cpg.0
GIS-type medium-voltage switchgear with full insulation in SF₆ gas, up to 40.5 kV in accordance with IEC Standards

General Instructions
IG-123-EN, version 09; 04/09/2017
CAUTION!

When medium-voltage equipment is operating, certain components are live, other parts may be in movement and some may reach high temperatures. Therefore, the use of this equipment poses electrical, mechanical and thermal risks.

In order to ensure an acceptable level of protection for people and property, and in compliance with applicable environmental recommendations, Ormazabal designs and manufactures its products according to the principle of integrated safety, based on the following criteria:

- **Elimination of hazards wherever possible.**
- **Where elimination of hazards is neither technically nor economically feasible, appropriate protection functions are incorporated in the equipment.**
- **Communication about remaining risks to facilitate the design of operating procedures which prevent such risks, training for the personnel in charge of the equipment, and the use of suitable personal protective equipment.**
- **Use of recyclable materials and establishment of procedures for the disposal of equipment and components so that once the end of their service lives is reached, they are duly processed in accordance, as far as possible, with the environmental restrictions established by the competent authorities.**

Consequently, the equipment to which the present manual refers complies with the requirements of section 11.2 of Standard IEC 62271-1. It must therefore only be operated by appropriately qualified and supervised personnel, in accordance with the requirements of standard EN 50110-1 on the safety of electrical installations and standard EN 50110-2 on activities in or near electrical installations. Personnel must be fully familiar with the instructions and warnings contained in this manual and in other recommendations of a more general nature which are applicable to the situation according to current legislation[^1].

The above must be carefully observed, as the correct and safe operation of this equipment depends not only on its design but also on general circumstances which are in general beyond the control and responsibility of the manufacturer. More specifically:

- **The equipment must be handled and transported appropriately from the factory to the place of installation.**
- **All intermediate storage should occur in conditions which do not alter or damage the characteristics of the equipment or its essential components.**
- **Service conditions must be compatible with the equipment rating.**
- **The equipment must be operated strictly in accordance with the instructions given in the manual, and the applicable operating and safety principles must be clearly understood.**
- **Maintenance should be performed properly, taking into account the actual service and environmental conditions in the place of installation.**

The manufacturer declines all liability for any significant indirect damages resulting from violation of the guarantee, under any jurisdiction, including loss of income, stoppages and costs resulting from repair or replacement of parts.

**Warranty**

The manufacturer guarantees this product against any defect in materials and operation during the contractual period. In the event that defects are detected, the manufacturer may opt either to repair or replace the equipment. Improper handling of this equipment and its repair by the user shall constitute a violation of the guarantee.

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[^1]: For example, in Spain the “Regulation on technical conditions and guarantees for safety in high-voltage electrical installations” – Royal Decree 337/2014 is obligatory.

In view of the constant evolution in standards and design, the characteristics of the elements contained in this manual are subject to change without prior notice. These characteristics, as well as the availability of components, are subject to confirmation by Ormazabal.
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1 General description

The cpg.0 switchgear is made up of a series of GIS-type cubicles, with complete insulation in SF₆, for primary distribution in medium-voltage networks up to 40.5 kV.

1.1 Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>cpg.0-v</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td>cpg.0-vl</td>
<td>Circuit breaker with side connection on the left</td>
</tr>
<tr>
<td>cpg.0-c</td>
<td>Longitudinal busbar coupling</td>
</tr>
<tr>
<td>cpg.0-s</td>
<td>Disconnector</td>
</tr>
<tr>
<td>cpg.0-f</td>
<td>Fuse protection</td>
</tr>
<tr>
<td>cpg.0-fl</td>
<td>Fuse protection with side connection on the right</td>
</tr>
<tr>
<td>cpg.0-rb</td>
<td>Busbar rise</td>
</tr>
<tr>
<td>cpg.0-pt</td>
<td>Busbar earthing</td>
</tr>
<tr>
<td>cpg.0-rc</td>
<td>Cables side rise</td>
</tr>
</tbody>
</table>

Table 1.1  cpg.0 switchgear models

1.2 Standards applied

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 62271-1</td>
<td>Common specifications for high voltage switchgear standards</td>
</tr>
<tr>
<td>IEC 62271-200</td>
<td>A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV</td>
</tr>
<tr>
<td>IEC 62271-100</td>
<td>Alternating current circuit breakers</td>
</tr>
<tr>
<td>IEC 62271-103</td>
<td>High voltage switches for rated voltages above 1 kV up to and including 52 kV</td>
</tr>
<tr>
<td>IEC 62271-102</td>
<td>Alternating current disconnectors and earthing switches</td>
</tr>
<tr>
<td>IEC 62271-105</td>
<td>A.C. fuse combination switch for rated voltages above 1 kV and up to and including 52 kV</td>
</tr>
<tr>
<td>IEC 62271-206 / IEC 61243-5</td>
<td>Voltage presence indicating systems</td>
</tr>
<tr>
<td>IEC 60529</td>
<td>Degrees of protection provided by enclosures (IP Code)</td>
</tr>
<tr>
<td>IEC 60282-1</td>
<td>Current-limiting fuses</td>
</tr>
</tbody>
</table>

Table 1.2  Standards applied
1.3 Main components

Figure 1.1 Main components of cubicles cpg.0

Gas tank

This is a sealed compartment, made of stainless steel and sealed for life, which houses the switching and breaking switchgear, with SF₆ gas as the insulating medium.

Depending on the function for which the cubicle was designed, it may contain the following components:

- Disconnector.
- Earthing switch.
- Internal busbar and connections.
- Vacuum circuit-breaker.
- Switch - disconnector
- Fuse holders

Connection to the busbar is possible via upper bushings. Connection to the medium voltage cables is made with the lower and/or side bushings.

The gas pressure is tested, in each cubicle visually by means of a pressure switch with a volt-free contact, allowing it to be used as a remote alarm or blocking/trip for the position.

Figure 1.2 Example of bushing position in gas tank (1)
**Busbar compartment**

The busbar compartment, designed to withstand an internal arc inside (optional), meeting the criteria of Annex A of Standard IEC 62271-200, class IAC: AFL/AFLR, is located at the top of the cubicle, separate from the gas tank. It is made from metal sheet, offering the degree of protection necessary for the connection device.

It comprises a fully assembled, tested unit, separated by phases (segregating them as an option), by way of earthed metal plates, with solid, screened insulation, earthed through an earth collector plate specific to the compartment.

Toroidal current transformers and/or plug-in voltage transformers can also be installed, thus avoiding the need for metering cubicles.

**Cable compartment**

Located in the bottom part of the cubicle, this has a cover, interlocked with the earthing circuit, which allows front access to the medium voltage cables. This compartment is prepared to withstand an internal arc in terminals up to 31.5 kA - 1 s, meeting the criteria of Annex A of Standard IEC 62271-200, class IAC: AFL/AFLR.

In the most complete case, the base can house the following components:

- Phase segregation assembly (optional) consisting of the main box and the segregating cover.
- Three\(^2\) symmetrical shielded terminals with reinforced connection (screwable) by phase or four asymmetric ones.
- Clamp flanges for the medium voltage cables.
- Earthing bars.
- Toroidal current transformers.
- Voltage transformers, with connection via medium voltage cable or plug-in/disconnectable.

All the elements making up the enclosure are earthed by means of a conductor consisting of a copper plate, sized to withstand the rated short-time current. This is located in the base, meaning it does not need to be dismantled in order to insert or remove a cable and its corresponding termination.

---

\(^2\) There are four or six in the case of cubicles with rated branch current of 2500 A.
Fuse compartment

The fuse protection cubicle has separate fuse holders to house medium voltage limiter fuses.

The compartments are pipe-shaped and are fully enclosed in the gas tank, making them unaffected by pollution. To remove and insert the fuses in the fuse holder, a carriage is used to simplify the operation and ensure correct fuse placement.

The pipe seal consists of an elastic membrane with the following functions:

- To ensure the water-tightness of the fuse holder against flooding and thus avoid interior pollution and degradation.
- Additional insulation to that provided by the fuse holder carriage insulator.
- To transmit the movement of the fuse striker to the tripping mechanism, while maintaining the water-tightness of the fuse holder tube.

By the very nature of its construction, this sealed solution is subject to the internal overpressure caused by abnormal overheating of the internal air. In this case, the trip device can act as protection against overheating, thus preventing damage to both the fuse and the fuse holder.

Exterior cable connections (bushing)

The cpg.0 cubicles have bushings on the front for medium-voltage cable connection. These are made of epoxy resin and can, thanks to their configuration, withstand the current transformers. They are duly screened and designed in line with Standard EN 50181, being of type “C”.

They allow the connection of conductors of up to 800 mm² via screw-in T-type connectors of any manufacturer. The cable compartment allows the installation of up to three cables (3) per phase, with a symmetrical terminal, or up to four cables per phase, with an asymmetric terminal.

---

(3) There are four or six in the case of cubicles with rated branch current of 2500 A.
The cpg.0-vl and cpg.0-fl models have side bushings for connection of up to two medium voltage cables per phase, up to 800 mm². These side bushings do not allow it to withstand current transformers.

Model cpg.0-rc (cable side rise) protects the cable side connection of models cpg.0-vl (cpg.0-rci, left cable rise) and cpg.0-fl (cpg.0-rcd, right cable rise).
Gas pressure relief duct (optional)

The entire cubicle is prepared to withstand an internal arc in the tank up to 31.5 kA - 1 s [4], meeting the criteria of Annex A of Standard IEC 62271-200, accessibility class IAC: AFLR.

A duct made of metal sheet, which conducts the gases produced by an internal arc towards the top of the cubicle, from any of the three compartments: gas tank, cable compartment and busbar compartment.

Control compartment

Placed at the top of the cubicle and separate from the medium-voltage area, this is ready for installation of the metering equipment and protection relays. It contains the terminal block with the control signals duly identified in accordance with the wiring diagram provided with the equipment. All the connections between the driving mechanisms compartment and the control box are made via connectors, which makes the assembly more flexible, and allows the control box to be assembled and connected on site in a straightforward, direct way.

In accordance with model, see the unit’s Name Plate.
Driving mechanism

In addition to a mimic diagram customised for each type of function, this has the driving elements in its middle section: disconnector/earthing switch and circuit breaker driving mechanisms, circuit breaker opening/closing push-buttons, status indicators, groove for access of the spring loading lever, etc.

Figure 1.14 Example of driving mechanism area
2 Technical characteristics

2.1 Electrical characteristics

<table>
<thead>
<tr>
<th>Functions</th>
<th>( c_{pg.0} -v )</th>
<th>( c_{pg.0}-vl^{(1)} )</th>
<th>( c_{pg.0-c} )</th>
<th>( c_{pg.0-f}^{(1)} )</th>
<th>( c_{pg.0-f}^{(1)} )</th>
<th>( c_{pg.0-s} )</th>
<th>( c_{pg.0-pt} )</th>
<th>( c_{pg.0-rb} )</th>
<th>( c_{pg.0-rc}^{(1)} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage ([U_r]) ( kV )</td>
<td>24</td>
<td>36</td>
<td>40.5 (^{(1)})</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial frequency ([U_d])</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between phases ( kV )</td>
<td>50</td>
<td>70</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolating distance ( kV )</td>
<td>60</td>
<td>80</td>
<td>118</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightning impulse ([U_p])</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between phases ( kV )</td>
<td>125</td>
<td>170</td>
<td>185</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolating distance ( kV )</td>
<td>145</td>
<td>195</td>
<td>215</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{(1)}\) For rated voltage of 40.5 \( kV \) there are no models available \( c_{pg.0-vl}, c_{pg.0-f}, c_{pg.0-f}^{(1)} \) and \( c_{pg.0-rc}^{(1)} \)

Table 2.1 Table of common electrical characteristics to the \( c_{pg.0} \) family

<table>
<thead>
<tr>
<th>For rated voltage of 24 ( kV )</th>
<th>( c_{pg.0-v} )</th>
<th>( c_{pg.0-vl} )</th>
<th>( c_{pg.0-c} )</th>
<th>( c_{pg.0-f} )</th>
<th>( c_{pg.0-f}^{(1)} )</th>
<th>( c_{pg.0-s} )</th>
<th>( c_{pg.0-pt} )</th>
<th>( c_{pg.0-rb} )</th>
<th>( c_{pg.0-rc} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current ([I_r])</td>
<td>A</td>
<td>1250</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>1250</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
</tr>
<tr>
<td>General busbar</td>
<td>A</td>
<td>1250</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>1250</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
</tr>
<tr>
<td>Branch</td>
<td>A</td>
<td>630</td>
<td>1250</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>1250</td>
<td>1600</td>
<td>2000</td>
</tr>
<tr>
<td>Short-circuit ([I_s]) ( t_s = 1 ) or 3 ( s )</td>
<td>kA</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
</tr>
</tbody>
</table>

\(^{(1)}\) With forced ventilation from 2250 \( A \)
\(^{(2)}\) Also for side branch

Table 2.2 Specific electrical characteristics for 24 \( kV \) series
Technical characteristics

GIS-type medium-voltage switchgear with full insulation in SF₆ gas, up to 40.5 kV in accordance with IEC Standards

### General Instructions

**cpg.0**

1. **GIS-type medium-voltage switchgear with full insulation in SF₆ gas, up to 40.5 kV in accordance with IEC Standards**

#### Table 2.3  Specific electrical characteristics for 36 kV series

<table>
<thead>
<tr>
<th>For voltage of 36 kV</th>
<th>cpg.0-v</th>
<th>cpg.0-vl</th>
<th>cpg.0-c</th>
<th>cpg.0-s</th>
<th>cpg.0-f</th>
<th>cpg.0-fl</th>
<th>cpg.0-pt</th>
<th>cpg.0-rb</th>
<th>cpg.0-rc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current [I_r]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General busbar</td>
<td>A</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
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<tr>
<td></td>
<td></td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>1600</td>
<td>2000</td>
</tr>
<tr>
<td>Branch</td>
<td>A</td>
<td>630</td>
<td>1250</td>
<td>NA</td>
<td>1250**</td>
<td>NA</td>
<td>200</td>
<td>1250**</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1250</td>
<td>2000</td>
<td>2500**</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit [I_l]</td>
<td></td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
</tr>
</tbody>
</table>

(*) With forced ventilation from 2250 A
(**) Also for side branch

#### Table 2.4  Specific electrical characteristics for 40.5 kV series

<table>
<thead>
<tr>
<th>For voltage of 40.5 kV</th>
<th>cpg.0-v</th>
<th>cpg.0-c</th>
<th>cpg.0-s</th>
<th>cpg.0-pt</th>
<th>cpg.0-rb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current [I_r]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General busbar</td>
<td>A</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>1600</td>
</tr>
<tr>
<td>Branch</td>
<td>A</td>
<td>630</td>
<td>NA</td>
<td>1250</td>
<td>1250</td>
</tr>
<tr>
<td>Short-circuit [I_l]</td>
<td></td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
<td>25 / 31.5</td>
</tr>
</tbody>
</table>

#### Table 2.5  Additional electrical characteristics

<table>
<thead>
<tr>
<th>Other characteristics</th>
<th>cpg.0-v / cpg.0-vl</th>
<th>cpg.0-c</th>
<th>cpg.0-s</th>
<th>cpg.0-rb / cpg.0-fl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic reclosing sequence</td>
<td>O - 0.3 s - CO - 15 s - CO</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorised spring loading time</td>
<td>s</td>
<td>&lt; 15</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Short-circuit breaking rated current</td>
<td>kA_rms</td>
<td>25 / 31.5</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Short-circuit closing rated current</td>
<td>kA_peak</td>
<td>65 / 82</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Opening time</td>
<td>ms</td>
<td>&lt; 45</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Short-circuit break-time</td>
<td>ms</td>
<td>&lt; 50</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Vacuum feeder rated current</td>
<td>A</td>
<td>10</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Vacuum cable rated current</td>
<td>A</td>
<td>31.5</td>
<td>50</td>
<td>31.5</td>
</tr>
<tr>
<td>Transfer rated current</td>
<td>A</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Capacitor bank rated current</td>
<td>A</td>
<td>400</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Internal fault rated current</td>
<td>kA</td>
<td>65 / 82</td>
<td>25 / 31.5</td>
<td></td>
</tr>
<tr>
<td>Internal fault rated time</td>
<td>s</td>
<td>1</td>
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</tr>
</tbody>
</table>

#### Electrical endurance

- Circuit breaker: E2
- Feeder disconnector: E0
- Earthing switch: E2
- Feeder disconnector: E0
- Earthing switch: E2
- Switch: E3
- Earthing switch: E2

#### Mechanical endurance

- Circuit breaker: M2
- Feeder disconnector: M1
- Earthing switch: M1

#### Internal arc classification in accordance with IEC 62271-202

AFL[R] 25 / 31.5 kA 1

NA: Not applicable
2.1.1 Name plate

Each unit includes a name plate, with some of the following data, reflecting each cubicle’s individual electrical characteristics:

![Figure 2.1 Example of name plate](image)

<table>
<thead>
<tr>
<th>Name plate</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N°</td>
<td>Cubicle serial number(*)</td>
</tr>
<tr>
<td>Type</td>
<td>Ormazabal cubicle system</td>
</tr>
<tr>
<td>Designation</td>
<td>Cubicle model</td>
</tr>
<tr>
<td>Standard</td>
<td>Standards applied to the equipment</td>
</tr>
<tr>
<td>U_r</td>
<td>Equipment rated voltage (kV)</td>
</tr>
<tr>
<td>U_l</td>
<td>Lightning impulse withstand voltage (kV)</td>
</tr>
<tr>
<td>U_d</td>
<td>Industrial frequency withstand voltage (kV)</td>
</tr>
<tr>
<td>f_e</td>
<td>Equipment rated frequency (Hz)</td>
</tr>
<tr>
<td>I_r</td>
<td>Equipment rated current (A)</td>
</tr>
<tr>
<td>I_s / I_p</td>
<td>Short-time withstand current/Short-time withstand peak value</td>
</tr>
<tr>
<td>t_s</td>
<td>Short-time withstand current time</td>
</tr>
<tr>
<td>P_m</td>
<td>Gas pressure inside the cubicle (MPa)</td>
</tr>
<tr>
<td>P_mw</td>
<td>Minimum operating gas pressure (MPa)</td>
</tr>
<tr>
<td>SF_6</td>
<td>Weight of insulating fluid (g)</td>
</tr>
<tr>
<td>Year</td>
<td>Year of manufacture</td>
</tr>
<tr>
<td>TC</td>
<td>Thermal class</td>
</tr>
<tr>
<td>IAC</td>
<td>Internal arc classification</td>
</tr>
</tbody>
</table>

(*) In the event of incident, this number should be reported to Ormazabal.

Table 2.6 List of information contained on the name plate
### 2.2  Mechanical characteristics

#### 2.2.1  Dimensions

**Figure 2.2  cpg.0 dimensions**

<table>
<thead>
<tr>
<th>Model</th>
<th>( l_{\text{outside}} )</th>
<th>a</th>
<th>ap</th>
<th>h</th>
<th>hp</th>
<th>f</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>630</td>
<td>600</td>
<td></td>
<td>2125</td>
<td>665</td>
<td>1015</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td>1250</td>
<td>600</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td>1600</td>
<td>700</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>900</td>
</tr>
<tr>
<td></td>
<td>2000 / 2500</td>
<td>1000</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>1100 / 1200</td>
</tr>
<tr>
<td>vl</td>
<td>1250</td>
<td>600</td>
<td>789</td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>870</td>
</tr>
<tr>
<td>f</td>
<td>200</td>
<td>600</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>550</td>
</tr>
<tr>
<td>fl</td>
<td>200</td>
<td>600</td>
<td>789</td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>850</td>
</tr>
<tr>
<td>s</td>
<td>1250</td>
<td>600</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td>1600</td>
<td>700</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>2000 / 2500</td>
<td>1000</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>1100 / 1200</td>
</tr>
<tr>
<td>c</td>
<td>1250</td>
<td>1200</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>1300</td>
</tr>
<tr>
<td></td>
<td>1600</td>
<td>1400</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>1550</td>
</tr>
<tr>
<td></td>
<td>2000 / 2500</td>
<td>2000</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>2300 / 2500</td>
</tr>
<tr>
<td>rb</td>
<td>1250</td>
<td>600</td>
<td></td>
<td>2425</td>
<td>665</td>
<td>1365*</td>
<td>500</td>
</tr>
<tr>
<td>pt</td>
<td>-</td>
<td>600</td>
<td></td>
<td>2125</td>
<td>665</td>
<td>1365*</td>
<td>850</td>
</tr>
<tr>
<td>rci</td>
<td>-</td>
<td>500</td>
<td></td>
<td>2425</td>
<td></td>
<td></td>
<td>260</td>
</tr>
<tr>
<td>rcd</td>
<td>-</td>
<td>430</td>
<td></td>
<td>2425</td>
<td></td>
<td></td>
<td>250</td>
</tr>
</tbody>
</table>

\( (*) \) 1410 mm in the case of cubicles with IAC AFLR rating.

**Table 2.7  cpg.0 dimensions and weights**
2.2.2 IP rating

All power circuit elements are installed inside a stainless steel gas tank, providing IP65 degree of protection. The standard degree of protection for the cubicle assembly, in all designations, is IP3X, and as an option it can reach IP4X.
3 Normal service conditions\(^{(a)}\)

<table>
<thead>
<tr>
<th>Installation</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum ambient temperature</td>
<td>+ 40 °C</td>
</tr>
<tr>
<td>Minimum ambient temperature</td>
<td>− 5 / - 15 / - 25 °C</td>
</tr>
<tr>
<td>Maximum mean ambient temperature, measured over a 24-hour period</td>
<td>+ 35 °C</td>
</tr>
<tr>
<td>Maximum mean relative humidity, measured over a 24-hour period</td>
<td>&lt; 95 %</td>
</tr>
<tr>
<td>Maximum mean vapour pressure, measured over a 24-hour period</td>
<td>22 mbar</td>
</tr>
<tr>
<td>Maximum mean vapour pressure, measured over a 1-month period</td>
<td>18 mbar</td>
</tr>
<tr>
<td>Maximum height above sea level</td>
<td>1000 m</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>Negligible</td>
</tr>
<tr>
<td>Ambient air pollution (dust, smoke, corrosive and/or flammable gases, vapours or salt)</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Vibrations caused by causes external to the switchgear or by seismic movements</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>

\(^{(a)}\) For special service conditions (maximum ambient temperature above + 40 °C, transport height, storage or installation over 1000 m above sea level, significant pollution level, or others different to those described) check with Ormaizabal.

Table 3.1 Normal service conditions

The specifications refer to the section 'Normal service conditions for indoor cubicles' in the IEC 62271-1 standard 'Common specifications for high-voltage cubicles'.
4 Handling and transport

4.1 Transport conditions

During transport, the switchgear must be perfectly seated and fixed so that it cannot move about and possibly damage the equipment. Always in upright position, directly on the ground or on a wooden pallet, depending on the type of handling involved. Check that the cubicle is perfectly balanced at all times.

4.2 Lifting means

The cpg.0 cubicles can be handled by lifting (with slings) or with a forklift truck (with a pallet):

![Figure 4.1](image1.png)  **Figure 4.1** Lifting a cpg.0 cubicle using chains

![Figure 4.2](image2.png)  **Figure 4.2** Lifting a cpg.0-c cubicle with a forklift truck
During the installation period, Ormazabal provides a specific tool for lifting the cpg.0-c coupling cubicle:

**Figure 4.3** Lifting a cpg.0-c cubicle with a specific tool

**Figure 4.4** Lifting a cpg.0-c cubicle using a forklift truck and specific tool

Elevating caster wheels can be used to put the cubicles in their final position.

---

Optional supply. Please check with Ormazabal.
5 Storage

If it needs to be stored, the equipment must be placed on dry ground or on top of damp-proof insulating material, still in its original packaging, ensuring it is not damaged during the storage period.

After prolonged storage, clean all the insulating parts carefully before commissioning the equipment. The enclosure should be cleaned with a clean, dry lint-free cloth.

Figure 5.1 Storage conditions detail

Storage must always be INDOORS, with the following conditions recommended:

1. Ambient air temperature should not exceed 40 °C and its mean value, measured in a period of 24 hours, should not exceed 35 °C.

2. The ambient air temperature should not drop below -5 °C. There are also cubicles with storage temperature up to -15 °C and up to -25 °C.

3. The switchgear must be protected from direct solar radiation.

4. Maximum altitude is 1000 m.

5. The environmental air must not have any significant contamination from dust, smoke, corrosive and/or inflammable gases, vapours or salt.

6. The switchgear must be protected from the rain, and the humidity conditions should be as follows:
   a) The mean relative humidity value, measured over a period of 24 hours, must not exceed 95%.
   b) The mean water steam pressure value, measured in a period of 24 hours, must not exceed 2.2 kPa.
   c) The mean relative humidity value, measured over a period of one month, must not exceed 90%.
   d) The mean water steam pressure value, measured in a period of one month, must not exceed 1.8 kPa.

7. During transport, vibrations caused by external factors or seismic movements must be insignificant.

Any other conditions must be notified beforehand, since the equipment must be factory-adjusted to the atmospheric pressure. Otherwise, the needle may indicate an incorrect value (red scale), even though the value of the equipment internal pressure is correct. Otherwise, the manometer needle may indicate an incorrect value, even if the equipment's internal pressure is correct.
6 Installation

6.1 Unpacking the equipment

The cpg.0 switchgear is supplied protected with a plastic cover.

On receiving the equipment, check that the goods supplied correspond to the order and associated documentation. If this is not the case, contact Ormazabal immediately.

The disassembly process for the equipment is as follows:

1. Using a blade, cutter or similar tool, cut the cellophane the cubicle is wrapped in.
2. Remove the cellophane.
3. Detach the white polystyrene corner pieces.
4. Unscrew the fixings between the base and the pallet.
5. Dispose of any waste in an environmentally-friendly manner.

It is advisable to make a visual inspection of the equipment to check whether it has suffered any damage in transit. If damaged, contact Ormazabal immediately.

6.2 List of assembly materials supplied

Along with the cpg.0 switchgear a box is supplied with all the material necessary for installation and correct operation.

Depending on the cubicles which form part of the supply, the assembly materials delivered will be some of the following:

1. Spring charging and actuating levers.
2. Interconnection busbars and busbar compartment enclosure elements.
3. Earthing bars.
4. Decorative sides.
5. Medium voltage fuses (where applicable)
7. Alcohol and paper roll.

Ensure the box contains the elements indicated in the materials list provided with the supply. If it does not, contact Ormazabal.
### 6.3 Minimum installation distances

The minimum distances to the walls and ceiling, in accordance with Standard IEC-62271-200 Annex AA, are as follows:

<table>
<thead>
<tr>
<th>Minimum distances [mm]</th>
<th>Cubicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side wall (a)</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>Roof (b)</td>
<td>&gt; 350</td>
</tr>
<tr>
<td>Front clearance (c)</td>
<td>Operation: &gt; 1000</td>
</tr>
<tr>
<td></td>
<td>Cubicle removal: &gt; 1500</td>
</tr>
<tr>
<td>Rear wall (d)</td>
<td>&gt; 100*</td>
</tr>
</tbody>
</table>

(*) if the cubicle is AFLR 600 mm

**Table 6.1 Minimum installation distances**

For other types of building work, please check with Ormazabal

---

### 6.4 Cable trench

The surface where the cubicles will be installed must be level with a tolerance of +/- 1 millimetre per metre. The general layout of the cubicles will be checked in order to verify the suitability of the medium and low-voltage cable area.

See recommended dimensions in section 6.3.
6.4.1 Recommended dimensions

Minimum recommended dimensions based on the trench dimensions used in the tests in accordance with IEC 62271-200. The dimensions of the trench may vary in accordance with the minimum radius of curvature of the cables used.

<table>
<thead>
<tr>
<th>Minimum distances [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trench</td>
</tr>
<tr>
<td>Depth (e)</td>
</tr>
<tr>
<td>Depth (f)</td>
</tr>
</tbody>
</table>

(*) The dimensions of the trench depend on the characteristics of the cables used.

Table 6.2 Minimum recommended dimensions for the cable trench

![Figure 6.4 Trench dimensions](image)

6.5 Fastening to the floor

Secure the cubicles to the floor at the relevant fixing points inside the bottom supports using the M8 x 50 hexagonal bolts provided with the material.

![Figure 6.5 Fixing points inside the cable compartment](image)
6.6 Connecting cubicles

Join the cubicles through the fixing points; use the M8 x 20 hexagonal screws and M8 nuts provided with the different material.

Figure 6.6 Hexagonal screw and nut detail

Figure 6.7 Detail of the positioned hexagonal screw

Figure 6.8 Detail of the nut

Figure 6.9 Detail of the two connected cubicles

The assembly sequence for the busbar and the busbar compartment enclosure is described in Ormazabal’s RA-283 Spares and Accessories Instructions document.
6.6.1 cpg.0-v 24 kV 630 A

The fixing points for circuit-breaker cubicles of up to 630 A are defined in figure 6.10:

![Figure 6.10 Fixing points](image1)

6.6.2 cpg.0-v 1250 A and 1600 A/cpg.0-pt/cpg.0-vl

The fixing points for 1250 and 1600 A circuit-breaker cubicles are defined in figure 6.11:

![Figure 6.11 Fixing points with side connection](image2)
6.6.3 **cpg.0-v 2500 A**

The fixing points for 2500 A circuit-breaker cubicles are defined in figure 6.12:

![Figure 6.12 Fixing points](image)

6.6.4 **cpg.0-c**

The fixing points for longitudinal coupling cubicles are defined in figure 6.13:

![Figure 6.13 Fixing points](image)
6.6.5  cpg.0-s

The fixing points for disconnector cubicles are defined in figure 6.14:

Figure 6.14  Fixing points

6.6.6  cpg.0-f / cpg.0-fl

The fixing points for fuse protection cubicles are defined in figure 6.15:

Figure 6.15  Fixing points
6.6.7 cpg.0-rb

The fixing points for busbar rise cubicles are defined in figure 6.16:

![Figure 6.16 Fixing points](image)

6.7 Equipment earthing

The cubicles earthing circuit consists of three zones: top, bottom and side, which join the top section with the bottom.

6.7.1 Top section

The top area will only have copper plates when the busbar enclosure has protection for internal arc or voltage transformers in busbars.

![Figure 6.17 Top earthing plate](image)

![Figure 6.18 Example of horizontal earthing plates](image)
6.7.2 **Bottom section**

The bottom part is always connected to a copper bar.

![Earthing circuit bottom area detail](image)

**Figure 6.19** Earthing circuit bottom area detail

(a) Earth bars between cubicles.
(b) Earth plates to join 24 kV - 630 A cubicles to other cubicles.
(c) Earth braid to join 24 kV - 630 A cubicles to busbar coupling cubicle.

**Figure 6.20** Type of bottom earthing plates

6.7.3 **Side area**

The top to bottom connection, by design, is on the right side.

![Side earth link detail](image)

**Figure 6.21** Side earth link detail
In the case of the right cable rise cubicle (cpg.0-rcd) that is assembled on a fuse protection cubicle with right side connection (cpg.0-fl) the link is different, as shown in Figure 6.22.

Figure 6.22  Detail of the end earthing on cubicle cpg.0-rcd
7 Operations sequence

7.1 Operation and commissioning sequence

7.1.1 Disconnector function operating sequence (cpg.0-s)

For cubicles of type:

- cpg.0-s up to 36 kV / 1250 A / 25 kA
- cpg.0-s 40.5 kV / 1250 A / 25 kA
- cpg.0-s up to 40.5 kV / 1250 A / 31.5 kA
- cpg.0-s 36 kV / 1600 A / 31.5 kA

When the disconnector and/or earthing switch driving mechanisms are motorised, they are fitted with a "MOTORISED" or "MANUAL" driving switch to first select the type of operation to be carried out.

![Diagram of disconnector function operating sequence]

Figure 7.1 Driving switch detail.

a) Manual operation of the feeder disconnector

![Diagram of manual operation of the feeder disconnector]

Figure 7.2 Details of the manual driving lever of the feeder disconnector.

The FEEDER DISCONNECTOR manual driving lever is identified by the GREY symbol area.
**Connection**

Move the access interlock down to the driving shafts and insert the lever with the disconnector open symbol aligned with the "I" in the disconnector operation area (grey). Then turn 135° CLOCKWISE.

**Disconnection**

Move the access interlock down to the driving shafts and insert the lever with the disconnector closed symbol aligned with the "I" in the disconnector operation area (grey). Then turn 135° ANTI-CLOCKWISE.

- **Figure 7.3** Feeder disconnector connection sequence
- **Figure 7.4** Feeder disconnector disconnection sequence
- **Figure 7.5** Details of the manual driving lever of the earthing switch

The EARTHING SWITCH manual driving lever is identified by the YELLOW symbol area.
**Connection**

Move the access interlock down to the driving shafts and insert the lever with the disconnector open symbol aligned with the "I" in the earthing switch operation area (yellow). Then turn 135° CLOCKWISE.

**Disconnection**

Move the access interlock down to the driving shafts and insert the lever with the disconnector closed symbol aligned with the "I" in the earthing switch operation area (yellow). Then turn 135° ANTI-CLOCKWISE.
For cubicles of type:

- **cpg.0-s** up to 24 kV / 1600 A / 25 kV

When the disconnector and/or earthing switch drives are motorised, they are fitted with a “MOTORISED” or “MANUAL” driving switch to first select the type of operation to be carried out.

![Driving switch detail](image)

**Figure 7.8** Driving switch detail

**Figure 7.9** Details of the manual driving lever of the feeder disconnector

The DISCONNECTOR manual driving lever is identified by the white sleeve on the neck and an orifice on the side which is inserted.
Connection
Move the cover interlocking down and insert the lever. Then turn 90º CLOCKWISE.

Disconnection
Lower the access interlock to the operating shafts and insert the lever. Then turn 90º ANTI-CLOCKWISE.

Figure 7.10 Feeder disconnector connection sequence

Figure 7.11 Feeder disconnector disconnection sequence

b) Manual operation in the earthing switch

Figure 7.12 Details of the manual driving lever of the earthing switch

The EARTHING SWITCH manual driving lever is identified by the yellow sleeve on the neck.
Connection

Lower the access interlock to the operating shafts and insert the lever. Then turn 90º CLOCKWISE.

Figure 7.13  Earthing switch connection sequence
**Disconnection**

Lower the access interlock to the operating shafts and insert the lever. Then turn 90º ANTI-CLOCKWISE.

*Figure 7.14  Earthing switch disconnection sequence*
7.1.2 Circuit-breaker function operation sequence (cpg.0-v / cpg.0-vl)

For cubicles of type:

- **cpg.0-v** up to 24 kV / 630 A / 25 kA
- **cpg.0-v** up to 36 kV / up to 1250 A / 25 kA
- **cpg.0-v** 40.5 kV / up to 1250 A / 25 kA
- **cpg.0-vl** up to 36 kV / up to 1250 A / 25 kA

The lever for the manual charging of the aforementioned CIRCUIT-BREAKER closing springs is identified by the hexagonal cavity in the end.

Connection

**Figure 7.15** Starting position of the **cpg.0-v** disconnector

Insert the lever in the feeder disconnector driving shaft. Then turn 90º CLOCKWISE. Check that the disconnector status indicator shows closed.

**Figure 7.16** Feeder disconnector connection sequence
If the spring charging status indicator on the circuit breaker shows DISCHARGED, move the access interlock cover to the right and insert the spring charging lever.

Turn ANTICLOCKWISE approximately one and a half turns until the indication changes to springs CHARGED.

Press the “I” pushbutton to close the circuit-breaker. The circuit-breaker status indicator shows CLOSED.

**Figure 7.17**  Spring charging sequence

**Figure 7.18**  Springs charged indication

**Figure 7.19**  Circuit-breaker closed indication
Operations sequence

GIS-type medium-voltage switchgear with full insulation in SF₆ gas, up to 40.5 kV in accordance with IEC Standards

**Disconnection**

Press the "0" pushbutton to open the circuit-breaker.

Insert the lever in the feeder disconnector driving shaft. Then turn 90º anti-clockwise. Check that the disconnector status indicator shows opened.

For cubicles of type:
- \textit{cpg.0-v} up to 24 kV / 1600 A / 25 kA
- \textit{cpg.0-v} 40,5 kV / up to 1250 A / 31.5 kA
- \textit{cpg.0-v} up to 36 kV / up to 1600 A / 31.5 kA
- \textit{cpg.0-v} up to 36 kV / up to 2500 A / 31.5 kA
- \textit{cpg.0-vl} up to 36 kV / up to 1250 A / 31.5 kA

The lever for the manual charging of the aforementioned CIRCUIT-BREAKER closing springs is identified by its black knob.

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{circuit-breaker-open-indication}
\caption{Circuit-breaker open indication}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{feeder-disconnector-disconnection-sequence}
\caption{Feeder disconnector disconnection sequence}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{starting-position-of-cpg0-v-disconnector}
\caption{Starting position of the \textit{cpg.0-v} disconnector}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{details-of-circuit-breaker-manual-spring-charging-lever}
\caption{Details of the circuit-breaker manual spring charging lever}
\end{figure}
a) Circuit-breaker manual operation.

Connection

Insert the lever in the feeder disconnector actuating shaft. Then turn 90° CLOCKWISE. Check that the disconnector status indicator shows closed.

Figure 7.24 Starting position of the cpg.0-v disconnector

Figure 7.25 Feeder disconnector connection sequence
If the spring charging status indicator shows DISCHARGED, slide the access interlocking cover to the left and insert the spring charging lever.

Move vertically, up and down, several times until the indication changes to springs CHARGED.

Press the "I" pushbutton to close the circuit-breaker. The circuit-breaker status indicator shows CLOSED.
**Disconnection**

Press the "0" pushbutton to open the circuit-breaker.

Insert the lever in the feeder disconnector driving shaft then turn 90º ANTI-CLOCKWISE. Check that the feeder disconnector status indicator shows opened.

---

**General Instructions**

GIS-type medium-voltage switchgear with full insulation in SF₆ gas, up to 40.5 kV in accordance with IEC Standards.
**Cable test**

Once the earthing switch has been connected and the cable compartment cover has been removed, proceed as follows:

1. With a thin screwdriver, or similar tool, push through the "cable compartment cover open" interlock slot, releasing this interlock and the operating push-buttons on the circuit-breaker.
2. Press the "0" pushbutton to open the circuit-breaker.
3. Disconnect the earthing switch. For safety reasons, it is advisable to padlock access to feeder disconnector operation.
4. Press the "I" pushbutton to close the circuit-breaker.
5. Press the "0" pushbutton to open the circuit-breaker.
6. Disconnect the earthing switch.
7. Close the feeder disconnector.
8. Press the "I" pushbutton to close the circuit-breaker.

To return the cubicle to the initial conditions perform the sequence in reverse order:

1. Press the "0" pushbutton to open the circuit-breaker.
2. Close the earthing switch.
3. Press the "I" pushbutton to close the circuit-breaker.
4. Lift the cable compartment cover interlock with a thin screwdriver, or similar, and fit the cable compartment cover.
7.1.3 **Busbar coupling function operation sequence (cpg.0-c)**

The following sequences are based on the instructions given for the operation of the feeder disconnector and circuit breaker in the previous sections.

The initial situation for the different operations is considered to be where both the feeder disconnectors and the circuit-breaker are open.

**a) Busbar coupling operations**

1. Close the right feeder disconnector.

2. Close the left feeder disconnector.

3. Connect the circuit-breaker.

---

**Figure 7.34**  Busbar coupling sequence (i)

**Figure 7.35**  Busbar coupling sequence (ii)

**Figure 7.36**  Busbar coupling sequence (iii)
b) Earthing operations of the right busbar

1. Close the right feeder disconnector.

2. Close the left earthing switch.

3. Connect the circuit-breaker.

To open the earthing connection of the right busbar, reverse the sequence of operation.
c) **Earthing operations of the left busbar**

1. Close the left earthing switch.

2. Close the right earthing switch.

3. Connect the circuit-breaker.

To open the earthing connection of the left busbar, reverse the sequence of operation.

---

**Figure 7.40**  *Left busbar earthing sequence (i)*

**Figure 7.41**  *Left busbar earthing sequence (ii)*

**Figure 7.42**  *Left busbar earthing disconnection sequence (iii)*
7.1.4 Busbar rise cubicle (cpg.0-rb)

Figure 7.43 Detail of the busbar rise cubicle mimic diagram
7.1.5 Busbar earthing function operating sequence (cpg.0-pt)

Initial conditions: open all the main busbar feeder disconnectors.

Connection

1. Insert the lever in the earthing switch driving shaft Then turn 90º CLOCKWISE. Check that the earthing switch status indicator shows closed.

2. Press the "I" pushbutton to close the circuit-breaker.

Figure 7.44 Earthing switch connection sequence

Figure 7.45 "I" pushbutton detail

Figure 7.46 Circuit-breaker closed indication
**Disconnection**

1. Press the "0" pushbutton to open the circuit-breaker.

![Figure 7.47 Circuit-breaker open indication](image)

2. Insert the lever in the earthing switch driving shaft. Then turn 90° ANTI-CLOCKWISE. Check that the earthing switch status indicator shows open.

![Figure 7.48 Earthing switch disconnection sequence](image)
### 7.1.6 Operating sequence in fuse protection function (cpg.0-f / cpg.0-fl)

**Figure 7.49** Initial situation for cpg.0-f cubicle

**Figure 7.50** Initial situation for cpg.0-fl cubicle

In the following sequences only figures of the mimic diagram of the fuse protection function with left-side connection are shown (cpg.0-fl). The sequences for the fuse protection cubicle (cpg.0-f) are identical.

---

**a) Switch-disconnector closing and opening operations:**

**Charging springs and connection**

1. Move the driving shaft access handle to its lower position.

2. Insert the lever in the switch-disconnector driving shaft, move the drive arm to the end and press inwards on the head of the lever with one hand, and turn clockwise with the other hand. In the same turn, the switch-disconnector is closed and the retaining springs are charged.

---

In the case of motorised driving mechanism, closing and tensioning of springs can be carried out manually or motorised.

**Figure 7.51** Situation prior to turning the lever
3. Verify that the cubicle is in closed position.

**Disconnection**

1. The switch can be opened manually, using the push-button on the front of the cubicle, an opening coil, or due to action by the fuses.

2. Verify that the cubicle is in disconnected position.
b) Earthing switch closing and opening operations

**Connection**

1. Move the driving shaft access handle to its lower position.

2. Insert the lever in the earthing switch driving shaft, move the drive arm to the end and press inwards on the head of the lever with one hand, and turn 90° clockwise with the other hand.

3. Verify that the cubicle is in earthing position.

**Figure 7.55** Situation prior to turning the lever

**Figure 7.56** Earthing switch closed
**Operations sequence**

GIS-type medium-voltage switchgear with full insulation in SF₆ gas, up to 40.5 kV in accordance with IEC Standards

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**Disconnection**

1. Move the driving shaft access handle to its lower position.

2. Insert the lever in the earthing switch driving shaft, move the drive arm to the end and press inwards on the head of the lever with one hand, and turn 90º anticlockwise with the other hand.

3. Verify that the cubicle is in disconnected position.

---

*Figure 7.57  Situation prior to turning the lever*

*Figure 7.58  Earthing switch open*
Replacing fuses

To access the fuse holders, first remove the cable compartment cover. It is essential to close the earthing switch. If any of the three fuses blows, the switch-disconnector (a) will open automatically; this is indicated by the red position indicator (b) located on the front of the driving mechanism compartment.

1. Close the earthing switch (c).
2. Remove the cable and fuse compartment access cover by pulling the handle (d) up.
3. Pull up the handle on the fuse holder cover until the locking clip is unhooked and then pull sharply outwards to open the fuse holder.
4. Remove the fuse holder carriage by pulling it outward.
5. Replace the blown fuse, taking special care with the striker as shown in the figure.

Make sure that the end of the new fuse with the striker faces the carriage insulator end. It is advisable to change all three fuses, even if only one of them appears to be damaged.
6. Insert the fuse holder carriage in its compartment by pulling it inward.

7. Reset the fuse striker by pressing downward with the thumb.

Before inserting the fuse holder carriage in the fuse protection cubicle, ensure that both the carriage as well as the inside of the fuse holder are properly cleaned.

8. Close the cover and check that all the strikers have been reset.

9. Place the fuse and cable compartment access cover (a) by pushing it downward and ensuring it is locked on the cubicle, taking into account that the fuse status indicator (b) is green.

10. Start up the cubicle following the instructions set out in these General Instructions document.
Revised fuses

The fuses recommended for use in the cpg.0-f and cpg.0-fl cubicles are defined according to tests carried out by the manufacturers. The following table shows the recommended fuse ratings according to the $U_r/P_{\text{transf}}$ ratio:

<table>
<thead>
<tr>
<th>$U_n$ (Network) (kV)</th>
<th>$U_n$ (Cubicle) (kV)</th>
<th>TRANSFORMER POWER (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 125 160 200 250</td>
<td>315 400 500 630 800 1000 1250</td>
</tr>
<tr>
<td>10</td>
<td>24 16 25 40 40 63 63 100 125 160</td>
<td></td>
</tr>
<tr>
<td>13.8</td>
<td>24 16 25 40 40 63 63 100 100 125</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>24 16 25 40 40 63 63 100 100 100</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>24 16 25 40 40 63 63 100 100 100</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>36 16 25 40 40 63 63 100 100 63</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>36 16 25 40 40 63 63 100 63 63</td>
<td></td>
</tr>
</tbody>
</table>

General operating conditions: Overload < 20% and Temperature < 40 °C

Shaded areas: Overload < 30% and Temperature < 50 °C Maximum permitted losses of the fuse: < 75 W (55 W for $U = 10$ kV)

Table 7.11 Ratings of recommended fuses

Transfer currents according to IEC 62271-105

The transfer currents have been tested in accordance with the following parameters:

<table>
<thead>
<tr>
<th>$U_r$ Fuse (kV)</th>
<th>$U_r$ Cubicle (kV)</th>
<th>$I_r$ Fuse (A)</th>
<th>$I$ Transfer (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 36</td>
<td>Up to 36</td>
<td>40</td>
<td>820</td>
</tr>
</tbody>
</table>

Table 7.12 Transfer current
8 Safety elements

8.1 ekor.ivds voltage detectors

The voltage presence/absence detector installed in cpg.0 cubicles is designed and built in accordance with the recommendations set out in the IEC 61243-5, VDE 0682 Part 415 and IEC 62271-206 standards within the integrated detectors without auxiliary power supply category.

The unit has three light signals corresponding to phases L1, L2 and L3. On the front of the indicator, a test point is accessible for each of the phases and earth, which is used to test the balance of all phases. We recommend use of any universal phase comparator which complies with standard IEC 61243-5. As an option, the detection unit has a free auxiliary contact for remote indication of voltage presence/absence.

The device indication complies with the requirements laid down in standard IEC 61243-5:
- **Absence of voltage**: \( U (*) < 10\% U_r (***)
- **Uncertainty**: \(10\% U_r < U < 45\% U_r
- **Presence of voltage**: \( U > 45\% U_r

\( (*) U = \) phase-to-earth voltage
\( (***) U_r = \) rated operating voltage.

The presence of voltage is indicated by activation of the LEDs for each of the phases. If the presence of voltage is not detected, the LEDs for each of the phases remain unlit.

8.2 Locking with a padlock

As an option, upon request, the cubicles are supplied with an independent padlock for both the feeder disconnector and the earthing switch in closed or open positions. Padlocks with ring diameters of between 8 and 11 mm can be used.

Circuit breaker drive buttons can be individually locked using a padlock.

8.2.1 Locking with lock

Both the feeder disconnector and the earthing switches can have an optional lock locking device, which allows its operation to be blocked in both open and closed positions.
8.3 Interlocks

The switch, circuit breaker and earthing switch are interlocked in accordance with section 5.11 of standard IEC 62271-200.

The disconnector driving shafts are accessed via an “driving switch”, and the levers of both disconnectors can only be introduced if the circuit-breaker is in open position. The circuit-breaker can only be operated if all the disconnector driving levers have previously been removed. Also, all electrical operations are overridden if any of the levers has been inserted in the driving shaft.

The circuit breaker can only be connected in the end positions (connected) of the disconnector or earthing switch. There is also an effective earth driving switch fitted with protection.

The cable compartment is only accessible with the earthing switch and the circuit breaker connected (effective earthing).

In functional units which incorporate fuses (protection by means of a switch-fuse combination and busbar voltage metering with disconnection and fuses), access to the fuse compartment is interlocked with the corresponding disconnector so that the compartment is only accessible with the earthing rated in the closed position.
9 Maintenance

For safety reasons, maintenance operations performed directly on the driving mechanism must be performed WITHOUT any driving levers inserted.

The active parts of the main circuit of cpg.0 cubicles do not require inspection or maintenance, thanks to the integrated SF₆ insulation, meaning there is no influence from external environmental factors. Class E2 electrical endurance tests mean that the breaking components are maintenance free.

For all other elements, follow the preventive maintenance instructions indicated by Ormazabal.

Components manufactured from galvanised sheet steel have been painted to ensure their resistance to corrosion. Any scratches, dents or similar on them must be repaired to prevent corrosion.

9.1 Voltage indicator test

To test the ekor.ivds voltage indicator, connect it to 230 Vₜₚ. To do this, disconnect the ekor.ivds device from the cubicle, and, using 4 mm terminals, apply the voltage between the test point for the phase to be checked and the earth test point.

No polarity is defined for 230 Vₜₚ, so either the phase or neutral conductor can be connected.

If a flashing signal is observed, the device is working correctly. In order to properly test the ekor.ivds, this check should be carried out for all three phases.

Voltage presence indication is not sufficient in itself to ensure that the installation has been disconnected from the electricity supply. Before accessing the cable compartments, it is necessary to confirm that the feeder is connected to earth.

The ekor.ivds voltage indicator can be replaced if needed. To do so, loosen to release the two screws on the top right and bottom left of the indicator using a medium size Phillips screwdriver. The ekor.ivds unit can then be disconnected from the base without needing to power down the feeder.

9.2 Preventive maintenance circuit-breakers

The driving mechanisms and other elements outside the gas tank may require preventive maintenance; the frequency of this maintenance depends on the existing environmental conditions (harsh environments, dust, extreme temperatures, etc.) and must be established in line with the experience and responsibility of the installer.

Maintenance should be carried out every 5 years or 2000 operating cycles, unless, based on the conditions of use, the user, together with Ormazabal, considers otherwise.
10 Spares and accessories

Although the cubicles have been designed for a service life in accordance with IEC 62271-200, certain components can be replaced and installed for various reasons.

If any of the stated auxiliary components need to be changed, the corresponding spare parts kit must be ordered, and the instructions given in the corresponding documentation must be followed.

Certain spares and accessories must be installed in the cubicle by specialised personnel. Please check with Ormazabal.
11 Environmental information

11.1 Sulphur hexafluoride SF₆

The cpg.0 cubicles are designed as a hermetically sealed pressure system containing sulphur hexafluoride (SF₆). SF₆ is included in the Kyoto Protocol list of greenhouse gases. SF₆ has a GWP (Global Warming Potential) of 22 200 (TAR, IPCC 2001).

At the end of the product's life, the SF₆ contained in it must be recovered for processing and recycling, to prevent it being released into the atmosphere. Extracting and handling of SF₆ must be carried out by qualified personnel, using a sealtight piercing system.

For the use and handling of the SF₆, the indications listed in IEC 62271-303 must be followed.

11.2 Recyclability

The management and treatment of all other materials must be carried out in accordance with current legislation of the installation country.

The materials that make up the cubicle (bases and front, gas tank, circuit-breaker, switch-disconnector/earthing switch and driving mechanisms) can be recycled. For further information, contact Ormazabal.

The bushings contain copper components which are difficult to separate from the resin. Therefore, these are treated as inert industrial waste together with the plastics.