



**Technical Specification code: MAT-O&M-NCS-2021-0036-EGIN**

Version no. 2 dated 28/05/2021

**Subject:** Global Infrastructure and Networks – GSCM505 Extractable, Vertical Translation, Three-Pole, Vacuum Circuit Breaker, Ur=24kV for air insulated “Compact” Switchgear Family

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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**THE HEAD OF Network Components Standardization**  
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**Application Areas**

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## 1 DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to describe the construction and use characteristics of extractable, vertical translation and lateral command MV three pole Vacuum Circuit Breaker (VCB) for indoor application with nominal voltage  $U_r = 24\text{kV}$ , used in the Air Insulated “compact” Switchgear (AIS) family as described in the GSCM690 “Family of AIS “compact” **enel** type technical specifications collection” to be installed in HV-MV substation of 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
Iberia	e-distribución
Italy	e-distribuzione
Peru	Enel Distribución Perú
Romania	Enel Distribuție Banat Enel Distribuție Dobrogea Enel Distribuție Muntenia

**Table 1 - Distribution Companies**

### 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.

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## 2 DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
1	16/09/2020	Issuing of “Global Infrastructure and Networks GSCM505 Extractable, Vertical Translation, Three-Pole, Vacuum Circuit Breaker, Ur=24kV for air insulated “Compact” Switchgear Family” technical specification
2	28/05/2021	General revision of document

## 3 UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

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

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;
- 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

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## 6 DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
<b>Manufacturer Product</b>	Component manufactured by a Supplier in accordance with a technical specification
<b>Technical Conformity Assessment (TCA)</b>	A “conformity assessment” <sup>1</sup> with respect to “specified requirements” <sup>2</sup> 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
<b>Conformity assessment body</b>	Body that performs the conformity assessment activities [ISO 17000]
<b>Enel Equipment Key code</b>	It’s an equipment representative for a group (family) of similar equipment chose by Enel
<b>Enel Equipment Family code</b>	Equipment belonging to a specific group (family) in which another equipment is identified as key code
<b>TCA systems</b>	The “conformity assessment systems”, is applicable specifying that the rules and procedures to carry on the TCA are those specified in the present document
<b>Type A documentation</b>	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

<sup>1</sup> Definition 2.1 of ISO/IEC 17000

<sup>2</sup> Definition 3.1 of ISO/IEC 17000



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<b>Type B documentation</b>	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
<b>TCA report</b>	Document describing the activities carried out for TCA
<b>TCA dossier</b>	Set of final documents delivered by the Supplier for the TCA
<b>Material LifeCycle Management (MLM)</b>	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)

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## 6.1 ENEL GLOBAL INFRASTRUCTURE AND NETWORKS COUNTRIES REFERENCE STANDARDS

Reference documents listed below (amendments included) shall be the edition in-force at the contract 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)
ISO/IEC 17065	Conformity assessment – Requirements for bodies certifying products, processes and services

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## 7 DESCRIPTION

### 7.1 LIST OF COMPONENTS

List of components please refer to Annex B.

### 7.2 APPLICABLE LAWS AND REFERENCE STANDARDS

Reference documents listed below (amendments included) shall be the edition in-force at the contract date. For South America destinations, the reference standards are the IEC/ISO, whilst for Europe destinations the reference standards are the correspondent European ones (EN).

#### 7.2.1 International standard

- IEC 62271-1 “High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear”;
- IEC 62271-100 “High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers”;
- IEC 62271-200 “High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV”;
- IEC/TS 62271-210 “High-voltage switchgear and controlgear - Part 210: Seismic qualification for metal enclosed and solid-insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV”;
- IEC 62271-304 “High-voltage switchgear and controlgear - Part 304: Classification of indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV related to the use in special service conditions with respect to condensation and pollution”;
- IEC 60073 “Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators”;
- IEC 60695-11-10 “Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods”;
- IEC 60529 “Degrees of protection provided by enclosures (IP Code)”;
- IEC 60445 “Basic and safety principles for man-machine interface, marking and identification –

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Identification of equipment terminals and conductor terminations”;

- IEC 61810-1 “Electromechanical elementary relays – Part 1: General and safety requirements”;
- IEC 60332-1-2 “Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame”;
- EN 50399 “Common test methods for cables under fire conditions - Heat release and smoke production measurement on cables during flame spread test - Test apparatus, procedures, results”;
- IPC-A-610G “Acceptability of Electronic Assemblies”;
- ISO 16739 “Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries”;
- ISO 12944 “Paints and varnishes — Corrosion protection of steel structures by protective paint systems”.

### 7.2.2 **enel standards**

- MAT-O&M-NCS-2021-0033-EGIN version 3 “Global Infrastructure and Networks – GSCG002 Technical Conformity Assessment”;
- GSCM690 “Family of AIS “compact” **enel** type, technical specifications collection”;
- GSCM1676 “Mock-up template utilization procedure”;
- Contractual Requirements for Components and Materials Quality management;
- CNS-O&M-S&L-2021-0032-EGIN “Global Infrastructure and Networks Barcode specification”;
- Packaging, transport, and delivery requirements rev.2.

### 7.2.3 **Argentina**

#### 7.2.4 **Brazil**

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

#### 7.2.5 **Chile**

- Norma técnica de calidad de servicios para sistema de distribución, Comisión Nacional de Energía, Diciembre 2017;



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- ETG-1020 “Requisitos de Diseño Sísmico para Equipo Eléctrico”;
- IEEE 693-2005 “Recommended Practice for Seismic Design of Substations”;
- Norma Técnica de Seguridad y Calidad de Servicio, Comisión Nacional de Energía, Enero 2016.

**7.2.6 Colombia**

- RETIE – Reglamento Técnico de Instalaciones Eléctricas.

**7.2.7 Perú**

**7.2.8 Italy**

- D.Lgs n. 81 of the 9 of April 2008 and subsequent modifications;
- GUI 101 “Caratteristiche generali e prescrizioni di impiego del pallet in legno da utilizzare per imballo di trasporto”.

**7.2.9 Spain**

- RAT, Seguridad, Declaracion de conformidad;
- R.D. 614/2001, de 8 de junio, sobre disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico;
- R.D. 337/2014, de 9 de mayo, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión y sus Instrucciones Técnicas Complementarias ITC-RAT 01 a 23;
- R.D. 223/2008, de 15 de febrero, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en líneas eléctricas de alta tensión y sus instrucciones técnicas complementarias ITC-LAT 01 a 09.

**7.2.10 Romania**

- Prescriptia Energetica PE 101/85 – Normativ pentru construcția instalațiilor electrice de conexiuni și transformare cu tensiuni peste 1 kV;
- GUI 101RO "Caracteristicile generale și cerințele de utilizare ale paletului de lemn care urmează să fie utilizat pentru ambalarea de transport.

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### 7.2.11 Europe

- Regulation (EU) of the European Parliament and of the Council 517/2014 of the 16th April 2014.

### 7.3 SERVICE CONDITIONS

VCB shall be compliant with normal service conditions for indoor installation, defined in chapter 2 of IEC 62271-100, considering as minimum value of ambient temperature - 5°C.

Maximum altitude shall be as defined in normal service condition (1000 m).

Constructor shall define the Ur referred to 2700 m of altitude for Colombia, (a de-rating of Ur can be considered).

Seismic level of apparatuses, functional unit switchgear and VCB shall be:

- seismic severity 2;
- acceptance class 1.

as defined in IEC/TS 62271-210.

VCB shall be compliant for installation in three-phases MV effectively and non-effectively earthed neutral system (solidly earthed, isolated, impedance earthed, resonant earthed and arc-suppression-coil-earth neutral system).

VCB shall be compliant with design class 2 (CH; PH) of IEC 62271-304.

### 7.4 TECHNICAL CHARACTERISTICS

VCB shall be compliant with IEC 62271-100. In the following table, minimum electrical ratings for each type of VCB GSMC505 are defined.

<i>enel</i> Type	GSCM505/2	GSCM505/3	GSCM505/4	GSCM505/7	GSCM505/8	GSMC505/9
Rated Frequency fr (Hz)	50 and 60					
Rated normal current Ir (A)	1600		630		2000*	
Maximum voltage of grid (kV)	22					
Rated Voltage Ur (kV)	24					
Rated power-frequency withstand voltage Ud (kV)	50					
Rated lightning impulse withstand voltage Up (kV)	125					
Rated short circuit breaking current Isc (kA)	16					
Rated duration of short circuit tk (s)	1					
Rated short-circuit making current & Rated peak	41,6 (with d.c. time = 45 ms)					

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withstand current $I_p$ (kA)						
Rated supply voltage of closing and opening devices and of auxiliary and control circuits $U_{op}$ (Vdc) and rated supply voltage of auxiliary circuits $U_a$ (Vdc)	110 and 125					
Rated operating sequence VCB for rapid auto-reclosing	O – 0,3" – O – 15" – CO					
Break-time (ms)	60 ÷ 100					
Rated first-pole-to-clear factor $k_{pp}$	1,3 and 1,5					
Circuit breaker class	S1					
Electrical endurance class	E2					
Mechanical endurance class	M2					
Probability of restrike during capacitive current breaking class	C2					
Rated line charging breaking current $I_l$ (A)	10					
Rated cable-charging breaking current $I_c$ (A)	31,5					
Rated single capacitor bank-breaking current $I_{sb}$ (A) for 6MVAR of maximum reactive power	400					
Rated back-to-back capacitor bank breaking current $I_{bb}$ (A)	NA	400			NA	
Rated back-to-back capacitor bank inrush making current $I_{bi}$ (kA) fbi 4250 Hz	NA	20			NA	
IP degree of command	2X					
Command Type	B	D	C	A	B	D
Life expectancy (years)	30					

**Table 2 - Electrical Features**

\* $I_r$  = 2000 A reachable with forced ventilation (60 Hz) and opening under transformer/bus bar tie functional unit switchgear

Ratings for back-to-back capacitor bank is not required for VCB *enel* types GSCM505/2/3/8/9.

## 7.5 CONSTRUCTION CHARACTERISTICS

### 7.5.1 Generality

VCB shall be extractable type, with clamps for power connections and, for its operation, only the expected electrical auxiliary voltage is allowed.

Dimension of VCB, various views and sections are in Annex C of this document.

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**7.5.2 Insulated bushings**

Insulated bushing allows active part of each pole of VCB to cross the septum of the functional unit switchgear that separates the bus bar compartment from the cable compartment.

In case of high levels of partial discharges due to sharp edges interfering between functional unit switchgear and VCB, suitable deflectors (such as rings embedded in the resin of the bushing) in order to reduce the intensity of the field in the area above described shall be provided.

In any case, the solution adopted shall not introduce any modification to the family of switchgear technical specifications.

**7.5.3 Protection panel**

VCB command shall be equipped, in front and sides, with a metallic protection (other materials shall be taken into account) panel of adequate resistance to mechanical stress and internal fault. Panel shall be without sharp corners at the edges. Panel design of lowest part of the panel shall also take in consideration the maneuverability of the handles for extraction of the VCB trolley (see paragraph 7.5.6).

**7.5.4 Wheels**

VCB trolley shall be equipped of 4 sliding stainless wheels suited to the guides installed inside the functional unit switchgear; the wheels shall permit the easy handling of VCB trolley.

Wheels fixing system shall be contained in the maximum width of trolley.

**7.5.5 Earthing contact**

VCB shall be equipped with a copper earthing contact of proper dimension to be coupled with the functional unit switchgear earthing system.

**7.5.6 Drag handles for trolley**

VCB trolley shall be equipped with two handles positioned in the front panel, retractable by means of return springs; handles shall allow to release the two rectangular blocking pivots of the VCB trolley.

Mechanism shall be designed in order to operate correctly with functional unit switchgear interlocks.

Design of handles shall be ergonomic, safe and effortlessly for operators.

**7.5.7 Accessory openings**

In front of VCB, accessory openings are permitted in order to cope with various exigencies (for example to make visible signaling of springs loaded or no loaded); at least IP2X degree of protection (IEC 60529) shall be ensured.

Accessory openings shall be positioned such as to be visible by inspection through the window positioned on the door of functional unit switchgear.

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### 7.5.8 Clamp contacts

Clamp contacts shall be designed in order to be coupled with the functional unit switchgear fixed contacts (see annex C).

Penetration of clamp in the fixed contacts shall be 30 mm as minimum values; at any case the penetration shall be adequate in order to ensure the electrical ratings of functional unit switchgear.

Clamp contacts shall have a degree of mobility to permit a correct coupling with the fixed contacts even in case of offset with respect to the bus bar.

Every group of contacts shall be equipped with independent re-entry springs in order to permit, after a disconnection of VCB from bus bar, the clamp returning to pre-connection position.

### 7.5.9 Lifting devices

Removable lifting devices shall be installed on VCB (for example eyebolts or similar), for the lifting of the complete VCB.

### 7.5.10 Blocking pivot

VCB shall be equipped with a blocking pivot of 20 mm diameter, rounded edges and stroke at least 20 mm (see annex C).

When the trolley is “totally relieved” and “totally lowered” (VCB connected and disconnected), the pivot will be in its more external position.

Such position of pivot shall be maintained by a horizontal pressure towards external direction with respect to trolley.

The pressure shall have proper accordance with specific mechanism present on the front of functional unit switchgear, in any case untimely maneuvers shall be avoided.

Activation of blocking pivot shall occur when it is pushed towards internal direction starting from 5 mm and to 10 mm from beginning of horizontal stroke.

Activation interval shall occur in the following conditions:

- when the trolley is in intermediate position (for example during a translation of VCB).
- when the mechanism for the command of blocking pivot has been operated (meaning that the operator is preparing for vertical translation of VCB from position of “service” to position of “disconnected” or conversely).

Activation of blocking pivot shall cause the following interlocks:

- mechanical interlock that prevent the electric command (closing) of VCB;
- mechanical interlock that causes the automatic mechanical opening of the VCB.

Blocking pivot shall be equipped with electrical signaling (electrical contact) see annex D.

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**7.5.11 Devices to be installed on front of VCB**

Devices to be installed on front of VCB, shall be visible also when the VCB is in operating position inside functional unit switchgear.

Following devices compliant to IEC 60073 shall be installed:

- VCB commands symbology:

<b>Operation</b>	<b>All countries except Brazil (according with IEC 60073)</b>	<b>Brazil (according with NR10)</b>
<b>Closing</b>	White (green is permitted)	White "L" on Red background
<b>Opening</b>	Black (red is permitted in all countries excluded Perù)	White "D" on Green background

- opening button permits the opening maneuver of CB without using electric circuits. This button shall be equipped with protection against accidental bumps;
- closing button permits the closing of CB only when the energy maneuver is full. This button shall be operable and visible only once the carter (protection panel) of command has been removed;
- position indicator of VCB, the device used shall be mechanically connected with VCB power mobile contacts compliant with paragraph 5.12 of IEC 62271-200. VCB position shall be visualized with symbology defined by table below:

<b>Position</b>	<b>All countries except Brazil (according with IEC 60073)</b>	<b>Brazil (according with NR10)</b>
<b>Close</b>	Black "I" on white background	White "L" on Red background
<b>Open</b>	White "O" on black background	White "D" on Green background

- manual device for restoring the energy for maneuver, actuation sense shall be indicated on the command panel. For operator's safety the use of this device shall inhibit the restoring of energy by DC electric engine;
- bistable selector for activation and de-activation of under-voltage release (only for "B" and "C" types of command) with clear indication of its state.
- energy storage device state indicator:

- a) Yellow color, for energy storage device charged (see figure below);

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- b) White color, for energy storage device uncharged (see figure below).



- opening operation counter of VCB, five digits, un-resettable.

Commands and signalizations shall be understandable and interpretable with VCB carter (protection panel) removed.

## 7.6 CONSTRUCTION FEATURES OF COMMAND

VCB shall be compliant with 110 Vdc and 125 Vdc rated supply voltage of closing and opening devices Uop with the tolerance described by the standard.

Connecting to ground a polarity of 110 and 125 Vdc supply is not allowed.

### 7.6.1 Power contacts

Power contacts movement of the VCB shall be mechanical, energy storage device shall be mechanical type (springs command).

Alternative constructive solutions for energy storage device can be take in consideration, given the respect of all functional requirements of this specification.

Charging of energy storage devices shall be obtained in two ways:

- 1) DC electric engine;
- 2) mechanical device manually activated by operator.

VCB command shall achieve the followings cycles:

- with DC engine working:
  - O – 0,3” – CO – 15” – CO, starting by condition of circuit breaker closed and springs of closure charged;
- with DC engine out of working:
  - O – 0,3” – CO, starting by condition of circuit breaker closed and springs of closure charged;
  - CO, starting by condition of circuit breaker open and springs of closure charged;
  - O, starting by condition of circuit breaker closed and springs of closure not charged.

When VCB is close opening springs shall always be charged.

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In case that, during a maneuver, opposite maneuver request appears, the memorization and actuation shall be avoided until completion of maneuver on going.

Functional conditions for release, both closing and opening (by launch and under voltage), and maximum actuating force required for restoration of mechanical device shall be as indicated in IEC 62271-100.

Cabling shall be manufactured by flexible single-core cable with 450/750V minimum insulation class and minimum fire reaction Cca-s1b,d1,a1 as described below.

- Cca: EN 50399: Flame Spread (FS)  $\leq 2,00\text{m}$ ; Total Heat Release (THR)  $\leq 30\text{MJ}$ ; Maximum Heat Release Rate (HHR)  $\leq 60\text{kW}$ ; Fire Growth Rate, index of heat release rate (FIGRA)  $\leq 300\text{Ws}^{-1}$  /// IEC 60332-1-2: Flame Spread, vertical flame propagation  $H \leq 425\text{ mm}$ ;
- s1b: Total Smoke Production (TSP1200)  $\leq 50\text{ m}^2$ ; Smoke Production Rate, maximum smoke (SPR)  $0,25\text{ m}^2/\text{s}$ ; transmittance  $\geq 60\% < 80\%$ ;
- a1: electrical conductivity  $< 2,5\ \mu\text{S}/\text{mm}$  ; pH  $> 4,3$ ;
- d1: No flaming droplets/particles persisting longer than 10 s within 1200 s.

Conductors shall be of proper dimension as Constructor design with minimum section of  $1,5\text{ mm}^2$ , they shall be marked at their extremity, accordance with IEC 60445 and cabling drawings.

### 7.6.2 Types of command

VCB shall be equipped with a three-polar command:

- Type “A” command for line, capacitor bank and auxiliary services VCB;
- Type “B” and Type “D” command for transformer, bus bar tie VCB;
- Type “C” command for neutral maker transformer VCB;

Type “A” command shall be equipped with following circuit and devices:

- Three-polar shunt closing release by launch of tension;
- Three-polar shunt opening release by launch of tension;
- Anti-reclosing device (anti-pumping) with the scope of inhibiting further closures after the first, in case there is an opening command during the initial request of closing. This device cannot be deactivated by functional inhibitions.

Type “B” and type “C” commands shall be equipped with same devices of type “A” plus the following command device:

- Three-polar opening under-voltage release that can be deactivated with a selector positioned on front of command (see par. 7.5.11). Operation of activation and/or deactivation shall not produce untimely maneuvers.



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Type “D” command shall be equipped with same devices of type “B” replacing three-polar opening under-voltage release with:

- Second three-polar shunt opening release by launch of tension.

For more details see annex D.

### 7.6.3 Inhibit circuits

Circuits and/or devices shall be considered that must inhibit command of closing when there is at least one of follow events:

- not enough energy for maneuver of closing (springs not charged);
- activation of blocking pivot (activation of blocking pivot when VCB is closed shall cause the opening of VCB);
- command and/or maneuverer of opening on going;
- under-voltage release active when under-voltage coil is not energized for absence of Vdc or for fault conditions (only for types “B” and “C”).

Inhibition shall automatically end only after the conditions that had caused its activation disappeared.

Untimely inhibitions due to mechanical stress and vibrations present during the VCB maneuvers shall be avoided.

## 7.7 AUXILIARY DEVICES

Auxiliary devices of VCB shall be compliant with IEC 62271-100.

VCB shall be compliant with 110 Vdc and 125 Vdc rated supply voltage of auxiliary circuits Ua with the tolerance described by standard.

Connecting to ground a polarity of 110 and 125 Vdc supply is not allowed.

### 7.7.1 Auxiliary contacts of VCB

Auxiliary contacts of circuit breaker shall be mechanically joint to principal contacts.

Electrical features of auxiliary contacts shall be compliant with the class 1 table 6 of IEC 62271-1 ed.1.

### 7.7.2 Anti-reclosing device (anti-pumping)

If the device is designed with relays, these shall be compliant with IEC 61810-1 with electric life of 100.000 maneuverers.

Relays shall be of extractable type, with insertion on the base, having frontal sockets fixed by screws and protection degree at least IP2X compliant with IEC 60529.

Auxiliary contacts of relays shall be compliant with the class 1 table 6 of IEC 62271-1 ed.1.

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**7.7.3 Bistable selector for under voltage release**

Bistable selector shall be equipped with auxiliary contacts, closed when under voltage device is activated whose features shall be compliant with the class 1 table 6 of IEC 62271-1 ed.1.

**7.8 LV CONNECTORS**

Command circuits shall be designed according with drawings of annex D:

The circuits shall be mounted on the fixed part of the LV connector with male contacts (PINS), installed on the right part or on the top of VCB. Position of fixed part of connector shall guarantee the dielectric and mechanical distances without interferences.

VCB connector shall be compliant with functional unit switchgear connector.

Female switchgear LV connector is not included in the supply.

**7.9 MANUALS**

Constructor shall produce the VCB manual compliant with chapter 10 and 11 of IEC 62271-100 ed.2.

Minimum time of maintenance shall be 60 months. The maintenance shall not include the substitution of main components as vacuum bottle, springs, poles, closing and opening release and electronic parts.

Following points shall be defined in the manual:

- safe and easy method for vacuum bottle check;
- measuring procedure for typical parameters like resistance of main circuits, open and close time, current absorption and all parameters defined in the par. 7.12.2.7 and 7.12.2.8 (normally check during routine tests and maintenance operation);
- Operations maintenance during life expectancy shall be declared by constructor.

The manuals language shall be compliant with the supply country, e.g. in Italian/Spanish/Romanian/Portuguese.

**7.10 NAMEPLATE**

VCB shall be equipped, on frontal side and visible position, with a nameplate where data indicated by IEC 62271-100 shall be listed (included the mass).

Also on the nameplate shall be included the followings indications:

- **enel** type;
- **enel** material code;

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Service Function: -

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- Barcode compliant with CNS-O&M-S&L-2021-0032-EGIN (in case there is not enough space on the nameplate, barcode could be insert out of nameplate).

## 7.11 PROTECTIVE COATINGS

The carpentry shall have a protective coating compliant with ISO 12944 with the following features:

- Durability:
  - o Very High (VH) more than 25 years;
- Atmospheric corrosion category:
  - o C5.

Alternative values of atmospheric corrosion category are permitted but class 2 of IEC62271-304 shall be guaranteed.

Use of painting cycles or alternatively, electrolytic galvanizing on items that are not part of the load-bearing structure of the trolley is allowed.

## 7.12 TESTING

Type and routine test shall be performed in compliance with IEC 62271-100, IEC 62271-1 and IEC 62271-200 and the clarifications indicated in the follow paragraphs.

Technical conformity assessment (TCA) process shall be compliant with MAT-O&M-NCS-2021-0033-EGIN.

Electronic type A documentations (drawings) shall be “BIM compliant” according ISO 16739.

Functional unit switchgears with TCA in force necessary for all type and routine tests shall procured by Constructor.

Constructor shall produce a “values declared by Constructor” document necessary for Routine Test to be insert in TCA report.

In this document shall be present at least the following values declared by constructor and derived from type test:

- Adsorption at rated, minimum and maximum auxiliary voltage defined by IEC 62271-100 of following device:
  - o Under voltage opening release (only to rated voltage) shunt opening and closing launch releases;
  - o Recharge spring electrical engine.

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Staff Function: -

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- Timing operation at rated, minimum and maximum auxiliary voltage defined by IEC 62271-100 of following device:
  - o Under voltage opening release (only to rated voltage) shunt opening and closing launch releases;
  - o Recharge spring electrical engine.
- Resistance of main circuit (see par. 7.12.2.4).  
Previous values shall be identified during type tests by constructor.

## 7.12.1 List of tests

### 7.12.1.1 List of type tests

Type test	Reference
Constructive features and interlock functionality verifications	Par. 7.12.2.1
Mechanical operation test	Par. 7.12.2.2; Par. 6.102 of IEC 62271-200 ed.2:
Dielectric tests: <ul style="list-style-type: none"> <li>• Power-frequency voltage tests for main circuit;</li> <li>• Lightning impulse voltage test;</li> <li>• Partial discharge;</li> <li>• Power-frequency voltage tests for auxiliary circuit.</li> </ul>	Par. 7.12.2.3; Par. 6.2 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2 ;
Measurement of the resistance of the main circuit	Par.7.12.2.4 Par. 6.4 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2 ;
Temperature-rise test	Par. 7.12.2.5 Par. 6.5 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2 ;
Short-time withstand current and peak withstand current tests	Par. 7.12.2.6 Par. 6.6 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2;
Additional tests on auxiliary and control circuits and check of electric scheme	Par. 7.12.2.7 Par. 6.10 of IEC 62271-100 ed.2;

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Environmental tests and mechanical endurance test (M2 class)	Par. 7.12.2.8 Par. 6.101 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2;
Tightness test	Par. 7.12.2.9 Par. 6.8 of IEC 62271-100 ed.2;
Short-circuit current making and breaking tests	Par. 7.12.2.10 Par. from 6.102 to 6.106 of IEC 62271-100 ed.2 and par. 6.101 of IEC 62271-200 ed.2;
Critical current test (if defined);	Par. 7.12.2.10 Par. 6.107 of IEC 62271-100 ed.2
Single-phase test Double-earth fault test;	Par.7.12.2.10 Par. 6.108 of IEC 62271-100 ed.2
Capacitive current switching tests (C2 class): <ul style="list-style-type: none"> <li>• Line-charging current breaking tests</li> <li>• Cable-charging current breaking tests</li> <li>• Single capacitor bank switching tests</li> <li>• back-to-back capacitor bank switching tests</li> </ul>	Par. 7.12.2.10 Par. 6.111 of IEC 62271-100 ed.2
Electrical endurance test (E2 class)	Par. 7.12.2.11 Par. 6.112 of IEC 62271-100 ed.2
X-radiation test	Par. 6.11 of IEC 62271-1 ed.1
EMC test	Par. 7.12.2.12 Par. 6.9 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2;
Degree of protection verifications	Par. 6.7 of IEC 62271-100
Protective coating verifications	ISO 12944
Ageing and humidity test	Par. 7.12.2.13 IEC 62271-304
Flammability tests	Par. 7.12.2.14 IEC 60965-11-10
Seismic test	Par. 7.12.2.15 IEC TS 62271-210
IAC test	Par. 7.12.2.16 Par. 6.106 of IEC 62271-200

**Table 3 - Type Test**

Last edition of previous standards shall be utilized, paragraphs indicated are referred to current edition.

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Staff Function: -

Service Function: -

 Business Line: *Infrastructure & Networks*
**7.12.1.2 List of routine tests**

Routine test	Reference
Type correspondence verifications	Par. 7.12.3.1
Protective coating verifications	ISO 12944
Electric scheme verifications	Par. 7.12.3.2
Dielectric test on the main circuit	Par. 7.1 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2
Dielectric tests on auxiliary and control circuits	Par. 7.2 of IEC 62271-100 ed.2
Measurement of the resistance of the main circuit	Par. 7.12.3.3 Par. 7.3 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2
Mechanical operation tests and interlock functionality	Par. 7.12.3.4 Par. 7.101 of IEC 62271-100 ed.2 Par. 7.102 of IEC 62271-200 ed.2
Partial discharge verification	Par. 7.12.3.5

**Table 4 - Routine test**

Last edition of previous standards shall be utilized, paragraphs indicated are referred to current edition.

**7.12.2 Type tests**

Type tests shall be performed on VCB fully equipped as for ordinary use.

**7.12.2.1 Constructive features verifications and interlock functionality verifications**

For this verification a mechanical simulation of functional unit switchgear is necessary.

Mechanical simulation of functional unit switchgear and VCB (mock-up template) shall be manufactured by constructor in compliance with **enel** drawings and specifications; verification of the template accuracy is in charge of constructor.

Annual check of mock-up template with portable 3D automatic meter shall be performed by constructor.

Portable 3D automatic meter shall have at least 1 mm of precisions.

The right interlock functionality, listed in this document and its annexes, shall be also checked with the mock-up template, procedure described in GSCM1676 shall be followed.

Furthermore, nameplates shall be verified in compliance with paragraph 7.10.

**7.12.2.2 Mechanical operation tests**

Test shall be performed on VCB installed inside functional unit switchgear, in compliance with the paragraph 6.102 of IEC 62271-200 ed.2.

Correct insertion, vertical translation, correct LV connector position of VCB trolley inside functional unit switchgear shall be checked.

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**7.12.2.3 Dielectric tests**

Tests shall be performed on VCB installed inside functional unit switchgear completed of MV cables and terminations, in compliance with paragraph 6.2 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2.

Check of Partial Discharges (PDs) shall be performed with the following indication:

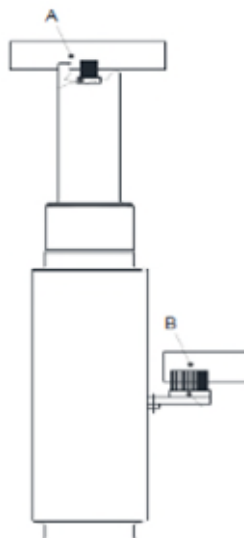
- Test shall be performed both with VCB inside functional unit and with VCB stand alone;
- inception and extinction voltage level of PDs shall be recorded;
- Measuring circuit shall be capable of detecting an intensity of discharge of at least 2 pC;
- PDs values shall not exceed the reference values described in the **enel** property test reports attached in certification documents.

**7.12.2.4 Measurement of the resistance of the main circuit**

Test shall be performed on VCB installed inside functional unit switchgear, in compliance with paragraph 6.4 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2.

With reference to figure 1, for each phase the R1 measurements between busbar and cable connection terminal (points A-B) shall be performed:

Average value, for each phase, of measurement carried out during type test, shall be adopted as referring value for the routine tests.



**Figure 1 - Points of measurement of resistance of main circuit**

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Staff Function: -

Service Function: -

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**7.12.2.5 Temperature-rise test**

Tests shall be performed in compliance with paragraph 6.5 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2, and installed inside their functional unit switchgear.

After temperature-rise test, measurement of resistance of main circuit at ambient temperature shall be performed.

Measured values shall not exceed 1.2 time the values measured during the test a) and d) of par. 7.12.2.4.

**7.12.2.6 Short-time withstand current and peak withstand current tests**

Test shall be performed on VCB installed inside functional unit switchgear, in compliance with paragraph 6.6 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2.

**7.12.2.7 Tests on auxiliary, control circuits and signaling and check of electric scheme**

Conformity of electrical schemes on VCB with respects to approved drawings shall be checked.

Correct functionality of all commands, of all blocks and for all signals and their conformity with prescriptions listed in this document and its annexes shall be checked.

The test on auxiliary and control circuits and signaling shall be performed in compliance with paragraph 6.10 of IEC 62271-100 ed.2.

For the opening releases (launch and under-voltage) and for closing releases, all absorption curves shall be recorded (made available in COMTRADE format), and maximum values of absorption (without rush value) and operation times shall be listed, at the followings conditions:

- rated voltage;
- 110% of rated voltage;
- 70% of rated voltage for opening releases;
- 85% of rated voltage for closing releases.

Features of under-voltage release shall be checked in accordance with IEC 62271-1 ed.1 par. 5.8.4 and in the conditions following indicated:

- ambient temperature;
- with VCB at -5 °C for at least 4 hours with release devices powered.

Absorption curves of electrical engine shall be recorded and maximum values of absorption (without rush value) and recharge time of springs shall be recorded, at the followings conditions:

- rated voltage;
- 110% of rated voltage;



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- 85% of rated voltage.

maximum values of DC engine absorption (without rush value) shall not exceed 3A.

**7.12.2.8 Mechanical and environmental tests (M2 class)**

Tests shall be performed in compliance with paragraph 6.101 of IEC 62271-100 ed.2., on the same VCB specimen installed inside functional unit switchgear, at ambient temperature and high temperature ( $T_H=+40^{\circ}\text{C}$ ), with following clarifications:

- Ambient temperature test:
  - Circuit-breakers for auto-reclosing;
  - All parameters registered (reference parag.6.101.2.5 letter b IEC 62271-100) in the same power supply conditions, after each cycle of 2000 maneuvers, shall remain inside the tolerance indicated by constructor. For opening and closing time, maximum and minimum value measured in the same power supply conditions before and after each cycle of 2000 maneuvers, shall not differ by more than 20% (with reference to minimum value).

**7.12.2.9 Tightness tests**

Tightness test shall be performed in compliance with paragraph 6.8 of IEC 62271-100 ed.2, on all the exemplars of circuit breaker that have performed the mechanical and environmental tests of the par. 7.12.2.8.

**7.12.2.10 Short-circuit current making and breaking tests**

Test shall be performed on VCB installed inside functional unit switchgear, in compliance with paragraph 6.101 of IEC62271-200 ed.2, paragraphs from 6.102 to 6.108 and 6.111 of IEC 62271-100 ed.2.

**7.12.2.11 Electrical endurance tests (E2 class)**

Test shall be performed on VCB installed inside functional unit switchgear, in compliance with paragraph 6.112 of IEC 62271-100 ed.2, VCB subjected to test shall be able to sustain one of the cycles of the lists 1, 2 and 3 of Table 33 par.6.112.2. of IEC 62271-100 ed.2.

Constructor will choose the list of execution in type test phase.

As described in par.6.112.2. of IEC 62271-100 after testing, in order to check the state of VCB, the dielectric tests considering 100% of rated values shall be performed.

**7.12.2.12 EMC test**

Test shall be performed on VCB installed inside functional unit switchgear, in compliance with par. 6.9 IEC 62271-100 ed.2 and IEC 62271-200 ed.2.

IPC-A-610G level of main boards for electronic parts of VCB shall be declared by constructor and evaluated by **enel**.

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**7.12.2.13 Ageing and humidity test**

Test shall be performed on VCB, installed inside functional unit switchgear, in compliance with IEC 62271-304 with design class 2.

**7.12.2.14 Flammability tests**

Test shall be performed on an exemplar for each insulation elements in organic material present on VCB. Test shall be performed in compliance with prescriptions of IEC 60965-11-10 considering the materials as V-0 type.

**7.12.2.15 Seismic test**

Test shall be performed on VCB installed inside their functional unit switchgear, compliance with IEC TS 62271-210.

**7.12.2.16 IAC test**

Test shall be performed on VCB installed inside their functional unit switchgear, in compliance with par.6.106 IEC 62271-200 ed.2.

**7.12.3 Routine tests**

The routine tests are indicated in the table 4, these tests shall be carried out by the constructor on all the specimen prepared for the commissioning.

For each piece belonging to the prepared batch, the supplier shall prepare a test report with the results of the tests performed.

For routine tests reference values and acceptability ranges defined in the TCA Report, type A documents shall be considered.

Routine tests shall be performed on VCB fully equipped as for ordinary use.

**7.12.3.1 Type correspondence verifications**

Following verifications shall be performed:

- a) Visual examination in order to check the absence of external imperfections and constructive defects;
- b) Dimensional and constructive verification, with mock-up template of functional unit switchgear conformity to **enel** drawings and specifications, according procedure described in the GSCM1676 shall be ensured;
- c) Constructive features check with drawings schemes and pictures of the approved type A documentations.

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Staff Function: -

Service Function: -

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**7.12.3.2 Electric scheme verifications**

For the execution of this test the constructor shall make available (also printed in convenient size paper) the electrical schemes of circuit breakers approved during TCA phase.

Conformity of the electrical drawings and electrical schemes implemented on VCB shall be checked.

Efficiency of anomaly/ block signals present shall be checked too.

**7.12.3.3 Measurement of the resistance of the main circuit**

Measurement shall be performed in compliance with par. 7.3 of IEC 62271-100 ed.2 and IEC 62271-200 ed.2, measures shall be executed with methods indicated in par. 7.12.2.4 , checking that measured values do not exceed 1.2 time the values of reference measuring obtained during type test.

**7.12.3.4 Mechanical operating tests and interlock functionality**

Test compliant with paragraph 7.102 of IEC 62271-200 ed.2 shall be performed on VCB installed inside functional unit switchgear.

Test compliant with paragraph 7.101 of IEC 62271-100 ed.2 shall be performed on VCB fully equipped as for ordinary use.

For the opening releases (launch and under-voltage) and for closing releases, all absorption curves shall be recorded, and maximum values of absorption (without rush value) and operation times shall be listed, at the followings conditions:

- rated voltage;
- 110% of rated voltage;
- 70% of rated voltage for opening releases;
- 85% of rated voltage for closing releases.

Absorption curves of recharge spring electrical engine shall be recorded and maximum values of absorption shall be listed (without rush value) recharging time of springs shall be recorded at the nominal voltage.

Maximum values of DC electric engine absorption (without rush value) shall not exceed 3A.

All measured, times and maximum values of absorption shall be checked with type A document “values declared by Constructor”; at any case they shall be not over the tolerance defined as below:

- $\pm 10$  % for VCB operation time;
- $\pm 15$  % absorption of releases and DC electric engine;
- recharge spring electrical engine operation time tolerance defined by Constructor (VCB rated operation cycle shall be taken in the account).

Under-voltage release and blocking pivot shall be checked.

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Staff Function: -

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For each typology of VCB shall be checked that blocking pivot action provokes:

- Circuit breaker opening;
- Inhibition of electric command.

Correct functionality of interlocks listed in this document and its annexes shall be checked.

The right interlock functionality, listed in this document and its annexes, shall be also checked with the mock-up template, procedure described in GSCM1676 shall be followed.

#### 7.12.3.5 PDs verification

Constructor shall perform PDs measures on VCB in standalone condition, test report result shall be minor or equal to PDs values obtained during type test described on the par. 7.12.2.3 of this specification.

#### 7.12.4 Acceptance test

Acceptance test shall be the same of the Routine tests.

Acceptance test shall be carried out on a sample basis, on a number of samples which depends on the consistency of the supply according conditions establish in document “Contractual Requirements for Components and Materials Quality management”.

### 7.13 SUPPLY REQUIREMENTS

VCB shall be supplied in single package, in order to ensure a proper protection during the transportation and storage.

Inside the package followings elements shall be supplied:

- VCB completely equipped;
- All accessories necessary for the complete installation and commissioning of VCB;
- Functional and cabling schemes;
- Installation, operation and maintenance manuals;
- Manual device for energy restore of springs of VCB;
- Any other device eventually needed for the operation VCB.

Out of the package followings indications shall be present:

- **enel** DSO;
- Name of supplier;
- Description of product;

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Staff Function: -

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- **enel** material and type code;
- Constructor designation and serial number;
- Gross weight.

BAR Code compliant with CNS-O&M-S&L-2021-0032-EGIN. Package shall be assembled for delivering as prescribed in **enel** standard.

**7.13.1 Warranty**

60 months of warranty period.

**7.13.2 Packaging**

For transport and handling in storage ENEL Group shall use packaging compliant to “Packaging, transport and delivery requirements - rev. 2”.

**7.14 DOCUMENTATIONS TO BE PROVIDED IN TECHNICAL OFFER**

Documentations:

- Check list see annex A to fill in for each **enel** type code;
- Drawings with overall dimensions;
- Supplier declaration of compliance of offered products with present TS and main standards and laws;
- Deviations letter (if any).

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 Perimeter: *Global*

Staff Function: -

Service Function: -

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## 8 ANNEXES

### 8.1 ANNEX A - TECHNICAL CHECK LIST

<b>Technical specification:</b>		<b>Offer number:</b>	
<b>Constructor:</b>		<b>Site of production:</b>	
<b>enel type code:</b>		<b>Constructor type code or designation:</b>	
<b>enel material code:</b>			
Technical ratings		Request	Constructor offer
1	Service conditions	Par. 7.2	
2	Maximum altitude (m)	1000	
3	Maximum altitude only for Colombia(m)	2700	
4	Minimum ambient air temperature (°C)	-5	
5	Severity degree of pollution (IEC 62271-304)	design class 2	
6	Seismic level; acceptance class	2 ;1	
7	Rated normal current Ir (A)	Table 2	
8	Rated frequency fr (Hz)	50 and 60	
9	Rated voltage Ur (kV)	24	
10	Rated Voltage Ur (kV) to 2700 m	Constructor information	
11	Rated power-frequency withstand voltage Ud (kV)	50	
12	Rated lightning impulse withstand voltage Up (kV)	125	
13	Rated short-circuit breaking current Isc (kA)	16	
14	Rated duration of short circuit tk (s)	1	
15	Rated short-circuit making current & Rated peak withstand current Ip (kA)	41,6	
16	Rated supply voltage of closing and opening devices and of auxiliary and control circuits Uop (Vdc) and rated supply voltage of auxiliary circuits Ua (Vdc)	110 and 125	
17	Rated operating sequence	O – 0,3” – CO – 15”- CO	
18	Break-time (ms)	60 ÷100	
19	Rated first-pole-to-clear factor <i>kpp</i>	1,3 and 1,5	
20	Auxiliary devices	Par 7.7	
21	Circuit breaker class	S1	
22	Electrical endurance class	E2	
23	Mechanical endurance class	M2	
24	Probability of restriking during capacitive current breaking class	C2	
25	Rated line charging breaking current Il (A)	10	
26	Rated cable-charging breaking current Ic (A)	31,5	
27	Rated single capacitor bank-breaking current Isb (A) for 6MVAR of maximum reactive power	400	



**Technical Specification code: MAT-O&M-NCS-2021-0036-EGIN**

Version no. 2 dated 28/05/2021

**Subject:** Global Infrastructure and Networks – GSCM505 Extractable, Vertical Translation, Three-Pole, Vacuum Circuit Breaker, Ur=24kV for air insulated “Compact” Switchgear Family

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

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28	Rated back-to-back capacitor bank breaking current $I_{bb}$ (A)	Table 2	
29	Rated back-to-back capacitor bank inrush making current $I_{bi}$ (kA) $f_{bi}$ 4250 Hz	Table 2	
30	IP degree of command	2X	
31	Life expectancy (years)	30	
32	Overall dimension	Annex C	

**Table 5 - Check list**

**Application Areas**

 Perimeter: *Global*

Staff Function: -

Service Function: -

 Business Line: *Infrastructure & Networks*
**8.2 ANNEX B – LIST OF COMPONENTS**

Type code	Description	Argentina	Brazil	Chile	Colombia	Italy	Perú	Rumania	Spain
<b>GSCM505/2</b>	Transformer/ Bus-bar-tie (1 opening release +1 closing release+1 opening under-voltage release) VCB Ir =1600A					140098		140048	
<b>GSCM505/3</b>	Transformer/ Bus-bar-tie (2 opening release+1 closing release+) VCB Ir =1600A								140715
<b>GSCM505/4</b>	Neutral maker transformer (1 opening release +1 closing release +1 opening under-voltage release) VCB Ir =630A		990206	140185		140097		140049	
<b>GSCM505/7</b>	Line/auxiliary services/ capacitor bank (1 opening release +1 closing release) VCB Ir =630A		990205	140322		140096		140050	140714
<b>GSCM505/8</b>	Transformer/ Bus-bar-tie (1 opening release+1 closing release +1 opening under-voltage release) VCB Ir =2000A		990204	140323		140095		140051	
<b>GSCM505/9</b>	Transformer/ Bus-bar-tie (2 opening release +1 closing release) VCB Ir =2000A		990203	140324					140713

**Table 6 - Local of material codes**



**Application Areas**

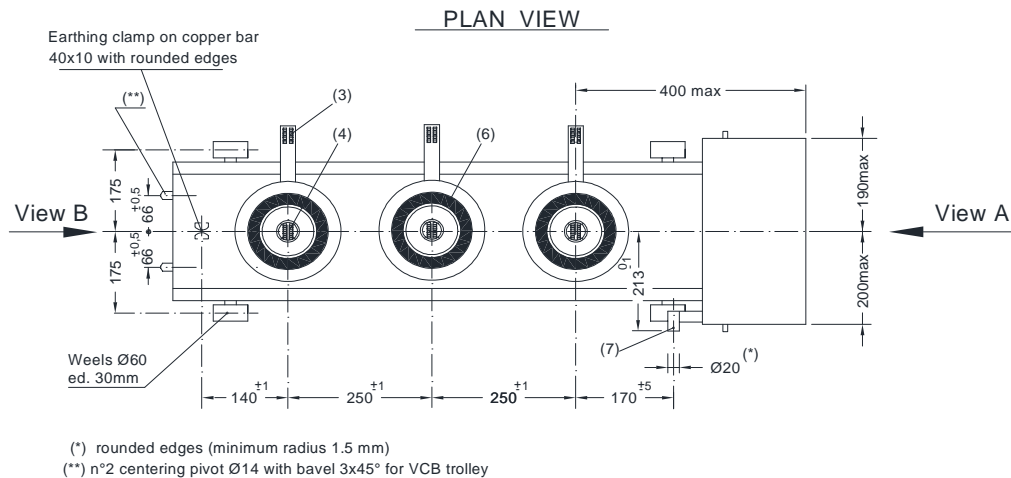
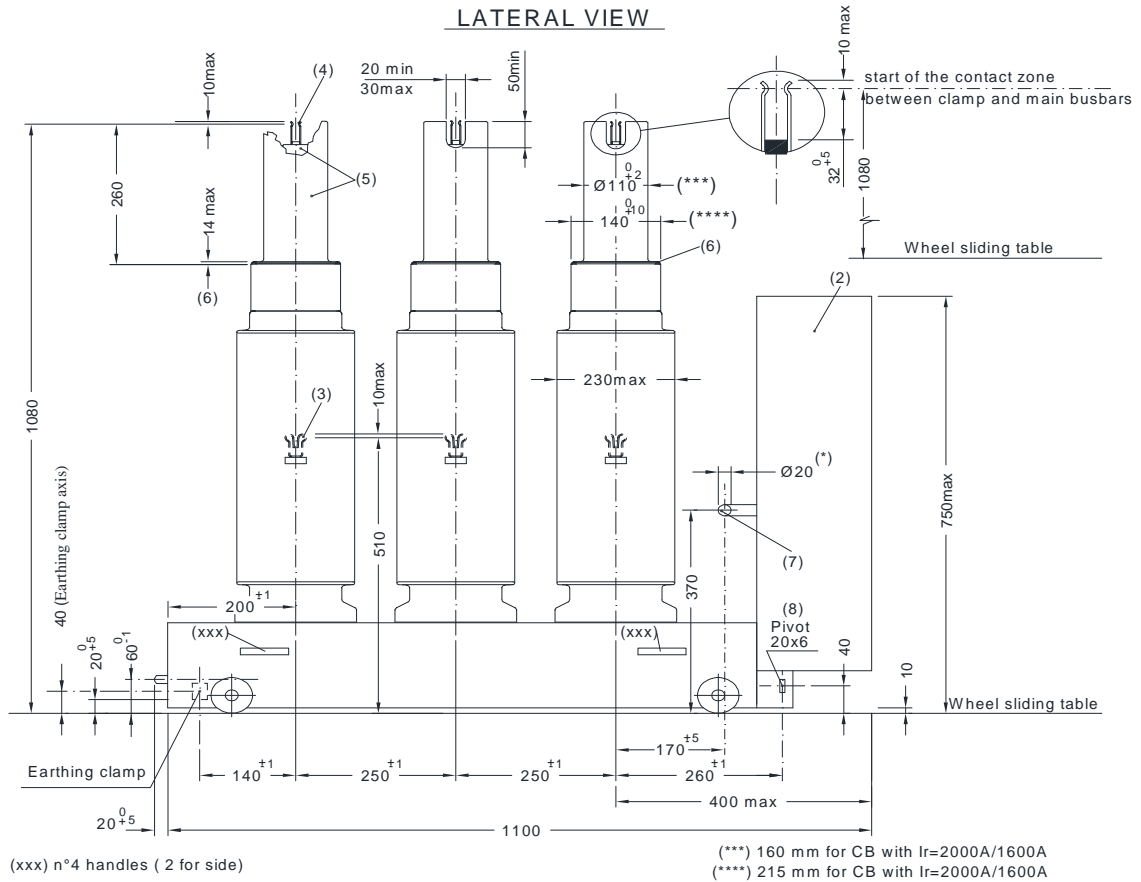
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**8.3 ANNEX C - OVERALL DIMENSIONS**



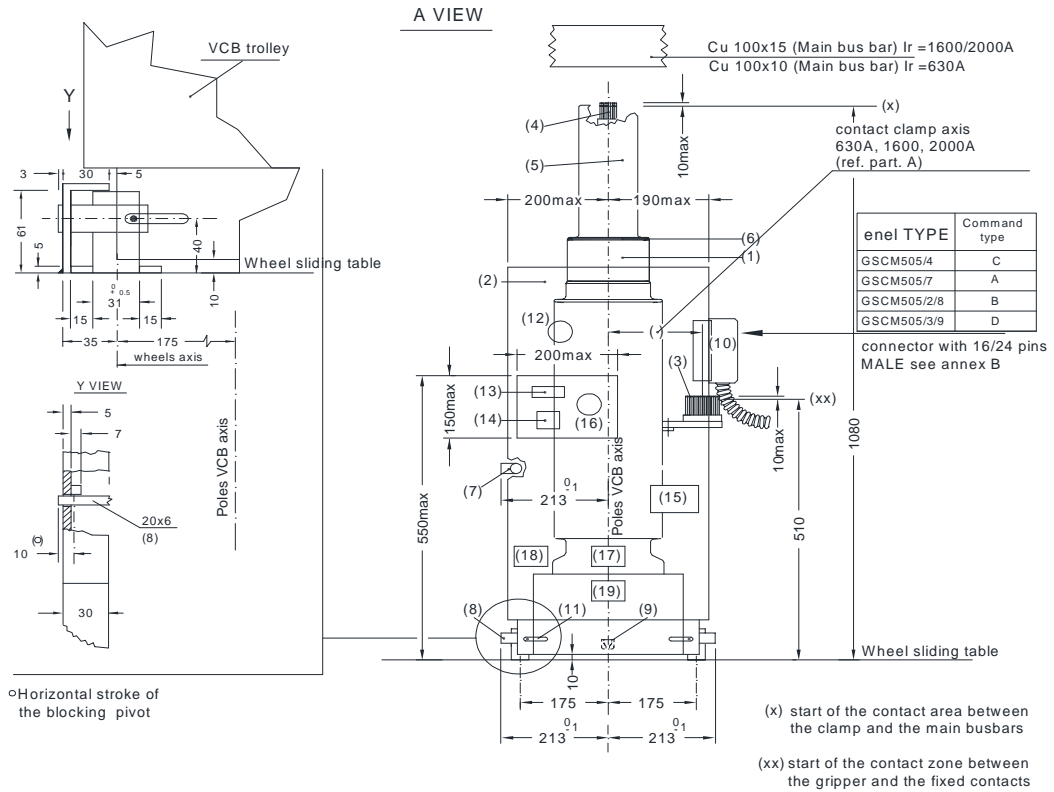
**Application Areas**

Perimeter: *Global*

Staff Function: -

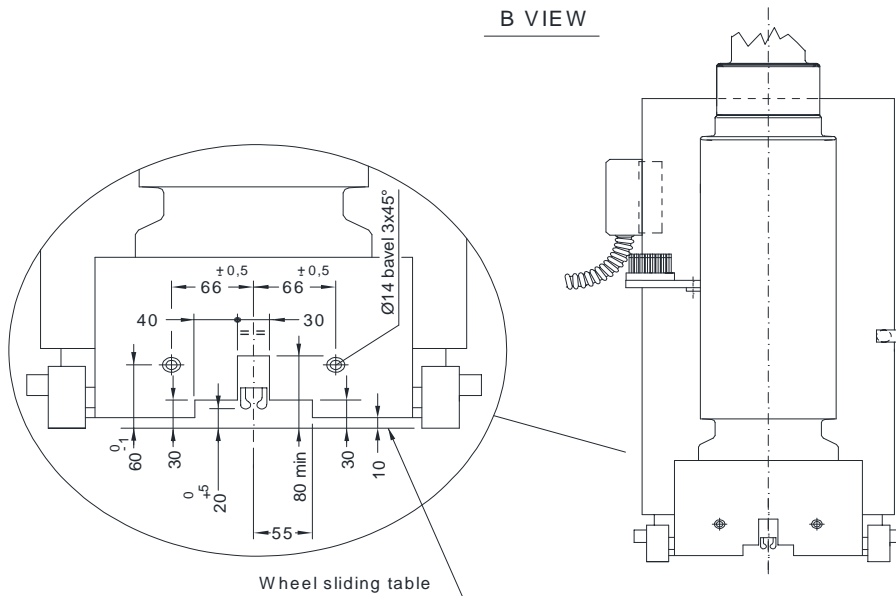
Service Function: -

Business Line: *Infrastructure & Networks*



Horizontal stroke of the blocking pivot

**B VIEW**



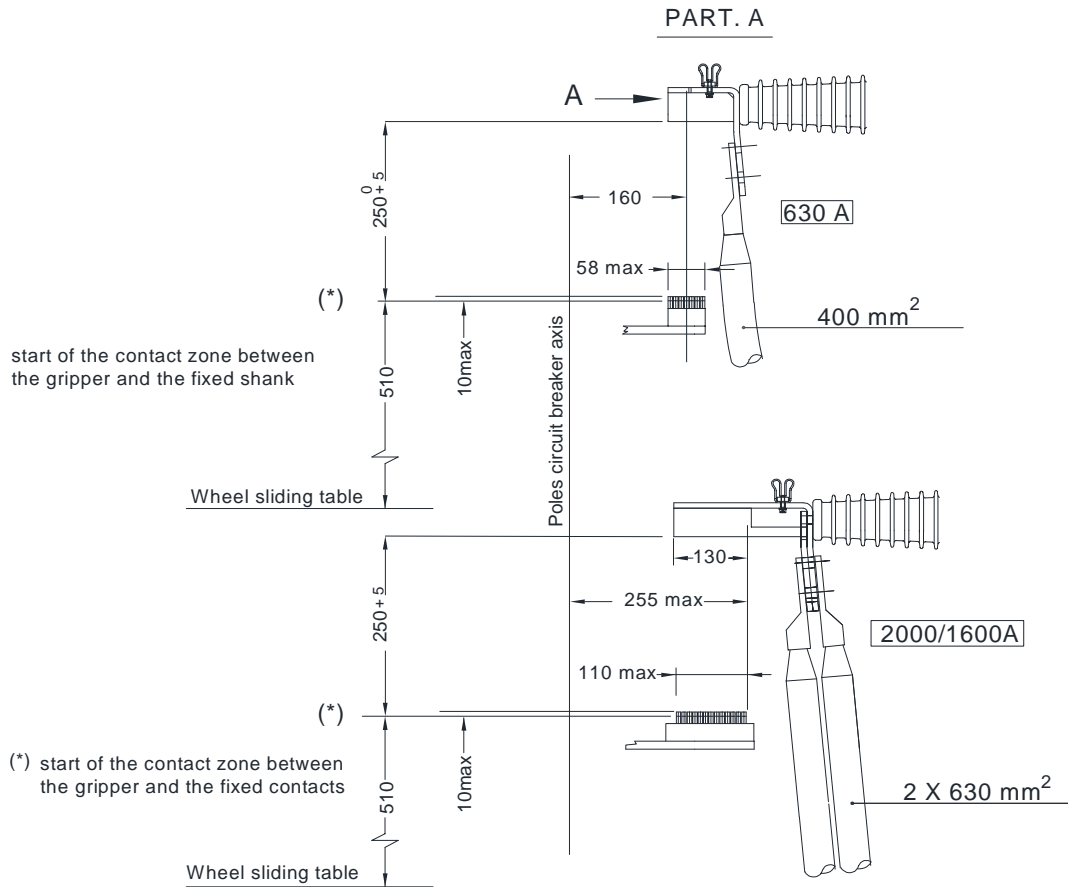
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*



**LEGEND**

- (1) Insulating container vacuum bottle
- (2) VCB command
- (3) Clamp contacts for inferior copper bar with thickness 15mm for Ir= 1600/2000 A and 10 mm for Ir=630A (see part A)
- (4) Clamp contacts for main copper bus bar 100x15 mm for Ir=1600/2000A and 100x10 mm for Ir=630A;
- (5) Contact-holder shaft insulating cover
- (6) Silicone rubber or EPDM ring (maximum thickness 14 mm); the ring shall have a hardness such as to guarantee the expected disconnection stroke of 280 mm.
- (7) Blocking pivot Ø20 of command during translation
- (8) Rectangular blocking pivots with VCB inserted in the switchgear
- (9) Earthing clamp for copper bar 40x10 mm (20 mm from the wheel slide table)
- (10) LV connector
- (11) Operation handles for rectangular blocking pivots (8)
- (12) Opening button
- (13) Manouvrers counter
- (14) Springs loaded/unloaded signalling
- (15) Plate
- (16) VCB status indicator (Op/Cl)
- (17) Manual device for restoring operating energy
- (18) Indicator of maneuvering energy storage status
- (19) State of the predisposer for activating/deactivating the opening under-voltage release (only for command type B/C)

**Application Areas**

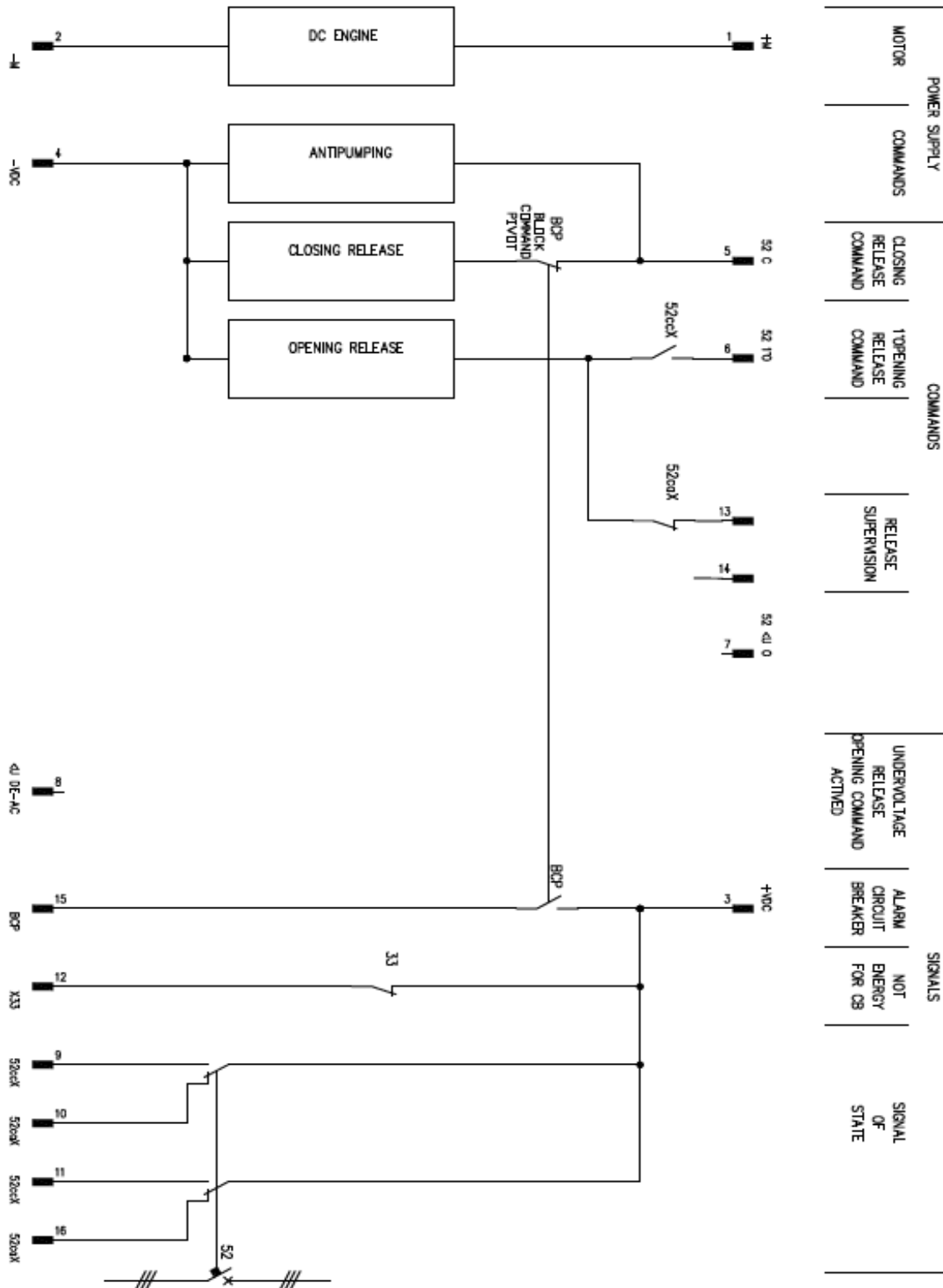
Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**8.4 ANNEX D - COMMAND CIRCUITS**



TYPE A

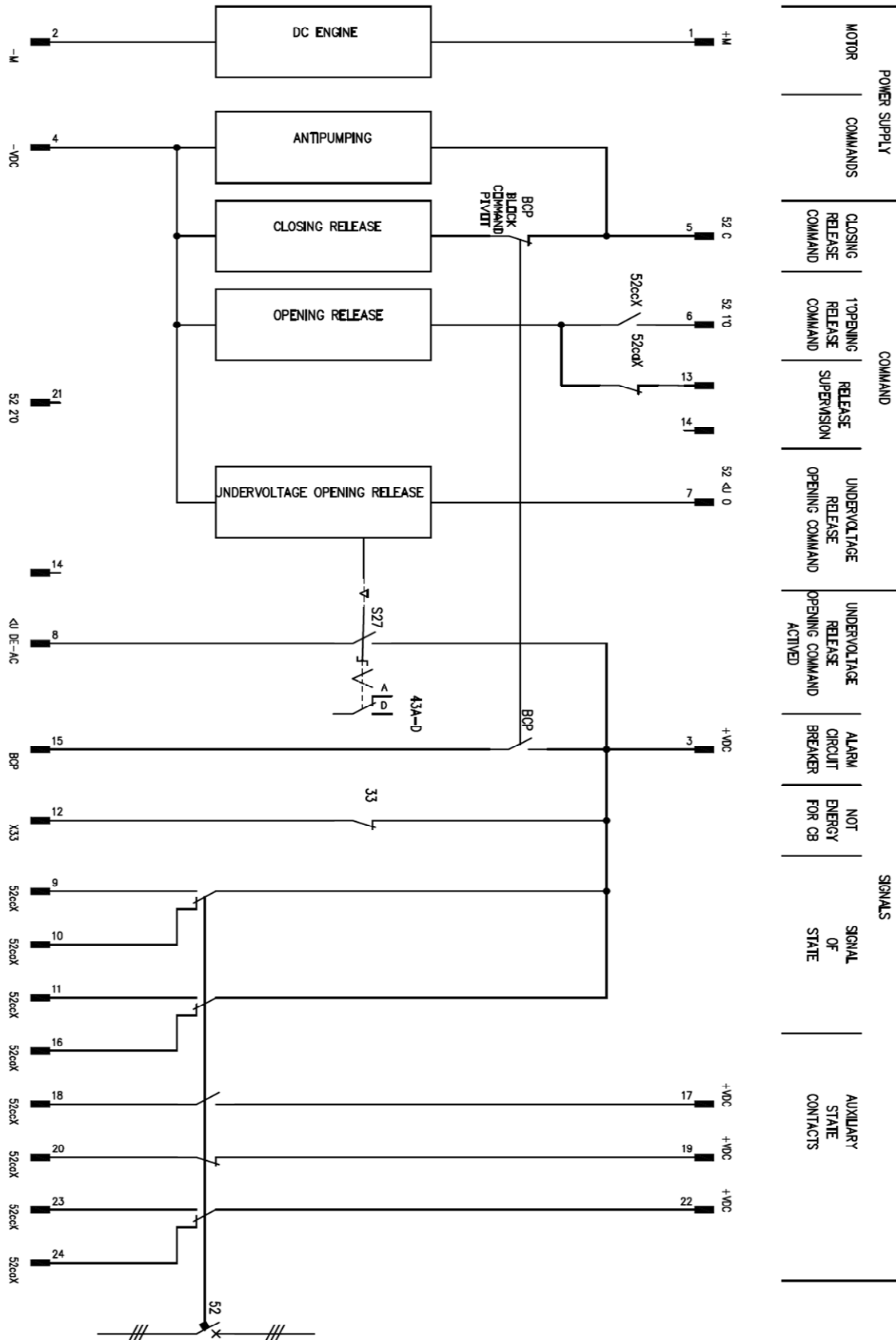
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*



TYPE B

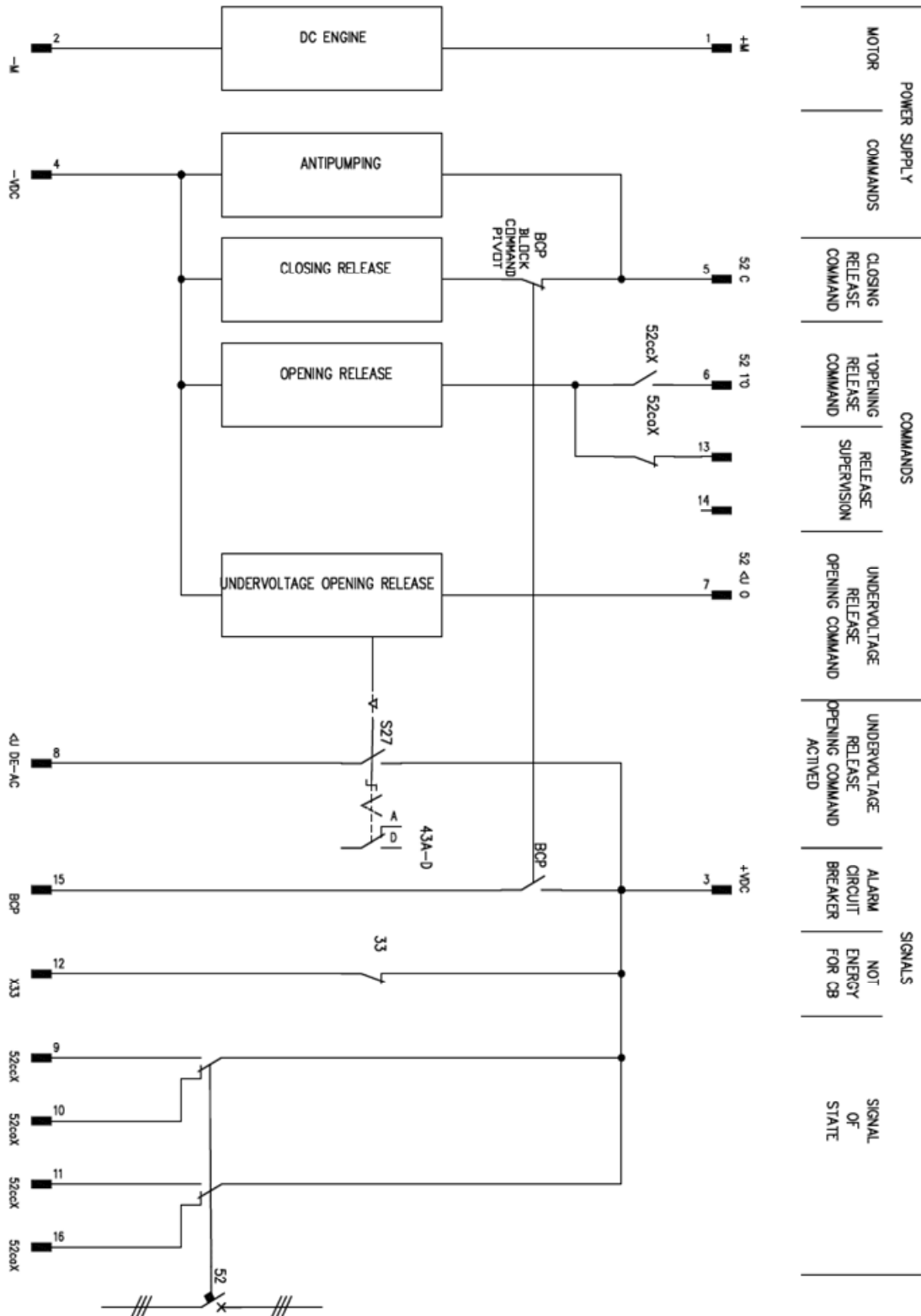
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*



TYPE C

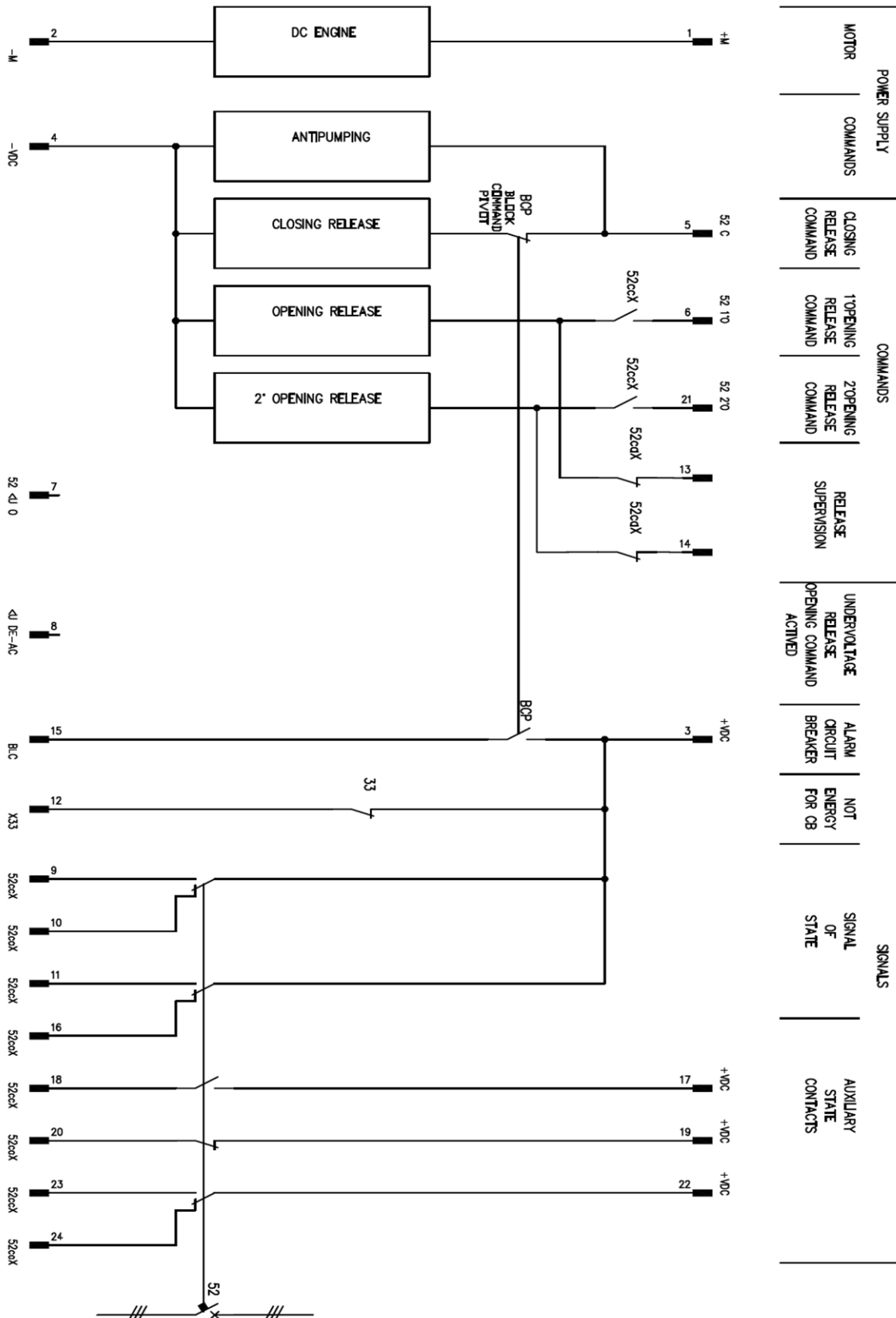
**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*



TYPE D