

HD4

Installation and service instructions 12-40.5 kV – 630-3600 A – 16-50 kA



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For your safety!

- Make sure that the installation room (spaces, divisions and ambient) is suitable for the electrical apparatus.
- Check that all the installation, putting into service and maintenance operations are carried out by qualified personnel with suitable knowledge of the apparatus.
- Make sure that the standard and legal prescriptions are complied with during installation, putting into service and maintenance, so that installations according to the rules of good working practice and safety in the work place are constructed.
- Strictly follow the information given in this instruction manual.
- Check that the rated performance of the apparatus is not exceeded during service.
- Check that the personnel operating the apparatus have this instruction manual to hand as well as the necessary information for correct intervention.
- Pay special attention to the danger notes indicated in the manual by the following symbol:



Responsible behaviour safeguards your own and others' safety!
For any requests, please contact the ABB Assistance Service.

I. Introduction

This publication contains the information necessary for installation and putting into service of HD4 medium voltage circuit breakers.

For correct usage of the product, please read this manual carefully.

For correct mounting of accessories and/or spare parts please refer to the relevant instructions.

Like all the apparatus manufactured by us, the HD4 circuit breakers are designed for different installation configurations.

They do, however, allow further technical-constructional variations (at the customer's request) to suit special installation requirements.

For this reason, the information given below does not always cover special configurations.

Apart from this booklet, it is therefore always necessary to refer to the latest technical documentation available (circuit diagram, wiring diagrams, assembly and installation drawings, any studies of protection co-ordination, etc.), especially with regard to any variations from standardized configurations requested.



All the operations regarding installation, putting into service, operation and maintenance must be carried out by suitably qualified personnel with in-depth knowledge of the apparatus.

Only use original spare parts for maintenance operations.

For further information, also see the technical catalogue of the circuit breaker and the spare parts catalogue.

II. Programme for the environmental protection

The HD4 circuit breakers comply with ISO 14000 Standards (Guidelines for the Environmental Management).

The production system of the Medium Voltage factories complies for the environmental protection in terms of energy consumption, raw materials and waste.

The environmental impact of the product life cycle is assessed by the LCA - Life Cycle Assessment procedure, which is also the result of a well-focused project phase in the selection of materials, processes and packaging.

The Product environmental declaration is available for the HD4 circuit breakers

Production techniques are carried out in order to achieve an easy dismantling and separation of the components at the end of the circuit breaker life cycle, while optimizing the recycling process.

1. Packing and transport

The circuit breaker is shipped in special packing in the open position with the springs discharged and with absolute pole pressure corresponding with the service value.

Each piece of apparatus is protected by a plastic film to prevent any infiltration of water during the loading and unloading stages and to keep the dust off during storage.

Handling and transport must only be carried out by expert and properly trained personnel.

Do not remove or alter the switch identification contents and labels.

Switches subject to UN3164 standards for transportation by air and / or sea.

Safety data sheet: 1VCD850182

2. Checking on receipt



Before carrying out any operation, always make sure that the operating mechanism springs are discharged and that the apparatus is in the open position.

On receipt, check the state of the apparatus, that the packing is undamaged and that the nameplate data corresponds (see fig. 1) with that specified in the order acknowledgement and in the delivery note. Also make sure that all the materials described in the shipping note are included in the supply. If any damage or irregularity is discovered on unpacking, notify ABB (directly or through the agent or supplier) as soon as possible and in any case within five days of receipt.

The apparatus is only supplied with the accessories specified at the time of order and confirmed in the order acknowledgement sent by ABB.

The following accompanying documents are inserted in the shipping packing:

- Instruction manual (this document)
- Test certificate
- Identification tag
- Fiscal copy of shipping note
- Electrical diagram

These other documents are sent prior to shipment:

- Order acknowledgement
- Original copy of shipping note
- Any drawings or documents regarding special configurations/conditions.

A

1

3

4

B

5

ABI

Circuit breaker	IEC 62271-100
HD4	CEI 17-1 ←
CLASSIFICATION	
SN	PR. YEAR
M MASS ... kV	
Ur	
ELECTRIC DIAGRAM	
FIG.	
... .. OPERATING MECHANISM	
-MO1 V	
Made by ABB	

Nameplate

Caption

- A Circuit breaker nameplate
- B Operating mechanism nameplate
- 1 Type of apparatus
- 2 Symbols and compliance with Standards
- 3 Serial number
- 4 Circuit breaker characteristics
- 5 Characteristics of the operating auxiliaries

Fig. 1

1VCD601246 - V9043 - Rev. T - en Instruction Manual 2021.12 (HD4) (gs)

3. Storage

In case a storage period is foreseen, on request our workshops will provide a suitable packing to the specified storage conditions.

On receipt, the apparatus must be carefully unpacked and checked as described in chapter 2: Checkink on receipt.

If immediate installation is not possible and the circuit breaker has to be re-stored again, it is necessary to restore the packaging at least suitable for protection against dust.

Insert hygroscopic substances in the packaging in the quantity of at least one standard pack per apparatus.

Therefore, store in a sheltered, well-ventilated area with a dry, non-dusty, non-corrosive atmosphere away from highly flammable materials, with a temperature between -5 °C and +45 °C.

In any case, avoid accidental shocks or accommodations that stress the structure of the circuit breaker

4. Handling

Before carrying out any operation, always check that the operating mechanism springs are discharged and that the apparatus is in the open position.

Circuit breakers up to 24 kV

- To lift and handle the circuit breaker, use ropes with two lifting hooks and a central ring (1) (fig. 2a).
- Put the hooks (2) (fig. 2b) in the holes prepared in the circuit breaker frame and lift.
- On completion of the operation (and in any case before putting into service) unhook and remove the lifting tool (1) (fig. 2c).

36 kV circuit breakers + COBRA P.275 circuit breakers

- Attach the tools (1) to lift and handle the circuit breaker (fig. 2d);
- Attach the tools (1) (fig. 2e).
- Attach the hooks (2) (fig. 2f) and lift.
- On completion of the operation (and in any case before putting into service) unhook and remove the lifting tools (1) (fig. 2g).



Fig. 2a

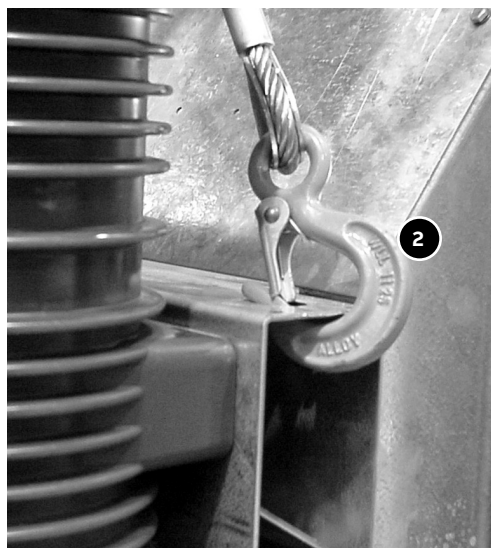


Fig. 2b

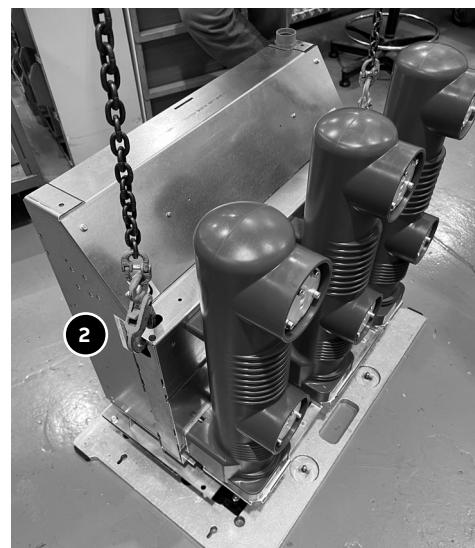


Fig. 2c

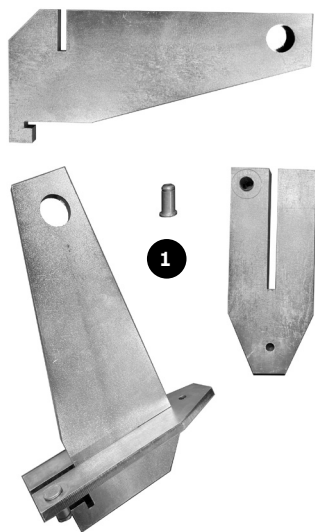


Fig. 2d

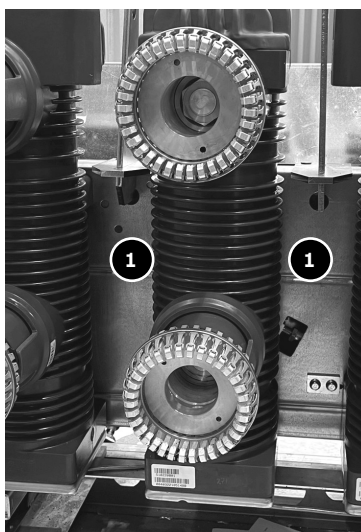


Fig. 2e

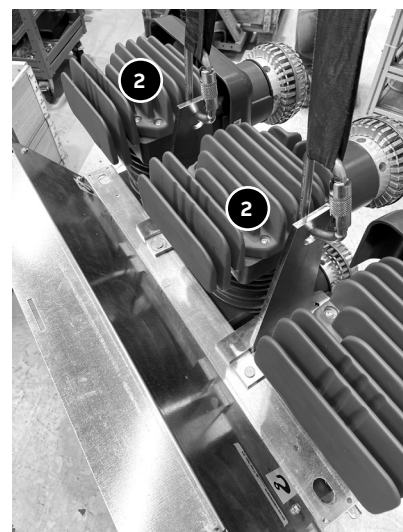


Fig. 2f



Fig. 2g

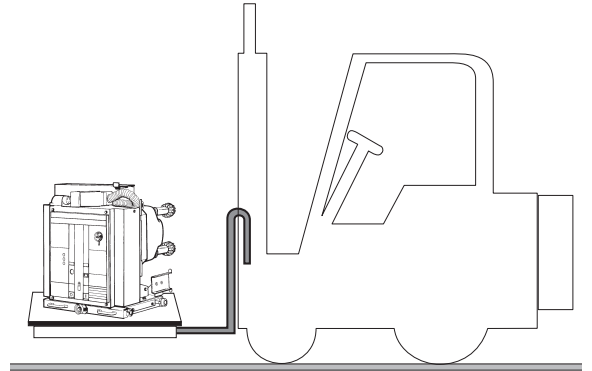


Fig. 3

Always take great care during handling not to stress the insulating parts and the circuit breaker terminals.



The apparatus must not be handled by inserting lifting devices directly under the apparatus itself. Should it be necessary to use this method, place the circuit breaker on a sturdy supporting surface (see fig. 3).

5. Description

5.1. General features

The HD4 series are sulphur hexafluoride circuit breakers for indoor installation. For the electrical performance, please refer to the corresponding technical catalogue code 1VCP000004.

For special installation conditions please ask ABB.

The following versions are available:

- fixed
- withdrawable for CBE, PowerCube enclosures and CBF fixed parts
- withdrawable for switchgear: UniGear type ZS1, UniGear type ZS2, UniGear type ZS3.2
- withdrawable for switchgear: UniSwitch, UniMix and UniSec.

5.2. Reference Standards

The HD4 series circuit breakers comply with the following Standards:

- IEC 62271-100

5.3. Fixed circuit breaker

The fixed circuit breaker (see fig. 4) corresponds to the basic version complete with a front protection shield and frame.

The anchoring holes are drilled in the lower part of the frame.

The terminal box, fixed on the upper protection, is available for connection of the circuit breaker auxiliary circuits.

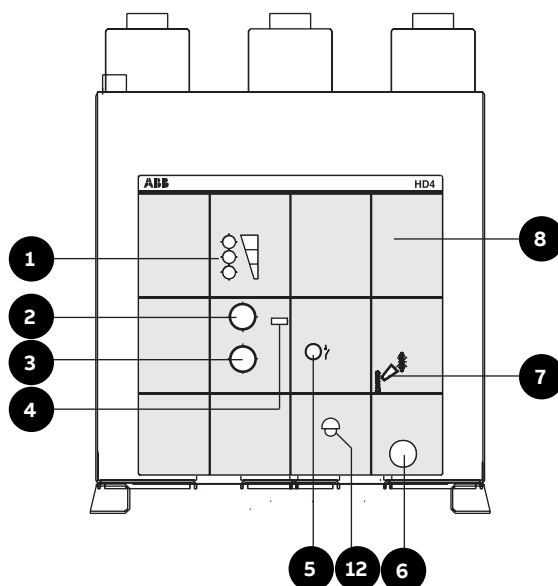
The earthing screw is located on the circuit breaker side.

For further details, refer to the caption of fig. 4.

5.4. Withdrawable circuit breaker

The withdrawable circuit breakers (see fig. 5) are consist of a truck on which the supporting structure of the circuit breaker itself is fixed. The cord with the connector (plug) for connection of the operating mechanism electrical accessories comes out of the front protection of the circuit breaker. The strikers for activating the contacts (connected/isolated), located in the enclosure or in the switchgear, are fixed in the top part of the circuit breaker. The slides for activating the segregation shutters of the medium voltage contacts of the enclosure or switchgear are fixed on the sides of the circuit breaker. The crosspiece for hooking the circuit breaker for the connection/isolation operation by means of the special operating lever is

Fixed circuit breaker



Caption

- 1 Signalling device for state of SF6 pressure (on request)
- 2 Opening push button
- 3 Closing push button
- 4 Operator counter
- 5 Signalling device for circuit breaker open/closed
- 6 Shaft for manual closing spring charging
- 7 Signalling device for closing springs charged/discharged
- 8 Characteristics nameplate
- 9 Terminals (only available for certain versions)
- 10 Pressure switch (on request)
- 11 Valve for checking the SF6 gas pressure
- 12 Resetting button for protection circuit breaker of geared motor (on request)

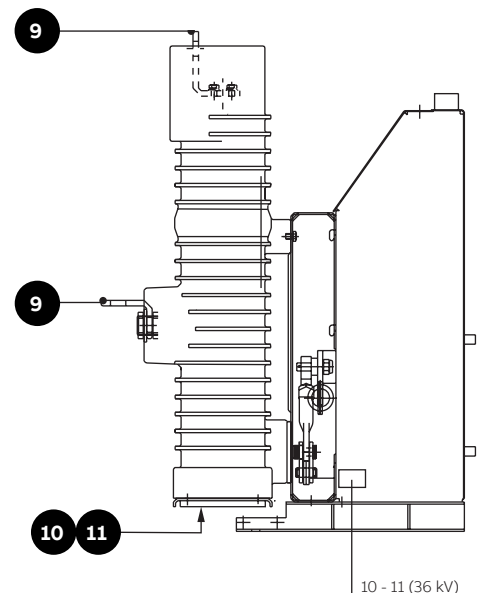


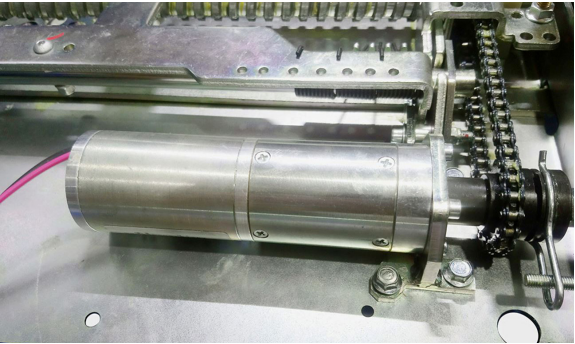
Fig. 4

mounted on the front part of the circuit breaker truck.

The circuit breaker is completed with the tulip isolating contacts. The withdrawable circuit breaker is fitted with special locks, on the front crosspiece, which allow hooking into the corresponding joints in the enclosure or fixed part. The locks can only be activated by the handles with the truck resting completely on the crosspiece. The activating lever (connection/isolation) must be fully inserted. A lock prevents the truck from advancing into the enclosure or fixed part (for example when the earthing switch is closed). With the truck in the middle position between isolated and connected, the lock prevents closure of the circuit breaker (both mechanical and electrical). On request, a locking magnet can be mounted on the truck which, when de-energised, prevents truck operation.

5.4.1 Motorised truck (-MAT)
(only for HD4/P 12-24kV 630-1250A 25-31.5kA)
It allows racking-in and racking-out of the circuit breaker in the switchgear to be carried out

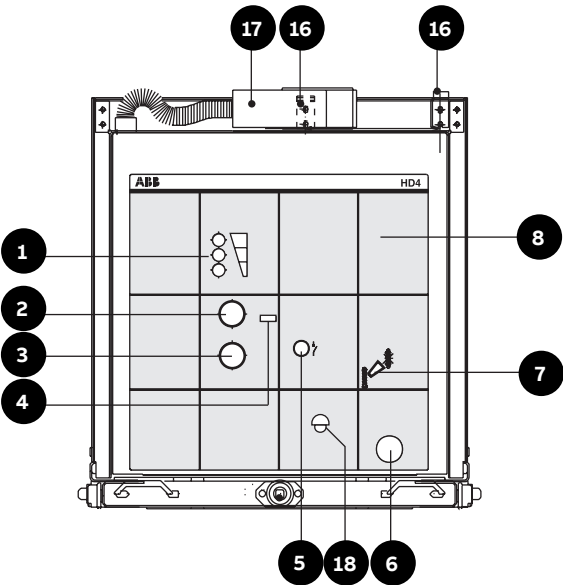
remotely. The motor version with clutch is supplied as standard, so that racking-in/ out can be performed in an emergency if the truck motor fails to operate.



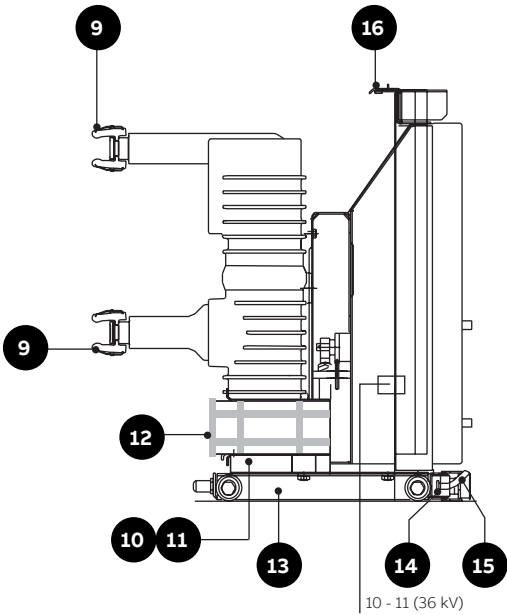
Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 220 V
Operating limits	85 ... 110% Un
Nominal power (Pn)	40 W

5.5. Enclosures and fixed parts
For information about the enclosures and fixed parts, please consult the relative documentation.

Withdrawable circuit breaker



- Caption
- 1 Signalling device for state of SF6 pressure (on request)
 - 2 Opening push button
 - 3 Closing push button
 - 4 Operator counter
 - 5 Signalling device for circuit breaker open/closed
 - 6 Shaft for manual closing spring charging
 - 7 Signalling device for closing springs charged/discharged
 - 8 Characteristics nameplate
 - 9 Isolating contacts



- 10 Pressure switch (on request)
- 11 Valve for checking the SF6 gas pressure
- 12 Slide for activating the enclosure shutters
- 13 Truck
- 14 Locks for hooking into the fixed part
- 15 Lock activating handles (17)
- 16 Strikers for activating the contacts located in the enclosure
- 17 Connector (plug)
- 18 Resetting button for protection circuit breaker of geared motor (on request)

Fig. 5

6. Instructions for circuit breaker operation

6.1. Safety indications



HD4 circuit breakers ensure a minimum degree of protection IP2X if installed under the following conditions:

- fixed version, with protection netting
- withdrawable version, installed in a switchgear.

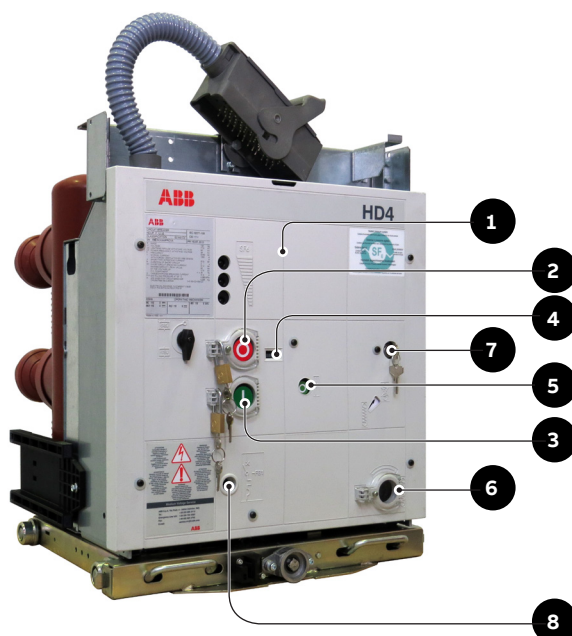
Under these conditions, the operator is guaranteed against accidental contact with moving parts.

Should any mechanical operations be carried out on the circuit breaker outside the switchgear or with the protection netting removed, be very careful of any moving parts.

If the operations are prevented, do not force the mechanical interlocks and check that the operation sequence is correct.

The racking-in and racking-out operations of the circuit breaker must be carried out gradually to prevent any impacts which might deform the mechanical interlocks.

6.2. Operating and signalling parts



Caption

- 1 Signalling device for state of SF6 pressure (on request)
- 2 Opening push button
- 3 Closing push button
- 4 Operator counter
- 5 Signalling device for circuit breaker open/closed
- 6 Shaft for manual closing spring charging
- 7 Signalling device for closing springs charged/discharged
- 8 Resetting button for protection circuit breaker of geared motor (on request)

6.3. Circuit breaker closing and opening operations (fig. 6)

Circuit breaker operation can be manual or electrical.

a) Manual operation for spring charging

To manually charge the closing springs, it is necessary fully insert the charging lever into the seat (6) and turn it clockwise until the yellow indicator (7) appears.

The force which can normally be applied to the charging lever fitted is 130 N. In any case, the maximum force which can be applied must not exceed 170 N.

b) Electrical operation for spring charging

On request the circuit breaker can be fitted with the following accessories for electrical operation:

- geared motor for automatic charging of the closing springs
- shunt closing release
- shunt opening release.

The geared motor automatically recharges the springs after each closing operation until the yellow indicator (7) appears. Should there be no voltage during charging, the geared motor stops and then starts recharging the springs automatically when the voltage is on again. It is, however, always possible to complete the charging operation manually.

c) Circuit breaker closing

This operation can only be carried out with the closing springs completely charged.

For manual closing, push the push button (3). When there is a shunt closing release, the operation can also be carried out with remote control by means of a control circuit. The indicator (4) shows that closing has been accomplished.

In case of earthing truck with making capacity, activate the key lock (in the closed position) and remove the key. This is to prevent accidental opening operations during any maintenance work on the installation.

d) Circuit breaker opening

For manual opening, push the push button (2).

When there is a shunt opening release, the operation can also be carried out with remote control by means of a control circuit. The indicator (4) shows that opening has been accomplished.

Fig. 6

7. Installation

7.1. General



Correct installation is of prime importance. The instructions given by the manufacturer must be carefully studied and followed. It is good practice to use gloves to handle the pieces during installation

7.2. Normal installation conditions

Maximum ambient air temperature	+ 40 °C
Minimum ambient air temperature	- 5 °C
Relative humidity	% ≤ 95
Altitude	≤ 1000 m

It must be possible to ventilate the installation room.

For other installation conditions, please follow what is indicated in the product Standards.

For special installation requirements please contact us.

The areas affected by the passage of power conductors or auxiliary circuit conductors must be protected against the possible access of animals which could cause damage or anomalous service.

7.3. Preliminary operations

- Clean the insulating parts with clean dry rags.
- Check that the upper and lower terminals are clean and free of any deformation caused by shocks received during transport or storage.

7.4. Installation of fixed circuit breaker

The circuit breaker can be mounted directly on the supporting frames provided by the customer. The circuit breaker, complete with supporting truck, must be fixed to the floor of its compartment with special brackets.

The parts of the floor surface on which the truck wheels rest must be perfectly level.

The areas on which the supporting frames or truck wheels rest (if a truck is provided) must be on the same horizontal plane to avoid any risk of distortion in the breaker frame.

Fit the isolating partitions if provided.

A minimum degree of protection (IP2X) must be guaranteed from the front towards live parts.

7.5. Installation of withdrawable circuit breaker

The withdrawable circuit breakers are preset for insertion in enclosures, in fixed parts or in the corresponding switchgears.

Insertion and racking-out of the circuit breakers must be gradual to avoid any shocks which could deform the mechanical interlocks.

If the operations are prevented, do not force the interlocks and check that the operating sequence is correct. The torque normally required to carry out racking-in and racking-out is <25 Nm.

Please also refer to the technical documentation of the enclosures and switchgears for the circuit breaker installation operations.



The insertion and racking-out operations must always be carried out with the circuit breaker open.

7. Installation

7.5.1. Circuit breakers with withdrawable motorized truck

Carry out the racking-in/racking-out test of the motorized truck in the same way as for a manual truck, following the instructions below:

- Rack the circuit breaker into the switchgear in the open and isolated position, with the power supply to the motor circuit cut off and with the enclosure door closed.
- Insert the manual racking-in lever (1) in the special coupling (2) Fig. 7, and take the motorized truck to about half its run between the isolated for test and the connected position. The torque needed to carry out truck handling is $< 25 \text{ Nm}$.
- In the case of accidental inversion of the truck motor power supply polarity, this operation allows a possible error in direction to be dealt with without any damage. Verification checks:
 - a) motor rotation clockwise during circuit breaker racking-in.
 - b) motor rotation anticlockwise during circuit breaker racking-out.
- Remove the manual lever (1) from the coupling (2) Fig. 7
- Supply the truck motor circuit.
- Activate the control for the electrical racking-in operation. When racking-in has taken place, check correct changeover of the relative auxiliary contact.
- On completion, activate the control for the electrical racking-out operation. When racking-out has taken place, check correct changeover of

the relative auxiliary contact.

- In the case of a motor fault during a racking-in or racking-out operation, in an emergency the truck can be taken to the end of its run manually, after first cutting off the power supply to the motor power supply circuit and then, using the manual lever, work in the same way as with the manual truck.

Nota

By means of the chain transmission, truck handling carried out using the manual lever makes the truck motor armature rotate which, behaving like a generator, can cause inverse voltage at the connection terminals. This may damage the permanent magnet of the motor, therefore all the truck racking-in and racking-out operations carried out using the manual lever must be done without power supply in the motor circuit.

7.6. Fixed circuit breaker power circuit connections

7.6.1. General directions

- The connections must be made using only the squares-terminals supplied with the circuit breaker.
- Select the conductor cross-section according to the operating and short-circuit current of the installation.
- Near the terminals of fixed version circuit breakers or enclosure, provide suitable support insulators dimensioned according to the electrodynamic stresses that may arise from the short-circuit current of the installation.
- Fit the isolating partitions if provided.

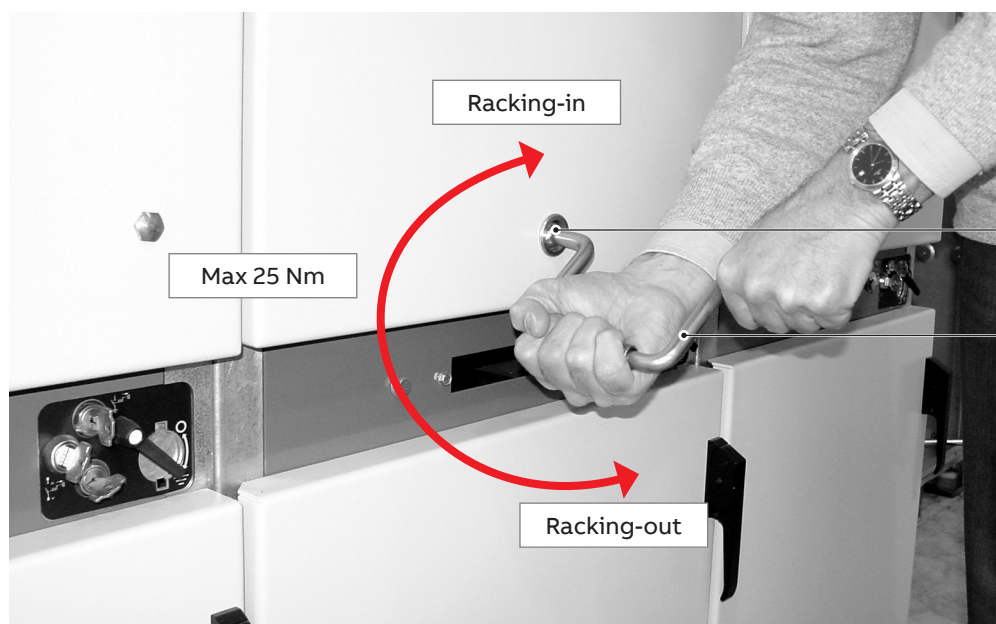


Fig. 7

7.6.2. Mounting the connections

- Check that the connection contact surfaces are perfectly flat and have no burrs, oxidation traces, or deformations due to drillings or impacts.
- Depending on the conductive material and surface treatment used, carry out the operations indicated in the table on the contact surface of the conductor.

Bare copper	Silver-plated copper or aluminium	Bare aluminium
Clean with a fine file or emery cloth.	Clean with a rough dry rag.	Clean with a metallic brush or emery cloth.
Fully tighten and smear a film of industrial vaseline grease over the contact surfaces.	In case of tough oxidation traces only, clean with a very fine emery cloth, taking care not to remove the surface layer.	Immediately smear a film of industrial vaseline grease over the contact surfaces.
Interpose the copper-aluminium bi-metal with restored surfaces between the aluminium connection and the copper terminal (copper side in contact with the terminal; aluminium side in contact with the connection).	If necessary, recondition the surface treatment.	

Mounting procedures

- Place the connections in contact with the circuit breaker terminals.
- Interpose a spring washer and a flat washer between the head of the bolt and the connection.
- Tighten the bolt, taking care not to subject the insulating parts to stress (see table tightening torque).
- Make sure that the connections do not exert force on the terminals.
- In case of cable connections, carefully follow the manufacturer's instructions for terminating the cables.

Table of tightening torque

Screw	Tightening torque
M6	10 Nm
M8	30 Nm
M10	40 Nm
M12	70 Nm

7.7. Earthing

For fixed version circuit breakers, use the screw marked with the relative symbol to effect the earthing.

Clean and degrease the surrounding area for a diameter of about 30 mm. After completion of the assembly, cover the entire joint with vaseline. Use a conductor (busbar or braid) with a cross-section as indicated in the Standards in force.

7.8. Auxiliary circuit connection

Notes

- **The minimum cross-section of the wires used for the auxiliary circuits must not be less than that used for internal wirings.**
- **Before carrying out the connection of the auxiliary circuits, it is advisable to check the selected type of automatism provided for operation of the pressure switch (if provided) referring to the latest technical documentation supplied by ABB.**

7.8.1. Fixed circuit breaker

The connection of the circuit breaker auxiliary circuits must be made via the terminal box mounted on the circuit breaker structure.

Outside the circuit breaker the wires must run inside appropriately earthed metal tubes or ducts.



Before removing the operating mechanism cover to access the terminal box, make sure that the circuit breaker is open and the closing springs discharged.

7.8.2. Withdrawable circuit breaker

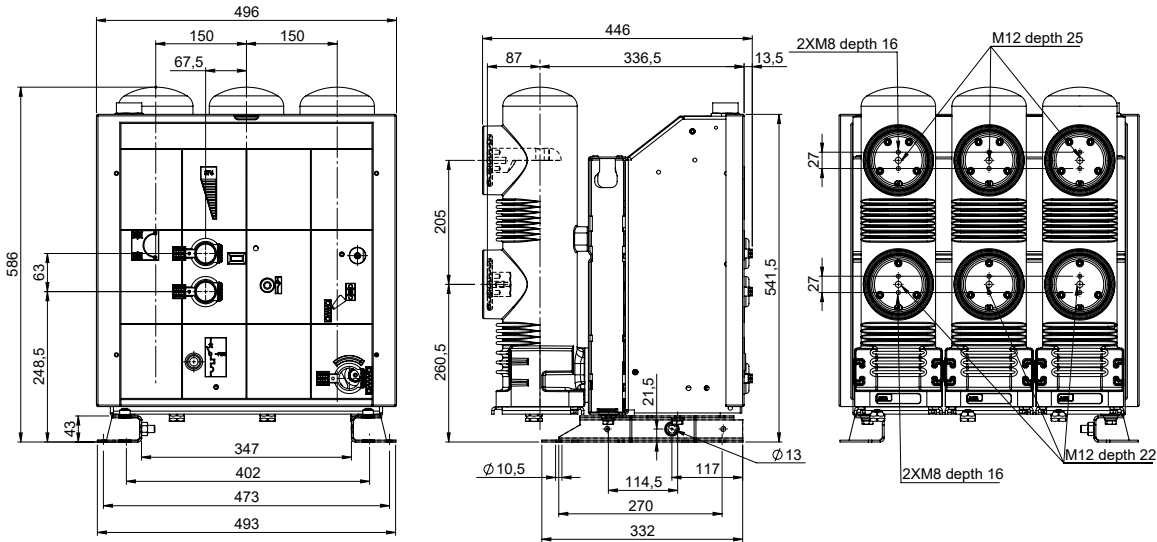
The auxiliary circuits of the withdrawable circuit breaker are fully cabled in the factory as far as the connector. For the external connections, please refer to the electric diagram of the enclosure or of the switchgear.

7. Installation

7.9. Overall dimensions

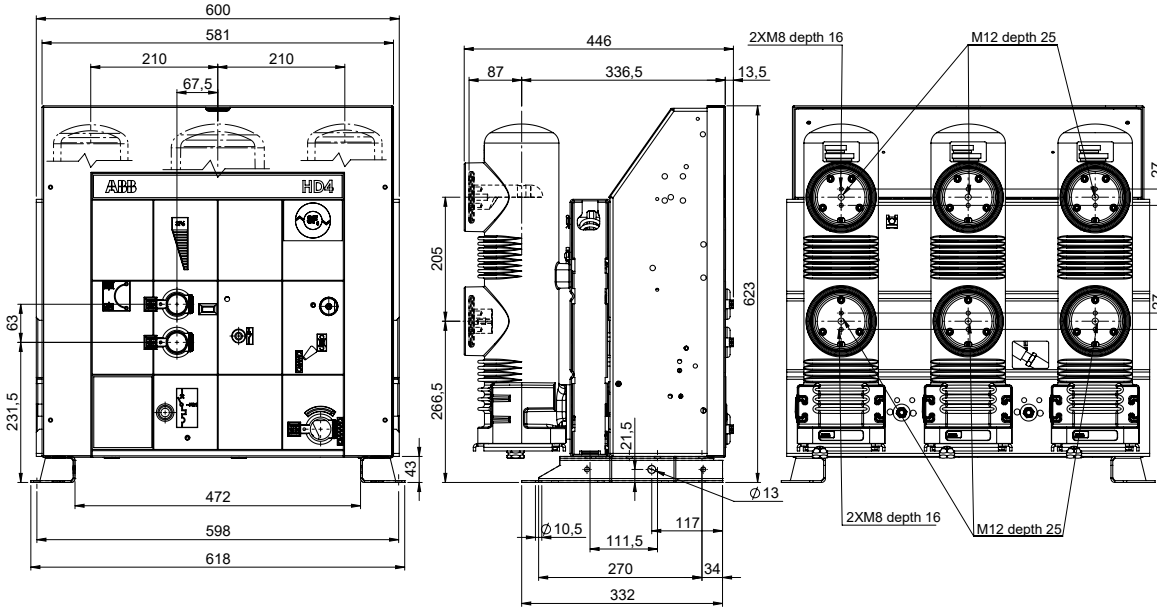
Fixed circuit breakers

HD4		
TN	1VCD000226	
Ur	12	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA



Fixed circuit breakers

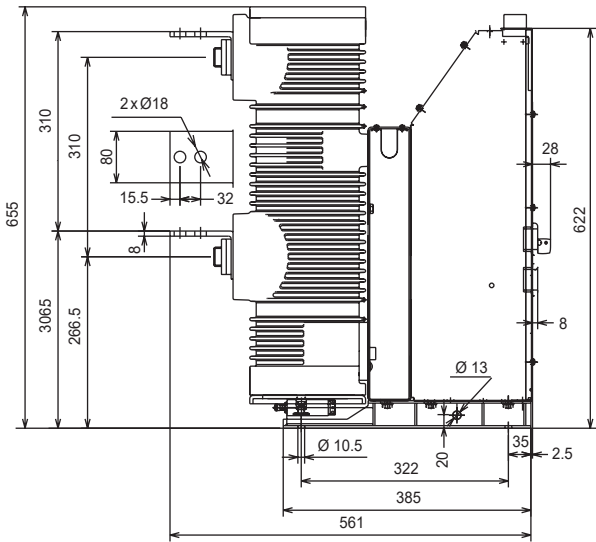
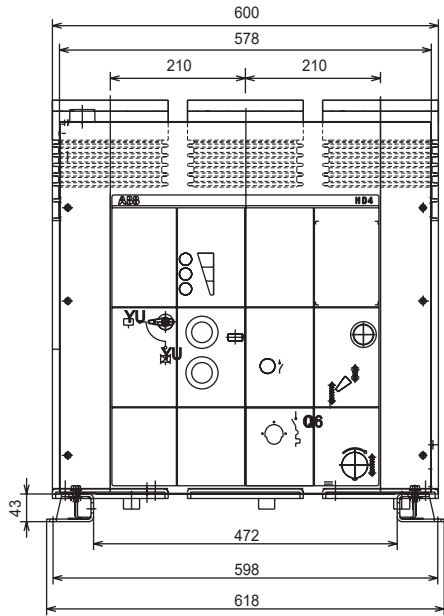
HD4		
TN	1VCD000231	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA



Fixed circuit breakers

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

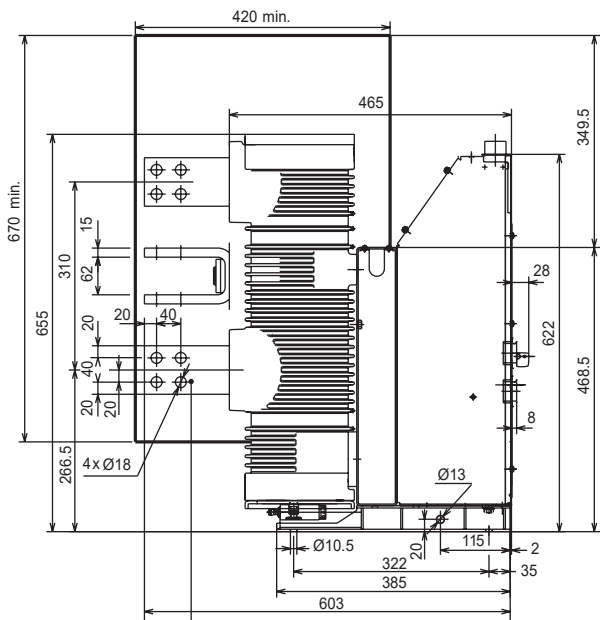
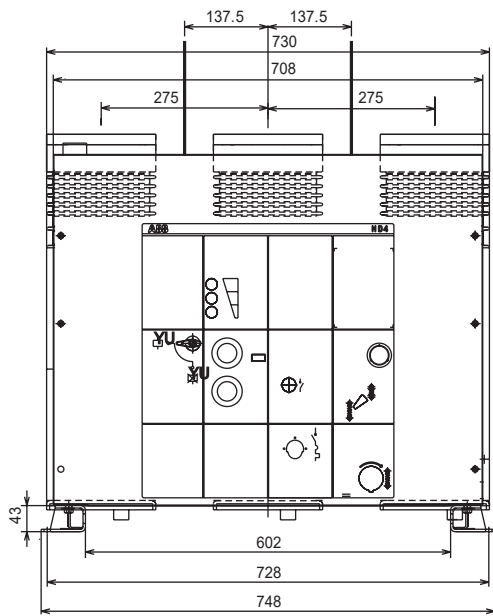
HD4		
TN	7163	
Ur	12	kV
	17,5	kV
Ir	2000	A
Isc	25	kA
	31.5	kA
	40	kA
	50	kA



Fixed circuit breakers

HD4		
TN	7165	
Ur	12	kV
	17.5	kV
Ir	2500	A
	3150	A
Isc	3600	A
	25	kA
	31,5	kA
	40	kA
	50	kA

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



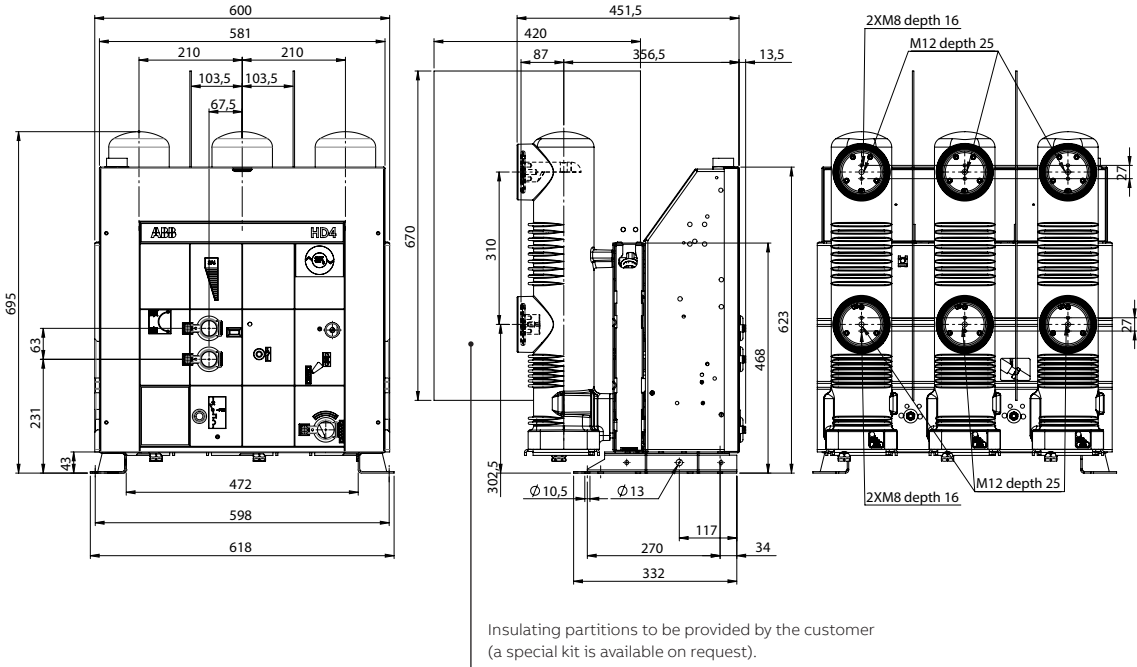
Insulating partitions (only for 24 kV)
to be provided by the customer
(a special kit is available on request).

7. Installation

7.9. Overall dimensions

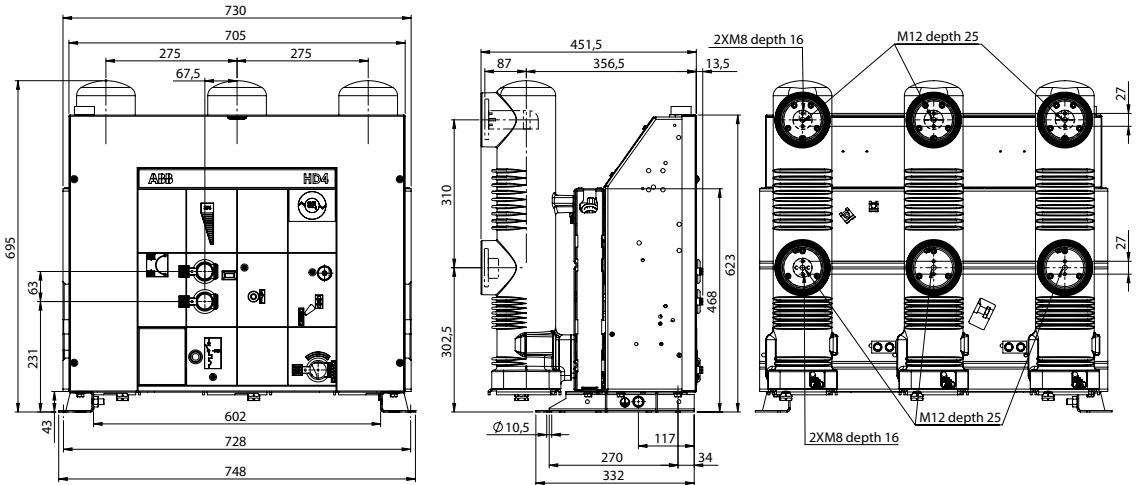
Fixed circuit breakers

HD4		
TN	1VCD000235	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA



Fixed circuit breakers

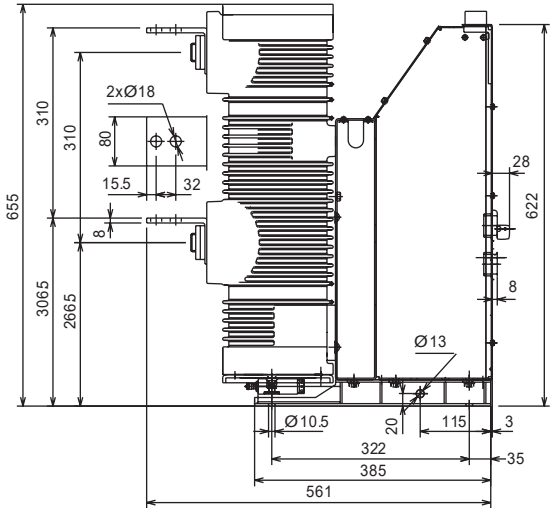
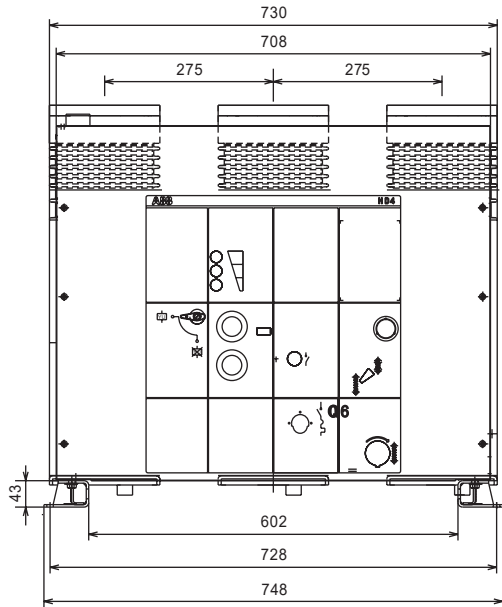
HD4		
TN	1VCD000237	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA



Fixed circuit breakers

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

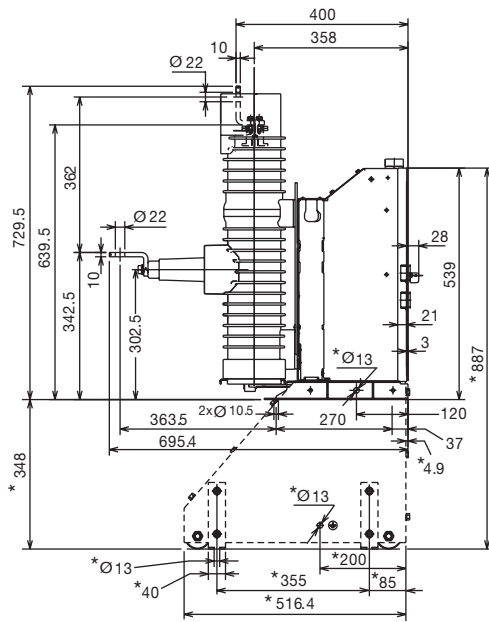
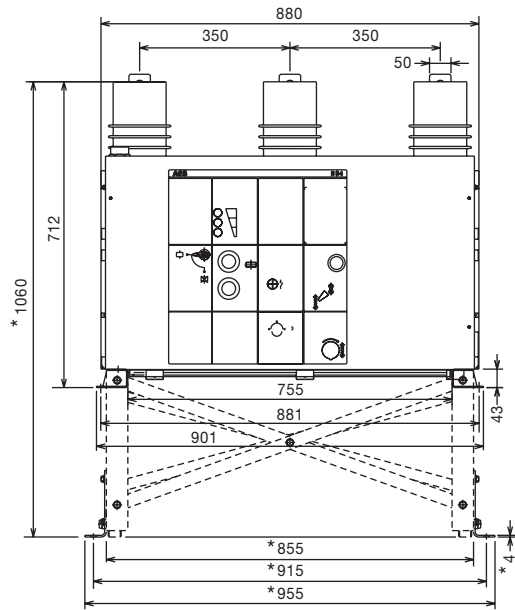
HD4			
TN	7174		
Ur	24	kV	
Ir	2000	A	
Isc	25	kA	
	31.5	kA	
	40	kA	



Fixed circuit breakers

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

* Distance with truck
(if provided).



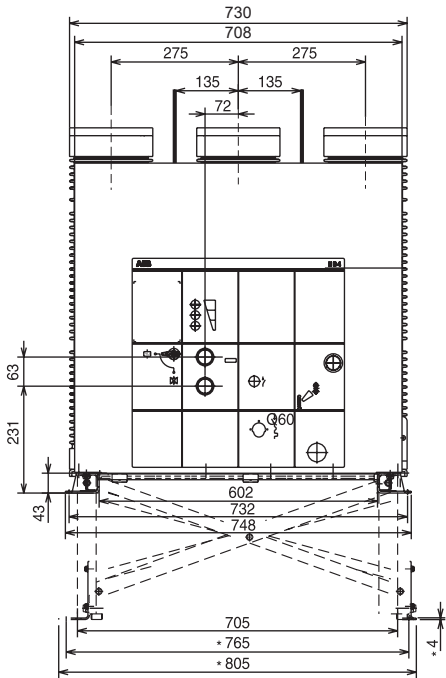
7. Installation

7.9. Overall dimensions

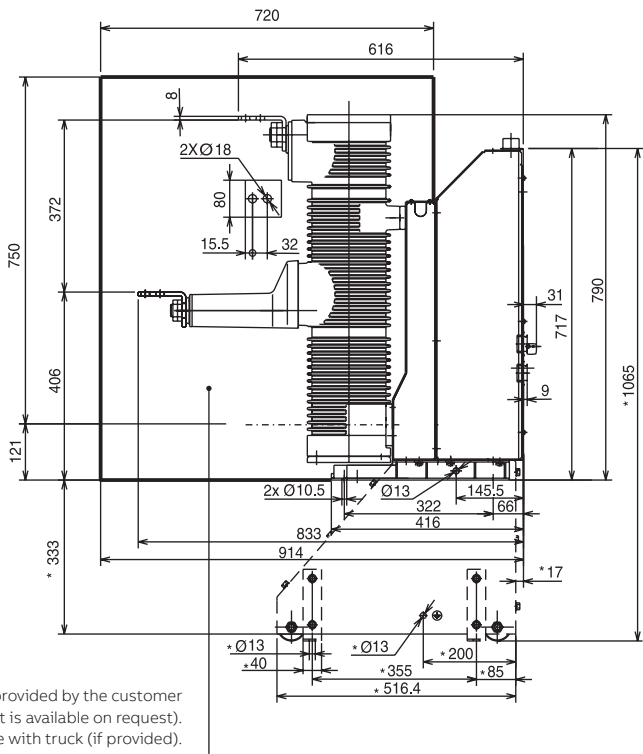
Fixed circuit breakers

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

HD4		
with truck		
(on request)		
TN	7268	
Ir	2000	A
	20	kA
Isc	25	kA
	31.5	kA

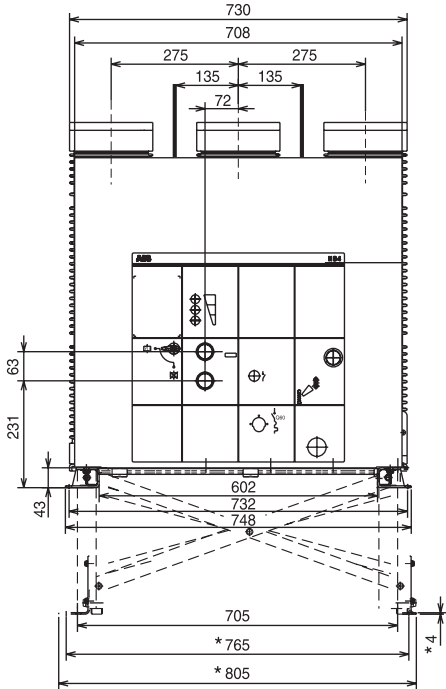


Insulating partitions to be provided by the customer
(a special kit is available on request).
* Distance with truck (if provided).

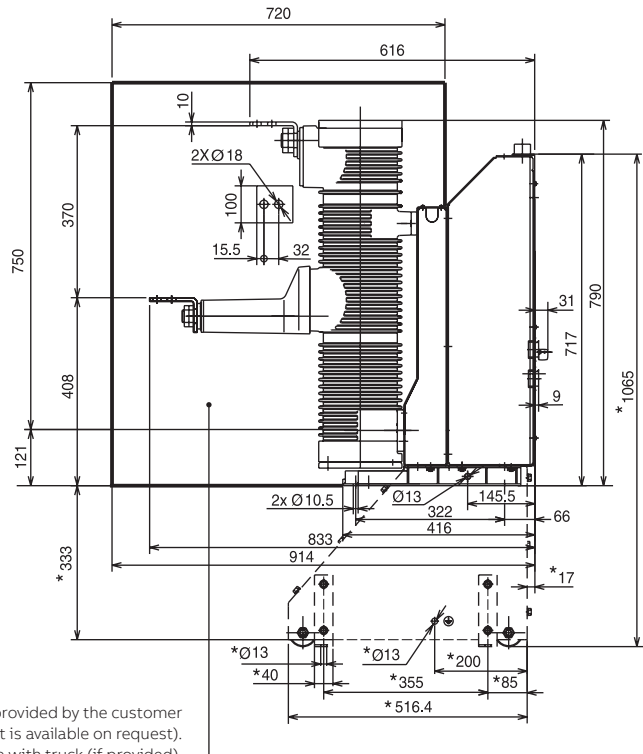


Fixed circuit breakers

HD4		
with truck		
(on request)		
TN	7315	
Ur	36	kV
Ir	2000	A
	20	kA
Isc	25	kA
	31.5	kA



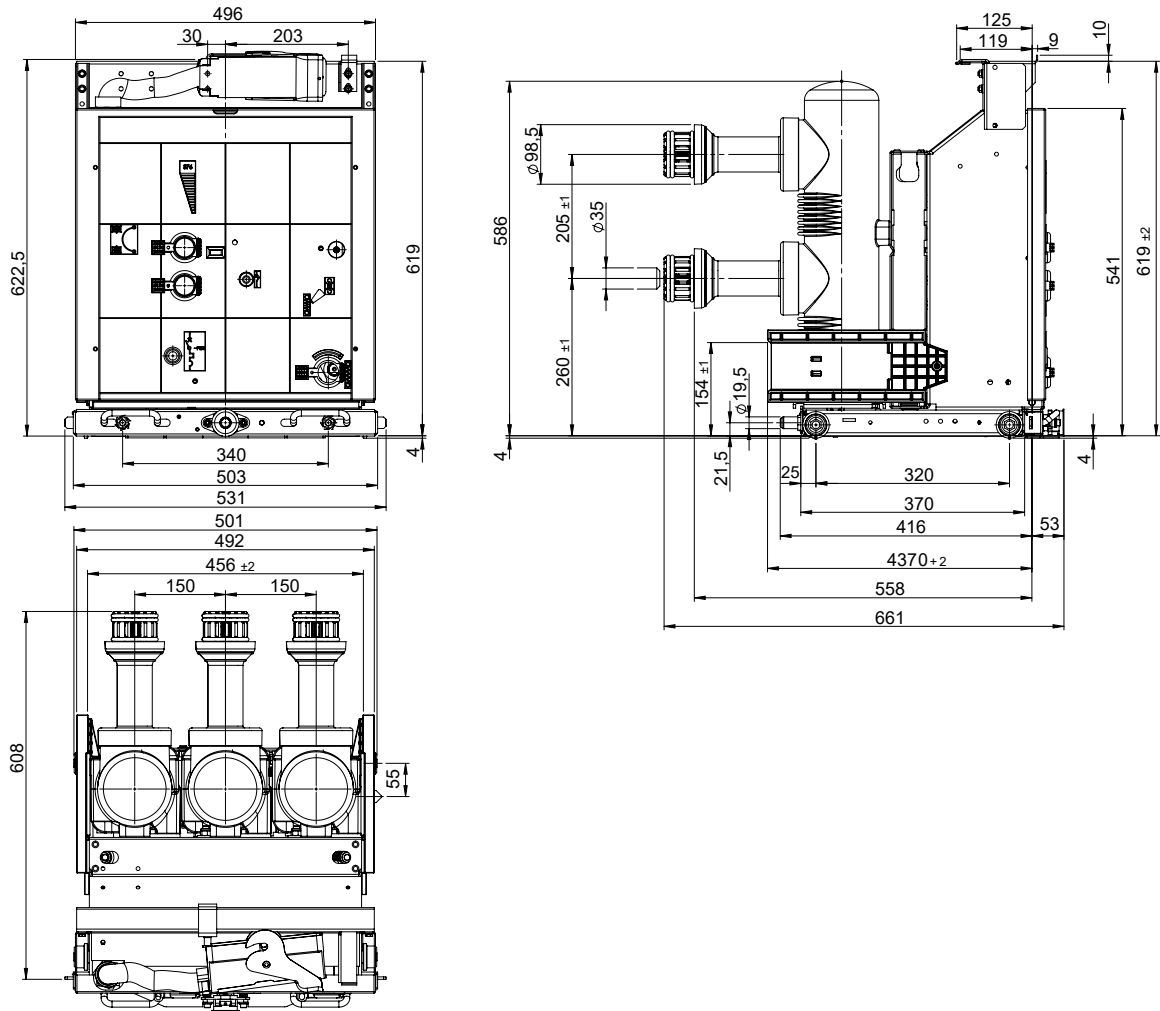
Insulating partitions to be provided by the customer
(a special kit is available on request).
* Distance with truck (if provided).



HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

HD4/P		
TN	1VCD000227	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	16	kA
	25	kA
	31.5	kA

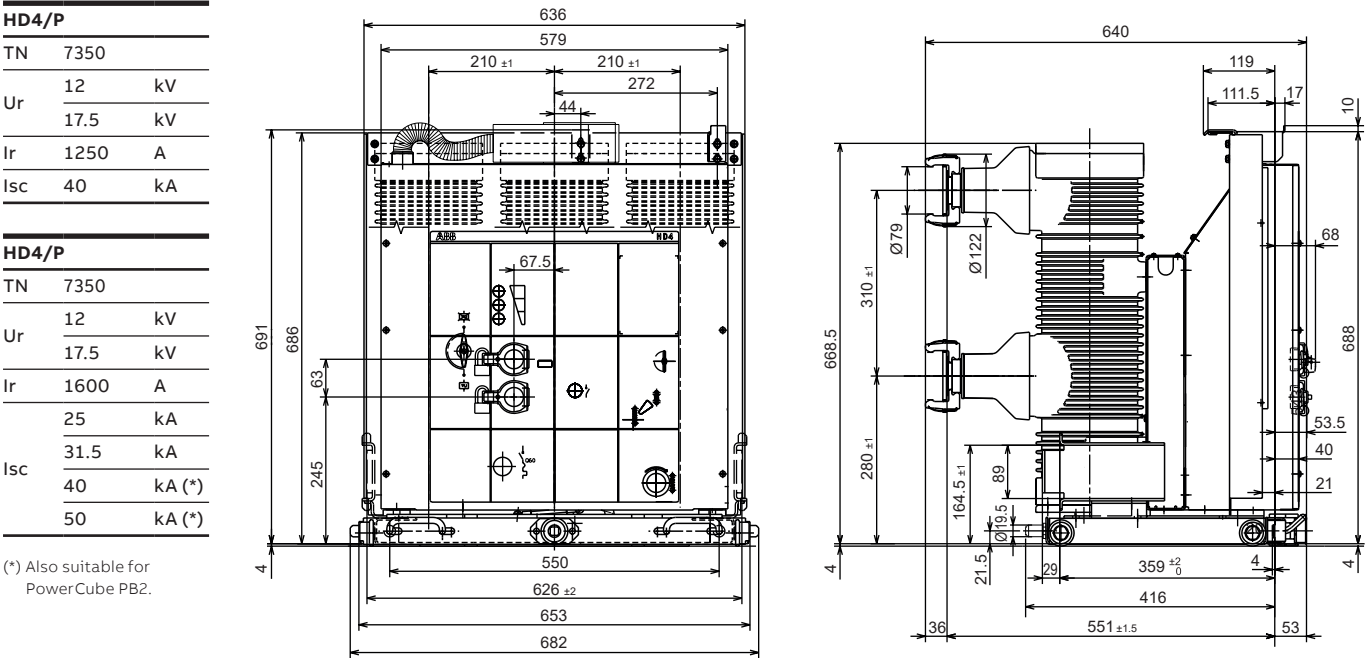
Also suitable for
PowerCube PB1



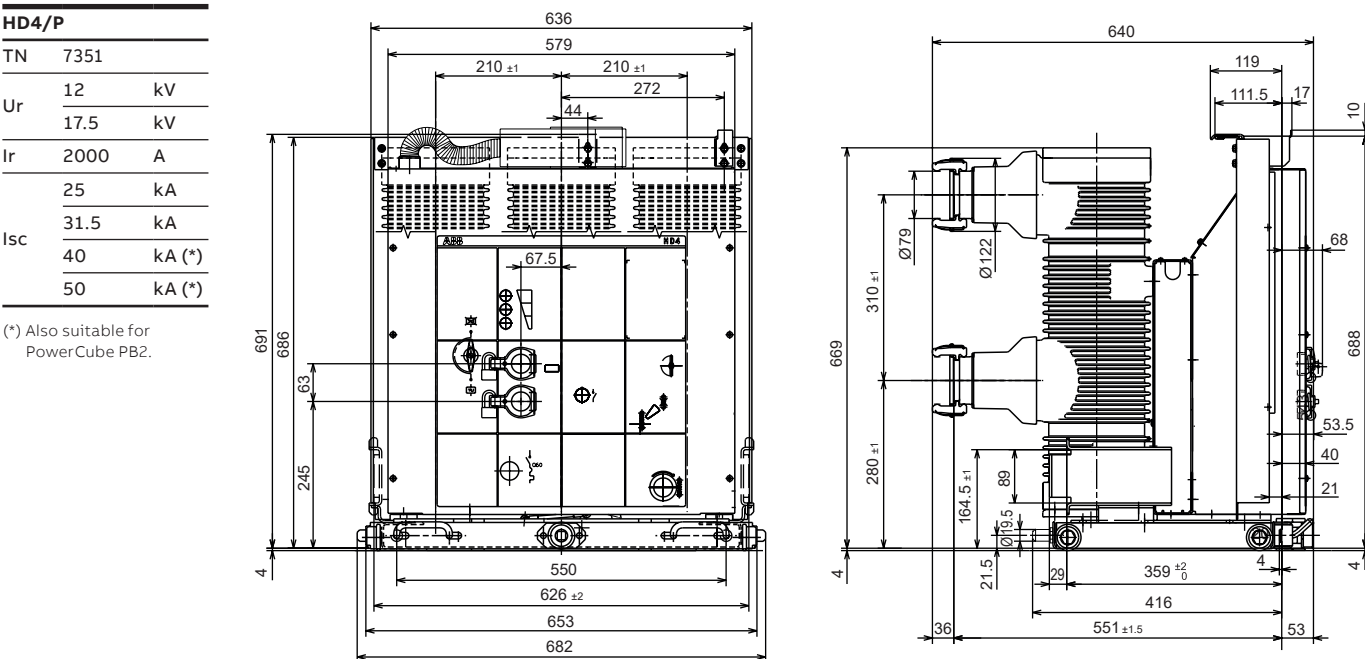
7. Installation

7.9. Overall dimensions

HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears



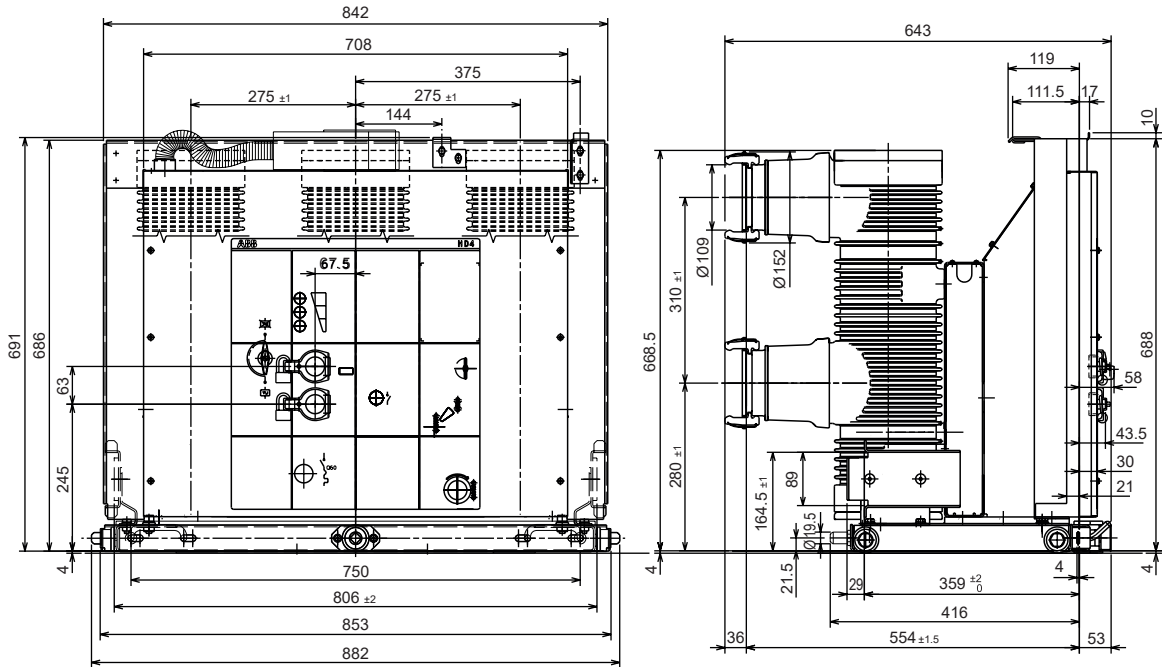
HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears



HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

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

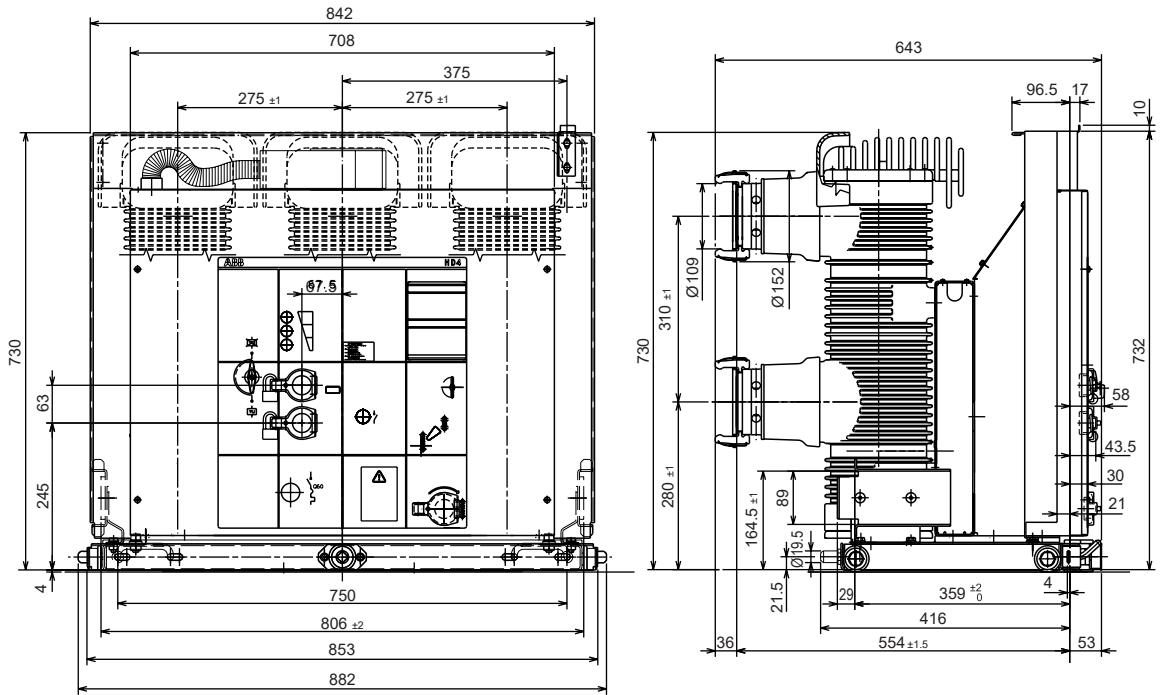
(*) Also suitable for PowerCube PB3.



HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

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

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



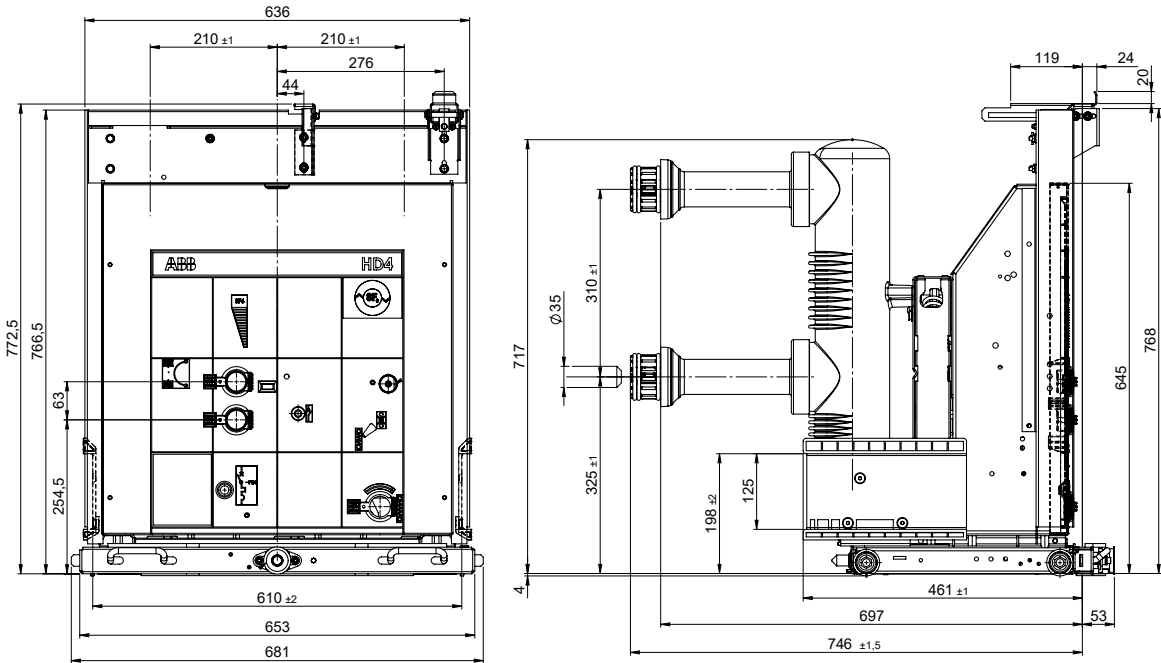
7. Installation

7.9. Overall dimensions

HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

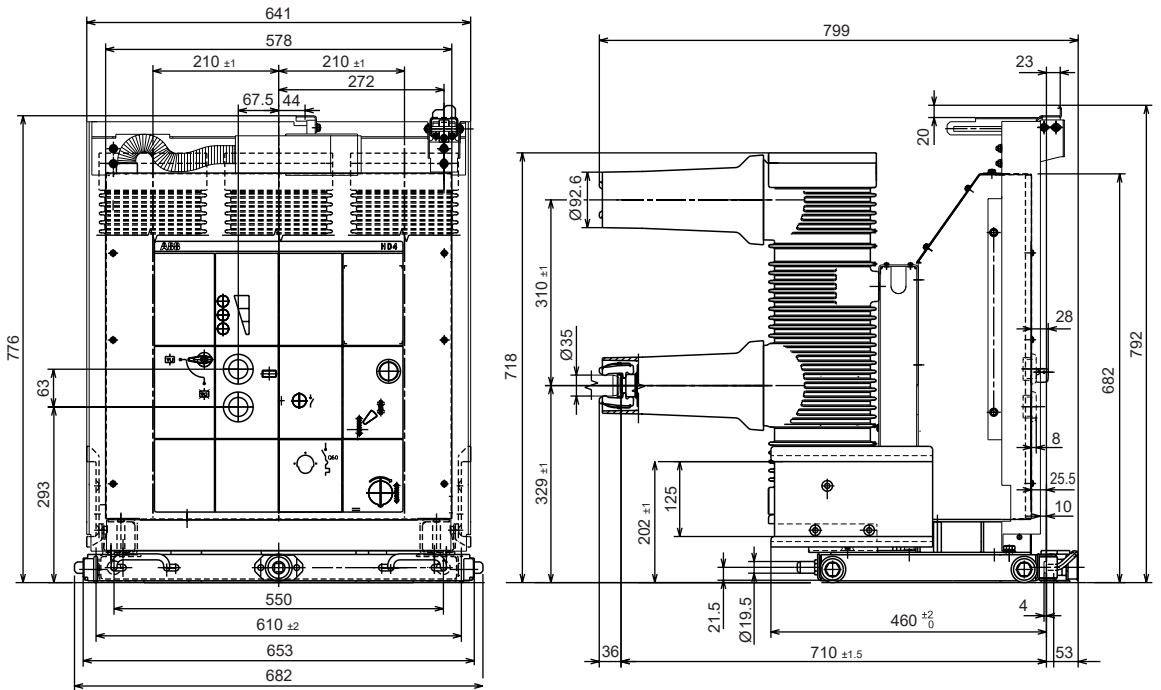
HD4/P			
TN	1VCD000236		
Ur	24	kV	
Ir	630	A	
	1250	A	
Isc	16	kA (*)	
	20	kA	
	25	kA	

(*) 630 A only.



HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

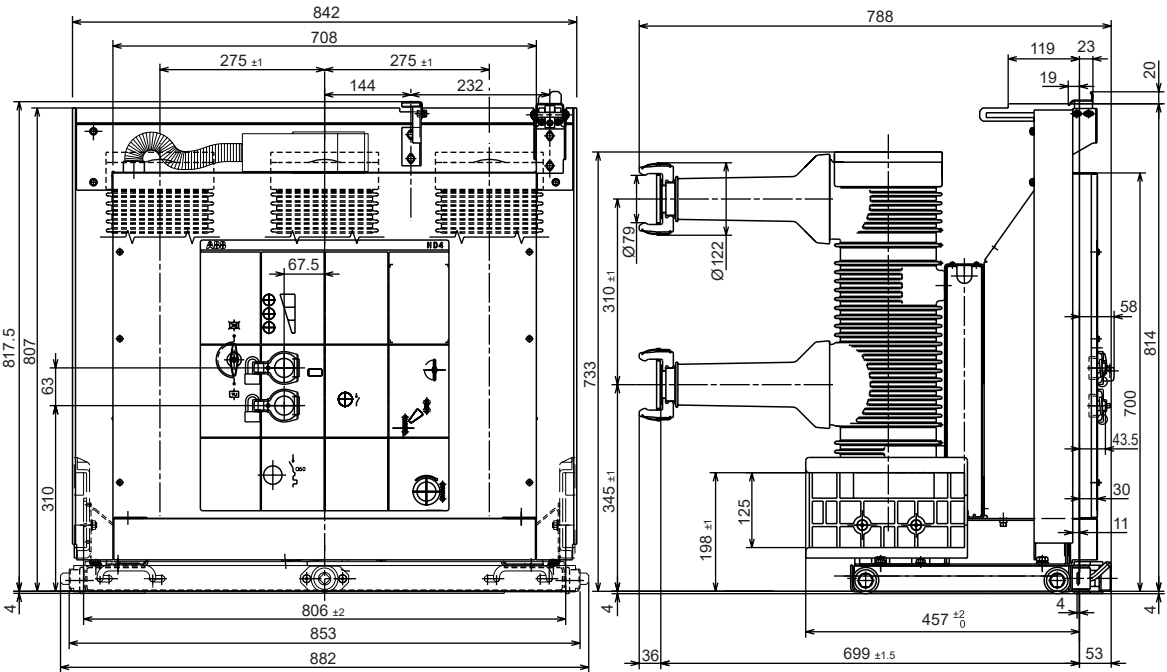
HD4/P			
TN	1VCD000099		
Ur	24	kV	
Ir	1250	A	
Isc	31.5	kA	



HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

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

(*) Also suitable for PowerCube PB5.



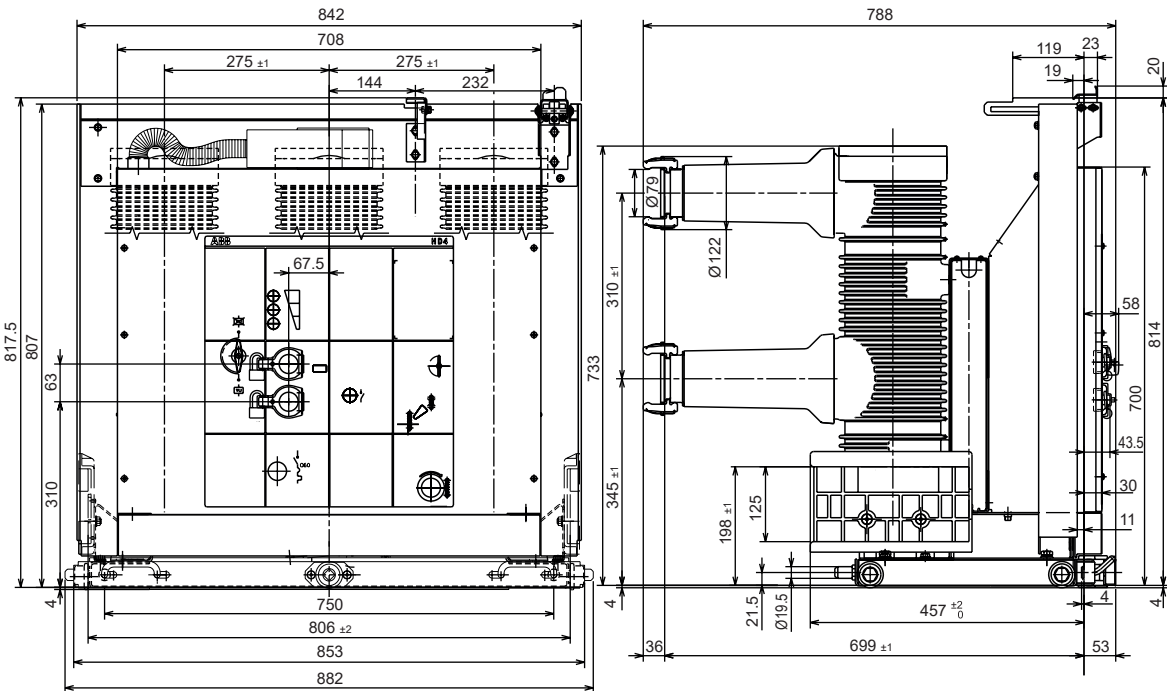
HD4/P withdrawable circuit breakers for UniGear type ZS1 switchgears

HD4/P		
TN	7356 (**)	
Ur	24	kV
Ir	2000	A
Isc	16	kA
	20	kA
	25	kA
	31,5	kA

HD4/P		
TN	7356 (**)	
Ur	24	kV
Ir	2500 A (*)	
Isc	20	kA
	25	kA
	31,5	kA

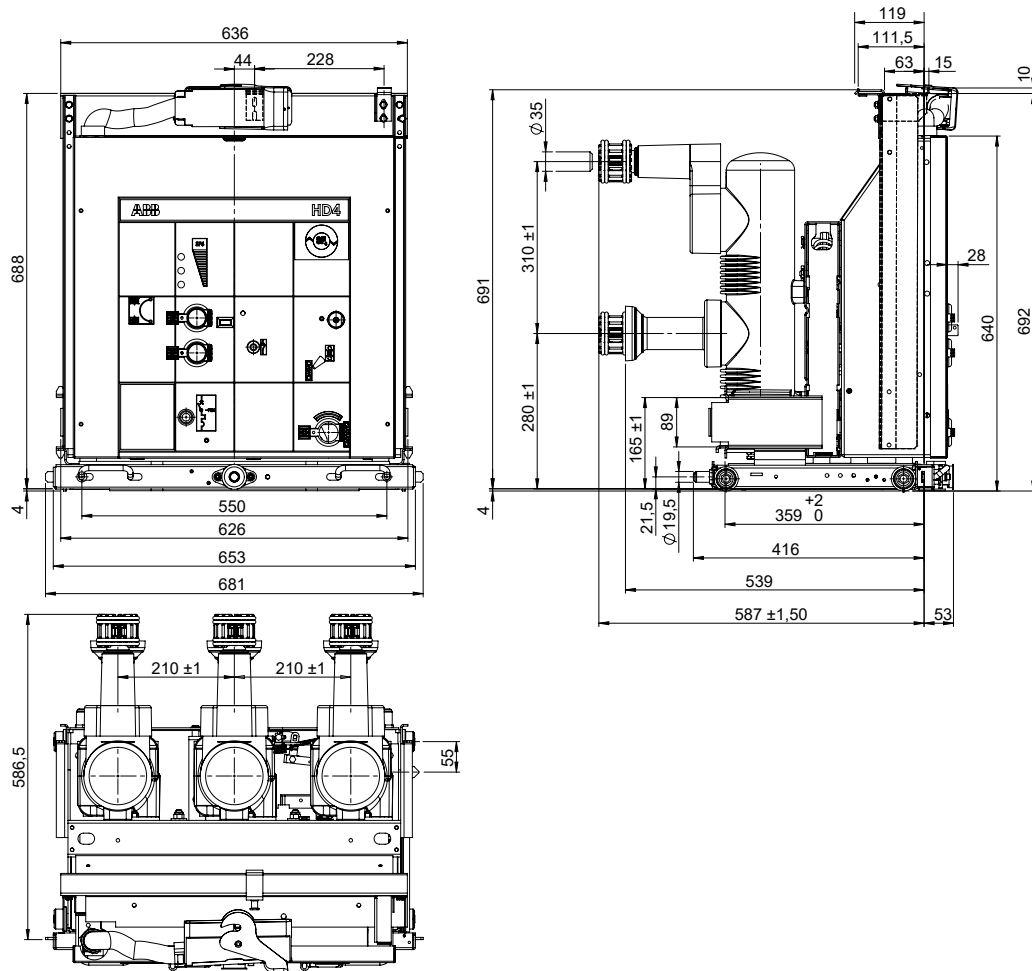
(*) 2500 A with forced ventilation; 2300 A with natural ventilation.

(**) Also suitable for PowerCube PB5.



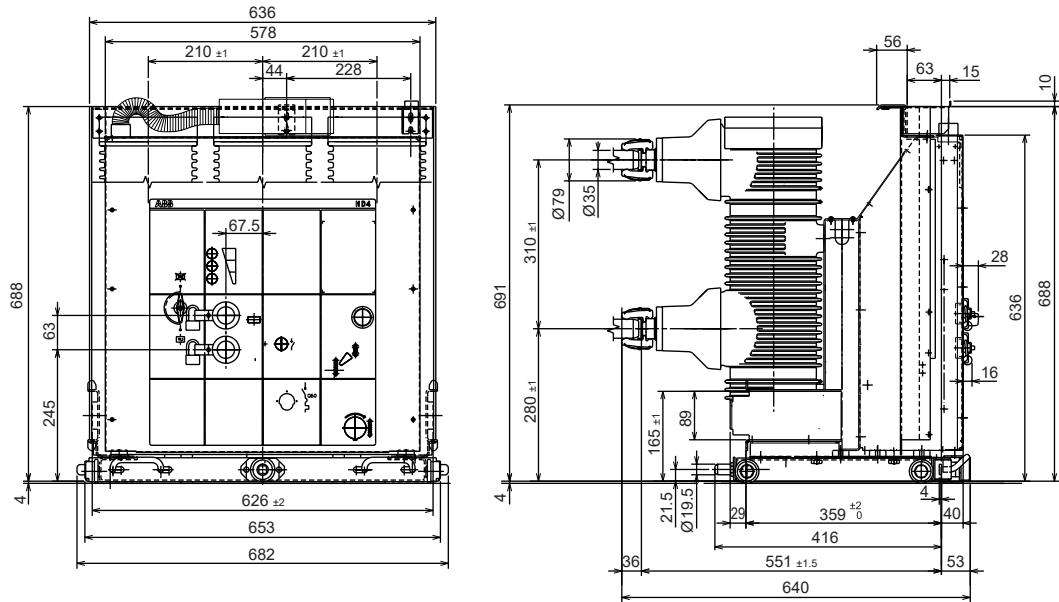
7.9. Overall dimensions

HD4/W		
TN	1VCD000228	
Ur	12	kV
	17.5	kV
I _r	630	A
	1250	A
I _{sc}	16	kA
	25	kA
	31.5	kA



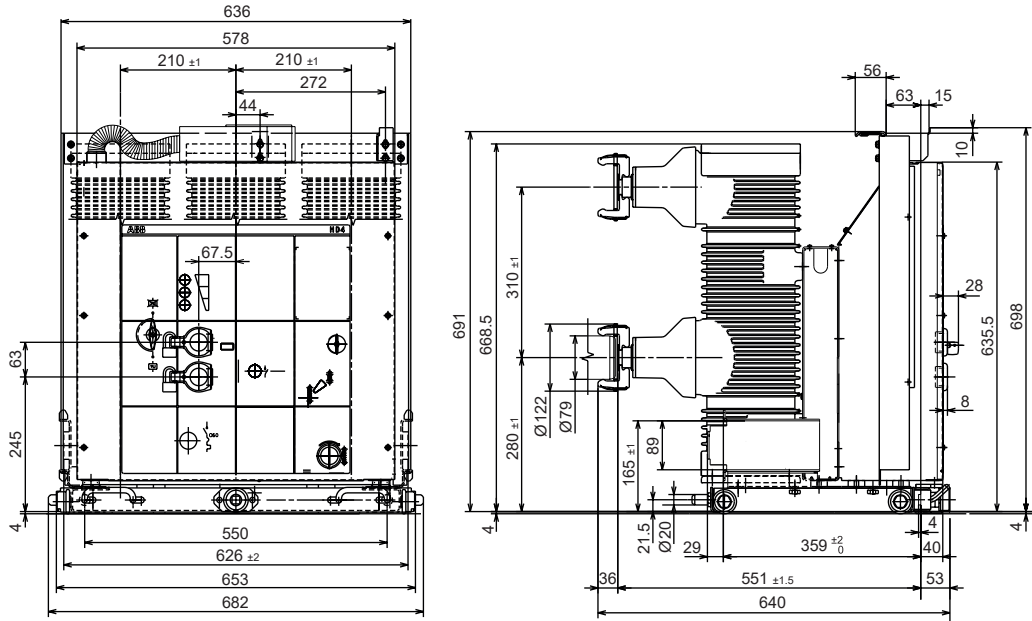
HD4/W withdrawable circuit breakers for PowerCube modules

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



HD4/W withdrawable circuit breakers for PowerCube modules

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

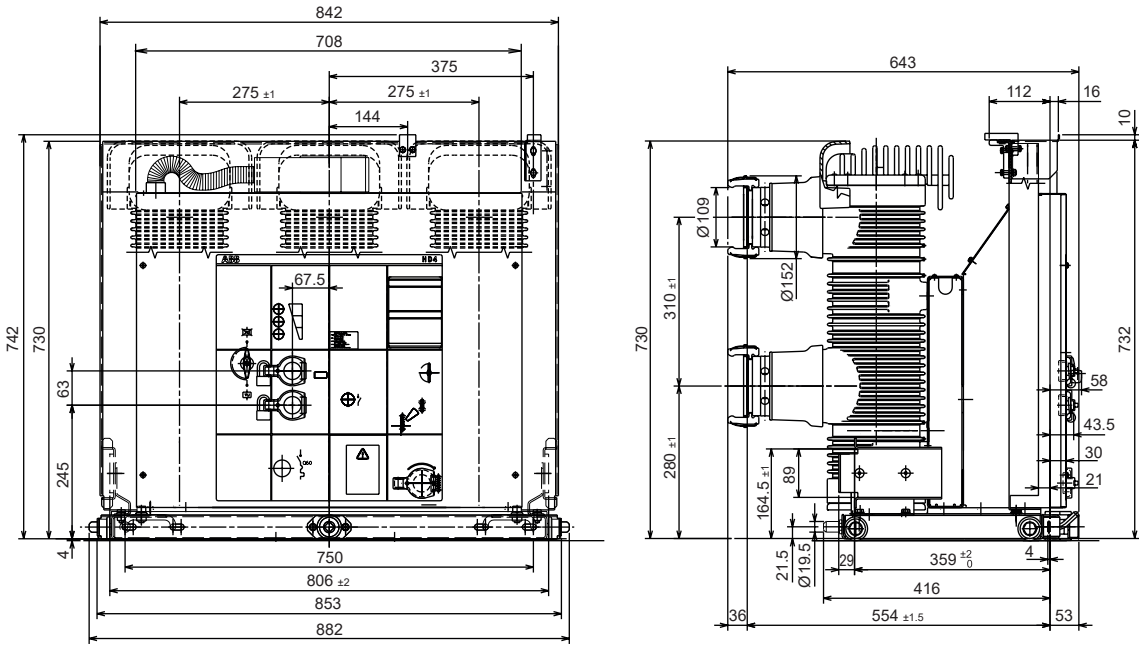


7. Installation

7.9. Overall dimensions

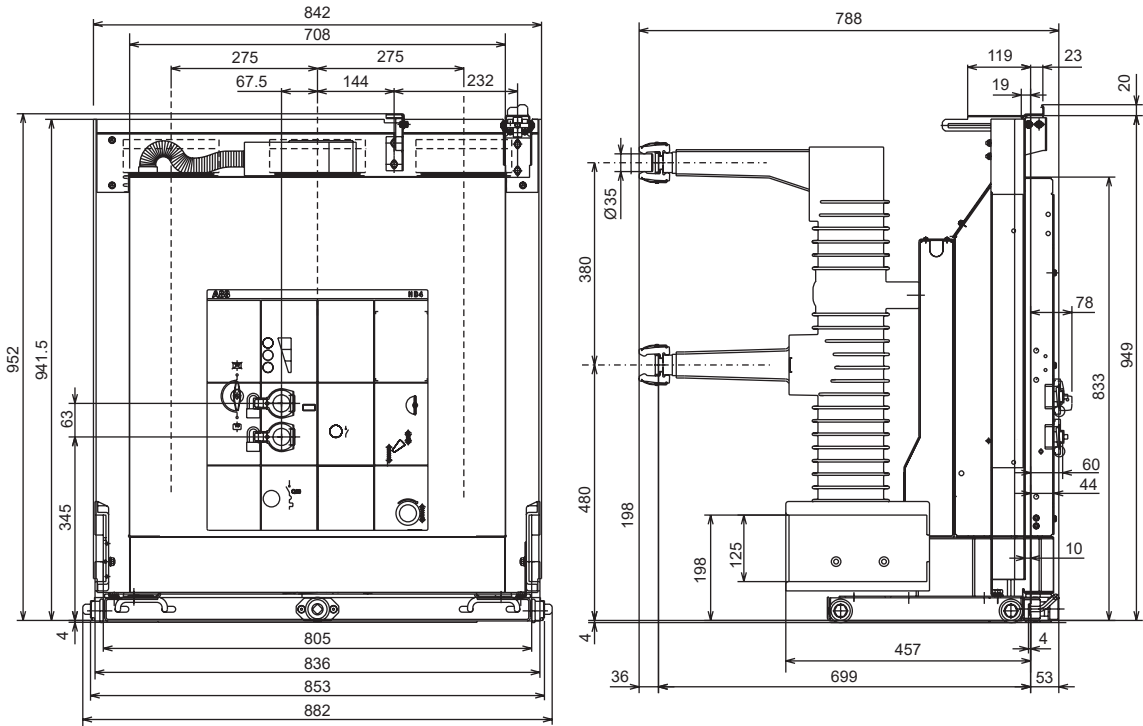
HD4/W withdrawable circuit breakers for PowerCube modules

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



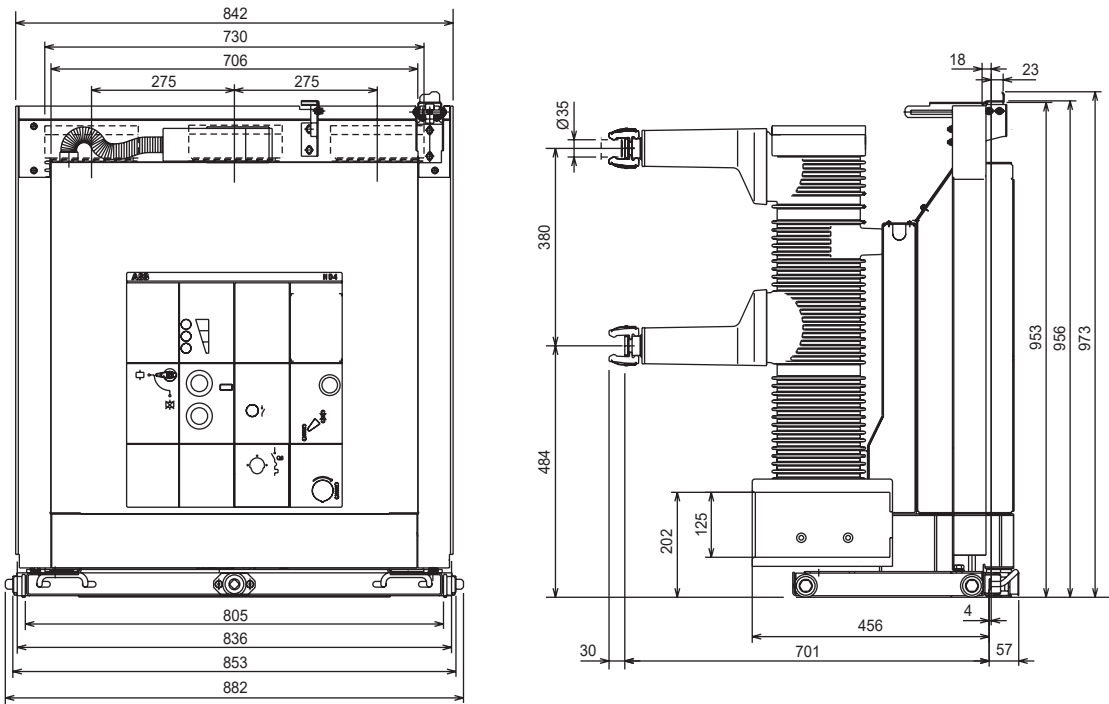
Withdrawable circuit breakers HD4/W for UniGear type ZS2 switchgear and for PowerCube module

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



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

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



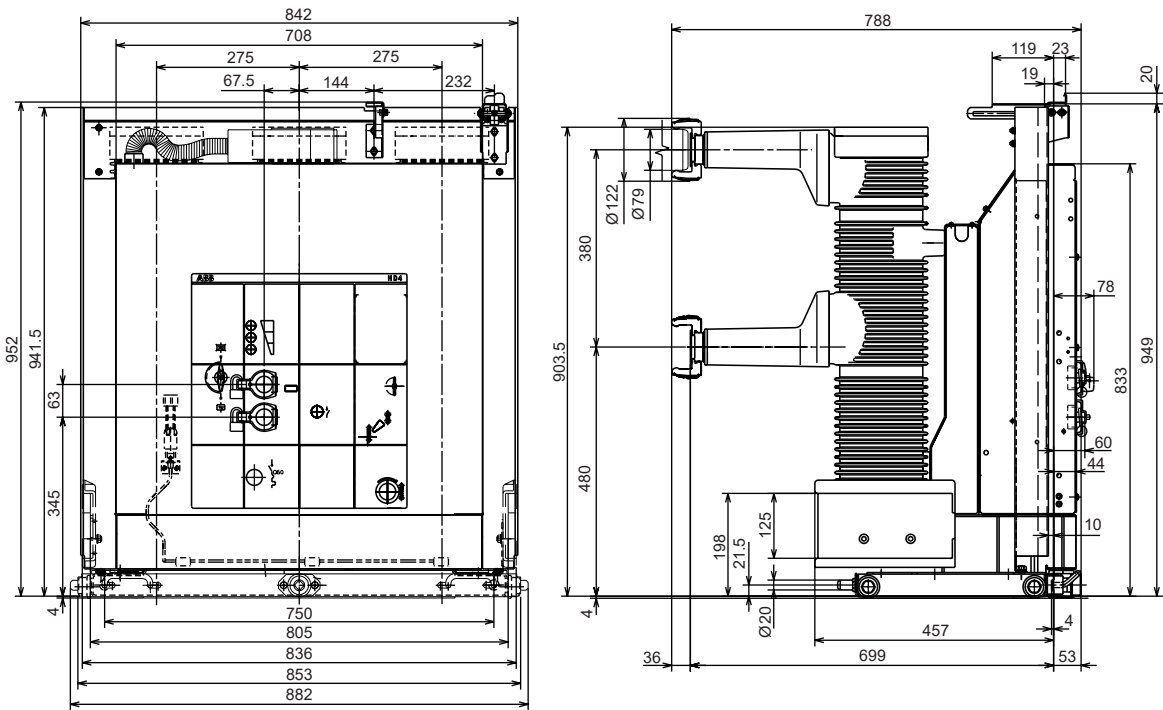
7. Installation

7.9. Overall dimensions

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

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

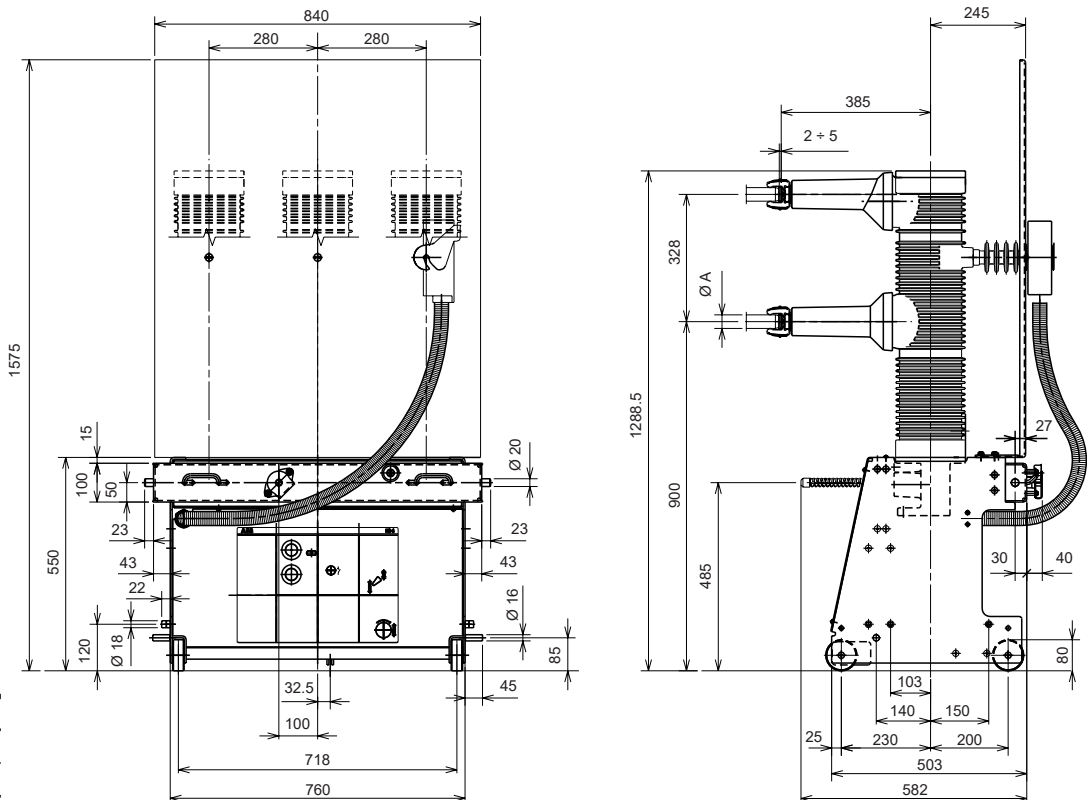
(*) With forced ventilation.



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

HD4/Z/40,5 kV			
TN	7227		
Ur	40,5	kV	
Ir	1250	A	
	1600	A	
	2000	A	
	2500	A (*)	
Isc	25	kA	
	31,5	kA	

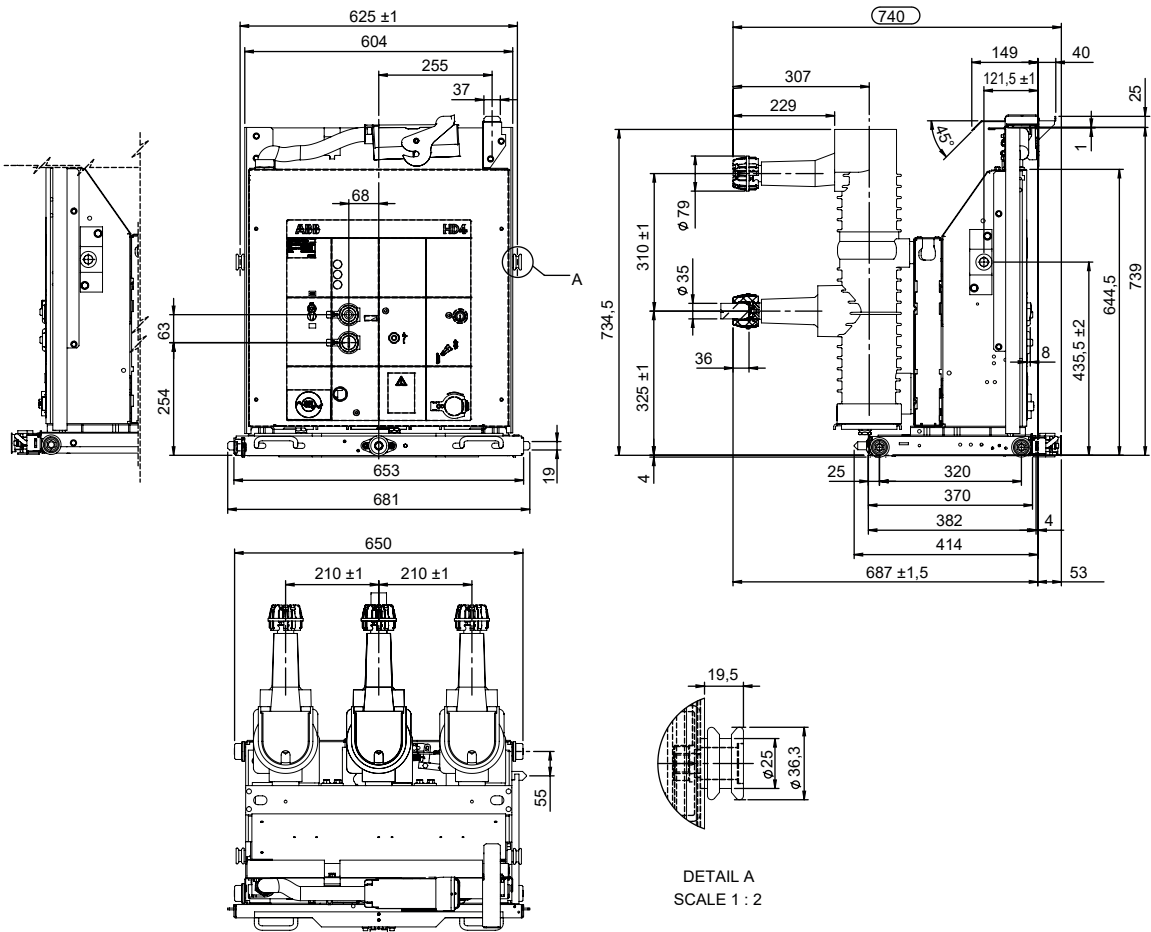
(*) With natural ventilation in loose enclosure type Powerbloc; with forced ventilation in switchgear type ZS3.2.



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

HD4/SEC withdrawable circuit breakers for UniSec switchgears

HD4/SEC 24 kV			
TN	1VCD000220		
Ur	24	kV	
Ir	630	A	
	1250	A	
Isc	169	kA	
	20	kA	



8. Putting into service

8.1. General procedures



All the operations regarding putting into service must be carried out by ABB personnel or customer personnel who are suitably qualified and have an in-depth knowledge of the apparatus and installation.

If the operations are prevented, do not force the mechanical interlocks, but check that the operation sequence is correct.

The operating forces which can be applied are indicated in paragraph 6.3.

Before putting the circuit breaker into service carry out the following operations:

- check the tightness of the power connections on the circuit breaker terminals;
- establish the setting of the direct solid-state overcurrent release (if provided);
- check that the value of the supply voltage for the auxiliary circuits is within 85% and 110% of the rated voltage of the electrical devices;
- check that no foreign body, such as packaging, has got into the moving parts;
- check that air circulation in the circuit breaker installation site is adequate so that there is no danger of overheating;
- carry out the checks indicated in the following table:

Subject of the inspection	Procedure	Positive check
1 Insulation resistance.	Medium voltage circuits With a 2500 V Megger, measure the insulation resistance between phases and exposed conductive part of the circuit.	The insulation resistance should be at least 50 MΩ and, in any case, constant in time.
	Auxiliary circuits With a 500 V Megger (installed equipment permitting) measure the insulation resistance between the auxiliary circuits and the exposed conductive part.	The insulation resistance should be a few MΩ and, in any case, constant in time
2 Auxiliary circuits.	Check that the connections to the control circuit are correct; proceed with relative supply.	Normal switchings and signalings
3 Manual operating mechanism.	Carry out a few closing and opening operations (see chap. 6). N.B. Supply the u/v release and the locking magnet on the operating mechanism at the relative rated voltage (if provided).	The operations and relative signals occur correctly.
4 Motor operator (if provided)	Supply the geared motor for spring charging at the relative rated voltage.	The springs are charged correctly. The signals are correct. The geared motor cuts off when the springs are charged.
	Carry out a few closing and opening operations. N.B. Supply the undervoltage release and the locking magnet on the operating mechanism at the relative rated voltage (if provided).	The geared motor recharges the springs after each closing operation.
5 Undervoltage release (if provided).	Supply the undervoltage release at the relative rated voltage and carry out the circuit breaker closing operation.	The circuit breaker closes correctly. The signals are correct.
	Disconnect the power supply to the release.	The circuit breaker opens. The signal changes over.

Subject of the inspection		Procedure	Positive check
6	Shunt opening release and additional shunt opening release (if provided).	Close the circuit breaker. Supply the shunt opening release at the relative rated voltage.	The circuit breaker opens correctly. The signals are correct.
7	Shunt closing release (if provided).	Open the circuit breaker. Supply the shunt closing release at the relative rated voltage.	The circuit breaker closes correctly. The signals are correct.
8	Key lock (if provided).	Open the circuit breaker. Turn the key and remove it. Attempt the circuit breaker closing operation.	Neither manual nor electric closing takes place.
		Insert the key again and turn it 90°. Carry out the closing operation.	Both electric and manual closing take place correctly; in this position the key cannot be removed.
9	Locking electromagnet (YL1) (if provided).	With the circuit breaker open, springs charged and locking electromagnet not supplied, attempt to close the circuit breaker both manually and electrically.	Closing is not possible.
10	Auxiliary contacts in the operating mechanism.	Insert the auxiliary contacts into suitable signalling circuits. Carry out a few closing and opening operations.	Signals occur correctly.
11	Locking electromagnet on the circuit breaker truck (YL2) (if provided).	With the circuit breaker open in the isolated for test position and the locking electromagnet not supplied, attempt to connect the circuit breaker.	Connection is not possible.
		Supply the locking electromagnet and carry out the connection operation.	Connection takes place correctly.
12	Auxiliary transmitted contacts for indicating that the circuit breaker is connected, isolated (CBE or PowerCube enclosures).	Insert the auxiliary contacts into suitable signalling circuits. With the circuit breaker inside the enclosure carry out a few translation operations from the isolated for test position to the connected position. Put the circuit breaker in the withdrawn position.	The signals of the relative operations occur correctly.
13	Electromechanical locking device (if provided) (CBE or PowerCube enclosures).	With no supply to the locking device try to rack-in the circuit breaker into the enclosure.	Racking-in is not possible.
		Supply the locking device at the relative rated voltage. Carry out the racking-in operation.	Racking-in is possible.

9. Periodical checking



Before carrying out any operation, make sure that the operating mechanism springs are discharged and that the apparatus is in the open position.

9.1. General

During normal service, the circuit breakers are maintenance-free. The frequency and sort of inspections basically depend on the service conditions. Various factors must be taken into account: frequency of operations, interrupted current values, relative power factor and the installation ambient.

The following paragraph gives the checking programme table, showing the relevant time intervals.

As far as the time interval between these operations is concerned, it is advisable to comply with specifications given in the table, at least during the first check. On the basis of the results obtained during the periodic inspections, set the optimal time limits for carrying out the following operations.

9.2. Checking programme

Checking operation	Time interval	Criteria
1 Carry out five mechanical opening closing operations.	1 year.	The circuit breaker must operate normally without stopping in intermediate positions
2 Visual inspection of the poles (parts in resin).	1 year or 5.000 operations.	The parts in resin must be free of any accumulation of dust, dirt, cracks, discharges or traces of surface discharges.
3 Visual inspection of the operating mechanism and transmission.	1 year or 5.000 operations.	The elements must be free of any deformation. Screws, nuts, bolts, etc. must be tight.
4 Visual inspection of the isolating contacts.	5 year or 5.000 operations.	The isolating contacts must be free of any deformation or erosion. Lubricate the contact elements with industrial vaseline greaseindustriale.
5 Measuring the insulation resistance.	5 year or 5.000 operations.	See para. 8.1. point 2.
6 Checking interlock operation.	5 year.	The interlocks provided must operate correctly.

After 10,000 operations or after 10 years, for installation in polluted and aggressive ambients, it is advisable to contact an ABB service center to have the circuit breaker checked.

10. Maintenance operations



Maintenance must only be carried out by ABB personnel or in any case by suitably qualified customer personnel who have in-depth knowledge of the apparatus (IEC 62271-1 para 10.4.2). Should the maintenance be carried out by the customer's personnel, responsibility for any interventions lies with the customer.

Replacement of any parts not included in the "List of spare parts/accessories" must only be carried out by ABB personnel.

In particular:

- Complete pole with bushings/connections
- Operating mechanism
- Closing spring unit
- Opening spring.

11. Indications for handling apparatus with SF₆

SF₆ in its pure state is an odourless, colourless, non-toxic gas with a density about six times higher than air. For this reason, although it does not have any specific physiological effects, it can produce the effects caused by lack of oxygen in ambients saturated with SF₆.

During the interruption phase of the circuit breaker, an electric arc is produced which decomposes a very small amount of SF₆. The decomposition products remain inside the poles and are absorbed by special substances which act as molecular sieves. The probability of contact with decomposed SF₆ is extremely remote, and its presence in small quantities (1-3 ppm) is immediately noticeable because of its sour and unpleasant smell. In this case, the room must be aired before anybody enters it. The strong infrared absorption of SF₆ and its long lifetime in the environment are the reasons for its high Global Warming Potential (GWP) which is 22.800 higher than CO₂, according to the Fourth Assessment Report.

The GWP is calculated over a time period of 100-years warming potential of 1 kg of a gas referred to 1 kg of CO₂. Its overall contribution to the global greenhouse gas effect from all applications amounts to approximately 0,2% overall.

However, the GWP of SF₆ alone is not adequate to measure the environmental impact of electric power equipment based on SF₆ technology.

The environmental impact of any specific application should be evaluated and/or compared using the Life Cycle Assessment – LCA approach as regulated by ISO 14040.

The Electric Industry utilises SF₆ in a closed cycle, banking it e.g. in gas insulated substations (GIS), medium-voltage and high-voltage gas circuit breakers (GCB), high-voltage gas insulated lines (GIL), gas insulated voltage transformers (GVT). In Asia, significant quantities of SF₆ are banked in gas insulated power transformers (GIT) as well.

The Electric Industry is reported as the most important user of SF₆, worldwide. In spite of being the most important user of SF₆, the Electric Industry is a low contributor to the global emission of SF₆, far below to other industries or users with “open application” of the gas. However, its importance as source substantially varies from region to region and from country to country, depending on the SF₆ handling procedures adopted, the tightness of the electric power equipment and the amount of gas banked in electric equipment.

For info about Life Cycle Assessment of apparatus, see document (1VCP000264).

To dispose of the SF₆ gas, please contact the ABB Assistance Service (see contact persons at <http://www.abb.com/ServiceGuide/alphabetical.aspx>) as this operation must be done only by trained and qualified personal; on request are available specific instructions for the evacuation of the SF₆ gas from the apparatuses.

The volume of SF₆ in each apparatus is indicated on the nameplate.

12. Spare parts and accessories



All assembly operations of spare parts/ accessories regarding installation, putting into service, service and maintenance must be carried out by ABB personnel or suitably qualified customer personnel with in-depth knowledge of the apparatus (IEC 62271-1 para. 10.4.2). Should the maintenance be carried out by the customer's personnel, responsibility for any interventions lies with the customer.

Before carrying out any operation, check that the circuit breaker is open, the springs discharged and that there is no voltage (medium voltage circuit and auxiliary circuits).

To order accessories or spare parts, please refer to the commercial ordering codes given in the technical catalogue and always indicate:

- circuit breaker type
- circuit breaker rated voltage
- circuit breaker rated thermal current
- circuit breaker breaking capacity
- circuit breaker serial number
- rated voltage of any electrical accessories.

For availability and ordering of spare parts please contact our Service department.e.

12.1. List of spare parts

- Shunt opening release
- Additional shunt opening release
- Undervoltage release
- Contact signalling undervoltage release energised/de-energised
- Undervoltage release delay device
- Mechanical exclusion device for undervoltage release
- Shunt closing release
- Spring charging geared motor with electric signalling of springs charged
- Geared motor thermomagnetic protection circuit breaker
- Contact signalling geared motor protection circuit breaker open/closed
- Contact signalling closing springs charged/ discharged
- Transient contact with momentary closure during circuit breaker opening
- Auxiliary circuit breaker contacts
- Locking electromagnet on operating mechanism
- Position contact of withdrawable truck
- Contacts signalling connected/isolated
- Opening solenoid
- Key lock in open position
- Isolation interlock with door
- Protection for opening pushbutton
- Protection for closing pushbutton
- Locking electromagnet on withdrawable truck
- Sliding earthing contact of withdrawable truck
- Opening/closing knob
- Set of six tulip contacts
- SF₆ gas pressure monitoring device.

13. Emergency Manual operation for Motorized Truck

The safest operation for people and equipment is the remote motorized rack-in/out feature with closed panel door; For emergency purpose operations only, it is possible to carry out manual operations following the next steps:

- To be able to insert the manual truck operating lever, firstly remove with a screwdriver the M4 screw from the Circuit Breaker truck power screw and take out the disk with the yellow warning label
- (!) Do not throw away the material as it shall be reassembled on the truck power screw after the manual rack-out operation
- Insert the lever in the truck collar and perform a standard manual rack out operation, as per Instruction Manual description
- If you face excessive resistance (i.e. greater than 25 Nm) please contact properly trained Service personnel
- Once the manual operation is done, the disk with warning label needs to be re-assembled on the truck with its original M4 screw. It is not necessary to use excessive torque to hold the disk in place since it is not subject to torque loosening during the motorized rackin/out operation
- Rack-in the breaker using the remote motorized feature with closed panel door.



- The racking-in/out operations must always be carried out whh the circuit breaker open.
- When putting into service for the first time, it is advisable to charge the circuit breaker operating mechanisms manually so as not to overload the auxiliary power suply circuit.

The application of excessive torque might rotate the power screw respect to its original angular position set during factory adjustments. In such case, the truck handles may get stuck. This situation can be solved simply by mean of one motorized rackin/out operation with closed panel doors or by restoring the original angle of the power screw respect to the truck.



Fig. 8

For further details please contact:



More product information:
abb.com/mediumvoltage
Your contact center:
abb.com/contactcenters
More service information:
abb.com/service

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