Technical catalogue

Tmax

Low voltage moulded-case circuit-breakers up to 630 A

Preliminary - 1SDC210004D0202

OVERVIEW


ABB
Tmax
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Tmax

T GENERATION

Tmax has grown. ABB SACE's experience in designing and manufacturing moulded-case circuit-breakers has made it possible to create apparatus which, up to 630 A, allows any application to be faced practically and simply. The new Tmax have been thought up to work together, to help you carry out selections and correct sizing, to make installation simpler, but above all to give you top level performances. The latest generation technology is present for the first time even in the smallest sizes, to reach protection releases with integrated dialogue units. With Tmax you have everything you need at hand to make your job easier, from all types of accessories and terminals. The T Generation grows, and so does freedom.

TMAX.
BE FREE.

INNOVATION TECHNOLOGY DESIGN

PREMIO INTEL DESIGN 2003

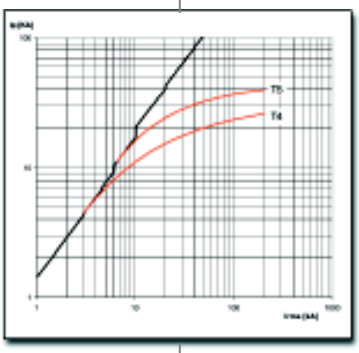
"AUGUSTO MORELLO"

The Tmax T4 and T5 circuit-breakers have obtained the prestigious "INTEL Design 2003 – Augusto Morello award" in the Product Technologies and Production processes section.

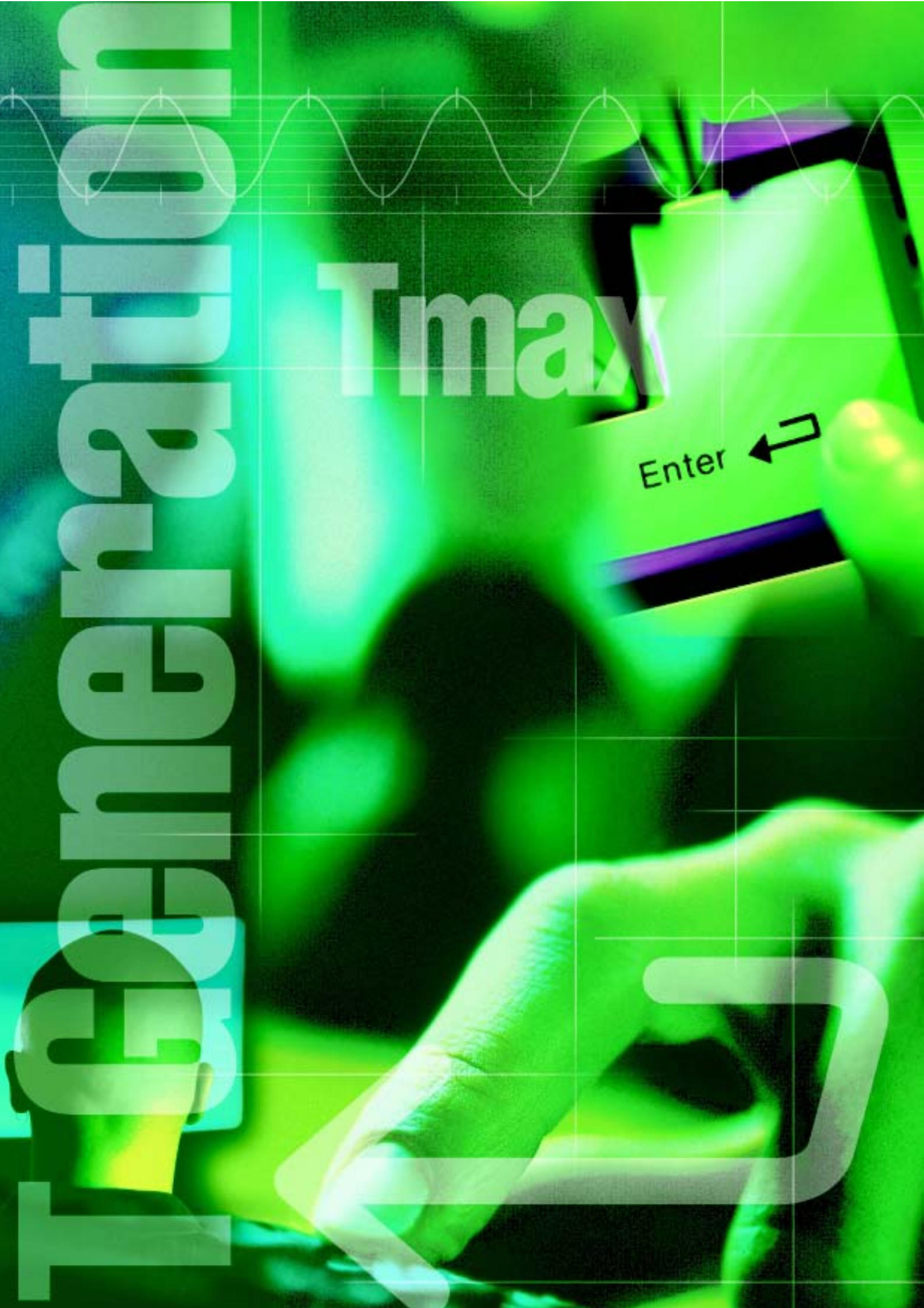

Imax

TECHNOLOGY

TMAX. BE FREE TO RIDE THE MOST ADVANCED TECHNOLOGY.



It was not easy to find solutions which would allow the Tmax circuit-breakers to achieve such high performances in such limited dimensions, but thanks to the experience which has been recognised to a leader such as ABB SACE for decades, the objectives we had set ourselves have been achieved. So this has meant being able to equip such a small circuit-breaker as the T2 with an electronic release, to fit the apparatus with new arcing chambers which allow the arc extinction time to be reduced, or, still further, to provide double insulation for ever greater safety right from the smallest size. A complete series of latest generation releases is available, from the electronic ones also fitted with an integrated dialogue unit, to the thermomagnetic, or magnetic only ones - all interchangeable. And residual current releases up to 630 A, among which the exclusive B type residual current release stands out, sensitive to continuous fault currents and frequencies up to 1000 Hz. The new Tmax T4 and T5 are an example of the great technology expressed by this family of apparatus with high breaking capacity, Ics at 100% of Icu and high limitation of the specific let-through energy. Being free is also all this.


Tmax
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SIZING

TMAX. BE FREE TO CHOOSE OPTIMAL SIZING.

All the apparatus in the Tmax family comes from optimisation of installation sizing. With T1,T2 and T3 you can find the ideal apparatus for sizing an installation up to 250 A, and with T4 and T5 up to 630 A. Furthermore, with the latter, high selectivity values are obtained for optimal coordination with other apparatus. You can also choose the best solution for motor protection up to 250 kW at 400 V in alternating current. Higher performances in less space. More applications up to 630 A. Easier selection of the apparatus and accessories. Optimal sizing of the installation and better protection of cables, busbar ducts and supports. Less space required in the switchgear and in the metal structures. Less oversizing and therefore lower costs. Less time for coordinating the installations. Fewer stock complications. With Tmax, all the solutions needed can be chosen, as well as that of feeling freer to choose.


Tenaga

INSTALLATION

TMAX. BE FREE TO DRIBBLE ROUND ALL INSTALLATION DIFFICULTIES.

Having apparatus available with smaller dimensions than all the others on the market undoubtedly offers great advantages - more space for cabling operations and simpler installation, therefore notable savings in time - five pieces of apparatus, just two depths - 70 mm for T1, T2, T3 and 103.5 mm for T4 and T5, and the latter also have the same height.

They are also available in all the versions: fixed, plug-in and withdrawable and, thanks to special kits, passing from a fixed circuit-breaker to a plug-in/withdrawable one is child's play.

Flexibility of use over the whole series is ensured by the complete range of connection terminals and by the large number of accessories. Being free also means having much more time for yourself.

Tmax

Main characteristics

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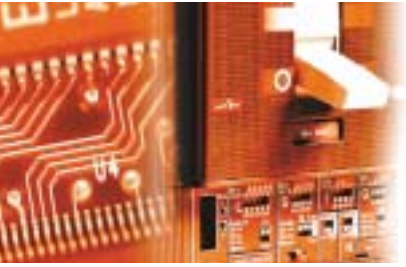


Overview of the Tmax family

Circuit-breakers for distribution AC-DC

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

Circuit-breakers for motor protection

Iu	[A]	
Poles	[Nr]	
Ue	[V]	(AC) 50 - 60 Hz
Magnetic only release, IEC 60947-2		
PR221DS-I electronic release, IEC 60947-2		
PR222MP electronic release, IEC 60947-4-1		

Circuit-breakers for applications up to 1000 V

Iu	[A]	
Poles	[Nr]	
Icu max	[kA]	1000 V AC
	[kA]	1000 V DC 4 poles in series

Switch-disconnectors

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

* For In 16 A and In 20 A: Icu @ 220/230 V AC = 16 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").






	T1 1p	T1	T2	T3	T4	T5
	160	160	160	250	250/320	400/630
	16…160	16…160	1.6…160	63…250	20…320	320…630
	1	3/4	3/4	3/4	3/4	3/4
	240	690	690	690	690	690
	125	500	500	500	750	750
	25* (220/230 V AC)	16				
		25				
		36	36	36	36	36
			50	50	50	50
			70		70	70
			85		120	120
					200	200

		T2	T3	T4	T5
		160	250	250	400
		3	3	3	3
		690	690	690	690
		■	■	■	
		■		■	■
				■	■

			T4	T5
			250	400/630
			3/4	3/4
			20	20
			40	40

	T1D	T3D	T4D	T5D
	160	250	320	400/630
	125	200	320	400/630
	3/4	3/4	3/4	3/4
	690	690	690	690
	500	500	750	750
	2.8	5.3	5.3	11
	2	3.6	3.6	6

Tmax, Isomax, Emax: Industrial^{IT} enabled!

Industrial^{IT} is the solution developed by ABB for the all-round integration of a company's activities, where each product is seen as part of a complete solution. Products and technologies are grouped into functional categories (Suites), each of which measures, controls, optimizes and supports a specific "block" of activities, and they can ensure coordinated interaction thanks to the platform created by ABB (AIP: Aspect Integrator Platform).

In addition to interactivity between certified products, every certified product also guarantees the ready availability of all the information needed for it to function - technical characteristics, installation instructions, use and maintenance instructions, environmental certificates and declarations, all updated to the latest version … a considerable advantage for the user*.

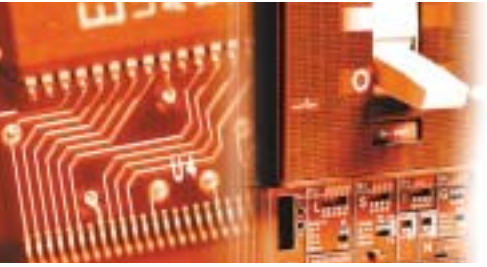
After **Tmax**, which was the first Industrial^{IT}-certified ABB SACE product, now the whole range of **Tmax** and **Isomax** moulded-case and **Emax** air circuit breakers has obtained certification and is fully entitled to join the Protect^{IT} suite of products. These circuit-breakers combine with about 700 products in the ranges of distribution boards, thus enabling complete switchboards to be assembled using all Industrial^{IT}-certified components. Moreover, T4 and T5, will feature e-plug communication interface, which will allow Integration to Industrial^{IT} systems.

Tmax, Isomax and Emax operation can be integrated with the configurable ABB products in a system: this compatibility has always been a fundamental premise of the ABB SACE design process. Mass customization, i.e. the mass production of components customized to meet a given buyer's specific needs is already feasible, as Industrial^{IT} certification demonstrates.

Yet again, ABB SACE is ahead of the field in offering a better and better customer service!

** All product technical data and related documentation can be found in Internet and is accessible to the customer. The standard documentation is in English, but there are local language versions for each country where a given product is marketed.*

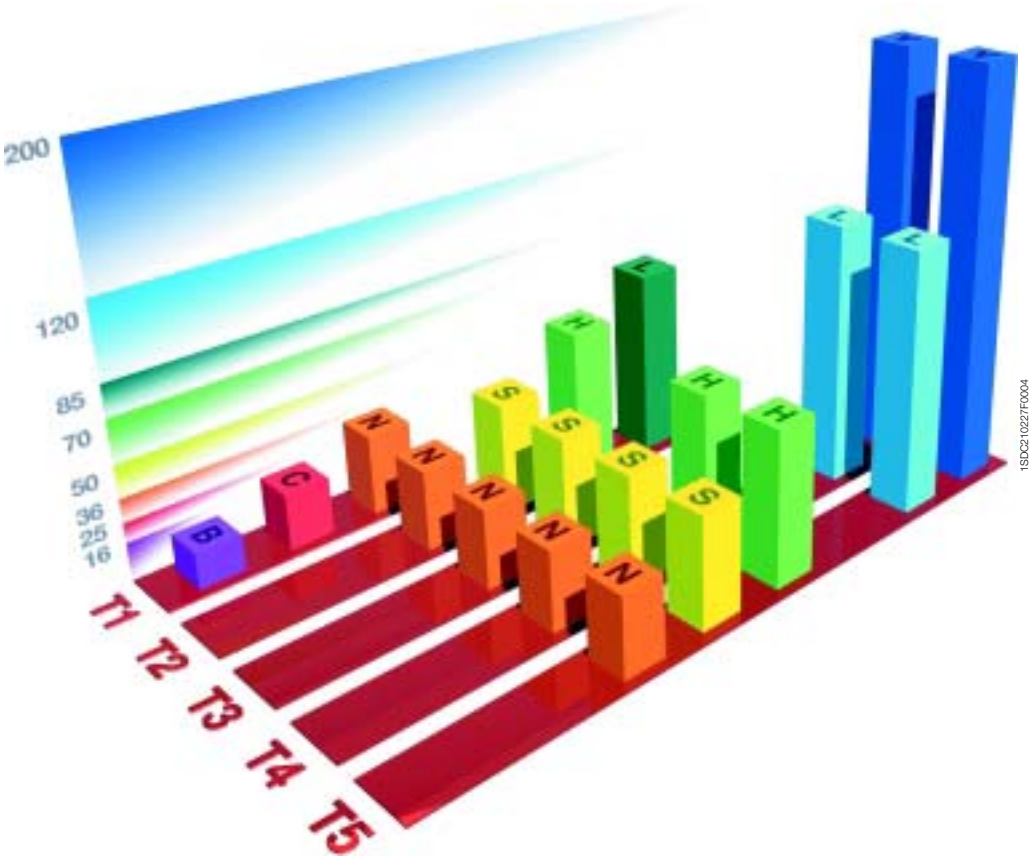
For further information, go to the ***Products and services/Industrial*** ^{IT} section on our web site: http://www.abb.com

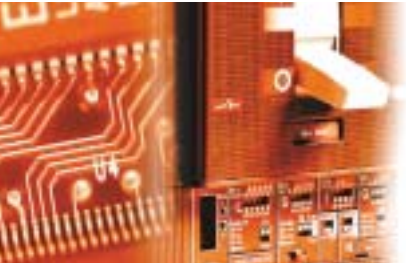


General

The new series of ABB SACE Tmax circuit-breakers is available in five sizes: T1, T2, T3, T4 and T5, able to cover a range of service currents from 1 to 630 A.
All the circuit-breakers - three-pole and four-pole - are available in the fixed version; the sizes T2, T3, T4 and T5 are available in the plug-in version, T4 and T5 also in the withdrawable one. The Tmax T1 circuit-breaker is also available in the single-pole Tmax T1 1p version, with breaking capacity of 25 kA (at 220/230 V).
The breaking capacities, at 380/415 V, are identified by the following letters:

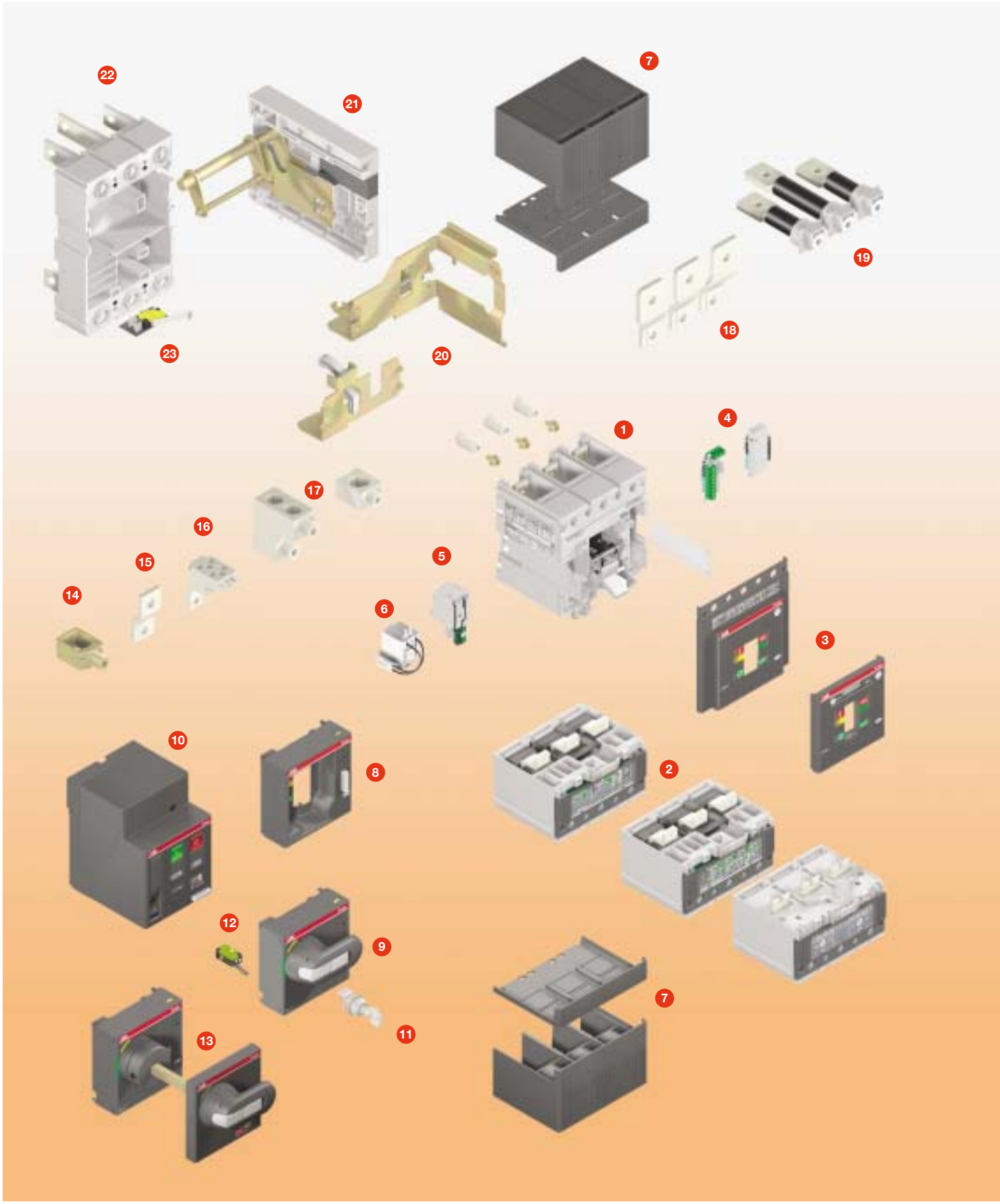
B 16 kA
C 25 kA
N 36 kA
S 50 kA
H 70 kA
L 85 kA (for T2) or 120 kA (for T4 and T5)
V 200 kA

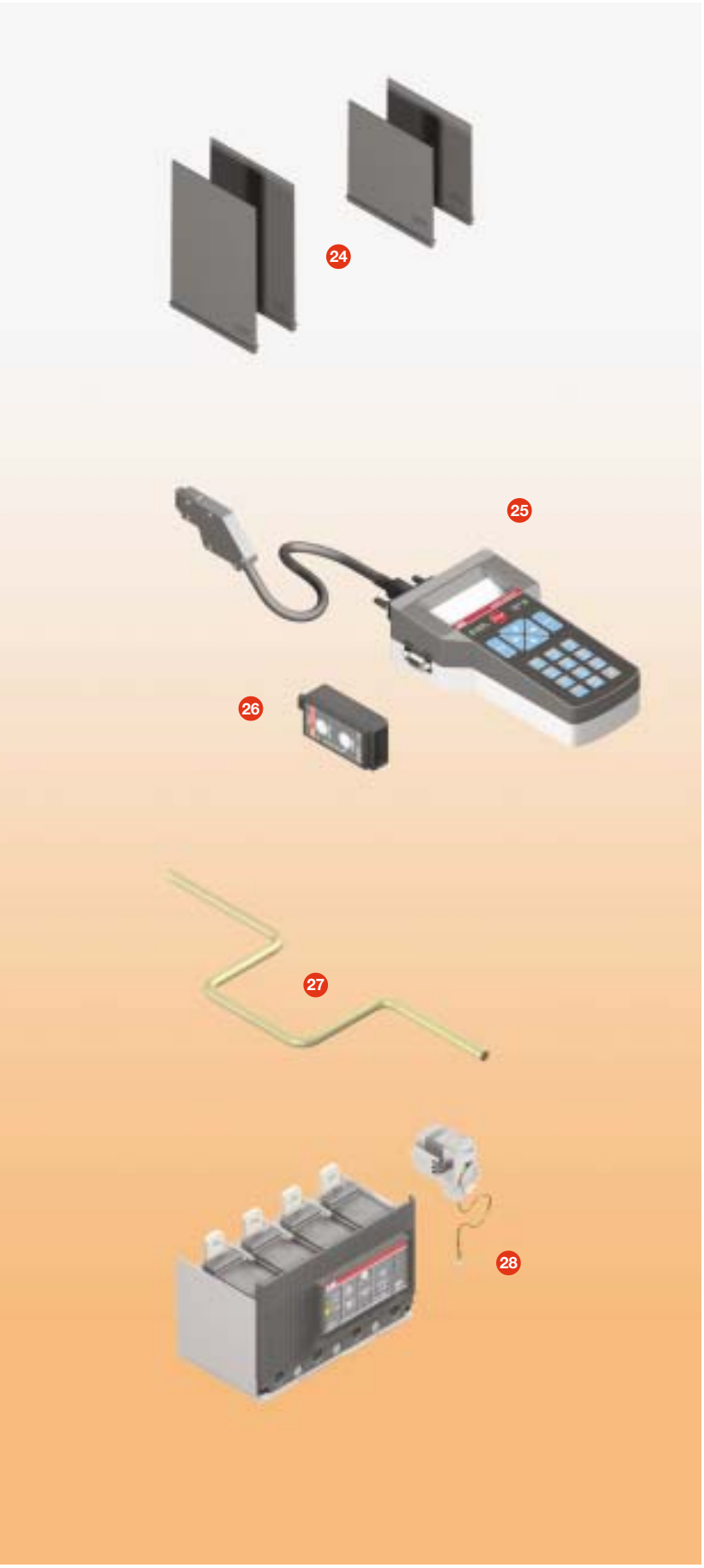




Construction characteristics

Modularity of the series





Starting from the fixed version circuit-breaker, all the other versions used for various requirements 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
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
25. PR010T
26. TT1
27. Racking out crank handle
28. Residual current release.

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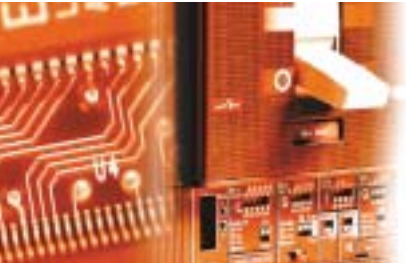

Construction characteristics

Distinguishing features of the series

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 of the installation. 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 unit 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 foreseen in American usage (UL 489 Standard).

1SDC210108F0004

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 release trip). The circuit-breaker operating mechanism has free release regardless of the pressure on the lever and the speed of the operation. Release 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.

1SDC210109F0004

Isolation behaviour

In the open position, the circuit-breaker guarantees circuit isolation 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. For the plug-in or withdrawable version circuit-breakers, in the racked-out or withdrawn position, the power and auxiliary circuits are insulated, guaranteeing that no part is live. By means of special sockets - plug, it is possible to carry out blank tests under these conditions, operating the circuit-breaker in complete safety.

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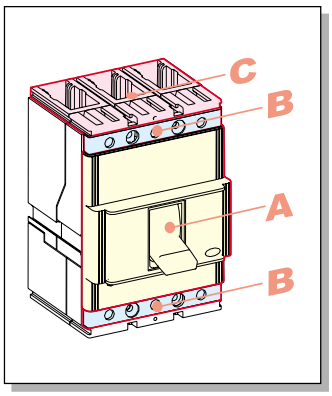

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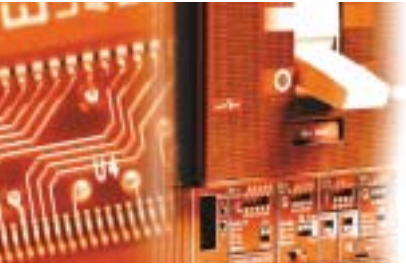
Degrees of protection

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

	With front	Without front(2)	Without terminal covers	With high terminal covers	With low terminal covers	With IP40 protection kit on the front
A	**IP 40**	**IP 20**	-	-	-	-
B	**IP 20**	**IP 20**	**IP 20**	**IP 40**	**IP 40**	**IP 40**
C	-	-	-	**IP 40**(1)	**IP 30**(1)	-

(1) After correct installation (2) During installation of the electrical accessories

The fixed parts are always preset with IP 20 degree of protection. IP 54 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).



Construction characteristics

Distinguishing features of the series

Operating temperature

The Tmax circuit-breakers can be used in ambient conditions where the surrounding 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 release 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 4/46 and following.
The electronic overcurrent releases 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 4/40 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.

1SDC210111F0004

Altitude

Up to an altitude of 2000 m the 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. The circuit-breaker performances therefore 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	3000	4000	5000
Rated service voltage, Ue	[V~]	690	600	500	440
Rated uninterrupted current, Iu	%Iu	100	98	93	90


1SDC210115F0004

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 releases 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 F Standards and European Directive No. 89/336 regarding EMC - electromagnetic compatibility.


1SDC210116F0004

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 6.3.3). 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:

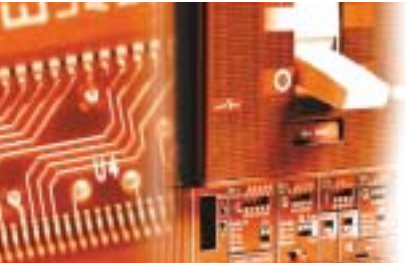
– moulded insulating cases made of synthetic resins reinforced with glass fibres;
– anti-corrosion treatment of the main metallic parts;
– Fe/Zn 12 galvanisation (ISO 2081), protected by a conversion layer mainly consisting of chromates (ISO 4520);
– application of anti-condensation protection for electronic overcurrent releases and relative accessories.

Resistance to shocks and vibrations

The 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 classification organisations:

– RINA
– Det Norske Veritas
– Bureau Veritas
– Lloyd’s register of shipping
– Germanischer Lloyd
– ABS
– Russian Maritime Register of Shipping.

The 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.

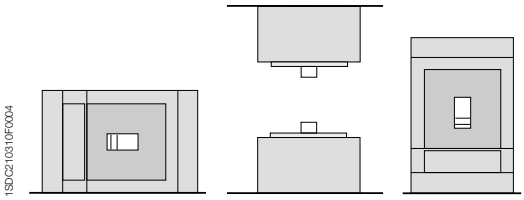


Construction characteristics

Distinguishing features of the series

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 jeopardising the apparatus functionality.
Apart from fixing on the base plate, T1, T2 and T3 can also be installed on DIN 50022 rails, thanks to the special fixing brackets.
Furthermore, the depth of 70 mm, takes Tmax T3 to the same standard as the two smaller sizes, making assembly of circuit-breakers up to 250 A in standard switchboards even simpler. In fact, it is possible to prepare standardised support structures, facilitating the design stage and construction of the switchboard metalwork.



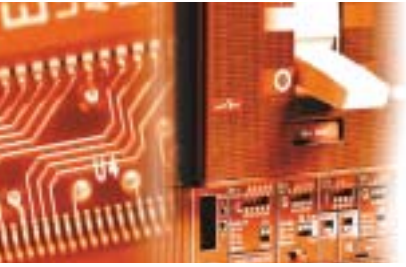
Racking-out with the door closed

With Tmax T4 and T5 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 rationalisation 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 solutions in development of the accessories:

– single range of accessories for T1, T2 and T3 and one for T4 and T5, characterised by completeness and simplicity for installation in switchboards. Harmonisation of the accessories allows reduction in stocks and greater service flexibility, offering increasing advantages for users of the Tmax series;
– same possibility of equipping with accessories, in terms of connection devices (terminals, terminal covers and phase separators), between fixed circuit-breakers and fixed parts of plug-in circuit-breakers for Tmax T1, T2 and T3;
– wide offer of residual current releases:
  - three-pole and four-pole RC221 and RC222 up to 250 A with T1, T2 and T3;
  - RC222 underneath, four-pole up to 630 A with T4 and T5;
  - RC223 (type B), also sensitive to currents with continuous components, four-pole for T3 and T4;
  - four-pole RC222 in plug-in version for T4 and T5.



Construction characteristics

Distinguishing features of the series

Compliance with Standards and company quality system

1SDC210117F0004

Tmax circuit-breakers and their accessories comply with the international IEC 60947-2 Standards and the EC directive:

– Low Voltage Directives (LVD) no. 73/23 EEC
– Electromagnetic Compatibility Directive (EMC) no. 89/336 EEC.

Certification of compliance with the product Standards mentioned above is carried out, in accordance with the European EN 45011 Standard, by the Italian certification organisation ACAE (Association for Certification of Electrical Apparatus), member of the European organization LOVAG (Low Voltage Agreement Group).
The Test Room at ABB SACE is accredited by SINAL (certificate No. 062/1997).
The Tmax series also has a range which has undergone certification according to the severe American UL 489 and CSA C22.2 Standards. Furthermore, the Tmax series is certified by the Russian GOST (Russia Certificate of Conformity) certification organisation.
The pieces of apparatus comply with the prescriptions for on-board shipping installations and are approved by the major Naval Registers - Lloyd's Register of Shipping, Germanischer Lloyd, Bureau Veritas, Rina, Det Norske Veritas, Russian Maritime Register of Shipping, and ABS (please ask ABB SACE for confirmation about the versions available).
ABB SACE's Quality System complies with the international ISO 9001 Vision 2000 Standard (model for quality assurance in design, development, construction, installation and service assistance) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards.
The third certifying Organisation is RINA-QUACER. ABB SACE obtained its first certification in 1990 with three-year validity, and has now reached its third confirmation of renewal.
The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques - a guarantee of the quality and genuineness of the circuit-breaker as an ABB SACE product.
Attention to protection of the environment is another priority commitment for ABB SACE, and, as confirmation of this, the environmental management system has been certified by RINA. ABB SACE - the first industry in the electromechanical sector in Italy to obtain this recognition - thanks to a revision of the production process with an eye to ecology - has been able to reduce the consumption of raw materials and waste from processing by 20%.
ABB SACE's commitment to safeguarding the environment is also shown in a concrete way by Life Cycle Assessments (LCA) of the products, carried out directly by ABB SACE's Research and Development in collaboration with the ABB Research Centre. Selection of materials, processes and packing materials is made optimising the true environmental impact of the product, also foreseeing the possibility of its being recycled.
Furthermore, in 1997 ABB SACE developed its Environmental Management system and got it certified in conformity with the international ISO14001 Standard, integrating it in 1999 with the Management System for Health and Safety in the workplace according to BS 8800 (British Standards).

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Power distribution

Circuit-breakers for power distribution

Index

Tmax circuit-breakers for power distribution

Circuit-breakers for power distribution

Electrical characteristics

				Tmax T1 1P	Tmax T1		
Rated uninterrupted current, **Iu [A]**			[A]	160	160		
No. Poles			[No.]	1	3/4		
Rated service voltage, **Ue**	(AC) 50-60 Hz		[V]	240	690		
	(DC)		[V]	125	500		
Rated impulse withstand voltage, **Uimp**			[kV]	8	8		
Rated insulation voltage, **Ui**			[V]	500	800		
Test voltage at industrial frequency for 1 min.			[V]	3000	3000		
Rated ultimate short-circuit breaking capacity, **Icu**				**B**	**B**	**C**	**N**
	(AC) 50-60 Hz 220/230 V		[kA]	25(*)	25	40	50
	(AC) 50-60 Hz 380/415 V		[kA]	–	16	25	36
	(AC) 50-60 Hz 440 V		[kA]	–	10	15	22
	(AC) 50-60 Hz 500 V		[kA]	–	8	10	15
	(AC) 50-60 Hz 690 V		[kA]	–	3	4	6
	(DC) 250 V - 2 poles in series		[kA]	25 (at 125 V)	16	25	36
	(DC) 250 V - 3 poles in series		[kA]	–	20	30	40
	(DC) 500 V - 2 poles in series		[kA]	–	–	–	–
	(DC) 500 V - 3 poles in series		[kA]	–	16	25	36
	(DC) 750 V - 3 poles in series		[kA]	–	–	–	–
Rated service short-circuit breaking capacity, **Ics**							
	(AC) 50-60 Hz 220/230 V		[%Icu]	75%	100%	75%	75%
	(AC) 50-60 Hz 380/415 V		[%Icu]	–	100%	100%	50% (25 kA)
	(AC) 50-60 Hz 440 V		[%Icu]	–	100%	75%	50%
	(AC) 50-60 Hz 500 V		[%Icu]	–	100%	75%	50%
	(AC) 50-60 Hz 690 V		[%Icu]	–	100%	75%	50%
Rated short-circuit making capacity, **Icm**							
	(AC) 50-60 Hz 220/230 V		[kA]	52.5	52.5	84	105
	(AC) 50-60 Hz 380/415 V		[kA]	–	32	52.5	75.6
	(AC) 50-60 Hz 440 V		[kA]	–	17	30	46.2
	(AC) 50-60 Hz 500 V		[kA]	–	13.6	17	30
	(AC) 50-60 Hz 690 V		[kA]	–	4.3	5.9	9.2
Opening time (415 V)			[ms]	7	7	6	5
Category of utilisation (EN 60947-2)				A	A		
Isolation behaviour				■	■		
Reference standard				IEC 60947-2	IEC 60947-2		
Releases:	thermomagnetic						
	T fixed, M fixed	TMF		■	–		
	T adjustable, M fixed	TMD		–	■		
	T adjustable, M adjustable (5…10 x In)	TMA		–	–		
	T adjustable, M fixed (3 x In)	TMG		–	–		
	T adjustable, M adjustable (2.5…5 x In)	TMG		–	–		
	magnetic only	MA		–	–		
	electronic	PR221DS-LS/I		–	–		
		PR221DS-I		–	–		
		PR222DS/P-LSI		–	–		
		PR222DS/P-LSIG		–	–		
		PR222DS/PD-LSI		–	–		
		PR222DS/PD-LSIG		–	–		
		PR222MP		–	–		
Interchangeability				–	–		
Versions				F	F		
Terminals	fixed			FC Cu	FC Cu-EF-FC CuAl -HR		
	plug-in			–	–		
	withdrawable			–	–		
Fixing on DIN rail				–	DIN EN 50022		
Mechanical life			[No. operations]	25000	25000		
			[No. hourly operations]	240	240		
Electrical life @ 415 V AC			[No. operations]	8000	8000		
			[No. hourly operations]	120	120		
Basic dimensions - fixed version			L [mm]	25.4 (1 pole)	76		
		4 poles	L [mm]	–	102		
			D [mm]	70	70		
			H [mm]	130	130		
Weight	fixed	3/4 poles	[kg]	0.4 (1 pole)	0.9/1.2		
	plug-in	3/4 poles	[kg]	–	–		
	withdrawable	3/4 poles	[kg]	–	–		

TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread
FC Cu = Front for copper cables
FC CuAl = Front for CuAl cables
R = Rear orientated
HR = Rear in horizontal flat bar
VR = Rear in vertical flat bar
MC = Multicable

Tmax T2				Tmax T3		Tmax T4					Tmax T5				
160				250		250/320					400/630				
3/4				3/4		3/4					3/4				
690				690		690					690				
500				500		750					750				
8				8		8					8				
800				800		1000					1000				
3000				3000		3500					3500				
N	**S**	**H**	**L**	**N**	**S**	**N**	**S**	**H**	**L**	**V**	**N**	**S**	**H**	**L**	**V**
65	85	100	120	50	85	70	85	100	200	300	70	85	100	200	300
36	50	70	85	36	50	36	50	70	120	200	36	50	70	120	200
30	45	55	75	25	40	30	40	65	100	180	30	40	65	100	180
25	30	36	50	20	30	25	30	50	85	150	25	30	50	85	150
6	7	8	10	5	8	20	25	40	70	80	20	25	40	70	80
36	50	70	85	36	50	36	50	70	100	150	36	50	70	100	150
40	55	85	100	40	55	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	25	36	50	70	100	25	36	50	70	100
36	50	70	85	36	50	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	16	25	36	50	70	16	25	36	50	70
100%	100%	100%	100%	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
100%	100%	100%	75% (70 kA)	75%	50% (27 kA)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
100%	100%	100%	75%	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
100%	100%	100%	75%	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%(1)	100%(2)
100%	100%	100%	75%	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%(1)	100%(2)	100%(2)
143	187	220	264	105	187	154	187	220	440	660	154	187	220	440	660
75.6	105	154	187	75.6	105	75.6	105	154	264	440	75.6	105	154	264	440
63	94.5	121	165	52.5	84	63	84	143	220	396	63	84	143	220	396
52.5	63	75.6	105	40	63	52.5	63	105	187	330	52.5	63	105	187	330
9.2	11.9	13.6	17	7.7	13.6	40	52.5	84	154	176	40	52.5	84	154	176
3	3	3	3	7	6	5	5	5	5	5	6	6	6	6	6
A				A		A					A (630 A) - B (400 A)(3)				
■				■		■					■				
IEC 60947-2				IEC 60947-2		IEC 60947-2					IEC 60947-2				
–				–		–					–				
■				■		■ (up to 50 A)					–				
–				–		■					■				
–				■		–					–				
–				–		–					■				
■ (MF up to In 12.5 A)				■		■					–				
■				–		■					■				
■				–		■					■				
–				–		■					■				
–				–		■					■				
–				–		■					■				
–				–		■					■				
–				–		■					■				
–				–		■					■				
F-P				F-P		F-P-W					F-P-W				
F-FC Cu-FC CuAl-EF-ES-R				F-FC Cu-FC Cu Al-EF-ES-R		F-FC Cu-FC CuAl-EF-ES-R-MC					F-FC Cu-FC CuAl-EF-ES-R				
F-FC Cu-FC CuAl-EF-ES-R				F-FC Cu-FC Cu Al-EF-ES-R		EF-ES-HR-VR-FC Cu-FC CuAl					EF-ES-HR-VR-FC Cu-FC CuAl				
–				–		EF-ES-HR-VR-FC Cu-FC CuAl					EF-ES-HR-VR-FC Cu-FC CuAl				
DIN EN 50022				DIN EN 50022		–					–				
25000				25000		20000					20000				
240				240		240					120				
8000				8000		8000 (250 A) - 6000 (320 A)					7000 (400 A) - 5000 (630 A)				
120				120		120					60				
90				105		105					140				
120				140		140					184				
70				70		103.5					103.5				
130				150		205					205				
1.1/1.5				2.1/3		2.35/3.05					3.25/4.15				
1.5/1.9				2.7/3.7		3.6/4.65					5.15/6.65				
–				–		3.85/4.9					5.4/6.9				

F = Fixed circuit-breakers
P = Plug-in circuit-breakers
W = Withdrawable circuit-breakers
(*) The breaking capacity for settings In=16 A and In= 20 A is 16 kA
(1) 75% for T5 630
(2) 50% for T5 630
(3) Icw = 5 kA
Notes: in the plug-in version of T2 and T3 the maximum setting is derated by 10% at 40 °C

General characteristics

The new series of Tmax moulded-case circuit-breakers - complying with the IEC 60947-2 Standard - is divided into five basic sizes, with an application range from 1 A to 630 A and breaking capacities from 16 kA to 200 kA (at 380/415 V AC).
Selection of the size allows the basic electrical characteristics to be identified simply and immediately, whereas selection of the overcurrent release is made according to the type of application required.
Furthermore, for the first time ABB SACE has also developed a moulded-case circuit-breaker with a single-pole construction characteristic: T1B 1p. This is a 160 A rated uninterrupted current circuit-breaker, able to operate at service voltages up to 240 V AC and 125 V DC, complying with the IEC 60947-2 Standard. From the viewpoint of dimensions, the new T1B 1p is absolutely identical to the Tmax T1 size (same height H = 130 mm and same depth D = 70 mm), except for the width, typical of a single pole (L = 25.4 mm). It is therefore suitable for being installed in distribution switchboards by means of a back plate, even side by side with other circuit-breakers in the series.
For protection of alternating current networks, the following are available:

- T1B 1p circuit-breaker, equipped with TMF thermomagnetic releases with fixed thermal and magnetic threshold (I_3 = 10 x In);
- T1, T2, T3 and T4 (up to 50 A) circuit-breakers equipped with TMD thermomagnetic releases with adjustable thermal threshold (I_1 = 0.7…1 x In) and fixed magnetic threshold (I_3 = 10 x In);
- T3 and T5 circuit-breakers, fitted with TMG releases for generator protection with adjustable thermal threshold (I_1 = 0.7…1 x In) and fixed magnetic threshold (I_3 = 3 x In) for T3 and adjustable magnetic threshold (I_3 = 2.5…5 x In) for T5;
- T4 and T5 circuit-breakers with TMA thermomagnetic releases with adjustable thermal threshold (I_1 = 0.7…1 x In) and adjustable magnetic threshold (I_3 = 5…10 x In).
- T2 with PR221DS electronic release;
- T4 and T5 with PR221DS, PR222DS/P and PR222DS/PD electronic releases.

The field of application in alternating current of the Tmax series varies from 1 A to 630 A with voltages up to 690 V.
The Tmax T1, T2, T3, T4 and T5 circuit-breakers equipped with TMD and TMA can also be used in direct current plants, with a range of application from 1 A to 630 A and a minimum operating voltage of 24 V DC. With two poles in series, T1, T2, T3 can be used with rated voltages of 250 V and T4, T5 with 500 V with breaking capacities up to 100 kA, whereas with 3 poles in series 500 V for T1, T2, T3 and 750 V for T4, T5 can be reached with breaking capacities still up to 100 kA for T1, T2, T3 and 70 kA for T4, T5.

Interchangeability

The Tmax T4 and T5 circuit-breakers can be equipped either with TMD, TMG or TMA thermomagnetic releases, MA magnetic only releases or PR221DS, PR222DS/P, PR222DS/PD and PR222MP electronic releases. Thanks to their simplicity of assembly, the end customer can, in fact, change the type of release extremely rapidly, according to

	Releases																			
	TMD			TMA												TMG				
Circuit-breakers																				
In [A]	**20**	**32**	**50**	**80**	**100**	**125**	**160**	**200**	**250**	**320**	**400**	**500**	**630**			**320**	**400**	**500**	**630**	
T4 250	■	■	■	■	■	■	■	■	■											
T4 320	▲	▲	▲	▲	▲	▲	▲	▲	▲	■										
T5 400										■	■					▲	▲			
T5 630										▲	▲	■	■			▲	▲	▲	▲	

■ = complete circuit-breaker already coded
▲ = circuit-breaker to be assembled (separate codes of the circuit-breaker part plus release)

Application range of alternating and direct current circuit-breakers

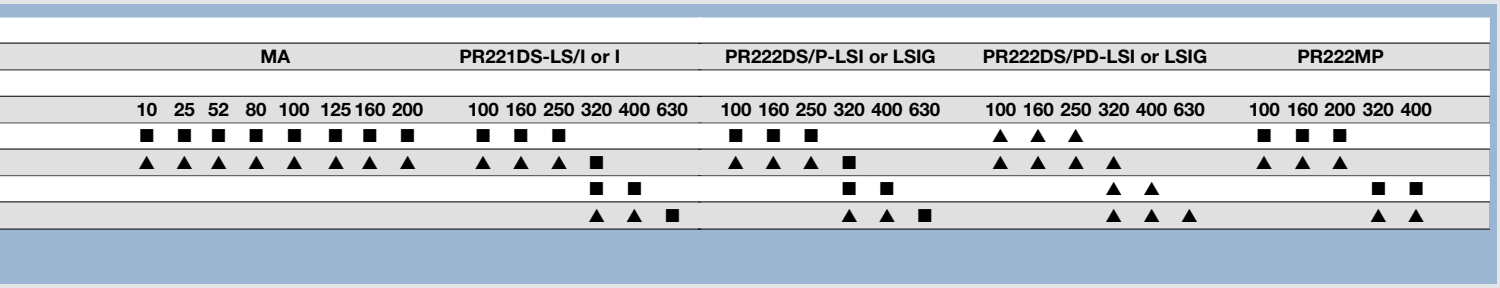
	Release	Range [A]
AC		
T1 1p 160	TMF	16...160
T1 160	TMD	16...160
T2 160	TMD	1,6...160
	MF/MA	1...100
	PR221DS	10...160
T3 250	TMG	63...250
	TMD	63...250
	MA	100...200
T4 250/320	TMD	20...50
	TMA	80...320
	MA	10...200
	PR221DS	100...320
	PR222DS/P	100...320
	PR222DS/PD	100...320
T5 400/630	TMG	320...630
	TMA	320...630
	PR221DS	320...630
	PR222DS/P	320...630
	PR222DS/PD	320...630
DC		
T1 1p 160	TMF	16...160
T1 160	TMD	16...160
T2 160	TMD	1,6...160
	MF/MA	1...100
T3 250	TMG	63...250
	TMD	63...250
	MA	100...200
T4 250/320	TMD	20...50
	TMA	80...320
	MA	10...200
T5 400/630	TMG	320...630
	TMA	320...630

TMF = thermomagnetic release with fixed thermal and magnetic threshold
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_ = electronic releases

The three-pole T2, T3 and T4 circuit-breakers can also be fitted with MA adjustable magnetic only releases, both for applications in alternating current and in direct current, in particular for motor protection (see page 2/19 and following).

2

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.

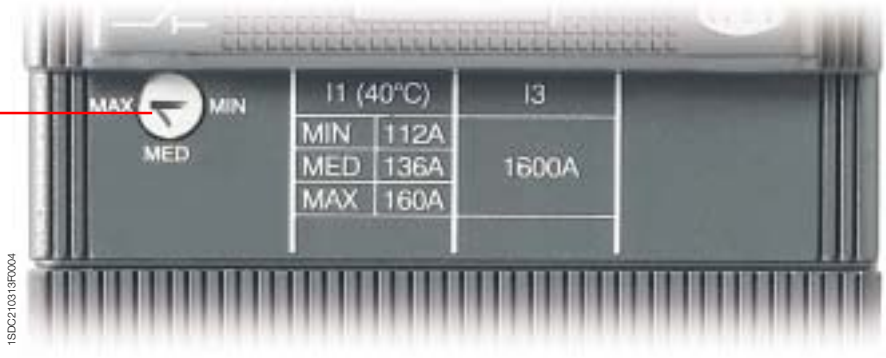


Thermomagnetic releases

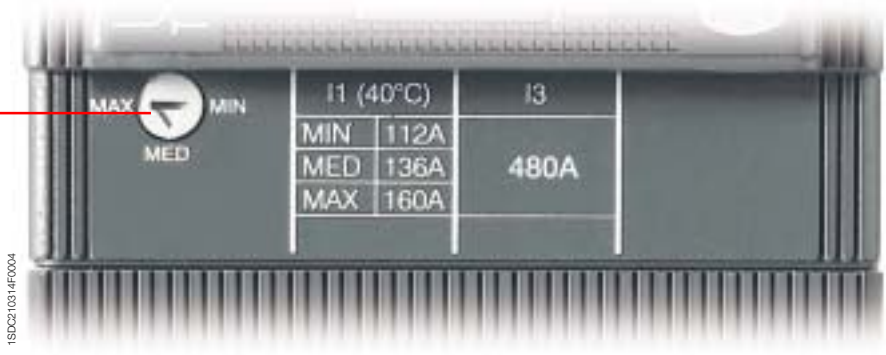
The Tmax T1 1p, T1, T2, T3, T4 and T5 circuit-breakers can be fitted with thermomagnetic releases and are used in protection of alternating and direct current networks with a range of use from 1,6 A to 630 A. They allow the protection against overload with a thermal device (with fixed threshold for T1 1p and adjustable threshold for T1, T2, T3, T4 and T5) realised using the bimetal technique, and protection against short-circuit with a magnetic device (with fixed threshold for T1, T2 and T3 and T4 up to 50 A and adjustable threshold for T4 and T5).
The four-pole circuit-breakers are always supplied with the neutral protected by the release and with protection of the neutral at 100% of the phase setting for settings up to 100 A. For higher settings, the version with protection of the neutral at 50% of the phase setting is also available.
Furthermore, for Tmax T3 and T5, the TMG thermomagnetic releases for generator protection are available. For T3 the release has adjustable thermal threshold (I_1 = 0.7…1 x In) and fixed magnetic threshold (I_3 = 3 x In), whereas for T5 the release has adjustable thermal threshold (I_1 = 0.7…1 x In) and adjustable magnetic threshold (I_3 = 2.5… 5 x In).

Thermomagnetic release TMD and TMG (for T3)

Thermal threshold
Adjustable from 0.7 to 1 x In



Thermal threshold
Adjustable from 0.7 to 1 x In



TMD = thermomagnetic release with adjustable thermal threshold (I_1 = 0,7…1 x In) and magnetic fixed threshold.
TMG (for T3) = thermomagnetic release for generator protection with adjustable thermal threshold (I_1 = 0.7…1 x In) and fixed magnetic threshold

Thermomagnetic release TMF for T1B 1p

TMF - T1 1p

I_1= In	In [A]	16	20	25	32	40	50	63	80	100	125	160
I_3 = 10 x In	I_3 [A]	500	500	500	500	500	500	630	800	1000	1250	1600

TMF = thermomagnetic release with fixed thermal and magnetic threshold.

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TMD - T1 and T3

I_1=0.7…1 x In	In [A]	16	20	25	32	40	50	63	80	100	125	125	160	200	250
	Neutral [A] - 100%	16	20	25	32	40	50	63	80	100	125	-	160	200	250
	Neutral [A] - 50%	-	-	-	-	-	-	-	-	-	-	80	100	125	160
T1 160		■	■	■	■	■	■	■	■	■	■	-	■	-	-
T3 250								■	■	■	■	■	■	■	■
I_3 = 10 x In	I_3 [A]	500	500	500	500	500	500	630	800	1000	1250	1250	1600	2000	2500
	Neutral [A] - 100%	500	500	500	500	500	500	630	800	1000	1250	-	1600	2000	2500
	Neutral [A] - 50%	-	-	-	-	-	-	-	-	-	-	800	1000	1250	1600

TMD - T2

I_1=0.7…1 x In	In [A]	1.6	2	2.5	3.2	4	5	6.3	8	10	12.5	16	20	25	32	40	50	63	80	100	125	160
	Neutral [A] - 100%	1.6	2	2.5	3.2	4	5	6.3	8	10	12.5	16	20	25	32	40	50	63	80	100	125	160
	Neutral [A] - 50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	100
I_3 = 10 x In	I_3 [A]	16	20	25	32	40	50	63	80	100	125	500	500	500	500	500	500	630	800	1000	1250	1600
	Neutral [A] - 100%	16	20	25	32	40	50	63	80	100	125	500	500	500	500	500	500	630	800	1000	1250	1600
	Neutral [A] - 50%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	800	1000

TMG - T3

I_1=0.7…1 x In	In [A]	63	80	100	125	160	200	250
	Neutral [A] - 100%	63	80	100	125	160	200	250
I_3 = 3 x In	I_3 [A]	400	400	400	400	480	600	750
	Neutral [A] - 100%	400	400	400	400	480	600	750

Notes:
- In identifies the setting current for protection of the phases (L1, L2 and L3) and of the neutral.
- The TMD and TMA thermomagnetic releases have the thermal element with adjustable threshold I_1 = 0.7…1 x In. The value of the thermal element adjustment which is obtained by acting on the special selector, is intended at 40 °C. The magnetic element has fixed trip threshold with ± 20% tolerance according to what is indicated by the IEC 60947-2 (pos. 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.

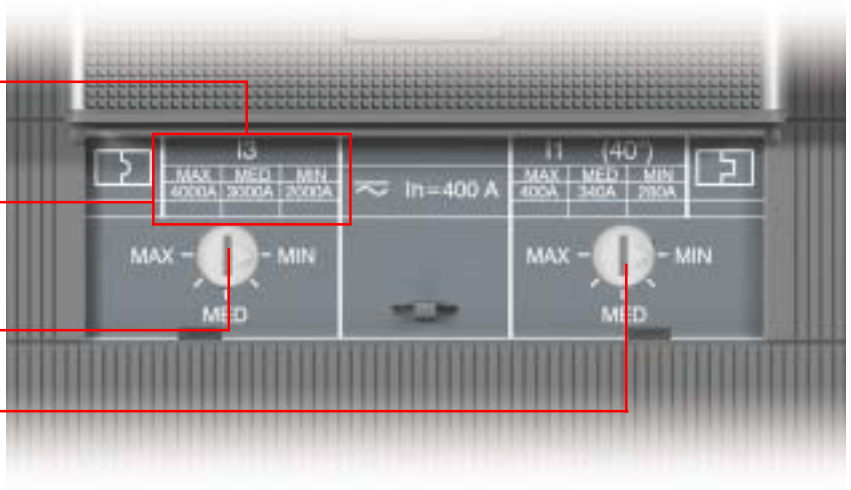
Thermomagnetic release TMA and TMG (for T5)

TMA

TMG

Magnetic threshold
Adjustable

Thermal threshold
Adjustable from 0.7 to 1 x In



TMA = thermomagnetic release with adjustable thermal threshold (I_1 = 0.7…1 x In) and adjustable magnetic threshold (I_3 = 5… 10 x In)
TMG (for T5) = thermomagnetic release for generator protection with adjustable thermal threshold (I_1 = 0.7…1 x In) and adjustable magnetic threshold (I_3 = 2.5 …5 x In)

TMD/TMA - T4

I_1= 0.7…1 x In	In [A]	20	32	50	80	100	125	160	200	250	320
	Neutral [A] - 100%	20	32	50	80	100	125	160	200	250	320
	Neutral [A] - 50%	-	-	-	-	-	80	100	125	160	200
I_3 = 10 x In **I_3 = 5…10 x In**	I_3 = 10 x In [A]	320	320	500							
	I_3= 5…10 x In [A]				400…800	500…1000	625…1250	800…1600	1000…2000	1250…2500	1600…3200
	Neutral [A] - 100%	320	320	500	400…800	500…1000	625…1250	800…1600	1000…2000	1250…2500	1600…3200
	Neutral [A] - 50%	-	-	-	-	-	400…800	500…1000	625…1250	800…1600	1000…2000

TMA - T5

I_1= 0.7…1 x In	In [A]	320	400	500	630
	Neutral [A] - 100%	320	400	500	630
	Neutral [A] - 50%	200	250	320	400
I_3 = 5…10 x In	I_3 [A]	1600…3200	2000…4000	2500…5000	3150…6300
	Neutral [A] - 100%	1600…3200	2000…4000	2500…5000	3150…6300
	Neutral [A] - 50%	1000…2000	1250…2500	1600…3200	2000…4000

TMG - T5

I_1= 0.7…1 x In	In [A]	320	400	500	630
	Neutral [A] - 100%	320	400	500	630
I_3 = 2.5…5 x In	I_3 [A]	800…1600	1000…2000	1250…2500	1600…3200
	Neutral [A] - 100%	800…1600	1000…2000	1250…2500	1600…3200

Notes:
- In identifies the setting current for protection of the phases (L1, L2 and L3) and of the neutral.
- The TMA and TMG thermomagnetic releases which equip the Tmax T4 and T5 circuit-breakers have the thermal element with adjustable threshold I_1 = 0.7…1 x In. 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 x In for TMA and I_3 = 2.5…5 x In for TMG) with a tolerance of ± 20% according to what is indicated in the Norma IEC 60947-2 (pos. 8.3.3.1.2) Standard.

General characteristics

The Tmax T2, T4 and T5 circuit-breakers for uses in alternating current can be equipped with PR221DS, PR222DS/P and PR222DS/PD overcurrent releases constructed using electronic technology. This allows protection functions to be obtained which guarantee great reliability, trip precision and immunity to electromagnetic components in compliance with the standards on the matter. The power supply required for correct operation is supplied directly by the release current transformers and tripping is always guaranteed, even under single-phase load conditions and in correspondence with the minimum setting.

Characteristics of the electronic releases - PR221DS, PR222DS/P and PR222DS/PD

Operating temperature	-25 °C ... +70 °C
Relative humidity	90%
Operating frequency	45...66 Hz
Electromagnetic compatibility (LF and HF)	IEC 60947-2 Annex F
Medium time before failure (MTBF)	15 years (at 45 °C)

The protection releases are made up of the current transformers (three or four depending on the number of conductors to be protected), the SACE PR221DS, PR222DS/P or PR222DS/PD protection unit and of a trip coil with demagnetisation which acts directly on the circuit-breaker operating mechanism unit and is mounted in the right-hand slot of the circuit-breaker for Tmax T2 or is already housed in the release box for Tmax T4 and T5.

The current transformers are housed inside the release box and supply the energy required for correct operation of the protection and the signal needed to detect the current. They are available with primary rated current as indicated in the table.

When the protection trips, the circuit-breaker opens by means of the trip coil, which changes over a contact (AUX-SA, supplied on request) to signal release tripped. Signalling reset is of mechanical type and takes place with resetting of the circuit-breaker operating lever.

The test of the trip coil can be carried out by means of the SACE TT1 test device. Positive outcome of the test coincides with circuit-breaker opening.

Current transformers

	In [A]	10	25	63	100	160	250	320	400	630
PR221DS	**T2**	■	■	■	■	■				
	T4				■	■	■	■		
	T5							■	■	■
	L	4...10	10...25	25...63	40...100	64...160	100...250	128...320	160...400	252...630
	S	10...100	25...250	63...630	100...1000	160...1600	250...2500	320...3200	400...4000	630...6300
	I	10...100	25...250	63...630	100...1000	160...1600	250...2500	320...3200	400...4000	630...6300
PR222DS/P or PR222DS/PD	**T4**				■	■	■	■		
	T5							■	■	■
	L				40...100	64...160	100...250	128...320	160...400	252...630
	S				60...1000	96...1600	150...2500	192...3200	240...4000	378...6300
	I				150...1200	240...1920	375...3000	480...3200*	600...4800	945...6300
	G				20...100	32...160	50...250	64...320	80...400	126...630

* For T5 ⇒ 480...3840

PR221DS

The PR221DS release, available for T2,T4 and T5, provides protection functions against overload L and short-circuit S/I (version PR221DS-LS/I): with this version, you can choose between protection S or I moving the dip-switch. Alternatively, the version with only the function of protection against instantaneous short-circuit I is available (version PR221DS-I, also see page 2/23).
The wide range of settings makes this release particularly suitable in all distribution applications where reliability and trip precision are required and where only protection against short-circuit (I_3= 1…10 x In) is needed, this obtained using the PR221DS release in version I.
The PR221DS release for Tmax T2 has some differences compared with the one which can be used with T4 and T5. With Tmax T2, the release is not interchangeable, protection against overload L can be set manually at I_1 = 0.4…1 x In with 16 thresholds by means of a dip switch on the front of the circuit-breaker, and it is possible to select between 2 trip curves 3s at 6 x I_1 and 6s at 6 x I_1.
On the other hand, with Tmax T4 and T5, protection L can be set manually at I_1= 0.4…1 x In with 16 thresholds by means of a dip switch on the front of the circuit-breaker and it is possible select between 2 different trip curves 3s at 6 x I_1 and 12s at 6 x I_1. The protection functions against delayed short-circuit S or, alternatively, instantaneous I are the same both for the PR221DS of Tmax T2 and for T4 and T5.

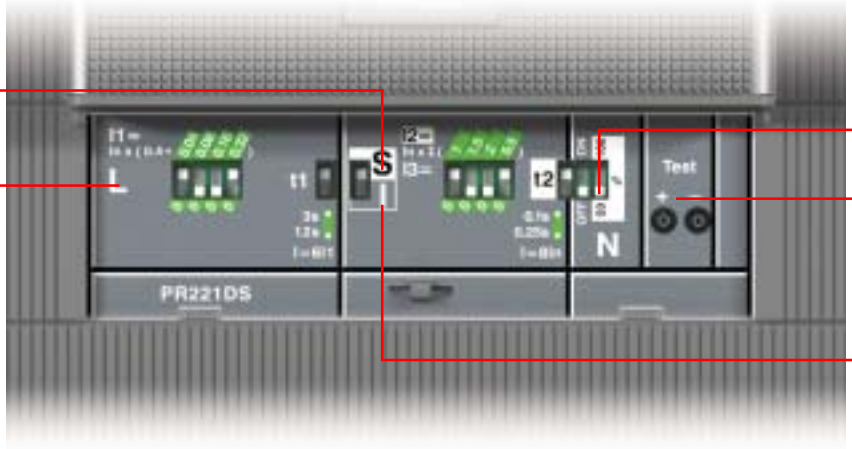
Example of protection setting

Given a T2 160 circuit-breaker with In= 100 A, set the protection L to I_1=80 A in curve 3s, and S to 300 A in curve 0.25s:
To obtain I_1= 80 A , the dip switches in correspondence with 0.08 and 0.32 must be moved so that I_1= In x (0.4 + 0.32 + 0.08) = 100 x (0.4 + 0.32 + 0.08) = 80 A. To select curve 3s, the dip switch in correspondence with t1 must be moved upwards.
To obtain I_2= 300 A, first of all, the dip must be moved in correspondance of "S" protection, then the dip switches in correspondence with 1 and 2 must be moved so that I_2= In x (1 + 2) = 100 x (1 + 2) = 300 A.
To select curve 0,25s, the dip switch in correspondence with t2 must be moved downwards.

PR221DS-LS/I

Protection S
Against short-circuit with delayed trip

Protection L
Against overload



Dip-switches for setting the neutral (only for T4 and T5)

Socket for TT1 test unit

Protection I
Against short-circuit with instantaneous trip

The protection function against short-circuit with delayed trip S, with inverse short time delay with inverse time characteristic (I^2t= const) can be set, I_2= 1...10 x In with15 thresholds, and the possibility of excluding the protection, which can be set by means of the dip switches on the front of the circuit-breaker. The protection time delay can be selected by adjusting the dip switches on one of the two available curves (0.1s at 8 x In, 0.25s at 8 x In).
The protection function against instantaneous short-circuit I can be adjusted to I_3= 1…10 x In with 15 thresholds and the possibility of excluding the protection, which can be set by means of the specific dip switch.
There is a single adjustment for the phases and the neutral. However, for these it can be decided whether to request the protection threshold of the functions at 50 - 100% of that of the phases for Tmax T2 (In = 100 A), whereas for T4 and T5 it is possible to select the protection threshold OFF, 50% or 100% directly from the front of the release by means of the specific dip switch.
The trip coil is always supplied with the PR221DS release for Tmax T2 and is housed in the right-hand slot of the circuit-breaker. A kit of auxiliary contacts, specifically for electronic T2, is available when ordering, which includes the following:
– 1 contact for signalling electronic release trip
– 1 contact for signalling open/closed
– 1 contact for signalling release trip.
On the other hand, for Tmax T4 and T5, the trip coil is housed inside the electronic release and therefore, since the right slot of the circuit-breaker is not occupied, the auxiliary contacts available can be used. The auxiliary contacts AUX-SA to signal release trip can always be used (see page 3/18).

PR221DS - Protection functions and parameterisations

Protection functions			Trip threshold	Trip curves[1]		
L **NOT EXCLUDABLE**	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I^2t=constant)		I_1 = 0.40 - 0.44 - 0.48 - 0.52 - 0.56 - 0.60 - 0.64 - 0.68 - 0.72 - 0.76 - 0.80 - 0.84 - 0.88 - 0.92 - 0.96 - 1 x In Release between 1.1...1.3 x I_1 (IEC 60947-2)	at 6 x I_1 t_1 = 3s Tolerance:	at 6 x I_1 t_1 = 6s **only for T2** ± 10% up to 6 x In; ± 20% above 6 x In	at 6 x I_1 t_1 = 12s **only for T4, T5**
S **EXCLUDABLE**	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I^2t=constant) (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 x In Tolerance: ± 10% (T4-T5) ± 10% up to 2 x In (T2) ± 20% above 2 x In (T2)		a 8 x In t_2 = 0,1s Tolerance: ± 10% up to 6 x In (T4-T5) ± 20% above 6 x In (T4-T5) ± 20% (T2)	a 8 x In t_2 = 0,25s
I **EXCLUDABLE**	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 x In Tolerance: ± 10% (T4-T5) ± 20% (T2)		istantaneous ≤ 25ms	

[1] These tolerances hold in the following conditions:
– self-powered relay at full power and/or auxiliary supply;
– two or three-phase power supply.
– peak factor $\left(\frac{peak}{rms}\right)$ = $\sqrt{2}$ (L and S with current ≥ 3 In; I)

PR222DS/P

The PR222DS/P release, available for T4 and T5, has protection functions against overload L, delayed S and instantaneous I short-circuit (version PR222DS/P-LSI) and, alternatively, as well as the functions L, S, I, also has protection against earth fault G (version PR222DS/P-LSIG).
The wide range of adjustments makes this release particularly suitable in all distribution applications where reliability and trip precision are required.
Function L, which cannot be excluded, can be set manually to I_1= 0.4…1 x In with 32 thresholds which can be set by means of the dip switches on the front of the release, or electronically by means of the SACE PR010T test and configuration unit which can be set between I_1= 0.4…1 x In with 61 thresholds (steps of 0.01 x In). Furthermore, it is possible to select among four different trip curves: 3s at 6 x I_1, 6s at 6 x I_1, 9s at 6 x I_1, 12s at 6 x In for T4 In = 320 A and T5 In = 630 A and 18s at 6 x I_1 for all the other settings.
Otherwise it is also possible to set the trip time to 6 x I_1 electronically between 3 and 18s with 31 thresholds (step of 0.5s), except for T4 In= 320 A and T5 In= 630 A, for which the maximum value is 12s.
The function of protection against short-circuit with delayed trip S, with inverse short delay with characteristic with inverse time (I^2t = cost) or with definite time, can be set to I_2 = 0.6…10 x In with 15 thresholds and the possibility of excluding the protection, which can be set by means of the dip switches on the front of the circuit-breaker, or with the SACE PR010T I_2 = 0.6…10 x In with 95 thresholds (steps of 0.1). The time delay of the protection can be selected either manually by adjusting the dip switch to one of the four curves available (with delay of 0.05s at 8 x In, 0.1s at 8 x In, 0.25s at 8 x In or 0.5s at 8 x In) or electronically by means of PR010T between 0.05 and 0.5s at 8 x In with 46 thresholds (steps of 0.01s).
The function of protection against instantaneous short-circuit I is adjustable to I_3[(1)] = 1.5…12 x In with 15 thresholds and the possibility of excluding the protection, can be set by means of dip switches, or with the SACE PR010T at I_3[(1)] = 1.5…12 x In with 86 thresholds (steps of 0.1 x In).
The function of protection against earth fault G is adjustable either manually, by means of dip switches, to I_4 = 0.2…1 x In with 7 thresholds and the possibility of excluding the protection, or electronically by means of the SACE PR010T to I_4 = 0.2…1 x In with 81 thresholds (steps of 0.01 x In). It is also possible to select among four different trip curves: 0.1s at 3.15 x I_4, 0.2s at 2.25 x I_4, 0.4s at 1.6 x I_4 and 0.8s at 1.10 x I_4, or to set the trip time electronically between 0.1 and 0.8s with 71 thresholds (steps of 0.01s).
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 to100% that of the phases by means of two special dip switches on the front of the circuit-breaker.
Furthermore, on the front of the PR222DS/P (or PD) releases, signalling of pre-alarm and alarm of protection L is available. The pre-alarm threshold value (cannot be excluded or modified by the user) is equal to 0.9 x I_1. It is also possible to transmit remotely the alarm of protection L, simply connecting connector X3 to the dedicated contact.

(1) For T4 In = 320 A and T5 In = 630 A ⇒ I_3max = 10 x In

PR222DS/PD

Apart from the protection functions against overload L, delayed S and instantaneous I short-circuit (version PR222DS/PD-LSI) or, alternatively, plus the extra protection against earth fault G (version PR222DS/PD-LSIG), the PR222DS/PD release, available for T4 and T5, 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 PR222/PD releases allow the Tmax T4 and T5 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 19200 bit/sec.

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

The PR222DS/PD release, with integrated communication and control functions, allows a wide range of information to be acquired and transmitted remotely, to carry out opening and closing commands thanks to shunt opening and closing releases installed on board the circuit-breaker, to store the configuration parameters and those for programming the unit itself like 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, and remotely by means of supervision and control systems.

The PR222DS/PD releases can be associated with the AUX-E auxiliary contacts in electronic version, to know the state of the circuit-breaker (open/closed), and with AUX-E plus 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 (also see page 3/17 and following).

If the circuit-breaker fitted with the PR222DS/PD release is inserted in a supervision system, during the test phases with the PR010/T unit, communication is automatically abandoned and starts again on completion of this operation.

Communication towards the display unit FDU is also available, which can also take place with self-supply starting from 0.35 x In present at least on one phase.

The details of the functions available are indicated in the diagram.

Communication functions	PR222DS/P	PR222DS/PD
Protocol		Modbus RTU standard
Physical medium		EIA RS485
Speed (maximum)		19200bps
Measurement functions		
Phase currents	■ (1)	■
Neutral	■ (1)	■
Earth	■ (1)	■
Signalling functions		
L pre-alarm and alarm LED	■	■
L alarm output contact (2)	■	■
Data available		
State of the circuit-breaker (open, closed)		■
Mode (local, remote)		■
Protection parameters set	■ (1)	■
Alarms		
Protections: L, S, I, G	■ (1)	■
Release control for failed fault	■ (1)	■
Maintenance		
Total number of operations		■
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		■
Commands		
Circuit-breaker opening/closing (with motor operator)		■
Alarm reset		■
Circuit-breaker reset (with motor operator)		■
Setting the protection curves and thresholds	■ (1)	■
Safety function		
Automatic opening in the case of failed release for fault (with motor operator)		■
Events		
Changes in circuit-breaker state, in the protections and all the alarams		■

(1) With PR010/T unit
(2) Typical contact: MOS photo Vmax: 48 V DC/30 V AC
Imax: 50 mA DC/35 mA AC

Auxiliary power supply - Electrical characteristics

	PR222DS/PD
Auxiliary power supply (galvanically insulated)	24 V DC ± 20%
Maximum ripple	5%
Inrush current @ 24 V	1 A for 30 ms
Rated current @ 24 V	100 mA
Rated power @ 24 V	2,5 W

Circuit-breakers for power distribution

Electronic releases

PR222DS/P

Protection S
Against short-circuit with delayed trip

Protection L
Against overload

Socket for test SACE TT1 test unit

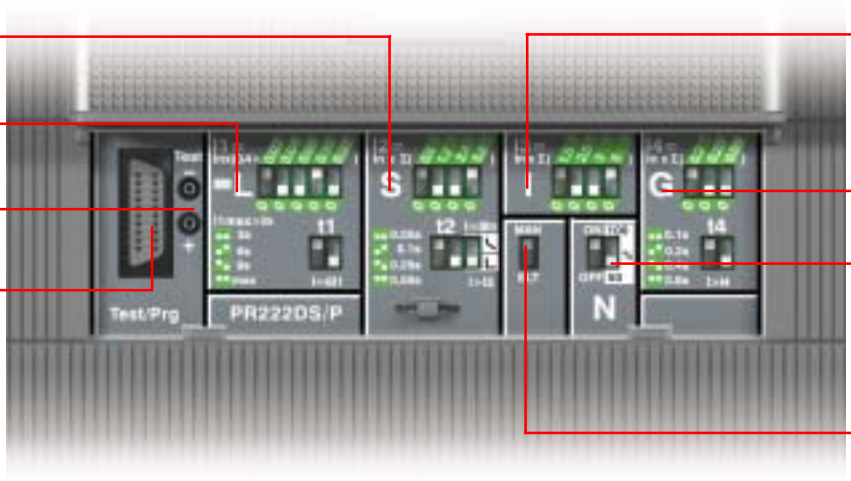
Socket for connection of SACE PR010/T test unit

Protection I
Against short-circuit with instantaneous trip

Protection G
Against earth fault

Dip-switches for setting the neutral

Selection for electronic or manual setting



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PR222DS/PD

Protection S
Against short-circuit with delayed trip

Protection L
Against overload

Socket for test SACE TT1 test unit

Socket for connection of SACE PR010/T test unit

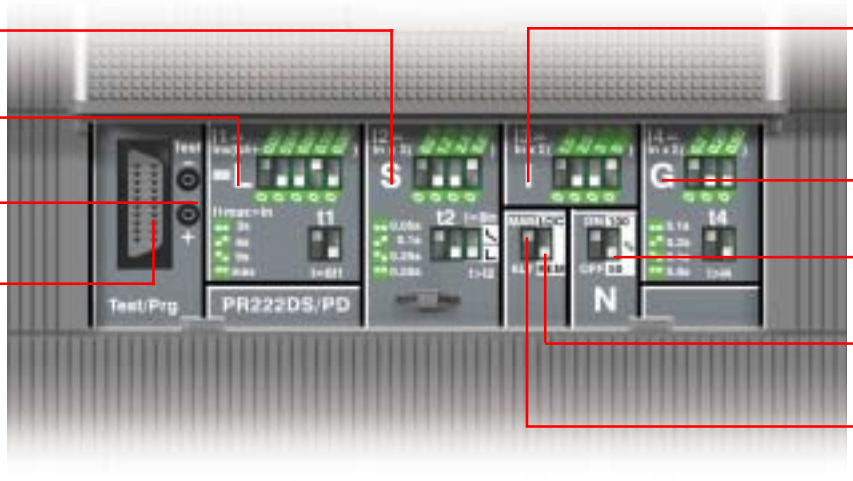
Protection I
Against short-circuit with instantaneous trip

Protection G
Against earth fault

Dip-switches for setting the neutral

Selection for local or remote setting

Selection for electronic or manual setting



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PR222DS/P and PR222DS/PD - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves[1]
L **NOT EXCLUDABLE**	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I^2t= constant)	**Manual setting** I_1 = 0.40 - 0.42 - 0.44 - 0.46 - 0.48 - 0.50 - 0.52 - 0.54 - 0.56 - 0.58 - 0.60 - 0.62 - 0.64 - 0.66 - 0.68 - 0.70 - 0.72 - 0.74 - 0.76 - 0.78 - 0.80 - 0.82 - 0.84 - 0.86 - 0.88 - 0.90 - 0.92 - 0.94 - 0.96 - 0.98 - 1 x In	**Manual setting** at 6 x I_1 t_1 = 3s; at 6 x I_1 t_1 = 6s; at 6 x I_1 t_1 = 9s; at 6 x I_1 t_1 = 18s[2]
		Electronic setting I_1= 0.40…1 x In (step 0.01 x In) Release between 1.1...1.3 x I_1 (IEC 60947-2)	**Electronic setting** at 6 x I_1 t_1 = 3…18s (step 0,5s)[2] Tolerance: ± 10%
S **EXCLUDABLE**	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I^2t= constant) or definite time	**Manual setting** I_2 = 0.6 - 1.2 - 1.8 - 2.4 - 3.0 - 3.6 - 4.2 - 5.8 - 6.4 - 7.0 - 7.6 - 8.2 - 8.8 - 9.4 - 10 x In	**Manual setting** at 8 x In t_2 = 0.05s; at 8 x In t_2 = 0.1s; at 8 x In t_2 = 0.25s; at 8 x In t_2 = 0.5s
	I^2t=const ON	**Electronic setting** I_2 = 0.60…10 x In (step 0.1 x In) Tolerance: ± 10%	**Electronic setting** at 8 x In t_2 = 0.05…0.5s (step 0.01s) Tolerance: ± 10% [4]
		Manual setting I_2 = 0.6 - 1.2 - 1.8 - 2.4 - 3.0 - 3.6 - 4.2 - 5.8 - 6.4 - 7.0 - 7.6 - 8.2 - 8.8 - 9.4 - 10 x In	**Manual setting** t_2 = 0.05s; t_2 = 0.1s; t_2 = 0.25s; t_2 = 0.5s
	I^2t=const OFF	**Electronic setting** I_2 = 0.60…10 x In (step 0.1 x In) Tolerance: ± 10%	**Electronic setting** t_2 =0.05…0.5s (step 0.01s) Tolerance: ± 10%[4]
I **EXCLUDABLE**	Against short-circuit with instantaneous trip	**Manual setting** 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 x In [3]	istantaneous ≤ 25 ms
		Electronic setting I_3 = 1.5…12 x In (step 0.1 x In) [3] Tolerance: ± 10%	
G **EXCLUDABLE**	Against earth fault with inverse short time delay trip and trip characteristic according to an inverse time curve (I^2t= constant)	**Manual setting** I_4 = 0.2 - 0.25 - 0.45 - 0.55 - 0.75 - 0.8 - 1 x In	**Manual setting** up to 3.15 x I_4 t_4 = 0.1s; up to 2.25 x I_4 t_4 = 0.2s; up to 1.6 x I_4 t_4 = 0.4s; up to 1.10 x I_4 t_4 = 0.8s
		Electronic setting I_4 = 0.2…1 x In (step 0.01 x In) Tolerance: ± 10%	**Electronic setting** t_4 = 0.1...0.8 x In (step 0.01s) Tolerance: ± 20%

[1] These tolerances hold in the following conditions:
- self-powered relay at full power and/or auxiliary supply;
- two or three-phase power supply
- sinusoidal wave forms with peak factor 1.41
- peak factor $\left(\frac{peak}{rms}\right) = \sqrt{2}$ (L ≥ 3 In; S, I, G)

[2] for T4 In = 320 A and T5 In = 630 A ⇒ t_1 = 12s
[3] for T4 In = 320 A and T5 In = 630 A ⇒ I_3max = 10 x In
[4] tolerance: ± 10 ms up to t_2 = 0.1s

Motor Protection

Circuit-breakers for motor protection

Index

Tmax circuit-breakers for motor protection

2

Circuit-breakers for motor protection

Electrical characteristics

			Tmax T2			
Rated uninterrupted current, **Iu**		[A]	160			
Rated service current, **In**		[A]	1...100			
Poles		[No.]	3			
Rated service voltage, **Ue**	(AC) 50-60 Hz	[V]	690			
	(DC)	[V]	500			
Rated impulse withstand voltage, **Uimp**		[kV]	8			
Rated insulation voltage, **Ui**		[V]	800			
Test voltage at industrial frequency for 1 min.		[V]	3000			
Rated ultimate short-circuit breaking capacity, **Icu**			**N**	**S**	**H**	**L**
(AC) 50-60 Hz 220/230 V		[kA]	65	85	100	120
(AC) 50-60 Hz 380/415 V		[kA]	36	50	70	85
(AC) 50-60 Hz 440 V		[kA]	30	45	55	75
(AC) 50-60 Hz 500 V		[kA]	25	30	36	50
(AC) 50-60 Hz 690 V		[kA]	6	7	8	10
Rated short-circuit service breaking capacity, **Ics**		[%Icu]				
(AC) 50-60 Hz 220/230 V		[%Icu]	100%	100%	100%	100%
(AC) 50-60 Hz 380/415 V		[%Icu]	100%	100%	100%	75% (70 kA)
(AC) 50-60 Hz 440 V		[%Icu]	100%	100%	100%	75%
(AC) 50-60 Hz 500 V		[%Icu]	100%	100%	100%	75%
(AC) 50-60 Hz 690 V		[%Icu]	100%	100%	100%	75%
Rated short-circuit making capacity, **Icm**		[kA]				
(AC) 50-60 Hz 220/230 V		[kA]	143	187	220	264
(AC) 50-60 Hz 380/415 V		[kA]	75.6	105	154	187
(AC) 50-60 Hz 440 V		[kA]	63	94.5	121	165
(AC) 50-60 Hz 500 V		[kA]	52.5	63	75.6	105
(AC) 50-60 Hz 690 V		[kA]	9.2	11.9	13.6	17
Opening time (415 V)		[ms]	3	3	3	3
Category of use (EN 60947-2-1)			A			
Isolation behaviour			■			
Reference Standard			IEC 60947-2			
Protection against short-circuit						
Magnetic only release	MA		■ (MF up to In 12.5 A)			
Electronic release	PR221DS-I		■			
Integrated protection (IEC 60947-4-1)						
Electronic release	PR222MP		–			
Interchangeability			–			
Versions			F-P			
Terminals	fixed		F - FC Cu - FC CuAl - EF - ES - R - FC CuAl			
	plug-in		F - FC Cu - FC CuAl - EF - ES - R - FC CuAl			
	withdrawable		–			
Fixing on DIN rail			DIN EN 50022			
Mechanical life		[No. operations]	25000			
		[No.hourly operations]	240			
Electrical life @ 415 V AC		[No. operations]	8000			
		[No.hourly operations]	120			
Basic fixed version dimensions		L [mm]	90			
		D [mm]	70			
		H [mm]	130			
Weight	fixed	[kg]	1.1			
	plug-in	[kg]	1.5			
	withdrawable	[kg]	–			

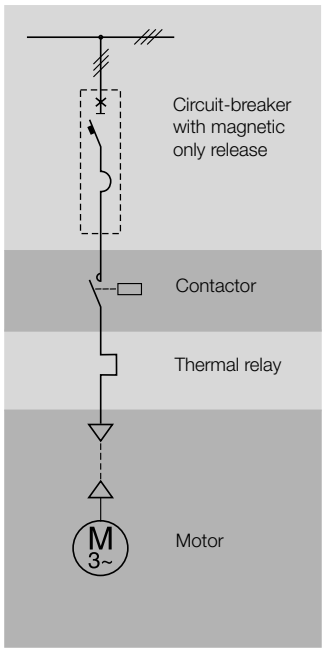
TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread
FC Cu = Front for copper cables
R = Rear orientated
FC CuAl = Front for CuAl cables
MC = Multicable
HR = Rear in horizontal flat bar
VR = Rear in vertical flat bar
(*) Icw = 5 kA

(1) 75% for T5 630
(2) 50% for T5 630

Tmax T3		Tmax T4					Tmax T5				
250		250, 320					400, 630				
100…200		10…320					320, 400, 630				
3		3					3				
690		690					690				
500		750					750				
8		8					8				
800		1000					1000				
3000		3500					3500				
N	**S**	**N**	**S**	**H**	**L**	**V**	**N**	**S**	**H**	**L**	**V**
50	85	70	85	100	200	300	70	85	100	200	300
36	50	36	50	70	120	200	36	50	70	120	200
25	40	30	40	65	100	180	30	40	65	100	180
20	30	25	30	50	85	150	25	30	50	85	150
5	8	20	25	40	70	80	20	25	40	70	80
75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
75%	50% (27 kA)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%(1)	100%(2)
75%	50%	100%	100%	100%	100%	100%	100%	100%	100%(1)	100%(2)	100%(2)
105	187	154	187	220	440	660	154	187	220	440	660
75.6	105	75.6	105	154	264	440	75.6	105	154	264	440
52.5	84	63	84	143	220	396	63	84	143	220	396
40	63	52.5	63	105	187	330	52.5	63	105	187	330
7.7	13.6	40	52.5	84	154	176	40	52.5	84	154	176
7	6	5	5	5	5	5	6	6	6	6	6
A		A					B (400 A)(7) - A (630 A)				
■		■					■				
IEC 60947-2		IEC 60947-2					IEC 60947-2				
■		■					–				
–		■					■				
–		■					■				
–		■					■				
F-P		F-P-W					F-P-W				
F - FC Cu - FC CuAl - EF - ES - R - FC CuAl		F - FC Cu - FC CuAl - EF - ES - R - MC					F - FC Cu - FC CuAl - EF - ES - R				
F - FC Cu - FC CuAl - EF - ES - R - FC CuAl		EF - ES - FC Cu - FC CuAl - HR - VR					EF - ES - FC Cu - FC CuAl - HR - VR				
–		EF - ES - FC Cu - FC CuAl - HR - VR					EF - ES - FC Cu - FC CuAl - HR - VR				
DIN EN 50022		–					–				
25000		20000					20000				
240		240					120				
8000		8000					7000				
120		120					60				
105		105					140				
70		103.5					103.5				
150		205					205				
2.1		2.35					3.25				
2.7		3.6					5.15				
–		3.85					5.4				

Circuit-breakers for motor protection

Protection against short-circuit



Protection against short-circuit

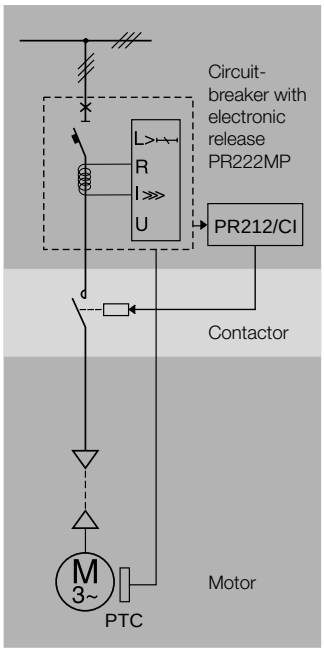
General characteristics

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 PR222MP release, 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.



Integrated protection

Protection against short-circuit

Magnetic only and electronic overcurrent releases

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.
The Tmax T2 ,T3 and T4 circuit-breakers in the three-pole version with fixed magnetic only release (only for T2, I_3= 13 x In up to In = 12.5 A) or adjustable between 6 and 12 times the rated service current for T2 and T3, and between 6 and 14 times for T4, 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.

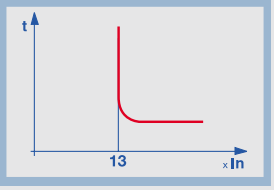
MF - Fixed magnetic only releases

Tmax T2

I_3 = 13 x In

In [A]	1	1.6	2	2.5	3.2	4	5	6.5	8.5	11	12.5
I_3 = 13 x In	13	21	26	33	42	52	65	84	110	145	163

Note
The magnetic only releases which equip the Tmax T2 in three-pole version circuit-breaker have a trip threshold I_3 fixed at 13 x In, according to what is indicated in the table.



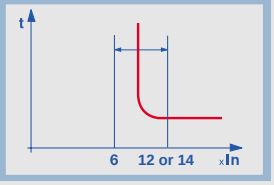
MA - Adjustable magnetic only releases

Tmax T2-T3-T4

I_3 = 6...12 x In
I_3 = 6...14 x In

In [A]	10	20	25	32	52	80	100	125	160	200
Tmax T2		■		■	■	■	■			
Tmax T3							■	■	■	■
Tmax T4	■		■		■	■	■	■	■	■
Tmax T2, T3 I_3= 6…12 x In	–	120...240	–	192...384	314...624	480...960	600...1200	750...1500	960...1920	1200...2400
Tmax T4 I_3= 6…14 x In	60...140	–	150...350	–	314...728	480...1120	600...1400	750...1750	960...2240	1200...2800

Note
The magnetic only releases which equip the Tmax T2 and T3 three-pole version circuit-breakers have a trip thresould I_3 which can be adjusted from 6 to 12 x In for T2 and T3 and from 6 to14 x In for T4, according to what is indicated in the table.



They can be used in a wide range of start-ups, from 0.37 kW to 45 kW for T2 and up to 250 kW for T5 (at 400 V).
Finally, T2, T4 and T5 with different levels of breaking capacity in the three-pole and four-pole versions, fitted with the PR221DS-I electronic release, allow selection of the most suitable trip value for any type of motor, thanks to the adjustment of the protection against short-circuit from 1 to 10 times the rated current.

Characteristics

In [A]	10	25	63	100	160	250	320	400	630
Tmax T2	■	■	■	■	■				
Tmax T4				■	■	■	■		
Tmax T5							■	■	■
I_3 [A]	10…100	25…250	63…630	100…1000	160…1600	250…2500	320…3200	400…4000	630…6300

PR221DS-I - Protection functions and parameterisation

Protection function

Against short-circuit with adjustable instantaneous trip

Trip threshold

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 x In

Tolerance ± 20% (T2)
± 10% (T4-T5)

Circuit-breakers for motor protection

Integrated protection: PR222MP

Integrated protection

PR222MP electronic overcurrent releases

In the three-pole version, the Tmax T4 and T5 circuit-breakers are fitted with PR222MP electronic releases. This makes it possible to obtain functions which guarantee high trip precision, extreme reliability and immunity to variations in the external temperature.
The PR222MP releases fully integrated on board the circuit-breaker guarantee complete protection of the motor. In fact, it is not necessary to provide the help of an external thermal relay for protection against overloads as, on the other hand, occurs with the standard solution.
The PR222MP can be connected to a contactor for the basic protection function (NORMAL mode) of the motor: the circuit-breaker can control contactor opening in the case of a fault (excluding short-circuit), by means of the SACE PR212/CI accessory control unit. In fact, a contactor has breaking capacities at high currents which are less efficient than the circuit-breaker, but a high number of possible operations consistently higher than those of the circuit-breaker (about 1.000.000). The combination of the two devices therefore optimises motor protection and control.
However, the PR222MP can also be connected directly to the motor (HEAVY mode). In this case, the circuit-breaker is called on to protect the plant in any case, without the help of the contactor: this solution is suggested for motors with a low number of operations.

Characteristics of the SACE PR222MP electronic release	
Operating temperature	-25 °C ... +70 °C
Relative humidity	90%
Operating frequency	45...66 Hz
Electromagnetic compatibility (LF and HF)	IEC 60947-2 Annex F
Medium time before failure (MTBF)	15 years (at 45°C)

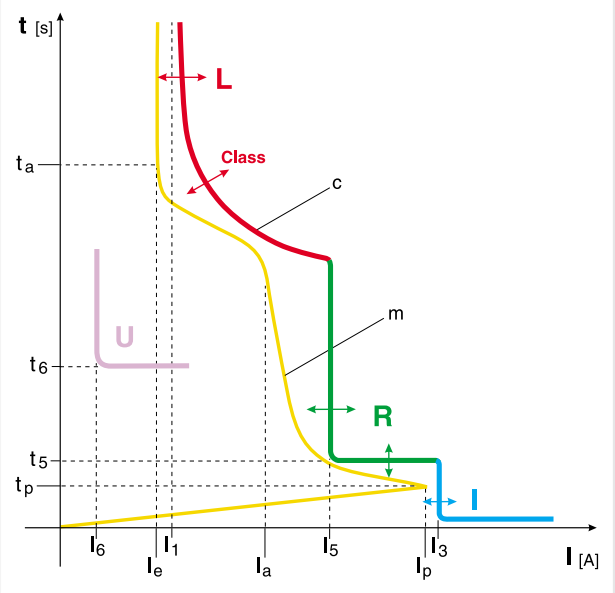
PR222MP - Electronic overcurrent releases

Tmax T4-T5

	In [A]	100	160	200	320	400
	T4 250 N, S, L	■	■	■		
	T5 400 N, S, L				■	■
L	I_1 [A]	40...100	64...160	80...200	128...320	160...400
R	I_5 [A]	3...10 x I_1				
I	I_3 [A]	600...1300	960...2080	1200...2600	1920...4160	2400...5200
U	I_6 [A]	0.4 x I_1				

In any case, the PR010/T unit for testing the release and checking the protection functions, and the PR020/K signalling unit are available for the PR222MP release.
The electronic releases are self-supplied and are made up of three current transformers, the PR222MP protection unit and a trip coil which acts directly on the circuit-breaker operating mechanism. The current transformers, housed inside the release box, supply the energy and the signal required for correct protection operation. Operation is guaranteed with a single-phase current equal to 20% of the rated current.
The release is temperature-compensated and is sensitive to missing phase according to Table IV of the IEC60947-4-1 7.2.1.5.2 Standards.
The T4 and T5 circuit-breakers for motor protection are perfectly integrated with the new line of ABB contactors. The latter - defined as A-line - together with the line of thermal relays and ABB SACE moulded-case circuit-breakers, is the basis for the new generation of apparatus specially designed to guarantee a system of products which can be integrated according to the required applications. All this has the aim not only of continually improving the products, but above all of providing designers, installers and end users with the best solutions in terms of performances and reliability, combined with the simplicity of the system.
The Tmax T4 and T5 circuit-breakers with PR222MP release and the “A” series of contactors are, in particular, an extraordinary solution in terms of compactness, sharing the same width and thereby saving space, assembly material, installation time and relative cabling operations. The combination of circuit-breaker-contactor allows an extremely compact protected starter to be made.

Typical operating characteristic of an asynchronous motor



I_1 = function L trip current
I_3 = function I trip current
I_5 = function R trip current
t_5 = function R trip time
I_6 = function U trip current
t_6 = function U trip time
I_e = rated service current of the motor
I_a = motor starting current
I_p = peak value of the sub-transient starting current
t_a = motor starting time
t_p = duration of the sub-transient starting phase
m = typical motor starting curve
c = example of trip curve of a motor protection circuit-breaker with electronic release

The different curves of the functions, with numerous threshold and time settings, allow an overall trip curve to be drawn which is really close to the motor starting curve, thereby optimising its protection.

Circuit-breakers for motor protection

Integrated protection: PR222MP

Protection functions

1SDC210330F0004

Function L

Function L protects the motor against overloads according to the indications and classes defined by the IEC 60947-4-1 Standard.
The protection is based on a pre-defined model (ABB SACE international patent) which, by simulating the copper and iron over-temperatures inside the motor, allows precise safeguarding of the motor. The protection intervenes when the established over-temperature is reached. The trip time is fixed by selecting the trip class defined in the above-mentioned Standard.
The function is temperature-compensated and sensitive to a missing/unbalanced phase according to the IEC 60947-4-1 Standard.
In the case of an auxiliary power supply, the thermal memory function is guaranteed, which allows the release to continue to calculate the motor temperature even following an opening.
Function L, which cannot be excluded, can be set manually to I_1=0.4…1 x In with 60 thresholds which can be set by means of the dip-switches on the front of the release, or electronically by means of the SACE PR010T test and configuration unit.
The starting class of the motor must then be selected, which determines the trip time for overload according to the IEC 60947-4-1 4.7.3 Table II Standards: class 10 A corresponds to a trip time t_1= 4s, class 10 to t_1= 8s, class 20 to t_1= 16s and class 30 to t_1= 24s at 7.2 x In. Setting this trip time can also be carried out electronically with the PR010T: the electronic steps are equal to 1s.
Tripping of this protection leads to contactor opening (with the PR212/CI unit). Any anomaly of the contactor would make the circuit-breaker open, thanks to the BACK UP function.
For protection L, there is then a pre-alarm and an alarm LED: the pre-alarm threshold value (cannot be either excluded or modified by the user) is equal to 0.9 x I_1 and the LED is permanently lit, whereas it flashes in case of alarm (I > 1.05s x I_1).

1SDC210333F0004

Function R: protection against rotor block

Function R protects the motor against possible rotor block during operation. Protection R has the characteristic of protecting the motor in two different ways, according to whether the fault is present at start-up or whether it is present during normal service of an already active plant.
In the former case, protection R is linked to protection L for time selection as well: in the presence of a fault during start-up, protection R is inhibited for a time equal to the time set with the trip class. Once this time is exceeded, protection R becomes active leading to a trip after a fixed set t_5 time.
In the latter case, protection R is already active and the protection tripping time will be equal to t_5.
The protection intervenes when at least one of the phase currents exceeds the established value and remains over that threshold for time t_5.
Function R can be set manually I_5= 3…10 x I_1 with 8 thresholds which can be set by means of the dip-switches on the front of the release, or with 70 thresholds by means of the SACE PR010T test and configuration unit (steps of 0.1 x I_1). The trip time t_5 can be set to 1, 4, 7 or 10 seconds by means of a dip-switch, or with steps of 0.5s by means of PR010T.
Tripping of this protection leads to contactor opening (with the PR212/CI unit); any anomaly of the contactor would make the circuit-breaker open, thanks to the BACK UP function.

1SDC210335F0004

Function I: protection against short-circuit

This protection function intervenes in the case of a short-circuit between phases. It is sufficient for just a single phase to exceed the set threshold to cause immediate opening of the circuit-breaker (protection cannot be excluded). The trip current can be adjusted up to 13 times the rated current of the release with 8 thresholds which can be set by means of a dip-switch or with 70 thresholds by means of the PR010T (steps of 0.1 x In).
To prevent unwarranted trips during starting, the protection recognises whether the motor to be protected is in the starting phase or whether there is a short-circuit: this is to allow starting in completely safe conditions.
Tripping of this protection makes the circuit-breaker open.

1SDC210332F0004

Function U: protection against missing phase and/or unbalanced

Function U can be used in those cases where a particularly precise control is needed regarding phase missing/unbalanced. This protection can be excluded and intervenes if the effective value of one or two currents drops below the level equal to 0.4 of the current I_1 set for protection L and remains there for longer than 4 seconds.
This protection can be set electronically with the PR010T from 0.4 to 0.9 x I_1 with time adjustable between 1 and 10s (steps of 0.5s).
Tripping of this protection leads to contactor opening (with the PR212/CI unit); any anomaly of the contactor would make the circuit-breaker open, thanks to the BACK UP function.

Parameterisation of the PR222MP release

Man/Elt: by means of a dip switch located on the front, the release can be provided for manual parameterisation (Man) of the thresholds and times acting directly on the dip switches located on the front of the release or with electronic parameterisation (Elt) by means of the PR010T.

Reset Mode

AUTO/Man: this function (AUTO) allows the state of activation of the PR212/CI to be automatically reset following contactor trip for L function, after a fixed time of 15s. The AUTO reset is only possible when there is an auxiliary voltage.

Setting the working modes

Normal: the Normal mode foresees the use of a circuit-breaker and a contactor: this configuration makes intervention towards the contactor possible, through the PR212/CI unit, when the PR222MP considers this appropriate.
Heavy: on the other hand, the heavy mode foresees the use of only the circuit-breaker and therefore the PR222MP sends the trip signal directly to the circuit-breaker.

1SDC210331F0004

BACK UP Function

This protection is conceived to manage the possibility that an opening command sent to the contactor might not have a positive outcome, i.e. that the contactor does not intervene. In this case, after having waiting for the time defined using the dip switch “k time” (**min** = 80ms or **max** = 160ms), the PR222MP sends a trip signal to the circuit-breaker.
Introducing a time delay between the command sent to the contactor and the back-up one is necessary to compensate the contactors actuation time.

Setting the PTC protection

PTC: this protection, by means of a PTC sensor inserted in the motor, controls the internal temperature. In case of overtemperature, the PR222MP will control opening of the contactor (when in “Normal” mode) or circuit-breaker (when in “Heavy” mode).
0/1: is a generic contact defined by the user and has nothing to do with the meaning of the PTC.

Circuit-breakers for motor protection

Integrated protection: PR222MP

PR222MP

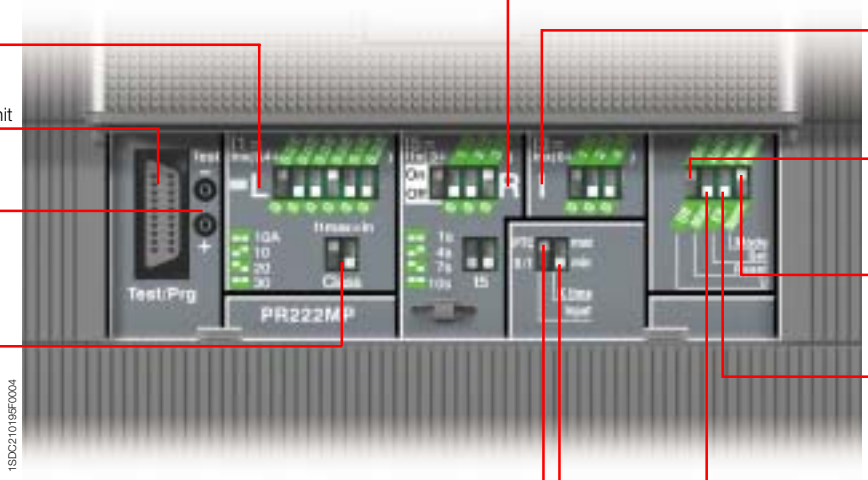
Protection R
Against rotor block

Protection L
Against motor overload

Socket for connection of SACE PR010/T test unit

Socket for SACE TT1 test unit

Class
Class of motor starting according to the IEC 60947-4-1 Standards



Protection I
Against short-circuit with instantaneous trip

Protection U
Against phase current unbalance or loss of phase

Setting the work methods

Man/Elt
Release parametrisation methods

Selection between:
- PTC(1) temperature sensor input
- 0/1 generic input

Setting the back-up time

Setting the reset following trip
- manual
- automatic

(1) A special input is available to connect a PTC temperature probe, inserted in the motor to be protected

PR222MP - Protection functions and parameterisation

Protection functions			Trip threshold	Trip curves[1]
L **NOT EXCLUDABLE**	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve		**Manual setting** I_1 = 0.4…1 x In with step 0.01 x In	**Manual setting** Trip classes: 10 A - 10 - 20 - 30 (IEC 60497-4-1) t_1 = 4-8-16-24s where t_1 is the trip time at 7.2 x I_1 cold, depending on the class selected
			Electronic setting I_1 = 0.4…1 x In with step 0.01 x In Tolerance: ± 15%	**Electronic setting** t_1 = 4…24s (step 1s) Tolerance: ± 15%
R **EXCLUDABLE**	Against rotor block with delayed trip and trip characteristic with definite time		**Manual setting** I_5 = OFF - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 x I_1	**Manual setting** t_5 = 1 - 4 - 7 - 10 s
			Electronic setting I_5 = OFF - 3…10 x I_1 (step 0.1 x I_1) Tolerance: ± 15%	**Electronic setting** t_5 = 1…10s (step 0.5s) Tolerance: ± 10%
I **NOT EXCLUDABLE**	Against short-circuit with adjustable instantaneous trip		**Manual setting** I_3 = 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 x In	
			Electronic setting I_3 = 6 -…-13 x In (step 0.1 x In) Tolerance: ± 15%	
U **EXCLUDABLE**	Against phase current unbalance or loss of phase with inverse long time delay trip and trip characteristic with definite time		**Manual setting** I_6 = ON (0.4 x I_1) - OFF **Electronic setting** I_6 = 0.4…0.9 x I_1 - OFF Tolerance: ± 15%	**Manual setting** t_6 = 4s **Electronic setting** t_6 = 1…10s (step 0.5s) Tolerance: ± 10%

[1] These tolerances hold in the following conditions:
– self-powered relay at full power and/or auxiliary supply;
– two or three-phase power supply.

1000 V AC/DC

Circuit-breakers for applications up to 1000 V

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Tmax circuit-breakers for applications up to 1000 V

Circuit-breakers for applications up to 1000 V

Electrical characteristics

The range of circuit-breakers for applications in direct current and in alternating current up to 1000 V also comes into the panorama of the Tmax proposal.
The typical sectors of use are installations in mines, road or rail tunnels, traction 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 for use in direct and alternating current, or in the three-pole version with PR221DS and PR222DS/P electronic releases for applications in alternating current.
The dimensions of these circuit-breakers are the same as the standard ones. Furthermore, they can also be combined with all the accessories available for the Tmax series, except for the residual current release, and can be converted into plug-in or withdrawable version using the conversion kits and fixed parts of standard circuit-breakers.

Circuit-breakers with electronic release for applications at 1000 V in AC

				Tmax T4		Tmax T5	
Rated uninterrupted current, **Iu**			[A]	250		400, 630	
Poles			[No.]	3		3	
Rated service voltage, **Ue**		(AC) 50-60 Hz	[V]	1000		1000	
Rated impulse withstand voltage, **Uimp**			[kV]	8		8	
Rated insulation voltage, **Ui**			[V]	1000		1000	
Test voltage at industrial frequency for 1 min.			[V]	3500		3500	
Rated ultimate short-circuit breaking capacity, **Icu**				**L**	**V**	**L**	**V**
(AC) 50-60 Hz 1000 V			[kA]	12	20	12	20
Rated service short-circuit breaking capacity, **Ics**			[%Icu]				
(AC) 50-60 Hz 1000 V			[kA]	100%	100%	75%	75%
Rated short-circuit making capacity, **Icm**			[kA]				
(AC) 50-60 Hz 1000 V			[kA]	24	40	24	40
Category of utilisation (EN 60947-2)				A		B (400 A)(*) - A (630A)	
Isolation behaviour				■		■	
Reference Standard				IEC 60947-2		IEC 60947-2	
Electronic releases		PR221DS-LS		■		■	
		PR221DS-I		■		■	
		PR222DS-LSI		■		■	
		PR222DS-LSIG		■		■	
Interchangeability				■		■	
Versions				F-P-W		F-P-W	
Terminals	fixed			F-FCCu-FCCuAl-EF-ES-R-MC		F-FCCu-FCCuAl-EF-ES-R	
	plug-in			FCCu-FCCuAl-EF-ES-HR-VR		FCCu-FCCuAl-EF-ES-HR-VR	
	withdrawable			FCCu-FCCuAl-EF-ES-HR-VR		FCCu-FCCuAl-EF-ES-HR-VR	
Mechanical life				20000		20000	
Basic dimensions - fixed version				240		120	
		3 poles	L [mm]	105		140	
			D [mm]	103.5		103.5	
			H [mm]	205		205	
Weight	fixed	3 poles		2.35		3.25	
	plug-in	3 poles		3.6		5.15	
	withdrawable	3 poles		3.85		5.4	

TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread
FC Cu = Front for copper cables
FC CuAl = Front for CuAl cables
R = Rear orientated
HR = Rear in horizontal flat bar
VR = Rear in vertical flat bar
MC = Multicable
(*) Icw = 5 kA

Electronic releases for applications up to 1000 V AC - PR221DS, PR222DS/PD and PR222DS/P

In [A]	100	250	400	630
T4 250	■	■		
T5 400			■	
T5 630				■

Circuit-breakers with thermomagnetic release for applications at 1000 V in AC/DC

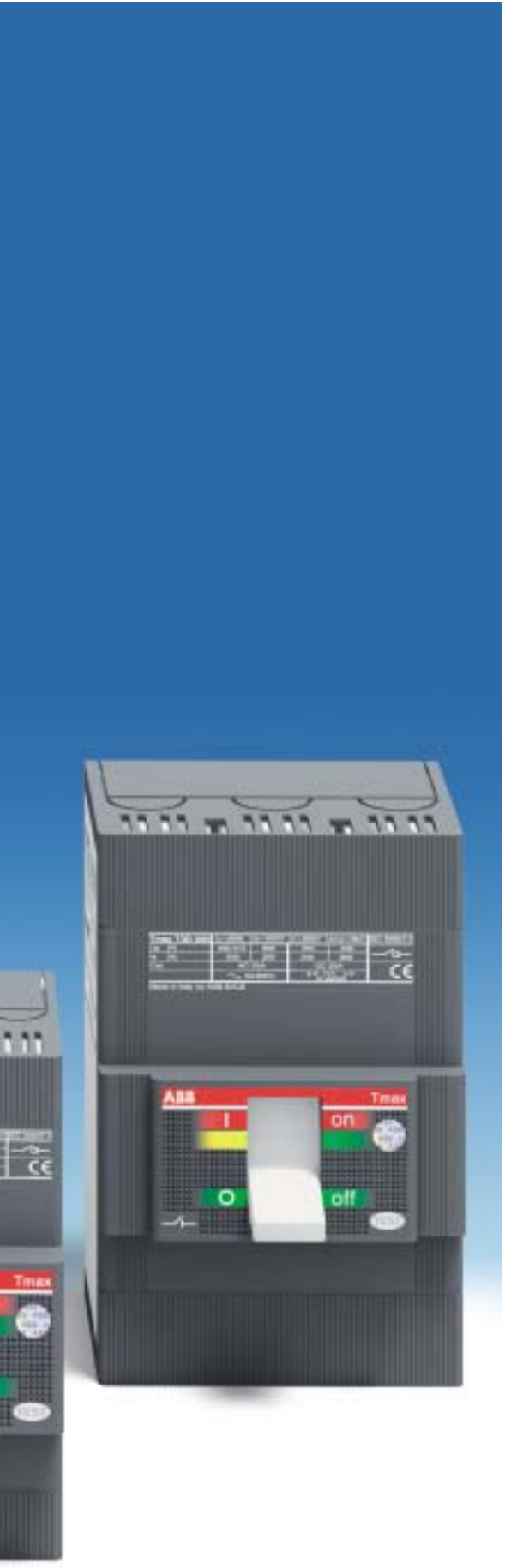
				Tmax T4	Tmax T5
Rated uninterrupted current, **Iu**			[A]	250	400, 630
No. Poles			Nr.	4	4
Rated service voltage, **Ue**	(AC) 50-60 Hz		[V]	1000	1000
Rated impulse withstand voltage, **Uimp**			[kV]	8	8
Rated insulation voltage, **Ui**			[V]	1000	1000
Test voltage at industrial frequency for 1 min.			[V]	3500	3500
Rated ultimate short-circuit breaking capacity, **Icu**				**V**	**V**
(AC) 50-60 Hz 1000 V			[kA]	20	20
(DC) 1000 V, 4 poles in series			[kA]	40	40
Rated service short-circuit breaking capacity, **Ics**			[%Icu]		
(AC) 50-60 Hz 1000 V			[kA]	100%	75%
Rated short-circuit making capacity, **Icm**			[kA]		
(AC) 50-60 Hz 1000 V			[kA]	40	40
Category of utilisation (EN 60947-2)				A	B (400 A)(*) - A (630A)
Isolation behaviour				■	■
Reference Standard				IEC 60947-2	IEC 60947-2
Thermomagnetic releases		TMD		■	–
		TMA		■	■
Interchangeability				■	–
Versions				F-P-W	F-P-W
Terminali	fixed			F-FCCu-FCCuAl-EF-ES-MC	F-FCCu-FCCuAl-EF-ES
	plug-in			FCCu-FCCuAl-EF-ES-HR-VR	FCCu-FCCuAl-EF-ES-HR-VR
	withdrawable			FCCu-FCCuAl-EF-ES-HR-VR	FCCu-FCCuAl-EF-ES-HR-VR
Mechanical life				20000	20000
				240	120
Basic dimensions - fixed version		3 poles	L [mm]	105	140
		4 poles	L [mm]	140	184
			D [mm]	103.5	103.5
			H [mm]	205	205
Weight	fixed	3 poles		2.35	3.25
	plug-in	3 poles		3.6	5.15
	withdrawable	3 poles		3.85	5.4

TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread
FC Cu = Front for copper cables
FC CuAl = Front for CuAl cables
R = Rear orientated
HR = Rear in horizontal flat bar
VR = Rear in vertical flat bar
MC = Multicable
(*) Icw = 5 kA

Thermomagnetic releases for applications at 1000 V in AC/DC - TMD and TMA

	In [A]	32	50	80	100	125	160	200	250	400	630
	Neutral [A] - 100%	32	50	80	100	125	160	200	250	400	630
I_1= 0.7…1 x In	T4 250	■	■	■	■	■	■	■	■		
	T5 400									■	
	T5 630										■
	I_3 = 10 x In [A]	320	500								
I_3 = 10 x In I_3 = 5…10 x In	I_3 = 5...10 x In [A]	-	-	400…800	500…1000	625…1250	800…1600	1000…2000	1250…2500	2000…4000	3150…6300

Switch-disconnectors



Switch-disconnectors

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Switch-disconnectors

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 releases.
They are characterised by a rated voltage of 690 V in alternating current and 750 V in direct current.

				Tmax T1D
Conventional thermal current, **Ith**			[A]	160
Rated service current in category AC23, **Ie**			[A]	125
Poles			[No.]	3/4
Rated service voltage, **Ue**		(AC) 50-60 Hz	[V]	690
		(DC)	[V]	500
Rated impulse withstand voltage, **Uimp**			[kV]	8
Rated insulation voltage, **Ui**			[V]	800
Test voltage at industrial frequency for 1 minute			[V]	3000
Rated short-circuit making capacity, **Icm**		(min) switch-disconnector only	[kA]	2.8
		(max) with circuit-breaker on supply side	[kA]	187
Rated short-time withstand current for 1s, **Icw**			[kA]	2
Insulation behaviour				■
Reference Standard				IEC 60947-3
Versions				F
Terminals				FCCu-EF-FCCuAl-HR
Mechanical life			[No. Operations]	25000
			[No. Hourly Operations]	120
Basic dimensions, fixed		3 poles	L [mm]	76
		4 poles	L [mm]	102
			H [mm]	130
			D [mm]	70
Weight	fixed	3/4 poles	[kg]	0.9/1.2
	plug-in	3/4 poles	[kg]	–
	withdrawable	3/4 poles	[kg]	–

Coordination between switch-disconnectors and circuit-breakers [380/415 V AC]

	T1			T2				T3	
	B	C	N	N	S	H	L	N	S
Icu [kA]	**16**	**25**	**36**	**36**	**50**	**70**	**85**	**36**	**50**
T1D 160	16	25	36	36	50	70	85		
T3D 250								36	50
T4D 320									
T5D 400									
T5D 630									

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.

Tmax T3D	Tmax T4D	Tmax T5D
250	320	400/630
200	320	400/630
3/4	3/4	3/4
690	690	690
500	750	750
8	8	8
800	800	800
3000	3000	3000
5.3	5.3	11
105	440	440
3.6	3.6	6
■	■	■
IEC 60947-3	IEC 60947-3	IEC 60947-3
F-P	F-P-W	F-P-W
F-FCCuAl-FCCu-EF-ES-R	F-FCCuAl-FCCu-EF-ES-R-MC-HR-VR	F-FCCuAl-FCCu-EF-ES-R-HR-VR
25000	20000	20000
120	120	120
105	105	140
140	140	184
150	205	205
70	103.5	103.5
2.1/3	2.35/3.05	3.25/4.15
2.1/3.7	3.6/4.65	5.15/6.65
–	3.85/4.9	5.4/6.9

T4					T5 400					T5 630				
N	S	H	L	V	N	S	H	L	V	N	S	H	L	V
36	**50**	**70**	**120**	**200**	**36**	**50**	**70**	**120**	**200**	**36**	**50**	**70**	**120**	**200**
36	50													
36	50	70	120	200										
					36	50	70	120	200					
										36	50	70	120	200

Making capacity

The making capacity Icm 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.

Withstand capacity in closed position

This identifies the capacity to maintain the closed position for short-time overcurrents. It is a significant parameter which qualifies the performances of this apparatus.

Accessories

Index

Accessories

The range of accessories of the Tmax series is characterised by the completeness of the solutions proposed together with flexibility and facility of use.

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Accessories

Versions and types

Starting from the fixed version with front terminals, the Tmax circuit-breakers can be converted into the various versions (plug-in for T2, T3, T4 and T5; withdrawable for T4 and T5), 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.

Fixed

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

- circuit-breakers characterised by just two depths: 70 mm for Tmax T1, T2 and T3 and 103.5 mm for Tmax T4 and T5
- standard front in groups of circuit-breakers: 45 mm for Tmax T1, T2 and T3 and 105 mm for T4 and T5
- flange for compartment door
- possibility of assembly on back plate (or on DIN rail with T1, T2 and T3, with the help of the special accessory, see page 3/39)
- thermomagnetic (on Tmax T1, T2, T3, T4 and T5) or electronic (on Tmax T2, T4 and T5) releases
- standard FC Cu type terminals (front for copper cables) for T1 and F type (front) for T2, T3, T4 and T5.

Plug-in

The PLUG-IN version of the circuit-breaker (Tmax T2, T3, 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.

Accessories

Versions and types

Withdrawable

The circuit-breakers in the WITHDRAWABLE version (Tmax T4 and T5) are made up of:

- fixed part to be installed directly on the back plate of the unit with the side group mounted on the fixed part to allow the racking-out and racking-in movement
- moving part obtained from the fixed circuit-breaker with addition of the isolating contacts (near the connection terminals), of the rear frame (which is coupled to the prepared side on the fixed part, for sliding) and of the terminal covers
- mandatory accessory to be applied onto the front of the circuit-breaker selected between front for lever operating mechanism, 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.

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.

Versions available

	F Fixed	P Plug-in	W Withdrawable
T1	■		
T2	■	■	
T3	■	■	
T4	■	■	■
T5	■	■	■

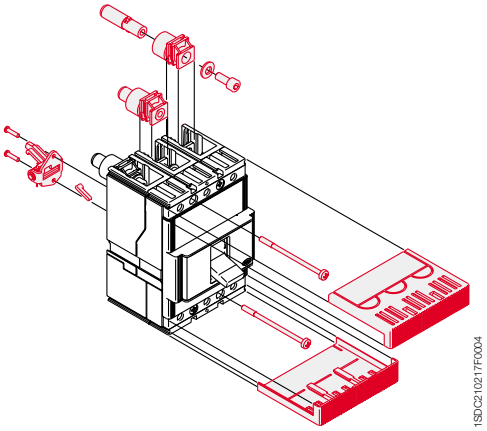
Kit for conversion into moving part of plug-in for T2 - T3 - T4 - T5

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
- terminal covers.

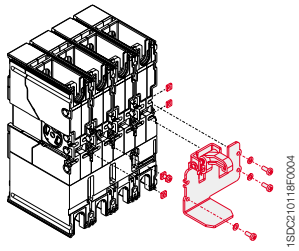
The fixed part for plug-in version is necessary to complete the circuit-breaker.
In the case where the circuit-breaker has some electrical accessories mounted (SOR, UVR, MOS, MOE, MOE-E, RC22_, AUX, AUX-E, AUE), the plug-socket connectors for isolation of the relative auxiliary circuits can also be ordered.

T1-T2-T3

T4-T5



T1-T2-T3

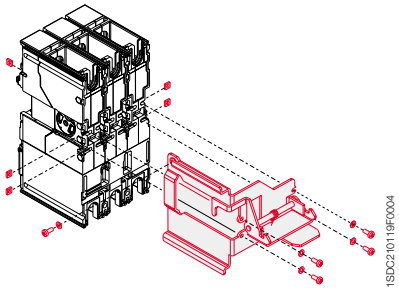


T4-T5

Kit for conversion into moving part of withdrawable for T4 and T5

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
- terminal covers.

The circuit-breakers in the withdrawable version must always be completed either with the front for lever operating mechanism, rotary handle operating mechanism or motor operator.
The fixed part for withdrawable version is necessary to complete the circuit-breaker.



Accessories

Versions and types

Fixed part - FP

The fixed part, available for T2, T3, T4 and T5, allows the circuit-breaker to be made in the plug-in or withdrawable version. Different positions of the circuit-breaker are possible:

– plug-in: racked-in, removed
– withdrawable: racked-in, removed and racked-out.

The fixed parts for T2 and T3 are available, in the standard version, with front terminals (F). A distinguishing characteristic is the possibility of equipping these fixed parts with the same terminal, terminal cover and phase separator kits used for the fixed circuit-breakers. With Tmax T4 and T5, codes of fixed parts are available with different types of terminals (EF, HR, VR). The fixed parts with EF terminals, moreover, can be also equipped with ES, FC Cu and FC CuAl terminals.

The fixed part for the withdrawable version circuit-breakers is fitted with a guide to support the moving part during the isolation or racking-out operations and is fitted with racking-out crank handle and flange for the compartment door to replace the one supplied with the fixed version circuit-breaker.

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

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.

Accessories

Connection terminals

The basic version circuit-breaker is supplied with:
– front terminals for copper cables (FC Cu), for the Tmax T1 circuit-breaker
– front terminals (F), for the Tmax T2, T3, T4 and T5 circuit-breaker.
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.
A notable characteristic for T2 and T3 is that all the different types of terminals available can be mounted either on the fixed version circuit-breaker or on the corresponding fixed part of the plug-in circuit-breaker. On the other hand, for T4 and T5 fixed part can mount EF, HR or VR terminals, and, moreover, fixed part with EF terminals can be equipped also with ES, FC Cu and FC CuAl terminals.

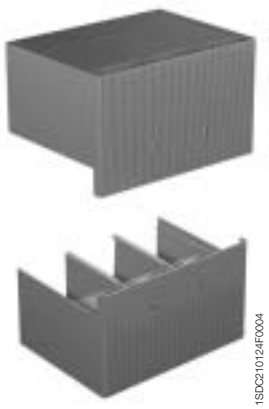
On page 3/9 and following, the information needed to make the connections for each type of terminal are summarised. For connection with bare cables, the minimum and maximum cross-sections of the cables which can be clamped in the terminals, the type of cables (rigid or flexible) and the diameter of the 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.
It is also very important to remember that 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.

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 IP40 degree of protection for fixed circuit-breakers with rear terminals and for moving parts of plug-in circuit-breakers
– high terminal covers (HTC): these guarantee IP40 degree of protection, for fixed circuit-breakers with front, front extended, front for cables terminals.
With Tmax T2 and T3, the fixed parts of plug-in circuit-breakers can use the same terminal covers as the corresponding fixed circuit-breakers. For fixed parts of T4 and T5 400, the proper terminal covers (TC-FP) are available.
The degrees of protection indicated are valid for the circuit-breaker installed in a switchboard.



Accessories

Connection terminals

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), whereas the ones with height H=200 mm are compulsory with front extended spread type terminals (ES).
They 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.
With the phase separating partitions mounted, on request, with Tmax T1, T2 and T3 a special kit is available to reach IP40 degree of protection from the front of the circuit-breaker.
Moreover, it is possible to mount the phase separating partitions between two circuit-breakers or fixed parts side by side.

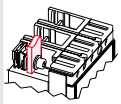
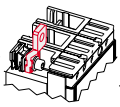
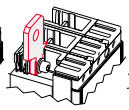
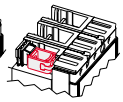
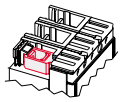
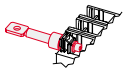
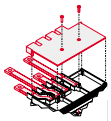
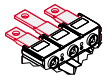
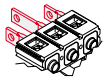
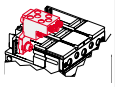
Screws for sealing the terminal covers

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 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) or with the front terminals (F) for T3, T4 and T5.

Connection terminals

	F	EF	ES	FC Cu	FC CuAl	FC CuAl	R	HR for RC221/222	HR	VR	MC
											
	Front terminals	Front extended terminals	Front extended spread terminals	Front terminals for copples cables	Front terminals for CuAl cables	Front terminals for CuAl cables[1]	Rear terminals	Rear flat horizontal terminals	Rear flat horizontal terminals	Rear flat vertical terminals	Multi-cable terminals
T1		F		F[2]		F		F	F		
T2	F-P[2]	F-P	F-P	F-P	F-P	F-P	F-P				
T3	F-P[2]	F-P	F-P	F-P	F-P	F-P	F-P				
T4	F[2]	F-P-W	F	F-P-W		F-P-W	F		P-W	P-W	F
T5	F[2]	F-P-W	F-P[3]-W[3]	F-P-W		F-P-W	F		P-W	P-W	

[1] Housed externally
[2] Standard supply
[3] Only for T5 630

F = Fixed
P = Plug-in
W = Withdrawable

Front terminals - F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Allow connection of busbars or cables terminated with cable terminal

Type	Version	Pieces	Busbars/cable terminal [mm]				Tightening [Nm]	Terminal covers			Phase separators
			W	H	D	Ø	B	high	low	fixed part	
T2	F - P	1	20	7.5	5	6.5	6	R	R	–	R
T3	F - P	1	24	9.5	8	8.5	8	R	R	–	R
T4	F	1	25	9.5	8	8.5	18	R	R	–	R
T5	F	1	35	11	10[1]	10.5	28	R	R	–	R

[1] minimum 5 mm


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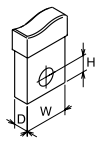
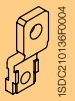


A = Tightening the terminal onto the circuit-breaker
B = Tightening the cable/busbar onto the terminal
R = On request
S = Standard

Accessories

Connection terminals

Front extended terminals - EF



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	D	Ø	L	Ø	A	B[1]	high	low	fixed part	
T1	F	1	15	5	8.5	15	8.5	7	9	R	–	–	S
T2	F - P	1	20	4	8.5	20	8.5	6	9	R	–	–	S
T3	F - P	1	20	6	10	20	10	8	18	R	–	–	S
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

[1] class 4.8 screws (not supplied)

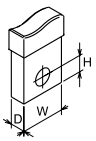
3

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	D	Ø	L	Ø	A	B	high	low	fixed part	
T2	F-P	1	30	4	10.5	30	10.5	6	18	–	–	–	S
T3	F-P	1	30	4	10.5	30	10.5	8	18	–	–	–	S
T4	F	1	30	6	10.5	30	10.5	18	18	–	–	–	S
T5	F-P[1]-W[1]	1	40	10	11	11	11	28	18	–	–	–	S

[1] only for T5 630



A = Tightening the terminal onto the circuit-breaker
B = Tightening the cable/busbar onto the terminal
R = On request
S = Standard

Front terminals for copper cables - FC Cu

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

Type	Version	Pieces	Cable [mm²]		Flexible busbars	Tightening [Nm]		Ø [mm]	Terminal covers			Phase separators
			rigid	flexible	W x S x N(1)	A	B		high	low	fixed part	
T1/T1 1p	F	1	2.5…70	2.5…50	9x0.8x6	–	7	12	R	R	–	R
	F	2	–	2.5…50	–	–	7	12	R	R	–	R
T2	F - P	1	1…95	1…70	13x0.5x10	–	7	14	R	R	R	R
	F - P	2	–	1…50	–	–	7	14	R	R	R	R
T3	F - P	1	6…185	6…150	15.5x0.8x10	–	10	18	R	R	R	R
	F - P	2	–	6…70	–	–	10	18	R	R	R	R
T4	F - P - W	1	2.5…185	2.5…150	15.5x0.8x10	–	10	18	R	R	S	R
	F	2	–	2.5…95	–	–	10	18	R	R	S	R
T5	F - P - W	1	16…300	16…240	24x1x10	–	25	28	R	R	S	R
	F	2	–	16…150	–	–	25	28	R	R	S	R
	F	2	50…185	50…185	–	18	31	21.5	S	–	–	–

(1) W = width; S = thickness; N = n. of bars

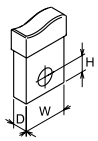
Front terminals for copper/aluminium cables - FC CuAl

T2-T5 Standard

T4-T5 External

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

Type	Assembly	Version	Pieces	Cable [mm²]	Tightening [Nm]		Ø [mm]	Terminal covers			Phase separators
				rigid	A	B		high	low	fixed part	
T1	external	F	1	35…95	7	13.5	14	S			
T2	standard	F - P	1	1…95		7	14	R	R	R	R
	external	F - P	1	70…185	6	25	18	S		S	
	external	F - P	2	35…95	6	12	16	S		S	
T3	standard	F - P	1	70…185		16	18	R		R	R
	external	F - P	1	150…240	8	31	24	S		S	
	external	F - P	2	35…150	8	16	18	S		S	
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	
T5	standard	F - P - W	1	120…300	18	43	24.5	R	R	R	R
	external	F	2	95…240	18	31	24.5	S		S	

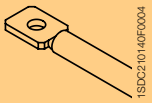


A = Tightening the terminal onto the circuit-breaker
B = Tightening the cable/busbar onto the terminal
R = On request
S = Standard

Accessories

Connection terminals

Rear orientated terminals - R

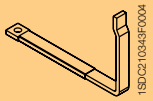


Allow connection of bu sbars or cable terminal at the rear. They can be installed in 4 different positions to facilitate connection to cable/busbars

Type	Version	Pieces	Busbars [mm]			Tightening [Nm]		Terminal covers		Phase separators
			W	D	Ø	A	B	high	low	
T2	F - P	1	20	4	8.5	6	9	–	S	–
T3	F - P	1	20	6	8.5	6	9	–	S	–
T4	F	1	20	10	8.5	6	9	–	S	–
T5	F	2	30	7	11	18	18	–	S	–

3

Rear flat horizontal terminals for RC221/RC222 - HR

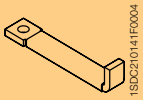


Allow connection of busbars or cable terminal at the rear with RC221/RC222. They can be installed horizontally

Type	Version	Pieces	Busbars [mm]			Tightening [Nm]		Terminal covers		Phase separators
			W	D	Ø	A	B	high	low	
T1	F	1	14	5	6.2	7	5[1]	–	–	–

[1] class 8.8 screws (not supplied)

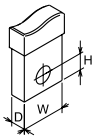
Rear flat horizontal terminals - HR



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

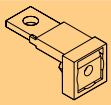
Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers		Phase separators
			W	D	Ø	L	Ø	A	B	high	low	
T1	F	1	14	5	6.2	14	6.2	7	5[1]	–	S	–

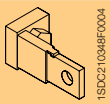
[1] class 8.8 screws (not supplied)



A = Tightening the terminal onto the circuit-breaker
B = Tightening the cable/busbar onto the terminal
R = On request
S = Standard

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

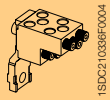




These allow connection of busbars or cable terminals at the rear. There are rear horizontal or vertical terminals.

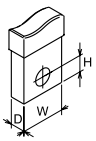
Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers			Phase separators
			W	D	Ø	W	Ø	A	B	high	low	fixed part	
T4	P - W	1	20	10	10	20	10	18	–	–	–	–	–
T5 400	P - W	1	25	10	12	25	12	18	–	–	–	–	–
T5 630	P - W	2	40	15	11	40	11	18	–	–	–	–	–

Multi-cable terminals - MC



Allow connection of cables directly to the circuit-breaker

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	–	–	–



A = Tightening the terminal onto the circuit-breaker
B = Tightening the cable/busbar onto the terminal
R = On request
S = Standard

Accessories

Service releases

The service releases, shunt opening release and undervoltage release, housed and fixed in the slot on the left-hand side of the circuit-breaker are always alternative to each other for T1, T2 and T3, both in the three- and four-pole version; whereas, for T4 and T5 in the four-pole version (the releases) can be housed simultaneously. They can be supplied in the pre-cabled version with 1 m long free cables for T1, T2 and T3 or with socket-plug connectors, still with 1m long cables for T4 and T5, or in the uncabled version, with wiring carried out by the customer. Assembly is carried out by pressing into the appropriate seat on the left-hand part of the circuit-breaker and fixing with the screw provided.

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 Un, both in alternating current and in direct current. It is always fitted with an auxiliary limit contact.

T1-T2-T3

T4-T5

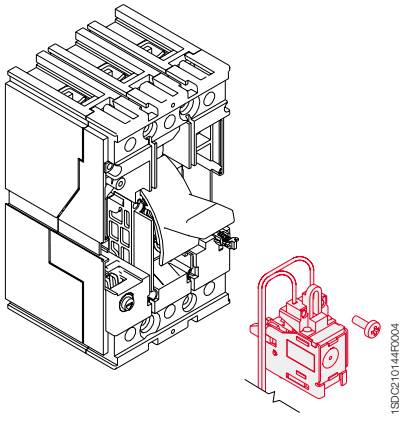
SOR - Electrical characteristics

	Tmax T1, T2, T3		Tmax T4, T5	
	Inrush power consumption			
Version	**AC [VA]**	**DC [W]**	**AC [VA]**	**DC [W]**
12 V DC		50		150
24…30 V AC/DC	50	50	150	150
48…60 V AC/DC	60	60	150	150
110…127 V AC - 110…125 V DC	50	50	150	150
220…240 V AC - 220…250 V DC	50	50	150	150
380…440 V AC	55		150	
480…500 V AC	55		150	
Opening times [ms]	15	15	15	15

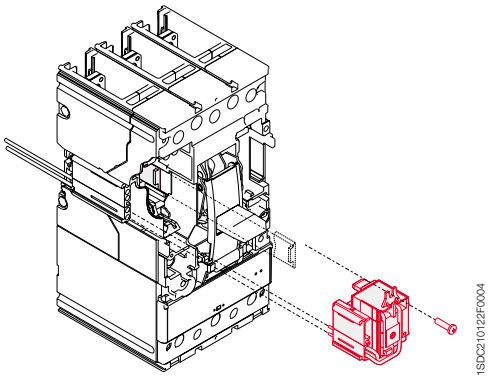
Furthermore, PS-SOR opening coils with permanent operation are also available for T4 and T5, with a much lower power consumption and these can be continuously supplied: in this case they are not, in fact, fitted with an auxiliary limit contact. Again for these coils, either the pre-cabled or uncabled version can be selected.

PS-SOR - Electrical characteristics

	Tmax T4, T5	
Version	**AC [VA]**	**DC [W]**
24…30 V DC		4
110…120 V AC	4	



T1-T2-T3



T4-T5

Undervoltage release - UVR

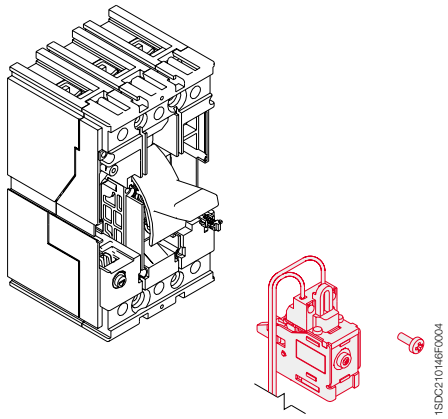
Opens the circuit-breaker due to lack of release power supply voltage or to drops to values under 0.7 x Un with a trip range from 0.7 to 0.35 x Un. After tripping, the circuit-breaker can be closed again starting from a voltage higher than 0.85 x Un. With the undervoltage release de-energised, it is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

T1-T2-T3

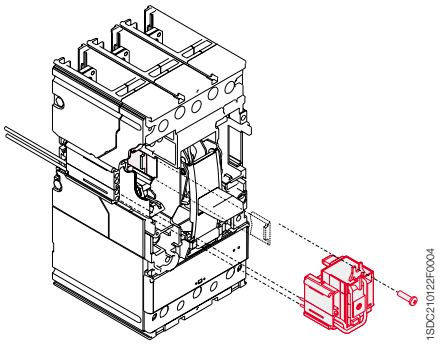
T4-T5

UVR - Electrical characteristics

	Tmax T1, T2, T3		Tmax T4, T5	
	Power consumption during permanent operation			
Version	**AC [VA]**	**DC [W]**	**AC [VA]**	**DC [W]**
24…30 V AC/DC	1.5	1.5	6	3
48 V AC/DC	1	1	6	3
60 V AC/DC	1	1	6	3
110…127 V AC - 110…125 V DC	2	2	6	3
220…240 V AC - 220…250 V DC	2.5	2.5	6	3
380…440 V AC	3		6	
480…500 V AC	4		6	
Opening times [ms]	15	15	≤ 25	≤ 25



T1-T2-T3



T4-T5

Accessories

Service releases

Time delay device for undervoltage release - UVD

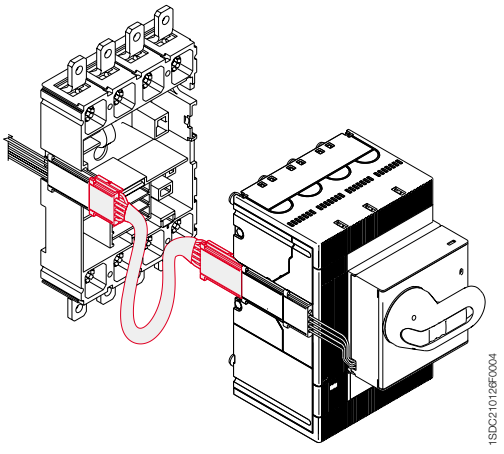
The undervoltage release can be combined with an external electronic power supply time delay device, which allows circuit-breaker opening to be delayed in the case of a drop or failure in the power supply voltage of the release itself, according to preset and adjustable delays, in order to prevent unwarranted trips caused by temporary malfunctions. The delay device must be combined with an undervoltage release with the same corresponding voltage.
This time delay device can also be combined either with the Tmax T1…T5 or Isomax circuit-breakers.

UVD

Circuit-breaker	Power supply voltage [V AC/DC]
T1…T5	24…30
T1…T5	48…60
T1…T5	110…125
T1…T5	220…250
Delay which can be set [s]	0.25 - 0.5 - 0.75 - 1 - 1.25 - 2 - 2.5 - 3

Testing extension for service releases

Available for Tmax T4 and T5, 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.



Accessories

Electrical signals

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. They can be supplied in the pre-cabled version with free cables 1 m long for T1, T2 and T3 or with socket-plug connectors, still with cables 1 m long, for T4 and T5, or in the uncabled version, with cabling carried out by the customer, according to the type of auxiliary contact.

Auxiliary contacts for external signalling - AUX and AUX-E

AUX - 250 V AC/DC

AUX-C - 250 V AC/DC

AUX 400 V AC

The AUX auxiliary contacts carry out electrical signalling of the operating state of the circuit-breaker:

- open/closed: indicates the position of the circuit-breaker contacts
- 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 due to operation of the test pushbutton
- contact for signalling electronic release trip: signals intervention of one of the protection functions of the electronic release.

Signalling is reset when the circuit-breaker is rearmed (reset).

The auxiliary contacts can be supplied (according to the type) either in the version with cabling to be carried out by the customer by means of connection to the terminals integrated with the auxiliary contacts, or in the pre-cabled version with 1m long cables for T1, T2 and T3 or with connectors, still with 1m long cables, for T4 and T5.

AUX - Electrical characteristics

AUX 250 V - T1, T2, T3, T4 and T5		
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 (Imax 6 A)		

AUX 400 V - T4, T5		
Power supply voltage	**Service current In [A]**	
	AC	**DC**
125 V	–	0.5
250 V	12	0.3
400 V	3	–

AUX 24 V - T1, T2, T3, T4 and T5		
Power supply voltage	**Service current In [A]**	
	AC	**DC**
24 V	0.3	≥ 0.75 mA
5 V		≥ 1 mA

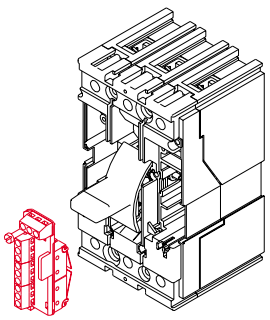
AUX-E	
Typical contact	photoMOS
Vmax	300V DC/250 V AC
Imax	100 mA AC/DC
Pmax (resistive load)	30 W
Insulation voltage	3500 V (1 min. and 50 Hz)

The auxiliary contacts are available for use with different voltages either in direct or alternating current:

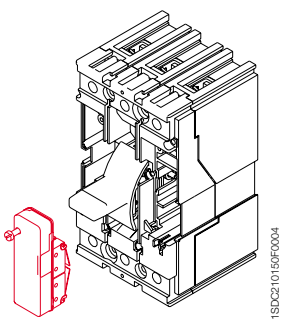
T1, T2, T3, T4 and T5 (AUX) - 250V AC/DC

Both in the pre-cabled and uncabled version for use at 250 V AC/DC:

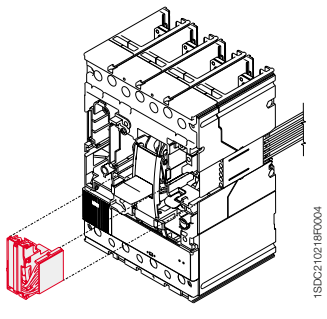
- a contact for signalling (on changeover) open/closed plus a contact (on changeover) for release trip
- three contacts for signalling (on changeover) open/closed plus a contact (on changeover) for release trip.



AUX 250 V AC/DC



AUX-C 250 V AC/DC



AUX 400 V AC

Accessories

Electrical signals

T4 and T5 (AUX) - 400 V AC

Only in the pre-cabled version for use at 400 V AC:

– a contact for signalling (on changeover) open/closed plus a contact (on changeover) for release trip
– two contacts for signalling (on changeover) open/closed.

T1, T2, T3, T4 and T5 (AUX) - 24 V DC

Gold-plated in both the pre-cabled and uncabled version for T4 and T5 and only in the uncabled version for T1, T2 and T3 for use up to 24 V DC (digital contacts):

– three contacts for signalling (on changeover) open/closed plus a contact (on changeover) for release trip.

T2 with PR221DS electronic release (AUX)

Only in the pre-cabled version:

– a contact for signalling alarm which signals intervention of one of the protection functions of the electronic release plus a contact for signalling (on changeover) open/closed plus a contact for signalling (on changeover) release trip.

T4 and T5 with PR221DS, PR222DS/P, PR222DS/PD or PR222MP electronic release (AUX-SA) - 250 V AC

Only in the pre-cabled version for use at 250 V AC:

– a contact for signalling electronic release trip.

T4 and T5 (AUX-MO)

Only in the uncabled version, to be combined with the MOE or MOE-E motor operator:

– a contact for signalling the operating mode of the circuit-breaker with the motor operator: manual or remote.

T4 and T5 with PR222DS/PD electronic release (AUX-E)

Only 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 release and make an open/closed signal available to the outside and one for electronic release trip.
They can only be combined with the PR222DS/PD electronic release and only function when there is a 24 V DC auxiliary power supply to the release for the communication functions.
The AUX-E contacts can, moreover, be directly connected to the MOE-E motor operator (see page 3/22).

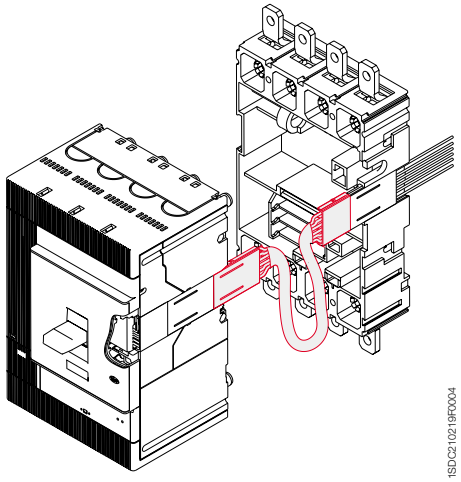
A changeover contact signalling trip of the residual current protection is always supplied for the circuit-breakers combined with the RC221 and RC222 residual current releases. With the RC222 changeover contacts for signalling pre-alarm and alarm are also available.

Types of auxiliary contacts

		Version	T1	T2 TMD	T2 PR221DS	T3	T4	T5
AUX 250 V AC/DC	1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled / not cabled	■	■		■	■	■
AUX 250 V AC/DC	3 open/closed changeover contacts + 1 release tripped changeover contact	pre-cabled / not cabled	■	■		■	■	■
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	3 open/closed changeover contacts + 1 release tripped changeover contact	pre-cabled / not cabled					■	■
AUX 24 V DC	3 open/closed changeover contacts + 1 release tripped changeover contact	not cabled	■	■		■		
AUX	1 contact signalling coil tripped + 1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled			■			
AUX-SA	1 contact signalling coil tripped	pre-cabled					■	■
AUX-MO	1 contact signalling manual/remote	not cabled					■	■
AUX-E	1 open/closed contact + 1 relay tripped contact (only with PR222DS/PD)	pre-cabled					■	■

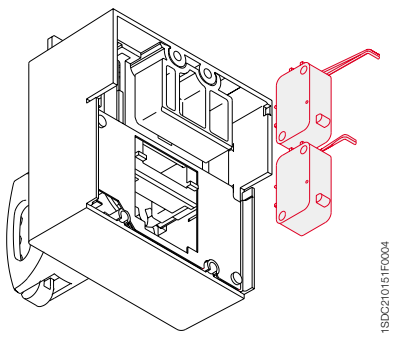
Testing extension for auxiliary contacts

Available for Tmax T4 and T5 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

Two normally open contacts, advanced in relation to closing. They allow the undervoltage release or a control device 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 rotary handle operating mechanism. The early contacts are only supplied in the cabled version with 1 m long cables, complete with socket-plug with 6 poles for T1, T2 and T3 or with socket-plug connectors with 1 m. cables for T4 and T5. It is necessary to bear in mind that the connectors for T4 and T5, once inserted in the special slot on the right-hand side of the circuit-breaker, extend in relation to the outline of the circuit-breaker itself.



Auxiliary position contacts - AUP

For the fixed part of circuit-breakers, Tmax T2, T3, T4 and T5, these provide electrical signalling of the circuit-breaker position in relation to the fixed part. The following auxiliary position contacts are available:

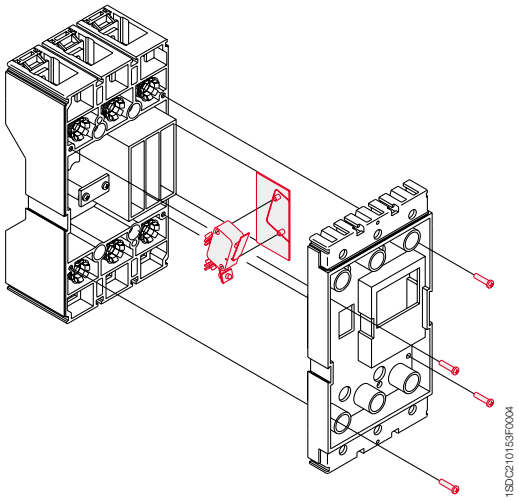
T2, T3

– contacts signalling circuit-breaker racked-in

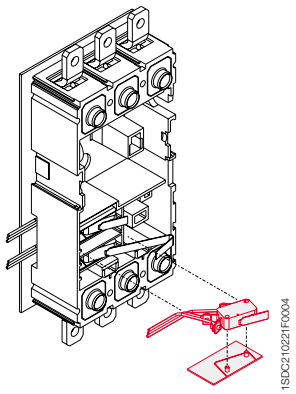
T4, T5

– contacts signalling circuit-breaker racked-in
– contacts signalling circuit-breaker racked-out
– contacts signalling circuit-breaker racked-in 24 V DC
– contacts signalling circuit-breaker racked-out 24 V DC.

A maximum of three contacts in any combination can be installed on the fixed part of T2, T3, T4 and T5.

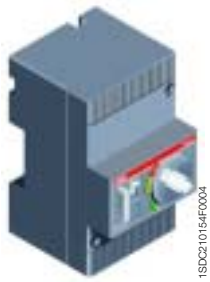


T2-T3



T4-T5

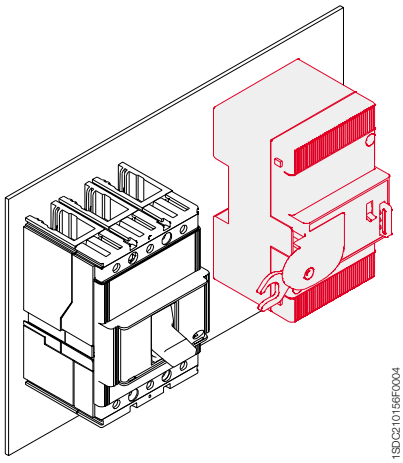
Solenoid operator for T1, T2 and T3 - MOS

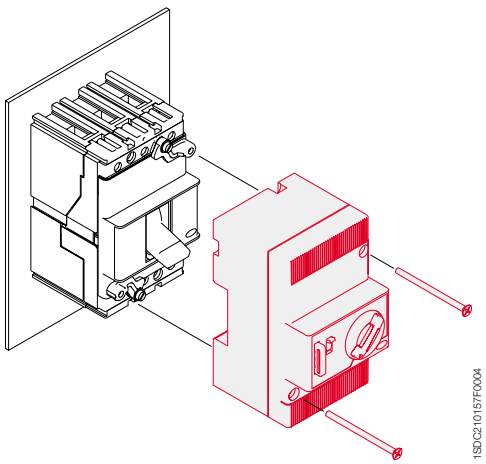


Allows remote circuit-breaker opening and closing control and is particularly recommended for use in electric network supervision and control systems. A selector allows passage from automatic to manual operation. It is always provided with a padlock in the open position.
It operates both circuit-breaker opening and closing, working directly on the circuit-breaker lever.
It is offered in two versions, one “side-by-side” with the circuit-breaker, with T1 and T2, for installation on a panel or DIN EN 50022 rail, the other on the “front”, with T1, T2 and T3, suitable for installation directly on the front of the circuit-breaker. The latter is complete with operating handle. The front version can also be used with plug-in circuit-breakers.
Coupling with the residual current release is only allowed for a circuit-breaker with solenoid operator side-by-side, to allow access to the user interface of the residual current release from the front of the switchgear. In fact, using the solenoid operator superimposed would imply the circuit-breaker position on the rear of the door and its residual current release and the interface would no longer be accessible. This combination can only be installed directly on the back plate of the switchgear.
Both versions can be used either in the three-pole or four-pole version.
The solenoid operator is supplied complete with 1m long cables and, just for the superimposed version, with a socket-plug connector with 3 poles.
Both the opening and closing commands are operated by the solenoid which acts directly on the circuit-breaker lever. The table shows the power supply voltage values Un [V].

Rated voltage, Un		
AC	[V]	110…250
DC	[V]	48…60 / 110…250
Operating voltage		85…110% Un
Inrush power consumprion		2500 [VA] / 1000 [W]
Time	opening [s]	< 0.1
	closing [s]	< 0.1
Mechanical life	[no. Operations]	25000
	[no. Operations/h]	240 (T1 e T2); 120 (T3)
Degree of protection, on the front		IP30
Minimum control impulse time on opening and closing	[ms]	>100

Note: with the MOS in the 110…250 V AC/DC version, it is necessary to use the MOS-A adapter (supplied) for the 200 V ≤ Un ≤ 250 V service voltage





Accessories

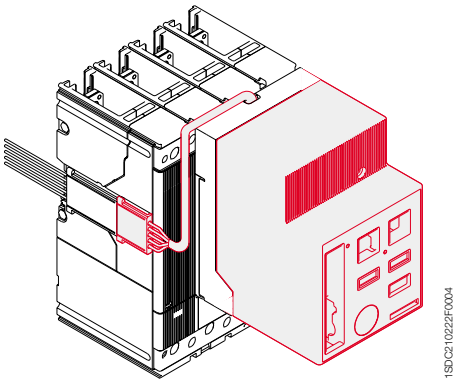
Remote control

Stored energy motor operator for T4 and T5 - 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 1m long cables and is always fitted with a padlock. The connectors, once inserted in the special slot on the right-hand side of the circuit-breaker, extend in relation to the outline of the circuit-breaker itself. The same flange already supplied with the circuit-breaker can be used.
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.

MOE and MOE-E		Tmax T4, T5	
Rated voltage, Un		AC [V]	DC [V]
		–	24
		–	48…60
		110…125	110…125
		220…250	220…250
		380	–
Operating voltage		85…110% Un	85…110% Un
Power consumption on inrush Ps		≤ 300 VA	≤ 300 W
Power consumption in service Pc		≤ 150 VA	≤ 150 W
Duration	opening [s]	1,5	
	closing [s]	< 0,1	
	resetting [s]	3	
Mechanical life	[no. operations]	20000	
Degree of protection, on the front		IP30	
Minimum opening and closing control time	[ms]	≥ 150	

The motor operator is always fitted with an auxiliary 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 the PR222DS/PD electronic release, instead of the MOE motor operator, it is necessary to use the MOE-E motor operator: for its use, the circuit-breaker must also be fitted with the AUX-E auxiliary contacts. The MOE-E allows use of the digital signals coming from the supervision and control system, by means of the PR222DS/PD release 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 table gives the power supply voltage values Un [V].



Testing extension for motor operators

Available for circuit-breakers Tmax T4 and T5, 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.

Adapters - ADP

For the pre-cabled SOR, UVR, AUX, MOE electrical accessories or MOE-E and AUE, used with Tmax T4 and T5 in the plug-in or withdrawable version, the adapters to be coupled with the plug which will then be connected to the socket placed on the fixed part must be used for the moving parts.
There are four types of adapters available:
– 5-way adapters
– 6-way adapters
– 10-way adapters
– 12-way adapters.
The table below indicates the adapters which must be used for all the possible combinations of accessories:

Adapters - ADP

	5-way	6-way	10-way	12-way
AUX 250 V AC/DC 1 open/closed changeover contact + 1 release tripped changeover contact		■		
AUX 400 V AC 1 open/closed changeover contact + 1 release tripped changeover contact		■		
AUX 400 V AC 2 open/closed changeover contact		■		
AUX-E 1 open/closed changeover contact + 1 release		■		
SOR	■			
UVR	■			
Trip coil for residual current release	■			
SOR o UVR + **Trip coil for residual current release**	■			
MOE o MOE-E			■	
MOE + **SOR o UVR**			■	
MOE + **SOR o UVR +** **Trip coil for residual current release**			■	
AUE			■	
AUE + **SOR o UVR**			■	
AUE + **SOR o UVR +** **Trip coil for residual current release**			■	
AUX 250 V AC/DC 3 open/closed changeover contacts + 1 release tripped changeover contact				■
AUX 24 V DC (digital contacts) 3 open/closed changeover contacts + 1 release tripped changeover contact				■

For Tmax T2 and T3 in the plug-in version, it is necessary, on the other hand, to order the socket-plug connectors: with 12 poles for the AUX auxiliary contacts - 3 open/closed changeover + 1 release tripped changeover, with 6 poles for the AUX auxiliary contacts -1 open/closed changeover + 1 release tripped changeover and with 3 poles for the service releases (SOR or UVR).

Accessories

Operating mechanism and locks

Rotary handle operating mechanism - RHD/RHE

T1-T2-T3

T4-T5

Thanks to its ergonomic grip, the rotary handle facilitates operation. 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 interlocking plate (MIF) for T1, T2 and T3, or to the motor operator and to the front for lever operating mechanism for T4 and T5. The rotary handle operating mechanism is available in either the direct version or in the transmitted version on the compartment door.

The release settings and nameplate data remain accessible to the user.

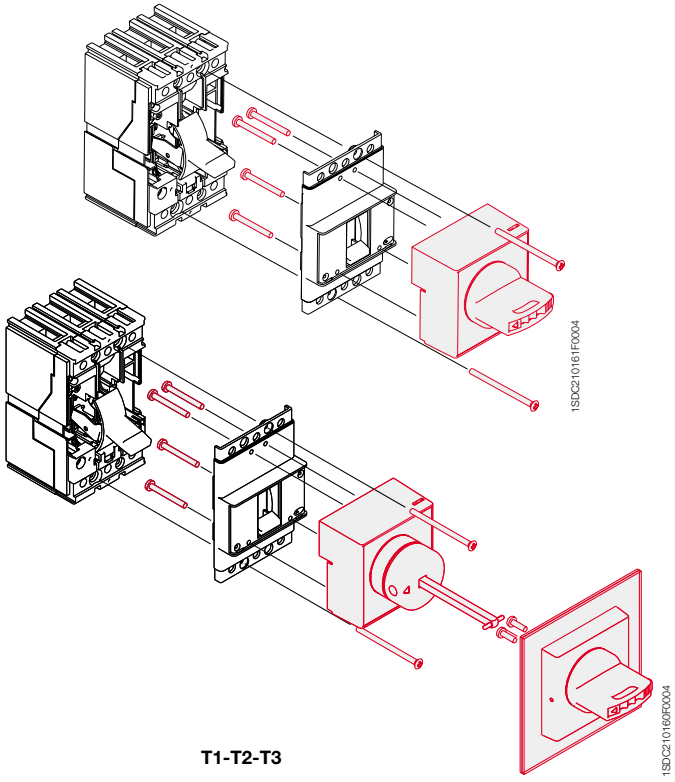
The rotary handle operating mechanism in the emergency version is also available, complete with yellow-red handle and yellow plate, suitable for controlling machine tools.

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

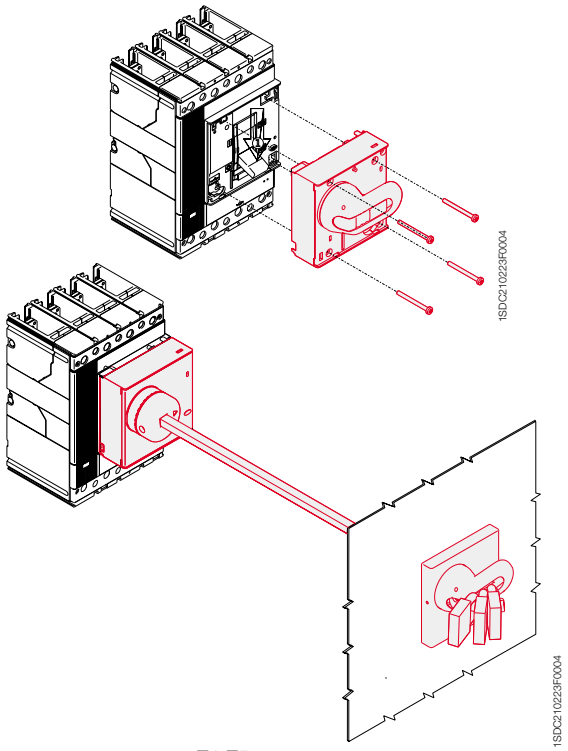
– rotary handle on the compartment door
– transmission rod (500 mm)
– base for circuit-breaker

or, alternatively, by using the code of the ready-configured version.

Type of RH_ operating mechanism		T1	T2, T3		T4, T5		
		F	F	P	F	P	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	■	■	■	■	■	■



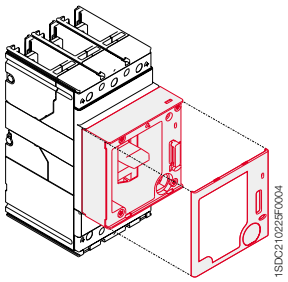
T1-T2-T3



T4-T5

Front for lever operating mechanism - FLD

This can be installed on fixed, plug-in or withdrawable Tmax T4 and T5 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.



Key lock for rotary handle operating mechanism for T1, T2 and T3 - RHL

This allows the mechanical closing operation of the circuit-breaker to be locked.
The following versions are available:
– lock with different key for each circuit-breaker
– lock with the same key for groups of circuit-breakers.
The circuit-breaker in the open position ensures isolation of the circuit in accordance with the IEC 60947-2 Standard. It is also available in the version which allows the lock both in the open and closed position. The lock in the closed position does not prevent release of the mechanism following a fault or remote control.

Key lock on the circuit-breaker for T1, T2 and T3 - KLC

This allows the mechanical closing operation of the circuit-breaker to be locked and is installed directly on the front in the slot in correspondence with the left pole. It cannot be mounted with a front operating mechanism, a rotary handle operating mechanism, a motor operator, RC221/RC222 residual current releases and, only in the case of three-pole circuit-breakers, with service releases (UVR, SOR). The key lock is the Ronis 622 type and is available in two versions:
– standard type, with key only removable with the circuit-breaker locked
– special type, with key removable in both positions.

Accessories

Operating mechanism and locks

Key lock for T4 and T5 - 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 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 and T5 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 and T5)

For T4 and T5 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).

Sealable thermal adjustment lock

This is applied to the circuit-breaker cover near the thermal element regulator of the TMD thermomagnetic release for T1, T2 and T3 and prevents it being tampered with.

IP54 protection for rotary handle

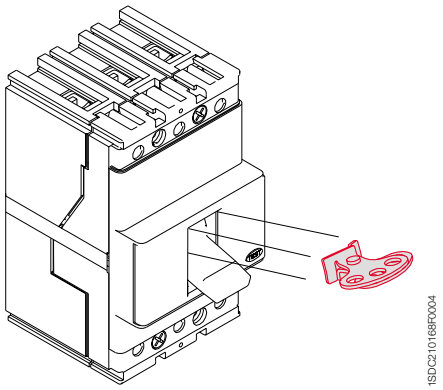
Allows IP54 degree of protection to be obtained.
It is available for the transmitted rotary handle operating mechanism on the compartment door (RHE) for the T1, T2, T3 , T4 and T5 circuit-breakers.

Padlock for operating lever - PLL

This is applied to the T1 - T2 - T3 circuit-breaker cover to prevent the lever closing or opening operation. It allows installation up to a maximum of three padlocks - 7 mm Ø stem (not supplied). It is available in the following versions:

– locking device only of the closing operation (it is applied with circuit-breaker on ON/OFF)
– locking device on the closing and opening operation according to the assembly position. The lock on the opening operation does not prevent release of the mechanism following a fault or remote control command.

It is incompatible with the front accessories: solenoid operator, rotary handle operating mechanism and mechanic interlock.



Overview of the available locks

	T1	T2	T3	T4	T5
FDL_ Front for lever operating mechanism				■	■
RHL_ Keylock for rotary handle operating mechanism	■	■	■		
KLC_ Key lock on the circuit-breaker	■	■	■		
KLF-D and **KLF-S** Key lock for front for lever and rotary handle				■	■
KLF-FP and **PLL FP_** Locks in open position for fixed part				■	■
Sealable lock of thermal adjustment	■	■	■		
PLL_ Padlock for operating lever	■	■	■		
MOL-D and **MOL-S_** Key lock in open position for MOE and MOE_E				■	■
MOL-M_ Key lock against manual operation for MOE and MOE_E				■	■

Accessories

Operating mechanism and locks

Mechanical interlock

T1, T2, T3

The mechanical MIF interlock can be applied on the front of two T1, T2 or T3 circuit-breakers mounted side by side, in either the three-pole or four-pole fixed version and prevents simultaneous closing of the two circuit-breakers. Fixing is carried out directly on the back plate of the switchboard. The front interlocking plate allows installation of a padlock in order to fix the position (possibility of locking in the O-O position as well). It is also possible to interlock three circuit-breakers side by side, using the proper plate, thereby making the following interlock combinations: IOO-OIO-OOI-OOO.
It is incompatible with the front accessories (solenoid operator, rotary handle operating mechanism) and with the residual current releases

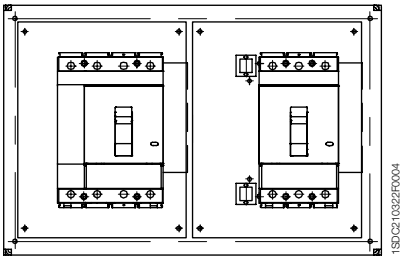
T4, T5

The mechanical interlock for T4 and T5 allows installation of two circuit-breakers on a single support and, by means of special lever mechanisms, makes them mechanically interdependent.
Unlike the interlock used with T1, T2 and T3 which is frontal, this is a rear interlock consisting of a vertical or horizontal frame group (MIR-HB or MIR-VB), made up of a metal frame and of the leverisms to interlock, and of two plates (MIR-P) on which the circuit-breakers are housed.
Types of back plates:

Interlock

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

It will be the customer to make up the interlock selecting the back plates available and the horizontal or vertical frames. The following interlock combinations can be made: IO-OI-OO.
Since this is a rear interlock, all the front accessories which are compatible with the circuit-breakers installed can be used.



Accessories

Residual current releases

All the Tmax series of circuit-breakers are preset for combined assembly with residual current releases. In particular, the Tmax T1, T2 and T3 circuit-breakers can be combined with the new version of the SACE RC221 or RC222 series of residual current releases and four-pole T4 and T5 with RC222 or RC223 to be installed below the circuit-breaker.
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 the Tmax T1D, T3D, 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 60255-3 (SACE RCQ and RC223) and IEC 61000: for protection against unwarranted release
– IEC 60755 (SACE RCQ): for insensitivity to direct current components.

3

RC221 and RC222 residual current releases for T1, T2 and T3


1SDC210170F0004


1SDC210212F0004

The RC221 and RC222 residual current releases can be installed either on the Tmax T1, T2 and T3 circuit-breakers, or on the T1D and T3D switch-disconnectors. The versions available make their use possible both with three-pole and four-pole circuit-breakers, in the fixed version.
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.
The RC221 and 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, whereas they are incompatible with the three-pole circuit-breakers.

Accessories

Residual current releases

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.

The bracket for fixing onto DIN 50022 rail is available on request.
The configuration foresees insertion of the circuit-breaker on the structure of the corresponding residual current release, making access to the adjustments on the left-hand side of the circuit-breaker available, whilst the toroid is in the underneath position.
A distinguishing characteristic is provided by the type of cable connection which is made directly on the circuit-breaker, once the residual current release has been mounted, thereby ensuring simplification and rationalisation of the installation procedure.
With Tmax T2 and T3, only front terminals for copper cables (FC Cu) at the bottom are mounted on the residual current releases. For this reason, when the residual current release is ordered, the FC Cu terminal semi-kit is always supplied (consult the code section on page 7/36).
On the other hand, for four-pole Tmax T1, it is also possible to mount the rear horizontal flat terminal kit below (HR for RC221/RC222).
Furthermore, still for four-pole T1, a version of the RC222 residual current release is available in 200 mm modules. This release keeps the same technical characteristics as the normal RC222 for T1, T2 and T3 but, thanks to its reduced height, allows installation in 200 mm modules. Its special shape also allows a reduction in the overall dimensions when two or more units are placed side by side.

3

RC222 residual current release for T4 and T5

With T4 and T5, in the four-pole version, it is possible to use an RC222 residual current release below the circuit-breaker.
This RC222 residual current release, in the fixed version, can easily be converted into plug-in by adding the special conversion kit.
The RC222 release is constructed using electronic technology and acts 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.
It does 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 as long as there is that of the neutral to the first pole on the left.
The RC222 residual current release 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 release is 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.

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

		RC221	RC222	
Circuit-breakers size		**T1-T2-T3**	**T1-T2-T3**	**T4 and T5**
Type		“L” shaped	“L” shaped	Placed below
Technology		microprocessor-based	microprocessor-based	microprocessor-based
Action		with solenoid	with solenoid	with solenoid
Primary service voltage (1)	[V]	85…500	85…500	85…500
Operating frequency	[Hz]	45…66	45…66	45…66
Self-supply		■	■	■
Test operation range (1)		85…500	85…500	85…500
Rated service current	[A]	up to 250 A	up to 250 A	up to 630 A
Rated residual current trip	[A]	0.03 - 0.1 - 0.3 - 0.5 - 1 - 3	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 - 3 - 5 - 10
Time limt for non-trip	[s]	istantaneous	istantaneous - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3	istantaneous - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3
Tolerance over trip times			± 20%	± 20%
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% IΔn (tollerance ±3%)			■	■
Indication of alarm timing			■	■
Automatic residual current reset		■	■	■
“A” type for pulsanting alternating current, AC for alternating current		■	■	■
Remote release device			■	■
Selective type			■	■
Button 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				■

(1) Operation up to 50 V Phase-Neutral

RC223 (B type) residual current release for T4

Along with the family of residual current releases illustrated previously, ABB SACE is developing the RC223 (B type) residual current release, which can only be combined with the Tmax T4 four-pole circuit-breaker in the fixed or plug-in version. The range of operation of the primary line-to-line voltage of this residual current release varies between 110 V and 440 V, with operation starting from 55 V phase-neutral. It is characterised by the same types of reference as the RC222 (S and AE type) release, but can also boast conformity with type B operation, which guarantees sensitivity to residual fault currents with alternating, alternating pulsating and direct current components. The reference Standards are: IEC 60947-1, IEC 60947-2 Appendix B, and IEC 60755.

Apart from the signals and settings typical of the RC222 residual current release, the RC223 also allows selection of the maximum threshold of sensitivity to the residual fault frequency (3 steps: 400 – 700 – 1000 Hz). It is therefore possible to adapt the residual current device to the different requirements of the industrial plant according to the prospective fault frequencies generated on the load side of the release. Typical installations which may require frequency thresholds different from the standard ones (50 – 60 Hz) are the welding plants for the automobile industry (1000 Hz), the textile industry (700 Hz), airports and three-phase drives (400 Hz).

All the functions of the apparatus - even the most advanced ones - can be checked by the user by means of a careful watchdog test which is carried out by a series of simple successive steps.

Accessories

Residual current releases

SACE RCQ switchboard residual current relay

The Tmax circuit-breakers can also be combined with the SACE RCQ switchboard relay with separate toroid (to be installed externally on the line conductors) and these fulfil requirements with thresholds up to 30 A trips and times up to 5 s or when the installation conditions are particularly restrictive, such as with circuit-breakers already installed, or limited space in the circuit-breaker compartment. Thanks to the wide range of settings, the SACE RCQ switchboard relay is suitable for applications where a system of residual current protection coordinated with the various distribution levels, from the main switchboard to the end user, is required. It is particularly recommended when low sensitivity residual current protection is required, such as in partial (current) or total (chronometric) selective chains, and for high sensitivity applications (physiological sensitivity) to provide protection of people against direct contacts.

On a drop in the auxiliary power supply voltage, the opening command can intervene after a minimum time of 100 ms and after the time set plus 100 ms.

The SACE RCQ relay is a type A residual current relay and detects residual currents both of the alternating and pulsating type with continuous components.

The SACE RCQ relay is of the type with indirect action and acts on the circuit-breaker release mechanism by means of the shunt opening release of the circuit-breaker itself (to be ordered by the user), to be housed in the special slot made on the left-hand pole of the circuit-breaker.

3

Residual current relay		**SACE RCQ**
Power supply voltage	AC [V]	80 ... 500
	DC [V]	48 ... 125
Operating frequency	[Hz]	45 ÷ 66 Hz
Trip threshold adjustment IΔn		
1st range of adjustments	[A]	0.03-0.05-0.1-0.3-0.5
2nd range of adjustments	[A]	1-3-5-10-30
Trip time adjustment	[s]	0-0.1-0.2-0.3-0.5-0.7-1-2-3-5
Pre-alarm threshold adjustment	[%] x IΔn	25 ... 75% x IΔn
Range of use of closed transformers		
Toroidal transformer Ø 60 [mm]	[A]	0.03 ... 30
Toroidal transformer Ø 110 [mm]	[A]	0.03 ... 30
Toroidal transformer Ø 185 [mm]	[A]	0.1 ... 30
Range of use of transformers which can be opened		
Toroidal transformer Ø 110 [mm]	[A]	0.3 ... 30
Toroidal transformer Ø 180 [mm]	[A]	0.3 ... 30
Toroidal transformer Ø 230 [mm]	[A]	1 ... 30
Signalling for alarm pre-threshold		Yellow flashing LED 1 N.O. change-over contact 6 A - 250 V AC 50/60 Hz
Residual current relay trip signalling		Yellow magnetic flag change-over contacts (N.O. N.C.; N.O.) 6 A - 250 V AC 50/60 Hz
Remote opening control		N.O. contact Trip time 15 ms
Connection to the toroidal transformer		By means of 4 twisted conductors. Maximum length: 5 m
Dimensions L x H x P	[mm]	96 x 96 x 131.5
Drilling for assembly on door	[mm]	92 x 92

Accessories

Accessories for electronic releases

Front display unit - FDU

The front display is a display unit of the setting currents, alarms and parameters of the PR222DS/P and PR222DS/PD electronic releases of T4 and T5. The display unit can operate correctly with self-supply with I ≥ 0.35 x In on at least one phase.
If the display is used in combination with the PR222DS/PD release, 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 PR222DS/PD release must, compulsorily, pass through the AUX-E auxiliary contacts in electronic version, whereas with the PR222DS/P release 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.

SACE PR010/T test and configuration unit

The SACE PR010/T unit is an instrument able to carry out the Test, programming and parameter readout functions for the protection units which equip the SACE Isomax S and Tmax moulded-case circuit-breakers and the SACE Emax air circuit-breakers.
In particular, for the Tmax T4 and T5 circuit-breakers fitted with PR222DS/P or PD and PR222MP release, the test, programming and readout parameter functions are available.
All the functions mentioned can be carried out ON BOARD by connection of the SACE PR010/T unit to the front multipin connector on the protection unit; connection is guaranteed by means of special interfacing cables supplied as standard with the unit.
The human-machine interface is guaranteed by using a membrane keyboard and a multi-line alphanumerical display.
There are also two LEDs on the unit which signal the following respectively:
– POWER-ON and STAND BY state
– battery charging state.
Two different types of Test are provided: automatic and manual.
By means of connection to the PC (with software provided by ABB SACE), it is also possible to upgrade the software of the SACE PR010/T unit to allow adaptation of the Test unit to evolution of new products.
The most relevant test results can also be stored in the unit itself and sent to the PC on explicit request for “issue of report”.
Both in automatic and manual mode, the SACE PR010/T unit is able to test the following:
– protection functions L, S, I, G
– protection functions L, R, I, U with PR222MP
– monitoring of correct operation of the microprocessor.
The SACE PR010/T unit is of the portable type and operates with rechargeable batteries and/or with an external power supply.
In its standard supply, the unit includes:
– SACE PR010/T Test unit complete with rechargeable batteries
– SACE TT1 Test unit
– 100…240 V AC/12V DC external power supply
– connection cables between the unit and the multipin connector present on the ranges of releases which equip the Tmax, SACE Isomax S and SACE Emax series
– connection cable between the unit and the PC (serial RS232)
– power supply cable
– instruction manual and floppy with application SW
– plastic bag.

EP 010 - FBP

It is the “e-plug” interface which can connect T4 and T5, equipped with the PR222DS/PD electronic release, 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 release by means of the specific X3 connector.

Accessories

Accessories for electronic releases

SACE PR212/CI contactor control unit

The SACE PR212/CI accessory unit can be associated with all the circuit-breakers fitted with the electronic release for motor protection - PR222MP for Tmax and PR212MP for the SACE Isomax S family.
When the special dip switch on the front of the release is positioned on “Normal mode” working mode, it is possible to control contactor opening in the case of a fault due to overload L, blocked rotor R or missing/unbalance of phase U.
The SACE PR212/CI unit can also always be installed either on a DIN rail or on the rear of the door.

SACE PR020/K signalling unit

The SACE PR020/K signalling unit can convert the digital signals supplied by the PR222DS/PD (LSI or LSIG) protection unit into electrical signals, via normally open electrical contacts.
The unit is connected to the protection release by means of the Modbus RTU standard serial changeover line, on which all the information about the activation status of the protection functions flows. The corresponding power contacts are closed based on this information.
In particular, the following signals are available:

- the alarm signal remains active throughout the overload, until the release is tripped
- the trip signals of the protections remain active during the timing phase, and even after the release is tripped.

PR020/K (PR222DS/PD)	
Maximum changeover power (resistive load)	100W / 1250 VA (resistive load)
Maximum changeover voltage	130 V DC / 250 V AC
Maximum changeover current	5 A
Breaking capacity (resistive load) @ 30 V DC	3.3 A
Breaking capacity (resistive load) @ 250 V AC	5 A
Contact/coil insulation	2000 V eff (1 min @ 50 Hz)

Note: the PR020/K unit is an alternative to any supervision and control systems.

A reset pushbutton allows the state of all the signals to be reset.
The unit also has ten LEDs to visually signal the following information:

- “Power ON”: auxiliary power supply present
- “TX (Int Bus)”: flashing synchronised with dialogue with the internal Bus
- eight LEDs associated with the internal contacts.

The table indicates the characteristics of the signalling relays available in the SACE PR020/K unit.

Available signals

K51	PR222MP
1	Protection L alarm
2	Protection R alarm
3	Protection I alarm
4	Protection U alarm Welded conctactor alarm contacts (*)
5	Bus K.O.
6	PTC alarm (temperature sensor on motor) Generic input 0/1(*)
7	Release trip
8	Protection L pre-alarm Back-up protection alarm (*)

(*) alternatively by means of dip-switch.

K51	PR222DS
1	Protection L alarm
2	Protection S alarm
3	Protection I alarm
4	Protection G alarm
5	Bus K.O.
6-7	Release trip
8	Protection L pre-alarm

SACE TT1 test unit

This allows the PR221DS, PR222DS/P or PD, and PR222MP electronic release trip to be checked and the trip test of the trip coil. The device, supplied by a replaceable 9 V battery, is provided with a connector point with two polarised poles housed on the bottom of the box which allows connection of the device to the test input bushings on the front of the electronic release.
The limited dimensions of the accessory make it practically pocket-type.

CT for external neutral

This is applied to the external neutral conductor and allows protection against earth faults with three-pole circuit breakers.
The circuit breaker must be fitted with PR222DS/P or PD release.
The transformer must be connected to the release by means of the specific X4 connectors.

CT ext

T4	T5
[A]	[A]
100	320
160	400
250	630
320	

Connectors

Connectors X3 and X4 allow connection of the electronic release 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 PR020/K 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	Release
X3	PR020/K	PR222DS/PD and PR222MP
	L alarm signal	PR222DS/P, PR222DS/PD and PR222MP
	Dialogue	PR222DS/PD
	Auxiliary supply	PR222DS/PD
	Internal auxiliary supply	PR222MP
	EP 010	PR222DS/PD
X4	External neutral	PR222DS/P and PR222DS/PD
	PR212/CI	PR222MP
	PTC	PR222MP

Accessories

Automatic transfer switch - ATS010

Automatic transfer switch - ATS010

The switching unit ATS010 (Automatic Transfer Switch) is the new network-group switching device offered by ABB SACE. It is based on microprocessor technology in compliance with the leading electromagnetic compatibility and environmental standards (EN 50178, EN 50081-2, EN 50082-2, IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-3).

The device is able to manage the entire switching procedure between the normal line and emergency line circuit breakers automatically, allowing great flexibility of settings.

In case of an error in the normal line voltage, in accordance with the delays set, the normal line circuit breaker is opened, the generator started and the emergency line circuit breaker closed. Similarly, when the normal line returns to range, the reverse switching procedure is automatically controlled.

It is especially suited for use in all emergency power supply systems requiring a solution that is ready to install, easy to use and reliable.

Some of the main applications include: power supply for UPS (Uninterrupted Power Supply) units, operating rooms and primary hospital services, emergency power supply for civilian buildings, airports, hotels, data banks and telecommunications systems, power supply of industrial lines for continuous processes.

The switching system consists of the ATS010 unit connected to two motor-driven and mechanically interlocked circuit breakers. Tmax T4 and T5 circuit-breakers and T4D, T5D switch-disconnectors can be used. The built-in mains sensor of the SACE ATS010 device makes it possible to detect errors in the mains voltage. The three inputs may be directly connected to the three phases of the normal power supply line for networks with rated voltage up to 500 V AC. Networks with a higher voltage require the insertion of voltage transformers (TV), setting a rated voltage for the device that matches their secondary voltage (typically 100 V).

Two change-over contacts for each circuit breaker connect directly to the motor operator. The circuit breaker connection is completed by wiring the status contacts: Open/Closed, Relay tripped, Racked-in (for draw out/plug-in circuit-breakers).

That is why on every circuit breaker connected to the ATS010 unit, the following are included in addition to the mechanical interlock accessories:

- motor operator from 48 V to 110 V DC or up to 250 V AC,
- open/closed contact,
- relay tripped contact,
- racked-in contact (for withdrawable versions),
- signal and mechanical lock for protection relay tripped,
- key lock for motor operator.

The ATS010 device is designed to ensure extremely high reliability for the system it controls. It contains various safety systems intrinsically related to software and hardware operation.

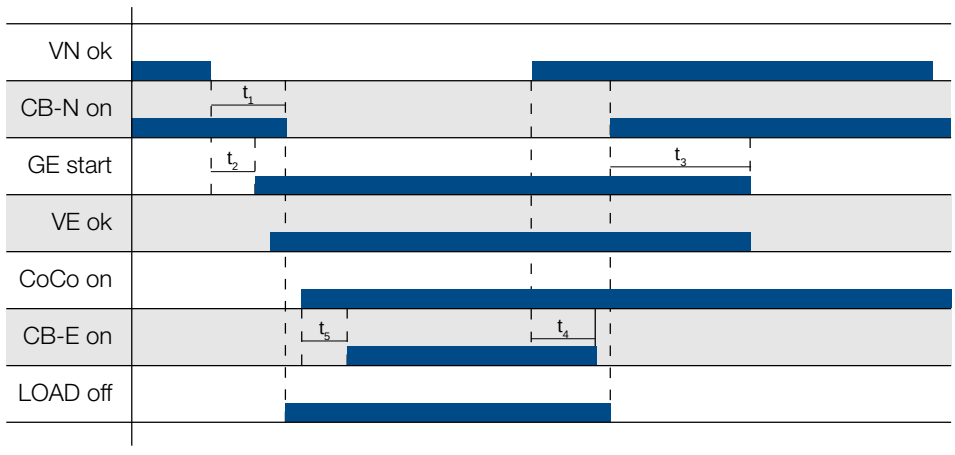
For software safety, a special logic prevents unwarranted operations, while a constantly operative watchdog system points out any microprocessor malfunctions via a LED on the front of the device.

Hardware safety allows integration of an electrical interlock via power relay, so that there is no need to use an external electrical interlock system. The manual selector on the front of the device can also control the entire switching procedure, even in the event of a microprocessor fault, by working electromechanically on the control relays.

General specifications		
Rated supply voltage (galvanically insulated from earth)		24 V DC ±20% 48 V DC ±10% (maximum ripple ±5%)
Maximum absorbed power		5 W @ 24 V DC 10 W @ 48 V DC
Rated power (mains present and circuit breakers not controlled)		1.8 W @ 24 V DC 4.5 W @ 48 V DC
Operating temperature		-25 °C…+70 °C
Maximum humidity		90% without condensation
Storage temperature		-25 °C…+80 °C
Protection rating		IP54 (front panel)
Protection rating	[mm]	144 x 144 x 85
Weight	[kg]	0.8

Setting range for thresholds and times		
Minimum voltage	Un Min	-5%…-30% Un
Maximum voltage	Un Max	+5%…+30% Un
Fixed frequency thresholds		10%…+10% fn
t_1: opening delay of the normal line circuit breaker due to network error	(CB-N)	0…32s
t_2: generator start-up delay due to network error		0…32s
t_3: stopping delay of the generator		0…254s
t_4: switching delay due to network stop		0…254s
t_5: closing delay of the emergency line circuit breaker after detecting the generator voltage	(CB-E)	0…32s

Operating sequence



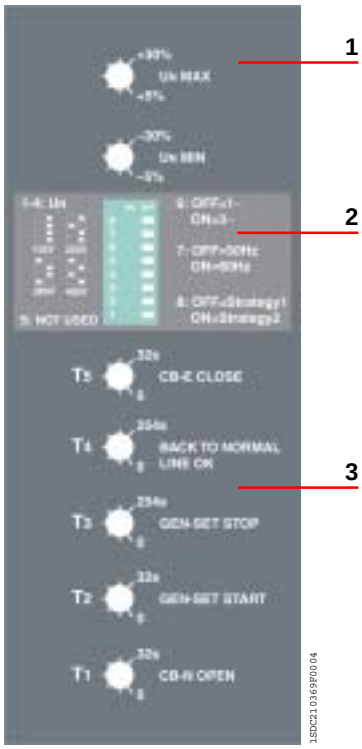
Caption

VN Mains voltage
CB-N Normal line circuit breaker closed
GE Generator
VE Emergency line voltage
CoCo Enable switching to emergency line
CB-E Emergency line circuit breaker closed
LOAD Disconnection of lower priority connected loads

Accessories

Automatic transfer switch - ATS010

Side panel settings



Caption

1 Selectors to set the under- and over-voltage thresholds
2 Dip-switches to set:
– rated voltage
– normal single-phase or three-phase line
– mains frequency
– switching strategy
3 Switching delay time settings for T1...T5

Front panel

Caption

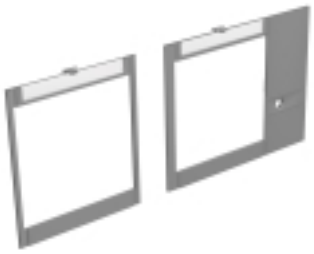
1 Status of the ATS010 unit and logic
2 Operating mode selector
3 Normal line check
4 Normal line circuit breaker status
5 Voltage on the emergency line
6 Emergency line circuit breaker status
7 Generator status

Accessories

Installation and test accessories and spare parts

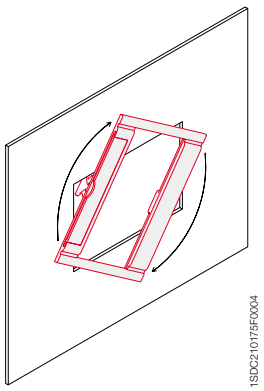
Bracket for fixing on DIN rail

This is applied to the fixed circuit breaker and allows installation on standardized DIN EN 50022 rails. It simplifies assembly of the T1 - T2 - T3 circuit breakers in standard switchboards.
The bracket for fixing on DIN rail is also available for Tmax circuit breakers combined with RC221 and RC222 residual current releases or with the solenoid operating mechanism of the side-by-side type.



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 and T5 withdrawable circuit-breakers, the flange supplied with the conversion kit must be used instead of the one suppled with the fixed circuit-breaker.



Spare parts

The following spare parts are available:
- trip coil for the RC221, RC222 and RC223 residual current releases
- trip coil for the PR221DS electronic release
- kit with washers, screws and plugs for assembly of the front terminals (F).

For further details, please ask the Service Division of ABB SACE for the spare parts catalogue.

Accessories

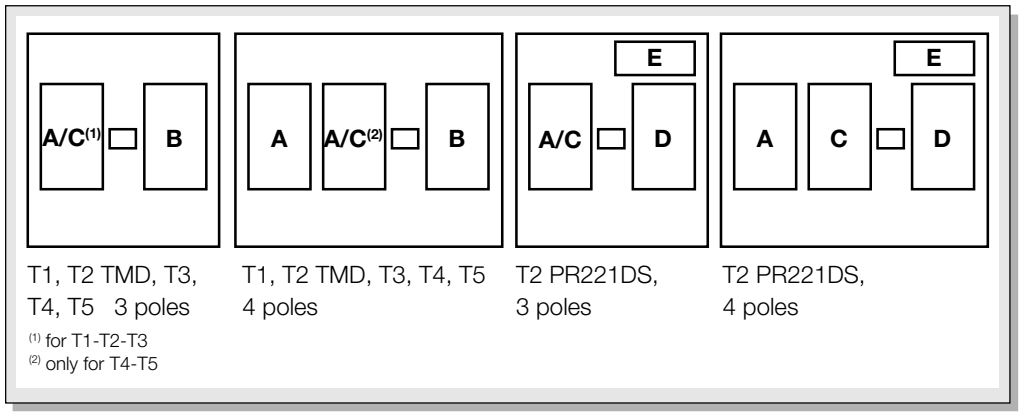
Compatibility - Internal accessories

Compatibility

An overview of the assembly compatibility of (internal) accessories with the Tmax T1, T2, T3, T4 and T5 circuit-breakers can be found in this section.

Possible combination among the internal accessories

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 release PR221DS
E = Auxiliary contacts for T2 with electronic release PR221DS



T1, T2 TMD, T3, T4, T5 3 poles

T1, T2 TMD, T3, T4, T5 4 poles

T2 PR221DS, 3 poles

T2 PR221DS, 4 poles

(1) for T1-T2-T3
(2) only for T4-T5

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

3

Characteristic curves and technical information

Index

Characteristic curves

Technical information

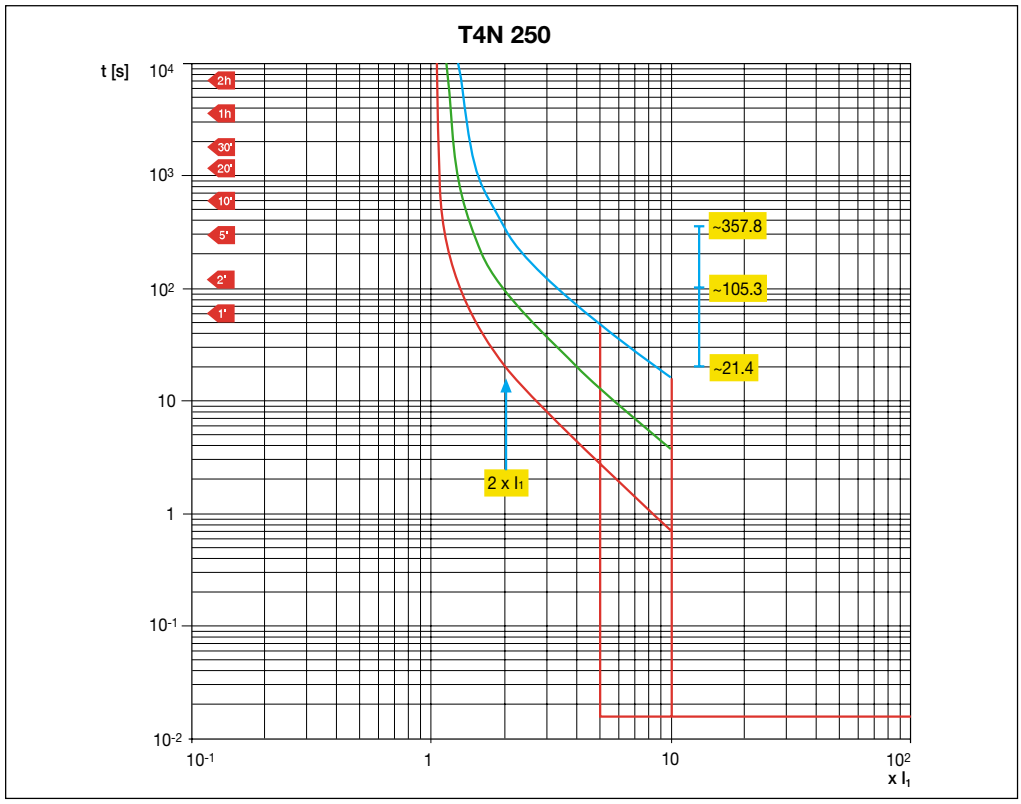
[1] For the T1 1P characteristic curves, please ask ABB SACE directly

Examples of curve readout

Example 1

Trip curves for distribution (thermo-magnetic release)

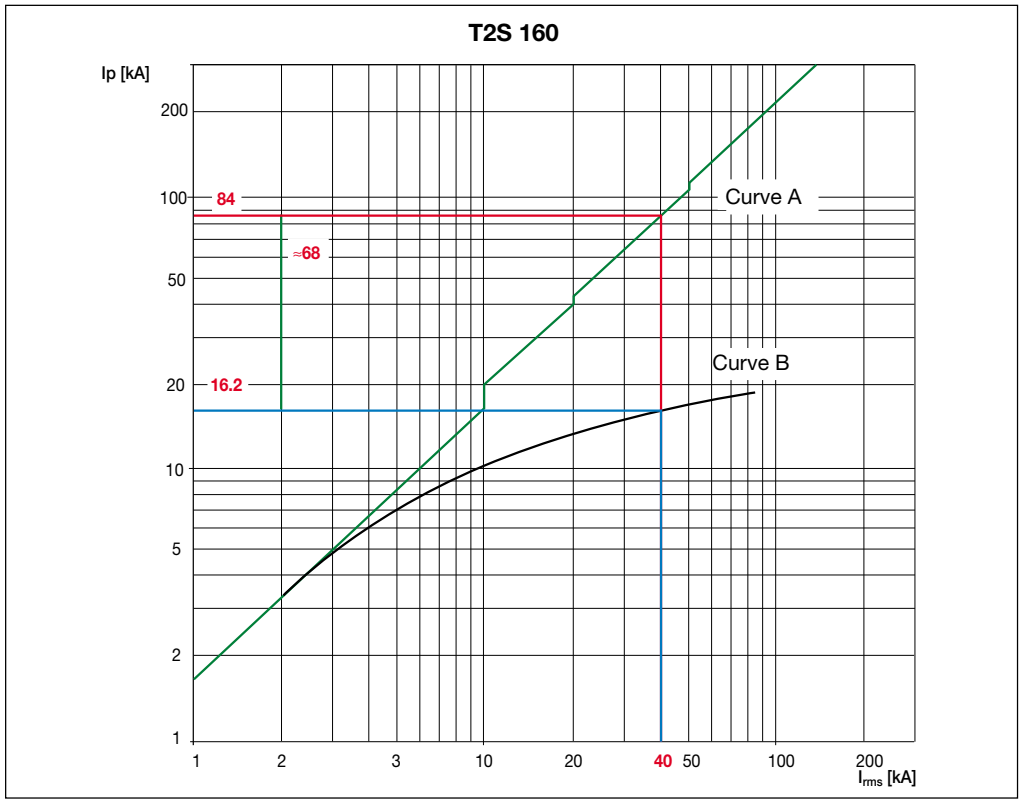
Setting the thermomagnetic release. Considering a T4N 250 In = 250 A circuit-breaker. By means of the thermal adjustment trimmer, the current threshold I_1 is selected, for example at 0.9 x In (225 A); the magnetic trip threshold I_3, adjustable from 5 to 10 x In, we select at 10 x In, equal to 2500 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 x 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

Current-limiting curves

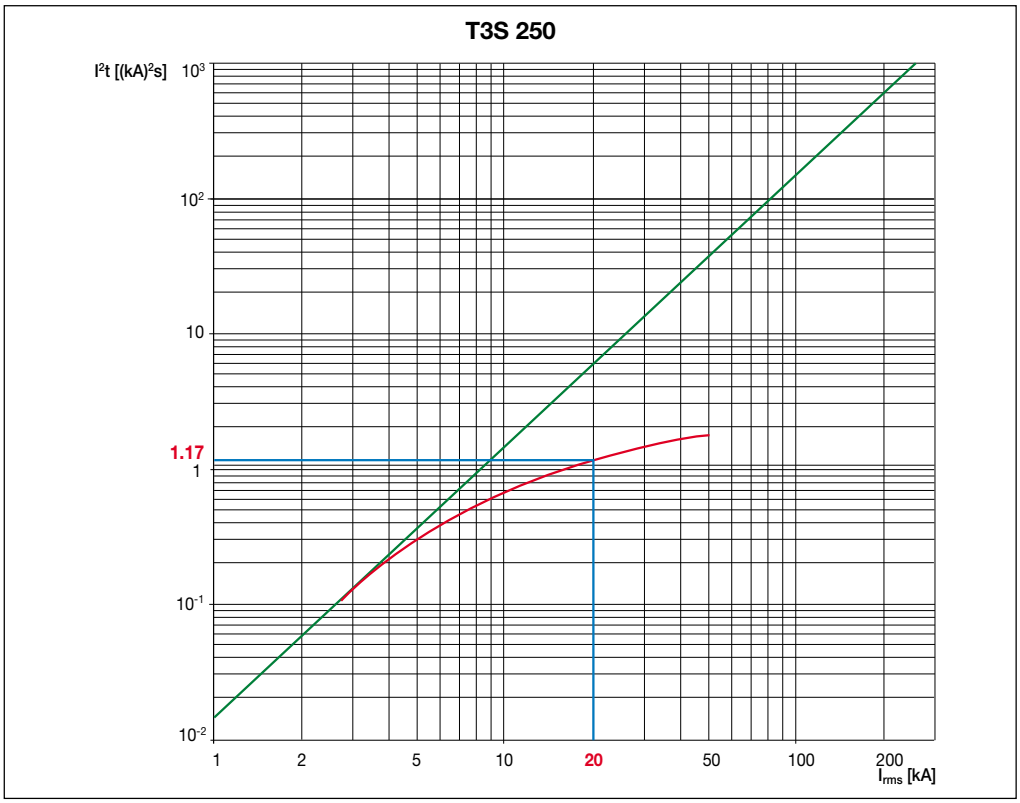
The following figure shows the trend of the Tmax T2S 160, R160 circuit-breaker current-limiting curves. The r.m.s. of the prospective symmetrical short-circuit current is indicated on the abscissa of the diagram, whereas the peak short-circuit current value is indicated on the ordinates. The current-limiting 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 T2S 160 circuit-breaker with R160 thermomagnetic release 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 curve

An example of reading the graph of the specific let-through energy curve of the T3S 250 R160 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 $[kA]^2s$.
In correspondence with a short-circuit current of 20 kA, the circuit-breaker lets through a value of I^2t equal to 1.17 $[kA]^2s$ (1170000 A^2s).



Abbreviations used

In = rated current of the thermomagnetic or electronic release
I_1 = set trip current for overload
I_3 = trip current for short-circuit
I_{rms} = prospective symmetrical short-circuit current

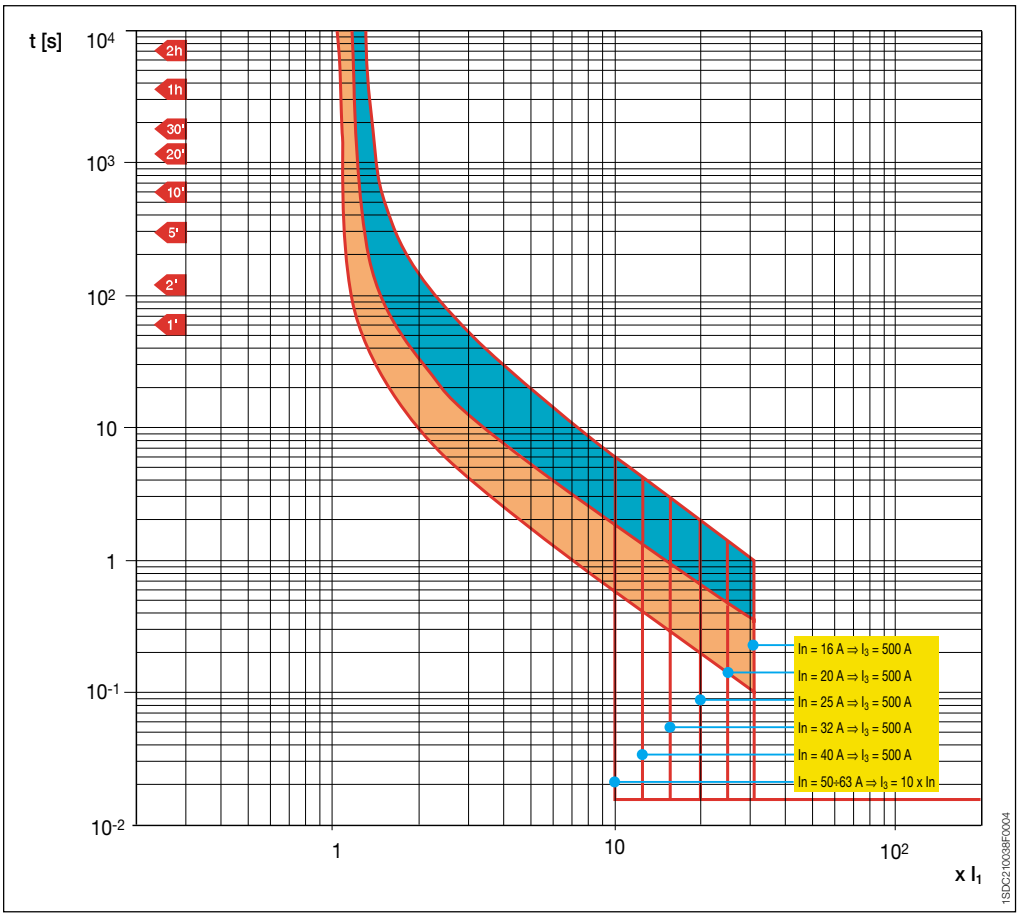
Trip curves for distribution

Circuit-breakers with thermomagnetic releases

T1 160

TMD

In = 16÷63 A

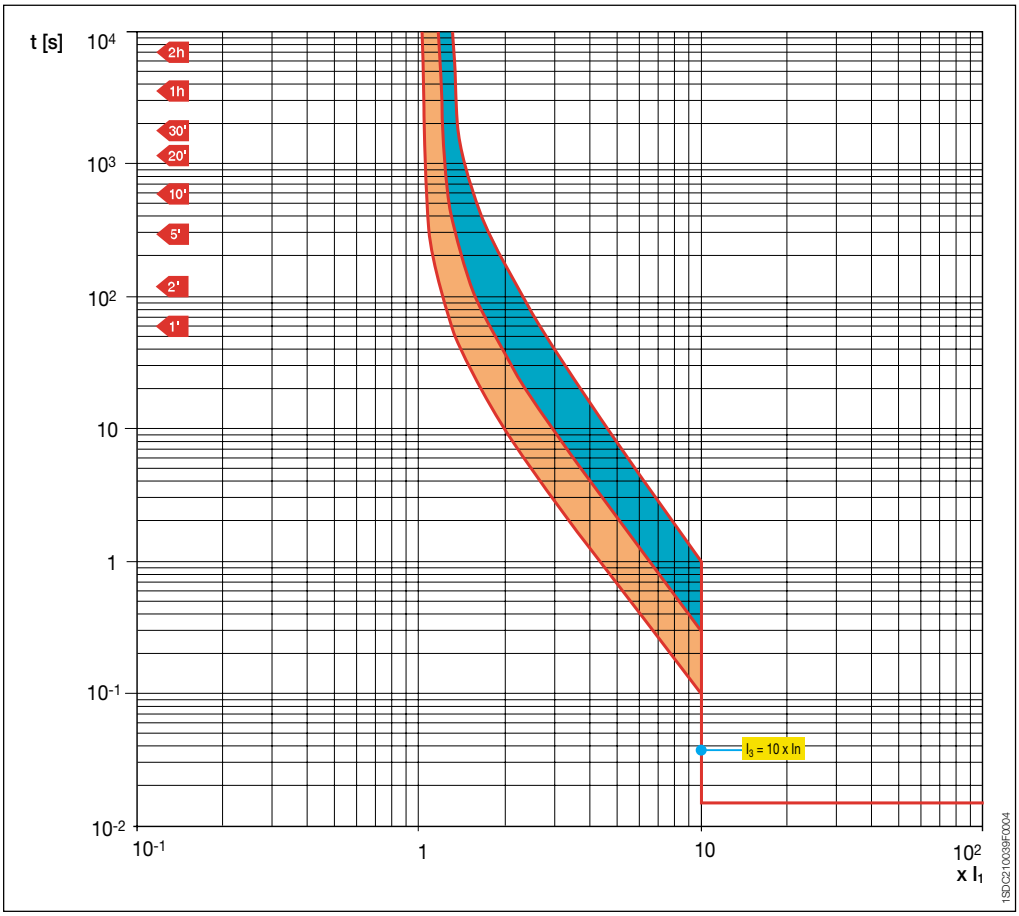


4

T1 160

TMD

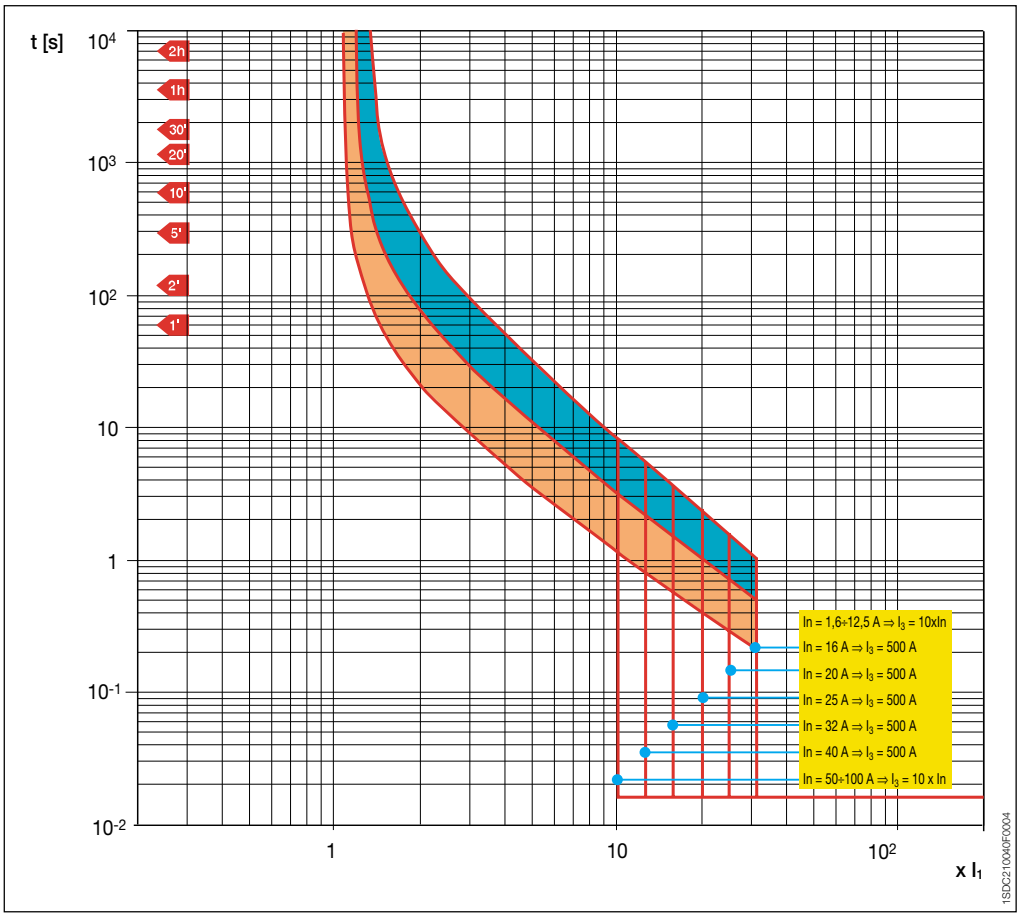
In = 80÷160 A



T2 160

TMD

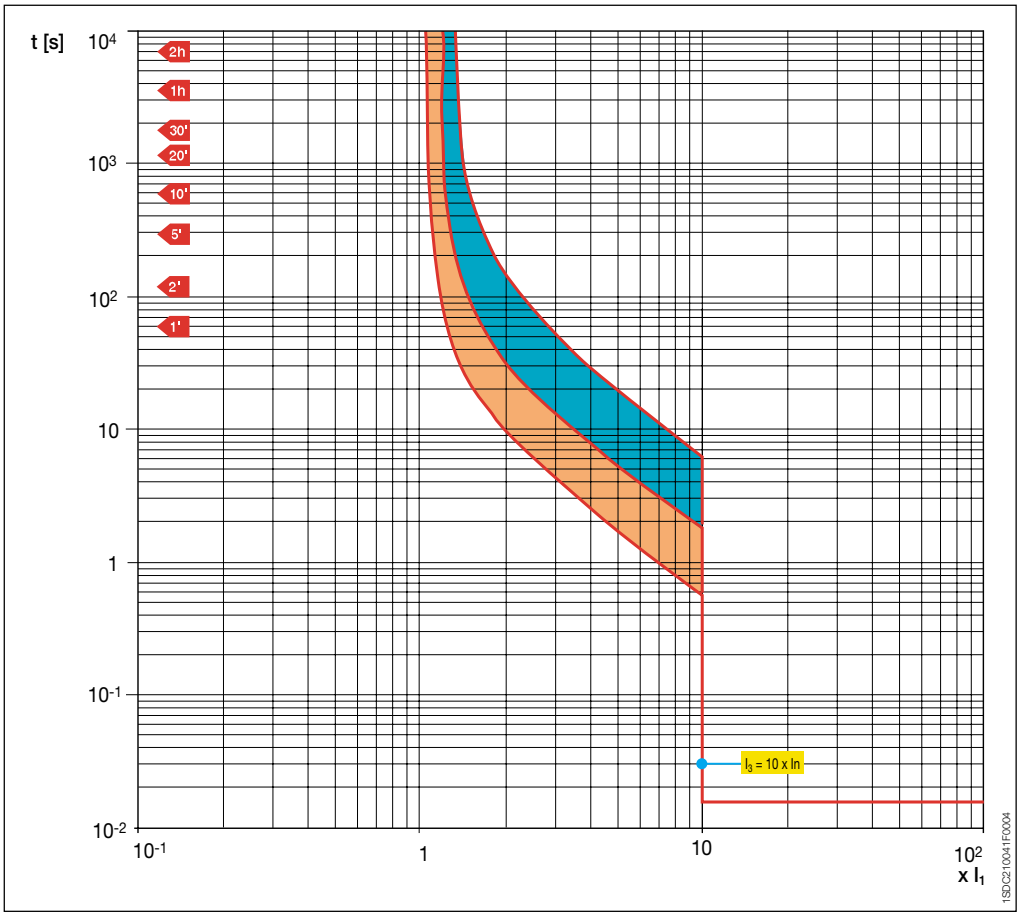
In = 1.6÷100 A



T2 160

TMD

In = 125÷160 A



4

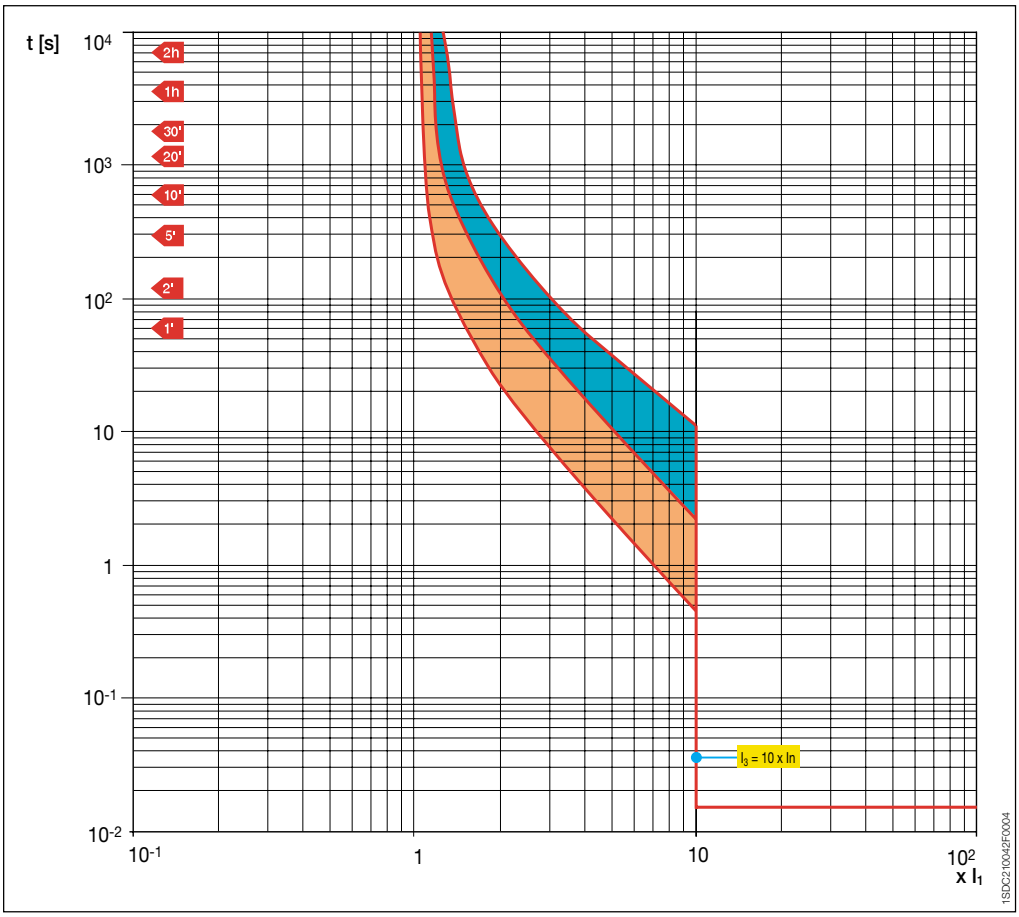
Trip curves for distribution

Circuit-breakers with thermomagnetic releases

T3 250

TMD

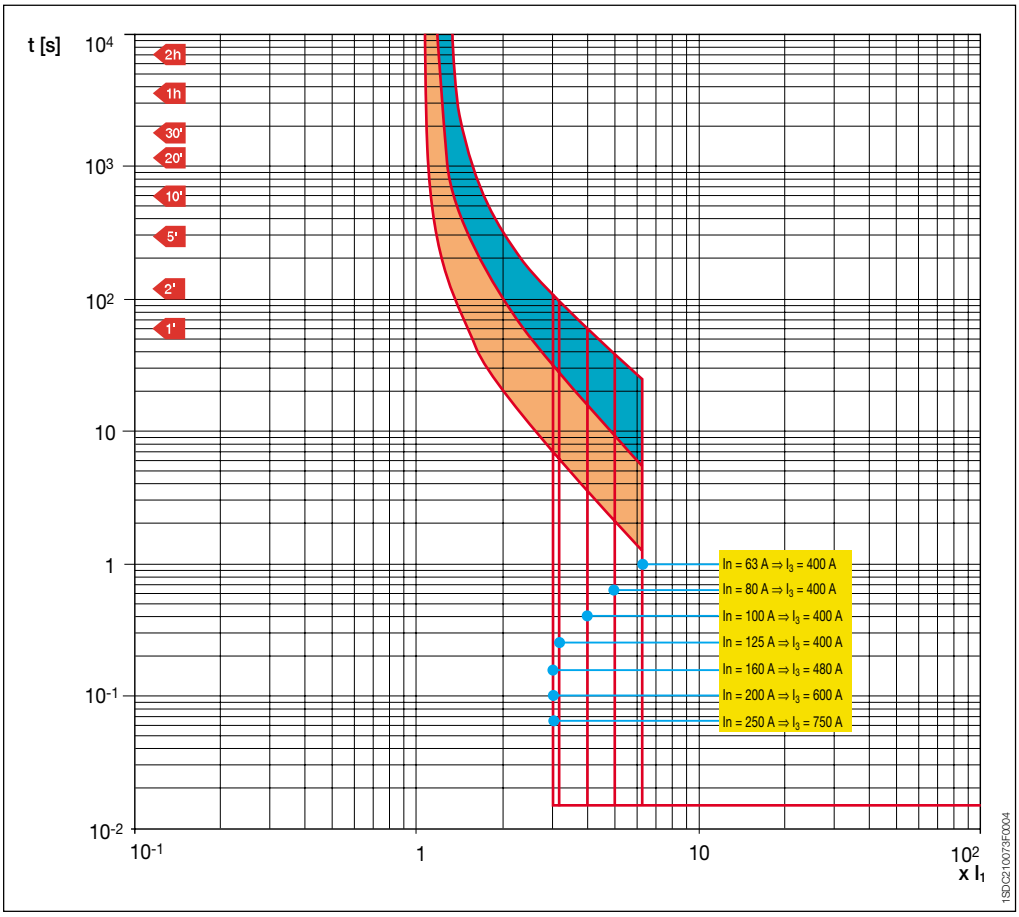
In = 63÷250 A



T3 250

TMG

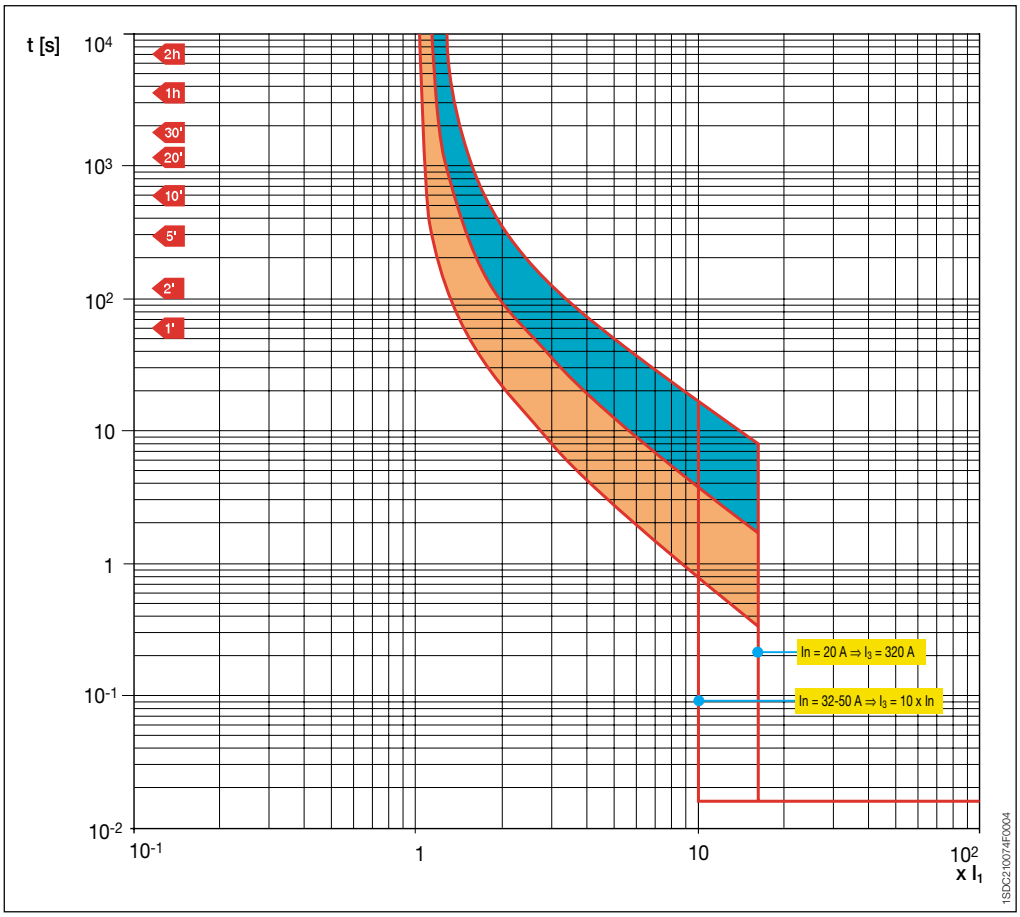
In = 63÷250 A



T4 250

TMD

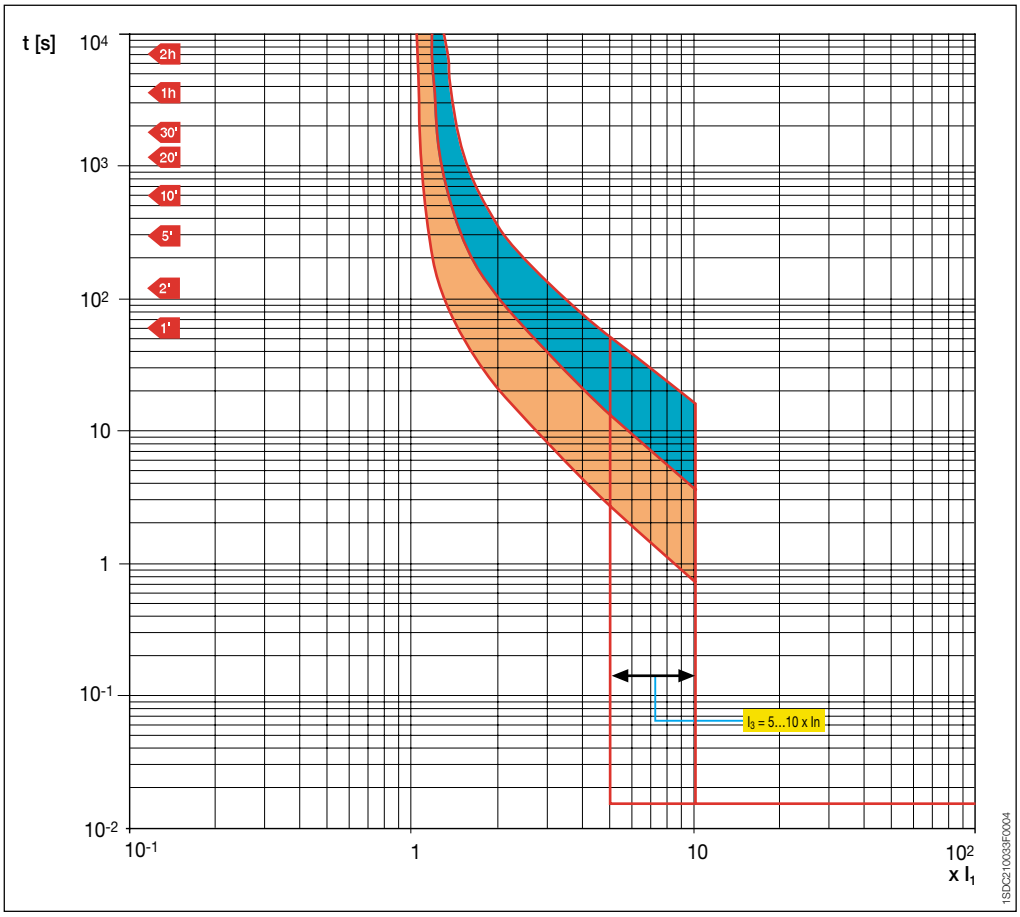
In = 20÷50 A



T4 250/320

TMA

In = 80÷320 A



4

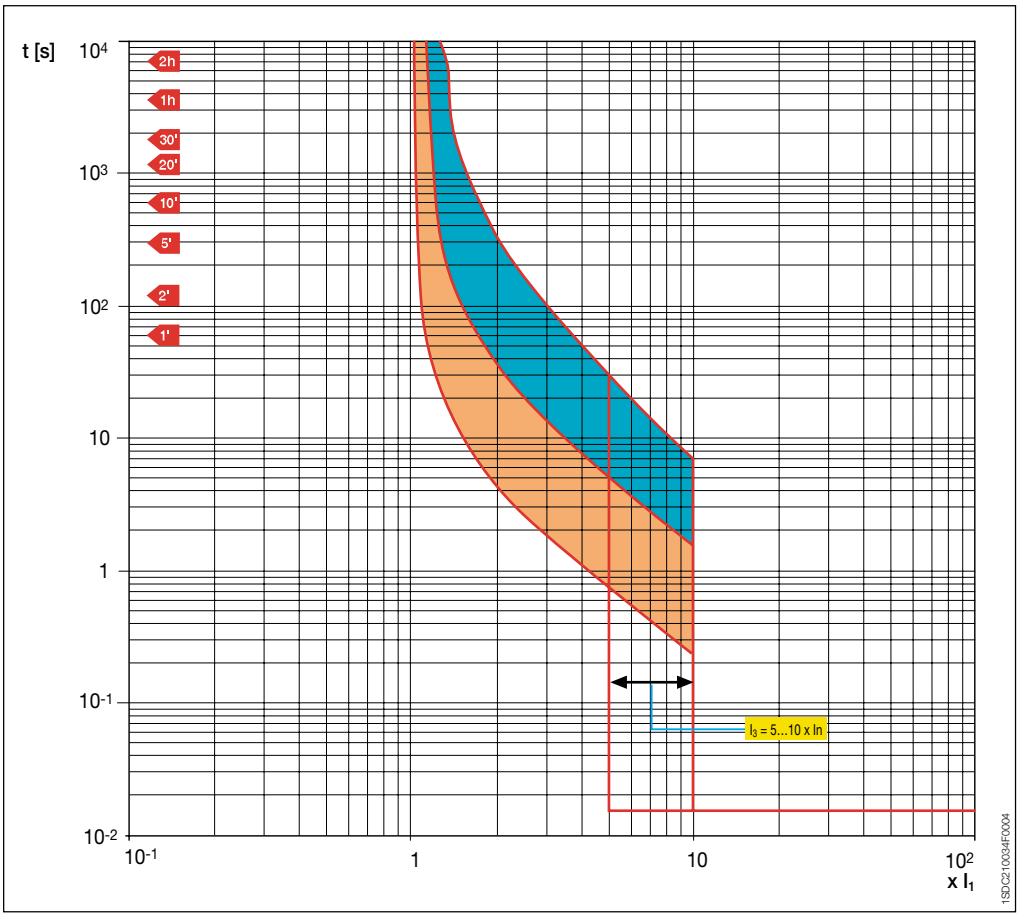
Trip curves for distribution

Circuit-breakers with thermomagnetic releases

T5 400/630

TMA

In = 320÷630 A

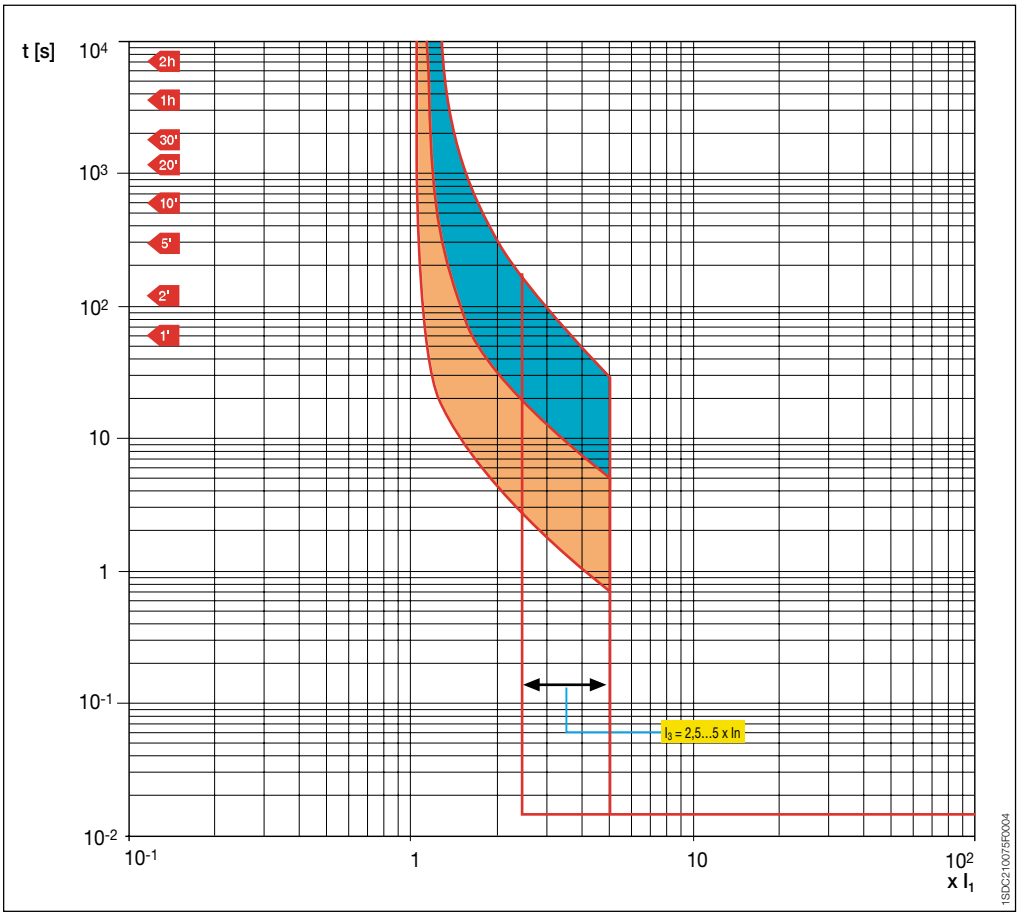


4

T5 400/630

TMG

In = 320÷630 A



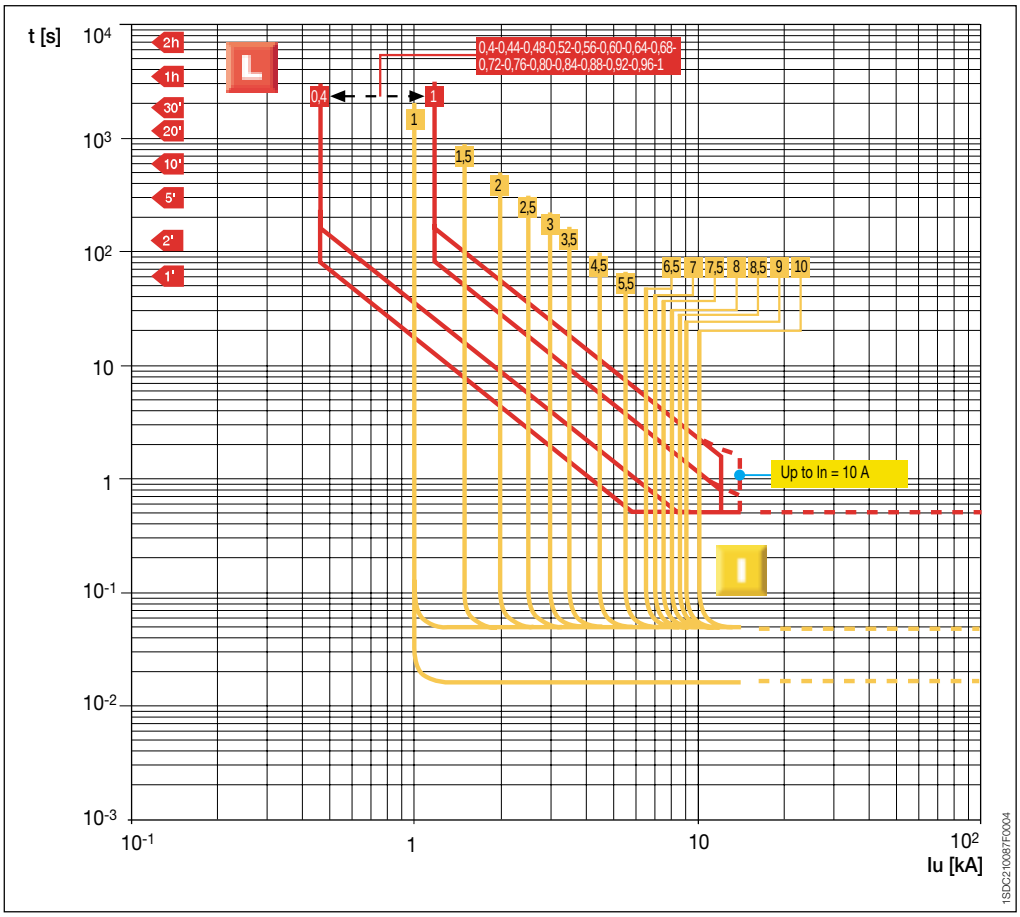
Trip curves for distribution

Circuit-breakers with electronic releases

T2 160

PR221DS-LS/I

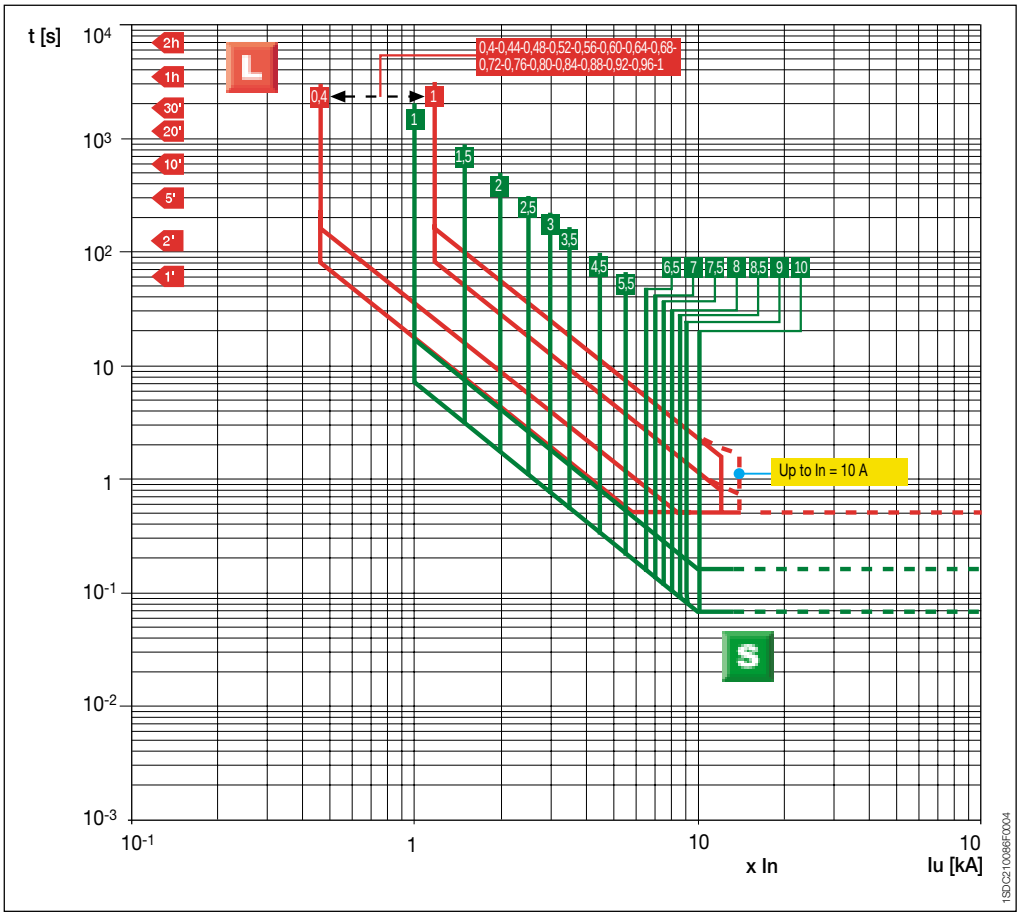
L-I Functions



T2 160

PR221DS-LS/I

L-S Functions



4

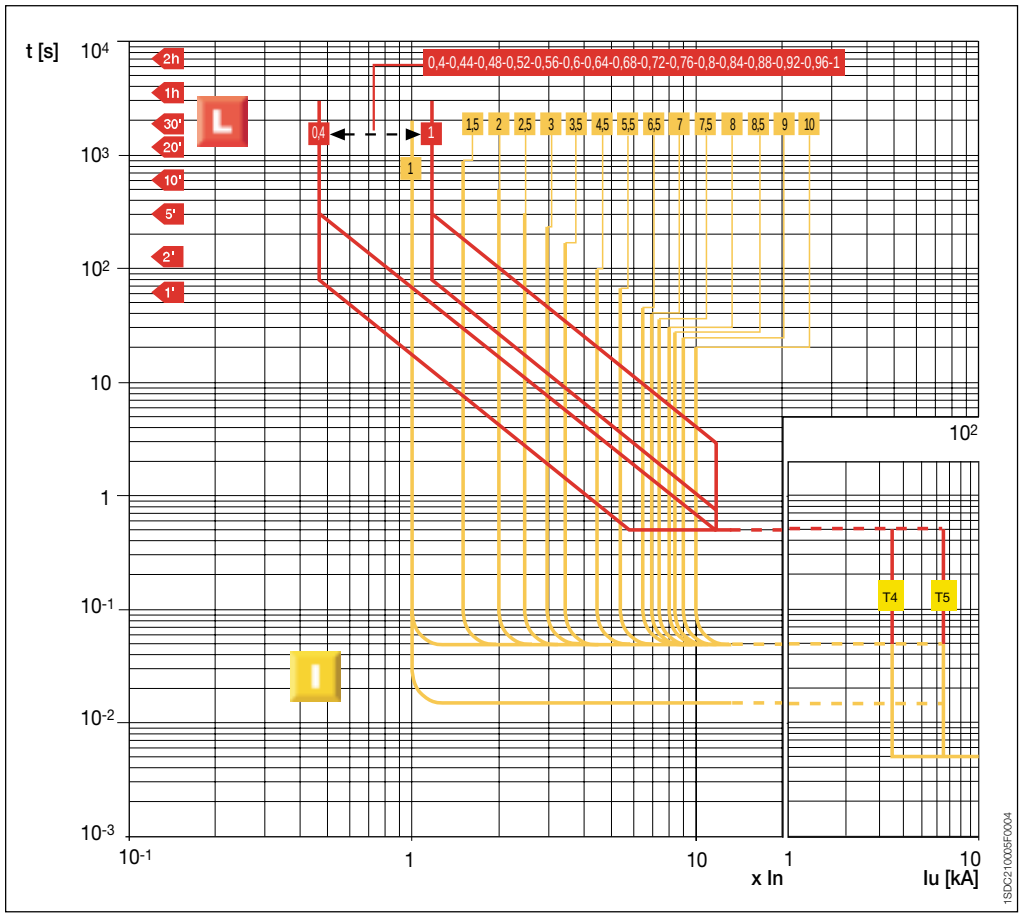
Trip curves for distribution

Circuit-breakers with electronic releases

T4 250/320 - T5 400/630

PR221DS

L-I Functions



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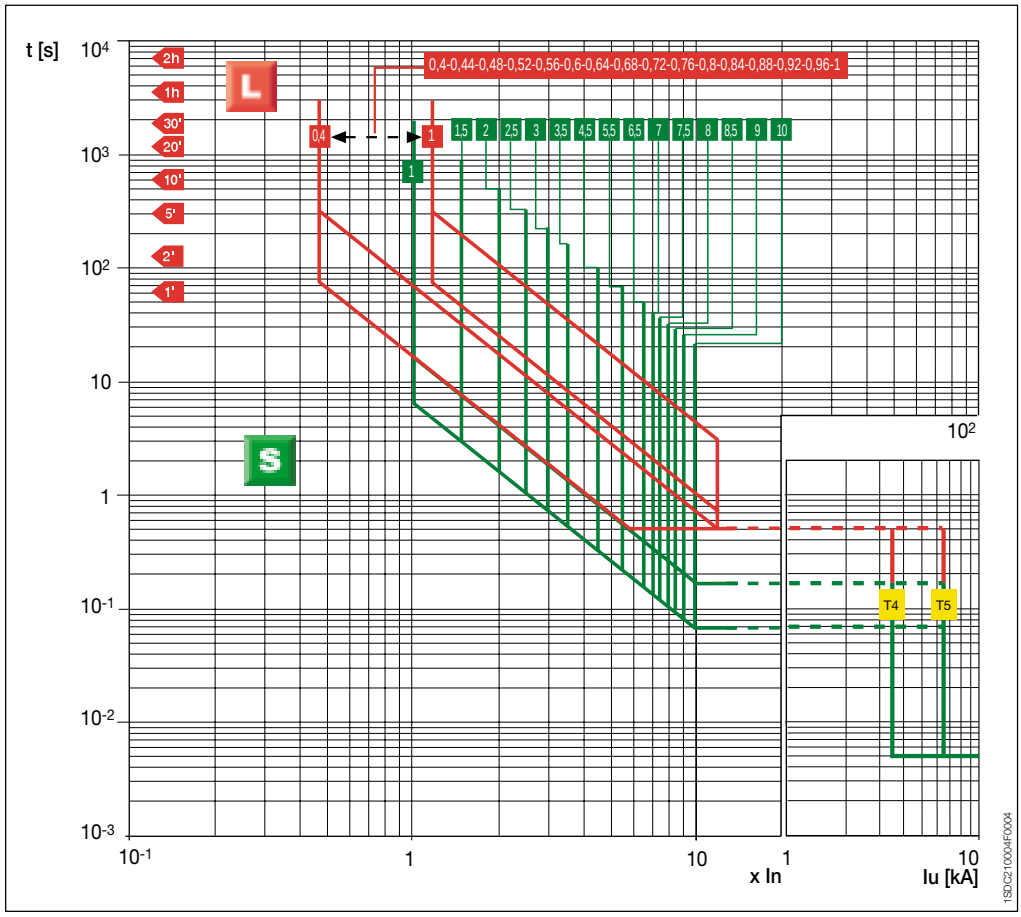
T4 250/320 - T5 400/630

PR221DS

L-S Functions

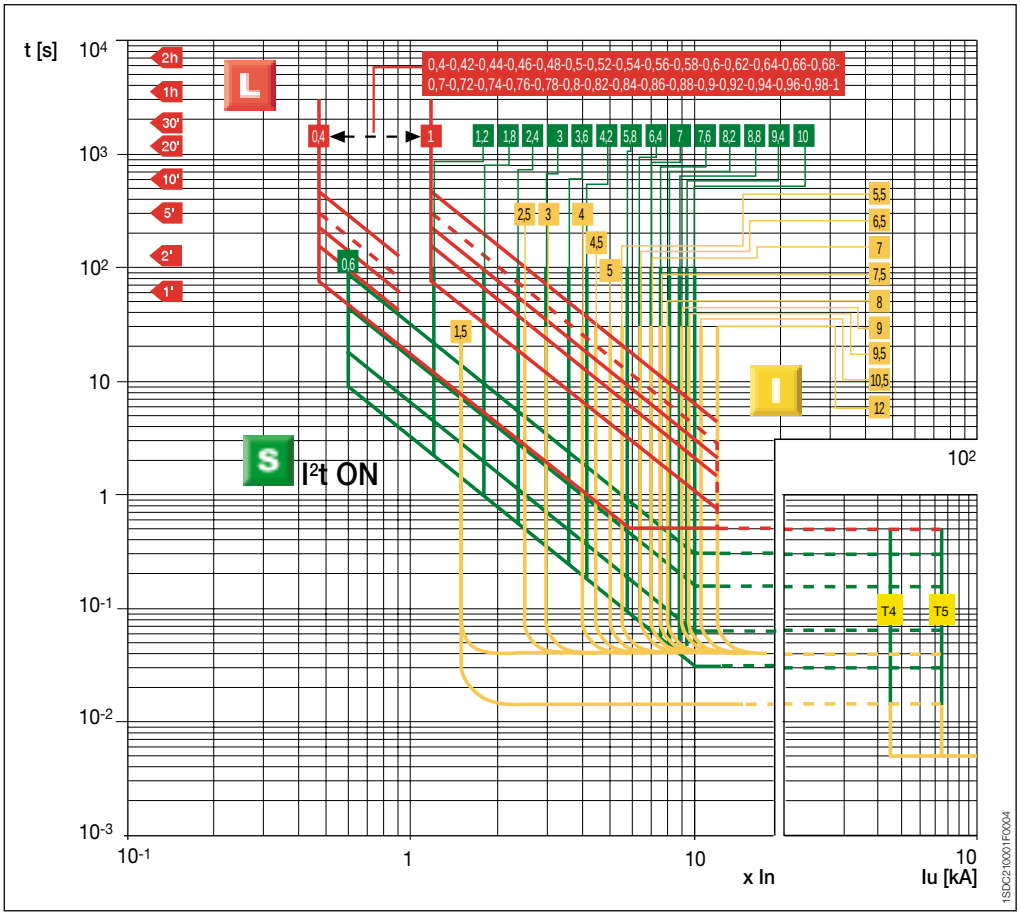


T4 250/320 - T5 400/630

PR222DS/P and PR222DS/PD

L-S-I Functions (I^2t const = ON)

Note: The dotted curve of function L corresponds to the maximum delay (t_1) which can be set at $6xI_1$, 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) and 630 A (T5) where t_1=12s.
For T4 In = 320 A and T5 In = 630 A ⇒ I_3max = 10 x In.

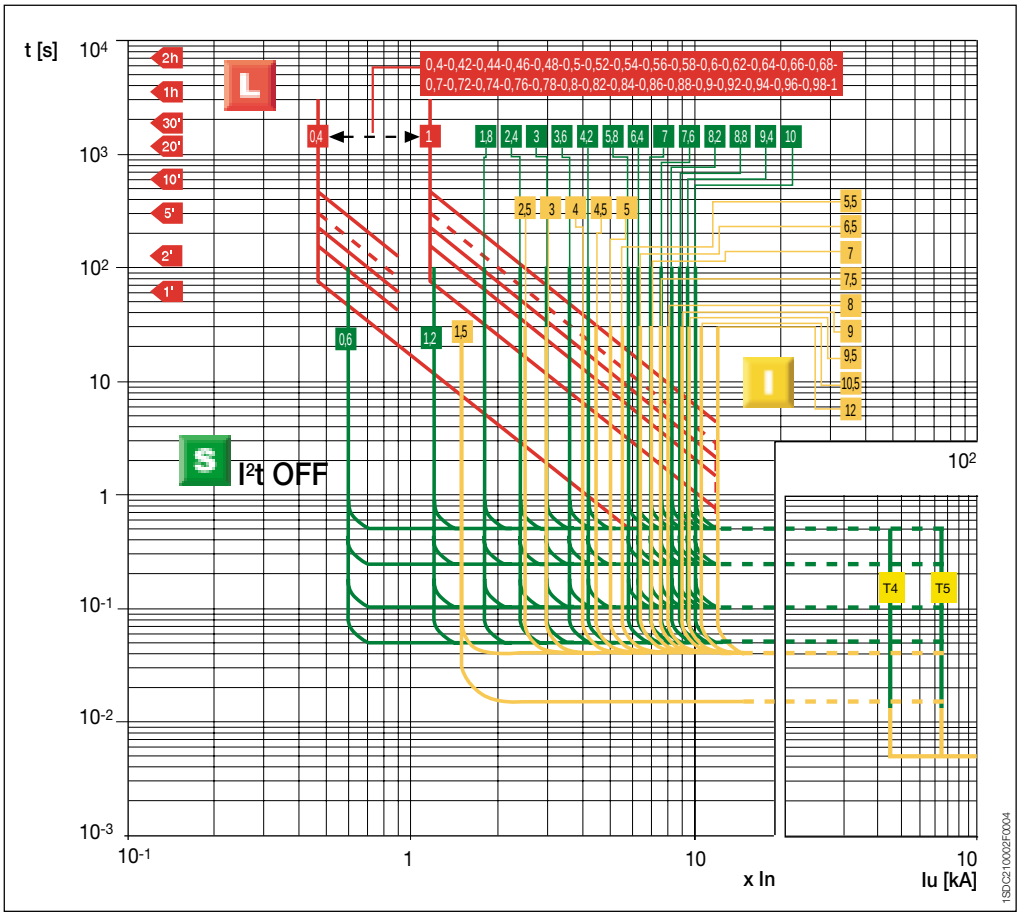


T4 250/320 - T5 400/630

PR222DS/P and PR222DS/PD

L-S-I Functions (I^2t const = OFF)

Nota: The dotted curve of function L corresponds to the maximum delay (t_1) which can be set at $6xI_1$, 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) and 630 A (T5) where t_1=12s.
For T4 In = 320 A and T5 In = 630 A ⇒ I_3max = 10 x In.



4

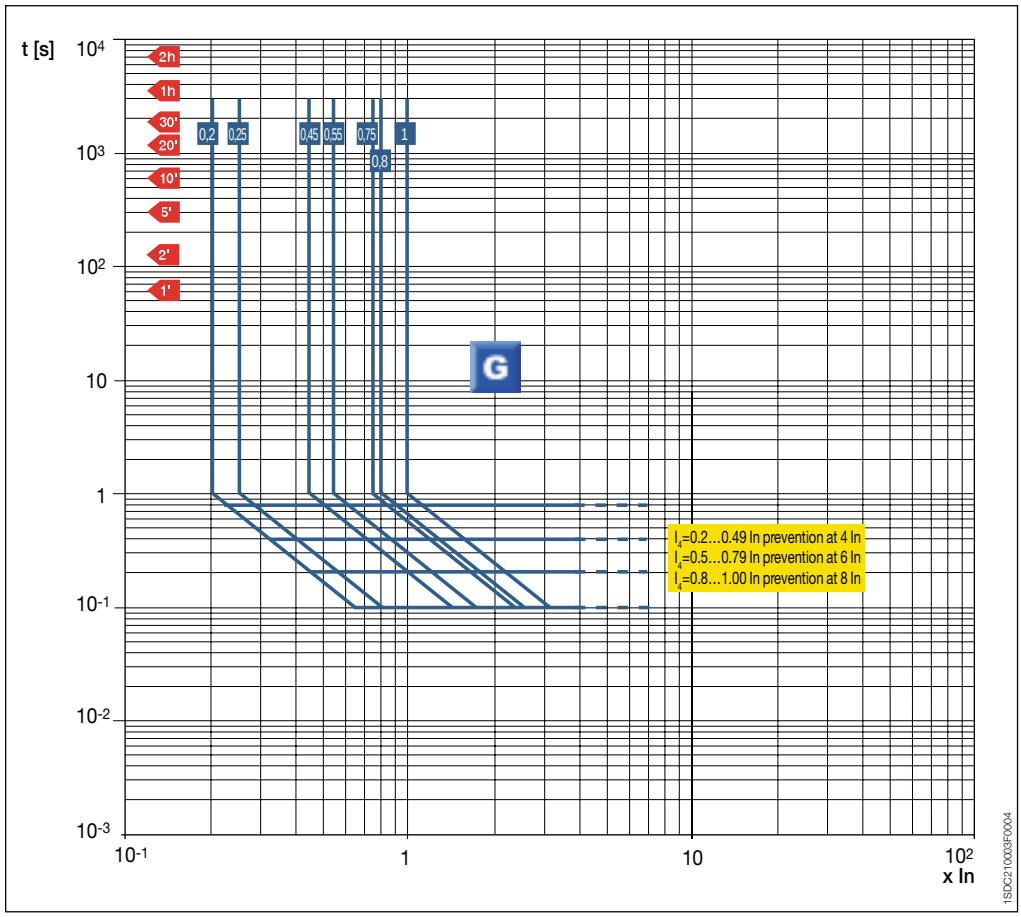
Trip curves for distribution

Circuit-breakers with electronic releases

T4 250/320 - T5 400/630

PR222DS/P and PR222DS/PD

G Function



4

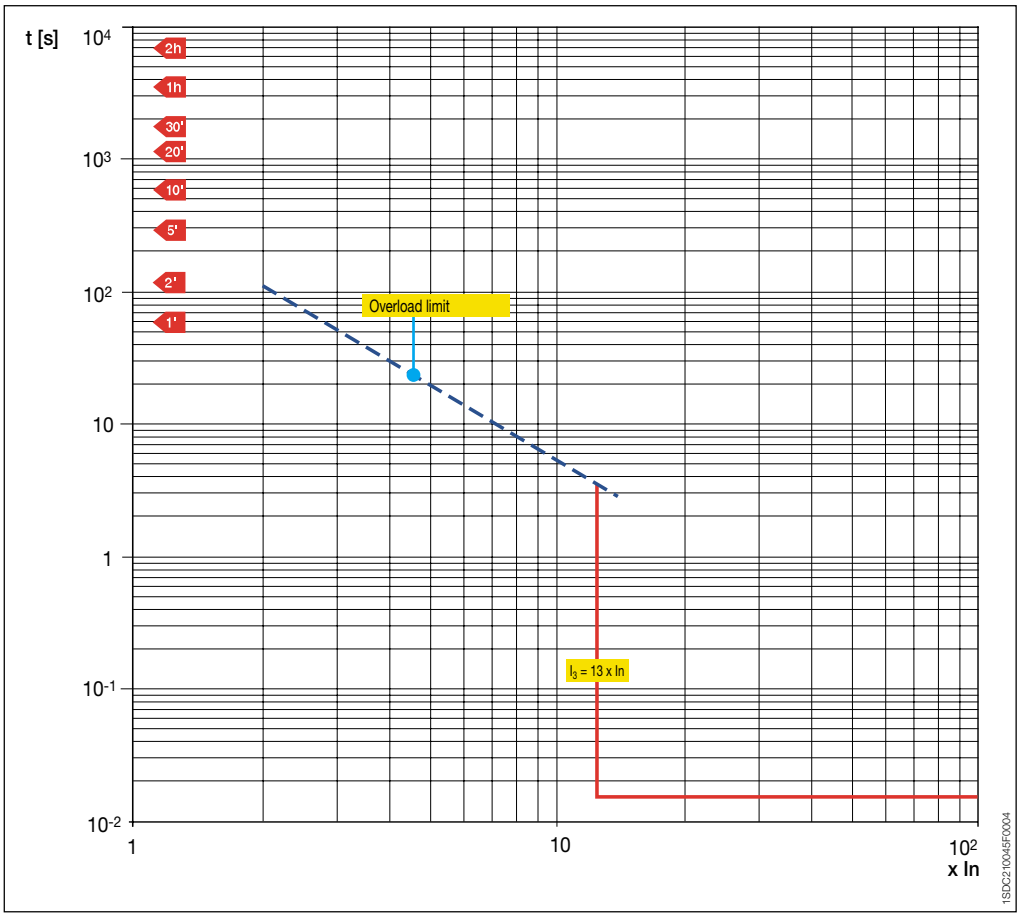
Trip curves for motor protection

Circuit-breakers with magnetic only releases

T2 160

MF

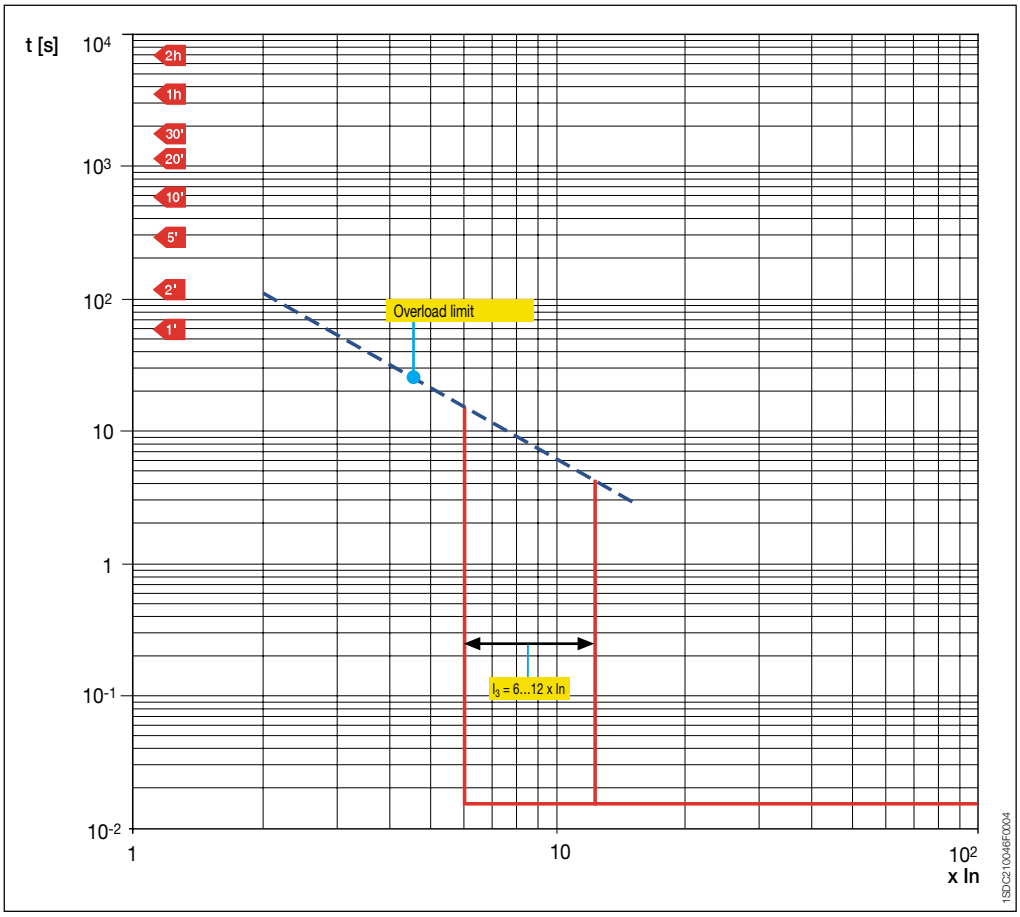
I_3 = 13 x In



T2 160 - T3 250

MA

I_3 = 6...12 x In



4

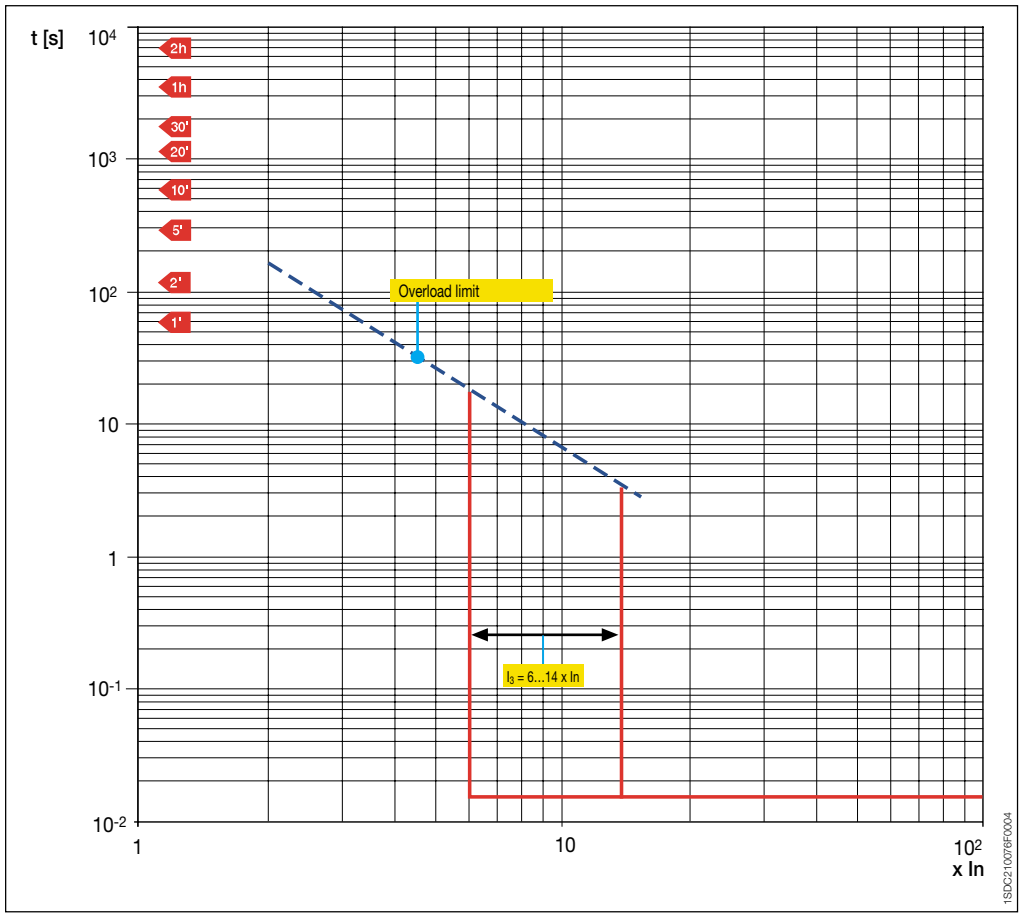
Trip curves for motor protection

Circuit-breakers with magnetic only releases

T4 250

MA

I_3 = 6...14 x In



4

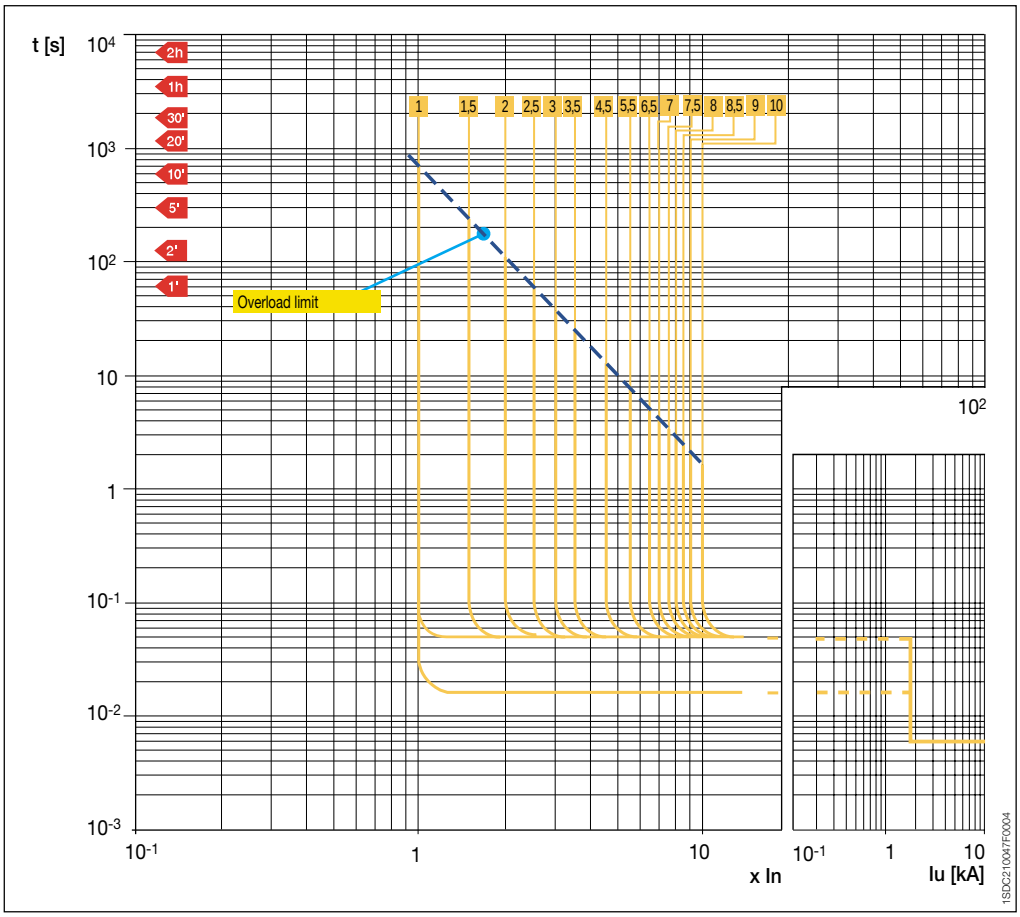
Trip curves for motor protection

Circuit-breakers with PR221DS-I electronic release

T2 160

PR221DS-I

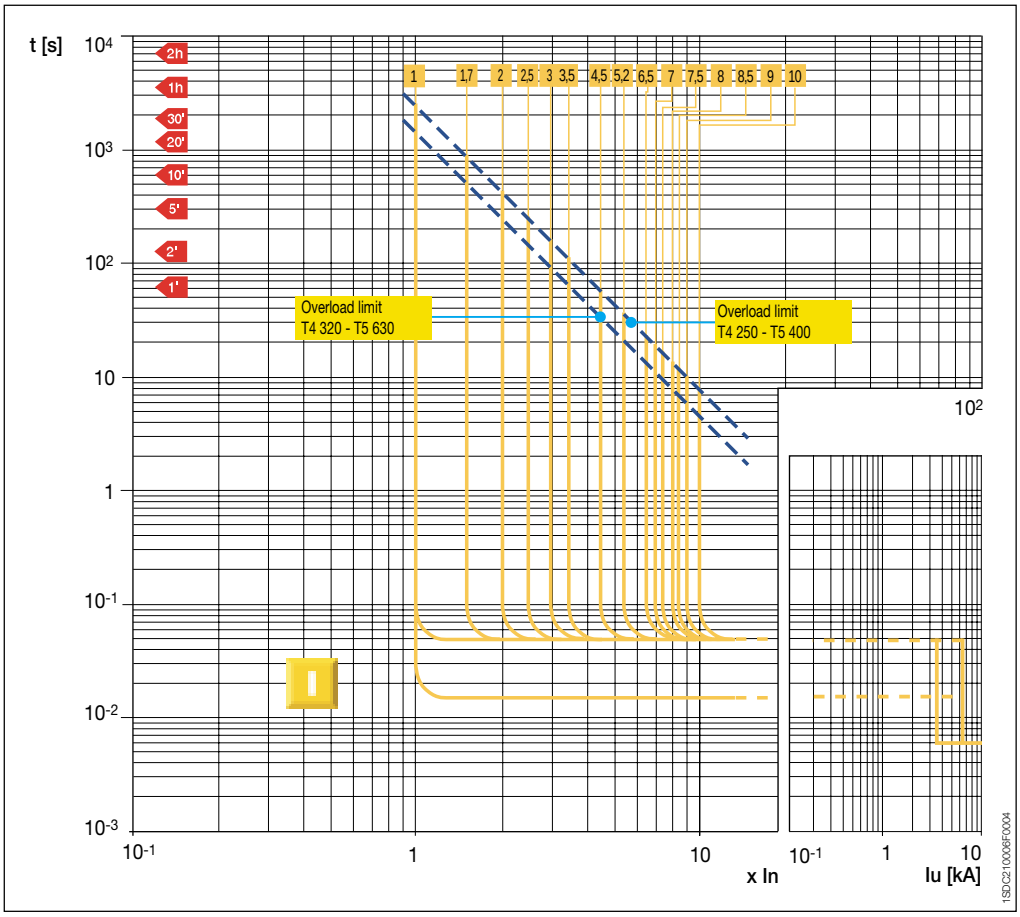
I Function



T4 250/320 - T5 400/630

PR221DS-I

I Function



4

Trip curves for motor protection

Use of the trip curves of circuit-breakers with PR222MP electronic release

For correct parameter setting of the PR222MP electronic release, it may be useful to compare the overall circuit-breaker curve with the motor starting curve.
For this purpose, with the protection function graphics shown on the following pages, it is possible to draw the overall curve required for the circuit-breaker fitted with PR222MP release simply and immediately.
N.B. For function L, as for all the other functions, make sure you place a glossy tracing sheet over the curve so that the times on the axis of the co-ordinates coincide.

Function L (cannot be excluded)
Protection against overload

To protect the motor against any overloads, as a first step it is necessary to adjust function L to a current I_1 higher than or equal to the rated current of the motor Ie: $I_1 \geq Ie$.
For example, if Ie = 135 A, an T4 250 circuit-breaker can be selected with In = 160 A and the following adjustment carried out: $I_1 = 0.85 \times In = 136$ A.
The second step is to select the trip class according to the motor starting time ta. For a motor with a start-up overload of 6 seconds, class 10 can be selected, with a trip time of 8s at $7.2 \times I_1$.
To trace the curve correctly on the glossy sheet, according to I/In, simply place the glossy sheet over the graph of function L so that I/In = 0.85 (on the glossy sheet) corresponds to $I/I_1 = 1$ (on the graph) and draw the curve relative to class 10.

Function R (can be excluded)
Protection against rotor blockage

Protection against rotor blockage can be set both with regard to the trip current $I_5 = 3 \ldots 10 \times I_1$ (in this case $I_5 = 3 \ldots 10 \times 0.85 \times 160$), and with regard to the trip time t_5.
To trace the curve correctly on the glossy sheet, simply place the glossy sheet over the graph of function R so that $I/In = I_1/In$ (on the glossy sheet) corresponds to $I/I_1 = 1$ (on the graph). In this case $I/In = I_1/In = 0.85$, and draw the desired curve.

Function I (cannot be excluded)
Protection against short-circuit

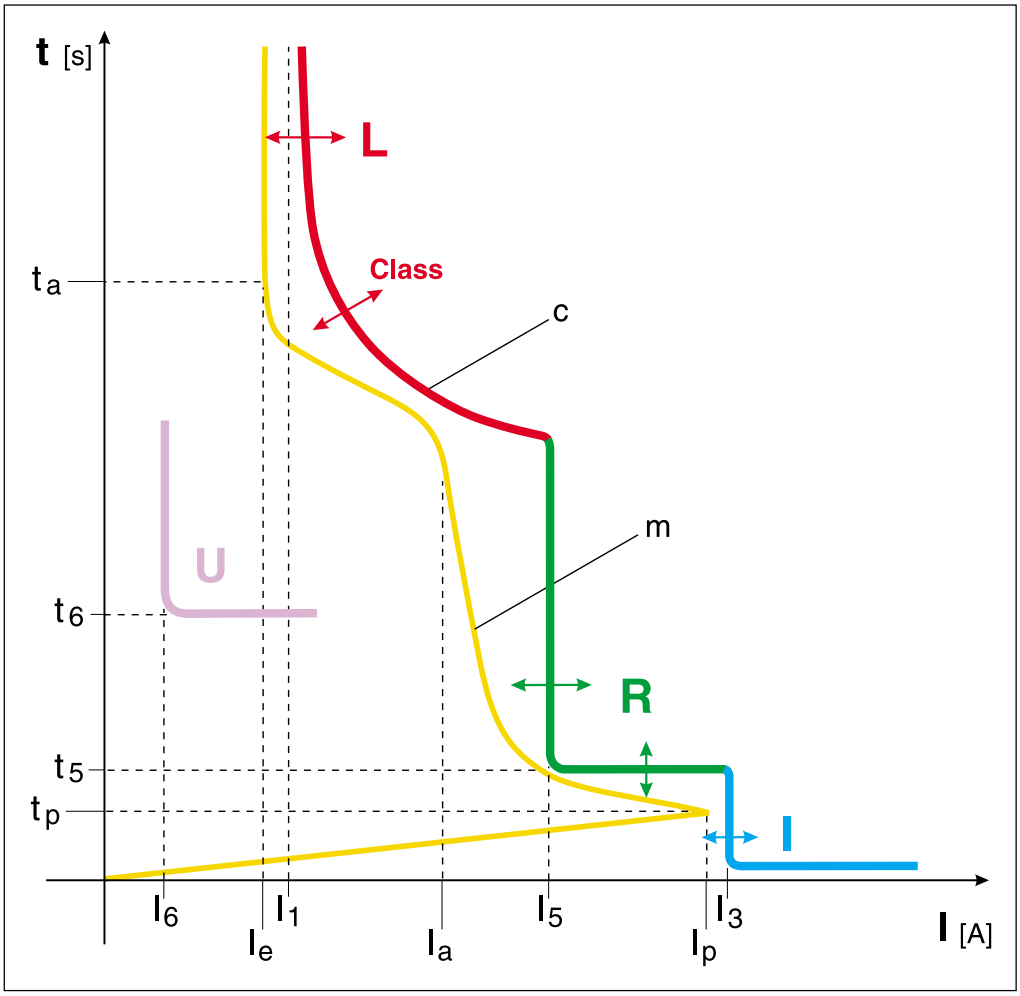
This protection function against short-circuit recognises whether the motor is in the starting phase, thereby avoiding unwarranted trips; the trip threshold can be set from 6 x In to 13 x In.
To trace the curve correctly on the glossy sheet, simply place the glossy sheet over the graph of function I so that I/In = 1 (on the glossy sheet) corresponds to I/In = 1 (on the graph) and draw the desired curve.

Function U (can be excluded)
Protection against loss and/or unbalance of a phase

Protection against loss or unbalance of a phase, if set to ON, intervenes when one or two phases have a current lower than 0.4 x I_1 (0.4 x 0.85 x In = 0.4 x 0.85 x 160 A = 54.4 A in this case). To trace the curve correctly on the glossy sheet, simply place the glossy sheet over the graph of function U so that I/In = I_1/In (on the glossy sheet) corresponds to I/I_1 = 1 (on the graph). In this case I/In = I_1/In = 0.85, and draw the desired curve.

Curves operating characteristic of an asynchronous motor

I_1 = function L trip current
I_3 = function I trip current
I_5 = function R trip current
t_5 = function R trip time
I_6 = function U trip current
t_6 = function U trip time
I_e = rated service current of the motor
I_a = motor starting current
I_p = peak value of the sub-transient starting current
t_a = motor starting time
t_p = duration of the sub-transient starting phase
m = typical motor starting curve
c = example of trip curve of a motor protection circuit-breaker with electronic release



4

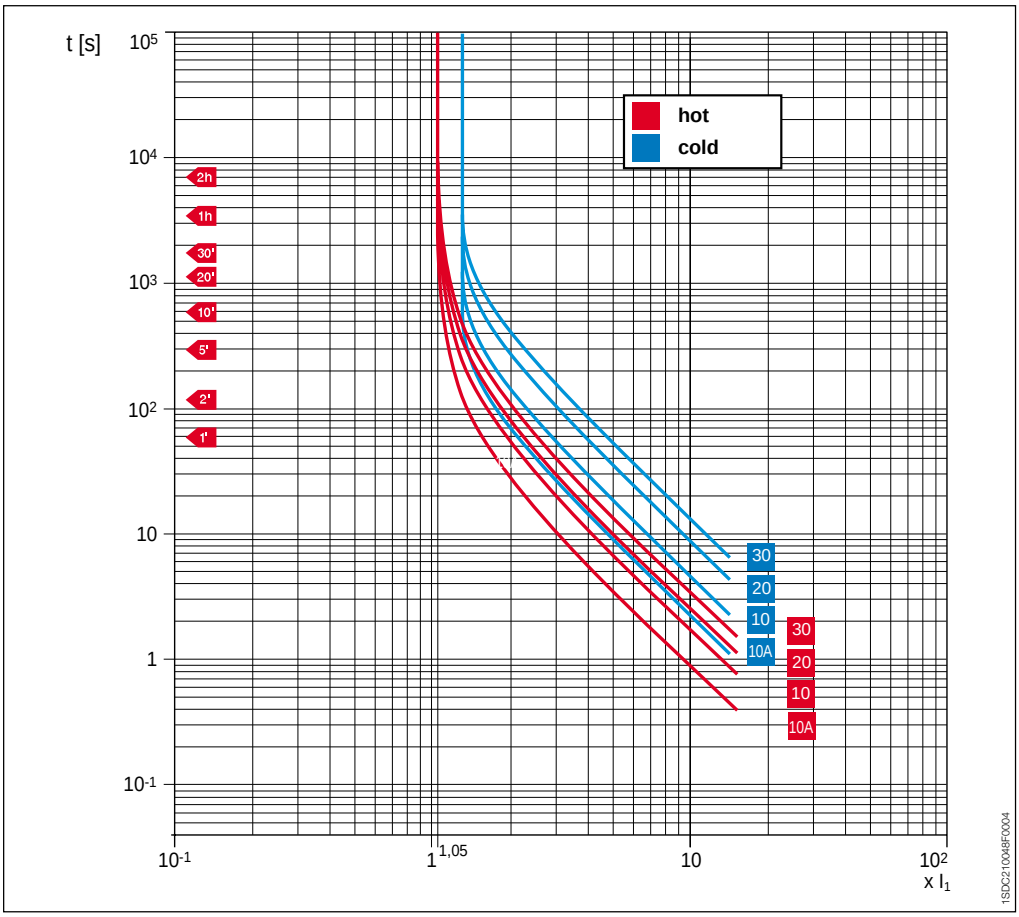
Trip curves for motor protection

Circuit-breakers with PR222MP electronic release

T4 250 - T5 400

PR222MP

L Function
(hot and cold trip)

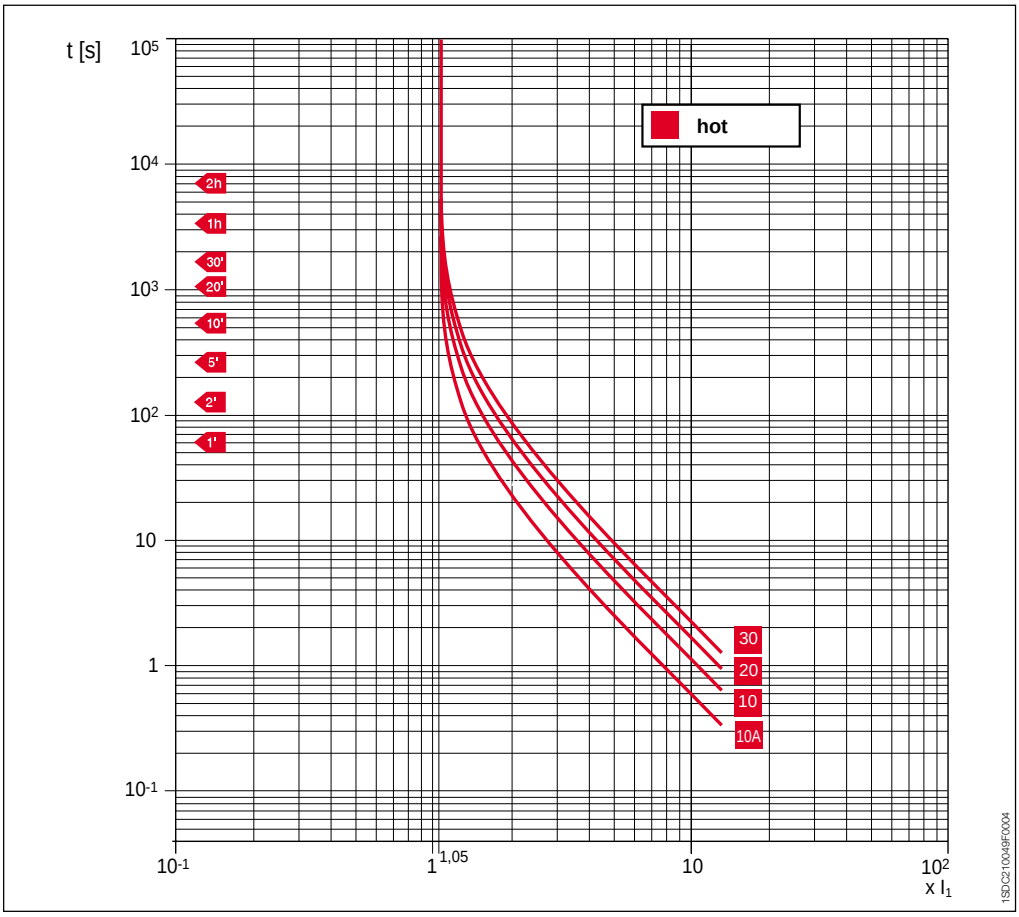


4

T4 250 - T5 400

PR222MP

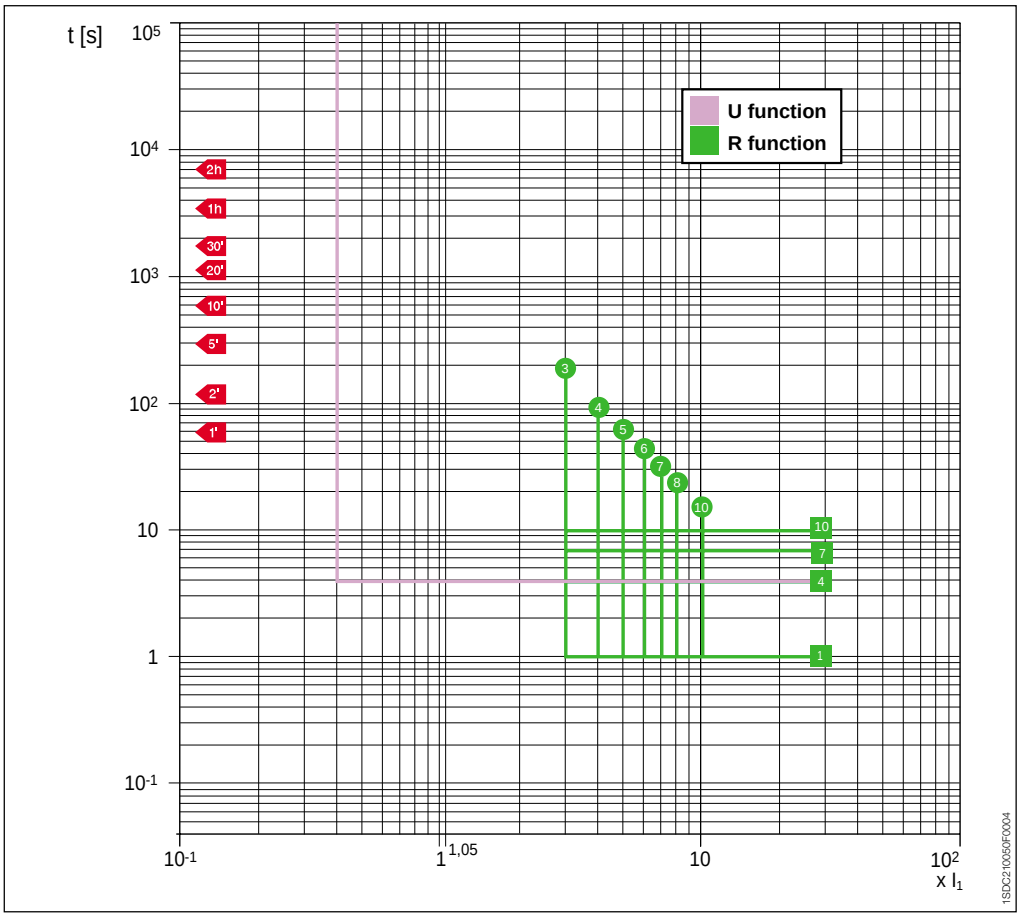
L Function
(hot trip with 1 or 2
phases supplied)



T4 250 - T5 400

PR222MP

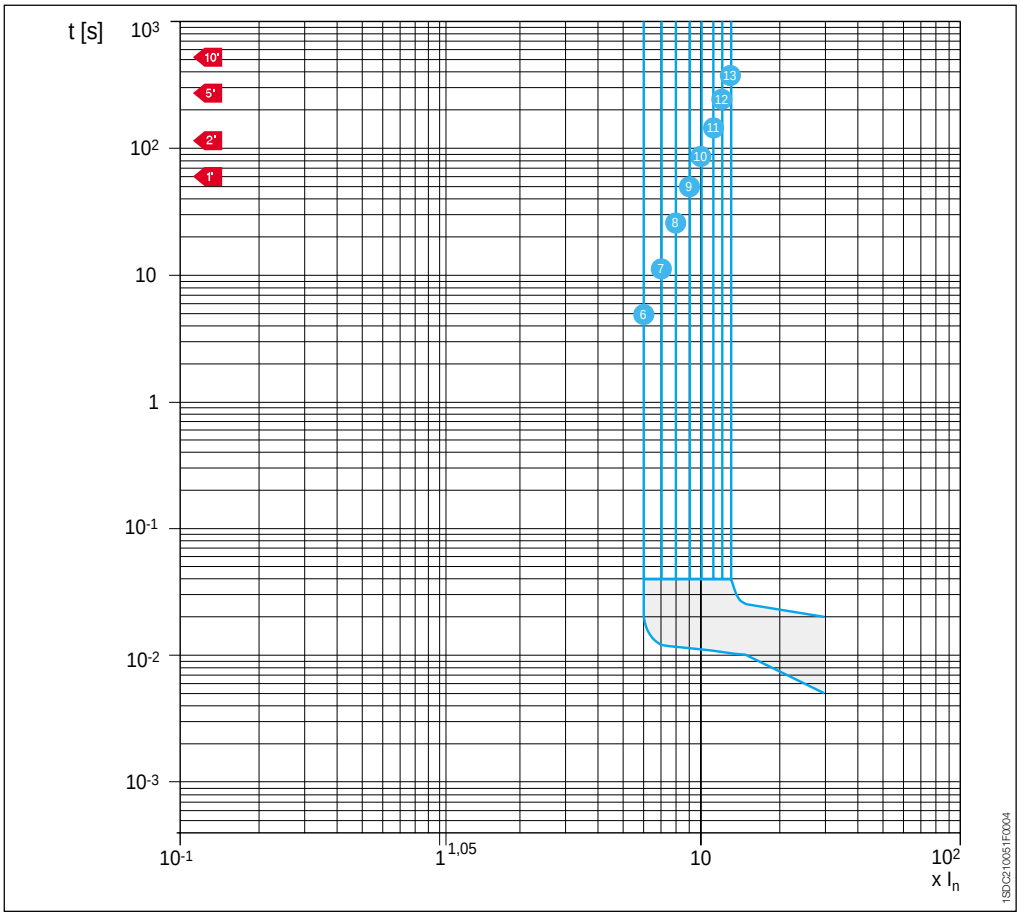
R-U Function



T4 250 - T5 400

PR222MP

I Function

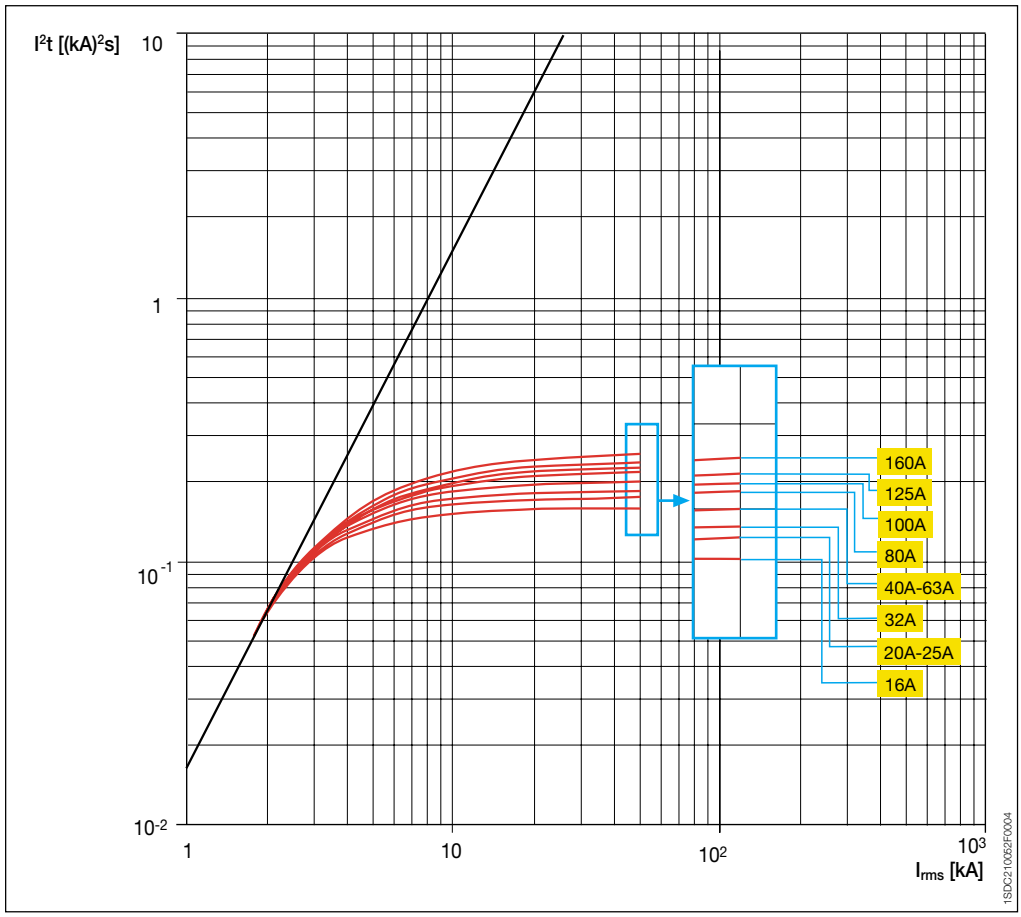


4

Specific let-through energy curves

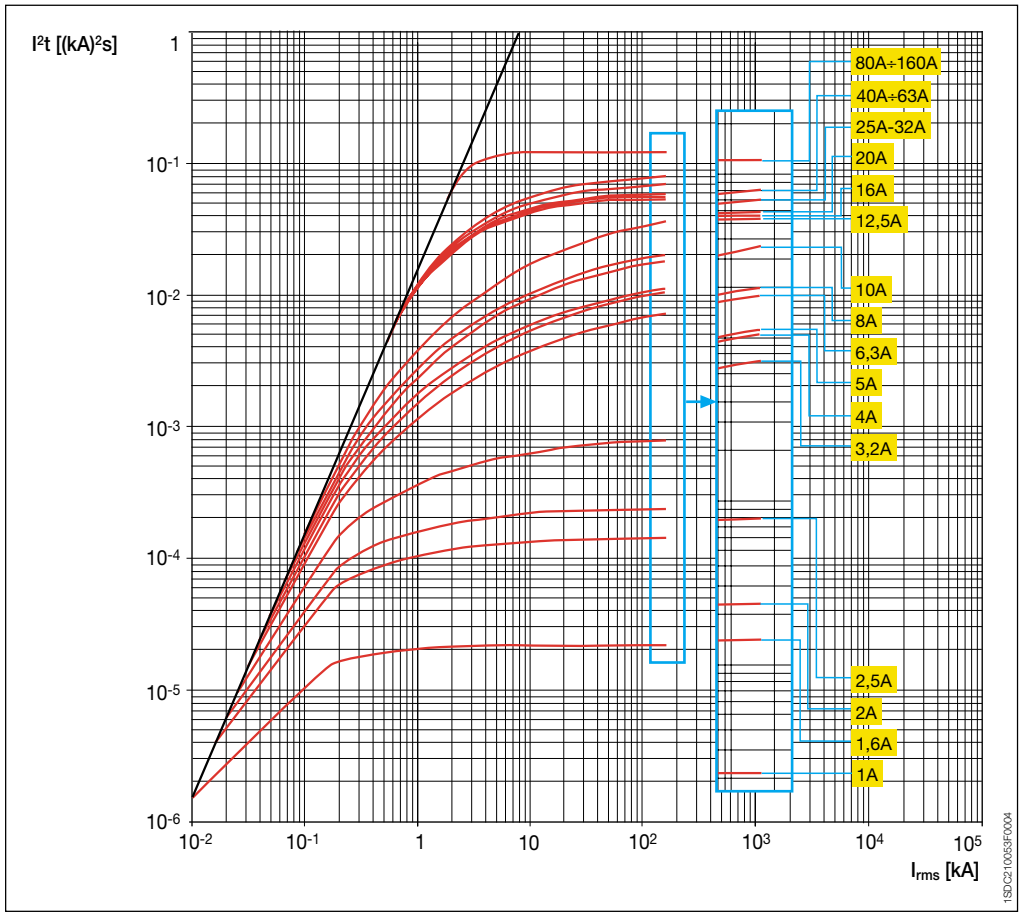
T1 160

230 V



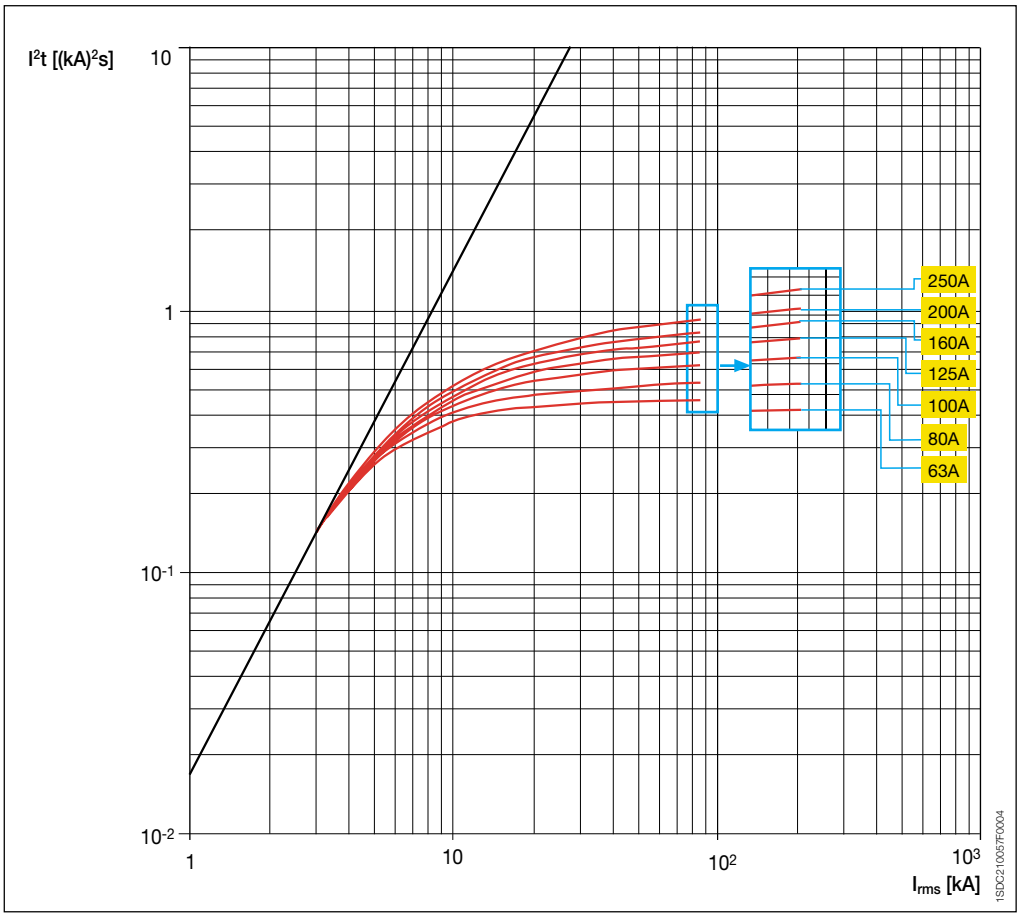
T2 160

230 V



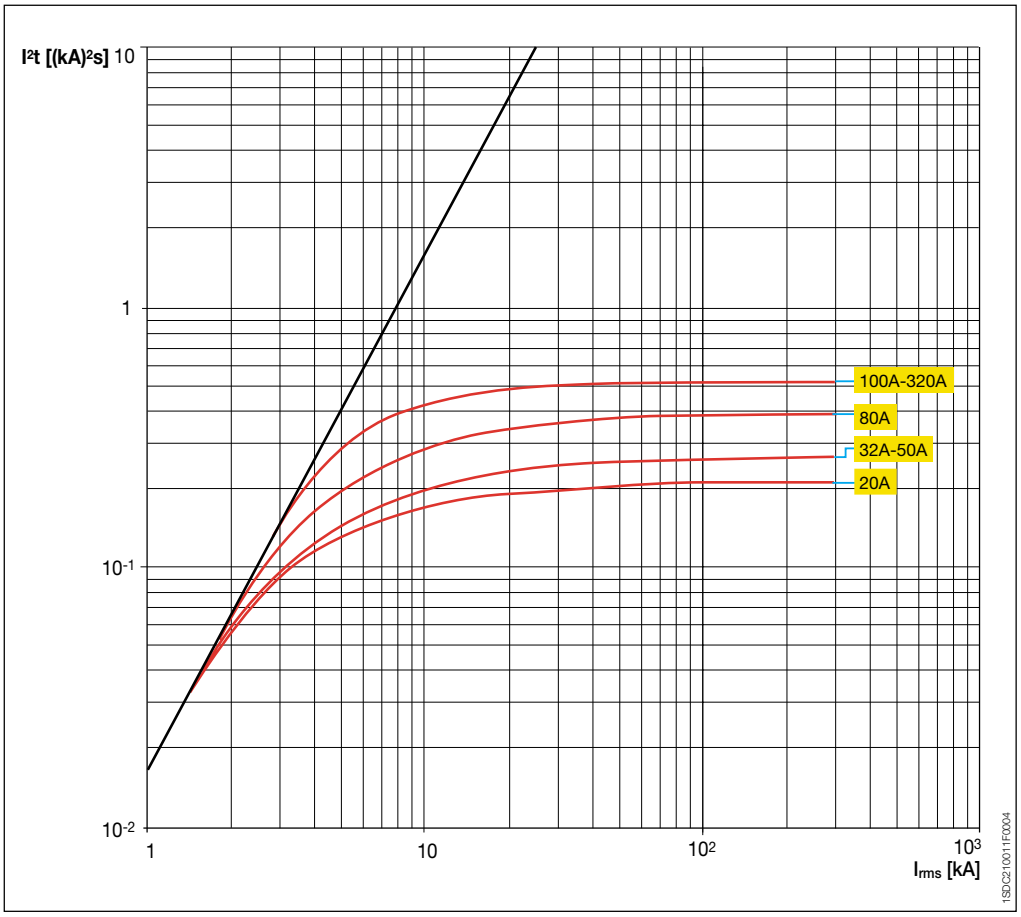
T3 250

230 V



T4 250/320

230 V

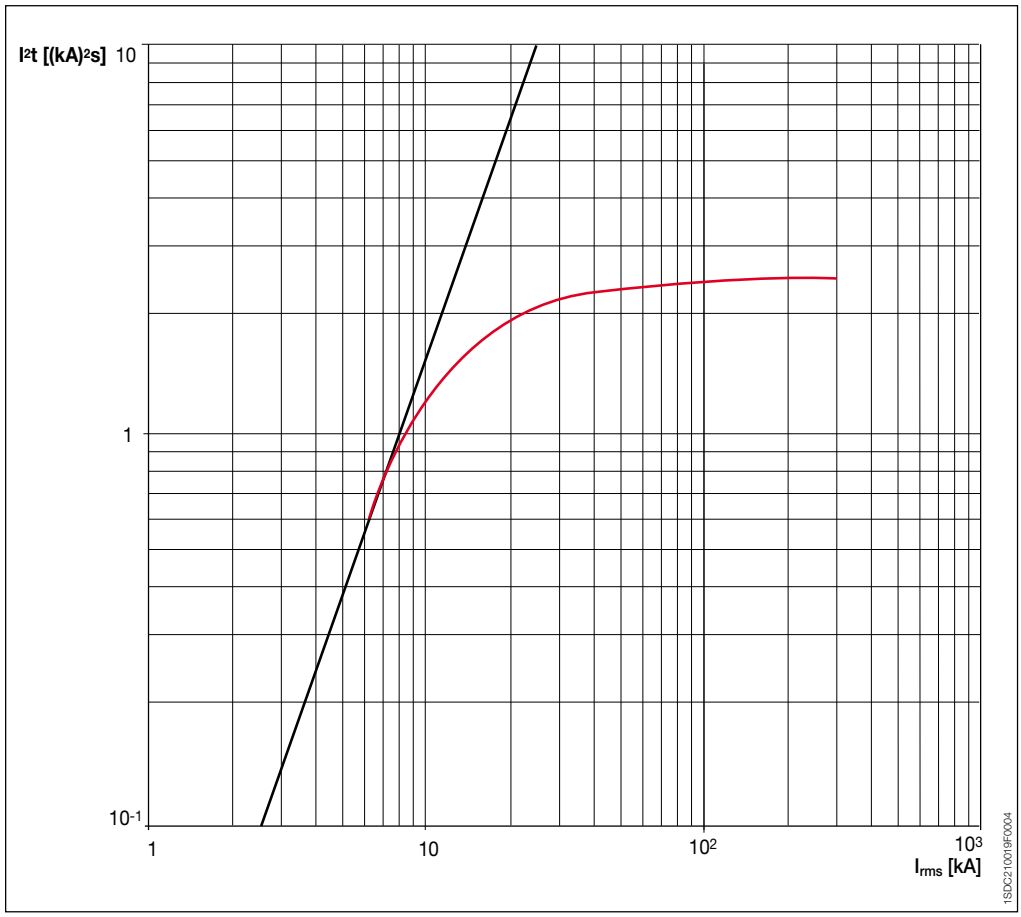


4

Specific let-through energy curves

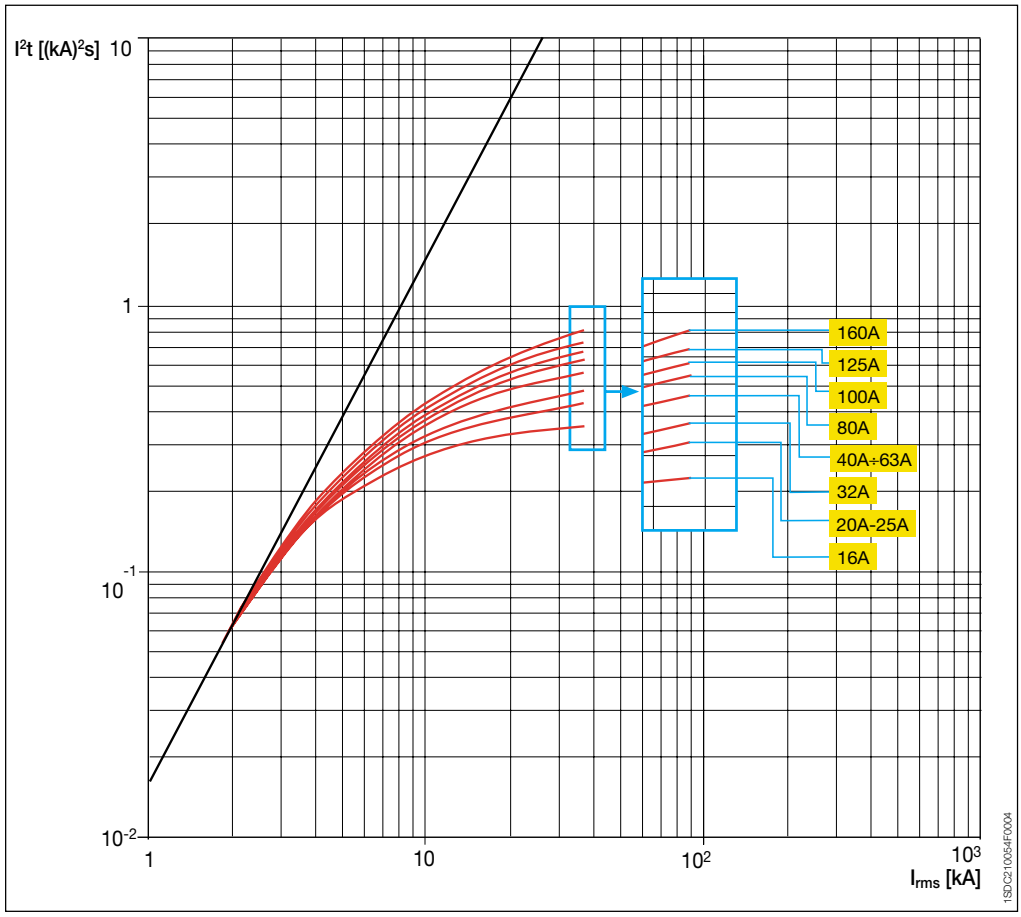
T5 400/630

230 V



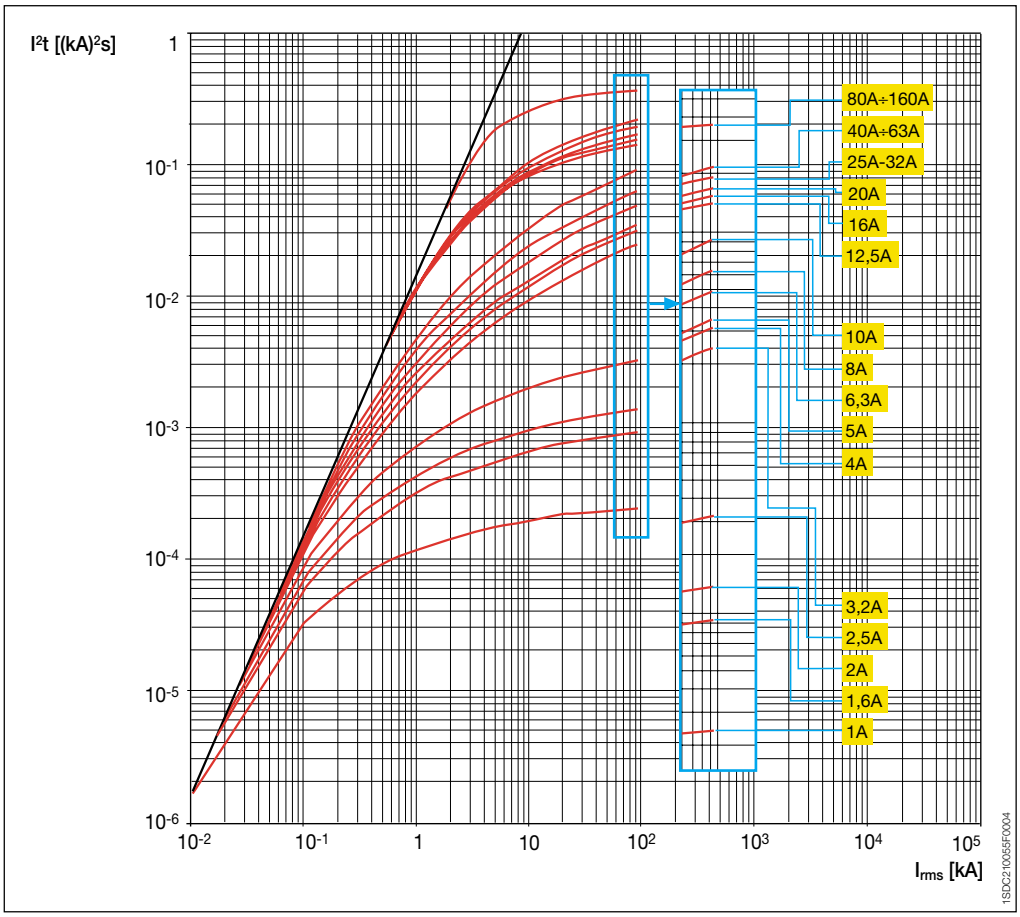
T1 160

400-440 V



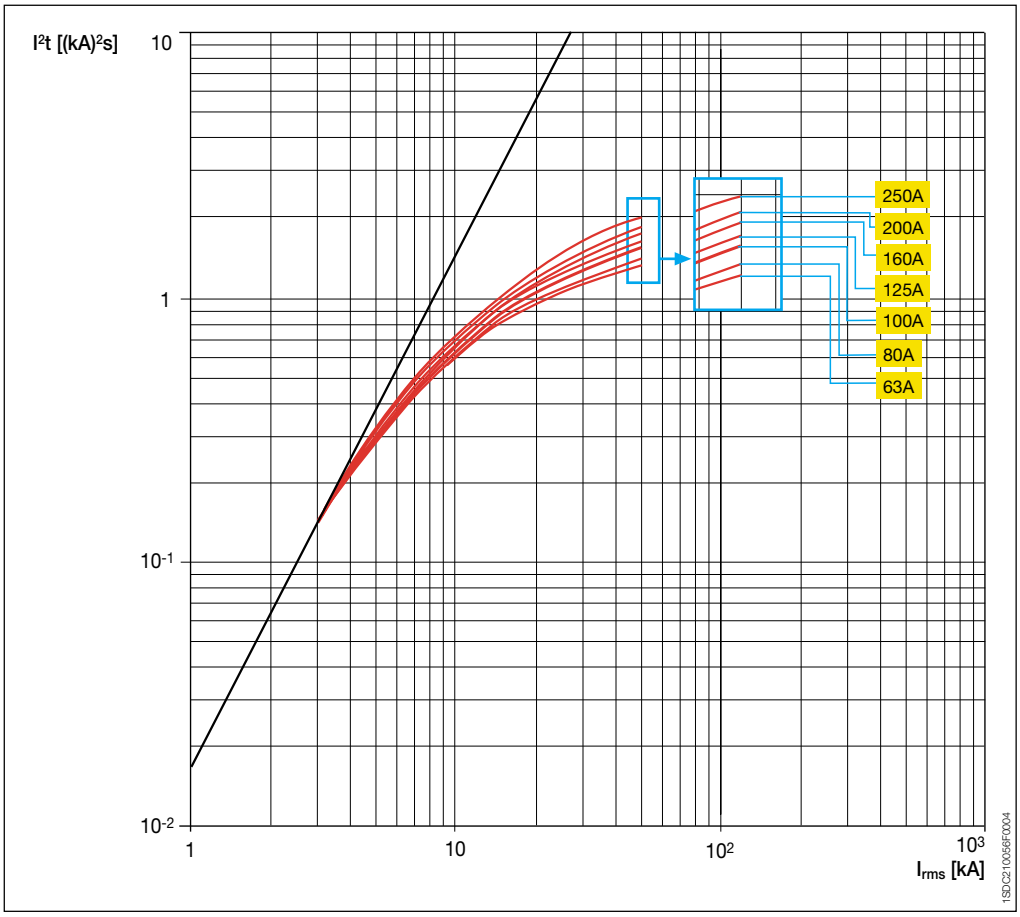
T2 160

400-440 V



T3 250

400-440 V

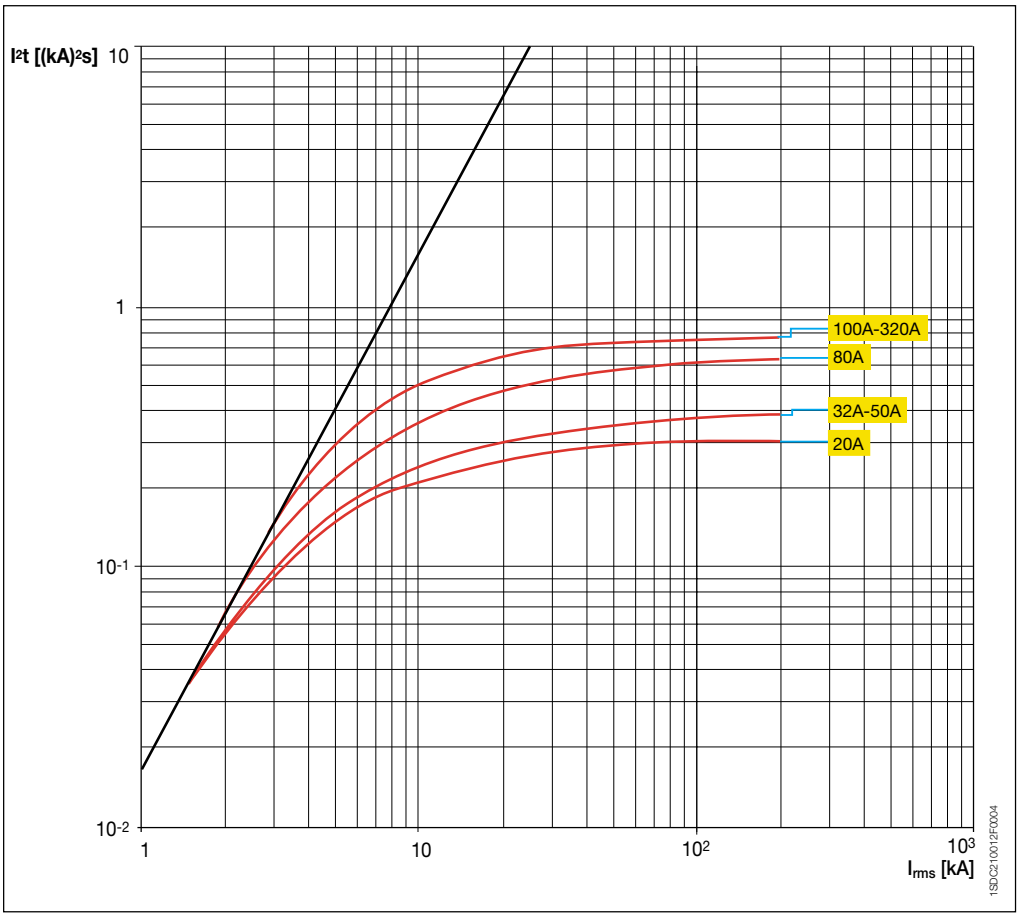


4

Specific let-through energy curves

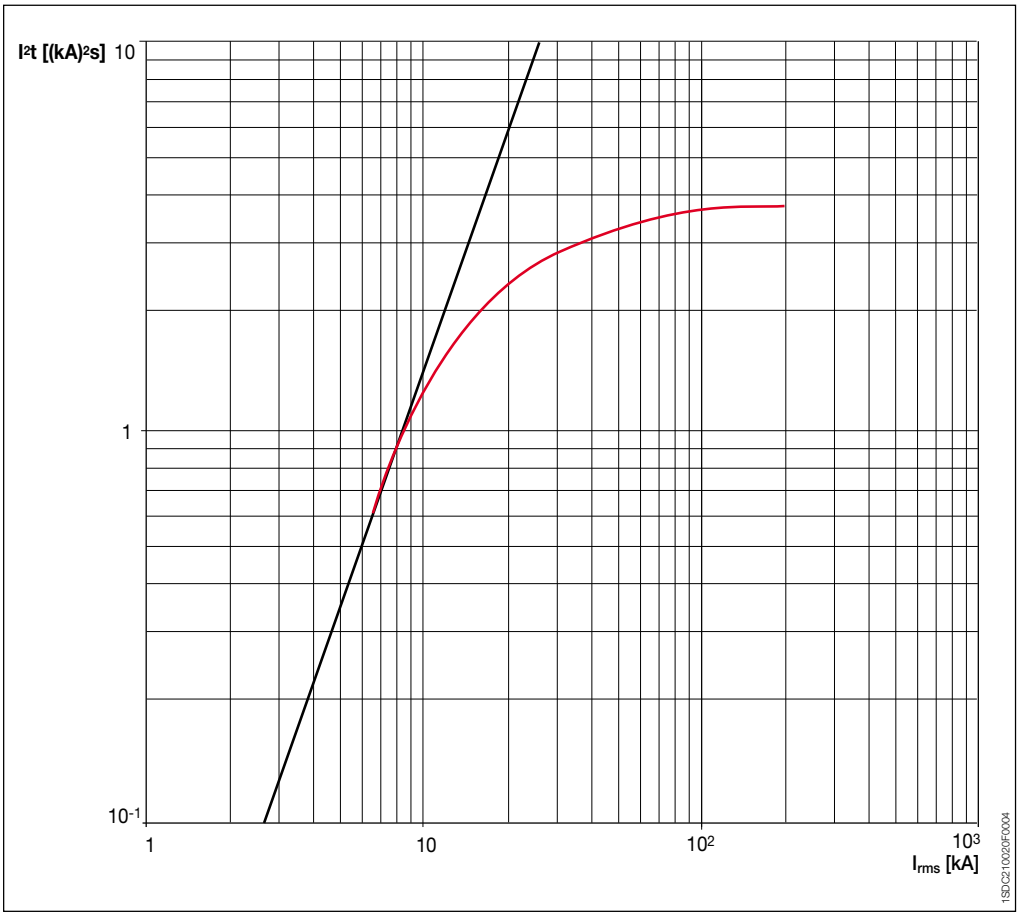
T4 250/320

400-440 V



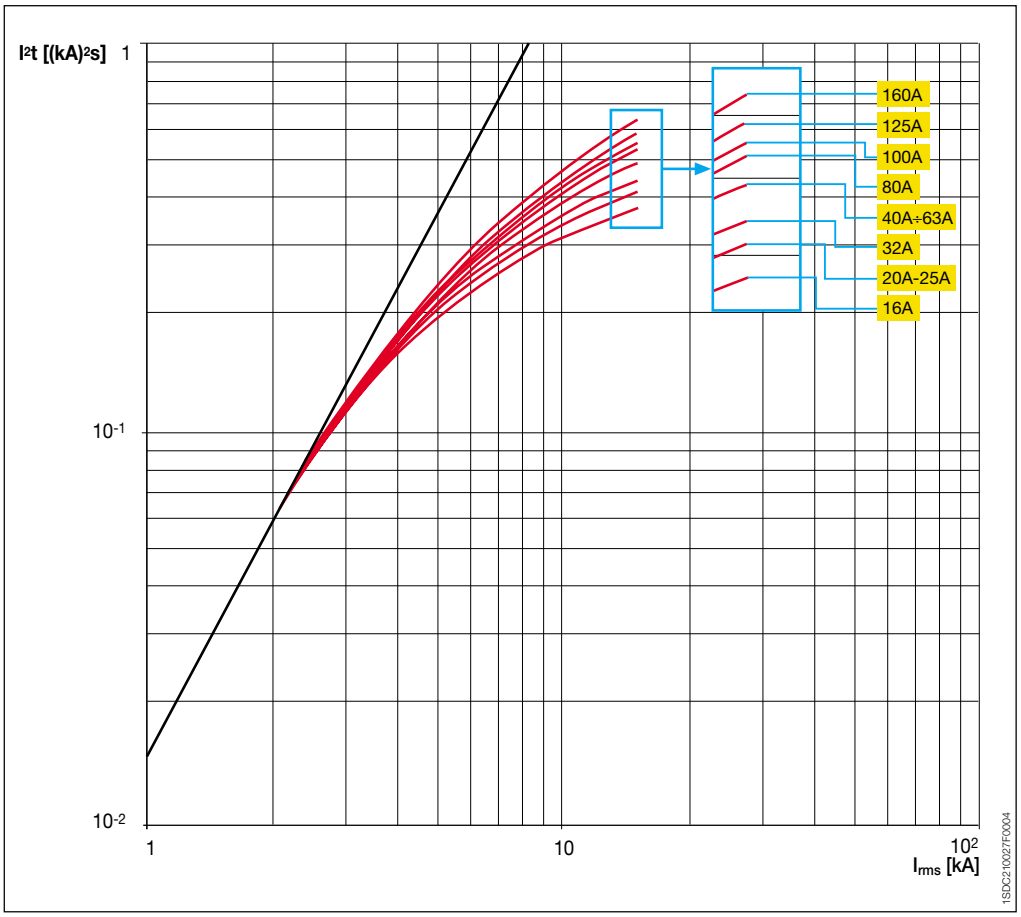
T5 400/630

400-440 V



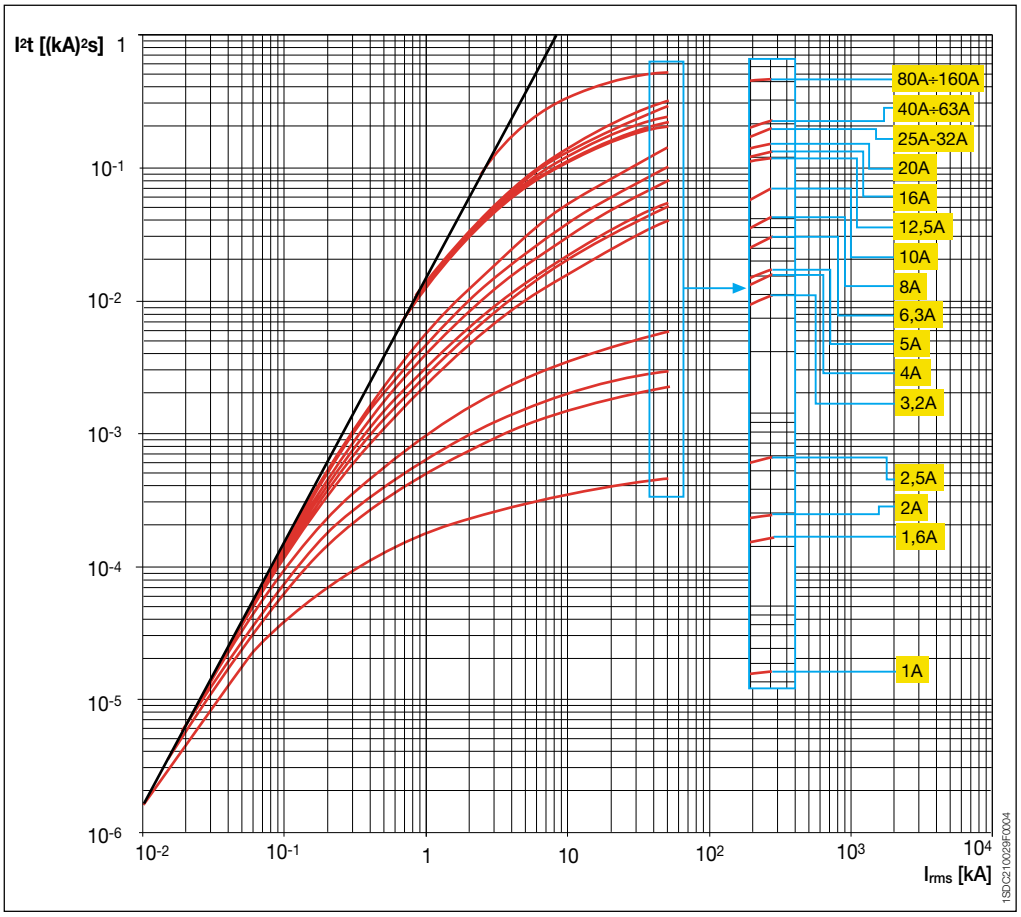
T1 160

500 V



T2 160

500 V

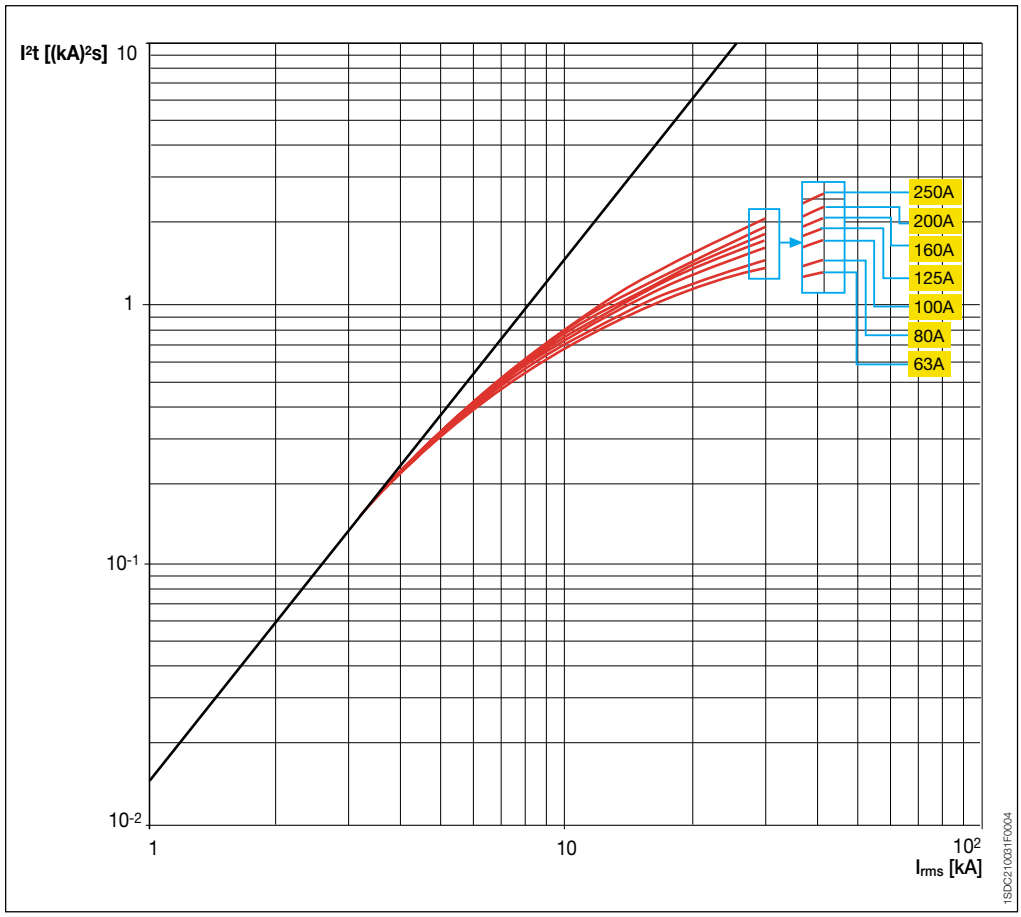


4

Specific let-through energy curves

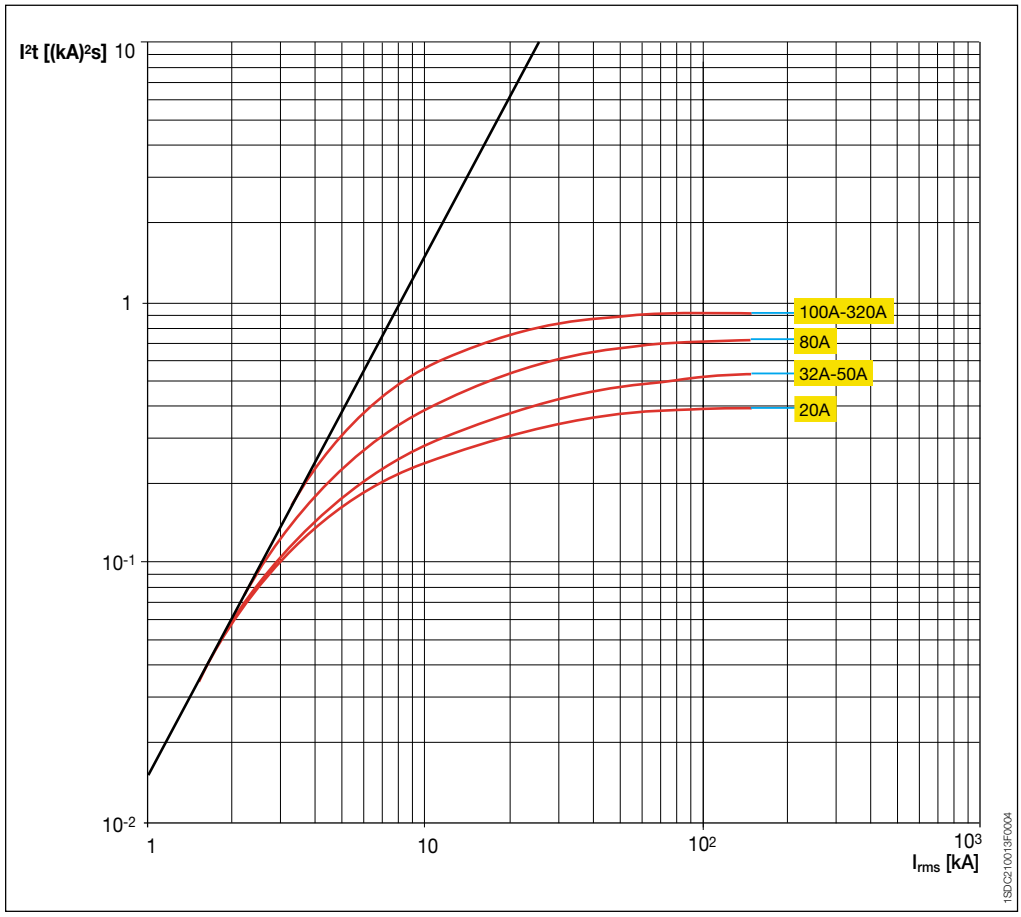
T3 250

500 V



T4 250/320

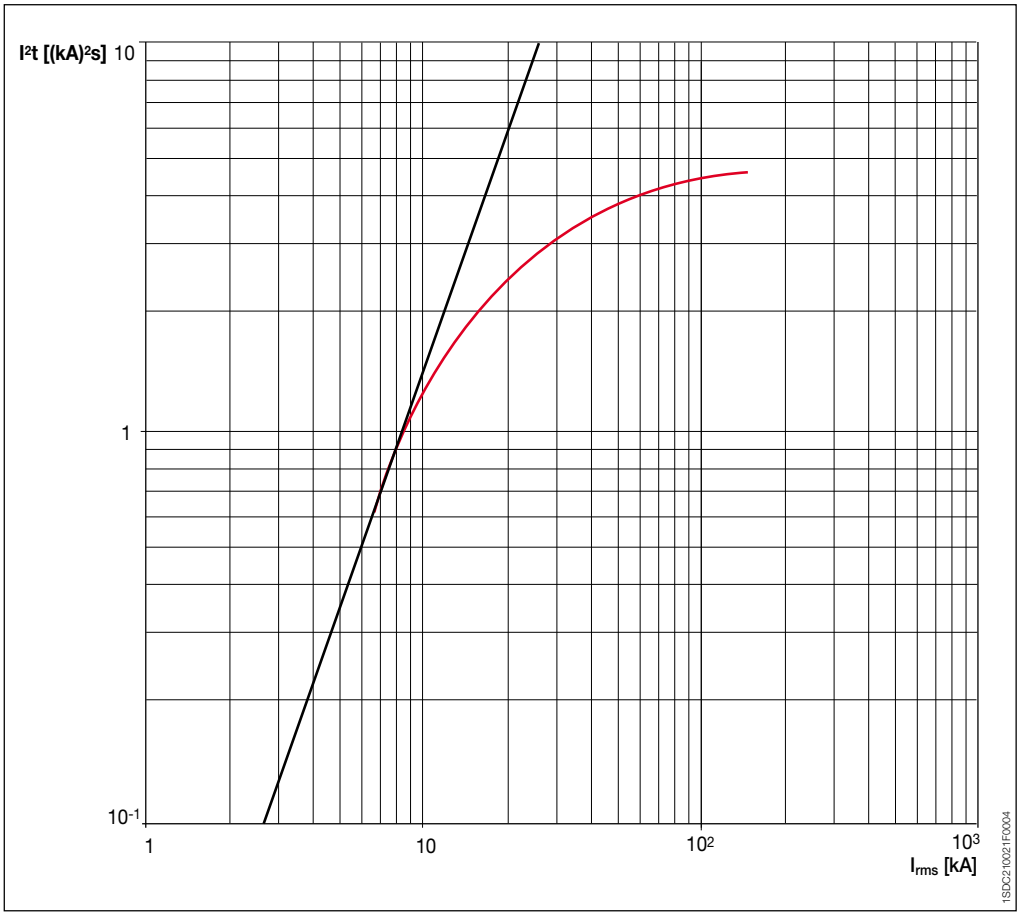
500 V



4

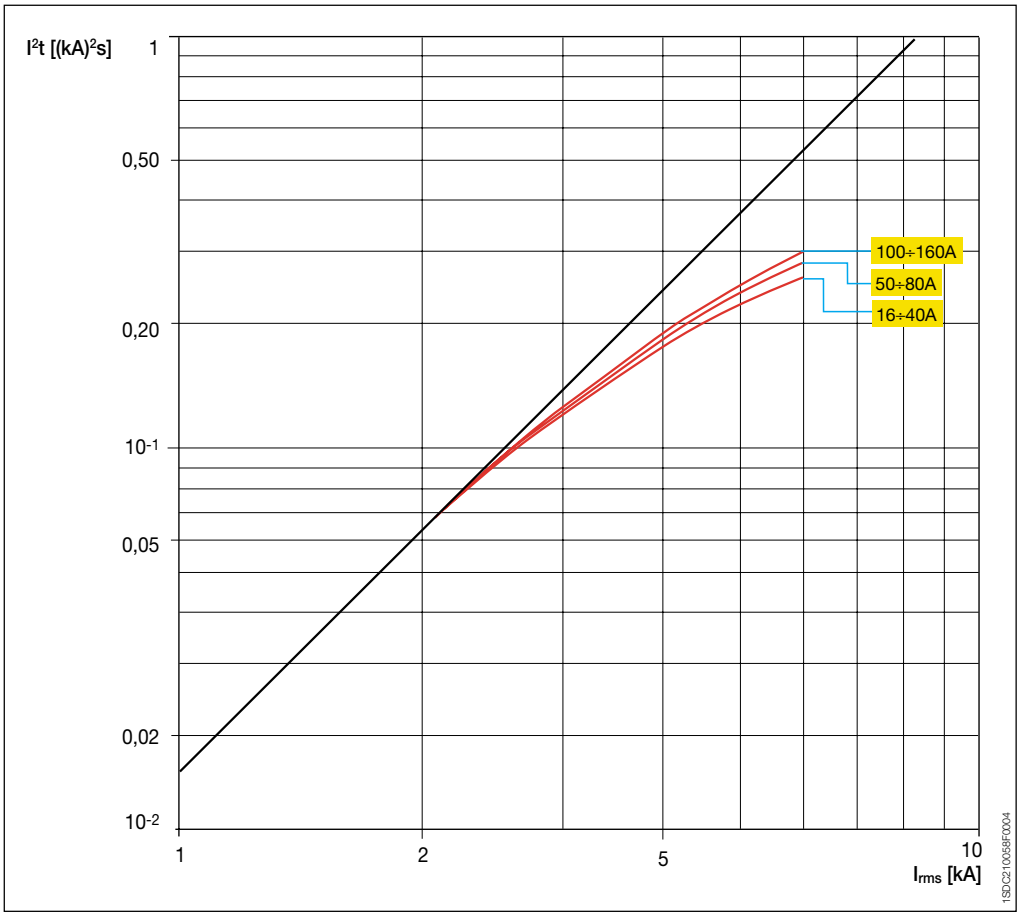
T5 400/630

500 V



T1 160

690 V

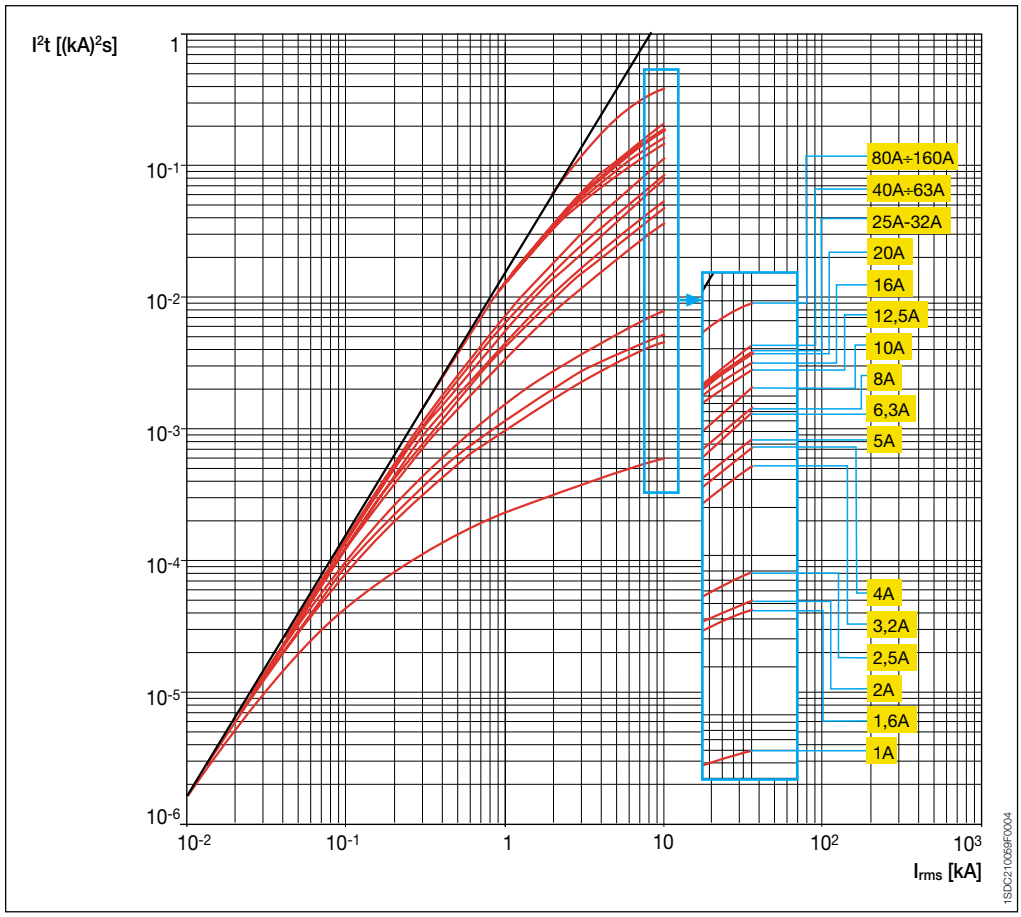


4

Specific let-through energy curves

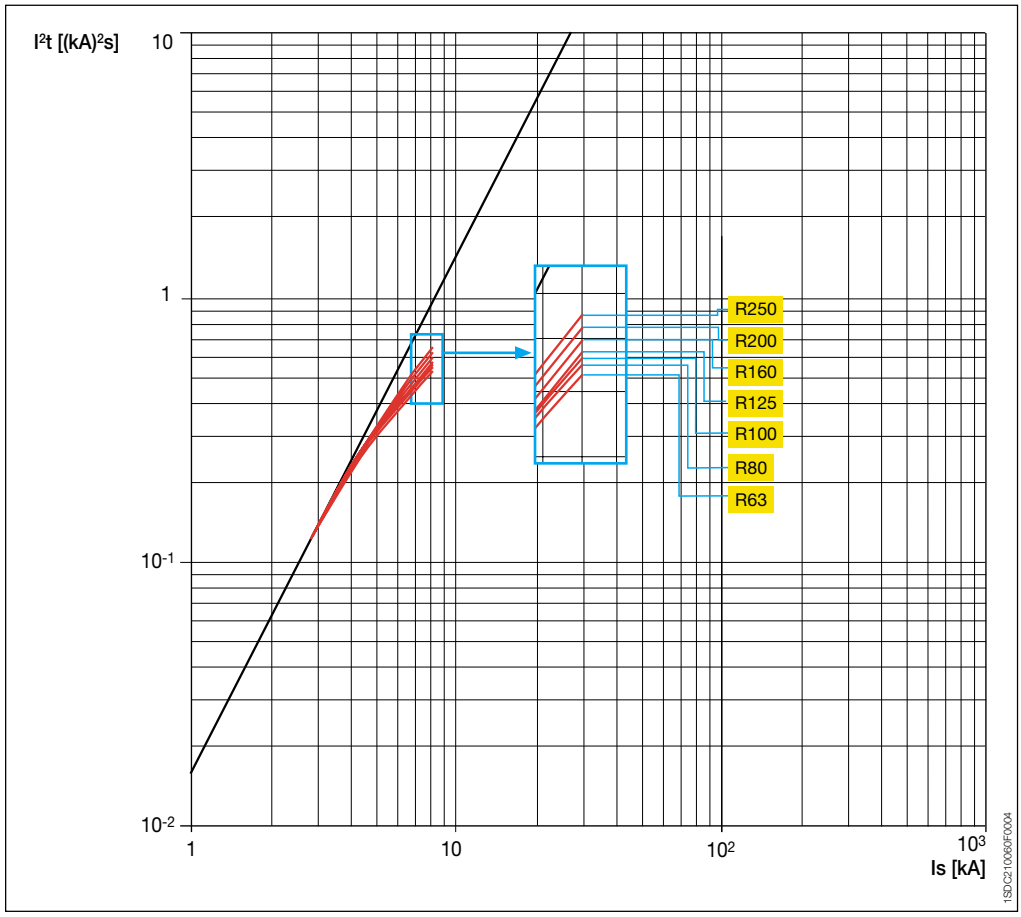
T2 160

690 V



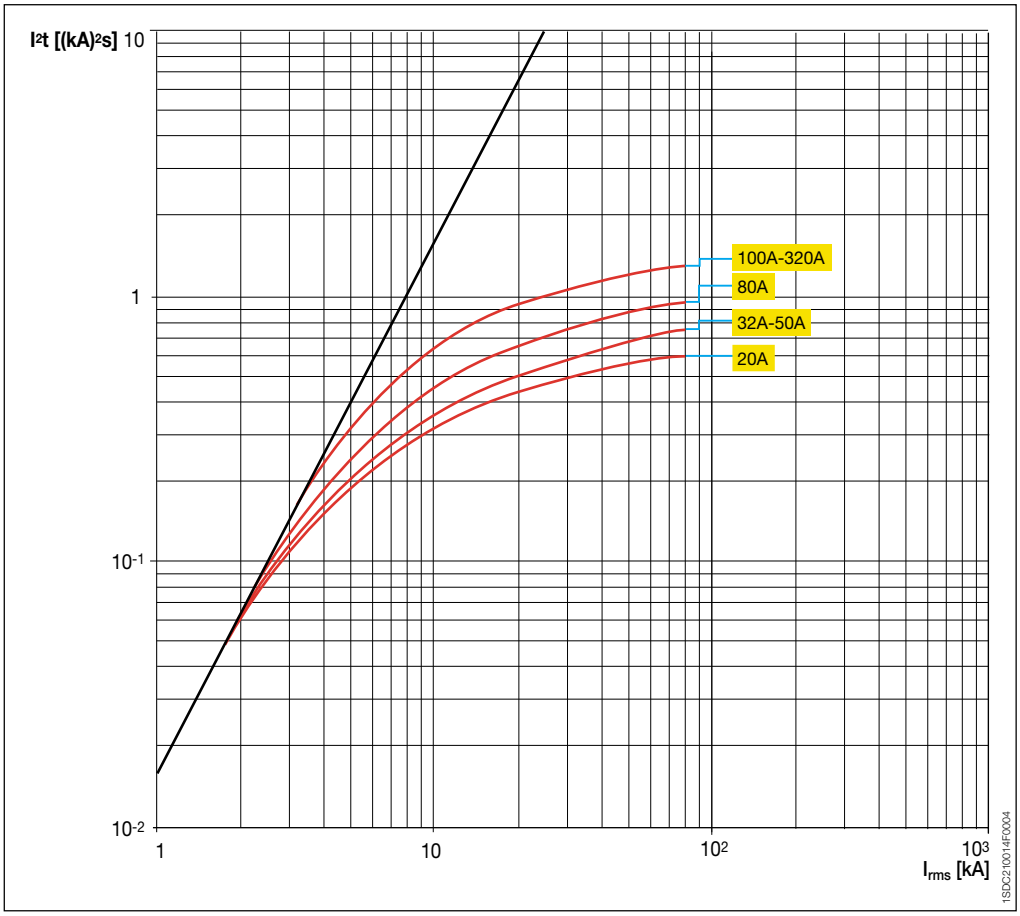
T3 250

690 V



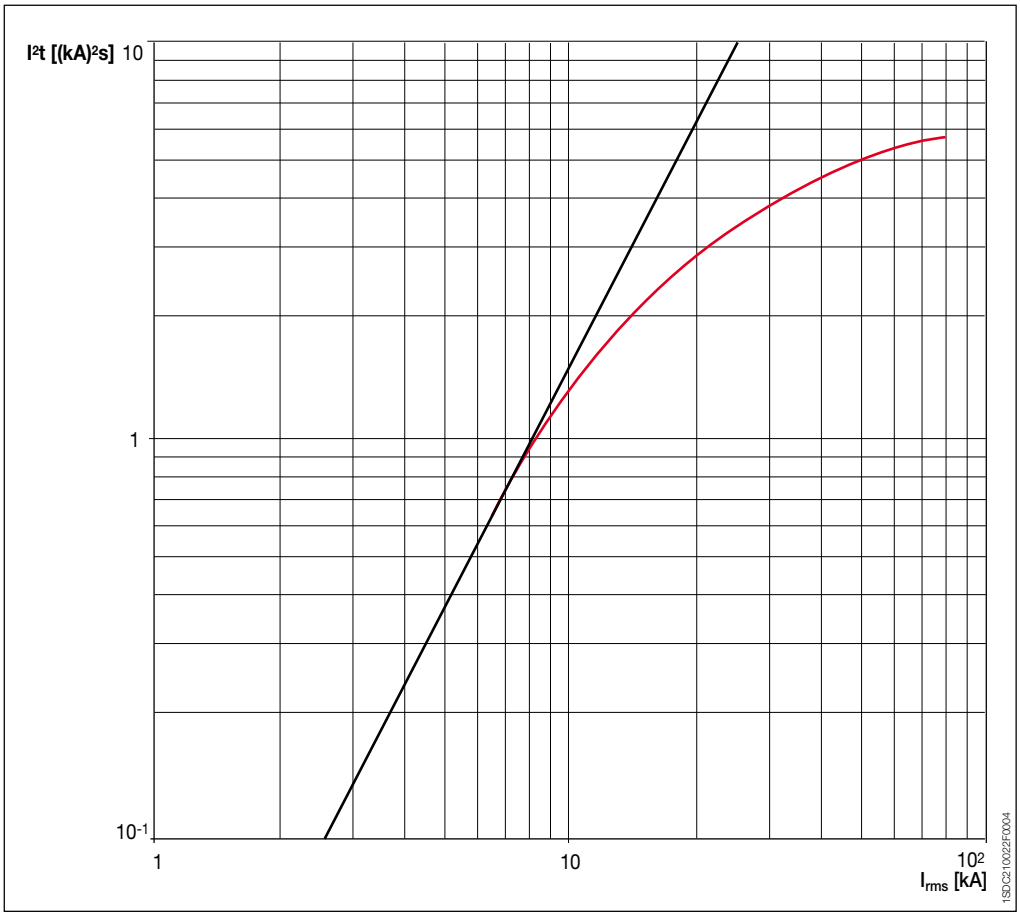
T4 250/320

690 V



T5 400/630

690 V

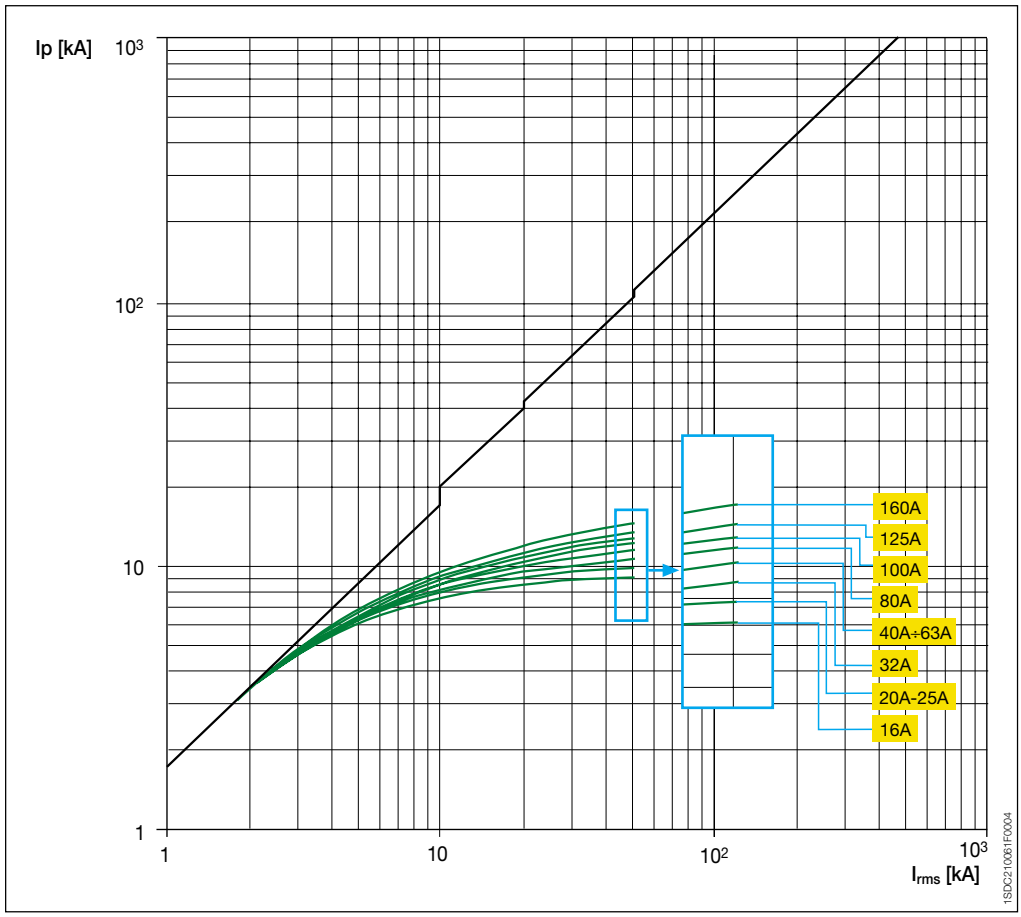


4

Limitation curves

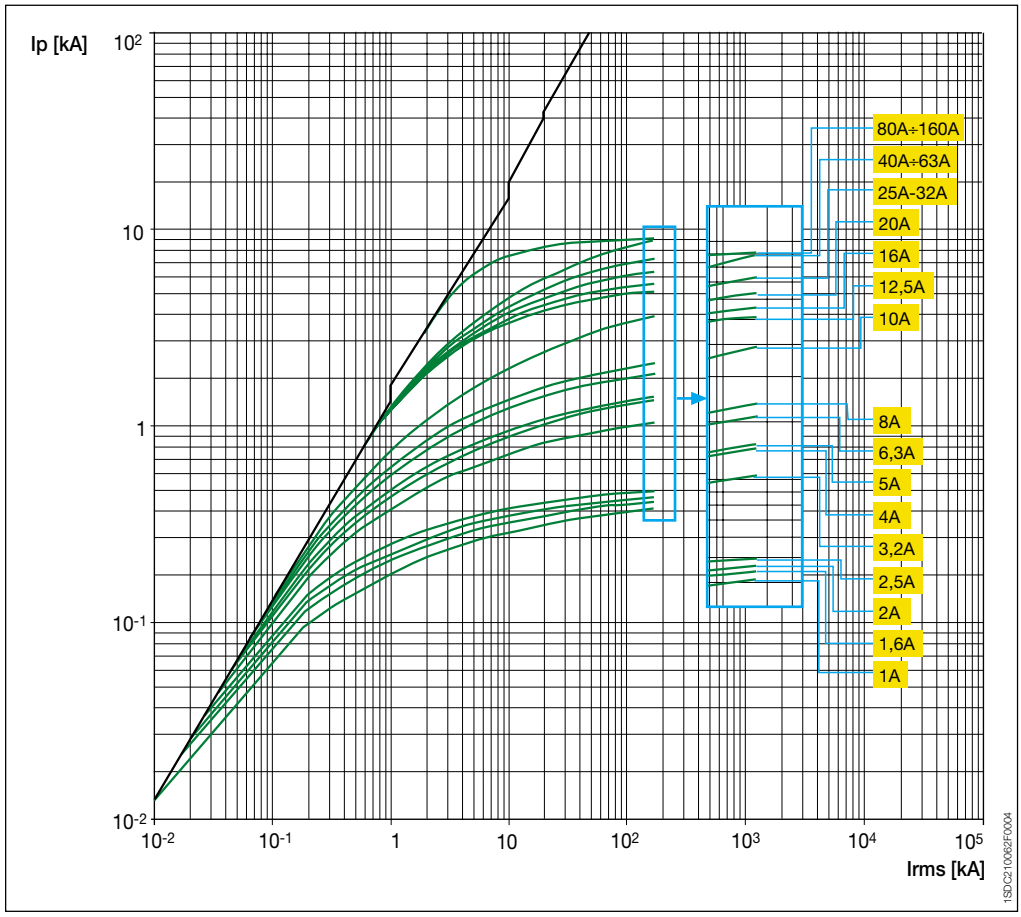
T1 160

230 V



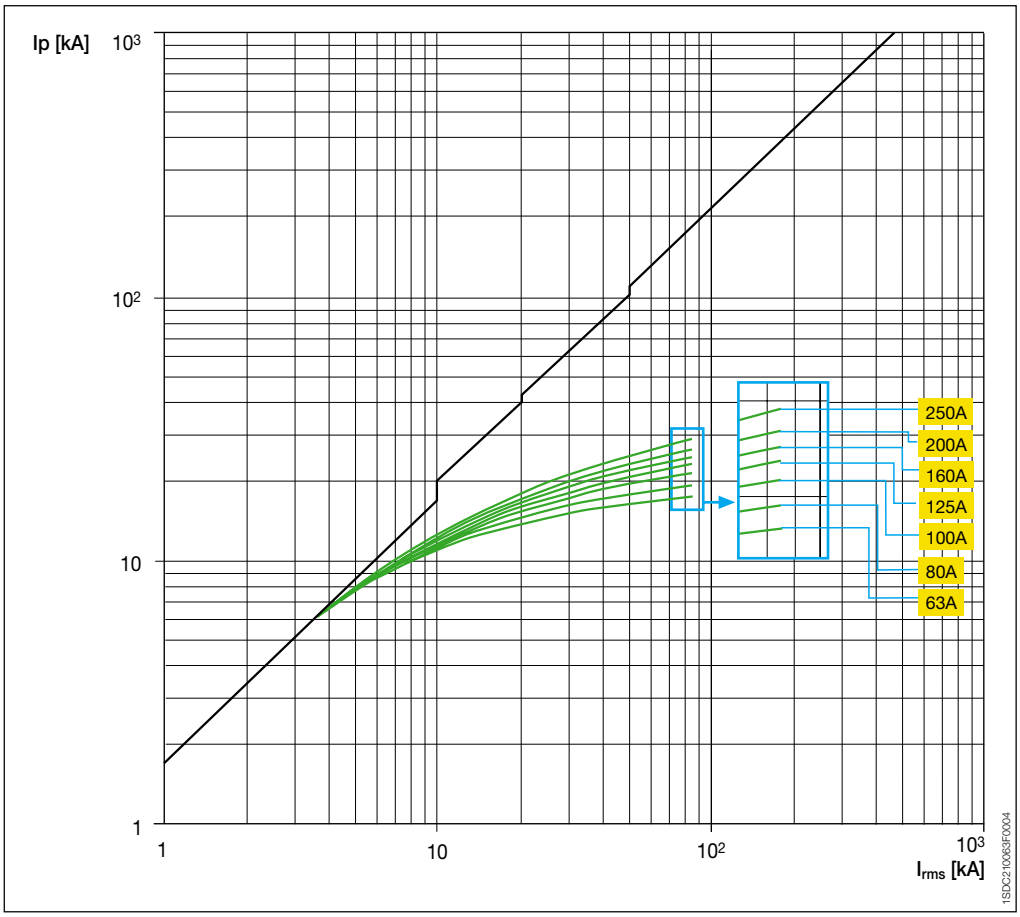
T2 160

230 V



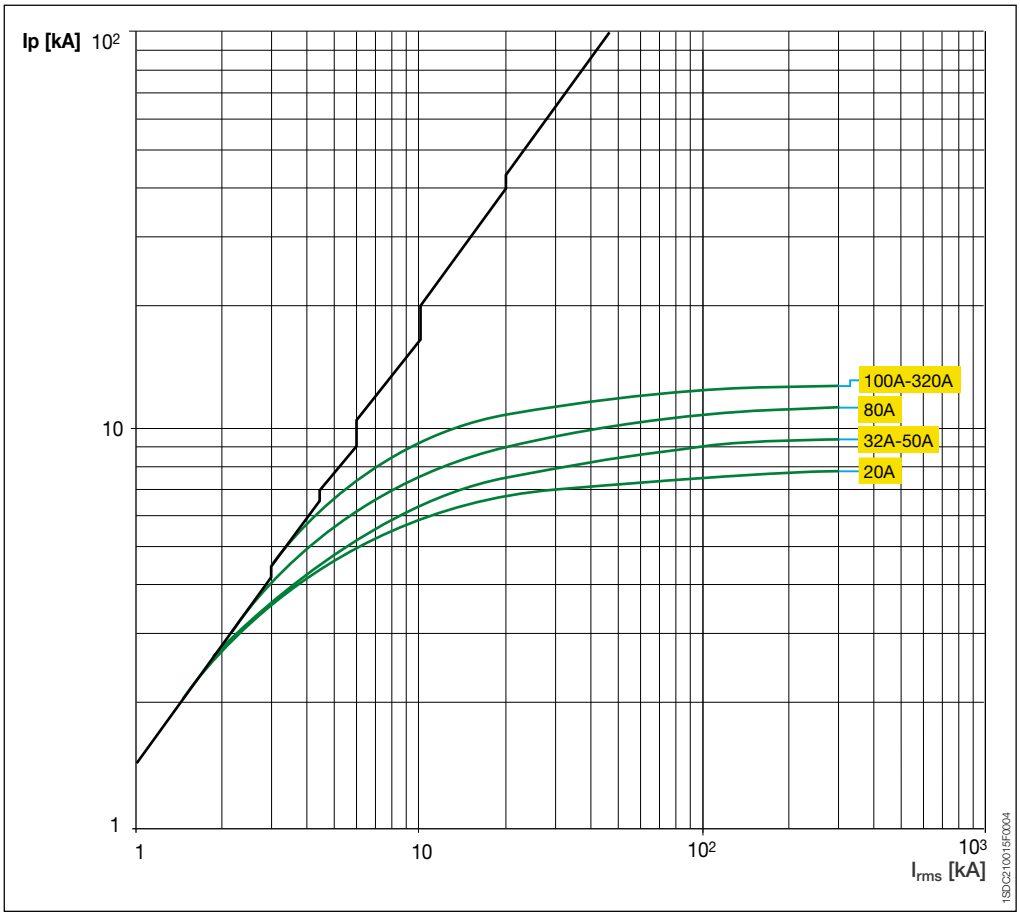
T3 250

230 V



T4 250/320

230 V

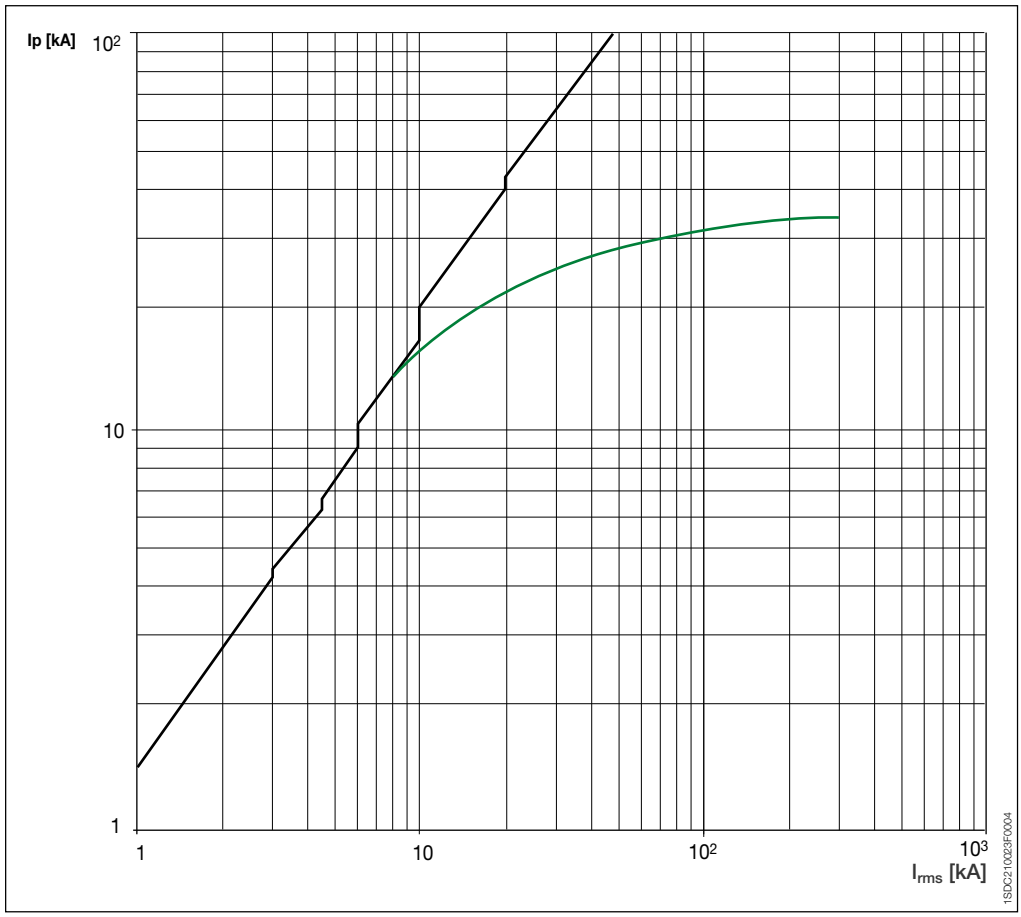


4

Limitation curves

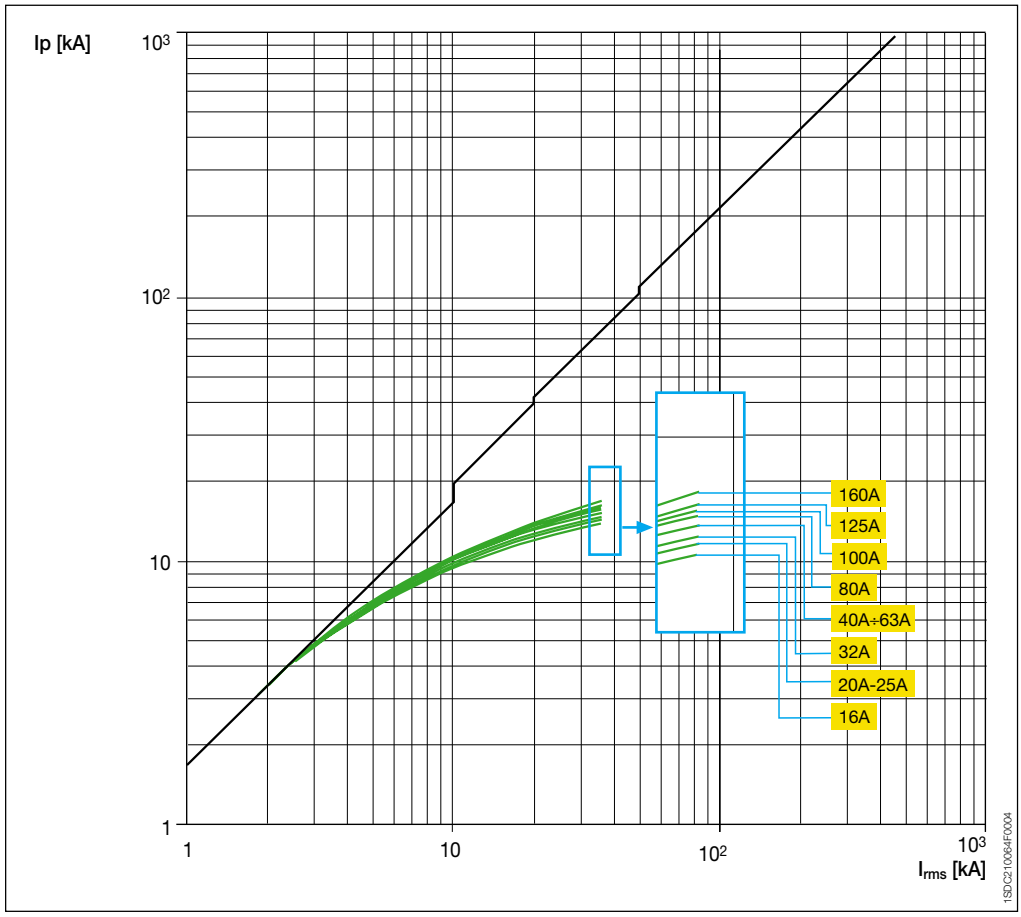
T5 400/630

230 V



T1 160

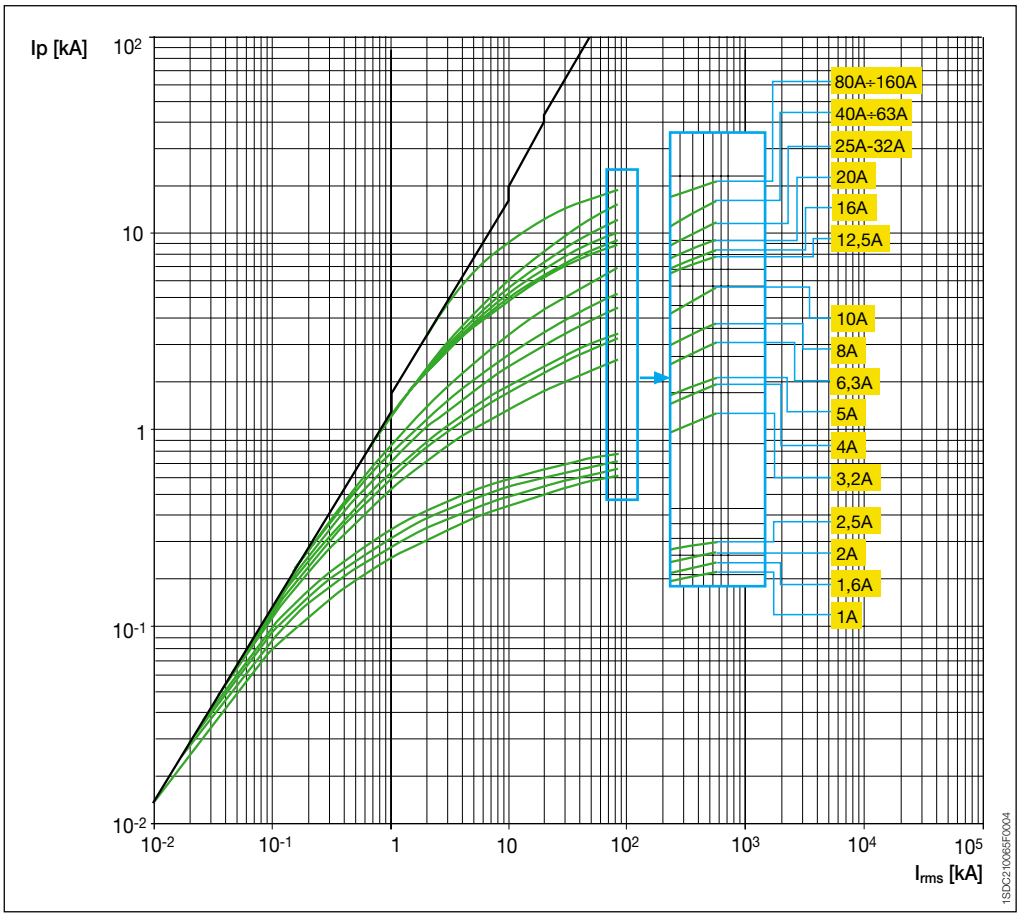
400-440 V



4

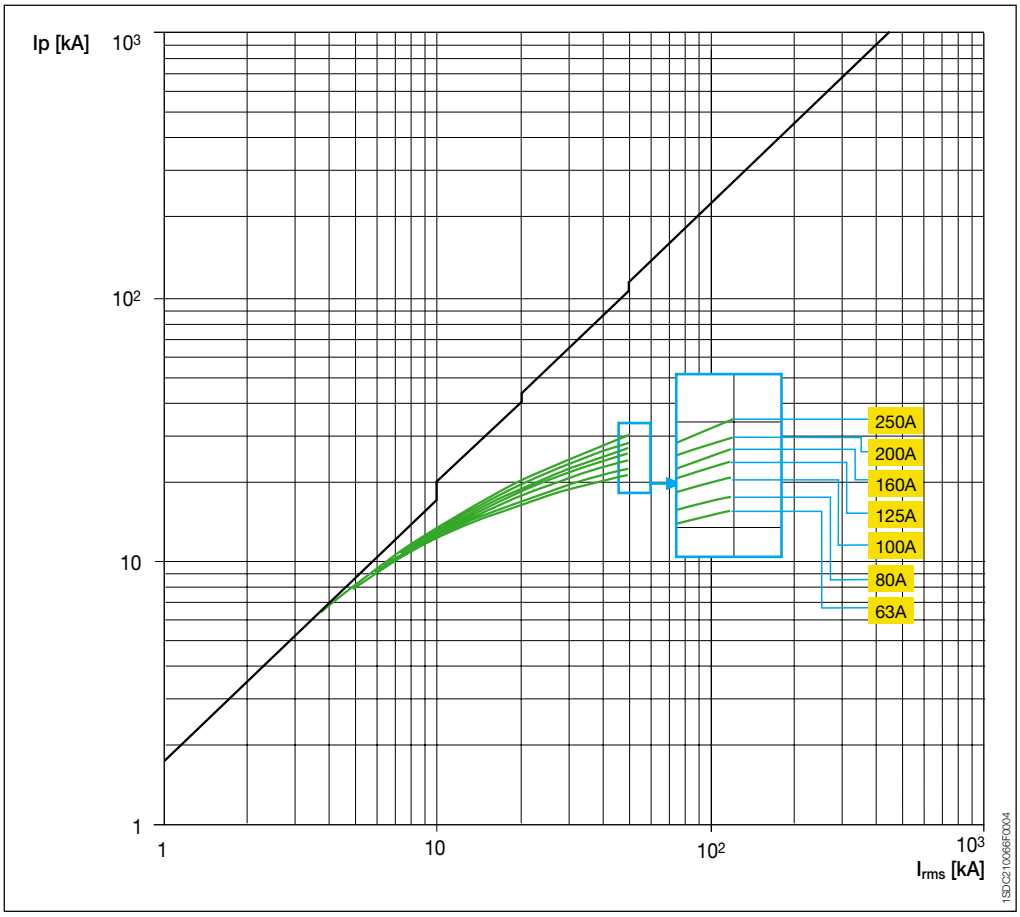
T2 160

400-440 V



T3 250

400-440 V

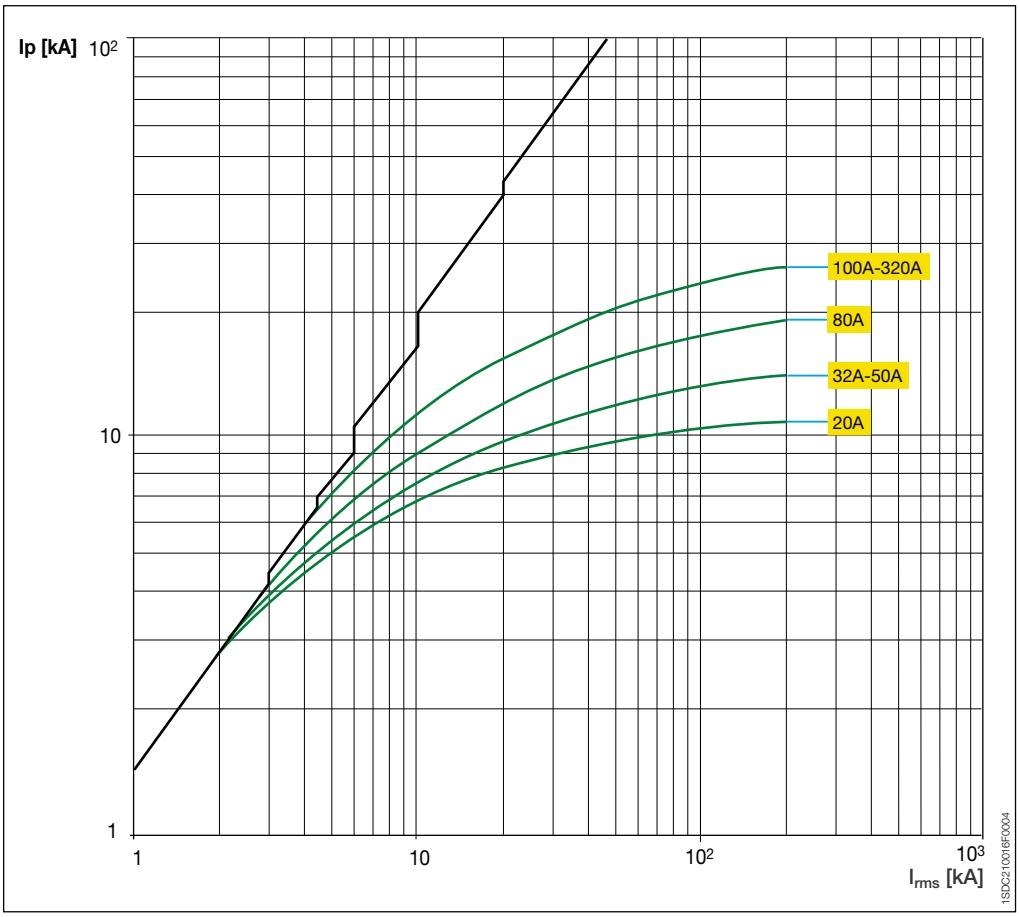


4

Limitation curves

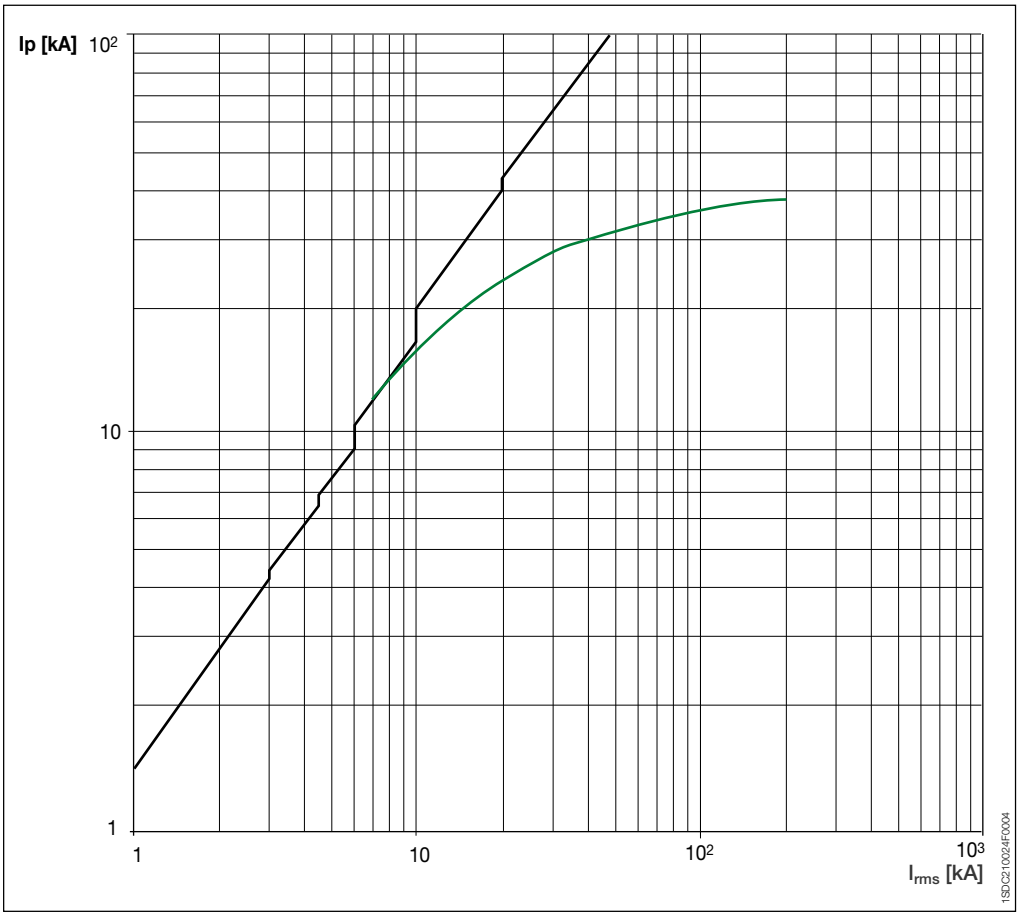
T4 250/320

400-440 V



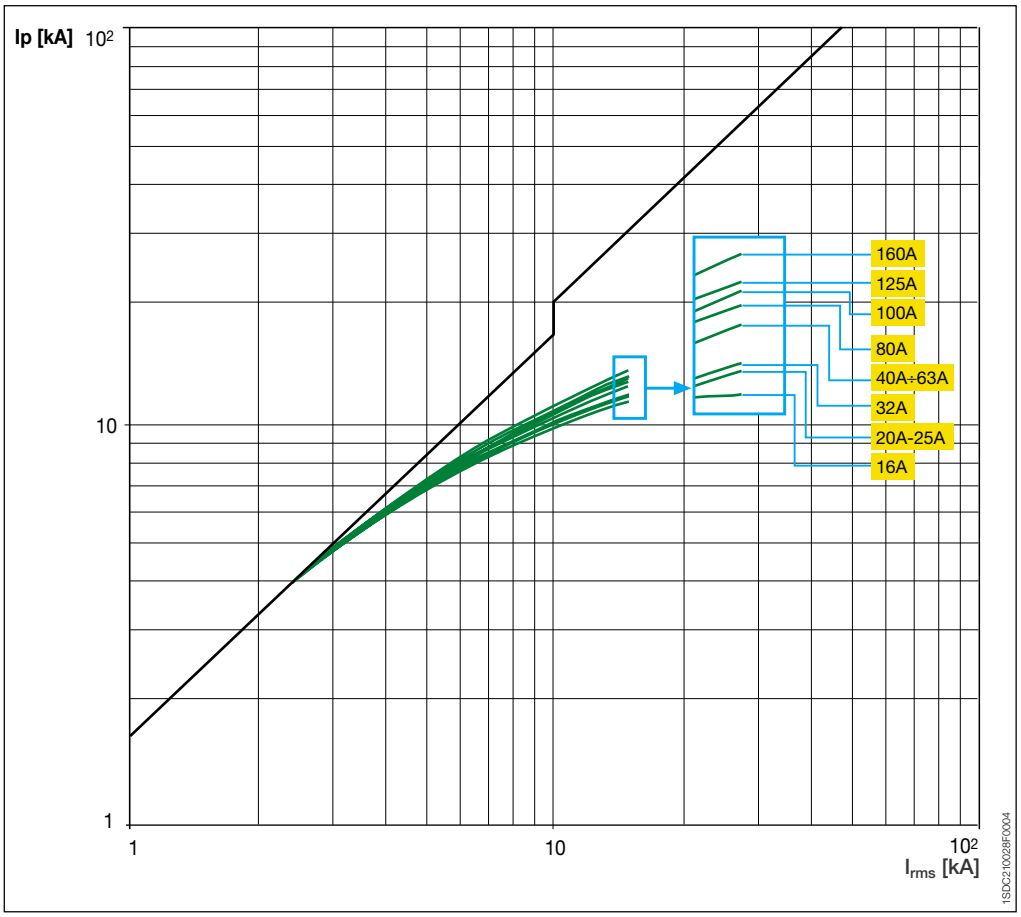
T5 400/630

400-440 V



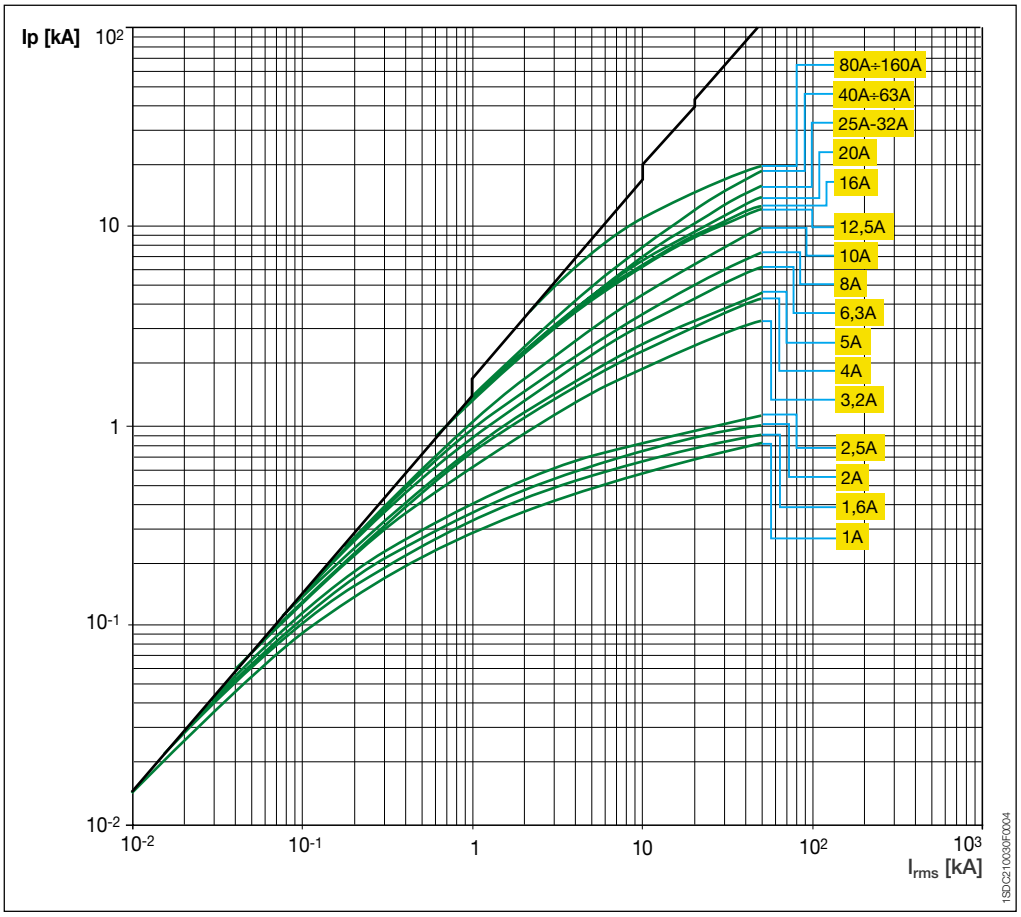
T1 160

500 V



T2 160

500 V

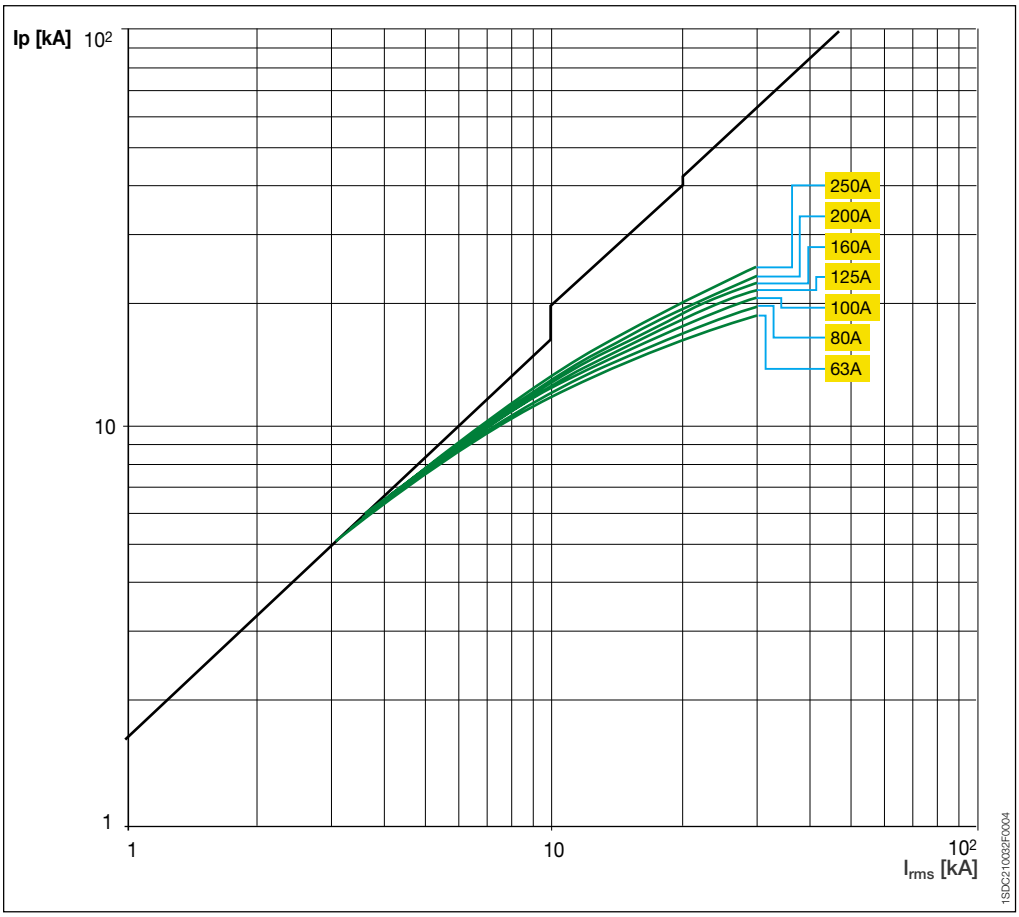


4

Limitation curves

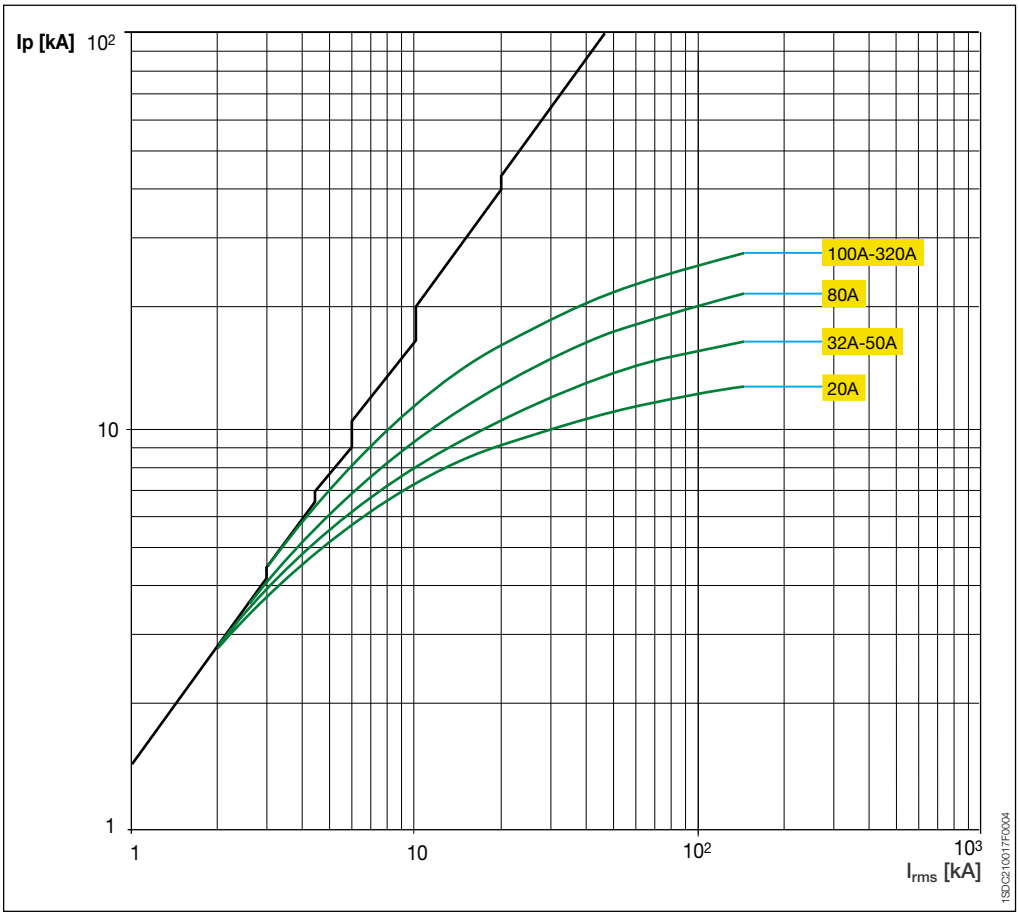
T3 250

500 V



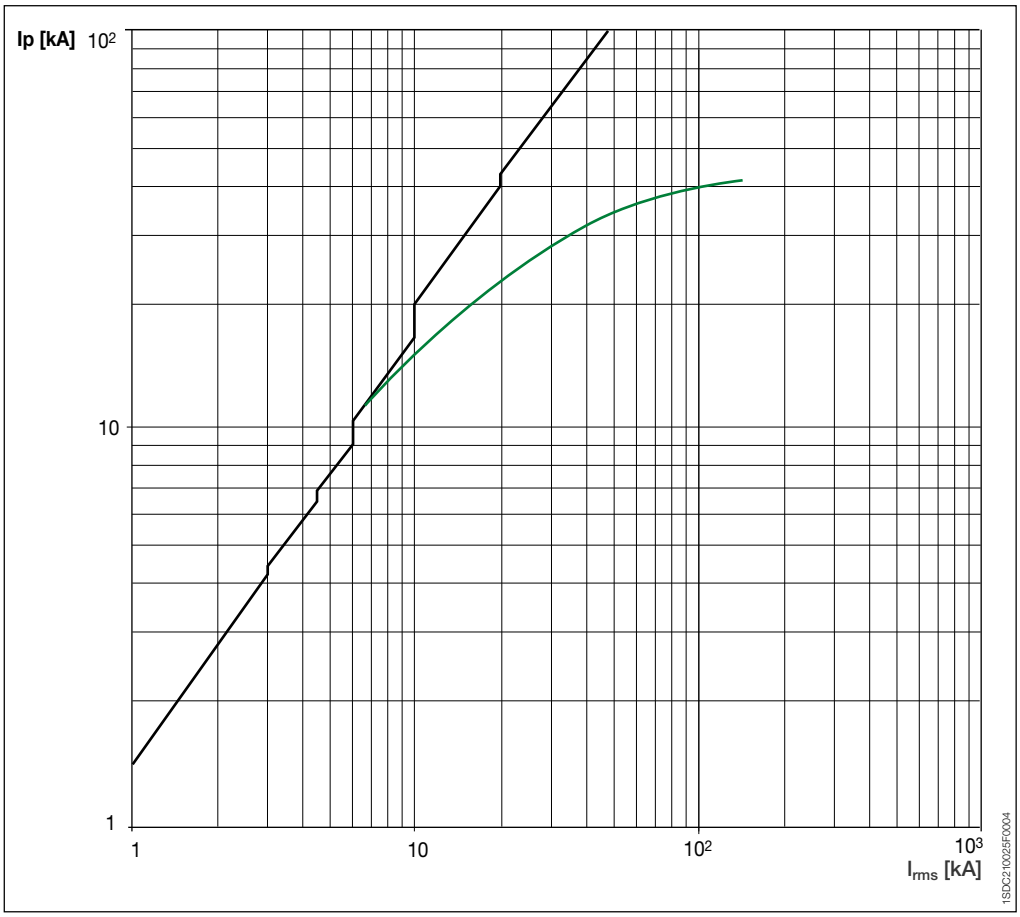
T4 250/320

500 V



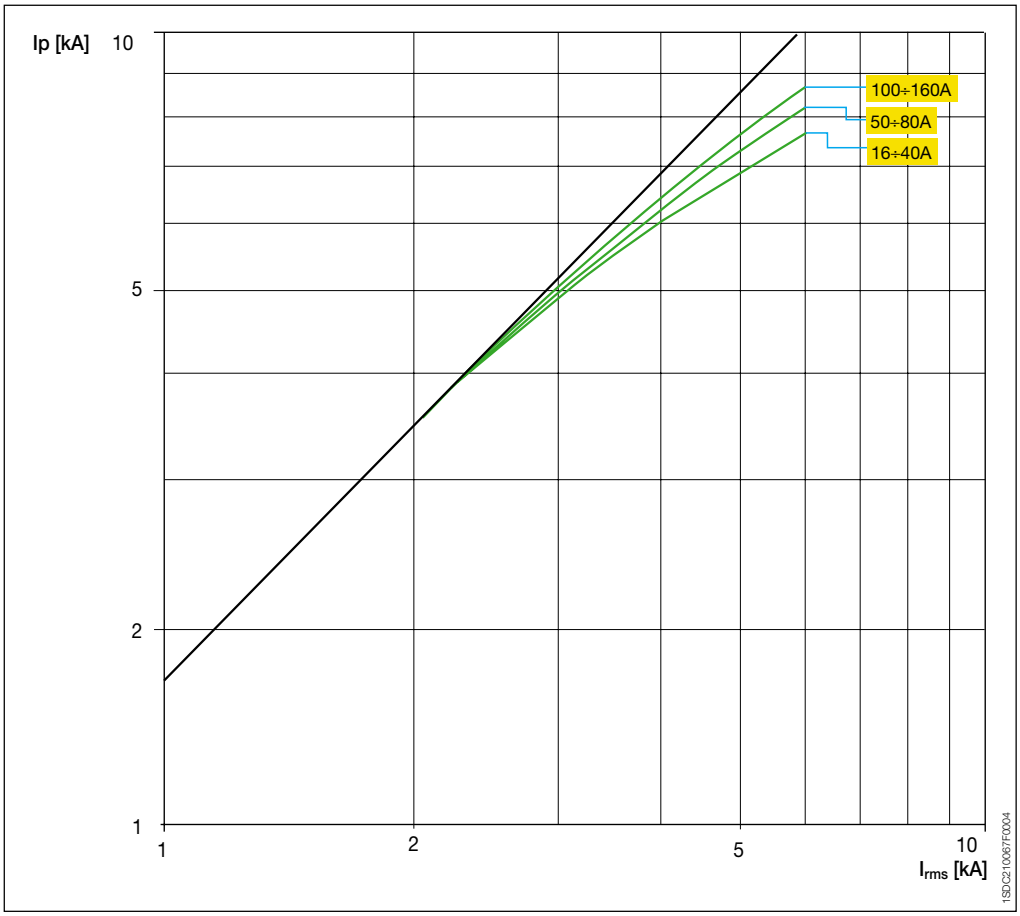
T5 400/630

500 V



T1 160

690 V

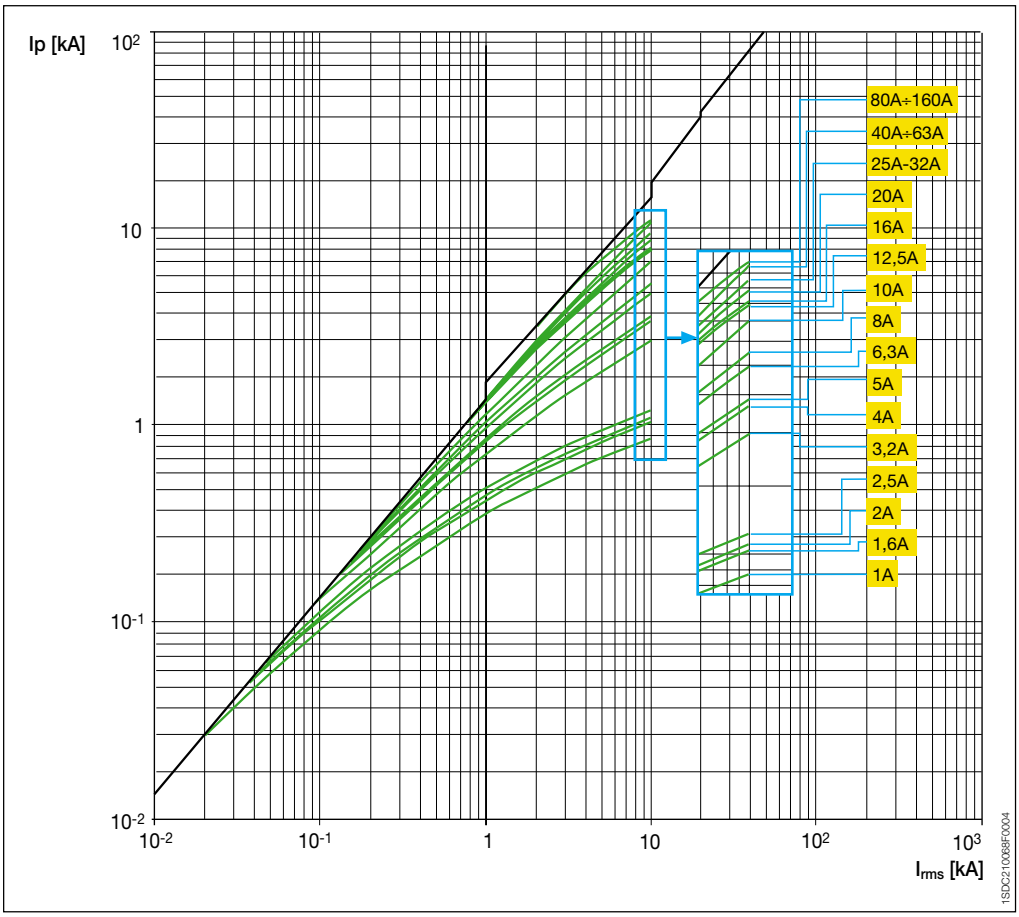


4

Limitation curves

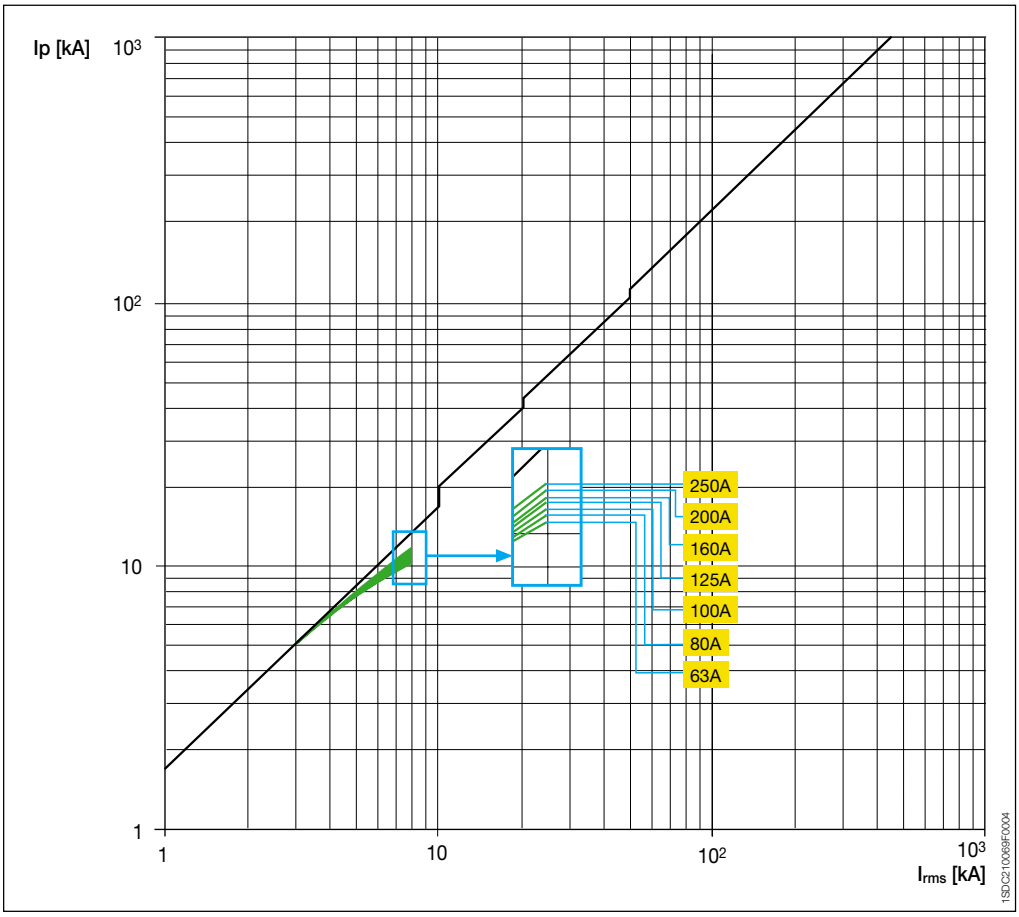
T2 160

690 V



T3 250

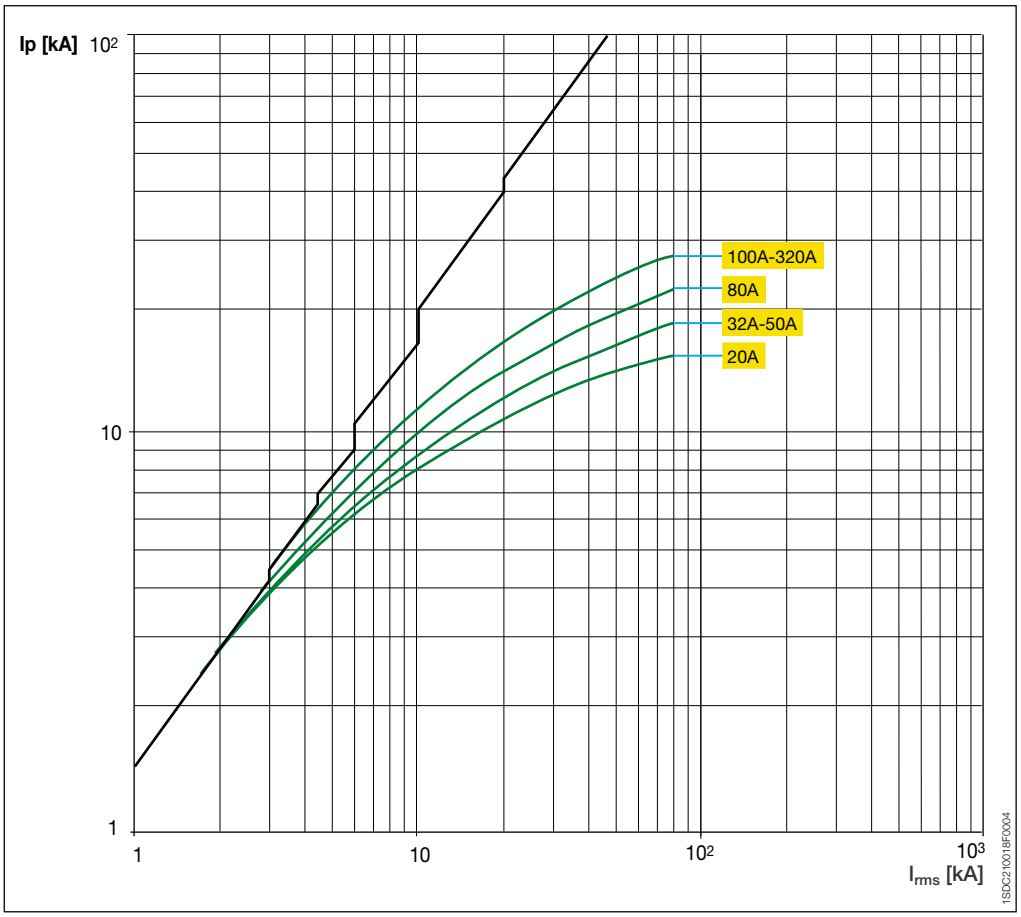
690 V



4

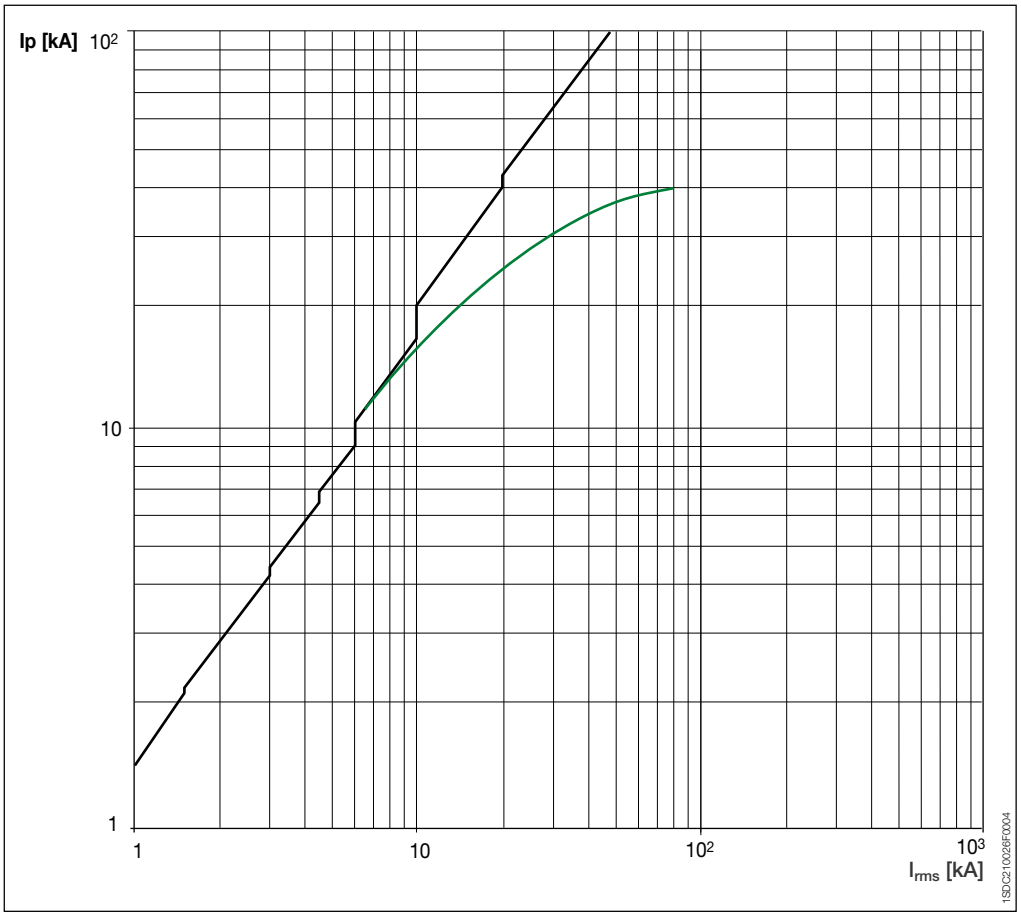
T4 250/320

690 V



T5 400/630

690 V



4

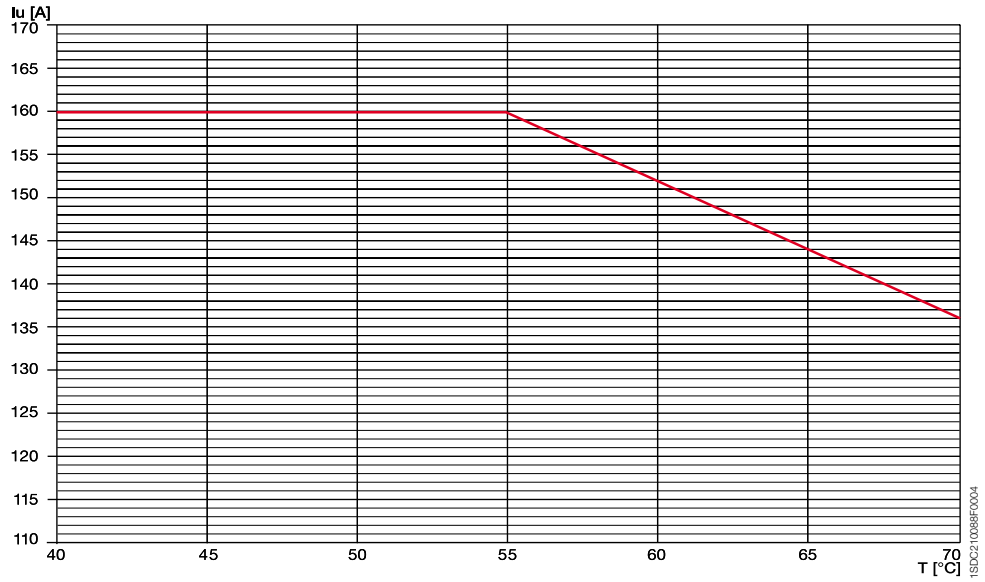
Temperature performances

Circuit-breakers with electronic releases and switch-disconnectors

T1D 160

	up to 40 °C	50 °C	60 °C	70 °C
	Imax [A]	Imax [A]	Imax [A]	Imax [A]
FC	160	160	152	136
F	160	160	152	136

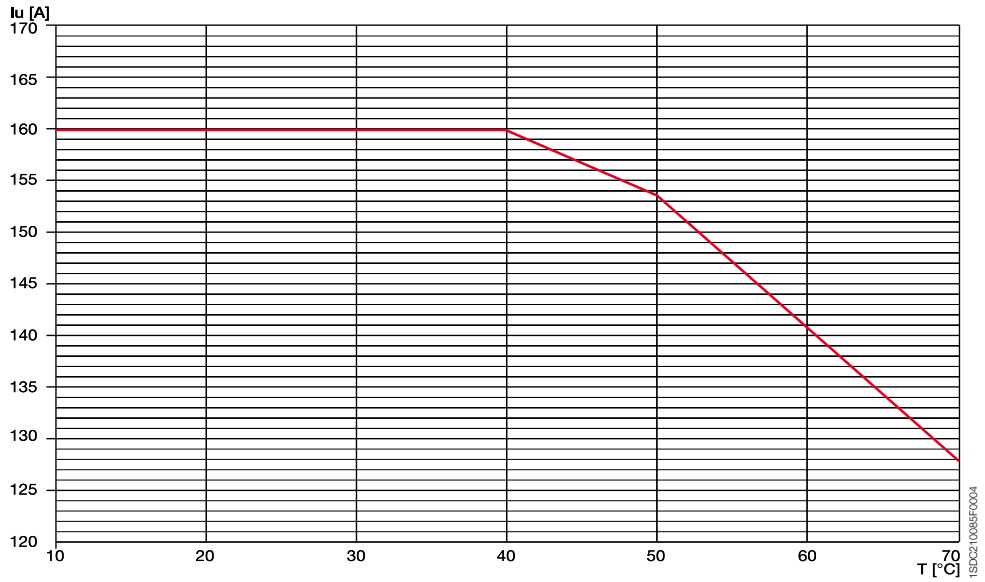
F = Front flat terminals
FC = Front terminals for cables



T2 160 PR221DS

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
F	160	1	153.6	0.96	140.8	0.88	128	0.8
EF	160	1	153.6	0.96	140.8	0.88	128	0.8
ES	160	1	153.6	0.96	140.8	0.88	128	0.8
FC Cu	160	1	153.6	0.96	140.8	0.88	128	0.8
FC CuAl	160	1	153.6	0.96	140.8	0.88	128	0.8
R	160	1	153.6	0.96	140.8	0.88	128	0.8

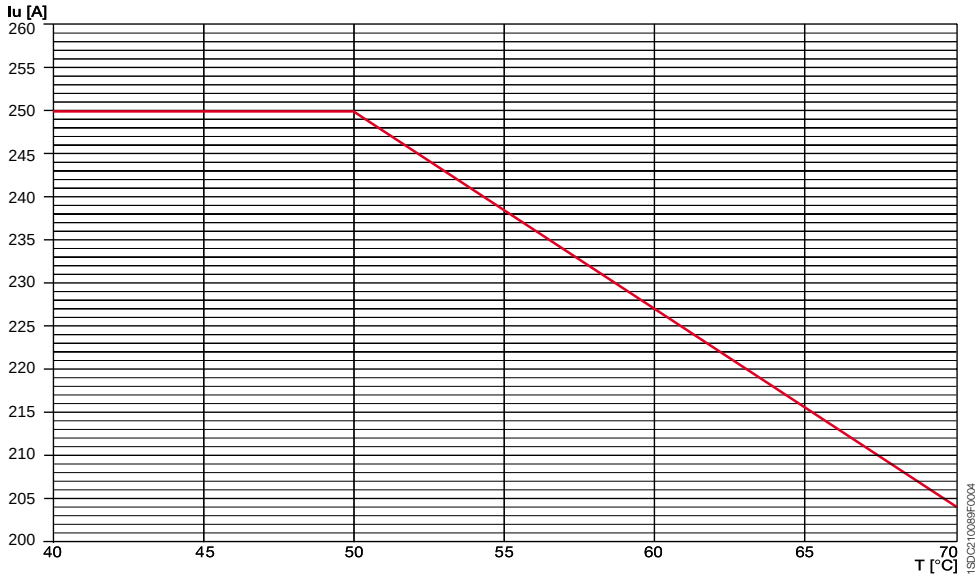
F = Front flat terminals
EF = Front extended terminals
ES = Front extended spread terminals
FC Cu = Front terminals for copper cables
FC CuAl = Front terminals for CuAl cables
R = Rear terminals



T3D 250

	up to 40 °C	50 °C	60 °C	70 °C
	Imax [A]	Imax [A]	Imax [A]	Imax [A]
F	250	250	227	204

F = Front flat terminals



4

Temperature performances

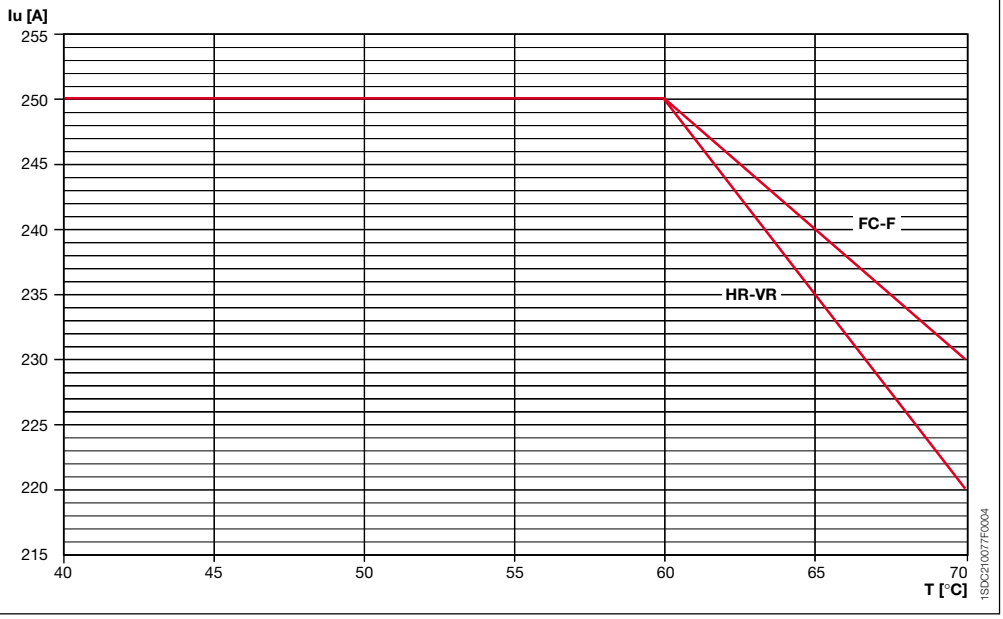
Circuit-breakers with electronic releases and switch-disconnectors

T4 250

Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	250	1	250	1	250	1	230	0.92
F	250	1	250	1	250	1	230	0.92
HR	250	1	250	1	250	1	220	0.88
VR	250	1	250	1	250	1	220	0.88

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals

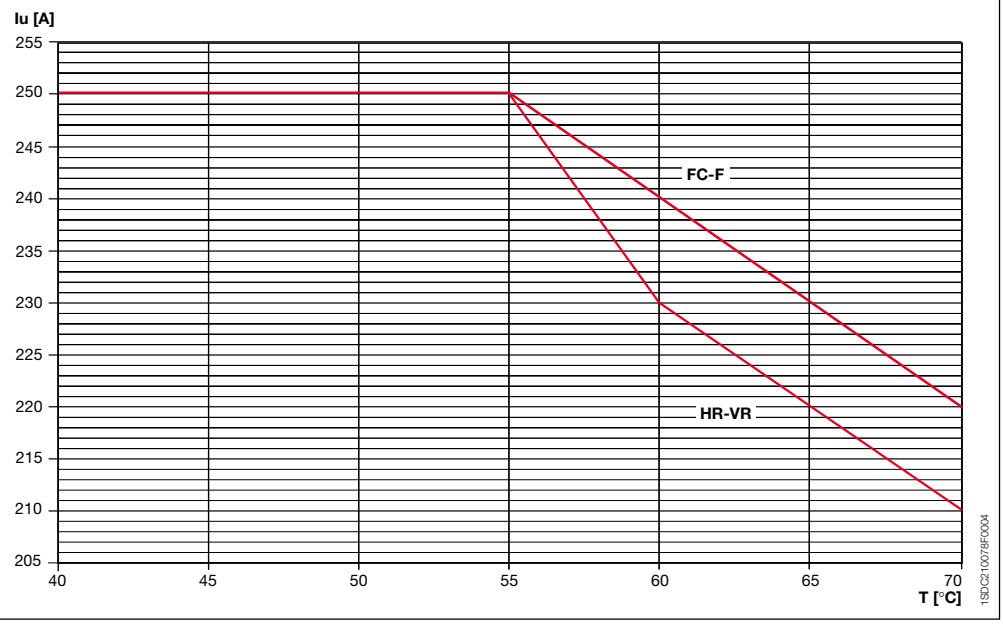


T4 250

Plug-in / Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	250	1	250	1	240	0.96	220	0.88
F	250	1	250	1	240	0.96	220	0.88
HR	250	1	250	1	230	0.92	210	0.84
VR	250	1	250	1	230	0.92	210	0.84

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals

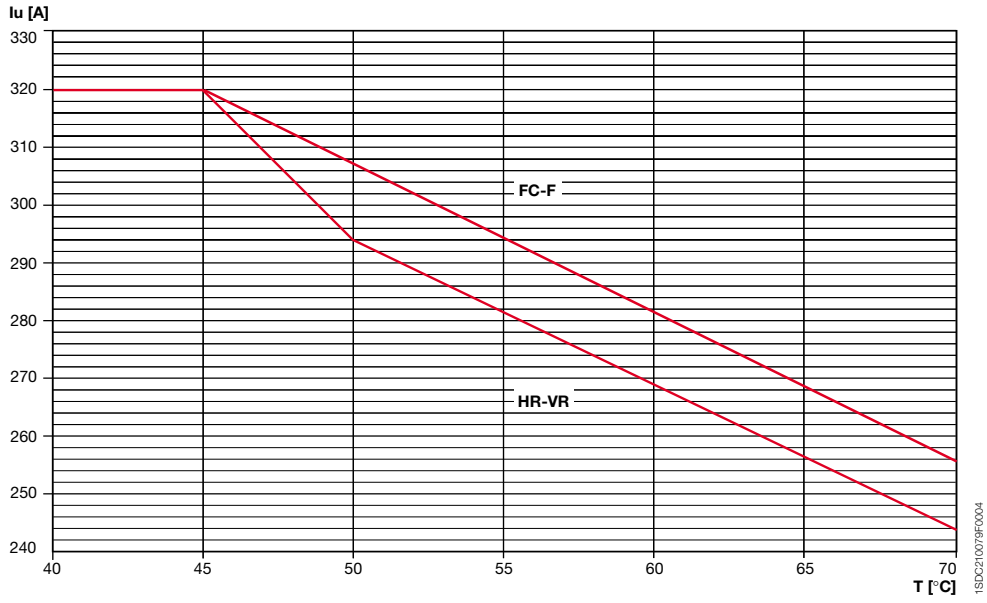


T4 320 and T4D 320

Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	320	1	307	0.96	281	0.88	256	0.80
F	320	1	307	0.96	281	0.88	256	0.80
HR	320	1	294	0.92	269	0.84	243	0.76
VR	320	1	294	0.92	269	0.84	243	0.76

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals

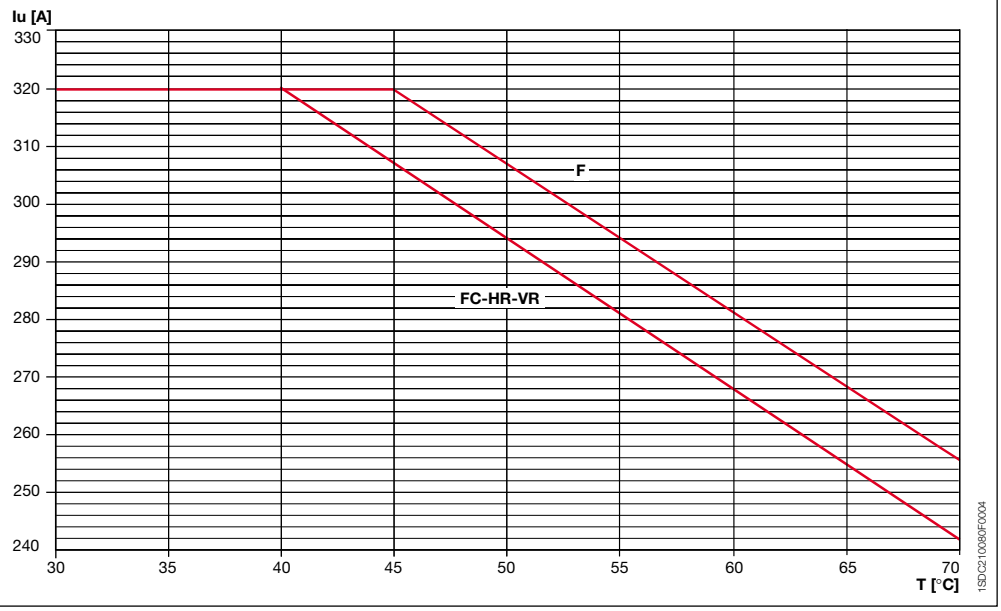


T4 320 and T4D 320

Plug-in / Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	320	1	294	0.92	268	0.84	242	0.76
F	320	1	307	0.96	282	0.88	256	0.80
HR	320	1	294	0.92	268	0.84	242	0.76
VR	320	1	294	0.92	268	0.84	242	0.76

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals



4

Temperature performances

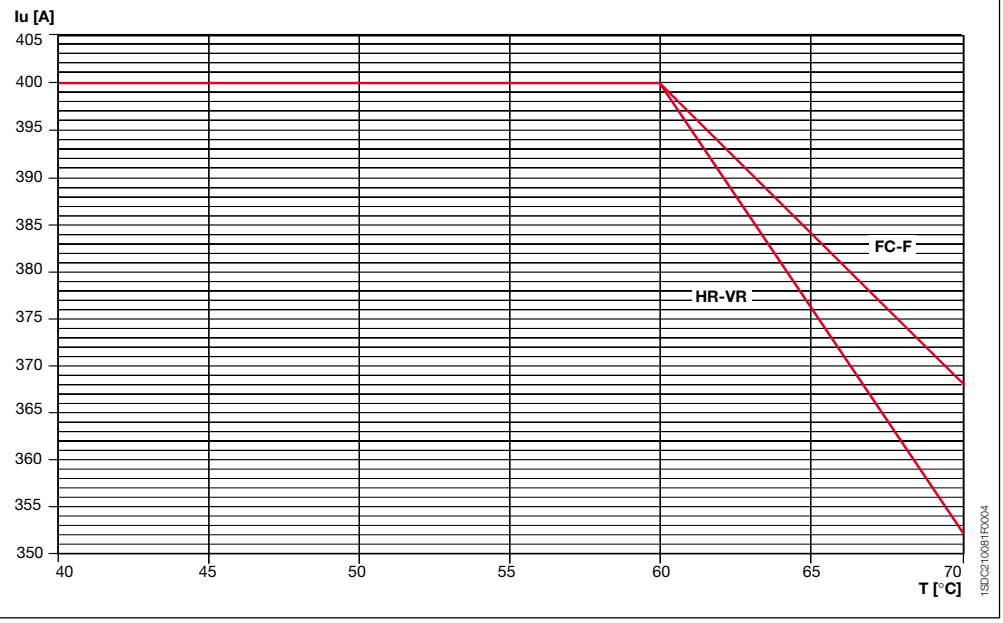
Circuit-breakers with electronic releases and switch-disconnectors

T5 400 and T5D 400

Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	400	1	400	1	400	1	368	0.92
F	400	1	400	1	400	1	368	0.92
HR	400	1	400	1	400	1	352	0.88
VR	400	1	400	1	400	1	352	0.88

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals



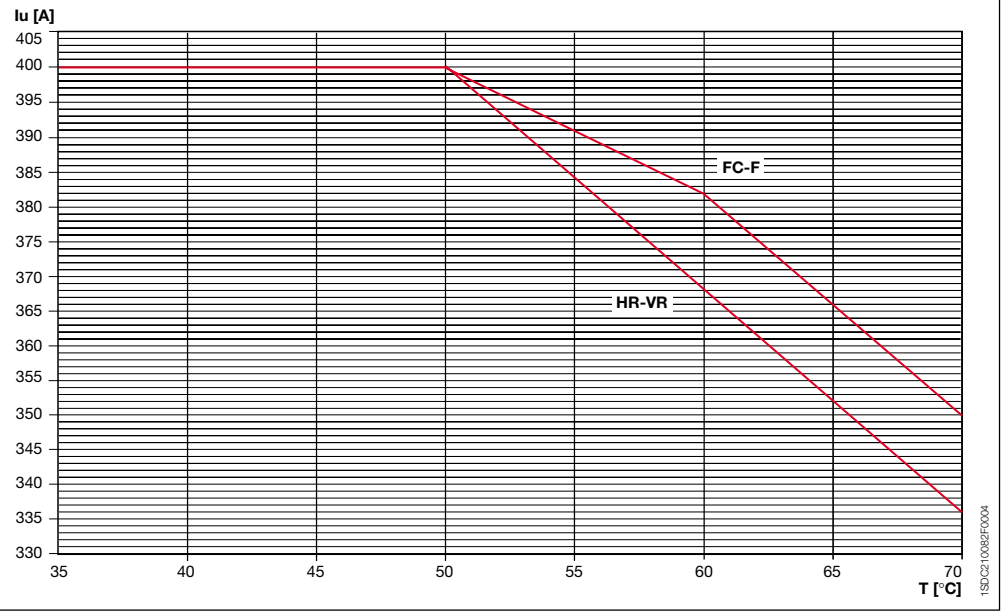
4

T5 400 and T5D 400

Plug-in / Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	400	1	400	1	382	0.96	350	0.88
F	400	1	400	1	382	0.96	350	0.88
HR	400	1	400	1	382	0.92	336	0.88
VR	400	1	400	1	382	0.92	336	0.88

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals

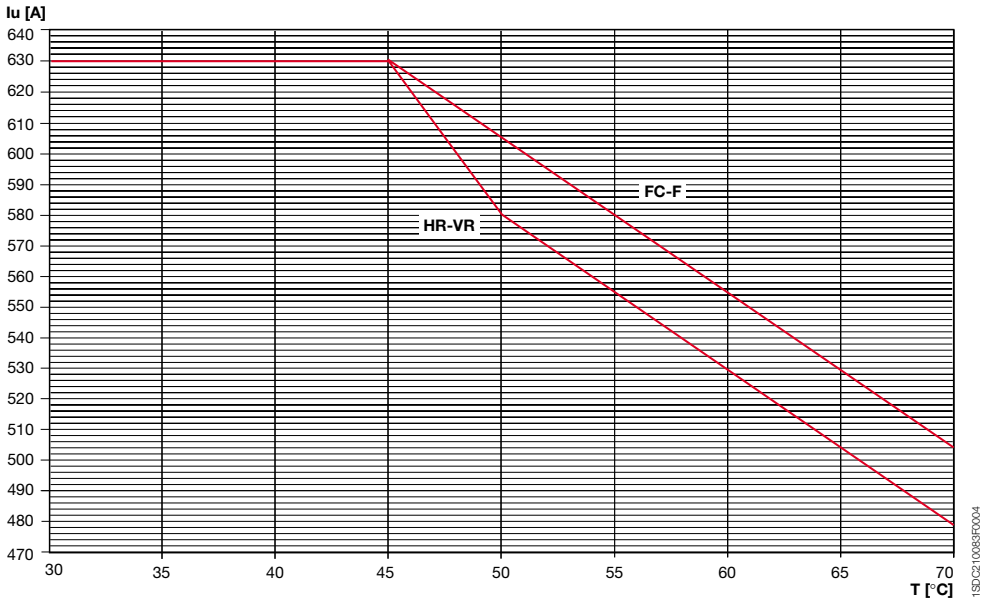


T5 630 and T5D 630

Fixed

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
FC	630	1	605	0.96	554	0.88	504	0.80
F	630	1	605	0.96	554	0.88	504	0.80
HR	630	1	580	0.92	529	0.84	479	0.76
VR	630	1	580	0.92	529	0.84	479	0.76

FC = Front terminals for cables F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals

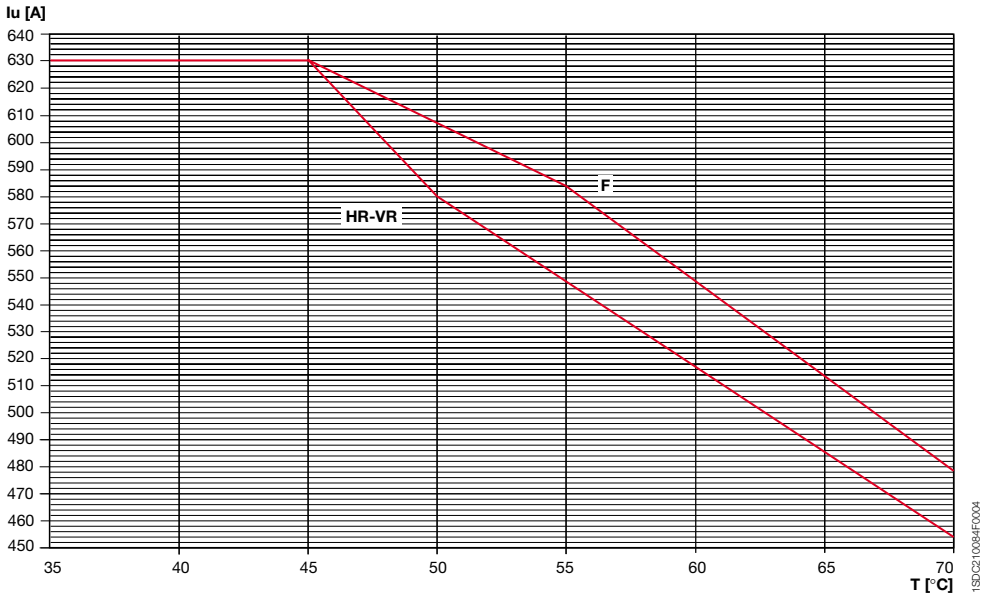


T5 630 and T5D 630

Plug-in / Withdrawable

	up to 40 °C		50 °C		60 °C		70 °C	
	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1	Imax [A]	I_1
F	630	1	607	0.96	552	0.88	476	0.76
HR	630	1	580	0.92	517	0.82	454	0.72
VR	630	1	580	0.92	517	0.82	454	0.72

F = Front flat terminals HR = Rear flat horizontal terminals VR = Rear flat vertical terminals



Temperature performances

Circuit-breakers with thermomagnetic releases

Tmax T1 and T1 1P (*)

	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
16	13	18	12	18	12	17	11	16	11	15	10	14	9	13
20	16	23	15	22	15	21	14	20	13	19	12	18	11	16
25	20	29	19	28	18	26	18	25	16	23	15	22	14	20
32	26	37	25	35	24	34	22	32	21	30	20	28	18	26
40	32	46	31	44	29	42	28	40	26	38	25	35	23	33
50	40	58	39	55	37	53	35	50	33	47	31	44	28	41
63	51	72	49	69	46	66	44	63	41	59	39	55	36	51
80	64	92	62	88	59	84	56	80	53	75	49	70	46	65
100	81	115	77	110	74	105	70	100	66	94	61	88	57	81
125	101	144	96	138	92	131	88	125	82	117	77	109	71	102
160	129	184	123	176	118	168	112	160	105	150	98	140	91	130

Tmax T2

	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
1.6	1.3	1.8	1.2	1.8	1.2	1.7	1.1	1.6	1.0	1.5	1.0	1.4	0.9	1.3
2	1.6	2.3	1.5	2.2	1.5	2.1	1.4	2.0	1.3	1.9	1.2	1.7	1.1	1.6
2.5	2.0	2.9	1.9	2.8	1.8	2.6	1.8	2.5	1.6	2.3	1.5	2.2	1.4	2.0
3.2	2.6	3.7	2.5	3.5	2.4	3.4	2.2	3.2	2.1	3.0	1.9	2.8	1.8	2.6
4	3.2	4.6	3.1	4.4	2.9	4.2	2.8	4.0	2.6	3.7	2.4	3.5	2.3	3.2
5	4.0	5.7	3.9	5.5	3.7	5.3	3.5	5.0	3.3	4.7	3.0	4.3	2.8	4.0
6.3	5.1	7.2	4.9	6.9	4.6	6.6	4.4	6.3	4.1	5.9	3.8	5.5	3.6	5.1
8	6.4	9.2	6.2	8.8	5.9	8.4	5.6	8.0	5.2	7.5	4.9	7.0	4.5	6.5
10	8.0	11.5	7.7	11.0	7.4	10.5	7.0	10.0	6.5	9.3	6.1	8.7	5.6	8.1
12.5	10.1	14.4	9.6	13.8	9.2	13.2	8.8	12.5	8.2	11.7	7.6	10.9	7.1	10.1
16	13	18	12	18	12	17	11	16	10	15	10	14	9	13
20	16	23	15	22	15	21	14	20	13	19	12	17	11	16
25	20	29	19	28	18	26	18	25	16	23	15	22	14	20
32	26	37	25	35	24	34	22	32	21	30	19	28	18	26
40	32	46	31	44	29	42	28	40	26	37	24	35	23	32
50	40	57	39	55	37	53	35	50	33	47	30	43	28	40
63	51	72	49	69	46	66	44	63	41	59	38	55	36	51
80	64	92	62	88	59	84	56	80	52	75	49	70	45	65
100	80	115	77	110	74	105	70	100	65	93	61	87	56	81
125	101	144	96	138	92	132	88	125	82	117	76	109	71	101
160	129	184	123	178	118	168	112	160	105	150	97	139	90	129

Tmax T3

	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
63	51	72	49	69	46	66	44	63	41	59	38	55	35	51
80	64	92	62	88	59	84	56	80	52	75	48	69	45	64
100	80	115	77	110	74	105	70	100	65	93	61	87	56	80
125	101	144	96	138	92	132	88	125	82	116	76	108	70	100
160	129	184	123	176	118	168	112	160	104	149	97	139	90	129
200	161	230	154	220	147	211	140	200	130	186	121	173	112	161
250	201	287	193	278	184	263	175	250	163	233	152	216	141	201

(*) For the T1 1p circuit-breaker (fitted with TMF fixed thermomagnetic release), only consider the column corresponding to the maximum adjustment of the TMD releases.

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	14	20	12	17	10	15	8	13
32	26	43	24	39	22	36	19	32	16	27	14	24	11	21
50	37	62	35	58	33	54	30	50	27	46	25	42	22	39
80	59	98	55	92	52	86	48	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	104	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
320	260	368	245	350	234	335	224	320	212	305	200	285	182	263

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
630	520	740	493	705	462	660	441	630	405	580	380	540	350	500

Power losses

Power [W/pole]		T1/T1 1p	T2		T3		T4		T5	
	In[A]	F	F	P	F	P	F	P/W	F	P/W
TMD	1		1.5	1.7						
TMA	1.6		2.1	2.5						
TMG	2		2.5	2.9						
MF	2.5		2.6	3						
MA	3.2		2.9	3.4						
	4		2.6	3						
	5		2.9	3.5						
	6.3		3.5	4.1						
	8		2.7	3.2						
	10		3.1	3.6						
	12.5		1.1	1.3						
	16	1.5	1.4	1.6						
	20	1.8	1.7	2			3.6	3.6		
	25	2	2.3	2.8						
	32	2.1	2.7	3.2			3.7	3.7		
	40	2.6	3.9	4.6						
	50	3.7	4.3	5			3.9	4.1		
	63	4.3	5.1	6	4.3	5.1				
	80	4.8	6.1	7.2	4.8	5.8	4.6	5		
	100	7	8.5	10	5.6	6.8	5.2	5.8		
	125	10.7	12	14.7	6.6	7.9	6.2	7.2		
	160	15	17	20	7.9	9.5	7.4	9		
	200				13.2	15.8	9.9	12.4		
	250				17.8	21.4	13.7	17.6		
	320						20.6	27	13.6	20.9
	400								19.5	31
	500								28.8	36.7
	630								44	56.6
PR221-222	10		0.5	0.6						
	25		1	1.2						
	63		3.5	4						
	100		8	9.2			1.7	2.3		
	160		17	20			4.4	6		
	250						10.7	14.6		
	320						17.6	24	10.6	17.9
	400								16.5	28
	630								41	53.6

Special applications

Use of apparatus at 16 2/3Hz

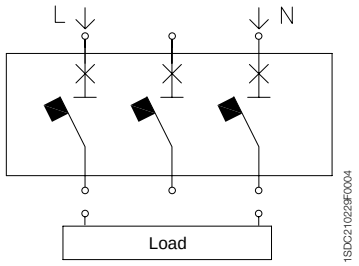
The series of thermomagnetic Tmax circuit-breakers are suitable for operation at 16 2/3 Hz frequencies - an application mainly used in the railway sector. The electrical performances are given below (Breaking capacity Icu) according to the voltage and the number of poles to be connected in series with reference to the connection diagrams.

		T1			T2				T3		T4					T5				
Icu [kA]	**Connection diagram**	**B**	**C**	**N**	**N**	**S**	**H**	**L**	**N**	**S**	**N**	**S**	**H**	**L**	**V**	**N**	**S**	**H**	**L**	**V**
250 V 2 poles in series	**A**	16	25	36	36	50	70	85	36	50	36	50	70	100	150	36	50	70	100	150
250 V 3 poles in series	**B-C**	20	30	40	40	55	85	100	40	55	–	–	–	–	–	–	–	–	–	–
500 V 2 poles in series	**A**	–	–	–	–	–	–	–	–	–	25	36	50	70	100	25	36	50	70	100
500 V 3 poles in series	**B-C**	16	25	36	36	50	70	85	36	50	–	–	–	–	–	–	–	–	–	–
750 V 3 poles in series	**B-C**	–	–	–	–	–	–	–	–	–	16	25	36	50	70	16	25	36	50	70
750 V 4 poles in series[1]	**D**	–	–	–	–	–	–	50	–	–	–	–	–	–	–	–	–	–	–	–
1000 V 4 poles in series[2]	**D**	–	–	–	–	–	–	–	–	–	–	–	–	–	40	–	–	–	–	40

[1] Circuit-breakers with neutral at 100%
[2] Use 1000 V DC version circuit-breakers

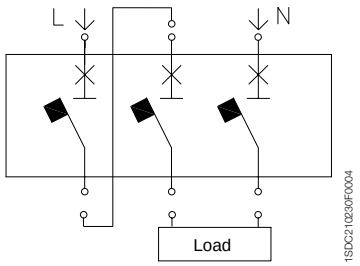
Connection diagrams

Diagram A: Interruption with one pole for polarity



Note: Without neutral connected to earth, the installation method must be such as to make the probability of a second earth fault negligible

Diagram B: Interruption with two poles in series for one polarity and one pole for the other polarity



Note: Without neutral connected to earth, the installation method must be such as to make the probability of a second earth fault negligible

4

Special applications

Use of apparatus at 16 2/3Hz

Diagram C: Interruption with three poles in series for one polarity (with neutral earthed)

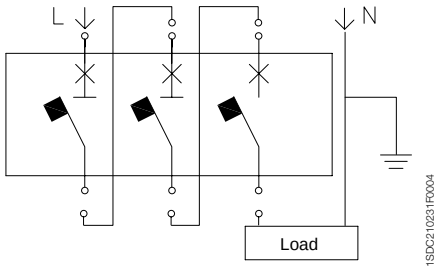


Diagram D: Interruption with four poles in series for one polarity (with neutral earthed)

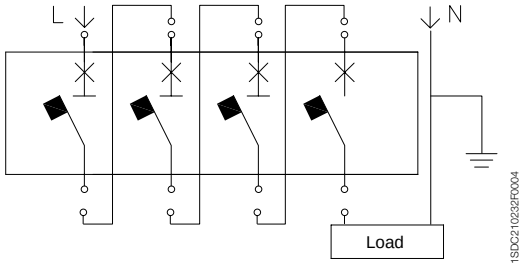
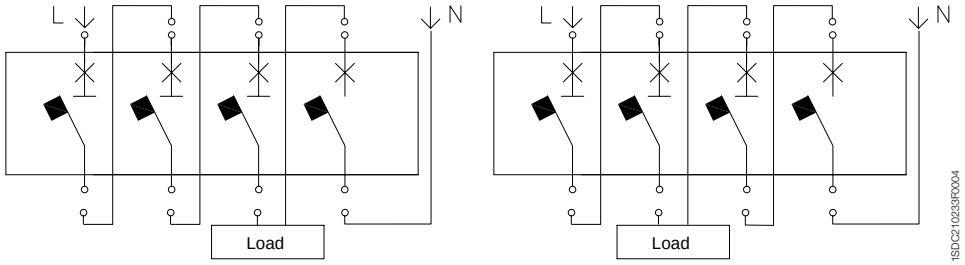


Diagram D: Interruption with three poles in series for one polarity and one pole for the other polarity, and interruption with two poles in series for each polarity



Note: Without neutral connected to earth, the installation method must be such as to make the probability of a second earth fault negligible

4

Trip thresholds

The thermal threshold of the circuit-breaker is the same as the normal version.
For the magnetic threshold, a correction coefficient must be used to be made on the protection thresholds as indicated in the table:

Circuit-breaker	Diagram A	Diagram B-C	Diagram D
T1	1	1	–
T2	0.9	0.9	0.9
T3	0.9	0.9	–
T4	0.9	0.9	0.9
T5	0.9	0.9	0.9

Setting adjustment of the magnetic threshold

The correction factor takes into consideration the phenomena that, with frequencies differing from 50-60 Hz, modifies the tripping value of protection threshold against short circuit. The value that must be set on the release is therefore the real wanted tripping value divided by the correction factor.

Example

- Service current: Ib = 200 A
- Circuit-breaker: T4 250 In = 250 A
- Desired magnetic protection: I_3 = 2000 A
- Magnetic threshold value to be set:

$$\text{Set: } \frac{I_3}{k_m}$$

therefore in this specific case, the setting for the adjustment value for the magnetic threshold is:

$$\text{Set: } \frac{2000}{0.9} = 2222 \text{ A (roughly equal to 9 In)}$$

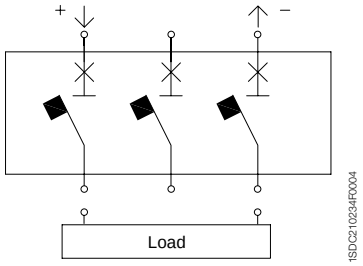
Special applications

Use of direct current apparatus

To obtain the number of poles in series needed to guarantee the required breaking capacity at the various operating voltages, suitable connection diagrams must be used. For the breaking capacity (Icu), according to the voltage and the number of poles connected in series with reference to the connection diagrams, please refer to the table of pag 4/47.

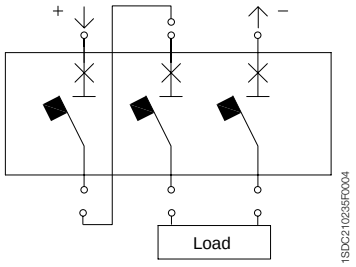
Protection and isolation of the circuit with three-pole circuit-breakers

Diagram A: Interruption with one pole for polarity.



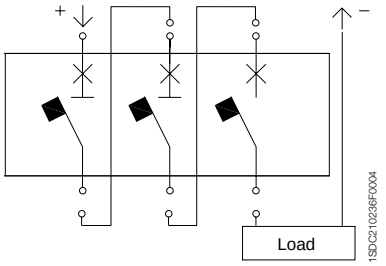
Note: Without negative polarity connected to earth, the installation method must be such as to make the probability of a second earth fault negligible.

Diagram B: Interruption with two poles in series for one polarity and one pole for the other polarity.



Note: Without negative polarity connected to earth, the installation method must be such as to make the probability of a second earth fault negligible.

Diagram C: Interruption with three poles in series for polarity



Use at 1000 V DC with four-pole circuit-breakers

Diagram D: Interruption with four poles in series for one polarity

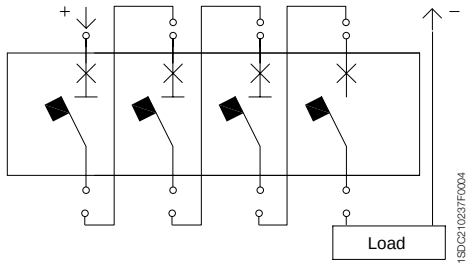
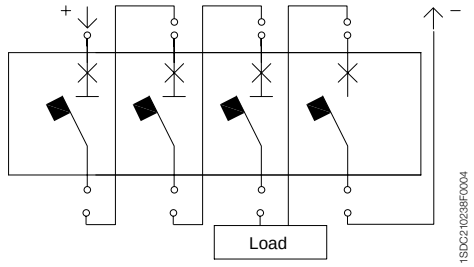
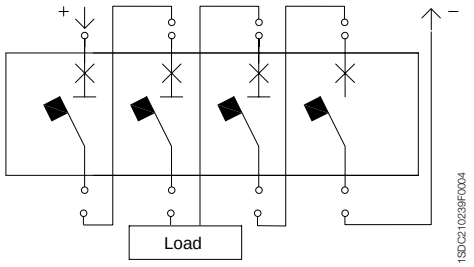


Diagram E: Interruption with three poles in series on one polarity and one pole on the other polarity



Note: Without negative polarity connected to earth, the installation method must be such as to make the probability of a second earth fault negligible.

Diagram F: Interruption with two poles in series for polarity



Note: Without negative polarity connected to earth, the installation method must be such as to make the probability of a second earth fault negligible.

Special applications

Use of direct current apparatus

The following table shows which connection diagram to use according to the number of poles to be connected in series to obtain the required breaking capacity, in relation to the type of distribution network:

Distribution system					
Rated voltage [V]	**Protection function**	**Isolation**	**Earth-insulated network**	**Network with one polarity[1] earthed**	**Network with a middle point earthed**
≤ 250	■	■	A	A	A
	■	–	–	–	–
≤ 500	■	■	A	B	A
	■	–	–	C	–
≤ 750	■	■	B	E	F
	■	–	–	C	–
≤ 1000	■	■	E, F	–	F
	■	–	–	D	–

[1] It is presumed that the negative polarity is earthed

Notes:
1) The risk of double earth fault is nil, therefore the fault current only involves a part of the interruption poles.
2) For rated voltages higher than 750V, the 1000V range for direct current is required.
3) For connections with four poles in series, circuit-breakers with neutral at 100% of the phase settings must be used.

In the following table, the correction value to be used for the protection thresholds is indicated for each circuit-breaker against short circuit (the thermal threshold doesn't undergo any alteration).

Circuit-breaker	Diagram A	Diagram B	Diagram C	Diagram D	Diagram E	Diagram F
T1	1.3	1	1	–	–	–
T2	1.3	1.15	1.15	–	–	–
T3	1.3	1.15	1.15	–	–	–
T4	1.3	1.15	1.15	1	1	1
T5	1.1	1	1	0.9	0.9	0.9

Example of setting the trip thresholds in DC - Diagram A

Setting	T1 160		T2 160		T3 250	
In [A]	I_1=0.7÷1xIn	I_3=10xIn	I_1=0.7÷1xIn	I_3=10xIn	I_1=0.7÷1xIn	I_3=10xIn
1.6			1.12÷1.6	20.8	0.7÷1	13
2			1.4÷2	26		
2.5			1.75÷2.5	32.5		
3.2			2.24÷3.2	41.6		
4			2.8÷4	52		
5			3.5÷5	65		
6.3			4.41÷6.3	81.9		
8			5.6÷8	104		
10			7÷10	130		
12.5			8.75÷12.5	162.5		
16	11.2÷16	650	11.2÷16	650		
20	14÷20	650	14÷20	650		
25	17.5÷25	650	17.5÷25	650		
32	22.4÷32	650	22.4÷32	650		
40	28÷40	650	28÷40	650		
50	35÷50	650	35÷50	650		
63	44.1÷63	819	44.1÷63	819	44.1÷63	819
80	56÷80	1040	56÷80	1040	56÷80	1040
100	70÷100	1300	70÷100	1300	70÷100	1300
125	87.5÷125	1625	87.5÷125	1625	87.5÷125	1625
160	112÷160	2080	112÷160	2080	112÷160	2080
200					140÷200	260
250					175÷250	325

Setting	T4 250		T4 320		T5 400		T5 630	
In [A]	I_1=0.7÷1xIn	I_3=5÷10xIn	I_1=0.7÷1xIn	I_3=5÷10xIn	I_1=0.7÷1xIn	I_3=5÷10xIn	I_1=0.7÷1xIn	I_3=5÷10xIn
20	14÷20	416						
25								
32	22.4÷32	416						
40								
50	35÷50	650						
63								
80	56÷80	5200÷1040						
100								
125	87.5÷125	812.5÷1625						
160	112÷160	1040÷2080						
200	140÷200	1300÷2600						
250	175÷250	1625÷3250						
320			224÷320	2080÷4160	224÷320	1760÷3520		
400					280÷400	2200÷4400		
500							350÷500	2750÷5500
630							441÷630	3465÷6930

Setting adjustment of the magnetic threshold

The correction factor takes into consideration the phenomena that, with direct current applications, modifies the tripping value of protection threshold against short circuit. The value that must be set on the release is therefore the real wanted tripping value divided by the correction factor.

Example

- Service current: Ib = 550 A
- Circuit-breaker: T5 630 In= 630 A
- Desired magnetic protection: I_3 = 5500 A
- Magnetic threshold value to be set:

$$\text{Set: } \frac{I_3}{k_m}$$

therefore, in this specific case, setting of the adjustment value for the magnetic threshold is:

$$\text{Set: } \frac{5500}{1.1} = 5000 \text{ A (roughly equal to 8 In)}$$

Wiring diagrams

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Wiring diagrams

Wiring diagrams

Information for reading - Circuit-breakers

State of operation represented

The diagram is shown in the following conditions:
– fixed, plug-in or withdrawable version circuit-breaker (depending on type of circuit-breaker), open and racked-in
– contactor for motor starting open
– circuits de-energised
– releases not tripped
– motor operator with springs charged (for T4 and T5).

Version

The diagram shows a circuit-breaker or switch-disconnector in the plug-in version (only T2, T3, T4 and T5), but 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 auxiliary contacts, with auxiliary relays for electrical signalling of circuit-breaker open and circuit-breaker tripped
A13	=	PR020/K type signalling unit, with auxiliary relays for electrical signalling of the protection functions of electronic release
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
A2	=	Applications of the solenoid operator or motor operator
A3	=	Applications of the RC221 or RC222 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 release: – PR221DS type overcurrent release, with the following protection functions: - L against overload with inverse long time delay - S against short-circuit with inverse short time delay - I against short-circuit with tempo of instantaneous trip – PR222DS/P or PR222DS/PD type overcurrent release, with the following protection functions: - L against overload with inverse long time delay - S against short-circuit with inverse or definite short time delay - I against short-circuit with instantaneous trip time - G against earth fault with short time trip – PR222MP motor protection type release, with the following protection functions: - against overload (thermal protection) - against rotor block - against short-circuit - against missing or unbalanced current between the phases
K87	=	RC221 or RC222 type residual current release
M	=	Motor for circuit-breaker opening and circuit-breaker closing spring charging
M1	=	Three-phase asynchronous motor
Q	=	Main circuit-breaker
Q/1…3	=	Auxiliary circuit-breaker contacts
R	=	Resistor (see note F)
R1	=	Motor thermistor
R2	=	Thermistor in the motor operator
S1, S2	=	Contacts controlled by the cam of the motor operator
S3	=	Contact controlled by the key lock of the solenoid operator or motor operator
S4/1-2	=	Contacts activated by the circuit-breaker rotary handle (see note C)
K51/1…8	=	Contacts for electrical signalling of the protection functions of the electronic release
S51/S	=	Contact for electrical signalling of overload in progress

S75I/1…3 = Contacts for electrical signalling of circuit-breaker in racked-in position (only provided with circuit-breakers in plug-in version)
S751S/1…3 = Contacts for electrical signalling of circuit-breaker in racked-out position (only provided with circuit-breakers in plug-in version)
S87/1 = Contact for electrical signalling of RC222 type residual current release pre-alarm
S87/2 = Contact for electrical signalling of RC222 type residual current release alarm
S87/3 = Contact for electrical signalling of circuit-breaker open due to RC221 or RC222 type residual current release trip
SC = Pushbutton or contact for closing the circuit-breaker
SC3 = Pushbutton for motor starting
SD = Switch-disconnector of the power supply of the RC221 or RC222 type residual current release
SO = Pushbutton or contact for opening the circuit-breaker
SO3 = Pushbutton for stopping the motor
SQ = Contact for electrical signalling of circuit-breaker open
SY = Contact for electrical signalling of circuit-breaker open due to YO, YO1, YO2 or YU thermomagnetic release trip (tripped position)
TI = Toroidal current transformer
TI/L1 = Current transformer placed on phase L1
TI/L2 = Current transformer placed on phase L2
TI/L3 = Current transformer placed on phase L3
TI/N = Current transformer placed on the neutral
W1 = Serial interface with the control system (EIA RS485 interface. See note D)
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)
X11 = Back-up terminal box
X3,X4 = Connectors for the circuits of the electronic release (in the case of circuit-breakers in the plug-in version, removal of the connectors takes place simultaneously with that of the circuit-breaker)
XA = Interfacing connector of the PR222DS/P or PR222DS/PD release
XA1 = Three-way connector for YO/YU (see note E)
XA10 = Three-way connector for solenoid operator
XA2 = Twelve-way connector for auxiliary contacts (see note E)
XA5 = Three-way connector for contact of electrical signalling of circuit-breaker open due to trip of the RC221 or RC222 type residual current release (see note E)
XA6 = Three-way connector for contact of electrical signalling of circuit-breaker open due to trip of the overcurrent release (see note E)
XA7 = Six-way connector for auxiliary contacts (see note E)
XA8 = Six-way connector for contacts operated by the rotary handle or for the motor operator (see note E)
XA9 = Six-way connector for the electrical signalling of RC222 type residual current release pre-alarm and alarm and for opening by means of the release itself (see note E)
XB,XC,XE = Interfacing connectors of the AUX-E unit
XD = Interfacing connector of the FDU unit
XF = Interfacing connector of the MOE-E unit
X0 = Connector for the YO1 trip coil
X01 = Connector for the YO2 trip coil
XV = Terminal boxes of the applications
YC = Shunt closing release of the solenoid operator or motor operator
YO = Shunt opening release
YO1 = Trip coil of the electronic release
YO2 = Trip coil of the RC221 or RC222 type residual current release
YO3 = Shunt opening release of the solenoid operator
YU = Undervoltage release (see note B).

Wiring diagrams

Information for reading - Circuit-breakers

Description of figures

Fig. 1 = Shunt opening release.
Fig. 2 = Permanent shunt opening release.
Fig. 3 = Instantaneous undervoltage release (see note B and F).
Fig. 4 = Undervoltage release with electronic time-delay device outside the circuit-breaker (see note B).
Fig. 5 = Instantaneous undervoltage release in version for machine tools with one contact in series (see note B, C, and F).
Fig. 6 = Instantaneous undervoltage release in version for machine tools with two contacts in series (see note B, C, and F).
Fig. 7 = One changeover contact for electrical signalling of circuit-breaker open due to RC221 or RC222 type residual current release trip.
Fig. 8 = RC222 type residual current release.
Fig. 9 = Two electrical signalling contacts for RC222 type residual current release pre-alarm and alarm.
Fig. 10 = Solenoid operator.
Fig. 11 = Stored energy motor operator.
Fig. 12 = One changeover contact for electrical signalling of motor operator locked with key.
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 release trip (tripped position).
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 thermomagnetic release trip (tripped position).
Fig. 23 = Two changeover contacts for electrical signalling of circuit-breaker open or closed.
Fig. 24 = One changeover contact for electrical signalling of circuit-breaker open due to overcurrent release trip.
Fig. 25 = One contact for electrical signalling of circuit-breaker open due to overcurrent release trip.
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.
Fig. 29 = First position of circuit-breaker changeover contact, for electrical signalling of isolated.
Fig. 30 = Second position of circuit-breaker changeover contact, for electrical signalling of isolated.
Fig. 31 = Third position of circuit-breaker changeover contact, for electrical signalling of isolated.
Fig. 32 = Circuit of the current transformer on neutral conductor outside the circuit-breaker (for plug-in version circuit-breaker).
Fig. 41 = Auxiliary circuits of the PR222DS/P electronic release connected with FDU front display unit.
Fig. 42 = Auxiliary circuits of the PR222DS/PD electronic release connected with PR020/K type signalling unit.
Fig. 43 = Auxiliary circuits of the PR222DS/PD electronic release connected with FDU front display unit and with PR020/K type signalling unit.
Fig. 44 = Auxiliary circuits of the PR222DS/PD electronic release connected with the AUX-E auxiliary contacts.
Fig. 45 = Auxiliary circuits of the PR222DS/PD electronic release connected with the auxiliary contacts AUX-E and with MOE-E type actuation unit.
Fig. 46 = Auxiliary circuits of the PR222DS/PD electronic release connected with FDU front display unit and with the AUX-E auxiliary contacts.
Fig. 47 = Auxiliary circuits of the PR222MP electronic release connected with PR020/K signalling unit.
Fig. 48 = Auxiliary circuits of the PR222MP electronic release connected with PR020/K signalling unit and with PR212/CI type contactor control unit for motor starting.
Fig. 49 = Auxiliary circuits of the PR222MP electronic release connected with PR020/K signalling unit and with PR212/CI type contactor control unit.
Fig. 50 = Auxiliary circuits of the PR222MP electronic release connected with PR020/K signalling unit.

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
41 - 42 - 43 - 44 - 45 - 46 - 47 - 48 - 49 - 50

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).
D) For connection of the EIA RS485 serial line, see the following documentation:
– ITSCE-RH0199 for MODBUS communication.
E) Connectors XA1, XA2, XA5, XA6, XA7, XA8 and XA9 are supplied on request. They are always supplied with T2 and T3 circuit-breakers in the plug-in version.
Connectors X1, X2, X5, X6, X7, X8 and X9 are supplied on request. They are always supplied with circuit-breakers in the plug-in version and with T4 and T5 circuit-breakers in the fixed version.
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) With MOS 110…250 V AC, only use MOS-A for 200 V ≤ Un ≤ 250 V.
I) SQ and SY are opto-insulated contacts.

Wiring diagrams

Information for reading - ATS010

State of operation represented

The circuit diagram is for the following conditions:
- circuit-breakers open and racked-in #
- generator not in alarm
- closing springs discharged
- overcurrent relays not tripped *
- ATS010 not powered
- generator in automatic mode and not started
- generator switching enabled
- circuits de-energised
- logic enabled via input provided (terminal 47).

\# The present diagram shows withdrawable circuit-breakers, but is also valid for fixed circuit-breakers: connect terminal 17 to 20 and terminal 35 to 38 on the ATS010 device.

* The present diagram shows circuit-breakers with overcurrent release (T4-T5), but is also valid for circuit-breakers with thermomagnetic release and to circuit-breakers with out relay (switch-disconnectors): connect terminal 18 to 20 and terminal 35 to 37 of the ATS010 device.

@ The present diagram shows four-pole circuit-breakers but is also valid for two-pole circuit-breakers: use only terminals 26 and 24 (phase and neutral) for the voltage connection of the normal power supply to the ATS010 device; also use the Q61/2 two-pole rather than four-pole auxiliary protection circuit-breaker.

Caption

A	=	Device type ATS010 for the automatic transfer switch of two circuit-breakers
K1	=	Auxiliary contactor for the emergency supply voltage presence
K2	=	Auxiliary contactor for the normal supply voltage presence
K51/Q1	=	Overcurrent release for emergency supply line*
K51/Q2	=	Overcurrent release for normal supply line*
M	=	Motor with series energization for the circuit-breaker opening and closing
Q/1	=	Circuit-breaker auxiliary contact
Q1	=	Circuit-breaker for emergency supply line
Q2	=	Circuit-breaker for normal supply line
Q61/1-2	=	Miniature circuit-breakers for auxiliary circuits protection @
S1, S2	=	Position contact operated by a cam of the operating mechanism
S3	=	Key lock contact operated by the remote opening release or the operating mechanism
S11…S16	=	Contacts for the ATS010 device inputs
S75I/1	=	Contact signalling circuit-breaker in withdrawable version connected #
SY	=	Contact signalling circuit-breaker tripped through releases operation (tripped position)*
TI/…	=	Current trasformers feeding the overcurrent relay
X2	=	Connector for the circuit-breaker auxiliary circuits
XV	=	Terminal boards of the accessories.

Wiring diagrams

Graphic symbols (IEC 60617 and CEI 3-14...3-26 Standards)

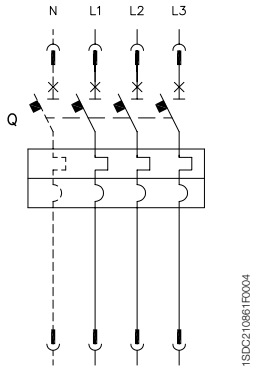
Thermal effect	Resistor (general symbol)	Thermal relay
Electromagnetic effect	Temperature dependent resistor	Instantaneous overcurrent or rate-of-rise relay
Delay	Motor (general symbol)	Overcurrent relay with adjustable short time-lag characteristic
Mechanical connection (link)	Induction motor, three-phase, squirrel cage	Overcurrent relay with inverse short time-lag characteristic
Manually operated control (general case)	Current transformer	Overcurrent relay with inverse long time-lag characteristic
Operated by turning	Current transformer with four threaded winding and with one permanent winding with one tapping	Earth fault overcurrent relay with inverse short time-lag characteristic
Operated by pushing	Make contact	Phase-balance current relay
Operated by key	Break contact	Differential current relay
Operated by cam	Change-over break before make contact	Phase-failure detection relay in a three-phase system
Hearth, groung (general symbol)	Position switch (limit switch), make contact	Locked-rotor detection relay operating by current sensing
Converter with galvanic separator	Position switch (limit switch), break contact	Lamp, general symbol
Conductors in a screened cable, two conductors shown	Position switch (limit switch) change-over break before make contact	Mechanical interlock between two devices
Twisted conductors, two conductors shown	Contactor (contact open in the unoperated position)	Operated by electric motor
Connection of conductors	Circuit-breaker disconnector with automatic release	Motor with series energization
Terminal	Switch-disconnector (on-load isolating switch)	
Plug and socket (male and female)	Operating device (general symbol)	

5

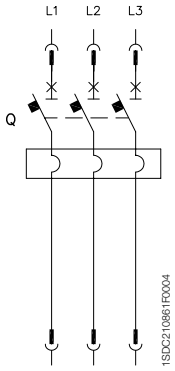
Wiring diagrams

Circuit diagram of the T1…T5 circuit-breakers

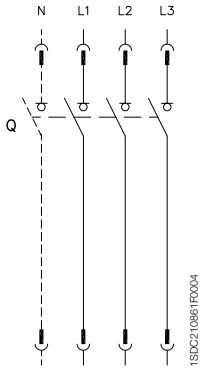
State of operation



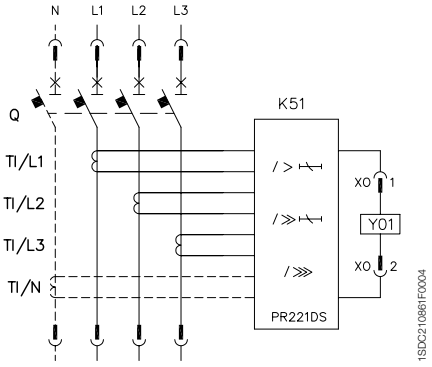
Three-pole or four-pole circuit-breaker with thermomagnetic release



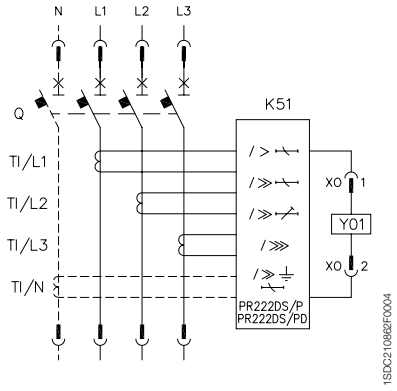
Three-pole circuit-breaker with magnetic release



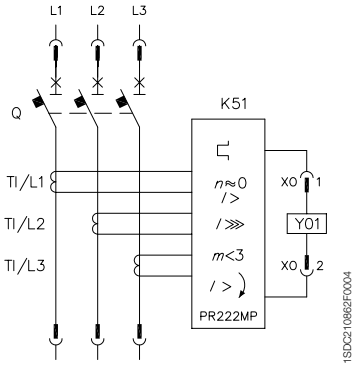
Three-pole or four-pole switch-disconnector (on-load isolating switch)



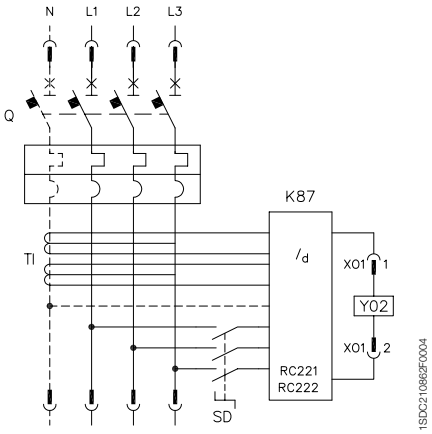
Three-pole or four-pole circuit-breaker with PR222DS electronic release



Three-pole or four-pole circuit-breaker with PR222DS/P or PR222DS/PD electronic release

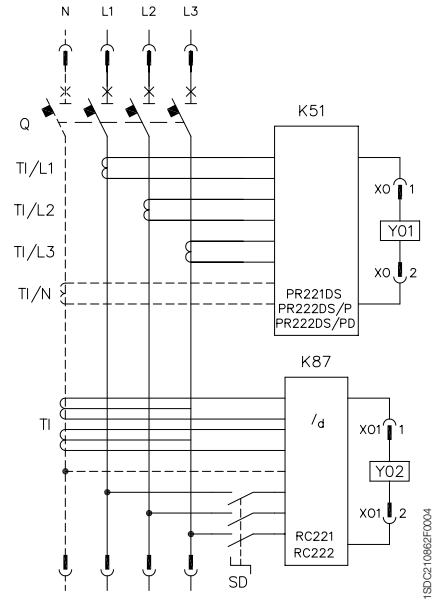


Three-pole circuit-breaker with PR222MP electronic release

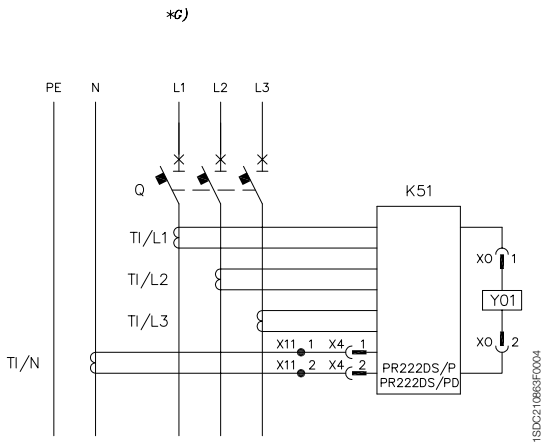


Three-pole or four-pole circuit-breaker with RC221 or RC222 residual current release

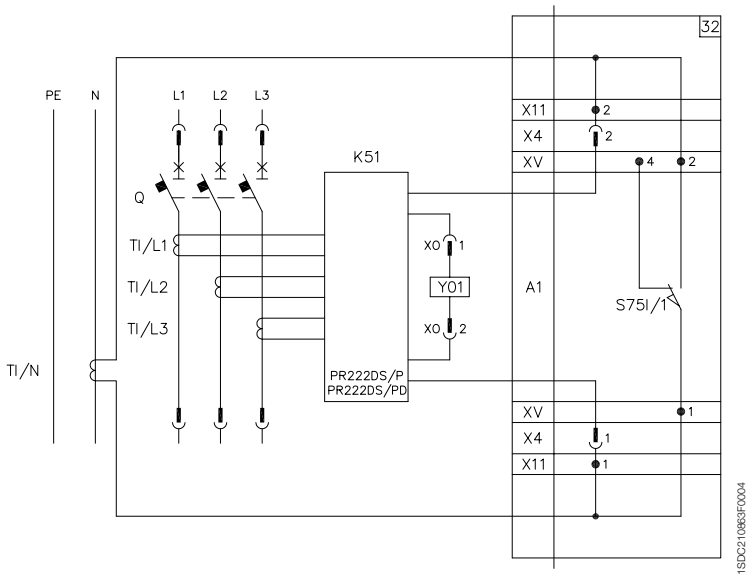
5



Three-pole or four-pole circuit-breaker with PR221DS, PR222DS/P or PR222DS/PD electronic release and RC221 or RC222 residual current release (for T4 and T5, four-pole only)



Fixed version three-pole circuit-breaker with current transformer on neutral conductor, external to circuit-breaker



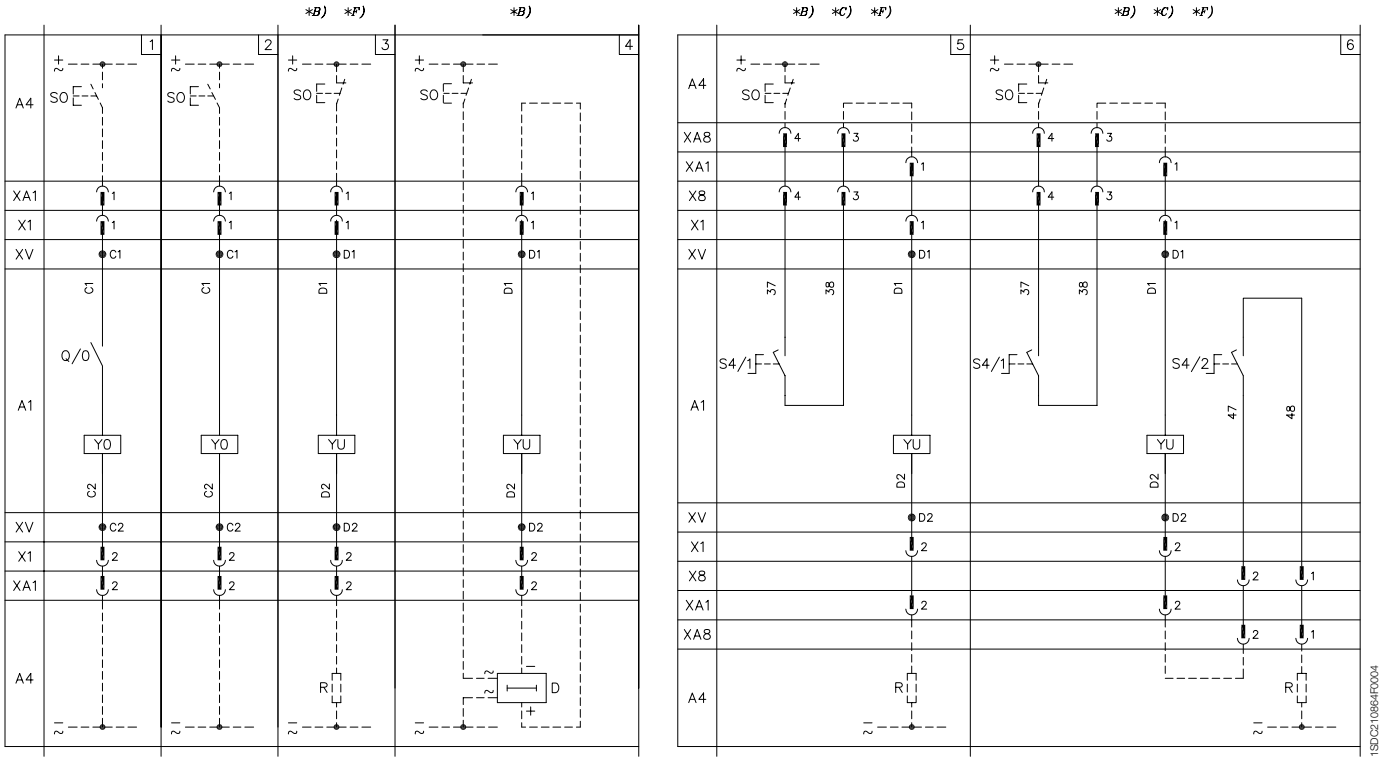
Plug-in or withdrawable version three-pole circuit-breaker with current transformer on neutral conductor, external to circuit-breaker

5

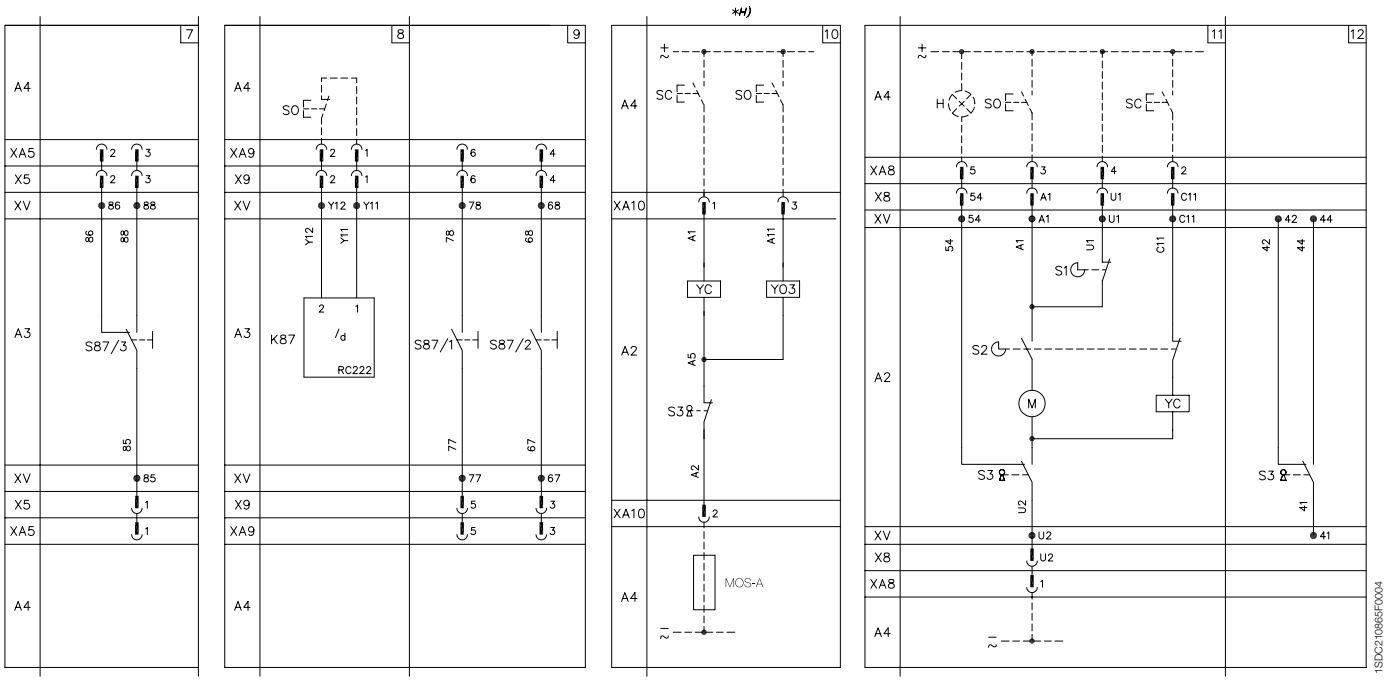
Wiring diagrams

Electrical accessories for T1…T5

Shunt opening and undervoltage releases

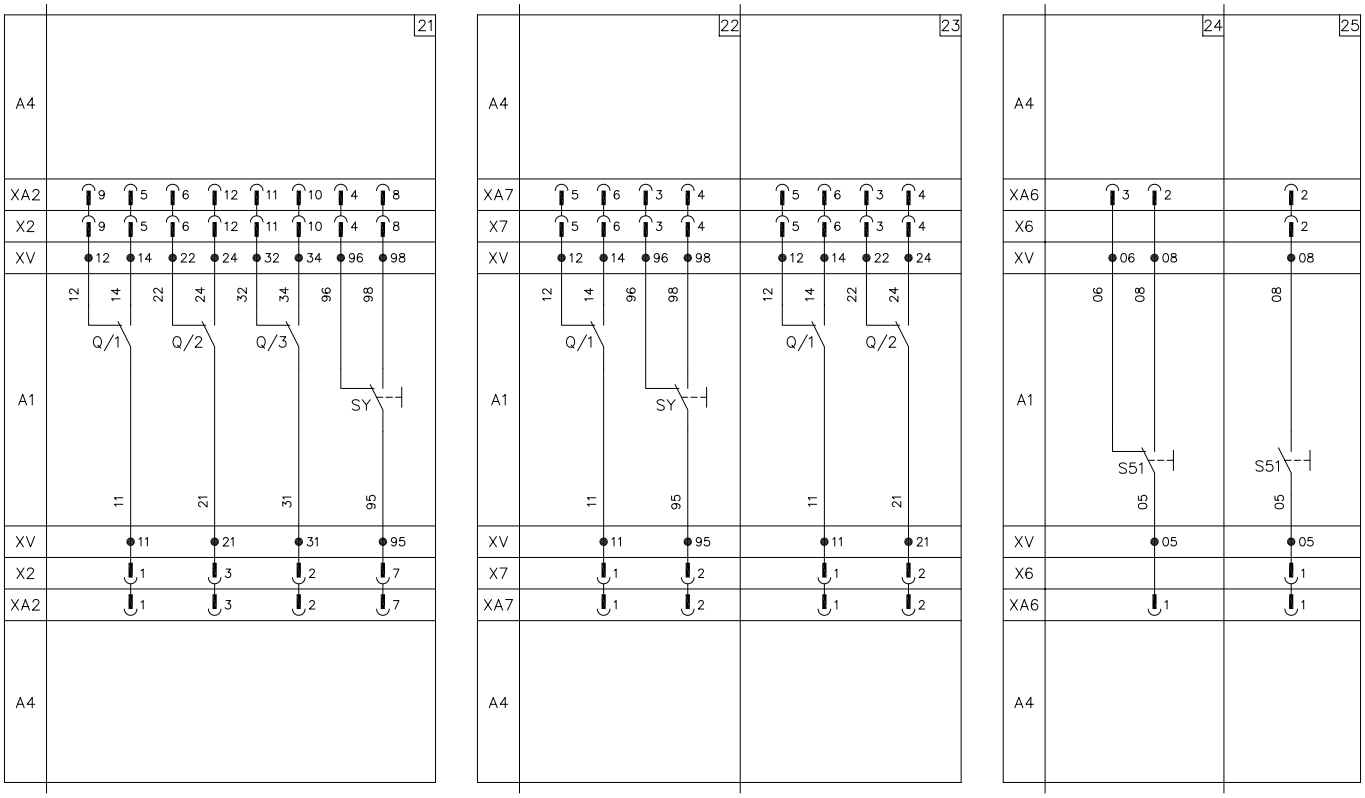


Residual current releases and remote controls

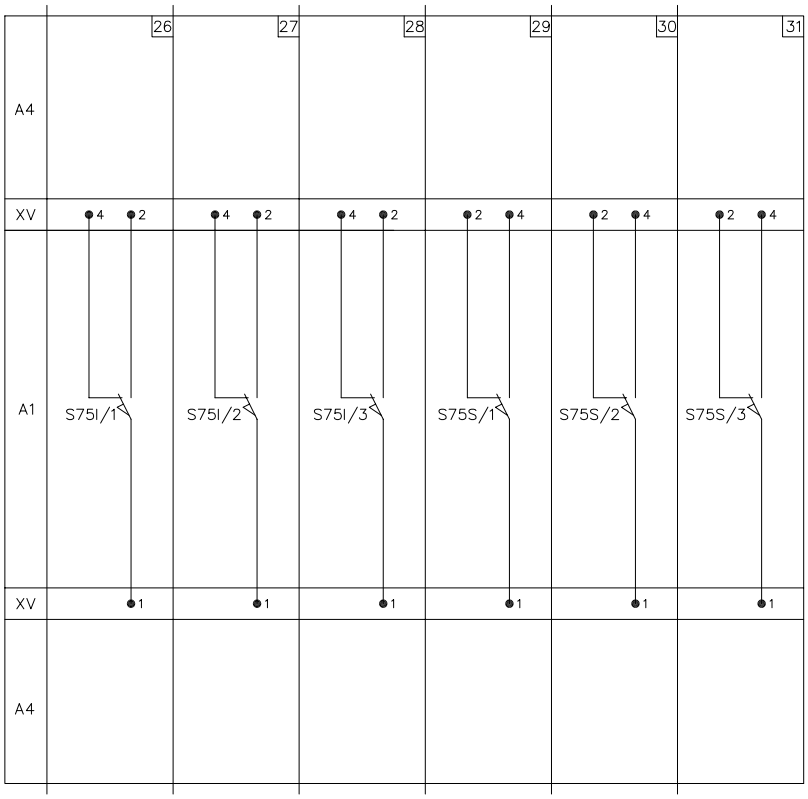


5

Auxiliary contacts



Position contacts

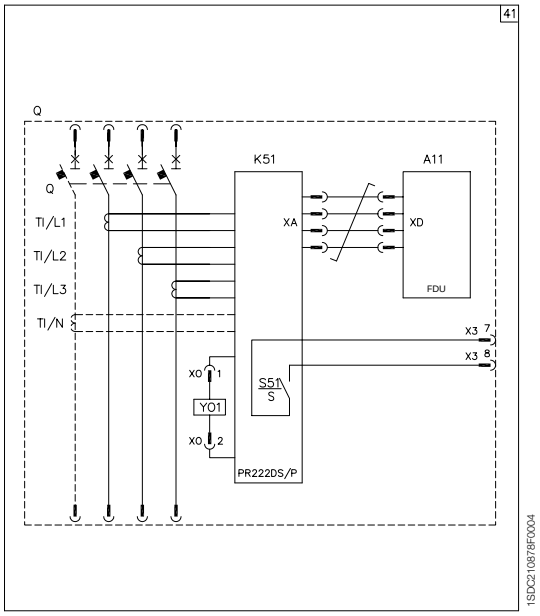


5

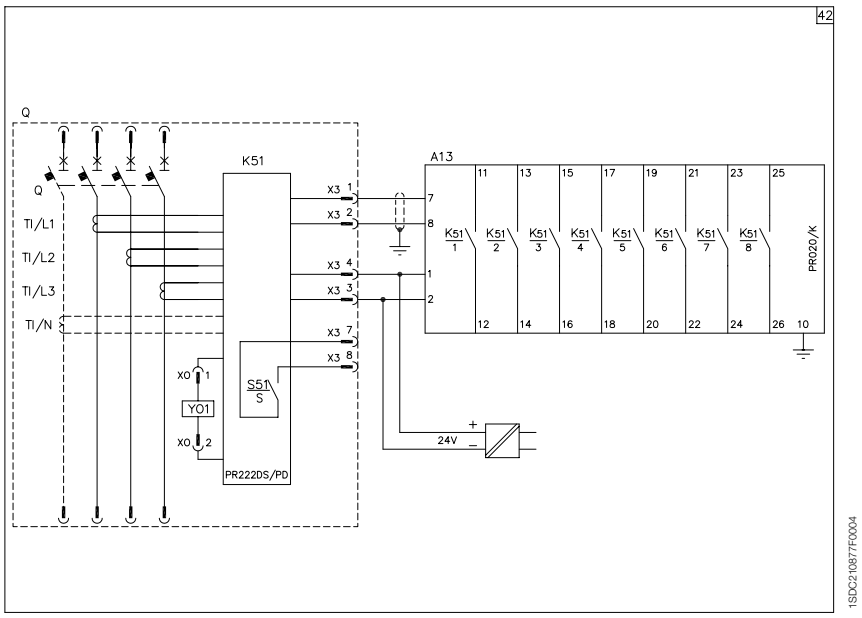
Wiring diagrams

Electrical accessories for T1…T5

PR222DS/P electronic release connected with the FDU front display unit



PR222DS/PD electronic release connected with the PR020/K signalling unit



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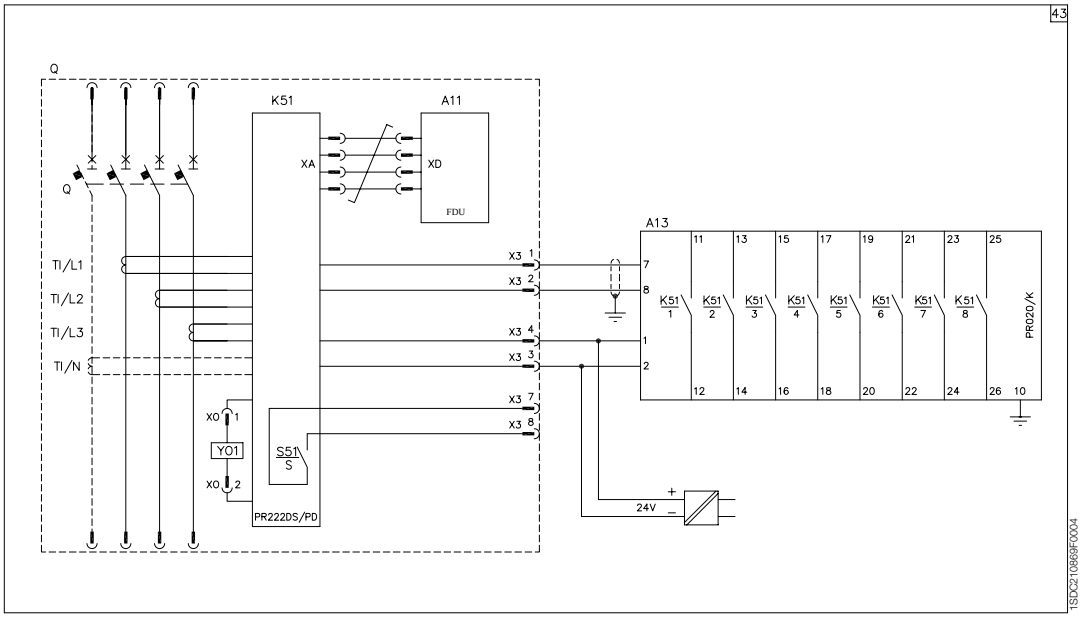
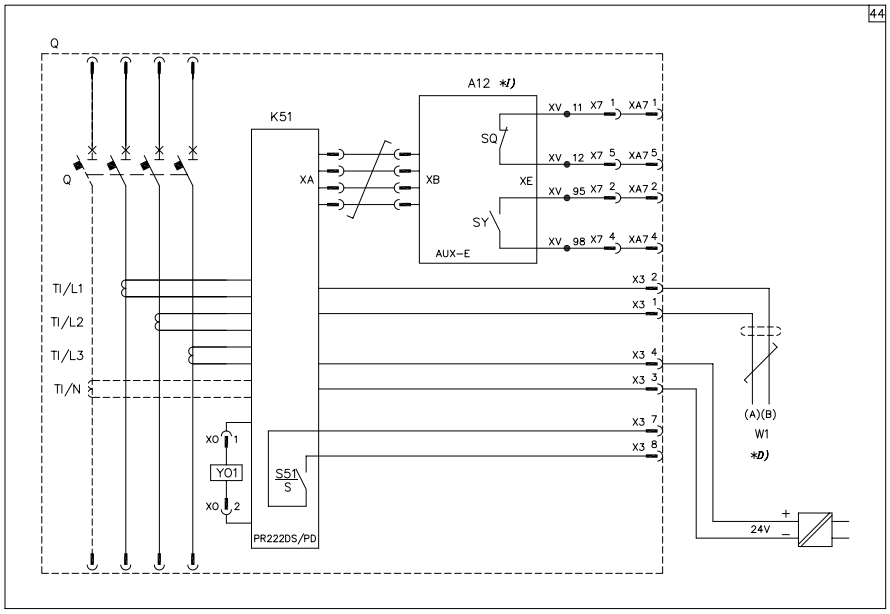
PR222DS/PD electronic release connected with the FDU front display unit and the PR020/K signalling unit



PR222DS/PD electronic release connected with the AUX-E auxiliary contacts

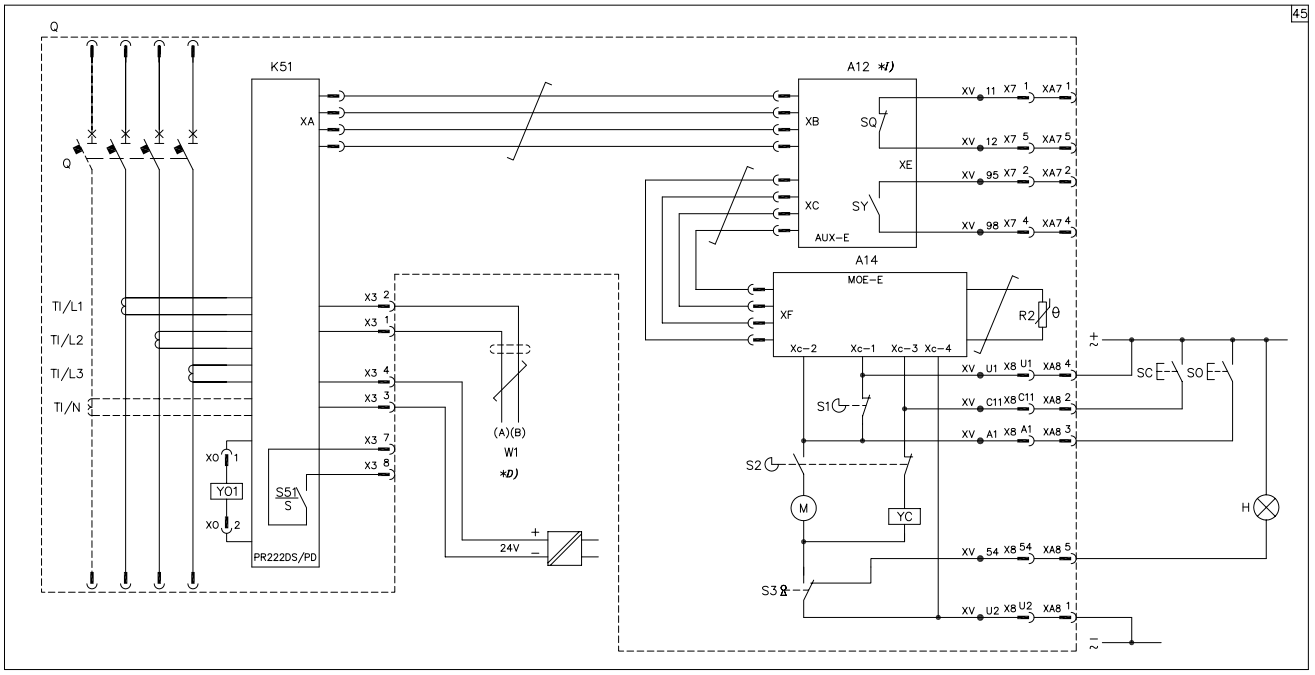


5

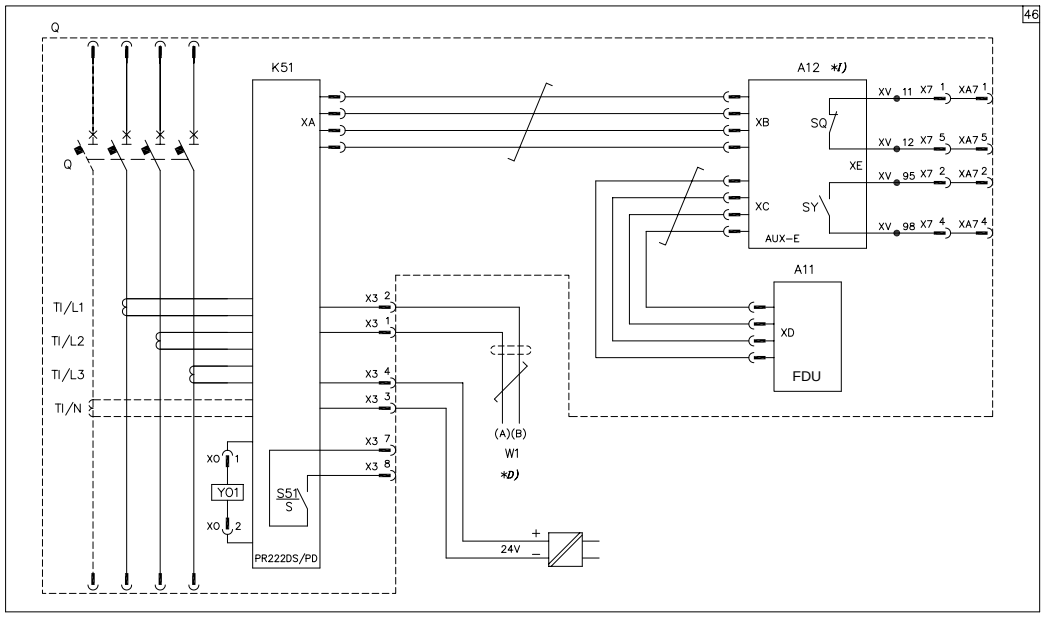
Wiring diagrams

Electrical accessories for T1…T5

PR222DS/PD electronic release connected with the AUX-E auxiliary contacts and the MOE-E actuation unit



PR222DS/PD electronic release connected with the FDU front display unit and with the AUX-E auxiliary contacts



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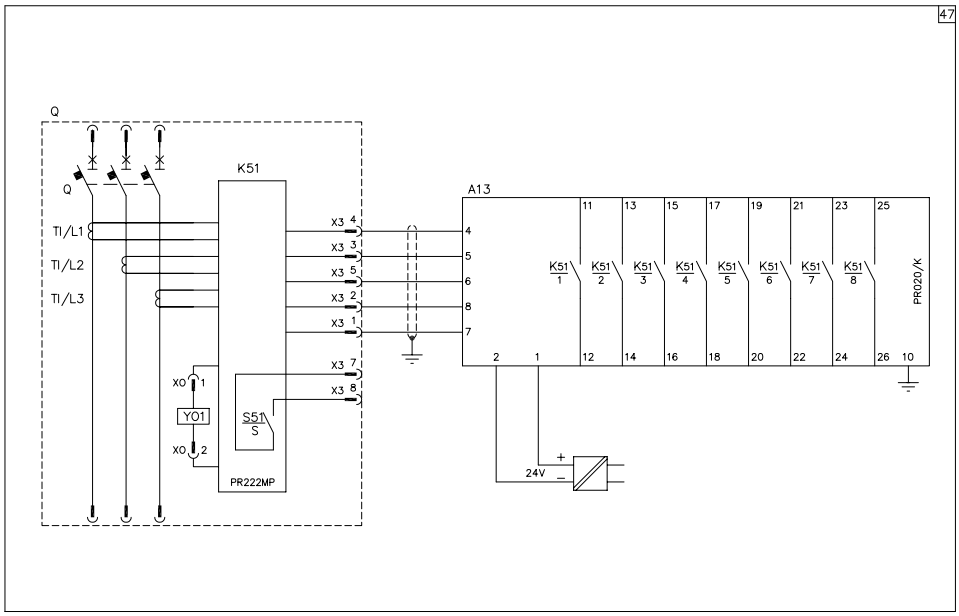
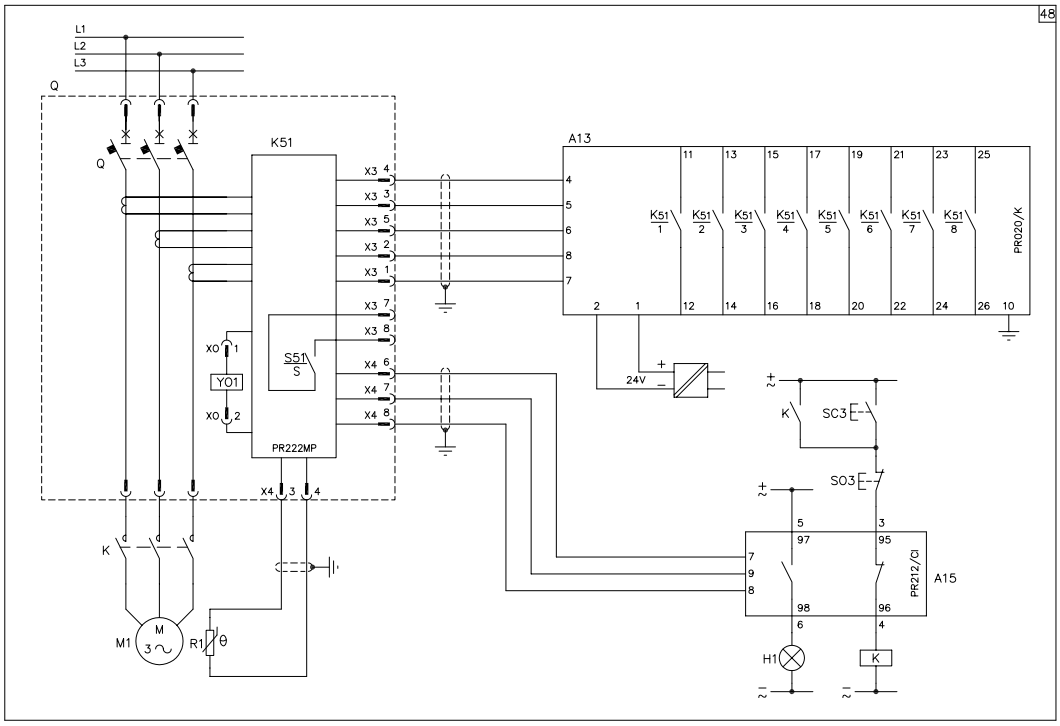
PR222MP electronic release connected with the PR020/K signalling unit



PR222MP electronic release connected with the PR020/K signalling unit and with the PR212/CI contactor control unit



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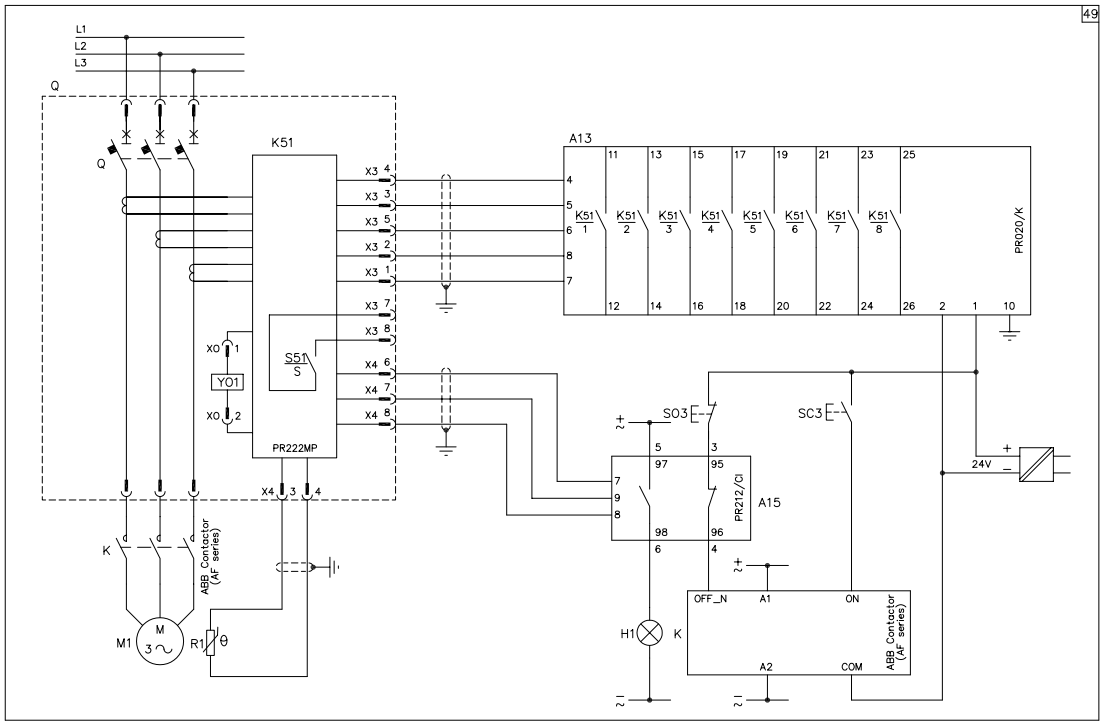
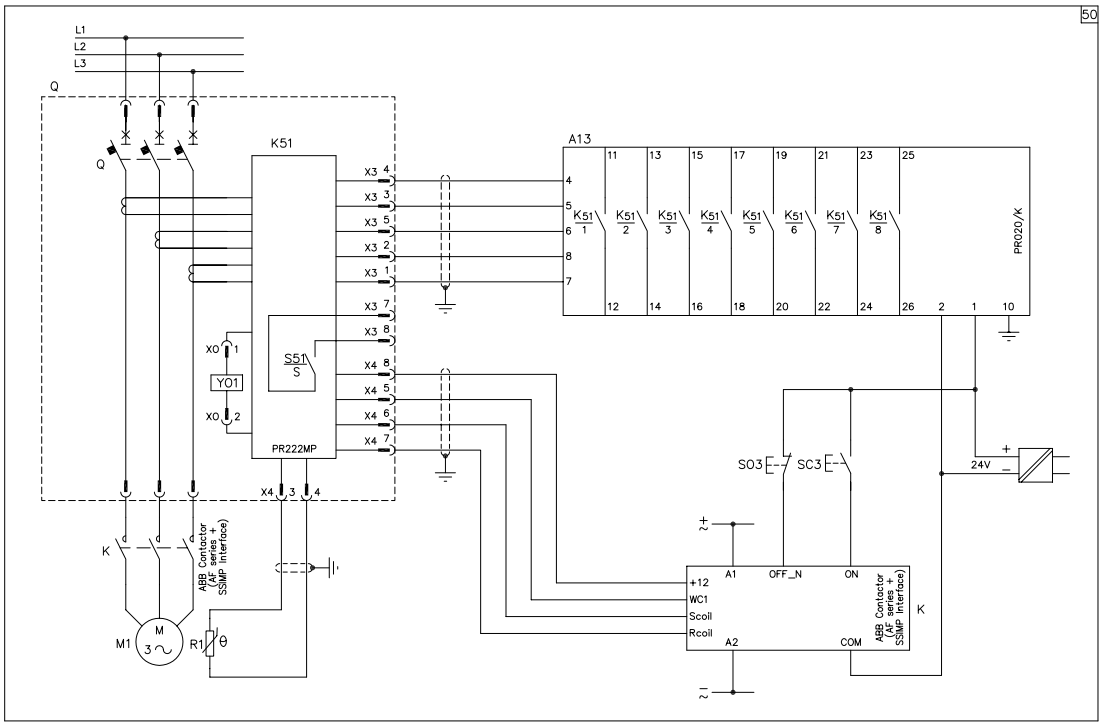
PR222MP electronic release connected with the PR020/K signalling unit, with the PR212/CI contactor control unit and with a contactor



PR222MP electronic release connected with the PR020/K signalling unit and with a contactor



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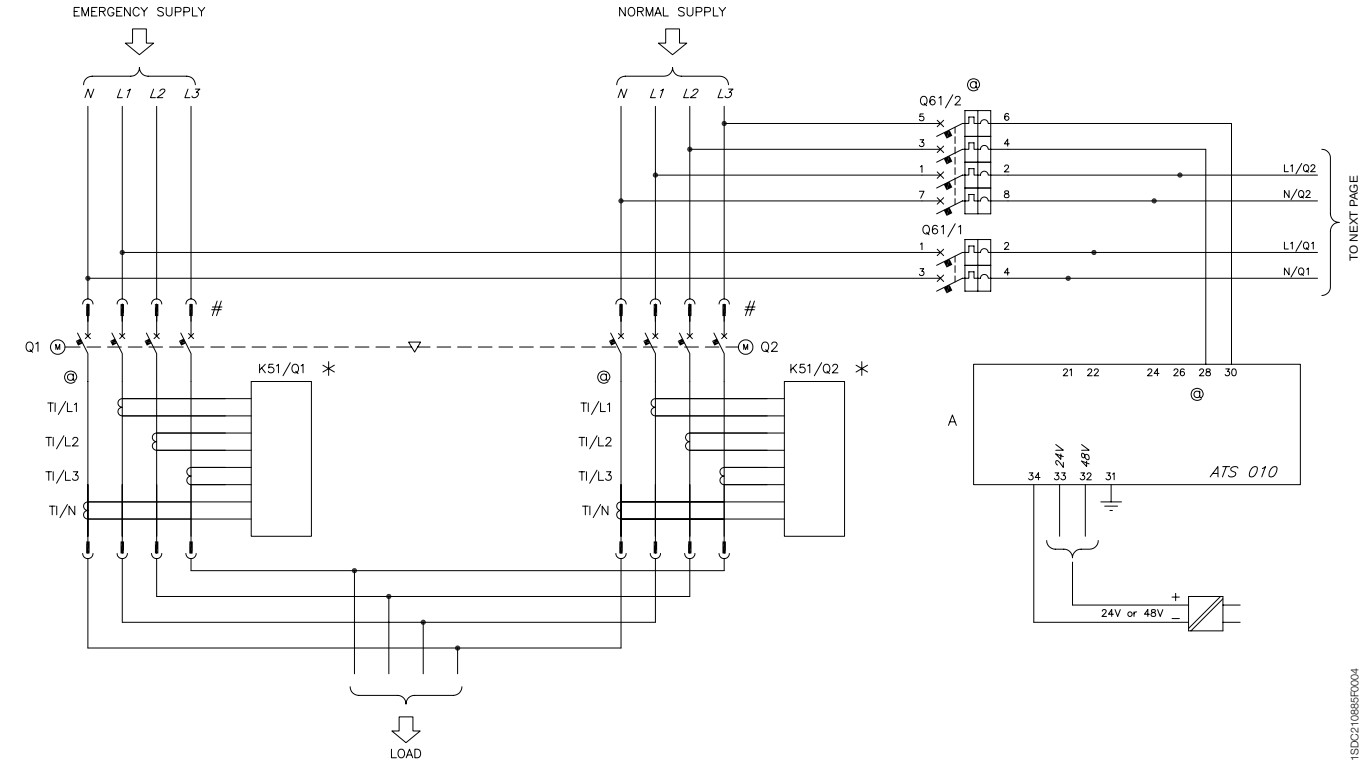
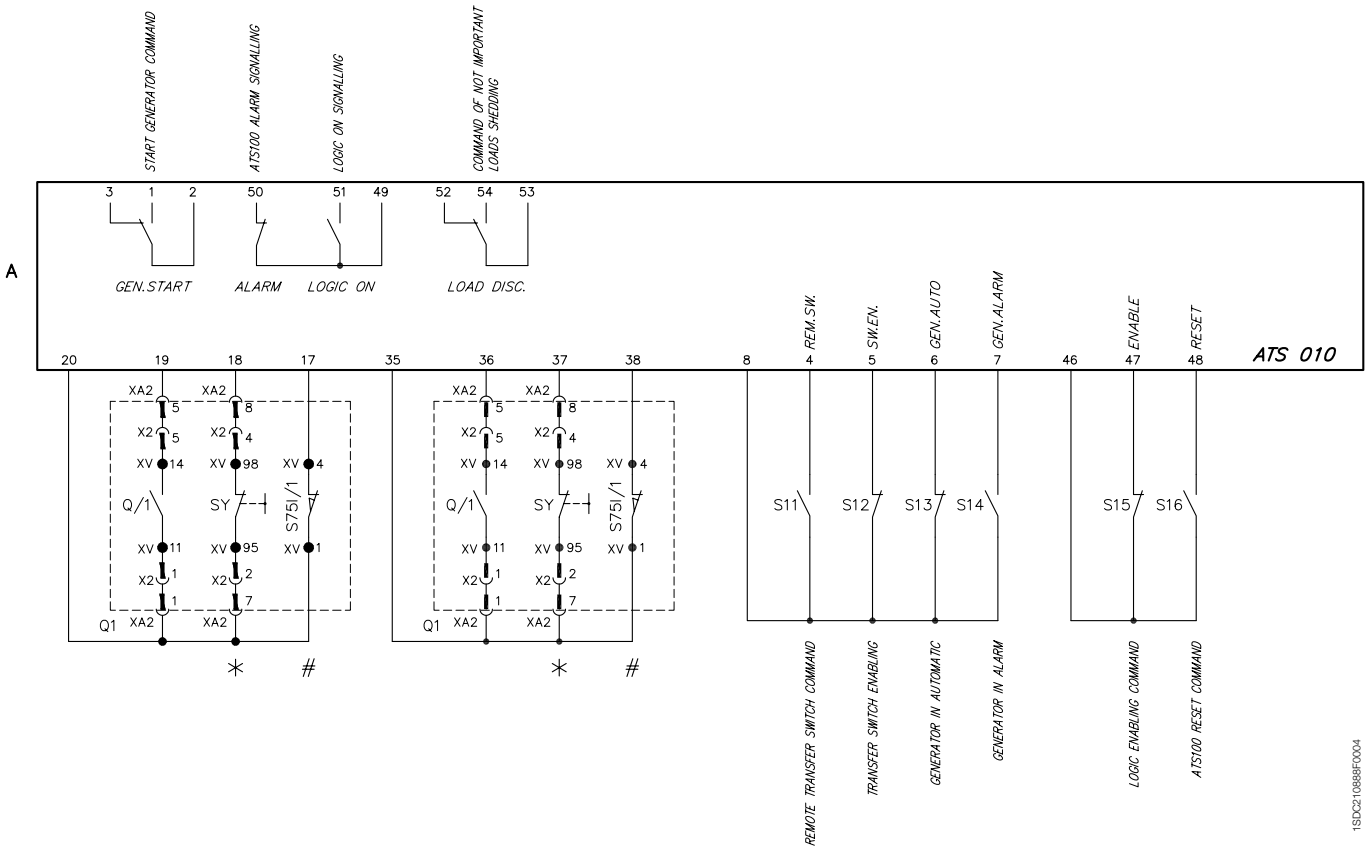
Wiring diagrams

Automatic transfer-switch ATS010

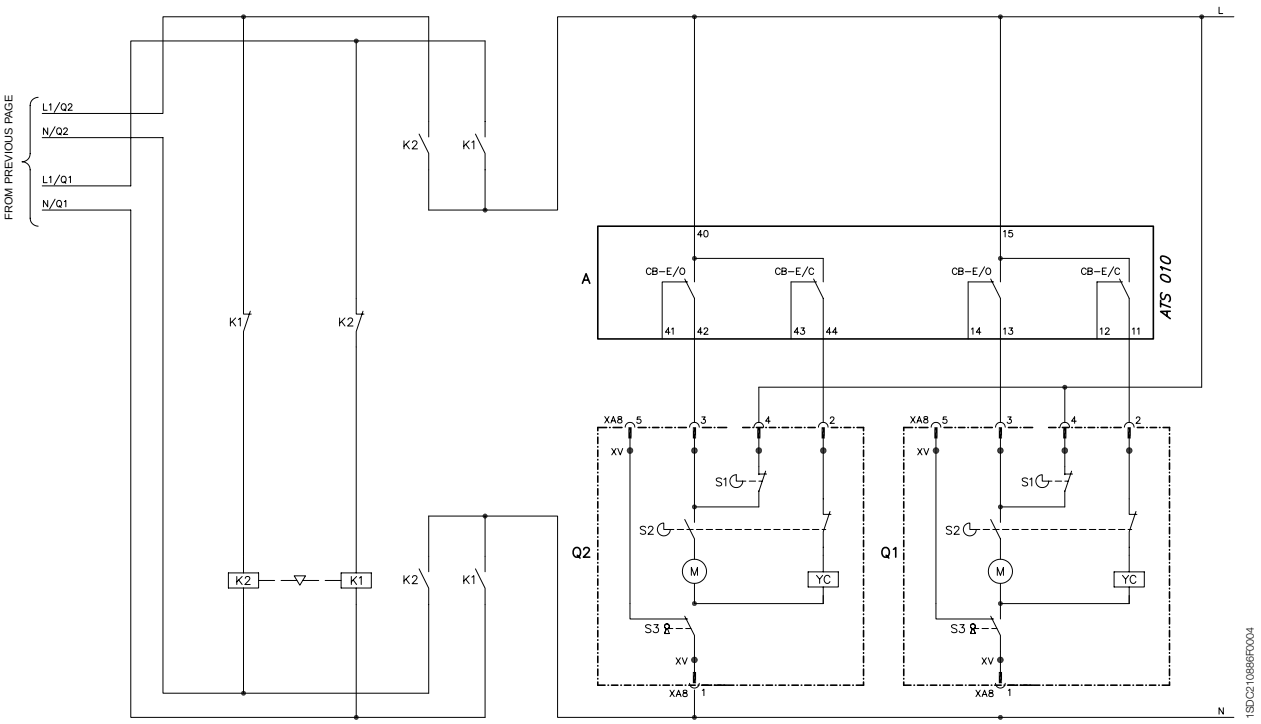
ATS010 device for the automatic transfer switch of two T4-T5 circuit-breakers without safety auxiliary voltage supply



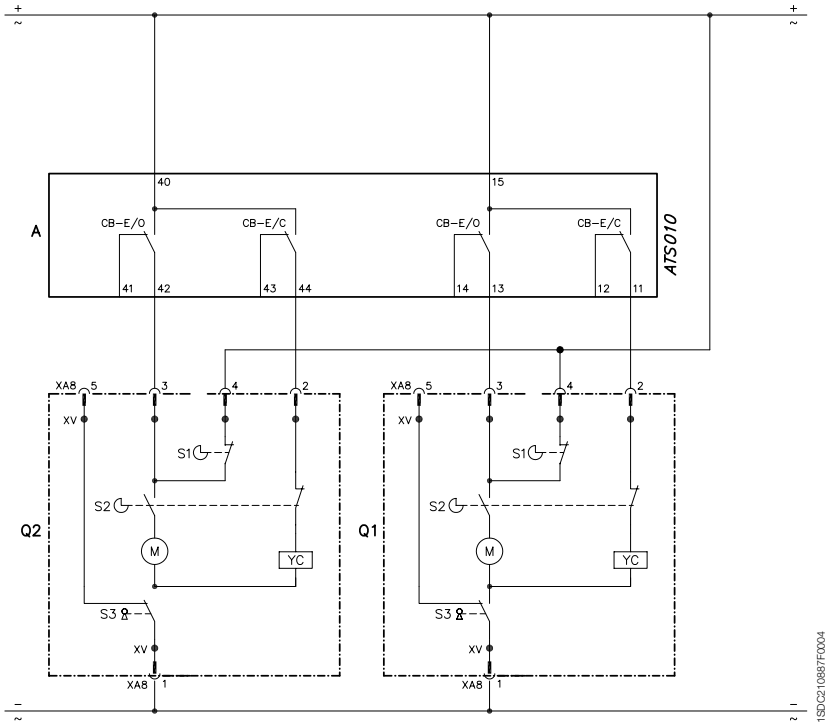


Wiring diagrams

Automatic transfer-switch ATS010



ATS010 device for the automatic transfer switch of two T4-T5 circuit-breakers with safety auxiliary voltage supply



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Index

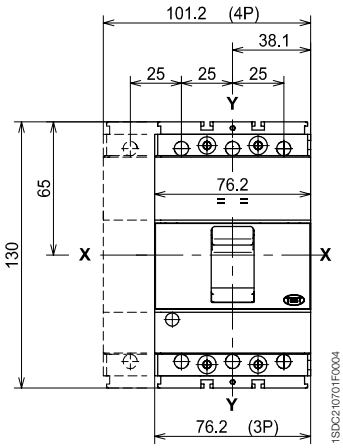
Overall dimensions

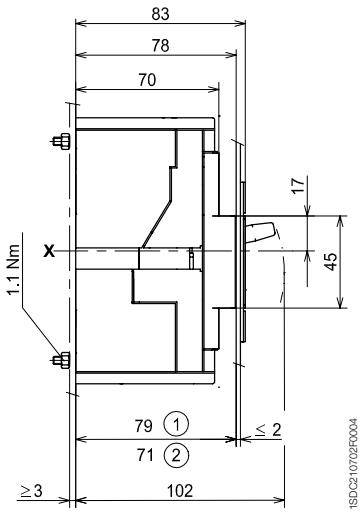
Overall dimensions

Tmax T1 and single-pole Tmax T1

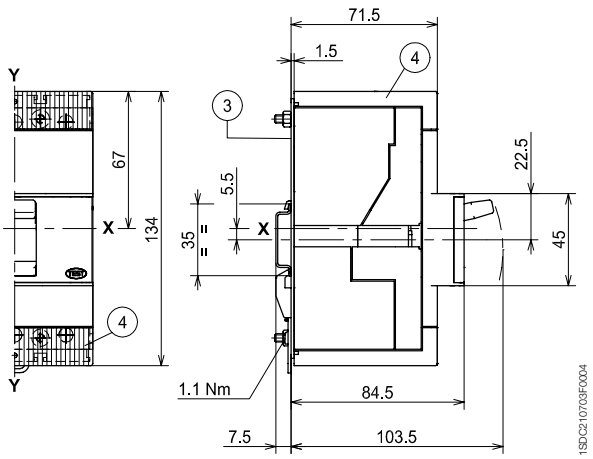
Fixed circuit-breaker

Fixing on sheet

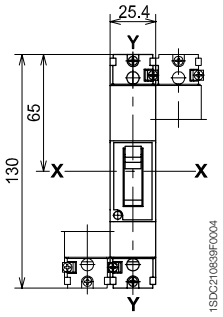




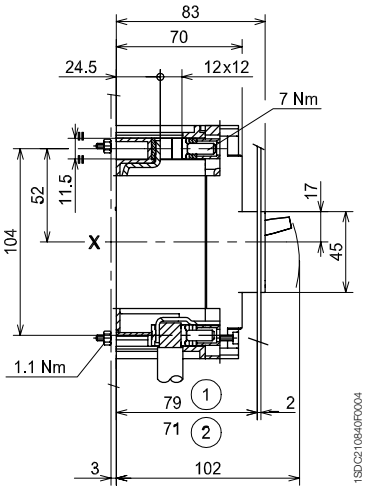
Fixing on DIN EN 50022 rail



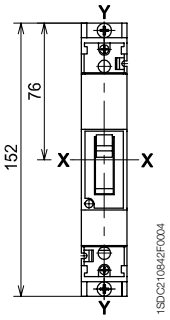
Without inserts



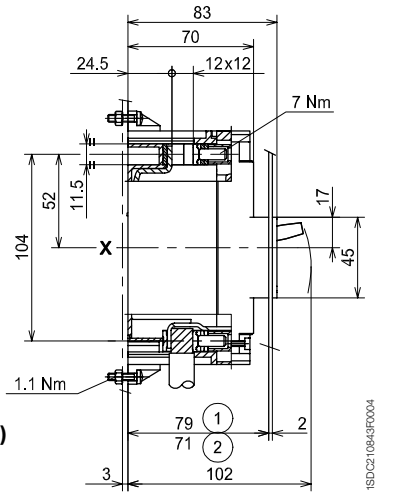
T1 1P (SINGLE-POLE)



With inserts



T1 1P (SINGLE-POLE)

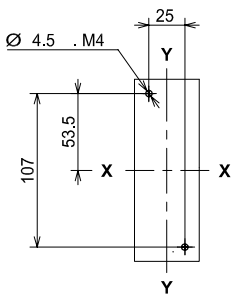


Caption

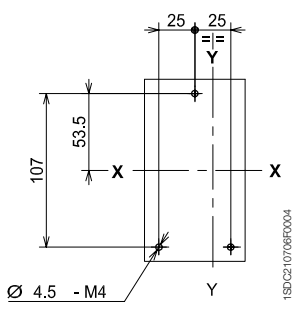
1. Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange
2. Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange
3. Bracket for fixing onto rail
4. Bottom terminal covers with IP40 degree of protection

Drilling templates for support sheet

For front terminals

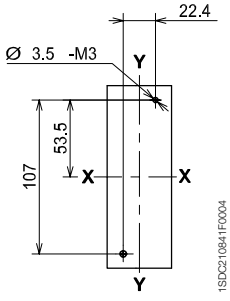


3 POLES

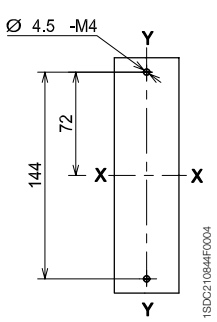


4 POLES

Without inserts



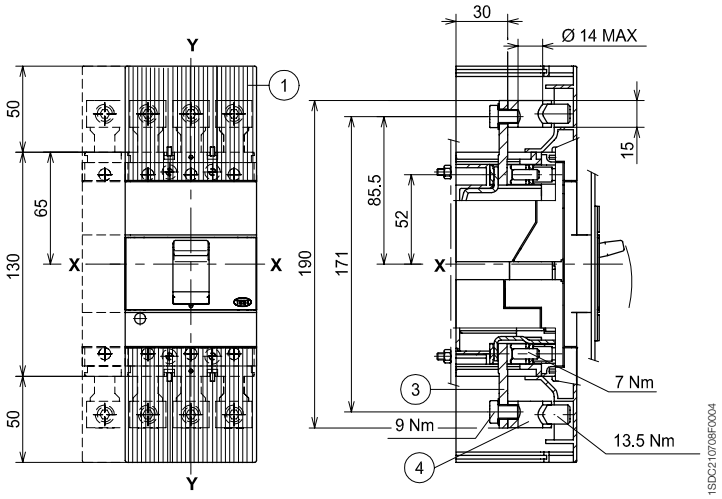
With inserts



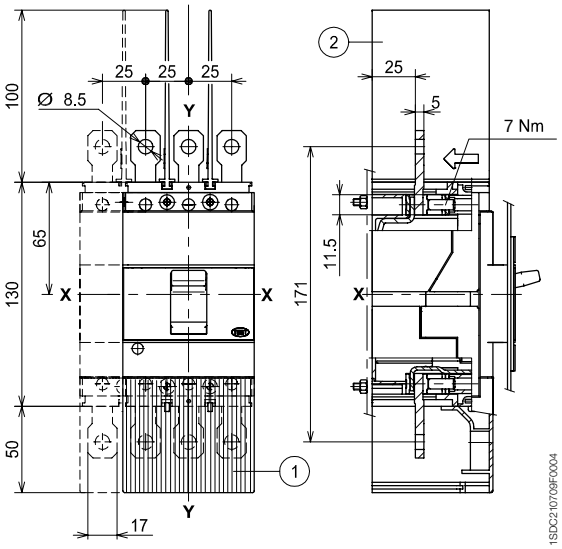
T1 1P (SINGLE-POLE)

Terminals

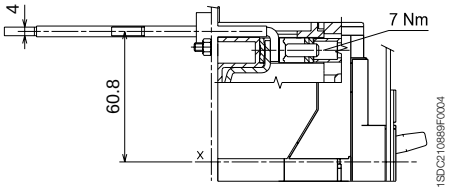
Front for copper/aluminium cables - FC CuAl

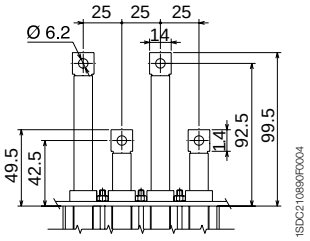


Front extended - EF

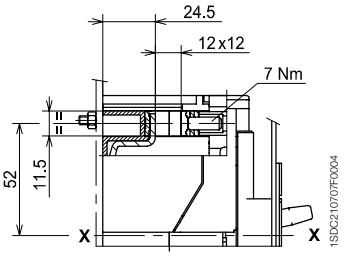


Rear flat horizontal

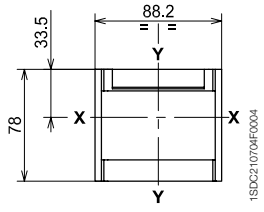




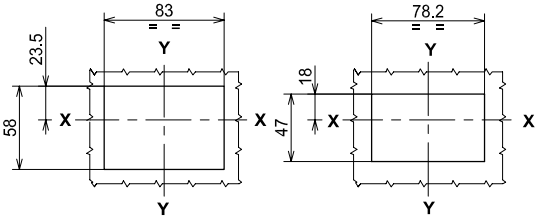
Front for copper cables - FC Cu



Flange for the compartment door

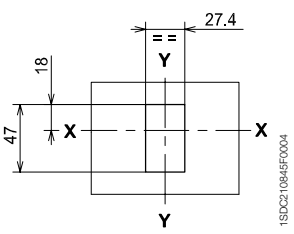


Drilling templates of the compartment door

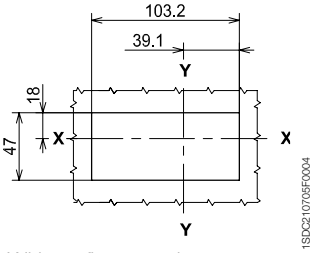


With flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face flush with door (3-4 POLES) or extending (3 POLES)



(SINGLE-POLE)



Without flange and circuit-breaker face extending (4 POLES)

Caption

1. High terminal covers with IP40 degree of protection (compulsory)
2. Insulating barriers between phases (compulsory in the absence of top terminal covers)
3. Front extended terminals
4. Terminals for CuAl cables 95 mm²

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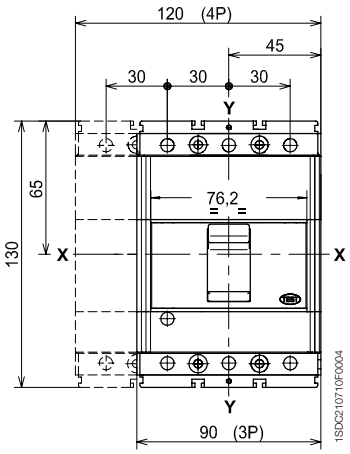
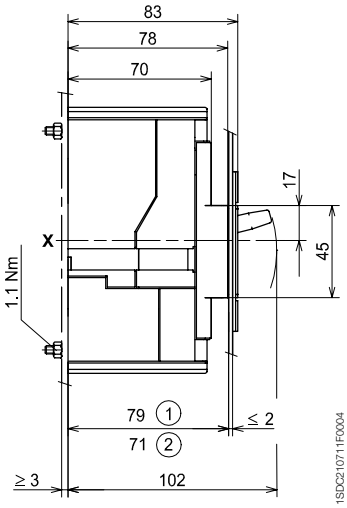
Overall dimensions

Tmax T2

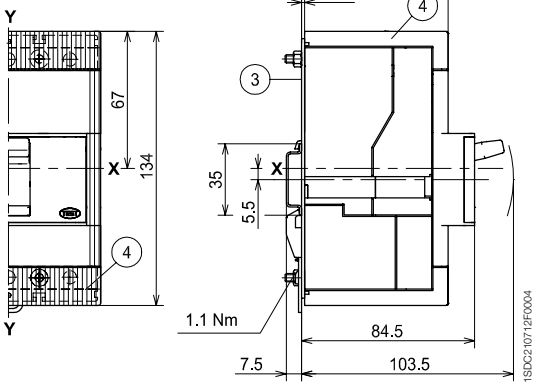
Fixed circuit-breaker

Fixing on sheet

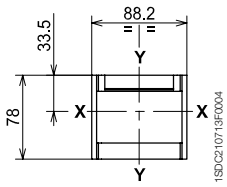




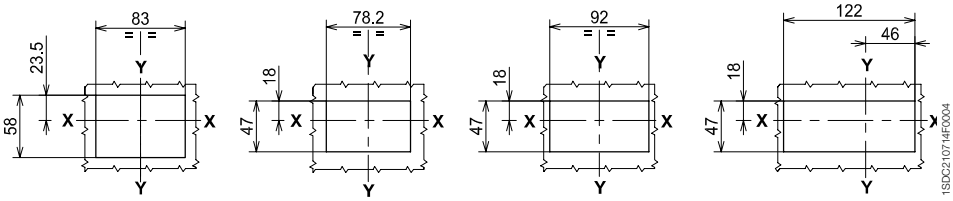
Fixing on DIN EN 50022 rail



Flange for the compartment door



Drilling templates of the compartment door



With flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face extending (3 POLES)

Without flange and circuit-breaker face extending (4 POLES)

Caption

(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

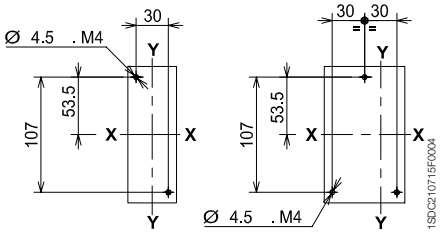
(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange

(3) Bracket for fixing onto rail

(4) Low terminal covers with degree of protection IP40

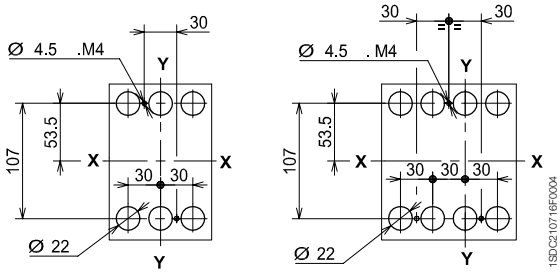
Drilling templates for support sheet

For front terminals



3 POLES 4 POLES

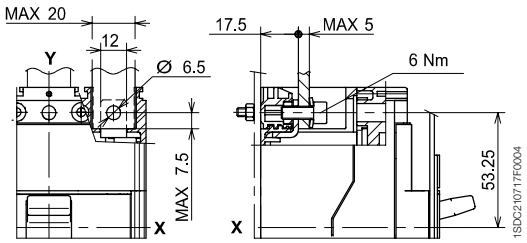
For rear terminals



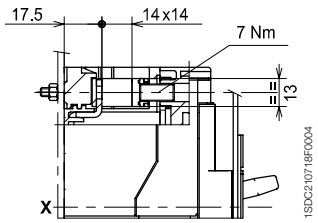
3 POLES 4 POLES

Terminals

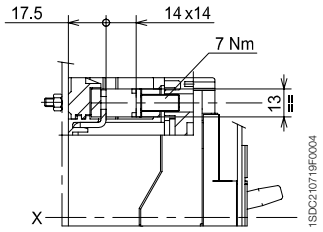
Front F



Front for copper cables - FC Cu



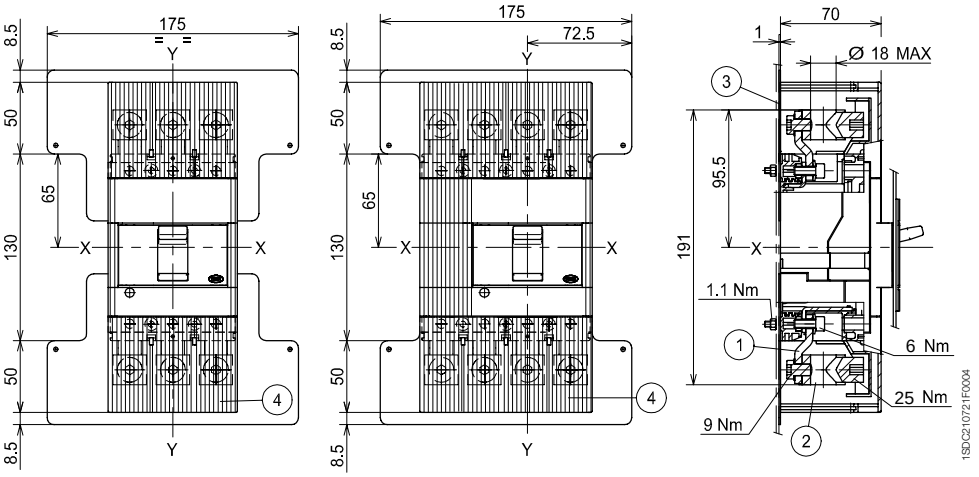
Front for copper/aluminium cables - FC CuAl 95 mm²

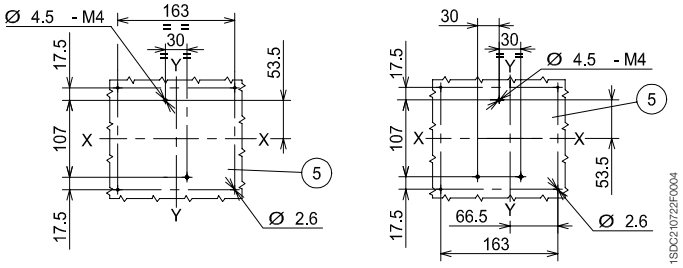


Caption

1. Front extended terminals
2. Front terminals for cables 185 mm² CuAl
3. Insulating base plate (compulsory)
4. High terminal covers with degree of protection IP40 (compulsory)
5. Drilling templates for support sheet

Front for copper/aluminium cables - FC CuAl 185 mm²





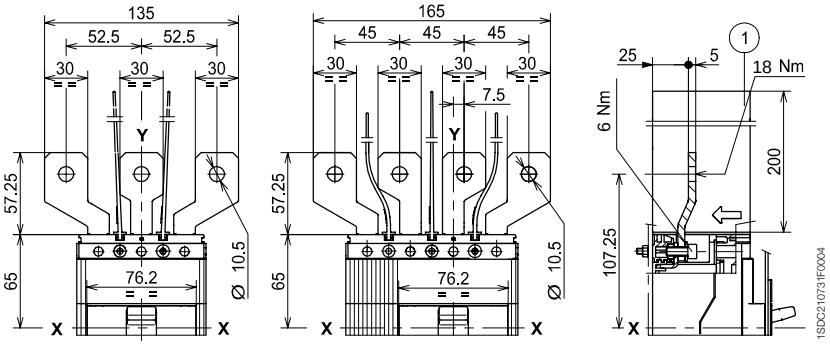
3 POLES

4 POLES

Caption

1. Insulating barriers between phases (compulsory)

Front extended spread - ES



6

Overall dimensions

Tmax T2

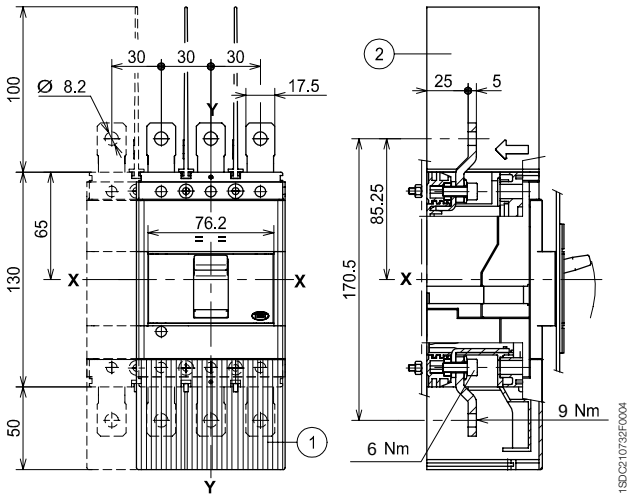
Terminals

Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

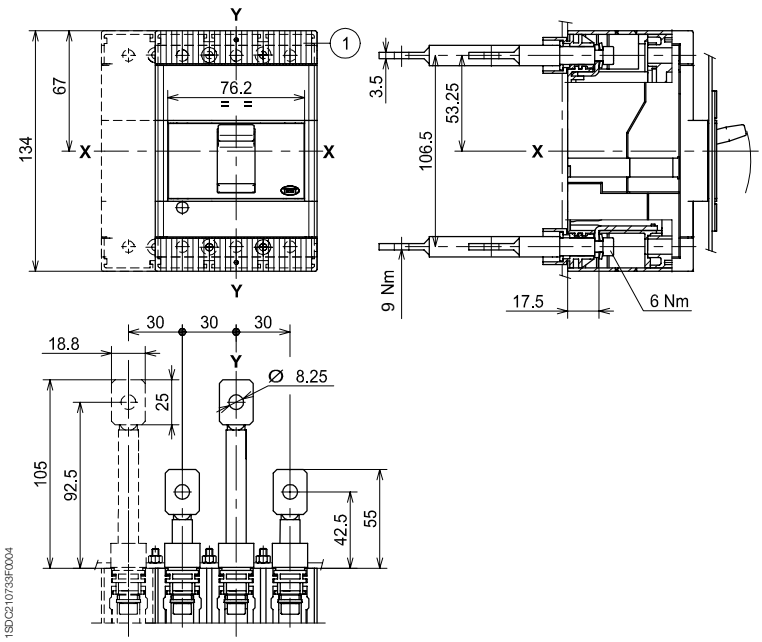
Front extended - EF



Caption

(1) Low terminal covers with degree of protection IP40

Rear - R



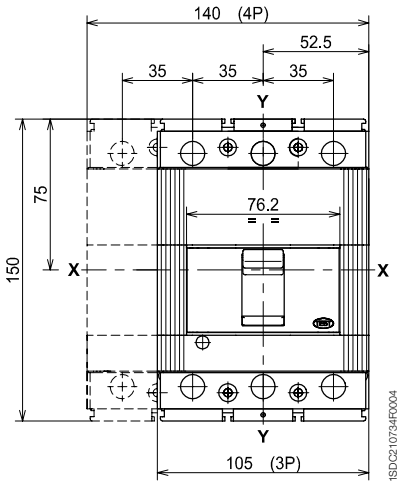
6

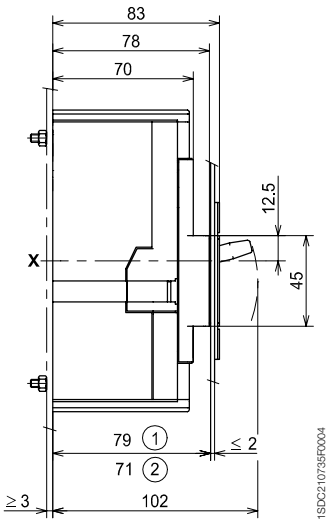
Overall dimensions

Tmax T3

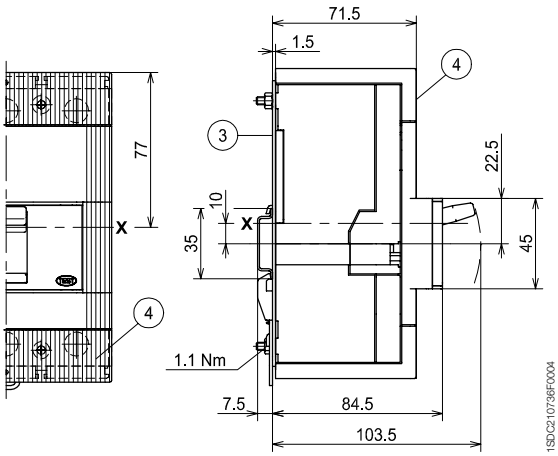
Fixed circuit-breaker

Fixing on sheet





Fixing on DIN EN 50022 rail



Caption

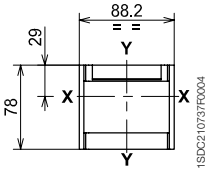
(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door

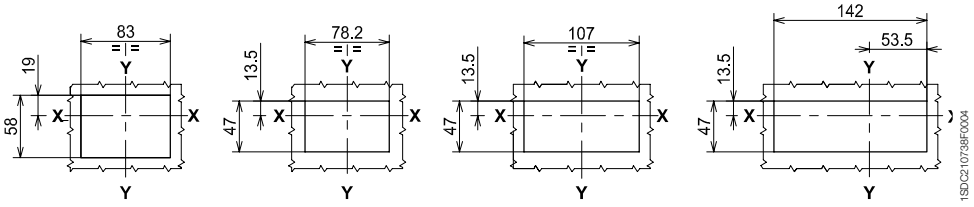
(3) Bracket for fixing on rail

(4) Low terminal covers with degree of protection IP40

Flange for compartment door



Drilling templates of the compartment door



With flange and circuit-breaker face flush with door (3-4 POLES)

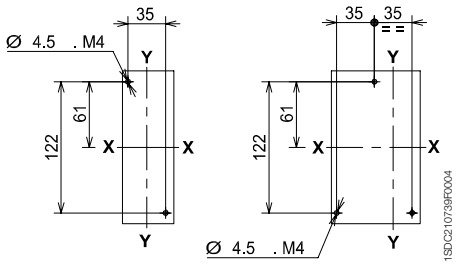
Without flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face extending (3 POLES)

Without flange and circuit-breaker face extending (4 POLES)

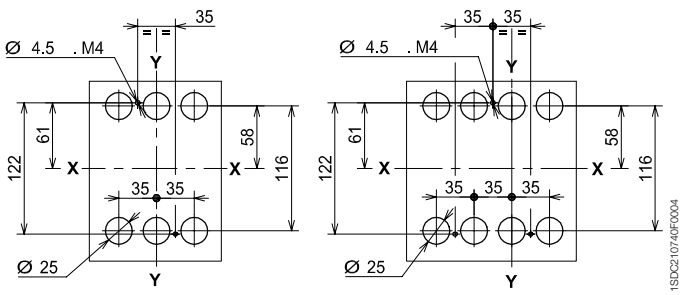
Drilling templates for support sheet

For front terminals



3 POLES 4 POLES

For rear terminals



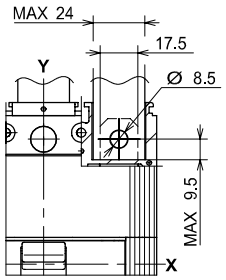
3 POLES 4 POLES

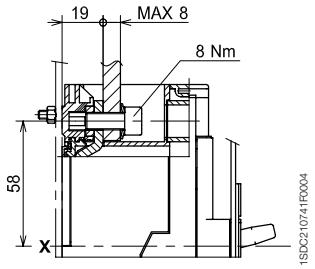
6

Overall dimensions
Tmax T3

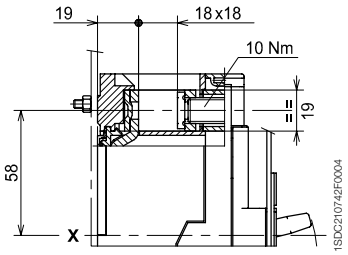
Terminals

Front - F

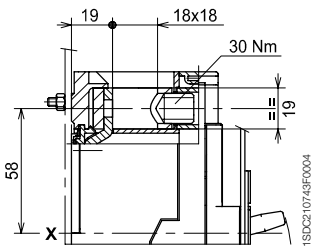




Front for copper cables - FC Cu



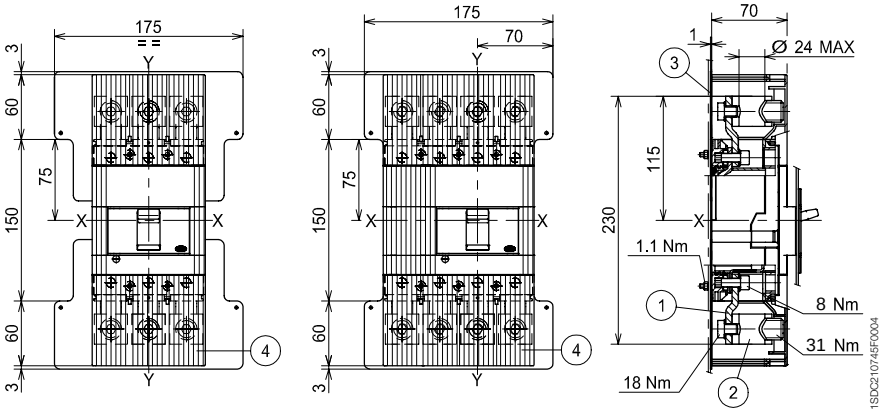
Front for copper/aluminium cables - FC CuAl 185 mm²

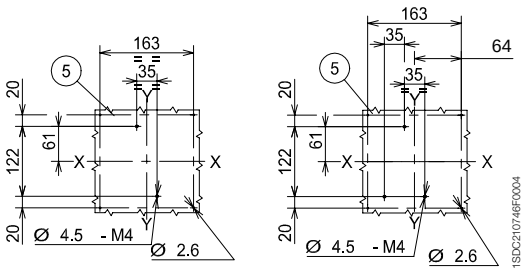


Caption

1. Front extended terminals
2. Front terminals for cables 240 mm² CuAl
3. Insulating base plate (compulsory)
4. High terminal covers with degree of protection IP40 (compulsory)
5. Drilling templates for support sheet

Front for copper/aluminium 240 mm² cables - FC CuAl 240 mm²





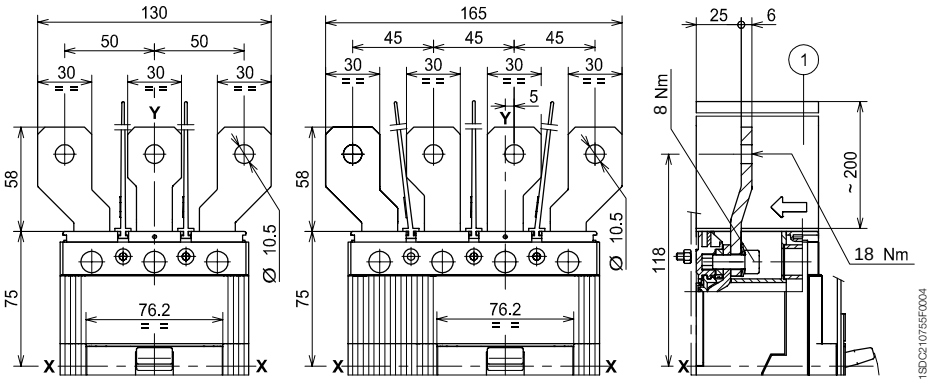
3 POLES

4 POLES

Caption

1. Insulating barriers between phases (compulsory)

Front extended spread - ES

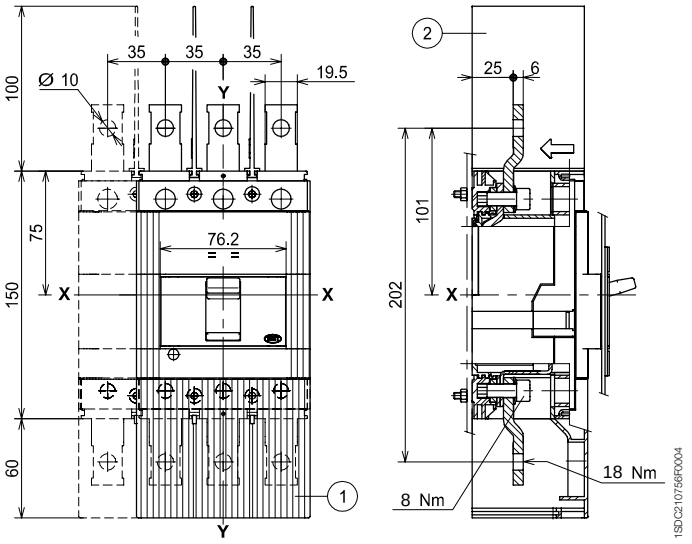


Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

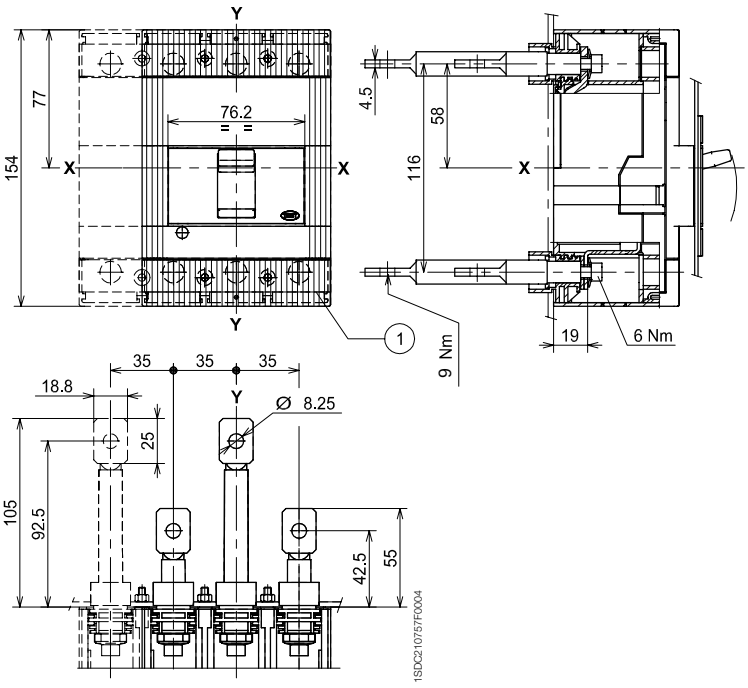
Front extended - EF



Caption

(1) Low terminal covers with degree of protection IP40

Rear - R



6

Overall dimensions
Tmax T4

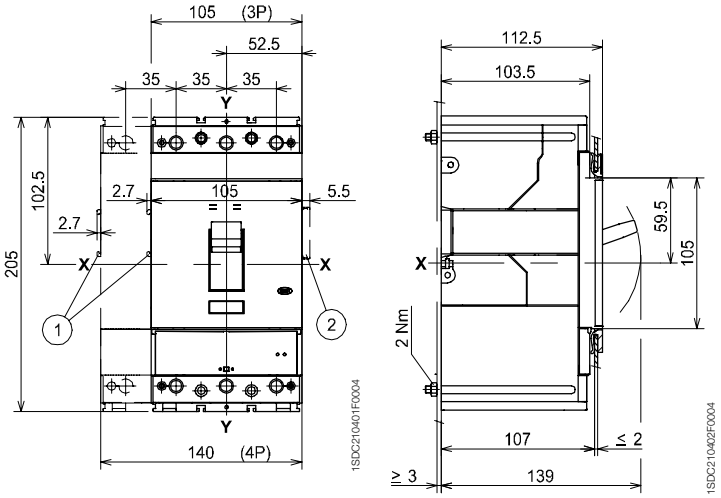
Fixed circuit-breaker

Fixing on sheet

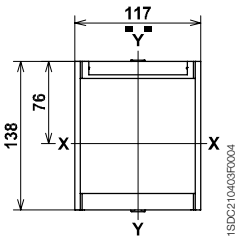
Caption

(1) Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC221-222)

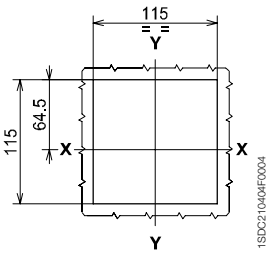
(2) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



Flange for compartment door

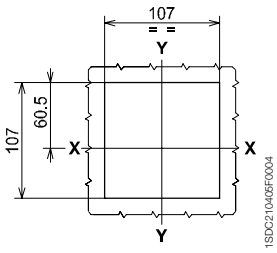


Drilling templates of the compartment door



3-4 POLES

With flange

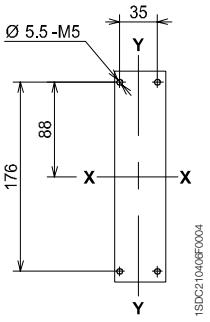


3-4 POLES

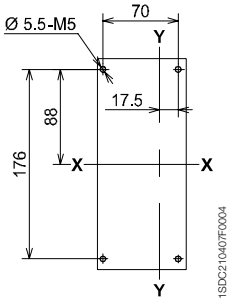
Without flange

Drilling templates for support sheet

For front terminals

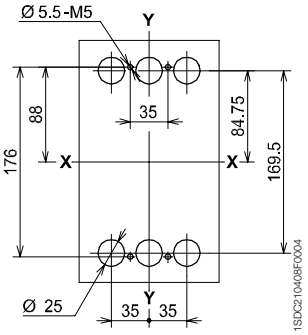


3 POLES

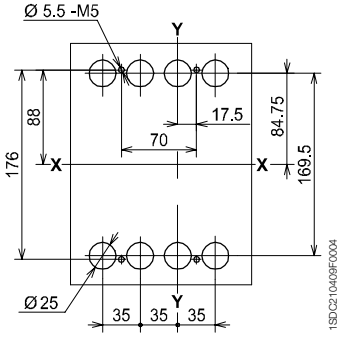


4 POLES

For rear terminals



3 POLES

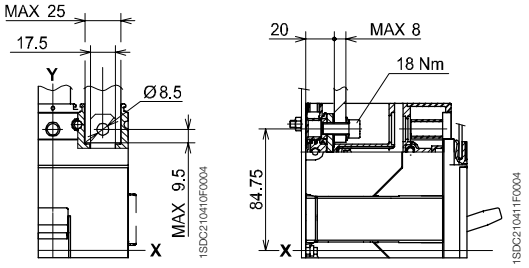


4 POLES

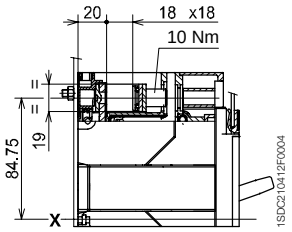
6

Terminals

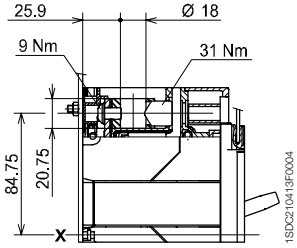
Front - F

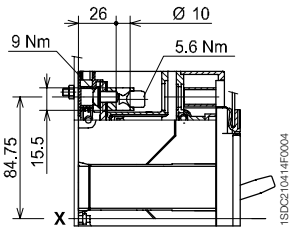


Front for copper cables - FC Cu



Front for copper/aluminium cables - FC CuAl

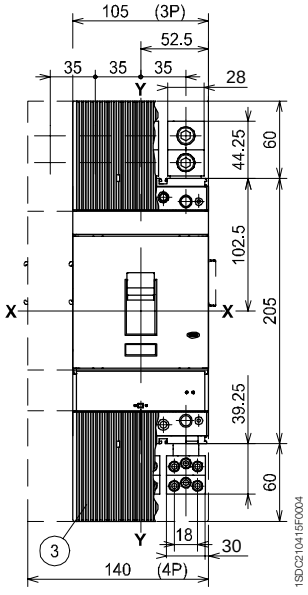


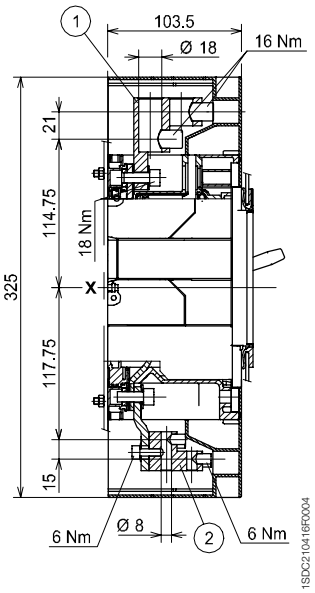


Caption

1. Front terminals for cable connection 2x150 mm²
2. Front terminals for multicable connection
3. High terminal covers with degree of protection IP40

Front multicable - MC

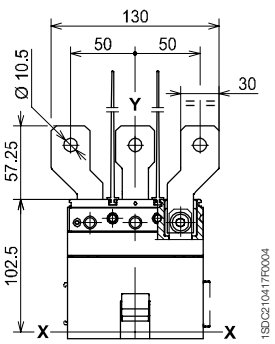


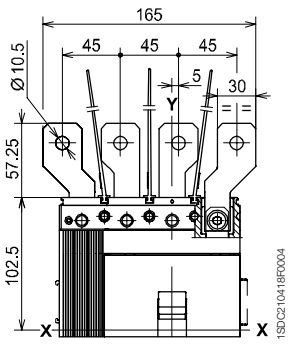


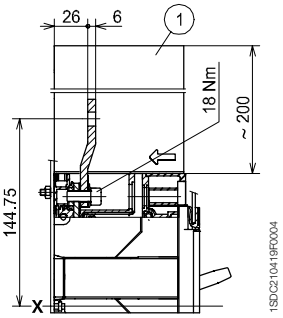
Caption

1. Insulating barriers between phases (compulsory)

Front extended spread - ES







6

Overall dimensions

Tmax T4

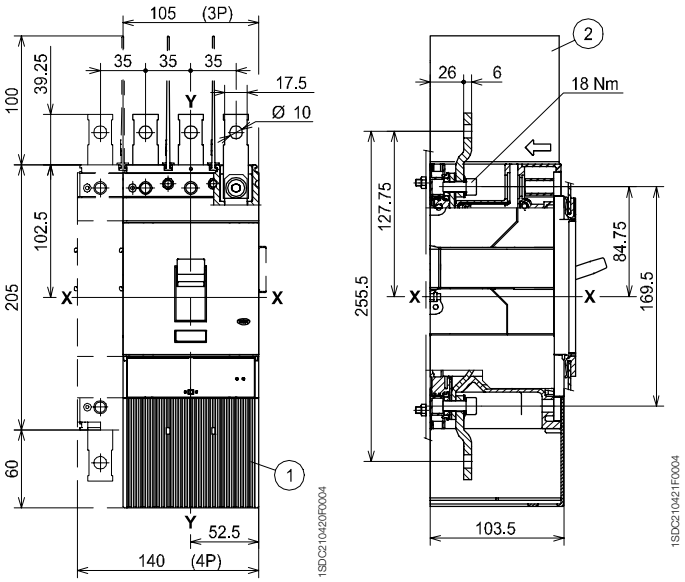
Terminals

Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

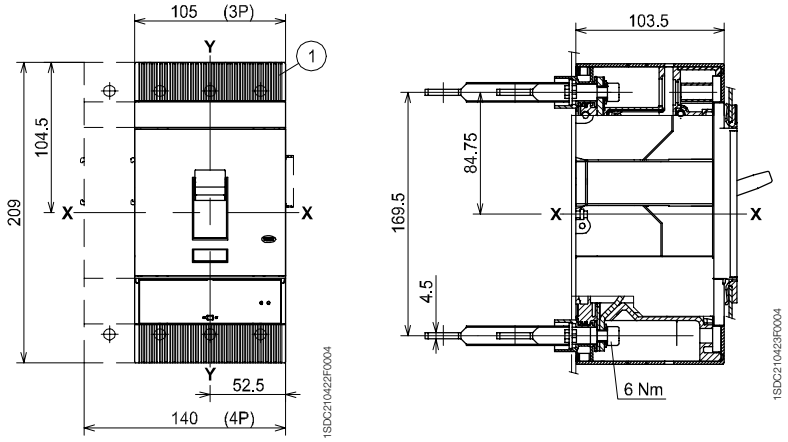
Front extended - EF

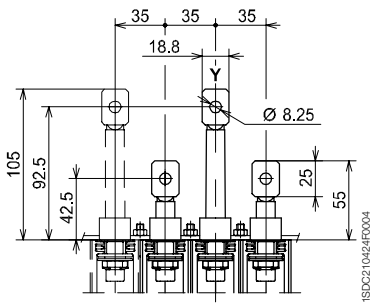


Caption

(1) Low terminal covers with degree of protection IP40

Rear - R





6

Overall dimensions

Tmax T5

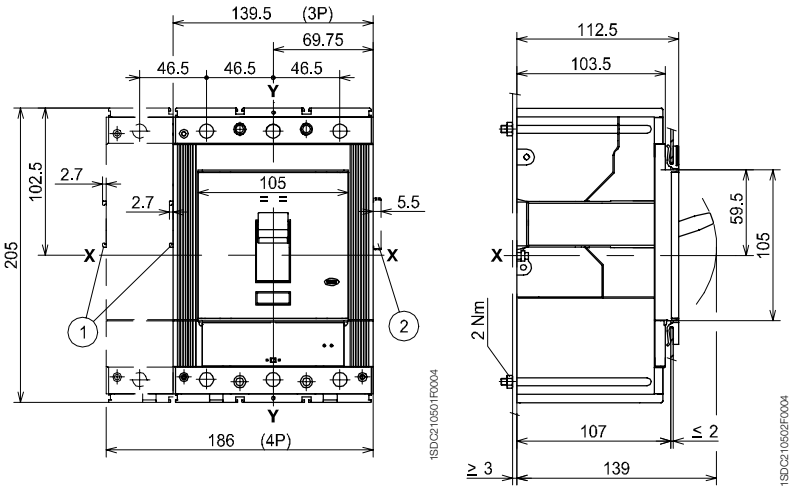
Fixed circuit-breaker

Fixing on sheet

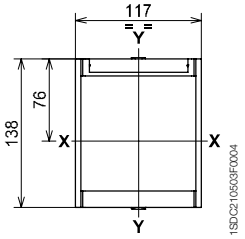
Caption

(1) Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC221-222)

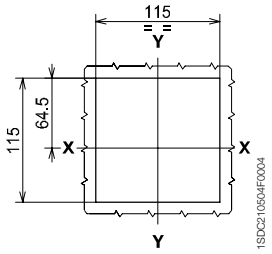
(2) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



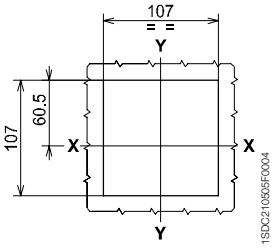
Flange for compartment door



Drilling templates of the compartment door



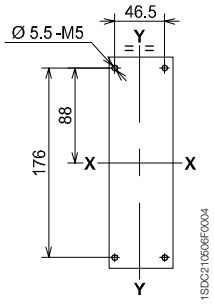
With flange (3-4 POLES)



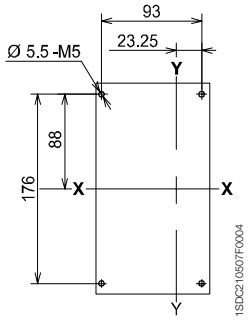
Without flange (3-4 POLES)

Drilling templates for support sheet

For front terminals

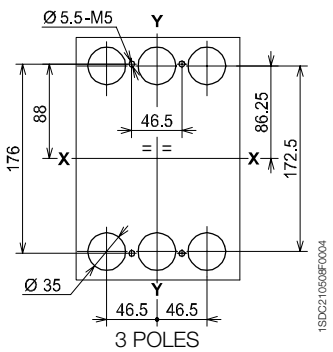


3 POLES

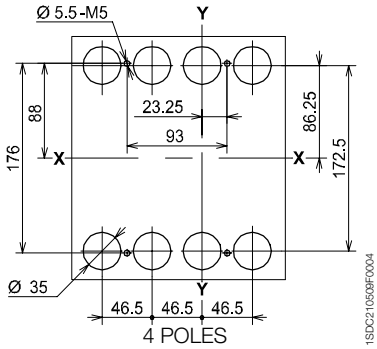


4 POLES

For rear terminals



3 POLES



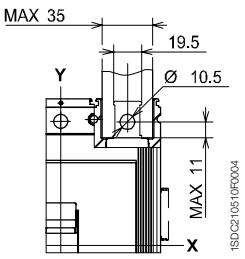
4 POLES

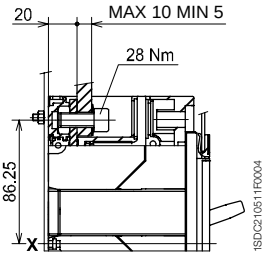
6

Overall dimensions
Tmax T5

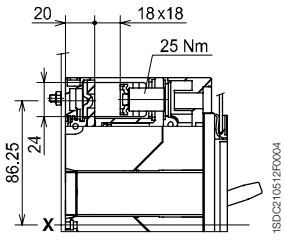
Terminals

Front - F





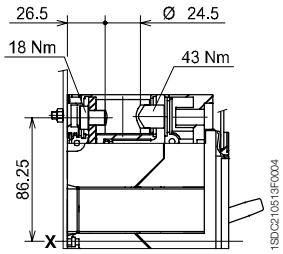
Front for copper cables - FC Cu



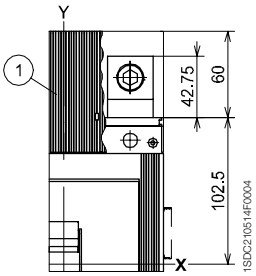
Caption

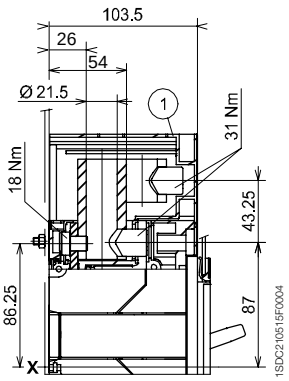
(1) High terminal covers with degree of protection IP40

Front for copper/aluminium cables Cu/Al 300 mm² FC CuAl



Front for copper/aluminium cables Cu/Al 2x240 mm² - FC CuAl

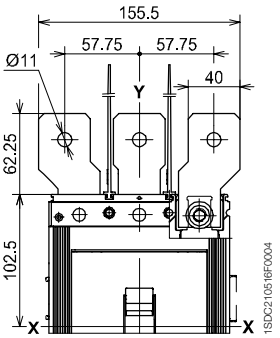


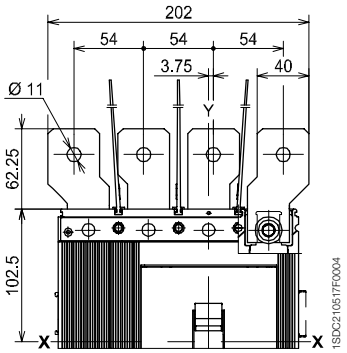


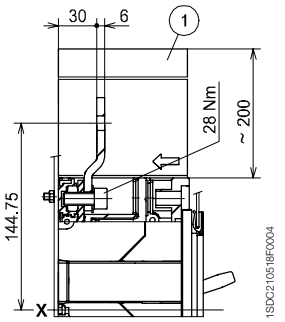
Caption

(1) Insulating barriers between phases (compulsory)

Front extended spread - ES







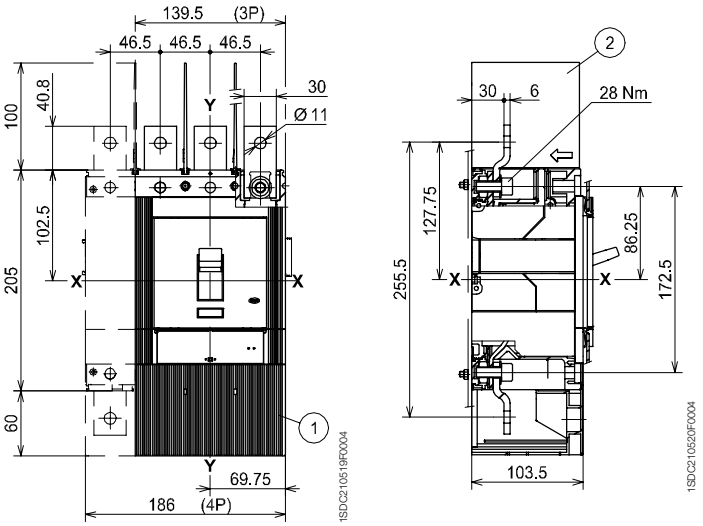
6

Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

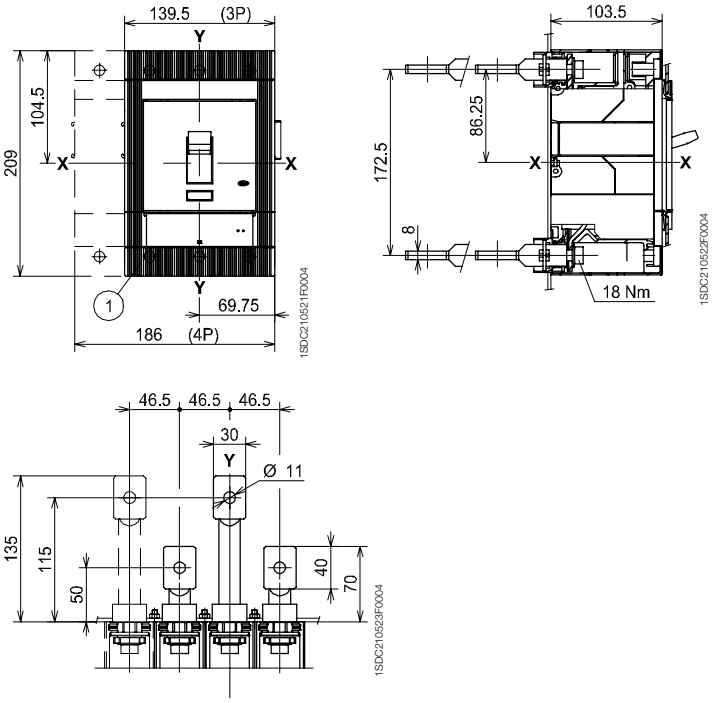
Front extended - EF



Caption

(1) Low terminal covers with degree of protection IP40

Rear - R



6

Overall dimensions
Tmax T2

Plug-in circuit-breaker

Fixing on sheet

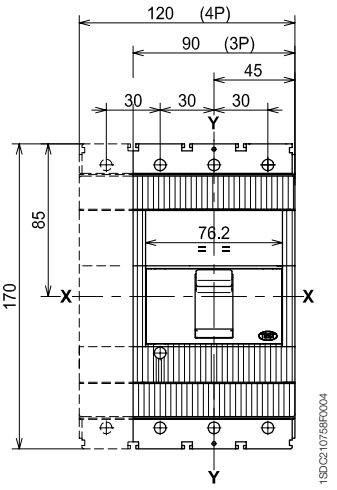
Caption

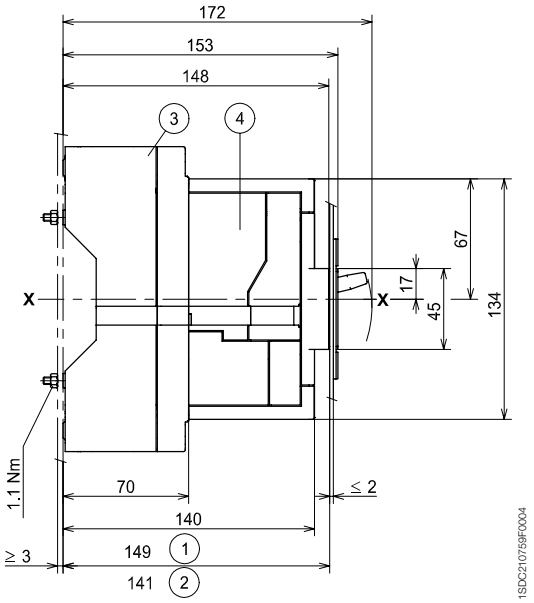
(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange

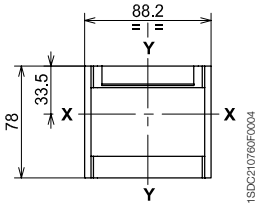
(3) Fixed part

(4) Moving part with terminal covers, degree of protection IP40

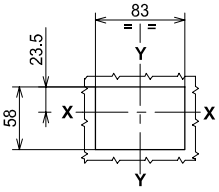




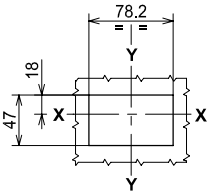
Flange for compartment door



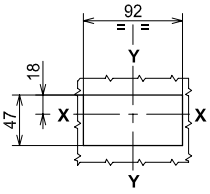
Drilling templates of the compartment door



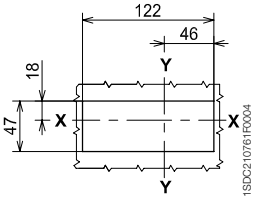
With flange and circuit-breaker face flush with door (3-4 POLES)



Without flange and circuit-breaker face flush with door (3-4 POLES)



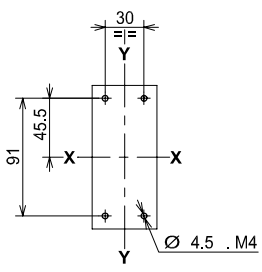
Without flange and circuit-breaker face extending (3 POLES)



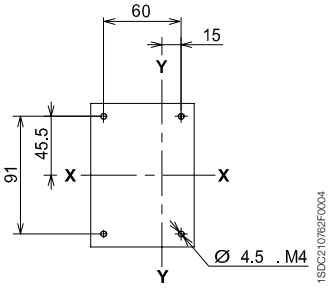
Without flange and circuit-breaker face extending (4 POLES)

Drilling templates for support sheet

For front terminals

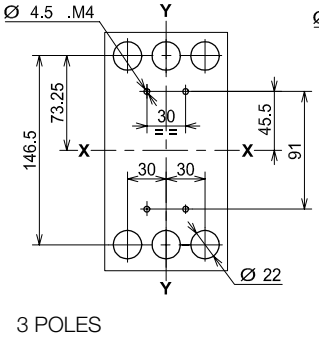


3 POLES

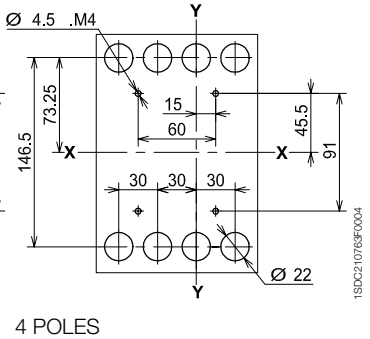


4 POLES

For rear terminals



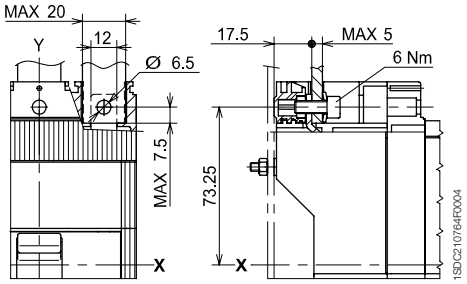
3 POLES



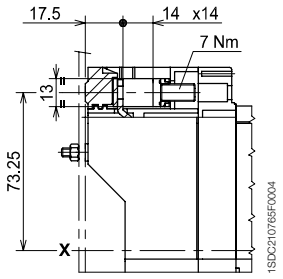
4 POLES

Terminals

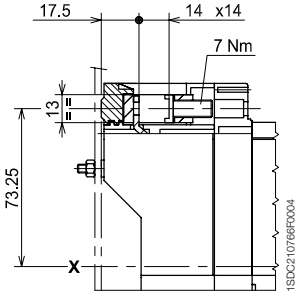
Front - F



Front for copper cables - FC Cu



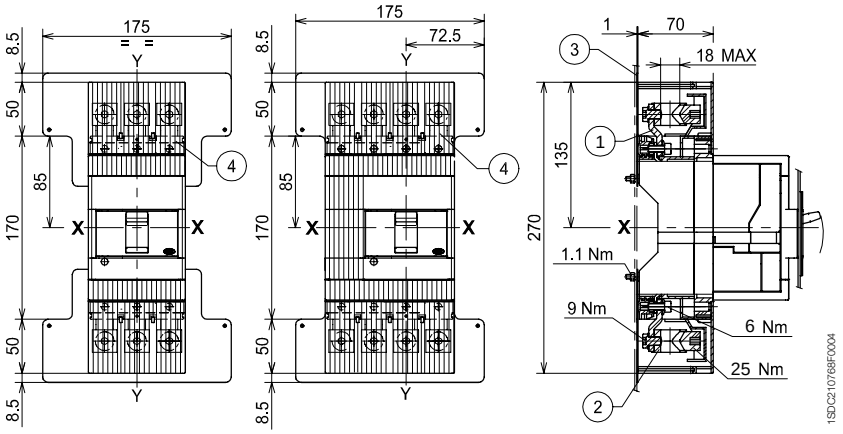
Front for copper/aluminium cables - FC CuAl 95 mm²

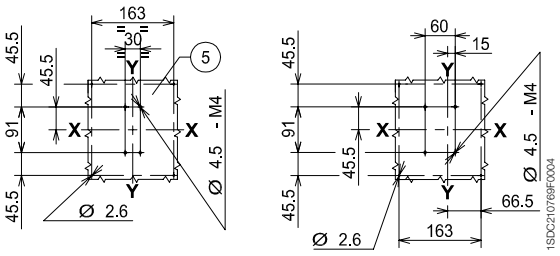


Caption

1. Front extended terminals
2. Front terminals for cables 185 mm² CuAl
3. Insulating base plate (compulsory)
4. High terminal covers with degree of protection IP40
5. Drilling templates for support sheet

Front for copper/aluminium 185 mm² cables - FC CuAl 185 mm²





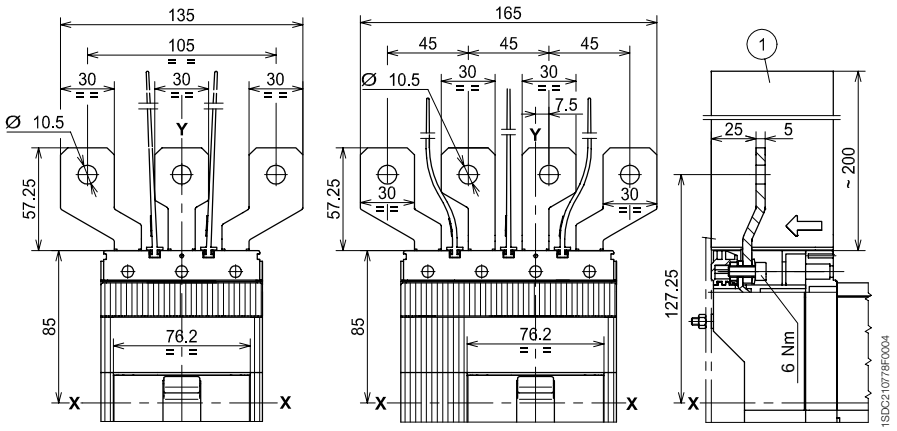
3 POLES

4 POLES

Caption

1. Insulating barriers between phases (compulsory)

Front extended spread - ES



Overall dimensions

Tmax T2

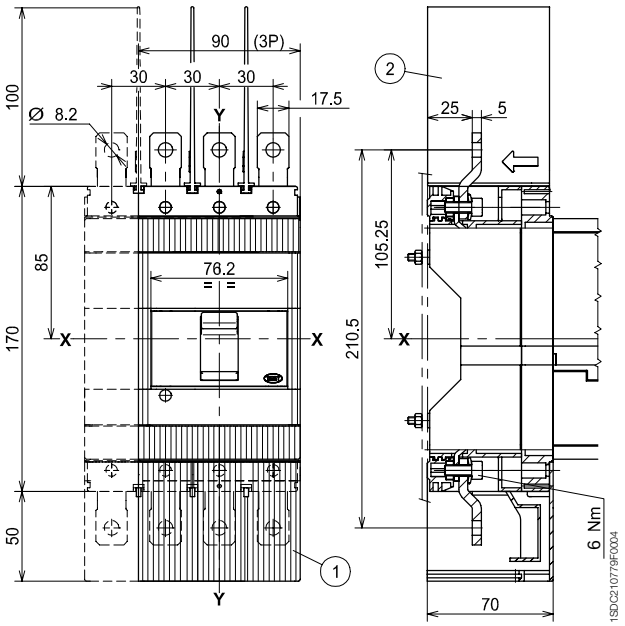
Terminals

Front extended - EF

Caption

(1) High terminal covers with degree of protection IP40

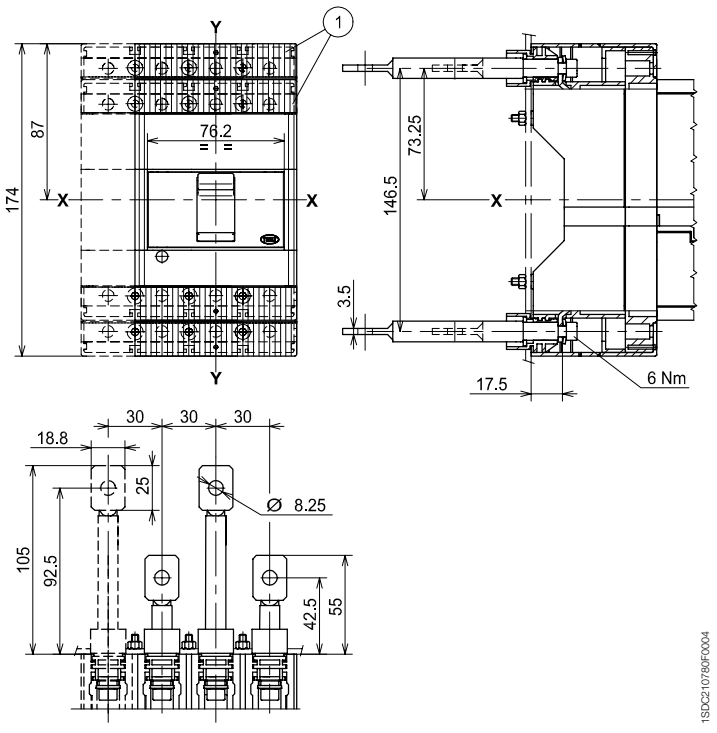
(2) Insulating barriers between phases (compulsory without 1)



Caption

(1) Low terminal covers with degree of protection IP40

Rear - R



6

Overall dimensions
Tmax T3

Plug-in
circuit-breaker

Fixing on sheet

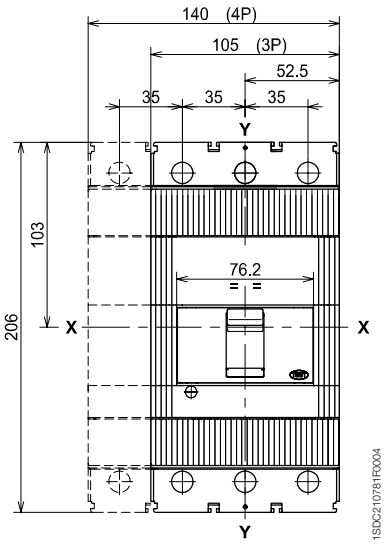
Caption

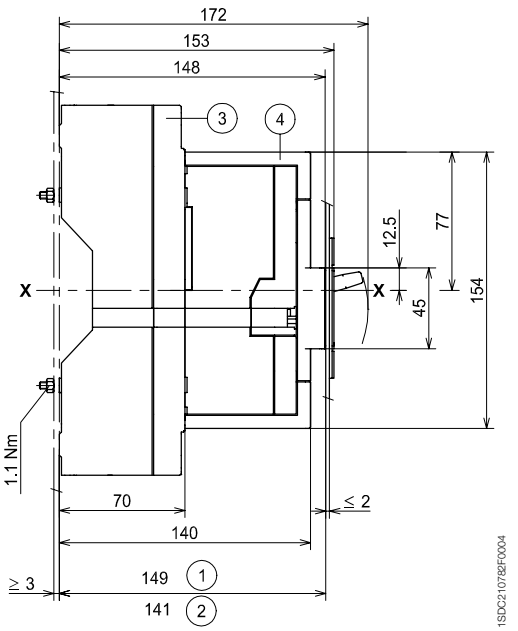
(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange

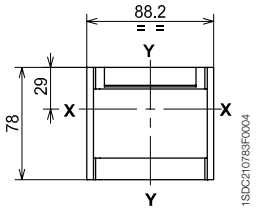
(3) Fixed part

(4) Moving part with terminal covers, degree of protection IP40

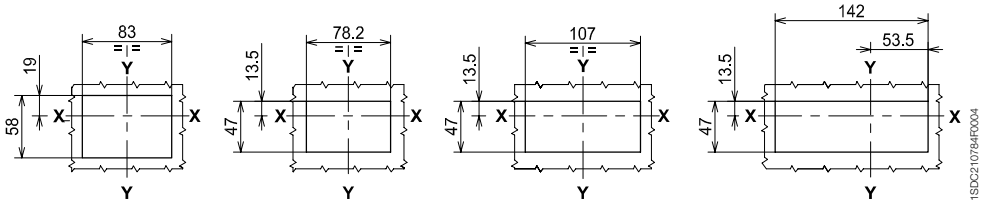




Flange for compartment door



Drilling templates of the compartment door



With flange and circuit-breaker face flush with door (3-4 POLES)

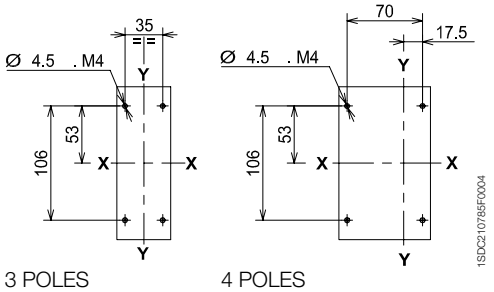
Without flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face extending (3 POLES)

Without flange and circuit-breaker face extending (4 POLES)

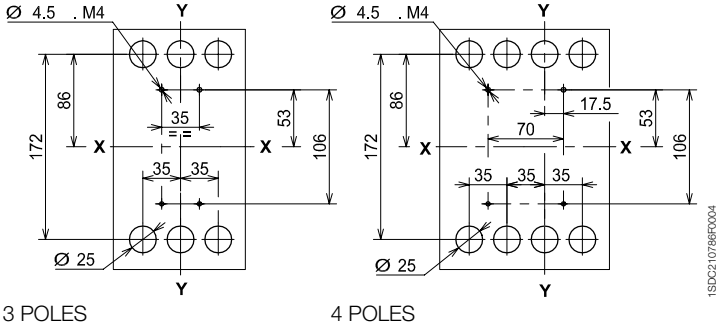
Drilling templates for support sheet

For front terminals



3 POLES 4 POLES

For rear terminals



3 POLES 4 POLES

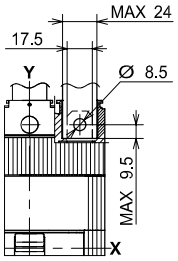
6

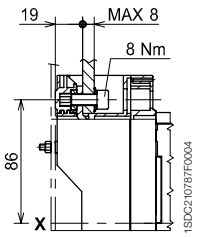
Overall dimensions

Tmax T3

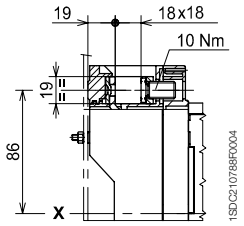
Terminals

Front - F

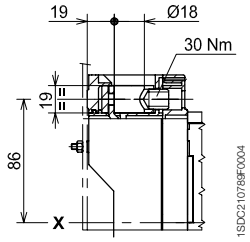




Front for copper cables - FC Cu



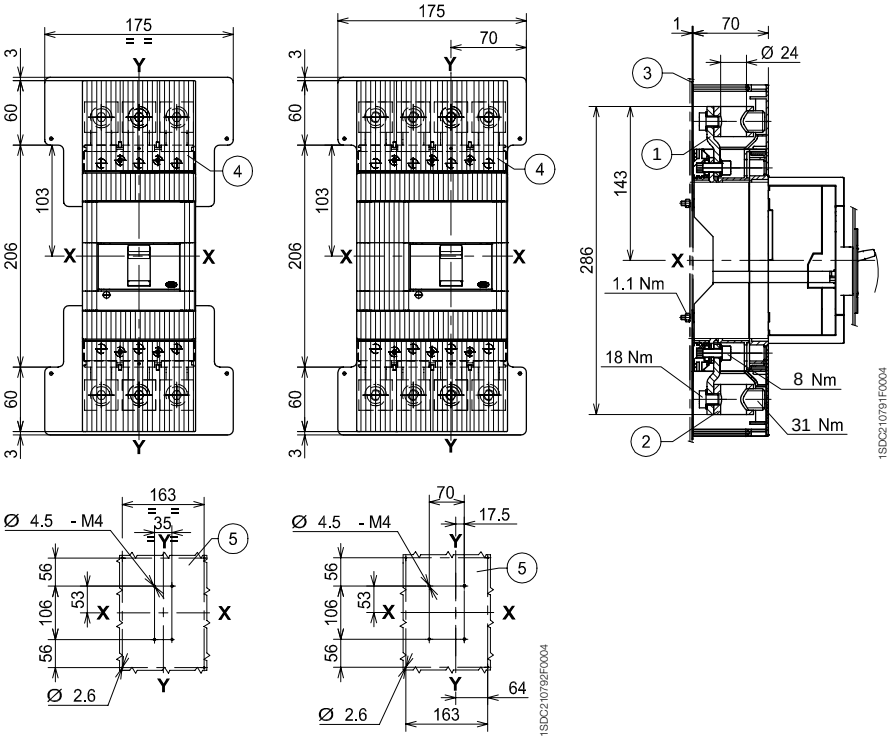
Front for copper/aluminium cables - FC CuAl 185 mm²



Caption

1. Front extended terminals
2. Front terminals for cables 240 mm² CuAl
3. Insulating base plate (compulsory)
4. High terminal covers with degree of protection IP40
5. Drilling templates for support sheet

Front for copper/aluminium 240 mm² cables - FC CuAl 240 mm²



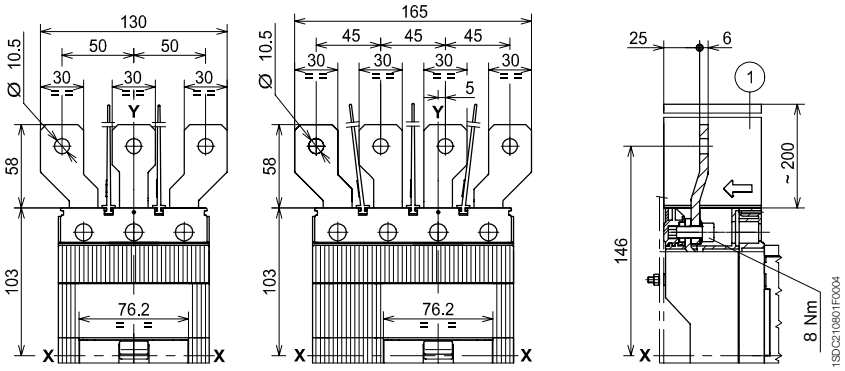
3 POLES

4 POLES

Caption

1. Insulating barriers between phases (compulsory)

Front extended spread - ES

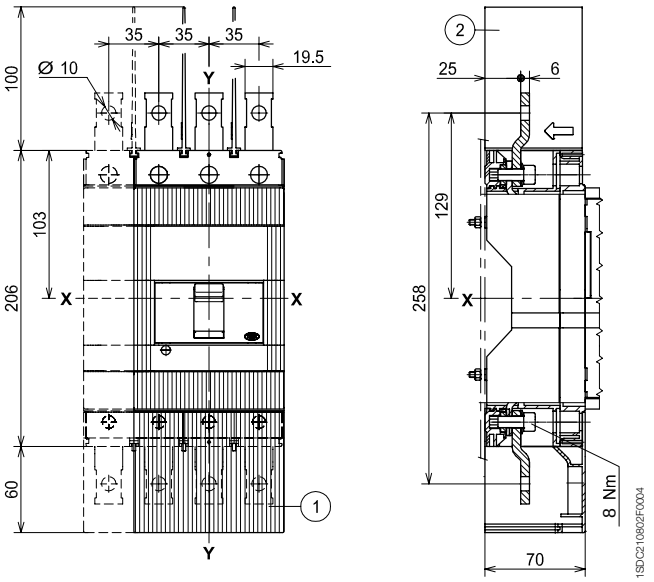


Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

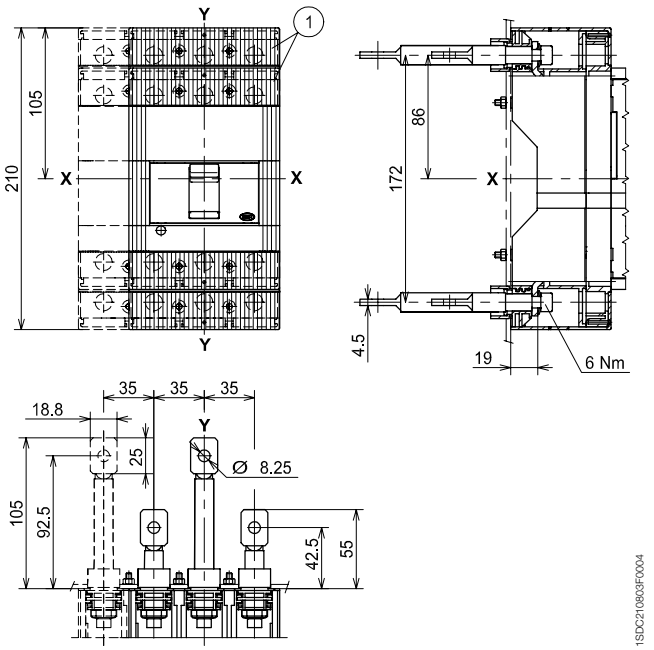
Front extended - EF



Caption

(1) Low terminal covers with degree of protection IP40

Rear - R



6

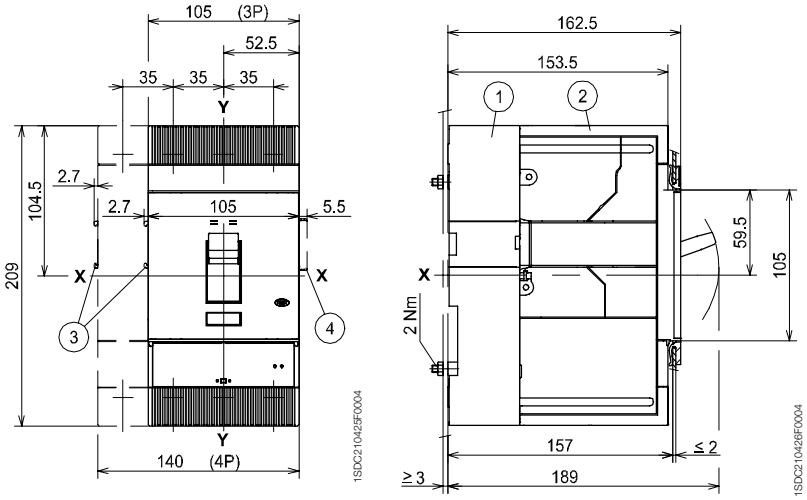
Overall dimensions
Tmax T4

Plug-in
circuit-breaker

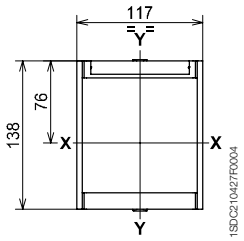
Caption

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)

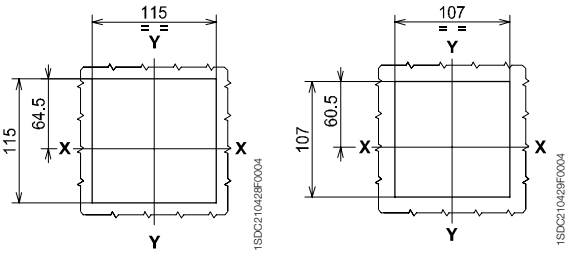
Fixing on sheet



Flange for compartment door



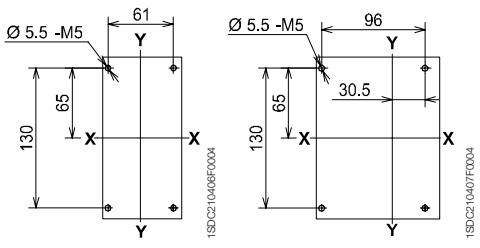
Drilling templates of the compartment door



With flange | Without flange

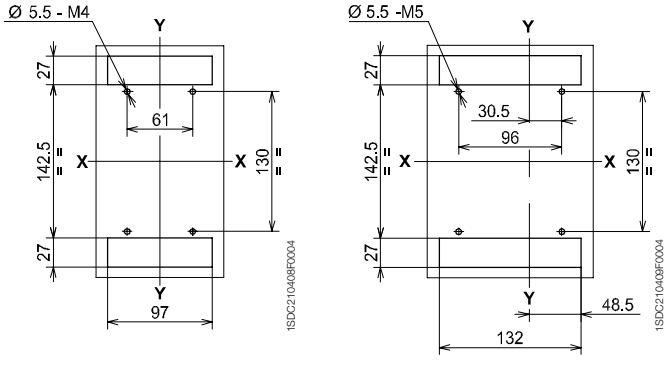
Drilling templates for support sheet

For front terminals



3 POLES | 4 POLES

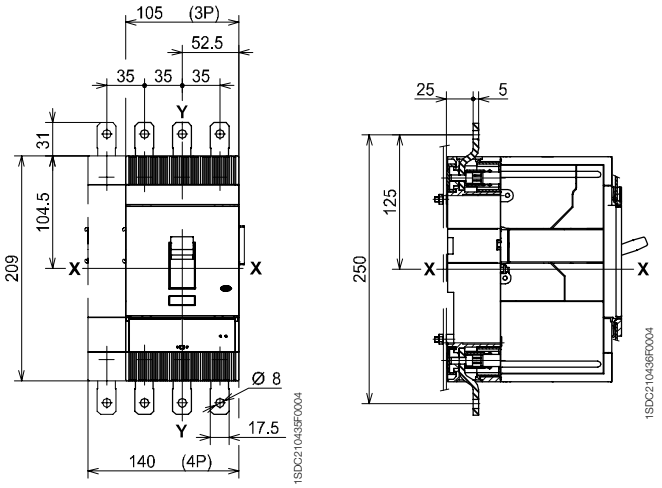
For rear terminals



3 POLES | 4 POLES

Terminals

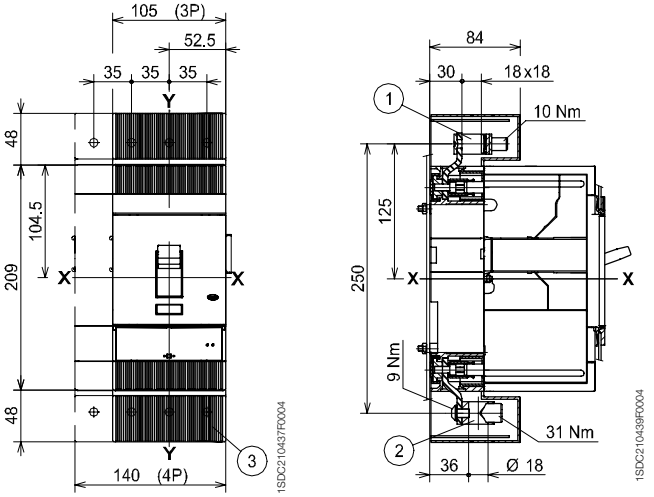
Front - EF



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



Caption

Front extended spread - ES

1. Insulating barriers between phases (compulsory)

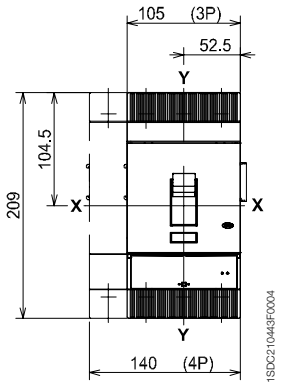
6

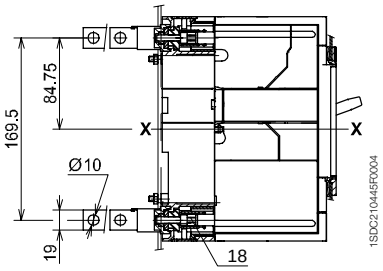
Overall dimensions

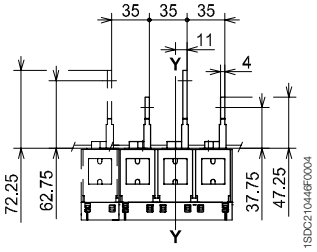
Tmax T4

Terminals

Rear flat vertical - VR

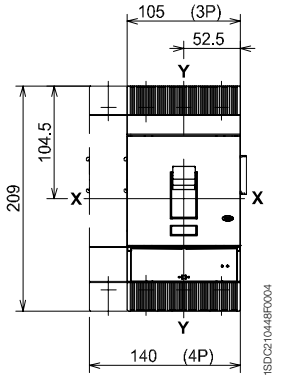


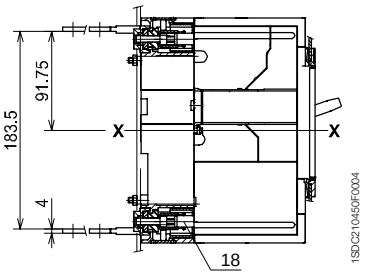


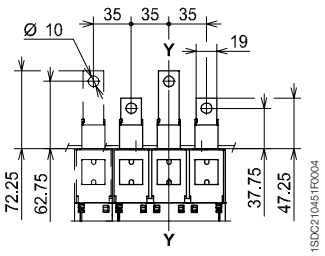


3-4 POLES

Rear flat horizontal - HR







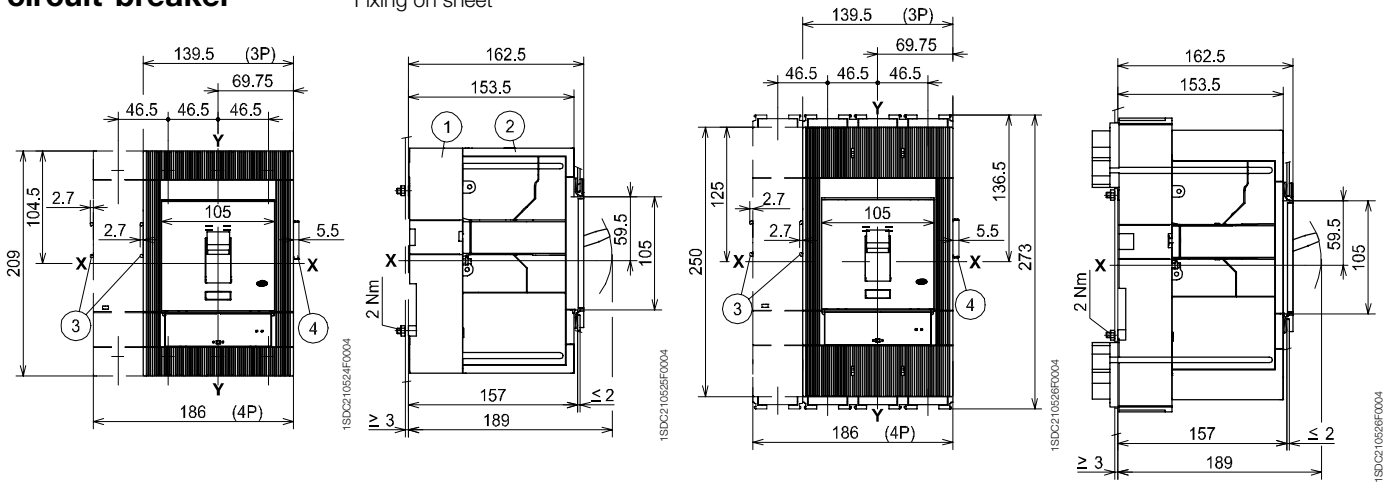
3-4 POLES

6

Overall dimensions
Tmax T5

Plug-in circuit-breaker

Fixing on sheet

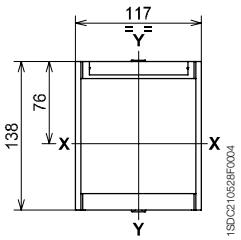


400 A | **630 A**

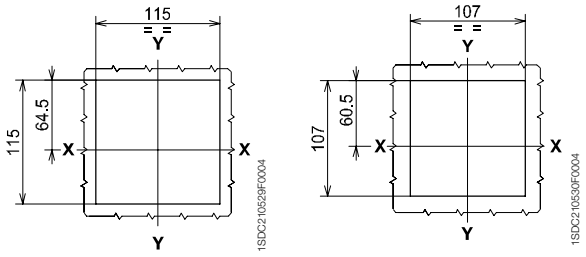
Caption

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



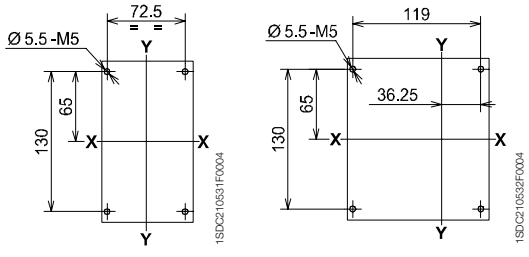
Drilling templates of the compartment door



With flange | Without flange

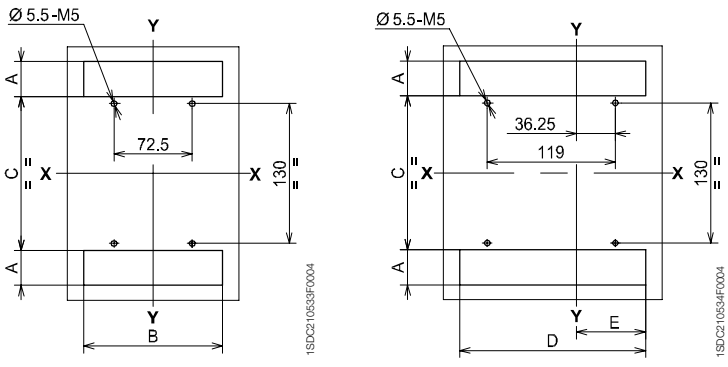
Drilling templates for support sheet

For front terminals 400 A



3 POLES | 4 POLES

For front terminals 630 A
For rear terminals 400 A - 630 A



3 POLES | 4 POLES

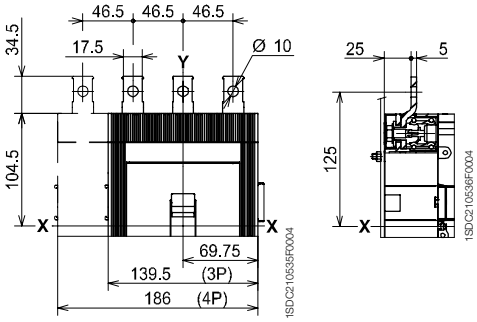
	A	B	C	D	E
Rear 400 A	32.5	128.5	143	172.5	64.5
Front and rear 630 A	61.8	139	142	185.5	69.5

Overall dimensions

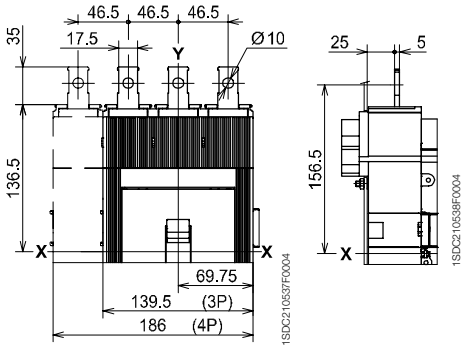
Tmax T5

Terminals

Front 400 A - EF



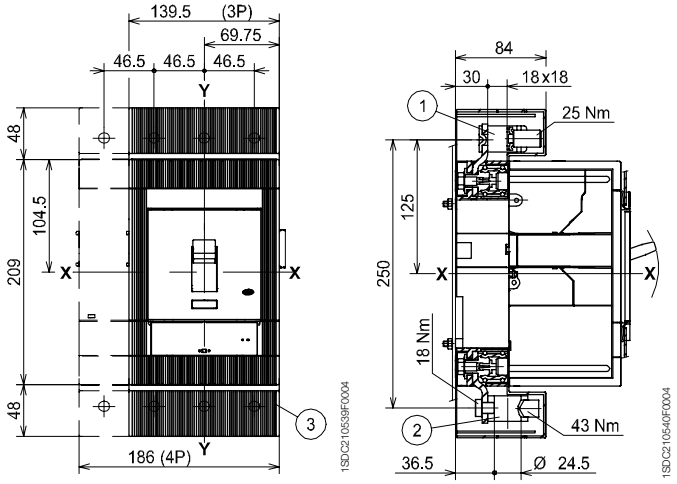
Front 630 A - F



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 cables Cu and Cu/Al - FC Cu - FC Cu/Al



Caption

1. Insulating barriers between phases (compulsory)

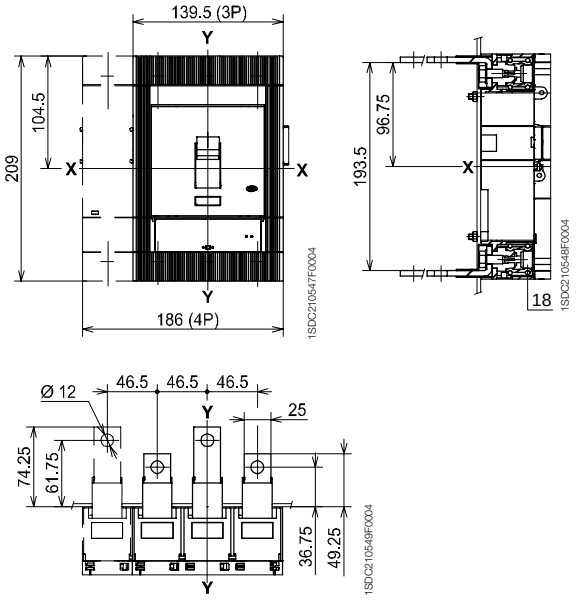
Front extended spread 400 A - ES

Caption

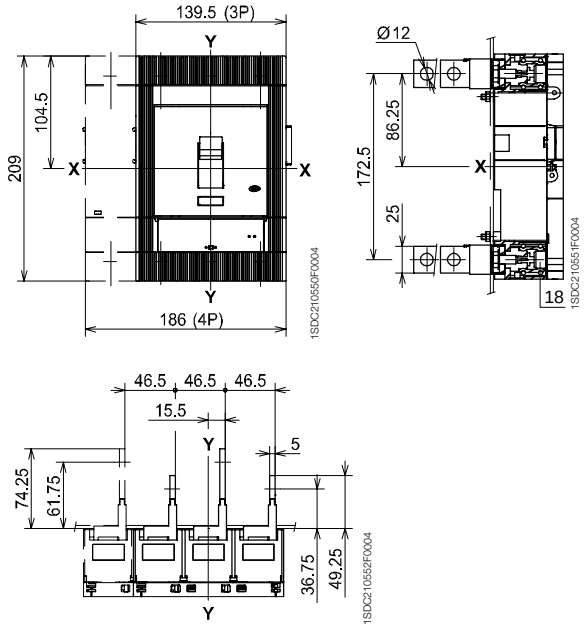
1. Insulating barriers between phases (compulsory)

Front extended spread 630 A - ES

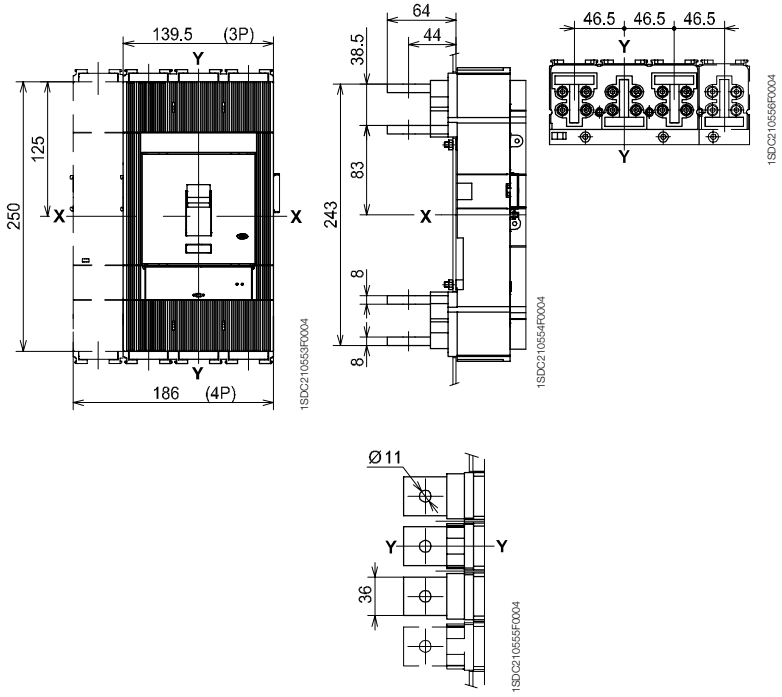
Rear flat horizontal 400 A - HR



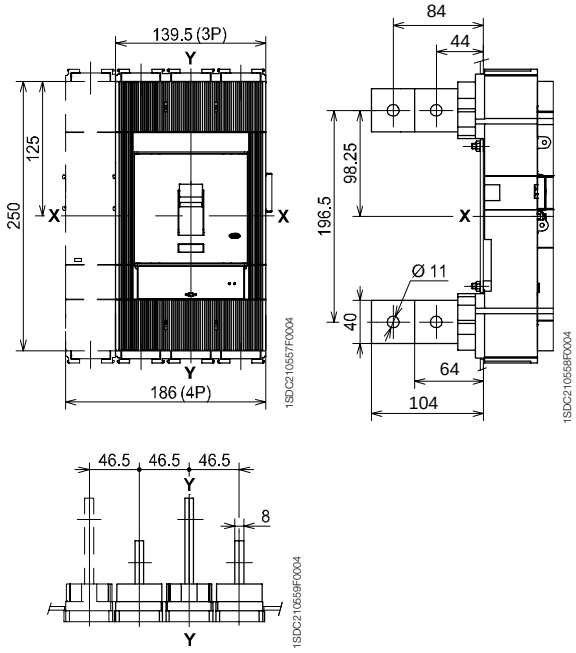
Rear vertical 400 A - VR



Rear flat horizontal 630 A - HR



Rear vertical 630 A - VR



6

Overall dimensions

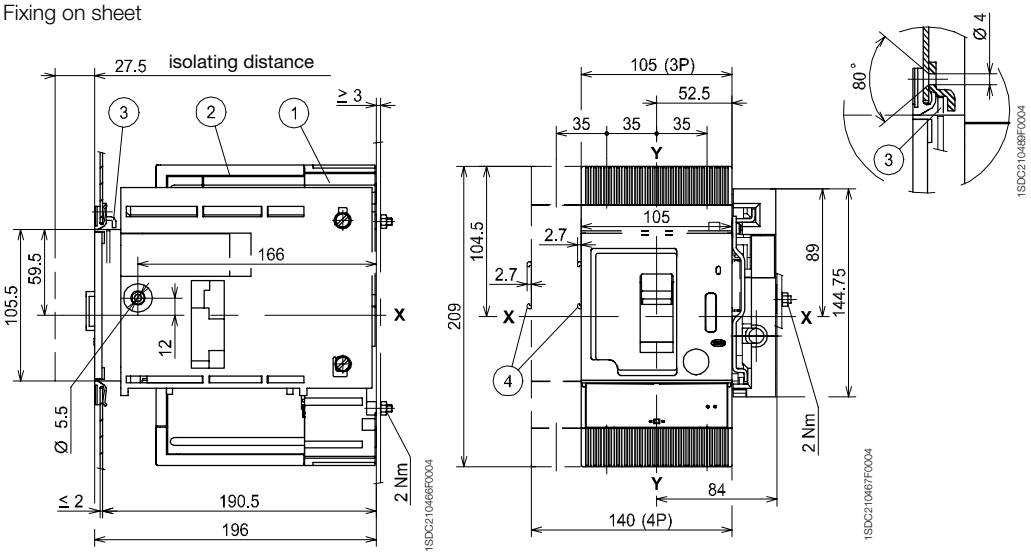
Tmax T4

Withdrawable circuit-breaker

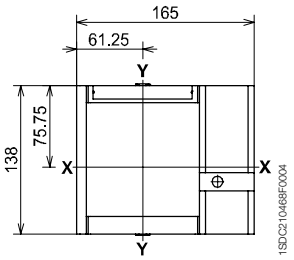
Caption

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, RC221-222)

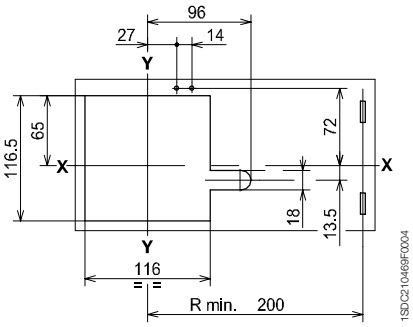
Fixing on sheet



Flange for compartment door

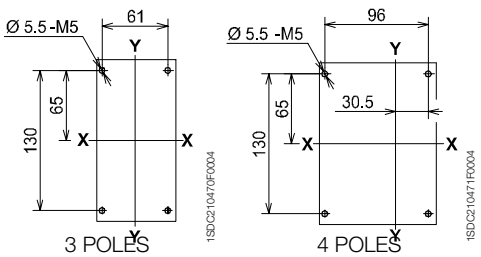


Drilling templates of the compartment door

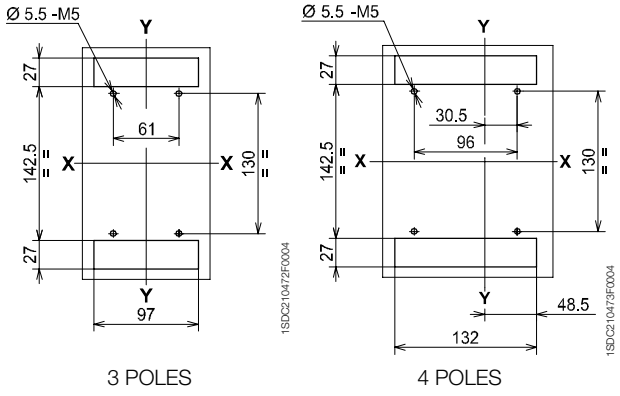


Drilling templates for support sheet

For front terminals



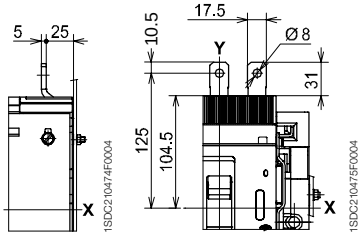
For rear terminals



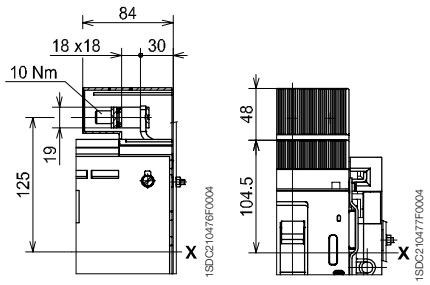
6

Terminals

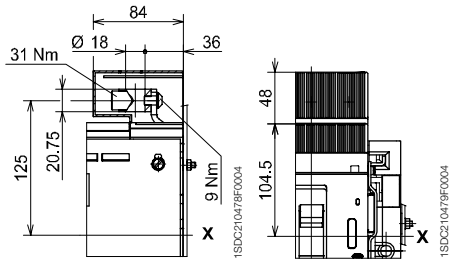
Front - EF



Front for copper cables - FC Cu



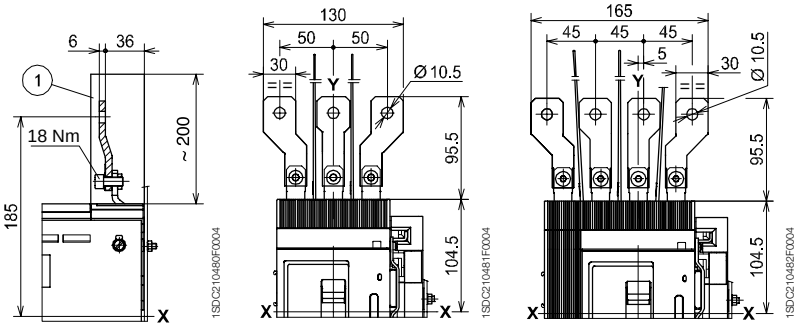
Front for copper/aluminium cables - FC CuAl



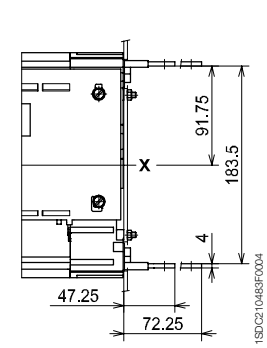
Caption

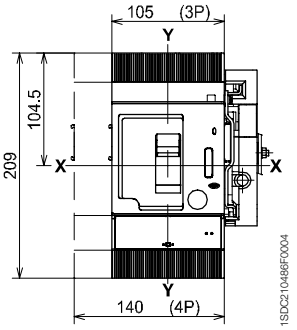
(1) Insulating barriers between phases (compulsory)

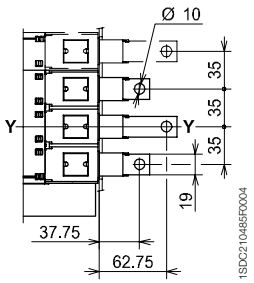
Front extended spread - ES



Rear flat horizontal - HR

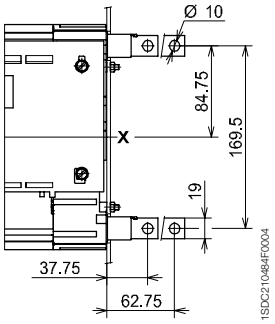


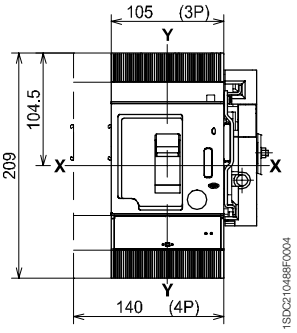


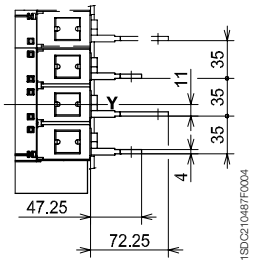


3-4 POLES

Rear flat vertical - VR







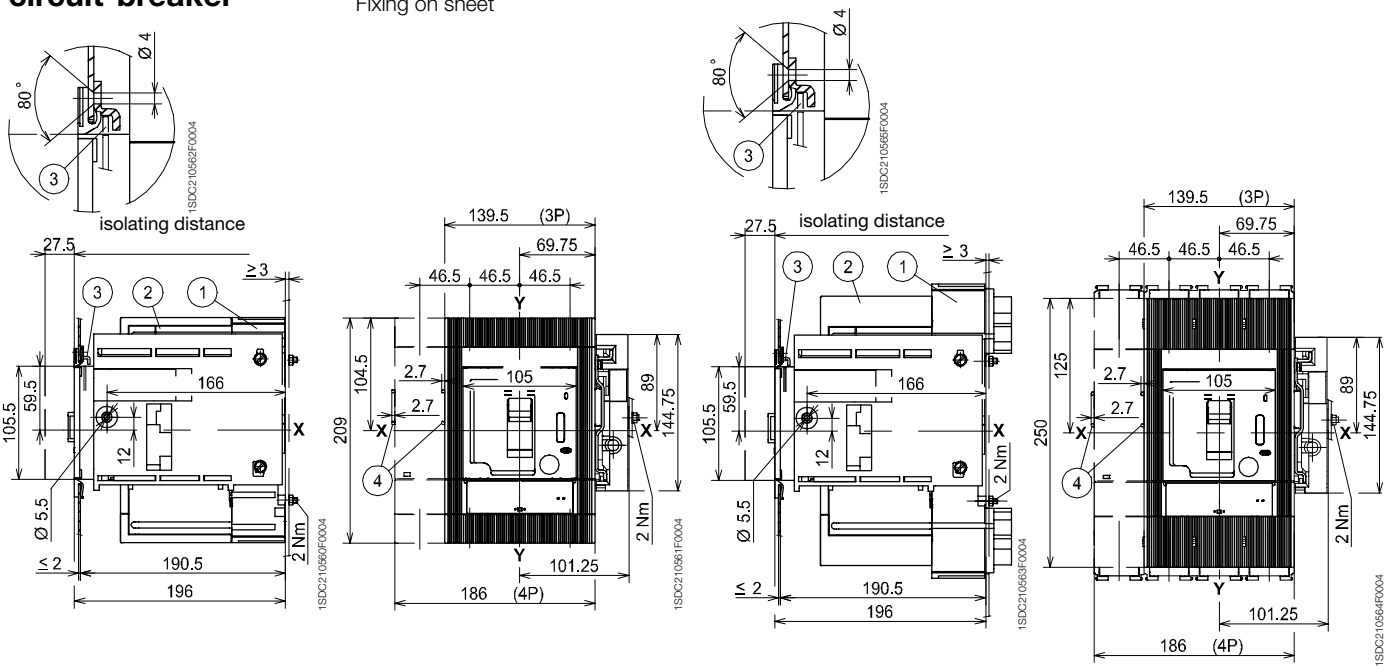
3-4 POLES

6

Overall dimensions
Tmax T5

Withdrawable circuit-breaker

Fixing on sheet

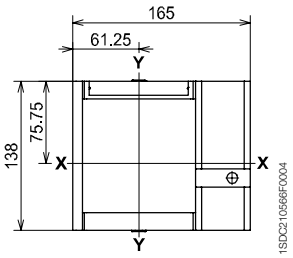


400 A | **630 A**

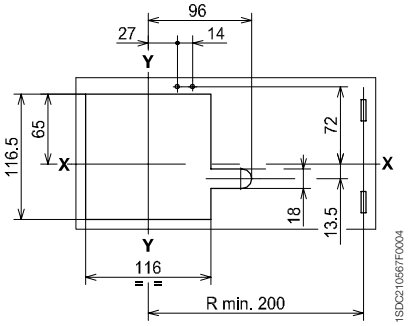
Caption

1. Fixed part
2. Moving part with terminal covers, degree of protection IP40
3. Lock for compartment door (available on request)
4. Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC221-222)

Flange for compartment door

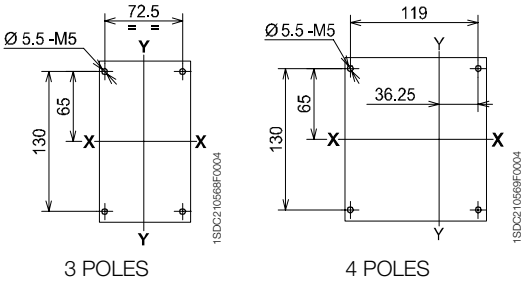


Drilling templates of the compartment door

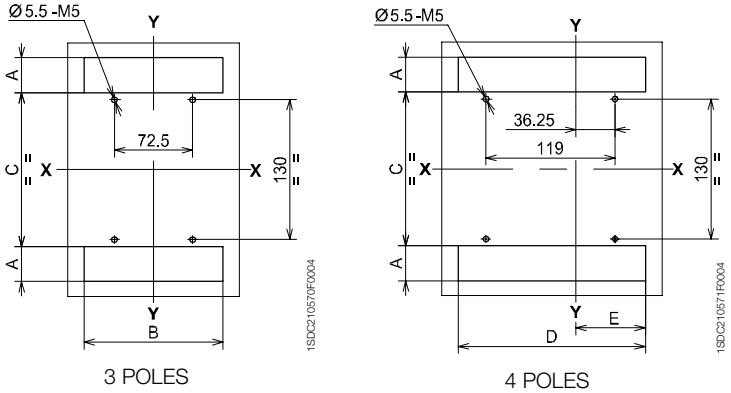


Drilling templates for support sheet

For front terminals 400 A



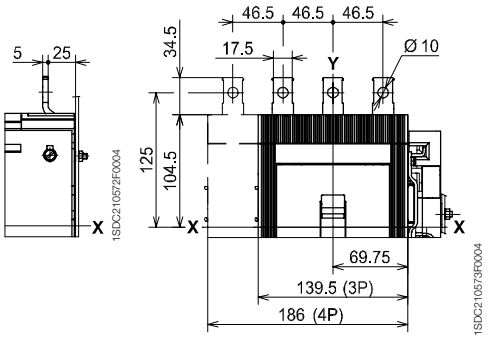
For front terminals 630 A
For rear terminals 400 A - 630 A



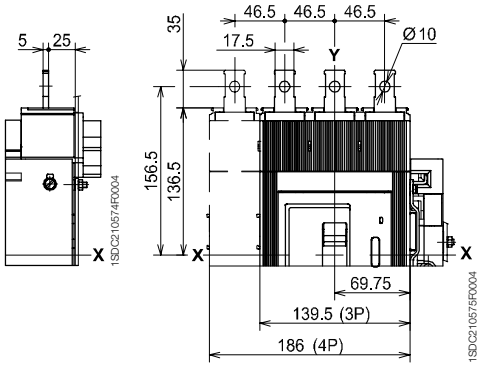
	A	B	C	D	E
Rear 400 A	32.5	128.5	143	172.5	64.5
Front and rear 630 A	61.8	139	142	185.5	69.5

Terminals

Front 400 A - EF



Front 630 A - EF



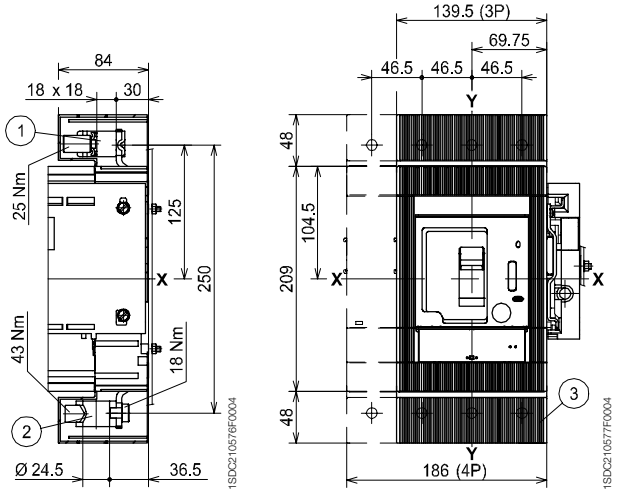
Caption

(1) Front terminals for copper cables

(2) Front terminals for copper/ aluminium cables

(3) Terminals with degree of protection IP40

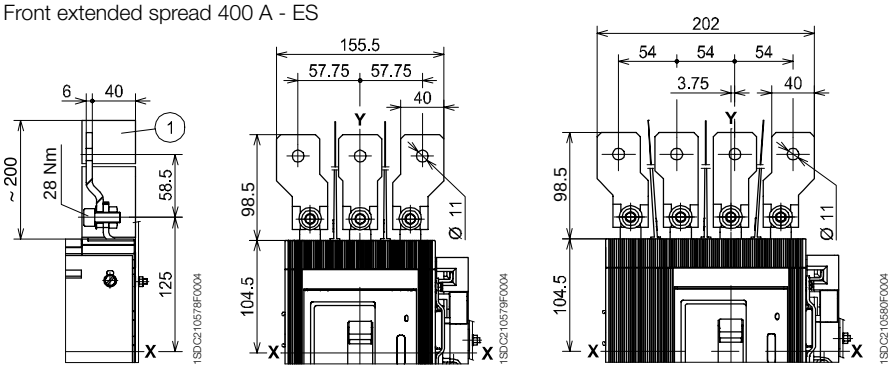
Front for cables Cu and Cu/Al 400 A- FC Cu - FC Cu/Al



Caption

(1) Insulating barriers between phases (compulsory)

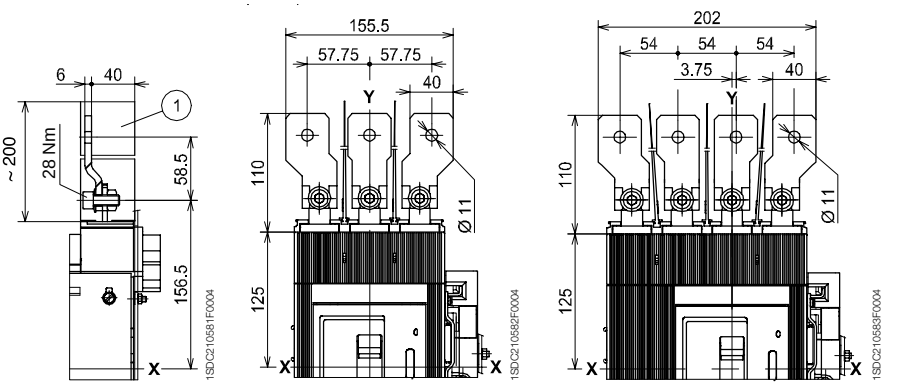
Front extended spread 400 A - ES



Caption

(1) Insulating barriers between phases (compulsory)

Front extended spread 630 A - ES



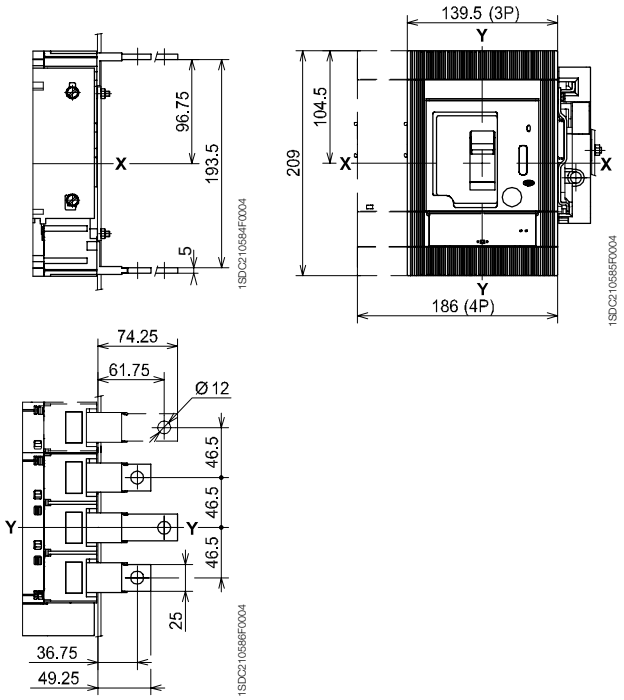
6

Overall dimensions

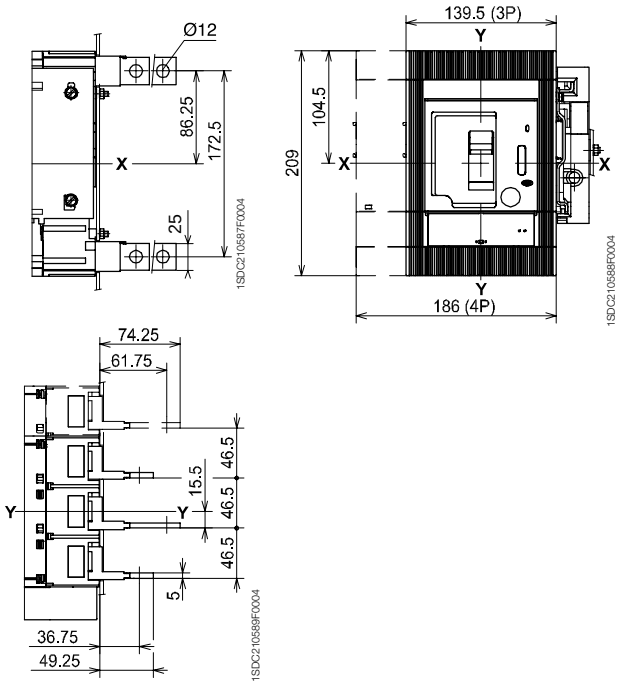
Tmax T5

Terminals

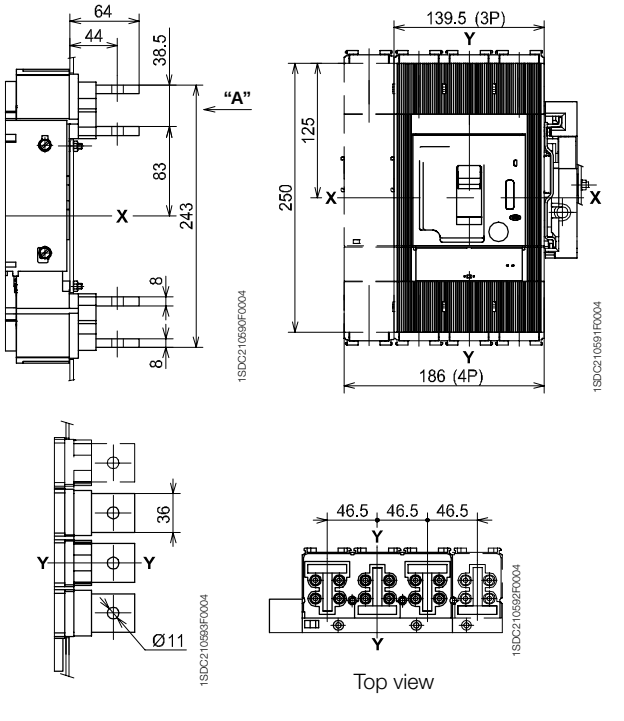
Rear flat horizontal 400 A - HR



Rear flat vertical 400 A - VR

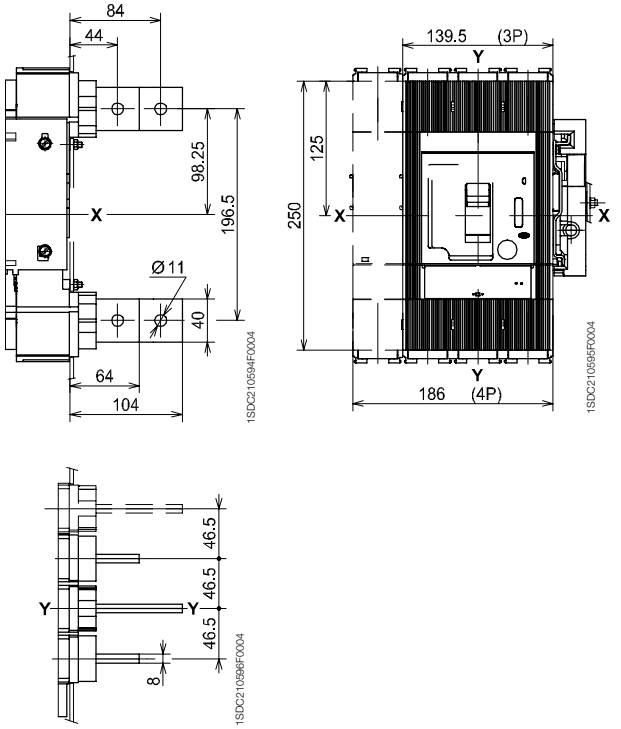


Rear flat horizontal 630 A - HR



Top view

Rear flat vertical 630 A - VR



6

Overall dimensions

Circuit-breaker with RC221/RC222 residual current release

Tmax T1 with RC222 for 200 mm module

Fixed version

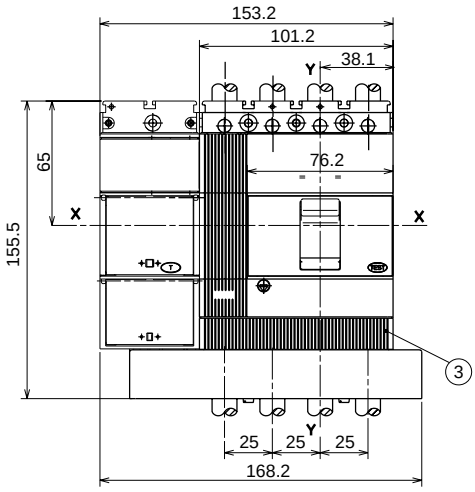
Caption

(1) Depth of the switchboard with circuit-breaker face extending

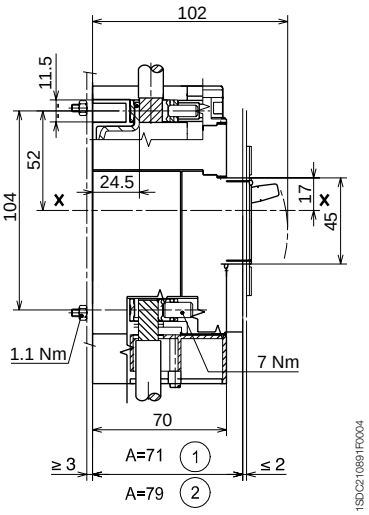
(2) Depth of the switchboard with circuit-breaker face flush with door

(3) Terminal covers with degree of protection IP40

Front terminals - F

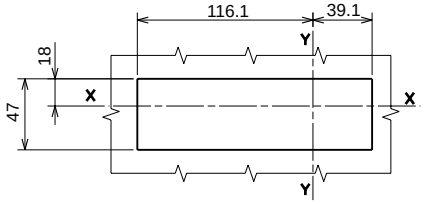


Fixing on sheet

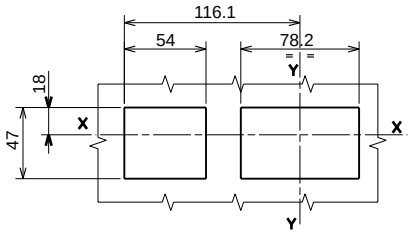


Drilling templates of the compartment door

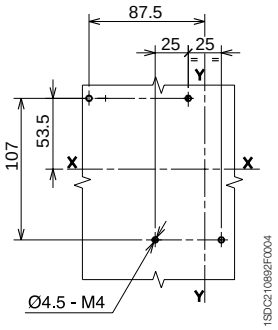
For A = 71 - without flange



For A = 79 - without flange



Drilling templates for support sheet



6

Overall dimensions

Circuit-breaker with RC221/RC222 residual current release

Tmax T1 - T2 - T3

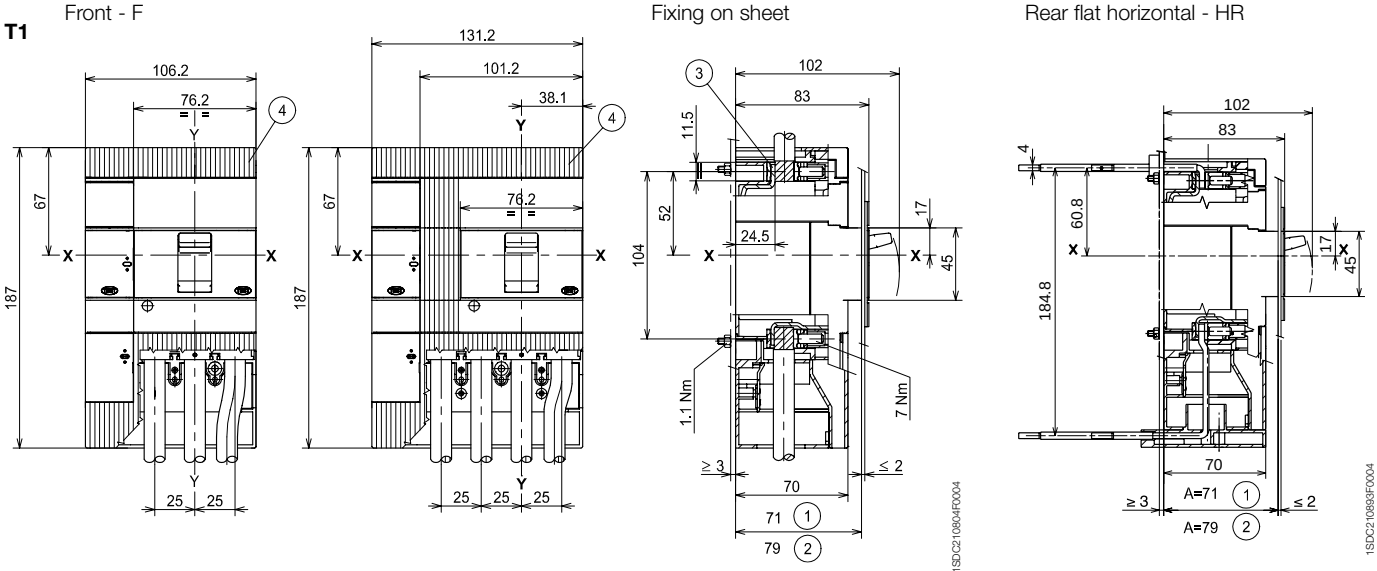
Fixed version

Front - F

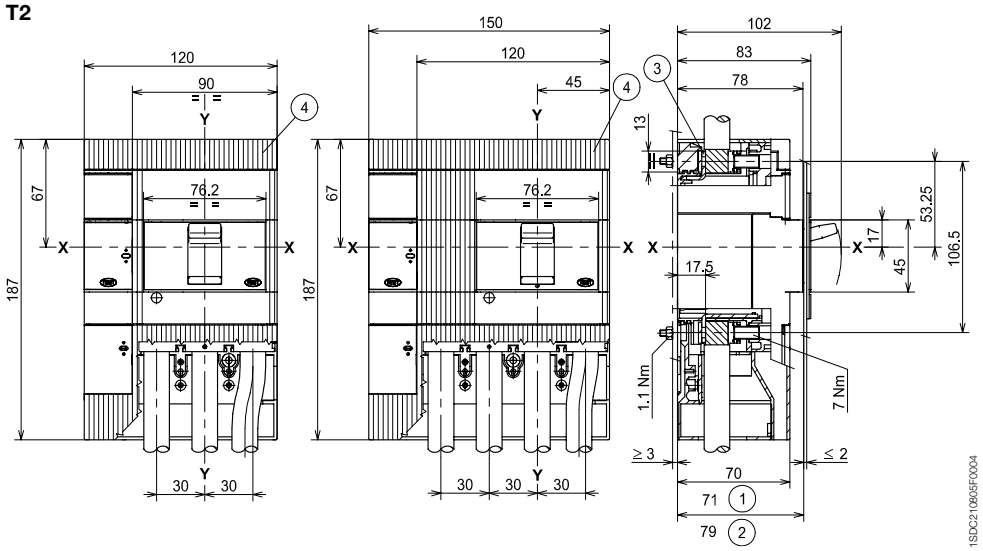
Fixing on sheet

Rear flat horizontal - HR

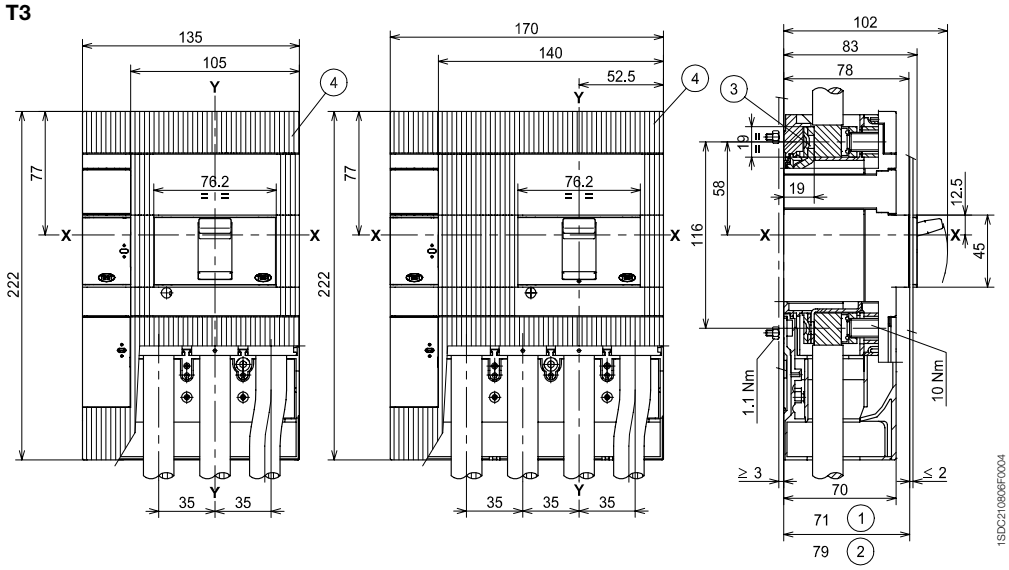
T1



T2



T3



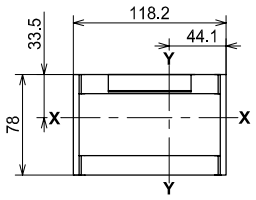
Caption

1. Depth of the switchboard with circuit-breaker face extending
2. Depth of the switchboard with circuit-breaker face flush with door
3. Front terminals for cable connection
4. Low terminal covers with degree of protection IP40

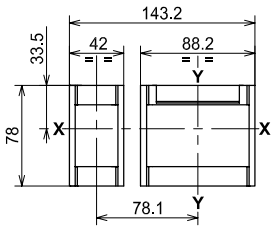
Flange for the compartment door

T1

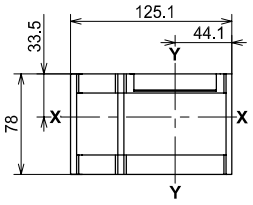
3 POLES

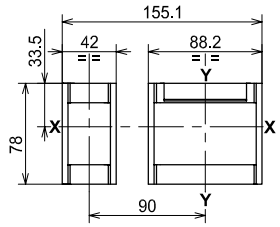


4 POLES

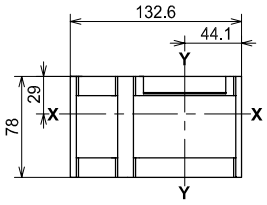


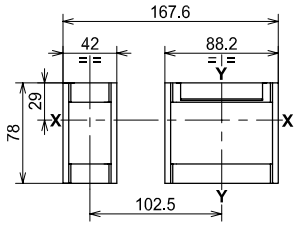
T2





T3

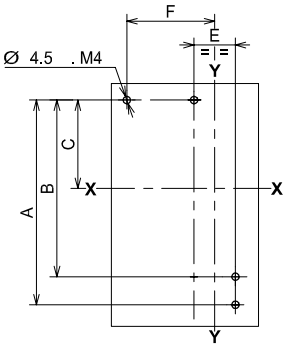




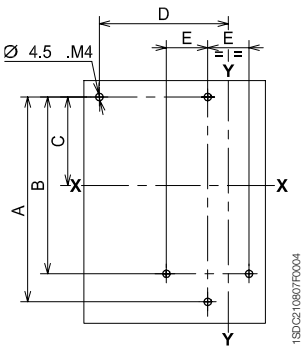
Drilling template for fixing sheet

T1 - T2 - T3

3 POLES

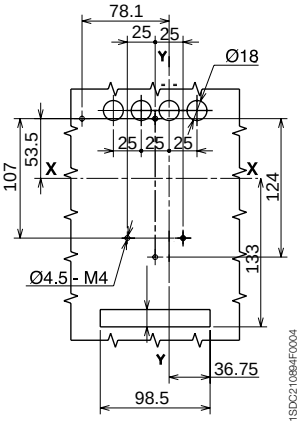


4 POLES



T1 rear flat horizontal - HR

4 POLES



	A	B	C	D	E	F
T1	124	107	53.5	78.1	25	53.1
T2	124	107	53.5	90	30	60
T3	141,5	122	61	102.5	35	67.5

Overall dimensions

Circuit-breaker with RC221/RC222 residual current release

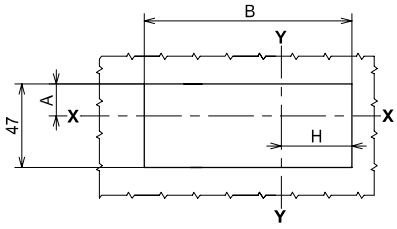
Tmax T1 - T2 - T3

Drilling templates of the compartment door

Without flange face extending

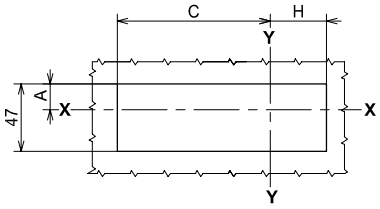
3 POLES

T1 - T2 - T3



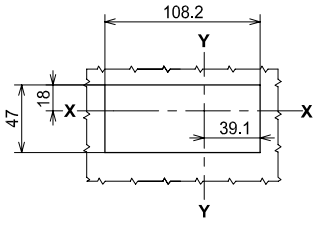
4 POLES

T1 - T2 - T3

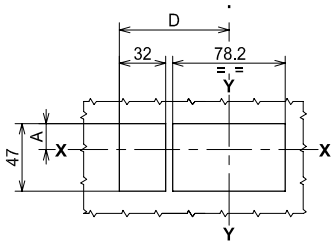


Without flange face not extending

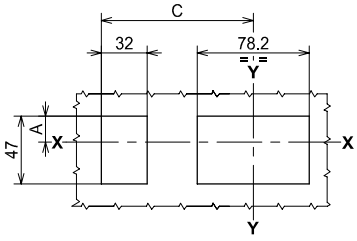
T1



T2 - T3

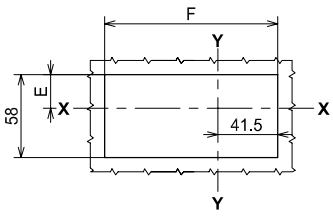


T1 - T2 - T3

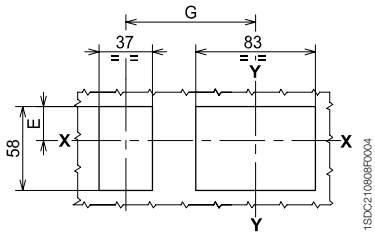


With flange face not extending

T1 - T2 - T3



T1 - T2 - T3



	A	B	C	D	E	F	G	H
T1	18	108.2	94.1	–	23.5	113	78.1	39.1
T2	18	122	106	76	23.5	120	90	46
T3	13.5	137	118.5	83.5	19	127.4	102.5	53.5

Overall dimensions

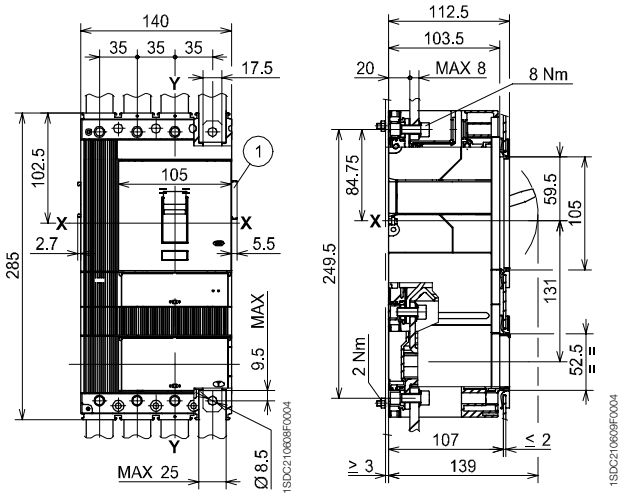
Circuit-breaker with RC221/RC222 residual current release

Tmax T4 - T5

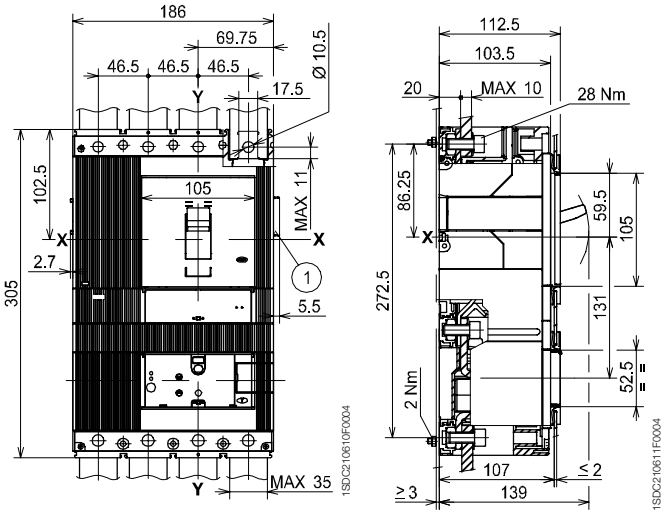
Fixed version

Front - F, fixing on sheet

T4



T5 (400 A)[1]

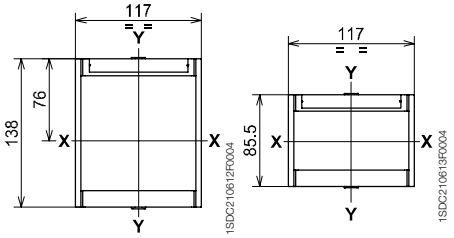


Caption

(1) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

[1] For T5 (630 A) ask ABB SACE

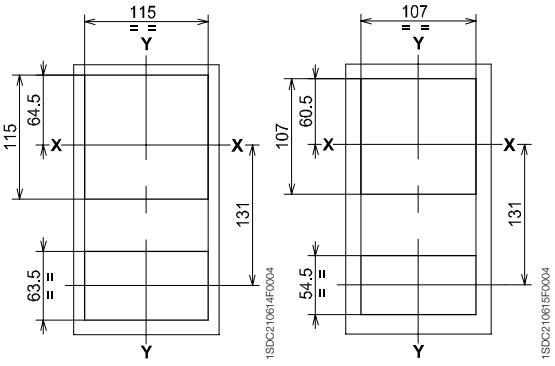
Flange for the compartment door



For circuit-breakers

For residual current release

Drilling templates of compartment door and fitting flange

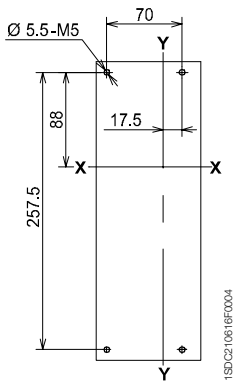


With flange

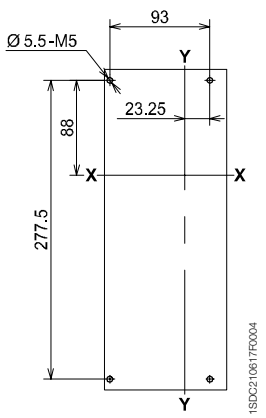
Without flange

Drilling templates for support sheet

T4



T5



6

Overall dimensions

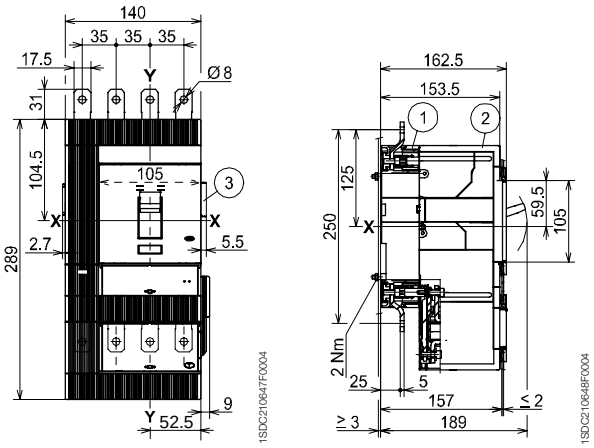
Circuit-breaker with RC221/RC222 residual current release

Tmax T4 - T5

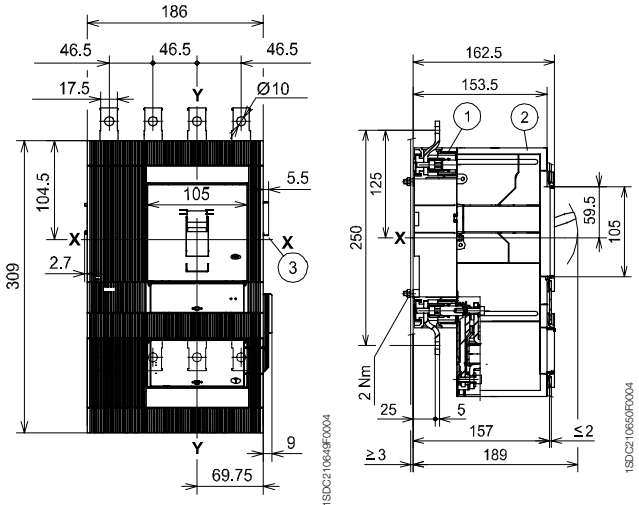
Plug-in version

Front - F, fixing on sheet

T4



T5 (400 A)[1]

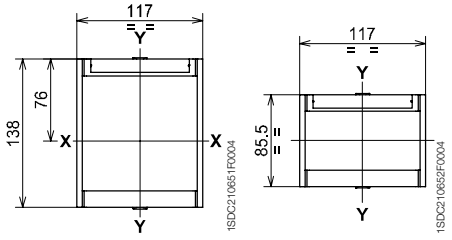


Caption

1. Fixed part
2. Mobile part
3. Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

[1] For T5 (630 A) ask ABB SACE

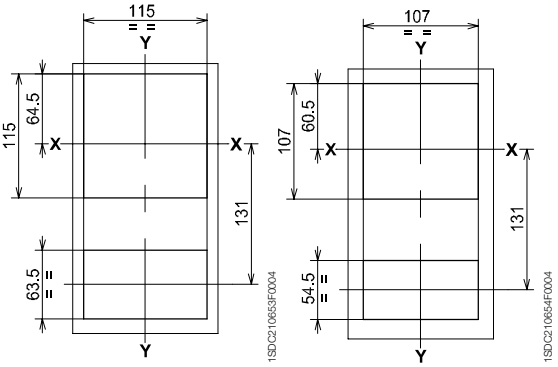
Flange for the compartment door



For circuit-breakers

For residual current release

Drilling templates of compartment door and fitting flange

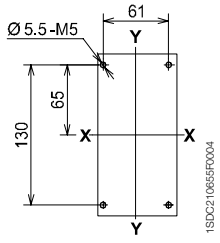


With flange

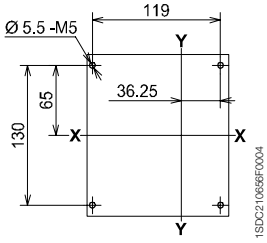
Without flange

Drilling templates for support sheet

T4



T5



6

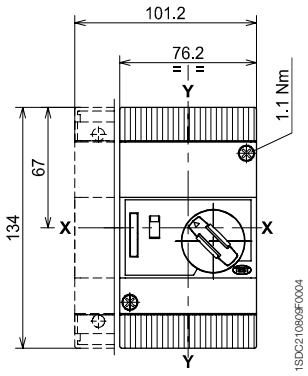
Overall dimensions

Accessories for Tmax T1 - T2 - T3

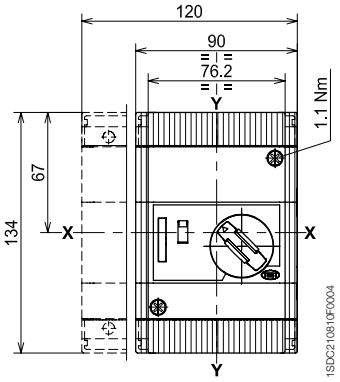
Fixed version

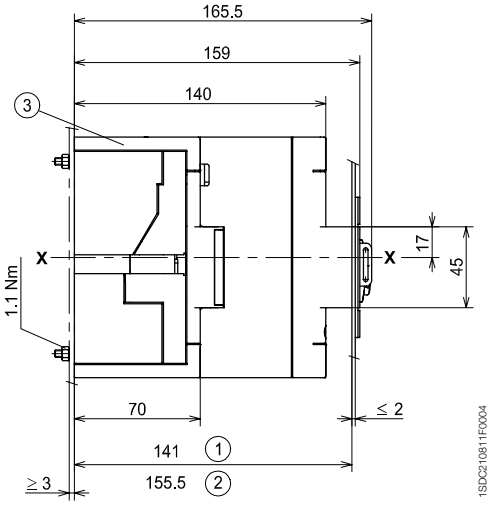
Solenoid operator superimposed

T1



T2

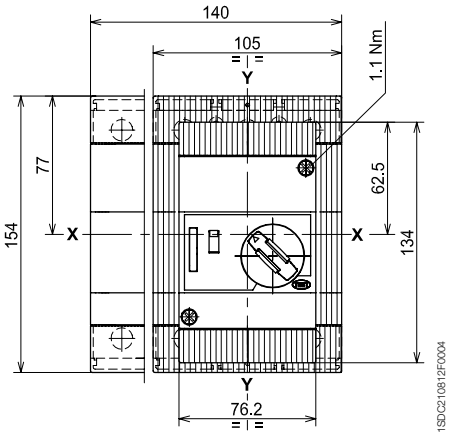


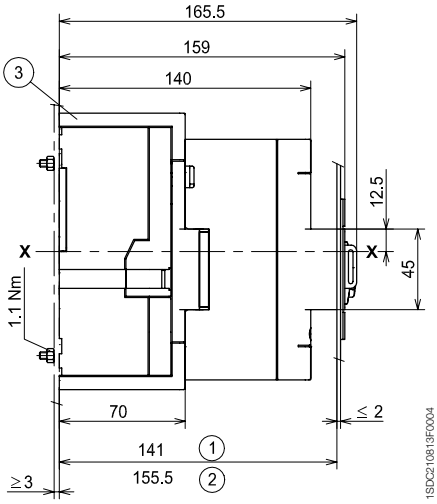


Caption

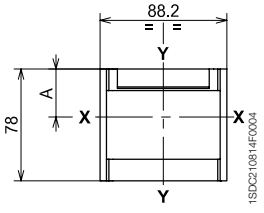
1. Depth of the switchboard with operating mechanism face extending
2. Depth of the switchboard with operating mechanism face flush with door
3. Low terminal covers with degree of protection IP40

T3



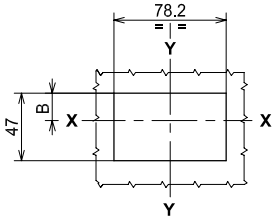


Flange for compartment door

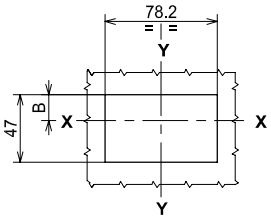


	A	B	C
T1	33.5	18	23.5
T2	33.5	18	23.5
T3	29	13.5	19

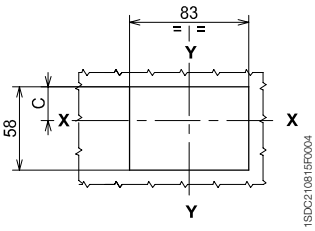
Drilling templates of the compartment door



Without flange
Operating mechanism face extending



Without flange
Operating mechanism face flush with door



With flange
Operating mechanism face flush with door

Overall dimensions

Accessories for Tmax T1 - T2 - T3

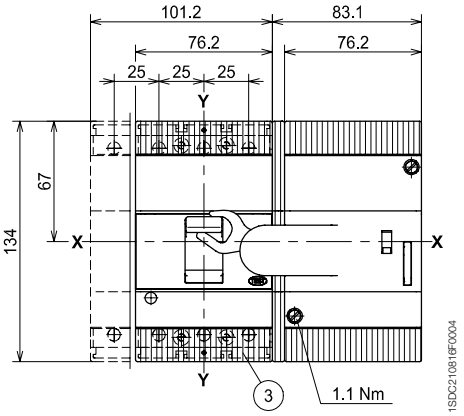
Fixed version

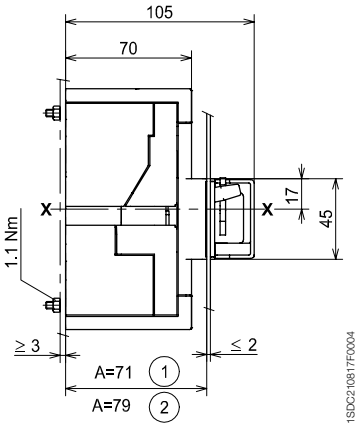
Caption

1. Circuit-breaker face extending
2. Circuit-breaker face flush with door
3. Low terminal covers with degree of protection IP40

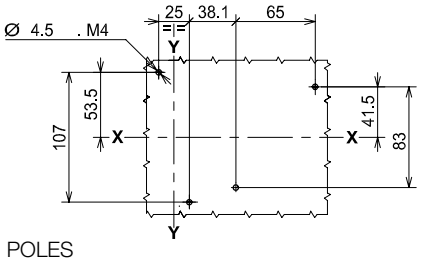
Solenoid operator side by side

T1

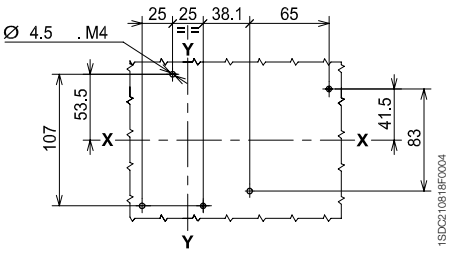




Drilling templates for fixing sheet

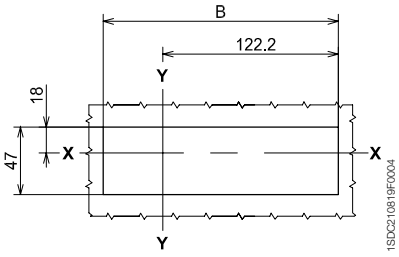


3 POLES



4 POLES

Drilling templates of the compartment door



	A	B
3P	79	161.3
	71	161.3
4P	79	161.3
	71	186.3

6

Caption

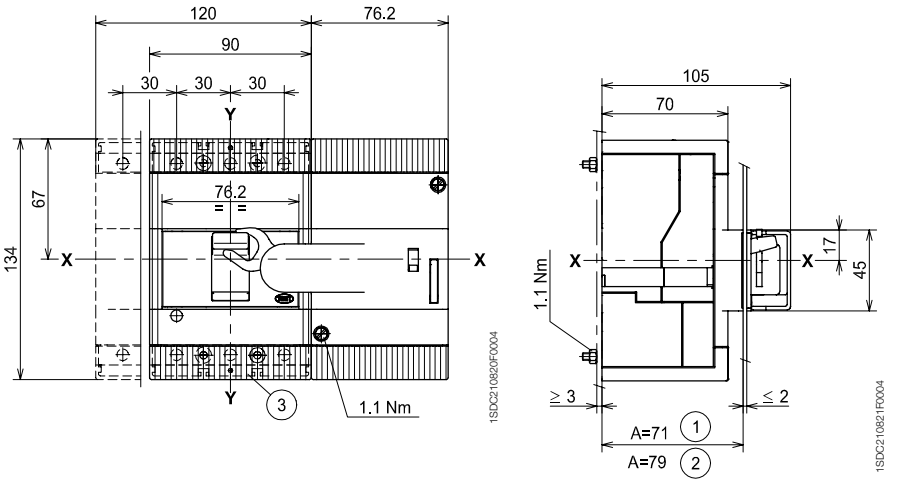
(1) Circuit-breaker face extending

(2) Circuit-breaker face flush with door

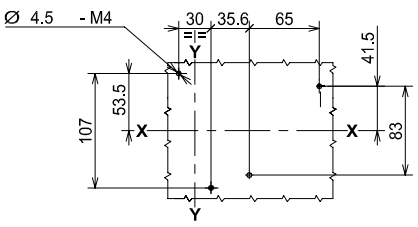
(3) Low terminal covers with degree of protection IP40

Solenoid operator side by side

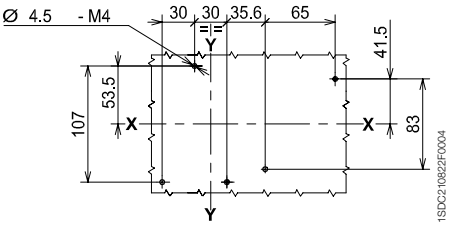
T2



Drilling templates for fixing sheet

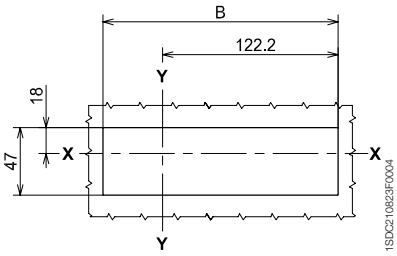


3 POLES



4 POLES

Drilling templates of the compartment door



	A	B
3P	79	161.3
	71	161.3
4P	79	161.3
	71	198.2

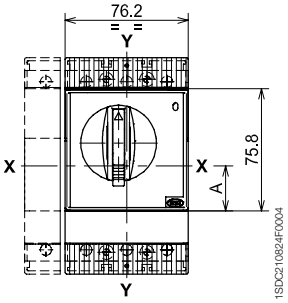
6

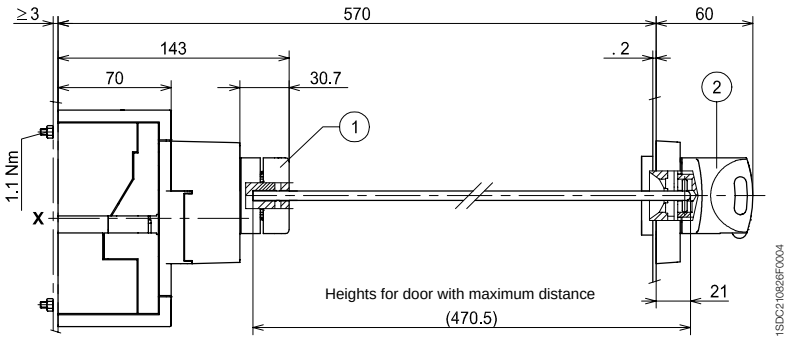
Overall dimensions

Accessories for Tmax T1 - T2 - T3

Fixed version

Rotary handle operating mechanism on the compartment door

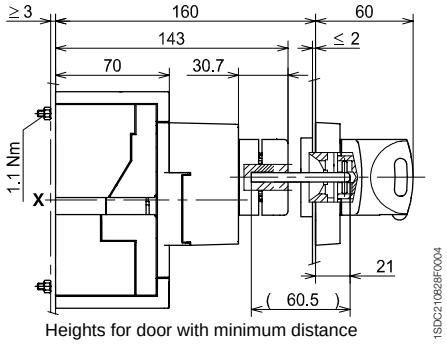




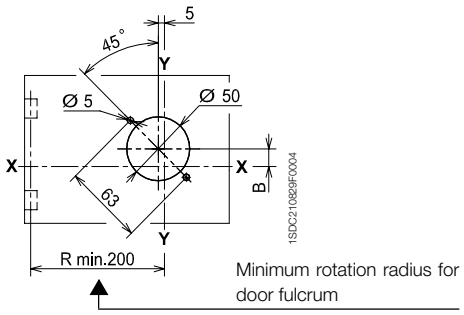
Caption

1. Transmission unit
2. Rotary handle operating mechanism on the compartment door

	A	B
T1-T2	28	14
T3	32.5	9.5



Drilling template of the compartment door

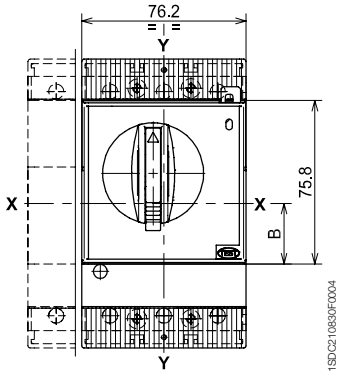


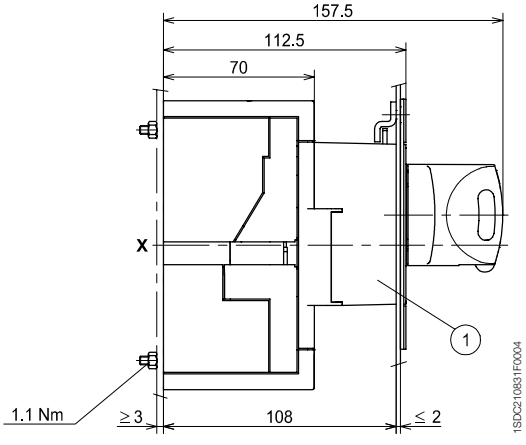
Rotary handle operating mechanism on circuit-breaker

Caption

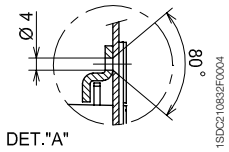
1. Rotary handle operating mechanism on circuit-breaker

	A	B	C	D
T1-T2	67.7	28	53.2	60.5
T3	63.2	32.5	48.7	56

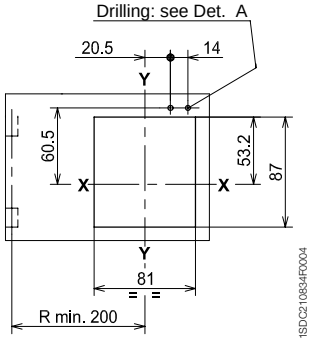


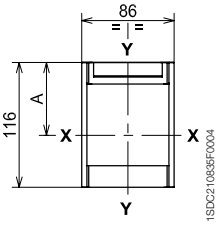


Drilling template of the compartment door



Flange for the compartment door

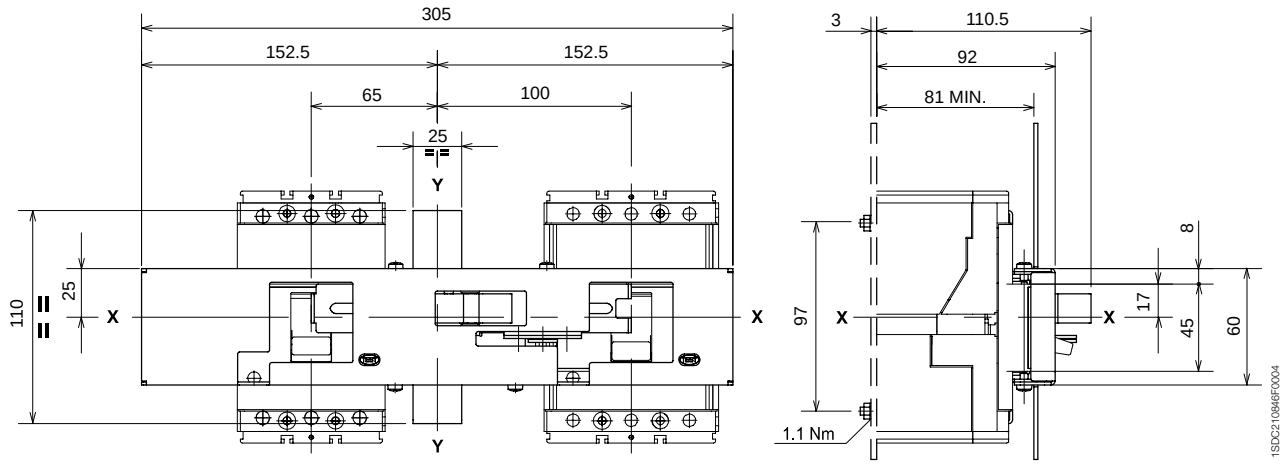




6

Mechanical interlock between circuit-breakers

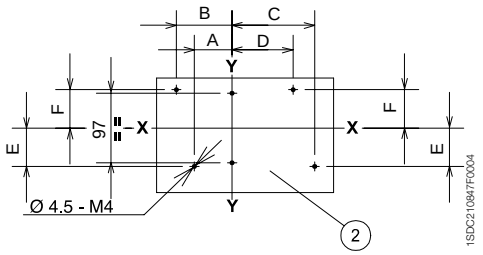
Front interlocking plate between two circuit-breakers

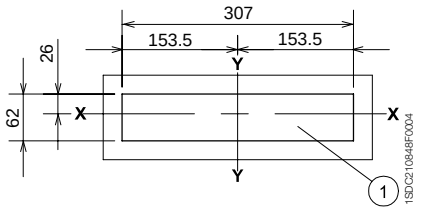


Caption

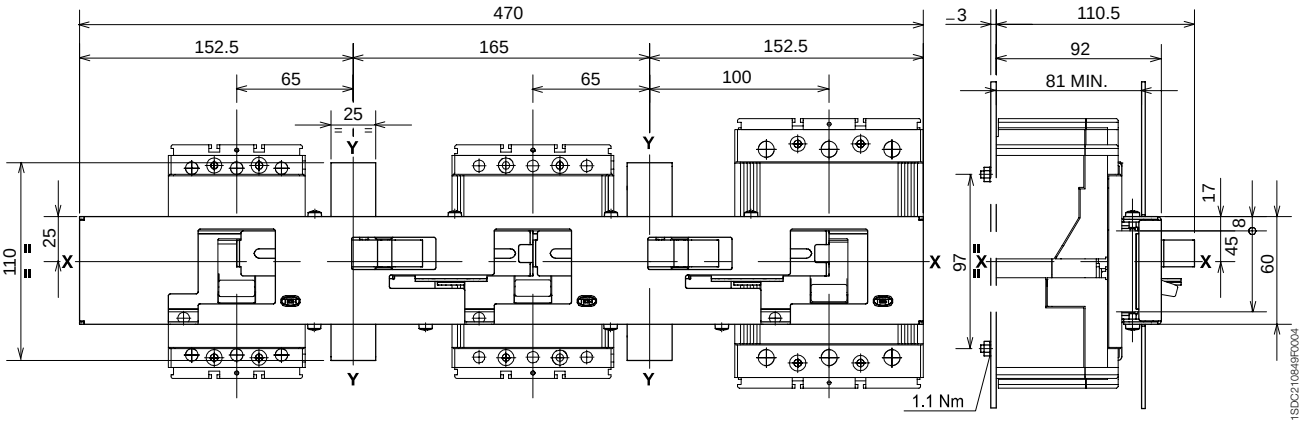
(1) Drilling templates of the compartment door

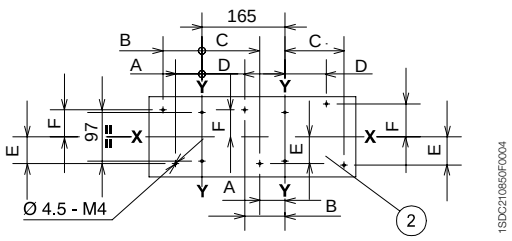
(2) Drilling templates for support sheet

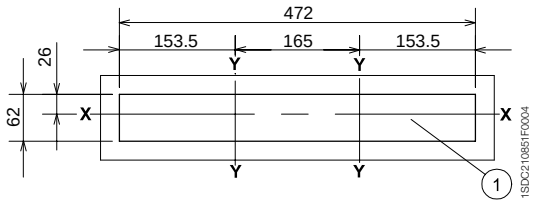




Front interlocking plate between three circuit-breakers







	A	B	C	D	E	F
T1	52.5	77.5	112.5	87.5	53.5	53.5
T2	50	80	115	85	53.5	53.5
T3	47.5	82.5	117.5	82.5	56.5	65.5

Overall dimensions

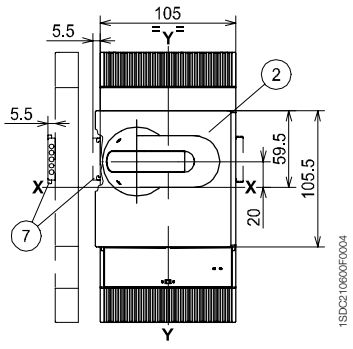
Accessories for Tmax T4 - T5

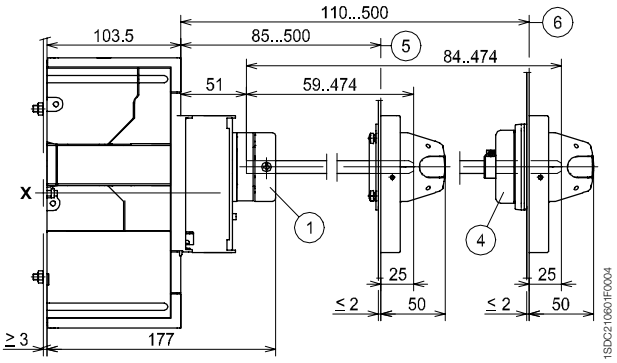
Fixed version

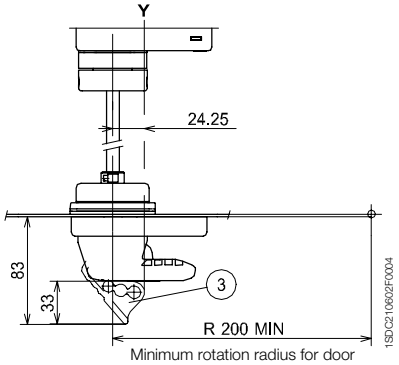
Caption

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)

Rotary handle operating mechanism on the compartment door

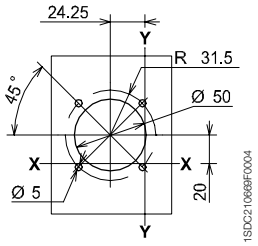






Minimum rotation radius for door fulcrum

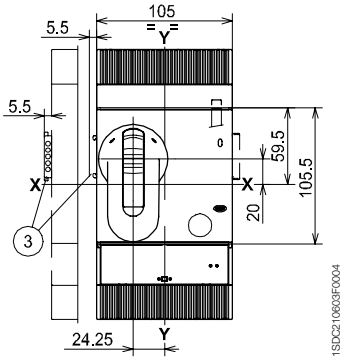
Drilling of compartment door

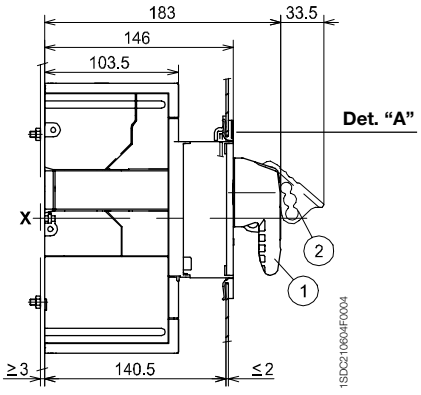


Caption

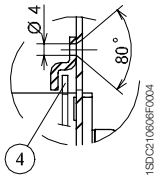
1. Rotary handle operating mechanism on circuit-breaker
2. Padlock device for open position (maximum 3 padlocks to be provided by the user)
3. Dimension with AUE connector (early making contact)
4. Compartment door lock

Rotary handle operating mechanism on circuit-breaker

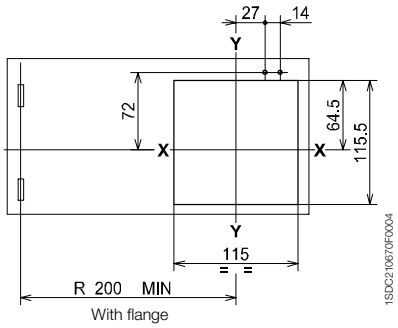




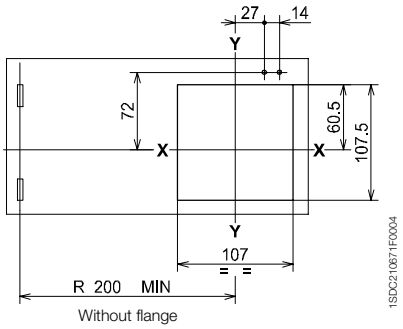
Det. "A"



Drilling template of the compartment door

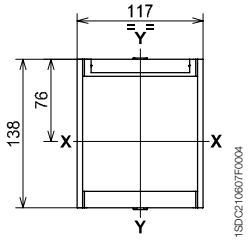


With flange



Without flange

Flange for the compartment door



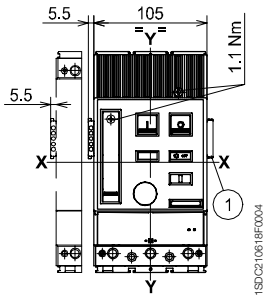
Fixed version

Caption

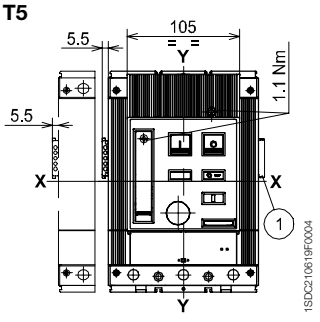
(1) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

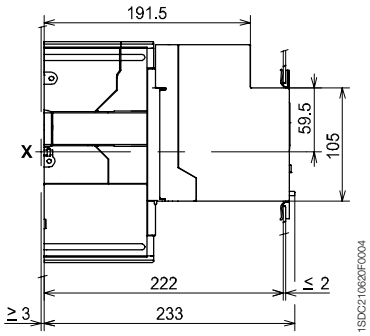
Motor operator

T4

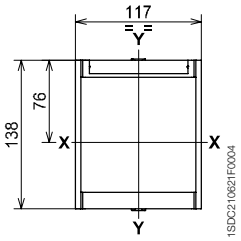


T5

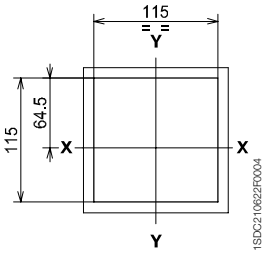




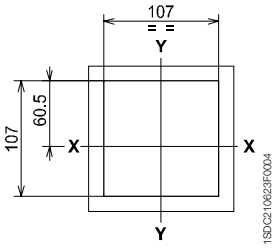
Flange for the compartment door (supplied as standard)



Drilling template of the compartment door



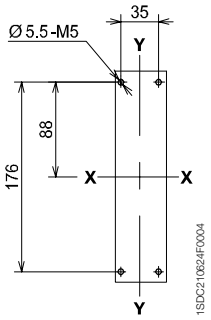
With flange



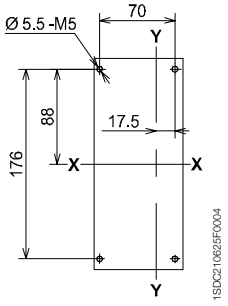
Without flange

Drilling template for support sheet

T4

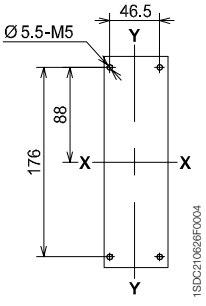


3 POLES

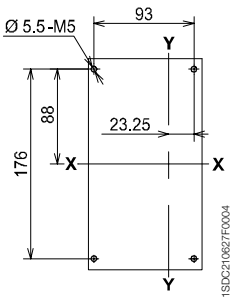


4 POLES

T5



3 POLES



4 POLES

6

Overall dimensions

Accessories for Tmax T4 - T5

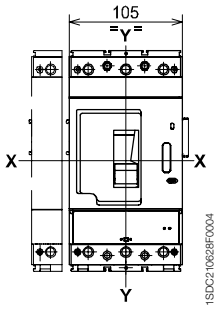
Fixed version

Caption

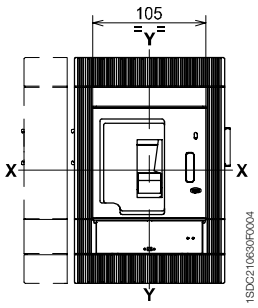
1. Front for lever operating mechanism
2. Lock for the compartment door (supplied on request)

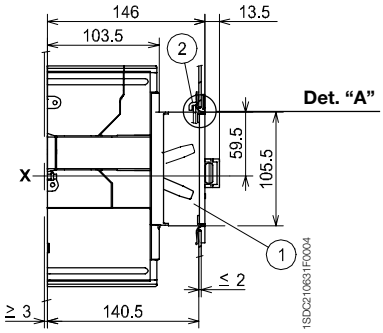
Front for lever operating mechanism

T4

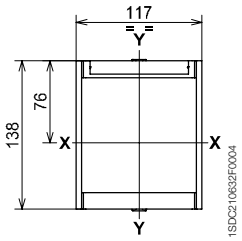


T5

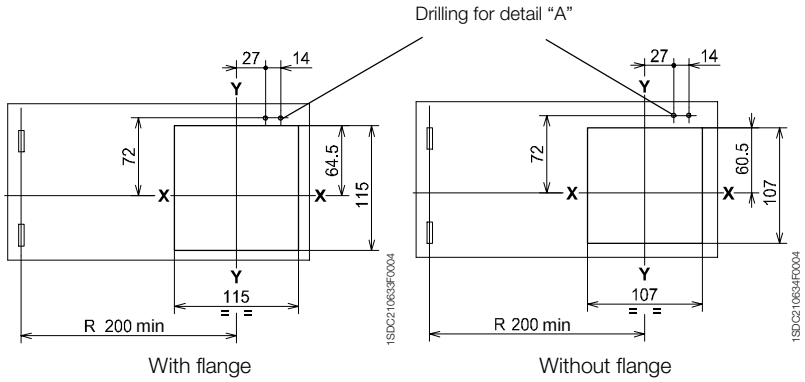




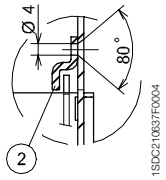
Flange for the compartment door (supplied as standard)



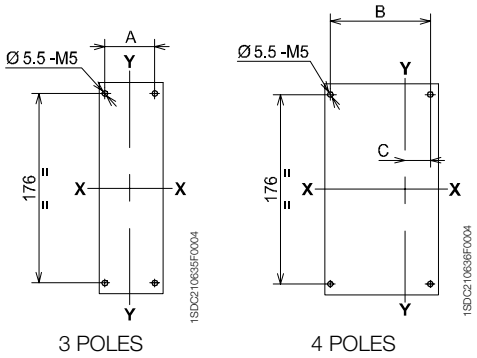
Drilling template for the compartment door



Det. "A"



Drilling template for support sheet



	A	B	C
T4	35	70	17.5
T5	46.5	93	23.25

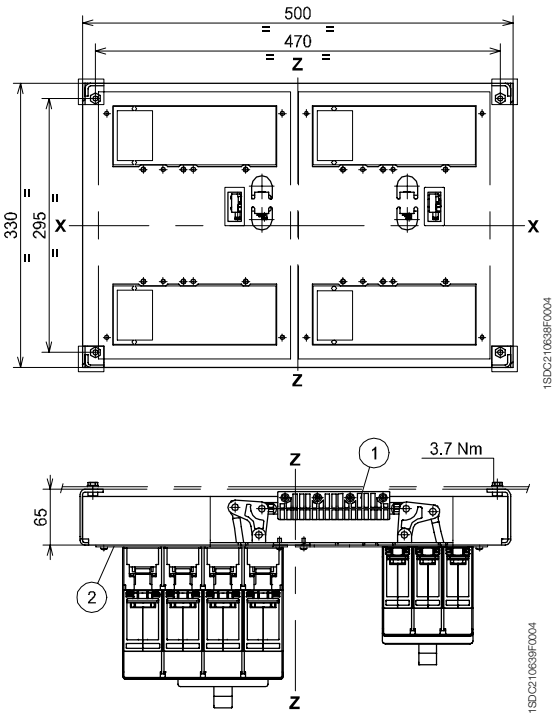
6

Caption

(1) Interlocking mechanism

(2) Circuit-breaker coupling plate

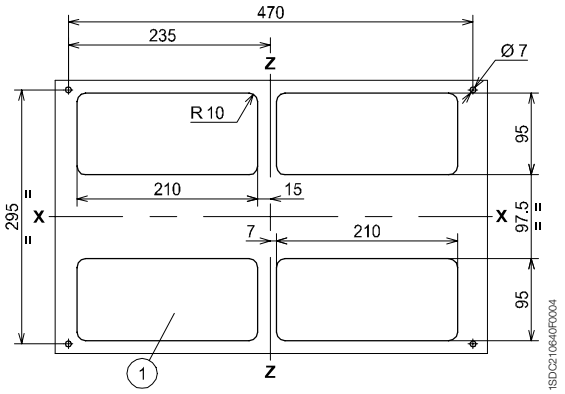
Interlock between two circuit-breakers placed side by side



Caption

(1) Drilling template for all versions with rear terminals

Drilling templates for fixing the circuit-breaker on the support sheet



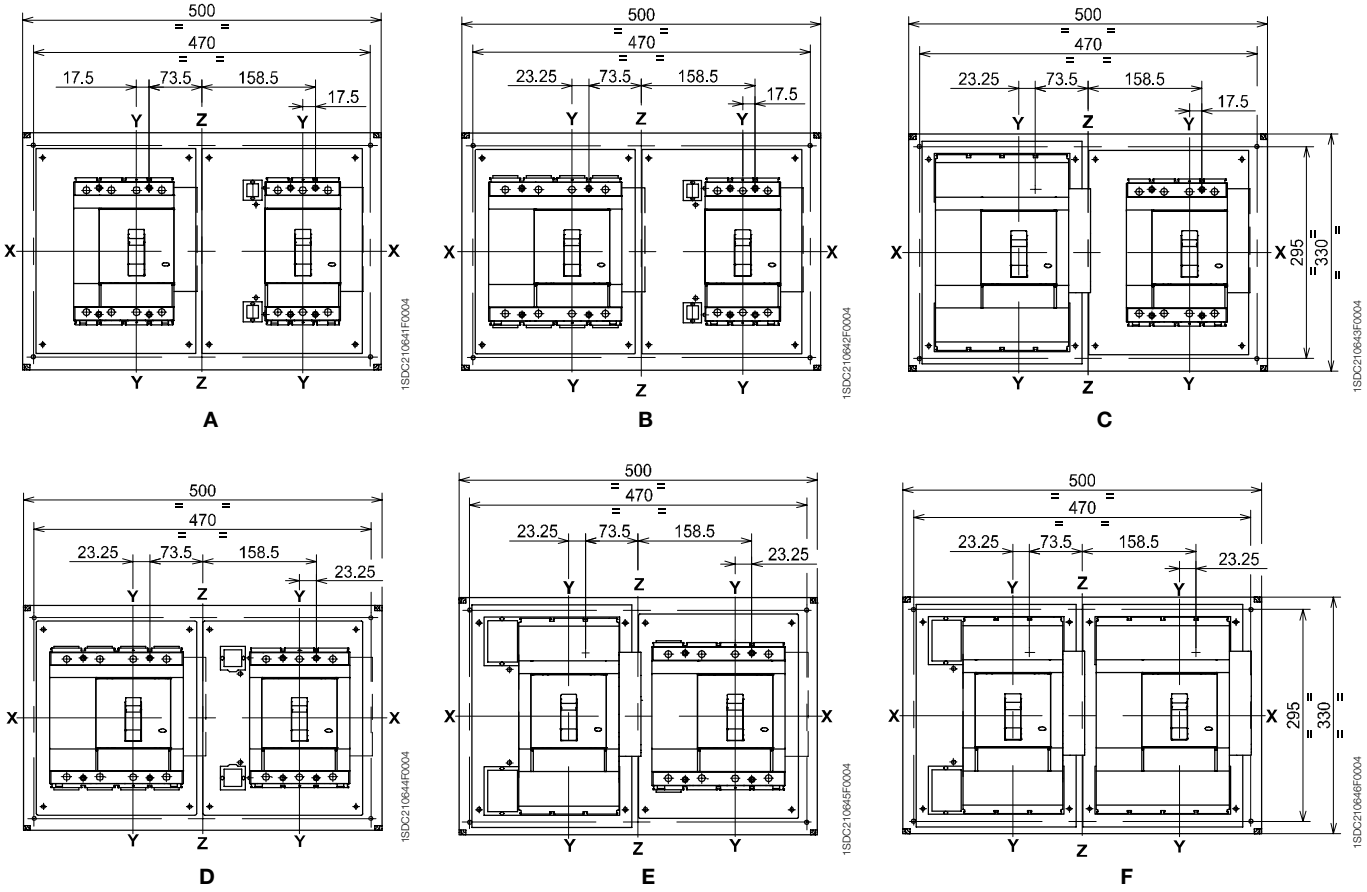
6

Overall dimensions

Accessories for Tmax T4 - T5

Fixed version

Interlock between two circuit-breakers placed side by side

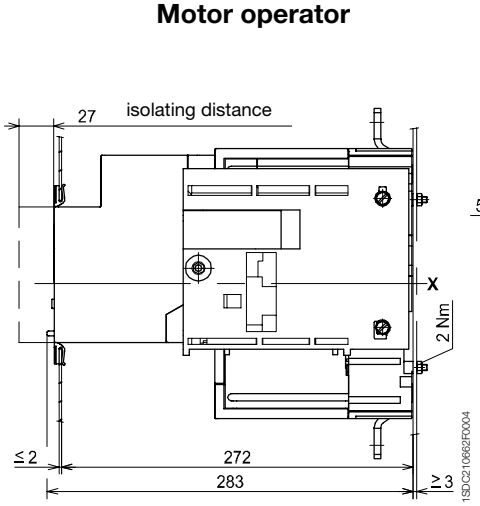


Type	Circuit-breakers
A	N° 1 T4 (F-P-W) N° 1 T4 (F-P-W)
B	N° 1 T4 (F-P-W) N° 1 T5/400 (F-P-W) or T5/630 (F)
C	N° 1 T4 (F-P-W) N° 1 T5/630 (P-W)
D	N° 1 T5/400 (F-P-W) or T5/630 (F) N° 1 T5/400 (F-P-W) or T5/630 (F)
E	N° 1 T5/400 (F-P-W) or T5/630 (F) N° 1 T5/630 (P-W)
F	N° 1 T5/630 (P-W) N° 1 T5/630 (P-W)

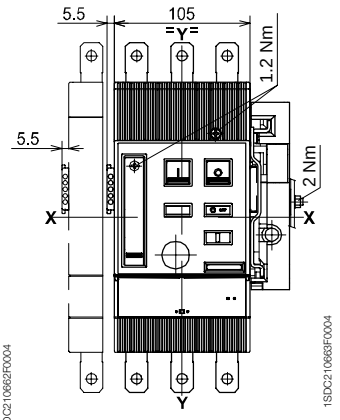
Note:
(F) Fixed circuit-breaker
(P) Plug-in circuit-breaker
(W) Withdrawable circuit-breaker

Withdrawable version

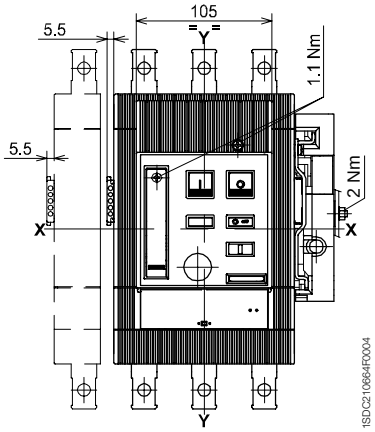
Motor operator



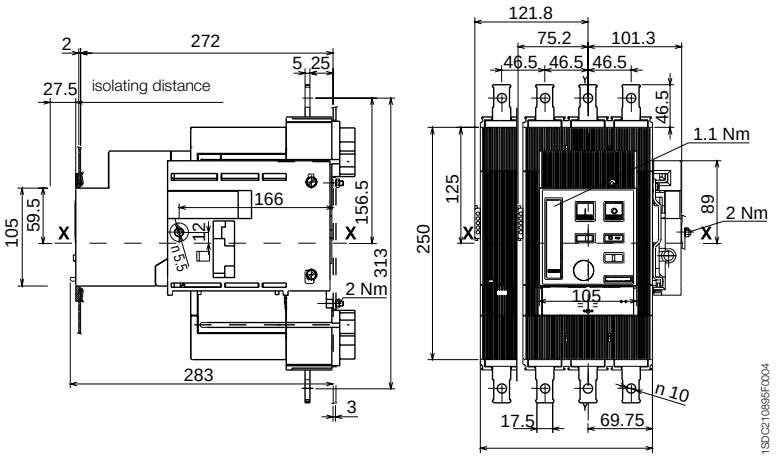
T4



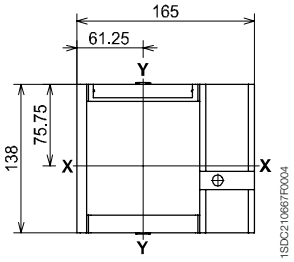
T5 (400 A)



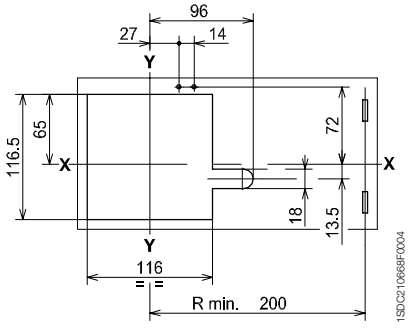
T5 (630 A)



Flange for the compartment door (supplied as standard)



Drilling templates for the compartment door and fitting flange



6

Overall dimensions

Accessories for Tmax T4 - T5

Withdrawable version

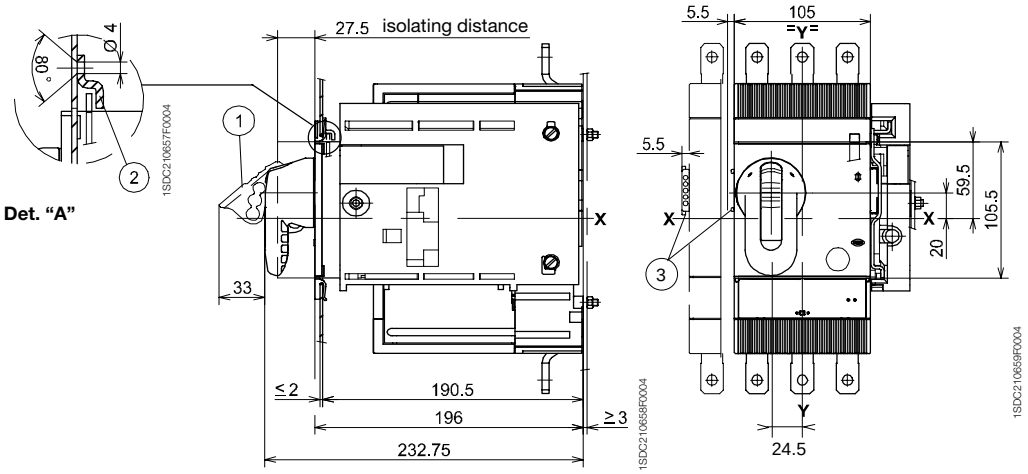
Caption

(1) Padlock device for open position (maximum 3 padlocks to be provided by the user)

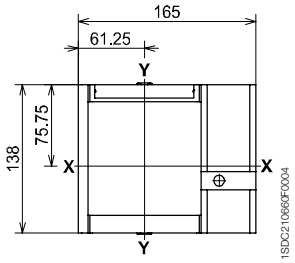
(2) Lock for compartment door (supplied on request)

(3) Dimension with AUE connector (early making contact)

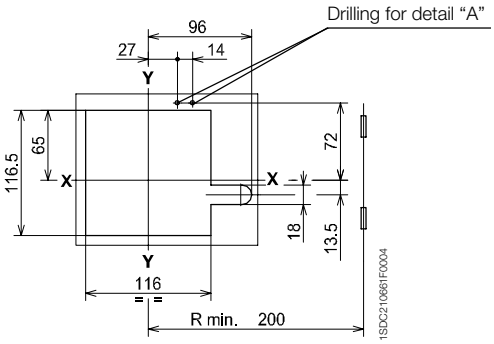
Rotary handle operating mechanism on the circuit-breakers



Flange for the compartment door



Drilling template for compartment door and fitting flange



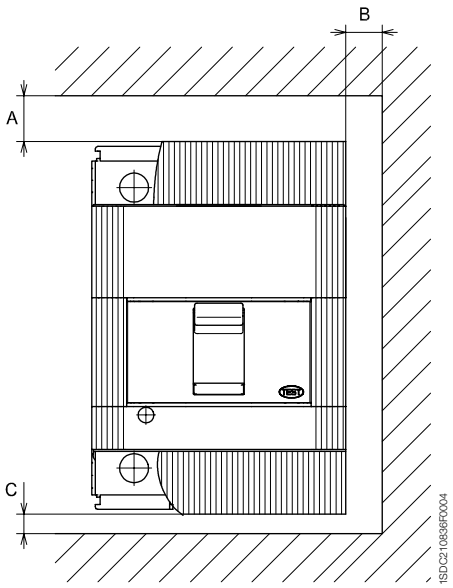
Overall dimensions

Distances to be respected

Insulation distances for installation in metallic cubicle

	A [mm]	B [mm]	C [mm]
T1	25	20	20
T2	25	20	20
T3	50	25	20
T4	30*	25	25*
T5	30*	25	25*

(*) For Ub ≥ 440 V: distance A ⇒ 60 mm; distance C ⇒ 45 mm

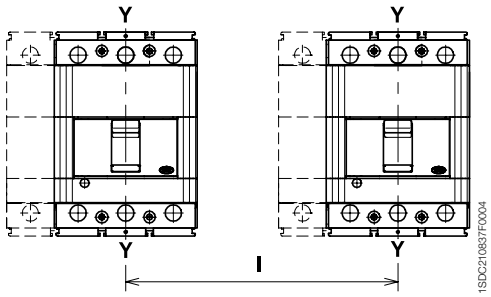


Minimum centre distance between two circuit-breakers side by side or superimposed

For assembly side by side or superimposed, check that the connection busbars or cables do not reduce the air insulation distance

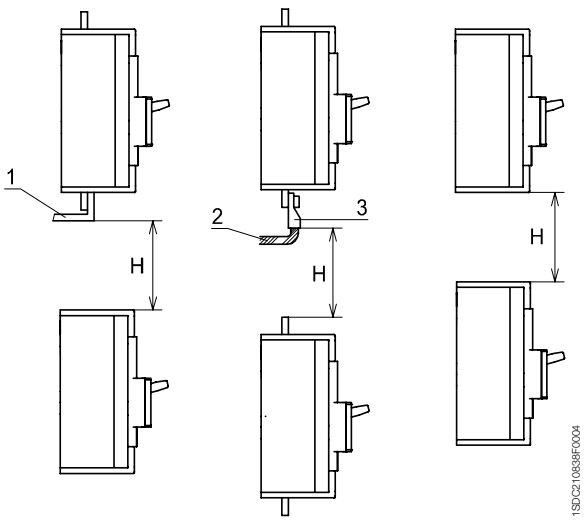
Minimum centre distance for two circuit-breakers side by side

	Circuit-breaker width [mm]		Centre distance I [mm]	
	3 poles	4 poles	3 poles	4 poles
T1	76	102	76	102
T2	90	120	90	120
T3	105	140	105	140
T4	105	140	105	140
T5	140	184	140	184



Minimum centre distance for superimposed circuit-breakers

	H [mm]
T1	60
T2	90
T3	140
T4	160
T5	160



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.

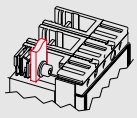
Ordering codes

Index

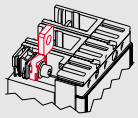
Ordering codes

General information

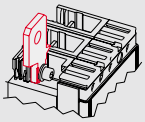
Abbreviations used to describe the apparatus



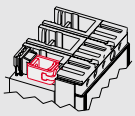
F = Front terminals



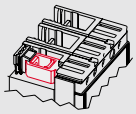
EF = Front extended terminals



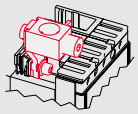
ES = Front extended spread terminals



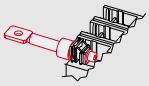
FC Cu = Front terminals for copper cables



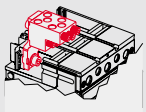
FC CuAl = Front terminals for Cu/Al cables



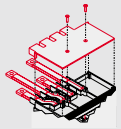
FC CuAl = Front terminals for Cu/Al cables (housed externally)



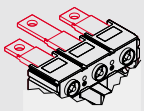
R = Rear terminals



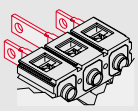
MC = Multi-cable terminals



HR for RC221/222 = Rear flat horizontal terminals



HR = Rear flat horizontal terminals



VR = Rear flat vertical terminals

I_3 Magnetic trip current [A]

In Rated current of the thermomagnetic release [A]

Iu Rated uninterrupted current of the circuit-breaker [A]

Icu Rated ultimate short-circuit breaking capacity [A]

N= 50%
N= 100% Protection of the neutral at 50% or at 100% of that of the phases [A]

TMF = Thermomagnetic release with fixed thermal and magnetic threshold

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

MF = Fixed magnetic only releases

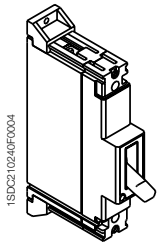
MA = Adjustable magnetic only releases

PR22_ = Electronic releases

Ordering codes

Power distribution circuit-breakers

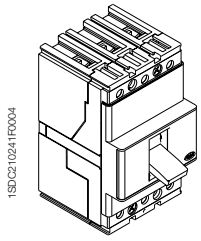
T1B 1P 160
Fixed (F)



Iu (40 °C) = 160 A - Icu (230 V) = 25 kA

FC Cu = Front terminals for copper cables	In	I_3	1SDA0.....R1 1 pole
Thermomagnetic release with fixed thresholds - TMF			
T1B 1P 160 F FC Cu (1x70mm²)	16	500	52616
T1B 1P 160 F FC Cu (1x70mm²)	20	500	52617
T1B 1P 160 F FC Cu (1x70mm²)	25	500	52618
T1B 1P 160 F FC Cu (1x70mm²)	32	500	52619
T1B 1P 160 F FC Cu (1x70mm²)	40	500	52620
T1B 1P 160 F FC Cu (1x70mm²)	50	500	52621
T1B 1P 160 F FC Cu (1x70mm²)	63	630	52622
T1B 1P 160 F FC Cu (1x70mm²)	80	800	52623
T1B 1P 160 F FC Cu (1x70mm²)	100	1000	52624
T1B 1P 160 F FC Cu (1x70mm²)	125	1250	52625
T1B 1P 160 F FC Cu (1x70mm²)	160	1600	52626

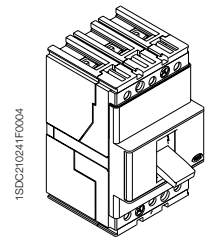
T1B 160
Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 16 kA

FC Cu = Front terminals for copper cables	In	I_3	1SDA0.....R1 3 poles	4 poles N= 50%	4 poles N= 100%
Thermomagnetic release - TMD					
T1B 160 F FC Cu (1x70mm²)	16	500	50870		50881
T1B 160 F FC Cu (1x70mm²)	20	500	50871		50882
T1B 160 F FC Cu (1x70mm²)	25	500	50872		50883
T1B 160 F FC Cu (1x70mm²)	32	500	50873		50884
T1B 160 F FC Cu (1x70mm²)	40	500	50874		50885
T1B 160 F FC Cu (1x70mm²)	50	500	50875		50886
T1B 160 F FC Cu (1x70mm²)	63	630	50876		50887
T1B 160 F FC Cu (1x70mm²)	80	800	50877		50888
T1B 160 F FC Cu (1x70mm²)	100	1000	50878		50889
T1B 160 F FC Cu (1x70mm²)	125	1250	50879		50890
T1B 160 F FC Cu (1x70mm²)	160	1600	50880	50891	50936

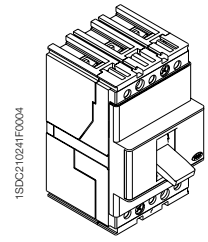
T1C 160
Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 25 kA

FC Cu = Front terminals for copper cables	In	I_3	1SDA0.....R1 3 poles	4 poles N= 50%	4 poles N= 100%
Thermomagnetic release - TMD					
T1C 160 F FC Cu (1x70mm²)	25	500	50894		50905
T1C 160 F FC Cu (1x70mm²)	32	500	50895		50906
T1C 160 F FC Cu (1x70mm²)	40	500	50896		50907
T1C 160 F FC Cu (1x70mm²)	50	500	50897		50908
T1C 160 F FC Cu (1x70mm²)	63	630	50898		50909
T1C 160 F FC Cu (1x70mm²)	80	800	50899		50910
T1C 160 F FC Cu (1x70mm²)	100	1000	50900		50911
T1C 160 F FC Cu (1x70mm²)	125	1250	50901		50912
T1C 160 F FC Cu (1x70mm²)	160	1600	50902	50913	50937

T1N 160
Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 36 kA

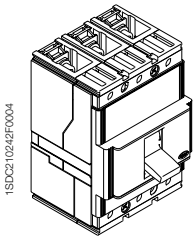
FC Cu = Front terminals for copper cables	In	I_3	1SDA0.....R1 3 poles	4 poles N= 50%	4 poles N= 100%
Thermomagnetic release - TMD					
T1N 160 F FC Cu (1x70mm²)	32	500	50917		50928
T1N 160 F FC Cu (1x70mm²)	40	500	50918		50929
T1N 160 F FC Cu (1x70mm²)	50	500	50919		50930
T1N 160 F FC Cu (1x70mm²)	63	630	50920		50931
T1N 160 F FC Cu (1x70mm²)	80	800	50921		50932
T1N 160 F FC Cu (1x70mm²)	100	1000	50922		50933
T1N 160 F FC Cu (1x70mm²)	125	1250	50923		50934
T1N 160 F FC Cu (1x70mm²)	160	1600	50924	50935	50938

Ordering codes

Power distribution circuit-breakers

T2N 160

Fixed (F)



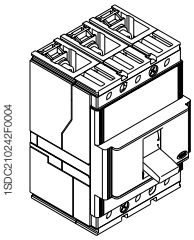
Iu (40 °C) = 160 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Electronic release				**N= 50%**	**N= 100%**
T2N 160 F F	PR221DS-LS	10	51123		51128
T2N 160 F F	PR221DS-LS	25	51124		51129
T2N 160 F F	PR221DS-LS	63	51125		51130
T2N 160 F F	PR221DS-LS	100	51126		51131
T2N 160 F F	PR221DS-LS	160	51127	51132	51613
T2N 160 F F	PR221DS-I	10	51163		51169
T2N 160 F F	PR221DS-I	25	51164		51170
T2N 160 F F	PR221DS-I	63	51165		51171
T2N 160 F F	PR221DS-I	100	51166		51172
T2N 160 F F	PR221DS-I	160	51168	51173	51617

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot. When ordered, the set of auxiliary contacts for electronic T2 (1SDA0…R1) is available, consisting of:
1 open/closed contact for signalling electronic release trip
1 open/closed contact for signalling release trip
1 open/closed contact for signalling state of the circuit-breaker

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD				**N= 50%**	**N= 100%**
T2N 160 F F	1.6	16	50940		50962
T2N 160 F F	2	20	50941		50963
T2N 160 F F	2.5	25	50942		50964
T2N 160 F F	3.2	32	50943		50965
T2N 160 F F	4	40	50944		50966
T2N 160 F F	5	50	50945		50967
T2N 160 F F	6.3	63	50946		50968
T2N 160 F F	8	80	50947		50969
T2N 160 F F	10	100	50948		50970
T2N 160 F F	12.5	125	50949		50971
T2N 160 F F	16	500	50950		50972
T2N 160 F F	20	500	50951		50973
T2N 160 F F	25	500	50952		50974
T2N 160 F F	32	500	50953		50975
T2N 160 F F	40	500	50954		50976
T2N 160 F F	50	500	50955		50977
T2N 160 F F	63	630	50956		50978
T2N 160 F F	80	800	50957		50979
T2N 160 F F	100	1000	50958		50980
T2N 160 F F	125	1250	50959	50981	51115
T2N 160 F F	160	1600	50960	50982	51116

T2S 160
Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 50 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Electronic release				N= 50%	N= 100%
T2S 160 F F	PR221DS-LS	10	51133		51138
T2S 160 F F	PR221DS-LS	25	51134		51139
T2S 160 F F	PR221DS-LS	63	51135		51140
T2S 160 F F	PR221DS-LS	100	51136		51141
T2S 160 F F	PR221DS-LS	160	51137	51142	51614
T2S 160 F F	PR221DS-I	10	51174		51179
T2S 160 F F	PR221DS-I	25	51175		51180
T2S 160 F F	PR221DS-I	63	51176		51181
T2S 160 F F	PR221DS-I	100	51177		51182
T2S 160 F F	PR221DS-I	160	51178	51183	51618

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot. When ordered, the set of auxiliary contacts for electronic T2 (1SDA0…R1) is available, consisting of:
1 open/closed contact for signalling electronic release trip
1 open/closed contact for signalling release trip
1 open/closed contact for signalling state of the circuit-breaker

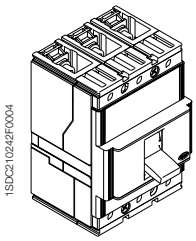
F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD				N= 50%	N= 100%
T2S 160 F F	1.6	16	50984		51006
T2S 160 F F	2	20	50985		51007
T2S 160 F F	2.5	25	50986		51008
T2S 160 F F	3.2	32	50987		51009
T2S 160 F F	4	40	50988		51010
T2S 160 F F	5	50	50989		51011
T2S 160 F F	6.3	63	50990		51012
T2S 160 F F	8	80	50991		51013
T2S 160 F F	10	100	50992		51014
T2S 160 F F	12.5	125	50993		51015
T2S 160 F F	16	500	50994		51016
T2S 160 F F	20	500	50995		51017
T2S 160 F F	25	500	50996		51018
T2S 160 F F	32	500	50997		51019
T2S 160 F F	40	500	50998		51020
T2S 160 F F	50	500	50999		51021
T2S 160 F F	63	630	51000		51022
T2S 160 F F	80	800	51001		51023
T2S 160 F F	100	1000	51002		51024
T2S 160 F F	125	1250	51003	51025	51117
T2S 160 F F	160	1600	51004	51026	51118

Ordering codes

Power distribution circuit-breakers

T2H 160

Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 70 kA

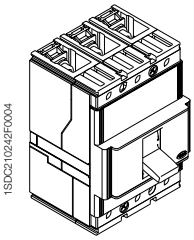
F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Electronic release				**N= 50%**	**N= 100%**
T2H 160 F F	PR221DS-LS	10	51143		51148
T2H 160 F F	PR221DS-LS	25	51144		51149
T2H 160 F F	PR221DS-LS	63	51145		51150
T2H 160 F F	PR221DS-LS	100	51146		51151
T2H 160 F F	PR221DS-LS	160	51147	51152	51615
T2H 160 F F	PR221DS-I	10	51184		51189
T2H 160 F F	PR221DS-I	25	51185		51190
T2H 160 F F	PR221DS-I	63	51186		51191
T2H 160 F F	PR221DS-I	100	51187		51192
T2H 160 F F	PR221DS-I	160	51188	51193	51619

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot. When ordered, the set of auxiliary contacts for electronic T2 (1SDA0…R1) is available, consisting of:
1 open/closed contact for signalling electronic release trip
1 open/closed contact for signalling release trip
1 open/closed contact for signalling state of the circuit-breaker

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD				**N= 50%**	**N= 100%**
T2H 160 F F	1.6	16	51028		51050
T2H 160 F F	2	20	51029		51051
T2H 160 F F	2.5	25	51030		51052
T2H 160 F F	3.2	32	51031		51053
T2H 160 F F	4	40	51032		51054
T2H 160 F F	5	50	51033		51055
T2H 160 F F	6.3	63	51034		51056
T2H 160 F F	8	80	51035		51057
T2H 160 F F	10	100	51036		51058
T2H 160 F F	12.5	125	51037		51059
T2H 160 F F	16	500	51038		51060
T2H 160 F F	20	500	51039		51061
T2H 160 F F	25	500	51040		51062
T2H 160 F F	32	500	51041		51063
T2H 160 F F	40	500	51042		51064
T2H 160 F F	50	500	51043		51065
T2H 160 F F	63	630	51044		51066
T2H 160 F F	80	800	51045		51067
T2H 160 F F	100	1000	51046		51068
T2H 160 F F	125	1250	51047	51069	51119
T2H 160 F F	160	1600	51048	51070	51120

T2L 160

Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 85 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Electronic release				N= 50%	N= 100%
T2L 160 F F	PR221DS-LS	10	51153		51158
T2L 160 F F	PR221DS-LS	25	51154		51159
T2L 160 F F	PR221DS-LS	63	51155		51160
T2L 160 F F	PR221DS-LS	100	51156		51161
T2L 160 F F	PR221DS-LS	160	51157	51162	51162
T2L 160 F F	PR221DS-I	10	51194		51199
T2L 160 F F	PR221DS-I	25	51195		51200
T2L 160 F F	PR221DS-I	63	51196		51201
T2L 160 F F	PR221DS-I	100	51197		51202
T2L 160 F F	PR221DS-I	160	51198	51203	51620

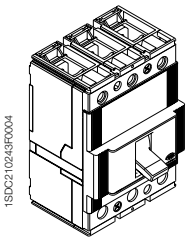
Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot. When ordered, the set of auxiliary contacts for electronic T2 (1SDA0…R1) is available, consisting of:
1 open/closed contact for signalling electronic release trip
1 open/closed contact for signalling release trip
1 open/closed contact for signalling state of the circuit-breaker

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD				N= 50%	N= 100%
T2L 160 F F	1.6	16	51072		51094
T2L 160 F F	2	20	51073		51095
T2L 160 F F	2.5	25	51074		51096
T2L 160 F F	3.2	32	51075		51097
T2L 160 F F	4	40	51076		51098
T2L 160 F F	5	50	51077		51099
T2L 160 F F	6.3	63	51078		51100
T2L 160 F F	8	80	51079		51101
T2L 160 F F	10	100	51080		51102
T2L 160 F F	12.5	125	51081		51103
T2L 160 F F	16	500	51082		51104
T2L 160 F F	20	500	51083		51105
T2L 160 F F	25	500	51084		51106
T2L 160 F F	32	500	51085		51107
T2L 160 F F	40	500	51086		51108
T2L 160 F F	50	500	51087		51109
T2L 160 F F	63	630	51088		51110
T2L 160 F F	80	800	51089		51111
T2L 160 F F	100	1000	51090		51112
T2L 160 F F	125	1250	51091	51113	51121
T2L 160 F F	160	1600	51092	51114	51122

Ordering codes

Power distribution circuit-breakers

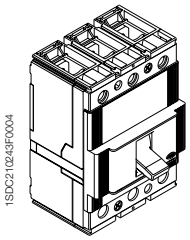
T3N 250
Fixed (F)



Iu (40 °C) = 250 A - Icu (415 V) = 36 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD				N= 50%	N= 100%
T3N 250 F F	63	630	51241		51252
T3N 250 F F	80	800	51242		51253
T3N 250 F F	100	1000	51243		51254
T3N 250 F F	125	1250	51244	51255	51303
T3N 250 F F	160	1600	51245	51256	51304
T3N 250 F F	200	2000	51246	51257	51305
T3N 250 F F	250	2500	51247	51258	51306
Thermomagnetic release for generator protection - TMG					N= 100%
T3N 250 F F	63	400	55105		55112
T3N 250 F F	80	400	55106		55113
T3N 250 F F	100	400	55107		55114
T3N 250 F F	125	400	55108		55115
T3N 250 F F	160	480	55109		55116
T3N 250 F F	200	600	55110		55117
T3N 250 F F	250	750	55111		55118

T3S 250
Fixed (F)



Iu (40 °C) = 250 A - Icu (415 V) = 50 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD				N= 50%	N= 100%
T3S 250 F F	63	630	51263		51274
T3S 250 F F	80	800	51264		51275
T3S 250 F F	100	1000	51265		51276
T3S 250 F F	125	1250	51266	51277	51307
T3S 250 F F	160	1600	51267	51278	51308
T3S 250 F F	200	2000	51268	51279	51309
T3S 250 F F	250	2500	51269	51280	51310
Thermomagnetic release for generator protection - TMG					N= 100%
T3S 250 F F	63	400	55119		55126
T3S 250 F F	80	400	55120		55127
T3S 250 F F	100	400	55121		55128
T3S 250 F F	125	400	55122		55129
T3S 250 F F	160	480	55123		55130
T3S 250 F F	200	600	55124		55131
T3S 250 F F	250	750	55125		55132

T4N 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4N 250 F F	PR221DS-LS/I	100	53997	54009
T4N 250 F F	PR221DS-LS/I	160	53998	54010
T4N 250 F F	PR221DS-LS/I	250	53999	54011
T4N 250 F F	PR221DS-I	100	54000	54012
T4N 250 F F	PR221DS-I	160	54001	54013
T4N 250 F F	PR221DS-I	250	54002	54014
T4N 250 F F	PR222DS/P-LSI	100	54003	54015
T4N 250 F F	PR222DS/P-LSI	160	54004	54016
T4N 250 F F	PR222DS/P-LSI	250	54005	54017
T4N 250 F F	PR222DS/P-LSIG	100	54006	54018
T4N 250 F F	PR222DS/P-LSIG	160	54007	54019
T4N 250 F F	PR222DS/P-LSIG	250	54008	54020

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles N= 50%	1SDA0.....R1 4 poles N= 100%
Thermomagnetic release - TMD and TMA					
T4N 250 F F	20	320	54171		54180
T4N 250 F F	32	320	54172		54181
T4N 250 F F	50	500	54173		54182
T4N 250 F F	80	400...800	54174		54183
T4N 250 F F	100	500...1000	54175		54184
T4N 250 F F	125	625...1250	54176	54185	54271
T4N 250 F F	160	800...1600	54177	54186	54272
T4N 250 F F	200	1000...2000	54178	54187	54273
T4N 250 F F	250	1250...2500	54179	54188	54274

T4N 320
Fixed (F)

Iu (40 °C) = 320 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4N 320 F F	PR221DS-LS/I	320	54117	54121
T4N 320 F F	PR221DS-I	320	54118	54122
T4N 320 F F	PR222DS/P-LSI	320	54119	54123
T4N 320 F F	PR222DS/P-LSIG	320	54120	54124

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles N= 50%	1SDA0.....R1 4 poles N= 100%
Thermomagnetic release - TMA					
T4N 320 F F	320	1600...3200	54261	54262	54291

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Ordering codes

Power distribution circuit-breakers

T4S 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 50 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4S 250 F F	PR221DS-LS/I	100	54021	54033
T4S 250 F F	PR221DS-LS/I	160	54022	54034
T4S 250 F F	PR221DS-LS/I	250	54023	54035
T4S 250 F F	PR221DS-I	100	54024	54036
T4S 250 F F	PR221DS-I	160	54025	54037
T4S 250 F F	PR221DS-I	250	54026	54038
T4S 250 F F	PR222DS/P-LSI	100	54027	54039
T4S 250 F F	PR222DS/P-LSI	160	54028	54040
T4S 250 F F	PR222DS/P-LSI	250	54029	54041
T4S 250 F F	PR222DS/P-LSIG	100	54030	54042
T4S 250 F F	PR222DS/P-LSIG	160	54031	54043
T4S 250 F F	PR222DS/P-LSIG	250	54032	54044

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD and TMA				N= 50%	N= 100%
T4S 250 F F	20	320	54189		54198
T4S 250 F F	32	320	54190		54199
T4S 250 F F	50	500	54191		54200
T4S 250 F F	80	400...800	54192		54201
T4S 250 F F	100	500...1000	54193		54202
T4S 250 F F	125	625...1250	54194	54203	54275
T4S 250 F F	160	800...1600	54195	54204	54276
T4S 250 F F	200	1000...2000	54196	54205	54277
T4S 250 F F	250	1250...2500	54197	54206	54278

T4S 320
Fixed (F)

Iu (40 °C) = 320 A - Icu (415 V) = 50 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4S 320 F F	PR221DS-LS/I	320	54125	54129
T4S 320 F F	PR221DS-I	320	54126	54130
T4S 320 F F	PR222DS/P-LSI	320	54127	54131
T4S 320 F F	PR222DS/P-LSIG	320	54128	54132

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T4S 320 F F	320	1600...3200	54263	54264	54292

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T4H 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 70 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4H 250 F F	PR221DS-LS/I	100	54045	54057
T4H 250 F F	PR221DS-LS/I	160	54046	54058
T4H 250 F F	PR221DS-LS/I	250	54047	54059
T4H 250 F F	PR221DS-I	100	54048	54060
T4H 250 F F	PR221DS-I	160	54049	54061
T4H 250 F F	PR221DS-I	250	54050	54062
T4H 250 F F	PR222DS/P-LSI	100	54051	54063
T4H 250 F F	PR222DS/P-LSI	160	54052	54064
T4H 250 F F	PR222DS/P-LSI	250	54053	54065
T4H 250 F F	PR222DS/P-LSIG	100	54054	54066
T4H 250 F F	PR222DS/P-LSIG	160	54055	54067
T4H 250 F F	PR222DS/P-LSIG	250	54056	54068

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD and TMA				N= 50%	N= 100%
T4H 250 F F	20	320	54207		54216
T4H 250 F F	32	320	54208		54217
T4H 250 F F	50	500	54209		54218
T4H 250 F F	80	400...800	54210		54219
T4H 250 F F	100	500...1000	54211		54220
T4H 250 F F	125	625...1250	54212	54221	54279
T4H 250 F F	160	800...1600	54213	54222	54280
T4H 250 F F	200	1000...2000	54214	54223	54281
T4H 250 F F	250	1250...2500	54215	54224	54282

T4H 320
Fixed (F)

Iu (40 °C) = 320 A - Icu (415 V) = 70 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4H 320 F F	PR221DS-LS/I	320	54133	54137
T4H 320 F F	PR221DS-I	320	54134	54138
T4H 320 F F	PR222DS/P-LSI	320	54135	54139
T4H 320 F F	PR222DS/P-LSIG	320	54136	54140

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T4H 320 F F	320	1600...3200	54265	54266	54293

Ordering codes

Power distribution circuit-breakers

T4L 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 120 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4L 250 F F	PR221DS-LS/I	100	54069	54081
T4L 250 F F	PR221DS-LS/I	160	54070	54082
T4L 250 F F	PR221DS-LS/I	250	54071	54083
T4L 250 F F	PR221DS-I	100	54072	54084
T4L 250 F F	PR221DS-I	160	54073	54085
T4L 250 F F	PR221DS-I	250	54074	54086
T4L 250 F F	PR222DS/P-LSI	100	54075	54087
T4L 250 F F	PR222DS/P-LSI	160	54076	54088
T4L 250 F F	PR222DS/P-LSI	250	54077	54089
T4L 250 F F	PR222DS/P-LSIG	100	54078	54090
T4L 250 F F	PR222DS/P-LSIG	160	54079	54091
T4L 250 F F	PR222DS/P-LSIG	250	54080	54092

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD and TMA				N= 50%	N= 100%
T4L 250 F F	20	320	54225		54234
T4L 250 F F	32	320	54226		54235
T4L 250 F F	50	500	54227		54236
T4L 250 F F	80	400...800	54228		54237
T4L 250 F F	100	500...1000	54229		54238
T4L 250 F F	125	625...1250	54230	54239	54283
T4L 250 F F	160	800...1600	54231	54240	54284
T4L 250 F F	200	1000...2000	54232	54241	54285
T4L 250 F F	250	1250...2500	54233	54242	54286

T4L 320
Fixed (F)

Iu (40 °C) = 320 A - Icu (415 V) = 120 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4L 320 F F	PR221DS-LS/I	320	54141	54145
T4L 320 F F	PR221DS-I	320	54142	54146
T4L 320 F F	PR222DS/P-LSI	320	54143	54147
T4L 320 F F	PR222DS/P-LSIG	320	54144	54148

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T4L 320 F F	320	1600...3200	54267	54268	54294

T4V 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 200 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4V 250 F F	PR221DS-LS/I	100	54093	54105
T4V 250 F F	PR221DS-LS/I	160	54094	54106
T4V 250 F F	PR221DS-LS/I	250	54095	54107
T4V 250 F F	PR221DS-I	100	54096	54108
T4V 250 F F	PR221DS-I	160	54097	54109
T4V 250 F F	PR221DS-I	250	54098	54110
T4V 250 F F	PR222DS/P-LSI	100	54099	54111
T4V 250 F F	PR222DS/P-LSI	160	54100	54112
T4V 250 F F	PR222DS/P-LSI	250	54101	54113
T4V 250 F F	PR222DS/P-LSIG	100	54102	54114
T4V 250 F F	PR222DS/P-LSIG	160	54103	54115
T4V 250 F F	PR222DS/P-LSIG	250	54104	54116

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD and TMA				N= 50%	N= 100%
T4V 250 F F	20	320	54243		54252
T4V 250 F F	32	320	54244		54253
T4V 250 F F	50	500	54245		54254
T4V 250 F F	80	400...800	54246		54255
T4V 250 F F	100	500...1000	54247		54256
T4V 250 F F	125	625...1250	54248	54257	54287
T4V 250 F F	160	800...1600	54249	54258	54288
T4V 250 F F	200	1000...2000	54250	54259	54289
T4V 250 F F	250	1250...2500	54251	54260	54290

T4V 320
Fixed (F)

Iu (40 °C) = 320 A - Icu (415 V) = 200 kA

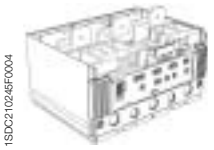
F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T4V 320 F F	PR221DS-LS/I	320	54149	54153
T4V 320 F F	PR221DS-I	320	54150	54154
T4V 320 F F	PR222DS/P-LSI	320	54151	54155
T4V 320 F F	PR222DS/P-LSIG	320	54152	54156

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T4V 320 F F	320	1600...3200	54269	54270	54295

Ordering codes

Power distribution circuit-breakers

T4 trip units



	In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release			
PR221DS-LS/I	100	54603	54615
PR221DS-LS/I	160	54604	54616
PR221DS-LS/I	250	54605	54617
PR221DS-LS/I	320	54627	54631
PR221DS-I	100	54606	54618
PR221DS-I	160	54607	54619
PR221DS-I	250	54608	54620
PR221DS-I	320	54628	54632
PR222DS/P-LSI	100	54609	54621
PR222DS/P-LSI	160	54610	54622
PR222DS/P-LSI	250	54611	54623
PR222DS/P-LSI	320	54629	54633
PR222DS/P-LSIG	100	54612	54624
PR222DS/P-LSIG	160	54613	54625
PR222DS/P-LSIG	250	54614	54626
PR222DS/P-LSIG	320	54630	54634
PR222DS/PD-LSI	100	54635	54641
PR222DS/PD-LSI	160	54636	54642
PR222DS/PD-LSI	250	54637	54643
PR222DS/PD-LSI	320	54647	54649
PR222DS/PD-LSIG	100	54638	54644
PR222DS/PD-LSIG	160	54639	54645
PR222DS/PD-LSIG	250	54640	54646
PR222DS/PD-LSIG	320	54648	54650

	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMD and TMA				**N= 50%**	**N= 100%**
TMD 20-200	20	320	54651		54660
TMD 32-320	32	320	54652		54661
TMD 50-500	50	500	54653		54662
TMA 80-800	80	800	54654		54663
TMA 100-1000	100	1000	54655		54664
TMA 125-1250	125	1250	54656	54665	54671
TMA 160-1600	160	1600	54657	54666	54672
TMA 200-2000	200	2000	54658	54667	54673
TMA 250-2500	250	2500	54659	54668	54674
TMA 320-3200	320	3200	54669	54670	54675

T5N 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5N 400 F F	PR221DS-LS/I	320	54316	54324
T5N 400 F F	PR221DS-LS/I	400	54317	54325
T5N 400 F F	PR221DS-I	320	54318	54326
T5N 400 F F	PR221DS-I	400	54319	54327
T5N 400 F F	PR222DS/P-LSI	320	54320	54328
T5N 400 F F	PR222DS/P-LSI	400	54321	54329
T5N 400 F F	PR222DS/P-LSIG	320	54322	54330
T5N 400 F F	PR222DS/P-LSIG	400	54323	54331

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5N 400 F F	320	1600...3200	54436	54438	54477
T5N 400 F F	400	2000...4000	54437	54439	54478

T5N 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5N 630 F F	PR221DS-LS/I	630	54396	54400
T5N 630 F F	PR221DS-I	630	54397	54401
T5N 630 F F	PR222DS/P-LSI	630	54398	54402
T5N 630 F F	PR222DS/P-LSIG	630	54399	54403

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5N 630 F F	500	2500...5000	54456	54459	54487
T5N 630 F F	630	3150...6300	54458	54460	54488

T5S 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 50 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5S 400 F F	PR221DS-LS/I	320	54332	54340
T5S 400 F F	PR221DS-LS/I	400	54333	54341
T5S 400 F F	PR221DS-I	320	54334	54342
T5S 400 F F	PR221DS-I	400	54335	54343
T5S 400 F F	PR222DS/P-LSI	320	54336	54344
T5S 400 F F	PR222DS/P-LSI	400	54337	54345
T5S 400 F F	PR222DS/P-LSIG	320	54338	54346
T5S 400 F F	PR222DS/P-LSIG	400	54339	54347

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5S 400 F F	320	1600...3200	54440	54442	54479
T5S 400 F F	400	2000...4000	54441	54443	54480

Ordering codes

Power distribution circuit-breakers

T5S 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (415 V) = 50 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5S 630 F F	PR221DS-LS/I	630	54404	54408
T5S 630 F F	PR221DS-I	630	54405	54409
T5S 630 F F	PR222DS/P-LSI	630	54406	54410
T5S 630 F F	PR222DS/P-LSIG	630	54407	54411

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				**N= 50%**	**N= 100%**
T5S 630 F F	500	2500...5000	54461	54463	54489
T5S 630 F F	630	3150...6300	54462	54464	54490

T5H 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 70 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5H 400 F F	PR221DS-LS/I	320	54348	54356
T5H 400 F F	PR221DS-LS/I	400	54349	54357
T5H 400 F F	PR221DS-I	320	54350	54358
T5H 400 F F	PR221DS-I	400	54351	54359
T5H 400 F F	PR222DS/P-LSI	320	54352	54360
T5H 400 F F	PR222DS/P-LSI	400	54353	54361
T5H 400 F F	PR222DS/P-LSIG	320	54354	54362
T5H 400 F F	PR222DS/P-LSIG	400	54355	54363

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				**N= 50%**	**N= 100%**
T5H 400 F F	320	1600...3200	54444	54446	54481
T5H 400 F F	400	2000...4000	54445	54447	54482

T5H 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (415 V) = 70 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5H 630 F F	PR221DS-LS/I	630	54412	54416
T5H 630 F F	PR221DS-I	630	54413	54417
T5H 630 F F	PR222DS/P-LSI	630	54414	54418
T5H 630 F F	PR222DS/P-LSIG	630	54415	54419

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				**N= 50%**	**N= 100%**
T5H 630 F F	500	2500...5000	54465	54467	54491
T5H 630 F F	630	3150...6300	54466	54468	54492

T5L 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 120 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5L 400 F F	PR221DS-LS/I	320	54364	54372
T5L 400 F F	PR221DS-LS/I	400	54365	54373
T5L 400 F F	PR221DS-I	320	54366	54374
T5L 400 F F	PR221DS-I	400	54367	54375
T5L 400 F F	PR222DS/P-LSI	320	54368	54376
T5L 400 F F	PR222DS/P-LSI	400	54369	54377
T5L 400 F F	PR222DS/P-LSIG	320	54370	54378
T5L 400 F F	PR222DS/P-LSIG	400	54371	54379

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5L 400 F F	320	1600...3200	54448	54450	54483
T5L 400 F F	400	2000...4000	54449	54451	54484

T5L 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (415 V) = 120 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5L 630 F F	PR221DS-LS/I	630	54420	54424
T5L 630 F F	PR221DS-I	630	54421	54425
T5L 630 F F	PR222DS/P-LSI	630	54422	54426
T5L 630 F F	PR222DS/P-LSIG	630	54423	54427

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5L 630 F F	500	2500...5000	54469	54471	54493
T5L 630 F F	630	3150...6300	54470	54472	54494

T5V 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 200 kA

F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5V 400 F F	PR221DS-LS/I	320	54380	54388
T5V 400 F F	PR221DS-LS/I	400	54381	54389
T5V 400 F F	PR221DS-I	320	54382	54390
T5V 400 F F	PR221DS-I	400	54383	54391
T5V 400 F F	PR222DS/P-LSI	320	54384	54392
T5V 400 F F	PR222DS/P-LSI	400	54385	54393
T5V 400 F F	PR222DS/P-LSIG	320	54386	54394
T5V 400 F F	PR222DS/P-LSIG	400	54387	54395

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5V 400 F F	320	1600...3200	54452	54454	54485
T5V 400 F F	400	2000...4000	54453	54455	54486

Ordering codes

Power distribution circuit-breakers

T5V 630

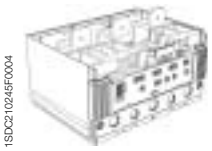
Fixed (F)

Iu (40 °C) = 630 A - Icu (415 V) = 200 kA

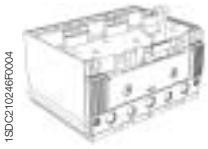
F = Front terminals		In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release				
T5V 630 F F	PR221DS-LS/I	630	54428	54432
T5V 630 F F	PR221DS-I	630	54429	54433
T5V 630 F F	PR222DS/P-LSI	630	54430	54434
T5V 630 F F	PR222DS/P-LSIG	630	54431	54435

F = Front terminals	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
T5V 630 F F	500	2500...5000	54473	54475	54495
T5V 630 F F	630	3150...6300	54474	54476	54496

T5 trip units



	In	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles
Electronic release			
PR221DS-LS/I	320	54691	54699
PR221DS-LS/I	400	54692	54700
PR221DS-LS/I	630	54707	55159
PR221DS-I	320	54693	54701
PR221DS-I	400	54694	54702
PR221DS-I	630	54708	55160
PR222DS/P-LSI	320	54695	54703
PR222DS/P-LSI	400	54696	54704
PR222DS/P-LSI	630	54709	55161
PR222DS/P-LSIG	320	54697	54705
PR222DS/P-LSIG	400	54698	54706
PR222DS/P-LSIG	630	54710	55162
PR222DS/PD-LSI	320	54711	54715
PR222DS/PD-LSI	400	54712	54716
PR222DS/PD-LSI	630	54719	54721
PR222DS/PD-LSIG	320	54713	54717
PR222DS/PD-LSIG	400	54714	54718
PR222DS/PD-LSIG	630	54720	54722



	In	I_3	1SDA0.....R1 3 poles	1SDA0.....R1 4 poles	
Thermomagnetic release - TMA				N= 50%	N= 100%
TMA 320-1600	320	3200	54723	54725	54731
TMA 400-2000	400	4000	54724	54726	54732
TMA 500-2500	500	5000	54727	54729	54733
TMA 630-3200	630	6300	54728	54730	54734

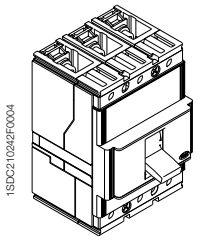
Thermomagnetic release for generator protection - TMG				N= 100%
TMG 320-1600	320	1600	55093	55101
TMG 400-2000	400	2000	55098	55102
TMG 500-2500	500	2500	55099	55103
TMG 630-3200	630	3200	55100	55104

Ordering codes

Motor protection circuit-breakers

T2N 160

Fixed (F)

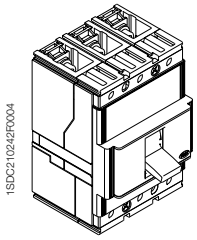


Iu (40 °C) = 160 A - Icu (415 V) = 36 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MF and MA			
T2N 160 F F	1	13	53110
T2N 160 F F	1.6	21	53111
T2N 160 F F	2	26	53112
T2N 160 F F	2.5	33	53113
T2N 160 F F	3.2	42	53114
T2N 160 F F	4	52	53115
T2N 160 F F	5	65	53116
T2N 160 F F	6.5	84	53117
T2N 160 F F	8.5	110	53118
T2N 160 F F	11	145	53119
T2N 160 F F	12.5	163	53120
T2N 160 F F	20	120...240	51207
T2N 160 F F	32	192...384	51208
T2N 160 F F	52	314...624	51209
T2N 160 F F	80	480...960	51210
T2N 160 F F	100	600...1200	51211

T2S 160

Fixed (F)



Iu (40 °C) = 160 A - Icu (415 V) = 50 kA

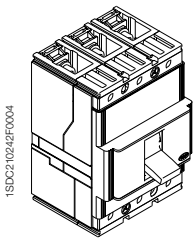
F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MF and MA			
T2S 160 F F	1	13	53121
T2S 160 F F	1.6	21	53122
T2S 160 F F	2	26	53123
T2S 160 F F	2.5	33	53124
T2S 160 F F	3.2	42	53125
T2S 160 F F	4	52	53126
T2S 160 F F	5	65	53127
T2S 160 F F	6.5	84	53128
T2S 160 F F	8.5	110	53129
T2S 160 F F	11	145	53130
T2S 160 F F	12.5	163	53131
T2S 160 F F	20	120...240	51216
T2S 160 F F	32	192...384	51217
T2S 160 F F	52	314...624	51218
T2S 160 F F	80	480...960	51219
T2S 160 F F	100	600...1200	51220

Ordering codes

Motor protection circuit-breakers

T2H 160

Fixed (F)

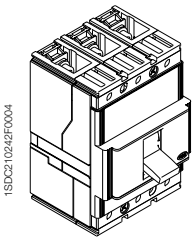


Iu (40 °C) = 160 A - Icu (415 V) = 70 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MF and MA			
T2H 160 F F	1	13	53132
T2H 160 F F	1.6	21	53133
T2H 160 F F	2	26	53134
T2H 160 F F	2.5	33	53135
T2H 160 F F	3.2	42	53136
T2H 160 F F	4	52	53137
T2H 160 F F	5	65	53138
T2H 160 F F	6.5	84	53139
T2H 160 F F	8.5	110	53140
T2H 160 F F	11	145	53141
T2H 160 F F	12.5	163	53142
T2H 160 F F	20	120...240	51224
T2H 160 F F	32	192...384	51225
T2H 160 F F	52	314...624	51226
T2H 160 F F	80	480...960	51227
T2H 160 F F	100	600...1200	51228

T2L 160

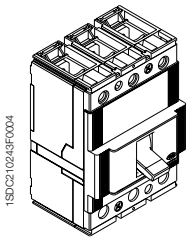
Fixed (F)



Iu (40 °C) = 160 A - Icu (415V) = 85 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MF and MA			
T2L 160 F F	1	13	53143
T2L 160 F F	1.6	21	53144
T2L 160 F F	2	26	53145
T2L 160 F F	2.5	33	53146
T2L 160 F F	3.2	42	53147
T2L 160 F F	4	52	53148
T2L 160 F F	5	65	53149
T2L 160 F F	6.5	84	53150
T2L 160 F F	8.5	110	53151
T2L 160 F F	11	145	53152
T2L 160 F F	12.5	163	53153
T2L 160 F F	20	120...240	51232
T2L 160 F F	32	192...384	51233
T2L 160 F F	52	314...624	51234
T2L 160 F F	80	480...960	51235
T2L 160 F F	100	600...1200	51236

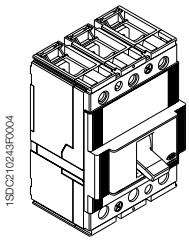
T3N 250
Fixed (F)



Iu (40 °C) = 250 A - Icu (415 V) = 36 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MA			
T3N 250 F F	100	600...1200	51315
T3N 250 F F	125	750...1500	51316
T3N 250 F F	160	960...1920	51317
T3N 250 F F	200	1200...2400	51318

T3S 250
Fixed (F)



Iu (40 °C) = 250 A - Icu (415 V) = 50 kA

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MA			
T3S 250 F F	100	600...1200	51320
T3S 250 F F	125	750...1500	51321
T3S 250 F F	160	960...1920	51322
T3S 250 F F	200	1200...2400	51323

Ordering codes

Motor protection circuit-breakers

T4N 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release for motor protection			
T4N 250 F F	PR222MP	100	54522
T4N 250 F F	PR222MP	160	54523
T4N 250 F F	PR222MP	200	54524

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MA			
T4N 250 F F	10	60...140	55068
T4N 250 F F	25	150...350	55069
T4N 250 F F	52	312...728	55070
T4N 250 F F	80	480...1120	54296
T4N 250 F F	100	600...1400	54297
T4N 250 F F	125	750...1750	54298
T4N 250 F F	160	960...2240	54299
T4N 250 F F	200	1200..2800	54300

T4S 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 50 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release for motor protection			
T4S 250 F F	PR222MP	100	54525
T4S 250 F F	PR222MP	160	54526
T4S 250 F F	PR222MP	200	54527

F = Front terminals	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MA			
T4S 250 F F	10	60...140	55071
T4S 250 F F	25	150...350	55072
T4S 250 F F	52	312...728	55073
T4S 250 F F	80	480...1120	54302
T4S 250 F F	100	600...1400	54303
T4S 250 F F	125	750...1750	54304
T4S 250 F F	160	960...2240	54305
T4S 250 F F	200	1200...2800	54306

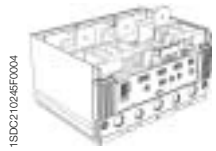
T4L 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (415 V) = 120 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release for motor protection			
T4L 250 F F	PR222MP	100	54528
T4L 250 F F	PR222MP	160	54529
T4L 250 F F	PR222MP	200	54530

F = Terminali anteriori	In	I_3	1SDA0.....R1 3 poles
Magnetic release - MA			
T4L 250 F F	10	60...140	55074
T4L 250 F F	25	150...350	55075
T4L 250 F F	52	312...728	58076
T4L 250 F F	80	480...1120	54308
T4L 250 F F	100	600...1400	54309
T4L 250 F F	125	750...1750	54310
T4L 250 F F	160	960...2240	54311
T4L 250 F F	200	1200...2800	54312

T4 trip units


1SDC210245F0004


1SDC210246F0004

	In	1SDA0.....R1 3 poles
Electronic release for motor protection		
PR222MP	100	54688
PR222MP	160	54689
PR222MP	200	54690

	In	I_3	1SDA0.....R1 3 poles	4 poles	
Magnetic only release - MA				**N= 50%**	**N= 100%**
MA 10-140	10	60…140	55077		55080
MA 25-350	25	150…350	55078		55081
MA 52-728	52	312…728	55079		55082
MA 80-1120	80	480…1120	54676		54682
MA 100-1400	100	600…1400	54677		54683
MA 125-1750	125	750…1750	54678	54684	
MA 160-2240	160	960…2240	54679	54685	
MA 200-2800	200	1200…2800	54680	54686	

Ordering codes

Motor protection circuit-breakers

T5N 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 36 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release for motor protection			
T5N 400 F F	PR222MP	320	54551
T5N 400 F F	PR222MP	400	54552

T5S 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 50 kA

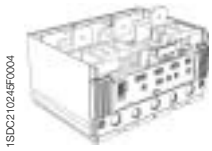
F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release for motor protection			
T5S 400 F F	PR222MP	320	54553
T5S 400 F F	PR222MP	400	54554

T5L 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (415 V) = 120 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release for motor protection			
T5L 400 F F	PR222MP	320	54555
T5L 400 F F	PR222MP	400	54556

T5 trip units



	In	1SDA0.....R1 3 poles
Electronic release for motor protection		
PR222MP	320	54735
PR222MP	400	54736

7

Ordering codes

Circuit-breakers for applications up to 1000 V

T4L 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (1000 V AC) = 12 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release			
T4L 250 F F	PR221DS-LS/I	100	54505
T4L 250 F F	PR221DS-I	100	54506
T4L 250 F F	PR222DS/P-LSI	100	54507
T4L 250 F F	PR222DS/P-LSIG	100	54508
T4L 250 F F	PR221DS-LS/I	250	54509
T4L 250 F F	PR221DS-I	250	54510
T4L 250 F F	PR222DS/P-LSI	250	54511
T4L 250 F F	PR222DS/P-LSIG	250	54512

T4V 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (1000 V AC) = 20 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release			
T4V 250 F F	PR221DS-LS/I	100	54513
T4V 250 F F	PR221DS-I	100	54514
T4V 250 F F	PR222DS/P-LSI	100	54515
T4V 250 F F	PR222DS/P-LSIG	100	54526
T4V 250 F F	PR221DS-LS/I	250	54517
T4V 250 F F	PR221DS-I	250	54518
T4V 250 F F	PR222DS/P-LSI	250	54519
T4V 250 F F	PR222DS/P-LSIG	250	54520

T4V 250
Fixed (F)

Iu (40 °C) = 250 A - Icu (1000 V AC) = 20 kA / Icu (1000 V DC) = 40 kA

F = Front terminals	In	I_3	1SDA0.....R1 4 poles
Thermomagnetic release - TMD and TMA			**N= 100%**
T4V 250 F F	32	320	54497
T4V 250 F F	50	500	54498
T4V 250 F F	80	800	54499
T4V 250 F F	100	500...1000	54500
T4V 250 F F	125	625...1250	54501
T4V 250 F F	160	800...1600	54502
T4V 250 F F	200	1000...2000	54503
T4V 250 F F	250	1250...2500	54504

T5L 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (1000 V AC) = 12 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release			
T5L 400 F F	PR221DS-LS/I	400	54535
T5L 400 F F	PR221DS-I	400	54536
T5L 400 F F	PR222DS/P-LSI	400	54537
T5L 400 F F	PR222DS/P-LSIG	400	54538

Ordering codes

Circuit-breakers for applications up to 1000 V

T5V 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (1000 V AC) = 20 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release			
T5V 400 F F	PR221DS-LS/I	400	54539
T5V 400 F F	PR221DS-I	400	54540
T5V 400 F F	PR222DS/P-LSI	400	54541
T5V 400 F F	PR222DS/P-LSIG	400	54542

T5L 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (1000 V AC) = 12 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release			
T5L 630 F F	PR221DS-LS/I	630	54543
T5L 630 F F	PR221DS-I	630	54544
T5L 630 F F	PR222DS/P-LSI	630	54545
T5L 630 F F	PR222DS/P-LSIG	630	54546

T5V 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (1000 V AC) = 20 kA

F = Front terminals		In	1SDA0.....R1 3 poles
Electronic release			
T5V 630 F F	PR221DS-LS/I	630	54547
T5V 630 F F	PR221DS-I	630	54548
T5V 630 F F	PR222DS/P-LSI	630	54549
T5V 630 F F	PR222DS/P-LSIG	630	54550

T5V 400
Fixed (F)

Iu (40 °C) = 400 A - Icu (1000 V AC) = 20 kA / Icu (1000 V DC) = 40 kA

F = Front terminals	In	I_3	1SDA0.....R1 4 poles
Thermomagnetic release - TMA			**N= 100%**
T5V 400 F F	320	1600...3200	54531
T5V 400 F F	400	2000...4000	54532

T5V 630
Fixed (F)

Iu (40 °C) = 630 A - Icu (1000 V AC) = 20 kA / Icu (1000 V DC) = 40 kA

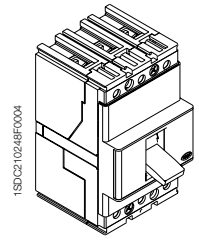
F = Front terminals	In	I_3	1SDA0.....R1 4 poles
Thermomagnetic release - TMA			**N= 100%**
T5V 630 F F	500	2500...5000	54533
T5V 630 F F	630	3150...6300	54534

Ordering codes

Switch-disconnectors

T1D 160

Fixed (F)

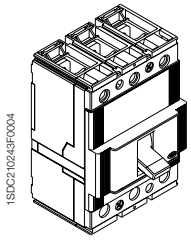


Iu (40 °C) = 160 A - Icw = 2 kA

FC Cu = Front terminals for copper cables	1SDA0.....R1	
	3 poles	4 poles
T1D 160 F FC Cu (1x70mm²)	51325	51326

T3D 250

Fixed (F)



Iu (40 °C) = 250 A - Icw = 3.6 kA

F = Front terminals	1SDA0.....R1	
	3 poles	4 poles
T3D 250 F F	51327	51328

T4D 320

Fixed (F)

Iu (40 °C) = 320 A - Icw = 3.6 kA

F = Front terminals	1SDA0.....R1	
	3 poles	4 poles
T4D 320 F F	54597	54598

T5D 400

Fixed (F)

Iu (40 °C) = 400 A - Icw = 6 kA

F = Front terminals	1SDA0.....R1	
	3 poles	4 poles
T5D 400 F F	54599	54600

T5D 630

Fixed (F)

Iu (40 °C) = 630 A - Icw = 6 kA

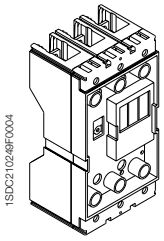
F = Front terminals	1SDA0.....R1	
	3 poles	4 poles
T5D 630 F F	54601	54602

Ordering codes

Fixed parts, conversion kits and breaking units

Plug-in(P)

Fixed part



F = Front terminals	1SDA0.....R1	
	3 poles	4 poles
T2 P FP F	51329	51330
T3 P FP F	51331	51332

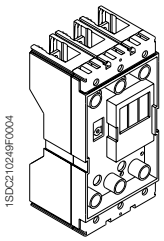
EF = Front extended terminals	1SDA0.....R1	
	3 poles	4 poles
T4 P FP EF	54737	54740
T5 400 P FP EF	54749	54752
T5 630 P FP EF	54762	54765

VR = Rear flat vertical terminals	1SDA0.....R1	
	3 poles	4 poles
T4 P FP VR	54738	54741
T5 400 P FP VR	54750	54753
T5 630 P FP VR	54763	54766

HR = Rear flat horizontal terminals	1SDA0.....R1	
	3 poles	4 poles
T4 P FP HR	54739	54742
T5 400 P FP HR	54751	54754
T5 630 P FP HR	54764	54767

Withdrawable (W)

Fixed part



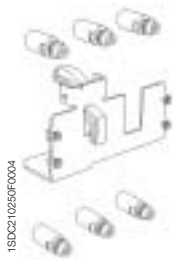
EF = Front extended terminals	1SDA0.....R1	
	3 poles	4 poles
T4 W FP EF	54743	54746
T5 W 400 FP EF	54755	54758
T5 W 630 FP EF	54768	54771

VR = Rear flat vertical terminals	1SDA0.....R1	
	3 poles	4 poles
T4 W FP VR	54744	54747
T5 W 400 FP VR	54756	54759
T5 W 630 FP VR	54769	54772

HR = Rear flat horizontal terminals	1SDA0.....R1	
	3 poles	4 poles
T4 W FP HR	54745	54748
T5 W 400 FP HR	54757	54761
T5 W 630 FP HR	54770	54774

Conversion

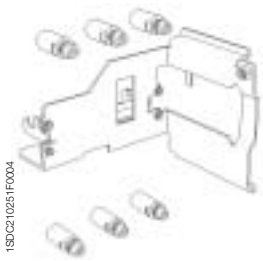
of the version



Conversion kit from fixed into moving part of plug-in T2…T5

Type	1SDA0.....R1	
	3 poles	4 poles
Kit P MP T2	51411	51412
Kit P MP T3	51413	51414
Kit P MP T4	54839	54840
Kit P MP T5 400	54843	54844
Kit P MP T5 630	54847	54848

Note: The plug-in version must be composed as follows:
1) Fixed circuit-breaker
2) Conversion kit from fixed into moving part of plug-in
3) Fixed part of plug-in



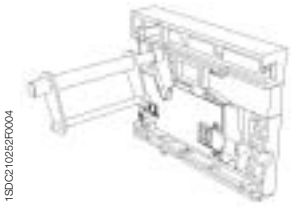
Conversion kit from fixed into moving part of withdrawable T4, T5

Type	1SDA0.....R1	
	3 poles	4 poles
Kit W MP T4	54841	54842
Kit W MP T5 400	54845	54846
Kit W MP T5 630	54849	54850

Note: The withdrawable version must be composed as follows:
1) Fixed circuit-breaker
2) Conversion kit from fixed into moving part of withdrawable
3) Fixed part of withdrawable
4) Front for lever operating mechanism or rotary handle or motor operator

Conversion kit from fixed into plug-in for RC222 and RC223

Type	1SDA0.....R1
Kit P FP RC T4	54851
Kit P FP RC T5 400	54852



Conversion kit from fixed part of plug-in into fixed part of withdrawable

Type	1SDA0.....R1
Kit FP P in FP W T4	54854
Kit FP P in FP W T5 400	54855

Terminals for fixed parts

Type	1SDA0.....R1	
	3 pieces	4 pieces
FC Cu T4 1x185mm^2	54831	54832
FC Cu T5 1x240mm^2	54833	54834
FC CuAl T4 1x185mm^2	54835	54836
FC CuAl T5 1x240mm^2	54837	54838
ES T5 (630 A)	55040	55041

Note: Terminals for fixed parts have to be added on the fixed parts with EF terminals.

Ordering codes

Fixed parts, conversion kits and breaking units

Breaking units

T4 250

	1SDA0.....R1	
	3 poles	4 poles
T4N 250 Breaking unit	54557	54562
T4S 250 Breaking unit	54558	54563
T4H 250 Breaking unit	54559	54564
T4L 250 Breaking unit	54560	54565
T4V 250 Breaking unit	54561	54566

T4 320

	1SDA0.....R1	
	3 poles	4 poles
T4N 320 Breaking unit	54567	54572
T4S 320 Breaking unit	54568	54573
T4H 320 Breaking unit	54569	54574
T4L 320 Breaking unit	54570	54575
T4V 320 Breaking unit	54571	54576

T5 400

	1SDA0.....R1	
	3 poles	4 poles
T5N 400 Breaking unit	54577	54582
T5S 400 Breaking unit	54578	54583
T5H 400 Breaking unit	54579	54584
T5L 400 Breaking unit	54580	54585
T5V 400 Breaking unit	54581	54586

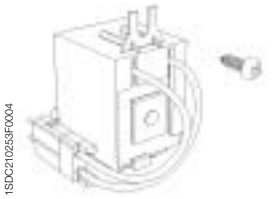
T5 630

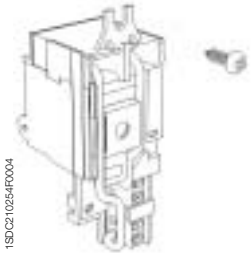
	1SDA0.....R1	
	3 poles	4 poles
T5N 630 Breaking unit	54587	54592
T5S 630 Breaking unit	54588	54593
T5H 630 Breaking unit	54589	54594
T5L 630 Breaking unit	54590	54595
T5V 630 Breaking unit	54591	54596

Ordering codes

Accessories

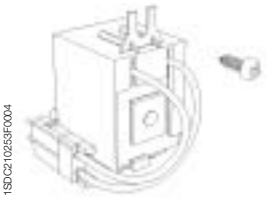
Services releases

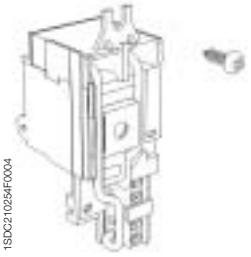




Shunt opening release - SOR

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
uncabled version		
SOR 12 V DC	53000	54862
SOR 24...30 V AC / DC	51333	54863
SOR 48...60 V AC / DC	51334	54864
SOR 110...127 V AC - 110...125 V DC	51335	54865
SOR 220...240 V AC - 220...250 V DC	51336	54866
SOR 380...440 V AC	51337	54867
SOR 480...500 V AC	51338	54868
cabled version		
SOR-C 12 V DC	53001	54869
SOR-C 24...30 V AC / DC	51339	54870
SOR-C 48...60 V AC / DC	51340	54871
SOR-C 110...127 V AC - 110...125 V DC	51341	54872
SOR-C 220...240 V AC - 220...250 V DC	51342	54873
SOR-C 380...440 V AC	51343	54874
SOR-C 480...500 V AC	51344	54875





Undervoltage release - UVR

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
uncabled version		
UVR 24...30 V AC / DC	51345	54880
UVR 48 V AC / DC	51346	54881
UVR 60 V AC/DC	52333	54882
UVR 110...127 V AC - 110...125 V DC	51347	54883
UVR 220...240 V AC - 220…250 V DC	51348	54884
UVR 380...440 V AC	51349	54885
UVR 480...500 V AC	51350	54886
cabled version		
UVR-C 24...30 V AC / DC	51351	54887
UVR-C 48 V AC / DC	51352	54888
UVR-C 60 V AC/DC	52335	54889
UVR-C 110...127 V AC - 110...125 V DC	51353	54890
UVR-C 220...240 V AC - 220…250 V DC	51354	54891
UVR-C 380...440 V AC	51355	54892
UVR-C 480...500 V AC	51356	54893

Shunt opening release with permanent operation - PS-SOR

Type	1SDA0.....R1
	T4-T5
uncabled version	
PS-SOR 24...30 V DC	54876
PS-SOR 110...120 V AC	54877
cabled version	
PS-SOR-C 24...30 V DC	54878
PS-SOR-C 110...120 V AC	54879

Time delay device for undervoltage release - UVD

Type	1SDA0.....R1
	T1…T5
UVD 24…30 V AC / DC	51357
UVD 48…60 V AC / DC	51358
UVD 110...125 V AC / DC	51360
UVD 220...250 V AC / DC	51361

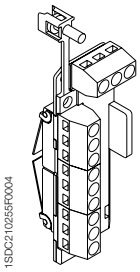
Ordering codes

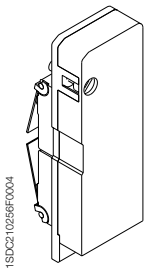
Accessories

Connectors for service releases

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
Socket-plug connectors 12 poles for AUX (3+1)	51362	51362
Socket-plug connectors 6 poles for AUX (1+1) - AUE	51363	51363
Socket-plug connectors 3 poles for SOR-UVR-MOS	51364	
Kit 12 cables L=2m for AUX (3+1)	51365	
Kit 6 cables L=2m for AUX (1+1)	51366	
Kit 2 cables L=2m for SOR-UVR	51367	

Electrical signals





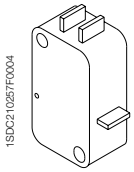
Auxiliary contacts - AUX

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
uncabled version [1]		
AUX 1Q 1SY 250 V AC/DC	51368	51368
AUX 3Q 1SY 250 V AC/DC	51369	51369
AUX 3Q 1SY 24 V DC	54914	54914
cabled version [1]		
AUX-C 1Q 1SY 250 V AC/DC	51370	54910
AUX-C 3Q 1SY 250 V AC/DC	51371	54911
AUX-C 1Q 1SY 400 V AC		54912
AUX-C 2Q 400 V AC		54913
AUX-C 3Q 1SY 24 V DC		54915
cabled version for T2 with PR221DS release		
AUX-C 1S51 1Q SY – 1 change-over device for electronic release tripped, 1 change-over device for release tripped and 1 open/closed change-over device	53704	
cabled contact in electronic version		
AUX-E-C 1Q 1SY		54916
cabled contact for signalling manual/remote operation		
AUX-MO-C		54917
cabled contact for signalling trip coil release trip		
AUX-SA 1 S51		55050

[1] These cannot be combined with the circuit-breakers fitted with PR221DS electronic releases.

Auxiliary position contacts - AUP

Type	1SDA0.....R1	
	T2-T3	T4-T5
AUP T2-T3 - 1 contact signalling circuit-breaker racked-in	51372	
AUP-I T4-T5 24 V DC - 1 contact for signalling circuit-breakers racked-in		54920
AUP-I T4-T5 400 V AC/DC - 1 contact for signalling circuit-breakers racked-in		54918
AUP-R T4-T5 24 V DC - 1 contact for signalling circuit-breakers racked-out		54921
AUP-R T4-T5 400 V AC/DC - 1 contact for signalling circuit-breakers racked-out		54919

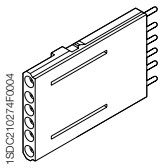


Early auxiliary contacts - AUE

Type	1SDA0.....R1	
	T2-T3	T4-T5
AUE - 2 early contacts	51374	54925

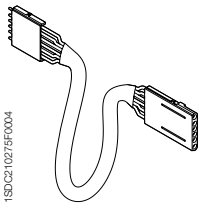
7

Adapters - ADP



Type	1SDA0.....R1
	T4-T5
ADP - Adapters 5pin	55173
ADP - Adapters 6pin	54922
ADP - Adapters 12pin	54923
ADP - Adapters 10pin	54924

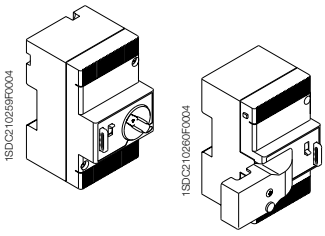
Testing extension



Type	1SDA0.....R1
	T4-T5
5-pin checking extension for blank tests on T4-T5 P/W service releases	55351
6-pin checking extension for blank tests on auxiliary contacts, (1+1) service and residual current releases T4-T5 P/W	55063
12-pin checking extension for blank tests on auxiliary contacts (3+1) T4-T5 P/W	55064
10-pin checking extension for blank tests on motor operator and early contacts T4-T5 P/W	55065

Motor operator

Solenoid operator - MOS



Type	1SDA0.....R1
	T1-T2-T3
Superimposed MOS 48...60 V DC	51376
Superimposed MOS 110...250 V AC/DC	51377
Note: it is always fitted with plug-socket	
Side-by-side MOS T1-T2 48...60 V DC	51379
Side-by-side MOS T1-T2 110...250 V AC / DC	51380
Note: it is always fitted with crimped cables	

Stored energy motor operator - MOE

Type	1SDA0.....R1
	T4-T5
MOE T4-T5 24 V DC	54894
MOE T4-T5 48...60 V DC	54895
MOE T4-T5 110...125 V AC/DC	54896
MOE T4-T5 220...250 V AC/DC	54897
MOE T4-T5 380 V AC	54898

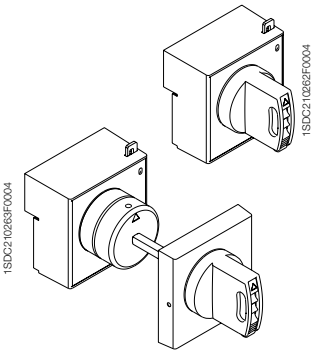
Stored energy motor operator with electronics - MOE-E

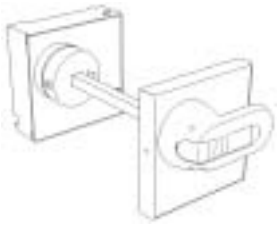
Type	1SDA0.....R1
	T4-T5
MOE-E T4-T5 24 V DC	54899
MOE-E T4-T5 48...60 V DC	54900
MOE-E T4-T5 110...125 V AC/DC	54901
MOE-E T4-T5 220...250 V AC/DC	54902
MOE-E T4-T5 380 V AC	54903
Note: always supplied complete with the AUX-E-C electronic auxiliary contact.	

Ordering codes

Accessories

Rotary handle operating mechanism





Direct - RHD

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
RHD normal for fixed and plug-in	51381	54926
RHD_EM emergency for fixed and plug-in	51382	54927
RHD normal for withdrawable		54928
RHD_EM emergency for withdrawable		55234

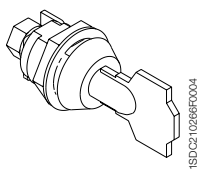
Transmitted - RHE

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
RHE normal for fixed and plug-in	51383	54929
RHE_EM emergency for fixed and plug-in	51384	54930
RHE normal for withdrawable		54933
RHE_EM emergency for withdrawable		54934
Individual components		
RHE_B just base for RHE	51385	54935
RHE_S just handle for 500mm per RHE	51386	54932
RHE_H just handle for RHE	51387	54936
RHE_H_EM just emergency handle for RHE	51388	54937

IP54 protection for rotary handle

Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
RHE-IP54 protection kit IP54	51392	54938

Operating mechanism and locks



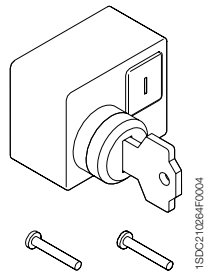
Key lock for rotary handle - RHL

Type	1SDA0.....R1
	T1-T2-T3
RHL - different keys for each circuit-breaker/in open position	51389
RHL - same keys for groups of circuit-breakers/in open position	51390
RHL - different keys for each circuit-breaker/in open-closed position	52021

Key lock for front/rotary handle - KLF

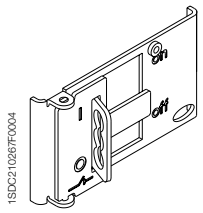
Type	1SDA0.....R1
	T4-T5
KLF-D - different key in open position	54939
KLF-S - same key for different groups of circuit-breakers (N. 20005)	54940
KLF-S - same key for different groups of circuit-breakers (N. 20006)	54941
KLF-S - same key for different groups of circuit-breakers (N. 20007)	54942
KLF-S - same key for different groups of circuit-breakers (N. 20008)	54943

Key lock for motor operator - MOL



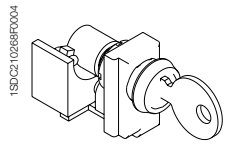
Type	1SDA0.....R1 T4-T5
MOL-D - different key	54904
MOL-S - same key for different groups of circuit-breakers (N. 20005)	54905
MOL-S - same key for different groups of circuit-breakers (N. 20006)	54906
MOL-S - same key for different groups of circuit-breakers (N. 20007)	54907
MOL-S - same key for different groups of circuit-breakers (N. 20008)	54908
MOL-M - lock only on manual operation with same key	54909

Padlock lever lock - PLL



Type	1SDA0.....R1 T1-T2-T3
PLL - in open position	51393
PLL - in open/closed position	51394

"Ronis" key lock in open position on the circuit-breaker - KLC (1)



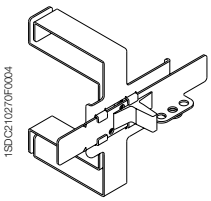
Type	1SDA0.....R1 T1-T2-T3
standard version	
KLC keys – the same key for sets of circuit-breakers – T1	53528
KLC keys – the same key for sets of circuit-breakers – T2	53529
KLC keys – the same key for sets of circuit-breakers – T3	53530
version with key removable in both positions	
KLC-S keys – the same key for sets of circuit-breakers – T1	51395
KLC-S keys – the same key for sets of circuit-breakers – T2	52015
KLC-S keys – the same key for sets of circuit-breakers – T3	52016

(1) It cannot be mounted when there is a front operating mechanism, a rotary handle operating mechanism, motor operator, or RC221/RC222 residual current releases and, only in the case of three-pole circuit-breakers, with the service releases (UVR, SOR).

Front for lever operating mechanism - FLD

Type	1SDA0.....R1 T4-T5
FLD - for fixed and plug-in	54944
FLD - for withdrawable	54945

Mechanical interlock - MIF

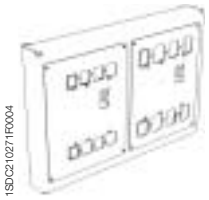


Type	1SDA0.....R1 T1-T2-T3
MIF front interlocking plate between 2 circuit-breakers	51396
MIF front interlocking plate between 3 circuit-breakers	52165

Ordering codes

Accessories

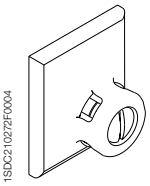
Mechanical interlock - MIR



Type	1SDA0.....R1
	T4-T5
MIR-HB - frame unit horizontal interlock	54946
MIR-VB - frame unit vertical interlock	54947
MIR-P - plate for type A interlock	54948
MIR-P - plate for type B interlock	54949
MIR-P - plate for type C interlock	54950
MIR-P - plate for type D interlock	54951
MIR-P - plate for type E interlock	54952
MIR-P - plate for type F interlock	54953

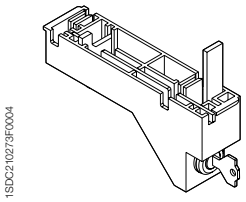
Note: To interlock two circuit-breakers you have to order a frame unit interlock and a plate (for type A or B or C or D or E or F) interlock.

Sealable lock of thermal adjustment



Type	1SDA0.....R1
	T1-T2-T3
TMD release anti-adjustment seal	51397

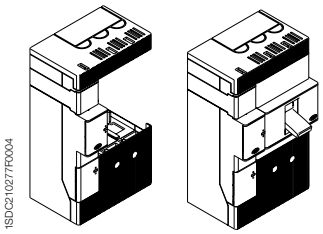
Lock for fixed part of withdrawable circuit-breaker

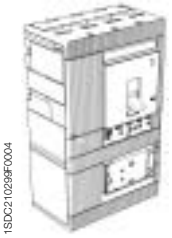


Type	1SDA0.....R1
	T4-T5
KLF-D FP - Different key for each circuit-breaker	55230
KLF-S FP - Same key for different groups of circuit-breakers	55231
PLL FP - Lock padlocks	55232
KLF-D Ronis FP - Lock Ronis type	55233

Residual current release

SACE RC221, SACE RC222, SACE RC223





Type	1SDA0.....R1	
	3 poles	4 poles
RC222/1 MOD 200 mm for T1 fixed		53869
RC221/1 for T1	51398	51401
RC222/1 for T1	51400	51402
RC221/2 for T2	51403	51405
RC222/2 for T2	51404	51406
RC221/3 for T3	51407	51409
RC222/3 for T3	51408	51410
RC222/4 for T4		54954
RC223/4 for T4		54956
RC222/5 for T5		54955

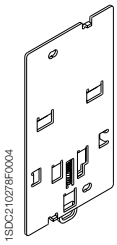
Note: The residual current releases for T2 and T3 circuit-breakers are always supplied complete the with FCCu terminal kit.

SACE RCQ

Type	1SDA0.....R1 T1-T2-T3-T4-T5
Relay and closed toroid - diameter 60 mm	37388
Relay and closed toroid - diameter 110 mm	37389
Relay and toroid which can be opened - diameter 110 mm	37390
Relay and toroid which can be opened - diameter 180 mm	37391
Relay and toroid which can be opened - diameter 230 mm	37392
Relay only	37393
Closed toroid only - diameter 60 mm	37394
Closed toroid only - diameter 110 mm	37395
Toroid which can be opened only - diameter 110 mm	37396
Toroid which can be opened only - diameter 180 mm	37397
Toroid which can be opened only - diameter 230 mm	37398

Installation accessories

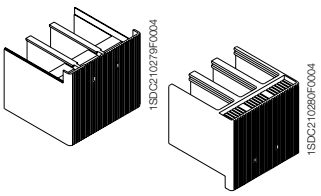
Bracket for fixing onto DIN rail



Type	1SDA0.....R1 T1-T2-T3
DIN50022 T1-T2	51437
DIN50022 T3	51439
DIN50022 T1 - T2 for RC221/RC222	51937
DIN50022 T3 for RC221/RC222	51938
DIN50022 T1 -T2 for MOS side-by-side	51939
DIN50022 T1 for RC222 mod. 200 mm	53940

Connection terminals

High insulating terminal covers - HTC



Type	1SDA0.....R1	
	3 poles	4 poles
HTC T1	51415	51416
HTC T2	51417	51418
HTC T3	51419	51420
HTC T4	54958	54959
HTC T5	54960	54961

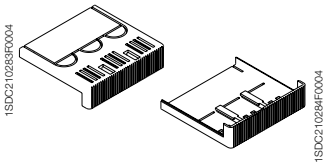
Protection for high insulating terminal covers - HTC-P

Type	1SDA0.....R1	
	3 poles	4 poles
HTC-P T4	54962	54963
HTC-P T5	54964	54965

Ordering codes

Accessories

Low insulating terminal covers - LTC



Type	1SDA0.....R1	
	3 poles	4 poles
LTC T1	51421	51422
LTC T2	51423	51424
LTC T3	51425	51426
LTC T4	54966	54967
LTC T5	54968	54969

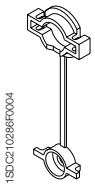
Terminal covers for fixed part - TC-FP

Type	1SDA0.....R1	
	3 poles	4 poles
TC-FP T4	54857	54858
TC-FP T5 400	54859	54861

IP40 front protections for screw terminals - STC

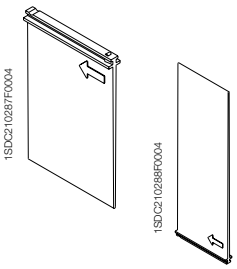
Type	1SDA0.....R1	
	3 poles	4 poles
STC T1	51431	51432
STC T2	51433	51434
STC T3	51435	51436

Sealable screws for terminal covers



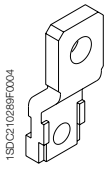
Type	1SDA0.....R1
	T1...T5
Sealable screws	51504

Separating partitions - PB

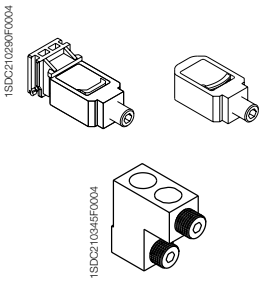


Type	1SDA0.....R1	
	T1-T2-T3	T4-T5
PB100 low (H=100 mm) - 4 pieces - 3P	51427	
PB100 low (H=100 mm) - 6 pieces - 4P	51428	
PB200 high (H=200 mm) - 4 pieces - 3P	51429	
PB200 high (H=200 mm) - 6 pieces - 4P	51430	
PB100 low (H=100mm) - 4 pieces - 3P		54970
PB100 low (H=100mm) - 6 pieces - 4P		54971
PB200 high (H=200mm) - 4 pieces - 3P		54972
PB200 high (H=200mm) - 6 pieces - 4P		54973

Front extended terminals - EF

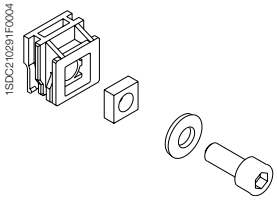


Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
EF T1	51442	51443	51440	51441
EF T2	51466	51467	51464	51465
EF T3	51490	51491	51488	51489
EF T4	55000	55001	54998	54999
EF T5	55036	55037	55034	55035



Front terminals for copper-aluminium cables - FC CuAl

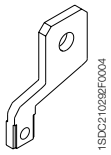
Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
FC CuAl T1 95mm² - external terminal	51446	51447	51444	51445
FC CuAl T2 95mm²	51458	51459	51456	51457
FC CuAl T2 2x95mm² - external terminal	55153	55154	55151	55152
FC CuAl T2 185mm² - external terminal	51462	51463	51460	51461
FC CuAl T3 2x150mm² - external terminal	55157	55158	55155	55156
FC CuAl T3 185mm²	51486	51487	51484	51485
FC CuAl T3 140…240mm² - external terminal	51940	51941	51942	51943
FC CuAl T4 1x50mm²	54984	54985	54982	54983
FC CuAl T4 2x150mm²	54992	54993	54990	54991
FC CuAl T4 1x185mm²	54988	54989	54986	54987
FC CuAl T5 400 2x120mm²	55028	55029	55026	55027
FC CuAl T5 400 1x240mm²	55020	55021	55018	55019
FC CuAl T5 400 1x300mm²	55024	55025	55022	55023
FC CuAl T5 630 2x240mm²	55032	55033	55030	55031



Front terminals - F (1)

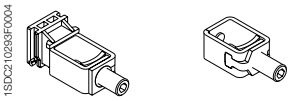
Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
F T2 - Plugs with screws	51450	51451	51448	51449
F T3 - Plugs with screws	51478	51479	51476	51477
F T4 - Plugs with screws	54976	54977	54974	54975
F T5 - Plugs with screws	55012	55013	55010	55011

(1) To be requested as loose kit.



Front extended spread terminals - ES

Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
ES T2	51470	51471	51468	51469
ES T3	51494	51495	51492	51493
ES T4	55004	55005	55002	55003
ES T5	55040	55041	55038	55039



Front terminals for copper cables - FC Cu

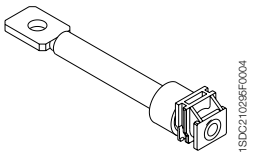
Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
FC Cu T2	51454	51455	51452	51453
FC Cu T3	51482	51483	51480	51481
FC Cu T4 1x185mm²	54980	54981	54978	54979
FC Cu T5 1x240mm²	55016	55017	55014	55015

Front multi-cable terminals - MC

Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
MC CuAl T4 6x35mm²	54994	54995	54996	54997

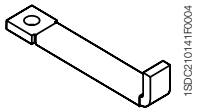
Ordering codes

Accessories



Rear orientated terminals - R

Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
R T2	51474	51475	51472	51473
R T3	51498	51499	51496	51497
R T4	55008	55009	55006	55007
R T5	55044	54045	55042	55043

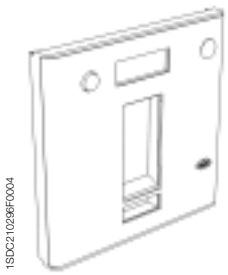


Rear flat horizontal terminals - HR

Type	1SDA0.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
HR T1	53865	53866	53867	53868
HR RC221/222 T1		53987		

Kit for taking up voltage for auxiliaries

Type	1SDA0.....R1	
	3 pieces	4 pieces
AuxV T2	51500	51501
AuxV T3	51502	51503
AuxV T4	55046	55047
AuxV T5	55048	55049



Front display unit - FDU

Type	1SDA0.....R1
FDU display unit for T4-T5 with PR222DS/P or PR222DS/PD	55051

Automatic transfer switch - ATS010

Type	1SDA0.....R1
ATS010 for T4 and T5	52927

Dialogue unit PR222DS/PD

Type	1SDA0.....R1
	T4-T5
LSI	55066
LSIG	55067

Note: To be specified only in addition to the code of the automatic circuit-breaker, with analogous overcurrent release (PR222DS/P). To order the release separately, see page 7/14 and 7/18.

7

Accessories for electronic releases

Type	1SDA0.....R1
Connector X4 release tripped signal and neutral protection for plug-in or withdrawable with PR222DS T4-T5	55062
Connector X3 release tripped signal for plug-in or withdrawable with PR222DS T4-T5	55061
Connettor X4 release tripped signal for fixed with PR222DS T4-T5	55060
Connettor X3 release tripped signal for fixed with PR222DS T4-T5	55059
CT for withd. external neutral - T4 320	55055
CT for withd. external neutral - T4 250	55054
CT for withd. external neutral - T4 160	55053
CT for withd. external neutral - T4 100	55052
CT for withd. external neutral - T5 400	55057
CT for withd. external neutral - T5 320	55056
CT for withd. external neutral - T5 630	55058
TT1 - Test unit for T2, T4, T5 with electronic release	37121
PR010/T - Test and configuration unit for T4 and T5 with PR222DS/P, PR222DS/PD or PR222MP electronic releases	48964
PR020/K - Signalling unit for T4 and T5 with PR222DS/PD or PR222MP electronic releases	53337




Due to possible developments of standards as well as of materials, the characteristics and dimensions specified in the present catalogue may only be considered binding after confirmation by ABB SACE.

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