Medium voltage products

HD4
Gas insulated MV circuit-breakers
12 ... 40.5 kV - 630 ... 3600 A - 16 ... 50 kA

Power and productivity
for a better world™

Index

1. Description

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 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.

- 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
- SF_6 gas pressure control device (on request).

(*) Up to 24 kV.

Circuit-breakers in the withdrawable version are fitted with a truck to allow racking in and racking out of the switchgear 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 PowerCube modules and UniGear type ZS1, ZS2, ZS3.2 switchgears.

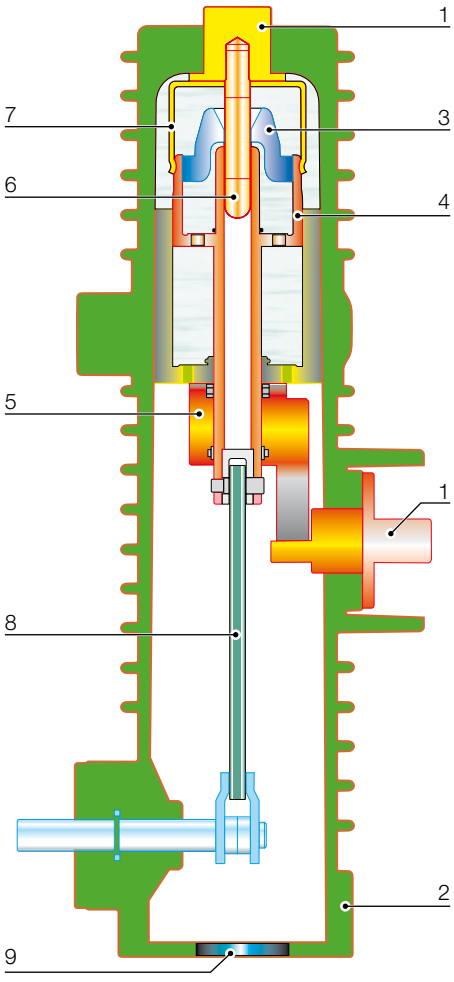
Fields of application

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

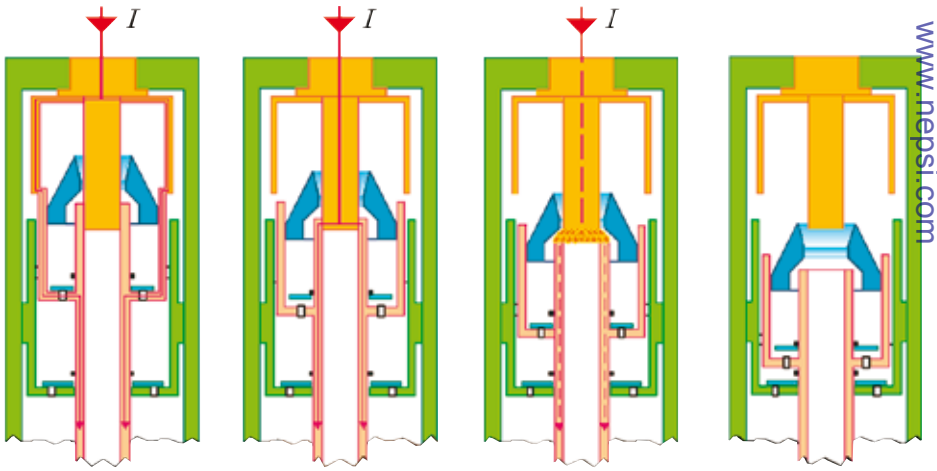
Thanks to the SF6 autopuffer breaking technique, the HD4 circuit-breakers do not generate operating overvoltages, and are therefore also highly suitable for retrofitting, upgrading and enlarging older installations where the motor, cable, etc. insulating materials may be particularly sensitive to dielectric 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.



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



Circuit-breaker closed | **Main contact separation** | **Arcing contact separation** | **Circuit-breaker open**

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.

1. Description

Standards and approvals

HD4 circuit-breakers comply with IEC 62271-100 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 33) and guarantee suitability for use in overhead lines, with rapid reclosing cycle. Versions approved according to the GOST Standard are also available (please contact us).

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 REF 601 switchgear release is available for protection of the installations.
In its basic version, the REF 601 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 REF 601 release, please consult technical manual MDU072061.

Service safety

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

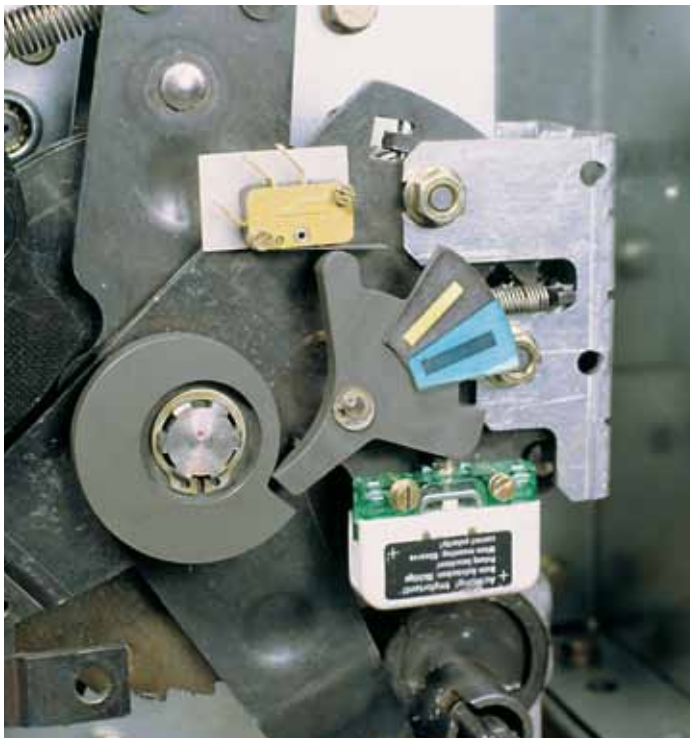
HD4 circuit-breakers have a complete range of accessories which fulfil all installation requirements.
The operating mechanism is the same type for the whole series and has a standardized range of accessories and spare parts which are easy to identify and order.
Apparatus use, maintenance and service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

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.**

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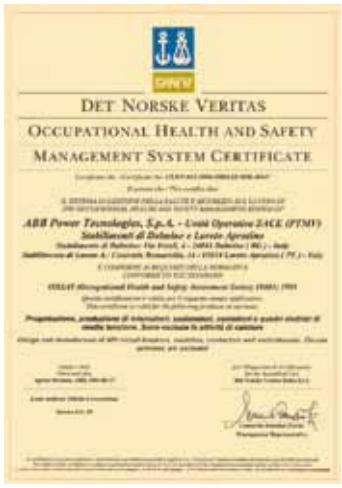
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CERTIFICATE OF ACCREDITATION

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 switchgears
- ZS3.2 / PowerBloc / UniSec switchgears
- UniSwitch type switchgears
- UniMix type switchgears
- REF542*plus* unit
- REF 601 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

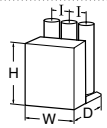
Complies with ISO 14001 Standards, certified by an independent organisation.

Health and Safety Management System

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

2. Selection and ordering

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

Circuit-breaker		HD4 12										
Standards	IEC 62271-100	•										
	VDE 0671; CEI EN 62271-100 - File 7642	•										
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	1600	630	1250	1600	1600	2000	2500	3150	3600
Rated breaking capacity	Isc [kA]	16	16	16	16	16	16	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–
		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	50
Rated short-time withstand current (3 s)	Ik [kA]	16	16	16	16	16	16	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–
		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	50
Making capacity	Ip [kA]	40	40	40	40	40	40	–	–	–	–	–
		50	50	50	50	50	50	–	–	–	–	–
		–	–	–	–	–	–	–	63	63	63	63
		80	80	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]	•										
Opening time	[ms]	45										
Arcing time	[ms]	10-15										
Total breaking time	[ms]	55-60										
Closing time	[ms]	80										
Overall dimensions 	H [mm]	640			649			655			655	
	W [mm]	493			618			618			730	
	D [mm]	496			496			561			603	
	Pole centre distance I [mm]	150			210			210			275	
Weight	[Kg]	114			114			145			165	
Standardised table of dimensions		TN 7177			TN 7177			TN 7163			TN 7165	
Absolute SF6 gas pressure (2)	[kPa]	380										
Operating temperature	[°C]	- 5 ... + 40 °C										
Tropicalization	IEC: 60068-2-30, 60721-2-1	•										
Electromagnetic compatibility	IEC 62271-1	•										

(1) Rated normal current defined in free air.
(2) Rated service value.
(3) 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	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	–	–	–	–	–	
	–	–	–	–	–	–	–	–	20	20	20	20	20	20	–	–	–	–	–	
	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	
	–	–	–	40	40	40	40	40	–	–	–	–	–	–	40	40	40	40	40	
	–	–	–	50	50	50	50	50	–	–	–	–	–	–	–	–	–	–	–	
	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	
	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	
	–	–	–	50	50	50	50	50	–	–	–	–	–	–	–	–	–	–	–	
	40	40	40	–	–	–	–	–	40	40	40	40	40	40	–	–	–	–	–	
	50	50	50	–	–	–	–	–	50	50	50	50	50	50	–	–	–	–	–	
	–	–	–	–	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	
	–	–	–	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											
	649			655		655			818			730			655		818 [3]			
	618			618		730			618			748			730		730			
	496			561		603			600			496			561		620 [3]			
	210			210		275			210			275			275		275			
	114			145		165			119			119			145		165			
	TN 7178			TN 7163		TN 7165			TN 7179			TN 7242			TN 7174		TN 7165			
	380								380						380 (480 at 40 kA)					
	- 5 ... + 40 °C								- 5 ... + 40 °C											
	•								•											
	•								•											

2. Selection and ordering

General characteristics of fixed circuit-breakers (36 kV)

Fixed HD4 36 kV circuit-breaker with 350 mm pole centre distance:
Ir = 630-1250-1600 A;
Isc = 16-20 kA.

Circuit-breaker		HD4 36		
Standards	IEC 62271-100	•		
	VDE 0671; CEI EN 62271-100 - File 7642	•		
Rated voltage	Ur [kV]	36		
Rated insulation voltage	Us [kV]	36		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	70		
Impulse withstand voltage	Up [kV]	170		
Rated frequency	fr [Hz	50-60		
Rated normal current (40 °C) (1)	Ir [A]	630	1250	1600
Rated breaking capacity	Isc [kA]	16	16	16
		20 (5)	20 (5)	20 (5)
		—	—	—
		—	—	—
Rated short-time withstand current (3 s)	Ik [kA]	16	16	16
		20	20	20
		—	—	—
		—	—	—
Making capacity	Ip [kA]	40	40	40
		50	50	50
		—	—	—
		—	—	—
Operation sequence	[O-0.3s-CO-15s-CO]			
	[O-0.3s-CO-3min-CO]	•	•	•
Opening time	[ms]	45		
Arcing time	[ms]	10-15		
Total breaking time	[ms]	55-60		
Closing time	[ms]	80		
Maximum overall dimensions without insulating screens between phases (4)	H [mm]	730/1060 (6)		
	W [mm]	880/955 (6)		
	D [mm]	695		
	Pole centre distance I [mm]	350		
Weight	[kg]	124	128	128
Standardised table of dimensions		TN 7241		
Absolute SF_6 gas pressure (2)	[kPa]	380		
Operating temperature	[°C]	- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1	•		
Electromagnetic compatibility	IEC 62271-1	•		

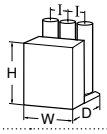
(1) Rated normal current defined in free air
(2) Rated service value
(3) For these versions, with 275 mm pole centre distance, special insulating partitions are provided (on request)
(4) For the dimensions of the insulating partitions (available on request), see the standardised table in chapter 5
(5) Operation sequence: O - 0.3 min - CO - 3 min - CO
(6) The second distance refers to the circuit-breaker with truck (available on request)

Fixed HD4 36 kV circuit-breaker
with 275 mm pole centre distance:
Ir = 1250-1600 A;
Isc = 25-31.5 kA;
Ir = 2000-2500 A;
Isc = 20-25-31.5 kA.

	HD4 36			
	•			
	•			
	36			
	36			
	70			
	170			
	50-60			
	1250 (3)	1600 (3)	2000 (3)	2500 (3)
	—	—	—	—
	—	—	20	20
	25	25	25	25
	31.5	31.5	31.5	31.5
	—	—	—	—
	—	—	20	20
	25	25	25	25
	31.5	31.5	31.5	31.5
	—	—	—	—
	—	—	50	50
	63	63	63	63
	80	80	80	80
	•	•	•	•
	45			
	10-15			
	55-60			
	80			
	790/1123 (6)			790/1123 (6)
	748/805 (6)			748/805 (6)
	833			833
	275			275
	175	175	180	190
	TN 7268			TN 7315
	450			450
	- 5 ... + 40			
	•			
	•			

2. Selection and ordering

General characteristics of withdrawable circuit-breakers for UniGear type ZS1 switchgear (12 - 17.5 - 24 kV) (4)

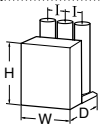
Circuit-breaker			HD4/P 12						
Standards		IEC 62271-100	•						
		VDE 0671; CEI EN 62271-100 - File 7642	•						
Rated voltage		Ur [kV]	12						
Rated insulation voltage		Us [kV]	12						
Withstand voltage at 50 Hz		Ud (1 min) [kV]	28						
Impulse withstand voltage		Up [kV]	75						
Rated frequency		fr [Hz]	50-60						
Rated normal current (40 °C) (1)		Ir [A]	630	1250	1250	1600	2000	2500	3150 (3)
Rated breaking capacity		Isc [kA]	16	16	—	—	—	—	—
			—	—	—	—	—	—	—
			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]	16	16	—	—	—	—	—
			—	—	—	—	—	—	—
			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]	40	40	—	—	—	—	—
			—	—	—	—	—	—	—
			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]	•						
Opening time		[ms]	45						
Arcing time		[ms]	10-15						
Total breaking time		[ms]	55-60						
Closing time		[ms]	80						
Overall dimensions		H [mm]	628		702		702	702	746
		W [mm]	532		682		682	882	882
		D [mm]	659		640		640	643	643
		Pole centre distance I [mm]	150		210		210	275	275
Weight		[Kg]	120		177		177	220	230
Standardised table of dimensions			TN 7286		TN 7350		TN 7351	TN 7352	TN7371
Absolute SF_6 gas pressure (2)		[kPa]	380						
Operating temperature		[°C]	- 5 ... + 40						
Tropicalization		IEC: 60068-2-30, 60721-2-1	•						
Electromagnetic compatibility		IEC 62271-1	•						

(1) Rated normal current with circuit-breaker in UniGear type ZS1 switchgear and 40 °C ambient temperature outside the switchgear
(2) Rated service value
(3) The circuit-breaker can reach rated currents higher than 3150 A with appropriate forced ventilation of the switchgear (for further information, consult the technical catalogue of the UniGear type ZS1 switchgear).
(4) In the standard fitting, the truck locking electromagnetic (-RL2) is included to prevent circuit-breaker racking-in with auxiliary circuits not connected (plug not inserted in the socket).
(5) Rated current in switchgear with forced ventilation; 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 [3]	630	1250	1250	1600	2000	2500 [5]
	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					
	628		702		702	702	746	736		792	821	821	
	532		682		682	882	882	636		653	842	842	
	659		640		640	643	643	799		799	788	788	
	150		210		210	275	275	210		210	275	275	
	120		177		177	220	230	125		177	177	220	
	TN 7286		TN 7350		TN 7351	TN 7352	TN7371	TN 7354		1VCD000099	TN 7355	TN 7356	
	380							380					
	- 5 ... + 40							- 5 ... + 40					
	•							•					
	•							•					

2. Selection and ordering

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

Circuit-breaker		
Standards	IEC 62271-100	
	VDE 0671; CEI EN 62271-100 - File 7642 (3)	
Rated voltage		Ur [kV]
Rated insulation voltage		Us [kV]
Withstand voltage at 50 Hz		Ud (1 min) [kV]
Impulse withstand voltage		Up [kV]
Rated frequency		fr [Hz]
Rated normal current (40 °C) (1)		Ir [A]
Rated breaking capacity		Isc [kA]
Rated short-time withstand current (3 s)		Ik [kA]
Making capacity		Ip [kA]
Operation sequence		[O-0.3s-CO-15s-CO]
Opening time		[ms]
Arcing time		[ms]
Total breaking time		[ms]
Closing time		[ms]
Maximum overall dimensions		H [mm]
		W [mm]
		D [mm]
		Pole centre distance I [mm]
Weight		[kg]
Standardised table of dimensions		
Absolute SF_6 gas pressure (2)		[kPa]
Operating temperature		[°C]
Tropicalization		IEC: 60068-2-30, 60721-2-1
Electromagnetic compatibility		IEC 62271-1

(1) Rated normal current with circuit-breaker in switchgear UniGear ZS3.2 and ambient temperature outside the switchgear 40 °C
(2) Rated service value
(3) The circuit-breaker also conforms to the following Chinese standards:
- GB 1984-1989 National Standard
- DL/T402-1999 National Power Company Standard
- JB/T9694-1999 Machinery/Electricity Ministry Standards
(4) Rated current in ZS3.2 switchgear with forced ventilation; in Powerbloc enclosure the 2500 A rated current is guaranteed with natural ventilation.
(5) The operation sequence becomes O-0.3-CO-3min-CO for the I_{sc} = 31.5 kA performance.

	HD4/Z 40.5			
	•			
	•			
	40.5			
	40.5			
	95			
	185			
	50-60			
	1250	1600	2000	2500 (4)
	25	25	25	25
	31.5 (5)	31.5 (5)	31.5 (5)	31.5 (5)
	25	25	25	25
	31.5	31.5	31.5	31.5
	63	63	63	63
	80	80	80	80
	•			
	45			
	10-15			
	55-60			
	80			
	1575			
	850			
	686			
	280			
	280			
	TN 7227			
	550			
	- 5 ... + 40			
	•			
	•			

2. Selection and ordering

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

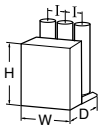
Circuit-breaker		HD4/W 12								HD4/P 12		
PowerCube module		PB1	PB1	PB2	PB2	PB2	PB2	PB2	PB3	PB2	PB2	PB3
Standards	IEC 62271-100	•								•		
	VDE 0671; CEI EN 62271-100 - File 7642	•								•		
Rated voltage	Ur [kV]	12								12		
Rated insulation voltage	Us [kV]	12								12		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28								28		
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	630	1250	1250	1600	2000	3150 (3)	1600	2000	2500
Rated breaking capacity	Isc [kA]	16	16	16	16	–	16	16	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–
		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]	16	16	16	16	–	16	16	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–
		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]	40	40	40	40	–	40	40	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–
		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]	•								•		
Opening time	[ms]	45								45		
Arcing time	[ms]	10-15								10-15		
Total breaking time	[ms]	55-60								55-60		
Closing time	[ms]	80								80		
Maximum overall dimensions	H [mm]	636		702		702	702		742	702	702	702
	W [mm]	532		682		682	682		882	682	682	882
	D [mm]	659		640		640	640		643	640	640	643
	Pole centre distance I [mm]	150		210		210	210		275	210	210	275
Weight	[kg]	120		120		177	177		230	177	177	220
Standardised table of dimensions		TN 7229		TN 7182		TN 7421	TN 7239		1VCD000053	TN 7350	TN 7351	TN 7352
Absolute SF_6 gas pressure (2)	[kPa]	380								380		
Operating temperature	[°C]	- 5 ... + 40								- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1	•								•		
Electromagnetic compatibility	IEC 62271-1	•								•		

(1) Rated normal current with withdrawable circuit-breaker in switchgear
(2) Rated service value
(3) There are higher currents with forced ventilation: 3600 A with a fan installed in the PB3 and 4000 A with a further fan in the rear of the switchgear (provided by the customer); see the PowerCube Instruction Manual
(4) 2500 A with forced ventilation
(5) 480 at 40 kA

	HD4/W 17								HD4/P 17			HD4/W 24	HD4/P 24		HD4/P 24		
	PB1	PB1	PB2	PB2	PB2	PB2	PB2	PB3	PB2	PB2	PB3	PB4	PB4	PB4	PB5	PB5	PB5
	•								•			•	•		•		
	•								•			•	•		•		
	17.5								17.5			24	24		24		
	17.5								17.5			24	24		24		
	38								38			50	50		50		
	95								95			125	125		125		
	50-60								50-60			50-60	50-60		50-60		
	630	1250	630	1250	1250	1600	2000	3150 (3)	1600	2000	2500	630	1250	1250	1600	2000	2500 (4)
	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
	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
	–	–	–	–	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
	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
	–	–	–	–	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
	80	80	80	80	–	80	80	80	–	–	80	–	–	80	80	80	80
	–	–	–	–	100	–	–	100	100	100	100	–	–	100	100	100	100
	–	–	–	–	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		
	636		702		702	702		742	702	702	702	792	792		821	821	
	532		682		682	682		882	682	682	882	682	641		842	842	
	659		640		640	640		643	640	640	643	799	799		788	788	
	150		210		210	210		275	210	210	275	210	210		275	275	
	120		120		177	177		230	177	177	220	125	177		177	220	
	TN 7229		TN 7182		TN 7421	TN 7239		1VCD000053	TN 7350	TN 7351	TN 7352	TN 7183	TN 7354	1VCD000099	TN 7355	TN 7356	
	380								380			380	380 (5)		380 (5)		
	- 5 ... + 40								- 5 ... + 40			- 5 ... + 40	- 5 ... + 40		- 5 ... + 40		
	•								•			•	•		•		
	•								•			•	•		•		

2. Selection and ordering

General characteristics of withdrawable circuit-breakers for PowerCube units (36 kV) and UniGear type ZS2 switchgear (36 kV)

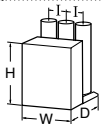
Circuit-breaker		
Standards	IEC 62271-100	
	VDE 0671; CEI EN 62271-100 - File 7642 (3)	
Rated voltage	Ur [kV]	
Rated insulation voltage	Us [kV]	
Withstand voltage at 50 Hz	Ud (1 min) [kV]	
Impulse withstand voltage	Up [kV]	
Rated frequency	fr [Hz	
Rated normal current (40 °C) (1)	Ir [A]	
Rated breaking capacity	Isc [kA]	
Rated short-time withstand current (3 s)	Ik [kA]	
Making capacity	Ip [kA]	
Operation sequence	[O-0.3s-CO-3min-CO]	
	[O-0.3s-CO-15s-CO]	
Opening time	[ms]	
Arcing time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Maximum overall dimensions 	H [mm]	
	W [mm]	
	D [mm]	
	Pole centre distance I [mm]	
Weight	[kg]	
Standardised table of dimensions		
Absolute SF_6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	IEC: 60068-2-30, 60721-2-1	
Electromagnetic compatibility	IEC 62271-1	

(1) Rated normal current with circuit-breaker in UniGear ZS2 switch-gear and 40 °C ambient temperature outside the switchgear
(2) Rated service value
(3) 2500 A with forced ventilation of the switchgear

	HD4/W 36							
	•							
	•							
	36							
	36							
	70							
	170							
	50-60							
	1250	1250	1600	1600	2000	2000	2500 (3)	2500 (3)
	20	—	20	—	20	—	20	—
	25	—	25	—	25	—	25	—
	—	31.5	—	31.5	—	31.5	—	31.5
	20	—	20	—	20	—	20	—
	25	—	25	—	25	—	25	—
	—	31.5	—	31.5	—	31.5	—	31.5
	50	—	50	—	50	—	50	—
	63	—	63	—	63	—	63	—
	—	80	—	80	—	80	—	80
	•	•		•		•		•
			•		•		•	
	45							
	10-15							
	55-60							
	80							
	973	973	973				973	
	882	882	882				882	
	788	788	789				789	
	275	275	275				275	
	130	225	225				270	
	TN 7402	TN 7316	TN 7317				TN 7317	
	450							
	- 5 ... + 40							
	•							
	•							

2. Selection and ordering

General characteristics of withdrawable circuit-breakers for UniSwitch switchgear (CBW type units) and UniMix switchgear (P1/E type units) (24 kV)

Circuit-breaker		
	UniSwitch / CBW type units	
	UniMix / P1/E type units	
Standards	IEC 62271-100	
	VDE 0671; CEI EN 62271-100 - File 7642	
Rated voltage	Ur [kV]	
Rated insulation voltage	Us [kV]	
Withstand voltage at 50 Hz	Ud (1 min) [kV]	
Impulse withstand voltage	Up [kV]	
Rated frequency	fr [Hz	
Rated normal current (40 °C) (1)	Ir [A]	
Rated breaking capacity	Isc [kA]	
Rated short-time withstand current (3 s) (3)	Ik [kA]	
Making capacity	Ip [kA]	
Operation sequence	[O-0.3s-CO-15s-CO]	
Opening time	[ms]	
Arcing time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Maximum overall dimensions 	H [mm]	
	W [mm]	
	D [mm]	
	Pole centre distance I [mm]	
Truck run	[mm]	
Weight	[kg]	
Standardised table of dimensions		
Absolute SF_6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	IEC: 60068-2-30, 60721-2-1	
Electromagnetic compatibility	IEC 62271-1	

(1) Rated normal current with withdrawable circuit-breaker in switchgear
(2) Rated service value
(3) The short-time withstand current and its duration can be limited by the switchgear: see the specific UniSwitch and UniMix switchgear catalogues
(4) The values in brackets refer to the 12 kV rated voltage
(5) The activation rollers of the top shutter are supplied mounted and adjusted by the supplier of the UniSwitch switchgear
(6) The activation rollers of the top shutter of the UniMix switchgear P1/E are available on request

	HD4/US 24 [5]		HD4/US 24 [6]	
	•	•		
			•	•
	•		•	
	•		•	
	24		24	
	24		24	
	50		50	
	125		125	
	50-60		50-60	
	630	1250	630	1250
	16 (25) [4]	16 (25) [4]	16	16
	20 (25) [4]	20 (25) [4]	20	20
	—	—	25	25
	16 (25) [4]	16 (25) [4]	16	16
	20 (25) [4]	20 (25) [4]	20	20
	—	—	25	25
	40 (63) [4]	40 (63) [4]	40	40
	50 (63) [4]	50 (63) [4]	50	50
	—	—	63	63
	•		•	
	45		45	
	10-15		10-15	
	55-60		55-60	
	80		80	
	800		800	
	682		682	
	739		739	
	210		210	
	200		200	
	123		123	
	1VCD000046		1VCD000046	
	380		380	
	- 5 ... + 40		- 5 ... + 40	
	•		•	
	•		•	

2. Selection and ordering

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 8 to 20.
The selected circuit-breaker can then be completed with the optional accessories indicated on the following pages.

Examples of identification

- The code HD4/P 12.16.25 identifies a withdrawable circuit-breaker for UniGear ZS1 switchgear with 12 kV rated voltage, 1600 A rated normal current and 25 kA breaking capacity.
- The code HD4/W 17.20.25 identifies a withdrawable circuit-breaker for PowerCube modules with 17 kV rated voltage, 2000 A rated normal current and 25 kA breaking capacity.

HD4 ... ...

Version	Fixed	–
	UniGear ZS1 type	P
	PowerCube / UniGear ZS2 type	W
	UniGear ZS3.2 type	z
	UniSwitch (CBW) - UniMix (P1E)	US
Rated voltage	12 kV	12
	17.5 kV	17
	24 kV	24
	36 kV	36
	40.5 kV	40
Rated normal current (1)	630 A	06
	1250 A	12
	1600 A	16
	2000 A	20
	2500 A	25
	3150 A	32
	3600 A	36
Rated breaking capacity	16 kV	16
	20 kV	20
	25 kV	25
	31.5 kV	32
	40 kV	40
	50 kV	50

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

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
  – terminal board for auxiliary circuits;
- for withdrawable circuit-breaker
  – isolating contacts
  – cord with connector (plug only) for auxiliary circuits
  – 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 versions).

Terminals for fixed circuit-breaker.

Tulip isolating contacts for withdrawable circuit-breaker.

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

Manual charging lever of operating mechanism springs.

2. Selection and ordering

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).	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).	-BB4 transient contact.
	1	2A	2B	3	4A	4B	5	6	7	8
Fixed circuit-breakers										
HD4 12	•	•	•	•	•	•	•	•	•	•
HD4 17	•	•	•	•	•	•	•	•	•	•
HD4 24	•	•	•	•	•	•	•	•	•	•
HD4 36	•	•	•	•	•	•	•	•	•	•
Withdrawable circuit-breakers for UniGear type ZS1 switchgear										
HD4/P 12	•	•	•	•	•	•	•	•	•	•
HD4/P 17	•	•	•	•	•	•	•	•	•	•
HD4/P 24	•	•	•	•	•	•	•	•	•	•
Withdrawable circuit-breakers for UniGear 36 type ZS3.2 switchgear										
HD4/Z 40.5	•	•	•	•	•	•	•	•	•	•
Withdrawable circuit-breakers for PowerCube modules										
HD4/W 12	•	•	•	•	•	•	•	•	•	•
HD4/W 17	•	•	•	•	•	•	•	•	•	•
HD4/W 24	•	•	•	•	•	•	•	•	•	•
HD4/W 36 (5)	•	•	•	•	•	•	•	•	•	•
Withdrawable circuit-breakers for UniSwitch and UniMix switchgear										
HD4/US 24	•	•	•	•	•	•	•	•	•	•

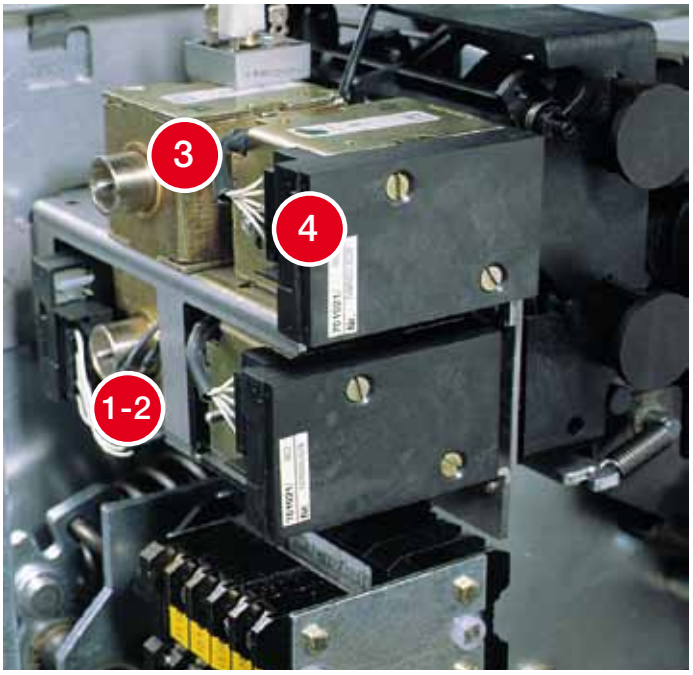
(1) Standard fitting: no. 6 auxiliary contacts.
(2) Application of the pressure switch is only possible in the factory.
(3) For this version it is only available without LED.
(4) The locking electro-magnet in the truck (-RL2) to prevent the circuit-breaker being racked-in with the auxiliary circuits disconnected (plug not inserted in the socket) is included in the standard equipment.
(5) Also suitable for UniGear type ZS2.

	-BT3 position contact of the withdrawable circuit-breaker (installed on the truck). It is compulsory if the RL1 locking magnet is present.	Withdrawable circuit-breaker transmitted contacts (installed in the circuit-breaker truck).	-MS spring charging geared motor.	-FB1 thermomagnetic protection of spring charging geared motor.	Electric signalling of springs charged.	Electric signalling of springs discharged.	Opening pushbutton lock.	Closing pushbutton lock.	Open circuit-breaker key lock.	-RL1 operating mechanism locking magnet.	-RL2 truck locking magnet.	Interlock for fixed circuit-breaker.	Mechanical isolation interlock with the switchgear door.	Two-level pressure switch [2].	Two-level pressure switch plus SF6 control device with three LEDs [2].	Insulating partitions.
	9	**10**	**11**	**12**	**13A**	**13B**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**22A**	**22B/C/D**	**23**
	-	-	•	•	•	•	•	•	•	•	-	•	-	•	•	-
	-	-	•	•	•	•	•	•	•	•	-	•	-	•	•	-
	-	-	•	•	•	•	•	•	•	•	-	•	-	•	•	•
	-	-	•	•	•	•	•	•	•	•	-	•	-	•	•	•
	•	•	•	•	•	•	•	•	•	•	(4)	•	•	•	•	-
	•	•	•	•	•	•	•	•	•	•	(4)	•	•	•	•	-
	•	•	•	•	•	•	•	•	•	•	(4)	•	•	•	•	-
	-	(1)	•	•	•	•	-	-	•	•	•	-	-	(3)	•	-
	•	•	•	•	•	•	•	•	•	•	-	-	•	•	•	-
	•	•	•	•	•	•	•	•	•	•	-	-	•	•	•	-
	•	•	•	•	•	•	•	•	•	•	-	-	•	•	•	-
	•	•	•	•	•	•	•	•	•	•	•	-	-	•	•	-
	•	•	•	•	•	•	•	•	•	•	•	-	-	•	•	-

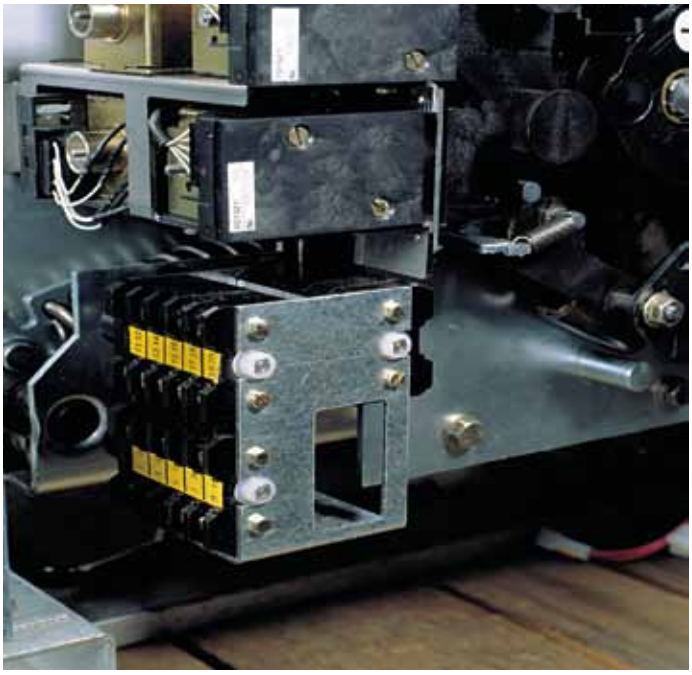
2. Selection and ordering

Optional accessories

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



1-2 Shunt opening release.
3 Shunt closing release.
4 Undervoltage release.



Auxiliary contacts.

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.

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 l on page 56).
5 Mechanical override of undervoltage release trip with electrical signalling of “undervoltage excluded”.
6 -BB5 undervoltage release electric signalling (energised or de-energised).

Auxiliary and signalling contacts

7 Group of 15 auxiliary circuit-breaker -BB1-BB2-BB3 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 and the transmitted - BT1, -BT2 contacts in the truck have not been requested).
10 Transmitted contacts of the withdrawable circuit-breaker (installed in the circuit-breaker truck - only for withdrawable circuit-breaker).

Spring charging geared motor.

Geared motor protection.

Motor operator

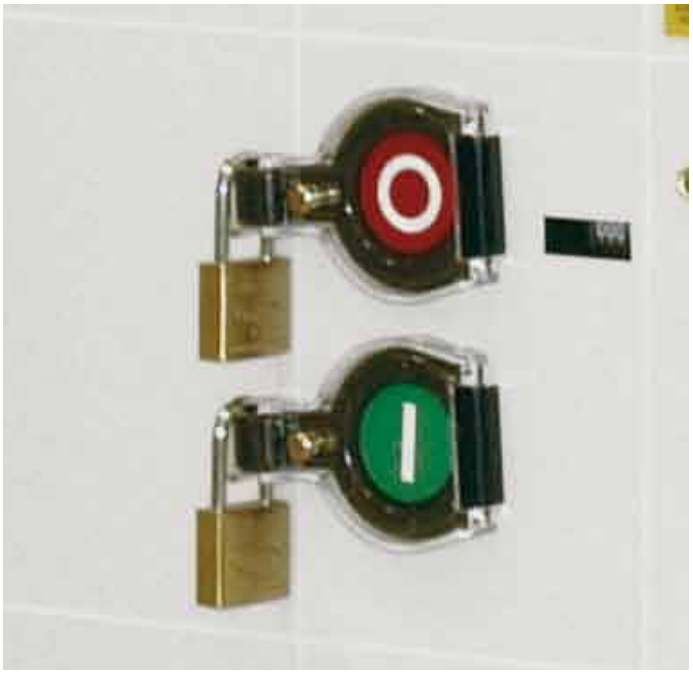
11 -MS spring-charging geared motor.
12 -FB1 thermomagnetic protection of the spring-charging geared motor (mounted as standard for 24 V d.c. geared motors) complete with electrical signalling of thermomagnetic protection trip.
13A Electrical signalling of operating mechanism springs charged.
13B Electrical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

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 switchgear 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).
20A Mechanical isolation interlock with the CBE enclosure door.
20B Mechanical isolation interlock with the UniGear type ZS2 switchgear door(mounted as standard in UniGear type ZS1 switchgear) or with the door of the PowerCube module.

2. Selection and ordering

Optional accessories



Opening and closing pushbutton locks.

SF6 control device with 3 LEDs.

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. Standard version for operating temperature -5 ... + 40 °C; on request temperature compensated pressure-switch for ambient temperature lower than minus 5 °C.

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 for fixed circuit-breakers. See charter 4 for which circuit-breakers they are available (on request).

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
	cosφ	=	0.4	–
	T	=	–	10 ms

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

3. Specific product characteristics

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 EN 12500 Standards environmental corrosive class C5.
Galvanisation is carried out in accordance with UNI ISO 2081 Standards, classification code Fe/Zn 12, with a thickness of $12x10^{-6}$ 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 IEC/TS 62271-304 Standards environmental severity conditions class 2.

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 62271-1 Standards.
The following example is a clear interpretation of the indications given above.

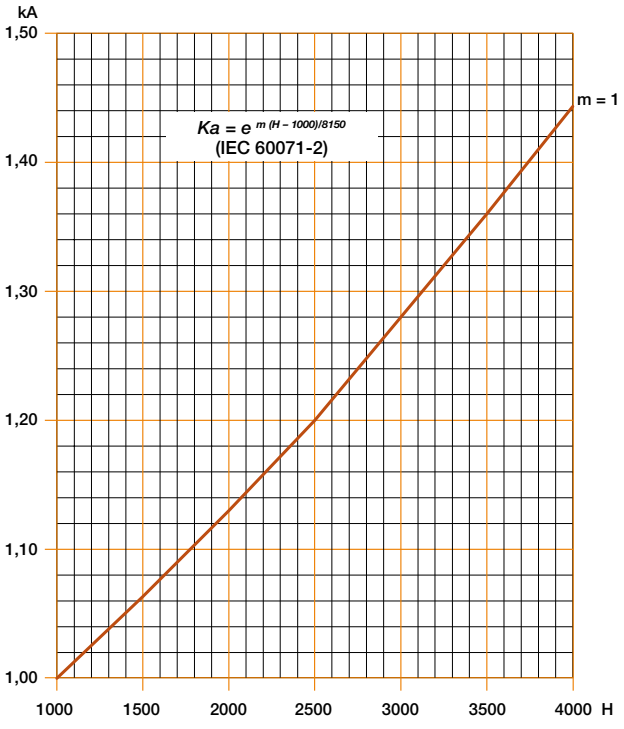
Graph for determining the Ka correction factor according to the altitude

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 x 1.13 = 31.6 kVrms
– impulse withstand voltage equal to:
75 x 1.13 = 84.7 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.



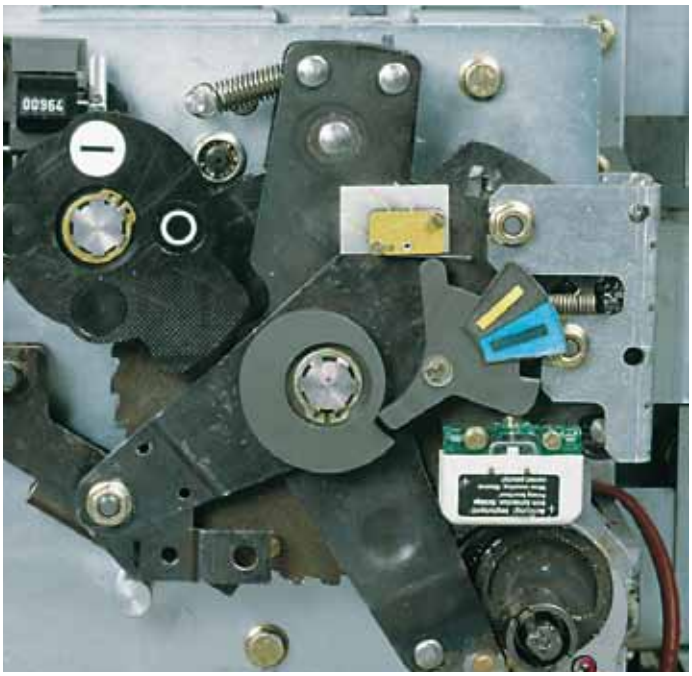
H = altitude in metres;
m = value referred to industrial frequency and the atmospheric impulse withstand voltages and those between phase and phase.

3. Specific product characteristics

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.

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) (1)	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

(1) Class C2, 400 A current for back-to-back capacitor banks (maximum peak connection current 20 kA, maximum connection frequency 4.25 Hz.

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.

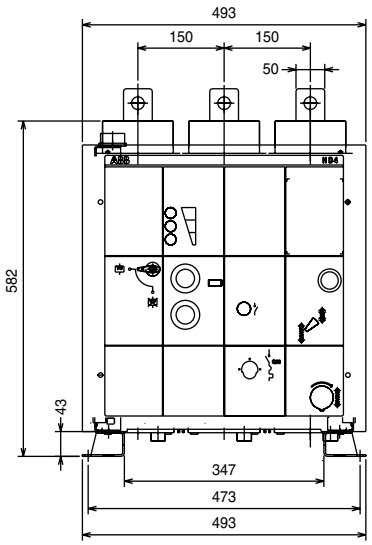
Ordering

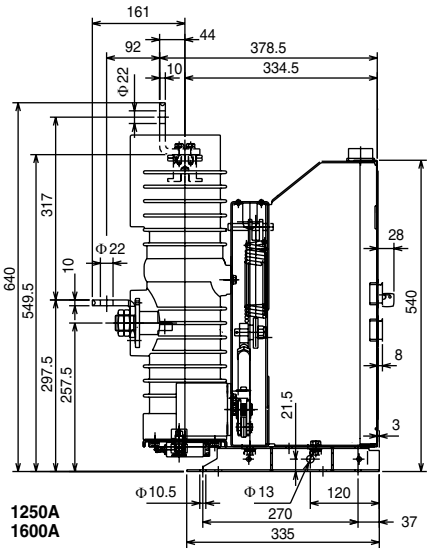
For availability and ordering of spare parts, please contact our Service, specifying the circuit-breaker serial number.

4. Overall dimensions

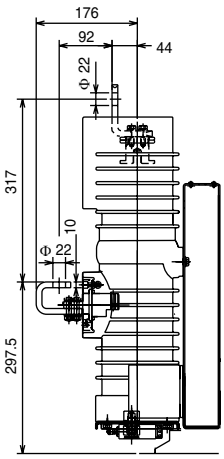
Fixed circuit-breakers

HD4		
TN	7177	
Ur	17.5	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	25	kA
	31.5	kA





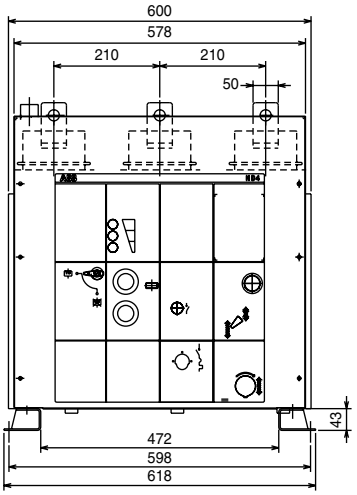
1250A
1600A

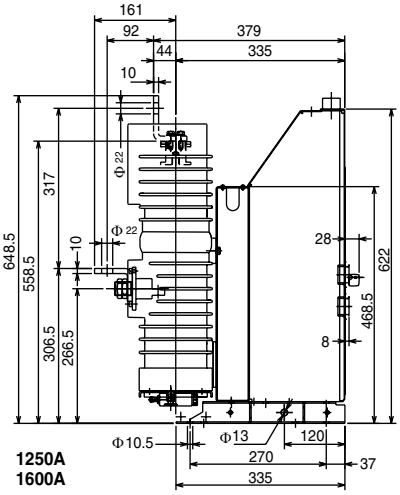


630A

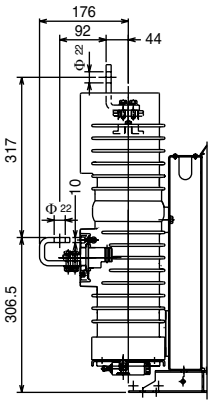
Fixed circuit-breakers

HD4		
TN	7178	
Ur	17.5	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	25	kA
	31.5	kA





1250A
1600A

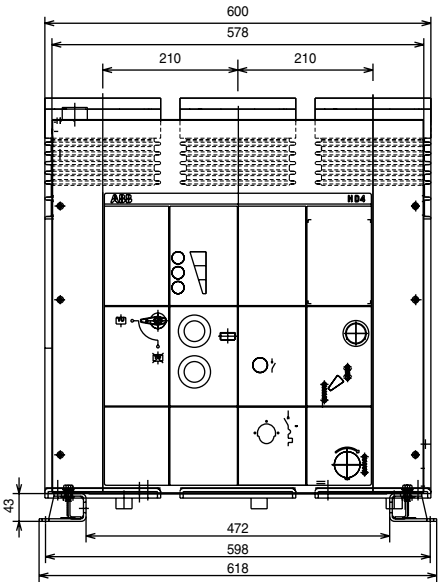


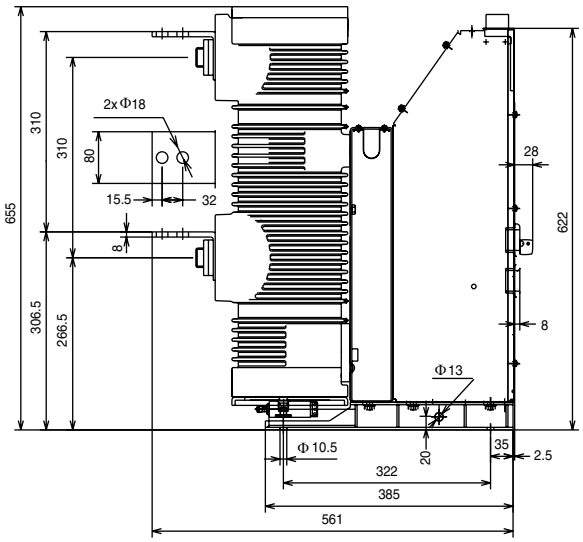
630A

Fixed circuit-breakers

HD4		
TN	7163	
Ur	12	kV
	17,5	kV
Ir	1600	A
Isc	40	kA
	50	kA

HD4		
TN	7163	
Ur	12	kV
	17,5	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA

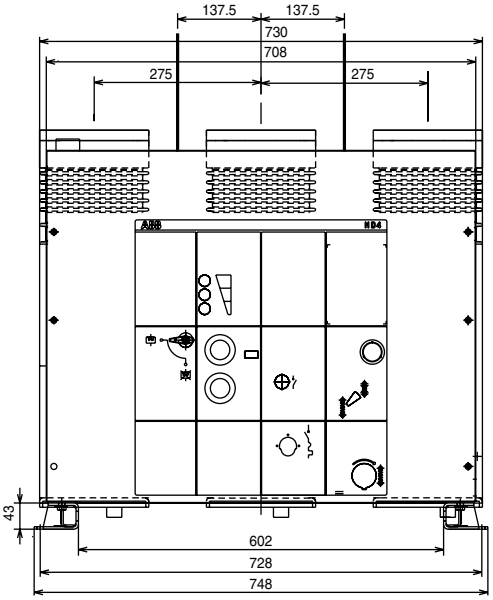


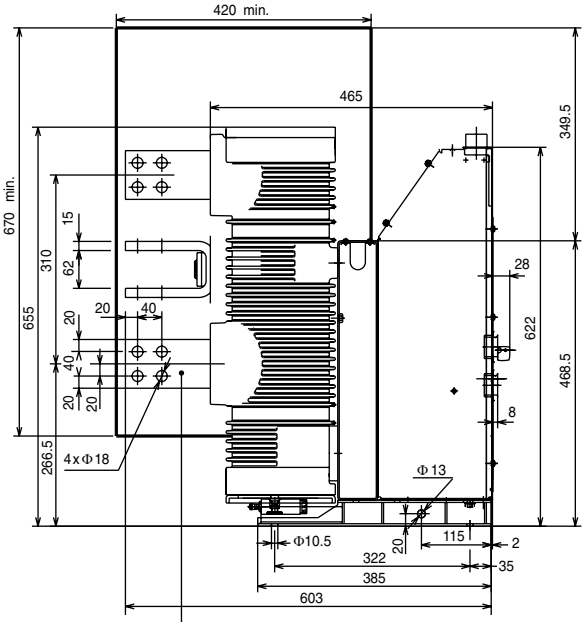


Fixed circuit-breakers

HD4		
TN	7165	
Ur	12	kV
	17,5	kV
Ir	2500	A
	3150	A
	3600	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA

HD4		
TN	7165	
Ur	24	kV
Ir	2500	A
	3150	A
	3600	A
Isc	25	kA
	31.5	kA
	40	kA



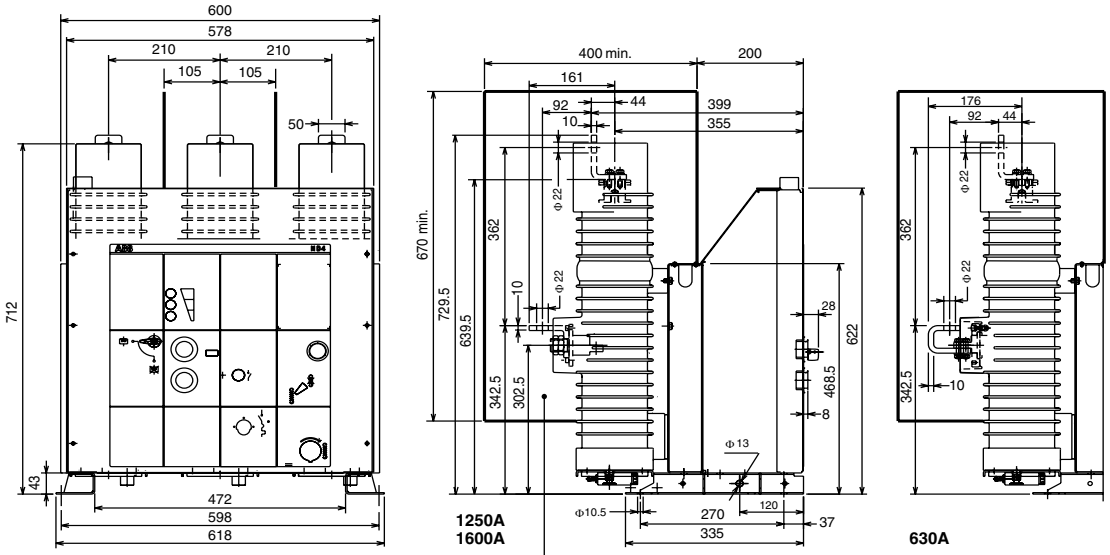


Insulating partitions (only for 24 kV)
to be provided by the customer
(a special kit is available on request).

4. Overall dimensions

Fixed circuit-breakers

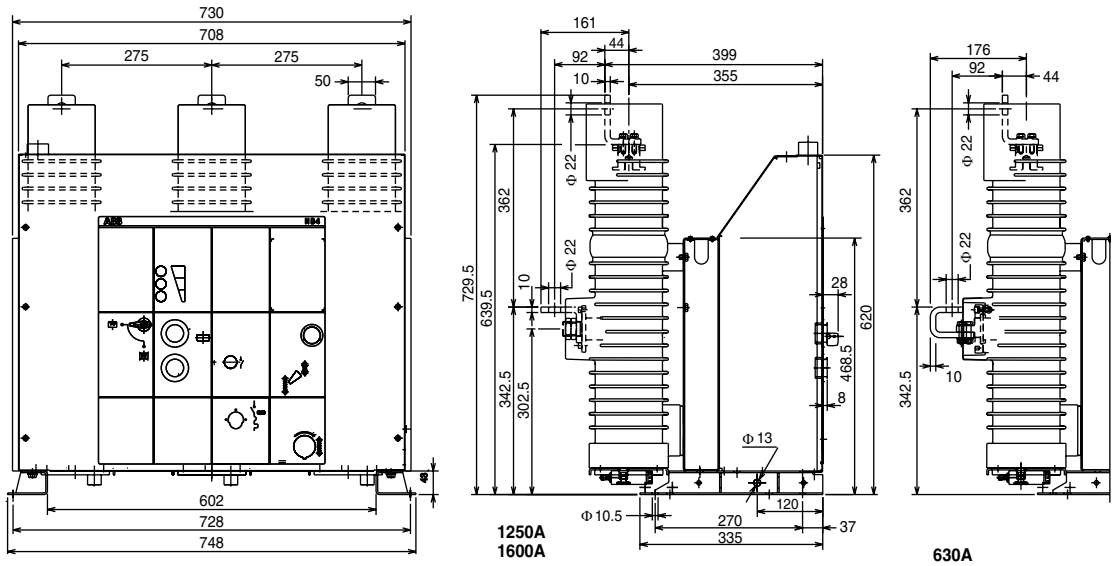
HD4		
TN	7179	
Ur	24	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	20	kA
	25	kA



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

Fixed circuit-breakers

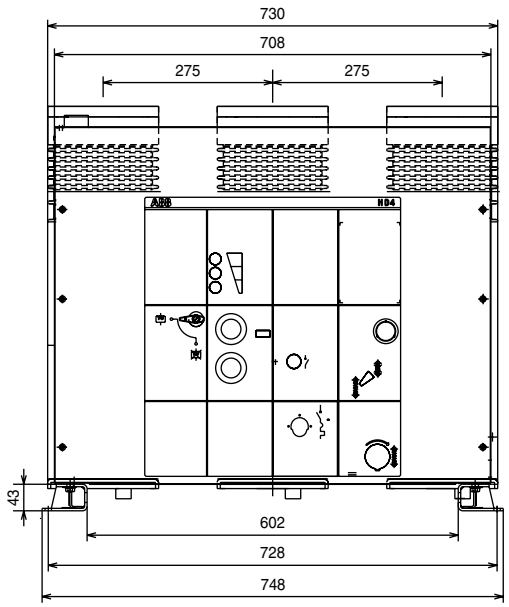
HD4		
TN	7242	
Ur	24	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	20	kA
	25	kA

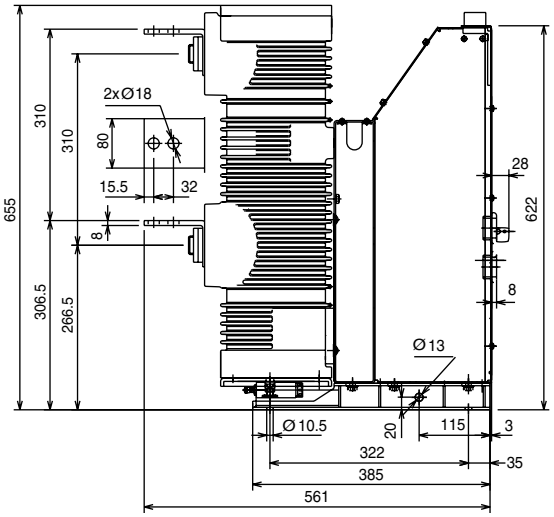


Fixed circuit-breakers

HD4		
TN	7174	
Ur	24	kV
Ir	1600	A
Isc	31,5	kA
	40	kA

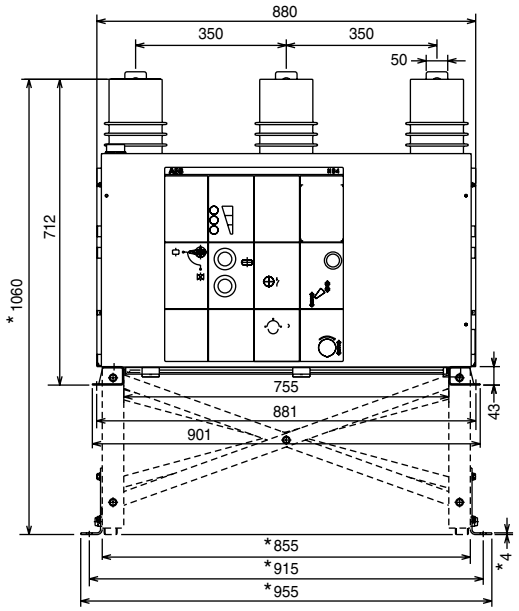
HD4		
TN	7174	
Ur	24	kV
Ir	2000	A
Isc	25	kA
	31,5	kA
	40	kA

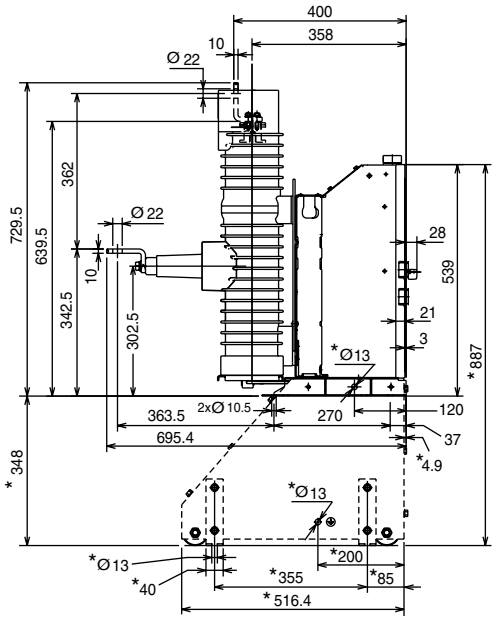




Fixed circuit-breakers

HD4		
with truck (on request)		
TN	7241	
Ur	36	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	20	kA





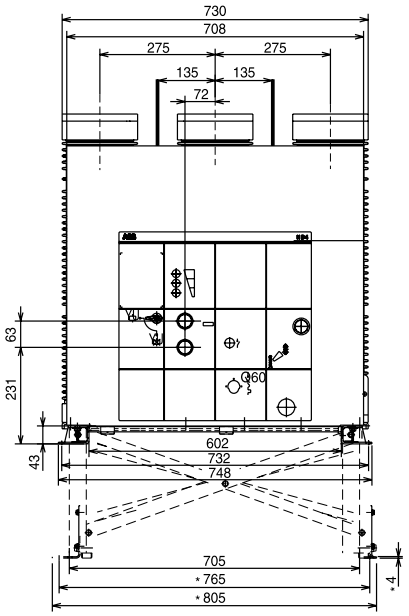
* Distance with truck (if provided).

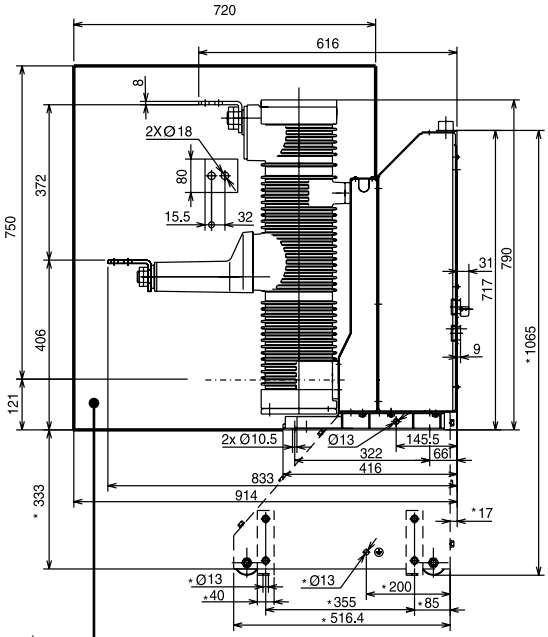
4. Overall dimensions

Fixed circuit-breakers

HD4		
with truck (on request)		
TN	7268	
Ur	36	kV
Ir	1250	A
	1600	A
Isc	25	kA
	31.5	kA

HD4		
with truck (on request)		
TN	7268	
Ir	2500	A
Isc	20	kA
	25	kA
	31.5	kA

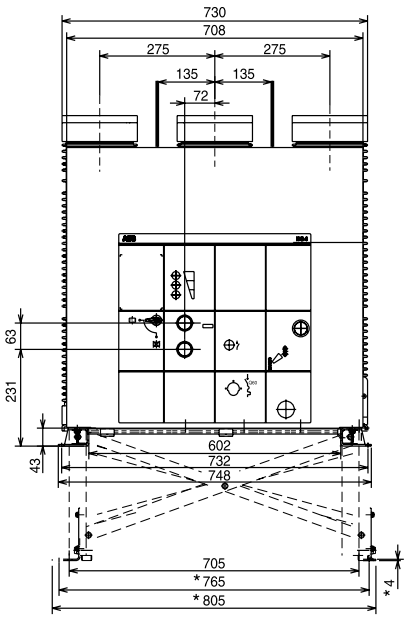


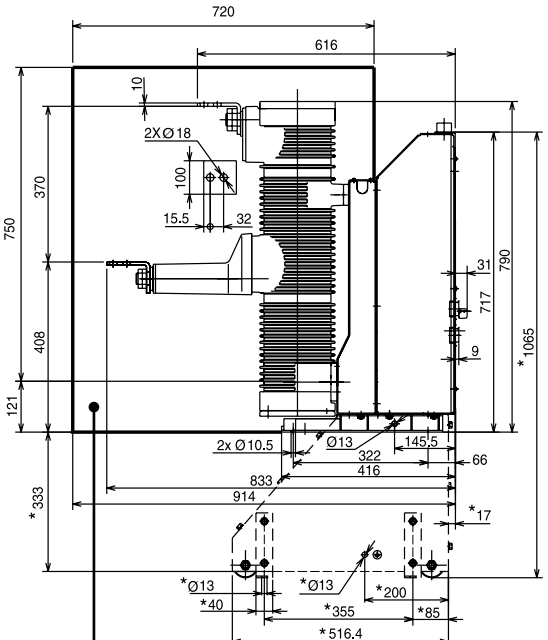


Insulating partitions to be provided by the customer
(a special kit is available on request).
* Distance with truck (if provided).

Fixed circuit-breakers

HD4		
with truck (on request)		
TN	7315	
Ur	36	kV
Ir	2500	A
Isc	20	kA
	25	kA
	31.5	kA

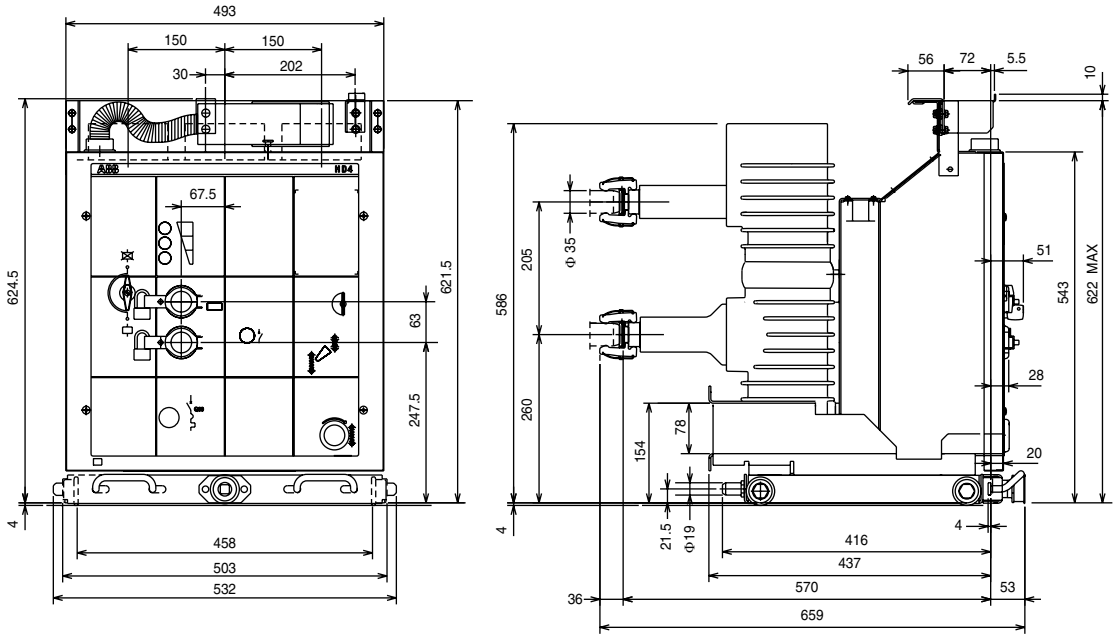




Insulating partitions to be provided by the customer
(a special kit is available on request).
* Distance with truck (if provided).

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

HD4/P		
TN	7286	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA

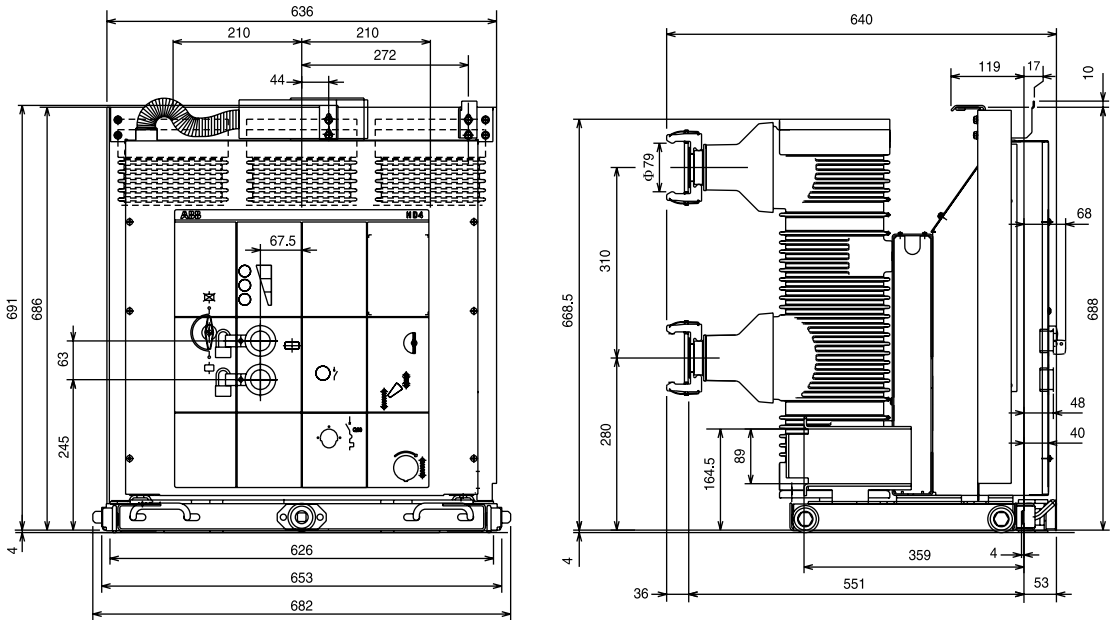


HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchgears

HD4/P		
TN	7350	
Ur	12	kV
	17.5	kV
Ir	1250	A
Isc	40	kA

HD4/P		
TN	7350	
Ur	12	kV
	17.5	kV
Ir	1600	A
Isc	25	kA
	31.5	kA
	40	kA (*)
	50	kA (*)

HD4/P		
TN	7351	
Ur	12	kV
	17.5	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA (*)
	50	kA (*)



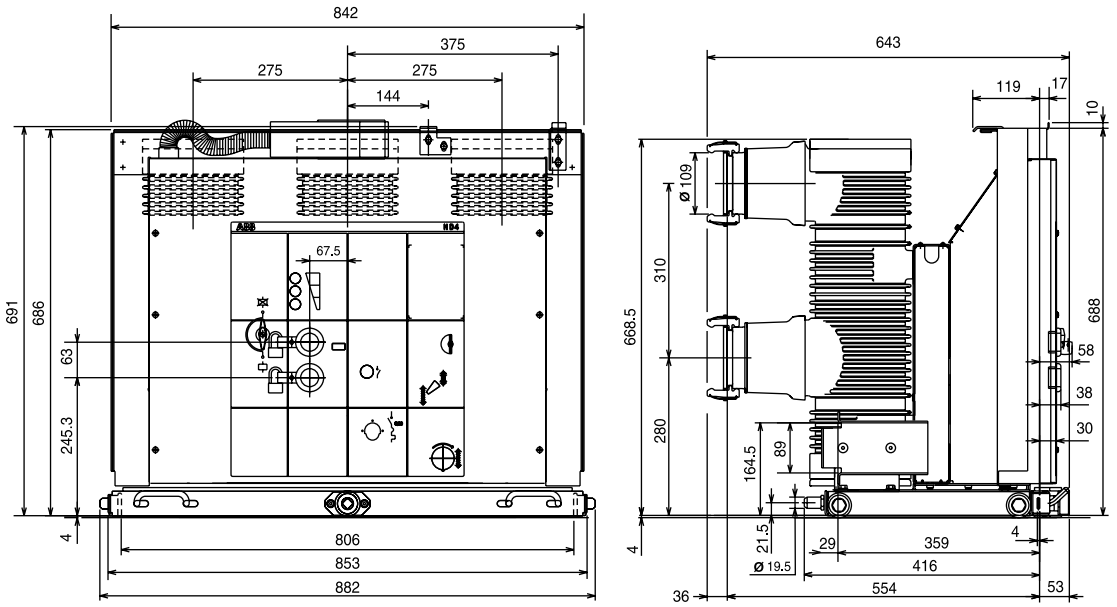
(*) Also suitable for PowerCube PB2.

4. Overall dimensions

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

HD4/P		
TN	7352	
Ur	12	kV (*)
	17.5	kV
Ir	2500	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA

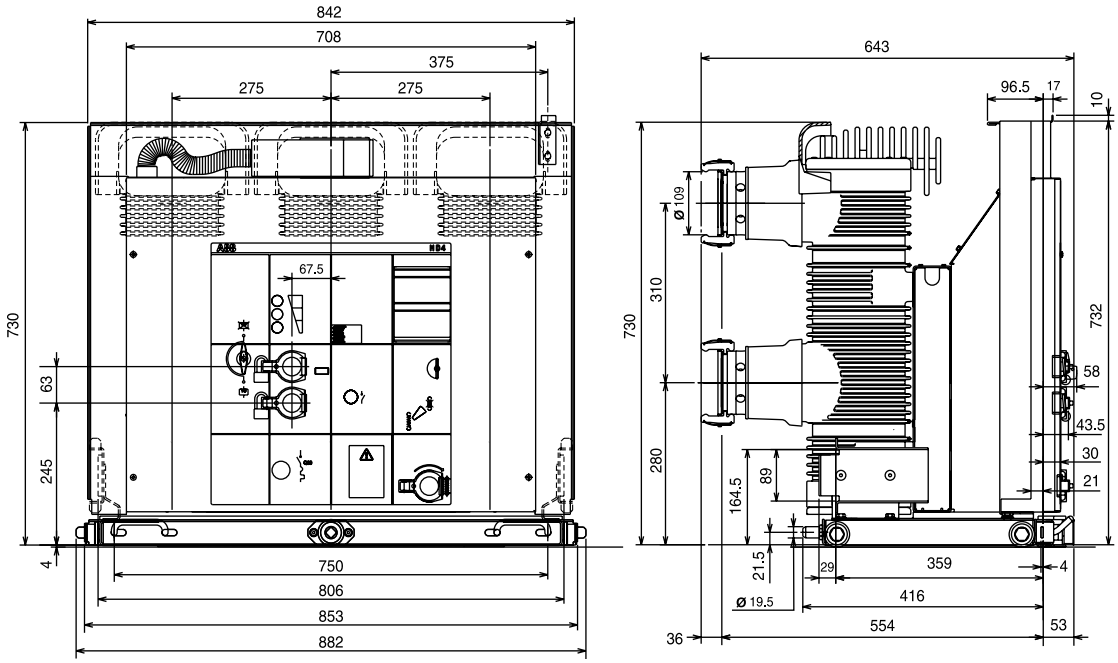
(*) Also suitable for PowerCube PB3.



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

HD4/P		
TN	7371	
Ur	12	kV
	17.5	kV
Ir	3150	A (*)
Isc	25	kA
	31.5	kA
	40	kA
	50	kA

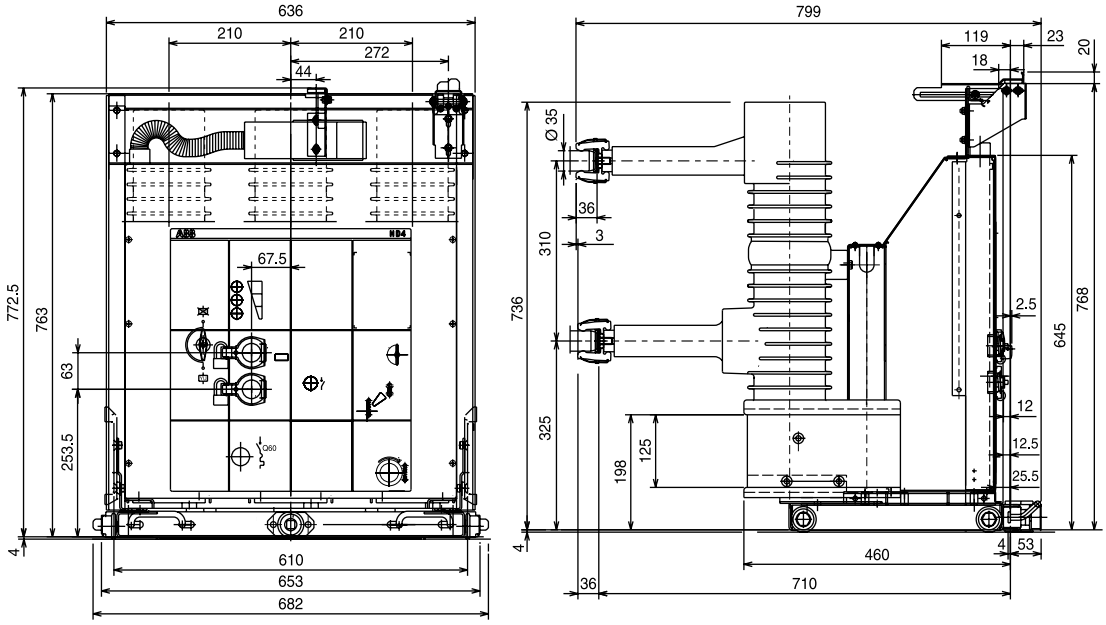
(*) 3150 A with forced switchgear ventilation (consult the UniGear type ZS1 switchgear technical catalogue).



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

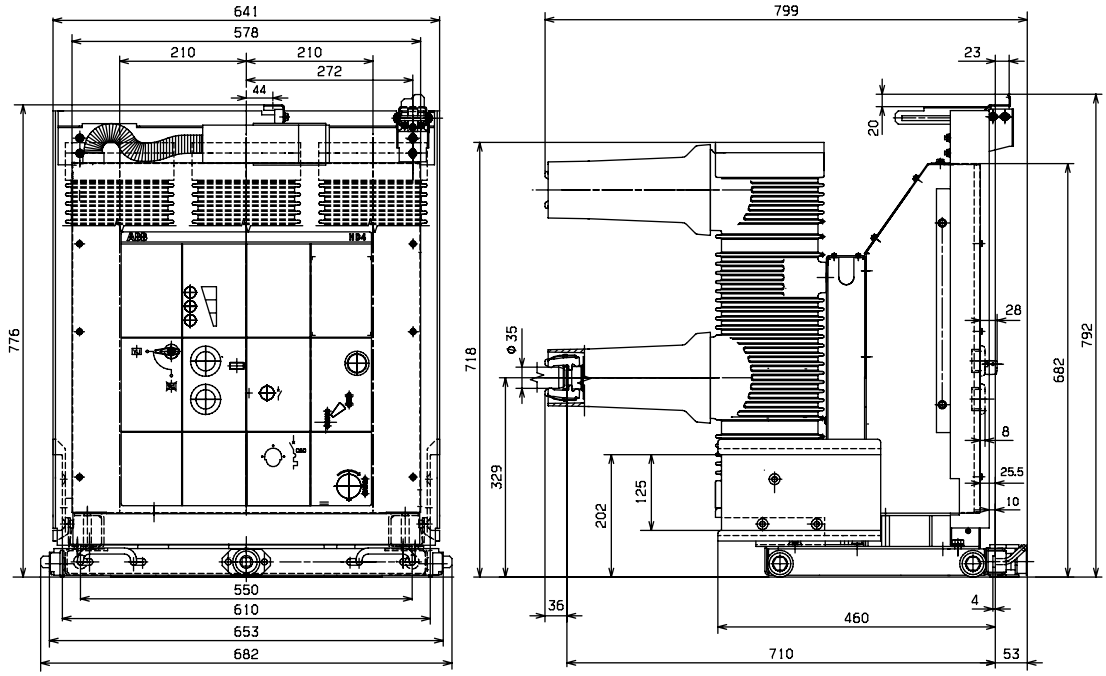
HD4/P		
TN	7354	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA (*)
	20	kA
	25	kA

(*) 630 A only.



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

HD4/P		
TN	1VCD000099	
Ur	24	kV
Ir	1250	A
Isc	31.5	kA

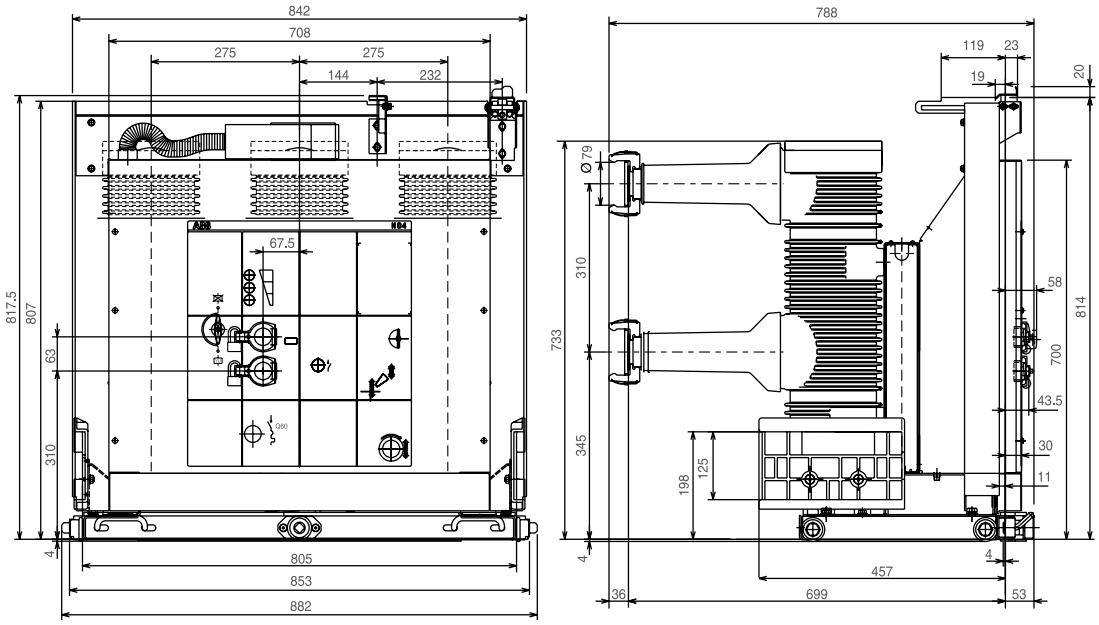


4. Overall dimensions

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

HD4/P		
TN	7355 (*)	
Ur	24	kV
Ir	1600	A
Isc	16	kA
	20	kA
	25	kA
	31.5	kA

(*) Also suitable for PowerCube PB5.

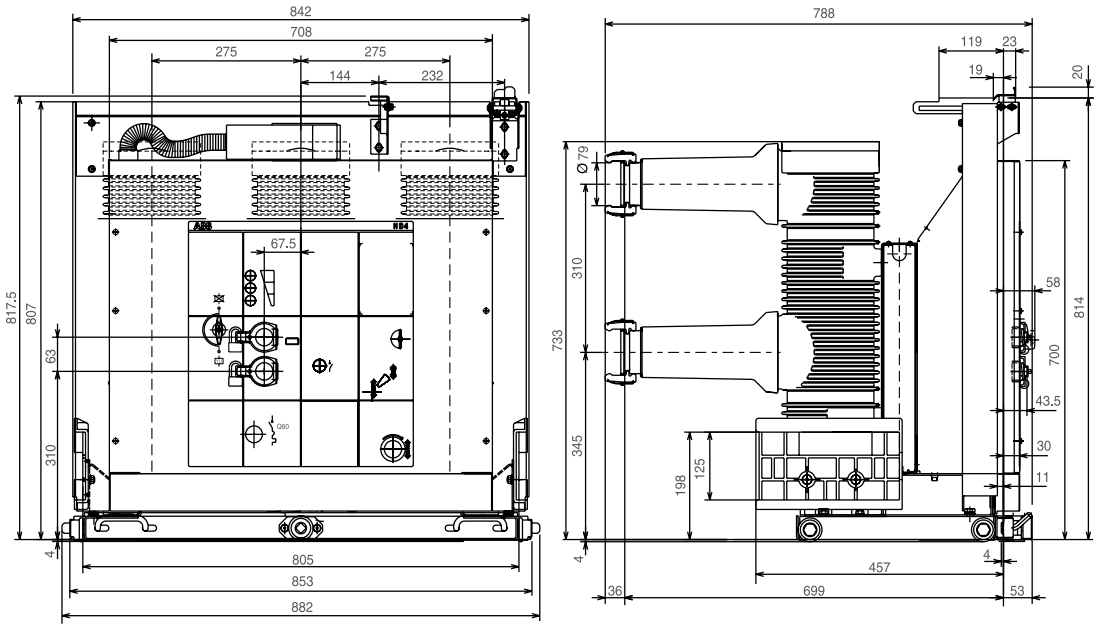


HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchgears

HD4/P		
TN	7356 (**)	
Ur	24	kV
Ir	2000	A
Isc	16	kA
	20	kA
	25	kA
	31.5	kA

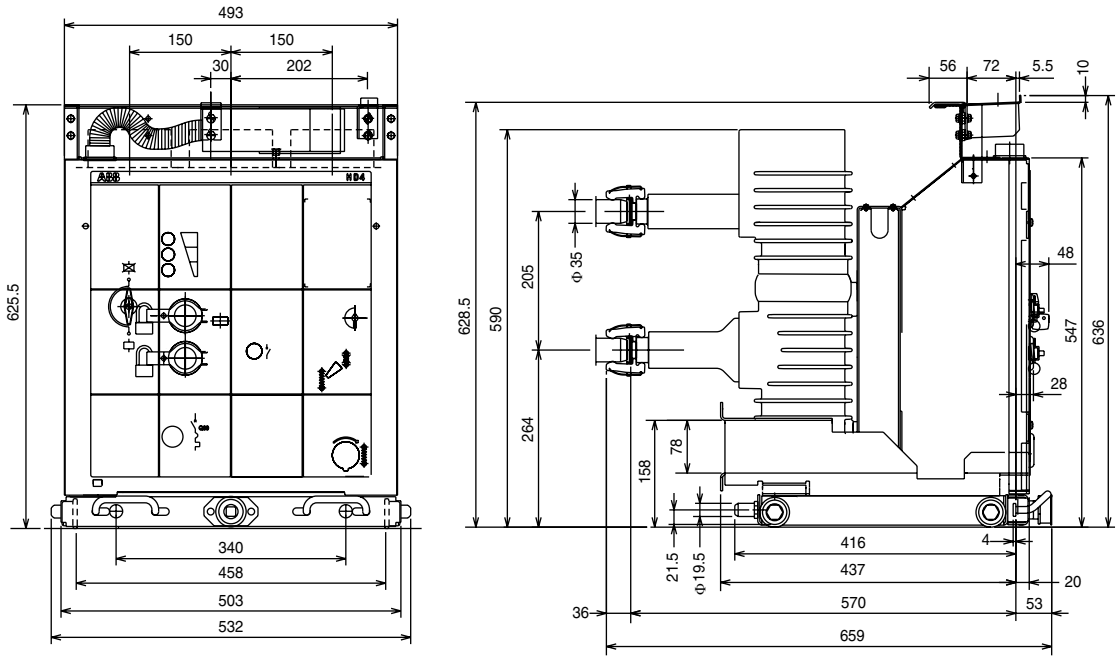
HD4/P		
TN	7356 (**)	
Ur	24	kV
Ir	2500	A (*)
Isc	20	kA
	25	kA
	31.5	kA

(*) 2500 A with forced ventilation; 2300 A with natural ventilation.
(**) Also suitable for PowerCube PB5.



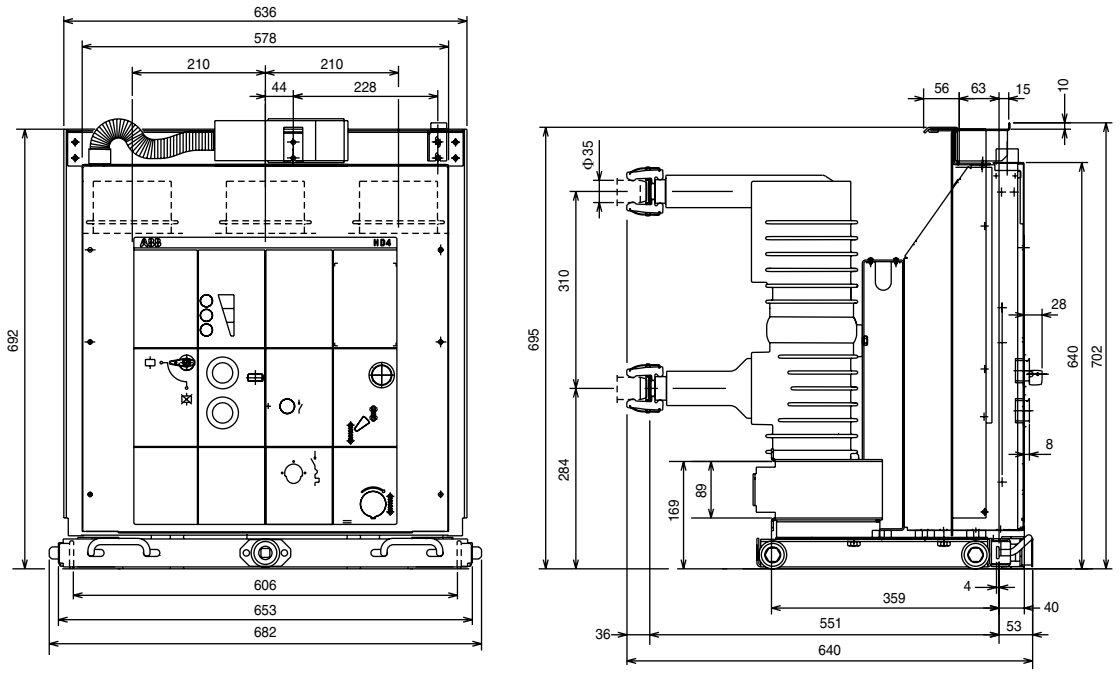
HD4/W withdrawable circuit-breakers for PowerCube modules

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

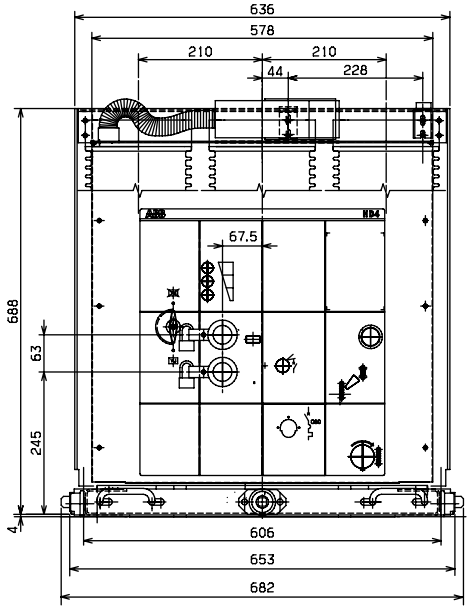
HD4/W		
TN	7182	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA

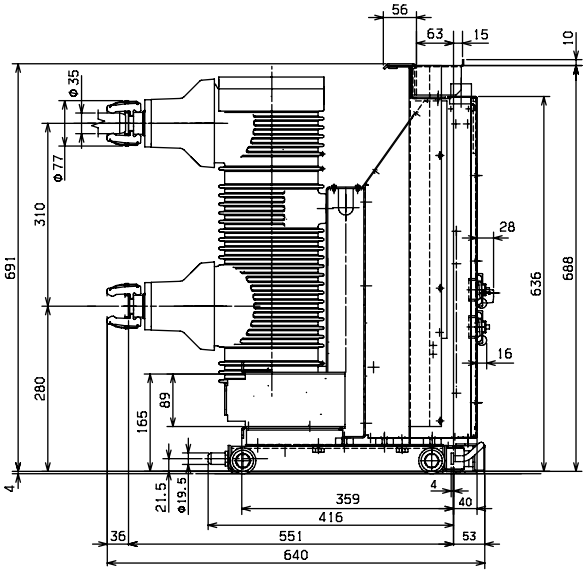


4. Overall dimensions

HD4/W withdrawable circuit-breakers for PowerCube modules

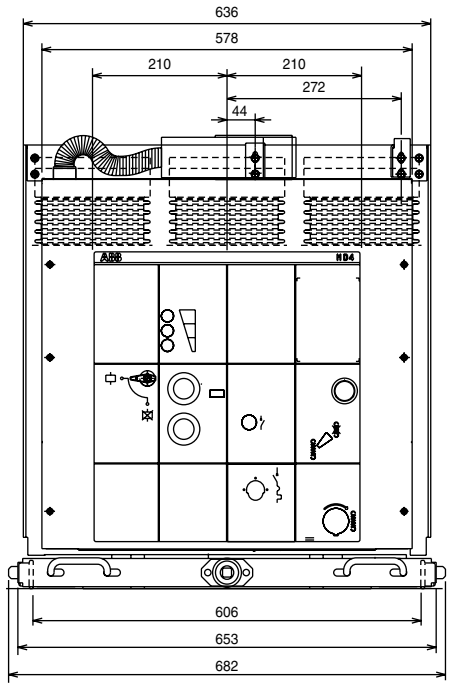
HD4/W		
TN	7421	
Ur	12	kV
	17.5	kV
Ir	1250	A
Isc	40	kA
	50	kA

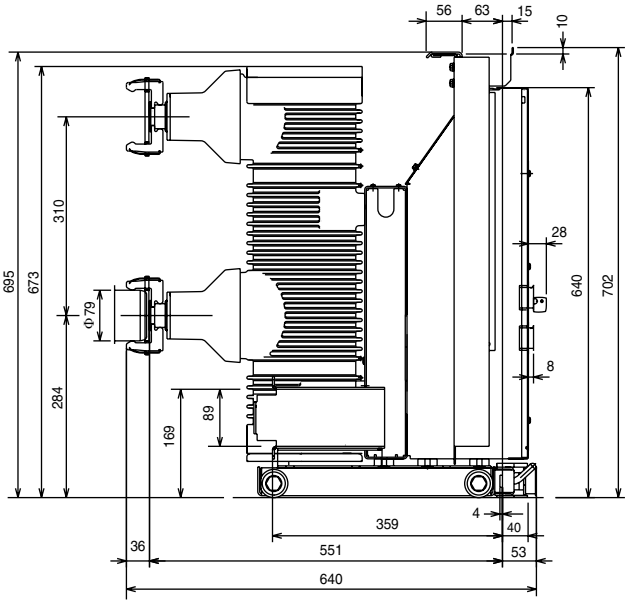




HD4/W withdrawable circuit-breakers for PowerCube modules

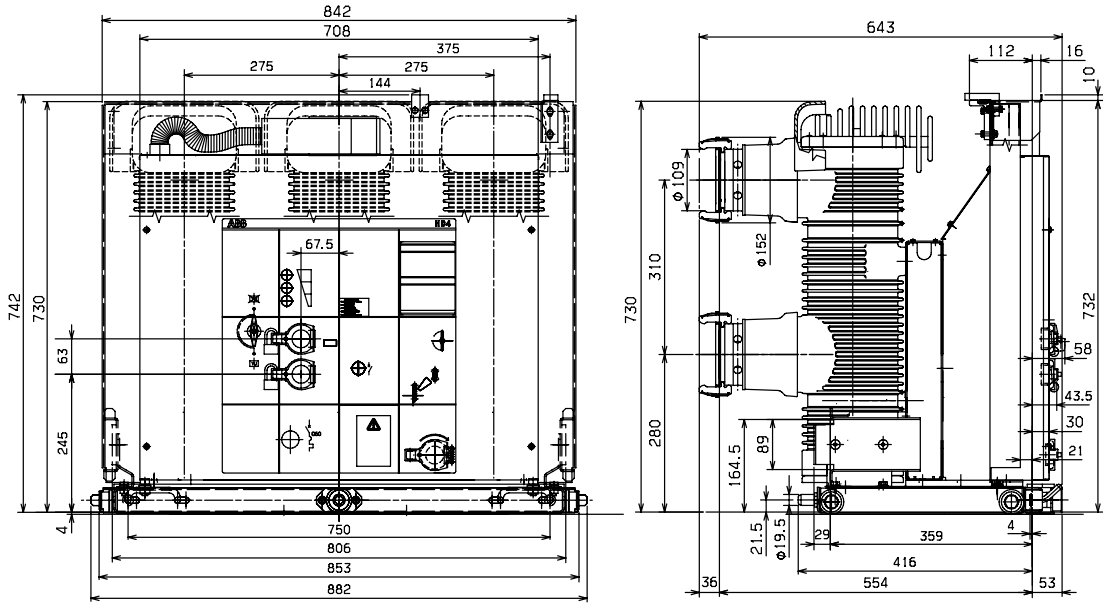
HD4/W		
TN	7239	
Ur	12	kV
	17.5	kV
Ir	1600	A
	2000	A
Isc	16	kA
	25	kA
	31.5	kA





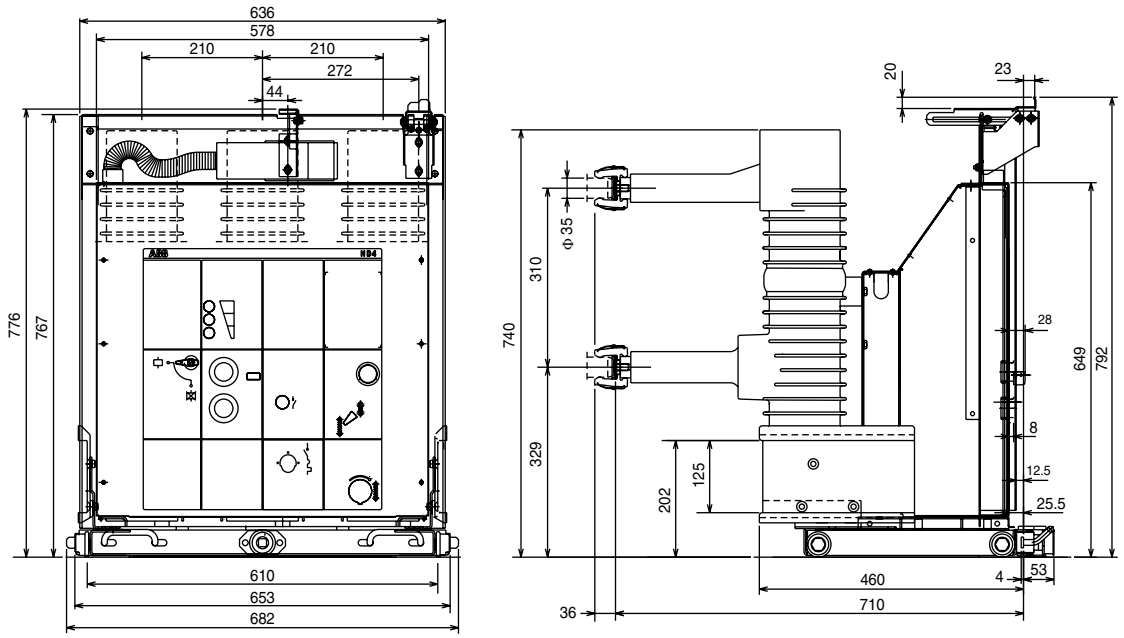
HD4/W withdrawable circuit-breakers for PowerCube modules

HD4/W		
TN	1VCD000053	
Ur	12	kV
	17.5	kV
Ir	3150	A
Isc	31.5	kA
	40	kA
	50	kA



HD4/W withdrawable circuit-breakers for PowerCube modules

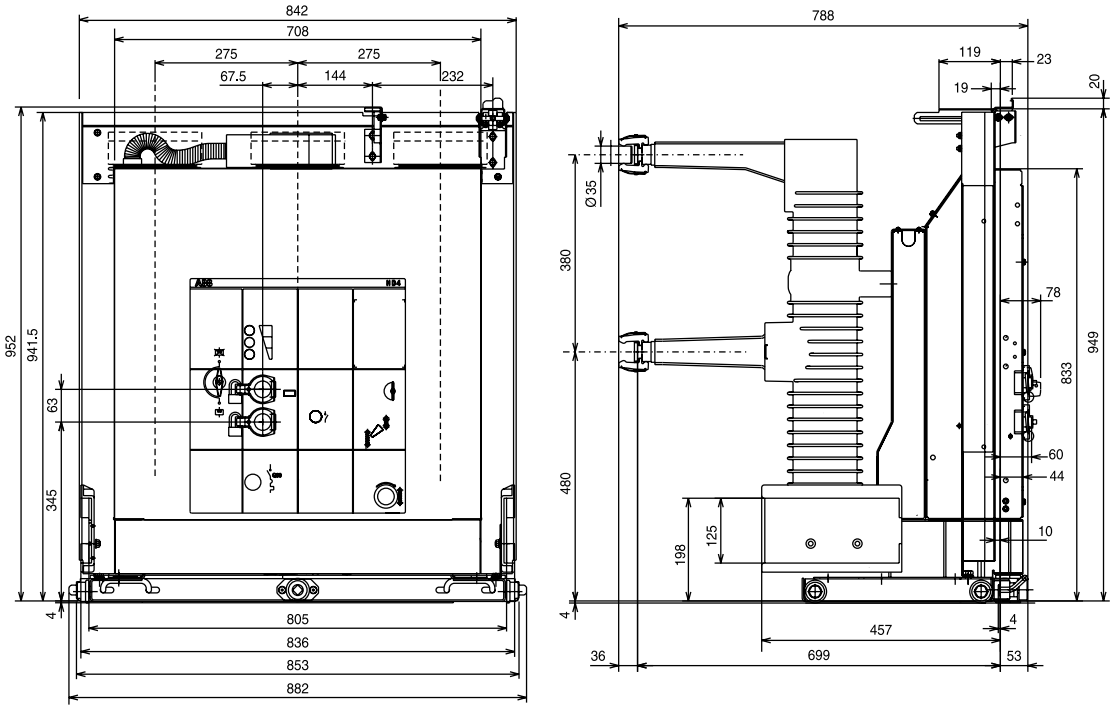
HD4/W		
TN	7183	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA



4. Overall dimensions

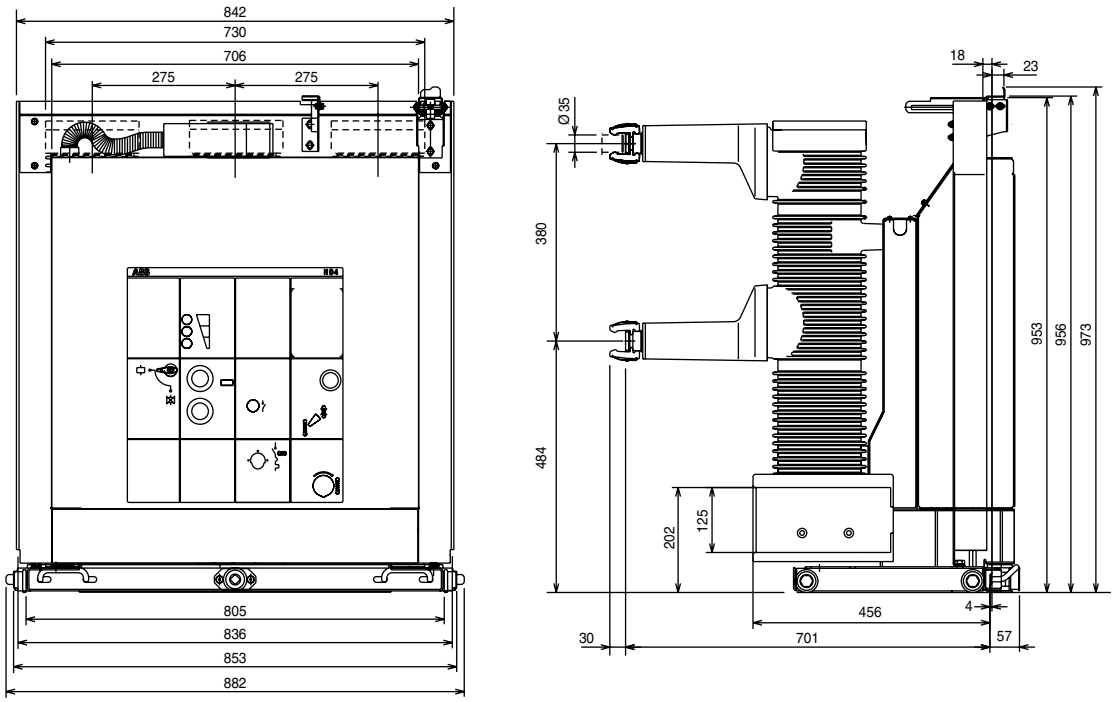
Withdrawable circuit-breakers HD4/W for UniGear type ZS2 switchgear and for PowerCube module

HD4/W		
TN	7402	
Ur	36	kV
Ir	1250	A
Isc	20	kA
	25	kA



Withdrawable circuit-breakers HD4/W for UniGear type ZS2 switchgear and for PowerCube module

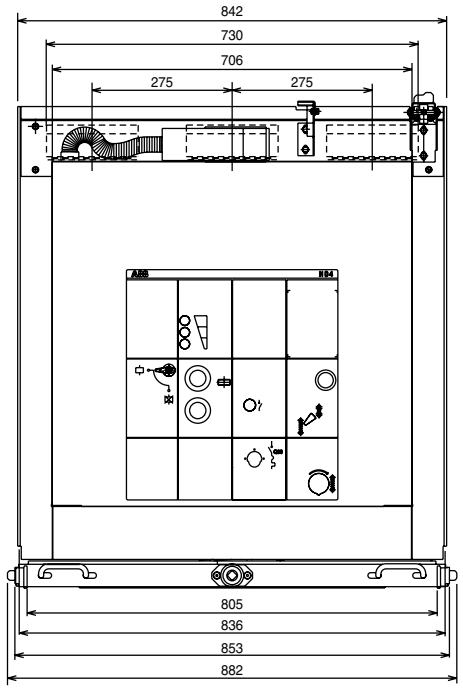
HD4/W		
TN	7316	
Ur	36	kV
Ir	1250	A
Isc	31.5	kA

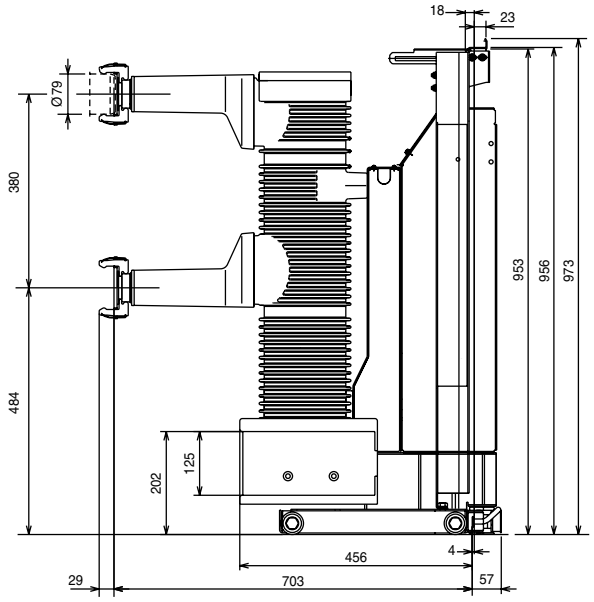


Withdrawable circuit-breakers HD4/W for UniGear type ZS2 switchgear and for PowerCube module

HD4/W		
TN	7317	
Ur	36	kV
Ir	1600	A
	2000	A
	2500	A (*)
Isc	20	kA
	25	kA
	31.5	kA

(*) With forced ventilation.



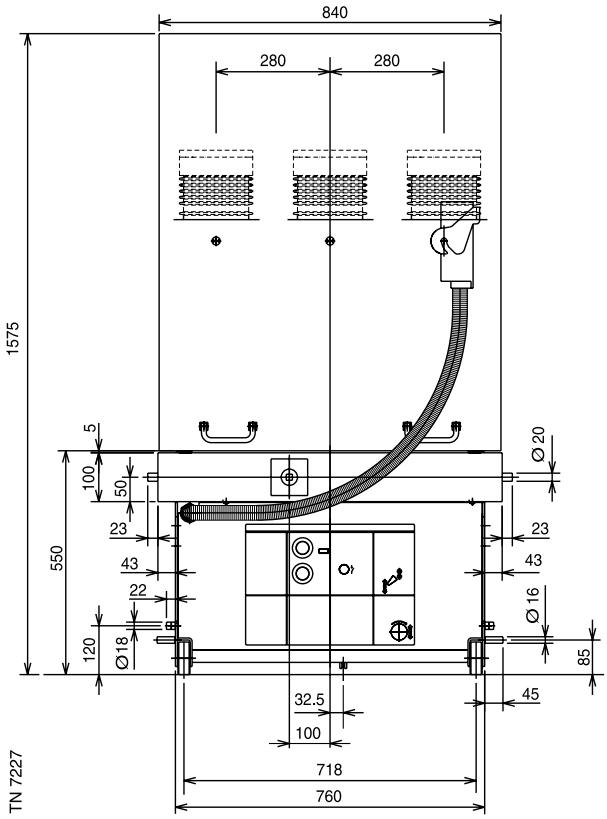


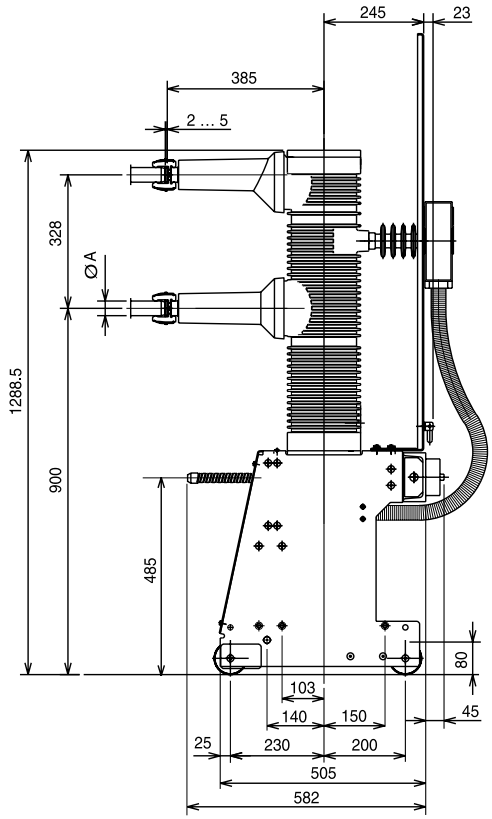
4. Overall dimensions

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

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

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



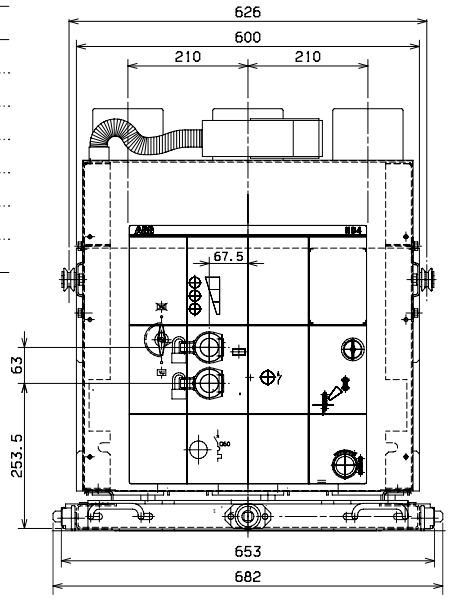


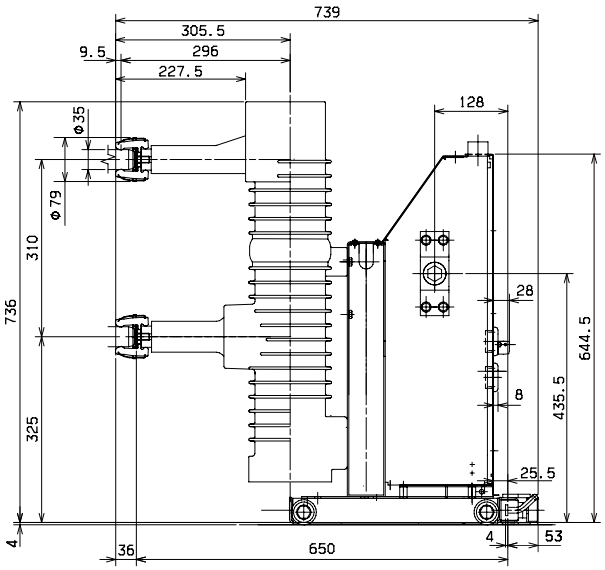
	Ø A
1250-1600 A	35 mm
2000-2500 A (*)	79 mm

HD4/US withdrawable circuit-breakers for UniSwitch (CBW) and UniMix (P1/E) switchgears

HD4/US 24 kV		
TN	1VCD000046	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	KA
	20	kA
	25	kA (*)

(*) Only for UniMix P1/E





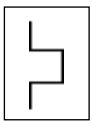
5. Electric circuit diagram

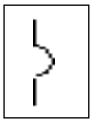
Application diagrams

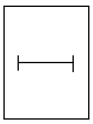
The following diagram (No. 1VCD 400007) shows the circuits of the withdrawable circuit-breakers up to 24 kV type HD4/P, HD4/W, HD4/US, delivered to the customer by means of connector “X”.

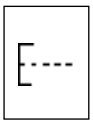
Specific diagrams are available for other types of circuit-breakers:
– fixed circuit-breakers up to 24 kV - No. 1VCD 400005
– fixed circuit-breakers 36 kV, 275 mm pole centre distance - N. 1VCD 400016
– fixed circuit-breakers up to 36 kV, 350 mm pole centre distance - No. 1VCD 400005
– withdrawable circuit-breakers for PowerCube PB6 and UniGear tipo ZS2 - No. 1VCD 400015
– HD4/z 40.5 kV - No. 1VCD 400013
In any case, to take into account the evolution of the product, it is always useful to refer to the circuit diagram provided with each circuit-breaker.

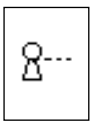
Graphical symbols for electrical diagrams (IEC 60617 and CEI 3-14 ... 3-26 Standards)

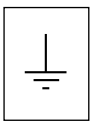

Thermal effect

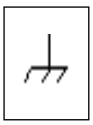

Electromagnetic effect


Timing

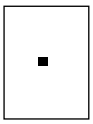

Pushbutton control

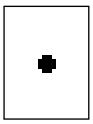

Operated by key

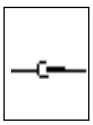

Earth (general symbol)

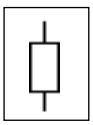

Mass, frame

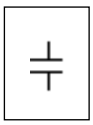

Conductors in shielded cable (two conductors shown)

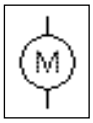

Connections of conductors


Terminal or clamp

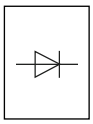

Socket and plug (female and male)

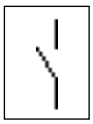

Resistor (general symbol)

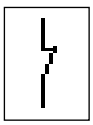

Capacitor (general symbol)

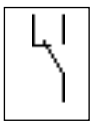


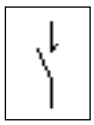
Motor (general symbol)

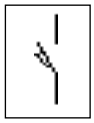

Rectifier with two half-waves (bridge)

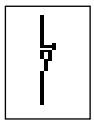

Make contact

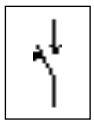

Break contact

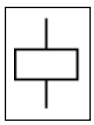

Change-over break before make contact

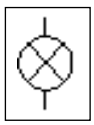

Passing make contact closing momentarily during release

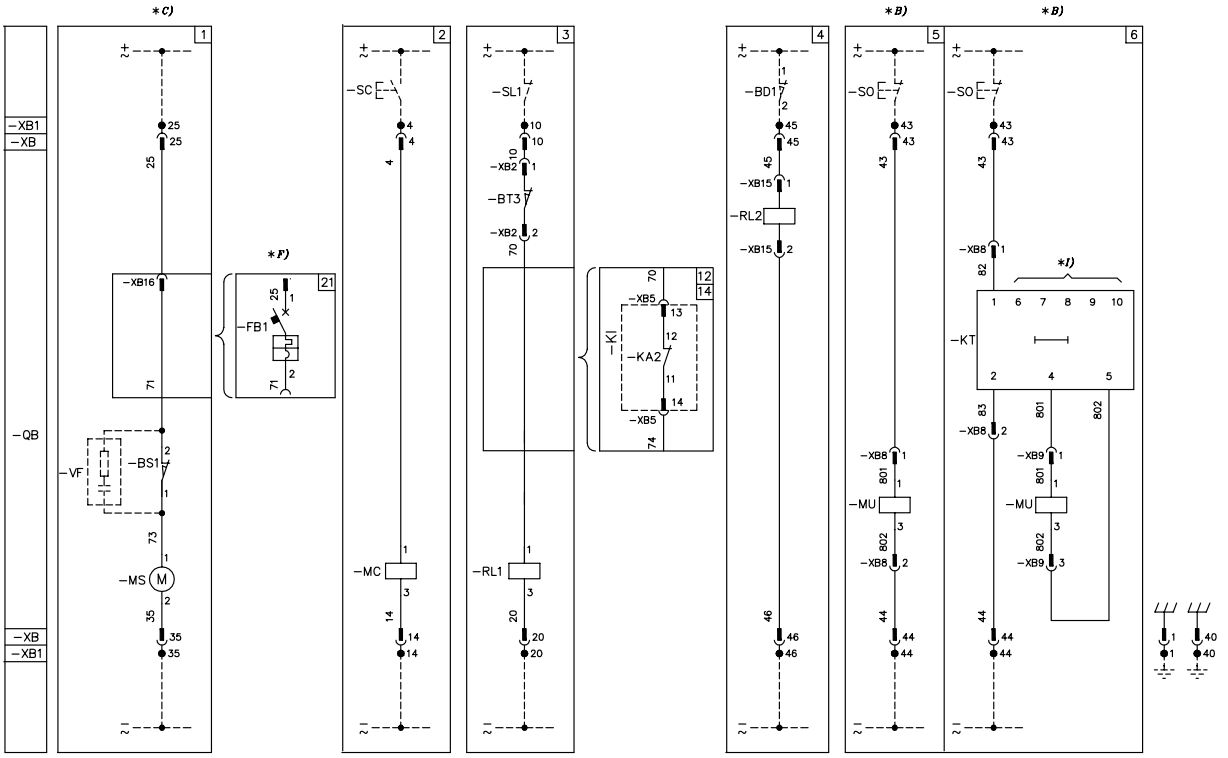

Closing position contact (limit switch)

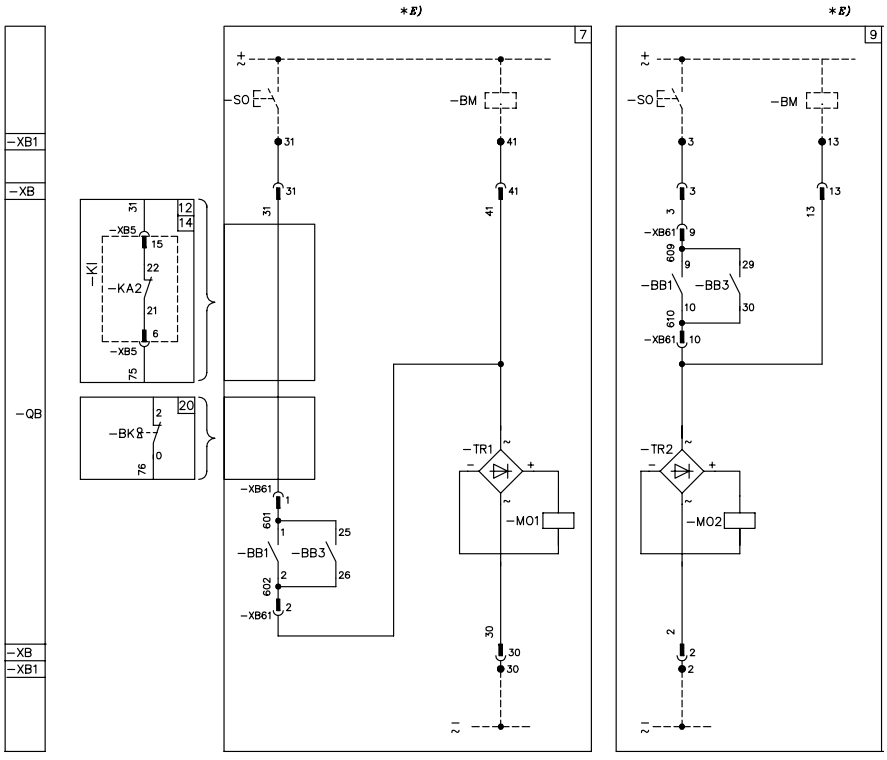

Opening position contact (limit switch)


Power circuit-breaker with automatic opening

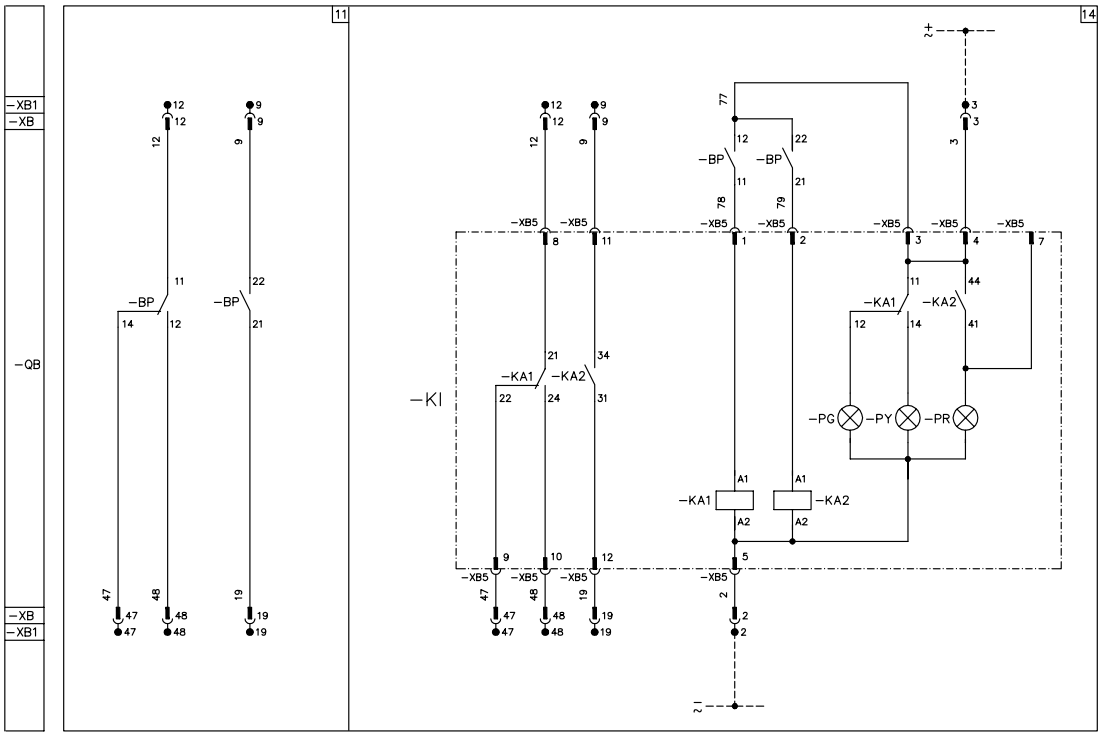

Control coil (general symbol)

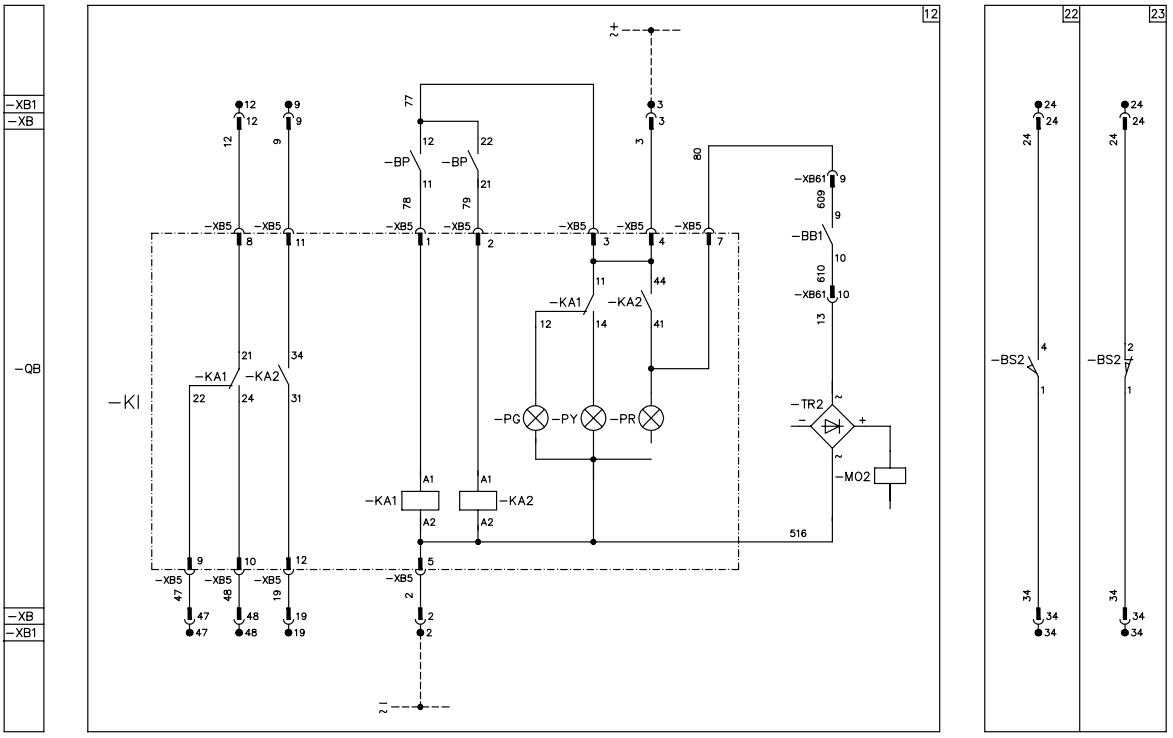

Lamp (general symbol)

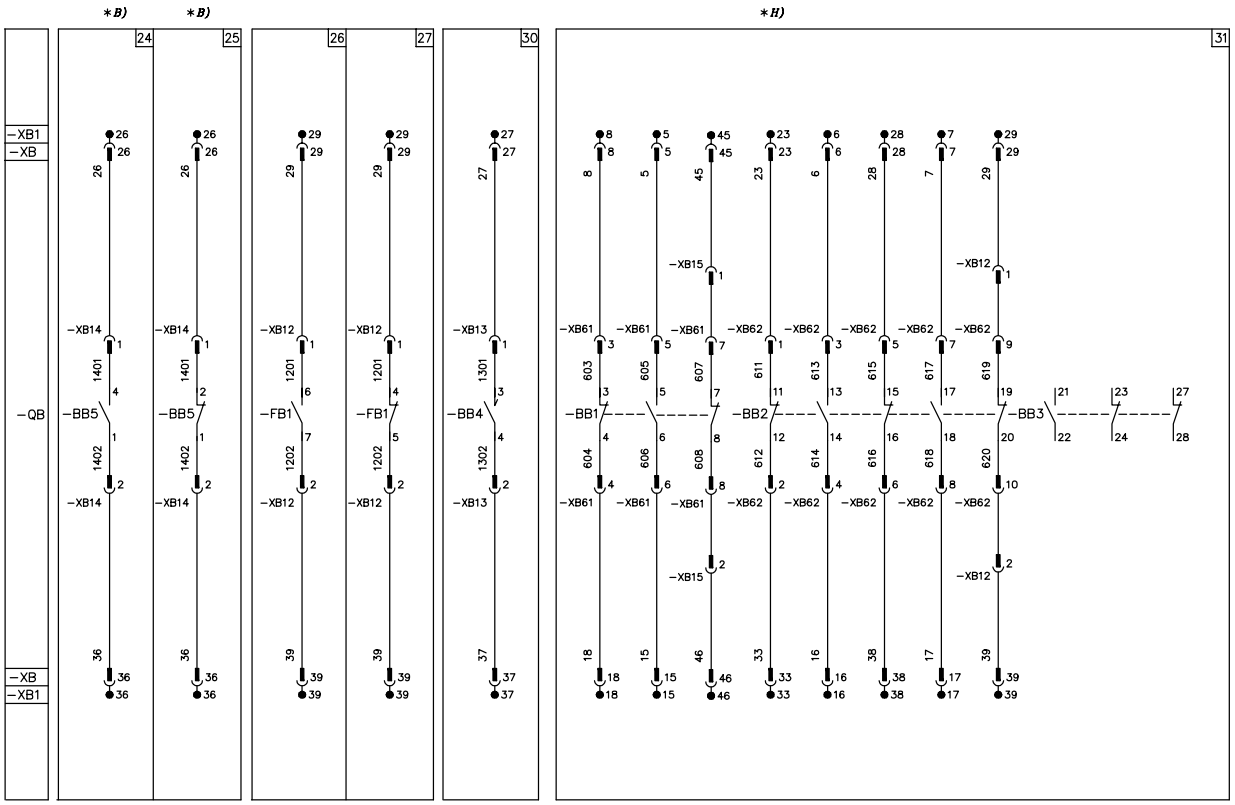


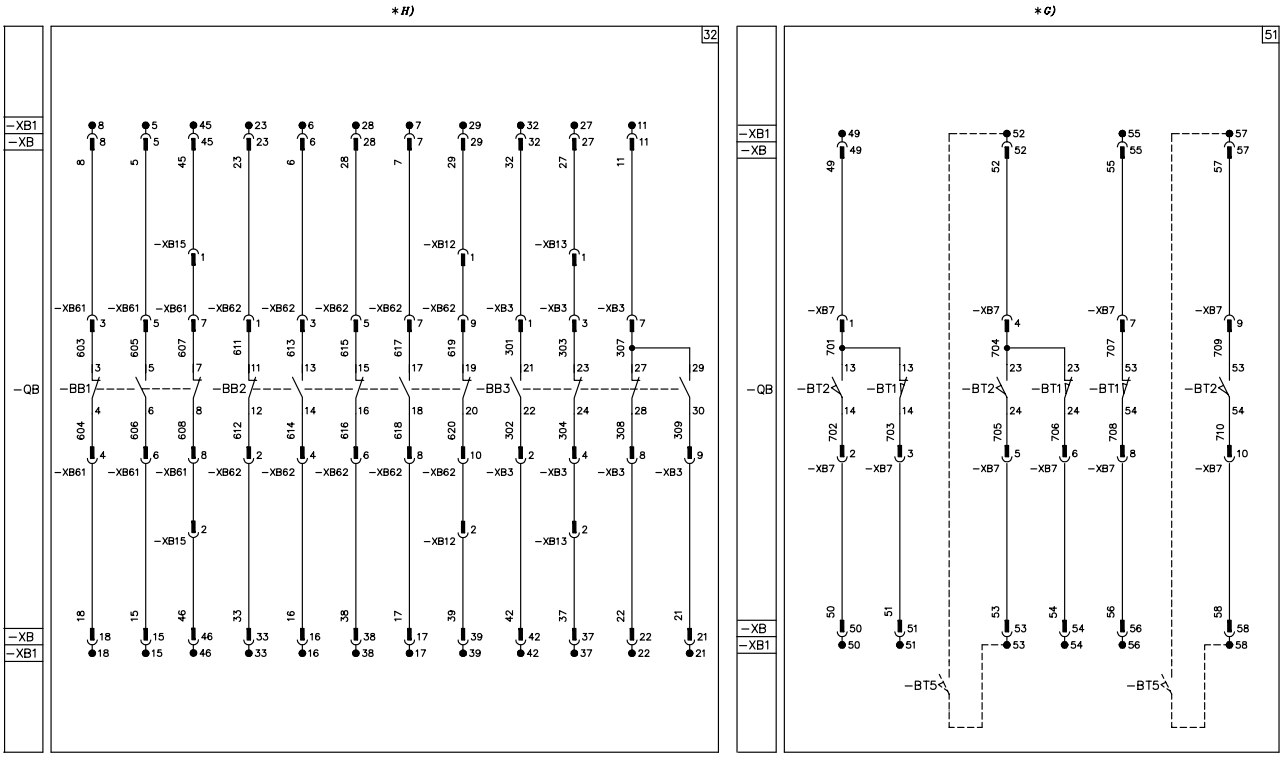


5. Electric circuit diagram









5. Electric circuit diagram

State of operation shown

The diagram indicates the following conditions:
- circuit-breaker open and connected
- circuits de-energized
- closing springs discharged
- key lock with key inserted and held
- gas pressure at rated service value (380 kPa absolute).

Caption

□ = Number of diagram figure

* = See note indicated by the letter

-BM = Device for continuous control of shunt opening release coil continuity (see note E)

-BP = Pressure-switch with two intervention thresholds:
- intervention for low gas pressure. Contacts 11-12-14 change over, in relation to the position indicated in the diagram, when the gas pressure reaches a value of less than 310 kPa absolute from 380 kPa absolute. If rated pressure is restored, these contacts change over again when, starting from a value of less than 310 kPa absolute, the value of 340 kPa absolute is reached.
- intervention for insufficient gas pressure. Contacts 21-22-24 change over when the gas pressure reaches a value of less than 280 kPa absolute from 380 kPa absolute. If rated pressure is restored, these contacts change over again when, starting from a value of less than 280 kPa absolute, the value of 310 kPa absolute is reached.

-KT = Undervoltage release electronic time-delay device (see note I)

-KI = Integrated circuit for gas pressure control, including:
- -PG = Green lamp indicating normal gas pressure
- -PR = Red lamp indicating insufficient gas pressure
- -PY = Yellow lamp indicating low gas pressure
- -KA1 = Auxiliary relay to double the -BP pressure-switch contacts with intervention for low gas pressure
- -KA2 = Auxiliary relay to double the -BP pressure-switch contacts with intervention for insufficient gas pressure
- -XB5 = Connector

-MS = Motor for the closing spring charging (see note C)

-QB = Main circuit-breaker

-BB1…-BB3 = Circuit-breaker auxiliary contacts (no. 3 packs of 5 contacts)

-BB4 = Auxiliary passage contact (with momentary closing during circuit-breaker opening)

-BB5 = Contacts for electrical signalling of undervoltage release energised/de-energised

-FB1 = Thermomagnetic circuit-breaker for protection of the spring-charging motor (see note F)

-BD1 = Position contact of the enclosure door.

-BS1...2 = Limit contacts of the spring charging motor

-BT3 = Circuit-breaker position contact, open during the isolating travel

-BT5 = Position contacts signalling circuit-breaker in the racked-out position (these are contacts signalling circuit-breaker isolated located in the enclosure, in the fixed part: see contacts -BT2 in diagram 1VCP400036 figures 5-6)

-BT1 = Contacts electrically signalling circuit-breaker in the connected position (see note G)

-BT2 = Contacts electrically signalling circuit-breaker in the isolated position (see note G)

-SC = Pushbutton or contact for circuit-breaker closing

-BK = Contact operated by the key lock preventing electrical opening with earthing truck connected (compulsory accessory for earthing trucks with making capacity)

-SL1 = Contact for circuit-breaker closing lock

-SO = Pushbutton or contact for circuit-breaker opening

-TR1, -TR2 = Rectifiers for -MO1 and -MO2 releases

-XB = Circuit-breaker circuit connector

-XB1 = Switchgear terminal board (outside the circuit-breaker)

-XB2…-XB62 = Accessory connectors

-MC = Shunt closing release

-RL1 = Locking magnet. If de-energized it mechanically prevents circuit-breaker closing

-RL2 = Locking magnet. If de-energized it mechanically prevents circuit-breaker racking-in and isolation (it is possible to limit its consumption by connecting a delayed pushbutton in series to enable the operation)

-MO1 = First shunt opening release (see note E)

-MO2 = Second shunt opening release (see note E)

-MU = Instantaneous undervoltage release or undervoltage release with electronic time-delay device (see note B)

-VF = Filter (only provided with 220V d.c. voltage supply)

Description of figures

Fig. 1 = Closing spring charging motor circuit (see note C).
Fig. 2 = Shunt closing release (antipumping is carried out mechanically).
Fig. 3 = Locking magnet. If de-energized it mechanically prevents circuit-breaker closing.
Fig. 4 = Locking magnet. If de-energized it mechanically prevents circuit-breaker racking-in and isolation (it is possible to limit its consumption by connecting a time-delay pushbutton in series for enabling the operation) (see note H).
Fig. 5 = Instantaneous undervoltage release (see note B)
Fig. 6 = Undervoltage release with electronic time-delay device (see notes B and I)
Fig. 7 = First shunt opening release circuit with possibility of continuous control of the winding (see note E).
Fig. 9 = Second shunt opening release circuit with possibility of continuous control of the winding (see note E).
Fig. 11 = Gas pressure control circuit. This includes the contacts for remote indication of normal, low and insufficient gas pressure.
For -BP pressure switch intervention values see the caption.
Fig. 12 = Gas pressure control circuit. It includes:
- intervention for insufficient gas pressure with circuit-breaker opening by means of the -MO2 release and lock on closing and opening by means of a -KA2 relay auxiliary contact (provide the locking magnet in fig. 3)
- 3 lamps for local indication of normal, low and insufficient gas pressure
- contacts for remote indication of normal, low and insufficient gas pressure.

For pressure switch pressure values please refer to circuit-breaker electrical diagram.
Fig. 14 = Gas pressure control circuit. It includes:
- intervention for insufficient gas pressure with lock on circuit-breaker closing and opening by means of the -KA2 relay auxiliary contacts (provide the locking magnet in fig. 3)
- 3 lamps for local indication of normal, low and insufficient gas pressure
- contacts for remote indication of normal, low and insufficient gas pressure.

For -BP pressure switch intervention values see the caption.
Fig. 20 = Contact operated by the key lock “in closed position” to prevent electrical opening of the earthing truck with making capacity “racked-in” (compulsory accessory for earthing trucks with making capacity when the -MO1 shunt opening release is provided).
Fig. 21 = Thermomagnetic circuit-breaker for protection of the spring-charging motor (see note F).
Fig. 22 = Contact for electrically signalling closing springs charged.
Fig. 23 = Contact for electrically signalling closing springs discharged.
Fig. 24 = Contact for electrically signalling under-voltage release energized (see note B).
Fig. 25 = Contact for electrically signalling under-voltage release de-energized (see note B).
Fig. 26 = Contact for electrically signalling motor protection circuit-breaker closed.
Fig. 27 = Contact for electrically signalling motor protection circuit-breaker open.
Fig. 30 = Auxiliary passing contact with momentary closing during circuit-breaker opening (intervention of -MO1, -MO2, -MO3 and -MU).
Fig. 31 = Circuit-breaker auxiliary contacts available.
Fig. 32 = Circuit-breaker auxiliary contacts available.
Fig. 51 = Contact for electrically signalling circuit-breaker in the racked-in and isolated positions located on the circuit-breaker, supplied on request (see note G).

Incompatibility

The circuits indicated by the following figures cannot be supplied at the same time 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

5. Electric circuit diagram

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.

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 220 V, 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 220 V, 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 1VCD400036.

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 (see diagram 1VCD400062):
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.

Notes

Notes

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1VCP000004 - Rev. O, en - Technical catalogue - 2013.06 (HD4) (gs)

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