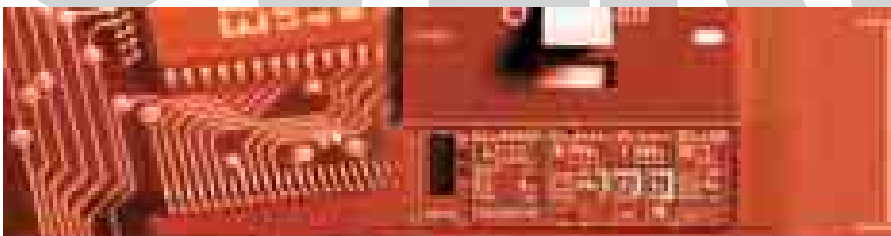


Low voltage moulded-case
circuit-breakers up to 630 A

1SDC210004D0204



OVERVIEW



MAIN CHARACTERISTICS



THE RANGES



ACCESSORIES



CHARACTERISTIC CURVES AND TECHNICAL INFORMATION



WIRING DIAGRAMS



OVERALL DIMENSIONS



ORDERING CODES



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.**



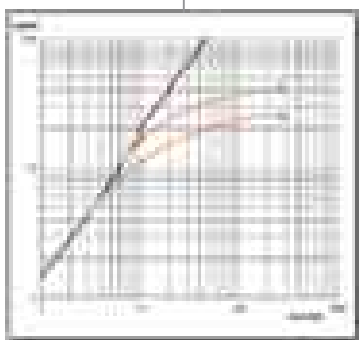
The Tmax T4 and T5 circuit-breakers have obtained the prestigious "INTEL Design 2003 - Augusto Morello award" in the Product Technologies and Production processes section.





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, I_{cs} at 100% of I_{cu}

and high limitation of the specific let-through energy.

Being free is also all this.

Temperature

Tmax

Enter





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.



Genio

Dark



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





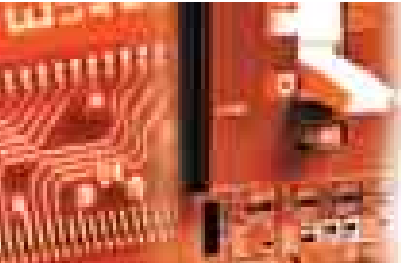
Main characteristics

1

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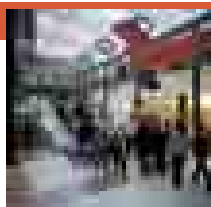
Overview of the Tmax family	1/2
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Construction characteristics	
Modularity of the series	1/6
Distinguishing features of the series	1/8





Overview of the Tmax family

1



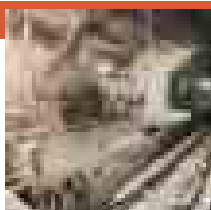
Circuit-breakers for distribution AC-DC

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



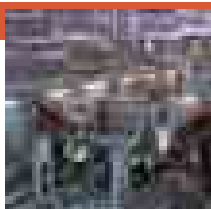
Circuit-breakers for motor protection

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**

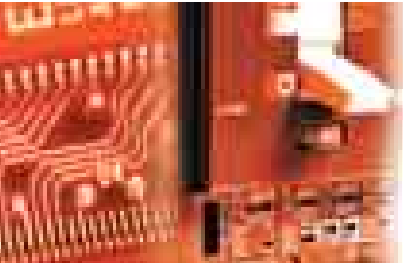
160	250	250	400
3	3	3	3
690	690	690	690
■	■	■	
■		■	■
		■	■

T4**T5**

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

T1D**T3D****T4D****T5D**

160	250	250/320	400/630
125	200	250/320	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

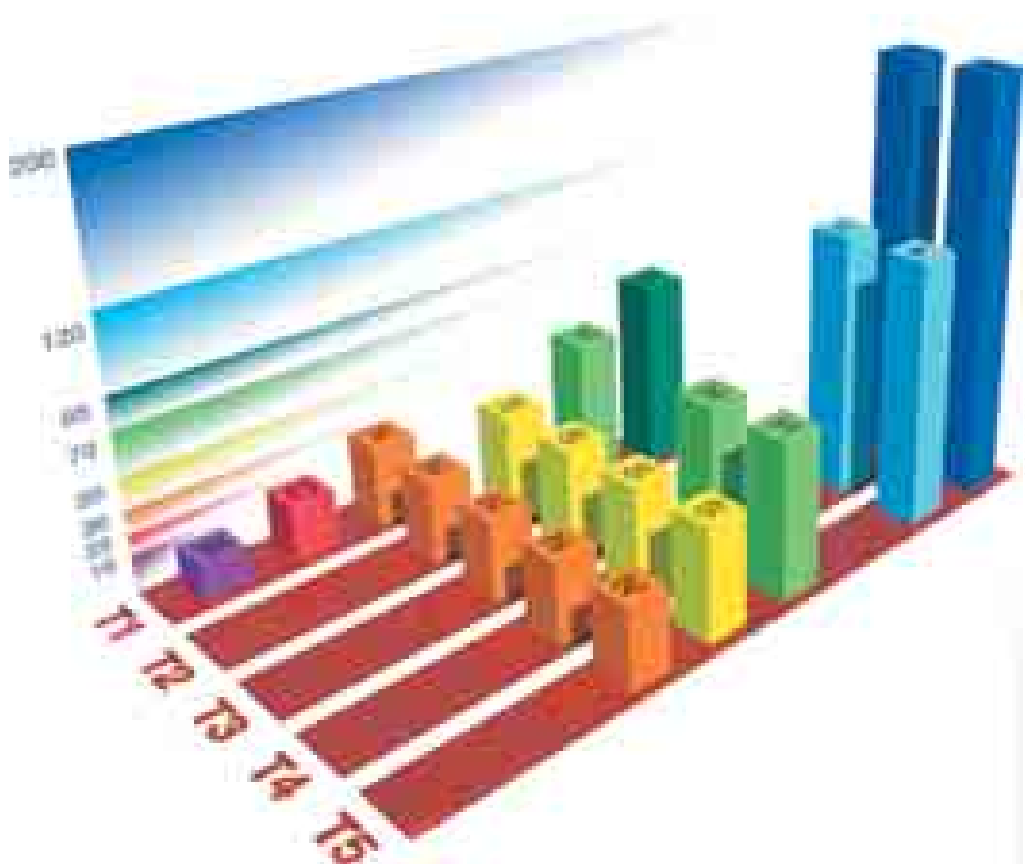


General

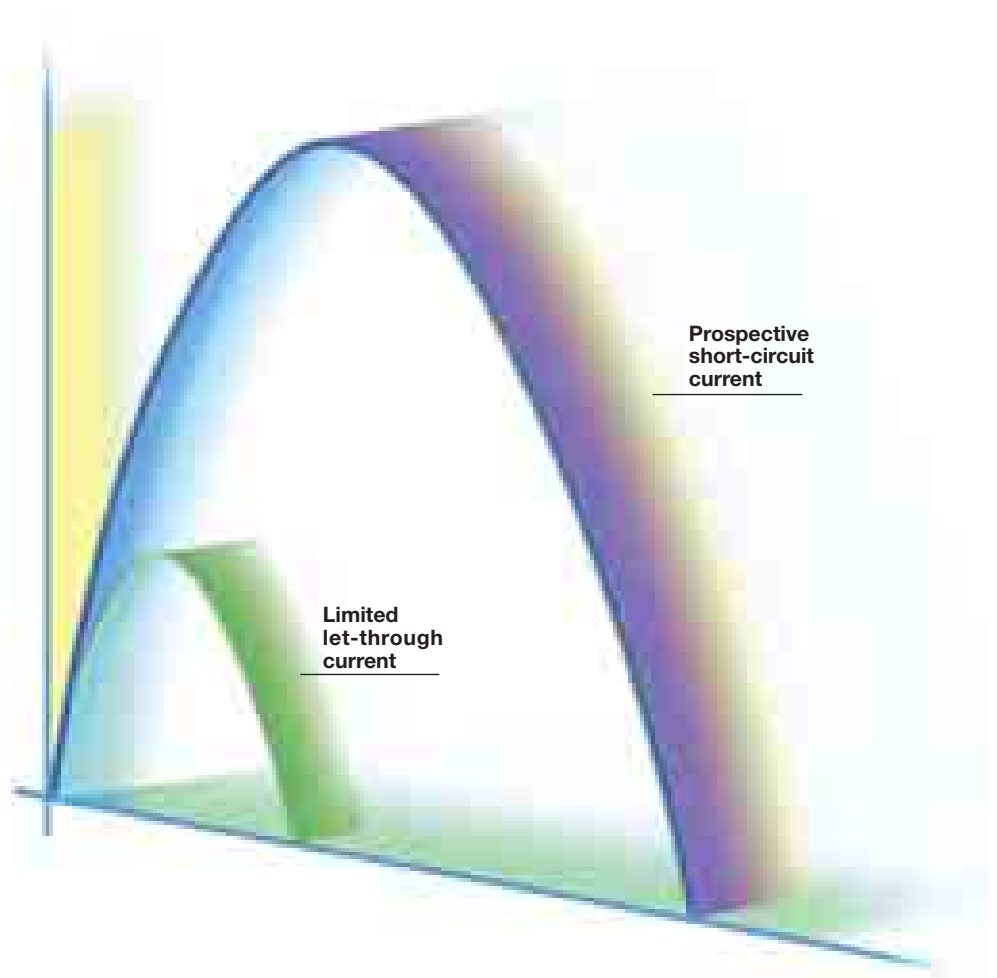
ABB SACE's Tmax moulded-case circuit-breakers come in five sizes: T1, T2, T3, T4 and T5, able to cover a range of service currents from 1 to 630 A. All the circuit-breakers, both three-pole and four-pole, are available in the fixed version; the sizes T2, T3, T4 and T5 in the plug-in version and T4 and T5 in the withdrawable one as well.

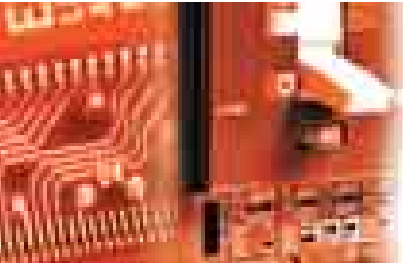
With the same overall dimensions, the circuit-breakers in the Tmax family, are available with different breaking capacities at 380/415 V, indicated by the following letters:

- 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



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

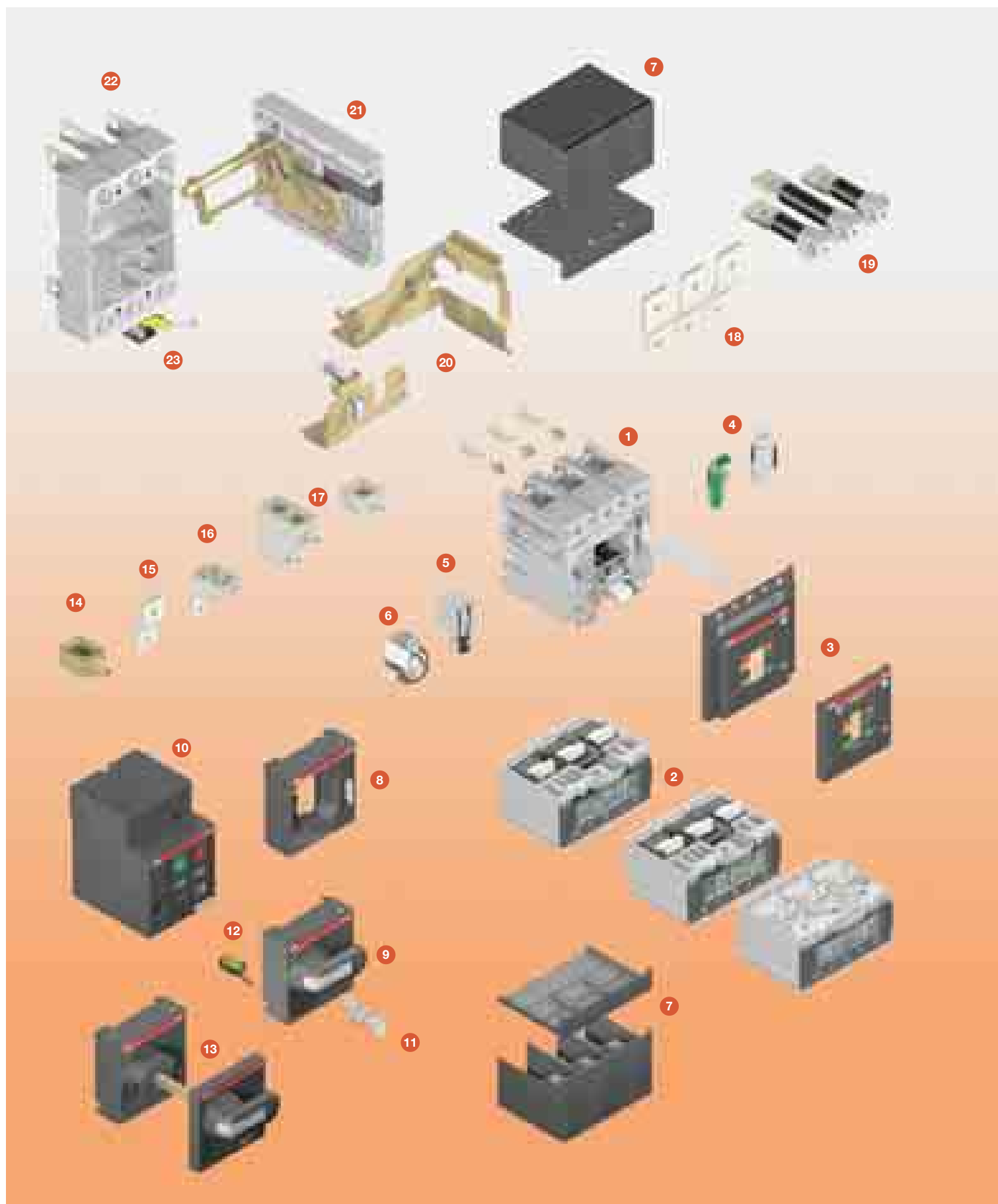


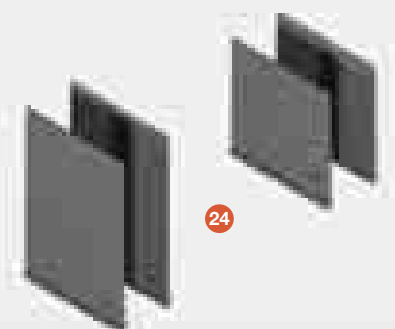


Construction characteristics

Modularity of the series

1





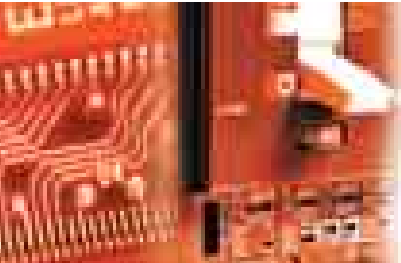
Starting from the fixed version circuit-breaker, all the other versions used for various requirements are obtained by means of mounting conversion kits.

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.



Construction characteristics

Distinguishing features of the series

1

Double insulation

Tmax has double insulation between the live power parts (excluding the terminals) and the front parts of the apparatus where the operator works during normal operation 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).



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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.



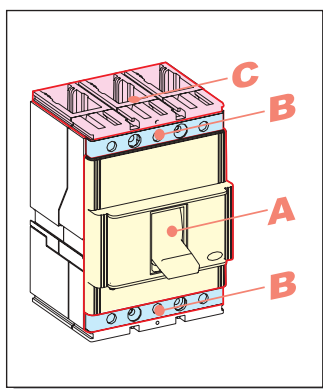
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Isolation behaviour

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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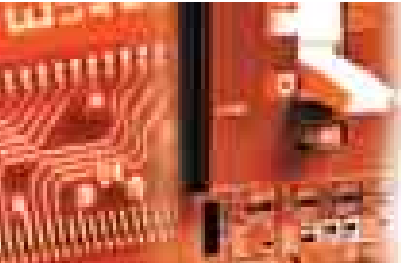
Degrees of protection

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⁽³⁾	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 ⁽³⁾ Also for front for lever operating mechanism and direct rotary handle

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

1

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.

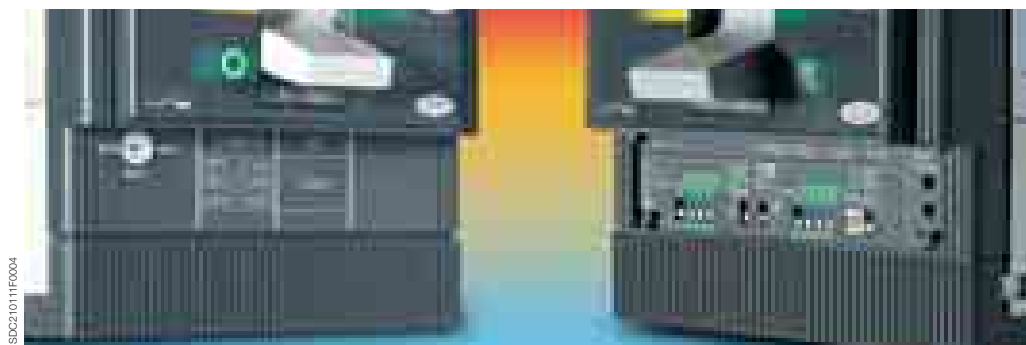
For temperatures other than +40 °C, with the same setting, there is a thermal trip threshold variation as shown in the table on page 4/46 and following.

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 perform-

ances are not guaranteed.

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



Altitude

Up to an altitude of 2000 m 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, U _e	[V~]	690	600	500	440
Rated uninterrupted current, I _u	%I _u	100	98	93	90



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.

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.



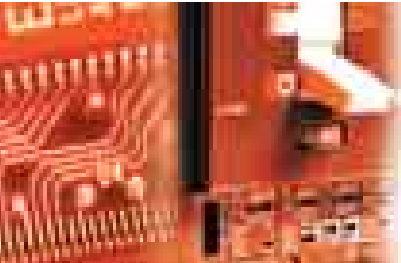
Resistance to shocks and vibrations

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

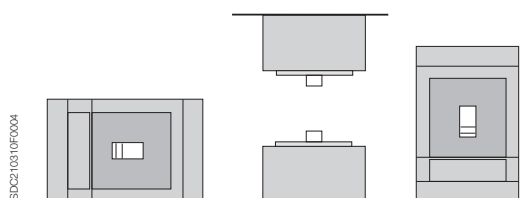
1

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.



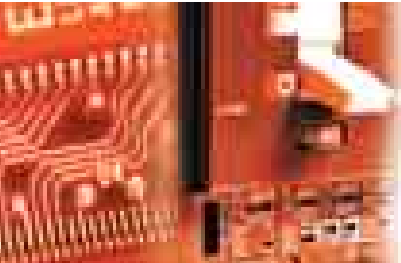
Range of accessories

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 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 500 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.



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Construction characteristics

Distinguishing features of the series

Compliance with Standards and company quality system

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) and by the Swedish certification organization SEMKO.

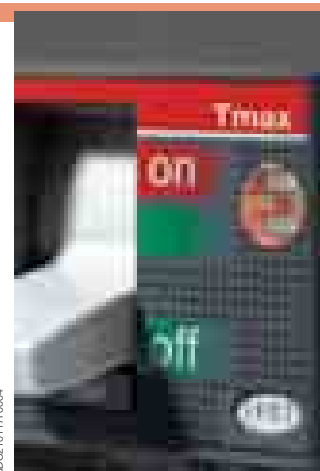
The Test Room at ABB SACE is accredited by SINAL (certificate No. 062). The Tmax series also has a range which has undergone certification according to the severe American UL 489 and CSA C22.2 Standards. Furthermore, the Tmax series is certified by the Russian GOST (Russia Certificate of Conformity) 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 9001-2000 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.

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 OHSAS 18001 (Swedish National Testing and Research Institute).



ISO 9001:2004



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Power distribution





Circuit-breakers for power distribution

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Tmax circuit-breakers for power distribution

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Circuit-breakers for power distribution

Electrical characteristics

2

				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%	75%
(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		W [mm]		25.4 (1 pole)	76		
		4 poles W [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)					-				
-				-		■ (up to 250 A)					■ (up to 500 A)				
-				■		-					-				
-				-		-					■ (up to 500 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				1.5/2		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⁾ I_{cw} = 5 kA

Notes: in the plug-in version of T2, T3 and T5, and in the withdrawable version of T5 the maximum setting is derated by 10% at 40 °C.



Circuit-breakers for power distribution

General characteristics

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 ($I_3 = 10 \times I_n$);
- T1, T2, T3 and T4 (up to 50 A) circuit-breakers equipped with TMD thermomagnetic releases with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and fixed magnetic threshold ($I_3 = 10 \times I_n$);
- T3 and T5 circuit-breakers, fitted with TMG releases for generator protection with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and fixed magnetic threshold ($I_3 = 3 \times I_n$) for T3 and adjustable magnetic threshold ($I_3 = 2.5 \dots 5 \times I_n$) for T5;
- T4 and T5 circuit-breakers with TMA thermomagnetic releases with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and adjustable magnetic threshold ($I_3 = 5 \dots 10 \times I_n$).
- 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 500 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		320	400	500
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...250
	MA	10...200
	PR221DS	100...320
	PR222DS/P	100...320
	PR222DS/PD	100...320
T5 400/630	TMG	320...500
	TMA	320...500
	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...250
	MA	10...200
T5 400/630	TMG	320...500
	TMA	320...500

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).

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.

MA								PR221DS-LS/I or I						PR222DS/P-LSI or LSI G						PR222DS/PD-LSI or LSI G						PR222MP					
10	25	52	80	100	125	160	200	100	160	250	320	400	630	100	160	250	320	400	630	100	160	250	320	400	630	100	160	200	320	400	
■	■	■	■	■	■	■	■	■	■	■				■	■	■				▲	▲	▲					■	■	■		
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	■			▲	▲	▲	■			▲	▲	▲	▲			▲	▲	▲			
											■	■					■	■					▲	▲					■	■	
											▲	▲	■			▲	▲	■				▲	▲	▲			▲	▲			



Circuit-breakers for power distribution

Thermomagnetic releases

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 500 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).

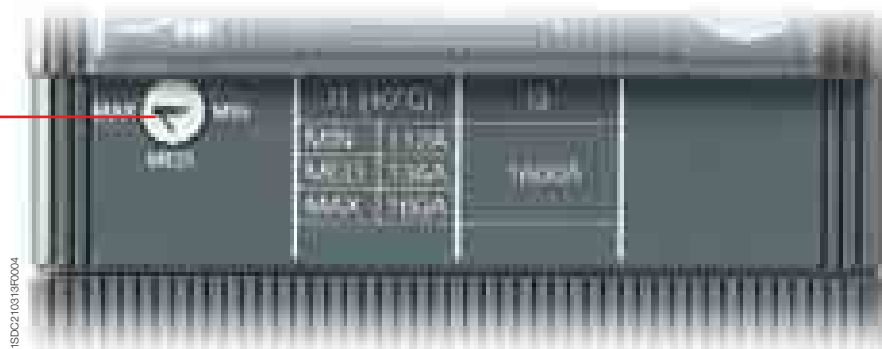
The four-pole circuit-breakers are always supplied with the neutral protected by the release and with protection of the neutral at 100% of the phase setting for settings up to 100 A. For higher settings, the protection of the neutral is at 50% of the phase setting unless the protection of the neutral at 100% of I_n is required.

Furthermore, for Tmax T3 and T5, the TMG thermomagnetic releases for generator protection are available. For T3 the release has adjustable thermal threshold ($I_1 = 0.7...1 \times I_n$) and fixed magnetic threshold ($I_3 = 3 \times I_n$), whereas for T5 the release has adjustable thermal threshold ($I_1 = 0.7...1 \times I_n$) and adjustable magnetic threshold ($I_3 = 2.5... 5 \times I_n$).

Thermomagnetic release TMD and TMG (for T3)

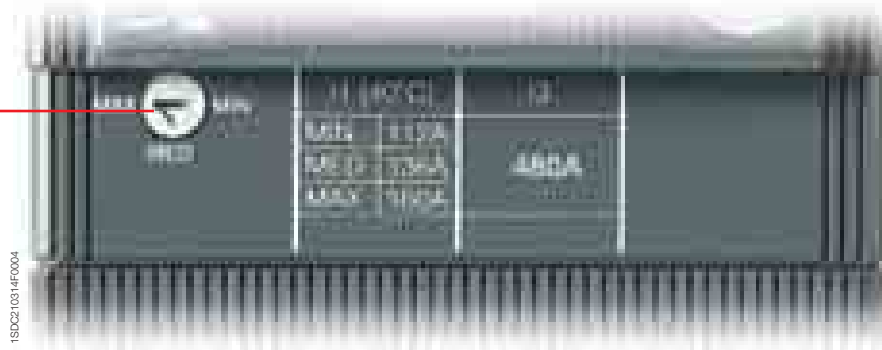
Thermal threshold

Adjustable from 0.7 to $1 \times I_n$



Thermal threshold

Adjustable from 0.7 to $1 \times I_n$



TMD = thermomagnetic release with adjustable thermal threshold ($I_1 = 0.7...1 \times I_n$) and magnetic fixed threshold.
 TMG (for T3) = thermomagnetic release for generator protection with adjustable thermal threshold ($I_1 = 0.7...1 \times I_n$) and fixed magnetic threshold

Thermomagnetic release TMF for T1B 1p



TMF - T1 1p

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

TMF = thermomagnetic release with fixed thermal and magnetic threshold.

TMD - T1 and T3

	I_n [A]	16 ⁽¹⁾	20 ⁽¹⁾	25 ⁽²⁾	32	40	50	63	80	100	125	125	160	200	250
$I_1 = 0.7 \dots 1 \times I_n$	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 [A]	500	500	500	500	500	500	630	800	1000	1250	1250	1600	2000	2500
$I_3 = 10 \times I_n$	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

 I₁=0.7...1 x I_n	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
 I₃ = 10 x I_n	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_n [A]	63	80	100	125	160	200	250
$I_1 = 0.7 \dots 1 \times I_n$	Neutral [A] - 100%	63	80	100	125	160	200	250
	I_3 [A]	400	400	400	400	480	600	750
$I_3 = 3 \times I_n$	Neutral [A] - 100%	400	400	400	400	480	600	750

Notes: ⁽¹⁾ only T1B ⁽²⁾ only T1B and T1C

- I_n 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 $I_1 = 0.7 \dots 1 \times I_n$. 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 $\pm 20\%$ 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.

Circuit-breakers for power distribution

Thermomagnetic releases

Thermomagnetic release TMA and TMG (for T5)

TMA



TMG

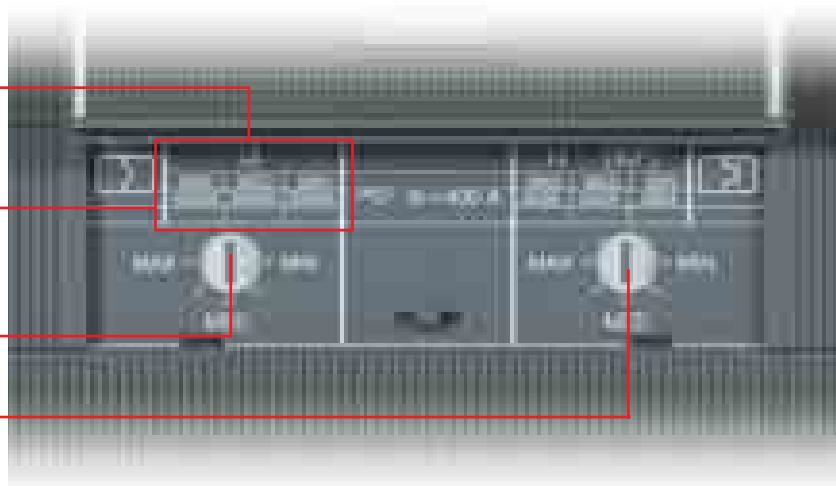


Magnetic threshold

Adjustable

Thermal threshold

Adjustable from 0.7 to 1 x I_n



1SD0210315F0004

TMA = thermomagnetic release with adjustable thermal threshold ($I_t = 0.7 \dots 1 \times I_n$) and adjustable magnetic threshold ($I_3 = 5 \dots 10 \times I_n$)

TMG (for T5) = thermomagnetic release for generator protection with adjustable thermal threshold ($I_t = 0.7 \dots 1 \times I_n$) and adjustable magnetic threshold ($I_3 = 2.5 \dots 5 \times I_n$)

TMD/TMA - T4

 I₁ = 0.7...1 x I_n	In [A]	20	32	50	80	100	125	160	200	250
	Neutral [A] - 100%	20	32	50	80	100	125	160	200	250
	Neutral [A] - 50%	-	-	-	-	-	80	100	125	160
 I₃ = 10 x I_n I₃ = 5...10 x I_n	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
	Neutral [A] - 100%	320	320	500	400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500
	Neutral [A] - 50%	-	-	-	-	-	400...800	500...1000	625...1250	800...1600

TMA - T5

 I₁ = 0.7...1 x I_n	In [A]	320	400	500
	Neutral [A] - 100%	320	400	500
	Neutral [A] - 50%	200	250	320
 I₃ = 5...10 x I_n	I ₃ [A]	1600...3200	2000...4000	2500...5000
	Neutral [A] - 100%	1600...3200	2000...4000	2500...5000
	Neutral [A] - 50%	1000...2000	1250...2500	1600...3200

TMG - T5

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

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 $I_t = 0.7 \dots 1 \times I_n$. The set current value which is obtained using the special selector is intended at 40°C. The magnetic element has adjustable trip threshold ($I_3 = 5 \dots 10 \times I_n$ for TMA and $I_3 = 2.5 \dots 5 \times I_n$ for TMG) with a tolerance of $\pm 20\%$ according to what is indicated in the Norma IEC 60947-2 (pos. 8.3.3.1.2) Standard.



Circuit-breakers for power distribution

Electronic releases

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 electro-magnetic 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

The protection releases are made up of the current transformers (three or four depending on the number of conductors to be protected), the PR221DS, PR222DS/P or PR222DS/PD protection unit and of a trip coil with demag-

netisation 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



Circuit-breakers for power distribution

Electronic releases

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 ($I_3 = 1 \dots 10 \times I_n$) 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 $I_1 = 0.4 \dots 1 \times I_n$ 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 $6 \times I_1$ and 6s at $6 \times I_1$.

On the other hand, with Tmax T4 and T5, protection L can be set manually at $I_1 = 0.4 \dots 1 \times I_n$ with 16 thresholds by means of a dip switch on the front of the circuit-breaker and it is possible to select between 2 different

trip curves 3s at $6 \times I_1$ and 12s at $6 \times I_1$. 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 $I_n = 100$ 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 $I_1 = I_n \times (0.4 + 0.32 + 0.08) = 100 \times (0.4 + 0.32 + 0.08) = 80$ 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 correspondence of "S" protection, then the dip switches in correspondence with 1 and 2 must be moved so that $I_2 = I_n \times (1 + 2) = 100 \times (1 + 2) = 300$ A.

To select curve 0.25s, the dip switch in correspondence with t2 must be moved downwards.

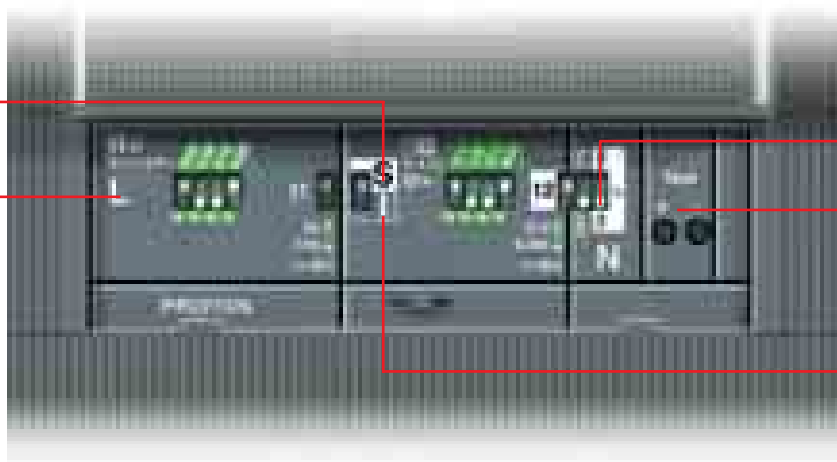
PR221DS-LS/I

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 ($I^2t = \text{const}$) can be set, $I_2 = 1 \dots 10 \times I_n$ 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. The protection time delay can be selected by adjusting the dip switches on one of the two available curves (0.1s at $8 \times I_n$, 0.25s at $8 \times I_n$).

The protection function against instantaneous short-circuit I can be adjusted to $I_3 = 1 \dots 10 \times I_n$ 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 ($I_n = 100 \text{ A}$), 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. These are available by ordering kits of auxiliary contacts specifically for T2 with electronic release (see page 3/18).

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
 NOT EXCLUDABLE	 $I_1 = 0.40 - 0.44 - 0.48 - 0.52 - 0.56 - 0.60 - 0.64 - 0.68 - 0.72 - 0.76 - 0.80 - 0.84 - 0.88 - 0.92 - 0.96 - 1 \times I_n$ Release between $1.1 \dots 1.3 \times I_1$ (T4-T5) Release between $1.05 \dots 1.30 \times I_1$ (T2) (IEC 60947-2)	at $6 \times I_1$ $t_1 = 3\text{s}$ Tolerance: $\pm 10\%$ up to $6 \times I_n$ (T4-T5) $\pm 10\%$ up to $2 \times I_n$ (T2) $\pm 20\%$ above $6 \times I_n$ (T4-T5) $\pm 20\%$ above $2 \times I_n$ (T2)
 EXCLUDABLE	 $I_2 = 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4.5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 8.5 - 9 - 10 \times I_n^{(1)}$ Tolerance: $\pm 10\%$ (T4-T5) $\pm 10\%$ up to $2 \times I_n$ (T2) $\pm 20\%$ above $2 \times I_n$ (T2)	at $8 \times I_n$ $t_2 = 0.1\text{s}$ at $8 \times I_n$ $t_2 = 0.25\text{s}$ Tolerance: $\pm 10\%$ up to $6 \times I_n$ (T4-T5) $\pm 20\%$ above $6 \times I_n$ (T4-T5) $\pm 20\%$ (T2)
 EXCLUDABLE	 $I_3 = 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4.5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 8.5 - 9 - 10 \times I_n$ Tolerance: $\pm 10\%$ (T4-T5) $\pm 20\%$ (T2)	instantaneous

⁽¹⁾ For T4 $I_n=320 \text{ A}$ and T5 $I_n=630 \text{ A} \Rightarrow I_{2,\text{max}} = 8.5 \times I_n$



Circuit-breakers for power distribution

Electronic releases

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 $I_L = 0.4 \dots 1 \times I_n$ 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 $I_L = 0.4 \dots 1 \times I_n$ with 61 thresholds (steps of $0.01 \times I_n$). Furthermore, it is possible to select among four different trip curves: 3s at $6 \times I_L$, 6s at $6 \times I_L$, 9s at $6 \times I_L$, 12s at $6 \times I_n$ for T4 $I_n = 320$ A and T5 $I_n = 630$ A and 18s at $6 \times I_L$ for all the other settings.

Otherwise it is also possible to set the trip time to $6 \times I_L$ electronically between 3 and 18s with 31 thresholds (step of 0.5s), except for T4 $I_n = 320$ A and T5 $I_n = 630$ 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 ($I^2t = \text{const}$) or with definite time, can be set to $I_2 = 0.6 \dots 10 \times I_n$ 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 $I_2 = 0.6 \dots 10 \times I_n$ 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 $8 \times I_n$, 0.1s at $8 \times I_n$, 0.25s at $8 \times I_n$ or 0.5s at $8 \times I_n$) or electronically by means of PR010T between 0.05 and 0.5s at $8 \times I_n$ with 46 thresholds (steps of 0.01s). The function of protection against instantaneous short-circuit I is adjustable to $I_3^{(1)} = 1.5 \dots 12 \times I_n$ with 15 thresholds and the possibility of excluding the protection, can be set by means of dip switches, or with the SACE PR010T at $I_3^{(1)} = 1.5 \dots 12 \times I_n$ with 86 thresholds (steps of $0.1 \times I_n$).

The function of protection against earth fault G is adjustable either manually, by means of dip switches, to $I_4 = 0.2 \dots 1 \times I_n$ with 7 thresholds and the possibility of excluding the protection, or elec-

tronically by means of the SACE PR010T to $I_4 = 0.2 \dots 1 \times I_n$ with 81 thresholds (steps of $0.01 \times I_n$). It is also possible to select among four different trip curves: 0.1s at $3.15 \times I_4$, 0.2s at $2.25 \times I_4$, 0.4s at $1.6 \times I_4$ and 0.8s at $1.10 \times I_4$, 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 to 100% 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 $0.9 \times I_L$. It is also possible to transmit remotely the alarm of protection L, simply connecting connector X3 to the dedicated contact.

⁽¹⁾ For T4 $I_n = 320$ A and T5 $I_n = 630$ A $\Rightarrow I_{3\text{max}} = 10 \times I_n$

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 I_n 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) ⁽³⁾		■
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) ⁽⁴⁾		■
Events		
Changes in circuit-breaker state, in the protections and all the alarms		■

⁽¹⁾ With PR010/T unit

⁽²⁾ Typical contact: MOS photo Vmax: 48 V DC/30 V AC
Imax: 50 mA DC/35 mA AC

⁽³⁾ Available with AUX-E electronic auxiliary contacts

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

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

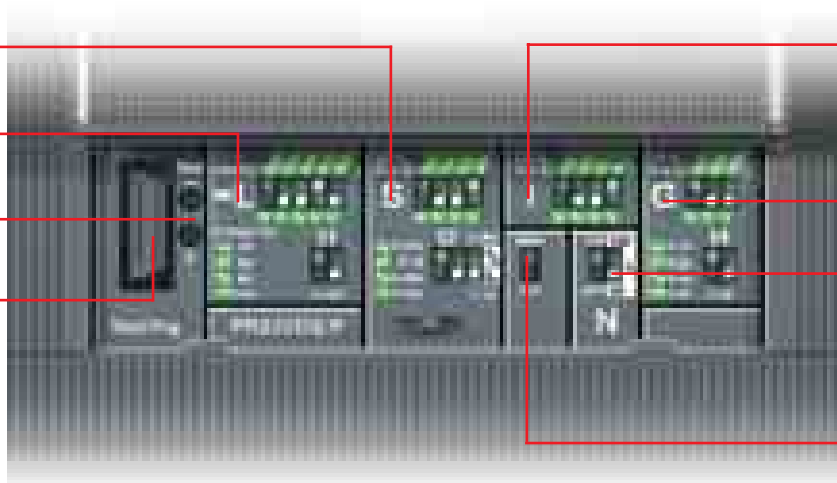
Against short-circuit
with instantaneous trip

Protection G

Against earth fault

Dip-switches for
setting the neutral

Selection for electronic
or manual setting



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

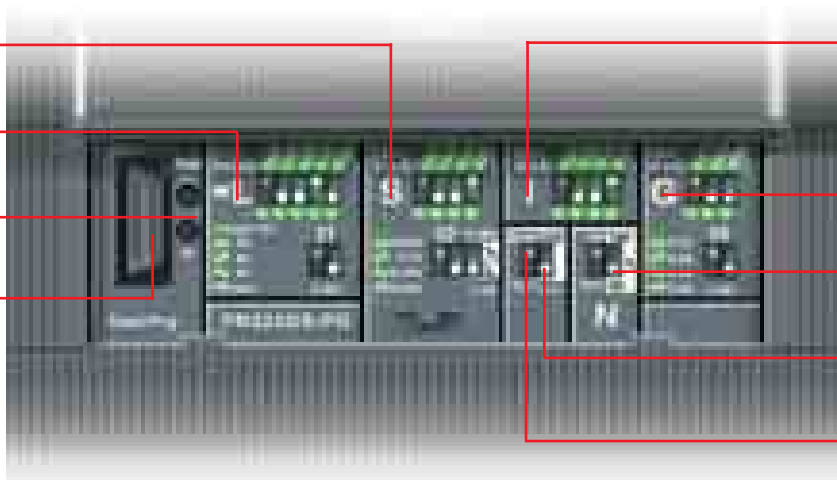
Protection G

Against earth fault

Dip-switches for
setting the neutral

Selection for local
or remote setting

Selection for electronic
or manual setting



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

Protection functions		Trip threshold		Trip curves			
 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 I_n	Manual setting at 6 x I_1 at 6 x I_1 at 6 x I_1 at 6 x I_1 $t_1 = 3s$ $t_1 = 6s$ $t_1 = 9s$ $t_1 = 18s^{(2)}$			
			Electronic setting $I_1=$ 0.40... 1 x I_n (step 0.01 x I_n) 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%			
 ⁽¹⁾ EXCLUDABLE	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time ($I^2t=$ constant) or definite time	 $I^2t=const$ ON	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 I_n	Manual setting at 8 x I_n at 8 x I_n at 8 x I_n at 8 x I_n $t_2 = 0.05s$ $t_2 = 0.1s$ $t_2 = 0.25s$ $t_2 = 0.5s$			
			Electronic setting $I_2 =$ 0.60... 10 x I_n (step 0.1 x I_n) Tolerance: ± 10%	Electronic setting at 8 x I_n $t_2 = 0.05...0.5s$ (step 0.01s) Tolerance: ± 10% ⁽⁴⁾			
		 $I^2t=const$ OFF	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 I_n	Manual setting $t_2 = 0.05s$ $t_2 = 0.1s$ $t_2 = 0.25s$ $t_2 = 0.5s$			
			Electronic setting $I_2 =$ 0.60... 10 x I_n (step 0.1 x I_n) Tolerance: ± 10%	Electronic setting $t_2 =$ 0.05...0.5s (step 0.01s) Tolerance: ± 10% ⁽⁴⁾			
 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 I_n ⁽³⁾	instantaneous			
			Electronic setting $I_3 =$ 1.5... 12 x I_n (step 0.1 x I_n) ⁽³⁾ Tolerance: ± 10%				
 ⁽¹⁾ 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 I_n	Manual setting up to 3.15 x I_4 up to 2.25 x I_4 up to 1.6 x I_4 up to 1.10 x I_4 $t_4 = 0.1s$ $t_4 = 0.2s$ $t_4 = 0.4s$ $t_4 = 0.8s$			
			Electronic setting $I_4 =$ 0.2... 1 x I_n (step 0.01 x I_n) Tolerance: ± 10%	Electronic setting $t_4 =$ 0.1...0.8 x I_n (step 0.01s) Tolerance: ± 15%			

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

	Trip time
S	$\pm 20\%$
G	$\pm 20\%$

⁽²⁾ for T4 In = 320 A and T5 In = 630 A $\Rightarrow t_1 = 12s$

⁽³⁾ for T4 In = 320 A and T5 In = 630 A $\Rightarrow I_{2\text{max}} = 8.8 \times I_n$ and $I_{3\text{max}} = 9.5 \times I_n$

⁽⁴⁾ tolerance: $\pm 10\text{ ms}$

Motor Protection





Circuit-breakers for motor protection

Index

Tmax circuit-breakers for motor protection

Electrical characteristics	2/20
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Integrated protection: PR222MP	2/24



Circuit-breakers for motor protection

Electrical characteristics

2

			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		W [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) ⁽¹⁾ - A (630 A)				
■			■					■				
IEC 60947-2			IEC 60947-2					IEC 60947-2				
■			■ (up to 200 A)					-				
-			■					■				
-			■					■				
-			■					■				
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				
1.5			2.35					3.25				
2.7			3.6					5.15				
-			3.85					5.4				

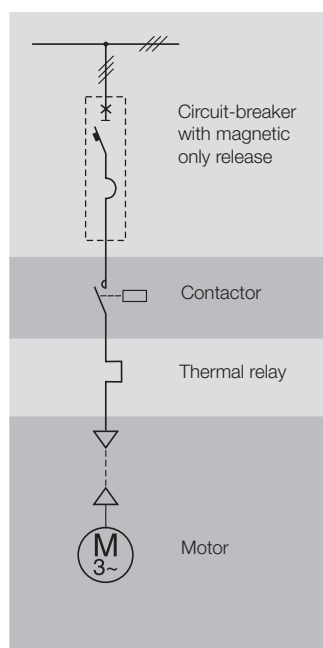
Notes: In the plug-in version of T2, T3 and T5, and in the withdrawable version of T5 the maximum setting is derated by 10% at 40 °C.



Circuit-breakers for motor protection

Protection against short-circuit

2



Protection against short-circuit

General characteristics

Starting, switching and protection of three-phase asynchronous motors are basic operations for their correct use.

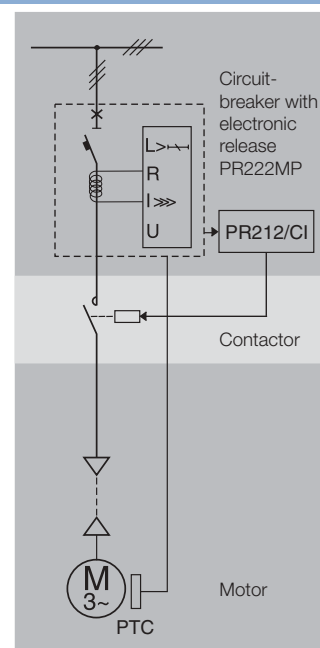
ABB SACE proposes two different solutions for this type of application:

- 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, $I_s = 13 \times I_n$ up to $I_n = 12.5$ 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.



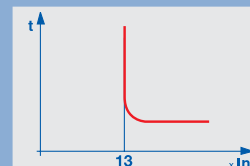
MF - Fixed magnetic only releases

Tmax T2

	In [A]	1	1.6	2	2.5	3.2	4	5	6.5	8.5	11	12.5
$I_3 = 13 \times I_n$	$I_3 = 13 \times I_n$	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 $13 \times I_n$, according to what is indicated in the table.



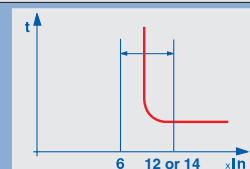
MA - Adjustable magnetic only releases

Tmax T2-T3-T4

	In [A]	10	20	25	32	52	80	100	125	160	200
$I_3 = 6...12 \times I_n$	Tmax T2		■		■	■	■	■			
$I_3 = 6...14 \times I_n$	Tmax T3							■	■	■	■
	Tmax T4	■		■		■	■	■	■	■	■
	Tmax T2, T3										
$I_3 = 6...12 \times I_n$		-	120...240	-	192...384	314...624	480...960	600...1200	750...1500	960...1920	1200...2400
	Tmax T4										
$I_3 = 6...14 \times I_n$		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 threshold I_3 which can be adjusted from 6 to $12 \times I_n$ for T2 and T3 and from 6 to $14 \times I_n$ 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,

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

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.

PR221DS-I - Protection functions and parameterisation

Protection function



Against short-circuit with adjustable instantaneous trip



Trip threshold

$I_3 = 1 - 1.5 - 2 - 2.5 - 3 - 3.5 - 4.5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 8.5 - 9 - 10 \times I_n$

Tolerance $\pm 20\%$ (T2)
 $\pm 10\%$ (T4-T5)

Trip curves

instantaneous



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.



2

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

PR222MP - Electronic overcurrent releases

Tmax T4-T5

	In [A]	100	160	200	320	400
	T4 250 N, S, L	■	■	■		
	T5 400 N, S, L				■	■
 I ₁ [A]		40...100	64...160	80...200	128...320	160...400
 I ₂ [A]		3...10 x I ₁				
 I ₃ [A]		600...1300	960...2080	1200...2600	1920...4160	2400...5200
 I ₄ [A]		0.4 x I ₁				

In any case, the PR010/T unit for testing the release and checking the protection functions, and the PR021/K signalling unit are available for the PR222MP release.

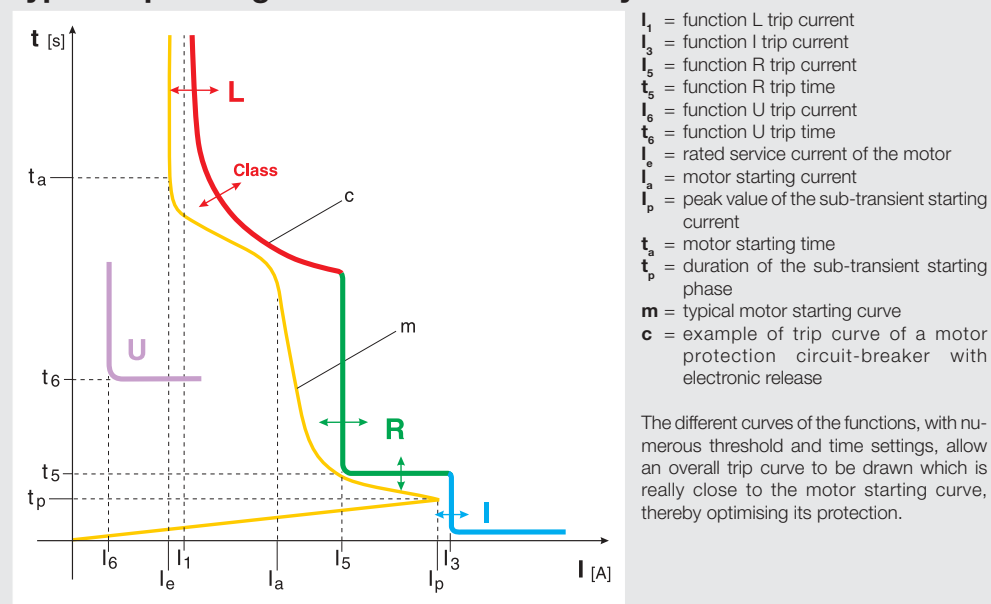
The electronic releases are self-supplied and are made up of three current transformers, the PR222MP protection unit and a trip coil which acts directly on the circuit-breaker operating mechanism. The current transformers, housed inside the release box, supply the energy and the signal required for correct protection operation. Operation is guaranteed with a single-phase current equal to 18% 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

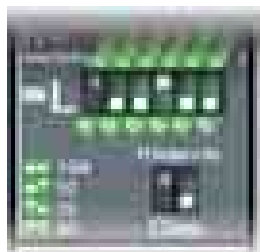




Circuit-breakers for motor protection

Integrated protection: PR222MP

2



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Protection functions

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.

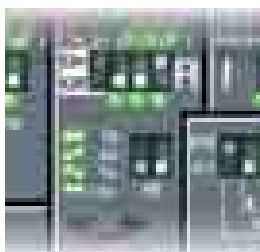
Function L, which cannot be excluded, can be set manually to $I_1=0.4...1 \times I_n$ with 60 thresholds which can be set by means of the dip-switches on the front of the release, or electronically by means of the SACE PR010T test and configuration unit.

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 $7.2 \times I_n$. 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 is equal to $0.9 \times I_1$ and the LED is permanently lit, whereas it flashes in case of alarm ($I > 1.05s \times I_1$).

It is also possible to transmit remotely the alarm of protection L, simply by connecting connector X3 to the dedicated contact.



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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_s time.

In the latter case, protection R is already active and the protection tripping time will be equal to t_s . The protection intervenes when at least one of the phase currents exceeds the established value and remains over that threshold for time t_s .

Function R can be set manually $I_s = 3...10 \times I_1$ 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 $0.1 \times I_1$). The trip time t_s 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.

Function I: protection against short-circuit

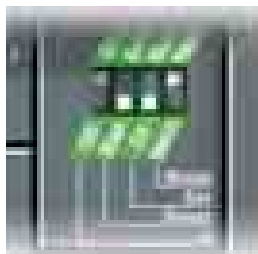
This protection function intervenes in the case of a short-circuit between phases. It is sufficient for just a single phase to exceed the set threshold to cause immediate opening of the circuit-breaker (protection cannot be excluded).

The PR222MP trip unit is able to recognize whether the motor to be protected is in the start-up phase or if there is a short-circuit: this is to allow starting in completely safe conditions.

Tripping of this protection makes the circuit-breaker open.



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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_l 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_l 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.

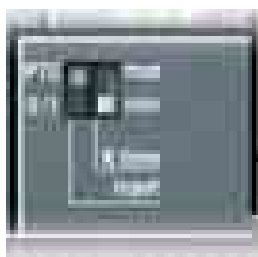
Reset Mode

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.



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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: in this mode - alternative to protection by means of PTC probe - by means of the SACE PR021/K signalling unit (see page 3/34), it is possible to signal the state of a generic potential free contact (see page 5/15 for the electric diagram).



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

Selection between:

- PTC⁽¹⁾ temperature sensor input
- 0/1 generic input

Setting the back-up time

Setting the reset
following trip

- manual
- automatic

Protection I

Against short-circuit
with instantaneous trip

Protection U

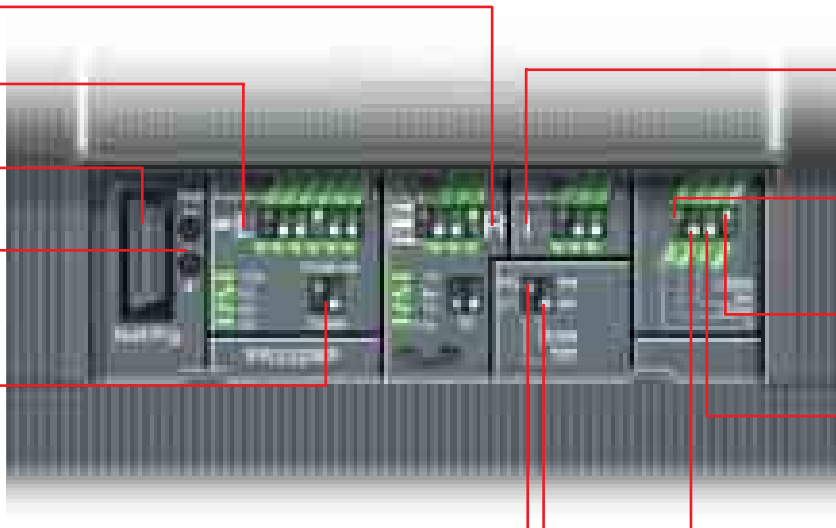
Against phase
current unbalance or
loss of phase

Setting the work methods

Man/Elt

Release parametrisation
methods

1SD2210185F0004



⁽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
 NOT EXCLUDABLE Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve	 Manual setting $I_1 = 0.4 \dots 1 \times I_n$ with step $0.01 \times I_n$ Electronic setting $I_1 = 0.4 \dots 1 \times I_n$ with step $0.01 \times I_n$ Tolerance: $\pm 15\%$	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 $7.2 \times I_1$ cold, depending on the class selected Electronic setting $t_1 = 4 \dots 24s$ (step 1s) Tolerance: $\pm 15\%$
 EXCLUDABLE Against rotor block with delayed trip and trip characteristic with definite time	 Manual setting $I_5 = \text{OFF} - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 \times I_1$ Electronic setting $I_5 = \text{OFF} - 3 \dots 10 \times I_1$ (step $0.1 \times I_1$) Tolerance: $\pm 15\%$	Manual setting $t_5 = 1 - 4 - 7 - 10 s$ Electronic setting $t_5 = 1 \dots 10s$ (step 0.5s) Tolerance: $\pm 10\%$
 NOT EXCLUDABLE Against short-circuit with adjustable instantaneous trip	 Manual setting $I_3 = 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 \times I_n$ Electronic setting $I_3 = 6 \dots 13 \times I_n$ (step $0.1 \times I_n$) Tolerance: $\pm 15\%$	instantaneous instantaneous
 EXCLUDABLE ⁽¹⁾ Against phase current unbalance or loss of phase with inverse long time delay trip and trip characteristic with definite time	 Manual setting $I_6 = \text{ON} (0.4 \times I_1) - \text{OFF}$ Electronic setting $I_6 = 0.4 \dots 0.9 \times I_1 - \text{OFF}$ Tolerance: $\pm 15\%$	Manual setting $t_6 = 4s$ Electronic setting $t_6 = 1 \dots 10s$ (step 0.5s) Tolerance: $\pm 10\%$

⁽¹⁾ These tolerances hold in the following conditions:

- self-powered relay at full power and/or auxiliary supply;
- two or three-phase power supply.

In conditions other than those considered, the following tolerances hold:

	Trip time
U	$\pm 20 \%$

10000 VAC/DC





Circuit-breakers for applications up to 1000 V

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Tmax circuit-breakers for applications up to 1000 V

Electrical characteristics 2/32





Circuit-breakers for applications up to 1000 V

Electrical characteristics

In the panorama of Tmax proposal there is also the range of circuit-breakers for applications in direct current or in alternating current up to 1000 V.

The typical sectors of application are in mining installations, road and 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 those of the standard ones. The circuit-breakers are supplied in the fixed version, with high terminal covers and insulating plates. They are compatible with all the electrical accessories, except for the residual current protection release. For the circuit-breakers in the two plug-in and withdrawable versions, please ask ABB SACE.

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⁽¹⁾	L	V⁽¹⁾
(AC) 50-60 Hz 1000 V	[kA]	12	20	12	20
Rated service short-circuit breaking capacity, Ics					
(AC) 50-60 Hz 1000 V	[kA]	12%	12%	10%	10%
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) ⁽²⁾ - A (630 A)	
Isolation behaviour		■		■	
Reference Standard		IEC 60947-2		IEC 60947-2	
Electronic releases	PR221DS-LS	■		■	
	PR221DS-I	■		■	
	PR222DS-LSI	■		■	
	PR222DS-LSIG	■		■	
Interchangeability		■		■	
Mechanical life	[No. operations]	20000		20000	
	[No. hourly operations]	240		120	
Basic dimensions - fixed version	3 poles	W [mm]	105	W [mm]	140
		D [mm]	103.5	D [mm]	103.5
		H [mm]	205	H [mm]	205
Weight	fixed 3 poles	2.35		3.25	

(1) The circuit-breaker can only be supplied from above

(2) 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⁽¹⁾	V⁽¹⁾	V⁽¹⁾
(AC) 50-60 Hz 1000 V		[kA]	20	20
(DC) 1000 V, 4 poles in series ⁽³⁾		[kA]	40	40
Rated service short-circuit breaking capacity, Ics				
(AC) 50-60 Hz 1000 V		[kA]	12%	10%
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) ⁽²⁾ - A (630 A)
Isolation behaviour			■	■
Reference Standard			IEC 60947-2	IEC 60947-2
Thermomagnetic releases	TMD		■	-
	TMA		■	■ (up to 500 A)
Interchangeability			■	-
Mechanical life	[No. operations]		20000	20000
	[No. hourly operations]		240	120
Basic dimensions - fixed version	3 poles	W [mm]	105	140
	4 poles	W [mm]	140	184
		D [mm]	103.5	103.5
		H [mm]	205	205
Weight	fixed	3 poles	2.35	3.25
		4 poles	3.05	4.15

(1) The circuit-breaker can only be supplied from above

(2) I_{cs} = 5 kA

(3) See connection diagrams pag. 4/59

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

 I₁ = 0.7...1 x I_n	In [A]	32	50	80	100	125	160	200	250	400	500
	Neutral [A] - 100%	32	50	80	100	125	160	200	250	400	500
	T4 250	■	■	■	■	■	■	■	■		
	T5 400									■	
	T5 630										■
 I₃ = 10 x I_n I₃ = 5...10 x I_n	I ₃ = 10 x I _n [A]	320	500								
	I ₃ = 5...10 x I _n [A]	-	-	400...800	500...1000	625...1250	800...1600	1000...2000	1250...2500	2000...4000	2500...5000

Switch-disconnectors





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Switch-disconnectors

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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, I_{th}		[A]	160
Rated service current in category AC22, I_e		[A]	160
Rated service current in category AC23, I_e		[A]	125
Poles		[No.]	3/4
Rated service voltage, U_e	(AC) 50-60 Hz	[V]	690
	(DC)	[V]	500
Rated impulse withstand voltage, U_{imp}		[kV]	8
Rated insulation voltage, U_i		[V]	800
Test voltage at industrial frequency for 1 minute		[V]	3000
Rated short-circuit making capacity, I_{cm}	(min) switch-disconnector only	[kA]	2.8
	(max) with circuit-breaker on supply side	[kA]	187
Rated short-time withstand current for 1s, I_{cw}		[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	W [mm]	76
	4 poles	W [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
I _{cu} [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					250/320					400/630				
250					250/320					400/630				
200					250					400				
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				
1.5/2					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 70 120 200					36 50 70 120 200					36 50 70 120 200				
36 50 70 120 200					36 50 70 120 200					36 50 70 120 200				

Making capacity

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

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.



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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.

3





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.

When the circuit-breaker has electrical accessories mounted (SOR, UVR, MOS, MOE, MOE-E, AUX, AUX-E, AUE and RC222), the socket-plug connectors or the adapters for isolation of the relative auxiliary circuits must also be ordered (see page 3/23).





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 (standard supply for interlocks with factory-mounted accessories), 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.

The withdrawable version T4 and T5 circuit-breakers can only be fitted with pre-cabled electrical accessories, provided with ADP adapters suitable for isolation of the relative auxiliary circuits (see page 3/23).

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
- low terminal covers for the moving part.

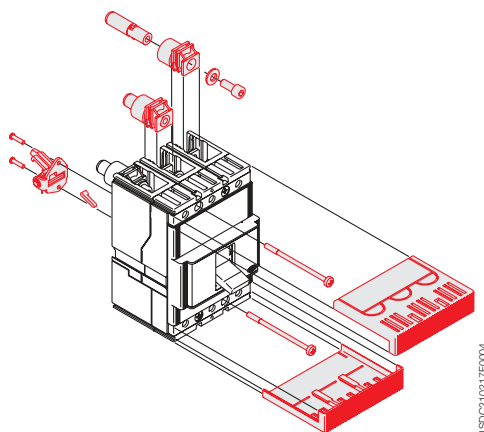
The fixed part for plug-in version is necessary to complete the circuit-breaker.



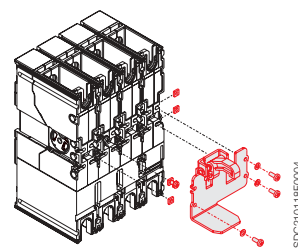
T1-T2-T3



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:

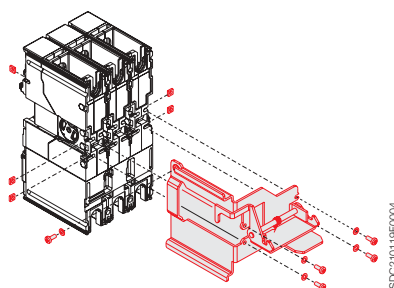
- isolating contacts
- frame
- assembly screws and nuts

– low terminal covers for the moving part.

The circuit-breakers in the withdrawable version must always be completed either with the front for lever operating mechanism (standard supply for interlocks with factory-mounted ac-

cessories), rotary handle operating mechanism or motor operator.

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





Accessories

Versions and types



1SDC210121R0004

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 the suitable 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



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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



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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.

3

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 and withdrawable circuit-breakers
- high terminal covers (HTC): these guarantee IP40 degree of protection, for fixed circuit-breakers with front, front extended, front for cables terminals.

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, 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.



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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.



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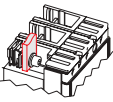
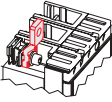
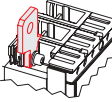
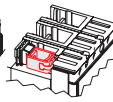
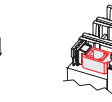
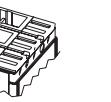
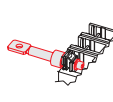
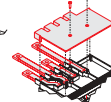
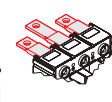
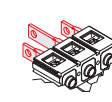
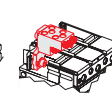
Kit for taking up the auxiliary power supply

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.



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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											

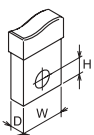
Front terminals - F



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		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



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



Accessories

Connection terminals

Front 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)



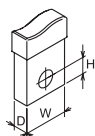
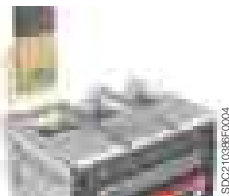
Front extended spread terminals - ES



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
 Pieces = number of busbars, cables or cable terminals

Front terminals for copper cables - FC Cu



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

Type	Version	Pieces	Cable [mm ²]		Flexible busbars W x S x N ⁽¹⁾	Tightening [Nm]		Ø [mm]	Terminal covers			Phase separators
			rigid	flexible		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	120...240	16...150	–	18	31	21.5	S	–	–	–

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



1SDC21038F0004



1SDC21038F0004

Front terminals for copper/aluminium cables - FC CuAl

T2-T5 Standard



1SDC21038F0004

T4-T5 External



1SDC21046F0004

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

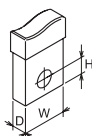
Type	Assembly	Version	Pieces	Cable [mm ²]		Tightening [Nm]		Ø [mm]	Terminal covers			Phase separators
				rigid		A	B		high	low	fixed part	
T1	external	F	1	35...95		7	13.5	14	S			
T2	standard	F - P	1	1...95			7	14	R	R	R	R
	external	F - P	1	70...185		6	25	18	S		S	
T3	standard	F - P	2	35...95		6	12	16	S		S	
	external	F - P	1	70...185			16	18	R		R	R
T4	standard	F - P	1	150...240		8	31	24	S		S	
	external	F - P	2	35...150		8	16	18	S		S	
T5	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	



1SDC21038F0004



1SDC21038F0004



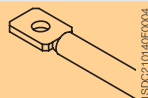
A = Tightening the terminal onto the circuit-breaker
B = Tightening the cable/busbar onto the terminal
R = On request
S = Standard
Pieces = number of busbars, cables or cable terminals



Accessories

Connection terminals

Rear orientated terminals - R

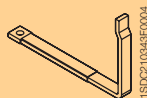


Allow connection of busbars or cable terminal at the rear. They can be installed in 4 different positions to facilitate connection to cable/busbars

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	–



Rear flat horizontal terminals for RC221/RC222 - HR

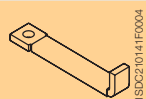


Allow connection of busbars or cable terminal at the rear with RC221/RC222. They can be installed horizontally

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)

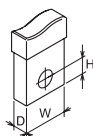
Rear flat horizontal terminals - HR



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

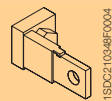
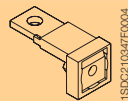
B = Tightening the cable/busbar onto the terminal

R = On request

S = Standard

Pieces = number of busbars, cables or cable terminals

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

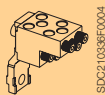


These allow connection of busbars or cable terminals at the rear. There are rear horizontal or vertical terminals.

Type	Version	Pieces	Busbars [mm]			Cable terminal [mm]		Tightening [Nm]		Terminal covers			Phase separators
			W	D	Ø	W	Ø	A	B	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	–	–	–	–	–

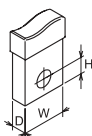


Multi-cable terminals - MC



Allow connection of cables directly to the circuit-breaker

Type	Version	Pieces	Cable [mm ²]		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
 Pieces = number of busbars, cables or cable terminals



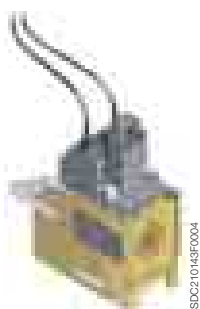
Accessories

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 1 m 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 U_n , both in alternating current and in direct current. The SOR shunt opening release is always fitted with a limit contact for cutting off the power supply in the open position and with the release tripped. For T4 and T5 in the three pole version, the pre-cabled shunt opening release can be housed in the slot of the third pole.



T1-T2-T3



T4-T5

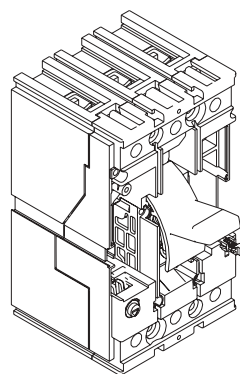
SOR - Electrical characteristics

	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...525 V AC	55		150	
Opening times [ms]	15	15	15	15

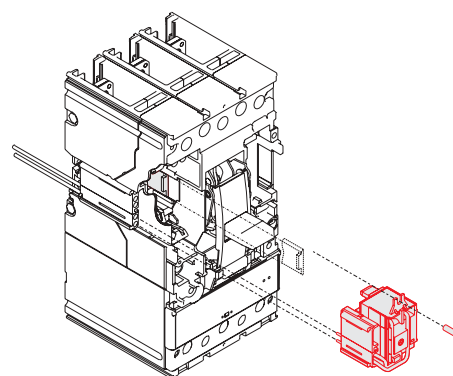
Furthermore, PS-SOR opening coils with permanent operation are also available for T4 and T5, with a much lower power consumption and these can be continuously supplied: in this case they are not, in fact, fitted with an auxiliary limit contact. Again for these coils, either the pre-cabled or uncabled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

PS-SOR - Electrical characteristics

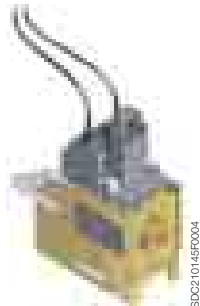
Version	Tmax T4, T5	
	AC [VA]	DC [W]
24...30 V DC		4
110...120 V AC	4	



T1-T2-T3



T4-T5



T1-T2-T3

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T4-T5

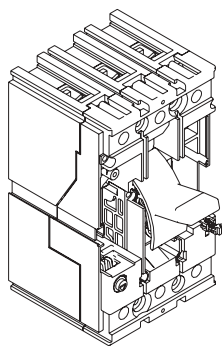
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Undervoltage release - UVR

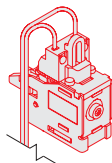
Opens the circuit-breaker due to lack of release power supply voltage or to drops to values under $0.7 \times U_n$ with a trip range from 0.7 to $0.35 \times U_n$. After tripping, the circuit-breaker can be closed again starting from a voltage higher than $0.85 \times U_n$. With the undervoltage release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

UVR - Electrical characteristics

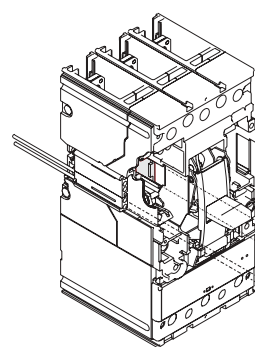
	Tmax T1, T2, T3		Tmax T4, T5	
	Power consumption during permanent operation			
Version	AC [VA]	DC [W]	AC [VA]	DC [W]
24...30 V AC/DC	1.5	1.5	6	3
48 V AC/DC	1	1	6	3
60 V AC/DC	1	1	6	3
110...127 V AC - 110...125 V DC	2	2	6	3
220...240 V AC - 220...250 V DC	2.5	2.5	6	3
380...440 V AC	3		6	
480...525 V AC	4		6	
Opening times [ms]	15	15	≤ 25	≤ 25



T1-T2-T3



1SDC210148F0004



T4-T5

1SDC210222F0004



Accessories

Service releases



1SDC210147F0004

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

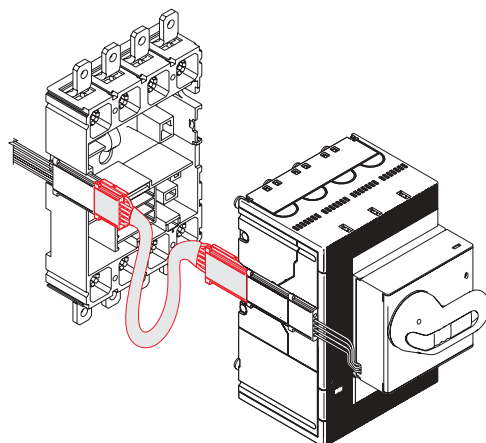
Circuit-breaker	Power supply voltage [V AC/DC]
T1...T5	24...30
T1...T5	48...60
T1...T5	110...125
T1...T5	220...250
Delay which can be set [s]	0.25 - 0.5 - 0.75 - 1 - 1.25 - 2 - 2.5 - 3

Testing extension for service releases



1SDC210125F0004

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.



1SDC210125F0004

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

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

- open/closed (Q): indicates the position of the circuit-breaker contacts
- release trip (SY): 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 (S51): 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 1 m long cables for T1, T2 and T3 or with connectors, still with 1 m long cables, for T4 and T5.

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

T1, T2, T3, T4 and T5 - 250 V 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 [1Q+1SY]
- three contacts for signalling (on changeover) open/closed plus a contact (on changeover) for release trip [3Q+1SY].



AUX - 250 V AC/DC



AUX-C - 250 V AC/DC



AUX 400 V AC

AUX - Electrical characteristics

AUX 250 V - T1, T2, T3, T4 and T5

Power supply voltage	Service current	
	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

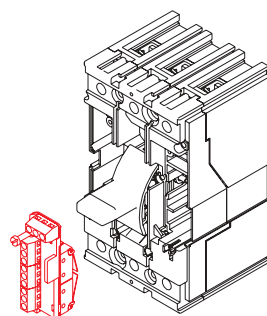
Power supply voltage	Service current In [A]	
	AC	DC
125 V	–	0.5
250 V	12	0.3
400 V	3	–

AUX 24 V - T1, T2, T3, T4 and T5

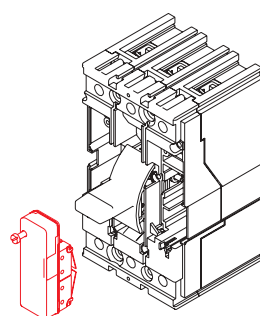
Power supply voltage	Service current In [A]	
	AC	DC
24 V	0.3	≥ 0.75 mA
5 V		≥ 1 mA

AUX-E

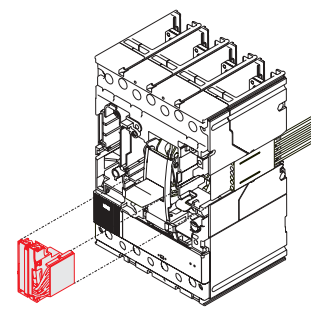
Typical contact	photoMOS
Vmax	300V DC/250 V AC
Imax	100 mA AC/DC
Pmax (resistive load)	30 W
Insulation voltage	3500 V (1 min. and 50 Hz)



AUX 250 V AC/DC



AUX-C 250 V AC/DC



AUX 400 V AC



Accessories

Electrical signals

T4 and T5 - 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 [1Q+1SY]
- two contacts for signalling (on changeover) open/closed [2Q].

T1, T2, T3, T4 and T5 - 24 V AC/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 [3Q+1SY].

T2 with PR221DS electronic release (AUX 250 V AC/DC)

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 [1S51+1Q+1SY].
- two open/closed signalling contacts plus one release tripped signalling contact (on changeover) [2Q+1SY]

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 [1S51].

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 (on changeover) an open/closed signal available to the outside and one (on changeover) for electronic release trip [1Q+1SY]. 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.

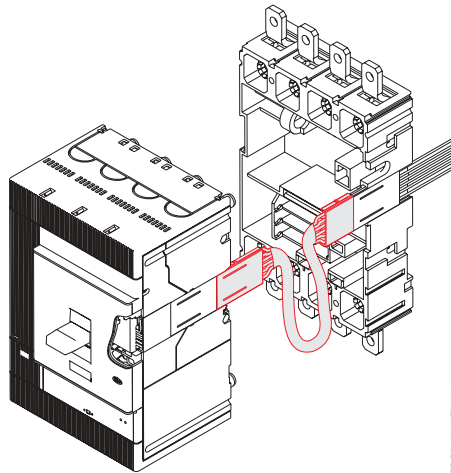
Types of auxiliary contacts		Version	T1	T2 TMD	T2 PR221DS	T3	T4	T5
AUX 250 V AC/DC 1Q-1SY	1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled / not cabled	■	■		■	■	■
AUX 250 V AC/DC 3Q-1SY	3 open/closed changeover contacts + 1 release tripped changeover contact	pre-cabled / not cabled	■	■		■	■	■
AUX 250 V AC/DC 1S51+1Q+1SY	1 contact signalling coil tripped + 1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled			■			
AUX 250 V AC/DC 2Q-1SY	2 open/closed changeover contacts + 1 release tripped changeover contact	pre-cabled			■			
AUX 400 V AC 1Q-1SY	1 open/closed changeover contact + 1 release tripped changeover contact	pre-cabled					■	■
AUX 400 V AC 2Q	2 open/closed changeover contacts	pre-cabled					■	■
AUX 24 V AC/DC 3Q-1SY	3 open/closed changeover contacts + 1 release tripped changeover contact	pre-cabled / not cabled					■	■
AUX 24 V AC/DC 3Q-1SY	3 open/closed changeover contacts + 1 release tripped changeover contact	not cabled	■	■		■		
AUX-SA	1 contact signalling coil tripped	pre-cabled					■	■
AUX-MO	1 contact signalling manual/remote	not cabled					■	■
AUX-E 1Q-1SY	1 open/closed contact + 1 relay tripped contact (only with PR222DS/PD)	pre-cabled					■	■



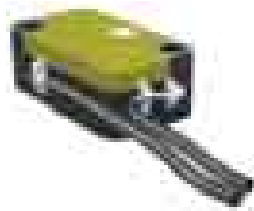
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Testing extension for auxiliary contacts

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.



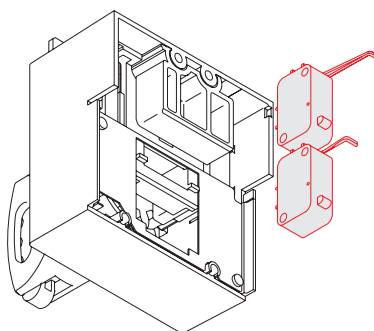
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Early auxiliary contacts - AUE

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 and transmitted 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 out-line of the circuit-breaker itself.



1SDC210151F0004



Accessories

Electrical signals



1SDC210153F0004

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

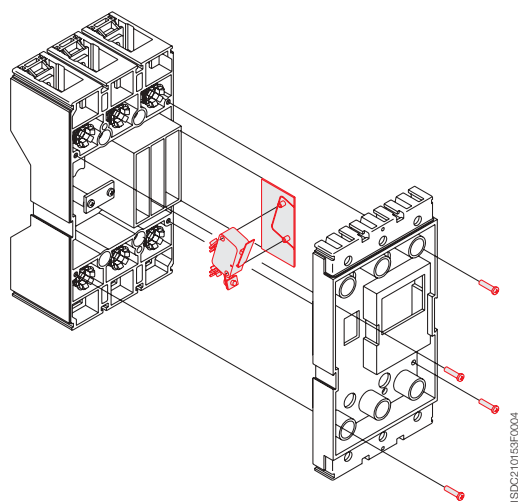
- contacts signalling circuit-breaker racked-in

T4, T5

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

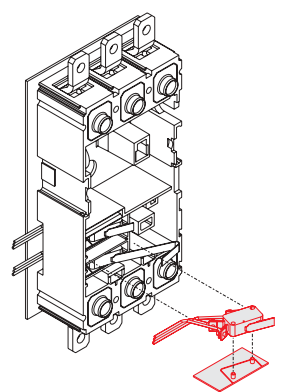
A maximum of three contacts in any combination can be installed on the fixed part of T2, T3, T4 and T5.

For T4 and T5 in the withdrawable version it is only possible to house a circuit-breaker racked-out signalling contact.



T2-T3

1SDC210153F0004



T4-T5

1SDC210221R0004

Accessories

Remote control

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 6 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 U_n [V].

Rated voltage, U_n

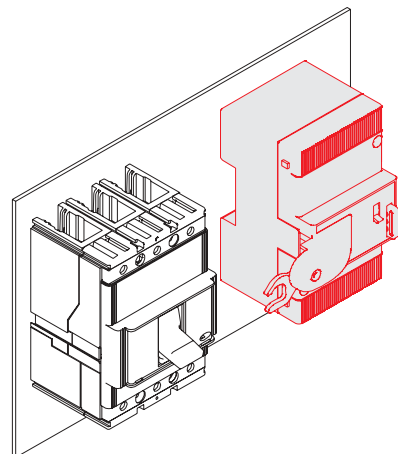
AC	[V]	110...250
DC	[V]	48...60 / 110...250
Operating voltage		85...110% U_n
Inrush power consumption		1800 [VA] / 1000 [W]
Time	opening [s]	< 0.1
	closing [s]	< 0.1
Mechanical life	[no. Operations]	25000
	[no. Operations/h]	240 (T1 e T2); 120 (T3)
Degree of protection, on the front		IP30
Minimum control impulse time on opening and closing	[ms]	>100



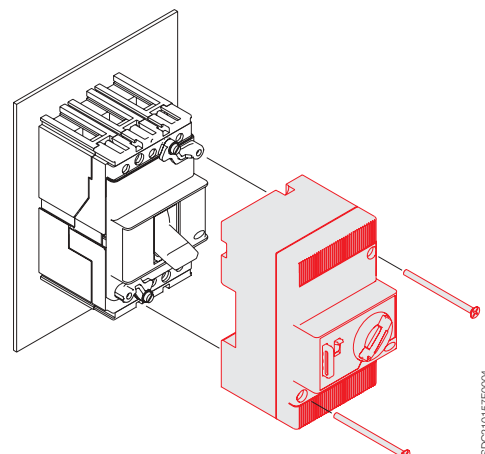
1SDC210154F0004



1SDC210155F0004



1SDC210156F0004



1SDC210157F0004



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 1 m long cables and is always fitted with a padlock. The connectors, once inserted in the special slot on the left-hand side of the circuit-breaker, extend in relation to the outline of the circuit-breaker itself. They are only compatible with pre-cabled electrical accessories.

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.

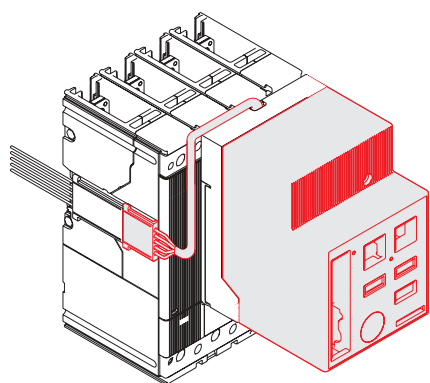
The motor operator is always fitted with an auxiliary contact to signal "auto" or "manual" (not on changeover). On request, it can also be fitted with an AUX-MO auxiliary contact (on changeover), which provides a signal of its state of service: "auto" (remote control of the circuit-breaker) or "manual".

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 U_n [V].

MOE and MOE-E	Tmax T4, T5	
	AC [V]	DC [V]
Rated voltage, U_n	–	24
	–	48...60
	110...125	110...125
	220...250	220...250
	380	–
Operating voltage	85...110% U_n 85...110% U_n	
Power consumption on inrush P_s	≤ 300 VA	≤ 300 W
Power consumption in service P_c	≤ 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



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 electrical accessories, it is necessary to use the adapters to be coupled with the plug, which will then be connected to the socket located on the fixed part for the moving parts of the plug-in or withdrawable version of Tmax T4 and T5.

Depending on the electrical accessories required, it will be necessary to ask for one or two adapters to be mounted on the left side and/or on the right side of the moving part

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 the various possible configurations of electrical accessories:

ADP adapters for T4 and T5 cabled accessories				
	5-way	6-way	10-way	12-way
left side				
SOR	■			
UVR	■			
SA for residual current RC222	■			
SOR o UVR + SA for residual current RC222	■			
MOE (MOE-E)			■	
MOE (MOE-E) + SOR or UVR			■	
MOE (MOE-E) + SOR or UVR + SA for residual current RC222			■	
AUE			■	
AUE + SOR or UVR			■	
AUE + SOR or UVR + SA for residual current RC222			■	
right side				
AUX 1Q + 1SY 1 open/closed changeover contact + 1 release tripped changeover contact		■		
AUX 2Q 2 open/closed changeover contacts		■		
AUX 3Q + 1SY 3 open/closed changeover contacts + 1 release tripped changeover contact				■

Socket-plug connectors

To allow the racking in and out operations of the moving part of the plug-in circuit-breaker, the cabled and uncabled electrical

accessories of Tmax T2 and T3 and the uncabled electrical accessories of Tmax T4 and T5 must be fitted with one or more

socket-plug connectors, as indicated in the table below.

Socket-plug connectors			
	3 poles	6 poles	12 poles
T2-T3-T4-T5			
SOR	■		
UVR	■		
AUX 1Q + 1SY 1 open/closed changeover contact + 1 release tripped changeover contact		■	
AUX 2Q 2 open/closed changeover contacts		■	
AUX 3Q + 1SY 3 open/closed changeover contacts + 1 release tripped changeover contact			■
T2-T3			
MOS on top ⁽¹⁾		■	
AUE	■		
AUX 2Q + 1SY for PR221DS 2 open/closed contacts + 1 release tripped changeover contact		■	
AUX 1S51 + 1Q + 1SY per PR221DS 1 changeover contact + 1 release tripped changeover contact	■	■	

⁽¹⁾ Always supplied for fitting the solenoid operator on top



Accessories

Operating mechanism and locks

Rotary handle operating mechanism - RHD/RHE

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 background, 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.



1SDC210159F0004



1SDC210159F0004

T1-T2-T3



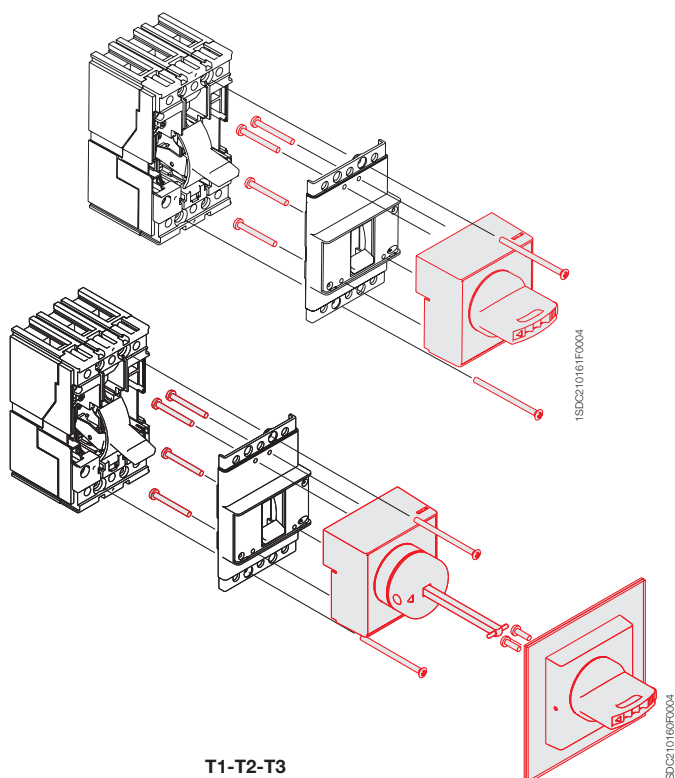
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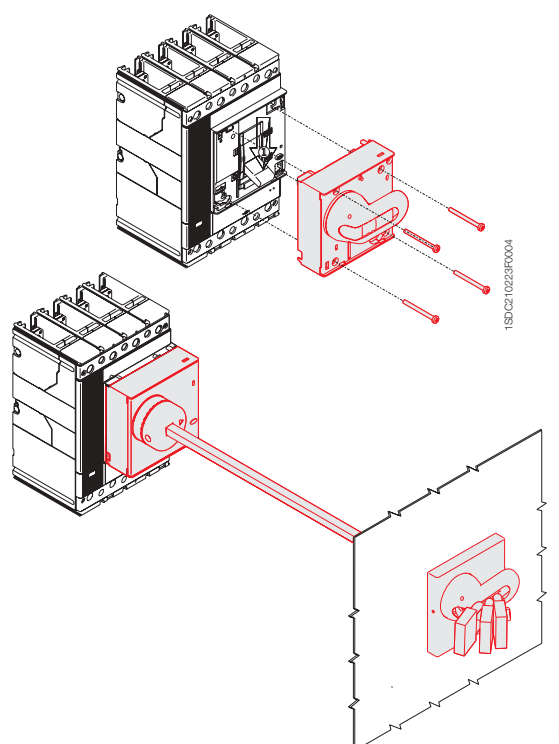
1SDC210238F0004

T4-T5

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 handle	■	■	■	■	■	■
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

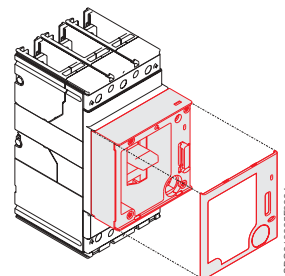
This can be installed on fixed, plug-in or withdrawable Tmax T4 and T5 circuit-breakers. In the case of withdrawable circuit-breakers, installed in a switchboard, it allows the IP40 degree of protection to be maintained for the whole isolation run of the circuit-breaker. It is always fitted with a padlock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



1SDC210164R004

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.



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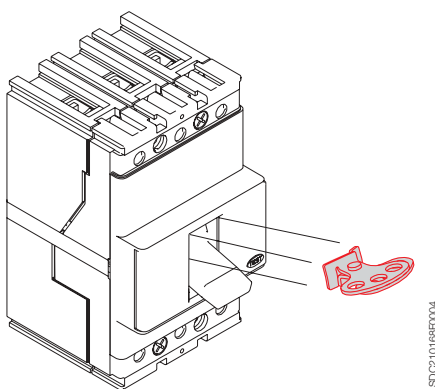


Padlock for operating lever - PLL

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:

- plug-in locking device only of the closing operation
- locking plate 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
- locking plate just for the closing operation.

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.

The MIR mechanical interlock is available for T3 in the fixed or plug-in version, both three-pole and four-pole. This rear interlock, available in the horizontal or vertical version (MIR-H, MIR-V), is compatible with all the front accessories and with the residual current release (only MIR-H). The following interlock combinations can be made: IO-OI-OO.

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.

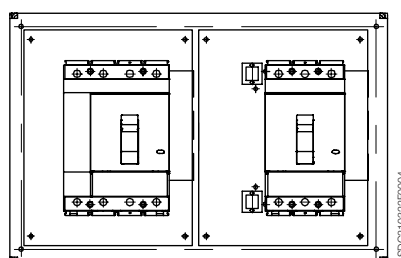
This rear interlock consists of a vertical or horizontal frame group (MIR-HB or MIR-VB), made up of a metal frame and of the leverisms to interlock, and of a couple of plates (MIR-P) on which the circuit-breakers are housed. Types of back plates:

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.

For instruction for ordering, please see the example at page 7/5.





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 switch-boards 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 $I_{\Delta n} \leq 30 \text{ mA}$, 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.



1SDC210176R0004



1SDC210212R0004

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

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 elec-

tronic 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 under-voltage 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



1SDC210171F0004



1SDC210324F0004

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 di-

rectly 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.

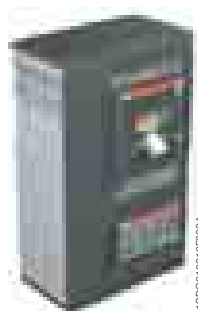
The four-pole circuit-breaker complete with residual current release can be fitted with the electrical accessories normally available for the circuit-breaker.

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.



1SDC210213F0004



1SDC210214F0004

		RC221	RC222		RC223
Circuit-breakers size		T1-T2-T3	T1-T2-T3	T4 and T5	T4 4p
Type		"L" shaped	"L" shaped	Placed below	Placed below
Technology		microprocessor-based	microprocessor-based	microprocessor-based	microprocessor-based
Action		with solenoid	with solenoid	with solenoid	with solenoid
Primary service voltage ⁽¹⁾	[V]	85...500	85...500	85...500	110...500
Operating frequency	[Hz]	45...66	45...66	45...66	0 - 400 - 700 - 1000
Self-supply		■	■	■	■
Test operation range ⁽¹⁾		85...500	85...500	85...500	110...500
Rated service current	[A]	up to 250 A	up to 250 A	up to 500 A	up to 250 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	0.03 - 0.05 - 0.1 0.3 - 0.5 - 1
Time limit for non-trip	[s]	instantaneous	instantaneous - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3	instantaneous - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3	instantaneous - 0 - 0.1 - 0.2 - 0.3 - 0.5 - 1 - 2 - 3
Tolerance over trip times			± 20%	± 20%	± 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% I _{Δn} (tolerance ±3%)				■	■
Indication of alarm timing at 75% I _{Δn} (tolerance ±3%)		■	■	■	■
Automatic residual current reset		■	■	■	■
"A" type for pulsating alternating current, AC for alternating current		■	■	■	■
"AE" type for remote release device			■	■	■
Selective "S" 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 sensitiv-

ity 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



1SD0210172F0004

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.

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 $I_{\Delta n}$		
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 $I_{\Delta n}$	25 ... 75% x $I_{\Delta n}$
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



1SDC210326F0004

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 $I \geq 0.35 \times I_n$ on at least one phase.

If the display is used in combi-

nation 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 elec-

tronic 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.



1SDC210219F0004

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 alphanumeric 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.



1SDC210350F0004

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



1SD210379F0004

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.



1SD210327F0004

SACE PR021/K signalling unit

The SACE PR021/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.

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 PR021/K unit.

PR021/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 PR021/K unit is an alternative to any supervision and control systems.

Available signals

K51	PR222MP
1	Protection L alarm
2	Protection R alarm
3	Protection I alarm
4	Protection U alarm Welded contactor 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 12 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 PR021/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	PR021/K	PR222DS/PD and PR222MP
	L alarm signal	PR222DS/P, PR222DS/PD and PR222MP
	Dialogue	PR222DS/PD
	Auxiliary supply	PR222DS/PD
	EP 010	PR222DS/PD
X4	External neutral	PR222DS/P and PR222DS/PD
	PR212/CI	PR222MP
	PTC / 0/1 generic contact	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 preventing the manual operation of the 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.

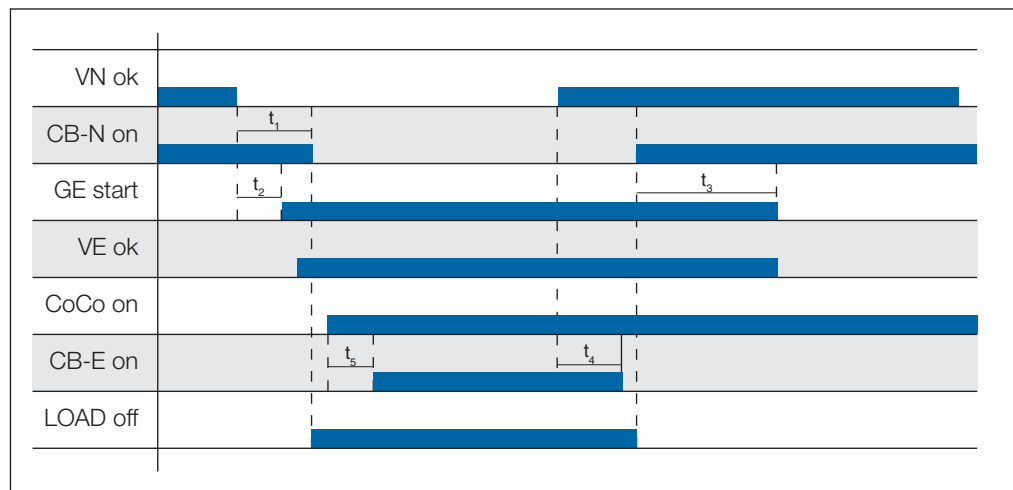
General specifications		
Rated supply voltage (galvanically insulated from earth)	24 V DC $\pm 20\%$ 48 V DC $\pm 10\%$ (maximum ripple $\pm 5\%$)	
Maximum absorbed power	5 W @ 24 V DC 10 W @ 48 V DC	
Rated power (mains present and circuit breakers not controlled)	1.8 W @ 24 V DC 4.5 W @ 48 V DC	
Operating 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

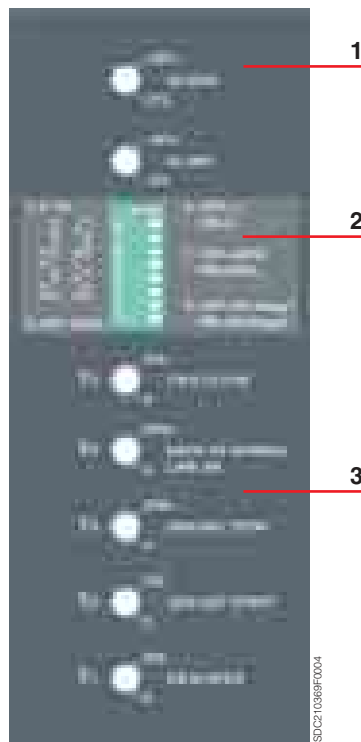




Accessories

Automatic transfer switch - ATS010

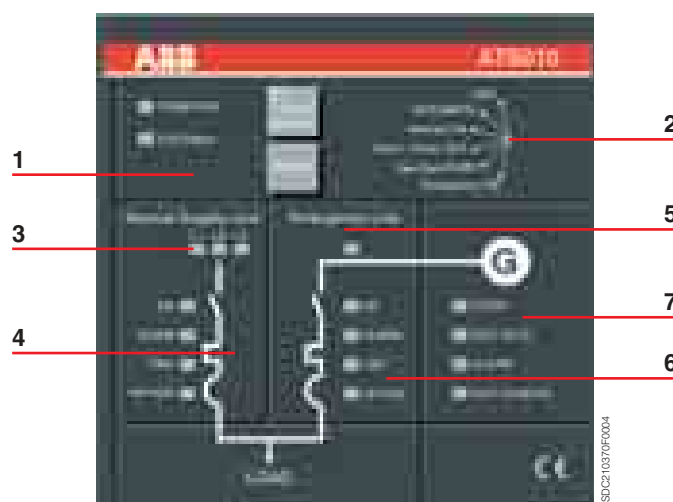
Side panel settings



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

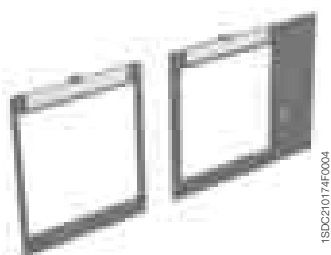
Installation and test accessories and spare parts



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.

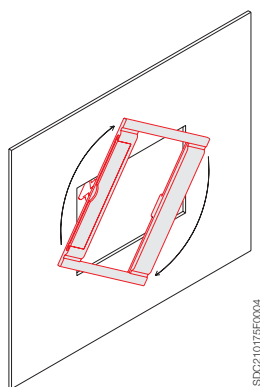


Flange for compartment door

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 supplied 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

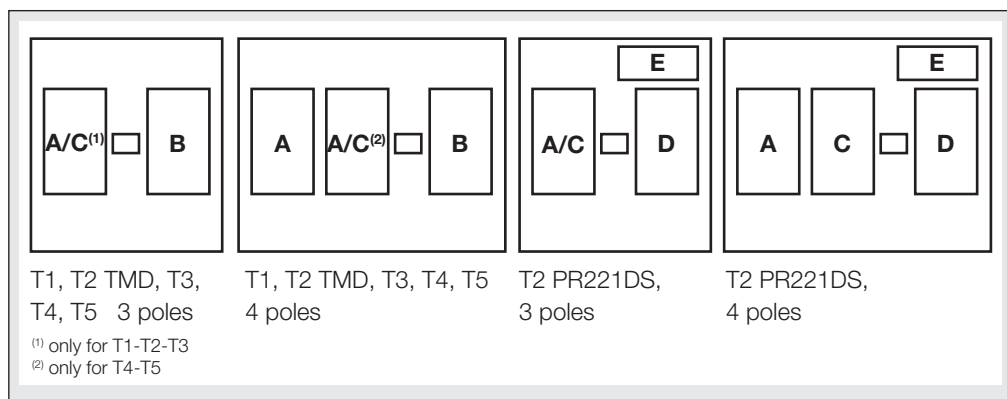
Compatibility - Internal accessories

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



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.



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Special applications

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⁽¹⁾ For the T1 1P and T2 with PR221DS, please ask ABB SACE directly



Examples of curve readout

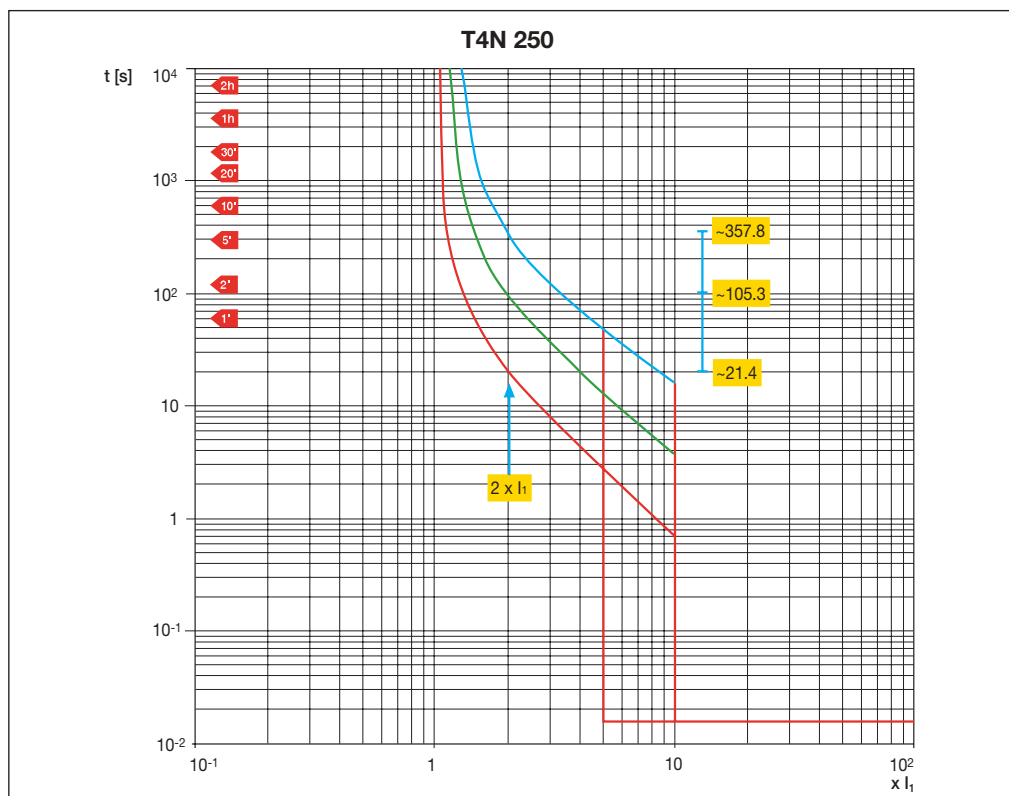
Example 1

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 $0.9 \times I_n$ (225 A); the magnetic trip threshold I_2 , adjustable from 5 to $10 \times I_n$, we select at $10 \times I_n$, equal to 2500 A.

It can be noted that, on the basis of the conditions in which the overload is presented, i.e. with the circuit-breaker at thermal running or not, the thermal relay trip varies considerably. For example, for an overload current of $2 \times I_1$, the trip time is between 21.4 and 105.3 s for hot trip, and between 105.3 and 357.8 s for cold trip.

For fault current values higher than 2500 A, the circuit-breaker trips instantaneously with the magnetic protection.

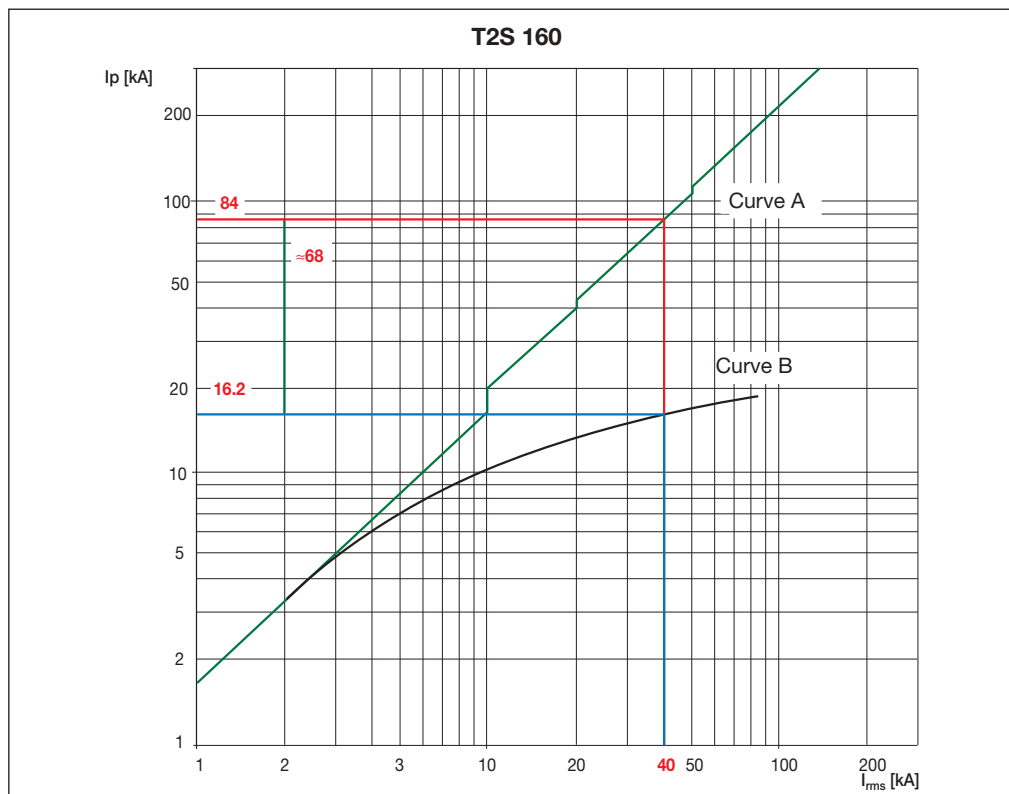


Example 2

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.



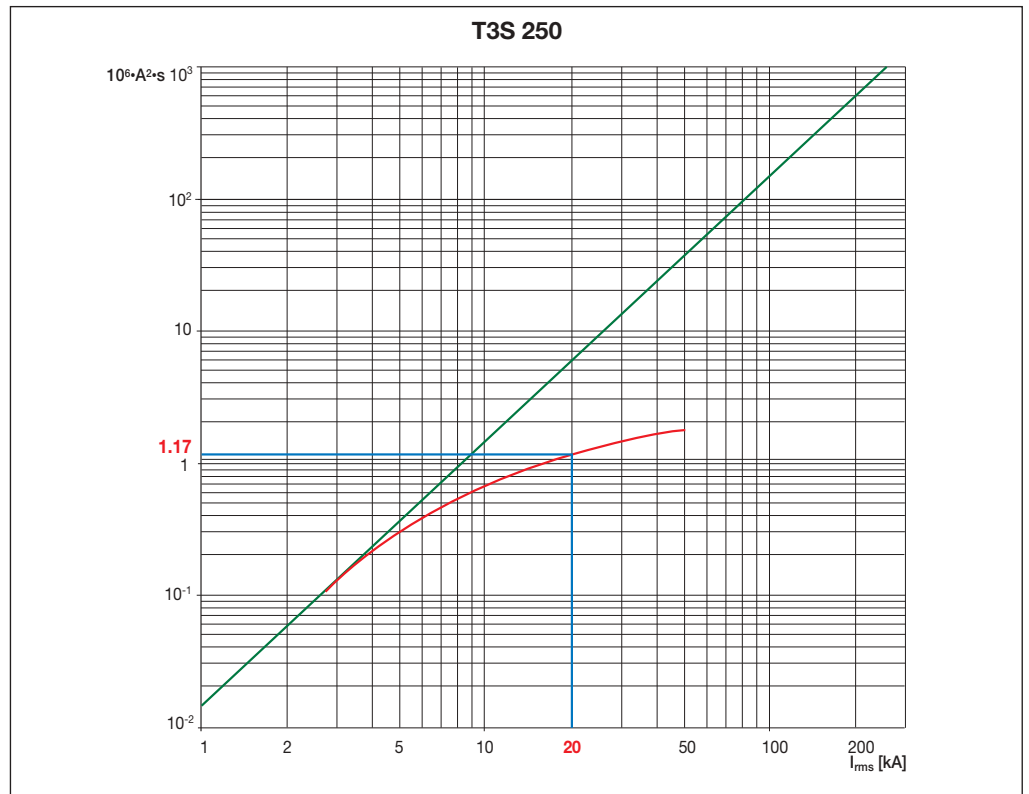
Example 3

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 $A^2 \cdot s$.

In correspondence with a short-circuit current of 20 kA, the circuit-breaker lets through a value of I^2t equal to $1,17 \cdot 10^6 \cdot A^2 \cdot s$.



Abbreviations used

- I_n = 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



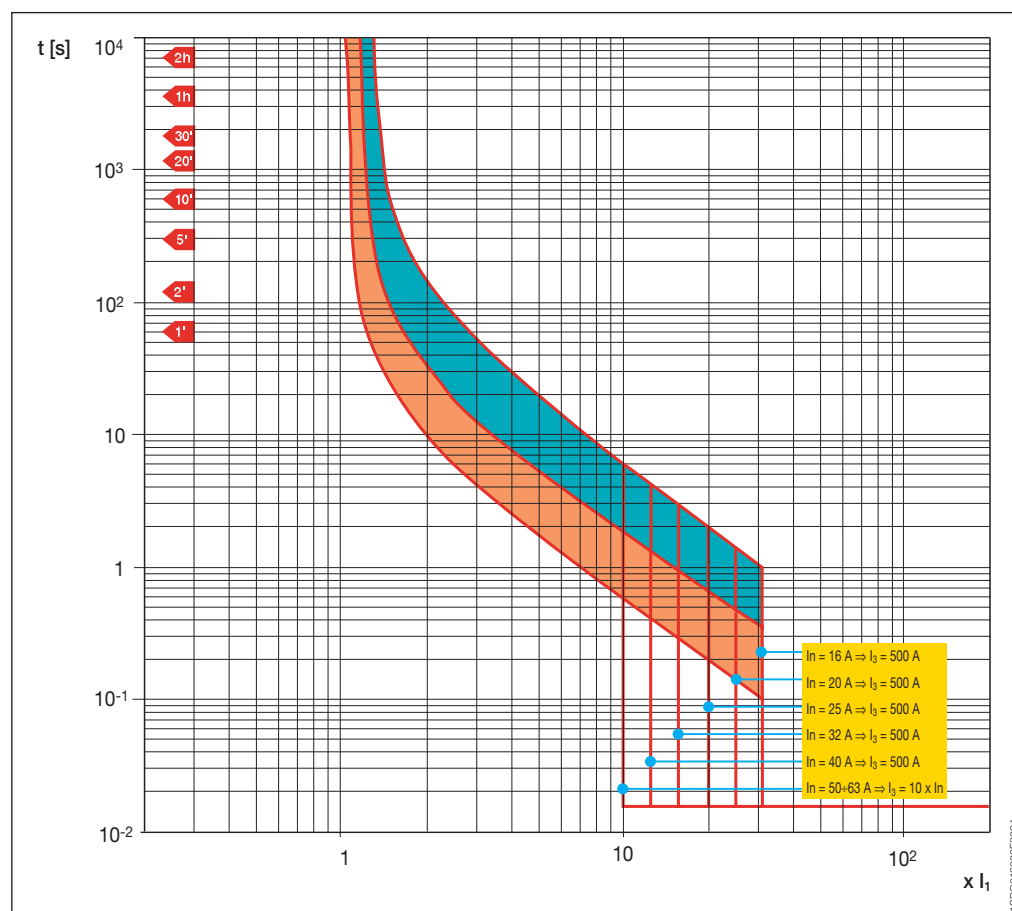
Trip curves for distribution

Circuit-breakers with thermomagnetic releases

T1 160

TMD

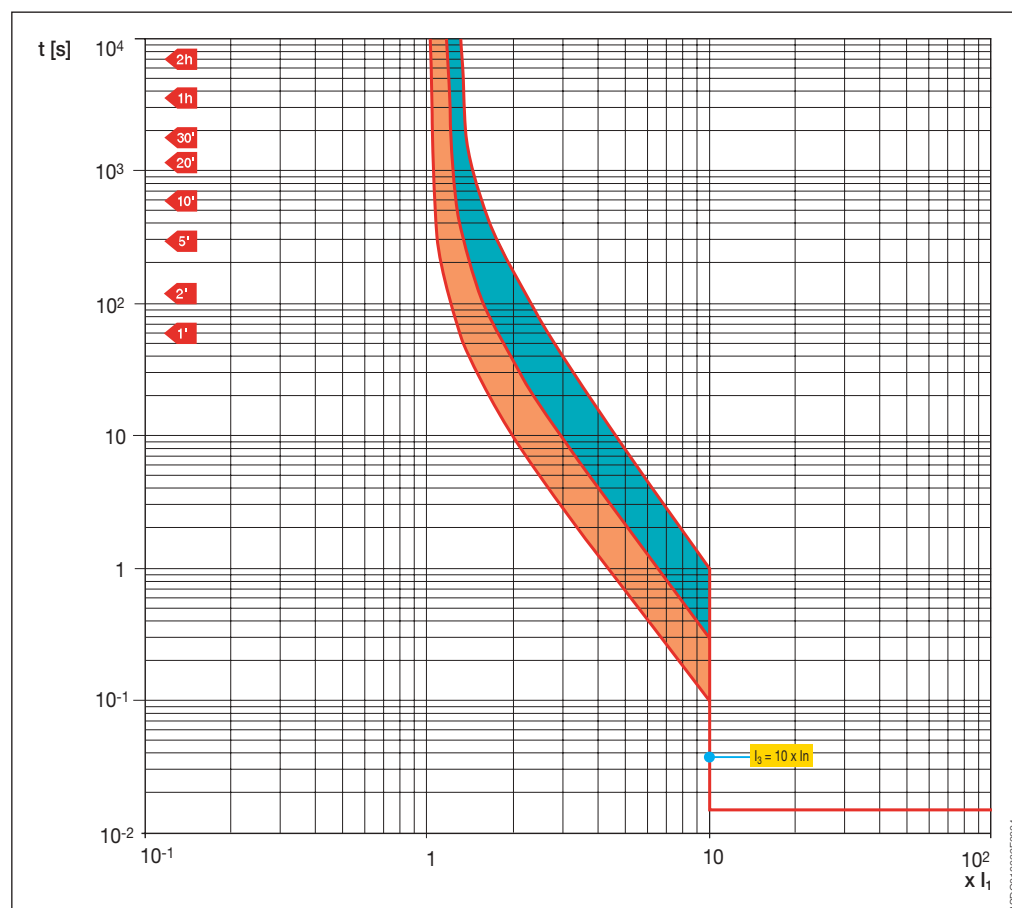
$I_n = 16 \div 63 \text{ A}$



T1 160

TMD

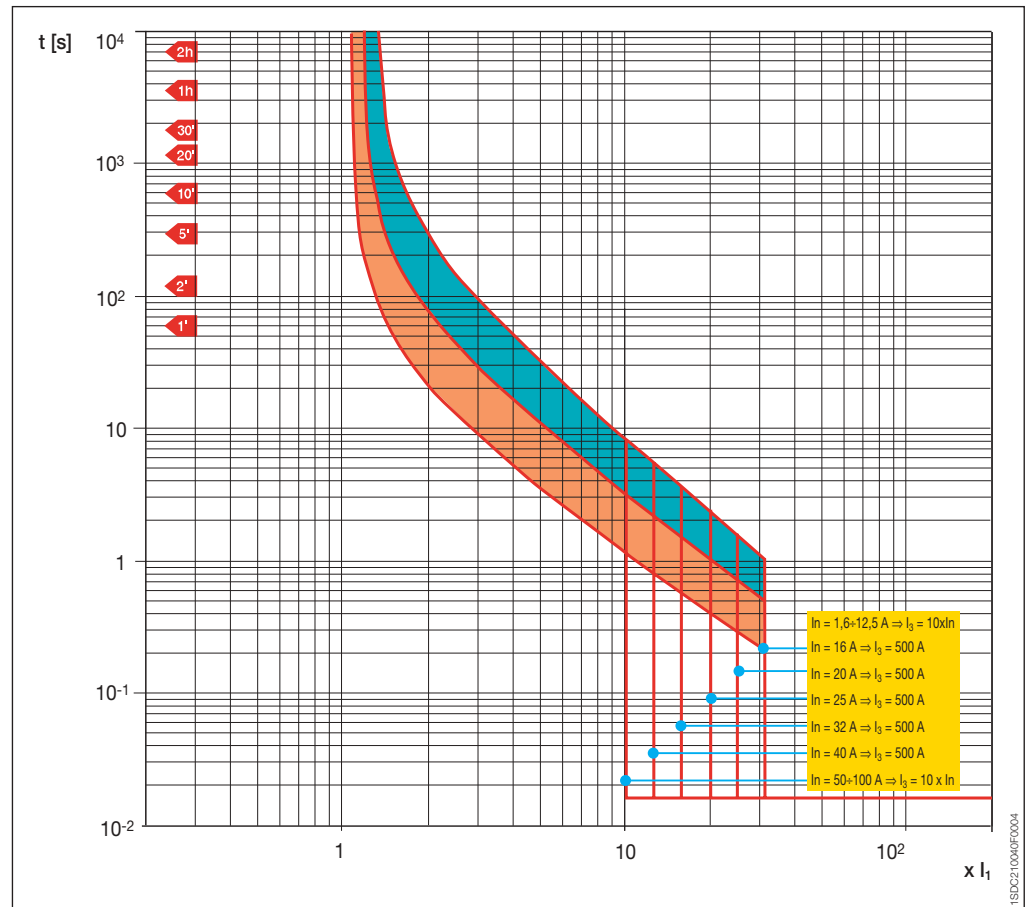
$I_n = 80 \div 160 \text{ A}$



T2 160

TMD

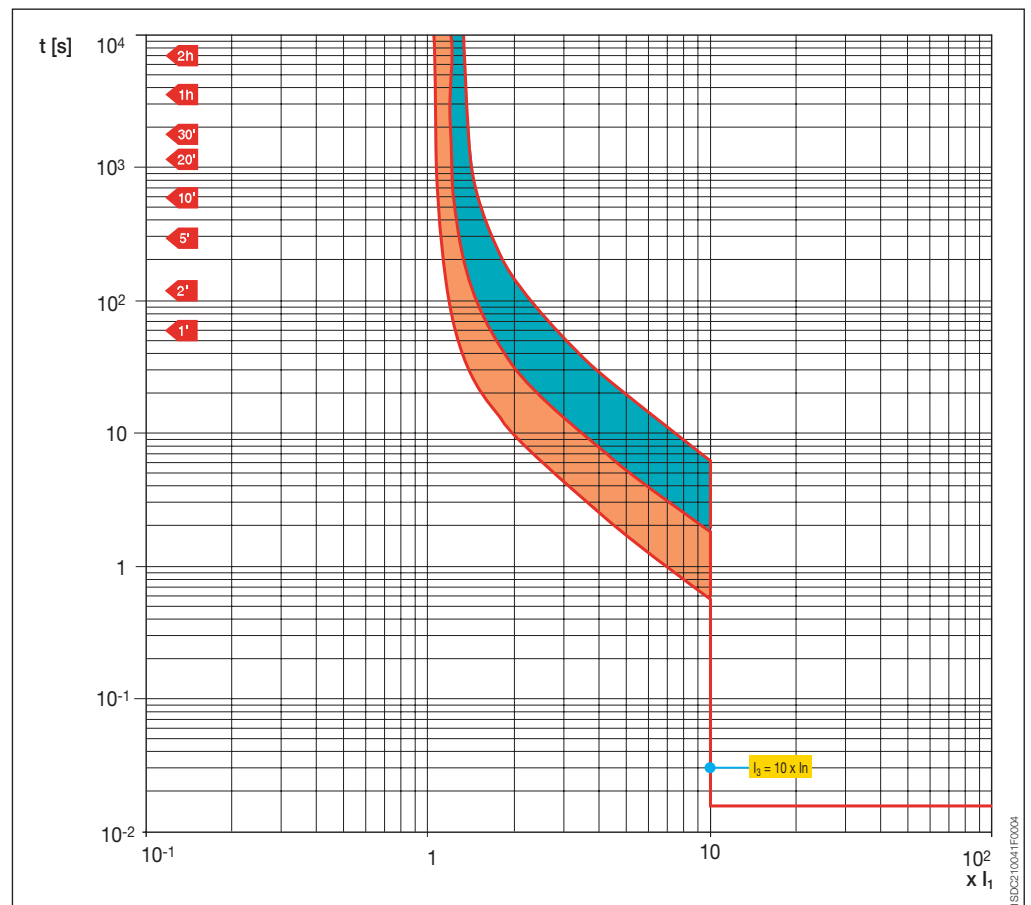
$I_n = 1.6 \div 100 \text{ A}$



T2 160

TMD

$I_n = 125 \div 160 \text{ A}$





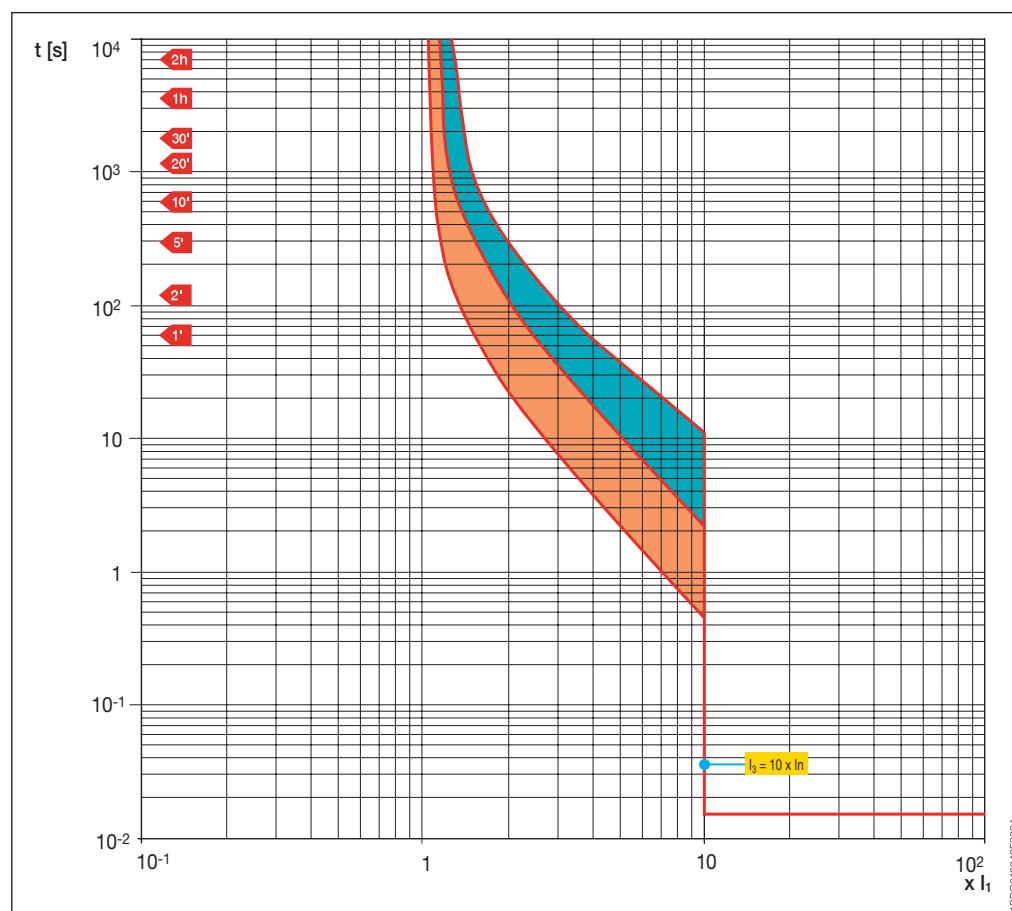
Trip curves for distribution

Circuit-breakers with thermomagnetic releases

T3 250

TMD

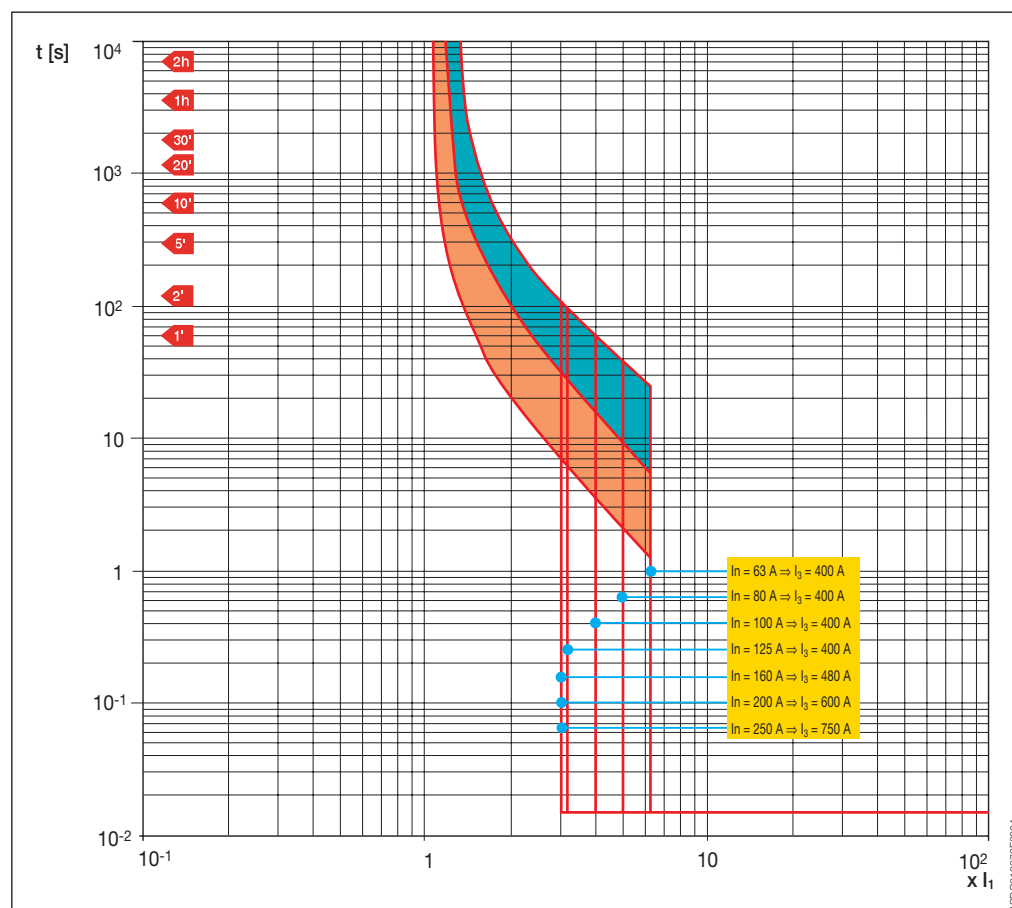
$I_n = 63 \div 250 \text{ A}$



T3 250

TMG

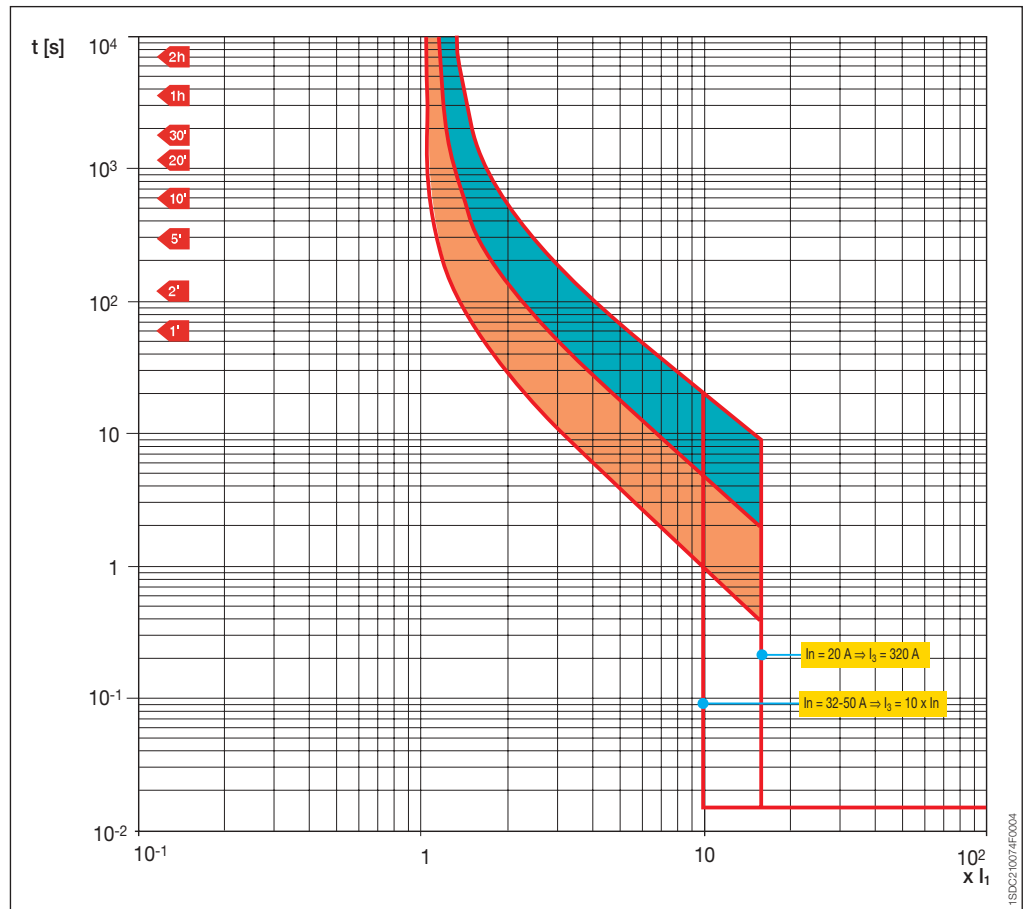
$I_n = 63 \div 250 \text{ A}$



T4 250

TMD

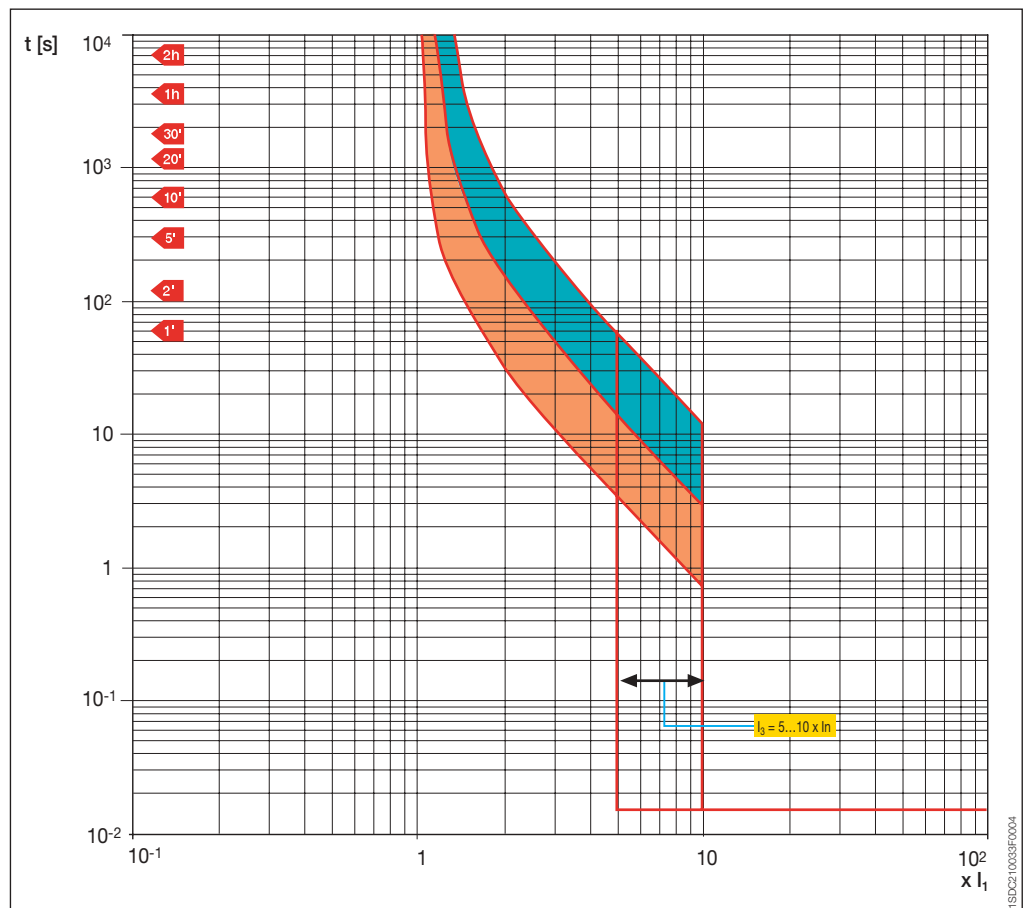
$I_n = 20 \div 50 \text{ A}$



T4 250/320

TMA

$I_n = 80 \div 250 \text{ A}$





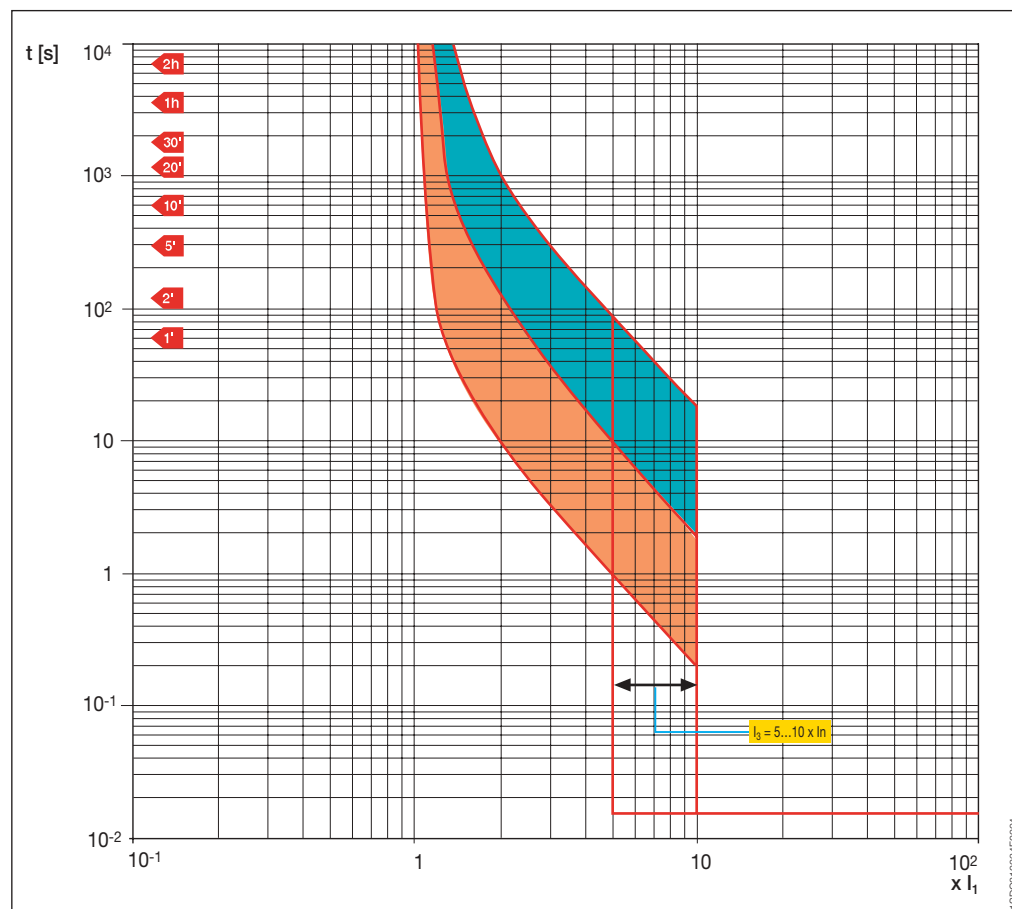
Trip curves for distribution

Circuit-breakers with thermomagnetic releases

T5 400/630

TMA

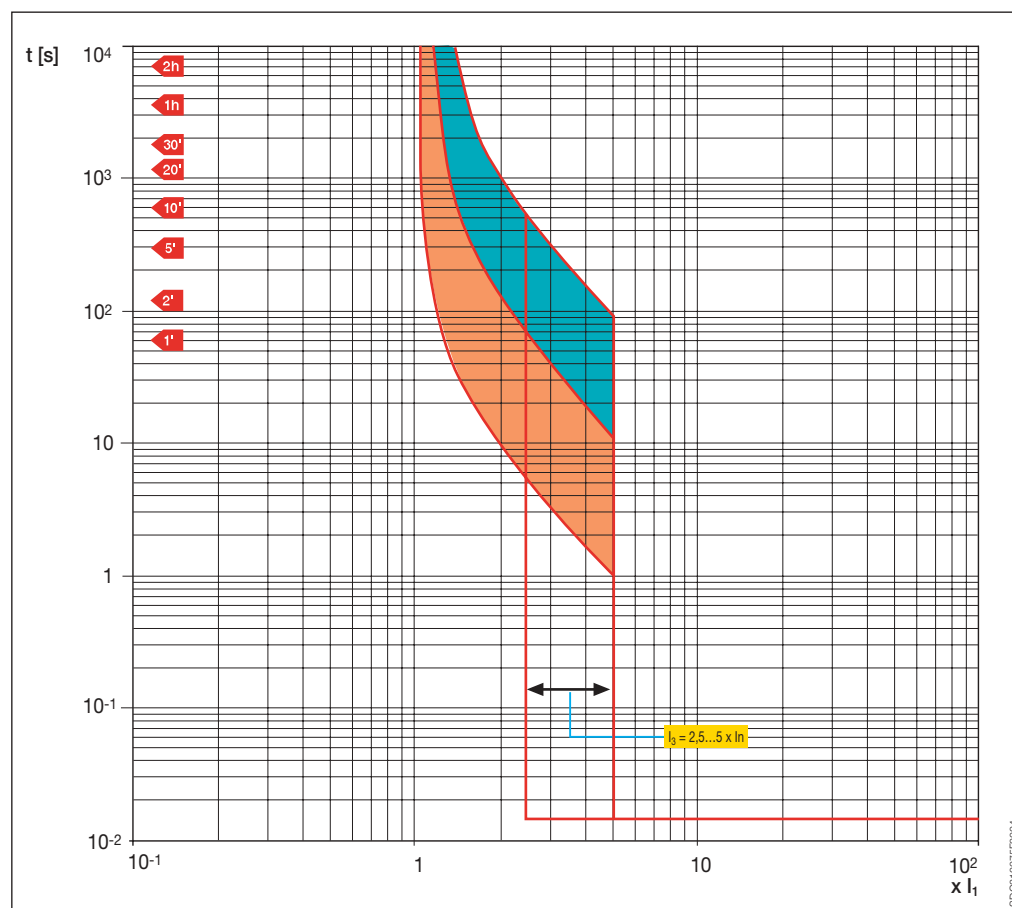
$I_n = 320 \div 500 \text{ A}$



T5 400/630

TMG

$I_n = 320 \div 500 \text{ A}$





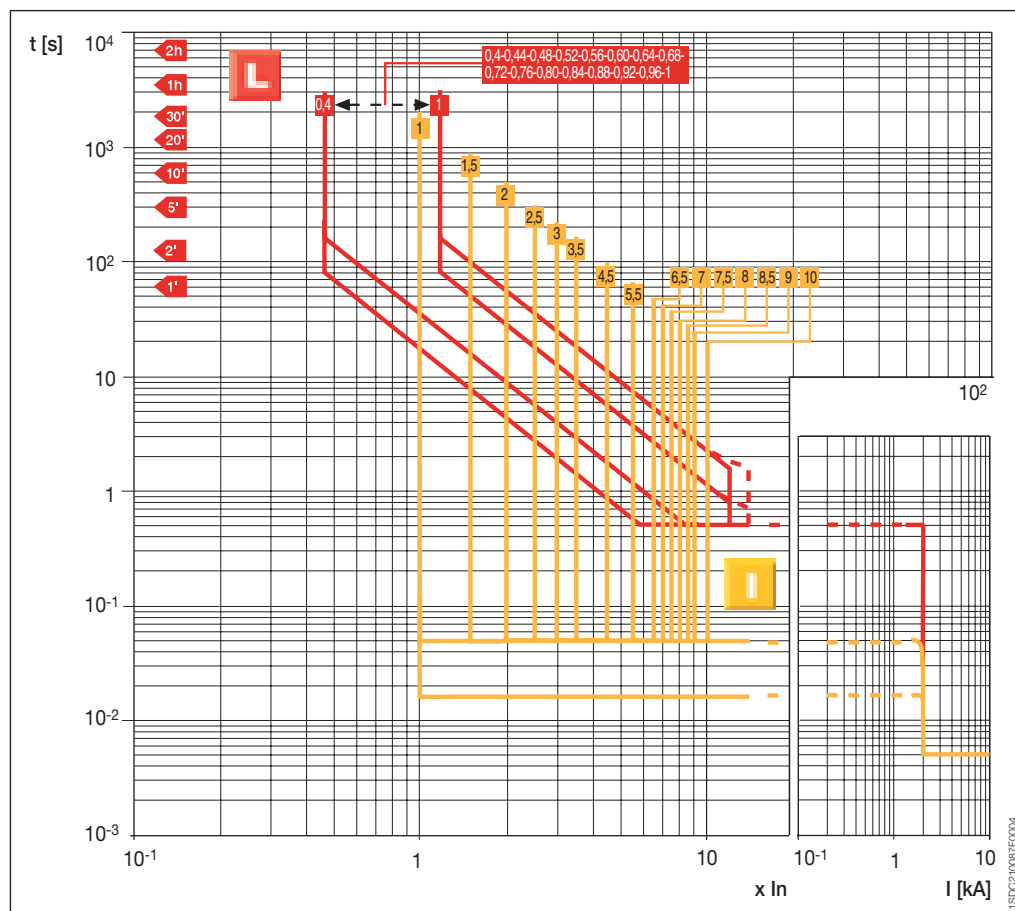
Trip curves for distribution

Circuit-breakers with electronic releases

T2 160

PR221DS-LS/I

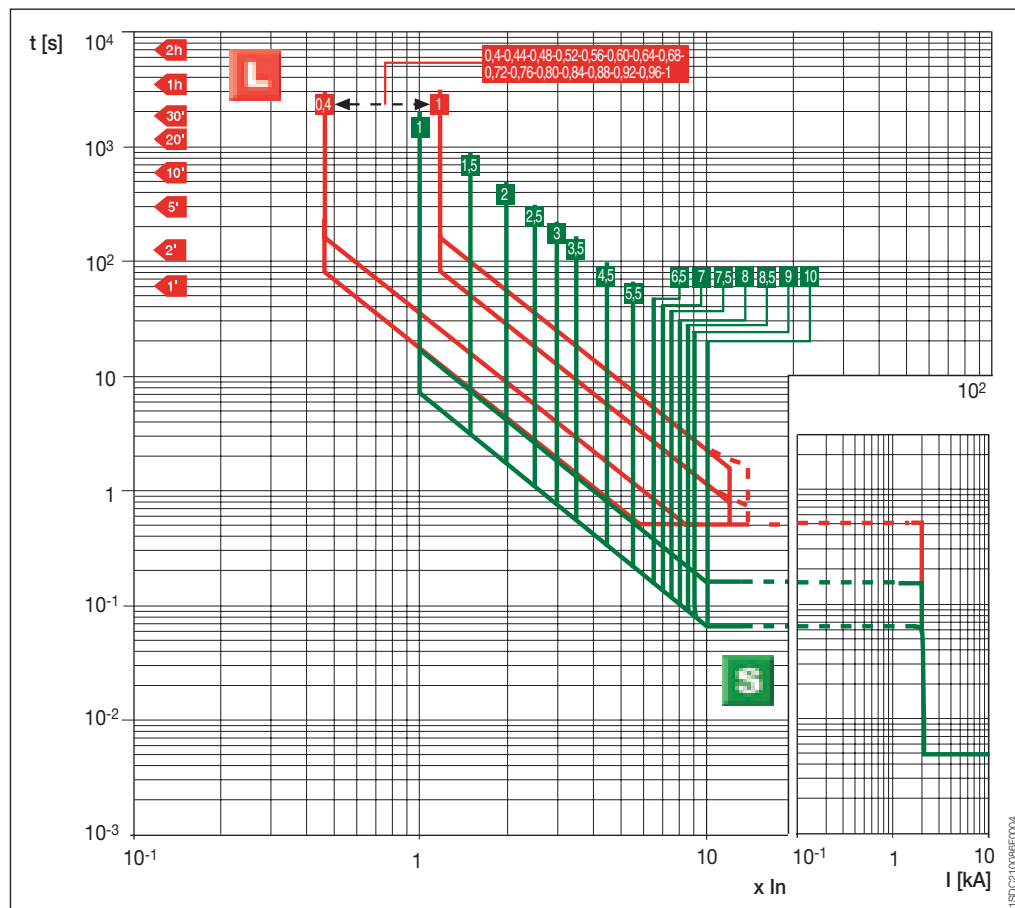
L-I Functions



T2 160

PR221DS-LS/I

L-S Functions



4



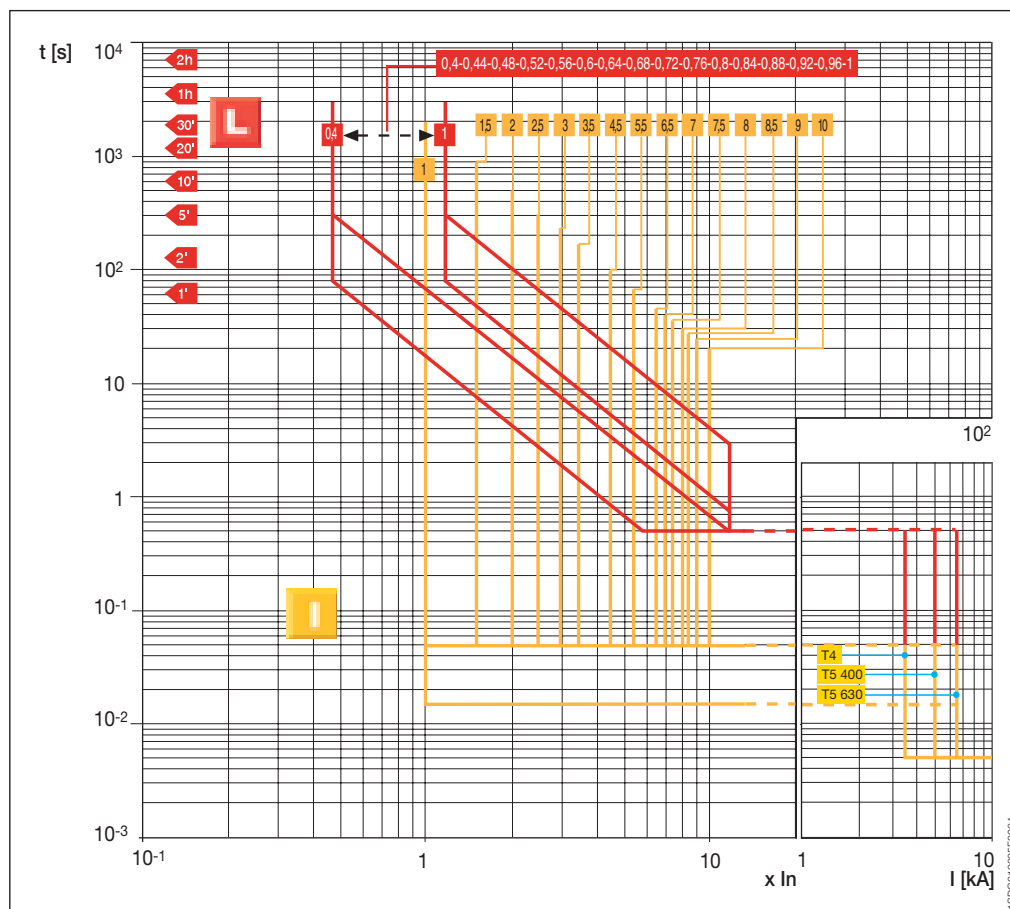
Trip curves for distribution

Circuit-breakers with electronic releases

T4 250/320 - T5 400/630

PR221DS

L-I Functions

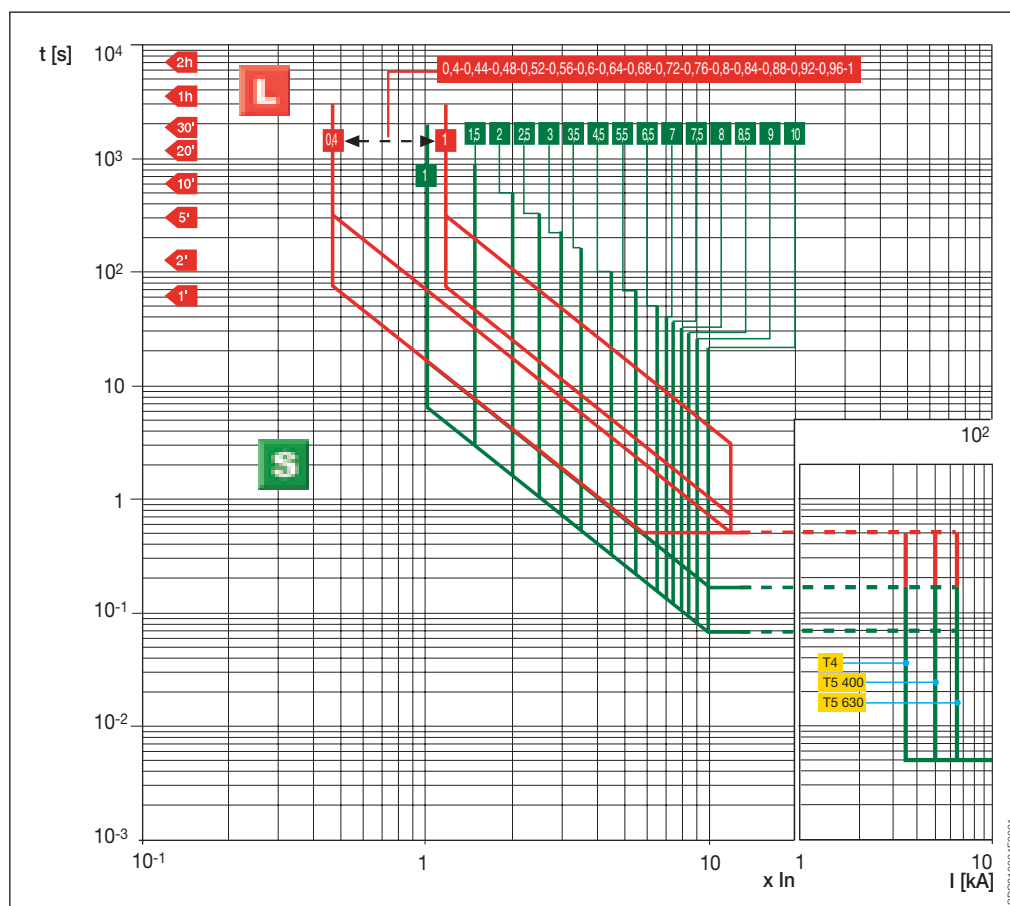


T4 250/320 - T5 400/630

PR221DS

L-S Functions

Note:
For T4 $I_n = 320$ A and
T5 $I_n = 630$ A $\Rightarrow I_{2max} = 8.5 \times I_n$



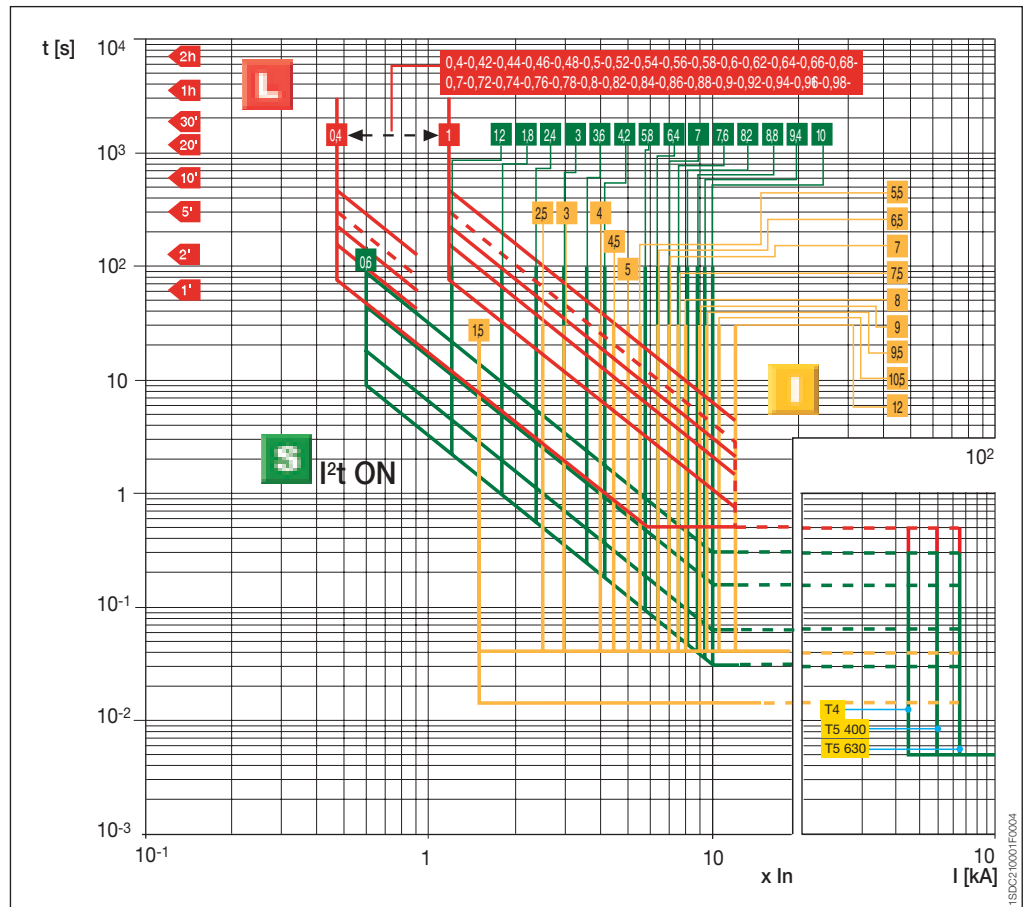
T4 250/320 - T5 400/630

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_i) which can be set at $6 \times I_{n1}$ in the case where 320 A CTs are used for T4 and 630 A for T5. For all the CT sizes $t_i = 18$ s, except with 320 A CT (T4) and 630 A (T5) where $t_i = 12$ s. For T4 $I_n = 320$ A and T5 $I_n = 630$ A $\Rightarrow I_{2max} = 8.8 \times I_n$ and $I_{3max} = 9.5 \times I_n$.



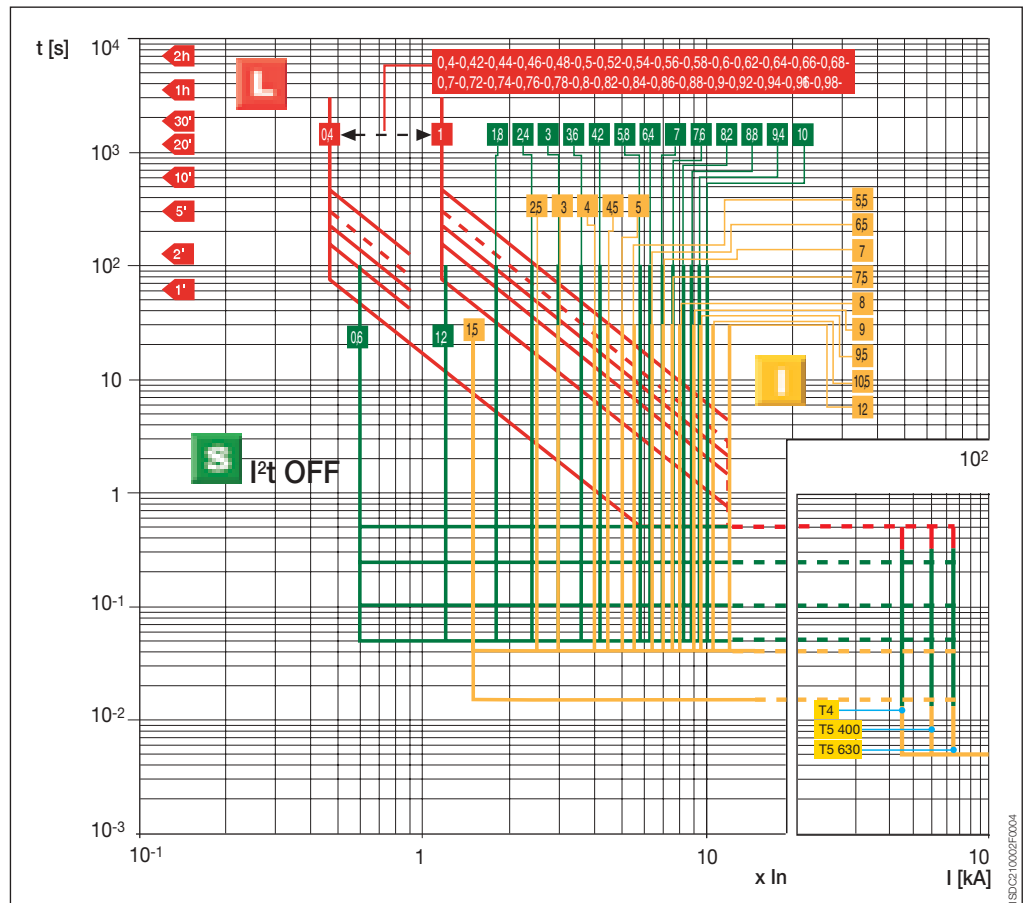
T4 250/320 - T5 400/630

PR222DS/P and PR222DS/PD

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

Note:

The dotted curve of function L corresponds to the maximum delay (t_i) which can be set at $6 \times I_{n1}$ in the case where 320 A CTs are used for T4 and 630 A for T5. For all the CT sizes $t_i = 18$ s, except with 320 A CT (T4) and 630 A (T5) where $t_i = 12$ s. For T4 $I_n = 320$ A and T5 $I_n = 630$ A $\Rightarrow I_{2max} = 8.8 \times I_n$ and $I_{3max} = 9.5 \times I_n$.





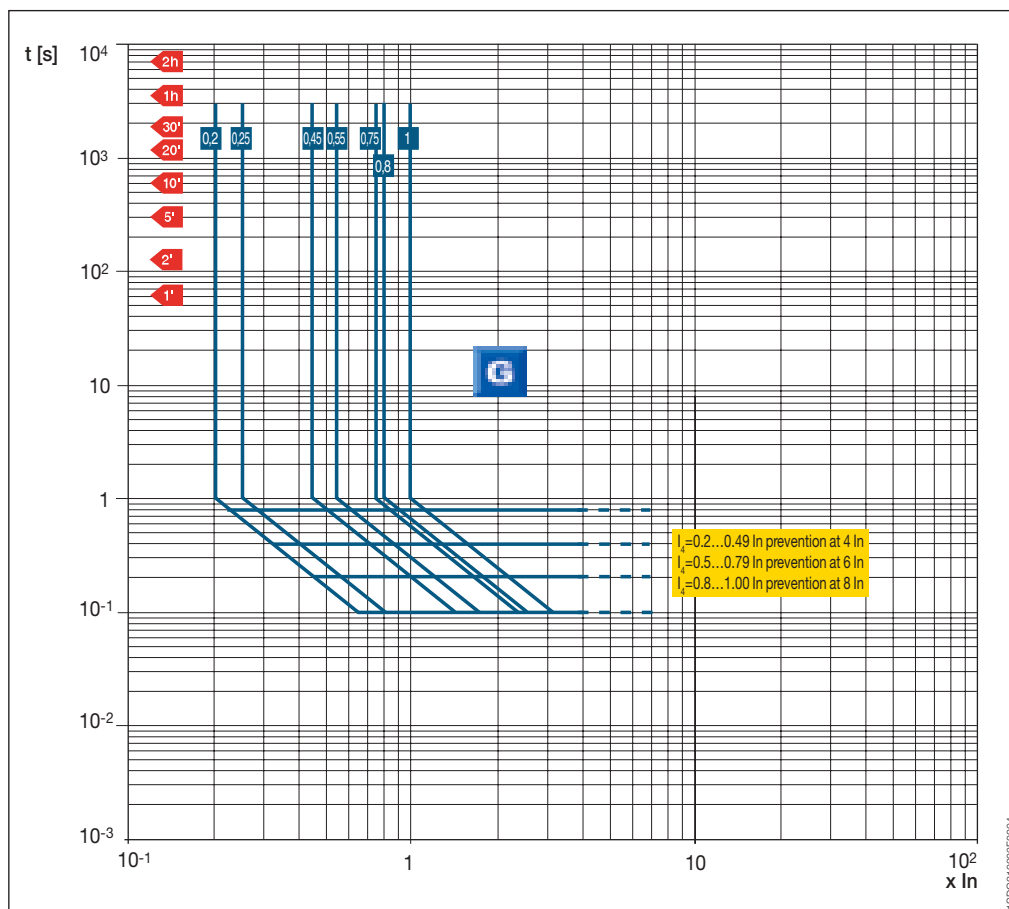
Trip curves for distribution

Circuit-breakers with electronic releases

T4 250/320 - T5 400/630

**PR222DS/P and
PR222DS/PD**

G Function





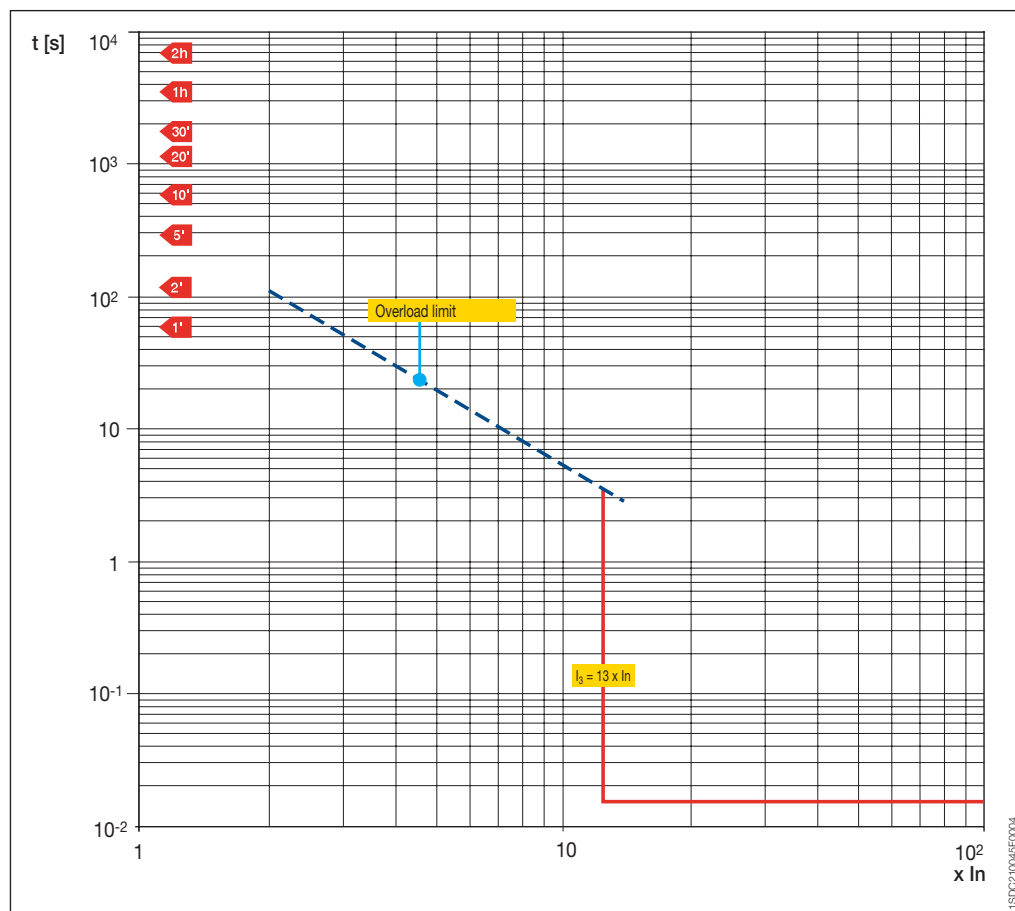
Trip curves for motor protection

Circuit-breakers with magnetic only releases

T2 160

MF

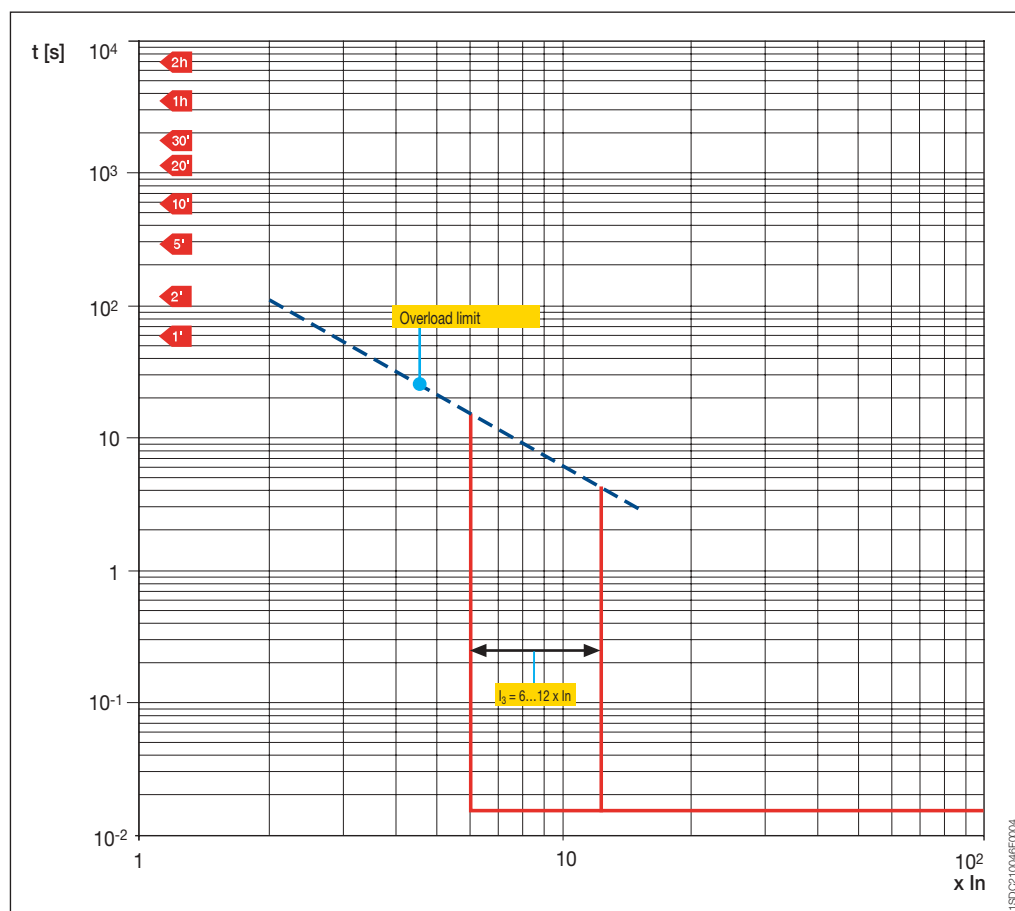
$$I_3 = 13 \times I_n$$



T2 160 - T3 250

MA

$$I_3 = 6...12 \times I_n$$



4



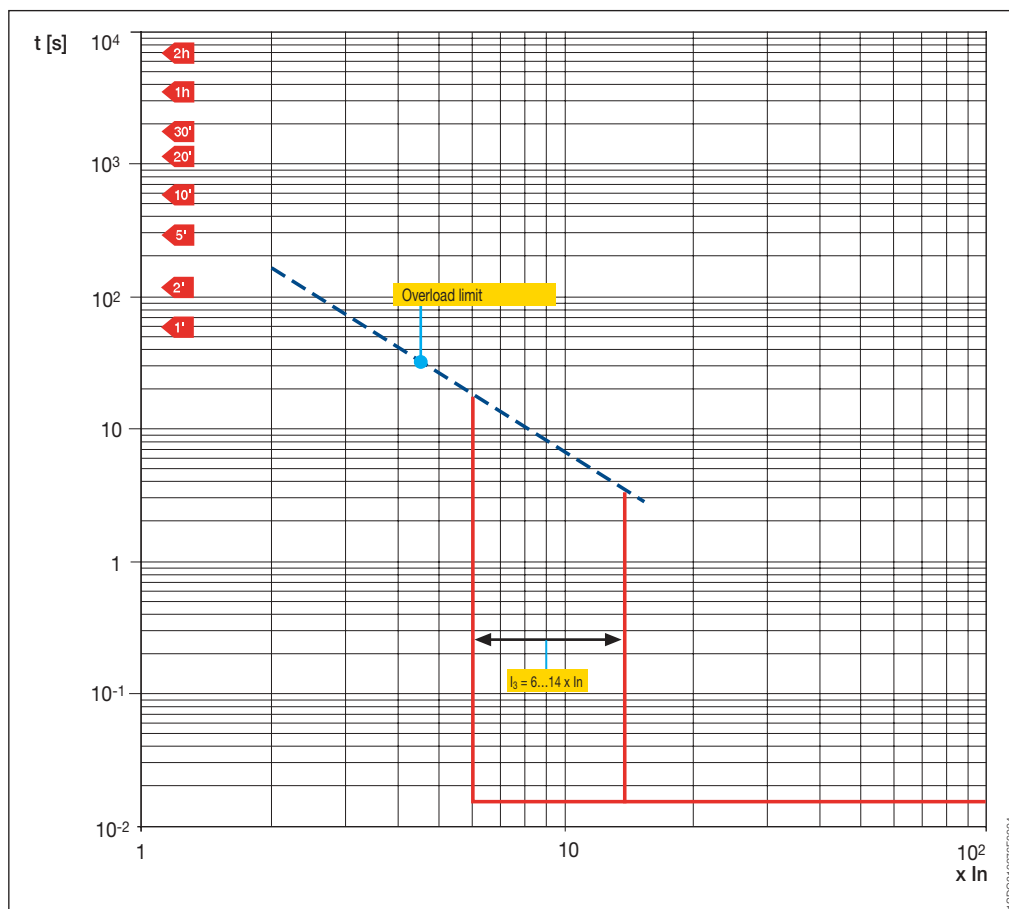
Trip curves for motor protection

Circuit-breakers with magnetic only releases

T4 250

MA

$$I_3 = 6 \dots 14 \times I_n$$





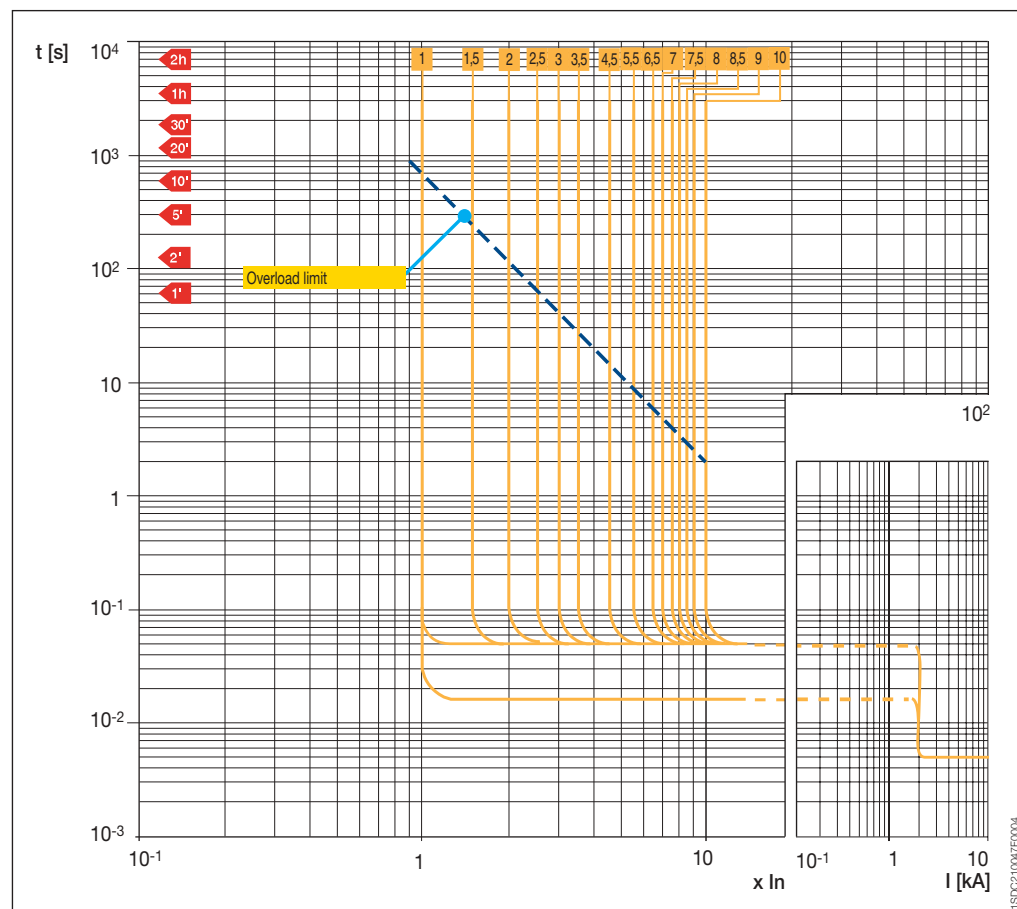
Trip curves for motor protection

Circuit-breakers with PR221DS-I electronic release

T2 160

PR221DS-I

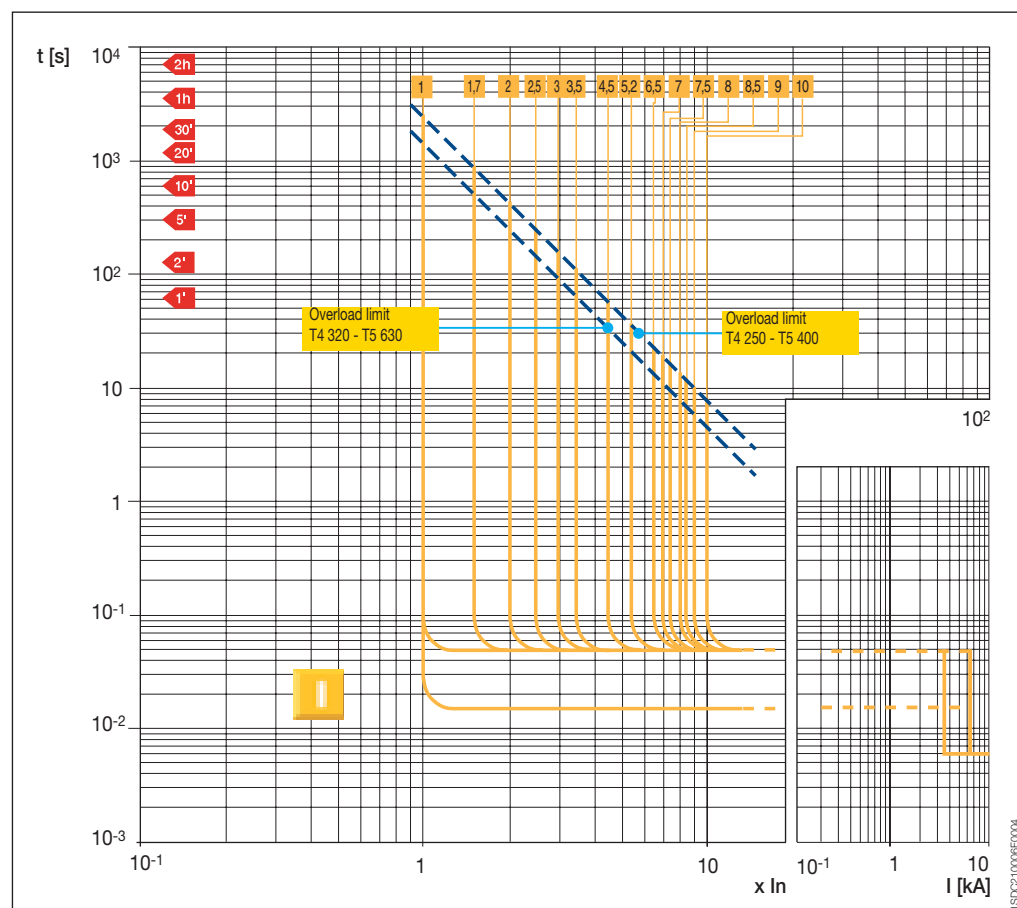
I Function



T4 250/320 - T5 400/630

PR221DS-I

I Function





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 I_e : $I_1 \geq I_e$.

For example, if $I_e = 135$ A, an T4 250 circuit-breaker can be selected with $I_n = 160$ A and the following adjustment carried out: $I_1 = 0.85 \times I_n = 136$ A.

The second step is to select the trip class according to the motor starting time t_a . 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/I_n , simply place the glossy sheet over the graph of function L so that $I/I_n = 0.85$ (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 $I_s = 3 \dots 10 \times I_1$ (in this case $I_s = 3 \dots 10 \times 0.85 \times 160$), and with regard to the trip time t_s .

To trace the curve correctly on the glossy sheet, simply place the glossy sheet over the graph of function R so that $I/I_n = I_1/I_n$ (on the glossy sheet) corresponds to $I/I_1 = 1$ (on the graph). In this case $I/I_n = I_1/I_n = 0.85$, 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 $6 \times I_n$ to $13 \times I_n$.

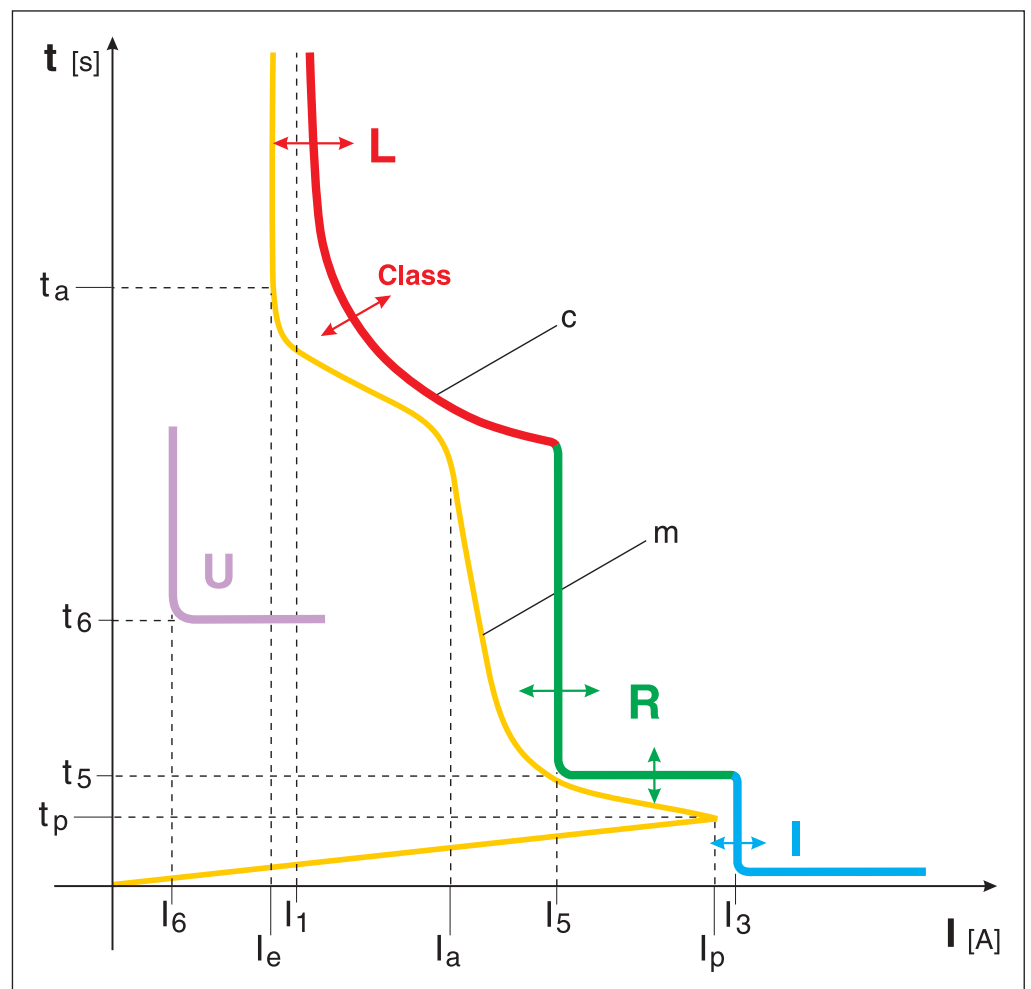
To trace the curve correctly on the glossy sheet, simply place the glossy sheet over the graph of function I so that $I/I_n = 1$ (on the glossy sheet) corresponds to $I/I_n = 1$ (on the graph) and draw the desired curve.

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 $0.4 \times I_1$ ($0.4 \times 0.85 \times I_n = 0.4 \times 0.85 \times 160 \text{ A} = 54.4 \text{ A}$ 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 $I/I_n = I_1/I_n$ (on the glossy sheet) corresponds to $I/I_1 = 1$ (on the graph). In this case $I/I_n = I_1/I_n = 0.85$, 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





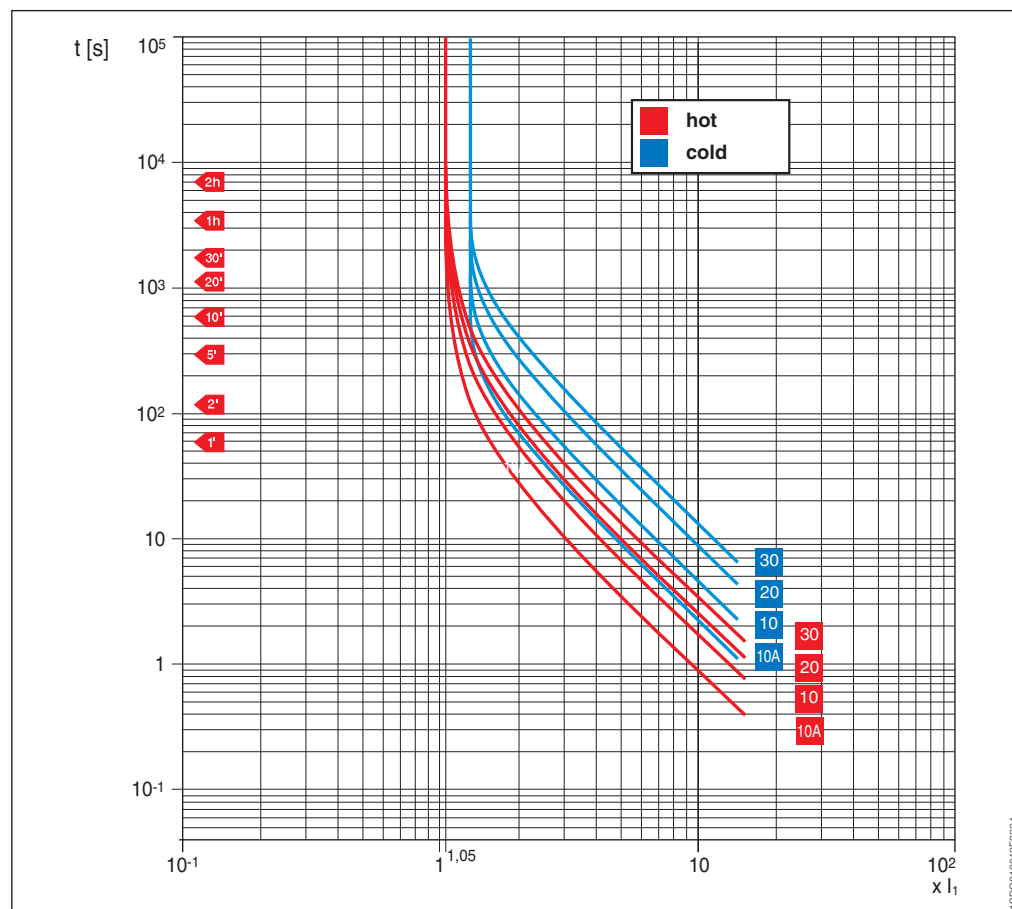
Trip curves for motor protection

Circuit-breakers with PR222MP electronic release

T4 250 - T5 400

PR222MP

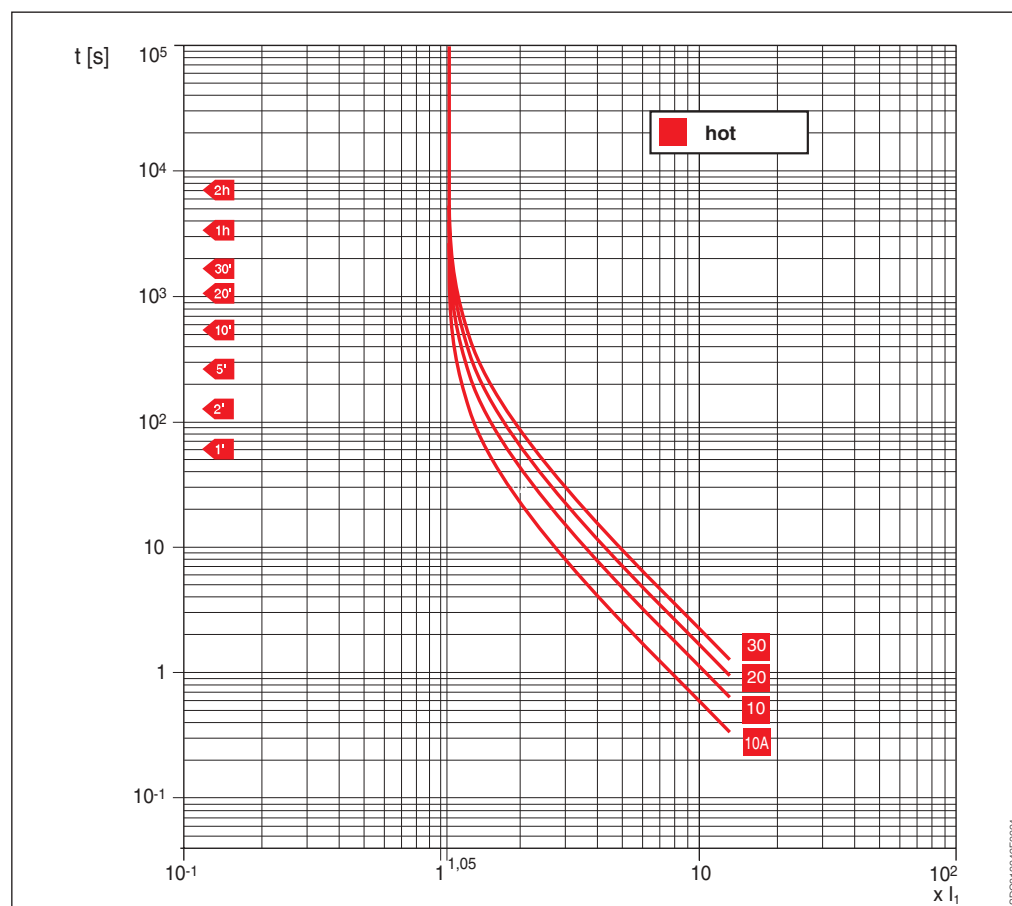
L Function
(hot and cold trip)



T4 250 - T5 400

PR222MP

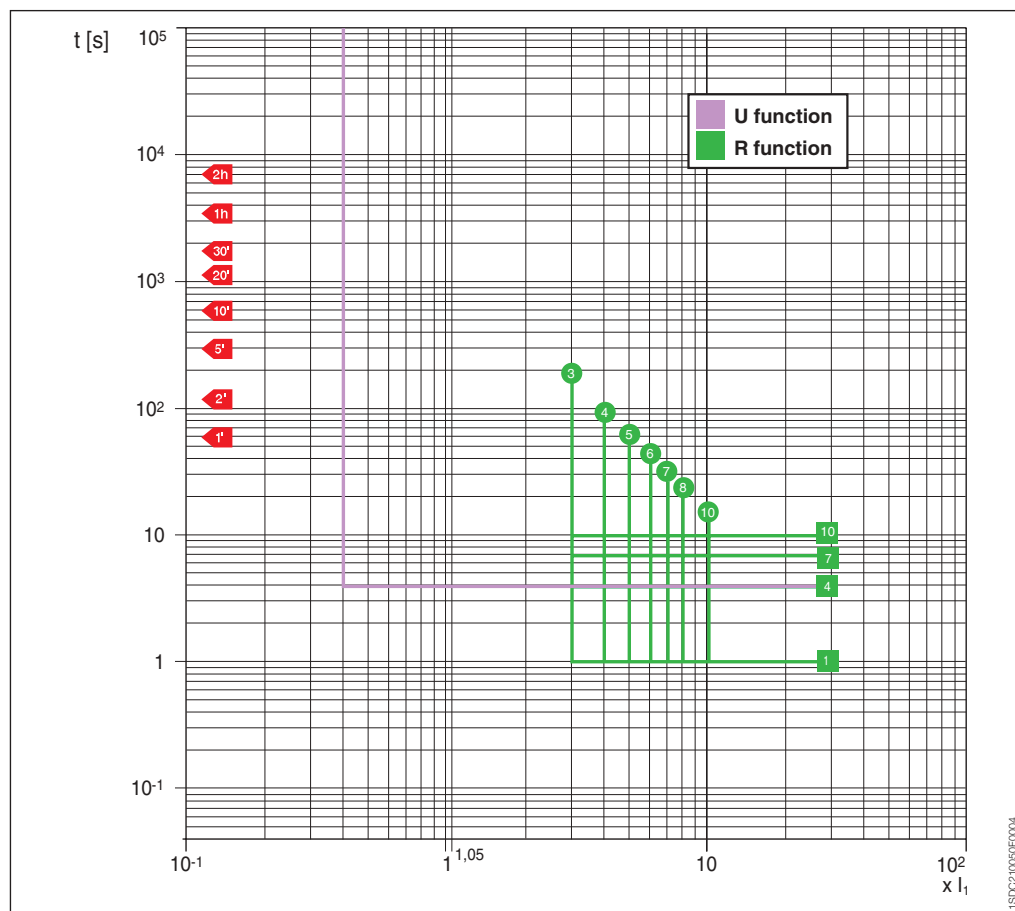
L Function
(hot trip with 1 or 2
phases supplied)



T4 250 - T5 400

PR222MP

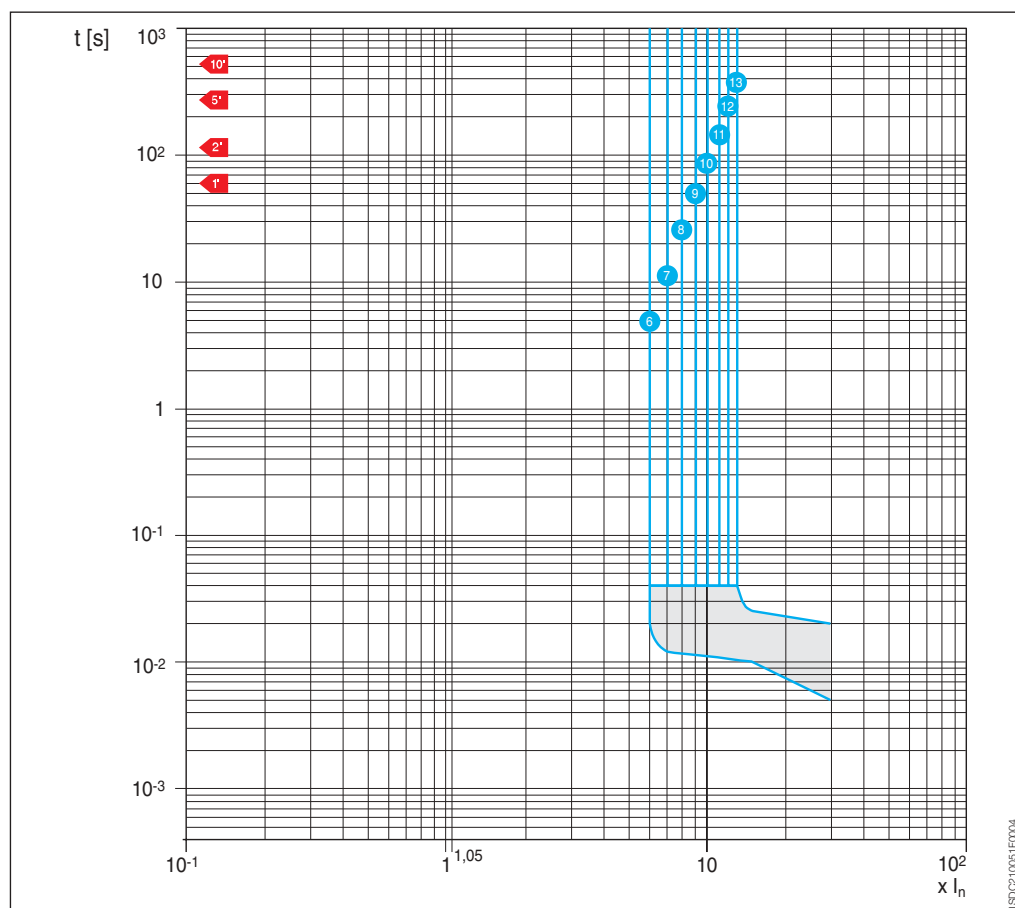
R-U Function



T4 250 - T5 400

PR222MP

I Function

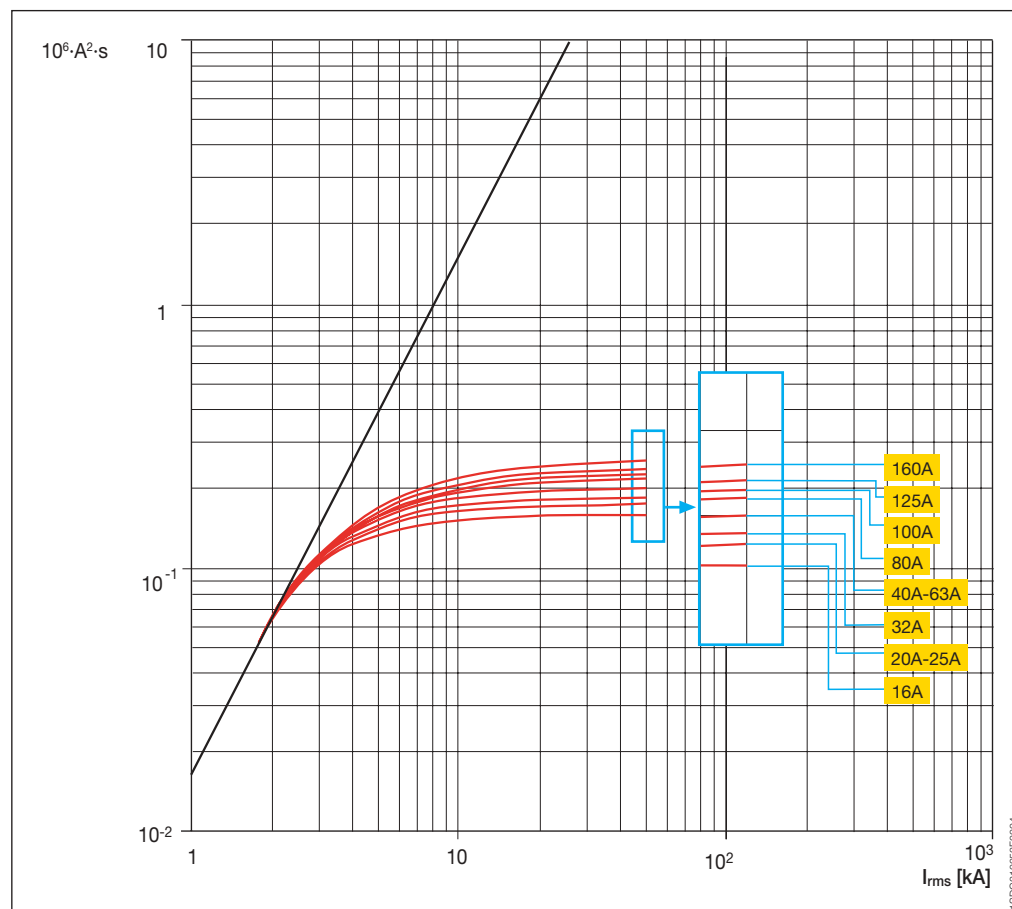




Specific let-through energy curves

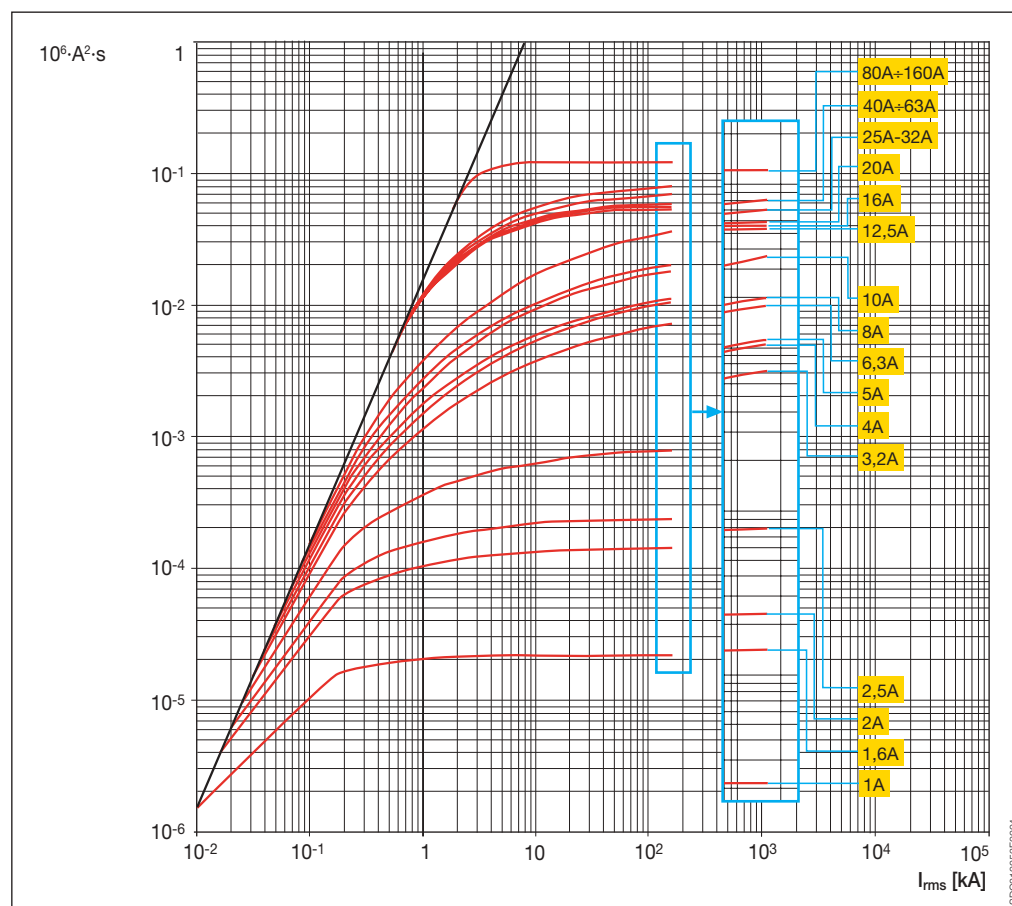
T1 160

230 V



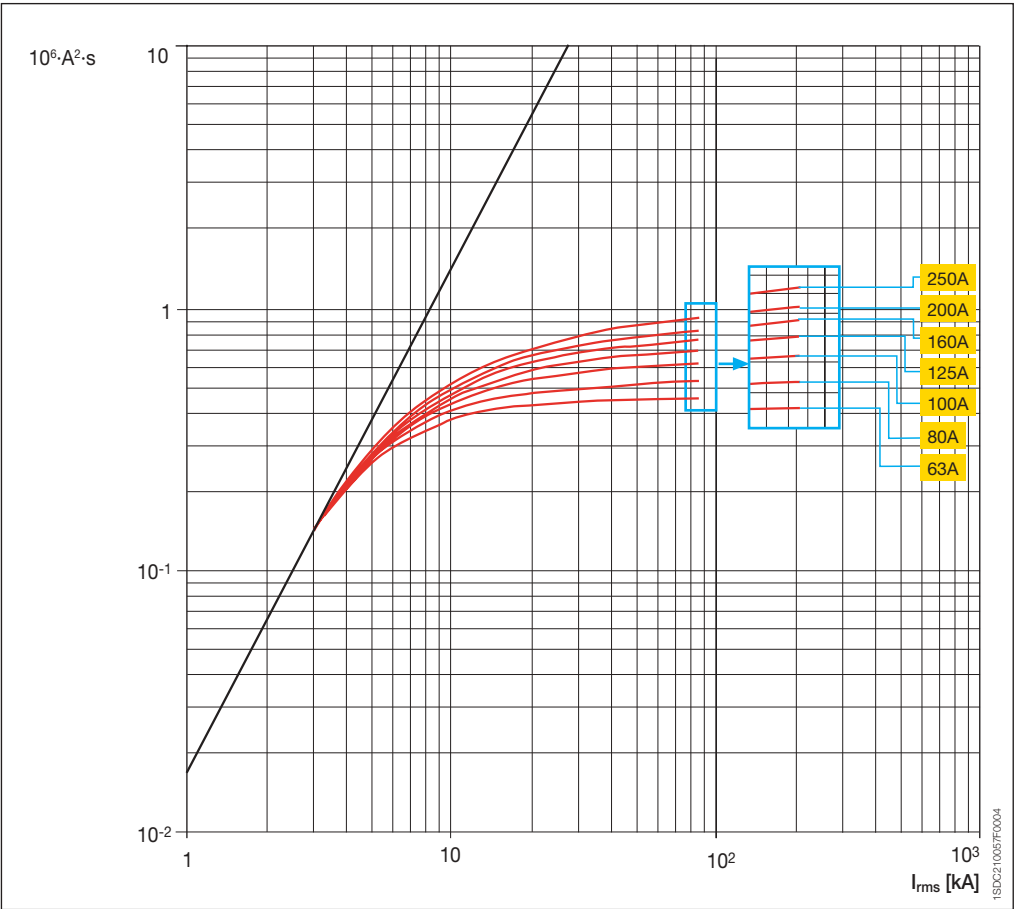
T2 160

230 V



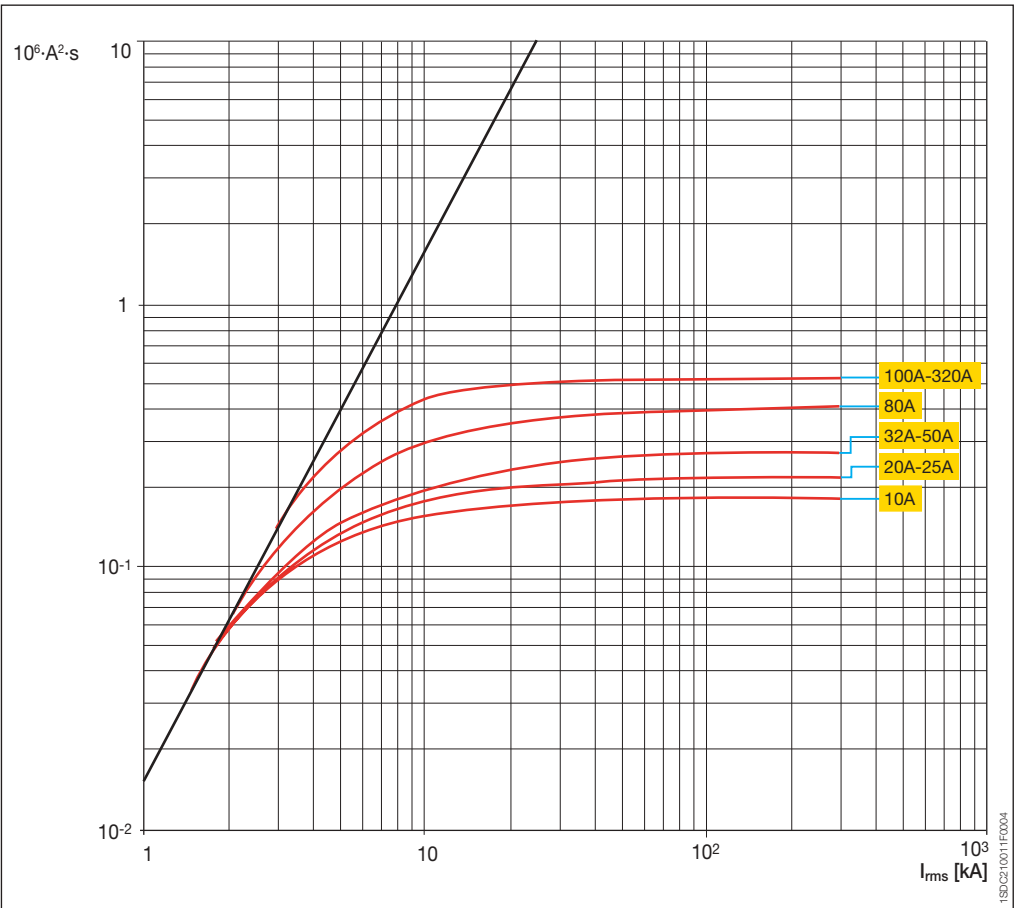
T3 250

230 V



T4 250/320

230 V

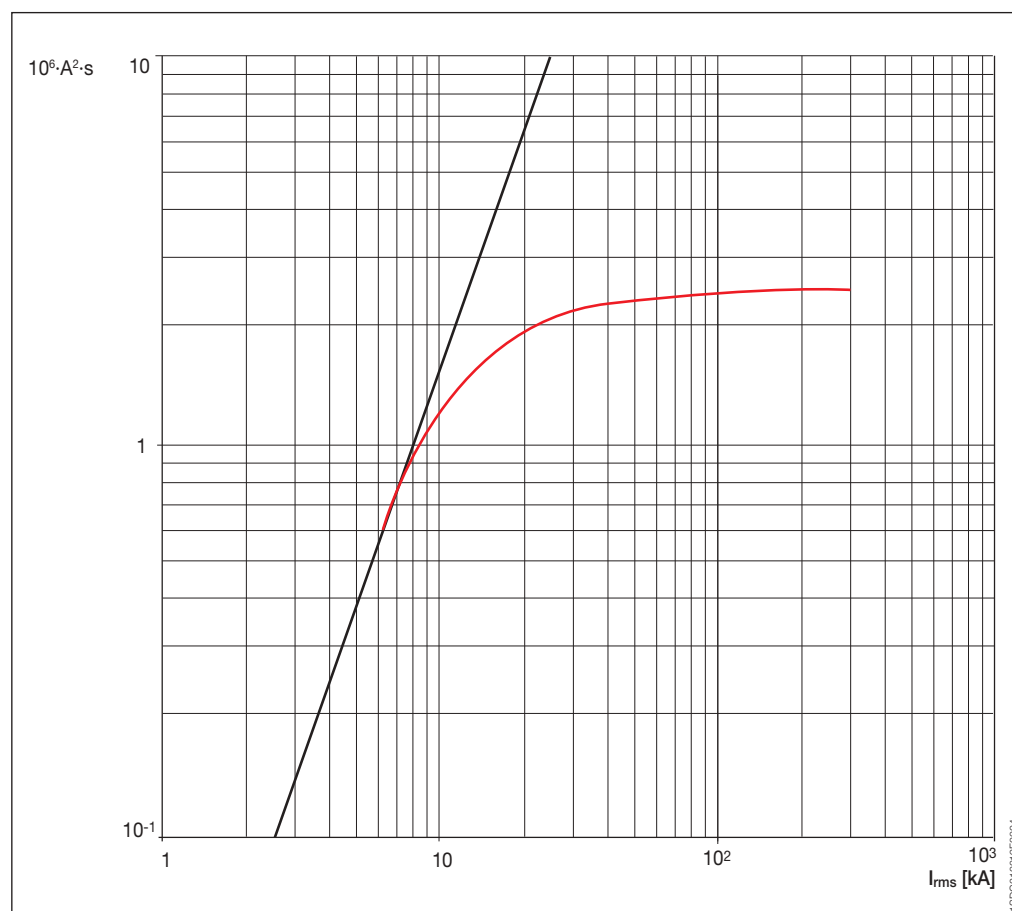




Specific let-through energy curves

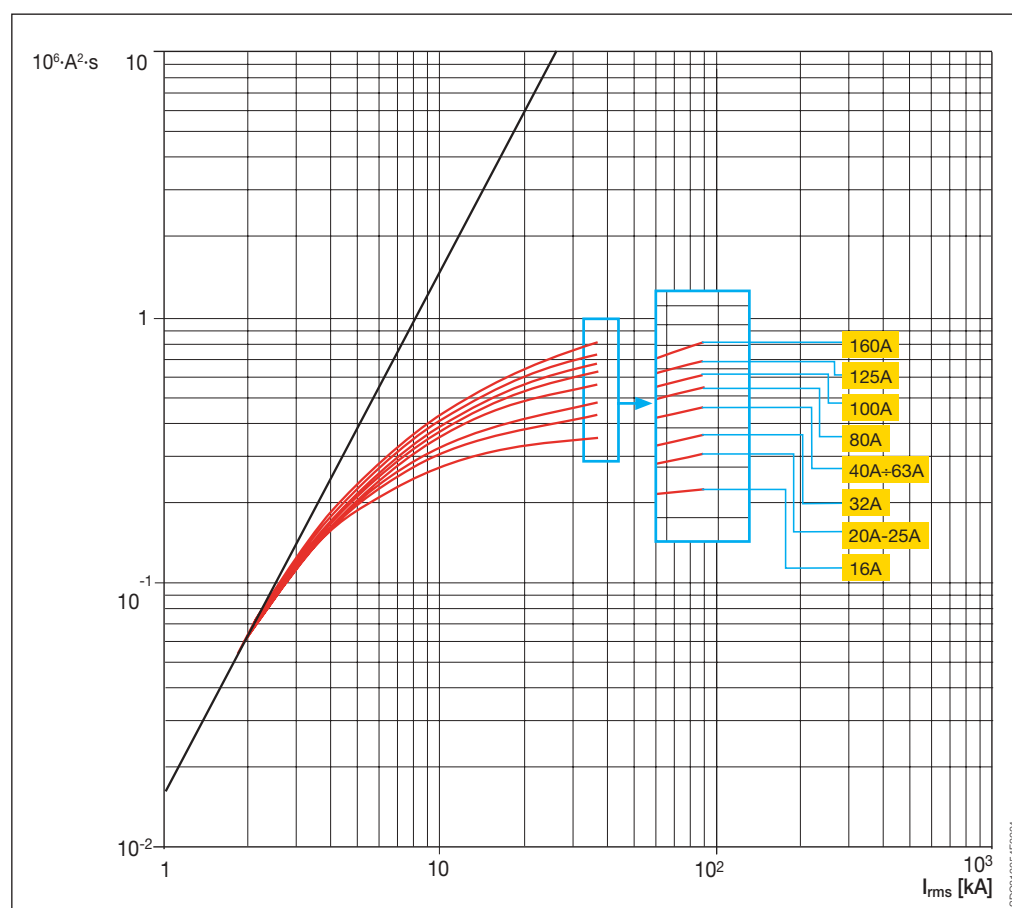
T5 400/630

230 V



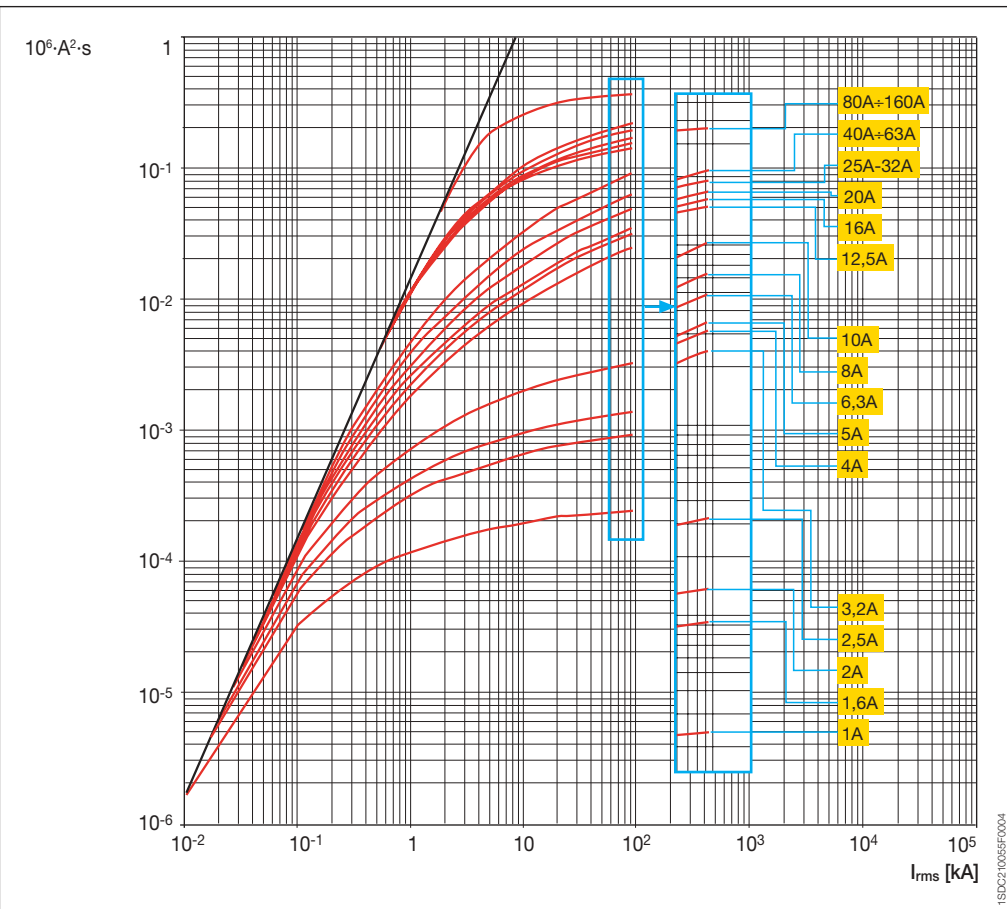
T1 160

400-440 V



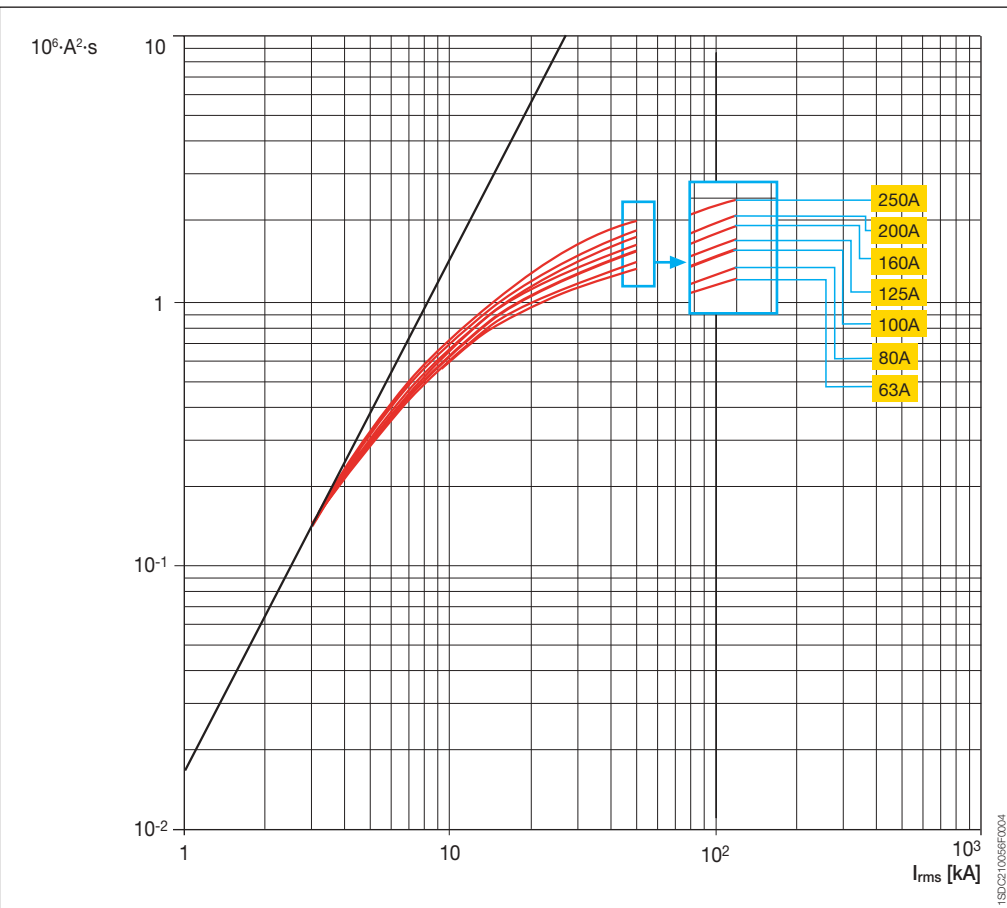
T2 160

400-440 V



T3 250

400-440 V

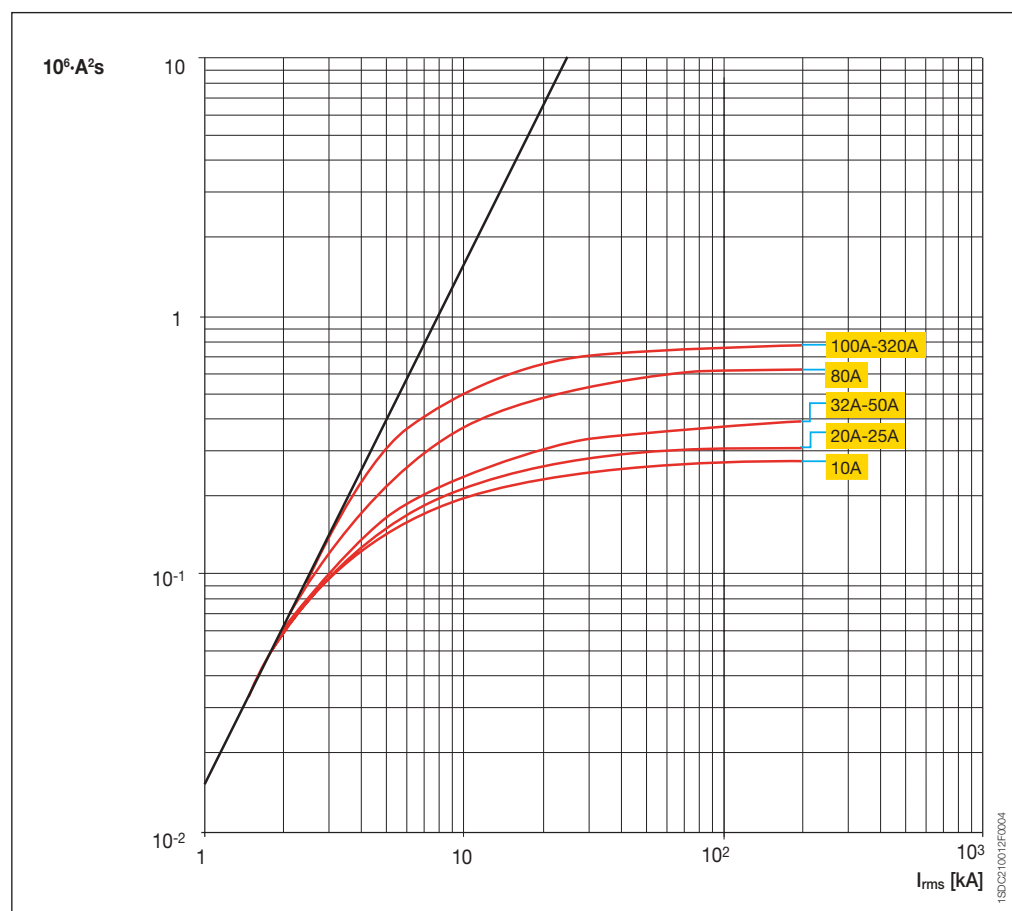




Specific let-through energy curves

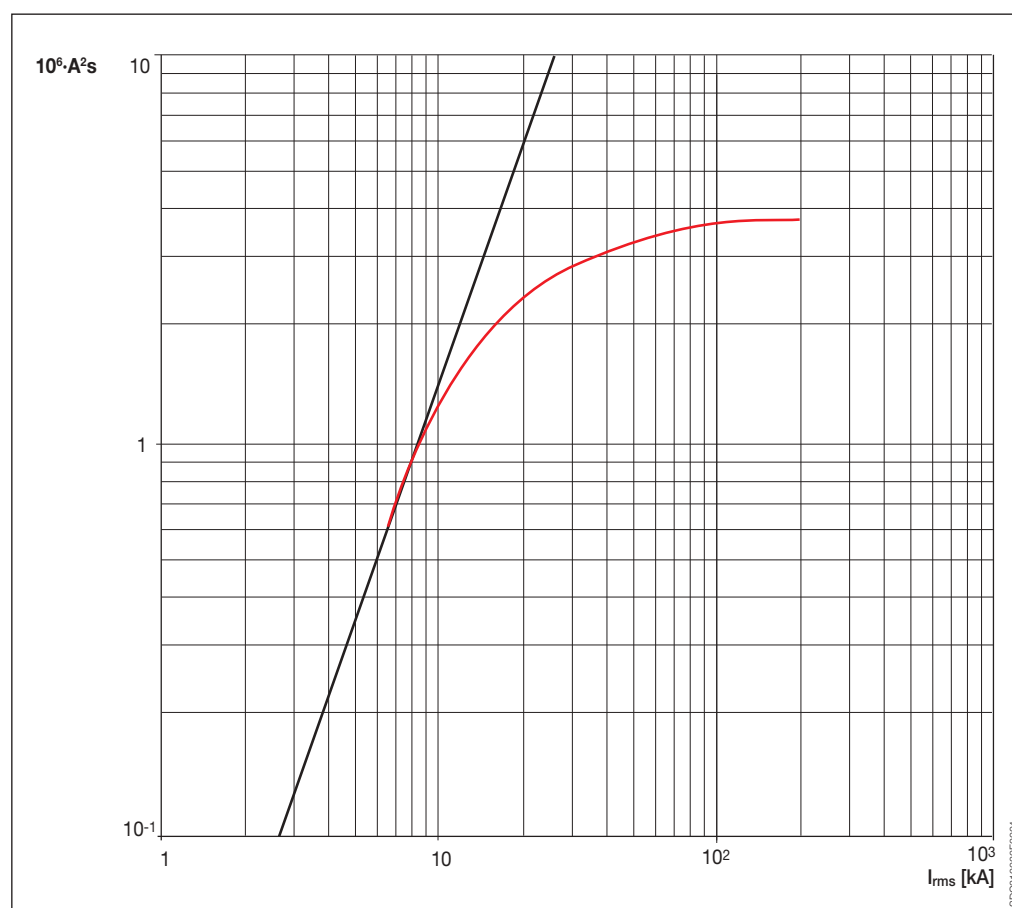
T4 250/320

400-440 V



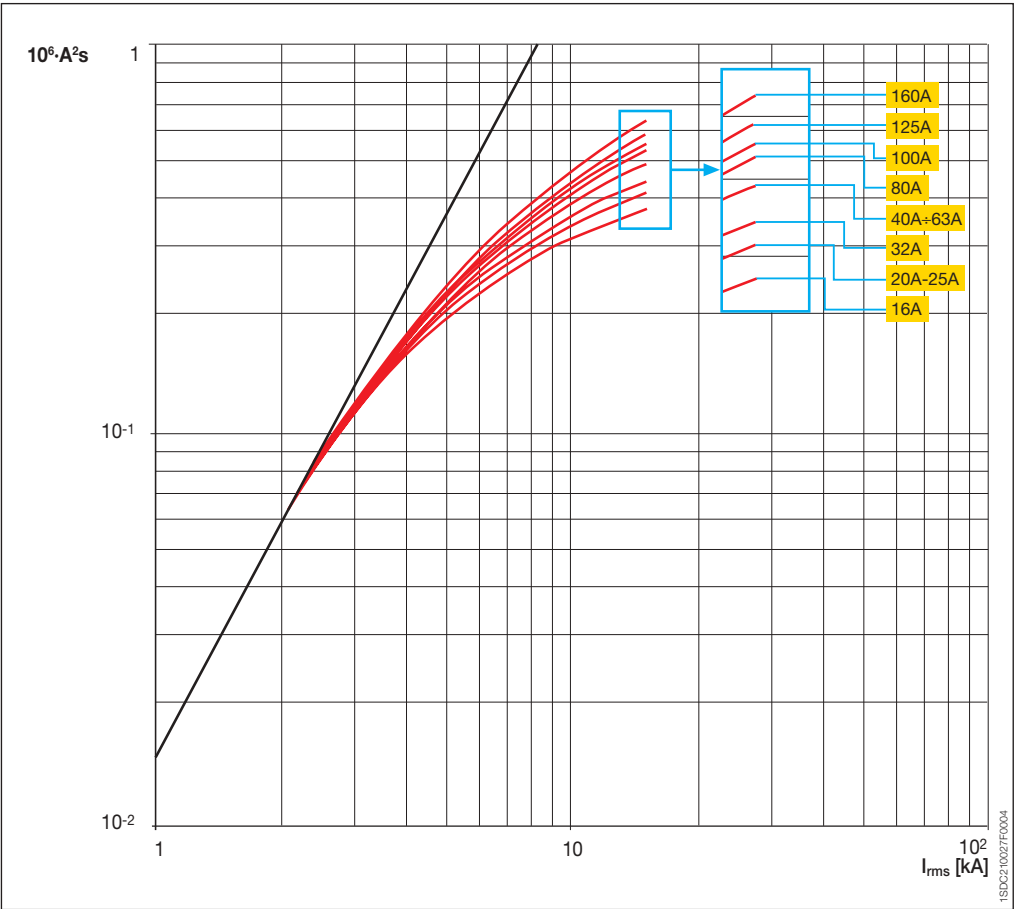
T5 400/630

400-440 V



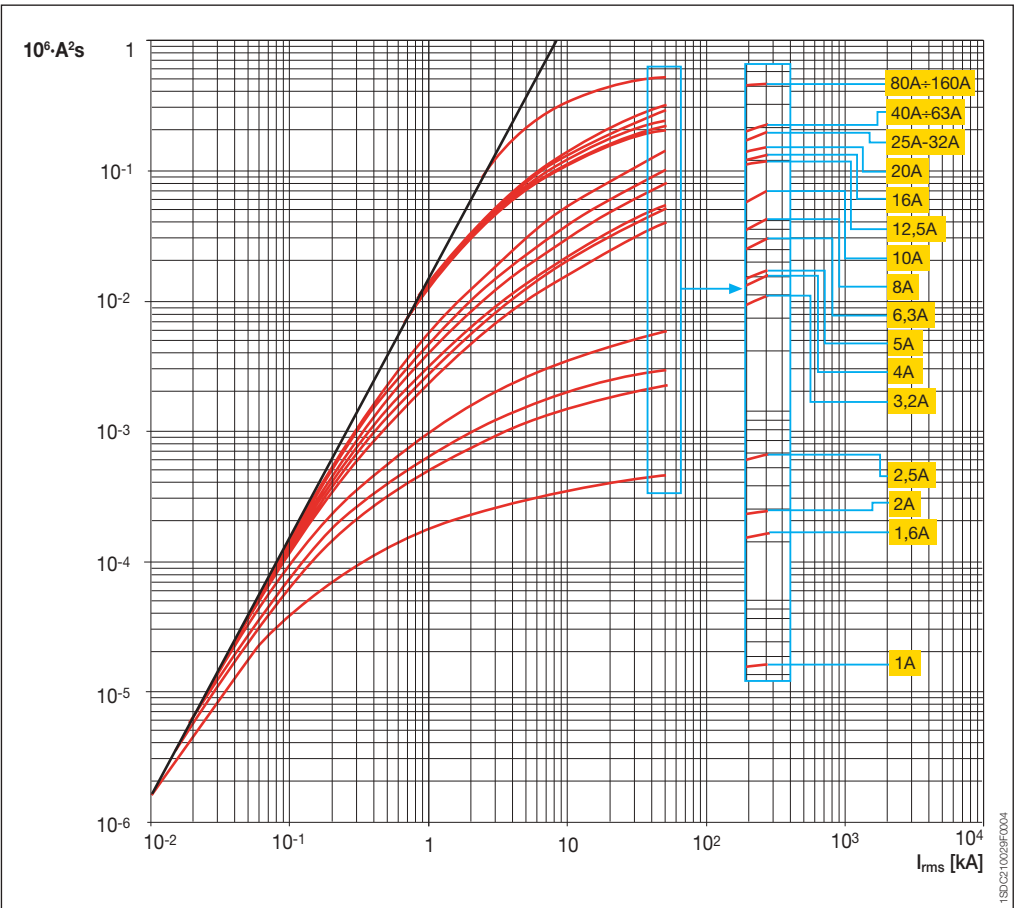
T1 160

500 V



T2 160

500 V

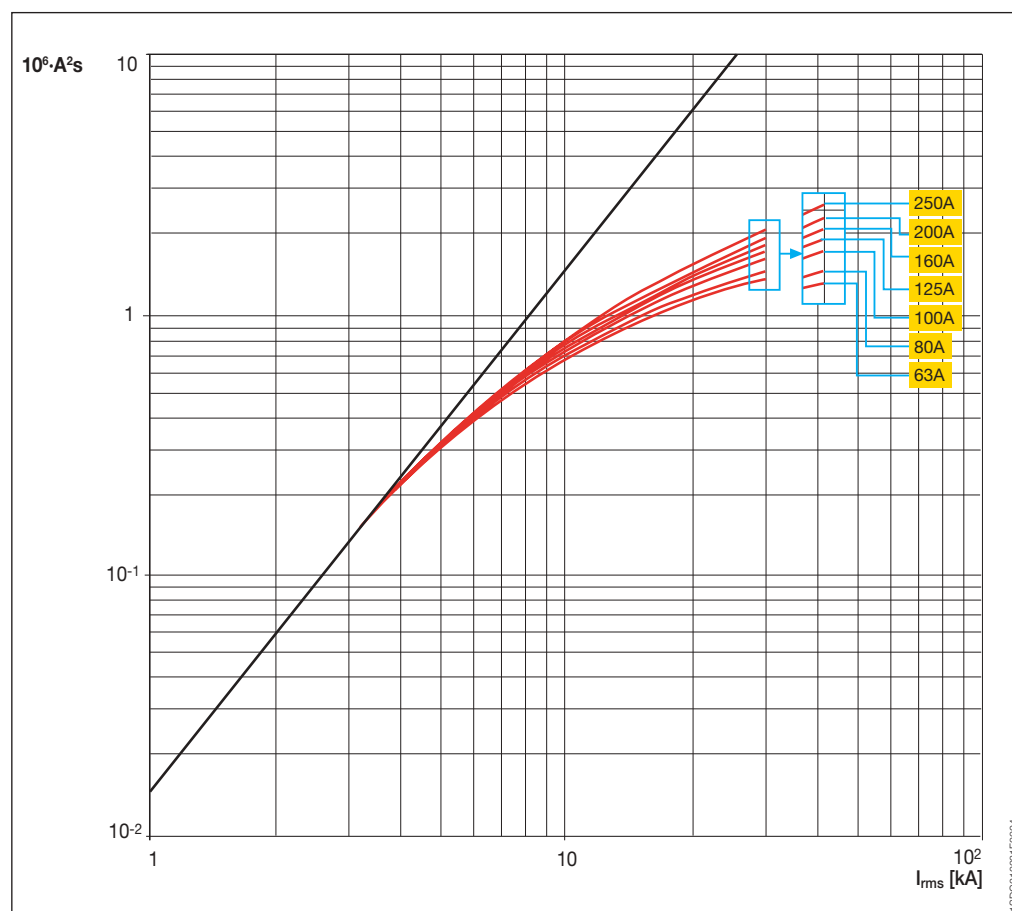




Specific let-through energy curves

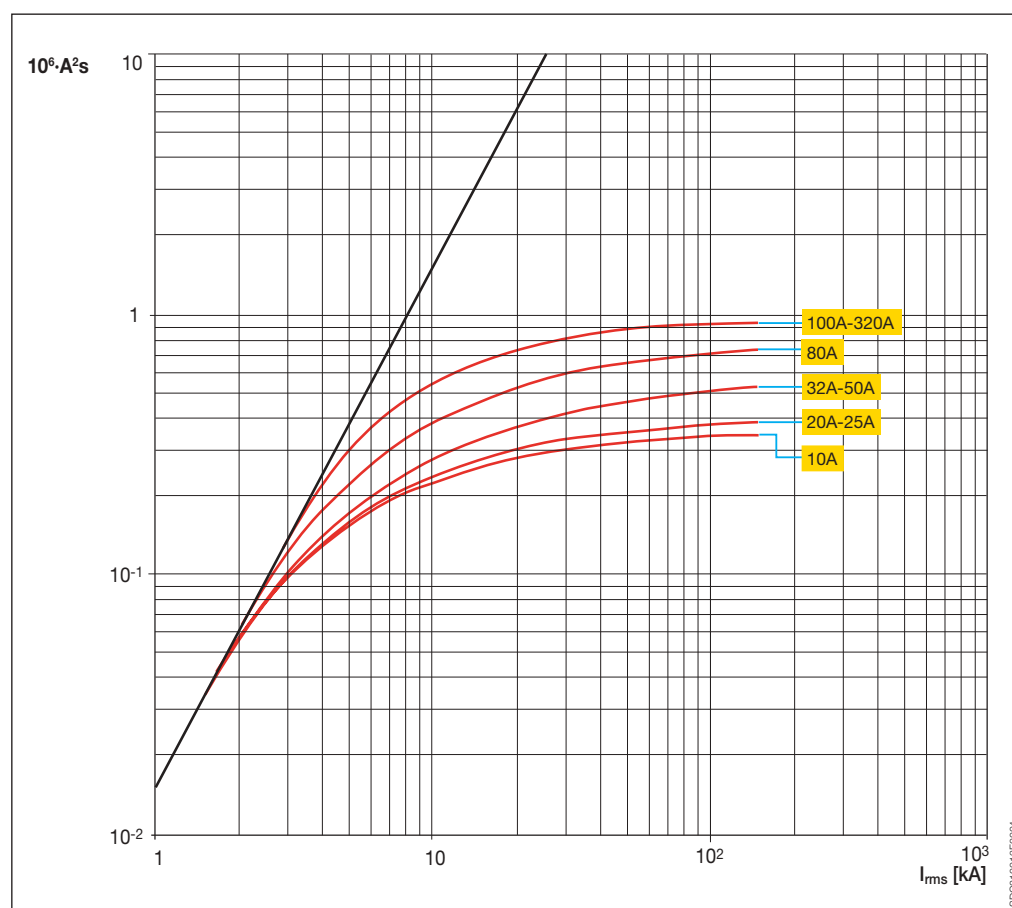
T3 250

500 V



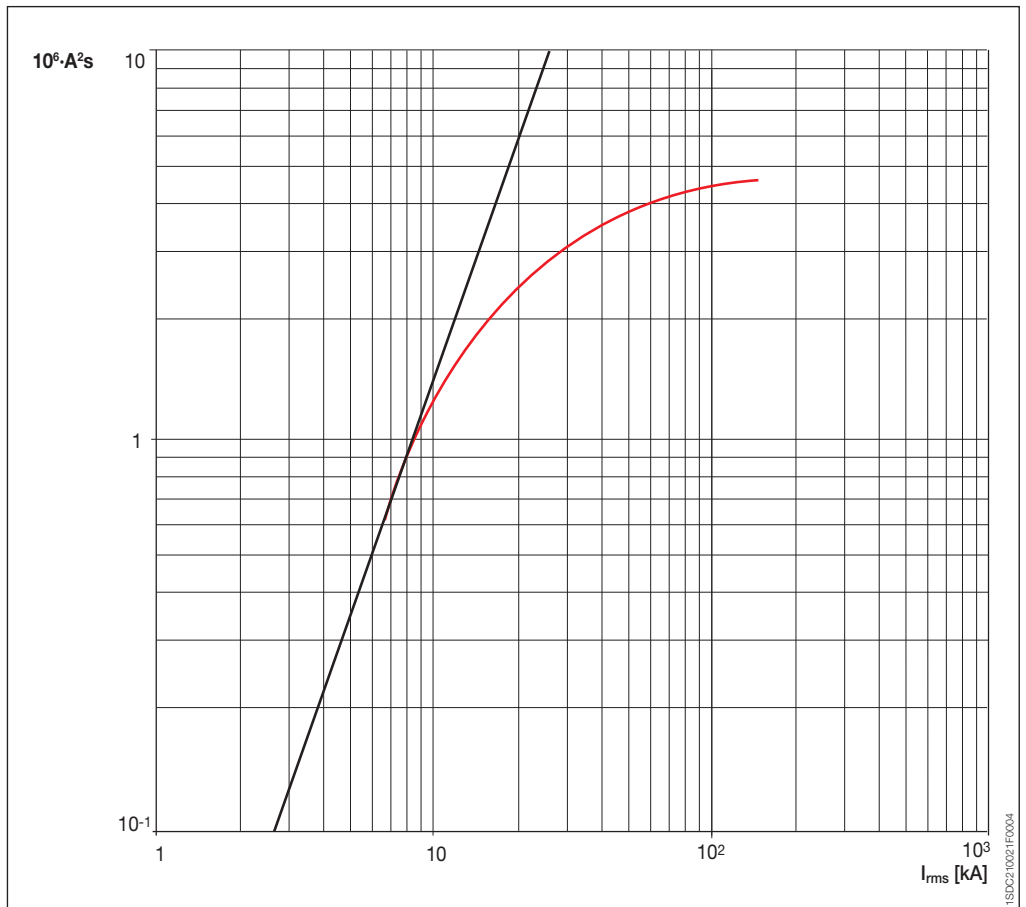
T4 250/320

500 V



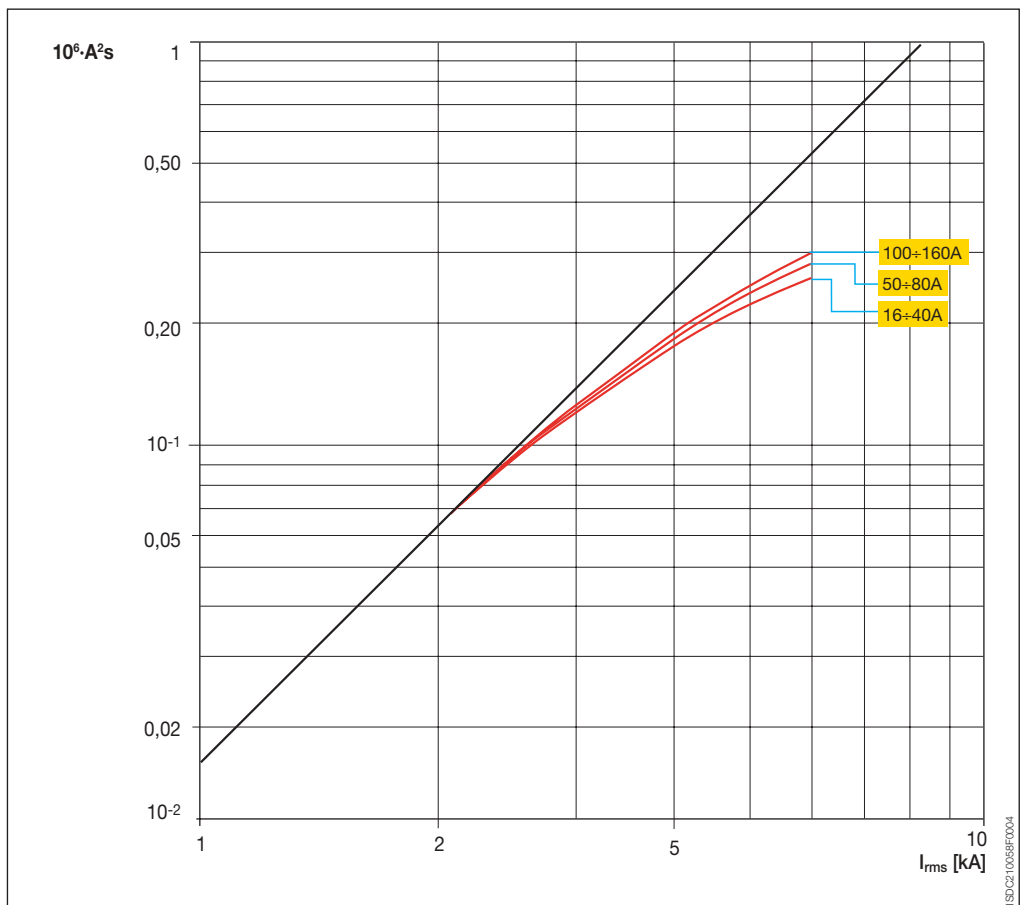
T5 400/630

500 V



T1 160

690 V

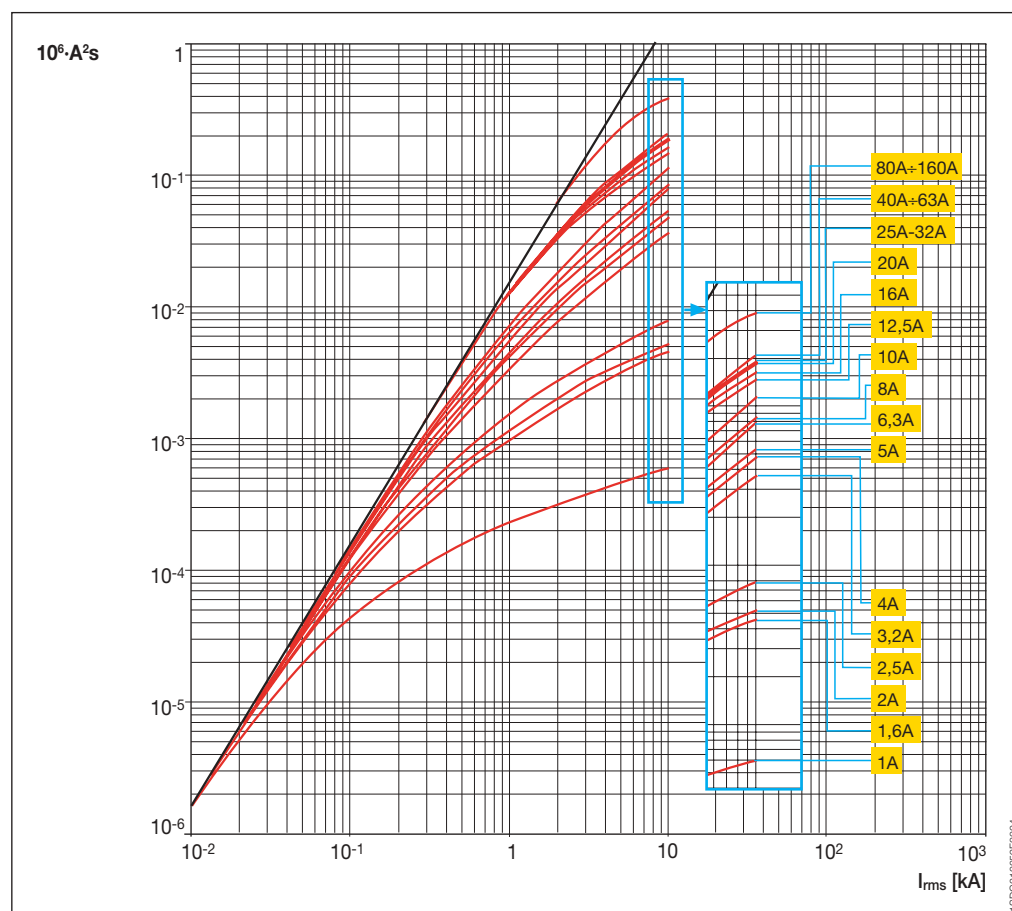




Specific let-through energy curves

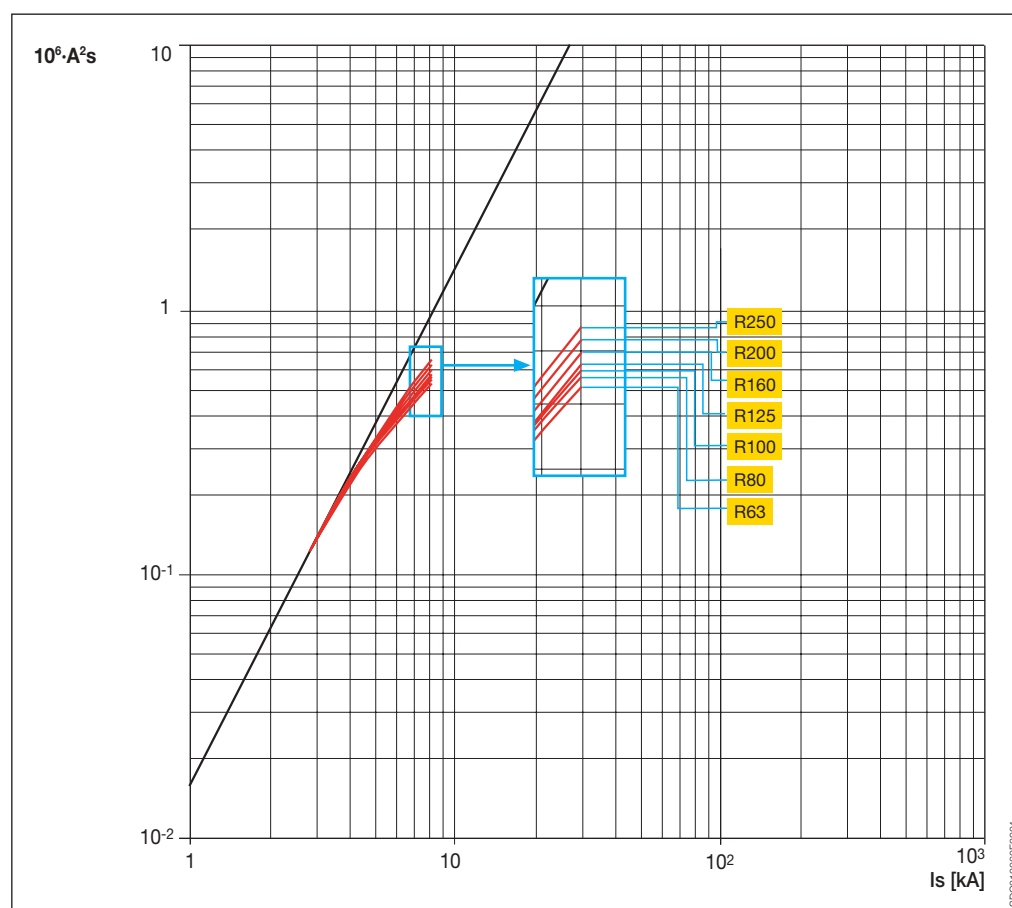
T2 160

690 V



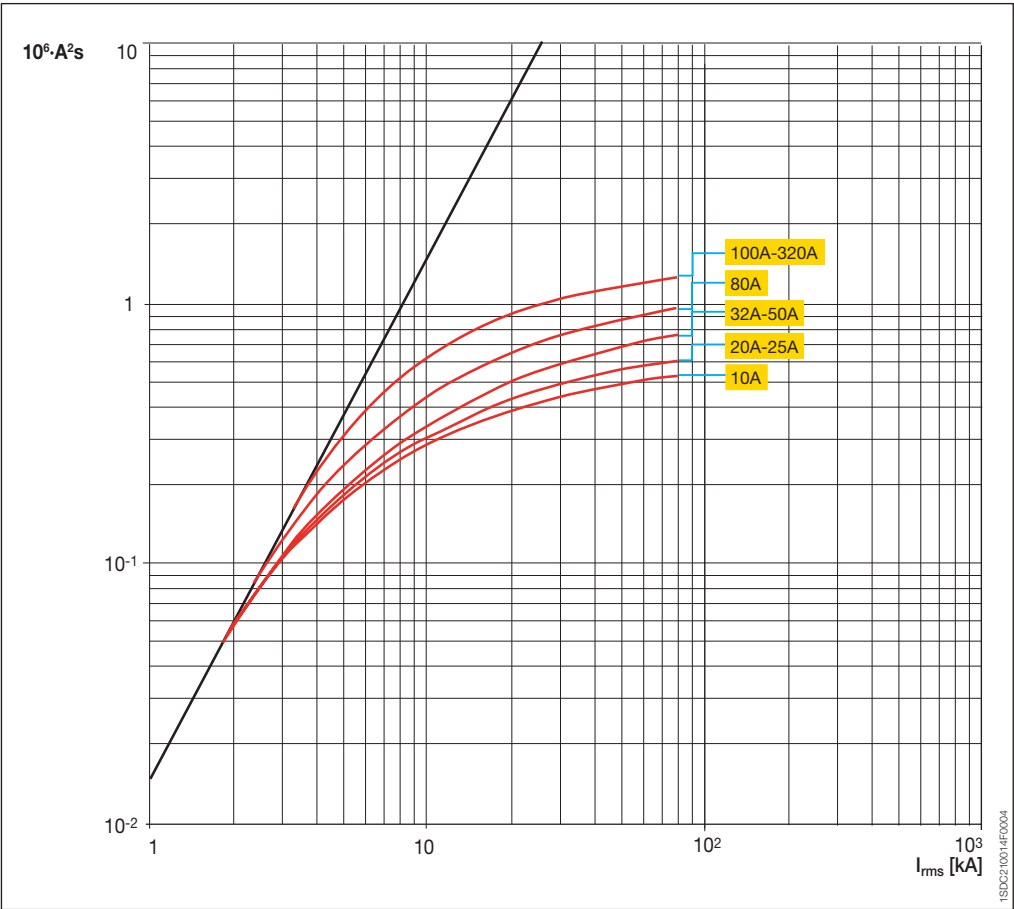
T3 250

690 V



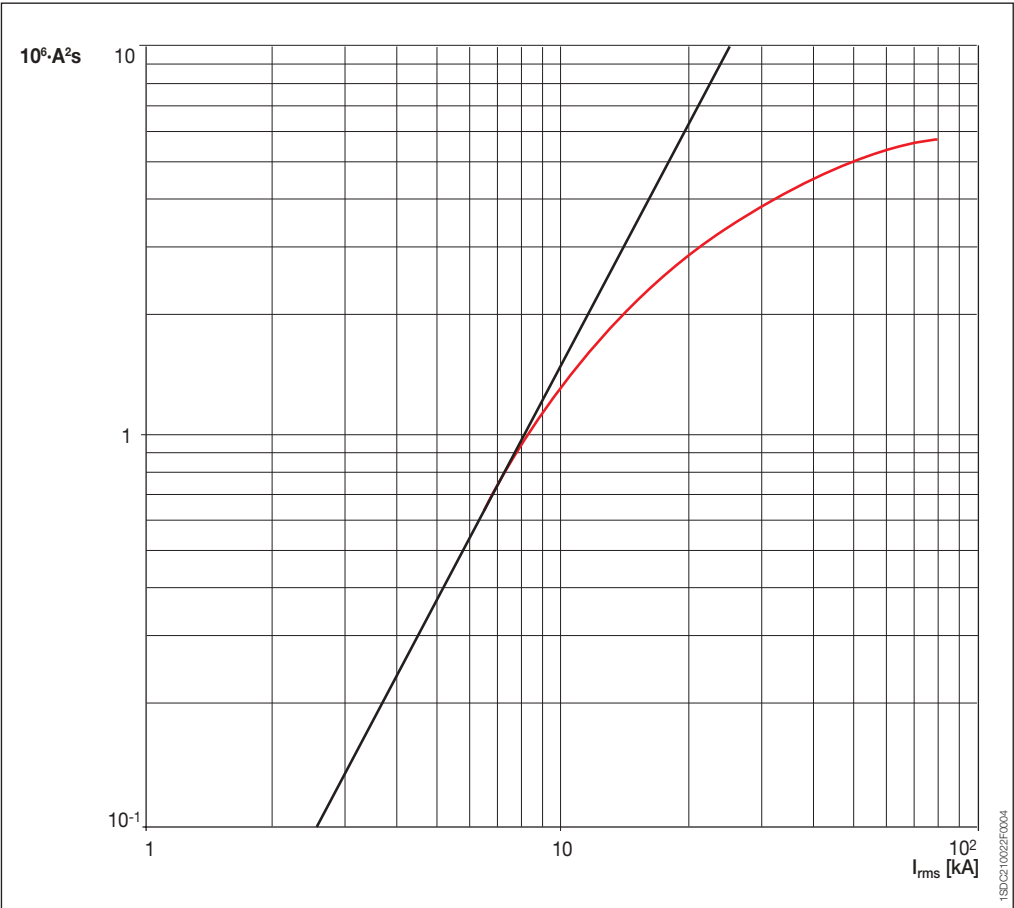
T4 250/320

690 V



T5 400/630

690 V

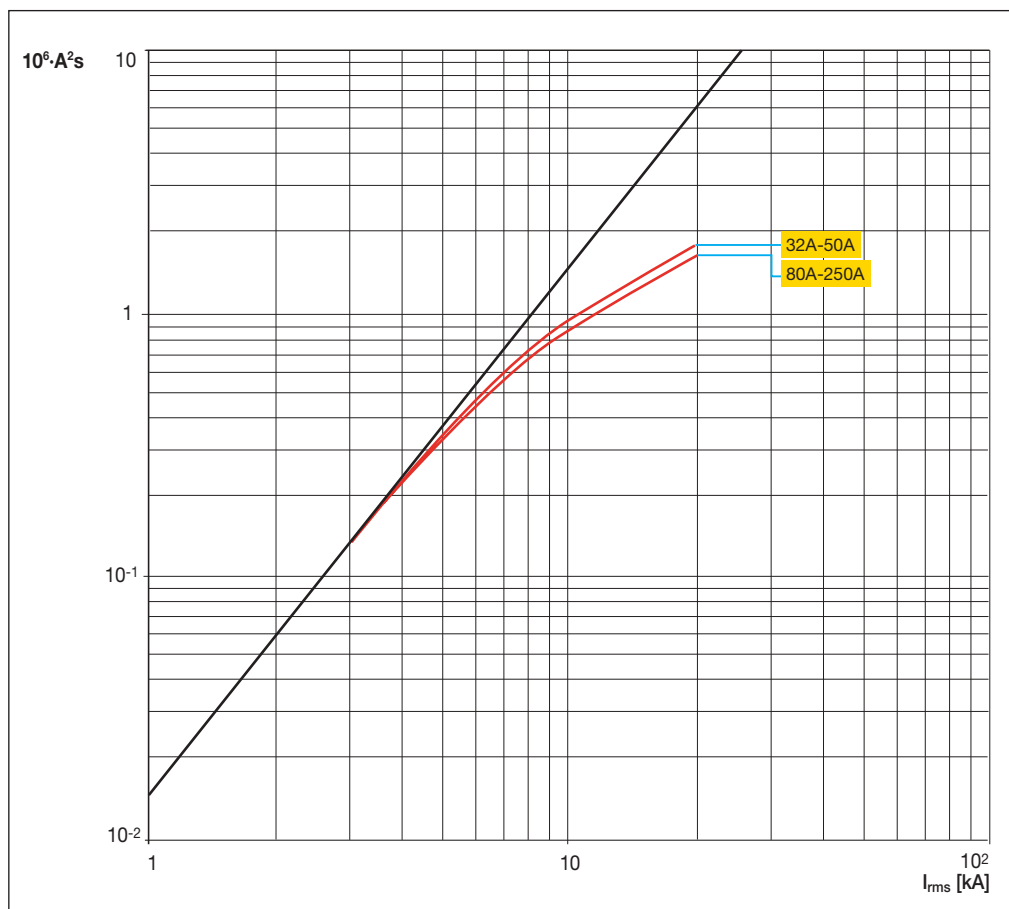




Specific let-through energy curves

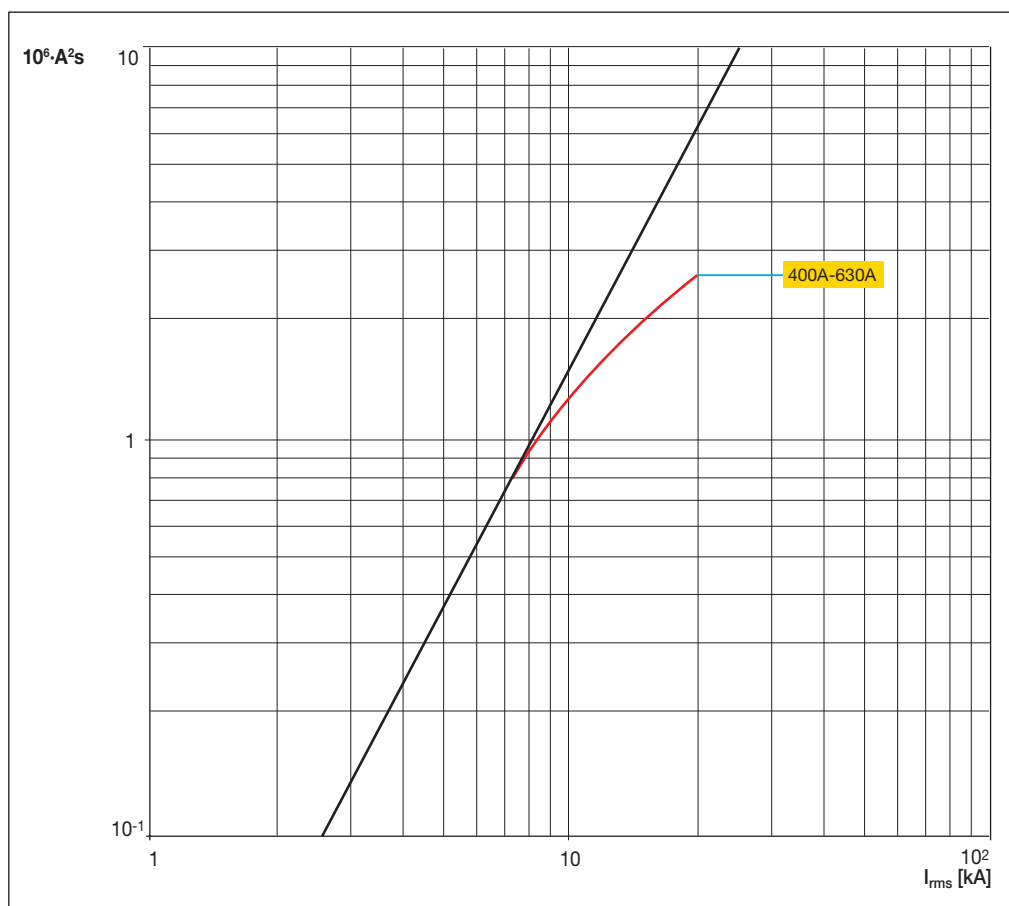
T4 250

1000 V



T5 400/630

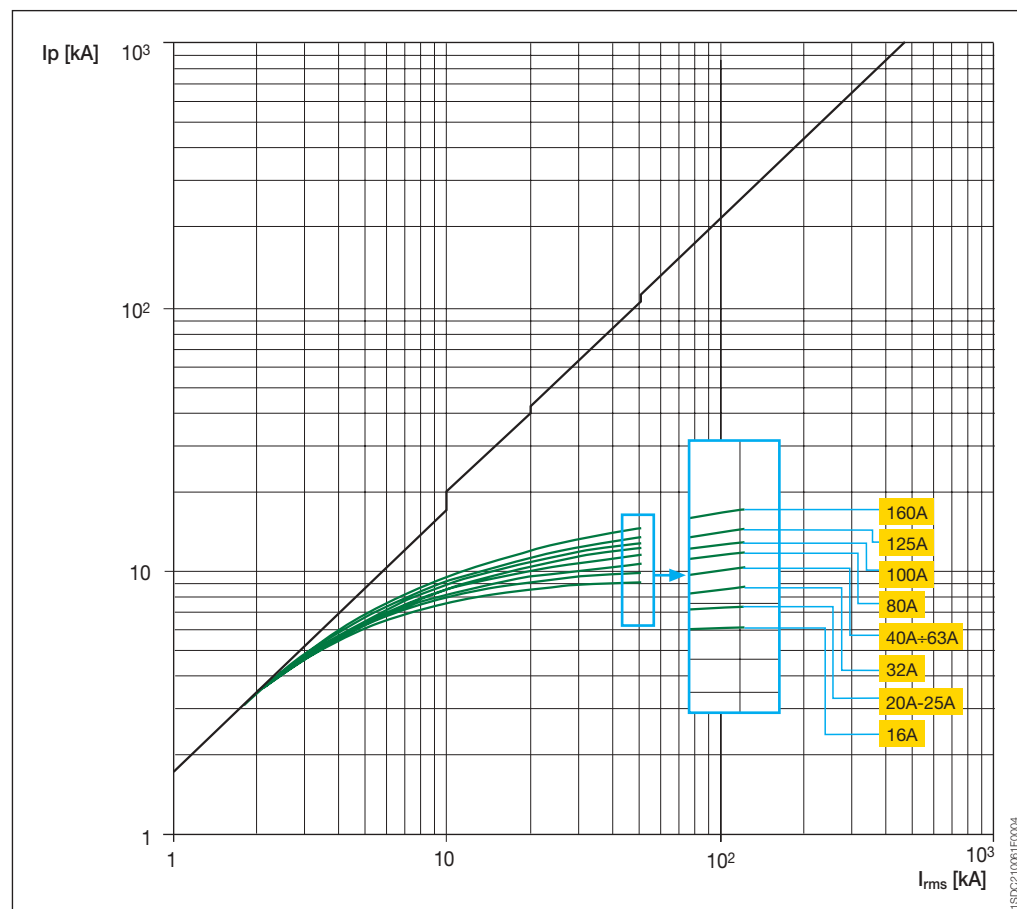
1000 V



Limitation curves

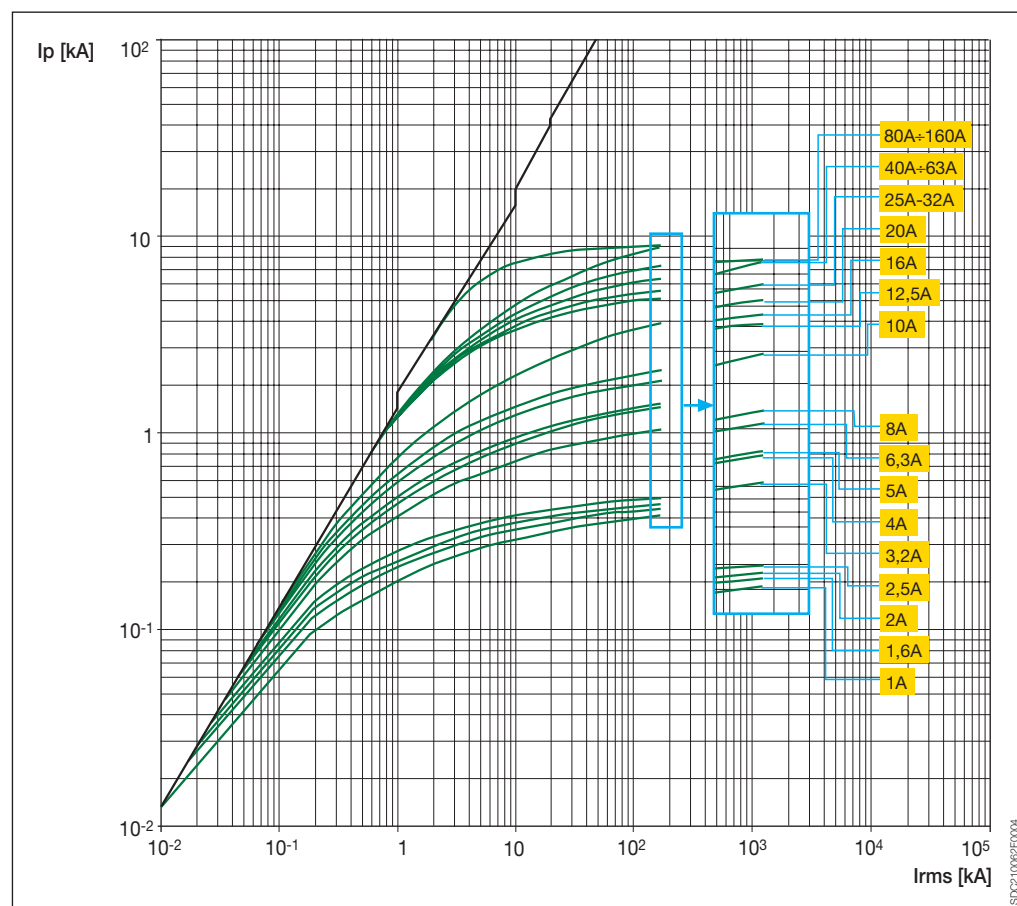
T1 160

230 V



T2 160

230 V

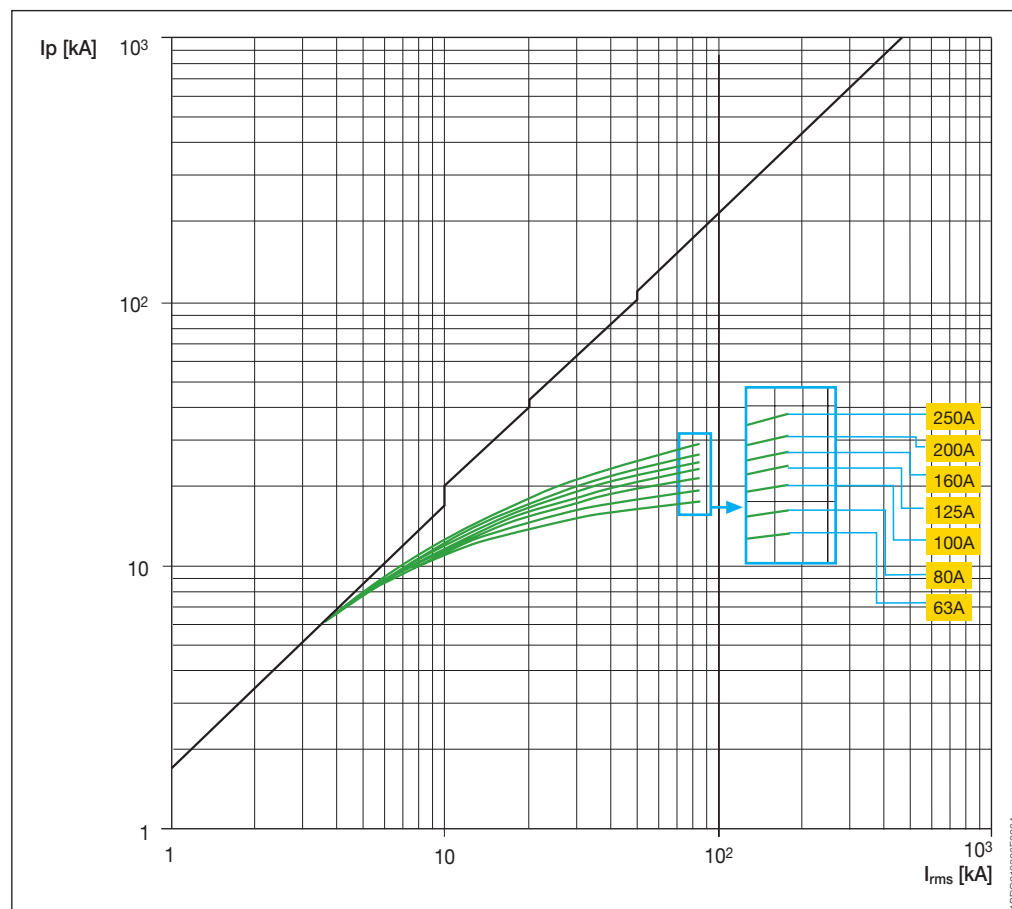




Limitation curves

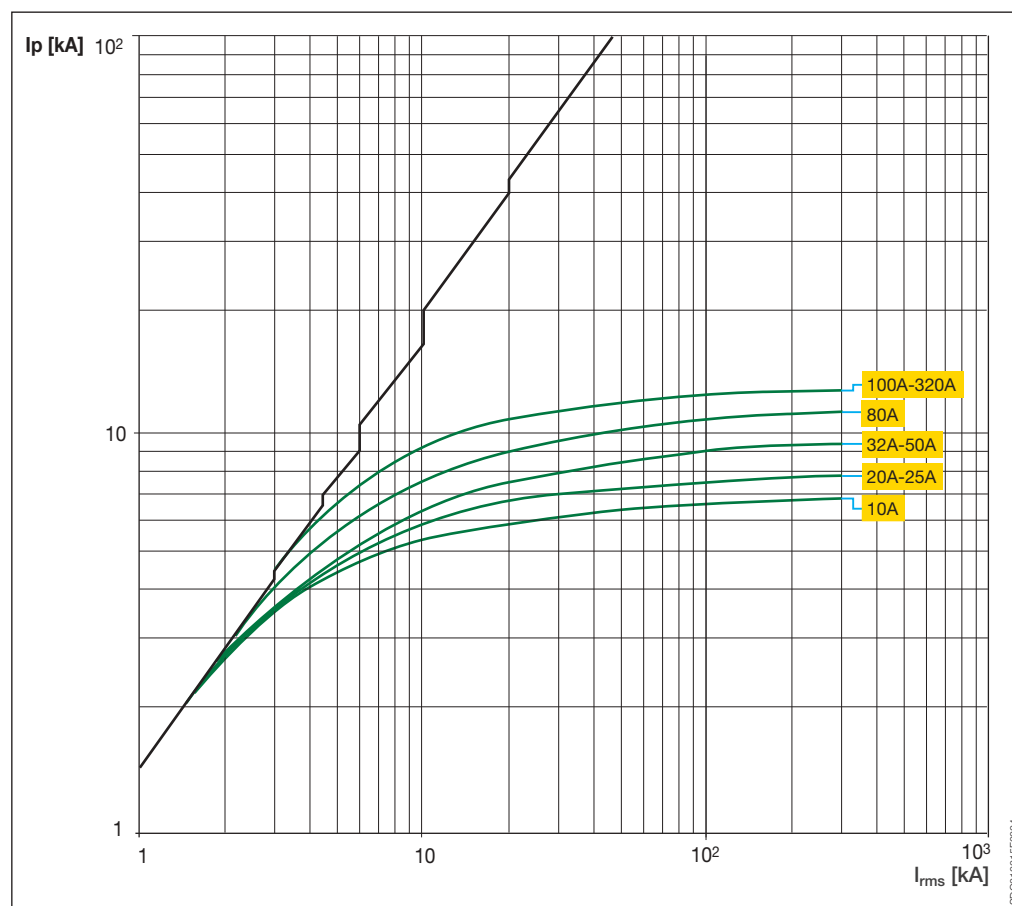
T3 250

230 V



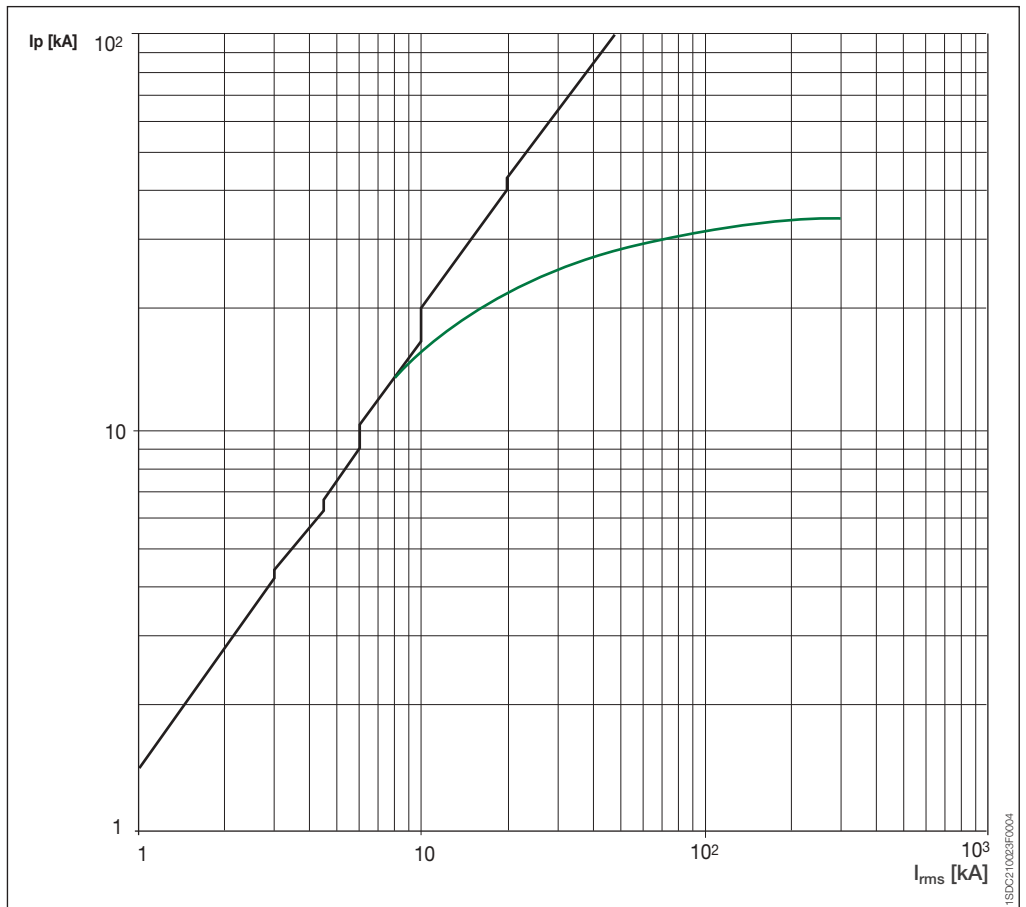
T4 250/320

230 V



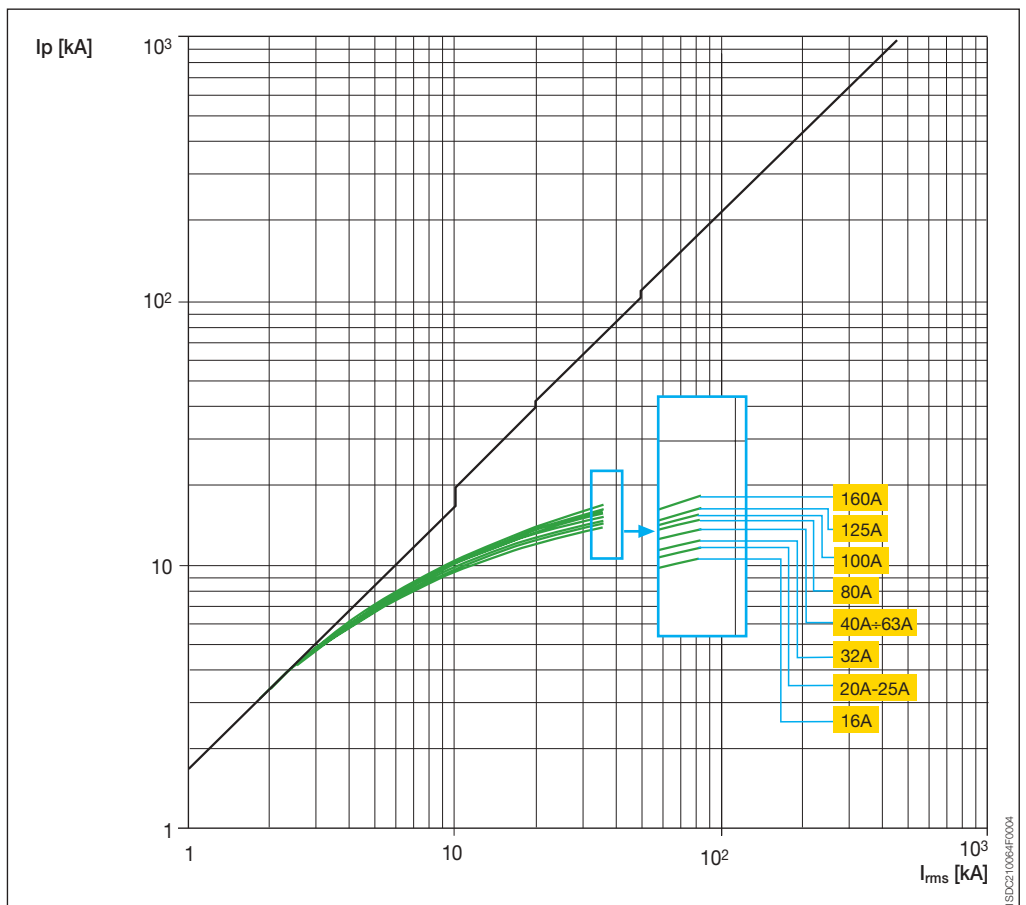
T5 400/630

230 V



T1 160

400-440 V

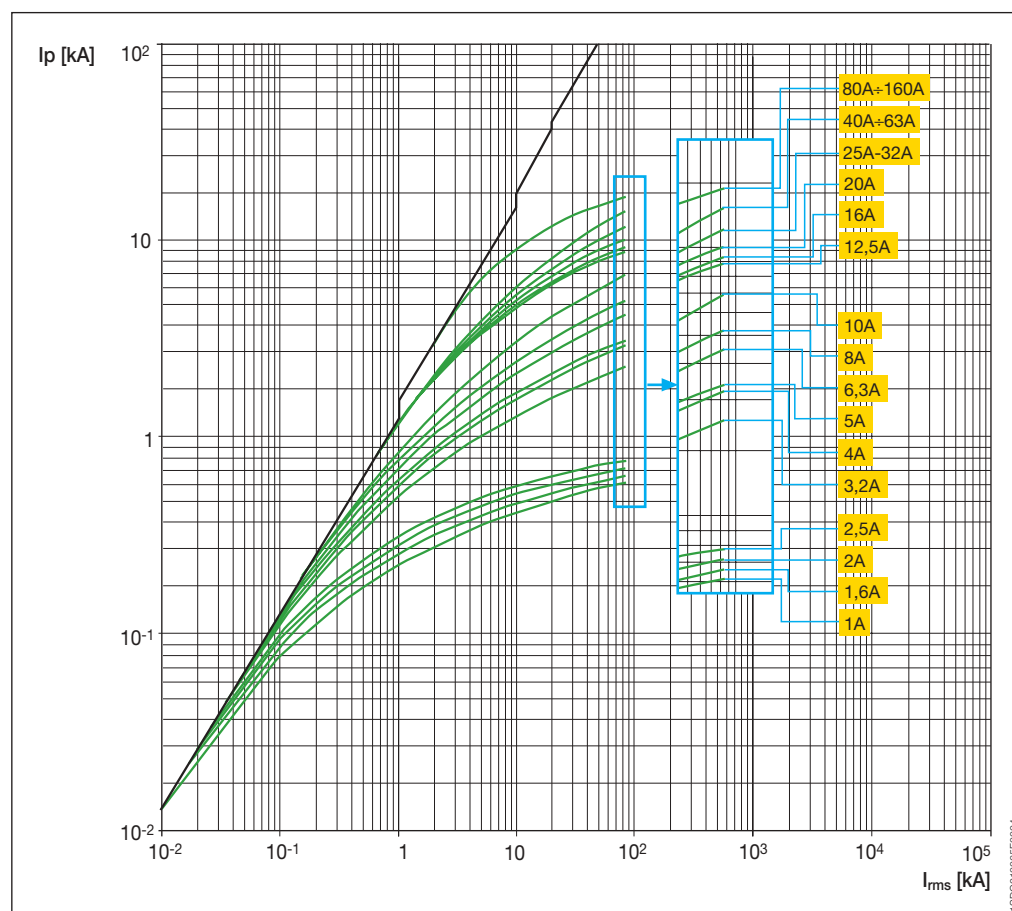




Limitation curves

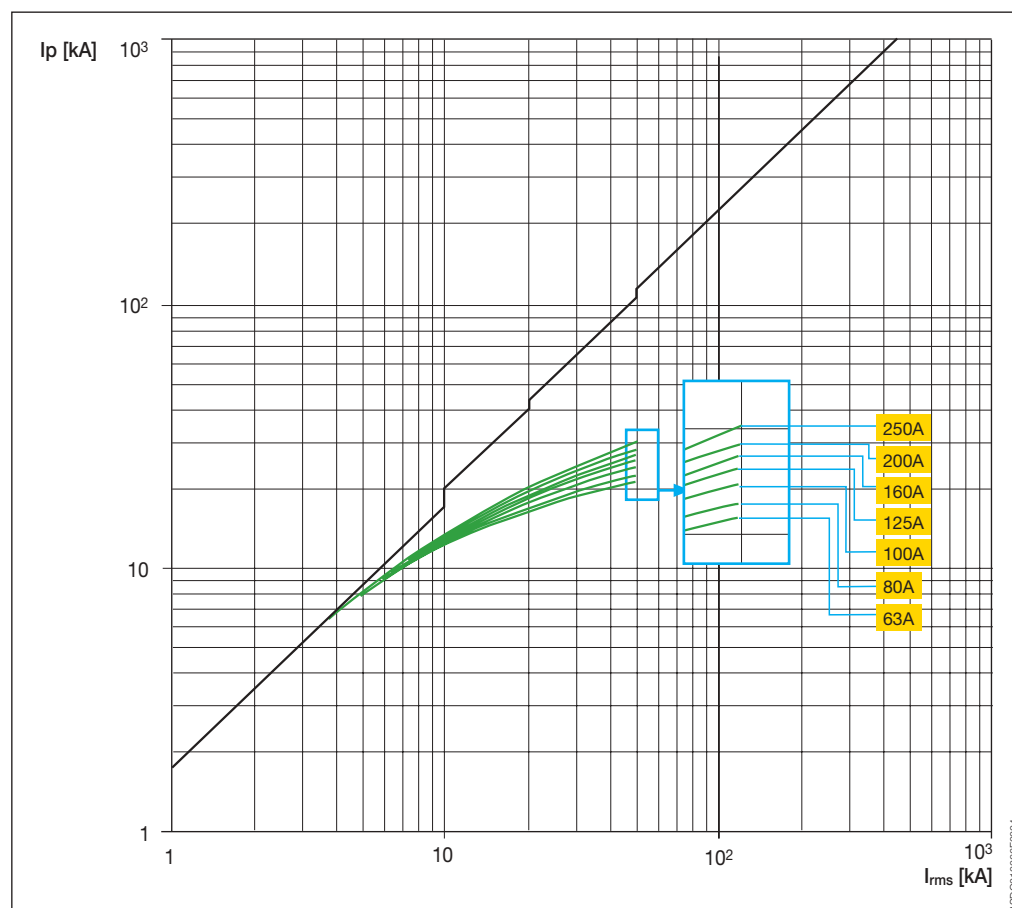
T2 160

400-440 V



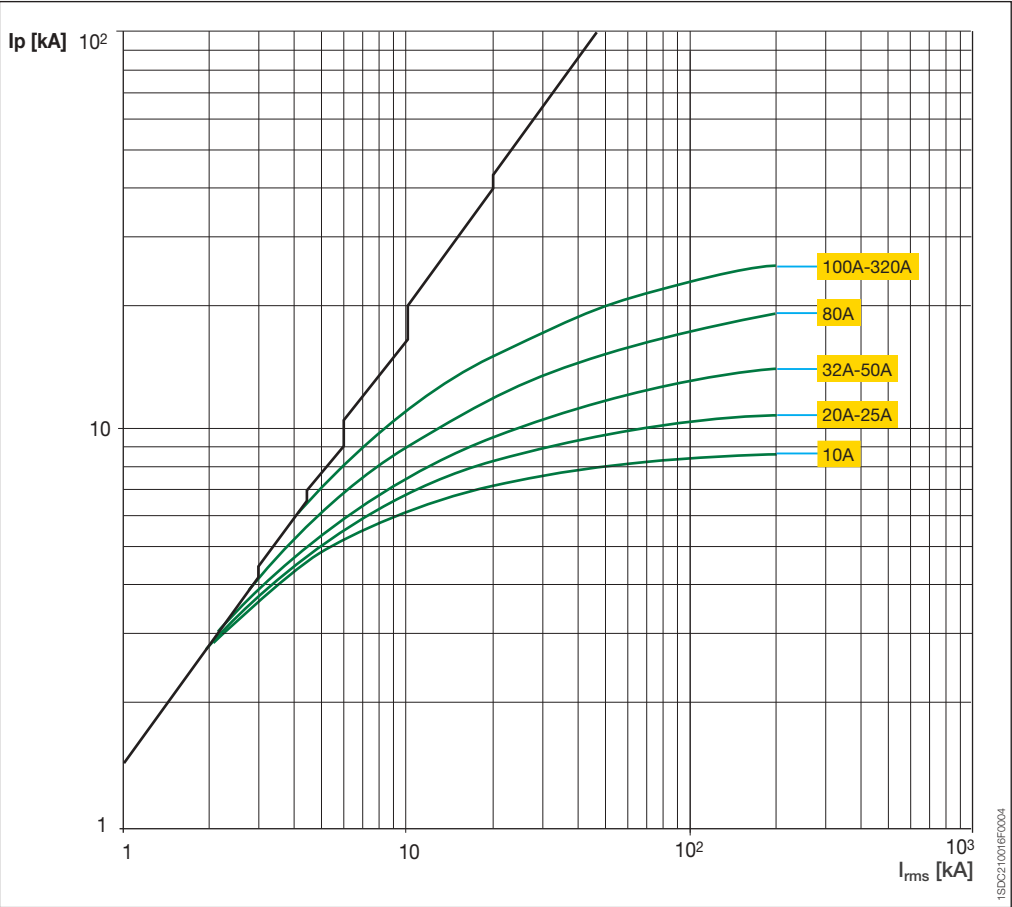
T3 250

400-440 V



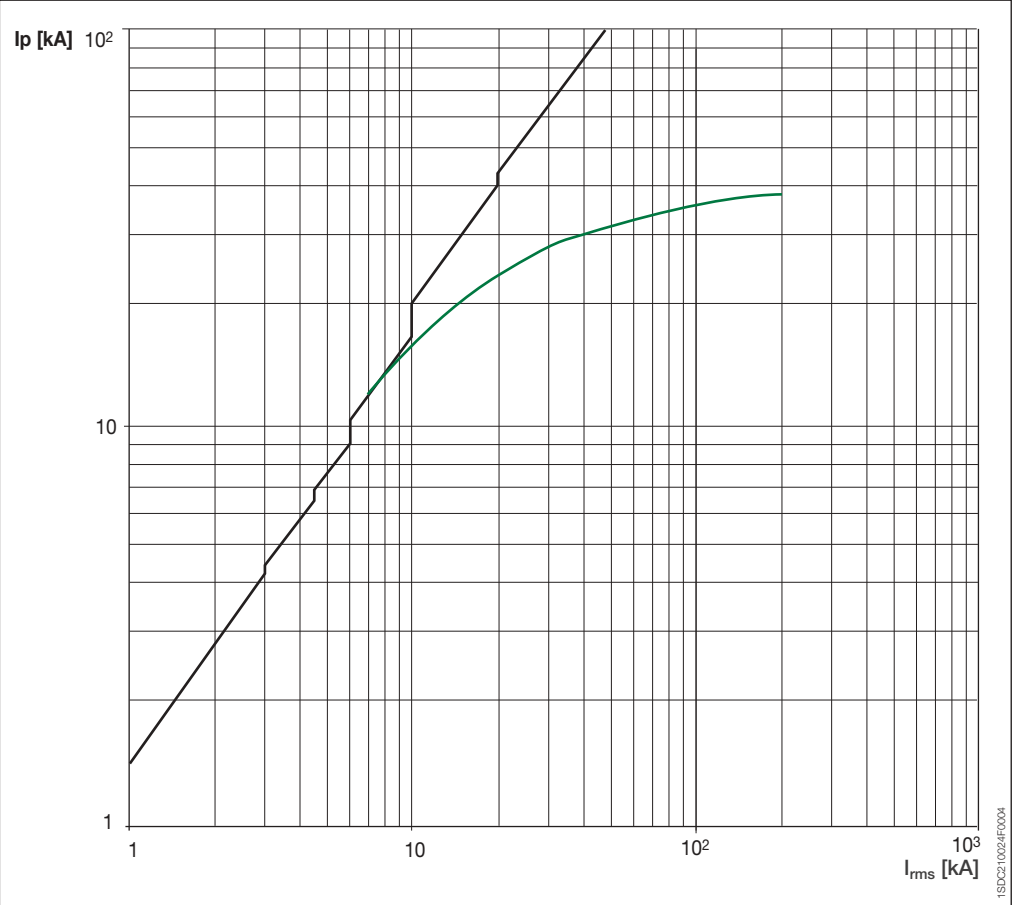
T4 250/320

400-440 V



T5 400/630

400-440 V

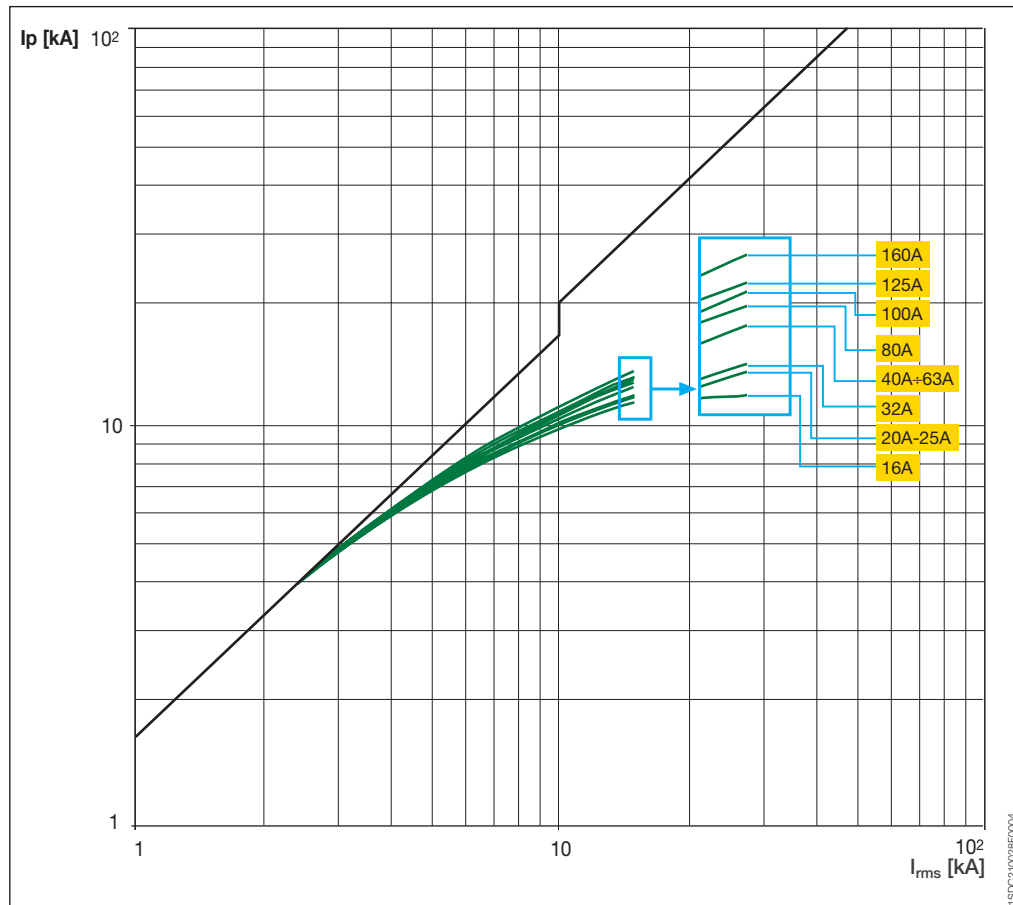




Limitation curves

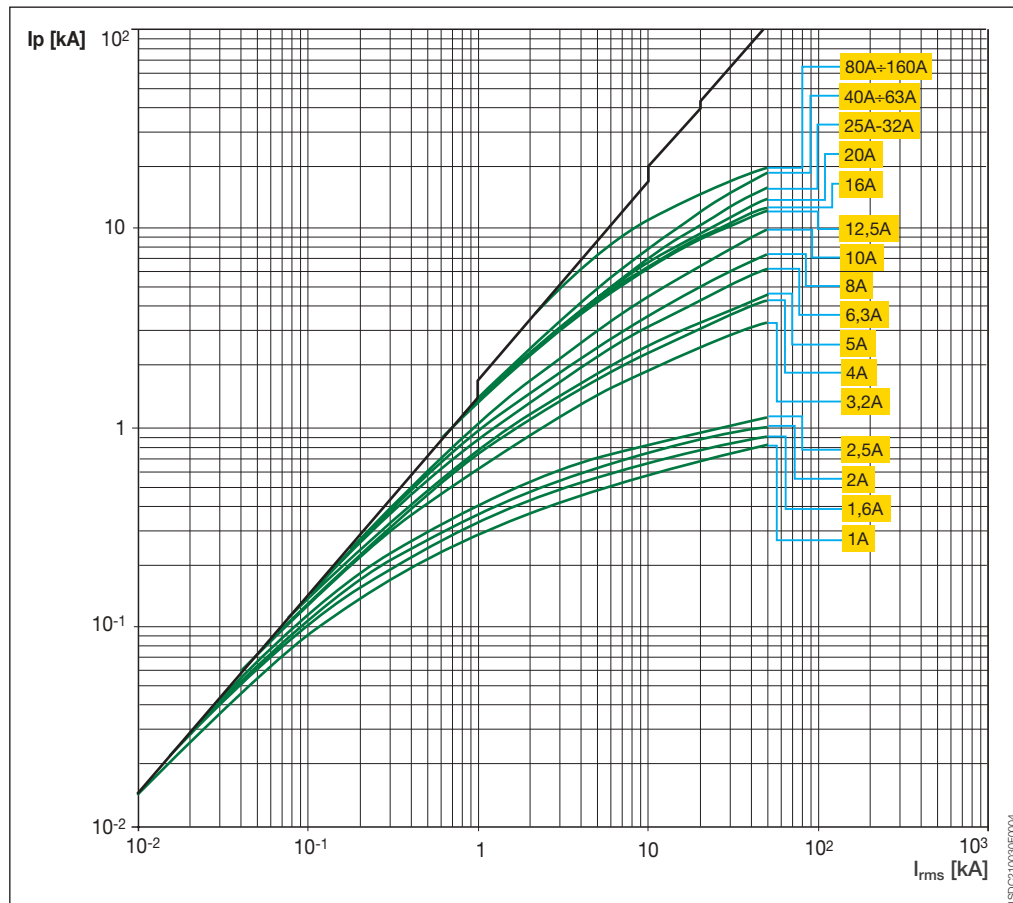
T1 160

500 V



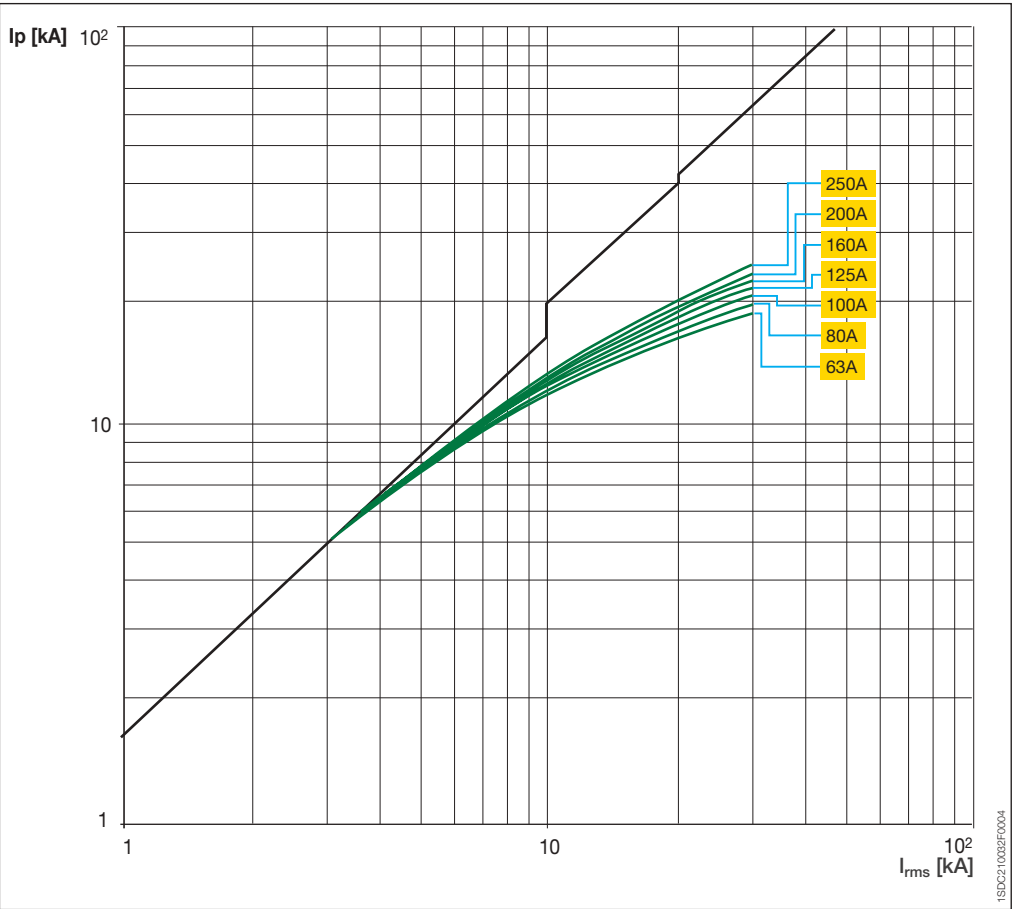
T2 160

500 V



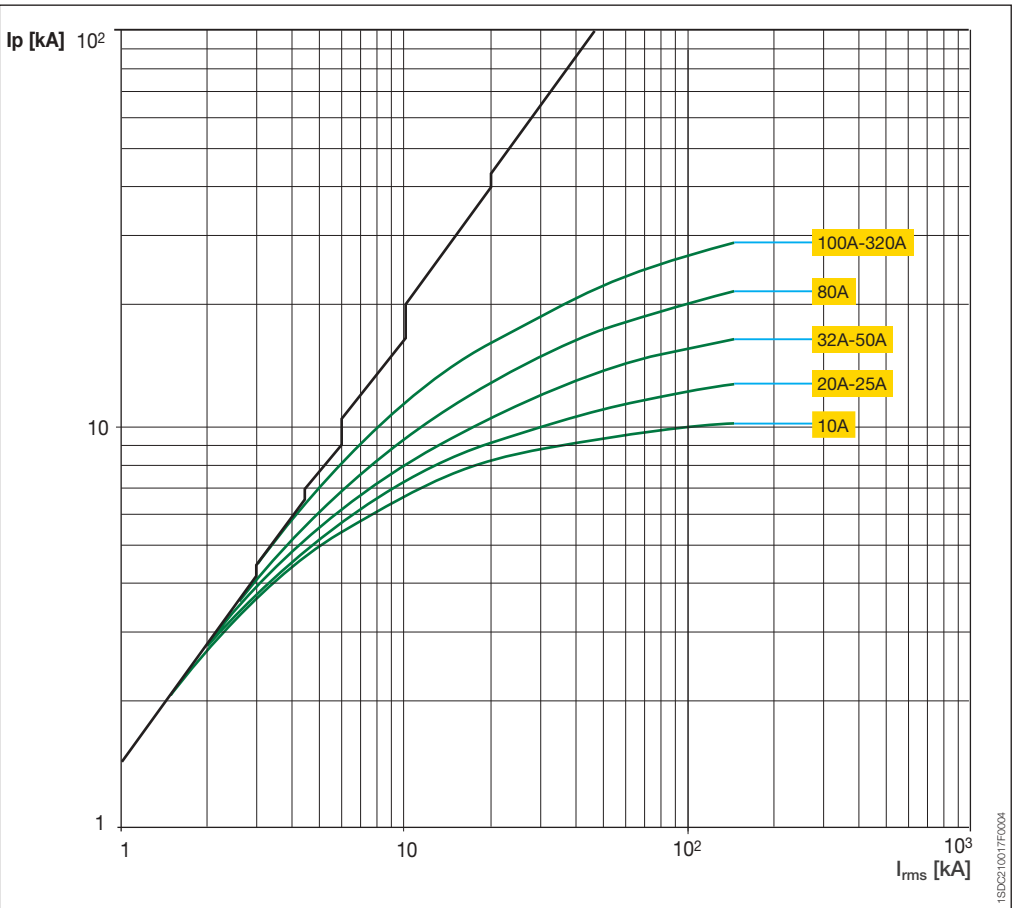
T3 250

500 V



T4 250/320

500 V

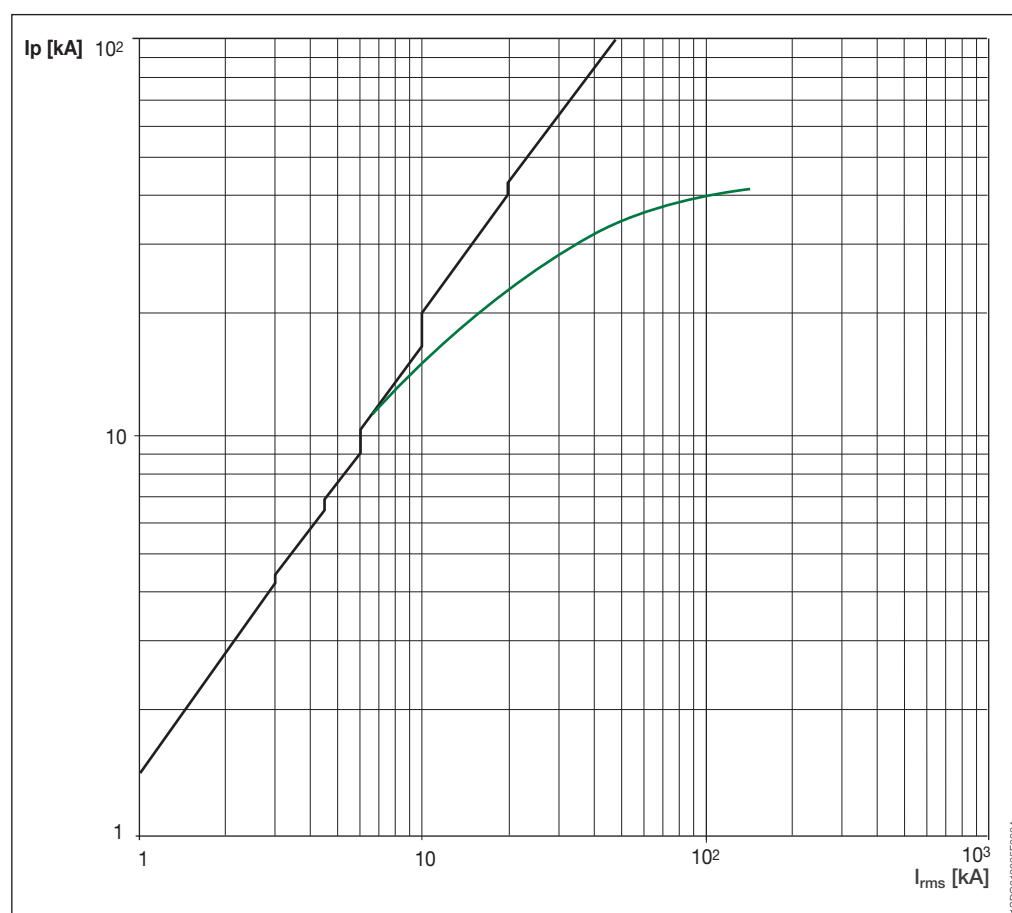




Limitation curves

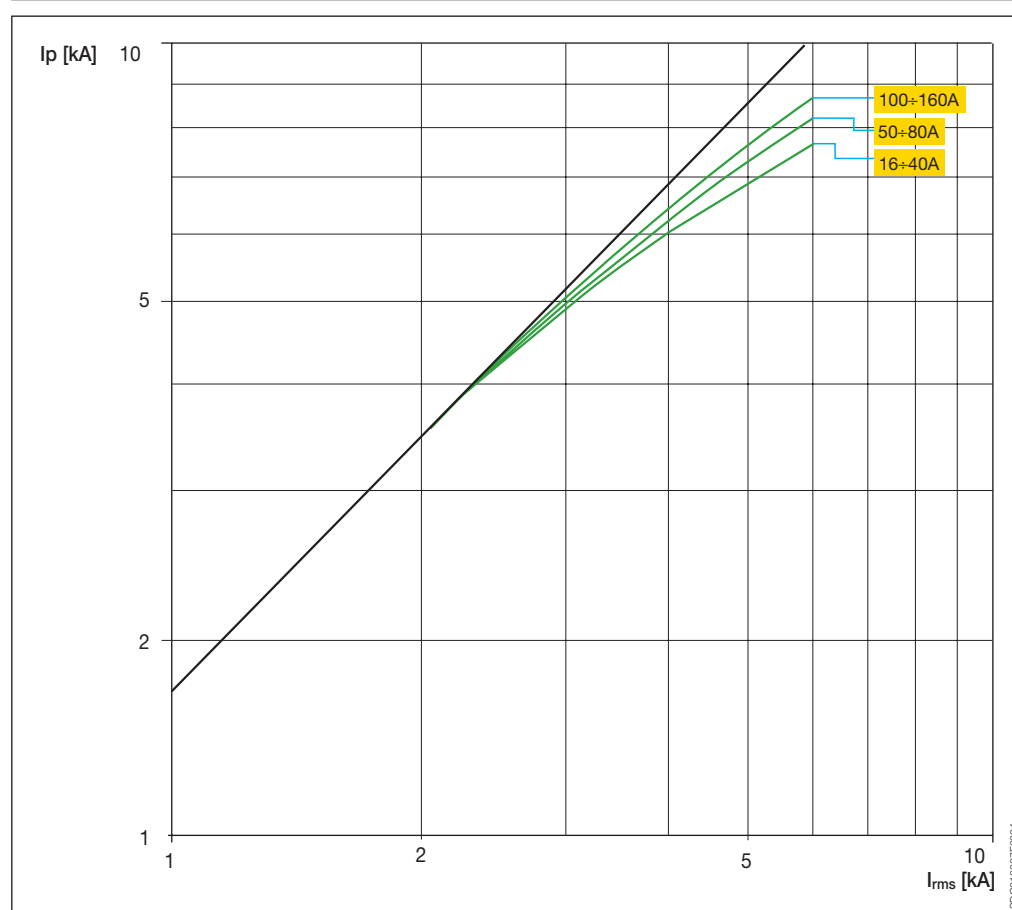
T5 400/630

500 V



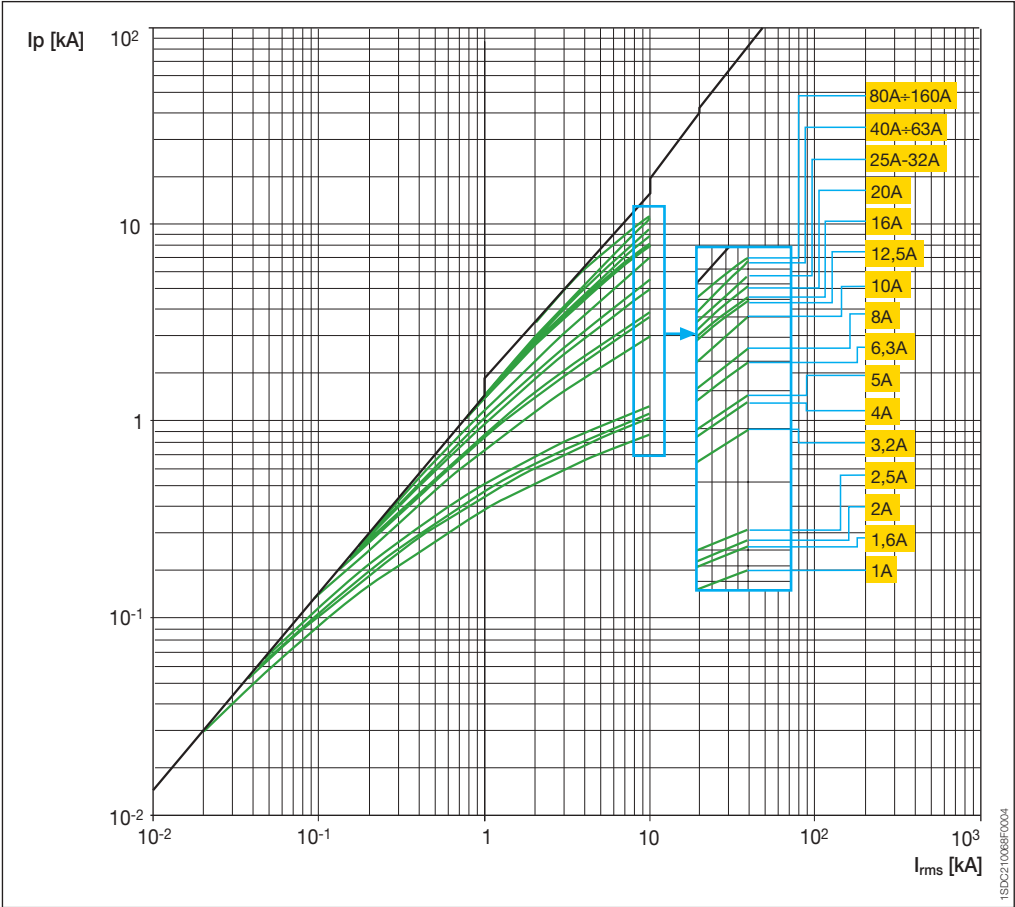
T1 160

690 V



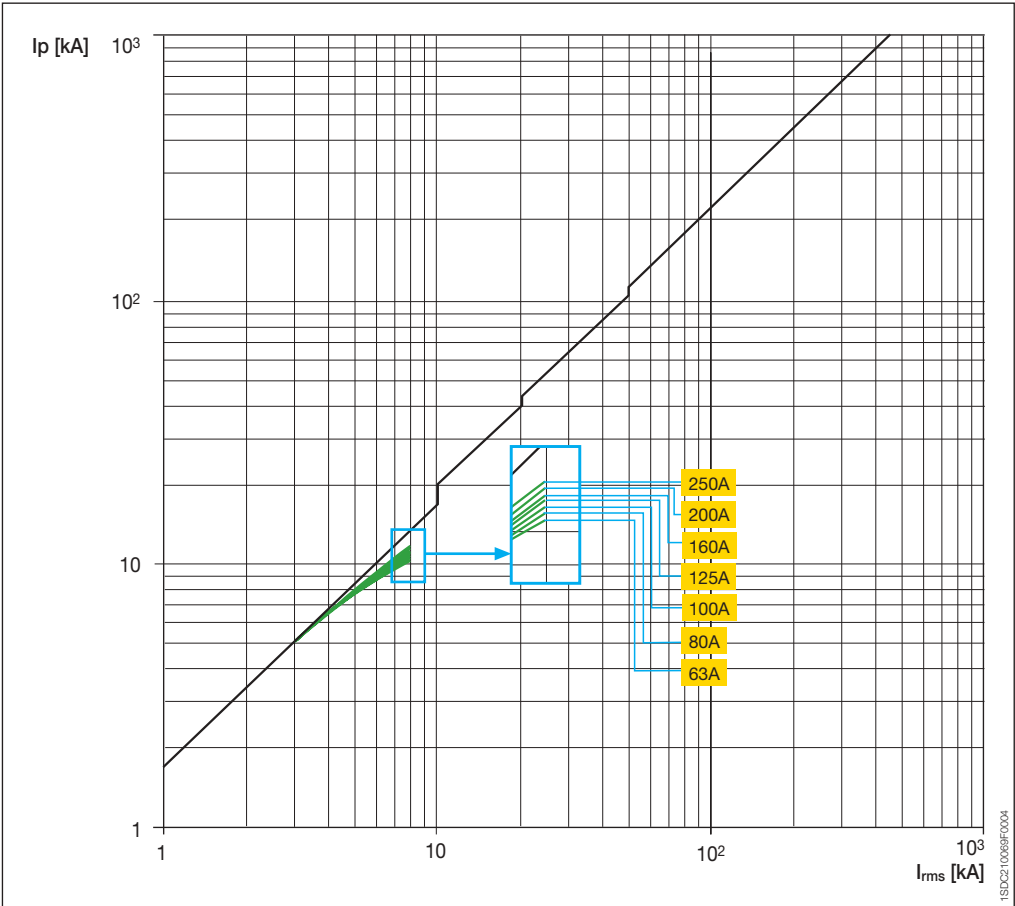
T2 160

690 V



T3 250

690 V

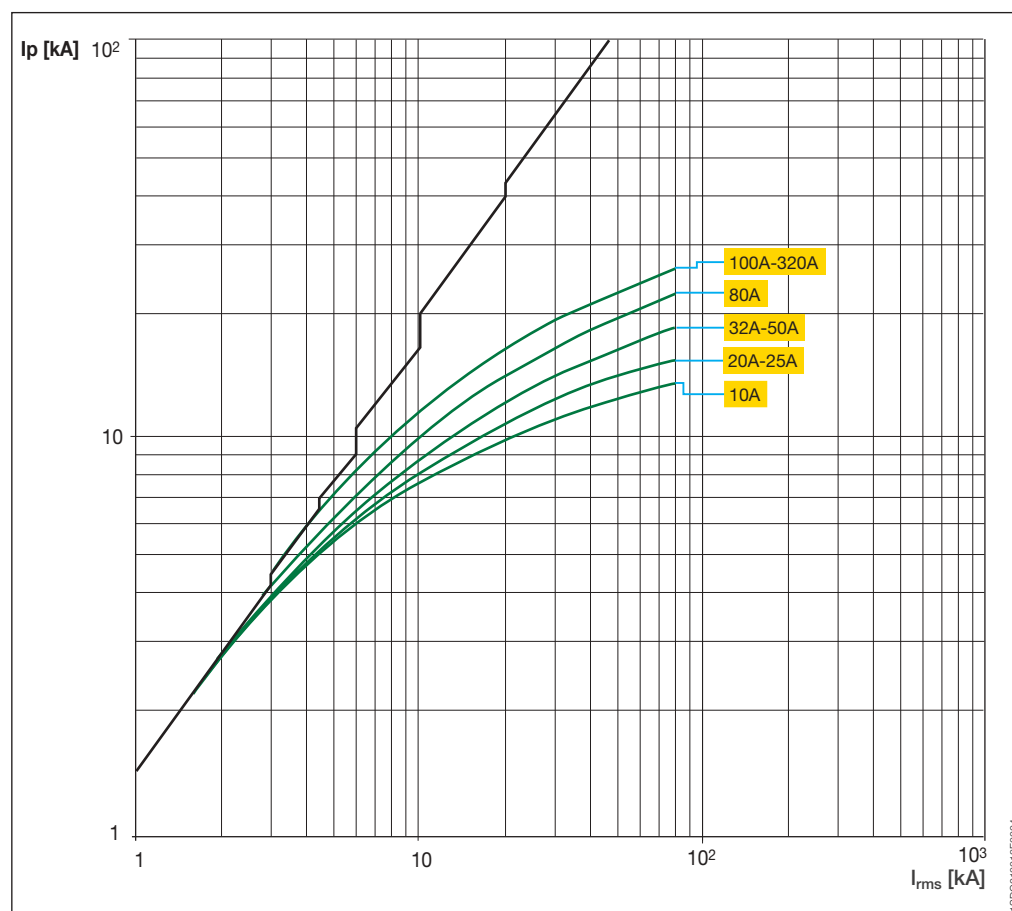




Limitation curves

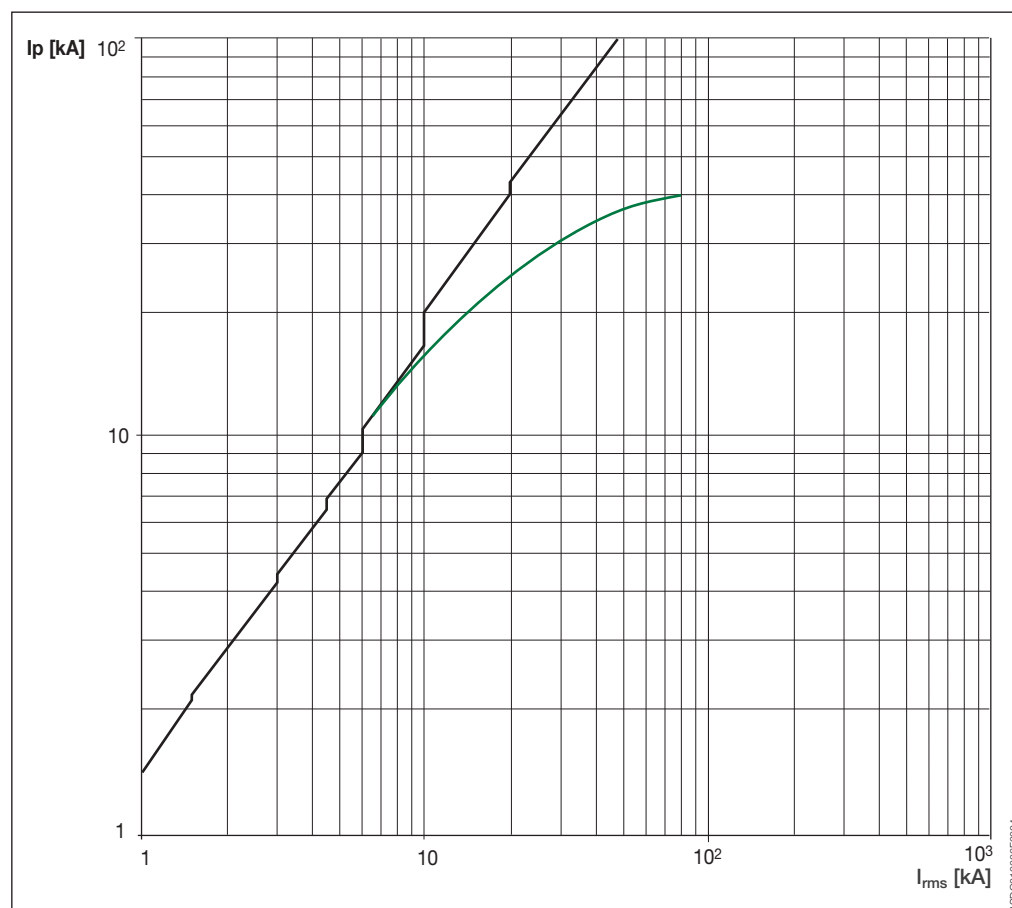
T4 250/320

690 V



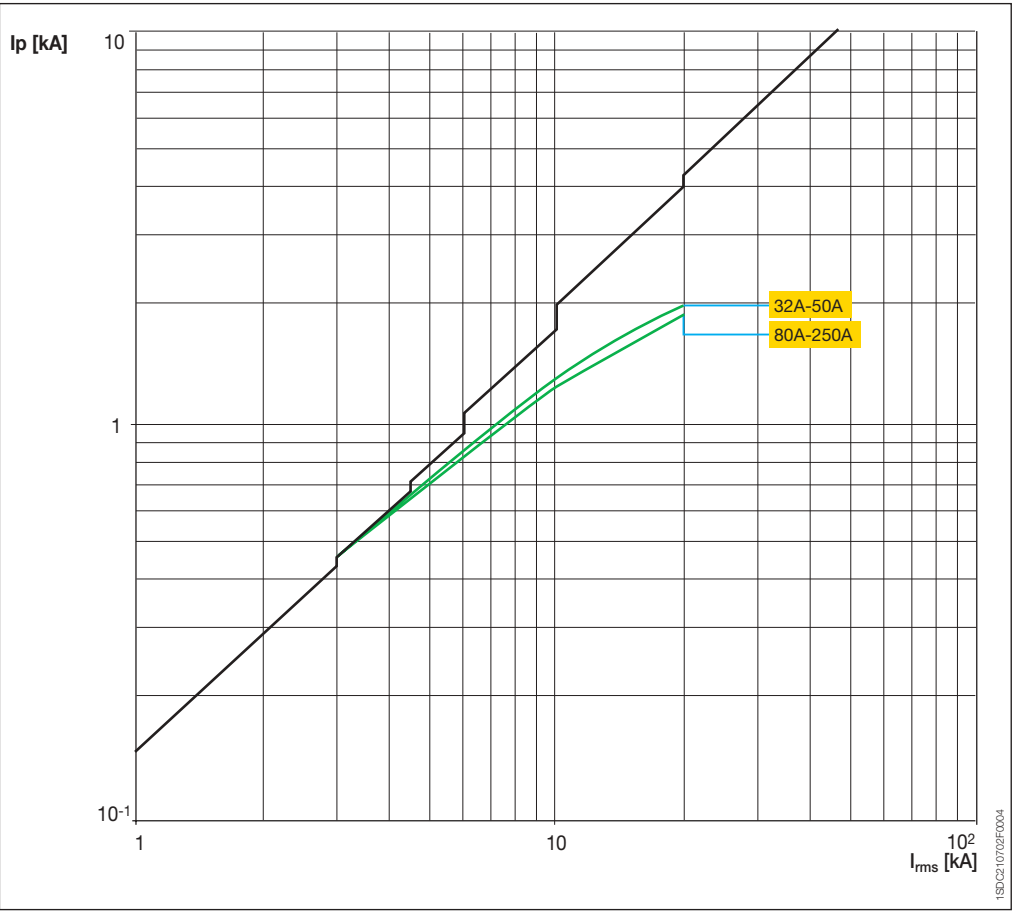
T5 400/630

690 V



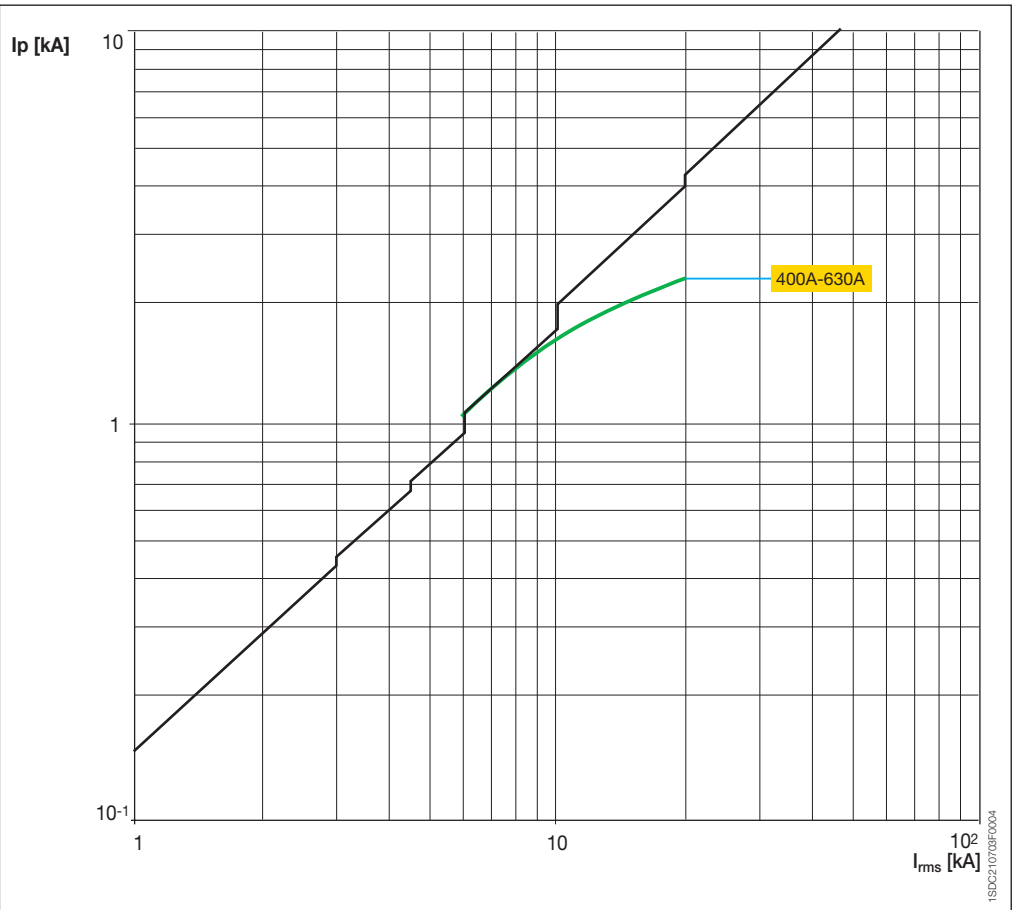
T4 250

1000 V



T5 400/630

1000 V

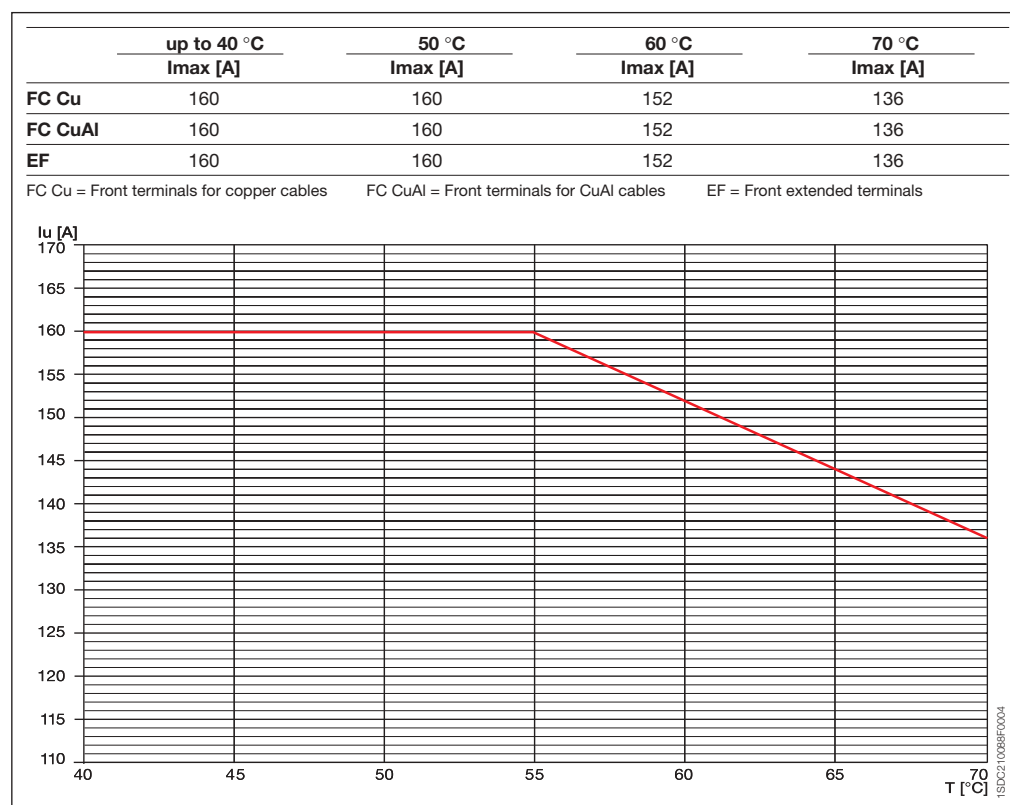




Temperature performances

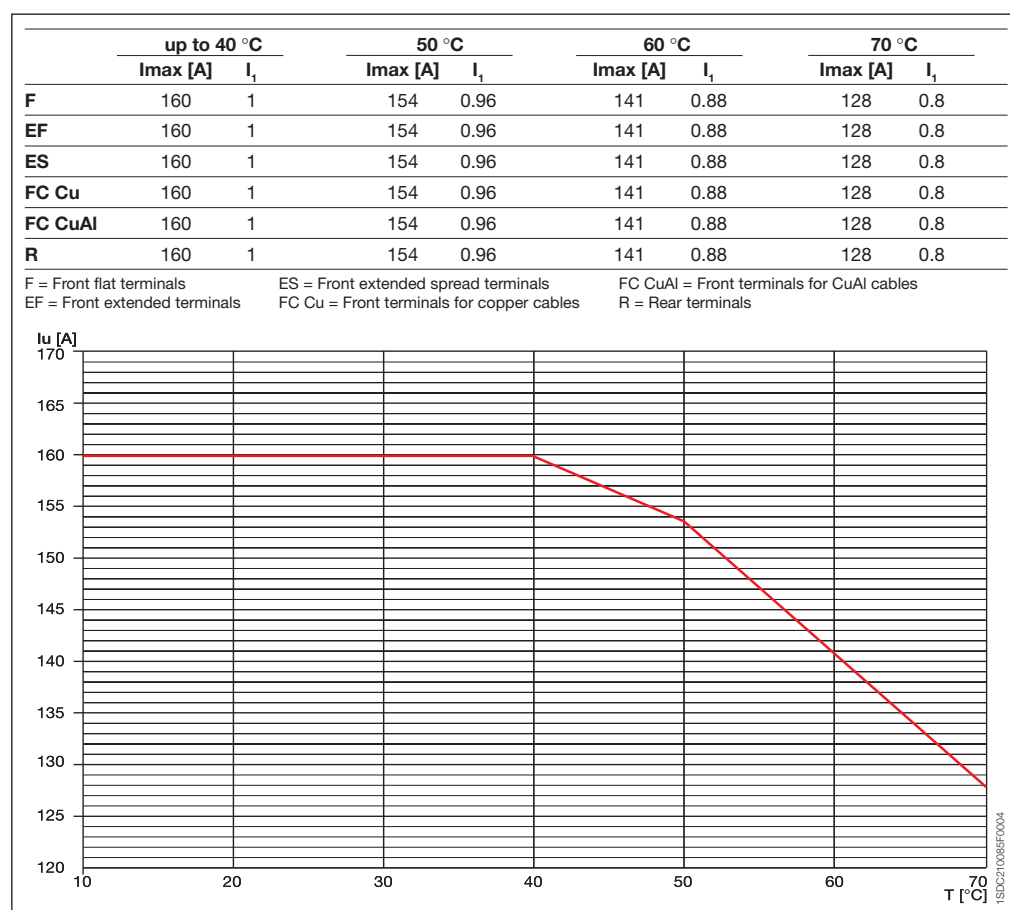
Circuit-breakers with only magnetics, electronic releases and switch-disconnectors

T1D 160



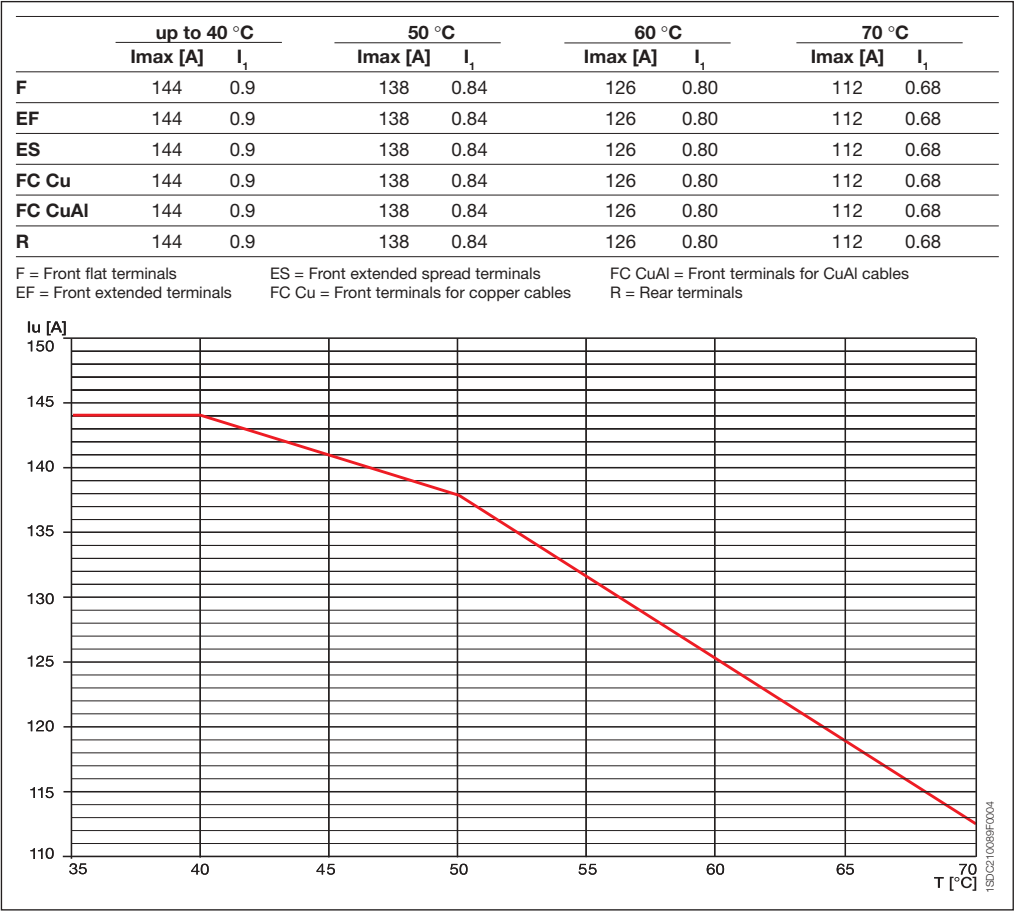
T2 160

Fixed



T2 160

Plug-in



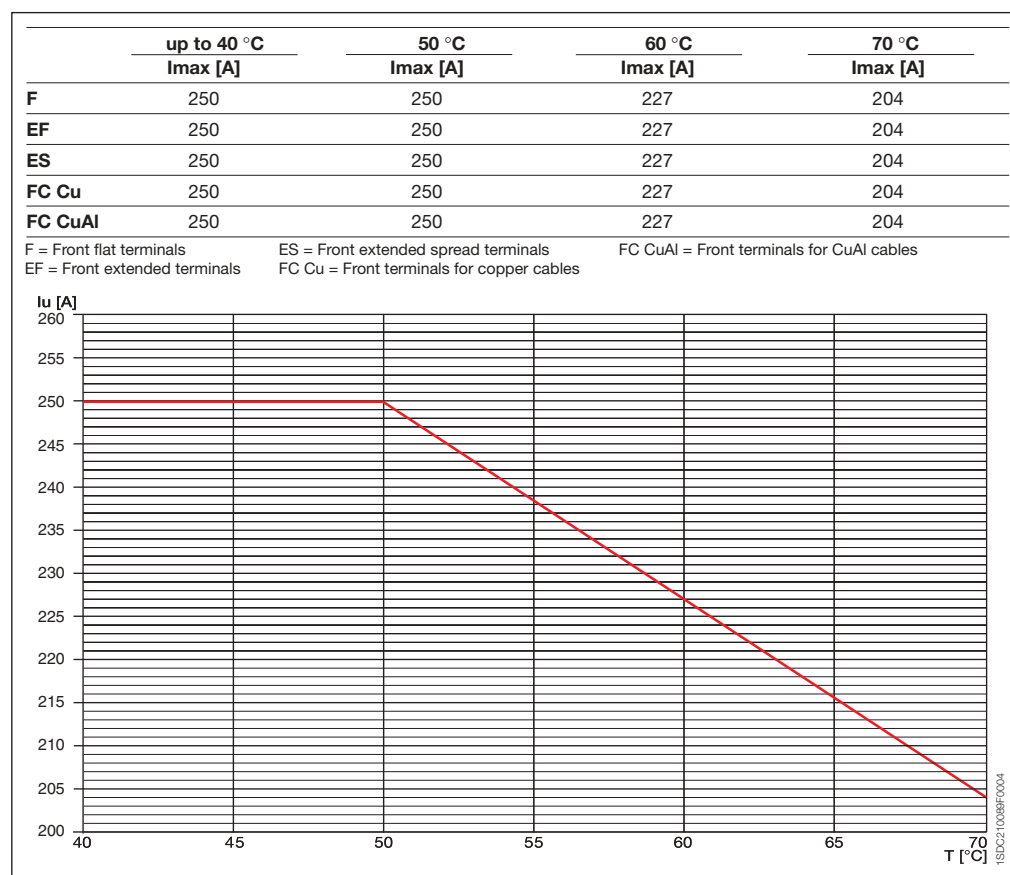


Temperature performances

Circuit-breakers with only magnetics, electronic releases and switch-disconnectors

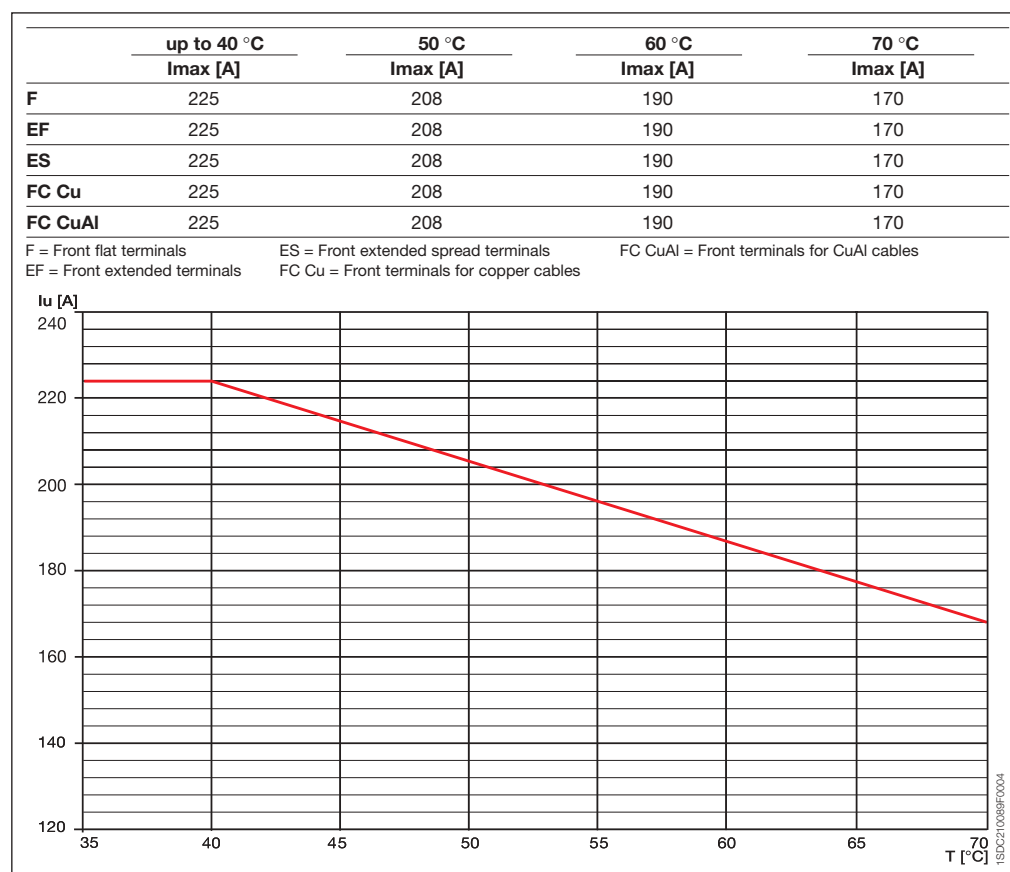
T3D 250

Fixed



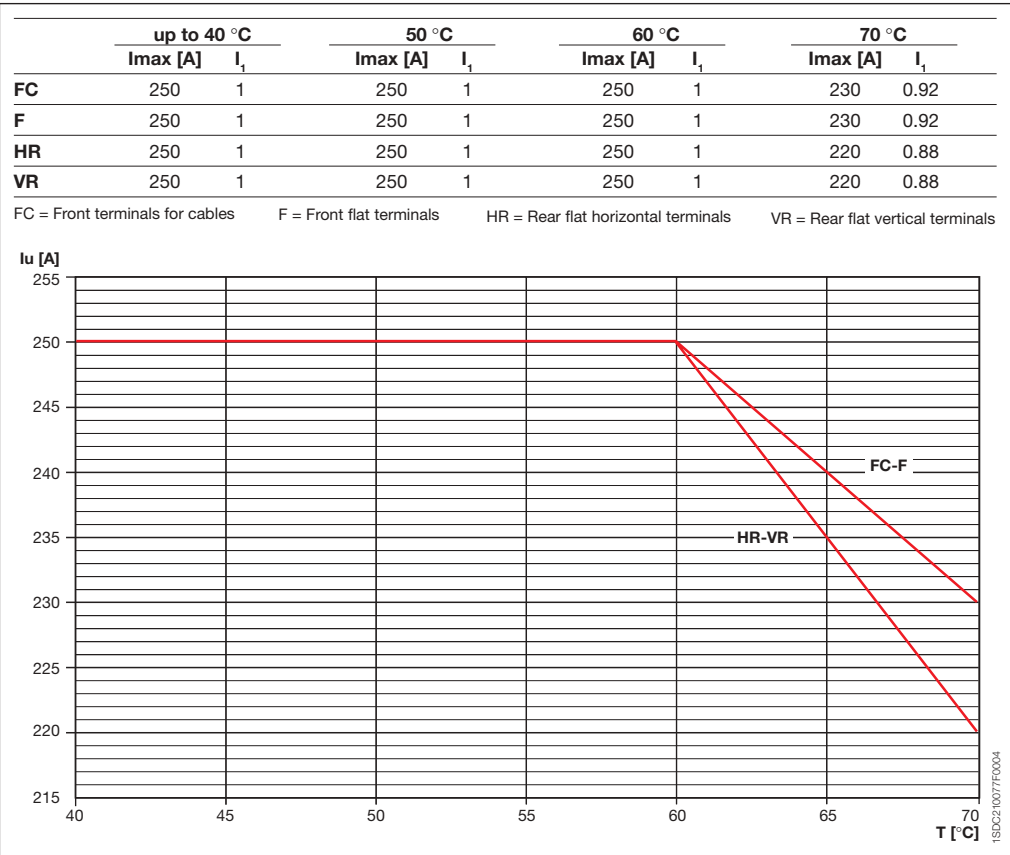
T3D 250

Plug-in



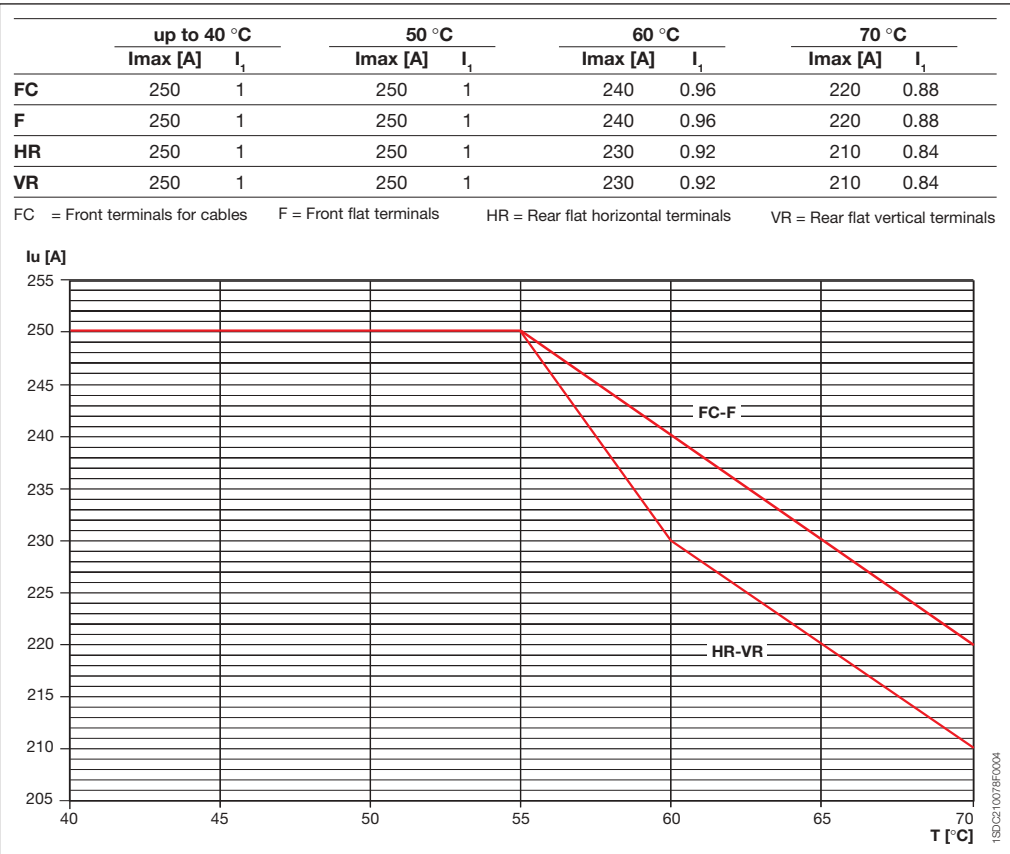
T4 250 and T4D 250

Fixed



T4 250 and T4D 250

Plug-in / Withdrawable



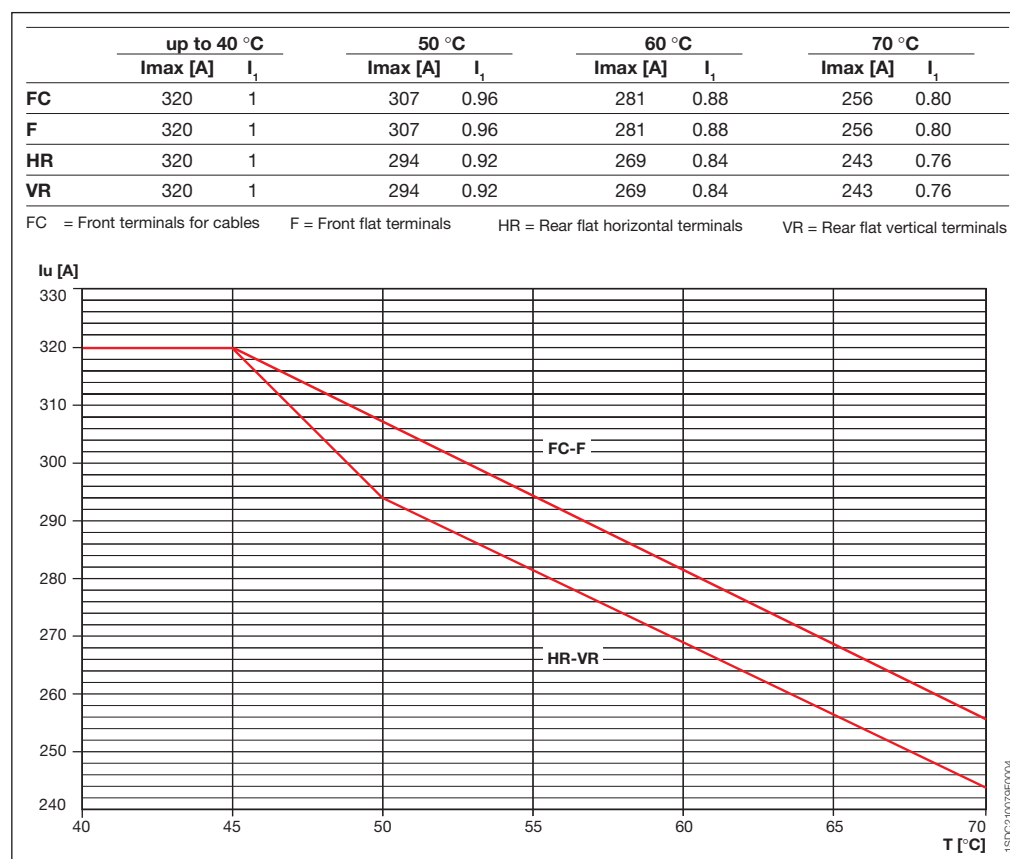


Temperature performances

Circuit-breakers with only magnetics, electronic releases and switch-disconnectors

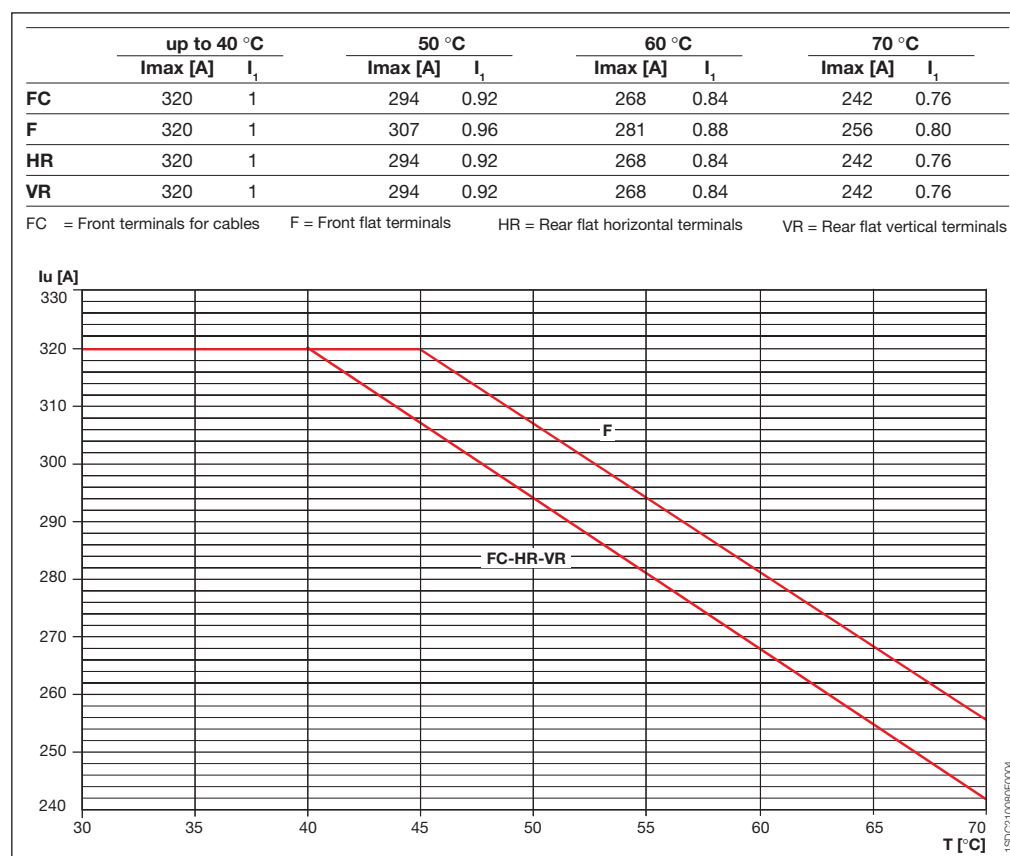
T4 320 and T4D 320

Fixed



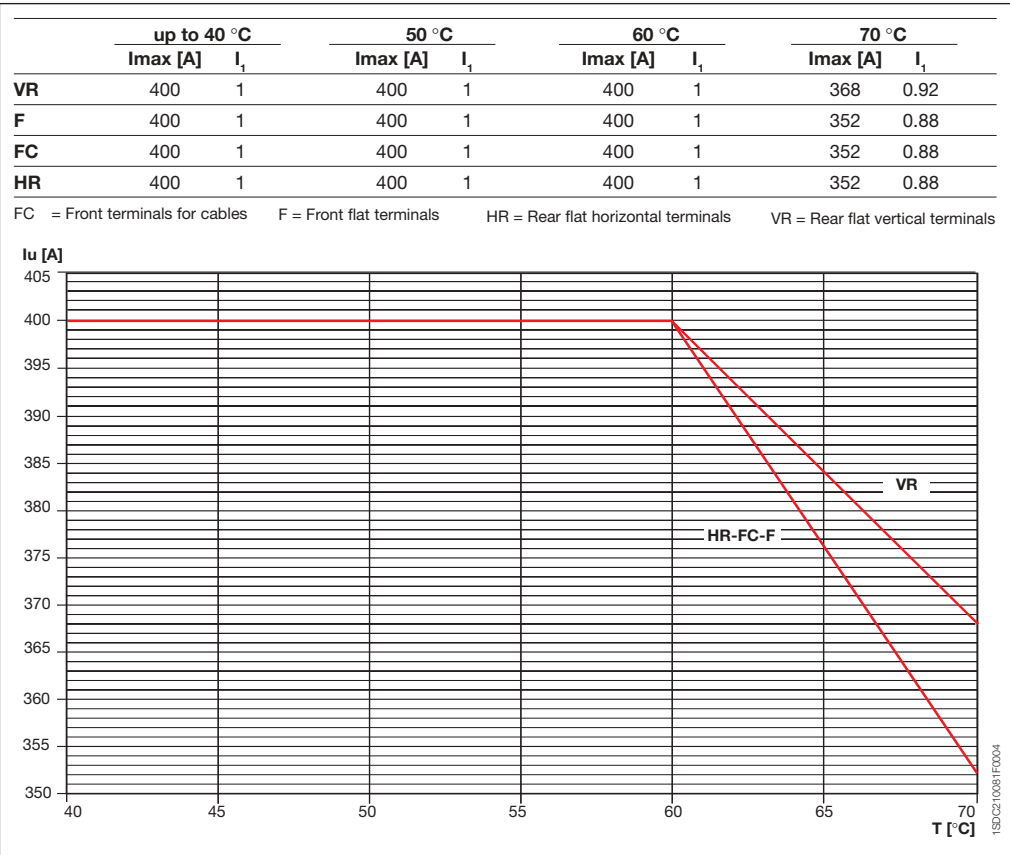
T4 320 and T4D 320

Plug-in / Withdrawable



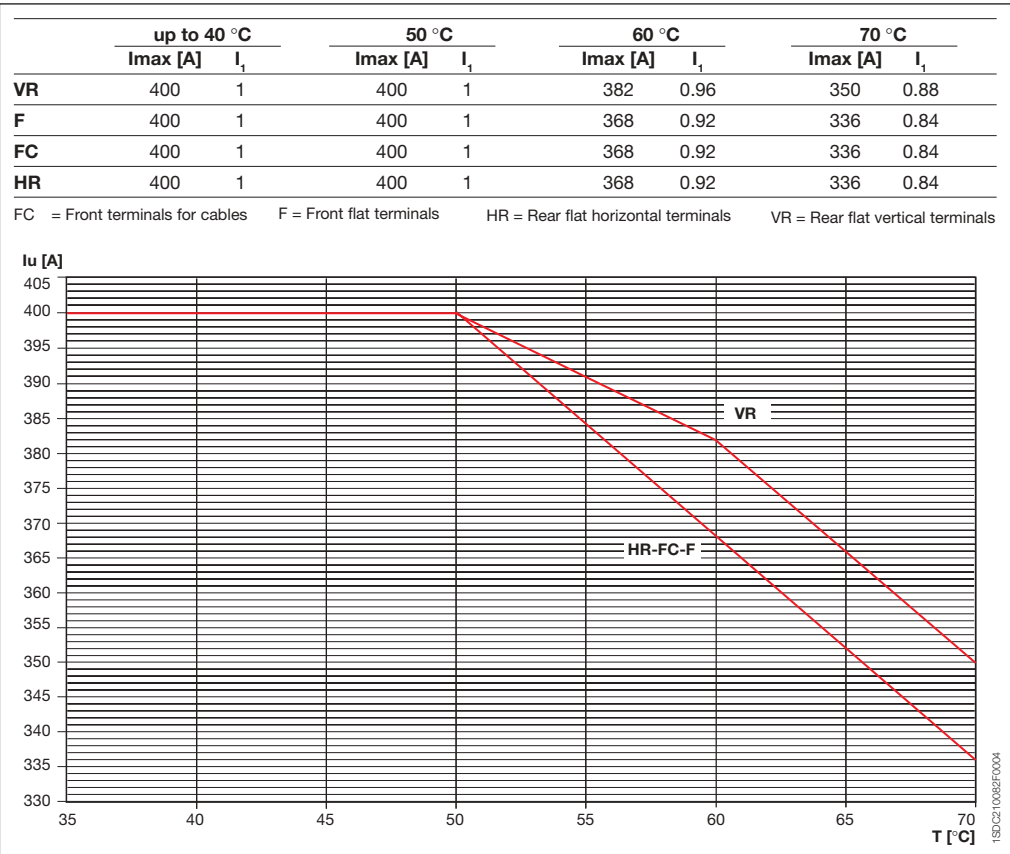
T5 400 and T5D 400

Fixed



T5 400 and T5D 400

Plug-in / Withdrawable



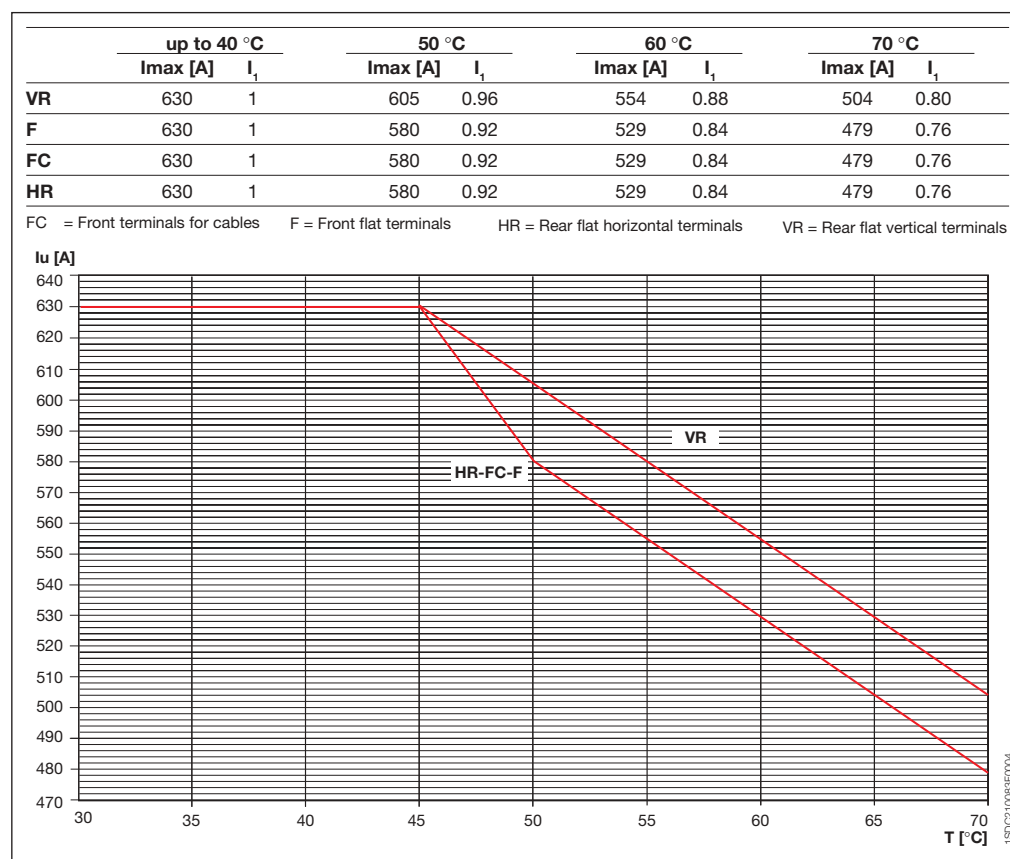


Temperature performances

Circuit-breakers with only magnetics, electronic releases and switch-disconnectors

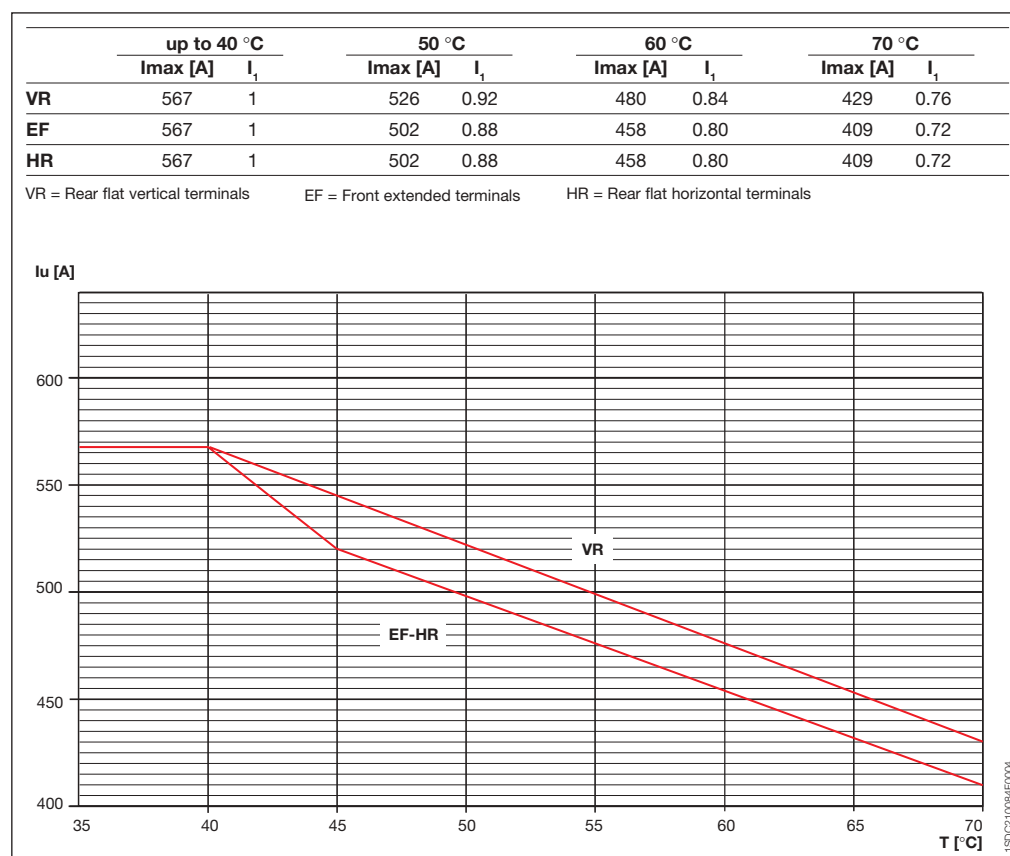
T5 630 and T5D 630

Fixed



T5 630 and T5D 630

Plug-in / Withdrawable





Temperature performances

Circuit-breakers with thermomagnetic releases

Tmax T1 and T1 1P ⁽¹⁾

In [A]	10 °C		20 °C		30 °C		40 °C		50 °C		60 °C		70 °C	
	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 ⁽²⁾

In [A]	10 °C		20 °C		30 °C		40 °C		50 °C		60 °C		70 °C	
	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 ⁽²⁾

In [A]	10 °C		20 °C		30 °C		40 °C		50 °C		60 °C		70 °C	
	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

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

⁽²⁾ In the plug-in version of T2 and T3 the maximum setting is derated by 10% at 40 °C.



Temperature performances

Circuit-breakers with thermomagnetic 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

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

Power losses

Power [W/pole]	In[A]	T1/T1 1p	T2		T3		T4		T5	
		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								13.6	20.9
	400								19.5	31
	500								28.8	36.7
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 2/3 Hz

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.

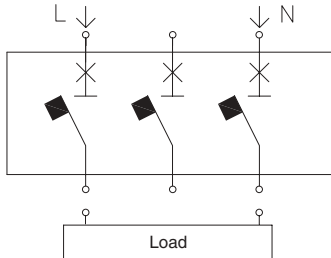
Icu [kA]	Connection diagram	T1			T2				T3		T4					T5				
		B	C	N	N	S	H	L	N	S	N	S	H	L	V	N	S	H	L	V
250 V 2 poles in series	A	16	25	36	36	50	70	85	36	50	36	50	70	100	150	36	50	70	100	150
250 V 3 poles in series	B-C	20	30	40	40	55	85	100	40	55	-	-	-	-	-	-	-	-	-	-
500 V 2 poles in series	A	-	-	-	-	-	-	-	-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

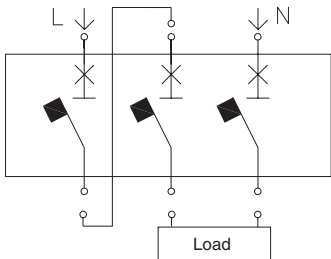
Connection diagrams

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

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

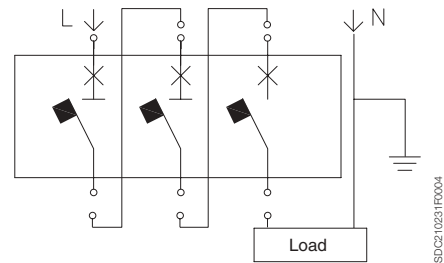


Diagram D: Interruption with four poles in series for one polarity (with neutral earthed)

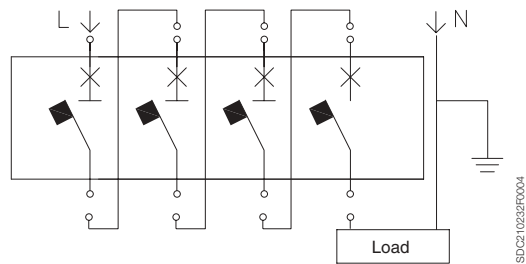
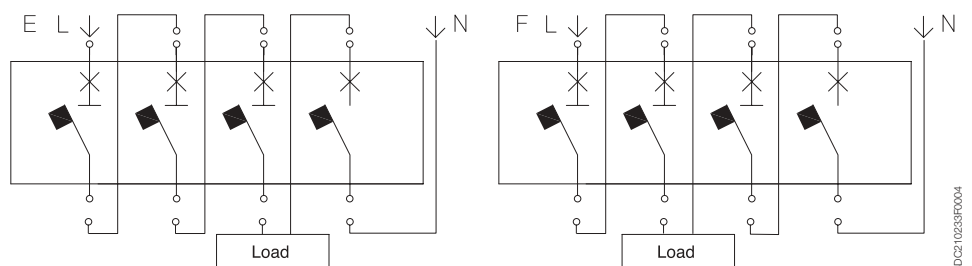


Diagram E-F: Interruption with three poles in series for one polarity and one pole for the other polarity, and interruption with two poles in series for each polarity



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



Special applications

Use of apparatus at 16 2/3 Hz

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-E-F
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: $I_b = 200 \text{ A}$
- Circuit-breaker: T4 250 In = 250 A
- Desired magnetic protection: $I_3 = 2000 \text{ A}$
- 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:

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

Special applications

Use of apparatus at 400 Hz

At high frequencies, performance is reclassified to take into account phenomena such as:

- the increase in the skin effect and the increase in the inductive reactance directly proportional to the frequency cause overheating of the conductors or the copper components in the breaker which normally carry current;
- the lengthening of the hysteresis loop and the reduction of the magnetic saturation value with the consequent variation of the forces associated with the magnetic field at a given current value.

In general, these phenomena have consequences on the behaviour of both the thermomagnetic trip units as well as of the current interrupting parts of the circuit-breaker.

The following tables refer to circuit-breakers with thermomagnetic trip units, with a breaking capacity lower than 36 kA. This value is usually more than sufficient for the protection of installations where such a frequency is used, normally characterized by rather low short-circuit currents.

As can be seen from the data

shown, the tripping threshold of the thermal element (I_1) decreases as the frequency increases because of the reduced conductivity of the materials and of the rise of the associated thermal phenomena; in general, the derating of this performance is generally equal to 10%.

Viceversa, the magnetic threshold (I_3) increases with the increase in frequency: for this reason it is recommended practice to use a 5-In version.

In these tables K_m is the multiplier factor of I_3 due to the induced magnetic fields.

T1 160 - TMD 16÷80 A

	I_1 (400 Hz)				I_3		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T1B 160	16	10	12	14	500	2	1000
T1C 160	20	12	15	18	500	2	1000
T1N 160	25	16	19	22	500	2	1000
	32	20	24.5	29	500	2	1000
	40	25	30.5	36	500	2	1000
	50	31	38	45	500	2	1000
	63	39	48	57	630	2	1260
	80	50	61	72	800	2	1600

T2 160 - TMD 1.6÷80 A

	I_1 (400 Hz)				I_3		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T2N 160	1.6	1	1.2	1.4	16	1.7	27.2
	2	1.2	1.5	1.8	20	1.7	34
	2.5	1.5	1.9	2.2	25	1.7	42.5
	3.2	2	2.5	2.9	32	1.7	54.4
	4	2.5	3	3.6	40	1.7	68
	5	3	3.8	4.5	50	1.7	85
	6.3	4	4.8	5.7	63	1.7	107.1
	8	5	6.1	7.2	80	1.7	136
	10	6.3	7.6	9	100	1.7	170
	12.5	7.8	9.5	11.2	125	1.7	212.5
	16	10	12	14	500	1.7	850
	20	12	15	18	500	1.7	850
	25	16	19	22	500	1.7	850
	32	20	24.5	29	500	1.7	850
	40	25	30.5	36	500	1.7	850
	50	31	38	45	500	1.7	850
	63	39	48	57	630	1.7	1071
	80	50	61	72	800	1.7	1360



Special applications

Use of apparatus at 400 Hz

T3 250 - TMG 63÷250 A

	I_1 (400 Hz)				I_3		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T3N 250	63	39	48	57	400	1.7	680
	80	50	61	72	400	1.7	680
	100	63	76.5	90	400	1.7	680
	125	79	96	113	400	1.7	680
	160	100	122	144	480	1.7	816
	200	126	153	180	600	1.7	1020
	250	157	191	225	750	1.7	1275

T3 250 - TMD 63÷125 A

	I_1 (400 Hz)				I_3		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T3N 250	80	50	61	72	800	1.7	1360
	100	63	76.5	90	1000	1.7	1700
	125	79	96	113	1250	1.7	2125

T4 250 - TMD 20÷50 A

	I_1 (400 Hz)				I_3		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T4N 250	20	12	15	18	320	1.7	544
	32	20	24.5	29	320	1.7	544
	50	31	38	45	500	1.7	850

T4 250/320 - TMA 80÷250 A

	I_1 (400 Hz)				I_3		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T4N 250/320	80	50	61	72	400	1.7	680
	100	63	76.5	90	500	1.7	850
	125	79	96	113	625	1.7	1060
	160	100	122	144	800	1.7	1360
	200	126	153	180	1000	1.7	1700
	250	157	191	225	1250	1.7	2125

T5 400/630 - TMA 320÷500 A

	I_1 (400 Hz)				Settaggio I_3 (MIN=5x I_n)		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T5N 400/630	320	201	244	288	1600	1.5	2400
	400	252	306	360	2000	1.5	3000
	500	315	382	450	2500	1.5	3750

T5 400/630 - TMG 320÷500 A

	I_1 (400 Hz)				Settaggio I_3 (MIN=5x I_n)		
	I_n	MIN	MED	MAX	I_3 (50 Hz)	K_m	I_3 (400 Hz)
T5N 400/630	320	201	244	288	800...1600	1.5	1200...2400
	400	252	306	360	1000...2000	1.5	1500...3000
	500	315	382	450	1250...2500	1.5	1875...3750

Example

Network data:

- rated voltage 400 V AC
- rated frequency 400 Hz
- load current 240 A (I_b)
- current carrying capacity of cable 260 A (I_z)
- short circuit current 32 kA

In order to choose the circuit-breaker suitable for this application, it is necessary to remember the two prescriptions fundamental for the proper use of a circuit-breaker at 400 Hz:

- 10% derating of the thermal protection;
- increase in the magnetic threshold according to the coefficient factor K_m.

In fact, at industrial frequency (50/60 Hz), a circuit-breaker T4N 250 TMA I_n=250 would be suitable for the load current but, being an application at 400 Hz the derating of the thermal protection involves the maximum setting for the trip unit equal to:

$$I_{1 \text{ max } 400 \text{ Hz}} = 250 - \left(\frac{250 \cdot 10}{100} \right) = 225 \text{ A}$$

This value results to be lower than the current of the load; therefore it is necessary to pass to a T4N 320 TMA I_n=320 set at the average value (0.85) which, taking into consideration the derating, corresponds to the following trip threshold:

$$I_{1 \text{ med } 400 \text{ Hz}} = 0,85 \cdot \left[320 - \left(\frac{320 \cdot 10}{100} \right) \right] = 244 \text{ A}$$

This value is higher than the I_b of the load and lower than the cable current carrying capacity I_z.

As far as the magnetic protection I₃ is concerned, as the frequency increases, the setting value of the magnetic trip rises in compliance with the multiplier factor K_m; therefore, it is recommended to have I₃ set at the minimum value of the available settings (5xI_n for a TMA), so as not to have a too high trip value for I₃:

$$I_3 = 5 \cdot I_n \cdot K_m = 5 \cdot 320 \cdot 1,7 = 2720 \text{ A}$$



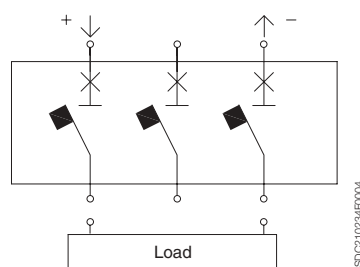
Special applications

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 (I_{cu}), 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.

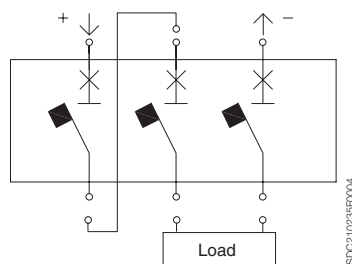
Protection and isolation of the circuit with three-pole circuit-breakers

Diagram A: Interruption with one pole for polarity.



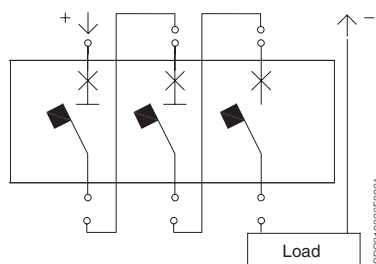
Note: Without negative polarity connected to earth, the installation method must be such as to make the probability of a second earth fault negligible.

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

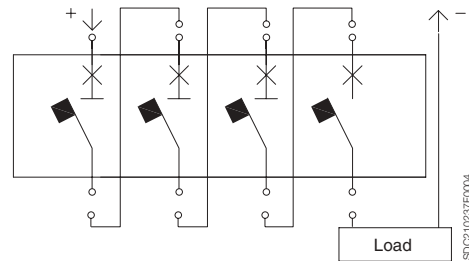
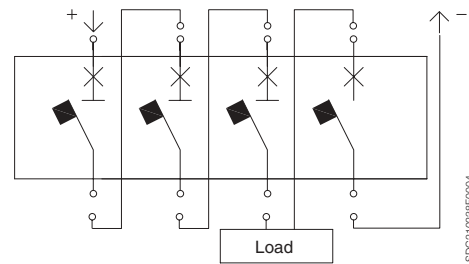
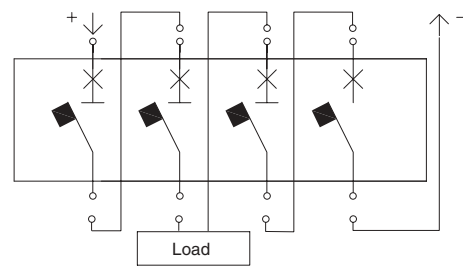


Diagram E: Interruption with three poles in series on one polarity and one pole on the other polarity



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 In [A]	T1 160		T2 160		T3 250	
	$I_1=0.7 \div 1 \times I_n$	$I_3=10 \times I_n$	$I_1=0.7 \div 1 \times I_n$	$I_3=10 \times I_n$	$I_1=0.7 \div 1 \times I_n$	$I_3=10 \times I_n$
1.6			1.12÷1.6	20.8		
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 In [A]	T4 250		T5 400		T5 630	
	$I_1=0.7 \div 1 \times I_n$	$I_3=5 \div 10 \times I_n$	$I_1=0.7 \div 1 \times I_n$	$I_3=5 \div 10 \times I_n$	$I_1=0.7 \div 1 \times I_n$	$I_3=5 \div 10 \times I_n$
20	14÷20	416				
25						
32	22,4÷32	416				
40						
50	35÷50	650				
63						
80	56÷80	520÷1040				
100	70÷100	650÷1300				
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	1760÷3520		
400			280÷400	2200÷4400		
500					350÷500	2750÷5500



Special applications

Use of direct current apparatus

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: $I_b = 550 \text{ A}$
- Circuit-breaker: T5 630 $I_n = 630 \text{ A}$
- Desired magnetic protection: $I_3 = 5500 \text{ A}$
- 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:

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



Index

Wiring diagrams

Information for reading - Circuit-breakers	5/2
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Electrical accessories for T1...T5	5/10
Automatic transfer-switch ATS010	5/17



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
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
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	= PR021/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
A16	= Solenoid operating mechanism
A17	= Unit for motor electrical latching
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 and withdrawable version)
S75IS/1...3	= Contacts for electrical signalling of circuit-breaker in racked-out position (only provided with circuit-breakers in plug-in and withdrawable 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 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
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 MOS 5 cables.
- 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 PR021/K type signalling unit.
- Fig. 43 = Auxiliary circuits of the PR222DS/PD electronic release connected with FDU front display unit and with PR021/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 PR021/K signalling unit.
- Fig. 48 = Auxiliary circuits of the PR222MP electronic release connected with PR021/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 PR021/K signalling unit and with PR212/CI type contactor control unit.
- Fig. 50 = Auxiliary circuits of the PR222MP electronic release connected with PR021/K signalling unit.
- Fig. 51 = Auxiliary circuits of the PR222MP electronic release in auxiliary power supply at 24 V DC connected with PR212/CI type contactor control unit and ABB contactor AF series with SSIMP interface.

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 - 51

Notes

- A) The circuit-breaker is only fitted with the applications specified in the ABB SACE order confirmation. To make out the order, please consult this catalogue.
- B) The undervoltage release is supplied for power supply branched on the supply side of the circuit-breaker or from an independent source: circuit-breaker closing is only allowed with the release energised (the lock on closing is made mechanically).
- C) The S4/1 and S4/2 contacts shown in figures 5-6 open the circuit with the circuit-breaker open and close it again when a manual closing command is given by means of the rotary handle, in accordance with the Standards regarding machine tools (in any case, closing does not take place if the undervoltage release is not supplied).
- E) Connectors XA1, XA2, XA5, XA6, XA7, XA8 and XA9 are supplied on request. They are always supplied with 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 380/440 V AC and 480/525 V AC.
- G) In the case of fixed version circuit-breaker with current transformer on external neutral conductor outside the circuit-breaker, when the circuit-breaker is to be removed, it is necessary to short-circuit the terminals of the TI/N transformer.
- H) SQ and SY are opto-insulated contacts.
- I) Instructions for resetting the circuit-breaker tripped by releases
The circuit breaker may be opened by the motor operator (or solenoid operating mechanism). It may also be tripped by the following releases:
- overcurrent trip unit
 - undervoltage release
 - shunt opening release
- with the resultant opening of the SY contact (if provided) connected in series to the M opening motor (or to opening release of solenoid operating mechanism).
In case of tripping, it is necessary to carry out a reset operation through a manual or electrical operation in order to reclose the circuit-breaker. On completion of the resetting operation, the SY contact closes.
The type of reset carried out depends on project requirements and service conditions. We suggest the following resetting types:
- 1) Manual resetting only
Operating electrical control (contact SO1) connected in series to contact SY. Opening is prevented till the circuit-breakers is in tripped position. To reset the circuit-breaker, it is necessary to operate the suitable lever till the circuit-breaker reaches the open position.
 - 2) Electrical reset at operator's responsibility
Normal opening electric control (contact SO1) connected in series to contact SY.
Another opening control (contact SO2) directly connected to the pole 3 of the connector XA8 (or to the pole A11 of the connector XA10) is provided; this must be protected (i.e. key pushbutton) and may only be used if the information sent to the control operator demonstrates that the tripping is not due to a short-circuit or, in the event of a short-circuit, that its cause has been removed.
 - 3) Always admitted electrical reset
The opening electric control (contact SO2) is directly connected to the pole 3 of the connector XA8 (or to the pole A11 of the connector XA10) and then it is always admitted.
Example: resetting of the circuit-breakers after releases tripping.
Notes: In case of overcurrent, it is necessary to find out the causes of the circuit-breaker tripping, in order to prevent a reclosing under short-circuit conditions.
The manual reset is always admitted in any case.



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/0	= Limit contact of BA for cutting off the power supply in the release tripped and open position
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 transformers 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)

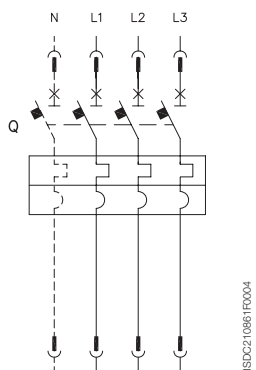
	Thermal effect		Resistor (general symbol)		Thermal relay
	Electromagnetic effect		Temperature dependent resistor		Instantaneous overcurrent or rate-of-rise relay
	Delay		Motor (general symbol)		Overcurrent relay with adjustable short time-lag characteristic
	Mechanical connection (link)		Induction motor, 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 disconnecter with automatic release		Motor with series energization
	Terminal		Switch-disconnector (on-load isolating switch)		
	Plug and socket (male and female)		Operating device (general symbol)		



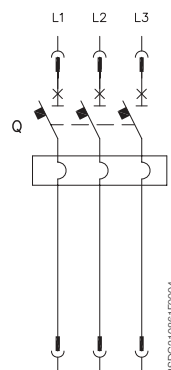
Wiring diagrams

Circuit diagram of the T1...T5 circuit-breakers

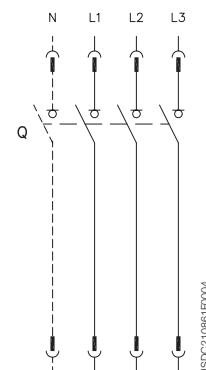
State of operation



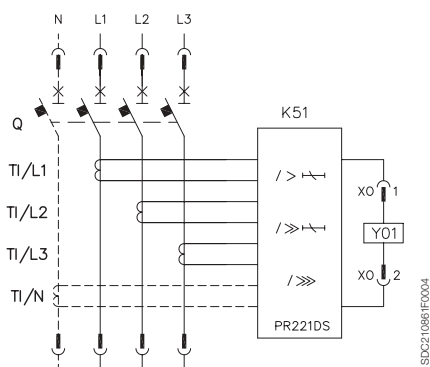
Three-pole or four-pole circuit-breaker with thermomagnetic release



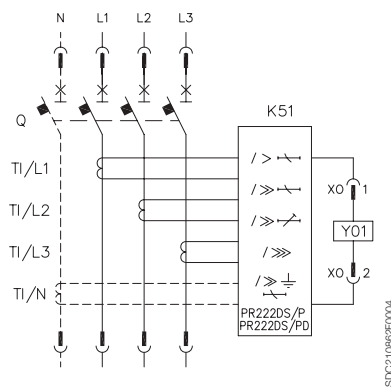
Three-pole circuit-breaker with magnetic release



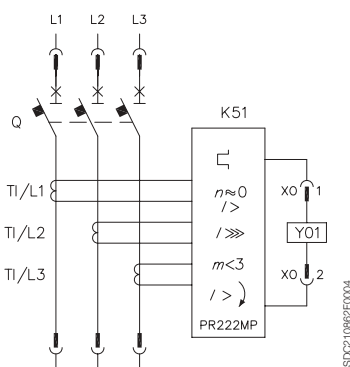
Three-pole or four-pole switch-disconnector (on-load isolating switch)



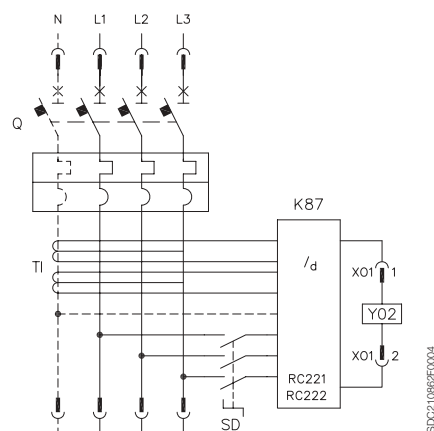
Three-pole or four-pole circuit-breaker with PR221DS electronic release



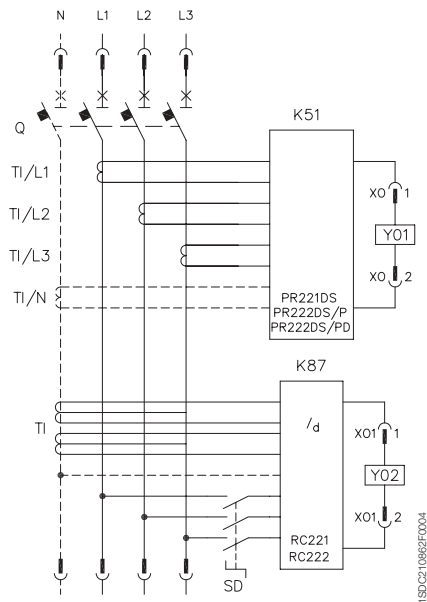
Three-pole or four-pole circuit-breaker with PR222DS/P or PR222DS/PD electronic release



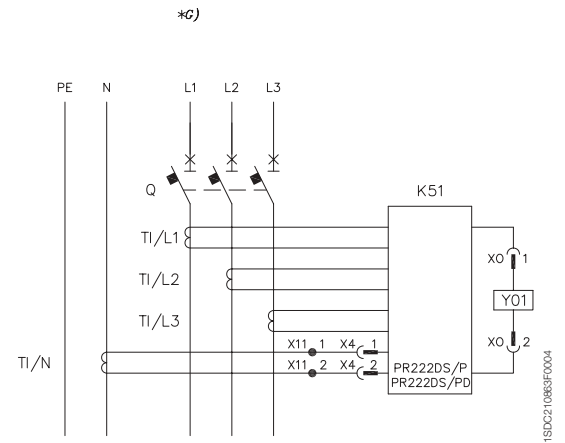
Three-pole circuit-breaker with PR222MP electronic release



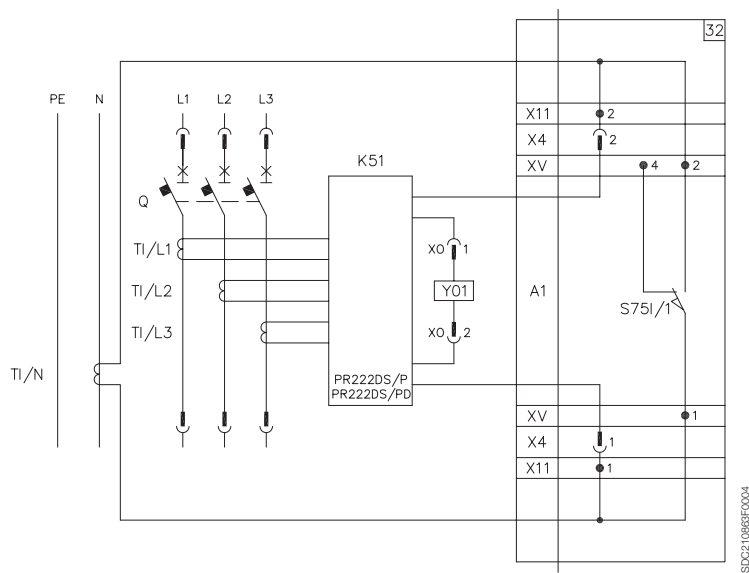
Three-pole or four-pole circuit-breaker with RC221 or RC222 residual current release



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



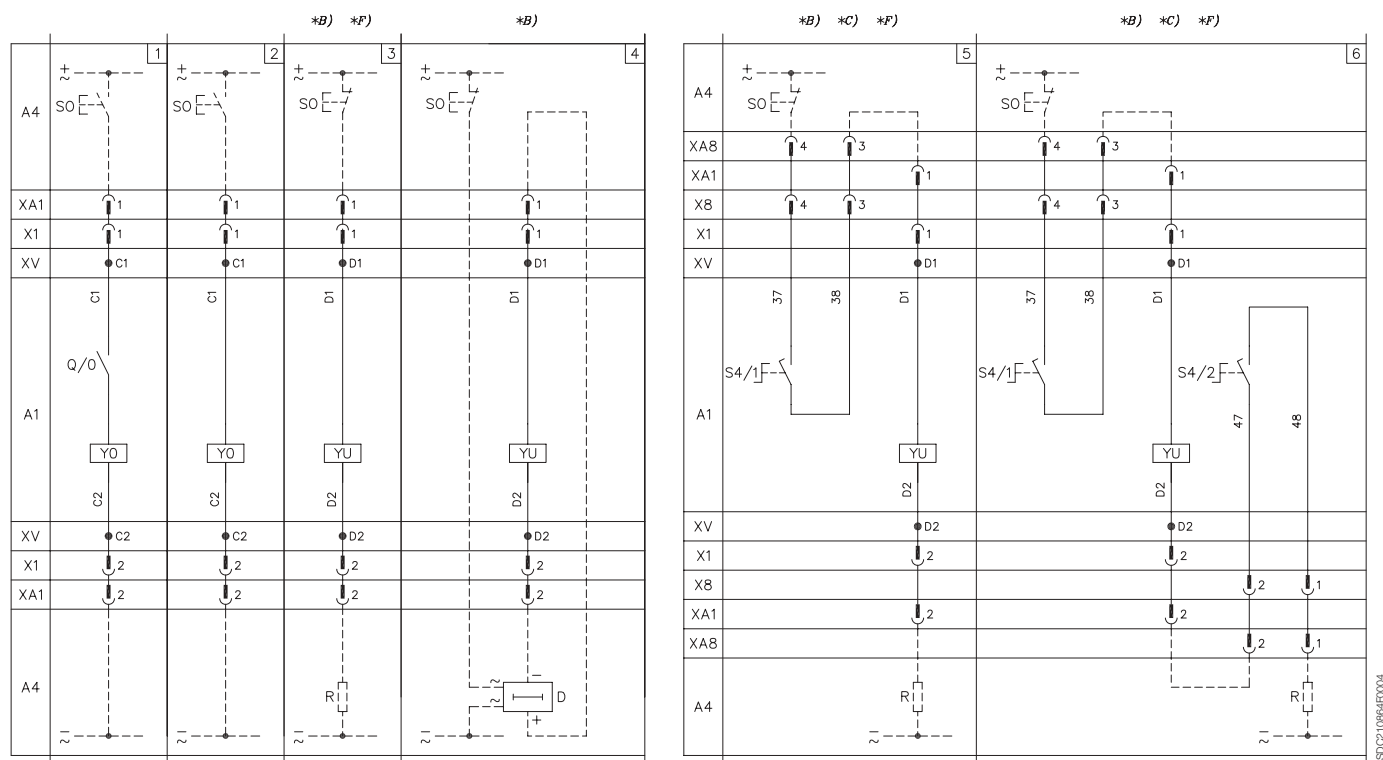
Plug-in or withdrawable version three-pole circuit-breaker with current transformer on neutral conductor, external to circuit-breaker



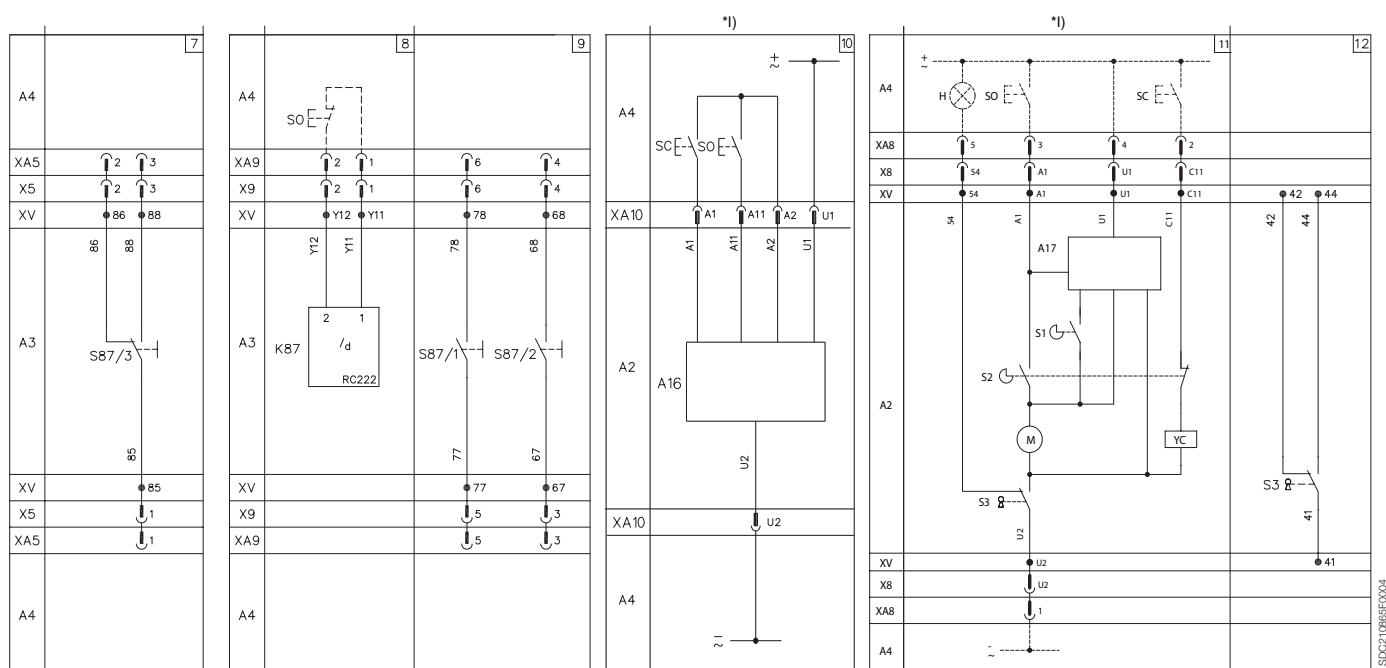
Wiring diagrams

Electrical accessories for T1...T5

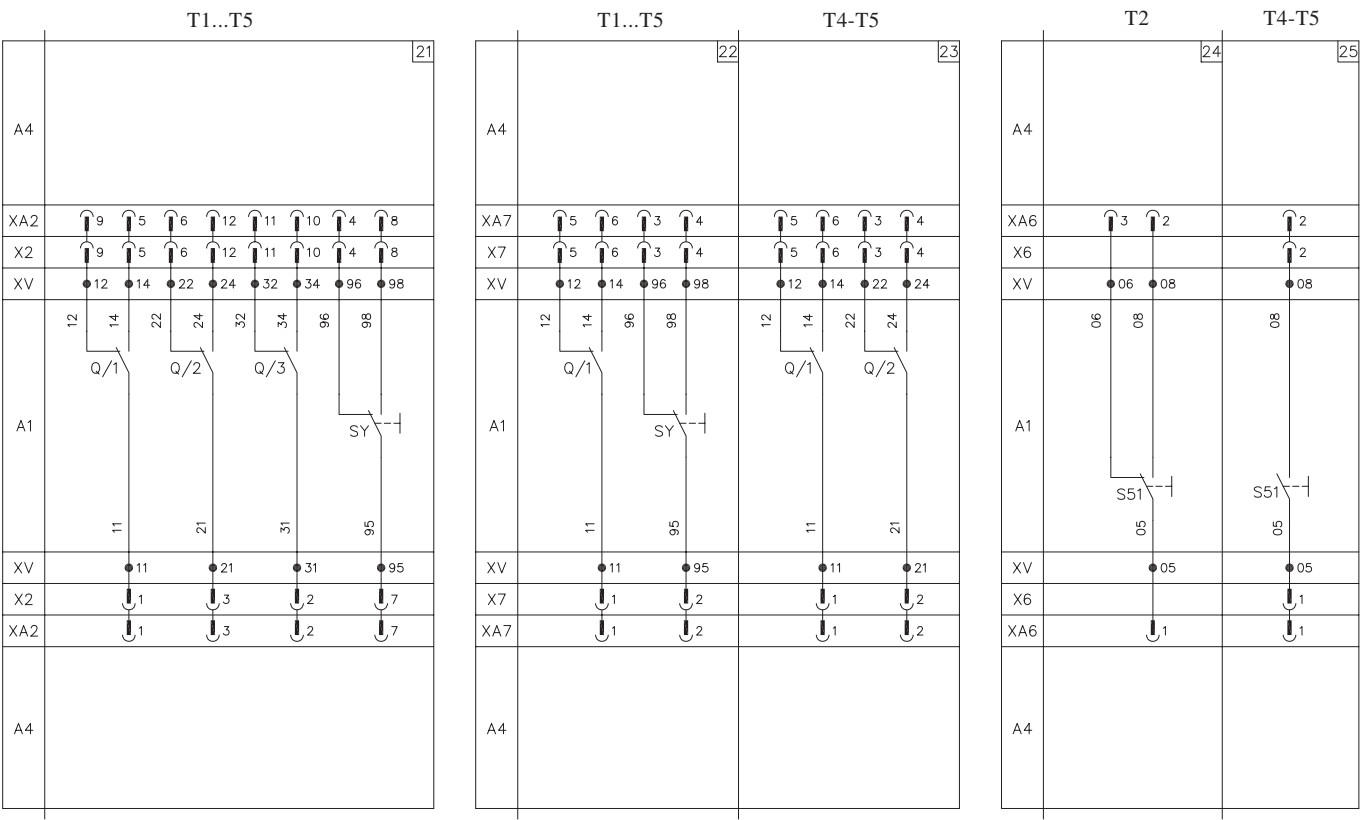
Shunt opening and undervoltage releases



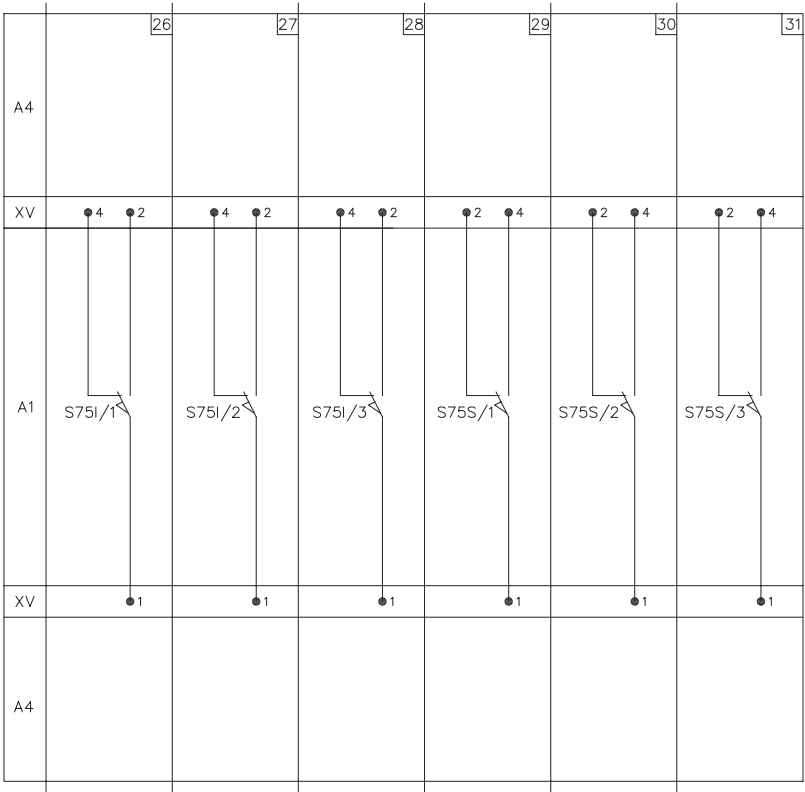
Residual current releases and remote controls



Auxiliary contacts



Position contacts

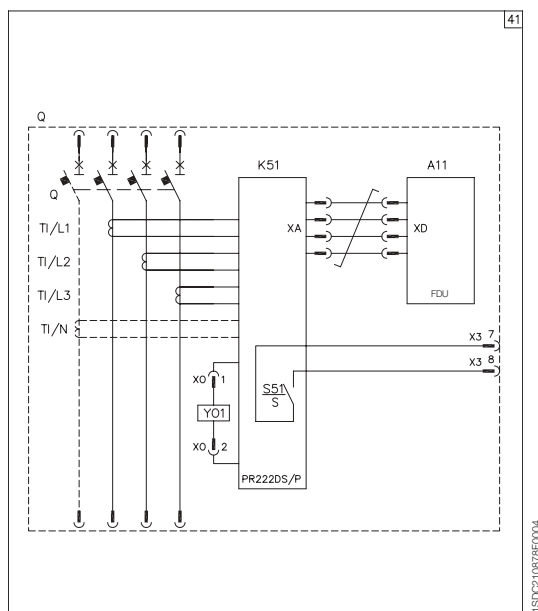




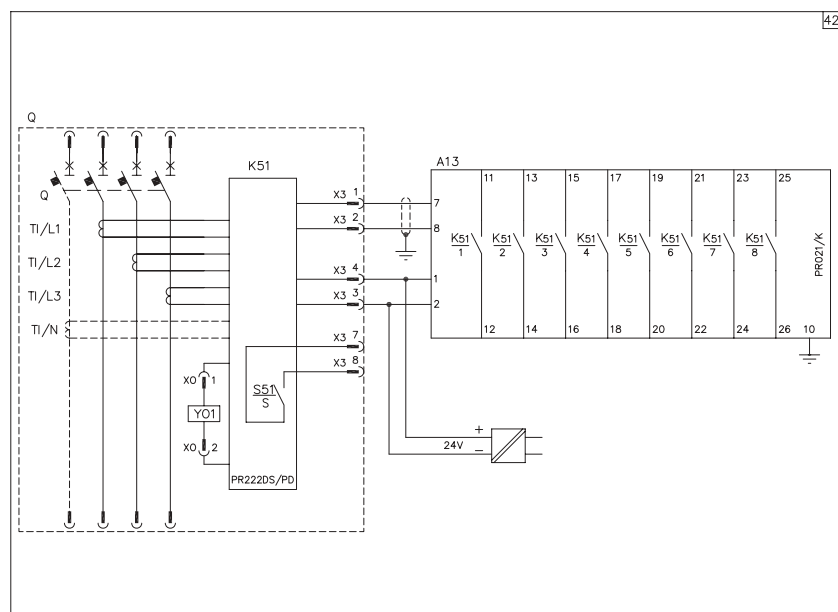
Wiring diagrams

Electrical accessories for T1...T5

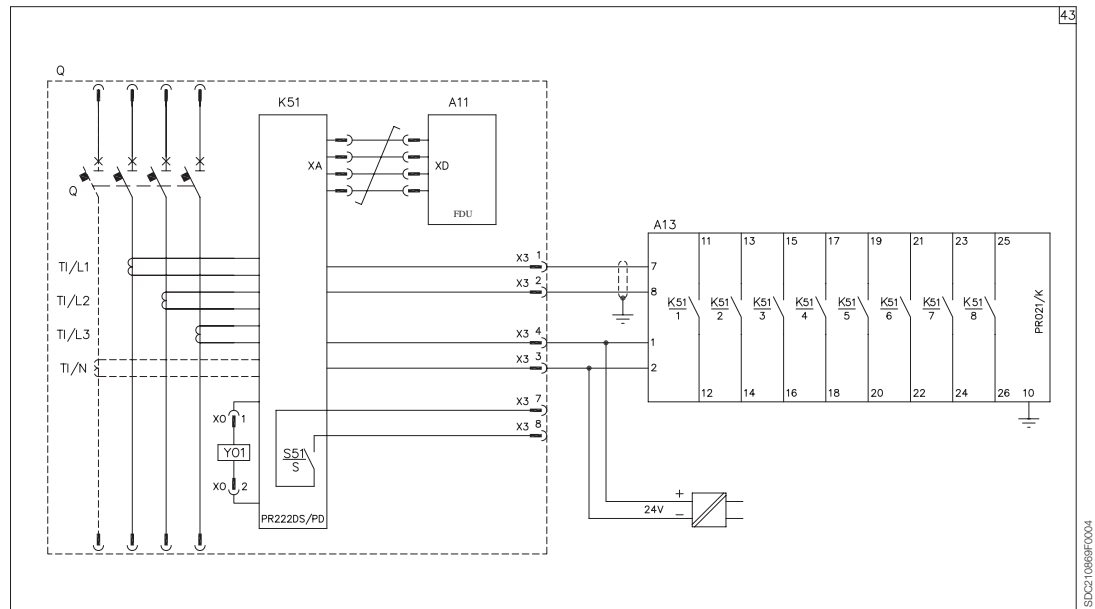
PR222DS/P electronic release connected with the FDU front display unit



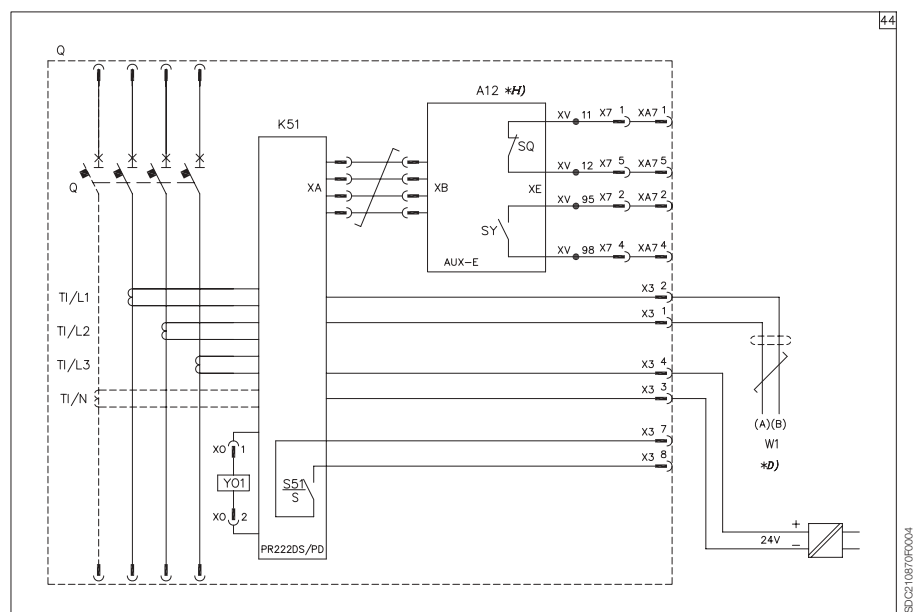
PR222DS/PD electronic release connected with the PR021/K signalling unit



PR222DS/PD electronic release connected with the FDU front display unit and the PR021/K signalling unit



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

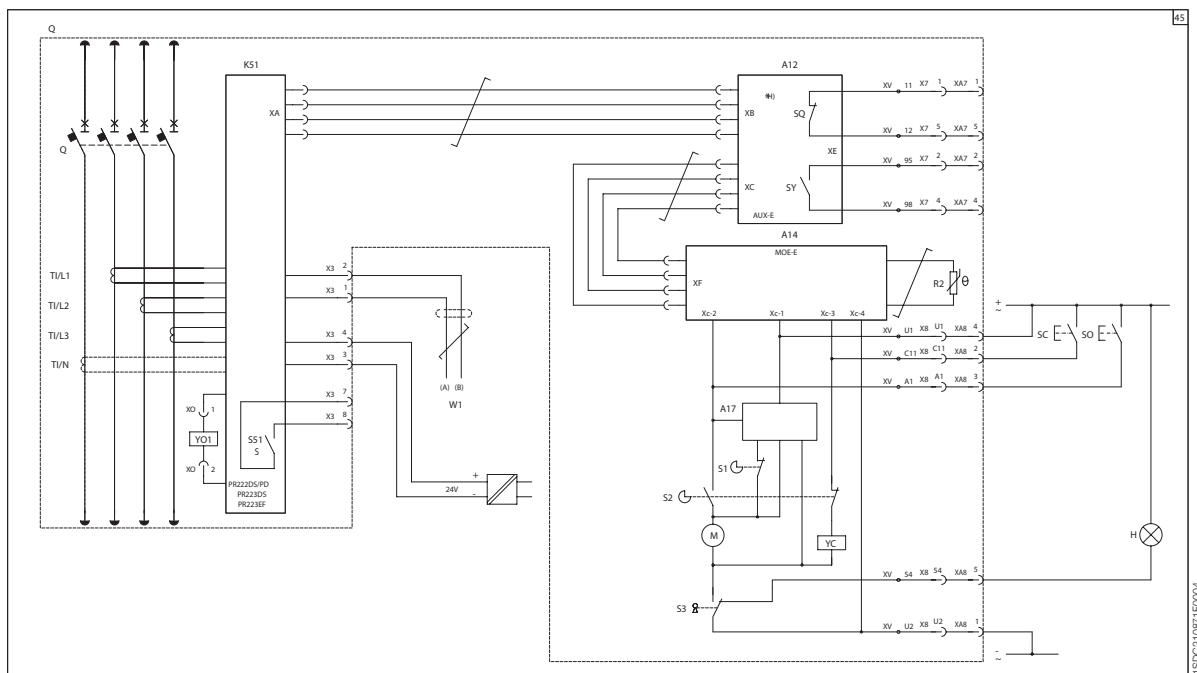




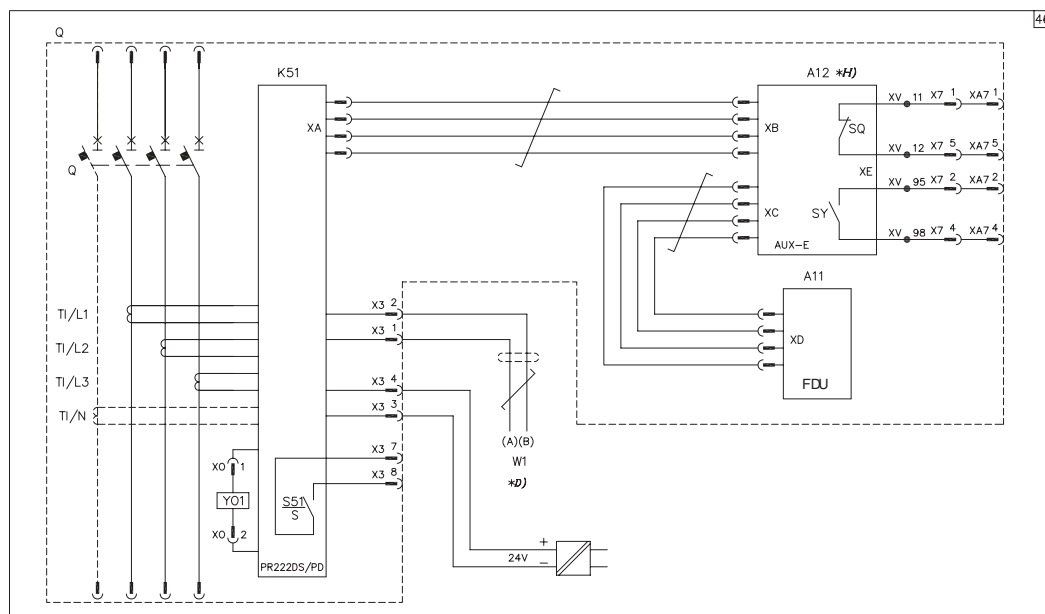
Wiring diagrams

Electrical accessories for T1...T5

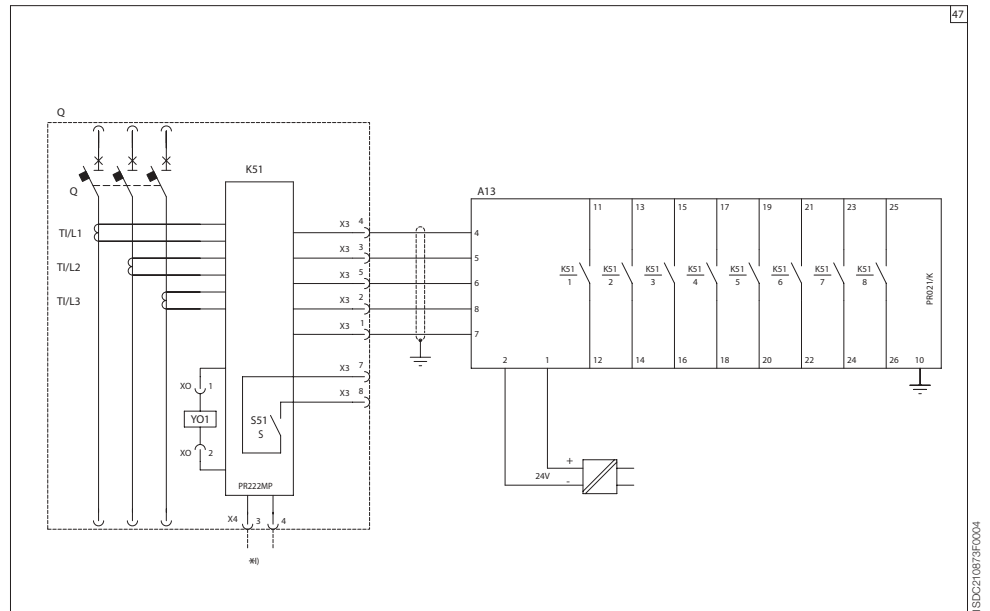
PR222DS/PD electronic release connected with the AUX-E auxiliary contacts and the MOE-E actuation unit



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

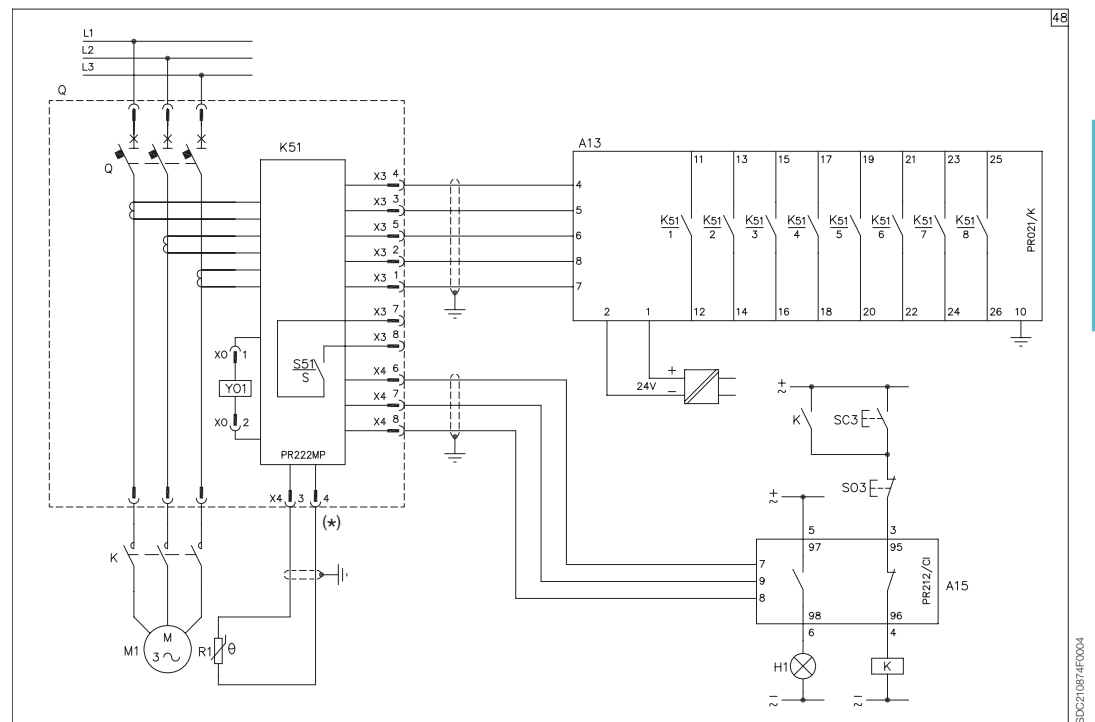


PR222MP electronic release connected with the PR021/K signalling unit



Generic 0/1 input - alternative to the PTC probe

PR222MP electronic release connected with the PR021/K signalling unit and with the PR212/CI contactor control unit



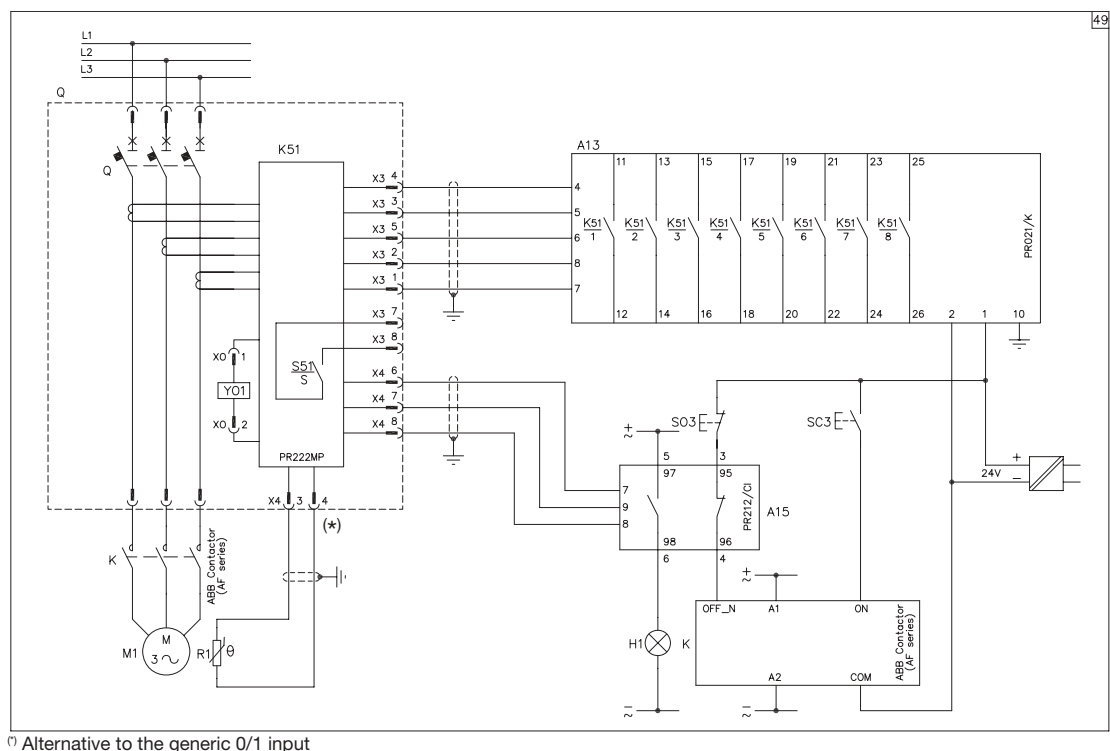
Alternative to the generic 0/1 input



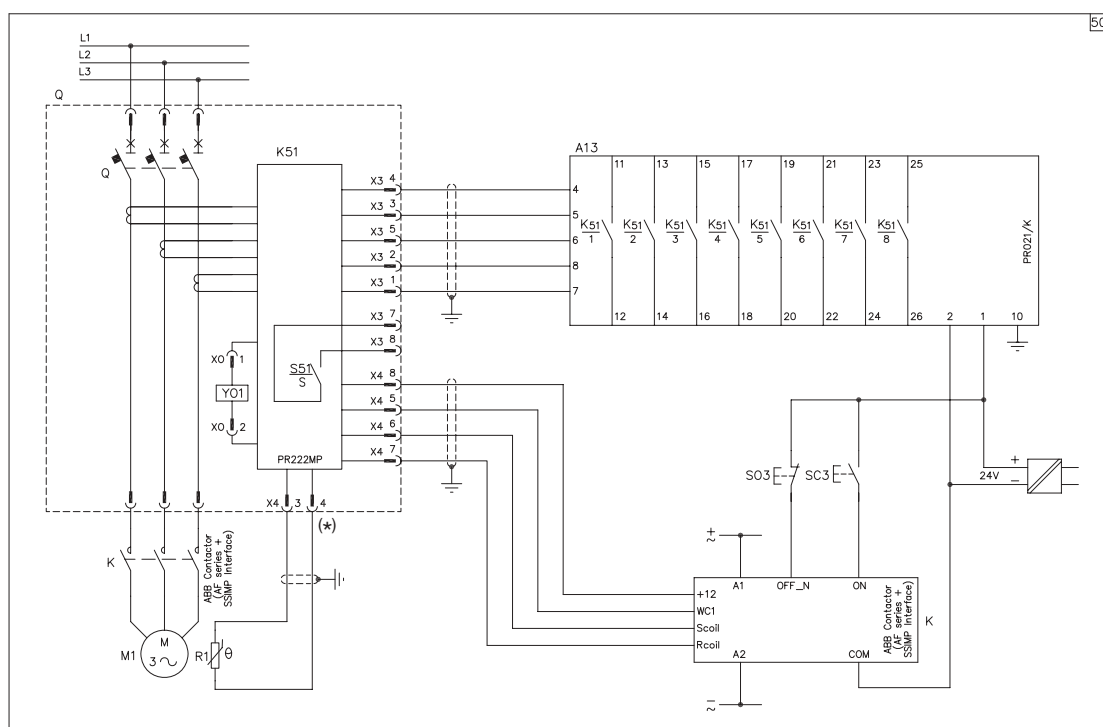
Wiring diagrams

Electrical accessories for T1...T5

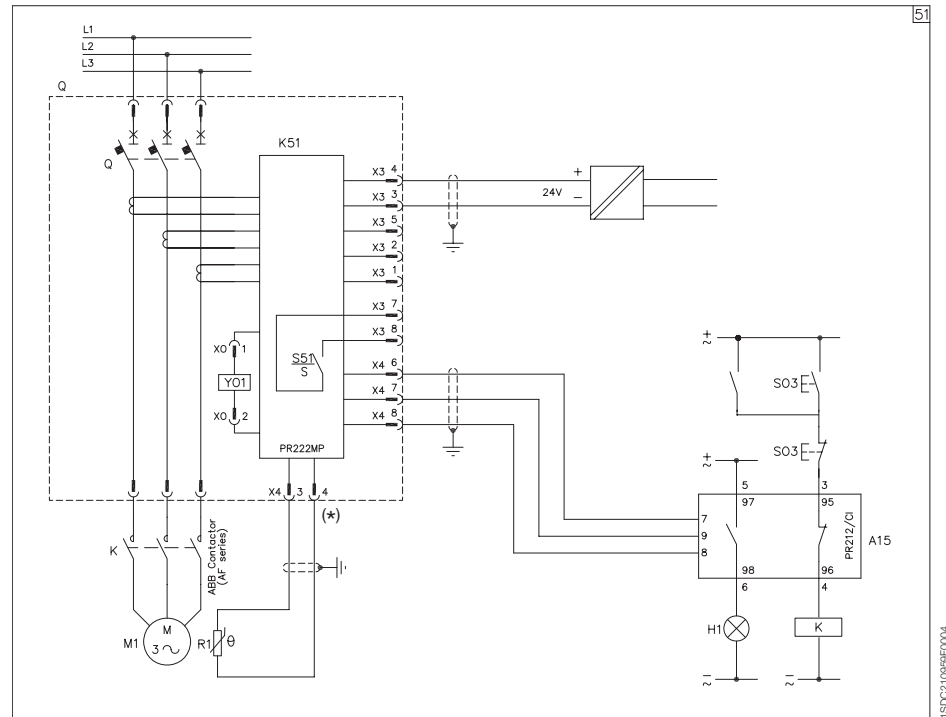
PR222MP electronic release connected with the PR021/K signalling unit, with the PR212/CI contactor control unit and with a contactor



PR222MP electronic release connected with the PR021/K signalling unit and with a contactor



PR222MP electronic release with auxiliary power supply and PR212/CI contactor control unit



¹⁾ Alternative to the generic 0/1 input

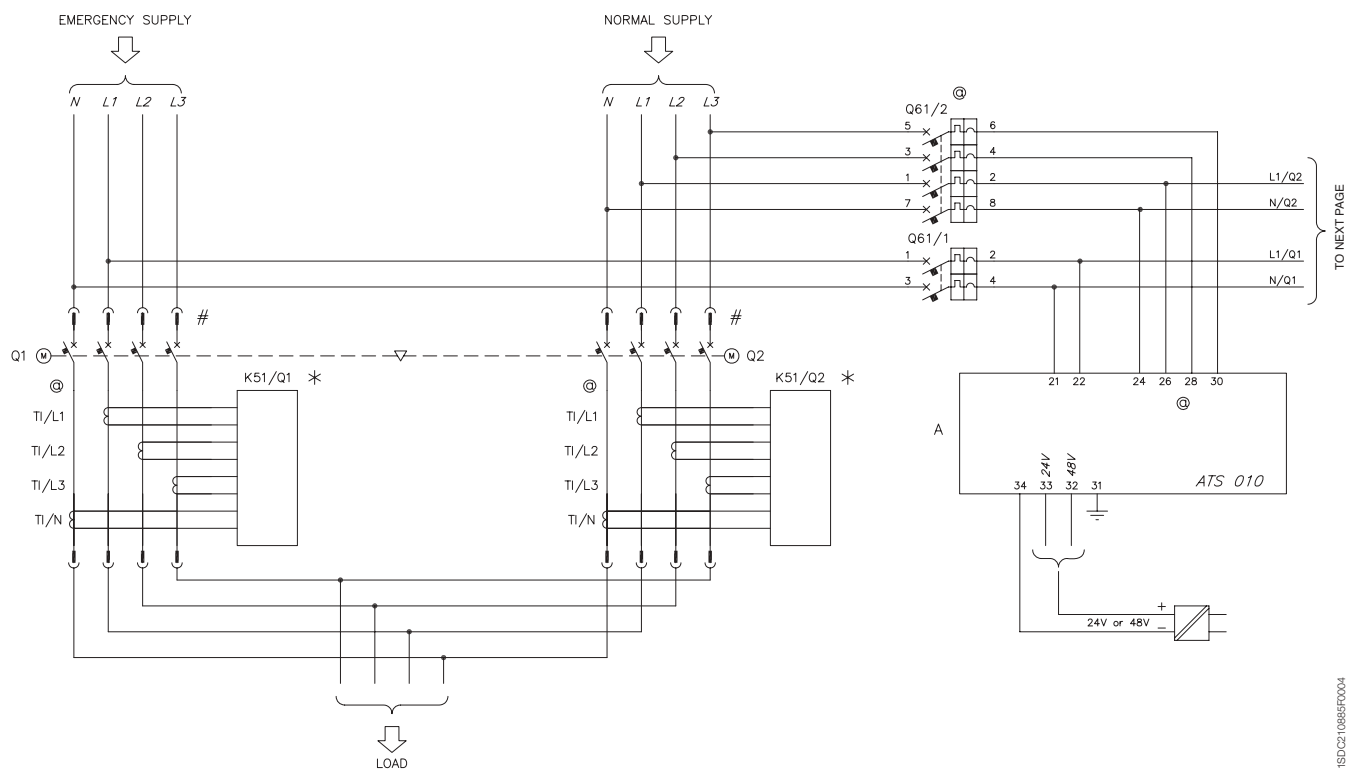
1SDC210958F0004



Wiring diagrams

Automatic transfer-switch ATS010

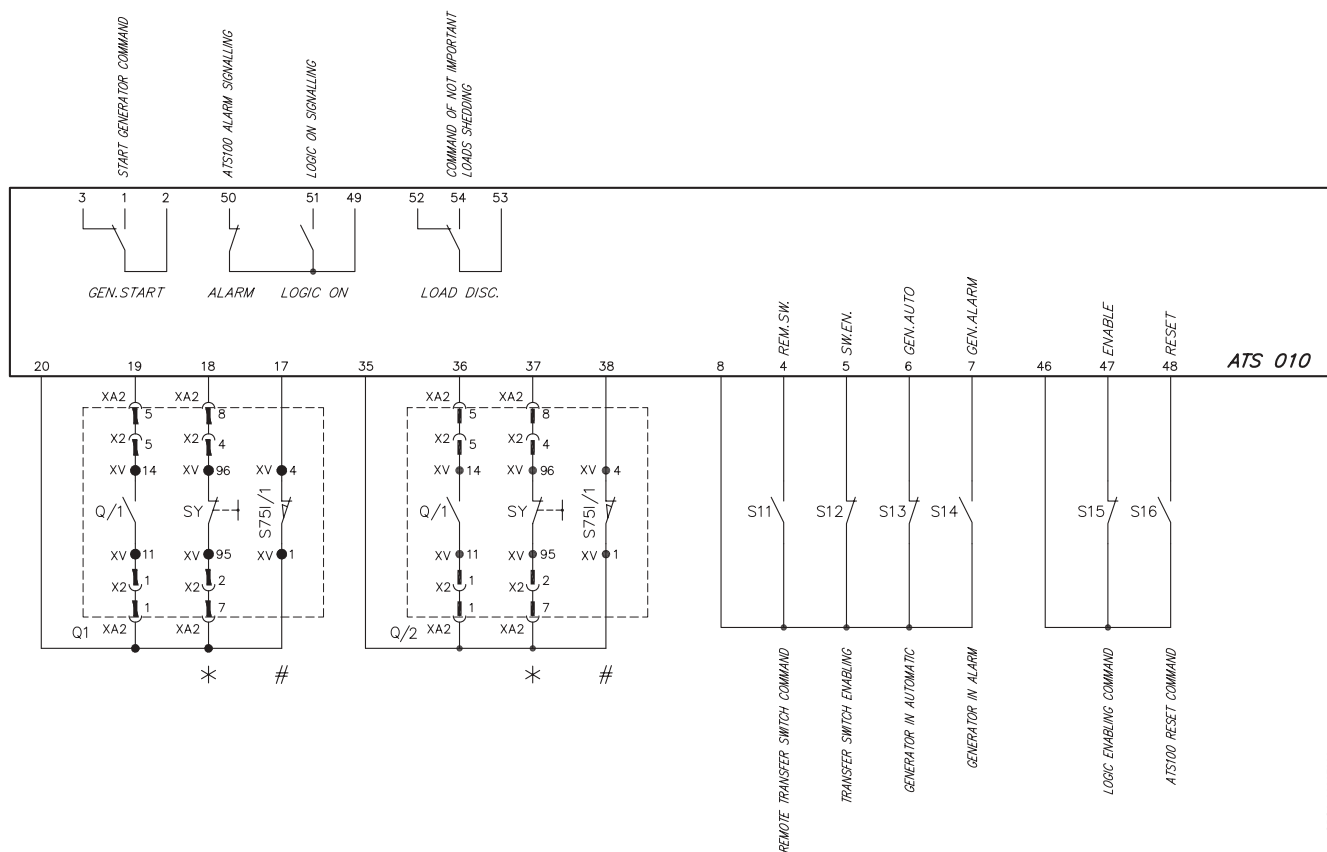
ATS010 device for the automatic transfer switch of two T3 or two T4-T5 circuit-breakers without safety auxiliary voltage supply



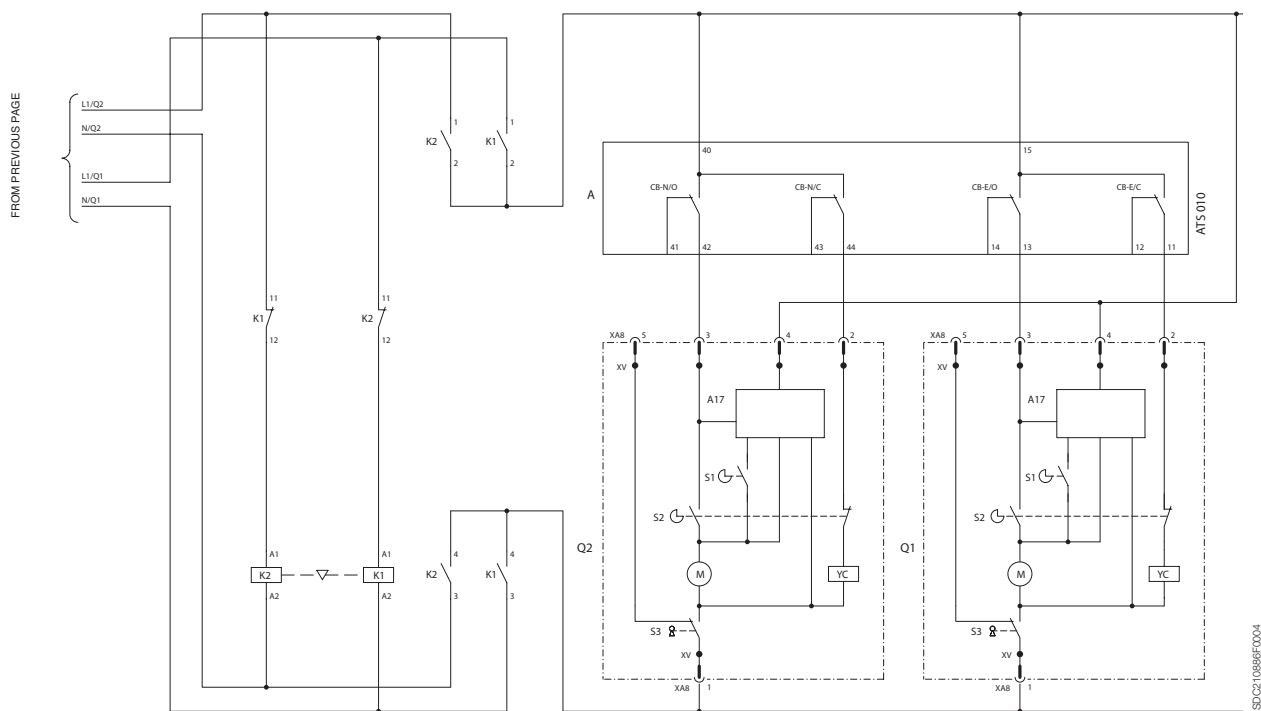
1SD2C10885F0004

5

A

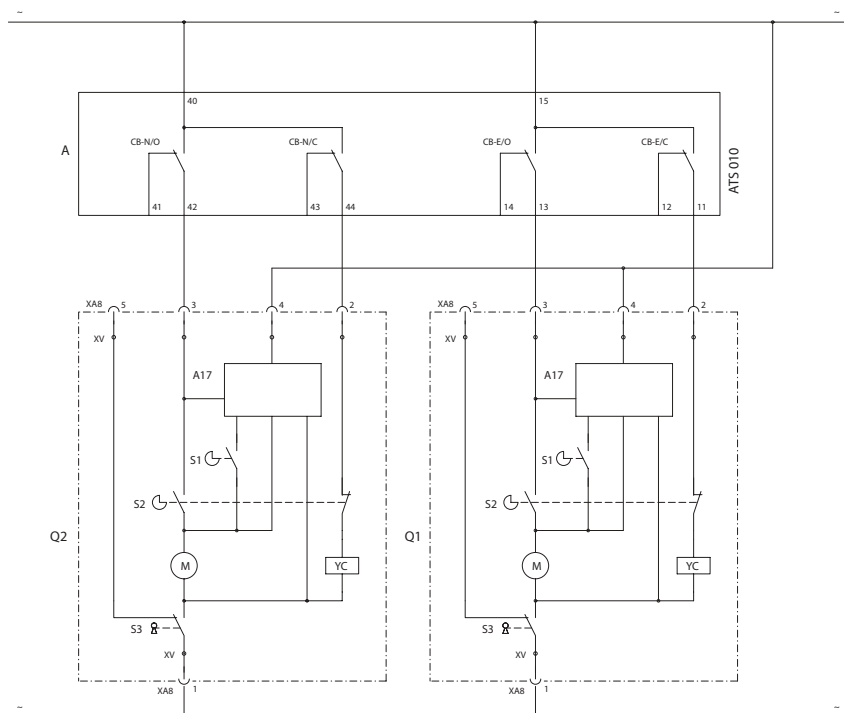


1SD2C10885F0004



1SD0210886F004

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



1SD0210886F004



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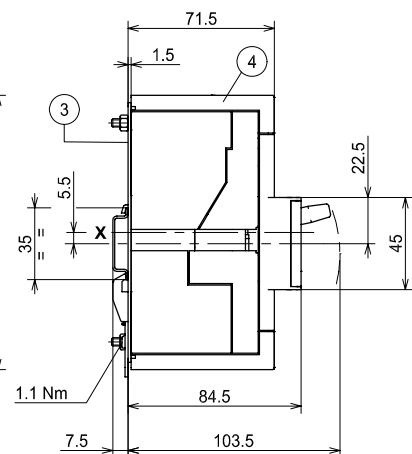
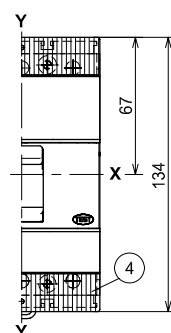
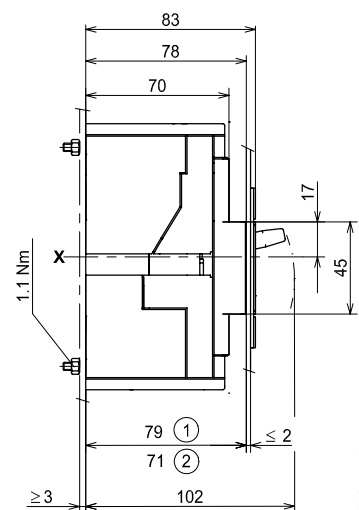
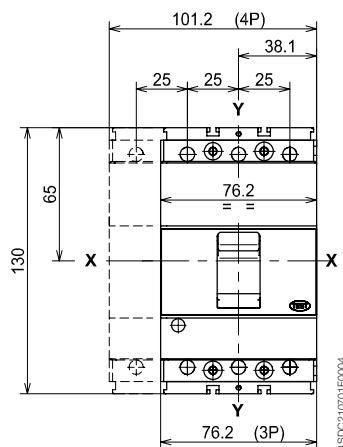
Overall dimensions

Tmax T1 and single-pole Tmax T1

Fixed circuit-breaker

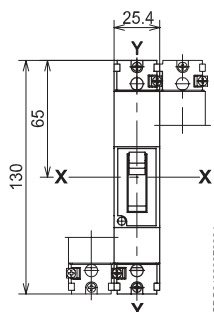
Fixing on sheet

Fixing on DIN EN 50022 rail

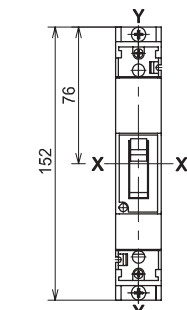
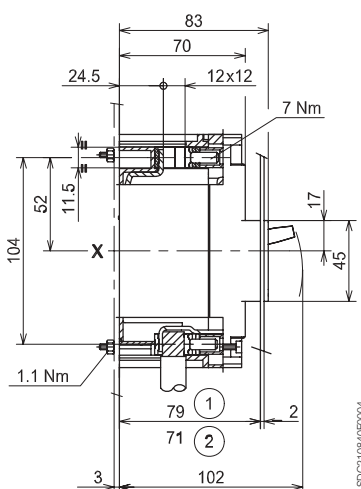


Without inserts

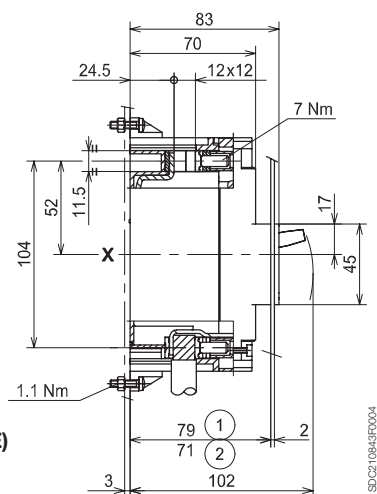
With inserts



T1 1P (SINGLE-POLE)



T1 1P (SINGLE-POLE)

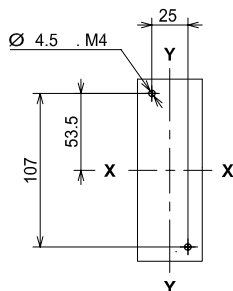


Caption

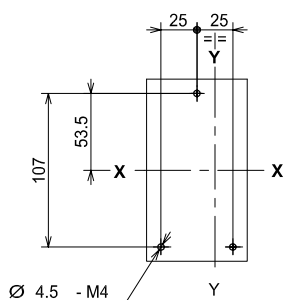
- ① Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange
- ② Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange
- ③ Bracket for fixing onto rail
- ④ Bottom terminal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

Drilling templates for support sheet

For front terminals



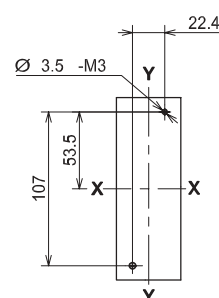
3 POLES



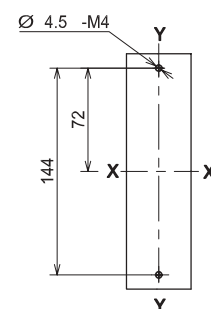
4 POLES

Without inserts

With inserts

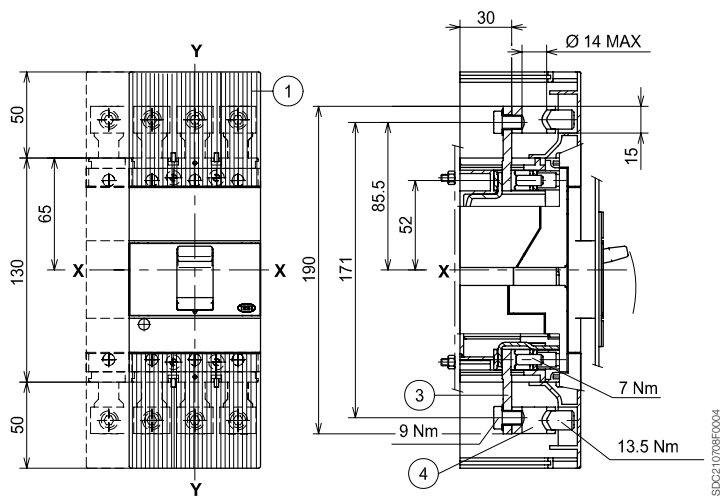


T1 1P (SINGLE-POLE)

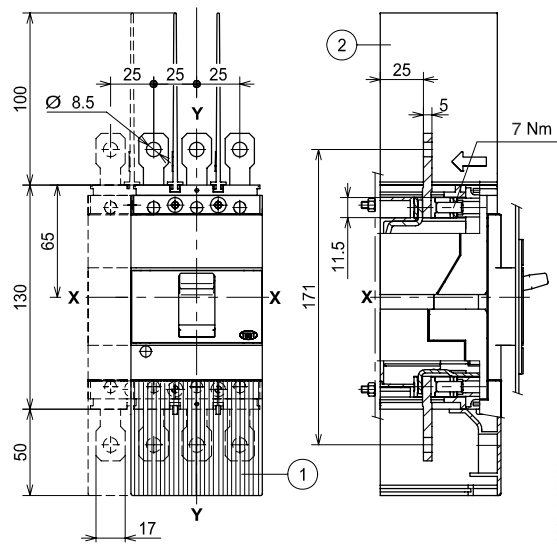


Terminals

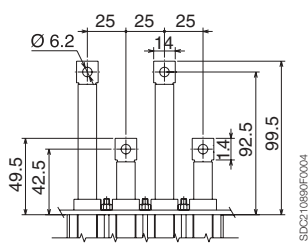
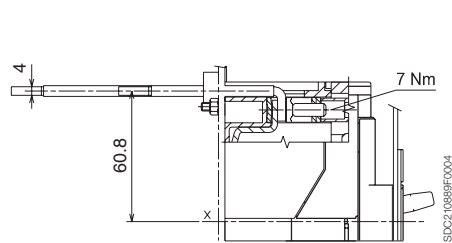
Front for copper/aluminium cables - FC CuAl



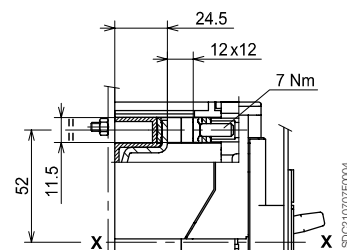
Front extended - EF



Rear flat horizontal



Front for copper cables - FC Cu



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

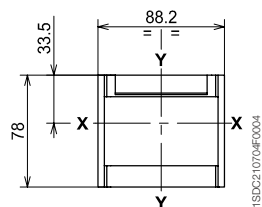


Overall dimensions

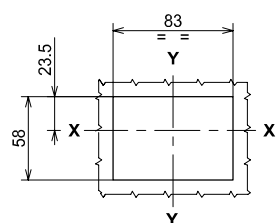
Tmax T1 and single-pole Tmax T1

Terminals

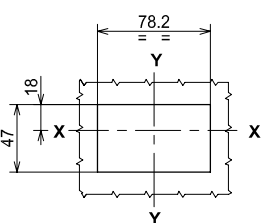
Flange for the compartment door



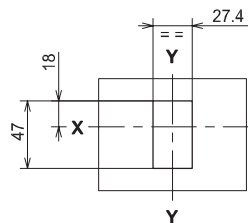
Drilling templates of the compartment door



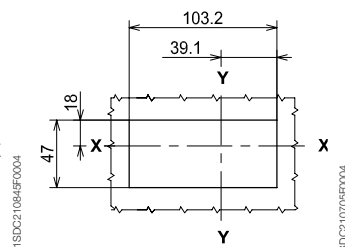
With flange and
circuit-breaker face flush
with door (3-4 POLES)



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



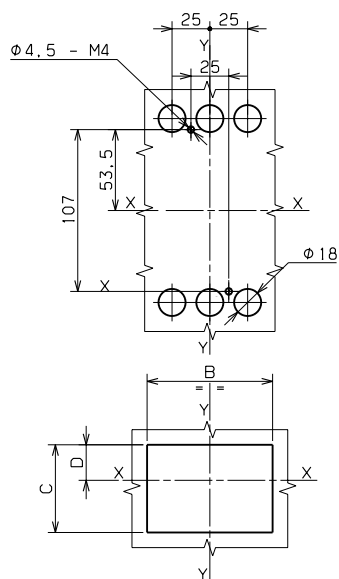
(SINGLE-POLE)



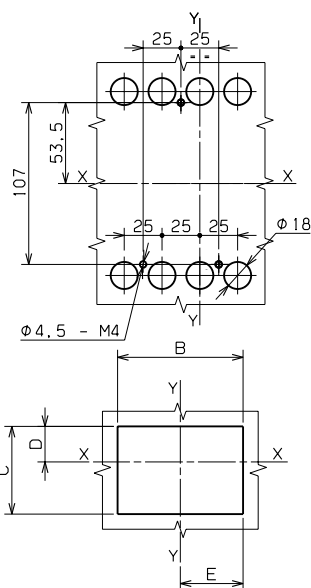
Without flange and
circuit-breaker face
extending (4 POLES)

Drilling templates for support sheet

For rear terminals



3 POLES



4 POLES



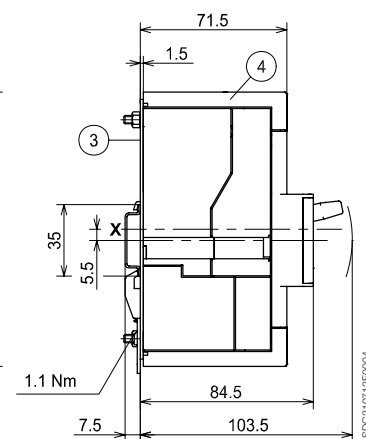
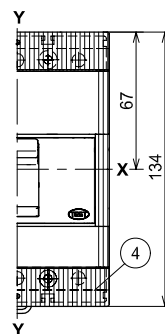
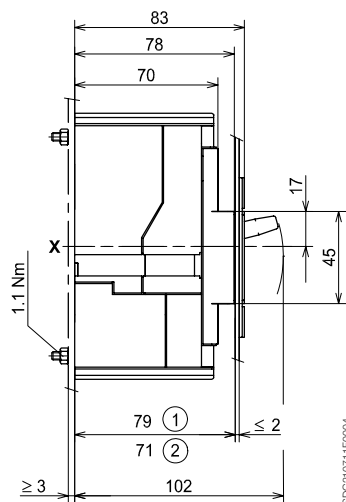
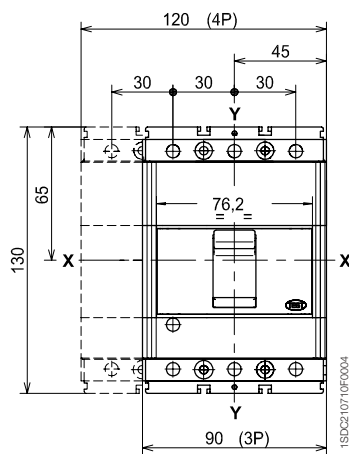
Overall dimensions

Tmax T2

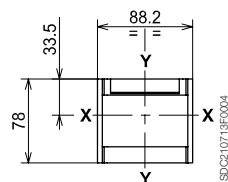
Fixed circuit-breaker

Fixing on sheet

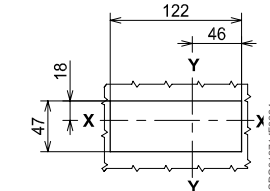
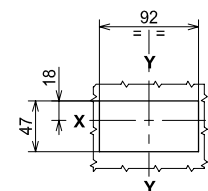
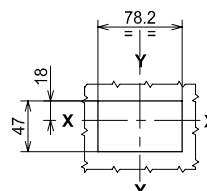
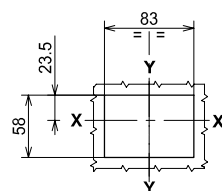
Fixing on DIN EN 50022 rail



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)

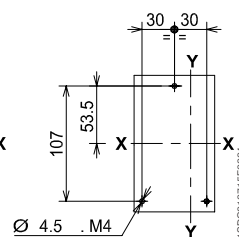
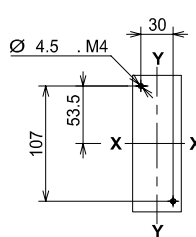
Without flange and circuit-breaker face extending (4 POLES)

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

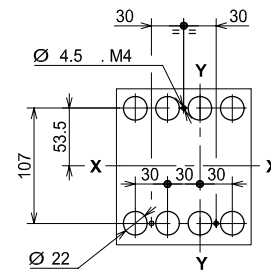
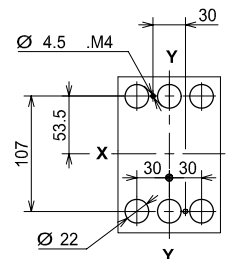
For front terminals



3 POLES

4 POLES

For rear terminals



3 POLES

4 POLES



Overall dimensions

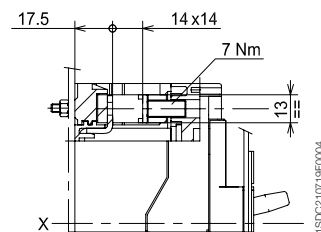
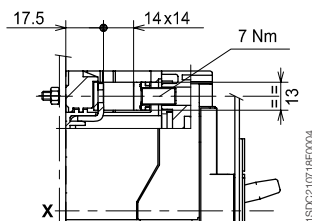
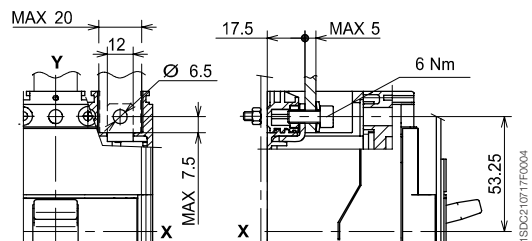
Tmax T2

Terminals

Front F

Front for copper cables - FC Cu

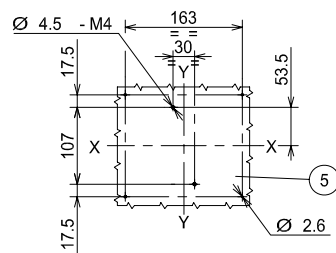
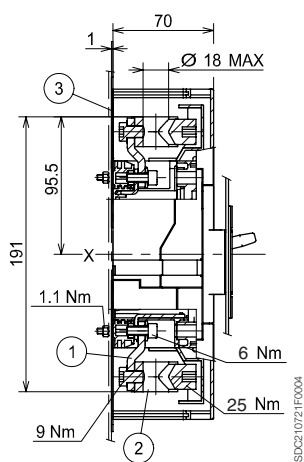
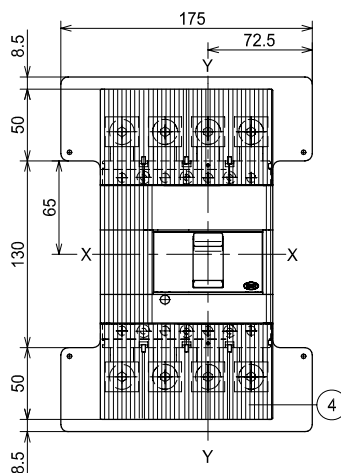
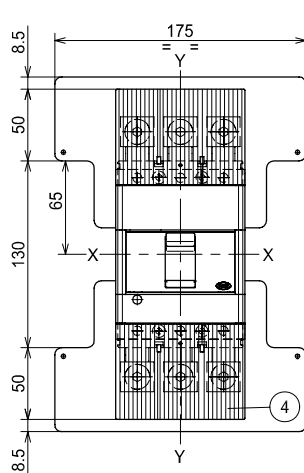
Front for copper/aluminium cables - FC CuAl 95 mm²



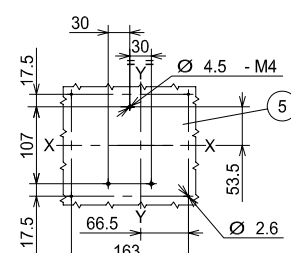
Caption

Front for copper/aluminium cables - FC CuAl 185 mm²

- 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



3 POLES

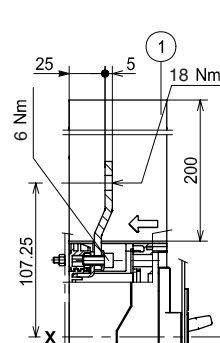
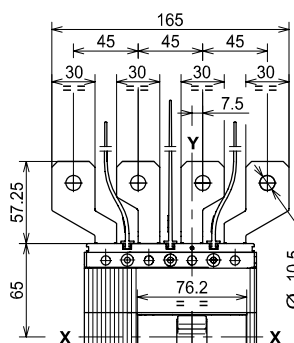
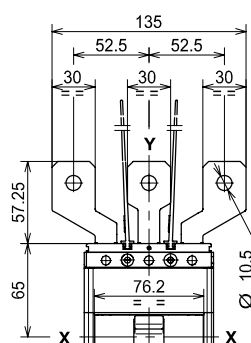


4 POLES

Caption

Front extended spread - ES

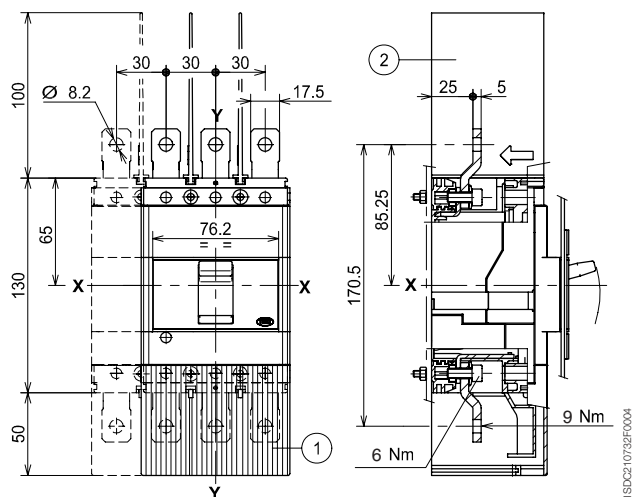
- ① Insulating barriers between phases (compulsory)



Caption

- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)

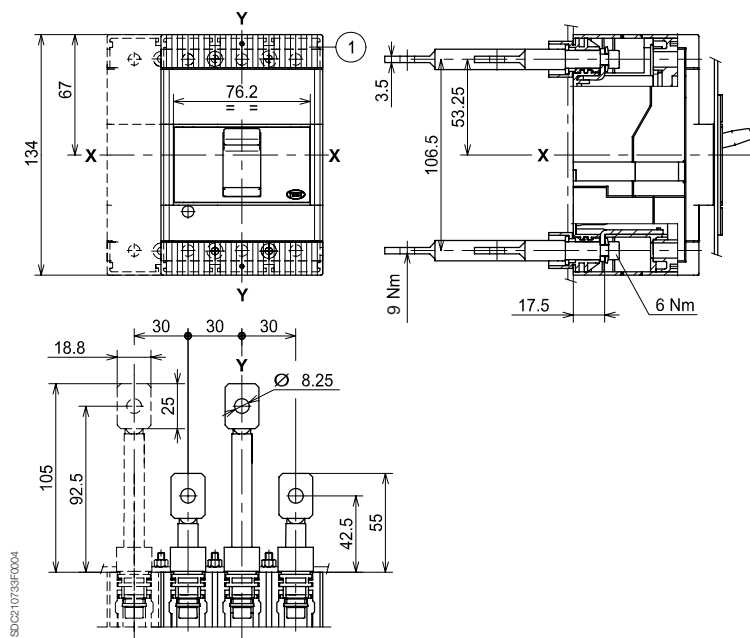
Front extended - EF



Caption

- ① Low terminal covers with degree of protection IP40

Rear - R





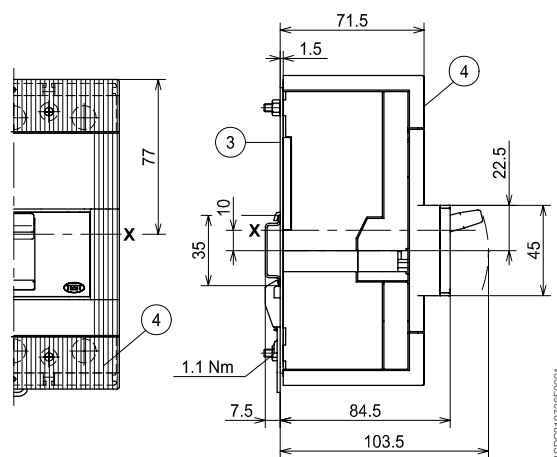
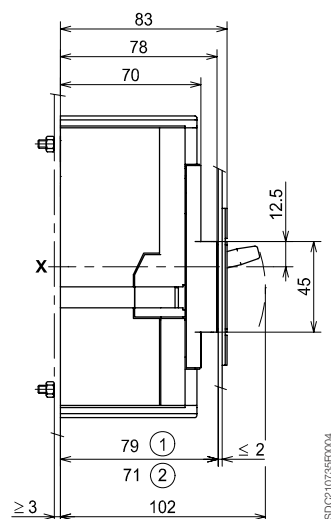
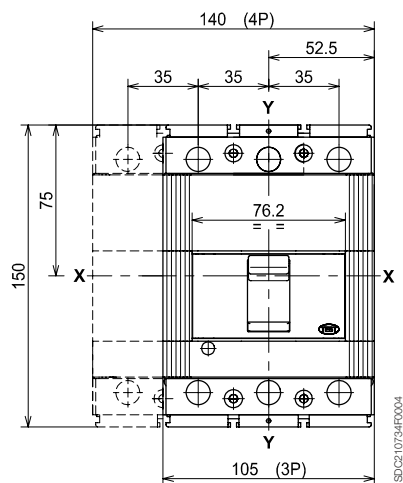
Overall dimensions

Tmax T3

Fixed circuit-breaker

Fixing on sheet

Fixing on DIN EN 50022 rail

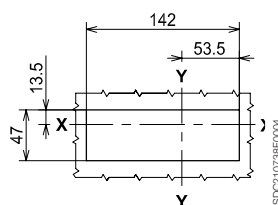
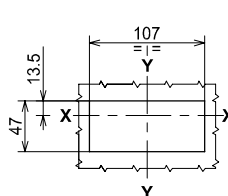
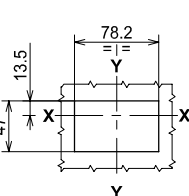
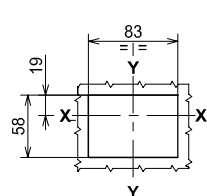
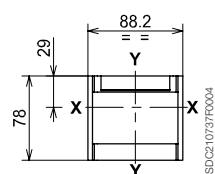


Caption

- 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)

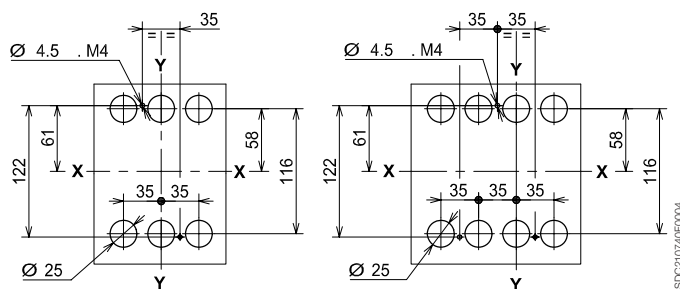
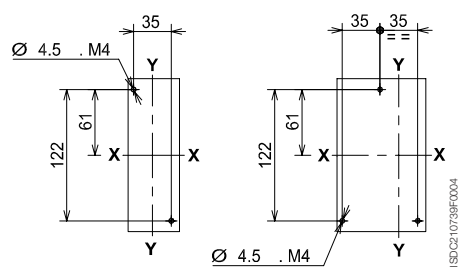
Without flange and circuit-breaker face extending (3 POLES)

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

Drilling templates for support sheet

For front terminals

For rear terminals



3 POLES

4 POLES

3 POLES

4 POLES



Overall dimensions

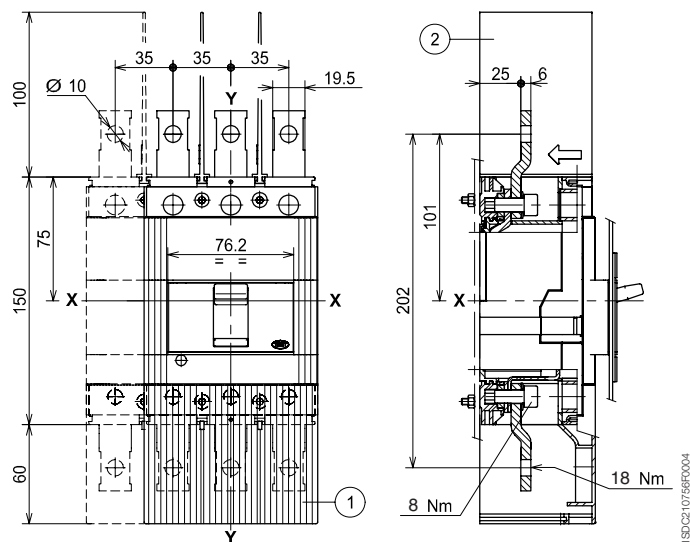
Tmax T3

Terminals

Caption

- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)

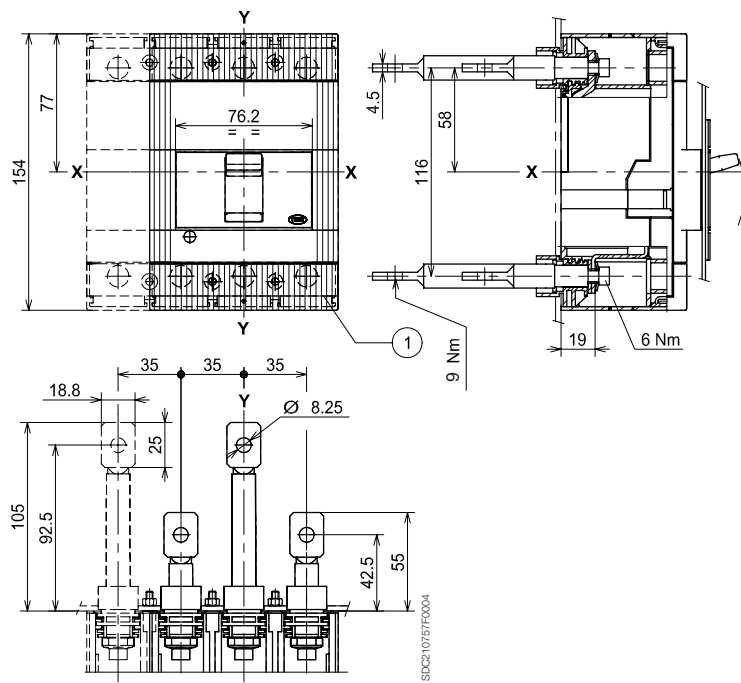
Front extended - EF



Caption

- ① Low terminal covers with degree of protection IP40

Rear - R

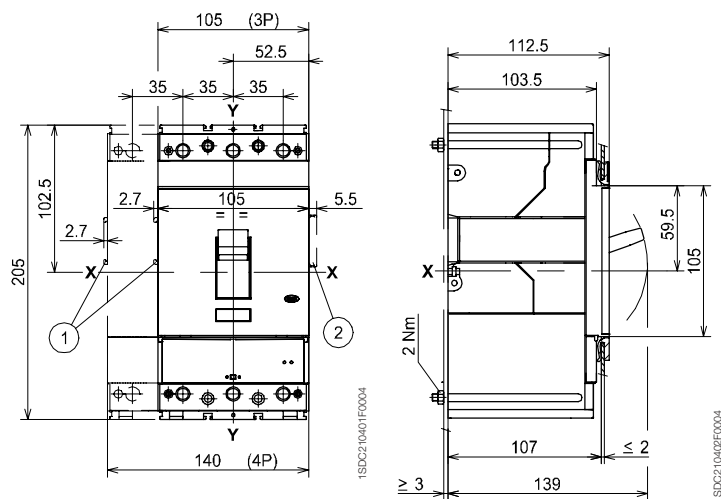




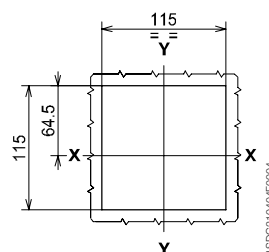
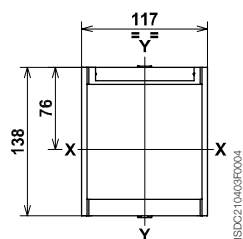
Fixing on sheet

① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)

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

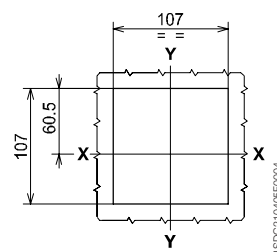


Drilling templates of the compartment door



3-4 POLES

With flange

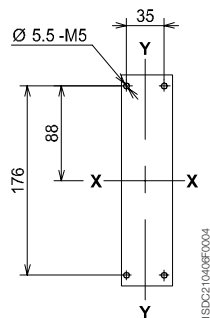


3-4 POLES

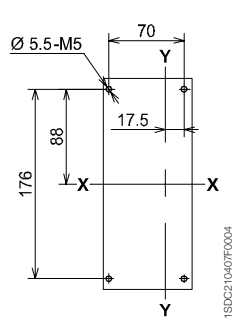
Without flange

Drilling templates for support sheet

For front terminals

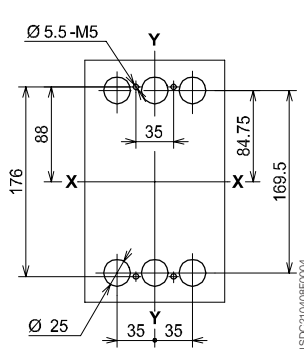


3 POLES

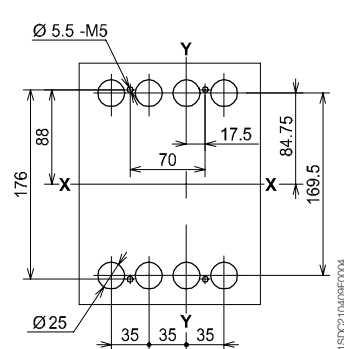


4 POLES

For rear terminals



3 POLES



4 POLES

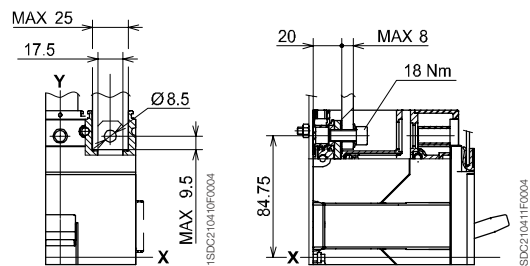


Overall dimensions

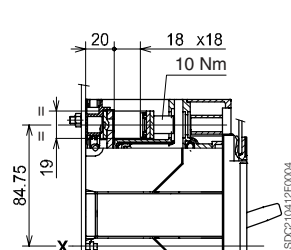
Tmax T4

Terminals

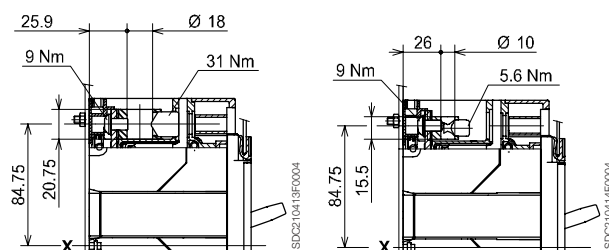
Front - F



Front for copper cables - FC Cu



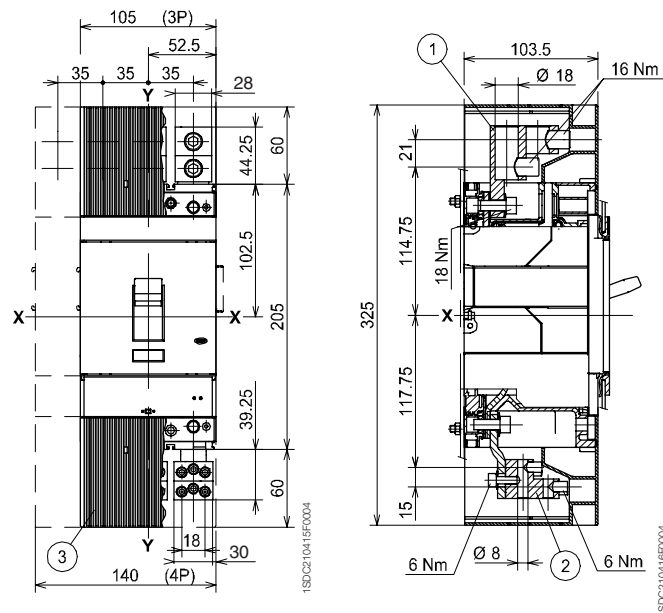
Front for copper/aluminium cables - FC CuAl



Caption

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

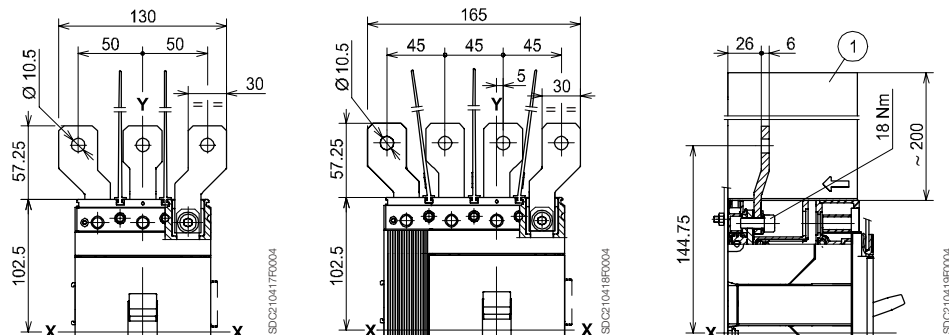
Front multicable - MC



Caption

- ① Insulating barriers between phases (compulsory)

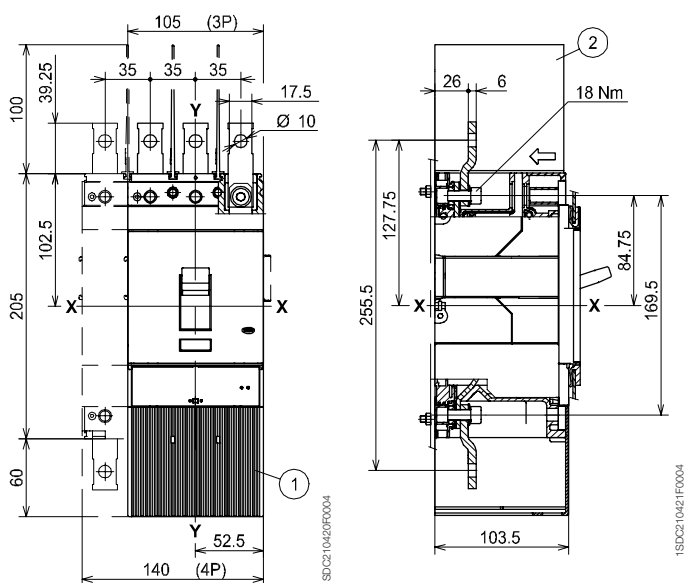
Front extended spread - ES



Caption

- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)

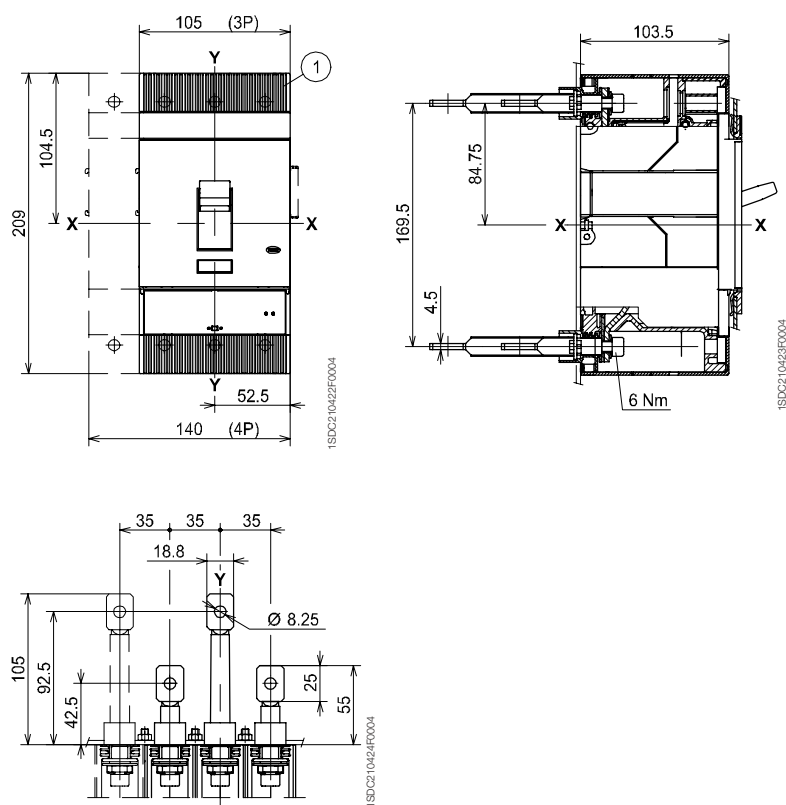
Front extended - EF



Caption

- ① Low terminal covers with degree of protection IP40

Rear - R





Overall dimensions

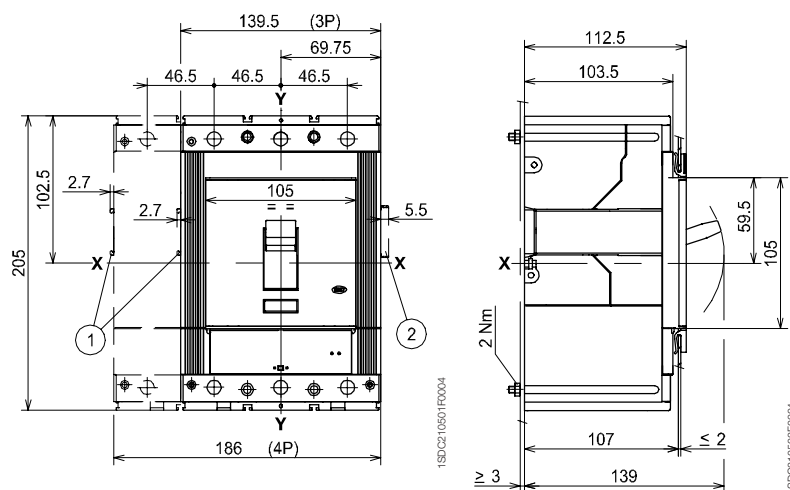
Tmax T5

Fixed circuit-breaker

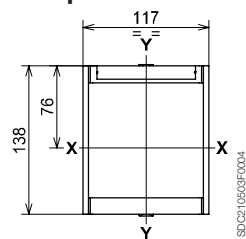
Fixing on sheet

Caption

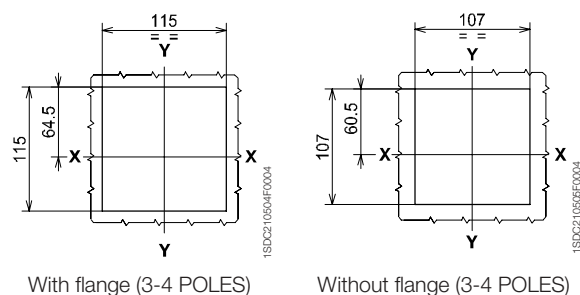
- ① Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222)
- ② Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



Flange for compartment door

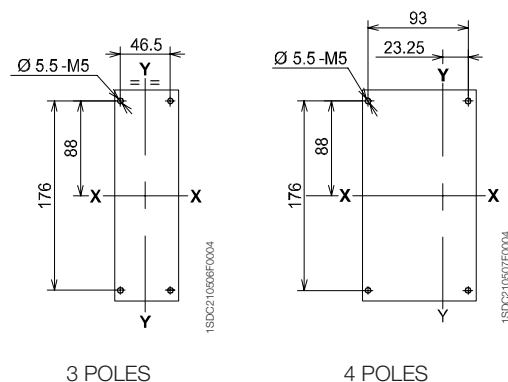


Drilling templates of the compartment door

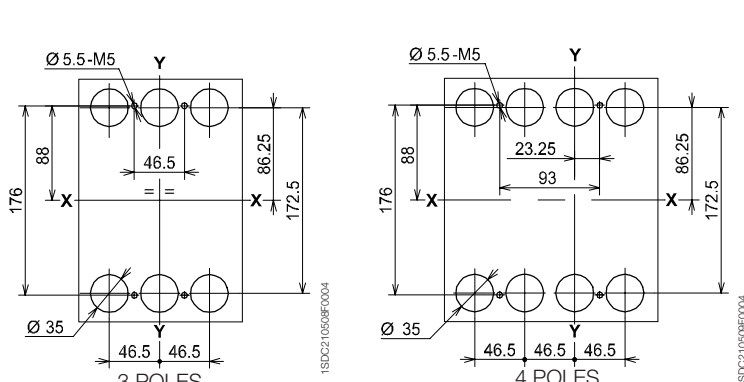


Drilling templates for support sheet

For front terminals

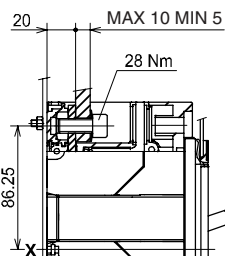
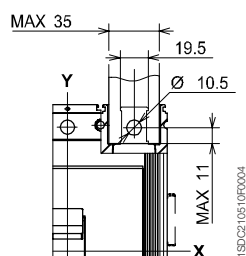


For rear terminals

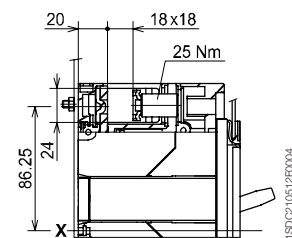


Terminals

Front - F



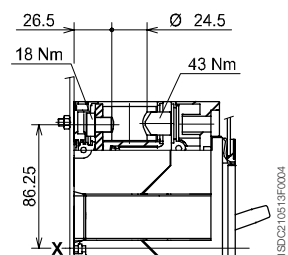
Front for copper cables - FC Cu



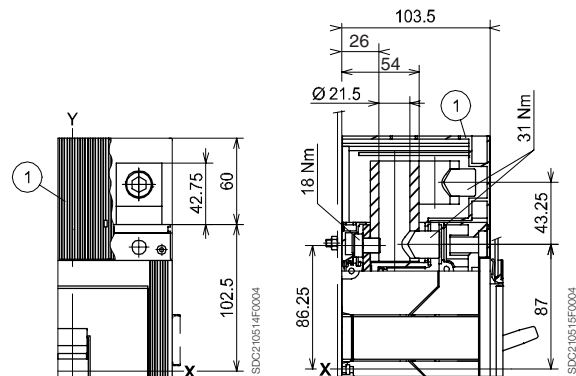
Caption

- ① High terminal covers with degree of protection IP40

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



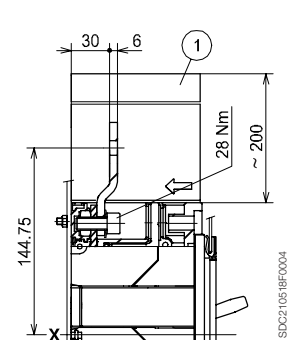
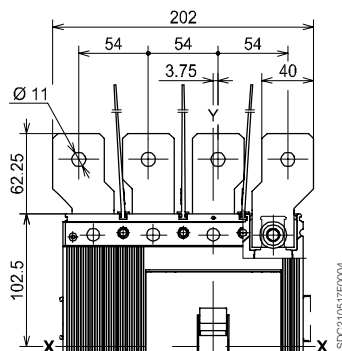
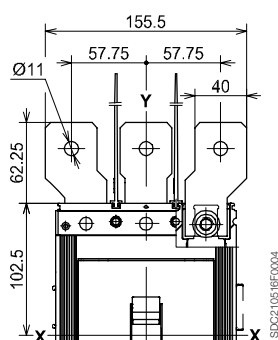
Front for copper/aluminium cables Cu/Al 2x240 mm² - FC CuAl



Caption

- ① Insulating barriers between phases (compulsory)

Front extended spread - ES





Overall dimensions

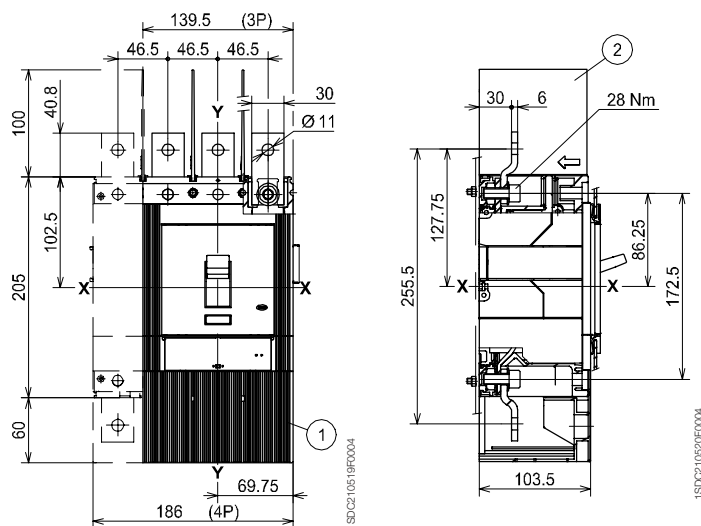
Tmax T5

Terminals

Caption

Front extended - EF

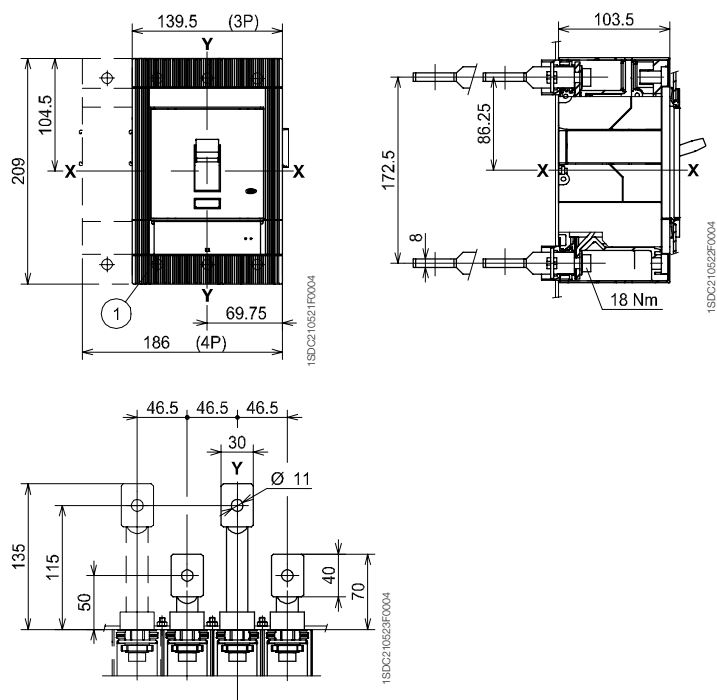
- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)



Caption

Rear - R

- ① Low terminal covers with degree of protection IP40





Overall dimensions

Tmax T2

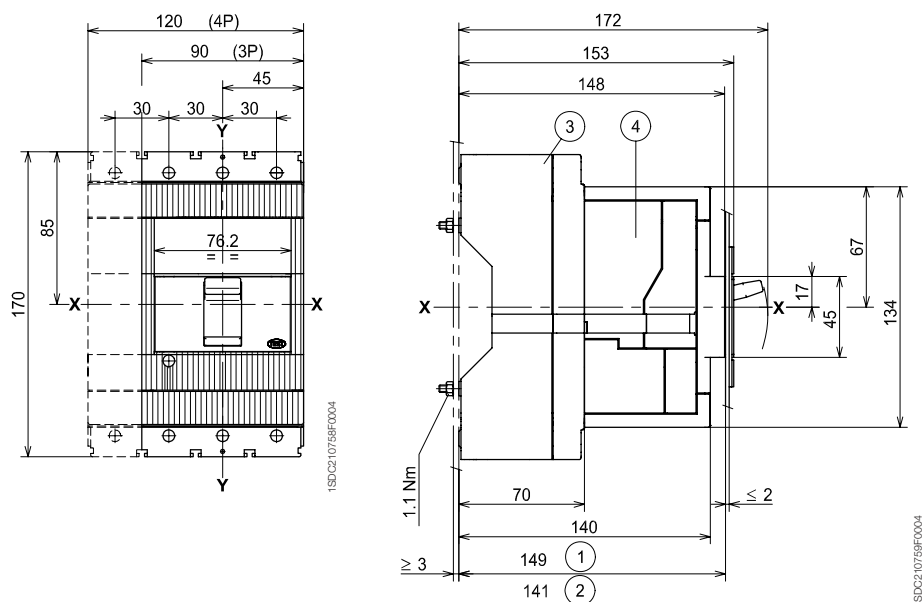
Plug-in

circuit-breaker

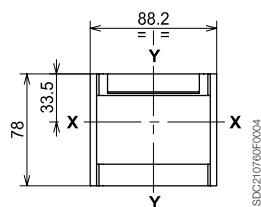
Fixing on sheet

Caption

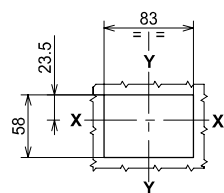
- ① Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange
- ② Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange
- ③ Fixed part
- ④ Moving part with terminal covers, degree of protection IP40



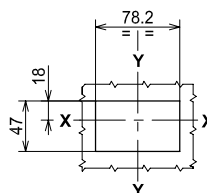
Flange for compartment door



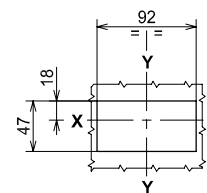
Drilling templates of the compartment door



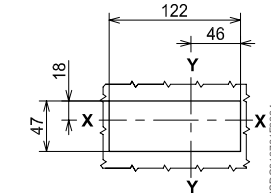
With flange and circuit-breaker face flush with door (3-4 POLES)



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



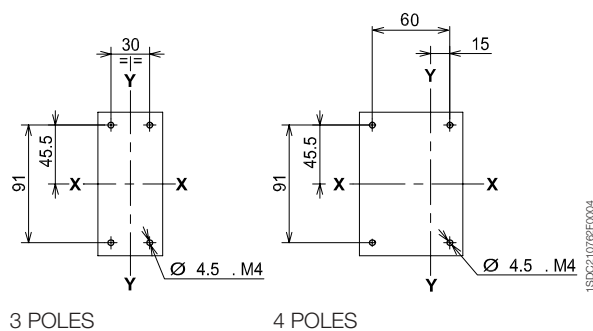
Without flange and circuit-breaker face extending (3 POLES)



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

Drilling templates for support sheet

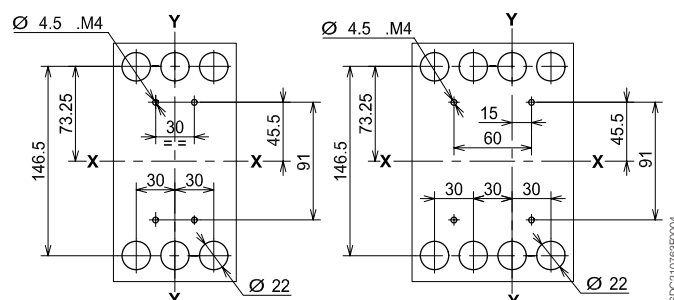
For front terminals



3 POLES

4 POLES

For rear terminals



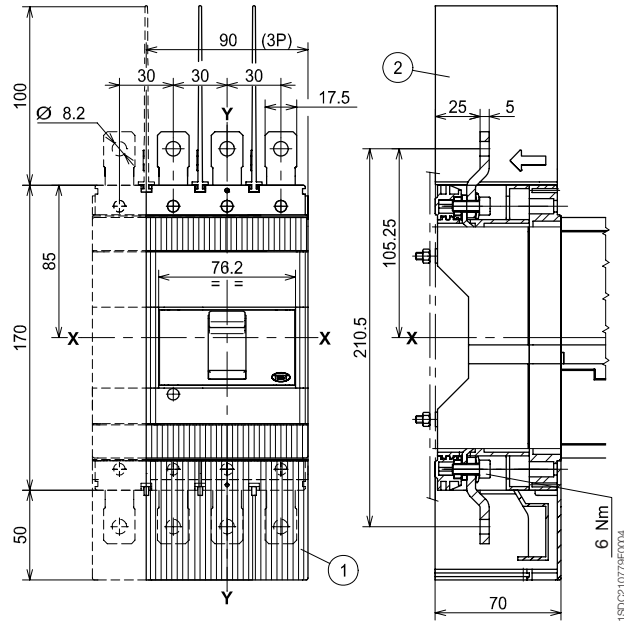
3 POLES

4 POLES

Front extended - EF

Caption

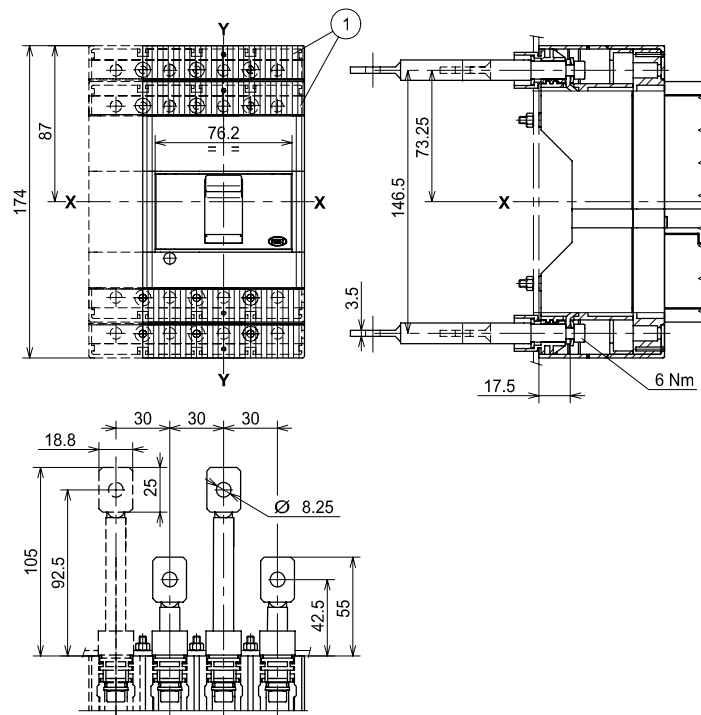
- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)



Caption

- ① Low terminal covers with degree of protection IP40

Rear - R





Overall dimensions

Tmax T3

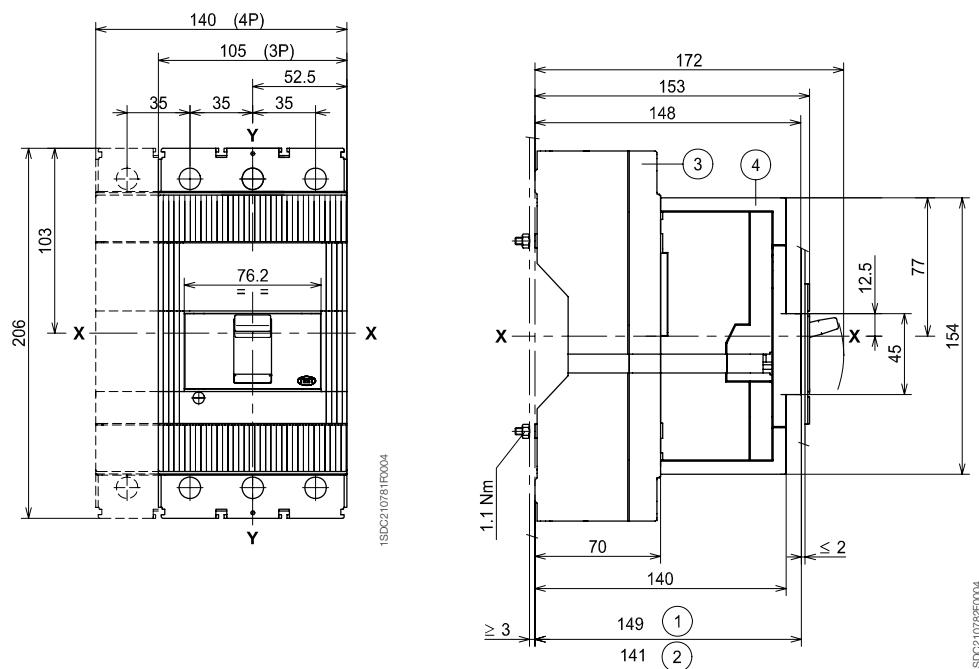
Plug-in

circuit-breaker

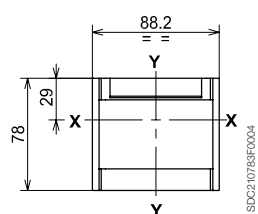
Fixing on sheet

Caption

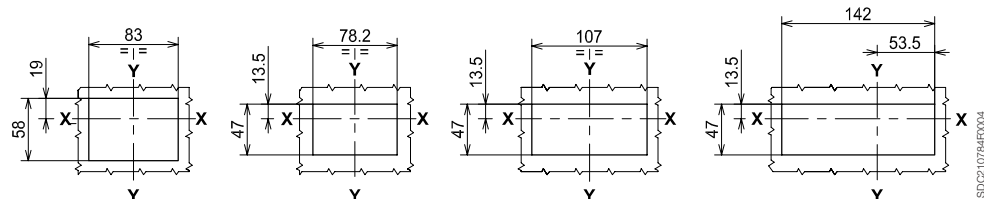
- ① Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange
- ② Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange
- ③ Fixed part
- ④ Moving part with terminal 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)

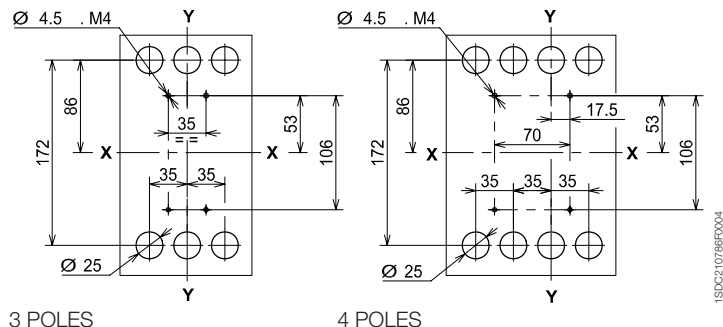
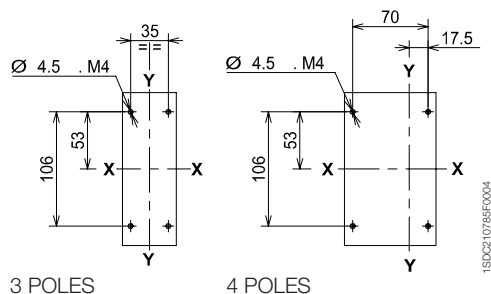
Without flange and circuit-breaker face extending (3 POLES)

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

Drilling templates for support sheet

For front terminals

For rear terminals

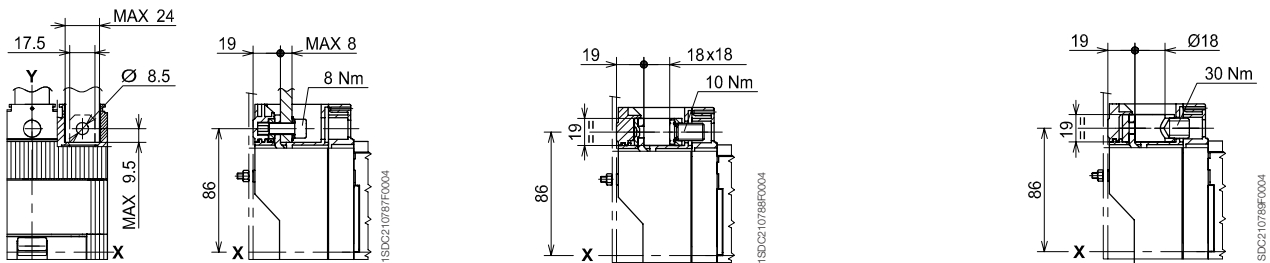


Terminals

Front - F

Front for copper cables - FC Cu

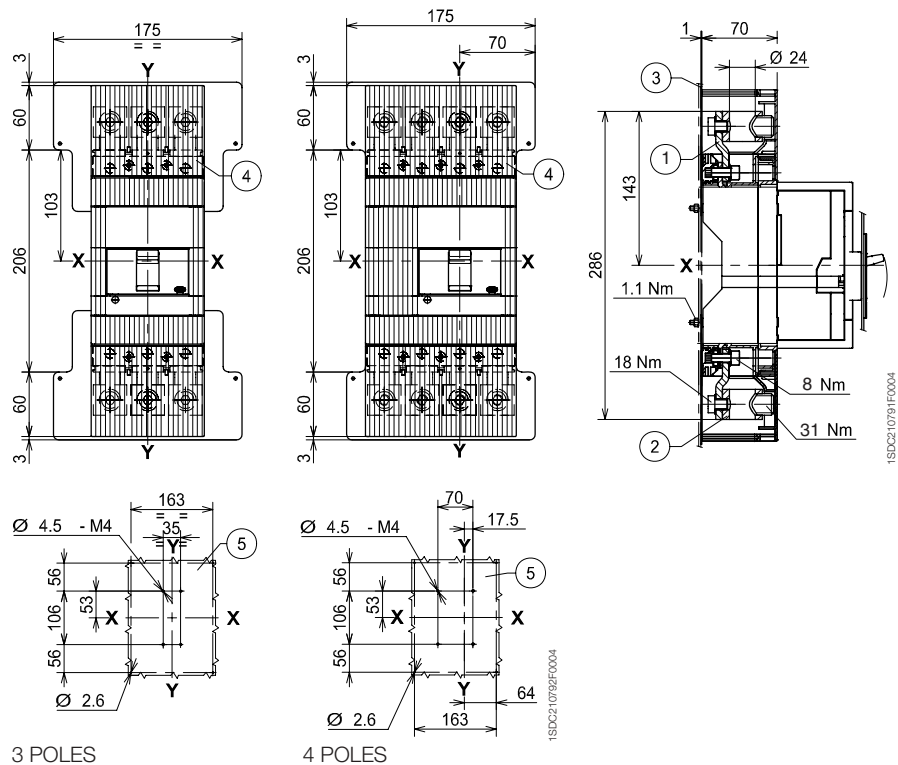
Front for copper/aluminium cables -
FC CuAl 185 mm²



Caption

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

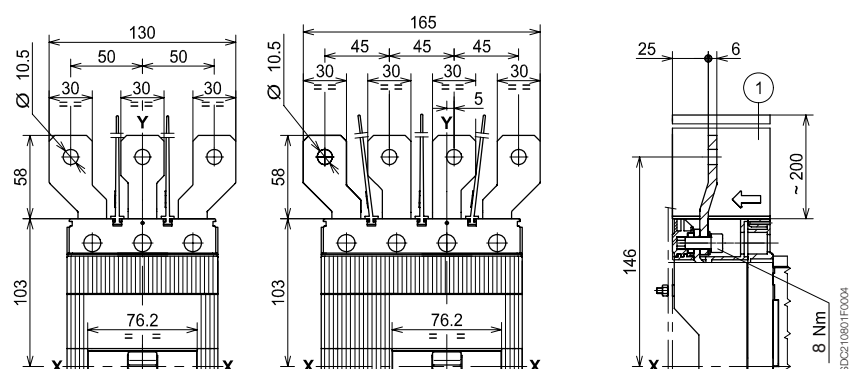
- ① Front extended terminals
- ② Front terminals for cables 240 mm² CuAl
- ③ Insulating base plate (compulsory)
- ④ High terminal covers with degree of protection IP40
- ⑤ Drilling templates for support sheet



Caption

Front extended spread - ES

- ① Insulating barriers between phases (compulsory)





Overall dimensions

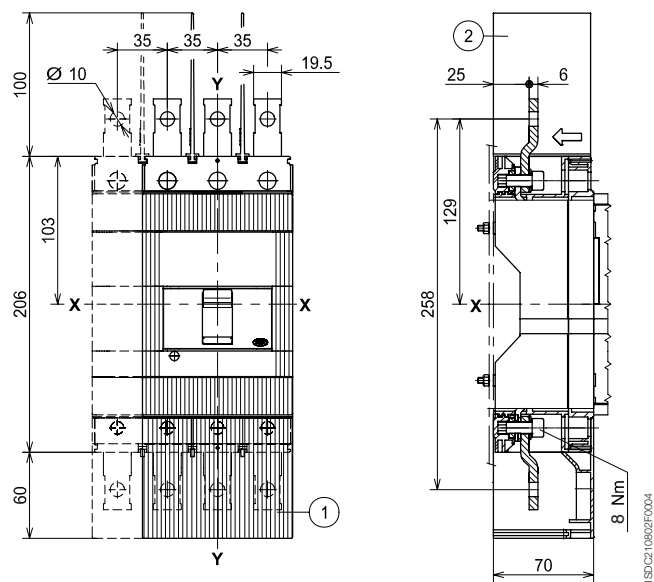
Tmax T3

Terminals

Caption

- ① High terminal covers with degree of protection IP40
- ② Insulating barriers between phases (compulsory without 1)

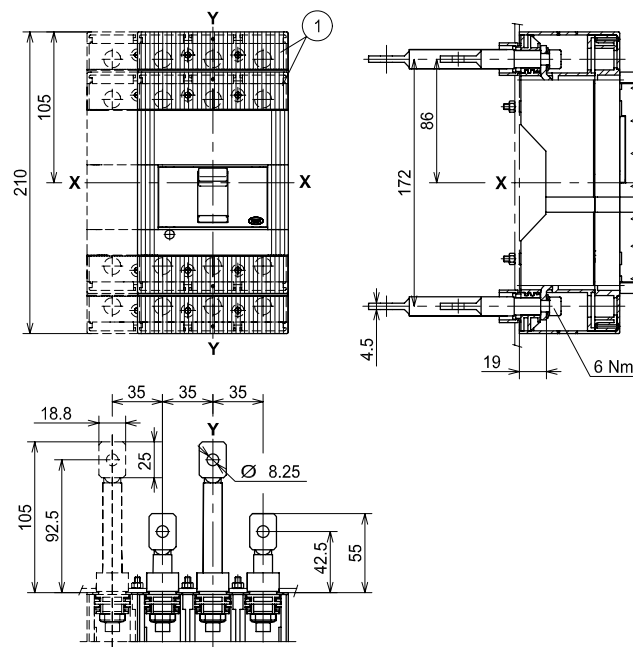
Front extended - EF



Caption

- ① Low terminal covers with degree of protection IP40

Rear - R





Overall dimensions

Tmax T4

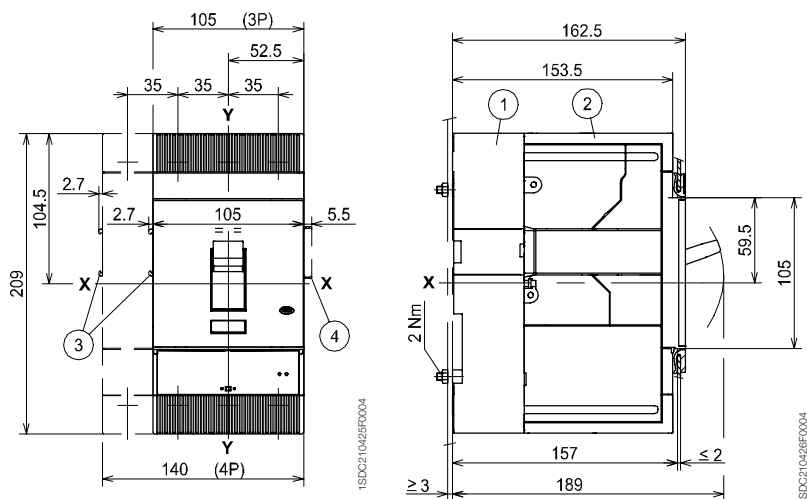
Plug-in

circuit-breaker

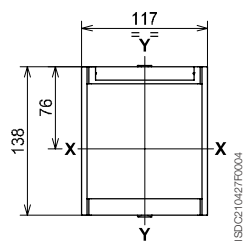
Fixing on sheet

Caption

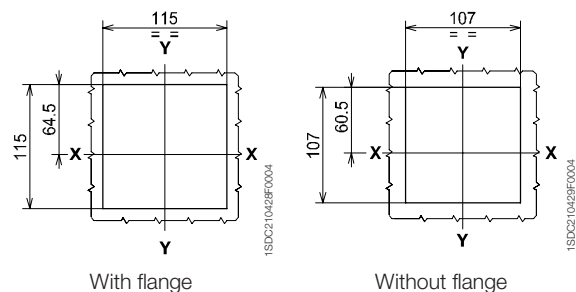
- ① Fixed part
- ② Moving part with terminal covers, degree of protection IP40
- ③ Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)
- ④ Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)



Flange for compartment door

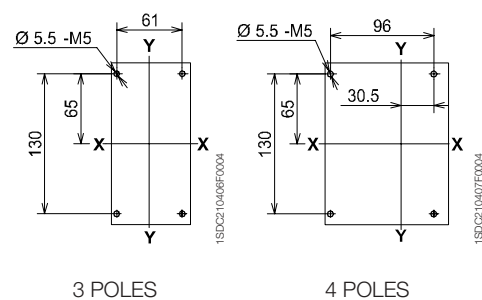


Drilling templates of the compartment door

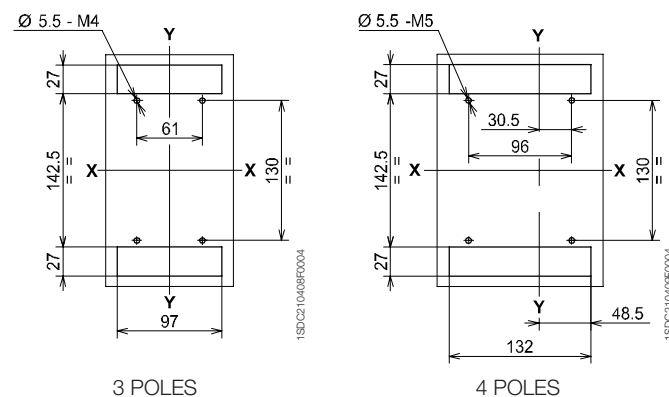


Drilling templates for support sheet

For front terminals



For rear terminals



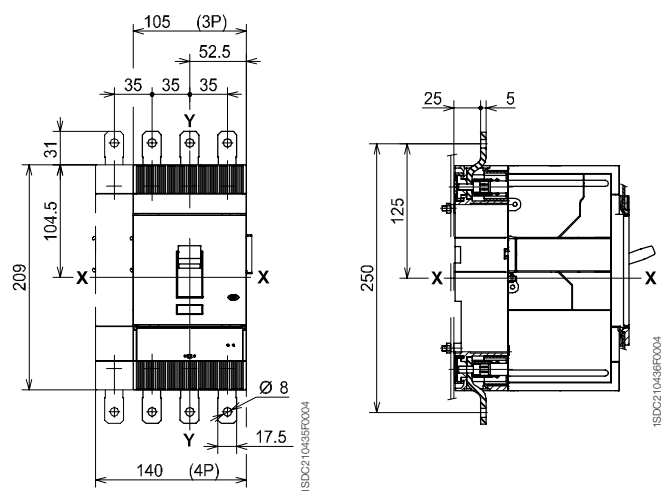


Overall dimensions

Tmax T4

Terminals

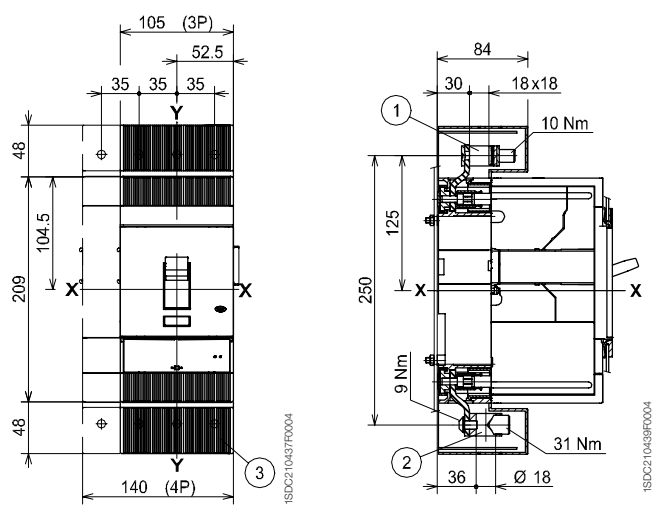
Front - EF



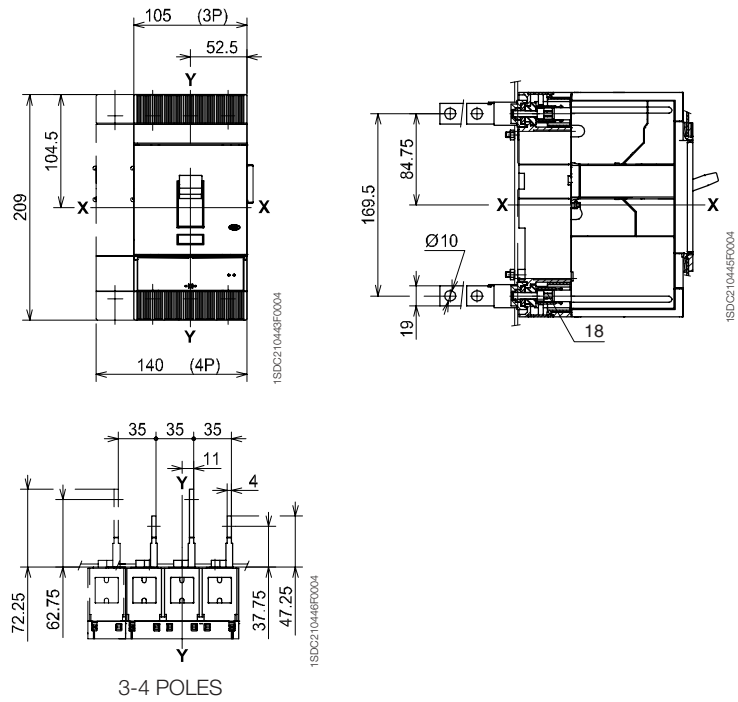
Caption

Front for copper cables - FC Cu or for copper/aluminium cables - FC CuAl

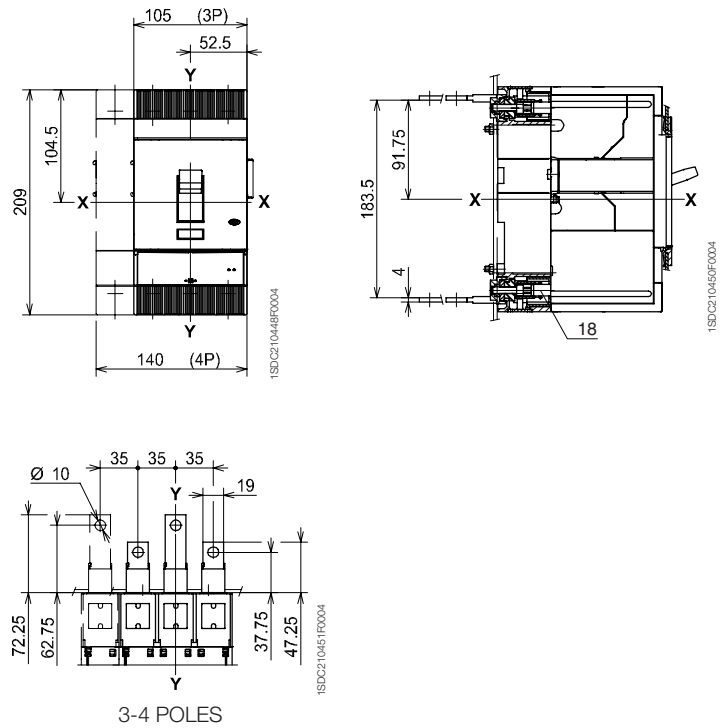
- ① For Cu cables
- ② For Cu Al cables
- ③ High terminal covers with degree of protection IP40



Rear flat vertical - VR



Rear flat horizontal - HR





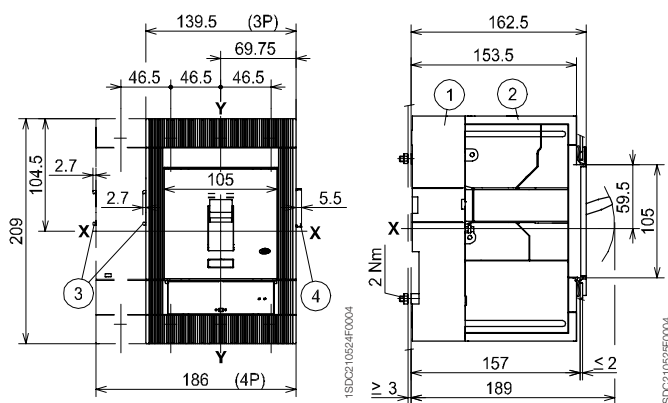
Overall dimensions

Tmax T5

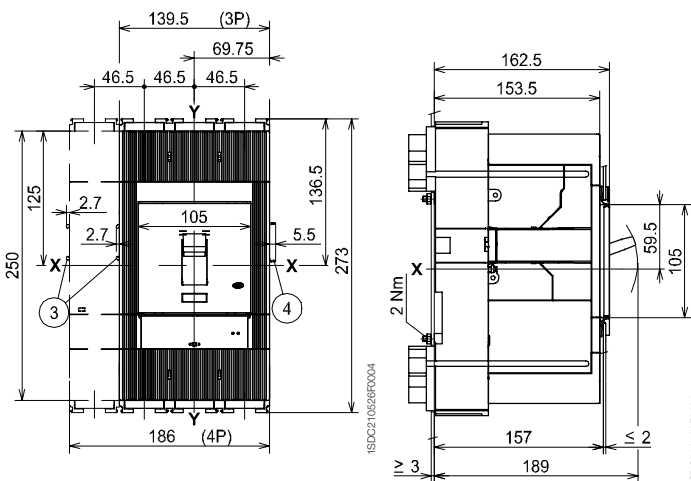
Plug-in

circuit-breaker

Fixing on sheet



400 A

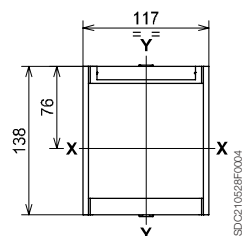


630 A

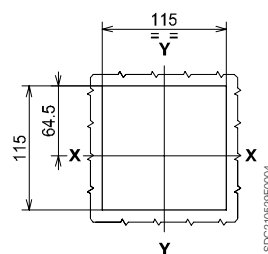
Caption

- 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)

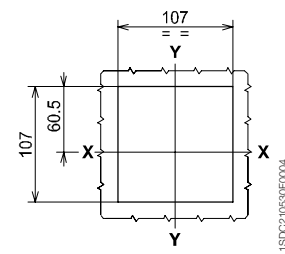
Flange for compartment door



Drilling templates of the compartment door



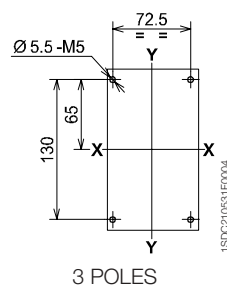
With flange



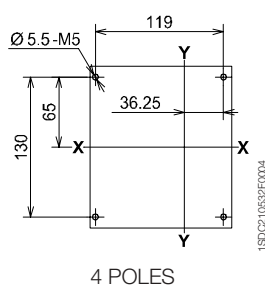
Without flange

Drilling templates for support sheet

For front terminals 400 A

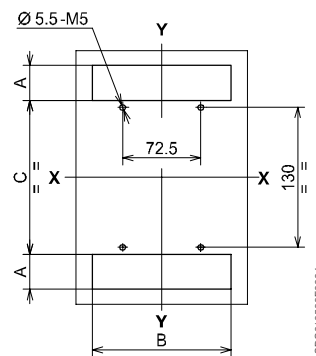


3 POLES

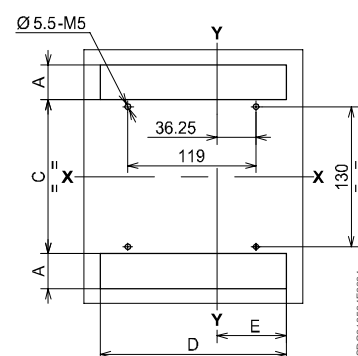


4 POLES

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



3 POLES



4 POLES

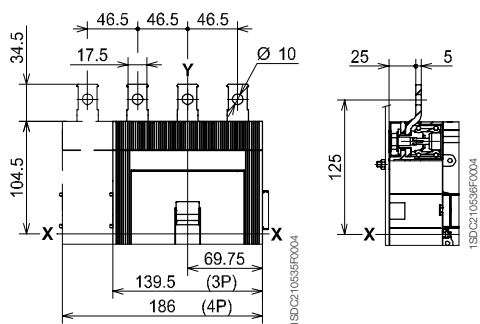
A	B	C	D	E
32.5	128.5	143	172.5	64.5
61.8	139	142	185.5	69.5

Rear 400 A

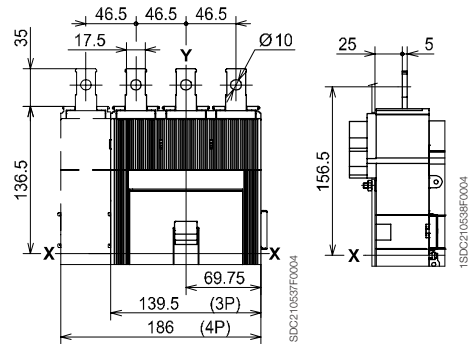
Front and rear 630 A

Terminals

Front 400 A - EF



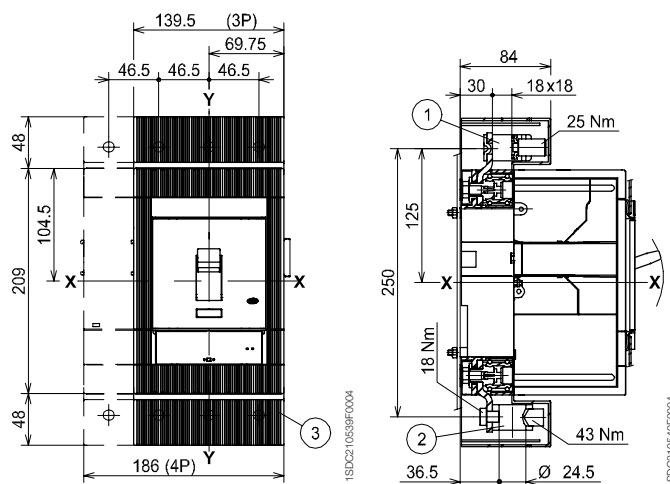
Front 630 A - F



Caption

- ① Front terminals for cables Cu
- ② Front terminals for cables Cu/Al
- ③ High terminal covers with degree of protection IP40

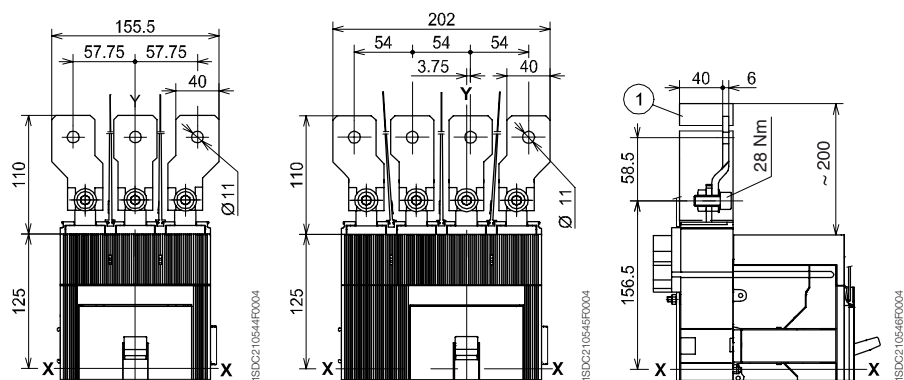
Front for cables Cu and Cu/Al - FC Cu - FC Cu/Al



Caption

- ① Insulating barriers between phases (compulsory)

Front extended spread 630 A - ES



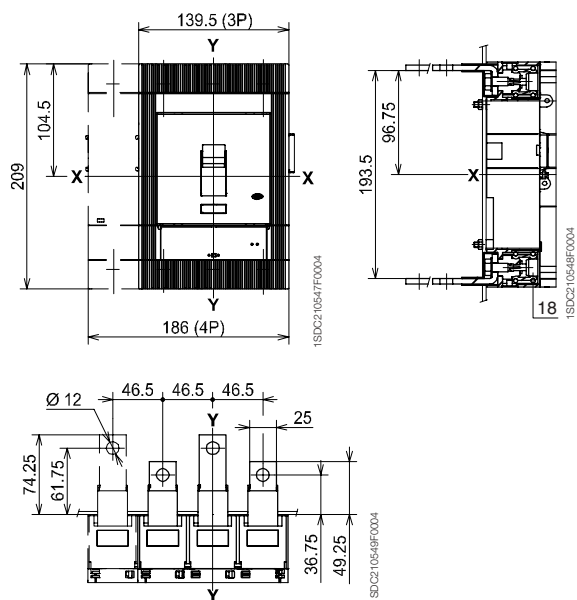


Overall dimensions

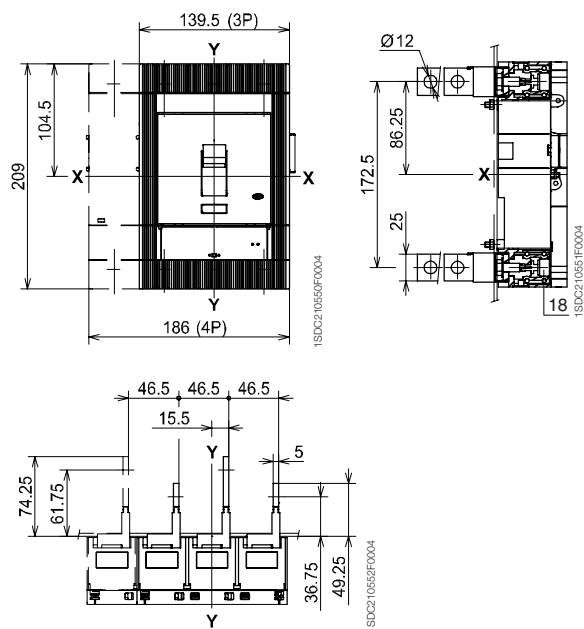
Tmax T5

Terminals

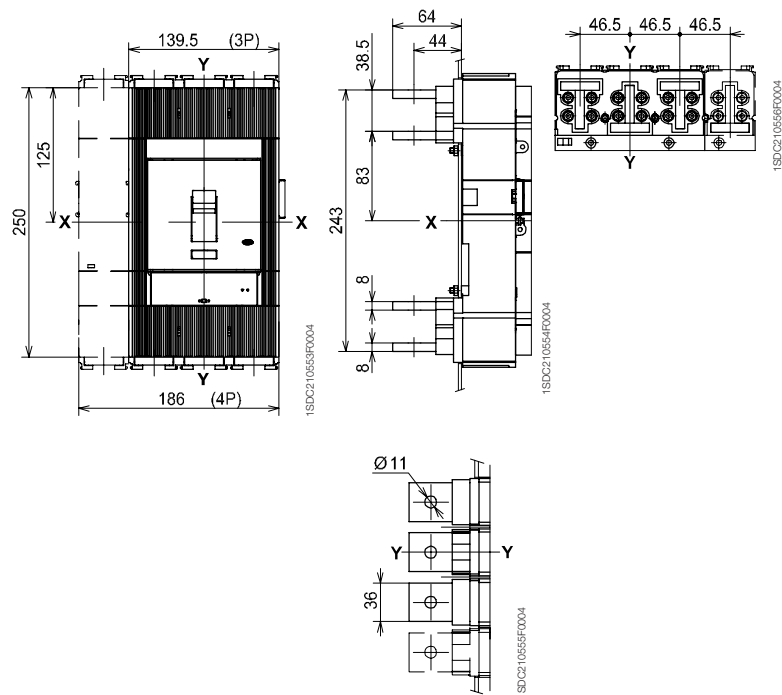
Rear flat horizontal 400 A - HR



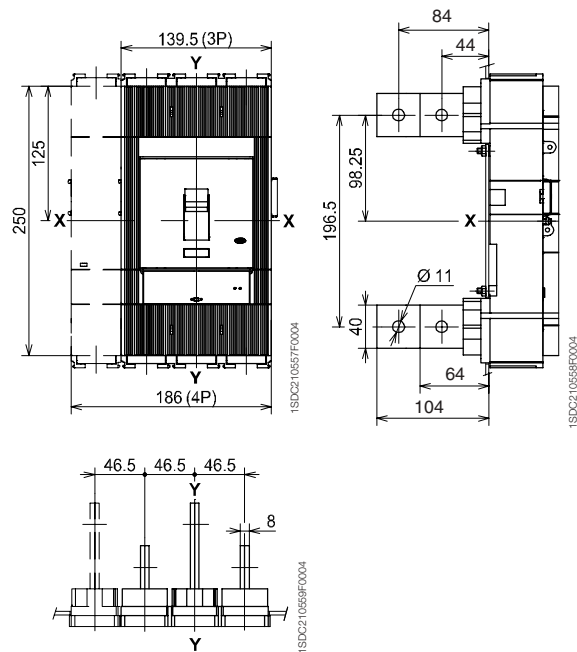
Rear vertical 400 A - VR



Rear flat horizontal 630 A - HR



Rear vertical 630 A - VR





Overall dimensions

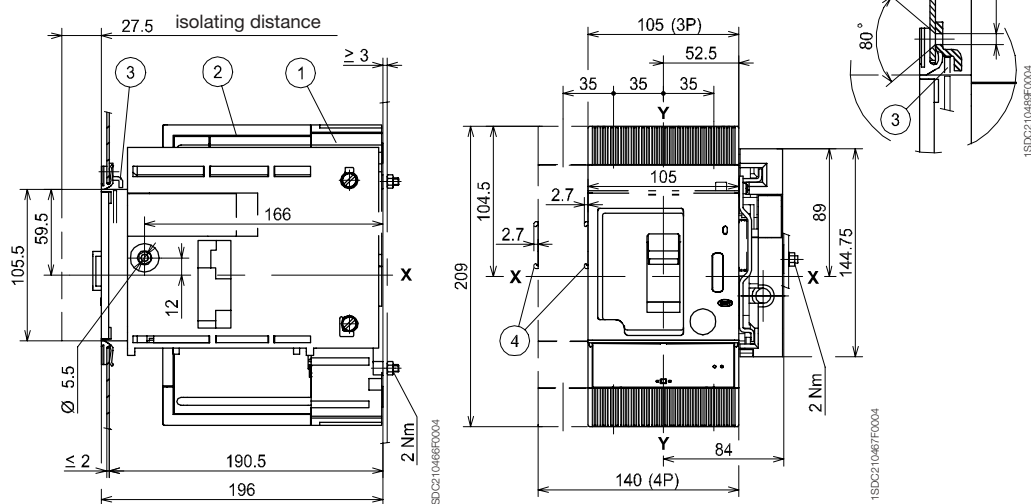
Tmax T4

Withdrawable circuit-breaker

Caption

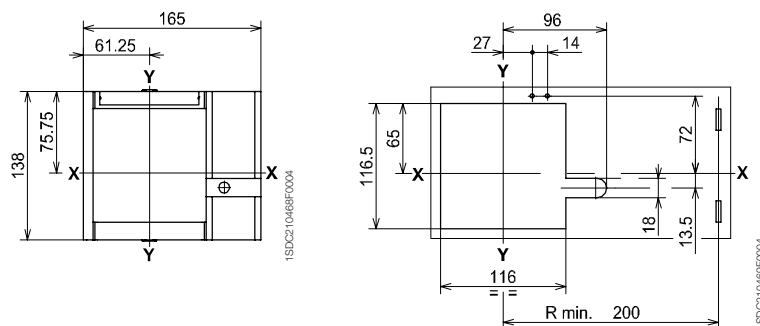
- ① Fixed part
- ② Moving part
- ③ Lock for compartment door (available on request)
- ④ Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)

Fixing on sheet



Flange for compartment door

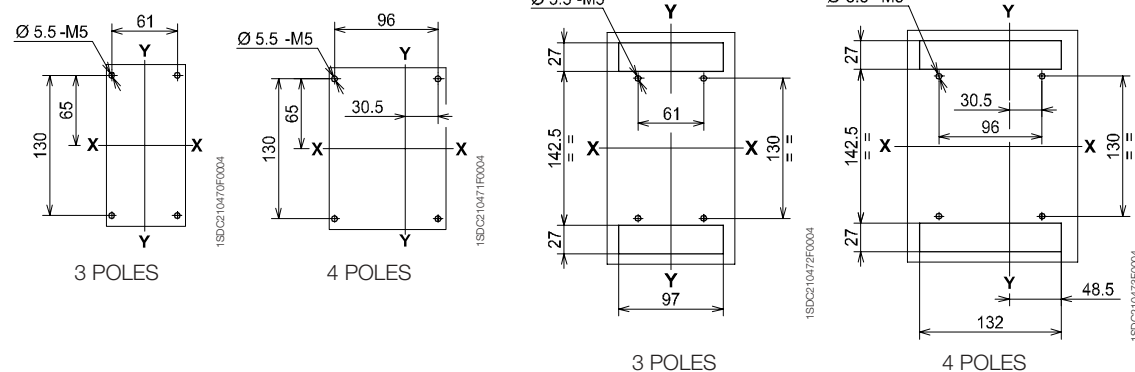
Drilling templates of the compartment door



Drilling templates for support sheet

For front terminals

For rear terminals





Overall dimensions

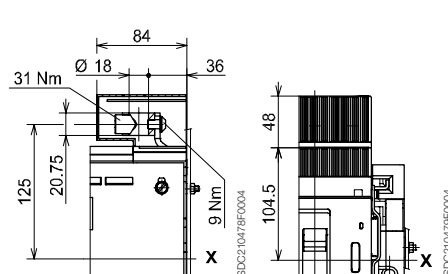
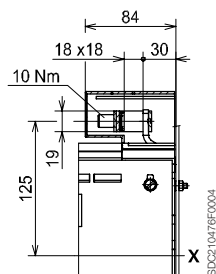
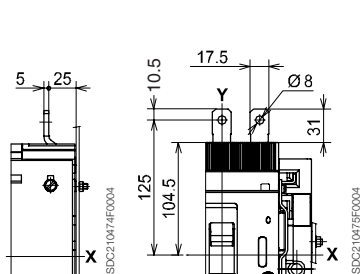
Tmax T4

Terminals

Front - EF

Front for copper cables - FC Cu

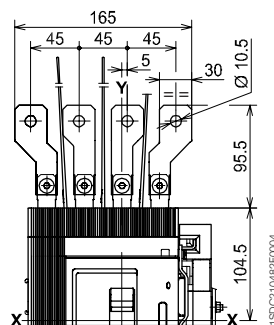
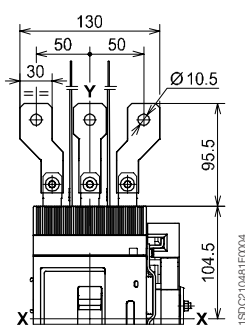
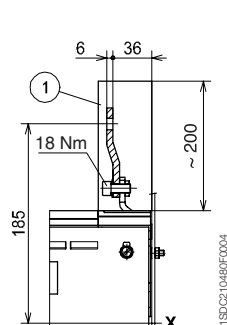
Front for copper/aluminium cables - FC CuAl



Caption

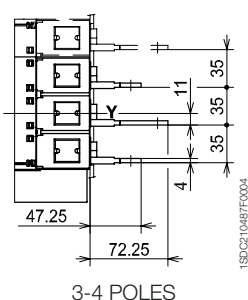
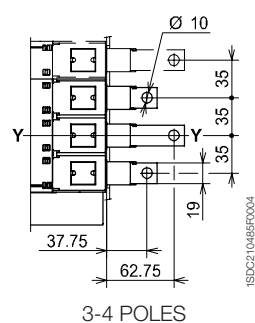
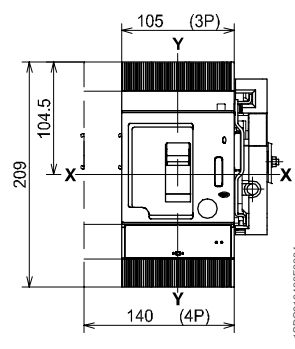
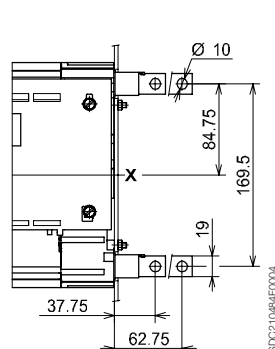
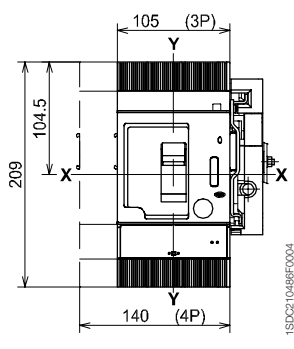
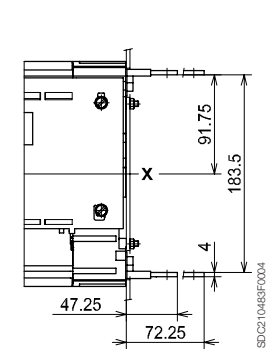
Front extended spread - ES

- 1 Insulating barriers between phases (compulsory)



Rear flat horizontal - HR

Rear flat vertical - VR



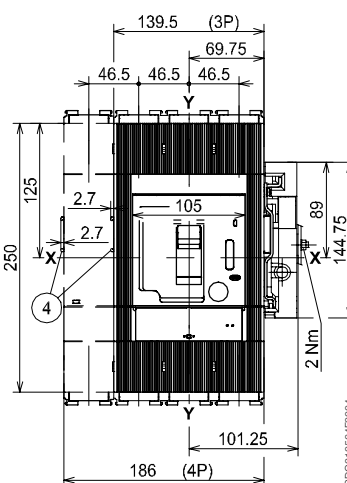
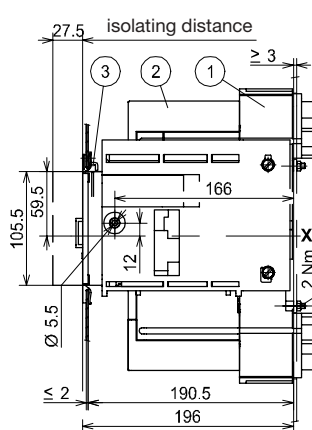
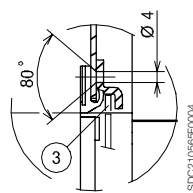
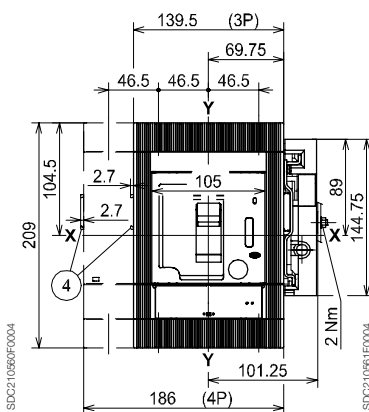
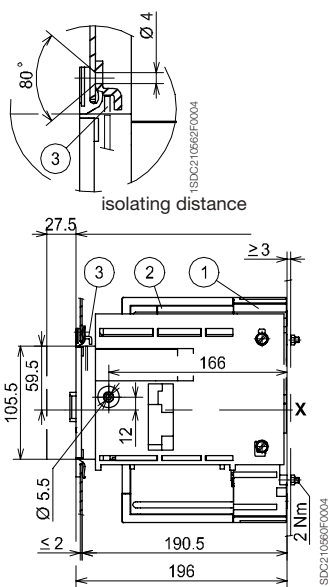


Overall dimensions

Tmax T5

Withdrawable circuit-breaker

Fixing on sheet



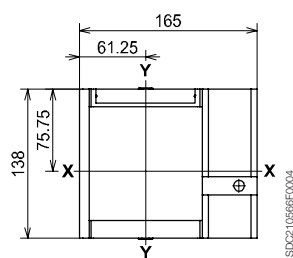
400 A

630 A

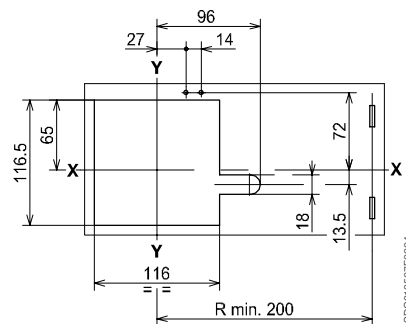
Caption

- 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, RC222)

Flange for compartment door

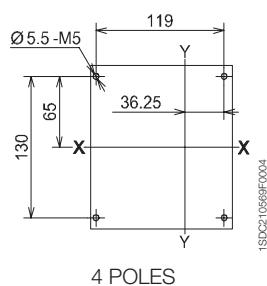
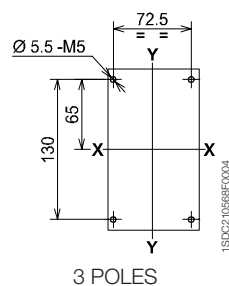


Drilling templates of the compartment door

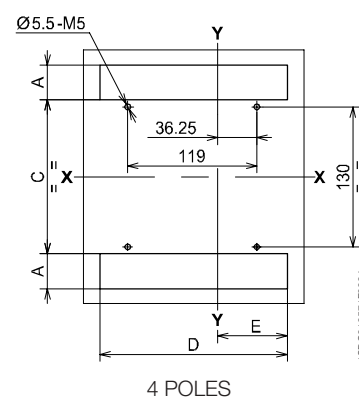
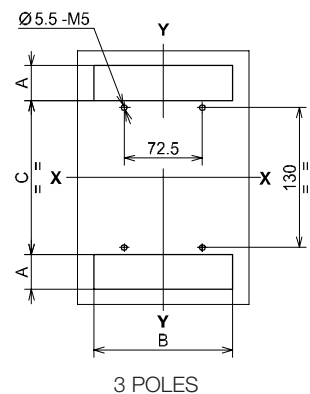


Drilling templates for support sheet

For front terminals 400 A



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



A	B	C	D	E
32.5	128.5	143	172.5	64.5
61.8	139	142	185.5	69.5

Rear 400 A

Front and rear 630 A

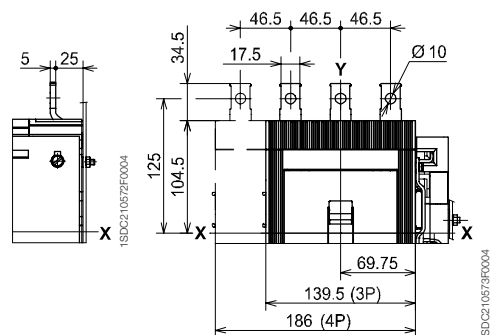


Overall dimensions

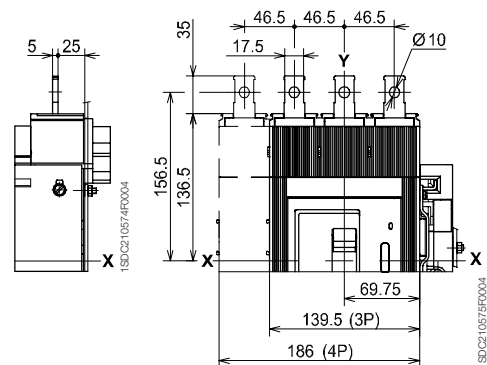
Tmax T5

Terminals

Front 400 A - EF



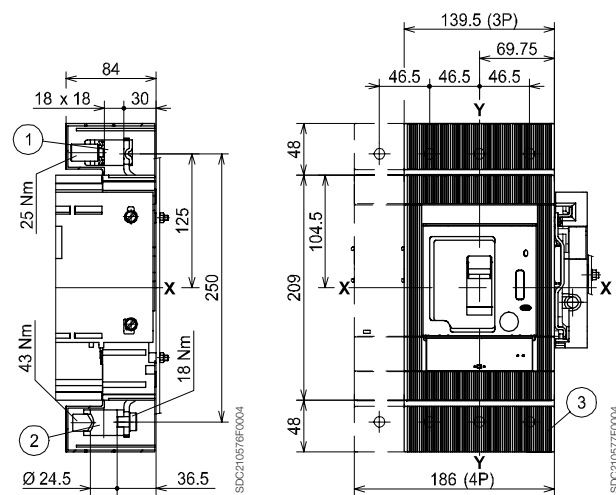
Front 630 A - EF



Caption

- ① Front terminals for copper cables
- ② Front terminals for copper/aluminium cables
- ③ Terminals with degree of protection IP40

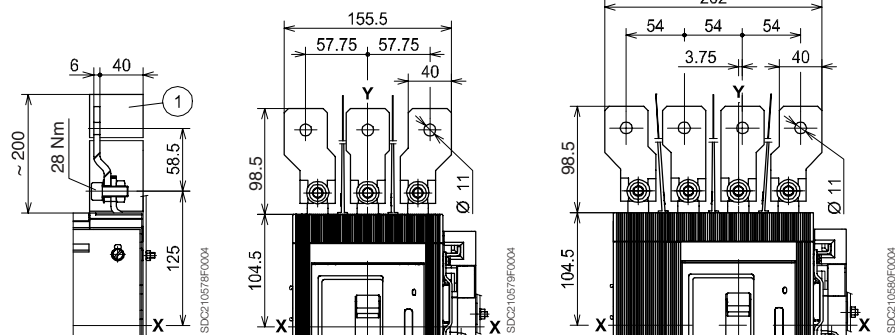
Front for cables Cu and Cu/Al 400 A - FC Cu - FC Cu/Al



Caption

- ① Insulating barriers between phases (compulsory)

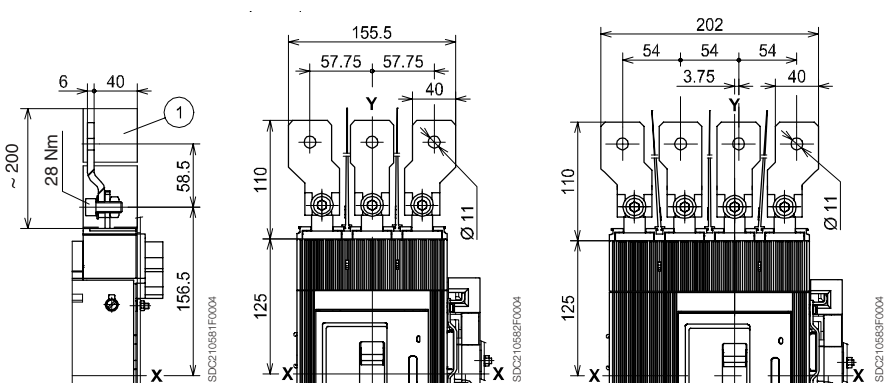
Front extended spread 400 A - ES



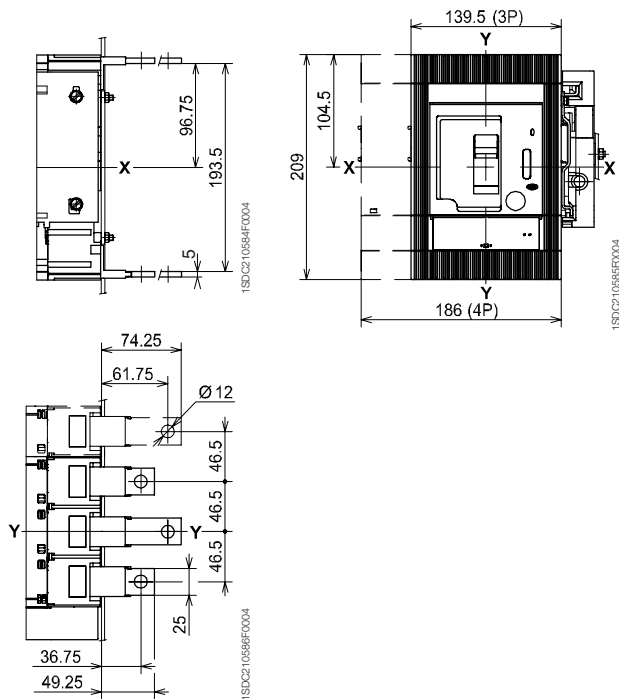
Caption

- ① Insulating barriers between phases (compulsory)

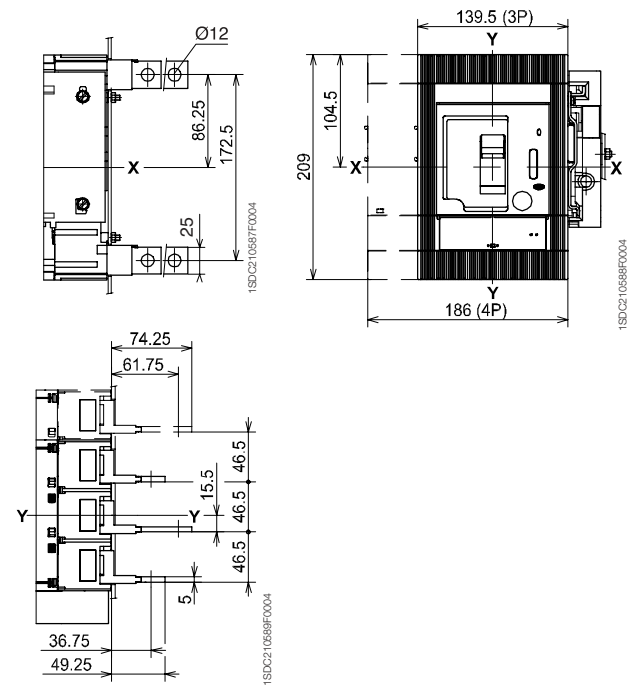
Front extended spread 630 A - ES



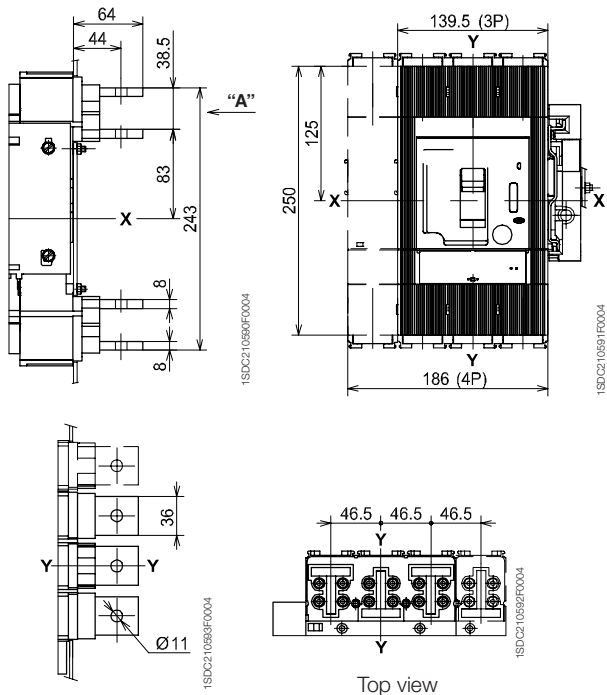
Rear flat horizontal 400 A - HR



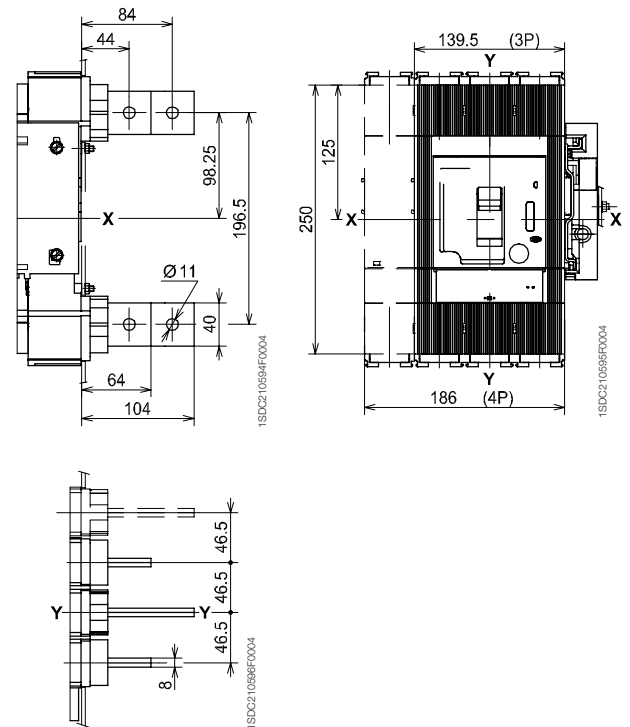
Rear flat vertical 400 A - VR



Rear flat horizontal 630 A - HR



Rear flat vertical 630 A - VR





Overall dimensions

Circuit-breaker with RC221/222 residual current release

Tmax T1 with RC222 for 200 mm module

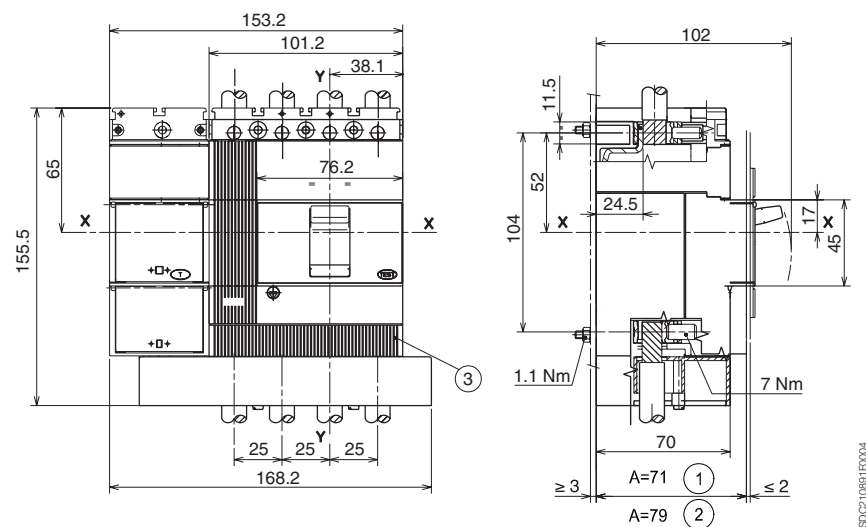
Fixed version

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

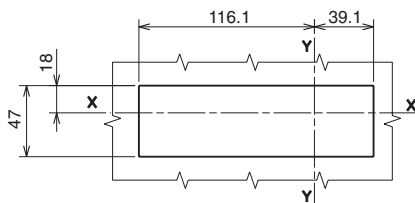
Front terminals - F

Fixing on sheet

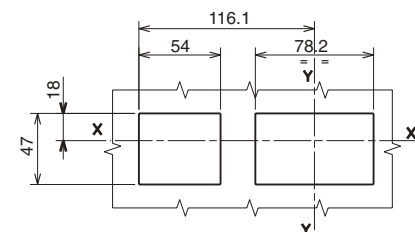


Drilling templates of the compartment door

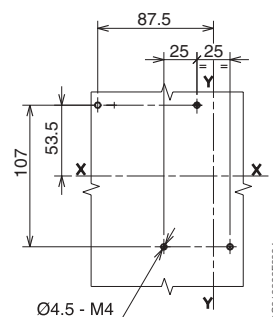
For A = 71 - without flange



For A = 79 - without flange



Drilling templates for support sheet





Overall dimensions

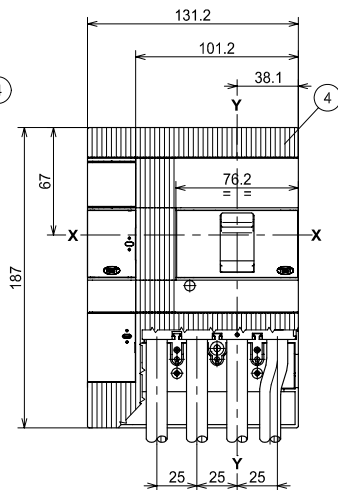
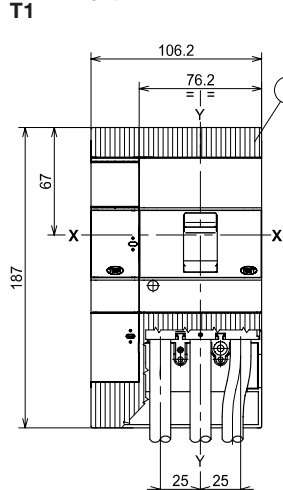
Circuit-breaker with RC221/222 residual current release

Tmax T1 - T2 - T3

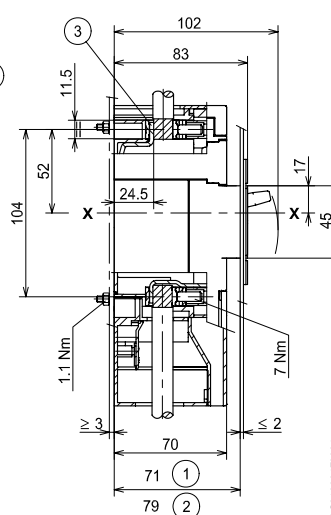
Fixed version

T1

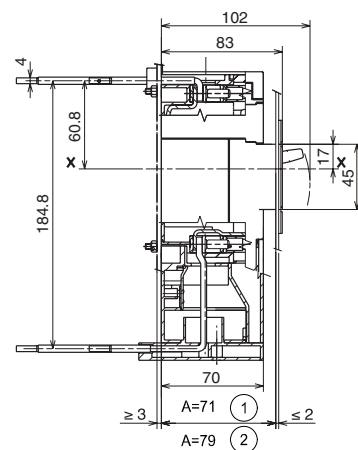
Front - F



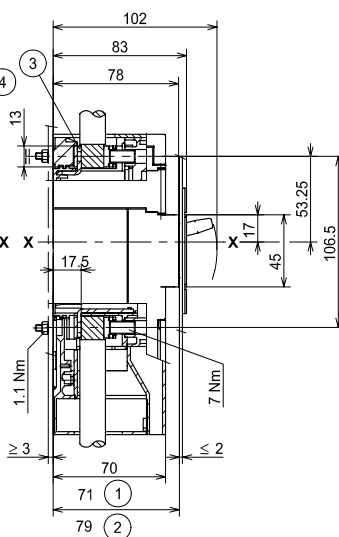
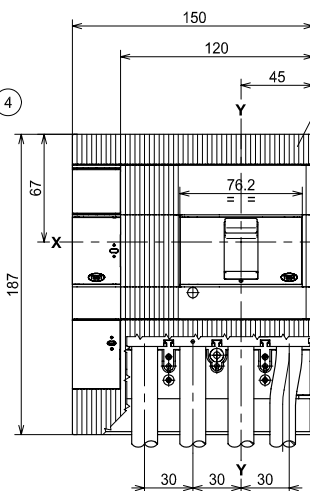
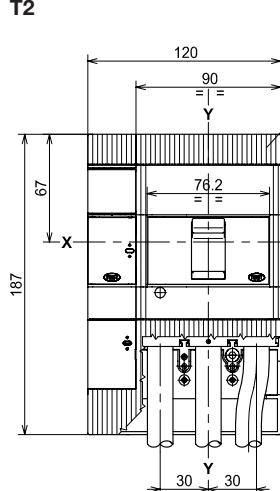
Fixing on sheet



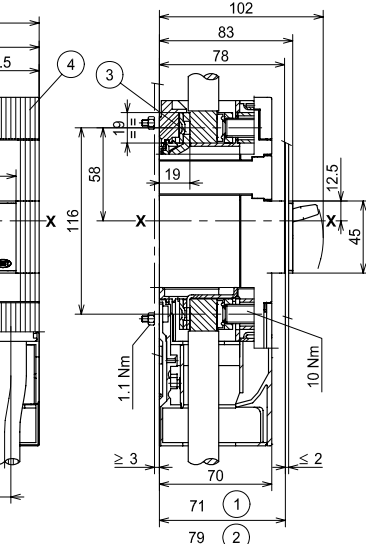
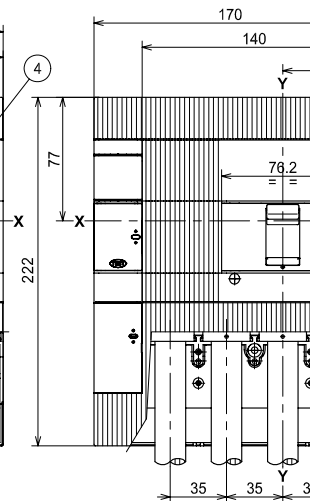
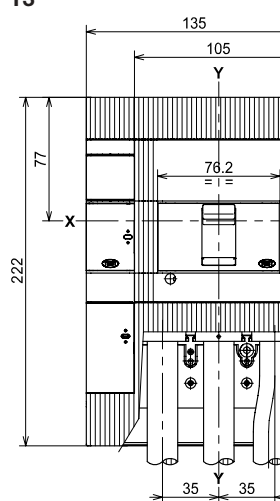
Rear flat horizontal - HR



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



Overall dimensions

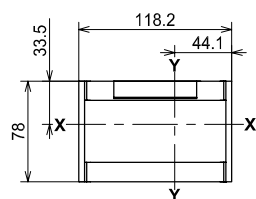
Circuit-breaker with RC221/RC222 residual current release
Tmax T1 - T2 - T3

Fixed version

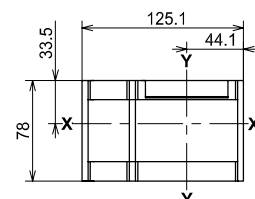
Flange for the compartment door

T1

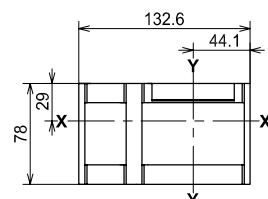
3 POLES



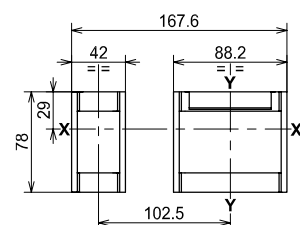
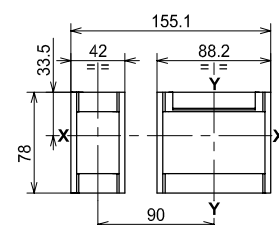
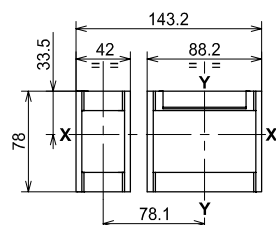
T2



T3



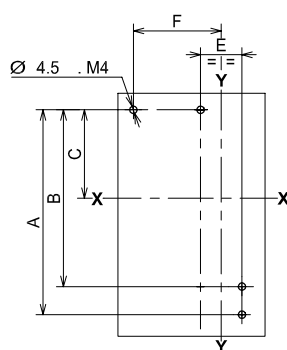
4 POLES



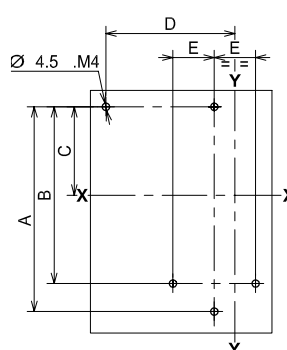
Drilling template for fixing sheet

T1 - T2 - T3

3 POLES

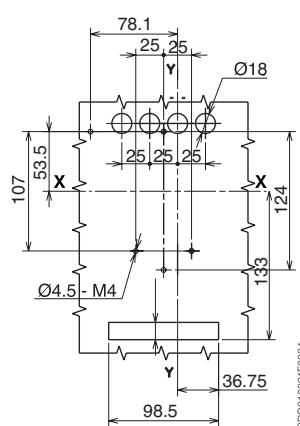


4 POLES



T1 rear flat horizontal - HR

4 POLES



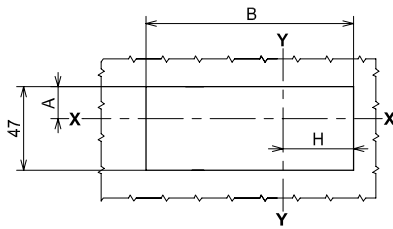
	A	B	C	D	E	F
T1	124	107	53.5	78.1	25	53.1
T2	124	107	53.5	90	30	60
T3	141.5	122	61	102.5	35	67.5

Drilling templates of the compartment door

Without flange
face extending

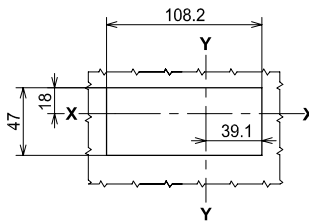
3 POLES

T1 - T2 - T3



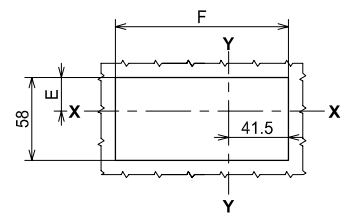
Without flange
face not extending

T1

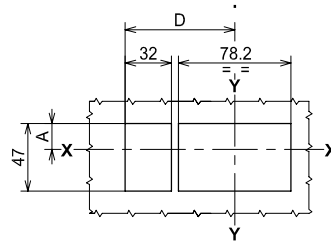


With flange
face not extending

T1 - T2 - T3

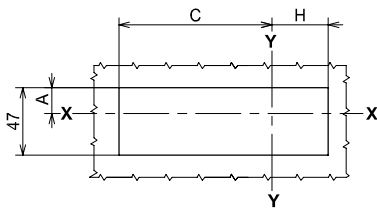


T2 - T3

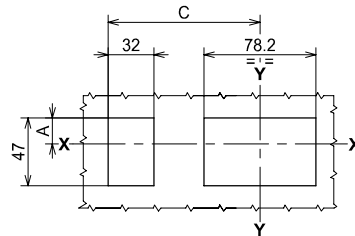


4 POLES

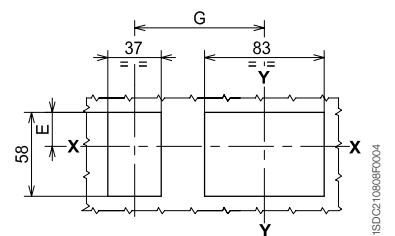
T1 - T2 - T3



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



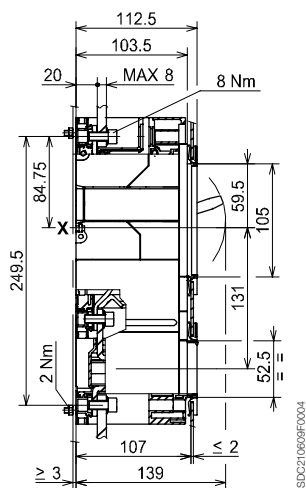
Circuit-breaker with RC222 residual current release

$T_{\max} T_4 - T_5$

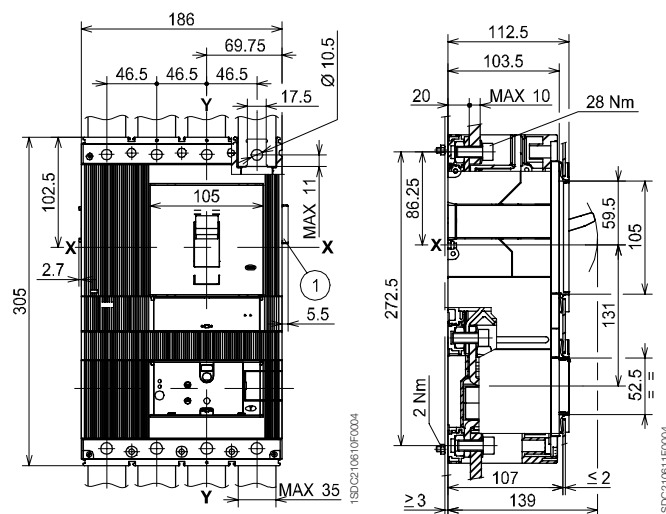
Fixed version

Front - F, fixing on sheet

T4



T5 (400 A)⁽¹⁾

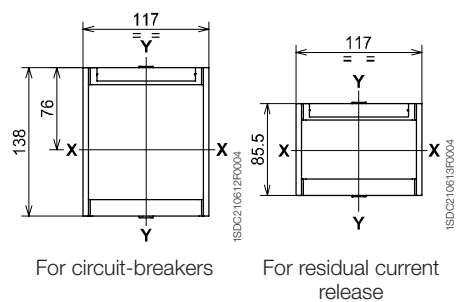


Caption

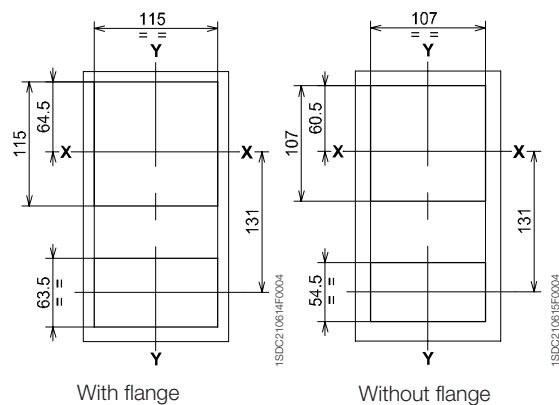
- ① Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

⁽¹⁾ For T5 (630 A) ask ABB SACE

Flange for the compartment door

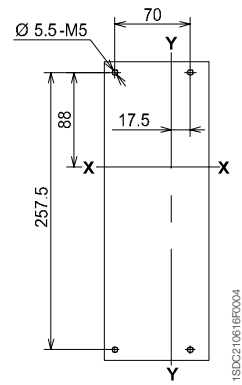


Drilling templates of compartment door and fitting flange

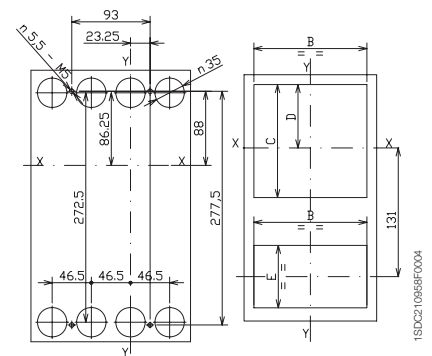
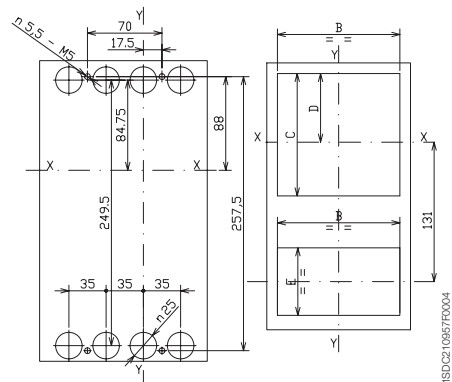
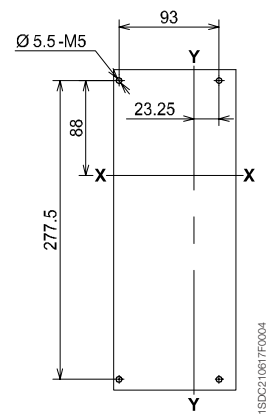


Drilling templates for support sheet

T4



T5





Overall dimensions

Circuit-breaker with RC222 residual current release

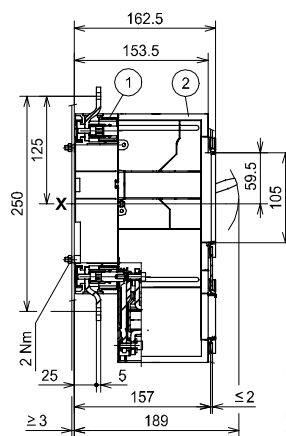
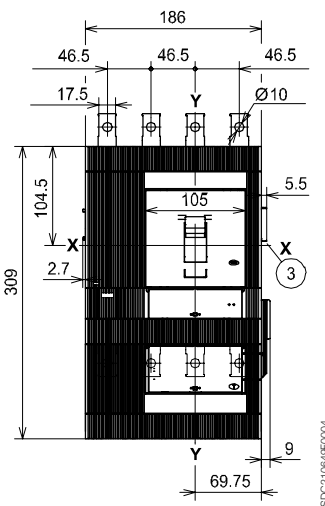
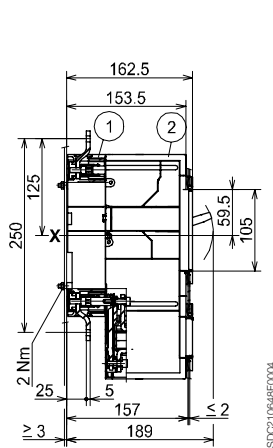
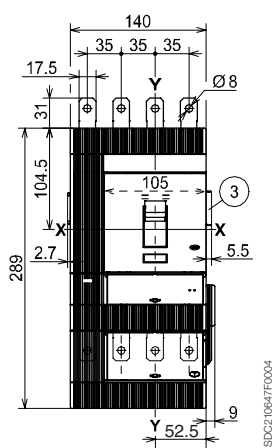
Tmax T4 - T5

Plug-in version

Front - F, fixing on sheet

T4

T5 (400 A)⁽¹⁾



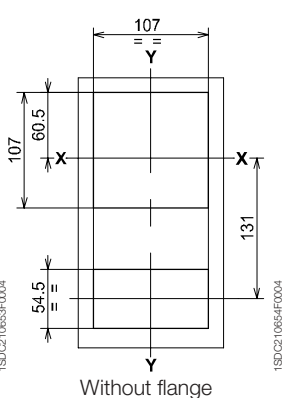
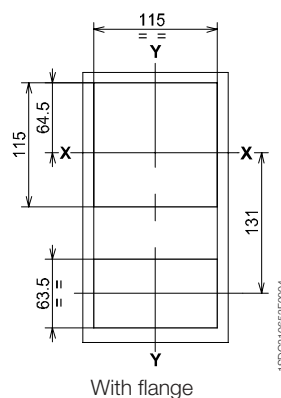
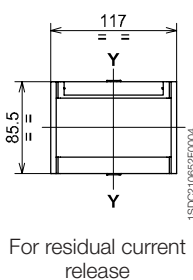
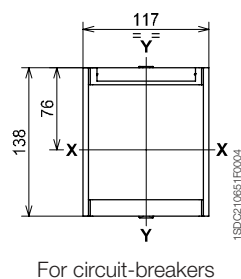
Caption

- 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

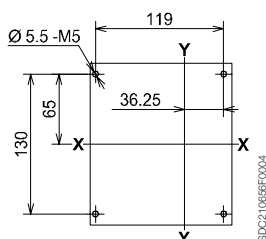
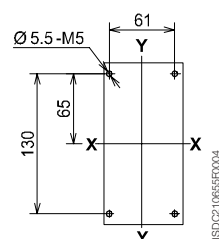
Drilling templates of compartment door and fitting flange



Drilling templates for support sheet

T4

T5





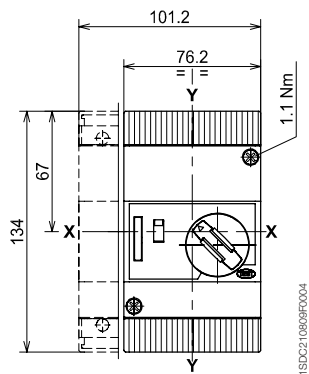
Overall dimensions

Accessories for Tmax T1 - T2 - T3

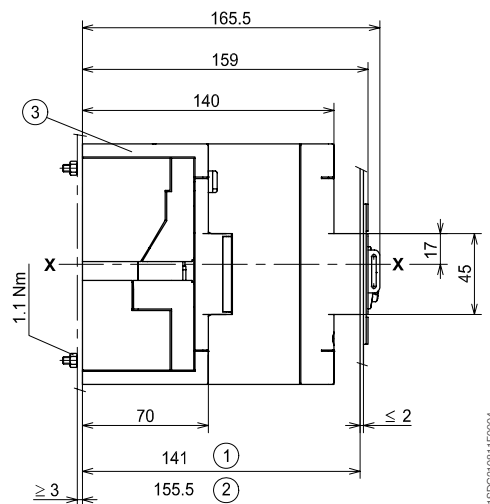
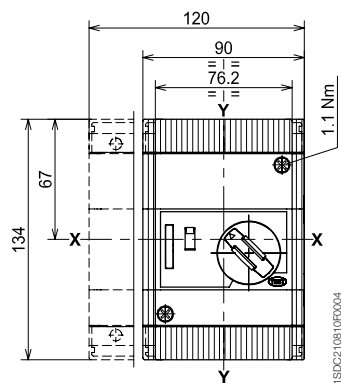
Fixed version

Solenoid operator superimposed

T1



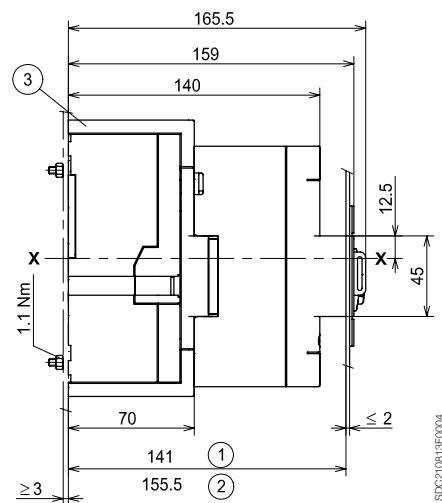
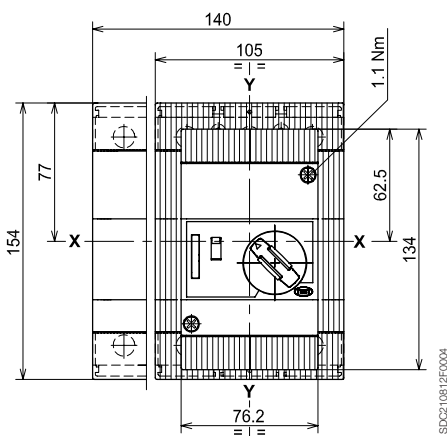
T2



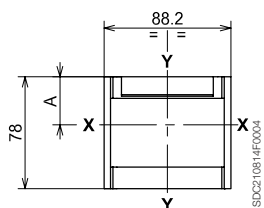
Caption

- 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

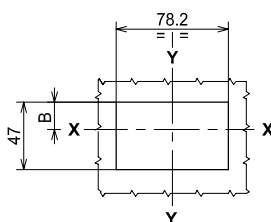


Flange for compartment door

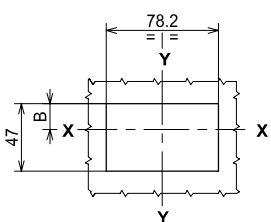


	A	B	C
T1	33.5	18	23.5
T2	33.5	18	23.5
T3	29	13.5	19

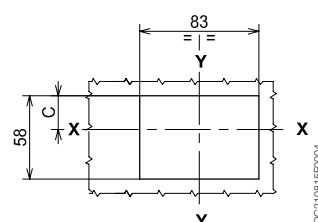
Drilling templates of the compartment door



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

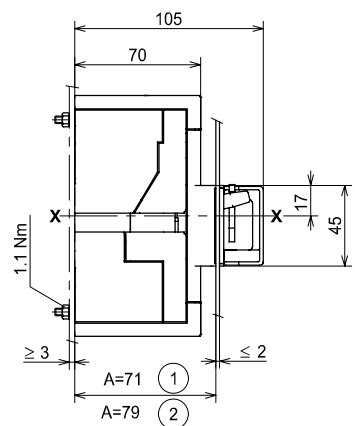
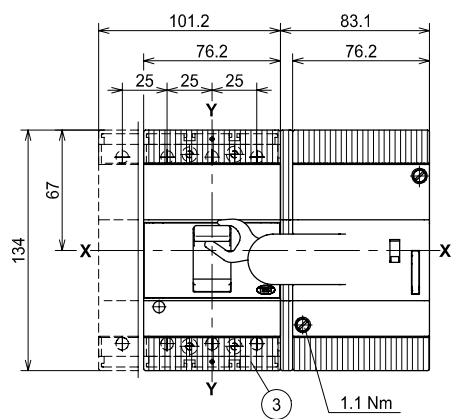
Fixed version

Caption

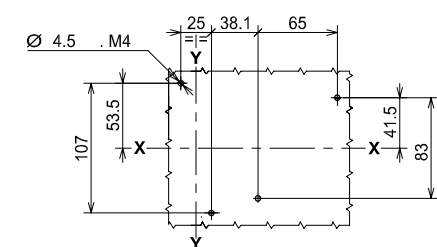
- ① Circuit-breaker face extending
- ② Circuit-breaker face flush with door
- ③ Low terminal covers with degree of protection IP40

Solenoid operator side by side

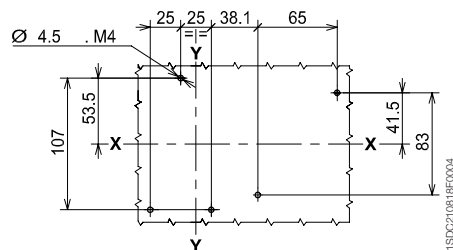
T1



Drilling templates for fixing sheet

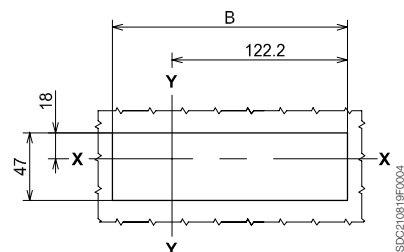


3 POLES



4 POLES

Drilling templates of the compartment door



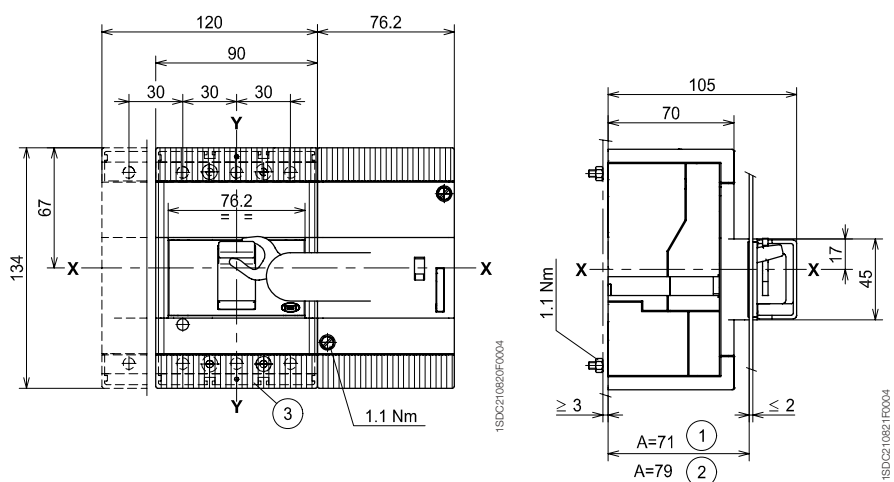
	A	B
3P	79	161.3
	71	161.3
4P	79	161.3
	71	186.3

Caption

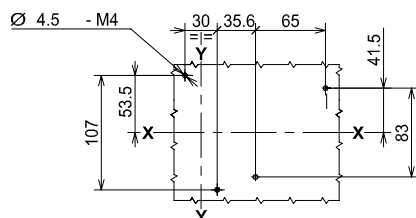
- ① Circuit-breaker face extending
- ② Circuit-breaker face flush with door
- ③ Low terminal covers with degree of protection IP40

Solenoid operator side by side

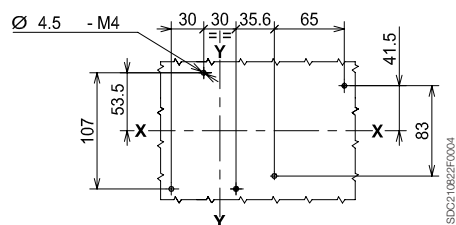
T2



Drilling templates for fixing sheet



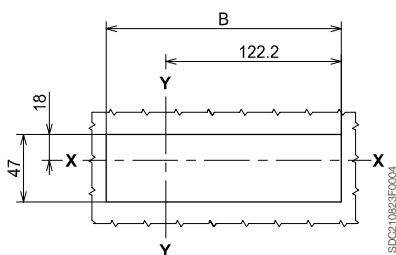
3 POLES



4 POLES

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

Drilling templates of the compartment door



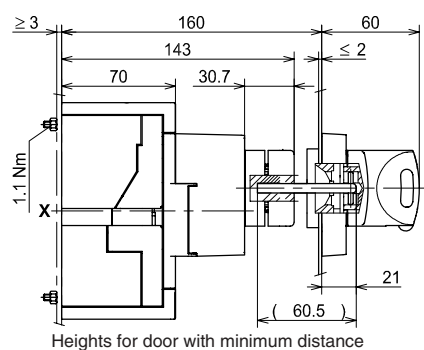
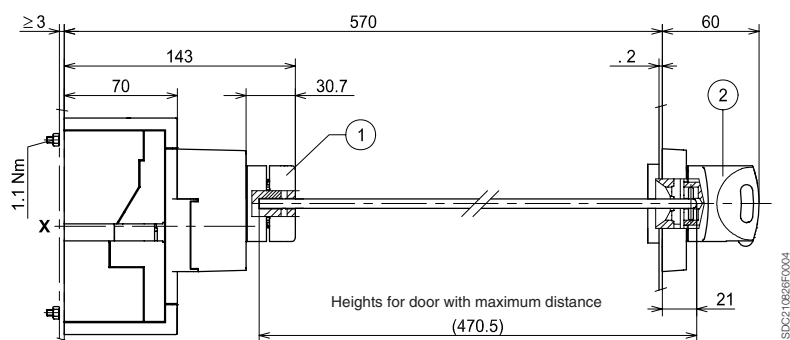
Accessories for Tmax T1 - T2 - T3

Rotary handle operating mechanism on the compartment door

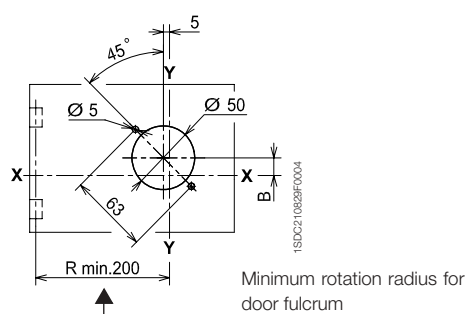


- ① Transmission unit
- ② Rotary handle operating mechanism on the compartment door

	A	B
T1-T2	28	14
T3	32.5	9.5



Drilling template of the compartment door

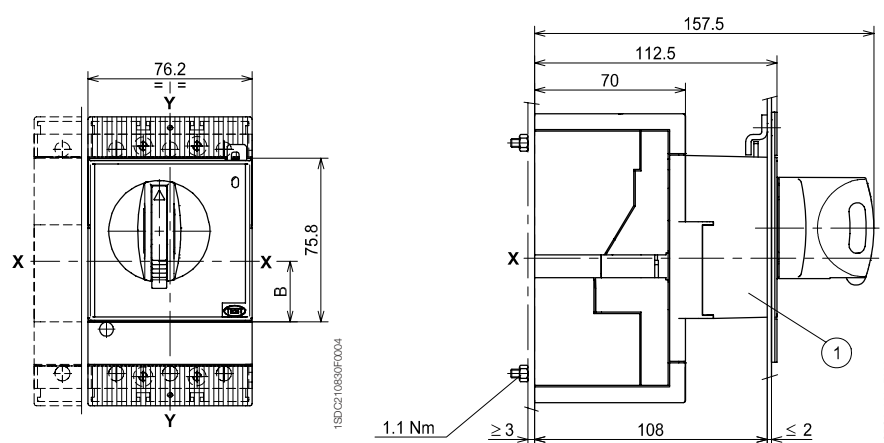


Rotary handle operating mechanism on circuit-breaker

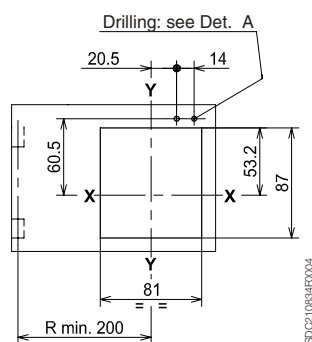
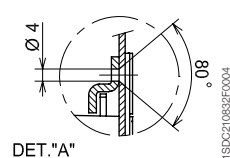
Caption

- ① Rotary handle operating mechanism on circuit-breaker

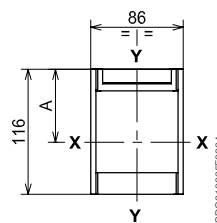
	A	B	C	D
T1-T2	67.7	28	53.2	60.5
T3	63.2	32.5	48.7	56



Drilling template of the compartment door

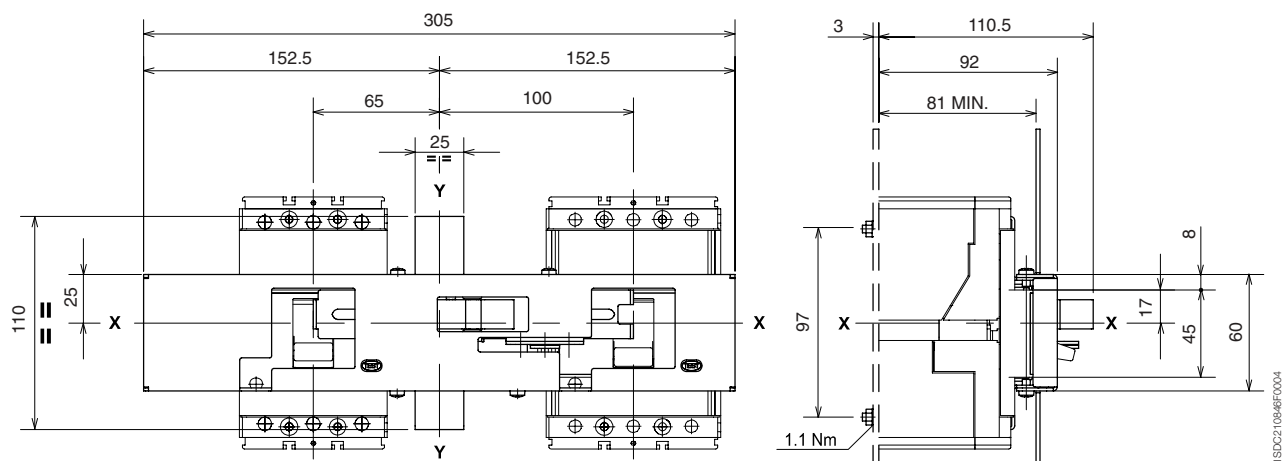


Flange for the compartment door



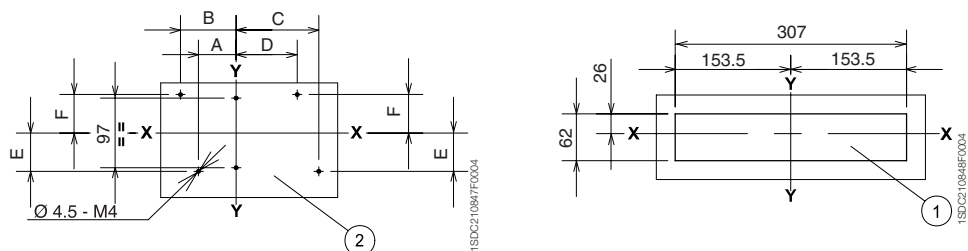
Mechanical interlock between circuit-breakers

Front interlocking plate between two circuit-breakers

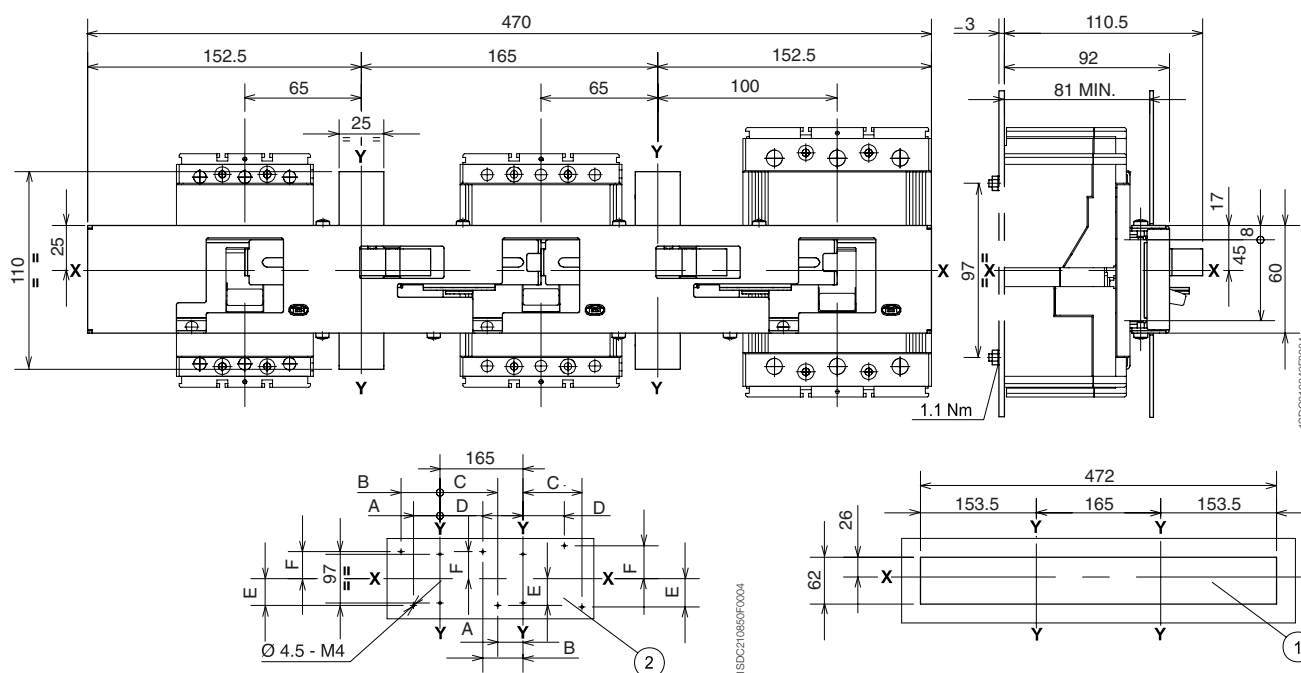


Caption

- 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



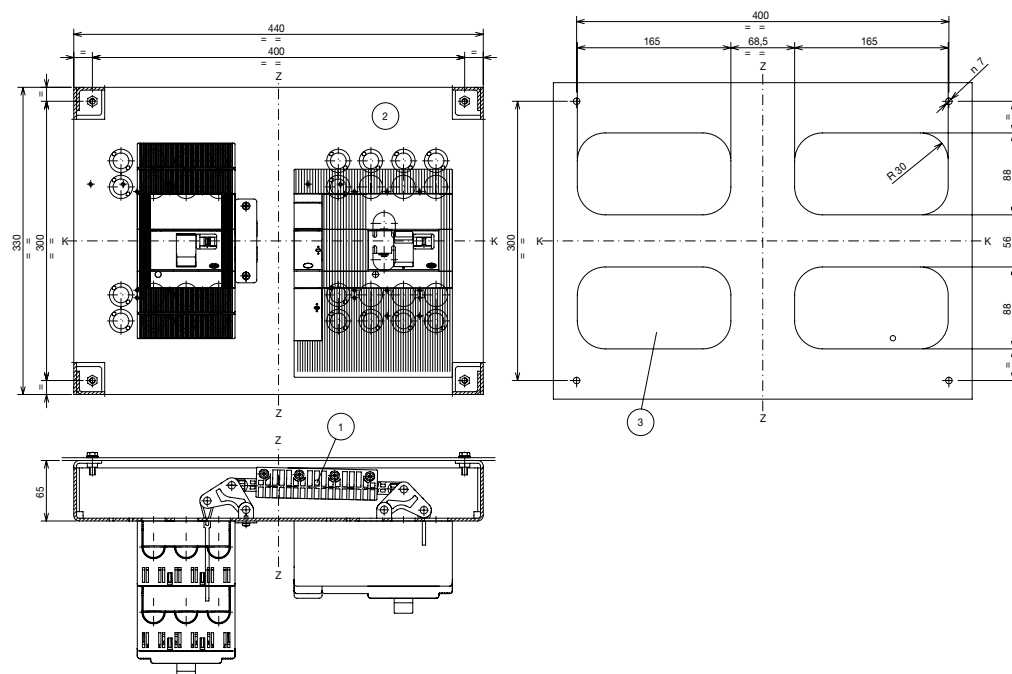
Overall dimensions

Accessories for Tmax T1 - T2 - T3

Caption

- ① Interlocking mechanism
- ② Circuit-breaker coupling plate
- ③ Drilling template for all terminal versions

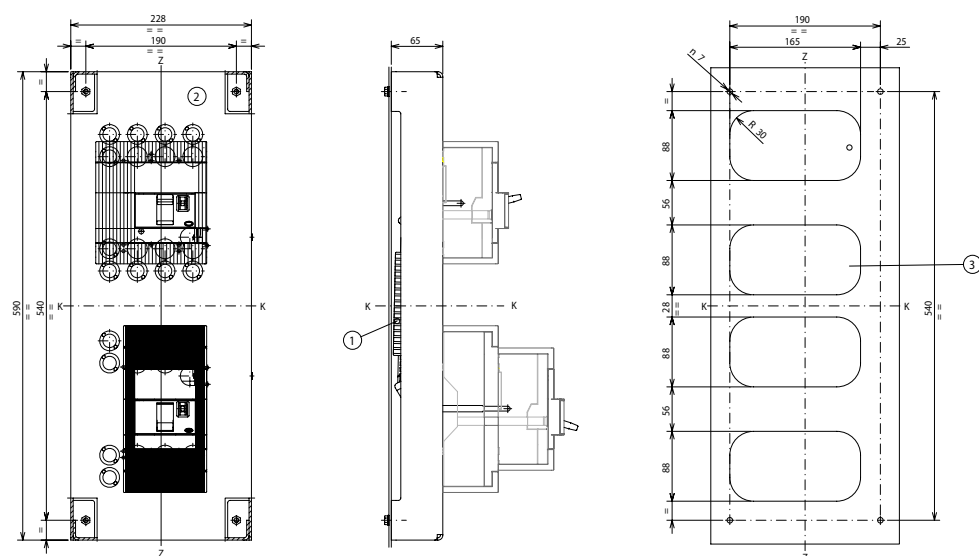
Rear horizontal interlock for two T3 circuit-breakers



Caption

- ① Interlocking device
- ② Circuit-breaker coupling plate
- ③ Drilling template for all terminal versions

Rear vertical interlock for two T3 circuit-breakers



The rear vertical interlock for Tmax T3 is not compatible with the RC221 and RC222 residual current releases.

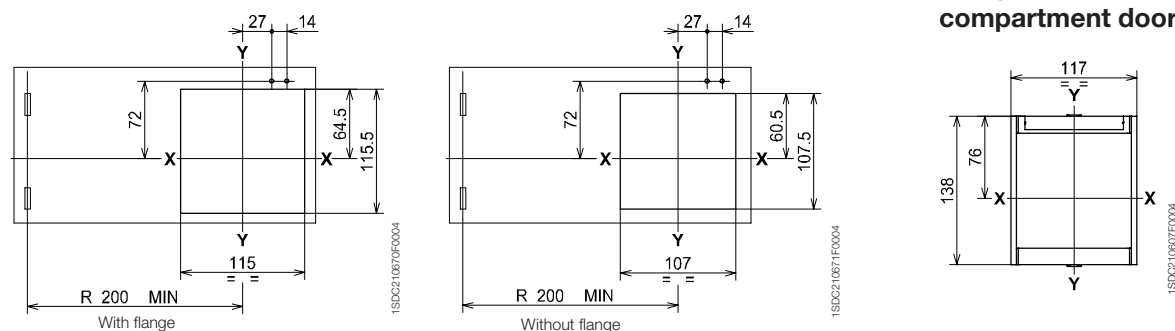
Rotary handle operating mechanism on the compartment door

-

Rotary handle operating mechanism on circuit-breaker

-

Flange for the compartment door





Overall dimensions

Accessories for Tmax T4 - T5

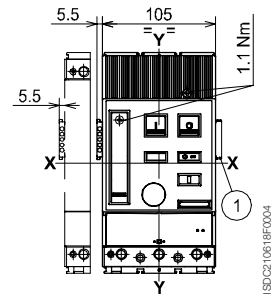
Fixed version

Caption

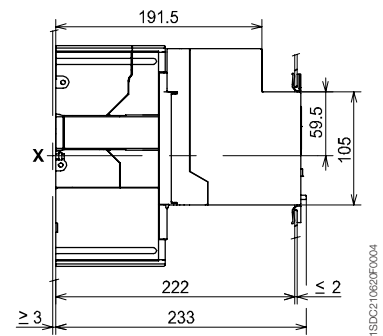
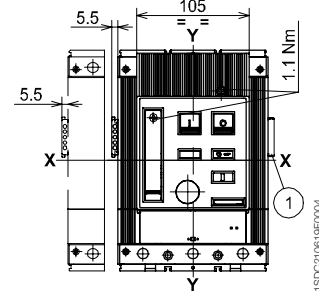
- ① Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

Motor operator

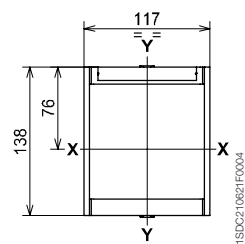
T4



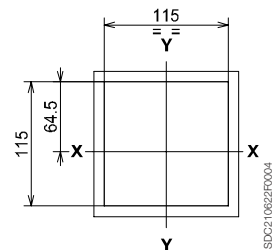
T5



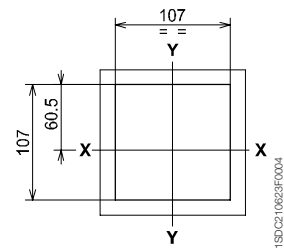
Flange for the compartment door (supplied as standard)



Drilling template of the compartment door



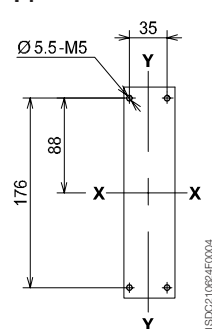
With flange



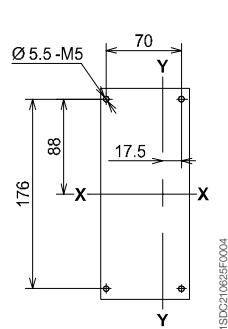
Without flange

Drilling template for support sheet

T4

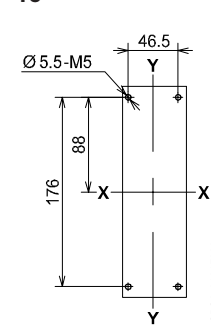


3 POLES

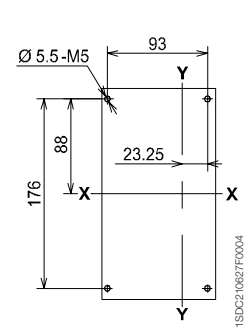


4 POLES

T5



3 POLES



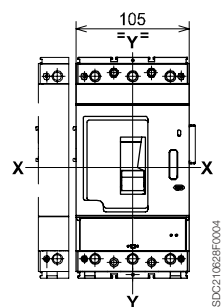
4 POLES

Caption

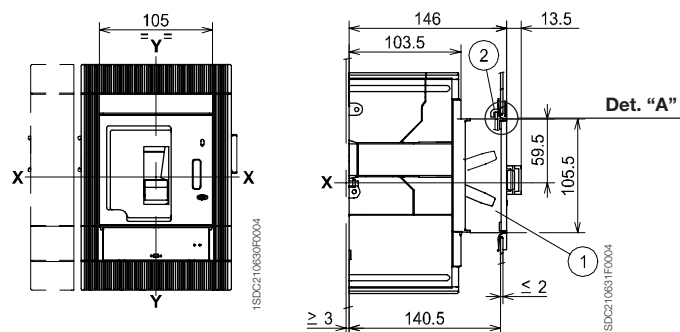
- ① Front for lever operating mechanism
- ② Lock for the compartment door (supplied on request)

Front for lever operating mechanism

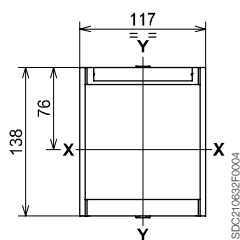
T4



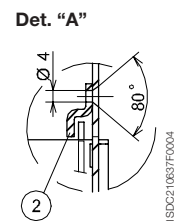
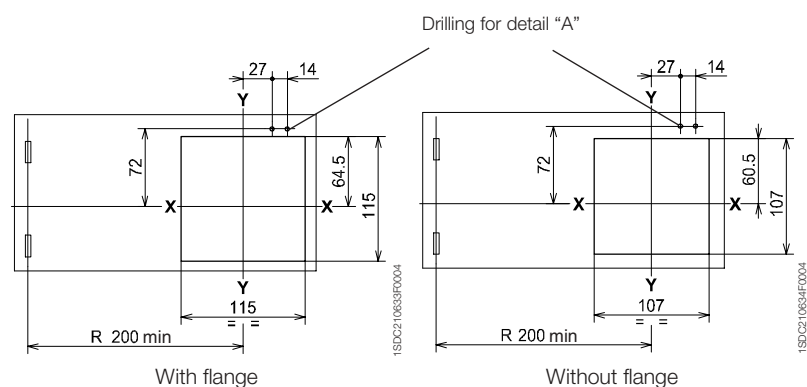
T5



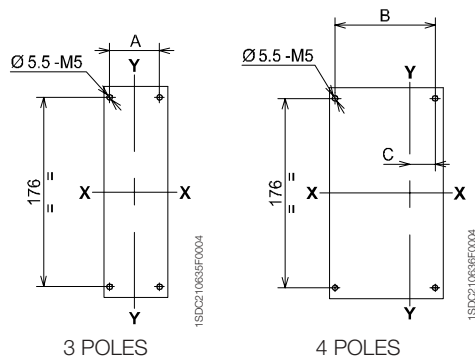
Flange for the compartment door (supplied as standard)



Drilling template for the compartment door



Drilling template for support sheet



	A	B	C
T4	35	70	17.5
T5	46.5	93	23.25



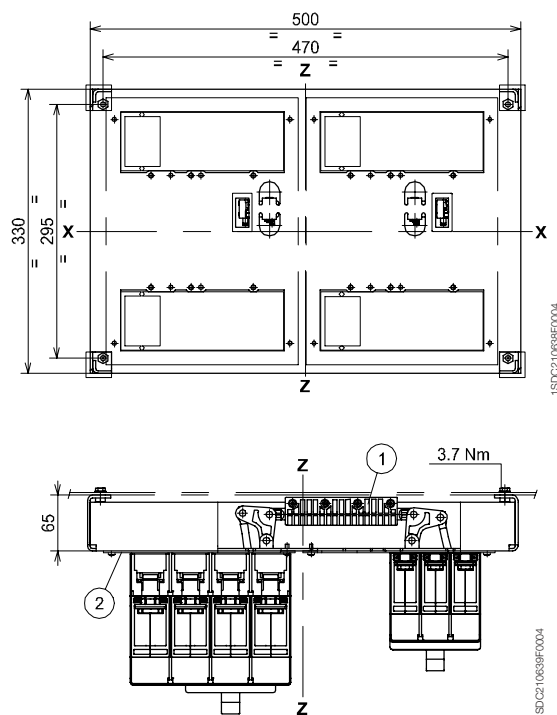
Overall dimensions

Accessories for Tmax T4 - T5

Caption

- ① Interlocking mechanism
- ② Circuit-breaker coupling plate

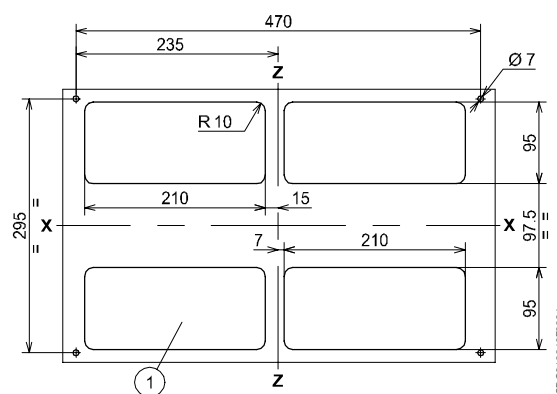
Interlock between two circuit-breakers placed side by side



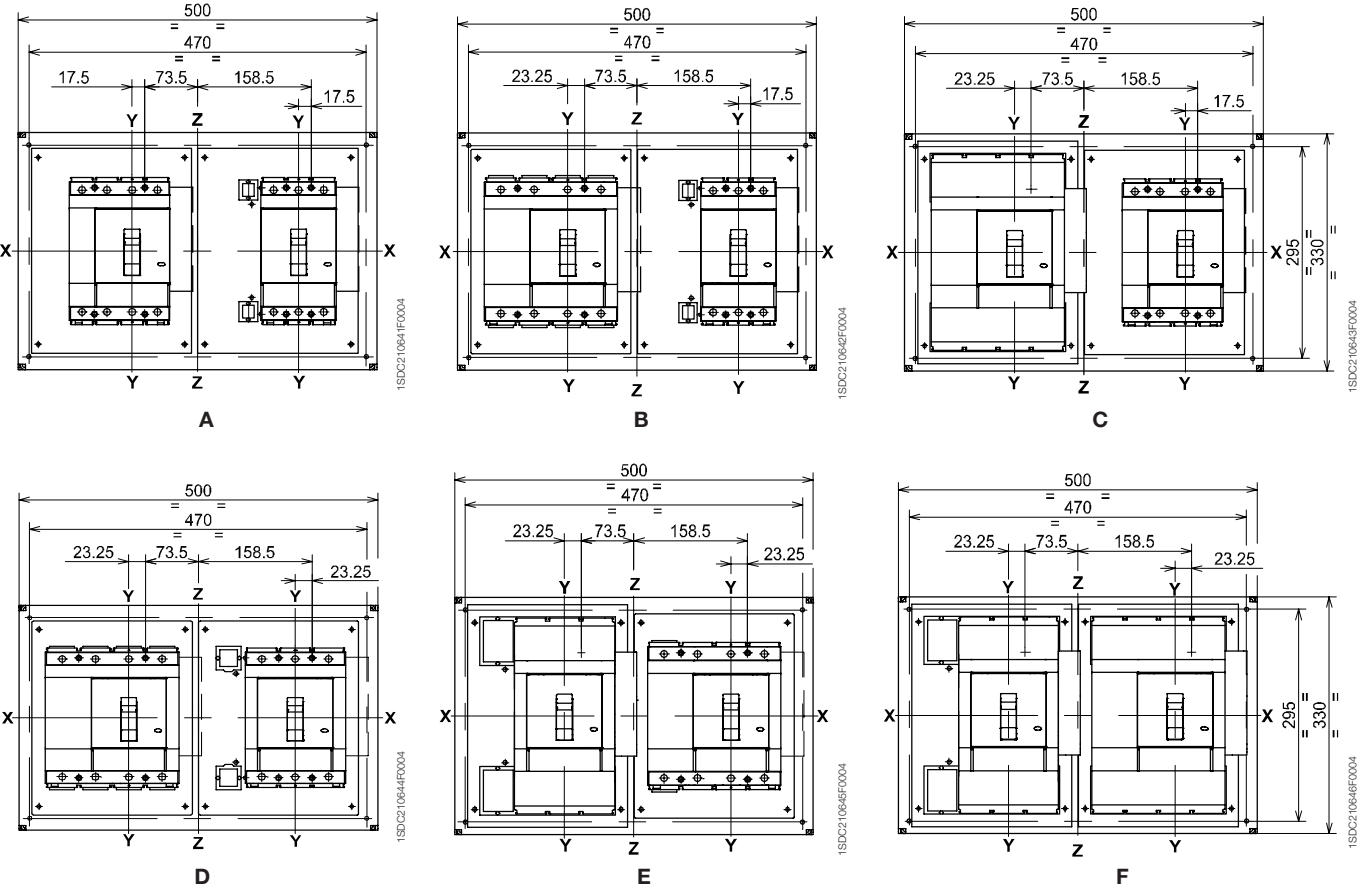
Caption

- ① Drilling template for all versions with rear terminals

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



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

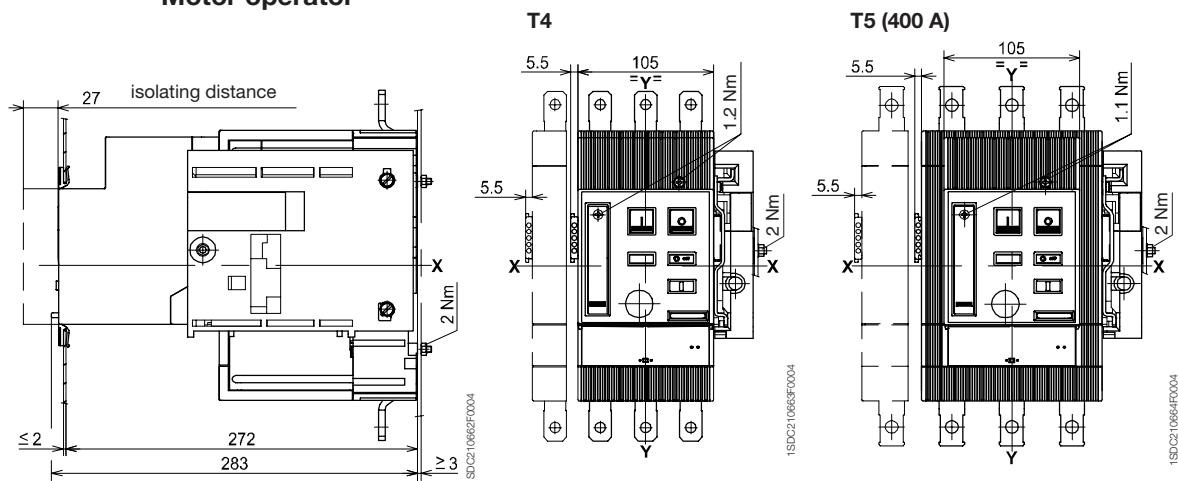


Overall dimensions

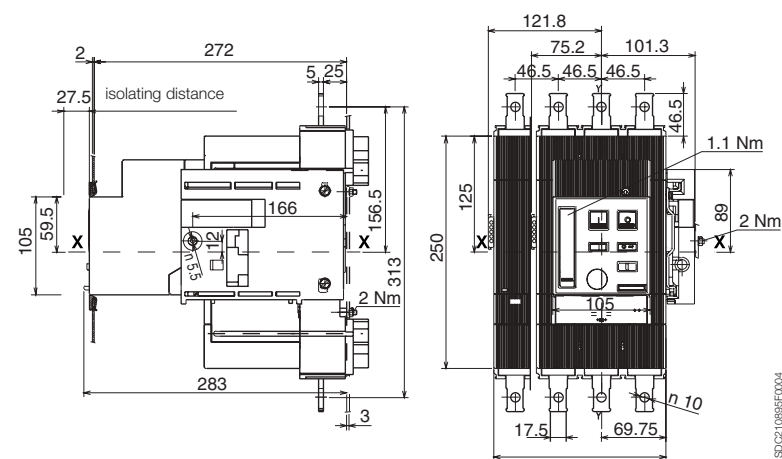
Accessories for Tmax T4 - T5

**Withdrawable
version**

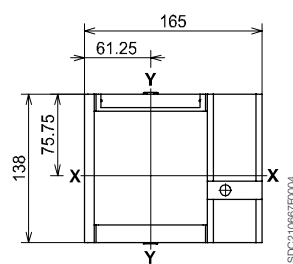
Motor operator



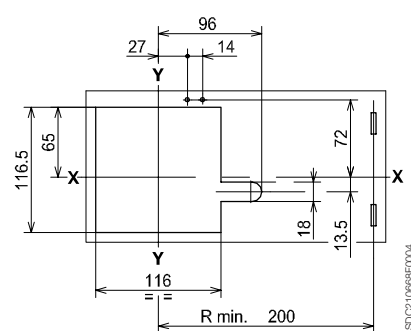
T5 (630 A)



**Flange for the
compartment door
(supplied as standard)**



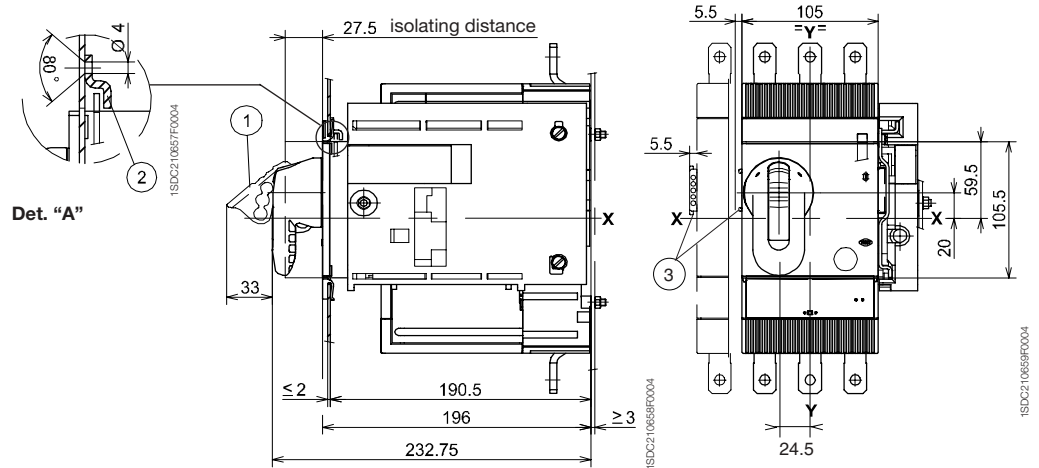
**Drilling templates for the compartment
door and fitting flange**



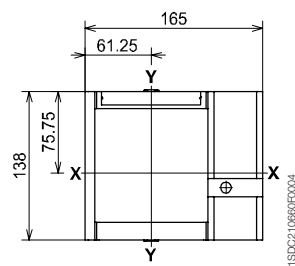
Rotary handle operating mechanism on the circuit-breakers

Caption

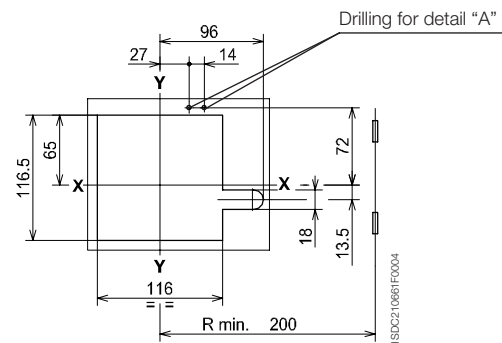
- ① Padlock device for open position (maximum 3 padlocks to be provided by the user)
- ② Lock for compartment door
- ③ Dimension with AUE connector (early making contact)



Flange for the compartment door



Drilling template for compartment door and fitting flange





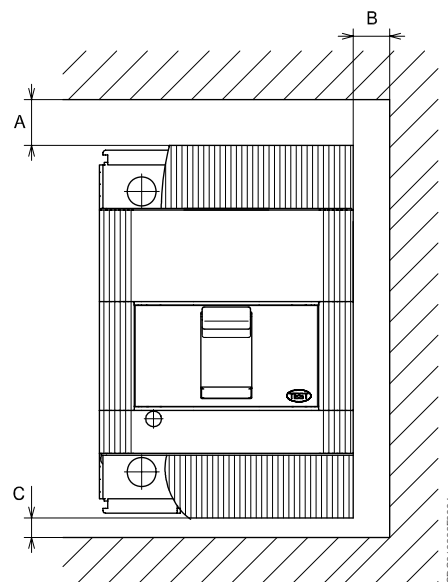
Overall dimensions

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 $U_b \geq 440$ V: distance A $\Rightarrow$ 60 mm; distance C $\Rightarrow$ 45 mm

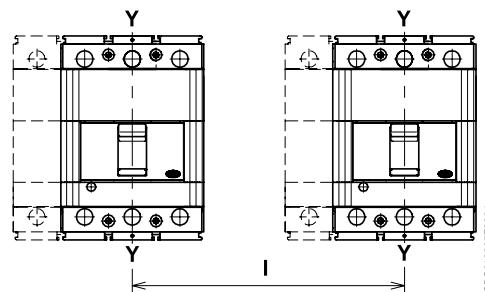


Minimum centre distance between two circuit-breakers side by side or superimposed

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



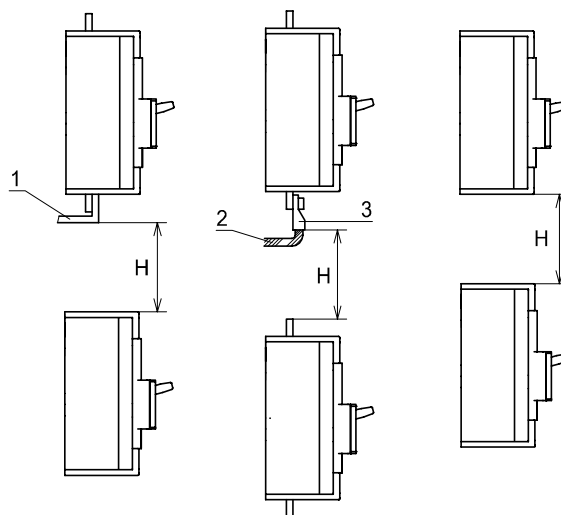
Minimum centre distance for superimposed circuit-breakers

	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 U_b up to 690 V. The dimensions to be respected must be added to the maximum dimensions of the various different versions of the circuit-breakers, including the terminals. For 1000 V versions, please ask ABB SACE.





Ordering codes

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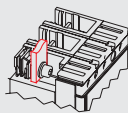
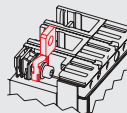
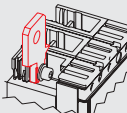
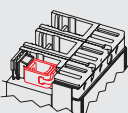
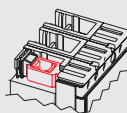
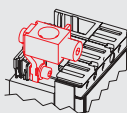
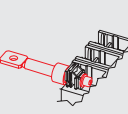
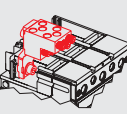
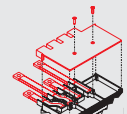
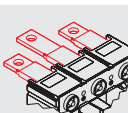
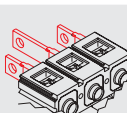
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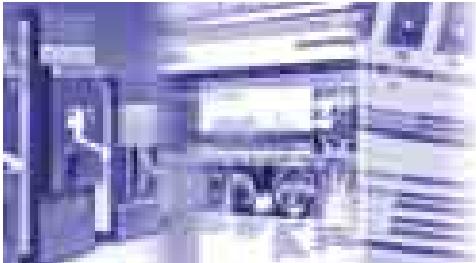


Ordering codes

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		
	I₃ = Magnetic trip current [A]		I_n = Rated current of the thermomagnetic release [A]	I_u	Rated uninterrupted current of the circuit-breaker [A]
				I_{cu}	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	TMA	= Thermomagnetic release with adjustable thermal and magnetic threshold	MF	= Fixed magnetic only releases
TMD	= Thermomagnetic release with adjustable thermal and fixed magnetic threshold	TMG	= Thermomagnetic release for generator protection	MA	= Adjustable magnetic only releases
				PR22_	= Electronic releases



Instructions for ordering

Instructions for ordering

Ordering Tmax circuit-breakers fitted with the accessories indicated in the catalogue means that these must be indicated by means of the relative sales codes expressly associated with the circuit-breaker code. The following examples are of particular importance for correctly loading orders for Tmax circuit-breakers fitted with accessories.

1) Terminal Kit for fixed circuit-breaker

To fit the circuit-breaker with different terminal accessories than those supplied on the basic circuit-breaker, it is possible to ask for complete kits (6 or 8 pieces) or half kits (3 or 4 pieces). For conversion of a complete circuit-breaker, it is necessary to specify the complete terminal kit. In the case of a mixed solution, the first code specified indicates the terminals to be mounted at the top, the second indicates the terminals to be mounted at the bottom. On the other hand, when only 3 or 4 pieces are requested, it is important to specify expressly whether the half kit is to be mounted at the top (*) rather than at the bottom (**).

a) Tmax T3N 250 with top FC Cu and bottom F terminals

	1SDA...R1
T3N 250 TMD 63 3p F F	051241
1/2 KIT FC Cu T3 3p ^(*)	051482

c) Tmax T3N 250 with top F and bottom FC Cu terminals

	1SDA...R1
T3N 250 TMD 63 3p F F	051241
1/2 KIT FC Cu T3 3p ^(*)	051482

d) Tmax T3N 250 with FC Cu top and bottom terminals

	1SDA...R1
T3N 250 TMD 63 3p F F	051241
1 KIT FC Cu T3 3p	051480

e) Tmax T3N 250 with top ES and FC Cu bottom terminals

	1SDA...R1
T3N 250 TMD 63 3p F F	051241
1/2 KIT ES T3 3p ^(*)	051494
1/2 KIT FC Cu T3 3p ^(*)	051482

2) T2-T3 electrical accessories on moving part of plug-in circuit-breaker

Fitting the moving parts of plug-in T2-T3 circuit-breakers with SOR, UVR and AUX and with SOR-C, UVR-C and AUX-C accessories always requires the appropriate plug-socket indicated in the catalogue.

a) Tmax T2N 160 moving part of plug-in circuit-breakers with auxiliary contacts

	1SDA...R1
T2N 160 F F PR221DS-LS 10 4p	051128
Kit P MP T2 4p	051412
AUX 1Q 1SY 250 V AC/DC	051368
socket-plug connectors 6 pole	051363

b) Tmax T2N 160 moving part of plug-in circuit-breakers with auxiliary contacts and opening coil

	1SDA...R1
T2N 160 F F PR221DS-LS 10 4p	051128
Kit P MP T2 4p	051412
AUX 3Q 1SY 250 V AC/DC	051369
SOR 220...240 V AC / 220...250 V DC	051336
socket-plug connectors 6 pole	051363
socket-plug connectors 3 pole	051364



Instructions for ordering

Instructions for ordering

3) T4-T5 electrical accessories on moving part of plug-in circuit-breaker

Fitting the moving parts of plug-in T4-T5 circuit-breakers with SOR, UVR and AUX accessories always requires the appropriate plug-sockets, i.e. in the case of cabled electrical accessories SOR-C, UVR-C, AUX-C, MOE, MOE-E and AUE, the ADP adapters indicated in the catalogue.

a) Tmax T4H 250 moving part of plug-in circuit-breakers with auxiliary contacts

	1SDA...R1
T4L 250 F F P221DS-LS/I 100 4p	054081
Kit P MP T4 4p	054840
AUX 3Q 1SY 250 V AC/DC	051369
socket-plug connectors 12 pole	051362

b) Tmax T4H 250 moving part of plug-in circuit-breakers with cabled auxiliary contacts

	1SDA...R1
T4L 250 F F P221DS-LS/I 100 4p	054081
Kit P MP T4 4p	054840
AUX-C 3Q 1SY 250 V AC/DC	054911
ADP – 12 pin adapter	054923

c) Tmax T5H 630 moving part of plug-in circuit-breaker with SOR-C, MOE and AUX-C

	1SDA...R1
T4L 250 F F P221DS-LS/I 100 4p	054081
Kit P MP T4 4p	054840
SOR-C 220...240 V AC – 220...250V DC	054873
MOE T4-T5 220...250 V AC/DC	054897
ADP – 10 pin adapter	054924
AU-C 1Q 1SY 250 V AC/DC	054910
ADP – 6 pin adapter	054922

4) T4-T5 electrical accessories on moving part of withdrawable circuit-breaker

Fitting the moving parts of T4-T5 withdrawable circuit-breakers can only take place using electrical accessories in the pre/cabled version, i.e. SOR-C, UVR-C, AUX-C, MOE, MOE-E and AUE with ADP adapter.

a) Tmax T5V 630 moving part of withdrawable circuit-breaker with UVR-C and MOE

	1SDA...R1
T5V 630 F F TMA 500 4p N=100%	054495
Kit W MP T5 630 4p	054850
UVR-C 24...30 V AC/DC	054887
MOE T4-T5 24 V DC	054894
ADP – 10 pin adapter	054924

b) Tmax T4S 250 moving part of withdrawable circuit-breaker SOR-C, RHE and AUE

	1SDA...R1
T4S 250 PR221DS-LS/I 100 4p F F	054033
KIT W MP T4 4p	054842
RHE normal for withdrawable circuit-breaker	054933
AUE – 2 early contacts	054925
SOR-C 220...240 V AC / 220...250 V DC	054873
ADP – 10 pin adapter	054924

5) T3 rear mechanical interlock

The rear MIR interlock for T3 allows all the accessories to be used. To be able to receive the circuit-breakers and/or fixed parts mounted directly on the interlocking plate, it is necessary to use the 1SDA050093R1 code to be specified regarding the second circuit-breaker (or fixed part) which is to be interlocked.

Horizontal mechanical interlock made between two T3S 250

		1SDA...R1
POS1	T3S 250 TMD 200 4p FF	051305
	MIR-H rear mechanical interlock for T3	063324
POS2	T3S 250 TMD 160 4p FF	051304
	Extra-code for circuit-breaker/fixed part mounted on the interlock	050093

6) T4-T5 mechanical interlock

The rear interlock for T4 and T5, consisting of the MIR-HB or MIR-VB frame unit and the MIR-P plates, allows use of all the front accessories compatible with the circuit-breakers used. To be able to receive the circuit-breakers mounted directly on the interlock plate, code 1SDA050093R1 must be specified regarding the second circuit-breaker (or fixed part) which is to be interlocked.

Horizontal mechanical interlock made between T4H 320 and T5L 630

		1SDA...R1
POS1	T4H 320 PR221DS-LS/I 320 4p F F	054137
	MIR-HB horizontal interlock frame unit	054946
	MIR-P plates for type C interlock	054950
POS2	T5L 630 PR221DS-LS/I 630 4p F F	054424
	Extra-code for circuit-breaker/fixed part mounted on the interlock	050093

7) PR222DS/PD T4-T5

The T4 and T5 circuit-breakers can be fitted with the PR222DS/PD electronic release, with communication and integrated control functions, using the special extracodes indicated in the catalogue. The circuit-breakers fitted with the PR222DS/PD release can only have the AUX-E electronic version of auxiliary contacts mounted, to communicate the state of the circuit-breaker to the PR222DS/PD, and the MOE-E dedicated stored energy operating mechanism, to remotely control circuit-breaker opening and closing.

a) T4V 250 with dialogue, auxiliary contacts and motor operator

	1SDA...R1
T4V 250 PR222DS/PD-LSIG 250 3p F F	054104
Extracode - Dialogue unit for LSIG	055067
AUX-E-C 1Q 1SY	054916
MOE-E T4-T5 380 V AC	054903
X3 PER PR222DS/P/PD T4-T5 F	055059

b) T4V 250 moving part of withdrawable circuit-breaker with dialogue, auxiliary contacts and motor operator

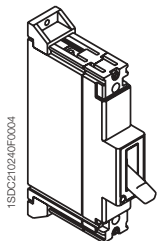
	1SDA...R1
T4V 250 PR222DS/PD-LSIG 250 3p F F	054104
Extracode - Dialogue unit for LSIG	055067
Kit W MP T4	054841
AUX-E-C 1Q 1SY	054916
ADP - 6 pin adapter	054922
MOE-E T4-T5 380 V AC	054903
ADP - 10 pin adapter	054924
X3 PARA PR222DS/P/PD T4-T5 P/W	055061

Ordering codes

Power distribution circuit-breakers

T1B 1P 160

Fixed (F)



I_u (40 °C) = 160 A - I_{cu} (230 V) = 25 kA

FC Cu = Front terminals
for copper cables

I_n

I_3

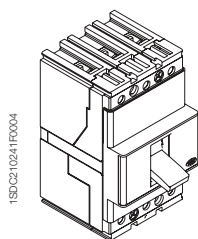
1SDA.....R1
1 pole

Thermomagnetic release with fixed thresholds - TMF

T1B 1P 160 F FC Cu (1x70mm ²)	16	500	052616
T1B 1P 160 F FC Cu (1x70mm ²)	20	500	052617
T1B 1P 160 F FC Cu (1x70mm ²)	25	500	052618
T1B 1P 160 F FC Cu (1x70mm ²)	32	500	052619
T1B 1P 160 F FC Cu (1x70mm ²)	40	500	052620
T1B 1P 160 F FC Cu (1x70mm ²)	50	500	052621
T1B 1P 160 F FC Cu (1x70mm ²)	63	630	052622
T1B 1P 160 F FC Cu (1x70mm ²)	80	800	052623
T1B 1P 160 F FC Cu (1x70mm ²)	100	1000	052624
T1B 1P 160 F FC Cu (1x70mm ²)	125	1250	052625
T1B 1P 160 F FC Cu (1x70mm ²)	160	1600	052626

T1B 160

Fixed (F)



I_u (40 °C) = 160 A - I_{cu} (415 V) = 16 kA

FC Cu = Front terminals
for copper cables

I_n

I_3

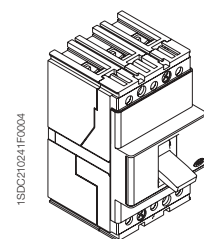
1SDA.....R1
3 poles 4 poles

Thermomagnetic release - TMD

			1SDA.....R1	
			N= 50%	N= 100%
T1B 160 F FC Cu (1x70mm ²)	16	500	050870	050881
T1B 160 F FC Cu (1x70mm ²)	20	500	050871	050882
T1B 160 F FC Cu (1x70mm ²)	25	500	050872	050883
T1B 160 F FC Cu (1x70mm ²)	32	500	050873	050884
T1B 160 F FC Cu (1x70mm ²)	40	500	050874	050885
T1B 160 F FC Cu (1x70mm ²)	50	500	050875	050886
T1B 160 F FC Cu (1x70mm ²)	63	630	050876	050887
T1B 160 F FC Cu (1x70mm ²)	80	800	050877	050888
T1B 160 F FC Cu (1x70mm ²)	100	1000	050878	050889
T1B 160 F FC Cu (1x70mm ²)	125	1250	050879	050890
T1B 160 F FC Cu (1x70mm ²)	160	1600	050880	050891
				050936

T1C 160

Fixed (F)



I_u (40 °C) = 160 A - I_{cu} (415 V) = 25 kA

FC Cu = Front terminals
for copper cables

I_n

I_3

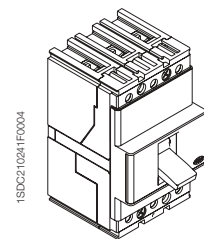
1SDA.....R1
3 poles 4 poles

Thermomagnetic release - TMD

			1SDA.....R1	
			N= 50%	N= 100%
T1C 160 F FC Cu (1x70mm ²)	25	500	050894	050905
T1C 160 F FC Cu (1x70mm ²)	32	500	050895	050906
T1C 160 F FC Cu (1x70mm ²)	40	500	050896	050907
T1C 160 F FC Cu (1x70mm ²)	50	500	050897	050908
T1C 160 F FC Cu (1x70mm ²)	63	630	050898	050909
T1C 160 F FC Cu (1x70mm ²)	80	800	050899	050910
T1C 160 F FC Cu (1x70mm ²)	100	1000	050900	050911
T1C 160 F FC Cu (1x70mm ²)	125	1250	050901	050912
T1C 160 F FC Cu (1x70mm ²)	160	1600	050902	050913
				050937

T1N 160

Fixed (F)



I_u (40 °C) = 160 A - I_{cu} (415 V) = 36 kA

FC Cu = Front terminals
for copper cables

I_n

I_3

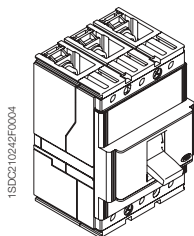
1SDA.....R1
3 poles 4 poles

Thermomagnetic release - TMD

			1SDA.....R1	
			N= 50%	N= 100%
T1N 160 F FC Cu (1x70mm ²)	32	500	050917	050928
T1N 160 F FC Cu (1x70mm ²)	40	500	050918	050929
T1N 160 F FC Cu (1x70mm ²)	50	500	050919	050930
T1N 160 F FC Cu (1x70mm ²)	63	630	050920	050931
T1N 160 F FC Cu (1x70mm ²)	80	800	050921	050932
T1N 160 F FC Cu (1x70mm ²)	100	1000	050922	050933
T1N 160 F FC Cu (1x70mm ²)	125	1250	050923	050934
T1N 160 F FC Cu (1x70mm ²)	160	1600	050924	050935
				050938

T2N 160

Fixed (F)



$I_n (40^\circ\text{C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 36\text{ kA}$

F = Front terminals

In

3 poles

1SDA.....R1

4 poles

Electronic release

				N= 50%	N= 100%
T2N 160 F F	PR221DS-LS	10	051123		051128
T2N 160 F F	PR221DS-LS	25	051124		051129
T2N 160 F F	PR221DS-LS	63	051125		051130
T2N 160 F F	PR221DS-LS	100	051126		051131
T2N 160 F F	PR221DS-LS	160	051127	051132	051613
T2N 160 F F	PR221DS-I	10	051163		051169
T2N 160 F F	PR221DS-I	25	051164		051170
T2N 160 F F	PR221DS-I	63	051165		051171
T2N 160 F F	PR221DS-I	100	051166		051172
T2N 160 F F	PR221DS-I	160	051168	051173	051617

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot.

For T2 with PR221DS the following groups of auxiliary contacts are available:

- 1SDA053704R1 AUX-C 1S51-1Q-1SY
- 1SDA055504R1 AUX-C 2Q-1SY

F = Front terminals

In

I₃

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMD

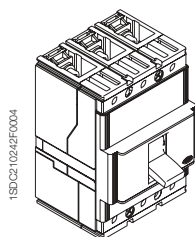
				N= 50%	N= 100%
T2N 160 F F	1.6	16	050940		050962
T2N 160 F F	2	20	050941		050963
T2N 160 F F	2.5	25	050942		050964
T2N 160 F F	3.2	32	050943		050965
T2N 160 F F	4	40	050944		050966
T2N 160 F F	5	50	050945		050967
T2N 160 F F	6.3	63	050946		050968
T2N 160 F F	8	80	050947		050969
T2N 160 F F	10	100	050948		050970
T2N 160 F F	12.5	125	050949		050971
T2N 160 F F	16	500	050950		050972
T2N 160 F F	20	500	050951		050973
T2N 160 F F	25	500	050952		050974
T2N 160 F F	32	500	050953		050975
T2N 160 F F	40	500	050954		050976
T2N 160 F F	50	500	050955		050977
T2N 160 F F	63	630	050956		050978
T2N 160 F F	80	800	050957		050979
T2N 160 F F	100	1000	050958		050980
T2N 160 F F	125	1250	050959	050981	051115
T2N 160 F F	160	1600	050960	050982	051116

Ordering codes

Power distribution circuit-breakers

T2S 160

Fixed (F)



$I_n (40^\circ\text{C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

				N= 50%	N= 100%
T2S 160 F F	PR221DS-LS	10	051133		051138
T2S 160 F F	PR221DS-LS	25	051134		051139
T2S 160 F F	PR221DS-LS	63	051135		051140
T2S 160 F F	PR221DS-LS	100	051136		051141
T2S 160 F F	PR221DS-LS	160	051137	051142	051614
T2S 160 F F	PR221DS-I	10	051174		051179
T2S 160 F F	PR221DS-I	25	051175		051180
T2S 160 F F	PR221DS-I	63	051176		051181
T2S 160 F F	PR221DS-I	100	051177		051182
T2S 160 F F	PR221DS-I	160	051178	051183	051618

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot.

For T2 with PR221DS the following groups of auxiliary contacts are available:

- 1SDA053704R1 AUX-C 1S51-1Q-1SY
- 1SDA055504R1 AUX-C 2Q-1SY

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

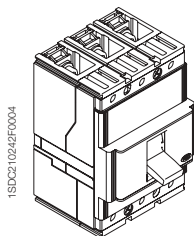
4 poles

Thermomagnetic release - TMD

				N= 50%	N= 100%
T2S 160 F F	1.6	16	050984		051006
T2S 160 F F	2	20	050985		051007
T2S 160 F F	2.5	25	050986		051008
T2S 160 F F	3.2	32	050987		051009
T2S 160 F F	4	40	050988		051010
T2S 160 F F	5	50	050989		051011
T2S 160 F F	6.3	63	050990		051012
T2S 160 F F	8	80	050991		051013
T2S 160 F F	10	100	050992		051014
T2S 160 F F	12.5	125	050993		051015
T2S 160 F F	16	500	050994		051016
T2S 160 F F	20	500	050995		051017
T2S 160 F F	25	500	050996		051018
T2S 160 F F	32	500	050997		051019
T2S 160 F F	40	500	050998		051020
T2S 160 F F	50	500	050999		051021
T2S 160 F F	63	630	051000		051022
T2S 160 F F	80	800	051001		051023
T2S 160 F F	100	1000	051002		051024
T2S 160 F F	125	1250	051003	051025	051117
T2S 160 F F	160	1600	051004	051026	051118

T2H 160

Fixed (F)



$I_n (40^\circ\text{C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 70\text{ kA}$

F = Front terminals

In

3 poles 1SDA.....R1
4 poles

Electronic release

				N= 50%	N= 100%
T2H 160 F F	PR221DS-LS	10	051143		051148
T2H 160 F F	PR221DS-LS	25	051144		051149
T2H 160 F F	PR221DS-LS	63	051145		051150
T2H 160 F F	PR221DS-LS	100	051146		051151
T2H 160 F F	PR221DS-LS	160	051147	051152	051615
T2H 160 F F	PR221DS-I	10	051184		051189
T2H 160 F F	PR221DS-I	25	051185		051190
T2H 160 F F	PR221DS-I	63	051186		051191
T2H 160 F F	PR221DS-I	100	051187		051192
T2H 160 F F	PR221DS-I	160	051188	051193	051619

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot.

For T2 with PR221DS the following groups of auxiliary contacts are available:

- 1SDA053704R1 AUX-C 1S51-1Q-1SY
- 1SDA055504R1 AUX-C 2Q-1SY

F = Front terminals

In

I₃

3 poles 1SDA.....R1
4 poles

Thermomagnetic release - TMD

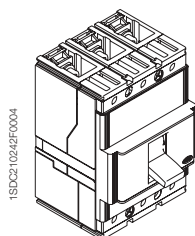
				N= 50%	N= 100%
T2H 160 F F	1.6	16	051028		051050
T2H 160 F F	2	20	051029		051051
T2H 160 F F	2.5	25	051030		051052
T2H 160 F F	3.2	32	051031		051053
T2H 160 F F	4	40	051032		051054
T2H 160 F F	5	50	051033		051055
T2H 160 F F	6.3	63	051034		051056
T2H 160 F F	8	80	051035		051057
T2H 160 F F	10	100	051036		051058
T2H 160 F F	12.5	125	051037		051059
T2H 160 F F	16	500	051038		051060
T2H 160 F F	20	500	051039		051061
T2H 160 F F	25	500	051040		051062
T2H 160 F F	32	500	051041		051063
T2H 160 F F	40	500	051042		051064
T2H 160 F F	50	500	051043		051065
T2H 160 F F	63	630	051044		051066
T2H 160 F F	80	800	051045		051067
T2H 160 F F	100	1000	051046		051068
T2H 160 F F	125	1250	051047	051069	051119
T2H 160 F F	160	1600	051048	051070	051120

Ordering codes

Power distribution circuit-breakers

T2L 160

Fixed (F)



$I_n (40^\circ\text{C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 85\text{ kA}$

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

				N= 50%	N= 100%
T2L 160 F F	PR221DS-LS	10	051153		051158
T2L 160 F F	PR221DS-LS	25	051154		051159
T2L 160 F F	PR221DS-LS	63	051155		051160
T2L 160 F F	PR221DS-LS	100	051156		051161
T2L 160 F F	PR221DS-LS	160	051157	051162	051162
T2L 160 F F	PR221DS-I	10	051194		051199
T2L 160 F F	PR221DS-I	25	051195		051200
T2L 160 F F	PR221DS-I	63	051196		051201
T2L 160 F F	PR221DS-I	100	051197		051202
T2L 160 F F	PR221DS-I	160	051198	051203	051202

Note: The trip coil of the T2 circuit-breaker with PR221DS electronic release is housed in the right slot.

For T2 with PR221DS the following groups of auxiliary contacts are available:

- 1SDA053704R1 AUX-C 1S51-1Q-1SY
- 1SDA055504R1 AUX-C 2Q-1SY

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

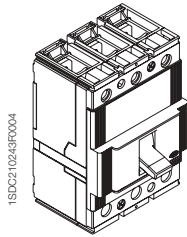
4 poles

Thermomagnetic release - TMD

				N= 50%	N= 100%
T2L 160 F F	1.6	16	051072		051094
T2L 160 F F	2	20	051073		051095
T2L 160 F F	2.5	25	051074		051096
T2L 160 F F	3.2	32	051075		051097
T2L 160 F F	4	40	051076		051098
T2L 160 F F	5	50	051077		051099
T2L 160 F F	6.3	63	051078		051100
T2L 160 F F	8	80	051079		051101
T2L 160 F F	10	100	051080		051102
T2L 160 F F	12.5	125	051081		051103
T2L 160 F F	16	500	051082		051104
T2L 160 F F	20	500	051083		051105
T2L 160 F F	25	500	051084		051106
T2L 160 F F	32	500	051085		051107
T2L 160 F F	40	500	051086		051108
T2L 160 F F	50	500	051087		051109
T2L 160 F F	63	630	051088		051110
T2L 160 F F	80	800	051089		051111
T2L 160 F F	100	1000	051090		051112
T2L 160 F F	125	1250	051091	051113	051121
T2L 160 F F	160	1600	051092	051114	051122

T3N 250

Fixed (F)



$I_u (40^\circ\text{C}) = 250\text{ A} - I_{cu} (415\text{ V}) = 36\text{ kA}$

F = Front terminals

I_n

I_3

3 poles 1SDA.....R1
4 poles

Thermomagnetic release - TMD

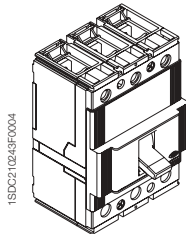
				N= 50%	N= 100%
T3N 250 F F	63	630	051241		051252
T3N 250 F F	80	800	051242		051253
T3N 250 F F	100	1000	051243		051254
T3N 250 F F	125	1250	051244	051255	051303
T3N 250 F F	160	1600	051245	051256	051304
T3N 250 F F	200	2000	051246	051257	051305
T3N 250 F F	250	2500	051247	051258	051306

Thermomagnetic release for generator protection - TMG

				N= 100%
T3N 250 F F	63	400	055105	055112
T3N 250 F F	80	400	055106	055113
T3N 250 F F	100	400	055107	055114
T3N 250 F F	125	400	055108	055115
T3N 250 F F	160	480	055109	055116
T3N 250 F F	200	600	055110	055117
T3N 250 F F	250	750	055111	055118

T3S 250

Fixed (F)



$I_u (40^\circ\text{C}) = 250\text{ A} - I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

I_n

I_3

3 poles 1SDA.....R1
4 poles

Thermomagnetic release - TMD

				N= 50%	N= 100%
T3S 250 F F	63	630	051263		051274
T3S 250 F F	80	800	051264		051275
T3S 250 F F	100	1000	051265		051276
T3S 250 F F	125	1250	051266	051277	051307
T3S 250 F F	160	1600	051267	051278	051308
T3S 250 F F	200	2000	051268	051279	051309
T3S 250 F F	250	2500	051269	051280	051310

Thermomagnetic release for generator protection - TMG

				N= 100%
T3S 250 F F	63	400	055119	055126
T3S 250 F F	80	400	055120	055127
T3S 250 F F	100	400	055121	055128
T3S 250 F F	125	400	055122	055129
T3S 250 F F	160	480	055123	055130
T3S 250 F F	200	600	055124	055131
T3S 250 F F	250	750	055125	055132

Ordering codes

Power distribution circuit-breakers

T4N 250

Fixed (F)



1SDC210244R0004

I_u (40 °C) = **250 A** - I_{cu} (415 V) = **36 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T4N 250 F F	PR221DS-LS/I	100	053997	054009
T4N 250 F F	PR221DS-LS/I	160	053998	054010
T4N 250 F F	PR221DS-LS/I	250	053999	054011
T4N 250 F F	PR221DS-I	100	054000	054012
T4N 250 F F	PR221DS-I	160	054001	054013
T4N 250 F F	PR221DS-I	250	054002	054014
T4N 250 F F	PR222DS/P-LSI	100	054003	054015
T4N 250 F F	PR222DS/P-LSI	160	054004	054016
T4N 250 F F	PR222DS/P-LSI	250	054005	054017
T4N 250 F F	PR222DS/P-LSIG	100	054006	054018
T4N 250 F F	PR222DS/P-LSIG	160	054007	054019
T4N 250 F F	PR222DS/P-LSIG	250	054008	054020

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMD and TMA

				N= 50%	N= 100%
T4N 250 F F	20	320	054171		054180
T4N 250 F F	32	320	054172		054181
T4N 250 F F	50	500	054173		054182
T4N 250 F F	80	400...800	054174		054183
T4N 250 F F	100	500...1000	054175		054184
T4N 250 F F	125	625...1250	054176	054185	054271
T4N 250 F F	160	800...1600	054177	054186	054272
T4N 250 F F	200	1000...2000	054178	054187	054273
T4N 250 F F	250	1250...2500	054179	054188	054274

T4N 320

Fixed (F)



1SDC210244F0004

I_u (40 °C) = **320 A** - I_{cu} (415 V) = **36 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T4N 320 F F	PR221DS-LS/I	320	054117	054121
T4N 320 F F	PR221DS-I	320	054118	054122
T4N 320 F F	PR222DS/P-LSI	320	054119	054123
T4N 320 F F	PR222DS/P-LSIG	320	054120	054124

T4S 250

Fixed (F)



$I_u (40\text{ °C}) = 250\text{ A}$ - $I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

In

3 poles

1SDA.....R1

4 poles

Electronic release

T4S 250 F F	PR221DS-LS/I	100	054021	054033
T4S 250 F F	PR221DS-LS/I	160	054022	054034
T4S 250 F F	PR221DS-LS/I	250	054023	054035
T4S 250 F F	PR221DS-I	100	054024	054036
T4S 250 F F	PR221DS-I	160	054025	054037
T4S 250 F F	PR221DS-I	250	054026	054038
T4S 250 F F	PR222DS/P-LSI	100	054027	054039
T4S 250 F F	PR222DS/P-LSI	160	054028	054040
T4S 250 F F	PR222DS/P-LSI	250	054029	054041
T4S 250 F F	PR222DS/P-LSIG	100	054030	054042
T4S 250 F F	PR222DS/P-LSIG	160	054031	054043
T4S 250 F F	PR222DS/P-LSIG	250	054032	054044

F = Front terminals

In

I₃

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMD and TMA

			N= 50% N= 100%	
T4S 250 F F	20	320	054189	054198
T4S 250 F F	32	320	054190	054199
T4S 250 F F	50	500	054191	054200
T4S 250 F F	80	400...800	054192	054201
T4S 250 F F	100	500...1000	054193	054202
T4S 250 F F	125	625...1250	054194	054203 054275
T4S 250 F F	160	800...1600	054195	054204 054276
T4S 250 F F	200	1000...2000	054196	054205 054277
T4S 250 F F	250	1250...2500	054197	054206 054278

T4S 320

Fixed (F)



$I_u (40\text{ °C}) = 320\text{ A}$ - $I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

In

3 poles

1SDA.....R1

4 poles

Electronic release

T4S 320 F F	PR221DS-LS/I	320	054125	054129
T4S 320 F F	PR221DS-I	320	054126	054130
T4S 320 F F	PR222DS/P-LSI	320	054127	054131
T4S 320 F F	PR222DS/P-LSIG	320	054128	054132

Ordering codes

Power distribution circuit-breakers

T4H 250

Fixed (F)



1SDC210244R0004

I_u (40 °C) = **250 A** - I_{cu} (415 V) = **70 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T4H 250 F F	PR221DS-LS/I	100	054045	054057
T4H 250 F F	PR221DS-LS/I	160	054046	054058
T4H 250 F F	PR221DS-LS/I	250	054047	054059
T4H 250 F F	PR221DS-I	100	054048	054060
T4H 250 F F	PR221DS-I	160	054049	054061
T4H 250 F F	PR221DS-I	250	054050	054062
T4H 250 F F	PR222DS/P-LSI	100	054051	054063
T4H 250 F F	PR222DS/P-LSI	160	054052	054064
T4H 250 F F	PR222DS/P-LSI	250	054053	054065
T4H 250 F F	PR222DS/P-LSIG	100	054054	054066
T4H 250 F F	PR222DS/P-LSIG	160	054055	054067
T4H 250 F F	PR222DS/P-LSIG	250	054056	054068

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMD and TMA

				N= 50%	N= 100%
T4H 250 F F	20	320	054207		054216
T4H 250 F F	32	320	054208		054217
T4H 250 F F	50	500	054209		054218
T4H 250 F F	80	400...800	054210		054219
T4H 250 F F	100	500...1000	054211		054220
T4H 250 F F	125	625...1250	054212	054221	054279
T4H 250 F F	160	800...1600	054213	054222	054280
T4H 250 F F	200	1000...2000	054214	054223	054281
T4H 250 F F	250	1250...2500	054215	054224	054282

T4H 320

Fixed (F)



1SDC210244F0004

I_u (40 °C) = **320 A** - I_{cu} (415 V) = **70 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T4H 320 F F	PR221DS-LS/I	320	054133	054137
T4H 320 F F	PR221DS-I	320	054134	054138
T4H 320 F F	PR222DS/P-LSI	320	054135	054139
T4H 320 F F	PR222DS/P-LSIG	320	054136	054140

T4L 250

Fixed (F)



1SDC210244R0004

$I_u (40\text{ °C}) = 250\text{ A}$ - $I_{cu} (415\text{ V}) = 120\text{ kA}$

F = Front terminals

In

3 poles

1SDA.....R1

4 poles

Electronic release

T4L 250 F F	PR221DS-LS/I	100	054069	054081
T4L 250 F F	PR221DS-LS/I	160	054070	054082
T4L 250 F F	PR221DS-LS/I	250	054071	054083
T4L 250 F F	PR221DS-I	100	054072	054084
T4L 250 F F	PR221DS-I	160	054073	054085
T4L 250 F F	PR221DS-I	250	054074	054086
T4L 250 F F	PR222DS/P-LSI	100	054075	054087
T4L 250 F F	PR222DS/P-LSI	160	054076	054088
T4L 250 F F	PR222DS/P-LSI	250	054077	054089
T4L 250 F F	PR222DS/P-LSIG	100	054078	054090
T4L 250 F F	PR222DS/P-LSIG	160	054079	054091
T4L 250 F F	PR222DS/P-LSIG	250	054080	054092

F = Front terminals

In

I₃

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMD and TMA

			N= 50% N= 100%	
T4L 250 F F	20	320	054225	054234
T4L 250 F F	32	320	054226	054235
T4L 250 F F	50	500	054227	054236
T4L 250 F F	80	400...800	054228	054237
T4L 250 F F	100	500...1000	054229	054238
T4L 250 F F	125	625...1250	054230	054239 054283
T4L 250 F F	160	800...1600	054231	054240 054284
T4L 250 F F	200	1000...2000	054232	054241 054285
T4L 250 F F	250	1250...2500	054233	054242 054286

T4L 320

Fixed (F)



1SDC210244F0004

$I_u (40\text{ °C}) = 320\text{ A}$ - $I_{cu} (415\text{ V}) = 120\text{ kA}$

F = Front terminals

In

3 poles

1SDA.....R1

4 poles

Electronic release

T4L 320 F F	PR221DS-LS/I	320	054141	054145
T4L 320 F F	PR221DS-I	320	054142	054146
T4L 320 F F	PR222DS/P-LSI	320	054143	054147
T4L 320 F F	PR222DS/P-LSIG	320	054144	054148

Ordering codes

Power distribution circuit-breakers

T4V 250

Fixed (F)



I_u (40 °C) = **250 A** - I_{cu} (415 V) = **200 kA**

F = Front terminals

		In	3 poles	1SDA.....R1 4 poles
Electronic release				
T4V 250 F F	PR221DS-LS/I	100	054093	054105
T4V 250 F F	PR221DS-LS/I	160	054094	054106
T4V 250 F F	PR221DS-LS/I	250	054095	054107
T4V 250 F F	PR221DS-I	100	054096	054108
T4V 250 F F	PR221DS-I	160	054097	054109
T4V 250 F F	PR221DS-I	250	054098	054110
T4V 250 F F	PR222DS/P-LSI	100	054099	054111
T4V 250 F F	PR222DS/P-LSI	160	054100	054112
T4V 250 F F	PR222DS/P-LSI	250	054101	054113
T4V 250 F F	PR222DS/P-LSIG	100	054102	054114
T4V 250 F F	PR222DS/P-LSIG	160	054103	054115
T4V 250 F F	PR222DS/P-LSIG	250	054104	054116

F = Front terminals

F = Front terminals	In	I ₃	3 poles	1SDA.....R1 4 poles	
Thermomagnetic release - TMD and TMA				N= 50%	N= 100%
T4V 250 F F	20	320	054243		054252
T4V 250 F F	32	320	054244		054253
T4V 250 F F	50	500	054245		054254
T4V 250 F F	80	400...800	054246		054255
T4V 250 F F	100	500...1000	054247		054256
T4V 250 F F	125	625...1250	054248	054257	054287
T4V 250 F F	160	800...1600	054249	054258	054288
T4V 250 F F	200	1000...2000	054250	054259	054289
T4V 250 F F	250	1250...2500	054251	054260	054290

T4V 320

Fixed (F)



I_u (40 °C) = **320 A** - I_{cu} (415 V) = **200 kA**

F = Front terminals

		In	3 poles	1SDA.....R1 4 poles
Electronic release				
T4V 320 F F	PR221DS-LS/I	320	054149	054153
T4V 320 F F	PR221DS-I	320	054150	054154
T4V 320 F F	PR222DS/P-LSI	320	054151	054155
T4V 320 F F	PR222DS/P-LSIG	320	054152	054156

T4 trip units



	In	3 poles	1SDA.....R1 4 poles
Electronic release			
PR221DS-LS/I	100	054603	054615
PR221DS-LS/I	160	054604	054616
PR221DS-LS/I	250	054605	054617
PR221DS-LS/I	320	054627	054631
PR221DS-I	100	054606	054618
PR221DS-I	160	054607	054619
PR221DS-I	250	054608	054620
PR221DS-I	320	054628	054632
PR222DS/P-LSI	100	054609	054621
PR222DS/P-LSI	160	054610	054622
PR222DS/P-LSI	250	054611	054623
PR222DS/P-LSI	320	054629	054633
PR222DS/P-LSIG	100	054612	054624
PR222DS/P-LSIG	160	054613	054625
PR222DS/P-LSIG	250	054614	054626
PR222DS/P-LSIG	320	054630	054634
PR222DS/PD-LSI	100	054635	054641
PR222DS/PD-LSI	160	054636	054642
PR222DS/PD-LSI	250	054637	054643
PR222DS/PD-LSI	320	054647	054649
PR222DS/PD-LSIG	100	054638	054644
PR222DS/PD-LSIG	160	054639	054645
PR222DS/PD-LSIG	250	054640	054646
PR222DS/PD-LSIG	320	054648	054650



	In	I ₃	3 poles	1SDA.....R1 4 poles
Thermomagnetic release - TMD and TMA				N= 50% N= 100%
TMD 20-200	20	320	054651	054660
TMD 32-320	32	320	054652	054661
TMD 50-500	50	500	054653	054662
TMA 80-800	80	800	054654	054663
TMA 100-1000	100	1000	054655	054664
TMA 125-1250	125	1250	054656	054665 054671
TMA 160-1600	160	1600	054657	054666 054672
TMA 200-2000	200	2000	054658	054667 054673
TMA 250-2500	250	2500	054659	054668 054674

Ordering codes

Power distribution circuit-breakers

T5N 400

Fixed (F)



I_u (40 °C) = **400 A** - I_{cu} (415 V) = **36 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5N 400 F F	PR221DS-LS/I	320	054316	054324
T5N 400 F F	PR221DS-LS/I	400	054317	054325
T5N 400 F F	PR221DS-I	320	054318	054326
T5N 400 F F	PR221DS-I	400	054319	054327
T5N 400 F F	PR222DS/P-LSI	320	054320	054328
T5N 400 F F	PR222DS/P-LSI	400	054321	054329
T5N 400 F F	PR222DS/P-LSIG	320	054322	054330
T5N 400 F F	PR222DS/P-LSIG	400	054323	054331

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

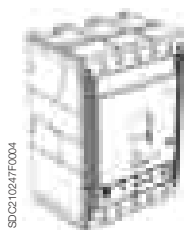
4 poles

Thermomagnetic release - TMA

				N= 50%	N= 100%
T5N 400 F F	320	1600...3200	054436	054438	054477
T5N 400 F F	400	2000...4000	054437	054439	054478

T5N 630

Fixed (F)



I_u (40 °C) = **630 A** - I_{cu} (415 V) = **36 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5N 630 F F	PR221DS-LS/I	630	054396	054400
T5N 630 F F	PR221DS-I	630	054397	054401
T5N 630 F F	PR222DS/P-LSI	630	054398	054402
T5N 630 F F	PR222DS/P-LSIG	630	054399	054403

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

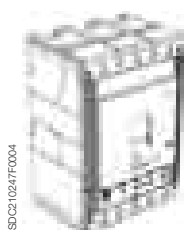
4 poles

Thermomagnetic release - TMA

				N= 50%	N= 100%
T5N 630 F F	500	2500...5000	054456	054459	054487

T5S 400

Fixed (F)



I_u (40 °C) = **400 A** - I_{cu} (415 V) = **50 kA**

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5S 400 F F	PR221DS-LS/I	320	054332	054340
T5S 400 F F	PR221DS-LS/I	400	054333	054341
T5S 400 F F	PR221DS-I	320	054334	054342
T5S 400 F F	PR221DS-I	400	054335	054343
T5S 400 F F	PR222DS/P-LSI	320	054336	054344
T5S 400 F F	PR222DS/P-LSI	400	054337	054345
T5S 400 F F	PR222DS/P-LSIG	320	054338	054346
T5S 400 F F	PR222DS/P-LSIG	400	054339	054347

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

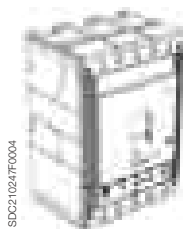
4 poles

Thermomagnetic release - TMA

				N= 50%	N= 100%
T5S 400 F F	320	1600...3200	054440	054442	054479
T5S 400 F F	400	2000...4000	054441	054443	054480

T5S 630

Fixed (F)



I_u (40 °C) = 630 A - I_{cu} (415 V) = 50 kA

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5S 630 F F	PR221DS-LS/I	630	054404	054408
T5S 630 F F	PR221DS-I	630	054405	054409
T5S 630 F F	PR222DS/P-LSI	630	054406	054410
T5S 630 F F	PR222DS/P-LSIG	630	054407	054411

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

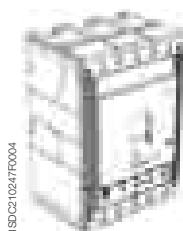
4 poles

Thermomagnetic release - TMA

T5S 630 F F	500	2500...5000	054461	054463	054489
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T5H 400

Fixed (F)



I_u (40 °C) = 400 A - I_{cu} (415 V) = 70 kA

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5H 400 F F	PR221DS-LS/I	320	054348	054356
T5H 400 F F	PR221DS-LS/I	400	054349	054357
T5H 400 F F	PR221DS-I	320	054350	054358
T5H 400 F F	PR221DS-I	400	054351	054359
T5H 400 F F	PR222DS/P-LSI	320	054352	054360
T5H 400 F F	PR222DS/P-LSI	400	054353	054361
T5H 400 F F	PR222DS/P-LSIG	320	054354	054362
T5H 400 F F	PR222DS/P-LSIG	400	054355	054363

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

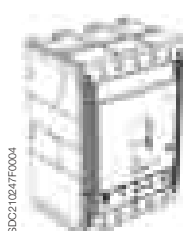
4 poles

Thermomagnetic release - TMA

T5H 400 F F	320	1600...3200	054444	054446	054481
T5H 400 F F	400	2000...4000	054445	054447	054482

T5H 630

Fixed (F)



I_u (40 °C) = 630 A - I_{cu} (415 V) = 70 kA

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5H 630 F F	PR221DS-LS/I	630	054412	054416
T5H 630 F F	PR221DS-I	630	054413	054417
T5H 630 F F	PR222DS/P-LSI	630	054414	054418
T5H 630 F F	PR222DS/P-LSIG	630	054415	054419

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMA

T5H 630 F F	500	2500...5000	054465	054467	054491
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Ordering codes

Power distribution circuit-breakers

T5L 400

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 400\text{ A}$ - $I_{cu} (415\text{ V}) = 120\text{ kA}$

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5L 400 F F	PR221DS-LS/I	320	054364	054372
T5L 400 F F	PR221DS-LS/I	400	054365	054373
T5L 400 F F	PR221DS-I	320	054366	054374
T5L 400 F F	PR221DS-I	400	054367	054375
T5L 400 F F	PR222DS/P-LSI	320	054368	054376
T5L 400 F F	PR222DS/P-LSI	400	054369	054377
T5L 400 F F	PR222DS/P-LSIG	320	054370	054378
T5L 400 F F	PR222DS/P-LSIG	400	054371	054379

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

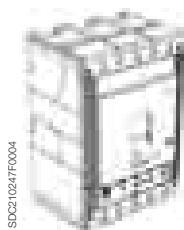
4 poles

Thermomagnetic release - TMA

				N= 50%	N= 100%
T5L 400 F F	320	1600...3200	054448	054450	054483
T5L 400 F F	400	2000...4000	054449	054451	054484

T5L 630

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 630\text{ A}$ - $I_{cu} (415\text{ V}) = 120\text{ kA}$

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5L 630 F F	PR221DS-LS/I	630	054420	054424
T5L 630 F F	PR221DS-I	630	054421	054425
T5L 630 F F	PR222DS/P-LSI	630	054422	054426
T5L 630 F F	PR222DS/P-LSIG	630	054423	054427

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

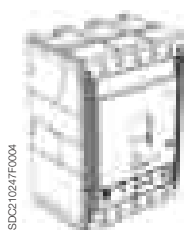
4 poles

Thermomagnetic release - TMA

				N= 50%	N= 100%
T5L 630 F F	500	2500...5000	054469	054471	054493

T5V 400

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 400\text{ A}$ - $I_{cu} (415\text{ V}) = 200\text{ kA}$

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5V 400 F F	PR221DS-LS/I	320	054380	054388
T5V 400 F F	PR221DS-LS/I	400	054381	054389
T5V 400 F F	PR221DS-I	320	054382	054390
T5V 400 F F	PR221DS-I	400	054383	054391
T5V 400 F F	PR222DS/P-LSI	320	054384	054392
T5V 400 F F	PR222DS/P-LSI	400	054385	054393
T5V 400 F F	PR222DS/P-LSIG	320	054386	054394
T5V 400 F F	PR222DS/P-LSIG	400	054387	054395

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

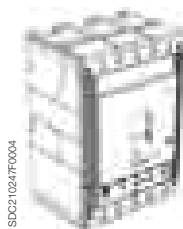
4 poles

Thermomagnetic release - TMA

				N= 50%	N= 100%
T5V 400 F F	320	1600...3200	054452	054454	054485
T5V 400 F F	400	2000...4000	054453	054455	054486

T5V 630

Fixed (F)



1SDC21024TF0004

$I_u (40\text{ }^{\circ}\text{C}) = 630\text{ A}$ - $I_{cu} (415\text{ V}) = 200\text{ kA}$

F = Front terminals

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

T5V 630 F F	PR221DS-LS/I	630	054428	054432
T5V 630 F F	PR221DS-I	630	054429	054433
T5V 630 F F	PR222DS/P-LSI	630	054430	054434
T5V 630 F F	PR222DS/P-LSIG	630	054431	054435

F = Front terminals

I_n

I_3

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMA

T5V 630 F F	500	2500...5000	054473	N= 50% 054475	N= 100% 054495
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T5 trip units



1SDC21024TF0004

I_n

3 poles

1SDA.....R1

4 poles

Electronic release

PR221DS-LS/I	320	054691	054699
PR221DS-LS/I	400	054692	054700
PR221DS-LS/I	630	054707	055159
PR221DS-I	320	054693	054701
PR221DS-I	400	054694	054702
PR221DS-I	630	054708	055160
PR222DS/P-LSI	320	054695	054703
PR222DS/P-LSI	400	054696	054704
PR222DS/P-LSI	630	054709	055161
PR222DS/P-LSIG	320	054697	054705
PR222DS/P-LSIG	400	054698	054706
PR222DS/P-LSIG	630	054710	055162
PR222DS/PD-LSI	320	054711	054715
PR222DS/PD-LSI	400	054712	054716
PR222DS/PD-LSI	630	054719	054721
PR222DS/PD-LSIG	320	054713	054717
PR222DS/PD-LSIG	400	054714	054718
PR222DS/PD-LSIG	630	054720	054722

I_n

I_3

3 poles

1SDA.....R1

4 poles

Thermomagnetic release - TMA

TMA 320-3200	320	3200	054723	N= 50% 054725	N= 100% 054731
TMA 400-4000	400	4000	054724	054726	054732
TMA 500-5000	500	5000	054727	054729	054733

Thermomagnetic release for generator protection - TMG

TMG 320-1600	320	1600	055093	N= 100% 055101
TMG 400-2000	400	2000	055098	055102
TMG 500-2500	500	2500	055099	055103



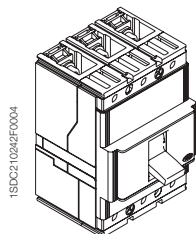
1SDC21024TF0004

Ordering codes

Motor protection circuit-breakers

T2N 160

Fixed (F)



$I_n (40\text{ °C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 36\text{ kA}$

F = Front terminals

I_n

I_3

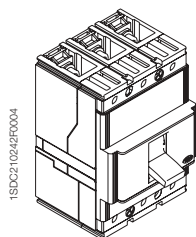
1SDA.....R1
3 poles

Magnetic release - MF and MA

T2N 160 F F	1	13	053110
T2N 160 F F	1.6	21	053111
T2N 160 F F	2	26	053112
T2N 160 F F	2.5	33	053113
T2N 160 F F	3.2	42	053114
T2N 160 F F	4	52	053115
T2N 160 F F	5	65	053116
T2N 160 F F	6.5	84	053117
T2N 160 F F	8.5	110	053118
T2N 160 F F	11	145	053119
T2N 160 F F	12.5	163	053120
T2N 160 F F	20	120...240	051207
T2N 160 F F	32	192...384	051208
T2N 160 F F	52	312...624	051209
T2N 160 F F	80	480...960	051210
T2N 160 F F	100	600...1200	051211

T2S 160

Fixed (F)



$I_n (40\text{ °C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

I_n

I_3

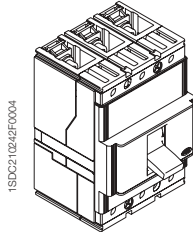
1SDA.....R1
3 poles

Magnetic release - MF and MA

T2S 160 F F	1	13	053121
T2S 160 F F	1.6	21	053122
T2S 160 F F	2	26	053123
T2S 160 F F	2.5	33	053124
T2S 160 F F	3.2	42	053125
T2S 160 F F	4	52	053126
T2S 160 F F	5	65	053127
T2S 160 F F	6.5	84	053128
T2S 160 F F	8.5	110	053129
T2S 160 F F	11	145	053130
T2S 160 F F	12.5	163	053131
T2S 160 F F	20	120...240	051216
T2S 160 F F	32	192...384	051217
T2S 160 F F	52	312...624	051218
T2S 160 F F	80	480...960	051219
T2S 160 F F	100	600...1200	051220

T2H 160

Fixed (F)



$I_u (40\text{ °C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 70\text{ kA}$

F = Front terminals

I_n

I_3

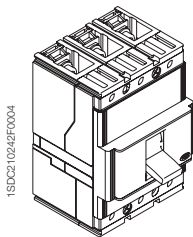
1SDA.....R1
3 poles

Magnetic release - MF and MA

T2H 160 F F	1	13	053132
T2H 160 F F	1.6	21	053133
T2H 160 F F	2	26	053134
T2H 160 F F	2.5	33	053135
T2H 160 F F	3.2	42	053136
T2H 160 F F	4	52	053137
T2H 160 F F	5	65	053138
T2H 160 F F	6.5	84	053139
T2H 160 F F	8.5	110	053140
T2H 160 F F	11	145	053141
T2H 160 F F	12.5	163	053142
T2H 160 F F	20	120...240	051224
T2H 160 F F	32	192...384	051225
T2H 160 F F	52	312...624	051226
T2H 160 F F	80	480...960	051227
T2H 160 F F	100	600...1200	051228

T2L 160

Fixed (F)



$I_u (40\text{ °C}) = 160\text{ A}$ - $I_{cu} (415\text{ V}) = 85\text{ kA}$

F = Front terminals

I_n

I_3

1SDA.....R1
3 poles

Magnetic release - MF and MA

T2L 160 F F	1	13	053143
T2L 160 F F	1.6	21	053144
T2L 160 F F	2	26	053145
T2L 160 F F	2.5	33	053146
T2L 160 F F	3.2	42	053147
T2L 160 F F	4	52	053148
T2L 160 F F	5	65	053149
T2L 160 F F	6.5	84	053150
T2L 160 F F	8.5	110	053151
T2L 160 F F	11	145	053152
T2L 160 F F	12.5	163	053153
T2L 160 F F	20	120...240	051232
T2L 160 F F	32	192...384	051233
T2L 160 F F	52	312...624	051234
T2L 160 F F	80	480...960	051235
T2L 160 F F	100	600...1200	051236

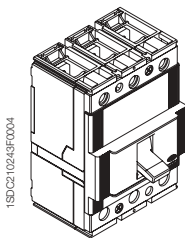


Ordering codes

Motor protection circuit-breakers

T3N 250

Fixed (F)



I_u (40 °C) = **250 A** - I_{cu} (415 V) = **36 kA**

F = Front terminals

I_n

I_3

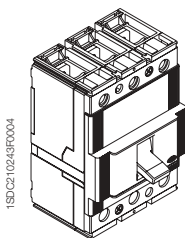
1SDA.....R1
3 poles

Magnetic release - MA

T3N 250 F F	100	600...1200	051315
T3N 250 F F	125	750...1500	051316
T3N 250 F F	160	960...1920	051317
T3N 250 F F	200	1200...2400	051318

T3S 250

Fixed (F)



I_u (40 °C) = **250 A** - I_{cu} (415 V) = **50 kA**

F = Front terminals

I_n

I_3

1SDA.....R1
3 poles

Magnetic release - MA

T3S 250 F F	100	600...1200	051320
T3S 250 F F	125	750...1500	051321
T3S 250 F F	160	960...1920	051322
T3S 250 F F	200	1200...2400	051323

T4N 250

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 250\text{ A}$ - $I_{cu} (415\text{ V}) = 36\text{ kA}$

F = Front terminals

I_n

1SDA.....R1
3 poles

Electronic release for motor protection

T4N 250 F F	PR222MP	100	054522
T4N 250 F F	PR222MP	160	054523
T4N 250 F F	PR222MP	200	054524

F = Front terminals

I_n

I_3

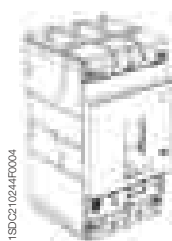
1SDA.....R1
3 poles

Magnetic release - MA

T4N 250 F F	10	60...140	055068
T4N 250 F F	25	150...350	055069
T4N 250 F F	52	312...728	055070
T4N 250 F F	80	480...1120	054296
T4N 250 F F	100	600...1400	054297
T4N 250 F F	125	750...1750	054298
T4N 250 F F	160	960...2240	054299
T4N 250 F F	200	1200...2800	054300

T4S 250

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 250\text{ A}$ - $I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

I_n

1SDA.....R1
3 poles

Electronic release for motor protection

T4S 250 F F	PR222MP	100	054525
T4S 250 F F	PR222MP	160	054526
T4S 250 F F	PR222MP	200	054527

F = Front terminals

I_n

I_3

1SDA.....R1
3 poles

Magnetic release - MA

T4S 250 F F	10	60...140	055071
T4S 250 F F	25	150...350	055072
T4S 250 F F	52	312...728	055073
T4S 250 F F	80	480...1120	054302
T4S 250 F F	100	600...1400	054303
T4S 250 F F	125	750...1750	054304
T4S 250 F F	160	960...2240	054305
T4S 250 F F	200	1200...2800	054306

T4L 250

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 250\text{ A}$ - $I_{cu} (415\text{ V}) = 120\text{ kA}$

F = Front terminals

I_n

1SDA.....R1
3 poles

Electronic release for motor protection

T4L 250 F F	PR222MP	100	054528
T4L 250 F F	PR222MP	160	054529
T4L 250 F F	PR222MP	200	054530

F = Front terminals

I_n

I_3

1SDA.....R1
3 poles

Magnetic release - MA

T4L 250 F F	10	60...140	055074
T4L 250 F F	25	150...350	055075
T4L 250 F F	52	312...728	058076
T4L 250 F F	80	480...1120	054308
T4L 250 F F	100	600...1400	054309
T4L 250 F F	125	750...1750	054310
T4L 250 F F	160	960...2240	054311
T4L 250 F F	200	1200...2800	054312

Ordering codes

Motor protection circuit-breakers

T4 trip units



1SDC210246F0004



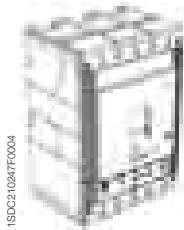
1SDC210246F0004

			1SDA.....R1	
			3 poles	
<i>Electronic release for motor protection</i>				
PR222MP		100		054688
PR222MP		160		054689
PR222MP		200		054690

			3 poles	1SDA.....R1	
				4 poles	
<i>Magnetic only release - MA</i>				N= 50%	N= 100%
MA 10-140	10	60...140	055077		055080
MA 25-350	25	150...350	055078		055081
MA 52-728	52	312...728	055079		055082
MA 80-1120	80	480...1120	054676		054682
MA 100-1400	100	600...1400	054677		054683
MA 125-1750	125	750...1750	054678	054684	
MA 160-2240	160	960...2240	054679	054685	
MA 200-2800	200	1200...2800	054680	054686	

T5N 400

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 400\text{ A} - I_{cu} (415\text{ V}) = 36\text{ kA}$

F = Front terminals

In

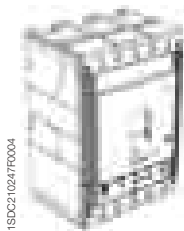
1SDA.....R1
3 poles

Electronic release for motor protection

T5N 400 F F	PR222MP	320	054551
T5N 400 F F	PR222MP	400	054552

T5S 400

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 400\text{ A} - I_{cu} (415\text{ V}) = 50\text{ kA}$

F = Front terminals

In

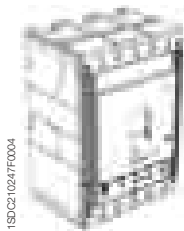
1SDA.....R1
3 poles

Electronic release for motor protection

T5S 400 F F	PR222MP	320	054553
T5S 400 F F	PR222MP	400	054554

T5L 400

Fixed (F)



$I_u (40\text{ }^{\circ}\text{C}) = 400\text{ A} - I_{cu} (415\text{ V}) = 120\text{ kA}$

F = Front terminals

In

1SDA.....R1
3 poles

Electronic release for motor protection

T5L 400 F F	PR222MP	320	054555
T5L 400 F F	PR222MP	400	054556

T5 trip units



In

1SDA.....R1
3 poles

Electronic release for motor protection

PR222MP	320	054735
PR222MP	400	054736

Ordering codes

Circuit-breakers for applications up to 1000 V

T4L 250

Fixed (F)



I_u (40 °C) = **250 A** - I_{cu} (1000 V AC) = **12 kA**

FC Cu = Front terminals for copper cables

I_n

1SDA.....R1
3 poles

Electronic release

T4L 250 F FC Cu (1x185mm ²)	PR221DS-LS/I	100	054505
T4L 250 F FC Cu (1x185mm ²)	PR221DS-I	100	054506
T4L 250 F FC Cu (1x185mm ²)	PR222DS/P-LSI	100	054507
T4L 250 F FC Cu (1x185mm ²)	PR222DS/P-LSIG	100	054508
T4L 250 F FC Cu (1x185mm ²)	PR221DS-LS/I	250	054509
T4L 250 F FC Cu (1x185mm ²)	PR221DS-I	250	054510
T4L 250 F FC Cu (1x185mm ²)	PR222DS/P-LSI	250	054511
T4L 250 F FC Cu (1x185mm ²)	PR222DS/P-LSIG	250	054512

T4V 250

Fixed (F)



I_u (40 °C) = **250 A** - I_{cu} (1000 V AC) = **20 kA**

FC Cu = Front terminals for copper cables

I_n

1SDA.....R1
3 poles

Electronic release

T4V 250 F FC Cu (1x185mm ²)	PR221DS-LS/I	100	054513
T4V 250 F FC Cu (1x185mm ²)	PR221DS-I	100	054514
T4V 250 F FC Cu (1x185mm ²)	PR222DS/P-LSI	100	054515
T4V 250 F FC Cu (1x185mm ²)	PR222DS/P-LSIG	100	054516
T4V 250 F FC Cu (1x185mm ²)	PR221DS-LS/I	250	054517
T4V 250 F FC Cu (1x185mm ²)	PR221DS-I	250	054518
T4V 250 F FC Cu (1x185mm ²)	PR222DS/P-LSI	250	054519
T4V 250 F FC Cu (1x185mm ²)	PR222DS/P-LSIG	250	054520

T4V 250

Fixed (F)



I_u (40 °C) = **250 A** - I_{cu} (1000 V AC) = **20 kA** / I_{cu} (1000 V DC) = **40 kA**

FC Cu = Front terminals
for copper cables

I_n

I_3

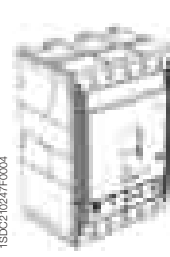
1SDA.....R1
4 poles

Thermomagnetic release - TMD and TMA

			N= 100%
T4V 250 F FC Cu (1x185mm ²)	32	320	054497
T4V 250 F FC Cu (1x185mm ²)	50	500	054498
T4V 250 F FC Cu (1x185mm ²)	80	800	054499
T4V 250 F FC Cu (1x185mm ²)	100	500...1000	054500
T4V 250 F FC Cu (1x185mm ²)	125	625...1250	054501
T4V 250 F FC Cu (1x185mm ²)	160	800...1600	054502
T4V 250 F FC Cu (1x185mm ²)	200	1000...2000	054503
T4V 250 F FC Cu (1x185mm ²)	250	1250...2500	054504

T5L 400

Fixed (F)



I_u (40 °C) = **400 A** - I_{cu} (1000 V AC) = **12 kA**

FC Cu = Front terminals for copper cables

I_n

1SDA.....R1
3 poles

Electronic release

T5L 400 F FC Cu (1x240mm ²)	PR221DS-LS/I	400	054535
T5L 400 F FC Cu (1x240mm ²)	PR221DS-I	400	054536
T5L 400 F FC Cu (1x240mm ²)	PR222DS/P-LSI	400	054537
T5L 400 F FC Cu (1x240mm ²)	PR222DS/P-LSIG	400	054538

T5V 400

Fixed (F)



$I_u (40\text{ °C}) = 400\text{ A}$ - $I_{cu} (1000\text{ V AC}) = 20\text{ kA}$

FC Cu = Front terminals for copper cables

In

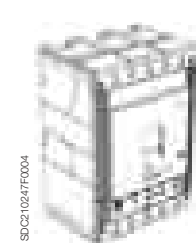
1SDA.....R1
3 poles

Electronic release

T5V 400 F FC Cu (1x240mm ²)	PR221DS-LS/I	400	054539
T5V 400 F FC Cu (1x240mm ²)	PR221DS-I	400	054540
T5V 400 F FC Cu (1x240mm ²)	PR222DS/P-LSI	400	054541
T5V 400 F FC Cu (1x240mm ²)	PR222DS/P-LSIG	400	054542

T5L 630

Fixed (F)



$I_u (40\text{ °C}) = 630\text{ A}$ - $I_{cu} (1000\text{ V AC}) = 12\text{ kA}$

FC Cu = Front terminals for copper cables

In

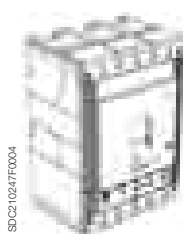
1SDA.....R1
3 poles

Electronic release

T5L 630 F FC Cu (2x240mm ²)	PR221DS-LS/I	630	054543
T5L 630 F FC Cu (2x240mm ²)	PR221DS-I	630	054544
T5L 630 F FC Cu (2x240mm ²)	PR222DS/P-LSI	630	054545
T5L 630 F FC Cu (2x240mm ²)	PR222DS/P-LSIG	630	054546

T5V 630

Fixed (F)



$I_u (40\text{ °C}) = 630\text{ A}$ - $I_{cu} (1000\text{ V AC}) = 20\text{ kA}$

FC Cu = Front terminals for copper cables

In

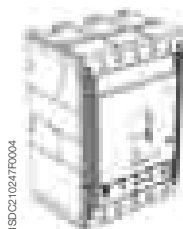
1SDA.....R1
3 poles

Electronic release

T5V 630 F FC Cu (2x240mm ²)	PR221DS-LS/I	630	054547
T5V 630 F FC Cu (2x240mm ²)	PR221DS-I	630	054548
T5V 630 F FC Cu (2x240mm ²)	PR222DS/P-LSI	630	054549
T5V 630 F FC Cu (2x240mm ²)	PR222DS/P-LSIG	630	054550

T5V 400

Fixed (F)



$I_u (40\text{ °C}) = 400\text{ A}$ - $I_{cu} (1000\text{ V AC}) = 20\text{ kA}$ / $I_{cu} (1000\text{ V DC}) = 40\text{ kA}$

FC Cu = Front terminals
for copper cables

In

I₃

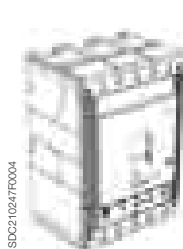
1SDA.....R1
4 poles

Thermomagnetic release - TMA

T5V 400 F FC Cu (1x240mm ²)	320	1600...3200	054531
T5V 400 F FC Cu (1x240mm ²)	400	2000...4000	054532

T5V 630

Fixed (F)



$I_u (40\text{ °C}) = 630\text{ A}$ - $I_{cu} (1000\text{ V AC}) = 20\text{ kA}$ / $I_{cu} (1000\text{ V DC}) = 40\text{ kA}$

FC Cu = Front terminals
for copper cables

In

I₃

1SDA.....R1
4 poles

Thermomagnetic release - TMA

T5V 630 F FC Cu (2x240mm ²)	500	2500...5000	054533
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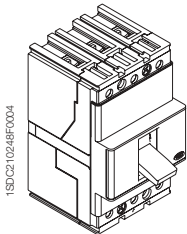


Ordering codes

Switch-disconnectors

T1D 160

Fixed (F)



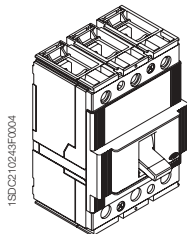
I_n (40 °C) = **160 A** - I_{cw} = **2 kA**

FC Cu = Front terminals for copper cables

	1SDA.....R1	
	3 poles	4 poles
T1D 160 F FC Cu (1x70mm ²)	051325	051326

T3D 250

Fixed (F)



I_n (40 °C) = **250 A** - I_{cw} = **3.6 kA**

F = Front terminals

	1SDA.....R1	
	3 poles	4 poles
T3D 250 F F	051327	051328

T4D 250



I_n (40 °C) = **250 A** - I_{cw} = **3.6 kA**

F = Front terminals

	1SDA.....R1	
	3 poles	4 poles
T4D 250 F F	057172	057173

T4D 320

Fixed (F)



$I_u (40\text{ °C}) = 320\text{ A}$ - $I_{cw} = 3.6\text{ kA}$

F = Front terminals

	1SDA.....R1	
	3 poles	4 poles
T4D 320 F F	054597	054598

T5D 400

Fixed (F)



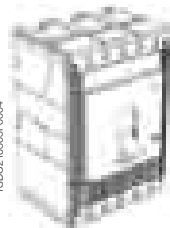
$I_u (40\text{ °C}) = 400\text{ A}$ - $I_{cw} = 6\text{ kA}$

F = Front terminals

	1SDA.....R1	
	3 poles	4 poles
T5D 400 F F	054599	054600

T5D 630

Fixed (F)



$I_u (40\text{ °C}) = 630\text{ A}$ - $I_{cw} = 6\text{ kA}$

F = Front terminals

	1SDA.....R1	
	3 poles	4 poles
T5D 630 F F	054601	054602

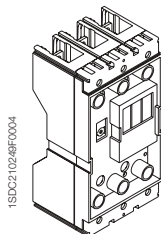


Ordering codes

Fixed parts, conversion kits and breaking units

Plug-in (P)

Fixed part



F = Front terminals	1SDA.....R1	
	3 poles	4 poles
T2 P FP F	051329	051330
T3 P FP F	051331	051332

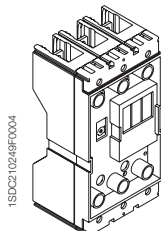
EF = Front extended terminals	1SDA.....R1	
	3 poles	4 poles
T4 P FP EF	054737	054740
T5 400 P FP EF	054749	054752
T5 630 P FP EF	054762	054765

VR = Rear flat vertical terminals	1SDA.....R1	
	3 poles	4 poles
T4 P FP VR	054738	054741
T5 400 P FP VR	054750	054753
T5 630 P FP VR	054763	054766

HR = Rear flat horizontal terminals	1SDA.....R1	
	3 poles	4 poles
T4 P FP HR	054739	054742
T5 400 P FP HR	054751	054754
T5 630 P FP HR	054764	054767

Withdrawable (W)

Fixed part



EF = Front extended terminals	1SDA.....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	1SDA.....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	1SDA.....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	1SDA.....R1	
	3 poles	4 poles
Kit P MP T2	051411	051412
Kit P MP T3	051413	051414
Kit P MP T4	054839	054840
Kit P MP T5 400	054843	054844
Kit P MP T5 630	054847	054848

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	1SDA.....R1	
	3 poles	4 poles
Kit W MP T4	054841	054842
Kit W MP T5 400	054845	054846
Kit W MP T5 630	054849	054850

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 (standard supply for interlocks with factory-mounted accessories), rotary handle or motor operator

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

Type	1SDA.....R1
Kit P FP RC T4	054851
Kit P FP RC T5 400	054852

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

Type	1SDA.....R1
Kit FP P in FP W T4	054854
Kit FP P in FP W T5	054855

Terminals for fixed parts T4 and T5

Type	1SDA.....R1	
	3 pieces	4 pieces
FC Cu T4 1x185mm ²	054831	054832
FC Cu T5 1x240mm ²	054833	054834
FC CuAl T4 1x185mm ²	054835	054836
FC CuAl T5 1x240mm ²	054837	054838
ES T5 (630 A)	055271	055272

Note: The FC Cu and FC CuAl terminals are supplied with insulating terminal covers for TC-FP fixed parts.



Ordering codes

Fixed parts, conversion kits and breaking units

Breaking units

T4 250

	1SDA.....R1	
	3 poles	4 poles
T4N 250 Breaking unit	054557	054562
T4S 250 Breaking unit	054558	054563
T4H 250 Breaking unit	054559	054564
T4L 250 Breaking unit	054560	054565
T4V 250 Breaking unit	054561	054566

T4 320

	1SDA.....R1	
	3 poles	4 poles
T4N 320 Breaking unit	054567	054572
T4S 320 Breaking unit	054568	054573
T4H 320 Breaking unit	054569	054574
T4L 320 Breaking unit	054570	054575
T4V 320 Breaking unit	054571	054576

T5 400

	1SDA.....R1	
	3 poles	4 poles
T5N 400 Breaking unit	054577	054582
T5S 400 Breaking unit	054578	054583
T5H 400 Breaking unit	054579	054584
T5L 400 Breaking unit	054580	054585
T5V 400 Breaking unit	054581	054586

T5 630

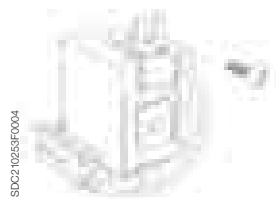
	1SDA.....R1	
	3 poles	4 poles
T5N 630 Breaking unit	054587	054592
T5S 630 Breaking unit	054588	054593
T5H 630 Breaking unit	054589	054594
T5L 630 Breaking unit	054590	054595
T5V 630 Breaking unit	054591	054596



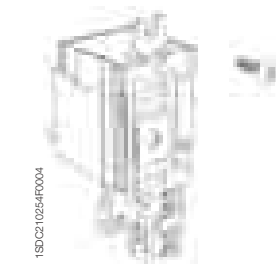
Ordering codes

Accessories

Services releases



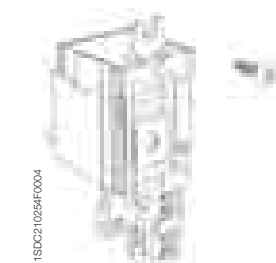
1SDC210253F0004



1SDC210254R0004



1SDC210253F0004



1SDC210254R0004

Shunt opening release - SOR

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
uncabled version		
SOR 12 V DC	053000	054862
SOR 24...30 V AC / DC	051333	054863
SOR 48...60 V AC / DC	051334	054864
SOR 110...127 V AC - 110...125 V DC	051335	054865
SOR 220...240 V AC - 220...250 V DC	051336	054866
SOR 380...440 V AC	051337	054867
SOR 480...525 V AC	051338	054868
cabled version		
SOR-C 12 V DC	053001	054869
SOR-C 24...30 V AC / DC	051339	054870
SOR-C 48...60 V AC / DC	051340	054871
SOR-C 110...127 V AC - 110...125 V DC	051341	054872
SOR-C 220...240 V AC - 220...250 V DC	051342	054873
SOR-C 380...440 V AC	051343	054874
SOR-C 480...525 V AC	051344	054875

Undervoltage release - UVR

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
uncabled version		
UVR 24...30 V AC / DC	051345	054880
UVR 48 V AC / DC	051346	054881
UVR 60 V AC/DC	052333	054882
UVR 110...127 V AC - 110...125 V DC	051347	054883
UVR 220...240 V AC - 220...250 V DC	051348	054884
UVR 380...440 V AC	051349	054885
UVR 480...525 V AC	051350	054886
cabled version		
UVR-C 24...30 V AC / DC	051351	054887
UVR-C 48 V AC / DC	051352	054888
UVR-C 60 V AC/DC	052335	054889
UVR-C 110...127 V AC - 110...125 V DC	051353	054890
UVR-C 220...240 V AC - 220...250 V DC	051354	054891
UVR-C 380...440 V AC	051355	054892
UVR-C 480...525 V AC	051356	054893

Shunt opening release with permanent operation - PS-SOR

Type	1SDA.....R1
	T4-T5
uncabled version	
PS-SOR 24...30 V DC	054876
PS-SOR 110...120 V AC	054877
cabled version	
PS-SOR-C 24...30 V DC	054878
PS-SOR-C 110...120 V AC	054879

Time delay device for undervoltage release - UVD

Type	1SDA.....R1
	T1...T5
UVD 24...30 V AC / DC	051357
UVD 48...60 V AC / DC	051358
UVD 110...125 V AC / DC	051360
UVD 220...250 V AC / DC	051361

Ordering codes

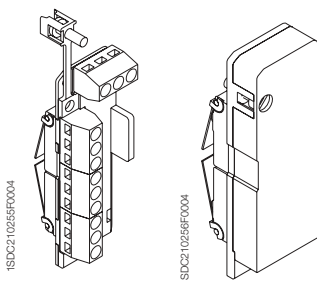
Accessories

Connectors for electrical accessories

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
Socket-plug connectors 12 poles	051362	051362
Socket-plug connectors 6 poles	051363	051363
Socket-plug connectors 3 poles	051364	051364
3-way connector for second SOR-C		055273
Kit 12 cables L=2m for AUX (3+1)	051365	
Kit 6 cables L=2m for AUX (1+1)	051366	
Kit 2 cables L=2m for SOR-UVR	051367	

Note: See table on page 3/23

Electrical signals



Auxiliary contacts - AUX

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
uncabled version ⁽¹⁾		
AUX 1Q 1SY 250 V AC/DC	051368	051368
AUX 3Q 1SY 250 V AC/DC	051369	051369
AUX 3Q 1SY 24 V AC/DC	054914	054914
cabled version ⁽¹⁾ with 1m long cables		
AUX-C 1Q 1SY 250 V AC/DC	051370	054910
AUX-C 3Q 1SY 250 V AC/DC	051371	054911
AUX-C 1Q 1SY 400 V AC		054912
AUX-C 2Q 400 V AC		054913
AUX-C 3Q 1SY 24 V AC/DC	055361	054915
cabled version for T2 with PR221DS release		
AUX-C 1S51 1Q SY	053704	
AUX-C 2Q 1SY	055504	
cabled contact in electronic version		
AUX-E-C 1Q 1SY		054916
cabled contact for signalling manual/remote operation		
AUX-MO-C ⁽²⁾		054917
cabled contact for signalling trip coil release trip		
AUX-SA 1 S51		055050

⁽¹⁾ These cannot be combined with Tmax T2 fitted with PR221DS electronic releases.

⁽²⁾ For T4 and T5 in plug-in/withdrawable version, it is necessary to order a socket-plug connector 3 poles 1SDA051364R1.

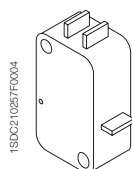
Auxiliary position contacts - AUP

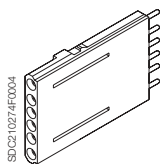
Type	1SDA.....R1	
	T2-T3	T4-T5
AUP T2-T3 - 1 contact signalling circuit-breaker racked-in	051372	
AUP-I T4-T5 24 V DC - 1 contact for signalling circuit-breakers racked-in		054920
AUP-I T4-T5 400 V AC/DC - 1 contact for signalling circuit-breakers racked-in		054918
AUP-R T4-T5 24 V DC - 1 contact for signalling circuit-breakers racked-out		054921
AUP-R T4-T5 400 V AC/DC - 1 contact for signalling circuit-breakers racked-out		054919



Early auxiliary contacts - AUE

Type	1SDA.....R1	
	T2-T3	T4-T5
AUE - 2 early contacts	051374	054925

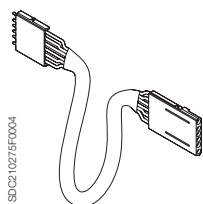




Adapters - ADP

Type	1SDA.....R1 T4-T5
ADP - Adapters 5pin	055173
ADP - Adapters 6pin	054922
ADP - Adapters 12pin	054923
ADP - Adapters 10pin	054924

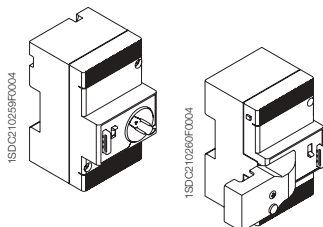
Note: See table on page 3/23



Testing extension

Type	1SDA.....R1 T4-T5
5-pin checking extension for blank tests on T4-T5 P/W service releases	055351
6-pin checking extension for blank tests on auxiliary contacts, (1+1) service and residual current releases T4-T5 P/W	055063
12-pin checking extension for blank tests on auxiliary contacts (3+1) T4-T5 P/W	055064
10-pin checking extension for blank tests on motor operator and early contacts T4-T5 P/W	055065

Motor operator



Solenoid operator - MOS

Type	1SDA.....R1 T1-T2-T3
Superimposed MOS 48...60 V DC	059596
Superimposed MOS 110...250 V AC/DC	059597
Note: it is always fitted with plug-socket	
Side-by-side MOS T1-T2 48...60 V DC	059598
Side-by-side MOS T1-T2 110...250 V AC / DC	059599
Note: it is always fitted with crimped cables	



Stored energy motor operator - MOE

Type	1SDA.....R1 T4-T5
MOE T4-T5 24 V DC	054894
MOE T4-T5 48...60 V DC	054895
MOE T4-T5 110...125 V AC/DC	054896
MOE T4-T5 220...250 V AC/DC	054897
MOE T4-T5 380 V AC	054898

Stored energy motor operator with electronics - MOE-E

Type	1SDA.....R1 T4-T5
MOE-E T4-T5 24 V DC	054899
MOE-E T4-T5 48...60 V DC	054900
MOE-E T4-T5 110...125 V AC/DC	054901
MOE-E T4-T5 220...250 V AC/DC	054902
MOE-E T4-T5 380 V AC	054903

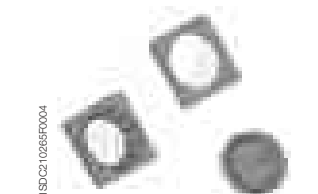
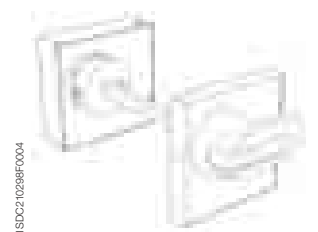
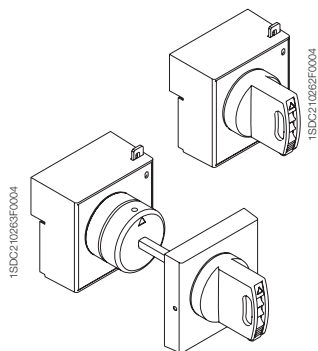
Note: always supplied complete with the AUX-E-C electronic auxiliary contact.



Ordering codes

Accessories

Rotary handle operating mechanism



Direct - RHD

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
RHD normal for fixed and plug-in	051381	054926
RHD_EM emergency for fixed and plug-in	051382	054927
RHD normal for withdrawable		054928
RHD_EM emergency for withdrawable		055234

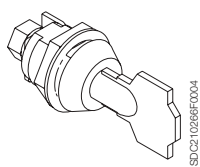
Transmitted - RHE

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
RHE normal for fixed and plug-in	051383	054929
RHE_EM emergency for fixed and plug-in	051384	054930
RHE normal for withdrawable		054933
RHE_EM emergency for withdrawable		054934
Individual components		
RHE_B just base for RHE for fixed and plug-in	051385	054931
RHE_B just base for RHE for withdrawable		054935
RHE_S just handle for 500mm per RHE	051386	054932
RHE_H just handle for RHE	051387	054936
RHE_H_EM just emergency handle for RHE	051388	054937

IP54 protection for rotary handle

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
RHE-IP54 protection kit IP54	051392	054938

Operating mechanism and locks

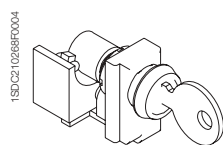
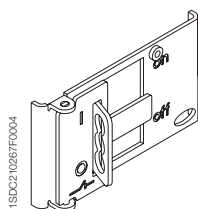
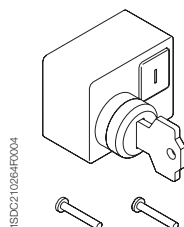
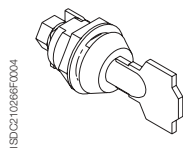


Key lock for rotary handle - RHL

Type	1SDA.....R1	
	T1-T2-T3	
RHL - different keys for each circuit-breaker/in open position	051389	
RHL - same keys for groups of circuit-breakers (N. 20005)	051390	
RHL - same keys for groups of circuit-breakers (N. 20006)	060147	
RHL - same keys for groups of circuit-breakers (N. 20007)	060148	
RHL - same keys for groups of circuit-breakers (N. 20008)	060149	
RHL - different keys for each circuit-breaker/in open-closed position	052021	

Key lock for front/rotary handle - KLF

Type	1SDA.....R1	
	T4-T5	
KLF-D - different key in open position	054939	
KLF-S - same key for different groups of circuit-breakers (N. 20005)	054940	
KLF-S - same key for different groups of circuit-breakers (N. 20006)	054941	
KLF-S - same key for different groups of circuit-breakers (N. 20007)	054942	
KLF-S - same key for different groups of circuit-breakers (N. 20008)	054943	



Key lock for motor operator - MOL

Type	1SDA.....R1 T4-T5
MOL-D - different key	054904
MOL-S - same key for different groups of circuit-breakers (N. 20005)	054905
MOL-S - same key for different groups of circuit-breakers (N. 20006)	054906
MOL-S - same key for different groups of circuit-breakers (N. 20007)	054907
MOL-S - same key for different groups of circuit-breakers (N. 20008)	054908
MOL-M - lock only on manual operation with same key	054909

Padlock lever lock - PLL

Type	1SDA.....R1 T1-T2-T3
PLL - plug-in in open position	051393
PLL - for T1 1p - plu-in in open position	060199
PLL - plate in open/closed position	051394
PLL - plate in open position	060534

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

Type	1SDA.....R1 T1-T2-T3
standard version	
KLC keys – the same key for sets of circuit-breakers – T1	053528
KLC keys – the same key for sets of circuit-breakers – T2	053529
KLC keys – the same key for sets of circuit-breakers – T3	053530
version with key removable in both positions	
KLC-S keys – the same key for sets of circuit-breakers – T1	051395
KLC-S keys – the same key for sets of circuit-breakers – T2	052015
KLC-S keys – the same key for sets of circuit-breakers – T3	052016

⁽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	1SDA.....R1 T4-T5
FLD - for fixed and plug-in	054944
FLD - for withdrawable	054945
FLD - for residual current	055366

Mechanical interlock - MIF

Type	1SDA.....R1 T1-T2-T3
MIF front interlocking plate between 2 circuit-breakers	051396
MIF front interlocking plate between 3 circuit-breakers	052165



Ordering codes

Accessories

Mechanical interlock - MIR

Type	1SDA.....R1	
	T3	T4-T5
MIR-H - rear horizontal mechanical interlock	063324	
MIR-V - rear vertical mechanical interlock	063325	
MIR-HB - frame unit horizontal interlock		054946
MIR-VB - frame unit vertical interlock		054947
MIR-P - plate for type A interlock T4 (F-P-W) + T4 (F-P-W)		054948
MIR-P - plate for type B interlock T4 (F-P-W) + T5 400 (F-P-W) o T5 630 (F)		054949
MIR-P - plate for type C interlock T4 (F-P-W) + T5 630 (P-W)		054950
MIR-P - plate for type D interlock T5 400 (F-P-W) o T5 630 (F) + T5 400 (F-P-W) o T5 630 (F)		054951
MIR-P - plate for type E interlock T5 400 (F-P-W) o T5 630 (F) + T5 630 (P-W)		054952
MIR-P - plate for type F interlock T5 630 (P-W) + T5 630 (P-W)		054953
Extra-code for circuit-breaker/fixed part mounted on the interlock		050093
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	1SDA.....R1
	T1-T2-T3
TMD release anti-adjustment seal	051397

Lock for fixed part of withdrawable circuit-breaker

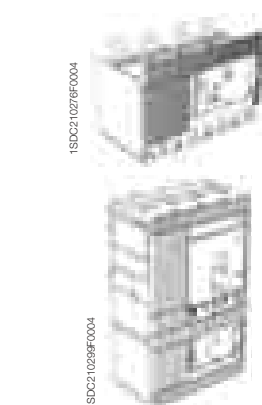
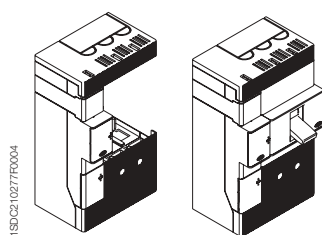
Type	1SDA.....R1
	T4-T5
KLF-D FP - Different key for each circuit-breaker	055230
KLF-S FP - Same key for different groups of circuit-breakers	055231
PLL FP - Lock padlocks	055232
KLF-D Ronis FP - Lock Ronis type	055233

Residual current release

SACE RC221, SACE RC222, SACE RC223

Type	1SDA.....R1	
	3 poles	4 poles
RC222/1 MOD 200 mm for T1		053869
RC221/1 for T1	051398	051401
RC222/1 for T1	051400	051402
RC221/2 for T2	051403	051405
RC222/2 for T2	051404	051406
RC221/3 for T3	051407	051409
RC222/3 for T3	051408	051410
RC222/4 for T4 250		054954
RC223/4 for T4 250		054956
RC222/5 for T5		054955

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

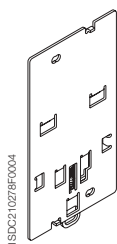


SACE RCQ

Type	1SDA.....R1 T1...T5
Relay and closed toroid - diameter 60 mm	037388
Relay and closed toroid - diameter 110 mm	037389
Relay and closed toroid - diameter 185 mm	050542
Relay and toroid which can be opened - diameter 110 mm	037390
Relay and toroid which can be opened - diameter 180 mm	037391
Relay and toroid which can be opened - diameter 230 mm	037392
Relay only	037393
Closed toroid only - diameter 60 mm	037394
Closed toroid only - diameter 110 mm	037395
Closed toroid only - diameter 185 mm	050543
Toroid which can be opened only - diameter 110 mm	037396
Toroid which can be opened only - diameter 180 mm	037397
Toroid which can be opened only - diameter 230 mm	037398

Note: Opening coil and undervoltage coil to be ordered separately

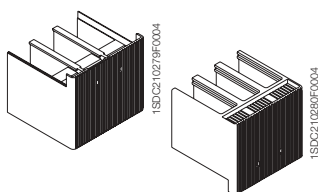
Installation accessories



Bracket for fixing onto DIN rail

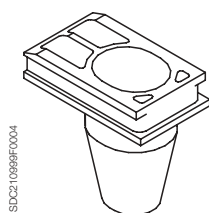
Type	1SDA.....R1 T1-T2-T3
DIN50022 T1-T2	051437
DIN50022 T3	051439
DIN50022 T1 - T2 for RC221/RC222	051937
DIN50022 T3 for RC221/RC222	051938
DIN50022 T1 -T2 for MOS side-by-side	051939
DIN50022 T1 for RC222 mod. 200 mm	053940

Connection terminals



High insulating terminal covers - HTC

Type	1SDA.....R1	
	3 poles	4 poles
HTC T1	051415	051416
HTC T2	051417	051418
HTC T3	051419	051420
HTC T4	054958	054959
HTC T5	054960	054961



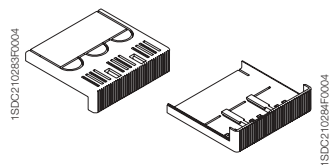
Protection for high insulating terminal covers - HTC-P

Type	1SDA.....R1	
	3 poles	4 poles
HTC-P T4	054962	054963
HTC-P T5	054964	054965



Ordering codes

Accessories



Low insulating terminal covers - LTC

Type	1SDA.....R1	
	3 poles	4 poles
LTC T1	051421	051422
LTC T2	051423	051424
LTC T3	051425	051426
LTC T4	054966	054967
LTC T5	054968	054969

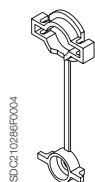
Terminal covers for fixed part - TC-FP

Type	1SDA.....R1	
	3 poles	4 poles
TC-FP T4	054857	054858
TC-FP T5 400	054859	054861



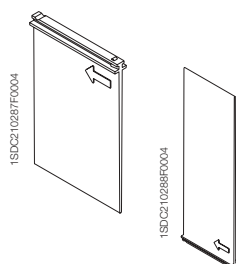
IP40 front protections for screw terminals - STC

Type	1SDA.....R1	
	3 poles	4 poles
STC T1	051431	051432
STC T2	051433	051434
STC T3	051435	051436



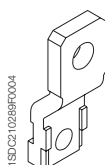
Sealable screws for terminal covers

Type	1SDA.....R1	
	T1...T5	
Sealable screws	051504	



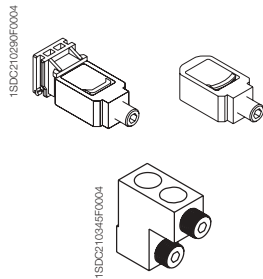
Separating partitions - PB

Type	1SDA.....R1	
	T1-T2-T3	T4-T5
PB100 low (H=100 mm) - 4 pieces - 3P	051427	
PB100 low (H=100 mm) - 6 pieces - 4P	051428	
PB200 high (H=200 mm) - 4 pieces - 3P	051429	
PB200 high (H=200 mm) - 6 pieces - 4P	051430	
PB100 low (H=100mm) - 4 pieces - 3P		054970
PB100 low (H=100mm) - 6 pieces - 4P		054971
PB200 high (H=200mm) - 4 pieces - 3P		054972
PB200 high (H=200mm) - 6 pieces - 4P		054973



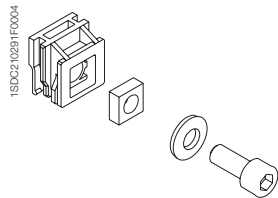
Front extended terminals - EF

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
EF T1	051442	051443	051440	051441
EF T2	051466	051467	051464	051465
EF T3	051490	051491	051488	051489
EF T4	055000	055001	054998	054999
EF T5	055036	055037	055034	055035



Front terminals for copper-aluminium cables - FC CuAl

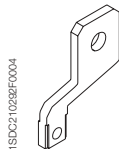
Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
FC CuAl T1 95mm ² - external terminal	051446	051447	051444	051445
FC CuAl T2 95mm ²	051458	051459	051456	051457
FC CuAl T2 2x95mm ² - external terminal	055153	055154	055151	055152
FC CuAl T2 185mm ² - external terminal	051462	051463	051460	051461
FC CuAl T3 2x150mm ² - external terminal	055157	055158	055155	055156
FC CuAl T3 185mm ²	051486	051487	051484	051485
FC CuAl T3 150...240mm ² - external terminal	051940	051941	051942	051943
FC CuAl T4 1x50mm ²	054984	054985	054982	054983
FC CuAl T4 2x150mm ²	054992	054993	054990	054991
FC CuAl T4 1x185mm ²	054988	054989	054986	054987
FC CuAl T5 400 2x120mm ²	055028	055029	055026	055027
FC CuAl T5 400 1x240mm ²	055020	055021	055018	055019
FC CuAl T5 400 1x300mm ²	055024	055025	055022	055023
FC CuAl T5 630 2x240mm ²	055032	055033	055030	055031



Front terminals - F ⁽¹⁾

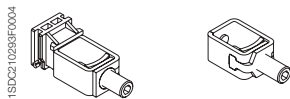
Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
F T2 - Plugs with screws	051450	051451	051448	051449
F T3 - Plugs with screws	051478	051479	051476	051477
F T4 - Plugs with screws	054976	054977	054974	054975
F T5 - Plugs with screws	055012	055013	055010	055011

⁽¹⁾ To be requested as loose kit.



Front extended spread terminals - ES

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
ES T2	051470	051471	051468	051469
ES T3	051494	051495	051492	051493
ES T4	055004	055005	055002	055003
ES T5	055040	055041	055038	055039



Front terminals for copper cables - FC Cu

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
FC Cu T2	051454	051455	051452	051453
FC Cu T3	051482	051483	051480	051481
FC Cu T4 1x185mm ²	054980	054981	054978	054979
FC Cu T5 1x240mm ²	055016	055017	055014	055015
FC Cu T5 2x240mm ²	055364	055365	055362	055363



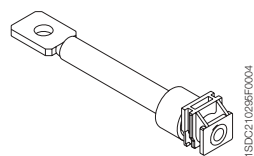
Front multi-cable terminals - MC

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
MC CuAl T4 6x35mm ²	054996	054997	054994	055995



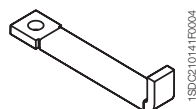
Ordering codes

Accessories



Rear orientated terminals - R

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
R T2	051474	051475	051472	051473
R T3	051498	051499	051496	051497
R T4	055008	055009	055006	055007
R T5	055044	055045	055042	055043

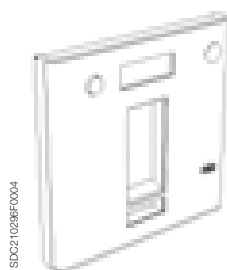


Rear flat horizontal terminals - HR

Type	1SDA.....R1			
	3 pieces	4 pieces	6 pieces	8 pieces
HR T1	053865	053866	053867	053868
HR RC221/222 T1		053987		

Kit for taking up voltage for auxiliaries

Type	1SDA.....R1	
	3 pieces	4 pieces
AuxV T2 for FC Cu	051500	051501
AuxV T3 for FC Cu	051502	051503
AuxV T4 for FC Cu	055046	055047
AuxV T4-T5 for F	055048	055049



Front display unit - FDU

Type	1SDA.....R1
FDU display unit for T4-T5 with PR222DS/P or PR222DS/PD	055051

Automatic transfer switch - ATS010

Type	1SDA.....R1
ATS010 for T3, T4 and T5	052927

Dialogue unit PR222DS/PD

Type	1SDA.....R1
	T4-T5
LSI	055066
LSIG	055067

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.



Accessories for electronic releases

Type	1SDA.....R1 T2-T4-T5
Connector X3 ⁽¹⁾ for PR222DS of fixed T4-T5	055059
Connector X3 ⁽¹⁾ for PR222DS of plug-in/withdrawable T4-T5	055061
Connector X4 ⁽¹⁾ for PR222DS of fixed T4-T5	055060
Connector X4 ⁽¹⁾ for PR222DS of plug-in/withdrawable T4-T5	055062
CT for withd. external neutral - T4 320	055055
CT for withd. external neutral - T4 250	055054
CT for withd. external neutral - T4 160	055053
CT for withd. external neutral - T4 100	055052
CT for withd. external neutral - T5 400	055057
CT for withd. external neutral - T5 320	055056
CT for withd. external neutral - T5 630	055058
TT1 - Test unit for T2, T4, T5 with electronic release	037121
PR010/T - Test and configuration unit for T4 and T5 with PR222DS/P, PR222DS/PD or PR222MP electronic releases	048964
PR021/K - Signalling unit for T4 and T5 with PR222DS/PD or PR222MP electronic releases	059146
PR212/CI - Contactor control for PR222MP T4-T5	050708
EP010 - Interface module for PR222DS/PD	059469

⁽¹⁾ For the use of X3 and X4 connectors, see page 3/35.



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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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