

	GLOBAL STANDARD	Page 1 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

MV/LV TRANSFORMERS

Country	Distribution Company
Argentina	R. De Antoni
Brazil	V. Robadey
Chile	D. Gonzalez
Colombia	J. C. Gomez
Spain	J. Gonzalez Lara
Italy	L. Giansante
Peru	R. Sanchez
Romania	V. Obrejan

	Elaborated by	Verified by	Approved by
Global I&N – O&M/NCS	G. Andreella J. M. Rey Sanchez	F. Mauri	F. Giammanco

This document is intellectual property of Enel SpA; reproduction or distribution of its contents in any way or by any means whatsoever is subject to the prior approval of the above mentioned company which will safeguard its rights under the civil and penal codes.

Revision	Data	List of modifications
00	30/09/2012	First emission
01	31/10/2012	Common List: LV bushing types updated for code /237 and /241 and noise level values reduced in accordance with relevant standards for Italy, Romania and Peru. Local Section A: additional requirements for rating plates indicated in 6.10.8. Local Section C: acceptable noise limits for reduced losses indicated in 5.12 and eyebolt positions and dimensions updated in 5.16.
02	02/02/2015	Commission Regulation (EU) N. 548/2014 (Ecodesign requirements), Type and Country Codes updated and other improvements. Local Section LATAM: for Edelnor and Codensa updated paragraphs and tables, added new country code /516 and other improvements. Local Section Spain: updating for R.D. 337/2014. Local Sections Italy and Romania: windings only aluminium up to 160 kVA, colour of painting RAL 6002, nylon-wheels accepted up to 250 kVA).
03	31/01/2018	Local Part of Spain: Standard references updating and editorial corrections. Local part Italy and Romania: added rating plate example in compliance with Ecodesign Common List European countries: updated with new country codes for Spain and some editorial improvements for Italy and Spain. (updatings are highlighted in yellow).

	GLOBAL STANDARD	Page 2 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

INDEX

1	SCOPE	4
2	LIST OF COMPONENTS	4
3	REFERENCE LAWS AND STANDARDS	4
3.1	LAWS.....	4
3.2	INTERNATIONAL STANDARDS.....	4
3.3	LOCAL STANDARDS.....	5
3.4	LIST OF REPLACED STANDARDS	5
3.5	OTHER RELEVANT DOCUMENTS.....	5
4	SERVICE CONDITIONS	6
5	RATINGS.....	6
5.1	TYPE OF TRANSFORMERS	6
5.2	NUMBER OF WINDINGS.....	6
5.3	NUMBER OF PHASES.....	6
5.4	COOLING SYSTEM	6
5.5	RATED POWER	6
5.6	RATED VOLTAGES	6
5.7	RATED FREQUENCY	6
5.8	VOLTAGE REGULATION	6
5.9	WINDINGS CONNECTIONS.....	6
5.10	INSTALLATION	7
5.11	INSULATION LEVELS.....	7
5.12	LOSSES, SHORT CIRCUIT IMPEDANCES AND SOUND POWER LEVELS.....	7
5.13	TEMPERATURE RISE	7
5.14	CAPABILITY TO WITHSTAND SHORT-CIRCUIT	7
5.15	OVERLOADING	7
5.16	OVERALL DIMENSIONS AND LAYOUT	8
5.17	TOLERANCES	8
6	DESIGN REQUIREMENTS.....	8
6.1	CORE.....	8
6.2	WINDINGS.....	8
6.3	TANK	8
6.4	INSULATING LIQUID AND MATERIAL	8
6.4.1	Oil filling and sealing procedures.....	9
6.5	BUSHINGS	9
6.5.1	MV Bushings.....	9
6.5.2	LV Bushings.....	10
6.6	DE-ENERGIZED TAP-CHANGER FOR MV VOLTAGE REGULATION	10
6.7	DE-ENERGIZED TAP-CHANGER FOR MV VOLTAGE COMMUTATION.....	10
6.8	SUPPORTING AND SLIDING DEVICES	11
6.8.1	SUPPORTING	11
6.8.2	SLIDING DEVICES.....	11
6.9	PAINTING	11
6.10	ACCESSORIES.....	12
6.10.1	Lifting and blocking devices.....	12
6.10.2	Oil drain device and sampling plug or valve	12
6.10.3	Thermometer pocket.....	12
6.10.4	Over pressure valve.....	13
6.10.5	Oil level indicator	13
6.10.6	Support for surge arresters.....	13
6.10.7	Earthing terminals.....	13
6.10.8	Rating plates and plate-holders	13
6.10.9	Filling hole and plug (filling cap)	13

	GLOBAL STANDARD	Page 3 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

6.11	IDENTIFICATION OF ACCESSORIES AND COMPONENTS	13
7	EXCEPTIONS	13
8	DOCUMENTATION.....	13
8.1	NOT-RESERVED DOCUMENTATION	14
8.2	RESERVED DOCUMENTATION	14
8.3	TECHNICAL DOCUMENTATION	14
9	TESTS.....	15
9.1	LIST AND CLASSIFICATION OF TESTS	15
9.1.1	Routine tests.....	15
9.1.2	Type tests	15
9.1.3	Type tests on accessories	15
9.1.4	Special tests.....	15
9.1.5	General statements for the tests.....	15
9.2	TESTS DESCRIPTION.....	18
9.2.1	ROUTINE TESTS	18
9.2.2	Type tests	19
9.2.3	Type tests on accessories	20
9.2.4	Special tests.....	20
10	GUARANTEE	21
11	TRANSPORT AND PACKING.....	21
12	OTHER LOCAL ISSUES	21
13	FIGURES.....	22

LOCAL SECTIONS

A	LATAM: Ampla (Brazil), Chilectra (Chile), Codensa (Colombia), Coelce (Brazil), Edelnor (Perù), Edesur (Argentina).....	26
B	ENDESA DISTRIBUCIÓN ELÉCTRICA (Spain).....	49
C	ENEL DISTRIBUZIONE (Italy), ENEL DISTRIBUTIE: Banat, Dobrogea, Muntenia (Romania).....	57

COMMON LIST OF MAIN REQUIREMENTS

MV/LV TRANSFORMERS REFERENCE LIST (COMMON LIST).....	69
--	----

	GLOBAL STANDARD	Page 4 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

1 SCOPE

The scope of this document is to provide technical requirements for the supply of the distribution transformers to be used in the distribution networks in the Enel Group Distribution Companies, listed below:

- | | |
|--------------------------------------|-----------|
| • Ampla (AM) | Brazil |
| • Chilectra (CH) | Chile |
| • Codensa (CD) | Colombia |
| • Coelce (CE) | Brazil |
| • Edelnor (EN) | Perù |
| • Edesur (ES) | Argentina |
| • Endesa Distribución Eléctrica (EE) | Spain |
| • Enel Distributie Banat (ER) | Romania |
| • Enel Distributie Dobrogea (ER) | Romania |
| • Enel Distributie Muntenia (ER) | Romania |
| • Enel Distribuzione (ED) | Italy |

This document is applicable for liquid immersed transformer, three-phase, bi-phase and single-phase for indoor, outdoor, pole mounted and inbox installation.

This document is composed by a main common part, three Local Section and a common list of main requirements in order to provide full information for transformers for each relevant country.

Additional prescriptions or integration to the main common part are reported in the Local Sections with the same corresponding clause or sub-clause number.

2 LIST OF COMPONENTS

The list of components with the main requirements, which is an integral part of the present document, is reported in: “MV/LV Transformers reference list” (Common List) attached.

3 REFERENCE LAWS AND STANDARDS

Here below is reported the list of reference laws and standard mentioned in this document.

3.1 LAWS

See Local Sections.

For European countries the Commission Regulation (EU) N. 548/2014 of 21 May 2014 applies.

3.2 INTERNATIONAL STANDARDS

- IEC 60076-1 (2011) Power transformers – Part 1: General
- IEC 60076-2 (2011) Power transformers – Part 2: Temperature rise for liquid-immersed transformers
- IEC 60076-3 (2013) Power transformers – Part 2: Insulation levels, dielectric tests and external clearances in air
- IEC 60076-5 (2006) Power transformers – Part 5: Ability to withstand short circuit

	GLOBAL STANDARD	Page 5 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

- IEC 60076-7 (2005) Power transformers – Part 7: Loading guide for oil-immersed power transformers
- IEC 60076-10 (2001) Power transformers – Part 10: Determination of sound levels
- IEC 60214-1 Tap-Changers - Part 1: Performance requirements and test methods
- IEC 60214-2 Tap-Changers - Part 2: Application guide
- IEC 60815 Guide for the selection and dimensioning of high-voltage insulators for polluted conditions
- IEC 60137 Insulated bushings for alternating voltages above 1 000 V
- IEC 60296 (2012) Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear
- IEC 60422 Mineral insulating oils in electrical equipment - Supervision and maintenance guidance
- IEC 60317 Specifications for particular types of winding wires
- IEC 60085 Thermal evaluation and designation of electrical insulation
- IEC 60641-2 Pressboard and presspaper for electrical purposes - Part 2: Methods of test
- IEC 60417-2 Graphical symbols for use on equipment - Part 2: Symbol originals
- ISO 2808 Paints and varnishes – Determination of film thickness
- ISO 2409 Paints and varnishes - Cross-cut test
- ISO 2859-1 Sampling procedures for inspections by attributes
- ISO 2178 Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method
- ISO 4628-3 Paints and varnishes - Assessment of degree of rusting
- EN 50464-1 (2007-11) Three-phase oil-immersed distribution transformers - General requirements
- EN 50216-4 Three-phase oil-immersed distribution transformers - Requirements and tests concerning pressurized corrugated tanks
- EN 50180 Bushings above 1 kV up to 36 kV and from 250 A to 3,15 kA for liquid filled transformers
- EN 50386 Bushings up to 1 kV and from 250 A to 5 kA for liquid filled transformers
- EN 50387 Busbar bushings 1 kV and from 1,25 kA to 5 kA for liquid filled transformers
- DIN 42551 Oil drain devices

and all the Standards mentioned in those listed above.

When the date of issue is not mentioned in the list above, the date to be taken as reference is that of the standard in force when the present document has been issued.

3.3 LOCAL STANDARDS

See Local Sections.

3.4 LIST OF REPLACED STANDARDS

See Local Sections.

3.5 OTHER RELEVANT DOCUMENTS

See Local Sections.

	GLOBAL STANDARD	Page 6 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

4 SERVICE CONDITIONS

Unless otherwise specified the normal service conditions defined in IEC 60076-1 apply with the following exceptions:

Characteristic	Ampla	Chilectra	Codensa	Coelce	Edelnor	Edesur	Endesa	Enel Distributie	Enel Distribuzione
Altitude (m)			2700						
Pollution level (IEC 60815)	High	Medium	Medium	Very High	Very High	Medium	Medium	Medium	Medium
Seismic activity		Yes ⁽¹⁾	Yes ⁽¹⁾		Yes ⁽¹⁾				

⁽¹⁾ For seismic requirements see Local Sections

5 RATINGS

For the definitions IEC 60076-1 applies.

5.1 TYPE OF TRANSFORMERS

This document is applicable for liquid immersed transformer, three-phase, bi-phase and single-phase.

For further details see Common List.

5.2 NUMBER OF WINDINGS

Two.

5.3 NUMBER OF PHASES

See Common List.

5.4 COOLING SYSTEM

ONAN.

5.5 RATED POWER

See Common List.

5.6 RATED VOLTAGES

See Common List.

5.7 RATED FREQUENCY

See Common List.

5.8 VOLTAGE REGULATION

See Common List.

5.9 WINDINGS CONNECTIONS

See Common List.

	GLOBAL STANDARD	Page 7 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

5.10 INSTALLATION

The type of installation can be indoor, outdoor, pole mounted and inbox.

Transformers are generally used for step-down voltage purpose but they can also be used as step-up. In the network, they could occasionally be subjected to frequent energisations, overvoltages and short-circuits.

5.11 INSULATION LEVELS

See Common List where specific rated insulation levels are defined for MV and LV side.

- U_m is the highest voltage for the equipment;
- LI is the lightning impulse withstand voltage;
- AC is the short duration induced and separated source AC withstand voltage.

5.12 LOSSES, SHORT CIRCUIT IMPEDANCES AND SOUND POWER LEVELS

See Common List and Local Sections.

For Italy, Romania and Spain the losses shall be in compliance with EU Regulation.

Possible capitalization criteria for further loss reductions are given in the tender, if not specified in Local Section.

For measured losses exceed the prescribed values and/or declared by the Manufacturer, within the tolerance admitted in 5.17, penalties will be applied.

If the losses exceed the maximum tolerance limits admitted by IEC 60076-1, the transformer is rejected.

The calculation of the penalties to apply to the single transformer, is the following:

$$L_v = 2 \times C_v \times \Delta P_v$$

$$L_j = 2 \times C_j \times \Delta P_j$$

where:

L_v penalties for no-load losses excess (expressed in local currency)

L_j penalties for load losses excess (expressed in local currency)

C_v no-load losses penalties rate (expressed in local currency per kW) ⁽¹⁾

C_j load losses penalties rate (expressed in local currency per kW) ⁽¹⁾

ΔP_v difference between measured no-load losses and no-load losses declared by the Manufacturer (kW)

ΔP_j difference between measured load losses and load losses declared by the Manufacturer (kW)

⁽¹⁾ Values given at tender stage

5.13 TEMPERATURE RISE

See IEC 60076-1.

5.14 CAPABILITY TO WITHSTAND SHORT-CIRCUIT

Transformers shall be able to withstand the short-circuit test in compliance with IEC 60076-5.

5.15 OVERLOADING

Transformers shall withstand overloading in the conditions specified in IEC 60076-7.

	GLOBAL STANDARD	Page 8 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

5.16 OVERALL DIMENSIONS AND LAYOUT

See Common List and Local Sections.

5.17 TOLERANCES

See IEC 60076-1 and in compliance with EU Regulation for European countries.

6 DESIGN REQUIREMENTS

Unless otherwise specified, the transformers shall comply with IEC 60076-1; the single parts of the transformers shall comply with the relevant standards.

6.1 CORE

The core shall be made wrapped type or cold rolled magnetic strips. The material shall be grain oriented or amorphous.

6.2 WINDINGS

The windings shall be made of electrolytic copper of 99.9% purity or aluminum conductors of at least 99.5% aluminum content; the cross section of windings shall be constant.

The star point of the LV windings shall be made on the connections of the layer or turn nearer to the oil duct between LV and MV windings.

The enameled insulated conductors shall comply with IEC 60317.

The ties of joints and connections from the windings to the bushings or to the de-energized tap-changer shall be manufactured in order to prevent the damaging of the conductor insulation during transformers lifetime.

For Italy and Romania for rated power up to 160 KVA it is mandatory to manufacturer the windings in aluminium.

6.3 TANK

The tank shall be made of steel sheets and shall not permit stagnation of water on the cover.

The tank can be provided sealed (without conservator), with full oil filling or with gas-cushion.

The coupling tank-cover shall be made by using a seal gasket, stainless steel fixing screws and washers, and brass or hot zinc-plated nuts.

In the sealed solution, the coupling by uninterrupted welding is also acceptable.

The tank shall be provided with standing and sliding devices, and also with lifting and blocking devices as specified in the following.

The whole tank, the cover and the accessories shall be uninterruptable connected (galvanic contact).

The cooling system is considered an integral part of the tank.

In case of hermetically tank transformers with gas-cushion and MV inside cone plug-in connections, specific design solutions shall be taken to assure the performance and reliability of the transformers.

6.4 INSULATING LIQUID AND MATERIAL

The insulating liquids shall be mineral oil of the not-inhibited type, identified with the U letter, without any anti-oxidant additive, accordingly to IEC 60296 (2012).

The oil shall not contain PCB.

It is forbidden the use of any mineral oil which presents characteristics such that to make it be classified as dangerous substance.

	GLOBAL STANDARD	Page 9 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

Alternatively insulating liquids can be specified in Local Sections.

Any part of the transformer which is in contact with the oil shall be compatible with it.

Oil supplier and type shall be clearly indicated in the rating plate or, alternatively, in the manual.

The maximal oil quantities for European Countries are indicated in the following table:

Transformers	≤ 160 kVA	250-400 kVA	630 kVA	> 630 kVA
Max oil quantities	200 liters	400 liters	500litres	600 liters

The value given in the table are applicable with the following indications:

- For rated power > 1000kVA oil quantity higher than 600 liters can be agreed.
- For LATAM the above specified values are not mandatory.
- For Spain the maximum oil quantity for transformers with MV $U_m=36$ kV and rated power > 400kVA shall be 600 liters.
- For Italy the the maximum oil quantity of 500 liters is mandatory for all transformers.

The solid insulation material used shall be in compliance to class “A” (105°C) of IEC 60085 or higher. The evaluation of the material should be carried out in accordance with the IEC 60641-2. Further specific requirements are requested in Local Sections.

6.4.1 Oil filling and sealing procedures

The filling and sealing of the transformer shall be done as stated by the Manufacturer in the Production and Control Plan and shall be submitted to quality control.

6.5 BUSHINGS

Bushing shall be in compliance with their relevant standards.

The MV bushings shall be fixed to the tank cover by using stainless steel studs, washers and nuts (or brass or hot galvanized steel nuts) and light metal alloy or stainless steel spacers and flanges.

Each MV and LV bushing shall be prearranged for sealing, by one drilled stud or two nuts.

Indications about bushing identifications and markings are reported in Local Sections.

The following solutions are defined for Medium Voltage and Low Voltage bushings.

6.5.1 MV Bushings

Solution	MV Bushing
1	EN 50180 -- type 24-250/P3
2	EN 50180 -- type 24-250/P2
3	EN 50180 -- type 36-250/P1
4	EN 50180 inside cone plug-in [Fig. A]
5	EN 50180 outside cone plug-in: - 24 kV interface type A - 36 kV interface type B
6	IEC 60137 (porcelain or polymeric)

6.5.2 LV Bushings

Solution	LV Bushing
1	EN 50386 - type 1)
2	EN 50386 - type 3)
3	EN 50386 - type 4)
4	EN 50386 - type 5)
5	EN 50386 - type 6)
6	Bus-bar (EN 50387) [Fig. B] without insulating protection
7	Bus-bar (EN 50387) [Fig.B] + insulating protection [Fig.C] – Assembly [Fig.D]
8	IEC 60137

6.6 DE-ENERGIZED TAP-CHANGER FOR MV VOLTAGE REGULATION

De-Energized Tap-Changer (DETC) shall be in compliance with IEC 60214.

The knob drives of the tap-changer shall have the markings turning to decreasing position by moving in a clock-wise direction (for example: +2, +1, 0, -1, -2, ...). The DETC shall be designed in order to avoid the possibility to be set on an intermediate position between two prescribed positions. It has to be mechanically locked only in correspondence of operating positions. The prescribed positions are indicate in the Common List.

The position markings shall be inerasably engraved on an aluminum plate with 10 ÷ 20 mm text size. They shall also be positioned in a way that the reading of the connected tapping shall be possible from the low-voltage side of the transformer in operation.

A clearly visible warning label shall indicate in local language "WARNING DO NOT OPERATE WHILE THE TRANSFORMER IS ENERGIZED".

The knob of the DETC shall be designed for blocking in any chosen position by a padlock.

The control shaft of the tap-changer shall be made of stainless steel or suitable insulating material; in the first case it shall be connected to earth under the cover.

6.7 DE-ENERGIZED TAP-CHANGER FOR MV VOLTAGE COMMUTATION

Transformers with two primary voltages shall be provided with an off-circuit changer for the commutation of the MV operating voltage.

The DETC has to be operated when the transformer is disconnected from the network.

The changer has to mechanically be locked only in correspondence of the operating position.

The positions of the changer shall bear markings showing the value of the operating voltage; these markings shall be engraved on a plate by characters 10÷20 mm in size.

A clearly visible warning label shall indicate in local language "WARNING DO NOT OPERATE WHILE THE TRANSFORMER IS ENERGIZED".

The knob of the DETC shall be designed for locking in both positions by a padlock.

The control shaft of the DETC shall be made of stainless steel or suitable insulating material; in the first case the shaft shall be connected to earth under the cover.

	GLOBAL STANDARD	Page 11 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

6.8 SUPPORTING AND SLIDING DEVICES

Transformers shall be provided with supporting and sliding devices.

6.8.1 SUPPORTING

See Local Sections.

6.8.2 SLIDING DEVICES

See Local Sections.

6.9 PAINTING

The external painting of transformers and the metallic accessories made of iron materials, shall be obtained by using epoxy or polyurethane painting cycle as indicated in the following:

Pollution level (IEC 60815)	Base layer (μm)	Cover layer (μm)	Total thickness (μm)
Medium	≥ 60	≥ 60	≥ 120
High or Very high	≥ 80	≥ 80	≥ 160
Extra very high	$\geq 80 + 80^{(1)}$	$\geq 60^{(2)}$	≥ 220

⁽¹⁾ Base layer - Primer-epoxy with zinc: 80 μm + Epoxy-polyamide micaceous iron oxide: 80 μm

⁽²⁾ Cover layer - Polyurethane aliphatic: 60 μm

NOTE: alternatively the painting may be made by one layer of the same total thickness, also mono component. Galvanized layers are also accepted.

Internal surfaces of the transformers shall be protected by a hot oil resistant painting (epoxy-polyamine or equivalent), $\geq 30 \mu\text{m}$ thick.

The surfaces to be painted shall be prepared by Manufacturer practice with suitable sandblasting or chemical cleaning (degreasing) treatments, specific for the painting cycle adopted.

The paint must be free of lead oxides or chromates. The safety and technical data sheets of the painting shall be provided by the Manufacturer.

The color to be used is prescribed in Local Section.

The reports and tests aimed to verify the good quality and the process of the painting cycle shall be provided by the Manufacturer.

6.10 ACCESSORIES

Each transformer shall be provided with the accessories as indicate:

Accessory	Totally filled transformers	Gas cushion filled transformers
Lifting and blocking devices	X	X ⁽¹⁾
Oil drain and sampling plug or valve	X	X ⁽¹⁾
Thermometer pocket	X	X ⁽¹⁾
Over-pressure valve		X ⁽¹⁾
Oil level indicator		X ⁽¹⁾
Supports for surge arresters	X ⁽¹⁾	X ⁽¹⁾
Earthing terminals	X	X
Rating plate	X	X
Filling hole and plug (filling cap)	X	X

⁽¹⁾ Only if specifically required

6.10.1 Lifting and blocking devices

Transformers shall be provided with 2 (two) eyebolts for the lifting of the complete transformer of a minimum diameter of 60mm. These two eyebolts shall be positioned in compliance with Local Section.

For LATAM specific requirements see Local Sections.

Furthermore 4 (four) blocking eyebolts shall be provided in the upper part of the tank for the blocking of transformers during transport. These four blocking eyebolts shall have a minimum diameter of 24 mm and shall be positioned in a way that, when in use, they will not damage accessories and cooling system.

6.10.2 Oil drain device and sampling plug or valve

Transformers shall be provided with an oil drain device and sampling plug or valve complying with:

- For Italy, Romania and Spain: EN 50216-4-- type C2 Standard (DIN 42551 Standard).
- For LATAM: see Local Section.

This device shall be placed at the bottom of the tank on the left short side looking at the transformer from the MV bushings side.

6.10.3 Thermometer pocket

Transformers shall have a thermometer pocket to allow the measuring of the top-oil temperature. This pocket shall be placed as shown in the EN 50216-4 (type A1). The pocket shall be provided with a corrosion-proof cap. The thread shall be protected with silicone-grease.

	GLOBAL STANDARD	Page 13 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

6.10.4 Over pressure valve

The pressure relief valve shall be installed on the transformer cover and the design shall be such that it does not permit the accumulation of dirt that could interfere in its calibration and/or operation.

6.10.5 Oil level indicator

The oil level indicator, which should be magnetic with a circular sight glass, should be located on the upper part of the tank wall.

6.10.6 Support for surge arresters

See Local Sections and Common List.

6.10.7 Earthing terminals

Transformers shall be provided with two stainless steel earthing terminals complying with EN 50216-4 (type 1). Only one of these terminals needs to be complete with stainless steel washer and screw.

These terminals shall be placed at the tank bottom.

They shall be countersigned by labels, glued on the tank wall, showing the earth symbol complying with IEC 60417-2, Symbol N. 5019.

6.10.8 Rating plates and plate-holders

See Local Sections.

6.10.9 Filling hole and plug (filling cap)

See Local Sections.

6.11 IDENTIFICATION OF ACCESSORIES AND COMPONENTS

All components and accessories, tap changers, MV and LV bushings, sliding rollers, tank, cooling system, etc. shall have the name or the mark of their Manufacturer.

7 EXCEPTIONS

Possible exceptions to the present prescriptions, concerning the adoption of technical and/or manufacturing aspects different from the ones prescribed in the present GS, can be evaluated by the Distribution company. In such a case, the Distribution company will take into account the opportunity to require additional tests with regard to the technical/manufacturing proposed solutions.

Such exceptions can be approved only by the Distribution company.

8 DOCUMENTATION

The Supplier, for each transformer prototype to be subjected to homologation or certification procedure, shall make available a complete documentation containing calculations, drawings, schemas, pictures of the MV and LV side, internal and external, descriptions, list of characteristics, performances, assembling, maintenance and operational norms and whatever necessary for the complete acknowledgment of the transformer.

	GLOBAL STANDARD	Page 14 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

8.1 NOT-RESERVED DOCUMENTATION

This is the documentation issued by the Manufacturer that allows to verify, directly or indirectly, the compliance of the transformer with the prescription of the GS. The Manufacturer authorizes the diffusion and the reproduction of this documentation within the Distribution Companies.

It shall contain at least:

- list of all the documents (including the list of the reserved documentation);
- list of the sub-suppliers of the main components and parts;
- transportation, installation, operation and maintenance manual;
- rating plates;
- overall drawings and relevant details;
- external pictures.

In addition to the documentation above, the Manufacturer shall submit all the test reports of the transformer, components and materials used and a document with the calculation of the capability to withstand the short circuit (in case of the test is not performed).

The documentation shall be in English or local language, except for the rating plates and the manuals that shall be in local language.

8.2 RESERVED DOCUMENTATION

It is the documentation considered reserved, of which the Manufacturer does not authorize the diffusion, used to completely identify the design and the manufacturing of the transformer; it shall include all the elements required in this GS and the documentation of the origins of the materials not reported in “not-reserved documentation”. Such documentation will be overviewed by the companies representatives or by the certification body during the homologation or certification and will be archived by the Manufacturer.

8.3 TECHNICAL DOCUMENTATION

When requested, the technical documentation to be produced by the Supplier with the economical offer shall contain the following items:

1. Description of the transformer and drawing of the overall dimensions;
2. Description of the design and main components:
 - magnetic core (type of magnetic strips, , type of magnetic core, clamping mode);
 - windings (type of winding, type of wire, isolations, channels of cooling);
 - bushing, tap-changer, accessories, etc.;
 - type of the tank;
 - painting cycle.
3. detailed plan of the quality control made during the manufacturing, assembling and commissioning

	GLOBAL STANDARD	Page 15 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

9 TESTS

Unless otherwise specified IEC 60076-1 applies.

9.1 LIST AND CLASSIFICATION OF TESTS

9.1.1 Routine tests

- 1) Check of the correspondence with the approved prototype
- 2) Measurement of winding resistance.
- 3) Measurement of voltage ratio and check of phase displacement.
- 4) Measurement of short-circuit impedance and load loss.
- 5) Measurement of no-load loss and current.
- 6) Dielectric routine tests (IEC 60076-3).
 - a. separate-source power-frequency voltage withstand test for MV and LV windings
 - b. induced AC withstand voltage test
 - c. lightning impulse test
- 7) Leak testing with pressure for liquid-immersed transformers (tightness test)
- 8) Oil tests (IEC 60422)
- 9) Test on de-energized tap-changers
- 10) Check of the external coating

9.1.2 Type tests

- 1) Verification of the compliance to the specification requirements
- 2) Temperature-rise type test (IEC 60076-2).
- 3) Dielectric type tests (IEC 60076-3):
 - a. lightning impulse test
- 4) Determination of sound level (IEC 60076-10).
- 5) Measurement of no-load loss and current at 90 % and 110 % of rated voltage.

9.1.3 Type tests on accessories

- 1) Tests concerning pressurized corrugated tanks
- 2) Check of the de-energized Tap Changer
- 3) Mechanical tests on wheels
- 4) Tests on rating plates

9.1.4 Special tests

- 1) Determination of capacitances windings-to-earth, and between windings
- 2) Short-circuit withstand test (IEC 60076-5)
- 3) Mechanical strength of brackets for fixing transformers, if required

9.1.5 General statements for the tests

Further tests in addition to ones listed above can be requested to the transformers manufacturer in case of particular technologies adopted.

If not elsewhere specified, for Certification, Homologation or Approval, all the Routine tests, Type tests and Special tests shall be performed.

	GLOBAL STANDARD	Page 16 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

9.1.5.1 Criteria for routine tests

With reference to par. 9.1.1, the routine tests shall be performed on each transformer as acceptance tests before delivering, with the following exceptions:

- Test 1) shall be performed on one transformer for each typology (type code);
- Tests 6).c, 8)⁽¹⁾ and 10) shall be carried out on a sample of transformers chosen at random amongst those submitted to the testing from the Manufacturer, within the maximum numbers of units stated on the sampling plan according to:

ISO 2859-1, for the double sampling plan, normal inspection AQL = 6,5%, level II.

To define the number of samples submitted to be tested for each batch of similar transformers, reference shall be made to general inspection level II. The following table gives an example of the sampling plan for transformer lots less than 500 units.

Lot or batch size	Sample	Sample size	Cumulated sample size	Acceptance number	Rejection number
2-8	Single	2	2	0	1
9-15	Single	3	3	0	1
16-25	First	5	5	0	2
	Second	5	10	1	2
26-50	First	5	5	0	2
	Second	5	10	1	2
51-90	First	8	8	0	3
	Second	8	16	3	4
91-150	First	13	13	1	4
	Second	13	26	4	5
151-280	First	20	20	2	5
	Second	20	40	6	7
281-500	First	32	32	3	7
	Second	32	64	8	9

As shown in the table, for lots greater than 15 units is prescribed a double sampling.

If the number of defectives found in the first sample is equal or less than the first acceptance number, the lot or batch shall be considered acceptable.

If the number of defectives found in the first sample is equal or greater than the first rejection number, the lot or batch shall be rejected.

If the number of defectives found in the first sample is between the first acceptance and rejection numbers, the number indicated in the table of the sample size for second sample shall be inspected.

The number of defectives found in the first and second sample shall be accumulated. If cumulative number of defectives is equal or less than the second acceptance number the lot, shall be considered acceptable.

If the cumulative number of defectives is equal or greater than the second rejection number, the lot or batch shall be rejected.

The transformers resulting afflicted by defects during the test are rejected. When the non-conformance is repaired, with Distribution Company representatives agreement, the units can be resubmitted to the test.

⁽¹⁾ NOTE: for test 8) "Oil tests", further reduction of the transformers to be tested, up to two oil samples for each lot, can be agreed between Distribution Company representatives

	GLOBAL STANDARD	Page 17 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

and Manufacturer during acceptance tests if the quality and treatments of oil are proved by the manufacturers also by quality documentations for each lot of impregnation.

The routine tests shall be performed by the Manufacturer at the Customer inspector presence if not otherwise agreed (the Manufacturer shall always inform the Customer in due time about the scheduled period to give the possibility to attend or not the tests).

In case of tests performing without inspector supervision, the Manufacturer may be requested to repeat the tests on the same sample size that shall be selected by the Customer inspector.

At the end of the testing, within the limits of the measures accuracy, no difference between the measured values and the values registered by the Manufacturer shall be found. If the testing of one unit is negative, the whole lot shall be rejected.

The Manufacturer shall prepare a test report containing the results of the tests.

9.1.5.2 Criteria for type and special tests

With reference to par. 9.1.2, 9.1.3 and 9.1.4, type tests and special tests shall be performed on one unit for each set of identical transformers which have the same type code, if unless otherwise specified in a specific document at the tender stage.

Before Type and Special tests performing, the unit shall have already passed all Routine Tests except test 1) and 6).c.

Type test on accessories shall be performed with the following exceptions:

- test 9.1.3; 1): Tests concerning pressurized corrugated tanks shall be performed on the two most stressed tanks of the series of the same sub-supplier.
NOTE: to identify the most stressed tanks, the ratio "oil volume in the corrugate wings/total oil volume", shall be calculated. The two tanks with the highest and the lowest ratios shall be tested. The results are considered also valid for the other tanks if the calculated over pressure at rated power do not exceeds the over pressure resulting from the two most stressed tanks tested.
- test 9.1.3; 3): Mechanical tests on wheels shall be performed for every wheels sub-supplier;
- test 9.1.3; 4): Tests on rating plates shall be performed for every plates sub-supplier;

Special tests shall be performed with the following exceptions:

- test 9.1.4; 2): Short-circuit withstand test (IEC 60076-5) shall be performed on one transformer for each rated power size. The test carried on such transformer will be valid for all transformer of different rated voltages having the same rated power. The rated voltages of the transformer under test will be selected by the Distribution Company representative in charge of the technical approval, if not otherwise agreed.
- test 9.1.4; 3): Mechanical strength of brackets for fixing transformers, when required Local Section shall be performed on one unit by rated power.

When permitted, in case of several transformers with same rated power and insulation level, but different rated voltage levels, possible further reduction of tests are reported in Local Sections.

	GLOBAL STANDARD	Page 18 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

9.2 TESTS DESCRIPTION

The accuracy of measurement during tests shall be in compliance with relevant standards. For loss measurements the accuracy minimum requirement shall be:

- wattmeters with low power factor: class 0,5;
- instruments/instrument transformers: class 0.2.

9.2.1 ROUTINE TESTS

9.2.1.1 Check of the correspondence with the approved prototype

The ratings and the design requirements of the transformer under test (including active part of the transformers, bushings, tap changer, accessories, etc.) shall be compared with the approved prototype drawings.

The visual inspection shall also be performed in order to verify the absence of defects.

9.2.1.2 Measurement of winding resistance

According to IEC 60076-1 § 11.2.

9.2.1.3 Measurement of voltage ratio and check of phase displacement

According to IEC 60076-1 § 11.3.

9.2.1.4 Measurement of short-circuit impedance and load loss

According to IEC 60076-1 § 11.4.

9.2.1.5 Measurement of no-load loss and current

According to IEC 60076-1 § 11.5

9.2.1.6 Dielectric routine tests

According to IEC 60076-3. In case of two primary rated voltages with different insulation levels, the dielectric tests shall be performed for each voltage level.

9.2.1.6.1 Separate-source power-frequency voltage withstand test for MV and LV windings

9.2.1.6.2 Induced AC withstand voltage test

9.2.1.6.3 Lightning impulse test (sample test)

9.2.1.7 Leak testing with pressure for liquid-immersed transformers (tightness test)

According to IEC 60076-1 § 11.8.

For totally filled transformers the maximum over pressure P+ (reference EN 50464-4) shall be maintained for 8 hours. At the end of the test the transformer shall not show leakages. After the test the pressure value shall be restored at the rated value.

	GLOBAL STANDARD	Page 19 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

9.2.1.8 Oil tests

With reference to IEC 60422 the following parameters shall be verified:

- Water content
- Acidity
- Breakdown Voltage
- Interfacial tension
- Dielectric Dissipator Factor (DDF)

The verifications above listed shall be performed on one sample of mineral oil, for each impregnating lot.

In case the instrumentations is available and certified in the manufacturer laboratory, the verifications can be performed by the manufacturers itself with the attendance of Enel or independent certification body representative, when permitted by the procedures (acceptance tests on lots).

For the PCB absence it is mandatory to perform the verification in a laboratory accredited ILAC or IAF in compliance with the test method of IEC 61619 with the indication of the transformer sampled. The detectability value of the analytic method shall be at least 2 mg/kg (2 ppm) to assure the respect of the parameters reported in table 3 of IEC 60422.

9.2.1.9 Test on de-energized tap-changers

The correct operation of the DETC (for regulation and for commutation) shall be checked by manually movement on the complete range of positions.

9.2.1.10 Check of the external coating

Following test shall be performed:

- Thickness: ISO 2808 or ISO 2178 "Measurement of coating thickness"
- Cross-cut test: ISO 2409

9.2.2 Type tests

9.2.2.1 Verification of the compliance to the specification requirements

The verification of compliance shall be executed through the comparison between the characteristics and the documentation of the transformer under test stated by the Manufacturer, and the requirements stated in the present GS (including the relevant Local Sections) concerning the ratings and the design (accessories, painting cycles, etc.).

9.2.2.2 Temperature-rise type test

According to IEC 60076-2.

9.2.2.3 Dielectric type tests

According to IEC 60076-3.

9.2.2.3.1 Lightning impulse test

	GLOBAL STANDARD	Page 20 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

9.2.2.4 Determination of sound power level

According to IEC 60076-10.

9.2.2.5 Measurement of no-load loss and current at 90 % and 110 % of rated voltage

According to IEC 60076-1.

9.2.3 Type tests on accessories

9.2.3.1 Tests concerning pressurized corrugated tanks

According to EN 50464-4.

9.2.3.2 Check of the De Energized Tap Changer

According to IEC 60214-1.

Moreover the following tests shall be certificated by the DETC supplier:

- **Salt fog test:** in compliance with UNI ISO 9227 NSS or ASTM B 117 (1000 hours)
- **UV ray test:** [UV-Condenser (in QUV-Panel)]: in compliance with EN ISO 11507 Method A or ASTM G53 (1000 hours)
- **Abrasion resistance test:** in compliance with ASTM D968

9.2.3.3 Mechanical tests on wheels

The mechanical characteristics specified in the Local Sections shall be verified.

9.2.3.4 Tests on rating plates

The following tests shall be certificated by the rating plate supplier:

- **Salt fog test:** in compliance with ISO 9227 NSS or ASTM B 117 (1000 hours)
- **UV ray test:** [UV-Condenser (in QUV-Panel)]: in compliance with EN ISO 11507 Method A or ASTM G53 (1000 hours)
- **Abrasion resistance test:** in compliance with ASTM D968

9.2.4 Special tests

9.2.4.1 Determination of capacitances windings-to-earth, and between windings

According to IEC 60076-1.

9.2.4.2 Short-circuit withstand test

According to IEC 60076-5.

9.2.4.3 Mechanical strength of brackets for fixing transformers, if required

See Local Sections.

	GLOBAL STANDARD	Page 21 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

GUARANTEE

The transformer guaranty is for a minimum period of 5 years, if not otherwise agreed.

Moreover the below conditions are valid for the guarantees of painting.

- during the twenty-four (24) months of the period of guarantee for faults as those described at previous point, the Manufacturer will have to, at his own expenses, carry out all the necessary finishing touches to eliminate possible alterations of the painted surface (blisters, split tings of the film of paint etc.). These alterations must not, however, cover more than 5% of the entire painted surface.
- The Manufacturer must also issue a five year guarantee (starting from the date of the end the acceptance tests with positive result). At the end of this period of guarantee, there it must not be rust on more than 1% of the entire painted surface; this compares to a rusting level not above the Ri3 (see ISO 4628-3).

10 TRANSPORT AND PACKING

It shall be care of the Manufacturer to provide the loading of vehicles. This applies even in case where transports are made using vehicles belonging to Distribution Company. More information may be given in other specific documents.

The transformers shall be delivered without any packing.

For LATAM, see Local Section.

11 OTHER LOCAL ISSUES

When necessary they are specified in Local Sections.

12 FIGURES

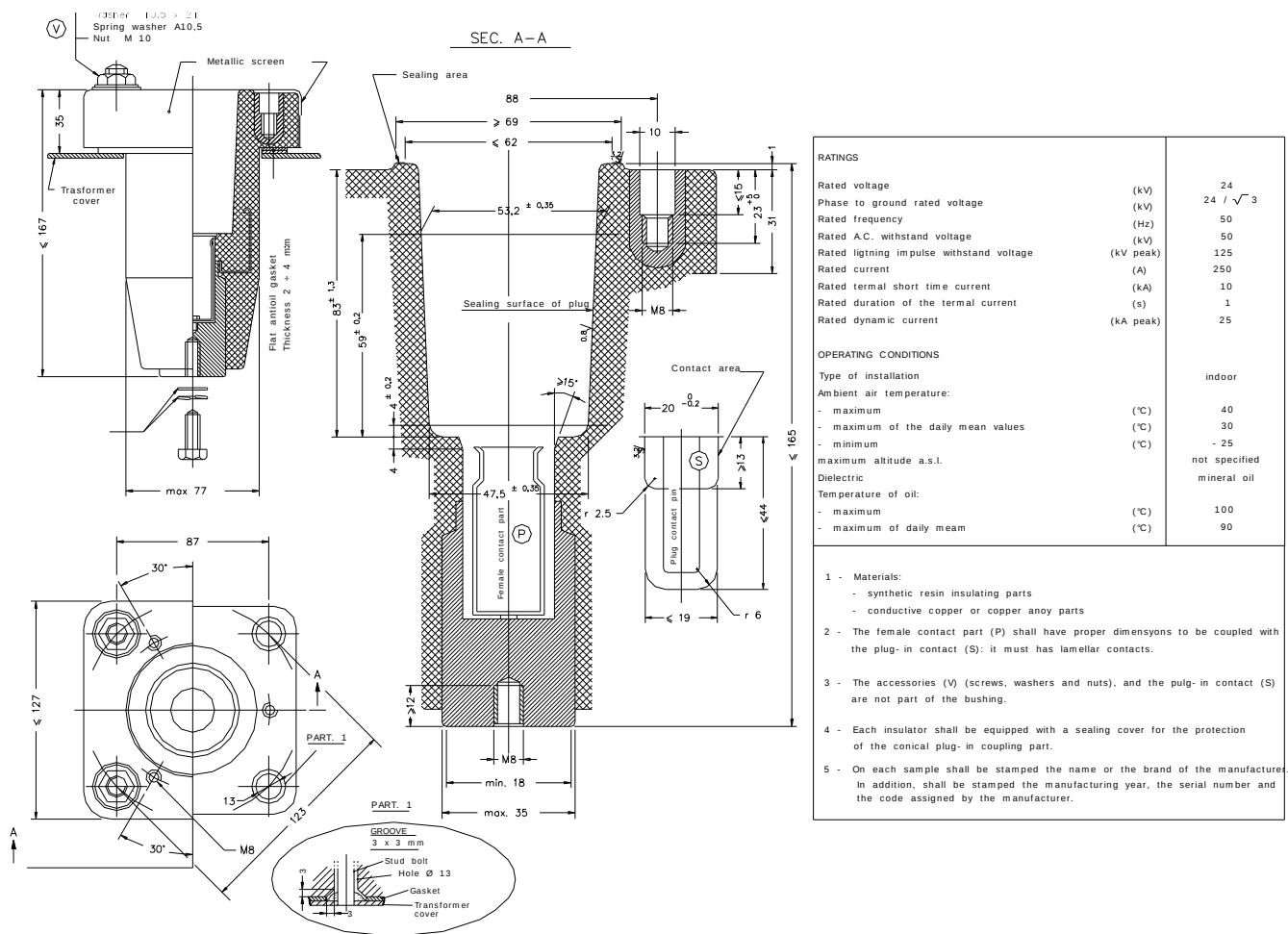
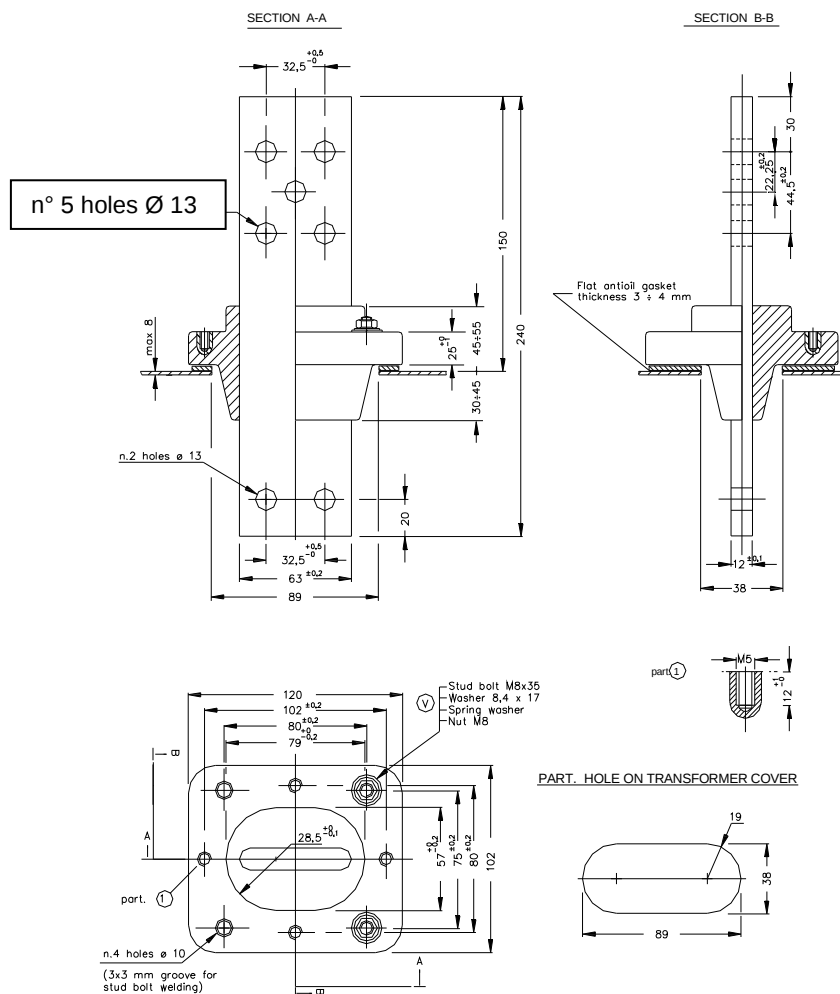


Figure A MV Bushing “Plug-in inside cone”



RATINGS

Rated voltage	(V)	1000
Phase to ground rated voltage	(V)	$1000 / \sqrt{3}$
Rated frequency	(Hz)	50
Rated A.C. withstand voltage	(kV)	10
Rated lightning impulse withstand voltage	(kV peak)	20
Rated current	(A)	1600
Rated thermal short time current	(kA)	16
Rated duration of the thermal current	(s)	1
Rated dynamic current	(kA peak)	40

OPERATIONAL CONDITIONS

Room air temperature:		
- maximum	(°C)	40
- maximum of the daily mean values	(°C)	30
- minimum	(°C)	-5
Type of installation		indoor
Dielectric		mineral oil
Temperature of the oil:		
- maximum	(°C)	100
- maximum of the daily mean values	(°C)	90

- Materials:
 - synthetic resin insulating parts
 - conductive copper part.
- Accessories (Stud bolts, washers and nuts) are not part of the insulator.
- On each sample shall be stamped the name or the brand of the manufacturer. In addition, shall be stamped, the manufacture year, the serial number and the code assigned by the manufacturer.

Figure B LV Bushing "Bus-bar"

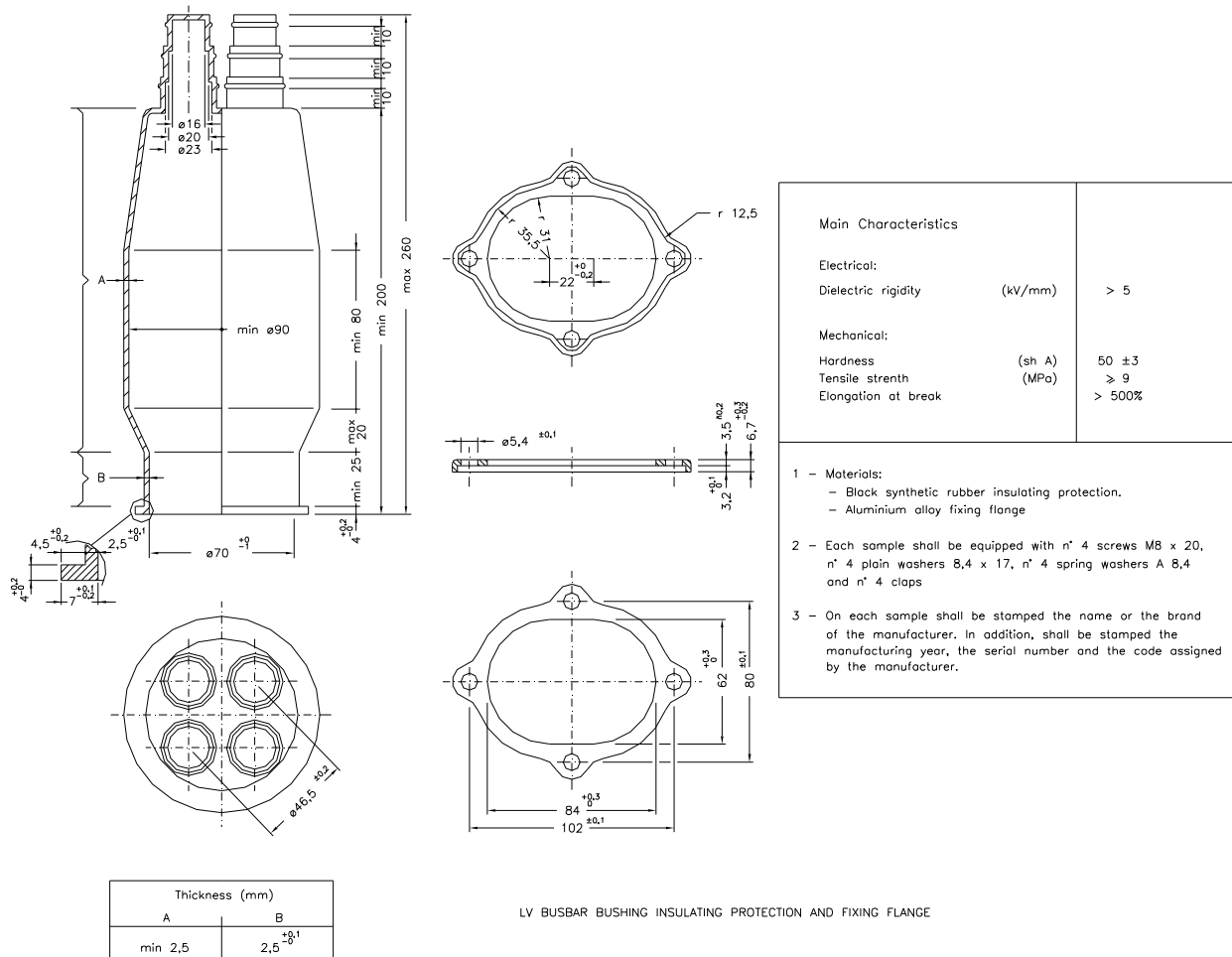
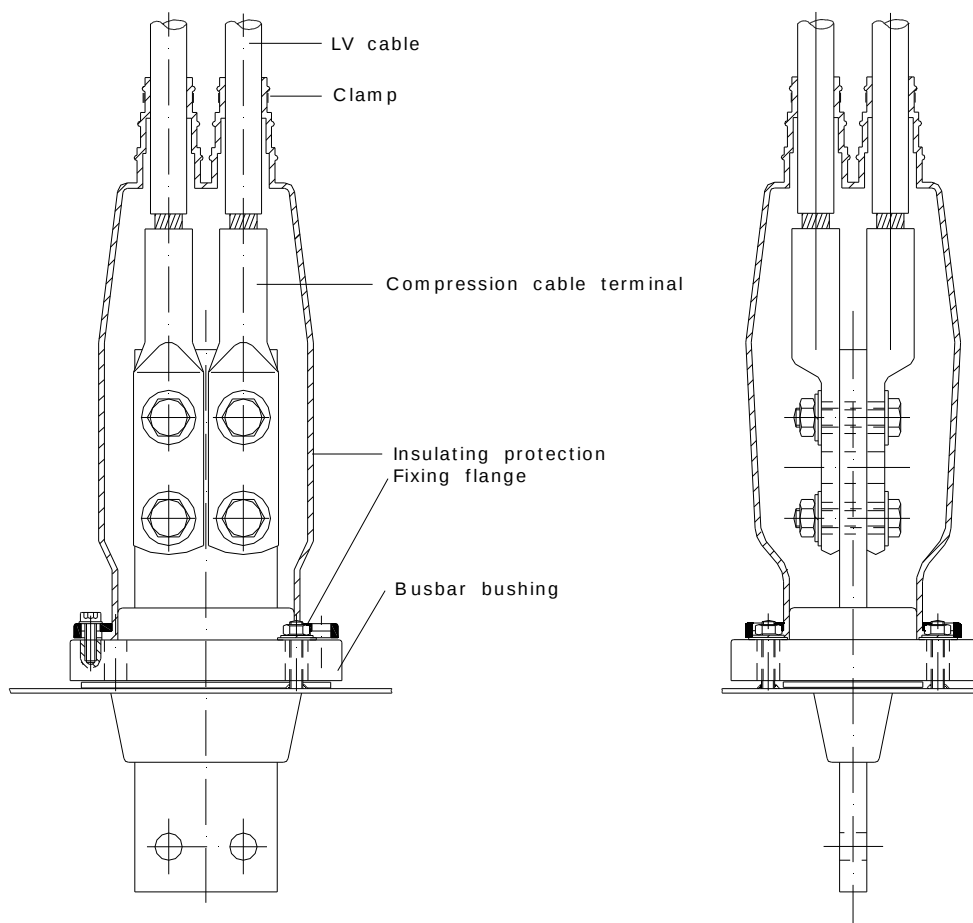


Figure C LV Bushing “Bus-bar” insulating protection



Example of realization of insulated connection between busbar bushing and LV cables.

Figure D Assembly LV Bushing “Bus-bar” and insulating protection

	GLOBAL STANDARD	Page 26 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

LOCAL SECTION A – LATAM: Ampla (Brazil), Chilectra (Chile), Codensa (Colombia), Coelce (Brazil), Edelnor (Perù), Edesur (Argentina)

In addition on what specified in the common part, the following requirements are prescribed:

3.2 INTERNATIONAL STANDARDS			
ASTM - B117, D2247, D2794, D3359: Requerimientos de Pintura del transformador. ASTM D-3487: Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus ASTM D 297: Standard Test Methods for Rubber Products-Chemical Analysis ASTM D 2240: Standard Test Method for Rubber Property—Durometer Hardness ASTM D 1619: Standard Test Methods for Carbon Black—Sulfur Content ASTM D 412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension ASTM D 471: Standard Test Method for Rubber Property-Effect of Liquids IEC 60068: Environmental test			
3.3 LOCAL STANDARDS			
ETG-1.020: “Requisitos de Diseño Sísmico para Equipo Eléctrico - INGENDESA “. Applies for Chilectra E – SE – 010: “Seismic action in electrical and mechanical equipment”. Applies for Edelnor NSR-98: “Seismic Resistant Design and Construction NSR – 98”. Applies for Codensa NBR 5440: Distribution transformers – Requirements (Support test). Applies for Ampla and Coelce RETIE Reglamento Tecnico de instalaciones eléctricas para Codensa			
3.4 LIST OF REPLACED STANDARDS			
E-MT-009			
5.10 INSTALLATION			
	Mounting System		
	Company	Single-Pole	Double-pole
			Surface Level
	Ampla	≤ 300	not used
	Codensa ⁽¹⁾	≤ 150	not used
	Coelce	≤ 300	not used
	Chilectra	≤ 150	>75
	Edelnor	≤ 160	160 y 250
	Edesur	≤ 100	>100 y ≤500
Table A1 – Mounting system NOTE 1: All transformers require anchoring base to be used either single-pole, double pole or surface level and TR ≤150kVA require support. For CODENSA 150 kVA transformers shall have two types of supports: one to be used on ground installation and other one to be used on pole mounted installation. Transformers with lower rated power shall have only pole mounted support.			

5.11 INSULATION LEVELS

Note: the exception of insulation levels for Coelce and Ampla for single-phase transformers (1P) of 7,967 kV as requirement of the standard NBR 5440 (Brazil) considering a maximum voltage of 17.5 kV therefore is considered in the common list the isolation levels 17.5/95/38kV.

5.12 LOSSES, SHORT CIRCUIT IMPEDANCES AND SOUND POWER LEVELS

The values for the short circuit impedance, referred to 75 ° C, shall be as shown in Table A2 with tolerance of $\pm 10\%$ that sets the standard IEC 60076-1.

Rated Power Transformer [kVA]	Short circuit impedance, referring to 75 °C [%]
single-phase and double-phase	
≤ 25	$2 \div 4$
Three-phase	
≤ 630	4
> 630	5

Table A2 – Short circuit impedance

5.16 OVERALL DIMENSIONS AND LAYOUT

See Common List TR MV/LV and Figure A1, A2 and A3 which define the maximum dimensions for the length, the width (depth) and the height of transformers and the layout of the main elements (bushings, supports, anchoring bases or wheels).

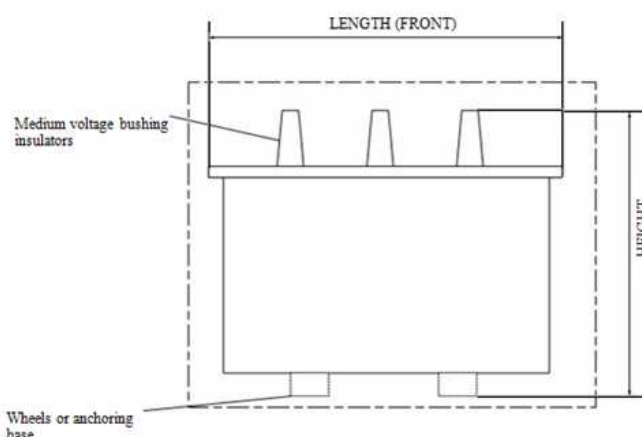


Figure A1 - Dimensions and layout of the main elements (Elevation)

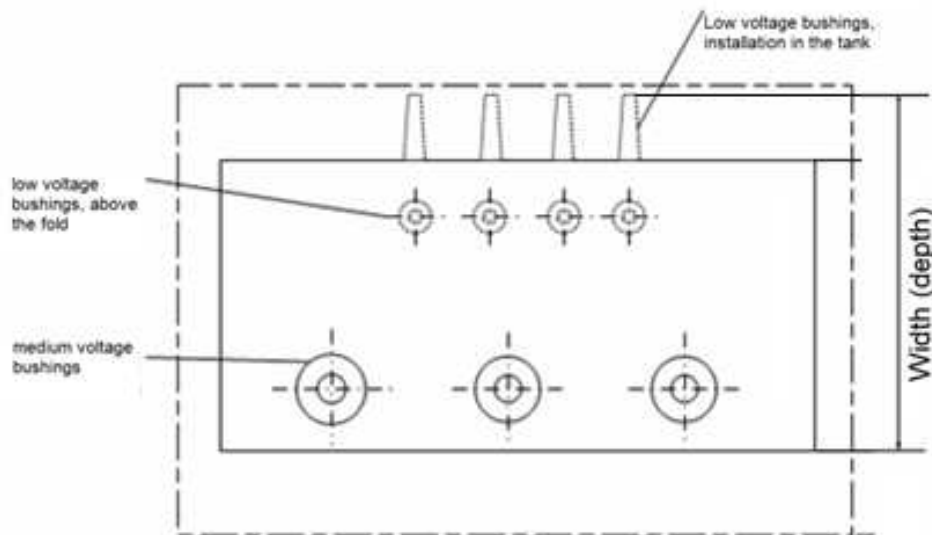


Figure A2 - Dimensions and layout of main elements (Top)

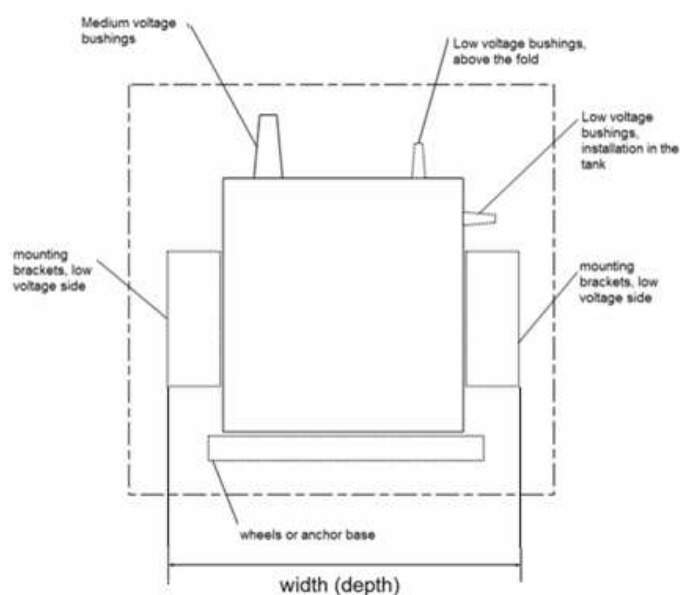


Figure A3 - Dimension and layout of the main elements (Side)

6.2 WINDINGS

For Edelnor, rated power transformers of ≤ 100 kVA the use of aluminum is mandatory for MV and LV winding.

6.3 TANK

In the case of transformers with a non-welded lid, the active part, which is mounted to the tank walls, should have devices (hooks, holes, or others) that facilitate its removal and placement. These devices should be symmetrical and guarantee lifting without horizontal movement; and they should be different from the tank fastening supports.

	GLOBAL STANDARD	Page 29 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

6.4 INSULATING LIQUID AND MATERIAL

Class "T" oil according to table 2 of IEC 60296. The use of paraffinic or naphthenic oil is permitted, according to the manufacturer's offer.

Alternatively, and only in the cases where required, silicone, mineral or vegetable oils with a high flammability point, according to the manufacturer's offer, may be requested.

SOLID INSULATING MATERIAL

For Ampla and Coelce the solid insulating material, of heat stable paper (equal or higher than Class "E" 120°C) will be required.

GASKETS

Seal materials of transformers should be nitrite rubber or higher, in accordance with ASTM D297, ASTM D2240 and ASTM D471

WEIGHT

For Ampla. The maximum weights to transformers admitted are:

Rated power ≤ 150 kVA: 750 kg.

Rated power > 150 kVA: 1200 kg.

Para Codensa se admite transformadores en un poste con peso max 700 kg.

6.5 BUSHINGS

The MV bushing is considered to LATAM the solution 6 considering porcelain or silicon rubber polymer as IEC 60137, and may be bolted either on or under the cover, according to the manufacturer's offer.

The LV bushing is considered to LATAM the solution 8 considering porcelain or epoxy as IEC 60137, or porcelain insulators and terminals according to DIN42530 standard NEMA or where indicated, see Table A3. **Error. L'origine riferimento non è stata trovata..**

Capacity [kVA]	AMPLA	CODENSA	COELCE	CHILECTRA	EDELNOR	EDESUR
≤75kVA	Blade connector (NEMA 2)	Locking connector	Locking connector	Locking connector	Locking connector (DIN 42530)	Blade connector (NEMA 1)
>75kVA and ≤150kVA	Blade connector (NEMA 4)	Blade connector (NEMA 2)	Blade connector (NEMA 4)	Blade connector (NEMA 2)	Blade connector (DIN 42530)	Blade connector (NEMA 1)
>150kVA	Blade connector (NEMA 4)	Blade connector (NEMA 4)	Blade connector (NEMA 4)	Blade connector (NEMA 4)	Blade connector (DIN 42530)	Blade connector (NEMA 4)

Table A3 - Type of low voltage terminal connectors

In the case of Edesur see particular requirements in paragraph 13 "Figure"

For Ampla and Coelce the LV bushing must be located in front part of the same side of the bracket.

For Edelnor, Codensa and Chilectra the LV bushing could be located over the lid or in front part according to the manufacturer offer.

	GLOBAL STANDARD	Page 30 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

For companies exposed to an environment with pollution levels of High and Very High, epoxy bushings should be accompanied by certificates demonstrating the good performance of this material in this type of environment. The testing certificates to be submitted will correspond to those defined as special tests according to IEC60068:

- Saline mist cycle – 96 hours
- Heat and humidity cycle – severity of 40°C, 6 cycles.
- UV Rays
- Climatic sequence – method 1

Phase markings and identification

The sequence for each phase of the distribution transformer should be marked. The identification should be engraved in high relief or bas-relief, each phase painted with a different color.

During the draft approval stage, details for the required markings and identification will be indicated.

6.6 DE-ENERGIZED TAP-CHANGER

The knob of the tap changer may be located on the cover or wall of the supply transformer according to the manufacturer. The DETC must be installed in the opposite side of LV bushing. For Ampla the DETC will be located on the tank side and at the low voltage side installed to ensure tightness. The lid switch must be fixed to the tank in order to be unmissable.

6.8.1 SUPPORTING

The position of the mounting support (on the MV or LV) for single-pole mounted transformer will be defined by each distribution company and is also detailed in Table A4.

Company	Position of the bracket	Rated Power
AMPLA	Fixing bracket in the LV side	All power values
CODENSA	Fixing bracket opposite to the LV side	≤ 150 kVA ⁽¹⁾
COELCE	Fixing bracket in the LV side	≤ 300 kVA
CHILECTRA	Fixing bracket in the LV side	≤ 150 kVA
EDELNOR	Fixing bracket in the LV side	≤ 160 kVA
EDESUR	Fixing bracket opposite to the LV side	≤ 100 kVA

Table A4 – Position of the bracket

(1) NOTE: maximum weight 700kg.

6.8.2 SLIDING DEVICES

At the base of the tanks should be placed rails or profiles which serve as fixing means and / or allowing a minimal height over the floor during storage, according to the weight of the equipment. See TR Common List MV / LV for wheels.

	GLOBAL STANDARD	Page 31 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

6.9 PAINTING
The color is RAL7038. Special requirement for Coelce: Pollution level: Extra very High.
6.10.1 Lifting and blocking devices
Transformer shall be provided with Two hooks located in the top part of the tank. The hooks will allow fastening the suspension of the transformer, in such way as not to damage the bushing insulators of the terminals and accessories and ensure the suspension of the transformer in a horizontal position. HOOK LIFTING OF THE ACTIVE PART Two eyebolts or hooks designated for machine detanking shall be located: on the cover, when the LV bushing are fixed on it, or on the structure of the active part, when the LV bushings are fixed on the side of tank. The eyebolts will allow fastening in such a way so as not to damage the bushing insulators of the terminals and ensure detanking with the cover in a horizontal position. These eyebolts will be provided with blind holes for the purpose of dissuading their use for machine transport. This accessory will not be requested for transformers of less than 150kVA. For transformers of 150kVA or higher, it may be required for Ampla, Chilectra, Edelnor and Edesur.
6.10.2 Oil drain device and sampling plug or valve
For evacuating the insulating oil is available at the bottom of tank, flush with the bottom, a valve gate-type one-inch diameter minimum. Oil drain is required for the following rated power: Ampla and Coelce: Not required Edelnor and Chilectra: ≥ 75 KVA Edesur: ≥ 150 kVA Codensa: All power values.
6.10.3 Thermometer pocket
Only for rated powers ≥ 150 kVA For Ampla, Coelce and Codensa: Not required
6.10.4 Over pressure valve
For totally filled transformers this accessory will not be required. For gas cushion transformers the over pressure valve is required for the following rated power: Ampla, Coelce and Codensa: all power values Edelnor ≥ 150 kVA Chilectra and Edesur: not required.
6.10.5 Oil level indicator

	GLOBAL STANDARD	Page 32 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

For totally filled transformers this accessory will not be required.
For gas cushion transformers the over pressure valve is required for the following rated power:

Coelce and Edesur: not required

Edelnor ≥ 50 kVA

Chilectra and Codensa ≥ 150 KVA

For Ampla ≥ 300 kVA. Rated power < 300 kVA internal marking paint in the tank

6.10.6 Support for surge arrester

This accessory is required by Ampla, Coelce and Codensa.

The transformer must be provided of a support (one each phase) for the installation of medium voltage arresters. The structures may be welded or bolted to the tank or fixed by the bolt, nut and washer of the tank-cover coupling hardware, according to manufacturer's design and approval of the distributor. The material used for brackets, bolts, nuts and washers shall be carbon steel hot dip galvanized.

The surge arresters are not considered in the supply.

6.10.7 Earthing terminals

Neutral grounding - Special requirement for Codensa

The transformers shall have a grounding connector. The terminal will have a hexagonal head screw, thread type M12x1.75 (diameter by length) and a washer, both made from stainless steel or brass, with a minimum copper content of 60%. In addition, the tin-plated bronze grounding connector (minimum 8 μ m) should be supplied.

6.10.8 Rating plates and plate-holders

Additional to data requested in IEC standard must be added:

- Level noise
- Losses
- Winding material
- Serial number
- Purchase order number
- Date of manufacture (Day, Month, Year)

Special requirement for Codensa

- It is necessary to add to the rating plate the sign " Classification according to 0222/2011: Group 4"
- The tank must be painting with the notice " NOT PCB "

Special requirement for Edesur

For Edesur is necessary to add one plate of notice (see Figure A4). This notice plate must be beside Rating Plate.

	GLOBAL STANDARD	Page 33 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018



Figure A4 - Notice plate

NOTE: Material of the plate: Aluminium (minimum thickness 0.8 mm)

Printing

- deposition of powder by electrostatic projection
- silkscreen (planograph photographic)

Painting

- polyester bakeable at 200 ° C / 250 ° C
- silkscreen epoxy ink plus polyurethane powder lacquer transparent and bakeable

Colors

According to IRAM-DEF D 1054

Blue: 08-2-070 (half matt)

Yellow: 05-02-040 (half matt)

White: 11-3-010 (matt)

Red: 03-1-050 (bright)

Black: 11-2-070 (half matt)

6.10.9 Filling hole and plug (filling cap)

For Ampla: to allow for the completion of the leak test the transformer should have a small tube in the top ½" internal thread and plug for nitrogen filling.

9.1.5.2 Criteria for type and special tests

	GLOBAL STANDARD	Page 34 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

Type tests

The selection of samples for type tests shall be two units by type of transformer. The rated power will be on agreement with the Distribution Company.

Special Test

Short-circuit test. The sample shall be one unit by type of transformer. The rated power will be on agreement with the Distribution Company.

NOTE. Type of transformer. Group of transformers which have the same voltage level in the primary side and the same kind of core, wrapped type or cold rolled . Transformers with dual voltage level on the primary side should be considered a different type.

9.1.4 Special tests

Test for support fixed to tank (NBR 5440).

10 TRANSPORT AND PACKING

The equipment should be individually packed onto treated wood or plastic pallets in a way suitable for transport, in such a way as to avoid any damage to equipment. The packing should be suitable for introducing equipment into standard transport industry containers. All additional elements of the equipment should be packed into a single crate.

Transformers should be transported with their complete oil load and accessories in place. The transformer should be completely secured in its packaging.

Wood should be treated according to international plague control requirements, avoiding compounds dangerous to human health or the environment, such as "pentachlorophenol" and "creosote". The treatment should consider at least: high toxicity to xylophagous organisms, high penetrability and staying power, chemical stability, and substances which are non-corrosive to metals and which do not affect the physical characteristics of wood.

A visual inspection of the equipment will be carried out upon receiving it, checking for possible damage occurred during transport and the warehousing process. In addition, the presence of the complementary elements should be verified (clamps, grounding bolt, fuses, etc.)

Packaging should be able to withstand the weight produced upon stacking up to 3 single-phase and 2 three-phase transformers of normal capacity no higher than 150 kVA.

A list of the packaging brands should be submitted for the Client's comments and final approval. The country of manufacture should be included in the packaging information.

12 FIGURES

PARTICULAR SCHEMES FOR LATAM

Ampla y Coelce (Brazil)

Support to single-phase and two-phase transformer

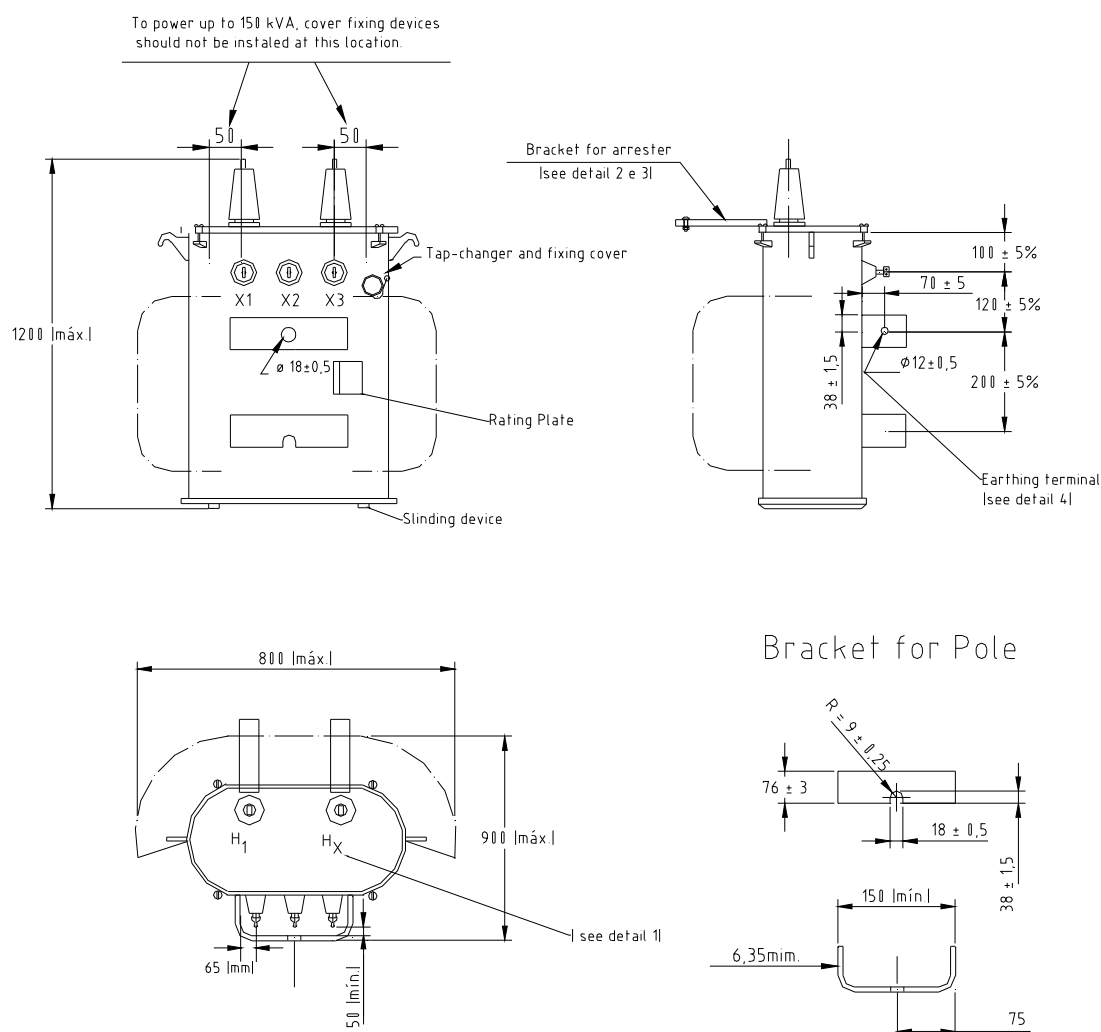
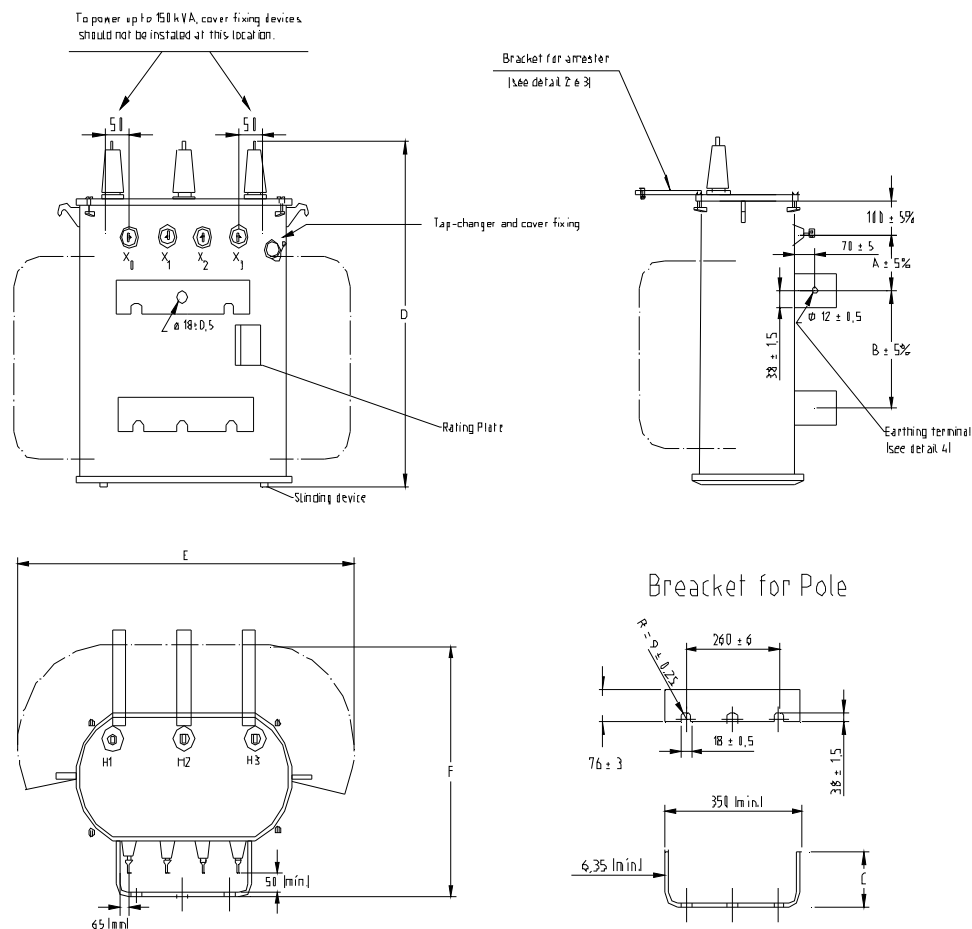


Figure A5 - Support to single-phase and two-phase transformer.

To Ampla and Coelce the vertical distance between supports should be 200 mm ±0.5%


Figure A5 - Three-phase transformer.

To Ampla vertical distance "B" for the range of ≥ 75 and ≤ 150 should be of 200 or 400mm $\pm 0,5\%$, for 300 kVA the vertical distances should be of 400 mm.

To Coelce vertical distance "B" for the range of ≤ 45 KVA should be of 200 mm $\pm 0,5\%$ and for power rated > 150 KVA should be of 400mm $\pm 0,5\%$

Ampla		Coelce	
Power (kVA)	C (mm)	Power (kVA)	C (mm)
≤ 45	150	≤ 75	150
≥ 75 and ≤ 150	180	112,5 and 150	284
300	270	225 and 300	350

Table A5
NOTE:

To Coelce:

- The bracket thickness should be as minimum 6,35 mm.
- There must be a distance of 50 mm between the bracket and the outer part of the BT Bushing

To Ampla and Coelce:

- The maximum weight to 150 kVA is 750 kg and to transformers of 300 kVA is 1200 kg.

Bracket for arrester to single-phase and two-phase transformer

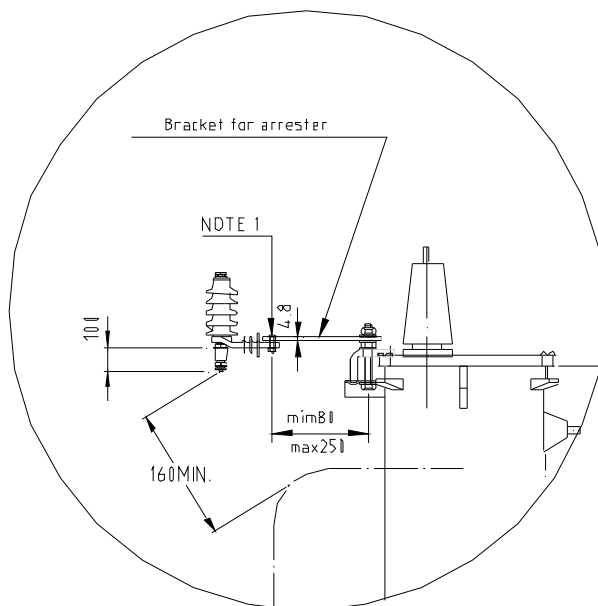


Figure A6a - Bracket for transformer with radiator

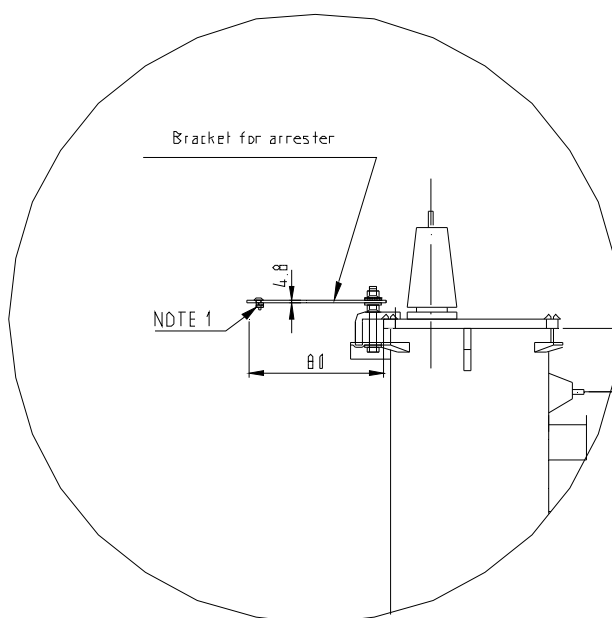


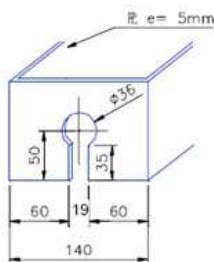
Figure A6b - Bracket for transformer without radiator

Chilectra (Chile)

Fixing support in single-pole (single-phase and two-phase transformer)

The single-phase transformers must carry two clamping backpacks, whose construction detail shown in Figure A3.

The bottom of the tank must be isolated at least 50mm from the floor level.



Support detail 1

Figure A7 - Fixing support of single-phase and two-phase transformer

Fixing support in single-pole (three-phase transformer up to 75 kVA)

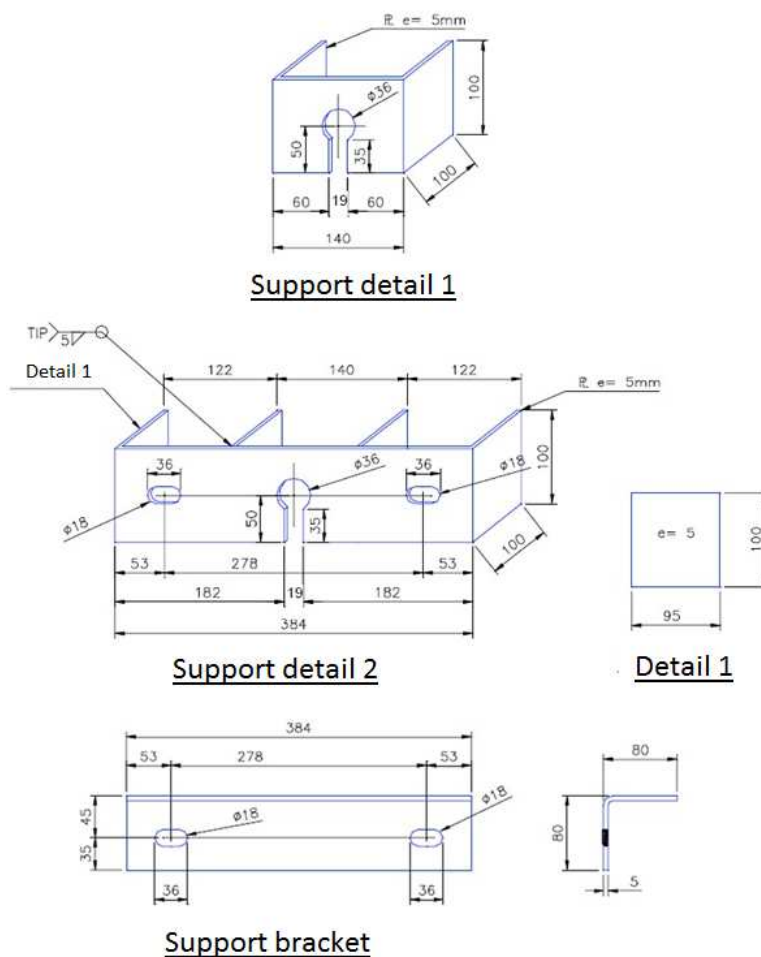


Figure A8 - Fixing support in single-pole of three-phase transformer up to 75 kVA

Support bracket, this is an item that must be installed in exceptional cases where the post holes do not match with supports of the transformer.

Anchoring base Docking (three-phase transformers up to 75kVA)

- Transformers must incorporate an anchoring base, with two U-profiles, separating the pond bottom floor, at least at 50 mm. The design must conform to Figure A9.
- The profiles must come with holes spaced at 590mm between centers measuring at least 630mm long.

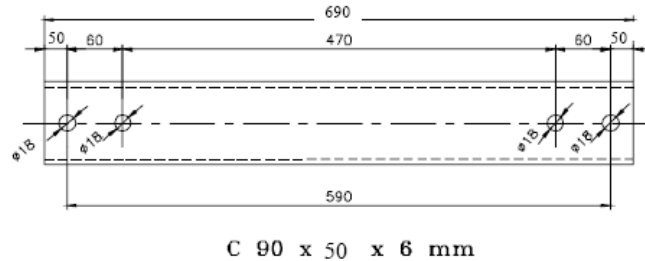


Figure A9 - Profile for anchoring base

Support for three-phase transformer greater than 75 kVA.

Anchoring base

- Transformers must incorporate an anchoring base, with two U-profiles, separating the pond bottom floor, at least at 50 mm. The design must conform to Figure A10.
- The profiles must come with holes spaced at 590mm between centers measuring at least 630mm long.

Anchoring base three-phase transformer greater than 75 kVA.

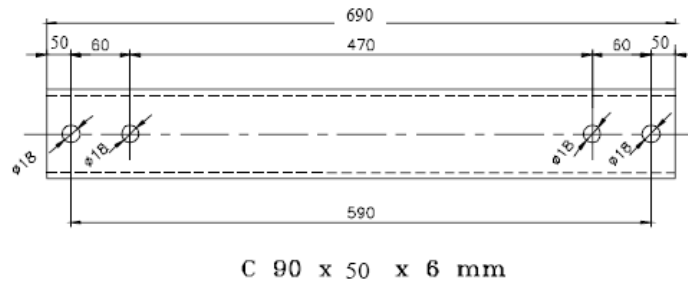


Figure A10 - Profile for anchoring base

Fixing support in single-pole (three-phase transformer up to 150 kVA)

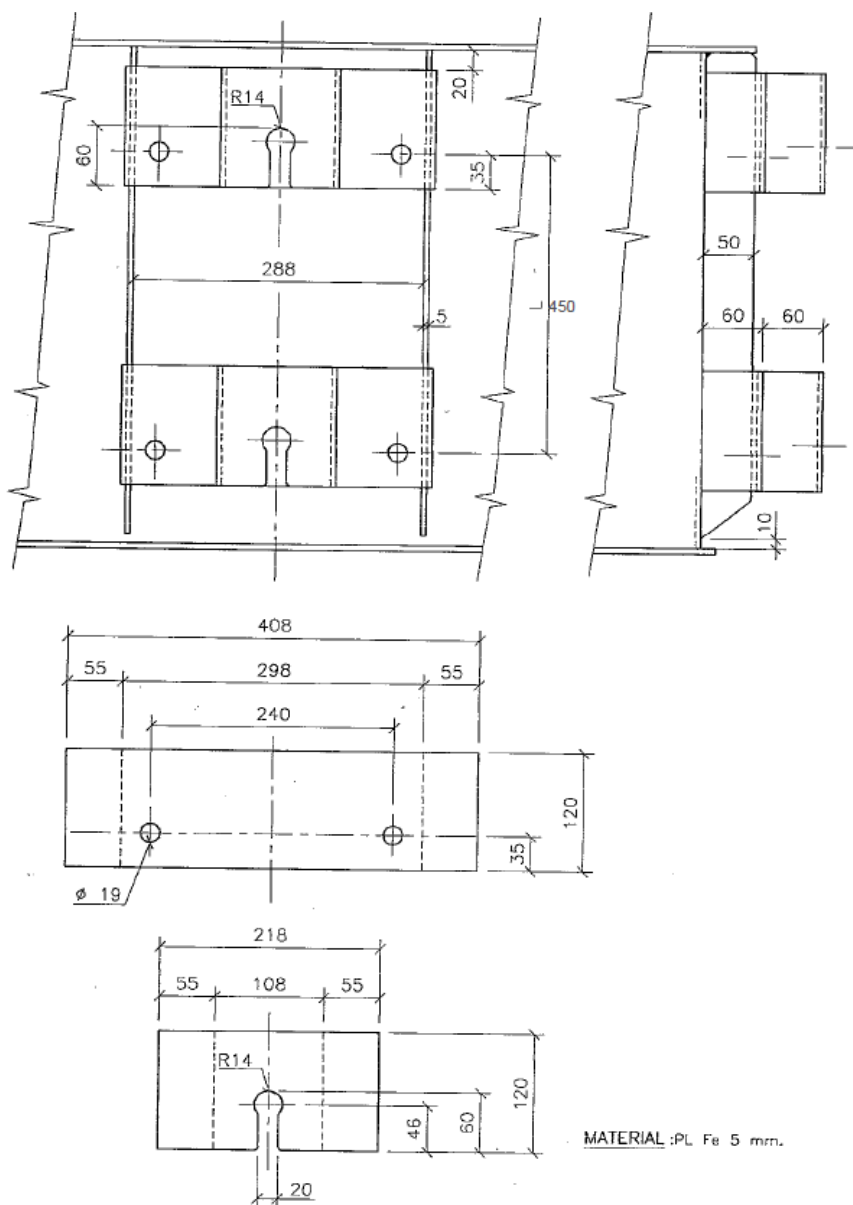


Figure A11 - Profile for anchoring base

Fixing support in single-pole

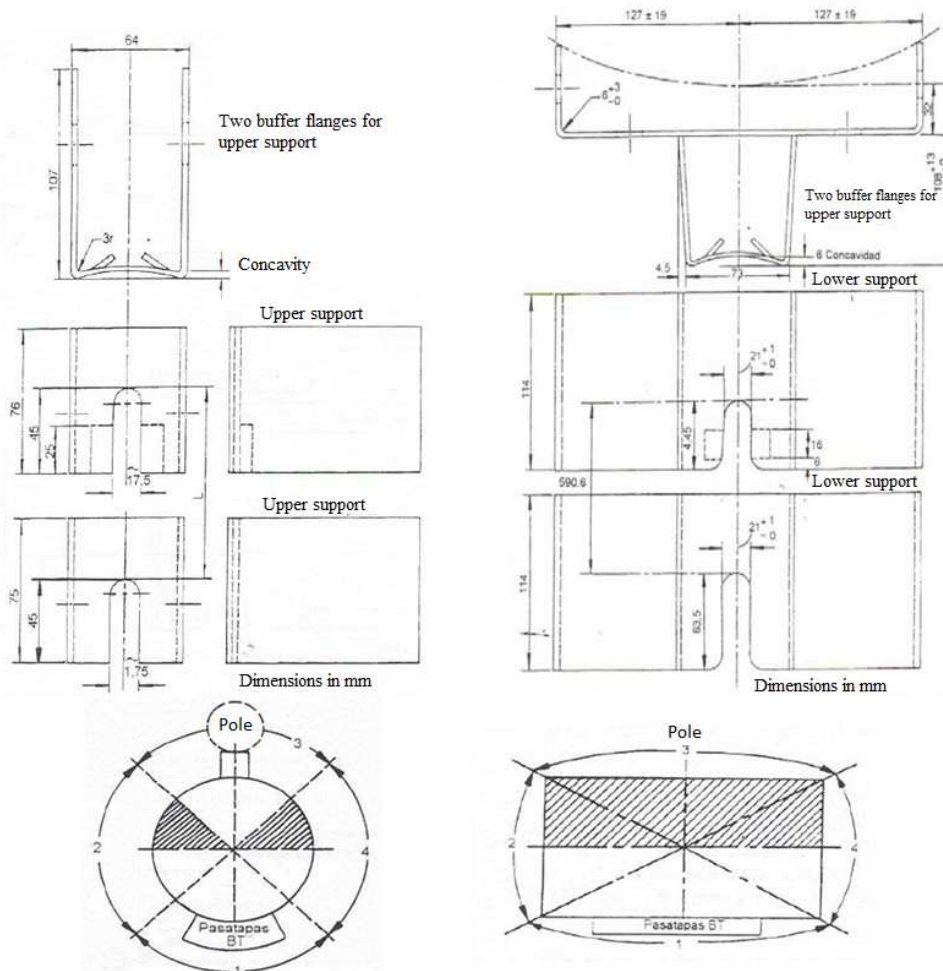


Figure A12 - Profile for anchoring base

Edelnor (Perú)

All labels on the transformer surface will be painted with a resistance material at corrosion, will not accepted any adhesive label.

The vertical distance between Fixing bracket must be 400 mm for transformers up to 160 kVA mounting at single-pole.

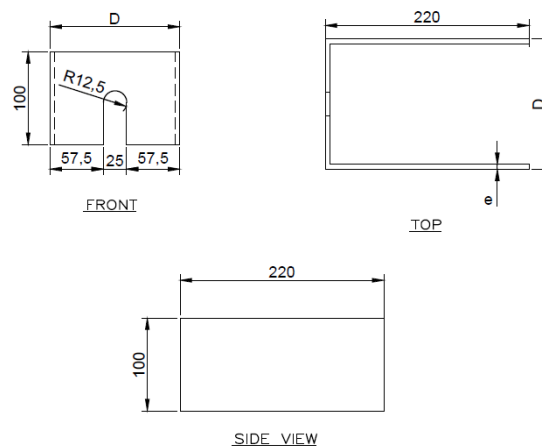
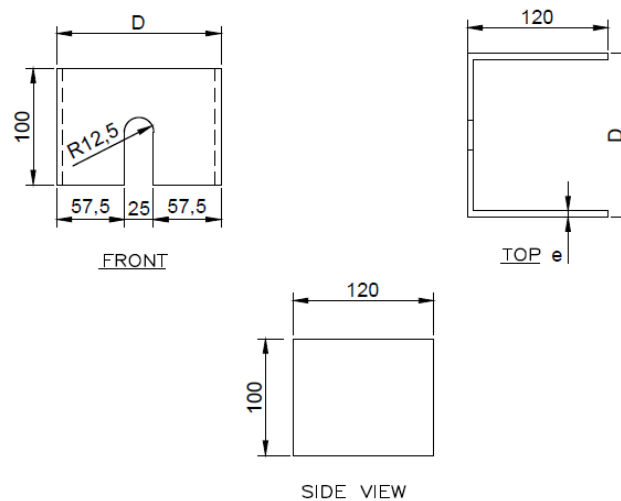


Figure A13 - Support for transformer bushing side



The thickness (e) and the front dimension (D) of the Fixing bracket are defined by the manufacturer. The dimensions are in mm.

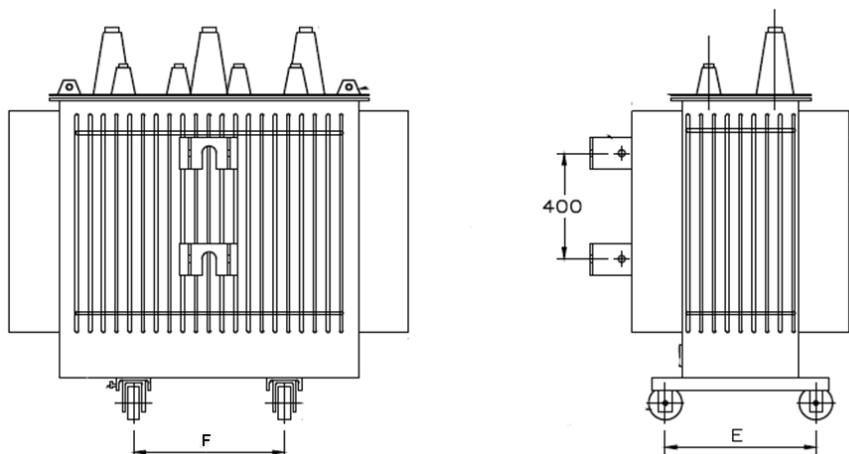
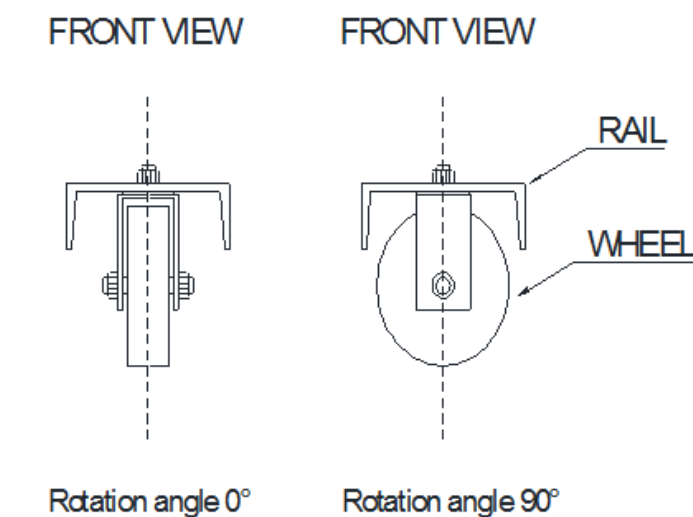


Figure A15 – Distance between wheels

The distance “E” should be 585 mm and the distance “F” should be 450 mm for all power values.

The wheels will be designed according to figure below and the dimension according to the manufacturer, furthermore when the wheel turns 90° it will not have contact with the rail.



The maximum height of the transformer will include the wheels (only if required depending to the power)

Edesur (Argentina)

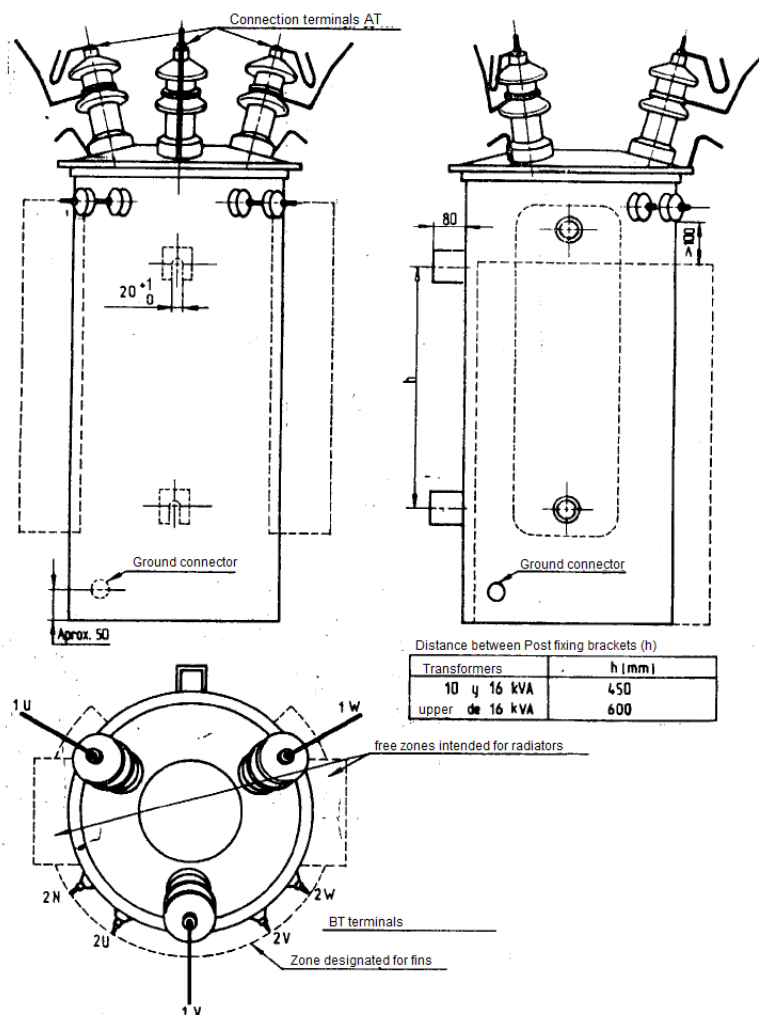


Figure A16 - Support for a three phase transformer

BUSHINGS

For three-phase transformers 25 kVA, 63 kVA and 100 kVA, Argentina by standard requirement, consider that the MV and LV bushing meet as indicated in Figure 17 and Figure 18, respectively. Also the three-phase transformers up to 1000 kVA are considered that comply with the bushing shown in Figure 19 and Figure 20.

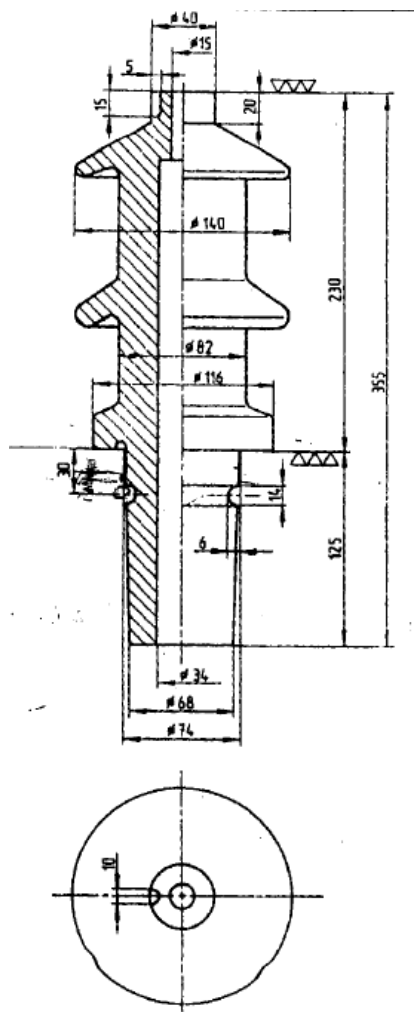


Figure A17 - Medium voltage through insulator

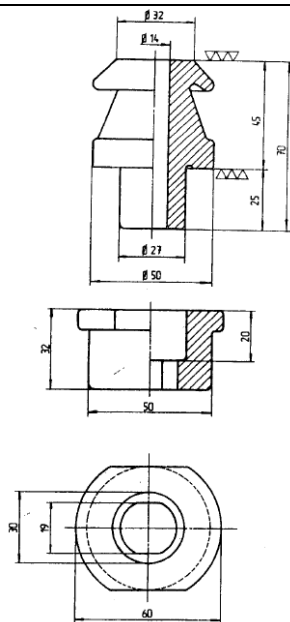


Figure A18 - Low voltage through insulator

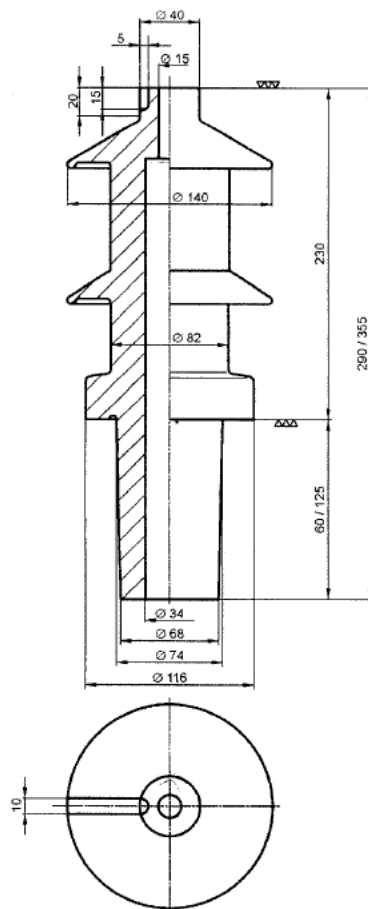


Figure A19 - Through insulator Type A

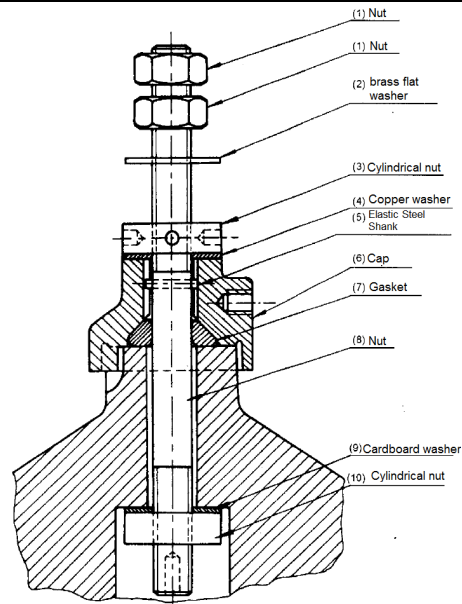


Figure A20 - View through insulator terminal of type A

	GLOBAL STANDARD	Page 49 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

LOCAL SECTION B – ENDESA DISTRIBUCIÓN ELÉCTRICA (Spain)

In addition on what specified in the common part, the following requirements are prescribed:

3.1 LAWS
R.D. 337/2014 “Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión y sus Instrucciones Técnicas Complementarias ITC-RAT 01 a 23.” R.D. 614/2001 “Disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico”. and subsequent modification/integration.
3.3 LOCAL STANDARDS
UNE 21428-1 (2017) UNE 21428-1-1 (2017) UNE 21428-1-2 (2017) UNE 21428-1-3 (2017) UNE 207019 IN (2009) UNE 48103 (2014) and all the Standard mentioned in those listed above.
3.4 LIST OF REPLACED STANDARDS
Norma ENDESA FND001
3.5 OTHER RELEVANT DOCUMENTS
ENDESA Technical Specification 6700496 (Thermometer)
5.1 TYPE OF TRANSFORMERS
The transformers shall be of one of the following classes: - Class B2 transformers: the no-load rated voltage of these transformers is 420 V phase-to-phase. - Class B1B2 transformers: Designed to simultaneously feed 242 V and 420 V networks, with a neutral common to both, with reduced load at the voltage of 242 V, and full rated load in that of 420 V (section 5.4). The no-load rated voltages of these transformers are 242 V and 420 V in their corresponding terminals. The 242 V voltage must be obtained with a tapping in the 420 V winding.
5.5 RATED POWER
In class B1B2 transformers, the rated power (Pr) will be that fixed for its total use at 420 V and will have the following distribution formula: $P_1/K + P_2 = P_r$ with: Pr = rated power of the transformer P1 = required power for 242 V P2 = required power for 420 V K = 0.75 guaranteed by the manufacturer (for Pr ≤ 630 kVA) K = 1 guaranteed by the manufacturer (for Pr = 1000 kVA)

	GLOBAL STANDARD	Page 50 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

5.12 LOSSES, SHORT CIRCUIT IMPEDANCES AND SOUND POWER LEVELS

See Common List

6.5 BUSHINGS

Looking at the transformer from the low voltage side, the low voltage bushing are designated from right to left, by the following symbols:

N - 2U - 2V - 2W

The symbol N corresponds to the neutral bushing.

Looking at the transformer from the high voltage side, the high voltage bushings are designated from left to right by the following symbols:

1U - 1V - 1W

For the class B1B2 transformers, the low voltage bushing symbols are as following:

Looking at the transformer from the low voltage side, the low voltage bushings are designated from right to left by the following symbols:

N - 2U - 2V - 2W - 3U - 3V - 3W

The symbol N corresponds to the neutral bushing

The symbols 2U, 2V and 2W correspond to the bushing at 420 V.

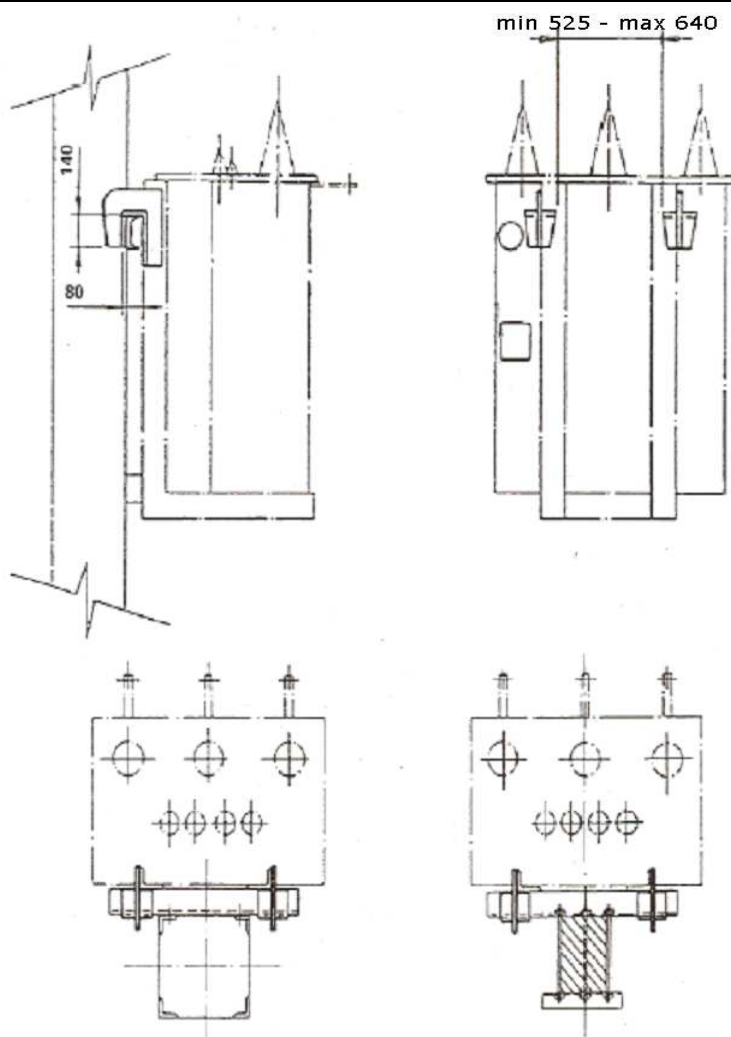
The symbols 3U, 3V and 3W correspond to the bushing at 242 V.

The symbols, which will be perfectly visible, must be located and marked on the tank cover indelibly, in relief and with a minimum size of 30 mm.

The transformers (B1B2) with Type 4, Type 5 and Type 6 LV bushings will be supplied with the corresponding flat coupling part.

6.8.1 SUPPORTING

The transformers of 50, 100 and 160 kVA will have a suspension device solidly joined (welded or screwed) to the tank for its mounting on a pole in accordance with Figure B1:



NOTE – All the dimensions are in mm.

Figure B1 - Suspension device

6.8.2 SLIDING DEVICES

All transformers, except 50 and 100 kVA rated power, are equipped with wheels without flanges, adjustable, in two perpendicular directions, for longitudinal and transversal displacements.

The dimensions of the wheels and the distances between shafts are those indicated in EN 50216-4 Standard, chapter 8.

	GLOBAL STANDARD	Page 52 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

6.9 PAINTING

The color of the external painting shall be type S 8010-R90B as described in UNE 48103 Standard. The equivalent color of RAL 840-HR is RAL 5008.

6.10.3 Thermometer pocket

The thermometer will be installed at source by the manufacturer in the supply of the followings transformers:

250 – 400 – 630 – 1000 kVA

The type and model of thermometer to be installed in these transformers is indicated in the ENDESA Technical Specification 6700496.

6.10.6 Support for surge arrester

The transformers of 50, 100 and 160 kVA will have support for surge arresters in accordance with the following Figure B2 **Errore. L'origine riferimento non è stata trovata.:**

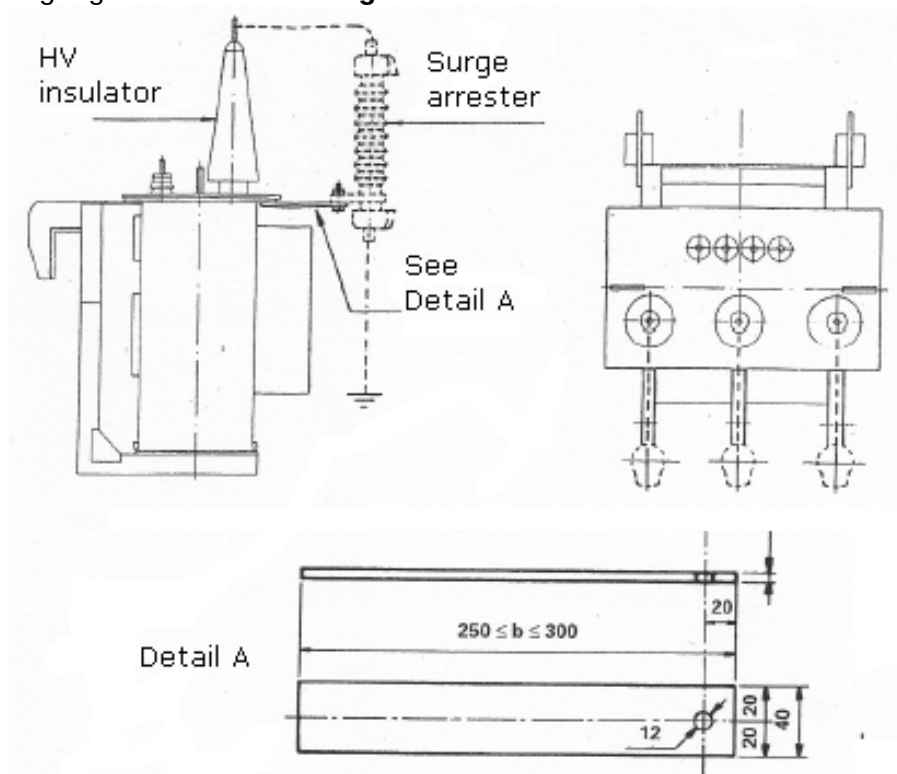


Figure B2 - Supports for surge arresters

6.10.7 Earthing terminals

See chapter 5.2 of UNE 21428-1 for number and placement of earthing terminals

6.10.8 Rating plates and plate-holders

All transformers must have a rating plate, ready to be easily set at both longer sides of the

transformer and for that purpose, adequate support shall be placed.

The contents, layout, dimensions and materials shall be as indicated in the following figures:

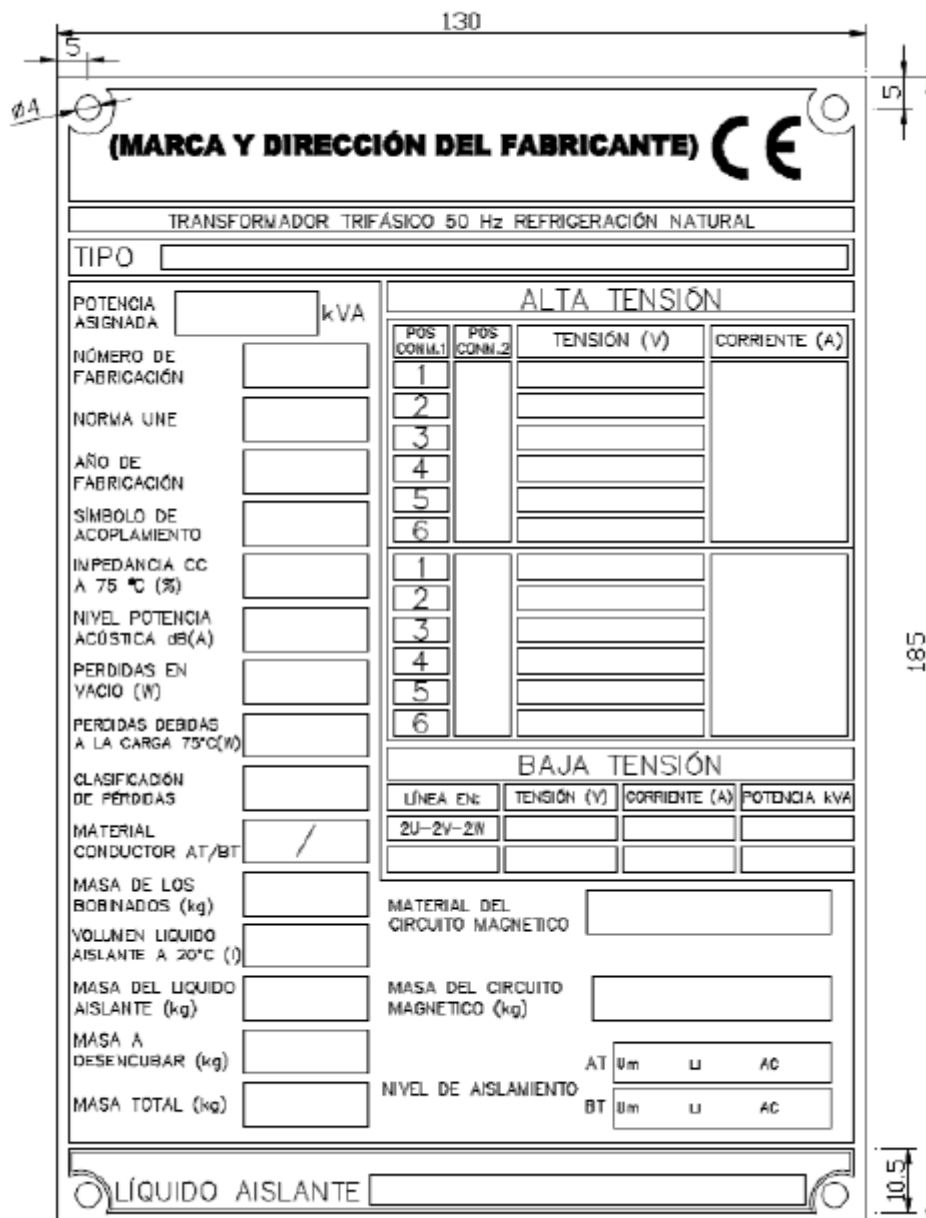


Figure B3 shows the layout of a transformer rating plate. The plate is rectangular with overall dimensions of 130 mm in width and 185 mm in height. It features a top section for manufacturer information and a CE mark. Below this is a section for transformer type and specifications, including power, number of turns, and various loss measurements. The plate is divided into sections for high voltage (ALTA TENSIÓN) and low voltage (BAJA TENSIÓN) ratings. It also includes fields for material, conductor, and insulation details. The bottom section is for liquid insulation information.

Dimensions: 130 mm (width), 185 mm (height), 5 mm (top margin), 10.5 mm (bottom margin).

Fields and sections include:

- (MARCA Y DIRECCIÓN DEL FABRICANTE) CE**
- TRANSFORMADOR TRIFÁSICO 50 Hz REFRIGERACIÓN NATURAL**
- TIPO**
- POTENCIA ASIGNADA** (kVA)
- NÚMERO DE FABRICACIÓN**
- NORMA UNE**
- AÑO DE FABRICACIÓN**
- SÍMBOLO DE ACOPLAMIENTO**
- IMPEDANCIA CC A 75 °C (%)**
- NIVEL POTENCIA ACÚSTICA dB(A)**
- PERDIDAS EN VACÍO (W)**
- PERDIDAS DEBIDAS A LA CARGA 75°C(W)**
- CLASIFICACIÓN DE PERDIDAS**
- MATERIAL CONDUCTOR AT/BT**
- MASA DE LOS BOBINADOS (kg)**
- VOLUMEN LÍQUIDO AISLANTE A 20°C (l)**
- MASA DEL LÍQUIDO AISLANTE (kg)**
- MASA A DESENCUBAR (kg)**
- MASA TOTAL (kg)**
- ALTA TENSIÓN** (Pos. Conn. 1, 2, Tensión (V), Corriente (A))
- BAJA TENSIÓN** (Línea En, Tensión (V), Corriente (A), Potencia kVA)
- MATERIAL DEL CIRCUITO MAGNÉTICO**
- MASA DEL CIRCUITO MAGNÉTICO (kg)**
- NIVEL DE AISLAMIENTO** (AT, BT, Um, U, AC)
- LÍQUIDO AISLANTE**

Figure B3 - Rating plate

NOTE:

- All the letters in bas and/or high relief
- Material: Stainless Steel
- Thickness: 0,8 mm
- Tolerances: $\pm 0,5$ mm

	GLOBAL STANDARD	Page 54 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

The field "TIPO" shall be engraved as follows:

- a number indicating the rated power followed by the letter I indicating the hermetically sealed liquid-immersed type.
- a number indicating the highest voltage for the material (12, 24 or 36 kV)
The two previous numbers are separated by a slash
- a number or numbers separated by a dash, indicating the rated primary voltages in kV. It follows a) and b) and separated from them by a slash
- the class (B2 or B1B2)
- the reference to this Standard
- Code assigned by the Manufacturer to each series of identical units, in brackets.

Example: 630I/24/9.5-16.4B1B2-GST001 r.03 ("Code assigned")

The K factors of the dual secondary voltage transformers can be identified by plates of 105 x 40 mm, white, with the identification K = 0.75 or K = 1, in black characters with a minimum height of 30 mm, mounted on the rating plate supports.

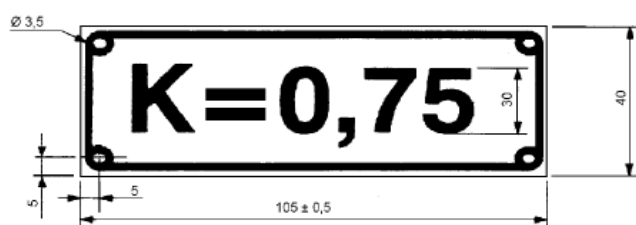


Figure B4 – K factor plate

In order to differentiate the transformers built in accordance with this standard from the ones before 2008, the following marking is established:

Yellow rectangular plates 105 x 40 mm, fastened to the lower part of the rating plate supports, indicating "420 V" in black characters with a minimum height of 30 mm.

6.10.9 Filling hole and plug

The filling cap shall be placed on the cover of the tank in the opposite side of the oil draining device and shall be compliant with EN 50216-4, chapter 7. The shape and dimensions are indicated in the Figure B5:

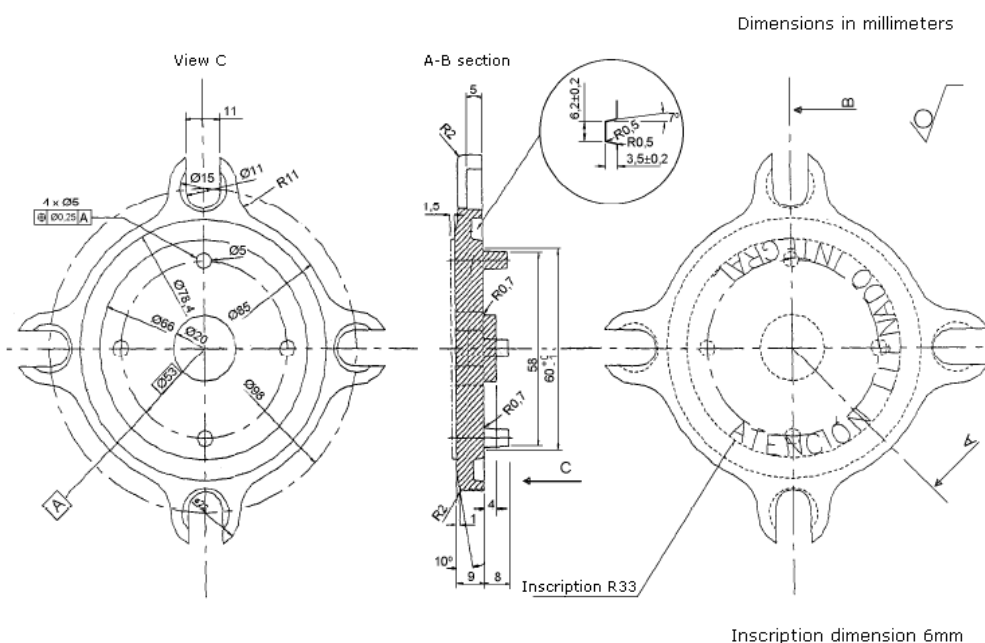


Figure B5 - Filling cap

9.1.1 Routine tests

The check of external coating shall be made in compliance with UNE 21428-1.

9.1.5.1 Criteria for routine tests

The Manufacturer shall prepare a test report, as indicated in document UNE 207019 IN, containing the results of the tests.

9.1.5.2 Criteria for type and special tests

	GLOBAL STANDARD	Page 56 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

In case of several transformers with same insulation level, but different rated voltage levels, it is possible to perform type and special test on only one transformer for each of the following families, provided that the all transformers are made using the same technology.

- Family 1: Transformers with $U_m = 24$ kV and rated power between 50 and 250 kVA, both included.
- Family 2: Transformers with $U_m = 24$ kV and rated power between 400 y 1000 kVA both included.
- Family 3: Transformers with $U_m = 36$ kV and rated power between 50 y 250 kVA both included.
- Family 4: Transformers with $U_m = 36$ kV and rated power between 400 y 1000 kVA both included.

For other transformers, the manufacturer must demonstrate that the constructive method allows to extend the validity of the above tests to the rest of the range or if additional testing is required.

In any case, for the extension of the homologation/certification the manufacturer must submit at least the following documents:

- Overall dimension drawings with general dimensions in compliance with the GST001.
- Drawing of rating plates in compliance with the GST001.
- Declaration regarding the fully compliance with the GST001.
- A copy of the Legal declaration regarding the fully compliance with R.D. 337/2014 (ITC-RAT 03) of the product. This document will be including in the documentation of each transformers delivered.

	GLOBAL STANDARD	Page 57 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

LOCAL SECTION C – ENEL DISTRIBUZIONE (Italy), ENEL DISTRIBUTIE: Banat, Dobrogea, Muntenia (Romania)

Where specified the prescriptions apply only for Enel Distribuzione or Enel Distributie. If not specified the prescriptions are applicable to both companies.

In addition on what specified in the common part, the following requirements are prescribed:

3.1 LAWS
Commission Regulation (EU) N. 548/2014 <u>Enel Distribuzione</u> D.Lgs n. 81/2008 D.Lgs n. 52/1997 D.Lgs. n. 209/1999 D.M. 11/10/2001 D.M. 28/04/1997 <u>Enel Distributie</u> Legea nr. 319/2006 Legea nr. 265/2006HG 1408/2008 HG 173/2000 HG 1159/2007 IPSSM 01/2007 and subsequent modification/integration.
3.2 INTERNATIONAL STANDARDS
ISO/IEC 17025
3.3 LOCAL STANDARDS
<u>Enel Distribuzione</u> UNI EU 54 (1981-09) CEI 14-13 (1998-04) UNEL 38137-67 EN 10279 <u>Enel Distributie</u> SR EN 10279 Standard (2007-09) SR HD 428 S1 Standard (2002 – 09) UNEL 38137-67 or DIN 43675 EN 10279
3.4 LIST OF REPLACED STANDARDS
- DT791, DT796, DT801, DT803, DT804, DT808, DT809 - DJ1106, DJ1107, DJ1109, DJ1111

	GLOBAL STANDARD	Page 58 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

3.5 OTHER RELEVANT DOCUMENTS

- DY 991 Protective coatings (paintings)
- DY 2101 Specifications for the type tests on protective coatings (paintings)
- DJ 1561 Collaudo isolatori MT a spina a cono interno
- DJ 1563 Collaudo isolatori BT in resina a barra passante

5.10 INSTALLATION

Enel Distribuzione

Outdoor/indoor (50-100-160 kVA)

Indoor (250-400-630 kVA)

Enel Distributie

Outdoor/indoor (50-100-160-250 kVA)

Indoor (400-630-800-1000 kVA)

5.12 LOSSES, SHORT CIRCUIT IMPEDANCES AND SOUND POWER LEVELS

For transformers with two primary voltages (20-10 kV), the prescribed rated powers and loss values are referred to both rated voltages.

For transformers two primary voltage (20-8,4 kV) and two secondary voltage (0,420-0,242 kV), the values are referred to the following conditions:

- Rated power 160, 250 e 400 kVA:
 - o 4% configuration 20/0,420 kV, referred to rated power;
 - o 4,5% configuration 8,4/0,420 kV, referred to rated power;
 - o 2,8% (tol. -0/+10%) in the condition 0,242 kV, referred to 75% of rated power.
- Rated power 630 kVA:
 - o 6% configuration 20/0,420 kV, referred to rated power;
 - o 6,2% configuration 8,4/0,420 kV, referred to rated power;
 - o 4,2% (tol. -0/+10%) nella in the condition 0,242 kV, referred to 75% of rated power.

With the MV tap-changer on the main tap, the values of load losses and no-load losses, are those specified in table of the Common List MV/LV transformers in accordance with EN 50464-1.

Capitalization of losses is possible in case of at least one better class for Pk and/or at least 10% less of Po. If considered, the capitalization loss parameters are indicated in the offer request.

The prescribed sound power level is also reported in Common List.

For transformers with loss values reduced to the prescribed one (see Common List), for specific rated powers, higher noise levels can be accepted (to be indicated in the offer request).

In this case the difference between the noise level declared by the Manufacturer and the noise level prescribed, such difference is evaluated in terms of penalties.

In any case the maximum acceptable values are the following:

- For rated power of 50 kVA and 100 kVA the max. value is 47 dB (as for 160 kVA)
- For rated power of 250 kVA and 400 kVA the max. value is 55 dB (as for 630 kVA)

In the rating plate of transformer, guaranteed values of losses and noise, shall be indicated.

	GLOBAL STANDARD	Page 59 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

5.16 OVERALL DIMENSIONS AND LAYOUT

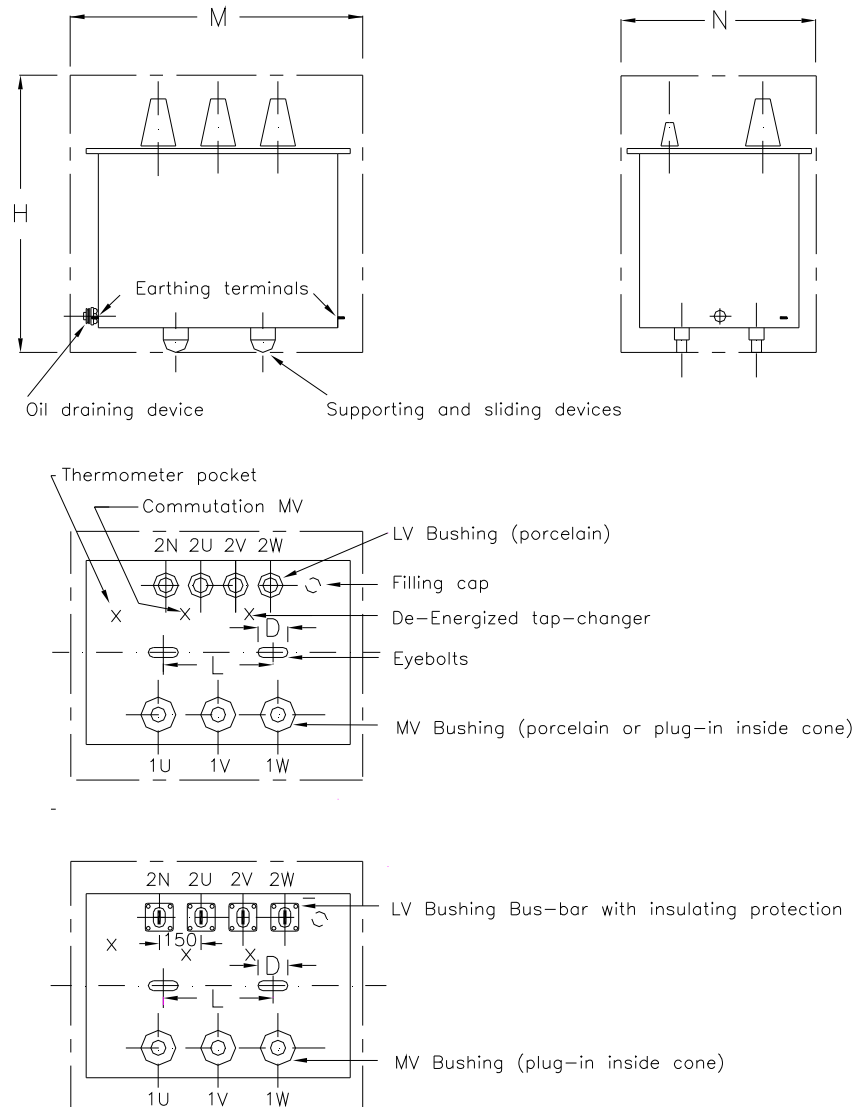
The overall dimensions are in table of the Common List MV/LV transformers. The position of the fittings (bushings, eyebolts, etc.) placed on the transformer cover, are described in Figure C1 and Table C1.

The phase-to-phase and phase-to-earth, air clearance of the active parts of MV bushings shall be 220 mm.

MAXIMUM WEIGHT

The maximum weights to transformers admitted are:

- Rated power 50, 100, 160 kVA: 1250 kg
- Rated power 250, 400, 630 kVA: 2700 kg
- Rated power > 630 kVA: No specific limits



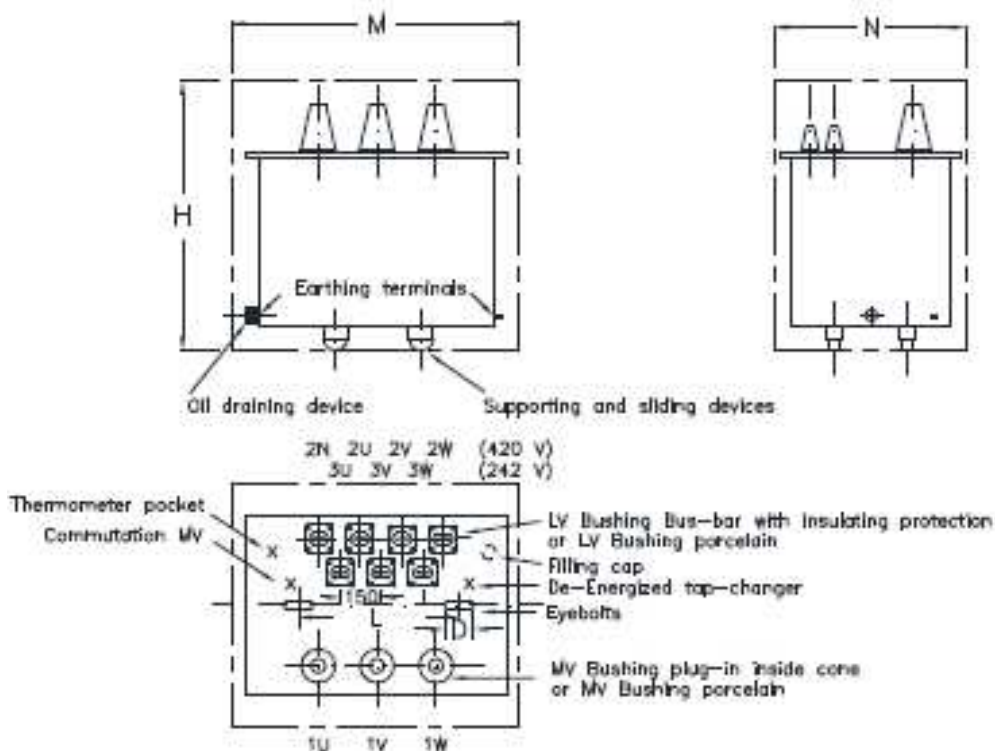


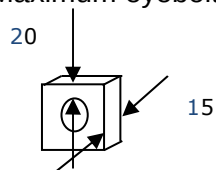
Figure C1- Overall dimensions and layout

EYEBOLTS

Rated power (kVA)	Internal diameter eyebolts D (mm)	Minimum interaxis distance between eyebolts L (mm)	Maximum interaxis distance between eyebolts L (mm)
50	60	280	- 1.000 mm, for transformers up to 2000 kg - 1.200 mm, for transformers above 2000 kg
100	60	300	
160	60	300	
250	60	360	
400	60	400	
630	60	400	
800	60	400	
1000	60	400	

Table C1 – Eyebolts: diameter dimensions and interaxis

Maximum eyebolt dimensions in mm are indicated below:



6.4 INSULATING LIQUID AND MATERIAL

It is forbidden to use insulating oil that can be classified as dangerous substances.

	GLOBAL STANDARD	Page 62 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

For each "impregnation lot" (all the transformers filled on the same date, even if they belong to different contracts, specifications and types), the Manufacturer shall check the absence of PCB from the oil and issue a self-certification document.

The aforementioned document must be edited in accordance with the following template *Annex "A"* (0) and in particular, it shall contain:

- the GS type code of the transformer (see Common List);
- the Manufacturer type code;
- the rated power and voltages;
- number and date of the testing notice, contracts and/or purchasing orders;
- identification number of all the units within the lot that have undergone and passed testing;
- a declaration of PCB absence from the oil in the listed transformers, supported by an oil analysis certificate including the units identification of the samples origin;

The expenses and responsibility for said analysis shall be borne exclusively by the Manufacturer and shall be carried out by a ILAC (International Laboratory Accreditation Cooperation) or IAF (International Accreditation Forum) accredited laboratory.

Enel Distribuzione

The Italian reference law is D.Lgs n.52/1997 and following modifications. The specific risk for oils classified as dangerous are identified by the "risks statements R45, R46 and R49", listed in D.M. 28/04/1997 and following modifications.

Enel Distributie

The Romanian reference law is HG 1159/2007 and following modifications. The specific risk for oils classified as dangerous are identified by HG 1408/2008.

Annex "A"

Manufacturer:

"SELF-CERTIFICATION" Document for MV/LV transformers

N.

In accordance with the Italian law (D.Lgs. 22.05.1999 n. 209 and D.M. 11.10.2001), and with reference to the Enel technical specification GST001, the Manufacturer guarantees the absence of PCB from the oil of the following transformers, under stated and belonging to the same "impregnation lot".

GS type code	Manufacturer code	Rated Power (kVA)	Rated Voltages (kV/kV)
Testing notice:	N.	date	
Contract:	N.	date	
Purchasing Order:	N.	date	
Manufacturer identification number(s)			

GS type code	Manufacturer code	Rated Power (kVA)	Rated Voltages (kV/kV)
Testing notice:	N.	date	
Contract:	N.	date	
Purchasing Order:	N.	date	
Manufacturer identification number(s)			

Annex: oil analysis certificate N. date
issued from the laboratory
date Signature

NOTE: for Enel Distributie replace the sentence "In accordance with the Italian law (D.Lgs. 22.05.1999 n. 209 and D.M. 11.10.2001)..." with: "In accordance with the Romanian law (HG 173/2000)..."

Figure C2 - Annex "A": template for oil self-certification

The neutral LV bushing shall be identified by blue colour (RAL 5015) as stated in the followings:

- For type EN 50386 bushing, the metallic washer under tightening bolt shall be painted;
- For type Bus-bar bushing, the border of the flange to be fixed over the tank cover, shall be painted or it must have the body in resin of blue colour.

All bushings shall have self-adhesive labels of 10÷20 mm diameter, inalterable in time and visible from the MV and the LV side of the transformer respectively. The terminal marking (black writings on silver background) shall be:

- for MV bushings: 1 U, 1 V, and 1W;
- for LV bushings: 2 U, 2 V, 2W and 2 N for the neutral terminal.

Sealed tank transformers shall be provided with a warning self-adhesive labels in order to prevent improper operations which can compromise the sealing, such as to unscrew the nuts blocking the head gaskets of porcelain MV bushings.

Enel Distribuzione

The LV bushings for all 23kV transformers (GST001/064, GST001/065, GST001/066) shall have a terminal plate compliant to UNEL 38137-67 (or DIN 43675).

Plug-in MV bushings type inside cone shall be in compliance with DJ1561.

LV Bus-bar bushing and relative insulating protection shall be in compliance with DJ1563.

6.8.2 SLIDING DEVICES

Transformers shall be provided with sliding devices.

Transformers of rated power of 50 kVA and 100 kVA shall have slides complying with Figure C1 and made of iron channel (U 65×42) complying with EN 10279. the slides shall be welded under the transformer, parallel to the longer side of the tank.

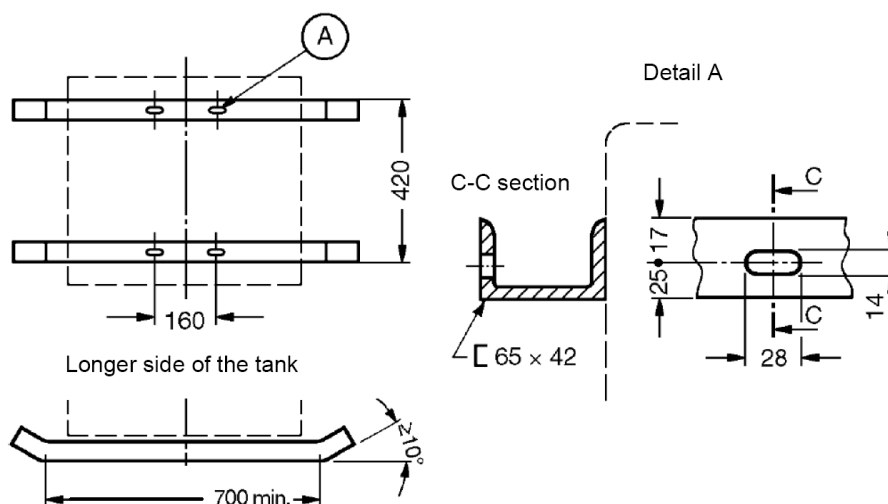


Figure C1 - Slides

Transformers of rated power higher than 100 kVA shall have cast-iron wheels and relative supporting pivots, having size complying with EN 50216-4. For transformers with rated power 160 and 250 kVA is possible to use nylon wheels.

	GLOBAL STANDARD	Page 65 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

The wheels shall have the following mechanical characteristics:

permanent maximum load:	20 kN
short duration maximum load:	80 kN
transversal static thrust:	2 kN

The Manufacturer's name and the maximum permanent load shall be engraved on each roll. Pivots shall be made of stainless steel, and their forks shall be made of steel, painted or cured against corrosion. The coupling between forks and the relative rod shall be assembled by stainless steel screws, nuts or hot zinc-plated steel washers. During transport the complete wheels (wheel + pivot + fork) shall be removed from their normal operating position, and shall travel together with the transformer, in a position that will not cause damage to the protective covering of the transformer.

Enel Distribuzione

The wheels for all 23kV transformers (GST001/064, 065, 066 and 074) shall be as indicated in the following figure:

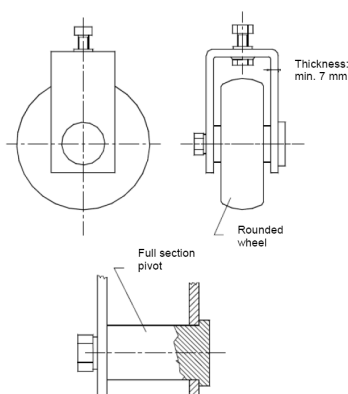


Figure C2 - Special wheels for 23kV transformers

6.9 PAINTING

Enel Distribuzione technical specifications DY991 and DY2101 apply. The colour of the final painted layer shall be green RAL 6002.

6.10.7 Earthing terminals

The two earthing terminals shall be placed on the bottom of the tank on the two short sides.

6.10.8 Rating plates and plate-holders

Transformers shall have two plate-holders (see figure Figure C3) and two rating plates (see Figure C4) and placed on the long sides of the transformer. The rating plates shall be mounted on the upper part of plate-holders and shall be fixed with aluminium rivets.

Plate-holders, even if mobile, shall be fixed to the transformer in a way allowing the complete painting of all parts that are behind them. Fixed plate-holders shall not be welded to the fins. The rating plates shall be made of aluminium, with a thickness of 1 mm. Edges, writings and boxes shall be white on matt black background. The white boxes and the engraved letters shall be of

4,8 mm and 4 mm height, respectively.

Transformers with two primary voltages shall have shown on the rating plate the ratings corresponding to the two operating conditions. In such case the two values of the parameters (voltages, currents, power and short-circuit impedance, when different for the two conditions) shall be engraved in the same box of the rating plate as prescribed in the following.

NOTE 1: a "series" is set-up with all the units that correspond to the same standardized Enel type and in addition have the same design, hence are identical from the manufacturing point of view. Each series is identified by a code assigned by the Manufacturer.

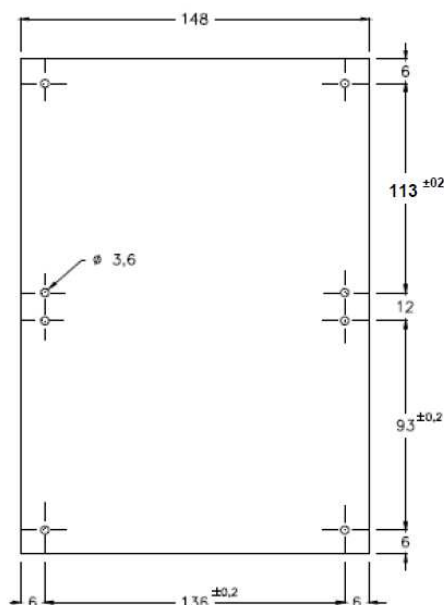
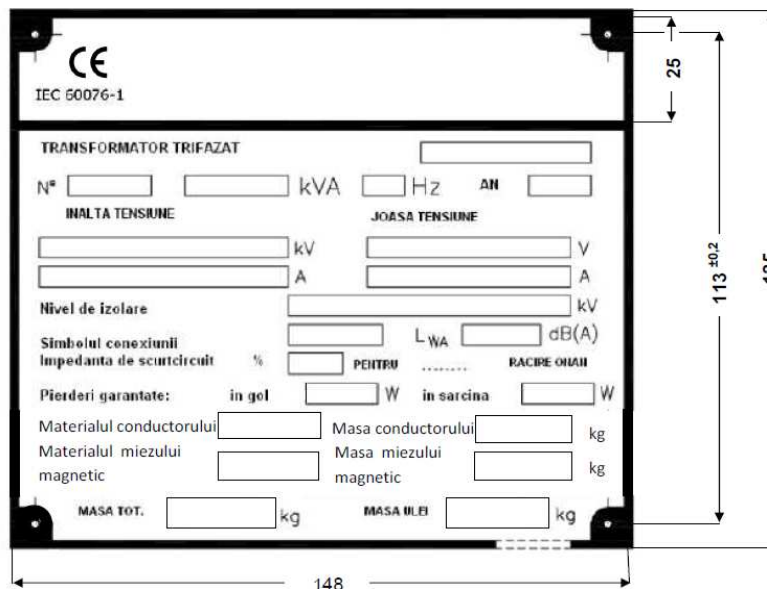


Figure C3 - Plate-holder

CE		(1)	
IEC 60076-1			
TRASFORMATORE TRIFASE		(2)	
N° (3)	(4) kVA	(5) Hz	ANNO (6)
ALTA TENSIONE		BASSA TENSIONE	
(7) kV	(8) V		
(9) A	(10) A		
Livelli di isolamento		(11) kV	
Simbolo di collegamento		(12)	L _{WA} (13) dB(A)
Impedenza di cto-cto %		(14)	PER (15) RAFFR. ONAN
Perdite garantite: a vuoto		(16) W	a carico (17) W
Materiale conduttore	(18)	Massa conduttore	(19) kg
Materiale nucleo	(20)	Massa nucleo	(21) kg
MASSA TOT.	(22) kg	MASSA OLIO	(23) kg
		(24)	



CE
IEC 60076-1

TRANSFORMATOR TRIFAZAT

N° kVA Hz AN

INALTA TENSIUNE kV A

JOASA TENSIUNE V A

Nivel de izolare kV

Simbolul conexiunii L_{WA} dB(A)

Impedanta de scurtcircuit % PENTRU RACIRE ONAN

Pierderi garantate: in gol W in sarcina W

Materialul conductorului Masa conductorului kg

Materialul miezului magnetic Masa miezului magnetic kg

MASA TOT. kg MASA ULEI kg

148 125 113 ±0.2 25

Figure C4 - Rating plates for Enel Distribuzione and Enel Distributie

With reference to the Figure C4 above, the following information shall be reported engraved on the plate:

1. Name of the Manufacturer
2. Code assigned by the Manufacturer to each series of identical units
3. Serial number assigned by the Manufacturer
4. Rated power
5. Rated frequency
6. Year of manufacturing
7. Primary rated voltage and regulation:
 - example 1: $20 \pm 2 \times 2,5\%$
 - example 2: $20 \pm 2 \times 2,5\% / 10 \pm 2 \times 2,5\%$
8. Secondary rated voltage
9. Primary rated current:
 - example 1: 11,5
 - example 2: 11,5 / 23,1
10. Secondary rated current
11. Insulation levels:
 - example 1: IA 125 FI 50 / FI 10
 - example 2: IA 125 FI 50 – IA 75 FI 28 / FI 10
12. Connection symbol
13. Sound power level declared by the Manufacturer
14. Short-circuit impedance
15. Type of installation:
 - Enel Distribuzione*: "EST" (outdoor) or "INT" (indoor);
 - Enel Distributie*: "EXT" (outdoor) or "INT" (indoor);
16. No-load losses declared by the Manufacturer
17. Load losses declared by the Manufacturer
18. Conductor material MV and LV windings: example (Aluminum - Copper/Aluminum – Copper)
19. Conductor mass MV and LV windings
20. Core material: example (silicon steel – amorphous steel)
21. Core mass
22. Total mass
23. Oil mass
24. Name of the rating plate Manufacturer

	GLOBAL STANDARD	Page 68 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

The following warning plate must be fixed on the cover, near the knob of the De-Energized Tap-Changer.



Note:

1. Material plate: aluminium
2. Thickness: 1 mm
3. Letter height: 4 mm
4. Letter will be in black colour.

6.10.9 Filling hole and plug

Sealed tank transformers shall be provided with a filling cap, 2" Gas female connection, protruding from the cover up to a height not exceeding the MV bushing porcelain one. The cap shall be closed by a hermetically sealable, corrosion-proof metal tap.

9.2.3.2 Check of the De Energized Tap Changer

Tests required.

9.2.3.4 Tests on rating plates

Tests required.

Note for the management of the materials

(SAP abbreviated description for internal ENEL Distribuzione use only):

Examples of compilation with abbreviated description:

Example 1

Transformer 100 kVA 20/0,420 kV with Porcelain bushing.

T	R	A	S	F	T	2	0	/	0	,	4	2	0	k	V	1	0	0	k	V	A	I	S	P	O	R	C
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Example 2

Transformer 250 kVA 20/0,420 kV with MV bushing Plug-in and LV bushing Busbar

T	R	A	S	F	T	2	0	/	0	,	4	2	0	k	V	2	5	0	k	V	A	I	S	S	B	P
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

	GLOBAL STANDARD	Page 69 of 69
	MV/LV TRANSFORMERS	GST001 Rev. 03 31/01/2018

COMMON LIST

MV/LV TRANSFORMERS REFERENCE LIST is attached in the following

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/040	ED-Italy	11 26 10	50	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1100	90	42	N	1500x1200x750	Medium	No	No
GST001/041	ED-Italy	11 26 11	100	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/042	ED-Italy	11 26 12	160	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/043	ED-Italy	11 26 32	160	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/044	ED-Italy	11 26 37	250	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/045	ED-Italy	11 26 38	400	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/046	ED-Italy	11 26 39	630	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/047	ED-Italy	11 36 10	50	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1100	90	42	N	1500x1200x750	Medium	No	No
GST001/048	ED-Italy	11 36 11	100	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/049	ED-Italy	11 36 12	160	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/050	ED-Italy	11 36 21	100	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/051	ED-Italy	11 36 22	160	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/053	ED-Italy	11 36 32	160	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/054	ED-Italy	11 36 42	160	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/055	ED-Italy	11 36 37	250	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/056	ED-Italy	11 36 38	400	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/057	ED-Italy	11 36 39	630	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/058	ED-Italy	11 36 47	250	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/059	ED-Italy	11 36 48	400	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/060	ED-Italy	11 36 49	630	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/061	ED-Italy	11 36 54	250	22	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	3250	300	50	Y	1800x1400x800	Medium	No	No
GST001/062	ED-Italy	11 36 55	400	22	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 3	CkAo	4600	430	53	Y	1800x1400x800	Medium	No	No
GST001/063	ED-Italy	11 36 56	630	22	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 4	CkAo	6500	600	55	Y	1800x1400x800	Medium	No	No
GST001/064	ED-Italy	11 36 06	250	23	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/065	ED-Italy	11 36 07	400	23	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 3	CkAo	4600	430	53	Y	1850x1600x930	Medium	No	No
GST001/066	ED-Italy	11 36 08	630	23	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 4	CkAo	6500	600	55	Y	1850x1800x930	Medium	No	No
GST001/067	ED-Italy	11 26 21	250	9	±2x2.5%	0,42	12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/068	ED-Italy	11 26 22	400	9	±2x2.5%	0,42	12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/069	ED-Italy	11 26 23	630	9	±2x2.5%	0,42	12/75/28	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/070	ED-Italy	11 26 31	100	15	±2x2.5%	0,42	17.5/95/38	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/071	ED-Italy	11 36 31	100	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/072	ED-Italy	11 36 41	100	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/073	ED-Italy	11 36 04	100	23	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/074	ED-Italy	11 36 05	160	23	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/075	ED-Italy	11 36 60	160	20-8,4	20 (±2x2.5%) 8,4 (±2x3%)	0,420-0,242	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4 (20 kV) 4,5 (8,4 kV)	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/076	ED-Italy	11 36 61	160	20-8,4	20 (±2x2.5%) 8,4 (±2x3%)	0,420-0,242	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4 (20 kV) 4,5 (8,4 kV)	Sol. 4	N/A	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/077	ED-Italy	11 36 62	250	20-8,4	20 (±2x2.5%) 8,4 (±2x3%)	0,420-0,242	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4 (20 kV) 4,5 (8,4 kV)	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/078	ED-Italy	11 36 63	400	20-8,4	20 (±2x2.5%) 8,4 (±2x3%)	0,420-0,242	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4 (20 kV) 4,5 (8,4 kV)	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/079	ED-Italy	11 36 64	630	20-8,4	20 (±2x2.5%) 8,4 (±2x3%)	0,420-0,242	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	6 (20 kV) 6,2 (8,4 kV)	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/119	ER-Romania	11 36 10	50	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1100	90	42	N	1500x1200x750	Medium	No	No
GST001/120	ER-Romania	11 36 11	100	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/121	ER-Romania	11 36 12	160	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/122	ER-Romania	11 36 13	250	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/123	ER-Romania	11 36 21	100	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 1	CkAo	1750	145	44	N	1600x1200x750	Medium	No	No
GST001/124	ER-Romania	11 36 22	160	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 1	600	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/125	ER-Romania	11 36 32	160	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/126	ER-Romania	11 36 42	160	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 2	CkAo	2350	210	47	Y	1600x1350x750	Medium	No	No
GST001/127	ER-Romania	11 36 37	250	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/128	ER-Romania	11 36 38	400	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/129	ER-Romania	11 36 39	630	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/130	ER-Romania	11 36 47	250	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	3250	300	50	Y	1750x1400x800	Medium	No	No
GST001/131	ER-Romania	11 36 48	400	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	4	Sol. 4	N/A	Sol. 7	CkAo	4600	430	53	Y	1850x1600x1030	Medium	No	No
GST001/132	ER-Romania	11 36 49	630	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	6500	600	55	Y	1850x1800x1030	Medium	No	No
GST001/133	ER-Romania	61 12 09	800	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	8400	650	56	Y	1950x1850x1000	Medium	No	No
GST001/134	ER-Romania	61 12 10	800	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	8400	650	56	Y	1950x1850x1000	Medium	No	No
GST001/135	ER-Romania	61 12 11	1000	20	±2x2.5%	0,42	24/125/50	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	10500	770	58	Y	2080x1990x1190	Medium	No	No
GST001/136	ER-Romania	61 12 12	1000	20-10	±2x2.5%	0,42	24/125/50 12/75/28	1.1/--/10	50	3P	Dyn11	6	Sol. 4	N/A	Sol. 7	CkAo	10500	770	58	Y	2080x1990x1190	Medium	No	No
GST001/201	EE-Spain	11 03 49 (6711321)	50	13,2	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	Medium	Yes	Yes
GST001/202	EE-Spain	11 04 60 (6711322)	50	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 3	480	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	Medium	Yes	Yes
GST001/203	EE-Spain	11 04 61 (6711323)	50	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	Medium	Yes	Yes
GST001/204	EE-Spain	11 04 62 (6711324)	50	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	Medium	Yes	Yes
GST001/205	EE-Spain	11 04 63 (6711325)	50	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	High	Yes	Yes
GST001/206	EE-Spain	11 04 64 (6711326)	50	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	High	Yes	Yes
GST001/207	EE-Spain	11 04 65 (6711327)	50	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 3	620	Sol. 1	CK+10A0+15	1210	104	48	N	1650x1100x780	Medium	Yes	Yes

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/208	EE-Spain	11 04 66 (6711328)	50	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 3	620	Sol. 1	CK+10A0+15	1210	104	48	N	1650x1100x780	Medium	Yes	Yes
GST001/209	EE-Spain	11 04 67 (6711329)	50	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CK+10A0+15	1210	104	40	N	1520x1100x740	Medium	Yes	Yes
GST001/210	EE-Spain	11 04 68 (6711331)	50	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yzn11 - Dzn0	4	Sol. 2	480	Sol. 1	CK+10A0+15	1210	104	40	N	1520x1100x740	Medium	Yes	Yes
GST001/211	EE-Spain	11 04 69 (6711332)	100	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 3	480	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/212	EE-Spain	11 04 70 (6711333)	100	16	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/213	EE-Spain	11 04 71 (6711334)	100	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/214	EE-Spain	11 04 72 (6711335)	100	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	High	Yes	Yes
GST001/215	EE-Spain	11 04 73 (6711336)	100	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	High	Yes	Yes
GST001/216	EE-Spain	11 04 74 (6711337)	100	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/217	EE-Spain	11 04 75 (6711338)	100	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 3	620	Sol. 1	CK+10A0+15	1925	167	51	N	1650x1100x780	Medium	Yes	Yes
GST001/218	EE-Spain	11 04 76 (6711339)	100	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 3	620	Sol. 1	CK+10A0+15	1925	167	51	N	1650x1100x780	Medium	Yes	Yes
GST001/219	EE-Spain	11 04 77 (6711340)	100	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CK+10A0+15	1925	167	42	N	1520x1100x740	Medium	Yes	Yes
GST001/220	EE-Spain	11 04 78 (6711341)	100	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yzn11 - Dzn0	4	Sol. 2	480	Sol. 1	CK+10A0+15	1925	167	42	N	1520x1100x740	Medium	Yes	Yes
GST001/221	EE-Spain	11 04 79 (6711342)	100	9,5-16,455	-2x5% +3x5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Yzn11 - Dzn0	4	Sol. 2	480	Sol. 1	CKA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/222	EE-Spain	11 04 80 (6711343)	160	13,2	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol.1 - Sol.2	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/223	EE-Spain	11 04 81 (6711344)	160	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 3	480	Sol. 1	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/224	EE-Spain	11 04 82 (6711345)	160	15,4	±2x2.5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 3	480	Sol.1 - Sol.2	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/225	EE-Spain	11 04 83 (6711346)	160	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/226	EE-Spain	11 04 84 (6711347)	160	16	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol.1 - Sol.2	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/227	EE-Spain	11 04 85 (6711348)	160	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/228	EE-Spain	11 04 86 (6711349)	160	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol.1 - Sol.2	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/229	EE-Spain	11 04 87 (6711350)	160	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	2350	210	44	Y	1570x1200x830	High	Yes	Yes
GST001/230	EE-Spain	11 04 88 (6711351)	160	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.1 - Sol.2	CkA0	2350	210	44	Y	1570x1200x830	High	Yes	Yes
GST001/231	EE-Spain	11 04 89 (6711352)	160	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 3	620	Sol. 1	CK+10A0+15	2585	242	53	Y	1770x1300x850	Medium	Yes	Yes
GST001/232	EE-Spain	11 04 90 (6711353)	160	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 3	620	Sol.1 - Sol.2	CK+10A0+15	2585	242	53	Y	1770x1300x850	Medium	Yes	Yes
GST001/233	EE-Spain	11 04 91 (6711354)	160	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol. 1	CK+10A0+15	2585	242	45	Y	1570x1200x830	Medium	Yes	Yes
GST001/234	EE-Spain	11 04 92 (6711355)	160	15,4-20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 2	480	Sol.1 - Sol.2	CKA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/235	EE-Spain	11 04 93 (6711356)	160	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 2	480	Sol. 1	CK+10A0+15	2585	242	45	Y	1570x1200x830	Medium	Yes	Yes
GST001/236	EE-Spain	11 04 94 (6711357)	160	9,5-16,455	-2x5% +3x5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 2	480	Sol.1 - Sol.2	CKA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/237	EE-Spain	11 04 95 (6711358)	250	11	±2x2.5% +10%	0,420	12/75/28	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/238	EE-Spain	11 04 96 (6711359)	250	11	±2x2.5% +10%	0,242-0,420	12/75/28	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/239	EE-Spain	11 04 97 (6711360)	250	13,2	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/240	EE-Spain	11 04 98 (6711361)	250	13,2	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/241	EE-Spain	11 04 99 (6711362)	250	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/242	EE-Spain	11 05 00 (6711363)	250	15,4	±2x2.5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/243	EE-Spain	110501 6711364	250	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/244	EE-Spain	11 05 02 (6711365)	250	16	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/245	EE-Spain	11 05 03 (6711366)	250	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/246	EE-Spain	11 05 04 (6711367)	250	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/247	EE-Spain	11 05 05 (6711368)	250	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	3250	300	47	Y	1680x1300x910	High	No	No
GST001/248	EE-Spain	11 05 06 (6711369)	250	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CkA0	3250	300	47	Y	1680x1300x910	High	No	No
GST001/249	EE-Spain	11 05 07 (6711370)	250	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 6	CK+10A0+15	3575	345	56	Y	1820x1350x980	Medium	No	No
GST001/250	EE-Spain	11 05 08 (6711371)	250	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 2	CK+10A0+15	3575	345	56	Y	1820x1350x980	Medium	No	No
GST001/251	EE-Spain	11 05 09 (6711372)	250	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CK+10A0+15	3575	345	49	Y	1680x1300x910	Medium	No	No
GST001/252	EE-Spain	11 05 10 (6711373)	250	15,4-20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 2	CKA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/253	EE-Spain	11 05 11 (6711374)	250	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol. 6	CK+10A0+15	3575	345	49	Y	1680x1300x910	Medium	No	No
GST001/254	EE-Spain	11 05 12 (6711375)	250	9,5-16,455	-2x5% +3x5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol. 2	CKA0	3250	300	47	Y	1680x1300x910	Medium	No	No
GST001/255	EE-Spain	11 05 13 (6711376)	400	11	±2x2.5% +10%	0,420	12/75/28	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/256	EE-Spain	11 05 14 (6711377)	400	11	±2x2.5% +10%	0,242-0,420	12/75/28	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/257	EE-Spain	11 05 15 (6711378)	400	13,2	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/258	EE-Spain	11 05 16 (6711379)	400	13,2	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/259	EE-Spain	11 05 17 6711380	400	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/260	EE-Spain	11 05 18 (6711381)	400	15,4	±2x2.5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/261	EE-Spain	11 05 19 (6711382)	400	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/262	EE-Spain	11 05 20 (6711383)	400	16	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/263	EE-Spain	11 05 21 (6711384)	400	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/264	EE-Spain	11 05 22 (6711385)	400	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CkA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/265	EE-Spain	11 05 23 (6711386)	400	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	4600	430	50	Y	1750x1620x1020	High	No	No
GST001/266	EE-Spain	11 05 24 (6711387)	400	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CkA0	4600	430	50	Y	1750x1620x1020	High	No	No
GST001/267	EE-Spain	11 05 25 (6711388)	400	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 6	CK+10A0+15	5060	495	59	Y	1900x1670x1050	Medium	No	No
GST001/268	EE-Spain	11 05 26 (6711389)	400	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol.2 - Sol.3	CK+10A0+15	5060	495	59	Y	1900x1670x1050	Medium	No	No
GST001/269	EE-Spain	11 05 27 (6711390)	400	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CK+10A0+15	5060	495	51	Y	1750x1620x1020	Medium	No	No
GST001/270	EE-Spain	11 05 28 (6711391)	400	15,4-20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CKA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/271	EE-Spain	11 05 29 (6711392)	400	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol. 6	CK+10A0+15	5060	495	51	Y	1750x1620x1020	Medium	No	No

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/272	EE-Spain	11 05 40 (6711393)	400	9,5-16,455	-2x5% +3x5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol.2 - Sol.3	CKA0	4600	430	50	Y	1750x1620x1020	Medium	No	No
GST001/273	EE-Spain	11 05 41 (6711394)	630	11	±2x2.5% +10%	0,420	12/75/28	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/274	EE-Spain	11 05 42 (6711395)	630	11	±2x2.5% +10%	0,242-0,420	12/75/28	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/275	EE-Spain	11 05 43 (6711396)	630	13,2	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/276	EE-Spain	11 05 44 (6711397)	630	13,2	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/277	EE-Spain	11 05 45 (6711398)	630	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/278	EE-Spain	11 05 46 (6711399)	630	15,4	±2x2.5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/279	EE-Spain	11 05 47 (6711400)	630	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/280	EE-Spain	11 05 48 (6711401)	630	16	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/281	EE-Spain	11 05 49 (6711402)	630	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/282	EE-Spain	11 05 50 (6711403)	630	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CkA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/283	EE-Spain	11 05 51 (6711404)	630	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CkA0	6500	600	52	Y	1870x1790x1140	High	No	No
GST001/284	EE-Spain	11 05 52 (6711405)	630	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CkA0	6500	600	52	Y	1870x1790x1140	High	No	No
GST001/285	EE-Spain	11 05 53 (6711406)	630	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 6	CK+10A0+15	7150	690	62	Y	2000x1850x1170	Medium	No	No
GST001/286	EE-Spain	11 05 54 (6711407)	630	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol.3 - Sol.4	CK+10A0+15	7150	690	62	Y	2000x1850x1170	Medium	No	No
GST001/287	EE-Spain	11 05 55 (6711408)	630	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 6	CK+10A0+15	7150	690	54	Y	1870x1790x1140	Medium	No	No
GST001/288	EE-Spain	11 05 56 (6711409)	630	15,4-20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CKA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/289	EE-Spain	11 05 57 (6711410)	630	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol. 6	CK+10A0+15	7150	690	54	Y	1870x1790x1140	Medium	No	No
GST001/290	EE-Spain	11 05 58 (6711411)	630	9,5-16,455	-2x5% +3x5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol.3 - Sol.4	CKA0	6500	600	52	Y	1870x1790x1140	Medium	No	No
GST001/291	EE-Spain	11 05 59 (6711412)	1000	11	±2x2.5% +10%	0,420	12/75/28	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol. 6	CkA0	10500	770	55	Y	2080x1990x1190	Medium	No	No
GST001/292	EE-Spain	11 05 60 (6711413)	1000	11	±2x2.5% +10%	0,242-0,420	12/75/28	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol.4 - Sol.5	CK+10A0+15	11550	886	56	Y	2080x1990x1190	Medium	No	No
GST001/293	EE-Spain	11 05 61 (6711414)	1000	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol. 6	CkA0	10500	770	55	Y	2080x1990x1190	Medium	No	No
GST001/294	EE-Spain	11 05 62 (6711415)	1000	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol. 6	CkA0	10500	770	55	Y	2080x1990x1190	Medium	No	No
GST001/295	EE-Spain	11 05 63 (6711416)	1000	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol.4 - Sol.5	CK+10A0+15	11550	886	56	Y	2080x1990x1190	Medium	No	No
GST001/296	EE-Spain	11 05 64 (6711417)	1000	20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol.4 - Sol.5	CK+10A0+15	11550	886	56	Y	2080x1990x1190	High	No	No
GST001/297	EE-Spain	11 05 65 (6711418)	1000	20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol. 6	CkA0	10500	770	55	Y	2080x1990x1190	High	No	No
GST001/298	EE-Spain	11 05 66 (6711419)	1000	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol. 6	CK+10A0+15	11550	886	63	Y	2190x2050x1200	Medium	No	No
GST001/299	EE-Spain	11 05 67 (6711420)	1000	25	±2x2.5% +10%	0,242-0,420	36/170/70	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol.4 - Sol.5	CK+10A0+15	11550	886	63	Y	2190x2050x1200	Medium	No	No
GST001/300	EE-Spain	11 05 68 (6711421)	1000	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol. 6	CK+10A0+15	11550	886	56	Y	2080x1990x1190	Medium	No	No
GST001/301	EE-Spain	11 05 69 (6711422)	1000	15,4-20	±2x2.5% +10%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Dyn11	6	Sol. 5	N/A	Sol.4 - Sol.5	CK+20A0+20	12600	924	56	Y	2080x1990x1190	Medium	No	No
GST001/302	EE-Spain	11 05 70 (6711423)	1000	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	6	Sol. 5	N/A	Sol. 6	CK+10A0+15	11550	886	56	Y	2080x1990x1190	Medium	No	No
GST001/303	EE-Spain	11 05 71 (6711424)	1000	9,5-16,455	-2x5% +3x5%	0,242-0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	6	Sol. 5	N/A	Sol.4 - Sol.5	CK+20A0+20	12600	924	56	Y	2080x1990x1190	Medium	No	No

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/304	EE-Spain	11 10 21	50	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	Medium	Yes	Yes
GST001/305	EE-Spain	11 10 20	50	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1100	90	39	N	1520x1100x740	Medium	Yes	Yes
GST001/306	EE-Spain	11 10 14	50	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 1	CK+10A0+15	1210	104	48	N	1650x1100x780	Medium	Yes	Yes
GST001/307	EE-Spain	11 10 22	50	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CK+10A0+15	1210	104	40	N	1520x1100x740	Medium	Yes	Yes
GST001/308	EE-Spain	11 10 13	50	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yzn11 - Dzn0	4	Sol. 5	N/A	Sol. 1	CK+10A0+15	1210	104	40	N	1520x1100x740	Medium	Yes	Yes
GST001/309	EE-Spain	11 10 12	100	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/310	EE-Spain	11 10 10	100	16	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	1750	145	41	N	1520x1100x740	Medium	Yes	Yes
GST001/311	EE-Spain	11 10 09	100	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 1	CK+10A0+15	1925	167	51	N	1650x1100x780	Medium	Yes	Yes
GST001/312	EE-Spain	11 09 92	100	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CK+10A0+15	1925	167	42	N	1520x1100x740	Medium	Yes	Yes
GST001/313	EE-Spain	11 09 53	100	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yzn11 - Dzn0	4	Sol. 5	N/A	Sol. 1	CK+10A0+15	1925	167	42	N	1520x1100x740	Medium	Yes	Yes
GST001/314	EE-Spain	11 09 52	160	15,4	±2x2.5%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/315	EE-Spain	11 09 09	160	16	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CkA0	2350	210	44	Y	1570x1200x830	Medium	Yes	Yes
GST001/316	EE-Spain	11 09 08	160	25	±2x2.5% +10%	0,420	36/170/70	1.1/20/10	50	3P	Dyn11	4,5	Sol. 5	N/A	Sol. 1	CK+10A0+15	2585	242	53	Y	1770x1300x850	Medium	Yes	Yes
GST001/317	EE-Spain	11 09 07	160	15,4-20	±2x2.5% +10%	0,420	24/125/50	1.1/20/10	50	3P	Dyn11	4	Sol. 5	N/A	Sol. 1	CK+10A0+15	2585	242	45	Y	1570x1200x830	Medium	Yes	Yes
GST001/318	EE-Spain	11 04 33	160	9,5-16,455	-2x5% +3x5%	0,420	24/125/50	1.1/20/10	50	3P	Yyn0-Dyn11	4	Sol. 5	N/A	Sol. 1	CK+10A0+15	2585	242	45	Y	1570x1200x830	Medium	Yes	Yes
GST001/510	EN-Peru	6758174	100	20	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	3P	Dyn5	4	Sol. 6	600	Sol. 8	max. value	≤1750	≤350	51	N	1700x1250x1000	Very High	Yes	No
GST001/511	EN-Peru	6758175	160	20	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	3P	Dyn5	4	Sol. 6	600	Sol. 8	max. value	≤2015	≤470	55	N	1700x1250x1000	Very High	No	No
GST001/512	EN-Peru	6758176	250	20	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	3P	Dyn5	4	Sol. 6	600	Sol. 8	max. value	≤2920	≤680	55	Y	1700x1250x1000	Very High	No	No
GST001/513	EN-Peru	6783709	50	22,9	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	3P	Dyn5	4	Sol. 6	600	Sol. 8	max. value	≤888	≤205	48	N	1700x1250x1000	Very High	Yes	No
GST001/514	EN-Peru	6776633	100	22,9	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	3P	Dyn5	4	Sol. 6	600	Sol. 8	max. value	≤1750	≤350	51	N	1700x1250x1000	Very High	Yes	No
GST001/515	EN-Peru	6776634	160	22,9	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	3P	Dyn5	4	Sol. 6	600	Sol. 8	max. value	≤2015	≤470	55	N	1700x1250x1000	Very High	No	No
GST001/516	EN-Peru	6798419	10	20	+1x2,5% -3x2,5%	0,23	24/125/50	1,1/~ /3	60	2P	II0	2,5	Sol. 6	600	Sol. 8	max. value	≤145	≤60	48	N	1070xunrestricted	Very High	Yes	No
GST001/601	CE-Brazil	6771613	10	13,8	+1x2,5% -3x2,5%	0,220	17,5/95/38	1,1/~ /3	60	2P	II0	3,5	Sol. 6	450	Sol. 8	max. value	≤195	≤50	48	N	1200x800x900	Very High	Yes	Yes
GST001/602	CE-Brazil	6771616	15	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	3,5	Sol. 6	450	Sol. 8	max. value	≤310	≤80	48	N	1300x1300x750	Very High	Yes	Yes
GST001/603	CE-Brazil	6771620	45	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤710	≤180	48	N	1300x1300x750	Very High	Yes	Yes
GST001/604	CE-Brazil	6771622	75	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤1090	≤265	51	N	1300x1300x750	Very High	Yes	Yes
GST001/605	CE-Brazil	4544187	112,5	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤1500	≤390	55	N	1300x1300x750	Very High	Yes	Yes
GST001/606	CE-Brazil	6771630	150	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤1885	≤450	55	N	1300x1300x750	Very High	Yes	Yes
GST001/607	CE-Brazil	6771636	225	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤2610	≤650	55	N	1800x1600x1000	Very High	Yes	Yes
GST001/608	CE-Brazil	6771637	300	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤3260	≤810	55	N	1800x1600x1000	Very High	Yes	Yes
GST001/609	CE-Brazil	6771626	10	7,967	- 2x4,35%	0,22	17,5/95/38	1,1/~ /3	60	1P	II0	3,5	Sol. 6	450	Sol. 8	max. value	≤195	≤50	48	N	1200x800x900	Very High	Yes	Yes
GST001/610	CE-Brazil	6797592	10	13,8	+1x2,5% -3x2,5%	0,220	17,5/95/38	1,1/~ /3	60	2P	II0	3,5	Sol. 6	450	Sol. 8	max. value	≤195	≤50	48	N	1200x800x900	Extra very high	Yes	Yes

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LIAC (kV)	LV Insulation level Um/LIAC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/No)
GST001/611	CE-Brazil	6797593	45	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤710	≤180	48	N	1300x1300x750	Extra very high	Yes	Yes
GST001/612	CE-Brazil	6797594	75	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤1090	≤265	51	N	1300x1300x750	Extra very high	Yes	Yes
GST001/613	CE-Brazil	6797595	112,5	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤1500	≤390	55	N	1300x1300x750	Extra very high	Yes	Yes
GST001/614	CE-Brazil	6797596	150	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤1885	≤450	55	N	1300x1300x750	Extra very high	Yes	Yes
GST001/615	CE-Brazil	6797597	225	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤2610	≤650	55	N	1800x1600x1000	Extra very high	Yes	Yes
GST001/616	CE-Brazil	6797598	300	13,8	+1x2,5% -3x2,5%	0,38	17,5/95/38	1,1/~ /3	60	3P	Dyn1	4	Sol. 6	450	Sol. 8	max. value	≤3260	≤810	55	N	1800x1600x1000	Extra very high	Yes	Yes
GST001/701	CD-Colombia	6776818	5	13,2	+1x2,5% -3x2,5%	0,24	17,5/95/38	1,1/~ /3	60	2P	II0	2 a 4	Sol. 6	350	Sol. 8	max. value	≤90	≤30	48	N	unrestricted	Medium	Yes	Yes
GST001/702	CD-Colombia	6776817	5	11,4	+1x2,5% -3x2,5%	0,24	17,5/95/38	1,1/~ /3	60	2P	II0	2 a 4	Sol. 6	350	Sol. 8	max. value	≤90	≤30	48	N	unrestricted	Medium	Yes	Yes
GST001/703	CD-Colombia	6762566	15	11,4	+1x2,5% -3x2,5%	0,24	17,5/95/38	1,1/~ /3	60	2P	II0	2 a 4	Sol. 6	350	Sol. 8	max. value	≤195	≤70	48	N	unrestricted	Medium	Yes	Yes
GST001/704	CD-Colombia	6762570	15	11,4	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	Dyn5	2 a 4	Sol. 6	350	Sol. 8	max. value	≤310	≤80	48	N	unrestricted	Medium	Yes	Yes
GST001/705	CD-Colombia	6762567	15	13,2	+1x2,5% -3x2,5%	0,24	17,5/95/38	1,1/~ /3	60	2P	II0	2 a 4	Sol. 6	350	Sol. 8	max. value	≤195	≤70	48	N	unrestricted	Medium	Yes	Yes
GST001/706	CD-Colombia	6762571	15	13,2	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	Dyn5	2 a 4	Sol. 6	350	Sol. 8	max. value	≤310	≤80	48	N	unrestricted	Medium	Yes	Yes
GST001/707	CD-Colombia	6762572	30	11,4	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤515	≤135	48	N	960X1300X880	Medium	Yes	Yes
GST001/708	CD-Colombia	6762574	30	13,2	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤515	≤135	48	N	960X1300X880	Medium	Yes	Yes
GST001/709	CD-Colombia	6762576	45	13,2	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤710	≤180	48	N	960X1300X880	Medium	Yes	Yes
GST001/710	CD-Colombia	6762575	45	11,4	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤710	≤180	48	N	960X1300X880	Medium	Yes	Yes
GST001/711	CD-Colombia	6762577	75	11,4	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤1090	≤265	51	N	960X1300X880	Medium	Yes	Yes
GST001/712	CD-Colombia	6762578	75	13,2	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤1090	≤265	51	N	960X1300X880	Medium	Yes	Yes
GST001/713	CD-Colombia	6779257	225	11,4	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤2700	≤615	55	N	1020X1300X880	Medium	Yes	Yes
GST001/714	CD-Colombia	6764401	150	13,2	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤1910	≤450	55	N	1020X1300X880	Medium	Yes	Yes
GST001/715	CD-Colombia	6762580	150	11,4	+1x2,5% -3x2,5%	0,214	17,5/95/38	1,1/~ /3	60	3P	dYN5	4	Sol. 6	350	Sol. 8	max. value	≤1910	≤450	55	N	1020X1300X880	Medium	Yes	Yes
GST001/801	CH-Chile	6785304	15	23-12	±2x2,5%	0,4	24/125/50	1,1/~ /3	50	2P	II0	2 a 4	Sol. 6	480	Sol. 8	max. value	≤195	≤70	48	N	1400x1300x1200	Medium	Yes	No
GST001/802	CH-Chile	6785307	45	23-12	±2x2,5%	0,4	24/125/50	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	480	Sol. 8	max. value	≤710	≤180	48	N	1150x1300x1200	Medium	Yes	No
GST001/803	CH-Chile	6785299	75	23-12	±2x2,5%	0,4	24/125/50	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	480	Sol. 8	max. value	≤1090	≤265	51	N	1150x1300x1200	Medium	Yes	No
GST001/804	CH-Chile	6785300	150	23-12	±2x2,5%	0,4	24/125/50	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	480	Sol. 8	max. value	≤1910	≤450	55	N	1800x1600x1400	Medium	No	No
GST001/805	CH-Chile	6785302	300	23-12	±2x2,5%	0,4	24/125/50	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	480	Sol. 8	max. value	≤3360	≤800	55	N	1800x1600x1400	Medium	No	No
GST001/806	CH-Chile	6785303	500	23-12	±2x2,5%	0,4	24/125/50	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	480	Sol. 8	max. value	≤6000	≤1200	56	N	1800x1600x1400	Medium	No	No
GST001/807	CH-Chile	6752137	15	12	±2x2,5%	0,4	17,5/95/38	1,1/~ /3	50	2P	II0	2 a 4	Sol. 6	350	Sol. 8	max. value	≤195	≤70	48	N	1400x1300x1200	Medium	Yes	No
GST001/808	CH-Chile	6776039	45	12	±2x2,5%	0,4	17,5/95/38	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	350	Sol. 8	max. value	≤710	≤180	48	N	1150x1300x1200	Medium	Yes	No
GST001/809	CH-Chile	6776050	75	12	±2x2,5%	0,4	17,5/95/38	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	350	Sol. 8	max. value	≤1090	≤265	51	N	1150x1300x1200	Medium	Yes	No
GST001/810	CH-Chile	6752143	150	12	±2x2,5%	0,4	17,5/95/38	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	350	Sol. 8	max. value	≤1910	≤450	55	N	1800x1600x1400	Medium	No	No
GST001/811	CH-Chile	6776052	300	12	±2x2,5%	0,4	17,5/95/38	1,1/~ /3	50	3P	Dyn1	4	Sol. 6	350	Sol. 8	max. value	≤3360	≤800	55	N	1800x1600x1400	Medium	No	No

GS Type Code	Distribution Company and Country	Country Code	Rated Power (kVA)	Rated MV (kV)	Volt. Reg. (steps number x step %)	Rated LV (kV)	MV insulation level Um/LI/AC (kV)	LV Insulation level Um/LI/AC (kV)	f (Hz)	N. of phases 1P, 2P, 3P	Connection Symbol	Zsc (%)	MV bushing type (ref. GS p. 6.5.1)	MV Minimum creepage distance (mm)	LV bushing type (ref. GS p. 6.5.2)	Losses classes or max values	Load Loss (W)	No Load Loss (W)	Noise level - Sound Power (dB)	Wheels (Yes/No)	Overall dimensions HxLxW (mm)	Painting (ref. GS p. 6.9)	Brackets for pole (Yes/ No)	Brackets for arrester (Yes/ No)
GST001/812	CH-Chile	6752145	500	12	±2x2,5%	0,4	17,5/95/38	1,1/~/ /3	50	3P	Dyn1	4	Sol. 6	350	Sol. 8	max. value	≤6000	≤1200	56	N	1800x1600x1400	Medium	No	No
GST001/813	CH-Chile	6776053	15	23	±2x2,5%	0,4	24/125/50	1,1/~/ /3	50	2P	Dyn1	2 a 4	Sol. 6	490	Sol. 8	max. value	≤195	≤70	48	N	1400x1300x1200	Medium	Yes	No
GST001/814	CH-Chile	6752167	45	23	±2x2,5%	0,4	24/125/50	1,1/~/ /3	50	3P	Dyn1	4	Sol. 6	490	Sol. 8	max. value	≤710	≤180	48	N	1150x1300x1200	Medium	Yes	No
GST001/815	CH-Chile	6752168	75	23	±2x2,5%	0,4	24/125/50	1,1/~/ /3	50	3P	Dyn1	4	Sol. 6	490	Sol. 8	max. value	≤1090	≤265	51	N	1150x1300x1200	Medium	Yes	No
GST001/816	CH-Chile	6776057	150	23	±2x2,5%	0,4	24/125/50	1,1/~/ /3	50	3P	Dyn1	4	Sol. 6	490	Sol. 8	max. value	≤1910	≤450	55	N	1800x1600x1400	Medium	No	No
GST001/817	CH-Chile	6752170	300	23	±2x2,5%	0,4	24/125/50	1,1/~/ /3	50	3P	Dyn1	4	Sol. 6	490	Sol. 8	max. value	≤3360	≤800	55	N	1800x1600x1400	Medium	No	No
GST001/818	CH-Chile	6752171	500	23	±2x2,5%	0,4	24/125/50	1,1/~/ /3	50	3P	Dyn1	4	Sol. 6	490	Sol. 8	max. value	≤6000	≤1200	56	N	1800x1600x1400	Medium	No	No
GST001/901	AM-Brazil	6772489	10	7,967	- 4x4,35%	0,24	17,5/95/38	1,1/~/ /3	60	1P	II0	2 a 4	Sol. 6	437,5	Sol. 8	max. value	≤195	≤50	48	N	1200x800x900	High	Yes	Yes
GST001/902	AM-Brazil	6772443	10	13,8	- 4x4,35%	0,24	17,5/95/38	1,1/~/ /3	60	2P	II0	2 a 4	Sol. 6	437,5	Sol. 8	max. value	≤195	≤50	48	N	1200x800x900	High	Yes	Yes
GST001/903	AM-Brazil	6772490	15	7,967	- 4x4,35%	0,24	17,5/95/38	1,1/~/ /3	60	1P	II0	2 a 4	Sol. 6	437,5	Sol. 8	max. value	≤265	≤65	48	N	1200x800x900	High	Yes	Yes
GST001/904	AM-Brazil	6772444	15	13,8	- 4x4,35%	0,24	17,5/95/38	1,1/~/ /3	60	2P	II0	2 a 4	Sol. 6	437,5	Sol. 8	max. value	≤265	≤65	48	N	1200x800x900	High	Yes	Yes
GST001/905	AM-Brazil	6772437	30	13,8	- 4x4,35%	0,22	17,5/95/38	1,1/~/ /3	60	3P	Dyn1	4	Sol. 6	437,5	Sol. 8	max. value	≤515	≤135	48	N	1300x1300x750	High	Yes	Yes
GST001/906	AM-Brazil	6772438	45	13,8	- 4x4,35%	0,22	17,5/95/38	1,1/~/ /3	60	3P	Dyn1	4	Sol. 6	437,5	Sol. 8	max. value	≤710	≤180	48	N	1300x1300x750	High	Yes	Yes
GST001/907	AM-Brazil	6772439	75	13,8	- 4x4,35%	0,22	17,5/95/38	1,1/~/ /3	60	3P	Dyn1	4	Sol. 6	437,5	Sol. 8	max. value	≤1090	≤265	51	N	1300x1350x950	High	Yes	Yes
GST001/908	AM-Brazil	6772485	150	13,8	- 4x4,35%	0,22	17,5/95/38	1,1/~/ /3	60	3P	Dyn1	4	Sol. 6	437,5	Sol. 8	max. value	≤1885	≤450	55	N	1300x1350x950	High	Yes	Yes
GST001/909	AM-Brazil	6772488	300	13,8	- 4x4,35%	0,22	17,5/95/38	1,1/~/ /3	60	3P	Dyn1	4	Sol. 6	437,5	Sol. 8	max. value	≤3260	≤800	55	N	1800x1650x1150	High	Yes	Yes