



**Technical Specification code:** GRI-GRI-MAT-E&C-0004

Version no. 3 dated 04/10/2022

**Subject:** GSCM005 Modular Medium Voltage Switchgears

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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THE HEAD OF NETWORK COMPONENTS

**Fabrizio Gasbarri**



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## 1 DOCUMENT AIMS AND APPLICATION AREA

The purpose of this document is to provide the technical requirements for the supply of hybrid - *gas (SF6 FREE) and air insulated* - modular units to be used in secondary substations of Enel's Group Distribution Companies, listed below:

Country	Distribution Company
Italy	e-distribuzione
Romania	Enel Distributie Banat Enel Distributie Dobrogea Enel Distributie Muntenia

*This document shall be implemented and applied to the extent possible within the Enel Grids Business Line and in compliance with any applicable laws, regulations and governance rules, including any stock exchange and unbundling-relevant provisions, which in any case prevail over the provisions contained in this document.*

### 1.1 Related documents to be implemented at country level

This document does not require implementation of further documents. Anyway, each Enel Grids Company can issue, under the supervision of Enel Grids Global Network Components detailed documents, according to the provisions of the present document and in case of specific needs.

## 2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
1	01/07/2021	First issue of "Global Infrastructure and Networks – GSCM005 modular MV switchboards technical specification.
2	03/08/2022	Only SF6 Free solutions are considered
3	04/10/2022	Busbar VDS constructive prescription indicated for CBL functional unit.
3	04/01/2023	Errata corrige for GSCM005 rev.3

## 3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:



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- Enel Grids: Engineering and Construction /Components and Devices Design/ Network Components/ MV and LV Equipment unit.

Responsible for authorizing the document:

- Enel Grids: Head of Network Components unit
- Enel Grids: Head Quality unit.

#### 4 REFERENCES

- Code of Ethics of Enel Group;
- Enel Human Right Policy;
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
- Organization and management model as per Legislative Decree No. 231/2001;
- Enel Global Compliance Program (EGCP);
- Integrated Policy for Quality, Health and Safety, Environment, anti-Bribery and Information security;
- ISO 9001:2015 - Quality Management System – Requirements;
- ISO 14001:2015 - Environmental Management System - Requirements with guidance for use;
- ISO 45001:2018 - Occupational Health and Safety Management System - Requirements with guidance for use;
- ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use;
- ISO 27001:2017 - Information Security Management System – Requirements.

##### 4.1 International technical references related to the product herein described

The listed reference documents shall be intended in the in-force edition at the TCA date (amendments and *errata corrigé* included). Unless otherwise specified, these documents are valid until the new editions replace them. The terms used in this document are according to the standards listed below.

- IEC 62271-1 High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear.
- IEC 62271-102 High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches.


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- IEC 62271-103 High-voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV.
- IEC 62271-105 High-voltage switchgear and controlgear - Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV.
- IEC 62271-200 High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.
- IEC TS 62271-210 High-voltage switchgear and controlgear - Part 210: Seismic qualification for metal enclosed and solid-insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV.
- IEC 61243-5 Live working - Voltage detectors - Part 5: Voltage detecting systems (VDS).
- IEC 60282-1 High-voltage fuses - Part 1: Current-limiting fuses.
- IEC 60447 Basic and safety principles for man-machine interface, marking and identification - Actuating principles.
- IEC 60529 Degrees of protection provided by enclosures (IP Code).
- IEC 60068-2-52 Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution).
- ISO 12944 Paints and varnishes — Corrosion protection of steel structures by protective paint systems.
- ISO 2409 Paints and varnishes — Cross-cut test.
- IEC 60137 Insulated bushings for alternating voltages above 1000 V
- EN 50181 Plug-in type bushings above 1 kV up to 52 kV and from 250 A to 2,50 kA for equipment other than liquid filled transformers
- ISO 4042 Fasteners - Electroplated coatings

**4.2 Enel Standards**

- GSCC006 12/20(24) kV and 18/30(36) kV Separable connectors for MV cables.
- GSCT005 Technical characteristics of LPITs for RGDM/RGDAT.
- GSC001 Underground Medium voltage cables
- CNS-O&M-S&L-2021-0032-EGIN Global Infrastructure and Networks Barcode specification



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## 5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Networks Management

Macro Process: Materials management

Process: Network components standardization

## 6 DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
<b>Circuit-Breaker</b>	Mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified duration and breaking currents under specified abnormal circuit conditions such as those of short circuit
<b>Low Voltage (LV)</b>	Any set of nominal voltage levels exceeding 50 V and up to 1 kV a.c. or 1,5 kV d.c.
<b>Medium Voltage (MV)</b>	System with a nominal operative voltage between the phases higher than 1 kV to 35 kV included. NOTE: The boundary value between medium voltage and high voltage depends on local and historical circumstances or on common usage. Nevertheless for internal standardization purposes, medium voltage is defined as a system with a nominal operative voltage between the phases higher than 1 kV to 35 kV included”
<b>Technical Conformity Assessment (TCA)</b>	A “conformity assessment” with respect to “specified requirements” consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued by Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications
<b>Type A documentation</b>	Not confidential documents used for product manufacturing and management from which it is possible to verify the product conformity to all technical specification requirements, directly or indirectly


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## 7 DESCRIPTION

### 7.1 List of Components

SWITCHGEAR TYPE	RATED VOLTAGE [kV]	WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]
CBL TYPE A	24	500	1050	1850
CBL TYPE B	24	500	1050	1950
CBL TYPE C	24	700	1050	1950
CABLE RISE UNIT RC	24	350	1050	1850
LINE UNIT SD	24	500		
TRANSFORMER PROTECTION	24	600		
UNIT WITH SELF-PROTECTED VOLTAGE TRANSFORMER AT (GSCT003)	24	350		
MEASUREMENT UNIT M UTMX	24	700		
MEASUREMENT UNIT M UMX	24	700	1150	1950

**Table 1 - List of components Italy and Romania**

The country codes below identify the units without accessories, such as UP connecting cable, FSL connector for RGDM and copper top connection bars.





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Type code	Configuration	GIS technology	Distribution Company and Country	Country Code	Rated frequency [Hz]	Rated normal current I <sub>n</sub> [A]	Rated Voltage U <sub>r</sub> [kV]	Dimension: Width [mm]	Dimension: Depth [mm]	Dimension: Height [mm]	Rated power-frequency withstand voltage U <sub>100</sub> [kV]	Rated lightning impulse withstand voltage U <sub>100</sub> [kV]	Rated short-time withstand current I <sub>k</sub> [kA]	Rated duration of short circuit t <sub>k</sub> [s]	Rated peak withstand current I <sub>p</sub> [kA]	Sequence of operations	Circuit Breaker	Rated supply voltage of closing and opening devices and of auxiliary circuit V <sub>cc</sub>	IK degree	IP degree	Circuit breaker unit number mechanical endurance class - Electrical endurance class	LD - Mechanical endurance class	ES - Mechanical endurance class - Electrical endurance class	Classification IAC	Arc fault current and duration I <sub>a</sub> [kA]; t <sub>a</sub> [s]	Protective Coatin	Command Type	Busbar Socket	Description
GSCM005/1	CBL TYPE A	SF6 free	ED-Italy	140199	50	630	24	500	1050	1850	50	125	16	1	40	O-0,3s-CO-15s-CO	S1	24V -15% +20%	IK08	IP3X	M2 - E2	M1	M1 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear CBL TYPE A SF6 free 24kV W:500 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H GSCM005/1
GSCM005/1	CBL TYPE A	SF6 free	ED-Romania	140199	50	630	24	500	1050	1850	50	125	16	1	40	O-0,3s-CO-15s-CO	S1	24V -15% +20%	IK08	IP3X	M2 - E2	M1	M1 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear CBL TYPE A SF6 free 24kV W:500 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H GSCM005/1
GSCM005/2	CBL TYPE B	SF6 free	ED-Italy	140200	50	630	24	500	1050	1950	50	125	16	1	40	O-0,3s-CO-15s-CO	S1	24V -15% +20%	IK08	IP3X	M2 - E2	M1	M1 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear CBL TYPE B SF6 free 24kV W:500 mm D:1050 mm H:1950 mm 16 kA IP3X AFL C3H GSCM005/2
GSCM005/2	CBL TYPE B	SF6 free	ED-Romania	140200	50	630	24	500	1050	1950	50	125	16	1	40	O-0,3s-CO-15s-CO	S1	24V -15% +20%	IK08	IP3X	M2 - E2	M1	M1 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear CBL TYPE B SF6 free 24kV W:500 mm D:1050 mm H:1950 mm 16 kA IP3X AFL C3H GSCM005/2
GSCM005/3	CBL TYPE C	SF6 free	ED-Italy	140201	50	630	24	700	1050	1950	50	125	16	1	40	O-0,3s-CO-15s-CO	S1	24V -15% +20%	IK08	IP3X	M2 - E2	M1	M1 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear CBL TYPE C SF6 free 24kV W:700 mm D:1050 mm H:1950 mm 16 kA IP3X AFL C3H GSCM005/3
GSCM005/3	CBL TYPE C	SF6 free	ED-Romania	140201	50	630	24	700	1050	1950	50	125	16	1	40	O-0,3s-CO-15s-CO	S1	24V -15% +20%	IK08	IP3X	M2 - E2	M1	M1 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear CBL TYPE C SF6 free 24kV W:700 mm D:1050 mm H:1950 mm 16 kA IP3X AFL C3H GSCM005/3

Type code	Configuration	GIS technology	Distribution Company and Country	Country Code	TV Ratio [kV/V]	TA Ratio [A/A]	Rated frequency [Hz]	Rated normal current I <sub>n</sub> [A]	Rated Voltage U <sub>r</sub> [kV]	Dimension: Width [mm]	Dimension: Depth [mm]	Dimension: Height [mm]	Rated power-frequency withstand voltage U <sub>100</sub> [kV]	Rated lightning impulse withstand voltage U <sub>100</sub> [kV]	Rated short-time withstand current I <sub>k</sub> [kA]	Rated duration of short circuit t <sub>k</sub> [s]	Rated peak withstand current I <sub>p</sub> [kA]	Rated supply voltage of closing and opening devices and of auxiliary circuit V <sub>cc</sub>	IK degree	IP degree	SD - Mechanical endurance class - Electrical endurance class	ES - Mechanical endurance class - Electrical endurance class	Classification IAC	Arc fault current and duration I <sub>a</sub> [kA]; t <sub>a</sub> [s]	Protective Coatin	Command Type	Busbar Socket	Description
GSCM005/18	1M UTMX	SF6 free	ED-Italy	140216	15/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:15/100kV/V CT:50/5kA/A GSCM005/18
GSCM005/19	1M UTMX	SF6 free	ED-Italy	140217	15/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:15/100kV/V CT:400/5kA/A GSCM005/19
GSCM005/20	1M UTMX	SF6 free	ED-Italy	140218	15/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:15/100kV/V CT:630/5kA/A GSCM005/20
GSCM005/21	1M UTMX	SF6 free	ED-Italy	140219	20/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:50/5kA/A GSCM005/21
GSCM005/21	1M UTMX	SF6 free	ED-Romania	140219	20/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:50/5kA/A GSCM005/21
GSCM005/22	1M UTMX	SF6 free	ED-Italy	140220	20/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:400/5kA/A GSCM005/22
GSCM005/22	1M UTMX	SF6 free	ED-Romania	140220	20/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:400/5kA/A GSCM005/22
GSCM005/23	1M UTMX	SF6 free	ED-Italy	140221	20/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:630/5kA/A GSCM005/23



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Type code	Configuration	GIS technology	Distribution Company and Country	Country Code	TV Ratio [kV/V]	TA Ratio [A/A]	Rated frequency [Hz]	Rated normal current I <sub>r</sub> [A]	Rated Voltage U <sub>r</sub> [kV]	Dimension: Width [mm]	Dimension: Depth [mm]	Dimension: Height [mm]	Rated power-frequency withstand voltage U <sub>d</sub> [kV]	Rated lightning impulse withstand voltage U <sub>p</sub> [kV]	Rated short-time withstand current I <sub>k</sub> [kA]	Rated duration of short circuit t <sub>k</sub> [s]	Rated peak withstand current I <sub>p</sub> [kA]	Rated supply voltage of closing and opening devices and of auxiliary circuit V <sub>cc</sub>	IK degree	IP degree	SD - Mechanical endurance class - Electrical endurance class	ES - Mechanical endurance class - Electrical endurance class	Classification IAC	Arc fault current and duration I <sub>a</sub> [kA], t <sub>a</sub> [s]	Protective Coatin	Command Type	Busbar Socket	Description
GSCM005/23	1M UTMX	SF6 free	ED-Romania	140221	20/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:630/5kA/A GSCM005/23
GSCM005/24	1M UMX	SF6 free	ED-Italy	140222	15/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:15/100kV/V CT:50/5kA/A GSCM005/24
GSCM005/25	1M UMX	SF6 free	ED-Italy	140223	15/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:15/100kV/V CT:400/5kA/A GSCM005/25
GSCM005/26	1M UMX	SF6 free	ED-Italy	140224	15/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:15/100kV/V CT:630/5kA/A GSCM005/26
GSCM005/27	1M UMX	SF6 free	ED-Italy	140225	20/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:50/5kA/A GSCM005/27
GSCM005/27	1M UMX	SF6 free	ED-Romania	140225	20/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:50/5kA/A GSCM005/27
GSCM005/28	1M UMX	SF6 free	ED-Italy	140226	20/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:400/5kA/A GSCM005/28
GSCM005/28	1M UMX	SF6 free	ED-Romania	140226	20/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:400/5kA/A GSCM005/28
GSCM005/29	1M UMX	SF6 free	ED-Italy	140227	20/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:630/5kA/A GSCM005/29
GSCM005/29	1M UMX	SF6 free	ED-Romania	140227	20/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:20/100kV/V CT:630/5kA/A GSCM005/29
GSCM005/30	1M UTMX	SF6 free	ED-Italy	140228	10/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:50/5kA/A GSCM005/30
GSCM005/30	1M UTMX	SF6 free	ED-Romania	140228	10/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:50/5kA/A GSCM005/30
GSCM005/31	1M UTMX	SF6 free	ED-Italy	140229	10/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:400/5kA/A GSCM005/31
GSCM005/31	1M UTMX	SF6 free	ED-Romania	140229	10/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:400/5kA/A GSCM005/31
GSCM005/32	1M UTMX	SF6 free	ED-Italy	140230	10/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:630/5kA/A GSCM005/32
GSCM005/32	1M UTMX	SF6 free	ED-Romania	140230	10/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:630/5kA/A GSCM005/32
GSCM005/33	1M UTMX	SF6 free	ED-Italy	140231	8,4/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:50/5kA/A GSCM005/33
GSCM005/33	1M UTMX	SF6 free	ED-Romania	140231	8,4/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:50/5kA/A GSCM005/33
GSCM005/34	1M UTMX	SF6 free	ED-Italy	140232	8,4/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:400/5kA/A GSCM005/34
GSCM005/34	1M UTMX	SF6 free	ED-Romania	140232	8,4/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:400/5kA/A GSCM005/34
GSCM005/35	1M UTMX	SF6 free	ED-Italy	140233	8,4/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:630/5kA/A GSCM005/35
GSCM005/35	1M UTMX	SF6 free	ED-Romania	140233	8,4/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:630/5kA/A GSCM005/35
GSCM005/36	1M UMX	SF6 free	ED-Italy	140234	10/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:50/5kA/A GSCM005/36



Technical Specification code: GRI-GRI-MAT-E&C-0004

Version no. 3 dated 04/10/2022

Subject: GSCM005 Modular Medium Voltage Switchgears

Application Areas

Perimeter: Global

Staff Function: -

Service Function: -

Business Line: Enel Grids

Type code	Configuration	GIS technology	Distribution Company and Country	Country Code	TV Ratio [kV/V]	TA Ratio [A/A]	Rated frequency [Hz]	Rated normal current I <sub>r</sub> [A]	Rated Voltage U <sub>r</sub> [kV]	Dimension: Width [mm]	Dimension: Depth [mm]	Dimension: Height [mm]	Rated power-frequency withstand voltage U <sub>d</sub> [kV]	Rated lightning impulse withstand voltage U <sub>p</sub> [kV]	Rated short-time withstand current I <sub>k</sub> [kA]	Rated duration of short circuit t <sub>k</sub> [s]	Rated peak withstand current I <sub>p</sub> [kA]	Rated supply voltage of closing and opening devices and of auxiliary circuit V <sub>cc</sub>	IK degree	IP degree	SD - Mechanical endurance class - Electrical endurance class	ES - Mechanical endurance class - Electrical endurance class	Classification IAC	Arc fault current and duration I <sub>a</sub> [kA], t <sub>a</sub> [s]	Protective Coatin	Command Type	Busbar Socket	Description
GSCM005/36	1M UMX	SF6 free	ED-Romania	140234	10/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:50/5kA/A GSCM005/36
GSCM005/37	1M UMX	SF6 free	ED-Italy	140235	10/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:400/5kA/A GSCM005/37
GSCM005/37	1M UMX	SF6 free	ED-Romania	140235	10/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:400/5kA/A GSCM005/37
GSCM005/38	1M UMX	SF6 free	ED-Italy	140236	10/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:630/5kA/A GSCM005/38
GSCM005/38	1M UMX	SF6 free	ED-Romania	140236	10/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:10/100kV/V CT:630/5kA/A GSCM005/38
GSCM005/39	1M UMX	SF6 free	ED-Italy	140237	8,4/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:50/5kA/A GSCM005/39
GSCM005/39	1M UMX	SF6 free	ED-Romania	140237	8,4/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:50/5kA/A GSCM005/39
GSCM005/40	1M UMX	SF6 free	ED-Italy	140238	8,4/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:400/5kA/A GSCM005/40
GSCM005/40	1M UMX	SF6 free	ED-Romania	140238	8,4/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:400/5kA/A GSCM005/40
GSCM005/41	1M UMX	SF6 free	ED-Italy	140239	8,4/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:630/5kA/A GSCM005/41
GSCM005/41	1M UMX	SF6 free	ED-Romania	140239	8,4/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:8,4/100kV/V CT:630/5kA/A GSCM005/41
GSCM005/42	1M UTMX	SF6 free	ED-Italy	140240	22/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:22/100kV/V CT:50/5kA/A GSCM005/42
GSCM005/43	1M UTMX	SF6 free	ED-Italy	140241	22/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:22/100kV/V CT:400/5kA/A GSCM005/43
GSCM005/44	1M UTMX	SF6 free	ED-Italy	140242	22/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:22/100kV/V CT:630/5kA/A GSCM005/44
GSCM005/45	1M UTMX	SF6 free	ED-Italy	140243	23/100	50/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:23/100kV/V CT:50/5kA/A GSCM005/45
GSCM005/46	1M UTMX	SF6 free	ED-Italy	140244	23/100	400/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:23/100kV/V CT:400/5kA/A GSCM005/46
GSCM005/47	1M UTMX	SF6 free	ED-Italy	140245	23/100	630/5	50	630	24	700	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H VT:23/100kV/V CT:630/5kA/A GSCM005/47
GSCM005/48	1M UTMX	SF6 free	ED-Italy	140246	22/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:22/100kV/V CT:50/5kA/A GSCM005/48
GSCM005/49	1M UTMX	SF6 free	ED-Italy	140247	22/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:22/100kV/V CT:400/5kA/A GSCM005/49
GSCM005/50	1M UTMX	SF6 free	ED-Italy	140248	22/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:22/100kV/V CT:630/5kA/A GSCM005/50
GSCM005/51	1M UTMX	SF6 free	ED-Italy	140249	23/100	50/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:23/100kV/V CT:50/5kA/A GSCM005/51
GSCM005/52	1M UTMX	SF6 free	ED-Italy	140250	23/100	400/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:23/100kV/V CT:400/5kA/A GSCM005/52
GSCM005/53	1M UTMX	SF6 free	ED-Italy	140251	23/100	630/5	50	630	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1-E3	M0 - E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear 1M UTMX SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H VT:23/100kV/V CT:630/5kA/A GSCM005/53



Technical Specification code: GRI-GRI-MAT-E&C-0004

Version no. 3 dated 04/10/2022

Subject: GSCM005 Modular Medium Voltage Switchgears

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

Type code	Configuration	GIS technology	Distribution Company and Country	Country Code	Rated frequency [Hz]	Rated normal current I <sub>r</sub> [A]	Rated normal current transformer [A]	Rated Voltage U <sub>r</sub> [kV]	Dimension: Width [mm]	Dimension: Depth [mm]	Dimension: Height [mm]	Rated power-frequency withstand voltage U <sub>s</sub> [kV]	Rated lightning impulse withstand voltage U <sub>p</sub> [kV]	Rated short-time withstand current I <sub>k</sub> [kA]	Rated duration of short circuit t <sub>k</sub> [s]	Rated peak withstand current I <sub>p</sub> [kA]	Rated supply voltage of closing and opening devices and of auxiliary circuit V <sub>cc</sub>	IK degree	IP degree	SD - Mechanical endurance class - Electrical endurance class	ES - Mechanical endurance class - Electrical endurance class	Classification IAC	Arc fault current and duration I <sub>a</sub> [kA]; t <sub>a</sub> [s]	Protective Coatin	Command Type	Busbar Socket	Description
GSCM005/4	CABLE RISE UNIT RC	Air	ED-Italy	140202	50	630		24	350	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear CABLE RISE UNIT RC Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H GSCM005/4
GSCM005/4	CABLE RISE UNIT RC	Air	ED-Romania	140202	50	630		24	350	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear CABLE RISE UNIT RC Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA IP3X AFL C3H GSCM005/4
GSCM005/5	LINE UNIT SD	SF6 free	ED-Italy	140203	50	630		24	500	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 – E3	M0 – E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear LINE UNIT SD SF6 free 24kV W:500 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/5
GSCM005/5	LINE UNIT SD	SF6 free	ED-Romania	140203	50	630		24	500	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 – E3	M0 – E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear LINE UNIT SD SF6 free 24kV W:500 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/5
GSCM005/6	PROTECTION TRANSFORMER	SF6 free	ED-Italy	140204	50		200	24	600	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 – E3	M0 – E2	AFL	16; 1	C3H	Manual	Yes	MV Switchgear PROTECTION TRANSFORMER SF6 free 24kV W:600 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/6
GSCM005/6	PROTECTION TRANSFORMER	SF6 free	ED-Romania	140204	50		200	24	600	1050	1850	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 – E3	M0 – E2	AFL	16; 1	C3H	Manual	Yes	MV Switchgear PROTECTION TRANSFORMER SF6 free 24kV W:600 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/6
GSCM005/8	UNIT with SVT (GSCT003/1)	Air	ED-Italy	140210	50	630		24	350	1050	1850	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/1) Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/8
GSCM005/8	UNIT with SVT (GSCT003/1)	Air	ED-Romania	140210	50	630		24	350	1050	1850	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/1) Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/8
GSCM005/9	UNIT with SVT (GSCT003/2)	Air	ED-Italy	140211	50	630		24	350	1050	1850	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/2) Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/9
GSCM005/10	UNIT with SVT (GSCT003/3)	Air	ED-Italy	140212	50	630		24	350	1050	1850	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/3) Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/10
GSCM005/10	UNIT with SVT (GSCT003/3)	Air	ED-Romania	140212	50	630		24	350	1050	1850	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/3) Air 24kV W:350 mm D:1050 mm H:1850 mm 16 kA AFL C3H GSCM005/10
GSCM005/11	CABLE RISE UNIT RC	Air	ED-Italy	140206	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear CABLE RISE UNIT RC Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H GSCM005/11
GSCM005/11	CABLE RISE UNIT RC	Air	ED-Romania	140206	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear CABLE RISE UNIT RC Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA IP3X AFL C3H GSCM005/11
GSCM005/12	LINE UNIT SD	SF6 free	ED-Italy	140207	50	630		24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 – E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear LINE UNIT SD SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/12
GSCM005/12	LINE UNIT SD	SF6 free	ED-Romania	140207	50	630		24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 – E2	AFL	16; 1	C3H	Electrical	Yes	MV Switchgear LINE UNIT SD SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/12
GSCM005/13	PROTECTION TRANSFORMER	SF6 free	ED-Italy	140208	50		200	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 – E2	AFL	16; 1	C3H	Manual	Yes	MV Switchgear PROTECTION TRANSFORMER SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/13
GSCM005/13	PROTECTION TRANSFORMER	SF6 free	ED-Romania	140208	50		200	24	700	1150	1950	50	125	16	1	40	24V -15% +20%	IK08	IP3X	M1 - E3	M0 – E2	AFL	16; 1	C3H	Manual	Yes	MV Switchgear PROTECTION TRANSFORMER SF6 free 24kV W:700 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/13

Technical Specification code: GRI-GRI-MAT-E&C-0004

Version no. 3 dated 04/10/2022

Subject: GSCM005 Modular Medium Voltage Switchgears

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

Type code	Configuration	GIS technology	Distribution Company and Country	Country Code	Rated frequency [Hz]	Rated normal current I <sub>r</sub> [A]	Rated normal current transformer [A]	Rated Voltage U <sub>r</sub> [kV]	Dimension: Width [mm]	Dimension: Depth [mm]	Dimension: Height [mm]	Rated power-frequency withstand voltage U <sub>d</sub> [kV]	Rated lightning impulse withstand voltage U <sub>p</sub> [kV]	Rated short-time withstand current I <sub>k</sub> [kA]	Rated duration of short circuit t <sub>k</sub> [s]	Rated peak withstand current I <sub>p</sub> [kA]	Rated supply voltage of closing and opening devices and of auxiliary circuit V <sub>cc</sub>	IK degree	IP degree	SD - Mechanical endurance class - Electrical endurance class	ES - Mechanical endurance class - Electrical endurance class	Classification IAC	Arc fault current and duration I <sub>a</sub> [kA];t <sub>a</sub> [s]	Protective Coatin	Command Type	Busbar Socket	Description	
GSCM005/15	UNIT with SVT (GSCT003/1)	Air	ED-Italy	140213	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/1) Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/15	
GSCM005/15	UNIT with SVT (GSCT003/1)	Air	ED-Romania	140213	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/1) Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/15	
GSCM005/16	UNIT with SVT (GSCT003/2)	Air	ED-Italy	140214	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/2) Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/16	
GSCM005/17	UNIT with SVT (GSCT003/3)	Air	ED-Italy	140215	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/3) Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/17	
GSCM005/17	UNIT with SVT (GSCT003/3)	Air	ED-Romania	140215	50	630		24	350	1150	1950	50	125	16	1	40		IK08	IP3X			AFL	16; 1	C3H		Yes	MV Switchgear UNIT with self-protected voltage transformer AT (GSCT003/3) Air 24kV W:350 mm D:1150 mm H:1950 mm 16 kA AFL C3H GSCM005/17	
GSCM005/54	COPPER BARS L570		ED-Italy	140252																								COPPER BARS L570 GSCM005/54
GSCM005/54	COPPER BARS L570		ED-Romania	140252																								COPPER BARS L570 GSCM005/54
GSCM005/55	COPPER BARS L790		ED-Italy	140253																								COPPER BARS L790 GSCM005/55
GSCM005/55	COPPER BARS L790		ED-Romania	140253																								COPPER BARS L790 GSCM005/55

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

## 7.2 Service conditions

Clause 2 of IEC 62271-200 is applicable with the following addition:

Minimum ambient air temperature for indoor switchgear	-15 °C
Network neutral earthing systems	Non effectively earthed neutral system
Maximum reference altitude	1.000 m

**Table 2 – Service Conditions**

The Manufacturer shall consider de-ratings related to altitudes up to 3.000 m for specific installation, these de-rating shall be subjected to **enel** approval.

Seismic qualification level: Severity level 1 – PGA 0,5 g.

Acceptance class 2 according to IEC TS 62271-210.

## 7.3 Technical characteristics

The switchgear shall be compliant with IEC 62271-200.

Each unit shall consist of an air insulated busbar compartment and an air insulated cable compartment, separated by an SF6 Free insulated compartment where a 3-position switch-disconnector and the circuit breaker, if required, is placed.

The switch-disconnector and the earthing switch (and circuit breaker for relevant type codes) shall be housed in a sealed stainless-steel or in insulating material enclosure, filled with gas.

The lowest compartment shall allow the connection of the power cables to the lower bushings of the switch-disconnector sealed compartment. Load bearing insulators for proper distancing and support of the conductor busbars and cable terminations from the external structure shall be foreseen.

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

Rated Voltage		[kV]	24
Rated insulation level	Rated short-duration power-frequency withstand voltage – Common values	[kV]	50
	Rated short-duration power-frequency withstand voltage – Across the insulation distance	[kV]	60
	Rated lightning impulse withstand voltage – Common value	[kV]	125
	Rated lightning impulse withstand voltage - Across the insulation distance	[kV]	145
Rated frequency (*)		[Hz]	50
Rated normal current:			
- for busbars and lines		[A]	630
- for transformer derivation		[A]	200
Rated short-time withstand current		[kA]	16
Rated peak withstand current		[kA]	40
Rated duration of short-circuit		[s]	1
Degree of protection for the whole enclosure except for the operating devices:			IP3X
Degree of protection for the operating devices (even with the operating lever inserted)			IP2XC
Degree of protection of the external part of the switchgear			IK08
Internal arc test	Type of accessibility		AFL
	Rated arc fault current	[kA]	16
	Rated arc fault duration	[s]	1
Rated supply voltage of closing and opening devices and of auxiliary circuit		[Vcc]	24V -15% +20%
Length of fuses to be used		[mm]	442
Expected operating life regarding leakage performance			40 years

**Table 3 - Characteristics of the switchgear**

(\*) The range of rated frequencies can vary according to the National Regulations and shall not affect the proper behavior of the equipment.

**Application Areas**

Perimeter: *Global*

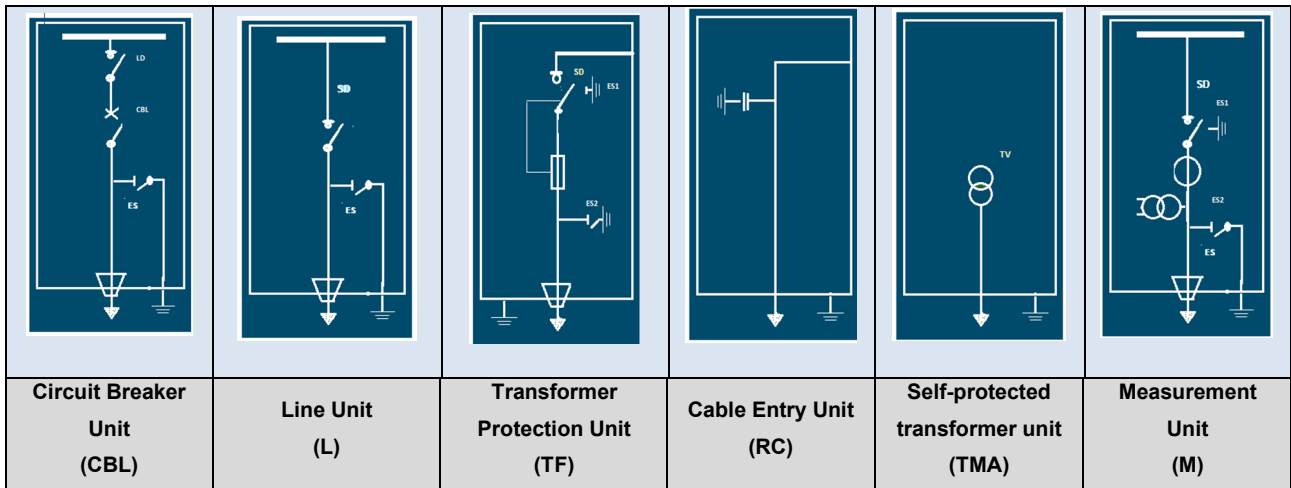
Staff Function: -

Service Function: -

Business Line: *Enel Grids*

### 7.3.1 Functional Unit Schemes

The general functional electric schemes of each unit are displayed in Figure 1.



**Figure 1 - Functional schemes**

### 7.3.2 Gas Insulation

Solutions shall be SF6 free and approved by Enel.

The enclosure containing gas shall be considered as sealed pressure system according to EIC 62271-200. For Italy, gas filling compartments having a design pressure exceeding 0,5 Bar (gauge) or a volume exceeding 2 m<sup>3</sup> shall be design according to the Italian pressure vessel code for electrical switchgear (DM 1 December 1980 and DM 10 1981).

The manufacturer shall ensure that at the end of the expected operating life of the equipment (40 years), the gas pressure remains greater than (or equal) the minimum operating pressure  $p_m$  (minimum necessary pressure to ensure the performances prescribed for the device). In any case, the loss shall not exceed the 0,1% value in weight per year (IEC 62271-1).

For installations above 1.500 meters, the supplier shall indicate the differences in the installation operating methods (if any).

Solid insulation could be used if compliant with all the requirements and standard indicated herein this document.



**Application Areas**

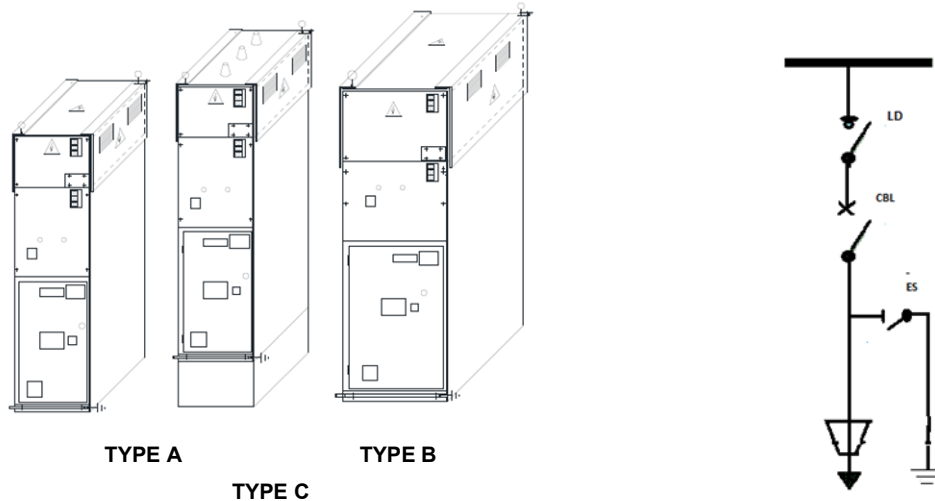
 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*
**7.3.3 Circuit breaker Functional Unit (CBL)**

The CBL unit is equipped with a vacuum circuit breaker and gas insulated line-disconnector and earthing switch.


**Figure 2 . Circuit Breaker Functional Unit General Schemes and Diagrams**
**7.3.3.1 Rated characteristic**

The characteristics of the circuit-breaker are shown in Table 4.

Rated Voltage	[kV]	24	
Rated normal current	[A]	630	
Rated short-circuit breaking current	[kA]	16	
Rated duration of short-circuit	[s]	1	
Sequence of operations		O-0,3 s-CO-15 s-CO	
Circuit-breaker class		C2, E2, M2, S1	
First-pole-to-clear factor		1,5	
Break time	[ms]	≤ 80	
Rated breaking current	Rated line charging breaking current ( $I_l$ )	[A]	10
	Rated cable-charging breaking current ( $I_c$ )	[A]	31,5
	Rated out-of-phase making and breaking current	[kA]	4
Maximum motor absorption	[W]	300	

**Table 4 - Circuit Breaker Characteristics**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

Rated Voltage	[kV]	24
Rated normal current	[A]	630
Rated short-time withstand current	[kA]	16
Rated duration of short-circuit	[s]	1
Rated peak withstand current	[kAc]	40
Mechanical endurance class		M1

**Table 5 - Characteristics of the line disconnectors (LD)**

Rated short-time withstand current	[kA]	16
Rated peak withstand current	[kAc]	40
Rated values of mechanical endurance for disconnectors		M1
Rated values of electrical endurance for earthing switches		E2

**Table 6 Characteristics of earthing switches (ES)**

The circuit-breaker shall comply IEC 62271-100, the switch-disconnectors shall comply IEC 62271-103 and the earthing switches shall comply IEC 62271-102. The operating points of the earthing switches shall be separate from those of the switching device and interlocked with them. The grounding blades shall have only one manual control. The movement of the three-poles shall be simultaneous.

The movement of the power contacts of the circuit breaker shall be carried out by means of mechanical transmissions, the switching energy supplied by an accumulation device mechanical type (spring command). A complete system shall be provided for the recovery of the energy storage of the circuit breaker in the absence of auxiliary voltage.

Alternative construction solutions for the storage device energy are subject to Enel approval, without prejudice to compliance with all the requirements functionalities of this specification.

**7.3.3.2 Operating Cycles:**
**a) With functioning motor:**

- O – 0,3 s – CO – 15 s – CO starting from the status of closed circuit breaker and charged closing springs.

**b) With non-functioning motor:**

- O – 0,3 s – CO starting from the status of closed circuit breaker and charged closing springs;
- CO starting from the status of open circuit breaker and charged closing springs.
- starting from the status of closed circuit breaker and discharged closing springs.

When the circuit breaker is closed, the opening springs shall always be charged.

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

If during an operation appears the request to perform an opposite operation, the consensus to the implementation of the latter shall be given after the completion of the operation in course. The operating conditions of the releases are indicated in the IEC 62271-1.

The MV circuit-breaker shall be equipped with a three-pole control equipped with the following circuits and devices:

- shunt release three-pole closing device.
- shunt release three-pole opening device.
- anti-pumping device which has the purpose to prevent reclosing after the first close-open operation when there is an opening during the first closing request. This device shall not be deactivated by functional restrictions.

Circuits and/or devices shall be provided to inhibit the closing command when at least one of the following events occurs:

- insufficient energy for the closing operation (springs discharged);
- command and/or opening maneuver in progress.

Without the power supply to the motor circuit the motorization circuit shall not absorb any current when it is in the stand-by state.

### 7.3.3.3 *Front panel*

The elements displayed on the front panel of the line unit should be such that they are easily visible, readable, and accessible.

The front panel is divided into four areas:

- a) Circuit breaker operation area.
- b) Line disconnecter operation area.
- c) Earthing switch operation area.
- d) Common area.

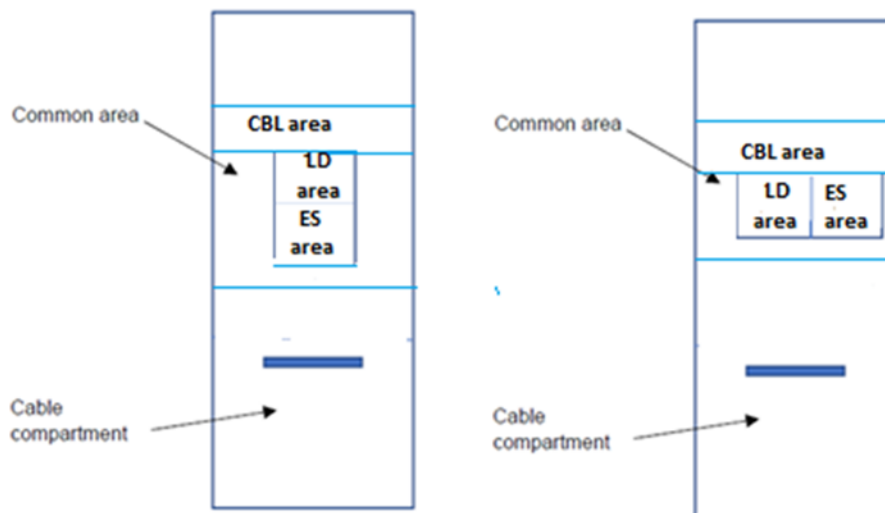
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 3 - Disposition of areas in the front panel in CBL unit**

**a) Circuit breaker operation area**

The devices to be provided on the front of the control panel shall be such as to make them easily visible and accessible. On the front of the command the following devices shall be provided:

Two electric opening and closing buttons and two mechanical opening and closing buttons (total 4 buttons) for operating the CB. The opening buttons shall be green, while the closing buttons shall be red, with the word indication according to table 8. All the buttons shall be protected against accidental pressure and provided with a plate indicating the function performed.

Manual device for restoring switching energy; the sense of actuation shall be indicated on the front side. To guarantee the safety of the operator, this device shall prevent the return of energy through the engine or the spring, loading lever shall not be dragged by the electric motor.

- Switching point for opening and closing the line disconnector (LD), with indication of the operating direction, in accordance with Figure 7;
- switching point for opening and closing of Earthing switch (ES), with indication of the operating direction, in accordance with the Figure 9.

The status indication of the circuit breaker (CB) shall be provided. The device used shall be mechanically interconnected with the mobile power contacts and the relative position shall be displayed using the following symbols:

- a) black "I" letter on red background corresponding to the close position of the circuit-breaker.
- b) black "O" letter on green background corresponding to the open position of the circuit-breaker.

**Application Areas**

Perimeter: *Global*

Staff Function: -

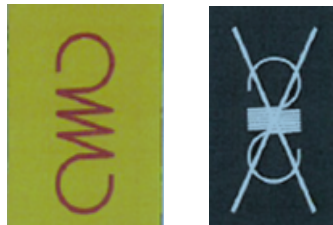
Service Function: -

Business Line: *Enel Grids*



**Figure 4 – Indicator for the position of the circuit breaker**

- c) display of the signal state of the energy storage device:
- orange color, charged energy storage device.
  - white color, discharged energy storage device.



**Figure 5 – Spring charged and discharged**

counter of the circuit-breaker openings, with a non-resettable five-digit numerator.

**b) Line-disconnector operation area**

- status signal of the line disconnector (LD). The device shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - (a) black "I" letter on red background 3000 RAL-F2 corresponding to the position of line disconnector LD closed.
  - (b) black "O" letter on green background 6017 RAL-F2 corresponding to the position of the open LD line disconnector.



**Figure 6 – Indicator for the position of the line-disconnector**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

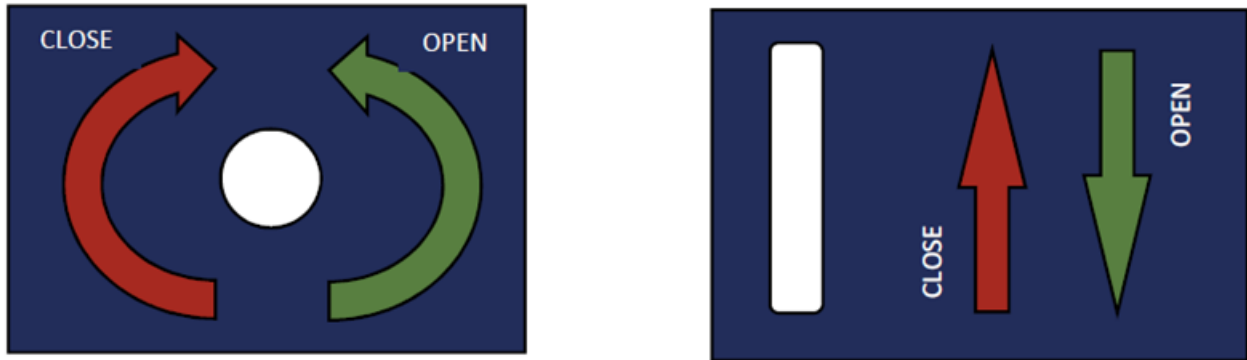


Figure 7 - Masks for the operating point of the line disconnector

**c) Earthing switch operation area**

- status indication of the earthing switch ES. The device shall be mechanically interconnected with the mobile power and auxiliary contact, and shall be displayed using the following symbols:
  - a) black "I" letter on yellow background 1021 RAL-F2 corresponding to the position of earthing switch ES closed;
  - b) black "O" letter on gray background 7030 RAL-F2 corresponding to the position of the earthing switch ES open;



Figure 8 – Indicator for the position of the heart switch

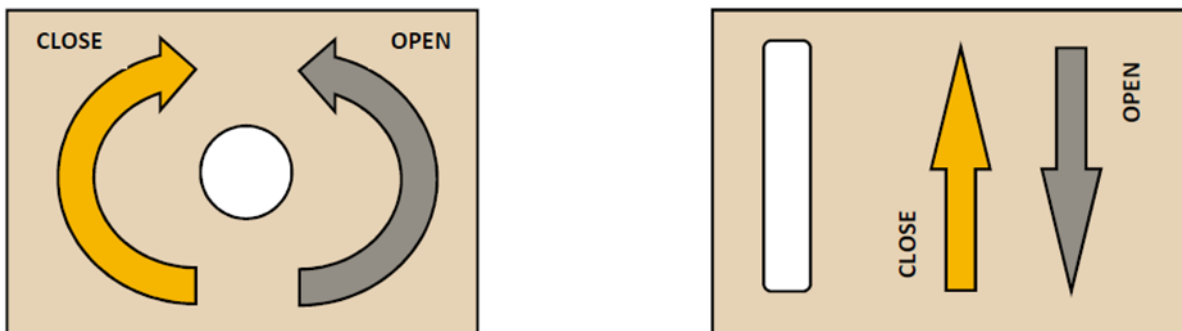


Figure 9 - Mask for the operating point of the earthing switch (see table 8 for the correct wording)

**d) Common area**

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

The common area of the front panel is the part of the front panel that contains the elements defined in the switch-disconnector area and the earthing switch area.

In the common area are located the following elements:

- Voltage detection system (VDS).
- Operating sequence nameplate.
- Synoptic scheme.
- Label holder.

#### 7.3.3.4 Interlocks

The sequence of operations for putting in service the equipment, irrespective of the possible constructive solutions, shall be:

1. opening of the ES earthing switch.
2. closing of the LD line disconnector.
3. closing of the CB circuit breaker.

Interlocking and operating directions shall comply with the IEC 62271-200. The interlocks shall foresee:

- The line disconnector can be operated only with circuit-breaker in open position; this condition shall be realized by a mechanical interlock.
- The earthing switch can be closed only with line disconnector in open position; this condition shall be realized with a mechanical interlock.
- The disconnector can be closed only with earthing switch in open position; this condition shall be realized with a mechanical interlock.

The circuit breaker can be operated electrically and mechanically with the lever not inserted engaged at any point of operation:

- with the line disconnector (LD) in the closed position (I) and the grounding switch (ES) in the open position (O).
- Interlocking shall be carried out both electrically with an interruption of the electrical controls of the switch (by means of limit switches) and mechanically.
- The access door to the compartment shall only be opened under safe conditions, with the earthing switch (I) closed; this condition shall be achieved with a mechanical interlock.
- The earthing switch ES may only be opened with the access door to the cable compartment closed.
- The access panel of the cable compartment shall be removed only in safe conditions, with the switch-disconnector open (O) and earthing switch closed (I); this condition shall be achieved with mechanical interlock.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- Two points shall be provided where a padlock can be inserted to lock the operation of the line-disconnector and of the earthing switch, in both open and closed positions. This padlock will have an arch of up to 6 mm diameter.

**7.3.3.5 Terminal Block for Advanced Automation (only module CBL)**

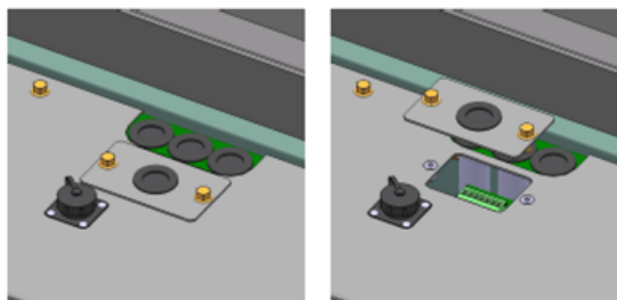
In the circuit breaker functional unit, to enable the SFS or SHA function with the RGDM, a terminal block where cables will be fitted according to the diagram shown in the Figure 11 shall be provided.

The numbering of the connectors on the terminal block is shown in the Figure 11.

The shunt to the terminal block shall be made by connecting the cables of the circular connector of the UP to the terminal block of the electronic board.

The terminal block should be as close as possible to the RGDM and should be housed inside the panel.

A window that can be opened with screws is installed on the terminal board. A cable gland shall be fitted above the window to which a 7x1,5 mm<sup>2</sup> is connected.



**Figure 10 - Terminal block**



**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

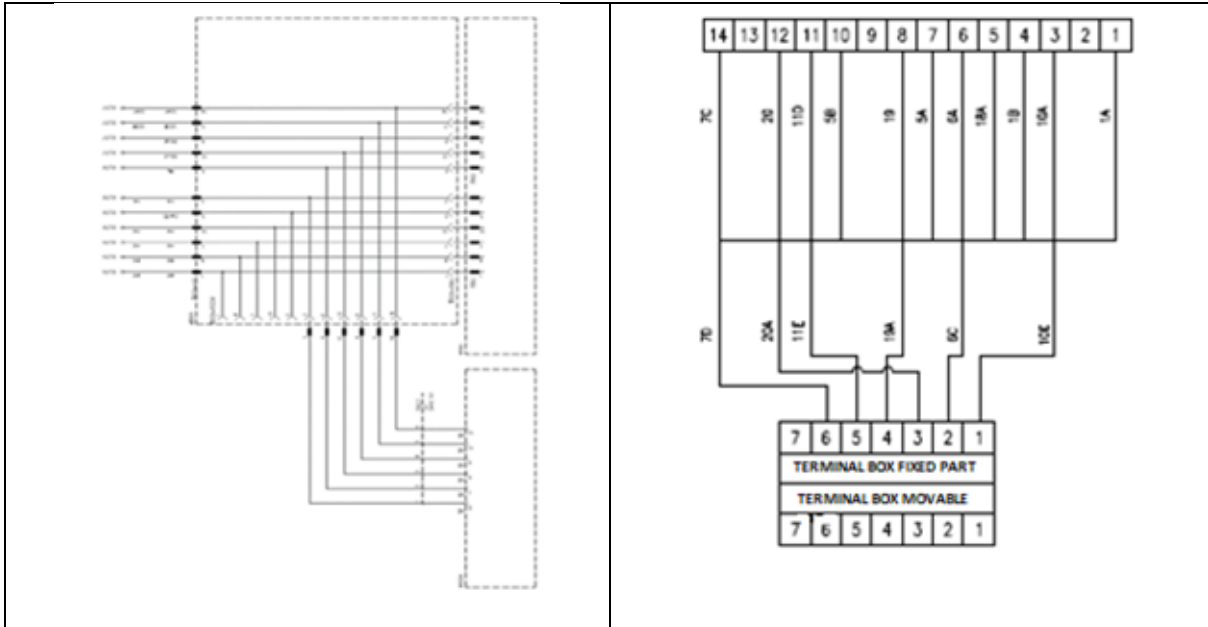


Figure 11 - Electrical diagram

**Application Areas**

Perimeter: *Global*

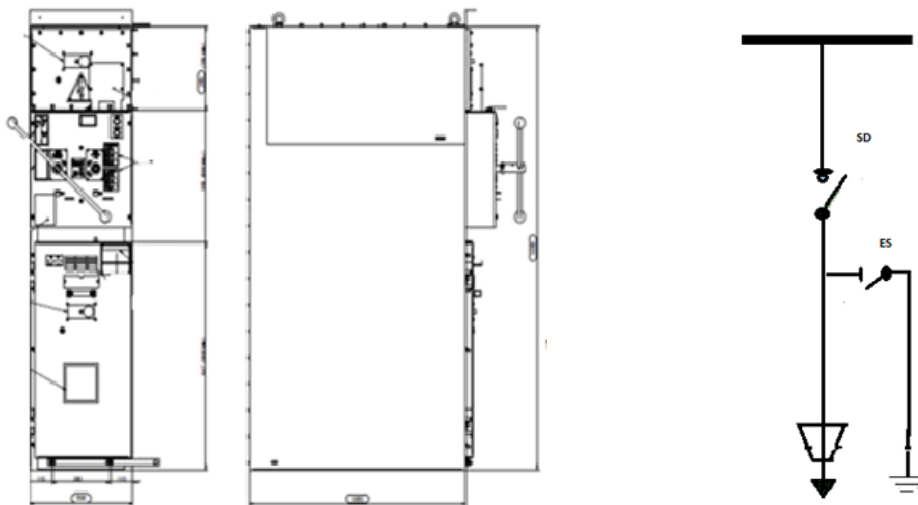
Staff Function: -

Service Function: -

Business Line: *Enel Grids*

### 7.3.4 Line Functional Unit (L).

Unit L consists of an SF6 free insulated line disconnecter and earthing switch.



**Figure 12 – Line Functional Unit General Schemes and Diagrams**

The three-pole switch-disconnector and earthing switches shall comply with IEC 62271-103 and IEC 62271-102 respectively.

The operating point of the earthing switch functionality shall be separated from the operating point of the switch-disconnector functionality and interlocked with it.

The movement of the blades of the switching devices shall be simultaneous.

The three-pole manual operating device of the switch-disconnectors shall be dead-center overcoming both in opening and closing, vertical, rotational or translational movement (IEC 60447).

The operations shall be performed by applying a moment that does not exceed 200 Nm, and the opening and closing speed shall be independent of the action of the operator.

In case that switch-disconnectors and earthing switches are separated, the shaft of the earthing switch shall be mechanically interlocked with the shaft of the switch-disconnector.

The electrical control of the switch-disconnector (SD) shall be of the override type with the following functional characteristics:

- When the springs are loaded it shall remain closed or open.
- the stability of the SD contact position shall be ensured until the dead center has been passed.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- if, during any maneuver, there should be an interruption of the power supply before the dead center has been exceeded, the system shall allow the manual completion of the maneuver in to remove the protective cover of the control safely with unloaded springs.

The manual control of the switch-disconnector (SD) shall be override dead center for both opening and closing and shall be of the rotary or vertical motion type.

Manual operation of the switch-disconnector (SD) shall be possible at all times.

The manual control shall be operable by means of an operating lever and the torque required for operation shall not exceed 200 Nm.

The earthing switch (ES) shaft shall be mechanically interlocked with the main shaft of the switch-disconnector (SD) and not with the operating shaft.

The insertion of the operating lever for manual control shall prevent the motor from operating; this interlocking shall act before the end of the lever engages the tang of any of the shafts being handled. An electrical interlock shall only allow the motor to operate when the blades of the earthing switch are fully open.

The degree of protection of the operating seats and control parts shall be IP3X (including the overpressure relief panel).

The earthing switches shall comply with IEC 62271-102 and shall be able to be opened and closed by means of a lever. The control is of the dead center type (independent of the operating speed of the operator) and the energy for the opening and closing maneuvers is provided by springs.

#### 7.3.4.1 *Rated characteristics*

The rated characteristics of the switch–disconnecter and the earthing switch are shown in the following table:

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

<b>Switch-disconnector</b>			
Rated Voltage		[kV]	24
Rated normal current		[A]	630
Rated short-time withstand current		[kA]	16
Rated peak withstand current		[kA]	40
Rated duration of short-circuit		[s]	1
Mechanical endurance class			M1
Electrical endurance class			E3
Rated breaking current	of a mainly active load	[A]	630
	of a no-load line	[A]	1,5
	of a no-load cable	[A]	16
	in case of earth fault	[A]	60
	with cable-charging in case of earth fault	[A]	40
<b>Earthing switch</b>			
Rated Voltage		[kV]	24
Rated short-time withstand current		[kA]	16
Rated peak withstand current		[kA]	40
Rated short-circuit duration		[s]	1
Mechanical endurance class			M0
Electrical endurance class			E2

**Table 7 - Characteristics of the switch–disconnector and earthing switch for Line Functional Unit**
**7.3.4.2 Front panel**

The elements displayed on the front panel of the line unit shall be such as to make them easily visible, readable, and accessible.

The front panel is divided in three areas:

- a) Switch-disconnector operation area.
- b) Earthing switch operation area.
- c) Common area.

All three areas shall be in the same vertical than the related cable compartment.

**Application Areas**

Perimeter: *Global*

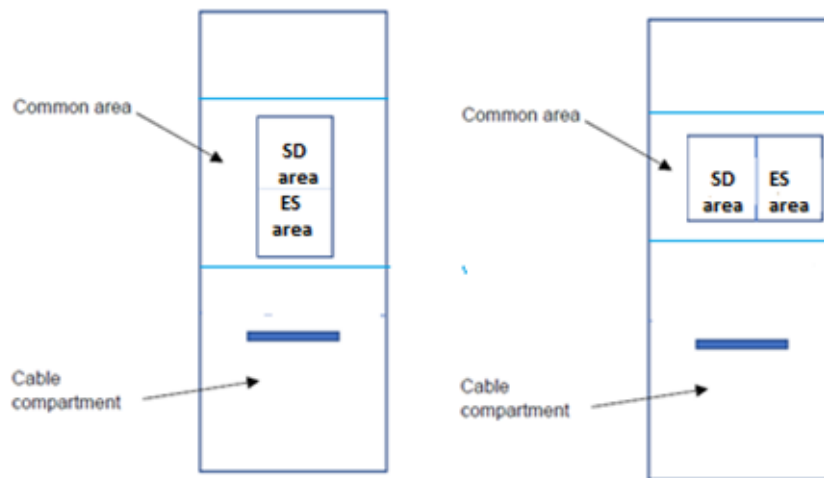
Staff Function: -

Service Function: -

Business Line: *Enel Grids*

If the operation of the switchgear is vertically oriented, the order of the areas shall be, from top to bottom: Switch-disconnector operation area → Earthing switch operation area.

If the operation of the switchgear is horizontally oriented, the order of the areas shall be, from left to right: Switch-disconnector operation area → Earthing switch operation area.



**Figure 13 - Disposition of areas in the front panel in line unit**

**a) Switch-disconnector operation area**

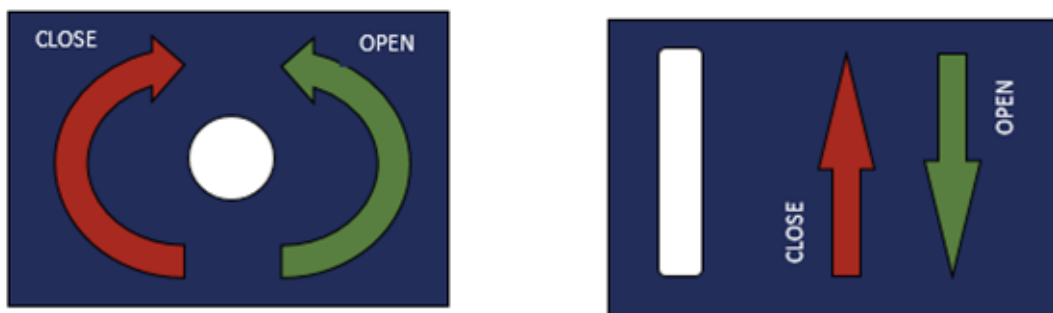
The background of the switch-disconnector area shall be colored according to the RAL 5022-F2.

The switch-disconnector operation area is composed of the following elements:

- point for the operation of switch-disconnector, with indication of the operating directions in local language.

The operating directions, according to IEC 60447, shall be displayed using the following colors:

- red 3000 RAL-F2 color corresponding to the close direction of the switch-disconnector.
- green 6017 RAL-F2 corresponding to the open direction of the switch-disconnector.



**Figure 14 - Point for the operation of switch-disconnector in line unit**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- Indicator showing the position of the switch-disconnector. The indicator shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - black "I" letter on red background 3000 RAL-F2 corresponding to the closed position of the switch-disconnector.
  - black "O" letter on green background 6017 RAL-F2 corresponding to the open position of the switch-disconnector.



**Figure 15 - Indicator for the position of the switch-disconnector in line unit**

The indicators shall be visible even with the front panel removed.

The indicators shall be protected by a transparent window that prevents the entry of foreign objects in order to prevent its indication from being altered by external manipulation.

- Two buttons for the electrical opening (green) and closing (red) operations in case of switchgears with electric command. The buttons shall be protected to avoid accidental touch and shall have a nameplate indicating their performed function (open / close) in the language that corresponds to the Country in which the switchgear will be delivered.

**b) Earthing switch operation area**

The background of the earthing switch area shall be colored according to RAL 1015-F2.

The earthing switch operation area is composed of the following elements:

- point for operation of the earthing switch, with indication of the operating directions in local language. The operating directions, according to IEC 60447, shall be displayed using the following colors:
  - yellow color 1021 RAL-F2 corresponding to the close direction of the earthing switch.
  - gray color 7030 RAL-F2 corresponding to the open direction of the earthing switch.

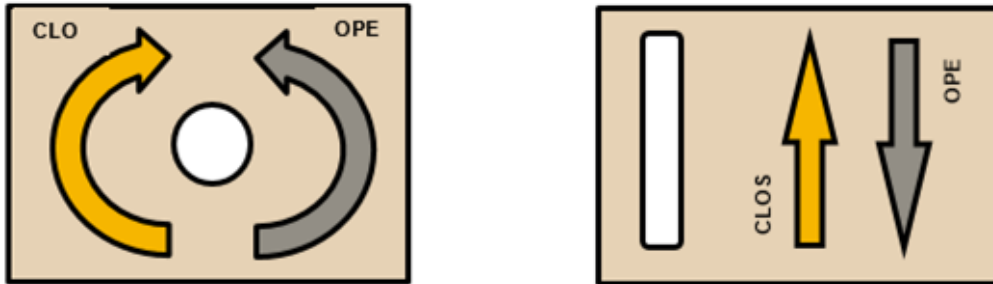
**Application Areas**

Perimeter: *Global*

Staff Function: -

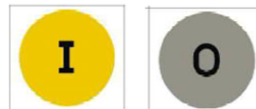
Service Function: -

Business Line: *Enel Grids*



**Figure 16 - Point for the operation of earthing switch in line unit**

- Indicator showing the position of the earthing switch. The indicator shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - black "I" letter on yellow background 1021 RAL-F2 corresponding to the closed position of the earthing switch.
  - black "O" letter on gray background 7030 RAL-F2 corresponding to the open position of the earthing switch.



**Figure 17 – Indicator for the position of the earthing switch in line unit**

The indicators shall be visible even with the front panel removed.

The indicators shall be protected by a transparent window that prevents the entry of foreign objects to prevent its indication from being altered by external manipulation.

**c) Common area**

The common area of the front panel is the part of the front panel that contains the elements defined in the switch-disconnector area and the earthing switch area.

In the common area are located the following elements:

- Voltage detection system (VDS).
- Operating sequence nameplate.
- Synoptic scheme.
- Label holder.

**7.3.4.3 Interlocks**

The sequence of operations to close the line output shall be:

1. Opening of the earthing switch.

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

---

## 2. Closing the switch-disconnector.

The sequence of operations to open the line output in safe condition shall be:

1. Opening of the switch-disconnector.
2. Closing the earthing switch.

It will only be possible to operate the switch-disconnector when the earthing switch is in the open position and the access door of the cable compartment is closed. An electrical interlock will allow the motor to operate only when the earthing blades are completely open.

It will only be possible to operate the earthing switch when the switch-disconnector is in the open position and with the access door of the cable compartment closed.

The switch-disconnector and the earthing switch shall not be concurrently closed.

Two points shall be provided where a padlock can be inserted to lock the manual operation of the switch-disconnector and of the earthing switch in an independent way, in both open and closed positions. They will allow the insertion of a padlock with a shackle up to 6 mm in diameter. These points shall be signaled by a "padlock" symbol

It shall be possible to lock the electrical operation of the switch-disconnector through the switch.

The insertion of the command lever in the switch-disconnector operation point or in the earthing switch operation point shall prevent the motorized operation of the switch-disconnector.

This interlock shall have act before the end of the lever engages on the operating shaft. This condition can be achieved both with a mechanical mechanism (decoupling of the motor) or with an electric solution (cutting motor power supply).

The access door of the cable compartment shall be removed only in safe condition, with the switch-disconnector open and earthing switch closed. This condition shall be achieved with a mechanical interlock.

With the access door removed, an electrical interlock shall prevent the electrical operation of the switch-disconnector and a mechanical interlock shall prevent the mechanical operation of both, the switch-disconnector, and the earthing switch.

For cable testing, with the access door removed, the interlock of the earthing switch may be bypassed only using a screwdriver. The mechanical and electrical interlock of the switch-disconnector shall remain in any case. This bypass system shall be designed in such a way that each time a closing operation of the earthing switch is executed, the interlock returns to its normal situation.



**Application Areas**

Perimeter: *Global*

Staff Function: -

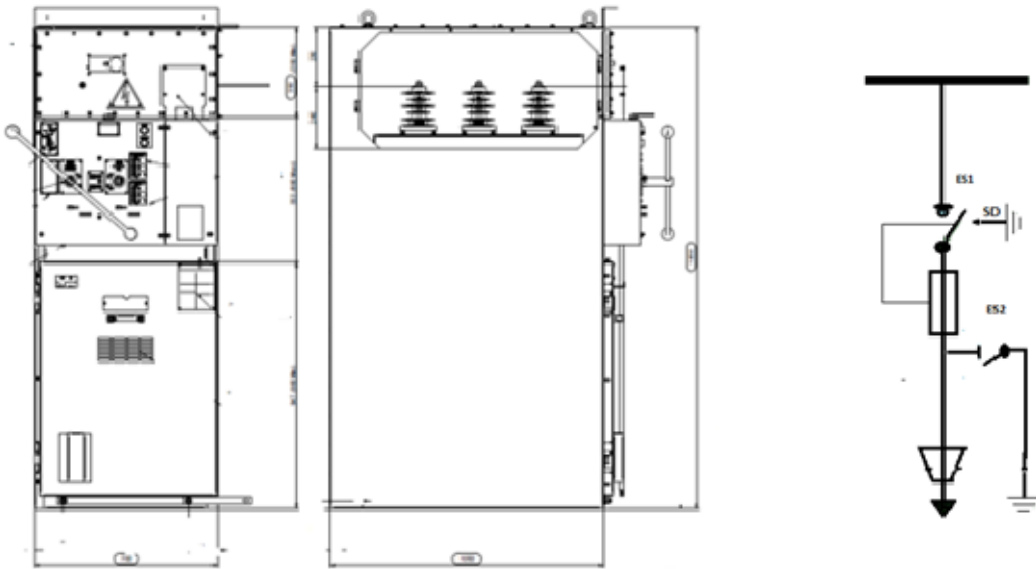
Service Function: -

Business Line: *Enel Grids*

**7.3.5 Transformer Protection Functional unit characteristics (TF)**

The T unit is an equipment consisting of a manual switch-disconnector (SD) combined with fuses, for the protection of the MV/LV transformer.

The equipment shall comply with IEC 62271-105 and IEC 62271-103.



**Figure 18 - Transformer Protection Functional Unit**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*
**7.3.5.1 Rated characteristics**

<b>Switch-disconnector</b>		
Rated voltage	[kV]	24
Rated normal current	[A]	200
Rated short-time withstand current	[kA]	16
Rated peak withstand current	[kA]	40
Rated duration of short-circuit	[s]	1
Mechanical endurance class		M1
Electrical endurance class		E3
Transfer Current ( $TD_{transfer}$ )	A	800
<b>Earthing switches ES1</b>		
Rated short-time withstand current	[kA]	16
Rated peak withstand current	[kA]	40
Rated short-circuit duration	[s]	1
Mechanical endurance class		M0
Electrical endurance class		E2
<b>Earthing switch ES2</b>		
Rated short-time withstand current	[kA]	1
Rated peak withstand current	[kA]	2,5
Rated short-circuit duration	[s]	1
Mechanical endurance class		M0
Electrical endurance class		E2

**Table 8 - Characteristics of the switch–disconnector and earthing switches in transformer unit**

To show the open position of the switch-disconnector, a micro-switch shall be provided. This micro-switch shall be put inside the operating device protective shell and shall be able to switch small currents.

This micro-switch shall be connected to a 2x1,5 mm<sup>2</sup> LV cable with a length of 8 m that protrudes from the switchgear. This cable should be correspondingly identified.

When the SD is open (has intervened), the LV circuit must be closed and the cell must send a signal to the UP.

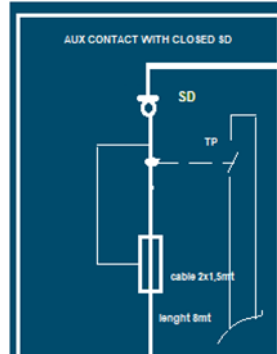
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 19- Wiring LV diagram between T and UP cells**

The connection shall have a faston with cable end sleeves as shown in the Figure 20.



**Figure 20 - Faston with cable end sleeves**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

### 7.3.5.2 Front panel

The elements displayed on the front panel of the transformer unit shall be such as to make them easily visible, readable, and accessible.

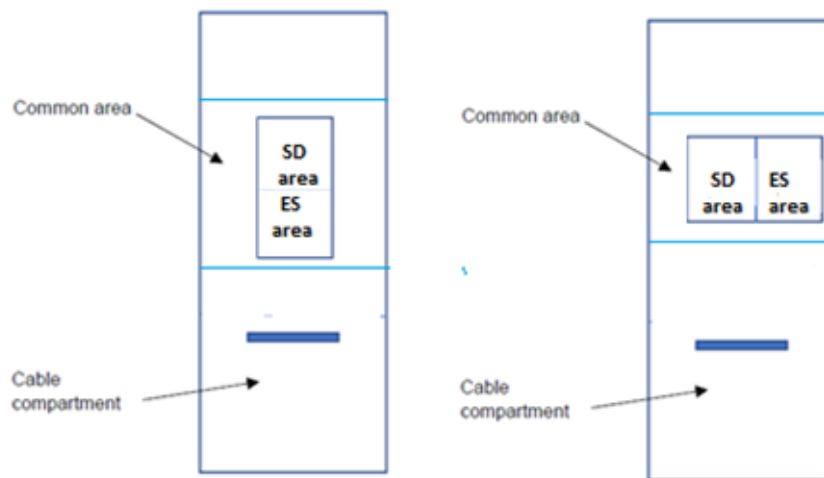
The front panel is divided in three areas:

- a) Switch-disconnector operation area.
- b) Earthing switch operation area.
- c) Common area.

All three areas shall be in the same vertical than the cable compartment.

If the operation of the switchgear is vertically oriented, the order of the areas shall be, from top to bottom: Switch-disconnector operation area → Earthing switch operation area

If the operation of the switchgear is horizontally oriented, the order of the areas shall be, from left to right: Switch-disconnector operation area → Earthing switch operation area



**Figure 21 - Disposition of areas in the front panel in transformer functional unit**

#### a) Switch-disconnector operation area

The background of the switch-disconnector area shall be colored according to RAL 5022-F2.

The switch-disconnector operation area is composed of the following elements:

- point for the operation of switch-disconnector / spring charger, with indication of the operating directions in local language. The operating directions, according to IEC 60447, shall be displayed using the following colors:
  - red 3000 RAL-F2 color corresponding to the close direction of the switch-disconnector.
  - green 6017 RAL-F2 corresponding to the open direction of the switch-disconnector.

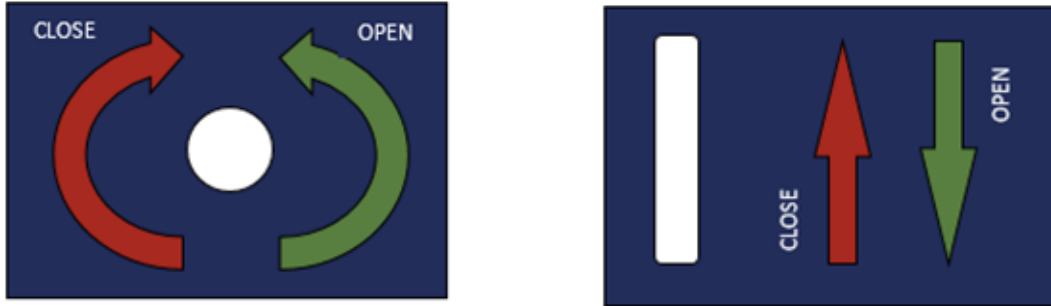
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 22 - Point for the operation of switch-disconnector in transformer functional unit**

The opening of the switch-disconnector by means of a release spring energy device is also accepted.

Other alternative operation solutions based on buttons will be considered, subject to Enel approval.

- Indicator showing the position of the switch-disconnector. The indicator shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - black "I" letter on red background 3000 RAL-F2 corresponding to the closed position of the switch-disconnector.
  - black "O" letter on green background 6017 RAL-F2 corresponding to the open position of the switch-disconnector.



**Figure 23 - Indicator for the position of the switch-disconnector in transformer functional unit**

The indicators shall be visible even with the front panel removed.

The indicators shall be protected by a transparent window that prevents the entry of foreign objects in order to prevent its indication from being altered by external manipulation.

**b) Earthing switch operation area**

The background of the earthing switch area shall be colored according to RAL 1015-F2.

The earthing switch operation area is composed of the following elements:

- point for operation of the earthing switch, with indication of the operating directions in local language. The operating directions, according to IEC 60447, shall be displayed using the following colors:
  - yellow color 1021 RAL-F2 corresponding to the close direction of the earthing switch.
  - gray color 7030 RAL-F2 corresponding to the open direction of the earthing switch.

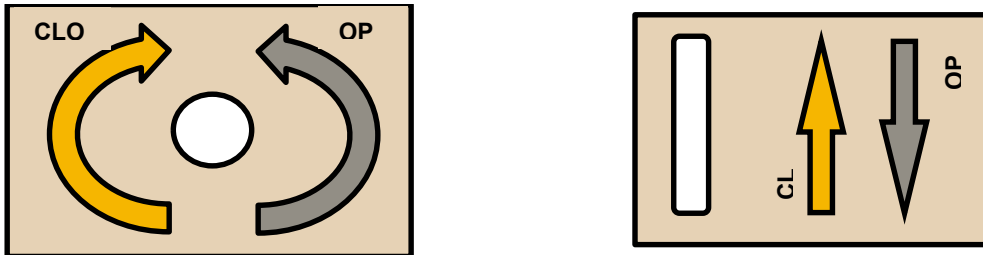
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 24 - Point for the operation of earthing switch in transformer functional unit**

- Indicator showing the position of the earthing switch. The indicator shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - black "I" letter on yellow background 1021 RAL-F2 corresponding to the closed position of the earthing switch;
  - black "O" letter on gray background 7030 RAL-F2 corresponding to the open position of the earthing switch;



**Figure 25 - Indicator for the position of the earthing switch in transformer functional unit**

The indicators shall be visible even with the front panel removed.

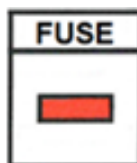
The indicators shall be protected by a transparent window that prevents the entry of foreign objects to prevent its indication from being altered by external manipulation.

**c) Common area**

The common area of the front panel is the part of the front panel that contains the elements defined in the switch-disconnector area and the earthing-switch area.

In the common area are located the following elements:

- fuse status indicator, with the following symbols:
  - green indicator: All fuses are operatives
  - red indicator: One or more fuses are melted.



**Figure 26 - Example of indicator showing one or more melted fuses**

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

The fuse indicator shall be protected by a transparent window that prevents the entry of foreign objects in order to prevent its indication from being altered by external manipulation.

#### 7.3.5.3 Interlocks

The sequence of operations to close the transformer output shall be:

1. opening of the earthing switches.
2. closing the switch-disconnector.

The sequence of operations to open the transformer output (safe condition) shall be:

1. opening of the switch-disconnector.
2. closing the earthing switches.

It will only be possible to operate the switch-disconnector when the earthing switches are in the open position and with the access door of the cable compartment and the transformer fuse compartment closed.

It will only be possible to operate the earthing switches when the switch-disconnector is in the open position and with the access door of the cable compartment and the transformer fuse compartment closed.

The switch-disconnector and the earthing switches shall not be concurrently closed.

Two points shall be provided where a padlock can be inserted to lock the operation of the switch-disconnector and of the earthing switches in an independent way, in both open and closed positions. They will allow the insertion of a padlock with a shackle up to 6 mm in diameter. These points should be signaled by a "padlock" symbol.

The access door of the cable compartment and the transformer fuse compartment shall be removed only in safe condition, with the switch-disconnector open and earthing switches closed. This condition shall be achieved with a mechanical interlock.

When the switch-disconnector is opened for fuse tripping, the switch-disconnector shall be ready to do the spring charging and the closing operation in one single maneuver, without intermediate operations

The intervention of one or more fuses shall cause the opening of the switch-disconnector.

After the fuse has tripped, the earthing switch can be closed without any intermediate operation.

#### 7.3.5.4 Fuse compartment

Fuse holder shall be designed to match with the use of fuses of maximum required size and 15 kV and 24 kV voltage.

In order to allow the use of fuses with nominal voltage different from 24 kV a specific adapter shall be supplied.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 27 – Fuse-link Dimensions**

The striker shall be on the centerline of the fuse-link.

The kinematics of the fuse-carrier, where the striker acts for the opening of the switch-disconnector, shall be made to be operated independently from the striker's diameter and, in any case, up to a maximum of 20 mm and should be compatible with medium type strikers according to paragraph 4.14 of IEC 60282-1.

The fuse holder contacts shall be spring-loaded silver plated or nickel plated.

The maximum rated current of the fuses shall be 100 A for 24 kV.

For remote signaling of the SD position, either following manual operation or fuse tripping, a microswitch.



**Application Areas**

Perimeter: *Global*

Staff Function: -

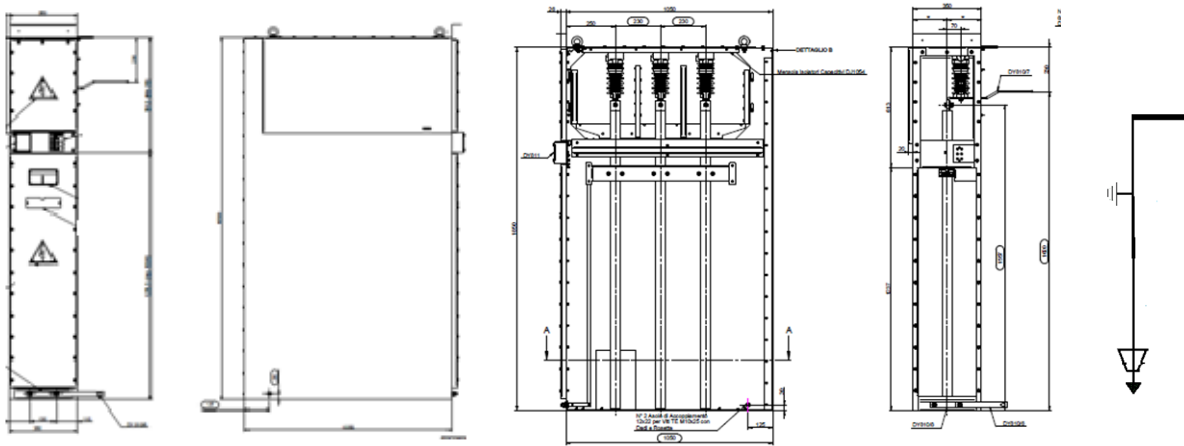
Service Function: -

Business Line: *Enel Grids*

**7.3.6 Cable rise Functional Unit (RC).**

The cable entry unit consists of a single compartment and a busbar system.

The metal enclosure shall meet the same characteristics as per the Line Functional Unit (L).



**Figure 28 – Cable Rise Functional Unit**

**7.3.6.1 Rated characteristics**

Rated Voltage	[kV]	24
Rated normal current	[A]	630
Insulation		Air

**Table 9 - Rated characteristics cable rise unit RC**

**7.3.6.2 Front panel**

The front panel consists of common area.

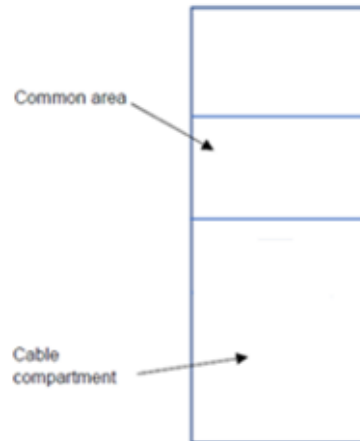
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 29 - Disposition of areas in the front panel in RC unit**

**a) Common area**

The common area of the front panel is the part of the front panel that contains the elements defined in the switch-disconnector area and the earthing switch area.

In the common area are located the following elements:

- Voltage detection system (VDS).
- Operating sequence nameplate.
- Synoptic scheme.
- Label holder

**7.3.6.3 Interlocks**

The front panel shall be screwed down to prevent access to live parts.

**Application Areas**

Perimeter: *Global*

Staff Function: -

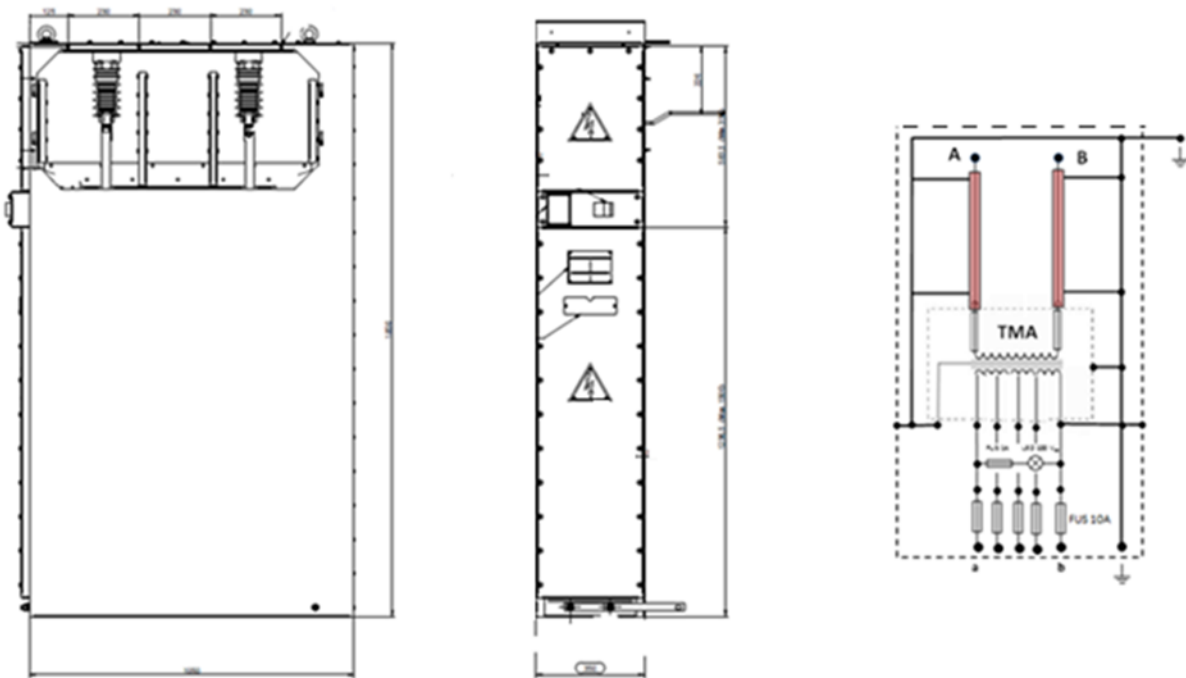
Service Function: -

Business Line: *Enel Grids*

**7.3.7 Self-protected voltage transformer functional unit (TMA)**

The TMA functional unit is an indoor equipment designed to be installed in secondary substations without distribution transformers to supply the Peripheral Telecontrol Unit (UP).

The unit shall consist of an upper part containing the main busbar system and a lower part containing the voltage transformer.



**Figure 30 – Self-protected transformer functional unit**

**7.3.7.1 Rated characteristics**

Rated Voltage	[kV]	24
Rated normal current	[A]	630
Rated short-time withstand current	[kA]	16
Rated duration of short-circuit	[s]	1
Insulation		Air

**Table 10 - Self-protected transformer functional unit rated characteristics**

**Application Areas**

Perimeter: *Global*

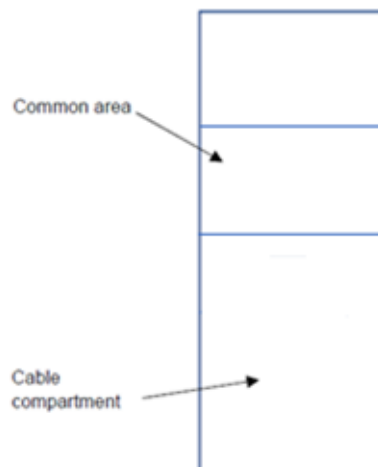
Staff Function: -

Service Function: -

Business Line: *Enel Grids*

### 7.3.7.2 Front panel

The front panel consists of a common area



**Figure 31 - Disposition of areas in the front panel of TMA functional unit**

The common area of the front panel is the part of the front panel that contains the elements defined in the switch-disconnector area and the earthing switch area.

In the common area are located the following elements:

- Voltage detection system (VDS).
- Operating sequence nameplate.
- Synoptic scheme.
- Label holder

### 7.3.7.3 Interlocks

The front panel shall be screwed down to prevent access to live parts.

### 7.3.7.4 Constructive characteristics

The construction features of the medium-voltage 24 kV equipment shall be such as that can be coupled to the self-protected voltage transformer according to the Global GSCT003.

A metal box containing the fuse-holder disconnector shall be provided in the switchgear.

Downline of the self-protected voltage transformer (SVT - GSCT003) 5 single-pole fuse disconnectors of 32 A type and 690V insulation voltage shall be provided, equipped with cylindrical fuses 10,3 x 38 [mm],  $I_n = 10A$  (type Ag).

Upstream of the fuses, a device for voltage presence, compliant with IEC 61243-5 shall be connected to the secondary output of SVT (operating range 100 Vca), protected by a 1A fuse.

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

The design and construction of the module shall consider the stresses to which the unit is subjected during handling, transport and installation.

The width of the switchgear shall be no more than 350 mm ( $L < 350$  mm).

On the switchgear a nameplate with the indications provided in 7.3.7.5 and the indications on the SVT (GSCT003) provided in the IEC 61869-1-3 standard shall be installed.

The supply shall be composed of following components:

- busbar elements.
- 1 earth conductor.
- 2 eyebolts M12.
- 1 busbar compartment side closure panel.
- 1 connection cable to the UP.
- n.1 SVT with TCA assessed according to the GSCT003 specification.
- 2 MV cables 50 mm<sup>2</sup> copper for SVT connection with external cones.
- n.1 LED indicator for voltage presence and fuse holder with 1A fuse.
- n.1 capacitive device type IEC 61243-5.
- n.1 earth conductor.
- n.5 fuse holders with n.5 10A fuses.
- Installation manual.
- all accessories for correct commissioning.
- For the completion of the TCA process, the manufacturer shall provide, in addition to what is indicated in point 24 dimensional drawings of the equipment (views and sections) with at least the following indications:
  - Position of the SVT (GSCT003) inside the panel.
  - Single-line electrical diagram of the auxiliary circuits of the equipment.
  - Plate design.

Type tests of the SVT as in GSCT003 specification shall be performed, including the internal arc test.

Routine tests as prescribed in GSCT003 specification shall be added, documental proof in case of sub-supply is accepted.

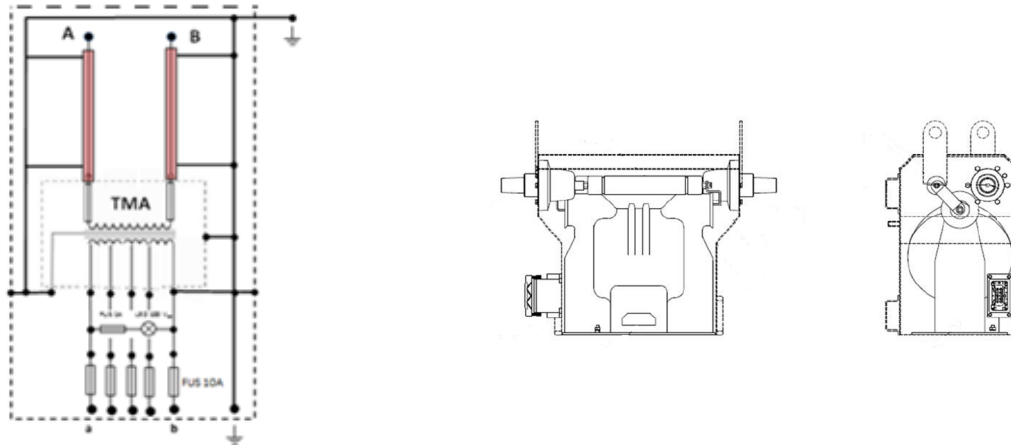
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 32 - Electric scheme and example of SVT**

**7.3.7.5 Nameplate**

The nameplate of the measuring unit shall comply with the Figure 33:

LOGO E NOME COSTRUTTORE		
<b>SCOMPARTO MT CON TMA</b>		
DESIGNAZIONE DEL TIPO		
NUMERO DI SERIE		
ANNO DI COSTRUZIONE		
NORMA APPLICABILE	CEI EN 62271-200	
TENSIONE NOMINALE	24	kV
FREQUENZA NOMINALE	50	Hz
TENSIONE DI TENUTA NOMINALE AD IMPULSO	125	kV
TENSIONE DI TENUTA NOMINALE A FREQUENZA DI ESERCIZIO	50	kV
CLASSIFICAZIONE D'ARCO INTERNO	IAC	
TIPO DI ACCESSIBILITÀ	AF	
CORRENTE DI PROVA D'ARCO	16	kA
DURATA DELLA CORRENTE DI PROVA D'ARCO	0,5	s
PESO TOTALE		
<b>TMA</b>		
NORMA APPLICABILE	CEI EN 60044-2	
VA/cl		
CORRENTE NOMINALE FUSIBILE		
POTERE DI INTERRUZIONE FUSIBILE		
Upn/Usn		
FATTORE DI TENSIONE		

**Figure 33 – TMA Functional Unit Nameplate**

**Application Areas**

Perimeter: *Global*

Staff Function: -

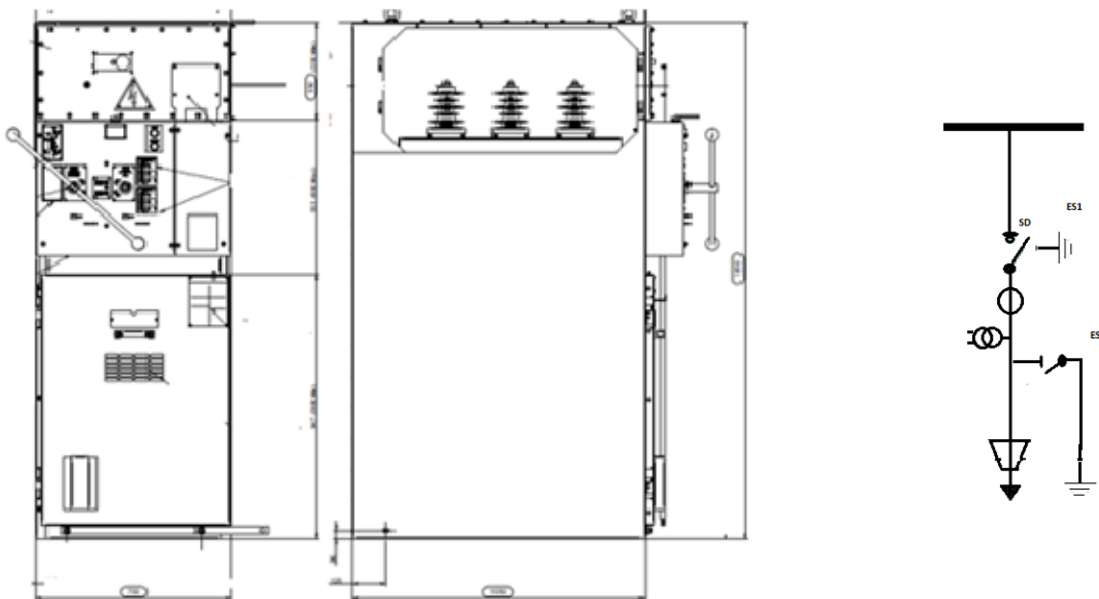
Service Function: -

Business Line: *Enel Grids*

**7.3.8 Measurement Functional unit (M).**

The measuring units shall be prepared for the installation of two current transformers (CT) and two voltage transformers (VT) of approved type as per specifications DMI 031052 and DMI031015.

The Switch-disconnector (SD) the 2 CTs and 2 VTs shall be contained in the SF6-free gas insulated enclosure.



**Figure 34 – Measurement unit**

The current and voltage transformers shall be of the approved type conforming respectively to the local standards as indicated in the table:

Countries' I&N	Current transformer technical specification	Voltage transformer technical specification
Italy	DMI031052	DMI031015
Romania	DMI031052	DMI031015

**Table 11 – Instrument transformers technical specifications**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*
**7.3.8.1 Rated characteristics**

<b>Switch-disconnector</b>		
Rated voltage	[kV]	24
Rated normal current	[A]	630
Rated short-time withstand current	[kA]	16
Rated peak withstand current	[kA]	40
Rated duration of short-circuit	[s]	1
Mechanical endurance class		M1
Electrical endurance class		E3
<b>Earthing switches ES1</b>		
Rated short-time withstand current	[kA]	16
Rated peak withstand current	[kA]	40
Rated short-circuit duration	[s]	1
Mechanical endurance class		M0
Electrical endurance class		E2
<b>Earthing switch ES2</b>		
Rated short-time withstand current	[kA]	1
Rated peak withstand current	[kA]	2,5
Rated short-circuit duration	[s]	1
Mechanical endurance class		M0
Electrical endurance class		E2

**Table 12 – Rated Characteristics for Measurement Functional Unit**
**7.3.8.2 Front panel**

The elements displayed on the front panel of the transformer unit shall be such as to make them easily visible, readable, and accessible.

The front panel is divided in three areas:

- a) Switch-disconnector operation area.
- b) Earthing switch operation area.
- c) Common area.

All three areas shall be in the same vertical than the cable compartment.

If the operation of the switchgear is vertically oriented, the order of the areas shall be, from top to bottom: Switch-disconnector operation area → Earthing switch operation area



**Application Areas**

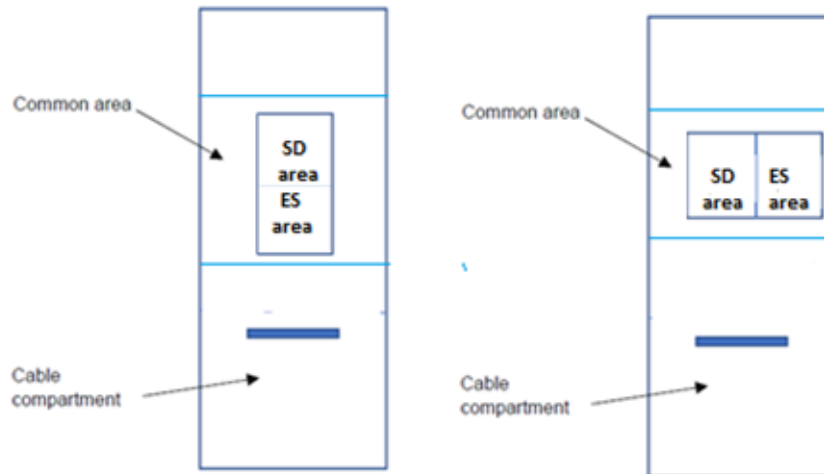
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

If the operation of the switchgear is horizontally oriented, the order of the areas shall be, from left to right: Switch-disconnector operation area → Earthing switch operation area



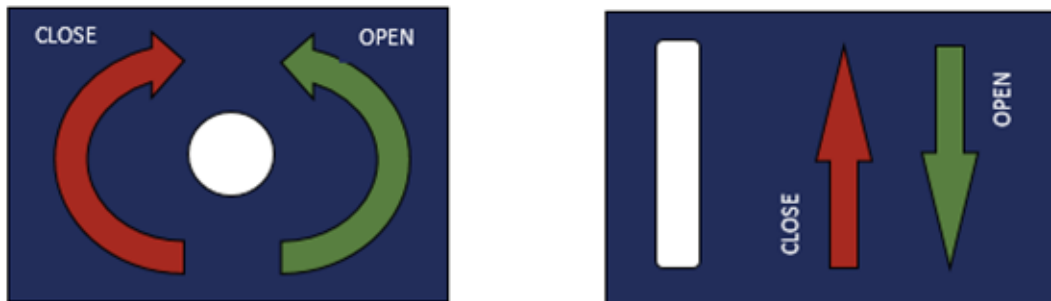
**Figure 35 - Disposition of areas in the front panel in measurement functional unit**

**a) Switch-disconnector operation area**

The background of the switch-disconnector area shall be colored according to RAL 5022-F2.

The switch-disconnector operation area is composed of the following elements:

- point for the operation of switch-disconnector / spring charger, with indication of the operating directions in local language. The operating directions, according to IEC 60447, shall be displayed using the following colors:
  - red 3000 RAL-F2 color corresponding to the close direction of the switch-disconnector.
  - green 6017 RAL-F2 corresponding to the open direction of the switch-disconnector.



**Figure 36 - Point for the operation of switch-disconnector in measurement unit**

The opening of the switch-disconnector by means of a release spring energy device is also accepted. Other alternative operation solutions based on buttons will be considered, subject to Enel approval.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- Indicator showing the position of the switch-disconnector. The indicator shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - black "I" letter on red background 3000 RAL-F2 corresponding to the closed position of the switch-disconnector;
  - black "O" letter on green background 6017 RAL-F2 corresponding to the open position of the switch-disconnector;



**Figure 37 - Indicator for the position of the switch-disconnector in measurement functional unit**

The indicators shall be visible even with the front panel removed.

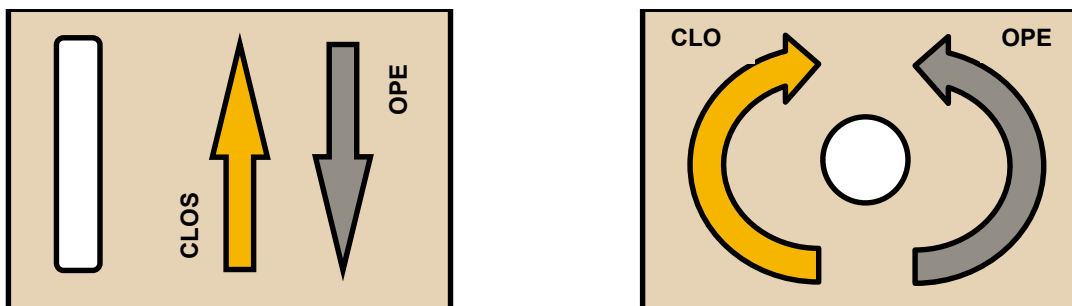
The indicators shall be protected by a transparent window that prevents the entry of foreign objects to prevent its indication from being altered by external manipulation.

**b) Earthing switch operation area**

The background of the earthing switch area shall be colored according to RAL 1015-F2.

The earthing switch operation area is composed of the following elements:

- point for operation of the earthing switch, with indication of the operating directions in local language. The operating directions, according to IEC 60447, shall be displayed using the following colors:
  - yellow color 1021 RAL-F2 corresponding to the close direction of the earthing switch.
  - gray color 7030 RAL-F2 corresponding to the open direction of the earthing switch.



**Figure 38 - Point for the operation of earthing switch in measurement functional unit**

- Indicator showing the position of the earthing switch. The indicator shall be mechanically interconnected with the mobile power contacts and the position shall be displayed using the following symbols:
  - black "I" letter on yellow background 1021 RAL-F2 corresponding to the closed position of the earthing switch.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- black "O" letter on gray background 7030 RAL-F2 corresponding to the open position of the earthing switch.



**Figure 39 - Indicator for the position of the earthing switch in measurement unit**

The indicators shall be visible even with the front panel removed.

The indicators shall be protected by a transparent window that prevents the entry of foreign objects to prevent its indication from being altered by external manipulation.

**c) Common area**

The common area of the front panel is the part of the front panel that contains the elements defined in the switch-disconnector area and the earthing switch area.

In the common area are located the following elements:

- Voltage detection system (VDS);
- Operating sequence nameplate;
- Synoptic scheme;
- Label holder.

**7.3.8.3 Interlocks**

The sequence of maneuvers and interlocks are the same as for the line unit.

**7.3.8.4 Measurement connector and wiring**

The secondary circuits of the voltage and current transformers shall be wired with 2,5 mm<sup>2</sup> copper conductors for the *voltage* circuits and 6 mm<sup>2</sup> for the *current* circuits. The conductors relating to the voltage and current transformers inside the equipment shall be properly spaced from each other to avoid the possibility of an accidental short circuit.

The secondary circuits in gas-air through-out shall be connected to a *female* connector, respecting the connection diagram shown in the Figure 41.

The *female* connector shall be suitable for connection with the *male* connector required by the cable according DMI AC 000160 specification, for connecting the metering units. The connector shall have a sealable protection cover with IP41 degree.

**Application Areas**

Perimeter: *Global*

Staff Function: -

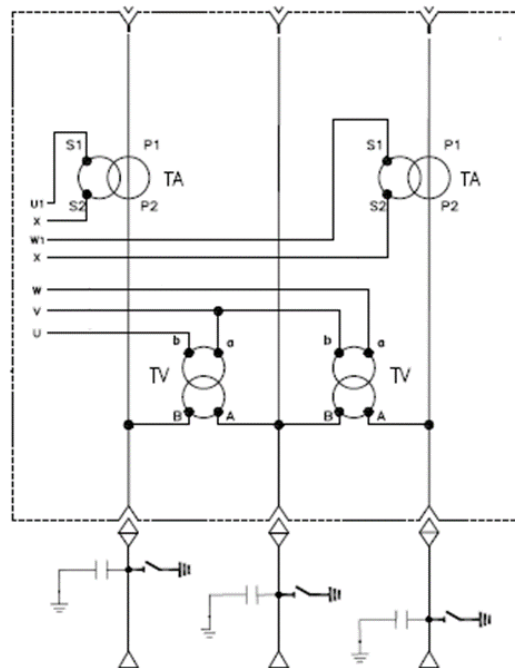
Service Function: -

Business Line: *Enel Grids*



**Figure 40 – Measurement Functional Unit Front Panel Example**

The primary and secondary circuits shall be connected as described in the figure Figure 41.



**Figure 41 – Connection Schemes**

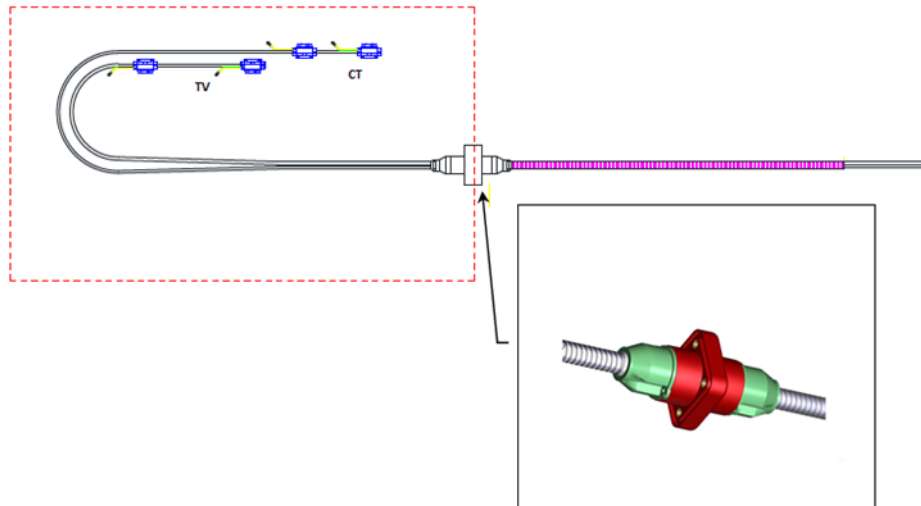
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 42 – Connection Cables**

**7.3.8.5 CT and TV wiring check**

On this equipment the supplier shall have an operating instruction for the production and 100% control of CT and TV cabling.

The checks to be carried out are the following

- Polarity matching between primary and secondary terminals.
- verification of CT and TV dimensions.
- verification of earthing.
- verification of transformer test reports.

The verification of the correspondence of polarity between the primary and secondary terminals shall be carried out with an instrument (oscilloscope) that compares the amplitudes of the signals with those already known from the reports and the manufacturer of the CTs and VTs.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.3.8.6 Nameplate**

The nameplate of the measuring functional unit shall comply with the Figure 43:

LOGO E NOME COSTRUTTORE		CODICE A BARRE	
<b>SCOMPARTO MIT UTENTE DY803</b>		<b>SEZIONATORE DI TERRA ST<sub>1</sub></b>	
DESIGNAZIONE DEL TIPO	DY803/	NORMA APPLICABILE	CEI EN 62271-102
NUMERO DI SERIE		POTERE DI CHIUSURA C.TO C.TO	40 kA
ANNO DI COSTRUZIONE		NUMERO DI CHIUSURE SU C.TO C.TO	5
NORMA APPLICABILE	CEI EN 62271-200	<b>SEZIONATORE DI TERRA ST<sub>2</sub></b>	
TENSIONE NOMINALE	24 kV	POTERE DI CHIUSURA C.TO C.TO	2,5 kA
FREQUENZA NOMINALE	50 Hz	NUMERO DI CHIUSURE SU C.TO C.TO	5
TENSIONE DI TENUTA NOMINALE AD IMPULSO	125 kV	<b>N.2 TRASFORMATORI DI CORRENTE</b>	
TENSIONE DI TENUTA NOMINALE A FREQ. DI ESERCIZIO	50 kV	CONSTRUTTORE TA	
CORRENTE TERMICA NOMINALE	630 A	SIGLA	
CORRENTE DI BREVE DURATA NOMINALE	16 kA	RAPPORTO DI TRASFORMAZIONE	A/A
CORRENTE DI PICCO NOMINALE	40 kA <sub>ca</sub>	PRESTAZIONE E CLASSE	VA/d
DURATA NOMINALE DI C.TO C.TO	1 s	CORRENTE MAX. PERMANENTE DI RISCALDAMENTO	A
QUANTITÀ SF <sub>6</sub>	kg	FATTORE DI SICUREZZA	15
CLASSIFICAZIONE D'ARCO INTERNO	IAC	MATRICOLE	
TIPO DI ACCESSIBILITÀ	AF	<b>N.2 TRASFORMATORI DI TENSIONE</b>	
CORRENTE DI PROVA D'ARCO	16 kA	CONSTRUTTORE TV	
DURATA DELLA CORRENTE DI PROVA D'ARCO	0,5 s	SIGLA	
PESO TOTALE	kg	RAPPORTO DI TRASFORMAZIONE	V/V
<b>IMS</b>		PRESTAZIONE E CLASSE	VA/d
NORMA APPLICABILE	CEI EN 62271-103	FATTORE DI SICUREZZA	15
DURATA ELETTRICA	E3	MATRICOLE	
TENSIONE DI ALIMENTAZIONE	24 V <sub>ca</sub>		

**Figure 43 – Measurement Functional Unit Nameplate (example in Italian)**

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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**7.4 Construction characteristics****7.4.1 Enclosure**

The main busbars shall be installed in ambient air and enclosed in an earthed metal enclosure.

The MV fuse box should be installed inside the gas insulated enclosure or outside of it.

The minimum creepage distance for support insulators shall not be less than 350 mm.

The metal enclosure of all types of compartments shall have an external protection rating of IK08.

The unit enclosure shall have:

- a front panel for closing the busbar cell, removable from the outside only using tools; a window for Thermovision shall be hosted.
- two lateral openings of the busbar compartment for the passage of the busbar conductors shaped to be closed from with a panel (removable also from inside).
- a cover panel of the busbar cell that can be removed from the outside.
- a front door for accessing the equipment on which an opening for the thermovision is made.
- a floor panel made of elements that can be dismantled from the inside.
- two earthing bolts.
- two eyebolts of appropriate size, for lifting the compartment, fixed with M12 screws and arranged diagonally across the top (the nuts for fixing the eyebolts shall be four and welded).
- one cable terminal support for line compartments only.
- 2 slotted holes (one on each side) for lateral coupling with other compartments
- 5 holes in the floor.
- 12 slotted holes, six per side.

If the roof panel has a load-bearing function in the enclosure structure, reinforcing elements shall be provided at the corners of the enclosure to ensure that the compartment remains square when the roof is removed to allow connections.

Each busbar side closure panel shall be provided with a riveted aluminum plate bearing the manufacturer's name.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 44 – Switchgear Constructive Example (Not bidding)**

For CBL, L and M functional units a switch to enable/disable the motorized electrical operation (both from local buttons and from remote control) shall be installed.

The switch shall be lockable and will allow the insertion of a padlock with a shackle up to 6 mm in diameter. The lockable point shall be signalized by a “padlock” symbol.

The switch shall have a nameplate indicating its function in the language that corresponds to the Country in which the switchgear will be delivered.

In addition, next to the switch, there will be the indications O Off (motor disabled) and I ON (motor enabled).



**Figure 45 - Example of switch to enable/disable the electrical operation**

**7.4.2 Dimensions**

The dimensions shall be as prescribed in 7.5.2, only the removable front panels and the door may protrude with accessories (handles, hinges, portholes, plates, etc.) not exceeding 80 mm; no projections are permitted on the roof except for eyebolts.

No protrusions are allowed on the side walls (without busbar compartment cover panels) or on the base to enable the compartments to be replaced correctly.

On the right-side wall of the transformer protection compartment, an opening measuring 450x150 mm. shall be provided to allow the passage of the transformer supply MV cables; its closing panel shall be removable from inside the compartment and effectively in contact with the ground of the enclosure.

Three slotted holes diam. 60 mm. placed at a distance between the axes of 150 mm shall be present.



**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

They shall be equipped with rubber grommets and positioned in such a way that when the cables are used, they are in correspondence with the opening, while otherwise, by turning the panel upside down, the opening is closed; alternatively, two panels of reduced height, one of which blind, are allowed.

On the side closing panels of the busbar cell, or alternatively on the rear closing panel, ventilation devices shall be provided, if necessary, to guarantee the prescribed external protection degree (IP3X).

**7.4.3 Door**

The equipment compartment door shall have the largest possible clear span compatible with the construction solution adopted and, in any case, shall have dimensions of not less than 400 x 850 mm.

The door shall be hinged on the left-hand side of the compartment front.

A window shall be shaped on the door.

An opening shall be provided on the door of the line compartments to allow the passage of conductors for troubleshooting tests on the MV cables.

It shall be in the position shown in the compartment unification table.

This opening shall have dimensions not less than 150x150 mm and shall be closed by a hinged or bolted door that can only be opened from inside the compartment. The edges of the opening shall be fitted with a suitable gasket to prevent damage to the conductors during troubleshooting tests.

The door opening of the Transformer Protection Functional Unit (T) shall have dimensions 910 mm x 530 mm and shall be such that the gas container cannot be seen when the door is open.

**7.4.4 Circuit connections**

The busbars for connecting the compartments, the connection fittings and the connection conductors of the main circuits shall comply with 7.4.19.

All bolts used for main circuit connections shall be protected by electrolytic galvanization.

**7.4.5 Gas evacuation**

The compartment shall be designed in such a way that the gases of any internal arc occurring in the equipment or busbar compartment and inside the gas container are expelled to the outside without transferring the arc and the gas from one compartment to another.

For this purpose, a chimney shall be provided at the rear to expel outwards any gases produced inside.

It is not permitted to expel gas through the trench.

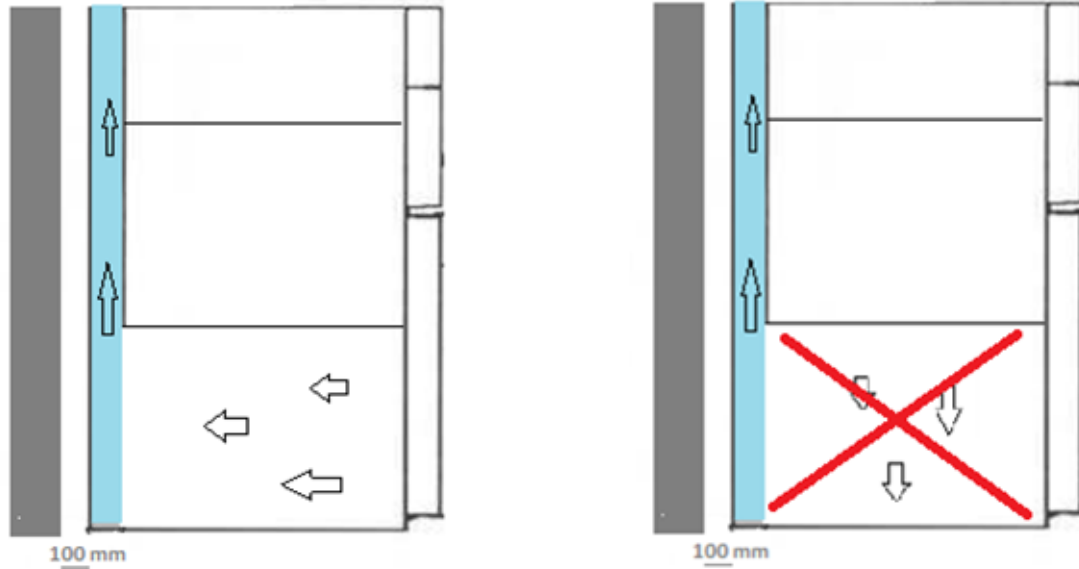
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 46 – Gas Evacuation Principle**

**7.4.6 Thermovision**

Openings shall be made for Lines Functional Unit (L), Transformer Protection Functional Unit (T) and Circuit Breaker Functional unit (CBL) compartments for temperature measurements at the connection points of switchgear and at the arrivals of the MV cables. The earthing of the sliding part shall be guaranteed.

**7.4.7 Earth connections**

The earthing connections shall be made with a copper conductor with a cross-section of no less than 50 mm<sup>2</sup>. The external earthing conductors are as shown in the table and shall be made with a 25x3 mm<sup>2</sup> copper plate. The Figure 47 shows the measurements of the earthing conductors.

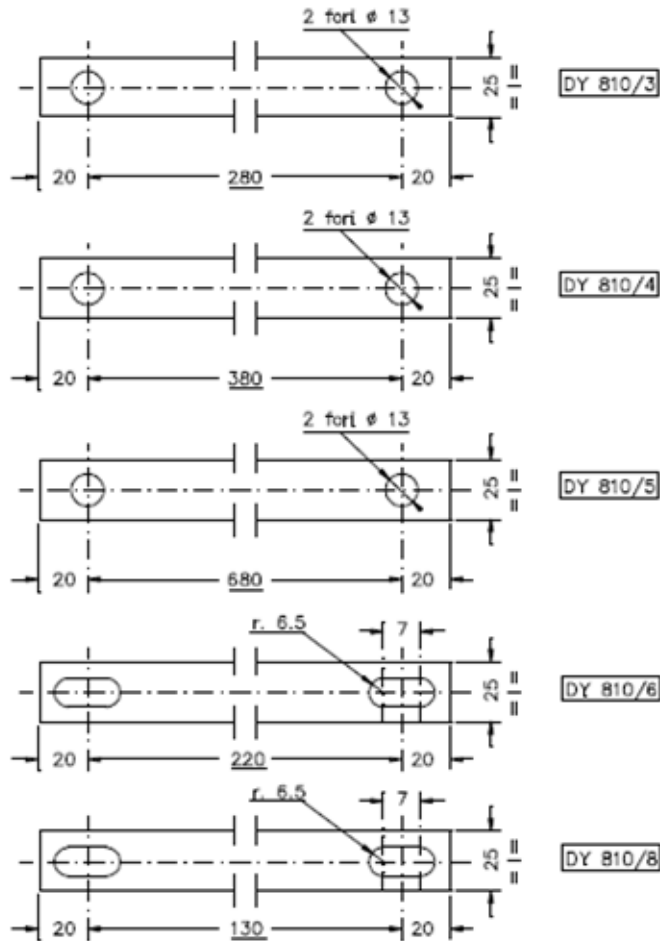
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 47 – Earthing Connections**

The earthing terminals of the various pieces of equipment and the door of the equipment room shall be directly connected to the earthing system; in addition, the moving control parts and other metal masses shall be earthed. The connections between fixed and moving parts shall be made with flexible copper conductors with a cross-section of no less than 30 mm<sup>2</sup>.

On the cable terminals of the line compartments, the earth connections for earthing the metal shields of the cables shall be made using one of the two bolts or screws fixing each terminal and the connecting element with which the terminals are equipped.

In the transformer protection and measurement units, an earthing connection with an M10 screw or bolt, directly connected to the earthing system, shall be provided on the right side, in a central position and close to the base of the cubicle, for earthing the metal shields of the power cables of the transformer or MV user.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

The support elements (guides) of any equipment (measurement transformers, etc.) subsequently installed in the switchboard shall also be directly connected to the earthing system.

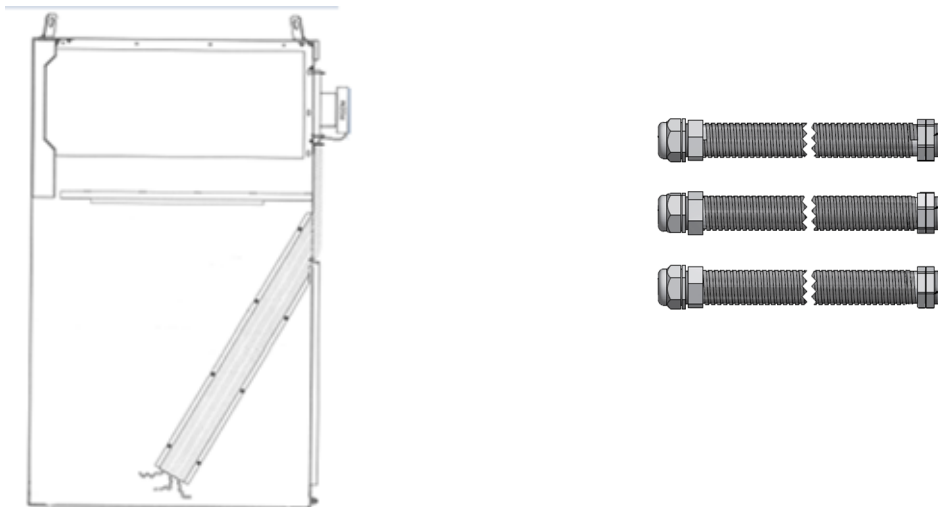
The external earth connection between the cubicles shall be made using the copper bars indicated above and connected to the earth bolts shown 7.4.19.

**7.4.8 Busbar segregation**

The segregation between the busbar cell and the MV cable terminal cell shall be achieved by means of the enclosure of the SD and its fixing parts; this segregation (diaphragm) shall ensure, in addition to the IP 2X degree of protection.

**7.4.9 Cable compartment**

The line and CBL units shall be provided with no. 3 passage pipes with an internal diameter  $\geq 22$  mm for the LPIT sensor connection cables from the base of the compartments to the RGDM/RGDAT device, made of flexible metal pipes coated with PVC sheathing, complete with fixing brackets and cut-proof protections at the 6 ends.



**Figure 48 – Cable Compartment**

All units shall be provided with a non-deformable plate on the bottom on which there are 3 holes for conduits for MV terminals with a diameter of 35 to 65 mm.

Small ventilation grids at the bottom of the base are permitted.

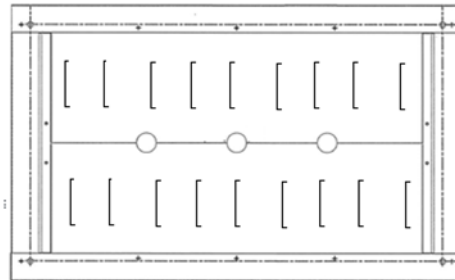
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

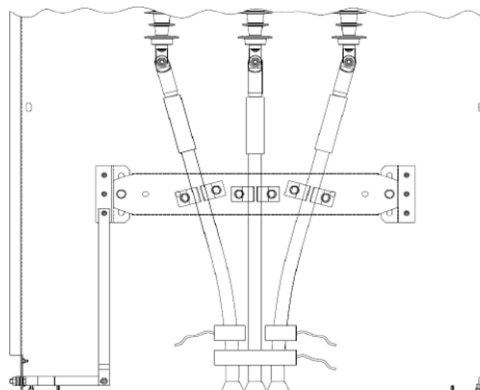


**Figure 49 – Plate on the bottom**

The units shall be fitted with 3 stainless steel brackets.

The clamping screws shall be made of non-magnetic stainless steel.

The adaptor baffles, consisting of two half-shells made of UV-stabilized thermoplastic material, shall be large enough to allow stable and durable clamping of the terminal. The baffles shall be designed in such a way as to be able to clamp diameters in the range min. 20 ÷ max. 60 mm.



**Figure 50 - Stainless steel brackets.**

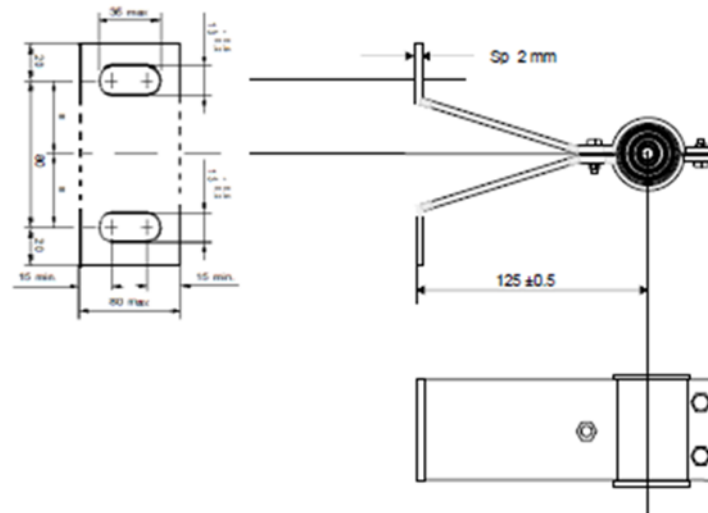
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



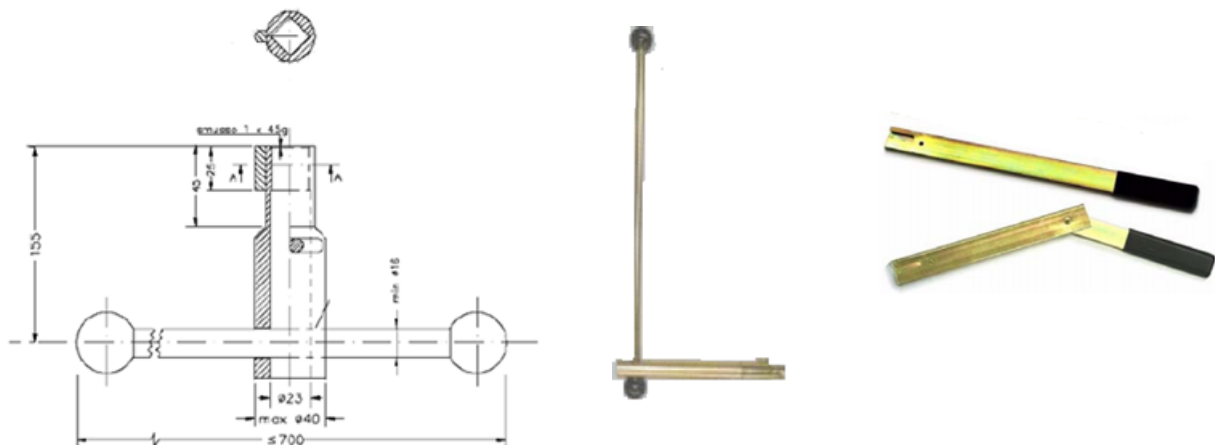
**Figure 51 – Bracket for Indoor**

**7.4.10 Command lever**

During the operations, the end of the command lever shall not stick out from the two sides of the switchgear.

The command lever shall be made in steel, treated with electrolytic zinc-plating according to ISO 2081 (FZn 12 III) standard and shall be stamped with the name of the manufacturer preferably with molding or, in any case, with a permanent indelible solution.

The manual operation of opening and closing of the operating devices shall be carried out using only one command lever for all devices, without the need for additional tools.



**Figure 52 – Examples for Command Levers**

**Application Areas**

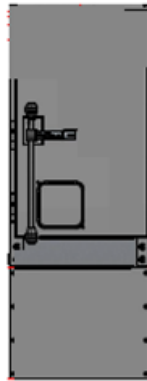
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

It shall be possible to place the command lever on the door of the cable compartment, as shown in the Figure 53.



**Figure 53 – Command lever placement on the cable compartment door**

**7.4.11 Low-Power Instrument Transformers (LPIT)**

Each phase of the Circuit Breaker Functional Unit (CBL) shall be equipped with Low-Power Current Transformers (LPCT) and Low-Power Voltage transformers (LPVT).

Each phase of the Line Functional Unit (L) shall be equipped with Low-Power Voltage transformers (LPVT).

LPIT shall be compliant with Enel Standard GSCT005. *Technical Characteristics of LPIT for RGDM/RGDAT.*

The connection cables (one per phase, for each line unit) and the related connectors, considered an integral part of the LPIT, shall comply with the GSCT005 specification, and integrated into the equipment, exiting near the RGDAT/RGDM support, with sufficient length available (the cables shall exit the compartment for 30 cm).

The secondary terminations of the LPVT intended to be connected to the ground shall be connected to the compartment ground inside it.

**7.4.12 Voltage Detecting System**

Each functional unit shall be equipped with a voltage detecting system (VDS) LMR type according to IEC 61243-5.

VDS shall be separable system with portable voltage indicators.

In line functional unit and circuit breaker functional unit and additional VDS for Busbar voltage shall be installed.

For construction requirements see §7.9.

The busbar VDS must be supplied without voltage-free lamps.

The busbar bushings shall be covered to be protected from direct contact.

On the VDS shall be indicated the marking of the phases L1, L2, L3.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.4.13 Protective coating**

The metal carpentry shall be painted with a paint conforming to series ISO 12944 and for corrosivity class C3 and durability HIGH.

No manual painting process is allowed.

New equipment shall have the front of the manual and electrical control in green (RAL code to be defined in agreement with Enel).

To check the performance of the painting system, a test according to IEC 60068-2-52 with method 5 shall be performed.

As an alternative it is possible to use pre-galvanized steel type EN 10346 with coating thickness > 200 [g / m<sup>2</sup>] except for the cable compartment door and front panel. In any case the type test indicated above shall be performed.

The ferrous parts of the operating controls shall be protected by an electrolytic coating of 9 μm of zinc, or alternatively in stainless steel.

Mounting nuts and bolts and small accessories, unless otherwise specified, shall be protected with electrolyte zinc Fe III Zn EN ISO 4042.

Alternative solutions/tests to demonstrate the equivalent suitability in this kind of environment can be proposed by the manufacturer and are subject to Enel approval.

**7.4.14 Insulators**

The insulators shall be made as shown in the Figure 54. The insulating parts shall be made of organic material, while the inserts shall be made of brass or electrolytically galvanized steel Fe/Zn25/C/2A, according to ISO 2081.

The rated characteristics of the insulator shall be:

Dielectric test	[kV]	163
Minimum creepage distance	[mm]	350

**Table 14 – Insulator main characteristics**

Each specimen shall be marked with the manufacturer's code for each series of identical insulators, the manufacturer's trademark, and the year of manufacture.



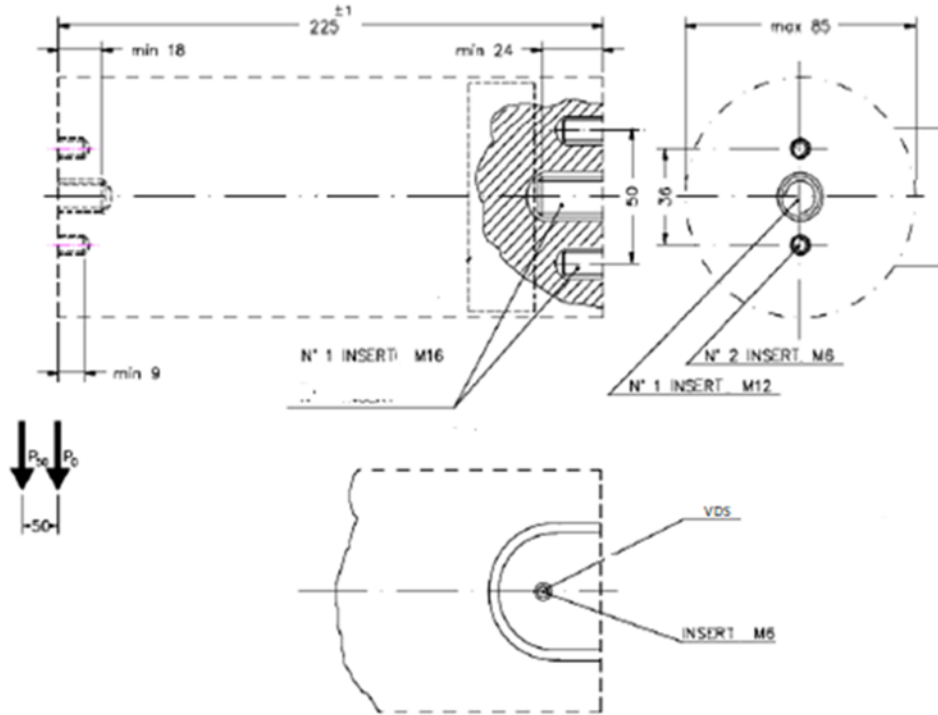
**Application Areas**

Perimeter: *Global*

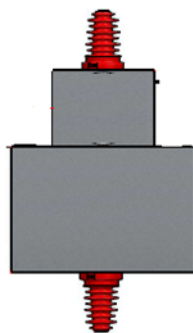
Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 54 – Insulator Dimensions**



**Figure 55 – example of insulator assembly**

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids***7.4.15 Nameplates****7.4.15.1 Rating plate and fluorinated gases plate**

The switchgear shall be provided with a rating plate which shall contain the information according to Table 101 of IEC 62271-200, indicating the Enel country code applicable.

The plate shall be made of anodized aluminum or adhesive printed with a laser printer and shall be durable and clearly legible under service conditions.

In reference to the European regulation regarding fluorinated greenhouse gases, the switchgear will include nameplates that comply in number, content, position and characteristics with:

- Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006
- Commission Implementing Regulation (EU) 2015/2068 of 17 November 2015 establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and of the Council, the format of labels for products and equipment containing fluorinated greenhouse gases.

**7.4.15.2 Operating sequence nameplates and synoptic scheme**

The switchgears shall be equipped with an operating sequence nameplate on which the sequence of operations to be executed shall be reported, respectively (in local language): close line / transformer output (switch-disconnector closed), the sequence open line / transformer output (safe condition) and sequence to access to the fuses (if applicable).

In addition, a label with the operating sequence in the cable compartment, clearly visible with the access panel removed, indicating the sequence for setting the cable test (showing the sequence of the opening of the earthing switch with the cable compartment access door removed).

The synoptic scheme of each single functionality (transformer or line unit) shall be displayed and shall be positioned in the front panel part of each unit, so that it is clearly visible under service condition.

**7.4.15.3 Signal masks on the operating places**

On each line and transformer protection upright, in correspondence of each manual operating place, signal masks for the position of the devices and the indication of the movement direction for the execution of the operations shall be provided.

**7.4.15.4 Warning nameplate for the switchgear drilling**

Each switchgear shall have circular nameplates, visible from all accessible sides during service, indicating the prohibition to use a drill, or similar tool, to avoid the perforation of the gas-filled compartment

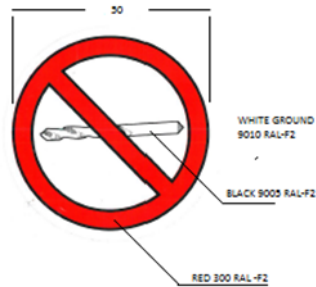
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 56 – No to use a drill**

**7.4.15.5 Label holder**

Every functional unit shall have a label holder with a transparent window with dimensions of 120x50 mm.

**7.4.15.6 Marks of the phases**

In correspondence with bushings the L1 - L2 - L3 signals shall be applied to identify the three different phases.

**7.4.15.7 Warning plate**

Every functional unit shall have a warning plate on the access door to the cable compartment, clearly visible in service condition, with the following characteristics:

- Triangle background: yellow.
- Arrow and triangle outline: black.
- Plate: Adhesive or attached to the door with rivets in stainless steel, aluminum or 3 mm thick plastic.



**Figure 57 – Electric shock hazard**

**7.4.16 Maintenance**

The operating devices shall be equipped, if necessary, with a manual, in accordance with the provisions of point 10.4 of standard IEC 62271-1, which shall contain the maintenance procedures to be observed (e.g. grease on certain parts of the control), according to the type of device and the interval in which they shall be carried out.

The appliance shall be maintenance-free for the first 36 months after delivery. Subsequent maintenance shall be carried out at intervals of not less than 36 months.

**Application Areas**

Perimeter: *Global*

Staff Function: -

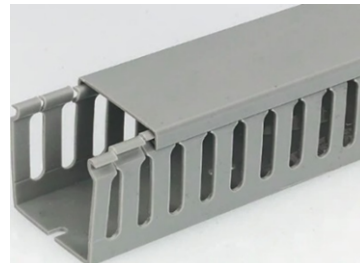
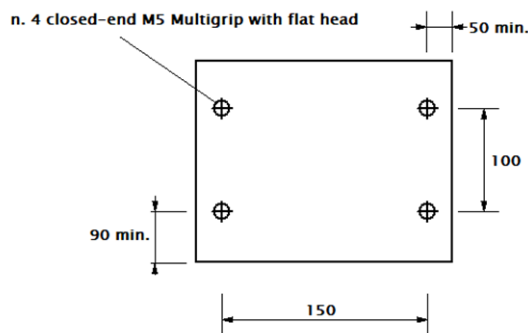
Service Function: -

Business Line: *Enel Grids*

**7.4.17 Support for the fault detector device and cable duct**

In the upper part of each line unit a support shall be provided for the fault detector device (as shown in Figure 58), located in its same vertical projection. These supports shall be external and shall allow the removal of the command protection shell without being removed.

Always in the upper part of the switchgear, a cable duct shall be provided for the external wiring of the cables that connect the motor and the fault detector to the UP.



**Figure 58 - Support for the fault detector device and cable duct**

**7.4.18 Electrical Command**

**7.4.18.1 Electric motor**

The equipment will be operated by an electric motor, suitable for continuous service, having the following characteristics:

Supply voltage	[V <sub>cc</sub> ]	24 +20% -15%
Power consumption at full speed	[W]	≤ 300
Degree of protection		≥ IP3X

**Table 13 - Characteristics of the electric motor**

**7.4.18.2 Electric command of the circuit breaker**

The CB command must have the following functional characteristics:

- the motorization circuit must not absorb any current when it is in the stand-by state;
- the excitation time of the electric control must be such as to provide self-latching with a command pulse lasting no more than 300 ms;
- when the power supply to the motor circuit is missing, the fallout of all self-retainers must be verified;
- In case of padlock insertion power supply to electric maneuvers shall be cut out.

An electrical interlock must allow the operation of the motor only when the earth blades are completely open.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

In case of manual control of the line or earthing switches, the insertion of the operating lever must prevent the electrical and manual controls of the switch; this interlock must as soon as the lever goes to engage the socket of any of the shafts.

**7.4.18.3 Electric command of the switch-disconnector**

The kinematic mechanism of the line disconnector must not be energy storage.

Functional characteristics:

- no component shall have stable positions with spring charged.
- the stability of the switch-disconnector contact position must be guaranteed until the spring has accumulated enough energy to operate.
- if a power failure occurs during any operation, before the spring will have accumulated energy, the system must allow the kinematic mechanism to be reset so that the control lever can be engaged.
- the motorization circuit shall not absorb any current when it is in the stand-by state.
- if the motor circuit has no supply voltage, no command must be memorized;

An electrical interlock shall allow the motorized operation only when the earthing blades are fully open. In case of manual command, the insertion of the lever shall prevent the motorized operation; such interlock must already act before the end of the lever engages on the tang of whatever operating shafts. This condition can be realized with both a mechanical (decoupling the gear motor) and electric solution (cutting the power of the motor).

The input impedance of the command circuit must be in the range of 5-5000  $\Omega$ .

**7.4.18.4 Connections**

The energy for the motorized control is supplied by power supply housed in the peripheral unit for remote control of the secondary substations (UP).

The supply circuits for the motors ( $\pm M$ ) and for the auxiliaries ( $\pm A$ ) shall remain separate and isolated from each other and are protected by different bipolar protections in the power supply.

To show the open position of the switch-disconnector in the transformer unit, a 2x1,5 mm<sup>2</sup> LV cable with a length of 8 m with characteristics indicated in table shall be provided.

**7.4.18.5 Internal wiring**

For internal wiring shall be used wire sections suitable for the correct operation of the equipment.

The end of each connection shall be equipped with pre-insulated terminals suitable for the type of connection required (faston, cylindrical, eyelet, etc.), identification marks, as well as reference to the wiring diagram.

Each cable passage hole shall be equipped with a suitable cable gland.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.4.18.6 Connectors**

To interface the electrical control circuit with the external remote unit, it is necessary to provide the fixed part of a circular connector, onto which the detachable connector of the type shall be inserted.

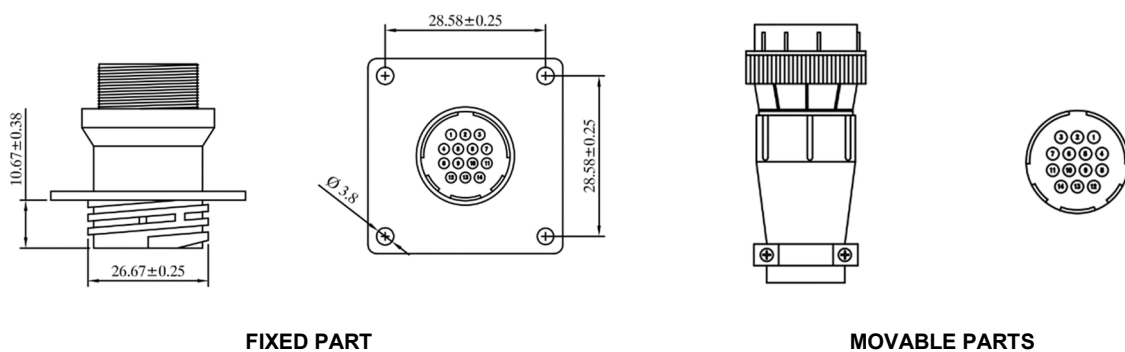
The coupling of the parts shall be ensured by means of a quick-release screw ring nut.

The fixed part shall be made of insulating material with dielectric characteristics.

The fixed part of the connector shall be accompanied by a cap (anti loss type); the detachable ones shall have cable clamps.

The position of the connector shall be positioned on the corresponding of the line unit and once the detachable part is connected the cable shall not interfere with any of the switching or signaling elements of the control equipment.

The cable does not have to be supplied.



**Figure 59 - Connectors at**

The wiring diagram of the cables should be as follows:

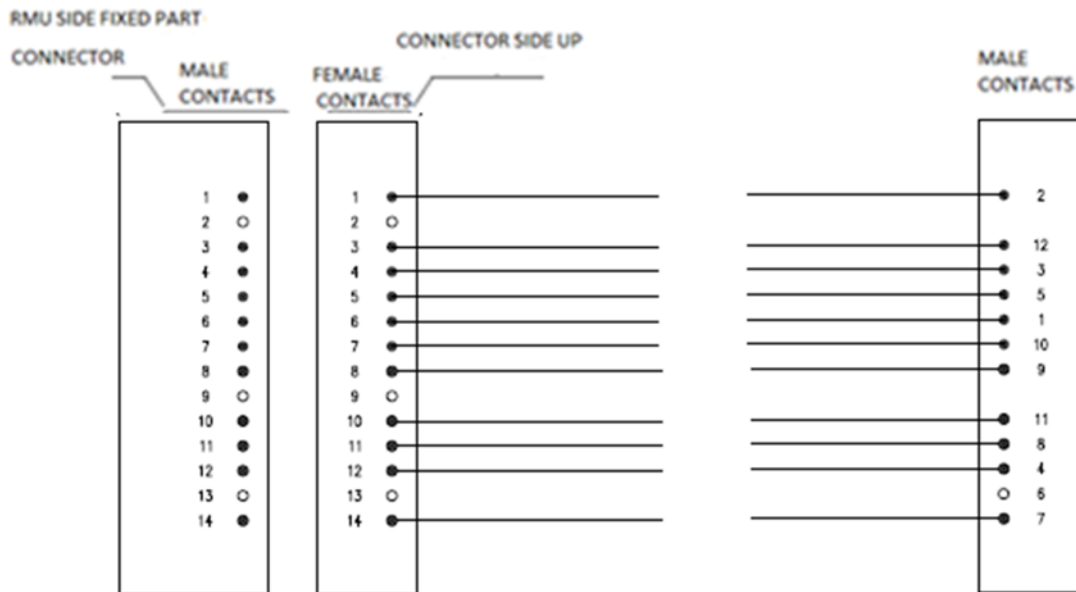
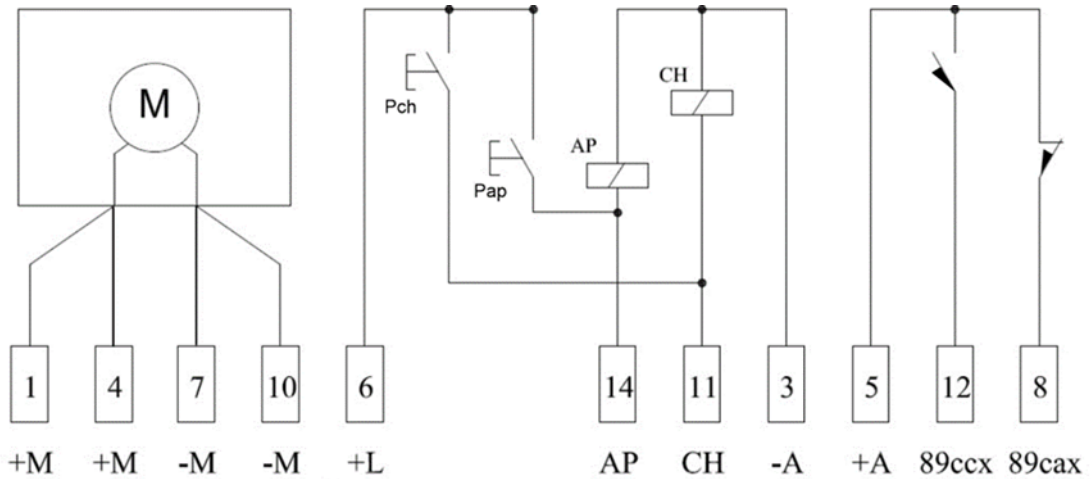
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 60 - Electric scheme of the switch-disconnector command**

1	+M	Motor supply voltage (+24 Vcc)	8	89cax	Signal opening position switch-disconnector
2		Not used	9		Not used
3	- A	Common (-24 Vcc) commands	10	- M	Motor supply voltage (-24 Vcc)

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

4	+ M	Motor supply voltage (+24 Vcc)	11	CH	Closing command
5	Com TS	Common position signals switch-disconnector	12	89ccx	Signal closing position switch-disconnector
6	+ L	Local commands supply (+24 Vcc)	13		Not used
7	- M	Power supply (-24 VDC) motor	14	AP	Opening command

**Table 14 - Pin connector motorisation side**



**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

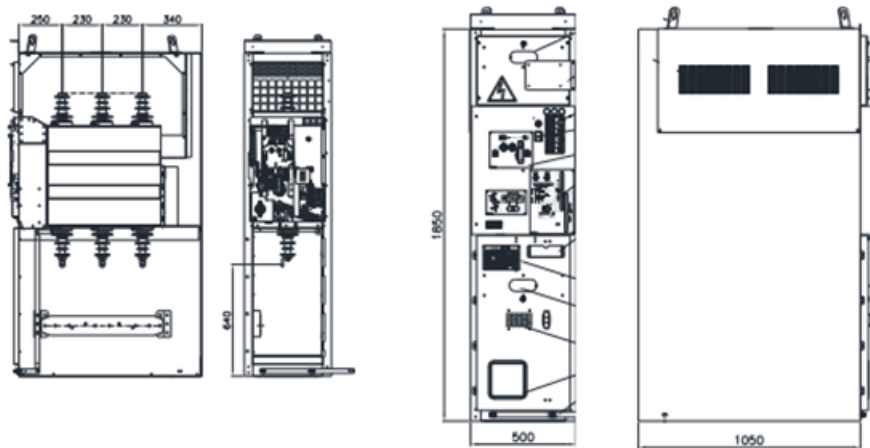
Business Line: *Enel Grids*

1	+ L	Local commands supply (+24 Vcc)	7	AP	Opening command
2	+ M	Motor supply voltage (+24 Vcc)	8	CH	Closing command
3	+ M	Motor supply voltage (+24 Vcc)	9	89cax	Signal opening position switch-disconnector
4	89ccx	Signal closing position switch-disconnector	10	- M	Power supply (-24 VDC) motor
5	Com TS	Common position signals switch-disconnector	11	- M	Power supply (-24 VDC) motor
6		Not used	12	- A	Common (-24 Vcc) commands

**Table 15 - Connector Peripheral Unit side**

**7.4.19 Drawings and dimensions**

**7.4.19.1 CBL UNIT**



**Figure 61 - UNIT CBL TYPE A**

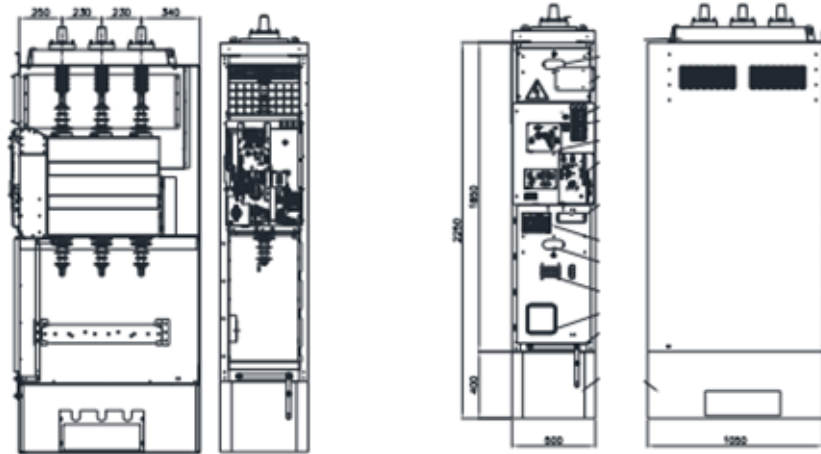
**Application Areas**

Perimeter: *Global*

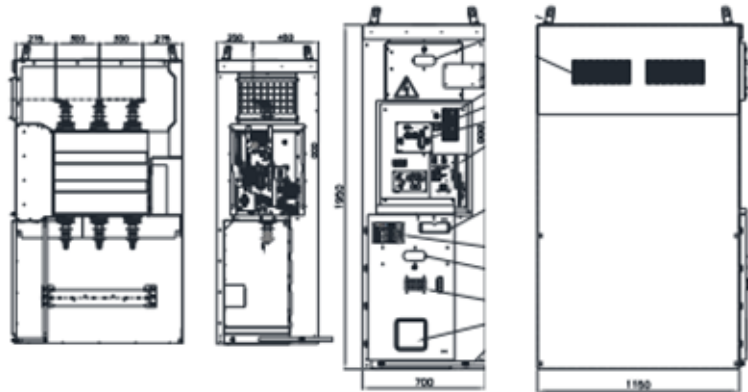
Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 62 - UNIT CBL TYPE B**



**Figure 63 - UNIT CBL TYPE C**

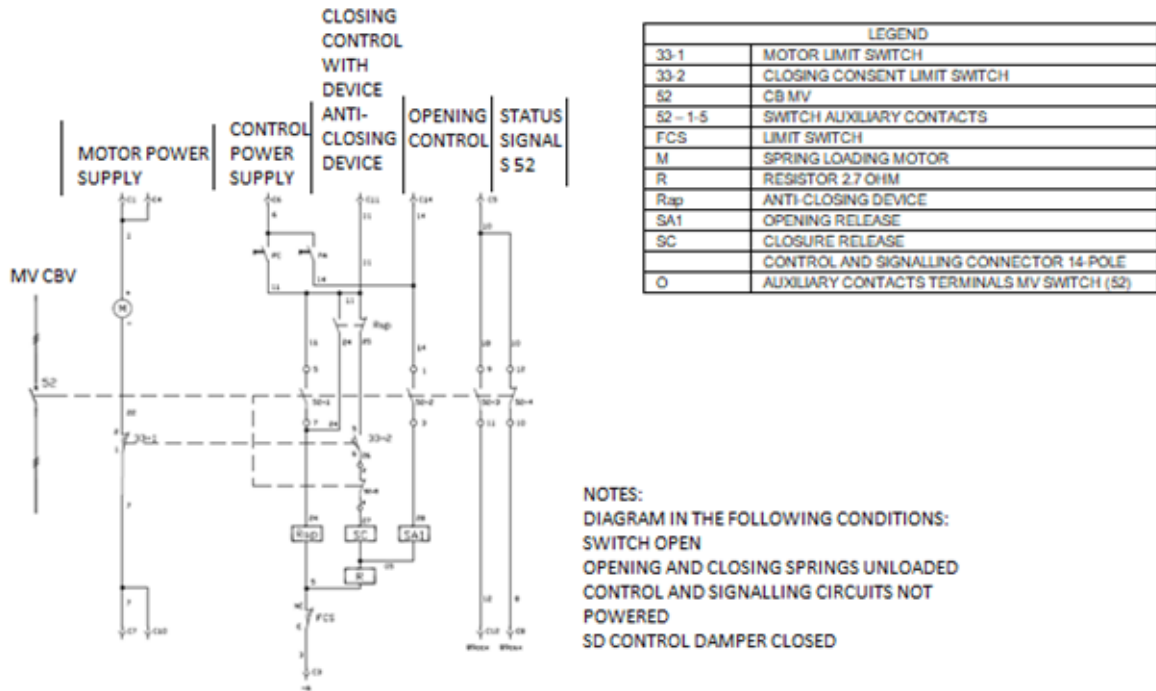
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 64 – Control diagram**

The units shall have the width as indicated in the table:

TYPE		COMPARTMENT WIDTH mm
A	LINE	500
B	LINE UP	500
C	LINE	700

**Table 16 - Dimensions**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

7.4.19.2 RC UNIT

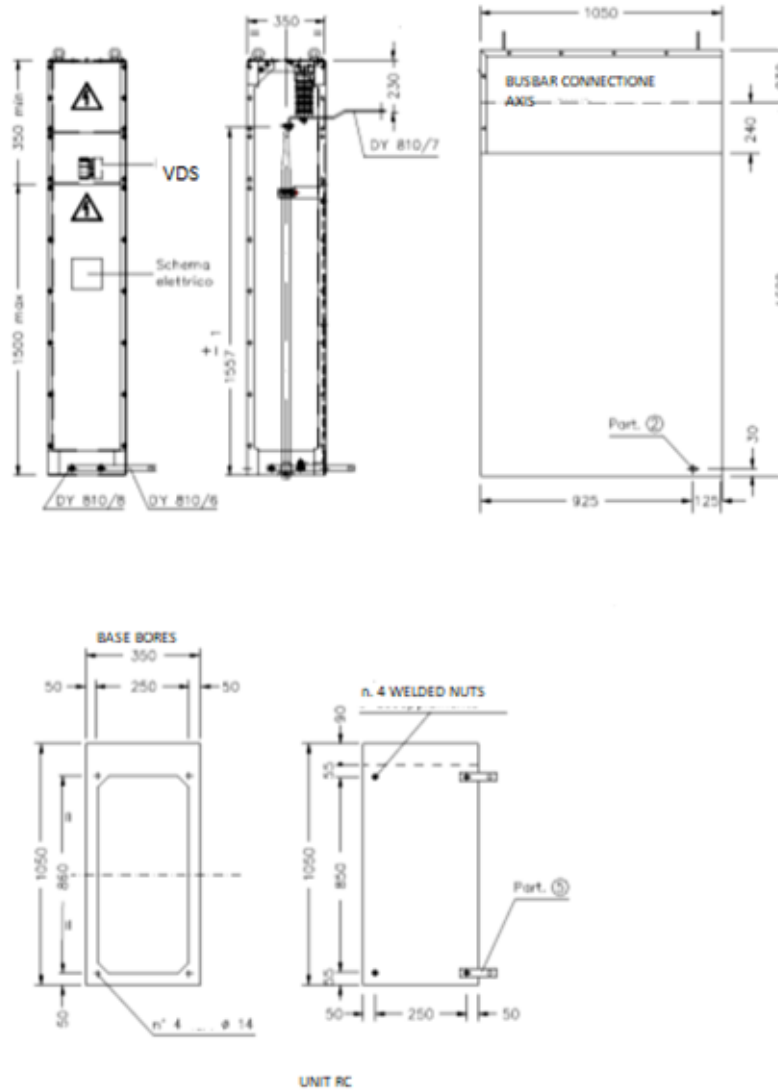


Figure 65 - Unit RC

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

7.4.19.3 L UNIT

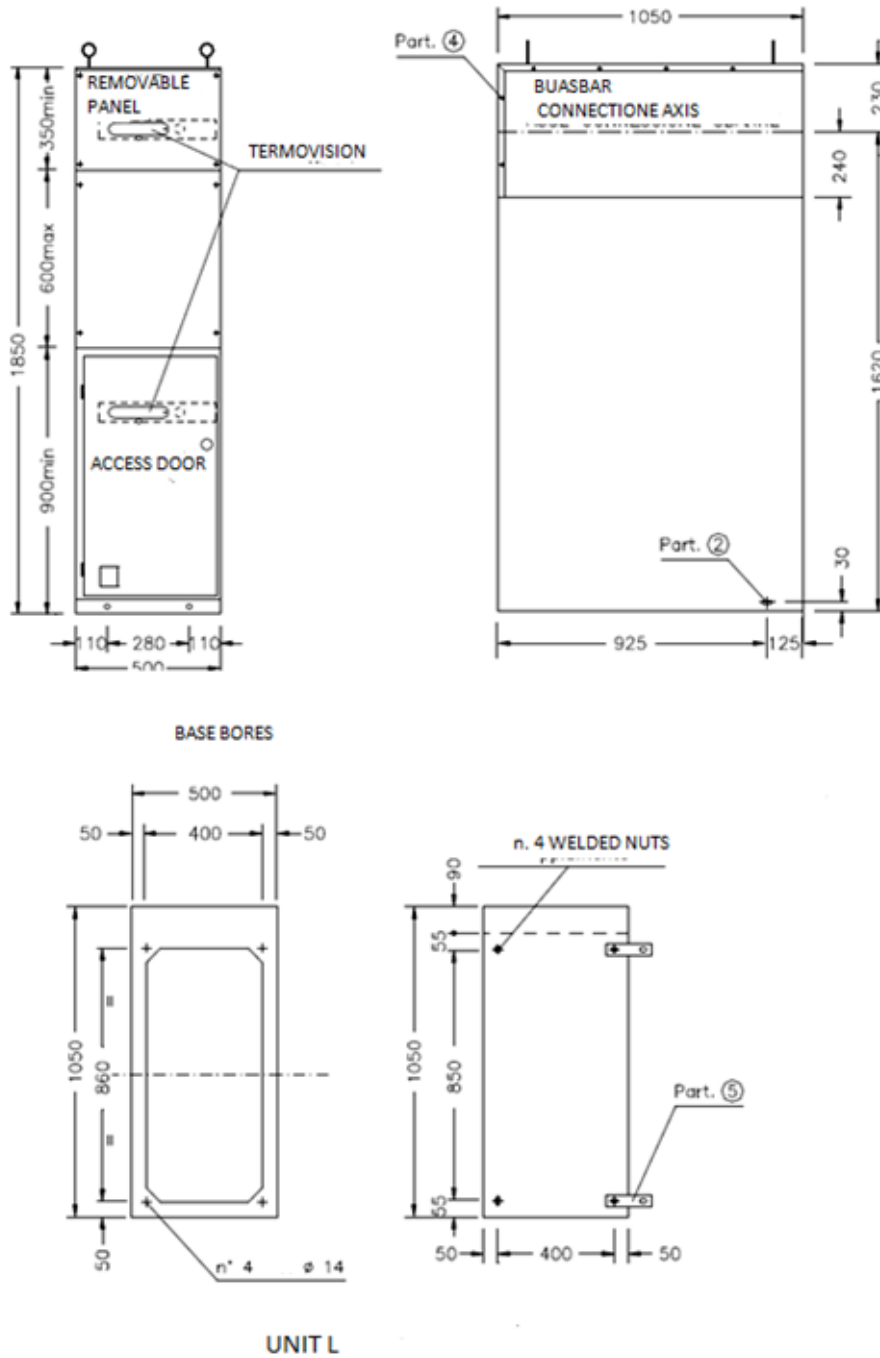


Figure 66 - L-Unit dimensions

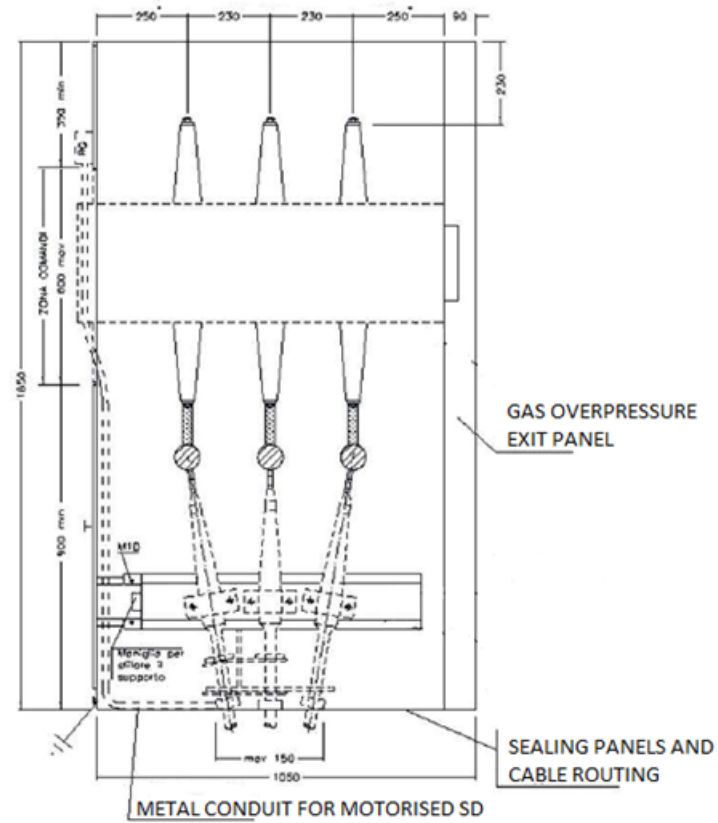
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 67 - L-Unit internal dimensions**

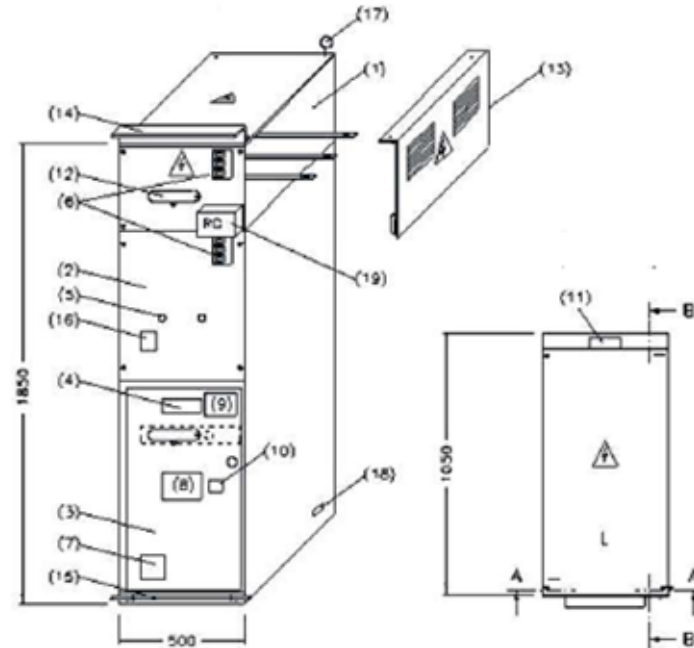
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



- 1 MAIN BUSBAR COMPARTMENT
- 2 SD COMPARTMENT
- 3 MT TERMINAL COMPARTMENT
- 4 INSPECTION WINDOW
- 5 SD AND ES OPERATING SEATS
- 6 VOLTAGE PRESENCE DETECTOR
- 7
- 8 OPERATING SEQUENCE AND SYNOPTIC DIAGRAM PLATE
- 9 EQUIPMENT RATING PLATE
- 10 CARD HOLDER
- 11 SAFETY VALVE FOR OVERPRESSURE
- 12 THERMOVISION
- 13 BUSBAR COMPARTMENT END PANEL
- 14
- 15 COPPER PLATE FOR EARTHING
- 16 EARTHING DISCONNECTOR PLATE
- 17 LIFTING EYEBOLTS
- 18 SLOT FOR COUPLING
- 19 RGDAT FIXING PLATE

THE EQUIPMENT SHALL BE EQUIPPED WITH:

- N. 3 CONNECTIONS OF FLEXIBLE TINNED COPPER BRAID WITH A MINIMUM CROSS-SECTION OF 150 SQ. MM FOR THE CONNECTION BETWEEN THE SD AND THE FUSES;
- 1 DY810/3 CONDUCTOR
- 1 DY810/1 BUSBAR ELEMENTS
- 1 DY810/6 EARTH CONDUCTOR
- 2 EYEBOLTS
- 1 BUSBAR COMPARTMENT END PANEL
- 1 OPERATING LEVER
- HARDWARE REQUIRED FOR FASTENING THE VARIOUS ACCESSORIES AND FOR COUPLING SEVERAL UNITS.
- 1 ATTACHMENT KIT ISOLATED FROM CABLE TERMINALS
- 1 UP CONNECTION CABLE
- 1 BUSBAR COMPARTMENT END PANEL
- N.1 SUPPORT FOR FIXING DUCT
- 2 DEVICE COUPLING PLATES

**Figure 68 - UNIT L**

**Application Areas**

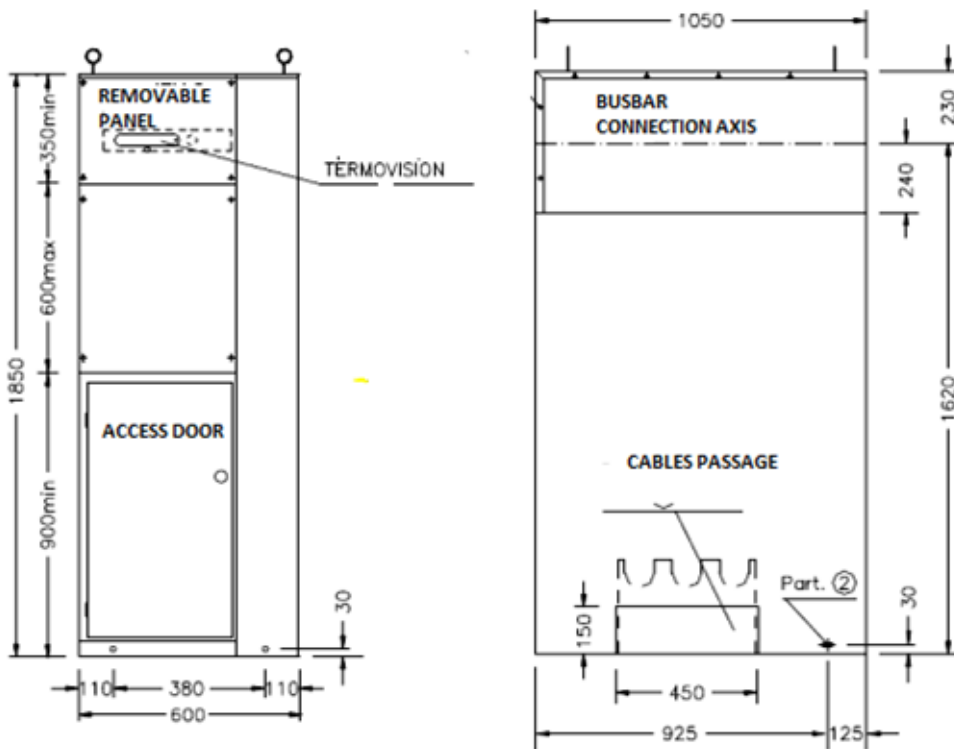
Perimeter: *Global*

Staff Function: -

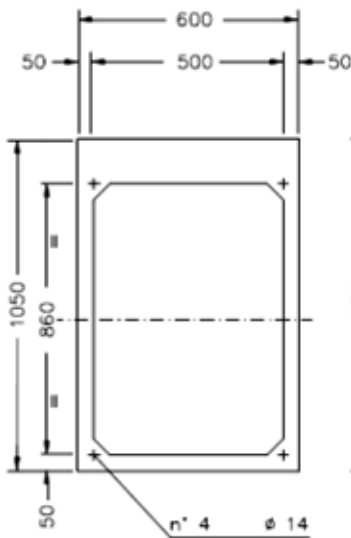
Service Function: -

Business Line: *Enel Grids*

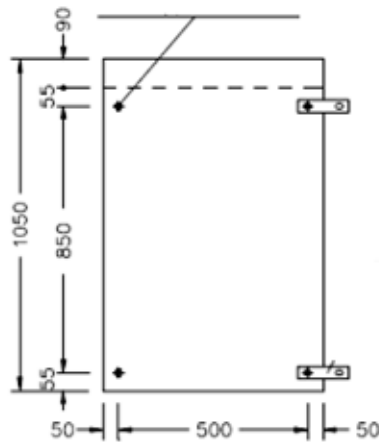
**7.4.19.4 TF UNIT**



**BASE BORES**



**n. 4 WELDED NUTS**





**Application Areas**

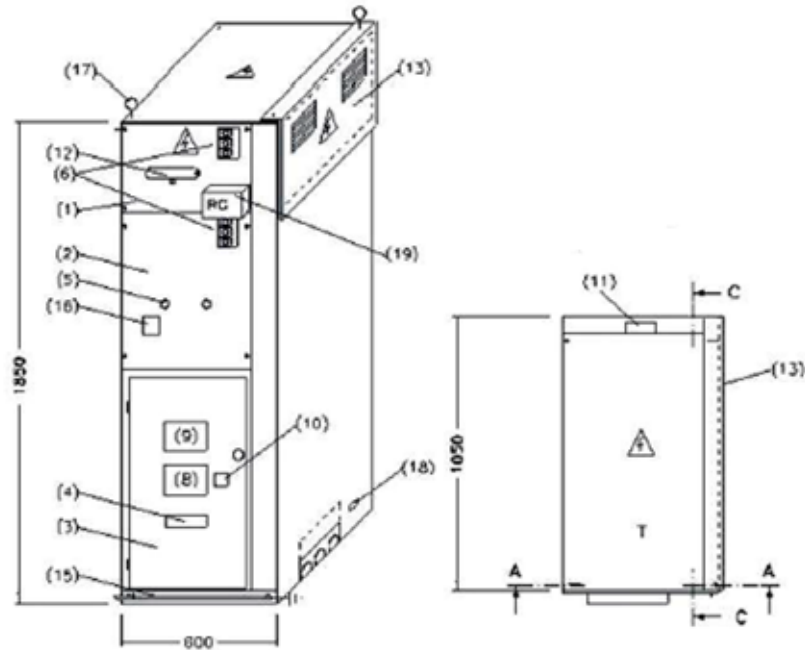
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**Figure 69 - TF module dimensions TF**



- 1 MAIN BUSBAR COMPARTMENT
- 2 COMPARTMENT
- 3 MT TERMINAL COMPARTMENT
- 4 INSPECTION WINDOW
- 5 SD AND ES OPERATING SEATS
- 6 VOLTAGE PRESENCE DETECTOR
- 7
- 8 OPERATING SEQUENCE AND SYNOPTIC DIAGRAM PLATE
- 9 EQUIPMENT RATING PLATE
- 10 CARD HOLDER
- 11 SAFETY VALVE FOR OVERPRESSURE
- 12 THERMOVISION
- 13 BUSBAR COMPARTMENT END PANEL
- 14
- 15 COPPER PLATE FOR EARTHING
- 16 EARTHING DISCONNECTOR PLATE
- 17 LIFTING EYEBOLTS
- 18 SLOT FOR COUPLING
- 19 RGDAT FIXING PLATE
- THE EQUIPMENT SHALL BE EQUIPPED WITH:
- 3 CONNECTIONS OF FLEXIBLE TINNED COPPER BRAID WITH A MINIMUM CROSS-SECTION OF 150 SQ. MM FOR THE CONNECTION BETWEEN THE SD AND THE FUSES;
- 1 DY810/4 EARTH CONDUCTOR
- 2 EYEBOLTS
- 1 BUSBAR COMPARTMENT END PANEL
- 1 OPERATING LEVER
- HARDWARE REQUIRED FOR FASTENING THE VARIOUS ACCESSORIES AND FOR COUPLING SEVERAL UNITS.

**Figure 70 - Unit TF**

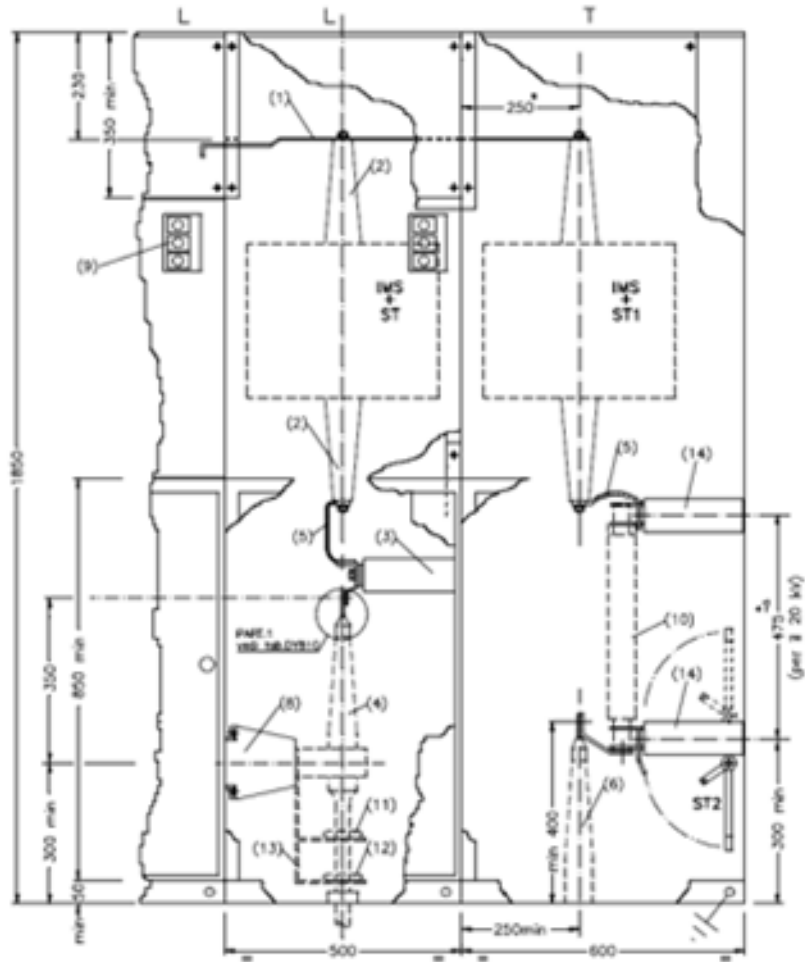
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



- 1 MAIN BUSBAR
- 2 SD THROUGH-INSULATORS
- 3 LOAD-BEARING INSULATORS
- 4 MT CABLE TERMINALS
- 5 FLEXIBLE COPPER BRAID
- 6 MT CABLE TERMINALS
- 7
- 8 MOVABLE PANEL SUPPORTING MT CABLE TERMINALS AND PLUGS
- 9 VDS
- 10 MT FUSE (ADJUSTABLE CLAMPS FOR 10, 12 AND 20 kV)
- 11 2 CTs
- 12 n. 1 HOMOPOLAR CT
- 13 CT SUPPORT
- 14 LOAD-BEARING INSULATOR

**Figure 71 – TF module internal dimensions**

**Application Areas**

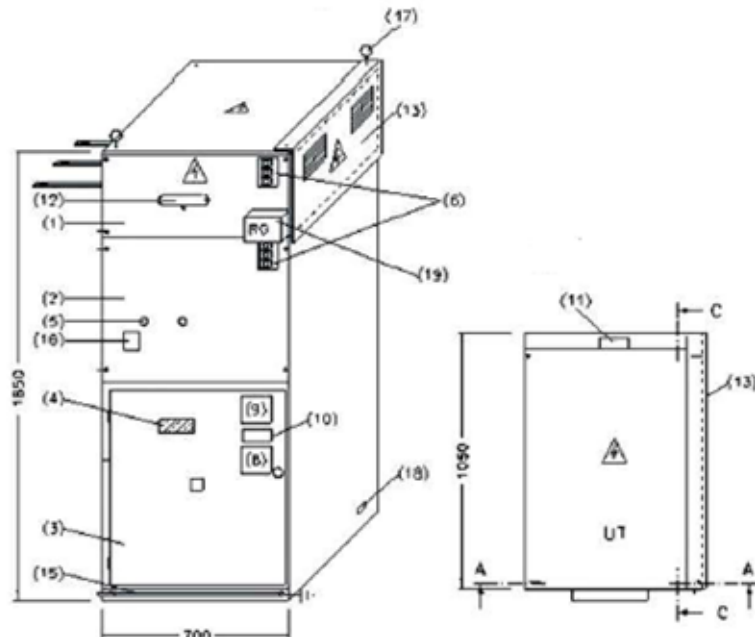
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.4.19.5 M UNIT**



- 1 MAIN BUSBAR COMPARTMENT
- 2 SD COMPARTMENT
- 3 MT TERMINAL COMPARTMENT
- 4 INSPECTION WINDOW
- 5 SD AND ES OPERATING LOCATIONS
- 6 VOLTAGE PRESENCE DETECTOR
- 7
- 8 OPERATING SEQUENCE PLATE AND SYNOPTIC DIAGRAM
- 9 EQUIPMENT RATING PLATE
- 10 CARD HOLDER
- 11 SAFETY VALVE FOR OVERPRESSURE
- 12 THERMOVISION
- 13 BUSBAR COMPARTMENT END PANEL
- 14
- 15 COPPER PLATE FOR EARTHING
- 16 EARTHING DISCONNECTER PLATE
- 17 LIFTING EYEBOLTS
- 18 SLOT FOR COUPLING
- 19 RGDAT FIXING PLATE
- THE EQUIPMENT SHALL BE EQUIPPED WITH:
- 3 CONNECTIONS OF FLEXIBLE TINNED COPPER BRAID WITH A MINIMUM CROSS-SECTION OF 150 SQ. MM FOR THE CONNECTION BETWEEN SD AND THE MEASUREMENT TRANSFORMERS;
- 3 BUSBAR ELEMENTS DY810/2
- 1 EARTHING CONDUCTOR DY810/5
- 1 EARTHING CONDUCTOR DY810/6
- N. 2 BEAMS
- 1 BUSBAR COMPARTMENT END PANEL
- 1 OPERATING LEVER
- 4 FIXING PLATES TA AND TV
- NUTS AND BOLTS REQUIRED FOR FASTENING THE VARIOUS ACCESSORIES AND FOR COUPLING SEVERAL UNITS.

**Figure 72 – M-Unit**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

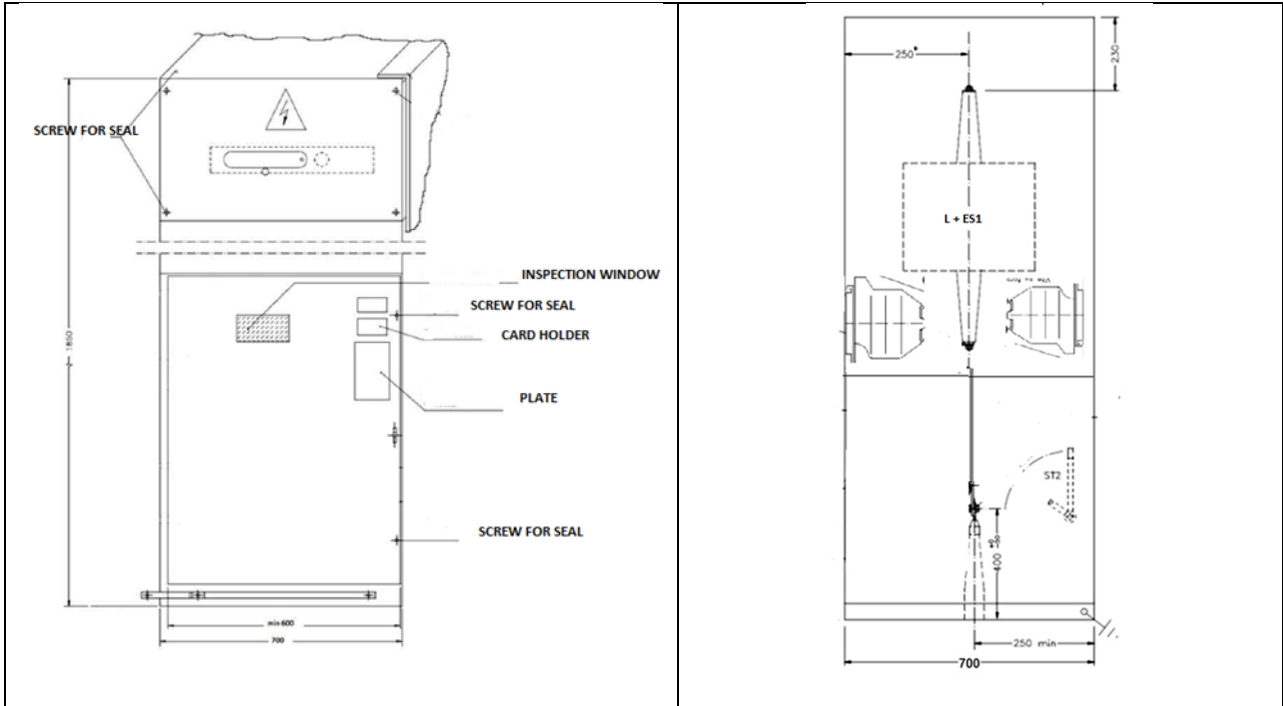


Figure 73 - front Unit M

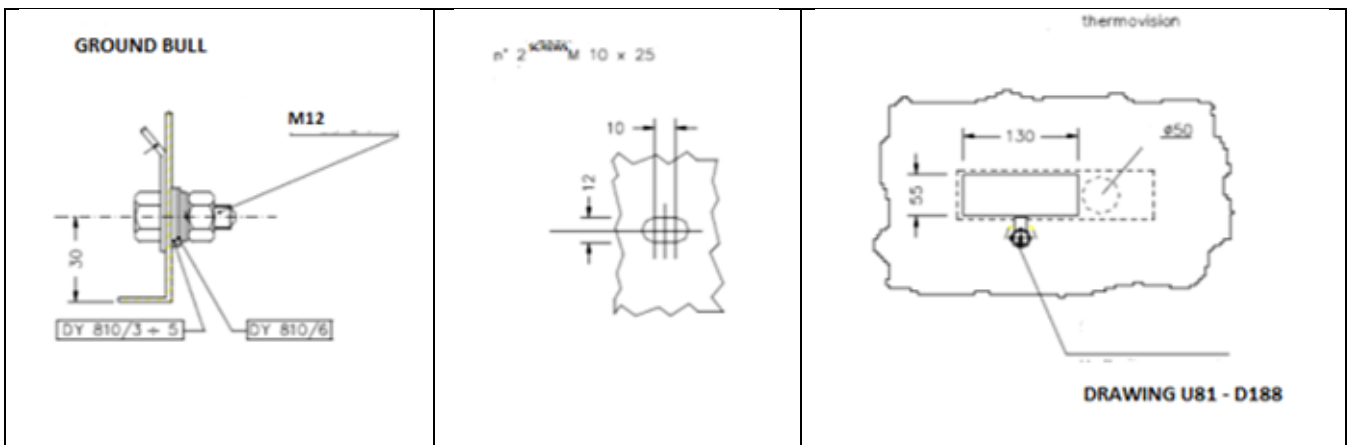


Figure 74 - Earthing connection



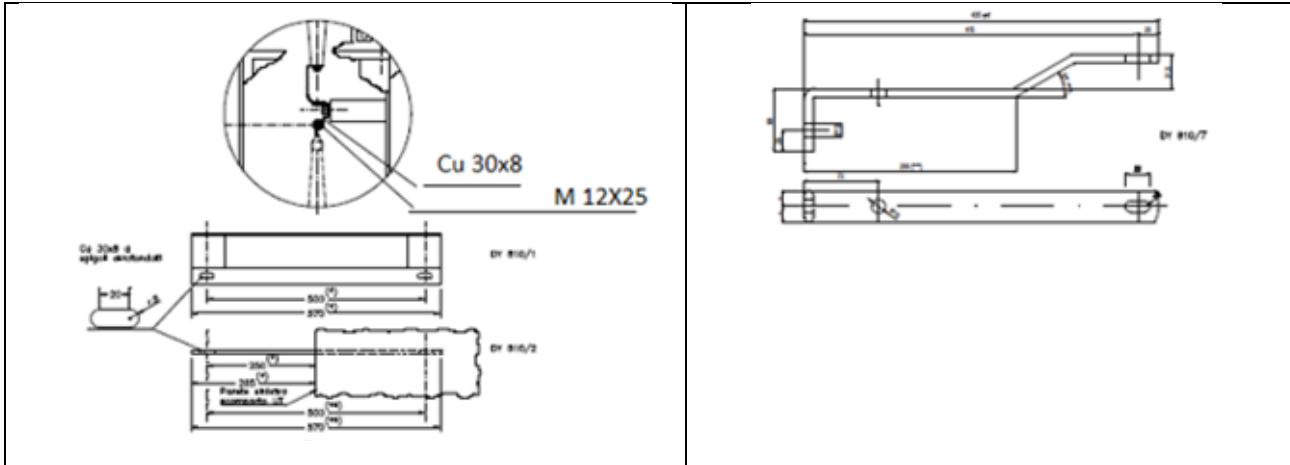
**Application Areas**

Perimeter: *Global*

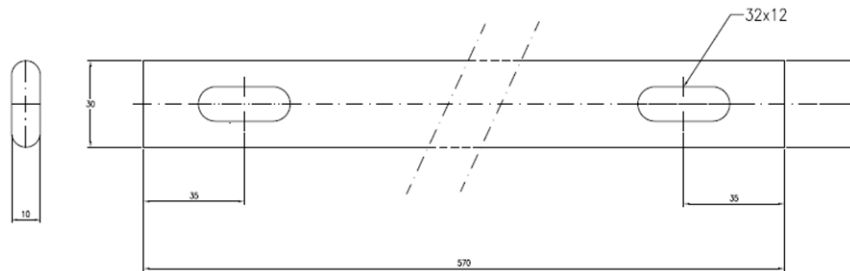
Staff Function: -

Service Function: -

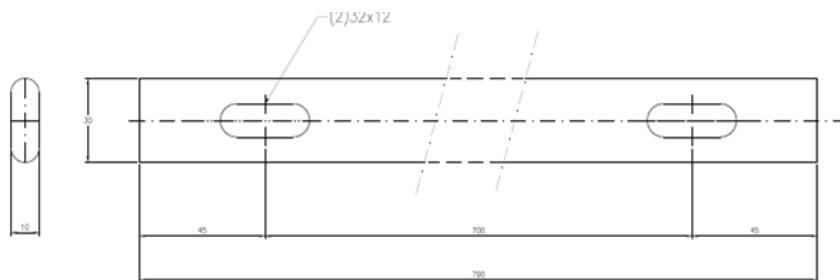
Business Line: *Enel Grids*



**Figure 77 - Internal connection bars**



**Figure 78 – copper bar 570 mm**



**Figure 79 – copper bar 790 mm**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

## 7.5 Testing

All tests described in the following paragraphs shall be performed on the switchgear:

Tests are divided in:

- Type tests and Special test (tests for TCA)
- Routine tests
- Acceptance tests

The tests described in the following paragraphs shall be carried out on the switchgear according to IEC 62271-1 – 62271-100, 62271/102, IEC62271-103, IEC 62271-105 and IEC 62271-200.

Type and special tests will be performed on samples submitted to the TCA.

### 7.5.1 Type tests

TEST	STANDARD	CHAPTER
Visual inspection	GSCM005	
Dielectric tests	IEC 62271-200	7.2
Radio interference voltage (RIV) test	IEC 62271-200	7.3
Measurement of the resistance of the main circuit and auxiliary circuits	IEC 62271-200	7.4
Continuous current test	IEC 62271-200	7.5
Short-time withstand current and peak withstand current tests	IEC 62271-200	7.6
Verification of the protection (IP and IK)	IEC 62271-200	7.7
Tightness tests	IEC 62271-200	7.8
Electromagnetic compatibility tests (EMC)	IEC 62271-200	7.9
Additional test on auxiliary and control circuits	IEC 62271-200	7.10
Verification of making and breaking capacities	IEC 62271-200	7.101
Mechanical operation tests	IEC 62271-200	7.102
Pressure withstand test for gas-filled compartments	IEC 62271-200	7.103
Internal arc test	IEC 62271-200	7-105
Tests to verify the proper functioning of the position-indicating device	IEC 62271-102	7.105
Pressure withstand test for gas-filled compartments	IEC 62271-200	7.103

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

TEST	STANDARD	CHAPTER
Internal arc test	IEC 62271-200	7-105
Tests to verify the proper functioning of the position-indicating device	IEC 62271-102	7.105
Check painting requirements	ISO 12944-6	ISO 12944-6
Verification of the protective coating	ISO 2409	LEVEL 0
Environmental testing	IEC 60068-2-52	METHOD 5
Seismic test	IEC TS 62271-210	Severity level 1 – PGA 0,5 g– CLASS 2
<b>Circuit breaker</b>		
Dielectric tests	IEC 62271-100	7.2
Radio interference voltage (RIV) test	IEC 62271-100	7.3
Measurement of the resistance of the main circuit and auxiliary circuits	IEC 62271-100	7.4
Continuous current test	IEC 62271-100	7.5
Short-time withstand current and peak withstand current tests	IEC 62271-100	7.6
Verification of the protection (IP and IK)	IEC 62271-100	7.7
Tightness tests	IEC 62271-100	7.8
Electromagnetic compatibility tests (EMC)	IEC 62271-100	7.9
Additional test on auxiliary and control circuits	IEC 62271-100	7.10
X-radiation test for vacuum interrupters	IEC 62271-100	7.11
Verification of making and breaking capacities	IEC 62271-100	7.101
Miscellaneous provisions fro making and breaking tests	IEC 62271-100	7.102
Mechanical shock test on fuses	IEC 62271-100	7.103
Demonstration of arcing times	IEC 62271-100	7.104
Short circuit test quantities and procedure	IEC 62271-100	7.106
Terminal-line fault tests	IEC 62271-100	7.107
Additional short-circuit tests	IEC 62271-100	7.108
Additional short -circuit tests	IEC 62271-100	7.109
Out-of-phase making and breaking tests	IEC 62271-100	7.110
Capacitive current tests	IEC 62271-100	7.111
Electrical endurance tests	IEC 62271-100	7.112



**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

TEST	STANDARD	CHAPTER
<b>Switch-disconnector (SD) and Line disconnector (LD)</b>		
Dielectric tests	IEC 62271-102	7.2
Radio interference voltage (RIV) test	IEC 62271-102	7.3
Measurement of the resistance of the main circuit and auxiliary circuits	IEC 62271-102	7.4
Continuous current test	IEC 62271-102	7.5
Short-time withstand current and peak withstand current tests	IEC 62271-102	7.6
Verification of the protection (IP and IK)	IEC 62271-102	7.7
Tightness tests	IEC 62271-102	7.8
Electromagnetic compatibility tests (EMC)	IEC 62271-102	7.9
Additional test on auxiliary and control circuits	IEC 62271-102	7.10
X-radiation test for vacuum interrupters	IEC 62271-102	7.11
Verification of making and breaking capacities	IEC 62271-102	7.101
Operating and mechanical endurance tests	IEC 62271-102	7.102
Low-and high temperature tests	IEC 62271-102	7.104
Tests to verify the proper functioning of the position indicating device	IEC 62271-102	7.105
<b>Earthing switches (ES)</b>		
Continuous current test	IEC 62271-103	7.5
Short-time withstand current and peak withstand current tests	IEC 62271-103	7.6
Verification of the protection (IP and IK)	IEC 62271-103	7.7
Tightness tests	IEC 62271-103	7.8
Electromagnetic compatibility tests (EMC)	IEC 62271-103	7.9
Additional test on auxiliary and control circuits	IEC 62271-103	7.10
X-radiation test for vacuum interrupters	IEC 62271-102	7.11
Making and breaking tests	IEC 62271-103	7.101

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

<b>Switch-disconnector combined with fuses</b>		
Dielectric tests	IEC 62271-105	7.2
Radio interference voltage (RIV) test	IEC 62271-105	7.3
Measurement of the resistance of the main circuit and auxiliary circuits	IEC 62271-105	7.4
Continuous current test	IEC 62271-105	7.5
Short-time withstand current and peak withstand current tests	IEC 62271-105	7.6
Verification of the protection (IP and IK)	IEC 62271-105	7.7
Tightness tests	IEC 62271-105	7.8
Electromagnetic compatibility tests (EMC)	IEC 62271-105	7.9
Additional test on auxiliary and control circuits	IEC 62271-105	7.10
X-radiation test for vacuum interrupters	IEC 62271-102	7.11
Verification of making and breaking capacities	IEC 62271-105	7.101
Mechanical operation test	IEC 62271-105	7.102
Mechanical shock test on fuses	IEC 62271-105	7.103
Thermal test with long pre-arcing time of fuse	IEC 62271-105	7.104
<b>LPVT</b>		
TEST	IEC 61869 TABLE 10 - GSCT005 INTEGRATION TEST	
<b>VDS</b>		
TEST	IEC 61243-5	TABLE A.3
Verification of RGDAT/RGDM calibration with VDS busbar side		
<b>VDIS</b>		
TEST	IEC 62271-213	TABLE 4

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

TEST	STANDARD	CHAPTER
SELF-PROTECTED TRANSFORMER TMA		
Dielectric tests	IEC 62271-200	7.2
Internal arc test	IEC 62271-200	7-105
Short-time withstand current on earth circuits	IEC 62271-200	7.6
Verification of the protection (IP and IK)	IEC 62271-200	7.7
Check painting requirements	ISO 12944-6	ISO 12944-6
Verification of the protective coating	ISO 2409	LEVEL 0
Environmental testing	IEC 60068-2-52	METHOD 5 (only applicable for "basic protection" switchgear)
Seismic test	IEC TS 62271-210	Severity level 1 – PGA 0,5 g– CLASS 2
Voltage transformer	GSCT003	

**Table 17– List of type tests for the switchgear**

**7.5.1.1 Internal arc test**

For the internal arc test on cable compartment, no gas expansion to the cable trench is admitted.

**7.5.1.2 Temperature-rise tests for switch-fuse combinations**

The temperature-rise tests of the switch-fuse combination shall be carried out as follows:

For 24 kV switchgear:

- The test shall be carried out using a set of fuses with a rated current  $\geq 100$  A
- During the test, the power dissipation in the fuse-link will be  $\geq 90$  W
- The minimum current through the fuses shall be 50 A

With these conditions, chapter 6.105.2 of IEC 62271-105 applies.

**7.5.2 Acceptance test and Routine test**

Table shows the list of routine tests to be carried out on the switchgear.

Routine tests shall be carried out at the factory by the manufacturer on all equipment to ensure that the equipment conforms to the type-tested equipment.

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

TEST	STANDARD
<b>Switchgear and controlgear</b>	
Dielectric test on the main circuit	IEC 62271-200-100- 102-103-105
Tests on auxiliary and control circuits	IEC 62271-200-100- 102-103-105
Measurement of the resistance of the main circuit	IEC 62271-200-100- 102-103-105
Tightness tests	IEC 62271-200-100- 102-103-105
Design and visual checks	IEC 62271-200-100- 102-103-105
Partial discharge measurement	IEC 62271-200-100- 102-103-105
Mechanical operation tests	IEC 62271-200-100- 102-103-105
Pressure tests of gas-filled compartments	IEC 62271-200
Tests of auxiliary electrical, pneumatic, and hydraulic devices	IEC 62271-200
Measurement of fluid condition after filling on site	IEC 62271-200
Verification of earthing function	IEC 62271-102
CT and TV wiring check	GSCM005 – 7.3.8.5
<b>LPVT</b>	
Power-frequency voltage withstand tests on primary terminals	IEC 61869-11 TABLE11
Partial discharge measurement	IEC 61869-11 TABLE11
Test for accuracy	IEC 61869-11 TABLE11
Verification of markings	IEC 61869-11 TABLE11
Enclosure tightness test at ambient temperature	IEC 61869-11 TABLE11
Pressure test for the enclosure	IEC 61869-11 TABLE11
Measurement of capacitance and dissipation factor at power frequency	IEC 61869-11 TABLE11 AND GSCT005
<b>VDIS</b>	
Arrangement, assembly, markings, instructions for use	IEC 62271-213 TABLE 6
Conditions on testing points	IEC 62271-213 TABLE 6
Indication	IEC 62271-213 TABLE 6
<b>VDS</b>	
Arrangement assembly, markings, instruction for use	EN 61243-5 TABLE A.3
Clear indication	EN 61243-5 TABLE A.3

Table 18– List of routine tests for the switchgear

All the tests indicated shall be carried out by the supplier on all the samples prepared for the commissioning. For each piece that belongs to the prepared batch, the supplier shall prepare a test report with the results of the tests performed.

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

The acceptance tests shall be repeated by the supplier, under the Distribution Companies surveillance, on a sample chosen randomly among those ones of the batch that has already been successfully tested by the supplier. The tests shall be carried out on samples defined by the sampling plan below

A	1 sample for type
B	At least 1 sample for type
D	Test to be certified on single units by the supplier
K	If the sample is constructed as a unique tank, these tests can be executed on the complete tank with the same sampling plan indicated for the modules

**Table 19- Sampling plan**

TEST	Standard	Sampling plan				
		CBL	TF	L	AT	M
Visual inspection (a)						
Dielectric test on the main circuit (g)	IEC 62271-200- 100- 102-103-105 § 8.2	B	B	B	B	B
Tests on auxiliary and control circuits (b)	IEC 62271-200-102-103-105 § 8.3	B	B	B	B	B
Measurement of the resistance of the main circuit (e)	IEC 62271-200-102-103-105 § 8.4	B	B	B	B	B
Tightness test (D)	IEC 62271-200-102-103-105 § 8.5	B	D	D	D	D
Design and visual checks (a)	IEC 62271-200-102-103-105 § 8.6	D	A	A	A	A
Partial discharge measurement (i)	IEC 62271-200-102-103-105 §§ 8.101	B	D	D	D	D
Mechanical operating tests (c)	IEC 62271-102 -105 §8.101	B	B	B		B
Mechanical operation tests (c)	IEC 62271-200-103- § 8.102	B	B	B		B
Verification of earthing function	IEC 62271-102 § 8.102	B	B	B	B	B
Verification of proactive coating	ISO 2808	B	B	B	B	B

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

Indication of VDIS and VDS (m)	IEC 62271-213 § 7.7 - IEC 61243-5 § 5.11	B	B	B	B	B
Dry-film thickness	ISO 2808	B	B	B	B	B
Verification of the protective coating	ISO 2409	B	B	B	B	B
CT and TV wiring check	GSCM005 – 7.3.7.6					B

**Table 21- Acceptance test list**

a	Including the verification of the gas –filled compartment s' degree of protection (IP).
b	1 kV power frequency testing voltage (10 kV for trip coil) during 1 second.
c	perform 5 manual maneuvers of the SD (transformer) measuring the speed of the main contacts in opening and closing and 5 manual operations of the earthing switch Es (line) and of the earthing switches ES1 - ES2 (transformer) measuring the speed of the pristip contacts in closure. During the maneuvers verify all the mechanical interlocks provided.
d	5 closing and 5 opening operations at $V_{min}$ (24 Vcc-15%) and $V_{max}$ (24 Vcc + 20%). At $V_n$ (24 Vcc) perform 5 C-O cycles and 5 Ot-C-O cycles. In the last cycle of every sequence, measure the operation times, the absorption current of the coils and of the spring charging motor. All the measured times and maximum values of absorption shall be included in the limits specified by the Manufacturer and, in any case, they shan't be outside the $\pm 15\%$ of the reference values obtained during the 7s.
e	Test to be performed on the same configuration used during the homologation process.
g	The test shall be performed with the operating devices closed and on the sectioning distance. All the tests shall be performed at a 50 kV power frequency voltage (for 24 kV switch-disconnector)
H	Perform the thickness verification with sampling plan "B" and the adherence verification on one sample only.
i	Test to be certified on single units by the supplier
m	The test will be performed during the dielectric test

**Table 20- Additional information**

## 7.6 Conditions of Supply

Each switchgear shall be supplied with:

- One Command lever
- Installation and operation manual in the language of the Country in which the switchgear has to be delivered, in compliance with provisions of 62271 series standards (including indication about gas end-of-life management and methods of recovery of gas, see chapter 13 of 62271-1);
- A connection cable for remoting of the status of the SD in the transformer protection mounting opening position.

Outside the box containing the equipment, the following indications shall be reported with clearly legible characters:

- name of the Distribution Company;

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

- name of the supplier;
- description of the product;
- code assigned by the supplier;
- type code and serial number of the Distribution Company;
- gross weight.

### 7.7 Warranty

The equipment shall be guaranteed for 3 years from the date of installation in the plant.

### 7.8 Packaging

The units shall be provided with packaging as indicated in the packaging supply requirements, such as to ensure suitable protection during transport and storage, in particular they shall have an external cover to prevent dust deposits and rainwater infiltration.

The screws, with nuts and washers, shall be placed in an envelope made of tear-proof and puncture-proof material, fixed inside the compartments themselves.

On the outside of the packaging, in a frontal position, the following information shall be shown on suitable labels in clearly legible characters

wording "T compartment" (example);

name of the manufacturer;

abbreviation assigned to the 24 kV compartment by the Manufacturer;

ENEL serial number, which shall be highlighted with respect to the other indications.

Each switchgear shall be equipped with a shock indicator (ShockWatch).

Indicators consist of labels containing a red liquid in suspension. If the device is subjected to an impact higher than a specific G level declared by the manufacturer, the impact will cause the red liquid to escape, clearly visible. The label shall be on the front of the appliance and clearly visible.



**Figure 80- ShockWatch**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

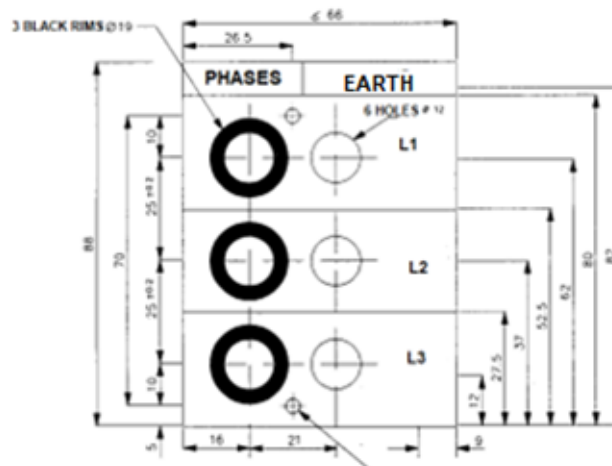
**7.9 Busbar VDS Constructive characteristics**

The busbar VDS is a specific requirement for Enel automation system. It shall be designed following IEC 61243-5 and the additional constructive and testing prescriptions indicated herein.

The device shall be type “MR-Sytem” and shall be supplied without lamps.

The voltage limiting device shall not be installed on the fixed part.

Dimensions fixed part:



**Figure 81 – Fixed Part**

The device shall be equipped with an M6 bolt to which the 16 mm<sup>2</sup> earth conductor shall be connected.



**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

**7.9.1 Electrical construction characteristics:**

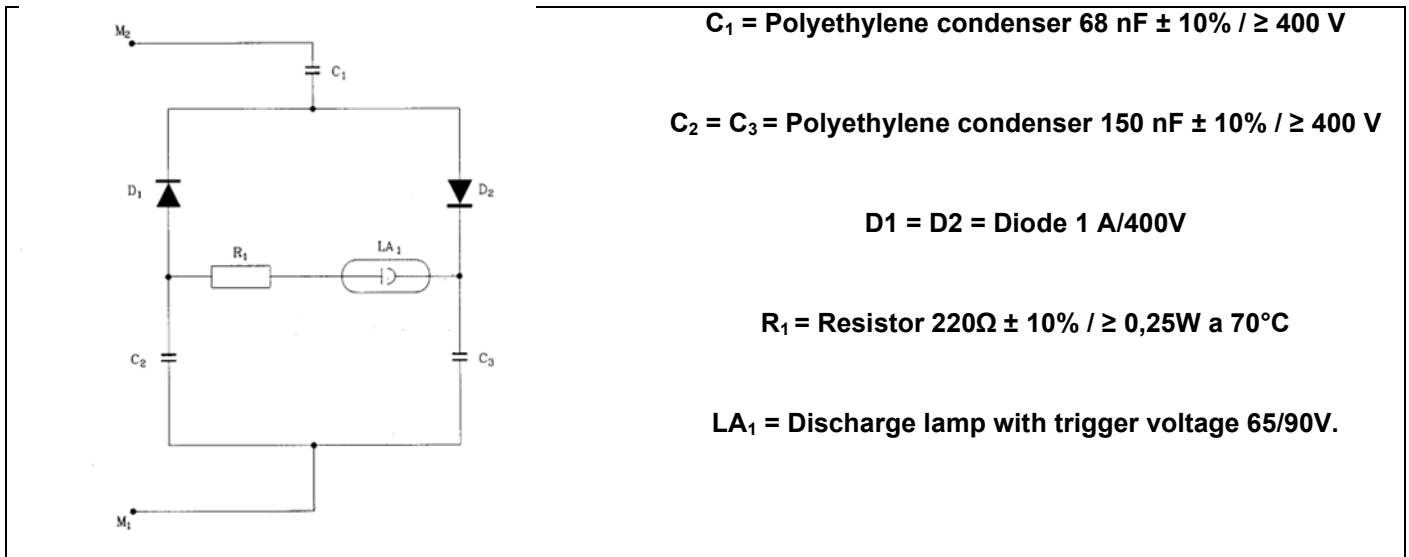


Figure 82 – Electrical Diagram

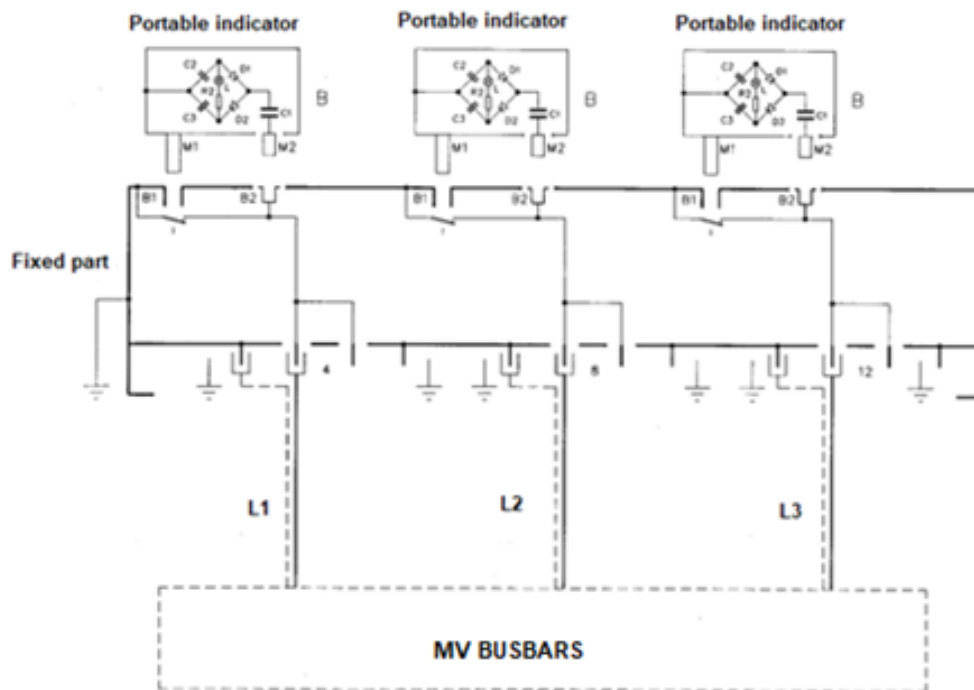


Figure 83 – Operating principle scheme

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

## 7.9.2 Testing

The busbar VDS equipped with capacitive voltage dividers shall be tested as indicated herein this paragraph.

Before carrying out the tests, any capacitive divider conductor on the terminals shall be connected to the earth of the switchgear.

The following tests shall be carried out:

### 7.9.2.1 Measurement of the short-circuit current value.

The short-circuit current value of the capacitive voltage divider shall not exceed 500  $\mu\text{A}$  when applying phase-to-phase voltage same as 24 kV. For the measurement of this current, it is necessary to remove the capacitor  $C_z$ , if any, (see Figure 84) and to proceed indirectly by measuring the voltage drop, with a voltmeter of internal impedance  $Z_i \geq 20 \text{ M}\Omega$ , on a given capacitive reactance of 0,96  $\text{M}\Omega$  (3,3 nF) connected between the two female fastened connections of the capacitive divider under test.

### 7.9.2.2 $I_m$ current measurement.

Using the circuit of Figure 84 the  $I_m$  current values shall be measured as follows:

- a) Applying a phase-to-phase voltage same as 6,6 kV, with the switchgear de-energized, the  $I_m$  current shall be  $> 2,5 \mu\text{A}$
- b) Applying a phase-to-phase voltage same as 2 kV, with the switchgear energized, the  $I_m$  current shall be  $< 2,5 \mu\text{A}$
- c) Applying a phase-to-phase voltage same as 24 kV the  $I_m$  current shall be  $\leq 35 \mu\text{A}$

### 7.9.2.3 Socket verifications

- a) Applying a phase-to-phase voltage same as 6,6 kV, with the switchgear de-energized, the “voltage present” indication shall appear ( $f \geq 0,25 \text{ Hz}$ )
- b) Applying a phase-to-phase voltage same as 2 kV, with the switchgear energized, the “voltage present” indication shall not appear ( $f = 0 \text{ Hz}$ )
- c) Applying a phase-to-phase voltage same from 2 kV up to 6,6 kV the “voltage present” indication could or could not appear ( $f = 0 \text{ Hz}$ )

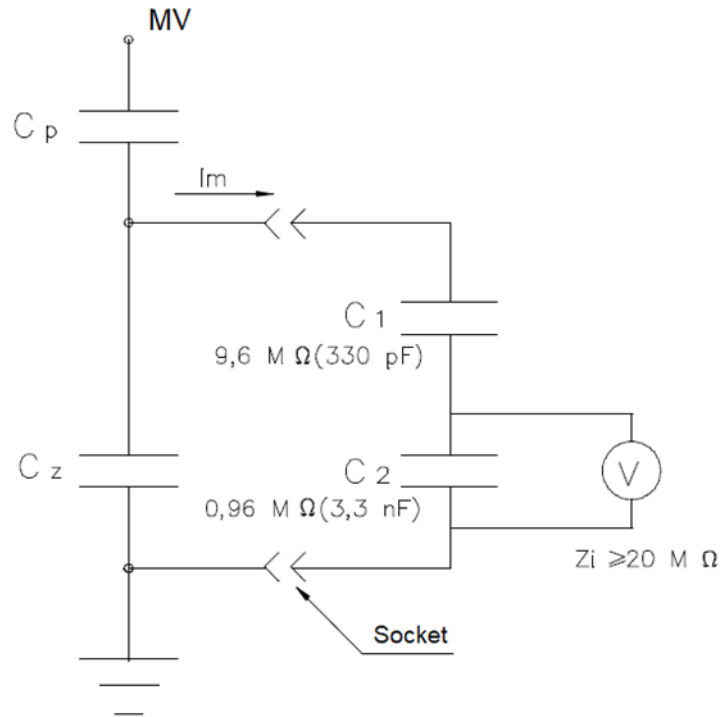
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*



**Figure 84 – Testing arrangement**

**7.9.2.4 Type tests**

The VDS shall be tested according to IEC 61243-5 (to the extent applicable).

**7.9.2.5 Acceptance tests**

Test	Standard	Point
Arrangement assembly markings, instruction for use	IEC 61243-5	5.2
Dielectric strength	IEC 61243-5	5.3
Threshold voltage and input impedance of indicators	IEC 61243-5	5.15
Vibration resistance	IEC 61243-5	5.12
Clear indication	IEC 61243-5	5.11

**Table 21 – Acceptance test for Busbar VDS**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*
**7.10 – Technical Check List**

<b>GSCM005</b>		
<b>GSCM005 Rev. 2</b>		
Enel Type:		
Enel Code:		
Enel Company:		
Country:		
Characteristic	Required value	
Conformity to international standards	IEC 62271-200 / 100 / 102 / 105	
Ambient temperature (°C)	-15	
Rated voltage	24 kV	
Rated lightning impulse withstand voltage - common value	125 kV	
Rated lightning impulse withstand voltage - Across the insulation distance (switch-disconnectors and line disconnectors)	145 kV	
Rated short-duration power-frequency withstand voltage - common value	50 kV	
Rated short-duration power-frequency withstand voltage - Across the insulation distance (switch-disconnectors and line disconnectors)	60 kV	
Rated frequency	50 Hz	
Rated normal current - busbars and line unit	630 A	
Rated normal current - transformer unit	200 A	
Rated short-time withstand current	16 kA	
Rated peak withstand current	40 kA	
Rated duration of short circuit	1 s	
Degree of protection (for the whole enclosure except for the operating devices)	IP3X	
Degree of protection for the operating devices (even with the operating lever inserted)	IP2XC	
Degree of protection of the external part of the switchgear	IK08	
Internal arc classification	IAC AFL, 16 kA, 1 s	
Rated supply voltage of closing and opening devices and of auxiliary circuits	24±20% Vcc	
Control, HMI and manual/electrical interlocks compliant with GSCM005	yes	
<b>CBL Circuit breaker</b>		
Rated Voltage	24kV	
Rated normal current	630 A	
Rated short-circuit breaking current	16 kA	
Rated duration of short-circuit	1 s	
Sequence of operations	O-0,3 s-CO-15 s-CO	
Circuit-breaker class	C2, E2, M2, S1	

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

First-pole-to-clear factor	1,5 and 1,3	
Break-time	≤ 80ms	
<b>LD Line Disconnecter</b>		
Rated Voltage	24 kV	
Rated normal current	630 A	
Rated short-time withstand current	16 kA	
Rated duration of short-circuit	1s	
Rated peak withstand current	40 kAc	
Mechanical endurance class	M1	
<b>ES Earthing switch</b>		
Rated short-time withstand current	16 kA	
Rated peak withstand current	40 MkAc	
Rated values of mechanical endurance for disconnectors	M1	
Rated values of electrical endurance for earthing switches	E2	
<b>AT</b>		
Rated Voltage	24 kV	
Rated normal current	630 A	
Rated short-time withstand current	16 kA	
Rated duration of short-circuit	1s	
Rated peak withstand current	40 kAc	

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Enel Grids*

<b>SD Switch-disconnector</b>		
Rated Voltage		24 kV
Rated normal current		630 A
Rated short-time withstand current		16 kA
Rated peak withstand current		40 kA
Rated duration of short-circuit		1 s
Mechanical endurance class		M1
Electrical endurance class		E3
Rated breaking current	of a mainly active load	630 A
	of a no-load line	1,5 A
	of a no-load cable	16 A
	in case of earth fault	60 A
	with cable-charging in case of earth fault	40 A
<b>ES Earthing switch</b>		
Rated Voltage		24 kV
Rated short-time withstand current		16 kA
Rated peak withstand current		40 kA
Rated short-circuit duration		1 s
Mechanical endurance class		M0
Electrical endurance class		E2
Earthing switch ES2		
Rated short-time withstand current		1 kA
Rated peak withstand current		2.5 kA
Rated short-circuit duration		1 s
Mechanical endurance class		M0
Electrical endurance class		E2

**Table 22 – Check list**

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

This amendment substitutes/integrates in every single paragraph some requirements or editorial corrections.

- 7.1 List of Components

Material codes 140201 (CBL type C) have depth 1150 mm.

- 7.3.1 Functional Unit Schemes

In the Figure 1, in the first column: "Circuit Breaker Unit (CBL)" the symbol of the LD is wrong.

- 7.3.3 Circuit breaker Functional Unit (CBL)List of Components

In Figure 2, in the left picture, the first CBL is type A, the central is type B and the last is type C.

- 7.3.3.1 Rated characteristic

After the Table 6, the first 2 rows must be:

*"The circuit-breaker shall comply IEC 62271-100, the **line-disconnectors** shall comply **IEC 62271-102** and the earthing switches shall comply IEC 62271-102."*

- 7.3.3.5 Terminal Block for Advanced Automation (only module CBL)

The first phrase must be: *"In the circuit breaker functional unit, **to enable the FSL function** (logic selective function) with the RGDM, a terminal block where cables will be fitted according to the diagram shown in the Figure 11 shall be provided."*

- 7.3.4 Line Functional Unit (L).

The first row must be: *"Unit L consists of an SF6 free insulated **switch disconnecter** and earthing switch."*

- 7.3.5.4 Fuse compartment

The last phrase must be: *"For remote signaling of the SD position, either following manual operation or fuse tripping, a microswitch **must be included**."*

- 7.4.12 Voltage Detecting System

Only for Measurement functional unit 2 LMR type VDS shall be provided.

- 7.4.18.3 Electric command of the switch-disconnector

First row must be: *"The kinematic mechanism of the **switch disconnecter** must not be energy storage...."*

- 7.5.1 Type tests



**Technical Specification code:** GRI-GRI-MAT-E&C-0004

Version no. 3 dated 04/01/2023

**Subject:** GSCM005 Modular Medium Voltage Switchgears/ERRATA CORRIGE

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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In Table 17 Type tests for switch-disconnector (SD) shall be performed according to IEC 62271-103. Type test for Line disconnector (LD) and Earthing switch (ES) shall be performed according to IEC 62271-102.