



Technical Specification code: GRI-GRI-MAT-E&C-0015

Version no. 1 dated 10/11/2022

Subject: Global GSCM013 MV AUTOMATIC THREE-PHASE RECLOSERS

Application Areas

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids*

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THE HEAD GLOBAL NETWORK COMPONENTS

Fabrizio Gasbarri


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1 DOCUMENT AIMS AND APPLICATION AREA

The scope of this document is to provide the technical requirements for the design, manufacturing, testing, supply and delivery of automatic three-phase circuit reclosers (reclosers in this document) for use in Medium Voltage distribution networks of the Enel Group Distribution Companies, listed below:

Country	Distribution Company
Argentina	Edesur
Brazil	Enel Distribuição Rio Enel Distribuição Ceará Enel Distribuição Goiás Enel Distribuição São Paulo
Chile	Enel Distribución Chile
Colombia	Enel Distribución Colombia
Peru	Enel Distribución Perú

Table 1 - Distribution Companies

This document shall be implemented and applied to the extent possible within the Enel Grids Business Line and in compliance with any applicable laws, regulations and governance rules, including any stock exchange and unbundling-relevant provisions, which in any case prevail over the provisions contained in this document

1.1 RELATED ORGANIZATIONAL DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

Within the corresponding geographical perimeter, each Enel Grids Company shall issue, under the supervision of Enel Grids Global Network Components, a detailed document in accordance with the provisions of this document.



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2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
1	10/11/2022	First Issuing of Global GSCM013 "MV AUTOMATIC THREE-PHASE RECLOSERS" Material Specification

3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- ENEL Grids: Engineering and Construction / Components and Devices Design / Network Components / MV and LV Equipment unit.

Responsible for authorizing the document:

- ENEL Grids: Head of Networks Components unit
- ENEL Grids: Head of Quality unit.

4 REFERENCES

- Code of Ethics of Enel Group.
- Enel Human Right Policy.
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan.
- Organization and management model as per Legislative Decree No. 231/2001.
- Enel Global Compliance Program (EGCP).
- Integrated Policy for Quality, Health and Safety, Environment, anti-Bribery and Information security.
- ISO 9001:2015 - Quality Management System – Requirements.
- ISO 14001:2015 - Environmental Management System - Requirements with guidance for use.
- ISO 45001:2018 - Occupational Health and Safety Management System - Requirements with guidance for use.
- ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use.
- ISO 27001:2017 - Information Security Management System – Requirements.


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4.1 INTERNATIONAL STANDARDS

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

- ISO/IEC 17000 Conformity assessment – Vocabulary and general principles.
- ISO/IEC 17020 General criteria for the operation of various types of bodies performing inspection.
- ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories.
- ISO/IEC 17050-1 Conformity assessment - Supplier's declaration of conformity - Part 1: General requirements (ISO/IEC 17050-1:2004, corrected version 2007-06-15).
- ISO/IEC 17050-2 Conformity assessment - Supplier's declaration of conformity - Part 2: Supporting documentation (ISO/IEC 17050-2:2004).
- IEC 62271-111/
IEEE C37.60 High-voltage switchgear and controlgear –Part 111: Automatic circuit reclosers for alternating current systems up to and including 38 kV.
- IEC 60529 Degrees of protection provided by enclosures (IP Code).
- IEC 62262 Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code).
- ISO 1461 Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.
- ISO 14713-1 Zinc coatings - Guidelines and recommendations for the protection against corrosion of iron and steel in structures - Part 1: General principles of design and corrosion resistance.
- ISO 1183-1 Plastics -- Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method.
- ISO 868 Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness).
- ISO 9223 Corrosion of metals and alloys — Corrosivity of atmospheres — Classification, determination and estimation.
- IEC TR 62271-300 High-voltage switchgear and controlgear - Part 300: Seismic qualification of alternating current circuit-breakers.
- IEC 60870-5-101 Telecontrol equipment and systems - Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks.
- IEC 60870-5-104 Telecontrol equipment and systems - Part 5-104: Transmission protocols –


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- | | |
|--------------------|--|
| | Network access for IEC 60870-5-101 using standard transport profiles. |
| • IEC 61850 Series | Communication networks and systems for power utility automation. |
| • IEC 60587 | Electrical insulating materials used under severe ambient conditions – Test methods for evaluating resistance to tracking and erosion. |
| • IEC 61621 | Dry, solid insulating materials - Resistance test to high-voltage, low-current arc discharges. |
| • IEC 62631-1 | Dielectric and resistive properties of solid insulating materials - Part 1: General. |
| • IEC TS 62073 | Guidance on the measurement of hydrophobicity of insulator surfaces. |
| • IEC 60695-11-10 | Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods. |
| • 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 60068-2-52 | Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution). |
| • IEC 61869-1 | Instrument transformers - Part 1: General requirements. |
| • IEC 61869-3 | Instrument transformers - Part 3: Additional requirements for inductive voltage transformers. |

4.2 APPLICABLE LAWS AND REFERENCE STANDARDS

4.2.1 Reference Laws

4.2.1.1 Brazil

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

4.2.1.2 Chile

- Reglamento de seguridad de instalaciones eléctricas destinadas a la producción, transporte, prestación de servicios complementarios, sistemas de almacenamiento y distribución de energía eléctrica.

4.2.1.3 Colombia

- RETIE – Reglamento Técnico de Instalaciones Eléctricas.


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4.2.1.4 Perú

- CNE – Suministro - Código Nacional de Electricidad – Suministro 2011.

4.2.2 Enel Grids Technical standards

- MAT-O&M-NCS-2021-0033-EGIN version 3 “GSCG002 Technical Conformity Assessment”.
- Working Instruction GRI-GRI-WKI-O&M-0020 “Contractual Requirements for Components and Materials Quality management” - ex WKI-QPT-CMQ-2020-0022 -.
- Construction Specification GRI-GRI-CNS-O&M-0002 “Barcode specification” – ex CNS-O&M-S&L-2021-0032-EGIN.
- Packaging, transport, and delivery requirements rev.2.
- Cyber Security Guideline n. 7.
- Cyber Security Guideline n. 12.

5 ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering and Construction.

Macro Process: Devices and Components Development.

Process: Standard Catalog Management.

6 DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
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
Manufacturer Product	Component manufactured by a Supplier in accordance with a technical specification
Material LifeCycle Management (MLM)	Integrated IT platform to manage the processes of Technical Specifications (TSM), Technical Conformity Assessment (TCA),


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	Quality Control Tools (QCA), Defects Managing (CMD), Warranties and Materials Shipping (MSH)
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
TCA dossier	Set of final documents delivered by the Supplier for the TCA
TCA report	Document describing the activities carried out for TCA
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
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

¹ Definition 2.1 of ISO/IEC 17000

² Definition 3.1 of ISO/IEC 17000

7 DESCRIPTION

7.1 LIST OF COMPONENTS

Type code	Description	Ur (kV)	Ir (A)	I _k , I _{sc} (kA)	Control included
GSCM013/1	Pole Mounted Automatic Recloser 630A 15,5 kV 16 kA	15,5	630	16	Yes
GSCM013/2	Pole Mounted Automatic Recloser 630A 27 kV 12,5 kA	27	630	12,5	Yes
GSCM013/3	Pole Mounted Automatic Recloser 630A 38 kV 12,5 kA	38	630	12,5	Yes
GSCM013/4	Substation Automatic Recloser 630A 15,5 kV 16 kA	15,5	630	16	Yes
GSCM013/5	Substation Automatic Recloser 630A 38 kV 12,5 kA	38	630	12,5	Yes
GSCM013/6	Substation Automatic Recloser 630A 15,5 kV 16 kA (no control)	15,5	630	16	No

Type code	Distribution Company and Contry	Country Code	Rated frequency fr [Hz]	Rated normal current Ir [A]	Rated Voltage Ur [kV]	Rated power-frequency withstand voltage [kV]	Rated lightning impulse withstand voltage [kV]	Rated short-time withstand current Ik [kA]	Rated duration of short circuit tk [s]	Rated peak withstand current Ip [kA]	Rated supply voltage of c/o devices and of auxiliary circuit Vcc [V]	IP degree	Rated full load operation and mechanical endurance	Rated short-circuit breaking current I _{sc} [kA]	Rated symmetrical (fault) making current [kA]	Climatic category type	Rated operating sequence	First-pole-to-clear factor	Voltage transformer	Primary voltage of VT [kV]
GSCM0013/2	ED-Chile	141952	50 and 60	630	27	60	125	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	12-23
GSCM0013/1	ED-Peru	141941	50 and 60	630	15,5	50	125	16	1	40 and 41,6	24	IP54	10000	16	16	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	10
GSCM0013/2	ED-Peru	141940	50 and 60	630	27	60	125	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	20
GSCM0013/1	ED-Colombia	141942	50 and 60	630	15,5	50	110	16	1	40 and 41,6	24	IP54	10000	16	16	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	11,4-13,2
GSCM0013/3	ED-Colombia	141943	50 and 60	630	38	70	190	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	34,5
GSCM0013/1	ED-Brazil	141947	50 and 60	630	15,5	50	110	16	1	40 and 41,6	24	IP54	10000	16	16	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	11,95-13,8-13,98
GSCM0013/2	ED-Brazil	141949	50 and 60	630	27	60	125	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	21-23
GSCM0013/3	ED-Brazil	141951	50 and 60	630	38	70	170	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	34,5
GSCM0013/4	ED-Brazil	141950	50 and 60	630	15,5	50	110	16	1	40 and 41,6	24	IP54	10000	16	16	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	No	-
GSCM0013/5	ED-Brazil	141948	50 and 60	630	38	70	170	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	No	-
GSCM0013/6	ED-Brazil	141946	50 and 60	630	15,5	50	110	16	1	40 and 41,6	24	IP54	10000	16	16	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	No	-
GSCM0013/1	ED-Argentina	0108-0653	50 and 60	630	15,5	50	110	16	1	40 and 41,6	24	IP54	10000	16	16	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	13,2
GSCM0013/3	ED-Argentina	0108-0653	50 and 60	630	38	70	170	12,5	1	31 and 32,5	24	IP54	10000	12,5	12,5	C5	O-0,1s CO-1s-CO-1s-CO	1,3 and 1,5	Yes	33

Table 1 – List of components



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7.2 SERVICE CONDITIONS

7.2.1 General service conditions

Clause 4.1.3 of IEC 62271-111 is applicable with the following addition

Maximum reference altitude for Colombia	2.700 m
Pollution level (IEC/TS 60815-3)	e "Very Heavy"
Climatic category type (ISO 9223 and ISO 14713-1)	C5 "Very High".
Minimum and maximum air temperature	-10°C / +45°C
Relative humidity	98%
Network neutral earthing systems	Effectively earthed neutral system Non effectively earthed neutral system

Table 2 - Service Conditions

The Manufacturer shall provide de-ratings table related to altitudes up to 3.000 m for specific installations.

7.2.2 Seismic qualification level

For the countries below, it shall be considered the following considerations upon the seismic qualification level:

Country	Standard (LEVEL)
Colombia	IEC/TR 62271-300 (AF5) + Reglamento Colombiano de Construcción sismo resistente
Chile	IEC/TR 62271-300 (AF5) + ETGI-1020
Peru	IEC/TR 62271-300 (AF5)

Seismic qualification level

7.3 TECHNICAL CHARACTERISTICS

The reclosers shall observe the general requirements and the regulations enforced by the reference documents in chapter 4.


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A recloser is self-controlled device for making, carrying, and automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold-closed, or lockout operation.

For this standard, a pole-mounted recloser also includes an assembly of control elements required to detect over-currents and control the recloser operation and a voltage transformer to power-up the control cabinet.

For the substation-type reclosers, the voltage transformer is not included.

For type code GSCM013/6 substation recloser, the control system of the recloser is not included.

The reclosers shall be solid insulation / vacuum circuit-breaker type, magnetic-type operation, with electronic control and shall be able to detect over-current conditions on phase fault and earth fault, to time and interrupt such fault currents, and to re-energize the line by reclosing automatically after a predetermined time delay.

It will have three current sensors or current transformers and six voltage sensors that allow bidirectional operation of the recloser.

Table 3 shows the specific requirements that all recloser shall observe.

Rated maximum voltage, U_r	[kV]	15,5	27	38	
Rated insulation level, U_d	- Rated short-duration power-frequency withstand voltage	[kV]	50	60	70
	- Rated lightning impulse withstand voltage	[kV]	110	125	170
Rated frequency, f_r	[Hz]	50 and 60			
Rated continuous current, I_r	[A]	630			
Rated short-time withstand current, I_k	[kA]	16	12,5	12,5	
Rated peak withstand current, I_p	[kA]	40 and 41,6	31 and 32,5	31 and 32,5	
Rated duration of short-circuit, t_k	[s]	1			
Rated supply voltage of closing and opening devices and auxiliary circuits, U_a	[Vcc]	24			
Rated short-circuit breaking current, I_{sc}	[kA]	16	12,5	12,5	
Rated symmetrical (fault) making current	[kA]	16	12,5	12,5	
Rated operating sequence		O-0,1s CO-1s-CO-1s-CO			
Rated line-charging current switching, I_l	[A]	2	5	5	
Rated cable-charging current switching, I_c	[A]	10	25	50	
First-pole-to-clear factor		1,3 and 1,5			
Rated full load operation and mechanical endurance		10000			
External degree of protection		IP54			

Table 3 – Ratings

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Business Line: *Enel Grids***7.4 CONSTRUCTION CHARACTERISTICS OF THE SWITCHGEAR****7.4.1 Tank**

The tank shall be made of stainless steel AISI 316 or anodized aluminum and strong enough to support dynamic short circuit forces and the vibration of the automatic recloser during operation and for transportation. In case of anodized aluminum tank, it shall guarantee the proper behavior in an environment of climatic category type C5 "Very High".

The tank shall be constructed in such a way as not to allow water to accumulate.

A connector for connecting the earthing cable shall be located on the bottom of the tank or on the fixing structure. The connector shall allow the connection of cables with sections between 16 and 50 mm².

The recloser tank shall have supports that allow the installation of surge arresters to protect the line and load terminals.

7.4.2 Lifting lugs

Attachment points for lifting the recloser shall be provided to permit lifting and installation in accordance with the manufacturer's instructions. They shall be designed and located on the upper part of the tank to avoid interference between lifting slings and any attachments (bushings, operating handles, etc.), and to avoid scratching or marring the tank finish during handling.

7.4.3 Polymeric insulators

The housing (sheath and sheds) of the insulators shall be HTV (High Temperature Vulcanized) solid silicone type. Other type of silicone will be accepted as long as it maintains same or better properties than listed in table 4.

Two fabrication processes are allowed for the silicone rubber considered in the standard, molding process or by assembling modules.



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The characteristics of the silicone-rubber are described in table 4

Mechanic characteristics	Standard	Unit	Minimum value HTV
Density	ISO 1183-1	g/cm ³	1,5
Hardness	ISO 868	Shore A	65
Breaking stress	ISO 37	N/mm ²	3,5
Breaking elongations	ISO 37	%	200
Tear strength	ISO 34-1	N/mm ²	12

Table 4 - Silicone-rubber characteristics

At every existing interface from the composite insulator, the adhesion strength of the interface (interface resistance) shall be higher than the tear strength of the silicone.

Silicone-rubbers of insulators shall have a resistance to tracking and electric erosion with a classification of Class 1A 4,5 according to IEC 60587 and shall resist the effects of corona discharges and ozone. It shall withstand a low-current arc discharge for more than 300 seconds under the conditions indicated in standard IEC 61621 and its volume resistivity shall be over 1010 $\Omega \cdot m$ according to IEC 62631-1.

The silicone-rubber shall be type V0 according to the IEC 60695-11-10.

Additionally, the silicone-rubber shall have highly hydrophobic features and shall be classified type WC1 as specified in IEC TS 62073.

The minimum creepage distance of the insulators shall be according to the rated voltage of the fuse and the pollution level assigned, considering RUSCD = 53,7 mm/kV (SPS class e). Alternative creepage distance could be accepted after Enel evaluation and approval.

The insulators shall resist a bending movement at the base of attack of at least 250 Nm and to resist an adequate torque to hold the conductors.

All the characteristics and type test on the insulators shall be included in the TCA documentation.

7.4.4 Terminals

For connection of bare conductors, terminals of a size adequate shall accommodate conductors to conduct the rated continuous current of the recloser without exceeding the appropriate temperature rise.

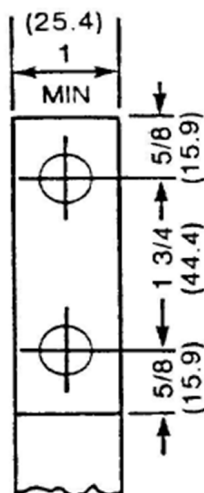
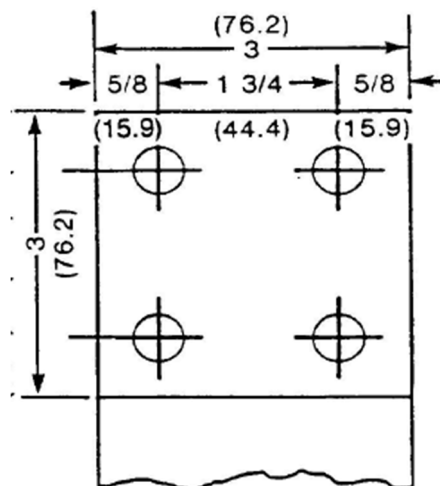
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The terminals will be galvanically compatible with copper and aluminum (bimetallic) and of the NEMA 2 type for pole mounted reclosers and NEMA 4 for substation reclosers.


NEMA 2 Terminal

NEMA 4 Terminal

Measures in inches (mm)

Minimum width of NEMA 2 terminal is 40 mm

7.4.5 Insulation

Reclosers shall have solid dielectric insulation with cycloaliphatic epoxy resin, with hydrophobic behavior, highly resistant to ozone, oxygen, humidity, contamination and resistant to ultraviolet radiation (UV).

The cycloaliphatic epoxy shall provide complete encapsulation of the vacuum interrupter inside the equipment. Other types of epoxy resins with equal or superior properties could be accepted after Enel evaluation and approval.

7.4.6 Surfaces treatment

All the external metallic parts which are not in stainless steel shall be designed to be used in environments of climatic category type C5 "Very High", in compliance with standards ISO 9223 and ISO 14713-1.

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They shall be protected with a hot dip galvanization process according to ISO 1461 with a minimum thickness of 140 µm. The zinc coating will be uniform and continuous, perfectly adhered to withstand all the stresses of normal use without cracking or peeling.

After galvanizing, the treated surfaces will not be subjected to any process that may affect the continuity or uniformity of the protective coating, complying with the standardized thicknesses.

To verify the adequate surface treatment IEC 60068-2-52, test method 6 (chapter 9.4.7) type test shall be performed. As a result of this test, the surface treatment shall not present a significant degradation of its characteristics.

The manufacturer of the recloser shall justify the treatment used in the TCA dossier.

7.4.7 Position indicators

Position indicators should be weather resistant, by adopting a transparent protection, and should be of such dimensions as to be clearly visible from the base of the pole and anyway at a distance greater than 8 m, is allowed for this purpose is also a type of lenticular transparent protection.

The following indications shall be provided:

For reclosers delivered to Argentina, Chile, Colombia and Peru

- black letter "I" on red background corresponding to the close position of the recloser
- black letter "O" on green background corresponding to the open position of the recloser

For reclosers delivered to Brasil

- black letter "L" on red background corresponding to the close position of the recloser
- black letter "D" on green background corresponding to the open position of the recloser

7.4.8 Mechanical Counter

A mechanical operations counter shall be provided to indicate the total number of unit operations of recloser. The counter shall be visible with the recloser in service.


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7.4.9 Identification of Source / Load Terminals

Reclosers shall be legibly and indelibly marked with the words "SOURCE" and "LOAD" in local language.

7.4.10 Opening and locking device

In the lower part of the tank there will be:

- a manual device that allows locking the recloser both mechanically and electronically in open position.
- a manual device that allows the opening of the recloser.

7.4.11 Support structure

The reclosers will be supplied with their respective support structure with the following characteristics:

a) For pole-mounted reclosers

The supplier shall evaluate the support or clamp, in terms of its diameter, depending on the pole and installation height in accordance with Enel's construction standard.

The support structure shall be delivered as an integral part of the supply and will be galvanized according to the pollution level (SPS class e).

The supply shall include the necessary parts for the assembly, except for the tools. If a backpack is used, the bolts shall not be included in the scope of supply.

The structures will be designed in such a way that they resist the impact forces due to the operation of the reclosers without excessive vibration.

The manufacturer will provide detailed drawings of structures during the TCA process.

The support structure shall have a terminal for its connection to earth through a 12 mm metric terminal.

b) For substation-installed reclosers

The supplier shall evaluate the support structure in accordance with Enel's construction standard.

The support structure shall be delivered as an integral part of the supply and will be galvanized according to the pollution level (SPS class e).

The supply shall include the necessary parts for the assembly, except for the tools.

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The structures will be designed in such a way that they resist the impact forces due to the operation of the reclosers without excessive vibration.

The manufacturer will provide detailed drawings of structures during the TCA process.

7.4.12 Rating plates

Each recloser shall have a stainless steel AISI 316 rating plate in the language of the Country in which it has to be delivered and placed on the recloser.

The rating plate shall contain information on the code that the Manufacturer assigns to each series of the same type. It shall contain the mandatory information required by IEC 62271-111 (table 7), the Enel Group type code and the local components codification (see chapter 7.1)

7.4.13 Marks on the phases

In correspondence of each bushing, the marks R – S – T to identify the three different phases shall be applied. These marks shall be designed to be used in environments of climatic category type C5 "Very High" (ISO 14713-1)

7.5 CONTROL CABINET AND REMOTE-CONTROL

The devices for control, protection and remote management of the recloser shall be placed in a box that guarantees protection against corrosion (even for those environments with high salinity levels).

The control cabinet is designed to protect the electronic circuits against severe weather conditions; the cabinet is supplied with all the appropriate connectors to guarantee the connection with the recloser.

A vandal resistant lockable door provides access to the internal devices. Any eventual air intakes are screened against vermin and insect entry and all electronic parts are enclosed to protect them from entry of moisture and condensation ensuring a long lifetime.

The cabinet shall guarantee a free internal space for the telecommunications equipment, with a free volume of at least 500 x 125 x 300 mm³. In this space, the Vdc supply shall be available for the telecommunication equipment.

The electronics shall have varnish to protect against condensation and accumulation of dust or pollution.


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The cabinet shall be supplied with a support structure for mounting on a pole with characteristics listed in Annex B. The support structure shall be delivered as an integral of the supply and is galvanized with a minimum thickness of 70 microns. The access door shall have a secure closing system with an operating handle that allows the installation of a padlock (Operating handle NOT in PVC). It shall provide a door lock with a master key. The control cabinet shall be equipped with an anti-tamper system to provide a remote notification in case of tampering event. A switch to activate the lamp and a tinned copper earth connector, having sections from 25 to 50 mm², shall be included. The door shall be electrically connected with the control cabinet to ensure the earth connection.

The devices in the control cabinet incorporates all the functions of a multi-function protection relay, a circuit breaker controller, a measurement unit and a remote terminal unit.

7.5.1 General features

- All devices inside the control cabinet shall be interchangeable (In the case that the voltage/current transducers have a fixed calibration value, this value shall be identified inside the control box by means of a label)
- The control shall be suitable for work in environments with condensation
- The cabinet shall be at least IP65 class in accordance with the IEC 60529 standard; shall have the appropriate coatings for the work environment; the connection cable and connectors shall be protected against the effects of the environment on them, including U.V. solar radiation
- Access to the configuration of the control cabinet shall be protected against unauthorized persons. The access to the configuration of the control cabinet shall be protected at least by two different secret keys, one for operation activities and the other for engineering or configuration (RBAC authorization model). A password encryption mechanism shall be compliant with the requirements R[43] and R[43.1] R[43.2] described in Guideline 12. There shall be a periodic password change policy (maximum every 3 months). The local password can be changed locally and remotely.
- It includes a voltage suppressor protection device on the input of the AC auxiliary voltage on the LV side of the auxiliary transformer or on the auxiliary voltage input, to protect the control cabinet with its internal devices from atmospheric or systems overvoltage conditions.
- The control cabinet shall have an interlock or safety system on the door to keep it open with an angle greater than 100°, allowing the operation of the control
- On the lower side of the cabinet there shall be at least 3 free inputs, in addition to those which are necessary for the right operation of the control cabinet (e.g. LV power supply, control cable, external TC cables, etc.), to be used for the communication cables (e.g. for the connection on external antenna,


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optical fiber etc.), all with PG19 cable glands model. All physical connection between cabinet and recloser shall be protected by PG19 cable glands too.

In all cases they shall guarantee the right protection (IP degree) against external factors (e.g., water, dust, pollution) that could impact the lifetime of the electronic part inside the control box.

- All devices inside the control cabinet shall be treated and protected against insects, avoiding their penetration.

7.5.2 Power supply system

- The input voltage (Auxiliary power supply) is in all cases 120-240 V c.a. 50/60 Hz that comes from the auxiliary transformer described in chapter 7.6, or directly from the low voltage network. All the control equipment will be powered in direct current at 12-24 Volt. The rectifier/battery equipment shall have enough capacity to power all the control equipment as well as the communications ones. The rectifier shall also guarantee, at the same time, the possibility to power up communication devices, that could work at both voltage levels: 12-24 V. For the power supply of telecommunication equipment specific outputs shall be available
- The rectifier shall include the necessary alarms to monitoring its correct operation, and the battery shall have enough capacity to maintain the system's operation for 24 hours or perform at least four cycles of opening/closing without AC power
- The power supply system shall guarantee the right protection against overload and short-circuit events that could damage the internal devices of the control cabinet
- The rectifier shall include the function of battery test
- The equipment shall be capable of using both lead acid and lithium batteries
- The rectifier shall be capable to recharge autonomously the battery after any voltage interruption (it means when the main power supply is restored) that caused even a complete discharge of the battery avoiding local human intervention
- The battery shall be included in the supply.
- It includes an auxiliary plug for powering a personal computer (type of terminal according to the country and voltage supply 120-240 V)
- Equipment using more than two batteries per cabinet is not allowed
- Rectifier shall have some contacts indicating that the battery is discharged or is failed and it requires maintenance or replacement
- Specific configurable alarms are available to notify at least lack of auxiliary voltage and low battery voltage


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Substation Recloser

For type code GSCM013/6, the substation recloser is supplied without the integrated relays (control cabinet). For the type codes other than GSCM013/6, the following requirements shall be considered as integration to the others described in this document:

- Power supply - for the application with controller the auxiliary transformer is not present and the manufacturer shall deliver an appropriate power cable that allows the back-compatibility with the cables currently used in the primary substations. The device can be supplied with any voltage level within the following ranges:
 - 120/240 VAC – 50/60 Hz
 - 85÷254 VCC
- I/O Module – a minimum number of 12 auxiliary contacts shall be available and programmable

7.5.3 Protection functionalities and local Control

The recloser control implement the following protection functions:

- Phase overcurrent protection functions (50-51)
- Residual overcurrent protection functions (50N-51N)
- Sensitive neutral (50Ns-51Ns)
- Directional phase overcurrent protection function 67 (inverse time and definite time)
- Directional earth phase overcurrent protection 67N (inverse time and definite time)
- Function 79 (multiple reclosing)
- Overfrequency and underfrequency (81U/O)
- Overvoltage (59/59N) and undervoltage (27), with timing (62)
- Synchronism (25)
- Unbalanced load protection 46/46 BC
- Circuit breaker failure protection 50 BF
- Sectionalizer mode
- Cold load pick-up
- Inrush current
- Multiple protection groups (each of which can be configured with separate protection characteristics with different inverse time curves and setting currents)


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It shall have at least two alternative profiles for phase, phase to earth and directional protections with all the needed settings and the ability to program curves. Typically, one of the two profiles can be used in case the power flow is from the Source side to the Load one and the other for the opposite direction. This profile switch, from one to the other, can be carried out automatically by the recloser when a power flow change is detected or by means push buttons or local switch. This profile change is realized automatically in case the recloser is used in networks having Loop Automation or similar automatisms at detection of power flow change, or via push buttons, local command, remote command, or by means a binary inputs.

In the homologation process, the ability to coordinate the equipment with the different protection configurations of the Distribution Companies as its integration within the remote-control center of the DSO will be verified.

The control cabinet includes the possibility of carrying out the following actions using buttons or independent switches (it is not accepted that this operation is carried out by the control panel navigation):

- Blocking of reconnections for both: phase unit and the residual unit
 - Local change of the configuration for group settings (minimum of 4 group settings)
 - Activation/deactivation of the Loop Automation scheme or similar
 - Activation/deactivation of the earth sensitive function
 - Blocking of the residual unit
 - Blocking of all the protections (Sectionalizer mode)
 - Open/Close of the recloser (two independent buttons)
 - Change from LOCAL to REMOTE control. In LOCAL position the closing operation can't be executed from the Control Center while in REMOTE it is enabled. Any of these operating modes will not affect the enabling/disabling of the protection functions. The Local/Remote interlocking is applicable only for the closing command, no interlocks are provided for the opening command.
-
- Activation/Deactivation of Hot Line Tag Mode (maintenance on powered line) with LED status indicator (ON if the function is active): prevents the operation of the switches by remote control and allows only a first intervention of protection with a programmable fast curve, avoiding the reclosing, in automatic way, by the control unit and through the connection with a computer and SCADA. It can be only deactivated by means the same way it was activated (for example, if it is activated in locally, it can be deactivated only locally not from SCADA or computer). The LED remains always in ON state when the function is active. This function shall be integrated in a single button so that both functions are managed (enabled hot line tag and disable reclosing).

This function activates more sensitive overcurrent protection elements than your currently settings on the normal sequence reclosing, due to security purposes in the case of services in energized networks


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carried out by crews. Therefore, recloser shall allow dedicated overcurrent settings 50/50N and 51/51N (with the possibility of choosing time-current curves) with automatic reclose function (79) blocked.

Configurable parameters

- It shall be possible to configure (locally and remotely) at least the following operating parameters:
 - Phase starting current, residual, directional and earth directional. The setting thresholds for earth functions shall start from a minimum of 2 A primary (for phases function at least 10 A or better).
 - Single shot
 - Hot line tag
 - Sensitive neutral
 - Operating curves for phase and residual currents. They implement the curve libraries of ANSI/IEEE, IEC, of reclosers (those recognized as standard de facto) and they shall be programmable by the user
 - Total number of operations until block, which shall be equal to or greater than four. The control will support any combination between instantaneous and slow curves
 - Reset time
 - Cold load pickup and inrush current

For Networks with Loop Automation or similar, it is required other proper features such as: opening due to absence of MV, loop restoration etc.

LOCAL indications

The electronic part inside the control cabinet shall have a local indication at least for:

- Switch position
- State of automatic reclosing
- Activated/deactivated status of protections
- General alarms
- Alarms of the power supply system
- Hot Line Tag on/off status
- Current, Voltage and Power

The indication implemented locally shall be readable even in remotely.


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RECORDED EVENTS AND DISPLAY

The recloser shall memorize the events, with related timestamp (date/hour/minutes/seconds/msg), those occur during the device operation. It shall have a non-volatile memory that guarantees the memorization of the oscillography events and all other ones listed below even if a complete discharge of the battery occurs. At least the following events shall be recorded by the device:

- Oscillographic events according to standard and filed in COMTRADE format
- Opening or closing operation
- Operations counter
- Reclosing and protections status (Activated/Deactivated)
- Activation of phase, residual and directional protections if applicable (includes all protection functions, not just current ones)
- General alarms and power supply system ones
- Loss of voltage (voltage records per phase shall be included for each event, preferably discriminated by each side of the equipment)
- Operating phase current
- Operating phase-to-earth current
- A display to view data and settings/configuration, with visible information during the day and at night. In general, the information showed in the display shall be simple and intuitive for local operators. The display messages can be available in different languages depending on the device configuration, at least: English, Spanish and Portuguese.
- It shall be possible to configure the measurement and the reading on display of currents, voltages and power with module and angle and also component of sequences with module and angle too.
- It shall include the measurement of harmonic orders.

In addition, all the recorded events shall be stored in a log file that are compliant with syslog standard.

The logging and auditing functions must be guaranteed, as described in Guideline no. 7 chapter 2.2 "Logging and Auditing".

For pole mounted reclosers it is necessary to guarantee the presence of at least:

- 4 digital inputs that can be activated by the auxiliary voltage of the equipment through contacts, capable of performing the following functions: switch closure; switch opening; enabling the reclosing function and inhibition of the reclosing function


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- 4 normally open potential-free switches, programmable to close permanently when the equipment is in the following states: switch closed, switch open, reclose function enabled and reclose function inhibited

If the functionalities indicated above for the contacts are managed via software by the control cabinet there is no need for these inputs and outputs.

7.5.4 Remote control and remote management functions

The recloser shall implement all the functionalities to be remotely controlled and managed, allowing remote recording, interrogation and supervision, and for this purpose it has the inputs and outputs necessary for it. In remote way shall be present the option to create configurable binary and analog outputs from logic.

These inputs and outputs shall provide the equipment to transmit at least the following signal and commands:

- The commands transmitted from the Control Center to the recloser are at least the following:
 - Opening/closing the recloser
 - Activation/Deactivation of automatic reclosing
 - Activation/Deactivation of the residual and sensitive neutral protection
 - Activation/Deactivation of Loop Automation or similar
 - Activation/Deactivation of Hot Line Tag
 - Change the settings group of protections
- The signal and information to be transmitted remotely by the recloser are at least:
 - Open/Closed status of the recloser
 - Activation/Deactivation status of automatic reclosing
 - Activation/Deactivation status of residual and sensitive neutral protection
 - LOCAL/REMOTE status of the recloser
 - Hot Line Tag On/Off status
 - Presence/absence of voltage for phase and side
 - Phase Voltages
 - Phase and neutral currents
 - Phase and neutral current fault
 - Locking of the switch (mechanical)
 - Open door of electric cabinet

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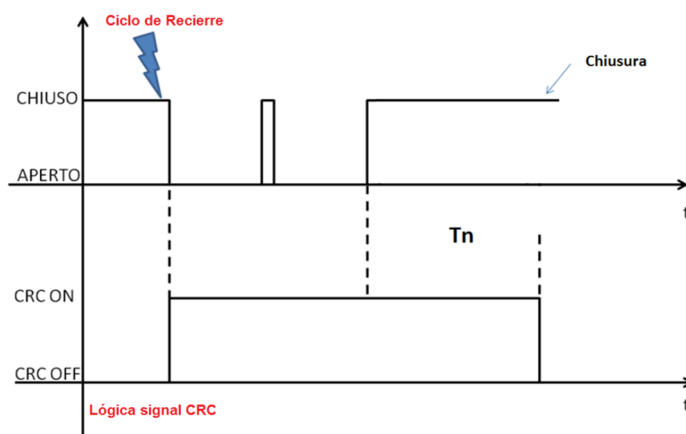
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- Reclosing signal in progress, successful reclosing and unsuccessful reclosing. (For details see 3.4.4.1. CRC alarm management)
- It shall be possible for the control cabinet to autonomously establish the communication with the Control Center (spontaneous calls) when the pre-configured events occur. The minimum events to be configured as alarms are at least the following:
 - Actuation or intervention of the recloser (discriminated by phase and residual intervention)
 - Lack of AC power supply
 - Battery failure with measurement of battery voltage level
 - Locking (mechanical) of the recloser
 - Low DC voltage

7.5.4.1 CRC alarm management

The control of the recloser shall have the event indicating the reclosing status in progress (CRC: ongoing reclosing cycle). Regarding the CRC alarm, two diagrams are attached below that show the CRC alarm status according to the programmed reclosing cycle (case 1- reclosing cycle with positive success; case 2 - reclosing cycle with definitive intervention).

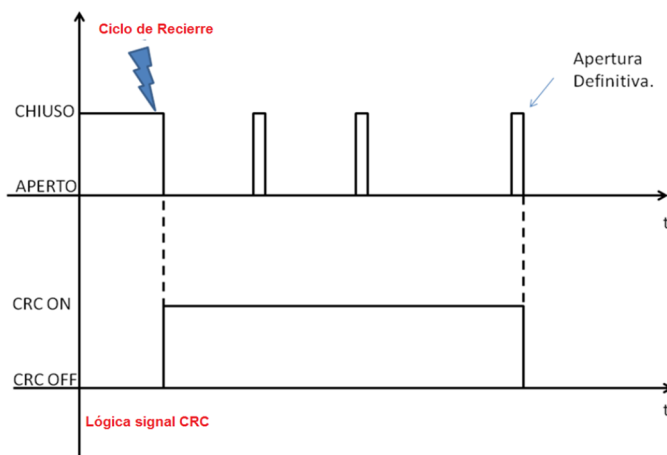

Case 1

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Case 2

7.5.5 Communication ports

- It has two ethernet port for connecting the control system with the telecommunications equipment and they shall be incorporated inside the relay. One ethernet port shall be provided in copper (RJ45) and another one in SFP port. Configuration is also possible using a personal computer connected to these ports.

Access to these ports shall be performed with the implementation of authentication mechanisms towards centralized external systems, therefore the device shall support authentication protocols (RADIUS / LDAP / Active Directory Domain). Refer to Guideline no. 7 chapter: "Identification, Authentication and Authorization".

- The operations of diagnostic, programming and configuration can be locally carried out via an ethernet port also located in the frontal position. In all cases this port is independent by those for the connection of telecommunications equipment. To this aim, a simple and intuitive software shall be provided which can be run on a portable PC equipped with the current Windows software, which allows the communication with the control system by means the local configuration portal. This configuration interface shall be based on secure protocols (HTTPS, SSH and TLS SFTP) as indicated by Guideline no. 12 requirement R[81]. This port can be disabled/enabled remotely. Centralized authentication is provided in accordance with the requirements of the Guideline no. 7 chapter: "Identification, Authentication and Authorization". In the event of a fault in the TLC component and therefore the failure to reach the centralized authentication system, authentication can take place locally. A password encryption mechanism shall be compliant with the requirements R[43] and R[43.1] R[43.2] described in Guideline 12. There shall be a periodic password change policy (maximum every 3 months).


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The logging and auditing functions shall be guaranteed for each port and shall be compliant with the Guideline no. 7 in chapter 2.2 “Logging and Auditing”.

Each port shall be isolated and the ethernet ports shall support the TCP/IP-UDP protocol.

To avoid any type of damage, all the ports that are not used in normal operation shall have the enabled/disabled function via software locally and remotely.

In addition, the device shall guarantee backward compatibility with the actual technical solution by means of 2 serial ports RS232 which can be disabled, via software locally and remotely, in order to guarantee the compliance with cybersecurity guidelines (See chapter 7.5.9 Cybersecurity prescriptions). One of these ports, located in frontal position, is used for local diagnostic, programming and configuration while the other one for connecting the control system with the telecommunications equipment.

7.5.6 Communication protocols

For the communication protocols between the Control Center and the recloser, the device shall support at least IEC 870-5-104 (manufacturer shall implement at least 2 different profiles - the specific details of parametrization and configuration parameters will be shared after the awarding as specified below) and DNP3.0 version 2 protocol with the possibility of transmission of unsolicited messages.

In addition, the device shall be capable to implement the following communication protocol: IEC 61850, IEC 61850v2, MITS, SYSLOG, IEC 870-5-101, IEC 870-5-103.

All the protocols mentioned above shall support the TCP/IP-UDP communication via ethernet port.

At least the DNP 3.0 v2 and IEC 870-5-101 protocols shall be compliant also with communication via RS232 port (to guarantee backward compatibility with the actual technical solutions).

Where possible, the secure version of the protocol DNP3.0 v6 shall be used (encryption and authentication).

The supplier shall deliver the DNP communication profile within 30 days.

In addition, after the awarding phase, the customer will deliver the communication profiles indicated above. The supplier has to integrate the communication profiles in the device and, in the TCA process, it is verified that the equipment correctly meets the necessary requirements to establish the communication with the control center under these protocols and implements the specific related messages for its correct communication.

Manufacturers shall carry out all communication, commands and integration tests in the SCADA during the homologation process, prior to the installation of the equipment in the networks. All communication protocol supported by the device shall be integrated into the SCADA systems of the utility of the group.


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7.5.7 Interconnection cable of the control cabinet and remote control with the recloser

- The cable and interconnection between command and recloser shall have a minimum length of 8 meters. The cable shall be suitable for the working conditions of the recloser
- The holes where the cable passes between cabinet and recloser shall prevent the passage of water as indicated in “General features”
- The cable shall be able to be separated at both ends, one side from the control unit and the other side from the recloser, without presenting problems in the measurement transformers (if the equipment has a CT for current measurement, the secondaries shall be short-circuited when the relative interconnection cable is disconnected, using an appropriate connector or plug)
- Through the cable it's possible to send opening and closing commands to the recloser, to receive alarms/signaling and measurements from the recloser itself

7.5.8 Oscillograph register

The register has the following characteristics:

- Minimum quantity of 20 oscillographs, configurable for starting and opening, with a resolution of 1 ms or better and a configurable duration (pre-fault/post-fault) filed in COMTRADE format
- It has a sequence of 1000 events with related timestamp having milliseconds resolution
- It has non-volatile memory to store the oscillographic and all other events even if a complete discharge of the battery occurs
- Sampling rate = 1000 Hz or higher
- Number of analog voltage signals: 4 (6 for Loop Automation system, 3 for each side)
- Number of Analog Current Signals: 4 (5 if it has an analog input for sensitive neutral)
- Number of digital signals: 64 or more
- Adjustable preset
- Minimum recording time for each oscillography: 10 sec

Event log:

- It has an event recorder with a minimum capacity of 1000 records.
- The event log shall contain all signals from internal functions and those that can be selected by the user through programmable logic
- It shall be possible to enter an “Alias” for user-defined functions

- **Fault log:**

- It shall have a fault recorder that indicates the event time with 1 ms of resolution, failed phases, function that caused the trigger, duration of the fault

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7.5.9 Cybersecurity prescriptions

The equipment shall be compliant to the Enel Cyber Security internal guideline about OT ICS: “Cyber Security Guideline no. 12” and IT: “Cyber Security Guideline no. 7”. For the Guideline no. 7 only the chapters: “Identification, Authentication and Authorization” and “Logging and Auditing” are required. The following Annex in excel format is a check list extracted by the Security Guideline (pdf) and the manufacturer shall fill in the “Compliance” columns of the check list.



GICT-SGL_7_Ax_v03_IT_Security_Guideline-Applications Control Ma...



GICT-SGL_12_Ax_v02_ICS OT Security Guideline Contr...



GICT-SGL_07_v03_IT_Security_Guidelines-Applications



GICT-SGL_12_V02_ICS OT Security Guideline

7.5.10 Other requirements

- The equipment and all its parts of the same supply and model shall be electrically and mechanically interchangeable
- The manufacturer shall indicate the dimensions of the equipment to be supplied in the metric system, through certified plans. In case the dimensions are provided in English and metric units, only the metric ones will be considered valid. No supplies or proposals will be accepted where dimensions are indicated in English units only
- The manufacturer shall include instructions for installation, operation and maintenance of the equipment. To this end, manuals and plans are intended to be printed and in electronic format. Also, shall attach two copies of the manuals in electronic format USB and CD per batch and company and shall authorize the end user of the equipment to copy and distribute them freely within the organization. The manual shall be available in different languages at least: English, Spanish, Portuguese.
- The manufacturer shall provide the time-current curves of the equipment and the operation of the control. It is necessary to indicate if it supports the programming of curves and their quantity
- The manufacturer shall provide a unique management software and related updates, software licenses and related updates, and communication cables for local management

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- The software shall have a unique interface of communication and configuration for the equipment including programming and operating function. This one shall be accessed locally and remotely and allowing real-time visualization of all the variables.

7.6 AUXILIARY VOLTAGE TRANSFORMER (ONLY FOR POLE-MOUNTED RECLOSER)

The control system will be powered by an MV/LV auxiliary voltage transformer, with a transformation ratio shown in table 5, with a capacity to reach 1.5 times the value calculated for the most unfavorable operating condition of the recloser - opening/closing operation with discharged battery, powering the control and the communication devices that are planned to be installed (GPRS/radiofrequency/digital radio, etc.), plus the battery charge and the maximum consumption of the control system.

The housing (sheath and sheds) of the insulators shall be HTV (High Temperature Vulcanized) solid silicone type with the characteristics described in Table 4 of this Technical Specification and considering a SPS level e.

The voltage transformer will comply with the IEC 61869-1 and IEC 61869-3 Standard and the manufacturer of the recloser shall include in the TCA dossier a report with the characteristics of the transformer and its corresponding type tests.


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ENEL Company	Ur (kV)	Primary transformer voltage (kV)	Secondary transformer voltage (kV)
Edesur	15,5	13,2	0,120-0,240
	38	33	
ENEL Distribución Chile	27	12-23	
ENEL Distribución Colombia	15,5	11,4-13,2	
	38	34,5	
ENEL Distribución Perú	15,5	10	
	27	20	
Enel Distribuição Ceará	15,5	13,8	
Enel Distribuição Goiás	15,5	13,8	
	38	34,5	
Enel Distribuição Río	15,5	11,95-13,98	
	38	34,5	
Enel Distribuição Sao Paulo	15,5	13,8	
	27	21-23	
	38	34,5	

Table 5 – Ratings of voltage transformer

The rated frequency shall be 50 and 60 Hz.

The voltage transformer support shall be independent of the recloser support and shall be prepared for the installation on the rear side of the recloser.

The voltage transformer will have MV bimetallic connectors (to be used interchangeably with copper and aluminum conductors) that allow connecting conductors with a section from 16 to 70 mm².

The voltage transformer will have LV bimetallic connectors (to be used interchangeably with copper and aluminum conductors) that allow connecting conductors with a section from 1.5 to 16 mm².

It shall be capable of operating outdoors, exposed to the sun (resistance to UV), pollution, humidity and rain, and temperatures that vary between -10°C to + 45°C. UV protection coatings or covers are not accepted.

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Version no. 1 dated 10/11/2022

Subject: Global GSCM013 MV AUTOMATIC THREE-PHASE RECLOSERS**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Enel Grids***7.7 TESTING**

Tests are divided in:

- Type tests.
- Routine tests.
- Acceptance test

7.7.1 Type tests

Reclosers shall be capable of meeting the type tests described in chapter 7 of IEC 62271-111.

The definition of an automatic circuit recloser includes its automatic control. The control shall be considered an essential part of the switchgear in the test report including its model number, serial number, firmware revision, software revision and other appropriate control schemes.

7.7.1.1 Visual inspection

The recloser shall be checked to verify compliance with the drawings included in type A documentation approved.

All the nameplate data and markings defined in chapters 7.4.12 and 7.4.13 of this Standard shall be clearly shown on the recloser.

7.7.1.2 Dielectric tests

Dielectric test shall done be according to chapter 7.2 of IEC 62271-111, including wet tests.

7.7.1.3 Resistance measurement

Resistance measurement shall done be according to chapter 7.4 of IEC 62271-111.

7.7.1.4 Continuous current tests

Continuous current test shall done be according to chapter 7.5 of IEC 62271-111.



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7.7.1.5 Short-time withstand current and peak withstand current tests

The tests shall done be according to chapter 7.6 of IEC 62271-111.

7.7.1.6 Verification of the protection

The test shall done be according to chapter 7.7 of IEC 62271-111.

7.7.1.7 X-radiation test procedure for vacuum interrupters

The test shall done be according to chapter 7.11 of IEC 62271-111.

7.7.1.8 Line-charging current and cable-charging current interruption tests

The tests shall done be according to chapter 7.101 of IEC 62271-111

7.7.1.9 Making current capability

The test shall done be according to chapter 7.102 of IEC 62271-111

7.7.1.10 Rated short-circuit breaking current tests

The tests shall done be according to chapter 7.103 of IEC 62271-111

7.7.1.11 Low current tests

The tests shall done be according to chapter 7.104 of IEC 62271-111

7.7.1.12 Minimum tripping current tests

The tests shall done be according to chapter 7.105 of IEC 62271-111

7.7.1.13 Partial discharge (corona) tests

The tests shall done be according to chapter 7.106 of IEC 62271-111

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The tests shall be done according to chapter 7.108 of IEC 62271-111

7.7.1.15 Mechanical duty test

The test shall be done according to chapter 7.109 of IEC 62271-111

7.7.1.16 Control electronic elements surge withstand capability (SWC) tests

The tests shall be done according to chapter 7.111 of IEC 62271-111

7.7.1.17 Condition of recloser after each test of 7.101, 7.103 and 7.104

The verification shall be done according to chapter 7.112 of IEC 62271-111

7.7.1.18 Thermal runaway test

The test shall be done according to chapter 7.113 of IEC 62271-111

7.7.1.19 Type tests on polymeric insulators

The type test intended to prove the characteristics required in chapter 7.4.3 of this technical specification shall be included in the TCA Dossier.



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7.7.2 Routine tests

The routine tests are for the purpose of revealing faults in material or construction. All applicable routine tests shall be made by the manufacturer on each recloser, at the factory after final assembly except that the partial discharge tests may be performed on subassemblies as described in chapter 8.102 of IEC 62271-111.

7.7.2.1 Dielectric test on the main circuit

The test shall done be according to chapter 8.2 of IEC 62271-111

7.7.2.2 Tests on auxiliary and control circuits

The tests shall done be according to chapter 8.3 of IEC 62271-111

7.7.2.3 Measurement of the resistance of the main circuit

The measurement shall done be according to chapter 8.4 of IEC 62271-111

7.7.2.4 Reclosing and overcurrent trip calibration

The calibration shall done be according to chapter 8.101 of IEC 62271-111

7.7.2.5 Partial discharge test

The test shall done be according to chapter 8.102 of IEC 62271-111

7.7.2.6 Mechanical operations tests

The tests shall done be according to chapter 8.103 of IEC 62271-111



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7.7.3 Acceptance tests

Acceptance tests will be considered as those indicated in chapter 7.7.2 of this standard (routine tests) plus those indicated below:

1. Visual inspection (will consist of verifying the external appearance of the recloser and its components, finish, homogeneity of the supply units and compliance with the designs of the material offered).
2. Operation test with the control: Review of the sequences, interlocks, simultaneity of contacts and locks as indicated by the manufacturer's manual and integration test with SCADA system.

The number of samples to be subjected to acceptance tests shall be determined statistically according to the indications given in Table ISO 2859-1 using:

- Sample plan: simple reduced
- Current testing at Level II
- Acceptable Quality Level (AQL): 0.65%

In the case of negative results of the test, Enel reserves the right, for subsequent tests, to use test plans that involve a larger sample than the previous test, starting from the simple ordinary type (statistical testing where the AQL = 0.65%) up to 100% of the batch.

7.8 CONDITIONS OF SUPPLY

Each unit of GSCM013 Recloser shall be supplied with:

- Recloser with characteristics indicated in chapter 7.3 and 7.4 of this Standard
- Control cabinet and telecontrol with characteristics indicated in chapter 7.5 of this Standard
- installation, operation and maintenance manual in the language of the Country in which the recloser has to be delivered.
- manual with procedures to be adopted for storage, after factory test and transportation.
- a connection cable (min. 8 m) together with connectors for connecting the recloser and the control cabinet.
- Voltage transformer with characteristics indicated in chapter 7.6 (in case of pole-mounted recloser).
- a connection cable together with connectors for connecting the voltage transformer and the control cabinet.

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- support bracket or support structure (see Chapter 7.4.11).

The insulators and the bushings shall be opportunely protected to safeguard them from impacts that may damage them during the transportation.

Outside of the box containing the recloser, it shall be clearly written:

- name of the Distribution Company.
- name of the supplier.
- description of the product.
- code assigned by the supplier.
- type code and serial number of the Distribution Company.
- gross weight.

In case of reclosers for Colombia, the manufacturer shall include the mandatory RETIE certificate in the TCA dossier.