

VD4/R - VD4/L - VD4/UniAir - VD4/UniMix

Installation and maintenance instructions

12 ... 24 kV - 630 ... 1250 A - 12 ... 25 kA



ABB

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, place contact the ABB Assistance Service.

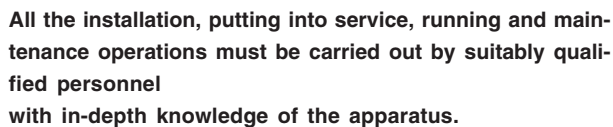
Index

I. Introduction	2
II. Programme for environmental protection	2
1. Packing and transport	2
2. Checking on receipt	2
3. Storage	3
4. Handling	4
5. Description	5
5.1. General information	5
5.2. Reference Standards	5
5.3. Fixed circuit-breakers	5
5.4. Circuit-breakers for ABB switchgear	9
5.5. Characteristics of the electrical accessories	16
6. Instructions for circuit-breaker operation	17
6.1. Safety indications	17
6.2. Switching and signalling parts	17
6.3. Circuit-breaker closing and opening operations	17
7. Installation	18
7.1. General	18
7.2. Installation and operating conditions	18
7.3. Preliminary operations	19
7.4. Installation of fixed circuit-breakers	19
7.5. Installation of circuit-breakers for ABB switchgear	19
7.6. Connections of the power circuit	19
7.7. Earthing	20
7.8. Connection of the auxiliary circuits	20
8. Putting into service	21
8.1. General procedures	21
9. Maintenance	22
9.1. General	22
9.2. Inspections and functionality tests	22
9.3. Overhauling	22
9.4. Repairs	24
10. Application of the standards for X-ray emission	25
11. Spare parts and accessories	25
11.1. List of spare parts	25
12. Overall dimensions	26

This publication contains the information needed to install and put the following medium voltage circuit-breakers into service:
VD4/R - VD4/L - VD4/UniAir - VD4/UniMix, and VD4/S, hereinafter called VD4.

However, this apparatus allows further technical-construction modifications (at the customer's request) to adapt to special installation requirements. Consequently, the information given below may sometimes not contain instructions concerning special configurations.

Only use original spare parts for maintenance operations.
For further information, please also see the technical catalogue of the
circuit-breaker and the spare parts catalogue.

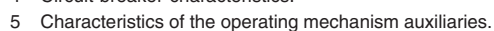


The VD4 circuit-breakers are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management). The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system.

The circuit-breaker is shipped in special packing, in the open position and with the springs discharged. Each piece of apparatus is protected by a plastic cover to prevent any infiltration of water during the loading and unloading stages and to keep the dust off during storage.

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

- any drawings or documents referring to special configurations/conditions.



2

3. Storage

When a period of storage is foreseen, our workshops can (on request) provide suitable packing for the specified storage conditions.

On receipt the apparatus must be carefully unpacked and checked as described in Checking on receipt (chap. 2).

If immediate installation is not possible, the packing must be replaced, using the original material supplied.

Insert packets of special hygroscopic substances inside the packing, with at least one standard packet per piece of apparatus.

Should the original packing not be available and immediate installation is not possible, store in a covered, well-ventilated, dry, dust-free, non-corrosive ambient, away from any easily flammable materials and at a temperature between -5°C and $+40^{\circ}\text{C}$.

In any case, avoid any accidental impacts or positioning which stresses the structure of the apparatus.

4. Handling

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

To lift and handle the circuit-breaker, proceed as follows (fig. 2):

- use special lifting ropes with safety hooks;
- insert the hooks in the supports (1) fixed to the frame of the circuit-breaker and lift.
- on completion of the operation (and in any case before putting into service) release the lifting tool and dismantle the supports (1) from the frame.

During handling, take great care not to stress the insulating parts and the terminals of the circuit-breaker.



The apparatus must not be handled by putting lifting devices directly under the apparatus itself. Should it be necessary to use this technique, put the circuit-breaker onto a pallet or a sturdy supporting surface (see fig. 3). In any case, it is always advisable to carry out lifting using the supports (3).

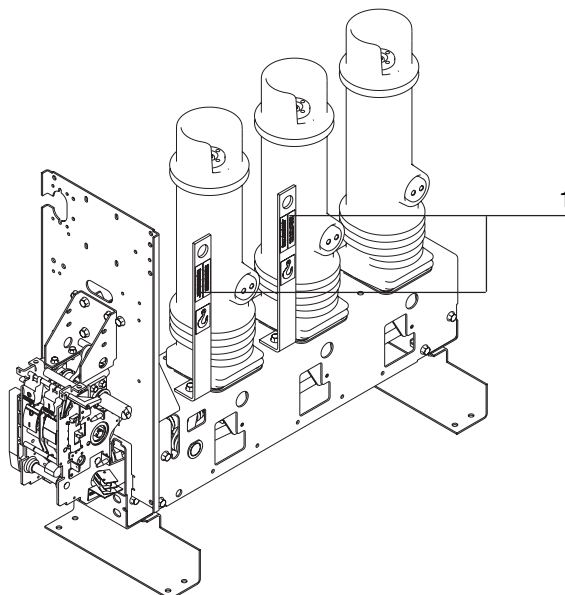


Fig. 2

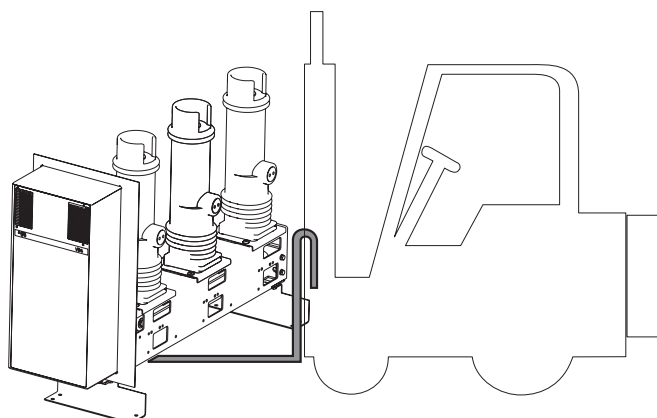


Fig. 3

5. Description

5.1. General

The VD4 series of circuit-breakers are pieces of apparatus under vacuum for indoor installation. For the electrical performances, please refer to the corresponding technical catalogue code 1VCP000263.

For special installation requirements, please contact ABB.

The VD4 series of medium voltage vacuum circuit-breakers for indoor installation with lateral operating mechanism are constructed using the separate pole technique.

Each pole has a vacuum interrupter inside it which, thanks to a special production process, is incorporated in the resin directly during the cylinder moulding stage.

This construction technique ensures protection of the vacuum interrupter against impact, dust and condensation phenomena.

The operating mechanism is the EL type with stored energy and free release, with opening and closing operations independent of the operator. The EL operating mechanism is already widely used in all the VD4 series circuit-breakers with front operating mechanism.

Remote control of the circuit-breaker is possible by means of applying special electrical accessories (geared motor, shunt opening and shunt closing release, etc.).

The operating mechanism, the three poles and the current sensors (if provided) are mounted on a metallic frame without wheels. Construction is particularly compact, sturdy and of limited weight.

The circuit-breakers in the VD4/R series with lateral operating mechanism are "sealed for life" pressure systems (IEC 62271-100 and CEI 17-1 Standards).

Versions available

VD4 circuit-breakers with lateral operating mechanism are available in the following versions:

- fixed with right lateral operating mechanism and 230 mm pole centre distance
- fixed with left lateral operating mechanism and 230 mm pole centre distance
- fixed with right lateral operating mechanism and 300 mm pole centre distance
- fixed with left lateral operating mechanism and 300 mm pole centre distance
- with right lateral operating mechanism, version for UniSwitch switchgear, 210 mm pole centre distance
- with right lateral operating mechanism, version for UniMix, switchgear, 230 mm pole centre distance
- with right lateral operating mechanism, version for UniAir, switchgear, 300 mm pole centre distance.

On request and according to the version, they can be fitted with two or three current sensors and with the PR521 series overcurrent protection device.

5.2. Reference Standards

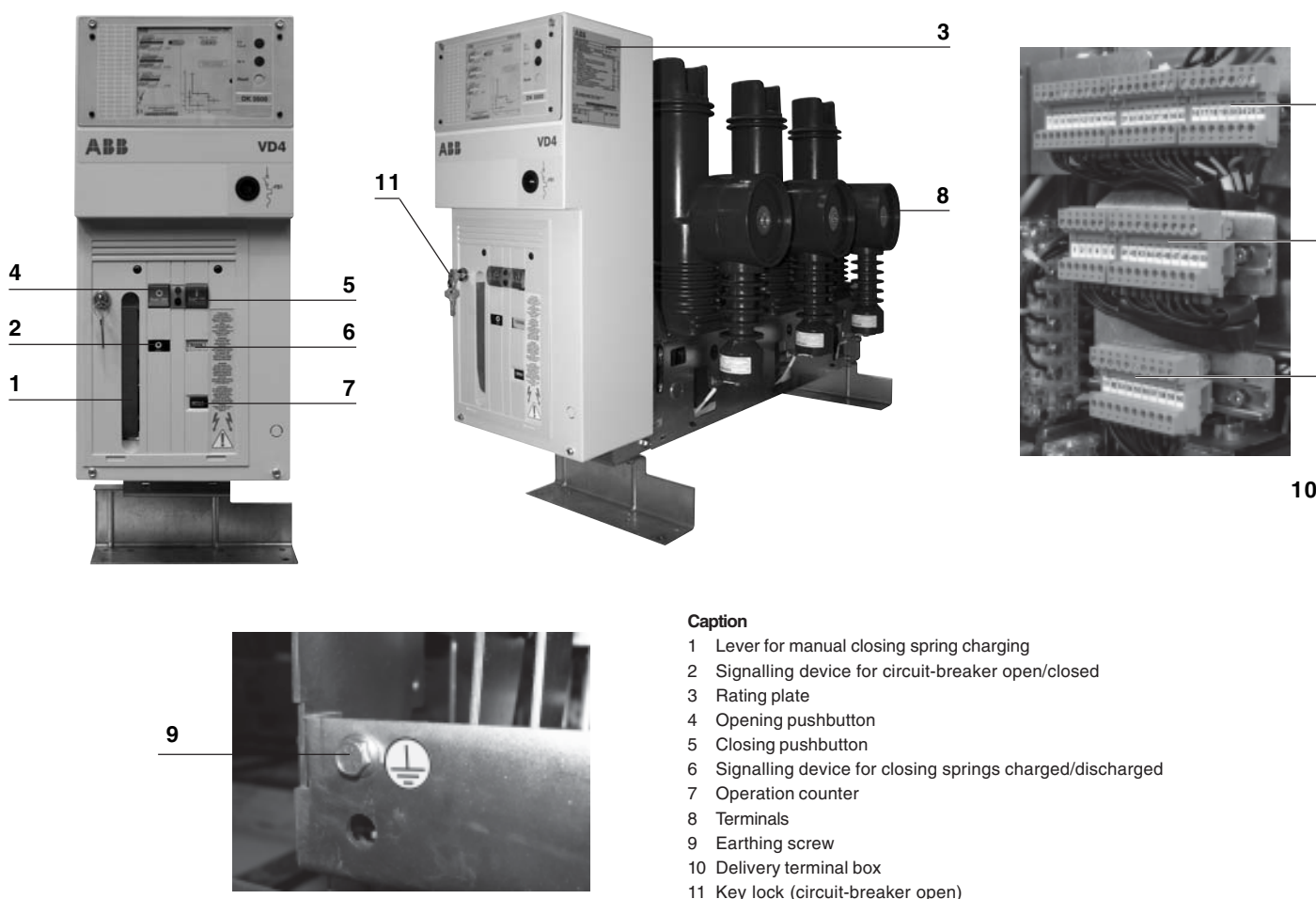
The VD4 circuit-breakers conform to the IEC 62271-100, CEI 17-1 file 1375 Standards and those of major industrialised countries.

5.3. Fixed circuit-breakers

The fixed circuit-breaker (fig. 4) is the basic version complete with structure and front protection screen. There are two drilled supports in the lower part of the structure to allow circuit-breaker fixing.

The terminal box (10) is available for the electrical connections of the circuit-breaker auxiliary circuits.

The earthing screw is placed in the rear part of the circuit-breaker. For further details please see the caption to figure 4.



Caption

- 1 Lever for manual closing spring charging
- 2 Signalling device for circuit-breaker open/closed
- 3 Rating plate
- 4 Opening pushbutton
- 5 Closing pushbutton
- 6 Signalling device for closing springs charged/discharged
- 7 Operation counter
- 8 Terminals
- 9 Earthing screw
- 10 Delivery terminal box
- 11 Key lock (circuit-breaker open)

Fig. 4

5.3.1. General characteristics of fixed circuit-breakers with right lateral operating mechanism (12 – 17.5 – 24 kV)



Circuit-breaker		VD4/R 12			VD4/R 17			VD4/R 24		
Standards	IEC 62271-100	■			■			■		
	CEI 17-1 (file 1375)	■			■			■		
Rated voltage	Ur [kV]	12			17.5			24		
Rated insulation voltage	Us [kV]	12			17.5			24		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28			38			50		
Impulse withstand voltage	Up [kV]	75			95			125		
Rated frequency	fr [Hz]	50-60			50-60			50-60		
Rated normal current (40°C)	Ir [A]	630	800	1250	630	800	1250	630	800	1250
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	12.5	—	—	12.5	—	—	12.5	—	—
		16	16	16	16	16	16	16	16	16
		20	20	20	20	20	20	20	20	20
		25	25	25	25	25	25	—	—	—
Rated short-time withstand current (3s)	Ik [kA]	12.5	—	—	12.5	—	—	12.5	—	—
		16	16	16	16	16	16	16	16	16
		20	20	20	20	20	20	20	20	20
		25	25	25	25	25	25	—	—	—
Making capacity	Ip [kA]	31.5	—	—	31.5	—	—	31.5	—	—
		40	40	40	40	40	40	40	40	40
		50	50	50	50	50	50	50	50	50
		63	63	63	63	63	63	—	—	—
Operation sequence	[O - 0.3s - CO - 15s - CO]	■	■	■	■	■	■	■	■	■
Opening time	[ms]	40...60			40...60			40...60		
Arcing time	[ms]	10...15			10...15			10...15		
Total breaking time	[ms]	50...75			50...75			50...75		
Closing time	[ms]	50...70			50...70			50...70		
Overall dimensions (maximum)	H [mm]	785			785			785		
	W [mm]	317			317			317		
	D [mm]	1029 ⁽¹⁾ / 1170 ⁽²⁾			1029 ⁽¹⁾ / 1170 ⁽²⁾			1029 ⁽¹⁾ / 1170 ⁽²⁾		
	Pole centre distance I [mm]	230 / 300			230 / 300			230 / 300		
Weight ⁽³⁾	[kg]	65 ⁽¹⁾ - 67 ⁽²⁾			65 ⁽¹⁾ - 67 ⁽²⁾			65 ⁽¹⁾ - 67 ⁽²⁾		
Application of PR521 protection device	In [A]	40 - 80 - 250 - 1250 ⁽⁴⁾			40 - 80 - 250 - 1250 ⁽⁴⁾			40 - 80 - 250 - 1250 ⁽⁴⁾		
Application of PR521/DK protection device		■ ⁽⁵⁾			■ ⁽⁵⁾			■ ⁽⁵⁾		
Table of standardised dimensions		1VCD000100 ⁽¹⁾			1VCD000100 ⁽¹⁾			1VCD000100 ⁽¹⁾		
		1VCD000101 ⁽²⁾			1VCD000101 ⁽²⁾			1VCD000101 ⁽²⁾		
Electric circuit diagram		1VCD400097			1VCD400097			1VCD400097		
Operating temperature	[°C]	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1	■			■			■		
Electromagnetic compatibility	IEC 60694	■			■			■		

(1) Pole centre distance: 230 mm

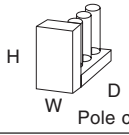
(2) Pole centre distance: 300 mm

(3) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg

(4) Rated current of the current sensors (the PR521 device and the current sensors are optional)

(5) DK type phase current sensors on board the circuit-breaker and toroidal CT for DK type homopolar protection not on board (the PR521/DK device and the DK sensors are optional)

5.3.2. General characteristics of fixed circuit-breakers with left lateral operating mechanism (12 – 17.5 – 24 kV)

Circuit-breaker		VD4/L 12			VD4/L 17			VD4/L 24			
Standards	IEC 62271-100	■			■			■			
	CEI 17-1 (file 1375)	■			■			■			
Rated voltage	Ur [kV]	12			17.5			24			
Rated insulation voltage	Us [kV]	12			17.5			24			
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28			38			50			
Impulse withstand voltage	Up [kV]	75			95			125			
Rated frequency	fr [Hz]	50-60			50-60			50-60			
Rated normal current (40°C)	Ir [A]	630	800	1250	630	800	1250	630	800	1250	
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	12.5	—	—	12.5	—	—	12.5	—	—	
		16	16	16	16	16	16	16	16	16	
		20	20	20	20	20	20	20	20	20	
		25	25	25	25	25	25	—	—	—	
Rated short-time withstand current (3s)	Ik [kA]	12.5	—	—	12.5	—	—	12.5	—	—	
		16	16	16	16	16	16	16	16	16	
		20	20	20	20	20	20	20	20	20	
		25	25	25	25	25	25	—	—	—	
Making capacity	Ip [kA]	31.5	—	—	31.5	—	—	31.5	—	—	
		40	40	40	40	40	40	40	40	40	
		50	50	50	50	50	50	50	50	50	
		63	63	63	63	63	63	—	—	—	
Operation sequence	[O - 0.3s - CO - 15s - CO]	■			■			■			
Opening time	[ms]	40...60			40...60			40...60			
Arcing time	[ms]	10...15			10...15			10...15			
Total breaking time	[ms]	50...75			50...75			50...75			
Closing time	[ms]	50...70			50...70			50...70			
Overall dimensions (maximum)		H [mm]	785			785			785		
		W [mm]	317			317			317		
		D [mm]	1029 ⁽¹⁾ / 1170 ⁽²⁾			1029 ⁽¹⁾ / 1170 ⁽²⁾			1029 ⁽¹⁾ / 1170 ⁽²⁾		
		Pole centre distance I [mm]	230 / 300			230 / 300			230 / 300		
Weight ⁽³⁾	[kg]	65 ⁽¹⁾ - 67 ⁽²⁾			65 ⁽¹⁾ - 67 ⁽²⁾			65 ⁽¹⁾ - 67 ⁽²⁾			
Application of PR521 protection device	In [A]	40 - 80 - 250 - 1250 ⁽⁴⁾			40 - 80 - 250 - 1250 ⁽⁴⁾			40 - 80 - 250 - 1250 ⁽⁴⁾			
Application of PR521/DK protection device		■ ⁽⁵⁾			■ ⁽⁵⁾			■ ⁽⁵⁾			
Table of standardised dimensions		1VCD003453 ⁽¹⁾			1VCD003453 ⁽¹⁾			1VCD003453 ⁽¹⁾			
		1VCD003454 ⁽²⁾			1VCD003454 ⁽²⁾			1VCD003454 ⁽²⁾			
Electric circuit diagram		1VCD400097			1VCD400097			1VCD400097			
Operating temperature	[°C]	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40			
Tropicalization	IEC: 60068-2-30, 60721-2-1	■			■			■			
Electromagnetic compatibility	IEC 60694	■			■			■			

(1) Pole centre distance: 230 mm

(2) Pole centre distance: 300 mm

(3) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg

(4) Rated current of the current sensors (the PR521 device and the current sensors are optional)

(5) DK type phase current sensors on board the circuit-breaker and toroidal CT for DK type homopolar protection not on board (the PR521/DK device and the DK sensors are optional)

5.3.3. Types available of fixed circuit-breakers VD4/R 12-17-24 (right lateral operating mechanism)

				Pole centre distance		Technical documentation			
U [kV]	In [A]	Isc [kA]	Description	230 mm	300 mm	Dimensions	Electric diagram		
12	630	12.5	VD4/R 12.06.12	■	■	1VCD000100 (230 mm);	1VCD400097		
		16	VD4/R 12.06.16	■	■				
		20	VD4/R 12.06.20	■	■				
		25	VD4/R 12.06.25	■	■				
	800	16	VD4/R 12.08.16	■	■	1VCD000101 (300 mm)			
		20	VD4/R 12.08.20	■	■				
		25	VD4/R 12.08.25	■	■				
	1250	16	VD4/R 12.12.16	■	■				
		20	VD4/R 12.12.20	■	■				
		25	VD4/R 12.12.25	■	■				
	17.5	630	12.5	VD4/R 17.06.12	■	■		1VCD000100 (230 mm);	1VCD400097
			16	VD4/R 17.06.16	■	■			
20			VD4/R 17.06.20	■	■				
25			VD4/R 17.06.25	■	■				
800		16	VD4/R 17.08.16	■	■	1VCD000101 (300 mm)			
		20	VD4/R 17.08.20	■	■				
		25	VD4/R 17.08.25	■	■				
1250		16	VD4/R 17.12.16	■	■				
		20	VD4/R 17.12.20	■	■				
		25	VD4/R 17.12.25	■	■				
24		630	12.5	VD4/R 24.06.12	■	■	1VCD000100 (230 mm);	1VCD400097	
			16	VD4/R 24.06.16	■	■			
	20		VD4/R 24.06.20	■	■				
	800	16	VD4/R 24.08.16	■	■	1VCD000101 (300 mm)			
		20	VD4/R 24.08.20	■	■				
	1250	16	VD4/R 24.12.16	■	■				
		20	VD4/R 24.12.20	■	■				

VD4/L 12-17-24 (left lateral operating mechanism)

				Pole centre distance		Technical documentation	
U [kV]	In [A]	Isc [kA]	Description	230 mm	300 mm	Dimensions	Electric diagram
12	630	12.5	VD4/L 12.06.12	■	■	1VCD003453 (230 mm)	1VCD400097
		16	VD4/L 12.06.16	■	■		
		20	VD4/L 12.06.20	■	■		
		25	VD4/L 12.06.25	■	■		
	800	16	VD4/L 12.08.16	■	■	1VCD003454 (300 mm)	
		20	VD4/L 12.08.20	■	■		
		25	VD4/L 12.08.25	■	■		
	1250	16	VD4/L 12.12.16	■	■		
		20	VD4/L 12.12.20	■	■		
		25	VD4/L 12.12.25	■	■		
17.5	630	12.5	VD4/L 17.06.12	■	■	1VCD003453 (230 mm)	1VCD400097
		16	VD4/L 17.06.16	■	■		
		20	VD4/L 17.06.20	■	■		
		25	VD4/L 17.06.25	■	■		
	800	16	VD4/L 17.08.16	■	■	1VCD003454 (300 mm)	
		20	VD4/L 17.08.20	■	■		
		25	VD4/L 17.08.25	■	■		
	1250	16	VD4/L 17.12.16	■	■		
		20	VD4/L 17.12.20	■	■		
		25	VD4/L 17.12.25	■	■		
24	630	12.5	VD4/L 24.06.12	■	■	1VCD003453 (230 mm)	1VCD400097
		16	VD4/L 24.06.16	■	■		
		20	VD4/L 24.06.20	■	■		
	800	16	VD4/L 24.08.16	■	■	1VCD003454 (300 mm)	
		20	VD4/L 24.08.20	■	■		
	1250	16	VD4/L 24.12.16	■	■		
		20	VD4/L 24.12.20	■	■		

Standard fittings for fixed circuit-breakers

VD4/R fixed circuit-breakers with right lateral operating mechanism (230 or 300 mm centre distance) and VD4/L fixed circuit-breakers with left lateral operating mechanism (230 or 300 mm centre distance)
The basic coded version of the fixed circuit-breakers is always three-pole and is fitted with:

- 1 opening pushbutton
- 2 closing pushbutton
- 3 operation counter
- 4 mechanical signalling device for circuit-breaker open/closed
- 5 lever for manual spring charging (incorporated in the operating mechanism)
- 6 mechanical signalling device for closing springs charged/discharged.

The basic cabling ends at a terminal box. The terminal box is fitted with a removable part which allows the customer to make a disconnectable power cord (see images at the side).

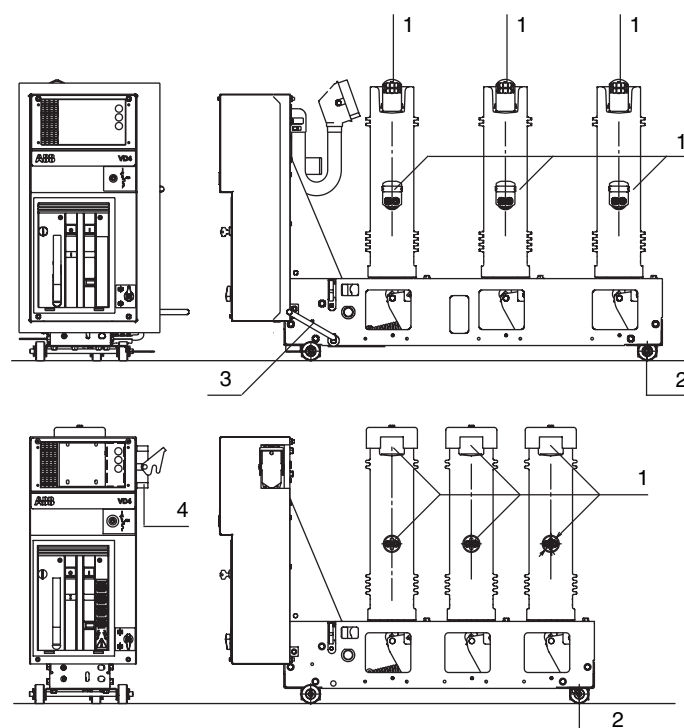
The basic version also includes the following accessories to be specified at the time of ordering: (see Kits 1, 2, 3).

- Kit 1** set of five open/closed auxiliary contacts or, alternatively and on payment, ten or fifteen auxiliary contacts. Each shunt opening release uses one NO auxiliary contact to de-energise after having opened the circuit-breaker, therefore there is one NO auxiliary contact less
- Kit 2** shunt opening release.
- Kit 3** key lock.

5.4. Circuit-breakers for ABB switchgear

Circuit-breakers (see fig. 5) available for UniSwitch, UniAir and UniMix switchgear.

They are basically derived from a fixed circuit-breaker to which the wheels, isolating contacts, locking lever and connector are applied.



Caption

- 1 Isolating contacts
- 2 Wheels
- 3 Release lever
- 4 Connector

Fig. 5

Standard fittings for ABB switchgear circuit-breaker

1. Circuit-breakers for UniSwitch switchgear with right lateral operating mechanism (centre distance 210 mm)

The basic coded version of the VD4/S circuit-breakers for UniSwitch switchgear is the same as that of the fixed circuit-breakers with the following exceptions and specific fittings:

- base fitted with wheels to facilitate handling and racking into the compartment of the UniSwitch switchgear,
- top and bottom terminals prepared for connection to the busbars of the UniSwitch switchgear
- insulating caps to be installed on the upper part of the poles (after having connected the busbars to the top terminals)
- special connector (58-pole male socket) fixed onto the right side of the operating mechanism casing. The connector is fitted with a lock which does not allow manual operation unless the plug fitted with the special insulating release pin is inserted
- insulating release pin to be inserted in the plug (58-pole female) to disable the lock which does not allow manual operation unless the plug is inserted in the socket on the operating mechanism.

On request and on payment, a set of 12 auxiliary contacts is available, alternatively to the group of 5 open/closed auxiliary contacts. Each shunt opening release uses one NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available.

2. Circuit-breakers for switchgear UniMix with right lateral operating mechanism (centre distance 230 mm)

The basic coded version of the circuit-breakers for UniSwitch switchgear is the same as that of the fixed circuit-breakers. The operating mechanism casing is fitted with a side frame specific to the UniMix unit which the circuit-breaker must be racked into. In particular:

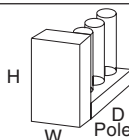
- type **VD4/UniMix-F** has the top and bottom terminals prepared for connection to the busbars of the UniMix switchgear P1/F unit. Alternatively and on payment, 10 or 15 auxiliary contacts are available. Each shunt opening release uses one NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available
- type **VD4/UniMix-R** has a base fitted with wheels to facilitate handling and racking into the switchgear compartment, a power cord with 58-pole plug for the auxiliary circuits, and the top and bottom terminals prepared for connection to the busbars of the UniMix switchgear P1/F unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses one NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available.

3. Circuit-breakers for switchgear UniAir with right lateral operating mechanism (centre distance 300 mm)

The basic coded version of the circuit-breakers for UniAir switchgear is the same as the one for the fixed circuit-breakers. The operating mechanism casing is fitted with a side frame specific to the UniAir unit which the circuit-breaker must be racked into. In particular:

- type **VD4/UniAir** has the base fitted with wheels to facilitate handling and racking into the switchgear compartment, a power cord with 58-pole plug for the auxiliary circuits, the top and bottom terminals prepared with flat contacts for connection to the isolator on the supply side and to the busbars (or DIN CT) on the load side of the UniAir switchgear P1/E unit, and the release lever which keeps the circuit-breaker locked in the unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses one NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available
- type **VD4/UniAir-2R** has the base fitted with wheels to facilitate handling and racking into the switchgear compartment, a power cord with 58-pole plug for the auxiliary circuits and the top and bottom terminals prepared with pliers for connection to the isolator on the supply and load side of the UniAir switchgear P1E/2R unit, and the release lever which keeps the circuit-breaker locked in the unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses one NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available
- type **VD4/UniAir-A** has the base fitted with wheels to facilitate handling and racking into the switchgear compartment, a power cord with 58-pole plug for the auxiliary circuits, the top fixed terminals and the bottom terminals are prepared with pliers for connection to the busbars/CT on the supply side and to the isolator on the load side of the UniAir switchgear P1/A unit, and the release lever which keeps the circuit-breaker locked in the unit. Alternatively and on payment, 12 auxiliary contacts are available. Each shunt opening release uses a NO auxiliary contact to de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available
- type **VD4/UniAir-F** is without wheels and power cord and only has the fixed bottom and top terminals prepared with pliers for connection to the busbars/CT on the load side of the UniAir switchgear P1/F unit. Alternatively and on payment, 10 or 15 auxiliary contacts are available. Each shunt opening release uses one NO auxiliary contact for de-energise after having carried out circuit-breaker opening, therefore for each shunt opening release installed there is one NO auxiliary contact less available.

General characteristics of circuit-breakers with right lateral operating mechanism for ABB UniSwitch type switchgear (12 – 17.5 – 24 kV)

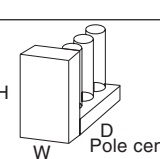
Circuit-breaker		VD4/S 12			VD4/S 17			VD4/S 24			
Standards	IEC 62271-100	■			■			■			
	CEI 17-1 (file 1375)	■			■			■			
Rated voltage	Ur [kV]	12			17.5			24			
Rated insulation voltage	Us [kV]	12			17.5			24			
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28			38			50			
Impulse withstand voltage	Up [kV]	75			95			125			
Rated frequency	fr [Hz]	50-60			50-60			50-60			
Rated normal current (40°C)	Ir [A]	630	800	1250	630	800	1250	630	800	1250	
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	
		16	16	16	16	16	16	16	16	16	
		20	20	20	20	20	20	20	20	20	
		25	25	25	—	—	—	—	—	—	
Rated short-time withstand current (3s)	Ik [kA]	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	
		16	16	16	16	16	16	16	16	16	
		20	20	20	20	20	20	20	20	20	
		25	25	25	—	—	—	—	—	—	
Making capacity	Ip [kA]	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	
		40	40	40	40	40	40	40	40	40	
		50	50	50	50	50	50	50	50	50	
		63	63	63	—	—	—	—	—	—	
Operation sequence	[O - 0.3s - CO - 15s - CO]	■			■			■			
Opening time	[ms]	40...60			40...60			40...60			
Arcing time	[ms]	10...15			10...15			10...15			
Total breaking time	[ms]	50...75			50...75			50...75			
Closing time	[ms]	50...70			50...70			50...70			
Overall dimensions (maximum)		H [mm]	730			730			730		
		W [mm]	282			282			282		
		D [mm]	990			990			990		
		Pole centre distance I [mm]	210			210			210		
Weight ⁽³⁾	[kg]	67			67			67			
Application of PR521 protection device	In [A]	40 - 80 - 250 - 1250 ⁽²⁾			40 - 80 - 250 - 1250 ⁽²⁾			40 - 80 - 250 - 1250 ⁽²⁾			
Application of PR521/DK protection device		see note ⁽³⁾			see note ⁽³⁾			see note ⁽³⁾			
Table of standardised dimensions		1VCD000098			1VCD000098			1VCD000098			
Electric circuit diagram		1VCD400098			1VCD400098			1VCD400098			
Operating temperature	[°C]	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40			
Tropicalization	IEC: 60068-2-30, 60721-2-1	■			■			■			
Electromagnetic compatibility	IEC 60694	■			■			■			

(1) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg

(2) Rated current of the current sensors (the PR521 device and the current sensors are optional)

(3) Special version with “B = 1” or “B = 1, RI” curves for the Belgian market: please ask ABB for availability and delivery times

General characteristics of circuit-breakers with right lateral operating mechanism for UniMix type switchgear (12 – 17.5 – 24 kV)

Circuit-breaker		VD4/UniMix 12	VD4/UniMix 17	VD4/UniMix 24
Standards	IEC 62271-100	■	■	■
	CEI 17-1 (file 1375)	■	■	■
Rated voltage	Ur [kV]	12	17.5	24
Rated insulation voltage	Us [kV]	12	17.5	24
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28	38	50
Impulse withstand voltage	Up [kV]	75	95	125
Rated frequency	fr [Hz]	50-60	50-60	50-60
Rated normal current (40°C)	Ir [A]	630	630	630
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	12.5	12.5	12.5
		16	16	16
		20	20	20
		25	25	—
Rated short-time withstand current (3s)	Ik [kA]	12.5	12.5	12.5
		16	16	16
		20	20	20
		25	25	—
Making capacity	Ip [kA]	31.5	31.5	31.5
		40	40	40
		50	50	50
		63	63	—
Operation sequence	[O - 0.3s - CO - 15s - CO]	■	■	■
Opening time	[ms]	40...60	40...60	40...60
Arcing time	[ms]	10...15	10...15	10...15
Total breaking time	[ms]	50...75	50...75	50...75
Closing time	[ms]	50...70	50...70	50...70
Overall dimensions (maximum)		H [mm]	700 ⁽⁴⁾ - 734 ⁽⁵⁾	700 ⁽⁴⁾ - 734 ⁽⁵⁾
		W [mm]	382 (IP30) - 393 (A.I.)	382 (IP30) - 393 (A.I.)
		D [mm]	1030	1030
		I [mm]	230	230
Weight ⁽³⁾	[kg]	65	65	65
Application of PR521 protection device	In [A]	40 - 80 - 250 - 1250 ⁽²⁾	40 - 80 - 250 - 1250 ⁽²⁾	40 - 80 - 250 - 1250 ⁽²⁾
Application of PR521/DK protection device		■ ⁽³⁾	■ ⁽³⁾	■ ⁽³⁾
Table of standardised dimensions		1VCD000106 ⁽⁴⁾	1VCD000106 ⁽⁴⁾	1VCD000106 ⁽⁴⁾
		1VCD000107 ⁽⁵⁾	1VCD000107 ⁽⁵⁾	1VCD000107 ⁽⁵⁾
Electric circuit diagram		1VCD400097 ⁽⁴⁾	1VCD400097 ⁽⁴⁾	1VCD400097 ⁽⁴⁾
		1VCD400098 ⁽⁵⁾	1VCD400098 ⁽⁵⁾	1VCD400098 ⁽⁵⁾
Operating temperature	[°C]	- 5 ... + 40	- 5 ... + 40	- 5 ... + 40
Tropicalization	IEC: 60068-2-30, 60721-2-1	■	■	■
Electromagnetic compatibility	IEC 60694	■	■	■

(1) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg

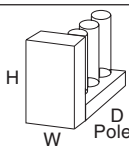
(2) Rated current of the current sensors (the PR521 device and the current sensors are optional)

(3) DK type phase current sensors on board the circuit-breaker and DK type toroidal CT not on board (the PR521/DK device and the DK sensors are optional)

(4) VD4/UniMix-F for P1/F Unit (fixed circuit-breaker without wheels and cabled to terminal box)

(5) VD4/UniMix-R for P1/F Unit (fixed circuit-breaker with wheels and power cord with plug)

General characteristics of circuit-breakers with right lateral operating mechanism for IP30 UniAir type switchgear (12 – 17.5 – 24 kV)

Circuit-breaker		VD4/UniAir 12			VD4/UniAir 17			VD4/UniAir 24		
Standards	IEC 62271-100	■			■			■		
	CEI 17-1 (file 1375)	■			■			■		
Rated voltage	Ur [kV]	12			17.5			24		
Rated insulation voltage	Us [kV]	12			17.5			24		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28			38			50		
Impulse withstand voltage	Up [kV]	75			95			125		
Rated frequency	fr [Hz]	50-60			50-60			50-60		
Rated normal current (40°C)	Ir [A]	630	800	1250	630	800	1250	630	800	1250
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	12.5	—	—	12.5	—	—	12.5	—	—
		16	16	16	16	16	16	16	16	16
		20	20	20	20	20	20	20	20	20
		25	25	25	25	—	—	—	—	—
Rated short-time withstand current (3s)	Ik [kA]	12.5	—	—	12.5	—	—	12.5	—	—
		16	16	16	16	16	16	16	16	16
		20	20	20	20	20	20	20	20	20
		25	25	25	25	—	—	—	—	—
Making capacity	Ip [kA]	31.5	—	—	31.5	—	—	31.5	—	—
		40	40	40	40	40	40	40	40	40
		50	50	50	50	50	50	50	50	50
		63	63	63	63	—	—	—	—	—
Operation sequence	[O - 0.3s - CO - 15s - CO]	■			■			■		
Opening time	[ms]	40...60			40...60			40...60		
Arcing time	[ms]	10...15			10...15			10...15		
Total breaking time	[ms]	50...75			50...75			50...75		
Closing time	[ms]	50...70			50...70			50...70		
Overall dimensions (maximum)		H [mm]	734.5 ^{(4) (5) (6)} - 725 ⁽⁷⁾		734.5 ^{(4) (5) (6)} - 725 ⁽⁷⁾		734.5 ^{(4) (5) (6)} - 725 ⁽⁷⁾			
		W [mm]	374 ^{(4) (5) (6)} - 282 ⁽⁷⁾		374 ^{(4) (5) (6)} - 282 ⁽⁷⁾		374 ^{(4) (5) (6)} - 282 ⁽⁷⁾			
		D [mm]	1170 ^{(4) (5) (6) (7)}		1170 ^{(4) (5) (6) (7)}		1170 ^{(4) (5) (6) (7)}			
		Pole centre distance I [mm]	300		300		300			
Weight ⁽³⁾	[kg]	70 ^{(4) (5) (6)} - 67 ⁽⁷⁾			70 ^{(4) (5) (6)} - 67 ⁽⁷⁾			70 ^{(4) (5) (6)} - 67 ⁽⁷⁾		
Application of PR521 protection device	In [A]	40 - 80 - 250 - 1250 ⁽²⁾			40 - 80 - 250 - 1250 ⁽²⁾			40 - 80 - 250 - 1250 ⁽²⁾		
Application of PR521/DK protection device		■ ⁽³⁾			■ ⁽³⁾			■ ⁽³⁾		
Table of standardised dimensions		1VCD000102 ⁽⁴⁾			1VCD000102 ⁽⁴⁾			1VCD000102 ⁽⁴⁾		
		1VCD000103 ⁽⁵⁾			1VCD000103 ⁽⁵⁾			1VCD000103 ⁽⁵⁾		
		1VCD000104 ⁽⁶⁾			1VCD000104 ⁽⁶⁾			1VCD000104 ⁽⁶⁾		
		1VCD000105 ⁽⁷⁾			1VCD000105 ⁽⁷⁾			1VCD000105 ⁽⁷⁾		
		1VCD400098 ^{(4) (5) (6)}			1VCD400098 ^{(4) (5) (6)}			1VCD400098 ^{(4) (5) (6)}		
Electric circuit diagram		1VCD400097 ⁽⁷⁾			1VCD400097 ⁽⁷⁾			1VCD400097 ⁽⁷⁾		
Operating temperature	[°C]	- 5 ... + 40			- 5 ... + 40			- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1	■			■			■		
Electromagnetic compatibility	IEC 60694	■			■			■		

- (1) For circuit-breakers with PR 521 device and 3 current sensors, increase the weight indicated by 20 kg
- (2) Rated current of the current sensors (the PR521 device and the current sensors are optional)
- (3) DK type phase current sensors on board the circuit-breaker and toroidal CT for DK type homopolar protection not on board (the PR521/DK device and the DK sensors are optional)
- (4) VD4/UniAir for P1/E Unit IP30 version (unit with plug-in circuit-breaker); the circuit-breaker for the same Arc Proof version unit is not available
- (5) VD4/UniAir-2R for P1E/2R Unit IP30 version (unit with withdrawable circuit-breaker on supply and load side); the circuit-breaker for the same Arc Proof version unit is not available
- (6) VD4/UniAir-A for P1/A Unit IP30 version (unit with fixed “upside-down” circuit-breaker); the circuit-breaker for the same Arc Proof version unit is not available
- (7) VD4/UniAir-F for P1/F Unit IP30 version (unit with fixed circuit-breaker without wheels and cabled to terminal box); the circuit-breaker for the same Arc Proof version unit is not available

5.4.2. Types available circuit-breakers for ABB switchgear

VD4/S 12-17-24 (right lateral operating mechanism; version for UniSwitch switchgear)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				210 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/S 12.06.12	■	1VCD000098	1VCD400098
		16	VD4/S 12.06.16	■		
		20	VD4/S 12.06.20	■		
		25	VD4/S 12.06.25	■		
	800	12.5	VD4/S 12.08.12	■		
		16	VD4/S 12.08.16	■		
		20	VD4/S 12.08.20	■		
		25	VD4/S 12.08.25	■		
	1250	12.5	VD4/S 12.12.12	■		
		16	VD4/S 12.12.16	■		
		20	VD4/S 12.12.20	■		
		25	VD4/S 12.12.25	■		
17.5	630	12.5	VD4/S 17.06.12	■	1VCD000098	1VCD400098
		16	VD4/S 17.06.16	■		
		20	VD4/S 17.06.20	■		
		25	VD4/S 17.06.25	■		
	800	12.5	VD4/S 17.08.12	■		
		16	VD4/S 17.08.16	■		
		20	VD4/S 17.08.20	■		
		25	VD4/S 17.08.25	■		
	1250	12.5	VD4/S 17.12.12	■		
		16	VD4/S 17.12.16	■		
		20	VD4/S 17.12.20	■		
		25	VD4/S 17.12.25	■		
24	630	12.5	VD4/S 24.06.12	■	1VCD000098	1VCD400098
		16	VD4/S 24.06.16	■		
		20	VD4/S 24.06.20	■		
		25	VD4/S 24.06.25	■		
	800	12.5	VD4/S 24.08.12	■		
		16	VD4/S 24.08.16	■		
		20	VD4/S 24.08.20	■		
		25	VD4/S 24.08.25	■		
	1250	12.5	VD4/S 24.12.12	■		
		16	VD4/S 24.12.16	■		
		20	VD4/S 24.12.20	■		
		25	VD4/S 24.12.25	■		

VD4/UniMix-F 12-17-24 (right lateral operating mechanism; version for UniMix switchgear P1/F unit both IP30, and Arc-proof; circuit-breaker without wheels and cabled to terminal box)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				230 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniMix-F 12.06.12	■	1VCD000106	1VCD400097
		16	VD4/UniMix-F 12.06.16	■		
		20	VD4/UniMix-F 12.06.20	■		
		25	VD4/UniMix-F 12.06.25	■		
17.5	630	12.5	VD4/UniMix-F 17.06.12	■	1VCD000106	1VCD400097
		16	VD4/UniMix-F 17.06.16	■		
		20	VD4/UniMix-F 17.06.20	■		
		25	VD4/UniMix-F 17.06.25	■		
24	630	12.5	VD4/UniMix-F 24.06.12	■	1VCD000106	1VCD400097
		16	VD4/UniMix-F 24.06.16	■		
		20	VD4/UniMix-F 24.06.20	■		

VD4/UniMix-R 12-17-24 (right lateral operating mechanism; version for UniMix switchgear P1/F unit both IP30, and Arc-proof; circuit-breaker with wheels and fitted with power cord with 58-pole plug)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				230 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniMix-R 12.06.12	■	1VCD000107	1VCD400098
		16	VD4/UniMix-R 12.06.16	■		
		20	VD4/UniMix-R 12.06.20	■		
		25	VD4/UniMix-R 12.06.25	■		
17.5	630	12.5	VD4/UniMix-R 17.06.12	■	1VCD000107	1VCD400098
		16	VD4/UniMix-R 17.06.16	■		
		20	VD4/UniMix-R 17.06.20	■		
		25	VD4/UniMix-R 17.06.25	■		
24	630	12.5	VD4/UniMix-R 24.06.12	■	1VCD000107	1VCD400098
		16	VD4/UniMix-R 24.06.16	■		
		20	VD4/UniMix-R 24.06.20	■		

VD4/UniAir 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/E unit - IP30 version – unit with circuit-breaker withdrawable on the supply side)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir 12.06.12	■	1VCD000102	1VCD400098
		16	VD4/UniAir 12.06.16	■		
		20	VD4/UniAir 12.06.20	■		
		25	VD4/UniAir 12.06.25	■		
	800	16	VD4/UniAir 12.08.16	■		
		20	VD4/UniAir 12.08.20	■		
		25	VD4/UniAir 12.08.25	■		
	1250	16	VD4/UniAir 12.12.16	■		
		20	VD4/UniAir 12.12.20	■		
17.5	630	12.5	VD4/UniAir 17.06.12	■	1VCD000102	1VCD400098
		16	VD4/UniAir 17.06.16	■		
		20	VD4/UniAir 17.06.20	■		
		25	VD4/UniAir 17.06.25	■		
	800	16	VD4/UniAir 17.08.16	■		
		20	VD4/UniAir 17.08.20	■		
		25	VD4/UniAir 17.08.25	■		
	1250	16	VD4/UniAir 17.12.16	■		
		20	VD4/UniAir 17.12.20	■		
24	630	12.5	VD4/UniAir 24.06.12	■	1VCD000102	1VCD400098
		16	VD4/UniAir 24.06.16	■		
		20	VD4/UniAir 24.06.20	■		
		25	VD4/UniAir 24.06.25	■		
	800	16	VD4/UniAir 24.08.16	■		
		20	VD4/UniAir 24.08.20	■		
		25	VD4/UniAir 24.08.25	■		
	1250	16	VD4/UniAir 24.12.16	■		
		20	VD4/UniAir 24.12.20	■		

VD4/UniAir-2R 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/E 2R unit - IP30 version – unit with circuit-breaker withdrawable on the supply and load side)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir-2R 12.06.12	■	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 12.06.16	■		
		20	VD4/UniAir-2R 12.06.20	■		
		25	VD4/UniAir-2R 12.06.25	■		
	800	16	VD4/UniAir-2R 12.08.16	■		
		20	VD4/UniAir-2R 12.08.20	■		
		25	VD4/UniAir-2R 12.08.25	■		
	1250	16	VD4/UniAir-2R 12.12.16	■		
		20	VD4/UniAir-2R 12.12.20	■		
17.5	630	12.5	VD4/UniAir-2R 17.06.12	■	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 17.06.16	■		
		20	VD4/UniAir-2R 17.06.20	■		
		25	VD4/UniAir-2R 17.06.25	■		
	800	16	VD4/UniAir-2R 17.08.16	■		
		20	VD4/UniAir-2R 17.08.20	■		
		25	VD4/UniAir-2R 17.08.25	■		
	1250	16	VD4/UniAir-2R 17.12.16	■		
		20	VD4/UniAir-2R 17.12.20	■		
24	630	12.5	VD4/UniAir-2R 24.06.12	■	1VCD000103	1VCD400098
		16	VD4/UniAir-2R 24.06.16	■		
		20	VD4/UniAir-2R 24.06.20	■		
		25	VD4/UniAir-2R 24.06.25	■		
	800	16	VD4/UniAir-2R 24.08.16	■		
		20	VD4/UniAir-2R 24.08.20	■		
		25	VD4/UniAir-2R 24.08.25	■		
	1250	16	VD4/UniAir-2R 24.12.16	■		
		20	VD4/UniAir-2R 24.12.20	■		

VD4/UniAir-A 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/A unit - IP30 version – unit “upside-down” with circuit-breaker withdrawable on the load side)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir-A 12.06.12	■	1VCD000104	1VCD400098
		16	VD4/UniAir-A 12.06.16	■		
		20	VD4/UniAir-A 12.06.20	■		
		25	VD4/UniAir-A 12.06.25	■		
	800	16	VD4/UniAir-A 12.08.16	■		
		20	VD4/UniAir-A 12.08.20	■		
		25	VD4/UniAir-A 12.08.25	■		
	1250	16	VD4/UniAir-A 12.12.16	■		
		20	VD4/UniAir-A 12.12.20	■		
		25	VD4/UniAir-A 12.12.25	■		
17.5	630	12.5	VD4/UniAir-A 17.06.12	■	1VCD000104	1VCD400098
		16	VD4/UniAir-A 17.06.16	■		
		20	VD4/UniAir-A 17.06.20	■		
	800	16	VD4/UniAir-A 17.08.16	■		
		20	VD4/UniAir-A 17.08.20	■		
	1250	16	VD4/UniAir-A 17.12.16	■		
		20	VD4/UniAir-A 17.12.20	■		
24	630	12.5	VD4/UniAir-A 24.06.12	■	1VCD000104	1VCD400098
		16	VD4/UniAir-A 24.06.16	■		
		20	VD4/UniAir-A 24.06.20	■		
	800	16	VD4/UniAir-A 24.08.16	■		
		20	VD4/UniAir-A 24.08.20	■		
	1250	16	VD4/UniAir-A 24.12.16	■		
		20	VD4/UniAir-A 24.12.20	■		

VD4/UniAir-F 12-17-24 (right lateral operating mechanism; version for UniAir switchgear P1/F unit - IP30 version – unit with fixed circuit-breaker without wheels and cabled to terminal box)

U [kV]	In [A]	Isc [kA]	Description	Pole centre distance	Technical documentation	
				300 mm	Dimensions	Electrical diagram
12	630	12.5	VD4/UniAir-F 12.06.12	■	1VCD000105	1VCD400097
		16	VD4/UniAir-F 12.06.16	■		
		20	VD4/UniAir-F 12.06.20	■		
		25	VD4/UniAir-F 12.06.25	■		
	800	16	VD4/UniAir-F 12.08.16	■		
		20	VD4/UniAir-F 12.08.20	■		
		25	VD4/UniAir-F 12.08.25	■		
	1250	16	VD4/UniAir-F 12.12.16	■		
		20	VD4/UniAir-F 12.12.20	■		
		25	VD4/UniAir-F 12.12.25	■		
17.5	630	12.5	VD4/UniAir-F 17.06.12	■	1VCD000105	1VCD400097
		16	VD4/UniAir-F 17.06.16	■		
		20	VD4/UniAir-F 17.06.20	■		
	800	16	VD4/UniAir-F 17.08.16	■		
		20	VD4/UniAir-F 17.08.20	■		
	1250	16	VD4/UniAir-F 17.12.16	■		
		20	VD4/UniAir-F 17.12.20	■		
24	630	12.5	VD4/UniAir-F 24.06.12	■	1VCD000105	1VCD400097
		16	VD4/UniAir-F 24.06.16	■		
		20	VD4/UniAir-F 24.06.20	■		
	800	16	VD4/UniAir-F 24.08.16	■		
		20	VD4/UniAir-F 24.08.20	■		
	1250	16	VD4/UniAir-F 24.12.16	■		
		20	VD4/UniAir-F 24.12.20	■		

5.5. Characteristics of the electrical accessories

Shunt opening release (-M01); Additional shunt opening release (-M02); Shunt closing release (-MC)

Un:	24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–
Un:	24 - 48 - 60 - 110 - 120 ... 127 - 220 ... 240 V~ 50 Hz
Un:	110 - 120 - 127 - 220 - 240 V~ 60 Hz
Operating limits:	70 ... 110 % Un
Inrush power (Ps):	DC 200 W; AC = 200 VA
Inrush time	approx. 100 ms
Continuous power (Pc):	DC = 5 W; AC = 5 VA
Opening time:	35 ... 60 ms
Closing time:	30 ... 80 ms
Insulation voltage:	2500 V 50 Hz (for 1 min)

Undervoltage release (-MU)

Un:	24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–
Un:	24 - 48 - 60 - 110 - 120 - 127 - 220 ... 240 V~ 50 Hz
Un:	110 - 120 ... 127 - 220 ... 240 V~ 60 Hz
Operating limits:	
– circuit-breaker opening:	35-70% Un
– circuit-breaker closing:	85-110% Un
Inrush power (Ps):	DC 200 W; AC = 200 VA
Inrush time	approx. 100 ms
Continuous power (Pc):	DC = 5 W; AC = 5 VA
Opening time:	30 ms
Insulation voltage:	2500 V 50 Hz (for 1 min)

Electronic time delay device for undervoltage release (mounted outside the circuit-breaker)

Un:	24 ... 30 - 48 - 60 - 110 ... 127 - 220 ... 250 V–
Un:	48 - 60 - 110 ... 127 - 220 ... 240 V~ 50/60 Hz
Adjustable opening time (release + time delay device):	0.5-1-1.5-2-3 s

Auxiliary contacts of the circuit-breaker

Un:	24 ... 250 V AC-DC
Rated current	Ith2 = 10 A
Insulation voltage:	2500 V 50 Hz (for 1 min)
Electrical resistance:	3 mOhm

Rated current and breaking capacity in category AC11 and DC11:

Un	Cosφ	T	In	Icu
220 V ~	0.7	--	2.5 A	25 A
24 V –	--	15 ms	10 A	12 A
60 V –	--	15 ms	6 A	8 A
110 V –	--	15 ms	4 A	5 A
220 V –	--	15 ms	1 A	2 A

Motor operator (-MS)

Characteristics

Un:	24...30 - 48...60 - 110...130 - 220...250 V–
Un:	100...130 - 220...250 V ~ 50/60 Hz
Operating limits:	85 ... 110% Un
Inrush power (Ps):	DC=500 W; AC=500 VA
Rated power (Pn):	DC=200 W; AC=200 VA
Inrush time	0.2 s
Charging time:	4-5 s
Insulation voltage:	2500 V 50 Hz (for 1 min)

Summary of the total number of auxiliary contacts available (*)

Total number	5 auxiliary contacts (-BB1)	10 auxiliary contacts (-BB1, -BB2)	12 auxiliary contacts (-BB1, -BB2, -BB3)	15 auxiliary contacts (-BB1, -BB2, -BB3)
VD4/R p230 VD4/R p300 VD4/L p230 VD4/L p300	Standard fitting	Alternative available on request. It is the minimum compulsory number if -M02 (the additional shunt opening release) is also requested	Alternative not available	Alternative available on request
VD4/UniMix-F p230	Standard fitting	As above	As above	As above
VD4/UniAir-F p230	Standard fitting	As above	As above	As above
VD4/S p210	Standard fitting	As above	Alternative available on request. It is the minimum compulsory number if -M02 (the additional shunt opening release) is also requested	Alternative not available
VD4/UniMix-R p230	Standard fitting	As above	As above	As above
VD4/UniAir VD4/UniAir-2R VD4/UniAir-A p300	Standard fitting	As above	As above	As above

(*) Each shunt opening release requested uses an auxiliary contact to de-energise after opening the circuit-breaker, therefore the number of auxiliary contacts actually available is reduced by the same number of shunt opening releases installed.

6. Instructions for operating the circuit-breaker

6.1. Safety indications



The VD4 circuit-breakers guarantee a minimum IP3X degree of protection when installed in the following conditions:

- fixed circuit-breaker, installed behind a protective metal net
- plug-in circuit-breaker, installed in switchgear.

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

Should mechanical operations be carried out on the circuit-breaker outside of the switchgear, take great care of the moving parts.

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

Racking the circuit-breaker in and out of the switchgear must be done gradually to avoid shocks which may deform

the mechanical interlocks.

6.2. Operating and signalling parts

6.3. Circuit-breaker closing and opening operations

Circuit-breaker operation can be either manual or electrical.

a) Manual charging of the closing springs (fig. 6)

Repeatedly activate the charging lever (2) (maximum rotation angle of the lever: about 90°) until the yellow indicator appears (5). Maximum force which can be applied to the lever: ≤150 N.

b) Electrical charging of the closing springs

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.

When supplied with power, the geared motor automatically recharges the springs after every closing operation until the yellow indicator appears (7). In the case of a power cut during charging, the geared motor stops and automatically starts charging the springs again when the power returns.

In any case, it is always possible to complete the charging operation manually.

In the case of an installation with several circuit-breakers with motor operator, to avoid excessive consumption, it is advisable to charge one operating mechanism at a time during the starting stage.

c) Circuit-breaker closing

The operation can only be carried out with the closing springs completely charged. For manual closing, press the pushbutton (7 - fig. 6). When there is a shunt closing release, the operation can also be carried out remotely by means of the special control circuit. Closing having taken place is signalled by the indicator (6 - fig. 6).

In the VD4/UniAir plug-in circuit-breakers without PR521 release, the closing pushbutton is not accessible.

d) Circuit-breaker opening

To open manually, press the pushbutton (8 - fig. 6).

When there is a shunt opening release, the operation can also be carried out remotely by means of the special control circuit. Opening having taken place is signalled by the indicator (6 - fig. 6).

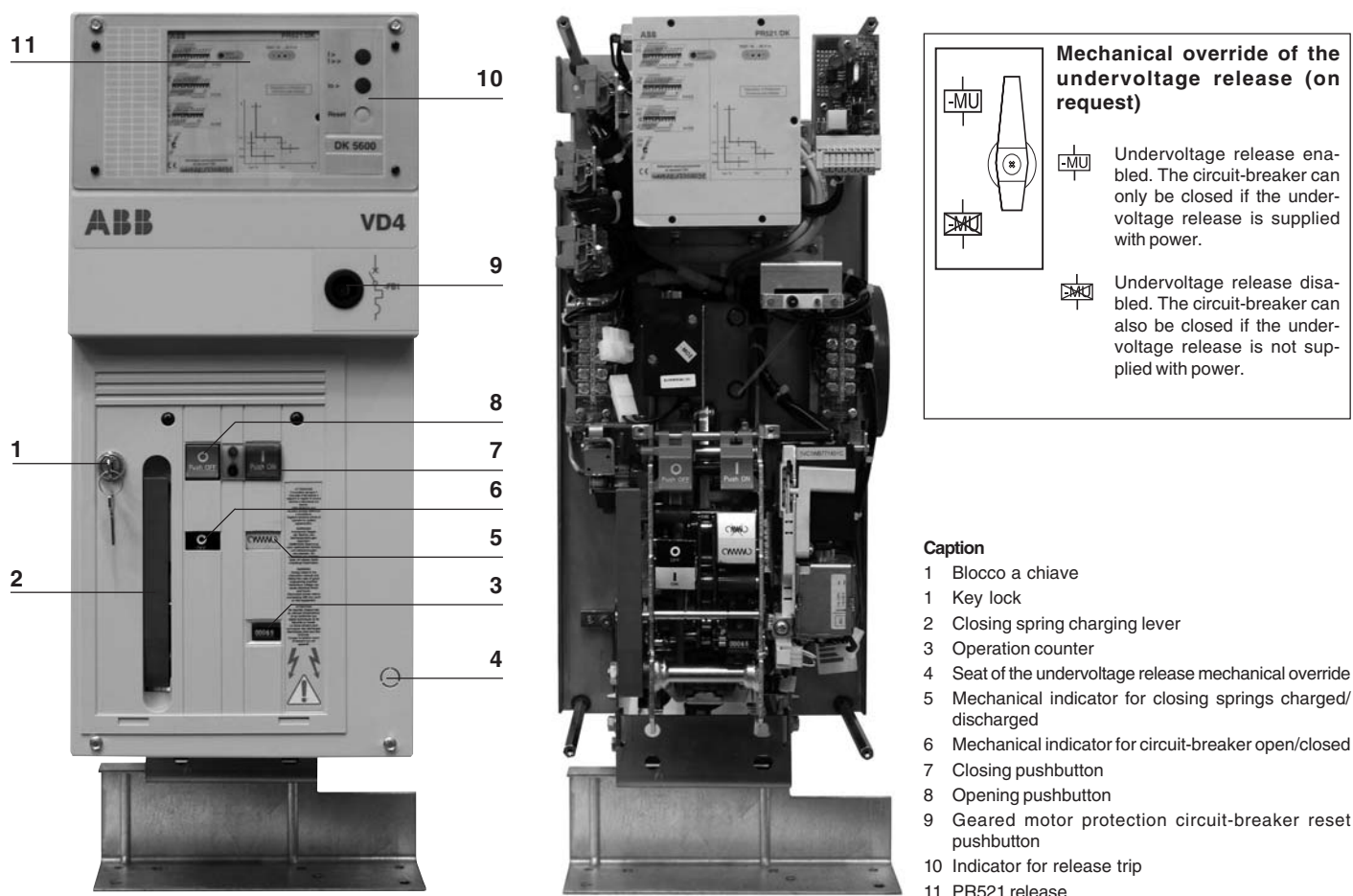



Fig. 6

7. Installation

7.1. General

 **Correct installation is of primary importance. The manufacturer's instructions must be carefully studied and followed. It is good practice to use gloves for handling the pieces during installation.**
All operations regarding installation, putting into service, service and maintenance must be carried out by qualified personnel.

7.2. Installation and operating conditions

The following Standards must be taken into particular consideration during installation and service:

- IEC60694/DIN VDE 0101
- VDE 0105: Electrical installation service
- DIN VDE 0141: Earthing systems for installations with rated voltage above 1 kV
- All the accident prevention regulations in force in the relative countries.

7.2.1. Normal conditions

Follow the recommendations in the IEC 60694 and 62271-100 Standards. In more detail:

Ambient temperature	
Maximum	+ 40 °C
Average maximum over 24 hours	+ 35 °C
Minimum (according to class– 5), apparatus for indoor installation	– 5°

Humidity	
The average value of the relative humidity, measured for a period longer than 24 hours, must not exceed 95%.	
The average value of the pressure of the water vapour, measured for a period longer than 24 hours, must not exceed 2,2 kPa.	

The average value of the relative humidity, measured for a period longer than 1 month, must not exceed 90%.
The average value of the pressure of the water vapour, measured for a period longer than 1 month, must not exceed 1,8 kPa.

Altitude
≤ 1000 m above sea level.


7.2.2. Special conditions

Installations over 1000 m a.s.l.
Possibile entro i limiti consentiti dalla riduzione della rigidità dielettrica dell'aria.

Increase in the ambient temperature
Reduction in the rated current.
Encourage heat dissipation with appropriate additional ventilation.

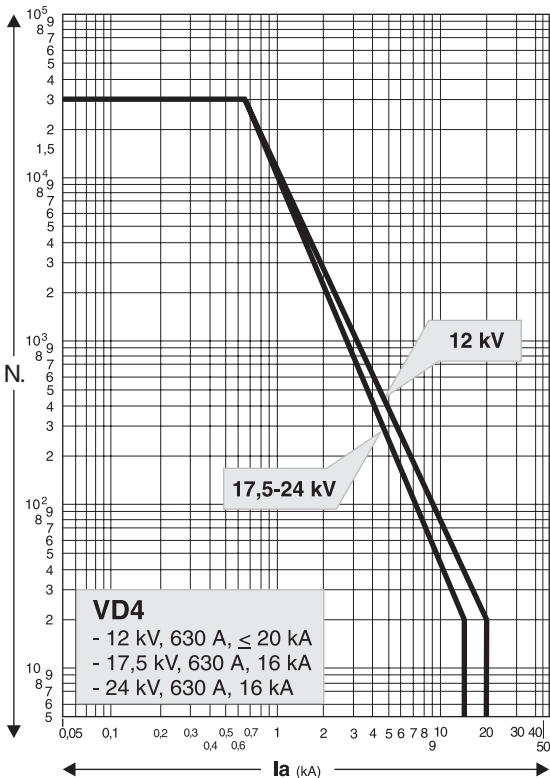
Climate
To avoid the risk of corrosion or other damage in areas:
– with a high level of humidity, and/or
– with rapid and big temperature variations, take appropriate steps (for example, by using suitable electric heaters) to prevent condensation phenomena.

For special installation requirements or other operating conditions, please contact ABB.

 **The areas involved by the passage of power conductors or auxiliary circuit conductors must be protected against access of any animals which might cause damage or dis-services.**

7.2.3. Trip curves

The following graphs show the number of closing-opening cycles (N.) allowed, of the vacuum interrupters, according to the breaking capacity (Ia).



Caption
N. Number if closing-opening cycles allowed for the vacuum interrupters.
Ia Breaking capacity of the vacuum interrupters.

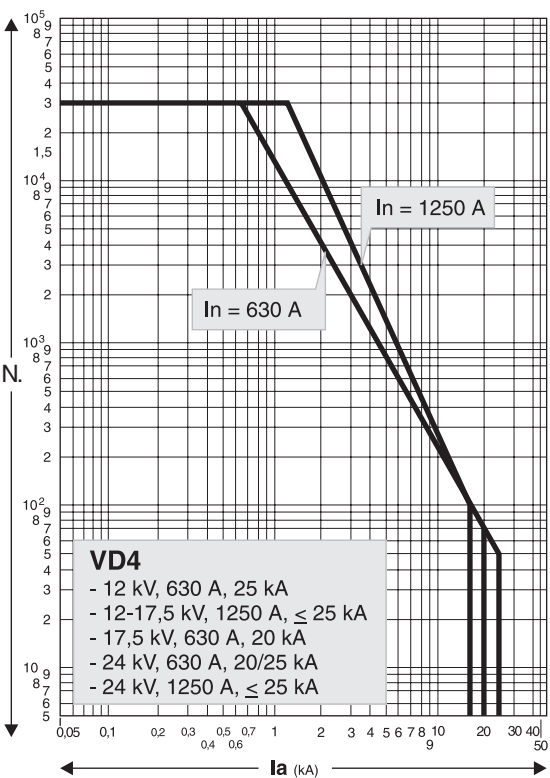


Fig. 7a _____ Fig. 7b _____

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-breakers

The circuit-breaker can be mounted directly on the floor or on supporting frames provided by the customer (see fig. 8).

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

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

Fixing can be carried out in the following ways:

- by means of special expansion anchoring bolts with M8 threaded hole in the case of fixing to cement floors
- by means of M8 bolts in the case of fixing onto metal structures or to cement floors where special steel sections have been embedded.

In any case, the fixing surface must be well-levelled and all the resting points must be on the same horizontal plane.

7.5. Installation of circuit-breaker for ABB switchgear

The removable circuit-breakers are destined for use in UniSwitch, UniAir or UniMix switchgear. Special assembly operations are not usually necessary.

In any case, consult the documentation relative to the switchgear.

7.6. Power circuit connections

7.6.1. General warnings

- Check that the circuit-breaker terminals are clean and are free of any deformation caused by shocks received during transport or storage.
- Select the conductor cross-section according to the service and short-circuit current of the installation.
- Provide suitable supporting insulators near the fixed circuit-breaker terminals or the monoblocs of the units, sized according to the electrodynamic stresses caused by the short-circuit current of the installation.



The circuit-breaker terminals are always silver-plated. To clean them, only use dry rags, soaked in a suitable solvent if necessary.

N.B. Never use a file or emery cloth!

7.6.2. Maximum dimensions of the connections

For the fixed version VD4 circuit-breakers, the connections must be shaped and installed in conformity with what is indicated in the overall dimensions, respecting the distances indicated.

7.6.3. Surface treatment of connections

The connections can be made of bare copper or bare aluminium. However, it is always advisable to silver-plate the contact surfaces.

The surface treatment must have an even and constant thickness.

7.6.4. Mounting connections

- Check that the contact surfaces of the connections are perfectly flat and do not have any burrs, traces of oxidation or any deformities due to drilling or shocks.
- According to the conductive material used and the surface treatment given, carry out the operations indicated in the following table T1 on the surface contact of the conductor.

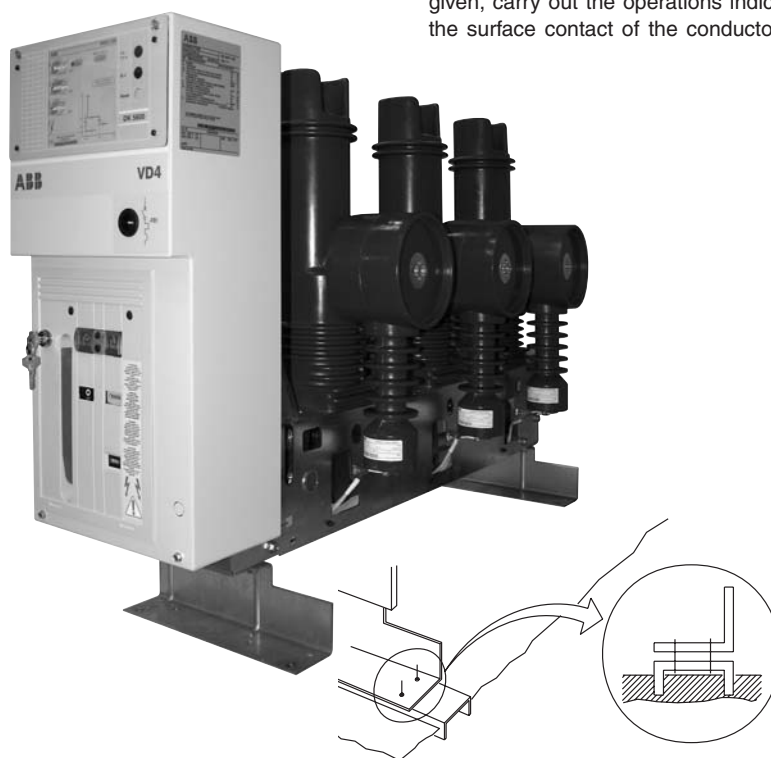


Fig. 8

T1

Bare copper

- Clean with a fine file or emery cloth
- Smear a film of 5RX Moly grease over the contact surfaces

Silver-plated copper or aluminium

- Clean with a rough dry cloth
- Only in case of tough oxidation traces, clean with a very fine emery cloth, taking care not to remove the surface layer
- If necessary, carry out surface treatment again.

Bare aluminium

- Clean with a metallic brush or emery cloth
- Immediately smear a film of neutral grease over the contact surfaces
- Insert the bi-metal copper-aluminium strip with beaded surfaces between the aluminium connection and the copper terminal (copper side touching the terminal; aluminium side touching the connection).

Mounting procedures

- Put the connections in contact with the circuit-breaker terminals.
- Insert a spring washer and a flat washer between the head of the bolt and the connection.
- The flat washers must be of a suitable diameter to distribute the tightening pressure over a large area.
- Tighten the bolt, taking care not to subject the insulating parts to stress. The use of bolts according to DIN class 8.8 standards is recommended, also making reference to what is indicated in table T2.
- Make sure that the connections do not exert any force on the terminals.
- In case of cable connections, carefully follow the manufacturer's instructions for terminating the cables.

T2

Bolt	Recommended tightening torque (1)	
	Without lubricant	With lubricant (2)
M6	10 Nm	4.5 Nm
M8	30 Nm	10 Nm
M10	40 Nm	20 Nm
M12	70 Nm	40 Nm
M16	200 Nm	80 Nm

(1) The nominal tightening torque is based on a friction coefficient of the thread of 0.14 (distributed value the thread is subjected to which, in some cases, is not negligible).
The nominal tightening torque with lubricant is according to the DIN 43673 Standards.

(2) Oil or grease. The thread and surfaces in contact with the lubricated heads. Take into account the deviations from the general Standards table (for example, for systems in contact or terminals) as foreseen in the specific technical documentation. The thread and surfaces in contact with the heads of bolts must be slightly oiled or greased, so as to obtain a correct nominal tightening torque.

7.7. Earthing


- For fixed version circuit-breakers, carry out earthing by means of the special screw marked with the relative symbol. Clean and degrease the area around the screw to a diameter of about 30 mm.
Use a conductor (busbar or cord) with a cross-section conforming to the Standards in force.
- When assembly is completed, cover the joint with vaseline grease.

7.8. Connection of the auxiliary circuits

The minimum cross-section of the wires used for the auxiliary circuits must not be less than the one used for the internal cabling. Furthermore, they must be insulated for a 2 kV test voltage at power frequency according to IEC 60694 par. 6.2.10 Standards.

7.8.1. Fixed version circuit-breakers

Connection of the circuit-breaker auxiliary circuits must be carried out by means of modular terminals mounted under the cover. The wires outside the circuit-breaker 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. Circuit-breaker for ABB switchgear

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



Fig. 9

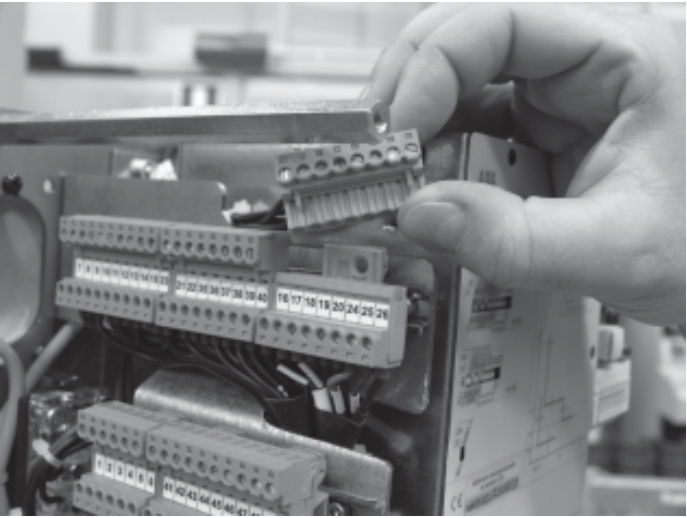


Fig. 10

8. Putting into service

8.1. General procedures



All the operations for putting into service must be carried out by ABB personnel or by customer's qualified personnel.

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

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

To access the inside of the operating mechanism, discharge the closing springs (close and open the circuit-breaker).

Before carrying out insulation tests on the circuit-breaker, disconnect the PR521 release (if provided).

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

- check tightness of the power connections to the circuit-breaker terminals;
- establish the setting of the primary electronic overcurrent release (if provided);
- check that the value of the power supply voltage of the auxiliary circuits is between 85% and 110% for a.c. and between 70% and 110% for d.c. of the rated voltage of the electrical accessories;
- check that no foreign bodies, such as bits of packing, have got into the moving parts;
- check that there is a sufficient exchange of air in the place of installation to avoid overtemperatures;
- also carry out the checks indicated in the following table:

	SUBJECT OF THE INSPECTION	PROCEDURE	POSITIVE CHECK
1	Insulation resistance.	<p>Medium voltage circuit With a 2500 V Megger, measure the insulation resistance between the phases and between phases and exposed conductive part of the circuit.</p> <p>Auxiliary circuits With a 500 V Megger (installed equipment permitting) measure the insulation resistance between the auxiliary circuits and the exposed conductive part.</p>	<p>The insulation resistance should be at least 50 MΩ and, in any case, constant over time.</p> <p>The insulation resistance should be a few MΩ and, in any case, constant over time.</p>
2	Auxiliary circuits.	Check that the connections to the control circuit are correct; proceed with relative power supply.	Normal operations and signals.
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)	<p>Supply the geared motor for spring charging at the relative rated voltage.</p> <p>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).</p>	<p>The springs are charged correctly. The signals are correct. The geared motor stops when the springs are charged.</p> <p>The geared motor recharges the springs after each closing operation.</p>
5	Undervoltage release (if provided).	<p>Supply the undervoltage release at the relative rated voltage and carry out the circuit-breaker closing operation.</p> <p>Disconnect the power supply to the release.</p>	<p>The circuit-breaker closes correctly. The signals are correct.</p> <p>The circuit-breaker opens. The signal changes over.</p>
6	Shunt opening release and additional shunt opening release (if provided).	<p>Close the circuit-breaker.</p> <p>Supply the shunt opening release at the relative rated voltage.</p>	<p>The circuit-breaker opens correctly. The signals are correct.</p>
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.	<p>Turn the key and remove it. Attempt the circuit-breaker closing operation.</p> <p>Insert the key again and turn it 90°. Carry out the closing operation.</p>	<p>Neither manual nor electric closing takes place.</p> <p>Both electric and manual closing take place correctly; in this position the key cannot be removed.</p>
9	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.

9. Maintenance

The maintenance operations are aimed at keeping the apparatus in good working condition for as long as possible.

In accordance with what is specified in the IEC 61208 / DIN 31 051 Standards, the following operations must be carried out.

Inspection: Finding out the actual conditions

Overhauling: Measures to be taken to maintain the specific conditions

Repairs: Measures to be taken to restore the specific conditions.

9.1. General

Vacuum circuit-breakers are characterised by simple, sturdy construction and a long life.

The operating mechanism is maintenance-free for its whole operating life, and only requires functional inspections (see par. 9.2.2.).

The vacuum interrupters are maintenance-free for their whole operating life.

Vacuum interruption does not produce any harmful effects even when there are frequent interruptions at the rated and short-circuit current.

The interventions during service and their aim are determined by the ambient conditions, by the sequence of operations and by the short-circuit interruptions.

Note

Respect the following Standards for maintenance work:

- the relative specifications given in the chapter on “Standards and Specifications”;
- work safety regulations in the chapter on “Putting into service and operations”;
- standards and specifications of the country where the apparatus is installed.

The maintenance operations must only be carried out by trained personnel and who follow all the safety regulations. Furthermore, it is advisable to call on ABB personnel, at least in cases for checking the performances in service and for repairs.

Cut the power supply off and put the apparatus under safe conditions during the maintenance operations.



Before carrying out any operations, check that the circuit-breaker is open, with the springs discharged and that it is not supplied (medium voltage circuit and auxiliary circuits).

9.1.1. Operating life

The operating life expectancy for the VD4 circuit-breakers is as follows:

- vacuum interrupters: up to 30,000 operations, according to their type (see par. 7.2.3. Trip curves).
- actuator and transmission system: up to 15,000 operations, under normal operating conditions, according to the type of circuit-breaker and with regular maintenance.

9.2. Inspections and functionality tests

9.2.1. Interruption devices in general

- Check the conditions of the interruption devices with regular inspections.
- Inspection at fixed intervals can be avoided when the apparatus is permanently under the control of qualified personnel.
- The checks must, first of all, include visual inspection to check for any contamination, traces of corrosion or electrical discharge phenomena.
- Carry out more frequent inspections when there are unusual operating conditions (including severe climatic conditions) and in the case of environmental pollution (e.g. high level of contamination or an atmosphere with aggressive agents).
- Visual inspection of the isolating contacts. It is recommended to turn the contact system alternately in order to keep the internal surface of the contact areas clean. The contact areas must be cleaned when there are signs of overheating (discoloured surface) (also see Repairs par.).
- In the case of abnormal conditions, take suitable overhauling measures (see Overhauling par.).

9.2.2. Stored energy operating mechanism

Carry out the functional test of the operating mechanism after 5,000 operations or after 4 years.

Before doing the test, open the circuit-breaker and de-energise the medium voltage circuit.

Note

Insulate the work area and make it safe, following the safety regulations specified in the IEC/DIN VDE Standards.

Functional test

- With the circuit-breaker not connected to the load, carry out a few opening and closing operations.
- If provided, cut the power supply to the spring charging motor off. Discharge the springs by closing and opening the circuit-breaker by means of the closing and opening pushbuttons.
- Visually inspect the lubrication conditions of the jaw isolating contacts, of the sliding surfaces, etc.
- Check correct electrical and mechanical operation of the various devices, with particular attention to the interlocks.
- The screws and nuts are tightened in the factory and correct tightening is marked with a coloured mark. No further tightening operations are foreseen during the operating life of the circuit-breaker. However, following any interventions, should it be necessary to retighten the screws or nuts, it is recommended to keep to the values indicated in fig. 11.
- Check lubrication of the main actuator lever roller bearings (see details A of fig. 12): it is advisable to lubricate with a few drops of SAE 80W/90 type oil, using a special oiler.

Proceed as follows:

- remove the circuit-breaker screen
- charge the operating mechanism springs and lubricate the right-hand bearing (circuit-breaker seen from the front)
- close the circuit-breaker and lubricate the left-hand bearing (circuit-breaker seen from the front).

9.2.3. Circuit-breaker pole

No other check except what has already been specified in par. 9.2.1. is necessary.

9.3. Overhauling

9.3.1. Interruption devices in general

Should it have been necessary to clean the devices during the inspections, according to what is specified in par. 9.2.1., use the following procedure:

- insulate the work area and make it safe, following the safety regulations specified in the IEC/DIN VDE Standards;
- general cleaning of the surfaces:
 - dry and eliminate light deposits of dirt with a soft dry cloth;
 - more resistant deposits of dirt can be removed using slightly alkaline domestic type detergent or Rivolta BWR 210 type detergent;
- cleaning insulating surfaces and conductive parts:
 - light dirt: with Rivolta BWR 210 detergent;
 - resistant dirt: with cold detergent type 716.

After cleaning, rinse thoroughly with clean water and dry carefully.

Note

Only use detergents without halogens and never 1.1.1-trichloroethane, trichloroethylene or carbon tetrachloride!

9.3.2. Actuator and transmission system

Circuit-breakers up to 31.5 kA

Complete replacement must be carried out after 15,000 operations for the actuator (trip box), for the shock-absorber and for all the other components of the transmission system (shaft, main levers, locking rings, etc.).

Note

Dismantling and replacement of the operating mechanism (trip box) can only be carried out by ABB personnel or by skilled and specially trained personnel, particularly for the necessary adjustments.

- the VIDAR vacuum tester, made by the company Programma Electric GmbH, Bad Homburg v.d.H.

Details regarding overhauling

- When foreseen, cut of the power supply to the spring charging motor and manually discharge the operating mechanism springs by closing and opening the circuit-breaker.
- Replace the parts subjected to mechanical stress or stress due to particular environmental conditions, (contact and ABB service centre).

Note

These operations can only be carried out by ABB personnel or by skilled and specially trained personnel.

9.3.3. Circuit-breaker pole

The circuit-breaker pole and relative vacuum interrupter are maintenance-free until the maximum number of electrical operations for the type of interrupter is reached (see par. 7.2.3. Trip curves).

The operating life of the vacuum interrupter is defined by the sum of the ultimate currents corresponding to the specific type of interrupter in accordance with what is indicated in the graphs of par. 7.2.3. Trip curves: when the sum of the ultimate currents is reached, the whole pole must be replaced.

Note

Dismantling and replacement of the pole can only be carried out by ABB personnel or by skilled and specially trained personnel, particularly for the necessary adjustments.

To carry out the interrupter test without dismantling the circuit-breaker pole, use:

To check vacuum tightness of the interrupter, the following test values must be set on the VIDAR tester:

Rated voltage of the circuit-breaker	d.c. test voltage
12 kV	40 kV
17.5 kV	40 kV
24 kV	60 kV

The test must always be carried out with the circuit-breaker open with the contacts at the nominal distance (12 kV ÷ 17.5 kV).

Procedure for testing the degree of vacuum of the interrupter of the circuit-breaker poles:

- Turn the power supply off and make the working area safe by following the safety regulations specified in the IEC/DIN VDE Standards;
- open the circuit-breaker;
- earth a terminal of each circuit-breaker pole;
- connect the earth terminal of the VIDAR tester to the circuit-breaker structure;
- connect the high voltage terminal of the VIDAR tester to the terminal of the circuit-breaker pole not connected to earth (L1 phase) and carry out the test. Repeat the test for phases L2 and L3.

Note

The tester connection cables can produce an indication due to the capacitive effect. In this case the cables must not be removed.

Checking tightness of the screws

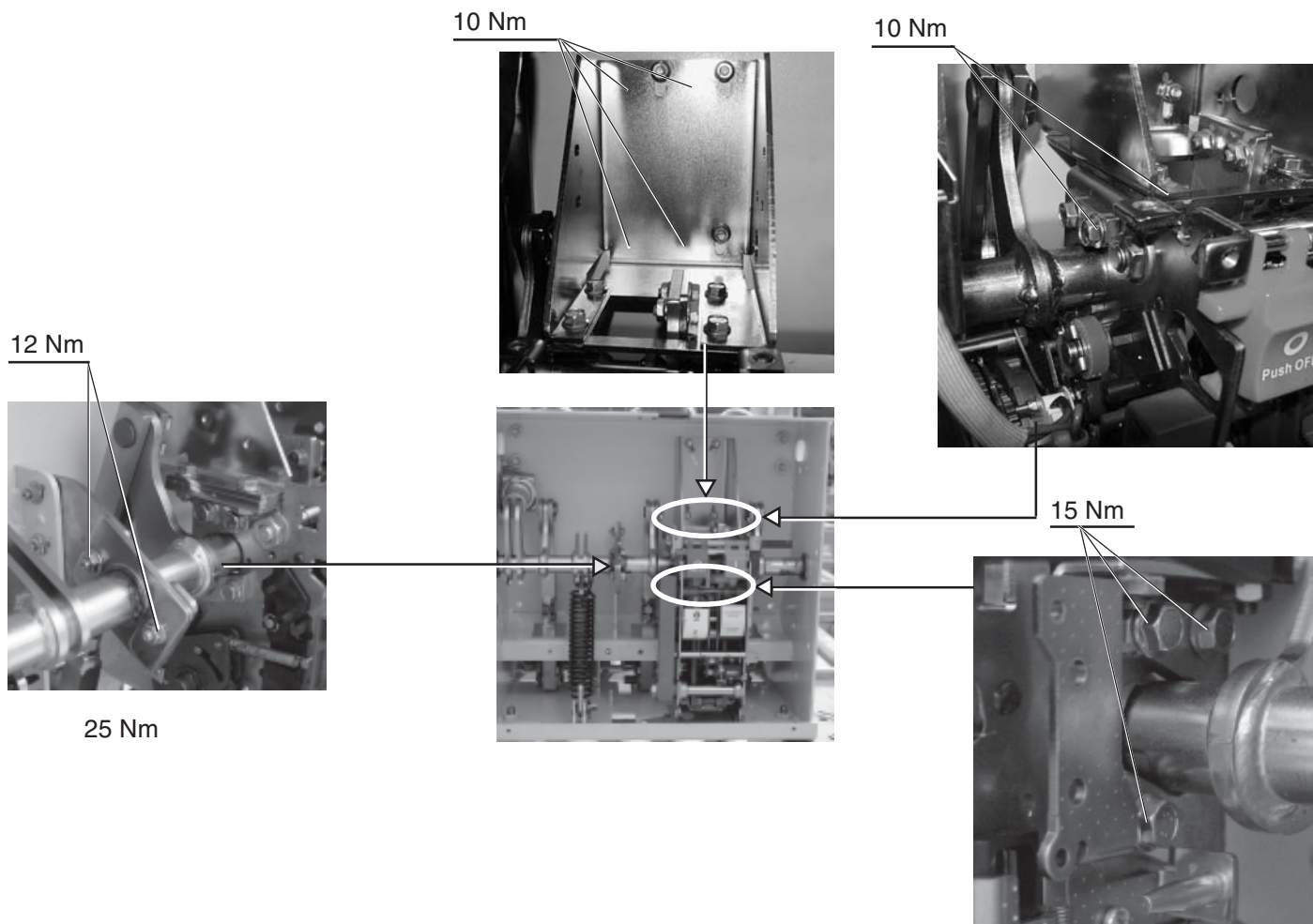


Fig. 11

9.4. Repairs

Replacement of spare parts and accessories must only be carried out by ABB personnel or suitably qualified and specially trained personnel. Always work with the circuit-breaker open and locked so that it cannot be closed again, with the work area insulated and made safe. The operating mechanism springs must be discharge. All power supply sources must be disconnected and made safe against any reclosing during removal and installation work.

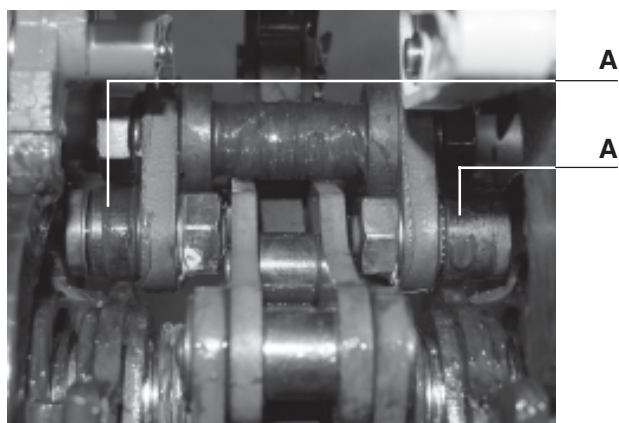


Should maintenance be carried out by the customer's personnel, responsibility for the interventions remains with the customer.

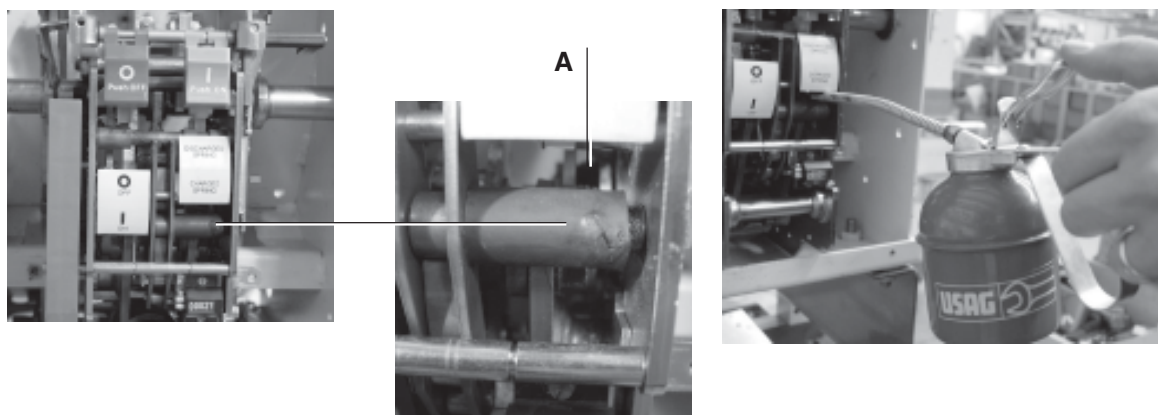
The replacement of parts not included in the "List of spare parts/accessories" (par. 12.1.) must only be carried out by ABB personnel. In particular:

- complete pole with bushings/connections
- actuator and transmission system
- closing spring set
- opening spring
- shock-absorber.

Lubrication of the roller bearings



Lubrication of the right-hand bearing (circuit-breaker seen from the front)



Lubrication of the left-hand bearing (circuit-breaker seen from the front)

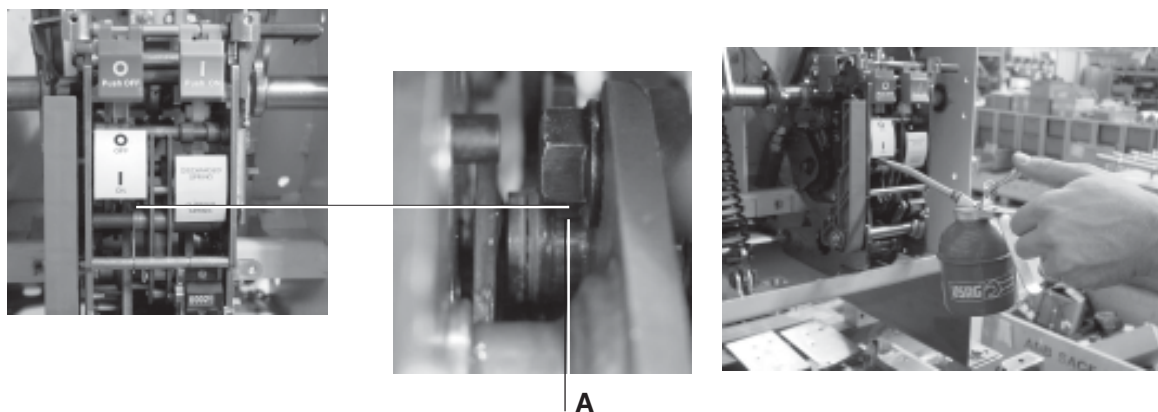


Fig. 12

10. Application of the X-ray emission Standards

One of the physical properties of vacuum insulation is the possibility of X-ray emission when the interrupter contacts are open. The specific tests carried out at the PTB laboratories (Physikalisch-Technische Bundesanstalt, in Brunswick - Germany) show that local emission at a distance of 10 cm from the interrupter or pole surface, does not exceed 1 mSv/h.

It follows that:

- at the rated service voltage the use of vacuum interrupters is absolutely safe;
- application of the withstand voltage at power frequency, according to the IEC 62271-100 and VDE 0670 Standards, is safe;
- application of a voltage higher than the withstand voltage at power frequency or of a test voltage in direct current, specified in the IEC and VDE Standards, cannot be used;
- limitation of the above-mentioned local phenomena, with interrupters with open contacts, depends on keeping the specific distance between the contacts.

This condition is intrinsically guaranteed by correct operation of the operating mechanism and by the adjustments of the transmission system.

11. Spare parts and accessories



All assembly operations of spare parts/accessories must be carried out following the instructions enclosed with the spare parts, by ABB personnel or by suitably qualified customer personnel with in-depth knowledge of the apparatus (IEC 60694) and of all the Standards aimed at carrying out these interventions in safe conditions. Should the maintenance be carried out by the customer's personnel, responsibility for the interventions remains with the customer. Before carrying out any operation, always make sure that the circuit-breaker is open, the springs discharged and that it is not energised (medium voltage circuit and auxiliary circuits).

To order circuit-breaker spare parts/accessories, refer to the ordering sales codes indicated in the technical catalogue and always state the following:

- type of circuit-breaker
- rated voltage of the circuit-breaker
- rated normal current of the circuit-breaker
- breaking capacity of the circuit-breaker
- serial number of the circuit-breaker
- rated voltage of any electrical spare parts.

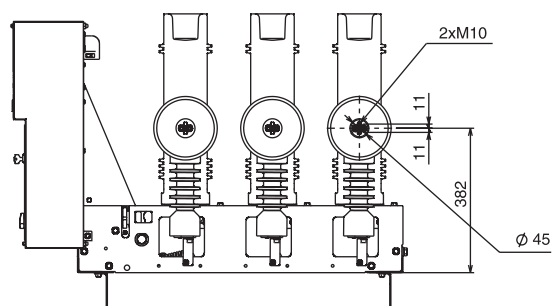
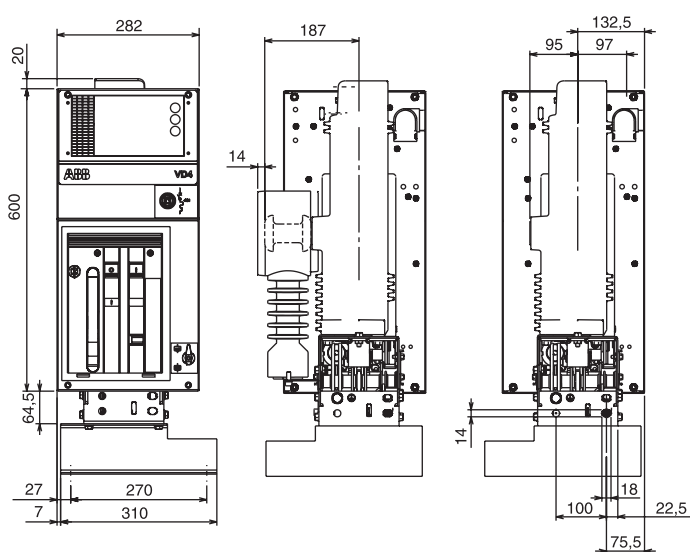
For availability and to order spare parts, please contact our Service office.

11.1. List of spare parts

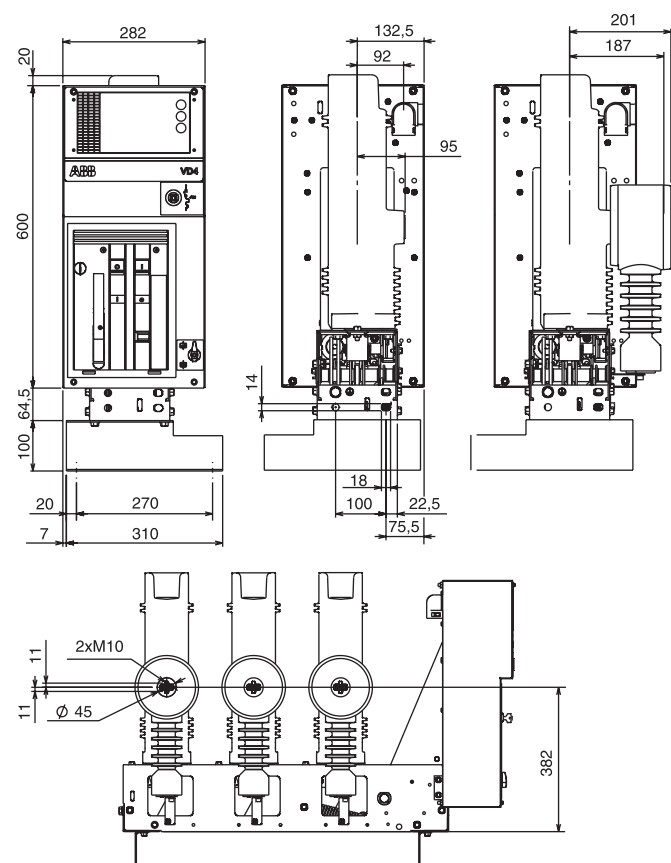
- Shunt opening release
- Additional shunt opening release
- Undervoltage release
- Contact for signalling undervoltage release energised/de-energised
- Time delay device for undervoltage release
- Mechanical override for undervoltage release
- Shunt closing release
- Spring charging geared motor with electrical signalling of springs charged
- Geared motor thermomagnetic protection circuit-breaker
- Contact for signalling geared motor protection circuit-breaker open/closed
- Contact for signalling closing springs charged/discharged
- Circuit-breaker auxiliary contacts
- Opening solenoid
- Key lock in open position
- Opening pushbutton protection
- Closing pushbutton protection
- Set of six main isolating contacts
- Current sensors
- PR521 protection releases
- Connector complete with sheath
- Wheel Kit
- Operation counter
- Complete pole.

12-17.5-24 kV - P = 230 mm

TN 1VDC 000100

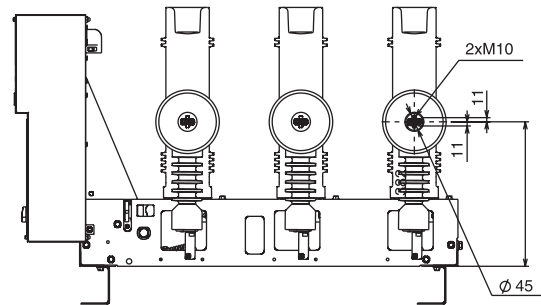
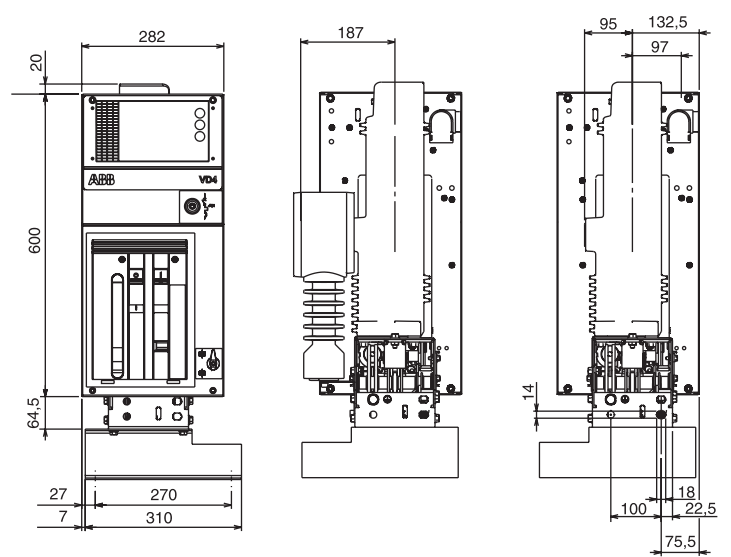
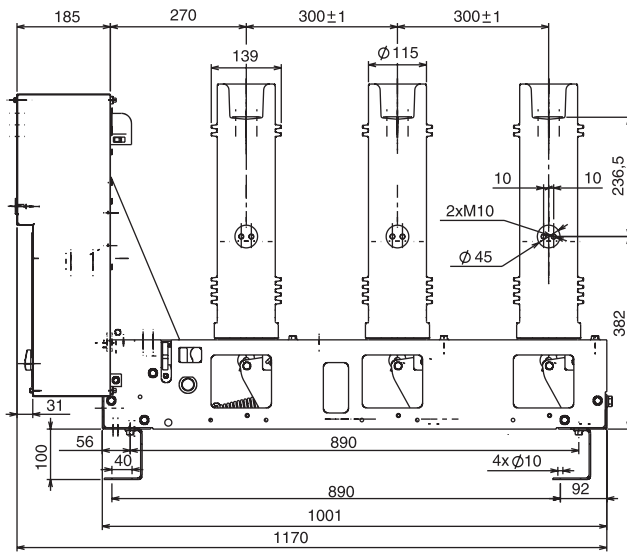


Fixed circuit-breaker left lateral operating mechanism



12-17.5-24 kV - P = 300 mm

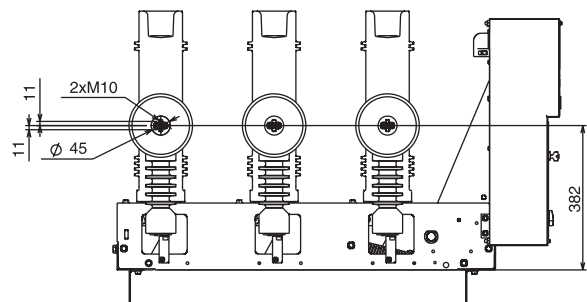
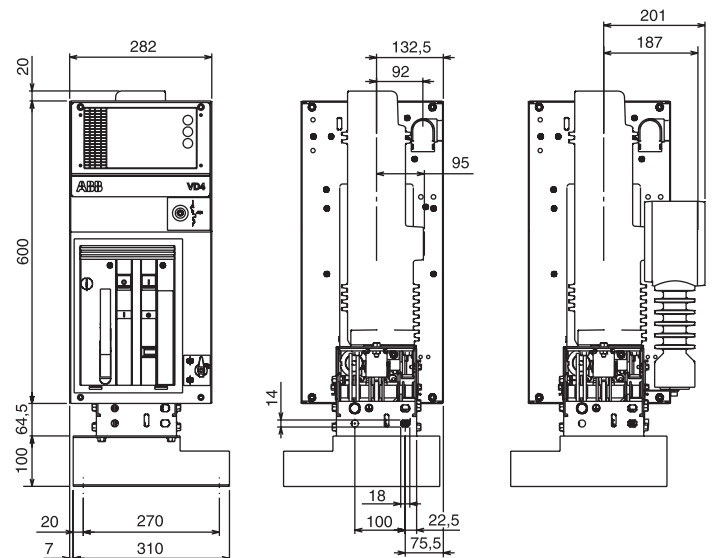
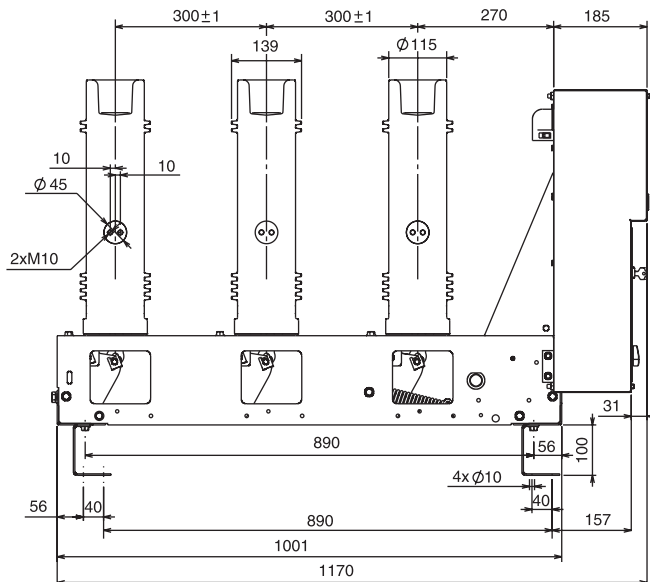
Fixed circuit-breaker right lateral operating mechanism



TN 1VDC 000101

12-17.5-24 kV - P = 300 mm

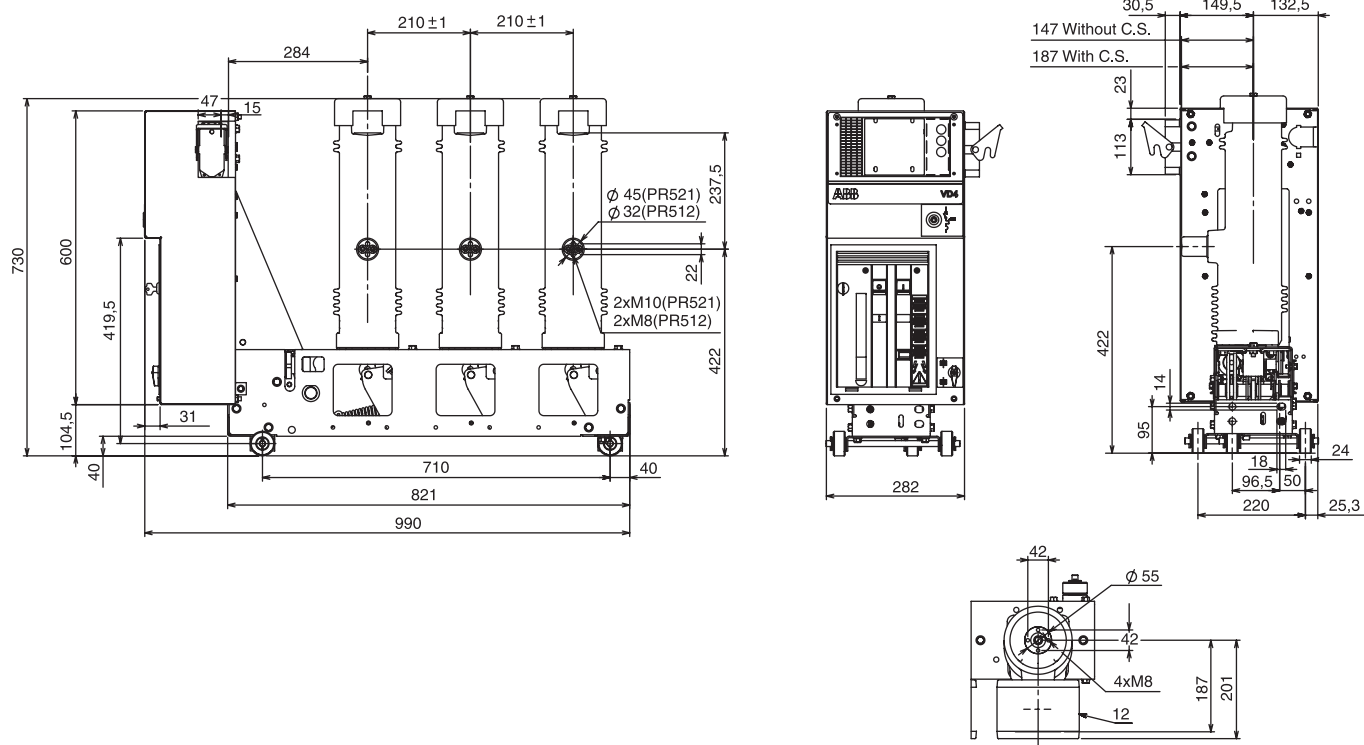
Fixed circuit-breaker left lateral operating mechanism



TN 1VDC 003454

12-17.5-24 kV - P = 210 mm

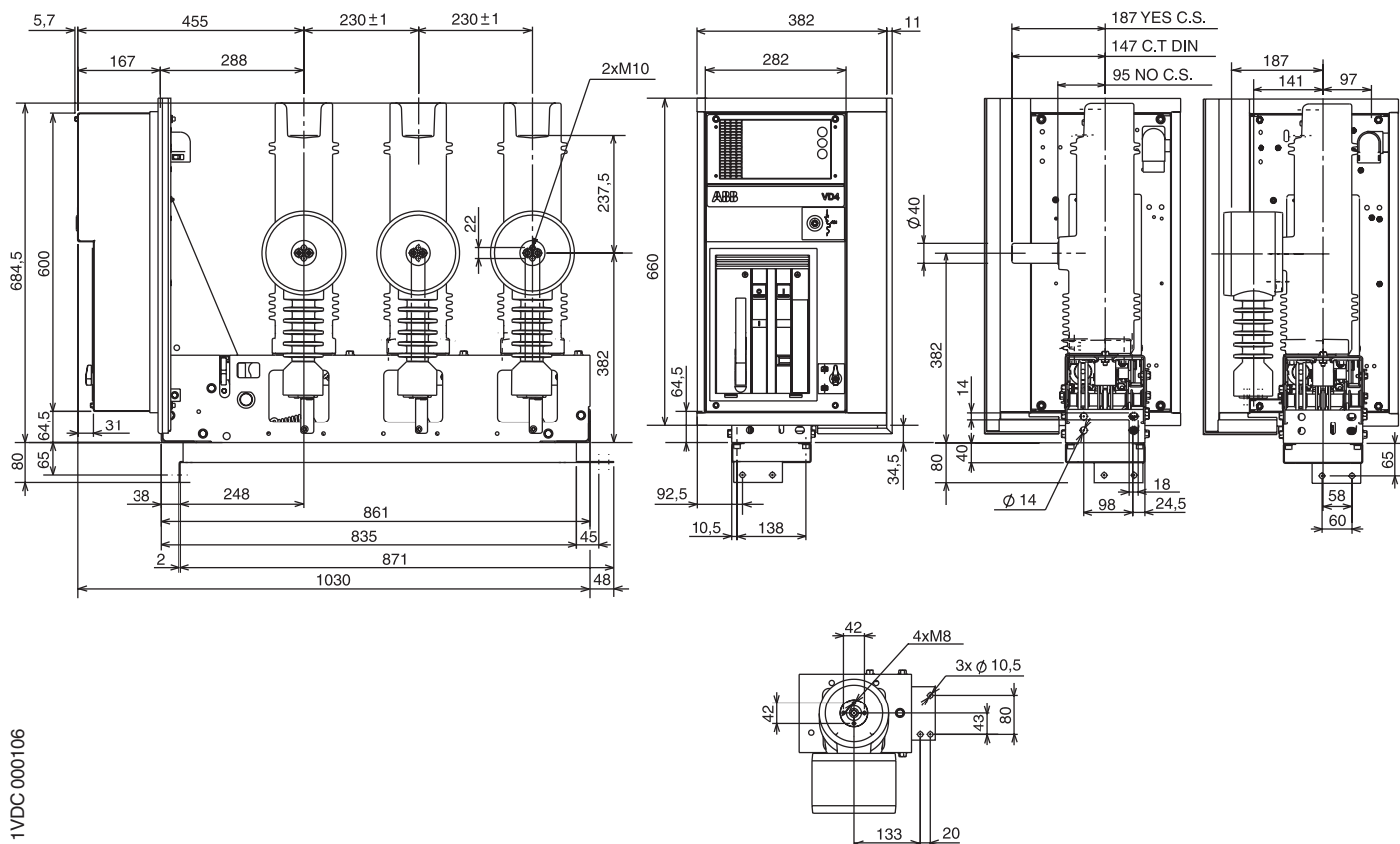
Circuit-breaker for UniSwitch switchgear with right lateral operating mechanism



TN 1VDC 000098

12-17.5-24 kV - P = 230 mm

Circuit-breaker for UniMix-F switchgear with right lateral operating mechanism



TN 1VDC 000106

Circuit-breaker for UniMix-R switchgear with right lateral operating mechanism

Circuit-breaker for UniMix-R switchgear with right lateral operating mechanism



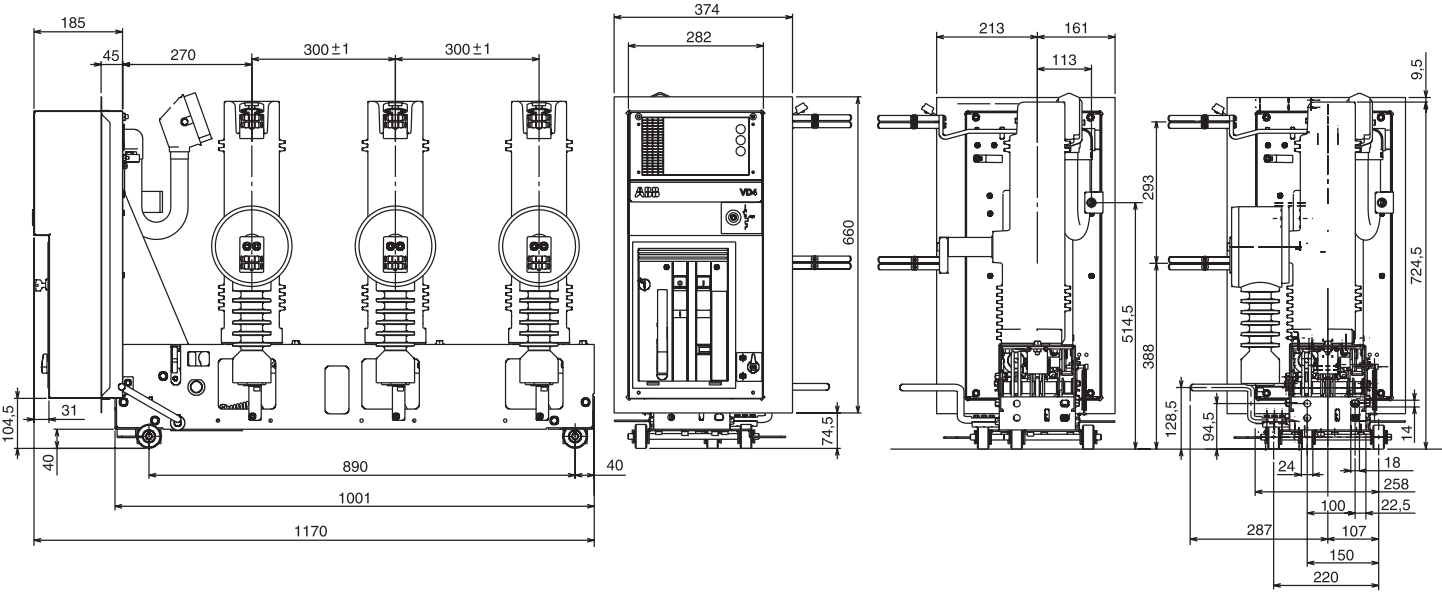
Circuit-breaker for UniAir switchgear with right lateral operating mechanism

Circuit-breaker for UniAir switchgear with right lateral operating mechanism



12-17.5-24 kV - P = 300 mm

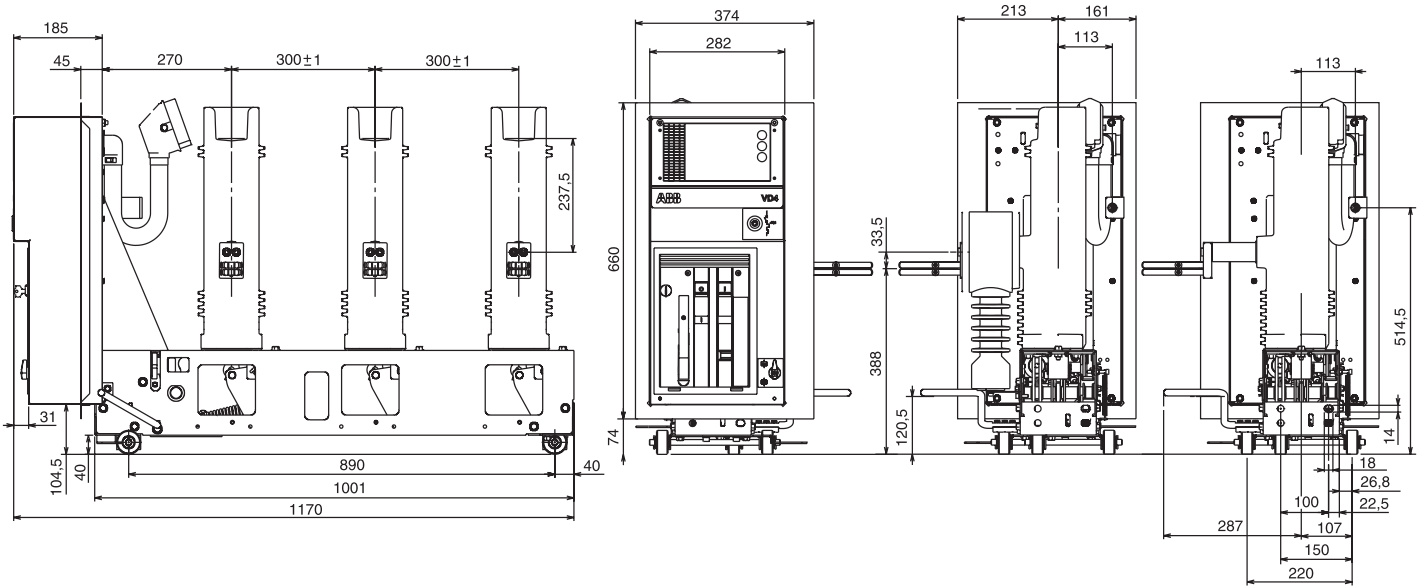
Circuit-breaker for UniAir-2R switchgear with right lateral operating mechanism



TN 1VDC 000103

12-17.5-24 kV - P = 300 mm

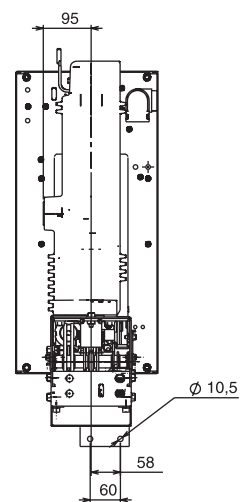
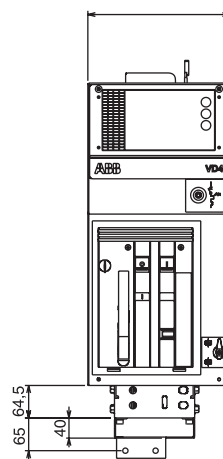
Circuit-breaker for UniAir-F switchgear with right lateral operating mechanism



TN 1VDC 000104

Circuit-breaker for UniAir-A switchgear with right lateral operating mechanism

Circuit-breaker for UniAir-A switchgear with right lateral operating mechanism



TN 1VDC 000105



ABB Power Technologies S.p.A.
Unità Operativa Sace
Via Friuli, 4
I-24044 Dalmine
Tel: +39 035 395111
Fax: +39 035 395874
E-mail: sacetms.tipm@it.abb.com
Internet: www.abb.com

ABB AG
Calor Emag Medium Voltage Products
Oberhausener Strasse 33 Petzower Strasse 8
D-40472 Ratingen D-14542 Glindow
Phone: +49(0)2102/12-1230, Fax: +49(0)2102/12-1916
E-mail: calor.info@de.abb.com
Internet: <http://www.abb.de/calor>

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

1VCD600565- Rev. -, en - Instruction Manual - 2007.06 (VD4R)