CM4-03

MEDIUM VOLTAGE SWITCHBOARDS, AIR-INSULATED UP TO 24KV

MINIFLUOR

IMESA®
ELECTRICAL ENGINEERING

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ELECTRICAL ENGINEERING

Factory 10,000 sq.m.
Offices 2,000 sq.m.
Warehouses 1,200 sq.m.
Open space 15,000 sq.m.

TABLE OF CONTENTS

GENERAL DESCRIPTION

The Minifluor product range consists of several indoor modular prefabricated units, air-insulated up to 24 KV, which can be equipped with cutting and disconnecting devices such as:

- Three-position SF6 switch-disconnectors, FLUORSWITCH series.
- Three-position SF6 isolators, FLUORSWITCH series.
- Additional air-insulated earthing switches
- Vacuum or SF6 circuit breakers.

MINIFLUOR MAIN CHARACTERISTICS

- Wide range of functional units
- Modularity
- Versions with internal arc protection (upon request)
- Mechanical and electrical interlocks available for maximum safety
- Compact design and optimum space utilisation
- Possibility to be pushed against the wall
- Easy installation and simple maintenance
- Product certifications, Acceptance and Type Tests

FIELDS OF APPLICATION

MINIFLUOR switchboards are used for medium voltage secondary power distribution: transforming substations controlling and protecting lines/transformers.

Considering their compact design, they are specially recommended for indoor installation, even in small rooms and prefabricated substations / CONTAINERS.

EXAMPLES OF APPLICATIONS

- Power supply systems
- Wind power plants
- Photovoltaic systems
- Underground and railway plants
- Electric power station
- Industry
- Ports, airports, hospitals, etc.

DESCRIPTION

STANDARDS

The equipment complies with the following standards:

- CEI EN 62271-200
- IEC 62271-200

More specifically, Minifluor switchboards are classified as follows:

- Service continuity: LSC2A
- Classification of partitions: PM
- Internal arc: IAC AFLR (upon request only)

CONDIZIONI DI SERVIZIO

- Ambient temperature
  - between -5°C and + 40°C
- Altitude
  - 1000 m or lower
  - For higher altitude, please contact IMESA
- Environment:
  - Normal atmosphere, no particles, flammable gases, corrosive components
- Humidity
  - Maximum relative humidity without condensation: 95%

STORAGE CONDITIONS

For the proper storage of the functional units, keep them wrapped in the original packaging and store in a dry place, protected from rain and sun, at a temperature between -5°C and + 45°C.

PROTECTION RATINGS

Switchboard protection ratings refer to IEC 60694 standards.

The MINIFLUOR range is generally manufactured with the following protection ratings:

- IP3X on the external housing (operation seats excluded)
- IP2X inside the units

External housing protection ratings higher than IP3X are available upon request.

AVAILABLE VERSIONS

- Standard
- Internal arc withstanding classification IAC AFLR 16KA x 1 s (upon request only)

SAFETY EQUIPMENT

- Power supply continuity of the metal structure
- Earthing of both structure and parts
- Interlocks preventing a wrong operation sequence:
  - Switch-disconnector or line-side isolator closure allowed only with open earthing switch and closed MV door.
  - Earthing switch closure allowed only with open switch-disconnector or line-side isolator.
  - MV door opening for accessing the line compartment allowed only with closed earthing switch.
  - In units with circuit breaker, line-side isolator opening and closure is allowed only with open circuit breaker. (with key interlock)
- Key locks or prearrangement for padlock installation on isolators (upon request)
- Voltage detection by means of galvanically isolated opto-electrical transducers
- Switch-disconnector and line-side isolator with a single three-position moving contact with independent operation (line closed – line/earth open - earth closed) with isolation safety guaranteed by:
  - “Safe position indicator” directly fitted on the moving contact shaft and compliant with the standards CEI EN 62271-102, IEC 60694 and IEC73
  - Visible isolation thanks to a special window (upon request)
  - Electric contacts for status indication (upon request)
- Versions with internal arc protection (upon request).

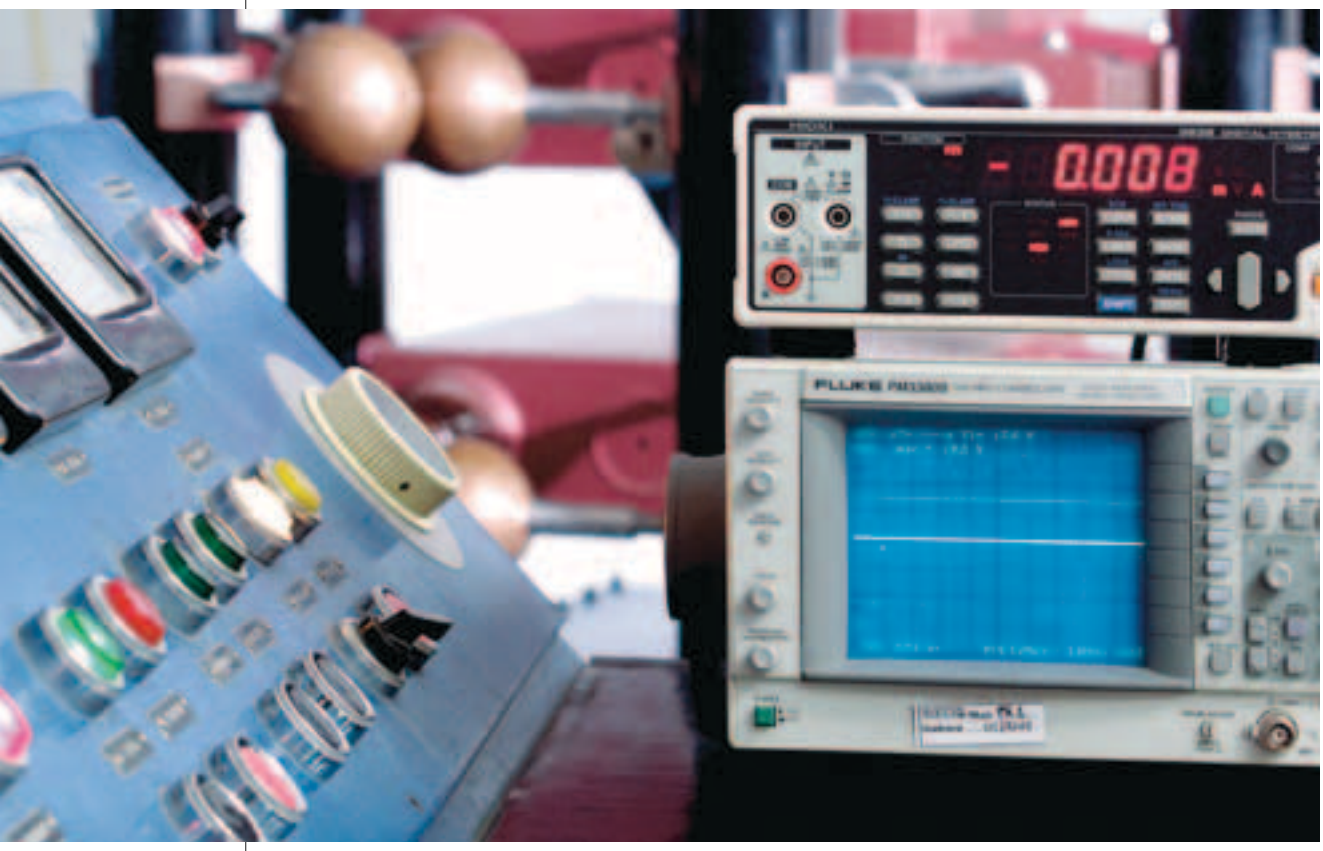
INTERNAL ARC PROTECTION

In the Minifluor switchboards with internal arc proof design IAC AFLR all functional units are equipped with flaps that open due to the overpressure caused by the internal arc and, thus, make the gas and any possible burning particles to be channelled into a rear venting pipe (large 90mm) so to avoid damages to persons, in compliance with the IEC 62271-200 standard, class A accessibility, criteria 1 to 5.

In order to guarantee all the above, panels are to be installed according to the abovementioned standard (see paragraph "INSTALLATION ROOM", page 35).

Arc detectors

Upon request, Minifluor switchboards can be equipped with various types of sensors that, if properly located on the functional units of the switchboard, immediately detect the fault and selectively open the circuit breakers. Their efficacy mainly consists in the prompt detection and fixing of the fault in a very short time, thus reducing fault occurrence on the equipment, as well as limiting damages.



Electrical characteristics

Rated voltage		Ur [kV]	12	17,5	24
Value of nominal isolation at operating frequency					
	• between the phases and to ground	Ud [kV]	28	38	50
	• between open contacts	Ud [kV]	32	45	60
Rated lightning impulse withstand voltage					
	• between the phases and to ground	Ud [kV]	75	95	125
	• between open contacts	Up [kV]	85	110	145
Rated frequency		Hz	50/60		
Nominal thermal current of main busbars		Ir [A]	400-630-800-1250		
Rated short-time current allowed					
	• for 1 s	Ik [kA]	12,5-16-20		
	• for 3 s	Ik [kA]	12,5-16		
Rated peak current		Ip [kA]	31,5-40-50		
Internal arc withstand current 1 s (IAC AFLR upon request)		[kA]	16		
Gas pressure (at 20°) of the switch-disconnector/line-side isolator		psw [MPA]	0,13		

Manufacturing characteristics

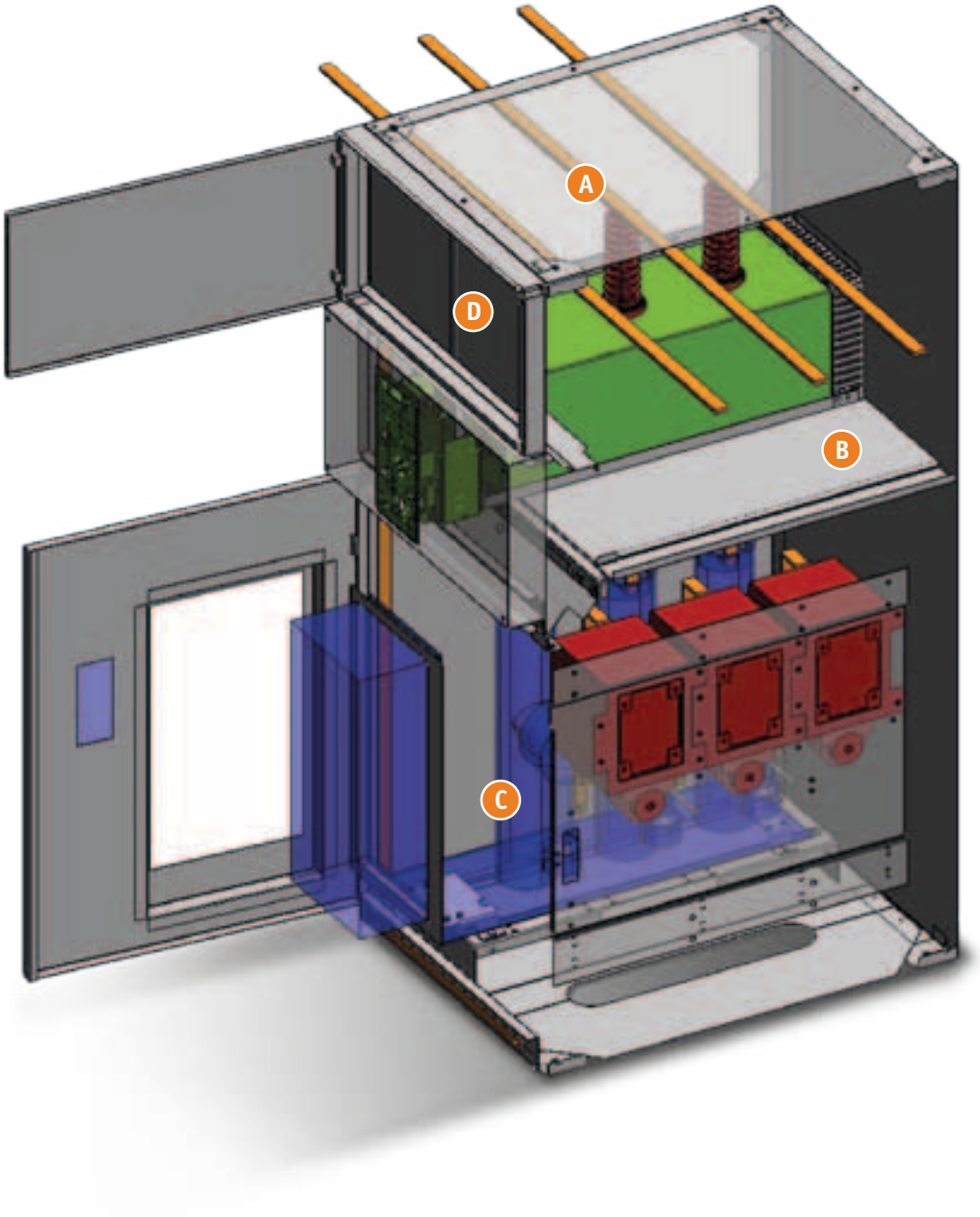
Each unit includes the compartments listed below:

A Busbar compartment

B Line-side isolator/switch-disconnector

C Cable compartment

D Auxiliary circuit and tooling compartment



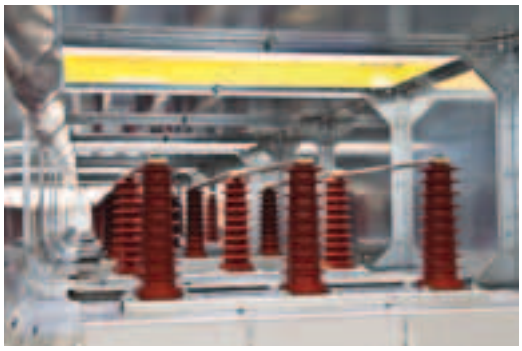
Compartments
Each unit is made of press formed sheet and includes multiple compartments segregated by metal partitions. Units are prearranged to be placed side by side and to be fixed to the floor by special holes on the steelworks; moreover, they are equipped with back closure featuring openings for medium voltage cable passage. All units feature doors with mechanical interlock enabling their opening only under safe conditions (compartment's live parts earthed). The busbar compartment can be accessed both from the front and from the roof, removing the relevant metal cover. In front of the busbar compartment, if necessary, there is the LV auxiliary circuit compartment, segregated from the busbar compartment. An incoming cable box with cable top entry can be provided, upon request, to complete the base unit.

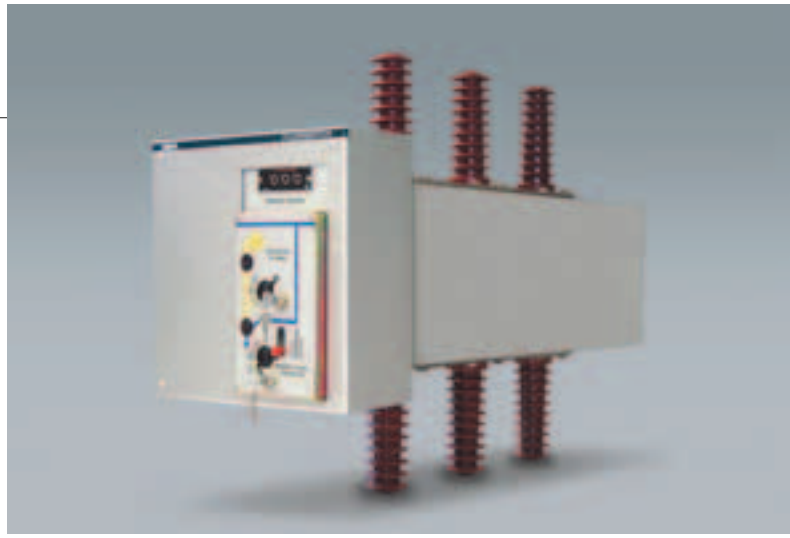
Cable compartment
It is segregated by metal partition from the busbar compartment thanks to the line-side isolator/switch-disconnector, and can include different devices according to the typical units such as, among the others: MV circuit breaker, current transformer (CT) and voltage transformer (VT), additional air insulated earthing switch, fuse holder with fuse release device and additional earthing switch, capacitive divider for voltage detection, cable terminal, surge arresters.

Auxiliary circuit and tooling compartment
If provided, this compartment can include the protective relays and signalling components. On top of the LV compartment there is a wireway to allow the connection of auxiliary cables between the panels.

Busbar compartment
It is located on the upper part of the unit, and contains the main busbar system. Busbars are made of bare electrolytic copper and are fixed to the insulator bushings of the switch-disconnector or of the line-side isolator, with air-insulation.

Line-side isolator / switch-disconnector compartment
It contains the live parts of the line-side isolator or switch-disconnector and is segregated by metal partitions from the busbar compartment and from the underlying cable compartment.
Such segregation guarantees the maximum safety for the staff in case of maintenance intervention.





FLUORSWITCH DISCONNECTORS AND ISOLATORS

General Information

FLUORSWITCH disconnectors and isolators are characterised by the use of sulphur hexafluoride (SF6) for disconnection and isolation.
Basically, they consist of a stainless steel housing sealed for life and containing SF6 at a pressure of 0.13 MPa at a temperature of 20°C).
Inside the housing there are the contacts (fixed, moving and earthing), the arcing chambers and the mechanisms for transferring movement to the moving contact themselves. External electrical connections are made by means of epoxy resin insulator bushings. Fluorswitch devices include: switch-disconnectors and earthing switches (IMS6), equipped with (manual and/or motor operated) operating mechanisms with independent operation of the over dead centre type and with stored energy; combined disconnectors/earthing switches (SLT6); SF6 insulated line-side isolators (SL6) and earthing switches (ST6) equipped with manual operating mechanism with dependent operation.

Three stable positions are possible for these devices: **Line Closed** - **Line/Earth Open** - **Earth Closed**.

- In the **Line Closed** position the device guarantees the electrical connection between the input and output of each pole, on insulator bushing end (pic.1)
- In the **Line/Earth Open** position the device guarantees the isolation between fixed and moving contacts, on both line and earth (pic.2).
- In the **Earth Closed** position, the line on device load side is earthed (Pic.3).

Main contacts and commands

On the operating mechanism front plate there are the mechanical position indicators (open/close) of the two combined devices, whereas for the stored energy operating mechanism there is also a mechanical indicator of fuse activation. Upon request, a special inspection window can be installed on the front of the enclosure

Upon request, the operating mechanisms can be equipped with key locks and device electric status signalling.

Moreover, the advantages of these devices are:

- No maintenance required for live parts;
- Safe operation: single contact moving shaft for both line and earth;
- Long lasting electrical and mechanical life (high operation frequency type);
- No leakage current is allowed to flow between input and output, since the metal housing is properly earthed.

Pic. 1

Pic. 2

Pic. 3

Device	kV	IMS6			SL6 - SLT6 - ST6		
Reference standards		CEI EN 60265-62271-102			CEI EN 62271-102		
Rated voltage and isolation voltage	Ur [kV]	12	17,5	24	12	17,5	24
Rated power-frequency withstand voltage (1 min)							
• between poles and to earth	Ud [kV]	28	38	50	28	38	50
• between open contacts	Ud [kV]	32	45	60	32	45	60
Rated lightning impulse withstand voltage (1.2/50 μs)							
• between poles and to earth	Up [kV]	75	95	125	75	95	125
• between open contacts	Up [kV]	85	110	145	85	110	145
Rated frequency	fr [Hz]	50/60			50/60		
Nominal thermal current	Ir [A]	400-630			400-630-800		
Rated breaking capacity							
• mainly active load	I1 [A]	400-630 (in E3 class)					
• closed loop	I2 [A]	400-630					
• no-load transformer	I3 [A]	16					
• no-load cables	I4a [A]	50					
• no-load line	Isa [A]	25					
Rated short-circuit making capacity	Ima [A]	31,5-40-50					
Rated short-time current							
• for 1 s	Ik [KA]	12,5-16-20-25			12,5-16-20		
• for 3 s	Ik [KA]	12,5-16			12,5-16		
Mechanical endurance	Classe	M1			M1		
Gas pressure (at 20°C)	psw [MPa]	0,13			0,13		

Guide to operating mechanism selection

- C1: manual operating mechanism with independent operation of the over dead centre type for opening and closing the switch-disconnector and the IMS6 type earthing switch.
- C1M: the same as C1, but with motor operated switch-disconnector opening and closing.
- C2: manual operating mechanism with independent operation of the over dead centre type with stored energy for IMS6 type isolator opening, in which the opening can be carried out by fuse activation by means of the proper manual lever and/or remotely by the opening coil.

- C2M: the same as C2, but with motor operated closing and spring charging for energy storage.
- M1: manual operating mechanism with dependent operation for opening the line-side isolator and/or the earthing switch, SLT6, ST6, SL6 type (an additional earthing switch can also be operated at the same time, if equipped).
- M2: manual operating mechanism with dependent operation for the simultaneous opening and closing of two combined disconnectors/earthing switches, SLT6 type, fitted side by side into the same unit.

Air-insulated earthing switches

Air insulated earthing switches are operated (by the C1/C2/M1/M2 operating mechanisms) simultaneously to the SF6 insulated earthing switch being inside the IMS6 and SLT6 tank. The air insulated earthing switches for PT and PTX compartments feature a peak making capacity >=2.5KA at 24 KV. Upon request, the compartments with circuit breaker and additional air insulated earthing switch can be equipped with earthing switch with 40KA peak making capacity.

Electrical characteristics

Tipo	Short-time short circuit current for 1"	Making capacity
STX2,5	1KA	2,5KA*
ST2,5	1KA	2,5KA*
ST	12,5-16KA	-
ST40	12,5-16KA	31,5-40KA*

* 2 locks

KEY TO SYMBOLS for selecting the compartments and properly understanding the tables

Compartment name

A Incoming unit
PT Transformer protection
P Outgoing unit
M Instrument
C Bus tie
L Improved version L 750 mm
R Busbar riser
X Reduced version L 375 mm
B Circuit breaker

First suffix (e.g. CR - **Z** - D)

I IMS switch-disconnector
Z SLT combined disconnector/earthing switch

Second subsequent suffix (e.g. CD - S - **D**)

S Left
D Right

- ● basic equipment
- ❍ additional equipment upon request
- \- not available

NB the anti-condensation heater, if requested, will always be located in the incoming cable compartment.

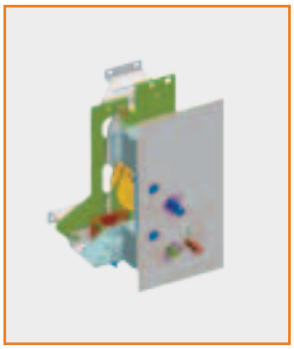
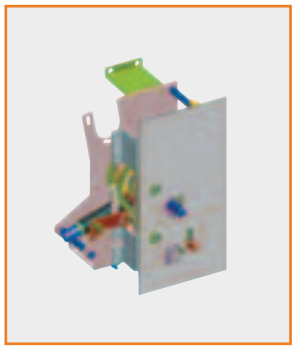
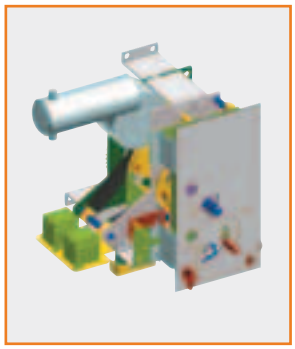
EQUIPMENT OF STANDARDISED COMPARTMENTS

	DEVICES							DEVICES				OTHER ACCESSORIES									
	IMS6	SLT6	ST6	SL6	P6	CIRCUIT BREAKER	AIR INSULATED EARTHING SWITCH	C1/C1M	C2/C2M	M1	M2	VERSIONS WITH INTERNAL ARC PROTECTION	INTERNAL LIGHTING	ANTI-CONDENSATION HEATER WITH THERMOSTAT	INCOMING CABLE BOX WITH TOP ENTRY	BASE H 300 MM	BASE H 400 MM	STANDARD LV COMPARTMENT	LV COMPARTMENT - DEPTH 180 MM	LV COMPARTMENT - DEPTH 300 MM	SET OF THREE LINE SIDE CAPACITIVE ISOLATORS	SET OF THREE BUSBAR SIDE CAPACITIVE ISOLATORS
AP-I	●	-	-	-	-	-	-	●	○	-	-	○	○	○	○	○	○	●	○	○	●	○
APX-I	●	-	-	-	-	-	-	●	○	-	-	○	-	○	○	○	○	●	○	○	●	○
AP-Z	-	●	-	-	-	-	-	-	-	●	-	○	○	○	○	○	○	●	○	○	●	○
APX-Z	-	●	-	-	-	-	-	-	-	●	-	○	-	○	○	○	○	●	○	○	●	○
A	-	-	-	-	-	-	●	-	-	●	-	○	○	○	○	○	○	●	○	○	●	○
AX	-	-	●	-	-	-	-	-	-	●	-	○	-	○	○	○	○	●	○	○	●	○
APB	-	●	-	-	-	●	●	-	-	●	-	○	○	○	○	○	○	●	○	○	●	○
APBR	-	●	-	-	-	●	●	-	-	●	-	○	○	○	○	○	○	●	○	○	●	●
CRB-S	-	●	●	-	-	●	-	-	-	-	●	○	○	○	○	○	○	●	○	○	●	○
CRB-D	-	●	●	-	-	●	-	-	-	-	●	○	○	○	○	○	○	●	○	○	●	○
CRB2	-	●x2	-	-	-	●	-	-	-	-	●	○	○	○	○	○	○	●	○	○	●	○
PT	●	-	-	-	-	-	●	-	●	-	-	○	○	○	○	○	○	●	○	○	●	○
PTX	●	-	-	-	-	-	●	-	●	-	-	○	-	○	○	○	○	●	○	○	●	○
CR-I-S	●	-	-	-	●	-	-	●	○	-	-	○	○	○	○	○	○	●	○	○	●	○
CR-I-D	●	-	-	-	●	-	-	●	○	-	-	○	○	○	○	○	○	●	○	○	●	○
CR-Z-S	-	●	-	-	●	-	-	-	-	●	-	○	○	○	○	○	○	●	○	○	●	○
CR-Z-D	-	●	-	-	●	-	-	-	-	●	-	○	○	○	○	○	○	●	○	○	●	○
CR2	-	●x2	-	-	-	-	-	-	-	-	●	○	○	○	○	○	○	●	○	○	●	○
APM	●	-	-	-	-	-	●	-	-	-	-	○	○	○	○	○	○	●	○	○	●	○
APMF	●	-	-	-	-	-	●	-	-	-	-	○	○	○	○	○	○	●	○	○	●	○
M-I	●	-	-	-	-	-	○	-	●	-	-	○	○	○	○	○	○	●	○	○	●	○
M-Z	-	●	-	-	-	-	○	-	-	●	-	○	○	○	○	○	○	●	○	○	●	○
ML-I	●	-	-	-	-	-	○	-	●	-	-	○	○	○	○	○	○	●	○	○	●	○
AR	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	-	○	○	-	○
ARX	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	-	○	○	-	○
RW-S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	-	○	○	-	○
RW-D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	-	○	○	-	○
CC-S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	-	-	-	-	○
CC-D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	-	-	-	-	○

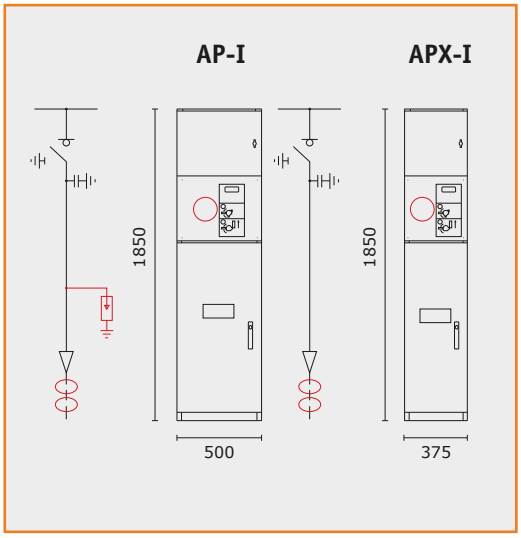
DEVICE EQUIPMENT AND OPERATING MECHANISMS

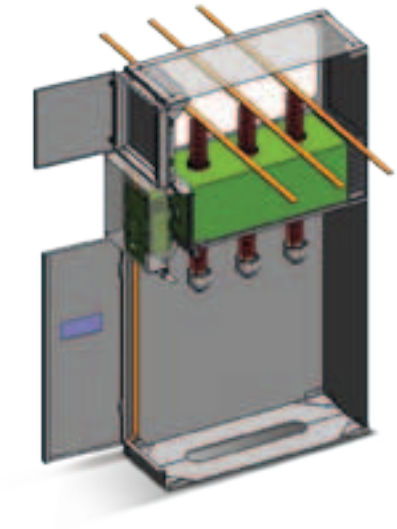
Available accessories	IMS6				SLT6		SL6		ST6	
	C1	C1M	C2	C2M	M1	M2	M1	M2	M1	M2
Key for enabling operations - LINE	-	-	○	○	-	-	-	-	-	-
n° 1 Key lock with the key free when the line-side isolator is open	○	○	-	-	○	○	○	○	-	-
n° 1 Key lock with the key free when the line-side isolator is closed	○	○	-	-	○	○	○	○	-	-
n° 1 Key lock with the key free when the earthing switch is open	○	○	○	○	○	○	-	-	○	○
n° 1 Key lock with the key free when the earthing switch is closed	○	○	○	○	○	○	-	-	○	○
Socket for phase sequence controller	○	○	○	○	○	○	○	○	○	○
Voltage detection unit with opto-electrical transducer	○	○	○	○	○	○	○	○	○	○
Opening coil (24-36W/150VA)*	-	-	○	○	-	-	-	-	-	-
Auxiliary contact signalling fuse release	-	-	○	○	-	-	-	-	-	-
Auxiliary EARTH contact (O-C)	○	○	○	○	○	○	-	-	○	○
Auxiliary LINE contact (O-C)	○	○	○	○	○	○	○	○	-	-
Motor operating mechanism	-	○	-	○	-	-	-	-	-	-
Front inspection window	○	○	○	○	○	○	○	○	○	○

* for different voltage values a power supply unit or transformer will be provided in the LV compartment


AP-I and APX-I UNITS
with switch-disconnector





Basic configuration
- Switch-disconnector and earthing switch IMS6 with C1/C1M, C2/C2M operating mechanism.
- Door lock
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics
- Ir 400-630 A
- Ik 12.5-16-20 kA

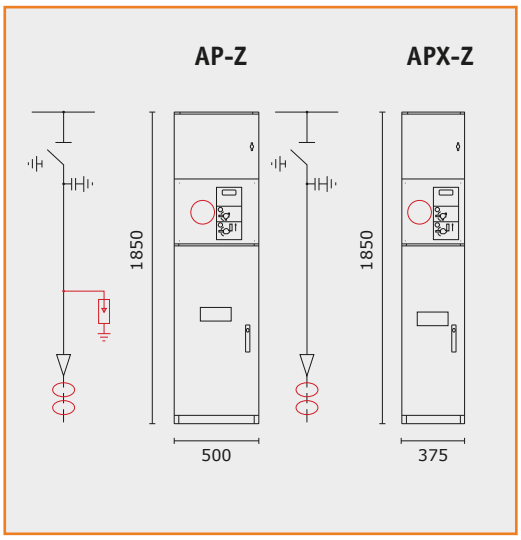
Medium voltage parts to be provided upon request for completing the base unit

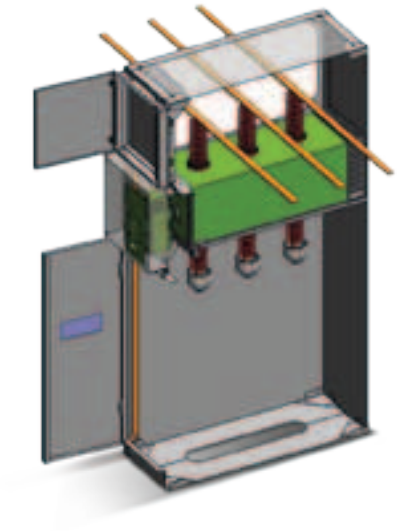
	AP-I	APX-I	Notes
Through-type CT	-	-	
Toroidal phase CT	○	○	
Homopolar toroid CT	○	○	
Phase-to-phase VT	-	-	
Phase-to-earth VT	-	-	
Medium voltage surge arresters	○	-	
MV surge arrester release device	○	-	*
MV surge arrester impulse counter	○	-	*

* Upon request, the incoming/outgoing cable unit can be excluded from the compartment.
It is not possible to install both devices.

AP-Z and APX-Z UNIT

with combined disconnector/earthing switch





Basic configuration

- Combined disconnector/earthing switch SLT6 with M1 operating mechanism
- Door lock
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics

- Ir 400-630-800 A
- Ik 12.5-16-20 kA

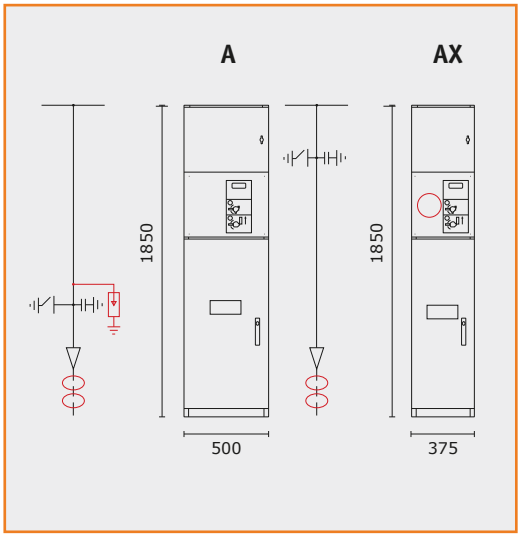
Medium voltage parts to be provided upon request for completing the base unit

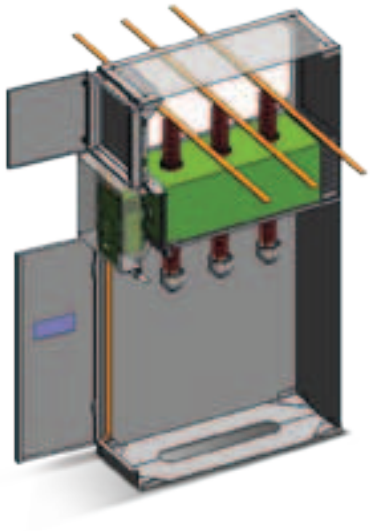
	AP-Z	APZ-X	Notes
Through-type CT	-	-	
Toroidal phase CT	○	○	
Homopolar toroid CT	○	○	
Phase-to-phase VT	-	-	
Phase-to-earth VT	-	-	
Medium voltage surge arresters	○	-	
MV surge arrester release device	○	-	*
MV surge arrester impulse counter	○	-	*

* Upon request, the incoming/outgoing cable unit can be excluded from the compartment.
It is not possible to install both devices.

A and AX UNITS

with combined disconnector/earthing switch





Basic configuration

- Earthing switch SLT6 with M1 operating mechanism
- Door lock
- Air insulated earthing switch ST for A units, SF6 gas insulated earthing switch ST6 for AX units
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics

- Ir 400-630-800 A
- Ik 12.5-16-20 kA

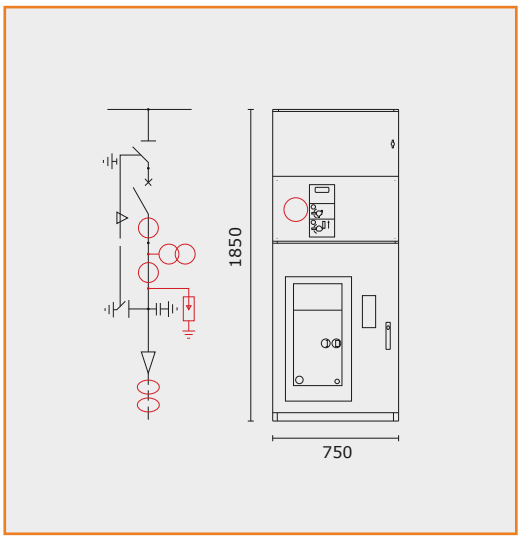
Medium voltage parts to be provided upon request for completing the base unit

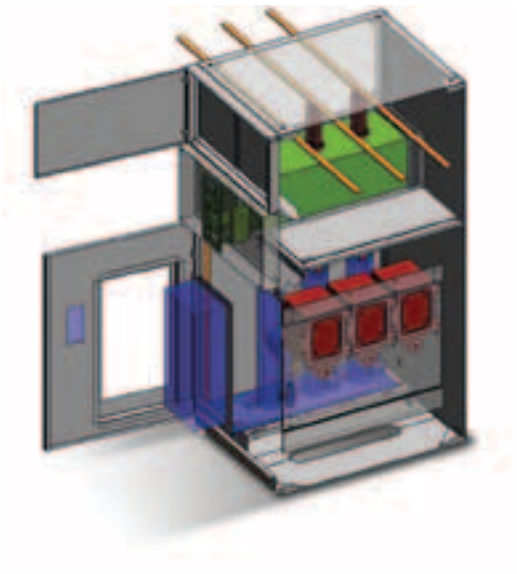
	A	AX	Notes
Through-type CT	-	-	
Toroidal phase CT	○	○	
Homopolar toroid CT	○	○	
Phase-to-phase VT	-	-	
Phase-to-earth V	-	-	
Medium voltage surge arresters	○	-	
MV surge arrester release device	○	-	*
MV surge arrester impulse counter	○	-	*

* Upon request, the incoming/outgoing cable unit can be excluded from the compartment.
It is not possible to install both devices.

APB UNIT

incoming/outgoing unit with combined disconnector/earthing switch and circuit breaker





Basic configuration

- Combined disconnector/earthing switch SLT6 with M1 operating mechanism, two combined disconnectors/earthing switches SLT6 with M2 operating mechanism for the 1250 A version.
- Vacuum or SF6 circuit breaker.
- Additional air-insulated earthing switch ST
- Mechanical interlock between the circuit breaker and the combined disconnector/earthing switch
- Door lock
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics

- Ir 400-630-800-1250 A
- Ik 12.5-16-20 kA

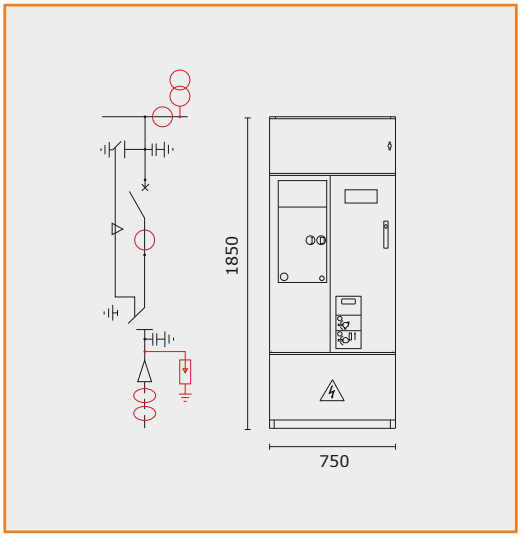
Medium voltage parts to be provided upon request for completing the base unit

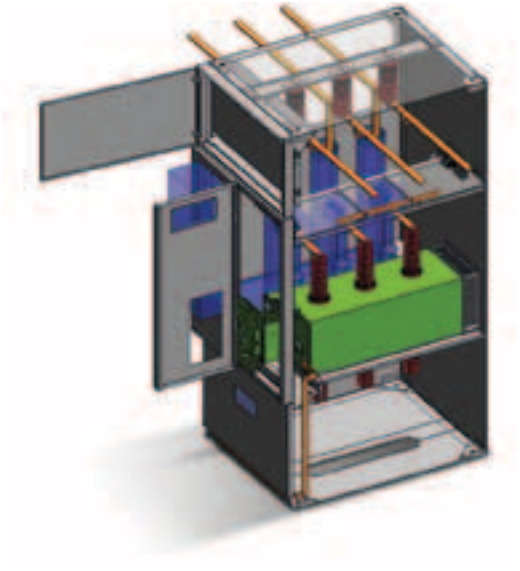
	APB	APB1250	Notes
2/3 pcs through-type CT	○ ○ ○ - -	- ○ - -	
Toroidal phase CT	○ ○ ○ ○ ○	○ ○ ○ ○	
Homopolar toroid CT	○ ○ ○ ○ ○	○ ○ ○ ○	
2 pcs phase-to-phase VT	- - ○ - -	○ - - ○	
3 pcs phase-to-earth VT	- ○ - ○ -	- - ○ -	
Current sensor on board the circuit breaker	- - - ○ ○	- - ○ ○	
Medium voltage surge arresters	○ - - - ○	○ ○ - -	
MV surge arrester release device	- - - - -	- - - -	
MV surge arrester impulse counter	- - - - -	- - - -	

The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

APBR UNIT

incoming/outgoing unit with combined disconnector/earthing switch and circuit breaker upside-down





Basic configuration

- Combined disconnector/earthing switch SLT6 with M1 operating mechanism
- Vacuum or SF6 circuit breaker.
- Additional earthing switch on OMNIBUS busbars
- Mechanical interlock between the circuit breaker and the combined disconnector/ earthing switch
- Door lock
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics

- Ir 400-630-800 A
- Ik 12.5-16-20 kA

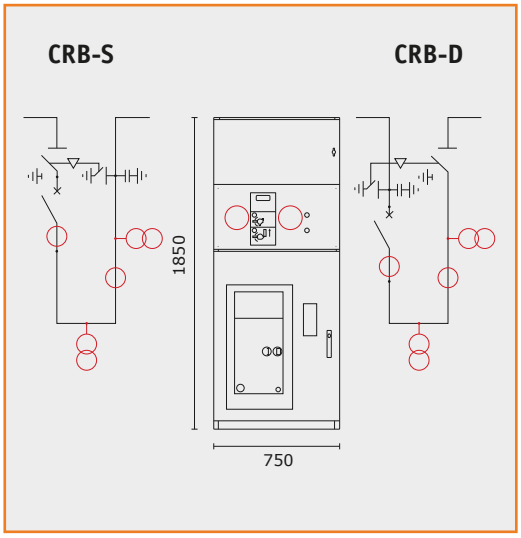
Medium voltage parts to be provided upon request for completing the base unit

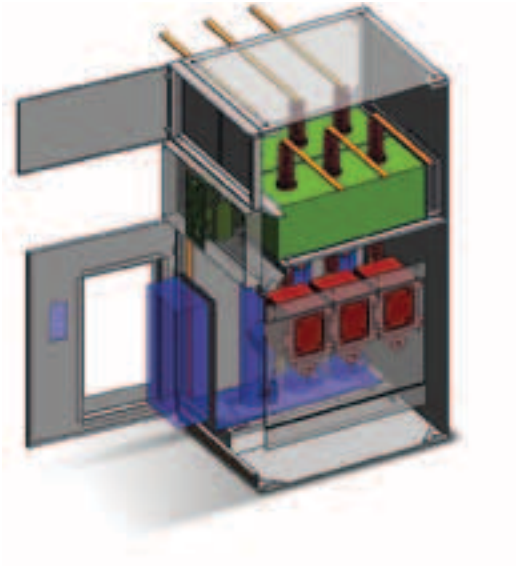
	APBR	Notes
2/3 pcs through-type CT	○ - -	
Toroidal phase CT	○ ○ ○	
Homopolar toroid CT	○ ○ ○	
2 pcs phase-to-phase VT	- ○ -	*
3 pcs phase-to-earth VT	- - ○	
Current sensor on board the circuit breaker	- ○ ○	
Medium voltage surge arresters	- - -	
MV surge arrester release device	- - -	
MV surge arrester impulse counter	- - -	

* On the roof with box or on the busbar compartment, at the discretion of our technical department.
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

CRB-S and CRB-D UNITS

busbar riser and isolation with line-side isolator and circuit breaker





Basic configuration

- Combined disconnector/earthing switch SLT6 and earthing switch ST6 with M2 operating mechanism
- Vacuum or SF6 circuit breaker.
- Mechanical interlock between the circuit breaker and the combined disconnector/earthing switch
- Door lock
- Busbar system and earthing circuit

Electrical characteristics

- Ir 400-630-800 A
- Ik 12.5-16-20 kA

NB: VT positioning will be decided by IMESA S.p.A. technical department according to the real technical requirements of the relevant project

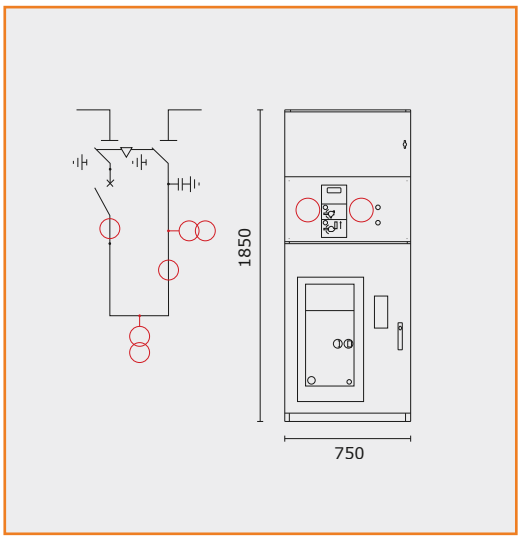
Medium voltage parts to be provided upon request for completing the base unit

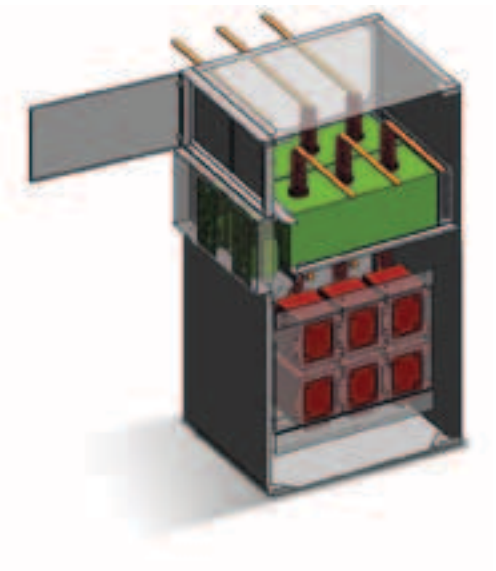
	CRB	Notes
2/3 pcs through-type CT	○ ○ - -	
Toroidal phase CT	○ ○ ○ ○	With ACA only
Homopolar toroid CT	○ ○ ○ ○	With ACA only
2 pcs phase-to-phase VT	- ○ - ○	
3 pcs phase-to-earth VT	○ - ○ -	
Current sensor on board the circuit breaker	- - ○ ○	
Medium voltage surge arresters	○ ○ ○ ○	
MV surge arrester release device	○ ○ ○ ○	
MV surge arrester impulse counter	- - - -	

The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

CRB2 UNIT

busbar riser and isolation with combined disconnector/earthing switch and circuit breaker





Basic configuration

- Two FLUORSWITCH combined disconnectors/ earthing switches SLT6 with M2 operating mechanism
- Vacuum or SF6 circuit breaker.
- Mechanical interlock between the circuit breaker and the combined disconnector/earthing switch
- Door lock
- Busbar system and earthing circuit

Electrical characteristics

- Ir 400-630-800 A
- Ik 12.5-16-20 kA

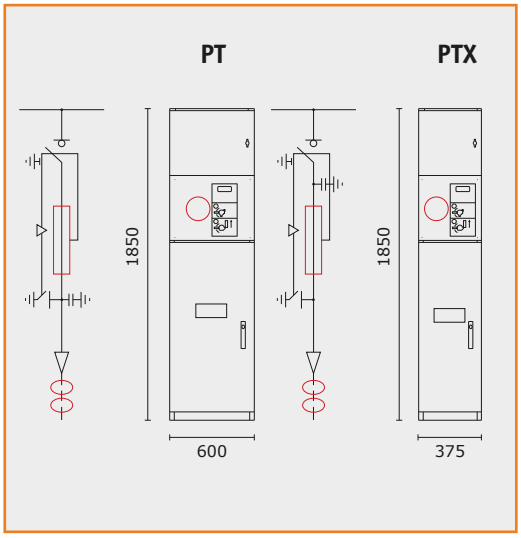
NB: VT positioning will be decided by IMESA S.p.A. technical department according to the real technical requirements of the relevant project

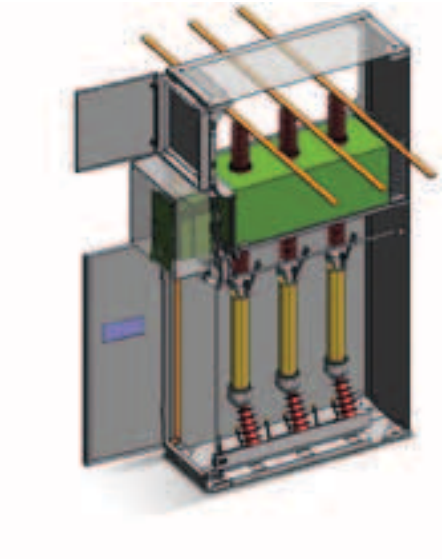
Medium voltage parts to be provided upon request for completing the base unit

	CRB2	Notes
2/3 pcs through-type CT	○ ○ - -	
Toroidal phase CT	○ ○ ○ ○	With ACA only
Homopolar toroid CT	○ ○ ○ ○	With ACA only
2 pcs phase-to-phase VT	- ○ - ○	
3 pcs phase-to-earth VT	○ - ○ -	
Current sensor on board the circuit breaker	- - ○ ○	
Medium voltage surge arresters	○ ○ ○ ○	
MV surge arrester release device	○ ○ ○ ○	
MV surge arrester impulse counter	- - - -	

The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

PT and PTX UNITS
transformer protection





Basic configuration

- Circuit breaker and combined disconnector/ earthing switch IMS6 with C2/C2M operating mechanism.
- Fuse holders
- Additional earthing switch on the load side of the fuses ST2.5 (STX2.5 for PTX) without making capacity
- Mechanical interlock between the switch-disconnector and the earthing switch
- Door lock
- Cable terminal
- Busbar system and earthing circuit

Electrical characteristics

- Ir 400-630 A
- Ik 12.5-16-20 kA

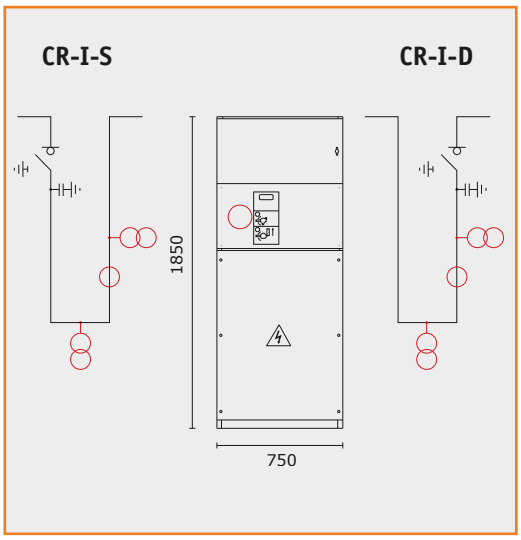
Medium voltage parts to be provided upon request for completing the base unit

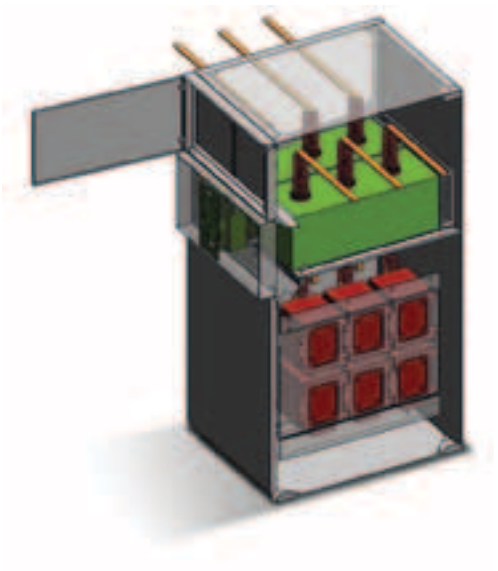
	PT	PTX	Notes
2/3 pcs through-type CT	-	-	
Toroidal phase CT	○	○	
Homopolar toroid CT	○	○	
2 pcs phase-to-phase VT	-	-	
3 pcs phase-to-earth VT	-	-	
Medium voltage surge arresters	-	-	
MV surge arrester release device	-	-	
MV surge arrester impulse counter	-	-	
Medium voltage fuses up to (see table on page 33)	○	○	*

* For larger size or isolation voltage values other than 24 KV, please contact IMESA

CR-I-S and CR-I-D UNITS

busbar isolation with switch-disconnector





Basic configuration

- Switch-disconnector and earthing switch IMS6 with C1 or C1M, C2 or C2M operating mechanism.
- Bolted door
- Busbar system and earthing circuit
- Back plate

Electrical characteristics

- Ir 400-630 A
- Ik 12.5-16-20 kA

NB: VT positioning will be decided by IMESA S.p.A. technical department.

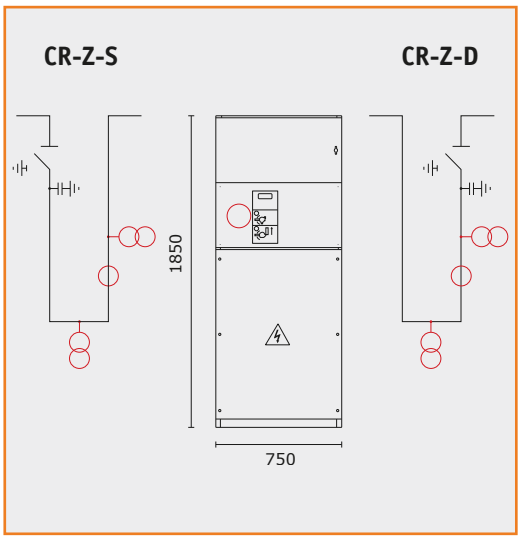
Medium voltage parts to be provided upon request for completing the base unit

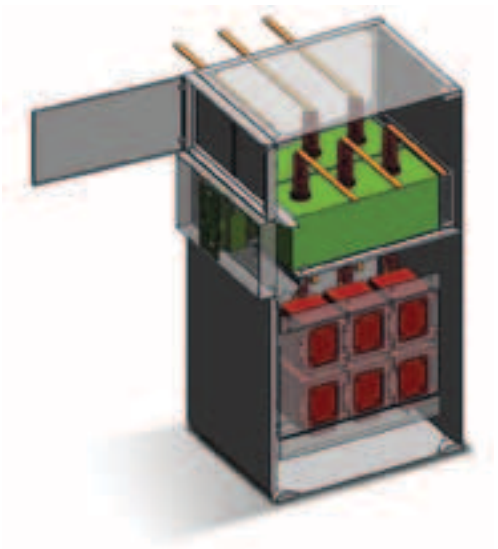
	CR-I	Notes
2/3 pcs through-type CT	○ ○ -	
Toroidal phase CT	○ ○ ○	With ACA only
Homopolar toroid CT	○ ○ ○	With ACA only
2 pcs phase-to-phase VT	- ○ ○	
3 pcs phase-to-earth VT	○ - ○	
Medium voltage surge arresters	○ ○ ○	
MV surge arrester release device	○ ○ ○	*
MV surge arrester impulse counter	○ ○ ○	*

*It is not possible to install both devices.
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

CR-Z-S and CR- Z-D UNITS

busbar isolation with combined disconnector/earthing switch





Basic configuration

- Combined disconnector/earthing switch SLT6 with M1 operating mechanism
- Bolted door
- Busbar system and earthing circuit
- Back plate

Electrical characteristics

- Ir 400-630 A
- Ik 12.5-16-20 kA

NB: VT positioning will be decided by IMESA S.p.A. technical department according to the real technical requirements of the relevant project

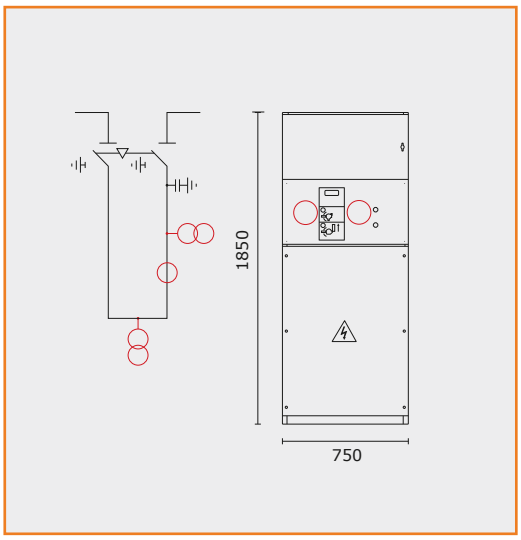
Medium voltage parts to be provided upon request for completing the base unit

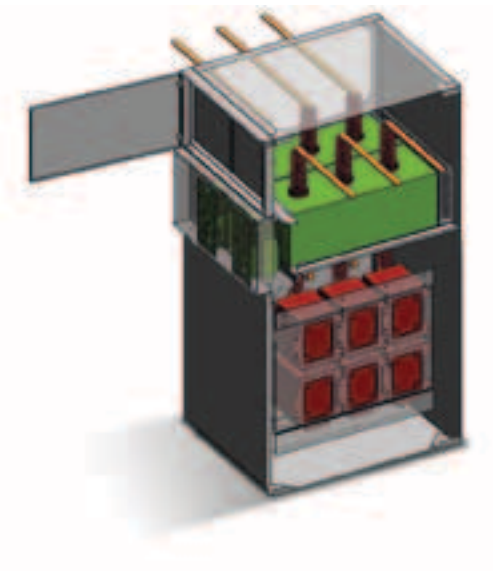
	CR-Z	Notes
2/3 pcs through-type CT	○ ○ -	
Toroidal phase CT	○ ○ ○	With ACA only
Homopolar toroid CT	○ ○ ○	With ACA only
2 pcs phase-to-phase VT	- ○ ○	
3 pcs phase-to-earth VT	○ - ○	
Medium voltage surge arresters	○ ○ ○	
MV surge arrester release device	○ ○ ○	*
MV surge arrester impulse counter	○ ○ ○	*

*It is not possible to install both devices.
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

CR2 UNIT

busbar riser and isolation with combined disconnector/earthing switch





Basic configuration

- Two FLUORSWITCH combined disconnectors/ earthing switches SLT6 with M2 operating mechanism
- Door lock
- Busbar system and earthing circuit
- Back plate

Electrical characteristics

- Ir 400-630-800 A
- Ik 12.5-16-20 kA

NB: VT positioning will be decided by IMESA S.p.A. technical department according to the real technical requirements of the relevant project

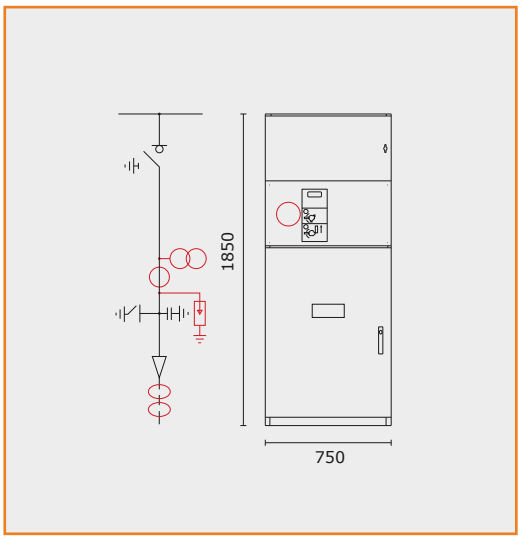
Medium voltage parts to be provided upon request for completing the base unit

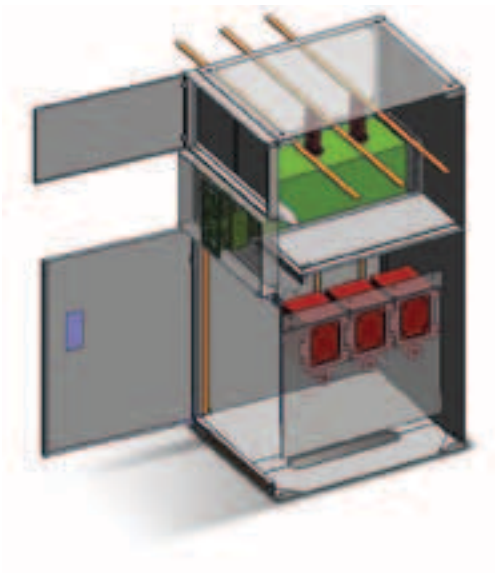
	CR2	Notes
2/3 pcs through-type CT	○ ○ -	
Toroidal phase CT	○ ○ ○	With ACA only
Homopolar toroid CT	○ ○ ○	With ACA only
2 pcs phase-to-phase VT	- ○ ○	
3 pcs phase-to-earth VT	○ - ○	
Medium voltage surge arresters	○ ○ ○	
MV surge arrester release device	○ ○ ○	*
MV surge arrester impulse counter	○ ○ ○	*

*It is not possible to install both devices.
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

APM UNIT

incoming/outgoing and instrument unit with switch-disconnector





Basic configuration

- Switch-disconnector and earthing switch IMS6 with C1 or C1M, C2 or C2M operating mechanism
- Mechanical interlock between the switch-disconnector and the earthing switch
- Additional air-insulated earthing switch ST
- Door lock
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics

- Ir 400-630 A
- Ik 12.5-16-20 kA

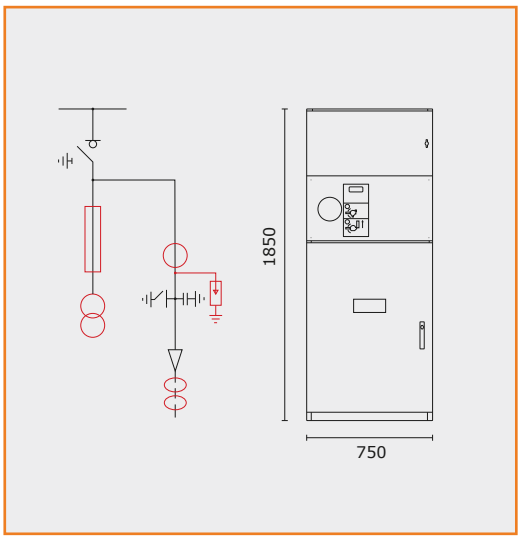
Medium voltage parts to be provided upon request for completing the base unit

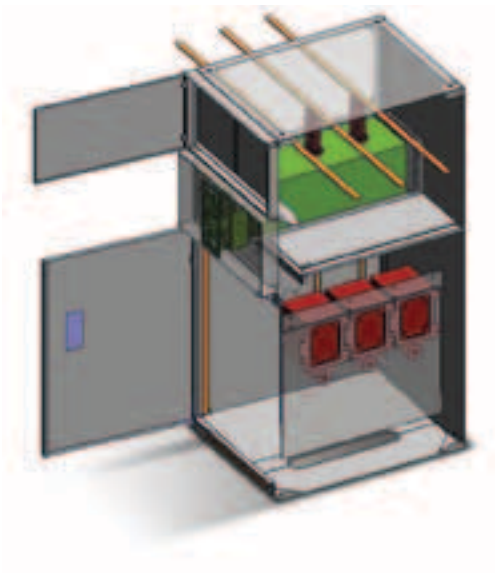
	APM	Notes
2/3 pcs through-type CT	○ ○ ○	
Toroidal phase CT	○ ○ ○	
Homopolar toroid CT	○ ○ ○	
2 pcs phase-to-phase VT	- - ○	
3 pcs phase-to-earth VT	- ○ -	
Medium voltage surge arresters	○ ○ ○	
MV surge arrester release device	○ - -	*
MV surge arrester impulse counter	○ - -	*

*It is not possible to install both devices.
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

APMF UNIT

incoming/outgoing unit with fuses and instrument unit with switch-disconnector





Basic configuration

- Switch-disconnector and earthing switch IMS6 with C2 or C2M operating mechanism
- Mechanical interlock between the switch-disconnector and the earthing switch
- Additional air-insulated earthing switch ST
- Door lock
- Busbar system and earthing circuit
- Cable terminal
- Back plate for cable anchoring

Electrical characteristics

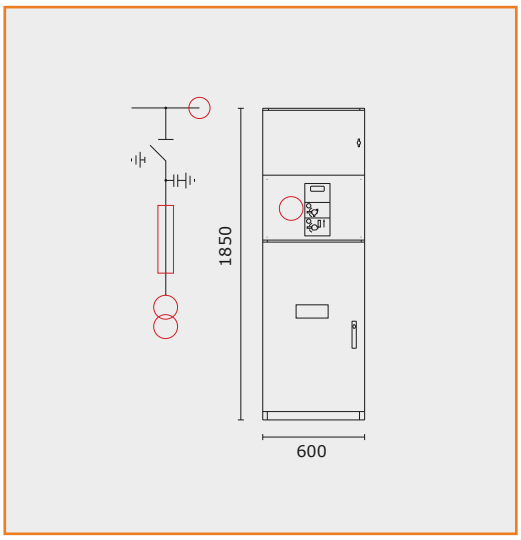
- Ir 400-630 A
- Ik 12.5-16-20 kA

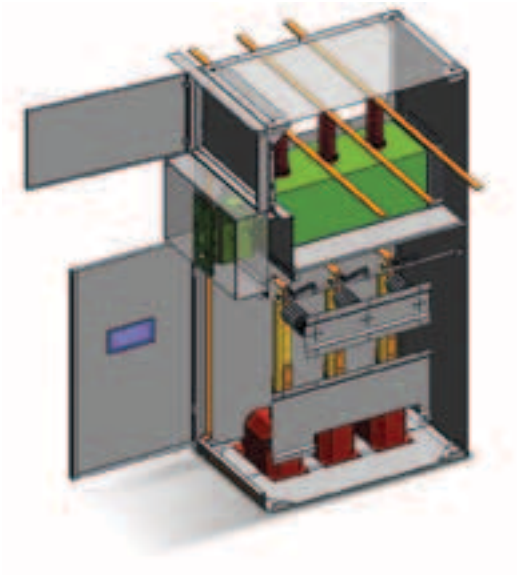
Medium voltage parts to be provided upon request for completing the base unit

	APMF	Notes
2/3 pcs through-type CT	○ ○ ○	
Toroidal phase CT	○ ○ ○	
Homopolar toroid CT	○ ○ ○	
2 pcs phase-to-phase VT	- - ○	
3 pcs phase-to-earth VT	- ○ -	
2.5 A medium voltage fuses	• • •	
Medium voltage surge arresters	○ ○ ○	
MV surge arrester release device	○ - -	*
MV surge arrester impulse counter	○ - -	*

*It is not possible to install both devices.
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

M-Z UNIT - MEASURING UNIT for voltmeter measurements with combined disconnector/earthing switch





Basic configuration

- Combined disconnector/earthing switch SLT6 with M1 operating mechanism
- Fuse holder
- Door lock
- Busbar system and earthing circuit
- Back plate

Electrical characteristics

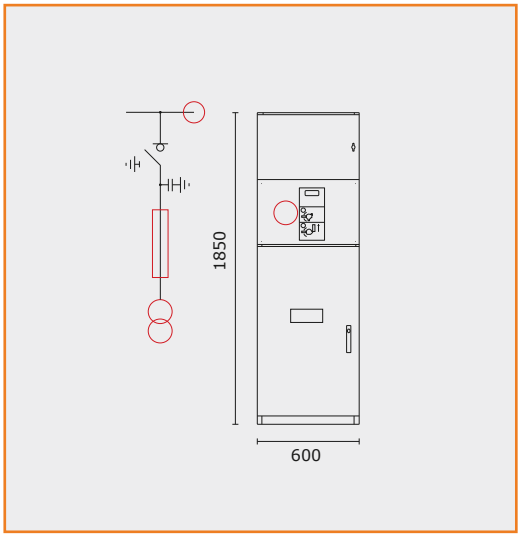
- Ir 400-630-800 A
- Ik 12.5-16-20 kA

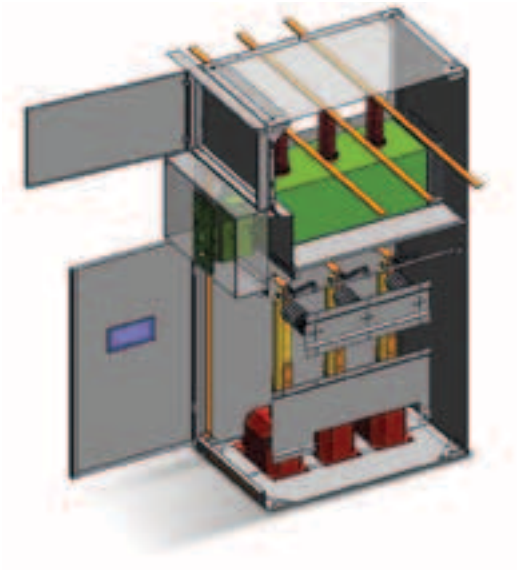
Medium voltage parts to be provided upon request for completing the base unit

	M-Z	Notes
2 pcs phase-to-phase VT	- ○	
3 pcs phase-to-earth VT	○ -	
2/3 pcs through-type CT	○ ○	*
2.5 A medium voltage fuses	• •	

* Located on omnibus busbars
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

M-I UNIT - MEASURING UNIT for voltmeter measurements with switch-disconnector





Basic configuration

- Switch-disconnector and combined disconnector/earthing switch IMS6 with C2/C2M operating mechanism.
- Fuse holder
- Mechanical interlock between the switch-disconnector and the earthing switch
- Door lock
- Busbar system and earthing circuit
- Back plate

Electrical characteristics

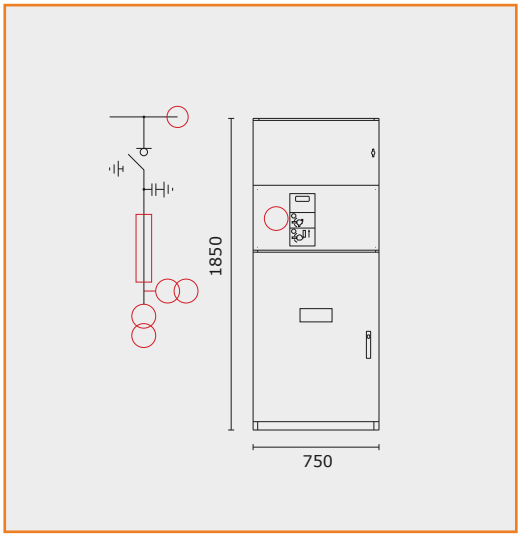
- Ir 400-630 A
- Ik 12.5-16-20 kA

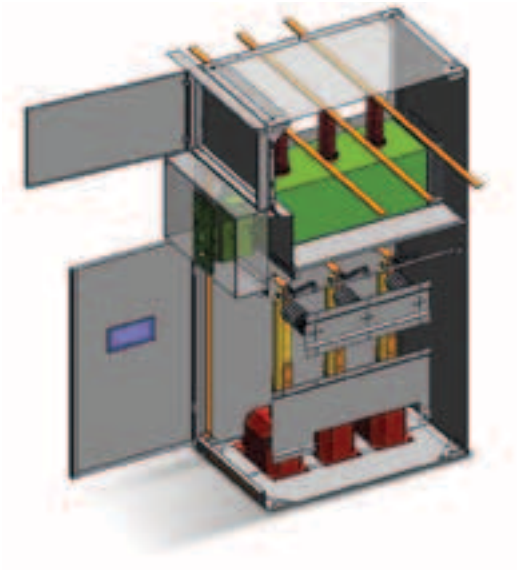
Medium voltage parts to be provided upon request for completing the base unit

	M-I	Notes
2 pcs phase-to-phase VT	- ○	
3 pcs phase-to-earth VT	○ -	
2/3 pcs through-type CT	○ ○	*
2.5 A medium voltage fuses	• •	

* Located on omnibus busbars
The table shows the possible configurations (right to left) when completing the base unit with several accessories at the same time (top to bottom)

ML-I UNIT - MEASURING UNIT for voltmeter measurements with switch-disconnector





Basic configuration

- Switch-disconnector combined disconnector/ earthing switch IMS6 with C2/C2M operating mechanism
- Fuse holder
- Mechanical interlock between switch disconnector and earthing switch
- Door lock
- Busbar system and earthing circuit
- Back plate

Electrical characteristics

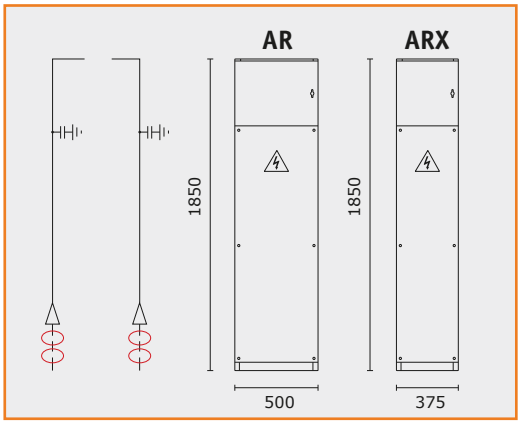
- Ir 400-630 A
- Ik 12.5-16-20 kA

Medium voltage parts to be provided upon request for completing the base unit

	ML-I	Notes
2 pcs phase-to-phase VT	○	
3 pcs phase-to-earth VT	○	
2/3 pcs through-type CT	○	*
2.5 A medium voltage fuses	•	

* Located on omnibus busbars

AR and ARX UNITS busbar incoming/outgoing unit



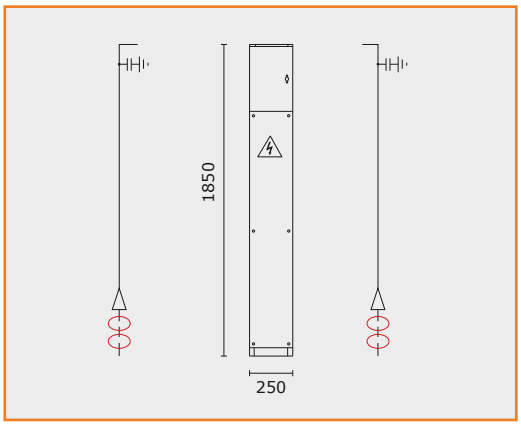
Basic configuration

- 3 supporting insulators
- Busbar system
- Set of three incoming line side capacitive isolators

Medium voltage parts to be provided upon request for completing the base unit

	AR	ARX
Toroidal phase CT	❍	❍
Homopolar toroid CT	❍	❍

RW-S and RW-D UNIT incoming cable, bottom entry



Basic configuration

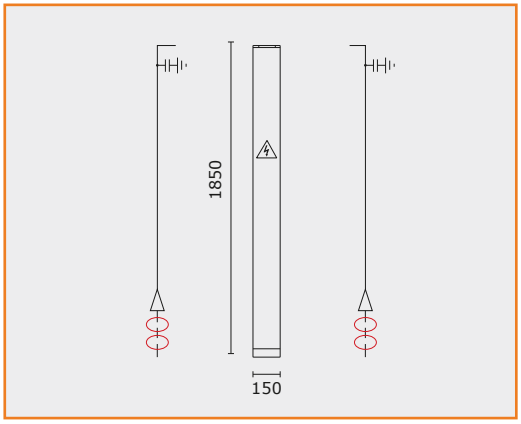
- Busbar system
- Set of three incoming line side capacitive isolators fitted on the busbar side of the adjacent compartment

Medium voltage parts to be provided upon request for completing the base unit

	RW
Toroidal phase CT	❍
Homopolar toroid CT	❍ *

* In the wireway or in the base, if equipped

CC-S and CC-D UNITS incoming cable, bottom entry



Basic configuration

- Busbar system
- Set of three incoming line side capacitive isolators fitted on the busbar side of the adjacent compartment

NB: the compartment can be accessed from the side only.

Medium voltage parts to be provided upon request for completing the base unit

	CC
Toroidal phase CT	❍ *
Homopolar toroid CT	❍ *

* In the wireway or in the base, if equipped

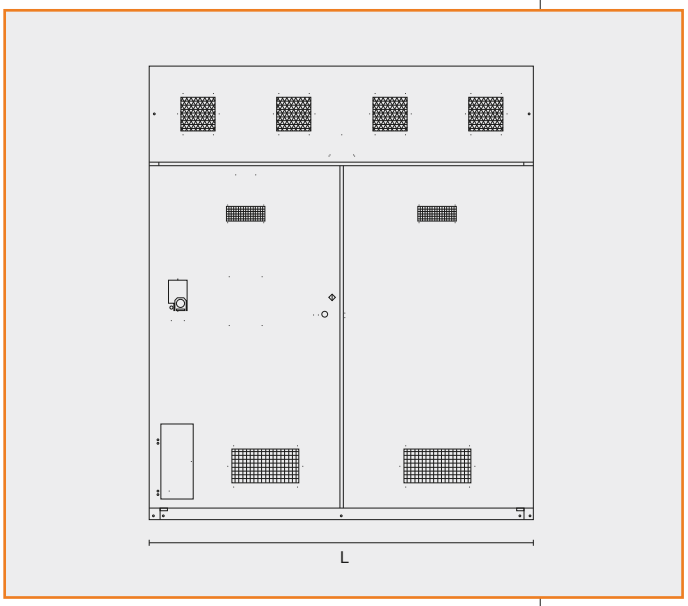
Transformer housing UNITS

Transformer housing units are available only in the standard version without internal arc protection. They are made of pre-galvanized sheet, except for the front, which is RAL 7035 painted.

They are equipped with KITs for their fitting on pallets.
Upon request, the dimensions of the transformer housing box can be different from those reported.
The standard protection degree is IP2X.
For further information, contact our sales office.

Available UNITS

Standard box dimensions			
Transformer box	L1500	P1150	H2250
Transformer box	L1500	P1300	H2250
Transformer box	L1500	P1150	H2250
Transformer box	L1500	P1725	H2250
Transformer box	L1500	P2000	H2250
Transformer box	L1800	P1150	H2250
Transformer box	L1800	P1300	H2250
Transformer box	L1800	P1500	H2250
Transformer box	L1800	P1725	H2250
Transformer box	L1800	P2000	H2250
Transformer box	L2000	P1150	H2250
Transformer box	L2000	P1300	H2250
Transformer box	L2000	P1500	H2250
Transformer box	L2000	P1725	H2250
Transformer box	L2000	P2000	H2250
Transformer box	L2000	P2500	H2250
Transformer box	L2500	P2000	H2250
Transformer box	L2500	P2000	H2500
Transformer box	L2500	P2500	H2500



Accessories provided upon request for completing the base unit

Internal lighting	○
AREL SBP1 key lock	•
Front earthing busbar	•

The transformer housing box shall be selected so to guarantee the compliance with the required insulation distance.

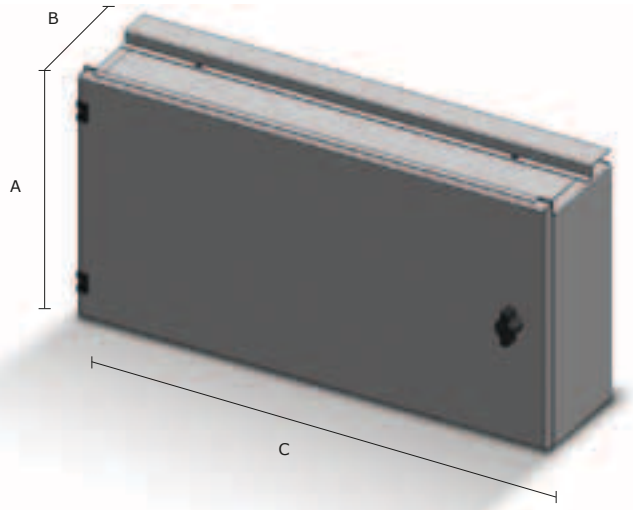
Painting

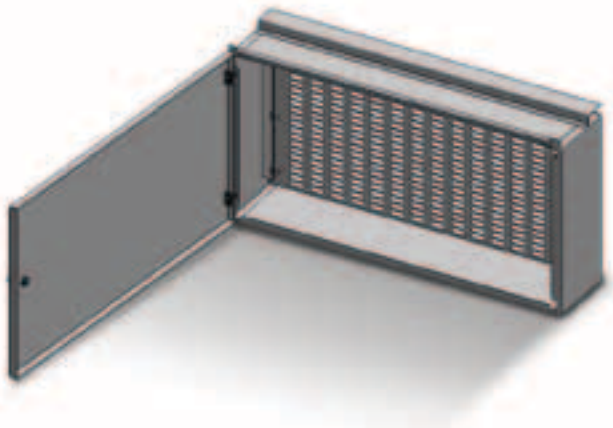
Only front doors will be painted.
Painting is carried out by using epoxy powder polymerized in oven at 180° after the surfaces to be painted have undergone washing, degreasing, phosphating, passivating and demineralised water treatments.
The standard colour point is RAL 7053 (upon request and against payment of an extra charge different RAL finishings are available).
Minimum paint thickness is 60 micron.
The bearing structure, the sides and the busbar compartment closing panels are made of pre-galvanized sheet (upon request and against payment of an extra charge side panels and locks can be painted).

LV compartment for auxiliary circuits

According to customer needs, it is possible to install the auxiliary circuit compartment on panel front or top. There, it is possible to place the instruments, protective relays and signalling components.
On top of the LV compartment there is a wireway to allow the connection of auxiliary cables between the panels. This wireway is easily accessible by removing the closing plate secured with self-tapping screws (see below).
The box is provided with a handle that, upon request, can be equipped with lock.

A 390/540 mm
B 70/180/300 mm
C 250/375/500/600/750 mm





ACA compartment (incoming cables, top entry) available for the standard version and for the version with internal arc protection
H 300 mm
W 375/500/600/750 mm
D 960 mm

ZOC base frame
H 300 o 400 mm
W 150/250/375/500/600/750 mm
PD960 mm

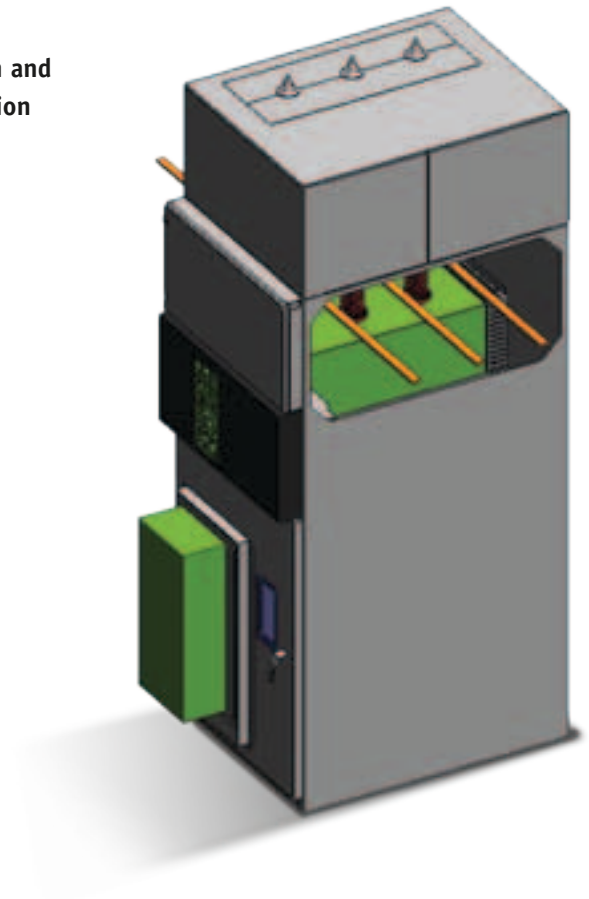


TABLE FOR MV FUSE SELECTION

Only fuses with striker compliant to the IEC 60282-1 standard are to be used for the compartments featuring fuse holders and used for protecting transformers.

Fuse size shall comply with the DIN 43625 standard. The following table lists the characteristics of the fuse to be used according to the data of the transformer to be protected.

Operating voltage (KV)	Transformer rated power (KVA)															
	25	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000
6	6,3	6,3	10	10	16	16	25	25	25	40	40	63	63	100	100	-
10	6,3	6,3	10	10	16	16	25	25	25	40	40	63	63	100	100	-
12	6,3	6,3	6,3	10	10	16	16	25	25	40	40	40	63	63	100	100
15	6,3	6,3	6,3	10	10	16	16	25	25	25	40	40	40	63	63	100
17,5	6,3	6,3	6,3	6,3	6,3	10	16	16	25	25	25	40	40	63	63	63
20	6,3	6,3	6,3	6,3	6,3	10	16	16	16	25	25	40	40	40	63	63
24	6,3	6,3	6,3	6,3	6,3	6,3	10	16	16	16	25	25	40	40	40	63

PREPARATION AND FIXING PROCEDURE

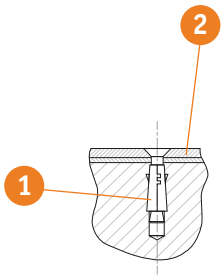
The switchboard can be fixed directly to the floor or to special base irons embedded in the floor (provided against payment of an extra charge). Before installing the switchboard, special wireways are to be prearranged to allow cable passing below each unit.

Lacking any wireways or floating floor, the base -available among the accessories- has to be purchased.

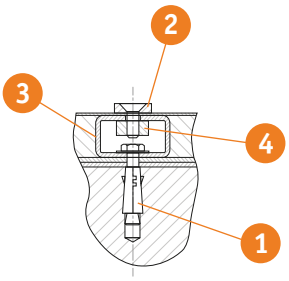
In all cases, the fixing surface shall be well levelled.

The tentative outline of the foundations (according to the dimensions of the compartment) is reported in the pictures below together with the fixing details.

Installation without base irons

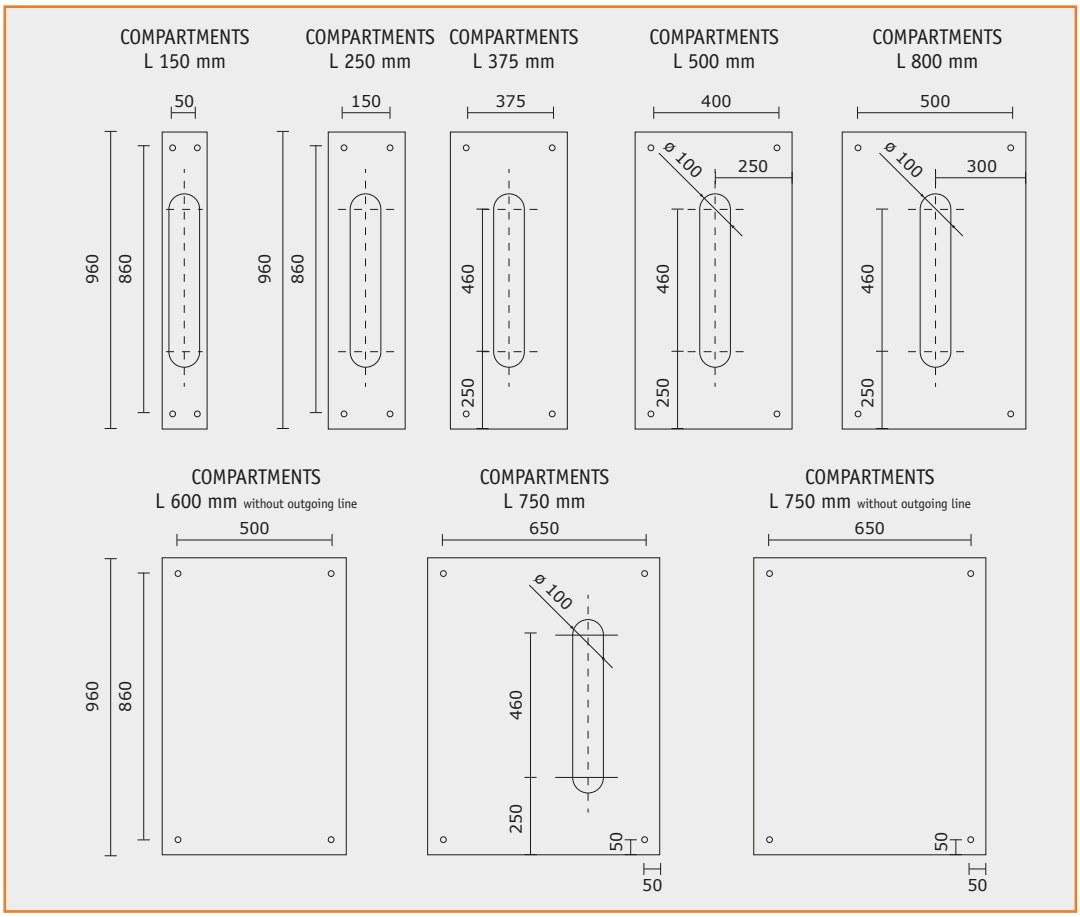


Installation with base irons (optional)

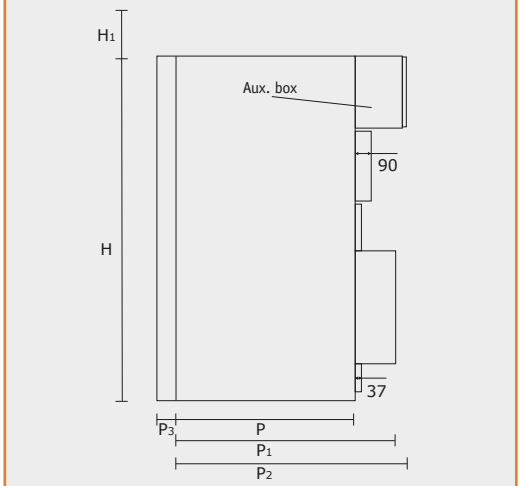


Key to symbols

1) Expansion screw
2) Plate
3) Base iron
4) Fixing block



OVERALL DIMENSIONS

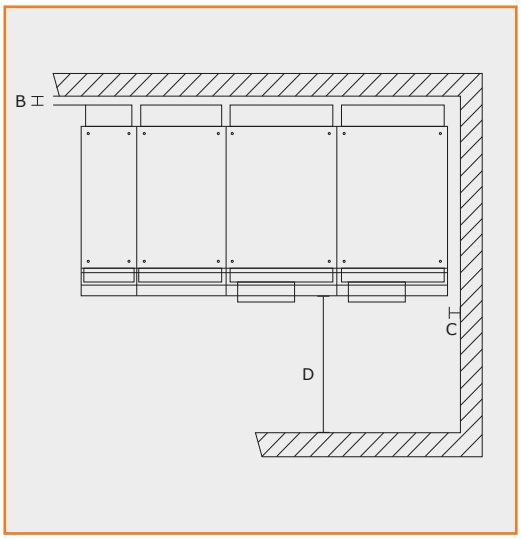


	H	P	P1	P2	P3
Compartments with circuit breaker	1850	960	1120	1260*	+90
Compartments with SLT6/IMS6	1850	960	1050	1260*	+90

* with 300 mm deep box
(Dimensions expressed in mm)

INSTALLATION ROOM

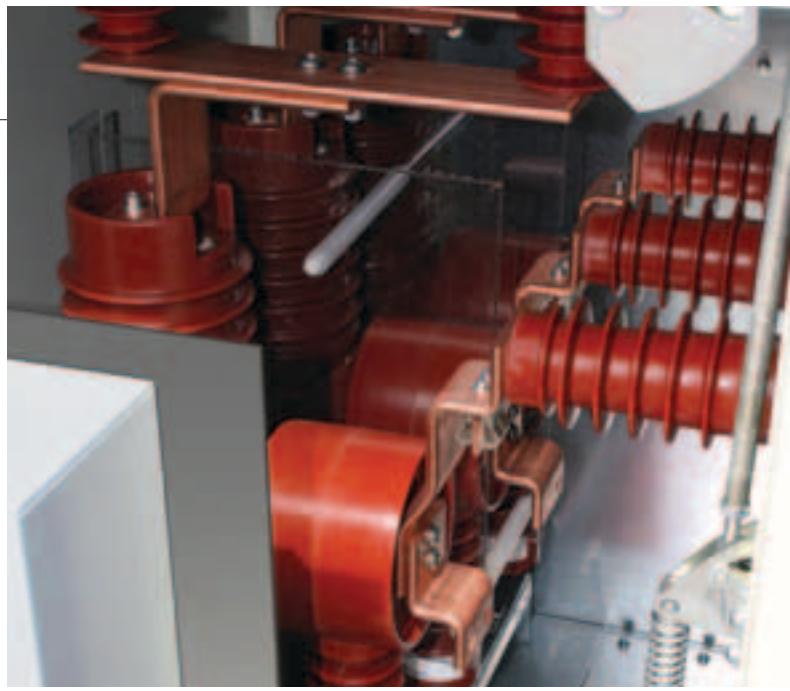
The installation room shall be prearranged according to switchboard size and version.
The compliance with the height values indicated will guarantee equipment correct operation
Should the conditions of installation differ from what reported, please contact us.



Version	B	C	D
Compartments with circuit breaker	≥50	≥50	≥1000*
Compartments with SLT6/IMS6	≥50	≥50	≥1000*

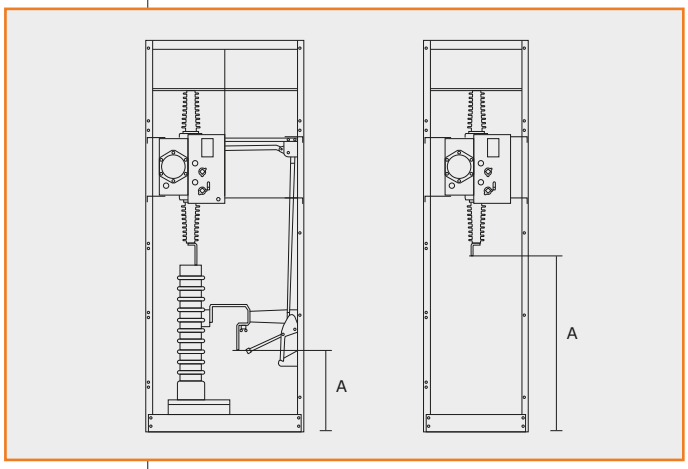
* 1200 with circuit breaker
Room dimensions shall be such to allow the access of one person in order to assemble main busbars.
(Dimensions are expressed in mm).

For the version with internal arc protection the minimum height value to be complied with is 600 mm (H1) from compartment roof to room roof, according to what set out by the IEC 62271-200 standard.



MEDIUM VOLTAGE CABLE CONNECTION

MINIFLUOR compartments are prearranged for the connection of a single-pole cable per medium voltage phase with elastomeric extruded solid insulation (G7 type cables).
For the certification, traditional medium voltage eyelet terminal connections are to be provided.
Height of the connection point from the floor:



Model	A	Model	A
AX	800	**A**	500
APX	800	**AP**	850
		APM and APMF	850*
			415**
		APB	500
		APBR	500
PTX	300	**PT**	400
ARX	1600	**AR**	1200
CC	1700	**RW**	1650

(Dimensions expressed in mm)

* without air-insulated ST
** with air-insulated ST

We recommend connecting the terminals after positioning the compartments.
In case of already existing connections, or connections made before switchboard installation, please contact IMESA technicians to confirm the data reported above.

WHAT IS REPORTED ABOVE SHALL NOT BE CONSIDERED BINDING FOR IMESA S.p.A.

IMS6P and IMS6PM

The "FLUORSWITCH" range is completed by the outdoor poletop switch-disconnectors with the following electrical characteristics:

Maximum isolation voltage	kV	24
Value of nominal isolation/withstand voltage:		
• lightning impulse to earth and between phases	kV	125
• impulse between IMS open contacts	kV	145
• at industrial frequency to earth and between phases	kV	50
• at industrial frequency between IMS open contacts	kV	60
Rated frequency	Hz	50
Rated continuous service current	A	400
Rated short-time current allowed (1s)	KA	12,5
Peak value of the short-time current allowed	KA	31,5
Outdoor protection rating	IP	54
Rated breaking currents:		
• mainly active circuit	A	400
• no-load transformer	A	6,3
• no-load line	A	10
• no-load cables	A	16
Rated making current on circuit	KA	31,5
Number of short circuit current makings		5

Versions

- Outdoor poletop switch-disconnector with IMS6/P manual operating mechanism.
- Outdoor poletop switch-disconnector with IMS6/PM manual and motor-operated (electric remote) operating mechanism with 24 Vdc power supply from a VT on the roof.

Both versions include:

- equipment support frame
- support frame of the transmissions with rocker arm for manual equipment opening and closing.
- IMS6/P and IMS6/PM poletop switch-disconnectors have the certificate of compliance with the ENEL DY806 standard.

Standard operating conditions

Ambient temperature range allowed:

- temperature below 40°C with average value over 24h not exceeding 35°C.
- minimum temperature for outdoor installation -25°C.

SPECIAL VERSIONS

Smart switchboards

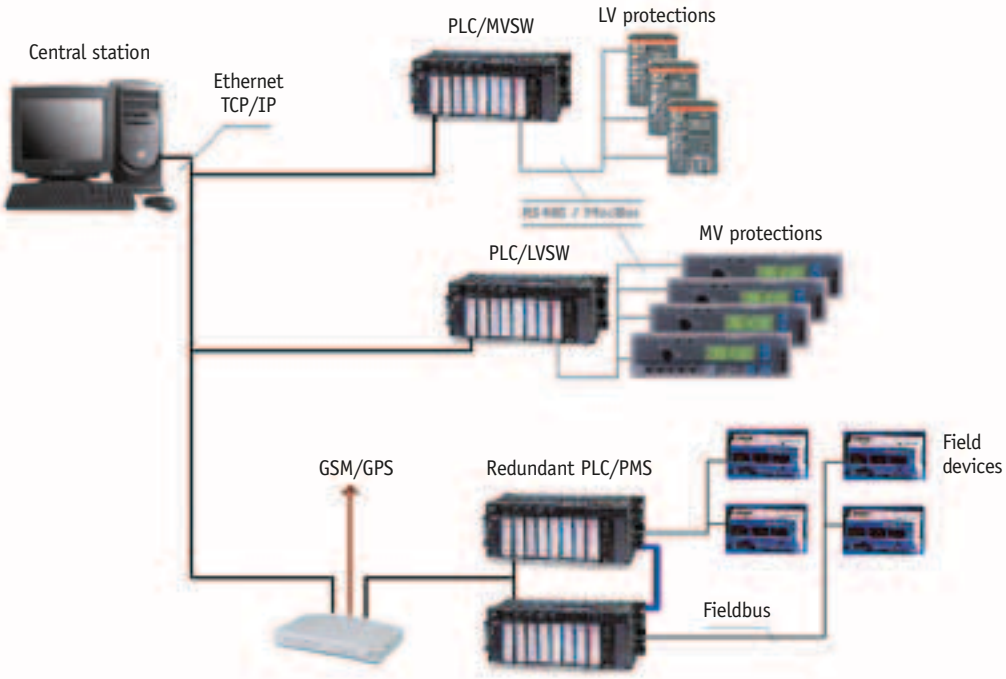
IMESA can equip its switchboards with a monitoring and control system.
This system, whose software is completely created by IMESA, allows to:

- monitor switchboards and systems,
- easily carry out the routine and extraordinary maintenance
- optimise data storage thanks to the connection with business software systems.

System architecture is decided according to the specifications as well as to customer needs, considering the possibility to use the following devices:

- field electronic devices
- interface devices for data grouping and for possible exchange with multiple communication protocols
- computerised supervisory devices SCADA for civil, military or industrial use with the most varied software packages available on the market, or through the control boards.

Together with the monitoring and control systems, we also provide our customers with the assistance required for system setup and for training the operating staff, besides the after sale assistance.



Fixed and movable outdoor switchboards
IMESA can provide outdoor cabinets, even movable on sleds, containing medium and low voltage switchboards, power transformers and various types of technological systems.

CERTIFICATIONS

The compartments for secondary power distribution of the MINIFLUOR range and the FLUORSWITCH range have been granted the certificates of compliance for type tests carried out at independent certification bodies holding the relevant authorisations such as ACAE, CESI, etc. in compliance with the 62271-200 standard.
The MINIFLUOR series is completed with special versions approved by ENEL (DY803 and DY800), ACEA, A2A Milan.

Type tests

- rated short-time and peak current capacity test
- capacity test in the presence of an electric internal arc
- temperature-rise measurement
- partial discharge measurement
- testing at industrial frequency
- testing at industrial frequency
- lightning impulse withstand dielectric tests
- protection rating testing
- mechanical endurance and operating tests on the earthing switch
- short-circuit making tests

Routine tests

Before their delivery to customers, all MINIFLUOR switchboards undergo the following routine tests, for which the relevant test certificate is issued by IMESA:

- visual inspection
- check of the mechanical operation sequence
- check of the electrical operation sequence
- wiring check
- insulation test and resistance measurement for both protection and main circuits
- operating tests
- paint adhesion and thickness tests
- mechanical durability tests

IMESA®
ELECTRICAL ENGINEERING

HOW TO GET HERE:

By car: from the A14 motorway, "Ancona Nord" exit, take the S.S. 76 clearway to Jesi, exit "Jesi est", and follow the road signs for "Zona Industriale ZIPA-Jesi". Our offices are approximately at 1km from the clearway exit.
GPS coordinates: 43° 31' 8" North,13° 14' 4" East.

By train: the Jesi train station is 2 km far from our offices.

By plain: the Ancona-Falconara airport is 12 km far from our offices.

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