



Medium voltage products

PowerCube PB6

Pre-assembled modules for building
medium voltage switchgear

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1. General characteristics

General

PowerCube modules allow medium voltage air-insulated switchgear to be constructed with the same rated currents as those of the enclosure.

PowerCube modules are pre-assembled and tested in the factory and comply with IEC 62271-100, CEI 17-1, IEC 60298 and CEI 17-6 Standards.

They are available with the following characteristics:

Rated voltage	[kV]	36
Rated current	[A]	... 2500 (*)
Rated short-time main circuit withstand current	[kA]	... 25 x 3s
		... 31.5 x 1s

(*) 2500 A with forced ventilation.

VD4 series circuit-breaker and HD4 series gas circuit-breakers can be installed in the PowerCube PB6 modules. All the operations are carried out from the front of the module.

Degrees of protection

The degrees of protection of PowerCube modules comply with IEC 60529 Standards.

The following standard degrees of protection are guaranteed on the front:

external housing	IP4X
inside the units	IP2X

Interlocks

The PowerCube module is fitted with interlocks to prevent incorrect operations which might endanger the personnel in charge of running the installation, as well as the efficiency and reliability of the apparatus.

In particular, locking devices to prevent the following operations are provided:

- circuit-breaker closing in the intermediate position
- racking-out of closed circuit-breaker
- racking-in of closed circuit-breaker
- circuit-breaker compartment door opening in the connected or intermediate position
- circuit-breaker racking-in with compartment door open.

And, if the unit is fitted with an earthing switch:

- earthing switch closing with the circuit-breaker in the connected or intermediate position
- racking-in the circuit-breaker with the earthing switch closed
- feeder compartment door opening with the earthing switch open
- earthing switch opening with the feeder compartment door open.

Note: some of the interlocks listed above are supplied on request.

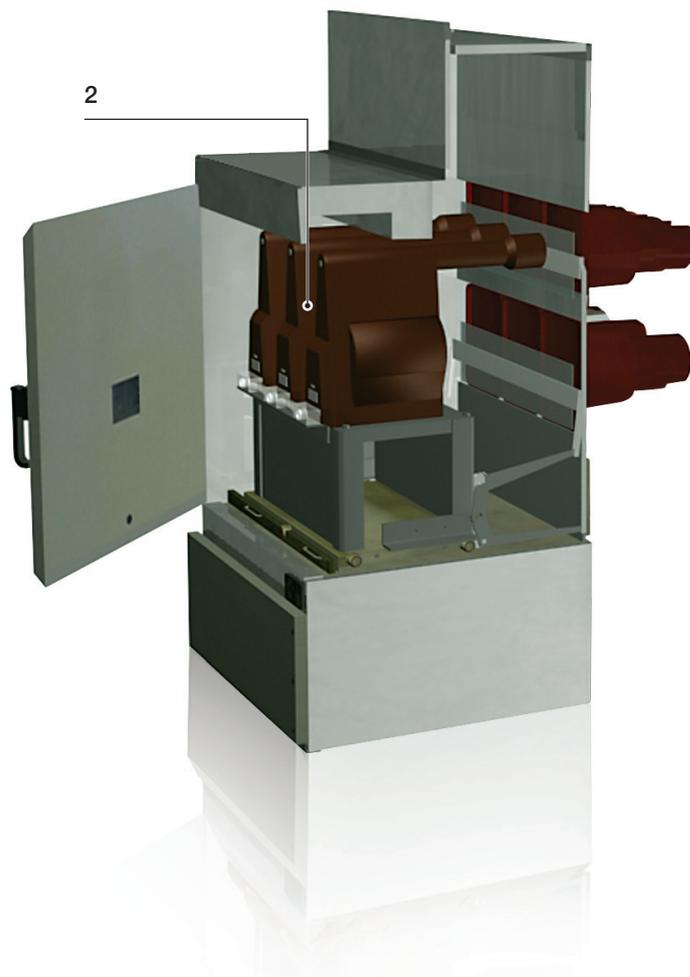
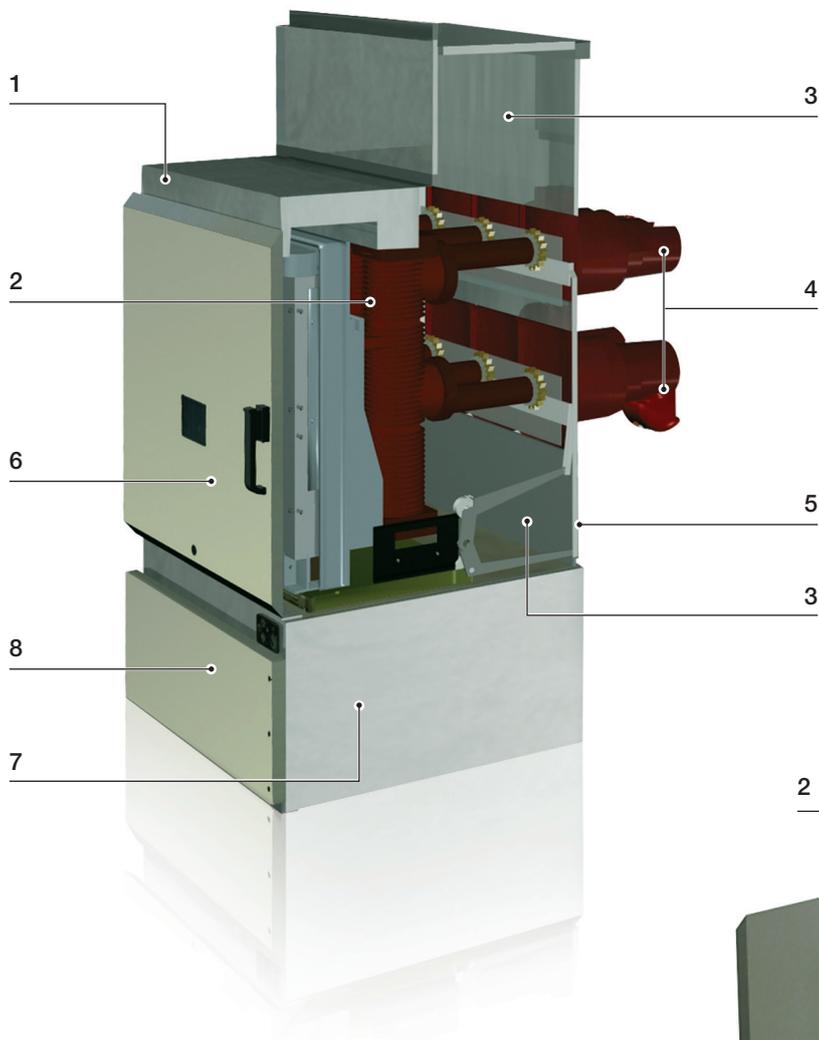


Environmental conditions

The switchgear ratings are guaranteed under the following ambient conditions:

Minimum ambient temperature	- 5 °C
Maximum ambient temperature	+ 40 °C
Maximum relative humidity	95%
Maximum altitude	1000 m a.s.l.

In an unpolluted and not corrosive atmosphere.



- A** Circuit-breaker compartment
- 1 Voltage signalling device (on request)
 - 2 Circuit-breaker/truck/VT truck
 - 3 Metal shutters
 - 4 Lower and upper monoblocs
 - 5 Earthing switch (on request)
 - 6 Door
 - 7 Fans (only for 2500 A)
 - 8 Lower door

1. General characteristics

Electrical characteristics of PowerCube modules

PowerCube	Module	Without earthing switch		With earthing switch	
		PB6	PR6	PB6	PR6
Module width	[mm]	1000	1000	1000	1000
Rated voltage	[kV]	36	36	36	36
Test voltage at industrial frequency	[kV]	70	70	70	70
Impulse withstand voltage	[kV]	170	170	170	170
Short-time withstand current	[kA]	25 (3s)	25 (3s)	25 (3s)	25 (3s)
	[kA]	31.5 (1s)	31.5 (1s)	31.5 (1s)	31.5 (1s)
Peak current	[kA]	63	63	63	63
	[kA]	79	79	79	79
Rated currents	[A]	630	630	630	630
	[A]	1250	1250	1250	1250
	[A]	1600	1600	1600	1600
	[A]	2000	2000	2000	2000
	[A]	2500 (*)	2500 (*)	2500 (*)	2500 (*)
Earthing switch making capacity	[kA]	-	-	25	25

(*) Forced ventilation

Quality System

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

Environmental Management System

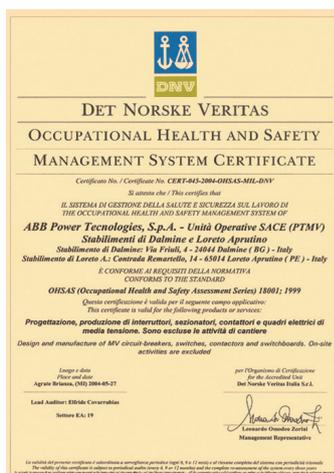
Complies with ISO 14001 Standards, certified by an independent external organisation.

Test laboratory

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

Health and Safety Management System

This complies with the OHSAS 18001 Standards, certified by an independent external organisation.



2. Main components

Circuit-breakers

PowerCube modules can be fitted with VD4 series withdrawable circuit-breakers or HD4 series SF6 withdrawable circuit-breakers.

The circuit-breakers are fitted with a truck which allows them to be racked-in and out in the switchboard with the door closed.

A compact and light structure ensures 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.

Series VD4 vacuum circuit-breakers

VD4 circuit-breakers use the 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 embedded 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; both operating mechanisms are the trip-free stored energy type with independent opening and closing regardless of the operator's action.

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 insulating medium. The breaking principle of HD4 circuit-breakers is based on compression and self-blast techniques to obtain top performance at all service current values, with gradual arc extinction, without any restriking, operating overvoltages and chopped currents. These characteristics guarantee long electrical life for the circuit-breaker and limited dynamic, dielectric and thermal stress on the installation. The circuit-breaker poles, which make up the interruption part, are sealed for life pressure systems (IEC 62271-100 and CEI 17.1 Standards) and are maintenance-free. The stored energy mechanical operating mechanism has free release and allows opening and closing operations independent of the operator.



VD4/W 36 kV



HD4 series SF6 gas circuit-breaker

2. Main components

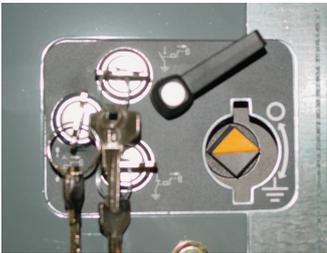
Earthing switches

The PowerCube PB6 module can be fitted with an earthing switch.

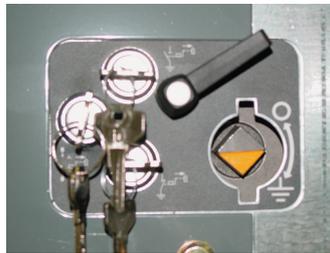
The earthing switch features making capacity on short-circuit. The opening and closing operations can be locked, on request, by means of key locks.

Earthing switch operation is carried out from the front of the module with manual operation suitably interlocked with the position of the circuit-breaker.

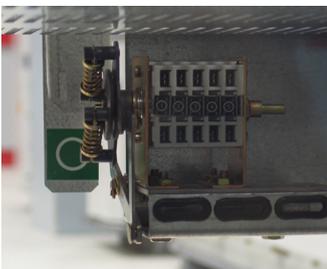
Consult the table on page 11 for the list of accessories".



Earthing switch open.

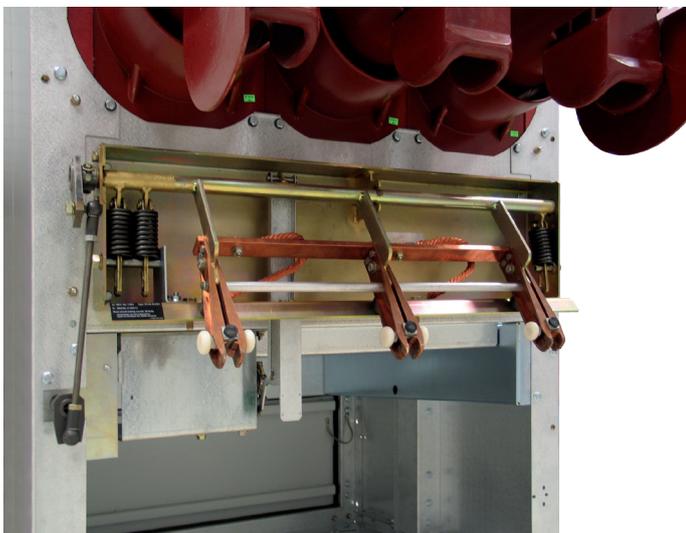


Earthing switch closed.



Signals (open/closed) showing the position of the earthing switch are visible from the front of the enclosure (if forced ventilation is not provided) or from the operating slot of the earthing switch.

Signalling of the earthing switch position.



Monoblocs and shutters

The monoblocs consist of insulating branches (fig. A) or terminals (fig. B) containing the power connections - top and bottom - of the circuit-breaker compartment, towards the feeder and busbar compartments respectively.

The shutters (fig. C) are the metal type and are activated automatically when the circuit-breaker changes from the test/ isolated position to the connected position and viceversa. Each shutter can be locked by means of two independent padlocks (optional).

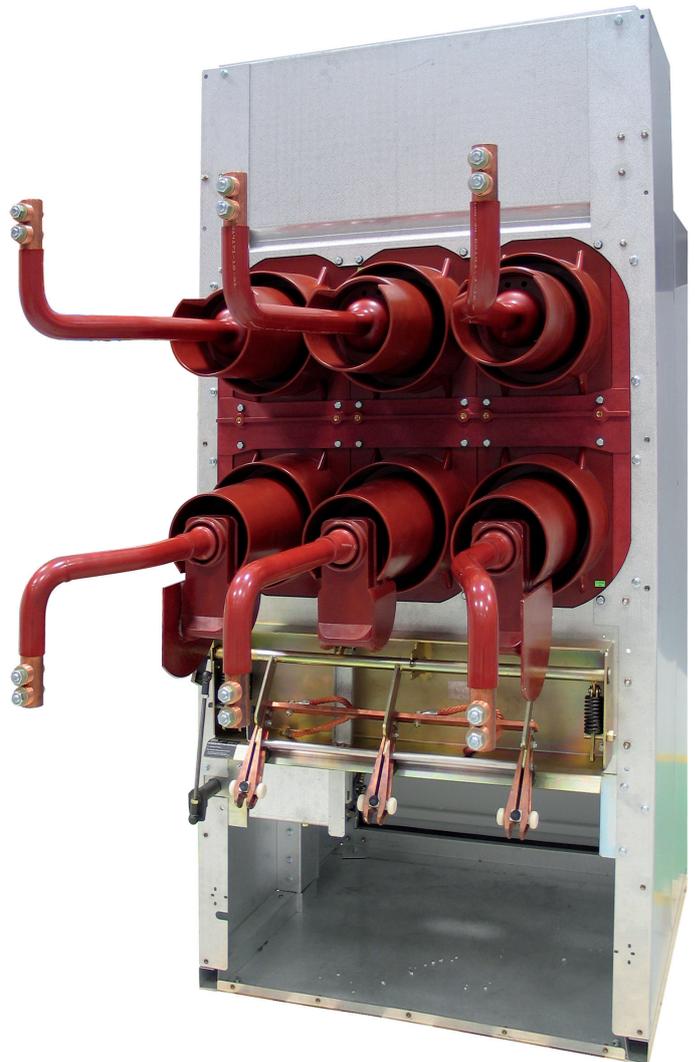


Figure A

VT Compartment

PowerCube PR6 module can be configured as VT compartment with withdrawable voltage transformers. The voltage transformers are the dedicated type and are protected by fuses. The fuses can be replaced with the switchgear in service as the fuse compartment is segregated metallically from the other compartments. Consult the table on page 11 for the list of accessories.

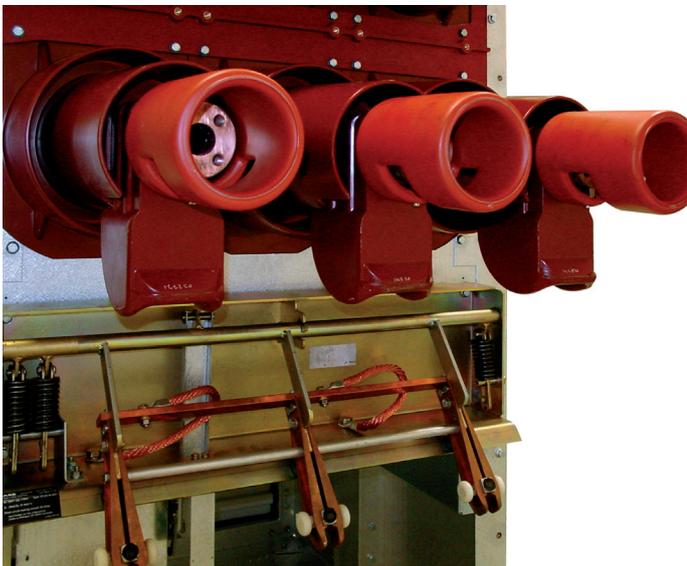
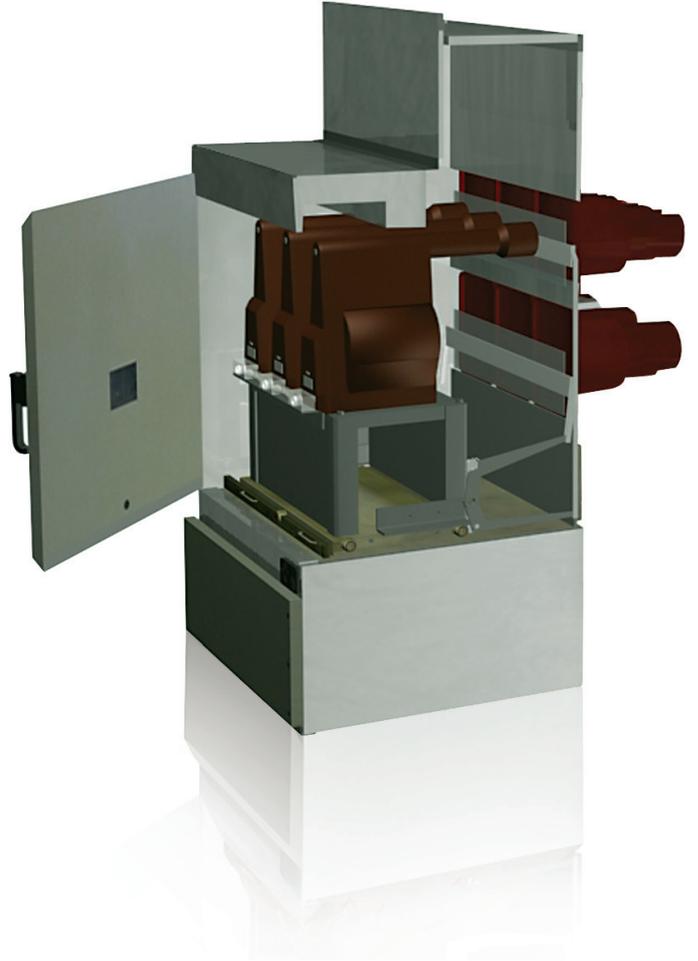
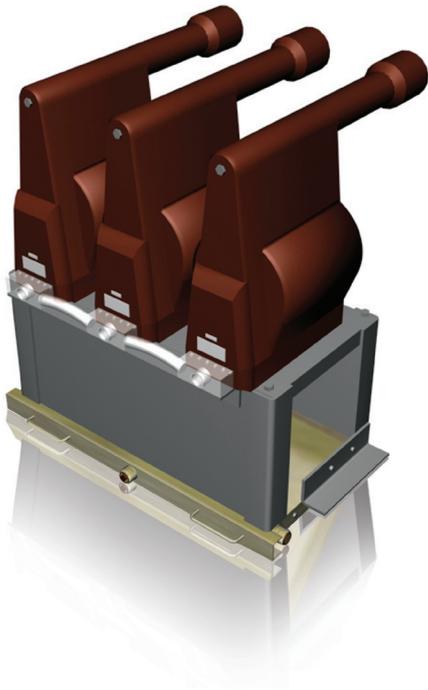


Figure B



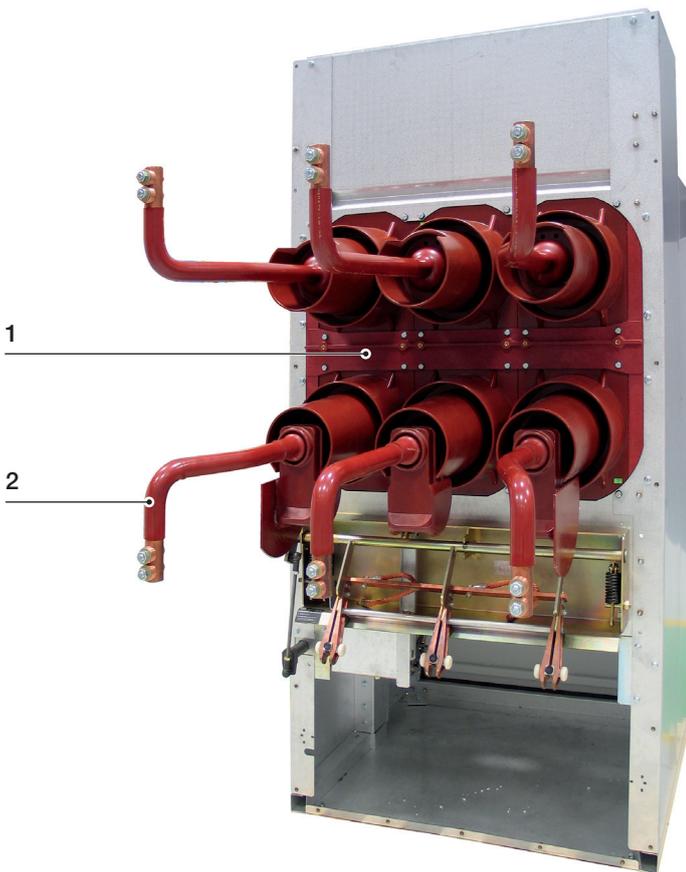
Figure C

3. Types available and apparatus

Notes for using PowerCube modules

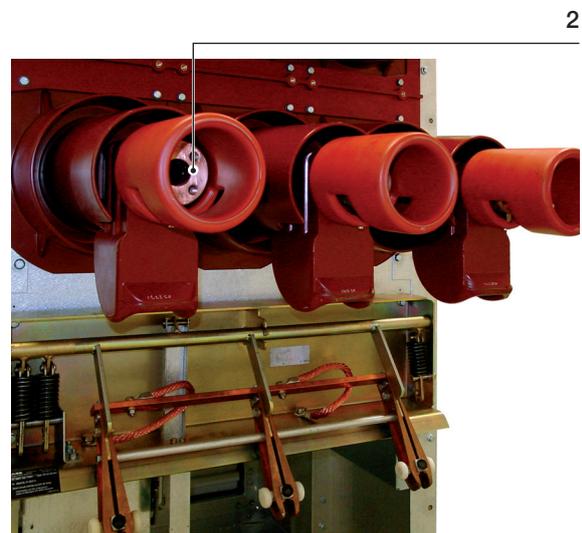
- Use of PowerCube PB6 modules is recommended for constructing incoming, outgoing and bus-tie type switchgear units (see table on following pages).
- Use of PowerCube PR6 modules is recommended for constructing bus-riser, measurement and direct busbar incoming switchgear units.

Example of PB6 PowerCube module (front and rear views).



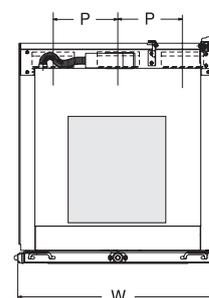
- 1. Monoblocs
- 2. Branches/terminals.
- 3. Fans. Pre-installed in 2500 A PB6 modules.

Example of PR6 PowerCube modules (front view).



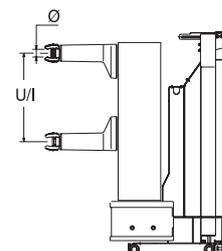
VD4 withdrawable circuit-breakers for PowerCube modules

[kV]	Isc [kA]	Icw [kA]	W=1000	W=1000	Circuit-breaker type designation	
			P=275	P=275		
			u/l=380	u/l=380		
			H=Ø=35	H=Ø=79		
			Rated uninterrupted current of the PowerCube module [A] (40 °C)			
36	25	25	1250		VD4/W 36.12.32 p275 (1)	
	31.5	31.5 (1s)				
	25	25	1600	VD4/W 36.16.32 p275 (1)		
	31.5	31.5 (1s)				
	25	25	2000	VD4/W 36.20.32 p275 (1)		
	31.5	31.5 (1s)				
	20	20	2500 (3)	VD4/W 36.25.32 p275 (1)		
31.5	31.5 (1s)					



HD4 withdrawable circuit-breakers for PowerCube modules

[kV]	Isc [kA]	Icw [kA]	W=1000	W=1000	Circuit-breaker type designation	
			P=275	P=275		
			u/l=380	u/l=380		
			H=Ø=35	H=Ø=79		
			Rated uninterrupted current of the PowerCube module [A] (40 °C)			
36	20	20	1250		HD4/W 36.12.20 p275 (1)	
	25	25				
	31,5	31,5 (1s)				
	20	20	1600	HD4/W 36.16.20 p275		
	25	25				
	31,5	31,5 (1s)				
	20	20	2000	HD4/W 36.20.20 p275		
	25	25				
	31,5	31,5 (1s)				
	20	20	2500 (2)	HD4/W 36.25.20 p275		
	25	25				
	31,5	31,5 (1s)				



(1) Operation sequence: O - 0.3"-CO-3'-CO.

(2) 2500 A with forced ventilation inside PowerCube PB6.

(3) Please ask ABB.

3. Types available and apparatus

Accessories

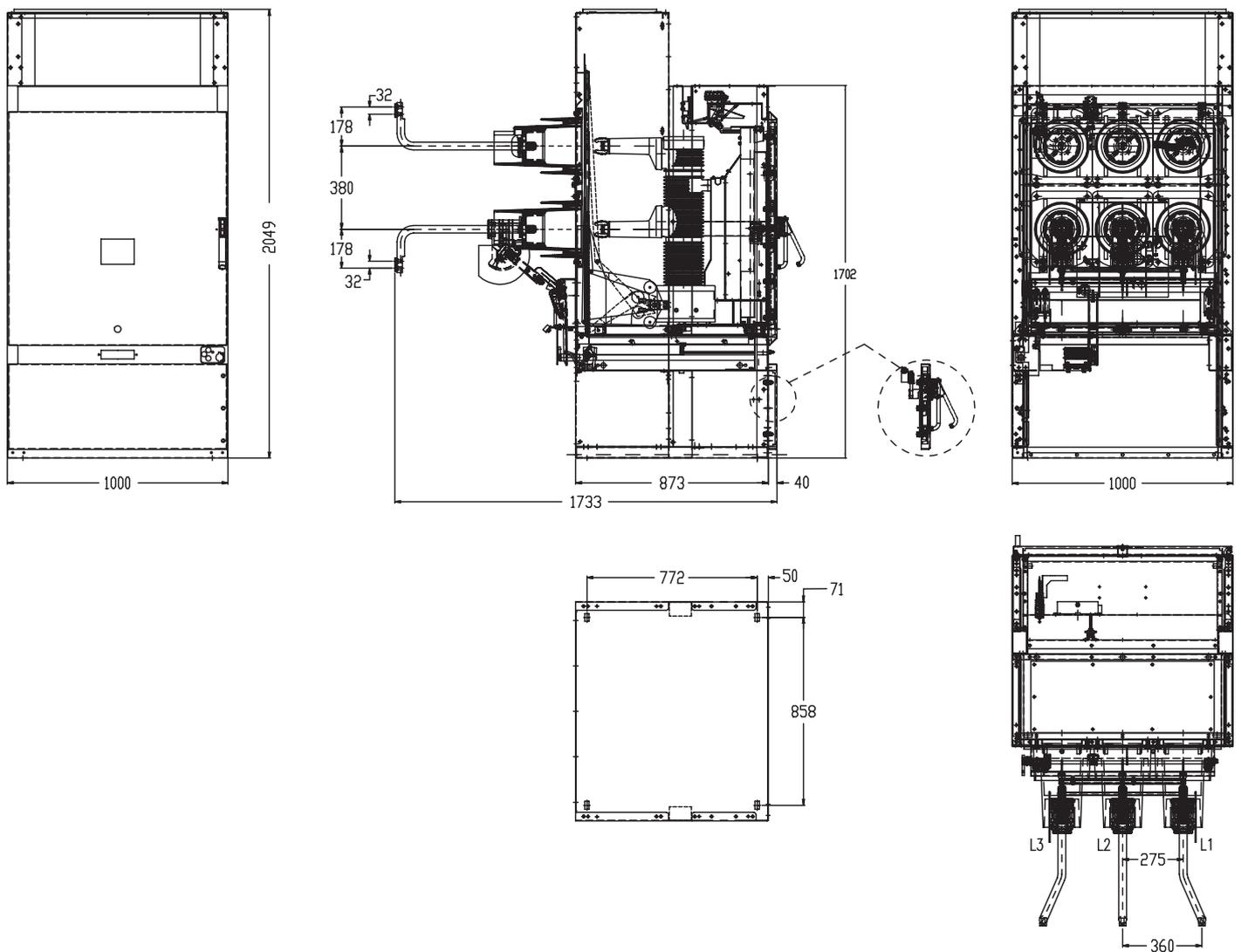
The table below indicates the accessories available and the relative combination with the PowerCube modules.

PowerCube module		PB6	PR6
Width [mm]		1000	1000
Rated voltage		36 kV	
Unit	Incoming/outgoing/bus-tie	•	•
	Bus-riser/measurements/incoming/direct	-	•
Standard fittings	1a Group of auxiliary contacts connected/isolated	•	-
	1b Anti-racking-in lock for circuit-breakers with lower rated current of the compartment	•	-
Accessories to be specified at the time of ordering (assembly by ABB)	2 Circuit-breaker anti-racking-in lock	•	-
	3 VT compartment	-	•
	4 Earthing switch	•	•
	5 Key locks open or closed or open and closed for earthing switch	•	•
	6 Electrom. lock for earthing switch (24-48-60-110-220 Vdc; 110-220 Vac 50 Hz)	•	•
	7 Earthing switch auxiliary contacts (5 or 10)	•	•
	8 Lower door with handle (only if earthing switch is requested)	•	•
	9 Anti-condensation heater (110-220 Vac 50 Hz)	•	• (VT truck) only
Accessories on request (assembly by the customer)	10 Mechanical interlock for circuit-breaker compartment door	•	• (VT truck) only
	11 Padlock for metal shutters (top or bottom or top and bottom)	•	• (VT truck) only
	12 Earthing switch operating lever - extra in relation to normal supply (*)	•	•
	13 Lifting eyebolts	•	•
	14 Apparatus transport and racking/in truck	•	• (VT truck) only

(*) Remember that the standard supply provides up to 10 levers per order position with a maximum of 1 lever per enclosure (fitted with earthing switch).

4. Overall dimensions and weights

PB6 PowerCube module - 630-1250 A - with branches

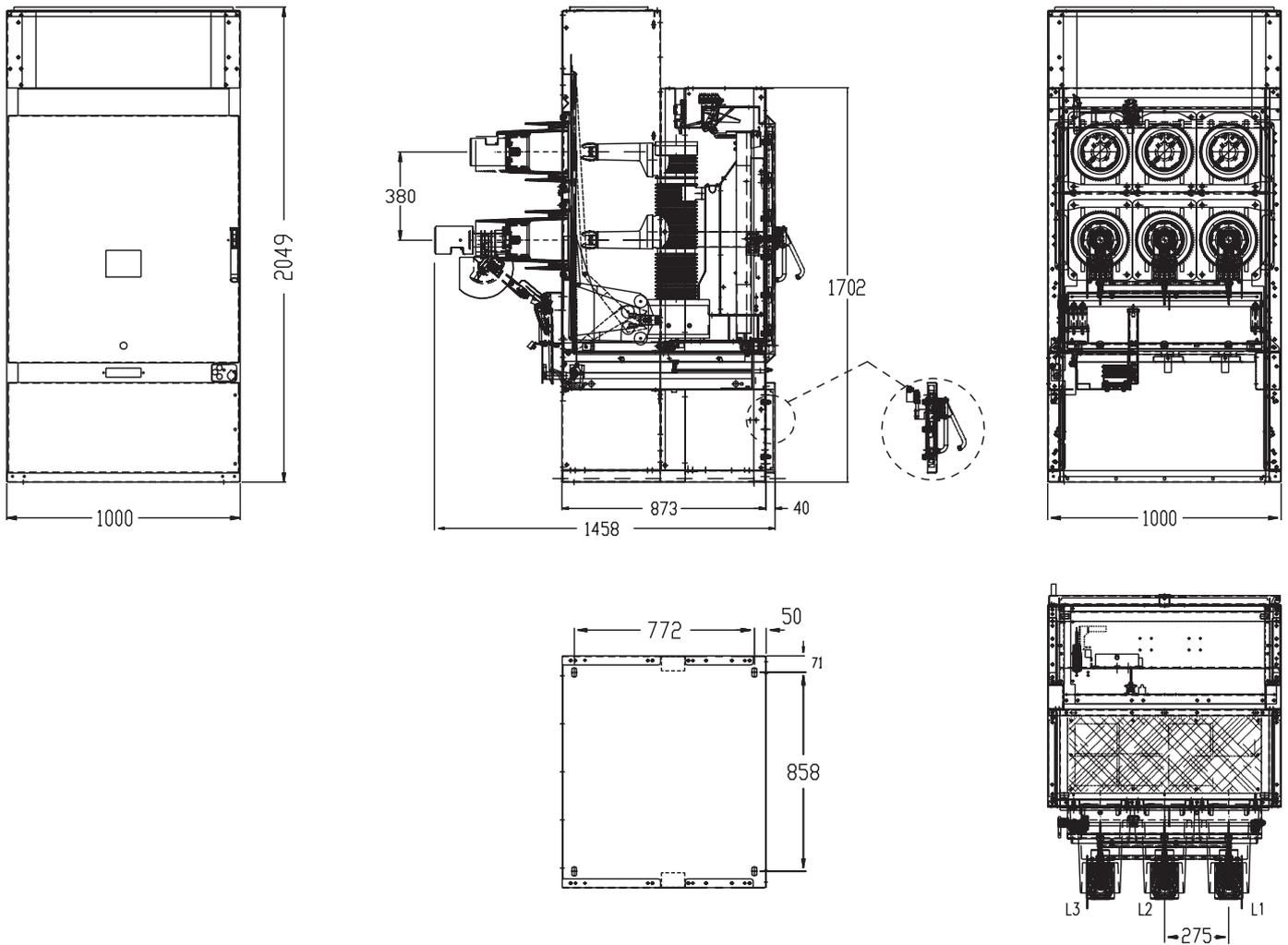


Indicative weight of the module (without earthing switch)

Rated current [A]	Weight [kg]
630 - 1250	400

4. Overall dimensions and weights

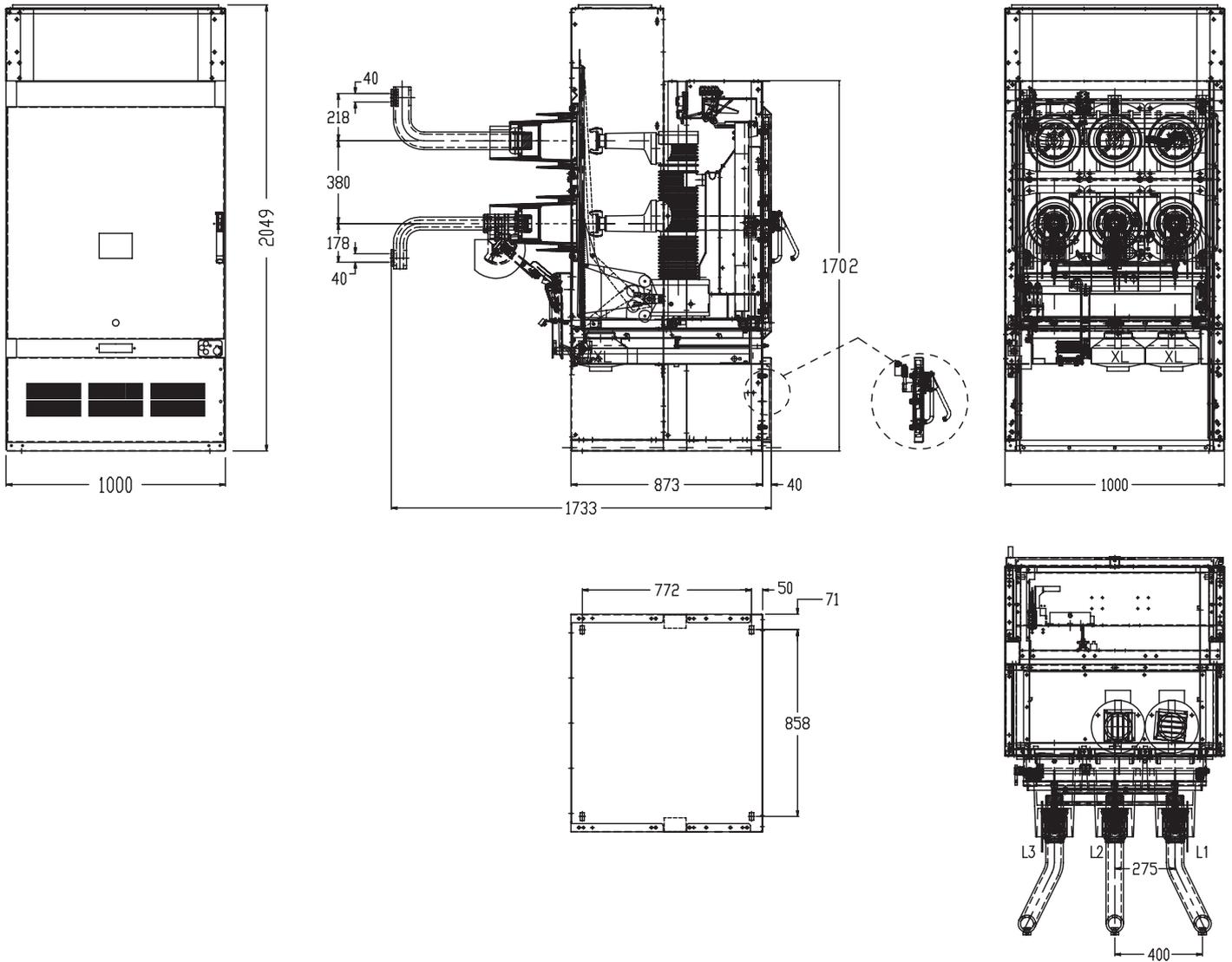
PB6 PowerCube module - 630-1250 A - with terminals



Indicative weight of the module (without earthing switch)

Rated current [A]	Weight [kg]
630 - 1250	350

PB6 PowerCube module - 1600 - 2500 A - with branches

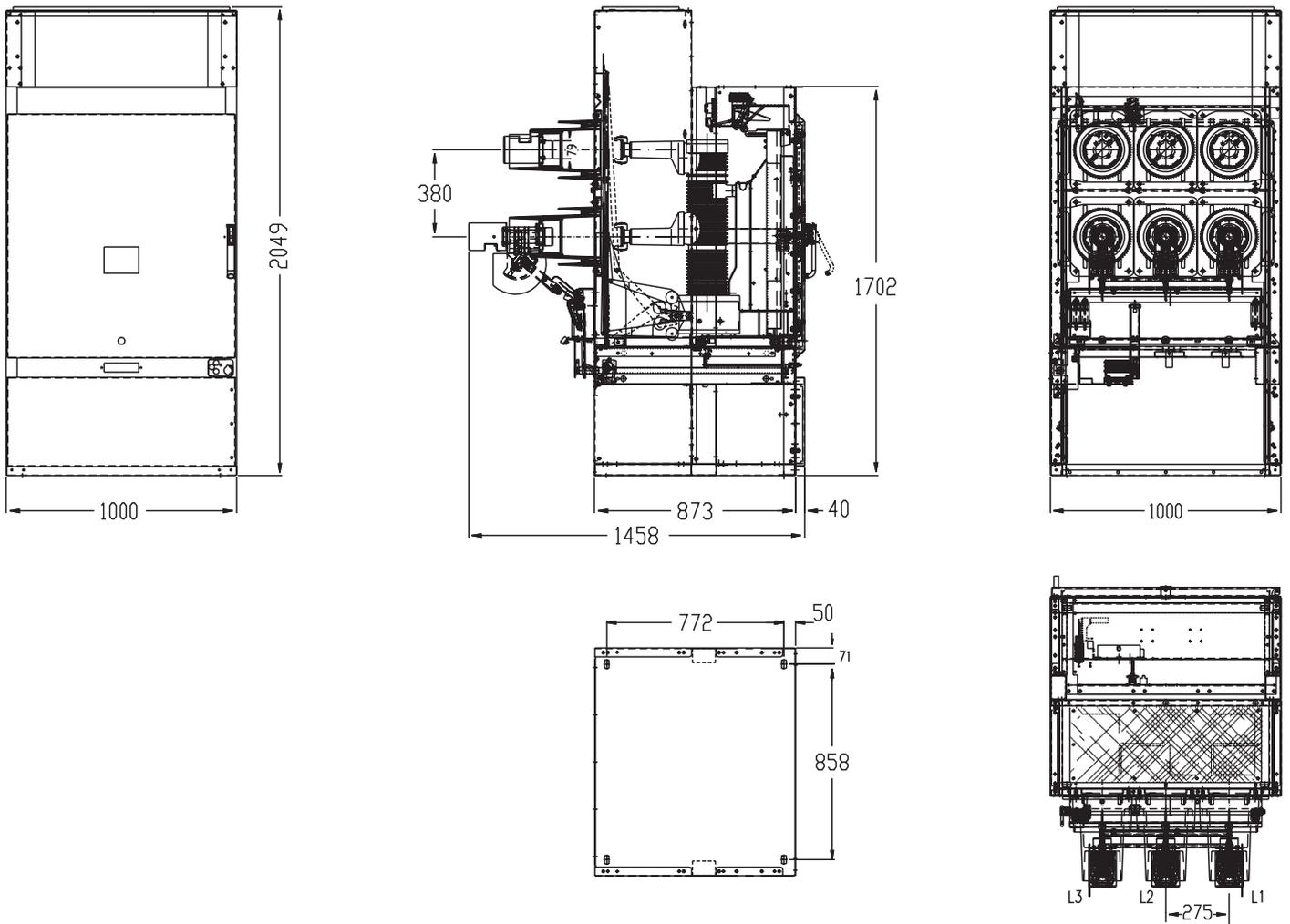


Indicative weight of the module (without earthing switch)

Rated current [A]	Weight [kg]
630 - 1250	450
2500	500

4. Overall dimensions and weights

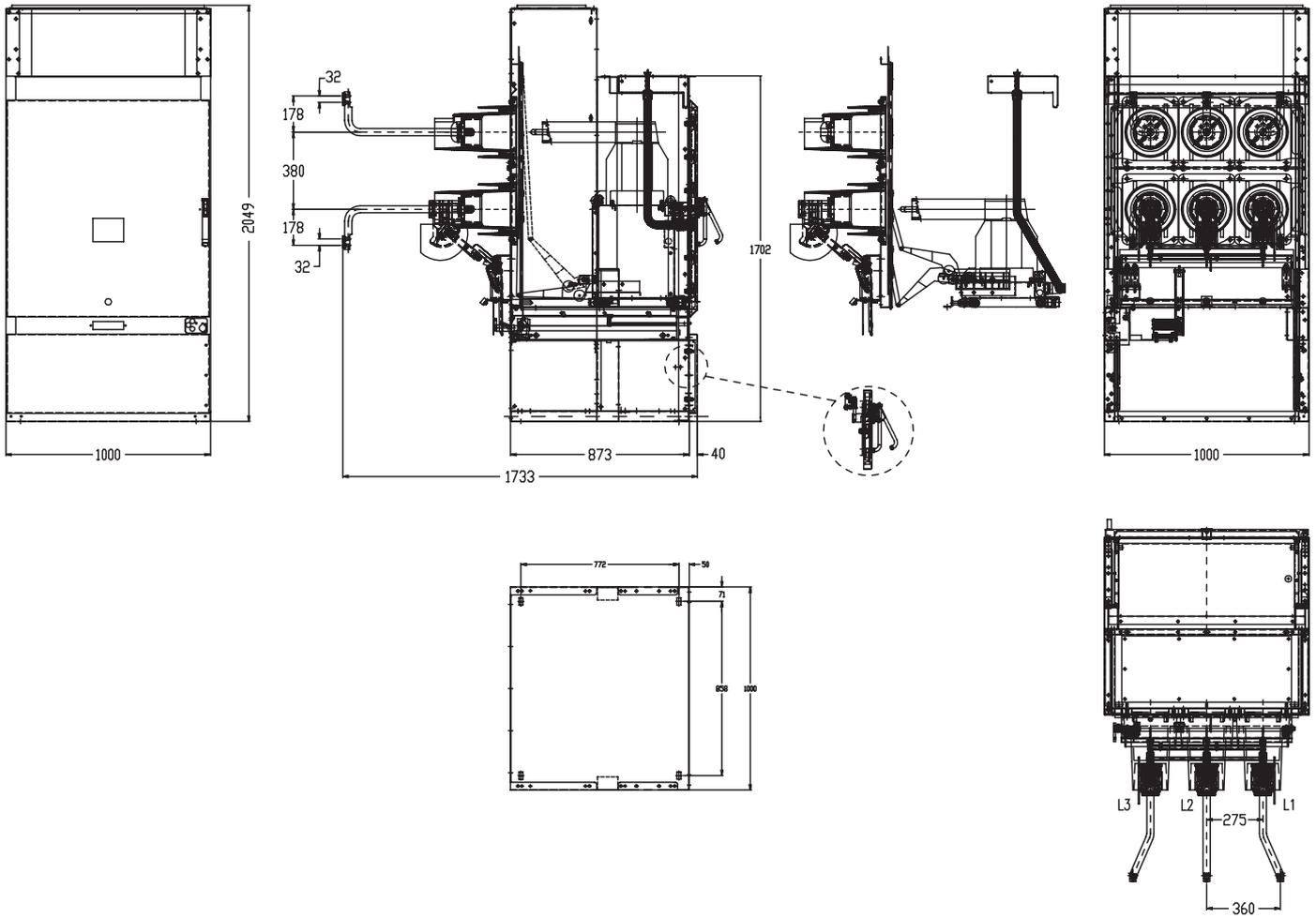
PB6 PowerCube module - 1600 - 2500 A - with terminals



Indicative weight of the module (without earthing switch)

Rated current [A]	Weight [kg]
1600 - 2000	400
2500	450

PR6 PowerCube module - with branches

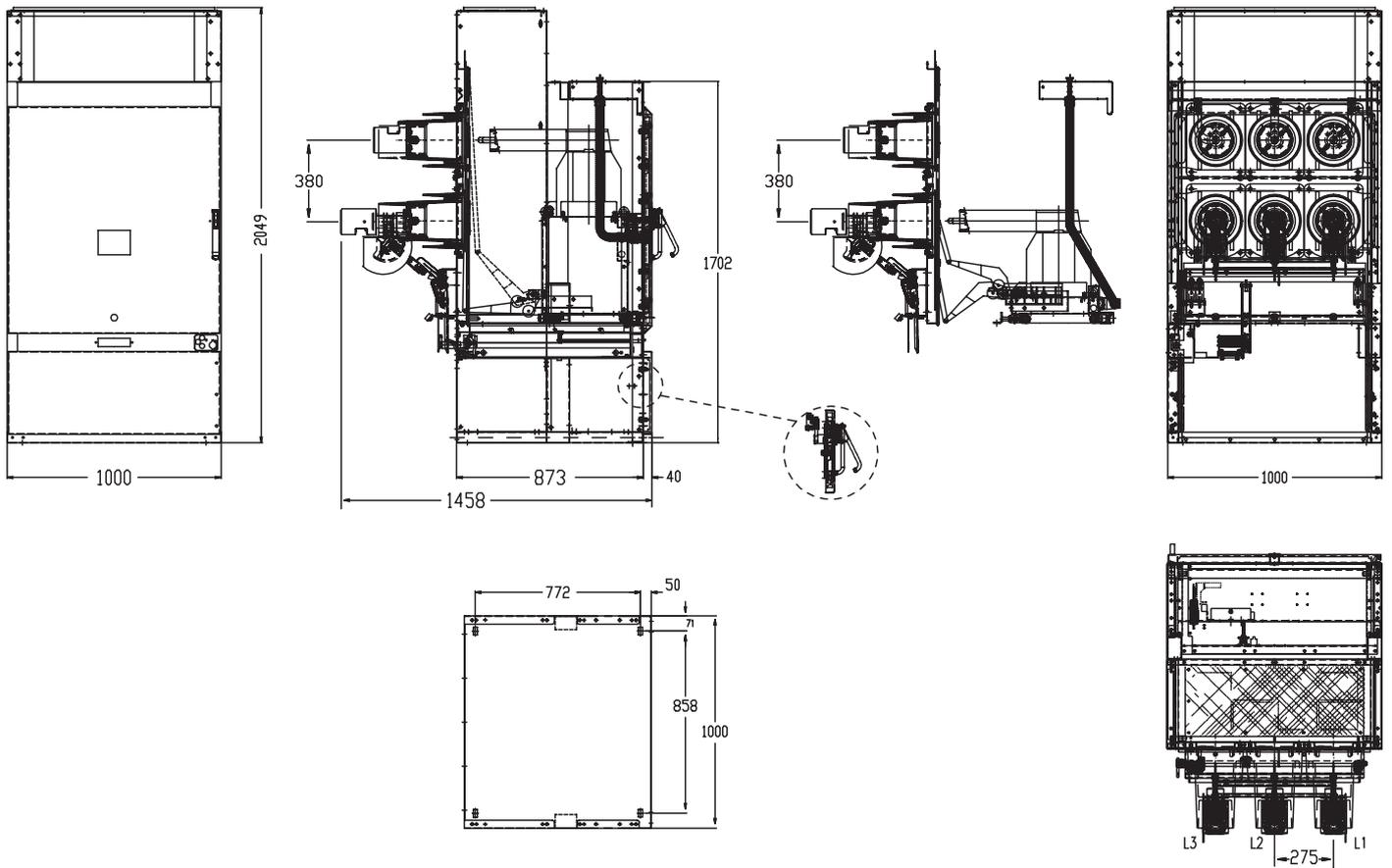


Indicative weight of the module (without earthing switch)

Rated current [A]	Weight [kg]
630 - 1250	up to 400
1600 - 2000	up to 400
2500	up to 400

4. Overall dimensions and weights

PR6 PowerCube module - with terminals



Indicative weight of the module (without earthing switch)

Rated current [A]	Weight [kg]
630 - 1250	up to 350
1600 - 2000	up to 350
2500	up to 350

5. Completion of the switchgear

To complete the switchgear, ABB can also offer the components indicated below.

For further details, please consult us.



Voltage transformers

The voltage transformers are the type insulated in resin and are used to supply measuring and protection devices. They are available for fixed assembly or for installation on withdrawable trucks.

They comply with the IEC 60044-2 Standards.

Their dimensions usually conform to the DIN 42600 Standard.

The transformers installed on withdrawable trucks are, on the other hand, of the dedicated type.

These transformers can have one or two poles, with performance and precision classes suited to the functional requirements of the instruments connected to them.

When they are installed on withdrawable trucks, they are fitted with medium voltage protection fuses. The fuses can be replaced with the switchgear in service.

Current transformers

The current transformers are the type insulated in resin and are used to supply measuring and protection devices. These transformers can either have a wound core or a through bar with one or more cores, with performance and precision classes suited to the installation requirements.

They comply with IEC 60044-1 Standards.

Their dimensions usually conform to the DIN 42600 standard.

The current transformers can also be fitted with a capacitive socket for connection to the voltage signalling lamps.

5. Completion of the switchgear

REF542plus electronic unit

The REF542plus unit integrates all the secondary functions of a switchgear unit in a single module with watchdog. Thanks to flexible software, the unit can meet a vast range of installation requirements: protection measurement, control and signalling. The user interface is simple and easy to use.

REF542plus in a kit for OEM

The integrated protection and control unit is based on the REF542plus platform - multi-purpose unit for medium voltage switchgear.

The REF542plus unit uses the latest microelectronic and information technology discoveries.

The REF542plus unit provides the following main functions:

- protection
- control
- measurement
- monitoring
- quality of the energy
- communication.

Thanks to the exceptional flexibility and scalability of this advanced unit, all the functions are integrated in a single configurable environment.

This unit therefore makes targeted and intelligent solutions possible, with limited wiring requirements, in those places where the traditional approach would be costly and inefficient.

IndustrialIT

This product has been tested and certified as conforming to IndustrialIT, Level 0 - Information. All the information about the product is provided in an interactive electronic format, compatible with ABB Aspect Object™ technology. ABB's commitment to respecting IndustrialIT conformity guarantees that each construction unit is provided with all the instruments needed to ensure efficient installation, function and maintenance operations throughout the useful life of the product.

For further information about IndustrialIT please visit the following site: <<http://www.abb.com/industrialit>>.

Some of the solutions already configured for protection and control of most of the common medium voltage applications are defined here.

These solutions are based on the REF542plus unit and do not require any programming.

The REF542plus unit is supplied already programmed and ready for installation.

Only the protection parameter setting remains to be carried out.

The REF542plus unit, already configured, can only be ordered as part of the medium voltage kit.

It cannot be sold separately.



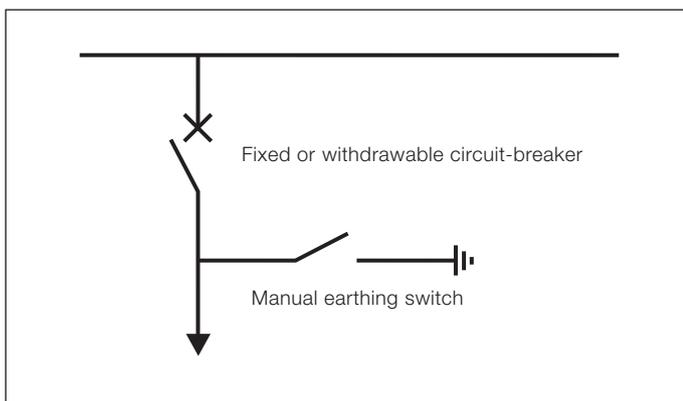
Configuration of the primary part is structured as shown in the single-line diagram below.

The circuit-breaker can be fixed or withdrawable. The earthing switch is manual. Configurations with a contactor in place of the circuit-breaker are also provided for outgoing motor feeders.

The ATEX certified version, in accordance with directive 94/9/EC for explosive environments, is also available. Please contact ABB.

Note

Specific and customised solutions and protection diagrams are possible. Please contact ABB.



Single-line diagram of the primary part.

Technical reference documentation

The pre-configured REF542*plus* unit described in this catalogue is based on release 1.1 (V4C01 software version).

For further information about the REF542*plus* unit, please ask for the following documentation:

- REF542*plus* Technical Catalogue, 1VTA100001en-H PTMV, 11.2003
- REF542*plus* Manual Part 1: Operation and Maintenance, 1VTA100002en-04 PTMV, 10.02.02.
- REF542*plus* Manual Part 2: Engineering & Technical References, 1VTA100003en-04 PTMV, 10.02.02.
- REF542*plus* Manual Part 3: Installation and Commissioning, 1VTA100004en-04 PTMV, 10.02.02.
- REF542*plus* Manual Part 4: Communication to station control system, 1VTA100005en-01 PTMV, 10.02.02.
- REF542*plus* Technical References Modbus RTU, 1VTA100065-2 PTMV, 10.02.02.
- REF542*plus* Release 1.1 Type Test Certificate 1VTA100022 PTMV, 31.01.02.
- REF542*plus* Connection Diagram 401734, Rev. M3565 7/6/01 ABB.
- REF542*plus* EC Conformity, 1VTA100159 PTMV, 28.08.02.
- EC-Type-Examination Certificate (PTB 02 ATEX 3000) PTB September 2002.

Notes

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