



Subject: Enel Grids – GSCM770 MV Section for HV-MV Substation in container solution

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

This document contains technical specifications for early installations of Container as in “Liberty1” project in the HV/MV substations of the Enel Group Distribution Companies, listed below:

Country	Distribution Company
Argentina	Edesur
Brazil	Enel Distribuição Rio Enel Distribuição Ceará Enel Distribuição Goiás Enel Enel Distribuição São Paulo
Chile	Enel Distribución Chile
Colombia	Enel Codensa
Iberia	e-distribución
Italy	e-distribuzione
Peru	Enel Distribución Perú
Romania	Enel Distribuție Banat Enel Distribuție Dobrogea Enel Distribuție Muntenia

Table 1 - Distribution Companies

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 applies to both Enel Grids Srl Company and to Enel Grids Line perimeter, when each Company does not have to issue further documents.

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2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
1	28/05/2021	Issuing of “Global Infrastructure and Networks GSCM770 MV Section for Primary Substation in container solution” technical specification
2	20/07/2022	Tests and documentations needed updated; GSCM770/3_4 introduction

3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

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

Responsible for authorizing the document:

- Enel Grids: Head of Network Components unit.
- Enel Grids: Head of 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;
- MAT-O&M-NCS-2021-0033-EGIN “GSCG002 Technical Conformity Assessment”;
- MAT-E&C-NC-2021-0057-GIN “GSCG003 Employer’s Information Requirements for supplier components”;
- MAT-E&C-NC-2021-0064-GIN “GSCM690 Family of AIS “compact” enel type, technical specifications collection”;
- MAT-E&C-NC-2021-0055-GIN “GSCM734 Voltage transformer trolley for air insulated “compact” switchgear family”;
- MAT-E&C-NC-2021-0033-GIN “GSCM505 Extractable, vertical translation, three-pole, vacuum circuit breaker, Ur=24kV for air insulated “compact” switchgear family”;
- MAT-E&C-NC-2021-0116-GIN “GSCM735 Earthing trolley for air insulated “compact” switchgear family”;

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- WKI-QPT-CMQ-2020-0019-EGIN “Contractual Requirements for Components and Materials Quality management”;
- CNS-O&M-S&L-2021-0032-EGIN “Barcode specification”;
- GSTZ111 “Power Supply Station (PSS) for HV/MV Substation”;
- GSTZ111_A1 “Addendum GSTZ111”;
- GSTZ112 “Power switchgear and controlgear assembly (PSC) for HV/MV Substation”;
- GSTZ112_A1 “Addendum GSTZ112”;
- 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/IEC 17000:2020 - Conformity assessment – Vocabulary and general principles;
- ISO/IEC 17020:2012 - General criteria for the operation of various types of bodies performing inspection;
- ISO/IEC 17025:2017 - General requirements for the competence of testing and calibration laboratories;
- ISO/IEC 17050-1:2004 - Conformity assessment - Supplier’s declaration of conformity - Part 1: General requirements (ISO/IEC 17050-1:2004, corrected version 2007-06-15);
- ISO/IEC 17050-2:2004 - Conformity assessment - Supplier’s declaration of conformity - Part 2: Supporting documentation (ISO/IEC 17050-2:2004);
- ISO/IEC 17065:2012 - Conformity assessment – Requirements for bodies certifying products, processes and services;
- ISO 668:2020 “Series 1 freight containers — Classification, dimensions and ratings”;
- IEC 62271-1 “High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear”;
- IEC 62271-202 “High-voltage switchgear and controlgear - Part 202: High-voltage/ low-voltage prefabricated substation”;
- IEC-TS 60815-1 “Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles”;
- IEC 60332-1-2 “Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame”;
- EN 50399 “Common test methods for cables under fire conditions - Heat release and smoke production measurement on cables during flame spread test - Test apparatus, procedures, results”;

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- IEC 60445 Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors;
- ISO 12944 “Paints and varnishes — Corrosion protection of steel structures by protective paint systems”;
- Regulation (EU) of the European Parliament and of the Council 517/2014 of the 16th April 2014.

Reference documents listed below (amendments included) shall be the edition in-force at the contract date. For South America destinations, the reference standards are the IEC/ISO, whilst for Europe destinations the reference standards are the correspondent European ones (EN).

Argentina

Brazil

- NR-10 – Segurança em instalações e serviços em eletricidade.

Chile

- Norma técnica de calidad de servicios para sistema de distribución, Comisión Nacional de Energía, Diciembre 2017;
- ETG-1020 “Requisitos de Diseño Sísmico para Equipo Eléctrico”;
- IEEE 693-2005 “Recommended Practice for Seismic Design of Substations”;
- Norma Técnica de Seguridad y Calidad de Servicio, Comisión Nacional de Energía, Septiembre 2020;
- Reglamento de producción, transporte y distribución de energía eléctrica – Decreto N°109;
- Pliego Técnico normativo RPTD N°15 Operación y Mantenimiento. Decreto N°109;
- Pliego Técnico normativo RPTD N°17 Sistema de Gestión de integridade de instalaciones eléctricas. Decreto N°109.

Colombia

- RETIE – Reglamento Técnico de Instalaciones Eléctricas.

Perú

Italy

- D.Lgs n. 81 of the 9 of April 2008 and subsequent modifications;
- D.P.R. n. 43 of the 27th of January 2012;
- Nota Operativa PVR001 – Rev. 2 – Ott. 2012 - Gestione Garanzie dei materiali di ENEL Distribuzione.
- GUI 101 “Caratteristiche generali e prescrizioni di impiego del pallet in legno da utilizzare per imballo di trasporto”.

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Spain

- R.D. 614/2001, de 8 de junio, sobre disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico;
- R.D. 337/2014, de 9 de mayo, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión y sus Instrucciones Técnicas Complementarias ITC-RAT 01 a 23;
- R.D. 223/2008, de 15 de febrero, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en líneas eléctricas de alta tensión y sus instrucciones técnicas complementarias ITC-LAT 01 a 09.

Romania

- Prescriptia Energetica PE 101/85 – Normativ pentru construcția instalațiilor electrice de conexiuni și transformare cu tensiuni peste 1 kV;
- GUI 101RO "Caracteristicile generale și cerințele de utilizare ale paletului de lemn care urmează să fie utilizat pentru ambalarea de transport.

5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering and Construction

Macro Process: Devices and Components Development

Process: Standard Catalog Management

6 DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
High Voltage (HV)	Electrical system with 230kV to 35kV nominal operative voltage between the phases
Medium Voltage (MV)	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"

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<p>Technical Conformity Assessment (TCA)</p>	<p>A “conformity assessment”¹ with respect to “specified requirements”² 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</p>
<p>Type A documentation</p>	<p>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</p>

¹ Definition 2.1 of ISO/IEC 17000

² Definition 3.1 of ISO/IEC 17000

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7 DESCRIPTION

7.1 LIST OF COMPONENTS

Type code	Description
GSCM770/1	Container with single section MV Ir=1600A
GSCM770/2	Container with double section MV Ir=1600A
GSCM770/3	Container with single section MV Ir=2000A
GSCM770/4	Container with double section MV Ir=2000A

Table 2 – Type codes

Material codes please refer to Annex B

7.2 SUPPLY CONFIGURATION

The supply shall be configured as below:

- Assembly of Medium Voltage (MV) Air Insulated Switchgear (AIS) compliant with GSCM690 “Family of AIS “compact” **enel** type technical specifications collection”;
- Completely assembling and cabling of MV AIS and LV equipment (protection relays, LV cabinet etc) compliant with **enel** drawings;
- Accessories for assembly of MV Switchgear compliant with GSCM739 (see annex L GSCM690) ;
- Current Transformer (CT) compliant with **enel** local standard to be installed inside the MV switchgear for protection function;
- CT homopolar compliant with **enel** standard to be installed inside the interspace under container floor for line switchgear;
- Voltage Transformer (VT) trolley compliant with GSCM734;
- Vacuum Circuit Breaker (VCB) trolley compliant with GSCM505;
- Earthing trolley compliant with GSCM735;
- Protection relays installation;
- N°10 Low Voltage (LV) rack with self-supporting structure, with dimensions 600X600 mm for LV equipments cabling according to **enel** drawings;
- Air-conditioning system;
- Smoke detector system;
- Pest control repeller system;
- Internal LV power system complaint with GSTZ112;

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- Internal and external (on top of container) light system;
- Earthing system;
- Energy station compliant with GSTZ111 with relative DC battery;
- Remote terminal unit system installation and LV/OF cabling;
- MV cable terminations and lugs for transformer functional unit, suitable for copper 630mm² MV cables, provided under Manufacturer responsibility compliant with relevant standards;
- 6 MV 630 mm² copper cables with terminals and lugs compliant with main IEC standards to be supplied for each GSCM770/2_4 to allow busbar tie functional units connection;
- Operation and safety equipment (signals, fire extinguisher etc.);
- Electrical and mechanical design of all systems;
- Container accessories (see par. 7.6.1)
- Only for Spain, annex D.2 GSCG002 for each equipment supplied;
- Services:
 - Transportation, unloading and installation in all **enel** site;
 - All that is needed for unloading, positioning and final assembly of Container will be Supplier's responsibility;
 - TCA compliant with GSCG002;
 - Factory acceptance tests;
 - Site acceptance tests;
 - Commissioning support.

7.3 SERVICES EXCLUDED FROM SUPPLY

Following equipment, excluded from supply, shall be installed inside the container by Manufacturer:

- Protection relays;
- RTU;
- Teletransmission equipment.

Installation and cabling of previous equipment shall be performed by Manufacturer .

7.4 SERVICE CONDITIONS

Container shall be installed to outdoor and fit for installation in three-phases MV effectively and non-effectively earthed neutral system.

Environmental values refer to normal outdoor condition according IEC 62271-1 with following special condition added:

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- Maximum altitude 1000 m and 2700 m for Colombia;
- Maximum temperature 55 °C;
- Minimum temperature -30 °C;
- Relative humidity 98%;
- Maximum wind speed: 40 m/s;
- Maximum snow load on horizontal projection: 1,95 kN/m2;
- Very heavy (e) pollution compliant with IEC-TS 60815-1;
- Seismic level: AF5.

7.5 TECNICAL CHARACTERISTICS

Container shall be compliant with standards described in the paragraph 7.2, table below and in the following paragraphs.

enel Type	GSCM770/1_2_3_4
IP degree of container	33
IK degree of container	10
Operation	indoor
IAC degree	A
Dimensions	Annex D

Table 3 - Container features

DC and AC rated supplies voltage of auxiliary circuits Ua for each country of supply are listed in the table below.

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Country	Rated supply DC voltage of auxiliary circuits Ua (VDC)	Rated supply AC voltage of auxiliary circuits Ua (VAC)
Italy	110	230 single phase 50 Hz
Romanian	110	230 single phase 50 Hz
Spain	125	230 single phase 50 Hz
Brazil*	125	127 single phase (SP/RJ) 60Hz 220 single phase (CE/GO) 60Hz
Colombia	125	120 single phase 60 Hz
Perù	125	220 between phases 60 Hz
Chile	125	220 single phase 50 Hz
Argentina	TBD	220 single phase - 50 Hz

Table 4- DC and AC rated supplies voltage of auxiliary circuits

*For Brasil, RJ=Enel Distribuição Rio; CE=Enel Distribuição Ceará; GO=Enel Distribuição Goiás Enel SP=Enel Distribuição São Paulo

Connecting to ground a polarity of 110 and 125 Vdc supply is not allowed.

7.5.1 Casing and structure

Container for outdoor installation shall have a metallic self-supporting structure built in profiles, insulated panels and corner blocks, similar to containers for oversea transport and with minimum thicknesses:

- 3 mm for sheet metals used for pillars;
- 2 mm for regular steel sheets used for internal panels and for inox steel sheets used for external infills (cover, slats, doors, hatches etc...).

Insulated panels for external walls can be built with 2 mm thick internal aluminum sheet and with 1.5 mm external inox steel sheet.

Internal surfaces shall be made of 2 mm thick steel or 2 mm aluminum, so this prescription is valid for walls and ceiling.

The structure must be resistant enough in order to be transported and installed on mounting brackets in one single block without being disassembled in multiple parts. Diagonal tie rods to maintain squaring between edges are not allowed.

The waterproof container will be equipped with apposite slots for ventilation and gas venting, appropriately shielded in order to ensure IP33 protection level.

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7.5.2 Mounting brackets and loading/unloading system

Mounting brackets shall be defined according Manufacturer design, in any case correct functionality of equipment inside the container shall be guaranteed even in maximum deformation conditions.

They will be equipped with attachment for fixing to the structure on one side and with support plate on the other. Their nominal height will be 90 cm. The surface of support plates shall be sized for a specific pressure on the ground lower than 10 N/cm².

Mounting brackets shall be preferably fixed to container's platform through twist locks, and they must be bounded to the concrete foundation with chemical or mechanical anchors, whose dimensions must be in accordance with environmental conditions described at paragraph 7.4.

Unload operation must be able to take place through four removable hydraulic jacks, suitable to lift the whole structure from the vehicle and to place it on mounting brackets, without other lifting means. The jacks will be single operation to level the container and then mechanically coupled in pairs (those on the short side) for lifting or lowering it on the truck bed or on definitive mounting brackets. The stroke of hydraulic jacks must be adequate for the movement required to load and unload the container on the truck bed or on mounting brackets. A kit of hydraulic jacks will be provided for each container.

Unload operation from vehicle must be able to take place through crane. Minimum requirements for crane shall be specified by the Supplier.

The container shall be crane liftable by hooking upper corner blocks only.

7.5.3 Dimensions

Container dimensions shall be compliant with annexes C and D.

Overall dimensions and weight of container in transport operating conditions are mandatory with reference to ISO 668 2020, other external dimensions of container are indicative and subject to **enel** approval.

7.5.4 Cable outlets

MV/LV cable outlets must be arranged on the floor and equipped with anti-animal closure, both with MV section out of order (without cables) and in service (with cables installed).

In order to place homopolar/phase CTs, bars to be installed on holes prepared on the base structure must be provided.

7.5.5 Hatches

The container shall have, on both long sides, double hatches for access, each one made by upper and lower hinged half doors. Therefore, they can be overturned one upward and the other downward.

These hatches are provided with security mechanical stop in open position. They shall be moved by manually operated screw jacks with reduction mechanism.

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The screw jacks shall be prepared for a motor command installation, optionally supply of hydraulic jacks actioned by hydraulic power unit installed on short side of container with external access (see paragraph 7.8.2) could be requested.

Lower hatches will lay on shelves bounded to the base structure of the container during installation. Shelves must be provided with adjustment devices in order to achieve perfect levelling of the hatch, which is mandatory condition in order to continue the assembly. Two adjustable struts shall be included for each side in order to support the hatches.

Two recessed guides will be made on the lower hatch, so that the circuit breaker platform can slide in constrained position. This platform must be equipped with a suitable device to lock it in a defined position on the front of each MV compartment.

A device shall be built in order to block the trolley on the platform during handling.

Each Container must be equipped with two platforms.

Whenever replacement or maintenance of circuit breakers needs be performed, it is necessary to move them safely from inside the container to outside. For this reason, the Supplier will provide a steel structure that will lean on the landing of the stair and will be joined and connected to the platform, so that the trolley can be moved through the container's door.

7.5.6 Walls

Walls shall be installed on the outer perimeter of hatches once the assembly of MV switchgear is placed on site, in order to create continuous corridors between switchgear cells front and the walls themselves.

All junctions must be made carefully to avoid water infiltrations. Particular care must be taken on their profiles and on interposed gaskets.

7.5.7 Floor

Walking surfaces of the container shall be non-slip, made of checkered aluminum sheets.

The floor of the central corridor can be made of steel if It has structural function. It must have anti-slip surface. Apposite profiles must be laid where differences in planarity on walking surface occur, for example on the hinge of the lower hatch, in order to avoid dangers.

7.5.8 Doors and stairs

The container shall be equipped with 3 entrance doors, as shown in drawings, with minimum width 900 mm and minimum height 2100 mm.

The door on the short side shall have an unbreakable glass on the upper side with minimum surface of 0,45 m².

Each door will be equipped with external lock, internal panic bar and a position detector able to send an alarm when the door is open.

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The three lockers must be openable with a security key with the same encryption.

A stair with steps and landing in grating steel and double handrail shall be supplied for each door. It must be disassemblable in order to be carried inside the container during transportation.

Each door shall be equipped with a chain or lever mechanism able to lock it in open position.

Stair sides shall be made of hot zinc plated steel or inox steel. The latter won't be painted but brushed.

Steel steps and stair landing made of inox steel or hot zinc plated steel, shall be compliant with the main standard applicable the max weight withstood shall be indicated by Manufacturer in order to guarantee the correct functionality and accessibility of container.

The stair landing shall be provided of side footbeds.

7.5.9 Cover

A cover made of metal reticular structures properly attached to the top of the container must be installed.

These structures support some crosspieces on which insulated panels (thermal cover) lay.

Panels protrude 500 mm from the plan shape of the container.

Minimum panel's thickness is 40 mm. Eventual corrugations could be necessary to strengthen the structure in order to bear wind, snow and accidental loads (see paragraph 7.4.).

Panels shall be made with inox steel sheets on both sides, with 0,6 mm thickness. An insulating layer is interposed between sheets, made of self-extinguishing polyurethane resins with superior non flammability characteristics and CFC-free.

A sheet metal shall be fixed on the top, with an interposed gasket for water tightness. It has to replicate inclination and corrugation of cover panels.

Both sides of the cover shall end on an inox steel channel, made to gather rainwater and for finishing.

Tubes with 80 mm diameter and 100 mm length must be welded on the channels ends, in correspondence of the beginning of the container. They will eventually allow to install a descending tube.

On headers an inox steel flashing will be applied, with finishing function.

Overall height of the cover from container's roof to the top shall be about 850 mm, while channels will be placed about 1000 mm under the top of the cover, so that proper ventilation is guaranteed and, on side view, there will be superposition between cover and container.

All materials described above must be treated with the same painting cycle used for the container and described at paragraph 7.5.10.

The structure of cover shall be completely supported by the container. Hot zinc plating is allowed for structures that support cover panels. From the ground point of view the cut section of panels mustn't be visible, indeed

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channel's edge is expected to be higher. Alternatively, panel's edges shall be closed with a sheet metal properly fixed. Channel and lower side of panels can be unpainted.

7.5.10 Material and protective coating

Container and all its auxiliary structure shall be in the following materials:

- stainless steel ;
- carbon steel.

carbon steel is allowed for following structural parts:

- the container's platform.
- the four corner posts.
- the four perimeter side members of the roof.
- supports that bear the lower hatch when open.

The bolting and accessory part like hinges, air conditioner brackets, headlight brackets, gas expulsion grids etc shall be in the stainless steel.

Container shall have a protective coating for carbon steel and stainless steel compliant with ISO 12944 with the following minimum features:

- Durability: Very High (VH) more than 25 years;
- Atmospheric - corrosivity category:C5;

Stainless steel and carbon steel could have different protective coating.

7.5.11 Nameplates

Container shall be equipped with a nameplate where data indicated by IEC 62271-202 shall be listed.

Also on the nameplate shall be included the followings indications:

- **enel** type;
- **enel** material code;
- **enel** DSO;
- QR code compliant with CNS-O&M-S&L-2021-0032-EGIN;
- Empty, transportation and installation container weight.

7.5.12 Manuals

Manufacturer shall produce the operation, maintenance and safety manuals for container compliant with IEC 62271-202

Safe introduction and removal of trolleys (GSCM505/734/735) from the container shall be described in the manual.

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MV and LV equipment manuals shall be supplied, too.

Minimum time of maintenance for container shall be 120 months.

7.6 ASSEMBLY OF MV SWITCHGEAR COMPOSITION AND SYSTEM INCLUDED IN THE CONTAINER

MV assembly of switchgear has no structural function. For this reason, supports can't be installed between switchgear and container's roof.

7.6.1 Assembly of MV switchgear

Assembly of MV switchgear compliant with GSCM690 AIS "compact" **enel** type technical specifications collection" with TCA in force shall be supplied by Manufacturer.

Alternative MV switchgear proposed by Manufacturer with at least the same ratings of GSCM690 and the same functional units described below shall be evaluated by **enel**

7.6.1.1 GSCM770/1_3

This type of container shall be used as half MV section of primary substation.

Assembly of MV switchgear shall be constituted by the following functional unit:

- n° 1 GSCM697/2 (GSCM690/6) with Ir=1600A for GSCM770/1 or GSCM697/1 (GSCM690/5) with Ir=2000A for GSCM770/3 (see annex B of GSCM690);
- n° 12 GSCM696/1 (GSCM690/9 see annex C of GSCM690). If required GSCM696/1 should be substituted by GSCM730/1 (GSCM690/15 see annex F of GSCM690) or GSCM699/1 (GSCM690/11 see annex D of GSCM690);
- n° 1 GSCM698/2 (GSCM690/2) with Ir=1600A for GSCM770/1 or GSCM698/1 (GSCM690/1) with Ir=2000A for GSCM770/3 (see annex A of GSCM690);
- n° 1 GSCM731/1 (GSCM690/17 see annex G of GSCM690);
- n° 1 GSCM700/1(GSCM690/13 see annex E of GSCM690);
- n° 1 GSCM738/2 (GSCM690/24) with Ir=1600A for GSCM770/1 or GSCM738/1 (GSCM690/23) with Ir=2000A for GSCM770/3 (see annex I of GSCM690).

7.6.1.2 GSCM770/2_4

This type of container shall be used as MV section of primary substation.

Assembly of MV switchgear shall be constituted by the following functional unit:

- n° 2 GSCM697/2 (GSCM690/6) with Ir=1600A for GSCM770/2 or GSCM697/1 (GSCM690/5) with Ir=2000A for GSCM770/4 (see annex B of GSCM690);
- n° 11 GSCM696/1 (GSCM690/9 see annex C of GSCM690). If required GSCM696/1 should be substituted by GSCM730/1 (GSCM690/15 see annex F of GSCM690) or GSCM699/1 (GSCM690/11 see annex D of GSCM690);

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- n° 2 GSCM698/2 (GSCM690/2) with Ir=1600A for GSCM770/2 or GSCM698/1 (GSCM690/1) with Ir=2000A for GSCM770/4 (see annex A of GSCM690);
 - n° 2 GSCM731/1 (GSCM690/17 see annex G of GSCM690);
 - n° 1 GSCM700/1(GSCM690/13 see annex E of GSCM690).

7.6.2 Key interlocks

The auxiliary MV/LV transformer shall be installed outside of container.

The transformer cabinet key, necessary to open the door shall be interlocked with the key of the earthing switch present on functional unit switchgear GSCM730/1 that will be free only when earthing switch will be closed.

7.6.3 Vents for gas overpressure

External openings for gas overpressure vent shall be realized in line with assembly of switchgear duct (placed 1820 mm above the floor), with tolerance that can allow correct coupling without modification of direction and/or cross section of the channel itself.

7.6.4 Air-conditioning system and ventilation system

Air conditioning system compliant with the relevant standard shall be installed for the container, it shall be composed by two “no house solution” conditioner/heat pump utilizing inverter technology.

Rated power of each conditioning shall be equal or higher than 80% of the power needed, in order to have acceptable conditions in case of failure of one unit.

These conditioners shall be powered by two separated electrical circuits, in order to be completely independent.

Air conditioning shall be able to guarantee, internal temperatures of 25 °C during hot season and 15 °C during cold season.

Relative humidity shall be kept below 80% by the system.

Conditioners shall have the following signalizations from instrument installed in the container:

- Generic alarm;
- Maximum and minimum temperature of container;
- Maximum humidity.

Ventilation slots shall be shielded, and their protection must be IP 33 or higher.

If conditioners lack of external air intake, necessary for air circulation inside the container, the Supplier shall provide a stand-alone ventilation system. Minimum diameter for the ventilator is 250 mm and the air intake must be openable only when ventilator is on, so that conditioned air is not dissipated outside.

On the opposite wall an opening shall be installed to allow air exit. Opening flaps will open only in reaction to overpressure generated by ventilator.

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7.6.5 Light system

Internal and external lighting system shall be designed in conformity to relevant standards in order to guarantee proper visibility during operations.

Lighting system shall be energy-saving type (for example to LED devices) composed by quality marked components, compliant with AC Voltage according to local electrical LV distribution system.

Lighting system shall be divided to two separate systems, services lighting (internal and external) and emergency lighting (internal and external).

The lighting system shall be powered from one AC LV switch site on LV auxiliary board.

External services lighting system shall be made by lighting devices above each container door.

External services lighting system shall be activated either automatically from dusky system or by manual switch trough a selector inside the container.

The container shall be equipped with three portable emergency LED spotlights with rechargeable battery.

Portable emergency LED spotlights shall have technical features compliant with EA0143 and shall be installed near each container door.

7.6.6 LV power system

LV power system AC Voltage to local electrical LV distribution system shall be composed by:

- Switchboard placed at container's entrance on the wall of the head compartment, including:
 - n° 1 C.E.E. socket 3p+g rated 32 A, equipped with plug and fuses;
 - n° 2 C.E.E. sockets 2p+g rated 16 A, interlocked and equipped with plug;
 - n° 2 standard sockets, rated 16 A ;
 - n° 3 10 A sockets to power portable spotlights;
 - n°3 multistandard sockets rated 16 A in each corridor, distributed at regular intervals.

7.6.7 LV cable and conductors

LV connections of all LV equipment and installed MV assembly switchgears shall be of proper dimensions and shall be compliant with features described in the **enel** drawings.

The minimum insulation level shall be 0,6/1kV for cable and 450/750V for conductor(single core).

The minimum fire reaction of LV cable and conductors shall be Cca-s1b, d1, a1 as described below

- Cca: EN 50399: Flame Spread (FS) $\leq 2,00\text{m}$; Total Heat Release (THR) $\leq 30\text{MJ}$; Maximum Heat Release Rate (HHR) $\leq 60\text{kW}$; Fire Growth Rate, index of heat release rate (FIGRA) $\leq 300\text{Ws}^{-1}$ /// IEC 60332-1-2: Flame Spread, vertical flame propagation $H\leq 425\text{ mm}$;
- s1b: Total Smoke Production (TSP1200) $\leq 50\text{ m}^2$; Smoke Production Rate, maximum smoke (SPR) $0,25\text{ m}^2/\text{s}$; transmittance $\geq 60\% < 80\%$;

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- a1: electrical conductivity < 2,5 $\mu\text{S}/\text{mm}$; pH > 4,3;
- d1: No flaming droplets/particles persisting longer than 10 s within 1200 s.

7.6.8 Earth circuit

A copper conductor of proper cross section shall be installed inside the container according to **enel** drawings. Such ring will be connected with all equipment and systems and shall be accessible from the outside at least in two easily reachable points, placed on each short side of the container. earth connections with HV/MV Substation's earth electrical circuit will be possible through these points.

7.6.9 Smoke detecting system

Smoke detecting system compliant with the relevant standard shall be installed in the container.

Alarm of anomaly system and smoke presence signaling shall be made available from smoke detecting system.

7.6.10 Pest control repeller system

Pest control repeller system shall repel or eliminate pests, usually rodents or insects.

This system shall be compliant with the relevant standard.

Alarm of anomaly system signaling shall be made available from this system.

7.6.11 Accessories

Following accessories must be supplied/installed:

- An edged C-profile shall be fixed on each corridor wall through all its length. It must be suitable to support both removable tables and convectors (eventually requested by option, see paragraph 7.7.1.);
- Three removable tables for each corridor installed on the wall-fixed profile. Their tabletop will be about 320 x 900 mm and able to bear a 15 kg load;
- Two folding chairs with small footprint;
- A pressed cork notice board with inox steel frame and dimensions 1,00 m x 0,80 m shall be fixed on the right corridor's wall close to transition from cabinets and MV assembly switchgear;
- Portable emergency LED spotlights shall have technical features compliant with EA0143 and shall be installed near each container door.

7.7 OPTIONAL SUPPLY

Following additional systems shall be supplied if requested.

7.7.1 Harsh climate setup

Containers for locations characterized by harsh winter climate will be powered with:

- Installation on the cover of appropriate snow hooks close to the channel;

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- Installation of a self-regulating heating cable on the channel powered with dedicated switch from LV auxiliary services.

Installation of four removable convectors rated 2000 W for each side corridor, locked to the wall-fixed profile. They will be powered through sockets with interlocked switches located on the upper part of the wall.

Power supply will be provided by a dedicated circuit installed on auxiliary service switchboard and driven by a thermostat placed in the center of the container. Being this an integration to standard included heating system, its operation will be independently managed and not interlocked with conditioners operation.

7.7.2 Oil dynamic system for hatches opening (“mobile” container)

Container utilized as “mobile station” could optionally be equipped with oil dynamic system for hatches opening (see paragraph 7.5.5).

The hydraulic power unit if requested, shall be positioned on the rear short side, and shall be accessible from outside.

7.7.3 Phase CT’s for GSCM697 and GSCM698

CT’s compliant with *enel* local standard to be installed inside the interspace under container floor for transformer energy measurement.

7.8 TYPE, ROUTINE AND ACCEPTANCE TESTS

Type, routine, factory and site acceptance tests shall be performed in compliance with IEC 62271-202 and the clarifications indicated in the followings paragraphs.

7.8.1 List of type test

In the table below is described a type test list.

Type test	Reference
Constructive features verifications	Par. 7.8.3.1
Dielectric tests of MV connections and main LV connection	Par. 6.2 of IEC 62271-202 ed.2;
Short-time withstand current and peak withstand current tests for earth circuit	Par. 6.6 of IEC 62271-202 ed.2
Degree of protection verifications	Par. 6.7 of IEC 62271-202 ed.2
Electromagnetic compatibility tests (EMC)	Par. 6.9 of IEC 62271-202 ed.2
Additional tests on auxiliary and control circuits and check of electric scheme	Par. 6.10 of IEC 62271-202 ed.2
Calculations and mechanical tests	Par. 6.101 of IEC 62271-202 ed.2
IAC test	Par. 6.102 of IEC 62271-202 ed.2

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Protective coating verifications	ISO 12944
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Table 5- Type Test

Last edition of previous standards shall be utilized, paragraph indicated are referred to current edition.

7.8.2 List of routine test

In the table below is described a routine test list.

Routine test	Reference
Type correspondence verifications	Par. 7.8.4.1
Dielectric test on the high voltage interconnection	Par. 7.101 of IEC 62271-202 ed.2
Voltage withstand tests on auxiliary circuits	Par. 7.102 of IEC 62271-202 ed.2
Functional tests	Par. 7.8.4.2 Par. 7.103 of IEC 62271-202 ed.2
Verification of correct wiring	Par. 7.104 of IEC 62271-202 ed.2
Protective coating dimensional check	Par. 7.8.4.3 and Main standards applicable
Routine Tests on Assembly of MV Switchgear	GSCM1674 (see annex M GSCM690)

Table 6 - Routine test

Last edition of previous standards shall be utilized, paragraph indicated are referred to current edition.

7.8.3 Type tests

The number of test specimen shall be compliant with par 6.1 of IEC 62271-202 ed.2, tests shall be performed on exemplars fully equipped as for ordinary use.

7.8.3.1 Constructive features verifications

Compliance with the present TS with features of container shall be checked.

Dimensions, compositions and apparatuses described in the present TS shall be checked.

Material verifications shall be performed by documentations checking.

Nameplates shall be verified in compliance with paragraph 7.5.11.

Furthermore the integrity of container shall be checked: deformations, damages and irregularities shall not be present.

7.8.4 Routine tests

The routine tests are indicated in the table 5, these tests shall be carried out by the Manufacturer on all the specimen prepare for the commissioning.

For each piece belonging to the prepared batch, the supplier shall prepare a test report with the results of the tests performed.

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For routine and acceptance tests reference values and acceptability ranges defined in the TCA Report shall be considered.

7.8.4.1 Type correspondence verifications

Test shall be performed on Container fully equipped as for ordinary use, following verifications shall be performed:

- a) Visual examination in order to check the absence of external imperfections and constructive defects;
- b) Dimensional and constructive verification according to type A documentations;

7.8.4.2 Functional tests

Test shall be performed on Container fully equipped as for ordinary use in compliance with the paragraph 7.103 of IEC 62271-202 ed.2.

Following functional verification and check shall be performed:

- a) Container functionality;
- b) Internal and external lighting systems;
- c) Air conditioning system;
- d) Smoke detector system;
- e) Pest control repeller system;
- f) LV equipment;
- g) Signalling and safety panels presence.

7.8.4.3 Protective coating dimensional check

Protective coating dimension declared during TCA shall be checked using the main standards applicable.

7.8.5 Factory acceptance tests

Acceptance test shall be carried out on a sample basis, on a number of samples which depends on the consistency of the supply according conditions establish in document “Contractual Requirements for Components and Materials Quality management”.

Acceptance test shall be the same of the Routine tests with the following clarification:

- Voltage withstand tests on auxiliary circuits shall be only a documental verification of routine tests performed

7.8.6 Site acceptance test and commissioning

Below are listed the site acceptance tests to perform:

- a) Tests after assembly on site (reference to Par. 7.105 of IEC 62271-202);

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- b) Verification of internal and external lighting systems;
- c) Verification of air conditioning system;
- d) Smoke detector system verification;
- e) Pest control repeller system verification;
- f) MV assemblies switchgears verifications compliant with GSCM1674 (see annex M GSCM690);
- g) Verification of painting and eventual fix of damage resulting from transport;
- h) IP degree verification.
- i) Commissioning support activities.

7.9 DOCUMENT TO SUPPLY

Technical conformity assessment (TCA) process shall be compliant with GSCG002.

Type A documentations shall be as listed in the GSCG002 with the following integration:

- 1) Container layout and various views (frontal, lateral, posterior, internal and external);
- 2) Air-conditioning system design and data sheet
- 3) LV power system design, calculation reports;
- 4) Light design, calculation reports and apparatuses data sheet;
- 5) Smoke detecting system design and component data sheet ;
- 6) Pest control repeller system design and component data sheet ;
- 7) Structural design, calculation report, seismic report;
- 8) Container energy efficiency and conditioning calculation;
- 9) Container nameplate;
- 10) Container accessory devices documentations;
- 11) MV cable, terminal and lug Manufacturers IEC certification;
- 12) Escape route and safety design with reports;
- 13) Container operation, maintenance and safety manual;
- 14) List of equipment supplied with TCA confirmations reference.

Drawings included in the type A documentations shall be compliant with GSCG003.

Other documentation to be sent and supply in paper format in the container

- 1) Main international and local standards conformity declarations for the systems defined in the points from 2) to 6) of previous list
- 2) Schemes and design of different systems from 2) to 6) of previous list

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- 3) Complete design and schemes (electrical, LV cabling, mechanical and structural) of different system;
- 4) LV equipment (LV power system compliant with GSTZ112; Energy station compliant with GSTZ111 and relative DC battery, LV cable and conductor.) and accessories supply manuals and /or data sheet;
- 5) MV equipment (switchgear, circuit breaker, voltage transformer trolley earthing trolley) present in the container operation and maintenance manuals.
- 6) Manufacturers IEC certification for CT's and VT's;
- 7) Only for Spain, annex D.2 GSCG002 for each equipment supplied;

7.10 WARRANTY

60 months of warranty period.

7.11 DOCUMENTATIONS TO BE PROVIDED IN TECHNICAL OFFER

Technical offer shall include following documents:

- Check list, see annex A, to fill in for each **enel** type code;
- Drawings with overall dimensions, views, sections etc ;
- Weight of container without equipment and completed of all devices in transport configuration and operation configuration.

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8 ANNEXES

8.1 ANNEX A - TECHNICAL CHECK LIST

Technical specification:		Offer number:	
Manufacturer		Manufactory factory:	
enel type code:		Manufacturer type code or designation:	
enel material code:			
Technical ratings		Request	Manufacturer offer
1	Maximum altitude (m)	1000	
2	Maximum altitude only for Colombia(m)	2700	
3	Minimum ambient air temperature (°C)	-30	
4	Maximum ambient air temperature (°C)	55	
5	Relative humidity	98%	
6	Maximum wind (m/s)	40	
7	Maximum snow load on horizontal projection (kN/m2)	1,95	
8	Seismic level	AF5	
9	Pollution (IEC-TS 60815-1)	Very heavy (e)	
10	Grid rated Voltage (kV)	Country information before tender	
11	Maximum grid rated voltage (kV)	Country information before tender	
12	IP degree of container	33	
13	IK degree of container	10	
14	Operation	indoor	
15	IAC degree	A	
16	Overall dimension	Annex C	
17	Protective coating (durability/category)	VH/C5	
18	Life expectancy (years)	40	

Table 7 - Check list

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8.2 ANNEX B - MATERIAL CODES

Type code	Description	Argentina	Brazil	Chile	Colombia	Italy	Perú	Rumania	Spain
GSCM770/1	Container with single section MV Ir=1600A			140345		140125			140741
GSCM770/2	Container with double section MV Ir=1600A			140344		140120			140742
GSCM770/3	Container with single section MV Ir=2000A								140866
GSCM770/4	Container with double section MV Ir=2000A								140873

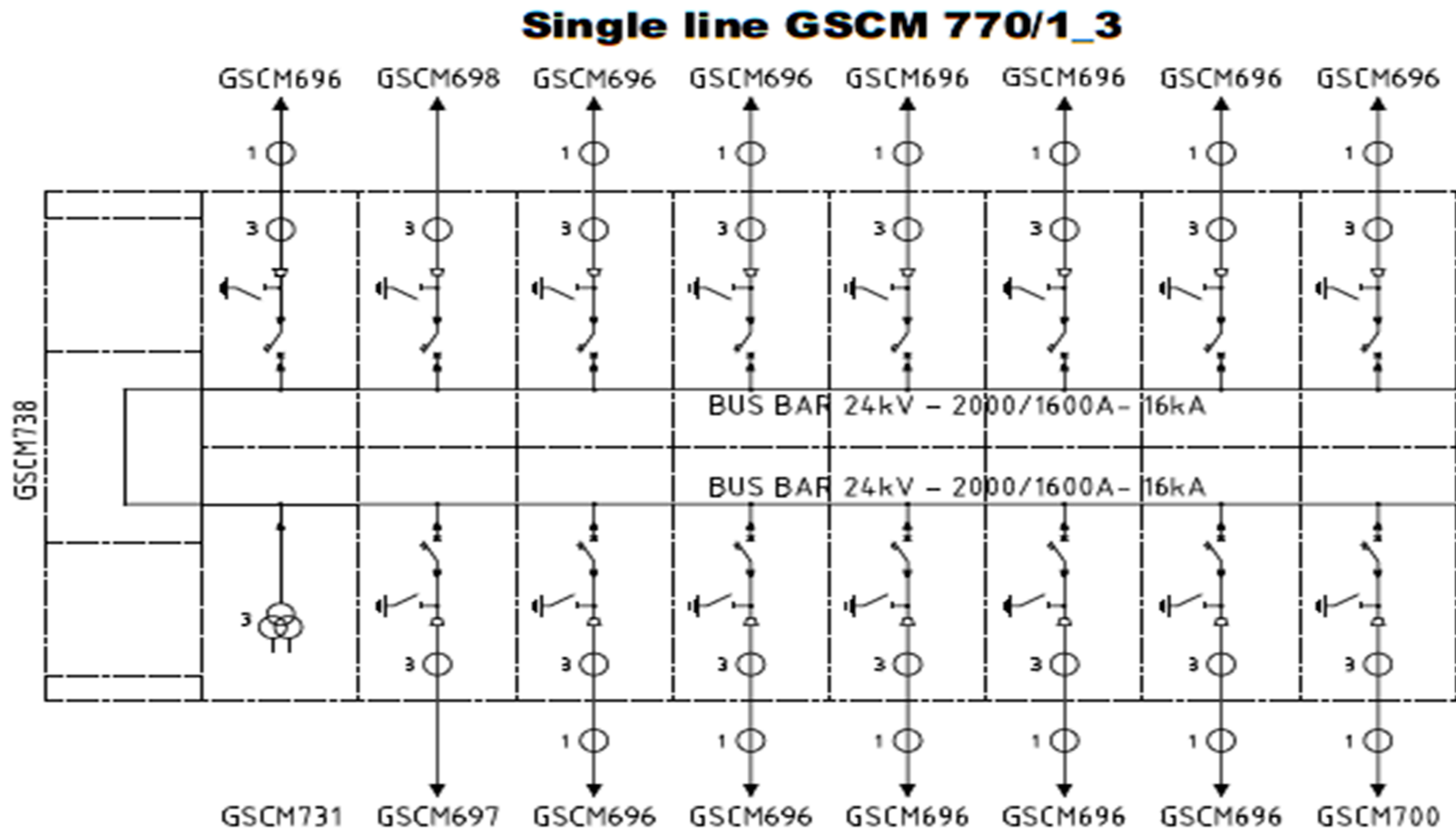
Table 8 - Local material codes

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Application Areas

Perimeter: *Global*
Staff Function: -
Service Function: -
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8.3 ANNEX C - ASSEMBLY OF MV SWITCHGEAR FOR EACH CONTAINER ENEL TYPE

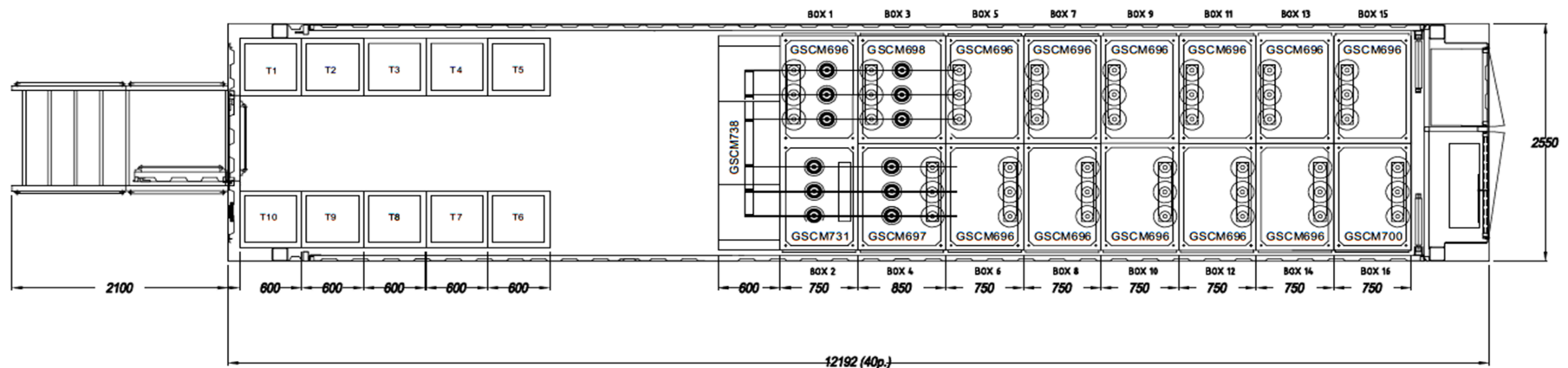
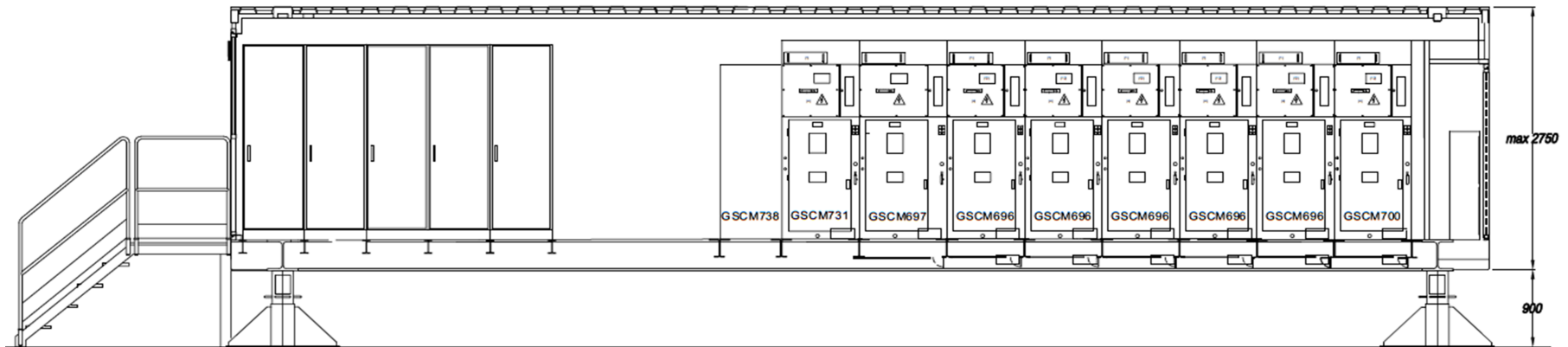


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Service Function: -
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Layout and lateral view GSCM770/1_3

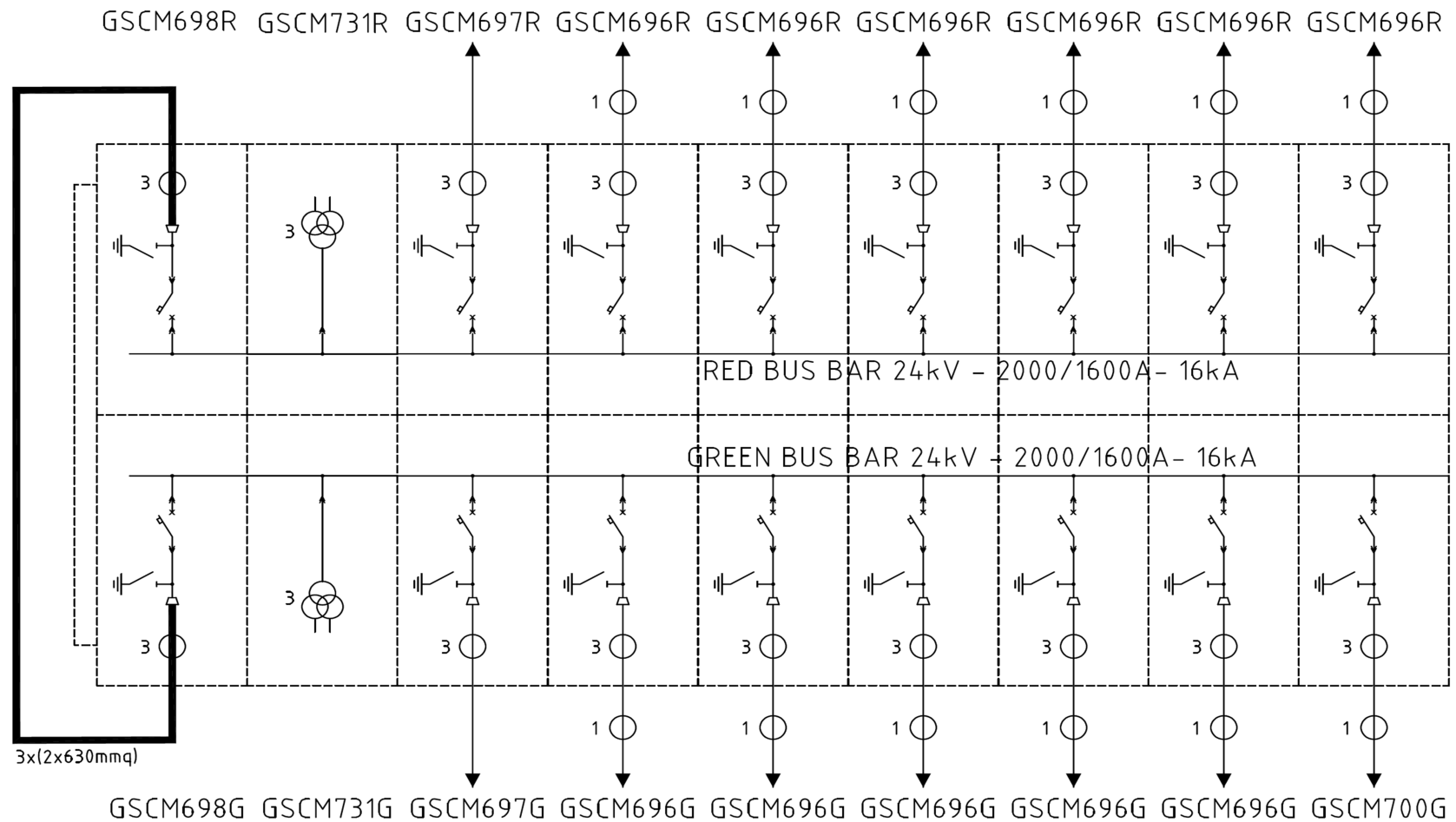


Subject: Enel Grids – GSCM770 MV Section for HV-MV Substation in container solution

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Single line GSCM 770/2_4

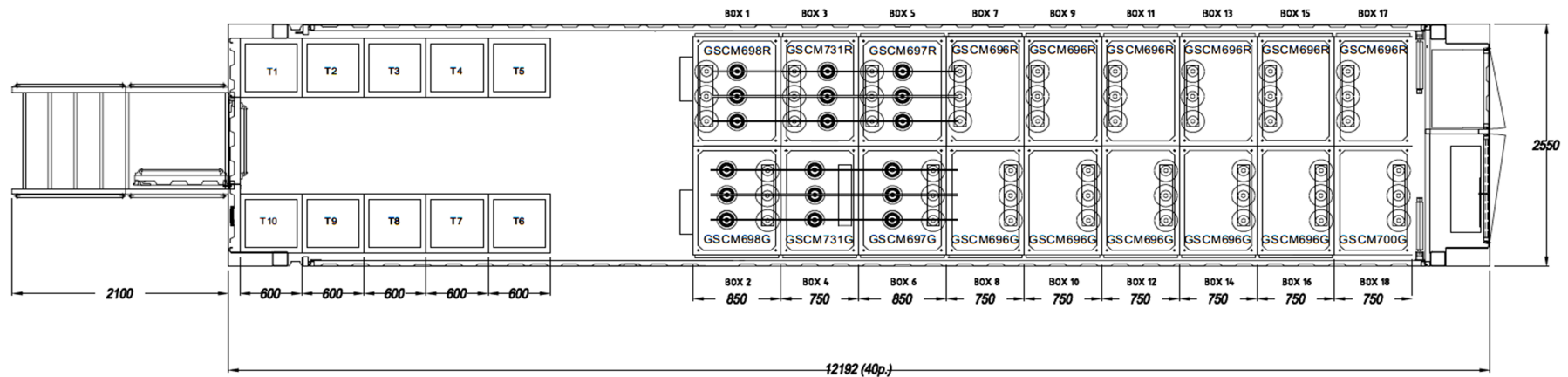
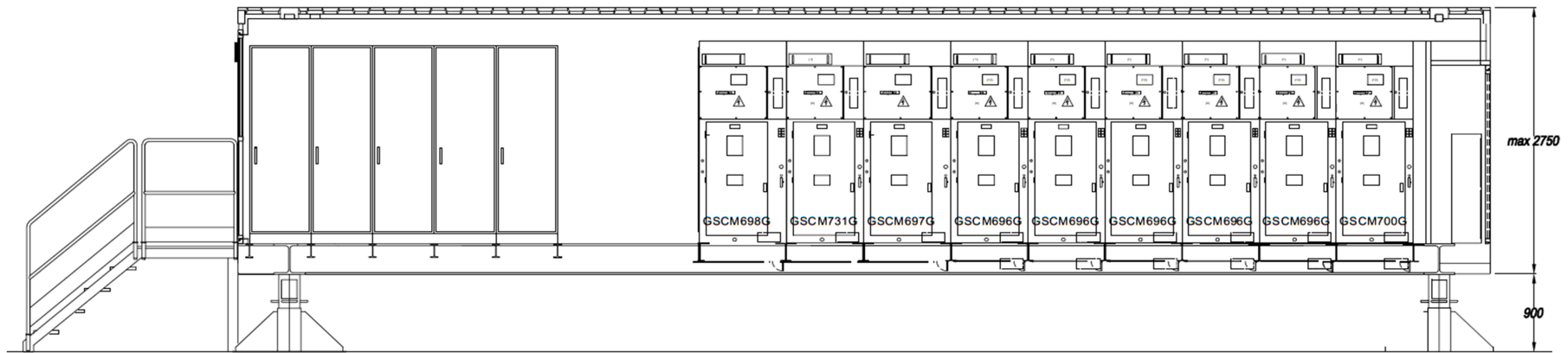


Subject: Enel Grids – GSCM770 MV Section for HV-MV Substation in container solution

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Staff Function: -
Service Function: -
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Layout and lateral view GSCM770/2_4



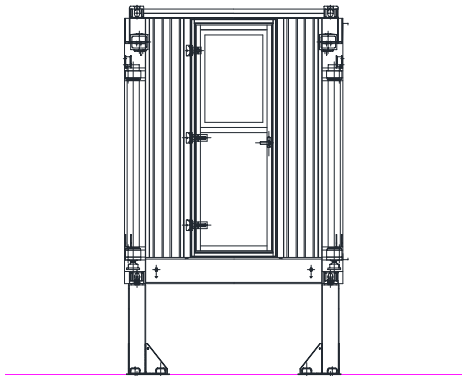
Subject: Enel Grids – GSCM770 MV Section for HV-MV Substation in container solution

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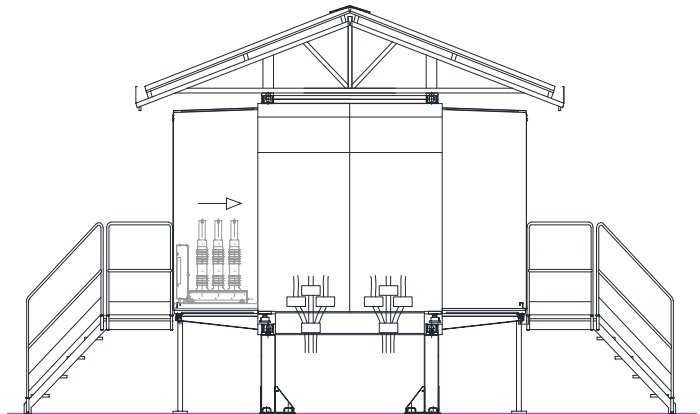
Perimeter: *Global*
Staff Function: -
Service Function: -
Business Line: *Enel Grids*

8.4 ANNEX D - CONTAINER VIEWS AND DIMENSIONS

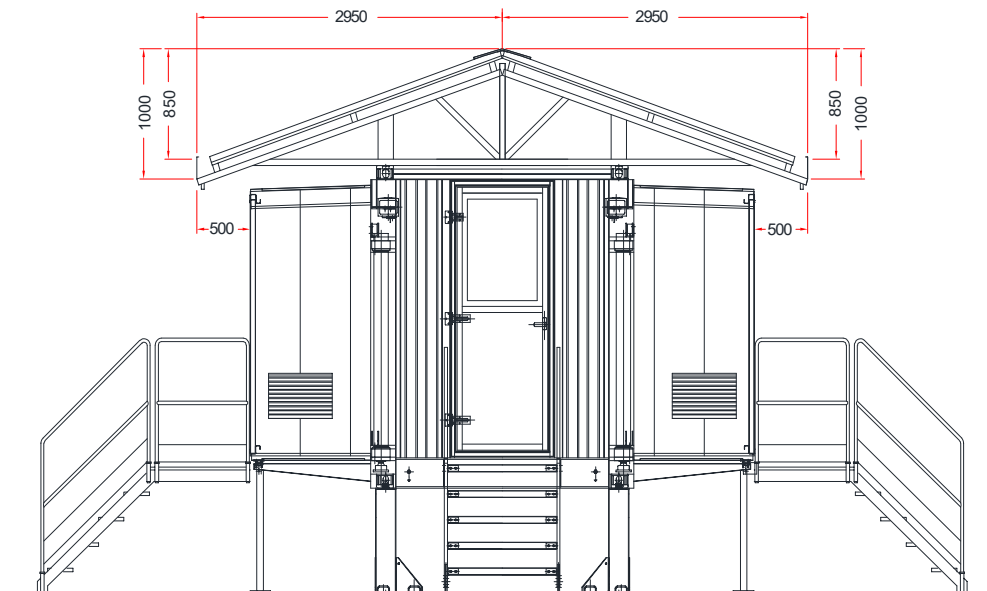
Front view container closed



Back view container opened



Front view container opened with dimensions



Subject: Enel Grids – GSCM770 MV Section for HV-MV Substation in container solution

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Final Layout of container with dimensions

