



Technical catalogue / May 2016

SACE Tmax. T Generation

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

Power and productivity
for a better world™



Circuit-breakers for power distribution

Electrical characteristics

2




















			Tmax T4 ⁽¹²⁾				
Rated uninterrupted current	[A]		250/320				
Poles	[No.]		3/4				
Rated service voltage, Ue	(AC) 50-60 Hz	[V]	690				
	(DC)	[V]	750				
Rated impulse withstand voltage, Uimp		[kV]	8				
Rated insulation voltage, Ui		[V]	1000				
Test voltage at industrial frequency for 1 min.		[V]	3500				
Rated ultimate short-circuit breaking capacity, Icu			N	S	H	L	V
(AC) 50-60 Hz 220/230 V	[kA]		70	85	100	200	200
(AC) 50-60 Hz 380/400/415 V	[kA]		36	50	70	120	200
(AC) 50-60 Hz 440 V	[kA]		30	40	65	100	180
(AC) 50-60 Hz 500 V	[kA]		25	30	50	85	150
(AC) 50-60 Hz 690 V	[kA]		20	25	40	70	80
(DC) 250 V - 2 poles in series	[kA]		36	50	70	100	150
(DC) 250 V - 3 poles in series	[kA]		—	—	—	—	—
(DC) 500 V - 2 poles in series	[kA]		25	36	50	70	100
(DC) 500 V - 3 poles in series	[kA]		—	—	—	—	—
(DC) 750 V - 3 poles in series	[kA]		16	25	36	50	70
Rated service short-circuit breaking capacity, Ics							
(AC) 50-60 Hz 220/230 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 380/400/415 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 440 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 500 V	[%Icu]		100%	100%	100%	100%	100%
(AC) 50-60 Hz 690 V	[%Icu]		100%	100%	100%	100%	100%
Rated short-circuit making capacity, Icm							
(AC) 50-60 Hz 220/230 V	[kA]		154	187	220	440	660
(AC) 50-60 Hz 380/400/415 V	[kA]		75,6	105	154	264	440
(AC) 50-60 Hz 440 V	[kA]		63	84	143	220	396
(AC) 50-60 Hz 500 V	[kA]		52,5	63	105	187	330
(AC) 50-60 Hz 690 V	[kA]		40	52,5	84	154	176
Opening time (415 V)	[ms]		5	5	5	5	5
Utilisation category (IEC 60947-2)			A				
Reference Standard			IEC 60947-2				
Isolation behaviour			■				
Trip units:	thermomagnetic						
	T fixed, M fixed	TMF	—				
	T adjustable, M fixed	TMD	■ (up to 50 A)				
	T adjustable, M adjustable (5...10 x In)	TMA	■ (up to 250 A)				
	T adjustable, M fixed (3 x In)	TMG	—				
	T adjustable, M adjustable (2,5...5 x In)	TMG	—				
	magnetic only	MA	■				
	electronic	PR221DS	■				
		PR221GP/PR221MP	—				
		PR222DS	■				
		PR223DS	■				
		PR231/P	—				
		PR232/P	—				
		PR331/P	—				
		PR332/P	—				
Interchangeability			■				
Versions			F-P-W				
Terminals	fixed		F-FC Cu-FC CuAl-EF-ES-R-MC				
	plug-in		EF-ES-HR-VR-FC Cu-FC CuAl				
	withdrawable		EF-ES-HR-VR-FC Cu-FC CuAl				
Fixing on DIN rail			—				
Mechanical life		[No. operations]	20000				
		[No. Hourly operations]	240				
Electrical life @ 415 V AC		[No. operations]	8000 (250 A) - 6000 (320 A)				
		[No. Hourly operations]	120				
Basic dimensions - fixed version	3 poles	W [mm]	105				
	4 poles	W [mm]	140				
		D [mm]	103,5				
		H [mm]	205				
Weight	fixed	3/4 poles [kg]	2,35/3,05				
	plug-in	3/4 poles [kg]	3,6/4,65				
	withdrawable	3/4 poles [kg]	3,85/4,9				

TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread

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

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

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

Tmax T5						Tmax T6 ⁽⁹⁾					Tmax T7				
400/630						630/800/1000					800/1000/1250/1600				
3/4						3/4					3/4				
690						690					690				
750						750					—				
8						8					8				
1000						1000					1000				
3500						3500					3500				
N	S	H	L	V		N	S	H	L	V	S	H	L	V ⁽⁶⁾	X ⁽¹⁰⁾
70	85	100	200	200		70	85	100	200	200	85	100	200	200	170
36	50	70	120	200		36	50	70	100	150	50	70	120	150	170
30	40	65	100	180		30	45	50	80	120	50	65	100	130	170
25	30	50	85	150		25	35	50	65	85	40	50	85	100	170
20	25	40	70	80		20	22	25	30	40	30	42	50	60	75
36	50	70	100	150		36	50	70	100	—	—	—	—	—	—
—	—	—	—	—		—	—	—	—	—	—	—	—	—	—
25	36	50	70	100		20	35	50	65	70	—	—	—	—	—
—	—	—	—	—		—	—	—	—	—	—	—	—	—	—
16	25	36	50	70		16	20	36	50	50	—	—	—	—	—
	100%	100%	100%	100%	100%	100%	100%	100%	75%	100%	100%	100%	100%	100%	100%
	100%	100%	100%	100%	100%	100%	100%	100%	75%	75% (120)	100%	100%	100%	100%	100%
	100%	100%	100%	100%	100%	100%	100%	100%	75%	75% (100)	100%	100%	100%	100%	100%
	100%	100%	100%	100% ⁽¹⁾	100% ⁽²⁾	100%	100%	100%	75%	75% (65)	100%	100%	75%	100%	100%
	100%	100%	100% ⁽¹⁾	100% ⁽²⁾	100% ⁽²⁾	75%	75%	75%	75%	75%	100%	75%	75%	75%	100%
	154	187	220	440	660	154	187	220	440	440	187	220	440	440	374
	75,6	105	154	264	440	75,6	105	154	220	330	105	154	264	330	374
	63	84	143	220	396	63	94,5	105	176	264	105	143	220	286	374
	52,5	63	105	187	330	52,5	73,5	105	143	187	84	105	187	220	374
	40	52,5	84	154	176	40	46	52,5	63	84	63	88,2	105	132	165
	6	6	6	6	6	10	9	8	7	7	15	10	8	8	8
B (400 A) ⁽³⁾ - A (630 A)						B (630A - 800A) ⁽⁹⁾ - A (1000A)					B ⁽⁷⁾ - A (T7X)				
IEC 60947-2						IEC 60947-2					IEC 60947-2				
															
—						—					—				
—						—					—				
 (up to 500 A)						 (up to 800 A) ⁽⁴⁾					—				
—						—					—				
 (up to 500 A)						—					—				
—						—					—				
											—				
—						—					—				
											—				
											—				
—						—					 ⁽¹¹⁾				
—						—					 ⁽¹¹⁾				
—						—									
—						—									
															
F-P-W						F-W ⁽⁴⁾					F-W ⁽¹¹⁾				
F-FC CuAl-EF-ES-R-RC						F-FC CuAl-EF-ES-R-RC					F-EF-ES ⁽¹¹⁾ -FC CuAl-HR/VR				
EF-ES-HR-VR-FC Cu-FC CuAl						—					—				
EF-ES-HR-VR-FC Cu-FC CuAl						EF-HR-VR					EF-HR/VR-RS-ES				
—						—					—				
20000						20000					10000				
120						120					60				
7000 (400 A) - 5000 (630 A)						7000 (630A) - 5000 (800A) - 4000 (1000A)					2000 (S, H, L versions) / 3000 (V, X versions)				
60						60					60				
140						210					210				
186						280					280				
103,5						103,5					154 (manual) /178 (motorizable)				
205						268					268				
3,25/4,15						9,5/12					9,7/12,5 (manual) - 11/14 (motorizable)				
5,15/6,65						—					—				
5,4/6,9						12,1/15,1					29,7/39,6 (manual) - 32/42,6 (motorizable)				

Circuit-breakers for power distribution

Electronic trip units

2

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

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

Characteristics of the Tmax electronic trip units

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

- For Tmax T4, T5 and T6 the protection trip unit consists of:
- 3 or 4 current sensors (current transformers)
 - external current sensors (e.g. for the external neutral), when available
 - a trip unit
 - a trip coil integrated in the electronic trip unit.
- For Tmax T7 the protection trip unit consists of:
- 3 or 4 current sensors (Rogowski coils and current transformers)
 - external current sensors (e.g. for the external neutral)
 - interchangeable rating plug
 - a trip unit
 - a trip coil housed in the body of the circuit-breaker.





Current sensors

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

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

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









Basic protection functions

	(L) Protection against overload This protection function trips when there is an overload with inverse long-time delay trip according to the IEC 60947-2 Standard ($I^2t=k$). The protection cannot be excluded.
	(S) Protection against short-circuit with time delay This protection function trips when there is a short-circuit, with long inverse time-delay trip ($I^2t=k$ ON) or a constant trip time ($I^2t=k$ OFF). The protection can be excluded.
	(I) Instantaneous protection against short-circuit This protection function trips instantaneously in case of a short-circuit. The protection can be excluded.
	(G) Protection against earth fault The protection against earth fault trips when the vectorial sum of the currents passing through the current sensors exceeds the set threshold value, with long inverse time-delay trip ($I^2t=k$ ON) or a constant trip time ($I^2t=k$ OFF). The protection can be excluded.

Advanced protection functions

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

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

 IEC 60255-3	(L) Protection against overload (IEC 60255-3) This protection trips in case of an overload with inverse long-time delay according to IEC 60255-3 Standard, for the coordination with fuses and MV protections. The protection can be excluded.
	(U) Protection against unbalanced phase The protection function against unbalanced phase U can be used in those cases where a particularly precise control is needed regarding missing and/or unbalance of the phase currents. The trip time is instantaneous. The protection can be excluded.
	(OT) Protection against overtemperature The protection against overtemperature trips instantaneously when the temperature inside the trip unit exceeds 85 °C, in order to prevent any temporary or continual malfunction of the microprocessor. The protection cannot be excluded.
	(Rc) Protection against residual current ⁽¹⁾ This integrated protection is based on current measurements made by an external toroid and is alternative to protection against earth fault G. The protection can be excluded.
	(ZS) Zone selectivity ⁽²⁾ ZS zone selectivity is an advanced method for carrying out coordination of the protections in order to reduce the trip times of the protection closest to the fault in relation to the time foreseen by time selectivity. Zone selectivity can be applied to the protection functions S and G, with constant time-delay trip. The protection can be excluded.
	(UV, OV, RV) Protections against voltage The three protections trip with a constant time-delay in the case of undervoltage, overvoltage and residual voltage respectively. The latter allows to detect interruptions of the neutral (or of the earthing conductor in systems with earthed neutral) and faults which cause movement of the star centre in systems with isolated neutral (e.g. large earth faults) to be identified. Movement of the star centre is calculated by vectorially summing the phase voltages. The protections can be excluded.
	(RP) Protection against reversal of power The protection against reversal power causes tripping of the breaker, with constant time-delay trip, when the flow of power reverses sign and exceeds, as an absolute value, the set threshold. It is particularly suitable for protection of large machines such as generators. The protection can be excluded.
	(UF, OF) Protections of frequency The two protections detect the variation in network frequency above or below the adjustable thresholds, opening the circuit-breaker, with constant time-delay trip. The protection can be excluded.

⁽¹⁾ It is not suitable for human protection.

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

Circuit-breakers for power distribution

Electronic trip units

Electronic trip units for power distribution

2

SACE PR221DS



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

SACE PR222DS/P



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

SACE PR222DS/PD



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

SACE PR223DS



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

SACE Ekip E-LSIG



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

SACE PR231/P



	PR231/P	PR231/P
Protection functions	L S / I	I

SACE PR232/P



	PR232/P
Protection functions	L S I

SACE PR331/P



	PR331/P
Protection functions	L S I G

SACE PR332/P



	PR332/P	PR332/P	PR332/P	PR332/P
Protection functions	L I	L S I	L S I G ⁽¹⁾	L S I R_d
Advanced protection function ⁽²⁾	L ⁽³⁾ U OT	L ⁽³⁾ U OT	L ⁽³⁾ U OT	L ⁽³⁾ U OT
Opt. ⁽⁴⁾	UV OV RV RP UF OF	UV OV RV RP UF OF	UV OV RV RP UF OF	UV OV RV RP UF OF

⁽¹⁾ In alternative to R_c (with external toroid).

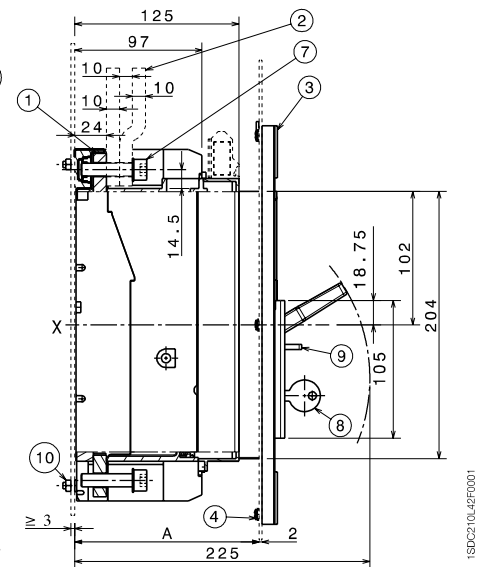
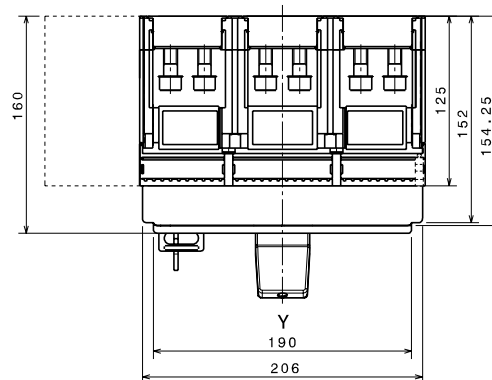
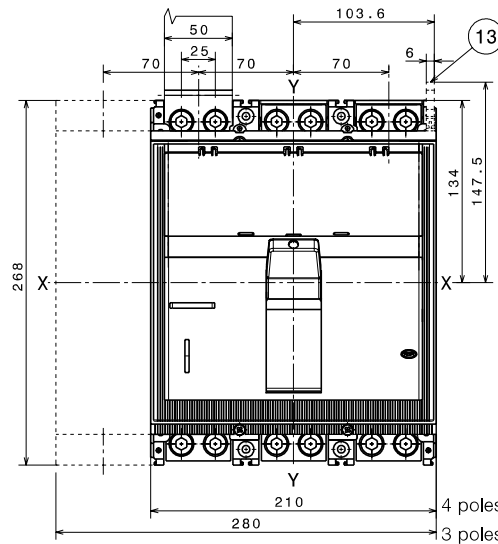
⁽²⁾ For all versions.

⁽³⁾ Available with PR330/V. Measurement module.

⁽⁴⁾ According to IEC 60255-3.

Front - F

- ① Front terminals for flat connection
- ② Busbars
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 18 Nm
- ⑧ Key lock (optional)
- ⑨ Padlock (optional)
- ⑩ Tightening torque: 2.5 Nm
- ⑪ Sheet drilling for compartment door with flange
- ⑫ Sheet drilling for compartment door for front 206 x 204
- ⑬ Terminal for auxiliary contacts
- ⑭ Reduce flange for the compartment door (optional)
- ⑮ Sheet drilling for compartment door with reduced flange
- ⑯ Sheet drilling for compartment door for front 190 x 105



USDC2101 58E0001

	With flange	Without flange
A	125...141	147

Technical drawing of a rectangular plate. The overall height is 245 mm. A section line X-X is shown at the bottom. A dimension of 122.5 mm is indicated from the top edge to the centerline of the section. The width is labeled C. A feature is labeled 6. A hole is specified as Ø 5.5 - M5. A dimension of 35 mm is shown from the right edge to the centerline of the section. The section is labeled Y-Y.

	III	IV
C	70	140

Figure 1 consists of four schematic diagrams of rectangular structures, labeled 11, 12, 15, and 16. Each diagram shows a central rectangle with various dimensions and labels.

- Diagram 11:** A rectangle with a central inner rectangle. The outer rectangle has a width of 241 and a height of 144.5. The inner rectangle has a width of 226 and a height of 151. The distance between the inner and outer rectangles is 14.5 on the right side. The left side is labeled 'X' and the bottom side is labeled 'Y'.
- Diagram 12:** A rectangle with a central inner rectangle. The outer rectangle has a width of 208 and a height of 103. The inner rectangle has a width of 206 and a height of 103. The distance between the inner and outer rectangles is 1 on the right side. The left side is labeled 'X' and the bottom side is labeled 'Y'.
- Diagram 15:** A rectangle with a central inner rectangle. The outer rectangle has a width of 201 and a height of 116. The inner rectangle has a width of 24 and a height of 24.25. The distance between the inner and outer rectangles is 24.25 on the right side. The left side is labeled 'X' and the bottom side is labeled 'Y'.
- Diagram 16:** A rectangle with a central inner rectangle. The outer rectangle has a width of 192 and a height of 107. The inner rectangle has a width of 19.75 and a height of 19.75. The distance between the inner and outer rectangles is 19.75 on the right side. The left side is labeled 'X' and the bottom side is labeled 'Y'.

SDC210L43F0001

Overall dimensions

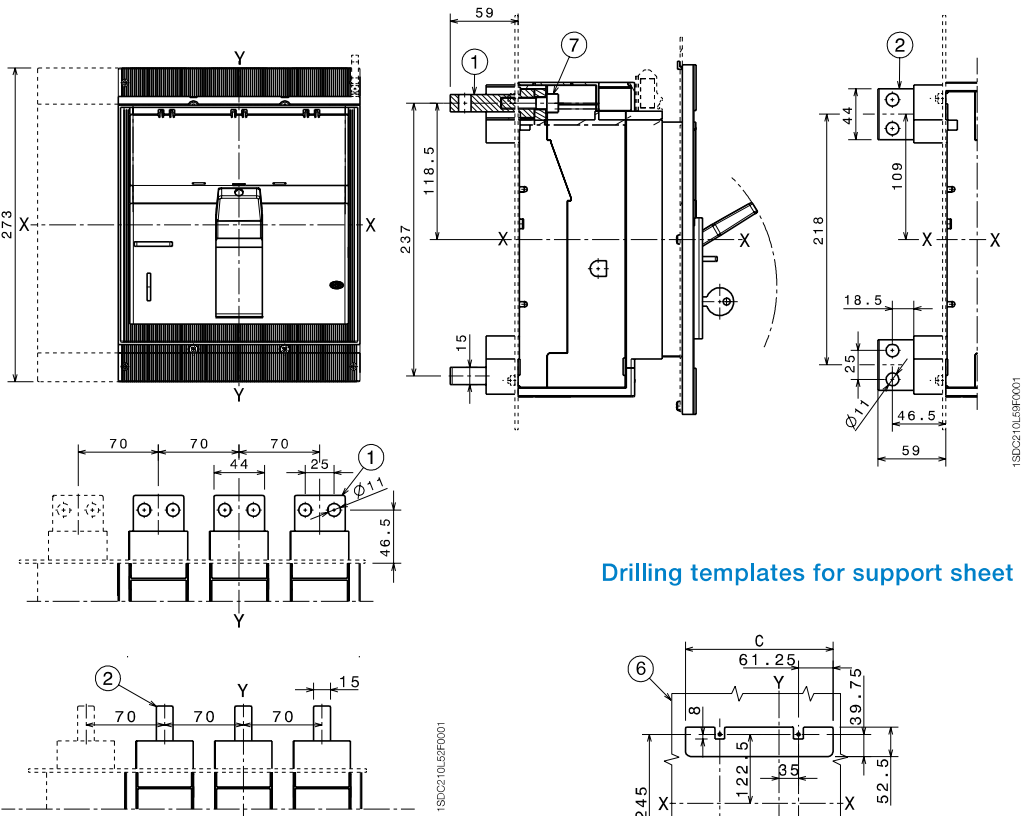
Tmax T7

Terminals

Rear flat horizontal or vertical - HR/VR

Caption

- ① Rear horizontal terminals
- ② Rear vertical terminals
- ⑥ Support sheet drilling template
- ⑦ Tightening torque: 20 Nm



Drilling templates for support sheet

	III	IV
B	70	140
C	192.5	262.5

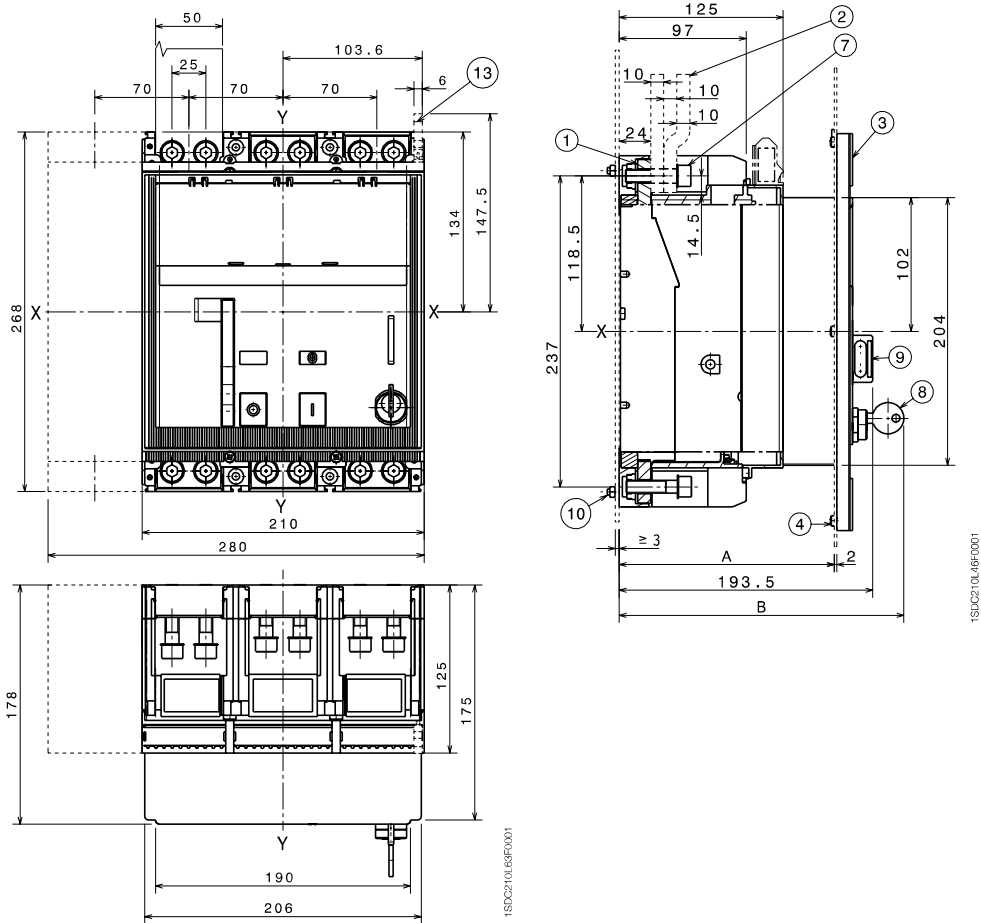
Overall dimensions

Tmax T7M

Fixed circuit-breaker Front - F

Caption

- ① Front terminal for flat connection
- ② Busbars
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 18 Nm
- ⑧ Key lock (optional)
- ⑨ Padlock (optional)
- ⑩ Tightening torque: 2.5 Nm
- ⑪ Compartment door with flange sheet drilling
- ⑫ Compartment door without flange sheet drilling
- ⑬ Terminal for auxiliary contacts

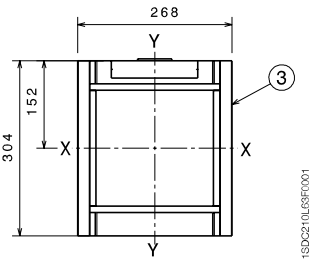


	With flange	Without flange
A	125...164	170

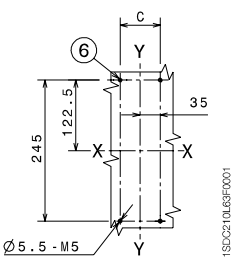
	Standard	Ronis	Profalux	Kirk	Castell
B	208	216	224	no	no

	III	IV
C	70	140

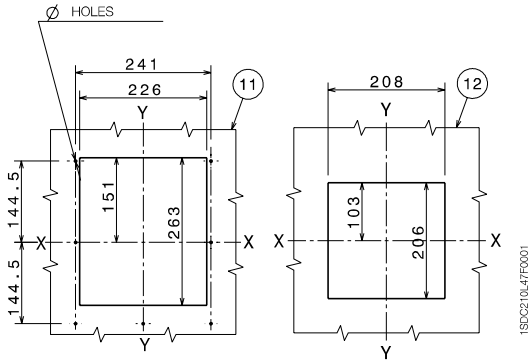
Flange for the compartment door (supplied as standard)



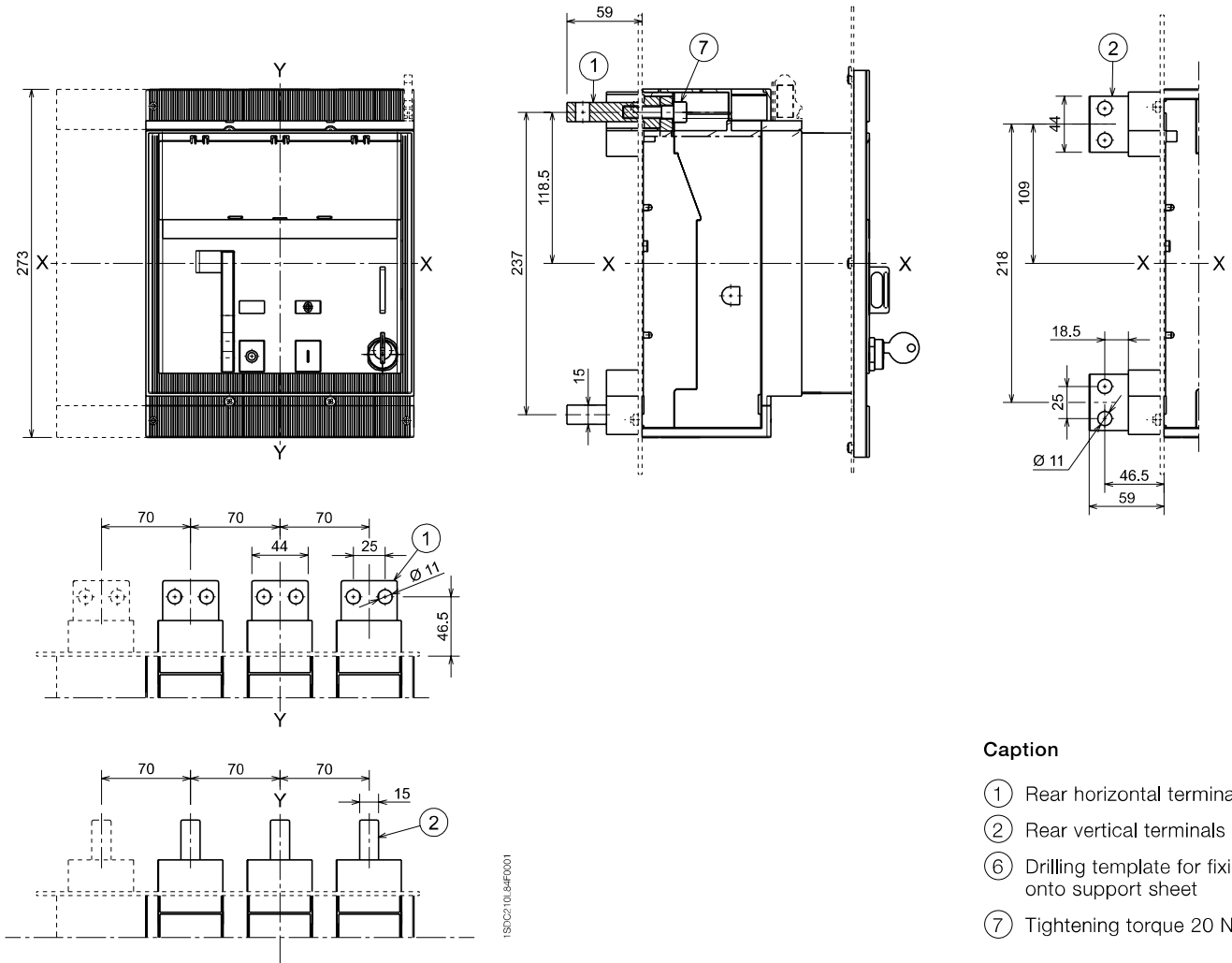
Drilling templates for support sheet



Drilling templates of the compartment door



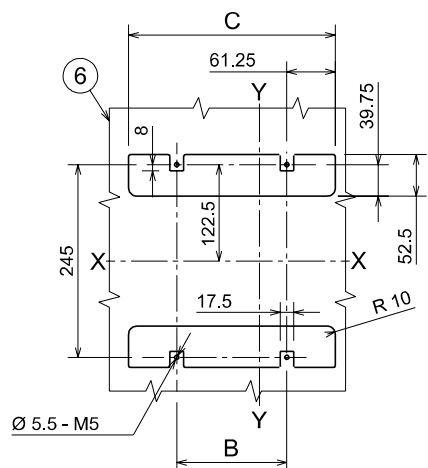
Rear flat horizontal or vertical - HR/VR



Caption

- ① Rear horizontal terminals
- ② Rear vertical terminals
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque 20 Nm

Drilling templates for support sheet



	III	IV
B	70	140
C	192.5	262.5

6

6



Drilling templates for support sheet

- ## Drilling templates for support sheet



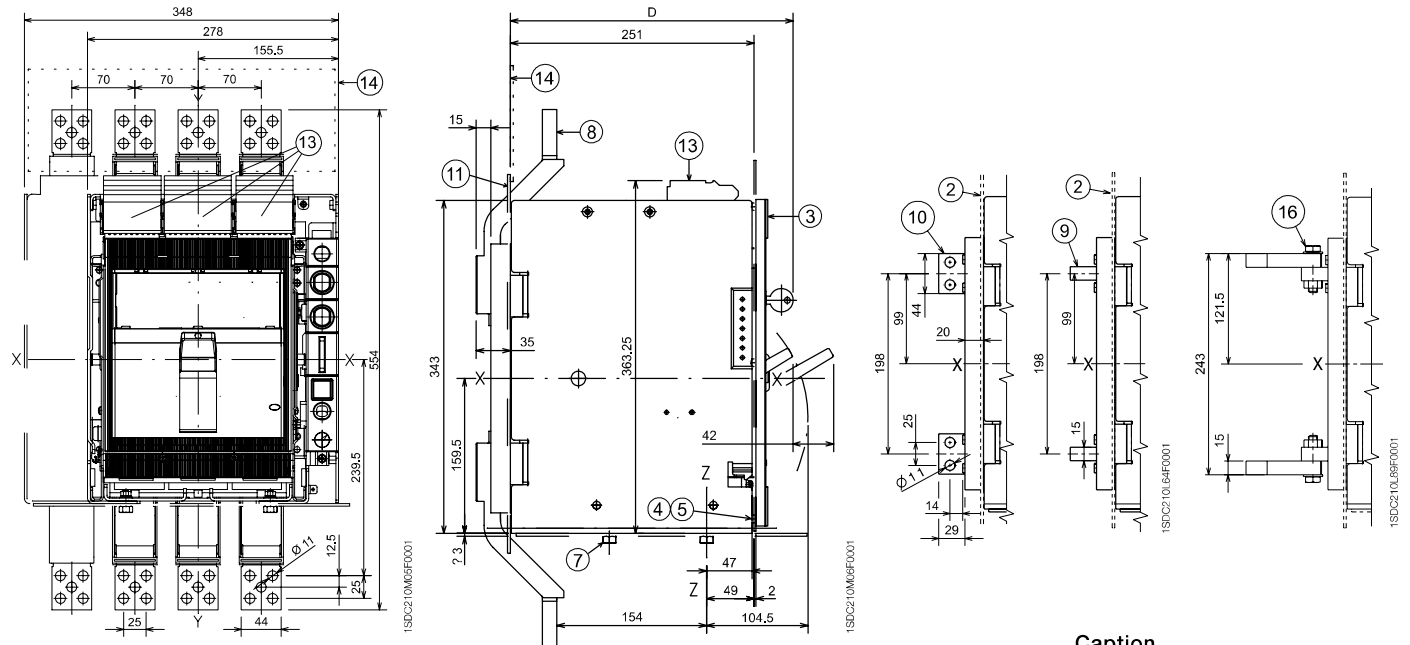
	III	IV
B	70	140
C	192.5	262.5

Overall dimensions

Tmax T7

Withdrawable circuit-breaker

Fixing on sheet

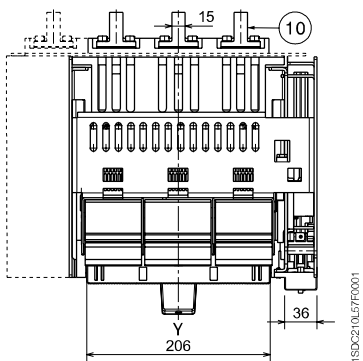


Caption

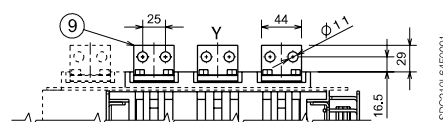
- ① Compartment door with flange sheet drilling
- ② Rear segregation for rear terminals
- ③ Compartment door flange
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑥ Drilling template for fixing onto support sheet
- ⑦ Tightening torque: 21 Nm
- ⑧ Front terminals
- ⑨ Rear horizontal terminals
- ⑩ Rear vertical terminals
- ⑪ Rear segregation for front terminals
- ⑫ Flange for compartment door
- ⑬ Auxiliary contact terminal
- ⑭ Insulating protection
- ⑮ Rear spread terminals (4 poles)
- ⑯ Tightening torque 18 Nm
- ⑰ Rear spread terminals (3 poles)

Terminals

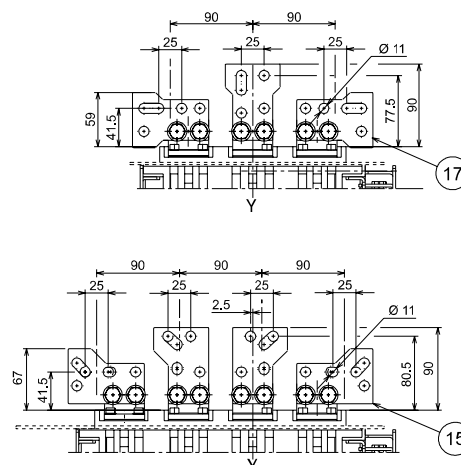
Rear flat vertical - VR



Rear flat horizontal - HR



Rear spread terminal - RS

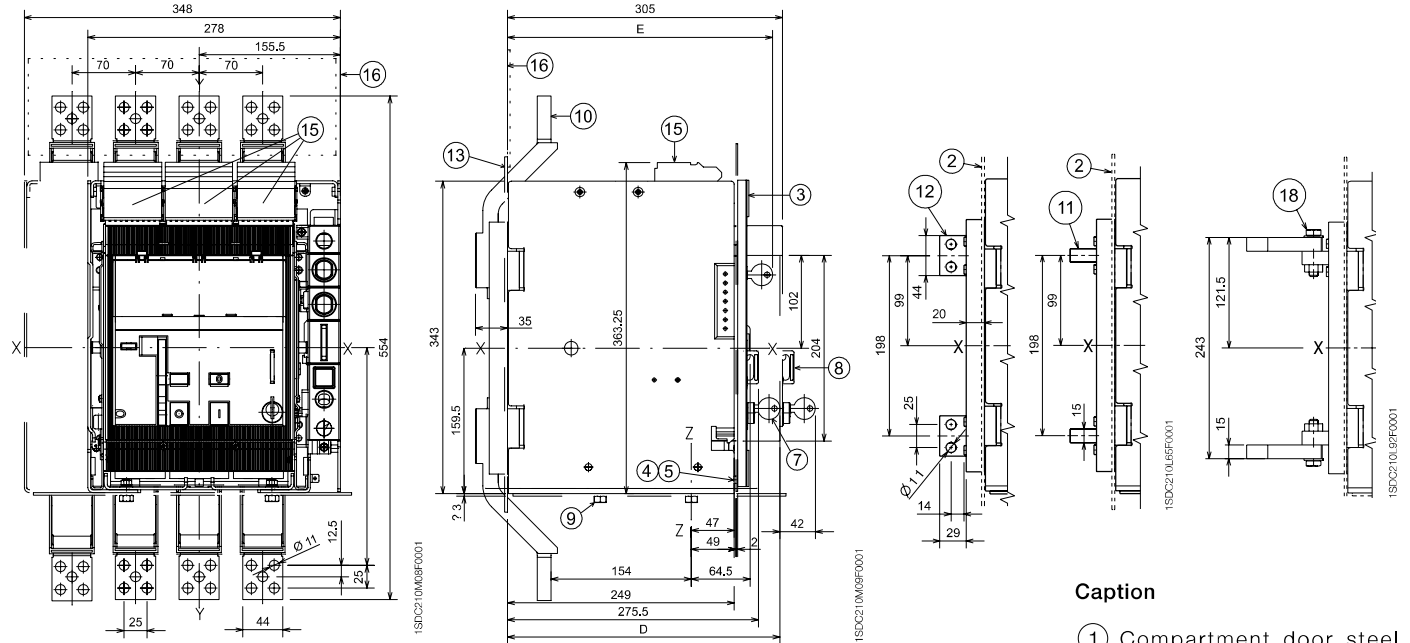


Overall dimensions

Tmax T7M

Withdrawable circuit-breaker

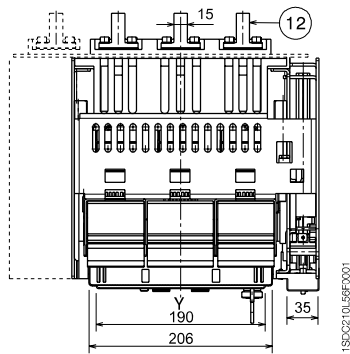
Front extended - EF



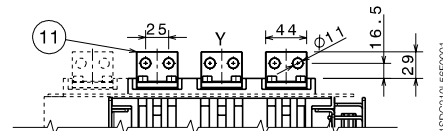
Caption

- ① Compartment door steel sheet drilling for flange
- ② Rear segregation for rear terminals
- ③ Flange for the compartment door
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑦ Key lock (optional)
- ⑧ Padlock (optional)
- ⑨ Tightening torque: 21 Nm
- ⑩ Front terminal
- ⑪ Rear horizontal terminal
- ⑫ Rear vertical terminal
- ⑬ Rear segregation for front terminals
- ⑭ Flange for compartment door
- ⑮ Overall dimensions of the auxiliary contact terminals
- ⑯ Insulating protection
- ⑰ Rear spread terminals (4 poles)
- ⑱ Tightening torque 18 Nm
- ⑲ Rear spread terminals (3 poles)

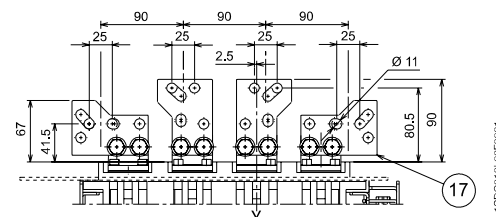
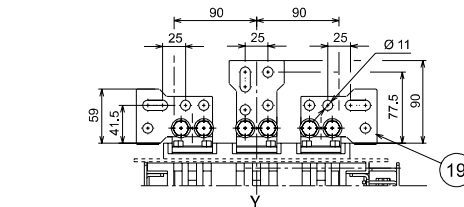
Rear flat vertical - VR



Rear flat horizontal - HR



Rear spread terminal - RS

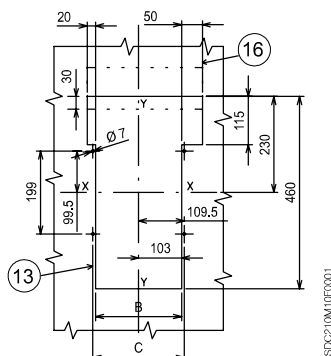
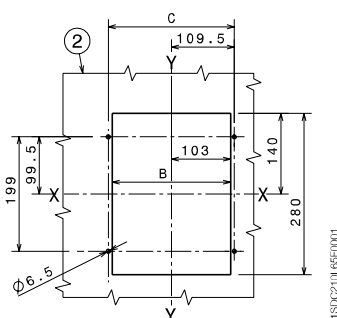


Front extended spread - ES



- ① Drilling a hole in the sheet metal door to the compartment with the flange for the RS-VR-HR-EF-ES terminals
- ② Rear segregation for rear terminals
- ④ Flange fixing screws
- ⑤ Tightening torque: 1.5 Nm
- ⑥ Drilling template for fixing onto support sheet
- ⑩ Front terminal
- ⑬ Rear segregation for front terminals
- ⑭ Flange for compartment door
- ⑮ Clamp for auxiliary contacts
- ⑯ Insulating protection
- ⑳ Spread terminals

6

[illegible]

	Standard	Ronis	Profalux	Kirk	Castell
D	290	298	306	NO	NO
E	287	291	299	298	328