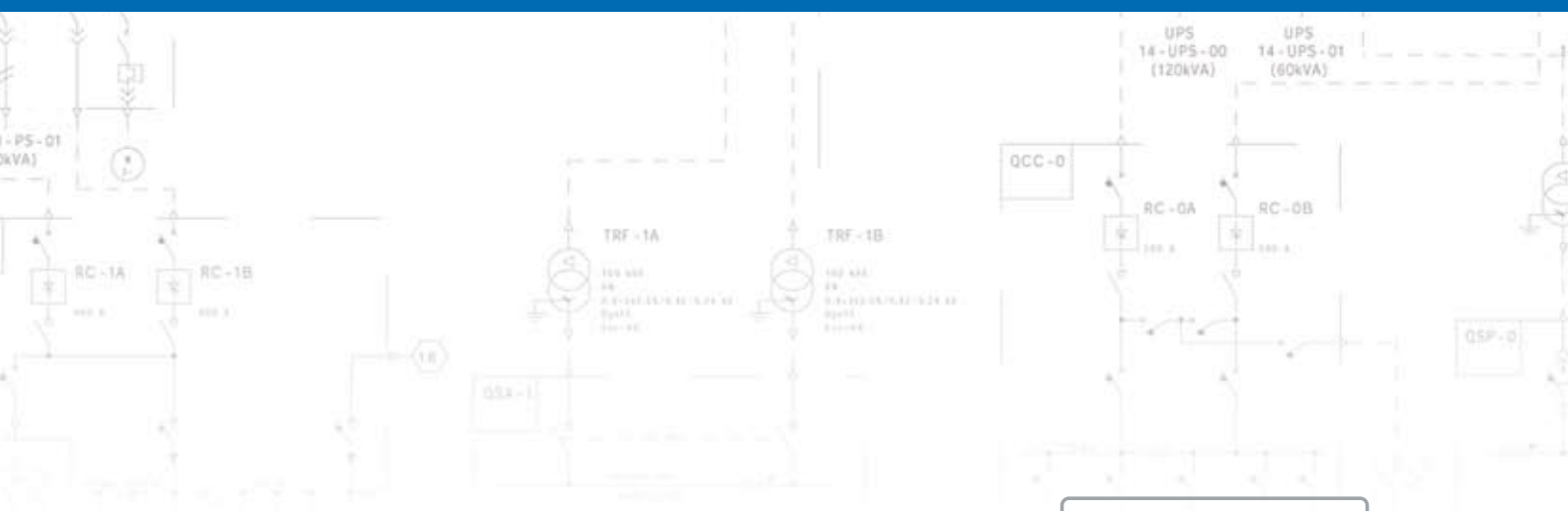
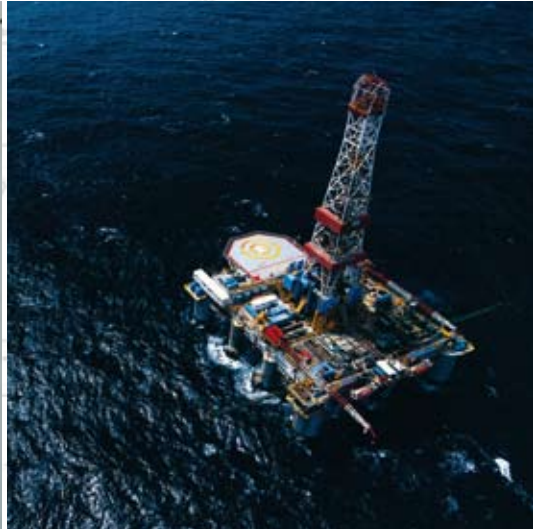
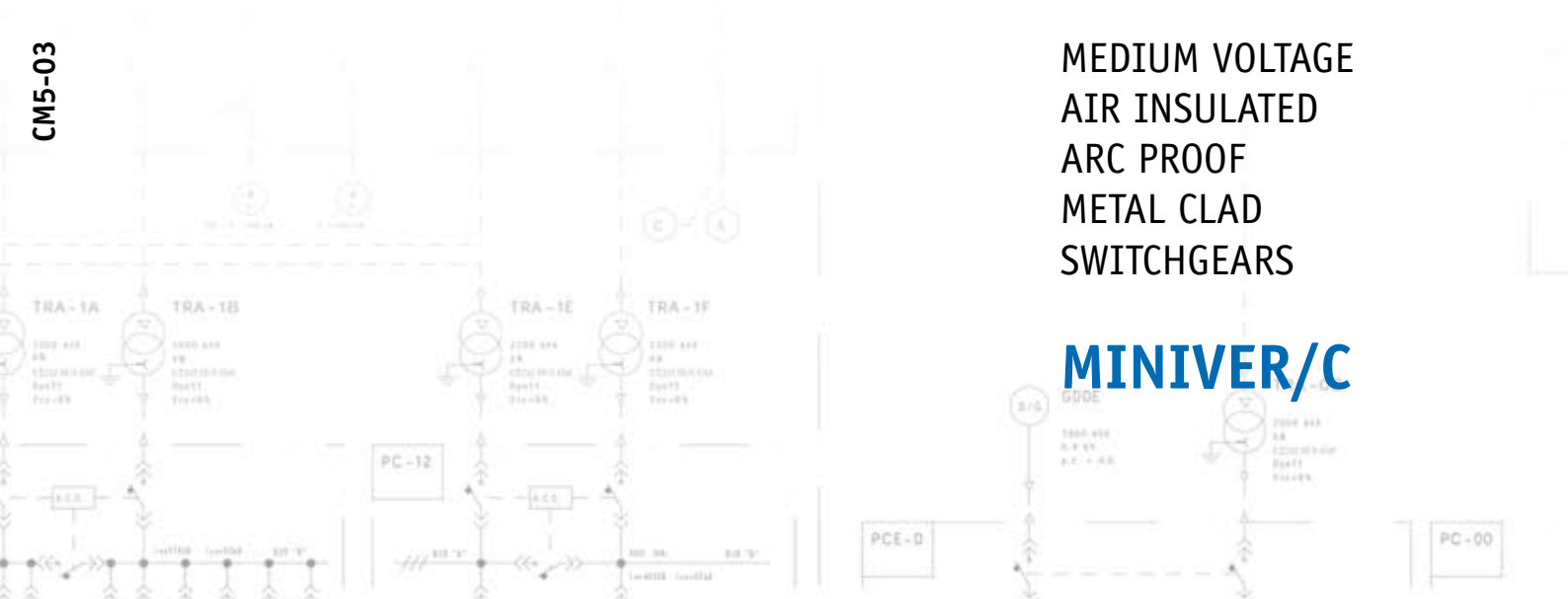


CM5-03

MEDIUM VOLTAGE
AIR INSULATED
ARC PROOF
METAL CLAD
SWITCHGEARS

MINIVER/C





MINIVER/C series is a set of prefabricated units, for internal use, in modular composition. These metal clad units have a metallic structure in LSC2B-PM class, air insulated and ready to be equipped with interrupting devices, SF6 or vacuum insulated in withdrawable execution.

Principal features of the MINIVER/C:

- Wide range of functional units
- Modular structure
- Internal arc version (if requested)
- Equipped with mechanical and electrical interlocks for maximum safety
- Compactness and optimization of the spaces
- Version with double outgoing in one cubicle available
- Easy installation and maintenance operation
- Certifications on type tests and acceptance tests available

With its features the MINIVER/C range is ideal for offering solutions designed for being adapted to every type of applications, maintaining the continuity of service and safety for operators.



The flexibility of Medium Voltage switchgears make them suitable for several installations in important electrical plants as:

- Industry (Cement, Petrochemical, Metallurgy, Paper)
- Utilities and Distribution (Power plants, Substations, Cogeneration, New technology Energy)
- Marine (Passenger ships, Military ships, Special ships, Off Shore)
- Transport (Railways, Underground transport, Airports)



DESCRIPTION

The pluriannual experience of Imesa has concentrated in MINIVER/C all the features that make it suitable for the primary distribution of Energy.

The switchgear, being the most important element in the energy distribution system, has to be able to satisfy the actual and future requirements of the producers, distributors and users of electric power.

MINIVER/C is a metal clad air insulated switchboard, suitable for internal use, composed by modular units, well identifiable and easy to assembly; these units, separated by metallic segregations, can be equipped with interrupting devices as gas or vacuum

circuit breakers, contactors, disconnectors or earthing trolleys. These devices are absolutely interchangeable inside the same unit.

Optionally a wall-mounted execution can be requested for MINIVER/C; in this version all the service and maintenance operations need to be done from the front.

In all its versions the MINIVER/C switchgear is designed in an execution that makes equipment operation possible (interrupting or earthing devices) directly from the front with closed door.

The MINIVER/C switchgear can be supplied in double level execution, ideal solution in case of limited available spaces.



RULES

The MINIVER/C range is compliant with the following international Rules:

- IEC 60694 - general rule for high voltage devices
- IEC 62271-200 - AC metal-enclosed switchgear and controlgear for rated voltage above 1KV and up to and including 52KV



DESCRIPTION

SERVICE CONDITIONS

- Ambient temperature
 - between -5°C and + 40°C
- Altitude
 - Equal or less than 1000m
 - For higher values, contact Imesa
- Ambient
 - Presence of normal, non corrosive atmosphere, absence of inflammable powders or gases
- Humidity
 - Average value of the relative humidity, in 24 hours, less or equal to 95%

PARTICULAR CONDITIONS

The MINIVER/C range is able to operate also in particular conditions:

- Marine application
- Presence of vibrations
- Presence of high temperatures
- Applications in seismic zones

STORAGE CONDITIONS

In order to preserve the functional units, in case of extended storage, we recommend to maintain them in their original packing, in dry ambient, protected from the rain or the sunlight, at a temperature between -5°C and +45°C.

PROTECTION DEGREE

The protection degree of the electrical switchboards is referred to IEC 60694 rules. The MINIVER/C range is manufactured with this standard IP protection degree:

- IP3X - External envelope
- IP2X - Internal part of the units

On request the external protection degree can reach IP43.



SAFETY EQUIPMENT

The strongest points of the MINIVER/C are the following:

- Self standing structure with appropriate dimensions
- In standard execution, presence of mechanical interlocks, able to grant the correct sequence of operations
- Possibility to foresee further interlocks in order to satisfy, in total safety conditions, the service activities and maintenance of the plant
- Possibility to foresee padlocks on the devices and the units
- Availability of electrical interlocks and specific sensors

PAINTING

The painting is realized with epoxy powders, with a polymerization procedure at 180°C, subject to processes like washing, degreasing, phosphation, passivation and treatments with water without salts.

The standard colour for metallic structures and doors is RAL 7030.

The minimal thickness of the painting is 70 micron.

SAFETY AGAINST FIRE

The use of insulating materials with high self-extinguish properties and the presence of metallic segregation between the different units prevents the propagation of fire.



PROTECTION AGAINST INTERNAL ARC

Internal arc test, performed in international accredited laboratories, shows that the metallic structure of the MINIVER/C switchboard is able to protect the personnel operating near it, also if a fault occurs.

The MINIVER/C switchboard was designed and manufactured in order to resist at the extreme pressures caused by an eventual internal arc and it is equipped with internal ducts for gas



evacuation.

Each functional unit is provided with a flap that, opening with the pressure due to the fault, permits the exit of hot gases and other particles in a gas duct, in order to avoid damages to the operators and devices.

The internal arc version of the switchgear, in compliance with IEC 62271-200 Rules, has to satisfy the following criteria, when an arc occurs:

Criterion 1

The doors and the units of the switchboard, duly locked, have not to open

Criterion 2

Particles of metallic envelope, or other little parcels, have not to detach from the main structure, being dangerous for the personnel

Criterion 3

The arc cannot cause holes in the part accessible by the operators

Criterion 4

The textile indicators, located around the switchboard at a distance of 10cm (B class) and 30cm (A class), have not to burn due to the hot gases

Criterion 5

The envelope has to remain connected to the point of earthing

The above mentioned Rules describe the internal arc switchboards with the following classes:

- "A" accessible only from authorized persons
- "B" unlimited accessibility, also from non-specialized people
- "F" frontal side only
- "L" lateral sides only
- "R" rear side only



PROTECTION AGAINST THE INTERNAL ARC

Imesa suggests the solution with the gas evacuation duct located on the top of the switchboard, running along all the length, in order to evacuate gases and parcels outside the switchboard room.

With this solution the dimensions can be the following:

- Maximum depth: 1939mm*
- Maximum height, gas duct included: 2650mm*

In case of particular installations, that is when the conditions do not permit a gas evacuation outside the room, special filters are used. In this case the evacuation of gases occurs above the switchboard.

With this solution the dimensions can be the following:

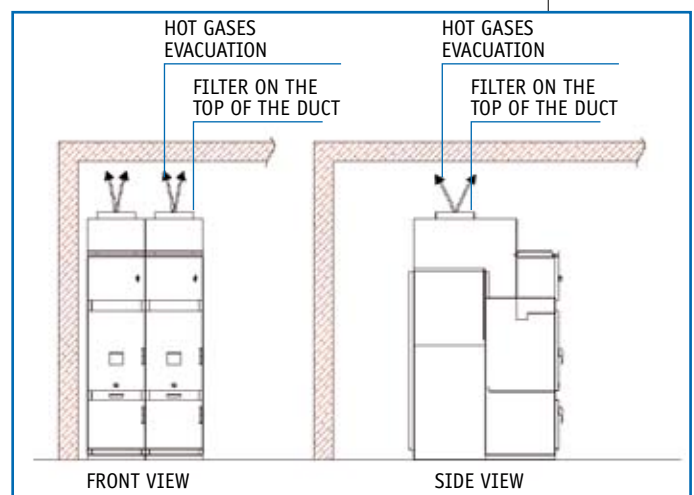
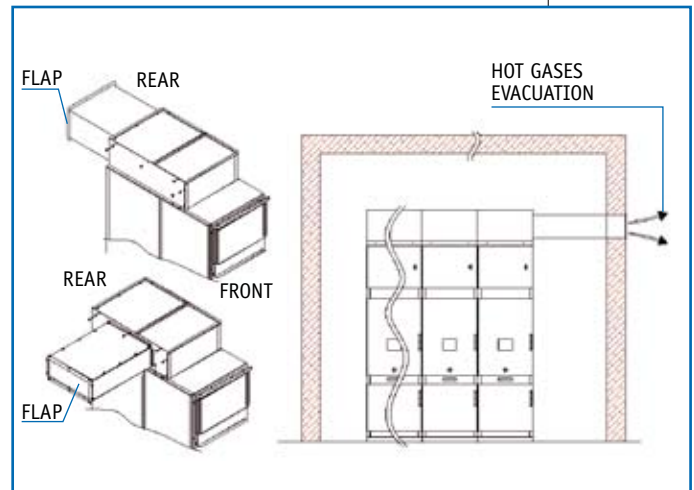
- Maximum depth: 1939mm*
- Maximum height, gas duct included: 2650mm*

* For further reduction in dimensions, contact Imesa

Arc detectors

On request, MINIVER/C switchboard can be equipped with several sensors located in particular zones of the functional units of the switchboard; these devices can immediately detect a fault and send a command for the opening of the interrupting devices. These sensors use the pressure or the light created by the fault with an activation time between 3ms and 20ms, depending on the type used.

The efficacy of these devices lies in the detection and deletion of the damage caused by a fault in a time period lower than 100ms.





ELECTRICAL AND MECHANICAL FEATURES

Electrical Features				
Rated Voltage	kV	7,2	12	17,5
Rated insulation voltage	kV	7,2	12	17,5
Rated power frequency withstand voltage	kV (1 min)	20	28	38
Rated lightning impulse withstand voltage	kV	60	75	95
Rated frequency	Hz	50-60	50-60	50-60
Rated short time withstand current up to	kA (1s)	50	50	50
	kA (3s)	40	40	-
Peak current	kA	125	125	125
Internal arc withstand current	kA (1s)	50	50	40
Main busbar rated current	A	4000	4000	4000
Branch connection rated current	A	630	630	630
		1250	1250	1250
		1600	1600	1600
		2000	2000	2000
		2500	2500	2500
		3150	3150	3150
Branch connection rated current with forced ventilation	A	3600	3600	3600
		4000	4000	4000



ELECTRICAL AND MECHANICAL FEATURES

Mechanical features

Every unit consists of these compartments:

- A** Low voltage compartment
- B** Circuit breaker compartment

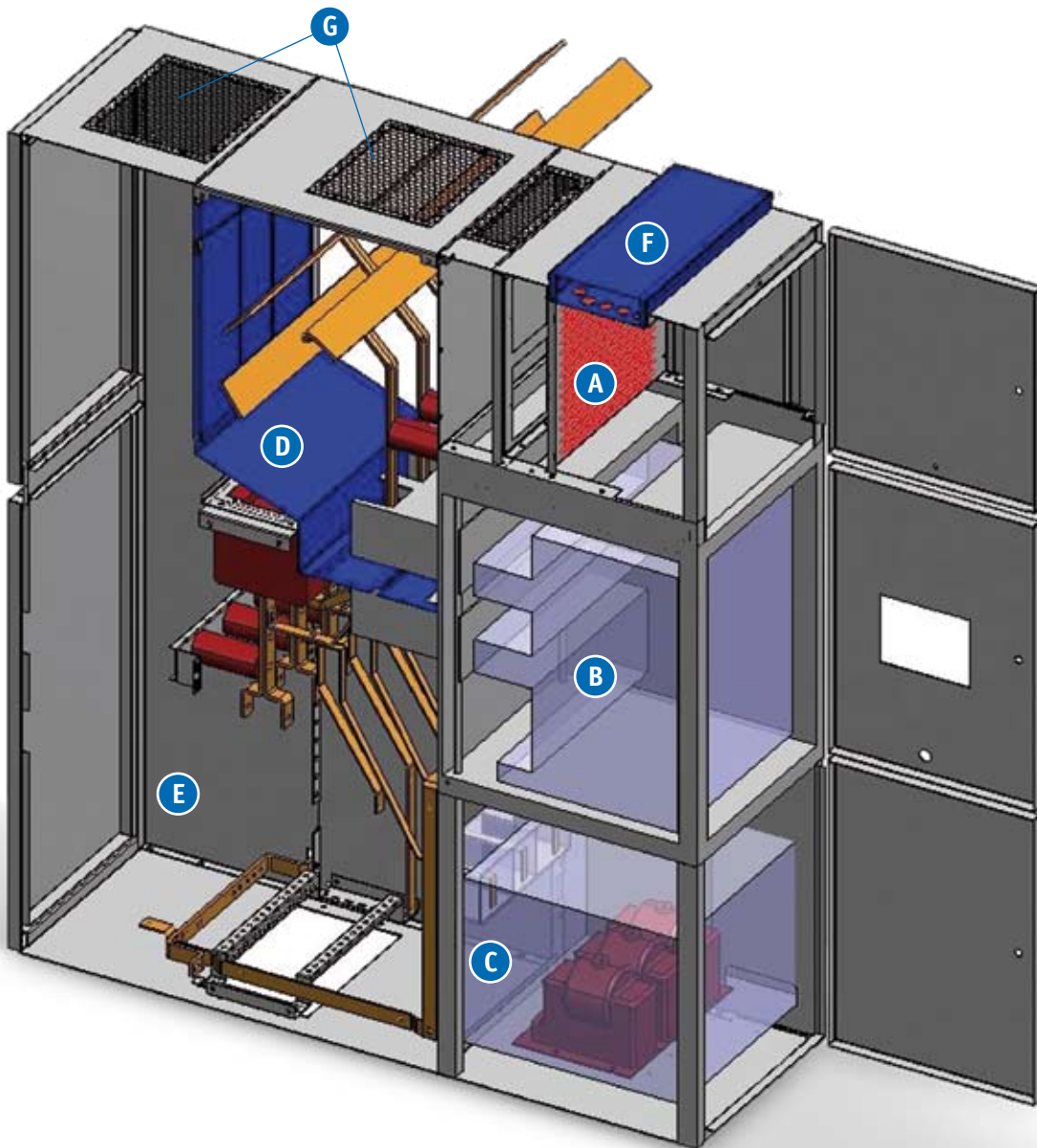
C VT compartment

D Busbar compartment

E Line compartment

F Interconnection duct

G Loopholes for gas evacuation





ELECTRICAL AND MECHANICAL FEATURES

A - Low voltage compartment

It is the place where the low voltage equipment is located.



B - Circuit breaker compartment

The interrupting device (gas/vacuum circuit breaker, contactor) is located in this compartment, together with the related trolley and the accessories for its operation.

This cell is equipped with:

- Fixed part of the interrupting device which, with its monoblock and insulators, creates the physical connection with the line unit

and the busbar unit

- Metallic obturators automatically operated by the movement of the trolley of the circuit breaker

- Transit of auxiliary cables

The interrupting device inside its cubicle can be set as:

- Connected: main circuit and auxiliary circuits in operation
- Test: main circuit not in operation, auxiliary circuits connected (sectioned in test) or with the auxiliary circuits not connected (sectioned not in test)
- Disconnected: main and auxiliary circuits not in operation



C - VT compartment

VT compartment can locate up to three VTs in fixed or withdrawable execution.

This compartment can be located:

- Inside the circuit breaker compartment
- Under the circuit breaker compartment
- Inside a bus rise unit (which can contain up to two VT cells)

This compartment can constitute the access to the rear part of the switchboard (to compartment E)



D - Busbar compartment

This compartment contains the busbar system, connected directly to the fixed contacts of the interrupting device envelopes. This area is protected by removable panels, in order to permit the maintenance and the direct access to the busbar system.

The main busbars are manufactured in electrolytic copper. On request it is possible to have the following versions:

- Bars with insulating material (resin or heat shrinkable sheath)
- Silvered bars

The busbar area is extended along the length of the entire switchboard, but also separated with segregations for each unit.



E - Line compartment

Located in the rear part of the switchboard, accessible from the rear or only from the front (in case of wall standing version).

The compartment can contain:

- Earthing switch
- Current transformers and toroidal transformers
- Cable terminations
- Capacitive insulators for the voltage indicators
- Anticondensation heater
- Voltage dischargers
- Voltage transformers

This compartment contains the derivations for the connection of power cables to the fixed contacts of the interrupting devices. At the bottom of the units there are some slots for the transit of power cables.

Inspection windows are present in rear door. The door of this compartment can be equipped with a window for thermographic view.



F - Interconnection duct

On request, over the roof of each unit, an interconnection duct can be installed in order to permit the transit of auxiliary cables between the different cubicles.

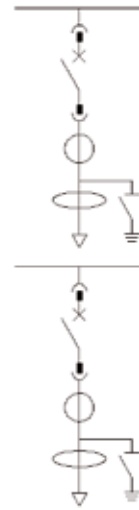
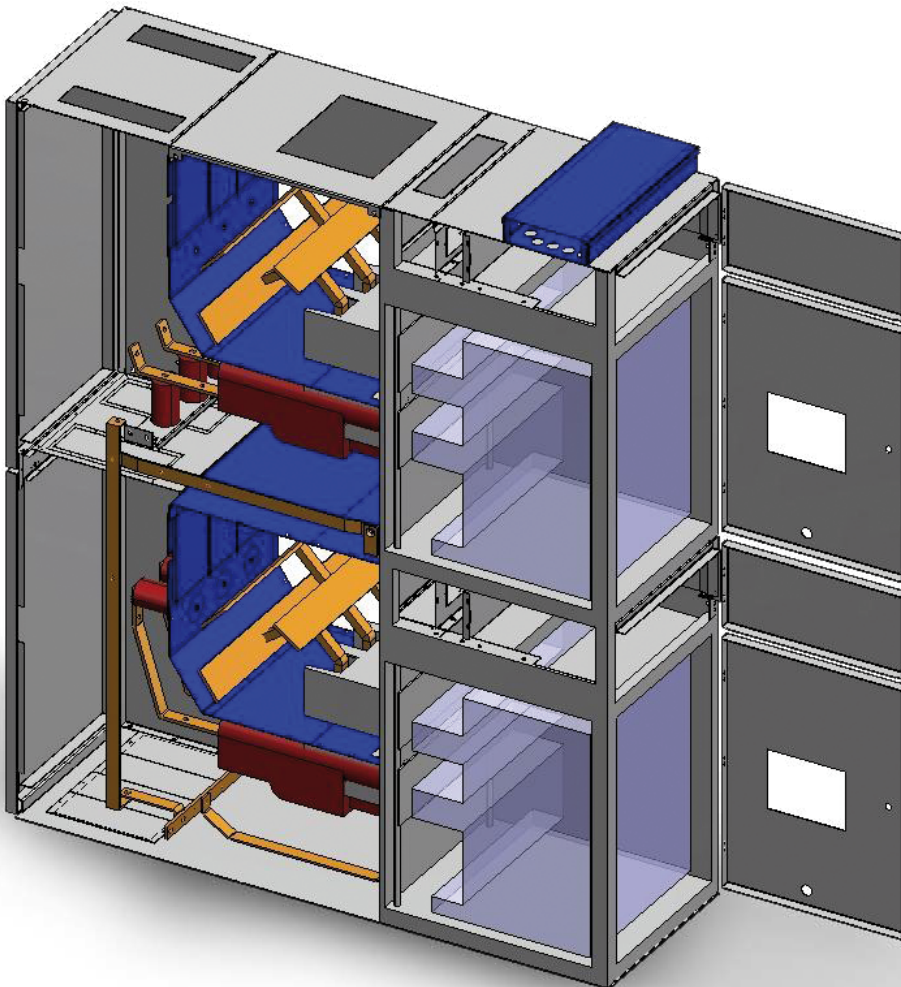




DOUBLE LEVEL APPLICATION

It is possible to couple standard units with double level units, maintaining the extensibility of the switchboard in both directions.

MINIVER/C2 DUPLEX



Switchboard Type	Rated Voltage (KV)	Rated Current (A)	Short time current (KA)	Dimensions		
				H (mm)	L (mm)	W (mm)
MINIVER/C2 DUPLEX	7,2÷17	630÷1250	25÷31,5	2400	same dimensions of MINIVER/C	
	7,2÷17	630÷2000	40÷50	2550		



CERTIFICATIONS



In order to confirm the electrical and mechanical features above declared, the MINIVER/C switchboard was subject to the following type tests, according to **IEC 62271-200** Rule.

Type tests

- Short time and peak withstand current test
- Internal arc test
- Temperature rise test up to 4000A
- Power frequency test
- Dielectric test
- Protection degree test
- Mechanical life test on the earthing switch

Special tests for shock and vibrations

Tests required by Shipping Registers

The MINIVER/C switchboard was subject to trials required by the most famous Shipping Registers: ABS, BV, DNV, LR, MMI and Rina.

Routine Tests

Before the delivery every unit of the MINIVER/C series is subject to the following routine tests, for which Imesa releases the relevant test report:

- Visual inspection
- Verification of the sequence of mechanical operations
- Verification of the sequence of electrical operations
- Verification of the wirings
- Insulation test and measurement of the resistance of main and protection circuits
- Functioning test





Switchboards for shock and vibration environment

A special version of the MINIVER/C switchboard was tested at official laboratories with the following trials:

- Shock test (according to NAV-30-A001) with:
 - Vertical shock
 - Horizontal shock
 - Shock in 3 directions, vertical, transversal and longitudinal
- Sinusoidal vibrations at increasing and decreasing frequency (according to RINA-IEC 68-2-6 1982) with:
 - Frequency range : $2 \div 100$ Hz
 - Movement amplitude between 2 and 13, 2Hz, 1mm
 - Acceleration in frequency range $13,3 \div 100$ Hz, 0,7g

Intelligent switchboards

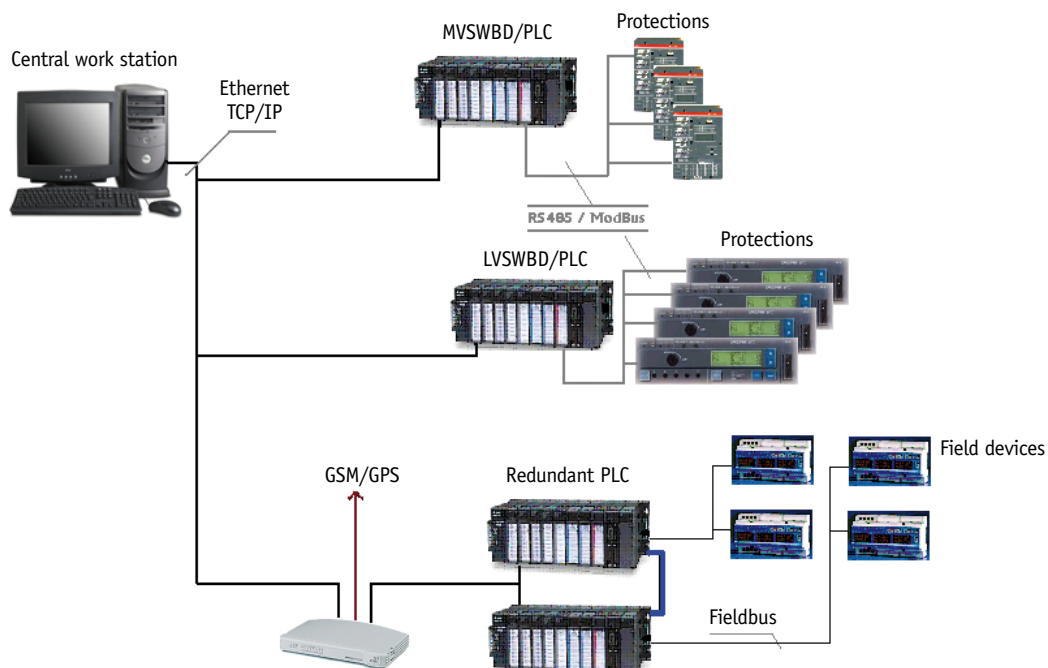
IMESA is able to supply its electrical switchboards together with supervision and control systems. Such systems, whose software is entirely realised at IMESA, allow:

- the monitoring of the switchboards and of the entire plant
- an easier ordinary and extraordinary maintenance
- the improvement of the data filing with connections to management software systems

The configuration of the systems is designed according to our customers' specifications and special requests; for such aim the following devices may be used:

- electronic devices in operation zones;
- interface devices which permit concentration of data and possible exchanges with several communication protocols;
- supervision devices designed on PC (SCADA) for civil, military and industrial plants, with the state of the art software available in the market or with operator panels.

Together with the supervision and control systems, IMESA provides to its customers all the necessary assistance for the commissioning of the system as well as the staff training, in addition to the after-sales assistance.



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