



Flucce Brulli


IMPIANTO DI RETE PER L'AMPLIAMENTO 132 kV DELLA CABINA PRIMARIA TRESIGALLO

COSTRUZIONE 3° STALLO LINEA IN CAVO
UBICATO NEL COMUNE DI TRESIGNANA(FE)

PROCEDURA AUTORIZZATIVA (Atto e/o Decreto Regionale o Provinciale) N° - DEL -

PROGETTO DEFINITIVO

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HV CIRCUIT-BREAKERS

Countries' I&N	Elaborated by
Italy	Stefano Magistroni

	Elaborated by	Verified by	Approved by
Solution Development Center	Oscar Izquierdo	C. Llovich Badia	Juan Gonzalez Lara
Global I&N – NT/NCS	-	JM. Rey Sanchez	F. Giammanco


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1 SCOPE

Scope of this document is to provide technical requirements for the supply of three-poles Alternating Current Circuit-Breakers with rated voltage from 72,5 kV to 245 kV to be used in Primary Substations of the Enel Group Distribution companies, listed below:

- Ampla (Brazil)
- Chilectra (Chile)
- Codensa (Colombia)
- Coelce (Brazil)
- Edelnor (Perú)
- Edesur (Argentina)
- Endesa Distribución Eléctrica (Spain)
- Enel Distributie Banat (Romania)
- Enel Distributie Dobrogea (Romania)
- Enel Distributie Muntenia (Romania)
- **Enel Distribuzione (Italy)**


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

Alternating Current Circuit-Breakers (hereinafter CBs) are SF6 insulated (in alternative, non-fluorinated greenhouse gases and vacuum circuit breakers are also acceptable), for outdoor installations in Primary Substations.

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

2 COMPONENTS LIST

The following CBs are covered by this global standard:

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Type code	Rated voltage U_r (kV)	Rated normal current I_r (A)	Rated short-circuit breaking current I_{sc} (kA)	Type of operation
GSH001/1	72,5	2000	31,5	Three-pole
GSH001/2	72,5	2000	40	Three-pole
GSH001/3	145	2000	40	Single-pole
GSH001/4	145	2000	40	Three-pole
GSH001/5	145	3150	40	Three-pole
GSH001/6	145	3150	50	Three-pole
GSH001/7	170	2000	40	Single-pole
GSH001/8	170	2000	40	Three-pole
GSH001/9	245	2000	40	Single-pole
GSH001/10	245	2000	40	Three-pole
GSH001/11	245	3150	40	Single-pole
GSH001/12	245	3150	40	Three-pole

For local components codification see annex A.

3 REFERENCE LAWS AND STANDARDS

3.1 Laws

3.1.1 Latam

3.1.1.1 Brasil

NR-10 - segurança em instalações e serviços em eletricidade

3.1.2 Italy

D.M. 1/12/1980 and subsequent modification D.M. 10/9/1981 *“Disciplina dei contenitori a pressione di gas con membrane miste di materiale isolante e di materiale metallico, contenenti parti attive di apparecchiature elettriche”*.

3.1.3 Spain

Real Decreto Riesgo Eléctrico 614/2001


Reglamento Electrotécnico para Baja Tensión, Real Decreto 842/2002.

Reglamento de puntos de Medida Real Decreto 1110/2007.

Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión, Real Decreto 337/2014.

3.1.4 All European countries

Commission Regulation (EC) 1494/2007 of 17 December 2007 (form of labels and additional labelling requirements as regards products and equipment containing certain fluorinated greenhouse gases).

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3.2 Standards

3.2.1 Common standards

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

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 62271-1	High-voltage switchgear and controlgear - Part 1: Common specifications
IEC 62271-100	High-voltage switchgear and controlgear – Part 100: Alternating current circuit-breakers
IEC/TR 62271-300	High-voltage switchgear and controlgear - Part 300: Seismic qualification of alternating current circuit-breakers
IEC/TR 62271-301	High-voltage switchgear and controlgear – Part 301: Dimensional standardization of high-voltage terminals
CLC/TR 62271-303	High-voltage switchgear and controlgear - Part 303: Use and handling of sulphur hexafluoride (SF6)
IEC 60376	Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment
IEC 60073	Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators
IEC 60447	Basic and safety principles for man-machine interface, marking and identification - Actuating principles
IEC 61936-1	Power installations exceeding 1 kV a.c. - Part 1: Common rules
IEC/TS 60815-1	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles
IEC/TS 60815-2	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 2: Ceramic and glass insulators for a.c. systems
IEC/TS 60815-3	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 3: Polymer insulators for a.c. systems
IEC 62155	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltage greater than 1000 V
IEC 61462	Composite hollow insulators – Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1000 V – Definitions, test methods, acceptance criteria and design recommendations
IEC 60332-3-24	Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C
IEC 60947-7-1	Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment - Terminal blocks for copper conductors
IEC 60947-7-2	Low-voltage switchgear and controlgear – Part 7-2: Ancillary equipment - Protective conductor terminal blocks for copper conductors
IEC 60068-2-17	Environmental testing – Part 2: Tests – Test Q: Sealing
ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles- Specifications and test methods

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ISO 2178	Non-magnetic coatings on magnetic substrates - Measurement of coating thickness -Magnetic method
ISO 4126	Safety devices for protection against excessive pressure
ISO 9223	Corrosion of metals and alloys -- Corrosivity of atmospheres -- Classification, determination and estimation
ISO 12944	Paints and varnishes -- Corrosion protection of steel structures by protective paint systems

3.2.2 Specific standards

3.2.2.1 *Latam*

3.2.2.1.a) *Chilectra*

ETGI-1020 - Especificaciones técnicas generales - Requisitos de diseño sísmico para equipo eléctrico

3.2.2.2 *Endesa Distribución Eléctrica*

NNM001 – Normas de operación definiciones

NMC001 – Procedimiento para el conexionado de armarios cuadros y paneles

NNC007 – Cables de control multipolares

NZC001 – Procedimiento para la confección de proyectos de control y protección

3.2.2.3 *Enel Distributie*

Prescriptia Energetica PE 101/85 – Normativ pentru construcția instalațiilor electrice de conexiuni și transformare cu tensiuni peste 1 kV

3.2.2.4 *Enel Distribuzione*

CEI 20-22/2 – Prove di incendio su cavi elettrici – Parte 2: Prova di non propagazione dell'incendio

UNI 11144 – Bombole trasportabili per gas – Valvole per bombole per pressioni di esercizio 250 bar – Connessioni: forme e dimensioni

ENEL operative note PVR006 (bar code)

LM 1023 (double cable 245 kV clamp)


LM 1026 (single cable 245 kV clamp)

4 SERVICE CONDITIONS

4.1 General service conditions

Unless otherwise specified, the reference service conditions are the outdoor normal service conditions of IEC 62271-1 (par. 2.1.2).

Minimum ambient air temperature (°C)	-25	
SPS Class (IEC/TS 60815 series)	d (Heavy)	e (Very Heavy)
RUSCD (mm/kV)	43,3	53,7
Ice coating (mm)	10	

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4.2 Specific service conditions

4.2.1 Colombia (Codensa)

The reference altitude is 2.600 m.

4.2.2 Romania¹ (Enel Distributie)

Minimum ambient air temperature (°C)	-30
Ice coating (mm)	22

4.2.3 Seismic qualification level

Chilectra	ETGI-1020
Codensa	AF3 (IEC/TR 62271-300)
Edelnor	AF5 (IEC/TR 62271-300)
Enel Distributie	AF5 (IEC/TR 62271-300)
Enel Distribuzione	AF5 (IEC/TR 62271-300)


5 TECHNICAL CHARACTERISTICS

In addition to IEC 62271-100, the following requirements are prescribed.

Rated voltage U_r (kV)		72,5	145	170	245
Rated short-duration power-frequency withstand voltage U_d (kV rms):		140	275	325	460
Rated lightning impulse withstand voltage U_p (kVp):		325	650	750	1050
Rated frequency f_r (Hz)	Chilectra, Edesur, Endesa Distribución, Enel Distributie and Enel Distribuzione	50			
	Ampla, Codensa, Coelce and Edelnor	60			
Rated normal current I_r (A)		See table in chapter 2			
Rated short-circuit breaking current I_{sc} (kA)		See table in chapter 2			
First-pole-to-clear factor k_{pp}		1,5 (non-effectively earthed neutral system)			1,3
Rated operating sequence		O - 0,3 s - CO - 1 min - CO ²			

¹ In accordance with Prescriptia Energetica PE 101/85

² This requirement can be verified by mean of type tests performed with O - 0,3 s - CO - 3 min - CO operating sequence and a declaration of the manufacturer about the CB compliance with O - 0,3 s - CO - 1 min - CO operating sequence.

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Maximum break-time (ms)		60			
Circuit breaker class		C2 - E1 - M2			
Rated line-charging breaking current I_l (A)		10	50	63	125
Rated cable-charging breaking current I_c (A)		125	160		250
Rated out-of-phase making and breaking current I_d (kA)		Clause 4.106 of IEC 62271-100			
Degrees of protection provided by enclosures		IP 54 ³			
Rated supply voltage U_a (Vdc)	Enel Distributie and Enel Distribuzione	110			
	Endesa Distribución Eléctrica, Ampla, Coelce, Chilectra, Codensa, Edelnor	125			
	Edesur	220			
d.c. maximum absorbed power (W)		2000			
Undervoltage release (if requested) - d.c. maximum abs. power (W/coil)		100			
Rated supply voltage for anti-condensation circuits (Vac)	Endesa Distribución, Enel Distributie and Enel Distribuzione	230			
	Ampla, Coelce, Chilectra, Edelnor, Edesur	220			
	Codensa	120			
a.c. maximum absorbed power (VA)		250			
Auxiliary contact classes (Table 6 IEC 62271-1)		1			

6 CONSTRUCTION CHARACTERISTIC

6.1 General characteristics


The CBs shall be manufactured in accordance with IEC 62271-100.

The dimensional drawings are in annex B, where are indicated:

- the main CBs binding dimensions;
- the metallic support (3 or 2 uprights, depending on the company);
- the external grounding connections;
- the cable shaft of the civil works.

The support, quoted separately, shall be always supplied when a seismic qualification level is required (see 4.2.3), otherwise it's an optional supply.

³ Applicable also to the Control Box and to the Operating Device Box(es).

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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 poles naming shall be A, B, C, from left to right, looking the CB from the side with the main contact position indicators.

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

6.2 Insulators

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

In case of ceramic insulators, they shall be in brown color and compliant with IEC 62155.

In case of composite insulators, 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.

6.3 Additional requirements for vacuum CBs

The breaking elements shall have an expected life above 30 years.

If an insulation gas is present, the manufacturer shall declare:

- the type of gas used (chemical composition of gas or gas blend) and the rated filling pressure at 20 °C;
- the type of system (closed pressure system or sealed pressure system, in the second case with an expected life above 30 years).

6.4 Additional requirements for gas CBs

6.4.1 Additional requirements for SF6 gas CBs

Generally the dielectric mean for insulation and arc extinction is SF6, with a pressure over the atmospheric one.


The gas SF6 shall comply with IEC 60376 standard. The manufacturer has to provide the necessary instructions for use and handling of SF6, in accordance with Technical Report IEC IEC/TR 62271-303.

In case of single-poles CB's a distinct SF6 circuit and connection for each pole is required.

In case of three-pole CB's the number of SF6 circuits and consequent connections is the following:

CB's rated voltage (kV)	Number of SF6 circuits			
	Latam	Endesa Distribución Eléctrica	Enel Distributie	Enel Distribuzione
72,5	Unique for the 3 poles			
145	Unique for the 3 poles	One for each pole		
170	One for each pole			
245	One for each pole			

Each SF6 circuit shall provide a connection elements (type DILO VK/BG-03/8 or equivalent), with a non-return valve, both for SF6 control device and for gas filling/replenishment, provided by not-losable protection screw taps (located not higher than 1.800 mm from the ground level).

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The SF6 circuit piping shall be performed using stainless steel or, in alternative, painted copper, in order to reduce the stealing risk.

6.4.2 Additional requirements for non-fluorinated greenhouse gases CBs

In alternative to the SF6, non-fluorinated greenhouse gases are also acceptable.

In case of single-poles CB's a distinct gas circuit and connection for each pole is required.

In case of three-pole CB's the number of gas circuits and consequent connections is the same of SF6 gas CBs (see table in 6.4.1).

Each gas circuit shall provide a connection elements (the manufacturer will propose a suitable type different from the one used for SF6, in order to avoid mistakes), with a non-return valve, both for gas control device and for gas filling/replenishment, provided by not-losable protection screw taps (located not higher than 1.800 mm from the ground level).

6.4.3 Gas (SF6 or non-fluorinated greenhouse gases) density control

The CB is a closed pressure system. The relative leakage rate shall be $Fre \leq 0,5\%$ per year. The value for the time between replenishments shall be at least 10 years.

It shall be possible to perform the gas replenishment with the equipment in service, avoiding the unwanted operation of the gas density control device.

Each gas circuit (1 or 3, see 6.4.1 or 6.4.2) shall have a device for the gas density control.

The alarm threshold calibration has to take into account the leakage rate. The block threshold calibration shall be at least 0,02 MPa lower respect to the alarm threshold.

The gas density control device shall be:

- suitable to work in the provided temperature range;
- located in order to avoid the solar radiation influence on the external temperature measuring;
- insensitive to the vibration produced by the equipments operation;
- manufactured with stainless materials;
- realized in order to allow the functionality verify and the substitution with the poles under pressure;
- with the following scale(s) for a visible indication of gas density level:

Type of scale	Endesa Distribución Eléctrica, Enel Distributiva and Enel Distribuzione	Latam
Colored	Mandatory	Mandatory
Graduated	Forbidden	Mandatory

The gas density control device shall provide 2 operating levels with contacts independently adjustable:


- 1st minimum gas density level: alarm (replenishment necessary) with 1 contacts;
- 2nd minimum gas density level: block (to get out of service) with 2 contacts working separately on 2 opening circuits (depending on specific requirements in chapter 7).

The contacts operating tolerance shall be lower than $\pm 1,5\%$ (referring to the full scale) in the provided temperature range; the contacts of each minimum gas density level shall have a difference $\leq 0,005$ MPa between them.

6.4.4 Overpressure safety devices

Safety devices against the internal overpressure is mandatory only in case of ceramic insulators.

The devices shall be compliant with ISO 4126 and shall be properly calibrated over the maximum operating pressure, in order to avoid improper operations.

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In case of overpressure safety valves operation, the expelled gas shall not run over people around the equipment.

6.4.5 Gas filling/replenishment device (*Optional*)

At request the manufacturer shall supply a device for the gas replenishment.

In case of SF₆, the device shall be provided by female thread connection, W 21,7 x 1/14" (UNI 11144 – only for Enel Distribuzione,) on gas bottle side and DILO VK/BG-03/8 or equivalent on pole junction device side. The device will consist of:

- pressure regulator
- a safety valve (ISO 4126 compliant, calibrated at 8 bar rel);
- a pressure gauge 0÷1 MPa, 0,5 class, minim resolution ± 5 kPa, accompanied with a calibration certificate;
- flexible tube 5 meters long, DN≥8.

In case of non-fluorinated greenhouse gases, the manufacturer will propose a suitable solution compliant, when applicable, with the above mentioned requirements for the SF₆ version.

6.5 Control Box and Operating Device Box(es)

The requested cabinets are the followings:

- a cabinet for control and interface with the remote control system (hereinafter "Control Box")
- cabinet(s) for the operating device (hereinafter "Operating Device Box"), 3 for single-pole CBs, 1 for three-pole CBs.

The Control Box can be physically integrated in the Operating Device Box (in one of the 3 operating device boxes in case of single-pole CBs).

6.5.1 Control Box

The Control Box shall be fixed on the CB support, compatibly with the civil works. The CBs shall be equipped with proper conduits for the connection cables to the substation control system, from the Control Box to the existing cable shaft of the civil works; the minimum dimensions of the conduits shall be 100x50 mm.

All CBs auxiliary and control equipments shall be placed in the Control Box.

In addition to the IP requirement of table at chapter 5, the box protection degree with open doors shall be minimum IP2X.

In addition to the dimensions shown in Annex B, the box base height respect to the ground shall be ≥ 400 mm and all HMI (Human Machine Interface) elements (controls and signalizations) shall be at ≤ 1800 mm.


The box interior shall be accessible from the front by mean of a door provided of handle and lock. The door (simple or double), hinged and equipped with an anti-wind system, shall be provided with a window in order to make visible from outside the signalization lamps. It shall be possible to open the door over 90°.

All accessories (hand-crank, document pocket etc.) shall be accommodated in the internal part of the box door.

All electric equipments components shall be:

- compliant with the respective IEC standards;
- equipped with an identification label indicating the codification used in the functional electric schemes;
- easily accessible for maintenance or substitution operations.

In particular, the extractible ones, plug-in connector included, shall be provided with proper anti-mistake coding.

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The box internal wiring shall be performed with conductors with adequate section (always $\geq 1\text{ mm}^2$), flexible type, compliant with IEC 60332-3-24 and insulated at $U_o/U = 450/750\text{ V}$.

The cable ends shall be provided of pre-insulated compression type terminals, suitable for the clamps where they have to be connected.

The connection cable from the Control Box to the equipments shall be of adequate section ($\geq 1,5\text{ mm}^2$), shielded, flexible, compliant with IEC 60332-3-24 and insulated at $U_o/U = 0,6/1\text{ kV}$.

Inside the Control Box an internal collector (in tin-plated or nickel-plated copper, section $\geq 60\text{ mm}^2$ and with M5 regular interval threaded hole) shall be present for the grounding connection of all cable shields; the manufacturer shall guarantee its effective connection to the CB grounding system.

The entrance of all cables (both CB's cables and control system cables) shall be from the Control Box bottom side, where a removable loophole (in aluminum, with useful dimension of $150 \times 100\text{ mm}$) shall be provided.

The Control Box shall include:

- remote/local selector switch
- control buttons for circuit breaker, with the following colors:

Operation	Chilectra, Codensa, Edelnor, Edesur, Endesa Distribución Eléctrica, Enel Distributie and Enel Distribuzione (according with IEC 60073)	Ampla, Coelce (according with NR10)
Closing	White	White "L" on Red white background
Opening	Black	White "D" on Green white background

- magneto-thermic automatic circuit breakers for the supplies protection (motors, lighting lamp, anti-condensation circuits – fuses are not admitted);
- interface terminal board for substation control system;
- anti-condensation circuit;
- internal lighting lamp, with automatic switching in case of open door;
- only in case of three gas circuits, gas density signalization lamps (for each gas circuit, yellow color about 1st minimum gas density level; red color about 2nd minimum gas density level);
- only in case of three gas circuits, lamps testing button.

The signalization lamps and the internal lighting lamps shall not be incandescent type.

The grounding of a dc supply polarity is not admitted.

The terminal boards shall be made with modular terminals. In particular, the terminals of control system interface terminal board shall have section 4 mm^2 for control, signalization and anti-condensation circuits and section 10 mm^2 for the motors supply circuit.

It shall be provided 2 bridged terminals couples for the anti-condensation circuit and 2 for the motor supply circuit.


If diodes are used for the circuit separations or for the voltage return protection, they shall have inverse voltage $\geq 3\text{ kV}$.

The cable trucking systems for the internal wiring shall shave sufficient residual space ($\geq 10\%$ of used volume); the cables shall be anchored in some points on order to avoid their falling.

The cable trunks close to the interface terminal boards shall be used for the control system wiring and cannot be used for the internal wiring.

6.5.1.1 Latam specific requirements

The remote/local selector switch shall have auxiliary contacts.

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The Control Box shall also include an electric socket output (Vac).

About the terminal boards, provision should be made for 20% of free terminals.

The control box shall also include auxiliary switch contacts to indicate CB position. The quantities of auxiliary contacts available (NO-Normally Open or NC-Normally Closed) for the different companies is indicated in Annex C.3.

6.5.1.2 *Enel Distribuzione specific requirements*

In alternative to IEC 60332-3-24, cables compliant with Italian standard CEI 20-22/2 and marked with "CEI 20-22 II" can be accepted.

It's necessary a space in the control box with a DIN bar width 150mm, height 200mm, depth 150mm for a device DV7203 (conversion digital signal in optical)

6.5.1.3 *Endesa specific requirements*

For Endesa the remote/local selector switch and the control buttons for opening and closing are not required in the CB. Please check Annex C.1

6.5.2 Operating Device Box(es)

The operating devices, the CB operation counters (mechanical, four-digits, not-resettable), the auxiliary electric equipments, the auxiliary contacts and the terminal boards (or connectors) shall be located: in a single cabinet for three-pole CBs; in 3 cabinet for single-pole CBs.

Each operating device box shall be equipped with spring loading condition signalization and with main contact position indicators, having the following characteristics:

Position	Chilectra, Codensa, Edelnor, Edesur, Endesa Distribución Eléctrica, Enel Distributie and Enel Distribuzione (according with IEC 60073)	Ampla, Coelce (according with NR10)
Close	Black "I" on white background	White "L" on Red white background
Open	White "O" on black background	White "D" on Green white background

During normal operation, with encloses and doors closed, the main contact position indicators and the spring loading condition signalization shall be visible from ground level.

In order to allow the verification, during maintenance activity, of the unchanged characteristics of the no-load travel curve (see note in 9.2.2-11b), manufacturer shall provide the measuring points, properly machined.

In addition to the IP requirement of table at chapter 5, the box(es) protection degree with open doors or when using hand-crank (to charge CB's springs) shall be minimum IP2X (unless the box can be opened only using tools).

All mechanical organs (included the motion transmission rods for three-pole CBs) shall be enclosed in metallic casings, IP2X, in order to prevent the access to parts in movement (see par. 5.13.1 of IEC 62271-1).


The manufacturer shall provided the instruction for a safety access to mechanical organs.

6.5.2.1 *Latam specific requirements*

The operation counter can be mechanical or electromechanical.

6.5.3 Nameplates

Par. 5.10 of IEC 62271-100 apply, specifying that both CB nameplate and operating devices nameplates shall include:

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- the optional values;
- the Enel Group type code (see table in chapter 2) and the local components codification (see Annex A).

For traceability purpose, if the Control Box is not integrated in the Operating Device Box(es), in the internal part of the Control Box door shall be located a self-adhesive nameplate with the following information:

- box manufacturer;
- serial number of the Control Box;
- year of construction.

6.5.3.1 *Latam specific requirements*

The self-adhesive nameplate to be located in the internal part of the Control Box door shall also contain the contract number.

6.5.3.2 *European countries specific requirements*

If applicable, an informative nameplate with the sentence “*Contains fluorinated greenhouse gases covered by the Kyoto Protocol*” (in accordance with Commission Regulation (EC) 1494/2007 of 17 December 2007) shall be provided.

6.6 HV terminals

6.6.1 Latam

The HV terminals shall be manufactured with corrosion resistant copper or aluminum alloy, in order to be interfaced with aluminum alloy connectors or clamps.

The terminals shall be rectangular shape with the following dimensions, according to fig. 3 (2x2 hole pattern) or fig. 4 (2x3 hole pattern) of IEC/TR 62271-301:

- Hole diameters Ø 14.3mm
- Distance between holes 44.5mm

6.6.2 Endesa Distribución

The HV terminals shall be compliant with fig. 6 (2x4 hole pattern) of IEC/TR 62271-301.

6.6.3 Enel Distributie and Enel Distribuzione

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

For CBs up to 170 kV the HV terminals shall have Ø 40 ±0,25 X 80 min (mm) (fig. 1 of IEC/TR 62271-301) dimensions.

For 245 kV CBs the HV terminals shall be suitable to be interfaced with standardized Enel clamps LM 1023 (double cable) and LM 1026 (single cable).

6.7 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).

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 (see Annex B).

6.8 Anti-condensation circuit

Inside all boxes a proper anti-condensation system shall be provided in order to prevent humidity damages and to ensure a proper air replacement.

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The anti-condensation circuit, controlled by a thermostat with fixed regulation at 25 °C (box internal temperature), shall be unique for the overall equipment, supplied in a.c. (see table in chapter 5 for the supply rated voltage) and protected with a magneto-thermic automatic circuit breaker.

The heating elements shall be preferably connected in series in order to have the circuit opening in case of failure of an element; a minimum current sensor shall detect and signal the anomaly.

In parallel connection case, the manufacturer shall assure a correct fault detection and distance anomaly signaling in case of failure of an element, properly evaluating the tolerances of the supply voltage and of the components resistance.

6.8.1 Endesa specific requirements

For the heating system, the minimum current sensor is not necessary. See Annex C.1.

6.9 Protective treatments

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

All iron parts (e.g. support, Control Box, Operating Device Box(es), 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.

6.9.1 Latam specific requirements

In Brazil (Ampla y Coelce) there is atmospheric corrosive environments "Very High" (C5- ISO 9223 and ISO 12944). Thus, in case of hot dip galvanized steel for control box or cabinet, it will apply a system of painting with ink wash primer, primer and finishing, with a minimum total thickness of 100 µm.

7 FUNCTIONAL CHARACTERISTIC

7.1 Operating Devices

7.1.1 General requirements


The CB controls shall be realized in order to be managed both remotely and locally. For this purpose a selector switch shall be located in the Control Box for the operation type choice: remote or local (hereinafter "remote/local selector switch"⁴).

In "remote" position the remote controls are enabled and the local controls are disabled. In "local" position the enabling are the opposite.

The switch operation shall not cause unwanted equipment operations.

⁴ the words "remote" and "local" have to be translated in all documents as:

- Italian language: "Servizio" (S) and "Prova" (P)
- Spanish language: "Remoto" and "Local"
- Romanian language: "In functiune" and "Probe"
- Portuguese language: "Remoto" and "Local"

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The local operation of circuit breakers (three-pole operations, it shall not be possible to operate locally single-pole operations) shall be controlled by the push-buttons located in the Control Box (see 6.5.1). During normal operation temporary block signalizations shall not be sent to the control system.

The CBs operating device shall be spring type, three-pole or single-pole type.

The operating device energy storage shall be normally made by mean of a d.c. electric motor (see table in chapter 5 for the supply rated voltage); when necessary it shall be possible to restore manually the operating device energy, with a maximum effort below 250 N. The manual device shall exclude the motor operation, or in alternative shall be designed excluding its possible movement in case of unexpected spring operation.

All releases, both for closing and for opening, shall not work with a signal duration ≤ 3 ms.

The CBs operating device shall be able to perform the following cycles⁵:

- with motor working:
 - O – 0,3 s – CO – 1 min – CO with CB closed and opening and closing springs charged;
- with motor not working:
 - O – 0,3 s – CO with CB closed and opening and closing springs charged;
 - CO with CB open and closing springs charged;
 - O with CB closed and opening springs charged.

The single-pole CBs shall be equipped with a device for the signalization of poles not being in the same position (closed or open).

7.1.1.1 *Endesa specific requirements*

The selector is located in a centralized control box, for this reason it's not necessary the local-manual-remote selector in the control box. For the same reason the open-close buttons are not necessary. See Annex C.1.

7.1.2 Release drive circuits

7.1.2.1 *General requirements*

The release drive circuits typologies are (see specific requirements for details):


- drive circuit of shunt closing release;
- drive circuit of shunt opening release;
- drive circuit of under-voltage release (if required in local requirements sections).

It shall be possible to request the CB opening acting both on a single circuit at a time and concurrently on any combination of the different opening circuits.

If during an operation an opposite operation request is received, the consent to the last operation shall be given only after the completion of on-going operation (in this case, only for single-pole CBs, the discrepancy between poles can be over the required limits).

The closing circuit shall be equipped with anti-pumping devices (1 for three-pole CBs and 3 for single-pole CBs) in order to inhibit further closing operations after the first one if an opening occurs during the initial closing request.

⁵ with the CB closed the opening springs shall be always charged.

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The main contacts position shall be assured stably and surely in the open and closed position. The CBs shall not operate in case of accidental auxiliary circuits supply interruption or in case of supply restore (excluding the drive circuit of under-voltage release).

7.1.2.2 *Latam specific requirements*

The circuit breaker will be provided with two opening and independent coils.

Function trip circuit supervision: it shall be possible, if not supplied with the CB, to install a monitoring open circuit device, which aim to explore safely and permanently in the continuity of such circuits open, regardless of the CB position (open or closed), so that the open operation results in all cases satisfactory.

It shall be possible to perform the CB closing and opening (when H.V. and d.c. supplies are off, i.e. due to a fault) by means of (safety located) hand operated levers or buttons.

For Ampla: capacitive source for circuit breaker opening.

Other requirements for different companies are in Annex C.3.

7.1.2.3 *Endesa Distribución specific requirements*

The circuit breaker will be provided with two opening and independent coils.

It shall be possible to perform the CB closing and opening (when H.V. and d.c. supplies are off, i.e. due to a fault) by means of (safety located) hand operated levers or buttons.

7.1.2.4 *Enel Distributie and Enel Distribuzione specific requirements*

The three-pole CBs shall be provided with the following drive circuits:

- N° 1 drive circuit of shunt closing release;
- N° 1 drive circuit of shunt opening release;
- N° 1 drive circuit of under-voltage release.

The single-pole CBs shall be provided with the following drive circuits:

- N° 1 drive circuit of shunt closing release;
- N° 2 drive circuits of shunt opening release;
- N° 1 drive circuit of under-voltage release.

The three-pole CBs can be installed only in transformer's bay.

The single-pole CB can be installed both in line's bay and in transformer's bay, selecting the service type by mean of a selector switch named "43LT" included in the Control Box: in case of transformer's bay use the selector switch will be in "T" position; in case of line's bay use the selector switch will usually be in "L" position (in case of line bays in substations looking out to substations with HV SF6 GIS, it shall be used single-pole CBs with the L/T selector switch in "T" position).

The single-pole CBs shall be provided of a congruency check (and consequent alarm) between the L/T selector switch position and the under-voltage release manual lock/unlock devices position.


The three-pole CBs shall be provided of an alarm signalization in case of under-voltage release manually locked.

It shall be possible to manually lock/unlock the under-voltage release by mean of a device provided of the "bloccato"/"sbloccato" indication. This device shall be located externally to the Operating Device Box and shall be maneuverable from the ground level. It shall be possible to operate this device with the CB in service and without causing an unwanted opening.

In the functional scheme it shall be provided the locked under-voltage release signalization.

Under-voltage releases consisting of energy storage systems (for example capacitors) are not admitted.

The CB closing consensus shall be interdict in case of under-voltage release drive circuit not supplied or locked (only if "43LT" selector is in "T" position, see flowcharts in annex C.2).

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7.1.3 Interlocking devices

7.1.3.1 General requirements

All operations shall be dependent to the internal CB interlockings.

The following interlocking circuits shall be provided, depending on the monitored values (springs status, gas pressure etc.):

- reclosing
- closing
- opening or, if required, automatic opening with open position blocking.

Further details are in the specific requirements.

7.1.3.2 Latam specific requirements

For the interlocking requirements refer to the annex C.3.

7.1.3.3 Endesa Distribución specific requirements

For the interlocking requirements refer to the annex C.1.

7.1.3.4 Enel Distributie and Enel Distribuzione specific requirements

For the interlocking devices and for the automatic opening with open position blocking, IEC 62271-100 applies with the clarifications in the following.

The following interlockings are requested:

- a) Closing block (enabled in both positions of the remote/local selector switch)
- b) Opening block (enabled in both positions of the remote/local selector switch) or in alternative automatic opening with open position blocking (enabled only in remote position of the remote/local selector switch)

The refresh shall occur automatically only after the ending of the condition causing the block.

Both during normal CB working and during operations shall not be sent to the control system temporary block signalizations.

7.1.3.4.a) Closing block

The closing block shall be activated if one of the following conditions occur:

- a) 2nd minimum gas density level (only in case of gas CBs);
- b) discharged closing springs (at least one of the three springs in case of single-pole CBs).

In case of three-pole CBs or single-pole CBs with L/T selector switch in “T” position, the closing block shall be activated also in the following conditions:

- a) drive circuit of under-voltage release not supplied;
- b) under-voltage release mechanically locked (at least one of the three releases in case of single-pole CBs).

In case of single-pole CBs with L/T selector switch in “L” position, the closing block shall be activated also in the following conditions:

- a) at least one of the three under-voltage releases mechanically locked.


7.1.3.4.b) Opening block

In case of single-pole gas CBs with L/T selector switch in “L” position, the opening block shall be activated in case of 2nd minimum gas density level intervention.

7.1.3.4.c) Automatic opening with open position blocking

In case of three-pole gas CBs or single-pole gas CBs with L/T selector switch in “T” position, the automatic opening with open position blocking shall be activated in case of 2nd minimum gas density level intervention.

The automatic openings operate in the same time:

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- a) for three-pole CBs, on the shunt release and on the under-voltage release;
- b) for single-pole CBs, only on the shunt releases.

7.2 Electric schemes, controls and signalizations

7.2.1 General requirements

The electric schemes shall:

- a) be represented in the reference conventional conditions:
 - a.1) CB in open position;
 - a.2) absence of a.c. and d.c. auxiliary supplies;
 - a.3) gas absence (only for gas insulated CBs – SF6 or non-fluorinated greenhouse gases);
 - a.4) closing springs discharged;
 - a.5) remote/local selector switch in remote position;
 - a.6) in case of micro-switches with the state dependent on the opening/closing of the boxes/carters of operating devices, they shall be represented disable (that is with boxes/carters open).
- b) report, only for gas CBs, the following pressures values at 20°C (relative values):
 - b.1) rated filling pressure;
 - b.2) threshold setting pressure of the 1st minimum gas density level (alarm, replenishment necessary);
 - b.3) threshold setting pressure of the 2nd minimum gas density level (block or automatic opening with open position blocking).
- c) contain the functional scheme, all information useful to identify the single wires and cables, the equipments wiring schemes (auxiliary contacts, relays, gas density control devices etc.), the topographic schemes for interconnections between boxes, the topographic schemes about all the electric components in Control box/Operating device box(es), the anti-mistake coding.

Further details are in the specific requirements and in annex C.

7.2.2 Latam specific requirements

The details of the requirements are in the annex C.3.

7.2.3 Endesa Distribucion specific requirements

The details of the requirements are in the annex C.1.

7.2.4 Enel Distributie and Enel Distribuzione specific requirements

7.2.4.1 Electric schemes


The electric schemes are indicatively represented (where applicable in case of vacuum CBs) in Figure 3 (for three-pole CBs), Figure 4 (for 72,5 ÷ 170 kV single-pole CBs) and Figure 5 (for 245 kV single-pole CBs) of Annex C.2. In these figures are also represented the two versions of “E” interface terminal board for substation control system.

Further reference conventional conditions are:

- a) for remote/local selector switch: S/P switch in S position and L/T switch (if present) in L position;
- b) unlocked under-voltage release for three-pole CBs;
- c) locked under-voltage releases for single-pole CBs.

7.2.4.2 Controls

The CBs operating logics are represented in the flowcharts in Annex C.2 (where applicable in case of vacuum CBs).

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It shall be reported in the terminal board the contacts referred to the following controls:

- a) single-pole CBs
 - a.1) drive circuit of shunt closing release control (CH-ABC)
 - a.2) 1st drive circuit of shunt opening release control (1° AP-A; 1°AP- B; 1°AP-C)
 - a.3) 2nd drive circuit of shunt opening release control (2° AP-ABC)
 - a.4) 3rd drive circuit of under-voltage release control (3° AP-ABC)
- b) three-pole CBs
 - b.1) drive circuit of shunt closing release control (CH-ABC)
 - b.2) 1st drive circuit of shunt opening release control (1° AP-ABC)
 - b.3) 3rd drive circuit of under-voltage release control (3° AP-ABC)

7.2.4.3 *Signalizations*

It shall be reported in the terminal board the contacts referred to the following signalizations:

- a) single-pole CBs
 - a.1) remote/local selector switch in local (P) position (43SP-Prova)
 - a.2) intervention of motor protection device and/or auxiliary supply missing (42RT)
 - a.3) anti-condensation circuit anomaly (AnR152)
 - a.4) motor maximum operation time (BX)
 - a.5) discharged springs (P4 MOLLE)
 - a.6) 1st minimum gas density level (P1 GAS)
 - a.7) 2nd minimum gas density level (P4 GAS)
 - a.8) open position (caX152)
 - a.9) close position (ccX152)
 - a.10) poles discrepancy (DP)
 - a.11) incongruence of drive circuit of under-voltage release control (3°AP-INC)
 - a.12) locking of drive circuit of under-voltage release control (BL3°AP-ABC)
 - a.13) open position (n° 3 152 NC)
 - a.14) close position (n° 3 152 NA)
- b) three-pole CBs
 - b.1) remote/local selector switch in local (P) position (43SP-Prova)
 - b.2) intervention of motor protection device and/or auxiliary supply missing (42RT)
 - b.3) anti-condensation circuit anomaly (AnR152)
 - b.4) motor maximum operation time (BX)
 - b.5) discharged springs (P4 MOLLE)
 - b.6) 1st minimum gas density level (P1 GAS)
 - b.7) 2nd minimum gas density level (P4 GAS)
 - b.8) open position (caX152)
 - b.9) close position (ccX152)
 - b.10) locking of drive circuit of under-voltage release control (BL3°AP-ABC)
 - b.11) open position (n° 3 152 NC)
 - b.12) close position (n° 3 152 NA)

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7.2.4.4 Specific requirements for 245 kV CBs

In case of single-pole CBs, the 2nd drive circuit of shunt opening release shall work in single-pole way and shall be, including everything is connected to it, galvanically separated respect to all other control and signalization circuits.

About the two 2nd minimum gas density level contacts, the 2nd circuit contact shall operate by mean of a suitable separator relay also on the terminal board signalizations of the 1st circuit, as well as on the closing block.

8 TESTING

8.1 General information

IEC 62271-100 applies.

The tests to be performed on CBs are divided in:

- Type tests;
- Routine tests;
- Commissioning tests.

8.2 Type tests

8.2.1 Visual inspection

The CB, complete of all accessories and fully assembled in operation layout, shall be subject to a visual inspection in order to verify its functional, dimensional and constructive compliance with this Global Standard.

8.2.2 Dielectric tests

(IEC 62271-100 par. 6.2)

8.2.3 Radio interference voltage (r.i.v.) tests

(IEC 62271-100 par. 6.3)

Not applicable for 72,5 kV CBs.

8.2.4 Measurement of the resistance of the main circuit

(IEC 62271-100 par. 6.4)

It shall be measured the contact resistance between each HV terminal and the correspondent CB plate: the measured value shall be $\leq 10 \mu\Omega$.

8.2.5 Temperature-rise tests

(IEC 62271-100 par. 6.5)

The temperature rise test shall be performed excluding the HV terminals.

8.2.6 Short-time withstand current and peak withstand current tests

(IEC 62271-100 par. 6.6)

8.2.7 Verification of the degree of protection


(IEC 62271-100 par. 6.7)

8.2.8 Tightness tests

(IEC 62271-100 par. 6.8)

Only in case of gas CBs (SF6 or non-fluorinated greenhouse gases).

The test must be done using test Qm, method 1 "Cumulative Test", IEC 60068-2-17.

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The initial gas concentration C_0 , with CB filled at rated pressure, shall be measured after at least 2 hours from pressurizing; the final concentration C_1 must be measured after more than 8 hours.

8.2.9 Electromagnetic compatibility (EMC) tests

(IEC 62271-100 par. 6.9)

8.2.10 Additional tests on auxiliary and control circuits

(IEC 62271-100 par. 6.10)

For this verification the manufacturer shall provide a paper copy of the CB electric schemes.

The correct operation of all controls, interlocking, automatic openings and signalizations shall be also verified.

The absorption curves of closing and opening (shunt and under-voltage) releases, taking note of the maximum values (inrush excluded), shall be registered in the following situations:

- at rated voltage;
- at 110% of the rated voltage;
- at 70% of the rated voltage, for opening releases;
- at 85% of the rated voltage, for closing release.

The absorption curves of the motors, taking note of the maximum values (inrush excluded) and of the springs charging times, shall be registered in the following situations:

- at rated voltage;
- at 110% of the rated voltage;
- at 85% of the rated voltage.

8.2.11 Mechanical and environmental tests

(IEC 62271-100 par. 6.101)

Humidity test is not required.

A new definition for operation with under-voltage release is added, similar to “opening time”, IEC 62271-100 par. 3.7.133 a):

“The opening time with under-voltage release is the time interval between the instant when the voltage drops suddenly to zero, the circuit breaker being in closed position, and the instant when the arcing contact are separated in all poles.”

In case of the under-voltage release is requested, its characteristics shall be verified in accordance with IEC 62271-1 (par. 5.8.4) at ambient temperature.

Moreover, for routine tests and commissioning tests purpose, the reference values and their tolerance at 110%, 100% and 70% of the rated voltage shall be provided.

8.2.12 Short-circuit current making and breaking tests

(IEC 62271-100 par. 6.102 to 6.106)

8.2.13 Critical current tests

(IEC 62271-100 par. 6.107)


If applicable (see 6.107.1)

8.2.14 Single-phase and double-earth fault tests

(IEC 62271-100 par. 6.108)

8.2.15 Short-line fault tests

(IEC 62271-100 par. 6.109)

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8.2.16 Out-of-phase making and breaking tests

(IEC 62271-100 par. 6.110)

8.2.17 Capacitive current switching tests

(IEC 62271-100 par. 6.111)

8.2.18 X-radiation test procedure for vacuum interrupters

(IEC 62271-1 par. 6.11)

Only in case of vacuum CBs.

8.2.19 Seismic qualification

If requested, CBs (including the support) shall be compliant with seismic qualification, according with standards listed in 4.2.3.

8.2.20 Protective treatments

Hot dip galvanized coatings on iron and steel components shall be verified in accordance with ISO 1461 by mean of magnetic flux equipments, performing at least 5 measures on each component, in uniform manner on the various surfaces, avoiding edges and angular parts.

The verification of other protective coatings shall be performed considering their characteristics: the manufacturer will indicate the minimum thickness allowed and the others characteristics.

8.2.21 Tests on insulators

The ceramic insulators shall be tested in accordance with IEC 62155.

The composite insulators shall be tested in accordance with IEC 61462.

8.2.22 Specific type tests

8.2.22.1 *Enel Distribuzione*

8.2.22.1.a) *Tests to verify the encloses endurance to gas internal pressure*

Only in case of gas CBs.

On the number and typologies of encloses provided by D.M. 1/12/1980 and subsequent modifications, it shall be performed the required tests to obtain ISPESEL certification for the verification of encloses endurance to gas internal pressure.

8.3 Routine tests

The Routine tests (also called acceptance tests) shall be made in the manufacturer's factory on each apparatus supplied, to ensure the product compliance with the sample approved during the conformity assessment (homologation, certification etc.) process and on which the type tests have been performed.

Test values/results shall be in compliance with rated values (and relative tolerances).

The manufacturer shall provide, for each CB supplied, the report of all measures and tests carried out.

8.3.1 Dielectric test on the main circuit


(IEC 62271-100 par. 7.1)

8.3.2 Tests on auxiliary and control circuits

(IEC 62271-100 par. 7.2)

Functional tests (par. 7.2.2 of IEC 62271-1) shall be done only at rated voltage. About density meters, the verification shall be performed at ambient temperature, in the real operating position, using nitrogen and no SF₆, with decreasing pressure values. The density meters verification can be also performed using SF₆, if precautions are taken to prevent SF₆ dispersion in the environment.

Dielectric tests (par. 7.2.4 of IEC 62271-1) shall be done applying 1 kV for 1 s.

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Electronic devices, motors etc. can be excluded by dielectric test only if agreed during the conformity assessment (homologation, certification etc.) process.

8.3.3 Measurement of the resistance of the main circuit

(IEC 62271-100 par. 7.3)

It shall be performed after mechanical operating tests.

The ambient temperature influence can be neglected.

The test can be performed without HV terminals, specifying it in the test report.

8.3.4 Tightness test

(IEC 62271-100 par. 7.4)

It shall be performed at least at 2nd minimum gas density level (block).

8.3.5 Design and visual checks

(IEC 62271-100 par. 7.5)

The checks shall be performed referring to conformity assessment (homologation, certification etc.) documents and verifying damage absence.

8.3.6 Mechanical operating tests

(IEC 62271-100 par. 7.101)

It shall be recorded:

- a. at V_{max} , V_n , V_{min} , closing (C) and opening (O) times, time spread (on each release);
 - a1. at V_{max} , V_n , V_{min} , opening (O) times, time spread of under-voltage release (if present – see 8.2.11) and it shall be verified its compliance with IEC 62271-1 par. 5.8.4;
- b. at V_n , close-open (CO) time and open-close-open (O – t – CO) cycle;
- c. at V_n , the operation time of one of each type (make and break) of auxiliary contacts, respect to the operation of main contacts on closing and on opening of CB;
- d. no-load travel curves.

The spring recharging time of the motor after a closing operation and its absorption (maximum value, inrush excluded) shall be measured only at V_n .

8.3.7 Protective treatments

The thickness of the protective coatings shall be verified according with 8.2.20.

8.3.8 Specific routine tests

8.3.8.1 *Enel Distribuzione*

8.3.8.1.a) *Tests to verify the encloses endurance to gas internal pressure*

Only in case of gas CBs.

Manufacturer shall provide the “*Certificazione di rispondenza*” (see D.M. 1/12/1980).


8.4 Commissioning tests

(IEC 62271-100 par. 10.2)

The Commissioning tests (also called on-site acceptance tests) shall be performed in the Enel Group Distribution Company plant on each apparatus supplied, after its installation.

The manufacturer, at the end of the on-site tests, will deliver the report containing the results of measures and tests performed on the CB.

This report, in paper and in electronic format (e.g. one or more “pdf” files) shall include also factory routine tests.

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8.4.1 Visual inspection, general checks and functionality test of the auxiliary and control circuits

The correct assembling (performed in accordance with manufacturer's drawings and instructions), the damages absence and the presence of all accessories and of the required documentation shall be verified.

Functionality tests of the auxiliary and control circuits shall be performed after dielectric tests. About density meters, the verification shall be performed with the same modalities of the routine test (see 8.3.2), paying attention to the ambient conditions (solar radiation, temperature) and, in case of three density meters, comparing between them the intervention threshold pressure measured values.

8.4.2 Mechanical Operating Tests

Before mechanical operating tests 10 C-O cycles on each release shall be performed.

It shall be recorded:

- a. at V_{max} , V_n , V_{min} , closing (C) and opening (O) times, time spread (on each release);
 - a1. at V_{max} , V_n , V_{min} , opening (O) times, time spread of under-voltage release (if present – see 8.2.11) and it shall be verified its compliance with IEC 62271-1 par. 5.8.4;
- b. at V_n , close-open (CO) time and open-close-open (O – t - CO) cycle;
- c. at V_n , the operation time of one of each type (make and break) of auxiliary contacts, respect to the operation of main contacts on closing and on opening of CB.

The spring recharging time of the motor after a closing operation and its absorption (maximum value, inrush excluded) shall be measured only at V_n .

8.4.3 Dielectric tests to the auxiliary and control circuits

Dielectric tests (par. 7.2.4 of IEC 62271-1) shall be performed applying 1 kV for 1 s.

Electronic devices, motors etc. can be excluded by dielectric test only if agreed during the conformity assessment (homologation, certification etc.) process.

8.4.4 Measurement of resistance to the main circuit

It shall be performed after mechanical operating tests.

The ambient temperature influence can be neglected.

The test have to be performed with HV terminals on CB plate.

It shall also be measured the contact resistance between each HV terminal and the correspondent CB plate: the measured value shall be $\leq 10 \mu\Omega$.

8.4.5 Tightness test

Only in case of gas CBs (SF6 or non-fluorinated greenhouse gases).

It shall be performed at rated pressure.

The test have to be done using test Qm, method 2 "Probing Test", IEC 60068-2-17, after all the other tests, eight hours after the gas filling (for example one night is enough).


Fittings, gas density control devices and piping shall be checked (HV insulators have been checked in manufacturer's factory).

The sensitivity of the sniffing device shall be at least $10^{-8} \text{ Pa} \times \text{m}^3/\text{s}$.

9 SUPPLY REQUIREMENTS

9.1 Tender's technical documentation

For each CB typology offered in the tender the supplier shall provide the Annex D properly filled.

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9.2 Conformity assessment

9.2.1 Conformity assessment process

The conformity assessment processes (homologation, certification etc.) are specified in the proper contractual documents.

9.2.2 Conformity assessment documentation

The project documentation that the supplier uses to manufacture each CB typology can be divided in Type A documents (public, not confidential) and Type B document (confidential).

For each Enel Group Distribution company requesting a specific CB typology, the manufacturer shall provide a specific documentation set according with the specific requirements stated in this document.

The Type A documentation shall consist at least in:

- 1) type A documents list;
- 2) type B documents list;
- 3) Annex D properly filled;
- 4) overall dimensions drawing, including the stresses transmitted to the foundations;
- 5) insulators drawings and characteristics;
- 6) electric diagram (see 7.2.1-c), low voltage components list included);
- 7) Control Box and Operating Device Box(es) layout drawings;
- 8) overall CB, Control Box and Operating Device Box(es) (with open/closed doors) pictures;
- 9) nameplate and labels drawings (Control Box and Operating Device Box(es), poles, coils etc.);
- 10) CBs installation, use and maintenance handbook/manual;
- 11) routine and commissioning tests:
 - a) test report form (two documents, one for factory tests and one for on-site tests);
 - b) reference values table (with tolerances);


Note: specific detailed instructions to verify the no-load travel curves during maintenance activity shall be included in CB's manual;
 - c) protective coatings (typology, minimum thickness, reference standards);
- 12) documentation of safety device for protection against pole excessive pressure (ISO 4126, only if present);
- 13) list of documentation, materials and accessories supplied;
- 14) only for gas CBs:
 - a) gas circuit(s) drawing;
 - b) gas density control device characteristics and drawings;
 - c) pressure/temperature table for rated density level, 1st minimum gas density level and 2nd minimum gas density level;
- 15) main sub-components suppliers list;
- 16) only for Enel Distribuzione, INAIL (ex ISPESL) Certification "Certificato di conformità del prototipo" - D.M. 01/12/1980;
- 17) only for Enel Distribuzione, Manufacturing and Control Plan (PFC).
- 18) Only for Endesa Distribución: List of components in the Control Box and data sheet of each one

9.3 Packaging, transport, storage and installation/testing

Par. 10.1 and 10.2 of IEC 62271-100 applies.

CB's package shall be suitable to guarantee:

- the protection during transport (including by ship, if necessary);

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- an elevation from the ground at least of 100 mm;
- the external storage for at least three months.


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

- 1) manufacturer name;
- 2) manufacturing year/month;
- 3) manufacturer designation type;
- 4) manufacturer serial number;
- 5) Enel component codification (see Annex A; i.e.: GSH001/1 - XXXXX);
- 6) contract number;
- 7) destination substation;
- 8) total weight;
- 9) lifting information (showing the points and the correct method of lifting);
- 10) only for Enel Distribuzione, the bar code, in accordance with PVR006.

With each CB the following items shall be supplied (items from 3 to 8 on paper):


- 1) the support structure (only if requested, including any interface plates if necessary) and the anchor bolts to the civil works (stainless or hot dip galvanized steel, chemical or expansion type);
- 2) springs hand-crank (and other tools according to the manufacturer design);
- 3) list of documentation, materials and accessories supplied;
- 4) overall dimensions drawing;
- 5) electric diagram;
- 6) CB installation, use and maintenance handbook/manual;
- 7) routine and commissioning tests:
 - a) routine (factory) test reports;
 - b) reference values table (with tolerances);
- 8) only for gas CBs:
 - a) dielectric gas;
 - b) pressure/temperature table for rated density level, 1st minimum gas density level and 2nd minimum gas density level;
- 9) one CD-Rom containing the whole type A documentation (pdf file format).

Waste (including packaging and the gas cylinders) shall be disposed by Manufacturer.

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ANNEX A – LOCAL COMPONENTS CODIFICATION

Type code	Edesur	Ampla	Ceará	Goiás	Sao Paulo	Chilectra	Codensa	Enel Distribuz.	Edelnor	Enel Distributie	Endesa D.E.
GSH001/1		4544579	6771180	6771180					150565		140032
GSH001/2									150568		
GSH001/3								150126		150126	140033
GSH001/4		6777842		6792841	305965 /305966	150047	150640	150127		150127	140034
GSH001/5	0103-2500										140035
GSH001/6											
GSH001/7								150186			
GSH001/8								150187			
GSH001/9						150050		150196			
GSH001/10							150612	150197	140918		
GSH001/11	0103-0303										
GSH001/12											

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ANNEX B – DIMENSIONAL DRAWINGS

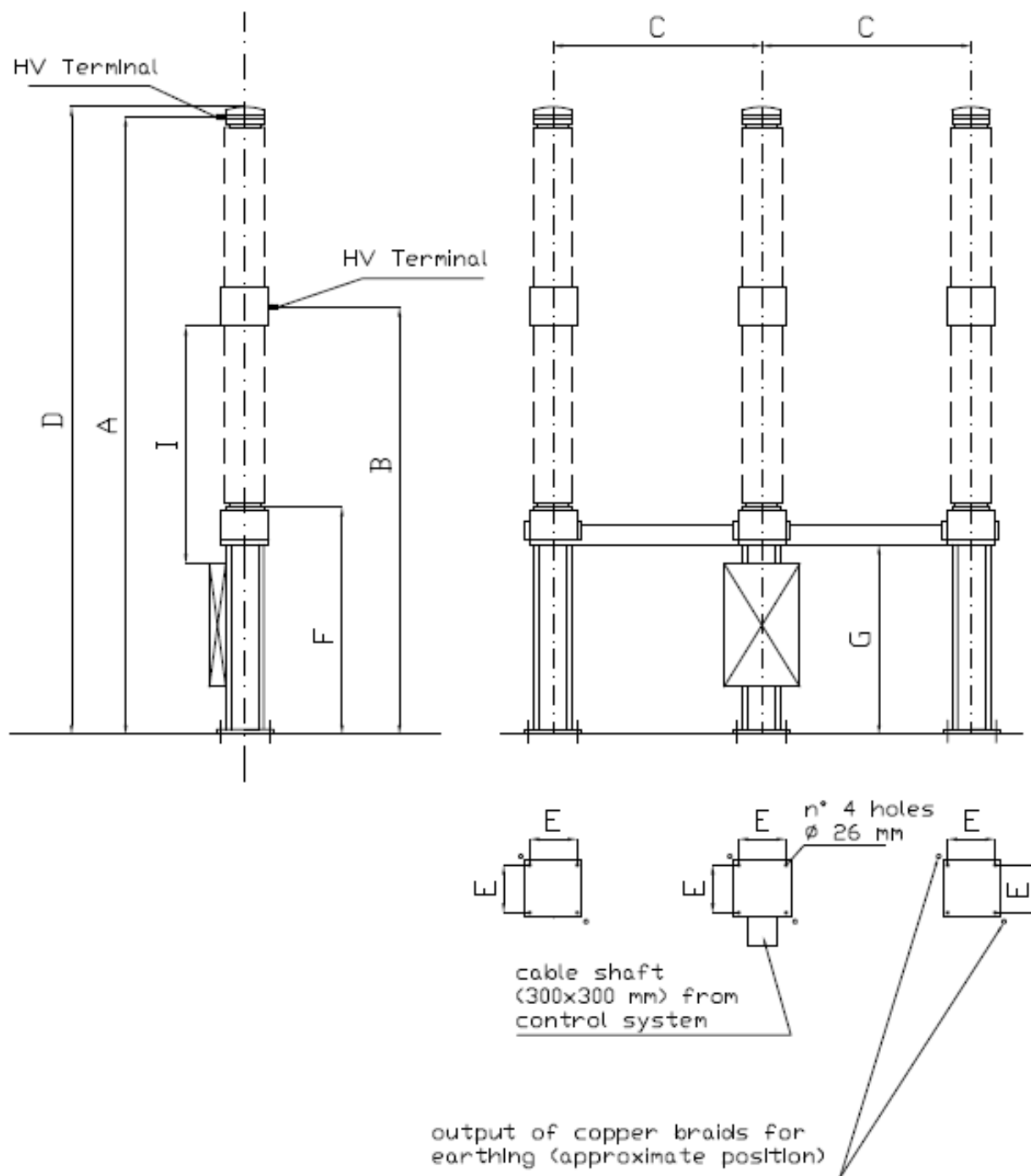



Figure 1

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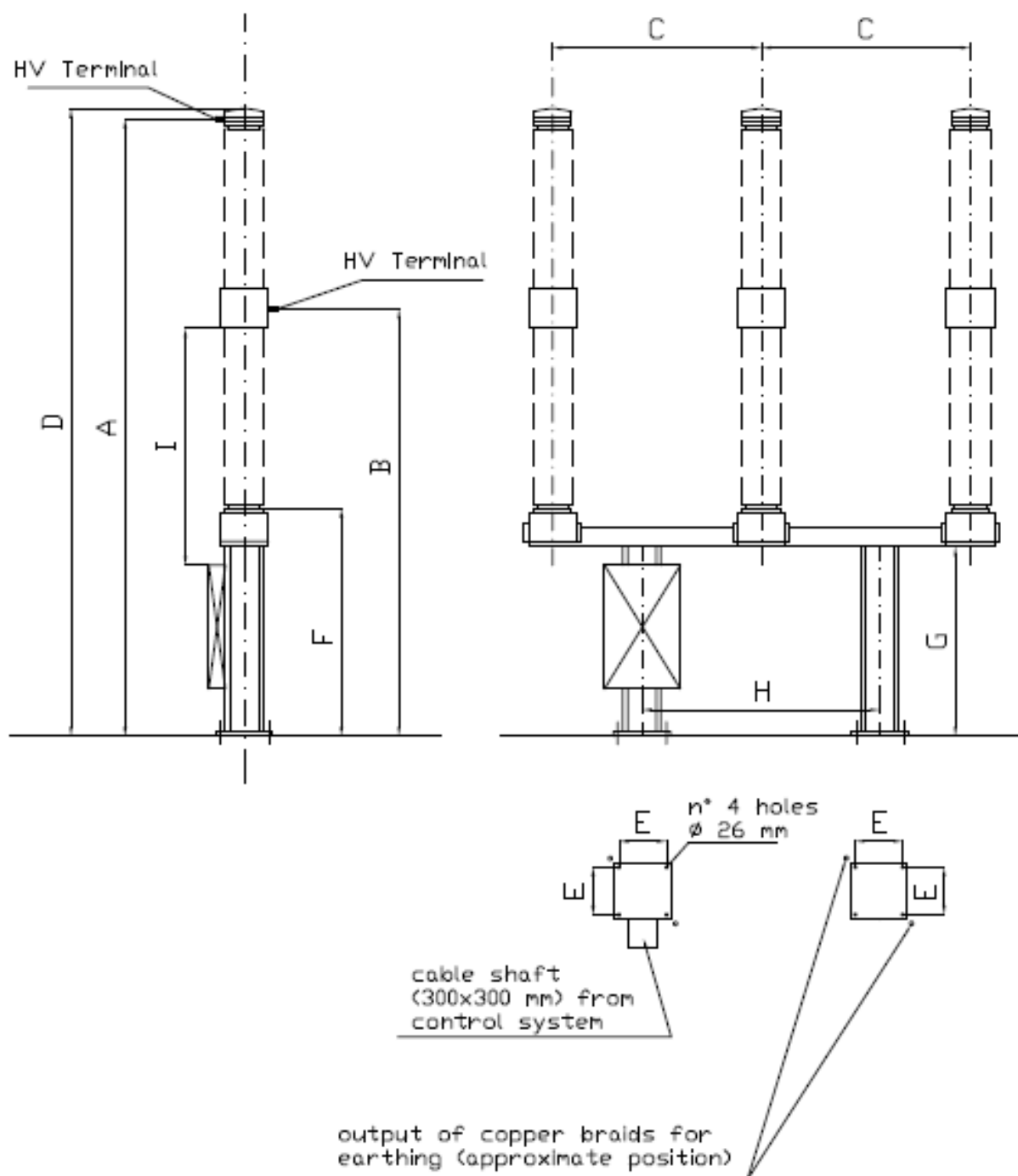



Figure 2

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Company	Ref. figure	A	B	C	D	E	F	G	H	I
Ampla	2	-	≥ 3100	≥ 790	≤ 4300	-	≥2250 ⁶	≥1700	-	-
Coelce	2	-	≥ 3100	≥ 790	≤ 4300	-	≥2250 ⁶	≥1700	-	-
Edelnor							≥2250 ⁶			
Endesa	2	-	≥ 3130	≥630	-	-	≥2300 ⁷	-		≥1400 ⁷

Table 1 – Dimensions for 72,5 kV CBs (in mm)⁸


Company	Ref. figure	A	B	C	D	E	F	G	H	I
Ampla	2	-	≥3600	≥1630	≤5200	-	≥2250 ⁶	≥2530		-
Chilectra			≥ 3500	≥ 1750	≤ 7000	400	≥2250 ⁶			
Codensa	2	≥ 5180	≥ 3630	≥ 1750	≥ 5480	370 x 230	≥2250 ⁶	2530		
Edesur			≥3700				≥2250 ⁶			
Endesa	2	-	≥ 3800	≥1300	-	-	≥2300 ⁷	-		≥2000 ⁷
Enel Distributie	1	≤6500	4500 ±30	2000	≤6500	500	≥2250 ⁶	≥2000		
Enel Distribuz.	1	≤6500	4500 ±30	2200	≤6500	500	≥2250 ⁶	≥2000		

Table 2 – Dimensions for 145 kV CBs (in mm)⁸

⁶ In accordance with par. 7.2.4 of IEC 61936-1

⁷ In accordance with Real Decreto Riesgo Eléctrico 614/2001 and NNM001.- Normas de operación definiciones. This distance is mandatory unless there is a physical barrier allowing distance I to be shorter.

⁸ Blank cell means that there isn't a mandatory requirement for that characteristic

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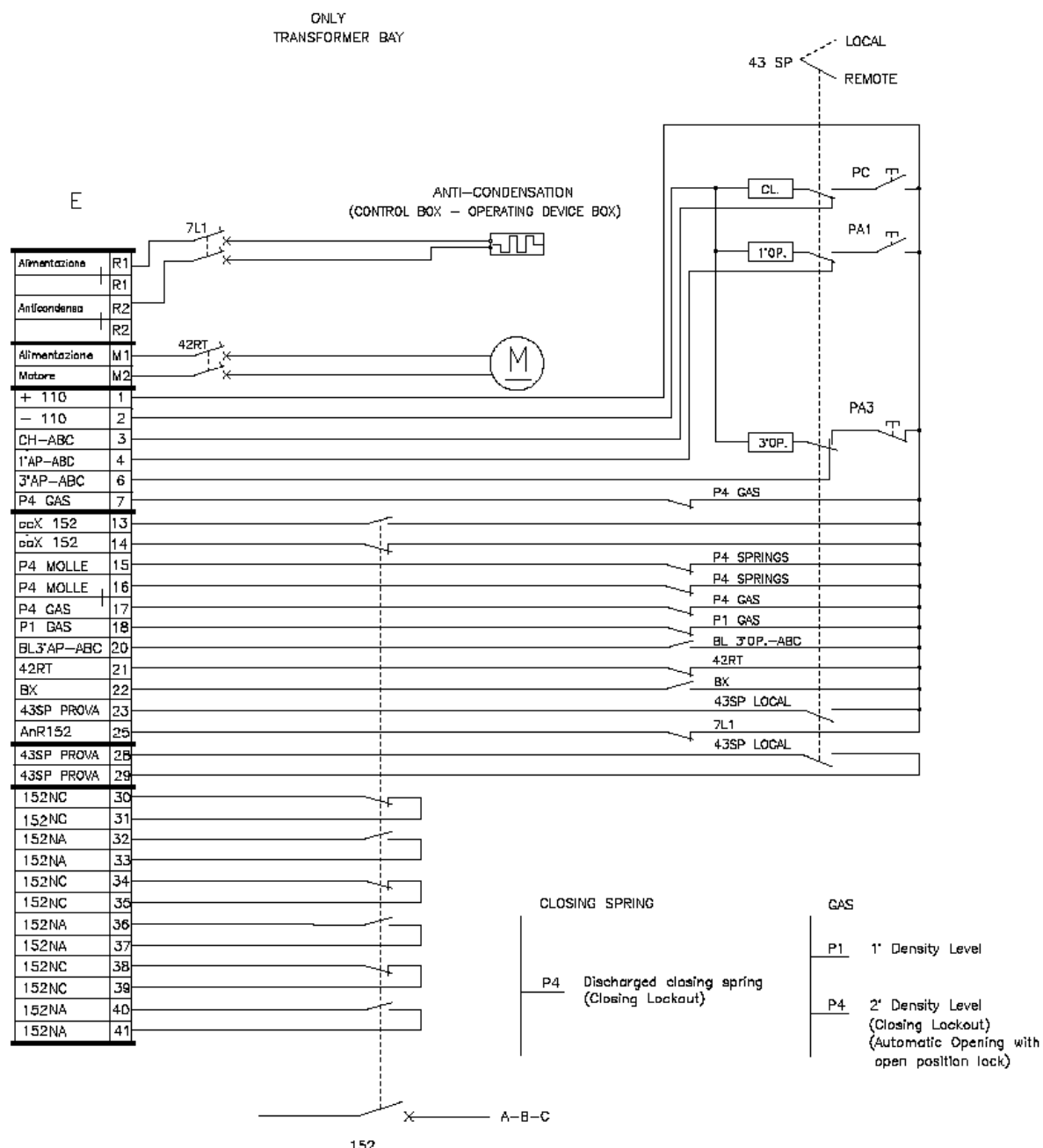
Company	Ref. figure	A	B	C	D	E	F	G	H	I
Enel Distribuz.	1	≤6500	4500 ±30	2200	≤6500	500	≥2250 ⁶	≥2000		

Table 3 – Dimensions for 170 kV CBs (in mm)⁸

Company	Ref. figure	A	B	C	D	E	F	G	H	I
Chilectra	1		≥4600	≥3500	≤8500	400	≥2250 ⁶			
Codensa							≥2250 ⁶			
Edelnor							≥2250 ⁶			
Edesur			≥4600				≥2250 ⁶			
Enel Distribuz.	1	≤8000	5300 ±30	3200		500	≥2250 ⁶	≥2000		

Table 4 – Dimensions for 245 kV CBs (in mm)⁸

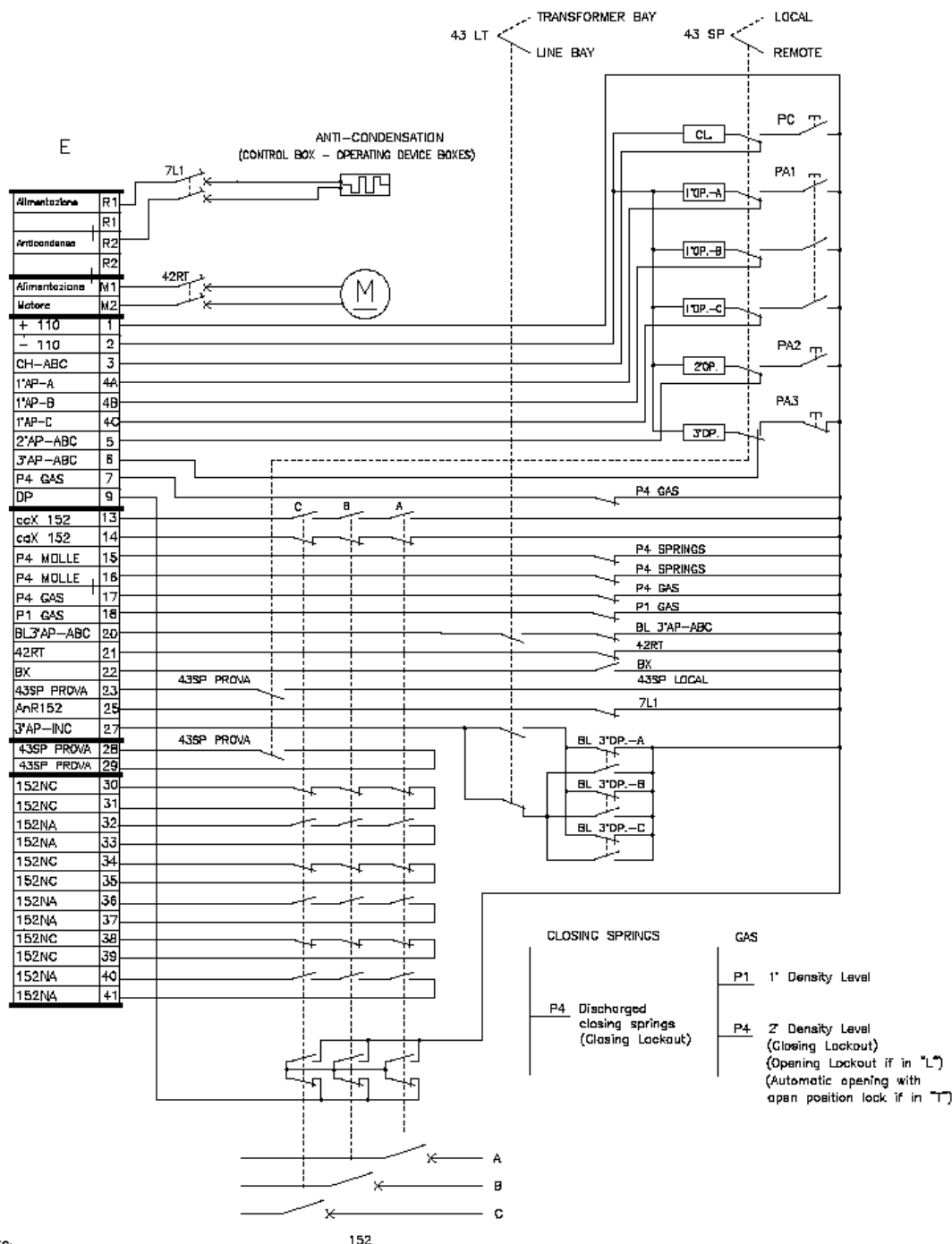
C.2 – ENEL DISTRIBUTIE AND ENEL DISTRIBUZIONE ELECTRICAL SCHEMES AND FLOWCHARTS



NOTE:

Circuit diagram – Reference conventional conditions: CB in open position, closing spring discharged, gas absence (only for gas insulated CB), 43 SP selector in S position, undervoltage release unlocked, absence of A.C. and D.C. auxiliary supplies.

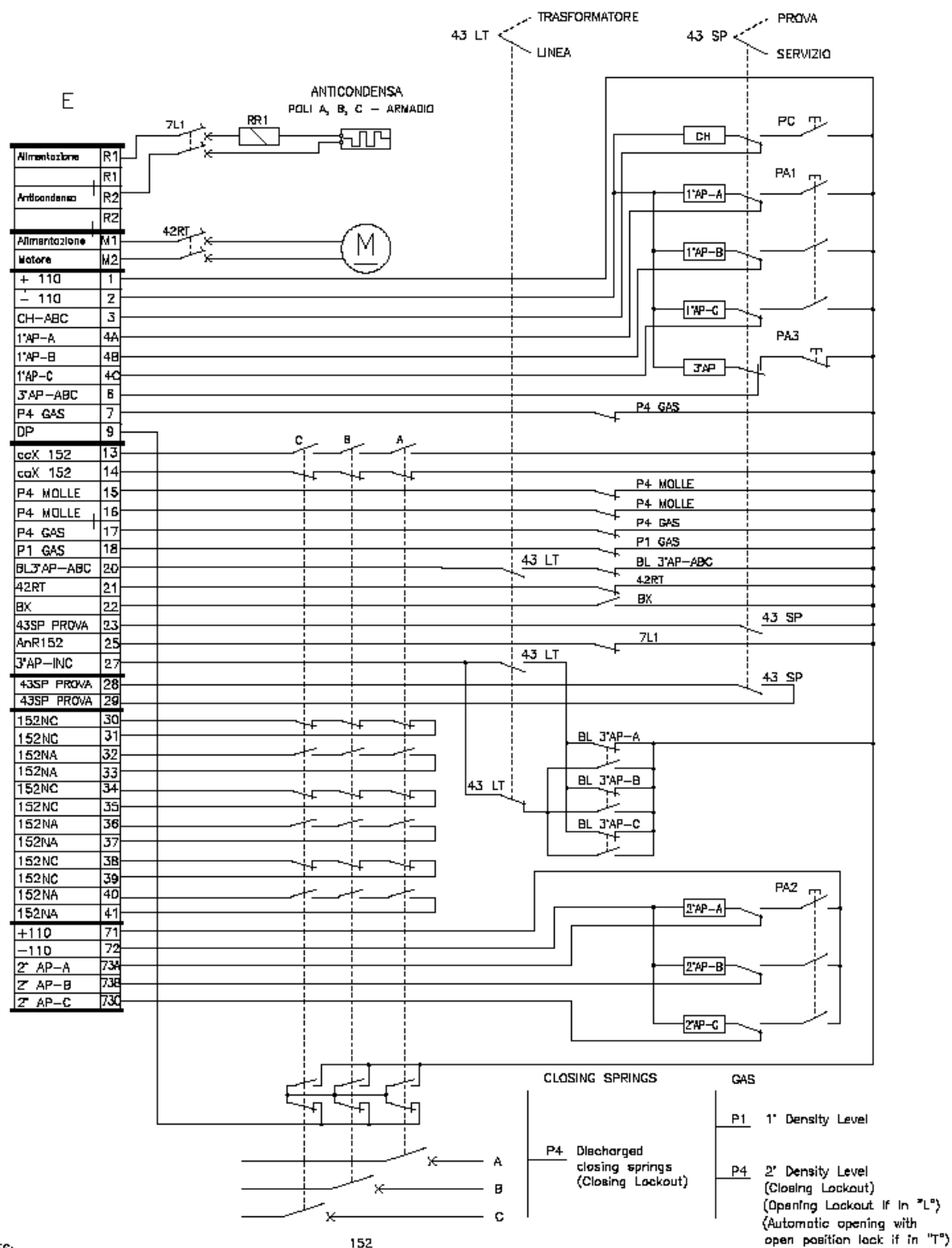
Figure 3 (three-pole CBs electrical scheme)



NOTES:

- 1) Circuit diagram - Reference conventional conditions: CB in open position, closing springs discharged, gas absence (only for gas insulated CB), 43 SP selector in S position, 43 LT selector in L position, undervoltage release locked, absence of A.C. and D.C. auxiliary supplies.
- 2) If CB is used in transformer bay, jumper between the groups of terminal blocks: 4A - 4B - 4C
2D - 21 - 22 - 23.
- 3) Only for gas insulated CB's: Low density gas CB's automatic opening (1° and 2° release) are ON if 43 LT selector is in T position.


Figure 4 (72,5 ÷ 170 kV single-pole CBs electrical scheme)



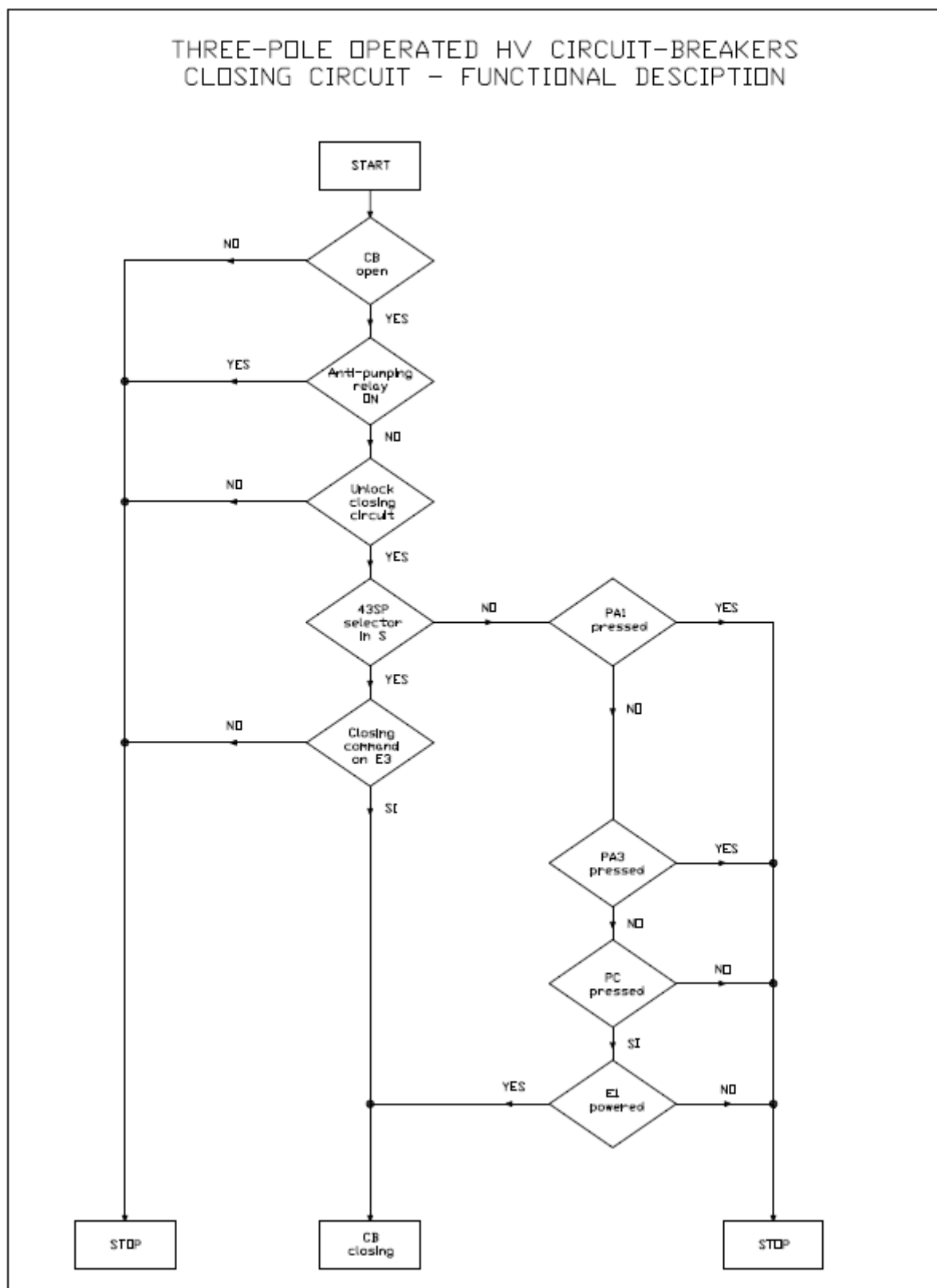
NOTES:

- 1) Circuit diagram - Reference conventional conditions: CB in open position, closing springs discharged, gas absence (only for gas insulated CB), 43 SP selector in S position, 43 LT selector in L position, undervoltage release locked, absence of A.C. and D.C. auxiliary supplies.
- 2) If CB is used in transformer bay, jumper between the groups of terminal blocks: 4A - 4B - 4C
2D - 21 - 22 - 23.
73A - 73B - 73C
- 3) Only for gas insulated CB's: Low density gas CB's automatic opening (1* and 2* release) are ON if 43 LT selector is in T position.

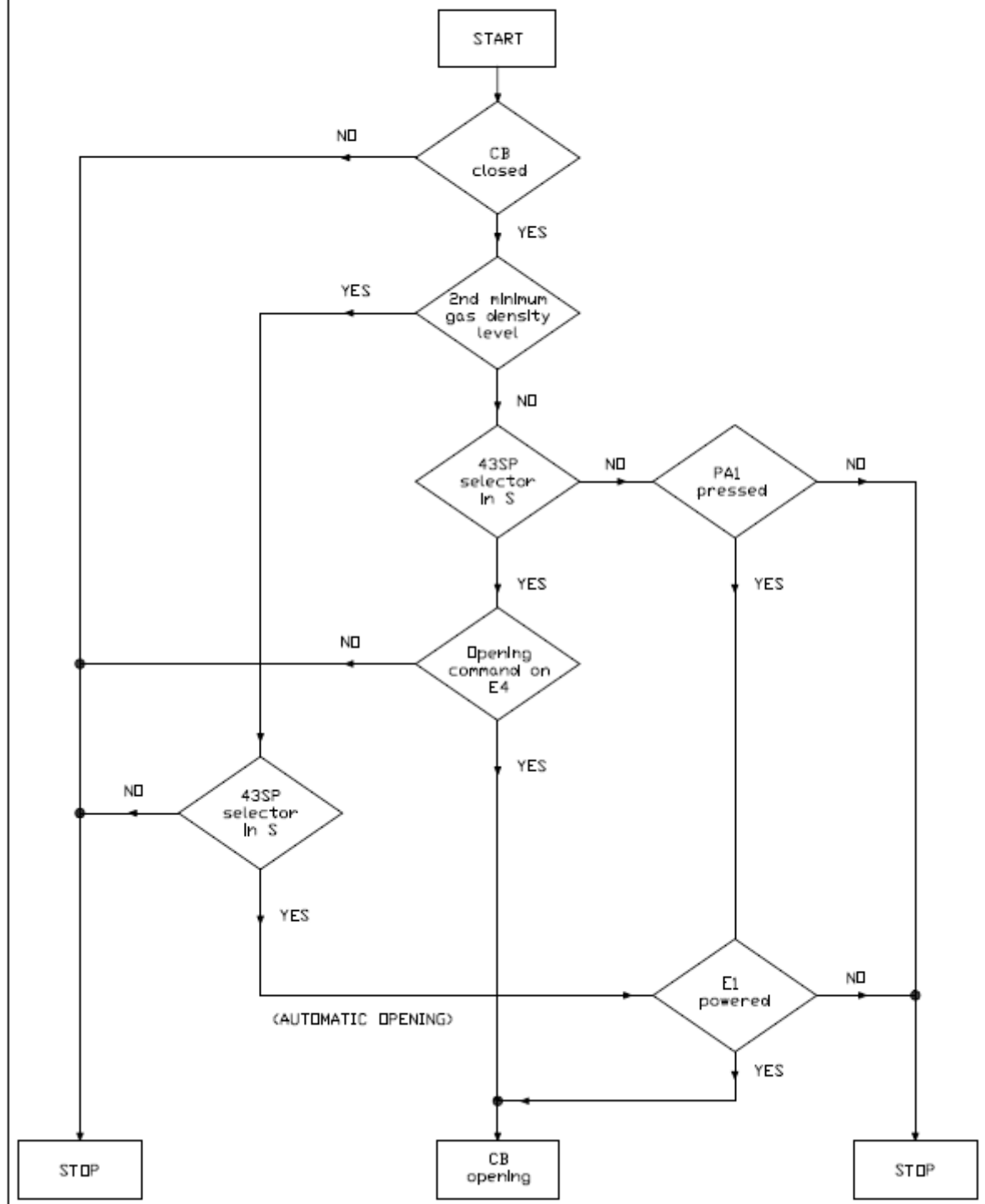
Figure 5 (245 kV single-pole CBs electrical scheme)

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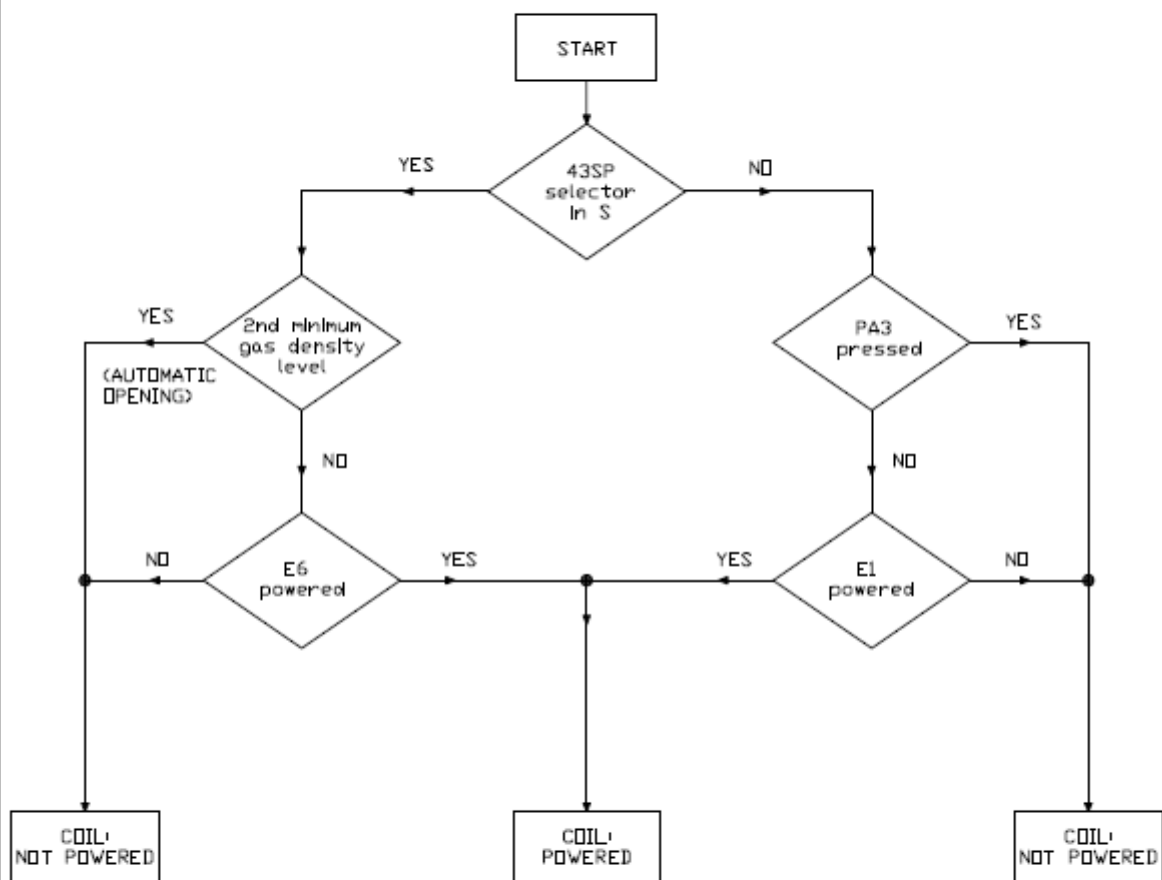
THREE-POLE CIRCUIT BREAKERS FLOWCHARTS:



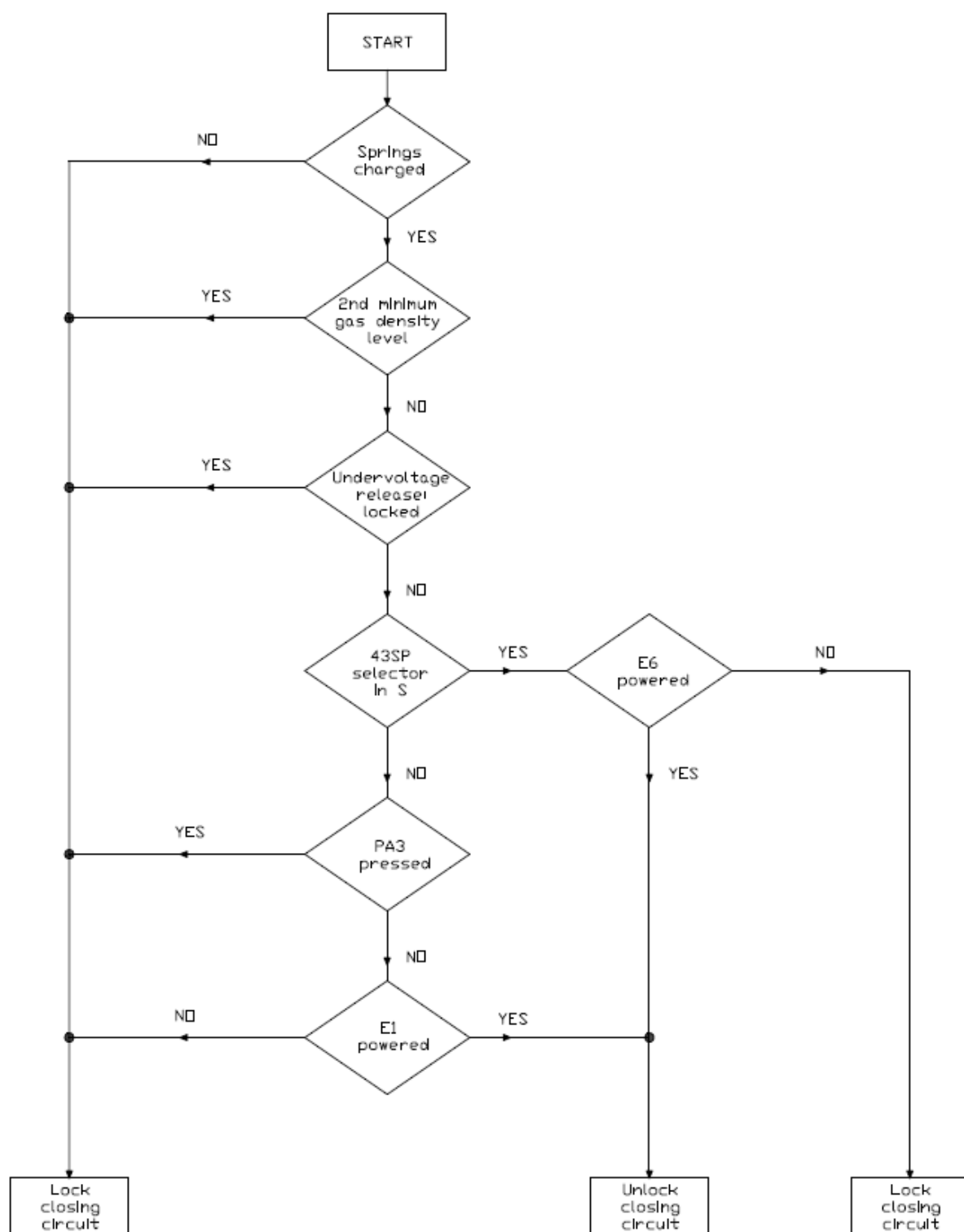
THREE-POLE OPERATED HV CIRCUIT-BREAKERS 1st OPENING CIRCUIT - FUNCTIONAL DESCRIPTION




THREE-POLE OPERATED HV CIRCUIT-BREAKERS
3rd OPENING CIRCUIT - FUNCTIONAL DESCRIPTION
(UNDER-VOLTAGE RELEASE)

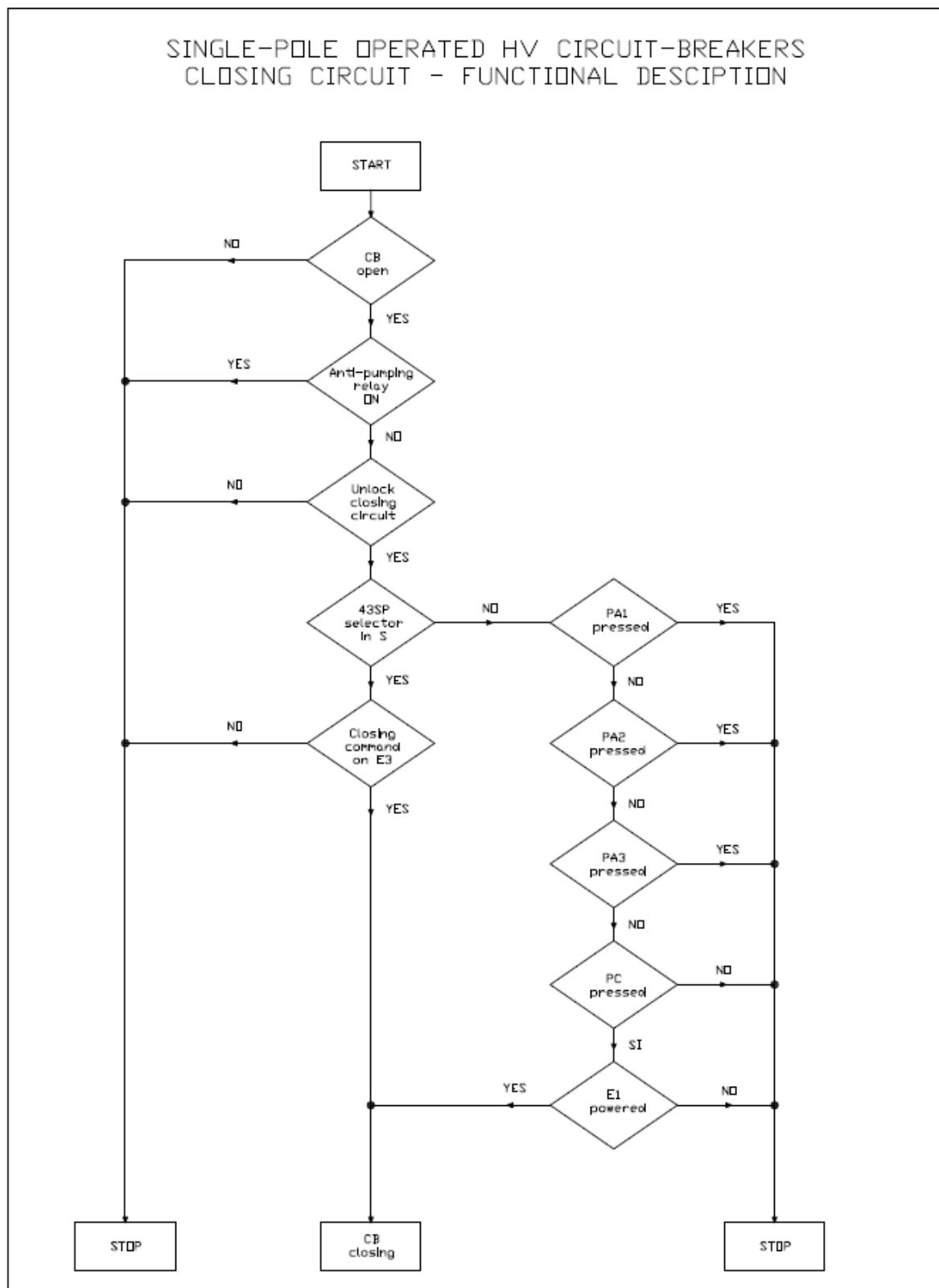


THREE-POLE OPERATED HV CIRCUIT-BREAKERS LOCK/UNLOCK CLOSING CIRCUIT - FUNCTIONAL DESCRIPTION

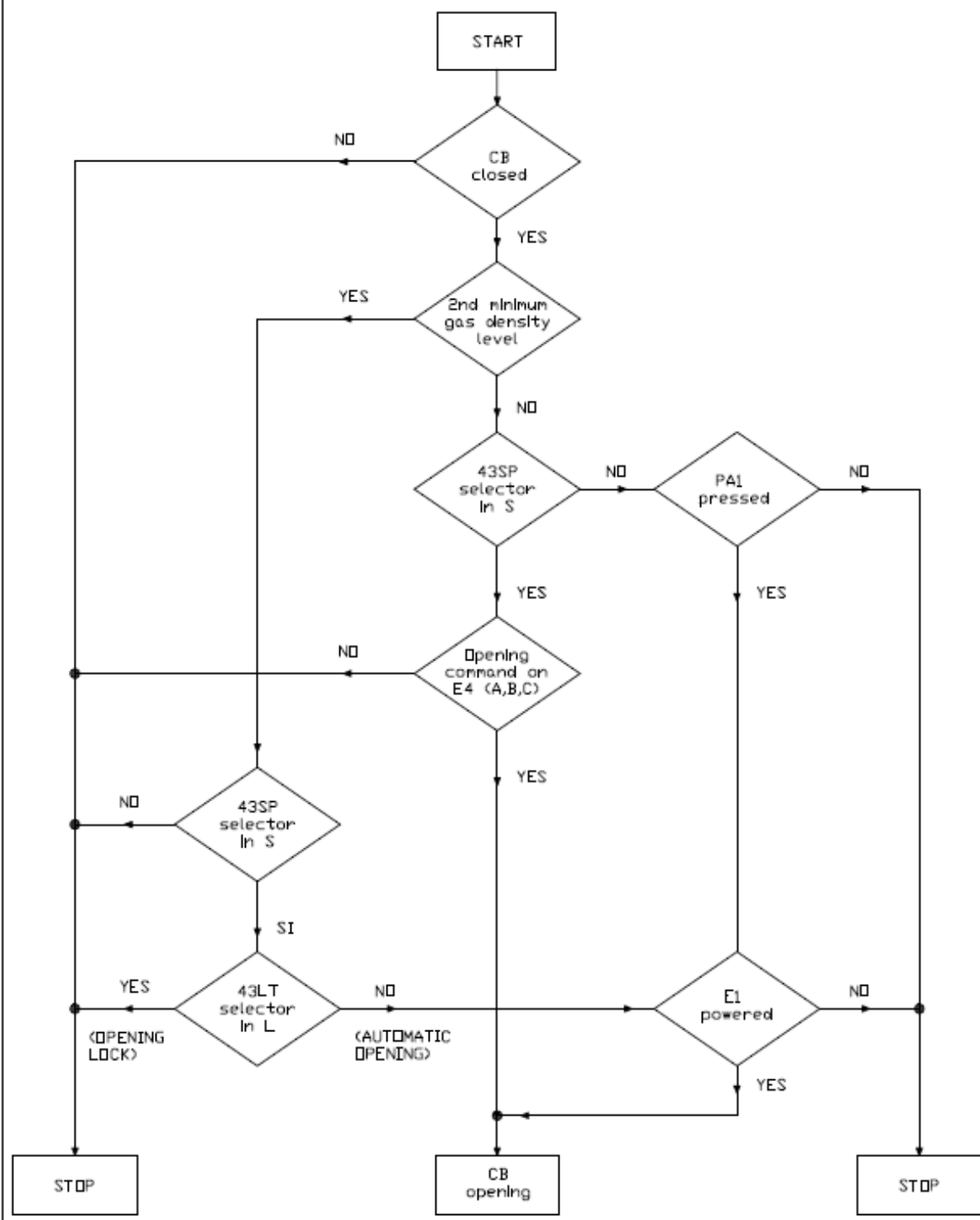


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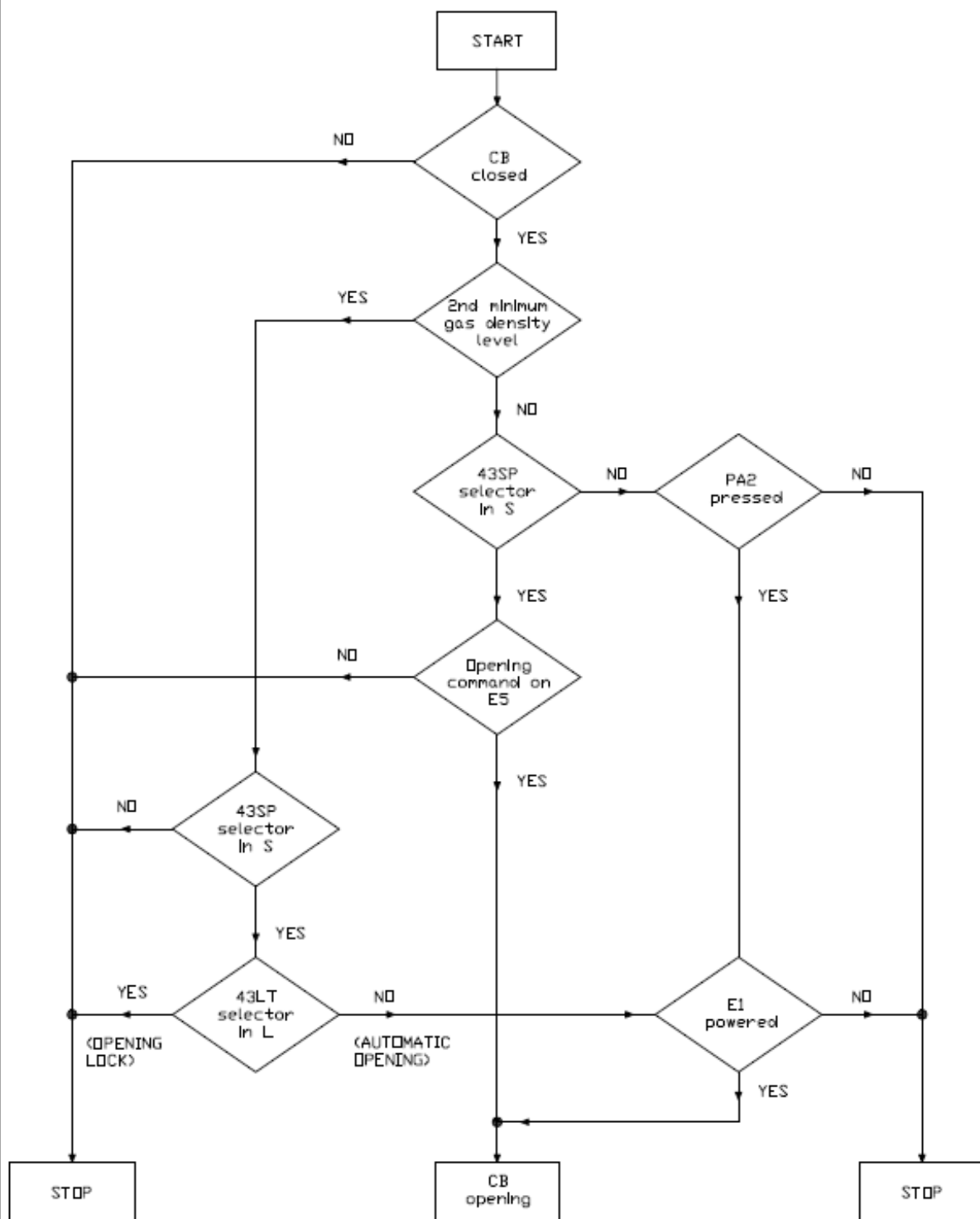
SINGLE-POLE CIRCUIT BREAKERS FLOWCHARTS:




SINGLE-POLE OPERATED HV CIRCUIT-BREAKERS 1st OPENING CIRCUIT - FUNCTIONAL DESCRIPTION

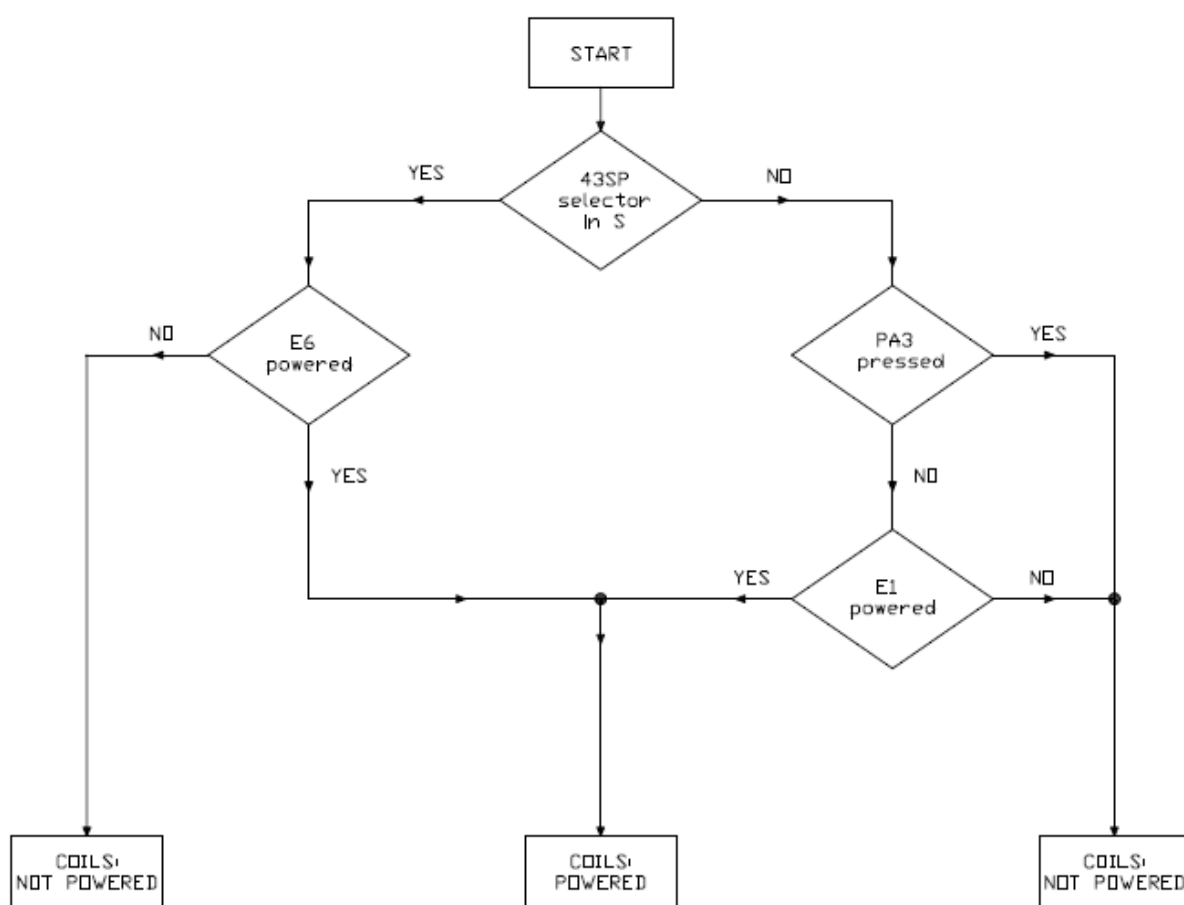


SINGLE-POLE OPERATED HV CIRCUIT-BREAKERS 2nd OPENING CIRCUIT - FUNCTIONAL DESCRIPTION

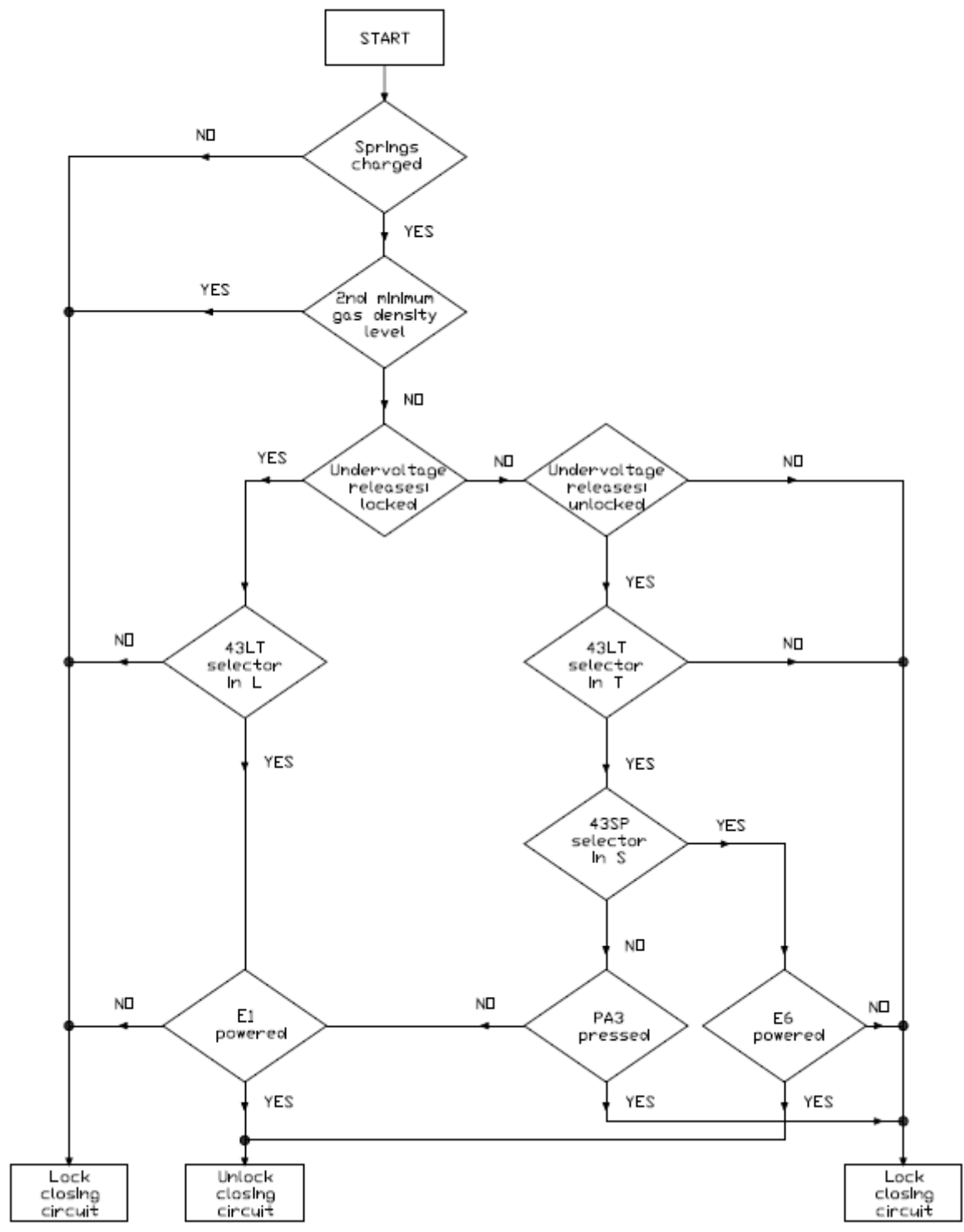



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SINGLE-POLE OPERATED HV CIRCUIT-BREAKERS
3rd OPENING CIRCUIT - FUNCTIONAL DESCRIPTION
(UNDER-VOLTAGE RELEASE)



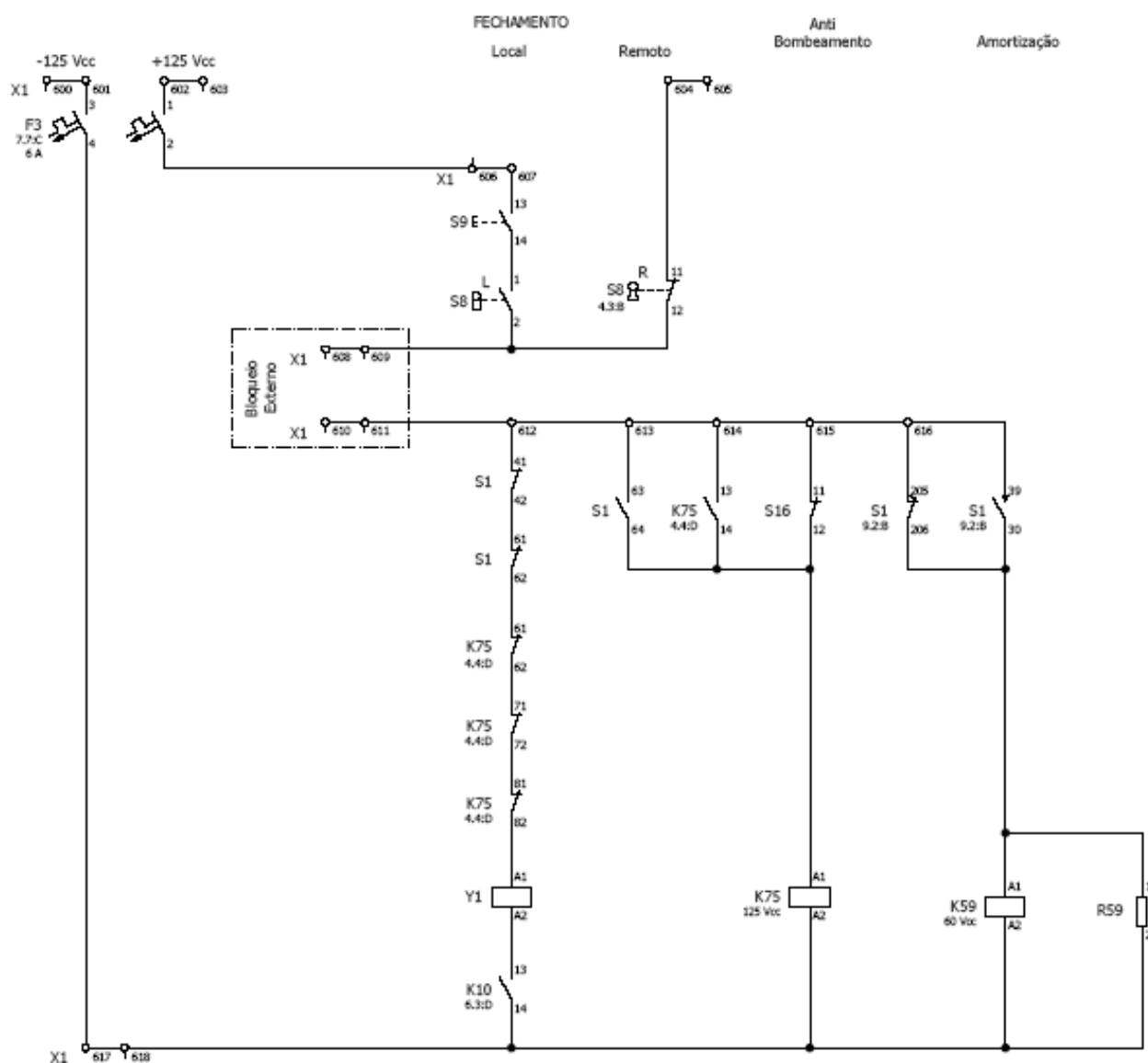
SINGLE-POLE OPERATED HV CIRCUIT-BREAKERS LOCK/UNLOCK CLOSING CIRCUIT - FUNCTIONAL DESCRIPTION

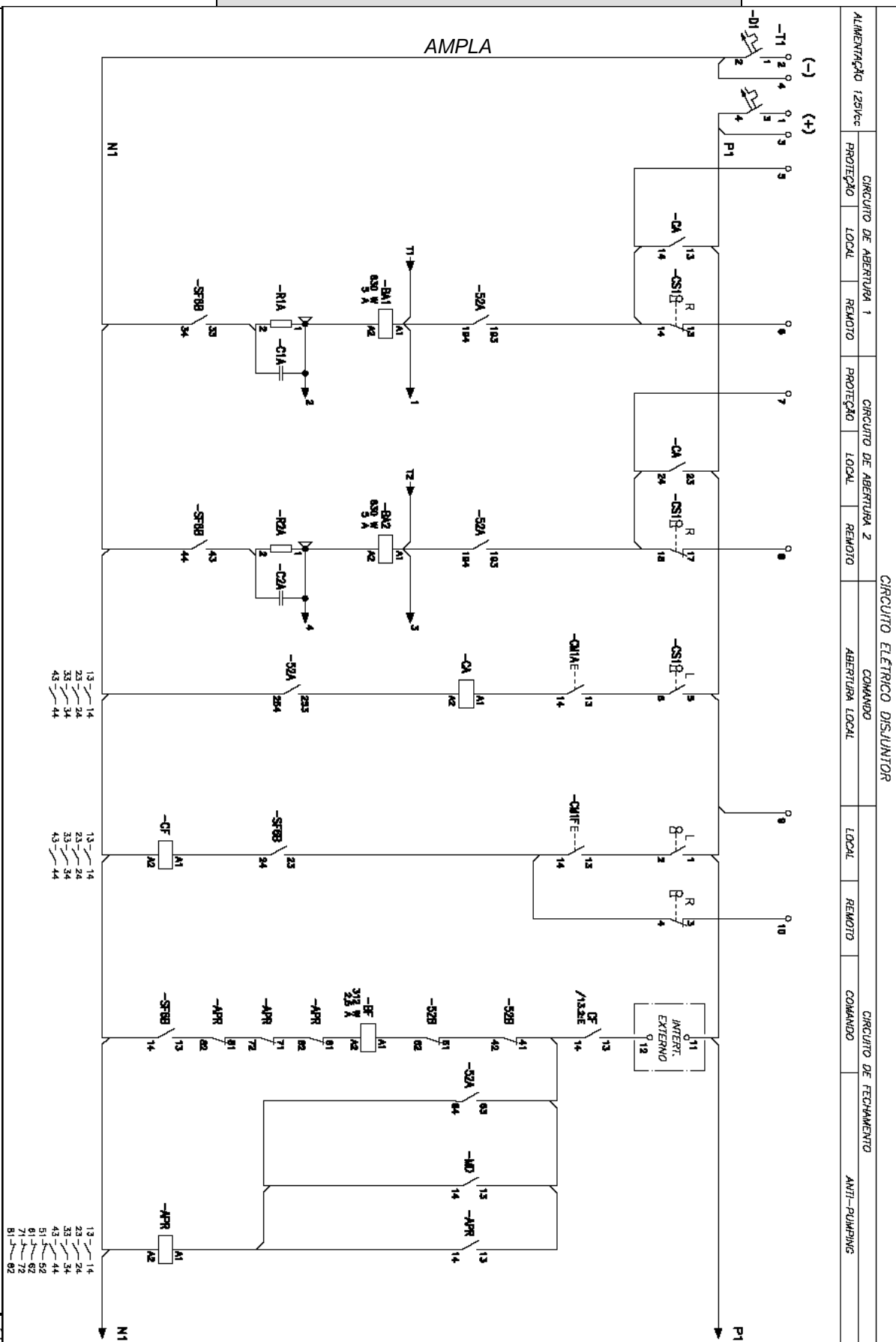


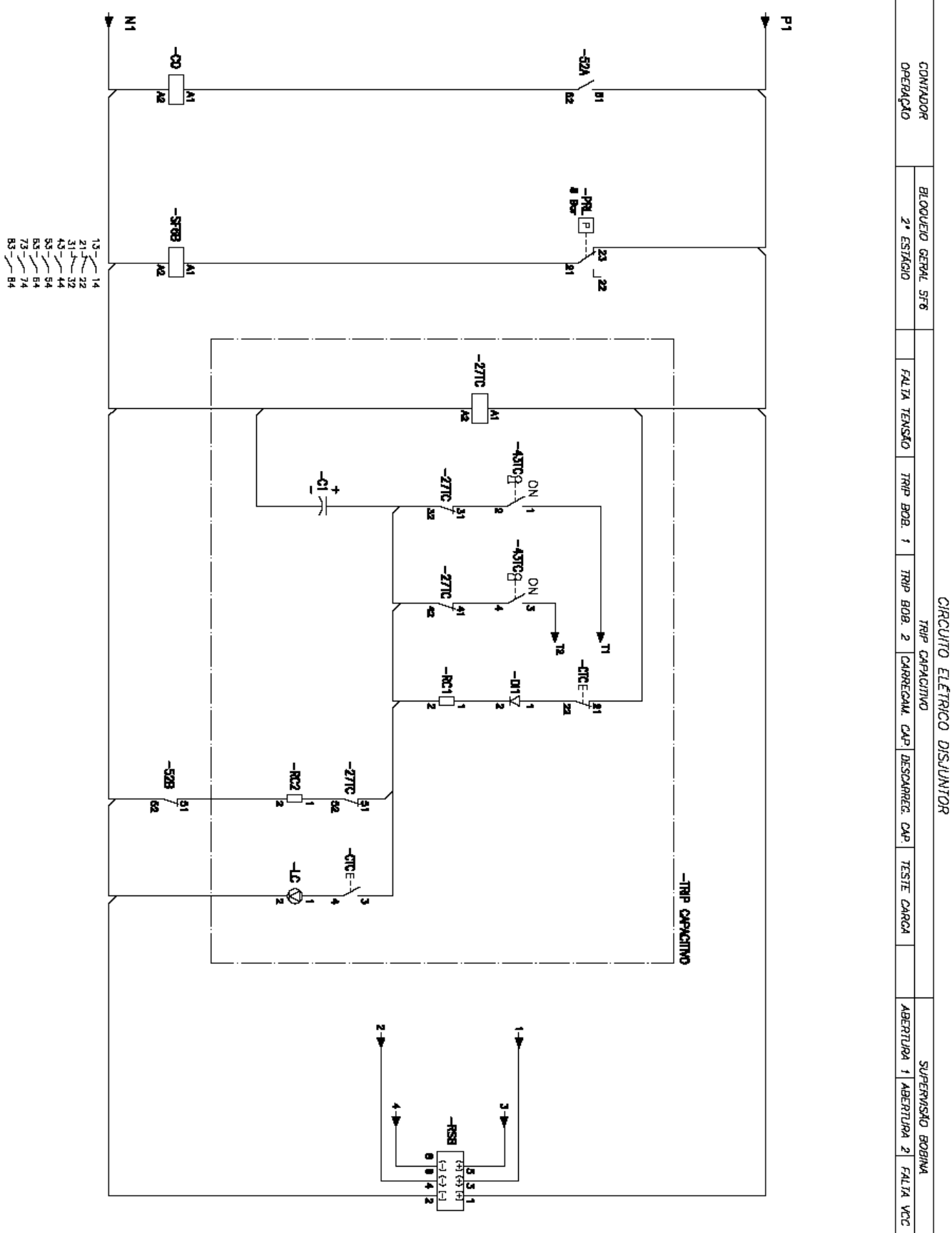
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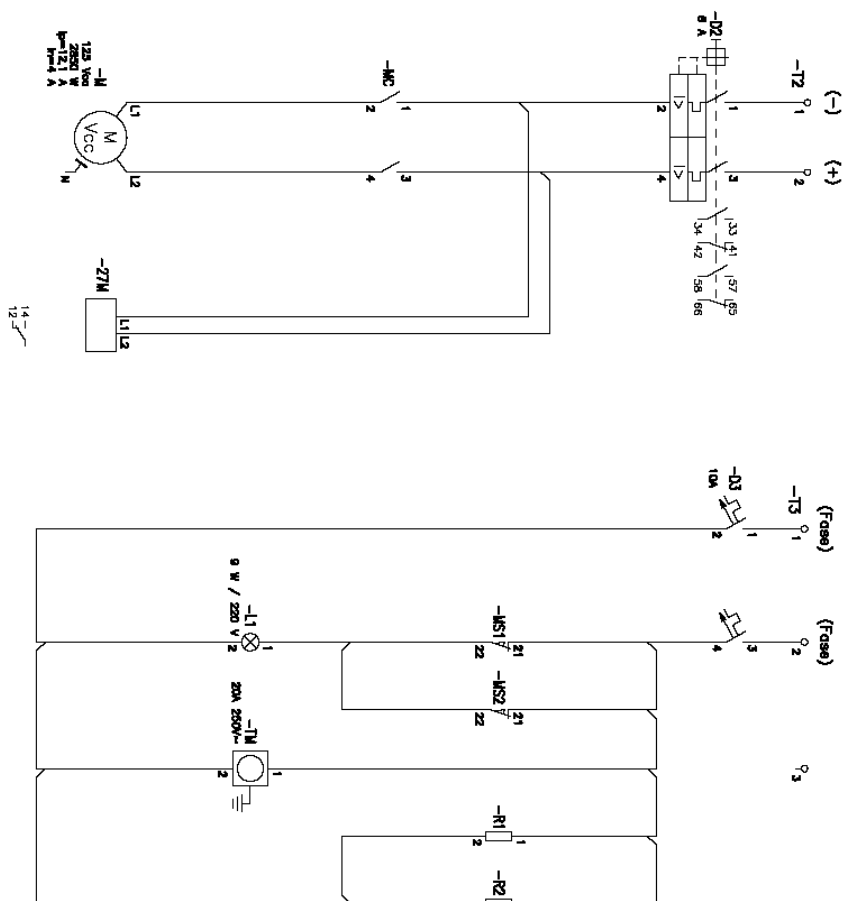
C.3 – LATAM ELECTRICAL SCHEMES

COELCE:







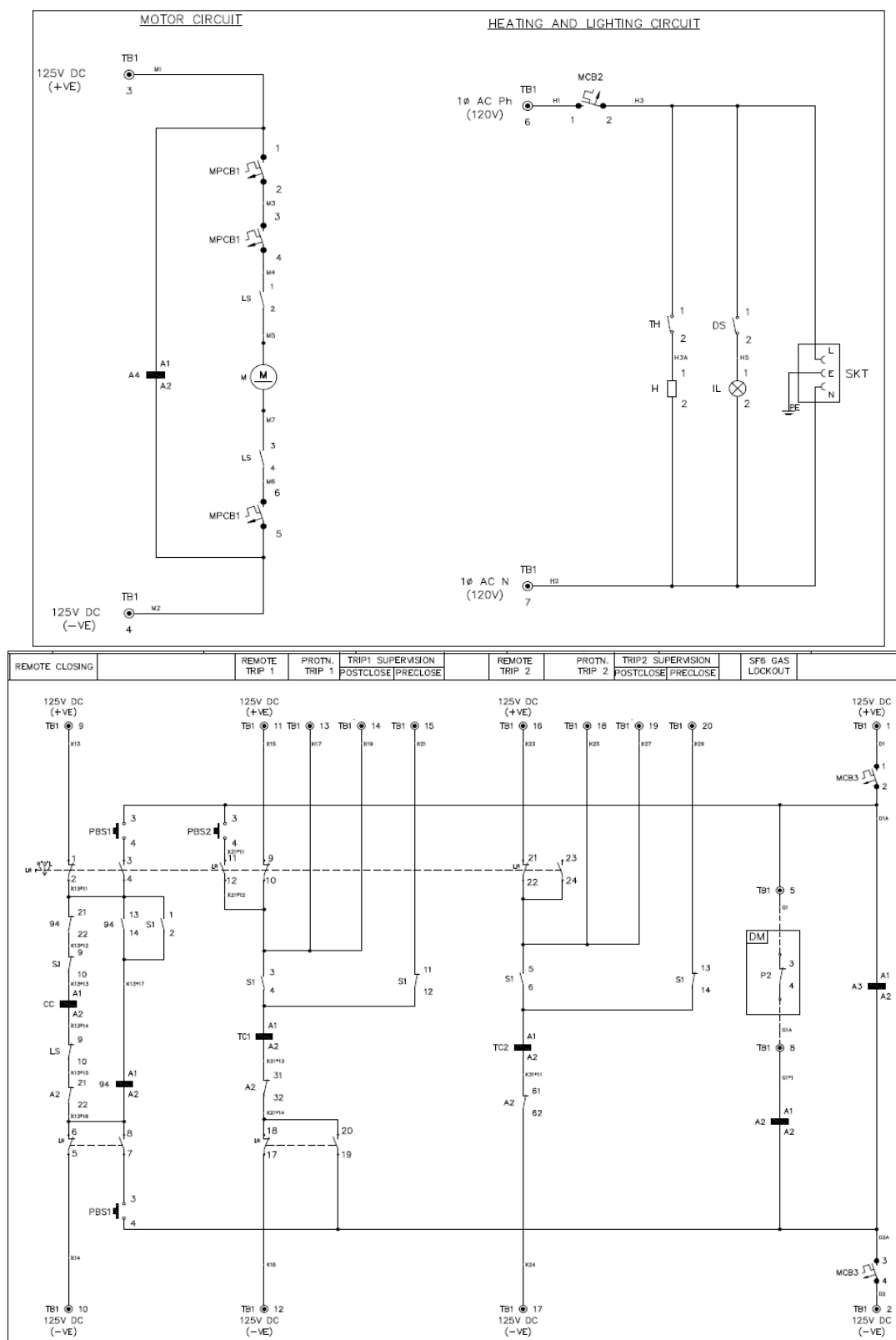


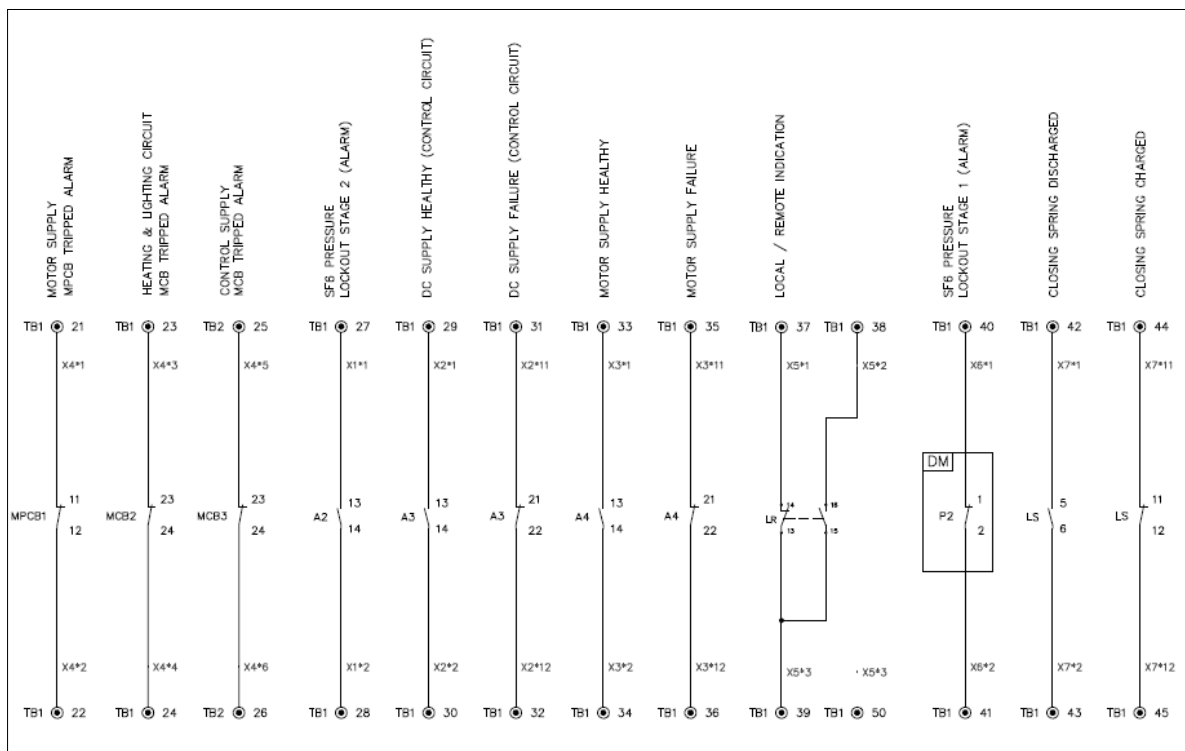
ALIMENTAÇÃO	SUPERAVISO	CIRCUITO DE ILUMINAÇÃO, AQUECIMENTO E TOMADAS	
MOTOR - 125V/c	TENSÃO MOTOR	LÂMPADA	AQUECIMENTO

APR	RELÉ DE ANTI-PUMPING (ANTI-PUMPING RELAY)
BA1	BOBINA DE ABERTURA 1 (OPENING COIL 1)
BA2	BOBINA DE ABERTURA 2 (OPENING COIL 2)
BF	BOBINA DE FECHAMENTO (CLOSING COIL 1)
CA	COMANDO DE ABERTURA (OPENING COMMAND)
CF	COMANDO DE FECHAMENTO (CLOSING COMMAND)
CH1A	COMANDO MANUAL DE ABERTURA (MANUAL OPENING COMMAND)
CH1F	COMANDO MANUAL DE FECHAMENTO (MANUAL CLOSING COMMAND)
CO	CONTIDOR DE OPERAÇÕES (OPERATING COUNTER)
CS1	CHAVE SELECÇÃO LOCAL/REMOTO (LOCAL/REMOTE SWITCH)
CTC	CHAVE TESTE TRIP CAPACITIVO (CAPACITIVE TRIP TEST KEY)
C1	CAPACITOR DE TRIP CAPACITIVO (CAPACITIVE TRIP CAPACITOR)
C1A	CAPACITOR CIRCUITO DE ABERTURA 1 (OPENING CIRCUIT 1 CAPACITOR)
C2A	CAPACITOR CIRCUITO DE ABERTURA 2 (OPENING CIRCUIT 2 CAPACITOR)
D1	DIDO DO CIRCUITO DE TRIP CAPACITIVO (CAPACITIVE TRIP DIODE)
D1	MINIDISJUNTOR CIRCUITO DE COMANDO (CONTROL CIRCUIT BREAKER)
D2	MINIDISJUNTOR CIRCUITO DE COMANDO (CONTROL CIRCUIT BREAKER)
D3	MINIDISJUNTOR CIRCUITO AUXILIAR CA (AUXILIARY AC CIRCUIT BREAKER)
LC	LÂMPADA DO CIRCUITO DE TRIP CAPACITIVO (CAPACITIVE TRIP LAMP)
L1, L2	LÂMPADAS DO ARRANQUE DE CONTROLE (CONTROL LAMP AC)
M	MOTOR 1250C (MOTOR 1250C)
MC	MOLA CARREGADA (CHARGED SPRING)
MO	MOLA DESCARREGADA (UNCHARGED SPRING)
MS1,MS2	MICROSWITCH DO CIRCUITO CA (AC CIRCUIT MICROSWITCH)
PR1	PRESSOSTATO SFS (SFS PRESSURE SWITCH)
RC1, RC2	RESISTORES CIRCUITO DE TRIP CAPACITIVO (CAPACITIVE RESISTORS)
REB	RELÉ DE SUPERVIMDO DE BOBINA (COIL SUPERVISION RELAY)
RI1,2	RESISTORES DE AQUECIMENTO (HEATING RESISTORS)
RIA	RESISTOR DO CIRCUITO DE ABERTURA 1 (OPENING CIRCUIT 1 RESISTOR)
R2A	RESISTOR DO CIRCUITO DE ABERTURA 2 (OPENING CIRCUIT 2 RESISTOR)
SFBB	RELÉ DE BLOQUEIO DE SFS (SFS BLOCKING RELAY)
TM	TOMADA 220VCA (ELECTRICAL SOCKET 220VAC)
27M	RELÉ DE TENSÃO DO MOTOR (VOLTAGE SUPERVISION RELAY)
27V1	RELÉ DE TENSÃO CIRCUITO DE TRIP CAPACITIVO (CAPACITIVE TRIP VOLTAGE SUPERVISION RELAY)
43TIC	CHAVE LIGA/DESLIGA TRIP CAPACITIVO (CAPACITIVE TRIP ON/OFF SWITCH)
52A	DISJUNTOR FECHADO (CLOSED CIRCUIT BREAKER)
52B	DISJUNTOR ABERTO (OPENED CIRCUIT BREAKER)

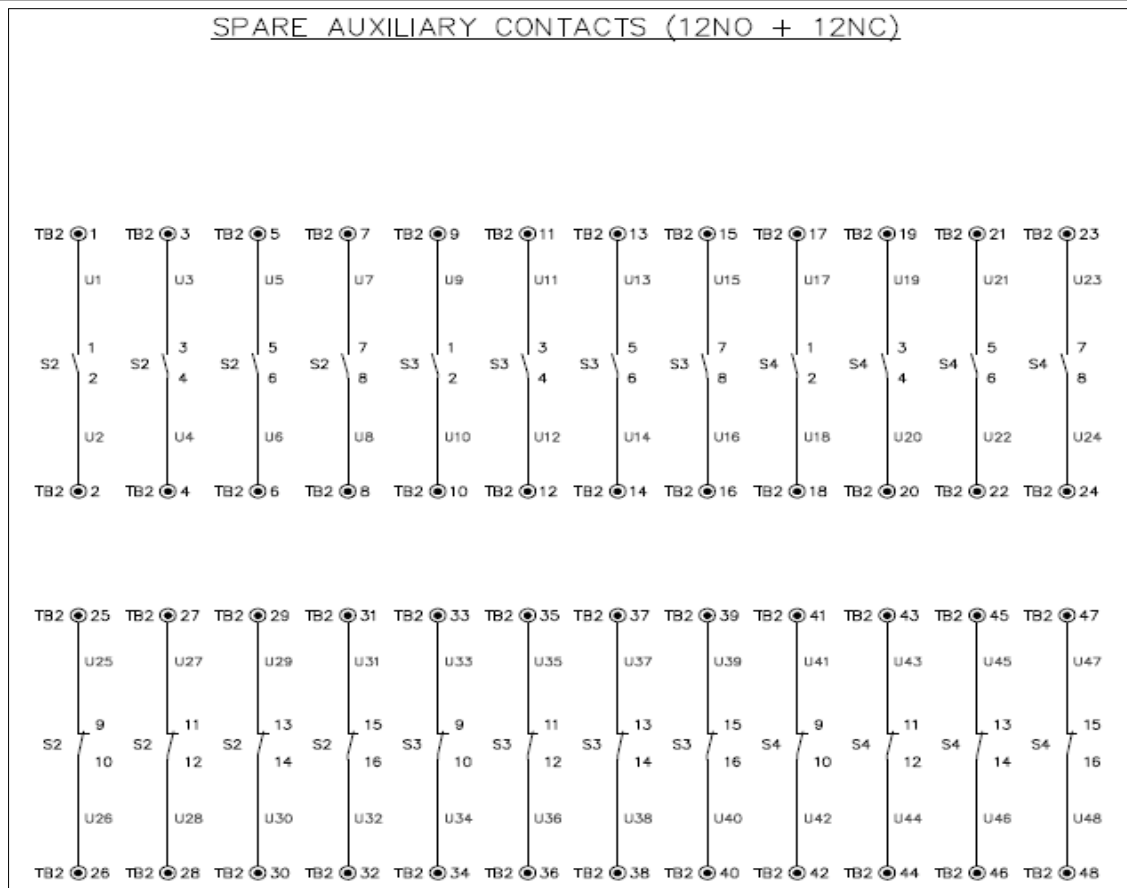



CODENSA



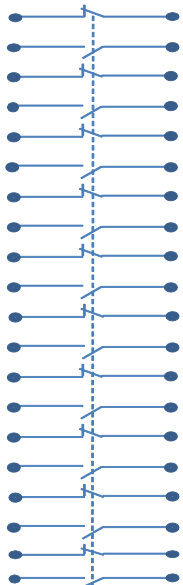



SPARE AUXILIARY CONTACTS (12NO + 12NC)



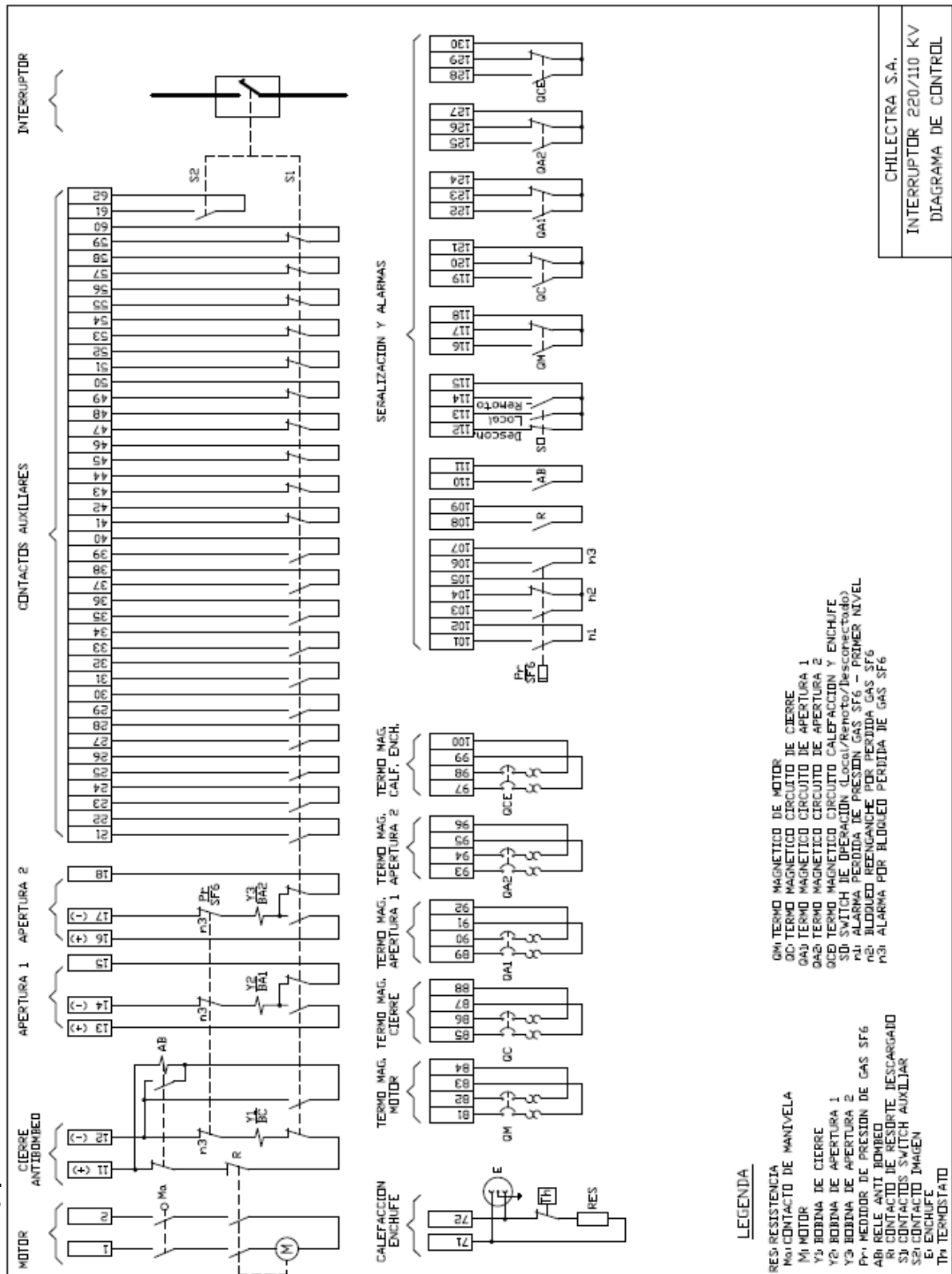
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EDELNOR

MOTOR	CIERRE Y ANTIBOMBEO	APERTURA 1	APERTURA 2	CONTACTOS AUXILIARES	SEÑALES Y CONTROLES SF6	CALEFACCION
INFORMACION DEL FABRICANTE					INFORMACION DEL FABRICANTE	

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CHILECTRA:



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	HV CIRCUIT-BREAKERS	GSCH001 Rev. 02 17/12/2020

ANNEX D – TENDER’S TECHNICAL DOCUMENTATION

GLOBAL STANDARD: GSH001 – HV Circuit Breakers	TENDER:	
SUPPLIER:	FACTORY:	
ENEL GROUP TYPE CODE: GSH001/___	SUPPLIER MODEL:	
TECHNICAL CHARACTERISTICS	STANDARD REQUIREMENT	SUPPLIER OFFER
<i>Service conditions</i>	outdoor normal service conditions of IEC 62271-1	
<i>Reference altitude (m)</i>	< 1.000 (2.600 for Colombia)	
<i>Minimum ambient air temperature (°C)</i>	-25 (-30° for Romania)	
<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 table in 4.2.3	
<i>Arc-suppression medium</i>	SF6, non-fluorinated greenhouse gases or vacuum	
<i>Rated short-duration power-frequency withstand voltage Ud (kV rms)</i>		
<i>Rated lightning impulse withstand voltage Up (kVp)</i>		
<i>Rated frequency fr (Hz)</i>	50 or 60	
<i>Rated normal current Ir (A)</i>		
<i>Rated short-circuit breaking current Isc (kA)</i>		
<i>Type of operation</i>		
<i>First-pole-to-clear factor k_{pp}</i>		
<i>Rated operating sequence</i>	O - 0,3 s - CO - 1 min – CO	
<i>Maximum break-time (ms)</i>	60	
<i>Rated opening time (ms)</i>	-	
<i>Rated closing time (ms)</i>	-	
<i>Circuit breaker class</i>	C2 - E1 - M2	
<i>Rated line-charging breaking current Il (A)</i>		
<i>Rated cable-charging breaking current Ic (A)</i>		
<i>Rated out-of-phase making and breaking current Id (kA)</i>	Clause 4.106 of IEC 62271-100	
<i>Auxiliary contact classes (Table 6 IEC 62271-1)</i>	1	
<i>Dimensions</i>	See Annex A	To enclose an overall equipment drawing for each Enel Group Distribution Company
<i>Insulators materials</i>	Composite or ceramic	

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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THE HEAD OF NETWORK COMPONENTS
Maurizio Mazzotti

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

1 DOCUMENT AIMS AND APPLICATION AREA

The scope of this document is to provide technical requirements for the supply of HV disconnectors (hereinafter DS) and earthing switches (hereinafter ES) with rated voltage from 72.5 kV to 245 kV in the Enel Group Distribution companies, listed below:

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

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.

1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document applies to both Enel Global Infrastructure and Networks Srl Company and to Infrastructure and Networks Business Line perimeter, when each Company does not have to issue further documents.

2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
00	30/09/2013	First emission
01	17/01/2014	New Type Codes in Component List of Enel Distribución Chile and Ampla Renumbered the Type Code for all items in Component List Editorial corrections Raised a.c. max absorbed power (VA)
02	30/05/2014	Added new columns in table in chapter 5 Introduction of alternative materials in nameplates (7.4.10) Added a new requirement in 7.5.1.1 for centre-break DSs Corrected 7.5.3.2.b), Closing block, b)

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Staff Function: -

Service Function: -

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		Added information about low voltage components in 7.5.3.4 Updated paragraph 7.5.4.1 Deleted sentence about measuring of resistance of earthing switch in 7.6.2.6 Modified requirement in 9.3 Updated fig. A.2.6 Annex A3: added electric schemes for Ampla and Edesur Added a note in the 2 nd figure of Annex B.2 Added a sentence at the beginning of Annex B.4 Added 2 notes in Annex D and the codes GSCH3/506..509 (EDELNOR) Added in 3.2.2. a new specific standard for Spain Added 9.3.1 Specific requirement for e-distribucion
03	17/04/2018	Introduction of Enel Goiás Exclusion of ceramic insulators New codes in Annex D New electric schemes for Italy Codes, description and electrical characteristics for Romania (05/11/2019)
04	08/04/2020	Introduction of Enel Sao Paulo Changes in 8.3 Routine Tests Clarification in 6.3. only polymeric insulators are accepted Modified Annex D Spain, Chile, Codensa codes 3.2.1 Add IEC polymeric insulators Remove IEC about ceramic insulators 8.2.17 Tests on insulators IEC
04	17/09/2021	Errors in table 7.3 Change in 7.6.3 Routine tests Codes E4E Brasil
04	24/11/2021	Format and editorial changes Introduction of new codes for Goiás and new codes 52kV for Spain

3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Engineering and Construction / Components and Devices Design / Network Components.

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head of Network Components unit
- Global Infrastructure and Networks: Head of Quality unit.

4 REFERENCES, LAWS AND STANDARDS

- Code of Ethics of Enel Group;

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

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-
- Enel Human Right Policy;
 - The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
 - Organization and management model as per Legislative Decree No. 231/2001;
 - RACI Handbook Infrastructure and Networks no. 06;
 - Enel Global Compliance Program (EGCP);
 - Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;
 - ISO 9001:2015 - Quality Management System - Requirements;
 - ISO 14001:2015 - Environmental Management System - Requirements and user guide;
 - ISO 45001:2018 - Occupational Health and Safety Management System - Requirements and user guide;
 - ISO 50001:2018 - Energy management systems - Requirements with guidance for use;
 - ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use.
 - IEC 62271-1 - High voltage switchgear and controlgear. Part 1: Common specifications.
 - IEC 62271-102 - Alternating current disconnectors and earthing switches
 - IEC 60273 - Characteristic of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V
 - IEC 62231 - Composite station post insulators for substations with a.c. voltages greater than 1 000 V up to 245 kV - Definitions, test methods and acceptance criteria
 - IEC 60507 - Artificial pollution tests on high-voltage insulators to be used on a.c. systems
 - IEC/TR 62271-300 - High-voltage switchgear and controlgear – Part 300: Seismic qualification of alternating current circuit breakers
 - IEC/TR 62271-301 - High-voltage switchgear and controlgear – Part 301: Dimensional standardization of high-voltage terminals
 - IEC 60073 - Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators
 - IEC 60447 - Basic and safety principles for man-machine interface, marking and identification - Actuating principles
 - IEC/TS 60815-1 - Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles
 - IEC/TS 60815-3 - Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 3: Polymer insulators for a.c. systems
 - IEC 60332-3-24 - Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C
 - ISO 1461 - Hot dip galvanized coatings on fabricated iron and steel articles- Specifications and test methods
 - EN 50575 Power, control and communication cables - Cables for general applications in construction works subject to reaction to fire requirements

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

-
- EN 1005-3:2002 - Safety of machinery. Human physical performance Recommended force limits for machinery operation
 - IEC 61462 - Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V - Definitions, test methods, acceptance criteria and design recommendations
 - IEC 60587 - Electrical insulating materials used under severe ambient conditions - Test methods for evaluating resistance to tracking and erosion
 - IEC TS 62073 - Guidance on the measurement of hydrophobicity of insulator surfaces
 - IEC TS 62039 - Selection guide for polymeric materials for outdoor use under HV stress
 - Specific for e-distribución and Spain:
 - Real Decreto Riesgo Eléctrico 614/2001 sobre disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico
 - Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión, Real Decreto 337/2014.
 - IEC 60332 Métodos de ensayo para cables eléctricos y cables de fibra óptica sometidos a condiciones de fuego. Parte 1-1: Ensayo de resistencia a la propagación vertical de la llama para un conductor individual aislado o cable.
 - IEC 60754-1 and 60754-2 Ensayo de los gases desprendidos durante la combustión de materiales procedentes de los cables.
 - Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión, Real Decreto 337/2014.
 - NMC001: Procedimiento para el conexionado de armarios cuadros y paneles
 - NNC007: Cables de control multipolares
 - NNM001 – Normas de operación definiciones
 - Specific for E-Distribuzione and Italy:
 - CEI 20-22/2 – Prove di incendio su cavi elettrici – Parte 2: Prova di non propagazione dell'incendio
 - ENEL operative note PVR006 (bar code)
 - LM 1023 (double cable 245 kV clamp)
 - LM 1026 (single cable 245 kV clamp)
 - Specific for Brasil:
 - NR-10 - SEGURANÇA EM INSTALAÇÕES E SERVIÇOS EM ELETRICIDADE
 - Specific for Colombia:
 - Resolución 9 0708 de Agosto 30 de 2013 con sus ajustes – REGLAMENTO TÉCNICO DE INSTALACIONES ELÉCTRICAS RETIE.
 - NTC 2050 Código Eléctrico Colombiano
 - Specific for Chile:

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

- ETGI-1020 - Especificaciones técnicas generales - Requisitos de diseño sísmico para equipo eléctrico
- Specific for e-Distributie and Romania:
 - CEI 20-22/2 – Prove di incendio su cavi elettrici – Parte 2: Prova di non propagazione dell'incendio
 - LS6016 Specifica Tecnica Enel – Sostegni per sezionatori tripolari 132 – 150 kV

Notes:

- The above listed reference documents shall be intended in the in-force edition at the contract date (amendment included).
- For Latin America destinations the reference standard are the IEC/ISO, whilst for Europe destinations the reference standard are the correspondent European standards (EN).

5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Networks Management

Macro Process: Materials management

Process: Network components standardization

6 DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Technical Conformity Assessment (TCA)	A “conformity assessment” ¹ with respect to “specified requirements” ² consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued by Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications
Type A documentation	Not confidential documents used for product manufacturing and management from which it is possible to verify the product conformity to all technical specification requirements, directly or indirectly

7 DESCRIPTION

7.1 Components list

The HV DS and, if required, ES are composed by two or three columns per each pole.

¹ Definition 2.1 of ISO/IEC 17000

² Definition 3.1 of ISO/IEC 17000

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Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Two main typologies are provided:

- Three columns per each pole (double-break)
- Two columns per each pole (centre-break)

The complete list of the equipment with their main characteristics is in Annex D (Common List of HV DS/ESs).

Other types occasionally could be required in special situations. The requirements will be indicated properly and opportunely.

7.2 SERVICE CONDITIONS

7.2.1 General service conditions

The reference service conditions are the outdoor normal service conditions of IEC 62271-1 (par. 2.1.2), with the further indications in Annex D.

7.2.2 Specific service conditions

7.2.2.1 Colombia

The reference altitude is 2.600 m³.

7.2.2.2 Seismic qualification level

Enel Distribución Chile	ETGI-1020
Enel Codensa	AF5 (IEC/TR 62271-300)
Enel Distribución Perú	AF5 (IEC/TR 62271-300)
E-Distributie	AF5 (IEC/TR 62271-300)
e-distribuzione	AF5 (IEC/TR 62271-300)

³ For Colombia the rated insulation levels in chapter 5 already consider the altitude effect on the external insulation, therefore the correction in clause 2.1.1 of IEC 62271-1 is not required. On the contrary are confirmed the precautions to be taken for low-voltage auxiliary and control equipments.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

7.3 TECHNICAL CHARACTERISTICS

DISCONNECTOR/EARTHING SWITCH												
Rated voltage U_r (kV)		72,5		123	145			170	245			
Rated short-time withstand current I_k (kA)		25/31,5	31,5/40	40	31,5	31,5/40	31,5/40/50	31,5/40/50	31,5	40	40	40
Rated short-duration power-frequency withstand voltage U_d (kV)	Common value	140		230	275			275	460			
	Across the isolating distance	160		265	315			315	530			
Rated lightning impulse withstand voltage U_p (kVp)	Common value	325		550	650			650	1050			
	Across the isolating distance	375		630	750			750	1200			
Rated frequency f_r (Hz)	Enel Distribución Chile, Edesur, e-distribucion, Enel Distributie and Enel Distribuzione	50										
	Enel Rio, Ceará, Goiás, Sao Paulo, Enel Codensa and Enel Perú	60										
Opening (closing) time if motor-operated (s)		≤ 15										
Degrees of protection provided by enclosures		IP 54										
Rated supply voltage U_a (Vdc)	Enel Distributie and Enel Distribuzione	110										
	Enel Sao Paulo	48 /125										
	e-distribucion, Enel Rio, Ceará, Goiás, Sao Paulo, Enel Chile, Enel Codensa, Enel Perú	125										
	Edesur	220										
d.c. maximum absorbed power (W)		1000										
Rated supply voltage for anti-condensation circuits (Vac)	e-distribucion, Enel Distributie and Enel Distribuzione	230										
	Enel Rio, Ceará, Goiás, Sao Paulo, Enel Chile, Enel Perú, Edesur	220										
	Enel Codensa	120										
a.c. max absorbed power (VA)	Manual operated DS/ES	50 (only for anti-condensation circuit)										
	Motor operated DS/ES, dc motor (Enel Distribuzione and Latam)	250 (only for anti-condensation circuit)										
	Motor operated DS/ES, ac motor (e distribucion and Enel Distributie)	1750 (400 Vac 3-phase)										
Auxiliary contact classes (table 6 IEC 62271-1)		1										
DISCONNECTOR:												
Rated normal current I_r (A)		1250	2000	1600	800	1250	2000	3150	1250	800	2000	3150
Rated static mechanical terminal load:	Straight load F_{a1} and F_{a2} (N)	400	400	500	600	600	800	1000	600	800	1000	1500
	Cross load F_{b1} and F_{b2} (N)*	130	130	170	200*	200*	250*	330*	200	270*	330*	500*
	Vertical force F_c (N)	500	500	1000	1000	1000	1000	1250	1000	1000	1250	1500
Mechanical endurance class M_r		M1										
Bus-transfer current switching by disconnectors (only if requested)	Rated bus-transfer current for disconnectors (A)	Clause B.4.106.1 of IEC 62271-102										
	Rated bus-transfer voltages for disconnectors (V)	Clause B.4.106.2 of IEC 62271-102										
EARTHING SWITCH:												
Earthing switches class		E0 – M0 – A										

Note: For Type Code GSH003/943 (150971), GSH003/944 (990216) and GSH003/945 (990212) the Vdc are 220V.

*Edesur 500N

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

7.4 CONSTRUCTION CHARACTERISTICS

7.4.1 General characteristics

The DS/ESs shall be manufactured in accordance with IEC 62271-102.

The manufacturer will provide all tubes, extensions, bearings and the rest of the necessary materials in order to assemble it properly and adapt it to the support standardized by each company defined in Annex B.

The driving mechanism of the DS and of the ES will be manual-operated or motor-operated.

The upgrading from manual-operated type to motor-operated type shall be possible by retrofit on site, without need of intervention on power contacts, main regulations or on the movement transmission shafts.

The manual-operation of DS and ES (both for motor-operated and for manual-operated DS/ES) shall be compliant with IEC 60447.

All DSs and ESs shall be equipped with mechanical stops for position limits.

IP54 must be accomplished by a specifically designed strip.

7.4.2 DS/ES Mechanical interlocking

DS combined with ES as a single unit will have a mechanical interlocking device that prevent the closure of the ES while DS is closed and prevent closure DS while closed ES. Electrical interlockings are described in chapter 7.5.

The mechanical interlocks shall be designed to withstand, preventing damages and without need of maintenance:

- in case of motor-operation, to the strains produced by the other DS/ES motor starting torque;
- on case of manual-operation, to 3 times the maximum force required for manual operation (5.105 of 62271-102), or, if a strain limiting device is present, to 1,5 times its intervention rated value.

7.4.3 Insulators

The insulators are requested by Enel Group Distribution companies only in composite materials.

Insulators shall be in light grey color and compliant with IECs in chapter 3.2.1. 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.

7.4.3.1 Specific requirements for Chile

Chile requires insulator with mechanical classification of type C8 for 145kV and type C10 for 245 kV.

7.4.3.2 Specific requirement for Enel Perú

Perú requires insulators with mechanical classification of type C8 for 72,5kV and C10 for 220kV

7.4.3.3 Specific requirements for e-distribucion

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

7.4.4 HV terminals

The HV terminals, DS main contacts and ES contacts shall be manufactured with corrosion resistant copper or aluminum alloy, in order to be interfaced with aluminum alloy connectors or clamps.

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Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*
7.4.4.1 Latam

The terminals shall be rectangular shape with the following dimensions, according to fig. 3 (2x2 hole pattern) or fig. 4 (2x3 hole pattern) of IEC/TR 62271-301:

- Hole diameters \varnothing 14.3mm
- Distance between holes 44.5mm

7.4.4.2 e-distribucion, E-Distributie and e-distribuzione

The HV terminals 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 X 80 (mm) (fig. 1 of IEC/TR 62271-301) dimensions.

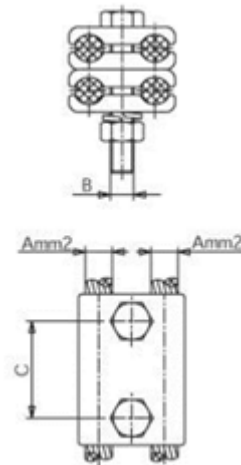
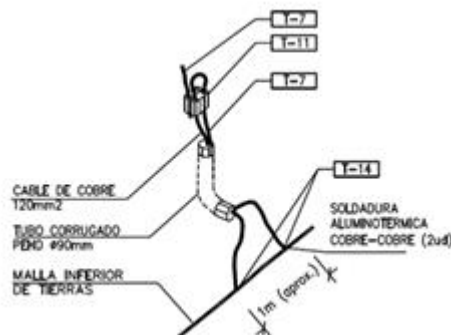
7.4.5 Grounding

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

Inside the Control Box an internal collector (in tin-plated or nickel-plated copper, section \geq 60 mm² and with M5 regular interval threaded hole) shall be present for the grounding connection of all cable shields; the manufacturer shall guarantee its effective connection to the DS+ES grounding system.

The support is not allowed as part of the ground connection.

At the base of each support upright shall be provided 2 earthing points, equipped with M12 stainless steel bolts (included in the supply) separated 50 mm vertically.



Support cannot be used as earthing path (even for CTs and VTs, that will also have an earthing path connection directly to the earthing points in the support base).

The manufacturer must ensure that the earthing at each of these points independently establishes that all parts of the equipment are equipotential. The equipment does not need additional grounding points to ensure an equipotential bonding of all components.

7.4.5.1 Specific requirements for Brazil

For Brazil is required a clamp grounding connector for range 70-120 mm² on each base plate and operating mechanism. The connector material shall be copper Alloy (maximum 5% Zinc).

7.4.6 Control and Operating device Box(es)

The control box must be build in accordance with IEC 60073.

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Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

The location of the control box should always consider pedestrian access to the equipment (projected and/or existing). Always prioritizing to facilitate the access and the operation of this.

The control box and the drive mechanisms with its control devices shall be included in one or two cabinets. In case of two cabinets all the cable connections of the substation will arrive only to the principal one and the connection to the other is in charge of the manufacturer.

In addition to the IP requirement of table at chapter **¡Error! No se encuentra el origen de la referencia.**, the box protection degree with open doors shall

be minimum IP2X.

The entrance of all cables shall be from the Control Box bottom side, where a removable loophole (in aluminum, with useful dimension of 150x100 mm) shall be provided.

Inside all boxes a proper anti-condensation system shall be provided in order to prevent humidity damages and to ensure a proper air replacement.

The anti-condensation circuit shall be one for the overall equipment, supplied in a.c (see table in chapter 5 for the supply rated voltage). It shall be controlled by a humidistat; thermostat is admitted in addition if the manufacturer needs it to comply the minimum ambient temperature requirement. Both shall have fixed regulation (typical regulation values are 60% R.H. and + 5°C) and the contacts shall be connected in parallel.

The anti-condensation circuit shall be protected with a magnetothermic automatic circuit-breaker

The heating elements shall be connected in series in order to open the circuit in case of breaking of an element; a minimum current sensor shall detect and signal the anomaly (obviously not when circuit is OFF for environmental causes).

In the case of a different heating system, the manufacturer must ensure correct fault detection and remote fault signaling in the event of the failure, correctly assessing the tolerances of the supply voltage and components resistance.

The heating elements must be easily removed for maintenance

The box interior shall be accessible from the front by mean of a door provided of handle and lock, hinged and equipped with an anti-wind system. It shall be possible to open the door over 90°. Should not have operational buttons on the external part of the control box.

In case of motor-operated DS/ES all accessories (hand-crank, document pocket etc.) shall be accommodated in the internal part of the box door. In case of manual-operated DS/ES is admitted to locate the hand-crank/swing lever outside the box.

In case of manual-operated DS/ES hand-crank shall have a specific place to store it. The documents shall be accommodated in the internal part of the box door.

All electric equipments components shall be:

- compliant with the respective IEC standards;
- equipped with an identification label indicating the codification used in the functional electric schemes;
- easily accessible for maintenance or substitution operations.
- of typologies for which interchangeable components are easily available in commerce (delivery time within 2 weeks) in the DS and ES destination country.

All components suitable to be replaced (like the heating elements) should be mounted in a DIN bar, with a connection with the terminal block and easy access

In particular, the extractible ones, plug-in connector included, shall be provided with proper anti-mistake coding.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

The box internal wiring shall be performed with conductors with adequate section (always $\geq 1\text{mm}^2$), flexible type, compliant with IEC 60332-3-24 and insulated at $U_o/U = 450/750\text{ V}$.

The ground connection of any removable panel or door must be done by braided cable.

The cable ends shall be provided of pre-insulated compression type terminals, suitable for the clamps where they have to be connected.

In case of motor-operated DS/ES, the Control Box(es) shall include:

- remote/manual/local selector switch (and/or relay); (no selector for e-distribucion)(Only two positions remote/manual "Servizio/Prova" for Italy)
- control buttons, with the following colors: (no push buttons for e-distribucion)

Operation	e-distribucion Chile, Enel Codensa, Enel Perú, Edesur, E-Distributie and e-distribuzione (according with IEC 60073)	Enel Rio, Enel Ceará, Enel Goiás, Enel Sao Paulo (according with NR10)
Closing	Black "I" on White background	White "L" on Red background
Opening	White "O" on Black background	White "D" on Green background

- magneto-thermic automatic circuit breakers for the supplies protection (motors, lighting lamp, anti-condensation circuits – fuses are not admitted) with auxiliary contacts.
- interface terminal board for substation control system;
- internal lighting lamp (incandescent type are not admitted), with automatic switching in case of open door.

The grounding of a dc supply polarity is not admitted.

If diodes are used for the circuit separations or for the voltage return protection, they shall have inverse voltage $\geq 3\text{ kV}$.

The cable trucking systems for the internal wiring shall shave sufficient residual space ($\geq 10\%$ of used volume); the cables shall be anchored in some points on order to avoid their falling.

The cable trunks close to the interface terminal boards shall be used for the control system wiring and cannot be used for the internal wiring.

All the external wiring and cables to the control box must be protected against mechanical damage with rigid or flexible metal conduits.

The control cables as well as the other internal components must comply with characteristics such as: no fire propagation, reduced emission of toxic gases and no corrosive gases emitted.

In addition to the dimensions shown in Annex B, the box base height respect to the ground shall be $\geq 400\text{ mm}$ and all HMI (Human Machine Interface) elements (controls and signalizations) shall be at $\leq 1800\text{ mm}$. The hand-crank/swing lever connection point shall be at $\leq 1000\text{ mm}$ respect to the ground.

The main contacts position auxiliary contacts can be located in the control box or, in alternative, in a separated external box, providing a proper anti-condensation resistance.

All conductors must arrive at terminal blocks and must have indelible marks indicating the place of Origin / Destination. Only one conductor will be accepted per terminal.

The manufacturer must provide a minimum of 20% of reserve terminal blocks for the Client's use.

The piping inside the cabinets must be run using plastic cable trays. The conductors shall be grouped and attached by means of non-metallic fasteners, suitable for protecting its insulation and support the weight of the cables.

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

On the lower face of the control box, the connection for low-voltage circuit cables shall be realized preferably with 2" diameter ducts.

Outside the Control box must be avoided spaces where birds could nest or any other animals like for example bees.

7.4.6.1 e-distribuzione specific requirements

In alternative to IEC 60332-3-24, cables compliant with Italian standard CEI 20-22/2 and marked with "CEI 20-22 II" can be accepted.

In case of "S/P" relay presence, a white lamp to indicate its activation (Lamp on in case of "P" status) shall be located in the DS Control Box.

It's necessary a space in the control box with a DIN bar width 150mm, height 200mm, depth 150mm for a device DV7203 (conversion digital signal in optical)

Will be provided a contact with the signalization of aperture of external doors (see Annex A)

7.4.6.2 e-distribucion specific requirements

Control box wiring and construction must be compliant with internal e-distribucion procedure NMC001, and NNC007.

It must be considered as a low voltage equipment. For that reason it also must be compliant with Reglamento Electrotécnico para Baja Tensión, Real Decreto 842/2002.

The heating elements should be easily replaced without affecting any other component of the enclosure (even wiring) and with the equipment in service.

The insulation material may be thermostable (Z) corresponding to the cable harmonized H07Z-K, or thermoplastic (Z1) for the 07Z1-K Cable and comply with the following requirements:

- Test for resistance to flame propagation conductors individual, according to IEC 60332-1-1
- Testing of no fire propagation according to IEC 60332-3-24, category C
- Testing of the gases evolved during combustion: No emission of halogen gases (IEC 60754-1 and 60754-2) and the weighted value of conductivity is not exceed 10 μ S/mm (IEC 60754-1 and 60754-2)
- Test for determining the cable smoke density, according to standard IEC 60754-1 and 60754-2, the level of light transmittance will be higher than 60%. The color of insulation is light gray except for earthing protection circuits which will be green-yellow color.

7.4.6.3 Latam specific requirements

The internal wiring must be of flexible copper with an operating temperature of 90°C.

7.4.7 Protective treatments

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

On request the enclosures shall be painted in light gray color (RAL 7035). Painting is anyway admitted even if not expressly requested.

All iron parts (e.g. support, Control Box, bolts etc.) shall be in non-corrosive material (AISI 316) 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.

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks***7.4.8 Dimensional characteristics**

Specific dimensional requirements are shown in Annex B.

7.4.9 Support

The support is an optional supply. If requested, the DS/ES support shall be compliant with LS6016.

If the support is not requested it must be considered the standard one in order to fix the command box to the columns or to a third small column. The manufacturer must provide the transmission and fixation for the control box to the support even if not requested the support. If it's fixed to a little third column, the column must be also supplied

7.4.9.1 Enel Distribuzione specific requirements

The Control Box and Operating device Box(es) support is a mandatory supply always included in the DS/ES supply.

7.4.10 Nameplates

The nameplates shall be for external installation 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 companies).

Par. 5.10 of IEC 62271-102 apply, specifying that both DS/ES nameplate and control box nameplates shall include:

- the optional values;
- the Enel Group type code (see Common List) and the local components codification.

For traceability purpose, in the internal part of the driving mechanism (if any) door shall be located a self-adhesive nameplate with the following information:

- box manufacturer;
- serial number of the Control Box;
- year of construction.
- Only for e-distribuzione shall be also provided in electronic format together with the guarantee and barcode data requested by PVR001 and PVR006 (The file sending modalities will be discussed during the conformity assessment process).
- Only for Latam the self-adhesive nameplate to be located in the internal part of the Control Box door shall also contain the contract number.

7.5 FUNCTIONAL CHARACTERISTICS**7.5.1 Common requirements****7.5.1.1 General characteristics**

The drive mechanism of the disconnectors and the earthing switches (if any), must guarantee the simultaneous operation of the poles.

The drive mechanism shall operate on a highly reliable transmission system, in order to avoid any interruptions.

The number of turns for a complete manual operation shall not exceed 50.

Centre-break DSs shall have the 2 movable contacts moving in the same direction.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

All disconnectors and earthing switches shall be equipped with mechanical stops for position limits. Moreover it shall be possible to lock them at operation limits by mean of padlocks with $\varnothing = 10$ mm pin.

7.5.1.2 *Motor-operated disconnectors and earthing switches*

The DSs and ESs operation shall be performed by tripolar motor-drive mechanisms with the possibility of emergency manual operation in case of necessity. It will consist of a gear motor (see table in chapter 5 for the supply rated voltage) which will transmit its movement to the drive shaft of the disconnector. The same for the earthing switch.

The motor circuit will be protected by a motor protector for short-circuits and overloads.

DS and ES shall be each one provided of the following circuits:

- a) n° 1 drive circuit of shunt closing release;
- b) n° 1 drive circuit of shunt opening release.

The ongoing operations shall be completed even in case of opposite operation request.

The operation requests persistence after the operation conclusion shall not produce effects.

In case of a DS/ES operation is not completed, any previously received operation requests shall not remain stored. In case of motor supply outage during a DS/ES operation, the drive mechanism shall ensure:

- the keeping of the reached position, both during supply absence and at its restore;
- the execution after the supply restore of any requested closing or opening operation, independently from the operation type ongoing at supply outage instant;
- that in case of not completed operation the operation sequence shall be stopped and an anomaly remote signalization (SNM – “Switch Not Maneuverable”) shall be sent, by mean of a timed contact.

The operations shall not be carried out if the request signal duration is shorter than 3 ms.

The hand-crank for manual operation shall be withdrawable type; its insertion shall disable the electric operations, both local and remote. The motor rotation shall not transmit movement to the hand-crank inserted. Turning sense must be marked close to the insertion site.

The manufacturer shall indicate the auxiliary contact calibration mode.

Further characteristics are specified in local specific requirements.

7.5.1.3 *Manual-operated disconnectors and earthing switches*

The characteristics are specified in local specific requirements.

7.5.1.4 *Electric schemes, controls and signalizations*

The electric schemes shall:

- a) be represented in the reference conventional conditions:
 - a.1) DS/ES (if any) in open position;
 - a.2) DBST not inserted (only for e-distribuzione);
 - a.3) DEC not energized (only for e-distribuzione);
 - a.4) absence of a.c. and d.c. auxiliary supplies;
 - a.5) remote/local selector switch in remote position (or relay, only for e-distribuzione);
 - a.6) in case of micro-switches with the state dependent on the opening/closing of the boxes/carters of operating devices, they shall be represented disable (that is with boxes/carters open), without primary voltage (27) and with the heating in anomaly status.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

- b) contain the functional scheme, all information useful to identify the single wires and cables, the equipments wiring schemes (auxiliary contacts, relays etc.), the topographic schemes for interconnections between boxes, the topographic schemes about all the electric components in Control box/Operating device box(es), the anti-mistake coding.

The principle electric schemes of the different DS/ES typologies are represented in Annex A, including the interface terminal board for substation control system and the auxiliary signalling contacts characteristics.

7.5.2 e-distribucion and E-Distributie functional characteristics

7.5.2.1 Disconnectors

The manual drive mechanism will have a signalling box with 6 closing contacts and 6 opening contacts, potential free.

7.5.2.2 Earthing switch

The drive mechanism of the earthing switches (if any) will be manual-operated or motor-operated.

Characteristics of the motor-operated drive mechanism are defined in section 7.1.2.

The manual-operated drive mechanism will have a signalling box with 4 closing contacts and 4 opening contacts, potential free, whose characteristics are defined in section 6.6 of this Standard.

7.5.2.3 Motor-operated disconnectors and earthing switches

All electric equipments components shall be compliant with the respective IEC standards.

The set of auxiliary contacts designed for the control of the switchings typical of the DS/ES and the sets of additional auxiliary contacts will be actuated by the actuation mechanism.

The electric diagram appears in Annex A.

7.5.3 e-distribuzione functional characteristics

7.5.3.1 DS/ESs applications

Application descriptions of the different DS/ES typologies and the relative reference electric schemes are listed in the following table:

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Type Code (see Annex D)	Enel Distribuzione codification (see Annex D)	Application description	Reference electric schemes (see Annex A.2)
GSCH003/001	156110	Line DS+ES motor-operated	Fig. A.2.1 + Fig. A.2.9
GSCH003/002	156111	Line DS+ES manual-operated	Fig. A.2.2 + Fig. A.2.9
GSCH003/003	156112	Busbar DS (line bay) manual-operated	Fig. A.2.3
GSCH003/004	156113	Busbar DS (transformer bay) manual-operated	Fig. A.2.4
GSCH003/005	156114	Conjoint busbar DS manual-operated	Fig. A.2.5
GSCH003/006	150003	Busbar DS (line bay) motor-operated	Fig. A.2.6
GSCH003/007	150004	Busbar DS (transformer bay) motor-operated	Fig. A.2.7
GSCH003/008	150005	Conjoint busbar DS motor-operated	Fig. A.2.8

7.5.3.2 Motor-operated DS and ES

7.5.3.2.a) Control circuits of motor-operated DS and ES

DS local controls (motor or manual) shall be enabled by consensus (“Prova”) coming from line bay Circuit Breakers, working on the “S/P” relay (servizio/prova⁴), located in its control box.

Usually the remote controls are enabled and the local controls are inhibited; with the “Prova” consensus it’s the opposite.

Earthing switch local controls (motor or manual) shall be subject to the remote/local switch (“Servizio/Prova”) located in its control box.

7.5.3.2.b) Blocking devices/circuits of motor-operated DS and ES

During normal operation, temporary block signalizations shall not be sent to the control system.

Closing block

The closing operation block (motor and manual) shall work when occurring at least one of the following conditions:

- a) DS
 - Circuit Breaker closed
 - ES closed
- b) ES
 - DS closed
 - line voltage presence

⁴ In Italian “Prova” means “Test” and “Servizio” means “In service”

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*Opening block

The opening operation block (motor and manual) shall work when occurring at least one of the following conditions:

- a) DS
 - Circuit Breaker closed
- c) ES
 - line voltage presence
 - DBST inserted

7.5.3.2.c) Manual operation of motor-operated DS and ES

The manual emergency operation shall be enabled by a Consensus Electromagnetic Device (DEC – “Dispositivo Elettromagnetico di Consenso”) (three if ES is present, one for DS, one for ES and one for DBST); with this device the hand-crank insertion is enabled pressing a button⁵ and in presence of external consensus “Prova” and of all requested conditions (see electric schemes).

The DEC shall be immune to possible malfunctions due to the residual magnetism.

The DEC status (energized/de-energized) shall be clearly visible.

With the hand-crank insertion an anomaly remote signalization (SNM) shall be sent.

7.5.3.2.d) ES blocking device (DBST)

The motor-operated ES shall be provided of a device for the earthing switch locking (DBST - “Dispositivo Elettromeccanico di Blocco Sezionatore di Terra”), subject to the ES remote/local switch (“Servizio/Prova”) located in its control box.

All requirements of clauses 7.5.1.2 and 7.5.3.2.c) are entirely applicable to the DBST (“SNM” signalization becomes “DBST NM”).

The DBST operation (motor or manual) shall be subjected to the ES in closed position; its insertion shall operate mechanically (operating directly on the mechanical transmission system) and electrically on the ES, avoiding its opening (motor or manual) and interrupting the motor supply.

The DBST operating device shall be preferably located in the ES operating device box.

The DBST insertion/exclusion circuits shall be electrically interlocked between them.

The access to internal part of DBST shall inhibit operations and shall generate a remote signal (“Blocco Violato”).

The inserted/not inserted DBST signalizations (“DBST INSERITO”, “DBST DISINSERITO”) shall be provided by mechanically independent auxiliary contacts, directly actuated by extreme position limits of the lock unit.

7.5.3.3 Manual-operated DS and ES**7.5.3.3.a) Control circuits of manual-operated DS and ES**

DS manual operation shall be enabled by consensus (“Prova”) coming from the correspondent bay Circuit Breakers (line bay or transformer bay), working on the “S/P” relay (servizio/prova), located in its control box. This consensus is not present for Conjoint busbar DS.

⁵ Different designs with the same functional results can be evaluated by Enel.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*
7.5.3.3.b) Blocking devices/circuits of manual-operated DS and ES

The manual-operation block (opening/closing) shall work when occurring the following conditions:

- a) Line DS+ES manual-operated:
 - a1) DS
 - Circuit Breaker closed
 - ES closed
 - a2) ES
 - DS closed
 - Line voltage presence
- b) Busbar DS (line bay) "189SB(L)":
 - Circuit Breaker closed
- c) Busbar DS (transformer bay) "189TR":
 - It shall be realized a key interlock between the DS "189 TR" and the earthing switch on the MV side of the HV/MV transformers "89 T TR", in order to make impossible the DS "189 TR" closing with the MV side earthing switch "89 T TR" closed, and viceversa.
This function shall be realized with an electromagnetic device enabling rotation and extraction of a key, to which is combined another key enabling closing of the MV side earthing switch "89 T TR".
The device, with its button activated, is energized with DS "189 TR" open in presence of "Prova" external consensus coming from transformer bay Circuit Breaker.
- d) Conjoint busbar DS "189SB":
 - the operation shall be enabled only if all Circuit Breakers of one of the 2 semi-busbars are open (absence of energy flowing between the two HV semi-busbars).

7.5.3.3.c) Manual operation of manual-operated DS and ES

The manual operation shall be enabled by a Consensus Electromagnetic Device (DEC) (two if ES is present, one for DS and one for ES); with this device the hand-crank insertion (or the swing lever operation) is enabled pressing a button⁶ and in presence of all requested conditions (see electric schemes). In case of swing lever operation the DEC blocking system shall be designed to withstand 3 times the maximum force required for manual operation (5.105 of 62271-102).

The DEC shall be immune to possible malfunctions due to the residual magnetism.

The DEC status (energized/de-energized) shall be clearly visible.

If closing or opening operation is not fully completed an anomaly remote signalization (MNC – "Manovra Non Completata") shall be sent.

Moreover, with the hand-crank insertion an anomaly remote signalization shall be sent using MNC signalization (not represented in the electric scheme, because not necessary in case of swing lever with an operation enabling).

7.5.3.4 Controls and signalizations

The contacts referred to the following controls and signalizations shall be reported in the terminal board, when they are necessary:

- a) drive circuit of shunt closing release control (CH, for DS and ES)

⁶ Different designs with the same functional results can be evaluated by Enel.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

- b) drive circuit of shunt opening release control (AP, for DS and ES)
- c) drive circuit of DBST insertion control (INS)
- d) drive circuit of DBST de-insertion control (DIS)
- e) consensus "P" (Prova) to local operations
- f) remote/local selector switch in local (P) position (43SP-Prova)
- g) intervention of motor protection device and/or auxiliary supply missing (42RT)
- h) motor maximum operation time (BX)
- i) not-maneuverable DS (SNM, only in case of motor-operated, for DS and ES)
- j) not completed manual operation (MNC) (only in case of manual-operated, for DS and ES)
- k) close position (ccX189, for DS and ES)
- l) open position (caX189, for DS and ES)
- m) anti-condensation circuit anomaly (AnR189)
- n) consensus from on-site switchgears CBs (152), DS and ES (189).

Further specific control circuits, using signals from secondary terminals of on-site Inductive or Capacitive Voltage Transformers (see electric diagrams), elaborate absence of voltage on HV line (and status ON/OFF of relative low voltage protection CBs) to enable the ES closing:

- a) voltage presence (27ON)
- b) voltage absence (27OFF)
- c) voltage presence anomaly (An PRES TENS)

For this purpose the low voltage components shall have the following characteristics:

- a) 3P+N circuit-breaker for protection of secondary VT circuits:
Ue = 400 V ac; In = 3A; Electromagnetic over current release - short circuit current setting: 12 A ("MA-type"); Icu ≥ 25 kA;
- b) 1 auxiliary contact discordant
- c) 1 auxiliary contact concordant (advanced in opening and delayed in closing)
- d) K27A/L, K27B/L and K27ATL relays:
Rated voltage = 100 V AC.

7.5.4 Latam functional characteristics

7.5.4.1 Operating mechanisms. General characteristics

For 3-column disconnectors, the rotation blades opening will be clockwise direction (seen from above).

7.5.4.2 Motor-operated and manual-operated disconnectors and earthing switches

In case the motor-operated, the manual emergency operation shall be enabled by a Consensus Electromagnetic Device (DEC) (two if ES is present, one for DS and one for ES); with this device the handcrank insertion is enabled pressing a button⁷ and in presence of all requested conditions. With the handcrank insertion an anomaly remote signalization (SNM) shall be sent.

A switch shall be to permit the selection of operation mode to 3 positions: "local, locked, remote" with auxiliary contacts that indicate the position. In the position, "local," the electric remote control shall be

⁷ Different designs with the same functional results can be evaluated.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

inoperable. In the position, "remote," the local electric control shall be inoperable. In the position, "locked," local and remote electric operations must be blocked.

In the case of motor-operated, must include an operations meter for the disconnecter.

The set of control contacts designed for the control of the switchings typical of the disconnecter and the sets of additional auxiliary contacts will be actuated by the actuation mechanism.

The DS and ES, both manual and motorized, shall have auxiliary contacts for remote indication of their position. Microcontact auxiliary schemes inserted in the electronic cards will not be accepted.

The DS and ES shall have a running switch limit to indicate the open or closed position of the blades. These must allow an adjustment of $\pm 10^\circ$.

For manual-operated, the contacts shall be included in a metal box appropriate for outdoor. In all cases, the auxiliary contacts shall be operated directly by the disconnecter's drive shaft.

The quantities of auxiliary contacts: normally open (NO) and normally close (NC) are indicated in the following table for DS and ES:

Company	72,5 [kV]		145 [kV]		245 [kV]	
	DS	ES	DS	ES	DS	ES
Enel Rio, Ceará, Goiás, Sao Paulo	6NO/6NC	4NO/4NC	6NO/6NC	4NO/4NC	-	
Enel Distribución Chile	-		6NO/6NC	4NO/4NC	6NO/6NC	4NO/4NC
Enel Codensa	-		6NO/6NC	4NO/4NC	6NO/6NC	4NO/4NC
Enel Perú	8NO/8NC	4NO/4NC	-		8NO/8NC	4NO/4NC
Edesur	-		10NO/10NC	6NO/6NC	10NA/10NC	6NA/6NC

Further requirements are specified in next paragraphs and in the electric scheme in Annex A.

7.6 TESTING

7.6.1 General information

The tests will be performed according to Standards IEC 62271-1 and IEC 62271-102.

The tests to be performed on DS/ESs are divided in:

- Type tests;
- Routine tests;
- Commissioning tests.

7.6.2 Type tests

7.6.2.1 Visual inspection

The DS/ES, complete of all accessories and fully assembled in operation layout, shall be subject to a visual inspection in order to verify its functional, dimensional and constructive compliance with this Global Standard.

7.6.2.2 Dielectric tests

(IEC 62271-102 par. 6.2)

7.6.2.3 Radio interference voltage (r.i.v.) tests

(IEC 62271-102 par. 6.3)

Not applicable for 72,5 kV DS/ES.

7.6.2.4 Measurement of the resistance of the main circuit

(IEC 62271-102 par. 6.4)

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks**7.6.2.5 Temperature-rise tests*

(IEC 62271-102 par. 6.5)

7.6.2.6 Short-time withstand current and peak withstand current tests

(IEC 62271-102 par. 6.6)

7.6.2.7 Verification of the degree of protection

(IEC 62271-102 par. 6.7)

7.6.2.8 Electromagnetic compatibility (EMC) tests

(IEC 62271-102 par. 6.9)

7.6.2.9 Additional tests on auxiliary and control circuits

(IEC 62271-1 par. 6.10)

For this verification the manufacturer shall provide a paper copy of the DS/ES electric schemes.

The correct operation of all controls, interlocking and signalizations shall be also verified.

The absorption curves of the motors, taking note of the maximum values (inrush excluded), shall be registered in the following situations:

- at rated voltage;
- at 110% of the rated voltage;
- at 85% of the rated voltage.

7.6.2.10 Operating and mechanical endurance tests

(IEC 62271-102 par. 6.102)

Note: par. 6.102.3.2 applies also to measuring of resistance of earthing switch.

7.6.2.11 Operation under severe ice conditions

(IEC 62271-102 par. 6.103)

This test is mandatory in case of ice coating higher than 1 mm.

Note: par. 6.103.4.2 applies also to measuring of resistance of earthing switch.

7.6.2.12 Operation at the temperature limits.

(IEC 62271-102 par. 6.104)

This test is mandatory.

7.6.2.13 Bus-transfer current switching tests

(IEC 62271-102 par. 6.106)

Tests is mandatory only for Disconnectors for which this characteristic is requested (see Annex D).

7.6.2.14 Induced current switching tests

(IEC 62271-102 par. 6.107)

This test is mandatory.

7.6.2.15 Seismic qualification

If requested, DS/ES (including the support) shall be compliant with seismic qualification, according with standards listed in 7.2.2.2.

7.6.2.16 Protective treatments

Hot dip galvanized coatings on iron and steel components shall be verified in accordance with ISO 1461 by mean of magnetic flux equipments, performing at least 5 measures on each component, in uniform manner on the various surfaces, avoiding edges and angular parts.

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

The verification of other protective coatings shall be performed considering their characteristics: the manufacturer will indicate the minimum thickness allowed and the others characteristics.

7.6.2.17 Tests on insulators

The composite insulators shall be tested in accordance with IEC 61462, IEC 60587, IEC TS 62073 and IEC TS 62039.

7.6.3 Routine Tests

The Routine tests shall be made in the manufacturer's factory on each apparatus supplied, to ensure the product compliance with the sample approved during the conformity assessment (homologation, certification etc.) process and on which the type tests have been performed.

The routine tests are for the purpose of revealing faults in material or construction. They do not impair the properties and reliability of a test object. The routine tests shall be made wherever reasonably practicable at the manufacturer's works on each apparatus manufactured, to ensure that the product is in accordance with the equipment on which the type tests have been passed. By agreement, any routine test may be made on site.

If for a DS/ES the erection and commissioning tests assistance are requested to be performed by the manufacturer, the fully assembling in factory is not required.

Test values/results shall be in compliance with rated values (and relative tolerances).

The manufacturer shall provide, for each DS/ES supplied, the report of all measures and tests carried out.

7.6.3.1 Dielectric test on the main circuit

(IEC 62271-102 par. 7.1)

Accordingly with 7.1 of 62271-1 the test is fulfilled with the test in 7.6.3.4.

7.6.3.2 Tests on auxiliary and control circuits

(IEC 62271-102 par. 7.2)

To be performed if auxiliary and control circuits are present.

The possibility to perform this test without connecting the Control Box(es) to the power kinematic chain shall be approved during conformity assessment process, considering the specific manufacturer design (fully functional tests will be performed on the completely assembled DS/ES on site).

Functional tests (par. 7.2.2 of IEC 62271-1) shall be done only at rated voltage.

Dielectric tests (par. 7.2.4 of IEC 62271-1) shall be done applying 1 kV for 1 s.

Electronic devices, motors etc. can be excluded by dielectric test only if agreed during the conformity assessment (homologation, certification etc.) process.

7.6.3.3 Measurement of the resistance of the main circuit

(IEC 62271-102 par. 7.3)

The ambient temperature influence can be neglected.

7.6.3.4 Design and visual checks

(IEC 62271-102 par. 7.5)

The checks shall be performed referring to conformity assessment (homologation, certification etc.) documents and verifying damage absence.

7.6.3.5 Mechanical operating tests

(IEC 62271-102 par. 7.101)

7.6.3.6 Protective treatments

The thickness of the protective coatings shall be verified according with 7.6.2.16.

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

7.6.4 Commissioning tests

The manufacturer shall indicate in the manual the checks and tests to be done after the erection (see 10.2.5 of 62271-1), consisting at least in:

- a) Visual check;
- b) Tests on auxiliary and control circuits (if any);
- c) Measurement of the resistance of the main circuit (after mechanical operating tests);
- d) Mechanical operating tests.

In case of erection and commissioning tests performed by Enel group personnel, if any problem occurs or any commissioning test has negative result, the manufacturer shall intervene in field to verify and solve the problem.

7.7 SUPPLY REQUIREMENTS

7.7.1 Tender's technical documentation

For each DS/ES typology offered in the tender the supplier shall provide the Annex C properly filled.

7.7.2 Conformity assessment

7.7.2.1 Conformity assessment process

The conformity assessment processes (homologation, certification etc.) are specified in the proper contractual documents.

7.7.2.2 TCA documentation (Technical Conformity Assessment)

The project documentation that the supplier uses to manufacture each DS/ES typology can be divided in Type A documents (public, not confidential) and Type B document (confidential).

For each Enel Group Distribution company requesting a specific DS/ES typology, the manufacturer shall provide a specific documentation set according with the specific requirements stated in this document.

The Type A documentation shall consist at least in:

- 1) Type A documents list;
- 2) Type B documents list;
- 3) Annex C properly filled;
- 4) Overall dimensions drawing;
- 5) Insulators drawings and characteristics;
- 6) Electric diagram (see 7.5.1.4-b), low voltage components list included;
- 7) Control Box (if any) layout drawings;
- 8) Overall DS/ES and Control Box (with open/closed doors) pictures;
- 9) Nameplate and labels drawings; (local language)
- 10) DS/ES installation, use and maintenance handbook/manual; (local language)
- 11) Routine and commissioning tests:
 - a) Test report form (two documents, one for factory tests and one for on-site tests);
 - b) Reference values table (with tolerances);
 - c) Protective coatings (typology, minimum thickness, reference standards);
- 12) List of documentation, materials and accessories supplied;
- 13) Main sub-components suppliers list;
- 14) Only for e-distribuzione, Manufacturing and Control Plan (PFC).

7.7.3 Packaging, transport, storage and installation/testing

Par. 10.1 and 10.2 of IEC 62271-102 applies.

Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

In order to limit the on-site mounting operations the DS/ES shall be transported in subassemblies consisting in the single poles fully mounted (this requirement is not mandatory for 245 kV DSs).

DS/ESs' package shall be suitable to guarantee:

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

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

- 1) manufacturer name;
- 2) manufacturing year/month;
- 3) manufacturer designation type;
- 4) manufacturer serial number;
- 5) Enel component codification (i.e.: GSCH003/1 – 156110);
- 6) contract number;
- 7) destination substation;
- 8) total weight;
- 9) lifting information (showing the points and the correct method of lifting);
- 10) only for e-distribuzione, the bar code, in accordance with PVR006.

With each DS/ES the following items shall be supplied (items from 4 to 8 on paper):

- 1) the support structure (only if requested) with its anchor bolts to the civil works (stainless or hot dip galvanized steel, chemical or expansion type);
- 2) bolts to assembly the DS/ES poles to support structure;
- 3) hand-crank or swing lever and Control Box(es) support with its anchor bolts to the civil works;
- 4) list of documentation, materials and accessories supplied;
- 5) overall dimensions drawing;
- 6) electric diagram;
- 7) DS/ES installation, use and maintenance handbook/manual (local language);
- 8) routine and commissioning tests:
 - a) routine (factory) test reports;
 - b) reference values table (with tolerances);

If on-site assembly is performed by the manufacturer, waste (including packaging) shall be disposed by him.

Wooden boxes will be treated, according to international requirements for the control of pests, avoiding the compound "Pentachlorophenol" and "Creosote". The treatment must contemplate, at least: high toxicity to xylophagous organisms, high penetrability and fixation power, chemical stability, non-corrosive substances to metals or that affect physical characteristics of the wood.

7.7.3.1 *Specific requirement for e-distribucion*

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."

Application Areas

Perimeter: *Global*

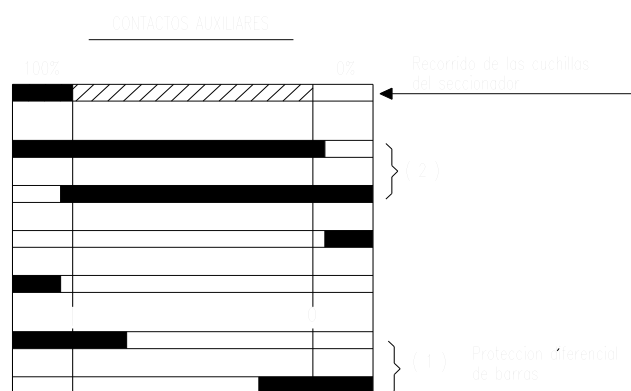
Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

ANNEX A – ELECTRICAL SCHEMES

A.0 General requirements



Application Areas

Perimeter: *Global*

Staff Function: -

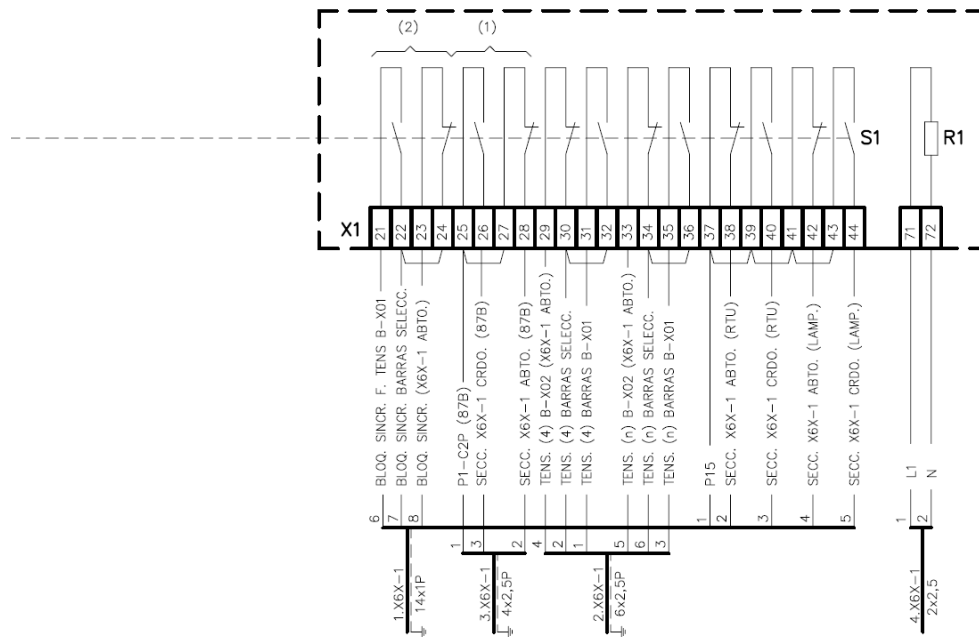
Service Function: -

Business Line: *Infrastructure & Networks*

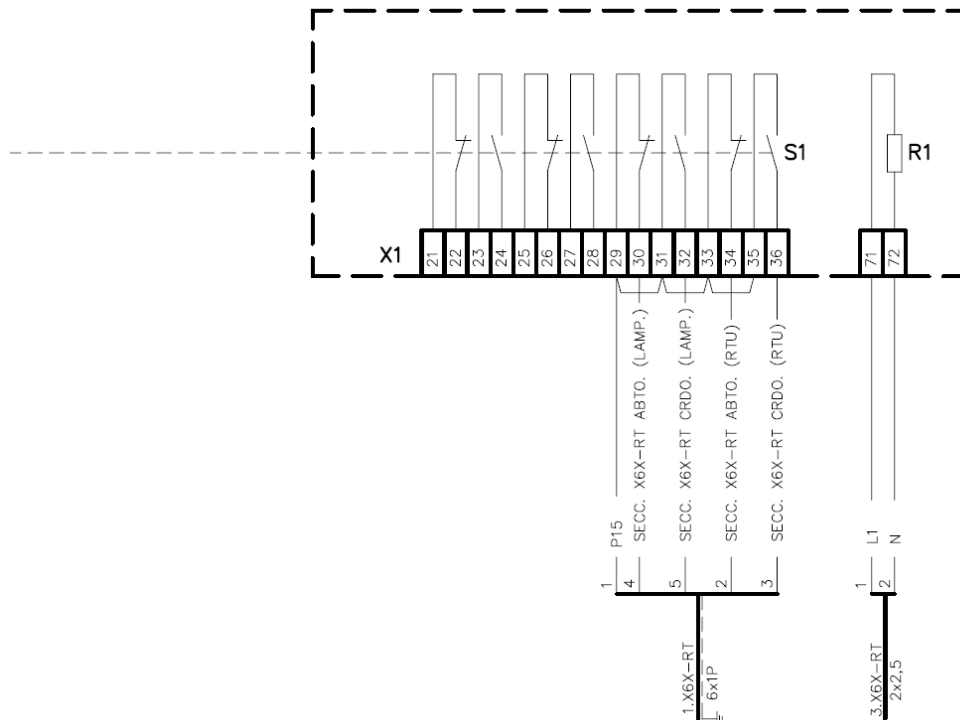
A.1 – e-distribucion, E-DISTRIBUTIE AND LATAM ELECTRICAL SCHEMES

A.1.1 MANUAL SCHEMES

FINAL TERMINAL STRIP MANUAL DRIVING DEVICE



FINAL TERMINAL STRIP ES DS



SCHEME AND FINAL TERMINAL STRIP ELECTRIC DRIVING DEVICE



Subject: Global Infrastructure and Networks **GSCH003** HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

A.2 – E-DISTRIBUZIONE ELECTRICAL SCHEMES

Fig. A.2.1.Motor-operated line DS+ES electrical scheme

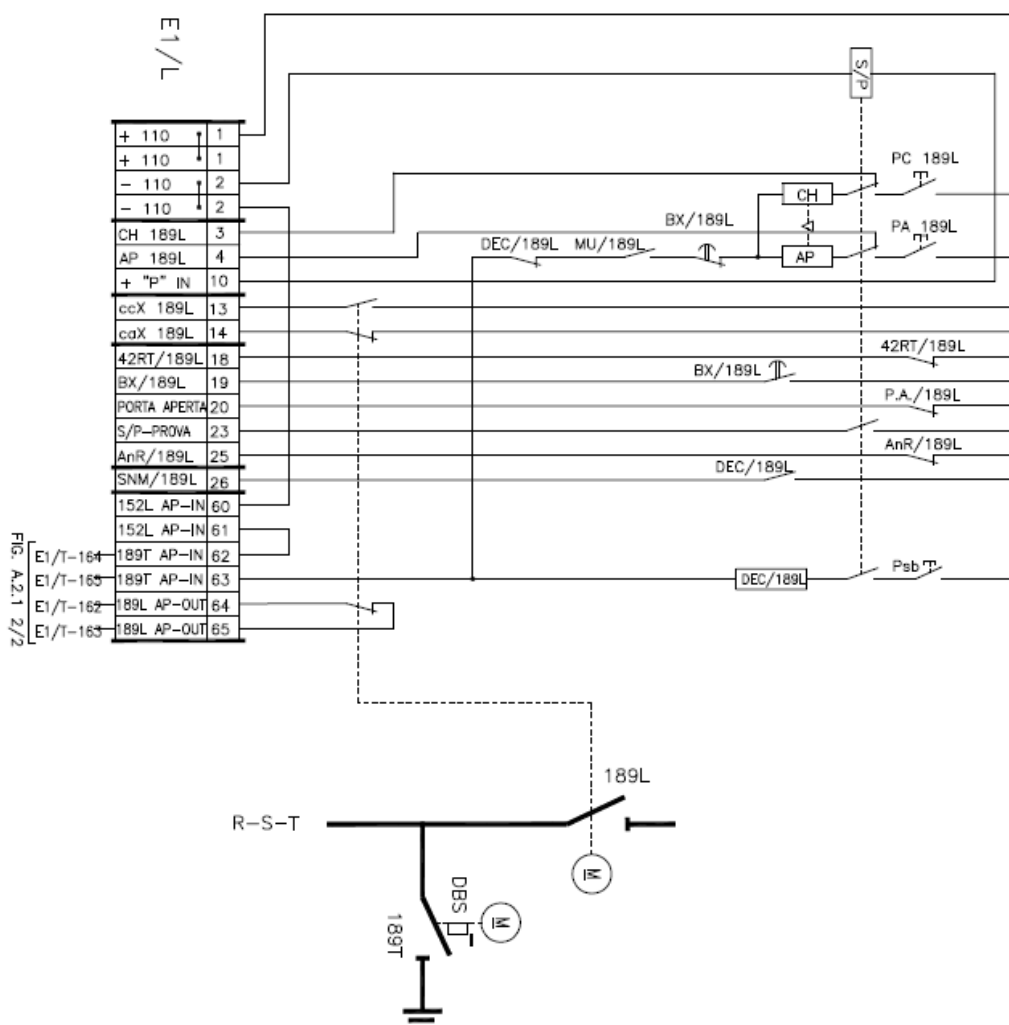
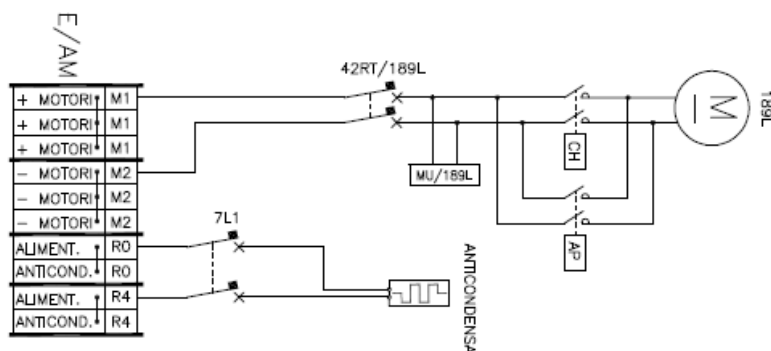


Fig. A.2.1 - SEZIONATORE DI LINEA (motorizzato)

Lo schema è rappresentato con sezionatore aperto e in assenza di tensione

FIG. A.2.1 2/2

Application Areas

Perimeter: Global

Staff Function: -

Service Function: -

Business Line: Infrastructure & Networks

Lo schema è rappresentato con sezionatore aperto, DBS disinserito e in assenza di tensione

Fig. A.2.1 1/2

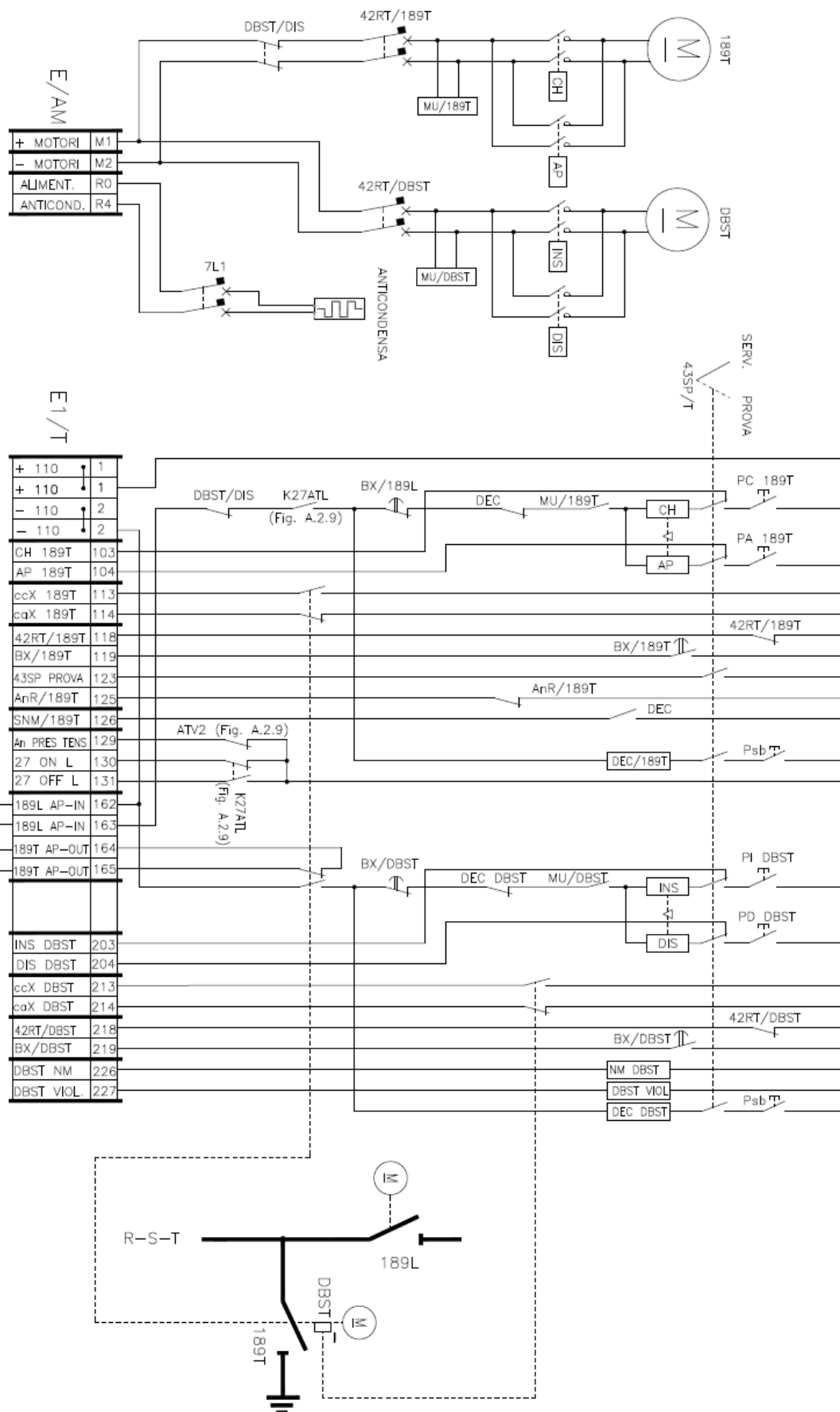


Fig. A.2.1 - SEZIONATORE DI TERRA (motorizzato)

Application Areas

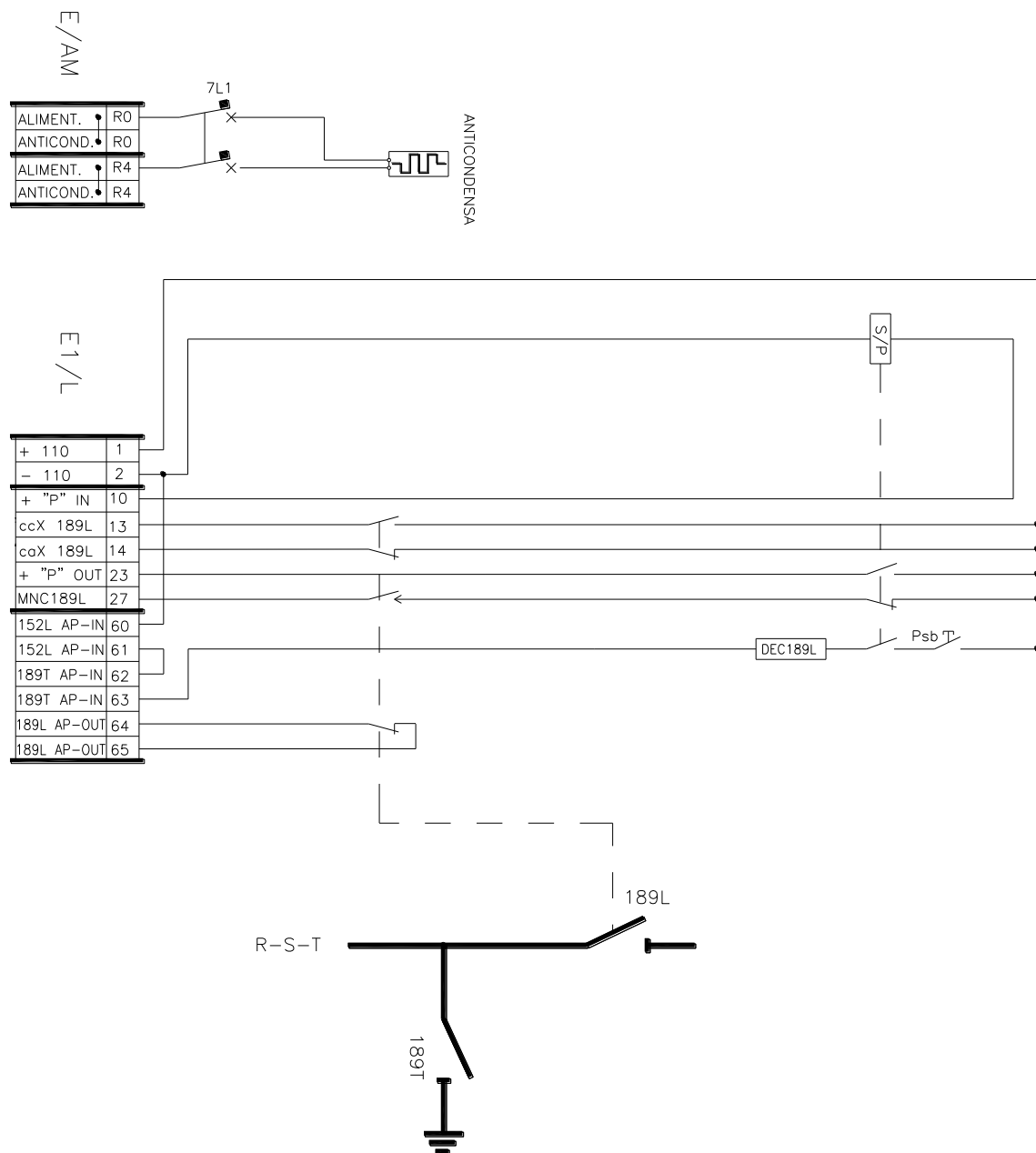
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.2 (manual-operated line DS+ES electrical scheme pag. 1/2)



Application Areas

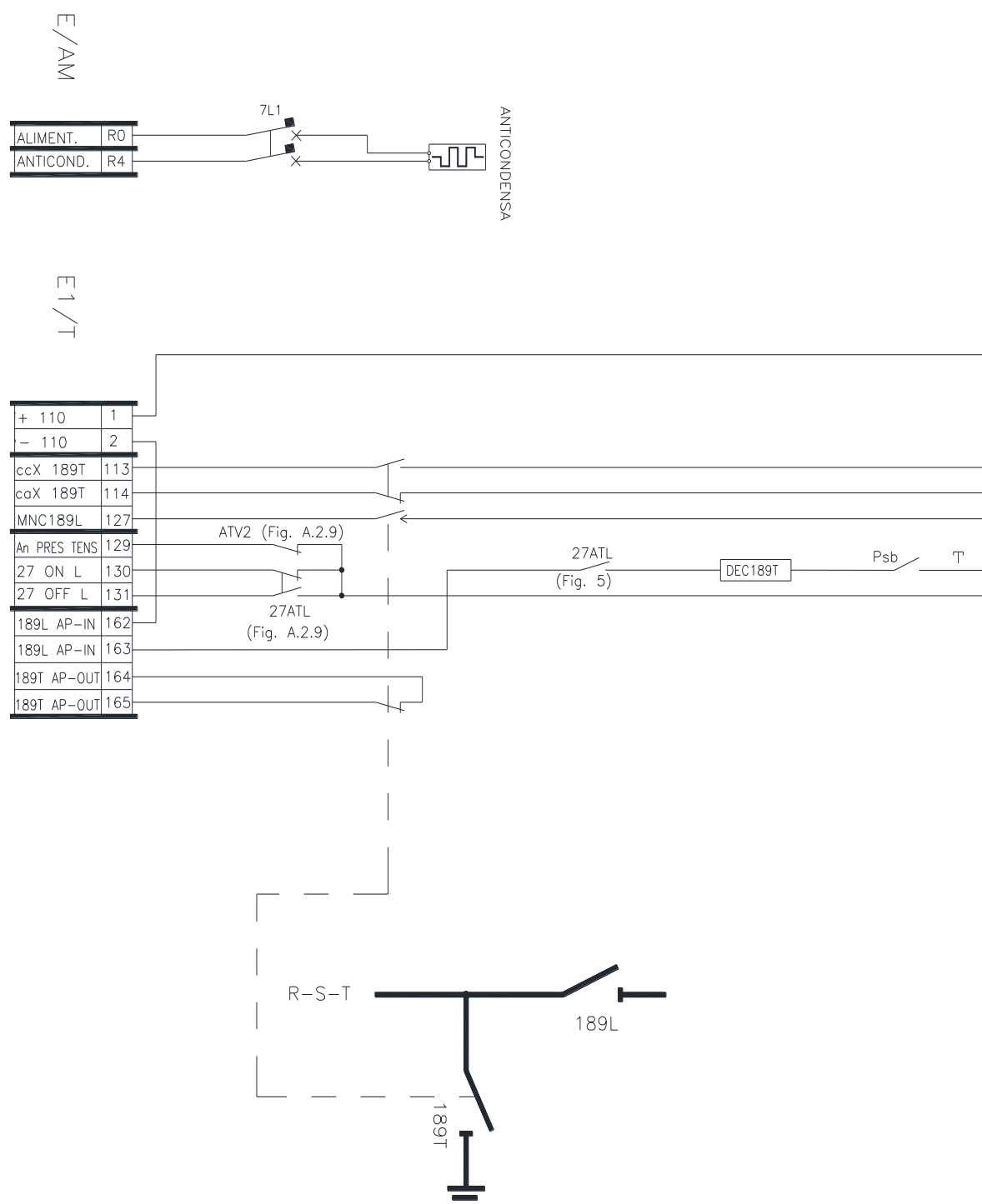
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.2 (manual-operated line DS+ES electrical scheme pag. 2/2)



Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.3. Manual operated Busbar DS (line bay)

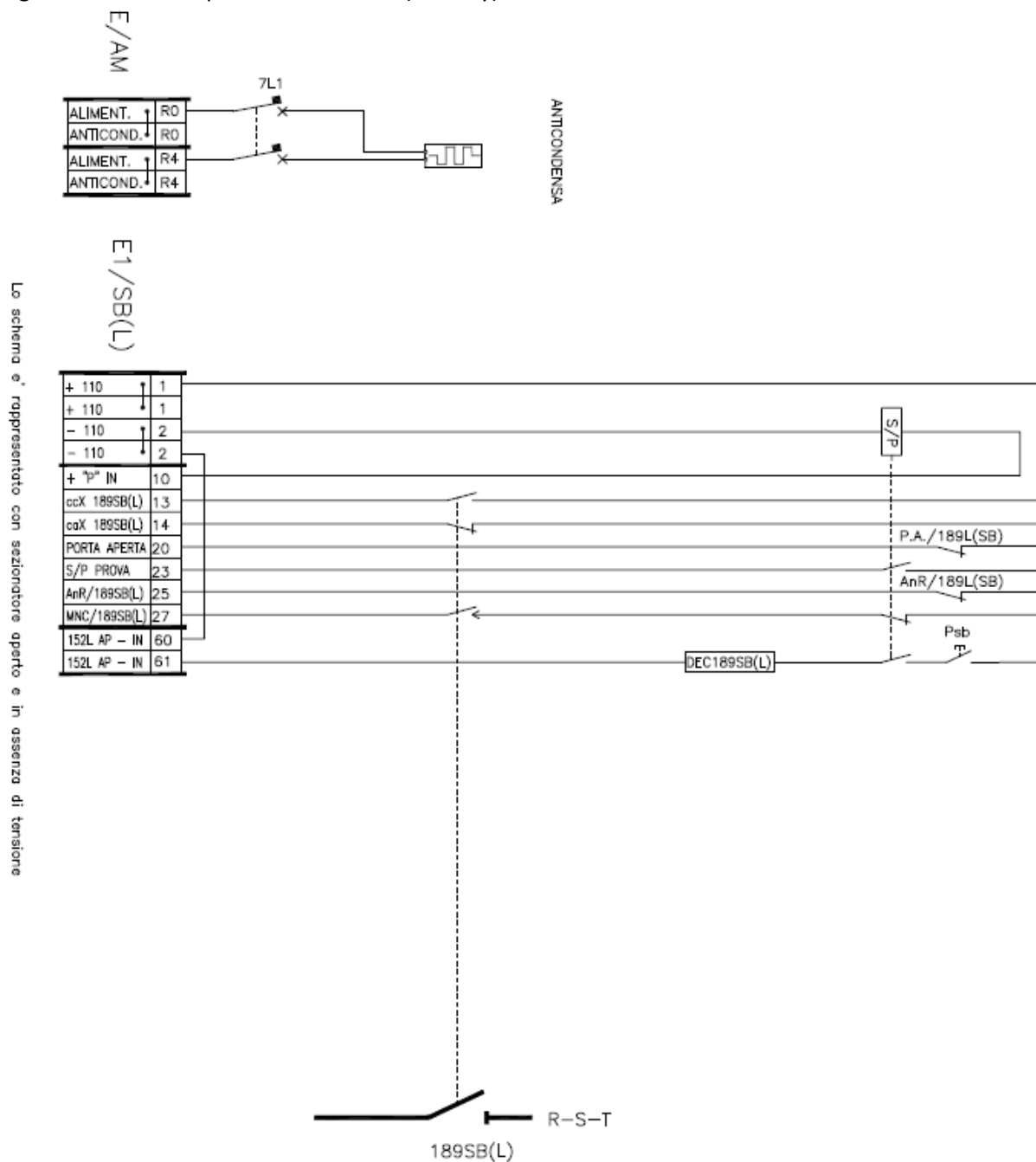


Fig. A.2.3 - SEZIONATORE SBARRA STALLO LINEA (motruale)

Application Areas

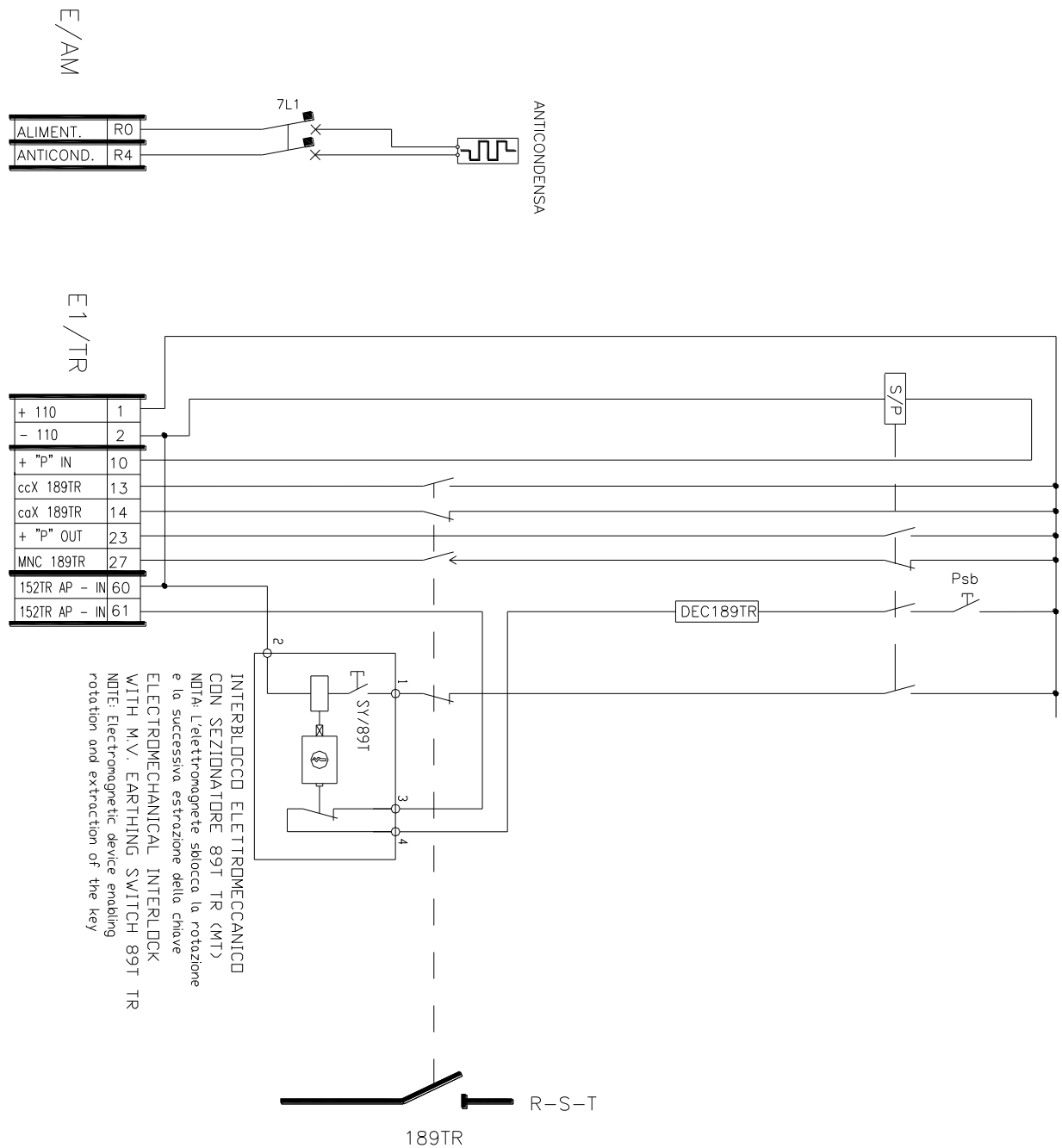
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.4 (manual-operated Busbar DS (transformer bay) electrical scheme)



Application Areas

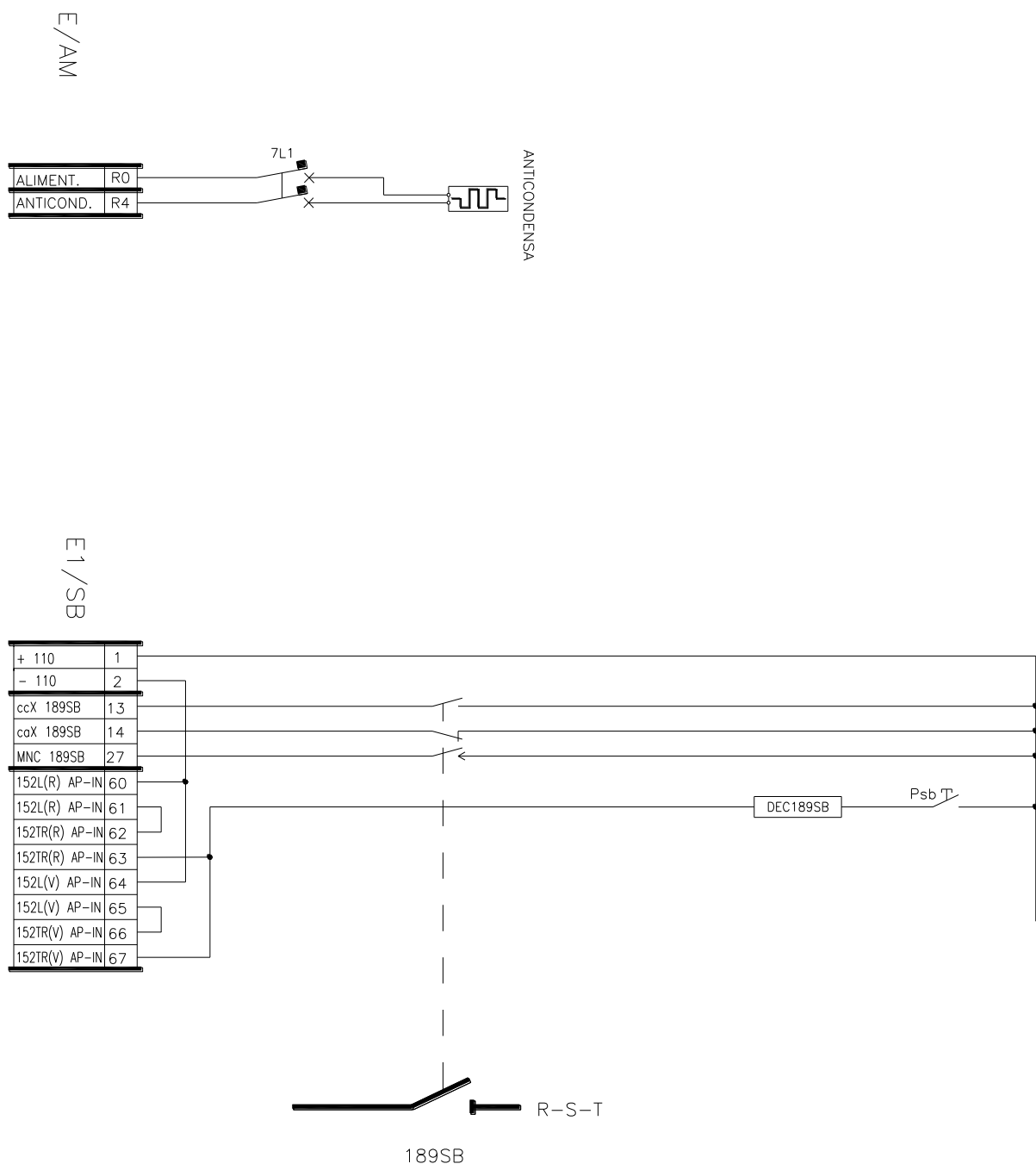
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.5 (manual-operated Conjoint busbar DS electrical scheme)



Application Areas

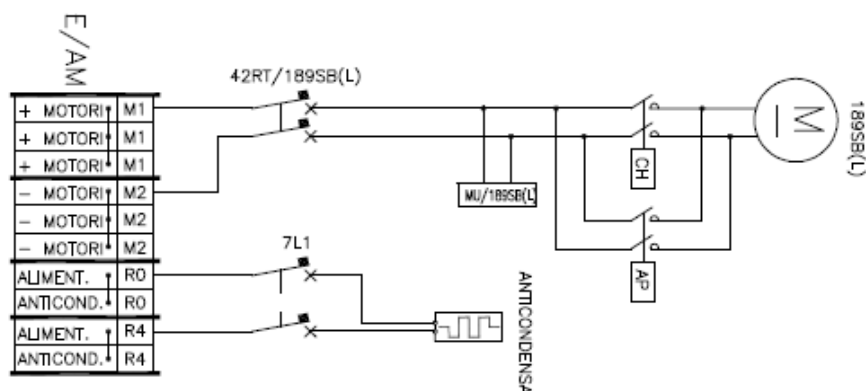
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.6 Motor operated Bus Bar DS (line bay)



Lo schema è rappresentato con sezionatore aperto e in assenza di tensione

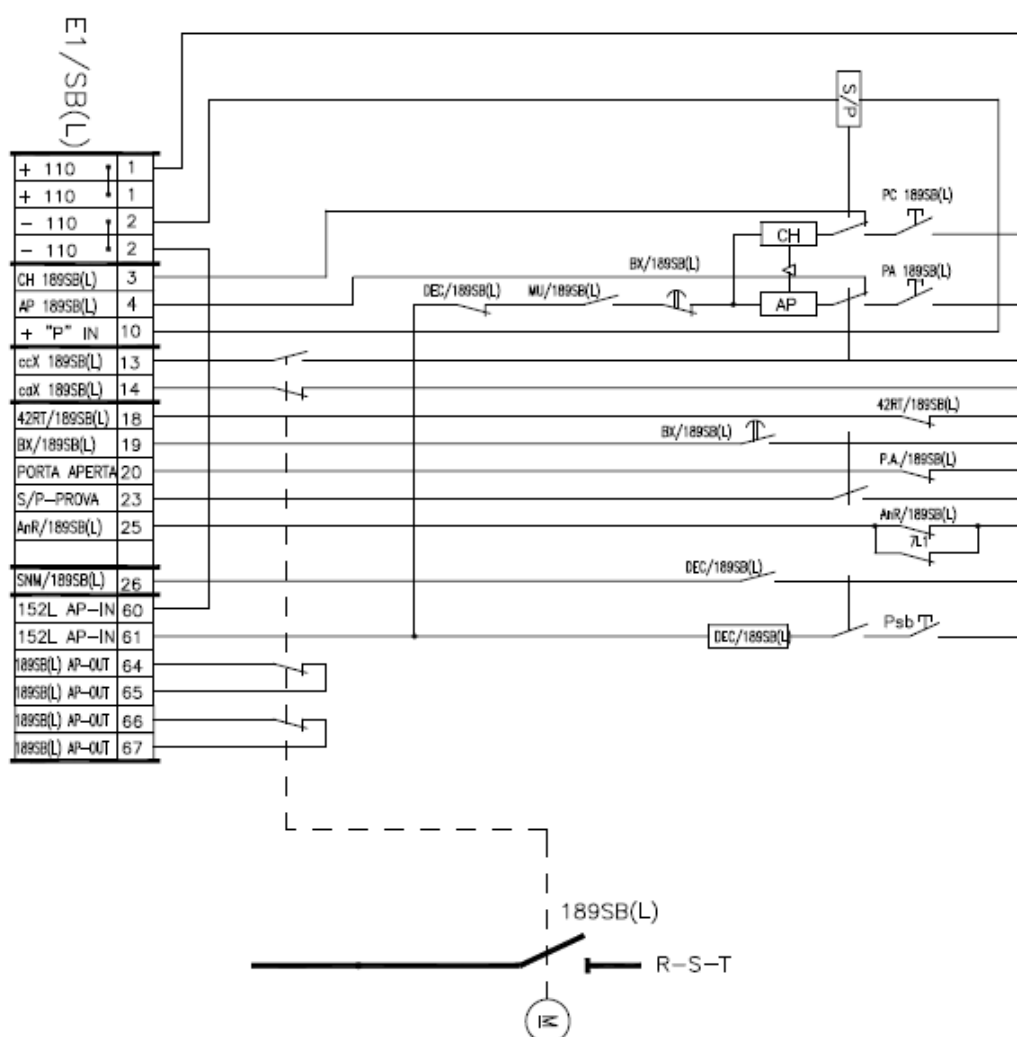


Fig. A.2.6 - SEZIONATORE DI LINEA LATO SIARRA MOTORIZZATO

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig A.2.7. Busbar DS (transformer bay) motor-operated

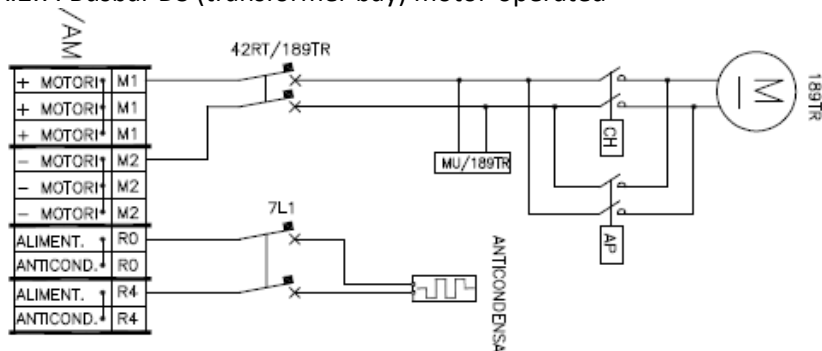
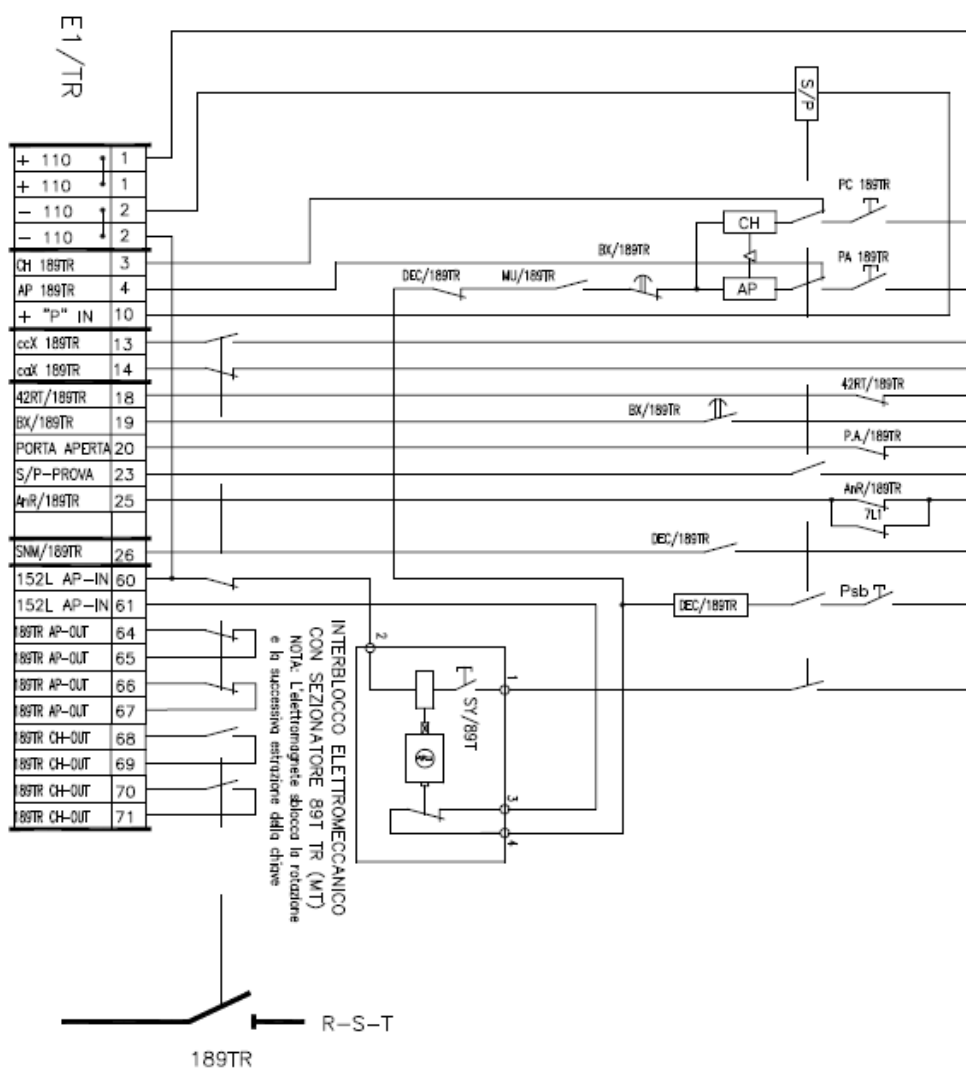


Fig. A.2.7 - SEZIONATORE SBARRA STALLO TRASFORMATORE MOTORIZZATO

Lo schema è rappresentato con sezionatore aperto e in assenza di tensione



Application Areas

Perimeter: Global

Staff Function: -

Service Function: -

Business Line: Infrastructure & Networks

Fig. A.2.8. Conjoint busbar DS motor-operated

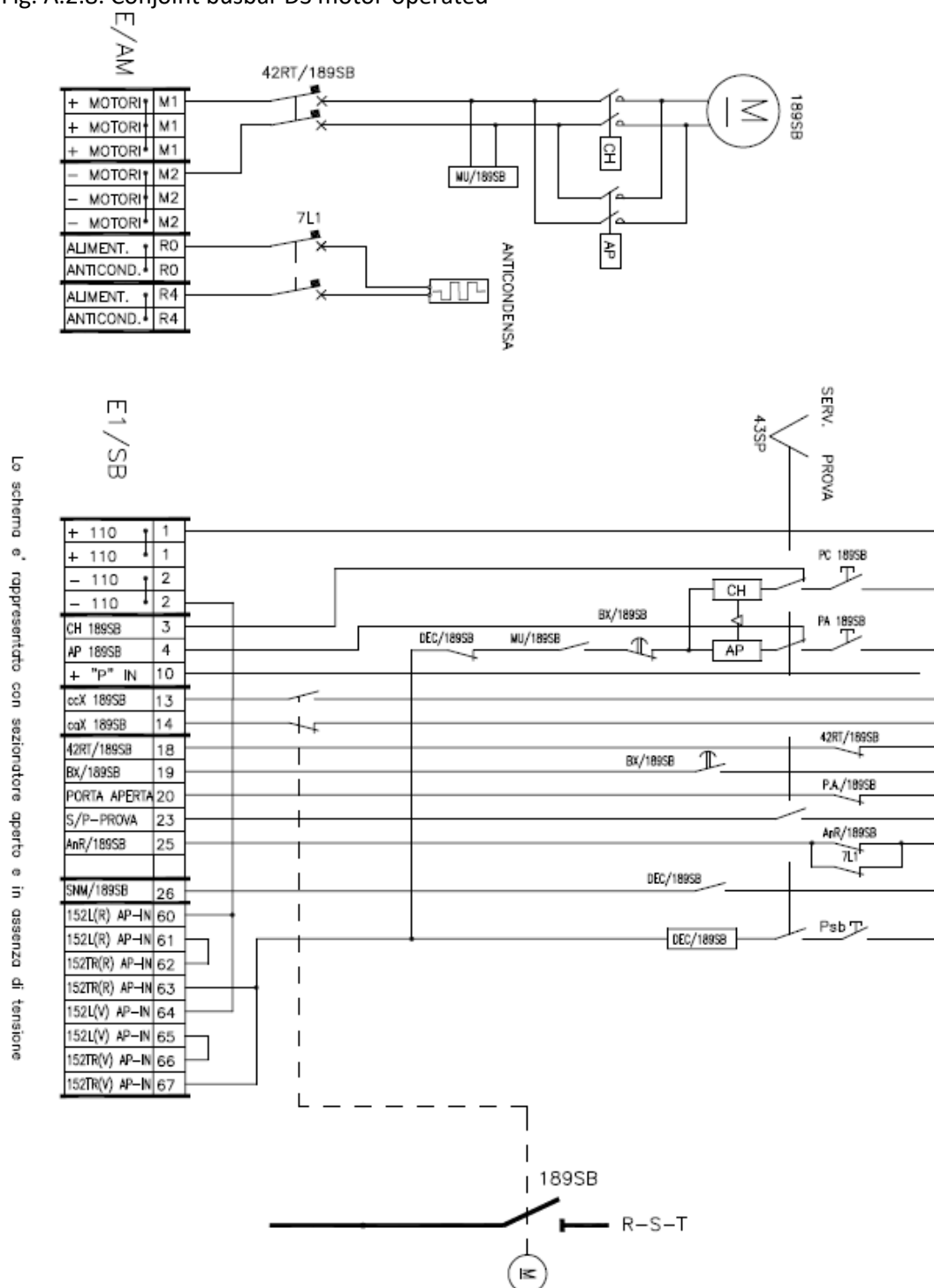


Fig. A.2.8 - SEZIONATORE CONGIUNTORE SBARRA MOTORIZZATO

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

Fig. A.2.9. VTs connection

Lo schema è rappresentato con interruttori aperti, pressione gas ai valori nominali e in assenza di tensione

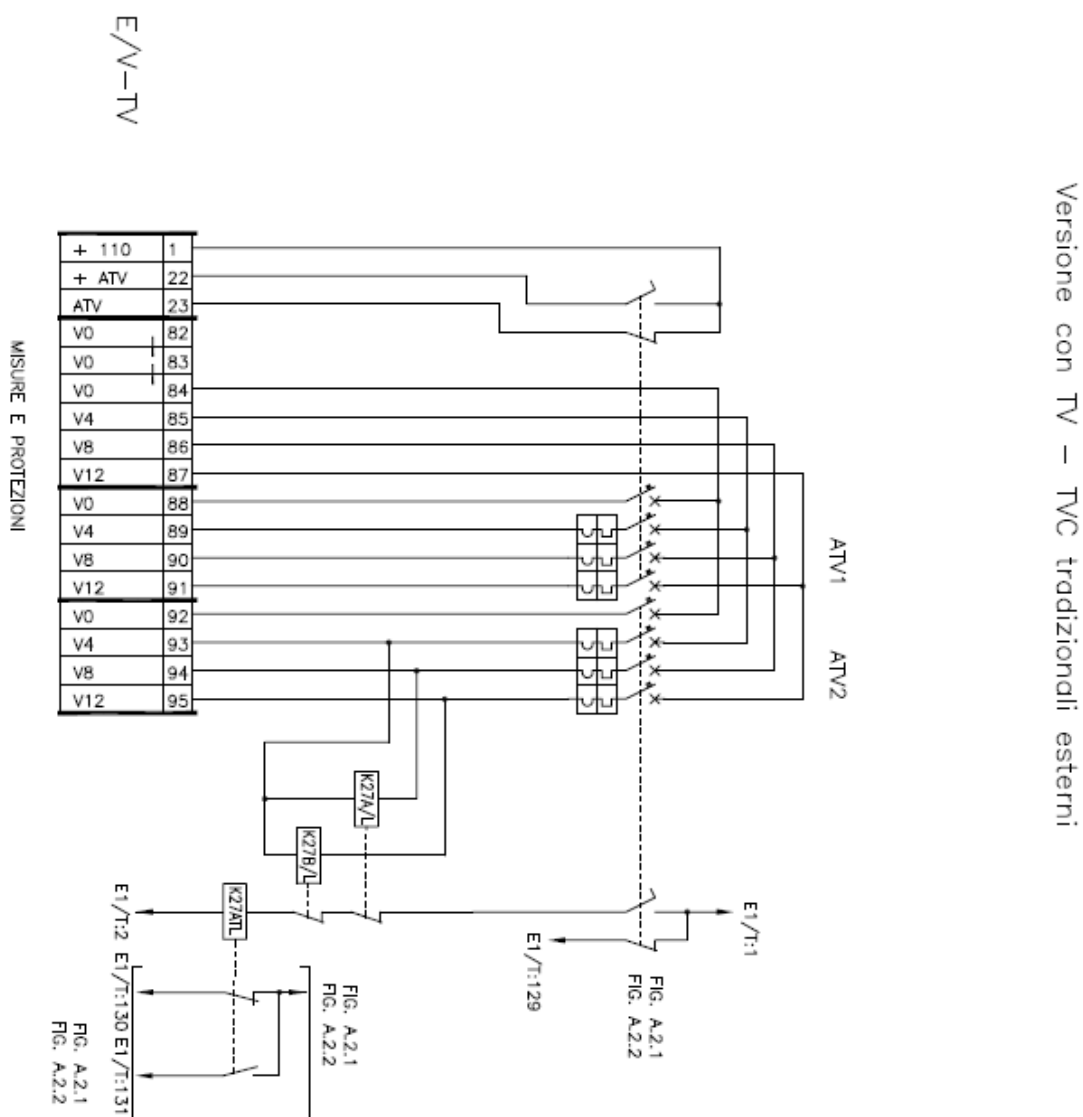


Fig. A.2.9 – COLLEGAMENTO TV

Application Areas

Perimeter: *Global*

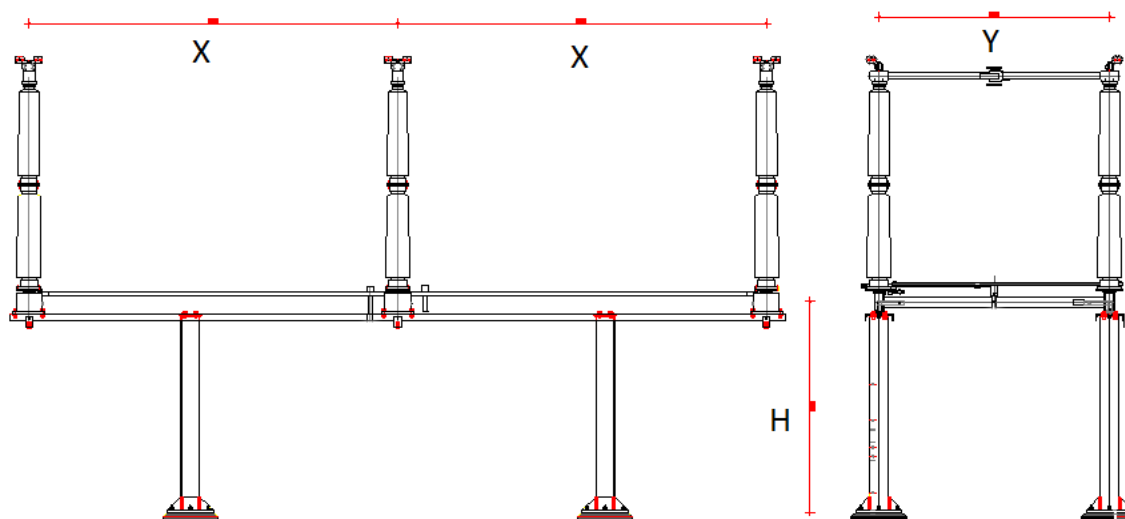
Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*
ANNEX B – DIMENSIONAL DRAWINGS
B.1 DISTANCES

The typical distances are the following (referential)

Different solutions shall be approved by Enel Distribution companies:



Voltage	X	H
72,5	1500 or 2000	3000
123	2000	2300 (bus bar)/3200 (line)
145	3000	3000
170	2200	2650/5150
245	4000	5150

Adaptar a Chile, colombia i brasil

Application Areas

Perimeter: *Global*

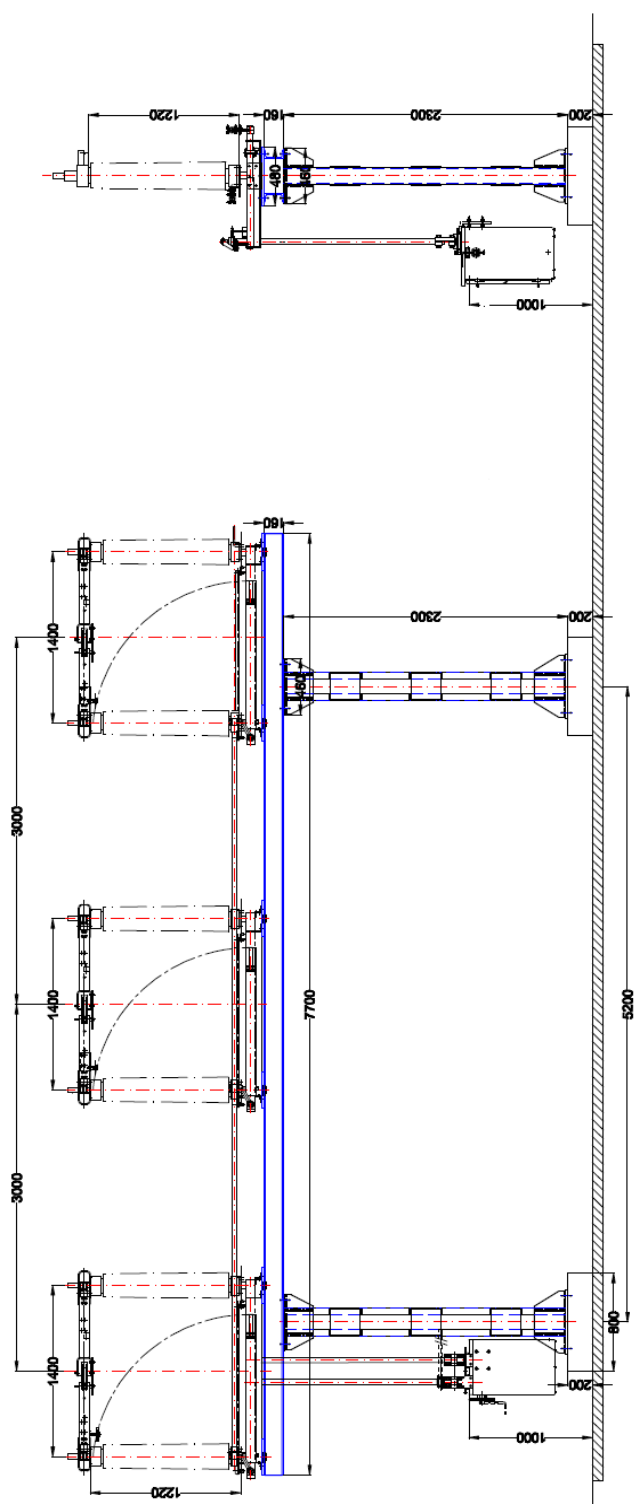
Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

B.3 – E-DISTRIBUTIE DIMENSIONAL DRAWINGS

HORIZONTAL IN LINE TYPE



Application Areas

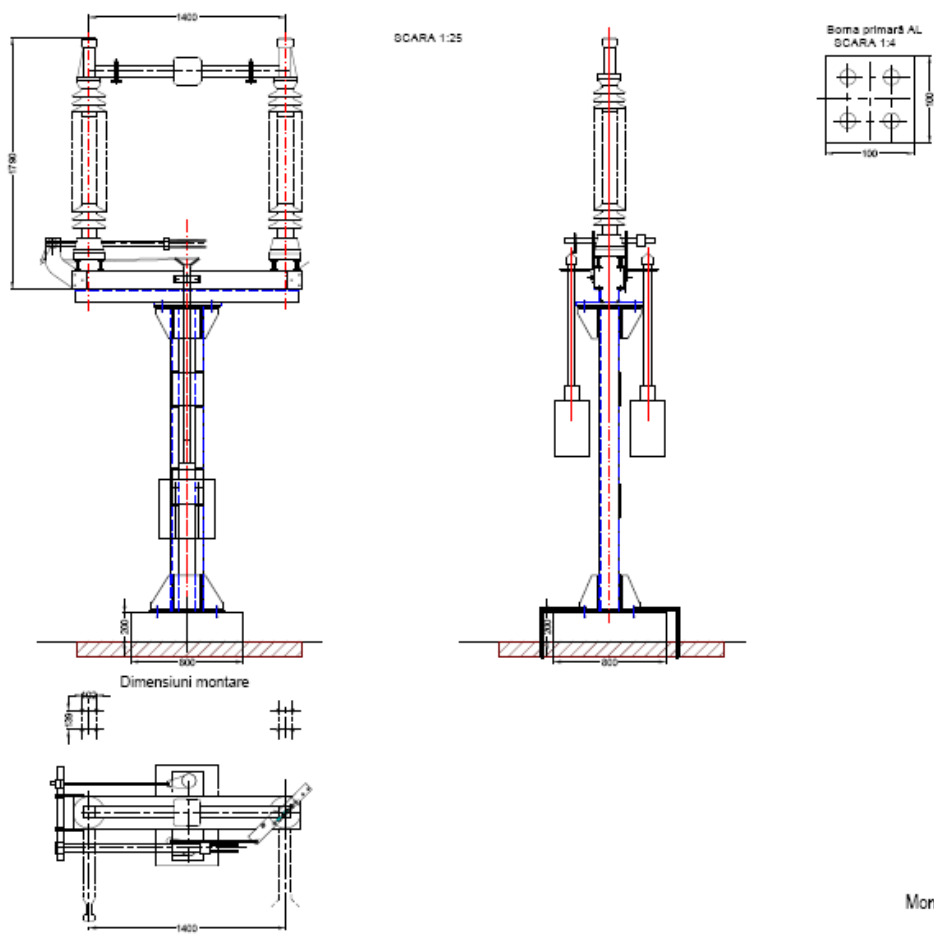
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

MONOPOLAR DS FOR NEUTRAL POWER TRANSFORMER



Application Areas

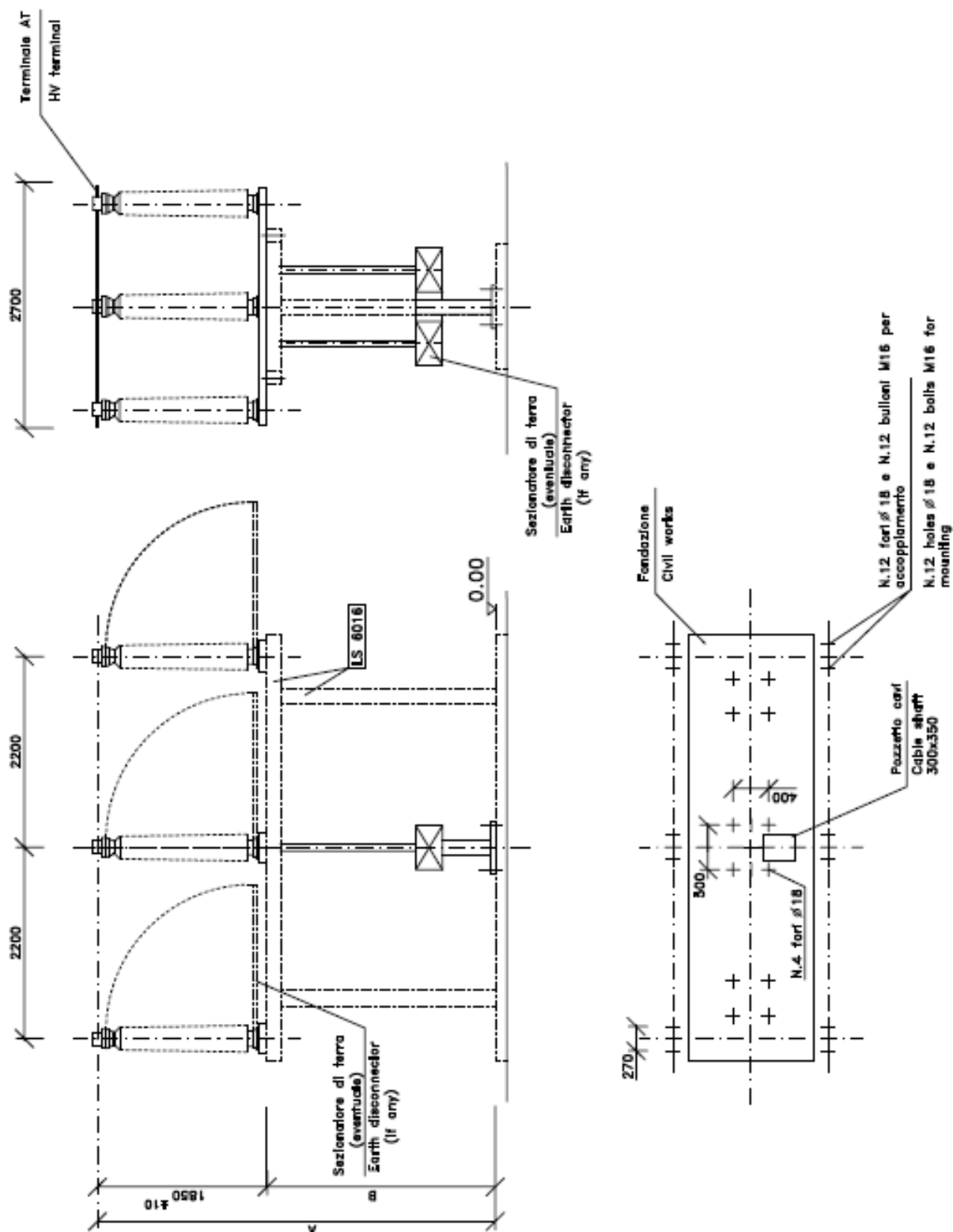
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

B.3 – E-DISTRIBUZIONE DIMENSIONAL DRAWINGS



Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*
ANNEX C – TENDER’S TECHNICAL DOCUMENTATION

GLOBAL STANDARD: GSCH003 – HV DS/ESs		TENDER:	
SUPPLIER:		FACTORY:	
ENEL GROUP TYPE CODE: GSCH003/___		SUPPLIER MODEL:	
TECHNICAL CHARACTERISTIC		STANDARD REQUIREMENT	SUPPLIER OFFER
<i>Service conditions</i>		outdoor normal service conditions of IEC 62271-1	
<i>Reference altitude (m)</i>		< 1.000 (2.600 for Colombia)	
<i>Minimum ambient air temperature (°C)</i>		See Annex D	
<i>SPS Class (IEC/TS 60815 series)</i>		See Annex D	
<i>Ice coating (mm)</i>		See Annex D	
<i>Seismic qualification level</i>		See table in 7.2.2.2	
<i>Rated short-time withstand current I_k (kA)</i>		See Annex D	
<i>Rated short-duration powerfrequency withstand voltage U_d (kV rms)</i>	<i>Common value</i>	See table in 5	
	<i>Across the isolating distance</i>	See table in 5	
<i>Rated lightning impulse withstand voltage U_p (kVp)</i>	<i>Common value</i>	See table in 5	
	<i>Across the isolating distance</i>	See table in 5	
<i>Rated frequency f_r (Hz)</i>		50 or 60	
<i>Opening (closing) time if motor-operated (s)</i>	<i>DS</i>	≤ 15	
	<i>ES</i>	≤ 15	
<i>Degrees of protection provided by enclosures</i>		IP 54	
<i>Rated supply voltage U_a (Vdc)</i>		See table in 5	
<i>d.c. max absorbed power (W)</i>		1.000	
<i>Rated supply voltage for heating and anti-condensation circuits (Vac)</i>		See table in 5	
<i>a.c. max absorbed power (VA)</i>		50 (250 if motor-operated)	
<i>Auxiliary contact classes</i>		1	
<i>DS Rated normal current I_r (A)</i>		See Annex D	
<i>DS Mechanical endurance class M_r</i>		M1	
<i>Bus-transfer current switching by disconnectors</i>	<i>Rated bus-transfer current for disconnectors (A)</i>	See Annex D and table in 5	
	<i>Rated bus-transfer voltages for disconnectors (V)</i>	See Annex D and table in 5	
<i>Earthing switches class E_r</i>		E0 – M0 – A	
<i>Insulators materials</i>		Composite	
<i>Dimensions</i>			To enclose an overall equipment drawing for each Enel Group Distribution Company

**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks***ANNEX D – COMPONENT LIST**

TYPE CODE	COMPANY	COMPANY CODE	E4E CODE	CODE	DESCRIPCION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature (°C)	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/200	EDE	6701206	140024	140621	SECCION. III,72,5KV,EXT,2000A,CON PAT MM POL	2	Central break	72,5	2000	31,5	Y	MANUAL	MANUAL	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/201	EDE	6701207	140025	140620	SECCION.III,72,5KV,EXT,2000A, SIN PAT MM POL	2	Central break	72,5	2000	31,5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/202	EDE	6701208	140026	140619	SECCION.III,72,5KV,EXT,1250A,CON PAT MM POL	2	Central break	72,5	1250	31,5	Y	MANUAL	MANUAL	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/203	EDE	6701209	140027	140618	SECCION.III,72,5KV,EXT,1250A, SIN PAT MM POL	2	Central break	72,5	1250	31,5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/204	EDE	6707698	150056	140622	SEC 72,5KV 2000A 31,5KA E MM PAT LF 31MM POL	2	Central break	72,5	2000	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/205	EDE	6707699	150057	140617	SEC72,5KV 2000A 31,5KA E MM SIN PAT LF31 POL	2	Central break	72,5	2000	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/206	EDE	6707700	150058	150033	SEC 72,5KV 1250A 31,5KA E MM PAT LF 31MM POL	2	Central break	72,5	1250	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/207	EDE	6707701	150059	150003	SEC72,5K 1250A 31,5KA E MM SIN PAT LF 31 POL	2	Central break	72,5	1250	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/208	EDE	6701204	150049	150174	SECCION. III,145KV,EXT,1250A, CON PAT MM POL	2	Central break	145	1250	31,5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/209	EDE	6707696	150054	150165	SEC 145KV 1250A 31,5KA E MM PAT LF31MM-K POL	2	Central break	145	1250	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/210	EDE	6701205	150170	150040	SECCION. III,145KV,EXT,1250A, SIN PAT MM POL	2	Central break	145	1250	31,5	Y	MANUAL	MANUAL	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/211	EDE	6707697	150055	150175	SEC145KV 1250A 31,5KA E MM SIN PAT LF31M POL	2	Central break	145	1250	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/212	EDE	6710771	140036	140624	SEC 145KV 1250A 31,5KA E ME SIN PAT LF25 POL	2	Central break	145	1250	31,5	N	MOTOR	-	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/213	EDE	6710772	140037	140623	SEC 145KV 1250A 31,5KA E ME SIN PAT LF31 POL	2	Central break	145	1250	31,5	N	MOTOR	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/214	EDE	6710773	140038	140625	SEC 145KV 1250A 31,5KA E ME PAT MM LF25M POL	2	Central break	145	1250	31,5	Y	MOTOR	MANUAL	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/215	EDE	6710774	140039	140626	SEC 145KV 1250A 31,5KA E ME PAT MM LF31M POL	2	Central break	145	1250	31,5	Y	MOTOR	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/216	EDE	6701203	150048	150177	SECCION. III,145KV,EXT,2000A, SIN PAT MM POL	2	Central break	145	2000	31,5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/217	EDE	6707695	150053	150215	SEC 145KV 2000A 31,5KA E MM SIN PAT LF31 POL	2	Central break	145	2000	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/218	EDE	6701202	150047	150176	SECCION. III,145KV,EXT,2000A, CON PAT MM POL	2	Central break	145	2000	31,5	Y	MANUAL	MANUAL	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/219	EDE	6707694	150052	150179	SEC 145KV 2000A 31,5KA E MM PAT LF31MM-K POL	2	Central break	145	2000	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/220	EDE	6710775	140220	150178	SEC 145KV 2000A 31,5KA E ME SIN PAT LF25 POL	2	Central break	145	2000	31,5	N	MOTOR	-	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/221	EDE	6710776	140221	150228	SEC 145KV 2000A 31,5KA E ME SIN PAT LF31 POL	2	Central break	145	2000	31,5	N	MOTOR	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/222	EDE	6710777	140222	150219	SEC 145KV 2000A 31,5KA E ME PAT MM LF25M POL	2	Central break	145	2000	31,5	Y	MOTOR	MANUAL	d	N	-25	10	Horizontal paralel	3000 mm
GSH003/223	EDE	6710778	140223	150229	SEC 145KV 2000A 31,5KA E ME PAT MM LF31M POL	2	Central break	145	2000	31,5	Y	MOTOR	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/224	EDE			150377	SEC. 52KV2000A31,5KA E MM CON PAT MM POL	2	Central break	52	2000	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/225	EDE			150378	SEC52KV2000A31,5KA E MM SIN PAT LF31MPOL	2	Central break	52	2000	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/226	EDE			150379	SEC52KV1250A31,5KA E MM SIN PAT LF31MPOL	2	Central break	52	1250	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/227	EDE			150546	SEC. 52KV1250A31,5KA E MM CON PAT MM POL	2	Central break	52	1250	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/228	EDE			150547	SEC. 52KV 2000A 31,5KA E MM SIN PAT POL	2	Central break	52	200	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/229	EDE			150548	SEC52KV2000A31,5KA E MM CON PAT LF31MPOL	2	Central break	52	2000	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/230	EDE			150550	SEC52KV1250A31,5KA E MM CON PAT LF31MPOL	2	Central break	52	1250	31,5	Y	MANUAL	MANUAL	e	N	-25	10	Horizontal paralel	3000 mm
GSH003/231	EDE			150551	SEC. 52KV 1250A 31,5KA E MM SIN PAT POL	2	Central break	52	1250	31,5	N	MANUAL	-	e	N	-25	10	Horizontal paralel	3000 mm



Technical Specification code: MAT-O&M-NCS-2021-00XX-EGIN

Version no. 4 dated 19.09.2021

Subject: Global infrastructure and Networks **GSCH003** HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	CODE	DESCRIPCION	N° Columns/pol e	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature (°C)	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/001	e-distribuzione	156110	SEZ.+SEZ.TERRA LINEA MOTORIZZ.145-170 k	3	Double break	170	1250	31.5	Y	MOTOR	MOTOR	d	N	-25	10	Horizontal paralel	2650 mm
GSH003/002	e-distribuzione	156111	SEZ.+SEZ.TERRA LINEA MANUALE 145-170 kV	3	Double break	170	1250	31.5	Y	MANUAL	MANUAL	d	N	-25	10	Horizontal paralel	2650 mm
GSH003/003	e-distribuzione	156112	SEZ. SBARRA LINEA MANUALE 145-170 kV	3	Double break	170	1250	31.5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	2650 mm
GSH003/004	e-distribuzione	156113	SEZ. SBARRA TRASFORM. MANUALE 145-170 k.	3	Double break	170	1250	31.5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	2650 mm
GSH003/005	e-distribuzione	156114	SEZ. CONGIUNT. SBARRA MANUALE 145-170 k.	3	Double break	170	1250	31.5	N	MANUAL	-	d	N	-25	10	Horizontal paralel	5150 mm
GSH003/006	e-distribuzione	150003	Sez. AT sbarra linea motoriz.	3	Double break	170	1250	31.5	N	MOTOR	-	d	N	-25	10	Horizontal paralel	2650 mm
GSH003/007	e-distribuzione	150004	Sez. AT sbarra trasf. motor.	3	Double break	170	1250	31.5	N	MOTOR	-	d	N	-25	10	Horizontal paralel	2650 mm
GSH003/008	e-distribuzione	150005	Sez. AT congiuntore sb. motor.	3	Double break	170	1250	31.5	N	MOTOR	-	d	N	-25	10	Horizontal paralel	5150 mm
GSH003/009	e-distribuzione	156850	SOST SEZ O3P150 2,2 H2,65 LS6016/1 UE	-	Support	170	-	-	-	-	-	-	-	-	-	Horizontal paralel	2650 mm
GSH003/010	e-distribuzione	156852	SOST SEZ O3P150 2,2 H5,15 LS6016/3 UE	-	Support	170	-	-	-	-	-	-	-	-	-	Horizontal paralel	5150 mm

**Technical Specification code: MAT-O&M-NCS-2021-00XX-EGIN**

Version no. 4 dated 19.09.2021

Subject: Global infrastructure and Networks **GSCH003 HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV****Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	OLD CODE	E4E CODE	DESCRIPCION	Nº Columns/pol e	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transf	Minimum ambient air temperatu	Ice coating (mm)	ASSEMBLY	Installation height (m)
GSCH003/900	E-RIO	4545883	150697	CH,72KV,1250A,MAN,C/LT,VER,<10m,GSCH003	2	Central break	72,5	1250	25	Y	MANUAL	MANUAL	d	N	-10	1	Vertical	< 10000
GSCH003/901	E-RIO	4545884	150698	CH,72KV,1250A,MAN,C/LT,HOR,<6m,GSCH003	2	Central break	72,5	1250	25	Y	MANUAL	MANUAL	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/902	E-RIO	4545894	150705	CH,72KV,1250A,MAN,C/LT,HOR,>10m,GSCH003	2	Central break	72,5	1250	25	Y	MANUAL	MANUAL	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/903	E-RIO	4545875	150695	CH,72KV,1250A,MAN,S/LT,HOR,>10m,GSCH003	2	Central break	72,5	1250	25	N	MANUAL	-	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/904	E-RIO	4545893	150704	CH,72KV,1250A,MAN,S/LT,VER,<10m,GSCH003	2	Central break	72,5	1250	25	N	MANUAL	-	d	N	-10	1	Vertical	< 10000
GSCH003/905	E-RIO	4545888	150701	CH72,5KV-1250A MAN S/LT MONT HOR <6,0M	2	Central break	72,5	1250	25	N	MANUAL	-	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/906	E-RIO	4545891	150941	CH,72KV,1250A,MOT,C/LT,HOR,<6m,GSCH003	2	Central break	72,5	1250	25	Y	MOTOR	MANUAL	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/907	E-RIO	4545890	150703	CH,72KV,1250A,MAN,S/LT,HOR,<10m,GSCH003	2	Central break	72,5	1250	25	N	MANUAL	-	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/908	E-RIO	4545882	150696	CH,72KV,1250A,MOT,C/LT,HOR,>10m,GSCH003	2	Central break	72,5	1250	25	Y	MOTOR	MANUAL	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/909	E-RIO	4545889	150702	CH,72KV,1250A,MOT,S/LT,HOR,<6m,GSCH003	2	Central break	72,5	1250	25	N	MOTOR	-	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/910	E-RIO	4545917	150713	CH,72KV,1250A,MOT,S/LT,HOR,<10m,GSCH003	2	Central break	72,5	1250	25	N	MOTOR	-	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/911	E-RIO	4545886	150699	CH,72KV,1250A,MOT,S/LT,HOR,>10m,GSCH003	2	Central break	72,5	1250	25	N	MOTOR	-	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/912	E-RIO	4545872	150693	CH,145KV,1250A,MAN,C/LT,HOR,<10m,GSCH003	2	Central break	145	1250	40	Y	MANUAL	MANUAL	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/913	E-RIO	4545887	150700	CH,145KV,1250A,MAN,C/LT,VER,<10m,GSCH003	2	Central break	145	1250	40	Y	MANUAL	MANUAL	d	N	-10	1	Vertical	< 10000
GSCH003/914	E-RIO	4545869	150940	CH,145KV,1250A,MAN,C/LT,HOR,>10m,GSCH003	2	Central break	145	1250	40	Y	MANUAL	MANUAL	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/915	E-RIO	4545868	150692	CH145KV-1250A MAN S/LT MONT HOR <6,0M	2	Central break	145	1250	40	N	MANUAL	-	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/916	E-RIO	4545916	150712	CH,72KV,1250A,MAN,S/LT,HOR,<10m,GSCH003	2	Central break	72,5	1250	25	N	MANUAL	-	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/917	E-RIO	4545948	150716	CH145KV-1250A MAN S/LT MONT VERT <10,0M	2	Central break	145	1250	40	N	MANUAL	-	d	N	-10	1	Vertical	< 10000
GSCH003/918	E-RIO	4545960	150718	CH,145KV,1250A,MOT,C/LT,HOR,<6m,GSCH003	2	Central break	145	1250	40	Y	MOTOR	MANUAL	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/919	E-RIO	4545961	150942	CH,145KV,1250A,MOT,S/LT,HOR,<10m,GSCH003	2	Central break	145	1250	40	N	MOTOR	-	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/920	E-RIO	4545955	150717	CH,145KV,1250A,MOT,C/LT,HOR,<10m,GSCH003	2	Central break	145	1250	40	Y	MOTOR	MANUAL	d	N	-10	1	Horizontal paralel	>10000
GSCH003/921	E-RIO	4584354	150721	CH,145KV,1250A,MOT,S/LT,HOR,<6m,GSCH003	2	Central break	145	1250	40	N	MOTOR	-	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/922	E-RIO	4545855	150691	CH,145KV,1250A,MOT,S/LT,VER,<10m,GSCH003	2	Central break	145	1250	40	N	MOTOR	-	d	N	-10	1	Vertical	< 10000
GSCH003/923	E-RIO	4545874	150694	CH145KV-1250A MAN S/LT MONT HOR >10,0M	2	Central break	145	1250	40	N	MANUAL	-	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/924	E-RIO	6806423	150767	CH,72KV,1250A,MOT,S/LT,VER,<10m,GSCH003	2	Central break	72,5	1250	25	N	MOTOR	-	d	N	-10	1	Vertical	< 10000
GSCH003/925	E-RIO	6806426	150954	CH,72KV,1250A,MAN,S/LT,VER,>10m,GSCH003	2	Central break	72,5	1250	25	N	MANUAL	-	d	N	-10	1	Vertical	> 10000
GSCH003/926	E-RIO	6806427	150768	CH,145KV,1250A,MAN,S/LT,VER,>10m,GSCH003	2	Central break	145	1250	40	N	MANUAL	-	d	N	-10	1	Vertical	> 10000
GSCH003/927	E-RIO	6808300	150769	CH145KV-1250A-MOT-C/LT-TRIP-CENTRAL->10M	2	Central break	145	1250	40	Y	MOTOR	MANUAL	d	N	-10	1	Vertical Invertida	> 10000
GSCH003/928	E-RIO	6810930	150770	CHAVE, SECC,LT,145KV,2000A,3F,MAN,SECO	2	Central break	145	2000	40	Y	MANUAL	MANUAL	d	N	-10	1	Vertical	< 10000
GSCH003/929	E-RIO	6810931	150771	CHAVE, SECC,145KV,2000A,3F,MAN,SECO,<10M	2	Central break	145	2000	40	N	MANUAL	-	d	N	-10	1	Vertical	< 10000
GSCH003/930	E-RIO	6810932	150772	CH,SEC,145KV,2000A,3F,MAN,SECO,GSCH003	2	Central break	145	2000	40	N	MANUAL	-	d	N	-10	1	Vertical	> 10000
GSCH003/931	E-RIO	6816305	6816305	SEC,72,5KV,1250A,TRIP,MA,SECO,GSCH003/931	2	Lateral break	72,5	1250	31,5	N	MANUAL	-	d	N	-10	1	Vertical	> 10000
GSCH003/932	E-RIO	T150040	150807	CH,SEC,145KV,2000A,3F,MAN,SECO,GSCH003	2	Central break	145	2000	40	N	MANUAL	-	d	N	-10	1	Horizontal paralel	> 10000
GSCH003/933	E-RIO	T150007	150805	CH,145KV,2000A,MAN,C/LT,HOR,<10m,GSCH003	2	Central break	145	2000	40	Y	MANUAL	MANUAL	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/934	E-RIO	T150008	150806	CH,145KV,2000A,MAN,S/LT,HOR,<10m,GSCH003	2	Central break	145	2000	40	N	MANUAL	-	d	N	-10	1	Horizontal paralel	< 10000
GSCH003/935	E-RIO		990208	CH,145KV,2000A,MAN,C/LT,VERT,<10m,GSCH003	3	Double-Break	145	2000	40	Y	Manual	Manual	d	N	-10	1	Vertical	< 10000
GSCH003/936	E-RIO		990209	CH,145KV,4000A,MAN,C/LT,VERT,<10m,GSCH003	3	Double-Break	145	4000	40	Y	Manual	Manual	d	N	-10	1	Vertical	< 10000
GSCH003/937	E-RIO		990215	CH,145KV,2000A,MAN,S/LT,HOR,>10m,GSCH003	3	Double-Break	145	2000	40	N	Manual	-	d	N	-10	1	Horizontal	> 10000
GSCH003/938	E-RIO		150970	CH,145KV,4000A,MAN,S/LT,HOR,>10m,GSCH003	3	Double-Break	145	4000	40	N	Manual	-	d	N	-10	1	Horizontal	> 10000
GSCH003/939	E-RIO		990210	CH,145KV,2000A,MOT,S/LT,VERT,<10m,GSCH003	3	Double-Break	145	2000	40	N	Motor	-	d	N	-10	1	Vertical	< 10000
GSCH003/940	E-RIO		990211	CH,145KV,4000A,MOT,S/LT,VERT,<10m,GSCH003	3	Double-Break	145	4000	40	N	Motor	-	d	N	-10	1	Vertical	< 10000
GSCH003/941	E-RIO		990214	CH,145KV,2000A,MOT,S/LT,HOR,<6m,GSCH003	3	Double-Break	145	2000	40	N	Motor	-	d	N	-10	1	Horizontal	< 6000
GSCH003/942	E-RIO		990213	CH,145KV,4000A,MOT,S/LT,HOR,<6m,GSCH003	3	Double-Break	145	4000	40	N	Motor	-	d	N	-10	1	Horizontal	< 6000
GSCH003/943	E-RIO	*	150971	CH,145KV,2000A,MOT,S/LT,HOR,<6m,GSCH003	3	Double-Break	145	2000	40	N	Motor	-	d	N	-10	1	Horizontal	<6000
GSCH003/944	E-RIO	*	990216	CH,145KV,2000A,MOT,S/LT,HOR,>10m,GSCH003	3	Double-Break	145	2000	40	N	Motor	-	d	N	-10	1	Horizontal	>10000
GSCH003/945	E-RIO	*	990212	CH,145KV,2000A,MOT,C/LT,HOR,<6m,GSCH003	3	Double-Break	145	2000	40	Y	Motor	Manual	d	N	-10	1	Horizontal	< 6000
GSCH003/946	E-RIO		150093	CH,145KV,2000A,MOT,C/LT,HOR<6m,GSCH003	3	Double-Break	145	2000	40	Y	Motor	Manual	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/947	E-RIO		150092	CH,72KV,1250A,MAN,C/LT,HOR<6m,GSCH003	2	Central-Break	72,5	1250	31.5	N	Motor	-	d	N	-10	1	Horizontal paralel	< 6000
GSCH003/948	E-RIO		150091	CH72,5KV,1250A,MAN,S/LT,HOR<6m,GSCH003	2	Central-Break	72,5	1250	31.5	N	Manual	-	d	N	-10	1	Horizontal paralel	< 6000

* Vdc is 220 V



Technical Specification code: MAT-O&M-NCS-2021-00XX-EGIN

Version no. 4 dated 19.09.2021

Subject: Global infrastructure and Networks **GSCH003** HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	COMPANY CODE	E4E CODE	CODE	DESCRICION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSCH003/600	E-CEARÁ	4544141	4544141	150686	SECCIONADOR, TRIPOLAR, 72.5KV, 1250A, COMANDO MANUAL, COM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM HORIZONTAL PARALELA	2	Central break	73	1250	32	Y	MANUAL	MANUAL	e	N	-10	1	Horizontal paralel	10010mm
GSCH003/601	E-CEARÁ	6771461	6771461	150742	SECCIONADOR, TRIPOLAR, 72.5KV, 1250A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM HORIZONTAL PARALELA	2	Central break	73	1250	32	N	MANUAL	-	e	N	-10	1	Horizontal paralel	10010mm
GSCH003/602	E-CEARÁ	6771466	6771466	150745	SECCIONADOR, TRIPOLAR, 72.5KV, 2000A, COMANDO MANUAL, COM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM HORIZONTAL PARALELA	2	Central break	73	2000	32	Y	MANUAL	MANUAL	e	N	-10	1	Horizontal paralel	10010mm
GSCH003/603	E-CEARÁ	6771467	6771467	150746	SECCIONADOR, TRIPOLAR, 72.5KV, 2000A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM HORIZONTAL PARALELA	2	Central break	73	2000	32	N	MANUAL	-	e	N	-10	1	Horizontal paralel	10010mm
GSCH003/604	E-CEARÁ	6771465	6771465	150744	SECCIONADOR, TRIPOLAR, 72.5KV, 1250A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM VERTICAL ALTA ALTURA DA	2	Central break	73	1250	32	N	MANUAL	-	e	N	-10	1	Vertical	6000mm
GSCH003/605	E-CEARÁ	6771469	6771469	150748	SECCIONADOR, TRIPOLAR, 72.5KV, 2000A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM VERTICAL ALTA ALTURA DA	2	Central break	73	2000	32	N	MANUAL	-	e	N	-10	1	Vertical	6000mm
GSCH003/606	E-CEARÁ	6771462	6771462	150743	SECCIONADOR, TRIPOLAR, 72.5KV, 1250A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM HORIZONTAL PARALELA	2	Central break	73	1250	32	N	MANUAL	-	e	N	-10	1	Horizontal paralel	2470mm
GSCH003/607	E-CEARÁ	6771468	6771468	150747	SECCIONADOR, TRIPOLAR, 72.5KV, 2000A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM HORIZONTAL PARALELA	2	Central break	73	2000	32	N	MANUAL	-	e	N	-10	1	Horizontal paralel	2470mm
GSCH003/608	E-CEARÁ	6783064	6783064	150756	SECCIONADOR, TRIPOLAR, 72.5KV, 1250A, COMANDO MANUAL, SEM LAMINA DE TERRA, ABERTURA LATERAL MONTAGEM VERTICAL INVERTIDA ALTA	2	Lateral break	73	1250	32	N	MANUAL	-	e	N	-10	1	Vertical	10400mm
GSCH003/609	E-CEARÁ	6803004	6803004	150766	SECCIONADOR, TRIPOLAR, 72.5KV, 2000A, COMANDO MANUAL, COM LAMINA DE TERRA, ABERTURA CENTRAL MONTAGEM VERTICAL ALTA	2	Central break	73	2000	32	Y	MANUAL	MANUAL	e	N	-10	1	Vertical	6000mm

TYPE CODE	COMPANY	COMPANY CODE	E4E CODE	CODE	DESCRICION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature (°C)	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSCH003/300	ENEL GO	48451	150099	150099	SECCIONADOR, C/LT, S/CARGA, 3P, 72,5 KV, ABERTURA LATERAL DUPLA, 1250A, 31,5 KA,	3	Double break	72,5	1250	31,5	Y	MANUAL	MANUAL	c	N	-10	1	Horizontal	< 6000
GSCH003/301	ENEL GO	48453	48453	150762	SECCIONADOR, S/LT, S/CARGA, 3P, 72,5 KV, ABERTURA LATERAL DUPLA, 1250A, 31,5 KA,	3	Double break	72,5	1250	31,5	N	MANUAL	-	c	N	-10	1	Horizontal	< 6000
GSCH003/302	ENEL GO	48452	48452	150761	SECCIONADOR, C/LT, S/CARGA, 3P, 138 KV, ABERTURA LATERAL DUPLA, 1250A, 40 KA,	3	Double break	145	1250	40	Y	MOTOR	MANUAL	c	N	-10	1	Horizontal	< 6000
GSCH003/303	ENEL GO	48755	48755	150100	SECCIONADOR, S/LT, S/CARGA, 3P, 138 KV, ABERTURA LATERAL DUPLA, 1250A, 40 KA,	3	Double break	145	1250	40	N	MOTOR	-	c	N	-10	1	Horizontal	< 6000
GSCH003/304	ENEL GO	150982		150982	CH, 72.5KV, 1250A, MAN, S/LT, HO, 2,45m, GSH003	3	Double-Break	72,5	1250	31.5	N	Manual	-	d	N	-10	1	Horizontal	2450
GSCH003/305	ENEL GO	150107		150107	CH, 72KV, 1250A, MAN, S/LT, VER, <10m, GSH3/305	2	Lateral	72,5	1250	31,5	N	Manual	-	D	N	-10	1	Vertical	<10000
GSCH003/306	ENEL GO	150775		150775	CH, 145KV, 1250A, MOT, S/LT, HOR, GSH003/306	3	Reverse Vertical Break	145	1250	40	N	Motor	-	c	N	-10	1	Horizontal	< 10000
GSCH003/307	ENEL GO	150821		150821	CH, 145KV, 1250A, MOT, S/LT, HOR, GSH003/307	3	Lateral Double-Break	145	1250	31,5	N	Motor	-	c	N	-10	1	Horizontal	< 10000



Technical Specification code: MAT-O&M-NCS-2021-00XX-EGIN

Version no. 4 dated 19.09.2021

Subject: Global infrastructure and Networks **GSCH003** HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	CODE	DESCRIPCION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/800	E-CHILE	150049	DESC 3F 245KV-2000A SPT HORIZ	2	Central break	245	2000	40	N	MOTOR	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/801	E-CHILE	150065	DESC 3F 245KV-2000A CPT HORIZ	2	Central break	245	2000	40	Y	MOTOR	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/802	E-CHILE	150066	DESC 3F 245KV-3150A SPT HORIZ	2	Central break	245	3150	40	N	MOTOR	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/803	E-CHILE	150067	DESC 3F 245KV-3150A CPT HORIZ	2	Central break	245	3150	40	Y	MOTOR	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/804	E-CHILE	150006	DESC TRIF 145KV 2000A 40kA MOTOR MON	2	Central break	145	2000	40	N	MOTOR	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/805	E-CHILE	150068	DESC 3F 145KV 2000A CPT HORIZ	2	Central break	145	2000	40	Y	MOTOR	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/806	E-CHILE	150057	DESC 3F 145KV-2000A SPT VERT	2	Central break	145	2000	40	N	MOTOR	-	c	-	-10	10	Vertical	7000 mm
GSH003/807	E-CHILE	150069	DESC 3F 145KV-2000A CPT VERT	2	Central break	145	2000	40	Y	MOTOR	MOTOR	c	-	-10	10	Vertical	7000 mm
GSH003/808	E-CHILE	150071	DESC 3F 145KV 3150A SPT HORIZ	2	Central break	145	3150	40	N	MOTOR	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/809	E-CHILE	150072	DESC 3F 145KV 3150A CPT HORIZ	2	Central break	145	3150	40	Y	MOTOR	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/810	E-CHILE	170512	DESC 3F 145KV-2000A-50KA SPT	2	Central break	145	2000	50	N	MOTOR	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/811	E-CHILE	170511	DESC 3F 145KV-2000A-50KA CPT	2	Central break	145	2000	50	Y	MOTOR	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/812	E-CHILE	150073	DESC 3F 145KV-2000A-50KA SPT VERT	2	Central break	145	2000	50	N	MOTOR	-	c	-	-10	10	Vertical	7000 mm
GSH003/813	E-CHILE	150074	DESC 3F 145KV-2000A-50KA CPT VERT	2	Central break	145	2000	50	Y	MOTOR	MOTOR	c	-	-10	10	Vertical	7000 mm
GSH003/814	E-CHILE	150075	DESC 3F 145KV-3150A-50KA SPT HORIZ	2	Central break	145	3150	50	N	MOTOR	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/815	E-CHILE	150076	DESC 3F 145KV-3150A-50KA CPT HORIZ	2	Central break	145	3150	50	Y	MOTOR	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/816	E-CHILE	150077	DESC 3F 145KV-2000A SPT HORIZ MANUAL	2	Central break	145	2000	40	N	MANUAL	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/817	E-CHILE	150078	DESC 3F 145KV-2000A CPT HORIZ MANUAL	2	Central break	145	2000	40	Y	MANUAL	MANUAL	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/818	E-CHILE	150079	DESC 3F 145KV-2000A SPT VERT MANUAL	2	Central break	145	2000	40	N	MANUAL	-	c	-	-10	10	Vertical	7000 mm
GSH003/819	E-CHILE	150080	DESC 3F 145KV-2000A CPT VERT MANUAL	2	Central break	145	2000	40	Y	MANUAL	MANUAL	c	-	-10	10	Vertical	7000 mm
GSH003/820	E-CHILE	150070	DESC 3F 145KV-2000A-50kA SPT HORZ MA	2	Central break	145	2000	50	N	MANUAL	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/821	E-CHILE	150081	DESC 3F 145KV-2000A-50kA CPT HORZ MA	2	Central break	145	2000	50	Y	MANUAL	MANUAL	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/822	E-CHILE	150082	DESC 3F 145KV-2000A-50kA SPT VERT MA	2	Central break	145	2000	50	N	MANUAL	-	c	-	-10	10	Vertical	7000 mm
GSH003/823	E-CHILE	150083	DESC 3F 145KV-2000A-50kA CPT VERT MA	2	Central break	145	2000	50	Y	MANUAL	MANUAL	c	-	-10	10	Vertical	7000 mm
GSH003/824	E-CHILE	150084	DESC 1F 245KV-2000A SPT HORIZ	2	Central break	245	2000	40	N	MOTOR (1 ø)	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/825	E-CHILE	150085	DESC 1F 245KV-2000A CPT HORIZ	2	Central break	245	2000	40	Y	MOTOR (1 ø)	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/826	E-CHILE	150086	DESC 1F 145KV-3150A SPT HORIZ	2	Central break	145	3150	40	N	MOTOR (1 ø)	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/827	E-CHILE	150087	DESC 1F 145KV-3150A CPT HORIZ	2	Central break	145	3150	40	Y	MOTOR (1 ø)	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/828	E-CHILE	150088	DESC 1F 145KV-3150A-50kA SPT HORIZ	2	Central break	145	3150	50	N	MOTOR (1 ø)	-	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/829	E-CHILE	150089	DESC 1F 145KV-3150A-50 kA CPT HORIZ	2	Central break	145	3150	50	Y	MOTOR (1 ø)	MOTOR	c	-	-10	10	Horizontal paralel	3000 mm
GSH003/830	E-CHILE	150007	DESC TRIF 145KV 3150A 40kA MOTOR MON	2	Central break	145	3150	40	N	MOTOR	-	c	-	-10	10	Vertical	7000 mm



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Version no. 4 dated 19.09.2021

Subject: Global infrastructure and Networks **GSCH003** HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	CODE	DESCRIPCION	Nº Columns/pole e	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/700	CODENSA	6788913	ECCIONADOR 145KV 2000A 40KA MANUAL SCPT HOR	2	Central break	145	2000	40	N	MANUAL	--	c	N	-10	10	Horizontal paralel	2150 mm
GSH003/701	CODENSA	6787659	ECCIONADOR 145KV 2000A 40KA MANUAL CCPT HOR	2	Central break	145	2000	40	Y	MANUAL	MANUAL	c	N	-10	10	Horizontal paralel	2150 mm
GSH003/702	CODENSA	150614	SECCIONADOR 145KV 2000A 40KA M SCPT HORZ	2	Central break	145	2000	40	N	MOTOR	MANUAL	c	N	-10	10	Horizontal paralel	2150 mm
GSH003/703	CODENSA	150615	SECCIONADOR 145KV 2000A 40KA M CCPT HORZ	2	Central break	145	2000	40	Y	MOTOR	MANUAL	c	N	-10	10	Horizontal paralel	2150 mm

TYPE CODE	COMPANY	COMPANY CODE	E4E CODE	CODE	DESCRIPCION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/500	E-PERU	6792662	150570	6792662	SECC.TRIP.60KV.1250A.40KA S/PT.HORZ.EXT	2	Central break	72,5	1250	40	N	MOTOR	-	e	Y	-10	1	Horizontal paralel	2300 mm
GSH003/501	E-PERU	6792646	150569	6792646	SECC.TRIP.60KV.1250A.40KA C/PT.HORZ.EXT	2	Central break	72,5	1250	40	Y	MOTOR	MANUAL	e	Y	-10	1	Horizontal paralel	2300 mm
GSH003/502	E-PERU	6760960	150546	6760960	SECC.TRIP.60KV.1250A.31,5KA S/PT.HORZ.EXT	2	Central break	72,5	1250	31,5	N	MOTOR	-	e	N	-10	1	Horizontal paralel	2300 mm
GSH003/503	E-PERU	6757158	150507	6757158	SECC.TRIP.60KV.1250A. APERT.CENTRAL	2	Central break	72,5	1250	31,5	Y	MOTOR	MANUAL	e	N	-10	1	Horizontal paralel	2300 mm
GSH003/504	E-PERU	6798993	150574	6798993	SECC. POT. TRIPOLAR, 220 KV, 1250A S/PT	2	Central break	245	2000	40	N	MOTOR	--	e	Y	-10	1	Horizontal paralel	2300 mm
GSH003/505	E-PERU	6798994	150575	6798994	SECC. POT. TRIPOLAR, 220 KV, 1250A C/PT	2	Central break	245	2000	40	Y	MOTOR	MOTOR	e	Y	-10	1	Horizontal paralel	2300 mm
GSH003/506	E-PERU	6806310	150580	6806310	SECC. POT. TRIPOLAR, 72,5 KV, 1250A S/PT VERT	2	Vertical-break	72,5	1250	31,5	N	MOTOR	-	e	Y	-10	1	Vertical (Exterior)	4200 mm
GSH003/507	E-PERU	6806311	150581	6806311	SECC. POT. TRIPOLAR, 72,5 KV, 1250A C/PT VERT	2	Vertical-break	72,5	1250	31,5	Y	MOTOR	MANUAL	e	N	-10	1	Vertical (Exterior)	4200 mm
GSH003/508	E-PERU	6761914	150551	6761914	SECC.TRIP.60KV.1250A.31.5KA.C/PT.VER.INT	2	Vertical-break	72,5	1250	31,5	Y	MOTOR	MOTOR	e	N	-10	1	Vertical (Interior)	4200 mm
GSH003/509	E-PERU	6761915	150552	6761915	SECC.TRIP.60KV.1250A.31.5KA.S/PT.VER.INT	2	Vertical-break	72,5	1250	31,5	N	MOTOR	-	e	Y	-10	1	Vertical (Interior)	4200 mm
GSH003/510	E-PERU	6797487	150573	6797487	SECC.TRIP.60KV.2000A.40KA.S/PT.HORZ.EXT	2	Centre-break	72,5	2000	40	N	MOTOR	-	e	Y	-10	1	Horizontal paralel	2300 mm

**Technical Specification code: MAT-O&M-NCS-2021-00XX-EGIN**

Version no. 4 dated 19.09.2021

Subject: Global infrastructure and Networks **GSCH003** HV DISCONNECTORS WITH RATED VOLTAGE 72,5kV TO 245 kV**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	CODE	DESCRIPCION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/400	EDESUR	0104-0049	SECC 132 KV, 2000 A, SIN PUESTA A TIERRA	3	Central break	145	2000	31,5	N	MOTOR	--	c	N	-10	10	Horizontal paralel	2250 mm
GSH003/401	EDESUR	0104-0367	SECC 132 KV 800 A SIN PUESTA A TIERRA	2	Central break	145	800	31,5	N	MOTOR	--	c	N	-10	10	Horizontal paralel	2250 mm
GSH003/402	EDESUR	0104-0361	SECC 132 KV 800 A. MONTAJE FILA INDIA, SIN PUESTA A TIERRA	2	Central break	145	800	31,5	N	MOTOR	--	c	N	-10	10	Horizontal in line	2250 mm
GSH003/403	EDESUR	0104-0048	SECC CON PUESTA A TIERRA, DE MONTAJE PARALELO, 132 KV. 800 A.	2	Central break	145	800	31,5	Y	MOTOR	MANUAL	c	N	-10	10	Horizontal paralel	2250 mm
GSH003/404	EDESUR	0104-0424	SECC 132 KV, 800 A, CON PUESTA A TIERRA, DE MONTAJE POLOS PARALELO	2	Central break	145	800	31,5	Y	MOTOR	MANUAL	d	N	-10	10	Horizontal paralel	2250 mm
GSH003/405	EDESUR	0104-0366	SECC SIN PUESTA A TIERRA, 132 KV. 2000 A	2	Central break	145	2000	31,5	N	MOTOR	--	c	N	-10	10	Horizontal in line	2250 mm
GSH003/406	EDESUR	0104-0401	SECC 132 KV, 2000 A, CON PUESTA A TIERRA, MONTAJE PARALELO	2	Central break	145	2000	31,5	Y	MOTOR	MANUAL	c	N	-10	10	Horizontal paralel	2250 mm
GSH003/407	EDESUR	0104-0382	SECC 132 KV 3150 A. MONTAJE FILA INDIA, SIN PUESTA A TIERRA	2	Central break	145	3150	31,5	N	MOTOR	--	c	N	-10	10	Horizontal in line	2250 mm
GSH003/408	EDESUR	0104-0362	SECC 220 KV 800 A. MONTAJE FILA INDIA, SIN PUESTA A TIERRA	2	Central break	245	800	40	N	MOTOR	--	c	N	-10	10	Horizontal in line	2250 mm
GSH003/409	EDESUR	0104-0363	SECC 220 KV 2000 A, MONTAJE FILA INDIA, SIN PUESTA A TIERRA	2	Central break	245	2000	40	N	MOTOR	--	c	N	-10	10	Horizontal in line	2250 mm
GSH003/410	EDESUR	0104-0364	SECC 220 KV 2000 A, CON PUESTA A TIERRA, MONTAJE POLOS PARALELOS.	2	Central break	245	2000	40	Y	MOTOR	MANUAL	c	N	-10	10	Horizontal paralel	2250 mm
GSH003/411	EDESUR	0104-0386	SECC 220 KV, 3150 A, CON PUESTA A TIERRA, DE MONTAJE DE POLOS	2	Central break	245	3150	40	Y	MOTOR	MANUAL	c	N	-10	10	Horizontal paralel	2250 mm
GSH003/412	EDESUR	0104-0394	SECC 220 KV, 3150 A, MONTAJE DE POLOS PARALELOS, SIN PUESTA A TIERRA.	2	Central break	245	3150	40	N	MOTOR		c	N	-10	10	Horizontal paralel	2250 mm
GSH003/413	EDESUR	0104-0385	SECC 220 KV, 3150 A, MONTAJE FILA INDIA, SIN PUESTA A TIERRA.	2	Central break	245	3150	40	N	MOTOR		c	N	-10	10	Horizontal in line	2250 mm

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

TYPE CODE	COMPANY	CODE	DESCRIPCION	Nº Columns/pole	Type opening	Ur	Ir	Ik	ES	DS operation	ES operation	SPS class	Bus bar transfer	Minimum ambient air temperature	Ice coating (mm)	ASSEMBLY	Installation height (mm)
GSH003/100	ENEL RO	150001	Separator tripolar 123kV 1600A 40kA cu CLP in montaj	2	Central break	123	1600	40	N	MANUAL	-	d	N	-30	22	Horizontal paralel	2300/3200 mm
GSH003/101	ENEL RO	150002	Separator tripolar 123kV 1600A 40kA cu 2 CLP in montaj	2	Central break	123	1600	40	N	ELECTRIC	-	d	N	-30	22	Horizontal paralel	2300/3200 mm
GSH003/102	ENEL RO	150003	Separator tripolar 123kV 1600A 40kA fara CLP in montaj	2	Central break	123	1600	40	Y	MANUAL	MANUAL	d	N	-30	22	Horizontal paralel	2300/3200 mm
GSH003/103	ENEL RO	150004	Separator tripolar 123kV 1600A 40kA fara CLP in montaj	2	Central break	123	1600	40	Y	ELECTRIC	ELECTRIC	d	N	-30	22	Horizontal paralel	2300/3200 mm
GSH003/104	ENEL RO	150005	Separator tripolar 123kV 1600A 40kA cu CLP in montaj	2	Central break	123	1600	40	YY (2ESs)	MANUAL	MANUAL	d	N	-30	22	Horizontal paralel	2300/3200 mm
GSH003/105	ENEL RO	150006	Separator tripolar 123kV 1600A 40kA 2 CLP in montaj p	2	Central break	123	1600	40	YY (2ESs)	ELECTRIC	ELECTRIC	d	N	-30	22	Horizontal paralel	2300/3200 mm
GSH003/106	ENEL RO	150007	Separator tripolar 123kV 1600A 40kA fara CLP in montaj	2	Central break	123	1600	40	N	MANUAL	-	d	N	-30	22	Horizontal in line	2300/3200 mm
GSH003/107	ENEL RO	150008	Separator tripolar 123kV 1600A 40kA fara CLP in montaj	2	Central break	123	1600	40	N	ELECTRIC	-	d	N	-30	22	Horizontal in line	2300/3200 mm
GSH003/108	ENEL RO	150009	Separator tripolar 123kV 1600A 40kA cu CLP in montaj	2	Central break	123	1600	40	Y	MANUAL	MANUAL	d	N	-30	22	Horizontal in line	2300/3200 mm
GSH003/109	ENEL RO	150010	Separator tripolar 123kV 1600A 40kA cu CLP in montaj	2	Central break	123	1600	40	Y	ELECTRIC	ELECTRIC	d	N	-30	22	Horizontal in line	2300/3200 mm
GSH003/110	ENEL RO	150011	Separator tripolar 123kV 1600A 40kA cu 2 CLP in montaj	2	Central break	123	1600	40	YY (2ESs)	MANUAL	MANUAL	d	N	-30	22	Horizontal in line	2300/3200 mm
GSH003/111	ENEL RO	150012	Separator tripolar 123kV 1600A 40kA cu 2 CLP in montaj	2	Central break	123	1600	40	YY (2ESs)	ELECTRIC	ELECTRIC	d	N	-30	22	Horizontal in line	2300/3200 mm
GSH003/112	ENEL RO	150013	Separator monopolar 123kV 1600A 40kA cu CLP coman	2	Central break	123	1600	40	Y	MANUAL	MANUAL	d	N	-30	22	Single Phase	2300 mm
GSH003/113	ENEL RO	150014	Separator monopolar 123kV 1600A 40kA cu CLP coman	2	Central break	123	1600	40	Y	ELECTRIC	ELECTRIC	d	N	-30	22	Single Phase	2300 mm

- Note: "MOTOR (1 ø)" means 3 motors, 1 for each phase
- Note: "YY (2 EEs)" means 2 earthing switches, located on the opposite ends of the disconnecter
- Note *** This disconnecter for Enel Ceará: there is three kinds of pole, shaped of truncated pyramid of rectangular outside beam with the following equations from the top:

Pole 1

Nominal stress side pole 1: $28.h + 140$

Secondary stress side pole 1: $20.h + 182$

Pole 2

Nominal stress side pole 2: $28.h + 170$

Secondary stress side pole 2: $20.h + 224$

Pole 3

Nominal stress side pole 3: $28.h + 230$

Secondary stress side pole 3: $20.h + 308$



INTERNAL

Technical Specification code: MAT-O&M-NCS-2021-00XX-EGIN

Subject: Global Infrastructure and Networks

GSCH005 SURGE ARRESTERS FOR SUBSTATIONS rev 2 25.08.2021

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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1 DOCUMENT AIMS AND APPLICATION AREA

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:

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

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.

1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document applies to both Enel Global Infrastructure and Networks Srl Company and to Infrastructure and Networks Business Line perimeter, when each Company does not have to issue further documents.

2. DOCUMENT VERSION MANAGEMENT

Revision	Data	List of modifications
01	05/07/2017	First emission
02	25/08/2021	Changes Annex C: codification E4E. Discard MT codes already in GSCC016

3. UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Operation and Maintenance / Network Components Standardization

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head of Operation and Maintenance unit
- Global Infrastructure and Networks: Head of Health, Safety, Environment and Quality unit.

4. REFERENCES

- Code of Ethics of Enel Group;



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Application AreasPerimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

- Enel Human Right Policy;
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
- Organization and management model as per Legislative Decree No. 231/2001;
- RACI Handbook Infrastructure and Networks no. 06;
- Enel Global Compliance Program (EGCP);
- Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;

5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Networks Management

Macro Process: Materials management

Process: Network components standardization

6. DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Manufacturer Product	Component manufactured by a Supplier in accordance with a technical specification
Technical Conformity Assessment (TCA)	A “conformity assessment” ¹ with respect to “specified requirements” ² consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued by Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications
Conformity assessment body	Body that performs the conformity assessment activities [ISO 17000]
Enel Equipment Key code	It's an equipment representative for a group (family) of similar equipment chose by Enel
Enel Equipment Family code	Equipment belonging to a specific group (family) in which another equipment is identified as key code
TCA systems	The “conformity assessment systems”, is applicable specifying that the rules and procedures to carry on the TCA are those specified in the present document

¹ Definition 2.1 of ISO/IEC 17000² Definition 3.1 of ISO/IEC 17000

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Type A documentation	Not confidential documents used for product manufacturing and management from which it is possible to verify the product conformity to all technical specification requirements, directly or indirectly
Type B documentation	Confidential documents used for product manufacturing and management where all product project details are described, in order to uniquely identify the product object of the TCA
TCA report	Document describing the activities carried out for TCA
TCA dossier	Set of final documents delivered by the Supplier for the TCA
Material LifeCycle Management (MLM)	Integrated IT platform to manage the processes of Technical Specifications (TSM), Technical Conformity Assessment (TCA), Quality Control Tools (QCA), Defects Managing (CMD), Warranties and Materials Shipping(MSH)

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.

Distribution 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.

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.

**Subject:** Global Infrastructure and Networks**GSCH005 SURGE ARRESTERS FOR SUBSTATIONS** rev 2 25.08.2021**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

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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).

7 LIST OF COMPONENTS

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

8 REFERENCE LAWS AND STANDARDS

8.1 Laws

8.1.1 Latam

8.1.1.1. Brazil:

NR-10 - SEGURANÇA EM INSTALAÇÕES E SERVIÇOS EM ELETRICIDADE

8.1.2 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.

8.1.3 Italy

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

8.1.4 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).

8.2 Standards

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

8.2.1 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".-

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"



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

8.2.2 Specific Standards**8.2.2.1. Latam****8.2.2.2. E-Distribución****8.2.2.3. E-distribuzione:**

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

8.2.2.4. 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

9 SERVICE CONDITIONS**9.1 General services conditions**

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

9.2 Specific services conditions**9.2.1 E-Distribución**

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

9.2.2 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)

9.2.3 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



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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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10 TECHNICAL CHARACTERISTICS

	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)
e-distribución	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	1,5 kA 0,2s Clase A	355	317	249	100	100
	132 kV	SM	145/230-275/550-650	50	120	92	10	1,5 kA 0,2s Clase A	444	396	312	100	100
	50 kV	SM	52/140/325	50	53	42	10	1,5 kA 0,2s Clase A	196	175	138	100	50
	66 kV	SM	72,5/140/325	50	60	48	10	1,5 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	SM	245/275/650	50	146	117	10	40 kA 0,2s Clase A	540	483	380	100	125
	Neutro Trafo 110	SM	123/275/650	50	75	60	10	1,5 kA 0,2s Clase A	278	254	195	100	100
	Neutro Trafo 132	SM	245/275/650	50	84	67	10	1,5 kA 0,2s Clase A	310	276	218	100	100
	Neutro Trafo 55/	SM	72,5/140/325	50	38	30	10	1,5 kA 0,2s Clase A	139	127	98	100	50
e-distribuzione	Neutro Trafo 66/	SM	72,5/140/325	50	42	34	10	1,5 kA 0,2s Clase A	155	142	109	100	50
	132 kV	SL	132/450/750	50	132	94	10	31,5 kA	386	336	270	100	200
ENEL Rom	150 kV	SL	150/450/750	50	158	110	10	31,5 kA	455	396	318	100	200
	110 kV	SL	123/230/550	50	96	72	10	40 kA	310	280	220	100	200
CODENSA	Neutro trafo 110	SL	123/185/450	50	57	45,5	10	40 kA	222	200	190	100	200
	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	50
	34,5 kV	SL	36/70/145	60	30	24	10	25 kA	81,2	100	78	100	50
Enel Chile	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
	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
Enel Peru.	12,5 kV	SL	17,5/38/110	50	12	8,7	10	25 kA	46,6	40	32,8	100	50
	220 kV	SM	245/460/1050	60	198	154	10	40 kA	554	502	455	100	125
	69 kV	SL	72,5/140/325	60	60	48	10	40 kA	170	160	126	100	100
	220 kV	SH	245/395/950	50	198	154	20	40 kA	-	502	455	100	125
EDESUR	132 kV	SM	245/230/550	50	120	92	10	40 kA	-	310	270	100	100
	138 kV	SM	145/275/650	60	120	92	10	40 kA	-	310	270	100	100
Enel Riq	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
	69 kV	SL	72,5/140/350	60	60	48	10	25 kA	-	200	150	100	50
Enel Ceará	13,8 kV	SL	17,5/38/110	60	12	10	10	25 kA	-	40	32,8	100	50
	34,5	SL	36/70/150	60	27	22	10	40	85	97	75	100	50
ENEL SP	138	SM	145/275/650	60	120	92	10	40	378	350	260	100	120
	138	SM	145/275/650	60	120	98	10	40	-	310	270	100	100
ENEL GO	69	SL	72,5/140/325	60	60	48	10	31,5	-	200	150	100	50
	34,5	SL	36/70/170	60	30	24,4	10	20	-	100	78	100	50
	13,8	SL	17,5/38/95	60	12	10,2	10	20	-	40	32,8	100	50

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Service Function: -

Business Line: *Infrastructure & Networks***11 CONSTRUCTION CHARACTERISTICS****11.1 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.

11.2 Specific characteristics**11.2.1 E-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.

11.2.2 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.

11.2.3 Latam

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

11.3 Insulators

The insulators are 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

11.4 HV terminals**11.4.1 E-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.

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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

11.4.2 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.

11.5 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).

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.

11.6 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.

11.6.1 Latam specific requirements.

In Brazil (E. Rio, E. Ceará, E. Goiás and E. Sao Paulo) 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.

11.7 Dimensional characteristics

Specific dimensional requirements are shown in Annex A.

11.8 Support

The support is an optional supply.

11.9 Nameplates

The nameplates shall be in stainless steel. Alternative materials can be considered if the manufacturer

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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:

- a) The manufacturer's name or trade mark, type and identification of the complete arrester;
- b) Serial number;
- c) The year of manufacture;
- d) Type code of Enel;
- e) Rated voltage;
- f) Continuous operating voltage;
- g) Rated frequency;
- h) Nominal discharge current;
- i) Rated short-circuit withstand current in kiloamperes (kA)
- j) Designation
- k) Contamination withstand level of the enclosure.

12 TESTING

12.1 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

12.2 Type tests

12.2.1 Insulation withstand tests on arrester housing.

(IEC 60099-4, par. 10.8.2)

12.2.2 Residual voltage tests

(IEC 60099-4, par. 10.8.3)

12.2.3 Test to verify long term stability under continuous operating voltage

(IEC 60099-4, par. 10.8.4)

12.2.4 Test to verify the repetitive charge transfer rating, Qrs

(IEC 60099-4, par. 10.8.5)

12.2.5 Heat dissipation behavior of test sample

(IEC 60099-4, par. 10.8.6)

12.2.6 Operating Duty tests

(IEC 60099-4, par 10.8.7)

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(IEC 60099-4, par. 10.8.8)

12.2.8 Short-circuit tests

(IEC 60099-4, par. 10.8.10)

12.2.9 Test of the bending moment

(IEC 60099-4, par. 10.8.11)

12.2.10 Environmental tests

(IEC 60099-4, par. 10.8.12)

12.2.11 Radio interference voltage (RIV) test

(IEC 60099-4, par. 10.8.14)

12.2.12 Test to verify the dielectric withstand of internal components

(IEC 60099-4, par. 10.8.15)

12.2.13 Test of internal grading components

(IEC 60099-4, par. 10.8.16)

12.2.14 Weather ageing test

(IEC 60099-4, par. 10.8.17)

12.3 Routine tests and acceptance tests**12.3.1 Routine tests**

(IEC 60099-4, par. 9.1)

12.3.2 Acceptance tests

(IEC 60099-4, par. 9.2)

13 CONFORMITY ASSESSMENT

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

13.1 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;



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- 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
- 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).

13.1.1 Specific requirement for e-distribución

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." in local language

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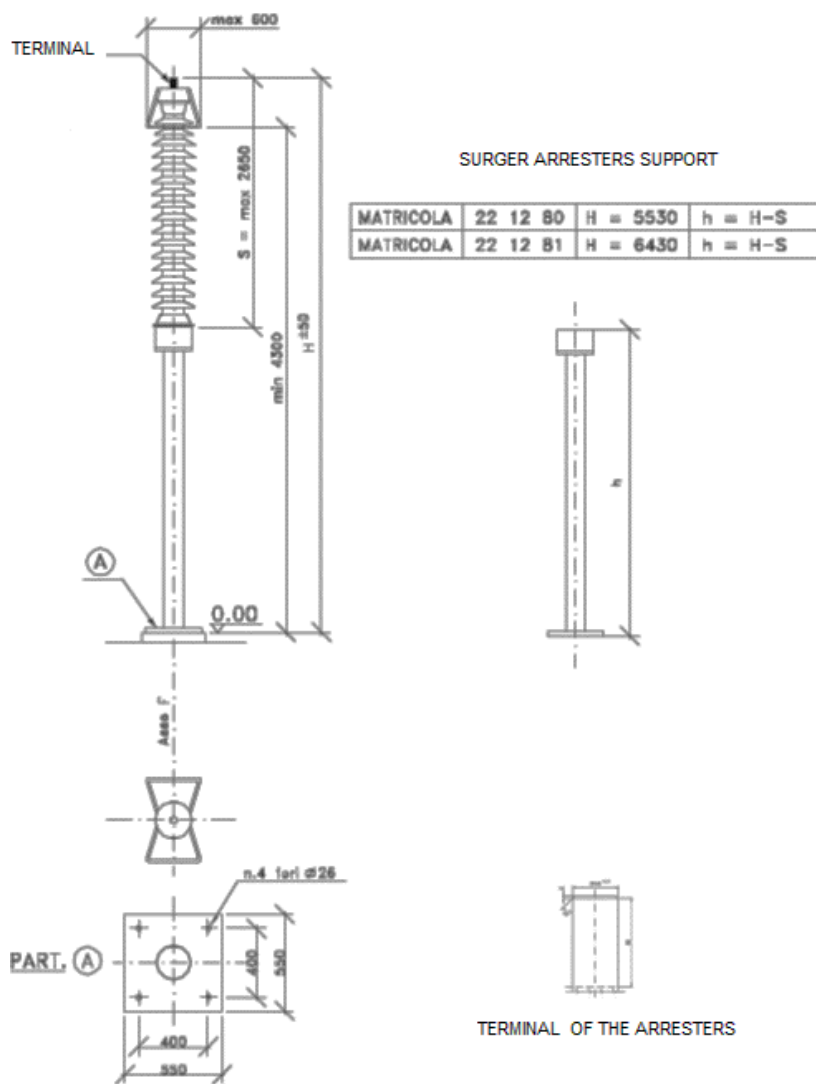
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ANNEX A – DIMENSIONAL DRAWINGS

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	Surge counter	-	50	-	-	-	-	-
GSCH005/100	E-DIST.	170105	170105	150	SL	50	132	94	10	-	polymer
GSCH005/101	E-DIST.	170135	170135	170	SL	50	158	110	10	-	polymer
GSCH005/102	E- DIST.	221280	221280	Support	-		-	-	-	-	-
GSCH005/103	E- DIST.	221281	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	ENEL RIO / GOIAS	4545929	170973	36	SL	60	30	24	10	34,7 kVmm/kV	Polymer
GSCH005/301	ENEL RIO / GOIAS	4545932	170974	72,5	SL	60	60	48	10	34,7 kVmm/kV	Polymer
GSCH005/302	ENEL RIO / GOIAS	4545944	170977	15	SL	60	12	10	10	34,7 kVmm/kV	Polymer
GSCH005/303	ENEL RJ/SP/GO	4660197 (RJ/GO) 312174 (SP)	820114 (RJ/GO)	145	SM	60	120	92	10	34,7 kVmm/kV	Polymer
GSCH005/304	ENEL RJ/CE/GO	12845 (SP) 4692337 (CE,GO,RJ)		Surge counter	-	50	-	-	-	-	-
GSCH005/400	ENEL CEARA	6771010	171073	15	SL	60	12	10	10	>=560	Polymer
GSCH005/401	ENEL CEARA	6771008	171072	72,5	SL	60	60	48	10	>=2139	Polymer



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Business Line: *Infrastructure & Networks*

GSCH005/500	CODENSA			220	SM	60	192	152	10	6625	Polymer
GSCH005/501	CODENSA	6787485	170903	115	SL	60	96	76	10	4370	Polymer
GSCH005/502	CODENSA	6787483	170901	13,2-11,4	SL	60	12	8,7	10	765	Polymer
GSCH005/503	CODENSA	6787484	170902	34,5	SL	60	30	24	10	1029	Polymer
GSCH005/600	EDELNOR	6757563	230812	245	SM	60	198	158	10	7595	polymer
GSCH005/601	EDELNOR	6800940	170812	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	170457	245	SM	50	198	154	10	4900	Polymer
GSCH005/801	CHILECTRA	6788802	170498	123	SM	50	96	76	10	2460	Polymer
GSCH005/802	CHILECTRA	6788803	170499	24	SL	50	21	17	10	480	Polymer
GSCH005/803	CHILECTRA	6788804	170500	17,5	SL	50	12	8,7	10	350	Polymer
GSCH005/804	CHILECTRA	6750037	170377	13,2	SL	50	15	12,7	10	355	Polymer
GSCH005/805	CHILECTRA	6755739	170471	25,3	SL	50	27	22	10	560	Polymer
GSCH005/900	ENEL SAO PAOLO	312124 (SP)	-	36	SM	60	27	22	10	34,7 mm/kV	Polymer