Material Specification code: GRI-GRI-MAT-E&C-0056

Version no. 1 dated 22/12/2023

Subject: GSCP006 – Provisional LV GenSet

Application Areas
Perimeter: Global
Staff Function: -
Service Function: -
Business Line: Enel Grids

CONTENTS

THE HEAD OF GLOBAL NETWORK COMPONENTS

FABRIZIO GASBARRI

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1. DOCUMENT OBJECTIVES AND AREA OF APPLICATION

This technical specification defines the functional, construction and testing requirements for Mobile LV GenSets defined in Tab.1, also referred to hereafter as "GenSet".

LV GenSets are intended for use in Low Voltage systems for temporary utility power supply in case of accidental outages due to faults or in case of planned outages for works.

LV GenSets with the help of connection to the Re-powering component (GSCP003) can also be used for re-powering portions of the MV grid in compliance with the relevant working instructions.

This document applies distribution networks of the following Enel Grids companies:

- Enel Distribuição Rio - Brazil
- Enel Distribuição São Paulo - Brazil
- Enel Distribución - Chile
- Enel Distribución - Colombia
- Enel Grids - Italy
- e-distribución – Spain

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 unit detailed documents, according to the provisions of the present document and in case of specific needs.

2. DOCUMENT VERSION MANAGEMENT

VERSION	ISSUE DATE	DESCRIPTION OF THE MAIN CHANGES
1	22/12/2023	Issuing of “Provisional LV GenSet” Technical specification

3. UNITS RESPONSIBLE FOR 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: Global: Head of Quality unit.

4. REFERENCE

- LVD 2014/35/EU - Low Voltage Directive
- Directive 2014/30/EU - Electromagnetic Compatibility (EMC)
- Directive 2006/42/CE - Machinery Directive (MD)
- Directive 2000/14/CE - Noise Emission
- Integrated Policy for Quality, Health and Safety, Environment, anti-Bribery, and Information security.
- ADR 2015 (files) - European Agreement concerning the International Carriage of Dangerous Goods by Road
- ISO 9001 - Quality Management System – Requirements.
- ISO 14001 - Environmental Management System - Requirements with guidance for use.
- ISO 45001 - Occupational Health and Safety Management System - Requirements with guidance for use.
- ISO 37001 - Anti-bribery Management System - Requirements with guidance for use.
- ISO 27001 - Information Security Management System – Requirements.
- ISO/IEC 17000 - Conformity assessment – Vocabulary and general principles
- ISO/IEC 17020 - General criteria for the operation of various types of bodies performing inspection.
- ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories
- ISO/IEC 17050-1 - 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 - Conformity assessment - Supplier's declaration of conformity - Part 2: Supporting documentation (ISO/IEC 17050-2:2004)
- ISO/IEC 17065 - Conformity assessment – Requirements for bodies certifying products, processes and services.
- ISO 8528 - Alternating current generator sets driven by reciprocating internal combustion engines (engine performance)
- ISO 8528 -13 - Alternating current generator sets powered by reciprocating internal combustion engines Part 13: Safety
- ISO 17020 - Conformity assessment - Requirements for the operation of various types of bodies performing inspections.
- ISO 17025 - General requirements for the competence of testing and calibration laboratories
- UNI ISO 11228 - Ergonomics - Manual Handling
- IEC 60034-1 - Rotating electrical machines - Part 1: Rating and performance
- IEC EN 60034 – 5 - Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) IP protection.
- IEC 60309-2 - Plugs and sockets for industrial and similar applications and for Electric Vehicles
- PL 479 - Global Infrastructure and Networks Guidelines for the preparation of the "Action Plan for improving the Continuity of Supply".

- PL 34 - Incident and Crisis Management Global Infrastructure and Network Guidelines
- PL 1073 - Global Infrastructure & Networks, Guidelines for Readiness, response and Recovery actions during emergencies on the
- Regulation (EU) 2016/1628 of the European Parliament and of the Council of 14 September 2016 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery, amending Regulations (EU) No 1024/2012 and (EU) No 167/2013, and amending and repealing Directive 97/68/EC (Text with EEA relevance)
- CEI EN 60529 - Degrees of protection of enclosures (IP Code)
- CEI 0-17 - Guidelines for the preparation of emergency plans of electricity distributors
- 2011/65/EU - "RoHS" directive (restriction of the use of certain hazardous substances in electrical and electronic equipment)
- 2019/19/EU - "WEEE" directive (waste electrical and electronic equipment)
- MAT-O&M-NCS-2021-0033-EGIN - “Global Infrastructure and Networks – GSCG002 Technical Conformity Assessment”
- CNS-O&M-S&L-2021-0032-EGIN - “Global Infrastructure and Networks Barcode specification”
- MAT-E&C-NC-2021-0057-GIN “GSCG003” Employer’s Information Requirements for supplier components

Reference documents listed below (amendments included) shall be the edition in-force at the approval request date.

If new technical standards and/or legislative provisions are issued after the issue of this specification, the devices shall comply with the standards/legislative provisions in force at the time of delivery. The application of new standards/provisions shall always be communicated to and agreed upon in advance with Enel Grids.

For internal Enel Grids (GSCG002, CNS-O&M-S&L-2021-0032-EGIN, etc.) the most recent revision attached to the Order Letter applies.

5. REFERENCE LAWS

The power generator shall comply with the relevant regulations and laws described below.

5.1. ENEL DISTRIBUIÇÃO RIO – BRAZIL

- NR10 – Segurança em instalações e serviços em eletricidade
- NR 35 – Trabalho em Altura
- NBR-11809 – Regulador de tensão
- Procedimentos de Rede Prodist – Módulo 8 - Qualidade do Fornecimento de Energia Elétrica
- NBR 5440: Distribution transformers – Requirements (Support test)
- Portaria Interministerial n°3, do Ministério de Minas e Energia de 31/07/201
- ETS-016 - OPERAÇÕES TÉCNICAS UTILIZAÇÃO DE GRUPO GERADOR
- WKI-OMBR-CHV-22-1517-EDBR - Instalação e Remoção de Grupo Gerador em Subestação
- WKI-OMBR-NOB-22-1519-EDBR- Gestão de Equipamentos e máquinas - Battery Limits;

- WKI-OMBR-NOB-23-1558-EDBR - Trabalhos com Grupos Geradores em BT e MT;
- EM-0002-BR - Instalação de Grupo Gerador em Baixa Tensão;
- EM-0003-BR - Conexão Emergencial e Programada de Gerador em Linhas de Média Tensão;
- EM-0004-BR - Instalação de Grupo Gerador em Subestação em MT.

5.2. ENEL DISTRIBUIÇÃO SÃO PAULO – BRAZIL

- NR 10 – Segurança em instalações e serviços em eletricidade
- NR 35 – Trabalho em Altura
- NBR 11809 – Regulador de tensão
- Procedimentos de Rede Prodist – Módulo 8 - Qualidade do Fornecimento de Energia Elétrica
- NBR 5440: Distribution transformers – Requirements (Support test)
- Portaria Interministerial n°3, do Ministério de Minas e Energia de 31/07/201

5.3. ENEL DISTRIBUCIÓN – CHILE

- RPTD N° 01 - Tensiones y Frecuencias Nominales.
- RIC N°05 - Medidas de Protección Contra Tensiones Peligrosas y Descargas Eléctricas.
- Norma Técnica de Calidad de Servicio Para Sistemas de Distribución.
- Decreto Supremo N° 38 del Ministerio de Medio Ambiente – Norma de Emisión de Ruidos Generados por Fuentes.
- Decreto Supremo N° 31 del Ministerio de Medio Ambiente - Plan de Prevención y Descontaminación Atmosférica para la Región Metropolitana de Santiago.
- Decreto Supremo N° 4/92 del Ministerio de Salud - Norma de Emisión de Material Particulado a Fuentes Estacionarias Puntuales y Grupales.

  DECRETO 34 - Modifica reglamento de seguridad para las instalaciones y operaciones de producción y refinación, transporte, almacenamiento, distribución y abastecimiento de combustibles líquidos).

5.4. ENEL DISTRIBUCIÓN – COLOMBIA

- RETIE, Reglamento Técnico de Instalaciones Eléctricas
- Ley 37 de 2003, Control del Ruido
- Resolución 627 de 2006, del Ministerio de Ambiente y Desarrollo Sostenible
- Resolución CREG 070 de 1998
- NTC 1340 (2004) - Electrotécnica, Tensiones y Frecuencias Nominales en Sistemas de Energía Eléctrica en Redes de Servicio Público.
- RETIE numeral 27.2.
- Ley 37 de 2003 El ruido en su vertiente ambiental
- Resolución 627 de 2006, del Ministerio de Ambiente y Desarrollo Sostenible

5.5. ENEL GRIDS – ITALY

- Decreto Legislativo n.81 of April 9, 2008 - Attuazione dell'articolo 1 della legge 3 agosto 2007, n. 123, in materia di tutela della salute e della sicurezza nei luoghi di lavoro
- D.M 13/07/2011 - Approvazione della regola tecnica di prevenzione incendi per la installazione di motori a combustione interna accoppiati a macchina generatrice elettrica
- CEI EN 50160 - Caratteristiche della tensione fornita dalle reti pubbliche di distribuzione dell'energia elettrica
- CEI 0-21 - Regola tecnica di riferimento per la connessione di Utenti attivi e passivi alle reti BT delle imprese distributrici di energia elettrica
- CEI 0-17 - Linee guida per la predisposizione dei piani di emergenza dei distributori di energia elettrica
- IEC 61439-1 - Low-voltage switchgear and control gear assemblies - Part 1: General rules
- IEC 61439-5 - Low-voltage switchgear and control gear assemblies - Part 5: Assemblies for power distribution in public networks
- IEC 61000-6-1 - Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments
- IEC 61000-6-3 - Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
- IEC 82079-1 - Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements
- IEC 60364-5-52 - Low-Voltage electrical installations
- EN 60204 - Safety of Machinery - Electrical Equipment of Machines
- IEC 62103 - Electronic equipment for use in power installations
- EN 61558-2-12 - Safety of Transformers, Reactors, Power Supply Units and Combinations Thereof
- EMI/EMC - Meets radiated requirements for Class A as defined by EN 61000-6-4:2007+A1 20011, CISPR22:1997 Class A
- IEC 61000-2-2 - Compatibility for Low Frequency Signalling on Public Supply Systems (AFLC)
- EN 61000-3-4 - Harmonic Distortion
- EN 61000-3-5 - Limitation of Voltage Fluctuations and Flicker in Low Voltage Power Supply Systems
- EN 61000-4-5 - Class 5 (6kV 1.2/50µS waveform) Transient protection of internal electronics
- EN 60529 - Salt Fog ASTM B 117-07, Enclosure
- IEC 60068-2-27, 2-29, and 2-64 - Vibration during transport
- Electromagnetic Compatibility Directive 2004/108/CE;
- EV 0862 - Technical Specification for inspections/inspections for mobile and wheeled LV gensets
- EM 1116 - Installation of mobile gensets on LV network
- 2016/1628 - Regolamento relativo alle prescrizioni in materia di limiti di emissione di inquinanti gassosi e particolato inquinante e di omologazione per i motori a combustione interna destinati alle macchine mobili non stradali

The most recent official edition of the indicated reference document should be applied, including any subsequent amendments/additions made to it by variants, errata, etc.

The tank shall be constructed in accordance with current legislation and good engineering standards.

5.6. E- DISTRIBUCIÓN – SPAIN

- Real Decreto 842/2002, de 2 de agosto, por el que se aprueba el Reglamento electrotécnico para baja tensión.
- UNE-211024 Cable accessories. Elements of connection to be used in low and medium voltage distribution networks up to 18/30 (36) kV.
- UNE-EN 60034-22:2010 Máquinas eléctricas rotativas. Parte 22: Generadores de corriente alterna para grupos electrógenos accionados por motores de combustión interna de pistones.
- UNE-EN ISO 8528-13:2017 Grupos electrógenos de corriente alterna accionados por motores alternativos de combustión interna. Parte 13: Seguridad (ISO 8528-13:2016, versión corregida 2016-10-15).
- UNE 26513:2004 Grupos electrógenos de corriente alterna accionados por motores alternativos de combustión interna. Medición del ruido aéreo mediante el método de la superficie envolvente.
- UNE-EN 12601 Grupos electrógenos accionados por motores alternativos de combustión interna.
- ISO 3046-1 “Reciprocating internal combustion engines – Performance – Part 1: Declarations of power, fuel and lubricating oil consumptions, and test methods — Additional requirements for engines for general use”.
- EN 60204-1 Seguridad de las máquinas. Equipo eléctrico de las máquinas. Parte 1. Requisitos generales.
- EN ISO 3744 Acústica. Determinación de niveles de potencia sonora de fuentes de ruido utilizando presión sonora. Método de ingeniería para condiciones de campo libre sobre un plano reflectante.
- REAL DECRETO 1644/2008, de 10 de octubre, por el que se establecen las normas para la comercialización y puesta en servicio de las máquinas.
- Directiva 2006/42/CE Seguridad de Máquinas.
- REGLAMENTO (UE) 2016/1628 sobre los requisitos relativos a los límites de emisiones de gases y partículas contaminantes y a la homologación de tipo para los motores de combustión interna que se instalen en las máquinas móviles no de carretera, por el que se modifican los Reglamentos (UE) n.o 1024/2012 y (UE) n.o 167/2013, y por el que se modifica y deroga la Directiva 97/68/CE
- 2000/14/CE (modificada por la 2005/88/CE) Emisiones sonoras de las máquinas al aire libre en grupos insonorizados.
- Directiva 2006/42/CE del Parlamento Europeo y del Consejo de 17 de mayo de 2006 relativa a las máquinas y por la que se modifica la Directiva 95/16/CE
- Directiva 2014/35/UE del Parlamento Europeo y del Consejo de 26 de febrero del 2014 sobre la armonización de las legislaciones de los Estados miembros en materia de comercialización de material eléctrico destinado a utilizarse con determinados límites de tensión (deroga la 2006/95/CE).
- Directiva 2014/30/UE del Parlamento Europeo y del Consejo de 26 de febrero de 2014, sobre la armonización de las legislaciones de los Estados miembros en materia de compatibilidad electromagnética (deroga la 2004/108/CE)
- REGLAMENTO (UE) 2016/1628 sobre los requisitos relativos a los límites de emisiones de gases y partículas contaminantes y a la homologación de tipo para los motores de combustión interna que se

instalen en las máquinas móviles no de carretera, por el que se modifican los Reglamentos (UE) n.o 1024/2012 y (UE) n.o 167/2013, y por el que se modifica y deroga la Directiva 97/68/CE

- Directiva 2000/14/CE del Parlamento Europeo y del Consejo de 8 de mayo de 2000 relativa a la aproximación de las legislaciones de los Estados miembros sobre emisiones sonoras en el entorno debidas a las máquinas de uso al aire libre.
- NEZ005 - "Procedimiento operativo para conexión de grupo electrógeno en BT".
- NNZ03401 - "Condiciones técnicas particulares para la contratación de servicios de prestación de grupos electrógenos de Endesa Distribución Eléctrica".

6. GROUP PILLAR REFERENCES:

- The Code of Ethics of Enel Group;
- The Enel Group Zero Corruption Tolerance Plan (ZTC);
- Human Rights Policy;
- Organization and Management Model as per Legislative Decree No. 231/2001;
- Enel Global Compliance Program (EGCP).

7. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

- Value Chain/Process Area: Engineering & Construction
- Macro Process: Devices and Components Development
- Process: Standard Catalog Management

8. Definitions and acronyms

Acronym and key words	Description
HV	High Voltage (CEI 11-27, rated voltage of systems over 35 kV both AC and DC)
MV	Medium Voltage (rated system voltage over 1 kV if AC or over 1.5 kV if DC, up to 35 kV)
LV	Low voltage (IEC 11-27, voltage > 50 V up to and including 1kV if AC or greater than 120 V up to and including 1.5 kV if DC)
AC	Alternating Current
DC	Direct Current
Cos φ	Power Factor
Mob	Mobile
Φ	Diameter
N°	Number (quantity)
$I_{\Delta n}$	Rated differential tripping current
I/O	Interface board with Input/Output modules
TCA	Technical Conformity Assessment

9. DESCRIPTION

The GenSets shall comply with the characteristics described below for individual Enel Global countries.

10. MATERIAL CODE

Characteristics	Brazil								
Material code	100028	100053	100029	100033	100054	100034	100035	100036	100040
Type Code	GSCP006/1	GSCP006/2	GSCP006/3	GSCP006/4	GSCP006/6	GSCP006/7	GSCP006/5	GSCP006/8	GSCP006/9
Phases	Three-Phase								
Minimum electrical power (kVA)	5	20	50	150	220	300	500	750	938
Power Factor (cos_{φ})	0,8								
LV Network Nominal Voltage (Vac)	380/220 - 220/127								
Nominal Voltage Tollerance (%)	- 8 + 6								
Frequency (Hz)	60								
Neutral Connection	TN-C and TT								
Noise level at 7 metres (dB) (5)	85								
Autonomy 75% (load)	8 hours		12 hours						
Max Size LxHxP (mm)	920/520/760 (1)	2200/1000/1300 (1)	2100/1000/1500 (2)	2200/1450/1500 (2)	3500/2000/1800 (2)	4400/1500/2300 (2)	5000/1700/2400 (2)	5880/1930/2400 (2)	5880/2398/2400 (2)
Max Weight	170 (3)	900 (3)	1354 (4)	2700 (4)	3500 (4)	3700 (4)	5100 (4)	6535 (4)	6629 (4)
Use	Outdoor								
Fire Extinguisher Capacity (Kg)	2 x 6								
Minimum Fire Extinguisher Class	34-A 233 B-C								

(1) : Maximum overall dimensions of GenSet alone

(2) : Maximum overall dimensions of GenSet mounted on truck

(3) : Homologation weight for fast towing on the road, with the unit ready for use, with a full tank of fuel, weight as stated in the vehicle registration

(4) : Weight of GenSet in operating position with full fuel tank. The amount of diesel in the tank must be less than 1000 litres

(5) : Noise level at 1,5 meters (dB)

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Characteristics	**Chile**		
Material code	100039	100038	100037
Type Code	GSCP006/8	GSCP006/9	GSCP006/10
Phases	Three-Phase		
Minimum electrical power (kVA)	300	500	1000
Power Factor (cos_{φ})	0,8		
LV Network Nominal Voltage (Vac)	380 / 220		
Nominal Voltage Tollerance (%)	± 7,5		
Frequency (Hz)	50		
Neutral Connection	TT		
Noise level at 7 metres (dB)	≤ 45		
Autonomy 75% (load)	12 hours		
Max Size LxHxP (mm)	4400/1500/2300	5000/1600/2400	6000/2500/2900
Max Weight	3700 (1)	4800 (1)	9800 (1)
Use	Outdoor		
Fire Extinguisher Capacity (Kg)	2 x 6		
Minimum Fire Extinguisher Class	34-A 233 B-C		
(1) : Weight of GenSet in operating position with full fuel tank. The amount of diesel in the tank must be less than 1000 litres			

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Characteristics	Colombia						
Material code	100001	100002	100003	100004	100005	100006	100007
Type Code	GSCP006/11	GSCP006/12	GSCP006/13	GSCP006/14	GSCP006/15	GSCP006/16	GSCP006/17
Phases	Three-Phase						
Minimum electrical power (kVA)	20	40	60	80	100	125	200
Power Factor (cos_{φ})	0,8						
LV Network Rated Voltage (Vac)	208/120						
Rated Voltage Tollerance (%)	+5, -8 (urban) and -10 (rural)						
Frequency (Hz)	60						
Neutral Connection	TN-C-S						
Noise level at 7 metres (dB)	30						
Autonomy 75% (load)	12 hours						
Max Size LxHxP (mm) (1)	-	-	-	-	-	-	-
Max Weight (Kg)(1)	-	-	-	-	-	-	-
Use	Outdoor						
Fire Extinguisher Capacity (Kg)(1)	-	-	-	-	-	-	-
Minimum Fire Extinguisher Class(1)	-	-	-	-	-	-	-
(1) TBD							

Characteristics	Italy			
Material code	100606	100603	100604	100001
Type Code	GSCP006/18	GSCP006/19	GSCP006/20	GSCP006/21
Phases	Three-Phase			
Minimum electrical power (kVA)	30	125	200	500
Power Factor (cos_{φ})	0,8 lagging			
LV Network Rated Voltage (Vac)	400 / 230			
Rated Voltage Tollerance (%)	± 10			
Frequency (Hz)	50			
Neutral Connection	TT			
Noise level at 7 metres (dB)	70			
Autonomy 75% (load)	12			8

Max Size LxHxP (mm)	2200/1500/900(1) 3800/1800/1500(2)	2900/2000/1500	3500/2000/1800	5500/2200/1800
Max Weight (Kg)	1100(3)	2700(4)	3500(4)	7000(4)
Use	Outdoor			
Fire Extinguisher Capacity (Kg)	1 x 3 or 1 x 4	1 x 6	1 x 6	2 x 6
Minimum Fire Extinguisher Class	21-A 144 B-C	34-A 233 B-C	34-A 233 B-C	34-A 233 B-C

(1) Maximum overall dimensions of GenSet alone
(2) Maximum overall dimensions of GenSet mounted on truck
(3) Homologation weight for fast towing on the road, with the unit ready for use, with a full tank of fuel, weight as stated in the vehicle registration
(4) Weight of GenSet in operating position with full fuel tank. The amount of diesel in the tank must be less than 1000 litres.

Characteristics	**Spain**						
Material code	-	-	-	-	-	-	-
Type Code	GSCP006/22	GSCP006/23	GSCP006/24	GSCP006/25	GSCP006/26	GSCP006/27	GSCP006/28
Phases	Three-Phase						
Minimum electrical power (kVA)	60	100	150	250	400	500	650
Power Factor (cos_{φ})	0,8 lagging						
LV Network Rated Voltage (Vac)	400 / 230						
Rated Voltage Tollerance (%)	± 10						
Frequency (Hz)	50						
Neutral Connection	TT						
Noise level at 7 metres (dB)	70						
Autonomy 75% (load)	12 hours						
Max Size LxHxP (mm) (1)	-	-	-	-	-	-	-
Max Weight (Kg) (1)	-	-	-	-	-	-	-
Use	Outdoor						
Fire Extinguisher Capacity (Kg) (1)	-	-	-	-	-	-	-
Minimum Fire (1) Extinguisher Class	-	-	-	-	-	-	-

(1) TBD

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Characteristics	**Spain**							
Material code	-	-	-	-	-	-	-	-
Type Code	GSCP006/29	GSCP006/30	GSCP006/31	GSCP006/32	GSCP006/33	GSCP006/34	GSCP006/35	GSCP006/36
Phases	Three-Phase							
Minimum electrical power (kVA)	800	1.000	1.250	400	500	650	800	1.000
Power Factor (cos_{φ})	0,8 lagging							
LV Network Rated Voltage (Vac)	400 / 230			Bitensión 400/230 o 230/132				
Rated Voltage Tollerance (%)	± 10							
Frequency (Hz)	50							
Neutral Connection	TT							
Noise level at 7 metres (dB)	70							
Autonomy 75% (load)	12 hours							
Max Size LxHxP (mm) (1)	-	-	-	-	-	-	-	-
Max Weight (Kg) (1)	-	-	-	-	-	-	-	-
Use	Outdoor							
Fire Extinguisher Capacity (Kg) (1)	-	-	-	-	-	-	-	-
Minimum Fire Extinguisher Class (1)	-	-	-	-	-	-	-	-
(1) TBD								

Table 1 - List of material codes

Fig. 1 - GenSet with power up to 30 kVA (wheeled)

Fig. 2 - GenSet with power up to 750 kVA

(Images are for illustrative purposes only)

11. TECHNICAL CHARACTERISTICS

The GenSets shall comply with Tab.1 and following technical characteristics:

- For European Countries:
    - Performance class with reference to ISO 8528-1 and guarantee a performance class G3 or higher
    - Rated electrical power PRP at 40°C and up to 1000 m above sea level (according to Tab.1 of ISO 8528)
    - Diesel engine complying with local regulations/directives/regulations concerning the limitation of pollutant emissions from combustion engines, in force at the time of delivery of the GenSet in accordance with EU Regulation 2016/1628 for non-road mobile machinery (NRMM);
    - Permanent operation even with totally unbalanced load
    - Total harmonic distortion (THD) in voltage measured phase-to-phase and phase-to-neutral with linear load: < 5%.
    - Electromagnetic Compatibility: for European Countries: fully equipped GenSet shall comply with the emission limits imposed by Directive 2014/30/EU, ensuring that the electrical equipment does not generate interference beyond acceptable limits, and is in turn immune to any interference present in the environment;
    - Battery-operate electric start
- For Colombia
    - Maximum harmonic distortion of 5%, based on IEEE 519

The environmental conditions for each country are as follows:

Characteristics	Brazil	Chile	Colombia	Italy	Spain
Ambient Temperature	- 10° C ÷ +40° C	- 20° C ÷ +50° C	- 5 °C ÷ 40 °C	- 20° C ÷ +50° C	- 20° C ÷ +50° C
Altitude[1]	Up to 1000 m above sea level	Up to 1000 m above sea level	2700 metros sobre el nivel del mar	Up to 2000 m above sea level	Up to 2000 m above sea level
Humidity	> 80%	100%	> 80%	> 80%	> 80%
Encloser Corrosivity Degree (ISO 12944)	C5				

Table 2 – Environmental conditions

11.1. Operating conditions

GenSets conforming to ISO 8528, ISO 8528-13 and the Machinery Directive for Italy, conforming to ABNT NBR ISO 8528 e ABNT NBR ISO 8528-13 for Brazil, conforming to ISO 8528, ISO 8528-13 for Chile and for Colombia NTC 2050 Código Eléctrico Colombiano, be capable of being started manually by means of a local start command.

Shutdown shall be carried out manually under normal service conditions and shall be performed automatically on the occurrence of faults that affect normal operation.

It shall be possible for the star point to be either rigidly earthed on board the machine, or separate, connectable to the distribution system, so there shall be adequate provision for the different configurations to be easily and quickly realised (on delivery, the unit shall be configured with an isolated neutral).

GenSets specified in this specification shall be equipped with an interlocking system that prevents parallel connection to a live portion of the grid.

11.2. Transportability, dimensions and weights

Generating sets of up to 30 kVA shall be towable by the vehicles equipped with tow hooks normally supplied to Enel Grids operational teams (Blue Teams).

GenSets with a power rating of 125 kVA to 750 kVA shall be easily loaded and transported on vehicles equipped with cranes normally used by work teams.

The overall dimensions and weight shall not exceed the values indicated in Tab.1.

The maximum weight listed in Tab.1 refers to the unit in complete functional trim, ready for operation and with a full internal fuel tank.

11.3. Container

The GenSet and its auxiliary equipment shall be stored in a single self-supporting totally sealed container.

[1] The supplier, for each type of GenSet, shall verify and guarantee the correct operation even at higher altitudes by reporting the necessary actions in the user and maintenance manual.

The lower part of the protective enclosure shall be sealed in such a way that it collects all possible leaks of combustible, lubricating and cooling liquids and does not disperse them into the environment; its effective volumetric capacity shall not be less than 110% of the liquids contained on board the machine.

GenSet shall be able to operate and stand outdoors indefinitely under the environmental conditions described in Tab.2 and shall be suitable for operation on solid ground without any preparation.

The user and maintenance manual (§ 14) shall indicate the maximum inclination of the ground on which the GenSet can be installed and used (this inclination may not be less than 5 degrees).

The GenSet enclosure shall be completely sealed against the penetration of water from the outside and shall be provided with all appropriate openings to the outside to allow accessibility to the internal components (engine, alternator, tank, battery, etc.) and to the electrical panels. All openings shall be fitted with an airtight seal, retractable handles or handles with a profile that does not protrude beyond the maximum overall dimensions and fitted with a key lock (a single key for all locks on the enclosure). The handles and hinges mounted on the openings shall be robust and made in AISI 316 stainless steel.

The top cover shall be suitably shaped to allow water to run off.

Openings shall allow easy accessibility for inspection, maintenance and repair.

Appropriately closed external access points shall be provided to allow the drainage of liquids (oil, coolant, fuel, etc.) directly from the engine and the drainage of liquids collected on the containment bottom as a result of abnormal leaks within the enclosure. Drainage shall be done without risk of dumping.

The proposed solution for the external access points shall be such as to prevent fuel theft or vandalism.

The GenSet user and maintenance manual shall contain instructions concerning the procedures for recovering any liquids to be drained and instructions for washing the fuel tank, changing the coolant or the engine oil. The method of handling any hazardous waste shall also be indicated, specifying the method of disposal and the relevant code: CER for Europe.

For Brazil:

- Artigo 19 A do DECRETO Nº 8.468, de 08 de setembro de 1976

For Chile:

- DECRETO 148 APRUEBA REGLAMENTO SANITARIO SOBRE MANEJO DE RESIDUOS PELIGROSOS

For Colombia:

- The user manual should provide the following information:Corriente de arranque.
  - Serial number of the machine.
  - Year of manufacture
  - Numerical reference of the standards applied.
  - Specific performance characteristics.
  - Maximum permissible ambient temperature.
  - Minimum permissible ambient temperatura

- Height above sea level for which the machine is designed
- Weight in kg.
- Thermal classification or admissible heating (maximum rated outdoor temperature).
- Connection instructions by means of a wiring diagram.
- Insulation class (e.g. F or H).
- Operating time, in hours. Type: Emergency, StandBy, or FullTime.

The entire structure including the load-bearing parts shall be made of galvanised and epoxy powder coated steel sheets and/or profiles.

The materials used for the structure shall be such as to guarantee the durability of the mechanical characteristics, taking into account that the GenSet is intended to be used and stationed in an environment exposed to external atmospheric agents with an industrial atmosphere containing dust and corrosive pollution.

Bolt and nuts for assembly shall be made of stainless steel.

The fire-retardant and self-extinguishing (sound-insulating/insulating) inner linings that comply with current safety standards shall be suitably fixed to the structure by means of suitable frames or equivalent steel locking systems.

The degree of protection of the enclosure in all parts shall not be less than IP23 according to IEC EN 60529.

The electrical system, control panel with pushbuttons, indicator lights, switches, displays, power cable outlets, service sockets, emergency button etc. shall have at least IP 44 protection rating if not directly exposed outdoors, otherwise they shall be suitable for outdoor use in all weather conditions (with at least IP 66 protection rating).

The container shall be equipped with an internal service lighting system suitable for machine inspections, the lighting system shall be with LED sources, shall be powered by the on-board battery and shall be equipped with an automatic switch-off system.

The outer structure of the container shall be fitted with suitable hooks, which can be secured for stabilisation and securing on transport vehicles.

Straps with ratchet to secure the unit to the means of transport shall be provided, EN 12195-1 e EN 12195-2 (a picture is shown below for illustrative purposes, see Fig. 3).

Fig. 3 – Straps to secure the GenSet to the vehicle (pictures for illustration purposes only)

With reference to wheeled GenSets with power up to 30 kVA in addition to the above requirements, the following requirements apply with regard to the drive system:

- For Italy:
  - the electrical system of the trailer shall have a standardised 13-pole connector for the road side, an additional 13 to 7-pole adapter shall be provided for each power unit to ensure compatibility with any 7-pole standardised connector on the tractor unit;
  - the structure, bumper, drawbar, tow bar and support bar for the number plate and lights of the truck shall be free of sharp and/or dangerous edges.
  - 4 plastic wheel chocks shall be provided for safe parking of the truck unit in operation on flat and sloping terrain. In ride attitude, they shall be placed inside the protective casing of the GenSet.
- For Chile
  - the structure, bumper, drawbar, tow bar and support bar for the number plate and lights of the truck shall be free of sharp and/or dangerous edges.
  - 4 plastic wheel chocks shall be provided for safe parking of the truck unit in operation on flat and sloping terrain. In ride attitude, they shall be placed inside the protective casing of the GenSet.

11.4. Lifting and Handling System

In order to enable easy and safe lifting with a crane with a small vertical footprint, the GenSet shall be equipped with 4 to 8 corner block systems positioned at the bottom and the corresponding accessories for lifting the GenSet in accordance with the corner block regulations contained within ISO 1161.

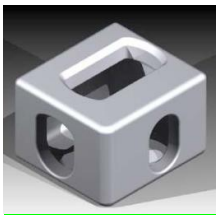

Fig. 4 – Corner block (images for illustration purposes only).

In order to lift GenSet from 125 kVA to 750 kVA, an 'H'-shaped fixed bar shall be provided with 4 chains at the end of which, by means of hooks, specific lateral anchorage hooks are provided for the corner blocks at the base of the unit. The length of the chains shall be such that a distance of no more than 30 cm remains between the top of the GenSet and the bottom of the rocker arm. Different lateral anchorage solution shall be approved by Enel Grids.

The rocker arm shall have a single central attachment point, adequately dimensioned to be compatible with the DIN hook simple forged steel lifting hooks with safety latch shall comply with EN 1677-2 fitted on cranes in use in each country.

Fig. 5 – Lifting rocker device (pictures for illustration purposes only)

The lifting system shall be appropriately dimensioned and guaranteed for the safety coefficients stipulated by the legal/regulatory provisions in force at the time of delivery.

A lifting system with central and barycentric eyebolt is permitted for the wheeled GenSet.

The yellow G80 hook shown here is used for handling universal type containers: thanks to the 90° universal T-profile in relation to the hook's main axis, the hook can be attached either to the right or left side of the container in the appropriate holes - The hook design is suitable for side attachments, both top and bottom of the container in accordance with DM2006/42/CE, EN1677-1,2,3,4.

11.5. Fire extinguishers

Approved fire extinguishers with powder charge according to the GenSet size as shown in Tab.1 shall be provided in an appropriate and easily accessible position.

Fire extinguishers shall be usable on live equipment.

When the GenSet is not in operation (transport and storage): fire extinguishers shall be installed outside, in silhouette with the container, in a fixed and easily accessible manner. If this is not possible, appropriate internal housing shall be provided. In the case of a fire extinguisher housed inside the container, the extinguisher support system on the outside of the unit shall be in silhouette without dangerous protrusions (e.g. fire extinguisher shelter, fire extinguisher shelf with folding base and parking belt).

The location where the fire extinguisher is placed should be marked with the appropriate pictogram (Fig. 6).

Appropriate signs/instructions shall be provided in the user and maintenance manual indicating how and where the fire extinguishers are to be positioned during operation and during parking/transport.

A reminder and the frequency of inspection of the fire extinguishers provided should be included in each country's operating and maintenance manual.

Fig. 6 – Pictogram relating to the fire extinguisher

11.6. Fuel supply system

The tank, which complies with the safety and environmental regulations in force at the time of delivery of the GenSet, shall be mounted inside the container system, in a position that is accessible for maintenance operations (washing) and shall have a capacity that guarantees at least 12 hours of operation at 75% of the nominal load.

It should be noted that for compliance with this requirement, it is not the total amount of fuel that can be contained in the tank that should be taken into account, but the amount of fuel less the amount corresponding to the level for which the GenSet is stopped to prevent the engine from sucking in air.

The internal tank shall have a capacity of no more than 1000 litres.

The GenSet shall be able to be transported/moved (also by road) with a full tank of fuel safely and in compliance with current regulations for each country (artigo 19 A do DECRETO Nº 8.468, de 08 de Setembro de 1976for Brazil, DECRETO 34 for Chile, and ADR for Europe)

The fuel tank, installed on board the GenSet, shall be within the dimensional limits indicated in Tab.1. This tank shall be of a hermetic type with a watertight seal to ensure refuelling without leakage/leakage even when the automatic refuelling system is operating. Refuelling from the external storage tank may be either higher or lower than that of the GenSet's internal service tank.

The tank shall have:

- a fuel tank inlet, not less than 80 mm in diameter, with a vent and hermetically sealed end cap designed to prevent fuel spillage when handling the GenSet at an angle of up to 40°.
- an external nozzle, but within the shape of the container structure, protected by a metal door fitted with a key lock and suitable for the use of the nozzle or approved fuel transport canister;
- A special inspection hatch for the fuel, easily accessible so that the fuel tank can be completely emptied for washing operations. The proposed solution shall protect against fuel theft;
- a continuous level indicator with contact for low fuel level warning, (minimum level warning light). The fuel level and minimum level warning shall be displayed on the control panel. All level signals and alarm states shall be made available on the GenSet alarm management and monitoring interface board;
- an engine cut-off contacts for minimum fuel level to prevent air intake;
- a connection for the fuel vapour vent pipe to be led to the outside;
- an engine block contact in the event of the liquid presence detector tripping in the lower sealed part of the container (§ 11.21).
- a continuous level indicator in the containment tank to monitor any spilled liquids.

The fuel supply circuit to the engine shall include, in addition to the filter installed on the engine, a two-stage filter with automatic water separator and water presence sensor/alarm in the decanter.

The fuel supply system, the tank and all associated components shall comply with/be certified according to fire safety regulations in accordance with the regulations in force in each country.

11.7. Fuel supply system from external tank

GenSets with power from 125 kVA up to 750 kVA shall be equipped with suitable quick couplings, connected to the internal tank by means of pressure pipes for delivery and overflow/return respectively. These connections shall be on side position inside of container's outline, protected from impact and easily accessible for inspections.

The connection of the flow and return pipes to the mobile tank shall be made without stopping the GenSet.

Tank connection hoses shall be made of reinforced and antistatic nitrile. Quick couplings shall comply with current fire regulations.

Couplings with quick-release couplings shall have automatic drip-proof sealing valves to allow connection and disconnection of the pipes to the auxiliary tank without oil leakage. They shall be of metal material suitably treated to resist oxidation over time, robust, with a mechanically secure seal at the connection allowing the connection of flexible hoses with a diameter of 1" for the delivery to the unit and ¾" for the return of the fuel to the external auxiliary tank.

The connection of the pipes to the mobile external storage tank shall be smooth with no possibility of error or reversal of the pipes for the diesel suction/refuelling and return of the overflow from the internal service tank to the GenSet.

There shall be a selector switch on the control panel to activate the external auxiliary tank operation mode. When this control is activated, the control logic shall monitor the fuel level in the inner tank; when the level is below the maximum indication, an alarm signal is triggered and sent to the control panel to indicate lack of fuel or anomalies in the transfer from the external tank.

The external tank shall be equipped with an equipment connection and equipotential bonding conductor.

11.7.1. Components and functional logic of the refuelling system:

The self-priming electric pump, approved/certified according to current standards, for each country, for fuel transfer, shall guarantee a flow rate of between 40 and 70 l/min.

Selecting the external auxiliary tank mode from the control panel will start the pump when the fuel level in the internal tank falls below the maximum level and stop when the full tank level is reached.

The fuel level is detected via an internal tank level sensor.

The fuel status parameter not only has to be managed as an indication at the control panel and in the logic of operation with the auxiliary tank, but also has to be sent to the interface card as a register parameter of the ModBus system.

In the event of a malfunction of the internal tank level sensor (no pump blockage), the excess fuel shall return to the auxiliary tank via the overflow pipe.

A flow switch shall be present on the return connection, the operation of which blocks the self-priming electropump.

In the event of fuel spillage from the tank, the same shall be collected in the lower part of the GenSet hood structure.

The presence of diesel or liquids in the lower part of the GenSet's structure shall be detected by means of a sensor that automatically blocks the GenSet and the automatic feed system, signalling an alarm signal to the control panel and the interface board.

To protect the automatic refuelling system (electric pump) and to reduce the amount of residual dirt sent from the external tank to the internal tank, a suitable replaceable water-absorbing cartridge filter shall be installed on board the machine, on the diesel delivery line.

Any lack of diesel fuel due to leaks in the piping or lack in the auxiliary tank, once a minimum value is reached in the unit's internal tank and defined as 'fuel reserve', causes the immediate shutdown of the GenSet and the refuelling system by activating a luminous and acoustic alarm and sending the signal to the I/O interface board to allow rapid diagnostics and remote monitoring (§ 11.24.2).

The automatic refuelling system shall be equipped with a hand pump.

Operation shall necessarily take place during initial start-up or in the event that the tank has been emptied.

Actuation of the hand pump shall allow the flooding of the pipes and the hydraulic part of the fuel supply/refuelling system by venting air from the system to prevent the pump from priming.

At the end of the flooding operation, it is possible to select the auxiliary tank operation on the control panel, which will initiate the filling and supply cycle.

In order to ensure the safety and integrity and functionality of the automatic refuelling system, it shall be taken into account that the external mobile fuel tanks could be positioned either higher or lower than the GenSets built-in tank (service tank).

The supply will include 2 flexible hoses made of antistatic reinforced nitrile with a single length of 5.5÷6m, equipped with quick couplings in line with the connectors already installed on the GenSet side and those on the external tank (§ 12.1.3) which shall guarantee the fuel delivery/overflow connection between the two components.

Interface fittings to the mobile external tank can also be supplied (for the latter, on the external tank side, it will be necessary to agree with the recipient of the unit on the size and type of threaded connection required, typically ½" or 1" male).

All parts comprising the automatic refuelling circuit and its functional logic shall comply with and be certified in accordance with the fire safety regulations in force (fire prevention technical regulations for the installation of internal combustion engines coupled to electric generating machines).

The automatic refuelling system shall be detailed in the operating manual with all the necessary recommendations for the correct and safe use of the refuelling system, with particular regard to the installation of the external storage tank and the minimum and maximum diesel levels in the tanks.

The automatic refuelling system shall include as an optional accessory a KIT of thermal covers fed directly from the GenSet control panel.

This KIT shall foresee the automatic activation of the preheating system to allow its easy installation on the GenSet-external tank connection pipes (filling and overflow pipes).

The KIT shall guarantee a temperature above 5 degrees to avoid paraffin formation in the fuel oil when the system is used in an environment with outside temperatures close to or below zero (§ 12.1.3)

11.8. Vibrations

The unit shall be mounted on a base made of steel profiles, of sufficiently rigid construction to ensure perfect alignment of the alternator engine coupling.

Alternator and diesel engine shall be mounted on anti-vibration elastic supports capable of absorbing multidirectional stresses: axial (traction and compression) and tangential.

Any destruction of the elastomers of the elastic supports shall not cause the engine or alternator to detach from the bedplate. The Supplier shall document the characteristics of the elastic supports with product data sheets.

Vibrations shall be within the limits permitted by the engine and alternator manufacturers, and in any case not greater than 0.08 mm; the amplitude of vibrations is understood to be measured between peak and peak.

11.9. Diesel engine

The diesel engine shall comply with the most up-to-date regulations in force in each country regarding pollutant emissions, guaranteeing a reduction in emissions with the minimum requirement of compliance with EU Regulation 2016/1628 for European countries and Regulation Decreto Supremo N° 31 del Ministerio de Medio Ambiente - Plan de Prevención y Descontaminación Atmosférica para la Región Metropolitana de Santiago, Decreto Supremo N° 4/92 del Ministerio de Salud - Norma de Emisión de Material Particulado a Fuentes Estacionarias Puntuales y Grupales.for Chile, norma Euro VI for Columbia.

Mechanical performance shall refer to ISO8528-5 for class G3 or higher.

11.10. Speed controller

The motor shall be equipped with a speed controller capable of guaranteeing a percentage frequency variation for loads between 0 and 100 % of no more than 1 %.

In transient operation, starting from a base load equal to 70% of the GenSet's rated power, the speed controller shall guarantee a step response to the switching on and off of a load equal to 40% of the GenSet's rated power, characterised by the following parameters:

- Maximum overspeed, not exceeding ± 6%;
- Maximum settling time at steady state speed (or frequency) ± 2% not exceeding 4 sec.

It shall also be fitted with an overspeed protection device that controls the stopping of the motor at a speed of between 115% and 120% of the rated speed, and in any case with an adequate margin in relation to the GenSet's safe design speed.

It shall be possible to verify the correct intervention of the overspeed protection.

Speed controller intervention alarms shall be tracked and reported on the I/O interface panel.

11.11. Lubrication System

The lubrication system shall be equipped with at least:

- minimum oil pressure switch;

- oil pressure gauge;
- alarms relating to the lubrication system shall be traced to the control panel and reported to the I/O interface card
- hand pump for the extraction of used oil, where there is no easy access to the drain for emptying without risk of leakage.

Please note: the user and maintenance manual shall describe the procedure for the extraction of used oil, the method of disposal and the relevant CER code.

11.12. Cooling system

The cooling system shall be equipped with:

- engine cooling water thermometer;
- maximum water temperature thermostat for signalling and blocking;
- cylinder head maximum temperature thermostat for signalling and blocking (in the case of air cooling).
- alarms related to the cooling system shall be traced to the control panel and reported to the I/O interface card.

11.13. Starter system and battery

The battery shall guarantee the starting of the GenSet under all service conditions even with the preheating system (§ 11.15) out of operation.

The battery capacity shall be sufficient to ensure a minimum of 10 consecutive starts at an outside temperature of -10°C, with the unit inactive for 1 week.

The battery capacity shall not be less than 120 % of the capacity recommended by the motor manufacturer. Batteries with lower capacity shall be (evaluated and) accepted, at the sole discretion of Enel Grids, subject to the supplier providing documentation and test reports proving that the proposed batteries have at least the same performance as a battery with 120 % of the capacity required by the engine manufacturer.

The battery circuit shall be equipped with an easily operable 'battery cut-off' switch/disconnector located in the vicinity of the battery. There shall also be a label identifying the presence of such a switch, and the location of this switch and its function shall be described in the user and maintenance manual.

The manufacturer shall declare the current value that the battery shall deliver to the GenSet control system with the ignition off (key removed) and the battery charger not connected to the mains.

The current absorbed over 30 days by the GenSet with the ignition off (key removed), battery charger not switched on and battery cut-off switch closed shall not reduce the capacity of the installed battery by more than 10 per cent, ensuring the reliability of the starting system.

There shall be a nameplate where the correct procedure for both starting and feeding the low-voltage grid shall be described.

11.14. Exhaust system of flue gas and particulate pollutants

The GenSets shall be equipped with an exhaust after-treatment system to ensure a reduction of exhaust and particulate emission values and shall comply with the European global emission standards in accordance with the regulations in force for non-road mobile machinery (NRMM) at the time of delivery.

All exhaust ducts shall be thermally and acoustically insulated in accordance with current regulations.

Points of hazardous temperature, typically > 60°C shall be suitably shielded for protection against accidental contact.

The end of the exhaust system shall be protected against water ingress by tilting rain guard or equivalent closure system.

Solutions involving the use of a dummy load consisting of electrical resistances to be used as a minimum load for reaching the design temperature of the particulate filter will be (evaluated and) accepted, at the sole discretion of Enel Grids. In case of acceptance by Enel Grids, the dummy load shall be provided with the unit. These resistors may be incorporated within the GenSet or may be an external accessory. They may be used in the regeneration of filters during the GenSet's stationary period or in normal operation, without impairing the proper operation of the GenSet under any environmental conditions in which it is intended to be used.

11.15. Preheating system (Optional)

In the case of stationing and/or operation in particularly harsh climates, to improve the reliability of the starting system, the Generating Set may be equipped with heaters, the characteristics of which are described in the section on optional accessories (§ 12.1.1).

11.16. Alternator

The type of connection of the alternator windings shall be as shown in the following table 3.

Characteristics	Brazil	Chile	Colombia	Italy	Spain
Winding electrical connections	Star with accessible neutral	Star with accessible neutral	Star with accessible neutral	Star with accessible neutral	-[1]

Table 3 – Alternator winding connection

The insulation class and degree of protection of the electrical connections of the stator and rotor, and the electromagnetic compatibility requirements of the alternator shall be as shown in the following table.

Characteristics	Brazil	Chile	Colombia	Italy	Spain
Insulation Class and Degrees Protection	class H materials and IP23 IEC EN 60034-5	class H materials and IP23 IEC EN 60034-5	class F materials and IP23 IEC EN 60034-5	class H materials and IP23 IEC EN 60034-5	-[1]

[1] TBD

Regulatory electromagnetic compatibility	IEC 61000 EN 55011

Table 4 – Alternator requirements

A CT of suitable characteristics for the unit's power rating shall be inserted on each phase.

11.17. Excitation systems and automatic voltage regulators

The alternator shall be equipped with a static-type excitation system with a brushless rotor. The electronic voltage regulator with three-phase reference shall be able to ensure voltage accuracy to ±2% under static conditions with any load and power factor.

In the transient regime, the dynamic voltage change resulting from the step-in insertion of a load having active power equal to 70% and the step-out disconnection of a load having active power equal to the maximum allowable overload power and $\cos\varphi = 0.8$ lagging, should be characterized by the following parameters:

- maximum over-elevation not exceeding ±15% of the calibration voltage;
- settling time to the steady state value ± 2% not more than 2 sec;
- capability to operate at fully unbalanced load, i.e., 100% of rated (phase) load on 1 or 2 phases with 2 or 1 phase at 0 load, maintaining the voltage value within the expected limits even in the case of disconnection/insertion of 100% of the rated phase load;
- the possibility of GenSet output voltage calibration ±5% of the calibration voltage shall be provided on the control panel (the units will be factory calibrated for no-load output voltage level for each country).

11.18. Control panel

The control panel shall comply with the accident prevention regulations in force pursuant to Legislative Decree No. 81 of 9 April 2008, and comply with standard UNI EN ISO 8528-13 for Italy and with standard Pliegos técnicos RIC for Chile, with standard los Tableros deben cumplir con RETIE for Colombia.

The control panel shall be equipped with:

- components for the command, control and securing of the system
- instrumentation for monitoring and managing electrical quantities of power circuits
- instrumentation for monitoring machine variables
- reports of the states and alarms of the GenSet and its associated accessories

The control panel shall allow suitable spaces for control and management maneuvers, allow simple and immediate detection of machine parameters, and make any maintenance easy.

The GenSet control panel shall be turned on by key switch, and the 'engine start shall be activated by appropriate control.

The unit shall be able to stop:

- by manual stop command on the main panel (by operator);

- by emergency button;
- by tripping of an engine and/or alternator protection;
- by command from outside (described in § 11.21).

Machine switches shall be in the vicinity of the main switchboard in an easily accessible position for maneuvering and calibration protections.

The control panel should preferably be located on the short side (alternator side), should be located in a compartment appropriately cut into the structure without protrusions, and should be protected by means of a lockable door with adequate airtightness protection (minimum IP 65 rating).

With the control panel door closed, all controls, information, statuses, signals and alarms for conducting and operating the GenSet (instrument lighting, displays, etc.) shall be visible under all lighting conditions.

All control and command systems/elements (instrument switches service sockets) shall be usable even in adverse weather conditions without precluding use even in heavy rain.

Any data connection cables between GenSet and personal computer, for calibration or downloading of operating logs, shall be opto-isolated to an isolation voltage level greater than 10% of the GenSet nominal voltage.

11.19. Machine switches and differential protection

Machine switches shall be included in the main switchboard or in the immediate vicinity, suitably protected, visible and easily accessible.

The tetrapolar main circuit breaker (machine circuit breaker) for GenSet protection against short circuits and overloads, for GenSet with power ≥125 kVA, shall be a fixed box-type with front terminals and lever control with AC electronic type release with release coil and minimum voltage relay (when the group is stopped, the machine circuit breaker cannot be closed).

The switch shall meet the requirements of a switch-disconnector, i.e. it shall comply with IEC EN 60947-3.

The breaking capacity of the circuit breaker shall be at least equal to the breaking capacity of the switching device in the secondary cubicle for each country.

It shall only be possible to close the circuit breaker if the power cables are correctly connected, the protective door is closed, and the unit's speed and voltage are within the prescribed limits. If one of the above conditions is not met, the switch shall not close and if it is closed, it shall open.

The main tetrapolar circuit breaker (machine switch) shall be able to calibrate the maximum current trip with the range 0.8 ÷ 1 In[1] and have magnetic protection for Icc = 5 ÷10 In.

Protection shall be provided by a differential relay fitted with a separate toroid with selectivity adjustable from 30 mA to 10 A lagging time from instantaneous to 600 ms with override possibility.

Differential current detection shall be carried out on the three phases plus neutral at the output of the machine switch, as close as possible to the terminals of the power cable.

[1] This calibration is necessary to limit the GenSet current when supplying road boxes with a rated current below the In of the GenSet.

Signals, clearly visible on the control panel, of protection excluded, protection in alarm/pre-alarm and protection tripped shall be provided. It shall be possible to easily discriminate the type of protection tripped.

All signals, statuses and alarms of the circuit breaker and earth leakage protection shall be made available on the I/O interface board. Signals, clearly visible on the control panel, of protection excluded, protection in alarm/pre-alarm and protection tripped shall be provided. It shall be possible to easily discriminate the type of protection tripped.

All signals, statuses and alarms of the circuit breaker and earth leakage protection shall be made available on the I/O interface board.

11.20. Tools and commands

The command-and-control equipment shall be accessible by means of a lockable, watertight transparent door that allows visibility of the instrumentation and control positions from the outside, with the exception of the emergency stop control, which is always accessible from the outside.

All equipment mounted on the front of the control panel shall be easily identifiable by means of suitable rating plates.

The following instruments and signals shall be mounted on the front of the control panel:

- No. 1 digital voltmeter, class 1.5 scale 0-500 V, switchable on phase and phase-linked voltages (VG) for measuring group voltages;
- No. 3 digital indicator ammeters with a scale appropriate to the rated current with current reducers installed on the individual phases appropriate to the power of the GenSet;
- No. 1 digital wattmeter, class 1.5, scaling and ratio of current reducers according to GenSet power;
- No. 1 non-resettable three-phase active energy meter;
- No. 1 digital frequency meter with scale suitable for each country;
- No. 1 non-resettable totaliser counter of GenSet running time;
- No. 1 instantaneous water temperature thermometer;
- No. 1 fuel level indicator;
- No. 1 oil pressure gauge;
- No. 1 voltmeter for starter battery voltage;
- No. 1 reset/acquisition button for optical/acoustic alarms and block signals.

As an alternative to the above, the supplier may propose and possibly approve by Enel Grids an equivalent display instrument and/or multifunctional command/control board compatible with the environmental operating conditions of the GenSet.

This display shall in any case present during operation the generator's main electrical quantities (voltages, currents, frequency, power) and the indications necessary for the correct functional monitoring of the engine (water temperature, fuel level, oil pressure). The visibility and legibility of the information shall be guaranteed in all lighting conditions (in any case, all the instrumental information required in the list shall be accessible). Modification of the quantities/parameters shown on the display/screen shall be simple and functional.

11.21. Alarms - Blocking

Anomalies or failures that allow the operation, even exceptional, of the GenSet shall provide an alarm signal; each anomaly shall be memorised and shall be restorable manually by means of a special reset button/procedure.

A list of all alarms/blocks shall be provided and the values of the quantities at which the alarms/blocks are triggered shall be available. This data shall also be given in the user and maintenance manual.

Anomalies that affect the operation of the GenSet shall result in the GenSet itself being blocked.

Any oil/liquid leaks in the lower part of the crankcase shall be detected. The level for which the detector device intervenes shall be such that it does not involve the plant engineering (cables and electrical equipment) and shall determine the blocking of the GenSet with specific signalling on the control panel (the intervention shall inhibit the operation of any automatic top-up system).

The liquid detector device (diesel/liquid) shall be in an intermediate position in the containment tank, easily accessible and it shall be possible to carry out a visual check and actual functional test of the detector.

The remote blocking command of the GenSet shall be foreseen for any external remote management, this function shall refer to a normally closed contact and shall be attested to two easily accessible terminals suitably protected and identified near the interface terminal board (which shall be short-circuited if not in use), its intervention shall be signalled on the control panel on board the GenSet as "remote blocking" and shall cause the power switch to open and the motor to stop.

A siren shall be provided for all alarm signals that can be excluded by means of a special key switch; the disabled acoustic alarm status shall be signalled by a flashing orange light.

All signalling, in addition to local signalling, shall be made available on a special I/O interface board installed in a special module/compartment accessible from the outside without opening the enclosure (§ 11.24.2)

All the control and signalling circuits shall be powered by the on-board battery, allowing their status to be maintained and monitored even when the unit is off.

11.22. LV power connection cables and connection points

All components and circuits in the switchboard which are connected to 230/400 Vac (power circuits) shall be adequate to withstand an isolation voltage of 3 kVeff. - 50 Hz.

GenSets above 125 kVA shall be equipped with a socket panel with the following sockets conforming to IEC 309 and with IP67 degree of protection:

- No. 1 IP67 fixed socket, 3P+N+E, 63 A 415 V 50/60 Hz;
- No. 2 IP67 fixed sockets, 3P+N+E, 32 A 415 V 50/60 Hz;
- No. 1 IP67 fixed socket, 2P+E, 16 A 250 V 50/60 Hz.

The 63 A and 32 A five-pole sockets shall each be protected by a single omnipolar circuit breaker, differential protection is provided by the differential relay described in section (§ 11.19).

Protection of the 16 A single-phase socket is provided by a differential thermomagnetic with Idn = 30 mA type B according to IEC 60755.

GenSets with power 30 kVA shall be supplied with no. 4 single cable reels having dimensions such as to comply with the bending radius indicated by the cable manufacturers and shall be equipped with a rotating storage drum gear made of plastic material, lifting handles and blocking against unwinding. Each of the four reels supplied shall be capable of storing sections of rubberised cable under heavy sheathing suitable for mobile service and for laying in water resistant to crushing and abrasion, with flexible copper conductor class 5/6 (e.g. type H07RN-F), laying temperature -20 °C, each 25 m long.

The ends of the cable with the cable lugs shall be covered with at least 20 cm of a double layer of coloured heat-shrink tubing for phase identification. A label with the phase identification R, S, T, N shall be applied in the vicinity of the cable lug. The label shall be indelible and resistant to abrasion (application of transparent heat shrink tubing is permitted). The other cable termination shall be fitted with an IP67 mobile plug conforming to standard IEC 309 and compatible, in terms of cable cross-section and rated current, to each of the 4 fixed sockets available on the GenSet's power socket panel. The IP67 mobile plugs conforming to standard IEC 309 shall be wound so as to be the outermost layer of the storage drum gear and shall be suitably secured to the drum gear.

If the weight is greater than 15 kg, the reels shall be equipped with a double handle so that they can be handled by 2 persons and have at least two wheels with brakes for horizontal movement on the ground.

On all units, in an easily accessible position, near the cable outlet shall be the device for connecting the star centre (Neutral) in an isolated configuration or directly connected to the ground on board the unit.

The GenSets, close to the cable connection compartment, shall be provided with an easily accessible earth connection point, protected from possible impacts during handling of the GenSet and appropriately marked with a suitable pictogram. Two pieces of single-core FS17 450/750 V cable with a cross-section of 25 sqmm shall be provided, and the insulating jacket shall be coloured in colour yellow - green for for Brazil, colour black for Chile, in colour yellow - green for Europe. These cables shall have at their ends the lug terminations. The cable ends with the cable lugs shall be covered with at least 20 cm of heat-shrinkable sheathing. Cables for connection to the PE protection system shall be laid on a single cable reel.

GenSets with power from 125 kVA to power 750 kVA shall be equipped with a cable outlet compartment near the socket-outlet panel with an IP rating to ensure protection against direct contact, closed by a door hinged on one side and locked in the closed position by means of screws.

The protective door shall be equipped with a safety limit switch with interlock in accordance with standard UNI EN ISO 14119:2013. Opening the door shall cause the machine switch to trip immediately and it shall only be reset when the door is closed and locked.

The lower part of the closing door shall be provided with slots to allow the passage of cables.

Inside the cable outlet compartment shall be the connection point which shall allow easy connection of the power cables. The compartment shall be located close to the control panel and disconnection and protection devices.

The connection compartment of the power cables shall not protrude from the outline of the enclosure structure and the whole shall have adequate mechanical strength.

The connection of the power cables shall be made on suitable shaped copper barbling with connection secured by means of a powerlock connection with screw clamping of a suitable cross-section in relation to the maximum power of the GenSet.

For GenSet with power 750 kVA, the busbar shall allow the connection of several cables, each with a maximum cross-section of 240 sqmm for each of the 4 poles.

Within the cable connection compartment, the phases R, S, T, and the neutral N shall be unambiguously identified at each cable connection point.

Near the exit point of the cables from the connection compartment, there shall be suitable cable anchoring systems which allow the cables to be clamped against electrodynamic and/or mechanical stress.

GenSet from power 125 kVA to power 750 kVA Each shall be supplied with sections of single-core heavy-gauge rubber-sheathed cable suitable for mobile service and installation in water resistant to crushing and abrasion, with class 5/6 flexible copper conductor (e.g. type H07RN-F), installation temperature -20 °C, with cable lugs at the ends.

For GenSets from power 125 kVA to power 750 kVA, the equipment provided is as follows:

- lengths of 25 m with a number of conductors per pole such that the formation per phase is suitable for the GenSet's rated power.
- maximum permissible cross-section of each individual conductor in the pole formation is 240 sq.mm Cu.

The cables supplied with the GenSets from power 125 kVA to power 750 kVA shall be suitably terminated at one end with a cable lug suitable for connecting the cable to the GenSet, the other remote end of the cable shall have a straight compression lug with a Ø 13 mm hole; the cable ends with the cable lugs shall be covered with at least 20 cm of double layer of coloured heat-shrink tubing for phase identification. An indelible, abrasion-resistant label with the phase identification R, S, T, N, shall be applied near the cable lug (application of transparent heat shrink tubing is permitted).

The single cable reels shall be arranged on a rack made of galvanised and epoxy powder coated steel sheet and/or profiles.

The structure consisting of the frame, the storage drums and the cables shall be movable by means of crane trucks normally supplied to Enel Grids. The single hooking point shall be in a barycentric position with respect to the structure, which as a whole shall not exceed a height of 1.30 m.

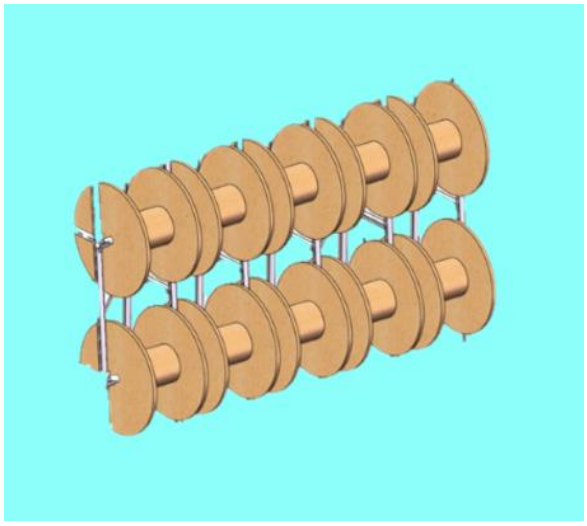

Fig 7: Cable reels (image for illustrative purposes only)

11.23. Stationary group parking services

For standby services when the GenSet is not in use, a low-voltage mains supply shall be provided to keep the starter battery charged.

The stand-by services shall be powered by means of a fixed panel-mounted plug complying with IEC 309 and with protection rating IP67 2P+E, 16A 250V 50/60 Hz.

This plug shall be installed in an easily accessible and sheltered position.

The stand-by services shall be protected by a differential magnetothermal switch Idn = 30 mA, located in the control panel, and suitably identified.

When the switch is closed, a green indicator light shall be provided to identify the presence of power to the services.

It shall also be provided with a FG16OR16 0.6/1 kV or N1VV-K 0.6/1 kV power supply cable with a suitable cross-section and length of 10 m, fitted with an IEC 309-compliant plug and socket and IP67 2P+E, 16 A 250 V 50/60 Hz protection rating.

In stationary mode, the minimum service loads are:

- Rectifier for maintaining the charge of the starter battery at standstill with electronic control of the storage voltage, capable of supplying the battery indefinitely without damaging it;
- pre-heating system (Optional); in the event of operation in particularly harsh climates, to improve the reliability of the starting system, the GenSet shall be equipped with heating elements (§ 12.1.1).

11.24. Connection for DC auxiliary accessories

All GenSets shall be fitted with a fixed socket capable of supplying the auxiliary tank with 12 Vdc.

The socket, which complies with the IEC 309 standard with a degree of protection of at least IP 44, type 2P 32 A 20-25 Vac and 40-50 Vdc shall be 'WHITE'.

The connector shall have a 10h time reference in accordance with EN60309-2 and shall be powered by the starter battery circuit, protected by a circuit breaker/fuse suitably sized for a nominal current of 30 A.

The socket may also be positioned on the side of the encloser near the quick couplings for connecting the external auxiliary tank as long as it is easy to reach and in a safe position, with the space completely inside the unit's outline and away from heat sources.

A note shall be made in the owner's manual to the effect that the power supply from this socket is inhibited when the minimum value of the battery's residual capacity is reached (value that allows safe engine starting).

11.24.1. MV repowering system connector

For GenSet with power 125 to 750 kVA, a 4-pin + T female connector conforming to standard EN 61984 10 A 230/400 V with dimensions 21 x 21 mm housed in a metal alloy enclosure with IP67 protection rating and captive closing cap shall be provided near the control panel or service socket panel.

Fig. 8 - Connector for auxiliary connection of MV repowering system

The following table shows the signals from MV Repowering System:

MV Repowering System Connector		
Pin	Function	Action
1	MV Repowering System Presence	Contact is closed when the system is connected
2		
3	MV Repowering System Release	Contact is closed when the system protection is activated
4		

Table 5 – MV Repowering System Connector

Both contacts of the power supply system are N.O. 6 A 250 V.

Activation (tripping) of the MV repower protection will cause the main switch of the GenSet machine to open and disconnect.

11.24.2. Board and connectors for I/O interface

The GenSet shall be equipped with an I/O interface board that shall make available and receive a series of inputs and outputs that allow the management of certain group commands and report all the operating, alarm and block statuses of the GenSet to allow remote control and supervision.

This board shall be installed in a special compartment, RTU compartment for now on, with terminal board accessible from the outside without opening the enclosure.

The RTU compartment where the interface board is housed shall guarantee an available space inside it that can accommodate, in a dedicated section with DIN rail preparation, the configuration of equipment shown in figures 7 and 8 that will be made available by Enel.

The RTU compartment in which the equipment will be housed shall not shield the signal of the 4G cellular modem inside the RTU.

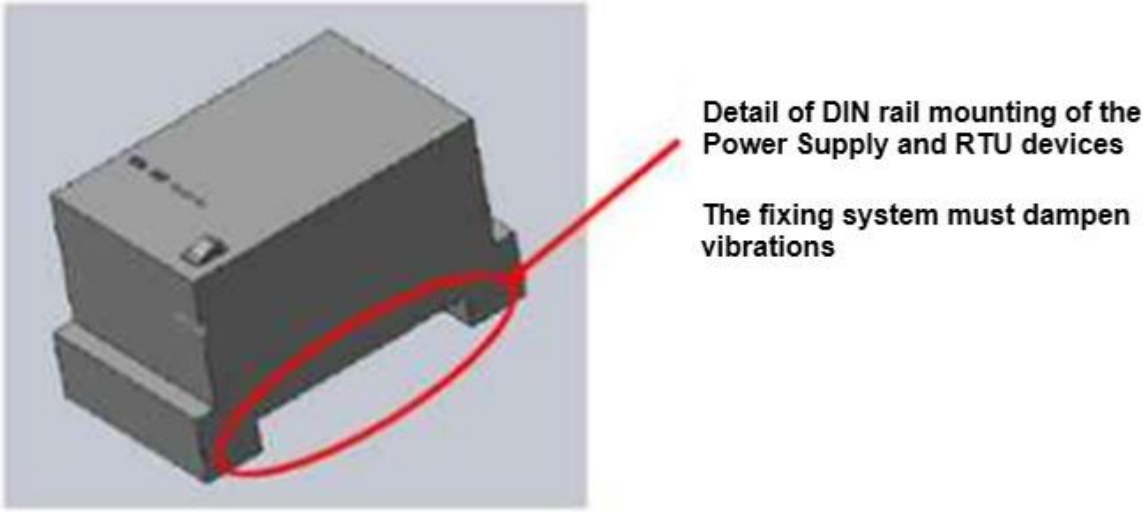

Fig. 9 – RTU power supply module (image for illustrative purposes only)

Inside the RTU compartment shall be available:

- Bipolar fuse holder for RTU power supply (max. width 72 mm);
- Cylindrical fuses 10.3 x 38 mm - rated current 2 A - EN60269
- Fuse holder input cable rated voltage 0.6/1 kV double insulation (conductor cross-section calculated according to upstream protection but minimum 2.5 sqmm)
- Connecting cable for ModBus RS485 communication (2 twisted, shielded):

ModBus	
Pin	Use
1	Data +
2	Data -
3	COM

Table. 6 – Modbus Pins

The ModBus protocol of the GenSet shall be submitted to Enel Grids for approval.

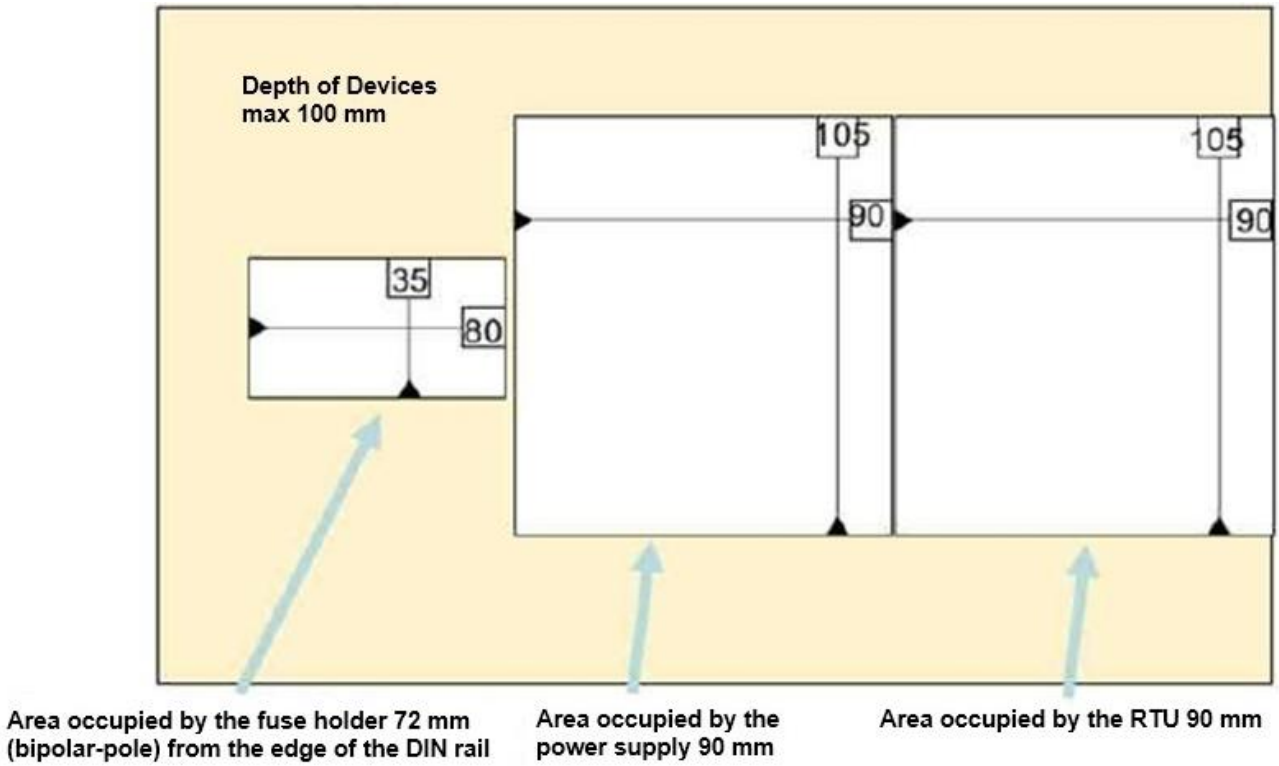

Fig. 10 – RTU compartment dimensions

Via ModBus RS485 communication protocol, commands shall be forwarded to the GenSet and status and alarm signals shall be received, as well as all measurements of the system's electrical quantities that allow monitoring and management of the GenSet.

The following output and input signals shall be made available on the terminal block of the I/O interface board.

All contacts shall have a 6 A – 250 V rating.

The following table shows the signals from GenSet:

Output Signals		
Function	**Signal Type**	**Action**
MV Repowering System Presence	System status	0 = disconnected 1 = connected
Low rpm	Alarm	0 = NORMAL 1 = alarm
Low water level	Alarm	0 = NORMAL 1 = alarm
Fuel reserve	Alarm	0 = NORMAL 1 = alarm
High water temperature	Alarm	0 = NORMAL 1 = alarm
Low oil pressure	Alarm	0 = NORMAL 1 = alarm
Anomaly Dynamo	Alarm	0 = NORMAL 1 = alarm
Failure engine ignition	Alarm	0 = NORMAL 1 = alarm
Engine exceed its maximum recommended RPM	Alarm	0 = NORMAL 1 = alarm
Emergency GenSet	Alarm	0 = NORMAL 1 = alarm

AUX fuel pump presence	System status	0 = disconnected 1 = connected
Engine started	System status	0 = GE OFF 1 = GE ON
Water temperature alarm	Alarm	0 = NORMAL 1 = alarm
Minimum alarm battery voltage	Alarm	0 = NORMAL 1 = alarm
Overload alarm	Alarm	0 = NORMAL 1 = alarm
Short-circuit alarm	Alarm	0 = NORMAL 1 = alarm
GenSet main switch opening	Alarm	0 = NORMAL 1 = alarm
Maximum indication fuel	System status	0 = NORMAL 1 = alarm
Differential tripping alarm	Alarm	0 = NORMAL 1 = alarm

Table. 7 – Output Signals

Input Signals		
Function	**Signal Type**	**Action**
Emergency from remote / Emergency for remote	Alarm	closed= NORMAL open=stop GenSet
GenSet ignition	System status	closed = start engine
Opening machine switch remotely	System status	closed = circuit breaker release
Closing the machine switch remotely	System status	closed = command in closed
Presence of liquids in the tank	Alarm	0 = NORMAL 1 = alarm

Table. 8 – Input Signals

11.24.3. Tracking device (GPS)

GenSet shall be equipped with a co-ordinate detection system (GPS).

The coordinates detected when the GenSet is in operation shall be transmitted via the RTU to the remote-control centre.

12. OPTIONAL ACCESSORIES

Below is the list of GenSet accessories that will be supplied on request.

Accessories	**Brazil**	**Chile**	**Colombia**	**Italy**	**Spain**
	Material code	Material code	Material code	Material code	Material code
Dummy Load	XXXXXX[1]	-	-	XXXXXX[1]	XXXXXX[1]
Thermal covers for external refuelling system	XXXXXX[1]	-	-	XXXXXX[1]	XXXXXX[1]
Mobile Tank	XXXXXX[1]	-	-	100611	XXXXXX[1]

Table 9 – Operation conditions

[1] TBD

12.1.1. Engine start-up heaters in cold environment

Motor preheating device consisting of a suitable resistive element which, supplied by the mains voltage, has the purpose of maintaining the motor at temperature, guaranteeing start-up even at particularly low outside temperatures, allowing maximum power to be delivered without a preheating cycle.

The heating device acts by maintaining, at the manufacturer's choice, either the water of the engine cooling circuit or the lubricating oil contained in the engine sump at preheating temperature. Both types of preheating are controlled and protected by a switch with an optical switch-on signal located on the control panel; the system will be powered by the 230 Vac service circuit.

The operation of the heaters will be regulated by an internal thermostat with a fixed setting preset by the manufacturer.

12.1.2. Dummy Load

A dummy load shall be provided consisting of a load resistor complete with protection devices, electromechanical devices for the step-by-step insertion of the individual elements required for modulating the load applied to the generator, and an integrated ventilation system.

This accessory shall make it possible to:

- perform load tests on the GenSet;
- act as a stabilising the load;
- in the case of operation at low loads, avoid 'wet-stacking' phenomena;
- allow the design temperature of the particulate filter to be reached so that it can be regenerated.

The purely resistive, three-phase, balanced dummy load shall consist of stainless steel finned resistive elements with a supply voltage of up to 690 V at a frequency of 50 Hz and the possibility of inserting the prescribed individual load steps with manual control.

The required degree of protection is IP67 for the control panel and IP 23 for the module containing the resistors. The optional equipment shall be designed for continuous operation, installed outdoors at ambient temperatures between -25 °C and +50 °C, equipped with a ventilation system for cooling and an over-temperature protection system.

The control panel shall comply with standard CEI EN 60204 and shall be equipped with a suitable disconnection, protection and mains presence light signal device.

The switch-on and switch-off controls of the individual steps shall display the value of the selected power with a light signal indicating switch-on.

Each time they are switched on, off or disconnected from the mains, the resistor steps shall be disconnected, resetting the power of the dummy load to zero.

The dummy load models that can be requested as an accessory are shown below in Tab.10

Accessory Ref.	GenSet type	Rated power of resistive bank (kW)	Insertion steps (no.)	Percentage of plugged-in power (%)	Plugged-in power (kW)	Max. dimensions L x W x H (mm)	Max. weight (kg)
R-20	30	20	5	10	3	900 x 500 x 500	60
				10	3		
				10	3		
				30	9		
				40	12		
R-250	From 125 kVA to 750 kVA	250	5	10	25	1300 x 1000 x 1000	350
				10	25		
				10	25		
				30	75		
				40	100		

Table 10 - Dummy load models with references

The connection of the dummy load to the GenSet should be made as follows:

- the R-30 accessory for GenSets of power up to 30 kVA shall be connected with a cable of suitable cross-section of rubberised type under heavy sheath, suitable for mobile service, resistant to crushing and abrasion. The cable conductor shall be class 5/6 flexible copper (e.g. type H07RN-F), laying temperature -20 °C, 10 m long, already wired to the dummy load and fitted with an IP 67 mobile plug, 3P+N+E, 63 A 415 V 50/60 Hz;
- the R-250 accessory for GenSets with power ratings from 125 kVA to 750 kVA shall be connected with cable of suitable cross-section, rubberised type under heavy sheath suitable for mobile service resistant to crushing and abrasion. The cable shall have a class 5/6 flexible copper conductor (e.g. type H07RN-F), laying temperature -20 °C, 10 m long, already wired to the fictitious load and prepared for connection to the GenSets with a straight compression lug with Ø 13 mm hole. The cable ends with the cable lugs shall be covered with at least 20 cm of double layer of coloured heat-shrinkable sheathing for phase identification. An indelible, abrasion-resistant phase identification label (R S T N) shall be applied in the vicinity of the cable lug (transparent heat shrink sleeving is permitted).
- The fairing of the R-250 dummy load shall be provided with a suitable cable support system when not connected.

The materials used for the structure shall be such as to ensure the durability of the mechanical properties, taking into account that the dummy load is intended for use in an environment exposed to outdoor weathering with marine and/or industrial atmosphere containing dust and corrosive pollution.

Frame profiles and cover plates if steel shall be galvanized and epoxy powder coated. All openings shall be fitted with retractable handles or with a profile that does not protrude from the maximum footprint and equipped

with a key lock (single key for all locks on the enclosure). Handles and hinges mounted on the openings shall be made of AISI 316 stainless steel.

The dummy load shall be provided no.4 attachment points arranged on the outer profile of the structure or single central and barycentric point. Lifting device compatible with attachment to the hooks of the cranes provided to e-d to the various countries shall be provided.

12.1.3. Thermal covers for external refuelling system

The accessory implements the protection of the auxiliary fuel system from the formation of kerosene in the pipes and tank containing diesel fuel preserving the system in the case of use in with external temperatures down to -30 °C. The accessory shall be connectable to the GenSet by means of a movable plug complying with IEC 309 standard with IP67 degree of protection type 2P+E, 16 A 250 V 50/60Hz and powered at the voltage of 230 Vac.

By means of a fixed setting thermostat it maintains the auxiliary tank-tubing complex at a temperature of not less than 5-10°C. The power consumption of the heating elements shall not exceed 1500W the heating cover the auxiliary tank and 1000W for the heating covers the connecting pipes.

Fig.11 – Thermal covers (Images are for illustrative purposes only)

13. LABELLING

All markings required by the relevant standards, including those below, shall be clearly, indelibly and permanently displayed.

13.1. Outer Enclosure

In a clearly visible position the GenSet identification plate with at least the following data:

- manufacturer;
- CE marking;
- pictogram indicating guaranteed sound power level (LWA);
- type;

- serial number;
- year of construction;
- power [kVA];
- rated line voltage [V];
- rated open-circuit voltage [V];
- current [A];
- frequency [Hz];
- power factor [cosφ];
- engine RPM [RPM];
- engine manufacturer, type and serial number;
- manufacturer, type and serial number of the generator;
- manufacturer, type and serial number, if any, of the control panel and control cabinet.

An additional plate, to be attached to the container, shall be indelibly marked with the weight of the GenSet and instructions for lifting it.

The centre of gravity point shall be marked on all sides of the assembly in order to verify that the attachment point of the crane hook to the lifting accessory with four fixed lifting links is perpendicular above the marking (§ 11.4).

13.2. Diesel engine

A plate with the following data shall be present on the engine:

- type of engine
- the manufacturer
- technical and identification data of the engine.

13.3. Generator

A plate with the following data shall be present on the generator:

- type of generator
- the manufacturer
- technical and identification data of the engine.

13.4. Control panel

All the equipment mounted on the front of the control panel shall be easily identifiable by means of indelible name plates fixed by means of screws or a system that guarantees equal effectiveness and durability.

A plate affixed in a clearly visible position on the control panel (or close to it) shall be marked with indelible lettering indicating the correct sequence of operations for starting and stopping the unit.

A QR code shall be applied near the control panel, unique for each type of GenSet, which once framed with a smartphone or other device equipped with an optical reader will make available to Enel Grids operators the user and maintenance manual and the video tutorials archived by Enel Grids on a special repository.

13.5. Auxiliaries

A plate with the following data shall be present on the battery:

- type of battery;
- capacity (Ah);
- maximum discharge current (A).

Close to battery cut-off switch/disconnector, a nameplate shall be provided with the following indication:

"Battery disconnect switch. Open only when the parking services cannot be switched on and during transport and handling of the Genset. Ensure that the switch is closed when the parking services are powered'.

Close to parking services connection plug a nameplate shall be provided with the following indication: "Parking Services - Group Auxiliary Services".

The switch and service sockets shall be provided with a nameplate describing their function.

All switches and main system components shall be clearly identified by function, status and position.

14. DOCUMENTATION SUPPLIED WITH THE GENSET

An user and maintenance manual shall be supplied with the GenSets in the language of the country of delivery and contain the following data about:

- diesel engine;
- alternator;
- plant engineering with circuit diagrams;
- generator set functionality;
- handling;
- maintenance;
- automatic refuelling system (if present);
- I/O interface card;
- cold start heater (if present);
- conformity, testing and origin certificates for the engine and alternator provided by the respective manufacturers;
- test certificates for the Generating Set;
- certification attesting to the acoustic power level in compliance with requirements/regulations;

- electromagnetic compatibility certification;
- EC Declaration and Certificates of Conformity;
- declaration of conformity with technical prescriptions regarding fire prevention standards, which in case the option for automatic fuel refilling is included shall also include the option itself with hoses and quick couplings up to the connection points with the external storage tank (external storage tank excluded if not included in the scope of supply);
- methods and precautions for lifting and loading the truck (for sizes 125, 200, 750 kVA);
- methods and precautions for docking the truck and its towing on the road, for size 30 kVA.

The GenSet shall be provided with a "machine booklet" for the registration of maintenance operations carried out; the data in the booklet shall be:

- identification data of the GenSet with technical characteristics;
- the checklist of all the routine operations considered necessary for the maintenance and operation of the GenSet;
- then there shall be a record of the data collected and the operations performed over time to demonstrate proper maintenance for product warranty purposes (recording of start-ups, hours of operation, checks, routine maintenance and anything else necessary). A suitably protected pocket shall be created near the main switchboard to hold the quick guide and the machine manual. The above documents shall be subject to verification, evaluation and approval by Enel Grids. With regard to what is required, the period between one inspection/verification and/or start-up and the next, shall not be less than two weeks in the case of an unused GenSet, daily in the case of a GenSet in generation operation.

Important: For each GenSet, actions in accordance with (§15.1) tests shall be carried out prior to shipment.

15. PRODUCT TECHNICAL CONFOMITY ASSESMENT

For the supply of the product, after the award of the contract, it is necessary that it passes the approval and testing processes described below.

15.1. Product Technical Conformity Assessment

After the tender has been awarded, a process of technical evaluation of product conformity with respect to the requirements of the technical specification and related standards, called "TCA" (Technical Conformity Assessment) or also "product homologation/approval", will be initiated.

The TCA consists in the verification of functional, dimensional and construction characteristics through the analysis of technical documentation, certifications and, when foreseen, through the execution of laboratory and plant tests; both documental verifications and laboratory/plant tests are among the verifications to be passed to obtain the TCA and are listed below and defined among the "TYPE TESTS". (§15.4)

For the description of the TCA process, please refer to Global Standard GSCG002, in the edition in force in the Order Letter; during the "Request for Proposal" phase, the type of TCA (first/second/third part) will also be defined, always in accordance with the Global Standard in force in the tender phase.

The supplier shall submit to Enel Grids, within the terms established in the Order Letter, the product documentation for the necessary approval and make available, prior to type testing, a prototype GenSet for each size offered.

The following documents shall be provided for the TCA of the product:

- the documents accompanying the GenSet (§ 14);
- copy of the EU type-examination certificates issued by the 'notified body
- a copy of the results of the tests carried out for EU certification purposes
- the TCA documents indicated in Global Standard GSCG002, in the edition in force in the Order Letter.

15.2. Testing and Supply Requirements:

Once approved, the GenSet prototype will have to be submitted to type and routine testing.

Type tests are intended to verify the conformity of the prototype with this technical specification. Routine tests will be carried out on each delivery lot.

15.3. TESTING REQUIREMENTS

Not destructive tests are listed and classified as in Tab. 11 and are to be performed in the order indicated on the same GenSet:

Test no.	Type Test	Routine Test	Description
1	X	X	Visual inspection
2	X	X	Control of geometric characteristics and weight
3	X		Mechanical strength and balanced lifting
4	X	X	Insulation
5	X		Cold start
6	X		Hot operation with load transients
7		X	Load and transients at room temperature
8	X		Checking the functioning of the fuel level detection system and monitoring hourly consumption
9	X		Vibration measurement
10	X		Measurement of noise level outside the container
11	X	X	Operation of unit's starting, stopping and control devices
12	X		Measurement of battery current with circuits in stand-by mode
13	X	X	Verification of power cables
14	X		Compliance with IP23 enclosure rating
15	X		Sealing of the lower part of the enclosure
16			Operation of the float switch for presence of liquids in the lower part of the crankcase and related alarms and arrests
17	X	X	Conformity of optional accessories

18	X		Overfilling with verification of the tightness of the fuel supply system from the storage tank
19	X		Vehicle homologation (only for GenSet with power 30 kVA): - presence of the bogie homologation file; - homologation characteristics in accordance with requirements; - functionality of road system (lights, brakes)
20		X	vehicle type-approval documentation for local public register of antivehicle registration (only for GenSet with power up 30kVA)
21		X	vehicle functionality (only for GenSet with power 30 kVA): (a) light system functionality; (b) brake system set-up, dynamic/inertial brake and hand brake adjustments.

Table 11 - List of tests

All tests shall be carried out according to the parameters listed in Tab. 1 for each country.

15.4. Type tests

In accordance with Global Standard GSCG002 (unless otherwise specified in Tab. 11), the supplier shall provide successful type test reports the tests.

The tests shall be carried out in a laboratory that complies with one of the following criteria:

a) A laboratory accredited according to ILAC (International Laboratory Accreditation Cooperation) to operate in accordance with ISO/IEC 17025 for each specific test to be performed; the laboratory shall issue a test report.

b) A non-accredited laboratory (possibly including the supplier's laboratory) under the supervision of a third party accredited according to IAF (International Accreditation Forum) to operate in accordance with ISO/IEC 17020 or ISO/IEC 17065 for the specific product family covered by this technical specification; the third party will issue an inspection report (appendix b point e) attesting to the suitability of the laboratory and the result of the tests, attaching the test report issued by the laboratory.

Enel Grids reserves the right to participate in all type tests performed by the supplier, who undertakes to give notice of the date of the tests in due time.

For type tests already carried out on marketed products, Enel Grid reserves the right to request the technical file containing the documentation and reports of the type tests and verifications carried out, on the basis of which the certificates of conformity with the applicable product standards are substantiated.

The technical file shall be made available by the supplier.

In the event of product certification/approval obtained prior to the contracted TCA and in accordance with this Technical Specification, Enel Grids reserves the right to require, at the supplier's expense, all or part of the following tests in Tab.11.

The documentation, provided to Enel Grids for verification of compliance with the specification requirements and the type test reports, shall be included in the prototype approval file.

The entire TCA process shall be carried out on Enel Grids IT systems.

It is required that the type-approval file relating to the type-approved prototype be accompanied by photographic documentation making the elements subject to type testing comparable for subsequent acceptance tests.

Any design or construction evolution that changes the functional or construction characteristics of the product (e.g. modification of the casing, probes, etc.) shall be authorised in advance by Enel Grids, which may request the repetition of one or more type tests and the updating of the certification documentation.

No prototype subject to destructive tests or in any case deteriorating the quality and resistance or duration of the product, shall be included in a supply lot.

15.5. Routine tests

The list of routine tests to be performed is given in this document.

Routine testing shall be performed to verify that the supply lot meets the requirements as approved in the TCA file and the sample.

The supplier shall carry out the acceptance tests independently, keeping documentary evidence of them following what is set out below, moreover, when deemed appropriate by Enel Grids, the tests may be repeated in the presence of Enel Grids personnel.

With reference to the acceptance tests:

- tests 1 - 20 shall be performed on 100% of the samples;
- tests 2 - 11 - 13 - 21 shall be performed on 50% of the samples (minimum 1 sample);
- tests 4 - 7 - 17 are carried out on 1 sample subject to acceptance.

The negative outcome of even one test shall determine the extension of the relevant test to all the samples in the batch, with replacement of the defective ones.

If the test is repeated in the presence of the inspectors of Enel Grids, it will be performed on a reduced sample, equal to half (rounded down) of the sample determined above for the tests performed independently; it will be the right of the Enel Grids inspector to freely choose whether to perform the tests on samples previously tested by the Supplier or not; the negative outcome of even a single test will determine the negative outcome of the test.

Routine tests will be carried out at the Supplier's expense at its own testing facility, where the necessary equipment and instrumentation shall be provided. At the time of testing the Supplier shall present the certificates of origin and test bulletins for the alternator and the Diesel engine. All tests shall be carried out with the unit in service trim, fully equipped.

15.6. Description of tests

15.6.1. Visual inspection

The visual inspection of the type tests shall verify the correspondence of the GenSet, its components and accessories to the necessary requirements and the correspondence of the switchgear and its components to this technical specification.

The visual inspection of the routine tests shall verify the correspondence of the GenSet with the approved documentation.

During the visual inspection it shall be verified that the geometric characteristics, dimensions, total weight of the assembly, surface protective treatment and accessories are in accordance with the drawings and data delivered by the Supplier.

Also to be verified is the absence of visible manufacturing defects, the accuracy of construction, and the presence of the prescribed components/accessories.

15.6.2. Test of mechanical strength and lifting in balance

The GenSet in functional set-up (with full liquid supply) with the addition of a ballast of +15% of the GenSet mass, evenly distributed on the bottom, shall be lifted by means of the coupling points and kept lifted for the duration of 5 minutes.

At the end of the tests, no permanent deformations shall be detected, in particular all hinged latches of the hood and control panel shall be checked for correct functioning and no visible misalignment.

During the lifting test of the assembly and accessories it shall be verified that the position of the load's centre of gravity in relation to the attachment point keeps the assembly in a stable position and avoids load swaying.

15.6.3. Insulation test of power circuits

In addition to the requirements of standard UNI EN ISO 8528-13, a voltage of 2500 Vac 50 Hz for 1 minute shall be carried out on all electrical circuits of the power connections (230/400 Vac) by applying a voltage of 2500 Vac 50 Hz for 1 minute between them and the earth and between separate circuits. The insulation resistance > 1000 MΩ at room temperature shall also be measured.

The test shall be carried out by disconnecting the alternator and its control circuits installed in the machine.

15.6.4. Cold start test

A cold start shall be performed with a fully charged battery on the GenSet in functional condition for 12 consecutive hours at a temperature of -10°C. ± 1 °C with the heaters switched off, the engine shall be able to start in a maximum of 5 attempts spaced 5 minutes apart.

The started engine shall remain running regularly for 15 minutes. At the end of the test the complete functionality of the unit will be checked.

15.6.5. Load test, hot running and transients

The test shall be conducted with the following initial conditions:

- full fuel tank
- GenSet conditioned for 12 consecutive hours at a temperature of 40 °C. ± 1°C;
- loads suitably prepared to carry out the dynamic tests described below.

The GenSet shall be operated for 8 consecutive hours in normal operation (with the enclosure closed) with a power output equal to the nominal value (PRP ISO 8528), at nominal voltage and with a power factor of 0.8 lagging.

A dynamic behaviour test shall be carried out every 2 hours as described below.

Dynamic performance test Load % Time diagram of load variations 0-100% in cycle of 30 seconds.

The unbalanced load functional test on one/two phases will be carried out once at the fourth hour of operation after the dynamic performance test.

The unbalance sequence shall involve opening (off)/closing (on) the nominal phase loads according to the following diagram:

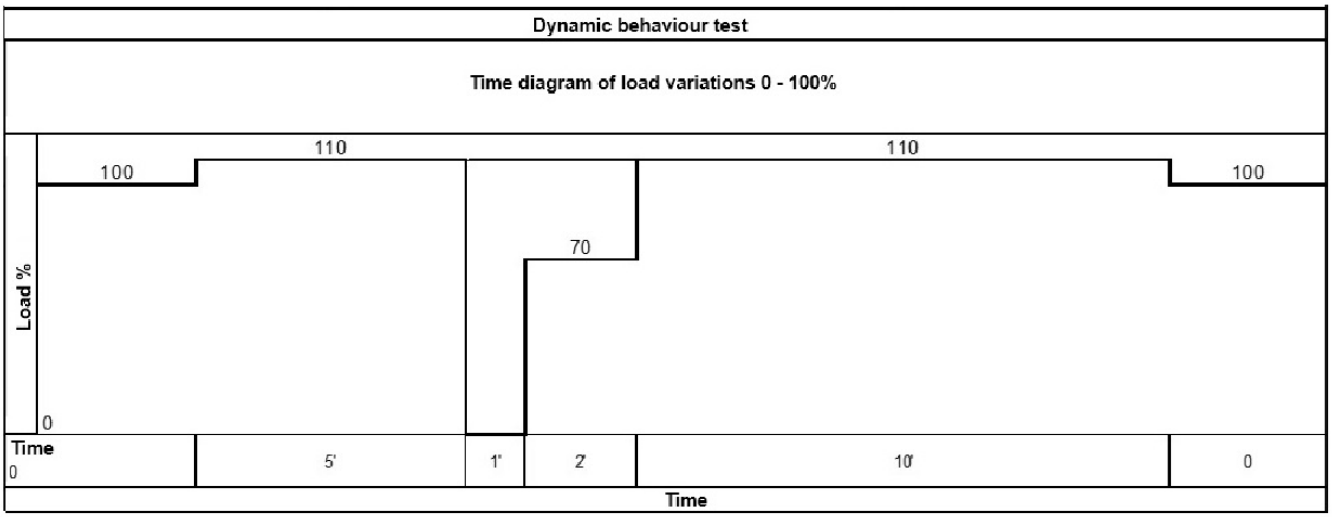

Fig.12 – Dynamic performance test cycle

The unbalanced load functional tests on one/two phases will be carried out once at the fourth hour of operation after the dynamic behaviour test.

The unbalance sequence shall involve opening (off)/closing (on) the nominal phase loads according to the following diagram:

110% unbalanced load tests		
Phase R	**Phase S**	**Phase T**
on	on	on
off	on	on
off	off	on
on	off	on
on	off	off
on	on	off
off	on	off
off	off	off
Phase circuit breaker manoeuvre sequence with 4 minutes of operation per unbalance condition		

Table 12 – Unbalance load test

During the tests, the following quantities shall be recorded continuously: voltage, current, frequency and ambient test temperature.

The follow functional parameters of the unit will be recorded every hour:

- time (hh:mm:ss)
- hours of operation
- oil pressure
- water temperature
- power output
- power factor
- waveform and harmonics

The following parameters shall be recorded continuously, with the appropriate time scale, during transient tests (load connection and disconnection and for unbalanced load operation tests):

- voltage
- current
- frequency

The tests shall be passed if during the eight hours of operation and the dynamic tests under variable/unbalanced load, the genset shall operate regularly in accordance with the parameters set out in the paragraphs on the speed regulator and the voltage excitation and regulation system, without showing any malfunctioning, even temporary.

15.6.6. Load test and transients at ambient temperature

After bringing the genset up to operating speed, the dynamic behaviour test shall be carried out according to the above diagram.

Functional unbalanced load tests shall then be carried out on a single phase and then on two phases according to the unbalance sequence shown above at 2 minutes intervals for each unbalance condition.

The following parameters shall be recorded continuously, with the appropriate time scale, during the tests:

- voltage
- current
- frequency

15.6.7. Checking the functioning of the fuel level detection system and monitoring hourly consumption

The objective of the test is to verify that the alarms coming from the tank fuel level detection system and the fuel quantity indications are real.

The procedure is as follows: the GenSet is placed on a flat, non-tilted surface with the tank empty.

Fuel shall be added and the quantity corresponding to the defined minimum value shall be recorded, which would activate the GenSet's engine cut-off command and the related alarms and warning states.

Then proceed by progressively filling the inner tank with a graduated container (10 litres for GenSet with power up to 30 kVA and 50 litres for GenSet with power form 125 kVA to 750 kVA), recording the percentage of fuel introduced from the minimum to the maximum level (full tank) and the corresponding data indicated by the control panel instrumentation and the values of the signals found on the interface board.

For the test to pass, the fuel level measurement error shall be less than ±5%.

When the indication of a full tank is reached, the activation of the lock status of the auxiliary fuel system pump and the transfer of status signals to the control panel and interface board shall be checked.

Then, with the internal tank full, the fuel time is checked by checking that it corresponds to that declared by the engine manufacturer with a tolerance of ±5%. The test shall be carried out by bringing the unit to nominal load.

15.6.8. Vibration measurement

It shall be verified that the vibrations on the shaft, at any load and under stabilised operating conditions, at the bearings are not greater than those recommended by the engine manufacturer and the alternator manufacturer, and in any case not greater than 0.08 mm; the vibration amplitude shall be measured between peaks.

15.6.9. Noise level measurement outside the container

GenSet shall comply with the provisions of the Noise Directive 2000/14/EC, also noting that the noise does not exceed 70 dBA at a distance of 7 m.

The noise level shall be measured and recorded at a distance of 1 - 7 - 14 m from the vertical walls of the container at the 4 sides of the Genset.

15.6.10. Testing of GenSet starting, shutdown and control logic devices

The correct operations of the devices shall be verified:

- start-up
- manual shutdown
- alarm shutdown
- stop for liquid spillage
- emergency shutdown
- remote shutdown
- MV re-powering system shutdown
- measurement of electrical and mechanical quantities
- electrical and mechanical protection
- signalling and pre-alarm
- battery charging (internal and external auxiliary)
- local signalling

15.6.11. Testing the battery current with the circuits at stand-by

No-load absorption test with GenSet not in operation, with battery switch closed, control panel switched off, with the parking services not powered from the mains.

The purpose of the test is to verify compliance with the requirement that the current absorbed over 30 days under the above conditions is not such as to discharge more than 10% of the capacity of the installed battery.

15.6.12. Checking power cables

Visual inspection, check of cable type, check of cable reels, connection/disconnection test and CEE plugs and sockets.

15.6.13. Enclosure IP verification

The IP23 degree of protection shall be verified at every part of the enclosure in accordance with CEI EN 60529.

15.6.14. Leak test of the lower part of the enclosure

The test shall be conducted by introducing liquid into the underside of the enclosure up to the level at which the warning signal triggered by the liquid presence float is activated.

The liquid shall be left in the lower part for at least 4 hours.

The test is passed if there is no leakage of the liquid.

15.6.15. Float function test for presence of liquids in the lower part of the enclosure

The function test of the liquid detection float in the lower part of the casing shall attest to the functioning of the sensor and the entire chain of alarms and signals causing the GenSet shutdown.

The alarm activation phase can be detected in the previous test during the filling operation of the same GenSet under test. Once the operation has been carried out, the liquids shall be removed and the return to normal of the sensor shall be verified, with resetting of the alarm signal and enabling to the GenSet's operation.

15.6.16. Checking the conformity of optional accessories

Tests shall be carried out on the intended accessories:

- Heaters: the GenSet, not in operation, control panel off, with the parking services not supplied by the mains, shall be stabilised for 12 hours at ambient temperature. Subsequently the heaters will be supplied by the parking services: it shall be verified within the next 10 hours that an over-temperature of the coolant in the entire cooling circuit (engine body and cooling radiator) of at least 20° C is reached. As an acceptance test, it shall be carried out on only one GenSet among those submitted for testing.
- Thermal covers for external refuelling system: It shall be checked that the accessory is compatible with the dimensions of the external tank in accordance with paragraph 14 and the connection pipes supplied with the unit. The check shall also ascertain that the installation of the accessory on the components is simple and easy. It shall be checked that the connection of the accessory corresponds to what is required and that the maximum heating power is within the prescribed limits. An installation and power supply test of the thermal covers shall be carried out with detection of the maximum temperature reached, which shall not exceed 20°C. The function of the fixed calibration thermostat that controls the insertion of the accessory shall be checked.

- Dummy load. Verification shall be conducted on both types of the optional accessory.

The test shall include the:

- verification of the structure
- test of balanced lifting of the load at the intended attachment points
- verification of connection, protection, signalling and control systems (CEI EN 60204)
- check of the insertion logic of the power steps, number and power of the individual steps with measurement of the inserted load by means of instrumental detection. Functional test with connection to the genset and supply of the load with the genset sizes foreseen by measuring the number of revolutions reached by each genset and the percentage of the power supplied with respect to the nominal.
- verification of the ventilation system and test of the over-temperature sensor with relative blocking and alarm signalling.
- verification of dimensional, weight and IP degree of protection according to IEC EN 60529.

15.6.17. Overfill test with verification of the tightness of the fuel supply system from the storage tank

With the GenSet stopped, in normal operation with the suction and overflow pipes connecting to the external tank set up as specified in the specification (complete with the anti-drip quick couplings), an overfilling of the internal service tank shall be simulated without the system safety blocks intervening. The overflow pipe, fitted with the quick-release couplings on both sides, shall have a free surface at a height of 2.5 m from the engine base to ensure the correct hydraulic head.

The test is passed if, with the refuelling system thus set up and kept in operation (automatic refuelling pump on board the GenSet running) for at least 20 minutes with flow from the overflow pipe, no leaks or leakage occur in any part of the diesel circuit.

The test report shall describe in detail the test methods and the final result.

In addition, the certifier shall be marked precisely as to compliance with fire prevention provisions for the automatic refuelling system (NR 20 and article 19 A do DECRETO Nº 8.468, 08 September 1976.regulation for Brazil, Piliegos Tècnicos for Chile, RETIE regulation for Colombia, D.M. of 13/07/2011 - Approval of the fire prevention technical regulation for the installation of internal combustion engines coupled to an electric generating machine for Italy).

15.6.18. Vehicle homologation verification (only for GenSet with power up to 30 kVA):

The truck's documentation shall be checked by checking the following documents:

- presence and adequacy of the truck homologation file
- homologation characteristics are within the requirements
- road system functionality (lights, brakes)
- conformity of optional accessories

15.6.19. Verification of vehicle type-approval documentation for registration in the Public Motor Vehicle Registry (for GenSet with power up to 30 kVA)

Checking the conformity of the documentation.

15.6.20. Vehicle functionality check (for GenSet with power up to 30 kVA)

For GenSet power up to 30 kVA, test shall certify the proper functioning of:

- lighting system functionality
- rake system set-up, dynamic/inertia brake and hand brake adjustments
- presence and adaptability of wheel chocks.

16. MOBILE TANKS CHARACTERISTICS

The technical, constructional, and functional requirements for mobile oil tanks are described below.

The mobile storage tank is designed for the transport and refuelling of fuel for mobile LV GenSet.

Two configurations are provided:

- as a storage tank: for automatic refuelling of GenSets equipped with an on-board refuelling system (pump and fuel control system in accordance with technical fire prevention regulations);
- as a refueller: for all GenSets when manual refuelling by means of a dispensing nozzle shall be required, in which case the tank shall be equipped (§ 16.4) with a 12/24V cc electric pump with dispensing nozzle.

16.1. Technical and construction requirements

Tanks shall comply with the safety regulations for the transport of dangerous goods in total exemption from the regulations concerning the requirements for the transport of dangerous materials by road in each country (DECRETO 34 for Chile, RETIE for Colombia and ADR for Europe) and comply with the fire prevention technical regulations for the installation of internal combustion engines coupled to an electric generating machine in use as a mobile fuel depot.

The tank, which is intended to be used outdoors, shall be protected by an outer casing on all sides and shall be usable as a fuel store permanently connected, during operation, by means of hoses to GenSets equipped with an automatic diesel refilling system.

Mobile tanks shall meet the following requirements:

- metal tank with containment basin at 110 % of rated capacity;
- rated capacity between 400 and 450 l (compatible with full exemption from the requirements for the transport of dangerous goods by road);
- empty weight ≤ 250 kg;
- maximum overall dimensions [mm] 1300 x 1300 height 1500;
- lockable or padlockable fuel connection hatch;
- loading mouth protected by key lock or padlockable;

- mechanical level indicator;
- easily accessible earth/equipotential bonding bolt;
- can be handled under full load by crane and pallet truck, with lifting eyebolts already in place;
- equipped with a synthetic fibre sling suitable for full-load lifting in accordance with current lifting equipment regulations;
- equipped with fittings for total emptying of the tank and containment basin, (for washing operations without risk of spillage of pollutants);
- provision for connection via flexible hoses with quick couplings for suction and return overflow from the genset (typically the outlet and overflow connections will be 1" female);
- shut-off valve on the outlet connection.

The connection interfaces of the quick-release couplings shall not protrude from the shape of the tank and, when the hoses are connected, the connection points shall be sufficiently protected but accessible for disconnection and shut-off of the diesel fuel in accordance with the regulations in force. Provision for the installation of an electric pump and hose assembly with an automatic shut-off nozzle for use as a vehicle refueller (§ 16.4).

16.2. Labelling

The tank shall have nameplates and markings in accordance with the regulations concerning the requirements for the transport of dangerous goods by road in each country (DECRETO 34 for Chile, RETIE for Colombia and ADR for Europe), lifting equipment regulations, technical fire prevention regulations, and any other indications required for correct use in safety.

A barcode plate shall comply with CNS-O&M-S&L-2021-0032-EGIN and be placed in an accessible location and in a position protected from the weather.

16.3. Supplied accessories

Tanks shall be provided with the following accessories:

- 10 m of 25 sqmm yellow/green single-core cable with 12 mm diameter eyelet terminals for earth/equipotential connection to the GenSet;
- slinging system for lifting with a single point of attachment; lifting slings shall be made of synthetic fibre, shall have a capacity for lifting the tank at full load and shall be certified in accordance with the regulations in force on lifting systems (the use of chains or wire ropes is not permitted); slinging is not necessary if the tank is equipped with a single lifting point that can be reached and used directly with the crane hook;
- documentation and certification for the use of the tank in full regulations concerning the requirements for the transport of dangerous goods by road exemption.
- operating and maintenance manual in the language of each country of delivery with clear indication of all methods of use for transport, handling with a full load of fuel, and all details and safety instructions for operation as a refuelling and/or storage tank to be connected to GenSets with an automatic fuel refilling system.

16.4. Optional Accessories

A fuel dispenser with electric pump and dispensing nozzle (option A) shall be supplied as an option.

The electric pump shall have a flow rate of 40÷50 l/min and shall be powered indifferently at 12 and 24 Vdc with a maximum absorbed current of 30 A.

The unit shall be equipped with:

- diesel filter with automatic water separator.
- 4.5÷5.5 m hose;
- dispensing gun with automatic stop.
- electrical power supply cable, suitable for mobile use, at least 8 m long, plugged into a 2-pin CEE socket for 30 A continuous current.

Everything shall be installed and certified according to current environmental safety and fire prevention regulations.

Any option "A" in addition to the basic version shall not preclude its use also as a storage tank for automatic refilling; any preparation for the intended use (manual refuelling or storage tank for automatic refilling) shall be permitted prior to use, to be carried out in a simple manner without the use of special equipment.

16.5. SUPPLY REQUIREMENTS

16.5.1. Product Approval

Supply of the tank is subject to the TCA described in document GSCG002.

For tank approval, the manufacturer/supplier shall submit the following documents:

- product data sheet with all the tank characteristics, in particular the compliance with the requirements in the chapter "Technical and constructional characteristics
- general construction drawings
- all documents certifying the tank's conformity to use for transport and as a mobile storage unit connected to a GenSet;
- all required documentation accompanying the tank (manuals, declarations of conformity, test ertificates);
- photos of construction details and markings and/or indications on the tank;
- documentation and certification, where required, of the accessories for lifting and handling the tank, components and any hydraulic connection accessories;
- data sheet of the optional refuelling system with pump (12/24 V DC) and dispensing nozzle;
- certification of the assembly and components of the refuelling system with dispensing gun.

16.5.2. Routine tests

Each tank shall be subjected to the following test routines per delivery:

- visual inspection: verification of conformity with the approved prototype in the TCA process

- check for absence of construction defects.
- verification of approval for transport by road with full exemption from the regulations concerning the requirements for the transport of dangerous goods by road with all accompanying certification, ready for use on delivery.
- check that the time interval between the date of the tank test certificate and the date of delivery at destination is no more than two months.
- Verify that at the time of delivery each GenSet has completed the actions indicated in the Operational Notes Vendor Rating CNS-O&M-S&L-2021-0032-EGIN.