

PRODUCT BROCHURE

PowerCube type PB

Preassembled modules and enclosures
for constructing medium voltage switchgear



- Flexibility for retrofit
- Standardized module

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1 General characteristics



PowerCube module type PB/M



PowerCube enclosure type PB/E



Mounting frame type PB/F

General information

PowerCube modules can be used to make metal-clad medium voltage air-insulated switchgear with the same rated current values as the enclosure.

The rated currents of the enclosures refer to versions tested in ABB UniSafe switchgear.

Use of the 4000 A PB3 enclosure allows a switchgear with the same rated current to be made so long as a suitable fan is installed in the rear part of the switchgear itself (consult ABB for further details).

PowerCube units type PB are available in three different versions: PB/M, PB/E and PB/F.

PB/M: complete module that also includes the cable access cubicle, which can also be pre-engineered to house the withdrawable TV compartment.

PB/E: enclosure without cable access compartment, thus unable to house the withdrawable TV compartment but more flexible and suitable for the construction of two-level switchgear since it is smaller in size.

PB/F: mounting frame allow construction of medium voltage air insulated switchgear divided

into compartments, with the same rated current as that of the fixed part.

PowerCube modules are preassembled and tested in the factory. They can be used to make switchgear conforming to Standards IEC 62271-200, CEI 17-1, IEC 60694-62271-1, CEI 17-6.

They are available with the following specifications:

Rated voltage (kV)	... 17.5	24
Rated current (A)	... 4000	... 2500
Rated short-time withstand current of main circuit (kA)	... 40 x 3 s	... 25 x 3 s
	... 50 x 1 s	

The following apparatus can be installed in PowerCube modules:

- series VD4, VM1, eVM1 and Vmax vacuum circuit-breakers
- series HD4 gas circuit-breakers
- series V-Contact V and V-Contact VSC vacuum contactors
- service trolleys

All the switching operations are carried out from the front of the module/enclosure.

Protection class

The protection classes of the PowerCube modules comply with IEC 60529 standards.

The following standard protection classes are guaranteed on the front:

- external housing: IP4X
- inside the cubicles: IP2X.

Interlocks

The PowerCube module is equipped with interlocks so as to prevent incorrect operations that could put the operators' safety at risk and compromise the efficiency and reliability of the actual equipment.

These interlocks inhibit the following operations:

- closing of the circuit-breaker unless the connected or isolated positions are reached
- plugging-out of the closed circuit-breaker
- plugging-in of the closed circuit-breaker
- door opening if the circuit-breaker is plugged in or halfway between being plugged in and isolated
- plugging-in of the circuit-breaker when the compartment door is open

Moreover, if the unit is equipped with an earthing switch:

- closing of the earthing switch if the circuit-breaker is plugged in or halfway between being plugged in and isolated
- plugging-in of the circuit-breaker with the earthing switch closed.
- opening of the feeder compartment door with the earthing switch open (PowerCube PB/M module only)
- opening of the earthing switch with the feeder compartment door open (PowerCube PB/M module only)

Note:

some of the aforementioned interlocks are available on request or only available for certain versions.

Quality System

Conforms to ISO 9001 Standards, certified by an independent body.

Test laboratory

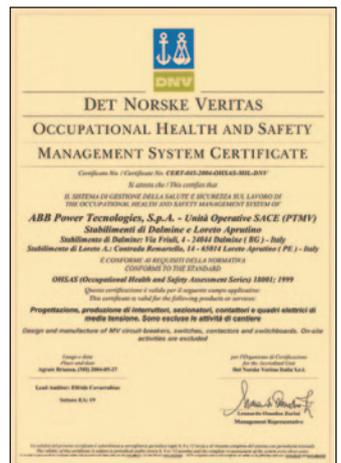
Conforms to ISO 45001 Standards, certified by an independent body.

Environmental Management System

Conforms to ISO 14001 Standards, certified by an independent body.

Health and Safety Management System

Conforms to OHSAS 18001 Standards, certified by an independent body.



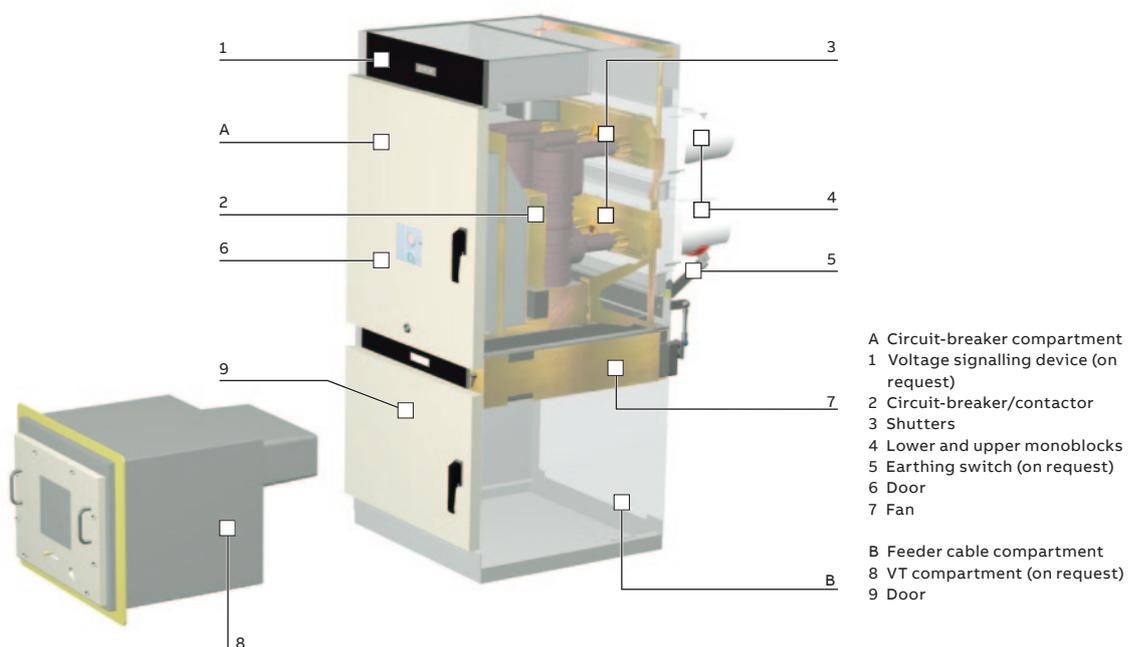
PowerCube PB

Technical data PB/M

PowerCube		PB/M	PB/M	PB/M
Rated voltage	[kV]	12	17.5	24
Rated insulation voltage	[kV]	12	17.5	24
Withstand voltage (50 Hz)	[kV]	28	38	50
Impulse withstand voltage	[kV]	75	95	125
Rated frequency	[Hz]	50-60	50-60	50-60
Rated normal current (40°C)	[A]	630	630	630
		1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	2500 ⁽¹⁾
		3150	3150	-
		3600 ⁽¹⁾	3600 ⁽¹⁾	-
4000 ⁽¹⁾	4000 ⁽¹⁾	-		
Rated short-time withstand current (3 s)	[kA]	25-31.5-40-50 ⁽²⁾	25-31.5-40-50 ⁽²⁾	25-31.5
Overall dimensions (excluding monoblocs)		H [mm]	1680	1680
		W [mm]	600/750/1000	600/750/1000
		D [mm]	1030	1030
Weight	[Kg]	120	450	320
Degree of protection		IP 3X	IP 3X	IP 3X
Compatible circuit-breakers and contactors				
• HD4		•	•	•
• VD4		•	•	•
• V-Contact (module width 600 mm)		•	-	-

(1) With forced ventilation using fan built into the enclosure (for 4000 A another fan must be installed in the rear part of the switchgear).
(2) 25-31.5 kA for PowerCube module width 600 mm.

Main components

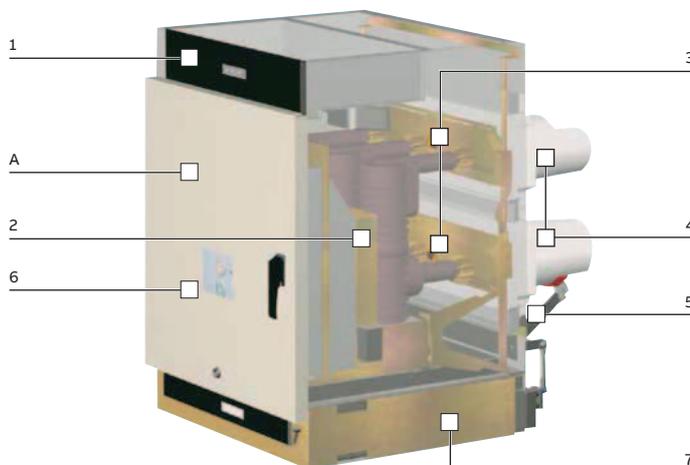


Technical data PB/E

PowerCube		PB/E	PB/E	PB/E	
Rated voltage	[kV]	12	17.5	24	
Rated insulation voltage	[kV]	12	17.5	24	
Withstand voltage (50 Hz)	[kV]	28	38	50	
Impulse withstand voltage	[kV]	75	95	125	
Rated frequency	[Hz]	50-60	50-60	50-60	
Rated normal current (40°C)	[A]	630	630	630	
		1250	1250	1250	
		1600	1600	1600	
		2000	2000	2000	
		2500	2500	2500 ⁽¹⁾	
		3150	3150	-	
		4000 ⁽¹⁾	4000 ⁽¹⁾	-	
Rated short-time withstand current (3 s)	[kA]	25-31.5-40-50 ⁽²⁾	25-31.5-40-50 ⁽²⁾	25-31.5	
Overall dimensions (excluding monoblocs)		H [mm]	1120	1120	1230
		W [mm]	600/750/1000	600/750/1000	750/1000
		D [mm]	1016/1030	1016/1030	1246
Weight	[Kg]	120	450	320	
Degree of protection		IP 3X	IP 3X	IP 3X	
Compatible circuit-breakers and contactors					
		•	•	•	
• HD4		•	•	•	
• VD4		•	•	•	
• V-Contact (module width 600 mm)		•	-	-	

(1) With forced ventilation using fan built into the enclosure (for 4000 A another fan must be installed in the rear part of the switchgear).
 (2) 25-31.5 kA for PowerCube module width 600 mm.

Main components

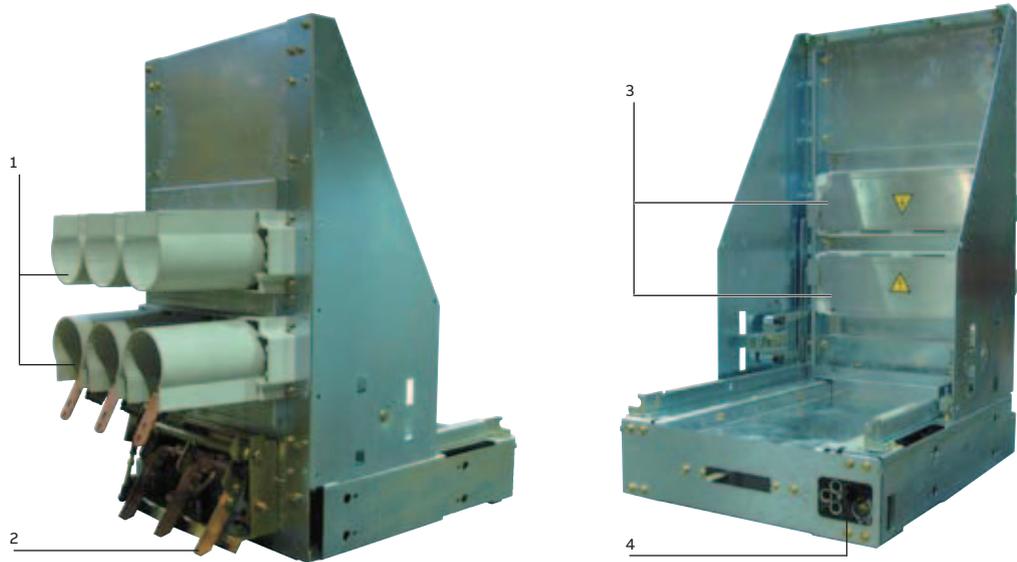


- A Circuit-breaker compartment
- 1 Voltage signalling device (on request)
- 2 Circuit-breaker/contactors
- 3 Shutters
- 4 Lower and upper monoblocks
- 5 Earthing switch (on request)
- 6 Door
- 7 Fan

Technical data

PowerCube		PB/F	PB/F	PB/F	
Rated voltage	[kV]	12	17.5	24	
Rated insulation voltage	[kV]	12	17.5	24	
Withstand voltage (50 Hz)	[kV]	28	38	50	
Impulse withstand voltage	[kV]	75	95	125	
Rated frequency	[Hz]	50-60	50-60	50-60	
Rated normal current (40°C)	[A]	630	630	630	
		1250	1250	1250	
		1600	1600	-	
		2000	2000	-	
Rated short-time withstand current	[kA]	31.5	31.5	25	
Overall dimensions (excluding monoblocs)		H [mm]	1098	1098	1226
		W [mm]	596/746	596/746	746
		D [mm]	1061	1061	1338
Compatible circuit-breakers and contactors					
		•	•	•	
• HD4		•	•	•	
• VD4		•	•	•	
• V-Contact		•	-	-	

Main components



- 1 Bottom and top monoblocs
- 2 Earthing switch (on request)
- 3 Shutters
- 4 Earthing switch operating mechanism

Electrical specifications of PowerCube modules

PowerCube module/enclosure		PB1	PB2	PB3	PB4	PB5	PB1/R	PB2/R	PB3/R	PB4/R	PB5/R
Module width	mm	600	750	1000	750	1000	600	750	1000	750	1000
Rated voltage	12 kV	■	■	■			■	■	■		
	17.5 kV	■	■	■			■	■	■		
	24 kV				■	■				■	■
Test voltage at industrial frequency	28 kV	■	■	■			■	■	■		
	38 kV	■	■	■			■	■	■		
	50 kV				■	■				■	■
Impulse withstand voltage	75 kV	■	■	■			■	■	■		
	95 kV	■	■	■			■	■	■		
	125 kV				■	■				■	■
Short-time withstand current	25 kA (3 s)	■	■	■	■	■					
	31.5 kA (3 s)	■	■	■							
	40 kA (3 s)		■	■							
	50 kA (1 s)		■	■							
	peak current	63 kA	■	■	■	■	■				
	79 kA	■	■	■							
	100 kA		■	■							
	125 kA		■	■							
Rated currents	630 A	■	■		■						
	1250 A	■	■		■						
	1600 A		■			■					
	2000 A			■		■					
	2500 A			■		■ ⁽¹⁾					
	3150 A			■ ⁽¹⁾							
	4000 A			■ ⁽¹⁾							

Not applicable

Electrical specifications of the earthing switch (on request)

PowerCube module/enclosure		PB1	PB2	PB3	PB4	PB5	PB1/R	PB2/R	PB3/R	PB4/R	PB5/R
Module width	mm	600	750	1000	750	1000	600	750	1000	750	1000
Short-time withstand current/	25 kA (3 s)	■	■	■	■	■	■	■	■	■	■
Short-circuit making capacity	31.5 kA (3 s)	■	■	■			■	■	■		
	40 kA (1 s)		■	■				■	■		
	50 kA (1 s)		■	■			■	■	■		
Peak current	63 kA	■	■	■	■	■	■	■	■	■	■
	79 kA	■	■	■				■	■		
	100 kA		■	■				■	■		
	125 kA		■	■				■	■		

(1) With forced ventilation in the circuit-breaker compartment: a further fan is required at the rear of the switchgear for 4000 A versions.

2 Main components

—
01 Series VD4 vacuum
circuit-breaker

Circuit-breakers

PowerCube Units can be equipped with HD4 series withdrawable gas circuit-breakers and VD4, VM1, eVM1 and Vmax series withdrawable vacuum circuit-breakers. The circuit-breakers come with a trolley that allows them to be racked in and out of the switchgear with the door closed.

Both types feature an extremely sturdy, compact, light structure with excellent mechanical strength. The operating mechanism and poles are fixed to the metal structure, which also acts as a support for the mechanism that operates the moving contacts.

Series VD4 and Vmax vacuum circuit-breakers

VD4 circuit-breakers use a vacuum as breaking and insulating medium. Thanks to the advanced

manufacturing techniques with which they are made, vacuum circuit-breakers provide a high performance in all operating conditions. The vacuum interrupters are encapsulated in poles made of epoxy resin. This construction protects the interrupters from shock, humidity and environmental pollution.

The circuit-breaker poles, which form the interrupting part, are life-long sealed pressure devices (Standards IEC 62271-100 and CEI 17.1-1) and are maintenance-free.

VD4 circuit-breakers feature a mechanical type of operating device while VM1 and eVM1 circuit-breakers have magnetic actuators. Both operating mechanisms are the trip-free stored energy type with independent opening and closing regardless of the operator's action.





02

Series Vmax/W vacuum circuit-breakers

Vmax circuit-breakers consist of an insulator block in which three vacuum interrupters are installed. The insulator block and operating mechanism are fixed to a frame. The vacuum interrupters house the contacts that form the circuit-breaker's arcing chamber. Vmax circuit-breakers feature a trip-free mechanical operating device of the stored energy type, with independent opening and closing regardless of the operator's action. The simply designed mechanical operating device is easy to use and can be customized with a wide range of easily and quickly installed accessories. All this makes the apparatus reliable, long-lasting and with little need for maintenance. Vmax circuit-breakers are used in electrical distribution systems to control and protect cables, overhead feeders, transformer and distribution substations, motors, transformers, generators and capacitor banks. The circuit-breaker's vacuum interrupters, which form the interrupting part, are life-long sealed pressure devices (Standards IEC 62271-100 and CEI 17.1-1) and are maintenance-free.



03

Series V-Contact VSC vacuum contactors

V-Contact series withdrawable contactors are used in PowerCube PB1 Units up to 12 kV. The contactors are suitable for controlling a.c. devices that need a considerable number of operations. They consist of a resin monobloc that houses the vacuum interrupters, the moving apparatus, the operating mechanism, the multivoltage feeder and the auxiliary accessories. The monobloc also acts as a support for fuse installation. Fuses of various different sizes can be used according to both DIN and BS Standards thanks to the relative adapters. The type of fuseholder (BS or DIN) must be specified at the time of order. The contactor is prevented from closing if even only one of the fuses is missing. Activation of one of the three fuses automatically opens the contactor. The compact, sturdy construction guarantees extremely long electrical and mechanical life.

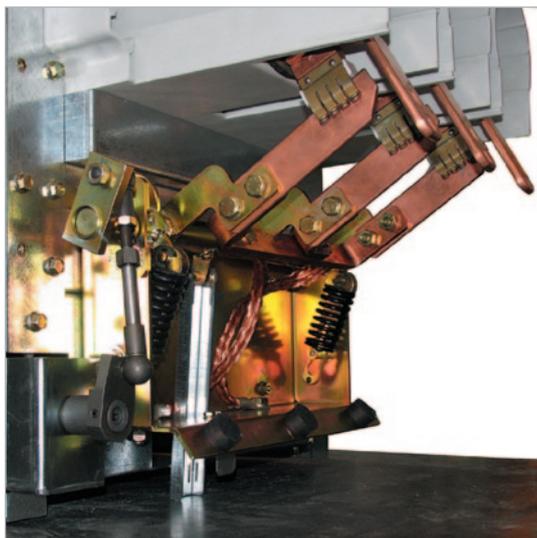
Earth switches

PowerCube units type PB can be equipped with an earthing switch. The earthing switch possesses short-circuit making capacity. On request, the opening and closing operations can be inhibited by means of a key lock. The earthing switch is controlled from the front of the module by means of a manual operation appropriately interlocked with the circuit-breaker's position.

The available accessories are listed in the table on page 21.

Insulator blocks and shutters

The insulator blocks consist of insulating bushings containing the upper and lower power connections of the circuit-breaker compartment, towards the power grid and busbar compartments respectively. The shutters are the metal type and are automatically activated when the circuit-breaker moves from the test/isolated position to the plugged-in position or vice versa. They can be equipped with a fail-safe safety device (optional) to prevent them from being opened in the manual mode when the circuit-breaker has been removed. Each shutter can be locked by means of two separate padlocks (optional).



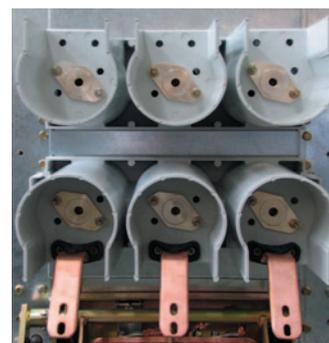
Switch closed



Segregating shutters with metal partitions



Switch open



Insulator blocks (viewed from rear)

Fail-safe indication of the earthing switch (open/closed) visible from the front of the enclosure.

TV compartment (PB/M units only)

PowerCube modules can be equipped with a TV compartment with withdrawable voltage transformers.

The voltage transformers are the dedicated type and are protected by fuses. The fuses can be replaced when the switchgear is in service since the fuse compartment is segregated from the other compartments by metal partitions.

The TV compartment is available for 750 mm and 1000 mm width PowerCube modules.

The available accessories are listed in the table on page 21.



TV compartment with withdrawable voltage transformers



3 Available types and apparatus

Accessories

1a Signalling contacts for circuit-breaker/ contactor in connected/isolated position.

The supply always comprises 10 contacts (5NO+5NC in change-over configuration) for signalling the connected status and another ten for signalling the isolated status. A second group of 10 contacts is available on request as an accessory for both signals.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
PB/E	Width 12 (mm)	17.5 kV	24 kV	Bus tie/ Direct incoming/riser/ outgoing measurements		
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No



Specifications

Rated voltage	V Up to 250 a.c. (50-60 Hz) /d.c.
Insulation voltage 50 Hz/1 min	V 2000 (towards earth)
Rated current	A 5
Rated thermal current	A 17.5

Breaking capacity of auxiliary contacts

Resistive load

48 V (d.c.)	A 3
110 V (d.c.)	A 0.8
220 V (d.c.)	A 0.5

Inductive load: L/R=5 ms

48 V (d.c.)	A 1.5
110 V (d.c.)	A 0.5
220 V (d.c.)	A 0.3

1b Anti-racking-in lock for circuit-breakers with lower rated current than that of the cubicle or for apparatus not envisaged for the cubicle itself.

Consists of a code on the socket that prevents the plug from being inserted if the rated current of the apparatus is incompatible with that of the PowerCube unit.

In order to function correctly, this lock requires a counter-part on the circuit-breaker, which consists of the code on the plug and the locking magnet on the trolley (-RL2). The plug cannot be removed when the apparatus is connected.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
PB/E	Width 12 (mm)	17.5 kV	24 kV	Bus tie/ Direct incoming/riser/ outgoing measurements		
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No



1c Lock to prevent racking-in with the door open

Prevents withdrawable apparatus from being switched from the withdrawn position to the plugged-in position (and vice versa) with the door open. In order to function correctly, this lock requires a counterpart on the circuit-breaker.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
Width (mm)	12 kV	17.5 kV	24 kV			
		Bus tie/ incoming/ outgoing measurements		Direct incoming/ riser/ measurements		
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No

Accessories that must be obligatorily indicated when ordering

2 Circuit-breaker anti-racking-in lock

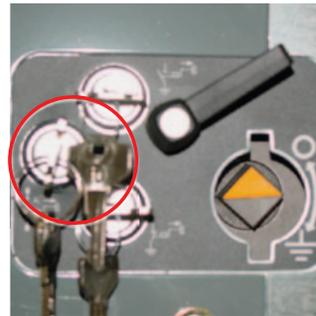
(the apparatus cannot be switched from the isolated position to the racked-in position when the key has been removed).

PowerCube unit	Rated voltage	Type of unit		Available accessory		
Width (mm)	12 kV	17.5 kV	24 kV			
		Bus tie/ incoming/ outgoing measurements		Direct incoming/ riser/ measurements		
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No



Lock installed in internal part of door

Counterpart on the apparatus



3 Withdrawable TV compartment (includes TV trolley)

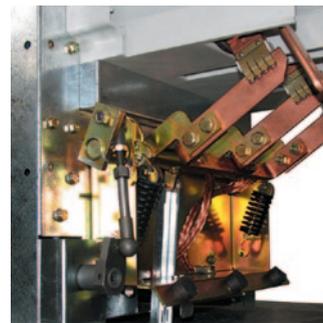
Can only be applied to module units (PB/M) for which the necessary presetting must be requested

PowerCube unit	Rated voltage	Type of unit		Available accessory
PB/M	Width 12 (mm)	17.5 kV	24 kV Bus tie/ incoming/ outgoing measurements	Direct incoming/riser/
PB1	600	■ ■ ■		No
PB2	750	■ ■ ■		Yes
PB3	1000	■ ■ ■		Yes
PB4	750		■ ■	Yes
PB5	1000		■ ■	Yes
PB1/R	600	■ ■		■ No
PB2/R	750	■ ■		■ Yes
PB3/R	1000	■ ■		■ Yes
PB4/R	750		■	■ Yes
PB5/R	1000		■	■ Yes



4 Earthing switch with making capacity

PowerCube unit	Rated voltage	Type of unit		Available accessory
PB/E	Width 12 (mm)	17.5 kV	24 kV Bus tie/ incoming/ outgoing measurements	Direct incoming/riser/
PB1	600	■ ■ ■		Yes
PB2	750	■ ■ ■		Yes
PB3	1000	■ ■ ■		Yes
PB4	750		■ ■	Yes
PB5	1000		■ ■	Yes
PB1/R	600	■ ■		■ Yes
PB2/R	750	■ ■		■ Yes
PB3/R	1000	■ ■		■ Yes
PB4/R	750		■	■ Yes
PB5/R	1000		■	■ Yes

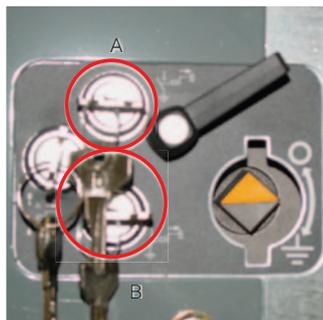


5 Key locks on earthing switches

Two locks are available when the earthing switch is required:

- a) Key lock released when switch is open
 - b) Key lock released when switch is closed
- Only one of the two locks or both may be ordered.

PowerCube unit	Rated voltage	Type of unit		Available accessory
		Bus tie/	Direct incom-	
PB/E	Width 12	24	ing/riser/	
PB/M	(mm)	kV	ing/riser/	
		kV	outgoing	measurements
PB1	600	■	■	Yes
PB2	750	■	■	Yes
PB3	1000	■	■	Yes
PB4	750		■	Yes
PB5	1000		■	Yes
PB1/R	600	■	■	Yes
PB2/R	750	■	■	Yes
PB3/R	1000	■	■	Yes
PB4/R	750		■	Yes
PB5/R	1000		■	Yes



6 Electromechanical lock on the earthing switch (BED)

PowerCube unit	Rated voltage	Type of unit		Available accessory
		Bus tie/	Direct incom-	
PB/E	Width 12	24	ing/riser/	
PB/M	(mm)	kV	ing/riser/	
PB/F		kV	outgoing	measurements
PB1	600	■	■	Yes
PB2	750	■	■	Yes
PB3	1000	■	■	Yes
PB4	750		■	Yes
PB5	1000		■	Yes
PB1/R	600	■	■	Yes
PB2/R	750	■	■	Yes
PB3/R	1000	■	■	Yes
PB4/R	750		■	Yes
PB5/R	1000		■	Yes



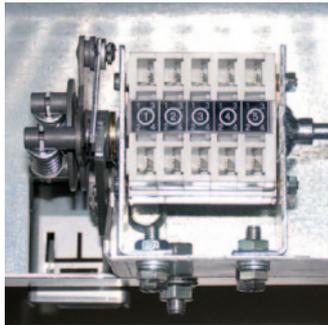
Rated voltage		
d.c.	V	24-30-48-60-110-125-220-250
a.c. 50 Hz	V	110-220
a.c. 60 Hz	V	110-220
Rated power		
d.c.	W	10.5±1.5
a.c.	VA	20±3

7 Auxiliary contacts for the earthing switch

Units equipped with earthing switches are available:

- a) Pack of 5 auxiliary contacts
- b) Pack of 10 auxiliary contacts.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
PB/E	Width 12 (mm)	17.5 kV	24 kV Bus tie/ incoming/ outgoing measurements	Direct incoming/ riser/		
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	Yes
PB2/R	750	■	■		■	Yes
PB3/R	1000	■	■		■	Yes
PB4/R	750		■		■	Yes
PB5/R	1000		■		■	Yes



8 Safety device for shutters (fail-safe)

This is a mechanical device which, in the absence of the withdrawable apparatus, prevents a person from opening the shutters in the manual mode.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
PB/E	Width 12 (mm)	17.5 kV	24 kV Bus tie/ incoming/ outgoing measurements	Direct incoming/ riser/		
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No



Specifications

Rated voltage V 24-500 a.c. (50-60 Hz) /d.c.

Insulation voltage 50 Hz/1 min V 250

Rated thermal current A 10

Breaking capacity of auxiliary contacts

500 V (a.c. 50/60 Hz) ; cos=0.4 A 5

220 V (a.c. 50/60 Hz) ; cos=0.4 A 10

220 V(d.c.) ; L/R=10 ms 1

Number of operations op,8N°

9 Voltage signalling lamps

These lamps indicate when the medium voltage side is being energized. They can be pre-assembled on PB/M modules with the appropriate presetting while for PB/E enclosures and PB/F fixed parts, they can be supplied loose for assembly in instrument compartments at the customer's charge.

The signal can be transmitted to the lamps by means of post insulators with capacitive sockets, by combisensors or current transformers.

PowerCube unit	Rated voltage	Type of unit		Available accessory	
PB/E PB/M (mm)	Width 12 17.5 24	Bus tie/ incoming/ outgoing	tie/ ing/riser/ measurements		
PB1	600	■ ■	■	Yes	
PB2	750	■ ■	■	Yes	
PB3	1000	■ ■	■	Yes	
PB4	750		■ ■	Yes	
PB5	1000		■ ■	Yes	
PB1/R	600	■ ■		■	Yes
PB2/R	750	■ ■		■	Yes
PB3/R	1000	■ ■		■	Yes
PB4/R	750		■	■	Yes
PB5/R	1000		■	■	Yes



10 Opening or closing operations with the door closed

This accessory can be supplied for circuit-breakers with mechanical control. It consists of either the sole opening button or the opening and closing button. This accessory requires different specific doors for VD4 or HD4 circuit-breakers. A specific door with an opening where a lever can be inserted for emergency operations is available for VM1 and eVM1 circuit-breakers and for V-Contact VSC/P contactors. This accessory is not available for 50 kA VD4 circuit-breakers.

PowerCube unit	Rated voltage	Type of unit		Available accessory	
PB/E PB/M (mm)	Width 12 17.5 24	Bus tie/ incoming/ outgoing	tie/ ing/riser/ measurements		
PB1	600	■ ■	■	Yes	
PB2	750	■ ■	■	Yes	
PB3	1000	■ ■	■	Yes	
PB4	750		■ ■	Yes	
PB5	1000		■ ■	Yes	
PB1/R	600	■ ■		■	No
PB2/R	750	■ ■		■	No
PB3/R	1000	■ ■		■	No
PB4/R	750		■	■	No
PB5/R	1000		■	■	No



Accessories that can be installed at the customer's charge

11 Anti-condensation heaters

PowerCube unit	Rated voltage	Type of unit	Available accessory
PB/E	Width 12	Bus tie/	Direct incom-
PB/M	(mm)	kV incoming/	ing/riser/
PB/F		outgoing	measurements
PB1	600	■ ■ ■	Yes
PB2	750	■ ■ ■	Yes
PB3	1000	■ ■ ■	Yes
PB4	750	■ ■	Yes
PB5	1000	■ ■	Yes
PB1/R	600	■ ■ ■	Yes
PB2/R	750	■ ■ ■	Yes
PB3/R	1000	■ ■ ■	Yes
PB4/R	750	■ ■	Yes
PB5/R	1000	■ ■	Yes



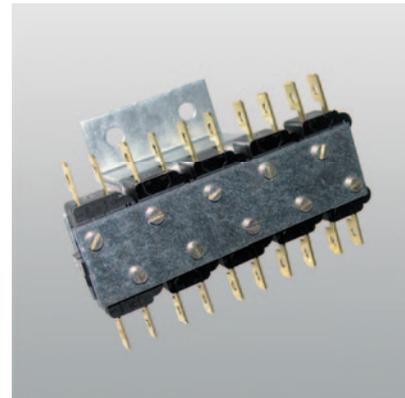
Rated voltage		
a.c. 50 Hz	V	110-220
a.c. 60 Hz	V	110-220
Rated power		W
		150±10

12 Contacts for signalling when earthing trolleys are racked in

Signal when the earthing trolley is in the racked-in position. Two kits are available:

- Group of 5 contacts
- Group of 10 contacts

PowerCube unit	Rated voltage	Type of unit	Available accessory
PB/E	Width 12	Bus tie/	Direct incom-
PB/M	(mm)	kV incoming/	ing/riser/
PB/F		outgoing	measurements
PB1	600	■ ■ ■	Yes
PB2	750	■ ■ ■	Yes
PB3	1000	■ ■ ■	Yes
PB4	750	■ ■	Yes
PB5	1000	■ ■	Yes
PB1/R	600	■ ■ ■	No
PB2/R	750	■ ■ ■	No
PB3/R	1000	■ ■ ■	No
PB4/R	750	■ ■	No
PB5/R	1000	■ ■	No



Specifications	
Rated voltage	V Up to 250 a.c. (50-60 Hz)/d.c.
Insulation voltage 50 Hz/1 min	V 2000 (towards earth)
Rated current	A 5
Rated thermal current	A 17.5
Breaking capacity of auxiliary contacts	
Resistive load	
48 V (d.c.)	A 3
110 V (d.c.)	A 0.8
220 V (d.c.)	A 0.5
Inductive load: L/R=5 ms	
48 V (d.c.)	A 1.5
110 V (d.c.)	A 0.5
220 V (d.c.)	A 0.3

13 Electromechanical door lock

The lock only allows the door to be opened if the relative coil is energized.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
PB/E PB/M (mm)	Width 12 kV	17.5 kV	24 kV	Bus tie/ incoming/ ing/riser/ outgoing measurements	Direct incom- ing/riser/ outgoing measurements	
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No



Rated voltage		
d.c.	V	24-30-48-60-110-125-220-250
a.c. 50 Hz	V	110-220
a.c. 60 Hz	W	110-220
Rated power		
d.c.	W	10.5±1.5
a.c.	VA	20±3
Operation		Unsuitable for continuous service (Energize to open door and normally leave de-energized)

14 Shutter padlocks

Can be fitted to the upper, lower shutters, or both.

PowerCube unit	Rated voltage	Type of unit		Available accessory		
PB/E PB/M (mm)	Width 12 kV	17.5 kV	24 kV	Bus tie/ incoming/ ing/riser/ outgoing measurements	Direct incom- ing/riser/ outgoing measurements	
PB1	600	■	■	■	Yes	
PB2	750	■	■	■	Yes	
PB3	1000	■	■	■	Yes	
PB4	750		■	■	Yes	
PB5	1000		■	■	Yes	
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No



15 Key lock to prevent earthing trolley from being racked-in

Available in kits with one or two locks.

Function "a)" or function "b)" can be obtained with a single lock, depending on where it is assembled:

- a) Key lock for earthing trolley with upper insulating bushings
- b) Key lock for earthing trolley with lower insulating bushings.

Both functions can be obtained with the kit with two locks.

PowerCube unit	Width (mm)	Rated voltage 12 kV	Rated voltage 17.5 kV	Rated voltage 24 kV	Type of unit	Available accessory
PB/E					Bus tie/ Direct incoming/riser/ outgoing measurements	
PB/M						
PB1	600	■	■	■		Yes
PB2	750	■	■	■		Yes
PB3	1000	■	■	■		Yes
PB4	750		■	■		Yes
PB5	1000		■	■		Yes
PB1/R	600	■	■		■	No
PB2/R	750	■	■		■	No
PB3/R	1000	■	■		■	No
PB4/R	750		■		■	No
PB5/R	1000		■		■	No

16 Earth switch operating lever

1 is supplied per confirmation or 1 per group of enclosures for the same confirmation position. Extra levers are supplied on request as accessories. Can be applied to any PowerCube equipped with earth switch.



17 Lifting bolts

Allow the module to be lifted when positioned at its sides. Can be applied to any PowerCube PB/M module.

**20 Padlock on earth switch**

This is fitted to the operating seat of the earth switch and prevents this latter from being operated by means of a padlock.

**18 Transport trolley**

With fixed height proportional to the height of PB/M modules. Allows the apparatus to be fitted into the module.

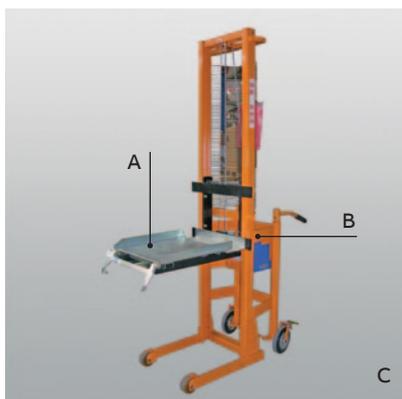
**21 Emergency operating lever for V-Contact VSC contactors**

This operating lever allows the contactor to be opened in an urgency if the specific door has been requested.

**19 Circuit-breaker lifting and transporting unit**

Allows the withdrawable apparatus to be lifted for insertion into the PowerCube unit. The sole lifting trolley, the sole carrier plate or the two pre-assembled items can be ordered.

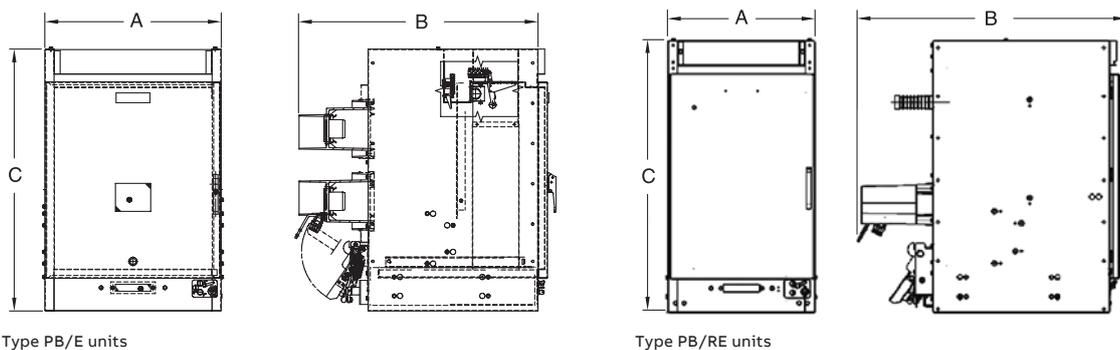
- a) Carrier plate for lifting trolley
- b) Lifting trolley
- c) Complete kit (plate installed on trolley).

**22 Rear fan to install at rear of switchgear**

When installed according to the instructions in the PowerCube manual, this fan allows panels with 4000 A rated current to be made in 3600 A PowerCube PB3 enclosures.



4 Overall dimensions and weights



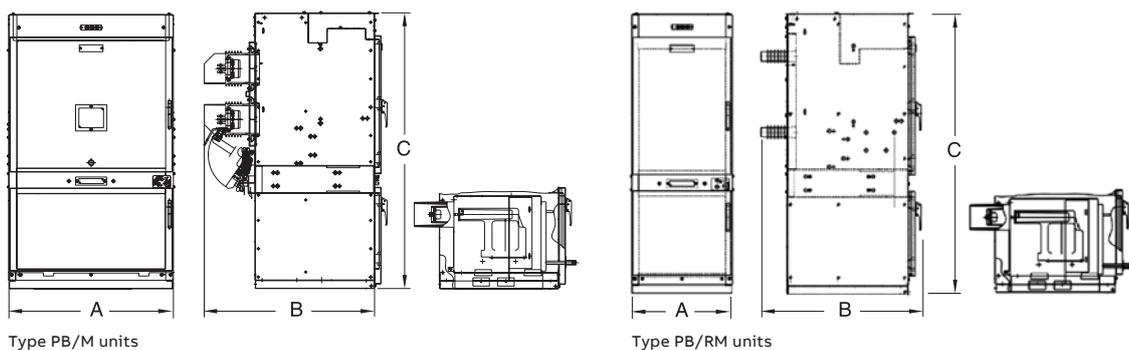
Type PB/E units

Type PB/RE units

Module	Rated voltage (kV)	Rated current (A)	Isc Icw (kV)	Dimension table	A (mm)	B (mm)	C (mm)	Weight (kg) ⁽¹⁾
PB1/E	12	630-1250	31.5	1VCD003369	600	1016	1120	180
	17.5	630-1250	31.5	1VCD003369	600	1016	1120	
PB2/E	12	630...2000	31.5	1VCD003370	750	1016	1120	200...240
	12	1250...2000	40-50	1VCD003370	750	1016	1120	
	17.5	630...2000	31.5	1VCD003370	750	1016	1120	
	17.5	1250...2000	40-50	1VCD003370	750	1016	1120	
PB3/E	12-17.5	2500	31.5	1VCD003371	1000	1030	1120	300
	12-17.5	3150	31.5	1VCD003372	1000	1030	1120	320
	12-17.5	4000	31.5	1VCD003373	1000	1030	1120	380
	12-17.5	2500	40-50	1VCD003371	1000	1030	1120	300
	12-17.5	3150	40-50	1VCD003372	1000	1030	1120	320
	12-17.5	4000	40-50	1VCD003373	1000	1030	1120	380
PB4/E	24	630-1250	31.5	1VCD003374	750	1246	1230	250
PB5/E	24	1600-2000	31.5	1VCD003375	1000	1246	1230	310
	24	2500	31.5	1VCD003376	1000	1246	1230	340
PB1/RE	17.5		31.5	1VCD003377	600	1016 ⁽²⁾	1120	165
PB2/RE	17.5		31.5	1VCD003378	750	1016 ⁽²⁾	1120	165...215
	17.5	Not applicable	40-50	1VCD003378	750	1016 ⁽²⁾	1120	165...215
PB3/RE	12-17.5		31.5	1VCD003379	1000	1030 ⁽²⁾	1120	270
	12-17.5		40-50	1VCD003379	1000	1030 ⁽²⁾	1120	270
PB4/RE	24		31.5	1VCD003380	750	1246 ⁽²⁾	1230	215
PB5/RE	24		31.5	1VCD003381	1000	1246 ⁽²⁾	1230	250

(1) Weight without earth switch.

(2) Dimension with earth switch applied.

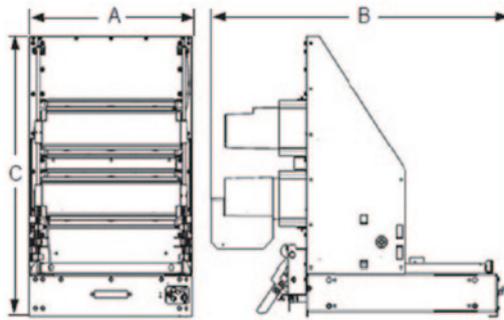


Module	Rated voltage (kV)	Rated current (A)	Isc Icw (kV)	Dimension table	A (mm)	B (mm)	C (mm)	Weight (kg) ⁽¹⁾
PB1/M	12	630-1250	31.5	1VCD000023	600	1016	1680	200
	17.5	630-1250	31.5	1VCD000028	600	1016	1680	
PB2/M	12	630...2000	31.5	1VCD000024	750	1016	1680	220...260
	12	1250...2000	40-50	1VCD000027	750	1016	1680	
	17.5	630...2000	31.5	1VCD000029	750	1016	1680	
	17.5	1250...2000	40-50	1VCD000030	750	1016	1680	
PB3/M	12-17.5	2500	31.5	1VCD000025	1000	1030	1680	320
	12-17.5	3150	31.5	1VCD000026	1000	1030	1680	344
	12-17.5	4000	31.5	1VCD000043	1000	1030	1680	400
	12-17.5	2500	40-50	1VCD000037	1000	1030	1680	320
	12-17.5	3150	40-50	1VCD000038	1000	1030	1680	344
	12-17.5	4000	40-50	1VCD000039	1000	1030	1680	400
PB4/M	24	630-1250	31.5	1VCD000031	750	1246	1745	270
PB5/M	24	1600-2000	31.5	1VCD000032	1000	1246	1745	330
	24	2500	31.5	1VCD000044	1000	1246	1745	330

Module	Rated voltage (kV)	Rated current (A)	Isc Icw (kV)	Dimension table	A (mm)	B (mm)	C (mm)	Weight (kg) ⁽¹⁾
PB1/RM	17.5	Not	31.5	1VCD000033	600	1016	1745	185
PB2/RM	12	applicable	31.5	1VCD000034	750	1016	1745	185...235
	17.5		40-50	1VCD000040	750	1016	1745	185...235
PB3/RM	12-17.5		31.5	1VCD000041	1000	1030	1680	290
	12-17.5		40-50	1VCD000042	1000	1030	1680	290
PB4/RM	24		31.5	1VCD000035	750	1246	1745	270
PB5/RM	24		31.5	1VCD000036	1000	1246	1745	270

(1) Weight without earth switch.

(2) Dimension with earth switch applied.



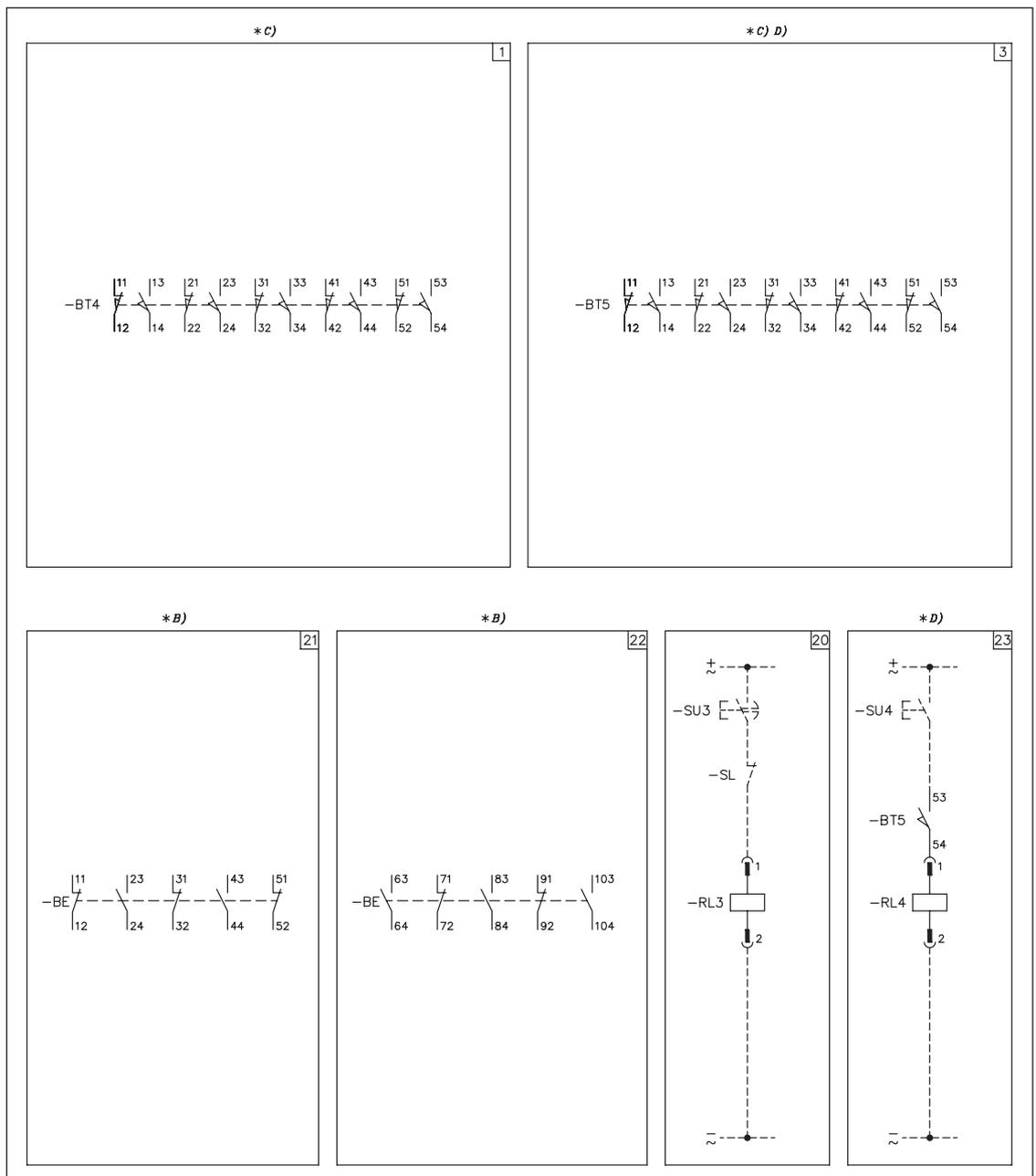
Type PB/F units

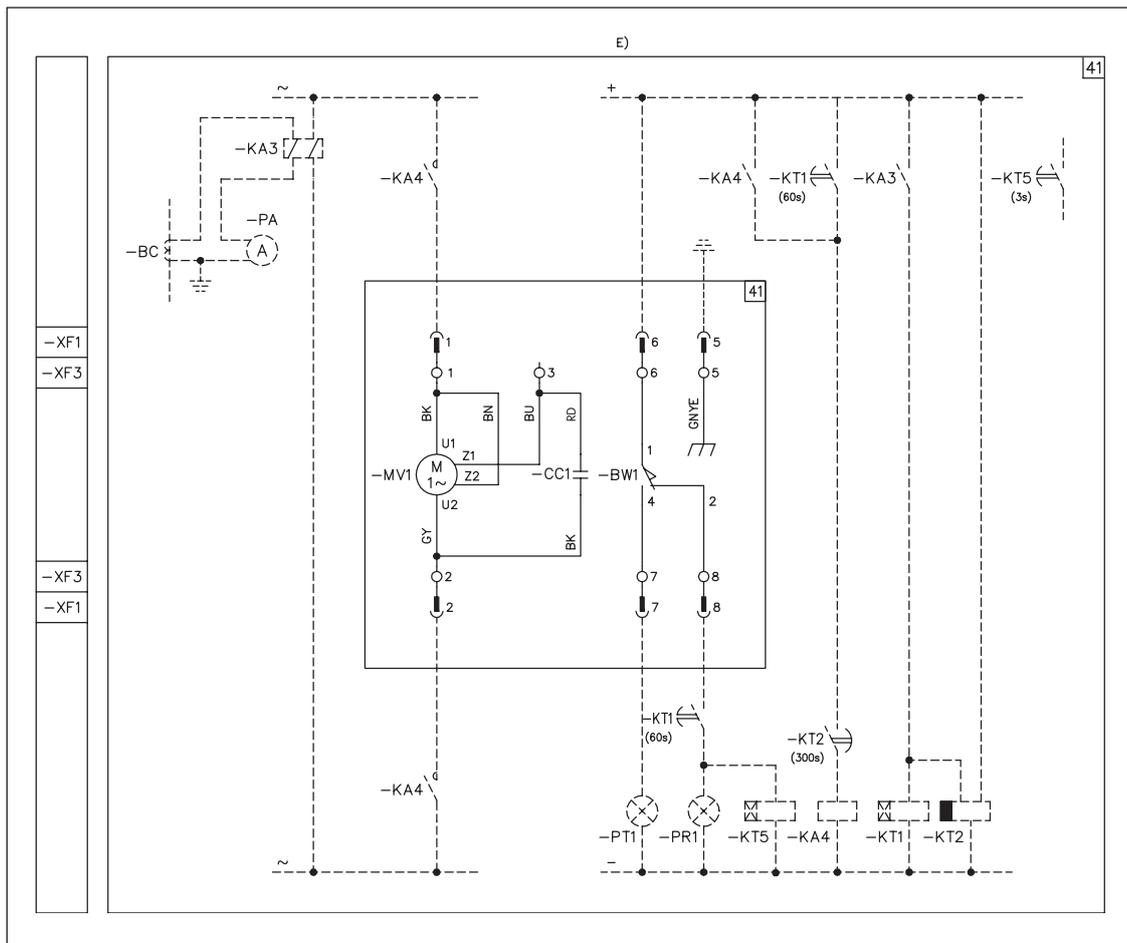
Module	Rated voltage (kV)	Rated current (A)	Isc Icw (kV)	Dimension table	A (mm)	B (mm)	C (mm)	Weight (kg)
PB1/F	12	630-1250	31.5	1VCD003382	596	1061	1106	(*)
	17.5	630-1250	31.5					
PB2/F	12	630-2000	31.5	1VCD003383	746	1061	1106	(*)
	17.5	630-2000	31.5					
PB4/F	24	630-1250	31.5	1VCD003384	746	1338	1236	(*)

(*) Ask ABB.

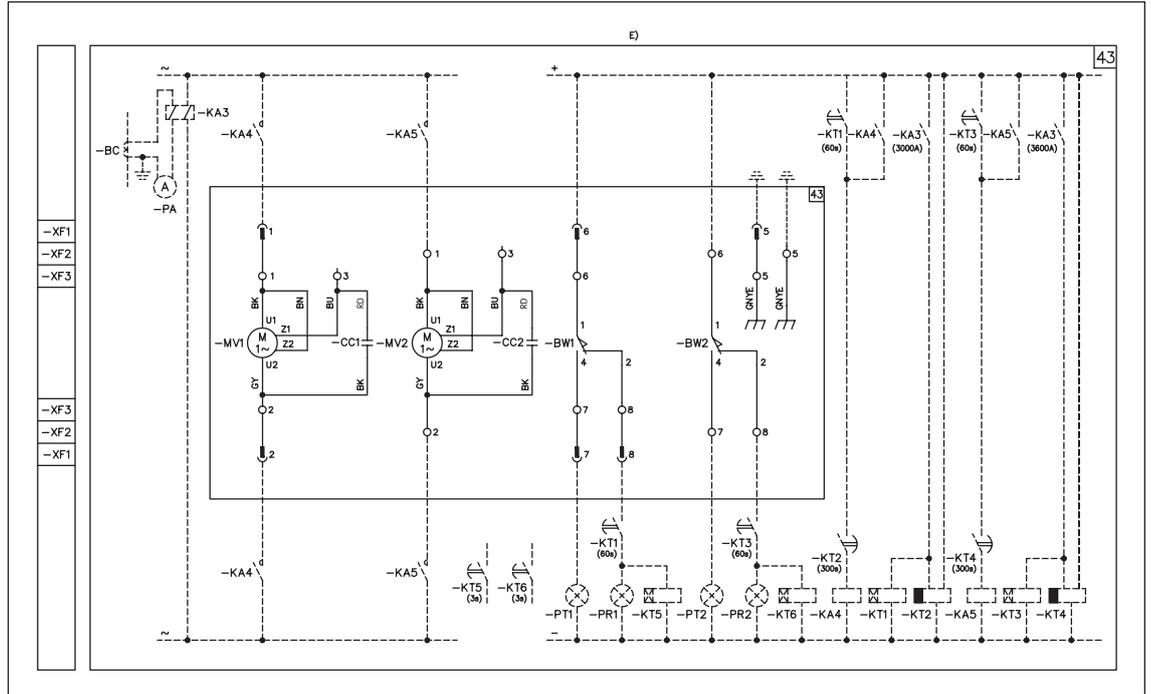
5 Wiring diagrams

Application diagrams





Application diagrams



Reference designations

(in compliance with standard IEC 61346-2 and technical standard ABB 2NBA000001).

Designation	Description
□	Figure number of the diagram
-BC	Current transformer
-BE	Auxiliary contacts of the earth switch (see note B)
-BT4	Contacts on switchgear for signalling trolley in racked-in position (see note C)
-BT5	Contacts on switchgear for signalling trolley in isolated position (see note C)
-BW1	Front fan position contact
-BW2	Rear fan position contact
-CC1	Capacitor for front fan
-CC2	Capacitor for rear fan
-KA3	Current metering relay
-KA4	Auxiliary contact for front fan operation
-KA5	Auxiliary contact for rear fan operation
-KT1, -KT2	Timed auxiliary relays for forced front fan operation
-KT3, -KT4	Timed auxiliary relays for forced rear fan operation
-KT5	Timed auxiliary relay for forced front ventilation failure alarm signal
-KT6	Timed auxiliary relay for forced rear ventilation failure alarm signal
-MV1	Front fan (see note E)
-MV2	Rear fan (see note E)
-PA	Ammeter
-PR1	Red lamp for forced front ventilation failure alarm signal
-PR2	Red lamp for forced rear ventilation failure alarm signal
-PT1	White lamp for forced front ventilation operation alarm signal
-PT2	White lamp for forced rear ventilation operation alarm signal
-RL3	Electromechanical lock on earth switch closing operation
-RL4	Locking magnet. Mechanically inhibits door opening if de-energized
-SL	Contact for locking earth switch operation
-SU3	Delay button for enabling earth switch operation (maximum permissible delay 1 minute)
-SU3	Door release button
-XF1	Connector for disconnecting the forced front ventilation circuits
-XF2	Connector for the forced rear ventilation circuits
-XF3	Connector for the forced front ventilation circuits

Figure

Figure	Description
Fig. 1	Electrical signalling contacts for switch in plugged-in position (see note C)
Fig. 3	Electrical signalling contacts for switch in isolated position (see note C)
Fig. 20	Circuit of electromechanical lock on earth switch closing operation: the operation is only permitted with coil -RL3 energized
Fig. 21	First pack of auxiliary contacts of the earth switch (see note B)
Fig. 22	Second pack of auxiliary contacts of the earth switch (see note B)
Fig. 23	Circuit of electromechanical door opening lock: opening is only permitted with coil -RL3 energized
Fig. 41	Forced front ventilation circuit
Fig. 43	Forced front and rear ventilation circuit

Notes

- A) The switchgear comes solely equipped with the specific applications in the order confirmation
- B) The auxiliary contacts -BE are supplied in the position indicated in the diagram. However, the user can easily convert them from make contacts to break contacts or vice versa.
- C) Position contacts -BT4 and BT5 are switch contacts. This means that the make contact and the break contact belonging to the same position contact cannot be powered with different voltage values.
- D) When fig. 23 is required, the contact -BT5 (terminals 51-52-53-54) of fig. 3 is not available
- E) The fans must activate when at least one phase exceeds the following thresholds for 60 seconds:
- UniSafe 12-17.5 kV 4000 A = 3000 A (front fan) and 3600 A (rear fan)
 - UniSafe 24 kV 2500 A = 2250 A (front fan)
- The fans must disconnect when the current of all three phases is lower than the following values for 300 seconds:
- UniSafe 12-17.5 kV 4000 A = 2900 A (front fan) and 3500 A (rear fan)
 - UniSafe 24 kV 2500 A = 2150 A (front fan)

Symbols (in compliance with Standards IEC 60617 and CEI EN 60617)

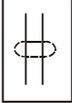
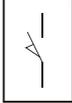
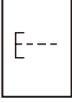
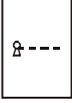
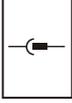
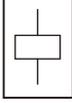
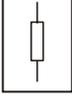
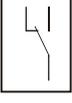
	Thermal effect		Mass, frame		Capacitor (general symbol)		Passing make contact closing momentarily during release
	Electromagnetic effect		Conductors in shielded cable (two conductors shown)		Motor (general symbol)		Closing position contact (limit switch)
	Timing		Connection of conductors		Rectifier with two half-waves (bridge)		Poening position contact (limit switch)
	Pushbutton control		Terminal or clamp		Make contact		Power circuit- breaker with automatic poening
	Key control		Socket and plug (female and male)		Break contact		Control coil (general symbol)
	Earth (general symbol)		Resistor (general symbol)		Change-over break before make contact		Lamp (general symbol)



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