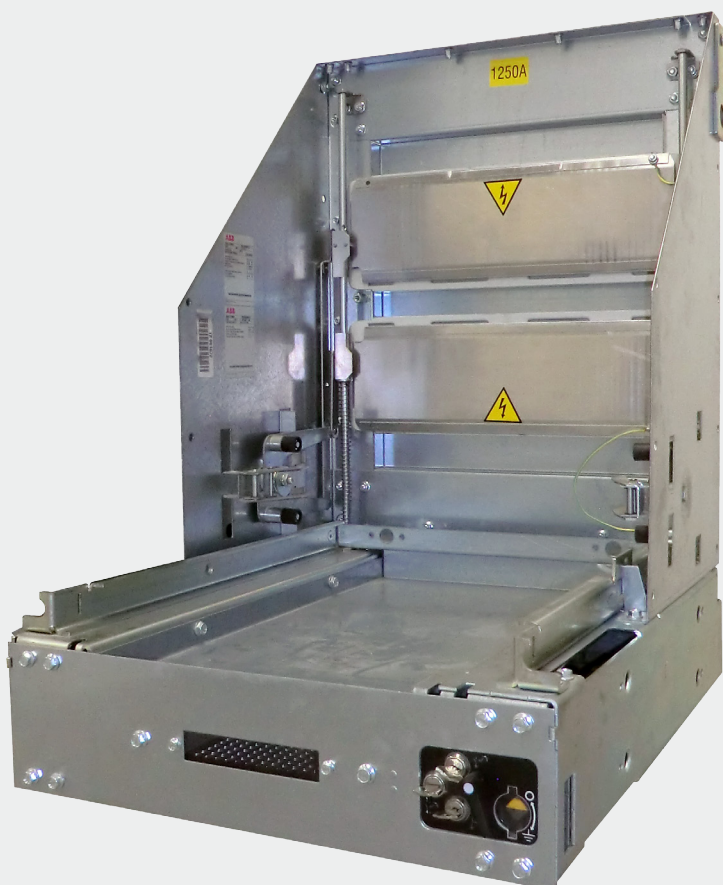

DISTRIBUTION SOLUTIONS

PowerCube PB/F

Fixed parts for medium voltage circuit breakers and contactors



PowerCube PB/F are the ideal solution for replacing fixed circuit breakers with withdrawable circuit breakers, for retrofitting activities and for upgrading obsolete switchgear to the new standards. Complete modules allow medium voltage air-insulated switchgear to be constructed with the same rated currents as those of the fixed parts.

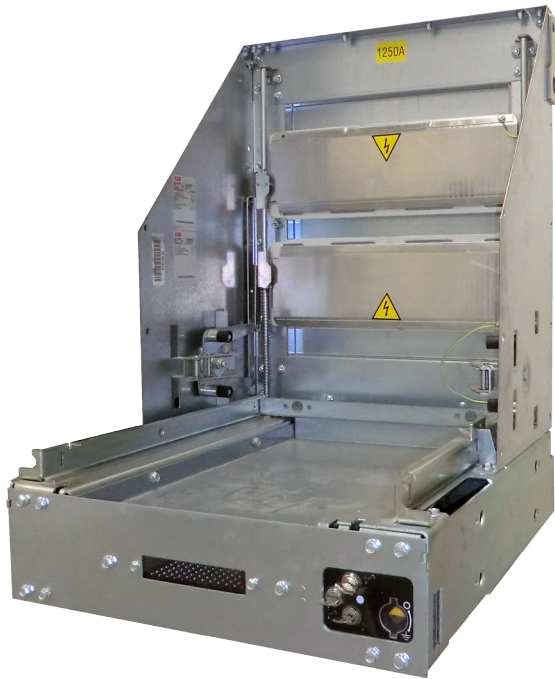


Table of contents

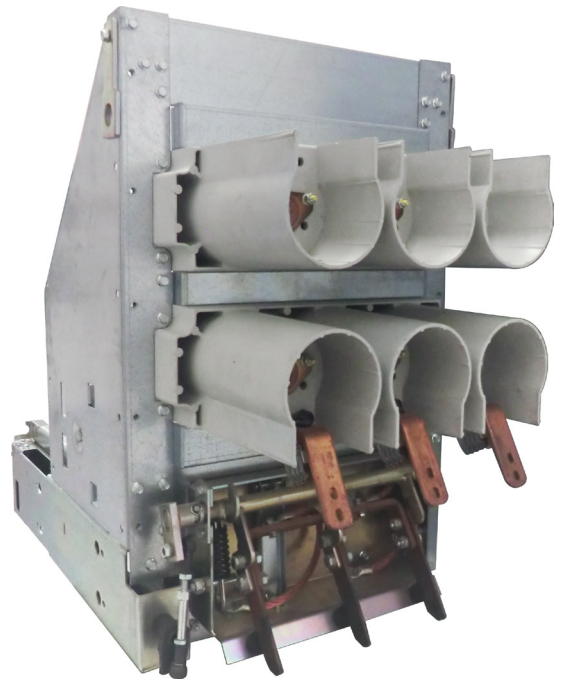
004 – 006	1. General characteristics
007 – 007	2. Main components
008 – 013	3. Available apparatus
014	4. Overall Dimensions
015	5. Electric circuit diagram

1. General characteristics

- The PowerCube type PB/F fixed parts allow construction of medium voltage air insulated switchgear divided into compartments, with the same rated current as that of the fixed part.
- The PowerCube type PB/F fixed parts are available with or without earthing switch with making capacity.



Front view of PowerCube type PB/F fixed part.



Rear view of PowerCube type PB/F fixed part.

Their compact dimensions and limited weights make the PowerCube type PB/F fixed parts the ideal solution for replacing fixed circuit breakers with withdrawable circuit breakers, for retrofitting activities and for upgrading obsolete switchgear to the new Standards.

The PowerCube type PB/F fixed parts are factory-assembled and tested and, where applicable, comply with IEC 62271-200 and IEC 62271-1 Standards.

The fixed parts allow construction of arc proof switchgear - classification LSC2B-PM IAC BFLR or LSC2B-PM AFLR according to IEC 62271-200 (in accordance with IEC 62271 Standards for general characteristics).

The following apparatus can be installed in the PowerCube type PB/F fixed parts:

- VD4, VD4G, and VM1 series vacuum circuit breakers
- HD4 series gas circuit breakers
- ConVac vacuum contactor

All apparatus operations are carried out from the front of the fixed part .

Interlocks

The PowerCube type PB/F fixed parts are fitted with the interlocks needed to prevent incorrect operations which might jeopardise safety of the personnel in charge of running the installation, or the efficiency and reliability of the apparatus. In particular, locking devices are provided to prevent the following operations:

- circuit breaker closing in the intermediate position
- racking-out of closed circuit breaker
- racking-in of closed circuit breaker
- manual opening of shutters when breaker is not installed.

The following are also available for the units provided with earthing switch:

- lock to prevent earthing switch closing with the circuit breaker in the connected or intermediate position
- lock to prevent circuit breaker racking-in with the earthing switch closed
- key locks on the earthing switch.

Note: some of the interlocks listed above are supplied on request or are only available for some versions.



Key locks on the earthing switch.



Lock on circuit breaker racking-in with earthing switch closed.

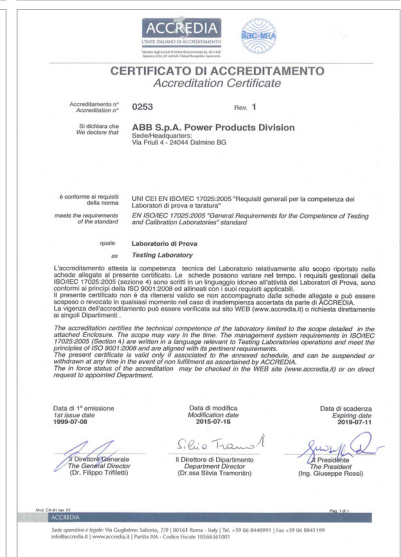
Quality System

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



Test laboratory

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



Environmental Management System

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

Health and Safety Management System

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

1. General characteristics

Fixed part electrical characteristics

PowerCube type		PB1/F - PB1/FL	PB2/F - PB2/FL		PB3/F	PB4/F
Panel width (mm)		600	750		1000	750
Contact diameter (mm)		35	35	79	109	35
Rated voltage	12 kV	•	•	•	•	
	17.5 kV	•	•	•	•	
	24 kV					•
Test voltage at power frequency	28 kV	•	•	•	•	
	38 kV	•	•	•	•	
	50 kV					•
Impulse withstand voltage	75 kV	•	•	•	•	
	95 kV	•	•	•	•	
	125 kV					•
Short-time withstand current	31.5 kA for 3s	•	•	•	•	•
	40 kA for 3s		•	•	•	
	50 kA for 1s		•	•	•	
Peak current	80 A	•	•	•		•
	100 kA		•	•	•	
	125 kA		•	•	•	
Rated currents	630 A	•	•			•
	1250 A	•	•			•
	1600 A			•		
	2000 A			•		
	2500 A				•	
	3150 A				•	

Electrical characteristics of earthing switch (if provided)

PowerCube type		PB1/F - PB1/FL	PB2/F - PB2/FL		PB3/F	PB4/F
Panel width (mm)		600	750		1000	750
Rated voltage	17.5 kV	•	•	•	•	
	24 kV					•
Impulse voltage	95 kV	•	•	•	•	
	125 kV					•
Rated withstand current	31.5 kA for 3s	•	•	•	•	
	40 kA for 3s		•	•	•	
	50 kA for 1s					•

2. Main components

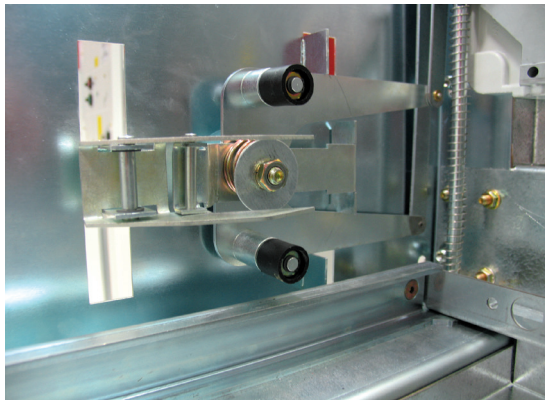
Monoblocs and shutters

The monoblocs consist of insulator bushings containing the top and bottom power connections of the circuit breaker compartment, towards the feeder and busbar compartments respectively.

The shutters are of the metal type and are activated automatically during movement of the circuit breaker from the test/isolated position to the connected position and vice versa.

They are fitted with a fail-safe safety device to prevent their manual opening with the circuit breaker removed.

Each shutter can be locked by means of two independent padlocks (optional).



Safety device on the shutters (fail safe).



Padlocks on the shutters (padlocks provided by the customer).

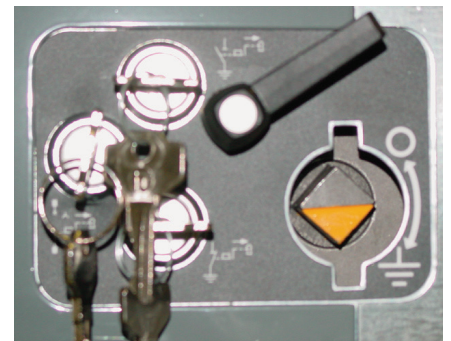
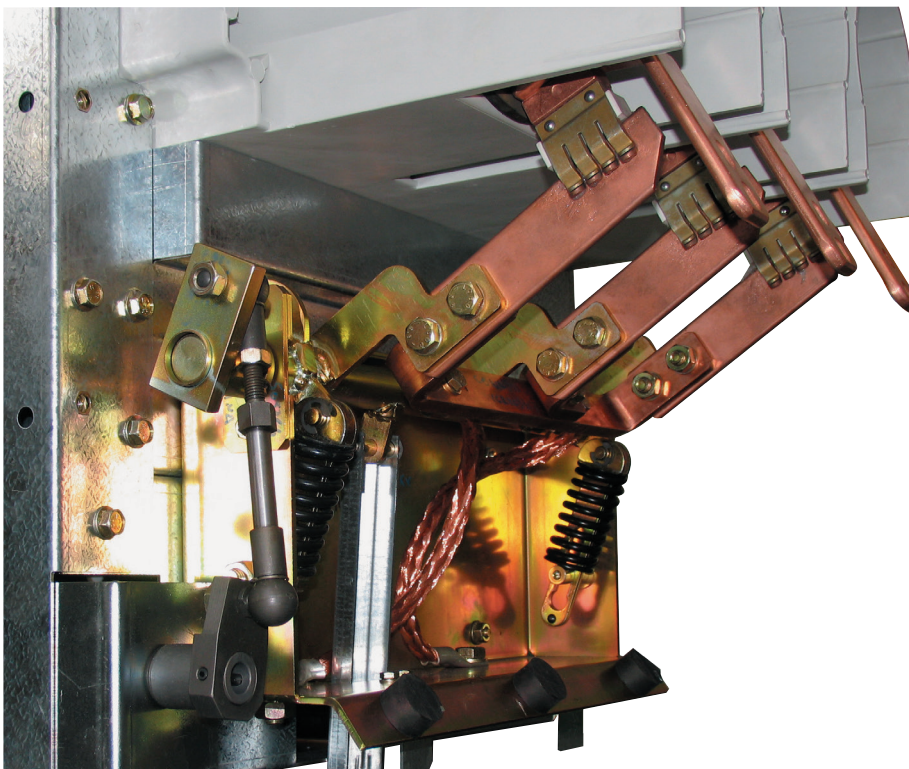
2. Main components

Earthing switches

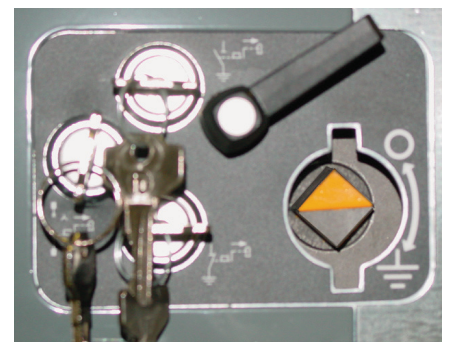
The PB/F type PowerCube units can be fitted with an earthing switch with short-circuit making capacity.

On request, the opening and closing operations can be locked by means of key locks.

Earthing switch control is carried out from the front of the unit with manual operation suitably interlocked with the circuit breaker position. For availability of the accessories, please see the table on page 5.



Earthing switch closed.



Earthing switch open.

Certain signalling of the earthing switch position (open/closed) visible from the front of the enclosure.

Accessories

PowerCube fixed part		PB1/F- PB1/TF	PB1/FL	PB2F- PB2/TF	PB2/FL	PB3/F	PB4/F- PB4/TF
Width (mm)		600	600	750	750	1000	750
Rated voltage	12 kV	•		•	•	•	
	17.5 kV	•		•	•	•	
	24 kV						•
Standard fittings	1 Plug socket with anti-racking-in lock for circuit-breakers with lower rated current than that of the unit or for apparatus not foreseen I for the unit itself	•		•	•	•	
	2 Safety device for metal shutters (Fail Safe)	•	•	•	•	•	•
	3 Circuit breaker anti-racking-in lock	•		•		•	•
Standard fittings	4 Earthing switch	•		•		•	•
	5 Key lock in open or closed position or in open and closed position, for earthing switch	•		•		•	•
	6 Electromechanical lock for earthing switch (24-30-48-60-110-125-220-250 Vdc; 110-220 Vac 50Hz)	•		•		•	•
	7 Earthing switch auxiliary contacts (5 or 10)	•		•		•	•
	8 Anti-condensation heater (110-220 Vac 50 Hz)	•	•	•	•	•	•
Accessories on request (assembly by customer)	9 Padlock for metal shutters (top or bottom or top and bottom)	•	•	•	•	•	•
	10 Earthing switch operating lever, extra in relation to normal supply (*)	•		•		•	•
	11 Apparatus transport and racking-in truck	•	•	•	•	•	•

(*) The normal supply consists of one operating lever for every 10 fixed parts.

3. Available apparatus

Circuit breakers

The PowerCube units can be fitted with HD4 series SF6 and VD4, VM1 series vacuum circuit breakers.

The circuit breakers are fitted with a truck which allows their racking-in and out of the switchgear with the door closed.

Both types have a compact and light structure which ensures great sturdiness and excellent mechanical reliability.

The operating mechanism and poles are fixed to the metal structure which also acts as a support for the moving contact actuation kinematics.

Suitable PB/F frame: please refer to related apparatus catalogue or ask ABB

VD4, VD4G and VM1 series vacuum circuit breakers

The VD4, VD4G and VM1 circuit breakers use vacuum as interruption and insulating medium. Thanks to the advanced techniques used for their construction, the vacuum circuit breakers ensure high performances under all service conditions. The vacuum interrupters are embedded in the poles made of polyamide or epoxy resin. This construction means the interrupters are unaffected by shocks, humidity and environmental pollution.

The circuit breaker poles, making up the interruption part, are sealed for life pressure systems (IEC 62271-100 Standards) and are maintenance-free.

The VD4 and VD4G circuit breakers use a mechanical type of operating mechanism, the VM1 circuit breakers use an operating mechanism with a magnetic actuator.

VD4G circuit breakers are designed to meet the most demanding plant requirements for generator applications as per IEEE C37.013 and the new revision IEC/IEEE 62271-C37-013 standards.



VD4 series vacuum circuit breaker.



VD4G series vacuum circuit-breaker.

HD4 series SF6 circuit breakers

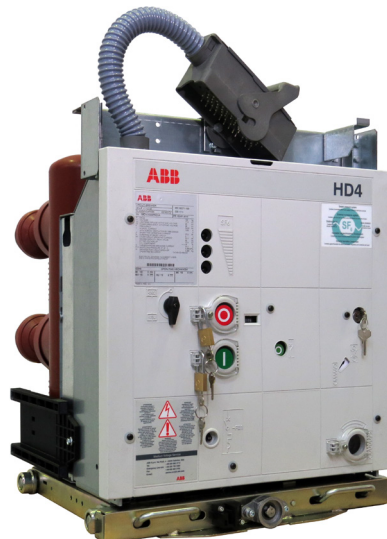
The HD4 series of medium voltage Circuit breakers use sulphur hexafluoride gas (SF6) to extinguish the electric arc and as the insulating medium.

The breaking principle of HD4 circuit breakers is based on compression and self-blast techniques to obtain top performances at all service current values, with gradual arc extinction, no restriking, operating overvoltages or chopped currents.

These characteristics guarantee long electrical life for the circuit breaker and limited dynamic, dielectric and thermal stresses on the installation.

The circuit breaker poles, which make up the interruption part, are sealed for life pressure systems (IEC 62271-100 Standards) and are maintenance-free.

The stored energy mechanical operating mechanism has free trip and allows opening and closing operations independent of the operator's actions.



HD4 series gas circuit breaker.

3. Available apparatus

ConVac/P contactors

ConVac series withdrawable contactors are used in PowerCube PB1 Units up to 12 kV.

ConVac is suitable to control a.c. devices that need to a considerable number of operations with an extremely low chopping current.

The Contactor is characterized by a monostable linear actuator and available in two basic configuration, Electrical latching and mechanical latching.

Close operation is always performed supplying the multi-voltage electronic feeded which reduce automatically power consumption after the close operation without the need of added resistances. In electrically latched units, as soon as power supply is not present, open operation is guaranteed by springs. In mechanically latched

units, after the closing operation is performed, the power supply is removed and a mechanical device lock the contactor in close position until a trip coil is energized.

When this happen, the mechanical lock disengage, and the contactor open by springs. The contactor is suitable to install both DIN and BS fuses with different lengths (type to be specified at order stage).

ConVac contactors are also characterized by an extreme flexibility in term of configuration, for instance it is possible for the customer to switch from electrical to mechanical latching or to change rated auxiliary voltage without ABB intervention by replacing the contactor drive unit. This allow to optimize and reduce spare units management and to fastly adapt to changes in specifications.

ConVac/P withdrawable contactors for PowerCube units type PB

			Rated current of ConVac contactors (40 °C) [A]						Contactor	PowerCube
kV	Isc (kA) ⁽²⁾	Icw (kA)	W=600 p=150 u/l=205 H=260 Ø=35	W=750 p=210 u/l=310 H=280 Ø=35	W=750 p=210 u/l=310 H=280 Ø=79	W=1000 p=275 u/l=310 H=280 Ø=109	W=750 p=210 u/l=310 H=325 Ø=35	W=1000 p=275 u/l=310 H=345 Ø=79		
7.2	16	6	400 ⁽³⁾						ConVac 7/P ⁽⁴⁾	PB 1/F
	20	6	400 ⁽³⁾							
	25	6	400 ⁽³⁾							
	31.5	6	400 ⁽³⁾							
12 ⁽⁵⁾	16	6	400 ⁽³⁾						ConVac 12/P ⁽⁴⁾	PB 1/F
	20	6	400 ⁽³⁾							
	25	6	400 ⁽³⁾							
	31.5	6	400 ⁽³⁾							

⁽¹⁾ Ask ABB whether available.

⁽²⁾ Guaranteed, using suitable fuses.

⁽³⁾ The rated current is liable to be derated depending on the rated current of the fuses.

⁽⁴⁾ Both ConVac 7/P and ConVac 12/P are available in two different versions, standard and high performances. for more details please check ConVac catalogue

⁽⁵⁾ for availability please ask ABB

W = Width of PowerCube Units type PB.

P = Horizontal center distance between the circuit-breaker poles.

U/L = Distance between the upper and lower terminal.

H = Distance between the lower terminal and earth.

Ø = Diameter of the contacts in the insulator block of PowerCube Units type PB.



Series ConVac vacuum contactor

Voltage transformers trucks

PTT/W VT trucks are used in PB/T measuring units. The TV trucks are supplied without voltage transformers, so that they can be ordered to ABB after plant configuration. The ABB voltage transformers suitable for these units are:

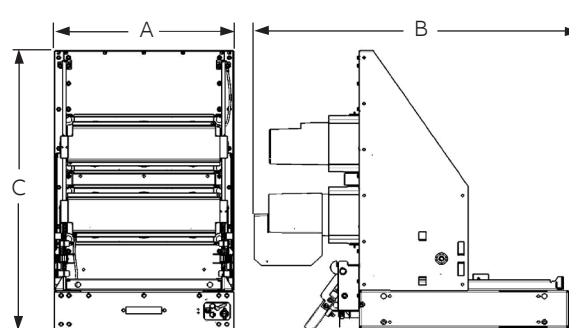
ABB TJP-F 4.0 (12 kV)

ABB TJP-F 5.0 (17 kV)

ABB TJP 6.0 (24 kV)

Trucks for measuring units			
kV	Isc/ Icw	Truck type	PowerCube
12	16	PTT1/W	PB1/TF
17.5	20		
	25		
	31.5		
12	40	PTT2/W	PB2/TF
17.5	50		
24	16	PTT4/W	PB4/TF
	20		
	25		
	31.5		

4. Overall Dimensions

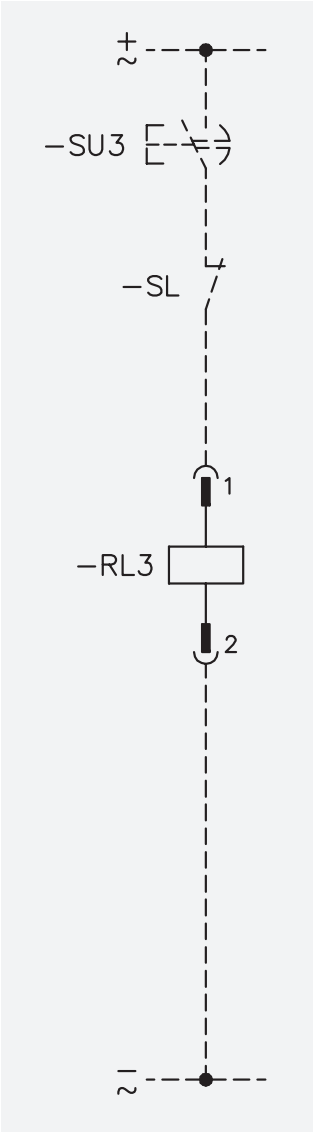


Module	Rated voltage [kV]	Rated current [A]	Isc Icw [kA]	Table of dimensions	A [mm]	B [mm]	C [mm]	Weight [kg]
PB1/F	12	630 - 1250	31.5	1VCD003382	596	1061	900	(*)
	17.5	630 - 1250						
PB1/FL	12	630 - 1250	31.5	1VCD003614	596	1015	787	(*)
	17.5	630 - 1250						
PB2/F	12	630...2000	50	1VCD003383	746	1061	1106	(*)
	17.5	1250...2000						
PB2/FL	12	630...2000	50	1VCD003383	746	1015	983	(*)
	17.5	1250...2000						
PB3/F	12	2500...3150	50	1VCD003893	996	1030	1096	(*)
	17.5	2500...3150						
PB4/F	24	630 - 1250	31.5	1VCD003384	746	1338	1236	(*)

(*) Ask ABB.



5. Electric circuit diagram



Reference designations

In compliance with IEC 61346-2 Standard and with the ABB 2NBA000001 technical standard

Designation	Description
-RL3	Electro-mechanical lock on earthing switch closing operation
-SL	Contact for the earthing switch operation lock
-SU3	Delayed pushbutton for enabling earthing switch operation (maximum delay allowed is 1 minute) (to be provided by the customer)

Graphic symbols (in compliance with IEC 60617 and CEI EN 60617 Standards)

- - - -	Mechanical, pneumatic or hydraulic connection
	Delayed movement (in the direction the arc moves towards its centre)
	Pushbutton actuator
●	Connection of conductors
	Socket and plug (female and male)
	Control coil (general symbol)



More product information:

abb.com/mediumvoltage

Your contact center:

abb.com/contactcenters

More service information:

abb.com/service