Medium voltage switchgear for Distribution Network Solutions

cgmcosmos
Fully gas insulated modular and compact (RMU) system

Up to 24 kV
Up to 27 kV

IEC Standards
ANSI/IEEE Standards

Reliable innovation. Personal solutions.

www.ormazabal.com
The quality of the products designed, manufactured and installed by Ormazabal is backed by the implementation and certification of a quality management system, based on international standard ISO 9001.

Our commitment to the environment is reaffirmed with the implementation and certification of an environmental management system as laid down in international standard ISO 14001.

In view of the constant evolution in standards and design, the characteristics of the elements contained in this catalogue are subject to change without prior notification. These characteristics, as well as the availability of components, are subject to confirmation by Ormazabal.
Preface

Getting its DNA from decades of experience in research, design, develop, manufacture and installation of Medium Voltage (MV) apparatus and switchgear, is now one of the world’s biggest suppliers of medium voltage gas insulated switchgear (GIS). Today over 1,350,000 Ormazabal medium voltage functional units have been installed in the electrical networks of over 100 electrical utilities and 600 wind farms in more than 110 countries.

Following the success of our well known ga, cgm, cgc and gae type fully GIS systems, the first cgmcosmos was launched in 2000, as the most flexible modular and compact ring main unit (RMU) range for secondary distribution networks up to 24 kV. Thanks to our Spanish and German R&D teams’ spirit of continuous innovation, cgmcosmos system has been continuously evolving into a more extended range with higher ratings based on our customers’ demands. Being manufactured 100% in Europe, cgmcosmos system has already been integrated into several Smart Grid applications. Currently more than 400,000 cgmcosmos functional units have been in service in more than 60 countries.

cgmcosmos system provides you reliable and efficient distribution network solutions (DNS) for all kind of MV installations from electrical utilities to infrastructures, from leisure facilities to industrial installations, and from wind farms to PV solar farms.

Ormazabal is the leading provider of customized solutions to electrical utilities, to electrical end users as well as renewable energy systems applications based on its own technology.

We encourage the development of the electrical sector towards the challenges of the future energy needs. We cooperate with the world’s leading local, regional and global companies in the electrical sector with a strong commitment to innovation towards personal safety, network reliability, energy efficiency, and sustainability.

Our highly qualified and focused team of innovation-motivated professionals have developed our own products and solutions during our more than a century long consolidated history, always by establishing close relationship with our customers aimed at achieving mutual long term benefits.

Velatia is a family-run, industrial, technological and benchmark global group which operates in the areas of electrical networks, electronics and communication networks as well as in the consulting, security and aeronautics component sectors, where safety, efficiency and reliability are valued.

Our customer orientation has led to the development of our extensive network of factories in Spain, France, Germany, Poland, Brazil, Mexico and China, helping to meet our customers’ needs in more than 50 countries.

The solutions of the companies in Velatia seek to make the world a more and better connected, more sustainable, smarter, safer, more humane place.
Your electrical network

"Your dedicated partner for reliable and intelligent electrical network".

Your business and DNS applications

Close relationship with our customers and the profound knowledge of the electrical business are the keys to success that enable us to offer Distribution Network Solutions (DNS) based on high added value products and services adapted to the needs of the electrical utilities, electrical energy end users and renewable energies.
**Our product map (SSS & DNS)**

We believe that **excellence** does not lie solely in offering **effective products and services**, but also in the ability to respond to **individual requirements and demands**.

We provide our clients with personalised projects for efficient energy management via **primary and secondary distribution equipment** and **solutions**.

**Our Business Lines**

- **SSS**: Substation Solutions for primary distribution
- **DNS**: Distribution Network Solutions for secondary distribution

### Our products for your segment

<table>
<thead>
<tr>
<th>SSS</th>
<th>DNS</th>
<th>Power transformers</th>
<th>Distribution transformers</th>
</tr>
</thead>
<tbody>
<tr>
<td>cpg.1</td>
<td>gae</td>
<td>cibor</td>
<td>transfor ma</td>
</tr>
<tr>
<td>cpg.0</td>
<td>gae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gae 1250kmax</td>
<td>cibor</td>
<td>Power transformers</td>
<td></td>
</tr>
<tr>
<td>nl/cibor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Protection, automation and control**

- **Conventional**
  - transfor ma.tpc
  - transfor ma.fine

- **Non-conventional**
  - Oil

- **Extended range solutions**
  - Organic

- **CURRENT® family**
  - Advanced metering, sensing & analytics, monitoring and communications
  - Low voltage board

- **Conventional**
  - Oil

- **Biodegradable dielectric liquid**

- **Concrete prefabricated transformer substations (TS)**
  - Underground
  - Walk-in
  - Compact

- **Metallic prefabricated TS**

- **CEADS**

- **Switching nodes**

- **Concrete enclosure for transformer substations (TS)**
  - Underground
  - Walk-in
  - Modular

- **Metallic enclosure for TS**

- **Photovoltaic substation**

- **Mobile substation**
Safety

Protection for people, environment and your electrical installations.

Special attention paid to the personal safety of the operators and the general public, even under fault conditions.

Internal arc

The cgmcosmos cubicles have been designed to withstand the effects of an internal arc. Under request, cgmcosmos cubicles can be supplied according to the classification IAC of IEC 62271-200 or its equivalent 1D-S class of IEEE Std C37.20.7.

Hermetically sealed

All live components are inside a hermetically sealed for life stainless steel gas tank. This provides resistance to normal service conditions for indoor switchgear in accordance with standard IEC 62271-1.

Interlocks

 cgmcosmos cubicles have mechanical and electrical interlocks as standard in accordance to IEC 62271-200 to enable safe and reliable service.

Interlocks prevent unsafe operations:

- It makes impossible to close the switch-disconnector and the earthing (grounding) switch at the same time
- It permits the opening of the access cover to the medium voltage cables when the earthing (grounding) switch is closed

Optional locks, key interlocks and electrical locks based on customers’ specifications are available.

Indicators

Additional safety by using:

- **Switchgear position** indicators: Visual indication on the mimic diagram, validated by the kinematic chain test in accordance with current standards (IEC 62271-102)
- **Capacitive voltage** indicators: ekor.vpis: a self-powered indicator that displays the voltage presence in the phases via three permanent light signals (IEC 62271-206). ekor.ivds: light signalling voltage presence/absence indicator (IEC 61243-5)
- **Acoustic alarm**: ekor.sas: alarm that warns against earthing (grounding) when MV cables are energized. It works in association with ekor.vpis/ekor.ivds
- **Phase comparator**: ekor.spc

Reliability

Help to maintain uninterrupted supply of your electrical network.

Sealed for life insulation

Insulation inside a stainless steel gas tank provides long service life (at least 30 years) and absence of maintenance in live parts.

Environmental suitability

Resistance according to the environmental conditions specified in standard IEC 62271-1*.

(*) Please consult Ormazabal for other specific conditions.

Immersion tested for 24 hours

 cgmcosmos system passes the immersion test at a pressure of 3 m high water column during 24 hours at rated voltage and power frequency insulation test.

100 % routine tested

All the switchgear is subject to 100 % electrical and mechanical routine tests according to the relevant standards. Also gas tightness test has been carried out 100 % of our switchgear as a routine test to guarantee the reliability throughout its operational life.

- Gas tightness test
- Power-frequency test
- Measurement of the resistance of the main circuit
- Mechanical endurance test
- Measurement of the partial discharge (optional)
Efficiency
High valuable features that make your task easier.

Modularity
cgmcosmos design is totally modular. It offers flexible diagram configurations, easy extension to both sides and minimal surface occupation.
Additionally, this equipment is adaptable to the evolution of the network.

Extensibility and replaceability
The normalink connecting set allows effortless mechanical and electrical connection between two cubicles without gas handling and future extensibility.
The driving mechanisms interchangeability and their motorization without interrupting supply help to improve the quality of the electrical supply.

Smart grid ready
cgmcosmos system has already been integrated into several Smart grid applications.
Ormazabal supplies complete medium voltage installations that include protection, control, automation and advanced meter management functions according to the most demanding needs of the intelligent networks.

Ergonomics
cgmcosmos presents the following user-friendly features:
• Front access to install medium voltage cables and fuses
• Easy connection and testing cables
• Optimal interface with operators
• Horizontal fuse holders
• Simple operation of driving mechanisms
• Small size and light weight

Sustainability
Continuous efforts in gas emission reduction.
Commitment to the environment:
• Incessant decrease in use of greenhouse gases
• Negligible SF₆ emission in manufacturing processes
• Switchgear gas leakage rates reduction
• No SF₆ gas use during installation
• Unceasing measures to reduce our environmental footprint
• End-of-life management
• Use of highly recyclable materials
• Constant research investment in alternative materials and own technology
• Provide self-powered relays and devices to avoid extra energy consumption

Continuous innovation
Help to maintain uninterrupted supply of your electrical network.
A focused team of professionals dedicated to innovation leads to a constant offer of new developments and upgrades, such as:
• Innovative circuit breaker cubicle with a three-position mechanism
• Modules operating in - 30 °C
• Metering cubicles tested according to IEC 62271-200, included IAC requirements
• Evolution in driving mechanisms
• Integrated in cubicle own protection and automation units
• Smart grid ready system
• Voltage and current sensors
• Preventive cable fault diagnosis
• Partial discharge (PD) detection for network diagnosis
Technical details

Family

Modular cubicles

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>Feeder function</td>
</tr>
<tr>
<td>p</td>
<td>Fuse protection function</td>
</tr>
<tr>
<td>v</td>
<td>Circuit-breaker protection function</td>
</tr>
<tr>
<td>s</td>
<td>Busbar switch function (grounding)</td>
</tr>
<tr>
<td>a</td>
<td>Auxiliary services supply</td>
</tr>
<tr>
<td>rb</td>
<td>Busbar rise function (grounding)</td>
</tr>
<tr>
<td>rc</td>
<td>Cable rise function (grounding)</td>
</tr>
<tr>
<td>m</td>
<td>Metering function</td>
</tr>
</tbody>
</table>

Compact cubicles

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2lp</td>
<td>2lp (RMU)</td>
</tr>
<tr>
<td>2l</td>
<td>2l (RMU)</td>
</tr>
<tr>
<td>3l</td>
<td>3l (RMU)</td>
</tr>
<tr>
<td>3lp</td>
<td>3lp (RMU)</td>
</tr>
<tr>
<td>2l2p</td>
<td>2l2p (RMU)</td>
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</tbody>
</table>

Other Options

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rlp</td>
<td>Fuse protection, feeder and busbar rise functions</td>
</tr>
<tr>
<td>2lv</td>
<td>Circuit breaker protection and feeder functions</td>
</tr>
</tbody>
</table>

Applicable electrical standards

**IEC**

- IEC 62271-1: Common specifications for high voltage switchgear and controlgear standards
- IEC 62271-200: Alternating current metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
- IEC 62271-103: Switches for rated voltages above 1 kV up to and including 52 kV
- IEC 62271-102: Alternating current disconnectors and earthing switches
- IEC 62271-105: High voltage alternating current switch-fuse combinations
- IEC 62271-100: High voltage alternating current circuit-breakers
- IEC 60255: Electrical relays
- IEC 60529: Degrees of protection provided by enclosures
- IEC 62271-206: Voltage presence indicating systems (vpis)
- IEC 61243-5: Voltage detecting systems (vds)

**IEEE/ANSI**

- IEEE C37.74: IEEE Standard Requirements for Subsurface, Vault, and Pad-Mounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems Up to 38 kV
- IEEE C37.20.3: IEEE Standard for Metal-Enclosed Interrupter Switchgear
- IEEE Std C37.20.4: IEEE Standard for Indoor AC Switches (1 kV-38 kV) for Use in Metal-Enclosed Switchgear
- IEEE C37.06: AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis-Preferred Ratings and Related Required Capabilities

(*) Others: SANS, HN, GB, SDMS...
## Technical data

### Electrical characteristics

<table>
<thead>
<tr>
<th></th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Voltage</strong></td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td><strong>Rated frequency</strong></td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td><strong>Rated normal current</strong></td>
<td>400/630</td>
<td>600</td>
</tr>
<tr>
<td><strong>Rated short-time withstand current</strong></td>
<td>16/20 (1/3 s)/25 (1 s)</td>
<td>20 (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td><strong>Peak value</strong></td>
<td>40/52</td>
<td>62.5</td>
</tr>
<tr>
<td><strong>Rated insulation level</strong></td>
<td>28/32</td>
<td>50/60</td>
</tr>
<tr>
<td><strong>Rated power-frequency withstand voltage</strong></td>
<td>75/85</td>
<td>125</td>
</tr>
<tr>
<td><strong>Rated lightning impulse withstand voltage</strong></td>
<td>AF/AFL 16 kA 1 s/20 kA 1 s/25 kA 1 s</td>
<td>30 kA 1 s/25 kA 1 s</td>
</tr>
<tr>
<td><strong>Degree of protection: Gas tank</strong></td>
<td>IPX7</td>
<td></td>
</tr>
<tr>
<td><strong>Degree of protection: External enclosure</strong></td>
<td>IP 2XD</td>
<td></td>
</tr>
<tr>
<td><strong>Colour of equipment</strong></td>
<td>RAL Grey 7035/Blue 5005</td>
<td></td>
</tr>
<tr>
<td><strong>Loss of service continuity category</strong></td>
<td>LSC</td>
<td></td>
</tr>
<tr>
<td><strong>Partition class</strong></td>
<td>PM</td>
<td></td>
</tr>
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</table>

### Driving mechanism

#### Three position switch disconnector

<table>
<thead>
<tr>
<th>B</th>
<th>BM*</th>
<th>BR</th>
<th>AR</th>
<th>ARM</th>
<th>AV3</th>
<th>AMV3</th>
<th>AV</th>
<th>AMV</th>
<th>RAV</th>
<th>RAMV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

#### Vacuum circuit breaker

<table>
<thead>
<tr>
<th>B</th>
<th>BM*</th>
<th>BR</th>
<th>AR</th>
<th>ARM</th>
<th>AV3</th>
<th>AMV3</th>
<th>AV</th>
<th>AMV</th>
<th>RAV</th>
<th>RAMV</th>
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</tr>
</tbody>
</table>

### Service conditions acc. to normal service conditions of IEC 62271-1

<table>
<thead>
<tr>
<th></th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of switchgear</strong></td>
<td>Indoor</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-5/-15/-30°C</td>
<td>+40°C</td>
</tr>
<tr>
<td><strong>Maximum/Minimum temperature</strong></td>
<td>+35°C</td>
<td>95°F</td>
</tr>
<tr>
<td><strong>Minimum storage temperature</strong></td>
<td>-40°C</td>
<td>-40°F</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>&lt;95%</td>
<td>&lt;90%</td>
</tr>
<tr>
<td><strong>Vapour pressure</strong></td>
<td>22 mbar</td>
<td>18 mbar</td>
</tr>
<tr>
<td><strong>Maximum height above sea level</strong></td>
<td>2000 m</td>
<td>6500 feet</td>
</tr>
<tr>
<td><strong>Solar radiation</strong></td>
<td>Negligible</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental air pollution (dust, smoke, corrosive and/or flammable gases, vapors or salt)</strong></td>
<td>Not significant</td>
<td></td>
</tr>
<tr>
<td><strong>Vibrations caused by external causes to the switchgear or earthquakes</strong></td>
<td>Negligible</td>
<td></td>
</tr>
</tbody>
</table>

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*Consult availability for k = 25 kA  **Consult availability for ARM  *24/48/110/125 Vdc 220 Vdc  **24/48/60/110/220 Vdc 110/230 Vdc  **21 A (24 Vdc)
Constructive structure

Front view

1. Mimic & driving mechanism cover:
   1.1 Switch-disconnector (Padlockable)
   1.2 Earthing-switch (Padlockable)
   2 Pressure indicator
   3 Voltage indicator (ekor.vpis)
   4 Switch-disconnector indication
   5 Acoustic alarm (ekor.sas)
   6 Cable compartment cover

Side view

1. Gas tank
   1.1 Busbar connection (side bushings)
   1.2 Switch-disconnector
   1.3 Lifting lugs
   2 Upper cover/Control box location
   2.1 Name plate + operating sequence
   3 Cable compartment
   4 Front bushings
   5 Connector and cable
   6 Cable clamp
   7 Earthing bars
   8 Gas relief duct

Worldwide certification and use

Application examples

Worldwide application/use
- Public distribution: urban and rural areas
- Smart grids
- Renewable energies: Wind on & off-shore, photovoltaic solar plants ...
- Hotels, stadiums, shopping centers
- Industrial areas
- Oil & Gas industry
- Airports, seaports, tunnels
Design characteristics

Key components

ormalink connecting set

Pioneers in extensible connecting set: The ormalink connecting set, patented by Ormazabal in 1991, allows for the electrical connection between different modules of the cgmcosmos system. It maintains the rated insulation values as well as the rated and short-circuit currents. It also controls the electric field.

Extensible on both sides of the cubicles. The extensible cubicles have side female bushings that make easier the connection between the main busbars.

Load break switch (LBS)

Puffer type high duty load break switch designed and developed by Ormazabal.

The switch-disconnector includes the functions of switch, disconnector and earthing (grounding) switch in a single three-position unit.

Features:
- Three position switch-disconnector: Open-Close-Earth (Ground)
- Operator independent operation
- Switch category: mechanical endurance:
  - 1000-M1
  - 5000-M2
- Electrical endurance certification:
  - 5-E3
- Earthing (grounding) switch category:
  - Mechanical endurance:
    - 1000-M0
  - Electrical endurance certification:
    - 5-E2

Vacuum circuit breaker (VCB)

Circuit-breaker with vacuum breaking technology, compact and with excellent reliability, certified in accordance to IEC 62271-100 standard. Depending on types it includes extended electrical endurance (class E2) with rapid reclosing cycle and hence maintenance-free during its whole service life.

Features:
- Mechanical endurance:
  - M2: 10 000 operations
  - M1: 2000 operations
- Operating sequence without rapid auto-reclosing
  - CO-15 s-CO
  - O-3 min-CO-3 min-CO
  - O-3 min-CO-15 s-CO
- Operating sequence with rapid auto-reclosing
  - O-0.3 s-CO-15 s-CO
  - O-0.3 s-CO-3 min-CO
- Associated with switch-disconnector (depending on cubicle type)
Main compartments

The cgmcosmos presents a structure divided into independent compartments:

1. Gas tank
   a) Busbar connection
   b) Switching devices
2. Driving mechanism
3. Base
   a) Cable compartment
   b) Gas relief duct
4. Control box

Gas tank
The gas tank, sealed and S_{6} gas-insulated, contains the busbar, as well as the switching and breaking devices. The dielectric used acts both as an insulating and extinguishing medium. The tank is equipped with a diaphragm to safely direct the output of the gases in the event of an internal arc, and a manometer to control the pressure of the insulating gas.

The busbar connects the single-phase bushings from the outside of the cubicle to the breaking elements within. The electrical connection between the different modules of the cgmcosmos system is through the ormalink connecting set.

The protection fuses are kept horizontally in phase-independent compartments and are installed in a fuse holder carriage. The fuse holder compartments provide insulation and sealing against pollution, temperature changes and adverse weather conditions. From the inside, the movement of the fuse striker is transmitted to the tripping mechanism.

Features:
- Sealed-for-life insulation system (+ 30 years)
- Internal arc tested
- Stainless steel – IP67 rating
- Switching, breaking and main circuit devices:
  - Switch-disconnector
  - Circuit-breaker
  - Fuse holders
- Outer-cone bushing plug-in type terminal
- Pressure indicator
- Pressure relief diaphragm valve
- Direct busbar connection through single-phase side bushings

Driving mechanism
The driving mechanism is used to perform making and breaking operations in the medium voltage circuits.

The front layout of the driving mechanisms and the use of anti-reflex levers permits safe, comfortable, simple operations with a minimum of effort.

The front mimic diagrams include the position indicating devices. Maximum reliability verified using the kinematic chain test of the signalling mechanism in accordance with IEC 62271-102.

Features:
- Mimic diagram and pushbuttons
- Position display (Kinematic chain)
- Switching devices
- Fuse tripping
- Capacitive voltage indicator (ekor.vpis/ekor.ivds)
- Interlocks (electrical and mechanical)
- Motorization without interrupting supply
- Replaceability and motorization at site

Example of BR driving mechanism
Types of driving mechanisms

Depending on the operating mechanism (three-position switch or circuit breaker), there are different models:

Three-position switch-disconnector

- **B and BM**
  - Basic driving mechanism with independent manual operation (B) or motorised (BM)
  - Local or remote controlled operations
  - Applicable to feeder and busbar functions

- **BR/AR and ARM**
  - Driving mechanism with manual (BR/AR) or motorised operation (ARM) and with opening toggle
  - Applicable to fuse protection functions

These may be replaced live in any of the positions (closed, open or earthed).

Circuit-breaker

- **AV3 and AMV3**:
  - Innovative 3-position circuit breaker, where circuit breaker and disconnector are operated in one single operation
  - Spring loaded driving mechanism: manually (AV3) or motorised (AMV3)

- **AV and AMV (without reclosing)/ RAV and RAMV (with reclosing)**
  - Spring loaded driving mechanism for circuit breaker function
  - This mechanism is installed in series with a B type mechanism
  - The spring set is reloaded manually (AV-RAV) or motorised (AMV-RAMV)

Cable compartment

The cable compartment, located in the lower front section of the cubicle, has a cover interlocked with the earthing (grounding) switch, thus allowing front access to the Medium Voltage cables.

The insulated medium voltage cables coming from the outside are connected using bushings which admit plug-in or screw-in terminals insulated with or without equipotential screens.

Features:

- Available up to **two connectors** per phase. Consult compatibilities
- More cable connectors or surge arresters with special cover
- Effortless connections (plug-in or screw-in)
- Suitable bushing height for three-core/big size cables
- Outer-cone bushing plug-in type terminal
- Easy cable earthing (grounding)
- Cable test
- Front cover interlocked with the earthing (grounding) switch
- **Protected ducts** for low voltage cables
- Optionally, the feeder functions can include a cable testing facility located in the upper front section of the base. It has a cover interlocked with the earthing switch, thus allowing front access to the three pistons for the test connection of the medium voltage cables.

Pressure relief duct

The pressure relief duct situated on the back side of the base channels through a diaphragm valve the generated gases as a result of an internal arc.

Features:

- **Expansion** of gases in case of internal arc
- **Rear conduction** of exhaust gases
- **Metal separation** from the cable compartment
- Optional: **Chimney** for rear internal arc protection

Control box

The control box, placed in the upper part of the cubicle and independent of the medium voltage compartments, is defined for installing protection relays, as well as metering and control devices.

Features:

- **Independent compartment** from medium voltage area
- **Ready** for installing protection relays, control and metering equipment
- **Factory assembled and tested** according to customer needs
- **Standard and compact design** for installing OrmaZabal’s protection relays and automation units
- **High adaptation** capabilities for other manufacturers’ protection relays, control and metering units as well as customers’ provided equipment
- **Customized size and design**

Attachable control boxes can be supplied optionally, for the location of signalling elements and the activation of motorised functions.
Smart grids

The aim of the intelligent networks or smart grids leads to generate and share electrical energy in a more efficient, reliable, cleaner and safer way.

In the value chain of the smart grids it converges and coexists the sectors of the electrical energy, telecommunications and information and communications technology.

**Ormazabal** collaborates in innovative projects and provides solutions and products focused on improving the energy distribution efficiency in a continuous changing environment as driver and dynamic factor for smart grids.

The **Ormazabal** technology specifically developed for the intelligent networks promotes, among others, the following benefits:

1. It allows the integration of new users in the network
2. It drives the efficiency of the network operation
3. It reinforces the safety of the grid, the control and the quality of supply
4. It optimizes the plan of investments for the electrical network improvement
5. It improves the market working and the customer service
6. It promotes the consumer participation in the energy management

References

- Iberdrola Star project. Spain (Castellón, Bilbao…)
- Endesa project. Spain (Málaga)
- Gas Natural Fenosa project. Spain (Madrid)

Protection & automation

**ekorsys family**

**Ormazabal** supplies complete medium voltage installations that include protection, control and automation functions.

**Ormazabal**, have a wide portfolio of applications and services to respond to the needs of the distribution network.
Protection

- Supply to medium voltage customers
  - ekor.pg
    3 x 50/51 + 50N/51N + 50Ns/51Ns
  - ekor.rpt
    3 x 50/51 + 50N/51N + 50Ns/51Ns

- Protection of switching substations and industrial customers
  - ekor.rps
    3 x 50/51 + 50N/51N + 50Ns/51Ns + 67 + 49 + 81 + 27 + 59N... + control
  - ekor.rps-ci
    3 x 50/51 + 50N/51N + 50Ns/51Ns + integrated control
  - ekor.rpt-ci
    3 x 50/51 + 50N/51N + 50Ns/51Ns + integrated control

- Protection of rural transformer substations (ctr)
  - ekor.rpt-k
    3 x 50/51 + 50N/51N + 49T + integrated control

- Generator set protection unit
  - ekor.upg

- Substation protection
  - ekor.rps-tcp:
    3 x 50/51 + 50N/51N + 50Ns/51Ns + 67 + 49 + 81 + 27 + 59N + 50BF... + control

Automation and remote control

- Remote control
  - ekor.uct
  - ekor.ccp
  - ekor.rci
  - cgmcosmos-2lpt

- Automatic transfer
  - ekor.stp
  - ekor.ccp
  - ekor.rtk

- Fault detection
  - ekor.rci

- Voltage presence acoustic alarm
  - ekor.sas

- Second operation points

Advanced meter management and communication

- ekor.gid

Dispatching center

Software

- ekor.soft

For further information, please refer to Ormazabal or visit www.ormazabal.com
### Type of modules

**cgmcosmos-l**

#### Feeder function

Feeder modular cubicle, equipped with a three-position switch-disconnector: closed, open or earthed (grounded).

**Extensibility:** right, left and both sides.

#### Electrical characteristics

<table>
<thead>
<tr>
<th></th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage</strong></td>
<td>$U_r$ [kV]</td>
<td>12* 24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15.5 27</td>
</tr>
<tr>
<td><strong>Rated frequency</strong></td>
<td>$f_r$ [Hz]</td>
<td>50/60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50/60</td>
</tr>
<tr>
<td><strong>Rated current</strong></td>
<td>$I_r$ [A]</td>
<td>400/630</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td><strong>Rated short-duration power frequency withstand voltage (1 min)</strong></td>
<td>$U_d$ [kV]</td>
<td>28 50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35 60</td>
</tr>
<tr>
<td></td>
<td>$I_d$ [kV]</td>
<td>32 60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38.5 66</td>
</tr>
<tr>
<td><strong>Rated lightning impulse withstand voltage</strong></td>
<td>$U_p$ [kV]</td>
<td>75 125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>95 125</td>
</tr>
<tr>
<td></td>
<td>$I_p$ [kV]</td>
<td>85 145</td>
</tr>
<tr>
<td></td>
<td></td>
<td>104.5 137.5</td>
</tr>
<tr>
<td><strong>Internal arc classification</strong></td>
<td>IAC</td>
<td>AFL 16 kA 1 s/20** kA 1 s/25 kA 1 s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AFL[<strong>R</strong>*] 20** kA 1 s</td>
</tr>
<tr>
<td><strong>DC withstand voltage</strong></td>
<td>$U_w$ [kV]</td>
<td>48 kV without cable testing facility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>$I_w$ [kV]</td>
<td>50 kV with cable testing facility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>78</td>
</tr>
</tbody>
</table>

#### Switch-disconnector

<table>
<thead>
<tr>
<th></th>
<th>IEC 62271-103 + IEC 62271-102</th>
<th>IEEE C37.74</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated short-time withstand current (main circuit)</strong></td>
<td>$I_m$ [kA]</td>
<td>16/20** (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20** (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td><strong>Mainly active load-breaking current</strong></td>
<td>$I_l$ [A]</td>
<td>400/630</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td><strong>Cable charging-breaking current/Line-charging breaking current</strong></td>
<td>$I_{lw}$ [A]</td>
<td>50/1.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Closed-loop breaking current</strong></td>
<td>$I_{lw}$ [A]</td>
<td>400/630</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td><strong>Earth (ground) fault breaking current</strong></td>
<td>$I_{lw}$ [A]</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Transformer magnetizing switching current</strong></td>
<td>$I_{lw}$ [A]</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Main switch making capacity (peak value)</strong></td>
<td>$I_{lw}$ [kA]</td>
<td>50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 Hz: 50 Hz: 52**/62.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 Hz: 54.6**/65</td>
</tr>
</tbody>
</table>

#### Switch category

| Mechanical endurance | 1000-M1/5000-M2 | 1000/5000 |
| Cycles of operations (Short-circuit making current)-class | 5-E3 | 3 |

#### Earthing (grounding) switch

<table>
<thead>
<tr>
<th>IEC 62271-102</th>
<th>IEEE C37.74</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated short-time withstand current (earthing circuit)</strong></td>
<td>$I_m$ [kA]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peak value</strong></td>
<td>$I_p$ [kA]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Earthing (grounding) switch making capacity (peak value)</strong></td>
<td>$I_{lw}$ [kA]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
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<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Applications

Input or output of the medium voltage cables, enabling communication with the main busbar of the transformer substation.
## Configuration

### Cubicle
- Internal arc IAC AFLR
  - 20 kA 1 s
- Internal arc IAC AF/AFL
  - 16 kA 1 s
  - 20 kA 1 s
  - 25 kA 1 s
- Internal arc: gas tank
  - 16 kA 0.5 s
  - 20 kA 0.5 s
  - 16 kA 1 s
  - 20 kA 1 s
  - 25 kA 1 s
- 1740 mm height cubicle
- 1450 mm (with cable testing facility)
- 1300 mm height cubicle

### Gas tank
- Stainless steel tank

### Gas pressure indicator:
- Manometer without contacts
- Manometer with temperature compensation and contacts

### Frontal connection:
- Cable bushing

### Side connection:
- Two side extensibility
- Left extensibility/right blind
- Right extensibility/left blind

### Type of side connection:
- Female bushing
  - Right
  - Left
  - Both
- Cone bushing
  - Right
  - Left
  - Both

### Driving mechanism
- Actuating levers
- B type manual mechanism
- BM type motorized mechanism
- Acoustic alarm ekor.sas
- Capacitive voltage presence indicator ekor.vpis
- Capacitive voltage presence/absence indicator ekor.ivds
- Other capacitive voltage indicators

### Integrated control and monitoring unit ekor.rci
### Voltage detector unit ekor.rtk

### Additional interlocks:
- Electrical interlocks
- Key lock interlocks
- Pad locks

### Cable compartment
- Screw type IEC bushings
- Screw type ANSI bushings
- Cable testing facility
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

### Pressure relief duct
- Rear chimney

### Control box
- Other voltage indicators
- Other protection relays
- Other metering and automation components

### Dimensions

<table>
<thead>
<tr>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>365 [14]</td>
<td>90[1/100]/220 Lbm</td>
</tr>
<tr>
<td>[mm]</td>
<td>[in]</td>
</tr>
</tbody>
</table>

### Cubicle Specifications
- 13001/1450/1740
- 725/1165
- 735 [29]
- 90[1/100]/220 Lbm
cgmcosmos

**Fuse protection function**

Fuse protection modular cubicle, equipped with a three-position switch-disconnector: closed, open or earthed (grounded) and protection with limiting fuses.

**Extensibility:** right, left and both sides.

### Electrical characteristics

<table>
<thead>
<tr>
<th></th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$ [kV]</td>
<td>12*</td>
<td>24</td>
</tr>
<tr>
<td>Rated frequency $f_r$ [Hz]</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current $I_r$ [A]</td>
<td>400/630</td>
<td>600</td>
</tr>
<tr>
<td>Output to transformer $I_r$ [A]</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

#### Rated short-duration power frequency withstand voltage (1 min)

| Phase-to-earth (ground) and between phases $U_{ud}$ [kV] | 28 | 50 | 35 | 60 |
| Across isolating distance $U_{ud}$ [kV] | 32 | 60 | 38.5 | 66 |

#### Rated lightning impulse withstand voltage

| Phase-to-earth (ground) and between phases $U_{up}$ [kV] | 75 | 125 | 95 | 125 |
| Across isolating distance $U_{up}$ [kV] | 85 | 145 | 104.5 | 137.5 |

#### Internal arc classification

<table>
<thead>
<tr>
<th>IAC</th>
<th>AFL</th>
<th>AFL***</th>
<th>AFL**</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 kA/1 s</td>
<td>20** kA/1 s</td>
<td>20** kA/1 s</td>
<td></td>
</tr>
</tbody>
</table>

#### DC withstand voltage

| [kV] | n/a | 53 |

#### Switch-disconnector

| IEC 62271-103 + IEC 62271-102 | IEEE C37.74 |

#### Rated short-time withstand current (main circuit)

<table>
<thead>
<tr>
<th>Value $t_s$ = (x) s</th>
<th>$I_k$ [kA]</th>
<th>16/20** (1/3 s)/25 (1 s)</th>
<th>20** (1/3 s)/25 (1 s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak value $I_p$ [kA]</td>
<td>50 Hz: 40/52**/62.5</td>
<td>50 Hz: 40/52**/62.5</td>
<td>50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td>60 Hz: 41.6/52**/65</td>
<td>60 Hz: 41.6/52**/65</td>
<td>60 Hz: 52**/62.5</td>
<td></td>
</tr>
</tbody>
</table>

#### Main switch making capacity (peak value)

<table>
<thead>
<tr>
<th>$I_{km}$ [kA]</th>
<th>50 Hz: 40/52**/62.5</th>
<th>50 Hz: 40/52**/62.5</th>
<th>50 Hz: 40/52**/62.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz: 41.6/52**/65</td>
<td>60 Hz: 41.6/52**/65</td>
<td>60 Hz: 52**/62.5</td>
<td></td>
</tr>
</tbody>
</table>

#### Switch category

| Mechanical endurance | 1000-M1/2000/5000-M2 | 1000/5000 |
| Cycles of operations (Short-circuit making current) - class | 5-E2 | 3 |

#### Combined switch-relay (ekor/rpt) take-over current

<table>
<thead>
<tr>
<th>Breaking $I_{km}$ acc. TD $I_{km}$</th>
<th>1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 62271-105</td>
<td>1300</td>
</tr>
</tbody>
</table>

#### Switch-fuse combination transfer current

<table>
<thead>
<tr>
<th>Breaking $I_{km}$ acc. TD $I_{km}$</th>
<th>2300</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 62271-105</td>
<td>1600</td>
</tr>
</tbody>
</table>

### Earthing (grounding) switch

| IEC 62271-102 | IEEE C37.74 |

#### Rated short-time withstand current (earthing circuit)

<table>
<thead>
<tr>
<th>Value $t_s$ = (x) s</th>
<th>$I_k$ [kA]</th>
<th>1 (1/3 s)/3 (1 s)</th>
<th>1 (1/3 s)/3 (1 s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak value $I_p$ [kA]</td>
<td>50 Hz: 2.5/7.5</td>
<td>50 Hz: 2.5/7.5</td>
<td>50 Hz: 2.5/7.5</td>
</tr>
<tr>
<td>60 Hz: 2.6/7.8</td>
<td>60 Hz: 2.6/7.8</td>
<td>60 Hz: 2.6/7.8</td>
<td></td>
</tr>
</tbody>
</table>

#### Earthing (grounding) switch making capacity (peak value)

<table>
<thead>
<tr>
<th>$I_{km}$ [kA]</th>
<th>50 Hz: 2.5/7.5</th>
<th>50 Hz: 2.5/7.5</th>
<th>50 Hz: 2.5/7.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz: 2.6/7.8</td>
<td>60 Hz: 2.6/7.8</td>
<td>60 Hz: 2.6/7.8</td>
<td></td>
</tr>
</tbody>
</table>

#### Earthing (grounding) switch category

| Mechanical endurance (manual) | 1000-M0 | 1000 |
| Cycles of operations (Short-circuit making current) - class | 5-E2 | 3 |

* Also available with $U_r$ = 7.2 kV on request
** Tests conducted at 21 kA/52.5 kA & 25 kA/65 kA
*** With gas exhaust upwards via chimney

### Applications

General and transformer protection, as well as connection or disconnection operations.
Configuration

Cubicle

- Internal arc IAC AFLR
  - 20 kA 1 s
- Internal arc IAC AF/AFL
  - 16 kA 1 s 20 kA 1 s
  - 25 kA 1 s
- Internal arc: gas tank
  - 16 kA 0.5 s 20 kA 0.5 s
  - 16 kA 1 s 20 kA 1 s 25 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer without contacts
- Manometer with temperature compensation and contacts

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility/right blind
- Right extensibility/left blind

Type of side connection:

- Female bushing
  - Right
  - Left
  - Both
- Cone bushing
  - Right
  - Left
  - Both

Fuse tripping:

- Via combined fuses
- Via associated fuses

Fuse holder:

- 24 kV
- 12 kV

Driving mechanism

- Actuating levers
- BR type manual mechanism
- AR type manual mechanism
- ARM type motorized mechanism
- Tripping coil

Acoustic alarm ekor.sas
Capacitive voltage presence indicator ekor.vpis
Capacitive voltage presence/absence indicator ekor.ivds
Other capacitive voltage indicators
Transformer protection unit ekor.rpt
Voltage detector unit ekor.rtk

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Plug-in type IEC bushings
- Screw type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

Pressure Relief Duct

- Rear chimney

Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

Dimensions

<table>
<thead>
<tr>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1740 mm height cubicle</td>
<td>1300 mm height cubicle</td>
</tr>
<tr>
<td>1740 mm height cubicle</td>
<td>1300 mm height cubicle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[mm]</th>
<th>[in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>470</td>
<td>18</td>
</tr>
</tbody>
</table>

140 lb/150 lb kg
331 Lbm
cgmcosmos-V

Circuit-breaker protection function with AV3/AMV3 mechanism

Circuit breaker protection modular cubicle, equipped with a three-position vacuum circuit-breaker.

**Extensibility:** right, left and both sides.

<table>
<thead>
<tr>
<th>Electrical characteristics</th>
<th>IEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>$U_r$ [kV] 12</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>$f_r$ [Hz] 50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td>$I_r$ [A] 400/630</td>
</tr>
<tr>
<td>Phase-to-earth (ground)</td>
<td>$U_{ph}$ [kV] 28</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>$U_{ph}$ [kV] 38</td>
</tr>
<tr>
<td>Rated lightning impulse</td>
<td>$U_{ph}$ [kV] 75</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td>$U_{ph}$ [kV] 85</td>
</tr>
<tr>
<td>Rated short-time withstand current (main circuit)</td>
<td>$I_t$ [kA] 16/20* (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>$I_p$ [kA] 50 Hz: 40/52*/62.5</td>
</tr>
<tr>
<td>Rated breaking capacity and making capacity</td>
<td>$I_b$ [kA] 16/20*25</td>
</tr>
<tr>
<td>Main switch making capacity (peak value)</td>
<td>$I_{ma}$ [kA] 50 Hz: 40/52*/62.5</td>
</tr>
<tr>
<td>Capacitive current capacity (50 Hz). Cable charging</td>
<td>$I_{cap}$ [A] 31.5</td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td>CO-15 s-CO</td>
</tr>
<tr>
<td>Circuit-breaker category</td>
<td>O-3 min-CO-3 min-CO</td>
</tr>
<tr>
<td>Mechanical endurance (operations-class)</td>
<td>2000-M1</td>
</tr>
<tr>
<td>Electrical endurance (class)</td>
<td>E2-C2** for 25 kA/E2-C1 for 20 kA</td>
</tr>
<tr>
<td>Earthing (grounding) switch</td>
<td>IEC 62271-102</td>
</tr>
<tr>
<td>Rated short-time withstand current (earthing circuit)</td>
<td>$I_{t}$ [kA] 16/20* (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>$I_p$ [kA] 50 Hz: 40/52*/62.5</td>
</tr>
<tr>
<td>Main switch making capacity (peak value)</td>
<td>$I_{ma}$ [kA] 50 Hz: 40/52*/62.5</td>
</tr>
<tr>
<td>Earthing (grounding) switch category</td>
<td>1000-M0</td>
</tr>
<tr>
<td>Mechanical endurance</td>
<td>5-E2</td>
</tr>
</tbody>
</table>

* Tests conducted at 21 kA/52.5 kA & 25 kA/65 kA  
** For cable charging switching

Applications

General protection and protection of transformer, feeder, etc., as well as connection or disconnection operations.
**Configuration**

**Cubicle**
- Internal arc IAC AFLR
  - 25 kA 1 s
- Internal arc IAC AF/AFL
  - 16 kA 1 s  20 kA 1 s  25 kA 1 s
- Internal arc: gas tank
  - 16 kA 0.5 s  16 kA 1 s  20 kA 0.5 s  20 kA 1 s  25 kA - 1 s
  - 1300 mm
  - 1450 mm
  - 1740 mm height cubicle

**Gas tank**
- Stainless steel tank

**Gas pressure indicator:**
- Manometer without contacts
- Manometer with temperature compensation and contacts

**Frontal connection:**
- Cable bushing

**Side connection:**
- Two side extensibility
- Left extensibility/right blind
- Right extensibility/left blind

**Type of side connection:**
- Female bushing
  - Right  Left  Both
- Cone bushing
  - Right  Left  Both

**Driving mechanism**
- Actuating levers
- AV3 type manual mechanism
- AVM3 type motorized mechanism
- Tripping coil
- Bistable coil
- 2nd Tripping coil
- Closing coil

**Dimensions**

**Cable compartment**
- Screw type IEC bushings
- Plug-in type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Partial discharge (PD) detection for network diagnosis

**Control box**
- Other voltage indicators
- Other protection relays
- Other metering and automation components

---

**Additional interlocks:**
- Electrical interlocks
- Key lock interlocks
- Pad locks

**Gas tank**
- Standard
- Optional

---

**IEC**

- 205/210/215 kg
Circuit-breaker protection with AV/AMV mechanism

Circuit breaker protection modular cubicle, equipped with a vacuum circuit-breaker in series with a three-position switch-disconnector.

### Extensibility:
- Right, left and both sides.

### Electrical characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage</strong></td>
<td>U_r [kV]</td>
<td>12</td>
</tr>
<tr>
<td><strong>Rated frequency</strong></td>
<td>f_r [Hz]</td>
<td>50/60</td>
</tr>
<tr>
<td><strong>Rated current</strong></td>
<td>I_i [A]</td>
<td>400/630</td>
</tr>
<tr>
<td><strong>Rated short-duration power frequency withstand voltage (1 min)</strong></td>
<td>U_w [kV]</td>
<td>28</td>
</tr>
<tr>
<td><strong>Across isolating distance</strong></td>
<td>U_w [kV]</td>
<td>38</td>
</tr>
<tr>
<td><strong>Rated lightning impulse withstand voltage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phase-to-phase (ground) and between phases</strong></td>
<td>U_p [kV]</td>
<td>75</td>
</tr>
<tr>
<td><strong>Across isolating distance</strong></td>
<td>U_p [kV]</td>
<td>85</td>
</tr>
<tr>
<td><strong>Internal arc classification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IAC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rated short-time withstand current (main circuit)</strong></td>
<td>I_k [kA]</td>
<td>16/20* (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td><strong>Peak value</strong></td>
<td>I_p [kA]</td>
<td>50 Hz: 40/52*7/62.5</td>
</tr>
<tr>
<td><strong>Mainly active current rated breaking capacity</strong></td>
<td>I_1 [A]</td>
<td>400/630</td>
</tr>
<tr>
<td><strong>Main switch making capacity (peak value)</strong></td>
<td>I_m [kA]</td>
<td>50 Hz: 40/52*7/62.5</td>
</tr>
<tr>
<td><strong>Capacitive current capacity (50 Hz). Cable charging</strong></td>
<td>I_c [A]</td>
<td>31.5</td>
</tr>
</tbody>
</table>

### Circuit-breaker

<table>
<thead>
<tr>
<th>Category</th>
<th>IEC 62271-100</th>
<th>IEEE C37.20.3</th>
</tr>
</thead>
</table>

### Switch-disconnector

<table>
<thead>
<tr>
<th>Category</th>
<th>IEC 62271-103 + IEC 62271-102</th>
<th>IEEE C37.74</th>
</tr>
</thead>
</table>

### Applications

General protection and protection of transformer, feeder, capacitor bank, etc, as well as connection or disconnection operations.
Configuration

Cubicle
- Internal arc IAC AFLR
  - 20 kA 1 s
- Internal arc IAC AF/AFL
  - 16 kA 1 s
  - 20 kA 1 s
  - 25 kA 1 s
- 1740 mm height cubicle

Gas tank
- Stainless steel tank

Gas pressure indicator:
- Manometer without contacts
- Manometer with temperature compensation and contacts

Frontal connection:
- Cable bushing

Side connection:
- Two side extensibility
- Left extensibility/right blind
- Right extensibility/left blind

Type of side connection:
- Female bushing
  - Right
  - Left
  - Both
- Cone bushing
  - Right
  - Left
  - Both

Driving mechanism
- Actuating levers
- B type switch mechanism
- BM type motorized mechanism
- AV type manual mechanism
- RAV type manual mechanism with re-closing
- AVM type motorized mechanism
- RAVM type motorized mechanism for re-closing
- Tripping coil
- Bistable coil
- 2nd Tripping coil
- Closing coil

Dimensions

- IEC
- ANSI/IEEE

- 1740 [mm] 68 [in]
- 695 [mm]
- 845 [33]
- 240 kg
- 529 Lbm

Additional interlocks:
- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment
- Undervoltage coil
- Acoustic alarm ekor.sas
- Capacitive voltage presence indicator ekor.vpis
- Capacitive voltage presence/absence indicator ekor.ivds
- Protection unit ekor.rpg
- Voltage detector unit ekor.rtk

Pressure Relief Duct
- Rear chimney

Control box
- Other voltage indicators
- Other protection relays
- Other metering and automation components
cgmcosmos
Fully gas insulated modular and compact (RMU) system
MV Switchgear for Distribution Network Solutions

cgmcosmos-s

Busbar switch function

Busbar switch modular cubicle, equipped with a two-position switch-disconnector (closed and open)
Optional earthing (grounding) switch (s-pto).

Extensibility: both sides.

<table>
<thead>
<tr>
<th>Electrical characteristics</th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>U_r [kV]</td>
<td>12*</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f_r [Hz]</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General busbar and cubicle interconnection</td>
<td>I_1 [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Feeder</td>
<td>I_1 [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U_d [kV]</td>
<td>28</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>U_d [kV]</td>
<td>32</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U_p [kV]</td>
<td>75</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>U_p [kV]</td>
<td>85</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch-disconnector</td>
<td></td>
<td>IEC 62271-103 + IEC 62271-102</td>
</tr>
<tr>
<td>Rated short-time withstand current (main circuit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value t_k = (x) s</td>
<td>I_k [kA]</td>
<td>16 (1/3 s)/20** (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>I_p [kA]</td>
<td>40/52**</td>
</tr>
<tr>
<td>Mainly active load-breaking current</td>
<td>I_1 [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Cable charging-breaking current/Line-charging breaking current</td>
<td>I_a [A]</td>
<td>50/1.5</td>
</tr>
<tr>
<td>Rated closed loop breaking capacity</td>
<td>I_2a [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Earth fault breaking current</td>
<td>I_3a [A]</td>
<td>300</td>
</tr>
<tr>
<td>Transformer magnetizing switching current</td>
<td>[A]</td>
<td>21</td>
</tr>
<tr>
<td>Cable &amp; line-charging breaking current under earth fault conditions</td>
<td>I_4a [A]</td>
<td>100</td>
</tr>
<tr>
<td>Main switch making capacity (peak value)</td>
<td>I_ma [kA]</td>
<td>40/52**</td>
</tr>
<tr>
<td>Switch category</td>
<td>Mechanical endurance</td>
<td>1000-M1/5000-M2</td>
</tr>
<tr>
<td>Cycles of operations (Short-circuit making current)- class</td>
<td>5-E3</td>
<td>3</td>
</tr>
<tr>
<td>Earthing (grounding) Switch (Optional)</td>
<td>IEC 62271-102</td>
<td>IEEE C37.74</td>
</tr>
<tr>
<td>Rated short-time withstand current (earthing circuit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value t_k = (x) s</td>
<td>I_k [kA]</td>
<td>16 (1/3 s)/20** (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>I_p [kA]</td>
<td>40/52**</td>
</tr>
<tr>
<td>Earthing (grounding) switch making capacity (peak value)</td>
<td>I_ma [kA]</td>
<td>40/52**</td>
</tr>
<tr>
<td>Earthing (grounding) Switch Category</td>
<td>Mechanical endurance (manual)</td>
<td>1000-M0</td>
</tr>
<tr>
<td>Cycles of operations (Short-circuit making current)- class</td>
<td>5-E2</td>
<td>3</td>
</tr>
</tbody>
</table>

* Also available with U_r = 7.2 kV on request
** Tests conducted at 21 kA/52.5 kA

Applications

Load breaking of the main busbar of the transformer substation and its earthing on the right (ptd) or left (pti) of the breaking point.
**Configuration**

**Cubicle**
- Internal arc IAC AF/AFL
  - 16 kA 1 s
  - 20 kA 1 s
- Internal arc gas tank
  - 16 kA 0.5 s
  - 20 kA 0.5 s
- 1300 mm height cubicle
- 1740 mm height cubicle

**Gas tank**
- Stainless steel tank

**Gas pressure indicator:**
- Manometer without contacts
- Manometer with temperature compensation and contacts

**Side connection:**
- Two side extensibility

**Type of side connection:**
- Female bushing
  - Right
  - Left
  - Both
- Cone bushing
  - Right
  - Left
  - Both

**Earthing (grounding):**
- With earthing (grounding) switch on left, s-pto type
- With earthing (grounding) switch on right s-pto

**Driving mechanism**
- Actuating levers
- B type manual mechanism
- BM type motorized mechanism
- Acoustic alarm ekor.sas
- Capacitive voltage presence indicator ekor.vpis (with earthing)
- Capacitive voltage presence/absence indicator ekor.ivds (with earthing)
- Other capacitive voltage indicators
- Integrated control and monitoring unit ekor.rci
- Voltage detector unit ekor.rtk

**Dimensions**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>CUBICLE</th>
<th>GAS TANK</th>
<th>PRESSURE RELIEF DUCT</th>
<th>CONTROL BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>[mm]</td>
<td>[in]</td>
<td>[mm]</td>
<td></td>
</tr>
<tr>
<td>735 [29]</td>
<td>1300</td>
<td>1740 [68]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>735 [29]</td>
<td>1300</td>
<td>1740 [68]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Options**

**cgmcosmos-s-pto**
- Additional interlocks:
  - Electrical interlocks
  - Key lock interlocks
  - Pad locks

**Cable compartment**
- Partial discharge (PD) detection for network diagnosis

**Pressure Relief Duct**
- Rear chimney

**Control box**
- Other relays
- Other metering and automation components

**OrmaZabal Velatia**
Auxiliary services supply function

Fuse protection modular cubicle, equipped with a three-position switch-disconnector: closed, open or earthed (grounded) and protection with limiting fuses.

Extensibility: right, left.

<table>
<thead>
<tr>
<th>Electrical characteristics</th>
<th>IEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>Ur [kV] 12* 24</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f [Hz] 50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td></td>
</tr>
<tr>
<td>General busbar and cubicle interconnection</td>
<td>I [A] 400/630</td>
</tr>
<tr>
<td>Output to transformer</td>
<td>I [A] 200</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U [kV] 28 50</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>U [kV] 32 60</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U [kV] 75 125</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>U [kV] 85 145</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>IAC</td>
</tr>
<tr>
<td>AFL 16 kA 0.5 s (Auxiliary services)</td>
<td>20** kA 1 s (Busbar voltage metering)</td>
</tr>
</tbody>
</table>

Switch-disconnector

<table>
<thead>
<tr>
<th>Rated short-time withstand current (main circuit)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value t = (x) s</td>
<td>I [kA] 16/20** (1/3 s)/25 (1 s) 16/20** (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>60 Hz: 40/52**/62.5 50/52**/62.5</td>
</tr>
<tr>
<td>Mainly active load-breaking current</td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
<tr>
<td>Main switch making capacity (peak value)</td>
<td>50 Hz: 40/52**/62.5 60 Hz: 41.6/52**/65</td>
</tr>
<tr>
<td>Switch category</td>
<td></td>
</tr>
<tr>
<td>Mechanical endurance</td>
<td>1000-M1</td>
</tr>
<tr>
<td>Cycles of operations (Short-circuit making current)-class</td>
<td>5-E3</td>
</tr>
</tbody>
</table>

Earthing (grounding) Switch

<table>
<thead>
<tr>
<th>Rated short-time withstand current (earthing circuit)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value t = 1 s or 3 s</td>
<td>I [kA] 1/3</td>
</tr>
<tr>
<td>Peak value</td>
<td>50 Hz: 2.5/7.5 60 Hz: 2.6/7.8</td>
</tr>
<tr>
<td>Earthing (grounding) switch making capacity (peak value)</td>
<td>I [kA] 50 Hz: 2.5/7.5 60 Hz: 2.6/7.8</td>
</tr>
</tbody>
</table>

Applications

Auxiliary services supply or busbar voltage metering.
Configuration

Cubicle
- Internal arc IAC AFL
- 16 kA 0.5 s
- 20 kA 1 s
- Internal arc: gas tank
- 16 kA 0.5 s
- 20 kA 0.5 s
- 16 kA 1 s
- 20 kA 1 s
- 25 kA 1 s
- 1740 mm height cubicle (Auxiliary services supply or busbar voltage metering)
- 1300 mm height cubicle (Auxiliary services supply)

Gas tank
- Stainless steel tank

Gas pressure indicator:
- Manometer without contacts
- Manometer with temperature compensation and contacts

Side connection:
- Left extensibility/right blind
- Right extensibility/left blind

Type of side connection:
- Female bushing
  - Right
  - Left
- Cone bushing
  - Right
  - Left

Fuse tripping:
- Via combined fuses
- Via associated fuses

Fuse holder:
- 24 kV
- 12 kV

Driving mechanism
- Actuating levers
- BR type manual mechanism
- Tripping coil
- Capacitive voltage presence indicator ekor.vpis
- Capacitive voltage presence/absence indicator ekor.ivds
- Other capacitive voltage indicators
- Transformer protection unit ekor.rpt
- Voltage detector unit ekor.rtk

Additional interlocks:
- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment
- Voltage transformers

Pressure Relief Duct
- Rear chimney

Control box
- Other voltage indicators
- Other protection relays
- Other metering and automation components

Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>470 [18]</td>
</tr>
<tr>
<td>1300 [150]</td>
</tr>
<tr>
<td>1740 [68]</td>
</tr>
<tr>
<td>410 X 850</td>
</tr>
<tr>
<td>735 [29]</td>
</tr>
</tbody>
</table>

IEC

140 [71]/150 [71] kg
331 Lbm
**cgmcosmos-rb**

**Busbar rise function**

Busbar rise gas insulated modular cubicle. Optional earthing (grounding) switch (rb-pt).

**Extensibility:** right and both sides.

### Electrical characteristics

<table>
<thead>
<tr>
<th></th>
<th>IEC</th>
<th>ANSI/IEEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated voltage</strong></td>
<td><strong>U_r [kV]</strong></td>
<td>12*</td>
</tr>
<tr>
<td><strong>Rated frequency</strong></td>
<td><strong>f_r [Hz]</strong></td>
<td>50/60</td>
</tr>
<tr>
<td><strong>Rated current</strong></td>
<td><strong>I_r [A]</strong></td>
<td>400/630</td>
</tr>
<tr>
<td><strong>Rated short-duration power frequency withstand voltage (1 min)</strong></td>
<td><strong>U_d [kV]</strong></td>
<td>28</td>
</tr>
<tr>
<td><strong>Rated lightning impulse withstand voltage</strong></td>
<td><strong>U_p [kV]</strong></td>
<td>75</td>
</tr>
<tr>
<td><strong>Internal arc classification</strong></td>
<td><strong>IAC</strong></td>
<td>AFL 16 kA 1 s/20** kA 1 s/25 kA 1 s</td>
</tr>
<tr>
<td><strong>Earthing (grounding) Switch (Optional)</strong></td>
<td><strong>IEC 62271-102</strong></td>
<td>IEEE C37.74</td>
</tr>
<tr>
<td><strong>Rated short-time withstand current</strong></td>
<td><strong>I_k [kA]</strong></td>
<td>16/20**/25</td>
</tr>
<tr>
<td><strong>Peak value</strong></td>
<td><strong>I_p [kA]</strong></td>
<td>40/52**/62.5</td>
</tr>
<tr>
<td><strong>Earthing (grounding) switch making capacity (peak value)</strong></td>
<td><strong>I_m [kA]</strong></td>
<td>40/52**/62.5</td>
</tr>
<tr>
<td><strong>Earthing (grounding) Switch Category</strong></td>
<td><strong>Mechanical endurance</strong></td>
<td>1000-M0</td>
</tr>
<tr>
<td></td>
<td><strong>Cycles of operations (Short-circuit making current)- class</strong></td>
<td>5-E2</td>
</tr>
</tbody>
</table>

* Also available with U_r = 7.2 kV on request
** Tests conducted at 21 kA/52.5 kA & 25 kA/65 kA
*** With gas exhaust upwards via chimney

### Applications

Input or output of medium voltage cables, enabling communication with the busbar of the transformer substation, on the right (rbd) or on both sides (rba).
**Configuration**

**Cubicle**
- Internal arc IAC AFLR
  - 20 kA 1 s
- Internal arc IAC AF/AFL
  - 16 kA 1 s □ 20 kA 1 s
  - 25 kA 1 s
- Internal arc gas tank
  - 16 kA 0.5 s □ 20 kA 0.5 s
  - 16 kA 1 s □ 20 kA 1 s □ 25 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

**Gas tank**
- Stainless steel tank

**Gas pressure indicator**
- Manometer without contacts
- Manometer with temperature compensation and contacts

**Frontal connection**:
- Cable bushing

**Side connection**:
- Two side extensibility: rba
- Right extensibility/Left blind: rba

**Type of side connection**:
- Female bushing
  - Right □ Left ■ Both
- Cone bushing
  - Right □ Left □ Both

**Earthing (grounding)**:
- With earthing (grounding) switch

**Driving mechanism**
- B type manual mechanism
- BM type motorized mechanism
- Acoustic alarm ekor.sas
- Capacitive voltage presence indicator ekor.vpis (with earthing)
- Capacitive voltage presence/absence indicator ekor.ivds (with earthing)

**Additional interlocks**:
- Electrical interlocks
- Key lock interlocks
- Pad locks

**Pressure Relief Duct**
- Rear chimney

**Cable compartment**
- Cover for one cable connector per phase
- Partial discharge (PD) detection for network diagnosis

**Control box**
- Other voltage indicators
- Other protection relays
- Other metering and automation components

**Options**
cgmcosmos-rb-pt

---

**Dimensions**

**IEC**
- 1300 mm height cubicle
- 1740 mm height cubicle

**ANSI/IEEE**
- 1300 mm height cubicle
- 1740 mm height cubicle

**Options**
cgmcosmos-rb-pt

---

**Key lock interlocks**

---

**Gas pressure indicator**
- Manometer without contacts
- Manometer with temperature compensation and contacts
cgmcosmos

Fully gas insulated modular and compact (RMU) system

**cgmcosmos-RC**

**Cable rise function**

Cable rise (up to the main busbar) air insulated modular cubicle. Optional double cable rise function (r2c).

**Extensibility:** Right or left.

<table>
<thead>
<tr>
<th><strong>Electrical characteristics</strong></th>
<th><strong>IEC</strong></th>
<th><strong>ANSI/IEEE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage ( U_i ) [kV]</td>
<td>12*</td>
<td>24</td>
</tr>
<tr>
<td>Rated frequency ( f_r ) [Hz]</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current ( I_r ) [A]</td>
<td>400/630</td>
<td>600</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>IAC</td>
<td>AFL 20 kA 1 s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AFL(R) 20 kA 1 s</td>
</tr>
</tbody>
</table>

* Also available with \( U_i = 7.2 \) kV on request
** Tests conducted at 21 kA/52.5 kA

**Applications**

Housing of the feeder cables up to the main busbar of the transformer substation, on the right (rcd) or on the left (rci).

**Configuration**

- IAC AFL 20 kA 1 s
- IAC AFL 25 kA 1 s
- IAC AFLR 20 kA 1 s
- 1740 mm height cubicle

**Connectivity**

- Extensibility: Right rcd or left rci

**Indicators**

- Capacitive voltage indicator ekor.vips
- Capacitive voltage indicator ekor.ivds
- Key lock interlocks

**Options**

**cgmcosmos-r2c** (without IAC class option)

Double cable rising functional unit (Width = 550 mm, Weight = 60 kg).

**cgmcosmos-cl**

Lateral incoming box (Width = 365 mm, Weight = 20 kg).
cgmcosmos-m

Metering function

Metering air insulated modular cubicle.

<table>
<thead>
<tr>
<th>Electrical characteristics</th>
<th>IEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>Ur [kV]</td>
</tr>
<tr>
<td></td>
<td>12*</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f_r [Hz]</td>
</tr>
<tr>
<td></td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td>I_r [A]</td>
</tr>
<tr>
<td>General busbar and cubicle interconnection</td>
<td></td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U_a [kV]</td>
</tr>
<tr>
<td></td>
<td>28</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U_b [kV]</td>
</tr>
<tr>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>IAC</td>
</tr>
<tr>
<td>Rating AFL 20 kA 0.5 s/20** kA 1 s</td>
<td></td>
</tr>
<tr>
<td>Rated short-time withstand current Value t = (x) s</td>
<td>I_r [kA]</td>
</tr>
<tr>
<td>16/20** (1/3 s) / 25 (3 s)</td>
<td></td>
</tr>
</tbody>
</table>

* Also available with U_r = 7.2 kV on request  ** Tests conducted at 21 kA/52.5 kA

Applications

Voltage and current metering transformer housing, enabling communication with the main busbar of the transformer substation, via busbars or dry cables.

Configuration

Cubicle
- IAC AFL 20 kA 0.5 s
- IAC AFL 20 kA 1 s
- Heater
- Protection mesh
- Locks/Interlocks

Busbar connections
- Rigid unscreened top connection
- Rigid unscreened bottom connection

Cable connections
- Cable bottom connection

Metering transformers
- Installed current transformers (3 CTS)
- Installed voltage transformers (3 VTs)
- No transformers

Control box
- Other metering and automation components

Indicators
- Capacitive voltage indicator ekor.vips
- Capacitive voltage indicator ekor.ivds

Options

<table>
<thead>
<tr>
<th>Options</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 03/07</td>
<td>165* kg</td>
</tr>
<tr>
<td>Type 04/08</td>
<td>363 Lbm</td>
</tr>
<tr>
<td>Type 05/07</td>
<td>(*) Empty enclosure</td>
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<tr>
<td>Type 06/09</td>
<td>(*) Empty enclosure</td>
</tr>
<tr>
<td>Type 15</td>
<td>(*) Empty enclosure</td>
</tr>
<tr>
<td>Type 14</td>
<td>(*) Empty enclosure</td>
</tr>
<tr>
<td>Type 17</td>
<td>(*) Empty enclosure</td>
</tr>
<tr>
<td>Type 16</td>
<td>(*) Empty enclosure</td>
</tr>
<tr>
<td>Type 22</td>
<td>(*) Empty enclosure</td>
</tr>
<tr>
<td>Type 21</td>
<td>(*) Empty enclosure</td>
</tr>
</tbody>
</table>
**cgmcosmos**

**cgmcosmos-2lp**

**Fuse protection and feeder functions**

Compact cubicle (RMU) with two feeder functions and one fuse protection function, housed in a single gas tank.

**Extensibility:** right, left, both sides or none.

### Electrical characteristics

<table>
<thead>
<tr>
<th>IEC</th>
<th>l</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>Uₚ [kV]</td>
<td>12*</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fₗ [Hz]</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General busbar and cubicle interconnection</td>
<td>Iₗ [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Feeder</td>
<td>Iₗ [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Output to transformer</td>
<td>Iₗ [A]</td>
<td>-</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>Uₑ [kV]</td>
<td>28</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>Uₑ [kV]</td>
<td>32</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>Uₚ [kV]</td>
<td>75</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td>Uₚ [kV]</td>
<td>85</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>IAC</td>
<td>AFL 16 kA 1 s/20** kA 1 s/25 kA 1 s</td>
</tr>
<tr>
<td>DC withstand voltage</td>
<td>[kV]</td>
<td>48 kV without cable testing facility</td>
</tr>
</tbody>
</table>

### Switch-disconnector

<table>
<thead>
<tr>
<th>IEC</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-time withstand current (main circuit)</td>
<td>Value tₛ = (x) s</td>
</tr>
<tr>
<td>Peak value</td>
<td>Iₚ [kA] 50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td></td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
<tr>
<td>Mainly active current rated breaking capacity</td>
<td>Iₘ [A] 400/630</td>
</tr>
<tr>
<td>Cable charging-breaking current/Line-charging breaking current</td>
<td>Iₘ [A] 50/1.5</td>
</tr>
<tr>
<td>Closed-loop breaking current</td>
<td>Iₘ [A] 400/630</td>
</tr>
<tr>
<td>Rated breaking capacity in the event of fault to earth</td>
<td>Iₘ [A] 300</td>
</tr>
<tr>
<td>Rated breaking capacity of no-load cables/lines in the event of fault to earth</td>
<td>Iₘ [A] 100</td>
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<tr>
<td>Main switch making capacity (peak value)</td>
<td>Iₘ [kA] 50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td></td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
</tbody>
</table>

### Switch-disconnector category

<table>
<thead>
<tr>
<th></th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical endurance</td>
<td>1000-M1/5000-M2</td>
</tr>
<tr>
<td>Cycles of operations (short-circuit making current) - class</td>
<td>5-E3</td>
</tr>
<tr>
<td>Combined switch-relay (ekor.rpt) take-over current</td>
<td>Breaking Iₑₑₑₑ acc. TDₑₑₑₑ IEC 62271-105</td>
</tr>
<tr>
<td>Switch-fuse combination transfer current</td>
<td>Breaking Iₑₑₑₑ acc. TDₑₑₑₑₑₑ IEC 62271-105</td>
</tr>
</tbody>
</table>

### Earthing (grounding) Switch

<table>
<thead>
<tr>
<th>IEC</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-time withstand current (earthing circuit)</td>
<td>Value tₛ = (x) s</td>
</tr>
<tr>
<td>Peak value</td>
<td>Iₚ [kA] 50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td></td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
<tr>
<td>Main switch making capacity (peak value)</td>
<td>Iₘ [kA] 50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td></td>
<td>60 Hz: 41.6/52**/65</td>
</tr>
</tbody>
</table>

### Earthing (grounding) switch Category

<table>
<thead>
<tr>
<th></th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical endurance (manual)</td>
<td>1000-M0</td>
</tr>
<tr>
<td>Cycles of operations (short-circuit making current) - class</td>
<td>5-E2</td>
</tr>
<tr>
<td>* Also available with Uₚ = 7.2 kV on request</td>
<td></td>
</tr>
<tr>
<td>** Tests conducted at 21 kA/52.5 kA &amp; 25 kA/65 kA</td>
<td></td>
</tr>
<tr>
<td>*** With gas exhaust upwards via chimney</td>
<td></td>
</tr>
</tbody>
</table>

### Applications

RMU which includes the features of the feeder and the protection cubicles.
**Configuration**

**Cubicle**
- □ Internal arc IAC AFLR
  - 20 kA 1 s
- □ Internal arc IAC AF/AFL
  - 16 kA 1 s □ 20 kA 1 s
  - 25 kA 1 s
- □ Internal arc: gas tank
  - 16 kA 0.5 s □ 20 kA 0.5 s
  - 16 kA 1 s □ 20 kA 1 s □ 25 kA 1 s
  - 1740 mm height cubicle
  - 1300 mm height cubicle

**Gas tank**
- □ Stainless steel tank

**Gas pressure indicator:**
- □ Manometer without contacts
- □ Manometer with temperature compensation and contacts

**Frontal connection:**
- □ Cable bushing

**Side connection:**
- □ Two side extensibility
- □ Left extensibility/right blind
- □ Right extensibility/left blind
- □ Blind both sides

**Type of side connection:**
- □ Female bushing
  - □ Right □ Left □ Both
- □ Cone bushing
  - □ Right □ Left □ Both

**Driving mechanism**
- □ Actuating levers
- □ B and BR type manual mechanisms
- □ BM type motorized mechanism
- □ AR type manual mechanism
- □ ARM type motorized mechanism
- □ Acoustic alarm ekor.sas
- □ Capacitive voltage presence indicator ekor.vpis
- □ Capacitive voltage presence/absence indicator ekor.ivds
- □ Other capacitive voltage indicators
- □ Integrated control and monitoring unit ekor.rci

**Options***
- □ Transformer protection unit ekor.rpt
- □ Voltage detector unit ekor.rtk

**Additional interlocks:**
- □ Electrical interlocks
- □ Key lock interlocks
- □ Pad locks

**Cable compartment**
- □ Screw type IEC bushings
- □ Screw type ANSI bushings
- □ Cover for one cable connector per phase
- □ Extended cable compartment cover for double cable connection
- □ Extended cable compartment cover for single cable plus surge arrester connection
- □ Partial discharge (PD) detection for network diagnosis

**Control box**
- □ Other voltage indicators
- □ Other protection relays
- □ Other metering and automation components

**Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>[mm]</th>
<th>[in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1190</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

**Options***
- □ *cgmcosmos-2l*: 2 feeders.
  - Width: 730 mm, Weight: 210 kg.
- □ *cgmcosmos-3l*: 3 feeders.
  - Width: 1095 mm, Weight: 340\(^\text{1)}\)/320\(^\text{2)}\) kg.
- □ *cgmcosmos-3lp*: 3 feeders + 1 fuse protection functions.
  - Width: 1565 mm, Weight: 385\(^\text{1)}\)/355\(^\text{2)}\) kg.
- □ *cgmcosmos-2l2p*: 2 feeders + 2 fuse protection functions.
  - Width: 1670 mm, Weight: 430\(^\text{1)}\)/400\(^\text{2)}\) kg.
- □ *cgmcosmos-3l2p*: 3 feeders + 2 fuse protection functions.
  - Width: 2035 mm, Weight: 525\(^\text{1)}\)/490\(^\text{2)}\) kg.
- □ *cgmcosmos-2lpt*: Compact integral unit with remote control features.
  - Width: 735 mm, Weight: 310\(^\text{1)}\)/290\(^\text{2)}\) kg.

\(^{1)} 683 Lbm
\(^{2)} 725/1165
\(^{p)} 410/850

\(*\) Confirm specific characteristics for every option
Circuit-breaker-2lv

Circuit-breaker protection and feeder functions

Compact cubicle (RMU) with two feeder functions and one vacuum circuit breaker protection function in a single gas tank.

**Extensibility:** Right, left, both sides or none. Existing two versions: with or without exterior cable testing

### Electrical characteristics

<table>
<thead>
<tr>
<th></th>
<th>IEC</th>
<th>l</th>
<th>v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>$U_r$ [kV]</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>$f_r$ [Hz]</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td>$I_r$ [A]</td>
<td>630</td>
<td>400/630</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td>$U_{rd}$ [kV]</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>$I_{rd}$ [kA]</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td>$U_{lp}$ [kV]</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>IAC</td>
<td>AFL 20° kA 1 s</td>
<td>AFL(R) 25 kA 1 s</td>
</tr>
<tr>
<td>DC withstand voltage</td>
<td>$U_{dc}$ [kV]</td>
<td>48 kV without cable testing facility/50 kV with cable testing facility</td>
<td>n/a</td>
</tr>
</tbody>
</table>

#### Circuit-breaker

**Rated short-time withstand current (main circuit)**

| Value $t_n = (x)$ s | $I_{np}$ [kA] | 16/20 (1/3 s)/25° (1 s) |
| Peak value | $I_{ph}$ [kA] | 50 Hz: 40/52°/62.5°/65° |
| Mainly active current rated breaking capacity | $I_{ms}$ [kA] | 50 Hz: 40/50°/62.5°/65° |
| Short-circuit breaking capacity | $I_{sc}$ [kA] | 16/20°/25° |
| Main switch making capacity (peak value) | $I_{ma}$ [kA] | 60 Hz: 52°/62.5°/65° |

**Switch-disconnector**

**Rated short-time withstand current (main circuit)**

| Value $t_n = (x)$ s | $I_{np}$ [kA] | 20° (1/3 s)/25° (1 s) |
| Peak value | $I_{ph}$ [kA] | 50 Hz: 52°/62.5°/65° |
| Mainly active current rated breaking capacity | $I_{ms}$ [kA] | 50 Hz: 52°/62.5°/65° |
| Main switch making capacity (peak value) | $I_{ma}$ [kA] | 60 Hz: 52°/62.5°/65° |

**Earthing switch**

| Value $t_n = (x)$ s | $I_{np}$ [kA] | 16/20° (1/3 s)/25° (1 s) |
| Peak value | $I_{ph}$ [kA] | 50 Hz: 40/50°/62.5°/65° |
| Main switch making capacity (peak value) | $I_{ma}$ [kA] | 50 Hz: 40/50°/62.5°/65° |

**Applications**

RMU which includes the features of the feeder and circuit breaker cubicles.
Configuration

Cubicle
- Internal arc IAC AFLR
  - 20 kA 1 s  □  25 kA 1 s
- 1740 mm height cubicle
- 1450 mm height cubicle
- 1300 mm height cubicle

Gas tankes
- Stainless steel tank

Frontal connection:
- Cable bushing

Side connection:
- Two side extensibility
- Left extensibility/right blind
- Right extensibility/left blind
- Blind both sides

Type of side connection:
- Female bushing
  - Right □ Left ■ Both
- Cone bushing
  - Right □ Left ■ Both

Driving mechanism
- Actuating levers
- B type switch mechanism
- BM type motorized mechanism
- AV type manual mechanism
- Capacitive voltage presence indicator ekor.vpis
- Capacitive voltage presence/absence indicator ekor.ivds
- Other capacitive voltage indicators

Additional interlocks:
- Electrical interlocks
- Key lock interlocks
- Pad locks

Options
- cgmcosmos-2l2v
  2 feeders + 2 CB protection functions
  ( Consult availability
- cgmcosmos-2lv (SANS type)
  According to SANS standards.

Dimensions

Without exterior cable testing

With exterior cable testing

420 kg
**cgmcosmos-rlp**

**Fuse protection, feeder and busbar rise functions**

Compact cubicle with one busbar rise function, one fuse protection function and one feeder function, fuse protection and feeder cubicles, housed in a single tank.

**Extensibility:** right, left, both sides or none.

### Electrical characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IEC</th>
<th>I-r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>U&lt;sub&gt;r&lt;/sub&gt; [kV]</td>
<td>12*</td>
<td>24</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f&lt;sub&gt;r&lt;/sub&gt; [Hz]</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General busbar and cubicle interconnection</td>
<td>I&lt;sub&gt;r&lt;/sub&gt; [A]</td>
<td>400/630</td>
<td>400/630</td>
</tr>
<tr>
<td>Feeder</td>
<td>I&lt;sub&gt;r&lt;/sub&gt; [A]</td>
<td>400/630</td>
<td>-</td>
</tr>
<tr>
<td>Output to transformer</td>
<td>I&lt;sub&gt;r&lt;/sub&gt; [A]</td>
<td>-</td>
<td>400/630</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage (1 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U&lt;sub&gt;d&lt;/sub&gt; [kV]</td>
<td>28</td>
<td>50</td>
</tr>
<tr>
<td>Across isolating distance</td>
<td></td>
<td>32</td>
<td>60</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase-to-earth (ground) and between phases</td>
<td>U&lt;sub&gt;p&lt;/sub&gt; [kV]</td>
<td>75</td>
<td>125</td>
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<tr>
<td>Across isolating distance</td>
<td></td>
<td>85</td>
<td>145</td>
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<tr>
<td>Internal arc classification</td>
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<td>IAC</td>
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### Switch-disconnector

<table>
<thead>
<tr>
<th>Parameter</th>
<th>IEC 62271-103</th>
<th>IEC 62271-103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-time withstand current (main circuit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value t&lt;sub&gt;s&lt;/sub&gt; = (x) s</td>
<td>I&lt;sub&gt;k&lt;/sub&gt; [kA]</td>
<td>16/20** (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>I&lt;sub&gt;p&lt;/sub&gt; [kA]</td>
<td>50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td>Mainly active current rated breaking capacity</td>
<td>I&lt;sub&gt;r&lt;/sub&gt; [A]</td>
<td>50/1.5</td>
</tr>
<tr>
<td>Rated no-load cable-charging breaking capacity</td>
<td>I&lt;sub&gt;vo&lt;/sub&gt; [A]</td>
<td>-</td>
</tr>
<tr>
<td>Closed-loop breaking current</td>
<td>I&lt;sub&gt;i&lt;/sub&gt; [A]</td>
<td>400/630</td>
</tr>
<tr>
<td>Rated breaking capacity in the event of fault to earth</td>
<td>I&lt;sub&gt;iw&lt;/sub&gt; [A]</td>
<td>-</td>
</tr>
<tr>
<td>Rated breaking capacity of no-load cables/lines in the event of fault to earth</td>
<td>I&lt;sub&gt;ko&lt;/sub&gt; [A]</td>
<td>100</td>
</tr>
<tr>
<td>Main switch making capacity (peak value)</td>
<td>I&lt;sub&gt;ma&lt;/sub&gt; [kA]</td>
<td>50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td>Switch category</td>
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<td></td>
</tr>
<tr>
<td>Mechanical endurance</td>
<td>1000-M1</td>
<td>5000-M2</td>
</tr>
<tr>
<td>Combined switch-relay (ekorr.pl) take-over current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaking I&lt;sub&gt;am&lt;/sub&gt; acc. TD&lt;sub&gt;am&lt;/sub&gt;, IEC 62271-105</td>
<td>[A]</td>
<td>-</td>
</tr>
<tr>
<td>Switch-fuse combination transfer current</td>
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</tr>
<tr>
<td>Breaking I&lt;sub&gt;am&lt;/sub&gt; acc. TD&lt;sub&gt;am&lt;/sub&gt;, IEC 62271-105</td>
<td>[A]</td>
<td>-</td>
</tr>
<tr>
<td>Earthing (grounding) Switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-time withstand current (earthing circuit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value t&lt;sub&gt;s&lt;/sub&gt; = (x) s</td>
<td>I&lt;sub&gt;k&lt;/sub&gt; [kA]</td>
<td>16/20** (1/3 s)/25 (1 s)</td>
</tr>
<tr>
<td>Peak value</td>
<td>I&lt;sub&gt;p&lt;/sub&gt; [kA]</td>
<td>50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td>Earthing (grounding) switch making capacity (peak value)</td>
<td>I&lt;sub&gt;ma&lt;/sub&gt; [kA]</td>
<td>50 Hz: 40/52**/62.5</td>
</tr>
<tr>
<td>Earthing (grounding) Switch Category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical endurance (manual)</td>
<td>1000-M40</td>
<td></td>
</tr>
<tr>
<td>Cycles of operations (Short-circuit making current)- class</td>
<td>5-E2</td>
<td></td>
</tr>
</tbody>
</table>

* Also available with U<sub>r</sub> = 7.2 kV on request
** Tests conducted at 21 kA/52.5 kA & 25 kA/65 kA
*** With gas exhaust upwards via chimney

### Applications

Compact cubicle for RES applications which includes the features of the busbar rise (0), fuse protection (p) and feeder (l) cubicles.
**Configuration**

**Cubicle**
- Internal arc IAC AFLR
  - 20 kA 1 s
- Internal arc IAC AF/AFL
  - 16 kA 1 s / 20 kA 1 s
  - 25 kA 1 s
- Internal arc: gas tank
  - 16 kA 0.5 s / 20 kA 0.5 s
  - 16 kA 1 s / 20 kA 1 s / 25 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

**Gas tank**
- Stainless steel tank

**Gas pressure indicator:**
- Manometer without contacts
- Manometer with temperature compensation and contacts

**Frontal connection:**
- Cable bushing

**Side connection:**
- Two side extensibility
- Left extensibility/right blind
- Right extensibility/left blind
- Blind both sides

**Type of side connection:**
- Female bushing
  - Right
  - Left
  - Both
- Cone bushing
  - Right
  - Left
  - Both

**Driving mechanism**
- Actuating levers
- B and BR type manual mechanisms
- BM type motorized mechanism
- AR type manual mechanism
- ARM type motorized mechanism
- Acoustic alarm ekor.sas
- Capacitive voltage presence indicator ekor.vpis
- Capacitive voltage presence/absence indicator ekor.ivds
- Other capacitive voltage indicators
- Integrated control and monitoring unit ekor.rci
- Transformer protection unit ekor.rpt
- Voltage detector unit ekor.rtk

**Additional interlocks:**
- Electrical interlocks
- Key lock interlocks
- Pad locks

**Cable compartment**
- Screw type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

**Control box**
- Other voltage indicators
- Other protection relays
- Other metering and automation components

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**Dimensions**

- **IEC**
  - 1190 [mm] / 47 [in]
  - 1300 [mm] / 650 Lbm

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**1740 [mm] / [in]**

(*) (l) 725/1365
(r & p) 410/850
275/295 [kg]
650 Lbm
**HRC Fuses**

**Features:**
- Horizontal fuse holders
- Front access
- Phase-independent compartments
- Protected within the gas tank
- Insulation and sealing against external agents (pollution, temperature changes, adverse weather conditions, including floods)
- Internal interlocks for a safe access to the fuse holder area

**Protection with fuses**
Protection against short circuits in the Medium Voltage network is made by means of the fuse protection functions.

The fuse holder tubes reach a uniform temperature all along the tube when they are placed horizontally inside the gas tank. When the cover is closed, they are fully sealed against floods and external pollution.

In accordance with the IEC 62271-105 standard, the switch-fuse combination may be either the “associated” or “combined” type. In the latter case, the tripping of each of the fuses is indicated on the front mimic diagram of the cubicle.

**Protection with fuses and tripping coil**
The combined switch-fuse option enables the opening of the switch-disconnector caused by an external signal, as for example that sent by the transformer thermostat in the event of overheating.

### HHD fuse selection according to IEC standards

<table>
<thead>
<tr>
<th>Ur Network [kV]</th>
<th>U, Fuse [kV]</th>
<th>Rated transformer power without overload [kVA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>50 75 100 125 150 200 250 315 400 500 630 800 1000 1250 1600 2000</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6/12</td>
<td>6.3 10 16 20 20 25 31.5 40 50 63 63 80 100 160 200 -</td>
</tr>
<tr>
<td>13.5</td>
<td>10/24</td>
<td>6.3 6.3 10 16 20 20 25 31.5 40 50 63 63 80 100 - -</td>
</tr>
<tr>
<td>15</td>
<td>10/24</td>
<td>6.3 6.3 10 16 16 20 20 25 31.5 40 50 63 80 80 - -</td>
</tr>
<tr>
<td>20</td>
<td>10/24</td>
<td>6.3 6.3 6.3 10 16 16 16 20 20 25 31.5 40 50 50 63 80 80 125</td>
</tr>
</tbody>
</table>

### Fuse selection according to IEEE standards

<table>
<thead>
<tr>
<th>Ur Grid [kV]</th>
<th>U, Fuse [kV]</th>
<th>Rated transformer power without overload [kVA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>50 75 100 125 150 160 200 250 315 400 500 630 800 1000 1250 1600 2000</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>6/12</td>
<td>6.3 10 16 20 20 25 31.5 40 50 63 80 100 160 200 250 - -</td>
</tr>
<tr>
<td>12.5</td>
<td>10/24</td>
<td>6.3 6.3 10 16 16 20 20 25 31.5 40 50 63 80 80 125 - -</td>
</tr>
<tr>
<td>13.2</td>
<td>10/24</td>
<td>6.3 6.3 10 16 16 20 20 25 31.5 40 50 63 80 100 - -</td>
</tr>
<tr>
<td>14.4</td>
<td>10/24</td>
<td>6.3 6.3 10 16 16 20 20 25 31.5 40 50 63 80 80 - -</td>
</tr>
<tr>
<td>25</td>
<td>10/24</td>
<td>6.3 6.3 6.3 10 16 16 16 20 20 25 31.5 40 50 50 63 80 80 80</td>
</tr>
</tbody>
</table>

### Remarks:
- Fuses recommended: SIBA brand with medium type striker, conforming to IEC 60282-1 (low power loss fuses)
- The values for combined fuses are given in blue
- The fuse-switch assembly has been temperature-rise tested under normal service conditions in accordance with IEC 62271-1
- A fuse holder carriage adapted for 292 mm (12.49 inches) 6/12 kV fuses is available
- For ratings marked in bold the length is 442 mm (17.40 inches)
- If any of the fuses blow, we recommend changing all three
- For overload conditions in the transformer or other brands of fuse, please consult OrmaZabal
Indicators

ekorsas acoustic alarm

The korsas earthing (grounding) prevention acoustic alarm unit is an acoustic indicator that works in association with the earthing (grounding) switch shaft and the voltage presence indicator, kors.vpis.

The alarm is activated when the earthing (grounding) switch actuation shaft access handle is operated while there is voltage in the cubicle’s Medium Voltage incoming line. Then an acoustic alarm warns the operator that a short-circuit may be caused in the network if the operation is carried out, resulting in greater safety for individuals and equipment and the continuity of supply.

kors.vpis voltage presence indicator

kors.vpis is a self-powered indicator incorporated into the cubicles that displays the presence of voltage in the phases via three permanent light signals, designed in accordance with the IEC 62271-206 standard.

It has easily accessible test points for performing the phase balance test.

Ormazabal’s kors.spc phase comparator and kors.ivds voltage presence/absence detector can be supplied on request.

Cable connections

Bushings EN 50181 & IEEE 396

- Manufactured in epoxy resin, they conform to the dielectric and partial discharge tests
- There are three types:
  - Plug-in up to 250 A (IEC) & 200 A (IEEE)
  - Plug-in up to 400 A
  - Screw-in up to 630 A (IEC) & 600 A (IEEE)
- Located in the cable compartment
  - Optionally, they may be placed on the side of the cubicles for direct supply to the main busbar

Cable connectors

Features:
- For single-core or three-core cables
- For dry cable or impregnated cable
- Shielded or unshielded
- Elbow or straight

Detailed information:
- Direct connection to the bushings located in the cable compartment or on the side via plug-in or screw-in connectors (rated current greater than 400 A or short-circuit current equal to or higher than 16 kA)
- 250 A plug-in connectors (straight or elbow type for rear exit of cable) in outputs to transformer (cable compartment) for fuse protection functions
- Shielded connectors for circuit-breaker protection functions
- Two symmetric terminals or symmetric terminal plus symmetric surge arrester.
- Metallic voltage transformers

For other types and values, please consult Ormazabal.
Spare parts

Metal enclosure

- Covers
- Auxiliary profiles for uneven floors
- Lateral incoming box (cgmcosmos-cl)

Operating levers

- Switch-disconnector general lever
- Antireflex lever for B/BM driving mechanism
- Levers for circuit breaker

Connectivity

- omalink connecting set
  It includes the earthing bar, bolts and nuts, instructions and other elements required for the correct assembly of two modules
- End assembly kit
  It includes end plugs, metal cover to be mounted on the side of one cubicle, instructions and other elements required for assembly
- Bushlink: side bushing adaptor
  It allows for converting a cubicle with side female bushings into a cubicle with side bushings

Fuse protection

- 12 kV fuse holder carriage
- 24 kV fuse holder carriage
- Carriage adaptor for 292 mm 6/12 kV fuses
Handling, installation and after sales

Handling

- Reduced size and weight make easier manipulation and installation tasks
- Safe cubicle delivery:
  - Upright position on a pallet, wrapped in protective plastic with polystyrene corner pieces
- Handling methods (up to five functional unit assemblies):
  - Lifting: Forklift truck or hand-operated pallet jack
  - Alternative methods: rollers or rods underneath
  - Raising: Slings & lifting beams
- Ergonomic design for easy cubicle connection and floor fastening

Inside buildings

- Easy handling with pallet jack (go through standard doors and elevators)
- Small dimensions: minimum room occupation
- Operation, extensibility and removal in reduced space
- No gas manipulation on site
- Optionally, installation on auxiliary profiles in case of uneven floors or to avoid cable trench works

<table>
<thead>
<tr>
<th>Installation minimum distances [mm] (inches)</th>
<th>Side wall (a)</th>
<th>Ceiling (b)</th>
<th>Front clearance (c)</th>
<th>Rear wall (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[100] (4)</td>
<td>[500] (20)</td>
<td>[500] (20)</td>
<td>[&gt; 100] (&gt; 4)**</td>
</tr>
</tbody>
</table>

** Except for cgmcosmos-m (AV/RAV) (> 50 mm/4 inches) and cgmcosmos-v (0 mm/inches)
In case of rear chimney = 0 mm/inches
The space required to extend the assembly with an additional cubicle is 150 mm/5.90 inches plus the width of the new cubicle

For handling and installation instructions request the corresponding manuals to Ormazabal.
### Maximum trench dimensions

for cubicles internal arc tested

<table>
<thead>
<tr>
<th>Function</th>
<th>Cubicle height [mm] (inches)</th>
<th>A [mm] (inches)</th>
<th>F [mm] (inches)</th>
<th>(1) D [mm] (inches)</th>
<th>(2) D [mm] (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>l, f &amp; rc</td>
<td>1300 (51)</td>
<td>1740 (68)</td>
<td>285 (11)</td>
<td>590 (23)</td>
<td>600 (23)</td>
</tr>
<tr>
<td>p, a</td>
<td>1300 (51)</td>
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<td>390 (15)</td>
<td>590 (23)</td>
<td>550 (21.6)</td>
</tr>
<tr>
<td>v (AV)</td>
<td>1740 (68)</td>
<td>520 (20)</td>
<td>590 (23)</td>
<td>550 (21.6)</td>
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</tr>
<tr>
<td>v (AV3)</td>
<td>1300 (51)</td>
<td>1740 (68)</td>
<td>520 (20)</td>
<td>590 (23)</td>
<td>800 (31.5)</td>
</tr>
</tbody>
</table>

### IAC class up to 20/25 kA. Dry cable

<table>
<thead>
<tr>
<th>Function</th>
<th>Cubicle height [mm] (inches)</th>
<th>A [mm] (inches)</th>
<th>F [mm] (inches)</th>
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<td>520 (20)</td>
<td>590 (23)</td>
<td>800 (31.5)</td>
</tr>
</tbody>
</table>

The dimensions of the trench depend on the minimum curvature radius of the cables used.

The dimensions given below are for the largest trench.

To dimension the trench with optimum proportions (minimum trench dimensions) for a particular type of cable, please consult Ormazabal.
Inside mobile or prefabricated transformer substations

- Turn-key solutions (fully assembling, testing and transportation from factory)
- Uniform quality
- Significant reduction of installation costs and time
- Possibility of cubicle on-site installation
- Wide range of Ormazabal’s TS: Walk-in, underground, kiosk, compact…
- Availability of having an operational Transformer Substation in short time

Inside wind turbines

- Off-shore & On-shore wind farms
- Since 1995 supplying medium voltage GIS cubicles for RES commercial generation
- Over 10 years of experience in the offshore wind sector

Commissioning and after sales

Services

- Technical assistance
- FAT
- Pick-up & delivery
- Supervision & installation
- Commissioning
- Training
- Warranty
- Inspection & maintenance
- Spare part
- Repair
- Retrofitting
- Recycling
- Engineering
- Procurement
- EPCM

Recycling and end-of-life

The Ormazabal production centres have introduced the corresponding environmental management systems, conforming to the requirements of the international ISO 14001 standard and endorsed by the Environmental Management Certificate among others.

cgmcosmos system cubicles have been designed and manufactured in accordance with the requirements of international IEC and IEEE standards.

By design, and depending on the models, they have a sealed compartment with SF₆ which allows full operation of the equipment throughout its service life (IEC 62271-200).

At the end of the product life cycle, the SF₆ gas content must not be released into the atmosphere. It is recovered and treated for reuse, in accordance with the instructions given in standards IEC 62271-303, IEC 60480 and the CIGRE 117 guide.

Ormazabal will provide the additional information required to carry out this task correctly, out of respect for the safety of individuals and that of the environment.