automatic transfer-switch ATS021-ATS022 for T7</a>	<a href="#">5/32</a>

# Wiring diagrams

## Information for reading - Circuit-breakers T4...T6

### State of operation represented

The diagram is shown in the following conditions:

- plug-in version circuit-breaker open and racked-in
- contactor for motor starting open
- circuits de-energised
- trip units not tripped
- motor operator with springs charged.

### Version

The diagram shows a circuit-breaker or switch-disconnector in the plug-in version (only T4 and T5) or in the withdrawable version (T6). The diagram is also valid for the fixed and withdrawable version circuit-breakers or switch-disconnectors.

With the fixed version circuit-breakers or switch-disconnectors, the applications indicated in figures 26-27-28-29-30-31 and 32 cannot be provided.

### Caption

□	= Figure number of the diagram
*	= See note indicated by the letter
A1	= Circuit-breaker applications
A11	= FDU interfacing unit (front display)
A12	= AUX-E type signalling unit, with auxiliary relays for electrical signalling of circuit-breaker open and circuit-breaker tripped
A13	= LD030 DO type signalling unit, with auxiliary relays for electrical signalling of the protection functions of electronic trip unit
A14	= MOE-E type actuation unit, with auxiliary relays for carrying out the commands coming from the dialogue unit
A15	= PR212/CI type contactor control unit for motor starting
A16	= Solenoid operating mechanism
A17	= Unit for M motor electrical latching
A18	= VM210 type voltage measuring unit
A19	= Interface unit (display) type HMI030-CAN
A2	= Applications of the solenoid operator or motor operator
A3	= Applications of the RC222 or RC223 type residual current release
A4	= Indication apparatus and connections for control and signalling, outside the circuit-breaker

D	= Electronic time-delay device of the undervoltage release (outside the circuit-breaker)
H, H1	= Signalling lamps
K	= Contactor for motor starting
K51	= Electronic trip unit: <ul style="list-style-type: none"> <li>– PR221 type overcurrent release, with the following protection functions: <ul style="list-style-type: none"> <li>- L against overload with inverse long time delay</li> <li>- S against short-circuit with inverse or definite short time delay</li> <li>- I against short-circuit with instantaneous trip</li> </ul> </li> <li>– PR222DS/P, PR222DS/PD, PR223DS, PR223EF or Ekip E, type overcurrent release, with the following protection functions: <ul style="list-style-type: none"> <li>- L against overload with inverse long time delay</li> <li>- S against short-circuit with inverse or definite short time delay</li> <li>- I against short-circuit with instantaneous trip time</li> <li>- G against earth fault with short time trip</li> </ul> </li> <li>– EFDP protection (Earth Fault Detector Prevention) for PR223EF trip unit only</li> <li>– Ekip M-LRIU motor protection type trip unit, with the following protection functions: <ul style="list-style-type: none"> <li>- against overload (thermal protection)</li> <li>- against rotor block</li> <li>- against short-circuit</li> <li>- against phase loss or current unbalance among phases</li> </ul> </li> </ul>
D01...08	= Contact for electrical signalling of the protection functions of the electronic trip unit
K87	= RC222 or RC223 type residual current trip unit
M	= Motor for circuit-breaker opening and circuit-breaker closing spring charging
M1	= Three-phase asynchronous motor
Q	= Main circuit-breaker
Q/0,1,2,3	= Auxiliary circuit-breaker contacts
R	= Resistor (see note F)
R1	= Motor thermistor
S3/1	= Change-over contact for electrical signalling of local/remote selector status
S4/1-2	= Contacts activated by the circuit-breaker rotary handle (see note C)
S51/S	= Contact for electrical signalling of overload in progress (start)



S75I/1...3	= Contacts for electrical signalling of circuit-breaker in racked-in position (only provided with circuit-breakers in plug-in and withdrawable version)	X1,X2,X5...X9	= Connectors for the circuit-breaker auxiliary circuits (in the case of circuit-breakers in plug-in version, removal of the connectors takes place simultaneously with that of the circuit-breaker. See note E)
S75S/1...3	= Contacts for electrical signalling of circuit-breaker in racked-out position (only provided with circuit-breakers in plug-in and withdrawable version)	X11	= Back-up terminal box
S87/1	= Contact for electrical signalling of RC222 or RC223 type residual current release pre-alarm	X3,X4	= Connectors for the circuits of the electronic trip unit (in the case of circuit-breakers in the plug-in version, removal of the connectors takes place simultaneously with that of the circuit-breaker)
S87/2	= Contact for electrical signalling of RC222 Change-over contact for electrical signalling of local/remote selector status type residual current release alarm	XA	= Interfacing connector of the PR222DS/P, PR222DS/PD, PR223DS or PR223EF trip unit
S87/3	= Contact for electrical signalling of circuit-breaker open due to RC222 or RC223 type residual current release trip	XA1	= Three-way connector for YO/YU (see note E)
SC	= Pushbutton or contact for closing the circuit-breaker	XA10	= Six-way connector for solenoid operator
SC3	= Pushbutton for motor starting	XA2	= Twelve-way connector for auxiliary contacts (see note E)
SD	= Switch-disconnector of the power supply of the RC222 type residual current release	XA5	= Three-way connector for contact of electrical signalling of circuit-breaker open due to trip of the RC222 or RC223 type residual current release (see note E)
SO	= Pushbutton or contact for opening the circuit-breaker	XA6	= Three-way connector for contact of electrical signalling of circuit-breaker open due to trip of the overcurrent release (see note E)
SO1, SO2	= Pushbuttons or contacts for the circuit-breaker opening (see Resetting instructions for circuit-breaker tripped by trip units)	XA7	= Six-way connector for auxiliary contacts (see note E)
SO3	= Pushbutton for stopping the motor	XA8	= Six-way connector for contacts operated by the rotary handle or for the motor operator (see note E)
SQ	= Contact for electrical signalling of circuit-breaker open	XA9	= Six-way connector for the electrical signalling of RC222 or RC223 type residual current release pre-alarm and alarm and for opening by means of the release itself (see note E)
SY	= Contact for electrical signalling of circuit-breaker open due to YO, YO1, YO2 or YU thermomagnetic trip unit intervention (tripped position)	XB,XC,XE	= Interfacing connectors of the AUX-E unit
TI	= Toroidal current transformer	XD	= Interfacing connector of the FDU unit
TI/L1	= Current transformer placed on phase L1	XF	= Interfacing connector of the MOE-E unit
TI/L2	= Current transformer placed on phase L2	X0	= Connector for the YO1 trip coil
TI/L3	= Current transformer placed on phase L3	X01	= Connector for the YO2 trip coil
TI/N	= Current transformer placed on the neutral	XV	= Terminal boxes of the applications
W1	= Serial interface with the control system (EIA RS485 interface. See note D)	YC	= Closing release of the motor operating mechanism
W2	= Interface to upstream circuit-breaker for zone selectivity interlocking (for PR223EF trip unit only)	YO	= Opening release
W3	= Interface to downstream circuit-breaker for zone selectivity interlocking (for PR223EF trip unit only)	YO1	= Trip coil of the electronic trip unit
		YO2	= Trip coil of the RC222 or RC223 type residual current release
		YU	= Undervoltage release (see note B).

# Wiring diagrams

## Information for reading - Circuit-breakers T4...T6

### Description of figures

- |         |   |         |  |
|---------|---|---------|--|
| Fig. 1  | = Opening release.  | Fig. 29 | = First position of circuit-breaker changeover contact, for electrical signalling of isolated.   |
| Fig. 2  | = Permanent opening release.  | Fig. 30 | = Second position of circuit-breaker changeover contact, for electrical signalling of isolated.  |
| Fig. 3  | = Instantaneous undervoltage release (see note B and F).  | Fig. 31 | = Third position of circuit-breaker changeover contact, for electrical signalling of isolated.   |
| Fig. 4  | = Undervoltage release with electronic time-delay device outside the circuit-breaker (see note B).  | Fig. 32 | = Circuit of the current transformer on neutral conductor outside the circuit-breaker (for plug-in and withdrawable version circuit-breaker).  |
| Fig. 5  | = Instantaneous undervoltage release in version for machine tools with one contact in series (see note B, C, and F).  | Fig. 39 | = Auxiliary circuits of the PR223DS trip units connected to VM210 voltage measuring unit.  |
| Fig. 6  | = Instantaneous undervoltage release in version for machine tools with two contacts in series (see note B, C, and F).   | Fig. 40 | = Auxiliary circuits of the PR223EF trip units connected to VM210 voltage measuring unit.  |
| Fig. 7  | = One changeover contact for electrical signalling of circuit-breaker open due to RC222 or RC223 type residual current release trip.  | Fig. 41 | = Auxiliary circuits of the PR222DS/P, PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with FDU front display unit.  |
| Fig. 8  | = RC222 or RC223 type residual current release circuits.  | Fig. 42 | = Auxiliary circuits of PR222DS/PD, PR223DS or PR223EF electronic trip unit connected to LD 030D0 signalling unit.   |
| Fig. 9  | = Two electrical signalling contacts for RC222 or RC223 type residual current release pre-alarm and alarm.  | Fig. 44 | = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the AUX-E auxiliary contacts.   |
| Fig. 11 | = Stored energy motor operator.   | Fig. 45 | = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the auxiliary contacts AUX-E and with MOE-E type actuation unit.  |
| Fig. 12 | = Local/remote auxiliary contact for stored-energy motor operating mechanism.   | Fig. 46 | = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with FDU front display unit and with the AUX-E auxiliary contacts.   |
| Fig. 21 | = Three changeover contacts for electrical signalling of circuit-breaker open or closed and one changeover contact for electrical signalling of circuit-breaker open due to YO, YO1, YO2 and YU thermomagnetic trip unit intervention (tripped position). | Fig. 47 | = Auxiliary circuits of Ekip M-LRIU electronic trip unit connected to PR212/CI contactor control unit (see note I).  |
| Fig. 22 | = One changeover contact for electrical signalling of circuit-breaker open or closed and a changeover contact for electrical signalling of circuit-breaker open due to YO, YO1, YO2 or YU the thermomagnetic trip unit intervention (tripped position).   | Fig. 48 | = Auxiliary circuits of Ekip M-LRIU electronic trip unit with auxiliary supply connected to PR212/CI contactor control unit with MODBUS RS485 communication option (see note I).                         |
| Fig. 23 | = Two changeover contacts for electrical signalling of circuit-breaker open or closed.  | Fig. 49 | = Auxiliary circuits of Ekip M-LRIU electronic trip unit connected to PR212/CI contactor control unit and to AF series contactor (see note I).   |
| Fig. 24 | = One changeover contact for electrical signalling of circuit-breaker open due to overcurrent release trip (T6).  | Fig. 50 | = Auxiliary circuits of Ekip M-LRIU electronic trip unit with auxiliary supply connected to PR212/CI contactor control unit and AF series contactor with MODBUS RS485 communication option (see note I). |
| Fig. 25 | = One NO contact for electrical signalling of circuit-breaker open due to overcurrent release trip (T4-T5).   | Fig. 51 | = Auxiliary circuits of Ekip E-LSIG electronic trip unit connected to AUX-E electronic auxiliary contacts, MOE-E motor operator and to HMI030 front panel display.                                       |
| Fig. 26 | = First position of circuit-breaker changeover contact, for electrical signalling of racked-in.   |         |  |
| Fig. 27 | = Second position of circuit-breaker changeover contact, for electrical signalling of racked-in.  |         |  |
| Fig. 28 | = Third position of circuit-breaker changeover contact, for electrical signalling of racked-in.   |         |  |

## Incompatibility

The circuits indicated by the following figures cannot be supplied at the same time on the same circuit-breaker:

1 - 2 - 3 - 4 - 5 - 6  
 5 - 6 - 11  
 10 - 11 - 45  
 10 - 12  
 21 - 22 - 23 - 44 - 45 - 46  
 24 - 25  
 26 - 32  
 39 - 40 - 41 - 42 - 43 - 44 - 45 - 46 - 47 - 48 - 49 - 50 - 51

## Notes

- A) The circuit-breaker is only fitted with the applications specified in the ABB SACE order confirmation. To make out the order, please consult this catalogue.
- B) The undervoltage release is supplied for power supply branched on the supply side of the circuit-breaker or from an independent source: circuit-breaker closing is only allowed with the release energised (the lock on closing is made mechanically).
- C) The S4/1 and S4/2 contacts shown in figures 5-6 open the circuit with the circuit-breaker open and close it again when a manual closing command is given by means of the rotary handle, in accordance with the Standards regarding machine tools (in any case, closing does not take place if the undervoltage release is not supplied).
- E) Connectors XA1, XA2, XA5, XA6, XA7, XA8 and XA9 are supplied on request. They are always supplied with T4 and T5 circuit-breakers in the plug-in version equipped with unwired electronic accessories. Connectors X1, X2, X5, X6, X7, X8 and X9 are supplied on request. They are always supplied with T4, T5 and T6 circuit-breakers in the fixed version or in the withdrawable version equipped with unwired electronic accessories.
- F) Additional external resistor for undervoltage release supplied at 250 V DC, 380/440 V AC and 480/500 V AC.
- G) In the case of fixed version circuit-breaker with current transformer on external neutral conductor outside the circuit-breaker, when the circuit-breaker is to be removed, it is necessary to short-circuit the terminals of the TI/N transformer.
- H) SQ and SY contacts of AUX-E signalling unit are opto-isolated contacts.
- I) The connection to poles 3-4 of X4 connector can be used in two ways: connecting a generic digital input or connecting the motor thermistor. The two functions are alternative.

# Wiring diagrams

## Information for reading - Circuit-breakers T7

### 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
- releases not tripped
- motor operating mechanism with springs discharged.

5

### 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 (connectors X12-X13-X14-X15 are not supplied). With this version, the applications indicated in figure 31A cannot be provided.

#### Withdrawable version

The control circuits are fitted between the poles of connectors X12-X13-X14-X15 (terminal box XV is not supplied).

#### Version without overcurrent release

With this version, the applications indicated in figures 13A, 14A, 41A, 42A, 43A, 44A, 45A, 62A cannot be provided.

#### Version with PR231/P or PR232/P electronic trip unit

With this version, the applications indicated in figures 41A, 42A, 43A, 44A, 45A, 62A cannot be provided.

#### Version with PR331/P electronic trip unit

With this version, the applications indicated in figures 42A, 43A, 44A, 45A cannot be provided.

#### Version with PR332/P electronic trip unit

With this version, the applications indicated in figure 41A 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
A13	= LD030 DO signalling unit (outside the circuit-breaker)
A19	= PR330/R actuation unit
AY	= SOR TEST UNIT Test/monitoring Unit (see note R)
D	= Electronic time-delay device of the under-voltage release, outside the circuitbreaker
K51	= PR231/P, PR232/P, PR331/P, PR332/P type electronic trip unit with the following protection functions: <ul style="list-style-type: none"> <li>– L overload protection with inverse long time-delay trip - setting <math>I_1</math></li> <li>– S short-circuit protection with inverse or definite short time-delay trip - setting <math>I_2</math></li> <li>– I short-circuit protection with instantaneous time-delay trip - setting <math>I_3</math></li> <li>– G earth fault protection with inverse short time-delay trip - setting <math>I_4</math></li> </ul>
D01...08	= Contacts of the LD030 DO signalling unit
K51/GZin (DBin)	= Zone selectivity: input for protection G or "reverse" direction input for protection D (only with Uaux. and PR332/P trip unit)
K51/GZout (DBout)	= Zone selectivity: output for protection G or "reverse" direction output for protection D (only with and PR332/P trip unit)
K51/SZin (DFin)	= Zone selectivity: input for protection S or "direct" input for protection D (only with Uaux. and PR332/P trip unit)
K51/SZout (DFout)	= Zone selectivity: output for protection S or "direct" output for protection D (only with Uaux. and PR332/P trip unit)
K51/YC	= Closing control from PR332/P electronic trip unit with communication module PR330/D-M and PR330/R actuation unit
K51/YO	= Opening control from PR332/P electronic trip unit with communication module PR330/D-M and PR330/R actuation unit
M	= Motor for charging the closing springs
Q	= Circuit-breaker
Q/1...6	= Circuit-breaker auxiliary contacts

S33M/1...3	= Limit contacts for spring-charging motor	UI/N	= Current sensor (Rogowski coil) located on neutral
S4/1-2-3	= Contacts activated by the rotary handle of the circuit-breaker – only for circuit-breakers with manual control (see note C)	UI/O	= Current sensor (Rogowski coil) located on the conductor connecting to earth the star point of the MV/LV transformer (see note G)
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)	W1	= Serial interface with control system (external bus): EIA RS485 interface (see note E)
		W2	= Serial interface with the accessories of PR331/P and PR332/P trip units (internal bus)
S51/P1	= Programmable contact (as default it signals overload present - start)	X12...X15	= Delivery connectors for auxiliary circuits of withdrawable version circuit-breaker
S75E/1...2	= Contacts for electrical signalling of circuit-breaker in racked-out position (only with withdrawable circuit-breakers)	XB1...XB7	= Connectors for the accessories of the circuit-breaker
S75I/1...7	= Contacts for electrical signalling of circuit-breaker in racked-in position (only with withdrawable circuit-breakers)	XF	= Delivery terminal box for the position contacts of the withdrawable circuit-breaker (located on the fixed part of the circuit-breaker)
S75T/1..2	= Contacts for electrical signalling of circuit-breaker in test isolated position (only with withdrawable circuit-breakers)	XO	= Connector for YO1 release
		XR1 – XR2	= Connector for power circuits of PR231/P, PR232/P, PR331/P, and PR332/P trip units
SC	= Pushbutton or contact for closing the circuit-breaker		
SO	= Pushbutton or contact for opening the circuit-breaker	XR5 – XR13	= Connector for power circuits of PR332/P trip unit
SO1	= Pushbutton or contact for opening the circuit-breaker with delayed trip	XV	= Delivery terminal box for the auxiliary circuits of the fixed circuit-breaker
SO2	= Pushbutton or contact for opening the circuit-breaker with instantaneous trip	XK5	= Connectors for the auxiliary circuits of the PR332 trip unit
SR	= Pushbutton or contact for electrical circuit-breaker reset	YC	= Shunt closing release
		YO	= Shunt opening release
SRTC	= Contact for electrical signalling of circuit-breaker open, with springs charged and ready to close	YO1	= Overcurrent shunt opening release (trip coil)
		YO2	= Second shunt opening release (see note Q)
SY	= Contact for electrical signalling of circuit-breaker open due to trip units tripped, YO, YO1, YO2, YU (tripped position) only for circuit-breakers with direct control	YR	= Coil to electrically reset the circuit-breaker
		YU	= Undervoltage release (see notes B, C and Q)
TI/L1	= Current transformer located on phase L1		
TI/L2	= Current transformer located on phase L2		
TI/L3	= Current transformer located on phase L3		
T0	= Homopolar Toroidal current transformer (see note T)		
TU	= Insulating voltage transformer		
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		

# Wiring diagrams

## Information for reading - Circuit-breakers T7

### Description of figures

- Fig. 1A = Motor circuit to charge the closing springs.  
 Fig. 2A = Circuit of shunt closing release.  
 Fig. 4A = Shunt opening release.  
 Fig. 6A = Instantaneous undervoltage release (see notes B, C and Q).  
 Fig. 7A = Undervoltage release with electronic time-delay device, outside the circuit-breaker (see notes B and Q).  
 Fig. 8A = Second shunt opening release (see note Q).  
 Fig. 11A = Contact for electrical signalling of springs charged or discharged.  
 Fig. 12A = Contact for electrical signalling of circuit-breaker open, with springs charged, and ready to close.  
 Fig. 13A = 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 electronic reset (if available).  
 Fig. 14A = Electrical reset control.  
 Fig. 15A = Contact operated by the circuit-breaker rotary handle – for circuit-breakers with manual control only (see note C).  
 Fig. 21A = Circuit-breaker auxiliary contacts (for circuit-breakers with manual control only).  
 Fig. 22A = Circuit-breaker auxiliary contacts (for circuit-breakers with motor control only).  
 Fig. 31A = First set of contacts for electrical signalling of circuit-breaker in racked-in, test isolated, racked out position.  
 Fig. 41A = Auxiliary circuits of PR331/P trip unit (see note F).  
 Fig. 42A = Auxiliary circuits of PR332/P trip units (see notes F and N).  
 Fig. 43A = Circuits of the measuring module PR330/V of the PR332/P trip units internally connected to the circuit-breaker (optional).  
 Fig. 44A = Circuits of the measuring module PR330/V of the PR332/P trip units externally connected to the circuit-breaker (optional; see note O).  
 Fig. 45A = Circuits of the PR332/P trip unit with communication module PR330/D-M connected to PR330/V actuation unit (see notes E, F and N).  
 Fig. 46A = Circuits of the PR332/P trip unit PR330/V measuring module connected internally to the three-pole circuit-breaker with external neutral conductor (optional).  
 Fig. 61A = SOR TEST UNIT Test/monitoring unit (see note R).  
 Fig. 62A = Circuits of the LD030 DO signalling module (outside the circuit-breaker).

### Incompatibilities

The circuits indicated in the following figures cannot be supplied simultaneously on the same circuit-breaker:

- 6A - 7A - 8A  
 21A - 22A  
 41A - 42A - 45A  
 43A - 44A - 46A

### Notes

- A) The circuit-breaker is only fitted with the applications specified in the ABB SACE order confirmation. To make out the order, please consult this catalogue.  
 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).  
 C) In conformity with the Standards governing machine tools, contacts S4 shown in Fig. 15A can be used to open the Yu undervoltage release circuit (Fig. 6A) when the circuit-breaker is open and close it again upon a manual closing command from the rotary handle.  
 E) For the EIA RS485 serial interface connection see document QT9 1SDC007108G0202 regarding MODBUS communication.  
 F) The auxiliary voltage Vaux allows actuation of all operations of the PR331/P, PR332/P and trip units. Having requested a Vaux 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 PR332/P trip unit by means of a current sensor located on the conductor connecting to earth the star centre 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 PR332/P trip unit, 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 greater than 690 V require the use of an insulation voltage transformer to connect to the busbars.
- P) With PR332/P trip unit with communication module PR330/D-M, the coils YO and YC can be controlled directly from contacts K51/YO and K51/YC with maximum voltages of 110-120 V DC e 240-250 V AC.
- Q) The second opening release may be installed as an alternative to the undervoltage release.
- R) The SACE SOR TEST UNIT + opening release (YO) is guaranteed to operate starting at 75% of the Vaux 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) The connection cable shield must only be earthed on the circuit-breaker side.
- T) The connections between the TO toroidal transformer and the poles of the X13 (or XV) connector of the circuit-breaker must be made using a four-pole shielded cable with paired braided conductors (BELDEN 9696 paired type), with a length of not more than 15 m. The shield must be earthed on the circuit-breaker side.



# Wiring diagrams

## Information for reading - ATS021-ATS022 for T4-T5-T6-T7

### State of operation represented

The diagram indicates the following conditions:

- circuit-breakers off and connected #
- circuits de-energized
- overcurrent relays not tripped \*
- motor operator with charged springs (for T4-T5-T6 circuit-breakers)
- closing springs charged (for T7-X1-EMAX circuit-breakers).

# The diagram indicates circuit-breakers in plug-in or withdrawable version but it may be applied also to circuit-breakers in fixed version: in this case it's not necessary connect S75I/1 contacts to the input X31:1 of ATS021 device or it's necessary connect the terminals X32:5 and X32:6 to the terminal X32:9 of ATS022 device.

\* The diagram indicates circuit-breakers equipped with overcurrent relay but it may be applied also to circuit-breakers without overcurrent relay (switch-disconnectors). If SY (or S51) contact is not foreseen it's necessary not consider SY /or S51) contacts to the input X31:1 of ATS021 device or it's necessary connect the terminals X32:7 and X32:8 to the terminal X32:9 of AT022 device.

Q61/1-2	= Miniature breakers with thermomagnetic overcurrent relay for isolation and protection of the lines auxiliary circuits
S11	= Contact for the automatic transfer enabling in the ATS021 device
S11...S15	= Contacts for the ATS022 device inputs
S1-S2	= Contacts controlled by the cam of the motor operator
S3	= Change-over contact for electrical signalling of local/remote selector status
S33M/1	= Limit contact for spring-charging motor
S51	= Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent trip unit
S75I/1	= Contact signalling circuit-breaker connected #
SY	= Contact signalling circuit-breaker tripped through releases operation (tripped position) *
W1	= Serial interface with control system (MODBUS EIA RS485 interface) available with ATS022 device
X	= Delivery connector for the auxiliary circuits of EMAX withdrawable version circuit-breaker
X12-X15	= Delivery connectors for the auxiliary circuits of T7-X1 withdrawable version circuit-breaker
X2-XA..	= Connectors for T3-T4-T5-T6 circuit-breakers auxiliary circuits
XF	= Delivery terminal board for the position contacts of the circuit-breaker
XV	= Delivery terminal board for the auxiliary circuits of T7-X1-EMAX fixed circuit-breakers
XV	= Terminal boxes of the applications (for T3-T4-T5-T6 circuit-breakers)
YC	= Closing release
YO	= Opening release

### Caption

A	= Devices type ATS021 and ATS022 for the automatic transfer switch of two circuit-breakers
A17	= Unit for M motor electrical latching (for T4-T5-T6 circuit-breakers)
CB1-N	= Circuit-breakers for normal supply line
CB2-E	= Circuit-breakers for emergency supply line
K1	= Auxiliary contactor type NF22E for the normal supply voltage presence
K2	= Auxiliary contactor type NF22E for the emergency supply voltage presence
KC1-KC2	= Auxiliary contactors type AL__-30 for circuit-breakers closing
KO1-KO2	= Auxiliary contactors type AL__-30 for circuit-breakers opening
M	= Closing springs charging motor (for T7-X1-EMAX circuit-breakers)
M	= Motor for opening the circuit-breaker and loading the closing springs of the circuit-breaker (for T4-T5-T6 circuit-breakers)
Q/1	= Circuit-breaker auxiliary contact
Q60	= Miniature breaker with thermomagnetic overcurrent relay for isolation and protection of safety auxiliary voltage supply circuit



# Wiring diagrams

## Graphic symbols (IEC 60617 and CEI 3-14...3-26 Standards)

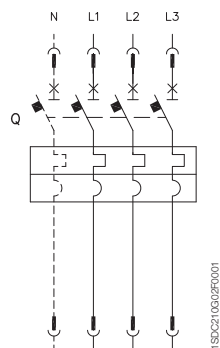
	Thermal effect		Connection of conductors		Position switch (limit switch), break contact		Differential current relay
	Electromagnetic effect		Terminal		Position switch (limit switch) change-over break before make contact		Phase-failure detection relay in a three-phase system
	Delay		Plug and socket (male and female)		Contactor (contact open in the unoperated position)		Locked-rotor detection relay operating by current sensing
	Mechanical connection (link)		Resistor (general symbol)		Circuit-breaker disconnect with automatic trip unit		Lamp, general symbol
	Manually operated control (general case)		Temperature dependent resistor		Switch-disconnector (on-load isolating switch)		Mechanical interlock between two devices
	Operated by turning		Motor (general symbol)		Operating device (general symbol)		Operated by electric motor
	Operated by pushing		Induction motor, three-phase, squirrel cage		Thermal relay		Motor with series energization
	Operated by key		Current transformer		Instantaneous overcurrent or rate-of-rise relay		Screen, shield (it may be drawn in any convenient shape)
	Operated by cam		Current transformer with four threaded winding and with one permanent winding with one tapping		Overcurrent relay with adjustable short time-lag characteristic		Equipotentiality
	Hearth, ground (general symbol)		Make contact		Overcurrent relay with inverse short time-lag characteristic		Voltage transformer
	Converter with galvanic separator		Break contact		Overcurrent relay with inverse long time-lag characteristic		Winding of three-phase transformer, connection star
	Conductors in a screened cable, two conductors shown		Change-over break before make contact		Earth fault overcurrent relay with inverse short time-lag characteristic		Current sensing element
	Twisted conductors, two conductors shown		Position switch (limit switch), make contact		Phase-balance current relay		

# Wiring diagrams

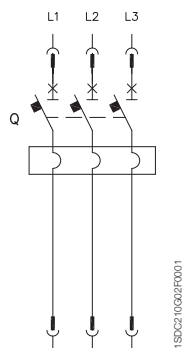
## Wiring diagram of the T4...T6 circuit-breakers

### State of operation

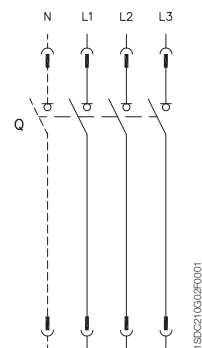
5



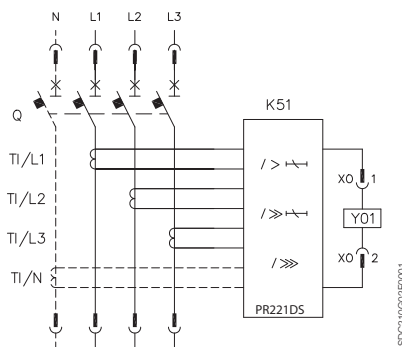
Three-pole or four-pole circuit-breaker with thermomagnetic trip unit



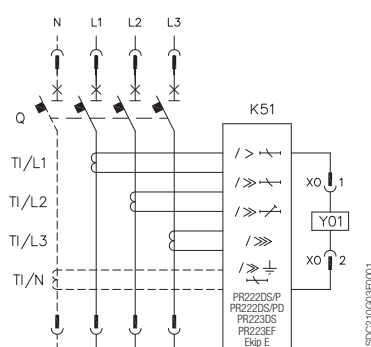
Three-pole circuit-breaker with magnetic trip unit



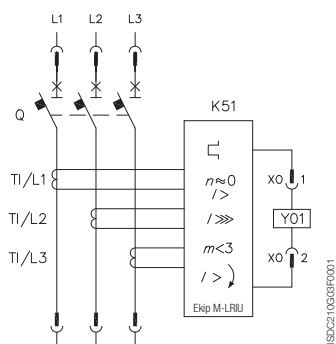
Three-pole or four-pole switch-disconnector (on-load isolating switch)



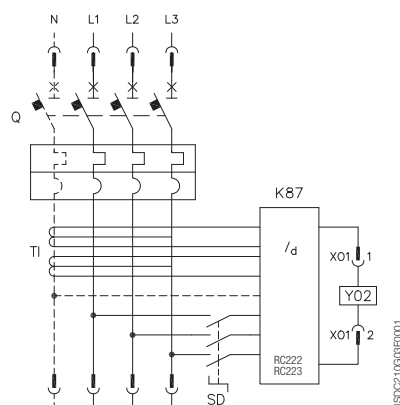
Three-pole or four-pole circuit-breaker with PR221 electronic trip unit



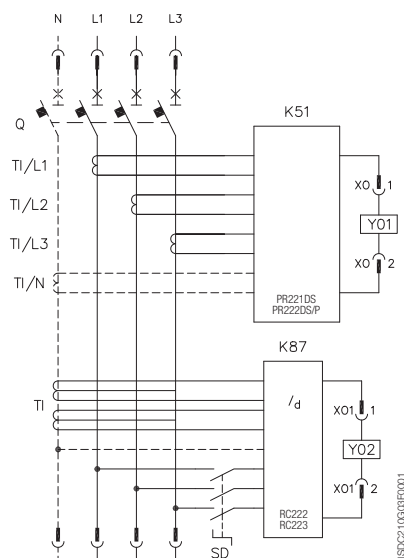
Three-pole or four-pole circuit-breaker with PR222DS/P, PR222DS/PD, PR223DS, PR223EF or Ekip E electronic trip unit (for T4, T5 and T6)



Three-pole circuit-breaker with Ekip M-LRIU electronic trip unit

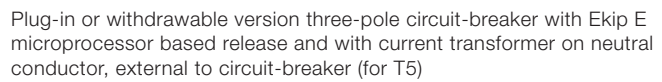
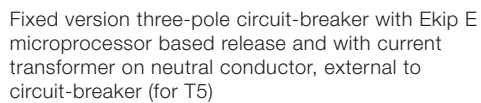
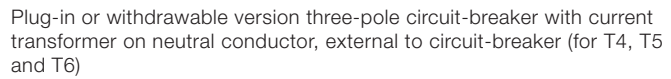
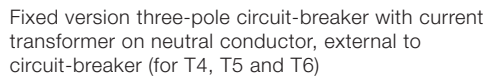


Three-pole or four-pole circuit-breaker with RC222 or RC223 residual current trip unit



Three-pole or four-pole circuit-breaker with PR221DS, PR222DS/P or PR222DS/PD electronic trip unit and RC222 or RC223 residual current trip unit (for T4, T5 and T6 four-pole only)

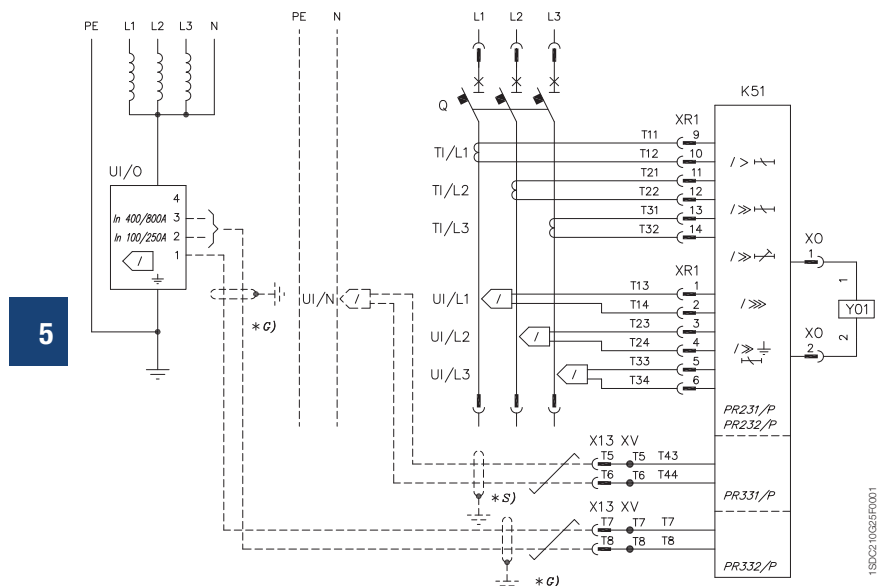
## 5



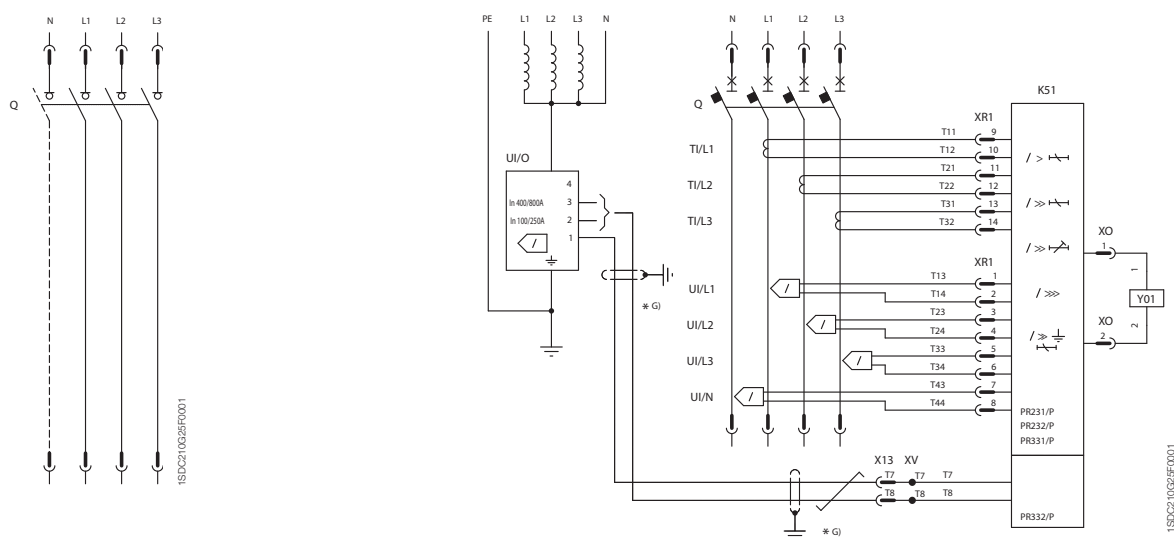
# Wiring diagrams

## Wiring diagram of the T7 circuit-breakers

### State of operation



Three-pole circuit-breaker with PR231/P, PR232/P, PR331/P, PR332/P electronic trip unit



Three- or four-pole  
switch-disconnector

Four-pole circuit-breaker with PR231/P, PR232/P, PR331/P, PR332/P electronic trip unit

## 5



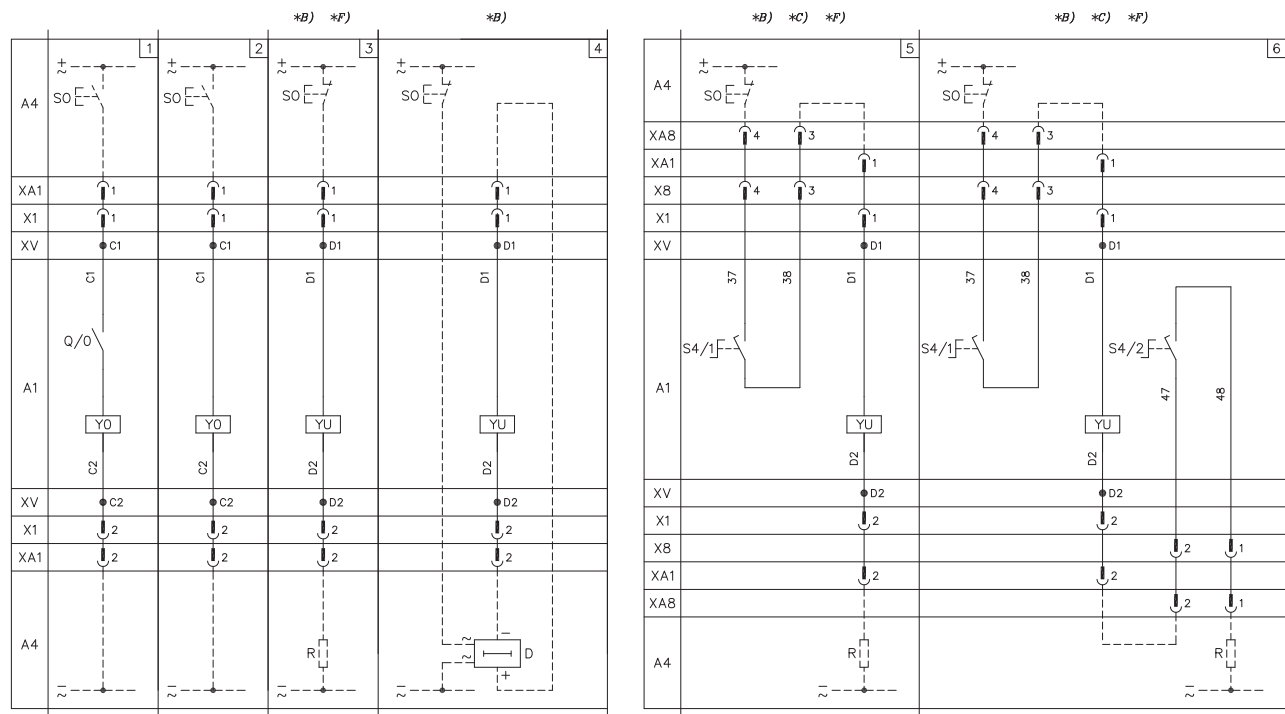
5

# Wiring diagrams

## Electrical accessories for T4...T6

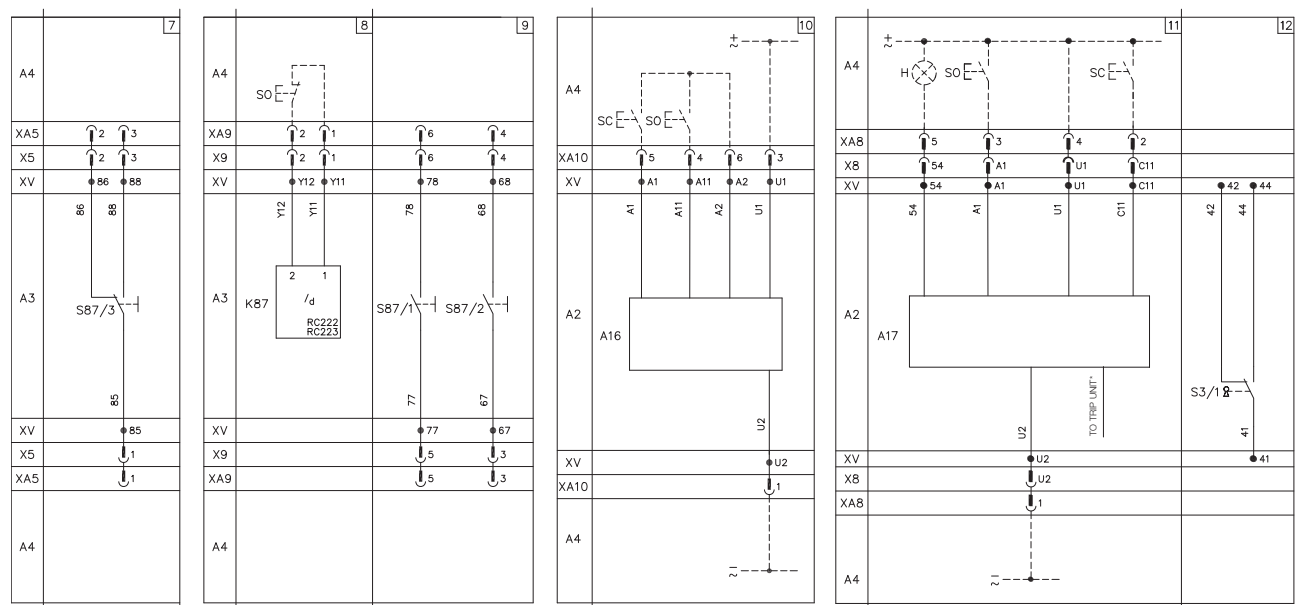
### Shunt opening and undervoltage releases

5



1SDC21035F0001

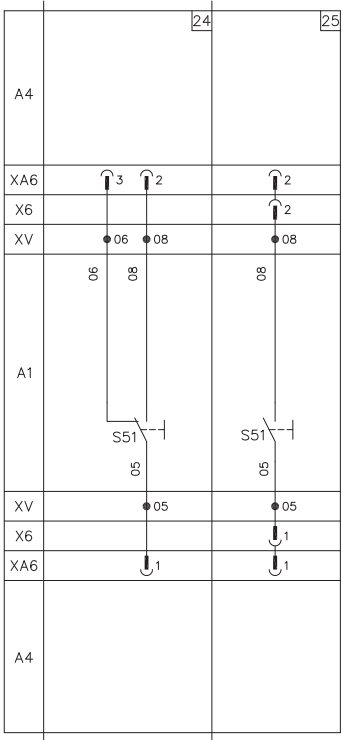
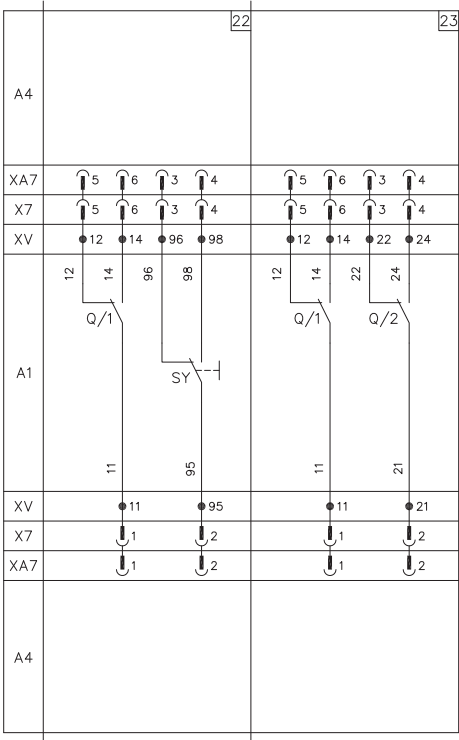
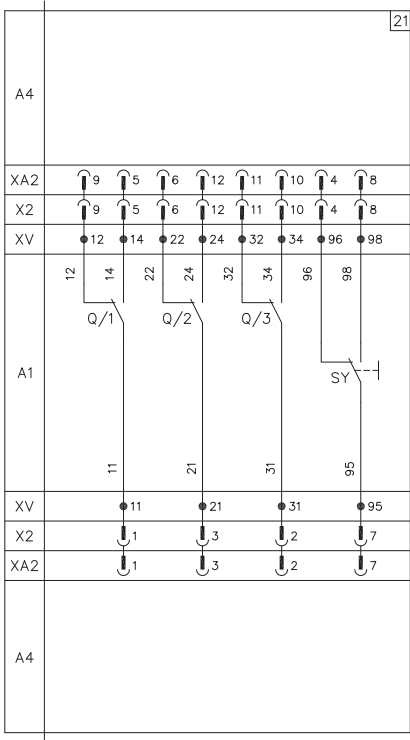
### Residual current releases and remote controls



\* ONLY FOR MOE-E

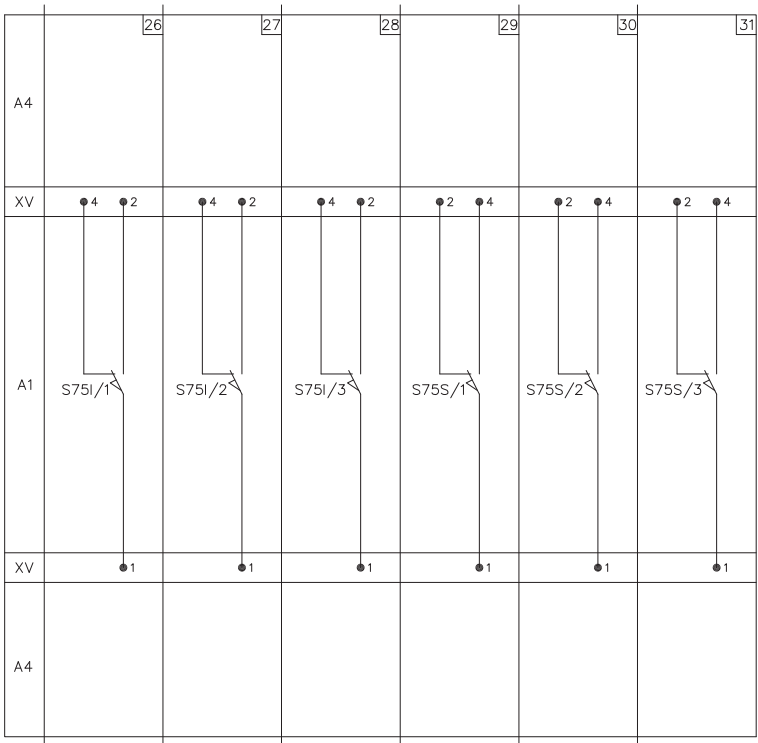
1SDC21038FF0001

Auxiliary contacts



5

Position contacts



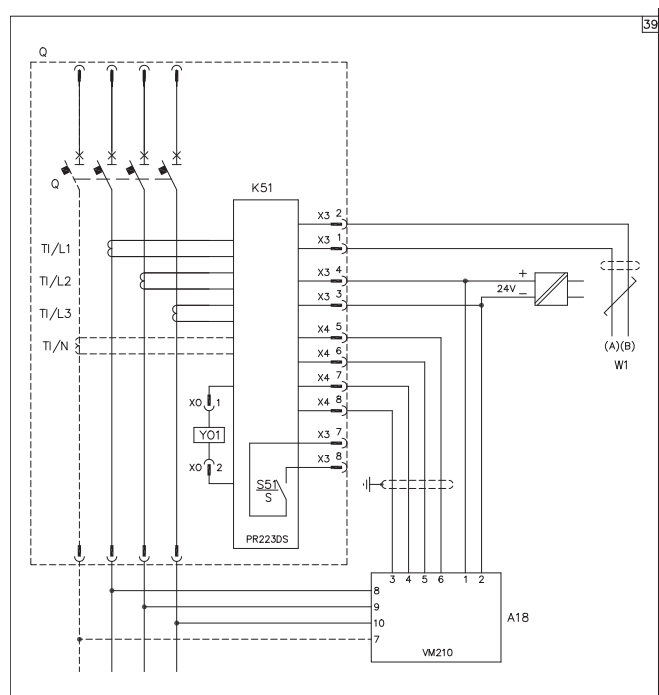
1SDC210015D0208

# Wiring diagrams

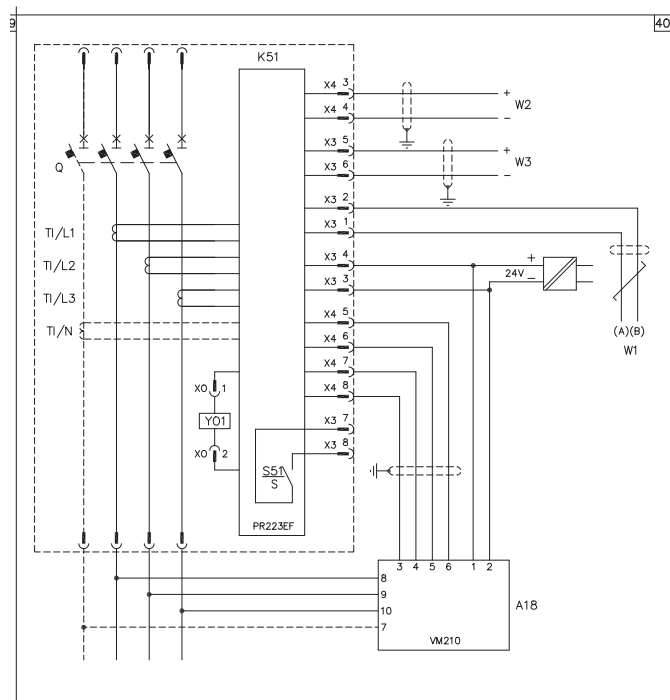
## Electrical accessories for T4...T6

PR223DS electronic trip unit connected with the VM210 voltage measuring device

5

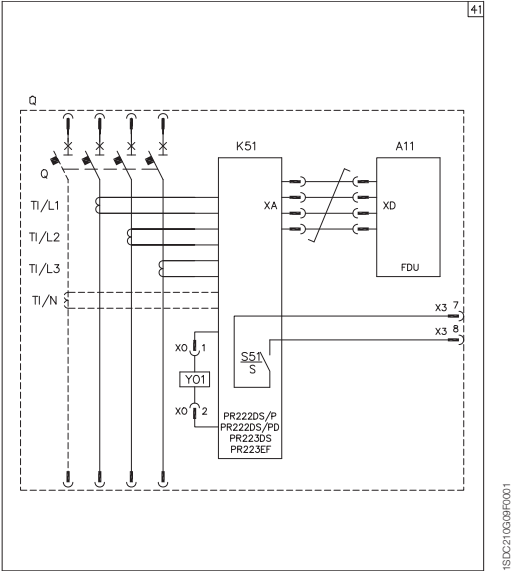


PR223EF electronic trip unit connected with the VM210 voltage measuring device





PR222DS/P, PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the FDU front display unit

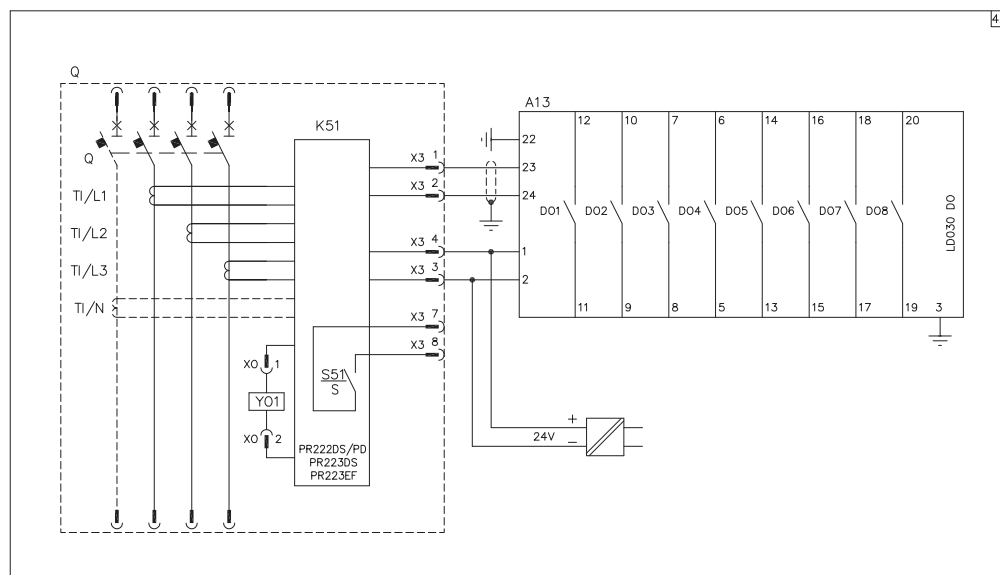


# Wiring diagrams

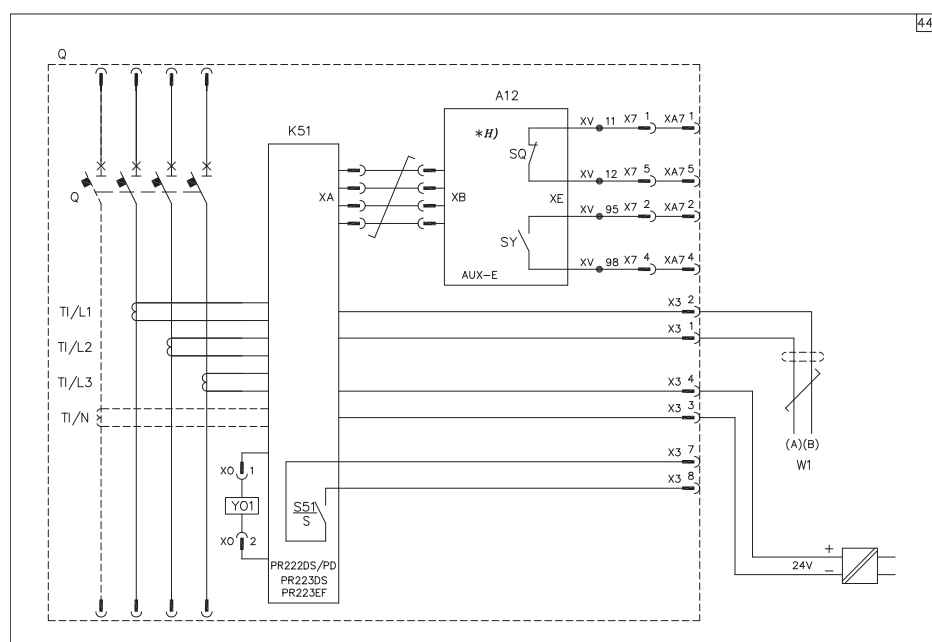
## Electrical accessories for T4...T6

PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with LD030 DO signalling unit

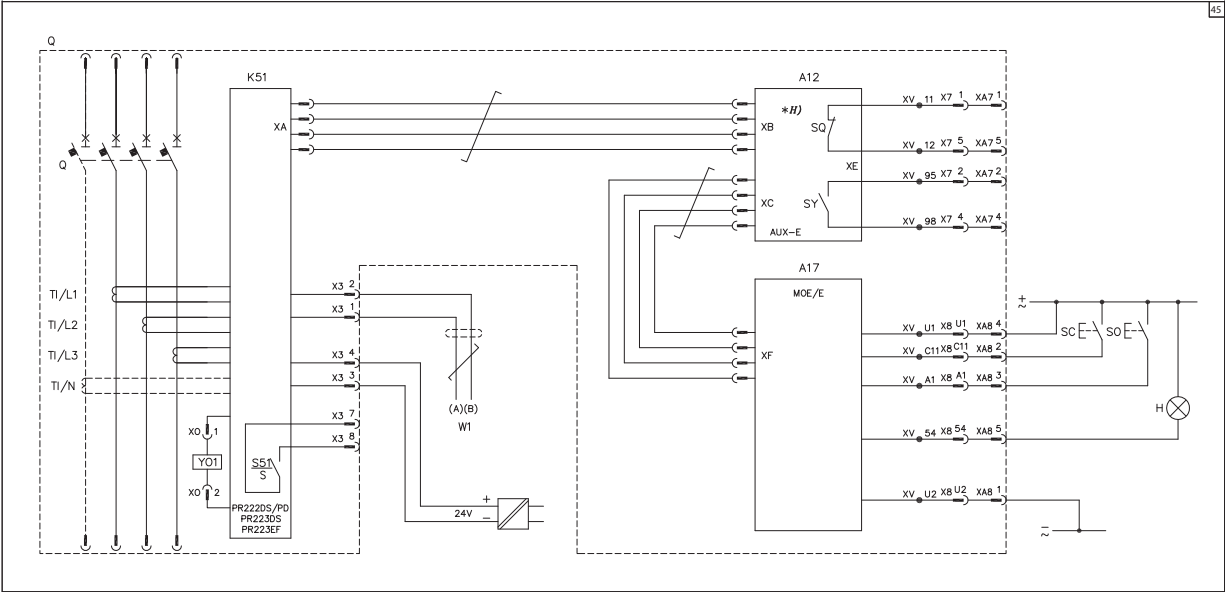
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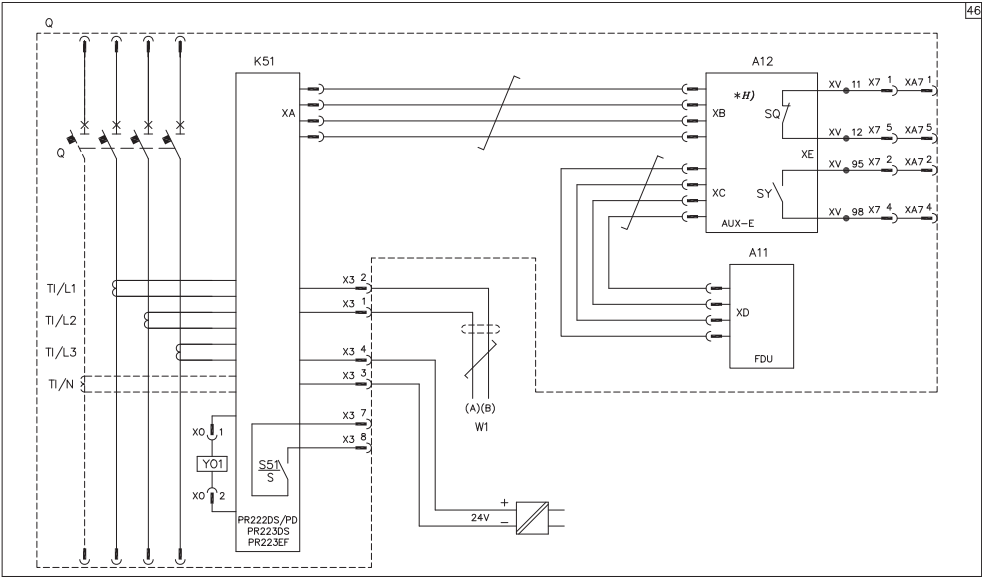
PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the AUX-E auxiliary contacts



PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the AUX-E auxiliary contacts and the MOE-E actuation unit



PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the FDU front display unit and with the AUX-E auxiliary contacts

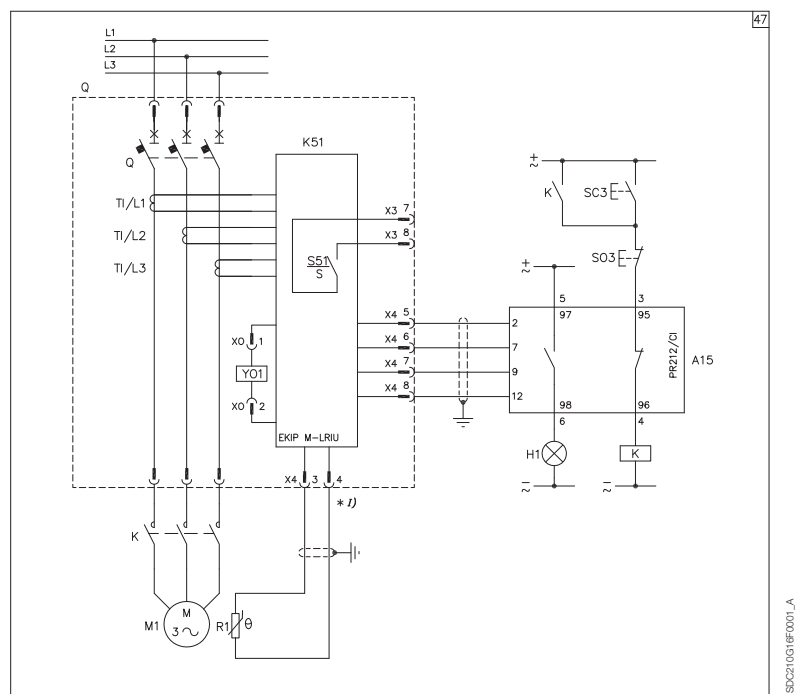


# Wiring diagrams

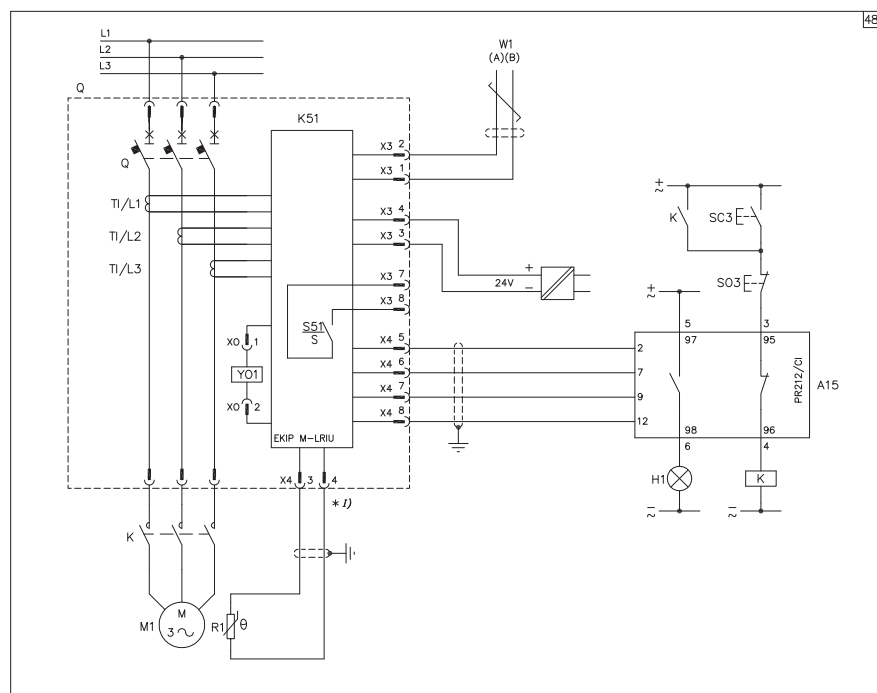
## Electrical accessories for T4...T6

Ekip M-LRIU electronic trip unit connected to PR212/CI contactor control unit

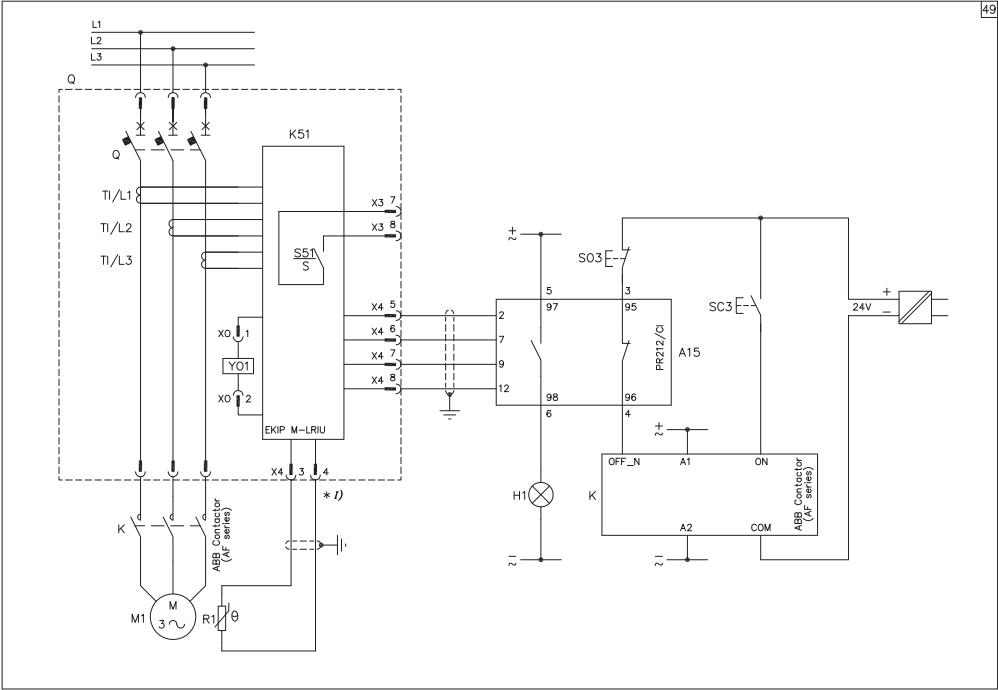
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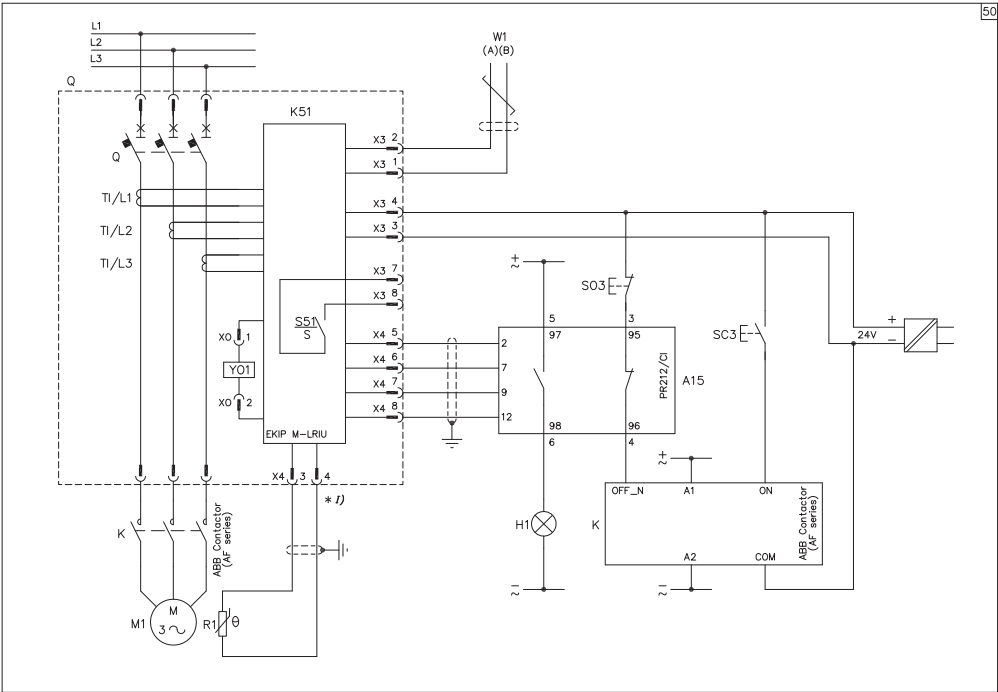
Ekip M-LRIU electronic trip unit with auxiliary supply connected to PR212/CI contactor control unit with MODBUS RS485 communication option



Ekip M-LRIU electronic trip unit connected to PR212/Ci contactor control unit and to AF series contactor



Ekip M-LRIU electronic trip unit with auxiliary supply connected to PR212/Ci contactor control unit and AF series contactor with MODBUS RS485 communication option

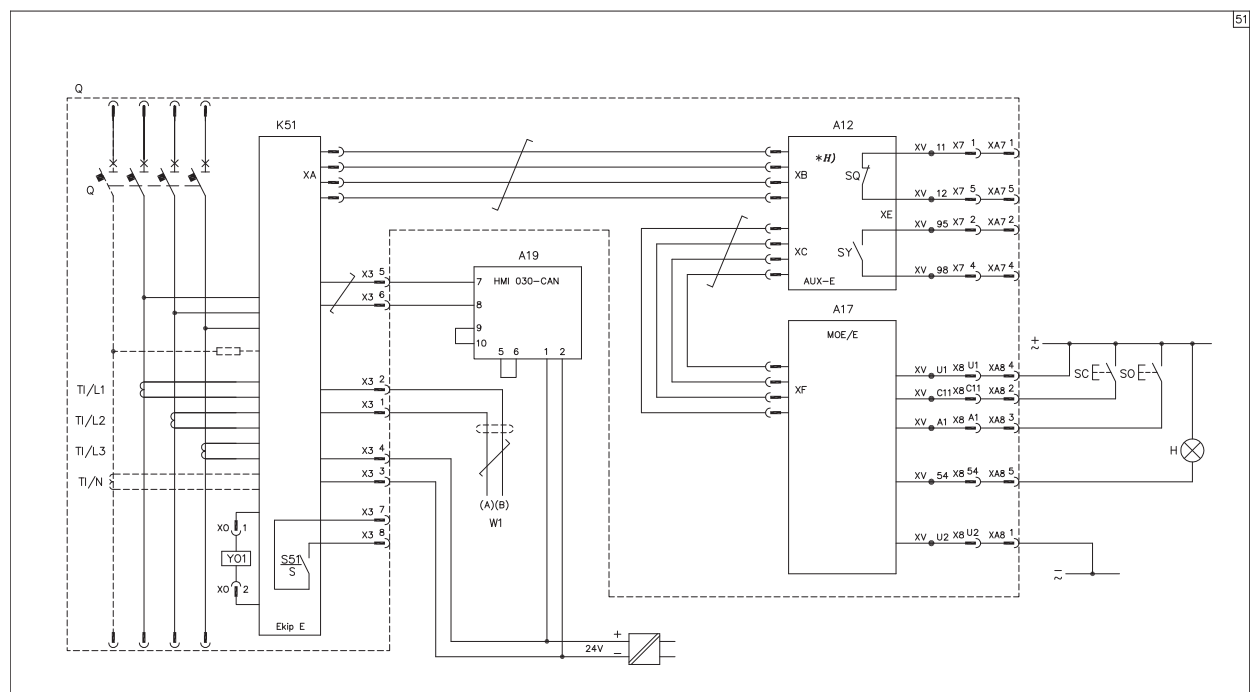


# Wiring diagrams

## Electrical accessories for T4...T6

Ekip E-LSIG electronic trip unit connected to AUX-E electronic auxiliary contacts, MOE-E motor operator and to HMI030 front panel display

5

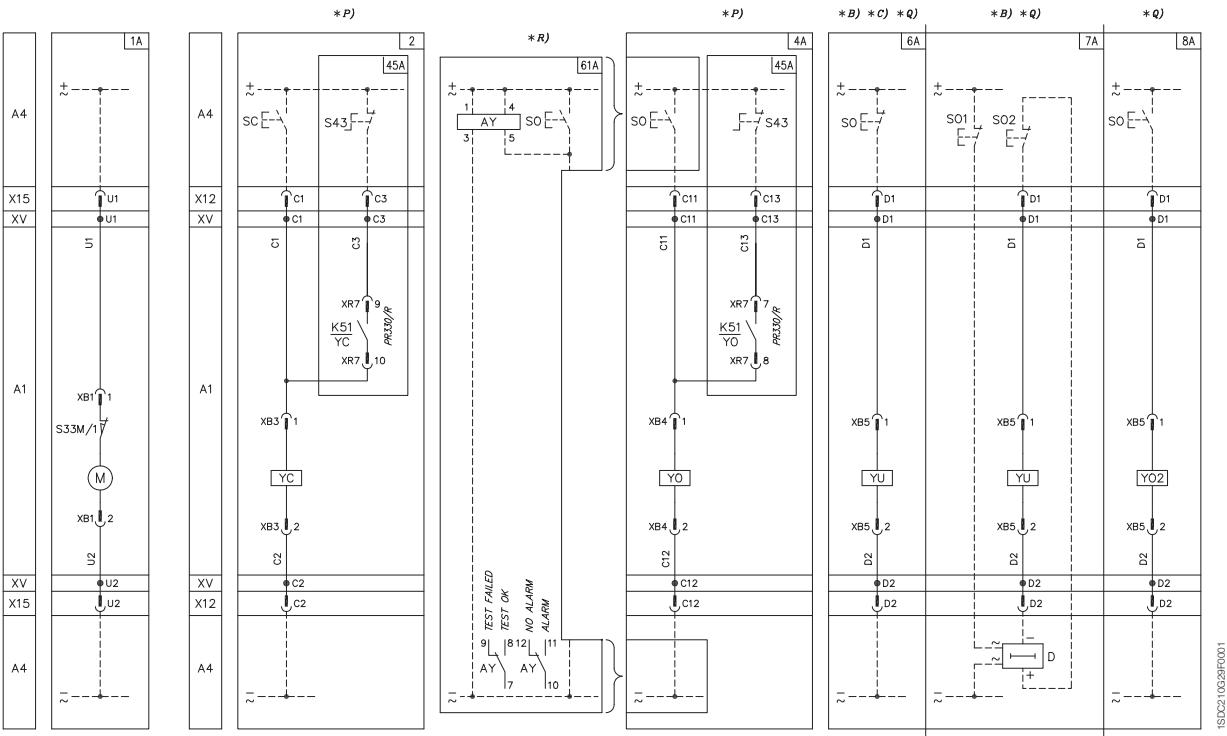


1SDC210G16F0001\_E

# Wiring diagrams

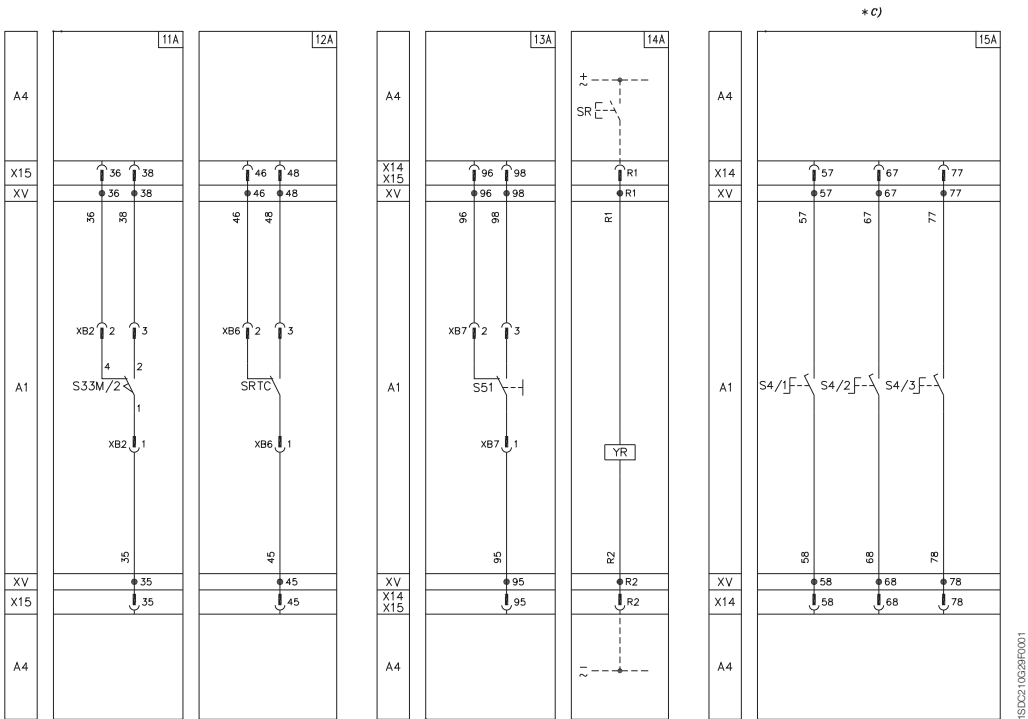
## Electrical accessories for T7

### Motor operating mechanism, opening, closing and undervoltage releases



5

### Signalling contacts

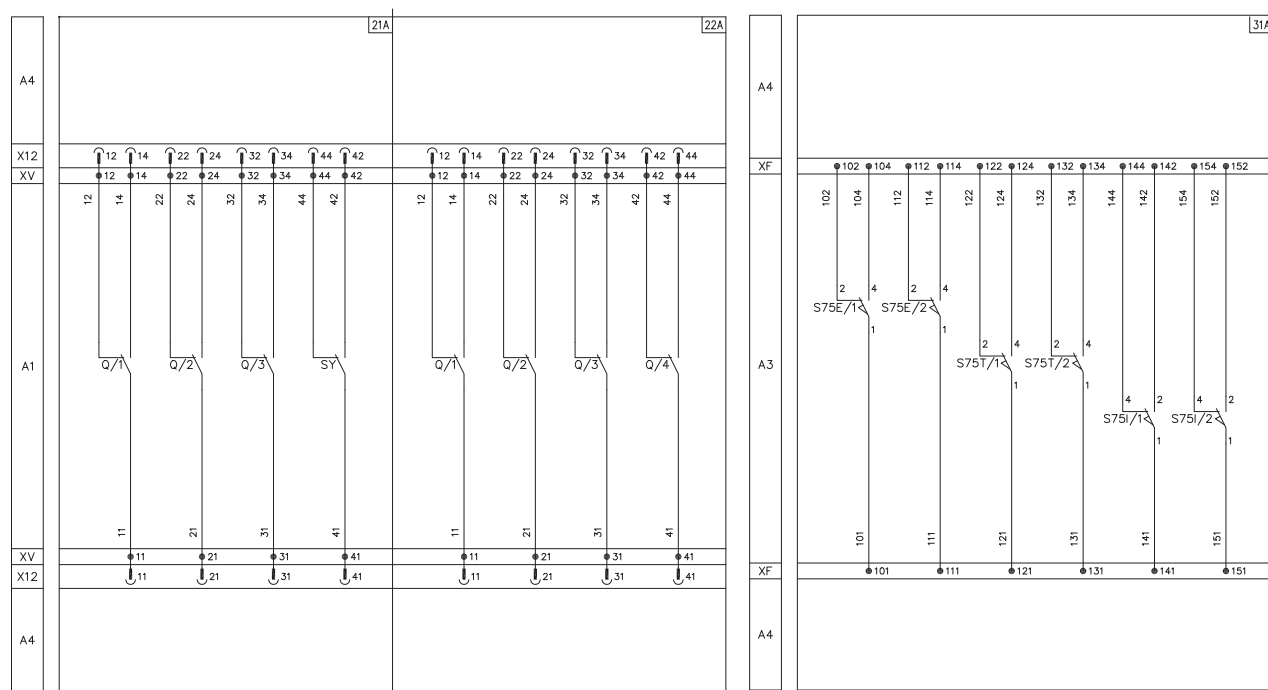


# Wiring diagrams

## Electrical accessories for T7

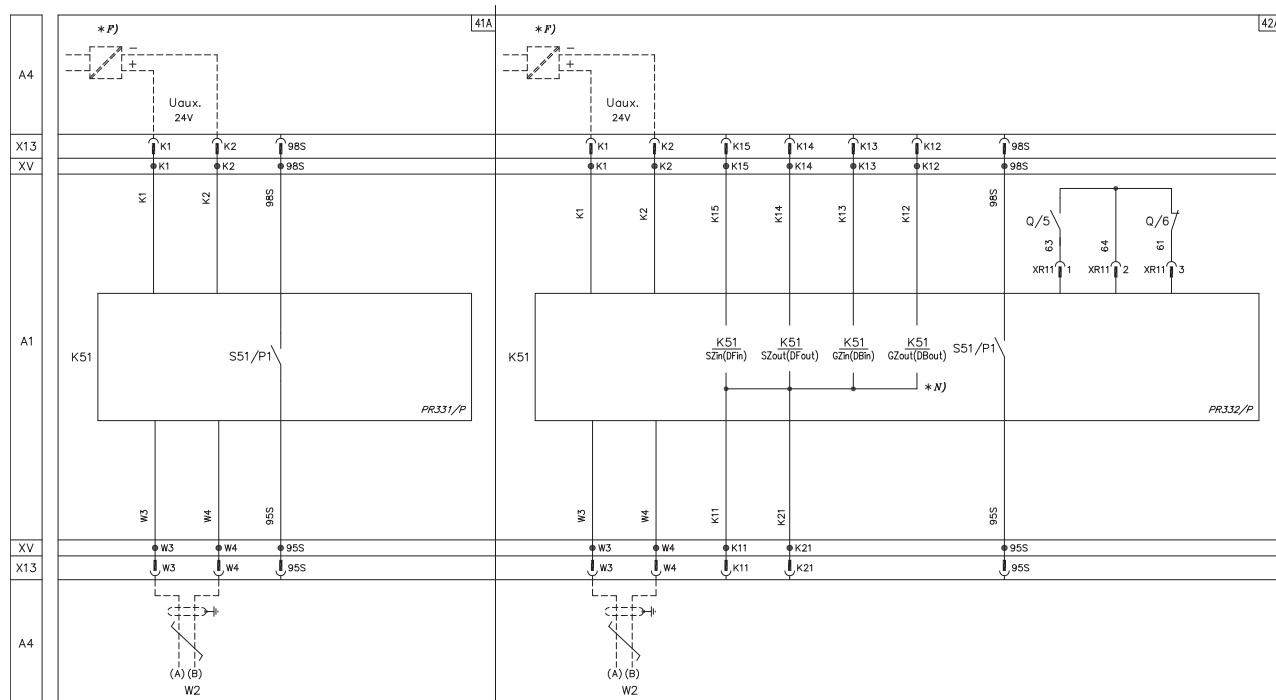
### Signalling contacts

5



1SDC210G31F0001

### Auxiliary circuits of the PR331/P and PR332/P trip units



1SDC210G31F0001



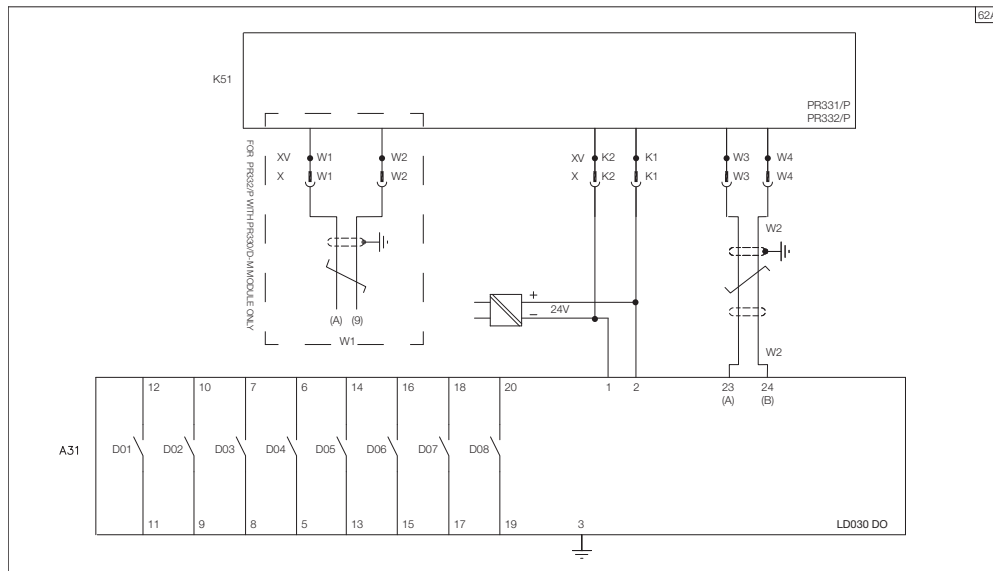


# Wiring diagrams

## Electrical accessories for T7

### LD030 DO signalling unit for PR331/P and PR332/P

5

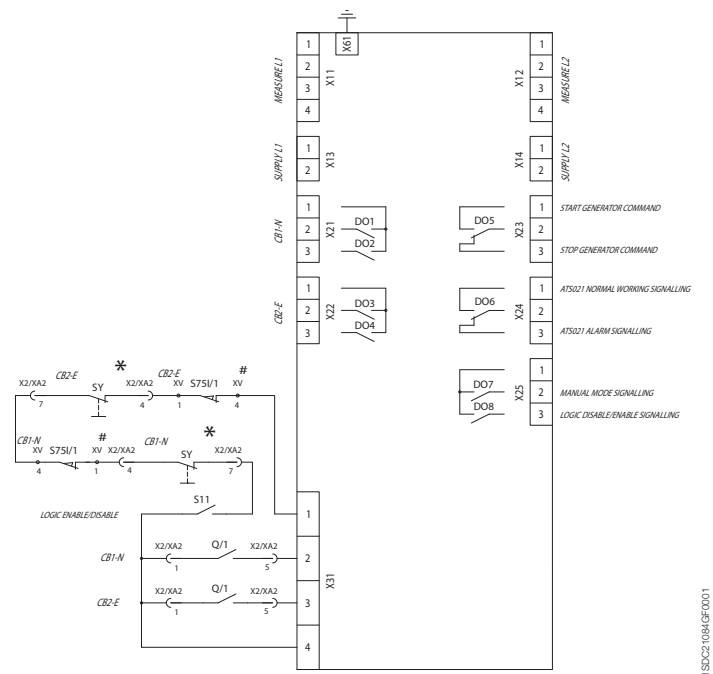


1SDC21031FR001\_A

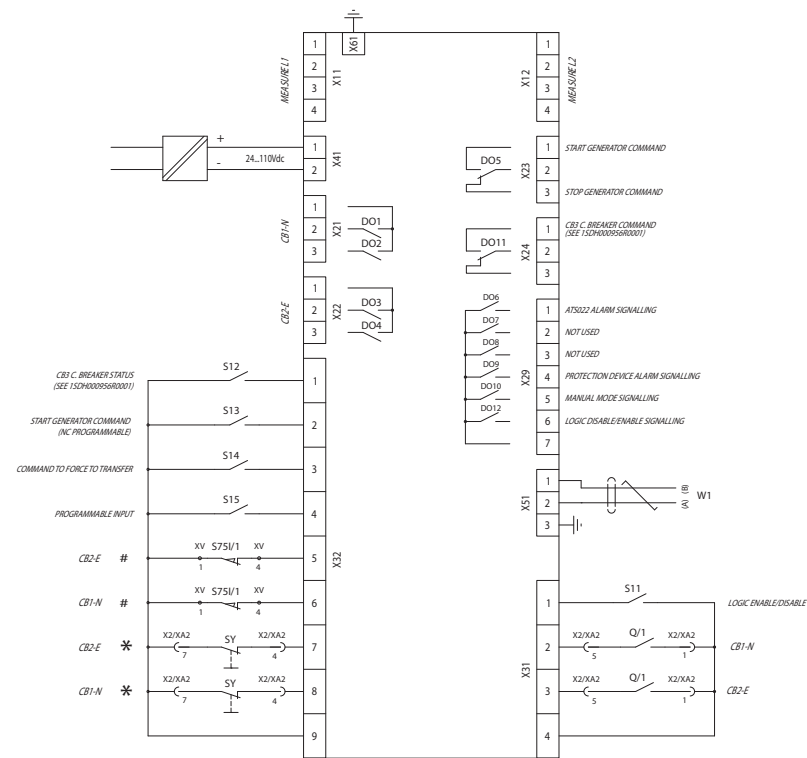
# Wiring diagrams

## Automatic transfer-switch ATS021-ATS022 for T4-T5-T6

### ATS021: T4-T5-T6 circuit-breakers



### ATS022: T4-T5-T6 circuit-breakers

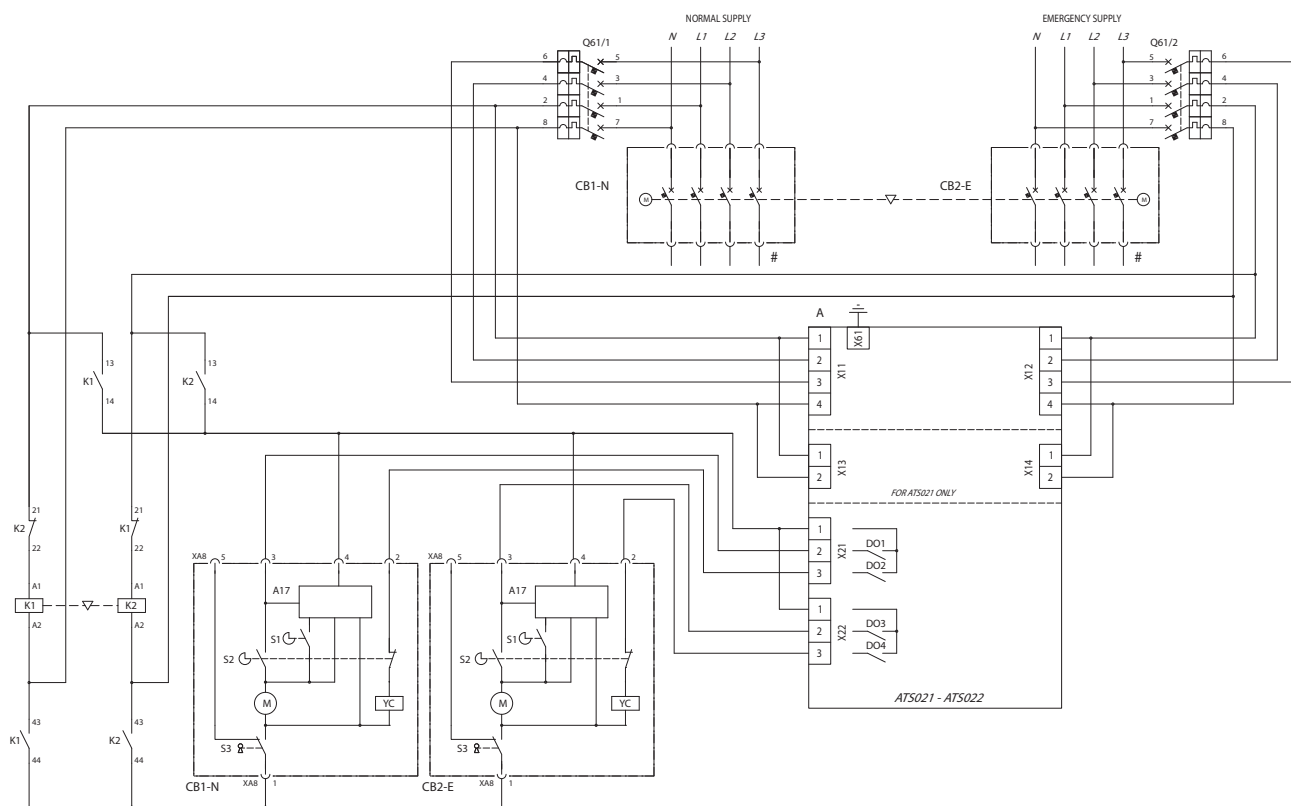


## Wiring diagrams

### Automatic transfer-switch ATS021-ATS022 for T4-T5-T6

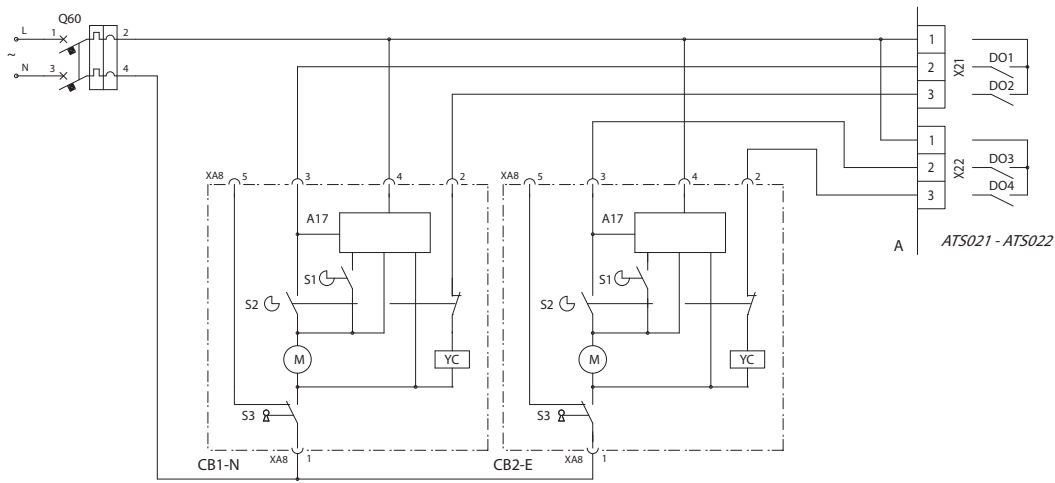
ATS021-ATS022 device for the automatic transfer switch of two T4-T5-T6 circuit-breakers without safety auxiliary voltage supply

5



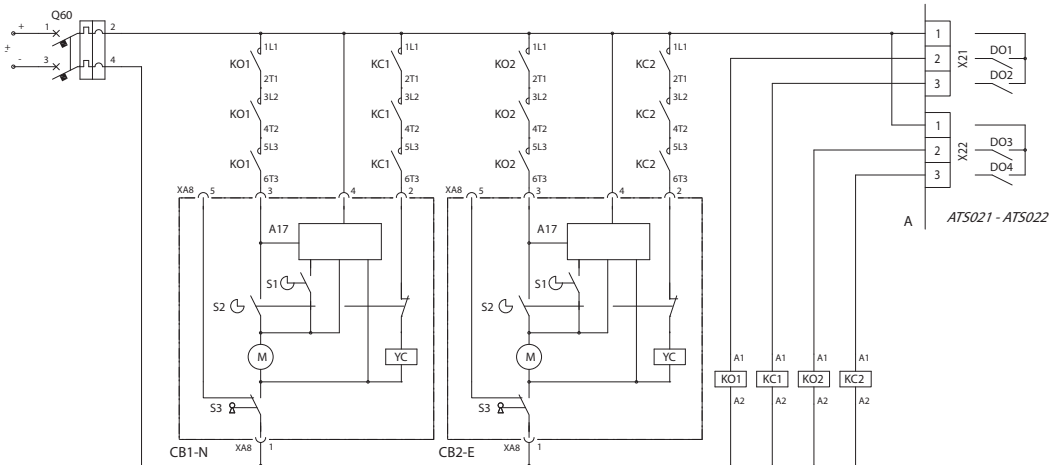
1SDC210015D0208

ATS021-ATS022 device for the automatic transfer switch of two T4-T5-T6 circuit-breakers with safety auxiliary voltage supply in alternating current (AC)



1SDC210896F0001

ATS021-ATS022 device for the automatic transfer switch of two T4-T5-T6 circuit-breakers with safety auxiliary voltage supply in direct current (DC)



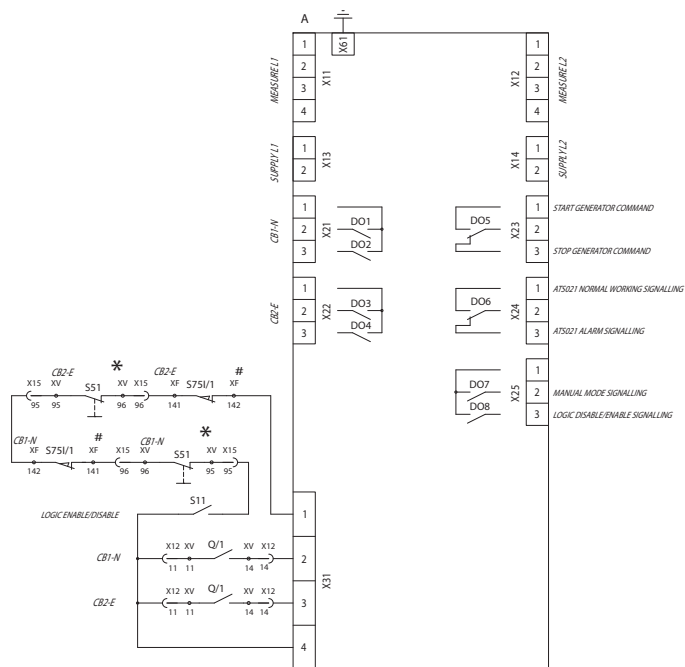
1SDC210896F0001

# Wiring diagrams

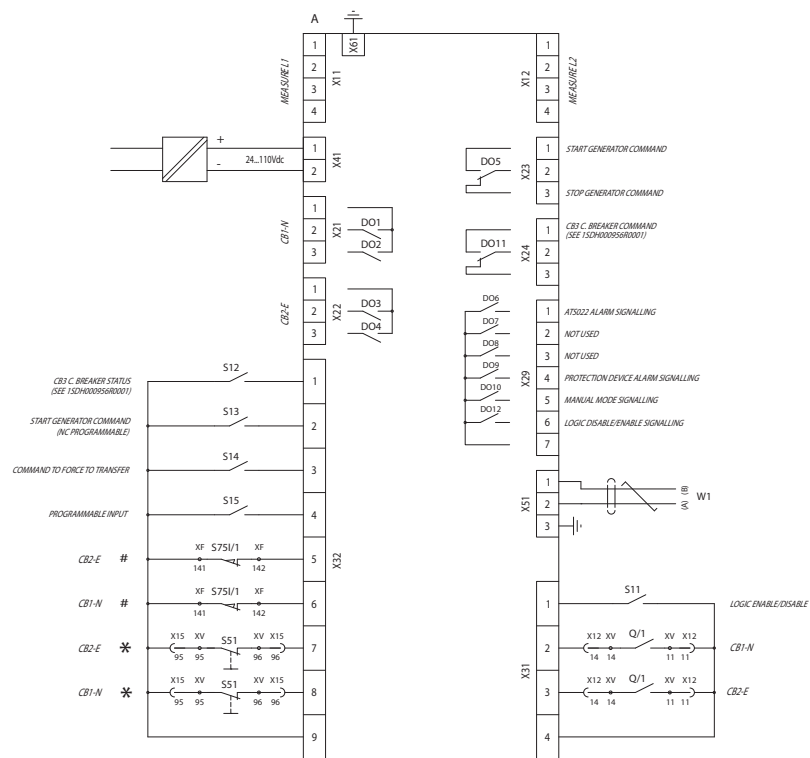
## Automatic transfer-switch ATS021-ATS022 for T7

### ATS021: T7 circuit-breakers

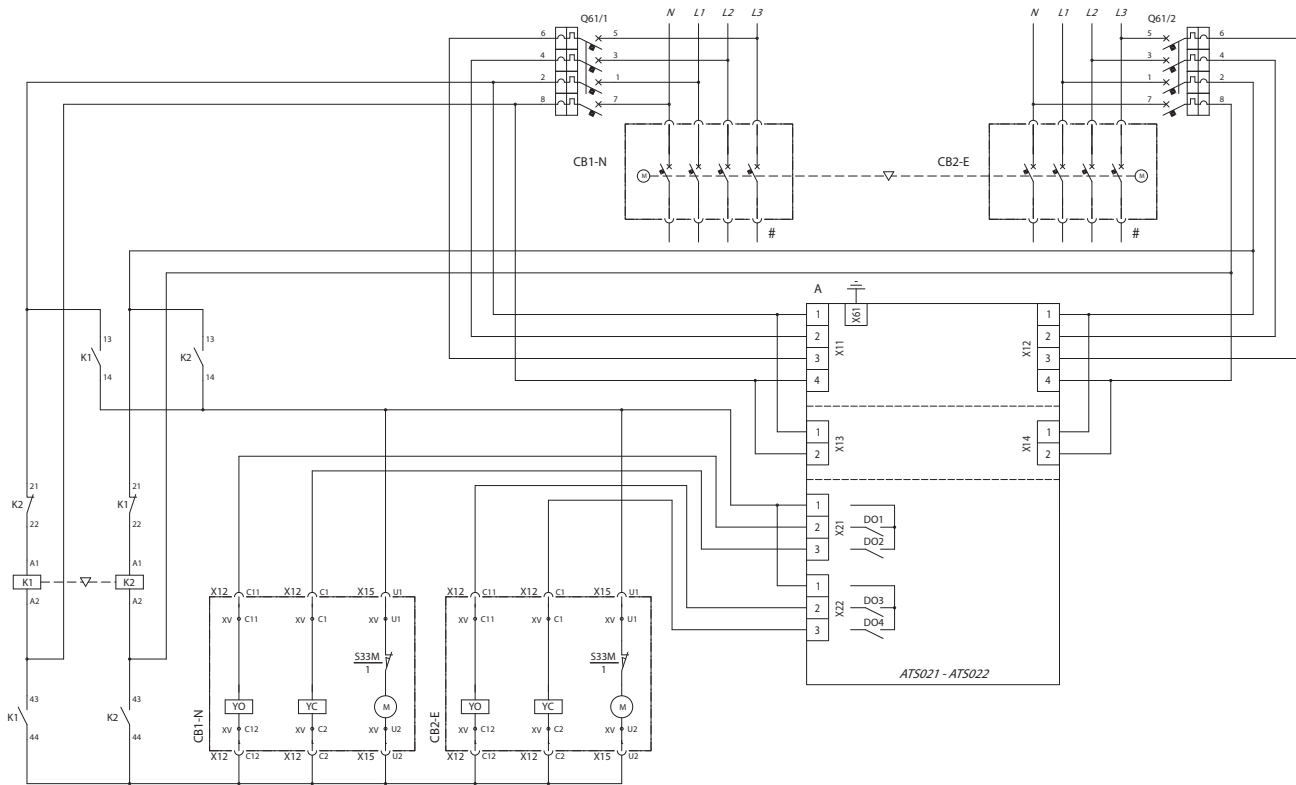
5



### ATS022: T7 circuit-breakers



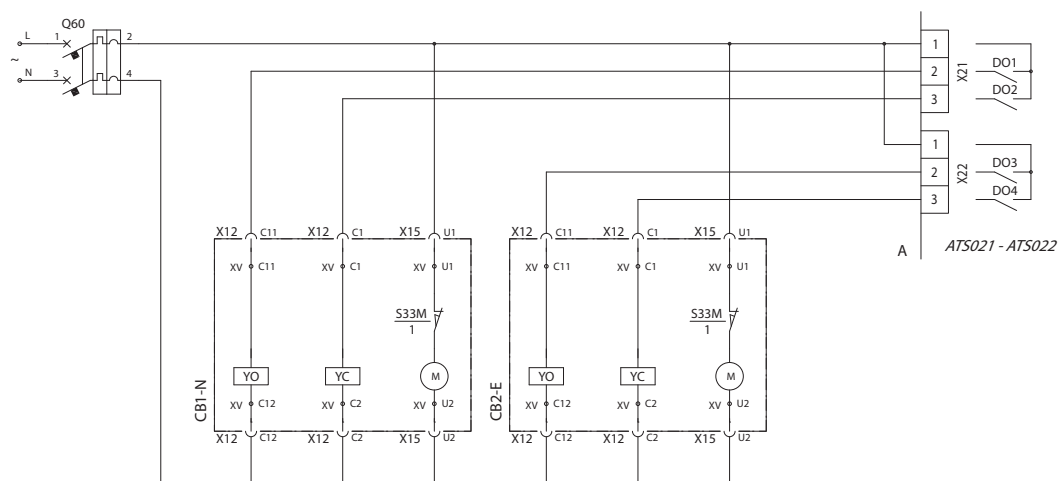
Automatic transfer-switch ATS021-ATS022 for the automatic transfer switch of the two T7 circuit-breakers, without safety auxiliary voltage supply



# Wiring diagrams

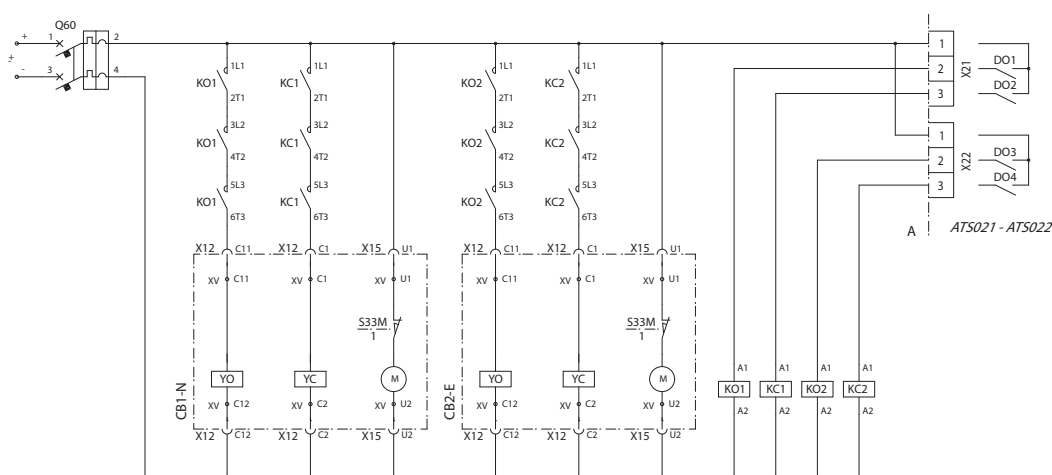
## Automatic transfer-switch ATS021-ATS022 for T7

Automatic transfer-switch ATS021-ATS022 for the automatic transfer switch of the two T7 circuit-breakers, with safety auxiliary voltage supply in alternating current (AC)



1SDC21030GF0001

Automatic transfer-switch ATS021-ATS022 for the automatic transfer switch of the two T7 circuit-breakers, with safety auxiliary voltage supply in direct current (DC)



1SDC21034GF0001



# Overall dimensions

## Fixed circuit-breaker and terminals

Tmax T4	6/2
Tmax T5	6/5
Tmax T6	6/8
Tmax T7	6/13
Tmax T7M	6/18

## Plug-in circuit-breaker and terminals

Tmax T4	6/23
Tmax T5	6/26

## Withdrawable circuit-breaker and terminals

Tmax T4	6/29
Tmax T5	6/31
Tmax T6	6/34
Tmax T7	6/36
Tmax T7M	6/38
Circuit-breaker with RC221/222 residual current release	6/40

## Accessories

Tmax T4 - T5	6/43
Tmax T6	6/51
Tmax T7	6/56

Distances to be respected	6/61
---------------------------	------

# Overall dimensions

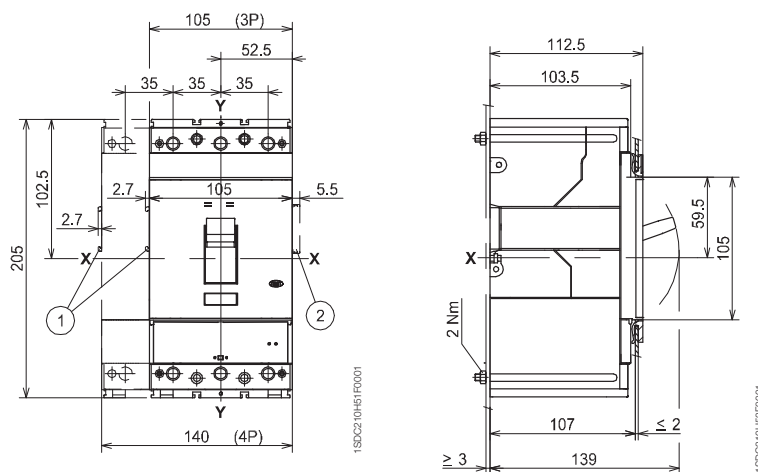
## Tmax T4

### Fixed circuit-breaker

#### Caption

- ① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)
- ② Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

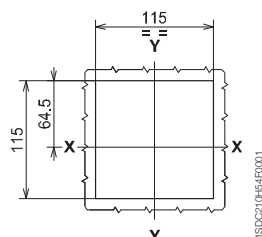
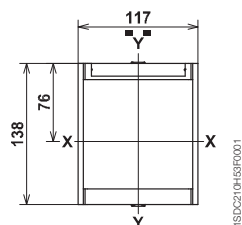
Fixing on sheet



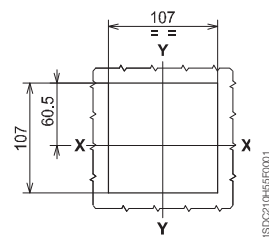
6

#### Flange for compartment door

#### Drilling templates of the compartment door



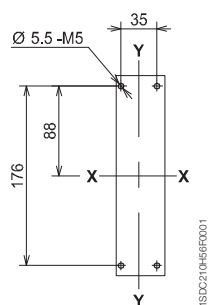
3-4 POLES  
With flange



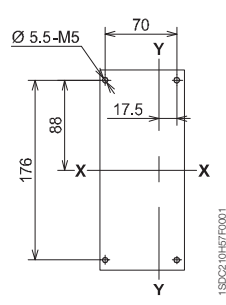
3-4 POLES  
Without flange

#### Drilling templates for support sheet

For front terminals

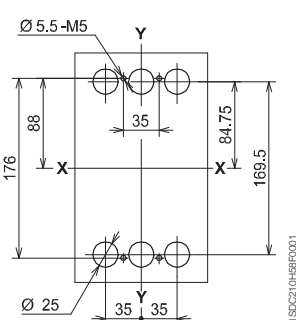


3 POLES

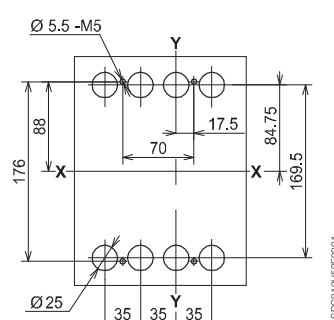


4 POLES

For rear terminals



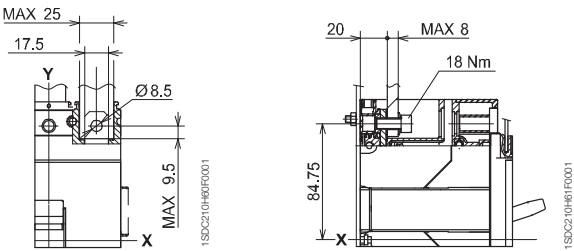
3 POLES



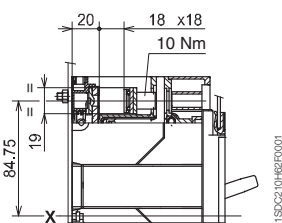
4 POLES

# Terminals

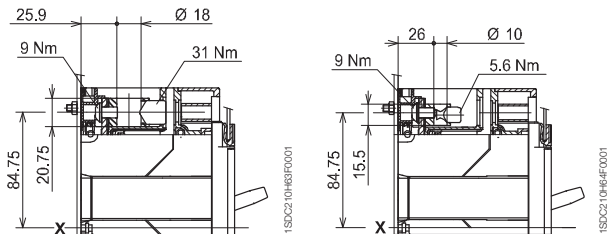
Front - F



Front for copper cables - FC Cu



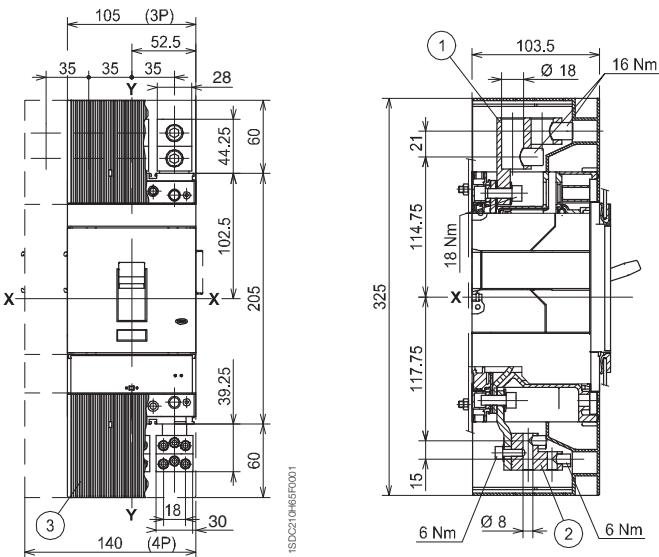
Front for copper/aluminium cables - FC CuAl



## Caption

- 1 Front terminals for cable connection 2x150 mm<sup>2</sup>
- 2 Front terminals for multicable connection
- 3 High terminal covers with degree of protection IP40

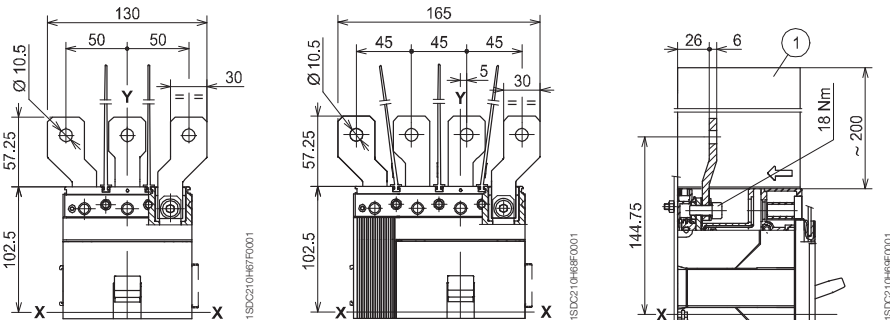
Front multicable - MC



## Caption

- 1 Insulating barriers between phases (compulsory)

Front extended spread - ES



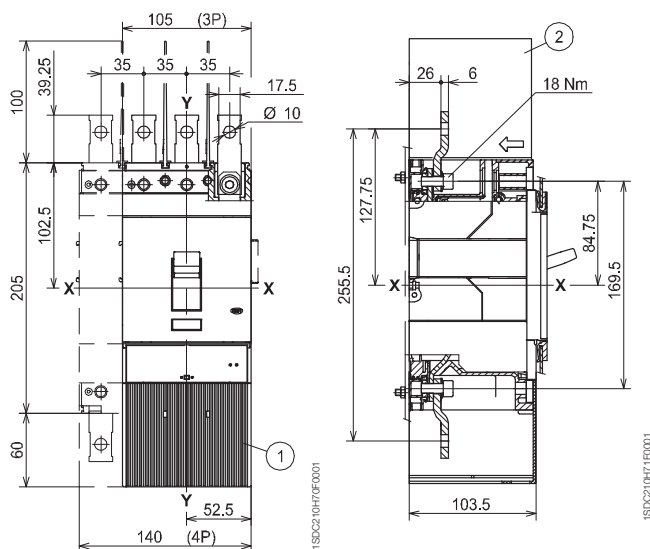
# Overall dimensions

## Tmax T4

### Caption

- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)

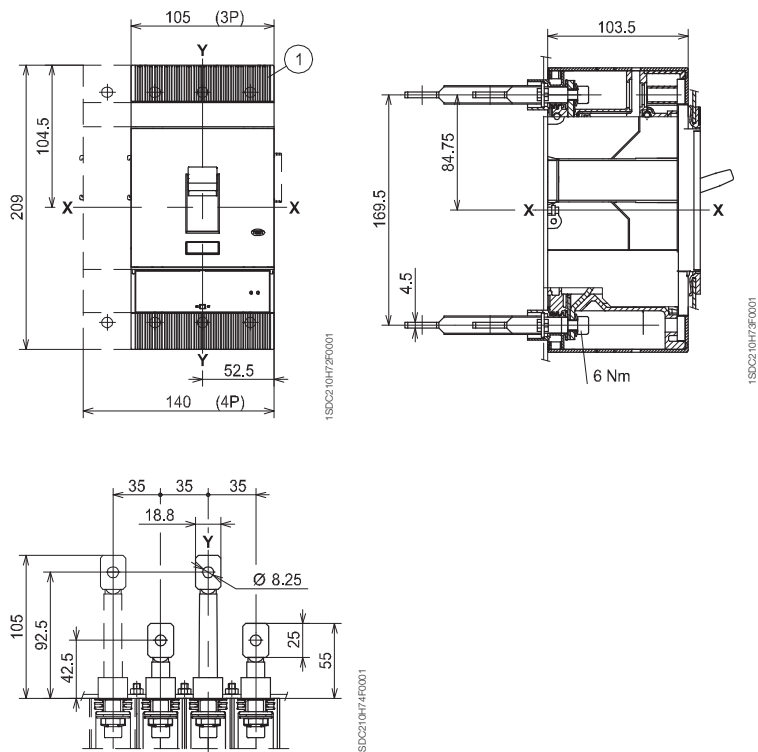
Front extended - EF



### Caption

- ① Low terminal covers with degree of protection IP40

Rear horizontal - R



# Overall dimensions

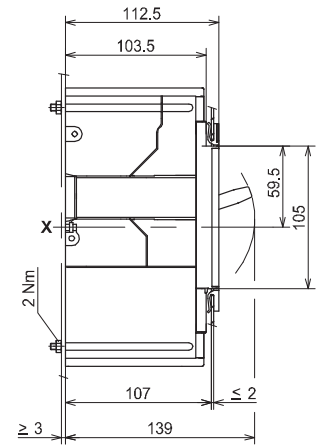
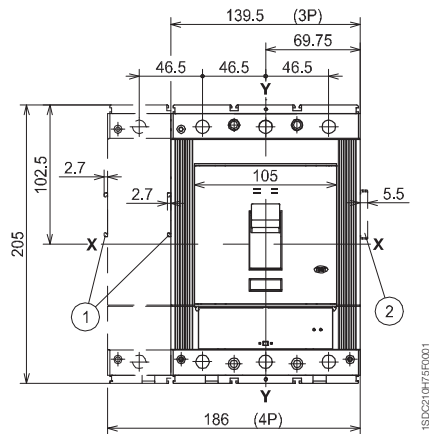
## Tmax T5

### Fixed circuit-breaker

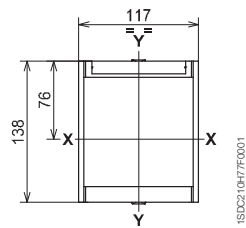
#### Caption

Fixing on sheet

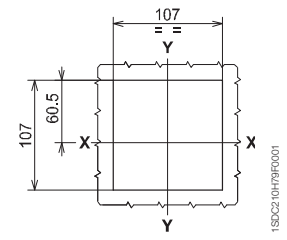
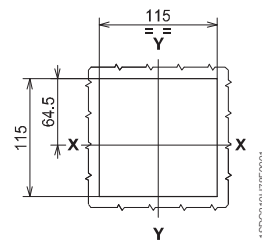
- ① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222)
- ② Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



#### Flange for compartment door

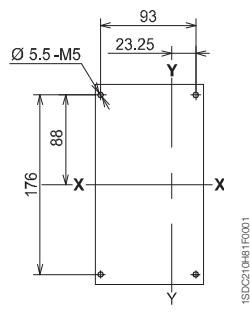
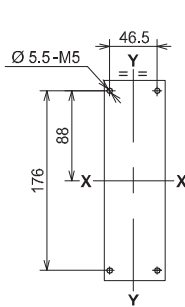


#### Drilling templates of the compartment door

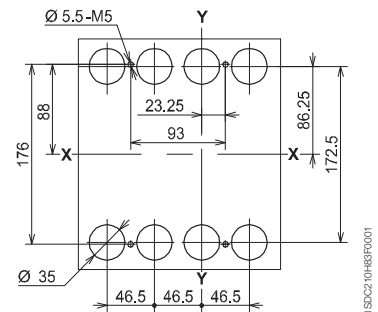
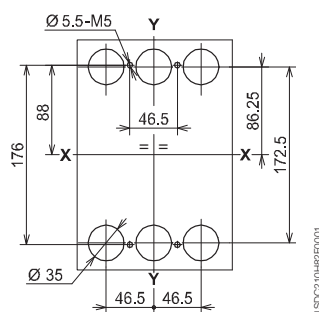


#### Drilling templates for support sheet

For front terminals



For rear terminals



3 POLES

4 POLES

3 POLES

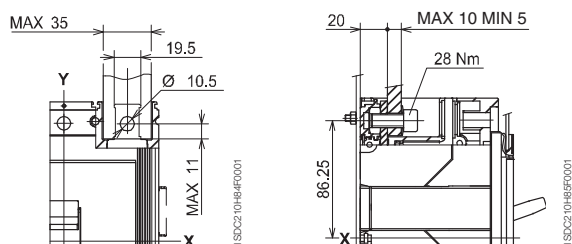
4 POLES

# Overall dimensions

## Tmax T5

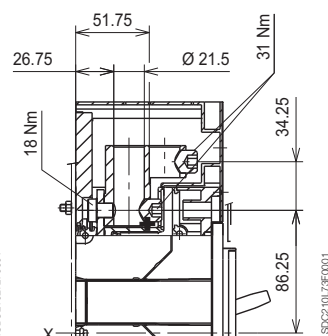
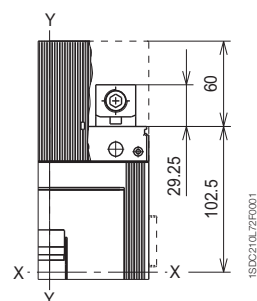
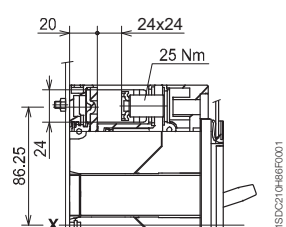
### Terminals

Front - F



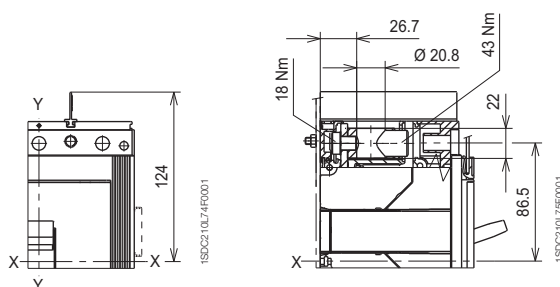
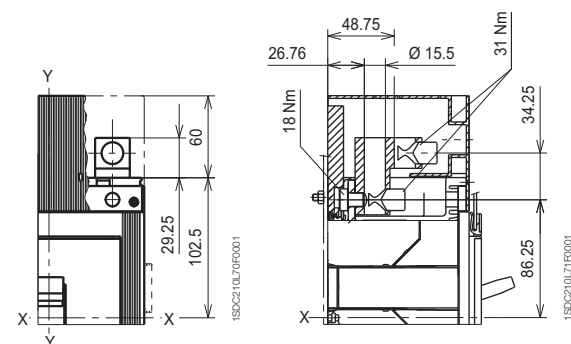
Front for copper cables - FC Cu

Front for copper cables - FC Cu 2x240 mm<sup>2</sup>



Front for copper/aluminum cables - FC CuAl 2x120 mm<sup>2</sup>

Front for copper/aluminum cables - FC CuAl 1x240 mm<sup>2</sup>

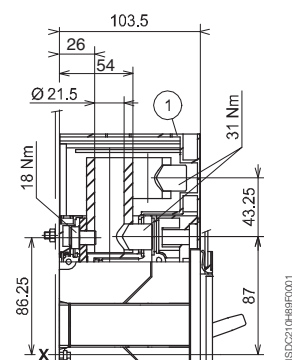
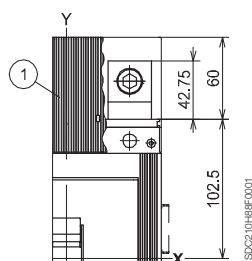
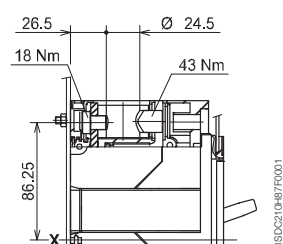


### Caption

- ① High terminal covers with degree of protection IP40

Front for copper/aluminium cables - FC CuAl 300 mm<sup>2</sup>

Front for copper/aluminium cables - FC CuAl 2x240 mm<sup>2</sup>

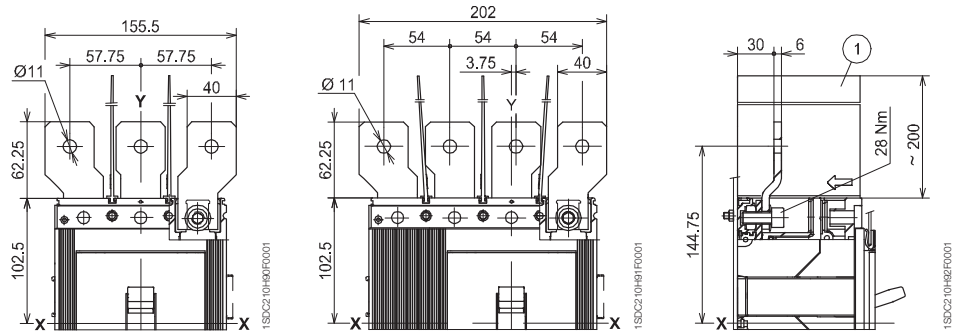


# Terminals

## Caption

- ① Insulating barriers between phases (compulsory)

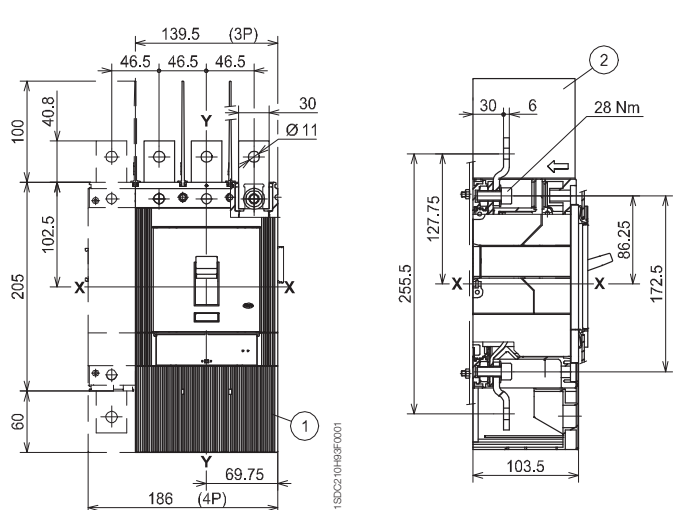
Front extended spread - ES



## Caption

- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)

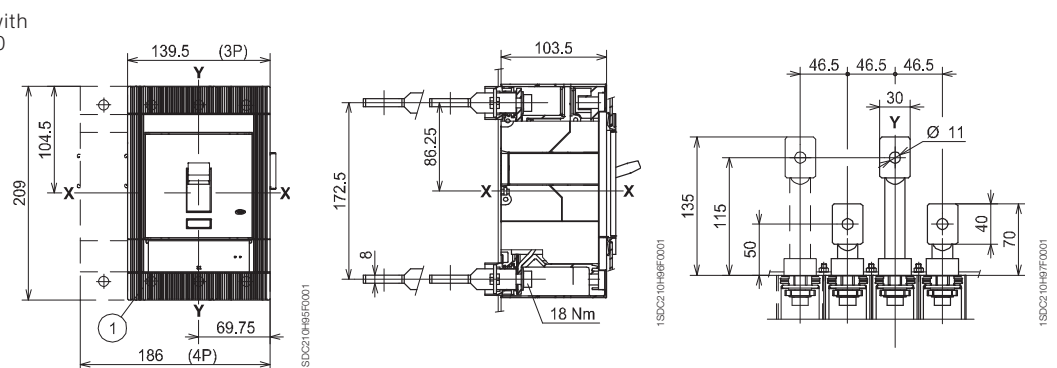
Front extended - EF



## Caption

- ① Low terminal covers with degree of protection IP40

Rear horizontal - R



# Overall dimensions

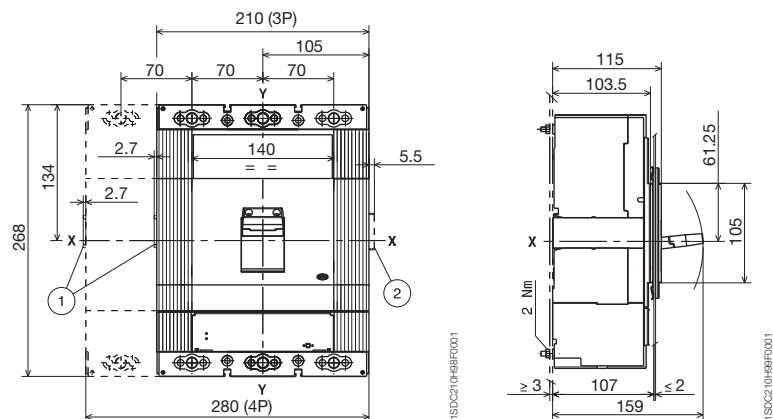
## Tmax T6

### Fixed circuit-breaker

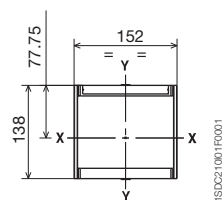
#### Caption

- ① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C)
- ② Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

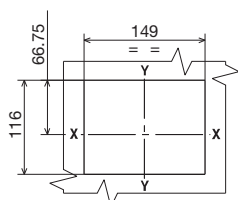
Fixing on sheet



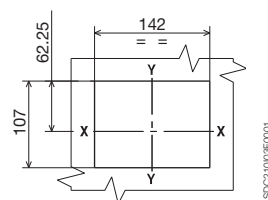
#### Flange for the compartment door



#### Drilling templates of the compartment door



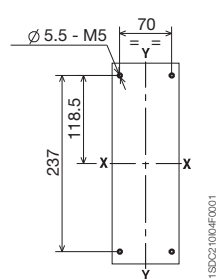
With flange 3-4 POLES



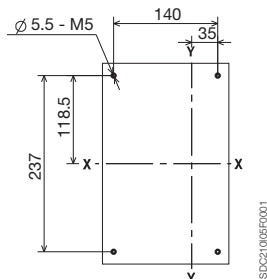
Without flange 3-4 POLES

#### Drilling templates for support sheet

For front terminals F, EF, ES, FC Cu, FC CuAl



3 POLES



4 POLES



## 6

Technical drawing of the 630 A (3 POLES) terminal block. The drawing shows the dimensions and features of the component.

Dimensions (mm):

- Overall width: 168
- Overall height: 150.5
- Terminal block width: 70
- Terminal block height: 118.5
- Base height: 301
- Terminal block depth: 237
- Terminal block radius: R 18

Features:

- Terminal block: 630 A (3 POLES)
- Terminal block screw: 5.5 - M5

800 A (3 POLES)

Technical drawing of a 2-pole terminal block for 800 A (4 poles). The drawing shows a side view of a rectangular block with two horizontal slots for screws. Dimensions include a total width of 241.5 mm, a slot width of 140 mm, and a slot depth of 35 mm. The distance between the centers of the slots is 118.5 mm. The total height is 150.5 mm, with a mounting flange height of 85.75 mm. The mounting holes have a diameter of 5.5 mm and an M5 thread. The radius of the mounting flange is R21.5 mm. The drawing is labeled "800 A (4 POLES)" and "1SDC21009F0001".

Technical drawing of a 150C2.10L7F6R001 component. The drawing includes a front view (top) and a side view (bottom). The front view shows a rectangular component with a total width of 140 mm (70 mm + 70 mm) and a total height of 241 mm. The top view features a central horizontal slot with a width of 35 mm and a depth of 70 mm. The slot is flanked by two circular features, each with a diameter of 35 mm. The distance from the center of the slot to the center of the circular features is 70 mm. The side view shows a rectangular component with a total height of 237 mm and a total width of 118.5 mm. The side view features a central horizontal slot with a width of 35 mm and a depth of 70 mm. The slot is flanked by two circular features, each with a diameter of 35 mm. The distance from the center of the slot to the center of the circular features is 70 mm. The drawing also includes a detail view of a hole with a diameter of 5.5 mm and a depth of 120.5 mm. The drawing is labeled with the part number 150C2.10L7F6R001.

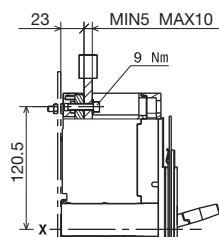
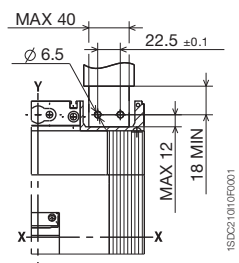
Technical drawing of a 2x4 panel showing dimensions and mounting details. The panel is 241mm high and 237mm wide. It features two rows of four circular mounting holes. The top row has a center-to-center distance of 140mm between the first two holes, with a 35mm offset from the left edge. The bottom row has a center-to-center distance of 70mm between the first two holes, with a 70mm offset from the left edge. The vertical distance between the centerlines of the two rows is 120.5mm. The panel has a Ø 5.5 M5 mounting hole and a Ø 35 hole. The drawing includes a coordinate system with X and Y axes.

# Overall dimensions

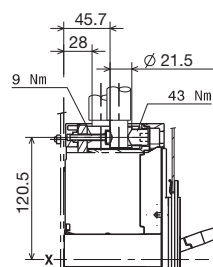
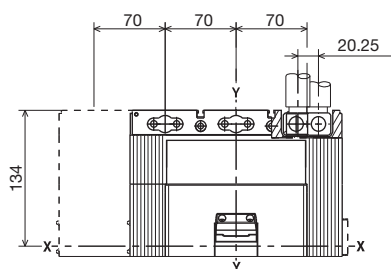
## Tmax T6

### Terminals

Front - F

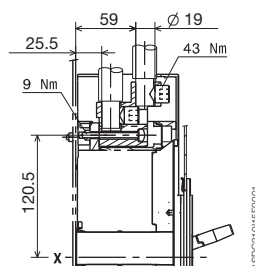
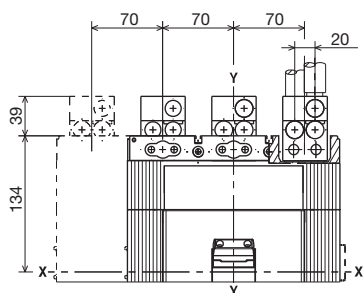


Front for copper/aluminium cables - FC CuAl 2x240 mm<sup>2</sup>



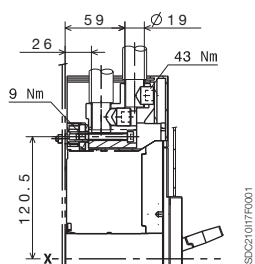
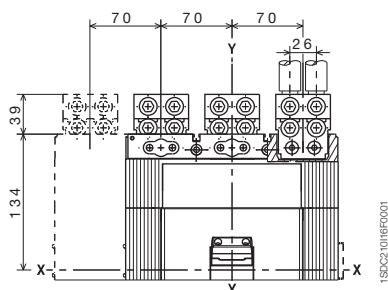
630 A

Front for copper/aluminium cables - FC CuAl 3x185 mm<sup>2</sup>



800 A

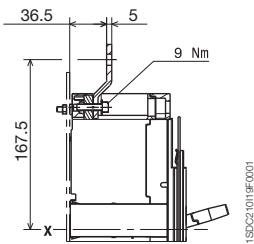
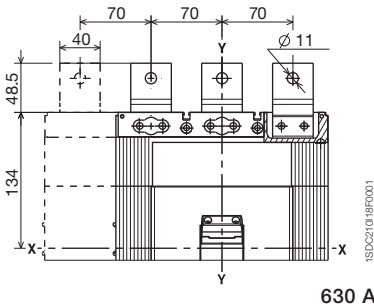
Front for copper/aluminium cables - FC CuAl 4x150 mm<sup>2</sup>



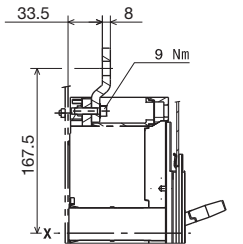
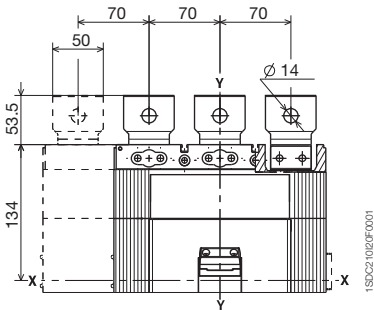
1000 A

# Terminals

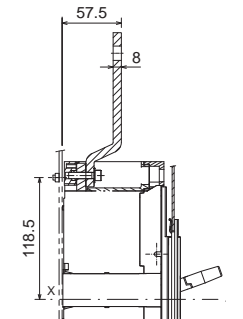
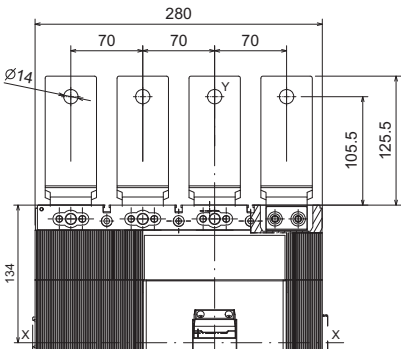
Front extended - EF



630 A

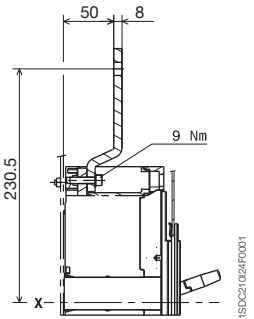
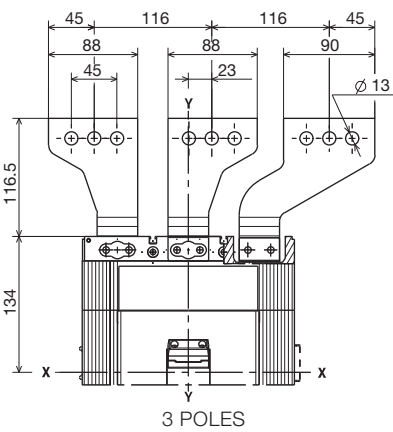
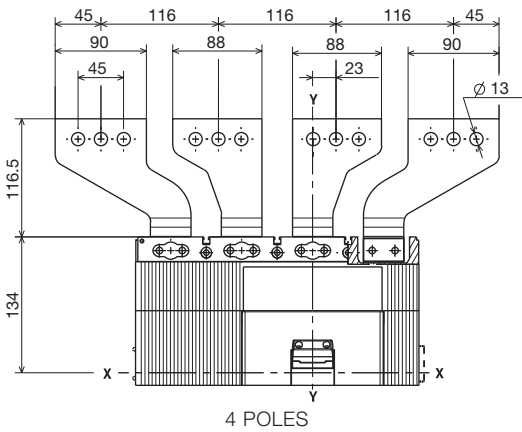


800 A



1000 A

Front extended spread - ES



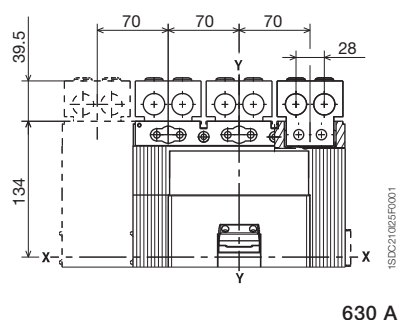
4 POLES

3 POLES

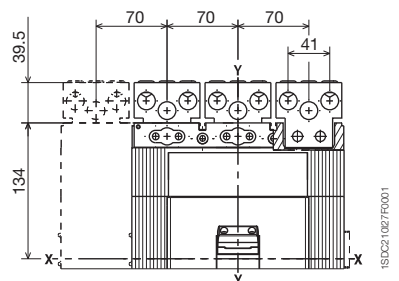
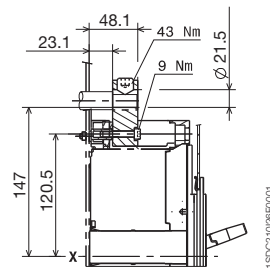
# Overall dimensions

## Tmax T6

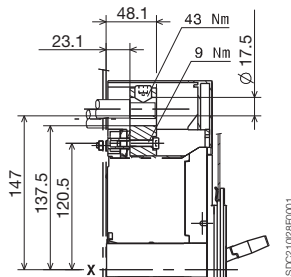
Rear for copper/aluminium cables - RC CuAl



630 A



800 A

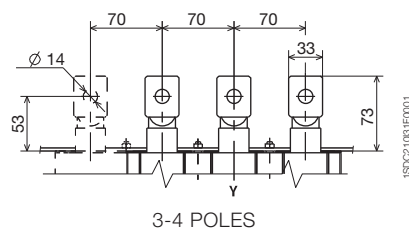
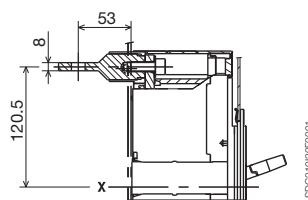
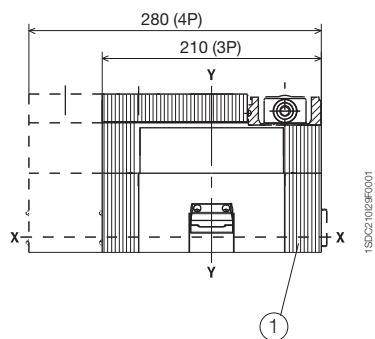


6

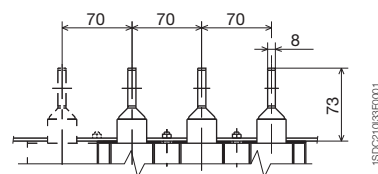
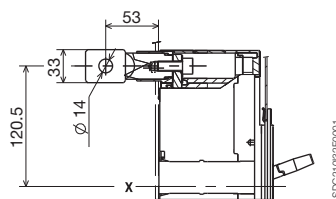
### Caption

- Low terminal covers with degree of protection IP40

Rear horizontal - R



3-4 POLES



3-4 POLES

# Overall dimensions

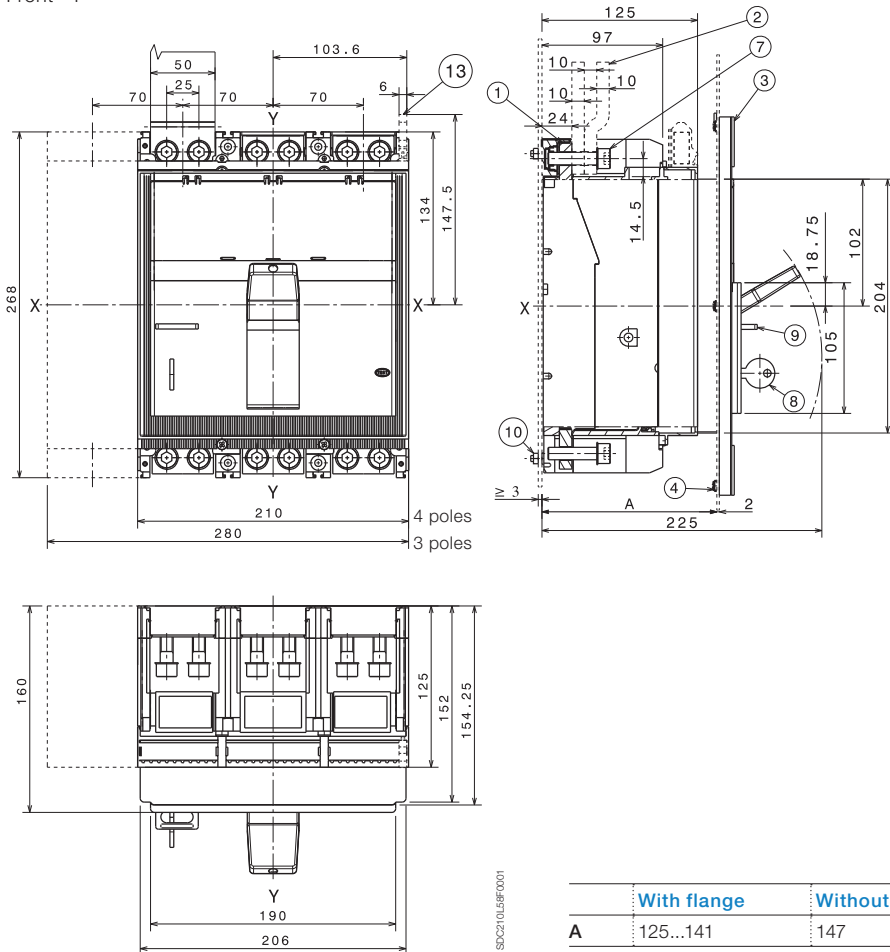
## Tmax T7

### Fixed circuit-breaker

Front - F

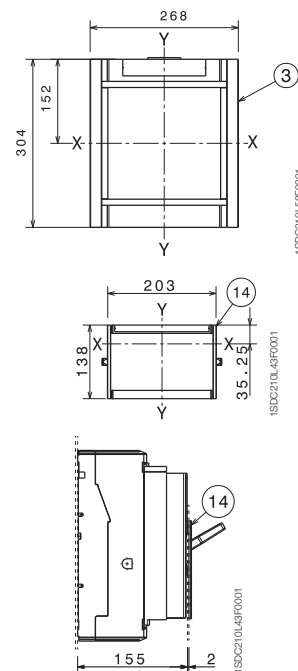
#### Caption

- ① Front terminals for flat connection
- ② Busbars
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 18 Nm
- ⑧ Key lock (optional)
- ⑨ Padlock (optional)
- ⑩ Tightening torque: 2.5 Nm
- ⑪ Sheet drilling for compartment door with flange
- ⑫ Sheet drilling for compartment door for front 206 x 204
- ⑬ Terminal for auxiliary contacts
- ⑭ Reduce flange for the compartment door (optional)
- ⑮ Sheet drilling for compartment door with reduced flange
- ⑯ Sheet drilling for compartment door for front 190 x 105

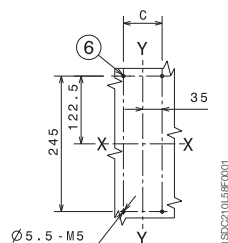


#### Flange for the compartment door (supplied as standard)

	With flange	Without flange
A	125...141	147

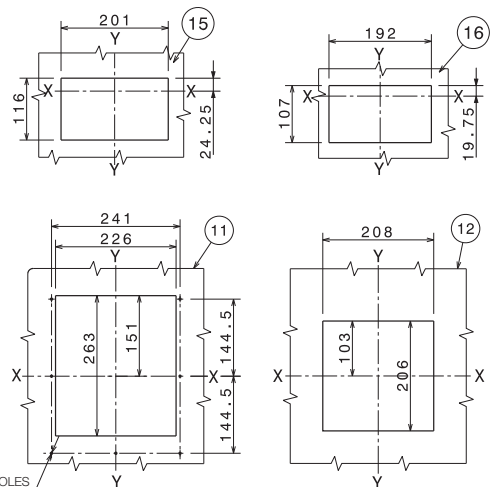


#### Drilling templates for support sheet



	III	IV
C	70	140

#### Drilling templates of the compartment door



# Overall dimensions

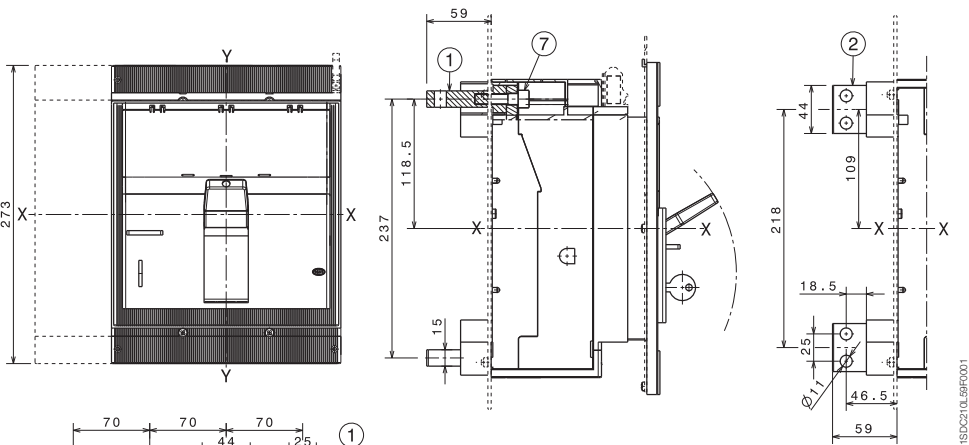
## Tmax T7

### Terminals

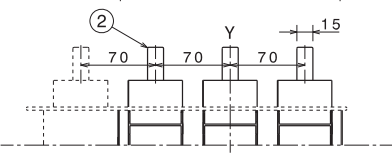
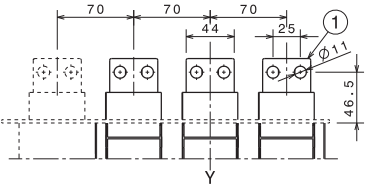
**Caption**

- ① Rear horizontal terminals
- ② Rear vertical terminals
- ⑥ Support sheet drilling template
- ⑦ Tightening torque: 20 Nm

Rear flat horizontal or vertical - HR/VR

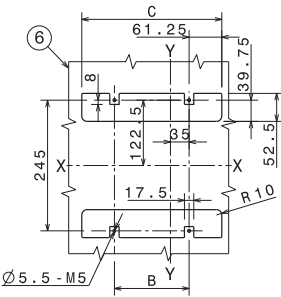


1SDC210L59F001



1SDC210L59F001

### Drilling templates for support sheet

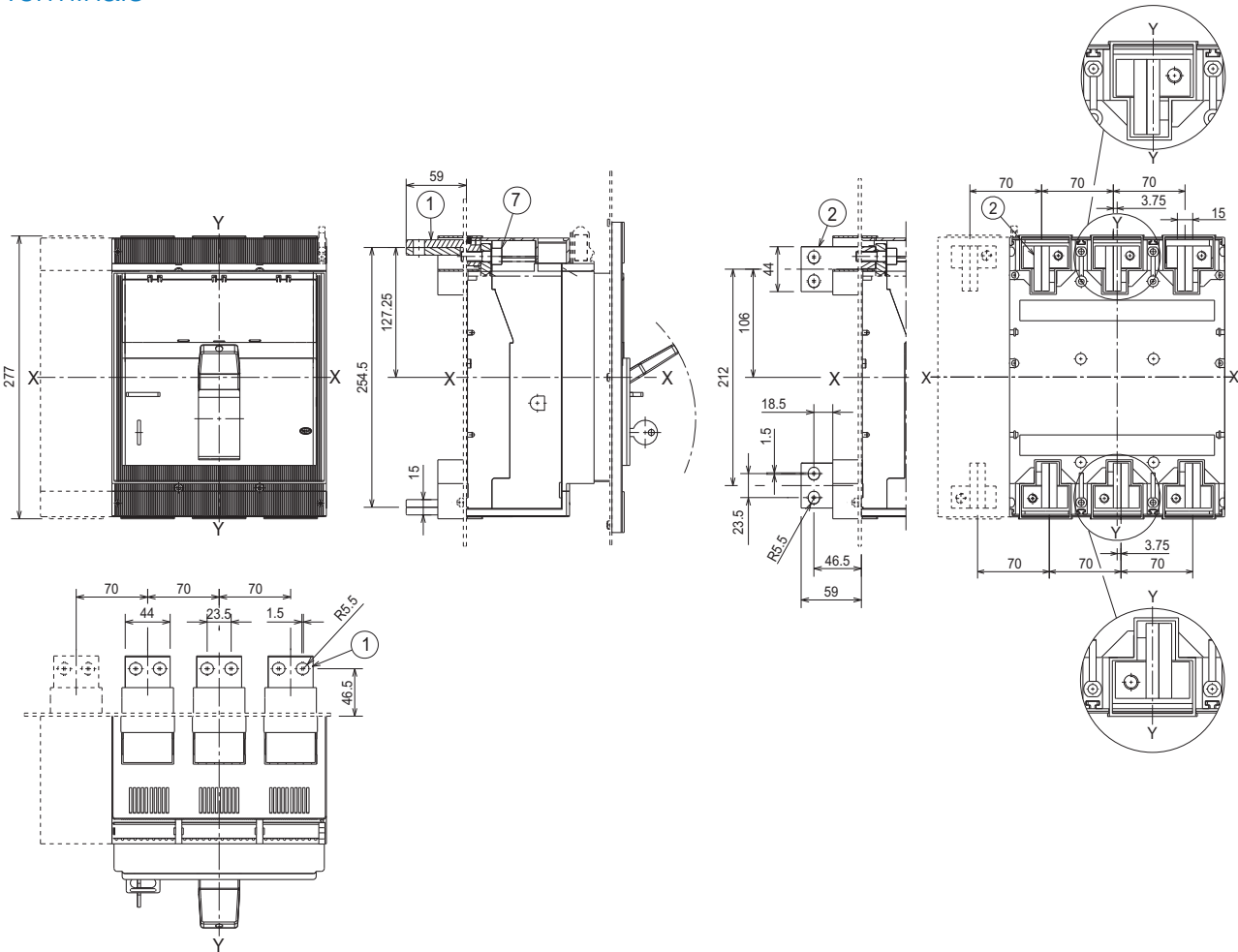


1SDC210L59F001

	III	IV
B	70	140
C	192.5	262.5

Terminals

Rear horizontal - R

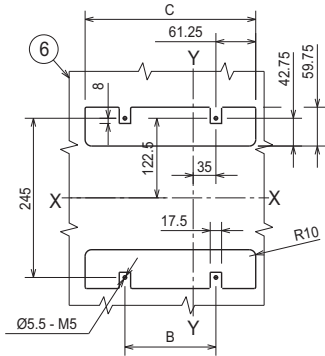


6

Caption

- ① Rear horizontal terminals
- ② Rear vertical terminals
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 20 Nm

Drilling templates for support sheet



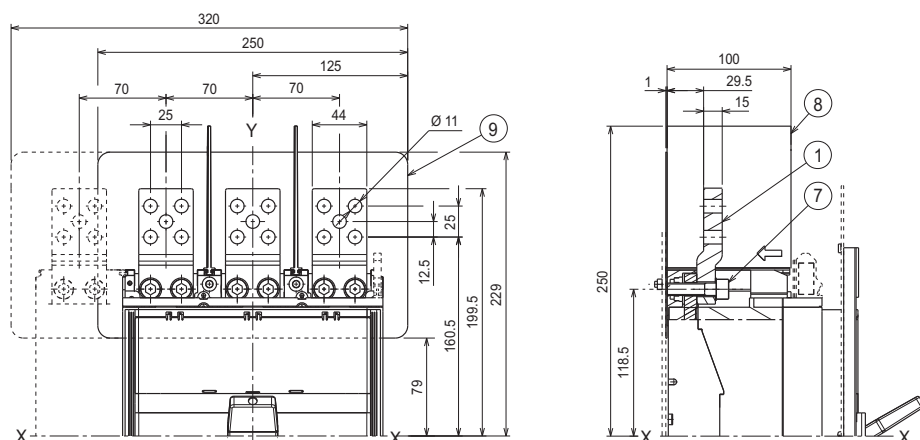
	III	IV
B	70	140
C	192.5	262.5

Overall dimensions  
Tmax T7

Caption

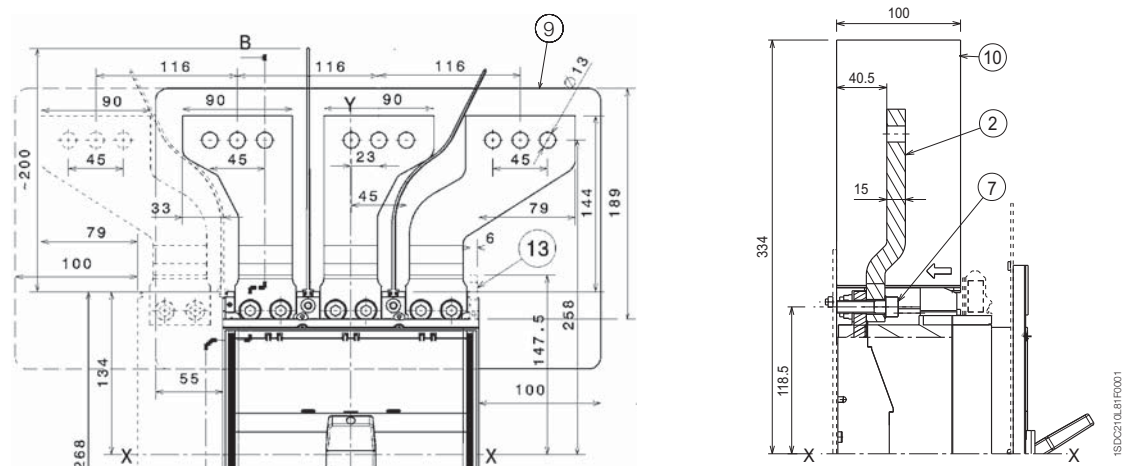
Front extended - EF

- ① Extended front terminals EF
- ② Extended front spread terminals ES
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 18 Nm
- ⑧ Phase separator 100 mm
- ⑨ Protection plate
- ⑩ Phase separator 200 mm
- ⑬ Clamp for auxiliary contacts

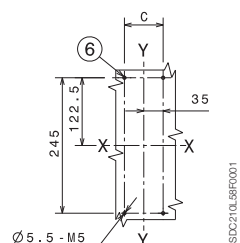


6

Front extended spread - ES



## Drilling templates for support sheet



III

IV

C 70 140

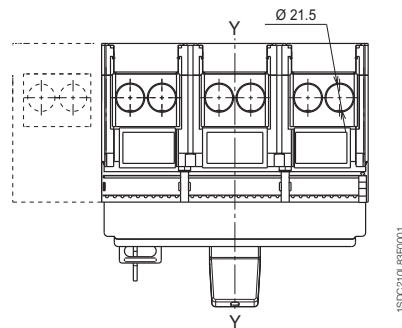
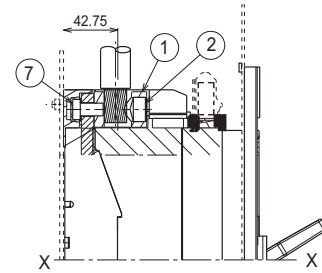
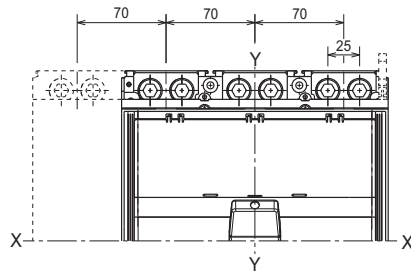


## Terminals

Front for copper/aluminium cables - FC CuAl 2x240 mm<sup>2</sup>

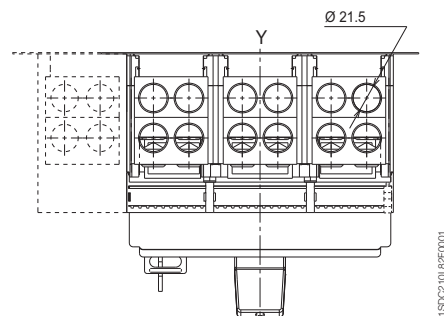
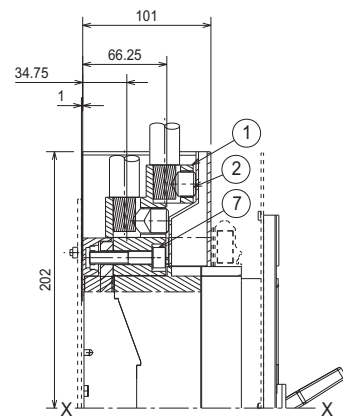
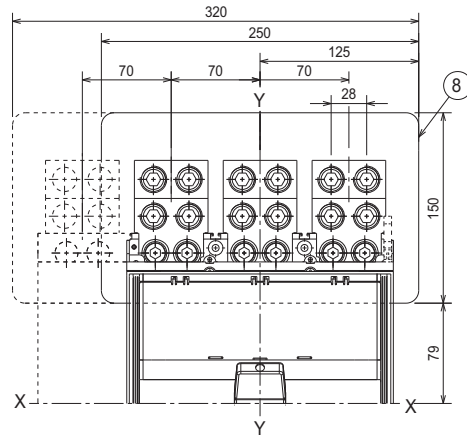
### Caption

- ① Front terminals for cables FC CuAl
- ② Tightening torque: 43 Nm
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 18 Nm
- ⑧ Protection plate



6

Front for copper/aluminium cables - FC CuAl 4x240 mm<sup>2</sup>



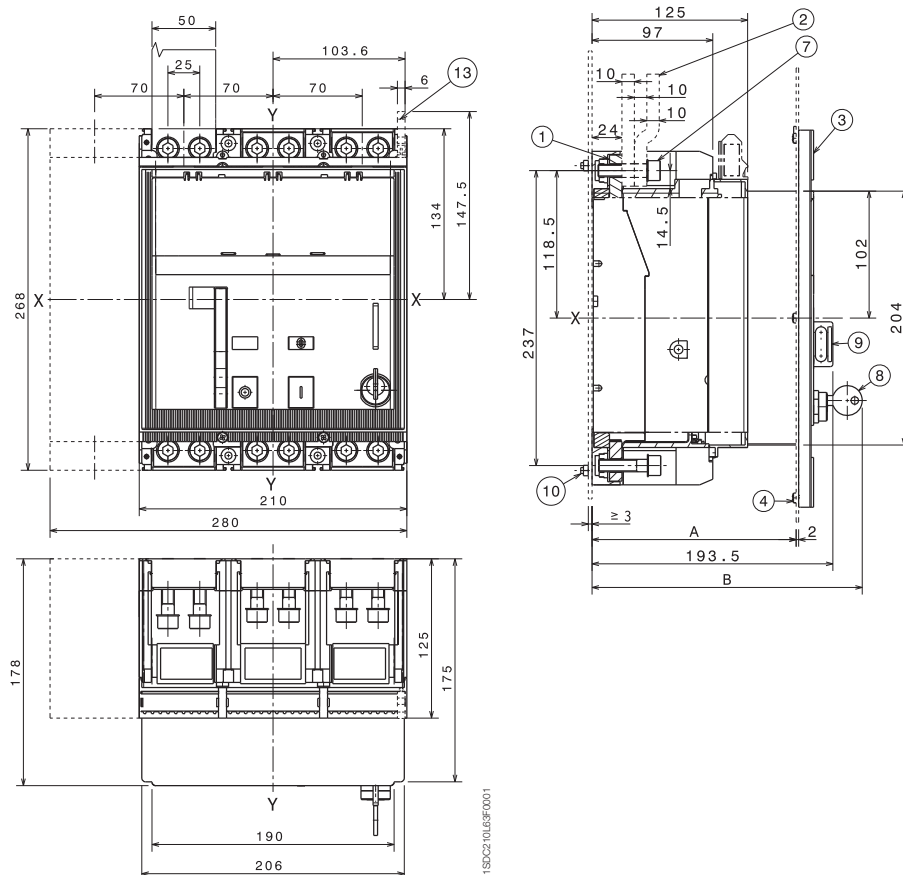
# Overall dimensions

## Tmax T7M

### Fixed circuit-breaker Front - F

#### Caption

- ① Front terminal for flat connection
- ② Busbars
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 18 Nm
- ⑧ Key lock (optional)
- ⑨ Padlock (optional)
- ⑩ Tightening torque: 2.5 Nm
- ⑪ Compartment door with flange sheet drilling
- ⑫ Compartment door without flange sheet drilling
- ⑬ Terminal for auxiliary contacts



	With flange	Without flange
A	125...164	170

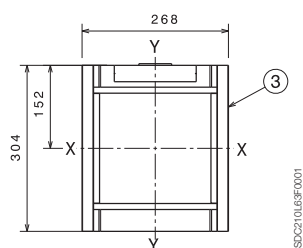
  

	Standard	Ronis	Profalux	Kirk	Castell
B	208	216	224	no	no

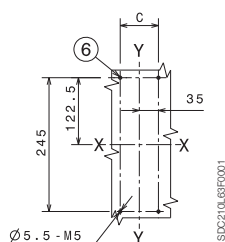
  

	III	IV
C	70	140

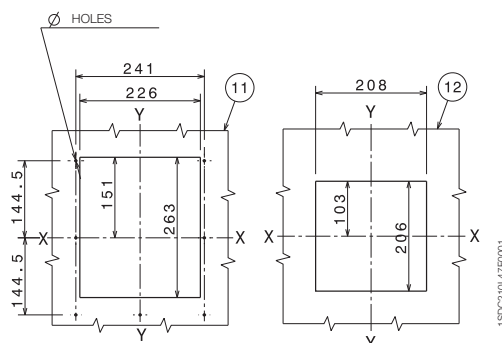
#### Flange for the compartment door (supplied as standard)



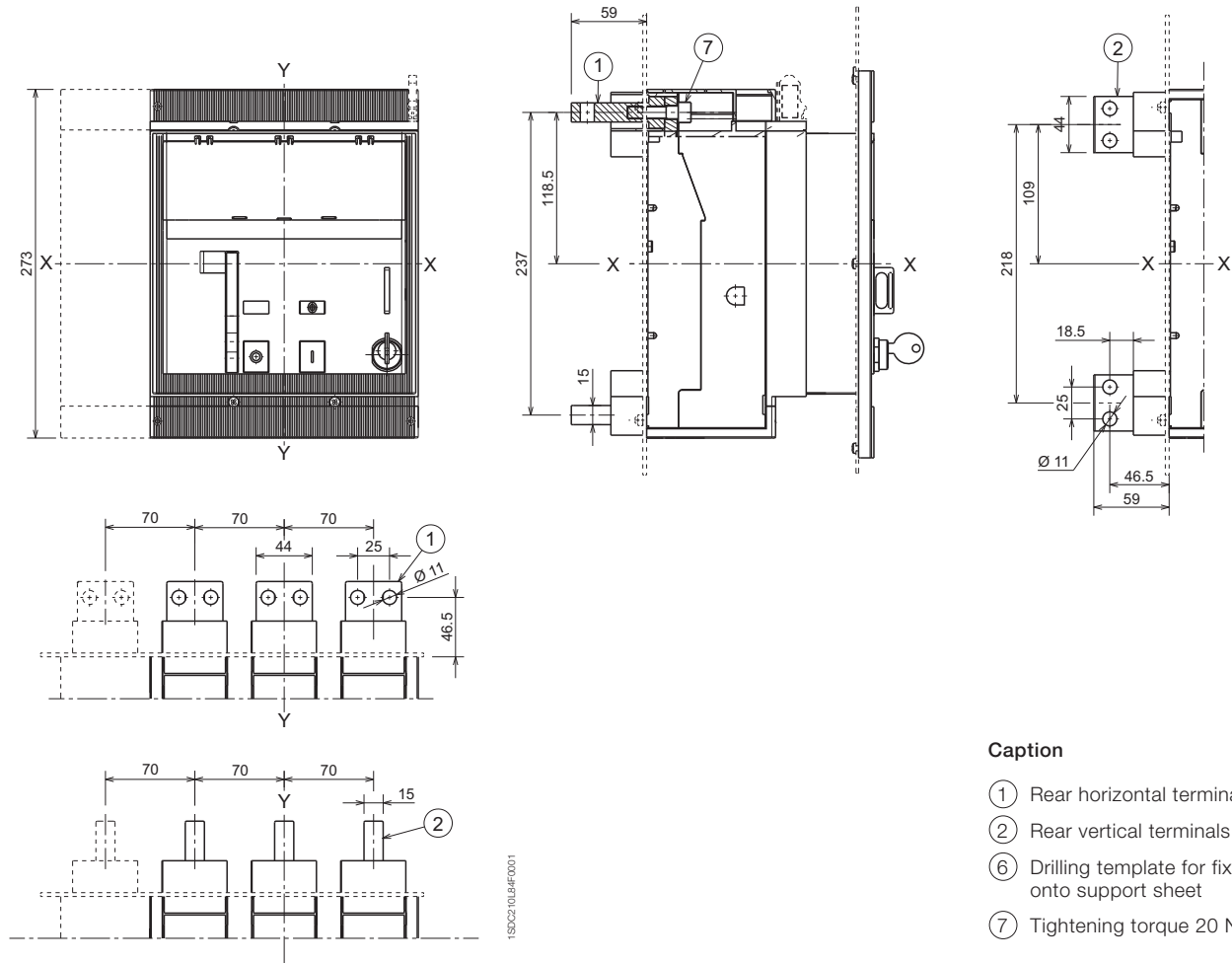
#### Drilling templates for support sheet



#### Drilling templates of the compartment door



Rear flat horizontal or vertical - HR/VR

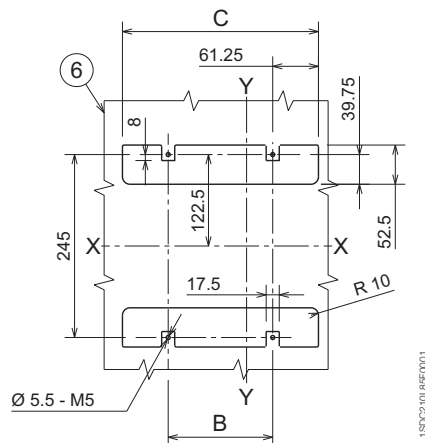


6

#### Caption

- ① Rear horizontal terminals
- ② Rear vertical terminals
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque 20 Nm

#### Drilling templates for support sheet

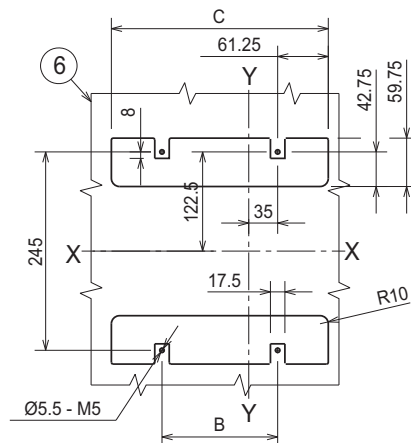


	III	IV
B	70	140
C	192.5	262.5

## 6

## Drilling templates for support sheet

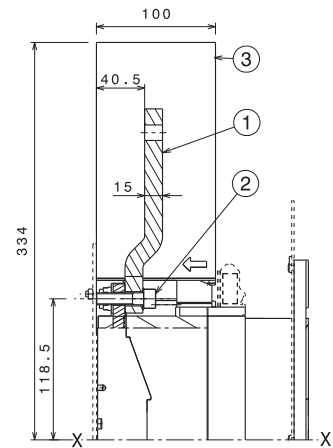
- ① Rear horizontal terminals
- ② Rear vertical terminals
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque 20 Nm



	III	IV
B	70	140
C	192.5	262.5

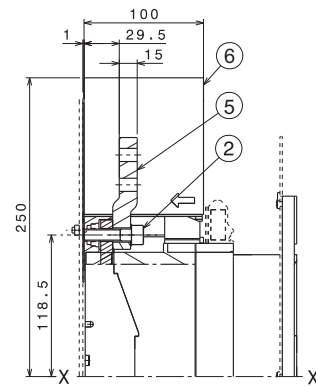
- ① Front extended spread terminals - ES
- ② Tightening torque 18 Nm
- ③ Phase separators 200 mm
- ④ Protection plate
- ⑤ Extended front terminals - EF
- ⑥ Phase separators 100 mm
- ⑬ Overall dimensions of auxiliary contact terminal

Technical drawing of a mechanical component, likely a pump or motor housing, showing a cross-section with dimensions in millimeters. The drawing includes a central vertical shaft, a base with mounting feet, and a top flange. Key dimensions include a total width of 320 mm, a central shaft diameter of 250 mm, and a base height of 278 mm. The drawing is labeled with 'X' and 'Y' axes.



1SDC210M01F0001

6



1SDC2 10M02F0001

# Overall dimensions

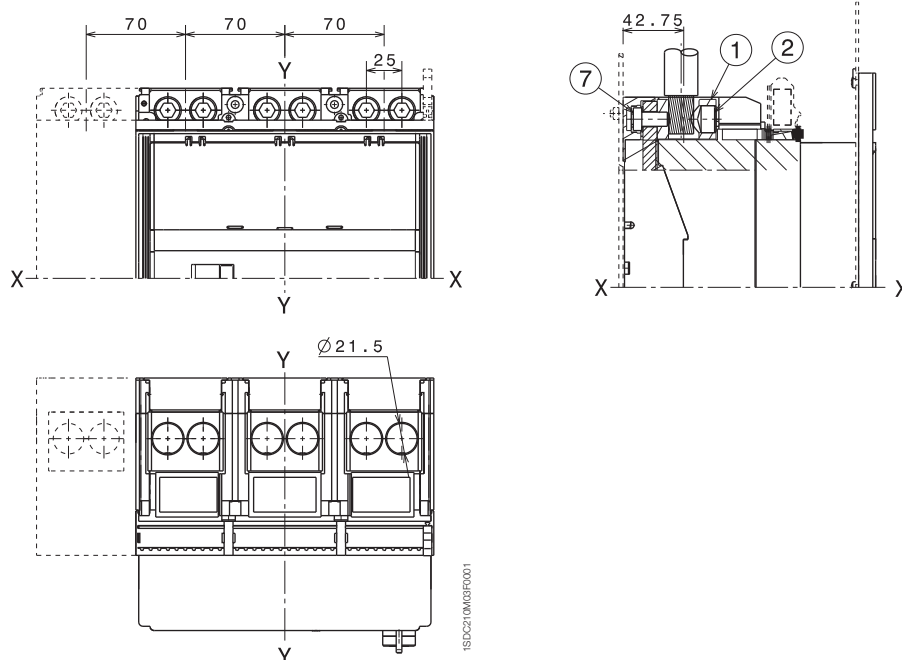
## Tmax T7M

### Terminals

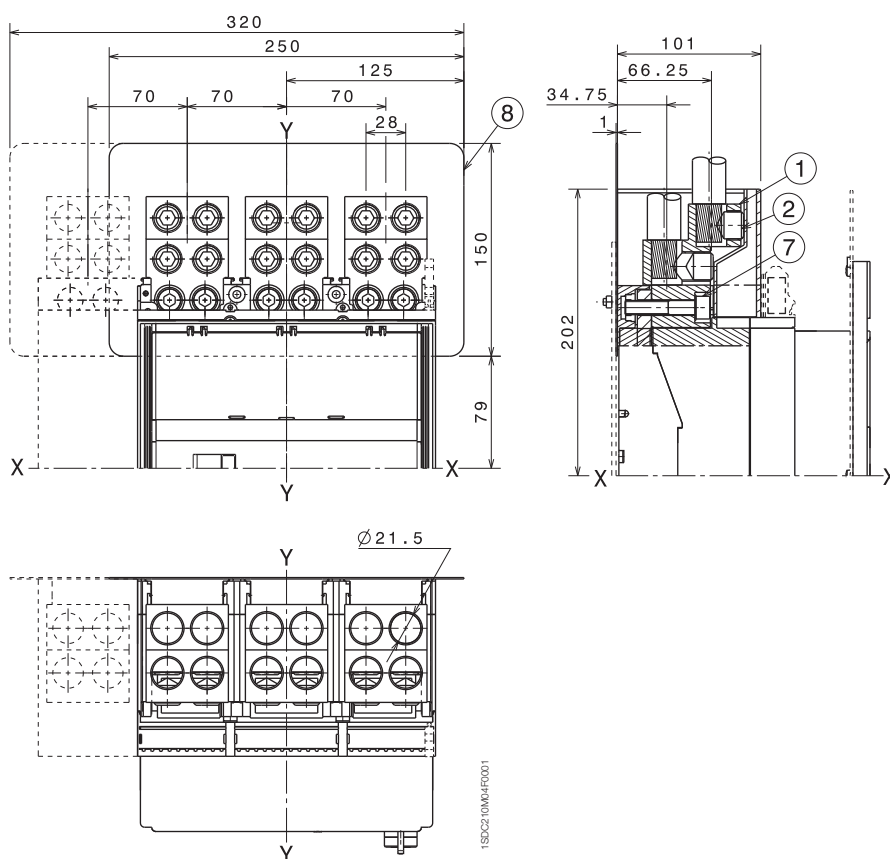
#### Caption

- ① Front terminals for cable FC CuAl
- ② Tightening torque 43 Nm
- ⑦ Tightening torque 18 Nm
- ⑧ Protection plate

Front for copper/aluminium cables - FC CuAl 2x240 mm<sup>2</sup>

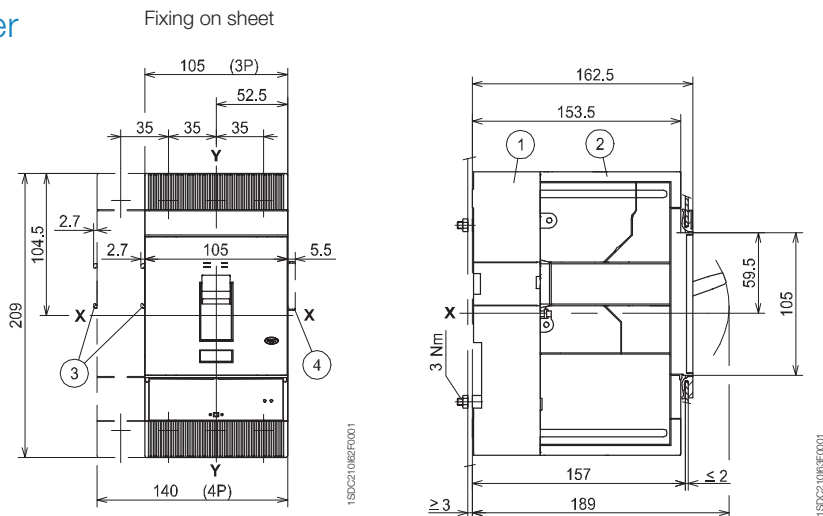


Front for copper/aluminium cables - FC CuAl 4x240 mm<sup>2</sup>

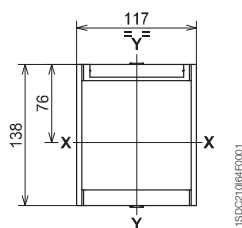


## Plug-in circuit-breaker

- ① Fixed part
- ② Moving part with terminal covers, degree of protection IP40
- ③ Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)
- ④ Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



Flange for  
compartment door

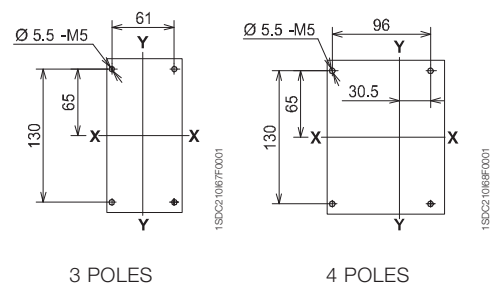


Technical drawings of two square plate types:

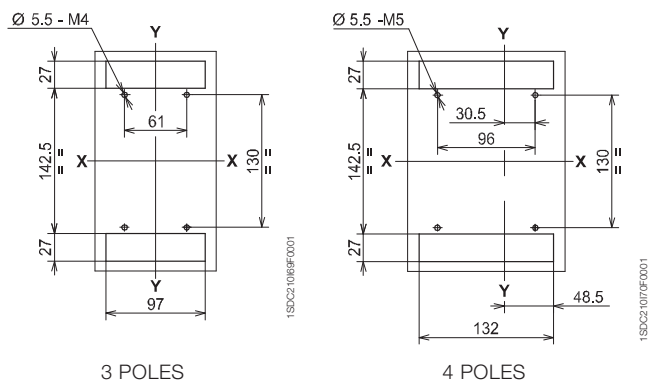
- With flange:** The overall dimensions are 115 (width) and 115 (height). The inner square has dimensions  $Y$  (width) and  $Y$  (height). The flange thickness is 64.5.
- Without flange:** The overall dimensions are 107 (width) and 107 (height). The inner square has dimensions  $Y$  (width) and  $Y$  (height). The flange thickness is 60.5.

Reference code: 130C21066F0001

For front terminals



For rear terminals

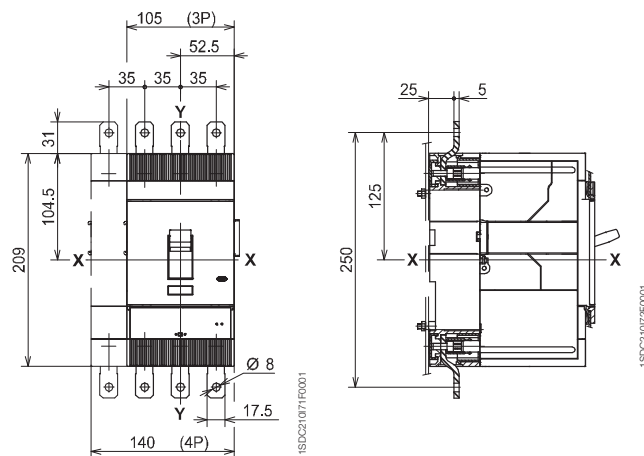


# Overall dimensions

## Tmax T4

### Terminals

Front extended - EF

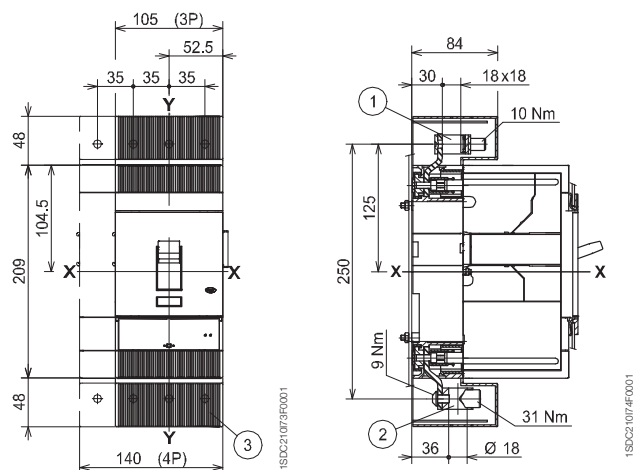


6

### Caption

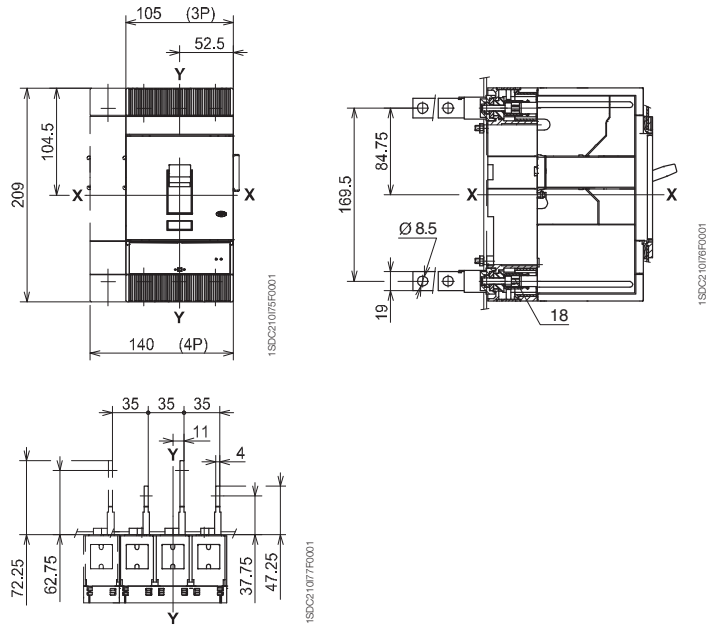
Front for copper cables - FC Cu or for copper/aluminium cables - FC CuAl

- ① For Cu cables
- ② For Cu Al cables
- ③ High terminal covers with degree of protection IP40



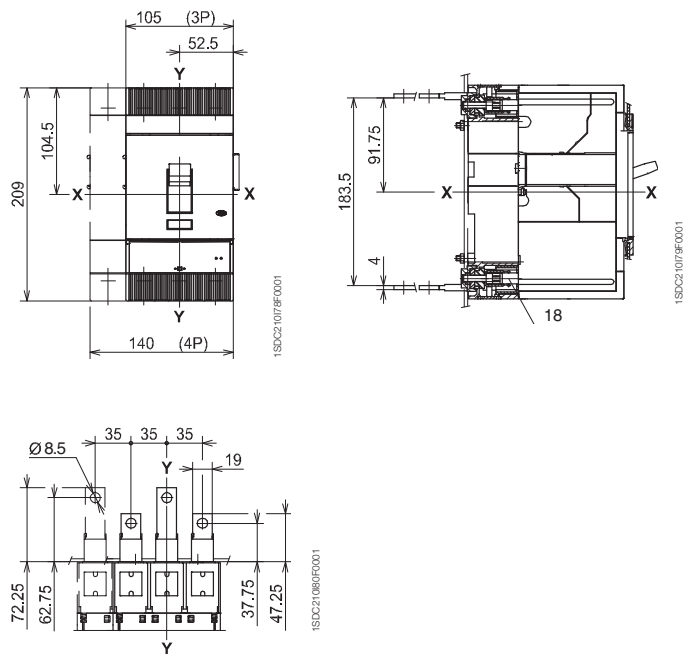


# Rear flat vertical - VR



3-4 POLES

# Rear flat horizontal - HR

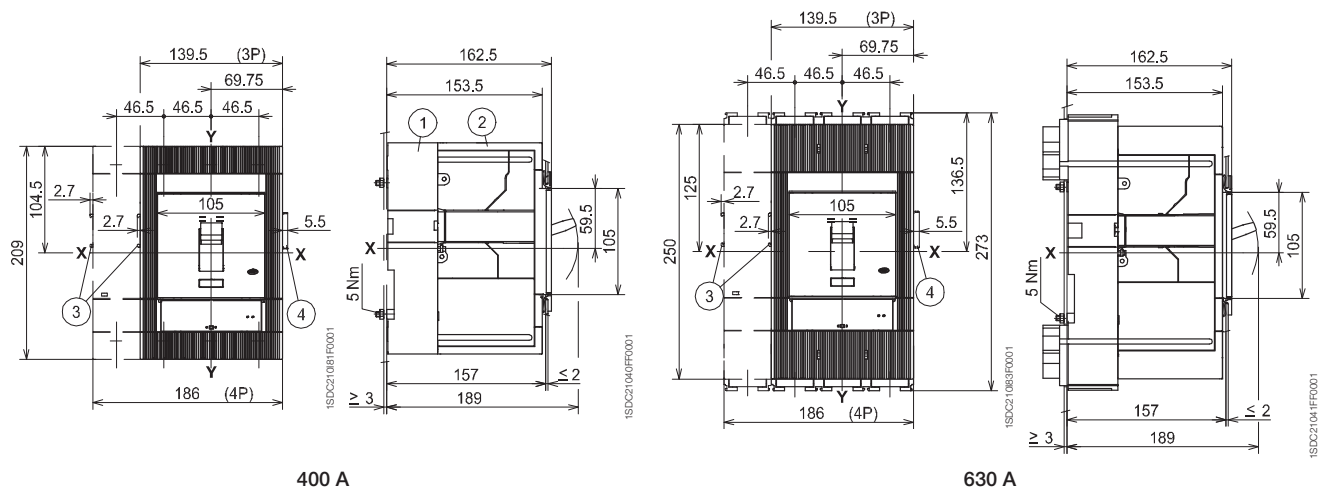


3-4 POLES

# Overall dimensions

## Tmax T5

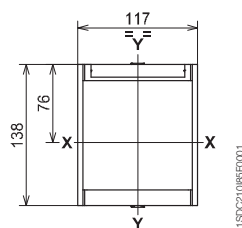
### Plug-in circuit-breaker Fixing on sheet



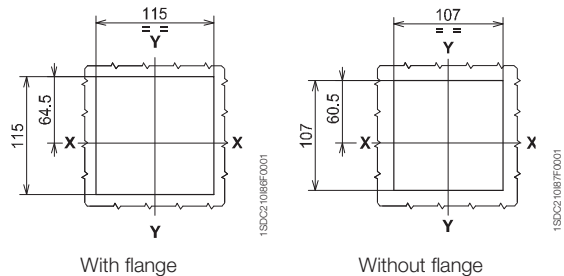
#### Caption

- ① Fixed part
- ② Moving part with terminal covers, degree of protection IP40
- ③ Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC221-222)
- ④ Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

#### Flange for compartment door

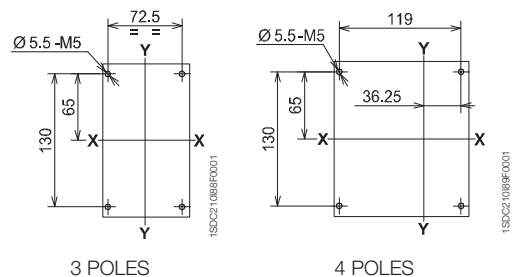


#### Drilling templates of the compartment door

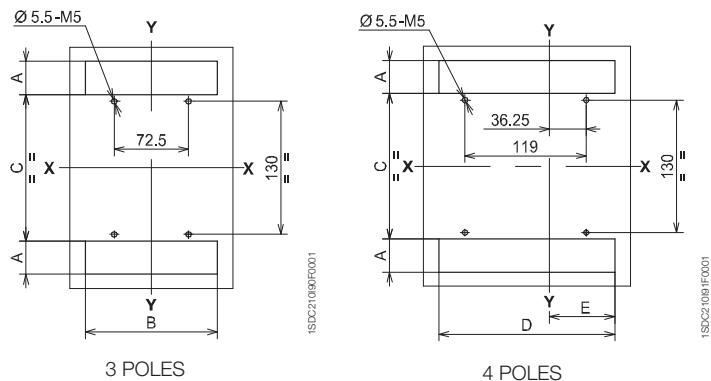


#### Drilling templates for support sheet

For front terminals 400 A



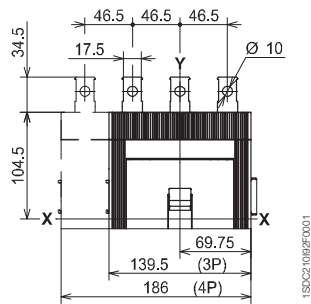
For front terminals 630 A  
For rear terminals 400 A - 630 A



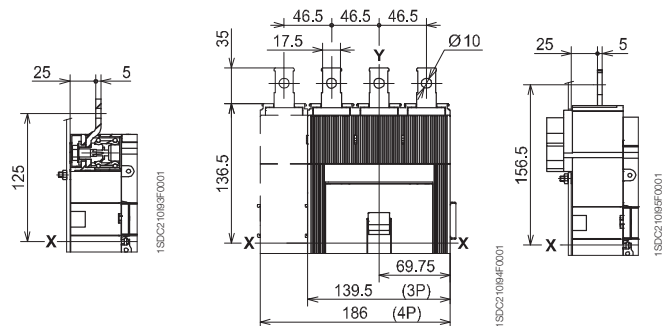
	A	B	C	D	E
Rear 400 A	32.5	128.5	143	172.5	64.5
Front and rear 630 A	61.8	139	142	185.5	69.5

## Terminals

Front extended 400 A - EF



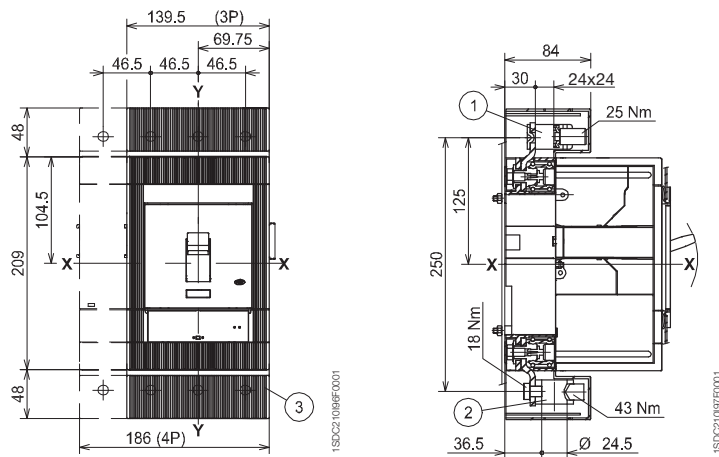
Front extended 630 A - F



### Caption

- ① Front terminals for cables Cu
- ② Front terminals for cables Cu/Al
- ③ High terminal covers with degree of protection IP40

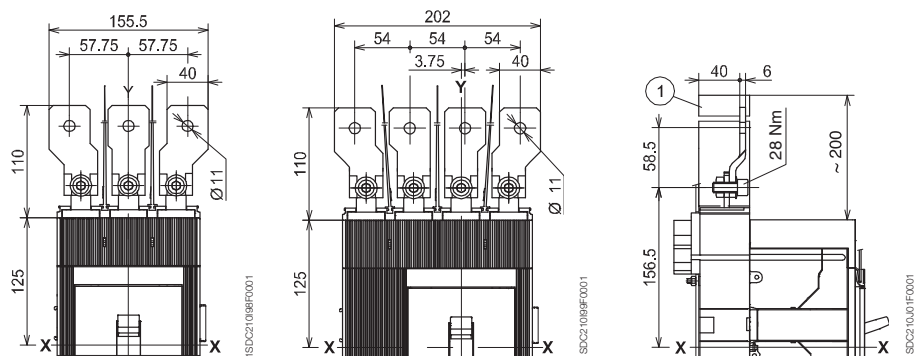
Front for copper cables - FC Cu or for copper/aluminium cables - FC CuAl



### Caption

- ① Insulating barriers between phases (compulsory)

Front extended spread 630 A - ES

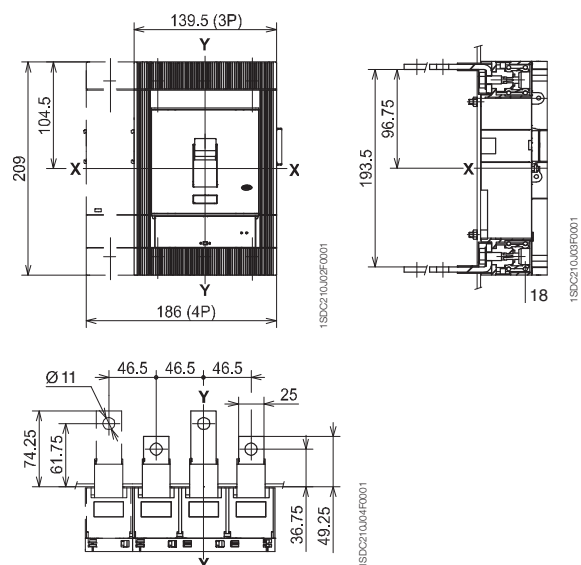


# Overall dimensions

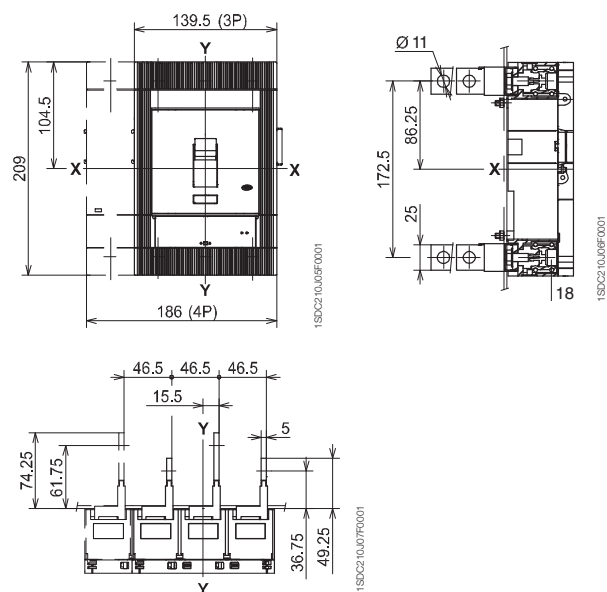
## Tmax T5

### Terminals

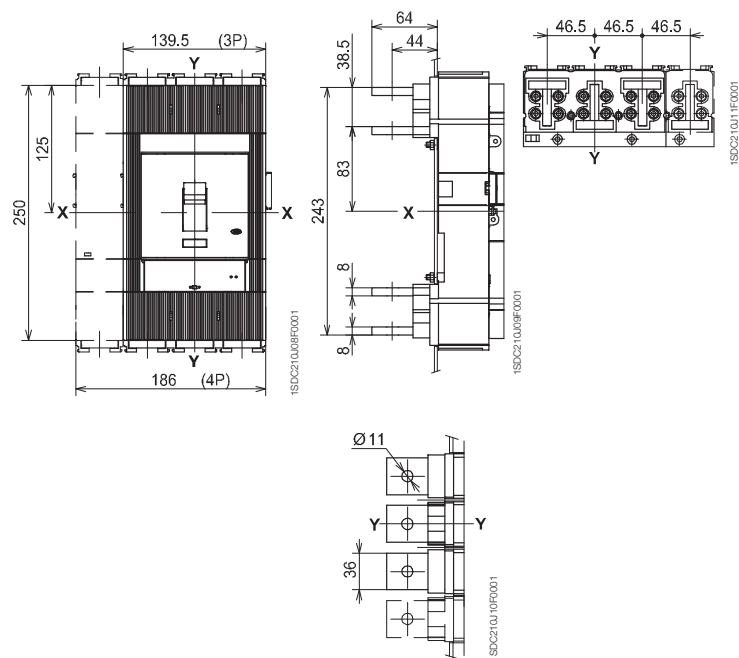
Rear flat horizontal 400 A - HR



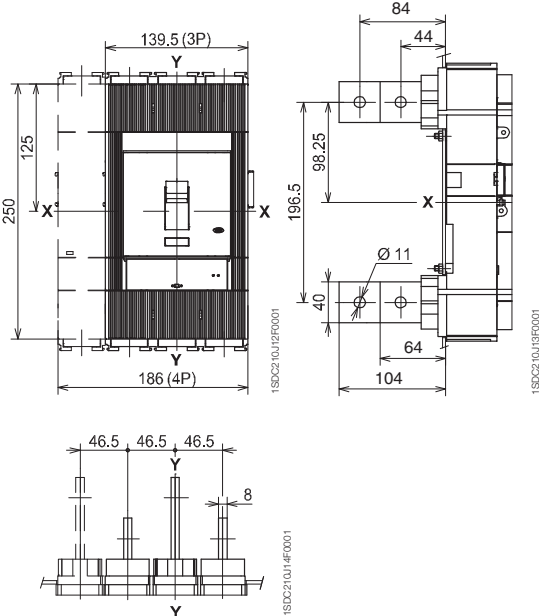
Rear flat vertical 400 A - VR



Rear flat horizontal 630 A - HR



Rear flat vertical 630 A - VR



# Overall dimensions

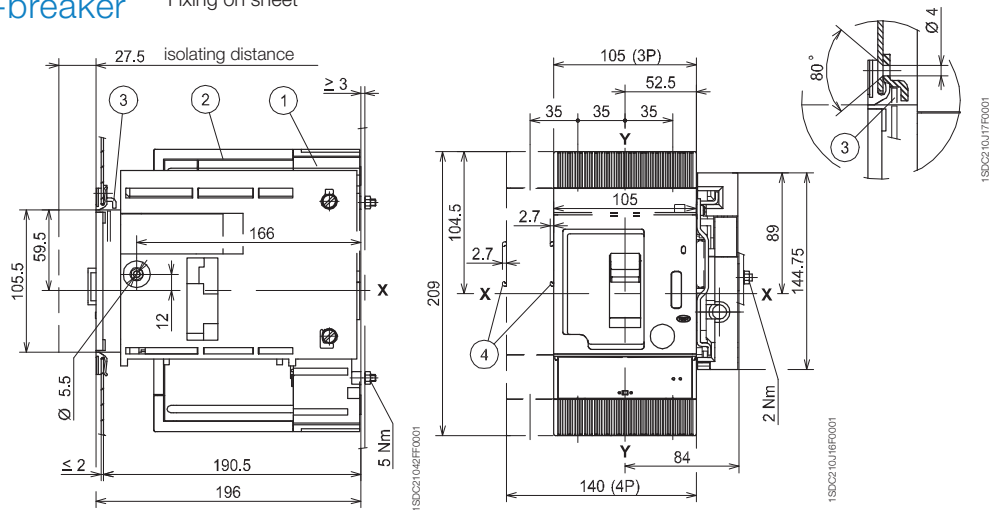
## Tmax T4

### Withdrawable circuit-breaker

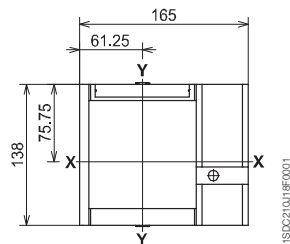
Fixing on sheet

#### Caption

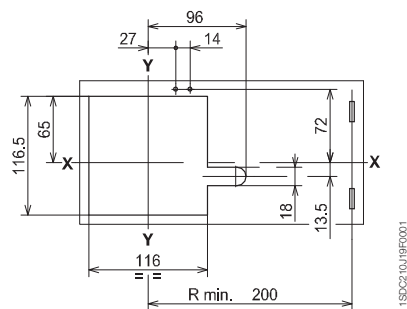
- ① Fixed part
- ② Moving part
- ③ Lock for compartment door (available on request)
- ④ Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)



### Flange for compartment door

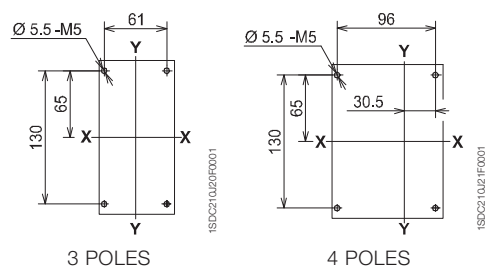


### Drilling templates of the compartment door

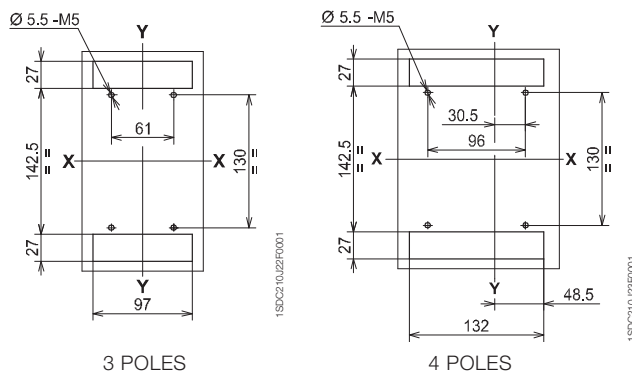


### Drilling templates for support sheet

For front terminals



For rear terminals

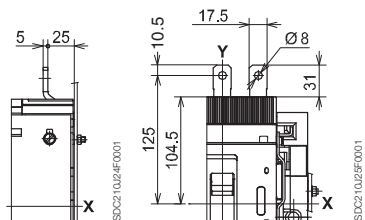


# Overall dimensions

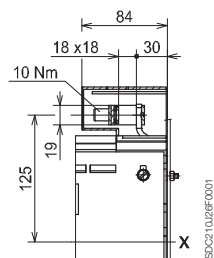
## Tmax T4

### Terminals

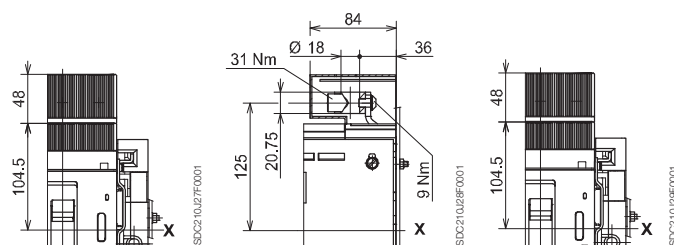
Front - EF



Front for copper cables - FC Cu

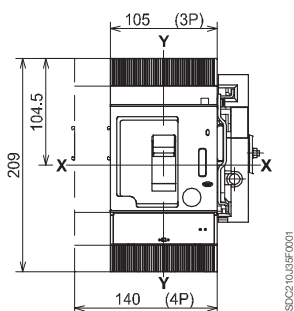
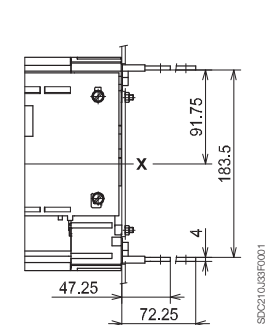


Front for copper/aluminium cables - FC CuAl

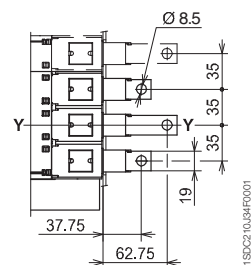
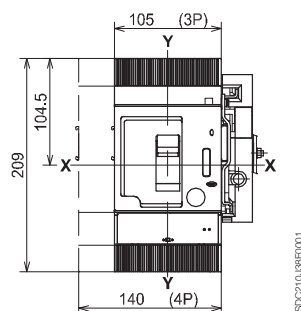
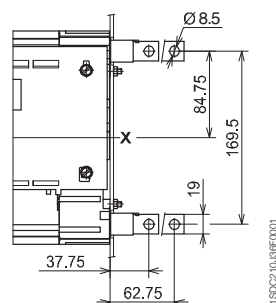


6

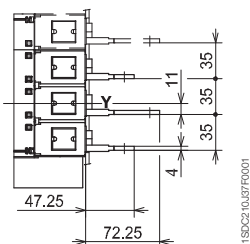
Rear flat horizontal - HR



Rear flat vertical - VR



3-4 POLES



3-4 POLES

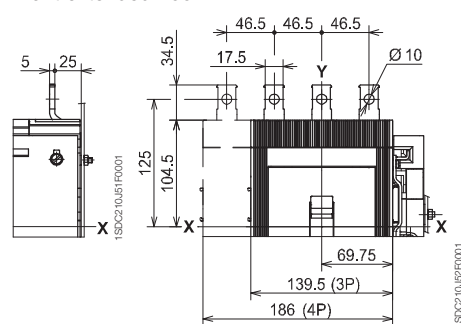


# Overall dimensions

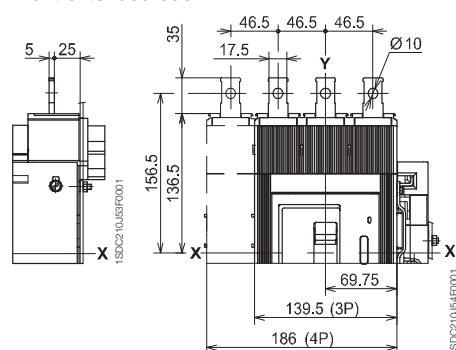
## Tmax T5

### Terminals

Front extended 400 A - EF



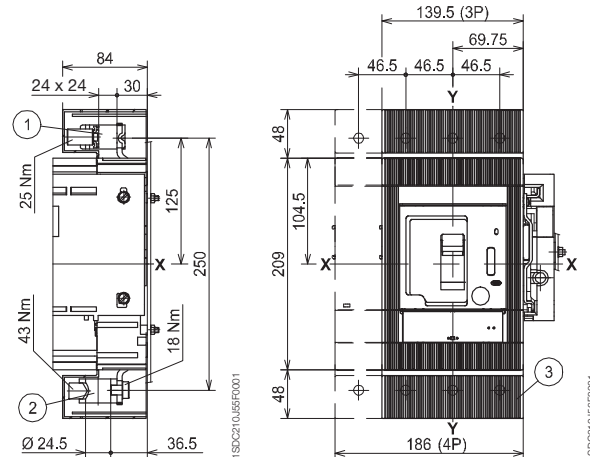
Front extended 630 A - EF



#### Caption

Front for copper cables - FC Cu or for copper/aluminium cables - FC CuAl 400 A

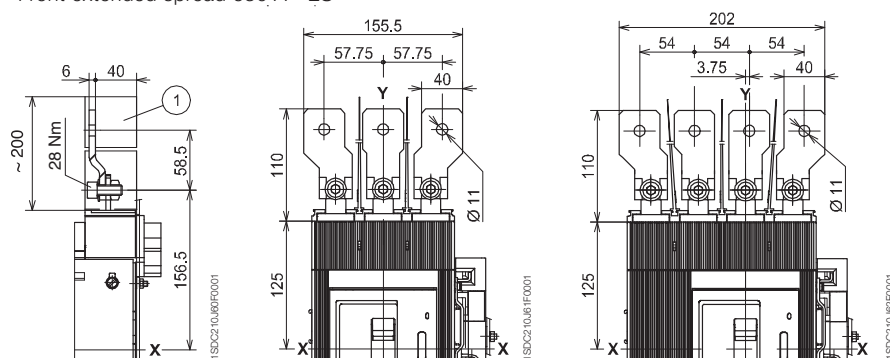
- ① Front terminals for copper cables
- ② Front terminals for copper/aluminium cables
- ③ Terminals with degree of protection IP40



#### Caption

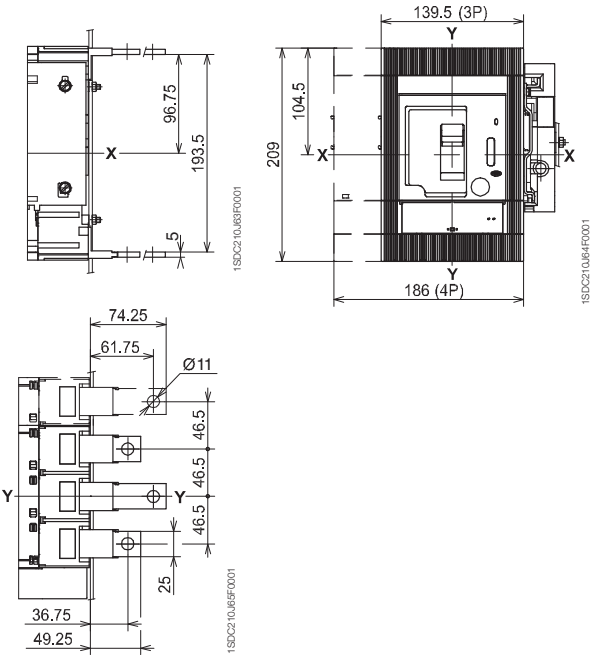
Front extended spread 630 A - ES

- ① Insulating barriers between phases (compulsory)

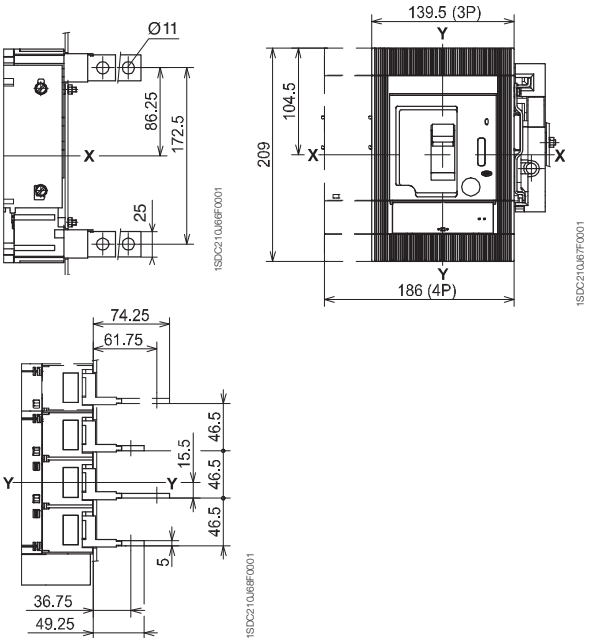




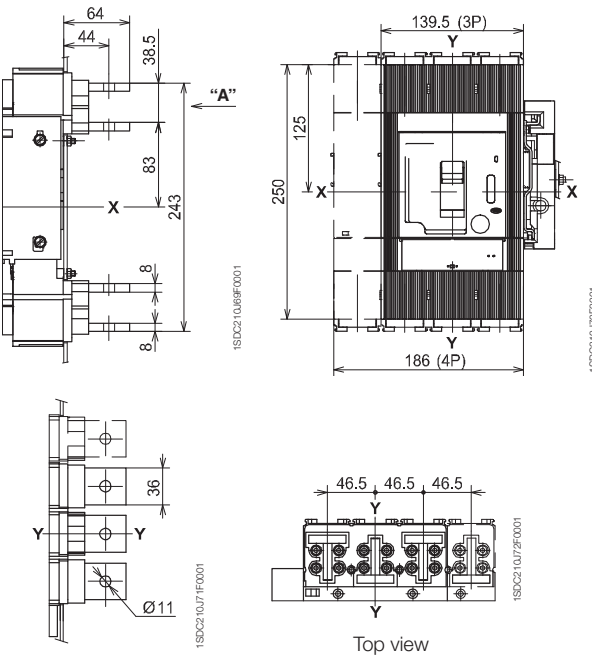
Rear flat horizontal 400 A - HR



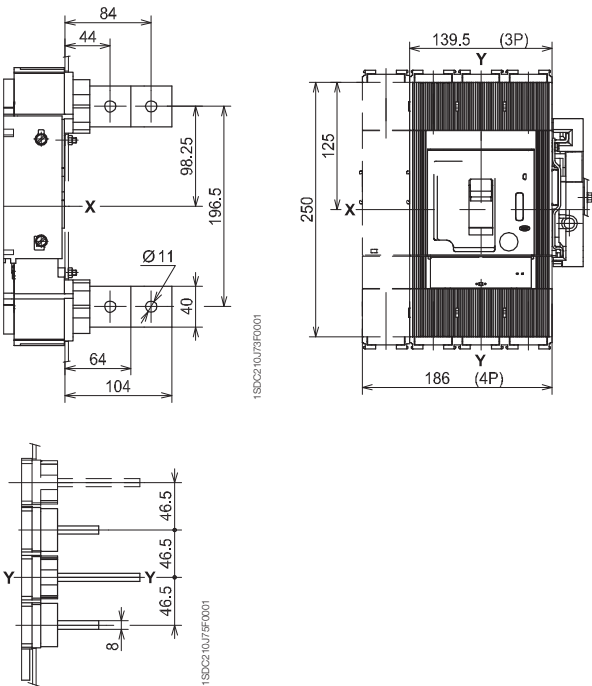
Rear flat vertical 400 A - VR



Rear flat horizontal 630 A - HR



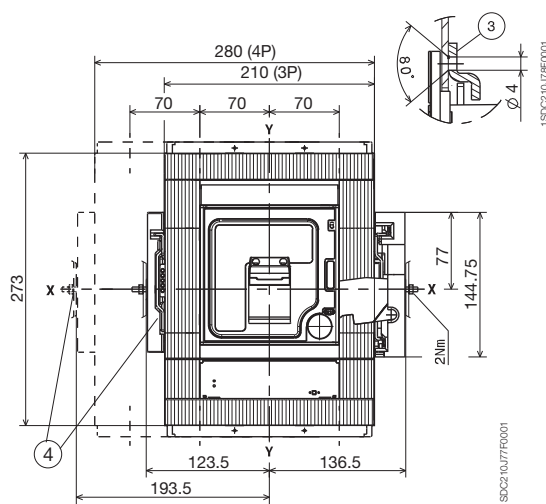
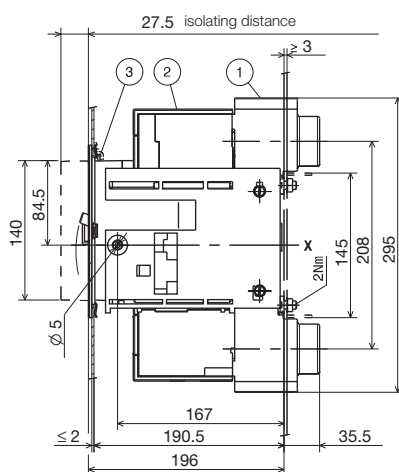
Rear flat vertical 630 A - VR



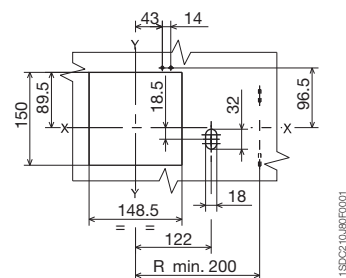
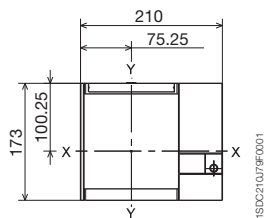
## Withdrawable circuit-breaker

**Caption**

- ① Fixed part
- ② Moving part
- ③ Lock for compartment (available on request)
- ④ Overall dimensions with cabled accessories mounted (SOR-C, UVR-C)



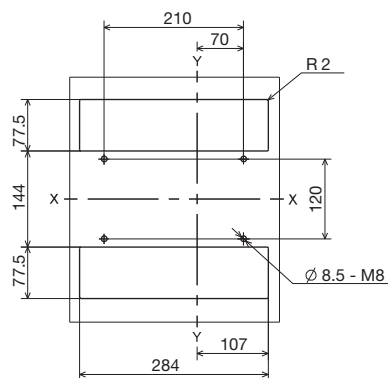
### Drilling templates of the compartment door



Technical drawing of a square plate with the following dimensions and features:

- Overall width: 214
- Overall height: 144
- Inner width: 140
- Inner height: 120
- Top and bottom margins: 77.5
- Left and right margins: 14
- Central hole diameter:  $\varnothing 8.5 - M8$
- Corner radius: R2
- Dimensions X and Y are indicated for the inner square area.

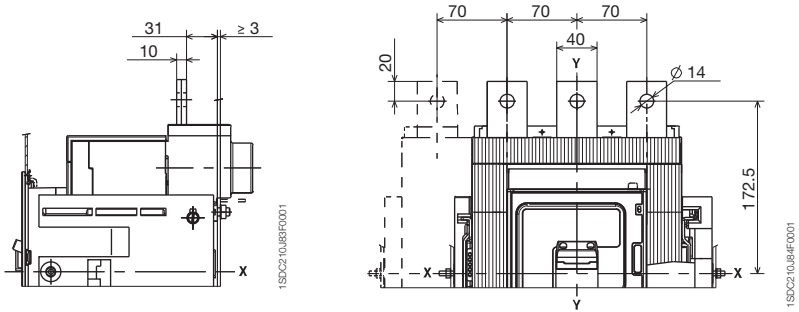
3 POLES



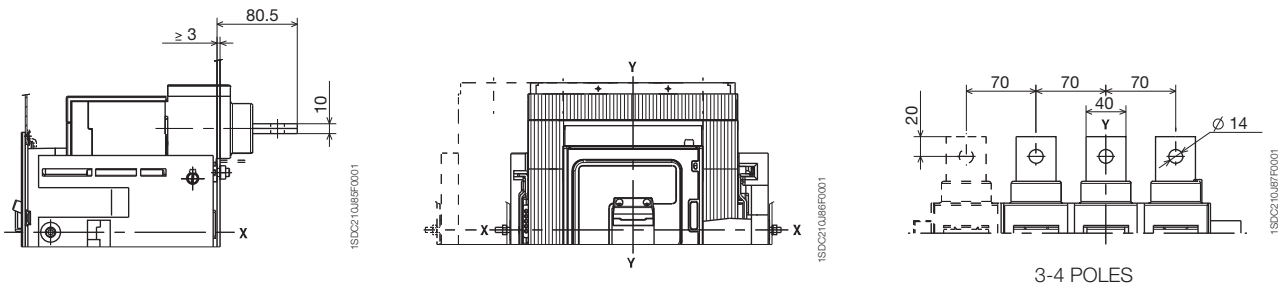
4 POLES

Terminals

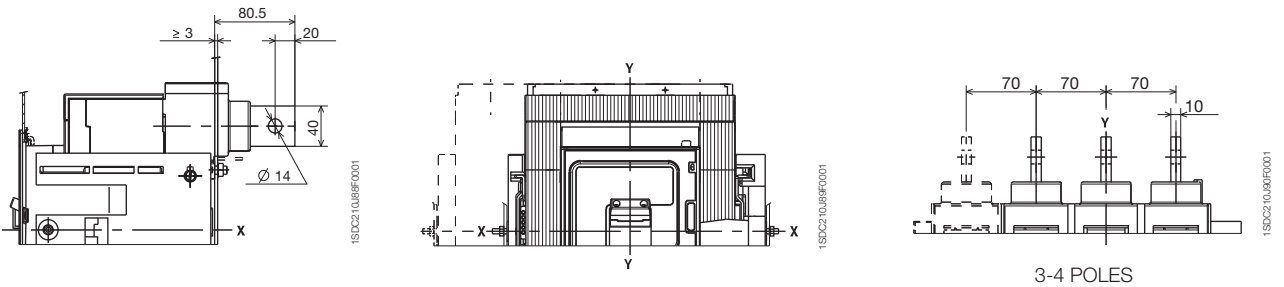
Front extended - EF



Rear flat horizontal - HR



Rear flat vertical - VR

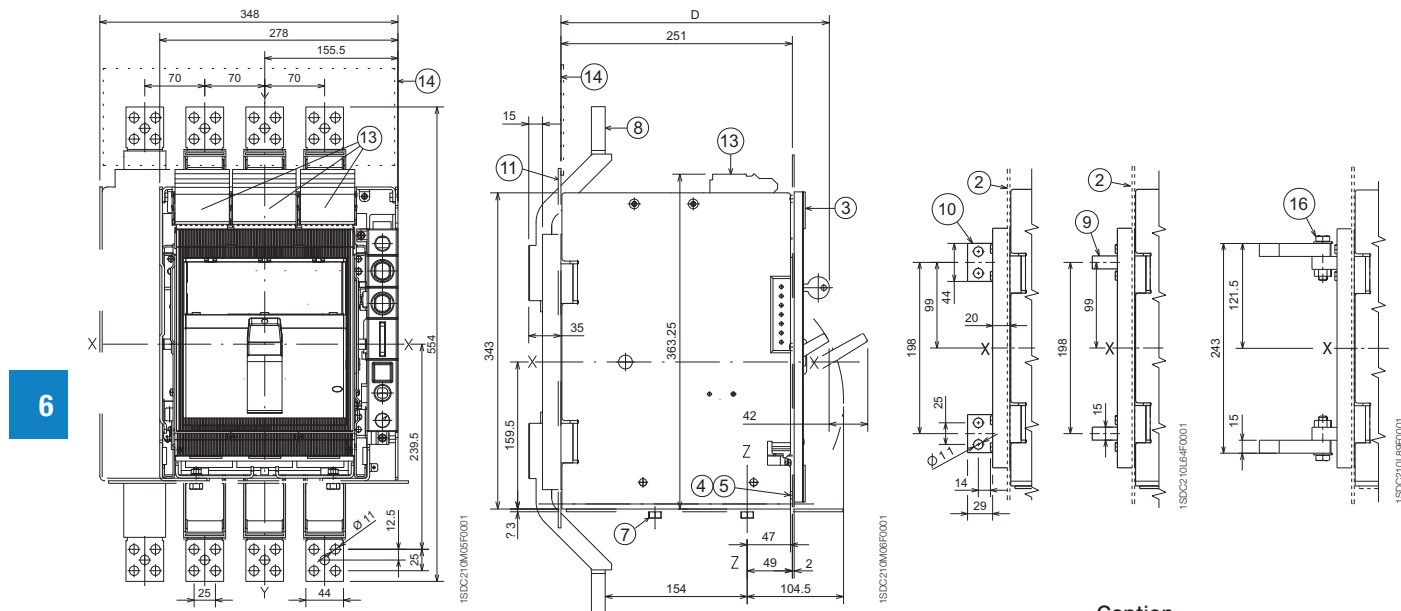


# Overall dimensions

## Tmax T7

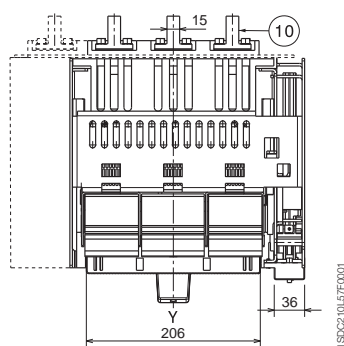
### Withdrawable circuit-breaker

Fixing on sheet

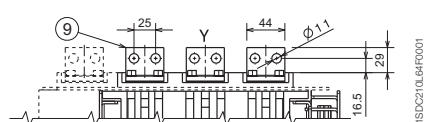


### Terminals

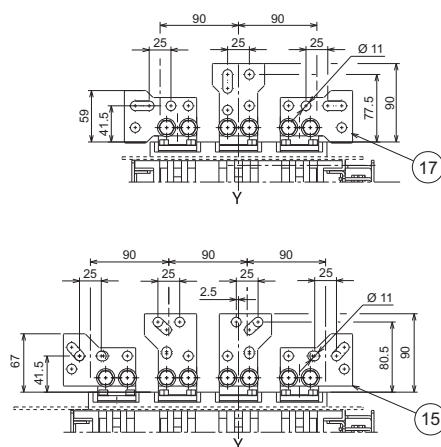
Rear flat vertical - VR



Rear flat horizontal - HR



Rear spread terminal - RS



#### Caption

- ① Compartment door with flange sheet drilling
- ② Rear segregation for rear terminals
- ③ Compartment door flange
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 21 Nm
- ⑧ Front terminals
- ⑨ Rear horizontal terminals
- ⑩ Rear vertical terminals
- ⑪ Rear segregation for front terminals
- ⑫ Flange for compartment door
- ⑬ Auxiliary contact terminal
- ⑭ Insulating protection
- ⑮ Rear spread terminals (4 poles)
- ⑯ Tightening torque 18 Nm
- ⑰ Rear spread terminals (3 poles)

## 6

6



6

- 6

## 6

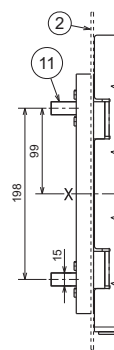


## 6

6

## Withdrawable circuit-breaker

6



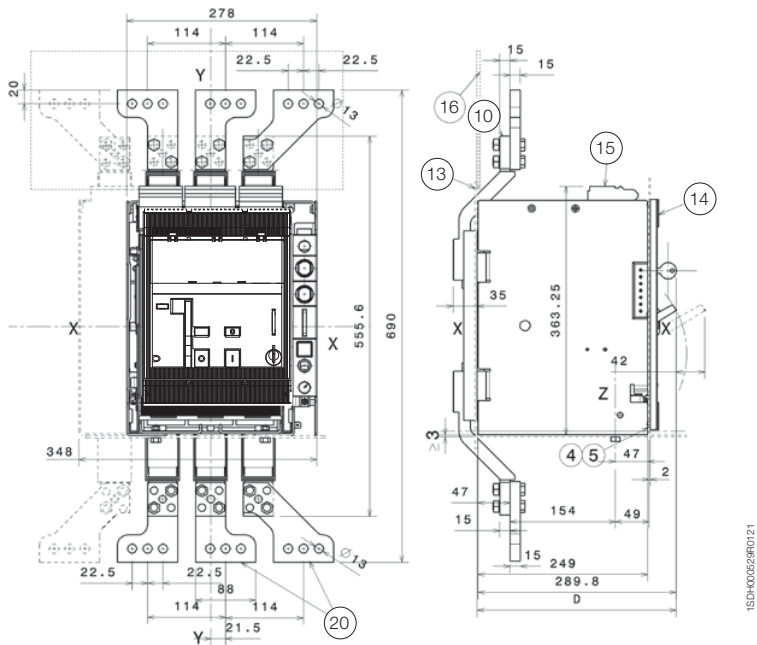
- ① Compartment door steel sheet drilling for flange
- ② Rear segregation for rear terminals
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑦ Key lock (optional)
- ⑧ Padlock (optional)
- ⑨ Tightening torque: 21 Nm
- ⑩ Front terminal
- ⑪ Rear horizontal terminal
- ⑫ Rear vertical terminal
- ⑬ Rear segregation for front terminals
- ⑭ Flange for compartment door
- ⑮ Overall dimensions of the auxiliary contact terminals
- ⑯ Insulating protection
- ⑰ Rear spread terminals (4 poles)
- ⑱ Tightening torque 18 Nm
- ⑲ Rear spread terminals (3 poles)

SDC210L56F001

SDC210L56F0001

Withdrawable circuit-breaker

Front extended spread - ES

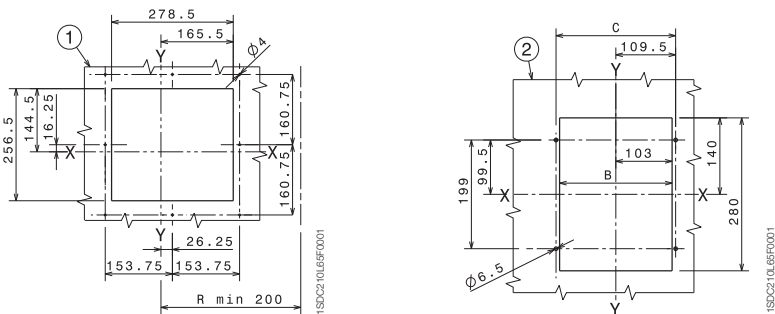


Caption

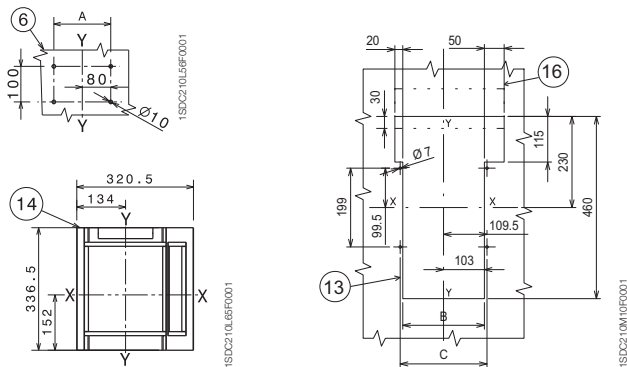
- ① Drilling a hole in the sheet metal door to the compartment with the flange for the RS-VR-HR-EF-ES terminals
- ② Rear segregation for rear terminals
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑥ Drilling template for fixing onto support sheet
- ⑩ Front terminal
- ⑬ Rear segregation for front terminals
- ⑭ Flange for compartment door
- ⑮ Clamp for auxiliary contacts
- ⑯ Insulating protection
- ⑰ Spread terminals

6

Drilling templates of the compartment door



Drilling templates for support sheet



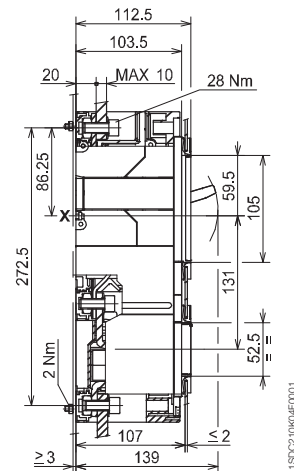
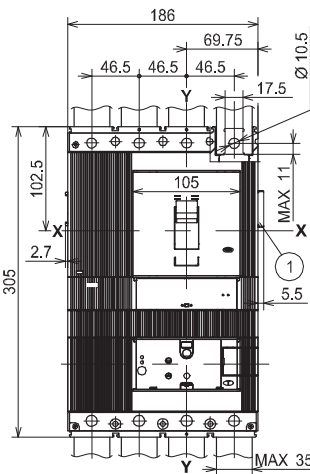
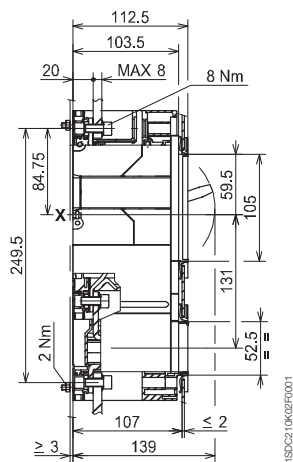
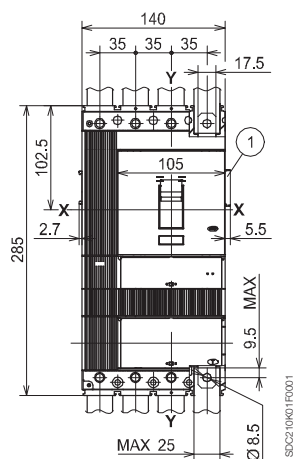
	III	IV
A	160	230
B	206	276
C	219	289

	Standard	Ronis	Profalux	Kirk	Castell
D	290	298	306	NO	NO
E	287	291	299	298	328

## Fixed version

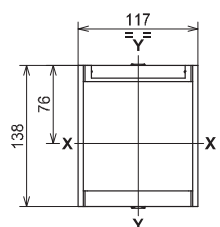
T4

T5 (400 A)

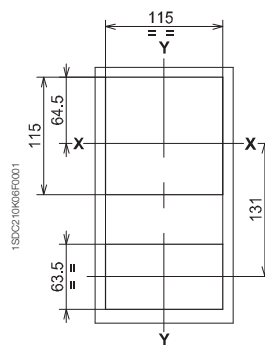


① Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

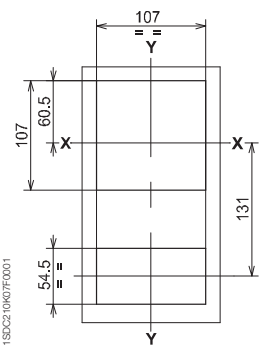
## Drilling templates of compartment door and fitting flange



For residual  
current release



With flange

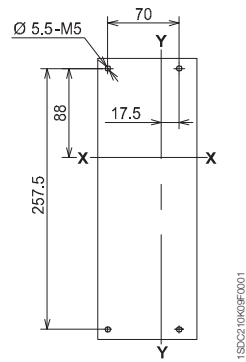


Without flange

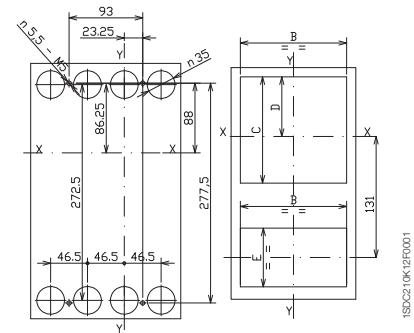
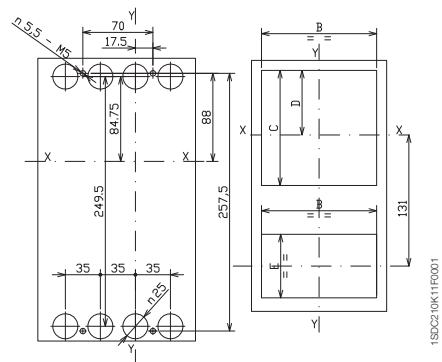
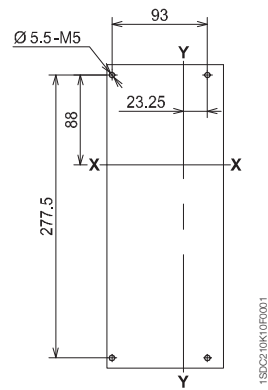


## Drilling templates for support sheet

T4



T5



	A	B	C	D	E
With flange	—	115	115	64.5	63.5
Without flange	—	107	107	60.5	54.5

# Overall dimensions

## Circuit-breaker with RC222 residual current release

### Tmax T4 - T5

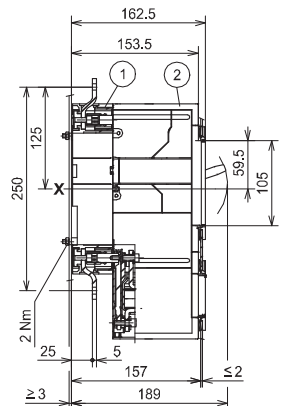
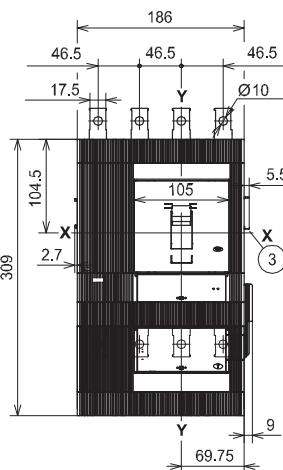
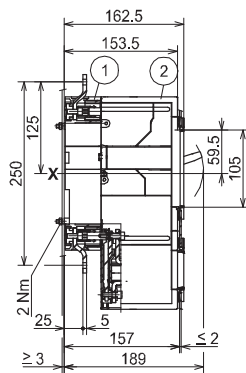
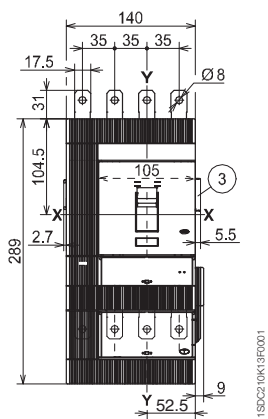
Plug-in version

Front - F, fixing on sheet

T4

T5 (400 A)<sup>(1)</sup>

6



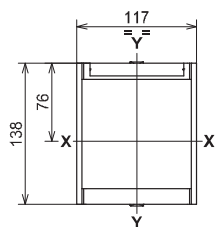
#### Caption

- ① Fixed part
- ② Mobile part
- ③ Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

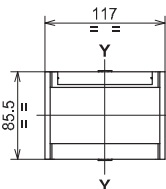
<sup>(1)</sup> For T5 (630 A) ask ABB SACE

#### Flange for the compartment door

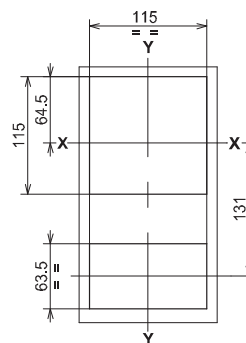
#### Drilling templates of compartment door and fitting flange



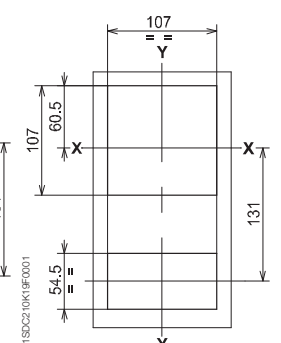
For circuit-breakers



For residual current release



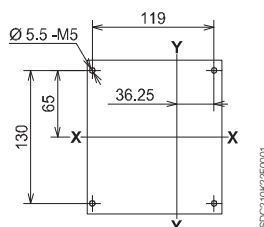
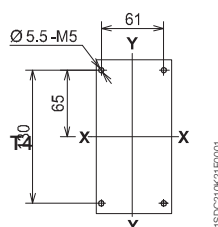
With flange



Without flange

#### Drilling templates for support sheet

T5



# Overall dimensions

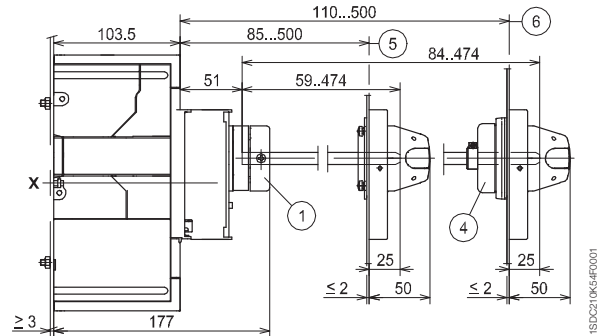
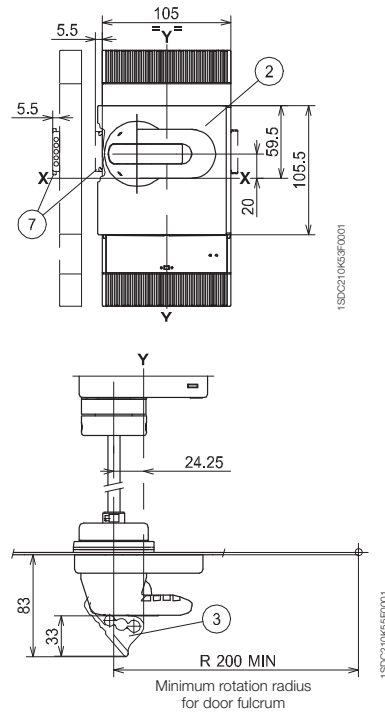
## Accessories for Tmax T4 - T5

### Fixed version

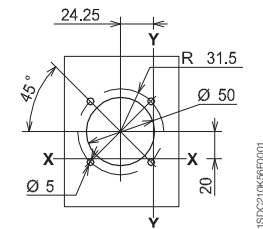
### Rotary handle operating mechanism on the compartment door

#### Caption

- ① Transmission unit
- ② Rotary handle assembly with door lock device
- ③ Padlock device for open position (maximum 3 padlocks to be provided by the user)
- ④ IP54 protection (supplied on request)
- ⑤ Min...max distance from the front of the door without accessory ④
- ⑥ Min...max distance from the front of the door with accessory ④
- ⑦ Dimension with AUE connector (early making contact)



### Drilling of compartment door

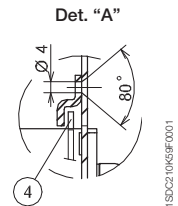
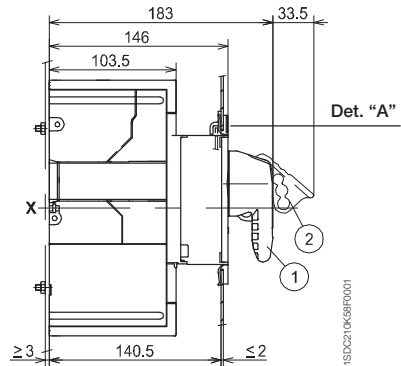
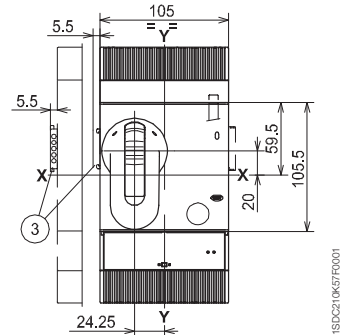


6

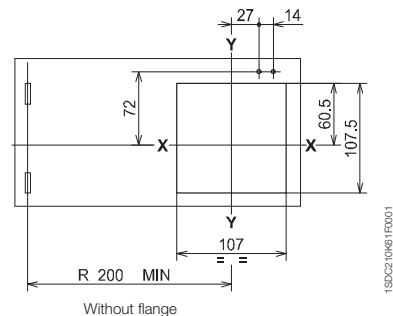
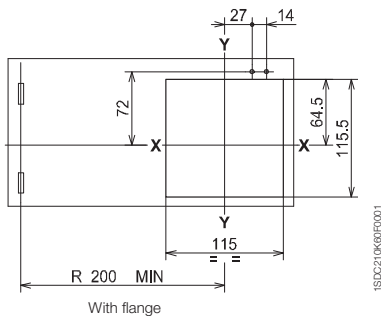
#### Caption

### Rotary handle operating mechanism on circuit-breaker

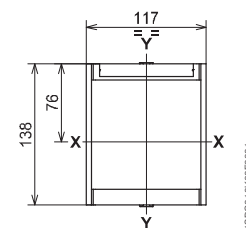
- ① Rotary handle operating mechanism on circuit-breaker
- ② Padlock device for open position (maximum 3 padlocks to be provided by the user)
- ③ Dimension with AUE connector (early making contact)
- ④ Compartment door lock



### Drilling template of the compartment door



### Flange for the compartment door



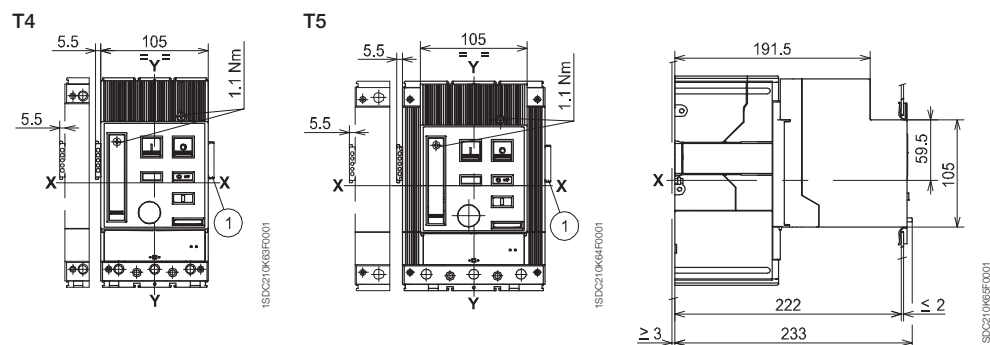
# Overall dimensions

## Accessories for Tmax T4 - T5

### Caption

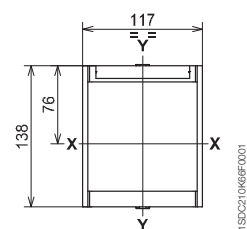
- ① Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

### Motor operator

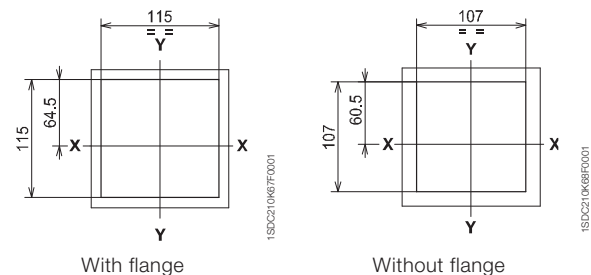


6

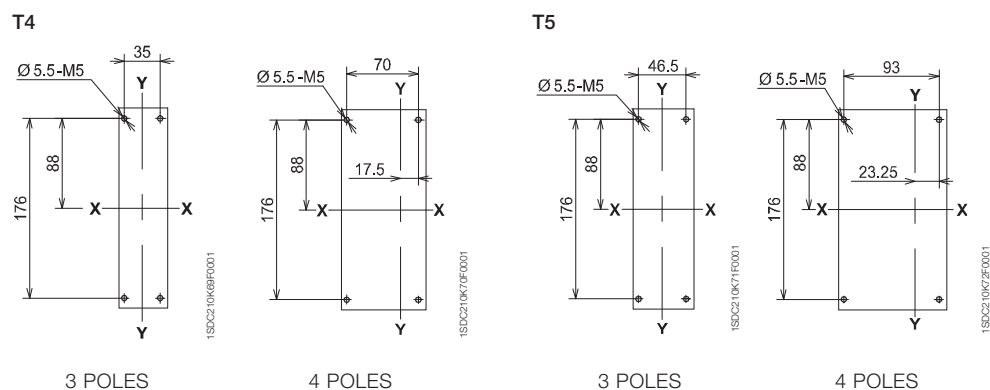
### Flange for the compartment door (supplied as standard)



### Drilling template of the compartment door



### Drilling template for support sheet

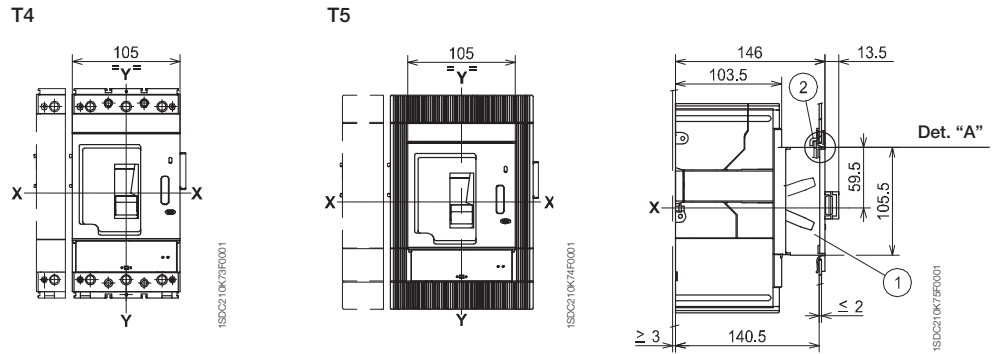


## Fixed version

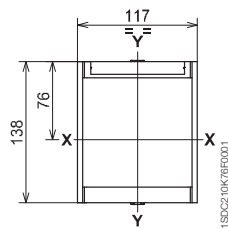
### Front for lever operating mechanism

Caption

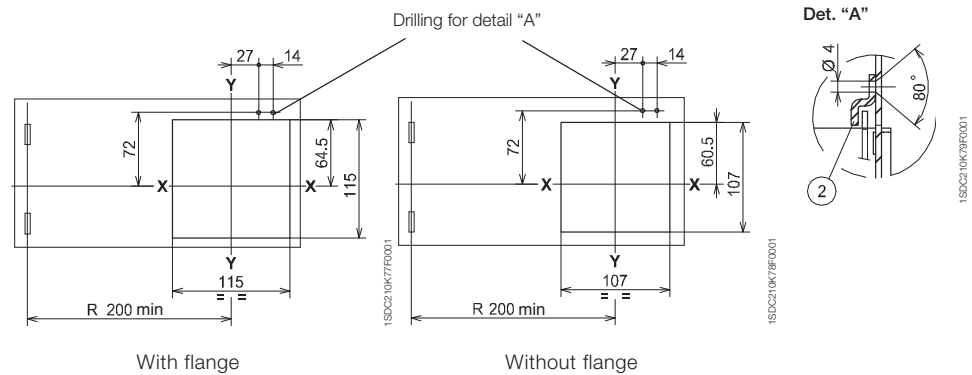
- ① Front for lever operating mechanism
- ② Lock for the compartment door (supplied on request)



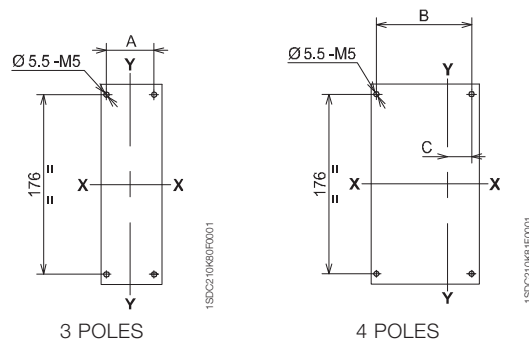
Flange for the  
compartment door  
(supplied as standard)



## Drilling template for the compartment door



## Drilling template for support sheet



	A	B	C
T4	35	70	17.5
T5	46.5	93	23.25

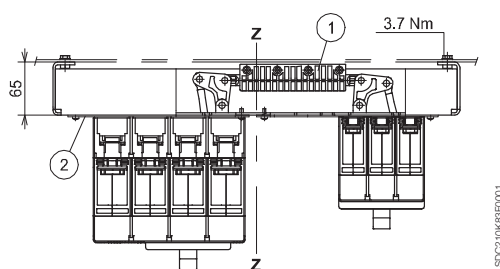
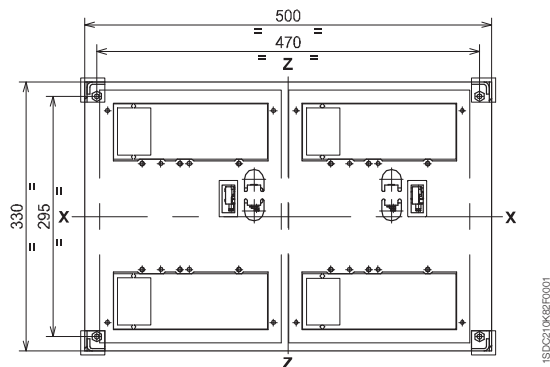
# Overall dimensions

## Accessories for Tmax T4 - T5

### Caption

### Interlock between two circuit-breakers placed side by side

- ① Interlocking mechanism
- ② Circuit-breaker coupling plate

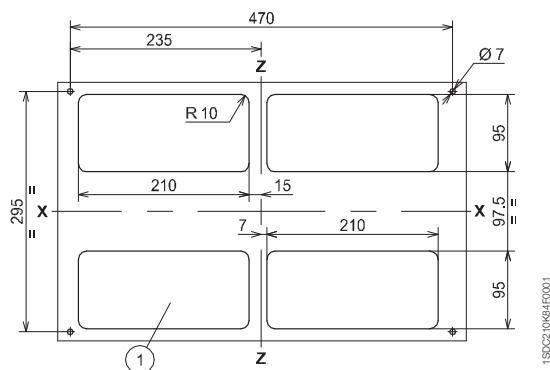


6

### Caption

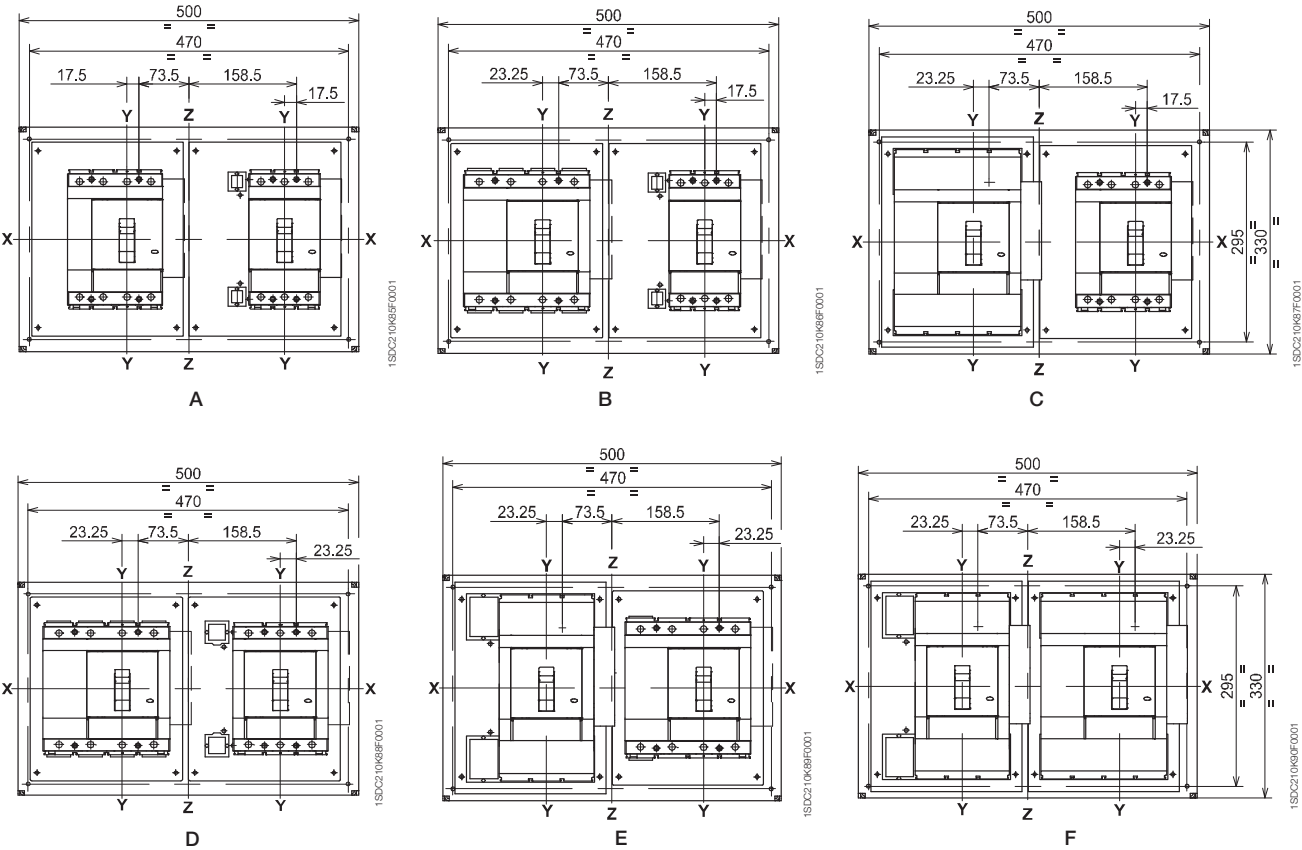
### Drilling templates for fixing the circuit-breaker on the support sheet

- ① Drilling template for all versions with rear terminals



Fixed version

Interlock between two circuit-breakers placed side by side



6

Type	Circuit-breakers
A	N° 1 T4 (F-P-W)
	N° 1 T4 (F-P-W)
B	N° 1 T4 (F-P-W)
	N° 1 T5 400 (F-P-W) or T5 630 (F)
C	N° 1 T4 (F-P-W)
	N° 1 T5 630 (P-W)
D	N° 1 T5 400 (F-P-W) or T5 630 (F)
	N° 1 T5 400 (F-P-W) or T5 630 (F)
E	N° 1 T5 400 (F-P-W) or T5 630 (F)
	N° 1 T5 630 (P-W)
F	N° 1 T5 630 (P-W)
	N° 1 T5 630 (P-W)

Note:  
(F) Fixed circuit-breaker  
(P) Plug-in circuit-breaker  
(W) Withdrawable circuit-breaker

# Overall dimensions

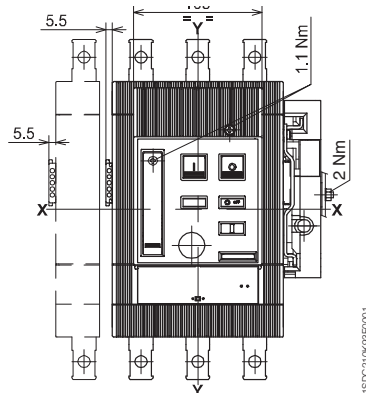
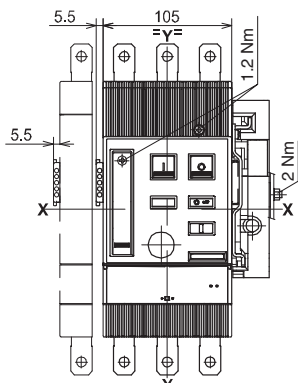
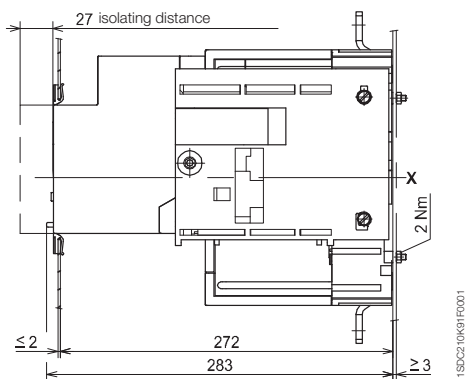
## Accessories for Tmax T4 - T5

### Withdrawable version

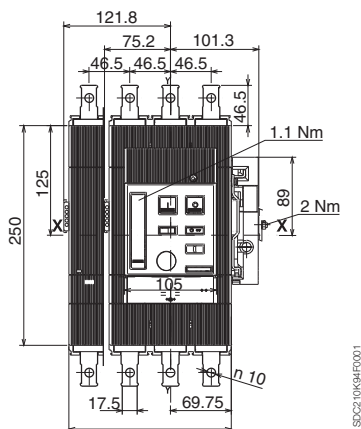
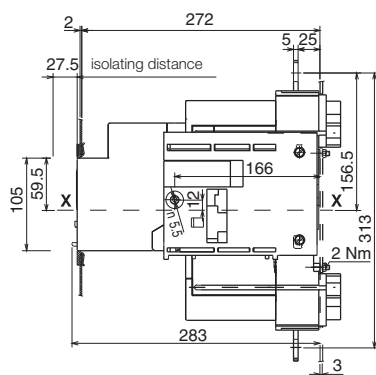
### Motor operator

T4

T5 (400 A)

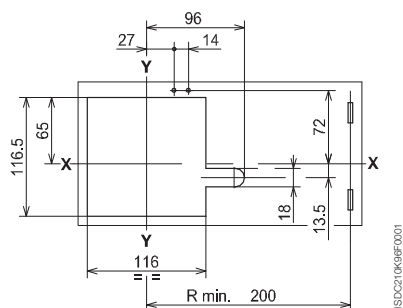
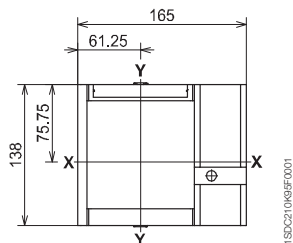


T5 (630 A)



### Flange for the compartment door (supplied as standard)

### Drilling templates for the compartment door and fitting flange



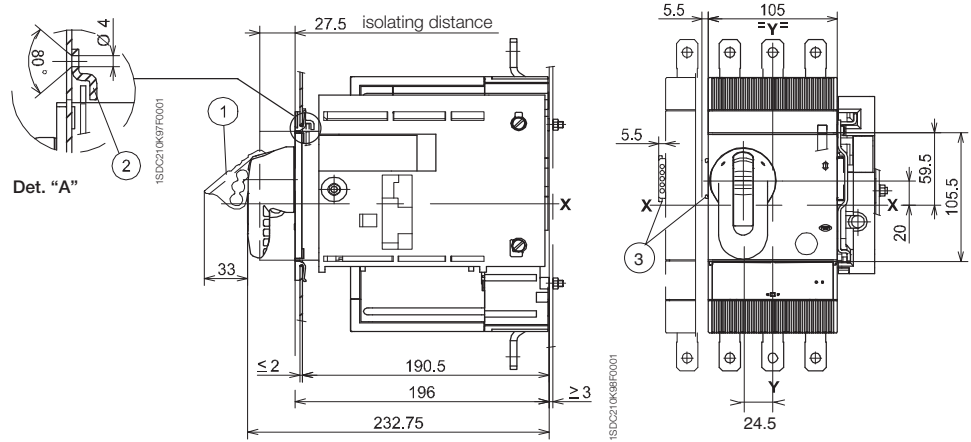


## Withdrawable version

## Rotary handle operating mechanism on the circuit-breakers

### Caption

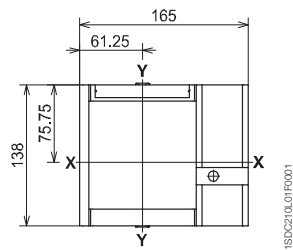
- ① Padlock device for open position (maximum 3 padlocks to be provided by the user)
- ② Lock for compartment door
- ③ Dimension with AUE connector (early making contact)



1SDC210K98F0001

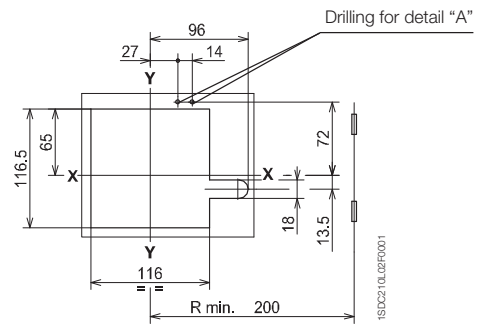
6

### Flange for the compartment door



1SDC210L01F0001

### Drilling template for compartment door and fitting flange



1SDC210L02F0001

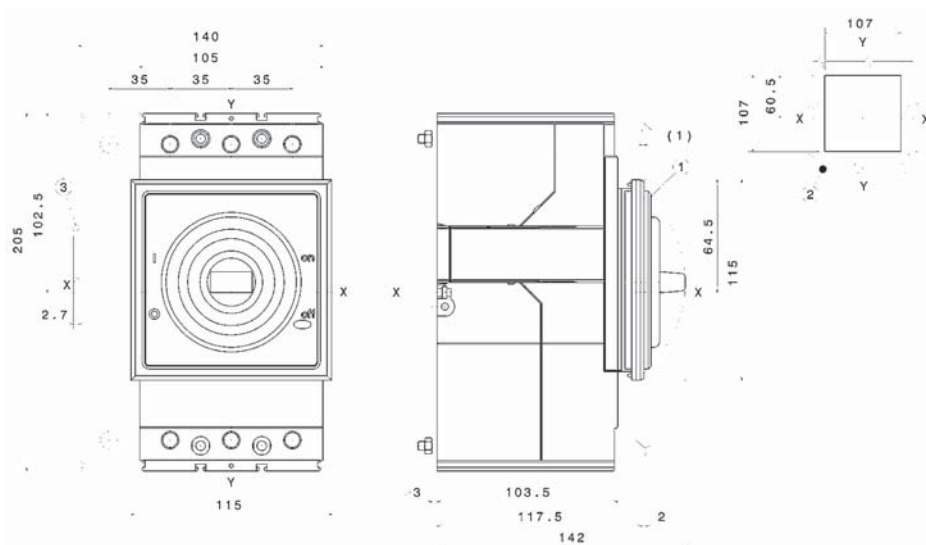
# Overall dimensions

## Accessories for Tmax T4 - T5

### Caption

- ① IP44 protection
- ② Compartment door sheet steel drilling
- ③ Spacing when equipped with SOR-C, UVR-C, RC221-222

### Protection kit IP44 for T4 fixed



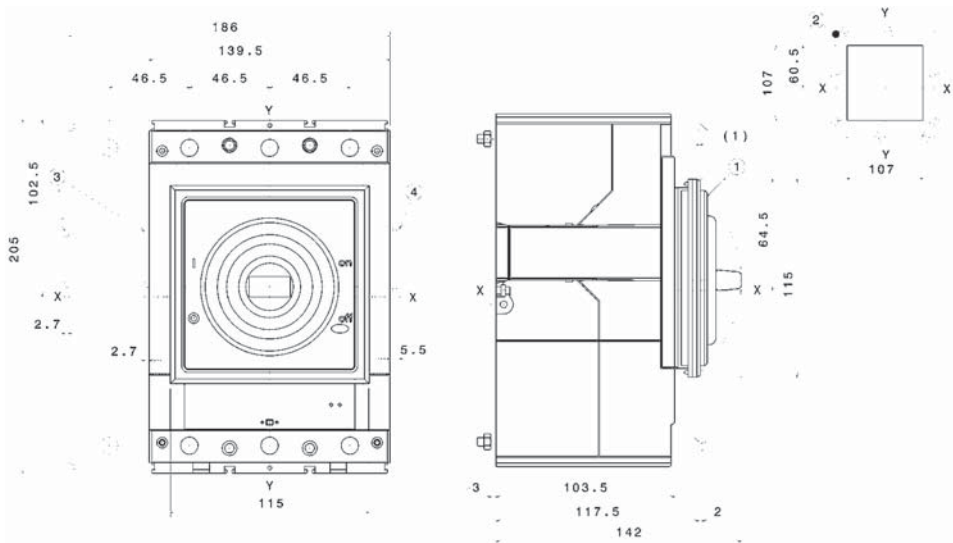
1SDC210286F001

6

### Caption

- ① IP44 protection
- ② Compartment door sheet steel drilling
- ③ Spacing when equipped with SOR-C, UVR-C, RC221-222
- ④ Spacing when equipped with AUX-C (3Q 1SY only)

### Protection kit IP44 for T5 fixed



1SDC210286F001



# Overall dimensions

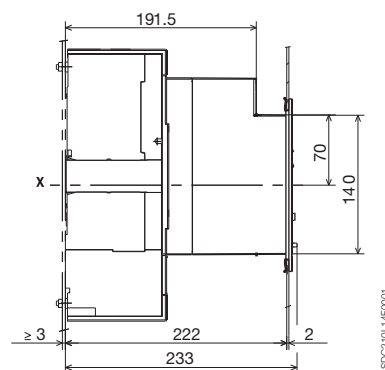
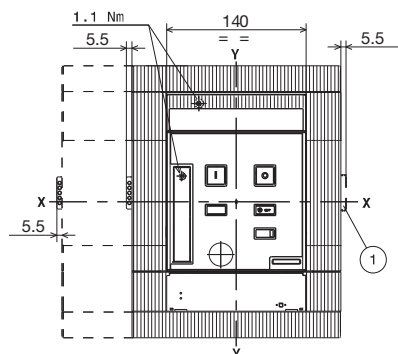
## Accessories for Tmax T6

### Fixed version

### Motor operator

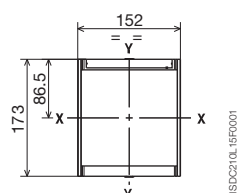
#### Caption

- ① Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



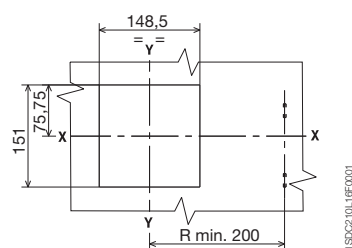
6

### Flange for the compartment door (supplied as standard)

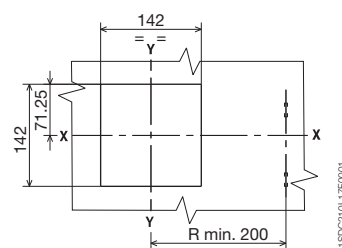


With flange

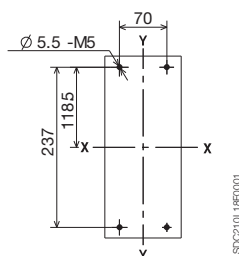
### Drilling template of the compartment door



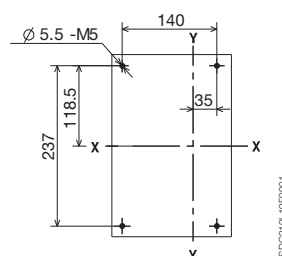
Without flange



### Drilling template for support sheet



3 POLES

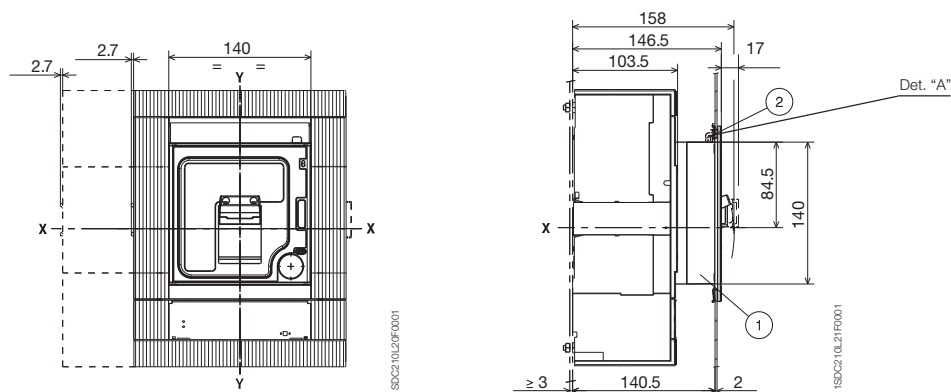


4 POLES

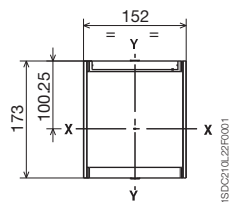
**Caption**

- ① Front for lever operating mechanism
- ② Lock for the compartment door

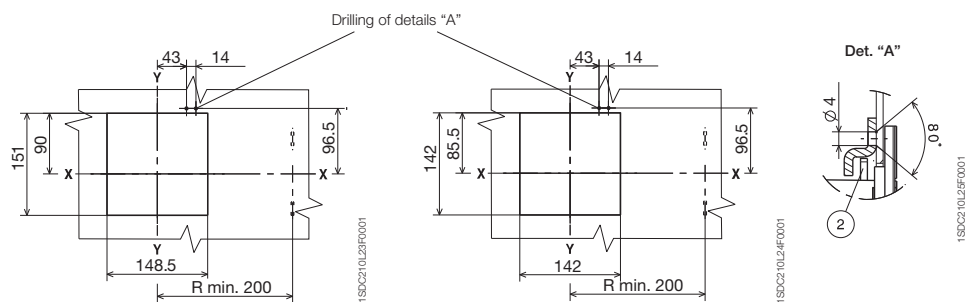
**Front for lever operating mechanism**



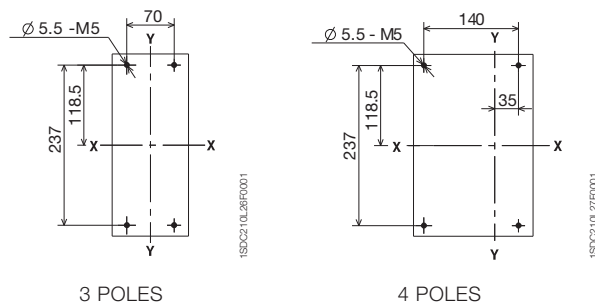
**Flange for the compartment door  
(supplied as standard)**



**Drilling template for the compartment door**



**Drilling template for support sheet**

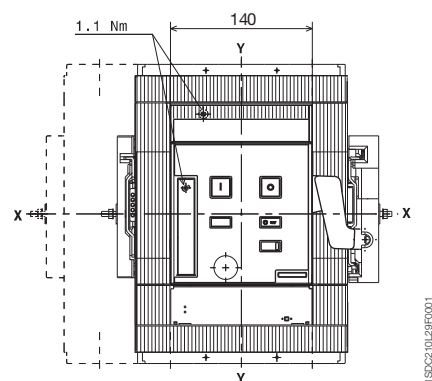
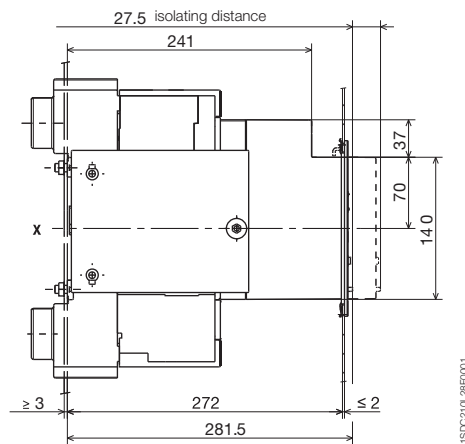


# Overall dimensions

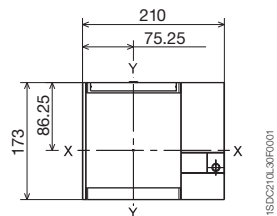
## Accessories for Tmax T6

Withdrawable version

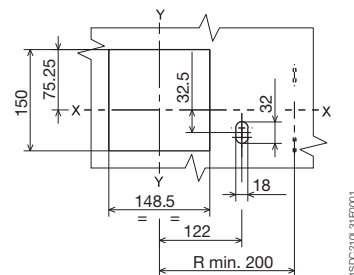
Motor operator



Flange for the compartment door  
(supplied as standard)



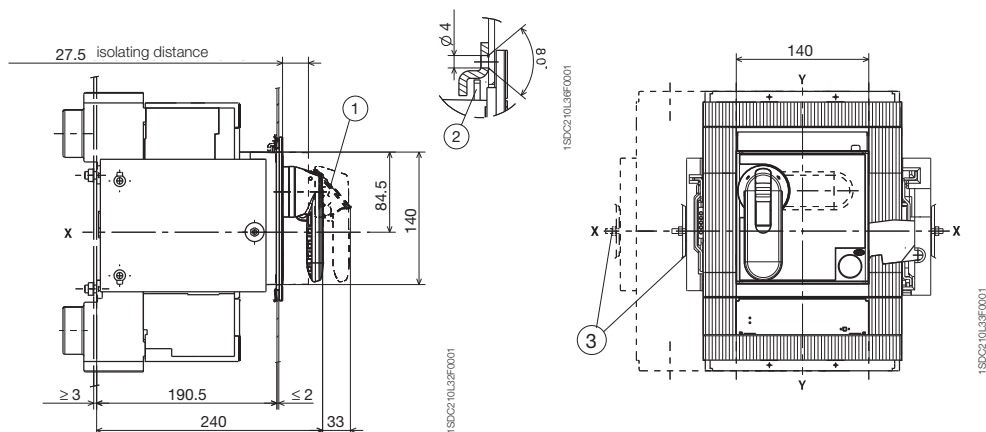
Drilling templates for the compartment door  
and fitting flange



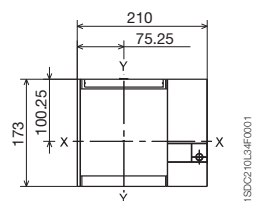
Caption

Rotary handle operating mechanism on the circuit-breakers

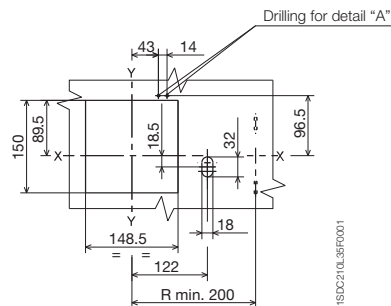
- ① Padlock device for open position (maximum 3 padlocks to be provided by the user)
- ② Lock for compartment door
- ③ Dimension with AUE connector (early making contact)
- ④ Interlock mechanism
- ⑤ Frame
- ⑥ Drilling template for each version of terminals



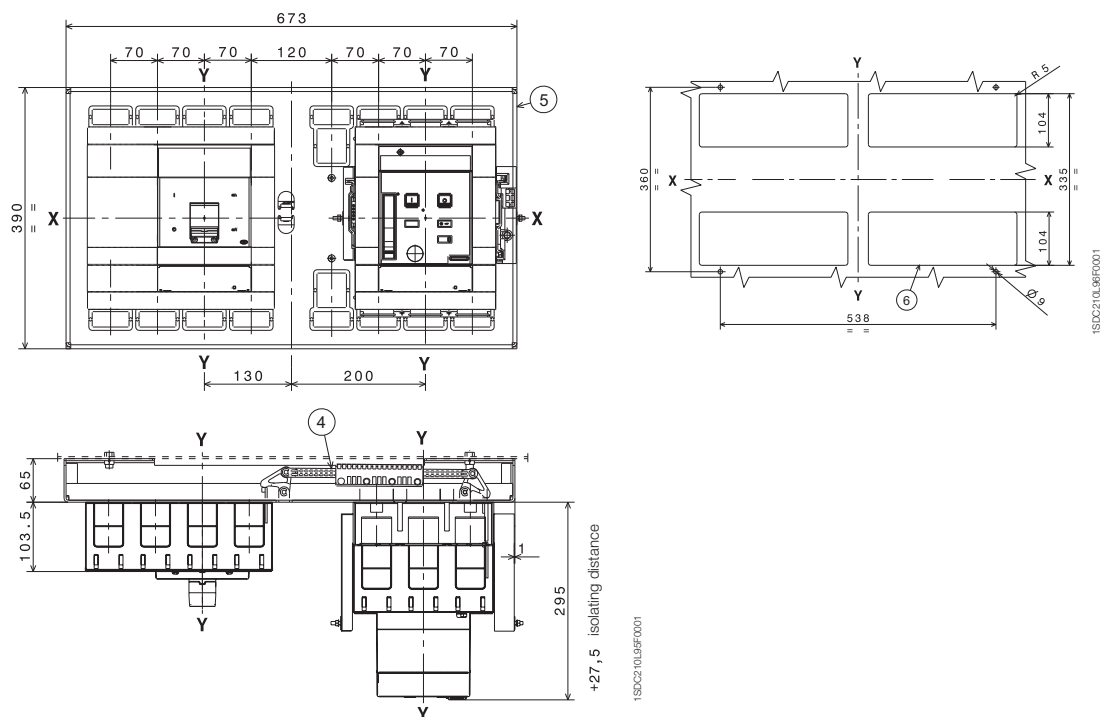
Flange for the compartment door



Drilling template for compartment door and fitting flange



Mechanical interlock



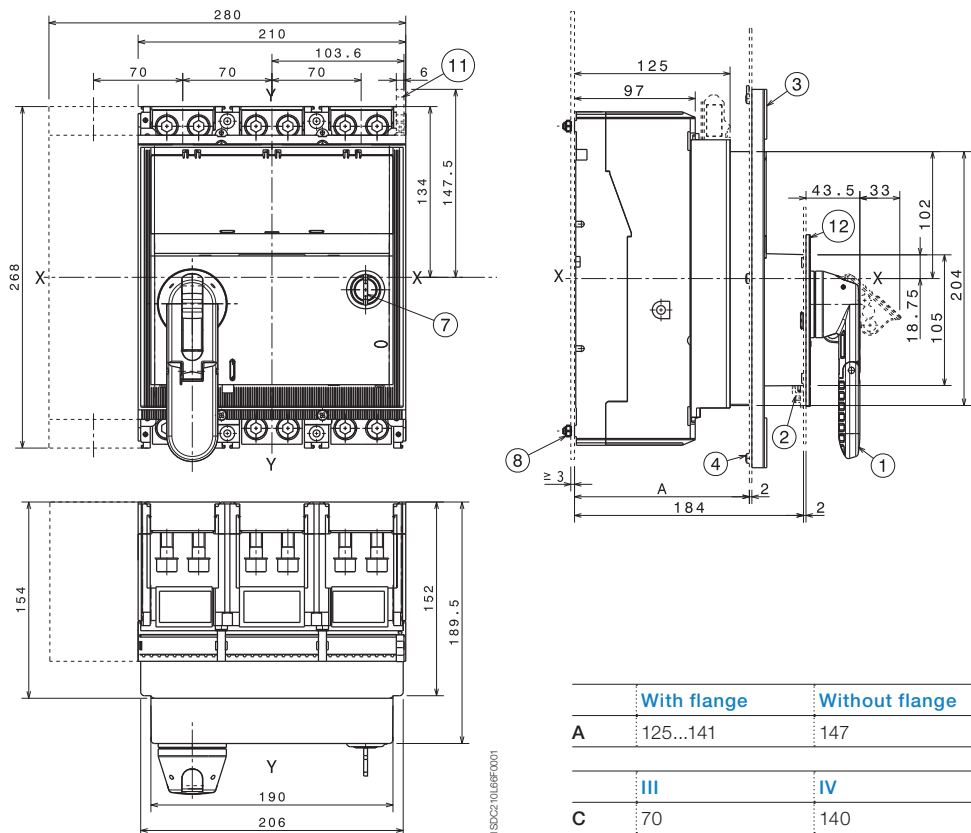
# Overall dimensions

## Accessories for Tmax T7

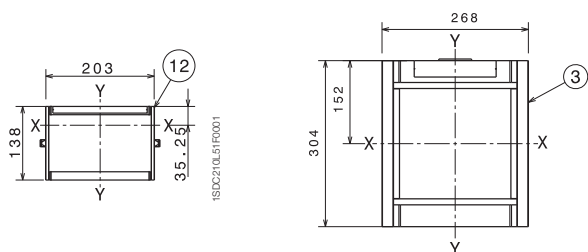
### Fixed circuit-breaker Rotary handle operating mechanism on the circuit-breaker

#### Caption

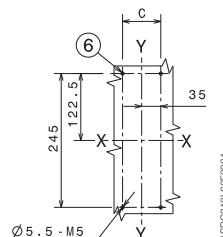
- ① Rotary handle operating mechanism for circuit-breaker
- ② Compartment door interlock
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑥ Support sheet drilling template
- ⑦ Key lock (optional)
- ⑧ Tightening torque: 2.5 Nm
- ⑨ Compartment door with flange sheet drilling
- ⑩ Compartment door sheet drilling for front 206 x 204
- ⑪ Terminal for auxiliary contacts
- ⑫ Reduced flange of the rotary handle for the compartment door (optional)
- ⑬ Compartment door sheet drilling for rotary handle
- ⑭ Compartment door sheet drilling without the rotary handle flange



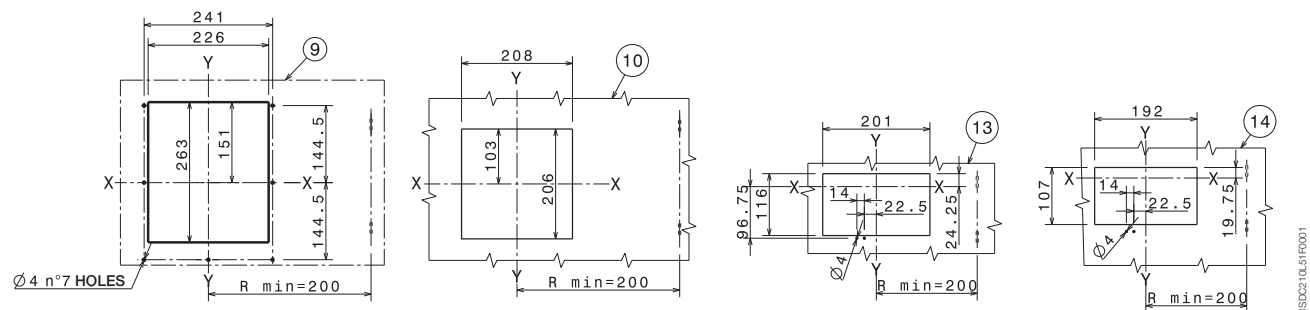
#### Flange for the compartment door (supplied as standard)



#### Drilling templates for support sheet

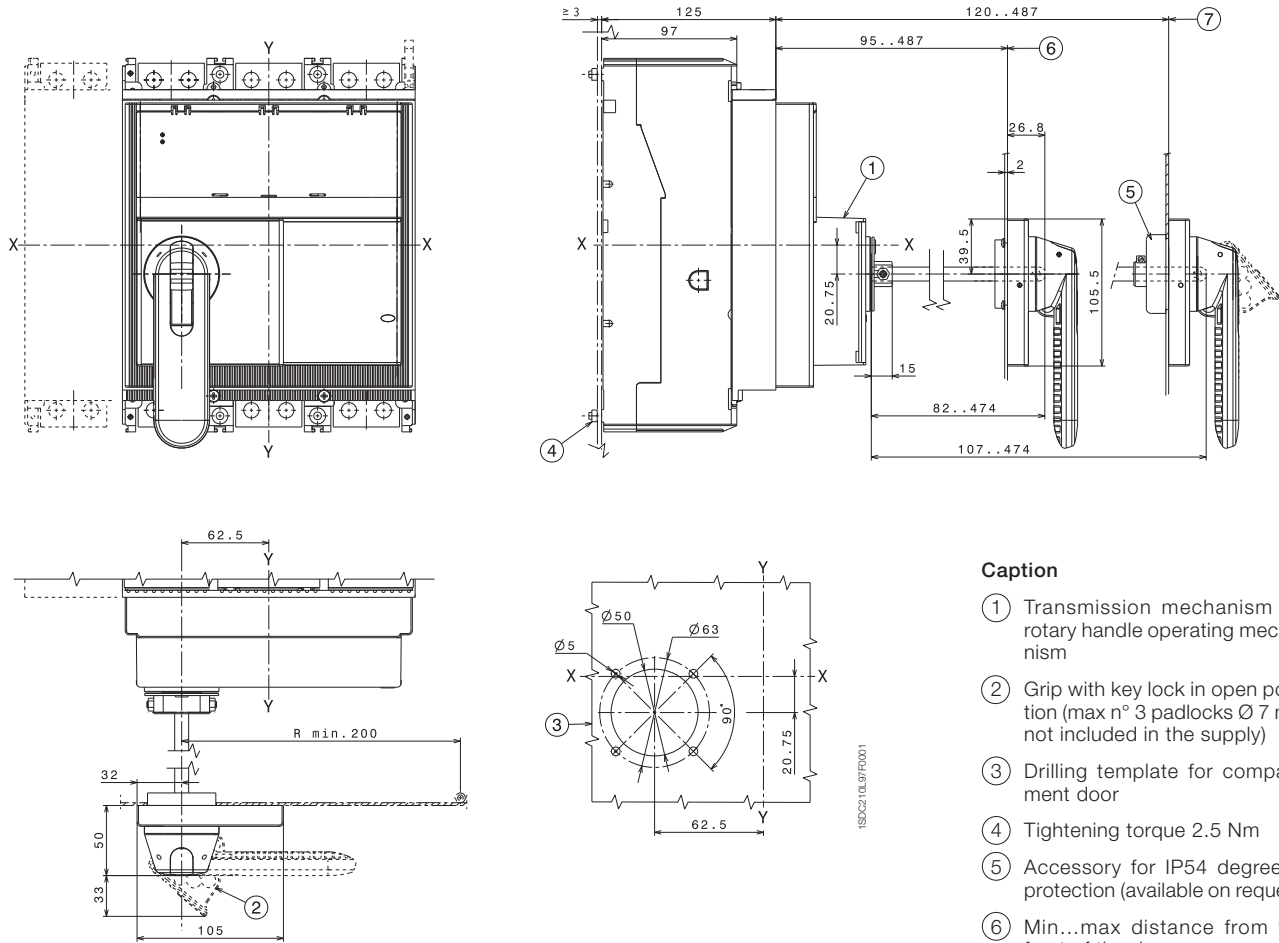


#### Drilling templates of the compartment door





## Rotary handle operating mechanism on the compartment door



### Caption

- ① Transmission mechanism for rotary handle operating mechanism
- ② Grip with key lock in open position (max n° 3 padlocks Ø 7 mm not included in the supply)
- ③ Drilling template for compartment door
- ④ Tightening torque 2.5 Nm
- ⑤ Accessory for IP54 degree of protection (available on request)
- ⑥ Min...max distance from the front of the door
- ⑦ Min...max distance from the front of the door (with accessory with IP54 degree of protection)

## Overall dimensions

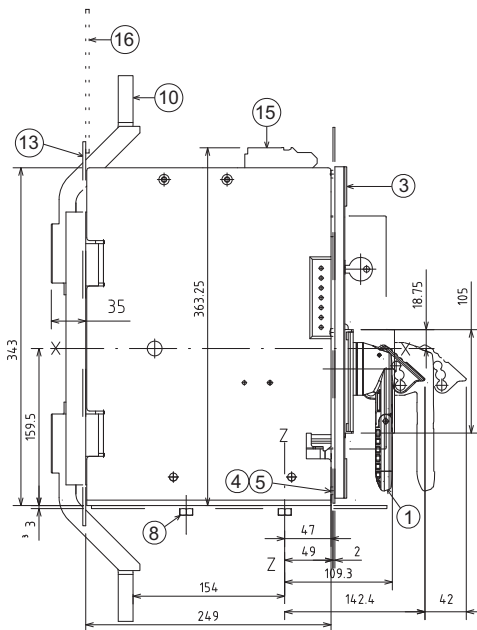
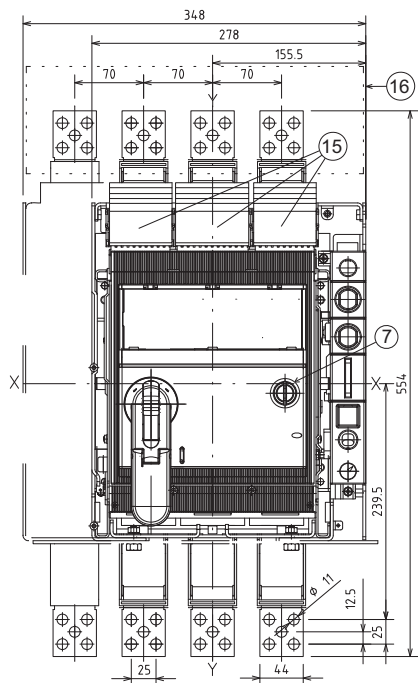
### Accessories for Tmax T7

## Withdrawable circuit-breaker

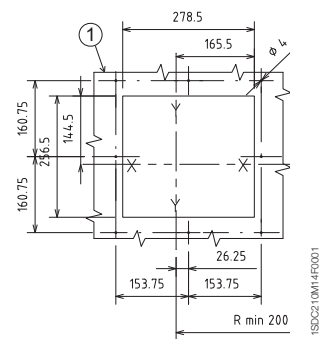
## Rotary handle operating mechanism on the circuit-breakers

**Caption**

- ① Rotary handle operating mechanism on circuit-breakers
- ② Rear segregation for rear terminals
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Key lock (optional)
- ⑧ Tightening torque: 9 Nm
- ⑨ Compartment door with flange sheet drilling
- ⑩ Front terminals
- ⑪ Rear horizontal terminals
- ⑫ Rear vertical terminals
- ⑬ Rear segregation for front terminals
- ⑭ Flange for the compartment door
- ⑮ Auxiliary contact terminal
- ⑯ Insulating protection

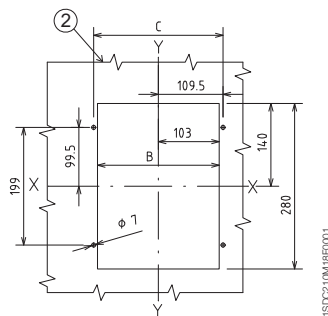
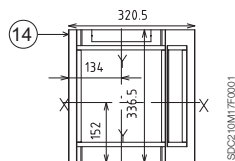
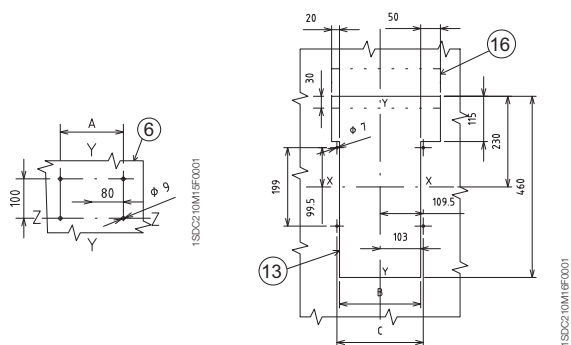


### Drilling templates of the compartment door



	III	IV
A	160	230
B	206	276
C	219	289

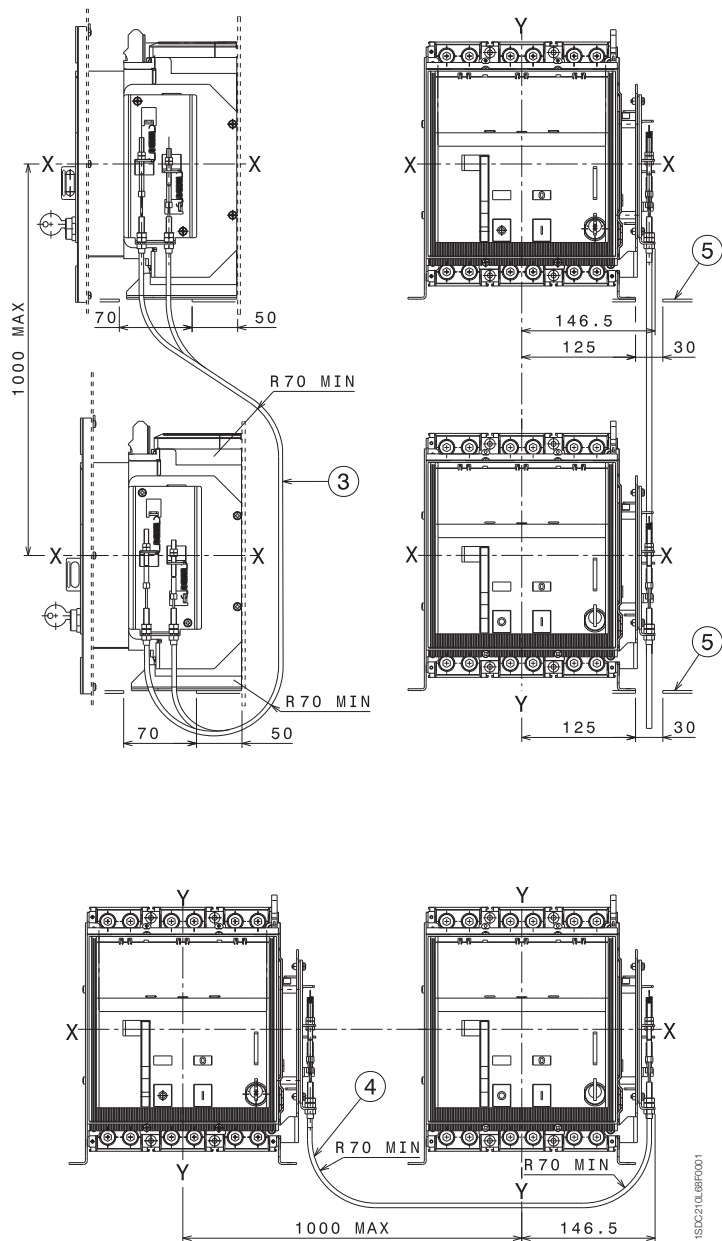
## Drilling templates for support sheet



# Caption

- ③ Mechanical vertical interlock for fixed circuit-breakers
- ④ Mechanical horizontal interlock for fixed circuit-breakers
- ⑤ Sheet drilling for wire passage of the mechanical interlock

## Mechanical interlock for fixed circuit-breakers



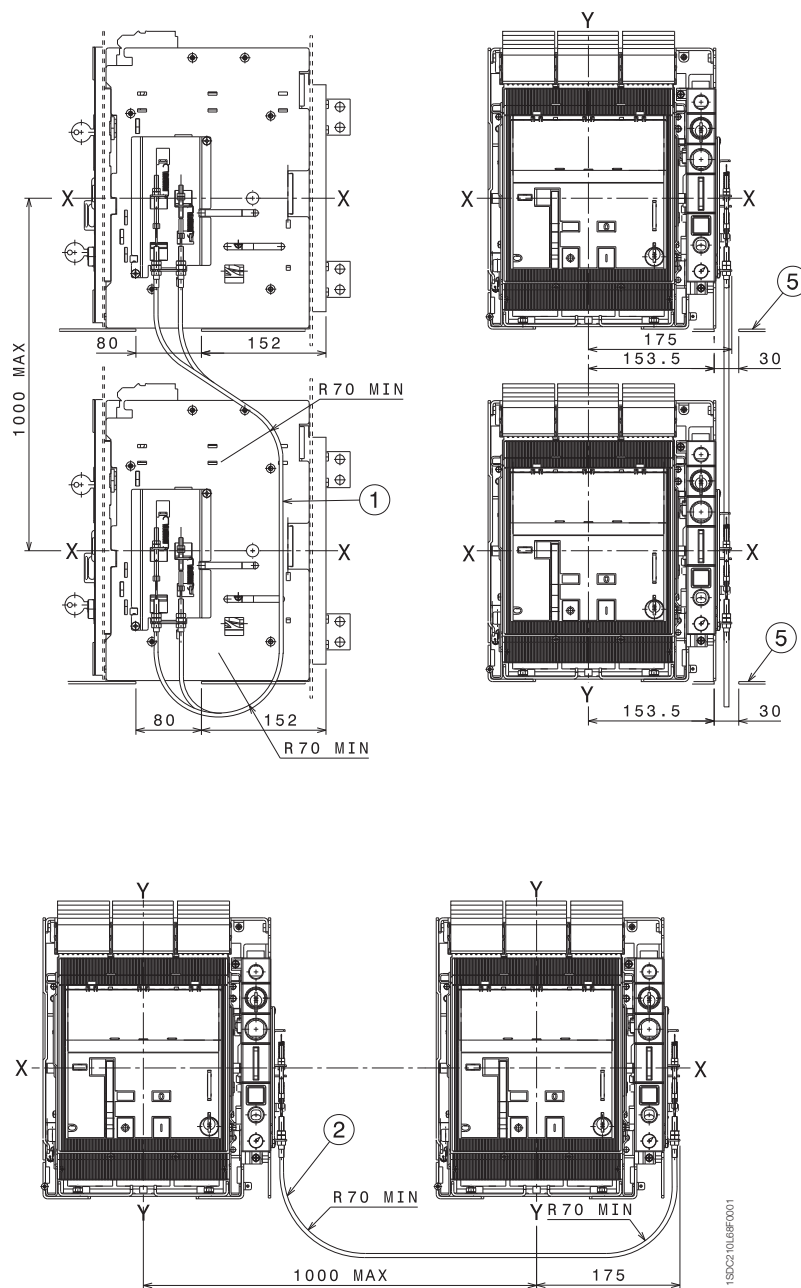
# Overall dimensions

## Accessories for Tmax T7

### Caption

- ① Mechanical vertical interlock for withdrawable circuit-breakers
- ② Mechanical horizontal interlock for withdrawable circuit-breakers
- ⑤ Sheet drilling for wire passage of the mechanical interlock

### Mechanical interlock for withdrawable circuit-breakers



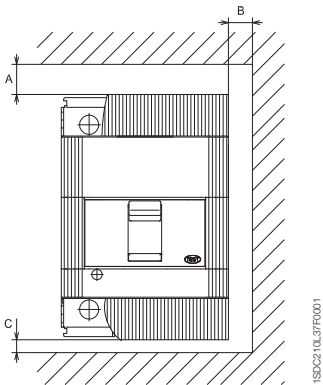
# Overall dimensions

## Distances to be respected

### Insulation distances for installation in metallic cubicle

	A (mm)	B (mm)	C (mm)
T4	30 <sup>(*)</sup>	25	25 <sup>(**)</sup>
T5	30 <sup>(*)</sup>	25	25 <sup>(**)</sup>
T6	35 <sup>(*)</sup>	25	20
T7	50 <sup>(*)</sup>	20	10

<sup>(\*)</sup> For Ub ≥ 440 V, T6L and T6V all versions: distances A ⇒ 100 mm  
<sup>(\*\*)</sup> For Un ≥ 440 V and ≤ 690 V: A = 60 mm, C = 45 mm and ≤ 690 V  
 Note: For the insulation distances of the 1000 V circuit-breakers, please ask ABB SACE



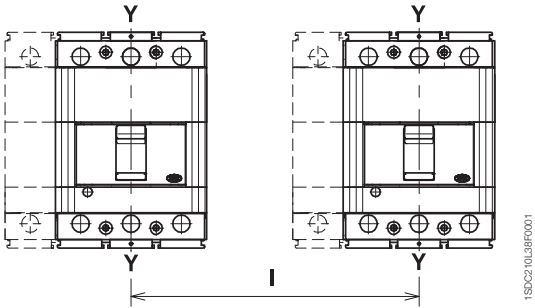
### Minimum centre distance between two circuit-breakers side by side or superimposed

For assembly side by side or superimposed, check that the connection busbars or cables do not reduce the air insulation distance

#### Minimum centre distance for two circuit-breakers side by side

	Circuit-breaker width (mm)		Centre distance l (mm)	
	3 poles	4 poles	3 poles	4 poles
T4	105	140	105 <sup>(*)</sup>	140 <sup>(*)</sup>
T5	140	186	140 <sup>(*)</sup>	186 <sup>(*)</sup>
T6	210	280	210	280
T7	210	280	210	280

<sup>(\*)</sup> T4 → For Ub: ≥ 500 V and ≤ 690 V minimum centre l (mm) 3 poles 145, minimum centre l (mm) 4 poles 184  
 T5 → For Ub: ≥ 500 V and ≤ 690 V minimum centre l (mm) 3 poles 180, minimum centre l (mm) 4 poles 224



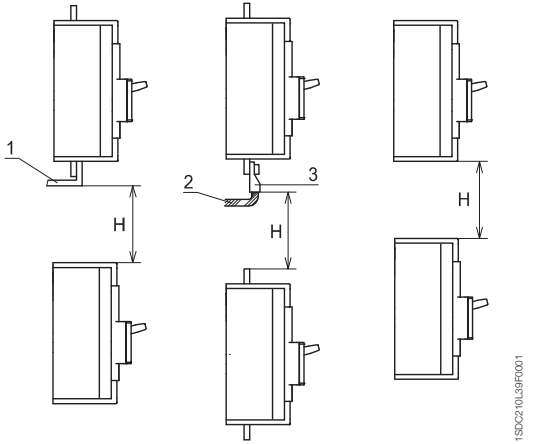
#### Minimum centre distance for superimposed circuit-breakers

	H (mm)
T4	160
T5	160
T6	180
T7	180

#### Caption

- ① Connection - not insulated
- ② Insulated cable
- ③ Cable terminal

**Note:** The dimensions shown apply for operating voltage Ub up to 690 V.  
 The dimensions to be respected must be added to the maximum dimensions of the various different versions of the circuit-breakers, including the terminals. For 1000 V versions, please ask ABB SACE.





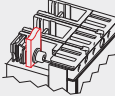
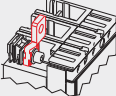



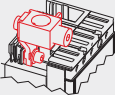
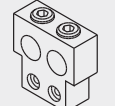
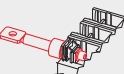
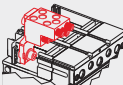
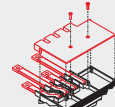

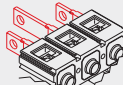
# Ordering codes



<a href="#">General information</a>	<a href="#">7/2</a>
<a href="#">Instructions for ordering</a>	<a href="#">7/3</a>
<a href="#">Power distribution circuit-breakers</a>	<a href="#">7/6</a>
<a href="#">Circuit-breakers for zone selectivity</a>	<a href="#">7/20</a>
<a href="#">Motor protection circuit-breakers</a>	<a href="#">7/22</a>
<a href="#">Circuit-breakers for use up to 1150 V AC and 1000 V DC</a>	<a href="#">7/26</a>
<a href="#">Switch disconnectors</a>	<a href="#">7/30</a>
<a href="#">Breaking units</a>	<a href="#">7/33</a>
<a href="#">Trip units</a>	<a href="#">7/35</a>
<a href="#">Fixed parts, conversion kit and accessories for fixed parts</a>	<a href="#">7/38</a>
<a href="#">Accessories</a>	<a href="#">7/42</a>

# Ordering codes

## General information

### Abbreviations used to describe the apparatus

	<b>F</b> Front terminals		<b>EF</b> Front extended terminals		<b>ES</b> Front extended spread terminals
	<b>FC Cu</b> Front terminals for copper cables		<b>FC CuAl</b> Front terminals for Cu/Al cables		<b>FC CuAl</b> Front terminals for Cu/Al cables (housed externally)
	<b>RC CuAl</b> Rear terminals for Cu/Al cables		<b>R</b> Rear terminals		<b>MC</b> Multi-cable terminals
	<b>HR for RC221/222</b> Rear flat horizontal terminals		<b>HR</b> Rear flat horizontal terminals		<b>VR</b> Rear flat vertical terminals
	<b>HR/VR</b> Rear flat terminals		<b>RS</b> Rear spread terminals		

	<b>I<sub>Δ</sub></b> Magnetic trip current [A]	<b>Iu</b> Rated uninterrupted current of the circuit-breaker [A]	<b>N= 50%</b> <b>N= 100%</b> Protection of the neutral at 50% or at 100% of that of the phases [A]
	<b>I<sub>n</sub></b> Rated current of the thermomagnetic trip unit [A]	<b>Icu</b> Rated ultimate short-circuit breaking capacity [A]	
		<b>Icw</b> Rated short-time withstand current for 1s	

**TMF** = Thermomagnetic trip unit with fixed thermal and magnetic threshold

**TMD** = Thermomagnetic trip unit with adjustable thermal and fixed magnetic threshold

**TMA** = Thermomagnetic trip unit with adjustable thermal and magnetic threshold

**TMG** = Thermomagnetic trip unit for generator protection

**MF** = Fixed magnetic only trip units

**MA** = Adjustable magnetic only trip units

**PR22\_** = Electronic trip units

**PR23\_** = Electronic trip units

**PR33\_** = Electronic trip units



# Ordering codes

## Instructions for ordering

Ordering Tmax circuit-breakers fitted with the accessories indicated in the catalogue means that these must be indicated by means of the relative sales codes expressly associated with the circuit-breaker code. The following examples are of particular importance for correctly loading orders for Tmax circuit-breakers fitted with accessories.

### 1) T4-T5 electrical accessories on moving part of plug-in circuit-breaker

Fitting the moving parts of plug-in T4-T5 circuit-breakers with SOR, UVR and AUX accessories always requires the appropriate plug-sockets, i.e. in the case of cabled electrical accessories SOR-C, UVR-C, AUX-C, MOE, MOE-E and AUE, the ADP adapters indicated in the catalogue.

#### a) Tmax T4H 250 moving part of plug-in circuit-breakers with auxiliary contacts

	1SDA...R1
T4L 250 F F P221DS-LS/I 100 4p	054081
Kit P MP T4 4p	054840
AUX 3Q 1SY 250 V AC/DC	051369
socket-plug connectors 12 pole	051362

#### b) Tmax T4H 250 moving part of plug-in circuit-breakers with cabled auxiliary contacts

	1SDA...R1
T4L 250 F F P221DS-LS/I 100 4p	054081
Kit P MP T4 4p	054840
AUX-C 3Q 1SY 250 V AC/DC	054911
ADP – 12 pin adapter	054923

#### c) Tmax T5H 630 moving part of plug-in circuit-breaker with SOR-C, MOE and AUX-C

	1SDA...R1
T4L 250 F F P221DS-LS/I 100 4p	054081
Kit P MP T4 4p	054840
SOR-C 220...240 V AC – 220...250V DC	054873
MOE T4-T5 220...250 V AC/DC	054897
ADP – 10 pin adapter	054924
AUX-C 1Q 1SY 250 V AC/DC	054910
ADP – 6 pin adapter	054922

### 2) T4-T5 electrical accessories on moving part of withdrawable circuit-breaker

Fitting the moving parts of T4-T5 withdrawable circuit-breakers can only take place using electrical accessories in the cabled version, i.e. SOR-C, UVR-C, AUX-C, MOE, MOE-E and AUE with ADP adapter.

#### a) Tmax T5V 630 moving part of withdrawable circuit-breaker with UVR-C and MOE

	1SDA...R1
T5V 630 F F TMA 500 4p N=100%	054495
Kit W MP T5 630 4p	054850
UVR-C 24...30 V AC/DC	054887
MOE T4-T5 24 V DC	054894
ADP – 10 pin adapter	054924

#### b) Tmax T4S 250 moving part of withdrawable circuit-breaker SOR-C, RHE and AUE

	1SDA...R1
T4S 250 PR221DS-LS/I 100 4p F F	054033
KIT W MP T4 4p	054842
RHE normal for withdrawable circuit-breaker	054933
AUE – 2 early contacts	054925
SOR-C 220...240 V AC / 220...250 V DC	054873
ADP – 10 pin adapter	054924

# Ordering codes

## Instructions for ordering

### 3) T4-T5 mechanical interlock

The rear interlock for T4 and T5, consisting of the MIR-HB or MIR-VB frame unit and the MIR-P plates, allows use of all the front accessories compatible with the circuit-breakers used. To be able to receive the circuit-breakers mounted directly on the interlock plate, code 1SDA050093R1 must be specified regarding the second circuit-breaker (or fixed part) which is to be interlocked.

#### Horizontal mechanical interlock made between T4H 320 and T5L 630

		1SDA...R1
POS1	T4H 320 PR221DS-LS/I 320 4p F F	054137
	MIR-HB horizontal interlock frame unit	054946
	MIR-P plates for type C interlock	054950
POS2	T5L 630 PR221DS-LS/I 630 4p F F	054424
	Code for circuit-breakers mounted on the plate	050093

### 4) PR222DS/PD T4-T5

The T4 and T5 circuit-breakers can be fitted with the PR222DS/PD electronic trip unit, with communication and integrated control functions, using the special extracodes indicated in the catalogue. The circuit-breakers fitted with the PR222DS/PD trip unit can only have the AUX-E electronic version of auxiliary contacts mounted, to communicate the state of the circuit-breaker to the PR222DS/PD, and the MOE-E dedicated stored energy operating mechanism, to remotely control circuit-breaker opening and closing.

#### a) T4V 250 with dialogue, auxiliary contacts and motor operator

	1SDA...R1
T4V 250 PR222DS/PD-LSIG 250 3p F F	054104
Extracode - Dialogue unit for LSIG	055067
AUX-E-C 1Q 1SY	054916
MOE-E T4-T5 380 V AC	054903
X3 for PR222DS/P/PD T4-T5 F	055059

#### b) T4V 250 moving part of withdrawable circuit-breaker with dialogue, auxiliary contacts and motor operator

	1SDA...R1
T4V 250 PR222DS/PD-LSIG 250 3p F F	054104
Extracode - Dialogue unit for LSIG	055067
Kit W MP T4	054841
AUX-E-C 1Q 1SY	054916
ADP - 6 pin adapter	054922
MOE-E T4-T5 380 V AC	054903
ADP - 10 pin adapter	054924
X3 for PR222DS/P/PD T4-T5 P/W	055061

### 5) Rating plug for Tmax T7

Thanks to the extra codes for the Tmax T7 rating plug (see page 3/49), it is possible to ask for a Tmax T7 circuit-breaker with lower rated current than the standard versions.

#### T7S 400 with PR332/P LSIG – lever operating mechanism

	1SDA...R1
T7S 800 PR332/P-LSIG In=800 3p F F	061968
Extra code for 400 A rating plug	063153

### 6) Sliding contacts for Tmax T7 in version withdrawable

The electrical accessories of Tmax T7 in the withdrawable version must be fitted with suitable sliding contacts for the moving part and for the fixed part, as per table on page 3/5.

#### a) T7S 1000 PR231/P with lever operating mechanism in withdrawable version, opening coil and auxiliary contacts

	1SDA...R1
<b>POS1</b>	
T7S 1000 PR231/P LSI In=1000A 3p F F	062738
Kit MP T7-T7M W 3p	062162
SOR 240...250 V AC/DC Opening coil	062070
AUX 1Q + 1SY Auxiliary contacts	062104
Right PM sliding block	062166
<b>POS2</b>	
Fixed part for withdrawable T7	062045
Right PF sliding block	062169

#### b) T7S 1250 PR332/P with lever operating mechanism in withdrawable version and undervoltage release

	1SDA...R1
<b>POS1</b>	
T7S 1250 PR332/P LSIG In=1250A 3p F F	062871
Kit MP T7-T7M W 3p	062162
UVR 240...250 V AC/DC Undervoltage release	062092
Right PM sliding block	062166
Central PM sliding block	062165
<b>POS2</b>	
Fixed part for withdrawable T7	062045
Right PF sliding block	062169
Central PF sliding block	062168

### 7) Interchangeability of the PR231/P trip unit for Tmax T7

#### Interchangeable T7S 800 PR231/P, with lever operating mechanism

	1SDA...R1
T7S 800 PR231/P LSI In=800 A 4p F F	061973
Extra code for PR231/P interchangeability	063140

### 8) Motorisation for Tmax T7

For Tmax T7 motorisation, the circuit-breaker in T7M version which can be motorised, must be fitted with spring charging geared motor, opening coil and closing coil.

#### Motorised T7S 1000 PR232/P

	1SDA...R1
T7S 1000 M PR232/P LSI In=1000 A 4p F F	062763
220...250 V AC/DC Spring charging geared motor	062116
SOR 240...250 V AC/DC Opening coil	062070
SCR 240...250 V AC/DC Closing coil	062081

# Ordering codes

## Power distribution circuit-breakers

### T4 250 – Fixed (F) – 3 Poles - Front terminals (F)

Thermomagnetic trip unit - TMD and TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1 L (120 kA)	V (200 kA)
	20	320		054225	054243
	32	320		054226	054244
	50	500		054227	054245
	80	400...800		054228	054246
	100	500...1000		054229	054247
	125	625...1250		054230	054248
	160	800...1600		054231	054249
	200	1000...2000		054232	054250
	250	1250...2500		054233	054251

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 L (120 kA)	V (200 kA)
PR221DS-LS/I	100		054069	054093
PR221DS-LS/I	160		054070	054094
PR221DS-LS/I	250		054071	054095
PR221DS-I	100		054072	054096
PR221DS-I	160		054073	054097
PR221DS-I	250		054074	054098
PR222DS/P-LSI	100		054075	054099
PR222DS/P-LSI	160		054076	054100
PR222DS/P-LSI	250		054077	054101
PR222DS/P-LSIG	100		054078	054102
PR222DS/P-LSIG	160		054079	054103
PR222DS/P-LSIG	250		054080	054104
PR223DS	160		059515	059523
PR223DS	250		059517	059525

#### T4 250 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMD and TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1 L (120 kA)	V (200 kA)
	20	320		054234	054252
	32	320		054235	054253
	50	500		054236	054254
	80	400...800		054237	054255
	100	500...1000		054238	054256
N=50%	125	625...1250		054239	054257
N=50%	160	800...1600		054240	054258
N=50%	200	1000...2000		054241	054259
N=50%	250	1250...2500		054242	054260
N=100%	125	625...1250		054283	054287
N=100%	160	800...1600		054284	054288
N=100%	200	1000...2000		054285	054289
N=100%	250	1250...2500		054286	054290

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 L (120 kA)	V (200 kA)
PR221DS-LS/I	100		054081	054105
PR221DS-LS/I	160		054082	054106
PR221DS-LS/I	250		054083	054107
PR221DS-I	100		054084	054108
PR221DS-I	160		054085	054109
PR221DS-I	250		054086	054110
PR222DS/P-LSI	100		054087	054111
PR222DS/P-LSI	160		054088	054112
PR222DS/P-LSI	250		054089	054113
PR222DS/P-LSIG	100		054090	054114
PR222DS/P-LSIG	160		054091	054115
PR222DS/P-LSIG	250		054092	054116
PR223DS	160		059516	059524
PR223DS	250		059518	059526

#### T4 320 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-LS/I	320		054117	054125	054133	054141	054149
PR221DS-I	320		054118	054126	054134	054142	054150
PR222DS/P-LSI	320		054119	054127	054135	054143	054151
PR222DS/P-LSIG	320		054120	054128	054136	054144	054152
PR223DS	320		059495	059503	059511	059519	059527

#### T4 320 – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-LS/I	320		054121	054129	054137	054145	054153
PR221DS-I	320		054122	054130	054138	054146	054154
PR222DS/P-LSI	320		054123	054131	054139	054147	054155
PR222DS/P-LSIG	320		054124	054132	054140	054148	054156
PR223DS	320		059496	059504	059512	059520	059528

# Ordering codes

## Power distribution circuit-breakers

### T5 400 – Fixed (F) – 3 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
	320	1600...3200		054436	054440	054444	054448	054452
	400	2000...4000		054437	054441	054445	054449	054453

Electronic trip unit	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-LS/I	320			054316	054332	054348	054364	054380
PR221DS-LS/I	400			054317	054333	054349	054365	054381
PR221DS-I	320			054318	054334	054350	054366	054382
PR221DS-I	400			054319	054335	054351	054367	054383
PR222DS/P-LSI	320			054320	054336	054352	054368	054384
PR222DS/P-LSI	400			054321	054337	054353	054369	054385
PR222DS/P-LSIG	320			054322	054338	054354	054370	054386
PR222DS/P-LSIG	400			054323	054339	054355	054371	054387
Ekip E-LSIG	320			081043	081044	081045	081046	081047
Ekip E-LSIG	400			081048	081049	081050	081051	081052

7

### T5 400 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
N=50%	320	1600...3200		054438	054442	054446	054450	054454
N=50%	400	2000...4000		054439	054443	054447	054451	054455
N=100%	320	1600...3200		054477	054479	054481	054483	054485
N=100%	400	2000...4000		054478	054480	054482	054484	054486

Electronic trip unit	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-LS/I	320			054324	054340	054356	054372	054388
PR221DS-LS/I	400			054325	054341	054357	054373	054389
PR221DS-I	320			054326	054342	054358	054374	054390
PR221DS-I	400			054327	054343	054359	054375	054391
PR222DS/P-LSI	320			054328	054344	054360	054376	054392
PR222DS/P-LSI	400			054329	054345	054361	054377	054393
PR222DS/P-LSIG	320			054330	054346	054362	054378	054394
PR222DS/P-LSIG	400			054331	054347	054363	054379	054395
Ekip E-LSIG	320			081053	081054	081055	081056	081057
Ekip E-LSIG	400			081058	081059	081060	081061	081062

#### T5 630 – Fixed (F) – 3 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1	N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
	500	2500...5000		054456	054461	054465	054469	054473	

Electronic trip unit	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1	N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-LS/I	630			054396	054404	054412	054420	054428	
PR221DS-I	630			054397	054405	054413	054421	054429	
PR222DS/P-LSI	630			054398	054406	054414	054422	054430	
PR222DS/P-LSIG	630			054399	054407	054415	054423	054431	
Ekip E-LSIG	630			081063	081064	081065	081066	081067	

#### T5 630 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1	N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
N=50%	500	2500...5000		054459	054463	054467	054471	054475	
N=100%	500	2500...5000		054487	054489	054491	054493	054495	

Electronic trip unit	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1	N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-LS/I	630			054400	054408	054416	054424	054432	
PR221DS-I	630			054401	054409	054417	054425	054433	
PR222DS/P-LSI	630			054402	054410	054418	054426	054434	
PR222DS/P-LSIG	630			054403	054411	054419	054427	054435	
Ekip E-LSIG	630			081068	081069	081070	081071	081072	

# Ordering codes

## Power distribution circuit-breakers

### T6 630 – Fixed (F) – 3 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
	630	3150...6300		060202	060204	060206	060208	069414
<b>Electronic trip unit</b>								
	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	
PR221DS-LS/I	630			060226	060236	060246	060256	069417
PR221DS-I	630			060227	060237	060247	060257	069418
PR222DS/P-LSI	630			060228	060238	060248	060258	069419
PR222DS/P-LSIG	630			060229	060239	060249	060259	069420
PR223DS	630			060230	060240	060250	060260	

### T6 630 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
N=50%	630	3150...6300		060203	060205	060207	060209	069415
N=100%	630	3150...6300		060210	060211	060212	060213	069416
<b>Electronic trip unit</b>								
	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
PR221DS-LS/I	630			060231	060241	060251	060262	069421
PR221DS-I	630			060232	060242	060252	060263	069422
PR222DS/P-LSI	630			060233	060243	060253	060264	069423
PR222DS/P-LSIG	630			060234	060244	060254	060265	069424
PR223DS	630			060235	060245	060255	060266	

### T6 800 – Fixed (F) – 3 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
	800	4000...8000		060214	060216	060218	060220	069425
<b>Electronic trip unit</b>								
	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
PR221DS-LS/I	800			060268	060278	060289	060299	069428
PR221DS-I	800			060269	060279	060290	060300	069429
PR222DS/P-LSI	800			060270	060280	060291	060301	069430
PR222DS/P-LSIG	800			060271	060281	060292	060302	069431
PR223DS	800			060272	060282	060293	060303	

### T6 800 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
N=50%	800	4000...8000		060215	060217	060219	060221	069426
N=100%	800	4000...8000		060222	060223	060224	060225	069427
<b>Electronic trip unit</b>								
	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
PR221DS-LS/I	800			060273	060283	060294	060305	069432
PR221DS-I	800			060274	060284	060295	060306	069433
PR222DS/P-LSI	800			060275	060285	060296	060307	069434
PR222DS/P-LSIG	800			060276	060286	060297	060308	069435
PR223DS	800			060277	060287	060298	060309	



#### T6 1000 – Fixed (F) – 3 Poles

Electronic trip unit	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	
PR221DS-LS/I	1000			060537	060547	060561	060574	
PR221DS-I	1000			060538	060548	060562	060575	
PR222DS/P-LSI	1000			060539	060552	060563	060576	
PR222DS/P-LSIG	1000			060540	060554	060564	060577	
PR223DS	1000			060541	060555	060565	060578	

**Note:** A type of terminal among EF - ES - FC CuAl - R must necessarily be mounted on the T6 1000 A circuit-breaker.  
If the T6 1000 is ordered without one of the previous terminal kits, the EF terminals are supplied by default.

#### T6 1000 – Fixed (F) – 4 Poles

Electronic trip unit	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	
PR221DS-LS/I	1000			060542	060556	060566	060580	
PR221DS-I	1000			060543	060557	060567	060581	
PR222DS/P-LSI	1000			060544	060558	060568	060582	
PR222DS/P-LSIG	1000			060545	060559	060569	060583	
PR223DS	1000			060546	060560	060573	060584	

**Note:** A type of terminal among EF - ES - FC CuAl - R must necessarily be mounted on the T6 1000 A circuit-breaker.  
If the T6 1000 is ordered without one of the previous terminal kits, the EF terminals are supplied by default.

# Ordering codes

## Power distribution circuit-breakers

### T7 800 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1				
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)	X (170 kA)
PR231/P LS/I <sup>(1)</sup>	800		061963	062642	062674	062706	
PR231/P I <sup>(1)</sup>	800		061962	062641	062673	062705	
PR232/P LSI	800		061964	062643	062675	062707	
PR331/P LSIg	800		061965	062644	062676	062708	069446
PR332/P LI	800		061966	062645	062677	062709	069447
PR332/P LSI	800		061967	062646	062678	062710	069448
PR332/P LSIg	800		061968	062647	062679	062711	069449
PR332/P LSIRc <sup>(2)</sup>	800		061969	062648	062680	062712	

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 800 – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1				
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)	X (170 kA)
PR231/P LS/I <sup>(1)</sup>	800		061973	062650	062682	062714	
PR231/P I <sup>(1)</sup>	800		061972	062649	062681	062713	
PR232/P LSI	800		061974	062651	062683	062715	
PR331/P LSIg	800		061975	062652	062684	062716	069453
PR332/P LI	800		061976	062653	062685	062717	069454
PR332/P LSI	800		061977	062654	062686	062718	069455
PR332/P LSIg	800		061978	062655	062687	062719	069456
PR332/P LSIRc <sup>(2)</sup>	800		061979	062656	062688	062720	

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1000 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1				
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)	
PR231/P LS/I <sup>(1)</sup>	1000		062738	062770	062802	062834	
PR231/P I <sup>(1)</sup>	1000		062737	062769	062801	062833	
PR232/P LSI	1000		062739	062771	062803	062835	
PR331/P LSIg	1000		062740	062772	062804	062836	
PR332/P LI	1000		062741	062773	062805	062837	
PR332/P LSI	1000		062742	062774	062806	062838	
PR332/P LSIg	1000		062743	062775	062807	062839	
PR332/P LSIRc <sup>(2)</sup>	1000		062744	062776	062808	062840	

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1000 – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1				
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)	
PR231/P LS/I <sup>(1)</sup>	1000		062746	062778	062810	062842	
PR231/P I <sup>(1)</sup>	1000		062745	062777	062809	062841	
PR232/P LSI	1000		062747	062779	062811	062843	
PR331/P LSIg	1000		062748	062780	062812	062844	
PR332/P LI	1000		062749	062781	062813	062845	
PR332/P LSI	1000		062750	062782	062814	062846	
PR332/P LSIg	1000		062751	062783	062815	062847	
PR332/P LSIRc <sup>(2)</sup>	1000		062752	062784	062816	062848	

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1250 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	1250		062866	062898	062930	062962
PR231/P I <sup>(1)</sup>	1250		062865	062897	062929	062961
PR232/P LSI	1250		062867	062899	062931	062963
PR331/P LSIG	1250		062868	062900	062932	062964
PR332/P LI	1250		062869	062901	062933	062965
PR332/P LSI	1250		062870	062902	062934	062966
PR332/P LSIG	1250		062871	062903	062935	062967
PR332/P LSIRc <sup>(2)</sup>	1250		062872	062904	062936	062968

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1250 – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	1250		062874	062906	062938	062970
PR231/P I <sup>(1)</sup>	1250		062873	062905	062937	062969
PR232/P LSI	1250		062875	062907	062939	062971
PR331/P LSIG	1250		062876	062908	062940	062972
PR332/P LI	1250		062877	062909	062941	062973
PR332/P LSI	1250		062878	062910	062942	062974
PR332/P LSIG	1250		062879	062911	062943	062975
PR332/P LSIRc <sup>(2)</sup>	1250		062880	062912	062944	062976

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1600 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)
PR231/P LS/I <sup>(1)</sup>	1600		062994	063026	063058
PR231/P I <sup>(1)</sup>	1600		062993	063025	063057
PR232/P LSI	1600		062995	063027	063059
PR331/P LSIG	1600		062996	063028	063060
PR332/P LI	1600		062997	063029	063061
PR332/P LSI	1600		062998	063030	063062
PR332/P LSIG	1600		062999	063031	063063
PR332/P LSIRc <sup>(2)</sup>	1600		063000	063032	063064

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1600 – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)
PR231/P LS/I <sup>(1)</sup>	1600		063002	063034	063066
PR231/P I <sup>(1)</sup>	1600		063001	063033	063065
PR232/P LSI	1600		063003	063035	063067
PR331/P LSIG	1600		063004	063036	063068
PR332/P LI	1600		063005	063037	063069
PR332/P LSI	1600		063006	063038	063070
PR332/P LSIG	1600		063007	063039	063071
PR332/P LSIRc <sup>(2)</sup>	1600		063008	063040	063072

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

# Ordering codes

## Power distribution circuit-breakers

### T7 800 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	800		061981	062658	062690	062722
PR231/P I <sup>(1)</sup>	800		061980	062657	062689	062721
PR232/P LSI	800		061982	062659	062691	062723
PR331/P LSIg	800		061983	062660	062692	062724
PR332/P LI	800		061984	062661	062693	062725
PR332/P LSI	800		061985	062662	062694	062726
PR332/P LSIg	800		061986	062663	062695	062727
PR332/P LSIRc <sup>(2)</sup>	800		061987	062664	062696	062728

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 800 M – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	800		061989	062666	062698	062730
PR231/P I <sup>(1)</sup>	800		061988	062665	062697	062729
PR232/P LSI	800		061990	062667	062699	062731
PR331/P LSIg	800		061991	062668	062700	062732
PR332/P LI	800		061992	062669	062701	062733
PR332/P LSI	800		061993	062670	062702	062734
PR332/P LSIg	800		061994	062671	062703	062735
PR332/P LSIRc <sup>(2)</sup>	800		061995	062672	062704	062736

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1000 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	1000		062754	062786	062818	062850
PR231/P I <sup>(1)</sup>	1000		062753	062785	062817	062849
PR232/P LSI	1000		062755	062787	062819	062851
PR331/P LSIg	1000		062756	062788	062820	062852
PR332/P LI	1000		062757	062789	062821	062853
PR332/P LSI	1000		062758	062790	062822	062854
PR332/P LSIg	1000		062759	062791	062823	062855
PR332/P LSIRc <sup>(2)</sup>	1000		062760	062792	062824	062856

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1000 M – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	1000		062762	062794	062826	062858
PR231/P I <sup>(1)</sup>	1000		062761	062793	062825	062857
PR232/P LSI	1000		062763	062795	062827	062859
PR331/P LSIg	1000		062764	062796	062828	062860
PR332/P LI	1000		062765	062797	062829	062861
PR332/P LSI	1000		062766	062798	062830	062862
PR332/P LSIg	1000		062767	062799	062831	062863
PR332/P LSIRc <sup>(2)</sup>	1000		062768	062800	062832	062864

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1250 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	1250		062882	062914	062946	062978
PR231/P I <sup>(1)</sup>	1250		062881	062913	062945	062977
PR232/P LSI	1250		062883	062915	062947	062979
PR331/P LSIG	1250		062884	062916	062948	062980
PR332/P LI	1250		062885	062917	062949	062981
PR332/P LSI	1250		062886	062918	062950	062982
PR332/P LSIG	1250		062887	062919	062951	062983
PR332/P LSIRc <sup>(2)</sup>	1250		062888	062920	062952	062984

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1250 M – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P LS/I <sup>(1)</sup>	1250		062890	062922	062954	062986
PR231/P I <sup>(1)</sup>	1250		062889	062921	062953	062985
PR232/P LSI	1250		062891	062923	062955	062987
PR331/P LSIG	1250		062892	062924	062956	062988
PR332/P LI	1250		062893	062925	062957	062989
PR332/P LSI	1250		062894	062926	062958	062990
PR332/P LSIG	1250		062895	062927	062959	062991
PR332/P LSIRc <sup>(2)</sup>	1250		062896	062928	062960	062992

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1600 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)
PR231/P LS/I <sup>(1)</sup>	1600		063010	063042	063074
PR231/P I <sup>(1)</sup>	1600		063009	063041	063073
PR232/P LSI	1600		063011	063043	063075
PR331/P LSIG	1600		063012	063044	063076
PR332/P LI	1600		063013	063045	063077
PR332/P LSI	1600		063014	063046	063078
PR332/P LSIG	1600		063015	063047	063079
PR332/P LSIRc <sup>(2)</sup>	1600		063016	063048	063080

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

### T7 1600 M – Fixed (F) – 4 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 S (50 kA)	H (70 kA)	L (120 kA)
PR231/P LS/I <sup>(1)</sup>	1600		063018	063050	063082
PR231/P I <sup>(1)</sup>	1600		063017	063049	063081
PR232/P LSI	1600		063019	063051	063083
PR331/P LSIG	1600		063020	063052	063084
PR332/P LI	1600		063021	063053	063085
PR332/P LSI	1600		063022	063054	063086
PR332/P LSIG	1600		063023	063055	063087
PR332/P LSIRc <sup>(2)</sup>	1600		063024	063056	063088

<sup>(1)</sup> To allow the interchangeability of PR231, T7-T7M circuit-breakers must be ordered specifying extra codes for its interchangeability. See page 7/57.

<sup>(2)</sup> RC protection can be obtained only with 1SDA063869R1 toroid.

# Ordering codes

## Circuit-breakers for zone selectivity

### T4L 250 – Fixed (F) - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			120 kA	120 kA			
PR223EF	160		059477	059478			
PR223EF	250		059479	059480			

### T4L 250 – Fixed (F) - Terminals for copper cables FC Cu 1000 V (AC)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			16 kA	16 kA			
PR223EF	160		064270	064271			
PR223EF	250		064272	064273			

### T4L 320 – Fixed (F) - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			120 kA	120 kA			
PR223EF	320		059481	059482			

### T5L 400 – Fixed (F) - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			120 kA	120 kA			
PR223EF	320		059483	059484			
PR223EF	400		059485	059486			

### T5L 400 – Fixed (F) - Terminals for copper cables FC Cu 1000 V (AC)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			16 kA	16 kA			
PR223EF	320		064274	064275			
PR223EF	400		064276	064277			

### T5L 630 – Fixed (F) - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			120 kA	120 kA			
PR223EF	630		059487	059488			

### T5L 630 – Fixed (F) - Terminals for copper cables FC Cu 1000 V (AC)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 3 poles	4 poles			
			16 kA	16 kA			
PR223EF	630		064278	064279			

**T6L 630 – Fixed (F) - Front terminals (F)**

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			3 poles	4 poles		
			100 kA	100 kA		
PR223EF	630		060261	060267		

**T6L 800 – Fixed (F) - Front terminals (F)**

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			3 poles	4 poles		
			100 kA	100 kA		
PR223EF	800		060304	060310		

**T6L 1000 – Fixed (F)**

Electronic trip unit	In	Icu (415 V)	1SDA.....R1			
			3 poles	4 poles		
			100 kA	100 kA		
PR223EF	1000		060579	060585		

**Note:** A type of terminal among EF - ES - FC CuAl - R must be mounted on the T6 1000 A circuit-breaker.  
If T6 1000 is ordered without specifying one of the terminals above, EF terminals are automatically assigned.

# Ordering codes

## Motor protection circuit-breakers

### T4 250 – Fixed (F) – 3 Poles - Front terminals (F)

Magnetic only trip unit - MA	In	I <sub>3</sub>	Icu (415 V)	1SDA.....R1				
	10	60...140		L (120 kA)				
	25	150...350		055074				
	52	312...728		055075				
	80	480...1120		055076				
	100	600...1400		054308				
	125	750...1750		054309				
	160	960...2240		054310				
	200	1200...2800		054311				
				054312				

Electronic trip unit for motor protection	In		Icu (415 V)	1SDA.....R1				
				L (120 kA)				
Ekip M-LRIU	100			054528				
Ekip M-LRIU	160			054529				
Ekip M-LRIU	200			054530				

Electronic trip unit	In		Icu (415 V)	1SDA.....R1				
				L (120 kA)	V (200 kA)			
PR221DS-I	100			054072	054096			
PR221DS-I	160			054073	054097			
PR221DS-I	250			054074	054098			

### T4 320 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In		Icu (415 V)	1SDA.....R1				
				N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-I	320			054118	054126	054134	054142	054150

#### Note:

T4, T5 and T6 in the three-pole version equipped with PR221DS-I electronic trip units and T7 in the three-pole version equipped with PR231/P-I electronic trip units, can be used for motor protection.



**T5 400 – Fixed (F) – 3 Poles - Front terminals (F)**

Electronic trip unit for motor protection	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	L (120 kA)		
Ekip M-LRIU	320		054551	054553	054555		

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-I	320		054318	054334	054350	054366	054382
PR221DS-I	400		054319	054335	054351	054367	054383

Electronic trip unit for motor protection	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	L (120 kA)		
Ekip M-LRIU	400		064157	064158	064160		

**T5 630 – Fixed (F) – 3 Poles - Front terminals (F)**

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (120 kA)	V (200 kA)
PR221DS-I	630		054397	054405	054413	054421	054429

**T6 630 – Fixed (F) – 3 Poles - Front terminals (F)**

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	
PR221DS-I	630		060227	060237	060247	060257	

**T6 800 – Fixed (F) – 3 Poles - Front terminals (F)**

Electronic trip unit for motor protection	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	V (150 kA)
Ekip M-LRIU	630		060311	060312	060313	060314	069436

Electronic trip unit	In	Icu (415 V)	1SDA.....R1 N (36 kA)	S (50 kA)	H (70 kA)	L (100 kA)	
PR221DS-I	800		060269	060279	060290	060300	

**Note:**

T4, T5 and T6 in the three-pole version equipped with PR221DS-I electronic trip units and T7 in the three-pole version equipped with PR231/P-I electronic trip units, can be used for motor protection.

# Ordering codes

## Motor protection circuit-breakers

### T7 800 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	800		061962	062641	062673	062705	

### T7 1000 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	1000		062737	062769	062801	062833	

### T7 1250 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	1250		062865	062897	062929	062961	

### T7 1600 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	1600		062993	063025	063057		

### T7 800 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	800		061980	062657	062689	062721	

### T7 1000 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	1000		062753	062785	062817	062849	

### T7 1250 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	1250		062851	062913	062945	062977	

### T7 1600 M – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	Icu (415 V)	1SDA.....R1	S (50 kA)	H (70 kA)	L (120 kA)	V (150 kA)
PR231/P I	1600		063009	063041	063073		

#### Note:

T4, T5 and T6 in the three-pole version equipped with PR221DS-I electronic trip units and T7 in the three-pole version equipped with PR231/P-I electronic trip units, can be used for motor protection.

# Ordering codes

## Circuit-breakers for use up to 1150 V AC and 1000 V DC

### T4 250 – Fixed (F) – 3 Poles - Front terminals for copper cables (FC Cu)

Electronic trip unit	In	I <sub>n</sub>	Icu (1000 V AC) Icu (1150 V AC)	1SDA.....R1 L (12 kA)	V (20 kA - 12 kA)			
PR221DS-LS/I	100			054505	054513			
PR221DS-I	100			054506	054514			
PR222DS/P-LSI	100			054507	054515			
PR222DS/P-LSIG	100			054508	054516			
PR221DS-LS/I	250			054509	054517			
PR221DS-I	250			054510	054518			
PR222DS/P-LSI	250			054511	054519			
PR222DS/P-LSIG	250			054512	054520			
Ekip M-LRIU	100			063434				
Ekip M-LRIU	160			063435				
Ekip M-LRIU	200			063436				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T4 250 – Fixed (F) – 4 Poles - Front terminals for copper cables (FC Cu)

Electronic trip unit	In	I <sub>n</sub>	Icu (1000 V AC) Icu (1150 V AC)	1SDA.....R1 L (12 kA)	V (20 kA - 12 kA)			
PR221DS-LS/I	100			063418	063426			
PR221DS-I	100			063419	063427			
PR222DS/P-LSI	100			063420	063428			
PR222DS/P-LSIG	100			063421	063429			
PR221DS-LS/I	250			063422	063430			
PR221DS-I	250			063423	063431			
PR222DS/P-LSI	250			063424	063432			
PR222DS/P-LSIG	250			063425	063433			

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T4 250 – Fixed (F) – 3 Poles - Front terminals for copper cables (FC Cu)

Thermomagnetic trip unit - TMD and TMA	In	I <sub>n</sub>	Icu (1000 V AC) Icu (1150 V AC)	1SDA.....R1 V (20 kA - 12 kA)				
	32	320		063410				
	50	500		063411				
	80	400...800		063412				
	100	500...1000		063413				
	125	625...1250		063414				
	160	800...1600		063415				
	200	1000...2000		063416				
	250	1250...2500		063417				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T4 250 – Fixed (F) – 4 Poles - Front terminals for copper cables (FC Cu)

Thermomagnetic trip unit - TMD and TMA	In	I <sub>n</sub>	Icu (1000 V AC) Icu (1150 V AC) Icu (1000 V DC)	1SDA.....R1 V (20 kA - 12 kA - 40 kA)				
	32	320		054497				
	50	500		054498				
	80	400...800		054499				
	100	500...1000		054500				
	125	625...1250		054501				
	160	800...1600		054502				
	200	1000...2000		054503				
	250	1250...2500		054504				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T4 250 – Fixed (F) – 4 Poles - Front terminals for use at 1000V DC with jumpers

Thermomagnetic trip unit - TMD and TMA	In	I <sub>n</sub>	Icu (1000 V DC)	1SDA.....R1 V (20 kA)				
	80	400...800		082616				
	100	500...1000		082617				
	125	625...1250		082618				
	160	800...1600		082619				
	200	1000...2000		082620				
	250	1250...2500		082621				

# Ordering codes

## Circuit-breakers for use up to 1150 V AC and 1000 V DC

### T5 400 – Fixed (F) – 3 Poles - Front terminals for copper cables (FC Cu)

Electronic trip unit	In	I <sub>n</sub>	Icu (1000 V AC) Icu (1150 V AC)	1SDA.....R1 L (12 kA)	V (20 kA - 12 kA)			
PR221DS-LS/I	320			063477	063485			
PR221DS-I	320			063478	063486			
PR222DS/P-LSI	320			063479	063487			
PR222DS/P-LSIG	320			063480	063488			
PR221DS-LS/I	400			054535	054539			
PR221DS-I	400			054536	054540			
PR222DS/P-LSI	400			054537	054541			
PR222DS/P-LSIG	400			054538	054542			
PR222MP	320			063456				
Ekip M-LRIU	400			063457				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T5 400 – Fixed (F) – 4 Poles - Front terminals for copper cables (FC Cu)

Electronic trip unit	In	I <sub>n</sub>	Icu (1000 V AC) Icu (1150 V AC)	1SDA.....R1 L (12 kA)	V (20 kA - 12 kA)			
PR221DS-LS/I	320			063481	063489			
PR221DS-I	320			063482	063490			
PR222DS/P-LSI	320			063483	063491			
PR222DS/P-LSIG	320			063484	063492			
PR221DS-LS/I	400			063440	063444			
PR221DS-I	400			063441	063445			
PR222DS/P-LSI	400			063442	063446			
PR222DS/P-LSIG	400			063443	063447			

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T5 400 – Fixed (F) – 3 Poles - Front terminals for copper cables (FC Cu)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (1000 V AC) Icu (1150 V AC)	1SDA.....R1 V (20 kA - 12 kA)				
	320	1600...3200		063437				
	400	2000...4000		063438				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T5 400 – Fixed (F) – 4 Poles - Front terminals for copper cables (FC Cu)

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (1000 V AC) Icu (1150 V AC) Icu (1000 V DC)	1SDA.....R1 V (20 kA - 12 kA - 40 kA)				
	320	1600...3200		054531				
	400	2000...4000		054532				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1

Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

### T5 400 – Fixed (F) – 4 Poles - Front terminals for use at 1000V DC with jumpers

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (1000 V DC)	1SDA.....R1 V (20 kA)				
	320	1600...3200		082622				
	400	2000...4000		082623				

**T5 630 – Fixed (F) – 3 Poles - Front terminals for copper cables (FC Cu)**

Electronic trip unit	In		Icu (1000 V AC)	1SDA.....R1					
			Icu (1150 V AC)	L (12 kA)	V (20 kA - 12 kA)				
PR221DS-LS/I	630			054543	054547				
PR221DS-I	630			054544	054548				
PR222DS/P-LSI	630			054545	054549				
PR222DS/P-LSIG	630			054546	054550				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1  
 Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

**T5 630 – Fixed (F) – 4 Poles - Front terminals for copper cables (FC Cu)**

Electronic trip unit	In		Icu (1000 V AC)	1SDA.....R1					
			Icu (1150 V AC)	L (12 kA)	V (20 kA - 12 kA)				
PR221DS-LS/I	630			063448	063452				
PR221DS-I	630			063449	063453				
PR222DS/P-LSI	630			063450	063454				
PR222DS/P-LSIG	630			063451	063455				

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1  
 Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

**T5 630 – Fixed (F) – 3 Poles - Front terminals for copper cables (FC Cu)**

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (1000 V AC)	1SDA.....R1					
			Icu (1150 V AC)	V (20 kA - 12 kA)					
	500	2500...5000		063439					

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1  
 Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

**T5 630 – Fixed (F) – 4 Poles - Front terminals for copper cables (FC Cu)**

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (1000 V AC)	1SDA.....R1					
			Icu (1150 V AC) Icu (1000 V DC)	V (20 kA - 12 kA - 40 kA)					
	500	2500...5000		054533					

Extracode to receive the circuit breaker with terminal F: 1SDA064111R1  
 Extracode to receive the circuit breaker with upper EF terminals: 1SDA065722R1

**T5 630 – Fixed (F) – 4 Poles - Front terminals for use at 1000V DC with jumpers**

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	Icu (1000 V DC)	1SDA.....R1					
				V (20 kA)					
	500	2500...5000		082624					

# Ordering codes

## Circuit-breakers for use up to 1150 V AC and 1000 V DC

### T6 630 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	I <sub>n</sub>	Icu (1000 V AC)	1SDA.....R1				
				L (12 kA)				
PR221DS-LS/I	630			060319				
PR221DS-I	630			060320				
PR222DS/P-LSI	630			060321				
PR222DS/P-LSIG	630			060322				

### T6 630 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>n</sub>	Icu (1000 V AC)	1SDA.....R1				
			Icu (1000 V DC)	L (12 kA - 40 kA)				
	630	3150...6300		060315				

### T6 800 – Fixed (F) – 3 Poles - Front terminals (F)

Electronic trip unit	In	I <sub>n</sub>	Icu (1000 V AC)	1SDA.....R1				
				L (12 kA)				
PR221DS-LS/I	800			060323				
PR221DS-I	800			060324				
PR222DS/P-LSI	800			060325				
PR222DS/P-LSIG	800			060326				

### T6 800 – Fixed (F) – 4 Poles - Front terminals (F)

Thermomagnetic trip unit - TMA	In	I <sub>n</sub>	Icu (1000 V AC)	1SDA.....R1				
			Icu (1000 V DC)	L (12 kA - 40 kA)				
	800	4000...8000		060317				

### T6 800 – Fixed (F) – 4 Poles - Front terminals for use at 1000V DC with jumpers

Thermomagnetic trip unit - TMA	In	I <sub>n</sub>	Icu (1000 V DC)	1SDA.....R1				
				L (20 kA)				
	630	3150...6300		082625				
	800	4000...8000		082626				

# Ordering codes

## Switch disconnectors

### T4D 250 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			3.6 kA	3.6 kA			
			057172	057173			

### T4D 320 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			3.6 kA	3.6 kA			
			054597	054598			

### T5D 400 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			6 kA	6 kA			
			054599	054600			

### T5D 630 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			6 kA	6 kA			
			054601	054602			

### T6D 630 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			15 kA	15 kA			
			060343	060344			

### T6D 800 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			15 kA	15 kA			
			060345	060346			

### T6D 1000 – Fixed (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			15 kA	15 kA			
			060594	060595			

**Note:** A type of terminal among EF - ES - FC CuAl - R must necessarily be mounted on the 1000 A circuit-breaker.  
If T6 1000 is ordered without specifying one of the terminals above, EF terminals are automatically assigned.

# Ordering codes

## Switch disconnectors

### T7D 1000 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			20 kA	20 kA			
			062032	062033			

### T7D 1250 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			20 kA	20 kA			
			062036	062037			

### T7D 1600 – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			20 kA	20 kA			
			062040	062041			

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### T7D 1000 M – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			20 kA	20 kA			
			062034	062035			

### T7D 1250 M – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			20 kA	20 kA			
			062038	062039			

### T7D 1600 M – Fixed (F) - Front terminals (F)

		lcw	1SDA.....R1				
			3 poles	4 poles			
			20 kA	20 kA			
			062042	062043			



# Ordering codes

## Breaking units

### T4 250 - F = Front terminals

	1SDA.....R1				
	3 poles	4 poles			
T4N 250 Breaking unit	054557	054562			
T4S 250 Breaking unit	054558	054563			
T4H 250 Breaking unit	054559	054564			
T4L 250 Breaking unit	054560	054565			
T4V 250 Breaking unit	054561	054566			

### T4 320 - F = Front terminals

	1SDA.....R1				
	3 poles	4 poles			
T4N 320 Breaking unit	054567	054572			
T4S 320 Breaking unit	054568	054573			
T4H 320 Breaking unit	054569	054574			
T4L 320 Breaking unit	054570	054575			
T4V 320 Breaking unit	054571	054576			

### T5 400 - F = Front terminals

	1SDA.....R1				
	3 poles	4 poles			
T5N 400 Breaking unit	054577	054582			
T5S 400 Breaking unit	054578	054583			
T5H 400 Breaking unit	054579	054584			
T5L 400 Breaking unit	054580	054585			
T5V 400 Breaking unit	054581	054586			

### T5 630 - F = Front terminals

	1SDA.....R1				
	3 poles	4 poles			
T5N 630 Breaking unit	054587	054592			
T5S 630 Breaking unit	054588	054593			
T5H 630 Breaking unit	054589	054594			
T5L 630 Breaking unit	054590	054595			
T5V 630 Breaking unit	054591	054596			

# Ordering codes

## Breaking units

### T6 630 - F = Front terminals

	1SDA.....R1				
	3 poles	4 poles			
T6N 630 Breaking unit	060327	060331			
T6S 630 Breaking unit	060328	060332			
T6H 630 Breaking unit	060329	060333			
T6L 630 Breaking unit	060330	060334			

### T6 800 - F = Front terminals

	1SDA.....R1				
	3 poles	4 poles			
T6N 800 Breaking unit	060335	060339			
T6S 800 Breaking unit	060336	060340			
T6H 800 Breaking unit	060337	060341			
T6L 800 Breaking unit	060338	060342			

### T6 1000

	1SDA.....R1				
	3 poles	4 poles			
T6N 1000 Breaking unit	060586	060590			
T6S 1000 Breaking unit	060587	060591			
T6H 1000 Breaking unit	060588	060592			
T6L 1000 Breaking unit	060589	060593			

**Note:** A type of terminal among EF - ES - FC CuAl - R must necessarily be mounted on the 1000 A circuit-breaker.  
If T6 1000 is ordered without specifying one of the terminals above, EF terminals are automatically assigned.

# Ordering codes

## Trip units



1SDC21019F0004

Trip units for T4						
Thermomagnetic trip unit - TMD and TMA	In	$I_n$	1SDA.....R1			
			3 poles		4 poles	
					N = 50%	N = 100%
TMD 20-200	20	320	054651			054660
TMD 32-320	32	320	054652			054661
TMD 50-500	50	500	054653			054662
TMA 80-800	80	400...800	054654			054663
TMA 100-1000	100	500...1000	054655			054664
TMA 125-1250	125	625...1250	054656	054665		054671
TMA 160-1600	160	800...1600	054657	054666		054672
TMA 200-2000	200	1000...2000	054658	054667		054673
TMA 250-2500	250	1250...2500	054659	054668		054674

Electronic trip unit	In		1SDA.....R1			
			3 poles		4 poles	
PR221DS-LS/I	100		054603		054615	
PR221DS-LS/I	160		054604		054616	
PR221DS-LS/I	250		054605		054617	
PR221DS-LS/I	320		054627		054631	
PR221DS-I	100		054606		054618	
PR221DS-I	160		054607		054619	
PR221DS-I	250		054608		054620	
PR221DS-I	320		054628		054632	
PR222DS/P-LSI	100		054609		054621	
PR222DS/P-LSI	160		054610		054622	
PR222DS/P-LSI	250		054611		054623	
PR222DS/P-LSI	320		054629		054633	
PR222DS/P-LSIG	100		054612		054624	
PR222DS/P-LSIG	160		054613		054625	
PR222DS/P-LSIG	250		054614		054626	
PR222DS/P-LSIG	320		054630		054634	
PR222DS/PD-LSI	100		054635		054641	
PR222DS/PD-LSI	160		054636		054642	
PR222DS/PD-LSI	250		054637		054643	
PR222DS/PD-LSI	320		054647		054649	
PR222DS/PD-LSIG	100		054638		054644	
PR222DS/PD-LSIG	160		054639		054645	
PR222DS/PD-LSIG	250		054640		054646	
PR222DS/PD-LSIG	320		054648		054650	
PR223DS	160		059561		059562	
PR223DS	250		059563		059564	
PR223DS	320		059565		059566	

Electronic trip unit for motor protection	In		1SDA.....R1			
			3 poles			
Ekip M-LRIU	100		054688			
Ekip M-LRIU	160		054689			
Ekip M-LRIU	200		054690			

Magnetic only trip unit - MA	In	$I_n$	1SDA.....R1			
			3 poles		4 poles	
					N = 50%	N = 100%
MA 10-140	10	60...140	055077			055080
MA 25-350	25	150...350	055078			055081
MA 52-728	52	312...728	055079			055082
MA 80-1120	80	480...1120	054676			054682
MA 100-1400	100	600...1400	054677			054683
MA 125-1750	125	750...1750	054678	054684		
MA 160-2240	160	960...2240	054679	054685		
MA 200-2800	200	1200...2800	054680	054686		

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# Ordering codes

## Trip units



1SDC210189F004

### Trip units for T5

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	1SDA.....R1			
			3 poles	4 poles		
				N = 50%	N = 100%	
TMA 320-3200	320	1600...3200	054723	054725	054731	
TMA 400-4000	400	2000...4000	054724	054726	054732	
TMA 500-5000	500	2500...5000	054727	054729	054733	

Thermomagnetic trip unit for generator protection - TMG	In	I <sub>3</sub>	1SDA.....R1			
			3 poles	4 poles		
TMG 320-1600	320	800...1600	055093	055101		
TMG 400-2000	400	1000...2000	055098	055102		
TMG 500-2500	500	1250...2500	055099	055103		

Electronic trip unit	In		1SDA.....R1			
			3 poles	4 poles		
PR221DS-LS/I	320		054691	054699		
PR221DS-LS/I	400		054692	054700		
PR221DS-LS/I	630		054707	055159		
PR221DS-I	320		054693	054701		
PR221DS-I	400		054694	054702		
PR221DS-I	630		054708	055160		
PR222DS/P-LSI	320		054695	054703		
PR222DS/P-LSI	400		054696	054704		
PR222DS/P-LSI	630		054709	055161		
PR222DS/P-LSIG	320		054697	054705		
PR222DS/P-LSIG	400		054698	054706		
PR222DS/P-LSIG	630		054710	055162		
PR222DS/PD-LSI	320		054711	054715		
PR222DS/PD-LSI	400		054712	054716		
PR222DS/PD-LSI	630		054719	054721		
PR222DS/PD-LSIG	320		054713	054717		
PR222DS/PD-LSIG	400		054714	054718		
PR222DS/PD-LSIG	630		054720	054722		
Ekip E-LSIG	320		081082	081084		
Ekip E-LSIG/COM	320		081083	081085		
Ekip E-LSIG	400		081086	081088		
Ekip E-LSIG/COM	400		081087	081089		
Ekip E-LSIG	630		081090	081092		
Ekip E-LSIG/COM	630		081091	081093		

Electronic trip unit for motor protection	In		1SDA.....R1			
			3 poles			
Ekip M-LRIU	320		054735			
Ekip M-LRIU	400 <sup>(1)</sup>		054736			

<sup>(1)</sup> to be mounted on T5 630 only



1SDC210B050001

#### Trip units for T6

Thermomagnetic trip unit - TMA	In	I <sub>3</sub>	1SDA.....R1		
			3 poles	4 poles	
				N = 50%	N = 100%
TMA 630-6300	630	3150...6300	060347	060348	060472
TMA 800-8000	800	4000...8000	060349	060350	060473

Electronic trip unit	In		1SDA.....R1		
			3 poles	4 poles	
PR221DS-LS/I	630		060351	060357	
PR221DS-LS/I	800		060363	060369	
PR221DS-LS/I	1000		060596	060602	
PR221DS-I	630		060352	060358	
PR221DS-I	800		060364	060370	
PR221DS-I	1000		060597	060603	
PR222DS/P-LSI	630		060353	060359	
PR222DS/P-LSI	800		060365	060371	
PR222DS/P-LSI	1000		060598	060604	
PR222DS/P-LSIG	630		060354	060360	
PR222DS/P-LSIG	800		060366	060372	
PR222DS/P-LSIG	1000		060599	060605	
PR222DS/PD-LSI	630		060355	060361	
PR222DS/PD-LSI	800		060367	060373	
PR222DS/PD-LSI	1000		060600	060606	
PR222DS/PD-LSIG	630		060356	060362	
PR222DS/PD-LSIG	800		060368	060374	
PR222DS/PD-LSIG	1000		060601	060607	
PR223DS	630		060376	060377	
PR223DS	800		060378	060379	
PR223DS	1000		060608	060609	

Electronic trip unit for motor protection	In		1SDA.....R1		
			3 poles		
Ekip M-LRIU	630 <sup>(1)</sup>		060375		

**Note:** The releases for the T6 1000 A necessarily have to be fitted with the following types of terminal: EF - ES - FC CuAl - R. If T6 1000 is ordered without specifying one of the terminals above, EF terminals are automatically assigned  
(1) to be mounted on T6 800 only

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1SDC210B10F0001

#### Trip units for T7-T7M

Electronic trip unit			1SDA.....R1		
PR231/P-LS/I 3p <sup>(1)</sup>			074527		
PR231/P-I 3p <sup>(1)</sup>			074528		
PR231/P-LS/I 4p <sup>(1)</sup>			074529		
PR231/P-I 4p <sup>(1)</sup>			074530		
PR232/P-LSI			074531		
PR331/P-LI			074532		
PR331/P-LSI			074533		
PR331/P-LSIG			074534		
PR332/P-LI			074535		
PR332/P-LSI			074536		
PR332/P-LSIG T7 <sup>(2)</sup>			074537		
PR332/P-LSIRc T7M <sup>(2)</sup>			074538		

**Note:** Loose trip units for T7-T7M are supplied without rating Plug. For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary.

(1) To have the possibility to substitute PR231 with a different electronic trip unit, key plug must be ordered. Extra code for PR231 interchangeability 1SDA063140R1 must be specified.

(2) RC protection can be obtained only with 1SDA063869R1 toroid.

# Ordering codes

## Fixed parts, conversion kit and accessories for fixed parts



### Plug-in (P) – Fixed part

#### EF = Front extended terminals

	1SDA.....R1			
	3 poles	4 poles		
T4 P FP EF	054737	054740		
T5 400 P FP EF	054749	054752		
T5 630 P FP EF <sup>(1)</sup>	054762	054765		

<sup>(1)</sup> For the circuit-breakers and the switch-disconnectors in plug-in version In max = 570 A

#### VR = Rear flat vertical terminals

	1SDA.....R1			
	3 poles	4 poles		
T4 P FP VR	054738	054741		
T5 400 P FP VR	054750	054753		
T5 630 P FP VR <sup>(1)</sup>	054763	054766		

<sup>(1)</sup> For the circuit-breakers and the switch-disconnectors in plug-in version In max = 570 A

#### HR = Rear flat horizontal terminals

	1SDA.....R1			
	3 poles	4 poles		
T4 P FP HR	054739	054742		
T5 400 P FP HR	054751	054754		
T5 630 P FP HR <sup>(1)</sup>	054764	054767		

<sup>(1)</sup> For the circuit-breakers and the switch-disconnectors in plug-in version In max = 570 A

### Fixed parts for T4 250 - T5 400 circuit-breakers at 1000 V AC

#### FC Cu = Front terminals for copper cables

	1SDA.....R1			
	3 poles	4 poles		
T4 250 P FP 1000 V AC	063458	063459		
T5 400 P FP 1000 V AC	063462	063463		



## Withdrawable (W) – Fixed part

### EF = Front extended terminals

	1SDA.....R1			
	3 poles	4 poles		
T4 W FP EF	054743	054746		
T5 400 W FP EF	054755	054758		
T5 630 W FP EF <sup>(1)</sup>	054768	054771		
T6 630/800 W FP EF	060384	060387		
T7-T7M W FP EF	062045	062049		

<sup>(1)</sup> For the circuit-breakers and the switch-disconnectors in plug-in version In max = 570 A

### VR = Rear flat vertical terminals

	1SDA.....R1			
	3 poles	4 poles		
T4 W FP VR	054744	054747		
T5 400 W FP VR	054756	054759		
T5 630 W FP VR <sup>(1)</sup>	054769	054772		
T6 630/800 W FP VR	060386	060389		

<sup>(1)</sup> For the circuit-breakers and the switch-disconnectors in plug-in version In max = 570 A

### HR = Rear flat horizontal terminals

	1SDA.....R1			
	3 poles	4 poles		
T4 W FP HR	054745	054748		
T5 400 W FP HR	054757	054761		
T5 630 W FP HR <sup>(1)</sup>	054770	054774		
T6 630/800 W FP HR	060385	060388		

<sup>(1)</sup> For the circuit-breakers and the switch-disconnectors in plug-in version In max = 570 A

### HR/VR = Rear flat terminals

	1SDA.....R1			
	3 poles	4 poles		
T7-T7M W FP HR	062044	062048		

**Nota:** Fixed parts of T7-T7M circuit-breaker with rear terminals are supplied as standard with terminals mounted horizontally. To order the terminals mounted vertically, the extra code 1SDA063571R1 must be specified.



## Fixed parts for T4 250 - T5 400 circuit-breakers at 1000 V AC

### FC Cu = Front terminals for copper cables

	1SDA.....R1			
	3 poles	4 poles		
T4 250 W FP 1000 V AC	063460	063461		
T5 400 W FP 1000 V AC	063464	063465		

# Ordering codes

## Fixed parts, conversion kit and accessories for fixed parts

### Conversion of the version



1SDC210190F0004



1SDC210200F0004



1SDC210170F0001

1SDC210171F0001

#### Conversion kit from fixed into moving part of plug-in T4...T5

Type	1SDA.....R1			
	3 poles	4 poles		
Kit P MP T4	054839	054840		
Kit P MP T5 400	054843	054844		
Kit P MP T5 630 <sup>(1)</sup>	054847	054848		

**Note:** The plug-in version must be composed as follows

- a) Fixed circuit-breaker
- b) Conversion kit from fixed into moving part of plug-in
- c) Fixed part of plug-in

<sup>(1)</sup> For the circuit-breakers and switch-disconnectors in plug-in version  $I_n \max = 570 \text{ A}$

#### Conversion kit from fixed into moving part of withdrawable T4...T7

Type	1SDA.....R1			
	3 poles	4 poles		
Kit W MP T4	054841	054842		
Kit W MP T5 400	054845	054846		
Kit W MP T5 630 <sup>(1)</sup>	054849	054850		
Kit W MP T6 630/800	060390	060391		
Kit W MP T7-T7M	062162	062163		

**Note:** The withdrawable version must be composed as follows

- a) Fixed circuit-breaker
- b) Conversion kit from fixed into moving part of withdrawable circuit-breaker
- c) Fixed part of withdrawable circuit-breaker
- d) Front for lever operating mechanism or rotary handle or motor operator (only for T4, T5 and T6)
- e) Sliding contact blocks if the circuit-breaker is automatic or fitted with electrical accessories (only for T7)

<sup>(1)</sup> For the circuit-breaker and switch-disconnector in withdrawable version  $I_n \max = 570 \text{ A}$

#### Sliding contacts blocks for T7

Type	1SDA.....R1			
Lef block - MP T7 - T7M	062164			
Central block - MP T7 - T7M	062165			
Right block - MP T7 - T7M	062166			
Left block - FP T7	063572			
Left block - FP T7M	062167			
Central block - FP T7 - T7M	062168			
Right block - FP T7 - T7M	062169			

**Note:** The moving part of a circuit-breaker fitted with electrical accessories or PR331/P and PR332/P electronic trip units is supplied as standard with blocks for the connection (see Accessories section), while blocks for the fixed part must always be ordered.

#### Conversion kit from fixed into plug-in for RC222 and RC223

Type	1SDA.....R1			
	4 poles			
Kit P MP RC T4	054851			
Kit P MP RC T5 400	054852			

#### Conversion kit from plug-in into withdrawable for RC222 and RC223

Type	1SDA.....R1			
	4 poles			
Kit W MP RC T4-T5	055366			

#### Conversion kit from fixed part of plug-in into fixed part of withdrawable circuit-breaker

Type	1SDA.....R1			
Kit FP P in FP W T4	054854			
Kit FP P in FP W T5	054855			





#### Terminals for fixed parts T4...T7

Type	1SDA.....R1			
	3 pieces	4 pieces		
<b>Front extended terminals - EF</b>				
EF T4	066119	066120		
EF T5 400	066123	066124		
EF T5 630	066127	066128		
EF T6	013984	013985		
EF T7-T7M	062171	062172		
<b>Front extended spread terminals - ES</b>				
ES T5 (630 A)	055271	055272		
ES T7-T7M	065620	065621		
<b>Front terminals for copper cables - FC Cu</b>				
FC Cu T4 1x185 mm <sup>2</sup>	054831	054832		
FC Cu T5 1x240 mm <sup>2</sup>	054833	054834		
<b>Front terminals for copper-aluminium cables - FC CuAl</b>				
FC CuAl T4 1x185 mm <sup>2</sup>	054835	054836		
FC CuAl T5 1x240 mm <sup>2</sup>	054837	054838		
<b>Rear flat vertical terminals - VR</b>				
VR T5 630	066131	066132		
VR T6	013988	013989		
<b>Rear flat horizontal terminals - HR</b>				
HR T5 630	066129	066130		
HR T6	013986	013987		
<b>Rear flat terminals - HR/VR</b>				
HR/VR T4	066121	066122		
HR/VR T5 400	066125	066126		
HR/VR T7-T7M	063089	063090		
<b>Rear spread terminals - RS</b>				
RS T7-T7M	063577	063578		

**Note:** The FC Cu and FC CuAl terminals are supplied with insulating terminal covers for TC-FP fixed parts.

#### Lock for fixed part of withdrawable circuit-breaker

Type	1SDA.....R1			
	T4-T5-T6			
KLF-D FP - Different key for each circuit-breaker	055230			
KLF-S FP - Same key for different groups of circuit-breakers	055231			
PLL FP - Lock padlocks	055232			
KLF-D Ronis FP - Lock type Ronis	055233			

#### Cache-bornes isolants pour parties fixes - TC-FP

Type	1SDA.....R1			
	3 poles	4 poles		
TC-FP T4	054857	054858		
TC-FP T5	054859	054861		

#### 60mm fixed part for 60mm distribution system

Type	1SDA.....R1			
T4 Fixed version	065803			
T4 Plug-in version	065804			
T5 400 Fixed version	065805			
T5 400 Plug-in version	065806			
T5 520 Fixed version	065807			

# Ordering codes Accessories

## Service releases



T4 - T5 - T6

1SDC21020AF0004



T7

1SDC210N75F0001

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### Shunt opening release - SOR

Type	1SDA.....R1			
	T4-T5-T6	T7-T7M		
<b>uncabled version</b>				
SOR 12 V DC	054862			
SOR 24 V AC / DC		062065		
SOR 24...30 V AC / DC	054863			
SOR 30 V AC / DC		062066		
SOR 48 V AC / DC		062067		
SOR 48...60 V AC / DC	054864			
SOR 60 V AC / DC		062068		
SOR 110...120 V AC / DC		062069		
SOR 110...127 V AC - 110...125 V DC	054865			
SOR 120...127 V AC / DC		063547		
SOR 220...240 V AC / DC		063548		
SOR 220...240 V AC - 220...250 V DC	054866			
SOR 240...250 V AC / DC		062070		
SOR 380...400 V AC		062071		
SOR 380...440 V AC	054867			
SOR 415...440 V AC		062072		
SOR 480...525 V AC	054868			
<b>cabled version<sup>(1)</sup></b>				
SOR-C 12 V DC	054869			
SOR-C 24...30 V AC / DC	054870			
SOR-C 48...60 V AC / DC	054871			
SOR-C 110...127 V AC - 110...125 V DC	054872			
SOR-C 220...240 V AC - 220...250 V DC	054873			
SOR-C 380...440 V AC	054874			
SOR-C 480...525 V AC	054875			

**Note:** For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.

<sup>(1)</sup> Compulsory with T4-T5-T6 in the withdrawable or motorized versions.

### SOR Test Unit

Type	1SDA.....R1			
T7-T7M	050228			



1SDC210P07F0001



1SDC210N75F0001

### Shunt closing release - SCR

Type	1SDA.....R1			
	T7M			
<b>cabled version</b>				
SCR 24 V AC / DC	062076			
SCR 30 V AC / DC	062077			
SCR 48 V AC / DC	062078			
SCR 60 V AC / DC	062079			
SCR 110...120 V AC / DC	062080			
SCR 120...127 V AC / DC	063549			
SCR 220...240 V AC / DC	063550			
SCR 240...250 V AC / DC	062081			
SCR 380...400 V AC	062082			
SCR 415...440 V AC	062083			

**Note:** For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.



T4 - T5 - T6

1SDC210304F0004



T7

1SDC210175F0001

### Undervoltage release - UVR

Type	1SDA.....R1			
	T4-T5-T6	T7-T7M		
<b>uncabled version</b>				
UVR 24 V AC / DC		062087		
UVR 24...30 V AC / DC	054880			
UVR 30 V AC / DC		062088		
UVR 48 V AC / DC	054881	062089		
UVR 60 V AC/DC	054882	062090		
UVR 110...120 V AC / DC		062091		
UVR 110...127 V AC – 110...125 V DC	054883			
UVR 120...127 V AC / DC		063551		
UVR 220...240 V AC / DC		063552		
UVR 220...240 V AC - 220...250 V DC	054884			
UVR 240...250 V AC / DC		062092		
UVR 380...400 V AC		062093		
UVR 380...440 V AC	054885			
UVR 415...440 V AC		062094		
UVR 480...525 V AC	054886			
<b>cabled version<sup>(1)</sup></b>				
UVR-C 24...30 V AC / DC	054887			
UVR-C 48 V AC / DC	054888			
UVR-C 60 V AC/DC	054889			
UVR-C 110...127 V AC - 110...125 V DC	054890			
UVR-C 220...240 V AC - 220...250 V DC	054891			
UVR-C 380...440 V AC	054892			
UVR-C 480...525 V AC	054893			

**Note:** For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.

<sup>(1)</sup> Compulsory with T4-T5-T6 in the withdrawable or motorized versions.

### Shunt opening release with permanent operation - PS-SOR

Type	1SDA.....R1			
	T4-T5-T6			
<b>uncabled version</b>				
PS-SOR 24 V AC/DC	054876			
PS-SOR 110...120 V AC	054877			
<b>cabled version</b>				
PS-SOR-C 24 V AC/DC	054878			
PS-SOR-C 110...120 V AC	054879			

### Connectors and socket-plugs for electrical accessories

Type	1SDA.....R1			
	T4-T5-T6			
Socket-plug 12 poles	051362			
Socket-plug 6 poles	051363			
Socket-plug 3 poles	051364			
3-way connector for second SOR-C	055273			

# Ordering codes Accessories



1SDC210147R004

## Time delay device for undervoltage release - UVD

Type	1SDA.....R1		
	T4...T6	T7-T7M	
UVD 24...30 V AC / DC	051357	038316	
UVD 48 V AC / DC		038317	
UVD 48...60 V AC / DC	051358		
UVD 60 V AC / DC		038318	
UVD 110...125 V AC / DC	051360	038319	
UVD 220...250 V AC / DC	051361	038320	

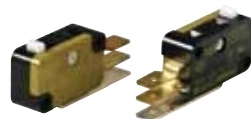
## Electrical signals



1SDC210148P004

1SDC210205P004

T1 - T2 - T3



1SDC210167R001

T7

## Auxiliary contacts - AUX

Type	1SDA.....R1		
	T4-T5-T6	T7	T7M
<b>uncabled version</b>			
AUX 1Q 1SY 250 V AC/DC	051368		
AUX 3Q 1SY 250 V AC/DC	051369		
AUX 1Q 1SY 400 V AC		062104	
AUX 2Q 400 V AC		062102	062102
AUX 1Q 1SY 24 V DC	068797	062103	
AUX 3Q 1SY 24 V DC	054914		
AUX 2Q 24 V DC		062101	062101
<b>cabled version with 1 m long cables</b>			
AUX-C 1Q 1SY 250 V AC/DC	054910		
AUX-C 3Q 1SY 250 V AC/DC	054911		
AUX-C 1Q 1SY 400 V AC	054912		
AUX-C 2Q 400 V AC	054913		
AUX-C 1Q 1SY 24 V DC	066075		
AUX-C 3Q 1SY 24 V DC	054915		
<b>cabled contact for signalling trip coil release trip</b>			
AUX-SA 1 S51 T4-T5 NO	055050		
AUX-SA 1 S51 T4-T5 NC	064518		
AUX-SA 1 S51 T6 <sup>(1)</sup>	060393		
AUX-SA 1 S51 T7-T7M 24 V		066099	066100
AUX-SA 1 S51 T7-T7M 250 V		062105	063553
<b>cabled contact for signalling manual/remote operation</b>			
AUX-MO-C <sup>(2)</sup>	054917		
<b>cabled contact circuit breaker ready to close</b>			
AUX-RTC 24 V DC			062108
AUX-RTC 250 V AC/DC			062109
<b>cabled contact signalling spring charged</b>			
AUX-MC 24 V DC			062106
AUX-MC 250 V AC/DC			062107
<b>cabled contacts in electronic version</b>			
AUX-E-C 1Q 1SY T4-T5 <sup>(3)</sup>	054916		
AUX-E-C 1Q 1SY T6 <sup>(3)</sup>	064161		

**Note:** For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.

<sup>(1)</sup> Available only mounted on the circuit-breaker.

<sup>(2)</sup> For T4, T5 and T6 in plug-in/withdrawable version, it is necessary to order a socket plug connector 3 poles 1SDA051364R1

<sup>(3)</sup> Only with circuit-breakers equipped with PR222DS/PD and PR223DS trip units.



1SDC210162F0004



1SDC210N77F0001



1SDC210206F0004

#### Auxiliary position contacts - AUP

Type	1SDA.....R1			
	T4-T5-T6	T7-T7M		
AUP-I T4-T5 24 V DC - 1 contact signalling circuit-breakers racked-in	054920			
AUP-I T4-T5 400 V AC/DC - 1 contact for signalling circuit-breakers racked-in	054918			
AUP-R T4-T5 24 V DC - 1 contact for signalling circuit-breakers racked-out	054921			
AUP-R T4-T5 400 V AC/DC - 1 contact for signalling circuit-breakers racked-out	054919			
AUP T7-T7M 24 V DC		062110		
AUP T7-T7M 250 V AC		062111		

**Note:** For T4-T5-T6 in plug-in version, contacts signaling circuit-breaker racked-in. For T4-T5-T6 in withdrawable version, contacts signaling circuit-breaker racked-in/racked-out.

#### Early auxiliary contacts - AUE

Type	1SDA.....R1			
	T4-T5	T6	T7	
AUE - early contacts	054925	060394	062112	

**Note:** On T7, the anticipated auxiliary contacts (AUE) can only be ordered already installed on the circuit-breaker.  
For T7 in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.

#### Adapters - ADP

Type	1SDA.....R1			
	T4-T5-T6			
ADP - Adapters 5pin	055173			
ADP - Adapters 6pin	054922			
ADP - Adapters 12pin	054923			
ADP - Adapters 10pin	054924			

#### Testing extension

Type	1SDA.....R1			
	T4-T5-T6			
5pin checking extension for blank tests on T4-T5-T6 P/W service releases	055351			
6pin checking extension for blank tests on T4-T5-T6 P/W auxiliary contacts (1+1) service and residual current releases	055063			
12pin checking extension for blank tests on T4-T5-T6 P/W auxiliary contacts (3+1)	055064			
10pin checking extension for blank tests on T4-T5-T6 P/W motor operator and early contacts	055065			



1SDC210125F0004

#### Trip reset

Type	1SDA.....R1			
	T7M			
Trip reset 24-30 V AC/DC	063554			
Trip reset 110-130 V AC/DC	062118			
Trip reset 200-240 V AC/DC	062119			

**Note:** For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.



1SDC210N78F0001

# Ordering codes

## Accessories



1SDC210N79F0001

### Mechanical signals

#### Mechanical operation counter

Type	1SDA.....R1			
	T7M			
Mechanical operation counter	062160			



1SDC210207F0004

#### Stored energy motor operator - MOE

Type	1SDA.....R1			
	T4-T5	T6		
MOE 24 V DC	054894	060395		
MOE 48...60 V DC	054895	060396		
MOE 110...125 V AC/DC	054896	060397		
MOE 220...250 V AC/DC	054897	060398		
MOE 380 V AC	054898	060399		

#### Stored energy motor operator with electronics - MOE-E

Type	1SDA.....R1			
	T4-T5	T6		
MOE-E 24 V DC	054899	060400		
MOE-E 48...60 V DC	054900	060401		
MOE-E 110...125 V AC/DC	054901	060402		
MOE-E 220...250 V AC/DC	054902	060403		
MOE-E 380 V AC	054903	060404		

**Note:** Always supplied complete with the AUX-E-C electronic auxiliary contact.

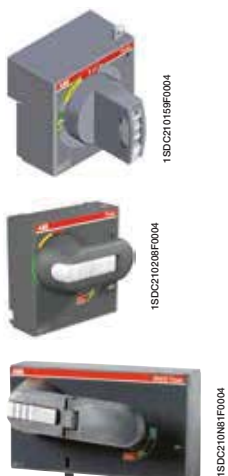


1SDC20090F0001

#### Spring charging motor

Type	1SDA.....R1			
	T7M			
Spring charging motor 24...30 V AC/DC	062113			
Spring charging motor 48...60 V AC/DC	062114			
Spring charging motor 100...130 V AC/DC	062115			
Spring charging motor 220...250 V AC/DC	062116			
Spring charging motor 380...415 V AC	062117			

**Note:** For T7-T7M in withdrawable version, sliding contact blocks for fixed and moving part are necessary. See page 3/5 and 7/37.



## Rotary handle operating mechanism

### Direct- RHD

Type	1SDA.....R1			
	T4-T5	T6	T7	
RHD normal for fixed and plug-in version	054926	060405	062120	
RHD_EM emergency for fixed and plug-in version	054927	060406	062121	
RHD normal for withdrawable version	054928	060407	062120	
RHD_EM di emergency for withdrawable version	055234	060408	062121	



### Transmitted - RHE

Type	1SDA.....R1			
	T4-T5	T6	T7	
RHE normal for fixed and plug-in version	054929	060409	062122	
RHE normal with self-centering base for fixed and plug-in version	069395			
RHE normal with self-centering base for withdrawable version	069396			
RHE_EM emergency for fixed and plug-in version	054930	060410	062123	
RHE normal for withdrawable version	054933	060411	062122	
RHE_EM di emergency for withdrawable version	054934	060412	062123	
<b>Individual components</b>				
RHE_B just base for RHE for fixed and plug-in version	054931	060413	062124	
RHE_B just base for RHE withdrawable version	054935	060414	062124	
RHE_S just rod 500 mm for RHE	054932	054932	064104	
RHE_H just handle for RHE	054936	060415	062125	
RHE_H_EM just emergency handle for RHE	054937	060416	062126	



### IP54 protection for rotary handle

Type	1SDA.....R1			
	T4-T5-T6	T7		
RHE_IP54 protection kit IP54	054938	054938		

# Ordering codes Accessories



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## Operating mechanism and locks

### Padlock lever lock - PLL

Type	1SDA.....R1			
	T7	T7M		
PLL - padlock in open position	062150	069656		

**Note:** On T7, the padlock is an alternative to the key lock.

### Key lock in open position on the circuit-breaker - KLC

Type	1SDA.....R1	
	T7	T7M
KLC-D - different key	062134	062141
KLC-S - same key for different groups of circuit-breakers (N. 20005)	062135	062142
KLC-S - same key for different groups of circuit-breakers (N. 20006)	062136	062143
KLC-S - same key for different groups of circuit-breakers (N. 20007)	062137	062144
KLC-S - same key for different groups of circuit-breakers (N. 20008)	062138	062145
KLC-R - arrangement for Ronis key lock	062139	062146
KLC-P - arrangement for Profalux key lock	062140	062146

### Key lock for front/rotary handle - KLF

Type	1SDA.....R1		
	T4-T5	T6	T7
KLF-D - different key	054939	060658	063555
KLF-S - same key for different groups of circuit-breakers (N. 20005)	054940	060659	063556
KLF-S - same key for different groups of circuit-breakers (N. 20006)	054941	060660	063557
KLF-S - same key for different groups of circuit-breakers (N. 20007)	054942	060661	063558
KLF-S - same key for different groups of circuit-breakers (N. 20008)	054943	060662	063559
KLF-S - arrangement for Ronis key lock			063560
KLF-S - arrangement for Profalux key lock			063561

### Key lock for motor operator - MOL

Type	1SDA.....R1	
	T4-T5	T6
MOL-D different key	054904	060611
MOL-S - same key for different groups of circuit-breakers (N. 20005)	054905	060612
MOL-S - same key for different groups of circuit-breakers (N. 20006)	054906	060613
MOL-S - same key for different groups of circuit-breakers (N. 20007)	054907	060614
MOL-S - same key for different groups of circuit-breakers (N. 20008)	054908	060615
MOL-M - lock only on manual operation with same key	054909	054909





1SDC210N8F0004

#### Key lock in racked-in/test isolated/racked-out position

Type	1SDA.....R1			
	T7-T7M			
For 1 circuit-breaker - different key	062153			
For groups of circuit-breakers - same key (N. 20005)	062154			
For groups of circuit-breakers - same key (N. 20006)	062155			
For groups of circuit-breakers - same key (N. 20007)	062156			
For groups of circuit-breakers - same key (N. 20008)	062157			
Arrangement for Ronis key lock	063567			
Arrangement for Profalux key lock	063570			
Arrangement for Castell key lock	063568			
Arrangement for Kirk key lock	063569			

**Note:** The fixed part can be equipped with two different key locks.



1SDC210N8F0004

#### Accessory for lock in racked-out position

Type	1SDA.....R1			
	T7-T7M			
Lock in racked-out position	062158			

**Note:** As optional in addition to the circuit-breaker lock in racked-in/isolated-test/racked-out position.



1SDC210N8F0004

#### Mechanical compartment door lock

Type	1SDA.....R1			
	T7	T7M		
Mechanical compartment door lock with cables for T7-T7M <sup>(1)</sup>	062159	062159		
Mechanical compartment door lock (fixing to wall) for T7M F		063722		
Mechanical compartment door lock (fixing to floor) for T7M F		063723		
Mechanical compartment door lock for T7-T7M W	063724	063724		

**Note:** A circuit-breaker equipped with mechanical compartment door lock cannot be interlocked with another circuit-breaker.

<sup>(1)</sup> To be ordered with cables kit for interlock and plate for interlock consistent with the circuit-breaker.



1SDC210210F0004

#### Front lever operating mechanism - FLD

Type	1SDA.....R1			
	T4-T5	T6		
FLD - for fixed and plug-in version	054944	060417		
FLD - for withdrawable version	054945	060418		

# Ordering codes

## Accessories



1SDC210379F0004

### Mechanical interlock - MIR

Type	1SDA.....R1			
	T4-T5			
MIR-HB - frame unit horizontal interlock	054946			
MIR-VB - frame unit vertical interlock	054947			
MIR-P - plate for interlock type A T4 (F-P-W) + T4 (F-P-W)	054948			
MIR-P - plate for interlock type B T4 (F-P-W) + T5 400 (F-P-W) or T5 630 (F)	054949			
MIR-P - plate for interlock type C T4 (F-P-W) + T5 630 (P-W)	054950			
MIR-P - plate for interlock type D T5 400 (F-P-W) or T5 630 (F) + T5 400 (F-P-W) or T5 630 (F)	054951			
MIR-P - plate for interlock type E T5 400 (F-P-W) or T5 630 (F) + T5 630 (P-W)	054952			
MIR-P - plate for interlock type F T5 630 (P-W) + T5 630 (P-W)	054953			

**Note:** To interlock two circuit-breakers you have to order a frame unit interlock and a plate (for type A or B or C or D or E or F) interlock.

### Mechanical interlock - MIR

Type	1SDA.....R1			
	T6			
Horizontal interlock	060685			
Vertical interlock	060686			

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1SDC210N89F0004

### Mechanical interlock with cables between two circuit-breakers

Type	1SDA.....R1			
	T7-T7M			
Cables kit for interlock	062127			
Plate for fixed unit – floor fixed	062130			
Wiring kit for interlock with Emax	064568			
Plate for fixed unit – wall fixed	062129			
Plate for withdrawable cb	062131			
Shoulders for fixing to floor	063856			

**Note:** To interlock two circuit-breakers you have to order a cable kit and two plates in function of the version of the circuit-breaker.

### Floor fixing plate

Type	1SDA.....R1			
	T7-T7M			
Floor fixing plate for fixed unit	063856			



1SDC210N50F0004

### Transparent protection for buttons

Type	1SDA.....R1			
	T7M			
Transparent protection for buttons	062132			
Transparent protection for buttons - independent	062133			



1SDC21017F0004



1SDC210212F0004



1SDC210215F0004



1SDC210214F0004



1SDC21072F0004



1SDC210124F0004

### IP54 door protection

Type	1SDA.....R1			
	T7M			
IP54 door protection	062161			

### IP44 toggle protection

Type	1SDA.....R1			
	T4-T5			
IP44 protection	065809			

### Residual current releases

#### SACE RC221, SACE RC222, SACE RC223

Type	1SDA.....R1			
	3 poles	4 poles		
RC222/4 for T4		054954		
RC222/4 HV T4		069932		
RC223/4 for T4 250		054956		
RC222/5 HV T5		069933		
RC222/5 for T5		054955		

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### SACE RCQ

Type	1SDA.....R1			
	T4...T7-T7M			
RCQ020/A 115-230 V AC		065979		
RCQ020/A 415 V AC		065980		
RCQ020/P 110-690 V AC		069390		
Closed toroid only - diameter 60 mm		037394		
Closed toroid only - diameter 110 mm		037395		
Closed toroid only - diameter 185 mm		050543		

**Note:** Opening coil and undervoltage coil to be ordered separately.

### Connections terminals

#### High insulating terminal covers - HTC

Type	1SDA.....R1			
	3 poles	4 poles		
HTC T4	054958	054959		
HTC T5	054960	054961		
HTC T6	014040	014041		
HTC T7-T7M	063091	063092		

#### Protection IP40 for high insulating terminal covers - HTC-P

Type	1SDA.....R1			
	3 poles	4 poles		
HTC-P T4	054962	054963		
HTC-P T5	054964	054965		

# Ordering codes

## Accessories



1SDC210123F0004



1SDC210127F0004

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1SDC210203F0004



1SDC210384F0004

### Low insulating terminal covers - LTC

Type	1SDA.....R1			
	3 poles	4 poles		
LTC T4	054966	054967		
LTC T5	054968	054969		
LTC T6	014038	014039		
LTC T7-T7M F	063093	063094		

### Sealable screws for terminal covers

Type	1SDA.....R1			
	T4-T5	T6-T7-T7M		
Sealable screws	051504	013699		

### Separating partitions - PB

Type	1SDA.....R1			
	T4-T5	T6	T7-T7M	
PB100 low (H=100 mm) - 4 pieces - 3p	054970	050696	054970	
PB100 low (H=100 mm) - 6 pieces - 4p	054971	050697	054971	
PB200 high (H=200 mm) - 4 pieces - 3p	054972		054972	
PB200 high (H=200 mm) - 6 pieces - 4p	054973		054973	

### Front extended terminals - EF

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
EF T4	055000	055001	054998	054999
EF T5	055036	055037	055034	055035
EF T6 630	023379	023389	013920	013921
EF T6 800	023383	023393	013954	013955
EF T6 1000	064319	064320	064321	064322
EF T7-T7M	063103	063104	063105	063106



1SDC210391F0004



1SDC210392F0004

#### Front terminals for copper-aluminium cables - FC CuAl

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
FC CuAl T4 1x50 mm <sup>2</sup>	054984	054985	054982	054983
FC CuAl T4 2x150 mm <sup>2</sup> - external terminal	054992	054993	054990	054991
FC CuAl T4 1x185 mm <sup>2</sup>	054988	054989	054986	054987
FC CuAl T4 1x240 mm <sup>2</sup> - external terminal	064549	064550	064551	064552
FC CuAl T5 400 2x120 mm <sup>2</sup> - external terminal	055028	055029	055026	055027
FC CuAl T5 400 1x240 mm <sup>2</sup>	055020	055021	055018	055019
FC CuAl T5 400 1x300 mm <sup>2</sup>	055024	055025	055022	055023
FC CuAl T5 2x240 mm <sup>2</sup> - external terminal	055032	055033	055030	055031
FC CuAl T6 630 2x240 mm <sup>2</sup>	023380	023390	013922	013923
FC CuAl T6 800 3x185 mm <sup>2</sup> - external terminal	023384	023394	013956	013957
FC CuAl T6 1000 4x150 mm <sup>2</sup> - external terminal	060687	060688	060689	060690
FC CuAl T7 1250-T7M 630 2x240 mm <sup>2</sup> - external terminal	063865	063866	063867	063868
FC CuAl T7 1250-T7M 1250 4x240 mm <sup>2</sup> - external terminal	063112	063113	063114	063115

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1SDC210387F0004

#### Front terminals - F <sup>(1)</sup>

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
F T4 - Plugs with screws	054976	054977	054974	054975
F T5 - Plugs with screws	055012	055013	055010	055011
F T6 630-800 - Plugs with screws	060421	060422	060423	060424
F T7-T7M - Plugs with screws	063099	063100	063101	063102

<sup>(1)</sup> To be requested as loose kit.



1SDC210389F0004

#### Front extended spread terminals - ES

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
ES T4	055004	055005	055002	055003
ES T5	055040	055041	055038	055039
ES T6 (1/2 upper kit)	050692			
ES T6 (1/2 lower kit)	050704			
ES T6		050693	050688	050689
ES T7-T7M (1/2 upper kit)	063107			
ES T7-T7M (1/2 lower kit)	063108			
ES T7-T7M		063109	063110	063111

# Ordering codes

## Accessories



1SDC210385F0004

Front terminals for copper cables - FC Cu				
Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
FC Cu T4 1x185 mm <sup>2</sup>	054980	054981	054978	054979
FC Cu T5 400 1x240 mm <sup>2</sup>	055016	055017	055014	055015
FC Cu T5 630 2x240 mm <sup>2</sup>	055364	055365	055362	055363

### Rear terminals for copper-aluminium cables - RC CuAl

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
RC CuAl T6 630 2x240 mm <sup>2</sup>	023381	023391	013924	013925
RC CuAl T6 800 3x185 mm <sup>2</sup>	023385	023395	013958	013959

**Note:** For ordering methods, please ask ABB SACE.

### Front multi-cable terminals - MC

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
MC CuAl T4 6x35 mm <sup>2</sup>	054996	054997	054994	054995
MC CuAl T5 6x50 mm <sup>2</sup>	064182	064183	064184	064185

### Rear terminals

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
R T4	055008	055009	055006	055007
R T5	055044	055045	055042	055043
R T6	060425	060426	060427	060428
R T7	063116	063117	063118	063119

### Rear flat horizontal terminals - HR

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
HR T7-T7M	063120	063121	063122	063123

### Rear flat vertical terminals - VR

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
VR T7-T7M	063124	063125	063126	063127

### Kit for taking up voltage for auxiliares

Type	1SDA.....R1			
	3 pieces	4 pieces		
AuxV T4 FC Cu	055046	055047		
AuxV T4-T5 F	055048	055049		

**Note:** Only available for fixed version circuit-breaker.

### Jumpers kit for connection of poles at 1000V DC

Type	1SDA.....R1			
	T4	T5	T6	
Jumper kit 2+2 poles in series for 4p 1000V DC circuit-breakers	082627	082628	082630	



#### Front display unit - FDU

Type	1SDA.....R1			
	T4-T5	T6		
FDU display unit with PR222 or PR223	055051	060429		

#### Automatic transfer switch - ATS021-ATS022

Type	1SDA.....R1			
ATS021 for T4, T5, T6, T7 and T7M	065523			
ATS022 for T4, T5, T6, T7 and T7M	065524			

#### HMI030 interface on the front of switchgear

Type	1SDA.....R1			
	T4...T7-T7M			
HMI030 interface on the front of switchgear	063143			

**Note:** It can be used with circuit-breaker equipped with PR222DS/PD, PR223EF, PR223DS, PR331/P and PR332/P trip units.

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1SDC210N93F0004



1SDC210N94F0004



1SDC210N95F0004



1SDC210N96F0004



1SDC210N97F0004



1SDC210N98F0004

#### Modules for PR33x electronic trip unit

Type	1SDA.....R1			
	T7	T7M		
PR330/V + internal voltage socket <sup>(1)</sup>	063144	063574		
PR330/V + external voltage socket <sup>(1)</sup>	069126	069127		
PR330/D-M communication module (Modbus RTU)	074547	074547		
PR330/R actuator module	063146	063146		
PR030B power supply unit	058258	058258		
Arrangement for internal voltage socket for PR332/P with PR330/V module <sup>(1)</sup>	063573	063573		
Extracode for external voltage socket for PR332/P LSIRC	069128	069128		

<sup>(1)</sup> Can be ordered only mounted on the circuit-breakers. See page 3/47.

#### Dialogue unit PR222DS/PD

Type	1SDA.....R1			
	T4-T5-T6			
LSI	055066			
LSIG	055067			
Ekip E-LSIG	081094 <sup>(1)</sup>			

**Note:** To be specified only in addition to the code of the automatic circuit-breaker, with analogous overcurrent release (PR222DS/P). To order the trip unit separately, see pag 7/35.

<sup>(1)</sup> available for T5 only

#### Extracode for PR231 interchangeability

Type	1SDA.....R1			
	T7-T7M			
Extracode for PR231 interchangeability	063140			

**Note:** To replace the PR231 with another electronic trip unit, the key-plug must be ordered. The extra-code 1SDA063140R1 for the interchangeability of the PR231 trip unit must be specified.

## Ordering codes Accessories



### Trip unit adapters for PR33x

Type	1SDA.....R1			
	T7	T7M		
Adapters for PR331-PR332	063141			
Adapters for PR33x		063142		

**Note:** Always provided with the circuit-breaker.

### CT for external neutral

Type	1SDA.....R1			
CT for external neutral - T4 320	055055			
CT for external neutral - T4 250	055054			
CT for external neutral - T4 160	055053			
CT for external neutral - T4 100	055052			
CT for external neutral - T5 400	055057			
CT for external neutral - T5 320	055056			
CT for external neutral - T5 630	055058			
CT for external neutral - T6 630	060430			
CT for external neutral - T6 800	060431			
CT for external neutral - T6 1000	060610			

**Note:** Connector X4 is not included and must be ordered separately.

### Kit auxiliary voltage Ekip E-LSIG

Type	1SDA.....R1			
	T5			
KIT for Ext NE Connection	081073			

### Current sensor for external neutral

Type	1SDA.....R1			
Current sensor for external neutral - T7-T7M 400...1600	063159			

### Rating plug

Type	1SDA.....R1			
	T7-T7M			
In = 400 A	074548			
In = 630 A	074549			
In = 800 A	074550			
In = 1000 A	074551			
In = 1250 A	074552			
In = 1600 A	074553			
In = 400 A for RC protection <sup>(1)</sup>	074557			
In = 630 A for RC protection <sup>(1)</sup>	074558			
In = 800 A for RC protection <sup>(1)</sup>	074559			
In = 1000 A for RC protection <sup>(1)</sup>	074560			
In = 1250 A for RC protection <sup>(1)</sup>	074561			
In = 1600 A for RC protection <sup>(1)</sup>	074562			

<sup>(1)</sup> For PR332/P LSIRc, PR332/P LSIG with PR330/V and RC toroid.





### Extracode rating plug

Type	1SDA.....R1			
In = 400 A	063153			
In = 630 A	063154			
In = 800 A	063155			
In = 1000 A	063156			
In = 1250 A	063157			
In = 400 A for RC protection <sup>(1)</sup>	063733			
In = 630 A for RC protection <sup>(1)</sup>	063734			
In = 800 A for RC protection <sup>(1)</sup>	063735			
In = 1000 A for RC protection <sup>(1)</sup>	063736			
In = 1250 A for RC protection <sup>(1)</sup>	063737			
In = 1600 A for RC protection <sup>(1)</sup>	064288			

**Note:** To be specified only in addition to the code of the automatic circuit-breaker.

<sup>(1)</sup> For PR332/P LSIRc

### Homopolar toroid for residual current protection

Type	1SDA.....R1			
	T7-T7M			
Toroid RC	063869			

### Homopolar sensor for the earthing conductor of the main power supply

Type	1SDA.....R1			
	T7-T7M			
Sensor	059145			

### Accessories for electronic releases

Type	1SDA.....R1			
	T4-T5-T6	T7-T7M		
X3 Connector for fixed circuit-breaker PR222DS, PR223DS, Ekip M-LRIU, Ekip E-LSIG	055059			
X3 Connector for plug-in/withdrawable circuit-breaker	055061			
X4 Connector for fixed circuit-breaker, PR222DS, PR223DS, Ekip M-LRIU, Ekip E-LSIG	055060			
X4 Connector for plug-in/withdrawable circuit-breaker	055062			
LD030 D0 - Signalling unit for PR222DS/PD, PR223DS, PR223EF, PR223EF, PR331 or PR332 electronic trip units	064574			
PR212/CI - Contactor control unit for Ekip M-LRIU	050708			
EP010 - Interface module for PR222DS/PD	059469			
EP010 - Interface module for PR332/P electronic trip unit		060198		
EP010 - Interface module for PR223EF	064515			
VM210 measurement module for PR223DS and PR223EF	059602			
Ekip Bluetooth	074164	074164		
Cable kit adapter Ekip Bluetooth	081652	081651		

**Note:** For the use of X3 and X4 connectors, see page 3/47.



1SDC210P2F0004



1SDC210T03F0004



1SDC210216F0004

## Ordering codes Accessories



1SDC200688F001



1SDC210P06F0004

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### Test and Configurator unit

Type	1SDA.....R1			
Ekip TT - Trip Test Unit	066988			
Ekip T&P - Programming and Test Unit	066989			

### Spare parts

#### Flanges for compartment door

Type	1SDA.....R1			
Flange for compartment door for T4-T5 fixed or plug-in version	055094			
Flange for compartment door for T4-T5 withdrawable version	055095			
Flange for compartment door for RC222 for T4-T5	055096			
Flange for the T6 compartment door	060432			
Flange for the withdrawable T6 compartment door	060433			
Flange for the fixed T6 compartment door with MOE/MOE-E, RHD and FLD	060434			
Flange for compartment door for T7-T7M fixed version	063160			
Flange for compartment door for T7-T7M withdrawable version	063161			
Flange for compartment door for T7 fixed/withdrawable version with rotary handle	063162			

#### Solenoid operator for residual current device

Type	1SDA.....R1			
RC222/RC223 for T4-T5	055097			

#### Connecting terminals for electrical accessories

Type	1SDA.....R1			
	T7-T7M			
Single terminal	062170			

**Note:** To have a complete overview of the spare parts available for the Tmax family of circuit-breakers, please consult the "Spare Parts Catalogue".



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