



Medium Voltage Products

HD4 according to IEC and GOST standards
Gas insulated MV circuit-breakers
12...40.5 kV - 630...3600 A - 16...50 kA



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General information

HD4 medium voltage circuit-breakers use sulphur hexafluoride gas (SF₆) to extinguish the electric arc and as the insulating medium.

Breaking in SF₆ gas takes place without any arc chopping and without generation of overvoltages. These characteristics ensure long electrical life of the circuit-breaker and limited dynamic, dielectric and thermal stresses on the installation. The circuit-breaker poles, which make up the breaking part, are systems with lifelong sealed pressure (IEC 62271-100 and CEI 17-1 Standards) and are maintenance-free.

The ESH type mechanical operating mechanism, with stored energy has free release and allows opening and closing operations independently of the operator's actions.

The operating mechanism and the poles are fixed to the metal structure which also acts as a support for the kinetics for operating the moving contacts. Circuit-breakers in the withdrawable version are fitted with a truck to allow racking in and racking out of the switchboard or enclosure.

The light and compact structure of the circuit-breaker ensures great sturdiness and excellent mechanical reliability.

Available versions

HD4 circuit-breakers are available in the fixed and withdrawable version with front operating mechanism.

The withdrawable version is available for: CBE enclosures, CBF fixed parts, PowerCube modules and UniGear type ZS1 switchboards.

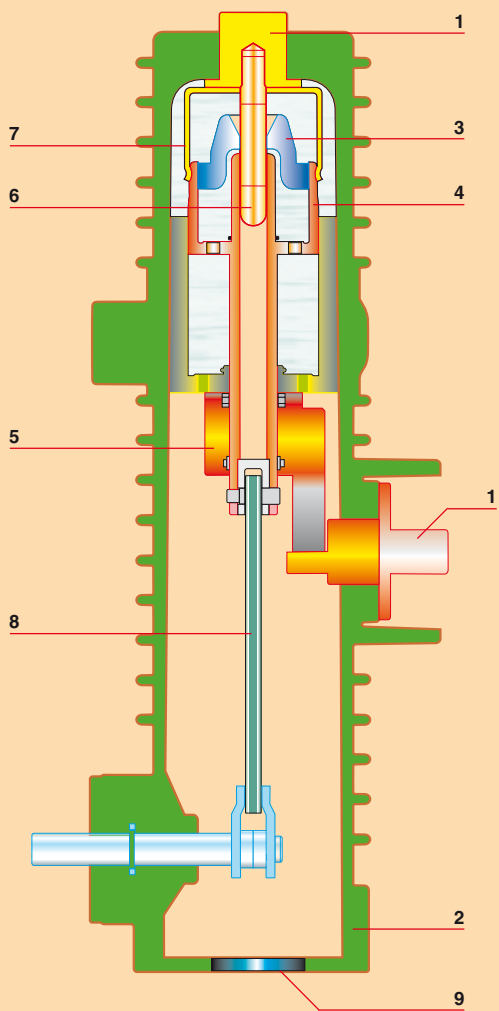
- Autopuffer breaking technique
- Electric arc extinction without chopped current
- No restriking after breaking
- Rapid recovery of the dielectric properties of the means of extinction
- Withstand insulation voltage even at zero relative pressure (*)
- Breaking up to 30% of the rated breaking capacity even at zero relative pressure (*)
- Sealed-for-life poles
- Test for checking gas tightness carried out three times on each piece of apparatus
- Compact dimensions
- Fixed and withdrawable version
- Stored energy operating mechanism with anti-pumping device as standard common to the whole circuit-breaker series
- Mechanical safety locks against incorrect operations
- Simple personalisation thanks to a complete range of accessories
- Maintenance-free
- SF₆ gas pressure control device (on request).

(*) Up to 24 kV.

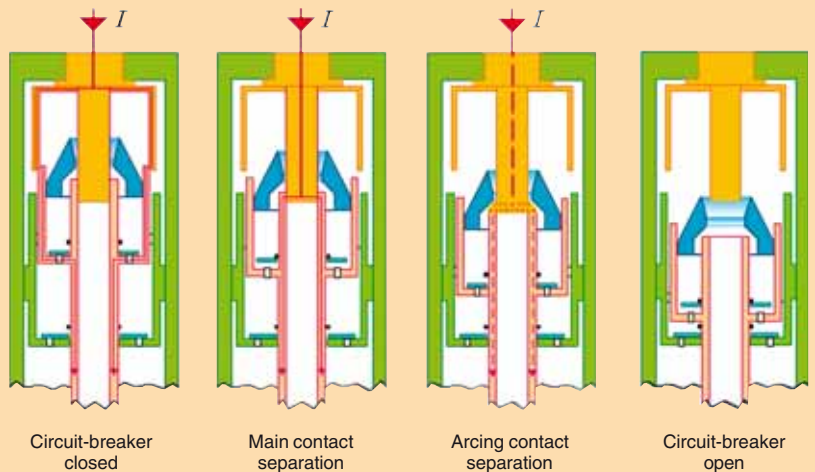
Fields of application

HD4 circuit-breakers are used in power distribution to control and protect lines, transformer and distribution substations, motors, transformers, capacitor banks, etc.

Thanks to the SF₆ **autopuffer** breaking technique, the HD4 circuit-breakers do not generate operating overvoltages, and are therefore also highly suitable for retrofitting, upgrading and enlarging older installa-



- | | |
|-------------------------|------------------------|
| 1 Terminal | 6 Fixed arcing contact |
| 2 Insulating case | 7 Fixed contact |
| 3 Blasting nozzle | 8 Insulating tie-rod |
| 4 Moving arcing contact | 9 Anti-explosion valve |
| 5 Moving contact | |



Main contact separation

No electric arc strikes as the current flows through the arcing contacts. During its run downwards, the moving part compresses the gas contained in the lower chamber. The compressed gas flows out of the lower chamber into the upper chamber, taking them both to the same pressure.

Arcing contact separation

The current flows thanks to the electric arc which has struck between the arcing contacts. The gas cannot get out through the nozzle because the hole is still closed by the fixed arcing contact and cannot get out through the inside of the moving arcing contact either because the electric arc closes this (clogging effect).

- **with low currents**, when the current passes through natural zero and the arc is quenched, the gas flows through the contacts. The low pressure reached cannot chop the current and the modest amount of compressed gas is sufficient to restore dielectric resistance between the two contacts, preventing restriking on the rising front of the return voltage.
- **with high short-circuit currents**, the pressure wave generated by the electric arc closes the valve between the two chambers so that the circuit-breaker starts to operate as a "pure self-blast". The pressure increases in the upper volume thanks to heating of the gas and molecular disassociation due to the high temperature. The increase in pressure generated is proportional to the arc current and ensures quenching on first passage through current zero.

Circuit-breaker open

The arc has been interrupted, the self-generated pressure in the upper volume is reduced because the gas is flowing through the contacts. The valve re-opens and so a new flow of fresh gas comes into the breaking chamber. The apparatus is therefore immediately ready to close and trip again up to its maximum breaking capacity.

tions where the motor, cable, etc. insulating materials may be particularly sensitive to dielectric stresses.

Breaking technique

The breaking technique of HD4 circuit-breakers is based on compression and self-blast techniques to obtain top performances at all service current values, with minimum arc times, gradual arc extinction without chopping, and no restriking or

operating overvoltages.

The HD4 series brings to medium voltage the advantages of the "autopuffer" breaking technique already used in high voltage.

Standards and approvals

HD4 circuit-breakers comply with IEC 62271-100, CEI 17-1 file 1375 Standards and with those of major industrialised countries.

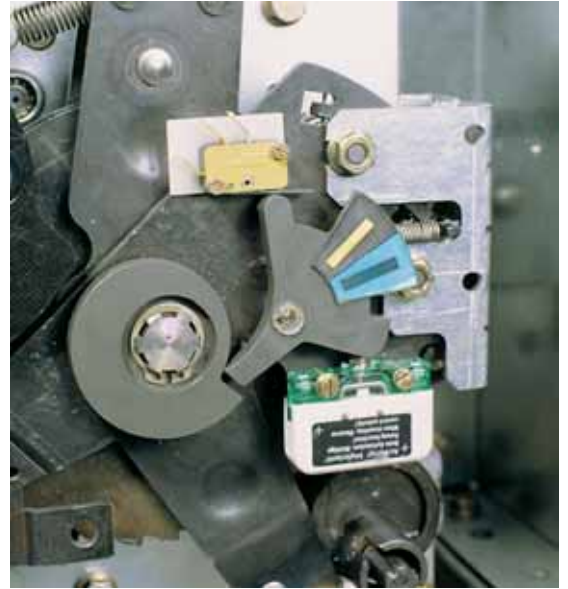
They have undergone the following tests and guarantee safety and reliability of the apparatus in service in all installations.

- **Type tests:** heating, withstand insulation at industrial and impulse frequency, short-time and peak withstand current, mechanical duration, making and breaking of short-circuit currents;
- **Individual tests:** insulation with voltage at industrial frequency in the main circuits and insulation of the auxiliary and control circuits, measurement of the main circuit resistance, mechanical and electrical operation.

The HD4 circuit-breakers are tested according to the requirements of the IEC 62271-100 Standard (class E2 - table 21) and guarantee suitability for use in overhead lines, with rapid reclosing cycle. Versions approved according to the GOST Standard are also available.

Service safety

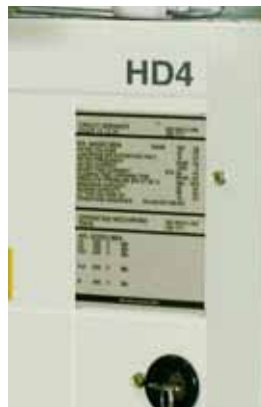
Thanks to the availability of a complete range of mechanical and electrical locks (on request), safe distribution switchboards can be constructed using



The terminals and isolating contacts are silver-plated.



The withdrawable circuit-breakers feature a device enabling them to be racked in/out with the door closed.



The nameplate, located on the front panel, enables all the circuit-breaker characteristics to be identified.



All the control and signalling devices are located on the front of the circuit-breaker. Suitable locks prevent incorrect operations. The antipumping device is always provided on the actuator.

HD4 circuit-breakers. The locking devices have been designed to prevent incorrect operations and to carry out inspection of the installation, ensuring maximum operator safety.

Accessories

HD4 circuit-breakers have a complete range of accessories which fulfil all installation requirements. The operating mechanism is the same type for the whole series and has a standardized range of accessories and spare parts which are easy to identify and order. Apparatus use, maintenance and service have been simplified and require less use of resources.

ESH operating mechanism

- Just one device for the whole series.
- The same set of accessories for all the types of HD4 circuit-breaker.
- Fixed strikers to facilitate assembly or replacement of accessories.
- Accessory cabling with socket and plug.



The self-supplied PR512 switchboard release is available for protection of the installations.

In its basic version, the PR512 carries out the following functions:

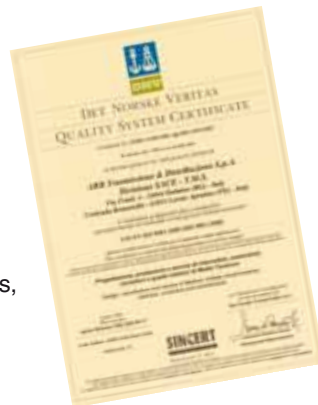
- 50-51-50N-51N protection
- current measurement with display of the maximum value between phases
- dialogue.

For further information about the PR512 release, please consult technical catalogue 649092.

Technical documentation

To obtain in-depth knowledge of technical and application aspects of the HD4 circuit-breakers please ask for the following publications:

- PowerCube modules
- UniGear ZS1 type switchboards
- ZS3.2/PowerBloc switchboards
- REF542*plus* unit
- PR512 protection device.



Quality System

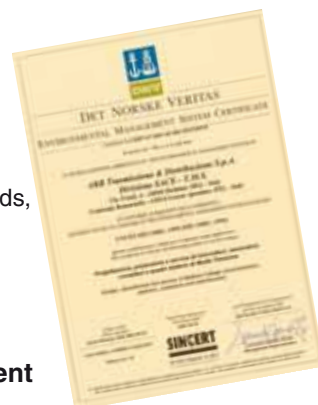
Complies with ISO 9001 Standards, certified by an independent organisation.

Test Laboratory

Complies with UNI CEI EN ISO/IEC 17025 Standards, accredited by an independent organisation.

Environmental Management System

Complies with ISO 14001 Standards, certified by an independent organisation.



Health and Safety Management System

Complies with OHSAS 18001 Standards, certified by an independent organisation.



General characteristics of fixed circuit-breakers (12 - 17.5 - 24 kV)



Circuit-breaker		HD4/GT 12									
Standards	GOST P 52565-2006	■									
	IEC 62271-100	■									
	CEI 17-1 (File1375)	■									
Rated voltage	Ur [kV]	10									
Rated insulation voltage	Us [kV]	12									
Withstand voltage at 50 Hz	Ud (1 min) [kV]	42									
Impulse withstand voltage	Up [kV]	75									
Rated frequency	fr [Hz]	50-60									
Rated normal current ⁽¹⁾	Ir [A]	630	1250	630	1250	1250	1600	2000	2500	3150	
Rated breaking capacity	Isc [kA]	-	-	-	-	-	-	-	-	-	
		20	20	20	20	-	20	-	-	-	
		25	25	25	25	-	25	25	25	25	
		31.5	31.5	31.5	31.5	-	31.5	31.5	31.5	31.5	
		-	-	-	-	40	40	40	40	40	
		-	-	-	-	50	50	50	50	50	
Rated short-time withstand current (3 s)	Ik [kA]	-	-	-	-	-	-	-	-	-	
		20	20	20	20	-	20	-	-	-	
		25	25	25	25	-	25	25	25	25	
		31.5	31.5	31.5	31.5	-	31.5	31.5	31.5	31.5	
		-	-	-	-	40	40	40	40	40	
		-	-	-	-	50	50	50	50	50	
Making capacity	Ip [kA]	-	-	-	-	-	-	-	-	-	
		50	50	50	50	-	50	-	-	-	
		63	63	63	63	-	63	63	63	63	
		80	80	80	80	-	80	80	80	80	
		-	-	-	-	100	100	100	100	100	
		-	-	-	-	125	125	125	125	125	
Operation sequence	[O-0,3s-CO-15s-CO]										
	[O-0,3s-CO-20s-CO]	■									
	[O-0,3s-CO-180s-CO]	■									
Opening time	[ms]	45									
Arcing time	[ms]	10-15									
Total breaking time	[ms]	55-60									
Closing time	[ms]	80									
Overall dimensions	Dimension standardization table	TN 7360	TN 7361	TN 7201	TN 7202						
		Pole distance [mm]	150	210	210	275					
		H [mm]	582	622	655	655					
		L [mm]	493	618	618	730					
		D [mm]	459	456	493	493					
Weight	[Kg]	114	114	145	165						
Absolute SF6 gas pressure ⁽²⁾	[kPa]	380									
Operating temperature ⁽³⁾	[°C]	- 25 ... + 55									
Tropicalization	IEC: 60068-2-30, 60721-2-1	■									
Electromagnetic compatibility	IEC 62271-1	■									

(1) Rated uninterrupted current defined in free air at 40 °C ambient temperature for HD4 17 and HD4 24; rated uninterrupted currents in free air at 55 °C ambient temperature for HD4/GT12.

(2) Rated service value.

(3) The minimum storage and transportation temperature is minus 35 °C.

(4) Including insulating shields (available on request).

HD4 17												HD4 24											
■												■											
■												■											
17.5												24											
17.5												24											
38												50											
95												125											
50-60												50-60											
630	1250	1600	630	1250	1600	1600	2000	2500	3150	3600	630	1250	1600	630	1250	1600	1600	2000	2500	3150	3600		
16	16	16	16	16	16	-	-	-	-	-	16	16	16	16	16	16	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	20	20	20	20	20	20	-	-	-	-	-	-	
25	25	25	25	25	25	-	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
31.5	31.5	31.5	31.5	31.5	31.5	-	31.5	31.5	31.5	31.5	-	-	-	-	-	-	31.5	31.5	31.5	31.5	31.5	31.5	
-	-	-	-	-	-	40	40	40	40	40	-	-	-	-	-	-	40	40	40	40	40	40	
-	-	-	-	-	-	50	50	50	50	50	-	-	-	-	-	-	-	-	-	-	-	-	
16	16	16	16	16	16	-	-	-	-	-	16	16	16	16	16	16	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	20	20	20	20	20	20	-	-	-	-	-	-	-
25	25	25	25	25	25	-	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
31.5	31.5	31.5	31.5	31.5	31.5	-	31.5	31.5	31.5	31.5	-	-	-	-	-	-	31.5	31.5	31.5	31.5	31.5	31.5	
-	-	-	-	-	-	40	40	40	40	40	-	-	-	-	-	-	40	40	40	40	40	40	
-	-	-	-	-	-	50	50	50	50	50	-	-	-	-	-	-	-	-	-	-	-	-	
40	40	40	40	40	40	-	-	-	-	-	40	40	40	40	40	40	-	-	-	-	-	-	-
50	50	50	50	50	50	-	-	-	-	-	50	50	50	50	50	50	-	-	-	-	-	-	-
-	-	-	-	-	-	-	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	
80	80	80	80	80	80	-	80	80	80	80	-	-	-	-	-	-	80	80	80	80	80	80	
-	-	-	-	-	-	100	100	100	100	100	-	-	-	-	-	-	100	100	100	100	100	100	
-	-	-	-	-	-	125	125	125	125	125	-	-	-	-	-	-	-	-	-	-	-	-	
■												■											
■												■											
■												■											
45												45											
10-15												10-15											
55-60												55-60											
80												80											
TN 7177			TN 7178			TN 7163			TN 7165			TN 7179			TN 7242			TN 7174			TN 7165		
150			210			210			275			210			275			275			275		
640			649			655			655			818 ⁽⁴⁾			730			655			818 ⁽⁴⁾		
493			618			618			730			618			748			730			730		
496			496			561			603			600 ⁽⁴⁾			496			561			620 ⁽⁴⁾		
114			114			145			165			119			119			145			165		
380												380											
- 25 ... + 40												- 25 ... + 40											
■												■											
■												■											

**General characteristics of withdrawable circuit-breakers
for CBE enclosures and CBF fixed parts (12 - 17.5 - 24 kV) ⁽⁵⁾**


Circuit-breaker		HD4/C 12						
Standards	GOST P 52565-2006							
	IEC 62271-100	■						
	CEI 17-1 (File1375)	■						
Rated voltage	Ur [kV]	12						
Rated insulation voltage	Us [kV]	12						
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28						
Impulse withstand voltage	Up [kV]	75						
Rated frequency	fr [Hz]	50-60						
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	1250	1600	2000	2500	3150 ⁽⁴⁾
Rated breaking capacity	Isc [kA]	16	16	–	–	–	–	–
		–	–	–	–	–	–	–
		25	25	–	25	25	25	–
		31.5	31.5	–	31.5	31.5	31.5	31.5
		–	–	40	40	40	40	40
		–	–	50	50	50	50	50
Rated short-time withstand current (3 s)	Ik [kA]	16	16	–	–	–	–	–
		–	–	–	–	–	–	–
		25	25	–	25	25	25	–
		31.5	31.5	–	31.5	31.5	31.5	31.5
		–	–	40	40	40	40	40
		–	–	50	50	50	50	50
Making capacity	Ip [kA]	40	40	–	–	–	–	–
		50	50	–	–	–	–	–
		–	–	–	63	63	63	–
		80	80	–	80	80	80	80
		–	–	100	100	100	100	100
		–	–	125	125	125	125	125
		–	–	–	–	–	–	–
Operation sequence	[O-0,3s-CO-15s-CO]	■						
	[O-0,3s-CO-20s-CO]	■						
	[O-0,3s-CO-180s-CO]	■						
Opening time	[ms]	45						
Arcing time	[ms]	10-15						
Total breaking time	[ms]	55-60						
Closing time	[ms]	80						
Overall dimensions	Dimension standardization table	TN 7184	TN 7151	TN 7153	TN 7155	1VCD000017		
		Pole distance [mm]	150	210	275	275	275	
		H [mm]	636	702	702	702	704	
		L [mm]	532	682	882	882	882	
		D [mm]	659	640	640	640	640	
Weight	[Kg]	120	177	210	220	230		
Absolute SF6 gas pressure ⁽²⁾	[kPa]	380						
Operating temperature ⁽³⁾	[°C]	– 25 ... + 40						
Tropicalization	IEC: 60068-2-30, 60721-2-1	■						
Electromagnetic compatibility	IEC 62271-1	■						

(1) Rated uninterrupted current guaranteed with withdrawable circuit-breaker installed in a switchboard at 40 °C ambient temperature externally the panel.

(2) Rated service value.

(3) The minimum storage and transportation temperature is minus 35 °C.

(4) Rated uninterrupted current in switchboard with forced ventilation (forced ventilation at customer care).

(5) For the replacement of already installed HD4/C only, as CBE and CBF are phased-out product

HD4/C 17							HD4/C 24					
■							■					
■							■					
17.5							24					
17.5							24					
38							50					
95							125					
50-60							50-60					
630	1250	1250	1600	2000	2500		630	1250	1250	1600	2000	2500
16	16	-	-	-	-		16	16	-	-	-	-
-	-	-	-	-	-		20	20	-	-	-	-
25	25	-	25	25	25		25	25	-	-	25	25
31.5	31.5	-	31.5	31.5	31.5		-	-	31.5	31.5	31.5	31.5
-	-	40	40	40	40		-	-	40	40	40	40
-	-	50	50	50	50		-	-	-	-	-	-
16	16	-	-	-	-		16	16	-	-	-	-
-	-	-	-	-	-		20	20	-	-	-	-
25	25	-	25	25	25		25	25	-	-	25	25
31.5	31.5	-	31.5	31.5	31.5		-	-	31.5	31.5	31.5	31.5
-	-	40	40	40	40		-	-	40	40	40	40
-	-	50	50	50	50		-	-	-	-	-	-
40	40	-	-	-	-		40	40	-	-	-	-
50	50	-	-	-	-		50	50	-	-	-	-
-	-	-	63	63	63		63	63	-	-	63	63
80	80	-	80	80	80		-	-	80	80	80	80
-	-	100	100	100	100		-	-	100	100	100	100
-	-	125	125	125	125		-	-	-	-	-	-
■							■					
■							■					
■							■					
45							45					
10-15							10-15					
55-60							55-60					
80							80					
TN 7184		TN 7151		TN 7153	TN 7155		TN 7186		TN 7156	TN7157	TN 7158	TN7159
150		210		275	275		210		210	275	275	275
636		702		702	702		792		792	838	838	838
532		682		882	882		682		682	882	882	882
659		640		640	640		799		799	788	788	771
120		177		210	220		125		177	177	177	220
380							380					
- 25 ... + 40							- 25 ... + 40					
■							■					
■							■					

**General characteristics of withdrawable circuit-breakers
for UniGear type ZS1 switchboards (12 - 17.5 - 24 kV) ⁽⁵⁾**


Circuit-breaker		HD4/GT/P 12							
Standards	GOST P 52565-2006	■							
	IEC 62271-100	■							
	CEI 17-1 (File1375)	■							
Rated voltage	Ur [kV]	10					10		
Rated insulation voltage	Us [kV]	12					12		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	42 ⁽⁶⁾					38 ⁽⁶⁾		
Impulse withstand voltage	Up [kV]	75					75		
Rated frequency	fr [Hz]	50-60					50-60		
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	1250	1600	2000	2500	3150 ⁽⁴⁾	
Rated breaking capacity	Isc [kA]	–	–	–	–	–	–	–	
		20	20	–	20	–	–	–	
		25	25	–	25	25	25	25	
		31,5	31,5	–	31,5	31,5	31,5	31,5	
		–	–	40	40	40	40	40	
		–	–	–	50	50	50	50	
Rated short-time withstand current (3 s)	Ik [kA]	–	–	–	–	–	–	–	
		20	20	–	20	–	–	–	
		25	25	–	25	25	25	25	
		31,5	31,5	–	31,5	31,5	31,5	31,5	
		–	–	40	40	40	40	40	
		–	–	–	50	50	50	50	
Making capacity	Ip [kA]	–	–	–	–	–	–	–	
		50	50	–	50	–	–	–	
		63	63	–	63	63	63	63	
		80	80	–	80	80	80	80	
		–	–	100	100	100	100	100	
		–	–	–	125	125	125	125	
Operation sequence	[O-0,3s-CO-15s-CO]								
	[O-0,3s-CO-20s-CO]	■							
	[O-0,3s-CO-180s-CO]	■							
Opening time	[ms]	45							
Arcing time	[ms]	10-15							
Total breaking time	[ms]	55-60							
Closing time	[ms]	80							
Overall dimensions	Dimension standardization table	TN 7286	TN 7350	TN 7351	TN 7352	TN 7371			
		Pole distance [mm]	150	210	210	275	275		
		H [mm]	628	702	702	702	746		
		L [mm]	532	682	682	882	882		
	D [mm]	659	640	640	643	643			
Weight	[Kg]	120	177	177	220	230			
Absolute SF6 gas pressure ⁽²⁾	[kPa]	380							
Operating temperature ⁽³⁾	[°C]	– 25 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1	■							
Electromagnetic compatibility	IEC 62271-1	■							

(1) Rated uninterrupted current guaranteed with withdrawable circuit-breaker installed in UniGear type ZS1 switchboard at 40 °C ambient temperature externally the panel.

(2) Rated service value.

(3) The minimum storage and transportation temperature is minus 35 °C.

(4) Rated uninterrupted current in switchboard with forced ventilation.

(5) The locking electromagnet (-RL2) in the truck to prevent the circuit-breaker being racked-in with the auxiliary circuits disconnected (plug not inserted in the socket) is included in the standard equipment.

(6) UniGear type ZS1 switchboard with rated insulation voltage 17.5 kV.


(7) Rated uninterrupted current in switchboard with forced ventilation. In a switchboard with natural ventilation, the rated current is 2300 A.



HD4/P 17								HD4/P 24					
■								■					
■								■					
17.5								24					
17.5								24					
38								50					
95								125					
50-60								50-60					
630	1250	1250	1600	2000	2500	3150 ⁽⁴⁾		630	1250	1250	1600	2000	2500 ⁽⁷⁾
16	16	–	–	–	–	–		16	–	–	16	16	–
–	–	–	–	–	–	–		20	20	–	20	20	20
25	25	–	25	25	25	25		25	25	–	25	25	25
31.5	31.5	–	31.5	31.5	31.5	31.5		–	–	31.5	31.5	31.5	31.5
–	–	40	40	40	40	40		–	–	–	–	–	–
–	–	–	50	50	50	50		–	–	–	–	–	–
16	16	–	–	–	–	–		16	–	–	16	16	–
–	–	–	–	–	–	–		20	20	–	20	20	20
25	25	–	25	25	25	25		25	25	–	25	25	25
31.5	31.5	–	31.5	31.5	31.5	31.5		–	–	31.5	31.5	31.5	31.5
–	–	40	40	40	40	40		–	–	–	–	–	–
–	–	–	50	50	50	50		–	–	–	–	–	–
40	40	–	–	–	–	–		40	–	–	40	40	–
50	50	–	–	–	–	–		50	50	–	50	50	50
–	–	–	63	63	63	63		63	63	–	63	63	63
80	80	–	80	80	80	80		–	–	80	80	80	80
–	–	100	100	100	100	100		–	–	–	–	–	–
–	–	–	125	125	125	125		–	–	–	–	–	–
■								■					
■								■					
■								■					
45								45					
10-15								10-15					
55-60								55-60					
80								80					
TN 7286		TN 7350		TN 7351	TN 7352	TN 7371		TN 7354		1VCD000099	TN 7355	TN7356	
150		210		210	275	275		210		210	275	275	
628		702		702	702	746		736		792	821	821	
532		682		682	882	882		636		653	842	842	
659		640		640	643	643		802		799	788	788	
120		177		177	220	230		125		177	177	220	
380								380					
– 25 ... + 40								– 25 ... + 40					
■								■					
■								■					

General characteristics of withdrawable circuit-breakers for PowerCube modules (12 - 17.5 - 24 kV)



Circuit-breaker	PowerCube enclosures	HD4/W 12							
		PB1	PB1	PB2	PB2	PB2	PB2	PB2	PB3
Standards	GOST P 52565-2006 IEC 62271-100 CEI 17-1 (File1375)	■							
Rated voltage	Ur [kV]	12							
Rated insulation voltage	Us [kV]	12							
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28							
Impulse withstand voltage	Up [kV]	75							
Rated frequency	fr [Hz]	50-60							
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	630	1250	1250	1600	2000	3150 ⁽⁴⁾
Rated breaking capacity	Isc [kA]	16	16	16	16	–	16	16	–
		–	–	–	–	–	–	–	–
		25	25	25	25	–	25	25	–
		31.5	31.5	31.5	31.5	–	31.5	31.5	31.5
		–	–	–	–	40	–	–	40
Rated short-time withstand current (3 s)	Ik [kA]	16	16	16	16	–	16	16	–
		–	–	–	–	–	–	–	–
		25	25	25	25	–	25	25	–
		31.5	31.5	31.5	31.5	–	31.5	31.5	31.5
		–	–	–	–	40	–	–	40
Making capacity	Ip [kA]	40	40	40	40	–	40	40	–
		–	–	–	–	–	–	–	–
		63	63	63	63	–	63	63	–
		80	80	80	80	–	80	80	80
		–	–	–	–	100	–	–	100
Operation sequence	[O-0,3s-CO-15s-CO] [O-0,3s-CO-20s-CO] [O-0,3s-CO-180s-CO]	■							
		■							
		■							
Opening time	[ms]	45							
Arcing time	[ms]	10-15							
Total breaking time	[ms]	55-60							
Closing time	[ms]	80							
Overall dimensions	Dimension standardization table	TN 7229	TN 7182		TN 7421	TN 7239		1VCD000053	
		Pole distance [mm]	150		210	210	210		275
		 H [mm]	636		702	702	702		742
		L [mm]	532		682	682	682		882
	D [mm]	659		640	640	640		643	
Weight	[Kg]	120		120	177	177		230	
Absolute SF6 gas pressure ⁽²⁾	[kPa]	380							
Operating temperature ⁽³⁾	[°C]	- 25 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1	■							
Electromagnetic compatibility	IEC 62271-1	■							

(1) Rated uninterrupted current guaranteed with withdrawable circuit-breaker installed in a switchboard at 40 °C ambient temperature externally the panel.

(2) Rated service value.

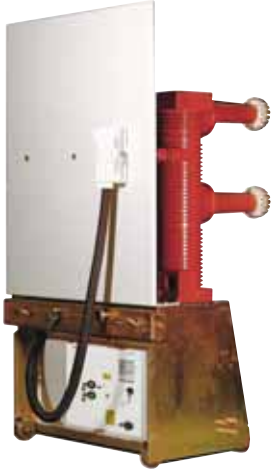
(3) The minimum storage and transportation temperature is minus 35 °C.

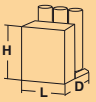
(4) Rated uninterrupted current in switchboard with natural ventilation; rated current 3600 A with one fan pre-installed in PB3 cassette; rated current 4000 A with one additional fan installed by customer in the back of switchgear (see PowerCube Instruction Manual).

(5) Rated uninterrupted current in switchboard with forced ventilation.

HD4/P 12			HD4/W 17						HD4/P 17			HD4/W 24		HD4/P 24				
PB2	PB2	PB3	PB1	PB1	PB2	PB2	PB2	PB2	PB2	PB3	PB2	PB2	PB3	PB4	PB4	PB5	PB5	
■			■								■			■		■		
■			■								■			■		■		
12			17.5								17.5			24		24		
12			17.5								17.5			24		24		
28			28								28			50		50		
75			95								95			125		125		
50-60			50-60								50-60			50-60		50-60		
1600	2000	2500	630	1250	630	1250	1250	1600	2000	3150 ⁽⁴⁾	1600	2000	2500	630	1250	1600	2000	2500 ⁽⁵⁾
-	-	-	16	16	16	16	-	16	16	-	-	-	-	16	16	16	16	16
-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	20	20	20	20
-	-	25	25	25	25	25	-	25	25	-	-	25	25	25	25	25	25	25
-	-	31.5	31.5	31.5	31.5	31.5	-	31.5	31.5	31.5	-	-	31.5	-	-	-	-	-
40	40	40	-	-	-	-	40	-	-	40	40	40	40	-	-	-	-	-
50	50	50	-	-	-	-	50	-	-	50	50	50	50	-	-	-	-	-
-	-	-	16	16	16	16	-	16	16	-	-	-	-	16	16	16	16	16
-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	20	20	20	20
-	-	25	25	25	25	25	-	25	25	-	-	25	25	25	25	25	25	25
-	-	31.5	31.5	31.5	31.5	31.5	-	31.5	31.5	31.5	-	-	31.5	-	-	-	-	-
40	40	40	-	-	-	-	40	-	-	40	40	40	40	-	-	-	-	-
50	50	50	-	-	-	-	50	-	-	50	50	50	50	-	-	-	-	-
-	-	-	40	40	40	40	-	40	40	-	-	-	-	40	40	40	40	40
-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	50	50	50	50
-	-	63	63	63	63	63	-	63	63	-	-	-	63	63	63	63	63	63
-	-	80	80	80	80	80	-	80	80	80	-	-	80	-	-	-	-	-
100	100	100	-	-	-	-	100	-	-	100	100	100	100	-	-	-	-	-
125	125	125	-	-	-	-	125	-	-	125	125	125	125	-	-	-	-	-
■			■								■			■		■		
■			■								■			■		■		
■			■								■			■		■		
45			45								45			45		45		
10-15			10-15								10-15			10-15		10-15		
55-60			55-60								55-60			55-60		55-60		
80			80								80			80		80		
TN 7350	TN 7351	TN 7352	TN 7229		TN 7182		TN 7421	TN 7239		1VCD000053	TN 7350	TN 7351	TN 7352	TN 7183		TN 7355	TN 7356	
210	210	275	150		210		210	210		275	210	210	275	210		275	275	
702	702	702	636		702		702	702		742	702	702	702	792		821	821	
682	682	882	532		682		682	682		882	682	682	882	682		842	842	
640	640	643	659		640		640	640		643	640	640	643	799		788	788	
177	177	220	120		120		177	177		230	177	177	220	125		177	220	
380			380								380			380			380	
- 25 ... + 40			- 25 ... + 40						- 25 ... + 40			- 25 ... + 40		- 25 ... + 40				
■			■								■			■		■		
■			■								■			■		■		

General characteristics of withdrawable circuit-breakers for UniGear type ZS3.2 switchboards (40.5 kV)



Circuit-breaker		HD4/Z 40.5			
Standards	GOST P 52565-2006				
	IEC 62271-100	■			
	CEI 17-1 (File 1375)	■			
Rated voltage	Ur [kV]	40.5			
Rated insulation voltage	Us [kV]	40.5			
Withstand voltage at 50 Hz	Ud (1 min) [kV]	95			
Impulse withstand voltage	Up [kV]	185			
Rated frequency	fr [Hz]	50-60			
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	1250	1600	2000	2500
Rated breaking capacity	Isc [kA]	25	25	25	25
		31.5 ⁽⁴⁾	31.5 ⁽⁴⁾	31.5 ⁽⁴⁾	31.5 ⁽⁴⁾
Rated short-time withstand current (3 s)	Ik [kA]	25	25	25	25
		31.5	31.5	31.5	31.5
Making capacity	Ip [kA]	63	63	63	63
		80	80	80	80
Operation sequence (4)	[O-0,3s-CO-15s-CO]	■			
Opening time	[ms]	45			
Arc time	[ms]	10-15			
Total breaking time	[ms]	55-60			
Closing time	[ms]	80			
Overall dimensions	Dimension standardization table	TN 7227			
	Pole distance [mm]	280			
	 H [mm]	1575			
	L [mm]	895			
	D [mm]	686			
Weight	[Kg]	280			
Absolute SF6 gas pressure ⁽²⁾	[kPa]	550			
Operating temperature ⁽³⁾	[°C]	- 25 ... + 40			
Tropicalization	IEC: 60068-2-30, 721-2-1	■			
Electromagnetic compatibility	IEC 62271-1	■			

(1) Rated uninterrupted current guaranteed with withdrawable circuit-breaker installed in UniGear type ZS3.2. switchboard at 40 °C ambient temperature externally the panel.

(2) Rated service value.

(3) The minimum storage and transportation temperature is minus 35 °C.

(5) The operating sequence is O-0.3sec-CO-3min-CO for the rated breaking capacity $I_{sc} = 31.5$ kA.

Standard equipment

The basic versions of the circuit-breakers are always three-pole and fitted with:

- manual operating mechanism
- mechanical signalling device for closing springs charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton
- opening pushbutton
- operation counter
- set of ten open/closed circuit-breaker auxiliary contacts (four opening (NC) and three closing (NO) available, according to the applications requested)
- lever for manually charging the closing springs (the quantity must be defined according to the number of pieces of apparatus ordered).

Moreover:

- for fixed circuit-breaker
 - connection terminals (on request for HD4/GT 12)
 - terminal board for auxiliary circuits;
- for withdrawable circuit-breaker
 - isolating contacts
 - cord with connector (plug only) for auxiliary circuits
 - earthing contact on truck (only for CBE, CBF)
 - lock to prevent racking-in of circuit-breaker with different rated current
 - racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
 - locking electromagnet in the truck (/P and /W versions).



Terminals for fixed circuit-breaker.



Tulip isolating contacts for withdrawable circuit-breaker.



Plier isolating contacts for withdrawable circuit-breaker.



Circuit-breaker racking-out/racking-in lever.



Manual charging lever of operating mechanism springs.

Table of availability of accessories

	-MO1 shunt opening release.	-MO2 additional shunt opening release.	-MO3 shunt opening release with demagnetisation.	-MC shunt closing release.	-MU undervoltage release (power supply on supply side).	-MU undervoltage release with electronic time delay device (power supply on supply side).	Mechanical override of undervoltage release trip.	-BB5 undervoltage release electric signalling (energised or de-energised).	
	1	2A	2B	3	4A	4B	5	6	
Fixed circuit-breakers									
HD4/GT 12	■	■	■	■	■	■	■	■	
HD4 17	■	■	■	■	■	■	■	■	
HD4 24	■	■	■	■	■	■	■	■	
Withdrawable circuit-breakers for CBE enclosures and CBF fixed parts									
HD4/C 12	■	■	■	■	■	■	■	■	
HD4/C 17	■	■	■	■	■	■	■	■	
HD4/C 24	■	■	■	■	■	■	■	■	
Withdrawable circuit-breakers for UniGear type ZS1 switchboards									
HD4/GT/P 12	■	■	■	■	■	■	■	■	
HD4/P 17	■	■	■	■	■	■	■	■	
HD4/P 24	■	■	■	■	■	■	■	■	
Withdrawable circuit-breakers for UniGear 36 type ZS3.2 switchboards									
HD4/Z 40.5	■	■	■	■	■	■	■	■	
Withdrawable c.-bs. for PowerCube modules									
HD4/W 12 - HD4/P 12	■	■	■	■	■	■	■	■	
HD4/W 17 - HD4/P 17	■	■	■	■	■	■	■	■	
HD4/W 24 - HD4/P 24	■	■	■	■	■	■	■	■	

(1) Standard fitting: no. 6 auxiliary contacts.

(2) Application of the pressure switch is only possible in the factory.

(3) For this version it is only available without LED.

(4) The locking electro-magnet in the truck (-RL2) to prevent the circuit-breaker being racked-in with the auxiliary circuits disconnected (plug not inserted in the socket) is included in the standard equipment.

Optional accessories

The accessories identified with the same number are alternative to each other.



Shunt opening release.

- **Shunt opening release**
- 1 -MO1 shunt opening release.

- **Additional shunt opening release**
- 2A Additional -MO2 shunt opening release
- 2B -MO3 opening solenoid with demagnetisation.

- **Shunt closing release**
- 3 -MC shunt closing release.



Shunt closing release.

- **Undervoltage release**
- 4A -MU undervoltage release (power supply branched on the supply side).
- 4B -MU undervoltage release with electronic delay device (0.5 – 1 – 1.5 – 2 – 3 s) (power supply branched on the supply side). This device is delivered set to 0.5 s see the Electric Diagram chapter - note I on page 82).
- 5 Mechanical override of undervoltage release trip with electrical signalling.
- 6 -BB5 undervoltage release electric signalling (energised or de-energised).



Undervoltage release.

- **Auxiliary and signalling contacts**
- 7 Group of 15 auxiliary circuit-breaker contacts: 4 make and 5 break (alternative to the 10 provided as standard, of which a maximum of 3 make and 4 break are available depending on the accessories requested).
- 8 -BB4 transient contact with momentary closing during circuit-breaker opening.
- 9 -BT3 position contact of the withdrawable circuit-breaker (installed on the truck, only available for the /C, /P, /W version when the locking magnet is not provided; mounted as standard when the -RL1 locking magnet is provided on the operating mechanism).
- 10 Transmitted contacts of the withdrawable circuit-breaker (installed in the circuit-breaker truck - only for withdrawable circuit-breaker).



Auxiliary contacts.

- **Motor operator**
- 11 -MS spring-charging geared motor.
- 12 -FB1 thermomagnetic protection of the spring-charging geared motor (mounted as standard for 24 V d.c. geared motors) complete with electrical signalling of thermomagnetic protection trip.
- 13A Electrical signalling of operating mechanism springs charged.
- 13B Electrical signalling of operating mechanism springs discharged.



Spring charging geared motor.



Geared motor protection.



SF6 control device with 3 LEDs.



Opening and closing pushbutton locks.

■ **Locks and interlocks**

- 14 Opening pushbutton lock (with or without padlock).
- 15 Closing pushbutton lock (with or without padlock).
- 16 Key lock for circuit-breaker open (different keys or the same keys).
- 17 **-RL1** operating mechanism locking magnet.
- 18 **-RL2** truck locking magnet. Compulsory accessory for the withdrawable versions for UniGear ZS1 type switchgear and PowerCube modules, to prevent racking-in of the circuit-breaker into the switchboard with the auxiliary circuit plug disconnected. The plug makes the anti-racking-in lock for different rated current (by means of a special pin).
- 19 Interlock for fixed circuit-breaker (for fixed apparatus converted into withdrawable type by the customer).
- 20 Mechanical isolation interlock with the door of the switchboard (on request for PoweCube version; not provided for HD4/Z 40.5 kV).

■ **Withdrawable circuit-breaker earthing**

- 21 Earthing contact on the truck (compulsory for circuit-breaker with CBE enclosure and for CBF fixed part; not available for UniGear ZS1 type switchgear and PowerCube modules).

■ **Gas control device**

Notes:

- **should application of the pressure switch be required, specify the request at the time of order since subsequent application by the customer is not possible.**
- **devices 22B and 22C are supplied without LEDs for the HD4/Z 40.5 kV series.**

- 22A Two-level pressure switch.
- 22B Two-level SF6 pressure switch control device with three LEDs and **-MO2** additional shunt opening release: circuit-breaker opening and lock on closing
- 22C Two-level SF6 pressure switch control device with three LEDs: circuit-breaker locking in the position it is found in.

■ **Insulating partitions**

- 23 Insulating partitions.

Characteristics of electrical accessories

Shunt opening release (-MO1; -MO2)	Ps = 125 W/VA (Instantaneous service ≤ 45 ms)
	Un = 24, 30, 48, 60, 110, 125, 220, 250 V–
	Un = 48, 110, 120 (127), 230 (220/240) V~ 50 Hz
	Un = 110 (127), 230 (220/240) V~ 60 Hz
Shunt closing release (-MC)	Ps = 250 W/VA (150 ms)
	Pc = 5 W/VA (antipumping function - continuous service)
	Un = 24, 30, 48, 60, 110, 125, 220, 250 V–
	Un = 48, 110, 120 (127), 230 (220/240) V~ 50 Hz
	Un = 110 (127), 230 (220/240) V~ 60 Hz
Undervoltage release (-MU)	Ps = 250 W/VA (150 ms)
	Pc = 5 W/VA (continuous service)
	Un = 24, 30, 48, 60, 110, 125, 220, 250 V–
	Un = 48, 110, 120 (127), 230 (220/240) V~ 50 Hz
	Un = 110 (127), 230 (220/240) V~ 60 Hz
Spring charging geared motor (-MS)	Ps = 1500 W/VA (100 ms)
	Pc = 400 W/VA (spring charging time: 6 s)
	Un = 24, 30, 48, 60, 110, 125, 220, 250 V–
	Un = 48, 110, 120 (127), 230 (220/240) V~ 50 Hz
	Un = 110 (127), 230 (220/240) V~ 60 Hz
Locking magnets (-RL1; -RL2)	Ps = 250 W/VA (150 ms)
	Pc = 5 W/VA (continuous service)
	Un = 24, 30, 48, 60, 110, 125, 220, 250 V–
	Un = 48, 110, 120 (127), 230 (220/240) V~ 50 Hz
	Un = 110 (127), 230 (220/240) V~ 60 Hz
Gas control device with 3 LEDs	Un = 24, 30, 48, 60, 110, 125, 220, 250 V–
	Un = 48, 110, 120 (127), 230 (220/240) V~ 50 Hz
	Un = 110 (127), 230 (220/240) V~ 60 Hz
Circuit-breaker auxiliary contacts	Un = 500 V~ 220 V–
	Icu = 15 A 1.5 A
	cos ϕ = 0.4 –
	T = – 10 ms

Un Rated voltage.
cos ϕ Power factor.
Icu Breaking capacity
Ps Inrush power consumption (the inrush time is indicated in brackets).
Pc Continuous service power consumption.
T Time constant.

Identification of the circuit-breaker type

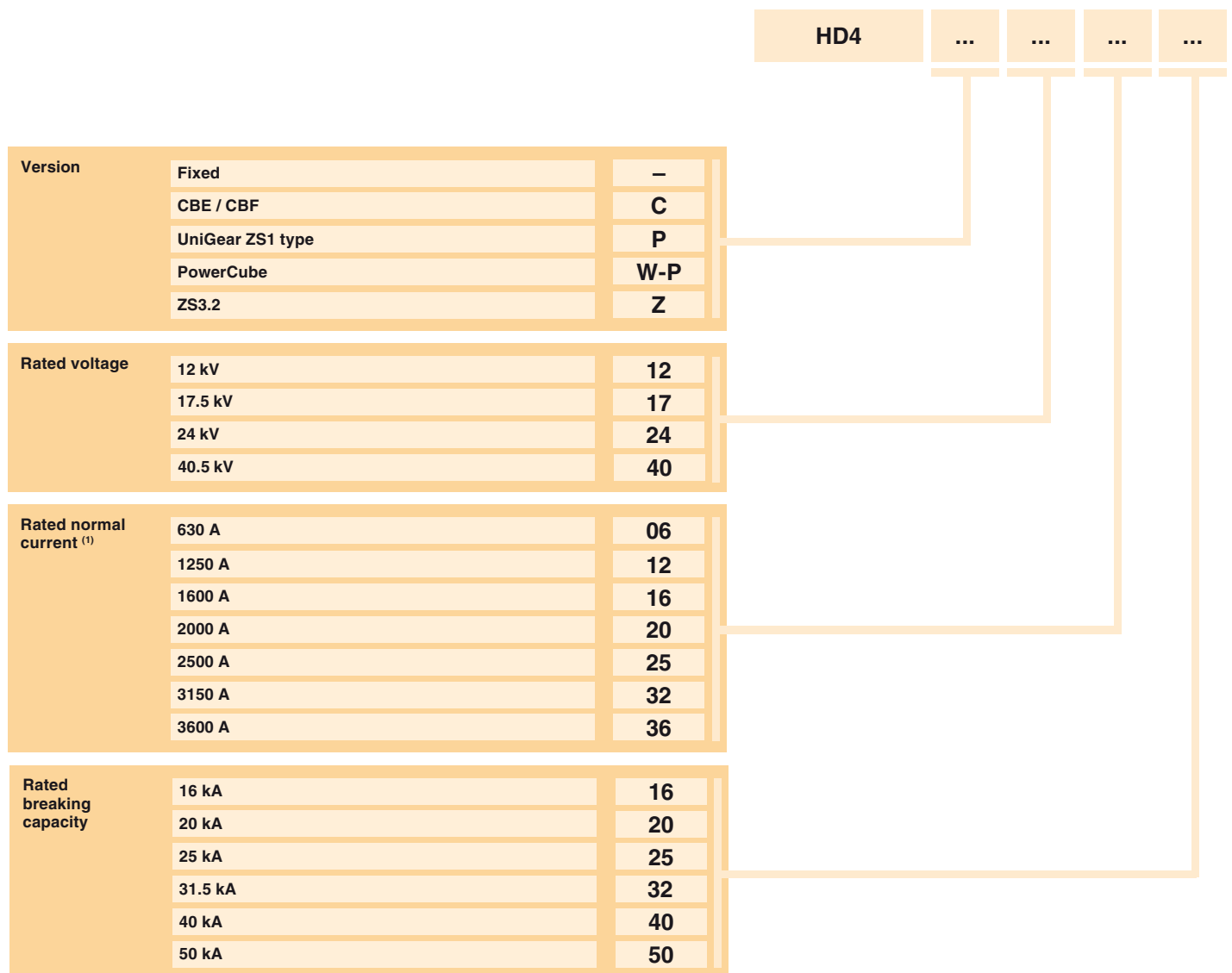
The identification code of a circuit-breaker is made up with the elements from the table below.

For correct identification of a circuit-breaker, it is necessary to refer to the characteristics tables on pages 12 to 16.

The selected circuit-breaker can then be completed with the optional accessories indicated on the following pages.

Examples of identification

- The code **HD4/C 12.16.25** identifies a withdrawable circuit-breaker for CBE enclosure or CBF fixed part with 12 kV rated voltage, 1600 A rated normal current and 25 kA breaking capacity.
- The code **HD4/W 24.20.25** identifies a withdrawable circuit-breaker for PowerCube modules with 24 kV rated voltage, 2000 A rated normal current and 25 kA breaking capacity.



(1) Rated uninterrupted current defined in free air for fixed circuit-breaker.
For the withdrawable version, see the previous pages.

Resistance to vibrations

HD4 circuit-breakers are unaffected by mechanically generated vibrations.
For the versions approved by the naval registers, please contact us.



Tropicalization

HD4 circuit-breakers are manufactured in compliance with the strictest regulations for use in hot-humid-saline climates.

All the most important metal components are treated against corrosive factors according to UNI 3564-65 Standards environmental class C. Galvanisation is carried out in accordance with UNI ISO 2081 Standards, classification code Fe/Zn 12, with a thickness of 12×10^{-6} m, protected by a conversion layer mainly consisting of chromates in compliance with the UNI ISO 5420 Standards.

These construction characteristics mean that the whole HD4 series of circuit-breakers and its accessories comply with climate graph 8 of the IEC



60721-2-1 and IEC 60068-2-2 (Test B: Dry Heat / IEC 60068-2-30 (Test Bd: Damp Heat, cyclic) Standards.

Altitude

The insulating property of air decreases as the altitude increases, therefore this must always be taken into account for external insulation of the apparatus (the internal insulation does not undergo any variations as it is guaranteed by the SF6 gas).

The phenomenon must always be taken into consideration during the design stage of the insulating components of apparatus to be installed over 1000 m above sea level. In this case a correction coefficient must be considered, which can be taken from the graph to the side, built up on the basis of the indications in the IEC 60694 Standards.

The following example is a clear interpretation of the indications given above.

Example

- Installation altitude 2000 m
- Operation at the rated voltage of 12 kV
- Withstand voltage at industrial frequency 28 kV rms
- Impulse withstand voltage 75 kVp
- Factor Ka obtained from graph = 1.13.

Considering the above parameters, the apparatus will have to withstand the following values (under test and at zero altitude, i.e. at sea level):

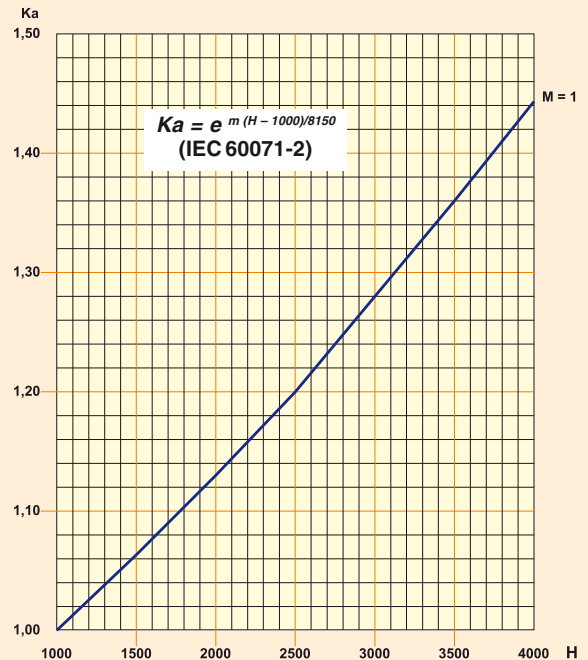
- withstand voltage at industrial frequency equal to:

$$28 \times 1.13 = 31.6 \text{ kVrms}$$

- impulse withstand voltage equal to:

$$75 \times 1.13 = 84.7 \text{ kVp.}$$

From the above, it can be deduced that for installations at an altitude of 2000 m above sea level, with 12 kV service voltage, apparatus must be provided with 17.5 kV rated voltage, characterised by insulation levels at industrial frequency of 38 kVrms with 95 kVp impulse withstand voltage.



Graph for determining the Ka correction factor according to the altitude

H = altitude in metres;

m = value referred to industrial frequency and the atmospheric impulse withstand voltages and those between phase and phase.

Switching special loads

The table indicates the breaking capacities which can be guaranteed for switching special loads.

Circuit-breaker			HD4						
Rated normal current for fixed circuit-breaker	In [A]		630	1250	1600	2000	2500	3150	3600
No-load MV/LV transformer breaking	Isc [A]		10	10	10	10	10	10	10
No-load cable breaking	Isc [A]	12 kV	25	25	25	25	25	25	25
		17.5 - 24 kV	31.5	31.5	31.5	31.5	31.5	31.5	31.5
		36 - 40.5 kV	50	50	50	50	50	–	–
Capacitive current breaking (C2 class)	Isc [A]		400	630	1000	1250	1250	1250	1250
Reactance compensation current breaking	Isc [A]		630	630	1250	1250	1250	1250	1250
Breaking of rated motor currents	Isc [A]		630	630	1250	1250	1250	1250	1250



Environmental protection programme

HD4 circuit-breakers are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management).

The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system.

Assessment of the environmental impact of the life cycle of the product, obtained by minimising energy consumption and overall raw materials of the product, became a concrete matter during the design stage by means of targeted selection of the materials, processes and packing.

Production techniques which prepare the products for simple dismantling and separation of the components are used during manufacture of the circuit-breakers. This is to allow maximum recycling at the end of the useful life cycle of the apparatus.

Anti-pumping device

The ESH operating mechanism on HD4 circuit-breakers (in all versions) is fitted with a mechanical anti-pumping device which prevents re-closing due to either electrical or mechanical commands.

Should both the closing command and any one of the opening commands be active at the same time, there would be a continuous succession of opening and closing operations.

The anti-pumping device avoids this situation, ensuring that each closing operation is only followed

by a single opening operation and that there is no closing operation after this. To obtain a further closing operation, the closing command must be released and then relaunched.

Furthermore, the anti-pumping device only allows circuit-breaker closure if the following conditions are present at the same time:

- operating mechanism springs fully charged
- opening pushbutton and/or opening release (-MO1/-MO2) not enabled
- main circuit-breaker contacts open.

Spare parts

Replacement can only be carried out by trained personnel and/or in our workshops:

- opening springs
- closing springs
- complete pole
- basic operating mechanism
- bushings, terminals and insulating protections.

Replacement which can be carried out by the customer:

- isolating contacts
- geared motor limit switch contact
- KA1 instantaneous relay
- KA2 instantaneous relay.

Ordering

For availability and ordering of spare parts, please contact our Service, specifying the circuit-breaker serial number.



4

OVERALL DIMENSIONS

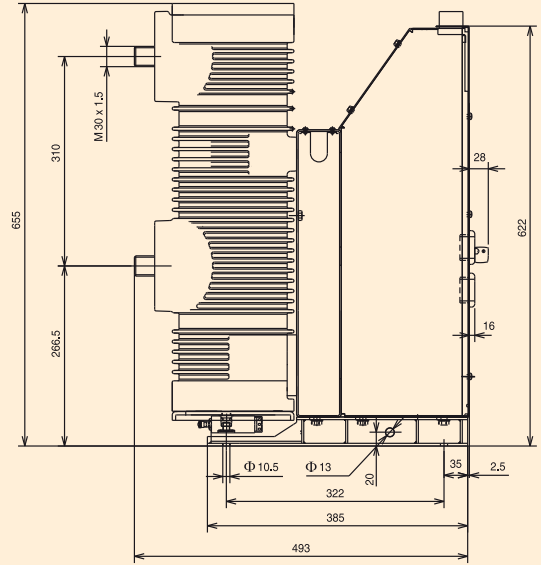
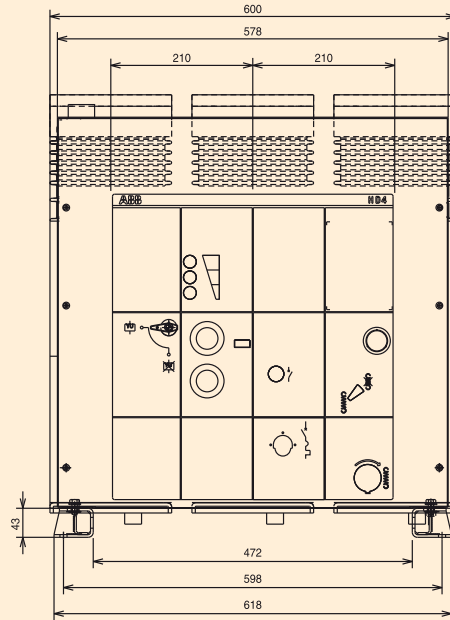
Type HD4/GT

TN	7201
Ur	12 kV
Ir	1250 A
Isc	40 kA
	50 kA

Type HD4/GT

TN	7201
Ur	12 kV
Ir	1600 A
Isc	20 kA
	25 kA
	31.5 kA
	40 kA
	50 kA

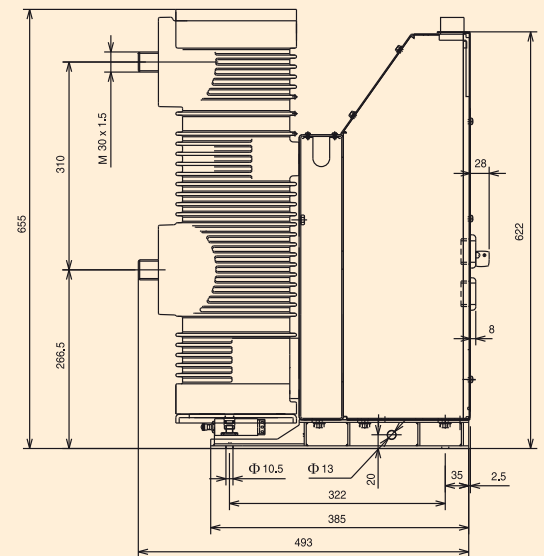
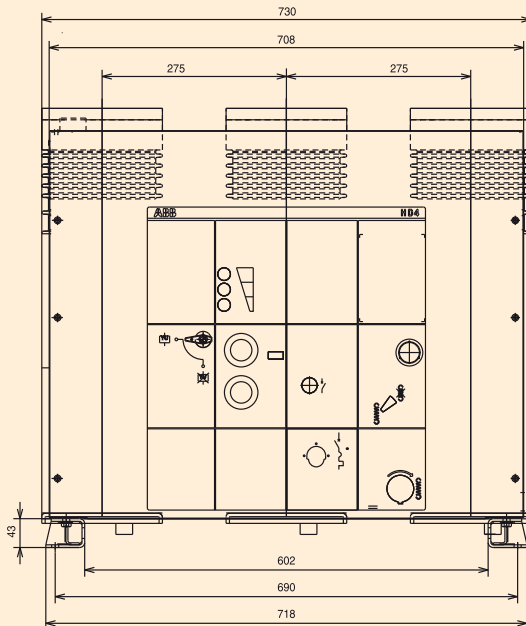
Fixed circuit-breakers without terminals



Type HD4/GT

TN	7202
Ur	12 kV
Ir	2000 A
	2500 A
	3150 A
Isc	25 kA
	31.5 kA
	40 kA
	50 kA

Fixed circuit-breakers without terminals



Type HD4/GT

TN 7360

Ur 12 kV

Ir 630 A

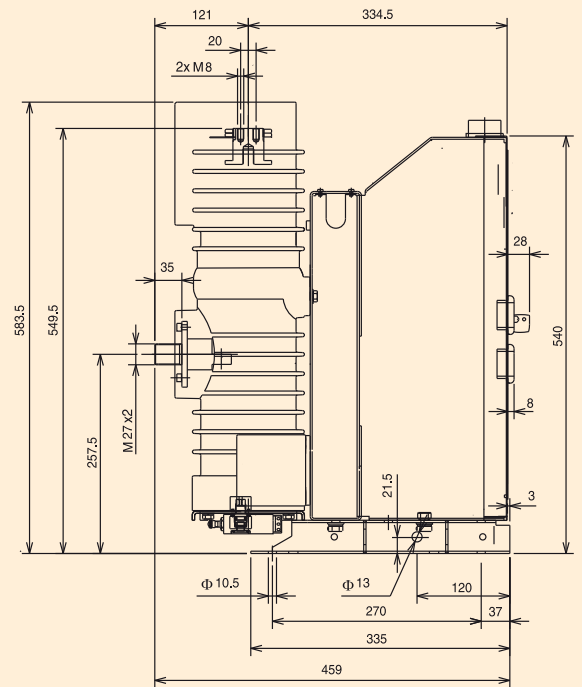
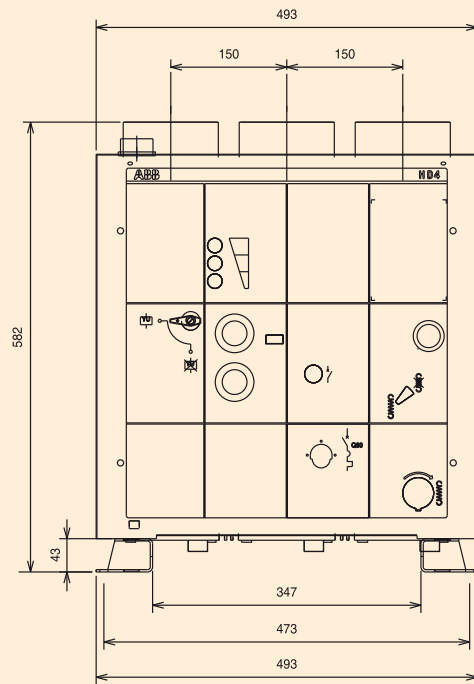
1250 A

Isc 20 kA

25 kA

31.5 kA

Fixed circuit-breakers without terminals



Type HD4/GT

TN 7361

Ur 12 kV

Ir 630 A

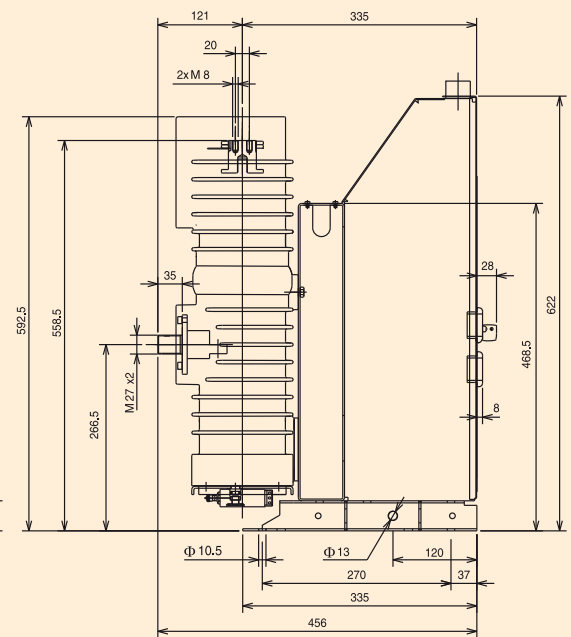
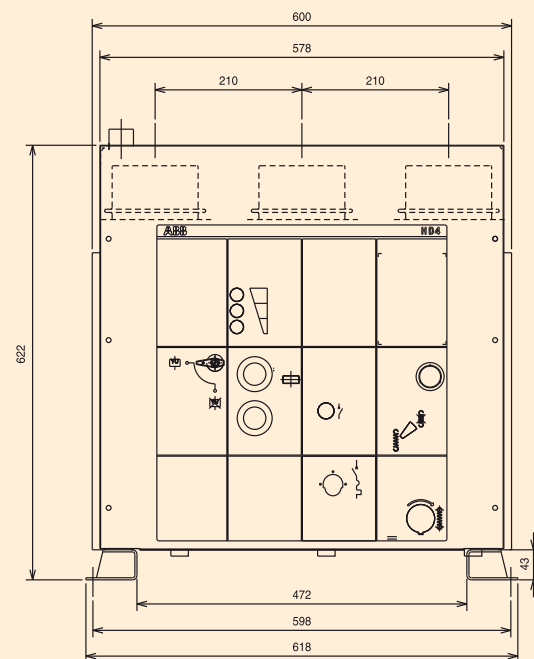
1250 A

Isc 20 kA

25 kA

31.5 kA

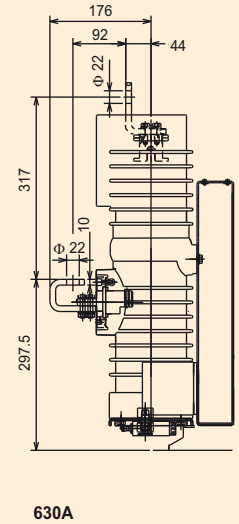
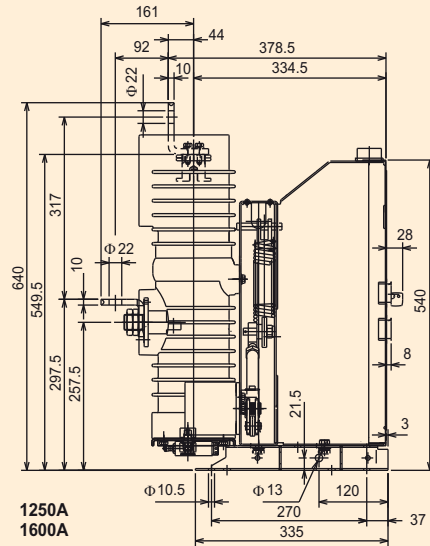
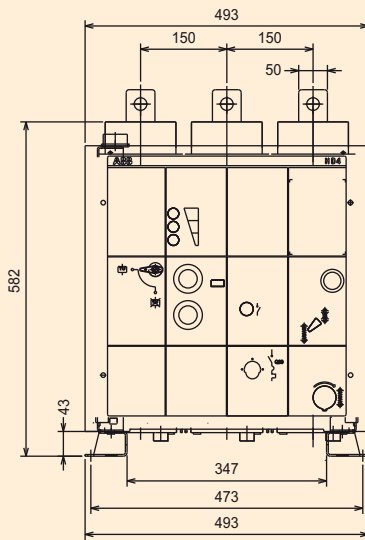
Fixed circuit-breakers without terminals



Type HD4

TN	7177
Ur	17.5 kV
Ir	630 A
	1250 A
	1600 A
Isc	16 kA
	25 kA
	31.5 kA

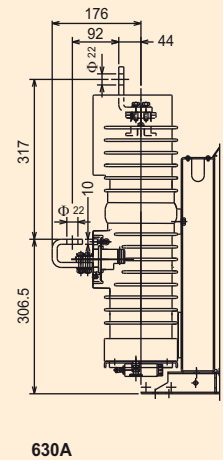
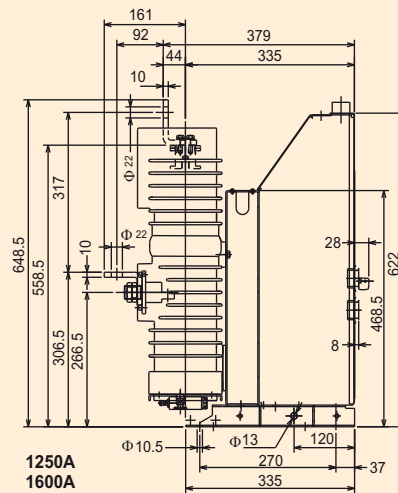
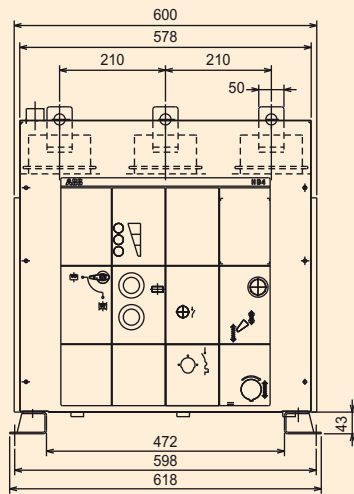
Fixed circuit-breakers



Type HD4

TN	7178
Ur	17.5 kV
Ir	630 A
	1250 A
	1600 A
Isc	16 kA
	25 kA
	31.5 kA

Fixed circuit-breakers



Type HD4

TN 7163

Ur 17.5 kV

Ir 1600 A

Isc 40 kA

50 kA

Type HD4

TN 7163

Ur 17.5 kV

Ir 2000 A

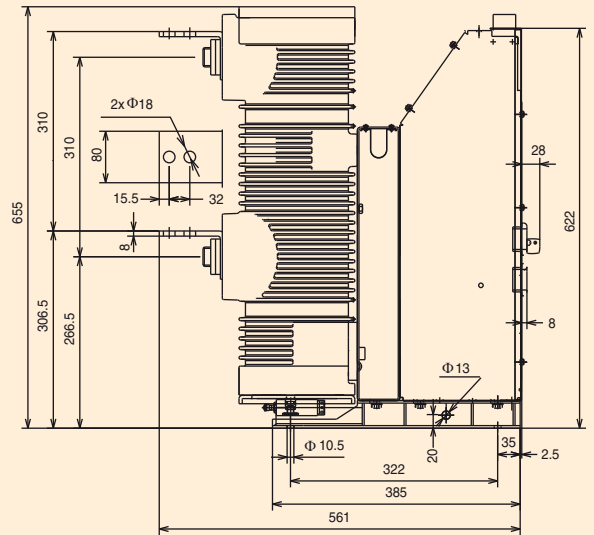
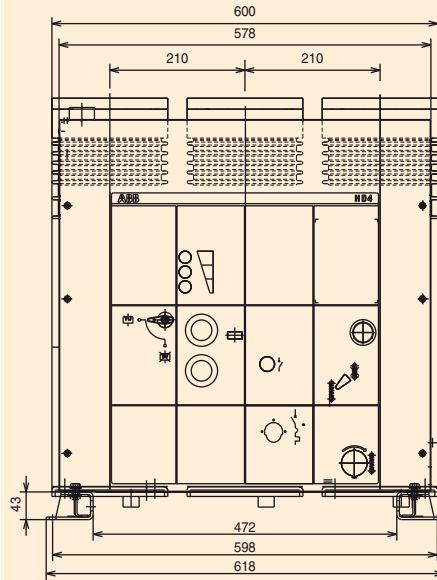
Isc 25 kA

31.5 kA

40 kA

50 kA

Fixed circuit-breakers



Type HD4

TN 7165

Ur 17.5 kV

Ir 2500 A

3150 A

3600 A

Isc 25 kA

31.5 kA

40 kA

50 kA

Type HD4

TN 7165

Ur 24 kV

Ir 2500 A

3150 A

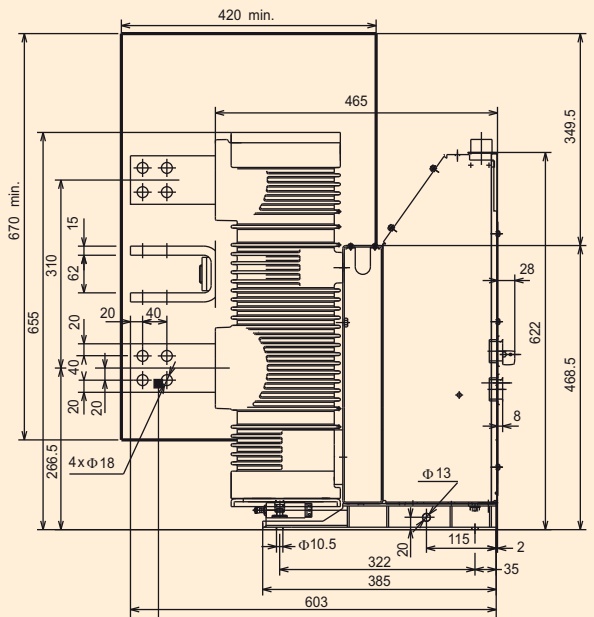
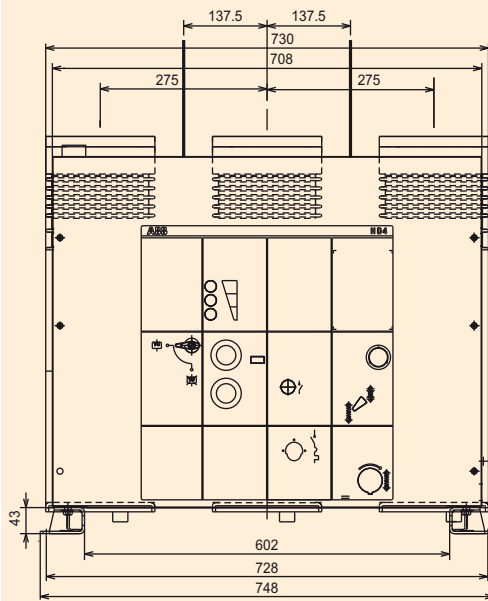
3600 A

Isc 25 kA

31.5 kA

40 kA

Fixed circuit-breakers



Insulating partitions (only for 24 kV) to be provided by the customer (a special kit is available on request).

Type HD4

TN 7174

Ur 24 kV

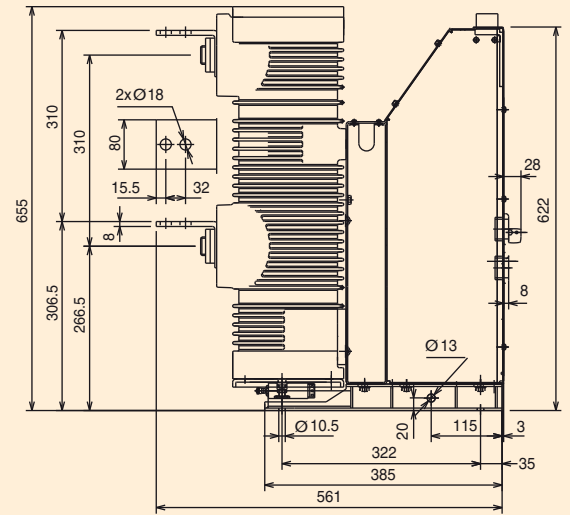
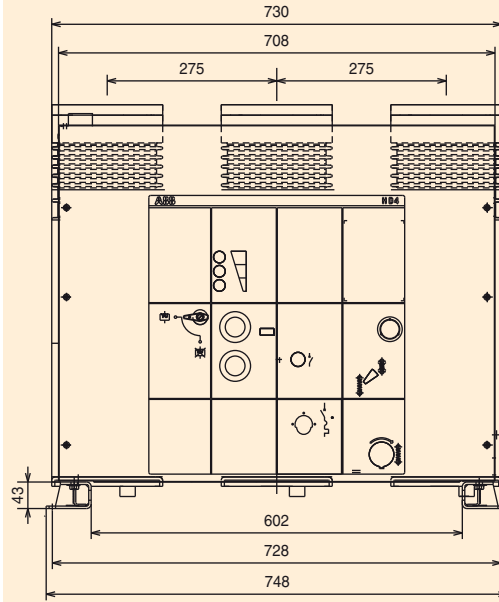
Ir 1600-2000 A

Isc 25 kA

31.5 kA

40 kA

Fixed circuit-breakers



Type HD4/C

TN 7184

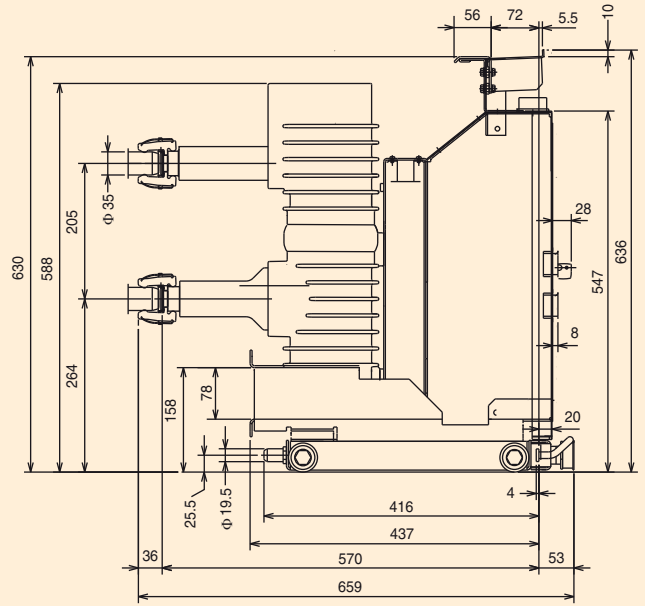
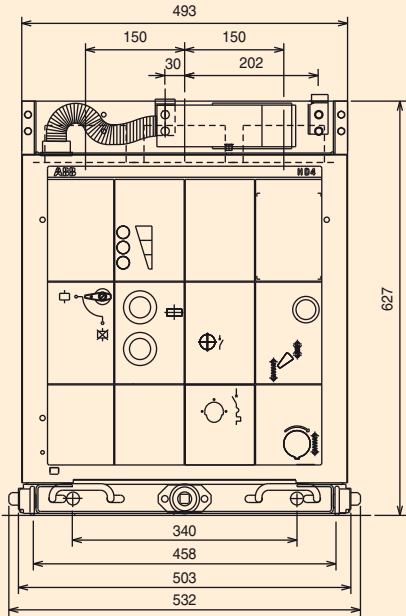
For CBE11
CBF11

Ur 12 kV
17.5 kV

Ir 630 A
1250 A

Isc 16 kA
25 kA
31.5 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts



Type HD4/C

TN 7151

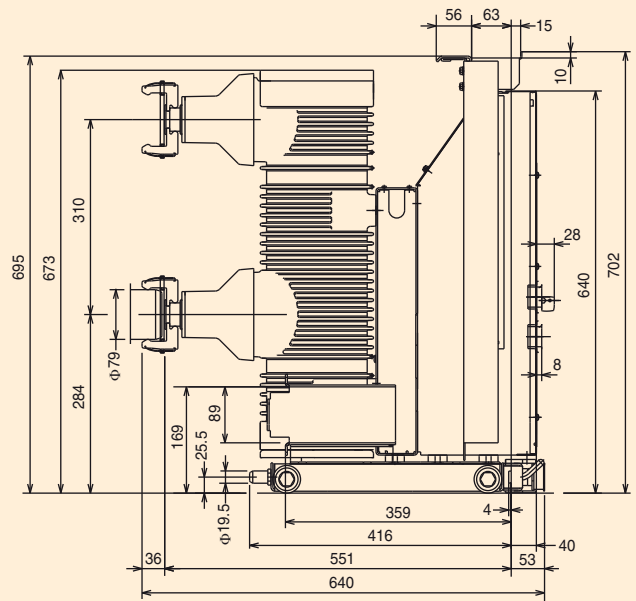
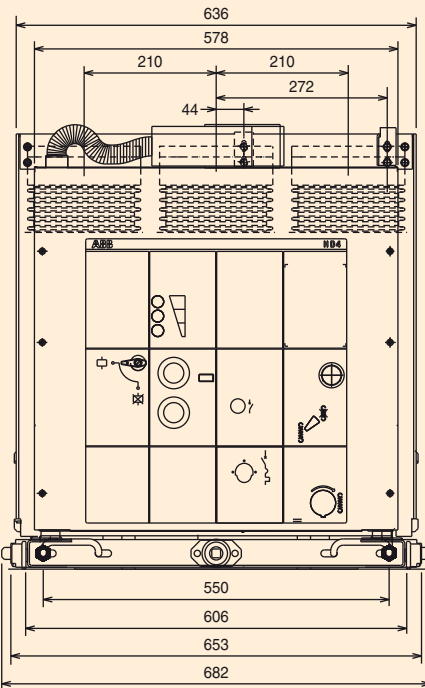
For CBE21

Ur 12 kV
17.5 kV

Ir 1250 A

Isc 40 kA
50 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts



Type HD4/C

TN 7151

For CBE21

CBF21 (31.5 kA)

Ur 12 kV
17.5 kV

Ir 1600 A

Isc 25 kA
31.5 kA
40 kA
50 kA

HD4/C

TN 7153

For CBE31

Ur 12 kV

17.5 kV

Ir 2000 A

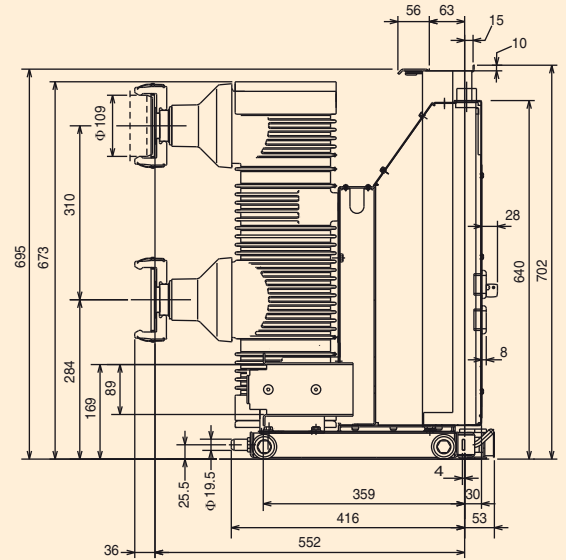
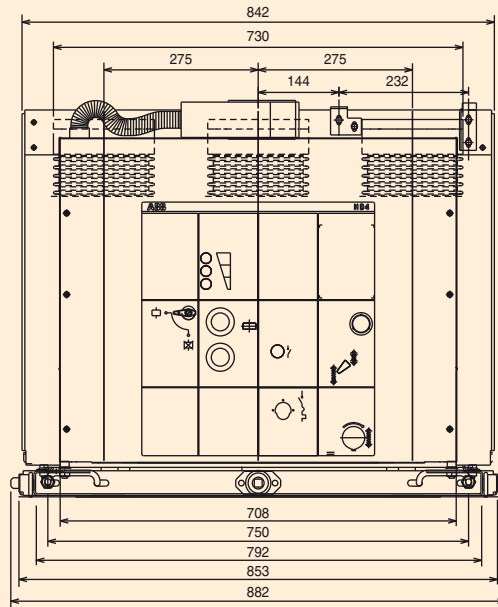
Isc 25 kA

31.5 kA

40 kA

50 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts



HD4/C

TN 7155

For CBE31

Ur 12 kV

17.5 kV

Ir 2500 A

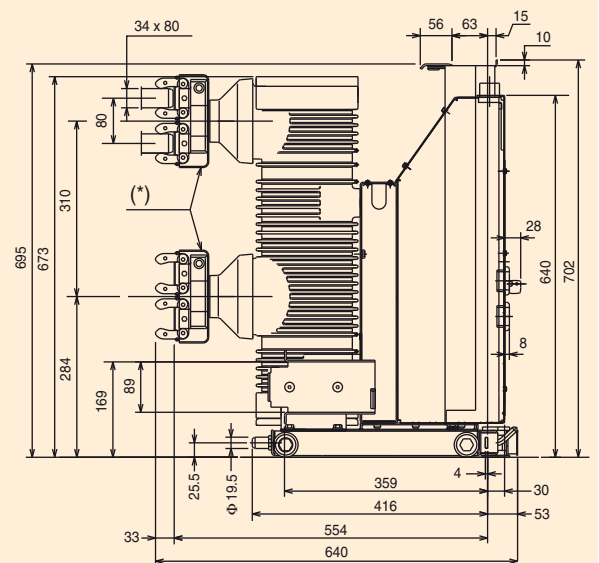
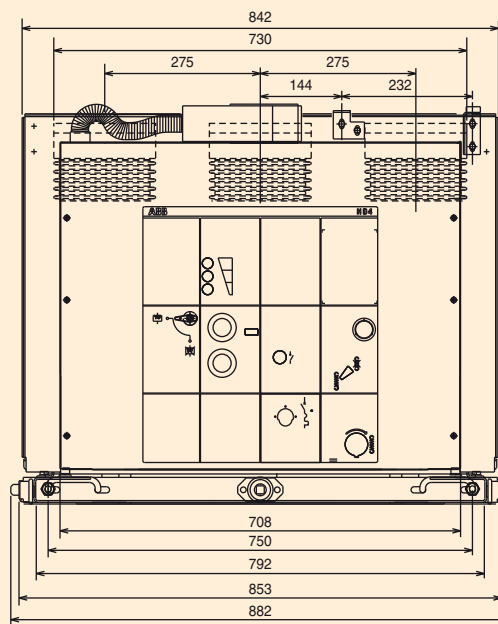
Isc 25 kA

31.5 kA

40 kA

50 kA

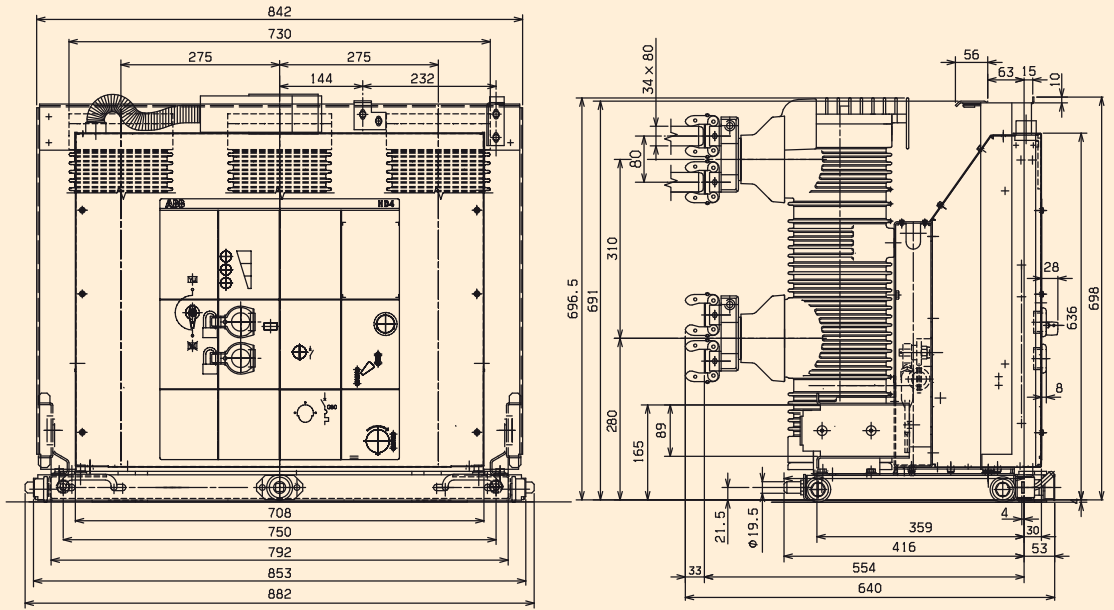
HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts



(*) Only for 17.5 kV.

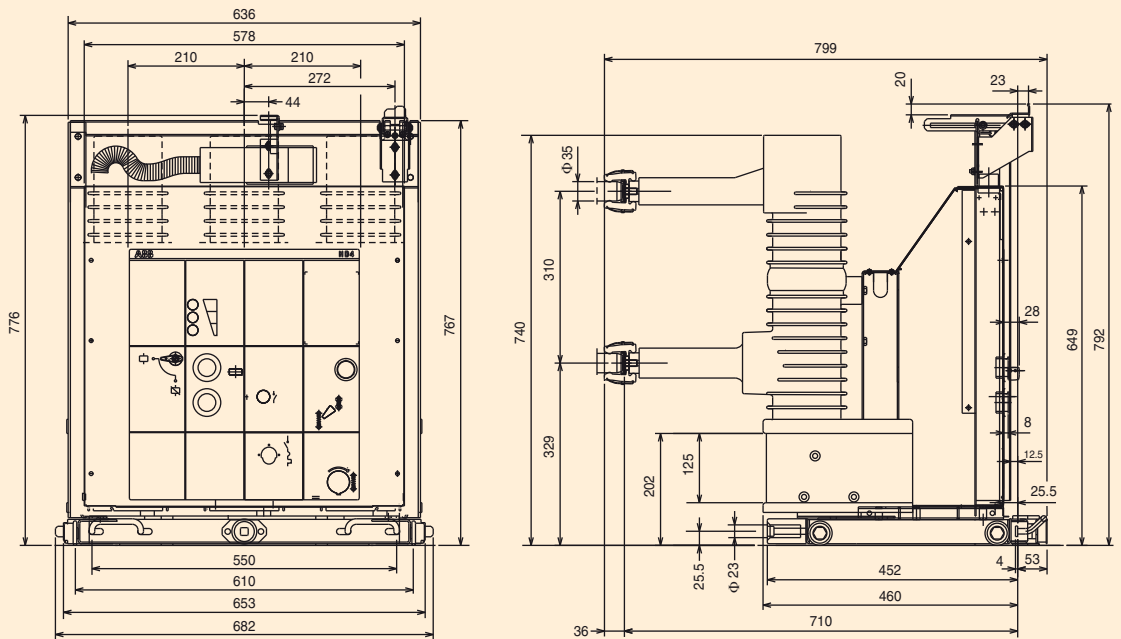
Type	HD4/C
TN	1VCD000017
For	CBF31
Ur	12 kV
Ir	3150 A
Isc	25 kA
	31.5 kA
	40 kA
	50 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts



Type	HD4/C
TN	7186
For	CBE41 CBF41
Ur	24 kV
Ir	630 A
Isc	1250 A
	16 kA
	20 kA 25 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts



HD4/C

TN 7156

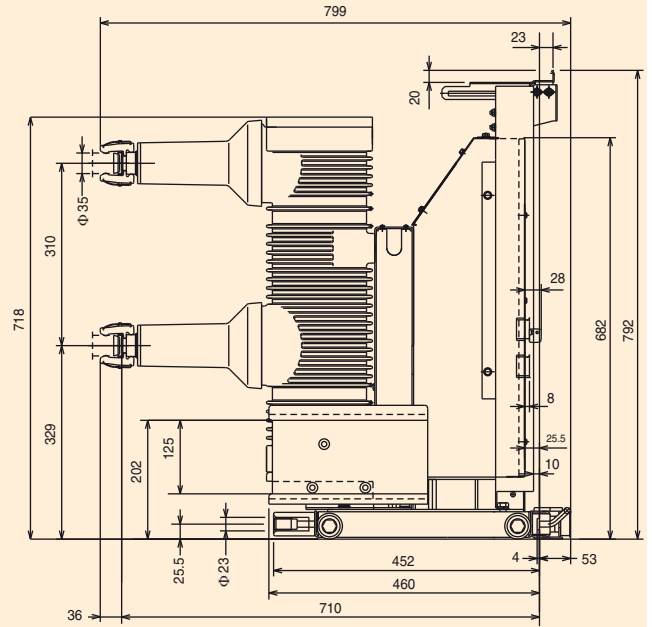
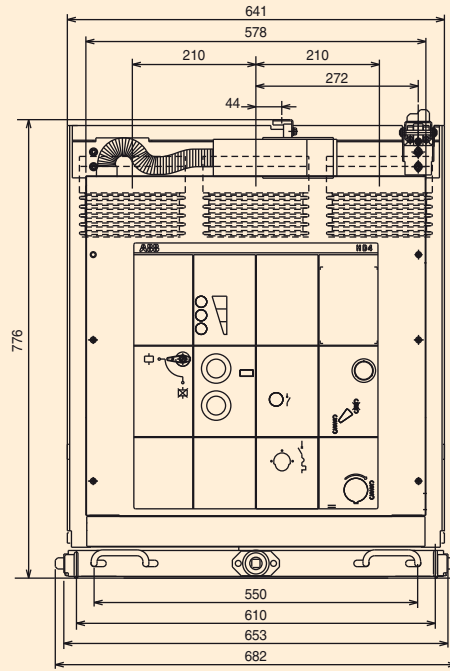
For CBE41

Ur 24 kV

Ir 1250 A

Isc 31.5 kA

40 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts**HD4/C**

TN 7157

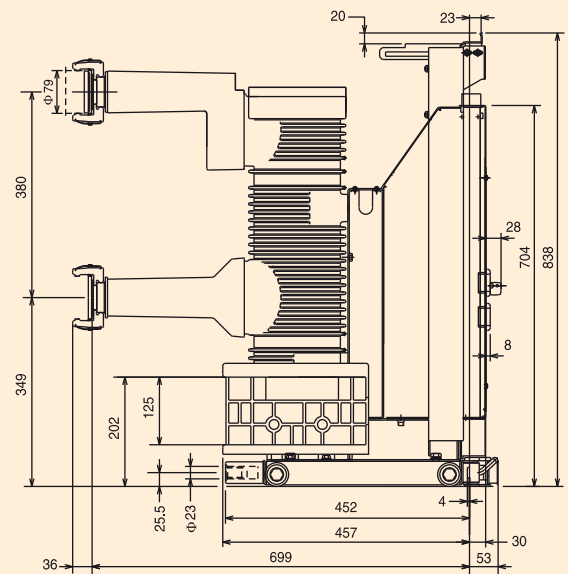
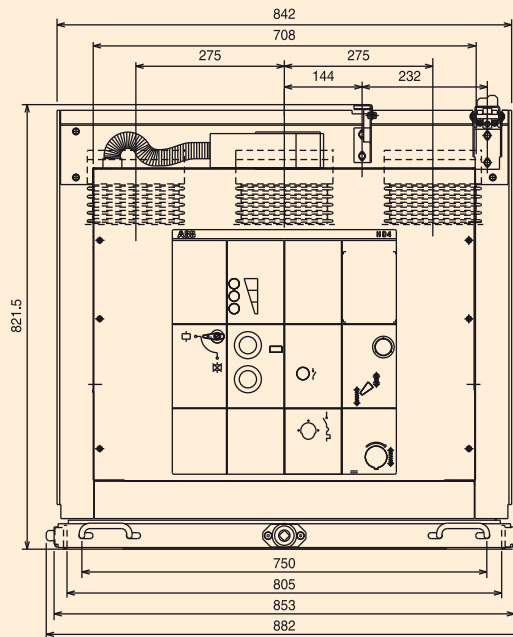
For CBE51

Ur 24 kV

Ir 1600 A

Isc 31.5 kA

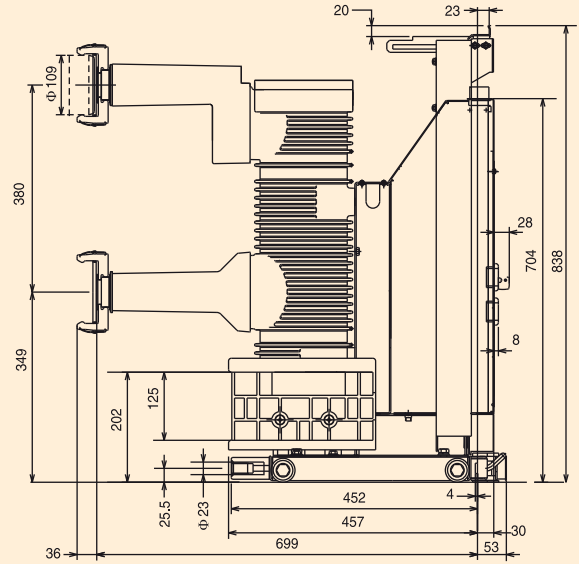
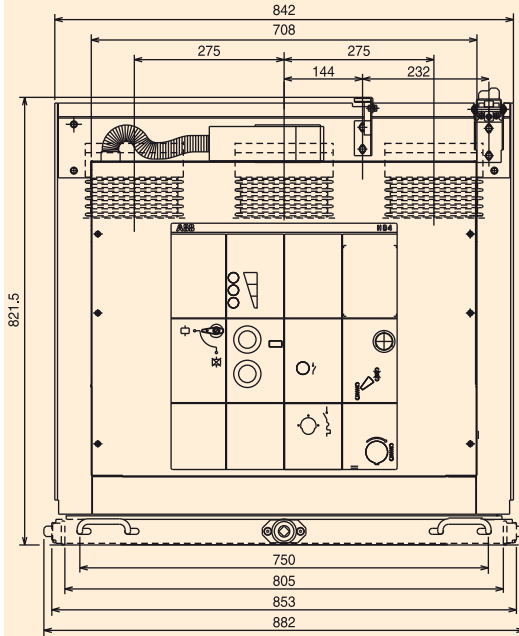
40 kA

HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts

HD4/C

TN	7158
For	CBE51
Ur	24 kV
Ir	2000 A
Isc	25 kA
	31.5 kA
	40 kA

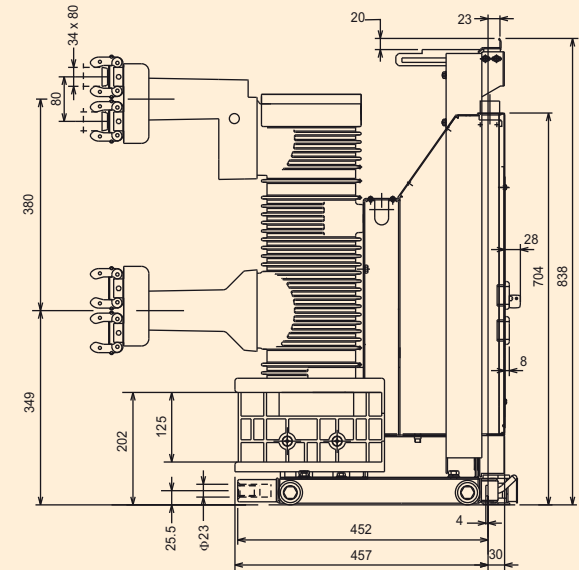
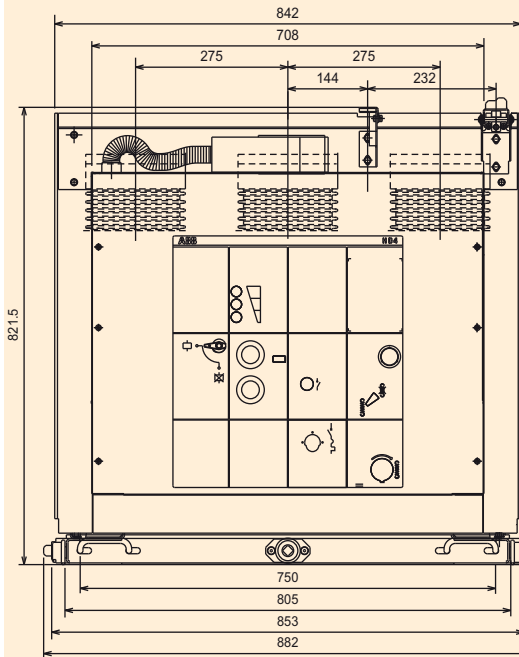
HD4/C withdrawable circuit-breakers for CBE enclosures



HD4/C

TN	7159
For	CBE51
Ur	24 kV
Ir	2500 A
Isc	25 kA
	31.5 kA
	40 kA

HD4/C withdrawable circuit-breakers for CBE enclosures



HD4/GT/P

TN 7286

Ur 12 kV

Ir 630 A

1250 A

Isc 20 kA

25 kA

31.5 kA

HD4/P (*)

TN 7286

Ur 12 kV

17.5 kV

Ir 630 A

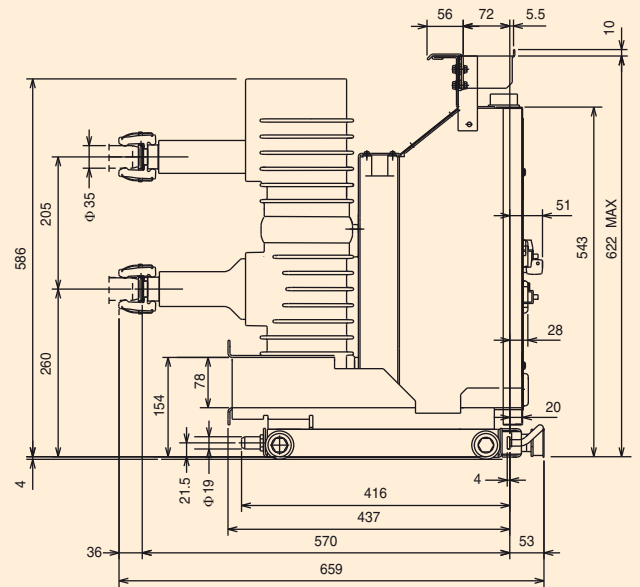
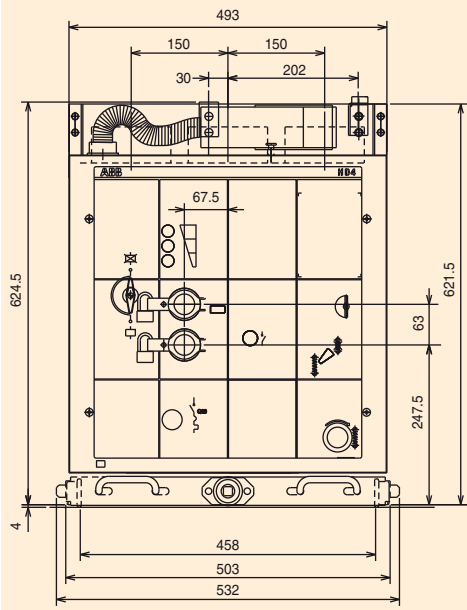
1250 A

Isc 16 kA

25 kA

31.5 kA

(*) HD4/P kV for PowerCube.

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards**HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards****HD4/GT/P**

TN 7350

Ur 12 kV

Ir 1250 A

Isc 40 kA

HD4/GT/P

TN 7350

Ur 12 kV

Ir 1600 A

Isc 20 kA

25 kA

31.5 kA

40 kA

50 kA

HD4/GT/P

TN 7351

Ur 12 kV

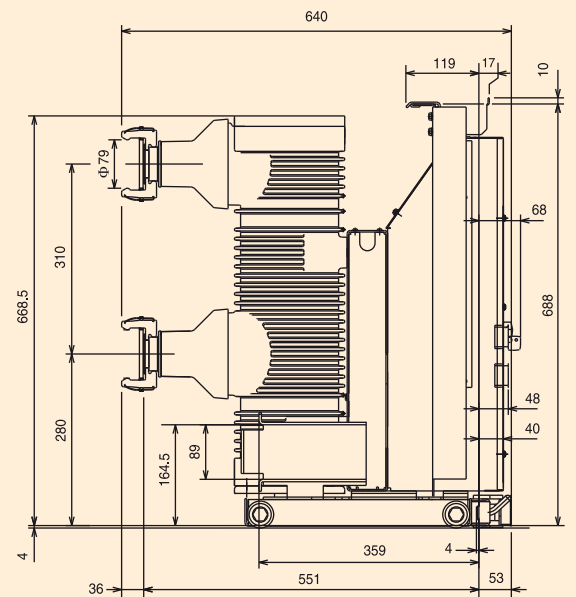
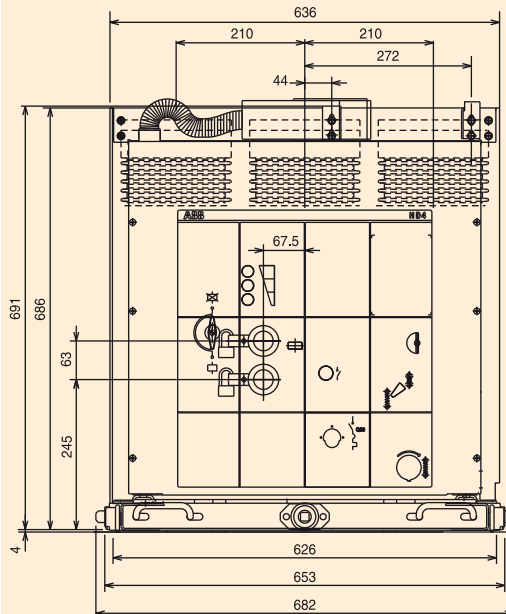
Ir 2000 A

Isc 25 kA

31.5 kA

40 kA

50 kA



HD4/P

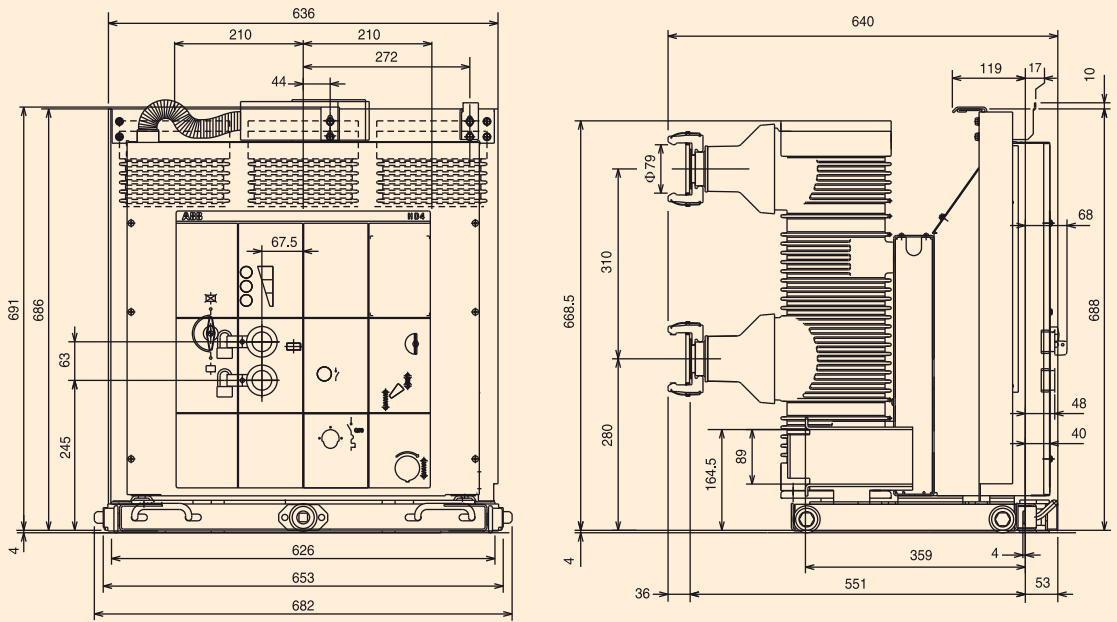
TN	7350
Ur	12 kV (*) 17.5 kV
Ir	1250 A
Isc	40 kA

HD4/P

TN	7351
Ur	12 kV (*) 17.5 kV
Ir	2000 A
Isc	25 kA 31.5 kA 40 kA 50 kA

(*) HD4/P 12 kV for PowerCube.

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards



HD4/GT/P

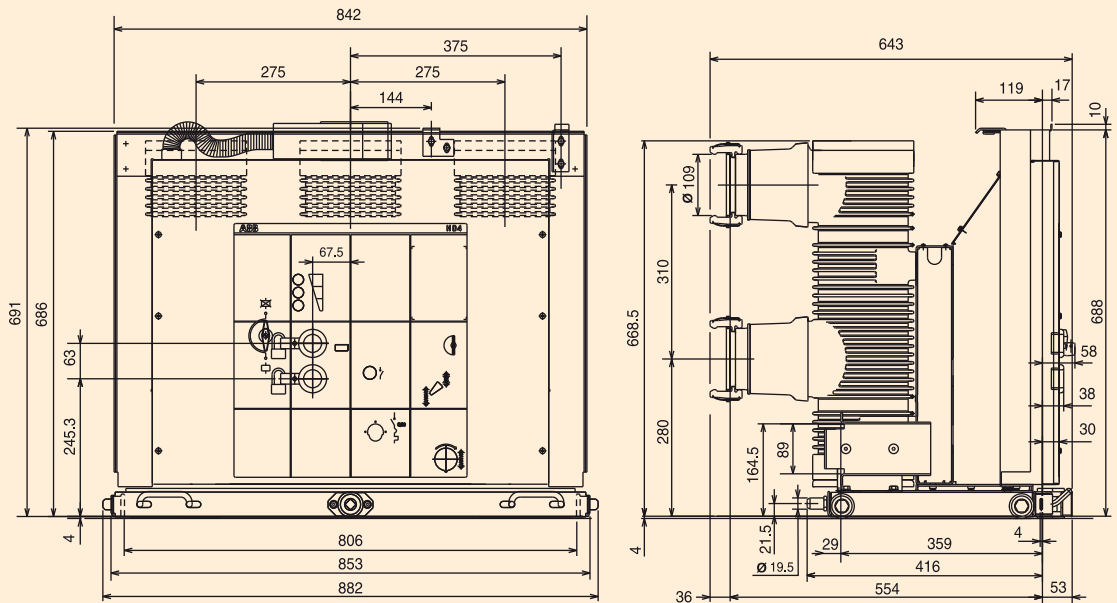
TN	7352
Ur	12 kV
Ir	2500 A
Isc	25 kA 31.5 kA 40 kA 50 kA

HD4/P

TN	7352
Ur	12 kV (*) 17.5 kV
Ir	2500 A
Isc	25 kA 31.5 kA 40 kA 50 kA

(*) HD4/P 12 kV for PowerCube.

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards



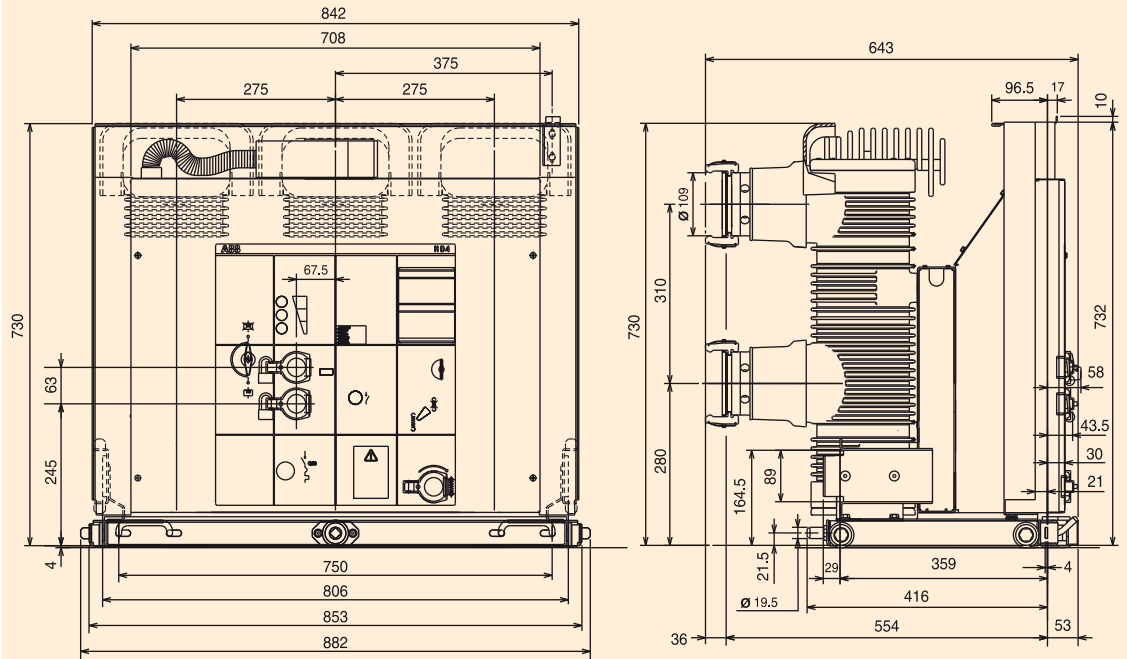
HD4/GT/P

TN	7371
Ur	12 kV
Ir	3150 A (*)
Isc	25 kA
	31.5 kA
	40 kA
	50 kA

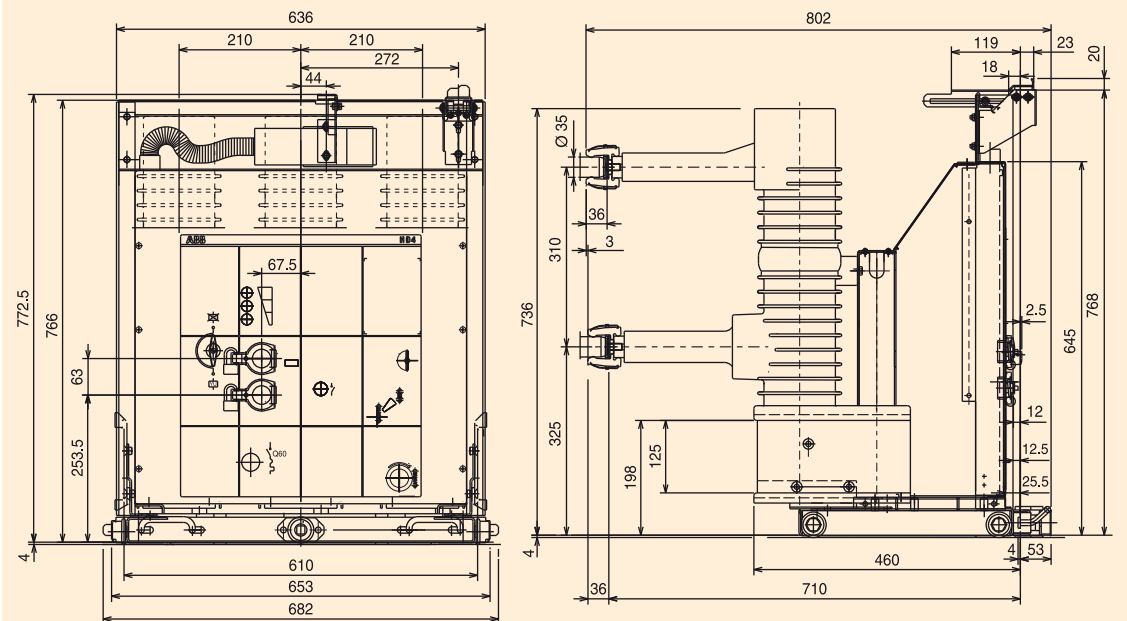
HD4/P

TN	7371
Ur	17.5 kV
Ir	3150 A (*)
Isc	25 kA
	31.5 kA
	40 kA
	50 kA

(*) 3600 - 4000 A with forced switchboard ventilation (consult the UniGear type ZS1 switchboard technical catalogue).

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards**HD4/P**

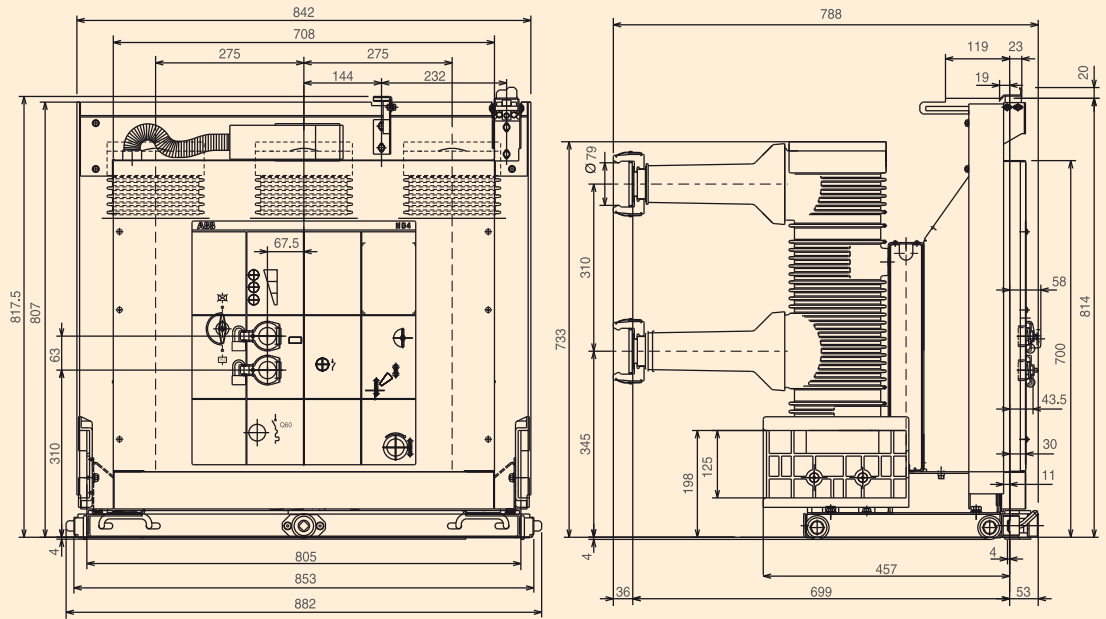
TN	7354
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards

HD4/P (*)

TN	7355
Ur	24 kV
Ir	1600 A
Isc	16 kA
	20 kA
	25 kA
	31.5 kA (**)

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards

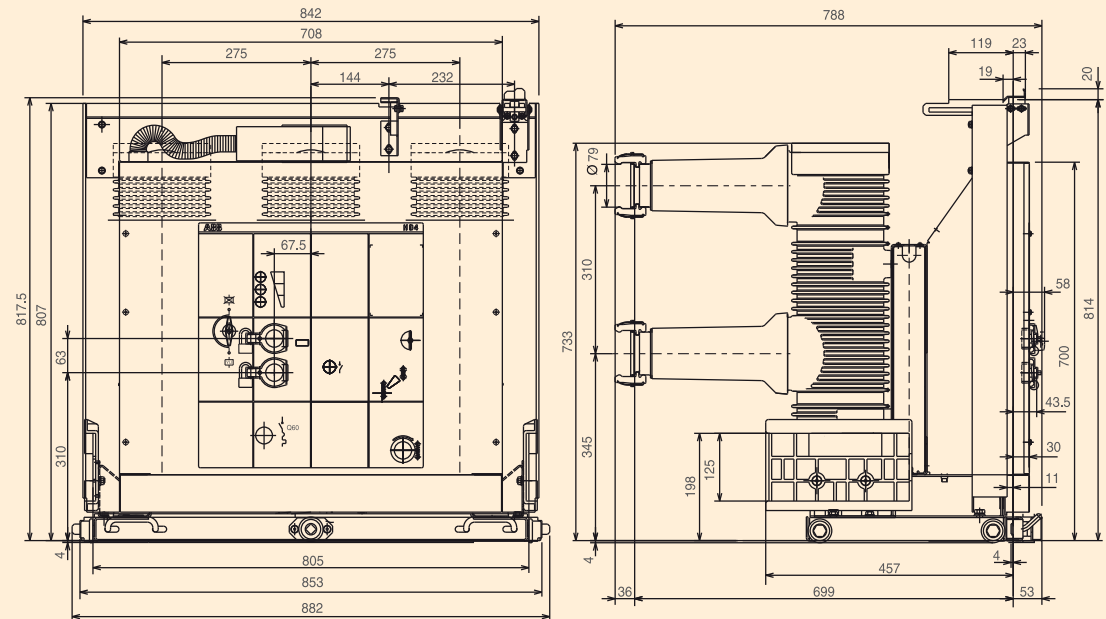


(*) Also valid for PowerCube.
(**) Not for PowerCube.

HD4/P (**)

TN	7356
Ur	24 kV
Ir	2000 A
Isc	16 kA
	20 kA
	25 kA
	31.5 kA (***)

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards



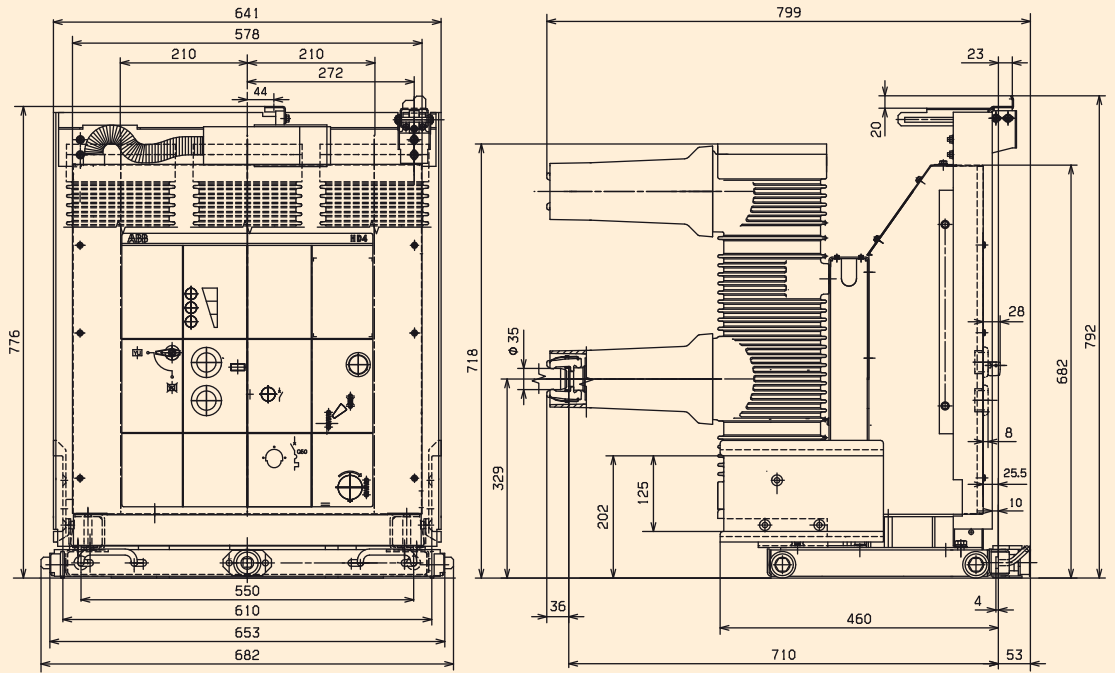
HD4/P (**)

TN	7356
Ur	24 kV
Ir	2500 A (*)
Isc	20 kA
	25 kA
	31.5 kA (***)

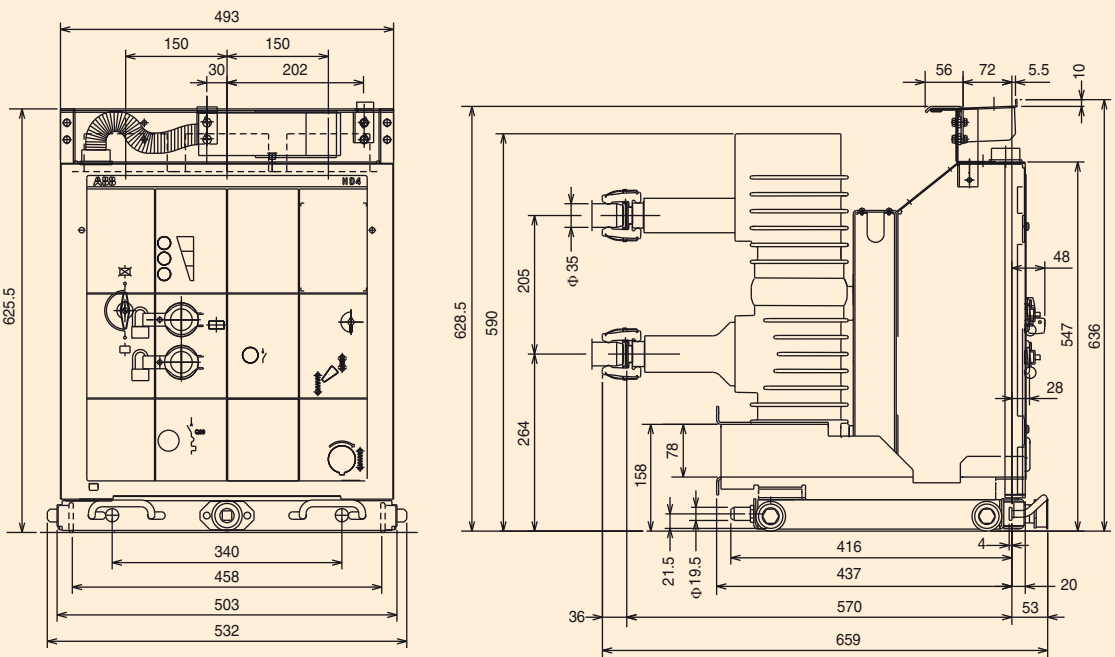
(*) 2500 A with forced ventilation; 2300 A with natural ventilation.
(**) Also valid for PowerCube.
(***) Not for PowerCube.

HD4/P

TN	1VCD000099
Ur	24 kV
Ir	1250 A
Isc	31.5 kA

HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards**HD4/W**

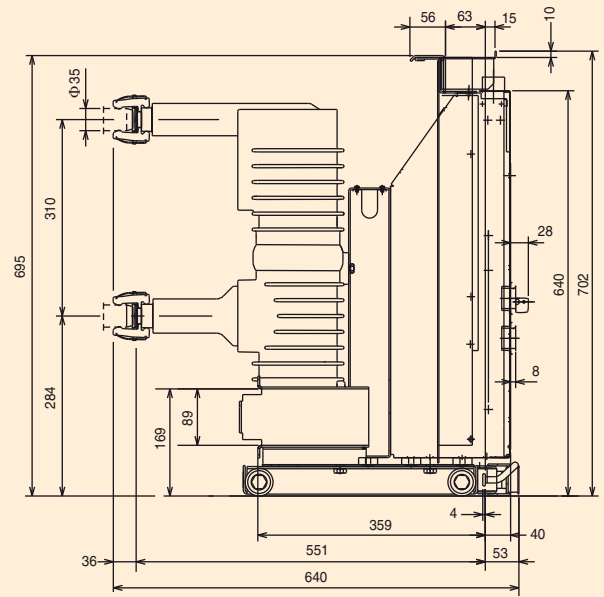
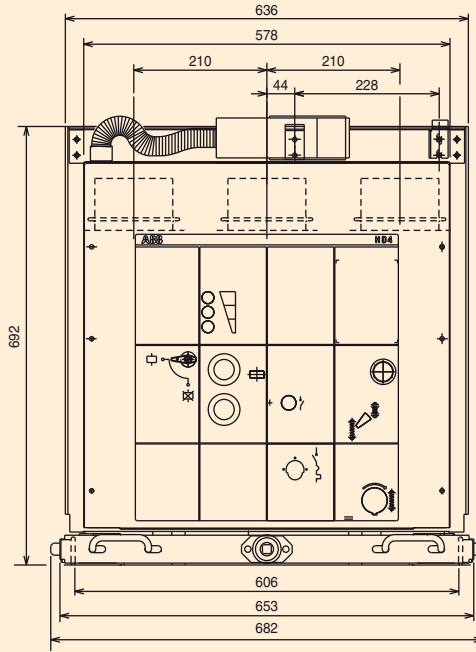
TN	7229
Ur	12 kV 17.5 kV
Ir	630 A 1250 A
Isc	16 kA 25 kA 31.5 kA

HD4/W withdrawable circuit-breakers for PowerCube modules

HD4/W

TN	7182
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	25 kA
	31.5 kA

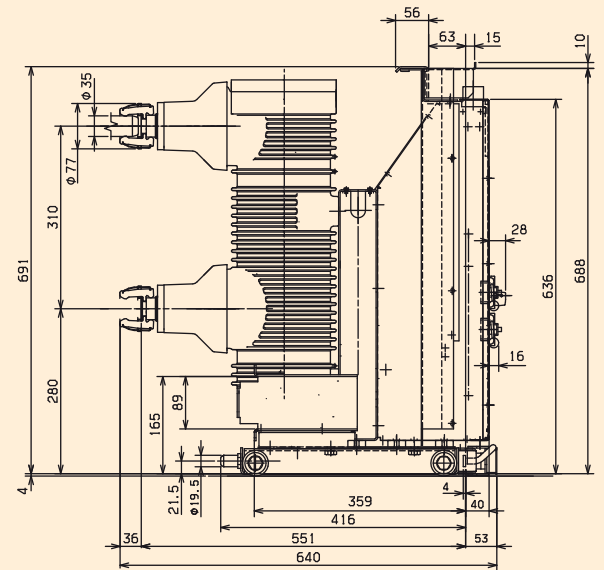
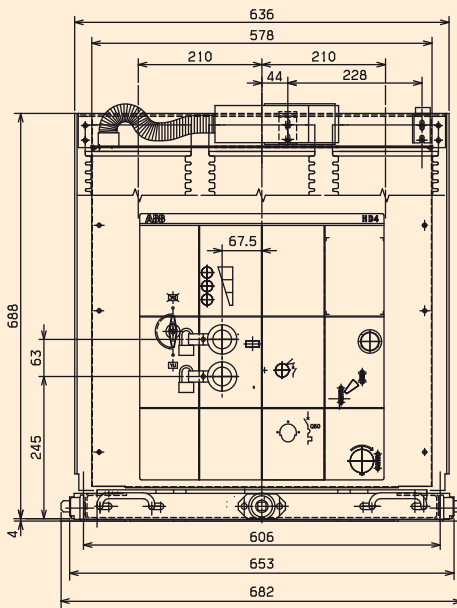
HD4/W withdrawable circuit-breakers for PowerCube modules



HD4/W

TN	7421
Ur	12 kV
	17.5 kV
Ir	1250 A
	50 kA
Isc	40 kA
	50 kA

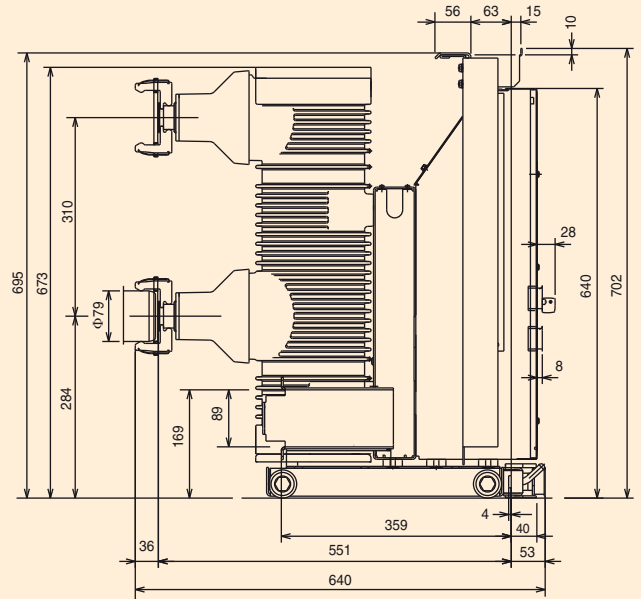
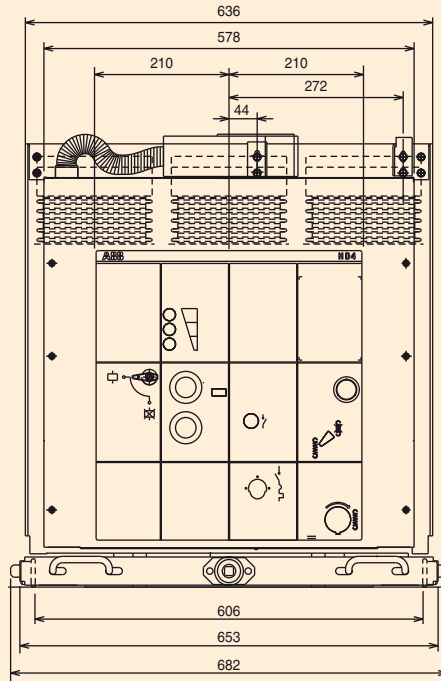
HD4/W withdrawable circuit-breakers for PowerCube modules



HD4/W

TN	7239
Ur	12 kV
	17.5 kV
I_r	1600 A
	2000 A
I_{sc}	16 kA
	25 kA
	31.5 kA

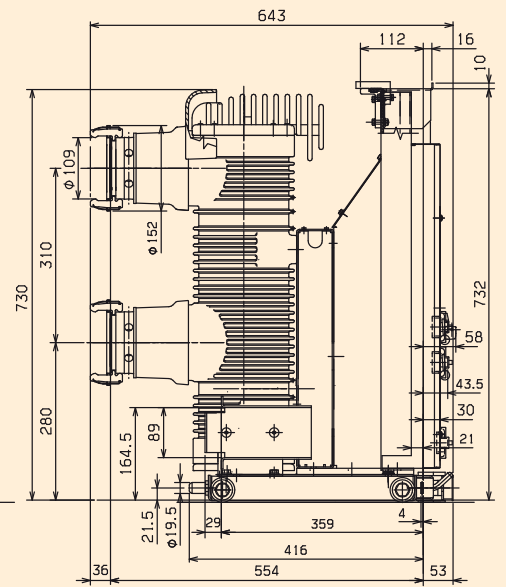
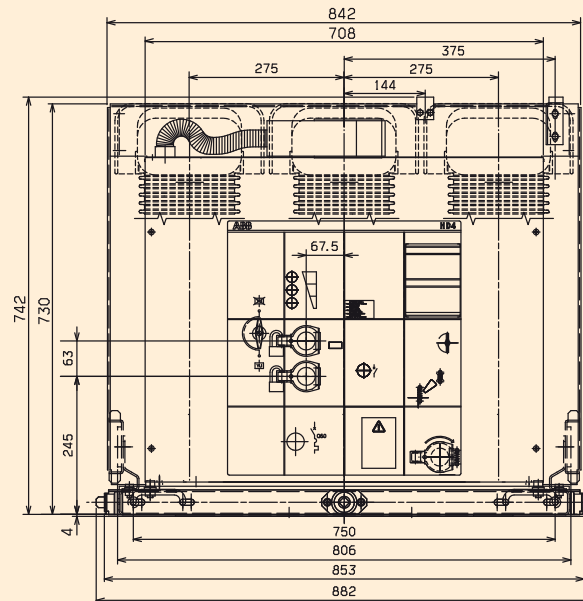
HD4/W withdrawable circuit-breakers for PowerCube modules



HD4/W

TN	1VCD000053
Ur	12 kV
	17.5 kV
I_r	3150 A
	40 kA
I_{sc}	31.5 kA
	50 kA

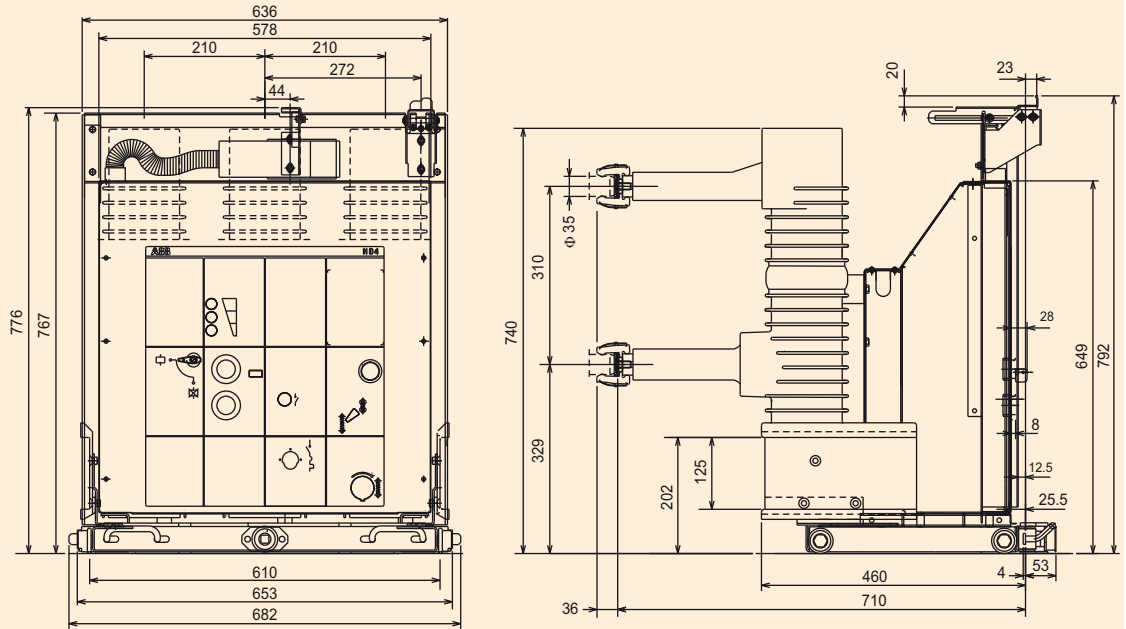
HD4/W withdrawable circuit-breakers for PowerCube modules



HD4/W

TN	7183
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA

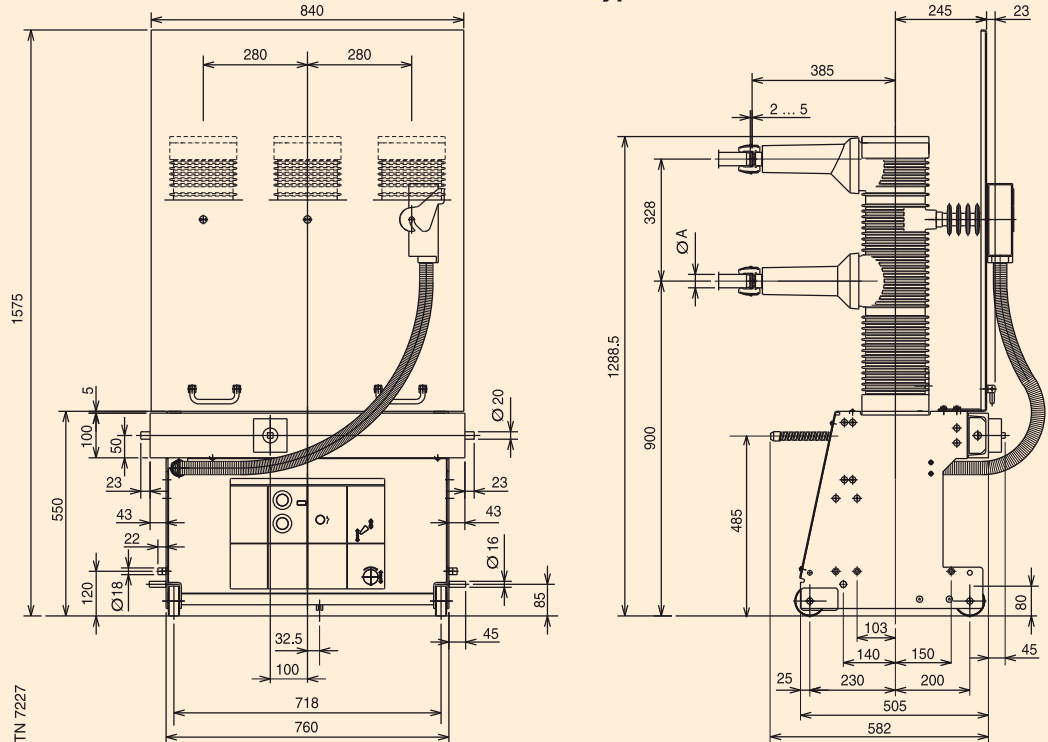
HD4/W withdrawable circuit-breakers for PowerCube modules



HD4/Z 40.5 kV

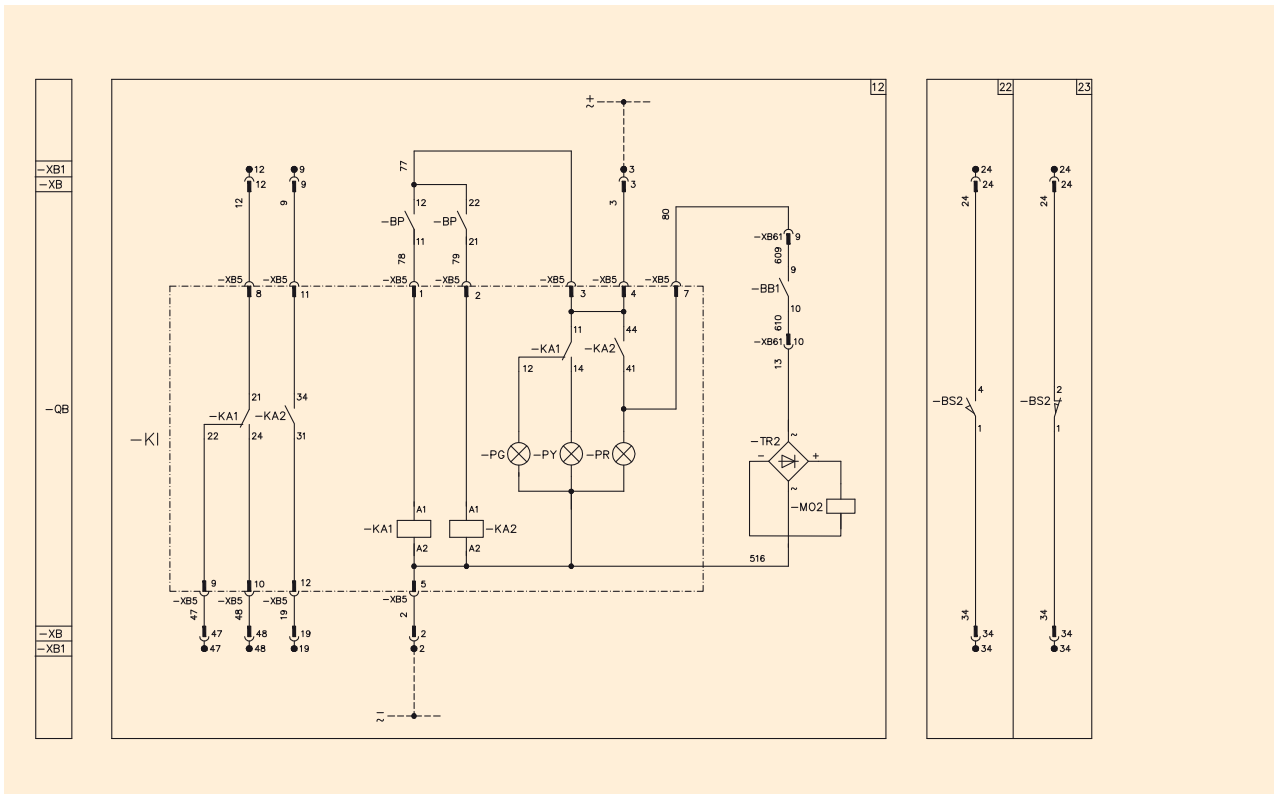
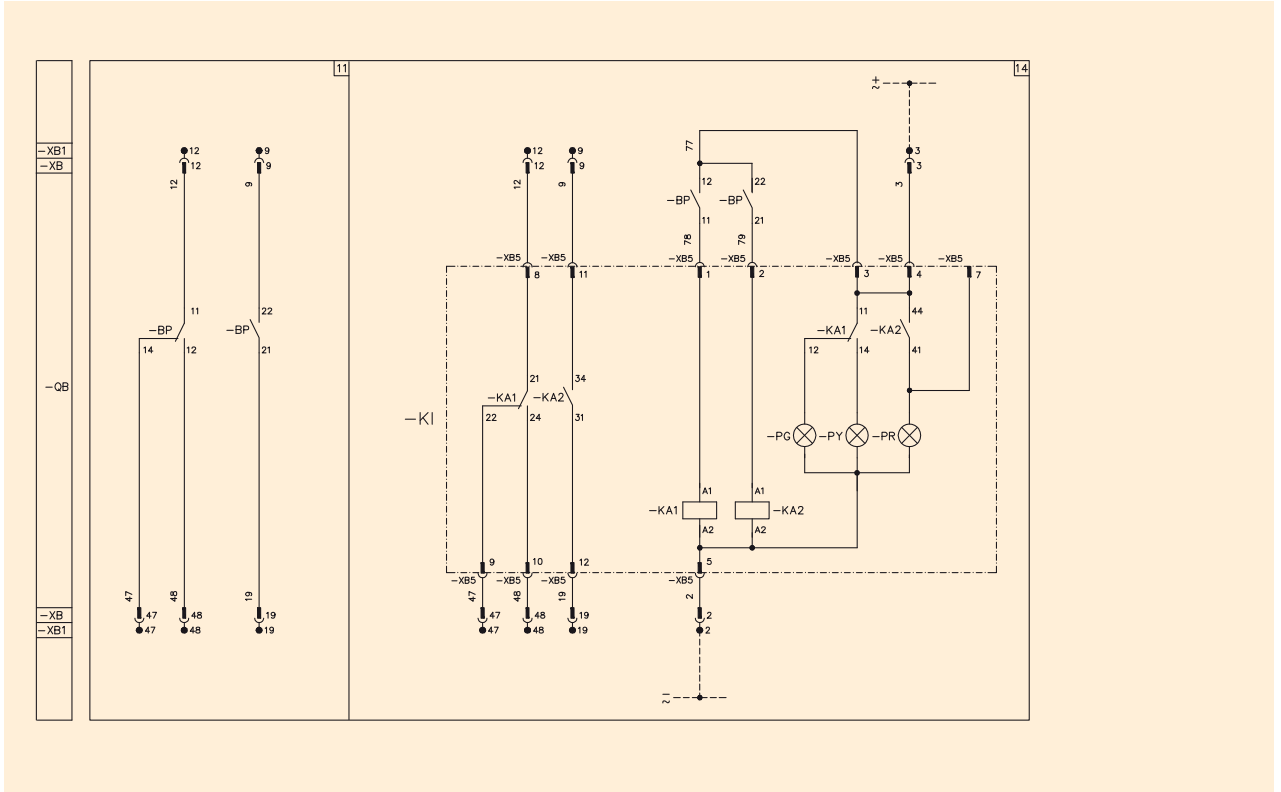
TN	7227
Ur	40.5 kV
Ir	1250 A
	1600 A
	2000 A
	2500 A (*)
Isc	25 kA
	31.5 kA

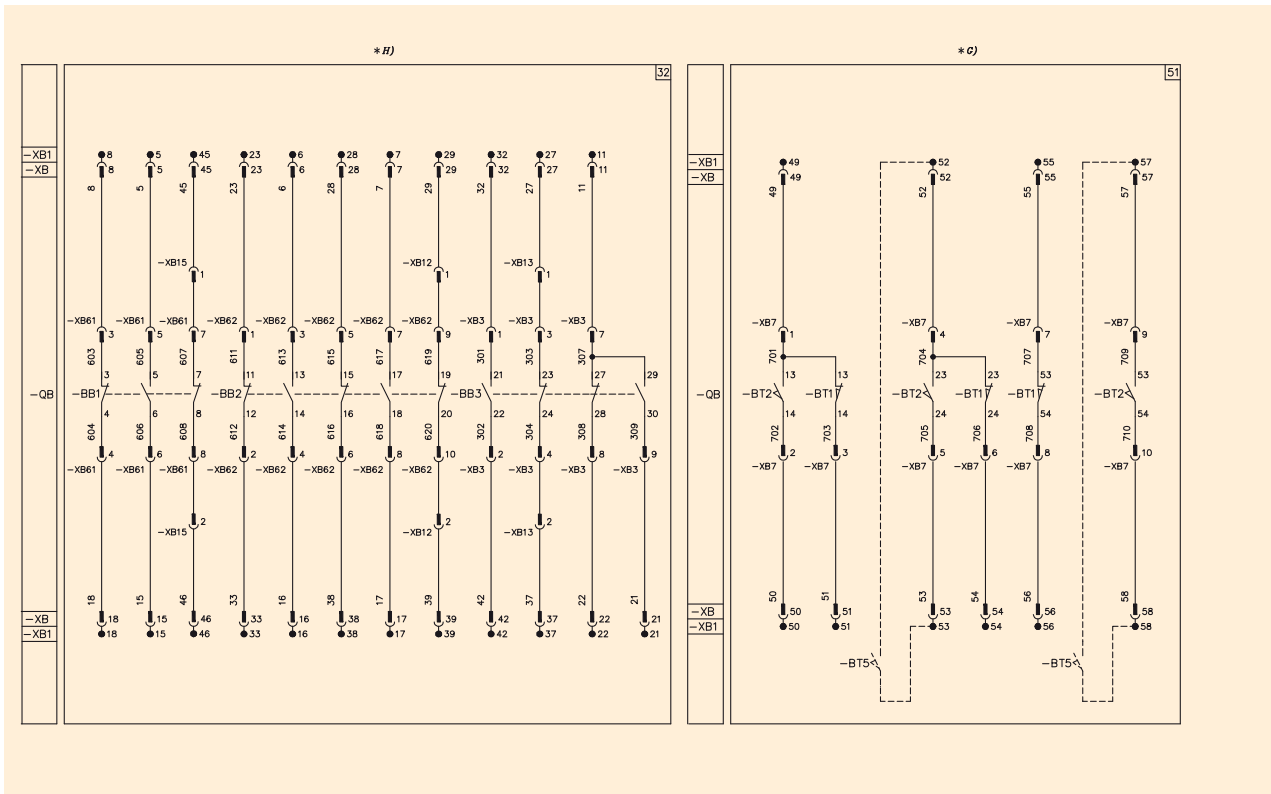
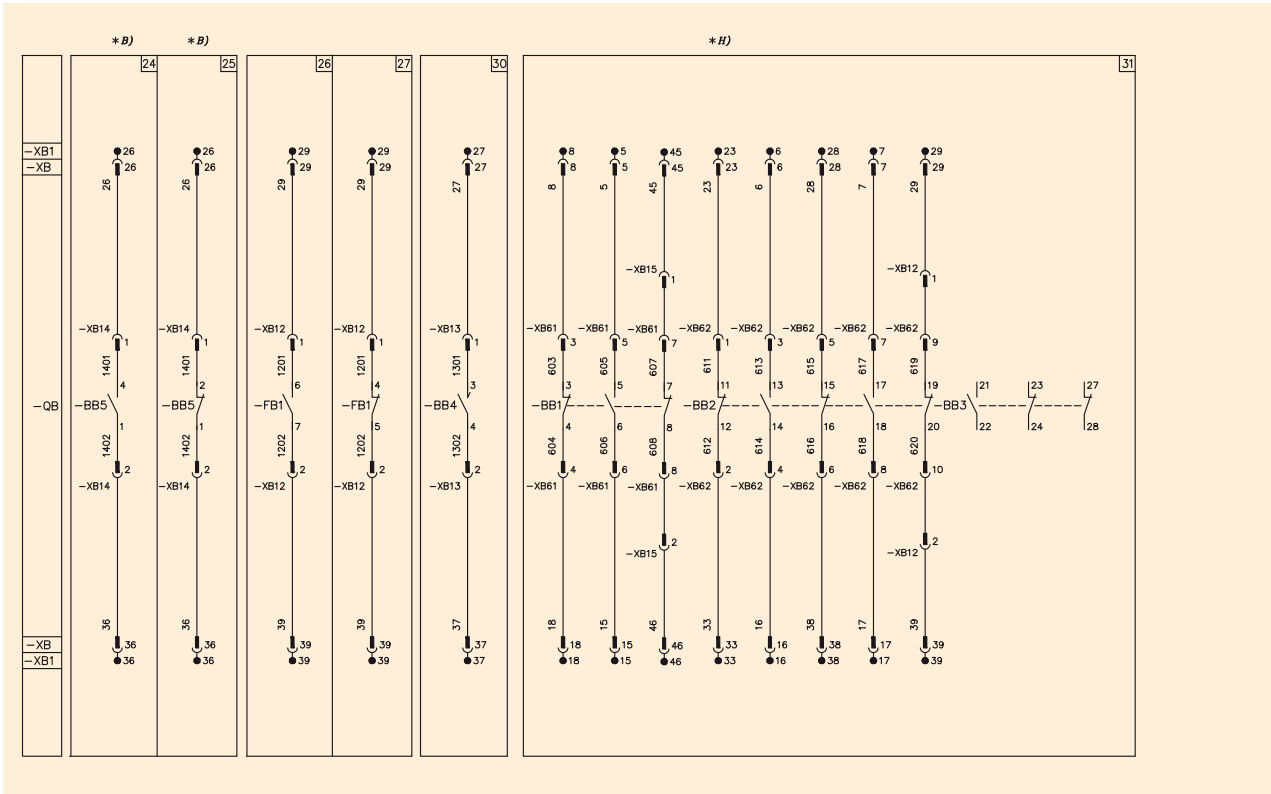
HD4/Z withdrawable circuit-breakers for UniGear type ZS3.2 - 40.5 kV switchboards



	Ø A
1250-1600 A	35 mm
2000-2500(*)A	79 mm

(*) With natural ventilation in loose enclosure type Powerbloc; with forced ventilation in switchboard type ZS3.2.





Represented operational state

The diagram indicates the following conditions:

- circuit-breaker open and connected
- circuits de-energized
- closing springs discharged
- key lock with key inserted and trapped
- SF₆ gas pressure at rated service value (380 kPa absolute).

Caption

- = Reference number of diagram figure
- * = See note indicated by the letter
- BM = Device for the supervision of shunt opening release coil continuity (see note E)
- BP = Pressure-switches with two operating levels:
 - operating for low gas pressure. Contacts 11-12-14 change position, as regard the position indicated on the diagram, when the pressure from 380 kPa absolute gets to a value lower than 310 kPa absolute. In case of rated pressure reset the same contacts change again position when the pressure, from a value lower than 310 kPa absolute, gets up to 340 kPa absolute.
 - operating for insufficient gas pressure. Contacts 21-22-24 change position when the pressure from 380 kPa absolute gets to a value lower than 280 kPa absolute. In case of rated pressure reset the same contacts change again position when the pressure, from a value lower than 280 kPa absolute, gets up to 310 kPa absolute.
- KT = Solid-state time-delaying device for the undervoltage release (see note I)
- KI = Integrated gas pressure control circuit, including:
 - PG = Green led indicating normal gas pressure
 - PR = Red led indicating insufficient gas pressure
 - PY = Yellow led indicating low gas pressure
 - KA1 = Auxiliary relay to double the -BP pressure-switch contacts operating for low gas pressure
 - KA2 = Auxiliary relay to double the -BP pressure-switch contacts operating for insufficient gas pressure
 - XB5 = Connector
- BR51 = Microprocessor based overcurrent release type PR512 external to the circuit-breaker (see note D)
- MS = Motor for the closing springs charging (see note C)
- QB = Main circuit-breaker
- BB1...-BB3 = Circuit-breaker auxiliary contacts (no. 3 packs of 5 contacts)
- BB4 = Auxiliary passing contact (closing momentarily when circuit-breaker opens)
- BB5 = Contacts signalling undervoltage release energized/de-energized
- FB1 = Miniature breaker with thermomagnetic O/C release for protection of the spring-charging motor (see note F)
- BS1...2 = Limit switches of the spring-charging motor
- BD1 = Position contact of the enclosure door. Foreseen for HD4/C only.
- BT3 = Circuit-breaker position contact. It is open during the isolating travel of the breaker
- BT5 = Contacts signalling circuit-breaker in the removed position (they are those signalling circuit-breaker in the isolated position located on the enclosure, in the fixed part: see contacts -BT2 given on circuit diagram 1VCD 400036 figures 5-6)
- BT1 = Contacts signalling circuit-breaker in the connected position (see note G)

- BT2 = Contacts signalling circuit-breaker in the isolated position (see note G)
- SC = Pushbutton or contact for the circuit-breaker closing
- BK = Contact operated by the key lock preventing electrical opening with earthing truck connected (It is mandatory for earthing truck with making capacity)
- SL1 = Contact locking for circuit-breaker closing
- SO = Pushbutton or contact for the circuit-breaker opening
- TR1, -TR2 = Rectifiers for shunt opening releases -MO1 and -MO2
- XB = Connector for the circuit-breaker circuits
- XB2...-XB62 = Connectors of accessories
- XB1 = Switchboard terminal board (mounted externally to the circuit-breaker)
- MC = Shunt closing release
- RL1 = Locking magnet on the operating mechanism. If de-energized it prevents the circuit-breaker closing mechanically
- RL2 = Locking magnet on the truck. If de-energized it prevents the circuit-breaker racking-in and racking-out mechanically (It is possible to limit its consumption by connecting in series a delaying pushbutton enabling the operation)
- MO1 = First shunt opening release (see note E)
- MO2 = Second shunt opening release (see note E)
- MO3 = Opening solenoid for the PR512 microprocessor based release external the circuit-breaker (see note D)
- MU = Instantaneous undervoltage release or undervoltage release with electronic time-delaying device (see note B)
- VF = Filter (provided with voltage supply 220V d.c. or greater)

Diagram figures description

- Fig. 1 = Spring charging-motor circuit (see note C).
- Fig. 2 = Shunt closing release (antipumping is achieved mechanically).
- Fig. 3 = Locking magnet on the operating mechanism. If de-energized it prevents the circuit-breaker closing mechanically.
- Fig. 4 = Locking magnet on the truck. If de-energized it prevents the circuit-breaker racking-in and racking-out mechanically (It is possible to limit its consumption by connecting in series a delaying pushbutton enabling the operation) (see note H).
- Fig. 5 = Instantaneous undervoltage release (see note B)
- Fig. 6 = Undervoltage release with solid-state time-delaying device (see notes B and I)
- Fig. 7 = First shunt opening release circuit with possibility of permanent supervision of coil continuity (see note E).
- Fig. 9 = Second shunt opening release circuit with possibility of permanent supervision of coil continuity (see note E).
- Fig. 10 = Opening solenoid for PR512 microprocessor based release external to the circuit-breaker (see note D).
- Fig. 11 = Gas pressure control circuit including:
 - contacts for remote indication of normal, low and insufficient gas pressure.
 - For -BP pressure-switches tripping values see the caption.
- Fig. 12 = Integrated gas pressure control circuit, including:
 - circuit-breaker opening through the -MO2 release and closing lock through a -KA2 relay auxiliary contact in case of insufficient gas pressure (provide the locking magnet given in fig. 3)
 - 3 leds for local indication of normal, low and insufficient gas pressure

- contacts for remote indication of normal, low and insufficient gas pressure.
- For -BP pressure switches tripping values see the caption.
- Fig. 14 = Integrated gas pressure control circuit, including:
 - lock of circuit-breaker closing and opening through -KA2 relay auxiliary contacts in case of insufficient gas pressure (provide the locking magnet given in fig. 3)
 - 3 leds for local indication of normal, low and insufficient gas pressure
 - contacts for remote indication of normal, low and insufficient gas pressure.
- For -BP pressure switches tripping values see the caption.
- Fig. 20 = Contact operated by the key lock, preventing electrical opening, with earthing truck with making capacity connected. (It is obligatory for earthing truck with making capacity when is requested the first shunt opening release -MO1).
- Fig. 21 = Miniature breaker with thermomagnetic O/C release for protection of the spring-charging motor (see note F).
- Fig. 22 = Contact signalling closing springs charged.
- Fig. 23 = Contact signalling closing springs discharged.
- Fig. 24 = Contact signalling undervoltage release energized (see note B).
- Fig. 25 = Contact signalling undervoltage release de-energized (see note B).
- Fig. 26 = Contact signalling miniature breaker for protection of the spring-charging motor on.
- Fig. 27 = Contact signalling miniature breaker for protection of the spring-charging motor off.
- Fig. 30 = Passing auxiliary make contact closing momentarily when circuit-breaker opens (-MO1, -MO2, -MO3 and -MU).
- Fig. 31 = Circuit-breaker available auxiliary contacts.
- Fig. 32 = Circuit-breaker available auxiliary contacts.
- Fig. 51 = Contacts signalling circuit-breaker in the connected and isolated positions located on the circuit-breaker, they are provided on request (see note G).

Incompatibility






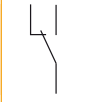

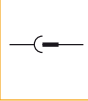

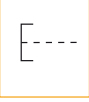
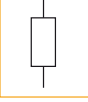








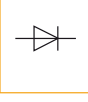
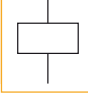



The combination of circuits given in the figures below are not possible on the same circuit-breaker:

5 - 6 - 14	9 - 10 - 12 - 20	24 - 25
5 - 6 - 20	11 - 12 - 14	26 - 27
9 - 10 - 12 - 14	22 - 23	31 - 32

Notes

- A) The circuit-breaker is only fitted with the accessories listed in the order confirmation. To make out the order, please consult the catalogue of the apparatus.
- B) The undervoltage release can be provided for power supply with voltage branched on the supply side of the circuit-breaker or from an independent source.
Either the instantaneous undervoltage release or the one with electronic delay device can be used (delay can be selected between 0.5 ... 3 s; see note I). Circuit-breaker closing is only possible with the release energised (the closing lock is made mechanically).
The contact in fig. 24 or the one in fig. 25 is available on request.
A delay of 50 ms between the moment of consent of the undervoltage release and energisation of the shunt closing release must be inserted when there is the same power supply for the shunt closing and undervoltage releases and automatic circuit-breaker closing on return of the auxiliary power supply is required. This can be carried out by means of a circuit outside the circuit-breaker, including a permanent closing contact, the contact indicated in fig. 24 and a time-delay relay.
- C) Check the power available on the auxiliary circuit to verify the possibility of starting several motors for charging the closing springs at the same time. To avoid excessive consumption, it is necessary to charge the springs manually before supplying the auxiliary circuit with voltage.
- D) Please see diagram 401530 for the connections between the circuit-breaker auxiliary circuits and the PR512 type of microprocessor-based overcurrent release located in the switchboard.
- E) The circuit for controlling continuity of the shunt opening release winding must only be used for this function.
At a power supply lower than 220V, connect the "Control Coil Continuity" device, or a relay or a signalling lamp which consumes a current not exceeding 20 mA.
At a power supply equal to or higher than 220V, connect a delay or signalling lamp which consumes a current not exceeding 10 mA.
Other uses might jeopardise release functionality.
- F) The -FB1 circuit-breaker in fig. 21 must always be provided when there is a 24 kV d.c. spring charging motor.
In case of opening caused by a fault in the motor, before carrying out manual resetting, recharge the springs by means of the special handle.
- G) The contacts (-BT1 and -BT2) shown in fig. 51 for signalling the circuit-breaker status are located on the circuit-breaker (moving part) and are available on request. However, application of these contacts on the enclosure is usually foreseen (fixed part): see diagram 401693 for CBE 11 - 21 - 31 and diagram 401526 for CBE 41 - 51.
- H) When fig. 9 is requested, the contact of pack -BB3 to terminals 29-30 in fig. 32 is not available.
When figs. 26-27 are requested, the -BB2 contact to terminals 29-30 of figs. 31-32 is not available.
When fig. 30 is requested, the contact of pack -BB3 to terminals 23-24 in fig. 32 is not available.
- I) Make one of the following bridges to select the delay required:
 - 0.5 s: terminals 6-7
 - 1 s: terminals 6-8
 - 1.5 s: terminals 6-9
 - 2 s: terminals 6-10
 - 3 s: no bridge.
- J) When fig. 4 is requested, the contact of pack -BB1 to terminals 7-8 in figs. 31-32 is not available.

Graphical symbols for electrical diagrams (IEC 60617 and CEI 3-14 ... 3-26 Standards)

	Thermal effect		Connections of conductors		Break contact
	Electromagnetic effect		Terminal or clamp		Change-over break before make contact
	Timing		Socket and plug (female and male)		Passing make contact closing momentarily during release
	Pushbutton control		Resistor (general symbol)		Closing position contact (limit switch)
	Operated by key		Capacitor (general symbol)		Opening position contact (limit switch)
	Earth (general symbol)		Motor (general symbol)		Power circuit-breaker with automatic opening
	Mass, frame		Rectifier with two half-waves (bridge)		Control coil (general symbol)
	Conductors in shielded cable (two conductors shown)		Make contact		Lamp (general symbol)

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