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METAL-OXIDE POLYMER-HOUSED SURGE ARRESTERS WITHOUT GAPS FOR A.C. SYSTEMS FOR SUBSTATIONS FROM 12KV TO 245 KV

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Revision	Data	List of modifications
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1 SCOPE

The scope of this document is to provide technical requirements for the supply of HV surge arresters for system from 12 kV to 245 kV in the Enel Group Distribution companies, listed below:

- Ampla (Brazil)
- Chilectra (Chile)
- Codensa (Colombia)
- Coelce (Brazil)
- Edelnor (Perù)
- Edesur (Argentina)
- Endesa Distribución Eléctrica (Spain)
- E-distributie Banat (Romania)
- E-distributie Dobrogea (Romania)
- E-distributie Muntenia (Romania)
- E-distribuzione (Italy)

Note: the indication "Latam" refers to the Enel Group Distribution companies in South America.

Some requirements are applicable only to one or more companies, therefore, depending on the destination of the surge arresters, the supplied equipment shall comply these specific requirements.

2 DEFINITIONS

Station class arrester: arresters intended for use in station to protect the equipment from transient overvoltages, typically but not only intended for use on system of $U_s \geq 72,5$ kV.

Distribución class arrester: arrester intended for use on distribution systems, typically of $U_s \leq 52$ kV, to protect components primarily from the effects of lightning.

Rated voltage of an arrester (U_r): maximum permissible 10 s power-frequency r.m.s. overvoltage that can be applied between the arrester, as verified in the TOV test and the operating duty test.

Continuous operating voltage of an arrester (U_c): designed permissible r.m.s. value of power-frequency voltage that may be applied continuously between the arrester terminals in accordance with IEC 60099-4

Rated frequency of an arrester: frequency of the power system on which the arrester is designed to used.

Steep current impulse: current impulse with a virtual front time of 1 μ s with limits in the adjustment of equipment such that the measured values are from 0,9 μ s to 1,1 μ s and the virtual time to half-value on the tail is not longer than 20 μ s.

Lightning current impulse: 8/20 current impulse with limits on the adjustment of equipment such that the measured values are from 7 μ s to 9 μ s for the virtual front time and from 18 μ s to 22 μ s for the time to half-value on the tail.

Nominal discharge current of an arrester (I_n): peak value of lightning current impulse which is used to classify an arrester in accordance with IEC 60099-4.

High current impulse of an arrester: peak value discharge current having a 4/10 impulse shape which is used to test the stability of the arrester on direct lightning strokes.

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Switching current impulse of an arrester: peak value of discharge current a virtual front time greater than 30 μ s but less than 100 μ s and a virtual time to half-value on the tail of roughly twice the virtual front time.

Reference voltage of an arrester (U_{ref}): peak value of power-frequency voltage divide by $\sqrt{2}$, which is obtained when the reference current flows through the arrester.

Residual voltage of an arrester (U_{res}): peak value of voltage that appears between the terminals of an arrester during the passage of discharge current.

Protective characteristics of an arrester: a combination of lightning impulse protection level (LIPL), switching impulse protection level (SIPL) and steep current impulse protection level (STIPL).

3 LIST OF COMPONENTS

The complete list of the equipment with their main characteristics is in Annex C (Common list of HV Surge arrester)

4 REFERENCE LAWS AND STANDARDS

4.1 Laws

4.1.1 Latam

4.1.1.1. Brazil:

NR-10 - SEGURANÇA EM INSTALAÇÕES E SERVIÇOS EM ELETRICIDADE

4.1.2 Spain

R.D. 337/2014: Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión.

R.D. 614/2001: Disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico.

4.1.3 Italy

D.Lgs n. 81 of the 9th of April 2008 and subsequent modifications

4.1.4 Romania

NTE 001/03/00 Normativ privind alegerea izolației coordonarea izolației și protecția instalațiilor electroenergetice împotriva supratensiunilor (Standard on choosing insulation, insulation coordination and overvoltage protection against electric installations).

4.2 Standards

The below listed reference documents shall be intended in the edition in force at the contract date (amendment included).

4.2.1 Common Standards

For Latin America destinations the reference standard are the IEC/ISO, whilst for Europe destinations the reference standard are the correspondent European standards (EN).

IEC 60099-4: "Metal-oxide surge arresters without gaps for a.c. systems".-

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IEC 60071-2: "Insulation co-ordination – Applications guide"

IEC 61462: "Composite insulators: hollow insulators for use in outdoor and indoor electrical equipment"

ISO 2178: "Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method"

CEI 7-6: "Requirements for checking hot galvanizing by immersion on ferrous components used in lines and electrical installations". IEC 60507: "Artificial pollution tests on high-voltage insulators to be used on a.c. systems"

IEC TS 60815: Selection and dimensioning of high-voltage insulators intended for use in polluted conditions

4.2.2 Specific Standards

4.2.2.1. Latam

4.2.2.2. Endesa Distribución

4.2.2.3. E-distribuzione:

ENEL DY 2052 (2005): "Prescrizioni per il collaudo di scaricatori ad ossido metallico senza spinterometri per Cabine Primarie"

4.2.2.4. E-distributie Banat, Dobrogea, Muntenia (Romania):

FT-189_ MAT (2015) „Descarcatoare cu oxizi metalici 110 kV

DY-557-RO Ed. 2 Statie de transformare. Descarcatoare MT cu oxizi metalici curent de descarcare 10 kV cu carcasa in material Organic cu dispozitiv de conectare

5 SERVICE CONDITIONS

5.1 General services conditions

The reference service conditions are the normal service conditions of IEC 60099-4, with the further indications include in 5.2.

5.2 Specific services conditions

5.2.1 Endesa Distribución

- a) Pollution level: Type d (Heavy) or type e (very Heavy)

5.2.2 Enel Distribuzione and Enel Distributie

- a) Pollution level: Type d (Heavy); 43,3 mm/kV (RUSCD)
- b) Seismic qualification level: AF5 (IEC/TR 62271-300)

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5.2.3 Latam

a) Pollution level: IEC TS 60815

	AMPLA	CODENSA	COELCE	CHILECTRA	EDELNOR	EDESUR
SPS Class (IEC/TS 60815 series)	(e) Very Heavy	(c) Medium	(e) Very heavy	(c) Medium	(e) Very Heavy	(c) Medium
RUSCD (mm/kV)	53,7	34,7	53,7	34,7	53,7	34,7

b) Altitude:

The reference altitude in Colombia is 2.850 ms

c) Seismic qualification level:

- a. Chilectra ETGI-1020
- b. Codensa AF3 (IEC/TR 62271-300)
- c. Edelnor AF5 (IEC/TR 62271-300)

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6 TECHNICAL CHARACTERISTIC

	Main voltage	Designation	Insulation level	rated frequency (Hz)	rated voltage (Ur) (kV)	continuous operating voltage (Uc) (kV)	nominal discharge current (In) (kA)	rated short-circuit current	Residual voltage for steep current impulse (kV)	Residual voltage for lightning current impulse (kV)	Residual voltage for switching current impulse (kV)	High current impulse (kA)	Rated static mechanical terminal load (daN)
EDE	220 kV	SM	245/395-460/950-1050	50	192	154	10	40 kA 0,2s Clase A	710	633	499	100	125
	110 kV	SM	123/230-275/550-650	50	96	77	10	31,5 kA 0,2s Clase A	355	317	249	100	100
	132 kV	SM	145/230-275/550-650	50	120	92	10	31,5 kA 0,2s Clase A	444	396	312	100	100
	50 kV	SM	52/140/325	50	53	42	10	31,5 kA 0,2s Clase A	196	175	138	100	50
	66 kV	SM	72,5/140/325	50	60	48	10	31,5 kA 0,2s Clase A	222	198	156	100	50
	45 kV	SL	52/95/250	50	42	34	10	25 kA 0,2s Clase A	155	138	109	100	50
	Neutro Trafo 220/MT	SM	245/275/650	50	146	117	10	40 kA 0,2s Clase A	540	483	380	100	125
	Neutro Trafo 110/MT	SM	123/275/650	50	75	60	10	31,5 kA 0,2s Clase A	278	254	195	100	100
	Neutro Trafo 132/MT	SM	245/275/650	50	84	67	10	31,5 kA 0,2s Clase A	310	276	218	100	100
	Neutro Trafo 55/MT	SM	72,5/140/325	50	38	30	10	31,5 kA 0,2s Clase A	139	127	98	100	50
	Neutro Trafo 66/MT	SM	72,5/140/325	50	42	34	10	31,5 kA 0,2s Clase A	155	142	109	100	50
E-Dist.	132 kV	SL	132/450/750	50	132	94	10	31,5 kA	386	336	270	100	200
	150 kV	SL	150/450/750	50	158	110	10	31,5 kA	455	396	318	100	200
ENEL Rom	110 kV	SL	123/230/550	50	96	72	10	40 kA	310	280	220	100	200
	Neutro trafo 110/MT	SL	123/185/450	50	57	45,5	10	40 kA	222	200	190	100	200
CODENSA	220 kV	SM	245/460/950	60	192	152	10	40 kA	489	452	381	100	200
	115 kV	SL	123/230/550	60	96	76	10	40 kA	266	226	185	100	200
	34,5 kV	SL	36/70/145	60	30	24	10	25 kA	81,2	100	78	100	50
	13,2-11,4 kV	SL	17,5/38-28/95-95	60	12	8,7	10	25 kA	35,1	40	32,8	100	50
CHILECTRA	220 kV	SM	245/395/1050	50	198	154	10	40 kA	554	502	455	100	125
	110 kV	SL	123/230/550	50	96	76	10	40 kA	284	250	220	100	100
	23,5 kV	SL	24/50/150	50	21	17	10	25 kA	73,2	55	45	100	50

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	Main voltage	Designation	Insulation level	rated frequency (Hz)	rated voltage (Ur) (kV)	continuous operating voltage (Uc) (kV)	nominal discharge current (In) (kA)	rated short-circuit current	Residual voltage for steep current impulse (kV)	Residual voltage for lightning current impulse (kV)	Residual voltage for switching current impulse (kV)	High current impulse (kA)	Rated static mechanical terminal load (daN)
	12,5 kV	SL	17,5/38/110	50	12	8,7	10	25 kA	46,6	40	32,8	100	50
EDELNOR	220 kV	SM	245/460/1050	60	198	154	10	40 kA	554	502	455	100	125
	60 kV	SL	72,5/140/325	60	60	48	10	40 kA	170	160	126	100	100
EDESUR	220 kV	SH	245/395/950	50	198	154	20	40 kA	-	502	455	100	125
	132 kV	SM	245/230/550	50	120	92	10	40 kA	-	310	270	100	100
AMPLA	138 kV	SM	145/275/650	60	120	92	10	40 kA	-	310	270	100	100
	69 kV	SL	72,5/140/325	60	60	48	10	31,5 kA	-	200	150	100	50
	34,5 kV	SL	36/70/170	60	30	24	10	25 kA	-	100	78	100	50
	13,8 kV- 11,95 kV	SL	17,5/38/95	60	12	10	10	25 kA	-	40	32,8	100	50
COELCE	69 kV	SL	72,5/140/350	60	60	48	10	25 kA	-	200	150	100	50
	13,8 kV	SL	17,5/38/110	60	12	10	10	25 kA	-	40	32,8	100	50

7 CONSTRUCTION CHARACTERISTICS

7.1 General characteristics

The surge arresters shall be manufactured in accordance with IEC 60099-4. The dimensional drawings, for E-distribuzione e E-distributie, are in annex A.

The support, quoted separately, shall be always supplied when a seismic qualification level is required (see 5.2.), otherwise it's an optional supply.

If interface plates and other accessories are necessary to adapt the support to the civil works, they shall be included in the supply of the support and shall be preliminary approved by Enel Group Distribution companies.

The HV surge arrester must be mounted on an insulating base, in order to isolate from earth, for connecting to surge counters and for measuring the surge arresters of the leakage current.

Only for Brazil the surge counters is an optional supply for HV arresters, but all arresters shall be mounted on an insulating base or bracket, in order to isolate from earth.

If it's necessary an grading ring to modify electrostatically the voltage distribution along the arrester, it shall be included in the supply.

The normal use, control and maintenance operations shall be performed with total workers safety.

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7.2 Specific characteristics

7.2.1 Endesa Distribución

The surge arrester shall be performed in one unit until 145 kV, and shall be performed in two units for higher voltages. Always, it makes in a unique column.

7.2.2 E-distribuzione and E-distributie

The surge arrester could be performed in one or more units connected in series. Always it makes in a unique column.

7.2.3 Latam

The surge arrester could be performed in one or more units connected in series. Always in a unique column.

7.3 Insulators

The insulators could be requested by Enel Group Distribution companies in composite materials.

They shall be in light grey color and compliant with IEC 61462. The envelope shall be made of silicone rubber, HTV type (High Temperature Vulcanized) or LSR type (Liquid Silicone Rubber) and completely free of EPDM or other organic rubbers.

The creepage distance must comply with IEC60815-2 and IEC 60815-3 part. 9.7 with no deviations

7.4 HV terminals

7.4.1 Endesa Distribución and Latam

The HV terminal shall be realized with corrosion resistant copper or aluminum alloy, in order to be interfaced with aluminum alloy clamps.

The HV terminals shall be compliant with fig. 3 (2x2 hole pattern) of IEC/TR 62271-301.

A (mm)	B (mm)	C (mm)
44,5	44,5	14,3

7.4.2 E-distribuzione and E-distributie

The HV terminal shall be realized with corrosion resistant copper or aluminum alloy, in order to be interfaced with aluminum alloy clamps.

The HV terminals shall have $\varnothing 40 \pm 0,25 \times 80$ min (mm) (fig. 1 of IEC/TR 62271-301) dimensions.

7.5 Grounding

The manufacturer shall ensure the equi-potentiality between all parts forming the equipment.

At the base of each support upright two grounding points shall be provided, equipped with M12 stainless steel bolts (included in the supply).

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If interface plates are necessary to adapt the support to the civil works, they shall be designed taking into account the position of the external grounding connections.

7.6 Protective treatments

All external surfaces shall have an effective and enduring anti-corrosion protection.

All iron parts (e.g. support, Control Box, bolts etc.) shall be in non-corrosive material or hot dip galvanized in compliance with ISO 1461. All processing shall be completed before the protective treatments.

Protective treatments alternative to the hot dip galvanization could be accepted if the manufacturer prove its fitness.

The metallic elements in contact between them shall be designed in order to avoid corrosion due to humidity galvanic effect.

7.6.1 Latam specific requirements.

In Brazil (Ampla y Coelce) and Perú (Edelnor) there is atmospheric corrosive environments "Very High" (C5- ISO 9223 and ISO 12944). Thus, control boxes or cabinets, bolts, etc.. shall be made of stainless steel.

7.7 Dimensional characteristics

Specific dimensional requirements are shown in Annex A.

7.8 Support

The support is an optional supply.

7.9 Nameplates

The nameplates shall be in stainless steel. Alternative materials can be considered if the manufacturer proves the marking endurance respect to the ageing (this solution shall be approved by Enel Distribution companies).

In accordance with IEC 60099-4, nameplates shall include:

- The manufacturer's name o trade mark, type and identification of the complete arrester;
- Serial number;
- The year of manufacture;
- Type code of Enel;
- Rated voltage;
- Continuous operating voltage;
- Rated frequency;
- Nominal discharge current;
- Rated short-circuit withstand current in kiloamperes (kA)
- Designation
- Contamination withstand level of the enclosure.

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8 TESTING

8.1 General information

The tests will be performed according to Standards 60099-4.

The tests to be performed on surge arrester are divided in:

- Type tests;
- Routine tests and acceptance tests;
- Test requirements on polymer-housed surge arrester

8.2 Type tests

8.2.1 Insulation withstand tests on arrester housing.

(IEC 60099-4, par. 10.8.2)

8.2.2 Residual voltage tests

(IEC 60099-4, par. 10.8.3)

8.2.3 Test to verify long term stability under continuous operating voltage

(IEC 60099-4, par. 10.8.4)

8.2.4 Test to verify the repetitive charge transfer rating, Qrs

(IEC 60099-4, par. 10.8.5)

8.2.5 Heat dissipation behavior of test sample

(IEC 60099-4, par. 10.8.6)

8.2.6 Operating Duty tests

(IEC 60099-4, par 10.8.7)

8.2.7 Power frequency voltage versus time test

(IEC 60099-4, par. 10.8.8)

8.2.8 Short-circuit tests

(IEC 60099-4, par. 10.8.10)

8.2.9 Test of the bending moment

(IEC 60099-4, par. 10.8.11)

8.2.10 Environmental tests

(IEC 60099-4, par. 10.8.12)

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8.2.11 Radio interference voltage (RIV) test

(IEC 60099-4, par. 10.8.14)

8.2.12 Test to verify the dielectric withstand of internal components

(IEC 60099-4, par. 10.8.15)

8.2.13 Test of internal grading components

(IEC 60099-4, par. 10.8.16)

8.2.14 Weather ageing test

(IEC 60099-4, par. 10.8.17)

8.3 Routine tests and acceptance tests

8.3.1 Routine tests

(IEC 60099-4, par. 9.1)

8.3.2 Acceptance tests

(IEC 60099-4, par. 9.2)

9 CONFORMITY ASSESSMENT

The Technical Conformity Assessment will carry out in accordance with Global Standard GSCG002.

9.1 Packing, transport, storage and installation/testing

The surge arrester package shall be suitable to guarantee:

- a) the protection during transport (including by ship, if necessary);
- b) an elevation from the ground at least of 100 mm;
- c) the external storage for at least three months.

On external side of packaging, the following information shall be present

- a) manufacturer name;
- b) manufacturing year/month;
- c) manufacturer designation type;
- d) manufacturer serial number;
- e) Enel component codification (i.e.: GSCH005/1 - 0505X);
- f) contract number;
- g) destination substation;
- h) total weight;
- i) lifting information (showing the points and the correct method of lifting);
- j) only for E-distribuzione, the bar code, in accordance with PVR006.

With each surge the following items shall be supplied in the local language of destination (items from 4 to 8 on paper):

- a) the support structure (only if requested) with its anchor bolts to the civil works (stainless or hot dip galvanized steel, chemical or expansion type);
- b) bolts to assembly the DS/ES poles to support structure

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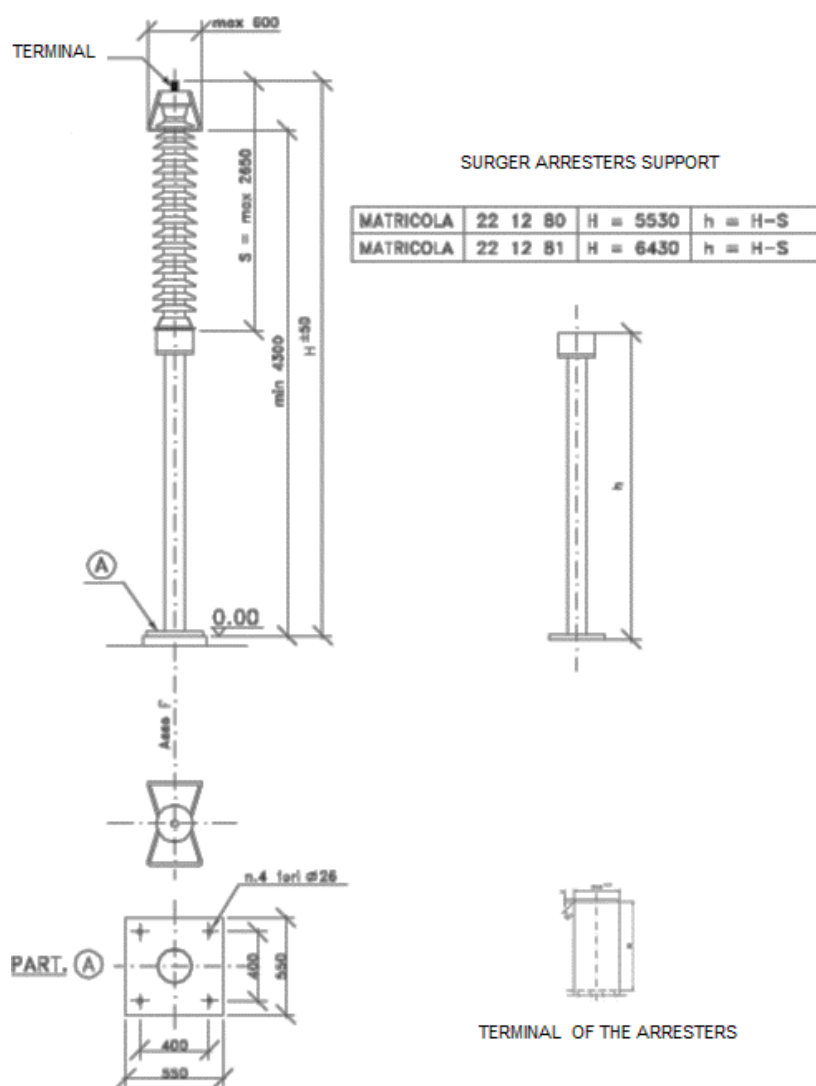
- c) list of documentation, materials and accessories supplied;
- d) overall dimensions drawing;
- e) electric diagram;
- f) surge arrester installation, use and maintenance handbook/manual;
- g) routine and commissioning tests:
 - a. routine (factory) test reports;
 - b. reference values table (with tolerances);
- h) one USB device containing the whole type A documentation (pdf file format).

9.1.1 Specific requirement for Endesa

The manufacturer must present the declaration of conformity in compliance with ITC-RAT 03 of the “Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión, Real Decreto 337/2014.”

ANNEX A – DIMENSIONAL DRAWINGS

A.1 – E-distribuzione – E-distributie



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ANNEX B – TENDER'S TECHNICAL DOCUMENTATION

GLOBAL STANDARD: GSH05X – HV Surge Arresters	TENDER:	
SUPPLIER:	FACTORY:	
ENEL GROUP TYPE CODE: GSH05X/	SUPPLIER MODEL:	
TECHNICAL CHARACTERISTIC	STANDARD REQUIREMENT	SUPPLIER OFFER
<i>Service conditions</i>	normal service conditions of IEC 60099-4	
<i>Reference altitude (m)</i>	< 1.000 (2.850 for Colombia)	
<i>SPS Class (IEC/TS 60815 series)</i>	d) or e)	
<i>Ice coating (mm)</i>	10 (22 for Romania)	
<i>Seismic qualification level</i>	See 5.2	
<i>Rated voltage</i>	See table in 6	
<i>Rated frequency fr (Hz)</i>	50 or 60	
<i>Continuous operating voltage (kV)</i>	See table in 6	
<i>Nominal discharge current (kA)</i>	See table in 6	
<i>Rated short-circuit current (kA)</i>	See table in 6	
<i>Residual voltage for steep current impulse (kV)</i>	See table in 6	
<i>Residual voltage for lightning current impulse (kV)</i>	See table in 6	
<i>Line discharge class</i>	See table in 6	
<i>Residual voltage for switching current impulse (kV)</i>	See table in 6	
<i>High current impulse (kA)</i>	See table in 6	
<i>Long-duration current impulse (2400 us)</i>	See table in 6	
<i>Rated static mechanical terminal load (daN)</i>	See table in 6	
<i>Dimensions</i>	See Annex A	To enclose an overall equipment drawing for each Enel Group Distribution Company

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ANNEX C – COMPONENT LIST

Type code	Company	Company code	TAM Company code	Highest system voltage (kV)	Designation	Rated frequency (Hz)	Rated voltage (Ur); (kV)	Continuous operating voltage (Uc); (kV)	Nominal discharge current (In); (kA)	Pollution level (mm)	Housed
GSCH005/001	EDE	6701231	170023	245	SM	50	192	154	10	6125	polymer
GSCH005/002	EDE	6701232	170024	145	SM	50	120	92	10	3625	polymer
GSCH005/003	EDE	6701233	170025	123	SM	50	96	77	10	3625	polymer
GSCH005/004	EDE	6701234	170026	72,5	SM	50	60	48	10	1813	polymer
GSCH005/005	EDE	6701235	170027	60	SM	50	53	42	10	1813	polymer
GSCH005/006	EDE	6701236	170028	52	SL	50	42	34	10	1300	polymer
GSCH005/007	EDE	6701749	170029	245	SM	50	146	117	10	3625	polymer
GSCH005/008	EDE	6701750	170120	123	SM	50	75	60	10	3625	polymer
GSCH005/009	EDE	6701751	170121	145	SM	50	84	67	10	3625	polymer
GSCH005/010	EDE	6701752	170122	72,5	SM	50	42	34	10	1813	polymer
GSCH005/011	EDE	6701753	170123	60,5	SM	50	38	30	10	1813	polymer
GSCH005/012	EDE	6704914	170092	245	SM	50	192	154	10	7595	polymer
GSCH005/013	EDE	6705241	170093	245	SM	50	146	117	10	4495	polymer
GSCH005/014	EDE	6705242	170094	145	SM	50	120	92	10	4495	polymer
GSCH005/015	EDE	6705243	170095	145	SM	50	84	67	10	4495	polymer
GSCH005/016	EDE	6705244	170096	123	SM	50	96	77	10	4495	polymer
GSCH005/017	EDE	6705245	170097	123	SM	50	75	60	10	4495	polymer
GSCH005/018	EDE	6705246	170098	72,5	SM	50	60	48	10	2248	polymer
GSCH005/019	EDE	6705247	170099	72,5	SM	50	42	34	10	2248	polymer
GSCH005/020	EDE	6705248	170110	60	SM	50	53	42	10	2248	polymer
GSCH005/021	EDE	6705249	170111	60,5	SM	50	38	30	10	2248	polymer
GSCH005/022	EDE	6705250	170112	52	SL	50	42	34	10	1612	polymer
GSCH005/023	EDE	6706805	170040	-	-	50	-	-	-	-	-
GSCH005/100	E-DIST.	170105		150	SL	50	132	94	10	-	polymer
GSCH005/101	E-DIST.	170135		170	SL	50	158	110	10	-	polymer
GSCH005/102	E- DIST.	221280		Support			-	-	-	-	-
GSCH005/103	E- DIST.	221281		Support			-	-	-	-	-
GSCH005/200	Enel Rom	617303		123	SL	50	96	72	10	3625	polymer
GSCH005/201	Enel Rom	617304		123	SL	50	57	45,5	10	3625	polymer
GSCH005/300	AMPLA	4545929		36	SL	60	30	24	10	34,7 kVmm/kV	Polymer
GSCH005/301	AMPLA	4545932		72,5	SL	60	60	48	10	34,7 kVmm/kV	Polymer
GSCH005/302	AMPLA	4545944		15	SL	60	12	10	10	34,7 kVmm/kV	Polymer
GSCH005/303	AMPLA	4660197		145	SM	60	120	92	10	34,7 kVmm/kV	Polymer
GSCH005/304	AMPLA/COELCE			surge counter		60					
GSCH005/400	COELCE	6771010		15	SL	60	12	10	10	>=560	Polymer
GSCH005/401	COELCE	6771008		72,5	SL	60	60	48	10	>=2139	Polymer

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GSCH005/500	CODENSA			220	SM	60	192	152	10	6625	Polymer
GSCH005/501	CODENSA	6787485		115	SL	60	96	76	10	4370	Polymer
GSCH005/502	CODENSA	6787483		13,2-11,4	SL	60	12	8,7	10	765	Polymer
GSCH005/503	CODENSA	6787484		34,5	SL	60	30	24	10	1029	Polymer
GSCH005/504	CODENSA	6781248		13,2-11,4	SL	60	12	8,7	10	765	Polymer
GSCH005/505	CODENSA	6781249		34,5	SL	60	30	24	10	1029	Polymer
GSCH005/600	EDELNOR	6757563		245	SM	60	198	158	10	7595	polymer
GSCH005/601	EDELNOR	6800940		72,5	SL	60	60	48	10	2248	polymer
GSCH005/700	EDESUR	0108-0563		145	SM	50	120	90	10	34,7 mm/kV	Polymer
GSCH005/701	EDESUR	0108-0564		245	SH	50	198	150	20	34,7 mm/kV	Polymer
GSCH005/800	CHILECTRA	6753286		245	SM	50	198	154	10	4900	Polymer
GSCH005/801	CHILECTRA	6788802		123	SM	50	96	76	10	2460	Polymer
GSCH005/802	CHILECTRA	6788803		24	SL	50	21	17	10	480	Polymer
GSCH005/803	CHILECTRA	6788804		17,5	SL	50	12	8,7	10	350	Polymer
GSCH005/804	CHILECTRA	6750037		13,2	SL	50	15	12,7	10	355	Polymer
GSCH005/805	CHILECTRA	6755739		25,3	SL	50	27	22	10	560	Polymer