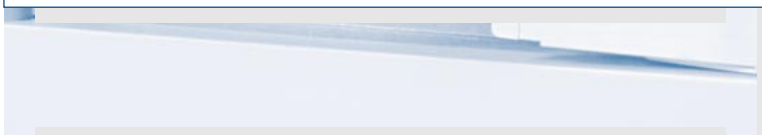
HD4

MV circuit-breakers in sulphur hexafluoride

12 ... 40.5 kV - 630 ... 3600 A - 16 ... 50 kA



1

DESCRIPTION

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 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.

Versions available

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, UniVer C switchboards, UniSafe and UniGear ZS1 type switchboards.

Fields of application

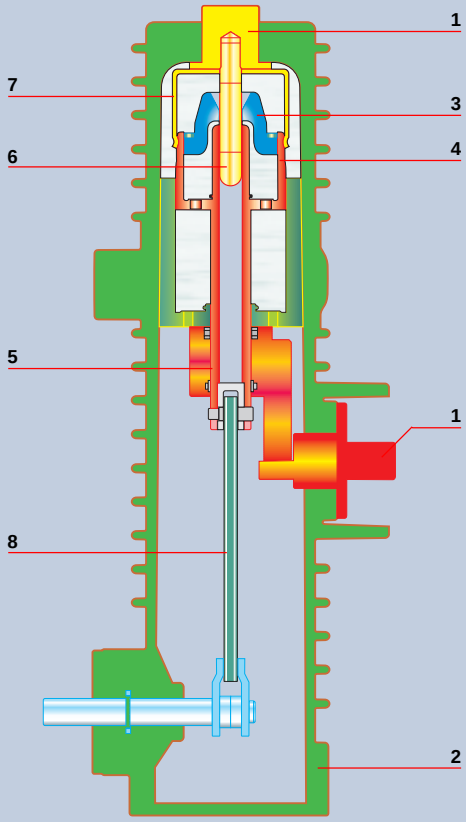
HD4 circuit-breakers are used in power distribution to control and protect lines, transformer and distribution substations, motors, transformers, capacitor banks, etc.
Thanks to the SF6 **autopuffer** breaking technique, the HD4 circuit-breakers do not generate operating overvoltages, and are therefore also highly suitable for retrofitting, upgrading and enlarging older installations where the motor, cable, etc. insulating materials may be particularly sensitive to dielectric stresses.

- 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).

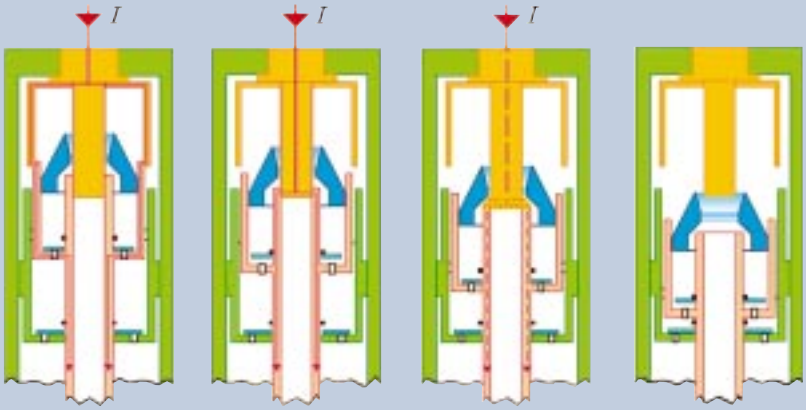
(*) Up to 24 kV.

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



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.

DESCRIPTION

Standards and approvals

HD4 circuit-breakers comply with IEC 62271-100, CEI 17-1 file 1375, CENELEC HD 348 S3 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.

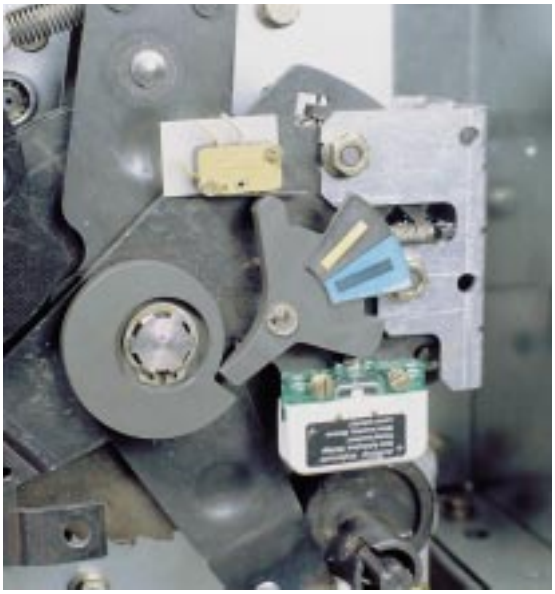
The HD4 circuit-breakers are tested according to the requirements of the IEC 62271-100 Standard (class E2 -table 21) and guarantee suitability for use in overhead lines, with rapid reclosing cycle.
Versions approved according to the GOST Standard are also available (please contact us).

Service safety

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

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.

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.

The self-supplied PR512 switchboard release is available for protection of the installations.
The PR512 makes the circuit-breaker trip by means of the special opening solenoid (YO3) (see chap. 2 - kit 2B).
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.

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

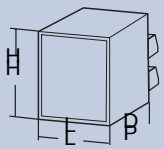
SF6 gas presence device (available on request).

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

CBE enclosures

The CBE enclosures are suitable for taking withdrawable HD4 circuit-breakers and their use allows medium voltage metal-clad switchboards to be constructed easily.
They comply with IEC 62271-100/CEI 17-1 - file 1375 and IEC 60298/CEI 17-6 file 2056 Standards.
They are available for voltage up to 24 kV, rated current up to 3150 A (3150 A with forced ventilation provided by the customer) and rated short-time withstand current up to 50 kA. The CBE enclosures have been studied and constructed to be practical to use and to give the user maximum safety.
They can be fitted with a complete and functional range of accessories to adapt the switchboard to the installation characteristics.
The main characteristics are as follows:
– standardised construction
– limited dimensions and weights
– preset for all mechanical and electrical couplings
– mechanical and electromechanical locks
– racking in and out with the door closed
– earthing switch with making capacity (on request)
– “Fail-Safe” device which prevents manual operation of the shutters.

	Un [kV]	**In** [A]	**L** [mm]	**H** [mm]	**D** [mm]
CBE11	12/17,5	630-1250	600	943	752
CBE21	12/17,5	1600	750	1015	752
CBE31	12/17,5	2000-2500-3150(*)	1000	1015	752
CBE41	24	630-1250	750	1125	910
CBE51	24	1600-2000-2500	1000	1125	910

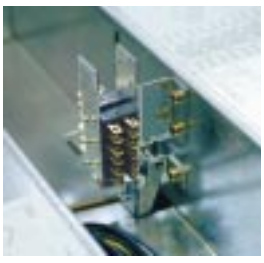


(*) Rated current in switchboard with forced ventilation (to be provided by the customer).

The terminals in the monoblocks are designed for easy connection to the power circuit.

The metal shutters are operated automatically by the movement of the circuit-breaker.

The earthing switch (if provided) is controlled from the front and interlocked with the circuit-breaker.

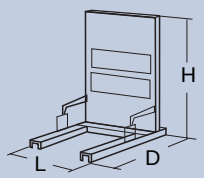


Special contacts indicate the circuit-breaker connected/isolated position.

CBF fixed parts

The CBF series fixed parts consist of a base with guides for racking-in of the circuit-breaker … and a rear wall where the insulating monoblocks with the power contacts are fixed.
The metal shutters on the rear wall are automatically operated by the circuit-breaker during the racking-in operation.
The fixed parts are made without side sheets and protruding screws to allow racking into prefabricated compartments of the same width as that of the fixed part.
The base, guides and rear panel with the monoblocks and shutters are normally packed separately to simplify storage operations. Assembly and installation in the compartments are particularly simple operations described in the special assembly instructions.
The fixed parts are made of galvanized metal sheet.
The various different components can be assembled using normal tools and a limited amount of nuts and screws.
The power contact terminals are silver-plated and ready for connection of the branches by means of bolts (branches and bolts are to be provided by the customer).

	Un [kV]	**In** [A]	**L** [mm]	**H** [mm]	**D** [mm]
CBF11	12/17.5	1250	594	863	1022
CBF21	12/17.5	1600	744	935	1018
CBF41	24	1250	744	1045	1263



Technical documentation

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

– UniSafe switchboards	code 649228
– UniGear ZS1 type switchboards	code 649424
– ZS3.2/PowerBloc switchboards	DECMS 226100 E
– REF 542 Plus unit	code 649423
– PR512 relay	code 649092

Quality Assurance System

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

Environmental Management System

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

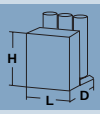
Test laboratory

Complies with ISO 45001 Standards, accredited by an external independent organisation.

2

CIRCUIT-BREAKER SELECTION AND ORDERING

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

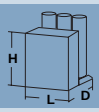
Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6**	
Rated voltage	**Ur** [kV]	
Rated insulation voltage	**Us** [kV]	
Withstand voltage at 50 Hz	**Ud (1 min)** [kV]	
Impulse withstand voltage	**Up** [kV]	
Rated frequency	**fr** [Hz]	
Rated normal current (40 °C) (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] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 60721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

(1) Rated uninterrupted currents defined in free air.
(2) Rated service value.
(3) Ik = 31.5 kA for 1 s.
(4) Including insulating shields (available on request).

	HD4 12								HD4 17								HD4 24							
	■								■								■							
	■								■								■							
	■								■								■							
	12								17,5								24							
	12								17,5								24							
	28								38								50							
	75								95								125							
	50-60								50-60								50-60							
	630	1250	1600	1600	2000	2500	3150	3600	630	1250	1600	1600	2000	2500	3150	3600	630	1250	1600	1600	2000	2500	3150	3600
	16	16	16	–	–	–	–	–	16	16	16	–	–	–	–	–	16	16	16	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	20	20	–	–	–	–	–
	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	31.5	31.5	31.5
	–	–	–	40	40	40	40	40	–	–	–	40	40	40	40	40	–	–	–	40	40	40	40	40
	–	–	–	50	50	50	50	50	–	–	–	50	50	50	50	50	–	–	–	–	–	–	–	–
	16	16	16	–	–	–	–	–	16	16	16	–	–	–	–	–	16	16	16	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	20	20	–	–	–	–	–
	25	25	25	–	25	25	25	–	25	25	25	–	25	25	25	–	25	25	25	–	25	25	25	25
	31.5[3]	31.5	31.5	–	31.5	31.5	31.5	31.5	31.5[3]	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	40	40	40	40
	–	–	–	50	50	50	50	50	–	–	–	50	50	50	50	50	–	–	–	–	–	–	–	–
	40	40	40	–	–	–	–	–	40	40	40	–	–	–	–	–	40	40	40	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	50	50	50	–	–	–	–	–
	63	63	63	–	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	80	80	80
	–	–	–	100	100	100	100	100	–	–	–	100	100	100	100	100	–	–	–	100	100	100	100	100
	–	–	–	125	125	125	125	125	–	–	–	125	125	125	125	125	–	–	–	–	–	–	–	–
	■								■								■							
	45								45								45							
	10-15								10-15								10-15							
	55-60								55-60								55-60							
	80								80								80							
	640			655			655		649			655			655		818[4]			655			818[4]	
	493			600			730		600			600			730		600			730			730	
	495			561			603		496			561			603		516			561			603	
	114			145			165		114			145			165		119			145			165	
	380								380								380							
	– 5 ... + 40								– 5 ... + 40								– 5 ... + 40							
	■								■								■							
	■								■								■							

Fixed HD4 36 kV circuit-breaker with 350 mm pole centre distance.

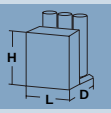
General characteristics of fixed circuit-breakers (36 kV)

Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6**	
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 of fixed circuit-breakers without truck and without insulating shields between the phases (4)	 **H** [mm] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

	HD4 36						
	■						
	■						
	■						
	36						
	36						
	70						
	170						
	50-60						
	630	1250	1250 (3)	1600	1600 (3)	2000 (3)	2500 (3)
	16	16	–	16	–	–	–
	20 (5)	20 (5)	–	20 (5)	–	20	20
	–	–	25	–	25	25	25
	–	–	31.5	–	31.5	31.5	31.5
	16	16	–	16	–	–	–
	20	20	–	20	–	20	20
	–	–	25	–	25	25	25
	–	–	31.5	–	31.5	31.5	31.5
	40	40	–	40	–	–	–
	50	50	–	50	–	50	50
	–	–	63	–	63	63	63
	–	–	80	–	80	80	80
	■						
	45						
	10-15						
	55-60						
	80						
	712/1060 (6)	712/1060 (6)	790/1123 (6)	712/1060 (6)	790/1123 (6)	790/1123 (6)	790/1123 (6)
	880/955 (6)	880/955 (6)	748/805 (6)	880/955 (6)	748/805 (6)	748/805 (6)	748/805 (6)
	695	695	833	695	833	833	883
	124	128	130	128	142	142	158
	450						
	– 5 ... + 40						
	■						
	■						

(1) Rated uninterrupted currents defined in free air.
(2) Rated service value.
(3) Special insulating partitions are provided for these versions (on request).
(4) For details of the overall dimensions, see chap. 6.
(5) Operation sequence O-0,3 min - CO - 3 min - CO.
(6) Distance with truck (if provided).

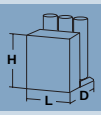
General characteristics of withdrawable circuit-breakers for CBE enclosures and CBF fixed parts (12 - 17.5 - 24 kV)

Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6**	
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) (5)	**Ik** [kA]	
Making capacity	**Ip** [kA]	
Operation sequence	[O-0,3s-CO-15s-CO]	
Opening time	[ms]	
Arc time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Overall dimensions	 **H** [mm] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 60721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

(1) Rated uninterrupted currents guaranteed with withdrawable circuit-breaker installed in a switchboard (40 °C).
(2) Rated service value.
(3) Ik = 31.5 kA for 1 s.
(4) Rated current in switchboard with forced ventilation.
(5) Please consult the specific catalogue for the short-time withstand current of the switchboard/enclosure/fixed part.

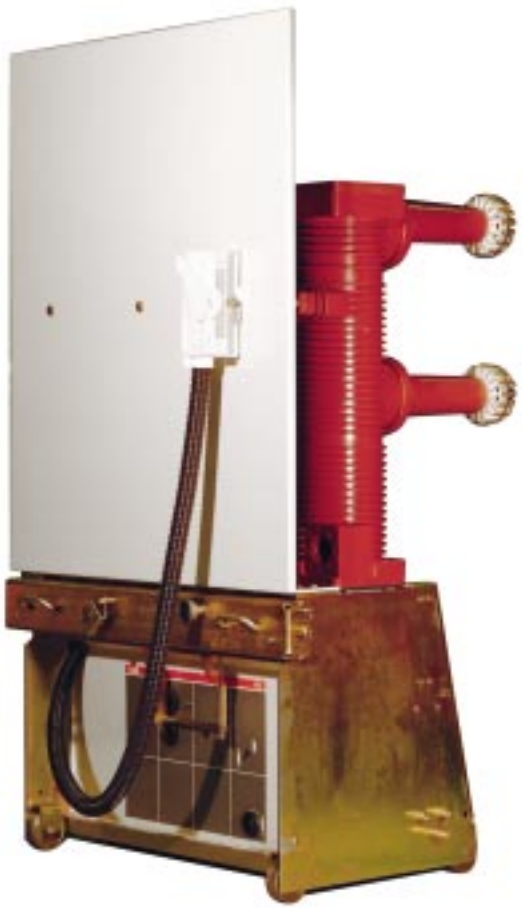
	HD4/C 12							HD4/C 17							HD4/C 24					
	■							■							■					
	■							■							■					
	■							■							■					
	12							17,5							24					
	12							17,5							24					
	28							38							50					
	75							95							125					
	50-60							50-60							50-60					
	630	1250	1250	1600	2000	2500	3150 [4]	630	1250	1250	1600	2000	2500	3150 [4]	630	1250	1250	1600	2000	2500
	16	16	–	–	–	–	–	16	16	–	–	–	–	–	16	16	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	20	–	–	–	–
	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	40	40	40
	–	–	50	50	50	50	50	–	–	50	50	50	50	50	–	–	–	–	–	–
	16	16	–	–	–	–	–	16	16	–	–	–	–	–	16	16	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	20	–	–	–	–
	25	25	–	25	25	25	25	25	25	–	25	25	25	25	25	25	–	25	25	25
	31.5[3]	31.5	–	31.5	31.5	31.5	31.5	31.5[3]	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	40	40	40
	–	–	50	50	50	50	50	–	–	50	50	50	50	50	–	–	–	–	–	–
	40	40	–	–	–	–	–	40	40	–	–	–	–	–	40	40	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–	–	50	50	–	–	–	–
	63	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	100	100	100
	–	–	125	125	125	125	125	–	–	125	125	125	125	125	–	–	–	–	–	–
	■							■							■					
	45							45							45					
	10-15							10-15							10-15					
	55-60							55-60							55-60					
	80							80							80					
	636	702	702					636	702	702					792	792	838	838		
	532	682	882					532	682	882					682	682	882	882		
	659	640	640					659	640	640					799	799	788	771		
	120	177	220					120	177	220					125	177	177	220		
	380							380							380					
	– 5 ... + 40							– 5 ... + 40							– 5 ... + 40					
	■							■							■					
	■							■							■					

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

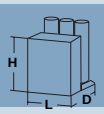
Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6**	
Rated voltage	**Ur** [kV]	
Rated insulation voltage	**Us** [kV]	
Withstand voltage at 50 Hz	**Ud (1 min)** [kV]	
Impulse withstand voltage	**Up** [kV]	
Rated frequency	**fr** [Hz]	
Rated normal current (40 °C) (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]	
Arc time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Overall dimensions	 **H** [mm] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

(1) Rated uninterrupted currents guaranteed with withdrawable circuit-breaker installed in a switchboard (40 °C).
(2) Rated service value.
(3) Ik = 31.5 kA for 1 s.
(4) Switchboard with forced ventilation. For availability, please contact us.
(5) In this type of circuit-breaker, the YL2 locking magnet, in the truck, is always provided to make the lock on racking-in without connection of the auxiliary circuits.

	HD4/P 12							HD4/P 17							HD4/P 24				
	■							■							■				
	■							■							■				
	■							■							■				
	12							17.5							24				
	12							17.5							24				
	28							38							50				
	75							95							125				
	50-60							50-60							50-60				
	630	1250	1250	1600	2000	2500	3150 [4]	630	1250	1250	1600	2000	2500	3150 [4]	630	1250	1600	2000	2500
	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	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	50	50	50	–	–	–	–	–
	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	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	50	50	50	–	–	–	–	–
	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	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	125	125	125	–	–	–	–	–
	■							■							■				
	45							45							45				
	10-15							10-15							10-15				
	55-60							55-60							55-60				
	80							80							80				
	628		695			695		628		695			695		736		821		821
	532		636			882		532		636			882		636		842		842
	659		640			643		659		640			643		802		788		788
	120		177			220		120		177			220		125		177		220
	380							380							380				
	– 5 ... + 40							– 5 ... + 40							– 5 ... + 40				
	■							■							■				
	■							■							■				



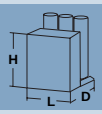
General characteristics of withdrawable circuit-breakers for UniGear 36 type ZS3.2 switchboards (40.5 kV)

Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6** **(4)**	
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]	
Arc time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Overall dimensions	 **H** [mm] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

	HD4/Z 40,5			
	■			
	■			
	■			
	■			
	40,5			
	40,5			
	95			
	185			
	50-60			
	1250	1600	2000	2500(3)
	25	25	25	25
	31.5	31.5	31.5	31.5
	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	1575	1575	1575
	895	895	895	895
	686	686	686	686
	370	370	370	370
	550			
	– 5 ... + 40			
	■			
	■			

(1) Rated uninterrupted currents guaranteed with withdrawable circuit-breaker installed in a switchboard.
(2) Rated service value.
(3) Rated current in switchboard with forced ventilation. In loose Powerbloc enclosure, the rated current of 2500 A is guaranteed with natural ventilation.
(4) These circuit-breakers also comply with the following Standards:
– GB 1984-1989 National Standard
– DL/T402-1999 National Power Company Standard
– JB/T9694-1999 Machinery/Electricity Ministry Standard (only for reference).

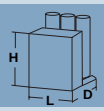
General characteristics of withdrawable circuit-breakers for UniSafe switchboards (12 - 17.5 - 24 kV) (4)

Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6**	
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]	
Arc time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Overall dimensions	 **H** [mm] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

(1) Rated uninterrupted currents guaranteed with withdrawable circuit-breaker installed in a switchboard (40 °C).
(2) Rated service value.
(3) Ik = 31.5 kA for 1 s.
(4) In this type of circuit-breaker, the YL2 locking magnet, in the truck, is always provided to make the lock on racking-in without connection of the auxiliary circuits.

	HD4/W 12					HD4/W 17					HD4/W 24			
	■					■					■			
	■					■					■			
	■					■					■			
	12					17,5					24			
	12					17,5					24			
	28					38					50			
	75					95					125			
	50-60					50-60					50-60			
	630	1250	1600	2000	2500	630	1250	1600	2000	2500	630	1250	1600	2000
	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	–	–	–	–	–	–	–	–	–	–	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	31.5	–	–	–	–
	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	–	–	–	–	–	–	–	–	–	–	20	20	20	20
	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	31.5 (3)	31.5	31.5	31.5	31.5	31.5 (3)	31.5	31.5	31.5	31.5	–	–	–	–
	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	–	–	–	–	–	–	–	–	–	–	50	50	50	50
	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	80	80	80	80	80	80	80	80	80	80	–	–	–	–
	■					■					■			
	45					45					45			
	10-15					10-15					10-15			
	55-60					55-60					55-60			
	80					80					80			
	636/702		702			636/702		702			792/838		838	
	532/682		682			532/682		682			682/882		882	
	640		640			640		640			799		788	
	120		177			120		177			125		177	
	380					380					380			
	– 5 ... + 40					– 5 ... + 40					– 5 ... + 40			
	■					■					■			
	■					■					■			

General characteristics of withdrawable circuit-breakers for UniSafe switchboards 36 kV

Circuit-breaker		
Standards	**IEC 62271-100** **CEI 17-1 (File 1375)** **CENELEC HD 348 S6**	
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]	
Arc time	[ms]	
Total breaking time	[ms]	
Closing time	[ms]	
Overall dimensions	 **H** [mm] **L** [mm] **D** [mm]	
Weight	[Kg]	
Absolute SF6 gas pressure (2)	[kPa]	
Operating temperature	[°C]	
Tropicalization	**IEC: 60068-2-30, 721-2-1**	
Electromagnetic compatibility	**IEC: 60694, 61000-6-2, 61000-6-4**	

	HD4/W 36			
	■			
	■			
	■			
	36			
	36			
	70			
	170			
	50-60			
	1250	1600	2000	2500 (3)
	20	20	20	20
	25	25	25	25
	20	20	20	20
	25	25	25	25
	50	50	50	50
	63	63	63	63
	■			
	45			
	10-15			
	55-60			
	80			
	973	973	973	973
	882	882	882	882
	788	788	789	789
	207	207	210	270
	450			
	– 5 ... + 40			
	■			
	■			

(1) Rated uninterrupted currents guaranteed with withdrawable circuit-breaker installed in a switchboard (40 °C).
(2) Rated service value.
(3) Rated current in switchboard with forced ventilation.

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 25.
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 UniSafe switchboard with 24 kV rated voltage, 2000 A rated normal current and 25 kA breaking capacity.

HD4	...	...	...	...

Version		
	Fixed	–
	CBE / CBF	C
	UniGear ZS1 type	P
	UniSafe	W
	ZS3.2	Z

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 kA	16
	20 kA	20
	25 kA	25
	31.5 kA	32
	40 kA	40
	50 kA	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
  – 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

	YO1 shunt opening release.	Additional YO2 shunt opening release.	Opening solenoid for PR512	YC shunt closing release.	YU undervoltage release (power supply on supply side).	YU undervoltage release with electronic time delay device (power supply on supply side).	Mechanical override of undervoltage trip.	Undervoltage release electric signalling (energised or de-energised).	
	1	**2A**	**2B**	**3**	**4A**	**4B**	**5**	**6**	
Fixed circuit-breakers									
HD4 12	■	■	■	■	■	■	■	■	
HD4 17	■	■	■	■	■	■	■	■	
HD4 24	■	■	■	■	■	■	■	■	
HD4 36	■	■	■	■	■	■	■	■	
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/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 UniSafe switchboards									
HD4/W 12	■	■	■	■	■	■	■	■	
HD4/W 17	■	■	■	■	■	■	■	■	
HD4/W 24	■	■	■	■	■	■	■	■	
HD4/W 36	■	■	■	■	■	■	■	■	

(1) Standard fitting: no. 6 auxiliary contacts.
(2) Application of the pressure switch is only possible in the factory.

	Group of 15 auxiliary circuit-breaker contacts (as alternative to the 10 provided as standard).	Q0 transient contact.	S75C position contact of the withdrawable circuit-breaker (installed on the truck). It is compulsory if the YL1 locking magnet is present.	Withdrawable circuit-breaker transmitted contacts (installed in the circuit-breaker truck).	M spring charging geared motor.	Q60 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.	YL1 operating mechanism locking magnet.	YL2 truck locking magnet.	Interlock for fixed circuit-breaker.	Mechanical isolation interlock with CBE enclosure door.	Earthing contact on the truck.	Two-level pressure switch [2].	Two-level pressure switch plus SF6 control device with three LEDs [2].	Insulating partitions.
	7	**8**	**9**	**10**	**11**	**12**	**13A**	**13B**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22A**	**22 B/C/D**	**23**
	■	■	–	–	■	■	■	■	■	■	■	■	–	■	–	–	■	■	–
	■	■	–	–	■	■	■	■	■	■	■	■	–	■	–	–	■	■	–
	■	■	–	–	■	■	■	■	■	■	■	■	–	■	–	–	■	■	■
	■	■	–	–	■	■	■	■	■	■	■	■	–	■	–	–	■	■	■
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–
	■	■	–	(1)	■	■	■	■	–	–	■	■	■	–	–	–	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	–	–	–	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	–	–	–	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	–	–	–	■	■	–
	■	■	■	■	■	■	■	■	■	■	■	■	■	–	–	–	■	■	–

Optional accessories

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

■ **Shunt opening release**

1 **YO1** Shunt opening release.

■ **Additional shunt opening release**

2A **YO2** additional shunt opening release

2B Opening solenoid for PR512 microprocessor-based release (PR512 mounted outside the circuit-breaker).

■ **Shunt closing release**

3 YC shunt closing release.

■ **Undervoltage release**

4A **YU** undervoltage release (power supply branched on the supply side).

4B **YU** 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 1).

5 Mechanical override of undervoltage release trip with electrical signalling.

6 Electrical signalling of the undervoltage release (energised or de-energised)

■ **Auxiliary and signalling contacts**

7 Set of 15 circuit-breaker auxiliary contacts (as alternative to the 10 provided as standard) (according to the applications requested, a maximum of seven opening contacts-NC and eight closing contacts-NO are available).

8 Transient **Q0** contact with momentary closing during circuit-breaker opening.

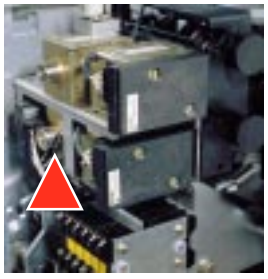
9 Position contact of the withdrawable S75C circuit-breaker (installed on the truck, only available for the /C, /P, /W version when the locking magnet is not provided; mounted as standard when the locking magnet **YL1** is provided on the operating mechanism).

10 Transmitted contacts of the withdrawable circuit-breaker (installed in the circuit-breaker truck).

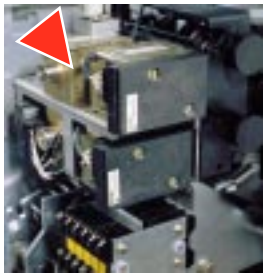
■ **Motor operator**

11 Spring-charging geared motor **M**.

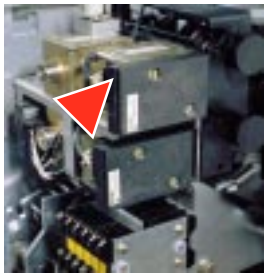
12 Thermomagnetic protection **Q60** of the spring-charging geared motor (mounted as standard for 24 V d.c. geared motors) complete with electrical signalling of thermomagnetic protection trip.



Shunt opening release.



Shunt closing release.



Undervoltage release.

Auxiliary contacts

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 Operating mechanism YL1 locking magnet.
18 Truck YL2 locking magnet. Compulsory accessory for the withdrawable versions for UniSafe and UniGear ZS1 type switchboards, 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 (not provided for HD4/Z and HD4/W).

■ **Withdrawable circuit-breaker earthing**
21 Earthing contact on the truck (compulsory for circuit-breaker for CBE enclosure, for CBF fixed part; not provided for UniSafe and UniGear ZS1 type switchboards).

■ **Gas control device**
N.B. 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.
22A Two-level pressure switch.
22B Two-level pressure switch control device with three LEDs and **YO2** additional shunt opening release: circuit-breaker opening and lock on closing.
22C Two-level pressure switch control device with three LEDs: circuit-breaker locking in the position it is found in.
22D Two-level pressure switch control device with three LEDs: version for HD4/Z circuit-breakers HD4/Z.

■ **Insulating partitions**
23 Insulating partitions.

Spring charging geared motor.

Geared motor protection.

SF6 control device.

Characteristics of electrical accessories

Shunt opening release (YO1-YO2)	**Ps**	=	125 W/VA (Instant. ≤ 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 (YC)	**Ps**	=	250 W/VA (150 ms)
	Pc	=	5 W/VA (antipumping function) (80 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
Undervoltage release (YU)	**Ps**	=	250 W/VA (150 ms)
	Pc	=	5 W/VA
	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 (M)	**Ps**	=	1500 W/VA (100 ms)
	Pc	=	400 W/VA (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 (YL1-YL2)	**Ps**	=	250 W/VA (150 ms)
	Pc	=	5 W/VA (80 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
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
Cosφ Power factor
Icu Breaking capacity
Ps Inrush power consumption
Pc Continuous service input
T Time constant

3

CBE ENCLOSURE SELECTION AND ORDERING

General characteristics

Enclosure		CBE11	CBE21	CBE31	CBE41	CBE51
Standards		**IEC publ. 60056 / 298 CEI 17-1 (file 1375) / 17-6 (file 2056) CENELEC HD 348 S6 / 187 S5**				
Rated voltage	**Ur** [kV]	12 17.5	12 17.5	12 17.5	24	24
Rated insulation voltage	**Ui** [kV]	12 17.5	12 17.5	12 17.5	24	24
Withstand voltage at 50 Hz	**Ud** (1 min) [kV]	28 38	28 38	28 38	50	50
Impulse withstand voltage	**Up** [kV]	75 95	75 95	75 95	125	125
Rated frequency	**fr** [Hz]	50-60	50-60	50-60	50-60	50-60
Rated current (1)	**Ir** (40 °C) [A]	630 1250 – – – –	– – 1600 – – –	– – – 2000 2500 3150 (2)	630 1250 – – – –	– – 1600 2000 2500 –
Rated admissible short-time current	**Ik** [kA]	31.5	50	50	40	40
Dimensions (monoblocs excluded)	 **L** [mm] **H** [mm] **D** [mm]	600 943 752	750 1015 752	1000 1015 752	750 1125 910	1000 1125 910
Weight	[kg]	120	200	320	225	370
Tropicalization		**IEC 721-2-1**				
Electromagnetic compatibility		**EN 50081.../50082...**				
Degree of protection		**IP 3X**				

(1) Rated current of the CBE enclosure installed in a switchboard.
(2) With forced ventilation (provided by the customer).

Standard equipment

The basic coded versions of CBE enclosures are always provided with degree of protection IP3X with the door closed, IP2X with the door open and are made up as follows:

– unpainted galvanised sheet structure
– door painted RAL 7035. On request, it is possible to supply the door dismantled and protected against corrosion (painting by the customer) with kit of accessories for completing the door (handle for door without lock, window and hinges; on request, the handle with lock is available).
– insulating monoblocs with medium voltage contacts
– automatic metal segregation shutters of the M.V. contacts with “fail safe” device which prevents manual operation of the shutters themselves
– sliding earthing contact
– connector (socket)
– anti-racking-in lock for different rated currents
– nameplate in the language of chosen.

The earthing switch (if requested) is controlled from the front and is interlocked with the circuit-breaker to prevent the power circuit being earthed with the circuit-breaker connected.

1 Segregation shutters
2 Socket connector
3 Inspection window
4 Earthing switch operating mechanism
5 Sliding earthing contact
6 Earthing switch release lever
7 Bush for passage of connected/isolated operating lever
8 Internal arc-proof door
9 Insulating monoblocs
10 Main circuit contacts

Circuit-breaker – enclosure combination table

HD4 circuit-breaker					Enclosure
Ur (kV)	**Isc (kA)**	**Ir (A)**			
12	16	630	HD4/C	12.06.16	**CBE11**
		1250	HD4/C	12.12.16	
	25	630	HD4/C	12.06.25	
		1250	HD4/C	12.12.25	
	31.5	630	HD4/C	12.06.32	
		1250	HD4/C	12.12.32	
17	16	630	HD4/C	17.06.16	**CBE11**
		1250	HD4/C	17.12.16	
	25	630	HD4/C	17.06.25	
		1250	HD4/C	17.12.25	
	31.5	630	HD4/C	17.06.32	
		1250	HD4/C	17.12.32	
12	25	1600	HD4/C	12.16.25	**CBE21**
	31.5	1600	HD4/C	12.16.32	
	40	1250	HD4/C	12.12.40	
		1600	HD4/C	12.16.40	
	50	1250	HD4/C	12.12.50	
		1600	HD4/C	12.16.50	
17	25	1600	HD4/C	17.16.25	**CBE21**
	31.5	1600	HD4/C	17.16.32	
	40	1250	HD4/C	17.12.40	
		1600	HD4/C	17.16.40	
	50	1250	HD4/C	17.12.50	
		1600	HD4/C	17.16.50	
12	25	2000	HD4/C	12.20.25	**CBE31**
		2500	HD4/C	12.25.25	
		3150 (1)	HD4/C	12.32.25	
	31.5	2000	HD4/C	12.20.32	
		2500	HD4/C	12.25.32	
		3150 (1)	HD4/C	12.32.32	
	40	2000	HD4/C	12.20.40	
		2500	HD4/C	12.25.40	
		3150 (1)	HD4/C	12.32.40	
	50	2000	HD4/C	12.20.50	
		2500	HD4/C	12.25.50	
		3150 (1)	HD4/C	12.32.50	

(1) With forced ventilation (provided by the customer).

HD4 circuit-breaker					Enclosure
Ur (kV)	**Isc (kA)**	**Ir (A)**			
17	25	2000	HD4/C	17.20.25	**CBE31**
		2500	HD4/C	17.25.25	
		3150 (1)	HD4/C	17.32.25	
	31.5	2000	HD4/C	17.20.32	
		2500	HD4/C	17.25.32	
		3150 (1)	HD4/C	17.32.32	
	40	2000	HD4/C	17.20.40	
		2500	HD4/C	17.25.40	
		3150 (1)	HD4/C	17.32.40	
	50	2000	HD4/C	17.20.50	
		2500	HD4/C	17.25.50	
		3150 (1)	HD4/C	17.32.50	
24	16	630	HD4/C	24.06.16	**CBE41**
		1250	HD4/C	24.12.16	
	20	630	HD4/C	24.06.20	
		1250	HD4/C	24.12.20	
	25	630	HD4/C	24.06.25	
		1250	HD4/C	24.12.25	
	32	1250	HD4/C	24.12.32	
	40	1250	HD4/C	24.12.40	
24	25	1600	HD4/C	24.16.25	**CBE51**
		2000	HD4/C	24.20.25	
		2500	HD4/C	24.25.25	
	31.5	1600	HD4/C	24.16.32	
		2000	HD4/C	24.20.32	
		2500	HD4/C	24.25.32	
	40	1600	HD4/C	24.16.40	
		2000	HD4/C	24.20.40	
		2500	HD4/C	24.25.40	

(1) With forced ventilation (provided by the customer).

Notes for ordering enclosures

The CBE enclosures are available in five different sizes as shown in the table on page 26. Each enclosure is available in two versions:
– enclosure without earthing switch
– enclosure with earthing switch.
The earthing switch is not an accessory and cannot be applied at a later date.
For this reason, when ordering, the actual installation requirements must be assessed in advance.
The CBE11 and CBE21 enclosures are also available in the version with earthing switch preset for current transformer:
– CT type IBR10L for CBE11
– CT type IBR20L for CBE21.
Please consult us for any applications.

Optional accessories

Notes
– The accessories identified with the same number are alternative to each other.
– For selection of the accessories, always specify the type of enclosure.

Circuit-breaker position contacts

CBE 11-21-31 enclosures

1A Group of twelve contacts signalling circuit-breaker isolated (six closing + six opening).

1B Group of twenty contacts signalling circuit-breaker isolated (ten closing + ten opening).

2A Group of twelve contacts signalling circuit-breaker connected (six closing + six opening).

2B Group of twenty contacts signalling circuit-breaker connected (ten closing + ten opening).

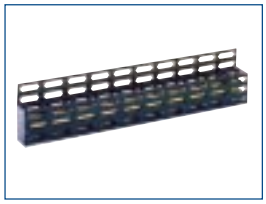
CBE 41-51 enclosures

3A Group of eight contacts signalling circuit-breaker isolated (three closing + (three opening).

3B Group of twenty contacts signalling circuit-breaker isolated (ten closing + ten opening).

4A Group of eight contacts signalling circuit-breaker connected (four closing + four opening).

4B Group of twenty contacts signalling circuit-breaker connected (ten closing + ten opening).



Anti-condensation heater.

Voltage signalling device.

Electrical door interlock (IP30).

Circuit-breaker auxiliary position contacts.

Anti-condensation heater
5A 150 W - 110/220/380 V a.c. or d.c. anti-condensation heater for CBE 11.
5B 150 W - 110/220/380 V a.c. or d.c. anti-condensation heater for CBE 21-31-41-51.

Voltage signalling device
6 Device for signalling voltage present (VIS type) to be used with current transformers with capacitive socket or with a set of three insulators with capacitive socket (to be provided by the customer). For the capacity values, ask for document T38152.

Interlocks
7 Mechanical door interlock.
8 Electrical door interlock.

Locks
9A Key lock for anti-racking-in circuit-breaker with different rated current for CBE 11-21-31.
9B Key lock for anti-racking-in circuit-breaker with different rated current for CBE 41-51.

Accessories for handling the circuit-breakers
10A Lifting truck for CBE 11-21-41.
10B Lifting truck for CBE 31-51.
11A Plate for truck for CBE 11.
11B Plate for truck for CBE 21-41.
11C Plate for truck for CBE 31-51.

Accessories for earthing switch (only for enclosures with earthing switch)

Auxiliary contacts
12A Group of five signalling contacts.
12B Group of ten signalling contacts.

Key lock
13A Key lock in open position. Can be activated with earthing switch open and prevents its closure. In this situation, the key can be removed.
13B Key lock in closed position. Can be activated with earthing switch closed and prevents its opening. In this situation, the key can be removed.
13C Key lock in open and closed position. Made of locks 13A + 13B.

Electromechanical lock
14A Electromechanical lock on de-energisation for CBE 11-21-31 enclosure.
14B Electromechanical lock on de-energisation for CBE 41-51 enclosure.

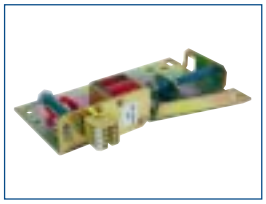
Rear door-isolator interlock
15 Only allows the rear door to be opened with the earthing switch closed (*).

Lever
16 Operating lever.


Mechanical door interlock.


Auxiliary open/closed contacts for earthing switch.


Key lock for earthing switch.


Electro-mechanical lock on de-energisation for earthing switch.

(*) The rear door is the one of the switchboard constructed using the CBE enclosure.

Characteristics of electrical accessories

Earthing switch

Earthing switch	ST/ZC 12-31/K80	ST/ZC 17.5-31/K80	ST/ZC 12/17.5-50/K125	ST/ZC 24-40/K100
For enclosure	CBE11 - 12 kV	CBE11 - 17.5 kV	CBE21-31 - 12/17.5 kV	CBE41-51 - 24 kV
Rated voltage	12 kV	17.5 kV	17.5 kV	24 kV
Short time current	31.5 kA	31.5 kA	50 kA	40 kA
Making capacity	80 kA	80 kA	125 kA	100 kA

Earthing switch auxiliary contacts

Open/Closed					
	Un	=	500 V~	220 V~	220 V –
	Icu	=	5 A	10 A	1 A
	cos φ	=	0,4	0,4	–
	T	=	–	–	10 ms

Auxiliary signalling contacts for CBE 11, 21, 31

Connected/Isolated						
	Un	=	250 V~	220 V–	110 V–	48 V –
	Icu	=	5 A	0,5 A / 0,3 A	0,8 A / 0,5 A	3 A / 1,5 A
	cos φ	=	–	–	–	–
	T	=	–	– / 5 ms	– / 5 ms	– / 5 ms

Auxiliary signalling contacts for CBE 41, 51

Connected/Isolated						
	Un	=	500 V~	220 V~	48 V~	240 V –
	Icu	=	0,5 A	1,5 A	3 A	2 A
	cos φ	=	0,7	0,7	0,7	–
	T	=	–	–	–	20 ms

4

CBF FIXED PART SELECTION AND ORDERING

CBF FIXED PART SELECTION AND ORDERING

General characteristics

Enclosure		CBF 11	CBF 21	CBF 41
Standards	**IEC 60298** (1)	■	■	■
Rated voltage	[kV]	12 17.5	12 17.5	24
Rated insulation voltage	[kV]	12 17.5	12 17.5	24
Withstand voltage at 50 Hz	[kV]	28 38	28 38	50
Impulse withstand voltage	[kV]	75 95	75 95	125
Rated frequency	[Hz]	50-60	50-60	50-60
Rated normal current (40 °C) (2)	[A]	1250	1600	1250
Rated admissible short-time current	[kA]	31,5	31,5	25
Overall dimensions	**H** [mm]	863	935	1045
	L [mm]	594	744	744
	D [mm]	1022	1018	1263
Weight	[kg]	64	87	88
Tropicalization	**IEC 60721-2-1**	■	■	■
Degree of protection	**IP**	2X	2X	2X

(1) It can be applied to the fixed part installed in a switchboard
(2) Rated uninterrupted currents in free air (the CBF is not installed in a switch-board).

Standard equipment

The basic coded versions of CBF fixed parts are made up as follows:
– unpainted galvanised sheet structure
– insulating monoblocs with medium voltage contacts
– automatic metal segregation shutters of the M.V. contacts.

Notes for ordering

To order CBF fixed parts always specify:
– type
– rated voltage
– rated current.

CBF 11

CBF 21

CBF 41

Circuit-breakers - fixed part combination table

HD4 circuit-breaker	Fixed part	HD4 circuit-breaker	Fixed part	HD4 circuit-breaker	Fixed part
HD4/C 12.06.16	**CBF 11**	HD4/C 12.16.25	**CBF 21**	HD4/C 24.06.16	**CBF 41**
HD4/C 12.12.16		HD4/C 12.16.32		HD4/C 24.12.16	
HD4/C 12.06.25		HD4/C 17.16.25		HD4/C 24.06.20	
HD4/C 12.12.25		HD4/C 17.16.32		HD4/C 24.12.20	
HD4/C 12.06.32				HD4/C 24.06.25	
HD4/C 12.12.32				HD4/C 24.12.25	
HD4/C 17.06.16					
HD4/C 17.12.16					
HD4/C 17.06.25					
HD4/C 17.12.25					
HD4/C 17.06.32					
HD4/C 17.12.32					

Accessories on request

For selection of the accessories, always specify the type of fixed part. The following accessories are available.

Connector

1 Socket connector (installation in the switchboard to be carried out by the customer).

Earthing contact

2 Earthing contact for use in circuits with fault currents higher than 20 kA, or lower than 20 kA but with duration higher than 1s).

Jointed lever

3 Jointed lever for circuit-breaker racking in/racking out in the case of assembly of the fixed part on the floor (in replacement of the lever supplied with the circuit-breaker).

5

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 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 $12x10^{-6}$ 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 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.

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.

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):

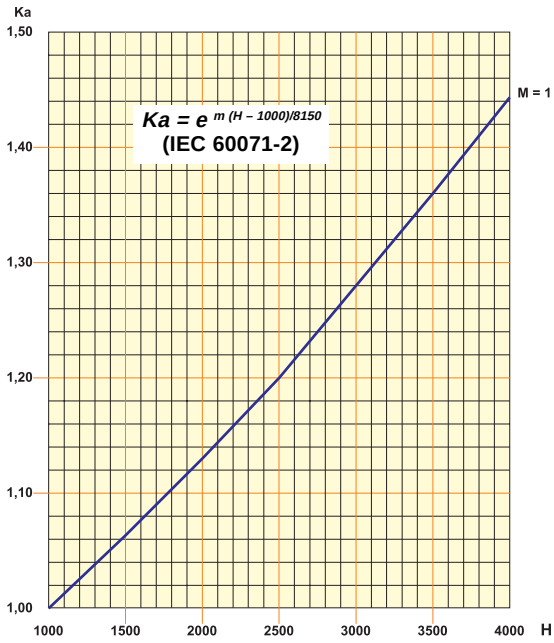
– withstand voltage at industrial frequency equal to:

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.



Switching special loads

The table indicates the breaking capacities which can be guaranteed for switching special loads.
The maximum overvoltages determined during all the trips under the conditions considered, are < 2.5 PU (PU = Per Unit = $2.5 \times \sqrt{2} \times \frac{Vn}{\sqrt{3}}$).

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 and line breaking	**Isc [A]**	31.5	31.5	31.5	31.5	31.5	31.5	31.5
Capacitive current breaking (single bank) ([1])	**Isc [A]**	400	630	1000	1250	1250	1250	1250
Reactance compensation current breaking	**Isc [A]**	630	630	1250	1250	1250	1250	1250
Rated motor current breaking	**Isc [A]**	630	630	1250	1250	1250	1250	1250

([1]) C2 class.

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 (YO1/YO2) not enabled
– main circuit-breaker contacts open and at their run end.

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
– K63 instantaneous relay
– K163 instantaneous relay.

Ordering

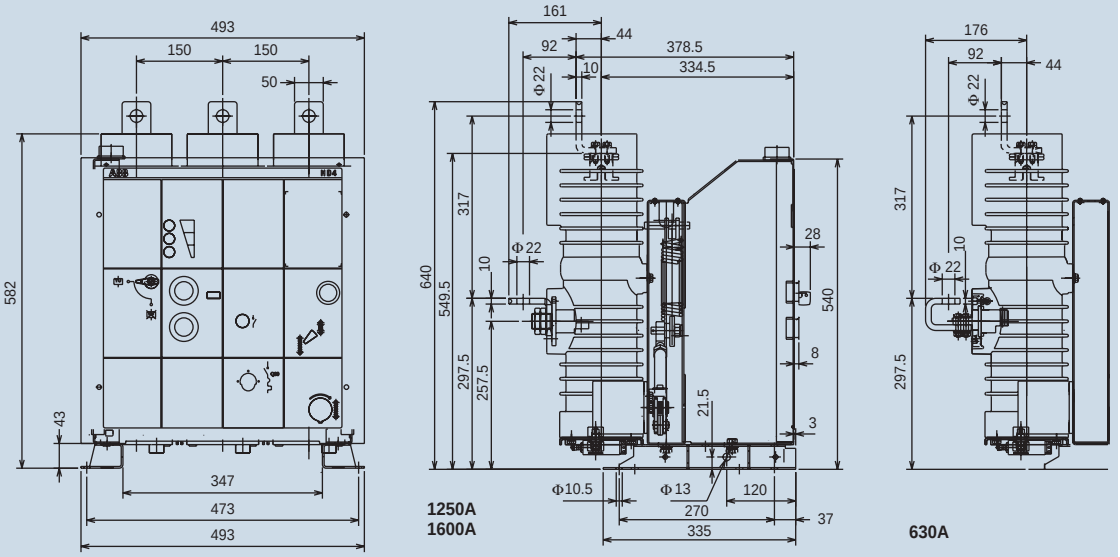
For availability and ordering of spare parts, please contact our Service, specifying the circuit-breaker serial number.

6

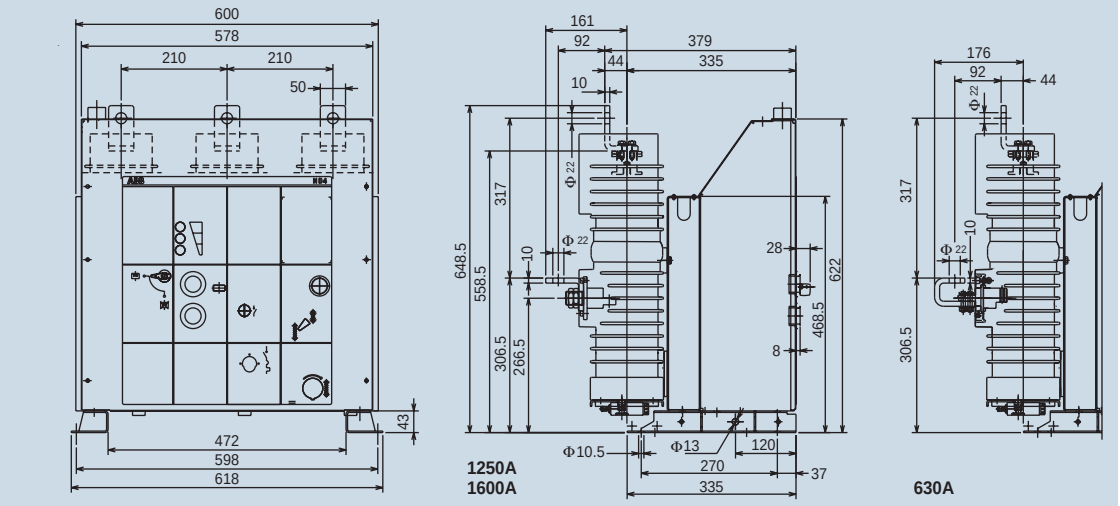
OVERALL DIMENSIONS

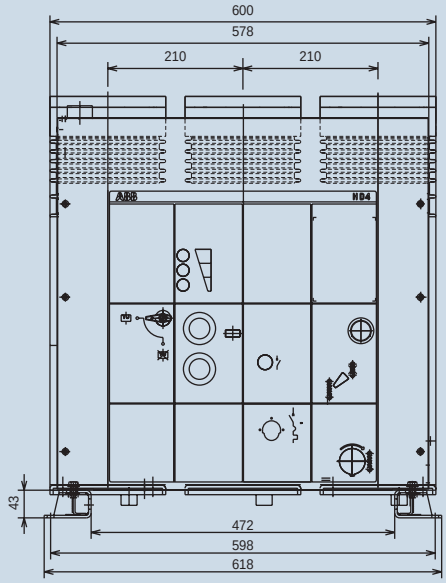
Fixed circuit-breakers

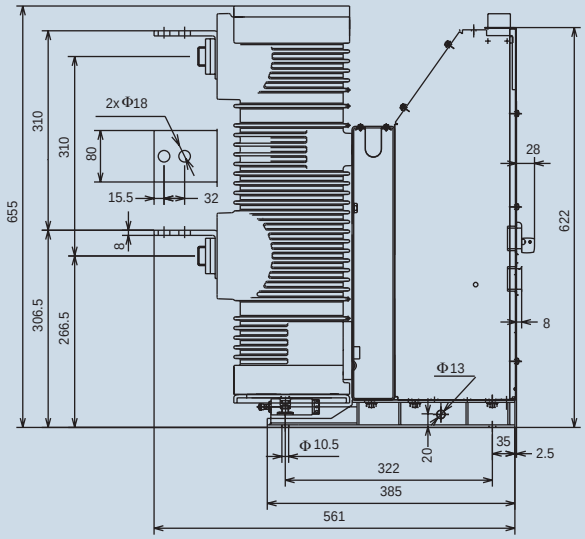
Type	HD4	
TN	7177	
Ur	12	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	25	kA
	31.5	kA



Type	HD4	
TN	7178	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	25	kA
	31.5	kA

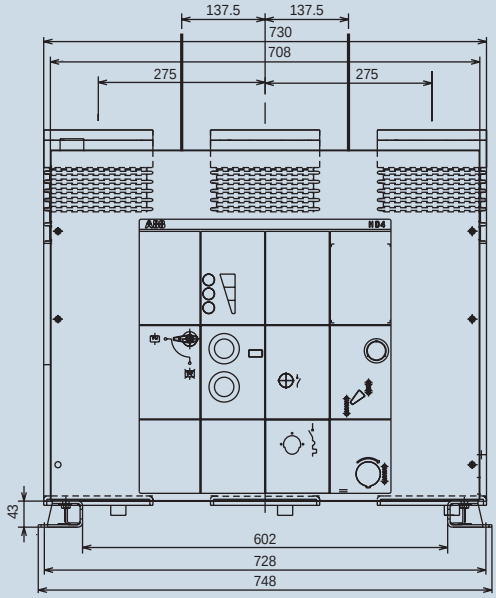


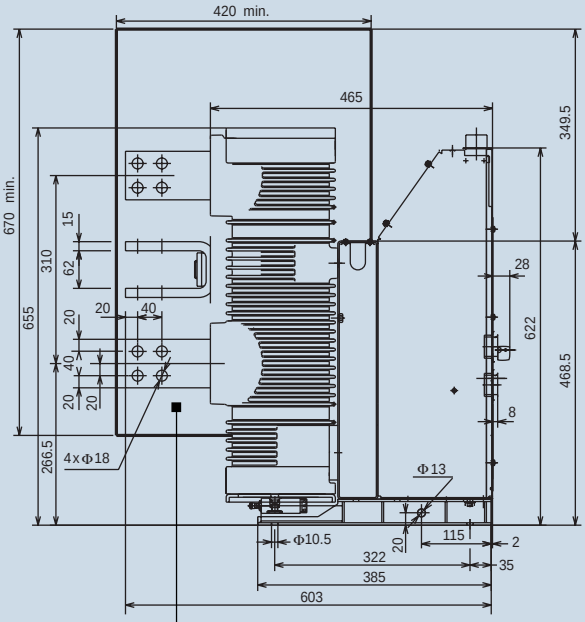




Type	HD4	
TN	7163	
Ur	12	kV
	17.5	kV
Ir	1600	A
Isc	40	kA
	50	kA

Type	HD4	
TN	7163	
Ur	12	kV
	17.5	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA





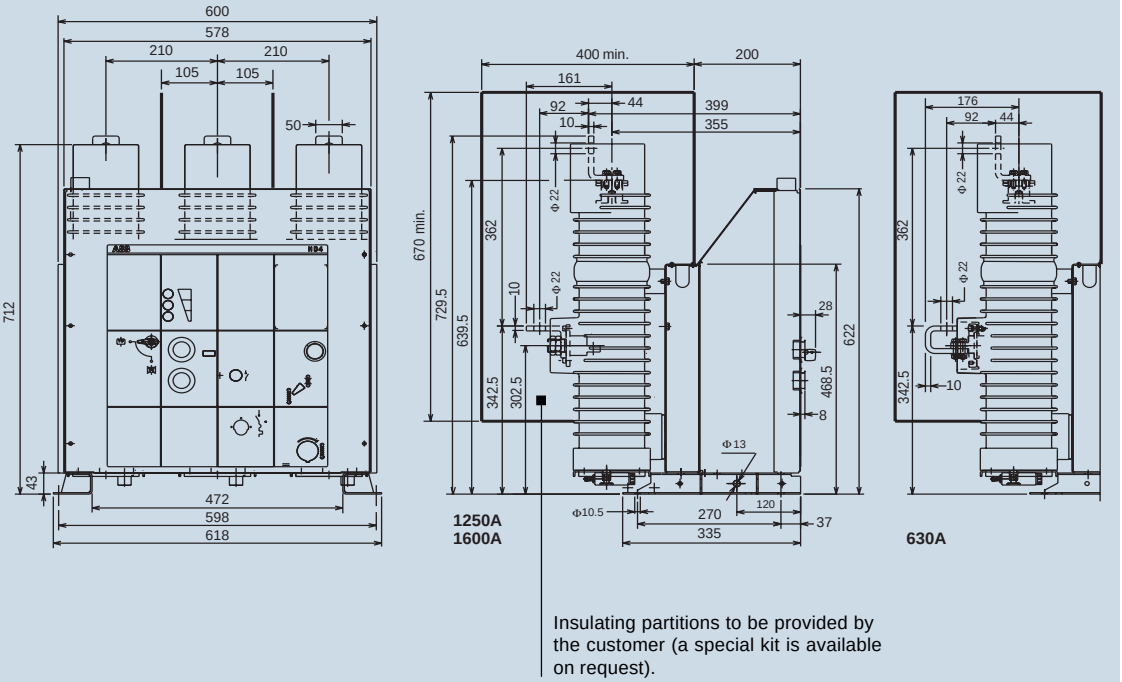
Insulating partitions to be provided by the customer (a special kit is available on request).

Type	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

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

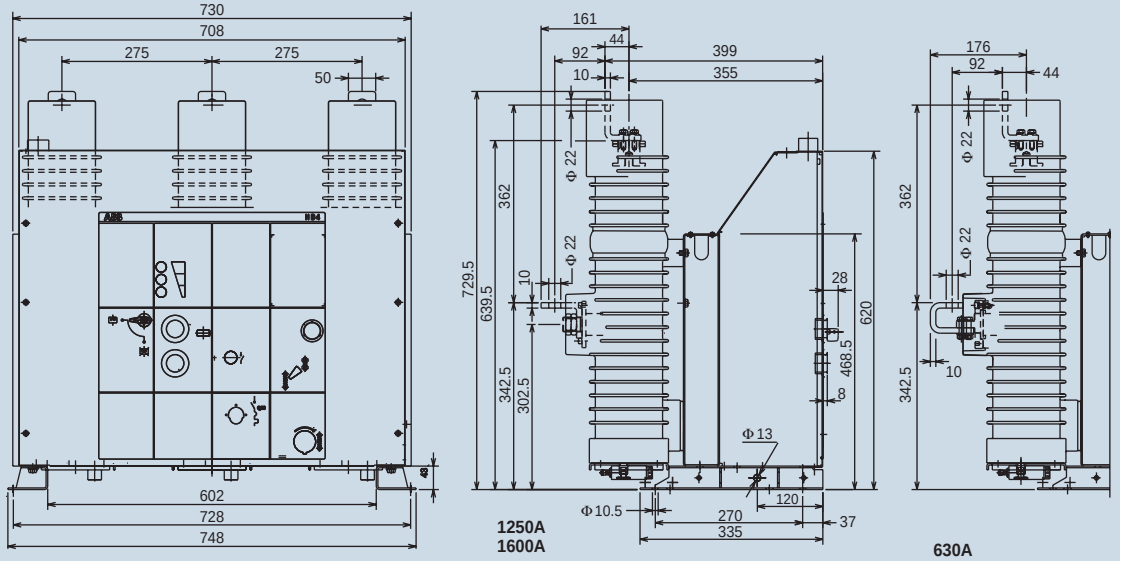
Fixed circuit-breakers

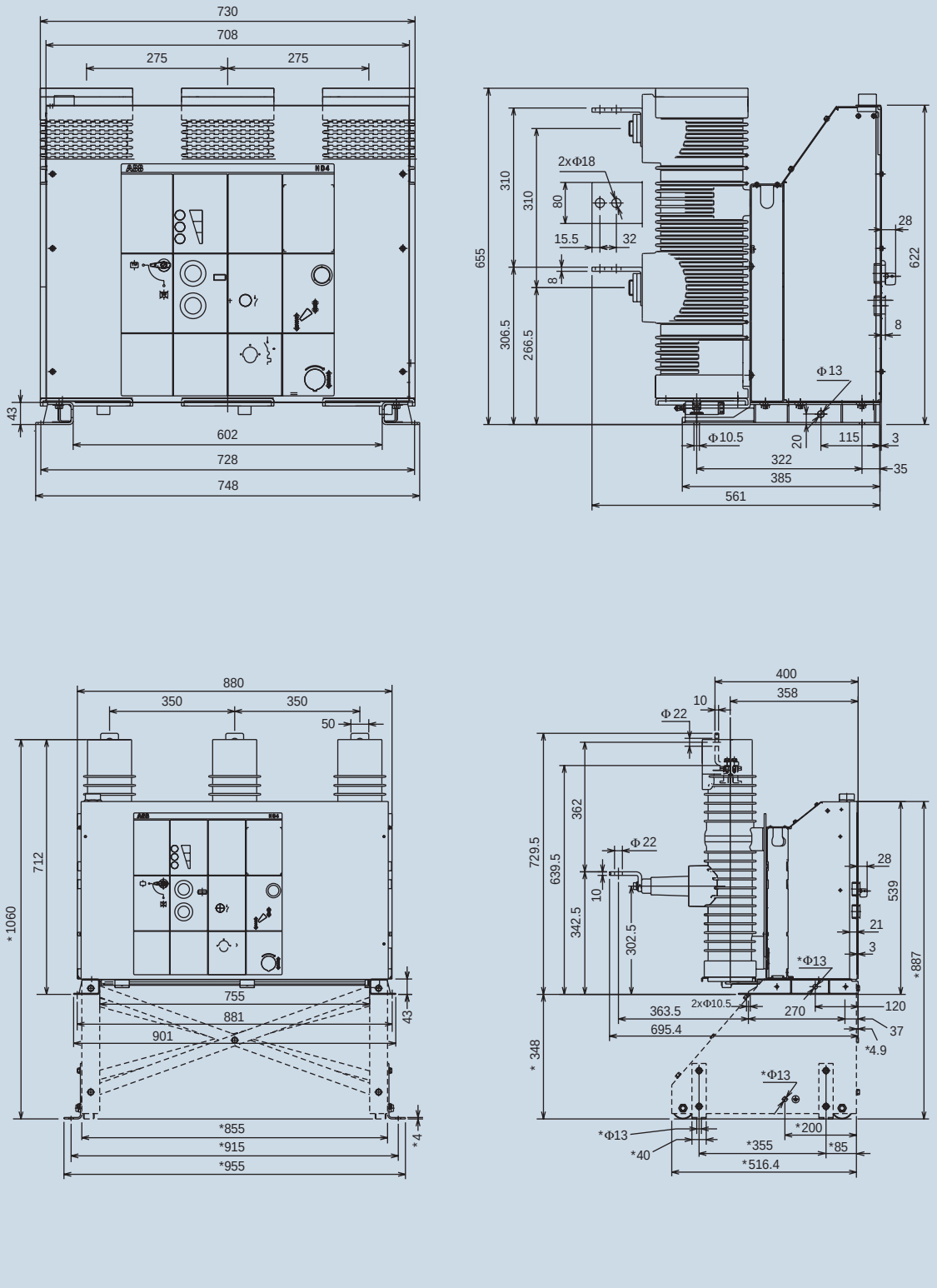
Type	HD4	
TN	7179	
Ur	24	kV
Ir	630	A
	1250	A
	1600	A
Isc	16	kA
	20	kA
	25	kA



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

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





Type	HD4	
TN	7174	
Ur	24	kV
Ir	1600	A
Isc	31.5	kA
	40	kA

Type	HD4	
TN	7174	
Ur	24	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA

Type	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).

Fixed circuit-breakers

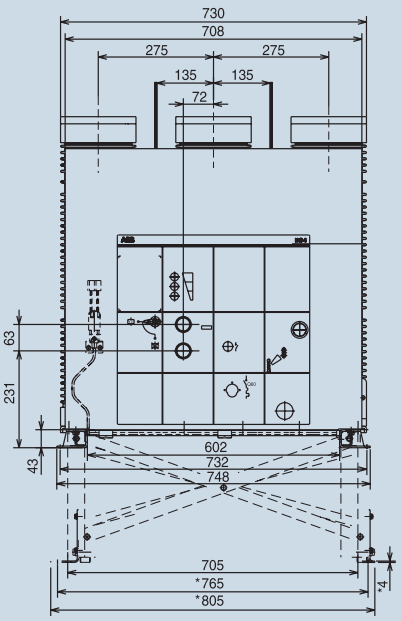
Type HD4
With truck
(on request)

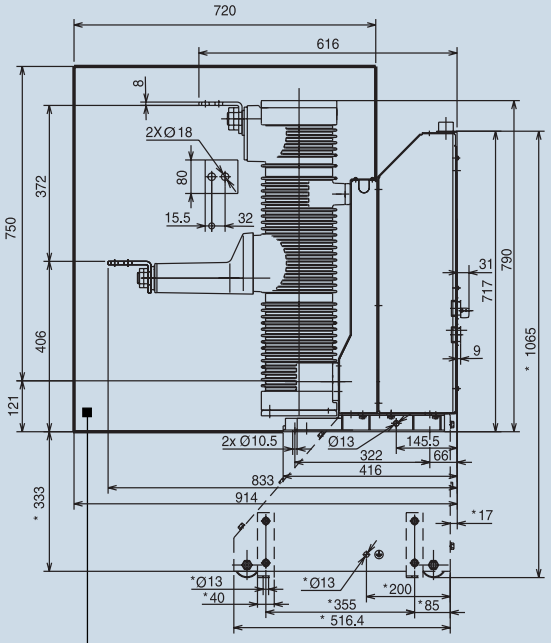
TN	7268	
Ur	36	kV
Ir	1250	A
	1600	A
Isc	25	kA
	31.5	kA

Type HD4
With truck
(on request)

TN	7268	
Ir	2000	A
Isc	20	kA
	25	kA
	31.5	kA

* Distance with truck (if provided).



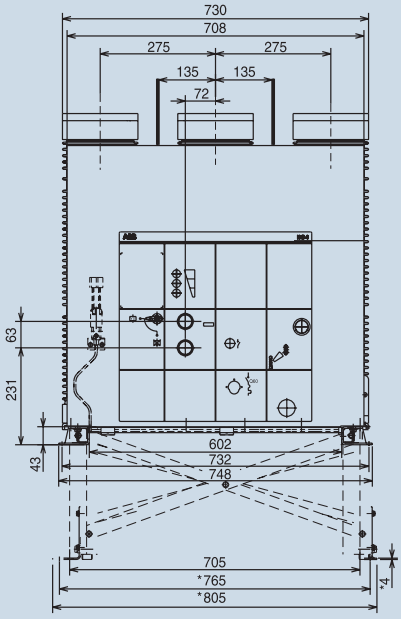


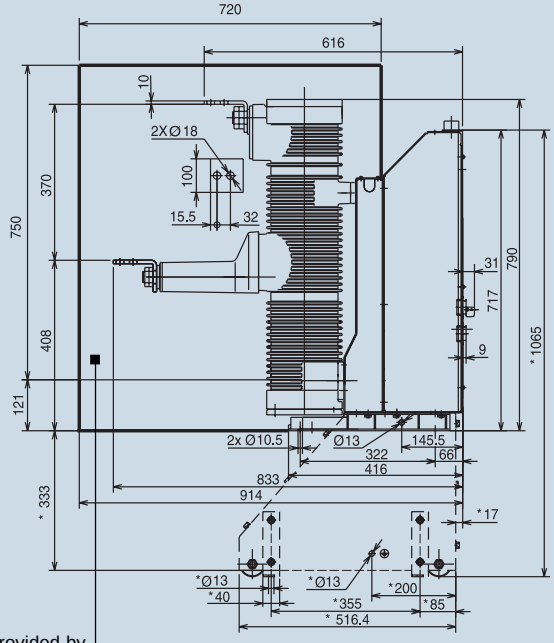
Insulating partitions to be provided by the customer (a special kit is available on request).

Type HD4
With truck
(on request)

TN	7315	
Ur	36	kV
Ir	2500	A
Isc	20	kA
	25	kA
	31.5	kA

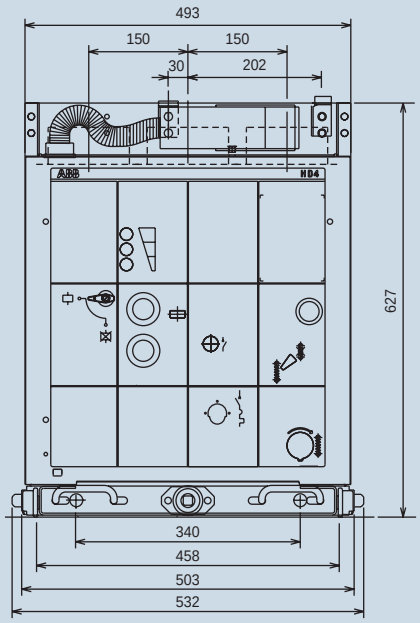
* Distance with truck (if provided).

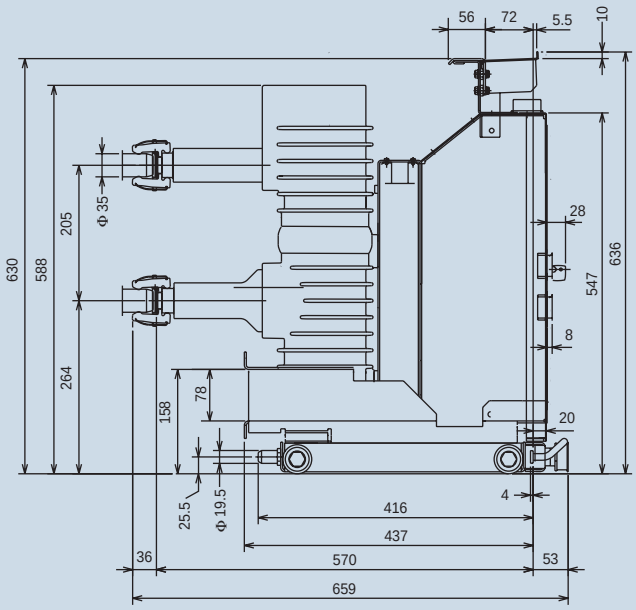




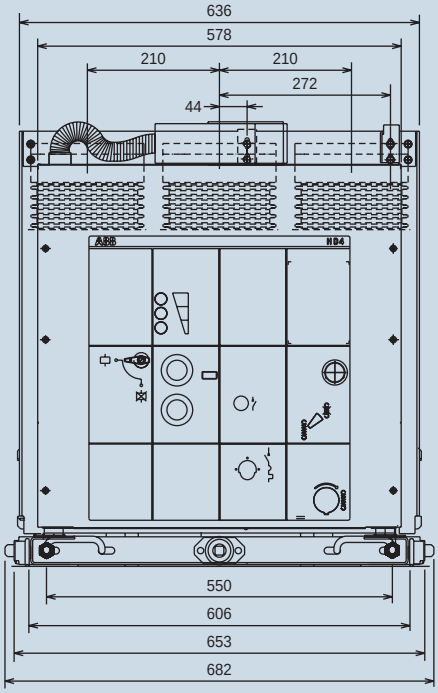
Insulating partitions to be provided by the customer (a special kit is available on request).

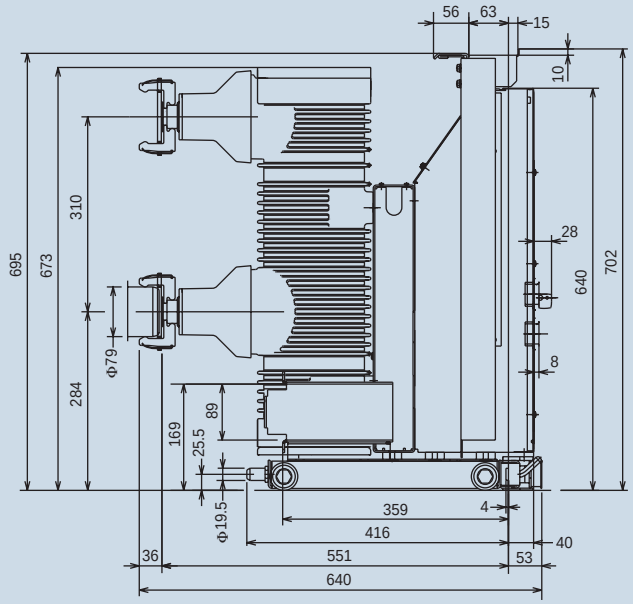
HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts





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



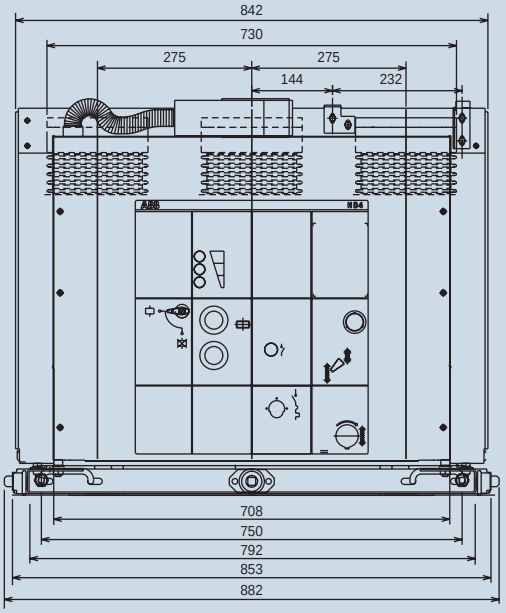


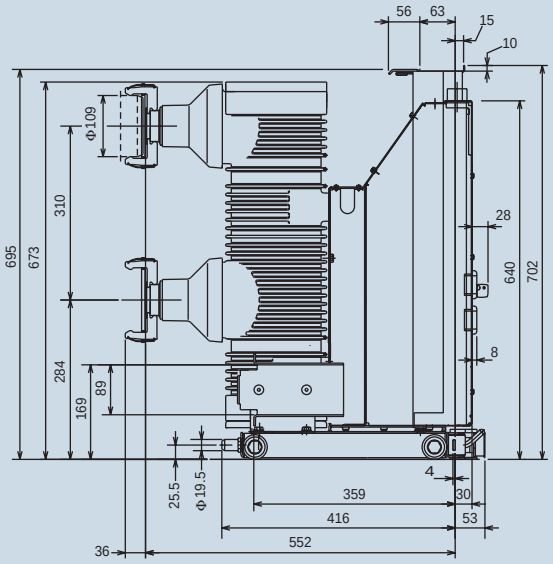
Type	HD4/C	
TN	7151	
For	CBE21	
	--	
Ur	12	kV
	17,5	kV
Ir	1250	A
Isc	40	kA
	50	kA

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 withdrawable circuit-breakers for CBE enclosures and CBF fixed parts

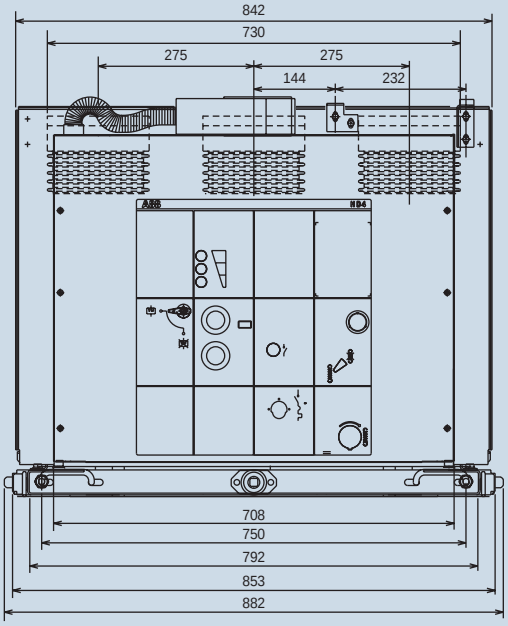
Type	HD4/C	
TN	7153	
For	CBE31	
Ur	12	kV
	17.5	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA

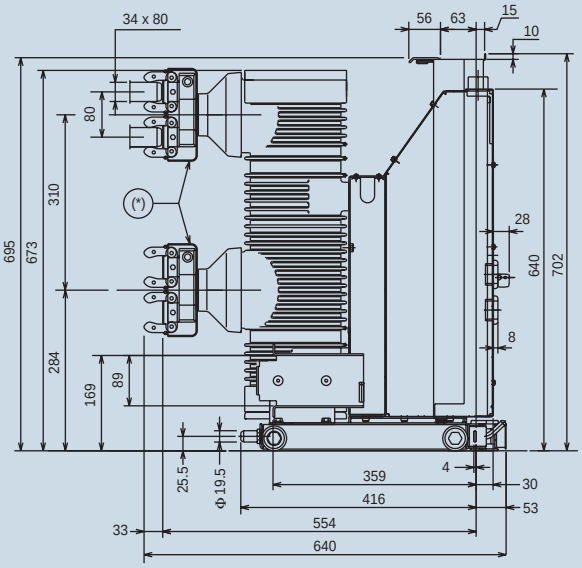


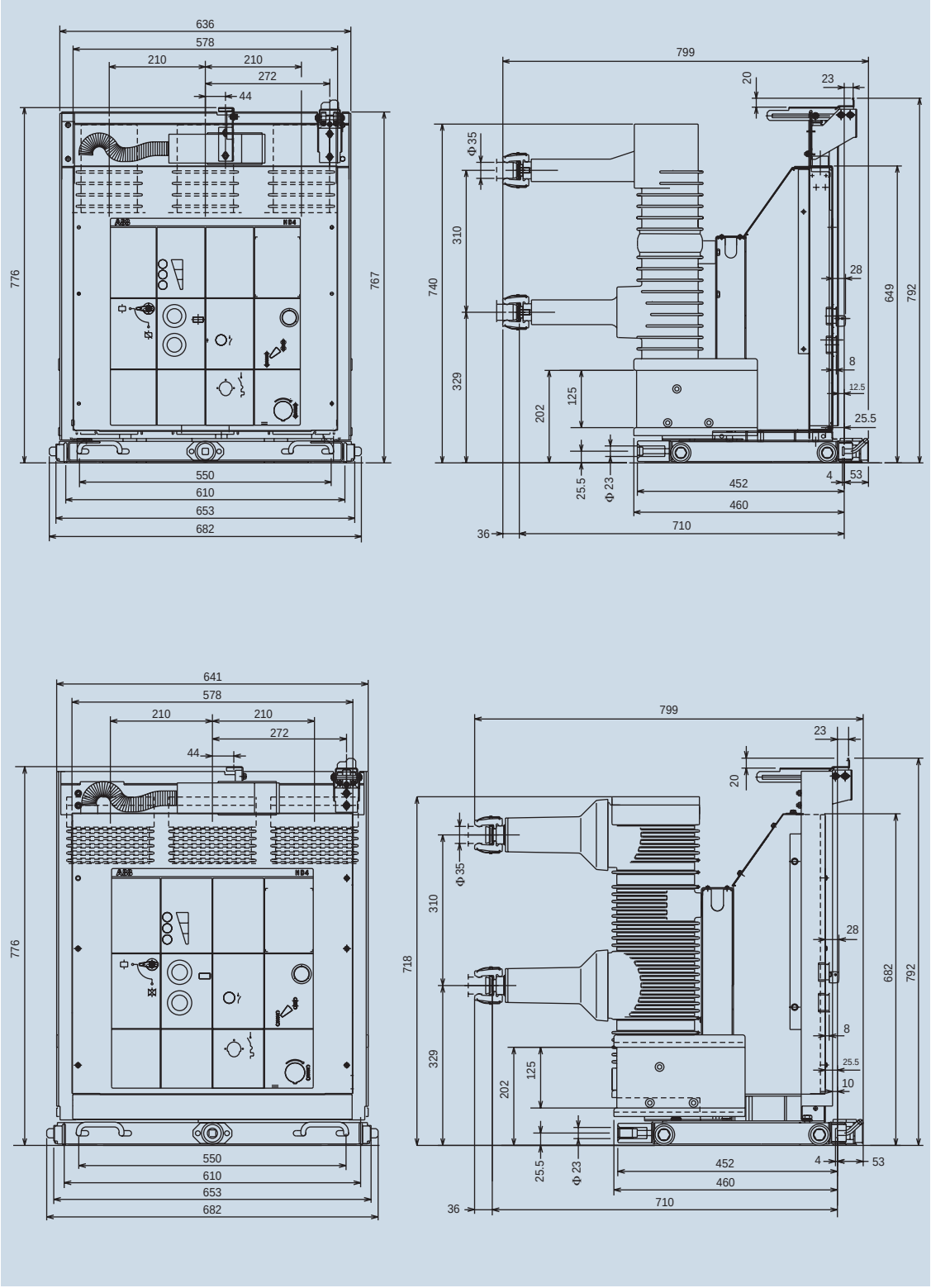


Type	HD4/C	
TN	7155	
For	CBE31	
Ur	12	kV
	17.5	kV
Ir	2500	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA

(*) Only for 17.5 kV.





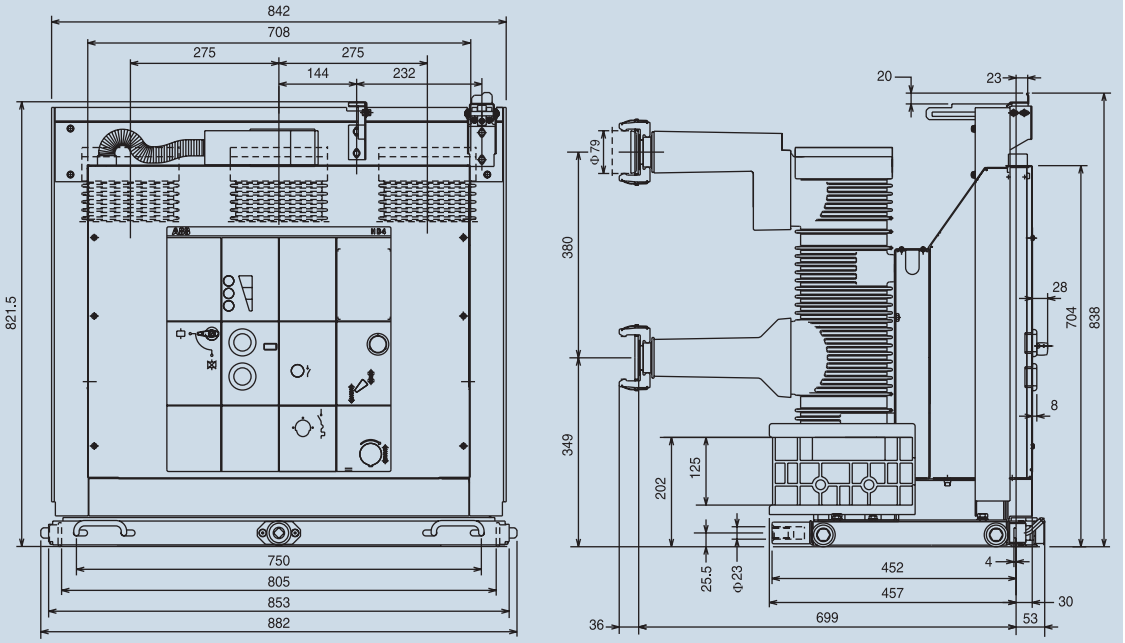


Type	HD4/C	
TN	7186	
For	CBE41	
	CBF41	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA

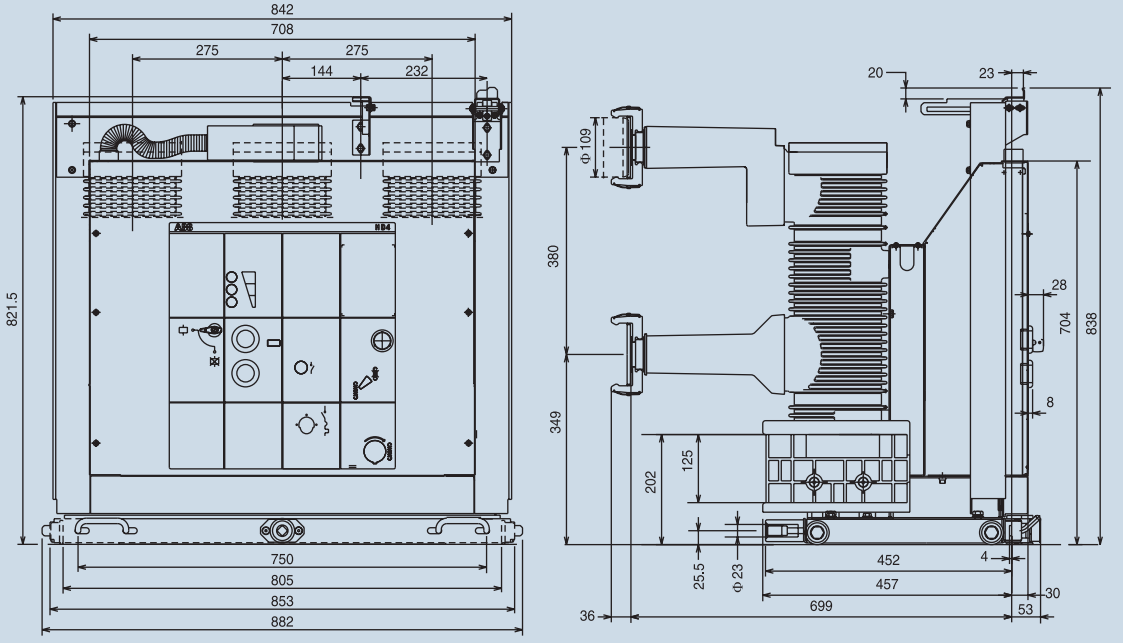
Type	HD4/C	
TN	7156	
For	CBE41	
	--	
Ur	24	kV
Ir	1250	A
Isc	31.5	kA
	40	kA

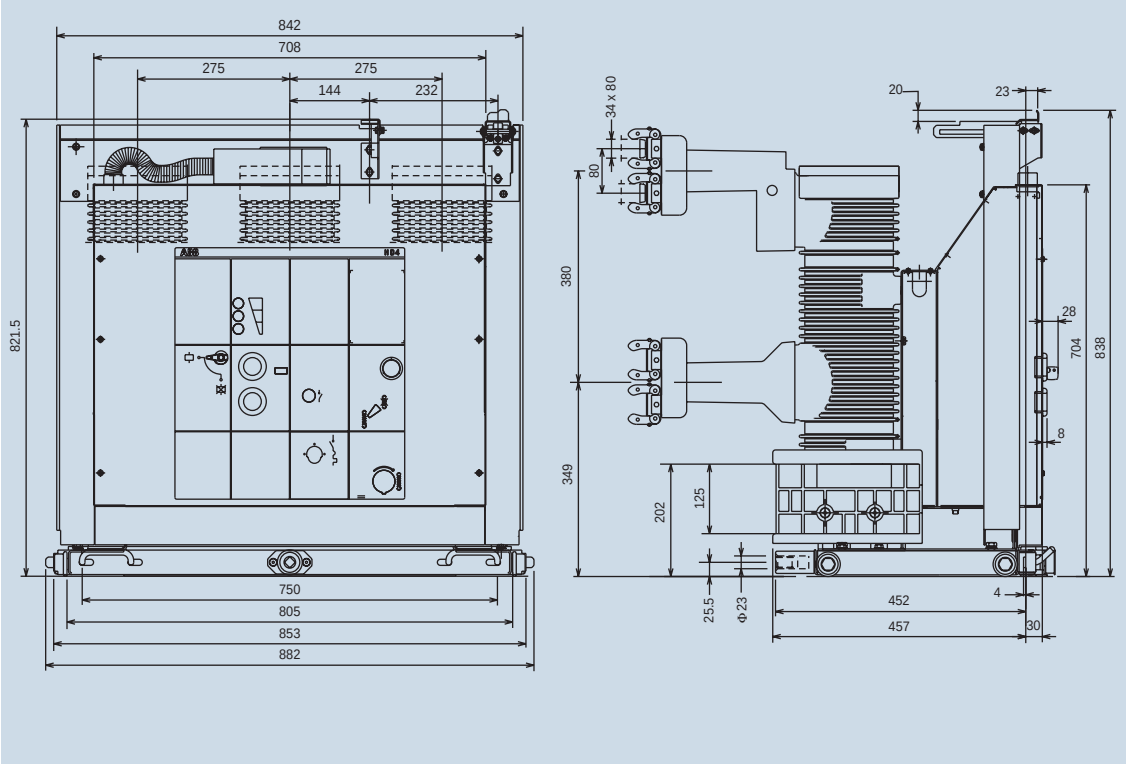
HD4/C withdrawable circuit-breakers for CBE enclosures and CBF fixed parts

Type	HD4/C	
TN	7157	
For	CBE51	
Ur	24	kV
Ir	1600	A
Isc	25	kA
	31.5	kA
	40	kA



Type	HD4/C	
TN	7158	
For	CBE51	
Ur	24	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA

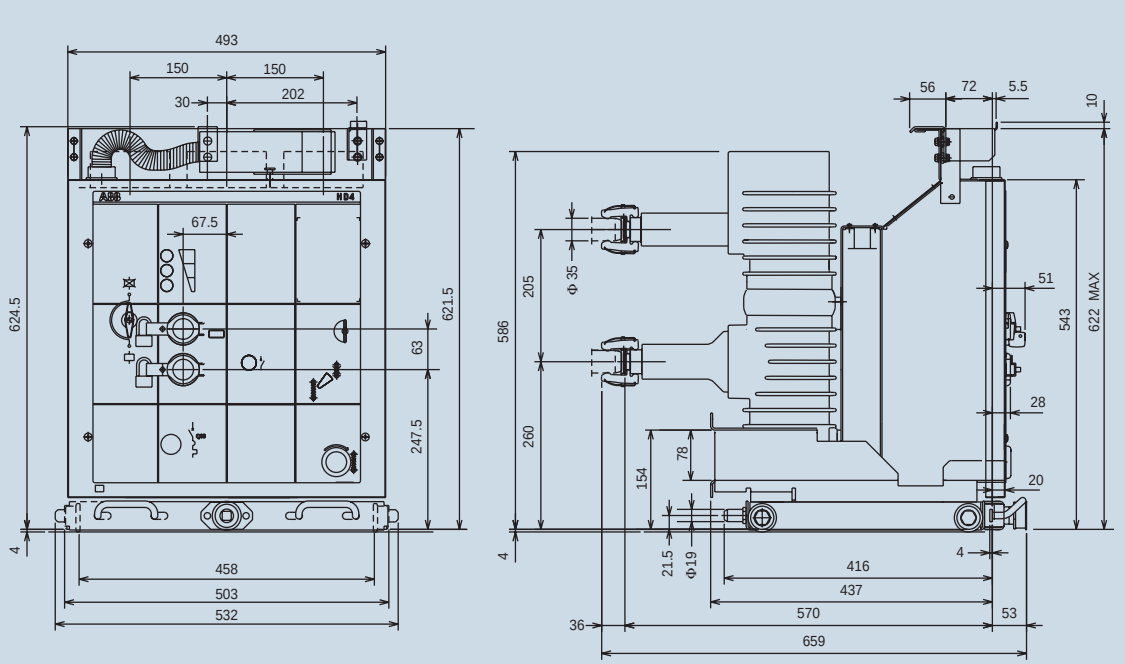




Type	HD4/C	
TN	7159	
For	CBE51	
Ur	24	kV
Ir	2500	A
Isc	25	kA
	31.5	kA
	40	kA

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

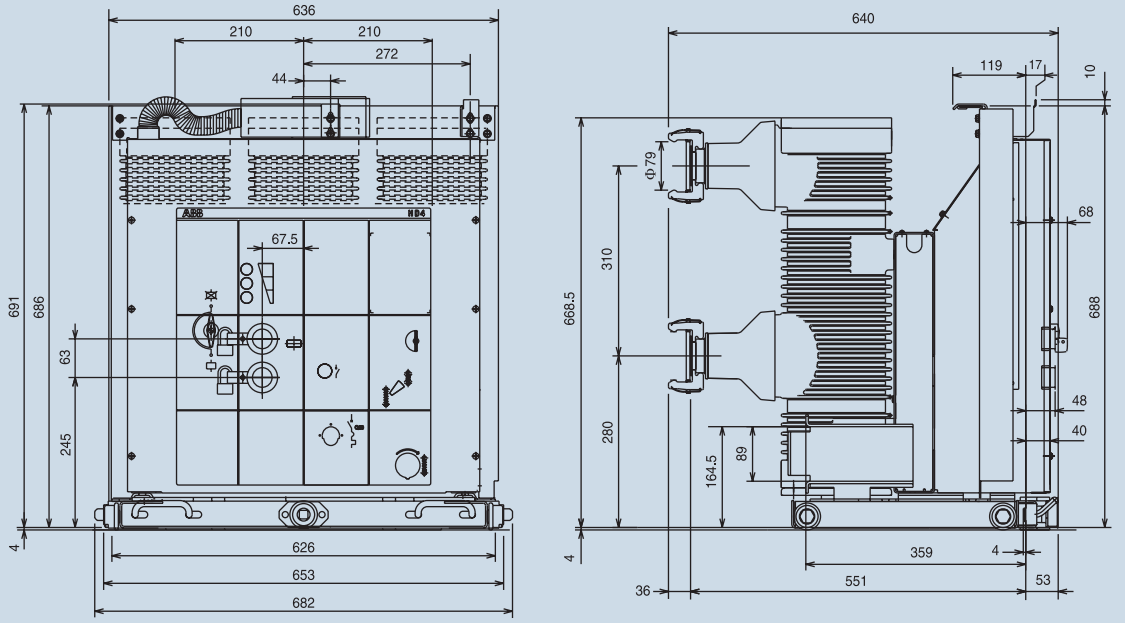
Type	HD4/P	
TN	7286	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA

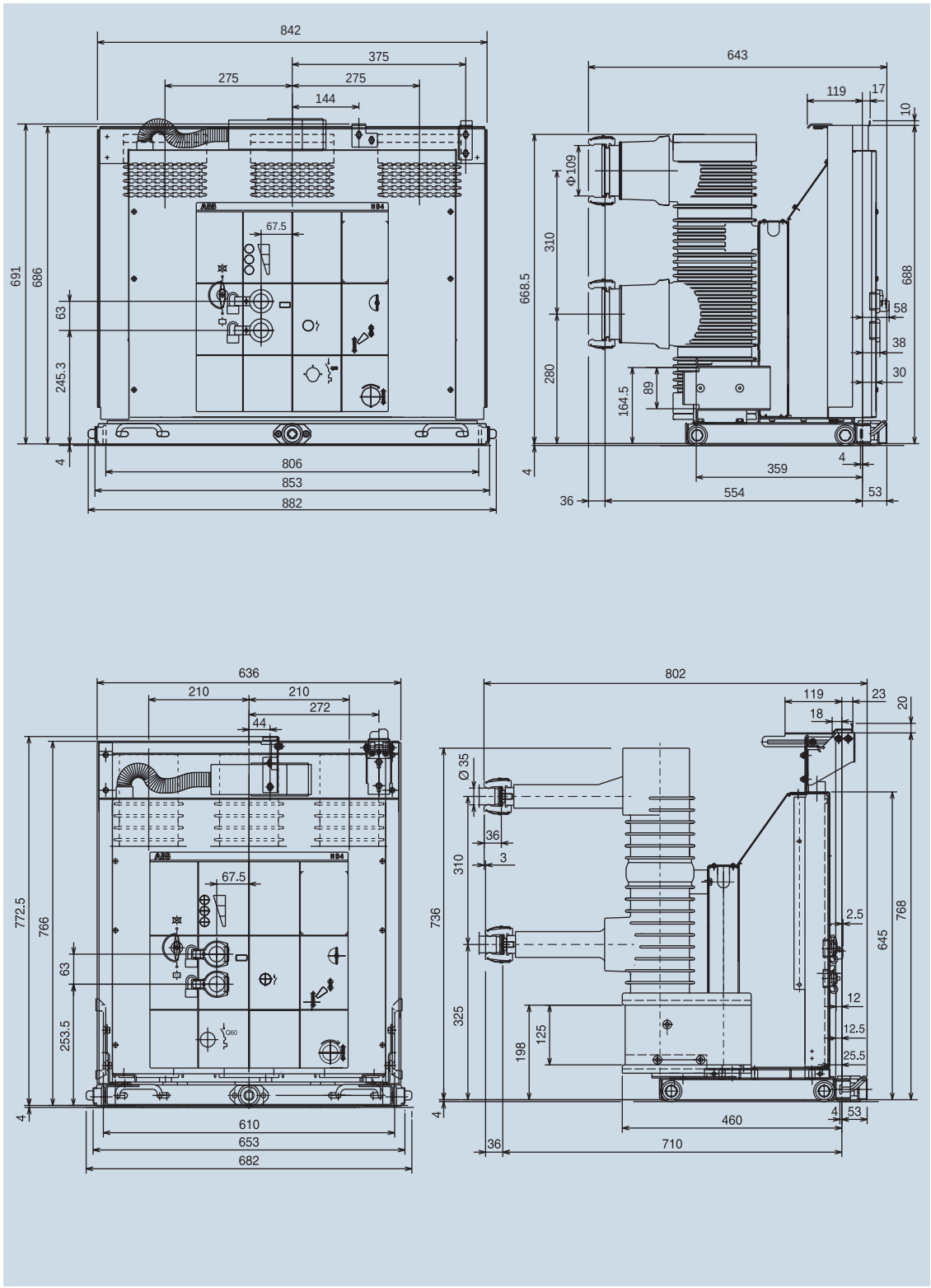


Type	HD4/P	
TN	7350	
Ur	12	kV
	17,5	kV
Ir	1250	A
Isc	40	kA

Type	HD4/P	
TN	7350	
Ur	12	kV
	17,5	kV
Ir	1600	A
Isc	25	kA
	31,5	kA
	40	kA
	50	kA

Type	HD4/P	
TN	7351	
Ur	12	kV
	17,5	kV
Ir	2000	A
Isc	25	kA
	31,5	kA
	40	kA
	50	kA





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

(*) 3150 A with forced ventilation.

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

OVERALL DIMENSIONS

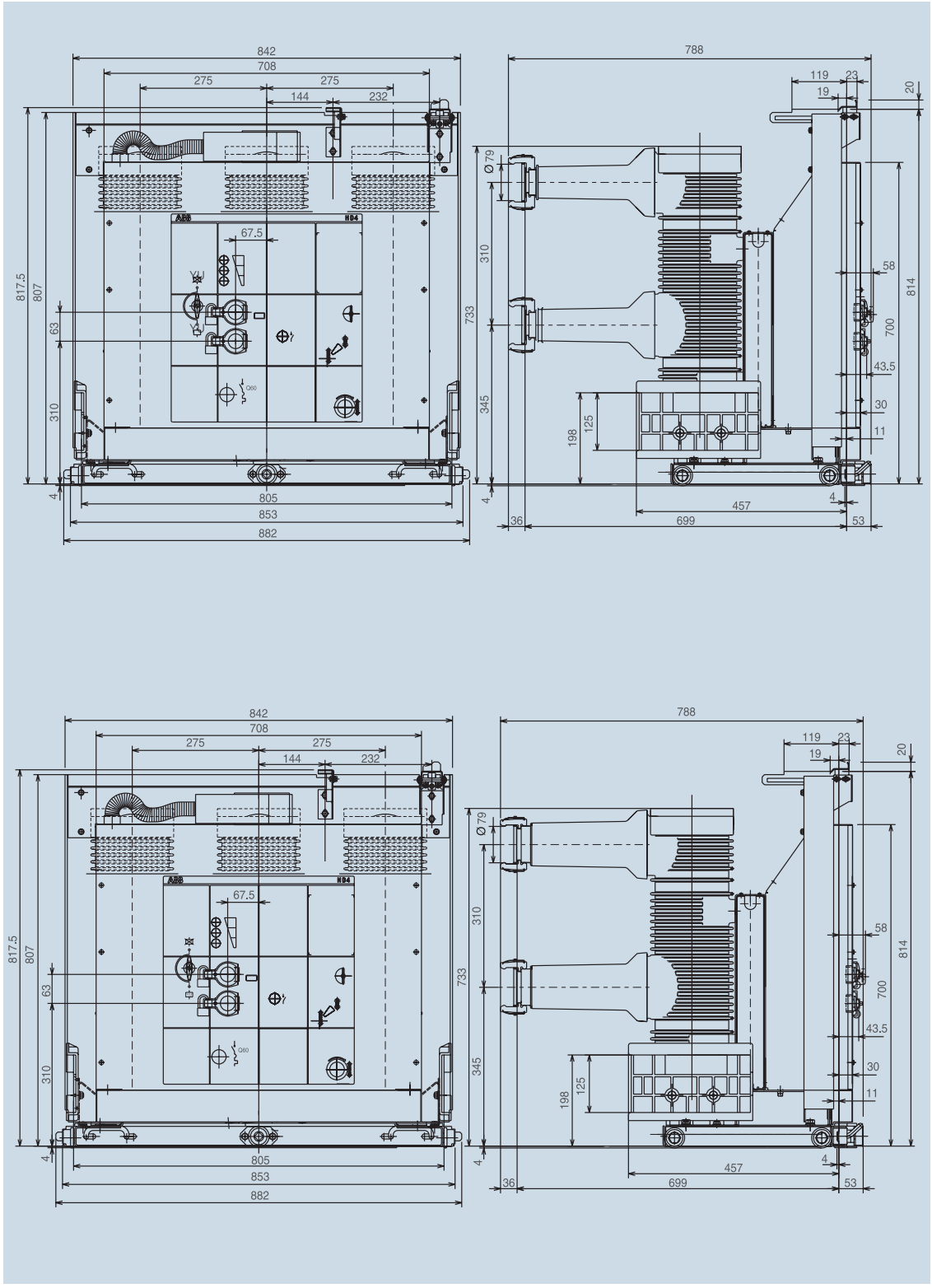
HD4/P withdrawable circuit-breakers for UniGear type ZS1 switchboards

Type	HD4/P	
TN	7355	
Ur	24	kV
Ir	1600	A
Isc	20	kA
	25	kA

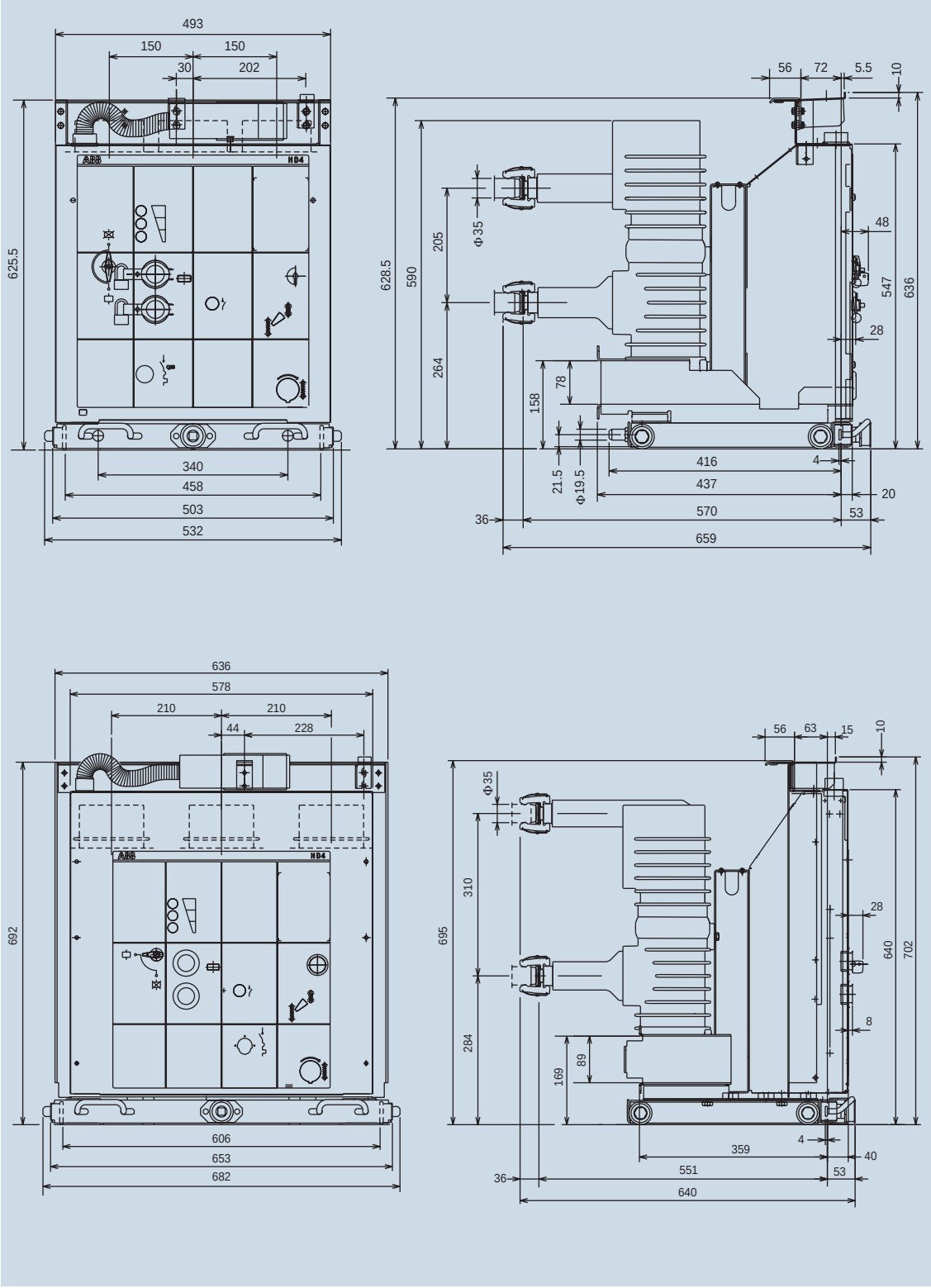
Type	HD4/P	
TN	7356	
Ur	24	kV
Ir	2000	A
Isc	16	kA
	20	kA
	25	kA

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

(*) 2500 A with forced ventilation; 2300 A with natural ventilation.



HD4/W withdrawable circuit-breakers for UniSafe switchboards



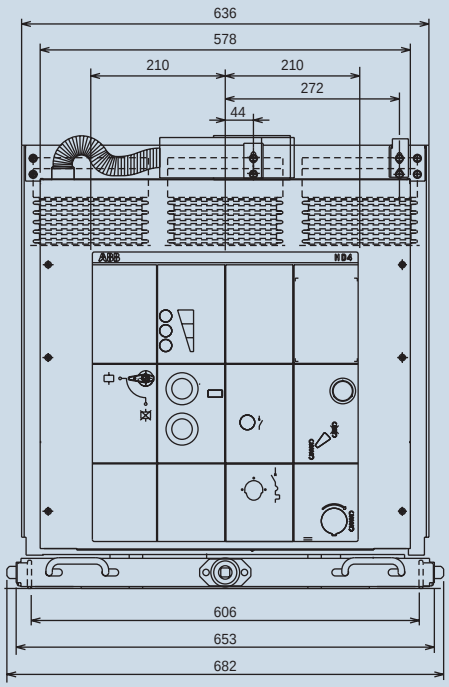
Type	HD4/W	
TN	7229	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA

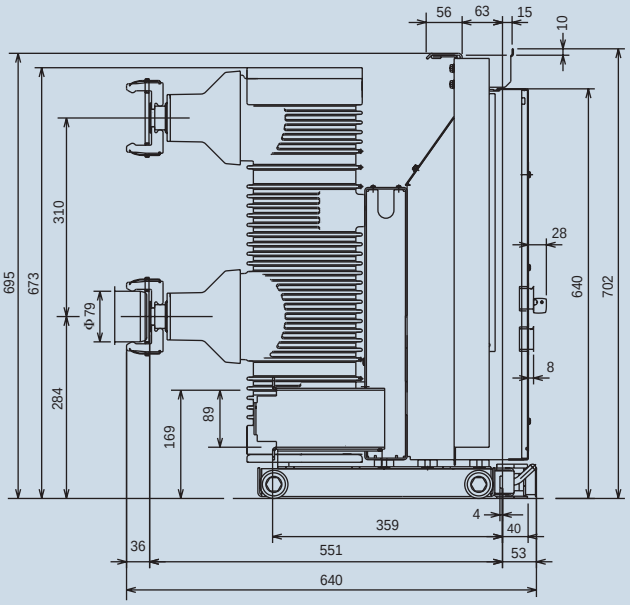
Type	HD4/W	
TN	7182	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA

OVERALL DIMENSIONS

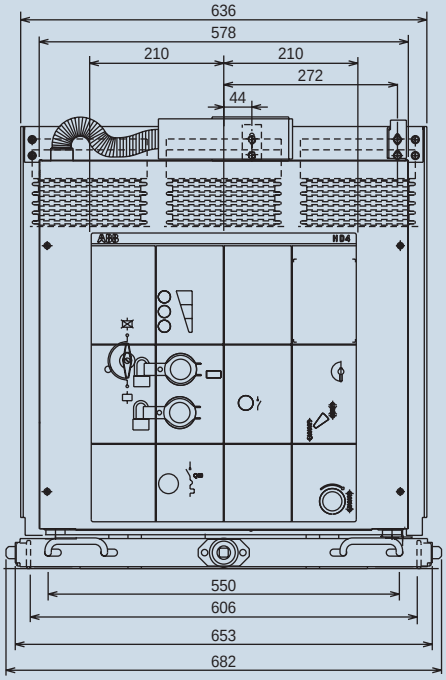
HD4/W withdrawable circuit-breakers for UniSafe switchboards

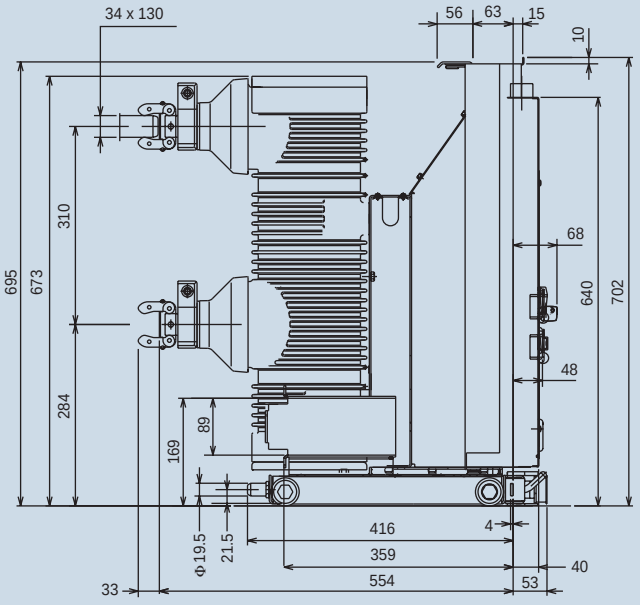
Type	HD4/W	
TN	7239	
Ur	12	kV
	17.5	kV
Ir	1600	A
	2000	A
Isc	16	kA
	25	kA
	31.5	kA

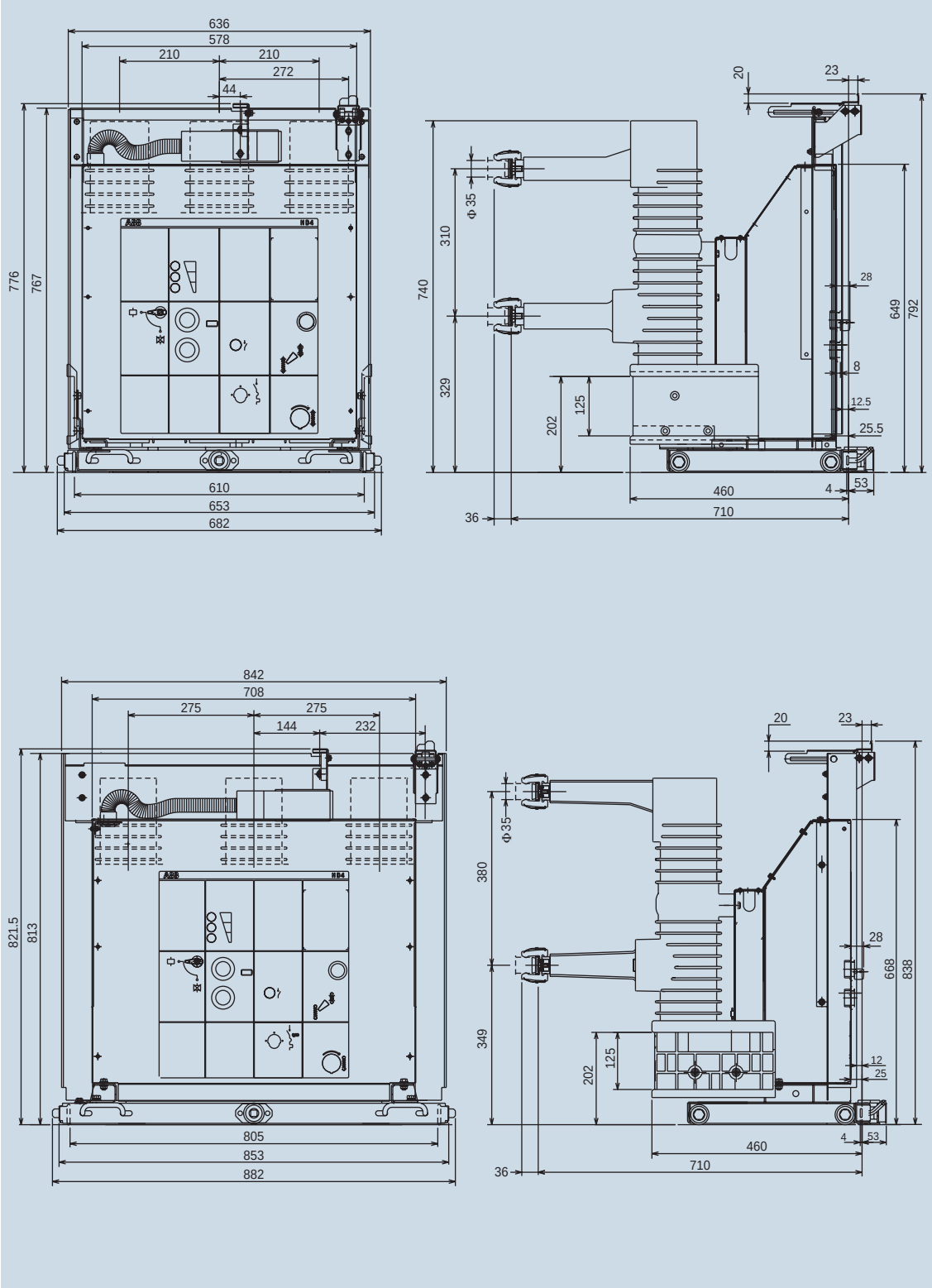




Type	HD4/W	
TN	7154	
Ur	12	kV
	17.5	kV
Ir	2500	A
Isc	16	kA
	25	kA
	31.5	kA





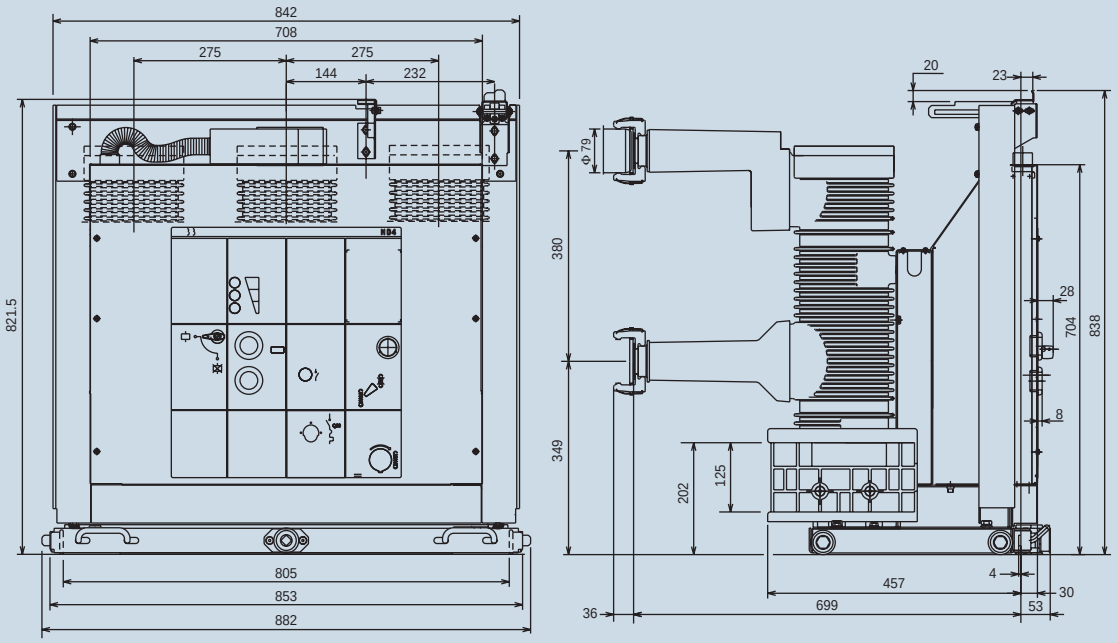


Type	HD4/W	
TN	7183	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA

Type	HD4/W	
TN	7217	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA

HD4/W withdrawable circuit-breakers for UniSafe switchboards

Type	HD4/W	
TN	7240	
Ur	24	kV
Ir	1600	A
	2000	A
Isc	16	kA
	20	kA
	25	kA



Type	HD4/W	
TN	7316	
Ur	36	kV
Ir	1250	A
Isc	20	kA
	25	kA
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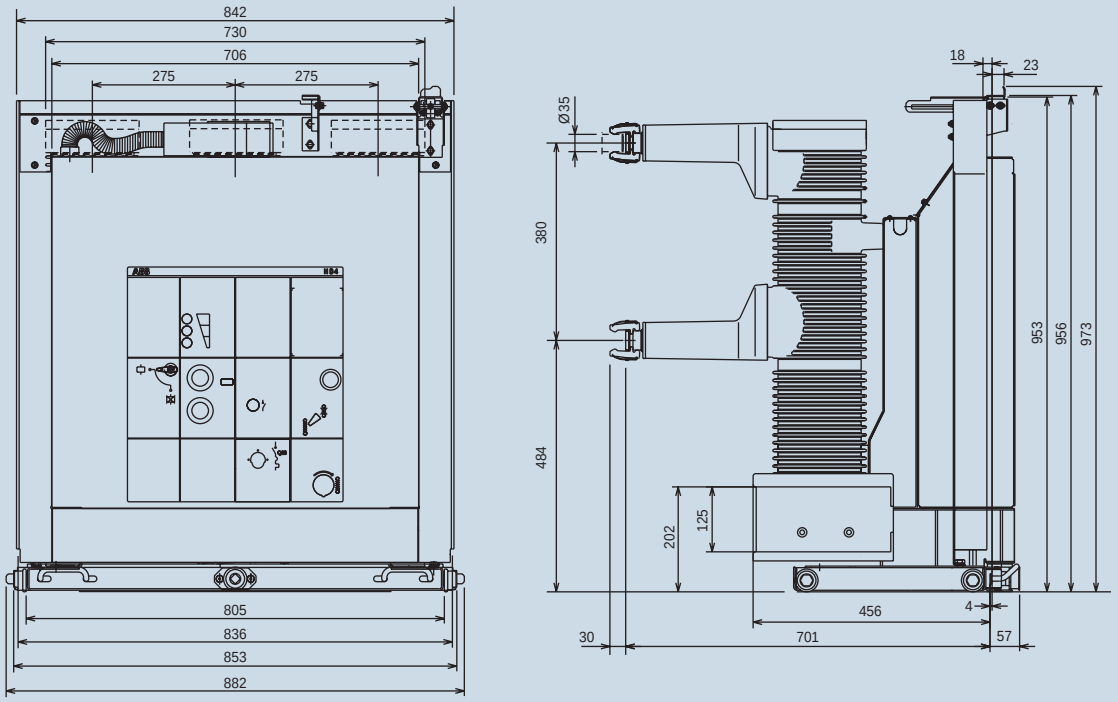
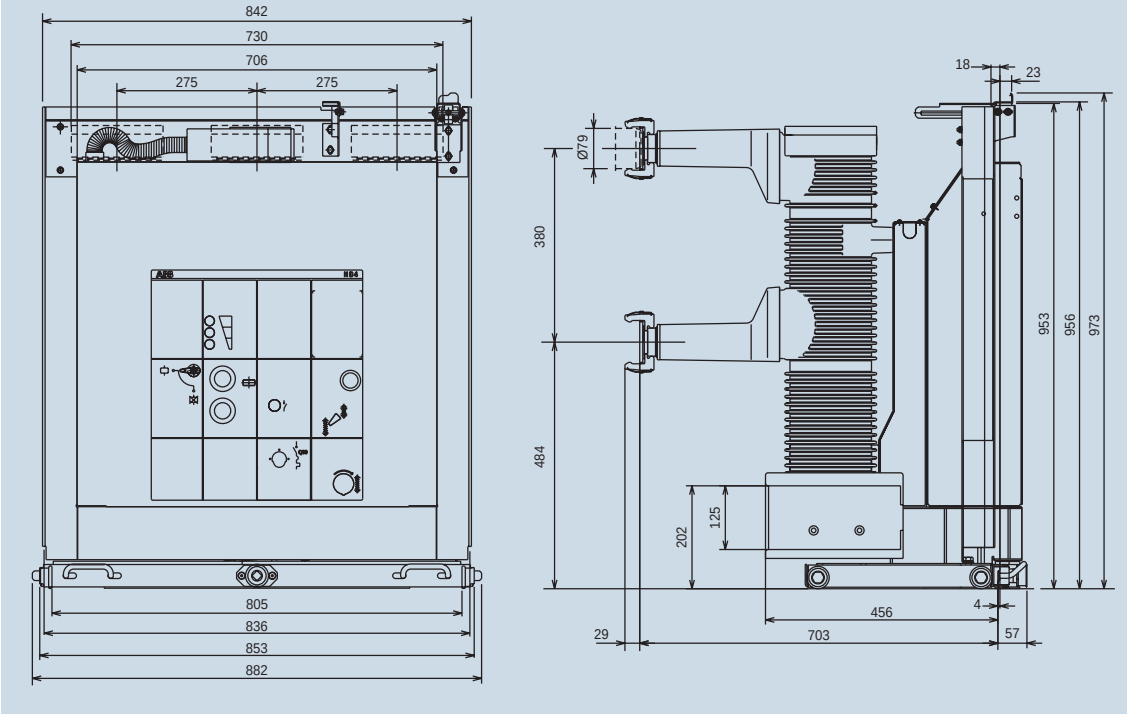
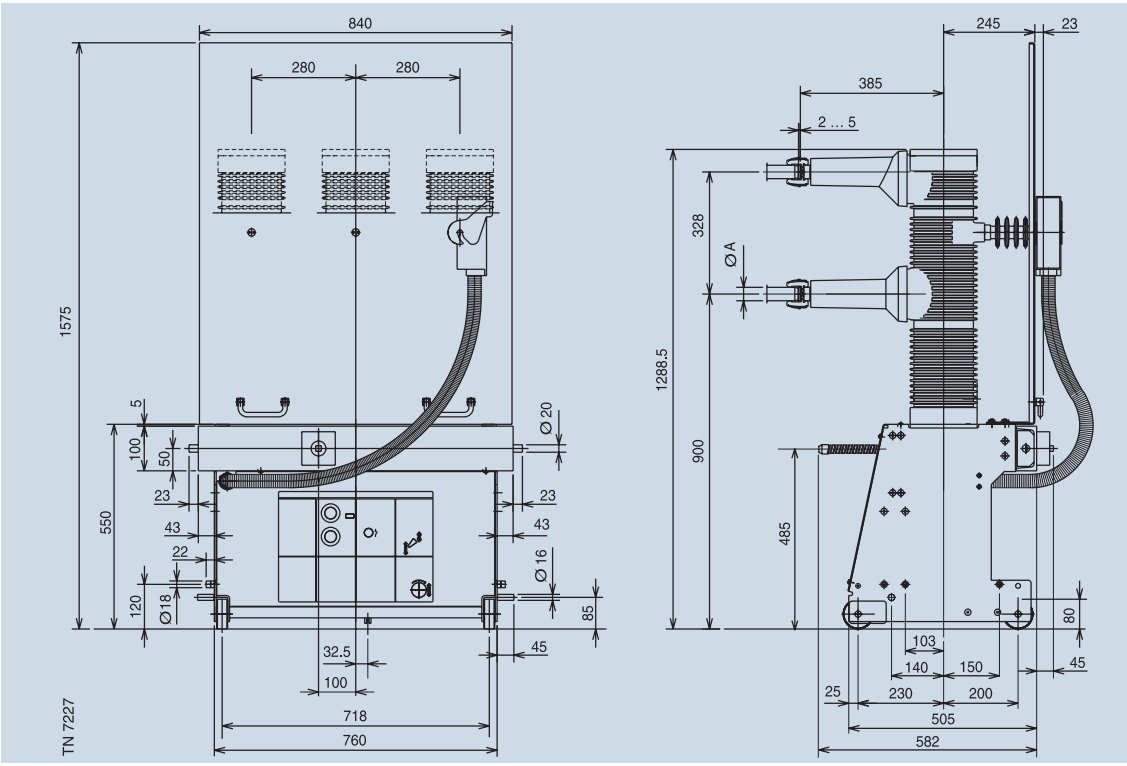




Type	HD4/W	
TN	7317	
Ur	36	kV
Ir	1600	A
	2000	A
	2500	A (*)
Isc	20	kA
	25	kA

(*) With forced ventilation.

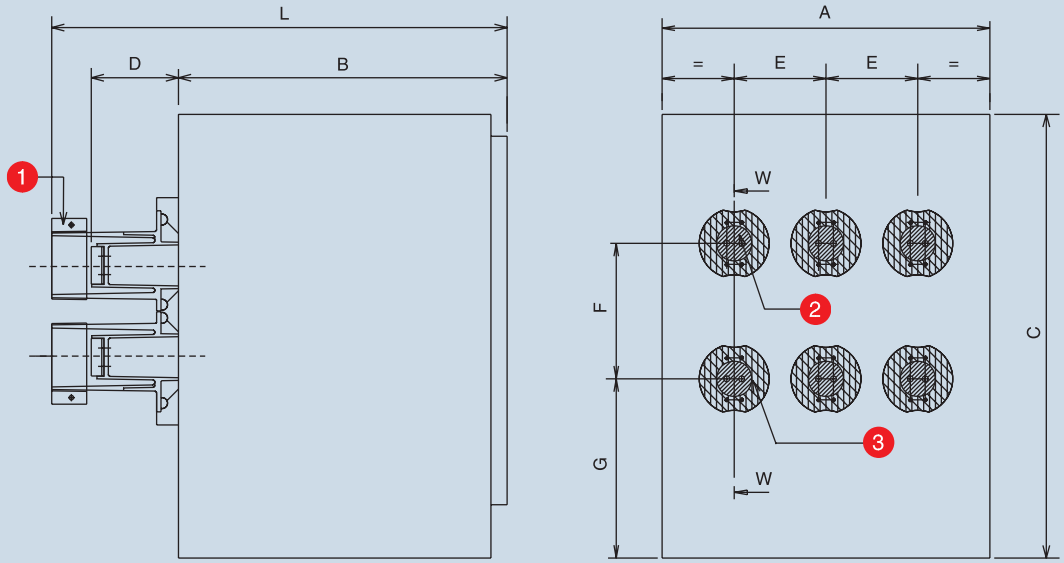
HD4/Z withdrawable circuit-breakers for UniGear type ZS3.2 - 40.5 kV switchboards



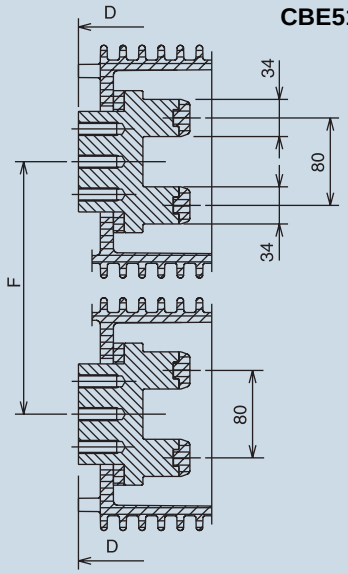
Type	HD4/Z 40.5 kV	
TN	7227	
Ur	40,5	kV
Ir	1250	A
	1600	A
	2000	A
	2500	A (*)
Isc	25	kA
	31.5	kA

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

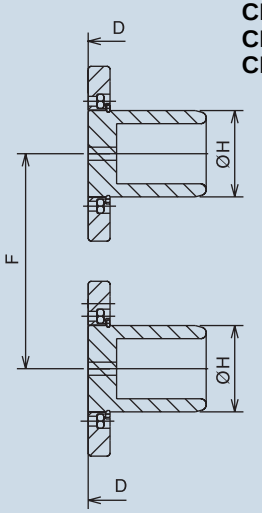
CBE enclosure without earthing switch for HD4/C circuit-breakers



CBE31 2500 A - 3150 A (2)
CBE51 2500 A



CBE11 630-1250 A
CBE21 1600 A
CBE31 2000 A
CBE41 630-1250 A
CBE51 1600-2000 A



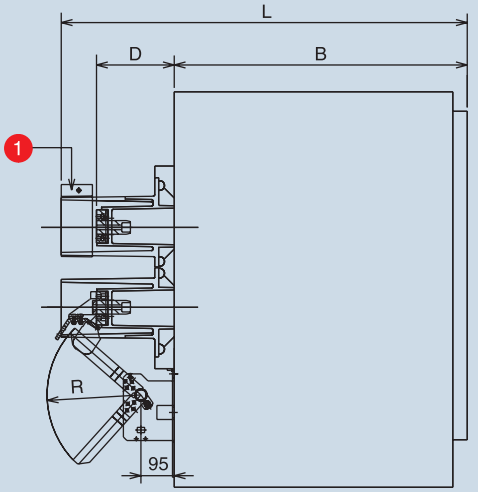
1 Cover (only for 24 kV).
2 Silver-plated copper contact surface.Silver-plated copper contact surface.
3 Insulating support surface.

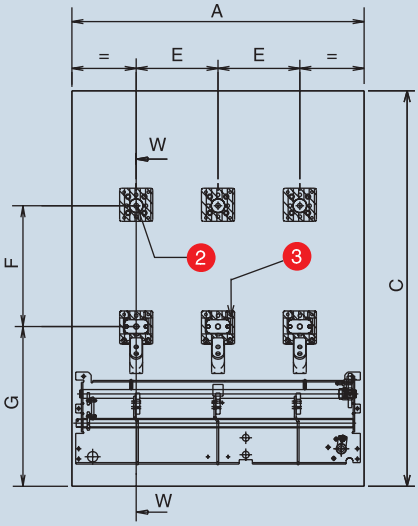
N.B. The overall dimensions and assembly items are given in detail in the documents accompanying the enclosure.
The detailed drawing can be requested in advance of the supply, so that the metalwork parts for completion of the switchboard can be prepared.

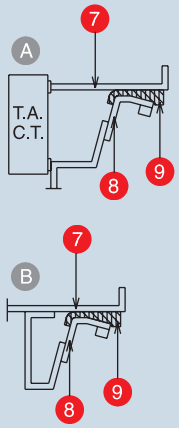
	U [kV]	In [A]	A	B	C	D	E	F	G	H	L
CBE11	12-17.5	630-1250	600	752	943	200	150	205	390	35	1043
CBE21	12-17.5	1600	750	752	1015	196	210	310	410	79	1044
CBE31	12-17.5	2000	1000	752	1015	196	275	310	410	109	1058
CBE31	12-17.5	2500-3150 (2)	1000	752	1015	196	275	310	410	(1)	1058
CBE41	24	630-1250	750	910	1125	275.5	210	310	455	35	1282
CBE51	24	1600	1000	910	1125	275.5	275	380	475	79	1296
CBE51	24	2000	1000	910	1125	275.5	275	380	475	109	1296
CBE51	24	2500	1000	910	1125	275.5	275	380	475	(1)	1296

(1) Double pliers; (2) 3150 A with forced ventilation.

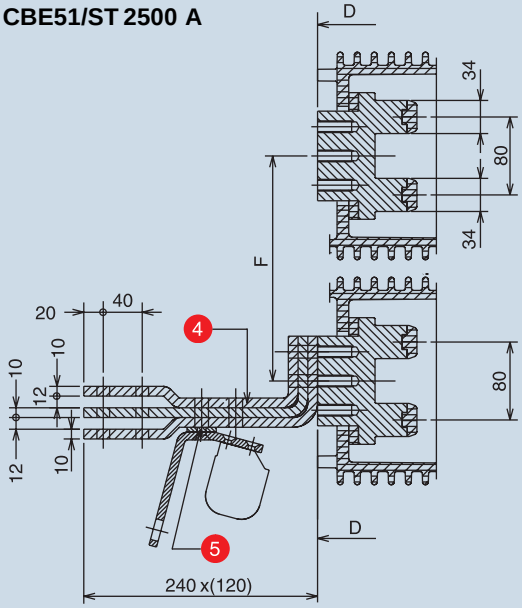
CBE enclosure with earthing switch for HD4/C circuit-breakers



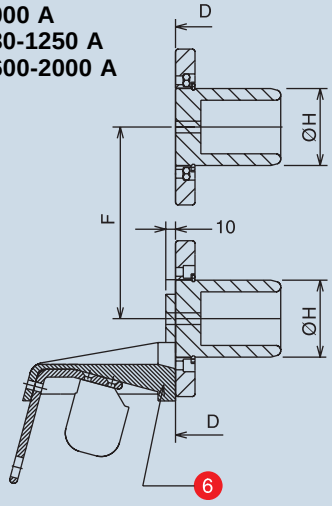




CBE31/ST 2500 A - 3150 A (2)
CBE51/ST 2500 A



CBE11/ST 630-1250 A
CBE21/ST 1600 A
CBE31/ST 2000 A
CBE41/ST 630-1250 A
CBE51/ST 1600-2000 A



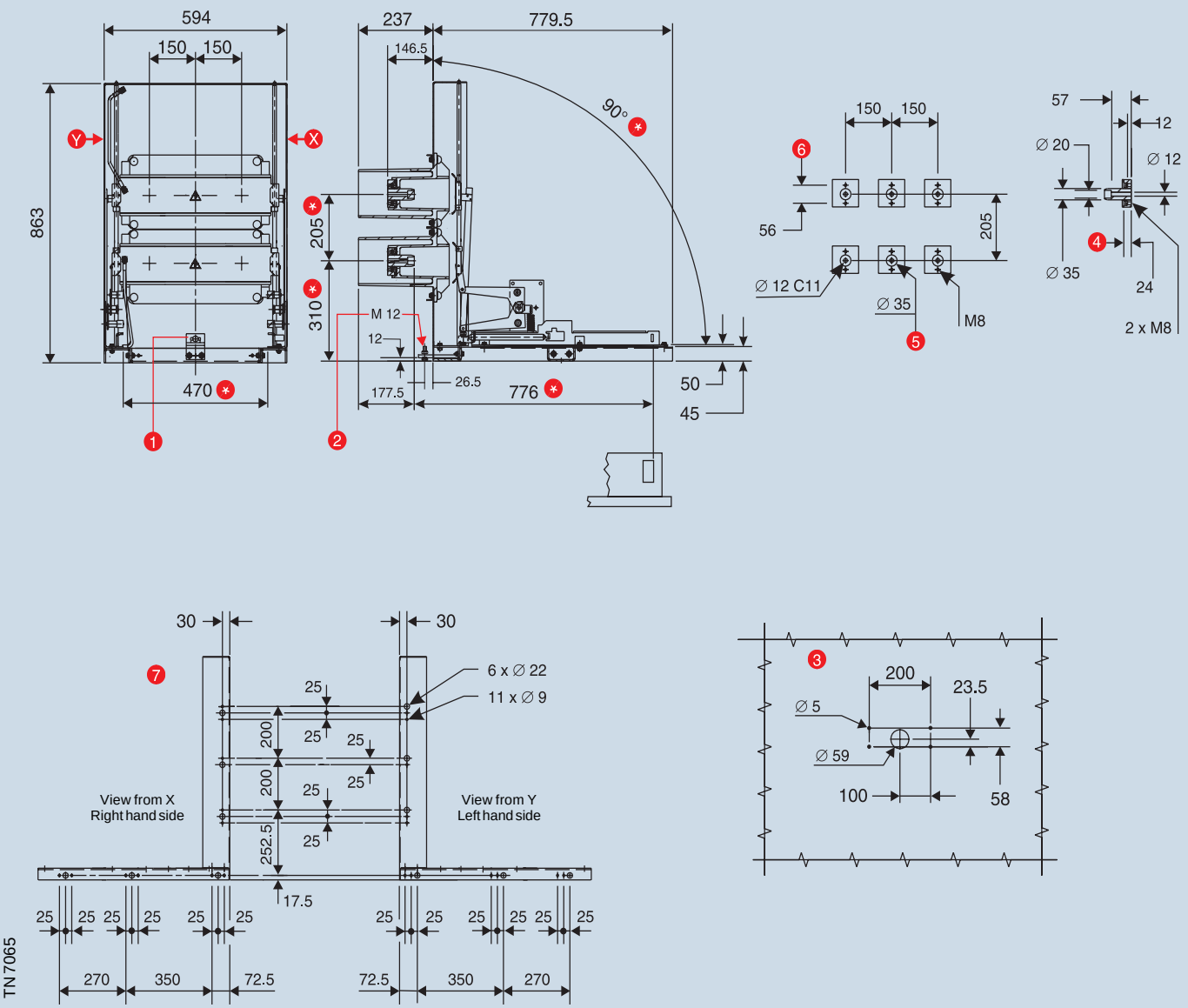
	U [kV]	In [A]	A	B	C	D	E	F	G	H	L	R
CBE11/ST	12-17.5	630-1250	600	752	943	200	150	205	390	35	1043	205
CBE21/ST	12-17.5	1600	750	752	1015	196	210	310	410	79	1044	235
CBE31/ST	12-17.5	2000	1000	752	1015	196	275	310	410	109	1058	235
CBE31/ST	12-17.5	2500-3150 (2)	1000	752	1015	196	275	310	410	(1)	1058	235
CBE41/ST	24	630-1250	750	910	1125	275.5	210	310	455	35	1282	285
CBE51/ST	24	1600	1000	910	1125	275.5	275	380	475	79	1296	285
CBE51/ST	24	2000	1000	910	1125	275.5	275	380	475	109	1296	285
CBE51/ST	24	2500	1000	910	1125	275.5	275	380	475	(1)	1296	285

(1) Double pliers; (2) 3150 A with forced ventilation.

1 Cover (only for 24 kV).
2 Silver-plated copper contact surface.
3 Insulating support surface.
4 Copper connections
5 Insulating spacer.
6 Insulating support.
7 Lower terminal.
8 ST/ZC fixed contact.
9 Insulating item

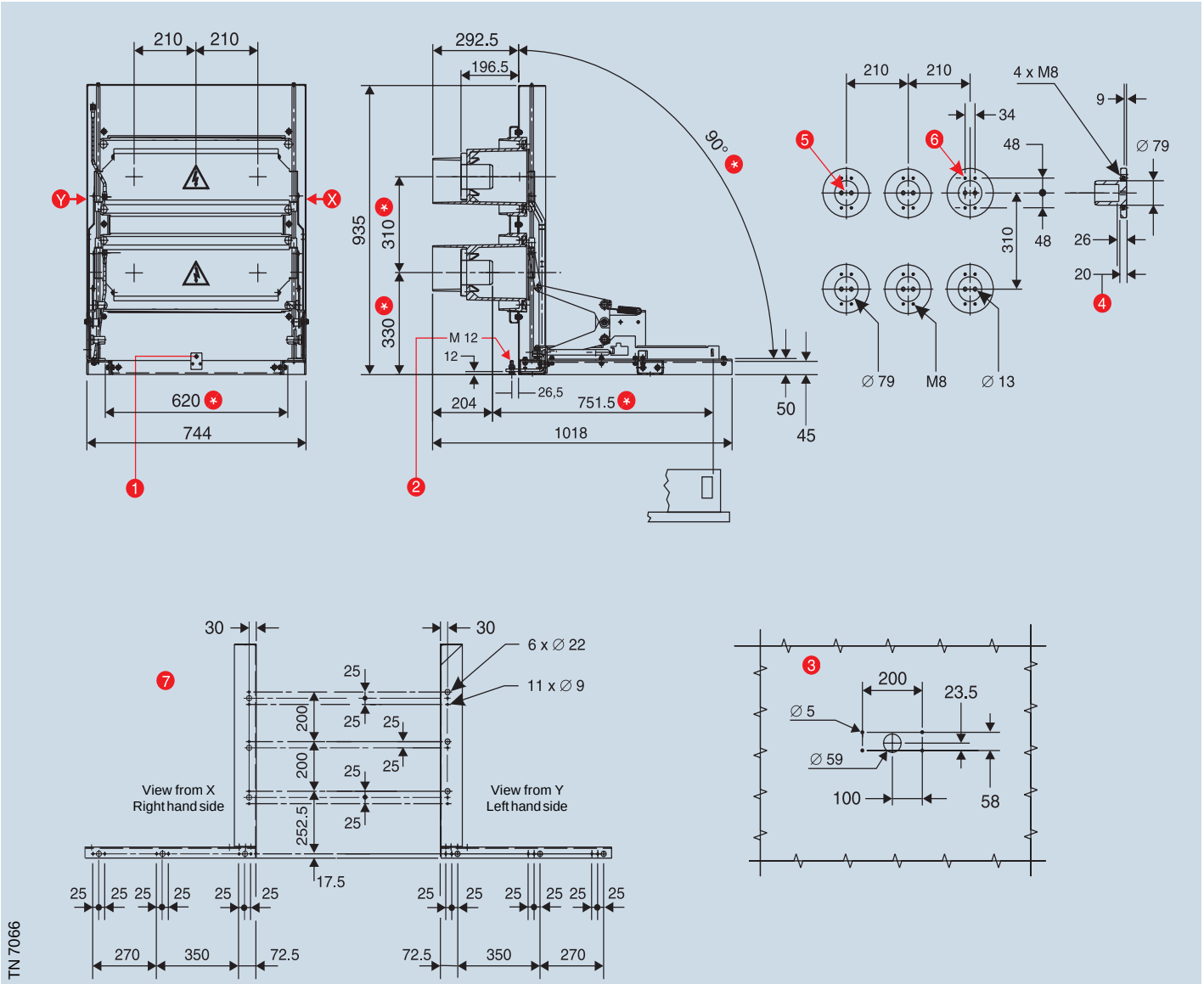
N.B. The overall dimensions and assembly items are given in detail in the documents accompanying the enclosure.
The detailed drawing can be requested in advance of the supply, so that the metalwork parts for completion of the switchboard can be prepared.

CBF11 fixed part - 12-17.5 kV - A - 31.5 kA



1 Circuit-breaker earthing contact (optional accessory)
2 Fixed part earthing
3 Drilling template for fixing socket in switchboard (on request)
4 Maximum protrusion of the branch fixing screws
5 Silvered copper contact area
6 Fixing of branches to the insulating support
7 Drillings for fixing to side sheets
***** Control dimensions (to be verified after assembly).

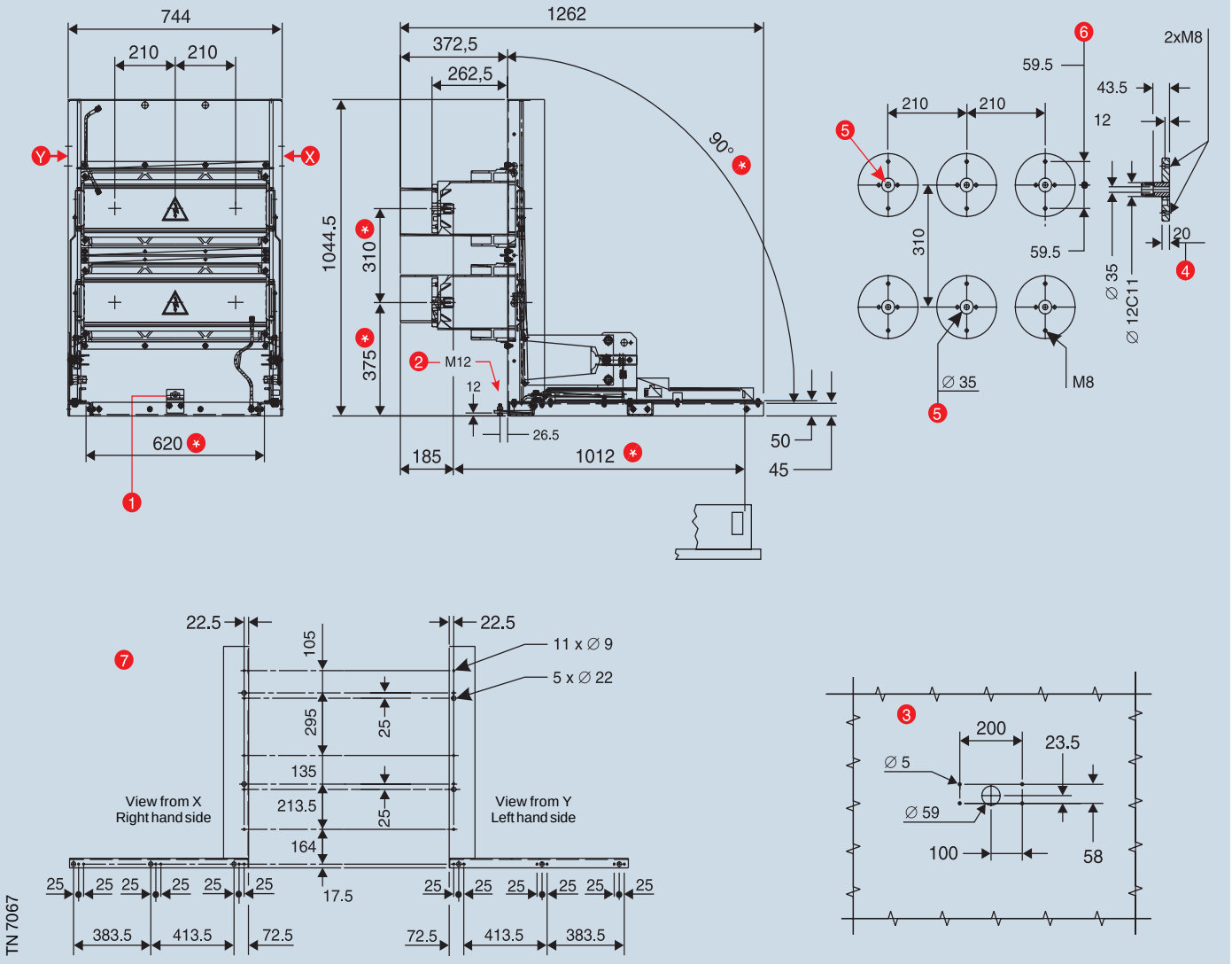
CBF21 fixed part - 12-17.5 kV - 1600 A - 31.5 kA



1 Circuit-breaker earthing contact (optional accessory)
2 Fixed part earthing
3 Drilling template for fixing socket in switchboard (on request)
4 Maximum protrusion of the branch fixing screws
5 Silvered copper contact area
6 Fixing of branches to the insulating support
7 Drillings for fixing to side sheets
***** Control dimensions (to be verified after assembly).

OVERALL DIMENSIONS

CBF41 fixed part - 24 kV - 1250 A - 25 kA



1 Circuit-breaker earthing contact (optional accessory)
2 Fixed part earthing
3 Drilling template for fixing socket in switchboard (on request)
4 Maximum protrusion of the branch fixing screws
5 Silvered copper contact area
6 Fixing of branches to the insulating support
7 Drillings for fixing to side sheets
***** Control dimensions (to be verified after assembly).

7

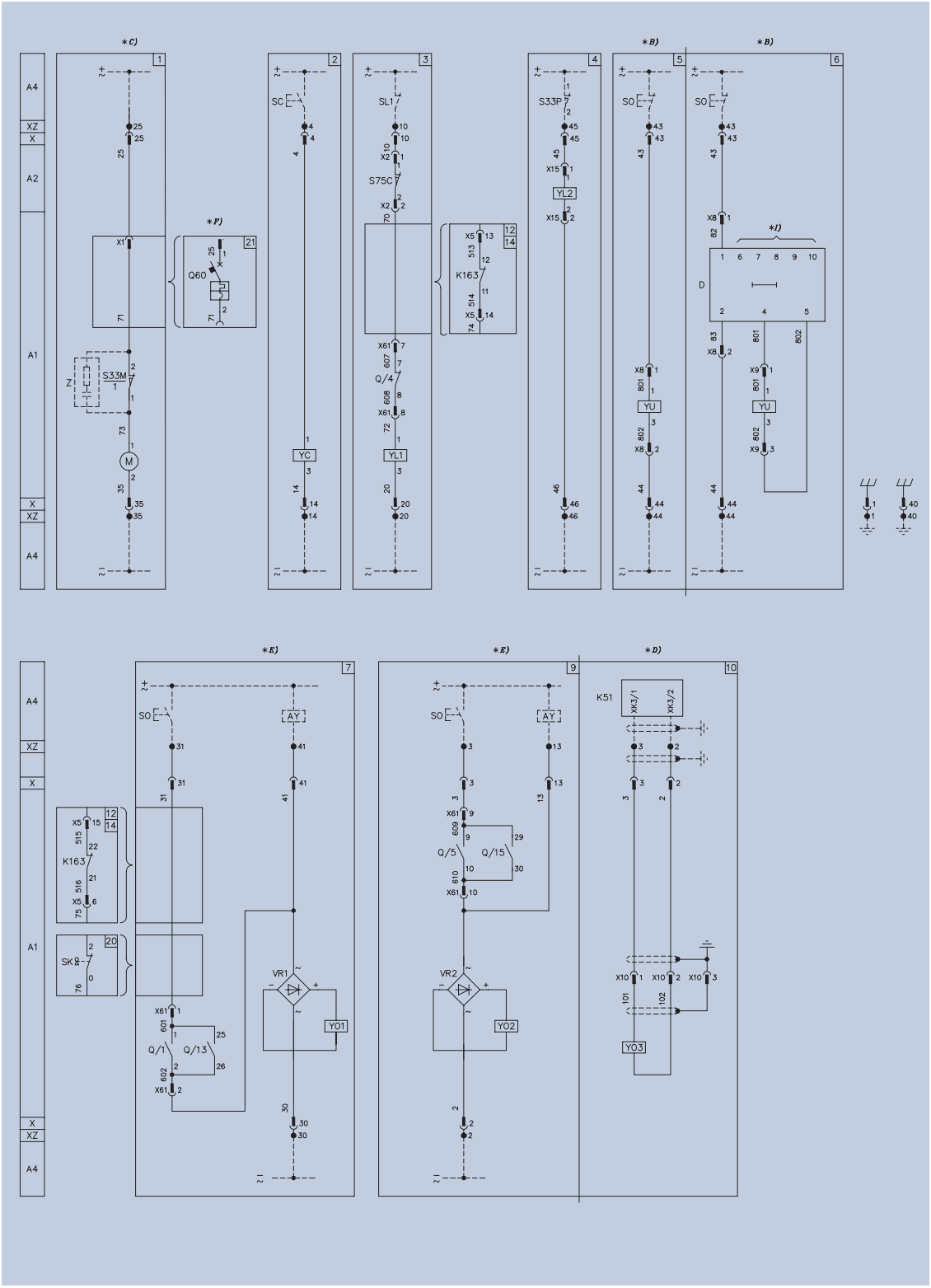
ELECTRICAL CIRCUIT DIAGRAM

Application diagrams

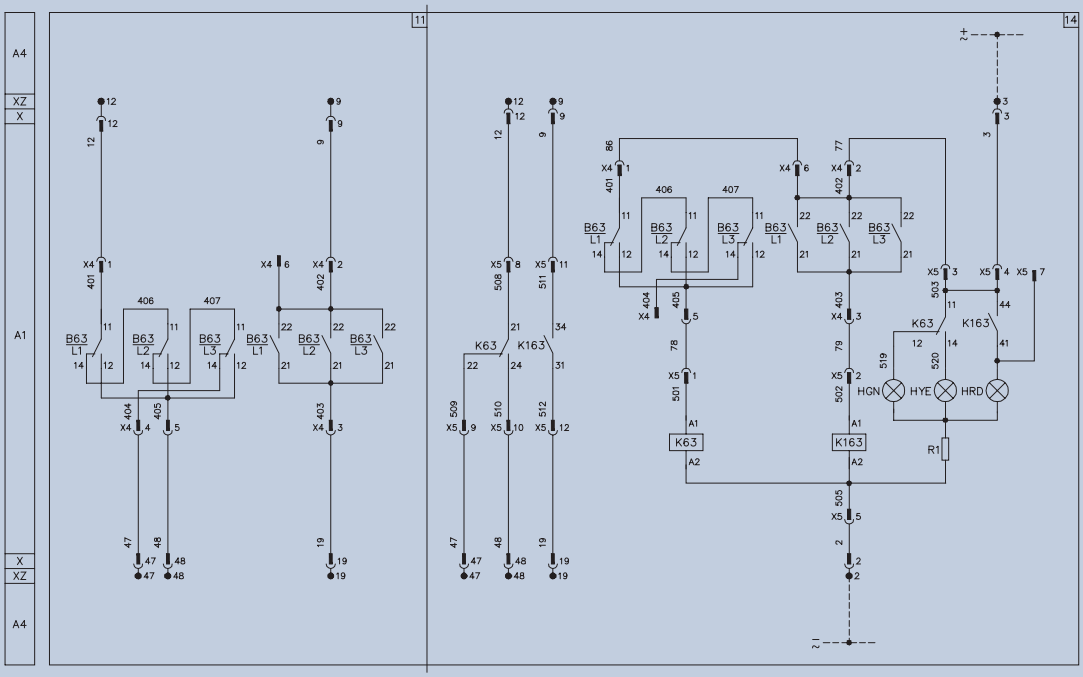
The following diagram (No. 401767) shows the circuits of the withdrawable circuit-breakers up to 24 kV type HD4/C, HD4/W, HD4/P, delivered to the customer by means of connector “X”.
Specific diagrams are available for other types of circuit-breakers:

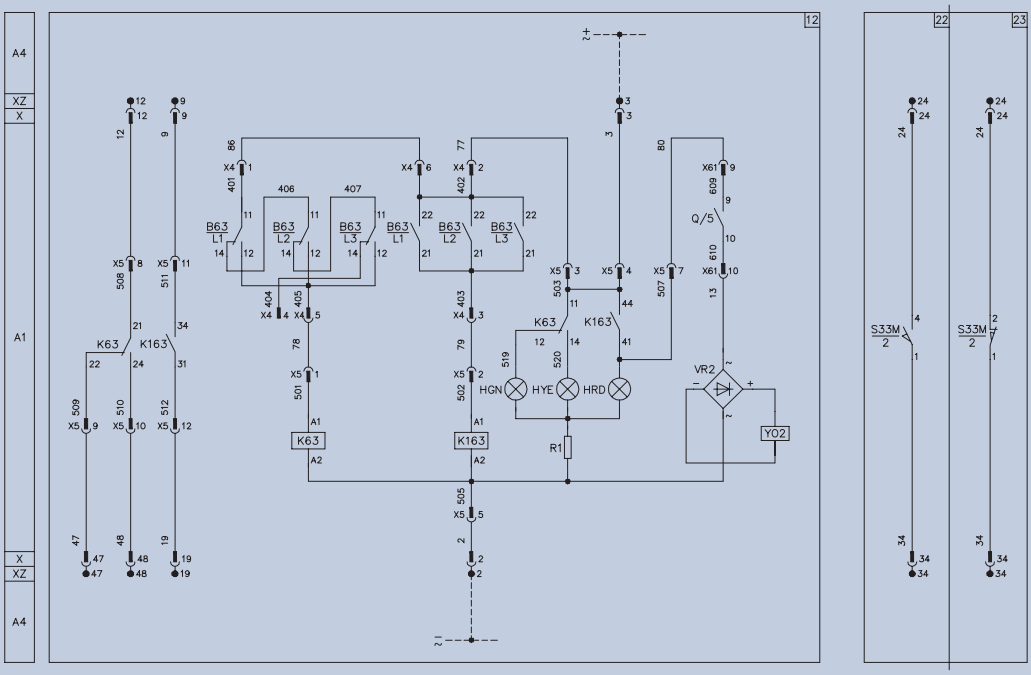
– fixed circuit-breakers up to 24 kV - No. 401768
– fixed circuit-breakers up to 36 kV, 275 mm pole centre distance - No. 401776
– fixed circuit-breakers up to 36 kV, 350 mm pole centre distance - No. 401775
– HD4/W 36 kV with drawable circuit-breakers - No. 401774
– HD4/z 40.5 kV with drawable circuit-breakers - No. 401755.

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.

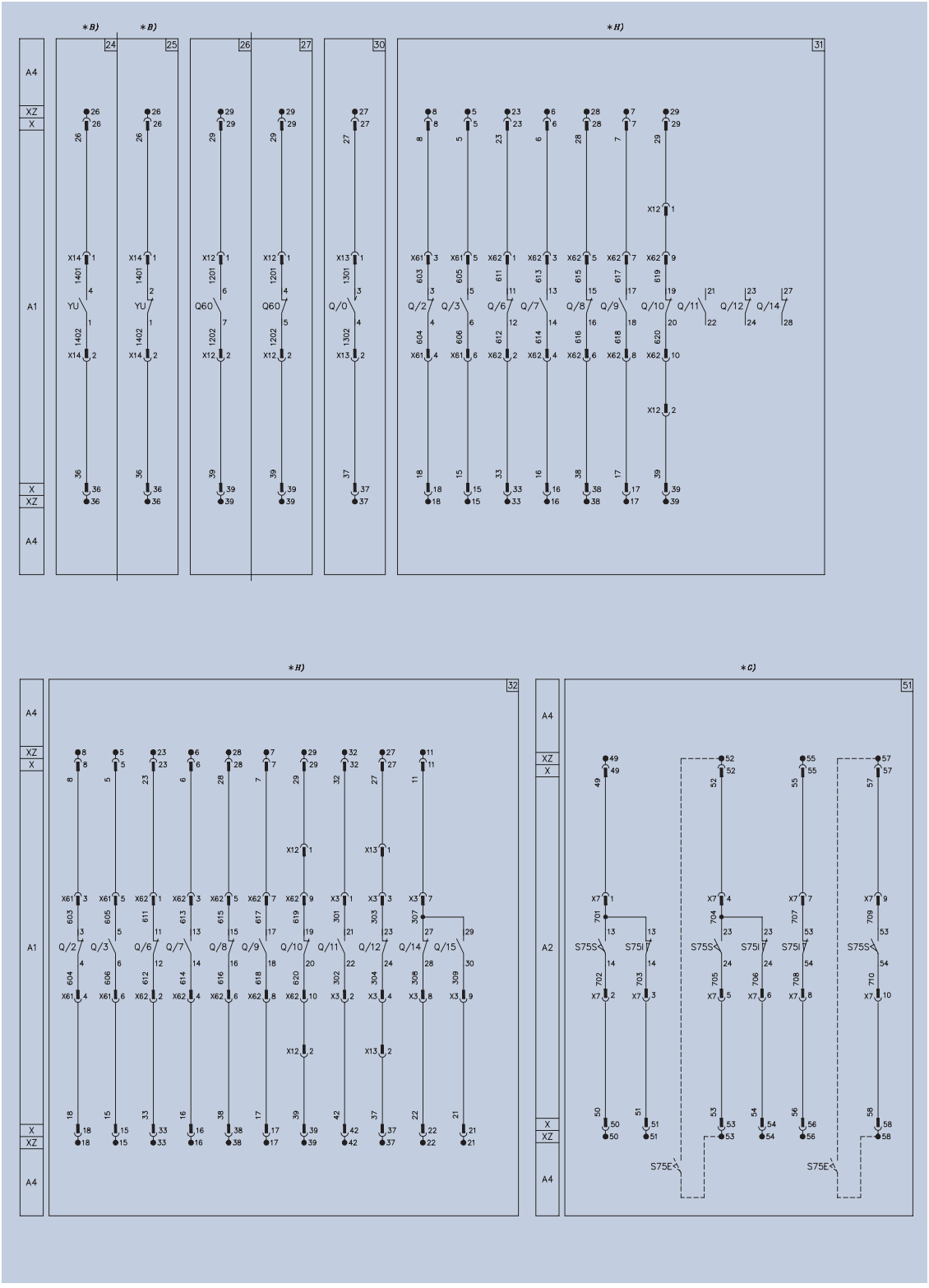


N. 401767 - M5086


A4
XZ
X
A1
X
XZ
A4
11
14
B63 L1
B63 L2
B63 L3
K63
K163
HGN
HYE
HRD
R1


A4
XZ
X
A1
X
XZ
A4
12
22
23
B63 L1
B63 L2
B63 L3
K63
K163
HGN
HYE
HRD
R1
Q/5
VR2
YO2
S33M

ELECTRICAL 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
A1 = Circuit-breaker operating mechanism accessories
A2 = Circuit-breaker accessories (outside the operating mechanism)
A4 = Switchboard accessories (indicative devices and connections for control and signalling)
AY = Device for continuous control of shunt opening release coil continuity (see note E)
B63/L1...L3 = Pressure-switches, located on poles of L1-L2-L3 phases, with two operating levels:
– 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.
D = Undervoltage release electronic time-delay device (see note I)
HGN = Green lamp indicating normal gas pressure
HRD = Red lamp indicating insufficient gas pressure
HYE = Yellow lamp indicating low gas pressure
K51 = Microprocessor-based overcurrent release type PR512 outside the circuit-breaker (see note D)
K63 = Auxiliary relay to double the B63 pressure-switch contacts with intervention for low gas pressure
K163 = Auxiliary relay to double the B63 pressure-switch contacts with intervention for insufficient gas pressure
M = Motor for the closing spring charging (see note C)
Q = Main circuit-breaker
Q/0...15 = Circuit-breaker auxiliary contacts
Q60 = Thermomagnetic circuit-breaker for protection of the spring-charging motor (see note F)
R1, R2 = Resistors (not provided with 24V voltage supply)
S33M/1...2 = Limit switches of the spring charging motor
S33P = Position contact of the enclosure door, not provided with HD4/W circuit-breakers
S75C = Circuit-breaker position contact, open during the isolating travel of the breaker
S75E = Contacts signalling circuit-breaker in the racked-out position (contacts signalling circuit-breaker in the isolated position located on the enclosure, in the fixed part: see contacts S75S in diagram 401693 figs. 5-6)
S75I = Contacts electrically signalling circuit-breaker in the connected position (see note G)
S75S = Contacts electrically signalling circuit-breaker in the isolated position (see note G)
SC = Pushbutton or contact for circuit-breaker closing
SK = Contact operated by the key lock preventing electrical opening with earthing truck connected (compulsory for earthing truck with making capacity)
SL1 = Contact for locking circuit-breaker closing
SO = Pushbutton or contact for circuit-breaker opening
VR1,VR2 = Rectifiers for shunt opening releases YO1 and YO2 supplied with a.c.
X = Circuit-breaker circuit connector
X1...X62 = Connectors of accessories
XZ = Switchboard terminal board (outside the circuit-breaker)
YC = Shunt closing release

YL1 = Locking magnet. If de-energized it mechanically prevents circuit-breaker closing

YL2 = Locking magnet. If de-energized it mechanically prevents circuit-breaker racking-in and racking-out (it is possible to limit its consumption by connecting a delayed pushbutton to enable the operation in series)

YO1 = First shunt opening release (see note E)

YO2 = Second shunt opening release (see note E)

YO3 = Opening solenoid for the PR512 microprocessor-based release outside the circuit-breaker (see note D)

YU = Instantaneous undervoltage release or undervoltage release with pneumatic time-delay device (see note B)

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

Description of figures

Fig. 1 = Closing spring charging motor circuit (see note C).

Fig. 2 = Shunt closing release (antipumping is achieved 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 for enabling the operation).

Fig. 5 = Instantaneous undervoltage release or undervoltage release with electronic time-delay device (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 continuity (see note E). If a.c. voltage supply is requested, foresee fig. 18 too.

Fig. 9 = Second shunt opening release circuit with possibility of continuous control of the winding continuity (see note E). If a.c. voltage supply is requested, foresee fig. 19 too.

Fig. 10 = Opening solenoid for the PR512 microprocessor-based release outside the circuit-breaker (see note D).

Fig. 11 = Gas pressure control circuit. This includes the contacts for remote indication of normal, low and insufficient gas pressure. For B63 pressureswitch 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 YO2 release and lock on closing and opening by means of a K163 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 B63 pressureswitch intervention values see the caption.

Fig. 14 = Gas pressure control circuit. It includes:
- lock of circuit-breaker closing and opening by means of K163 relay auxiliary contacts in case of insufficient gas pressure (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 B63 pressure switch intervention values see the caption.

Fig. 20 = Contact operated by the key lock preventing electrical opening with earthing truck connected (compulsory accessory for earthing trucks with making capacity).

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 undervoltage release energized (see note B).

Fig. 25 = Contact for electrically signalling undervoltage 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 YO1, YO2, YO3 and YU).
Fig. 31 = Circuit-breaker auxiliary contacts available.
Fig. 32 = Circuit-breaker auxiliary contacts available.
Fig. 51 = Contact for electrically signalling circuit-breaker in the connected and isolated positions located on the circuit-breaker.

Incompatibility

The circuits indicated by the following figures cannot be supplied at the same time on the same circuit-breaker:

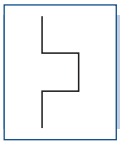
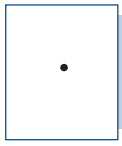
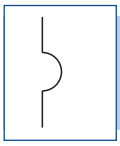
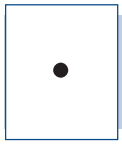
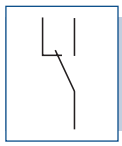
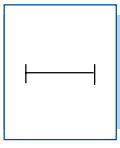
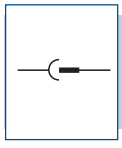
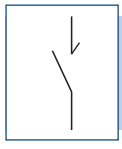
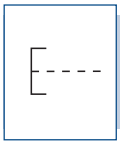
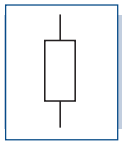
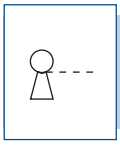
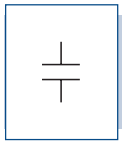
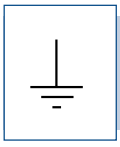
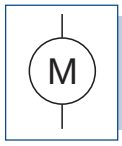
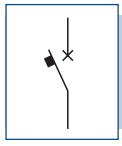
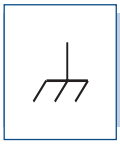
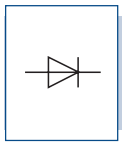
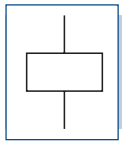
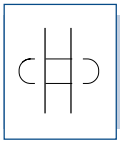
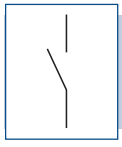
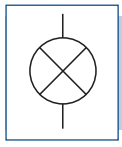
5 - 6 - 14	**9 - 10 - 12 - 20**	**24 - 25**
5 - 6 - 20	**11 - 12 - 14**	**26 - 27**
9 - 10 - 12 - 14	**22 - 23**	**31 - 32**

Notes

A) The circuit-breaker is only fitted with the accessories listed in the order acknowledgement. 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 absorption, 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 the continuity of the shunt opening release winding must be used for this function only. At a power supply lower than 220V, connect the “Control Coil Continuity” device, or a relay, or a relay or signalling lamp which absorbs a current not exceeding 20 mA.
At a power supply equal to or higher than 220V, connect a delay or signalling lamp which absorbs a current not exceeding 10 mA. Other uses might put the release functionality at risk.
F) The Q60 circuit-breaker in fig. 21 must always be provided if used in conjunction with a 24 kV d.c. spring charging motor. In case of opening caused by a faulty motor, before carrying out manual resetting, re-charge the springs by means of the special handle.
G) The contacts (S75I and S75S) 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.
H) When fig. 9 is requested, contact Q/15 in fig. 32 is not available.
When figs. 26-27 are requested, contact Q/10 of figs. 31-32 is not available.
When fig. 30 is requested, contact Q/12 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.

ELECTRICAL CIRCUIT DIAGRAM

Graphical symbols for electrical diagrams (IEC 60617 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)

The data and illustrations are not binding. We reserve the right to make changes in the course of technical development of the product.

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