Ormaset
Kiosk-type prefabricated transformer substation

General Instructions
IG-049-EN, version 02, 02/10/2017
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.

**Registered Trademarks and Copyrights**

All registered trademarks cited in this document are the property of their respective owners. The intellectual property of this manual belongs to Ormazabal.

\(^1\) For example, in Spain the “Regulation on technical conditions and guarantees for safety in high-voltage electrical installations” – Royal Decree 337/2014 is obligatory.
# Table of contents

1. **Description and main characteristics** ..........................4  
2. **Applicable standards** .........................................................5  
3. **Main components** ..............................................................6  
   3.1. Prefabricated monoblock concrete enclosure 6  
   3.2. Electrical equipment ......................................................7  
   3.2.1. Medium voltage switchgear ........................................8  
   3.2.2. Low voltage switchgear ..............................................8  
   3.2.3. Distribution transformer ...........................................8  
4. **Normal service conditions** .................................................9  
5. **Assigned ratings** ..............................................................10  
   5.1. Electrical characteristics .............................................10  
   5.2. Mechanical characteristics .........................................10  
6. **Handling** .......................................................................11  
   6.1. Handling ormaset .......................................................11  
   6.2. Handling the roof .......................................................11  
7. **Transport** ......................................................................12  
   7.1. Land transport ............................................................12  
   7.2. Sea transport ..............................................................12  
8. **Storage** .........................................................................13  
9. **Installation** ......................................................................14  
   9.1. Receiving the equipment .............................................14  
   9.2. Location .....................................................................14  
   9.3. Planning .....................................................................14  
   9.4. Preparing the ground ...................................................15  
   9.4.1. Excavation drawings ................................................15  
   9.4.2. Safety recommendations .........................................15  
   9.4.3. Levelling process ......................................................16  
   9.5. Access point for medium voltage and low voltage cables .................................17  
   9.6. Earth connection ..........................................................17  
   9.6.1. Protective earthing circuit (metallic parts) ................17  
   9.6.2. Operational earthing circuit (neutral) ......................18  
   9.6.3. Exterior earthing circuit ...........................................18  
10. **Operations sequence** .....................................................19  
    10.1. Opening and closing the access doors .......................19  
    10.2. Connecting the generator set before zero switching .................................20  
    10.3. Commissioning ..........................................................21  
11. **Maintenance** .................................................................22  
    11.1. Medium voltage switchgear ........................................22  
    11.2. Replacing the switchgear ..........................................22  
12. **Accessories included in the supply** .................................24  
13. **Environmental information** ...........................................25  
    13.1. Recyclability ..............................................................25
1. Description and main characteristics

**ormaset** is an *Ormazabal* transformer substation which is prefabricated, compact, half-buried and with external operation, designed in accordance with Standard IEC 62271-202 for use in public electrical distribution networks of up to 36 kV.
## 2. Applicable standards

*ormaset* meets the following standards and specifications:

<table>
<thead>
<tr>
<th>Standard / specification</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 62271-202</td>
<td>High voltage/low voltage prefabricated transformer substations.</td>
</tr>
<tr>
<td>IEC 60076</td>
<td>Power transformers</td>
</tr>
<tr>
<td>IEC 61439-1</td>
<td>Low voltage switchgear. General rules.</td>
</tr>
<tr>
<td>IEC 61439-5</td>
<td>Low voltage switchgear. Switchgear for public distribution networks.</td>
</tr>
<tr>
<td>IEC 60529</td>
<td>IP ratings for enclosures.</td>
</tr>
</tbody>
</table>

*Table 2.1. Applicable standards*
3. **Main components**

The *ormaset* transformer substation comprises the following main components:

- Prefabricated concrete enclosure.
- Electrical equipment

### 3.1. Prefabricated monoblock concrete enclosure

The prefabricated enclosure is made up of the following elements:

<table>
<thead>
<tr>
<th>1</th>
<th>Enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Removable roof</td>
</tr>
<tr>
<td>3</td>
<td>Compartments</td>
</tr>
<tr>
<td>3.1</td>
<td>Medium voltage switchgear</td>
</tr>
<tr>
<td>3.2</td>
<td>Distribution transformer</td>
</tr>
<tr>
<td>3.3</td>
<td>Low voltage switchgear</td>
</tr>
<tr>
<td>4</td>
<td>Access doors</td>
</tr>
<tr>
<td>4.1</td>
<td>Medium voltage area</td>
</tr>
<tr>
<td>4.2</td>
<td>Low voltage area and transformer</td>
</tr>
<tr>
<td>5</td>
<td>Ventilation grilles</td>
</tr>
<tr>
<td>5.1</td>
<td>Inlet grille</td>
</tr>
<tr>
<td>5.2</td>
<td>Outlet grille</td>
</tr>
<tr>
<td>6</td>
<td>Cable accesses</td>
</tr>
<tr>
<td>6.1</td>
<td>Pre-punched holes measuring 150 mm in diameter for medium voltage cable input/output</td>
</tr>
<tr>
<td>6.2</td>
<td>Pre-punched holes measuring 110 mm in diameter for low voltage cables</td>
</tr>
<tr>
<td>7</td>
<td>Earth cable access (holes measuring 20 mm in diameter)</td>
</tr>
<tr>
<td>8</td>
<td>Dielectric liquid collection pit</td>
</tr>
<tr>
<td>9</td>
<td>Earthing circuits</td>
</tr>
<tr>
<td>9.1</td>
<td>Protective earthing circuit (metallic parts)</td>
</tr>
<tr>
<td>9.2</td>
<td>Operational earthing circuit (neutral)</td>
</tr>
<tr>
<td>9.3</td>
<td>Roof earth connector braided cable</td>
</tr>
<tr>
<td>10</td>
<td>Hole for low voltage auxiliary supply</td>
</tr>
<tr>
<td>11</td>
<td>Cable support for anchoring the power transformer supply cables</td>
</tr>
<tr>
<td>12</td>
<td>Lighting and auxiliary services</td>
</tr>
<tr>
<td>13</td>
<td>Document holder with information regarding <em>ormaset</em></td>
</tr>
</tbody>
</table>

*Figure 3.1. Detail of main components of *ormaset*
The **ormaset** enclosure consists of a concrete body with access doors and metallic ventilations. It has three separate compartments used for housing the following electrical equipment:

1. Medium voltage functions, with independent access.
2. Transformer, accessible through the low voltage compartment.
3. Low voltage boards, with independent access.

The three compartments can be accessed through the two independent accesses with double-leaf metallic doors, which in their open positions are set at 90° or 180°.

The four-slope arrangement of the roof prevents water from accumulating on it.

If it is necessary to replace part of the electrical equipment housed inside **ormaset**, the roof has four embedded nuts for installing four M20 hoisting eyebolts, which allow using a crane for handling the roof.

### 3.2. Electrical equipment

The electrical equipment is located inside and anchored to the enclosure, which can house the following elements:

- **Ormazabal’s cgmcosmos** (24 kV) or **cgm.3** (36 kV) medium voltage switchgear unit with full SF₆ gas insulation allows maximum configurations of:
  - 3L1P for the 24 kV series (3 feeder functions and 1 fuse protection function).
  - 2L1P for the 36 kV series (2 feeder functions and 1 fuse protection function).

- Oil-filled medium voltage/low voltage distribution transformer unit with rated power of 1000 kVA and 36 kVA. It has natural ventilation, in accordance with standard EN 60076 and is equipped with medium voltage plug-in terminals.

- Low voltage switchgear:
  - AC-4 type switchboard, specifically built for **ormaset**.
  - AM-4 type switchboard, specifically built for **ormaset**.

- Medium voltage interconnections using plug-in terminals and low voltage interconnections direct by cable.

The maximum possible configurations for 24 kV and 36 kV are listed below, allowing other diagrams with fewer medium voltage functional units and/or low voltage switchboards:

#### Up to 24 kV

<table>
<thead>
<tr>
<th>Component</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV</td>
<td>3L1P</td>
</tr>
<tr>
<td>LVB</td>
<td>AC4 + AM4</td>
</tr>
<tr>
<td>Transformer</td>
<td>≤1000 kVA</td>
</tr>
</tbody>
</table>

#### Up to 36 kV

<table>
<thead>
<tr>
<th>Component</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV</td>
<td>2L1P</td>
</tr>
<tr>
<td>LVB</td>
<td>AC4 + AM4</td>
</tr>
<tr>
<td>Transformer</td>
<td>≤1000 kVA</td>
</tr>
</tbody>
</table>

Figure 3.2. Detail of maximum configuration single-wire diagrams for 24 kV and 36 kV
3.2.1. Medium voltage switchgear

ormaset can house medium voltage functions of Ormazabal's cgmcosmos (24 kV) or cgm.3 (36 kV) systems with SF₆ gas insulation.

The medium voltage unit is comprised of the following independent compartments:

- 1. SF₆ tank
- 2. Driving mechanism compartment
- 3. Base
  - 3a. Cable compartment
  - 3b. Gas relief compartment

![Figure 3.3](image)

**Figure 3.3.** Detail of configuration of Ormazabal's cgmcosmos.2lp for 24 kV

3.2.2. Low voltage switchgear

The low voltage area includes space for two AC4 and AM4 type switchboards specific for ormasdet, with four outputs per module.

- 1. Insulated enclosure
- 2. Three-pole vertical closed bases size 02 up to 400 A
- 3. Low voltage switchboard, type AM4, for ormasdet
- 4. Low voltage switchboard, type AC4, for ormasdet
- 5. Control and protection functional unit

![Figure 3.4](image)

**Figure 3.4.** Detail of low voltage switchboards for the ormasdet enclosure

3.2.3. Distribution transformer

ormaset can house three-phase distribution transformers in accordance with standard IEC 60076, up to 1000 kVA.

The medium voltage transformer connection is carried out using shielded plug-in terminals.

![Figure 3.5](image)

**Figure 3.5.** Transformer detail
4. Normal service conditions

ormaset is designed to operate under normal service conditions in accordance with Standard IEC 62271-1:

<table>
<thead>
<tr>
<th>Installation</th>
<th>Outdoor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum environmental temperature</td>
<td>40 °C</td>
</tr>
<tr>
<td>Minimum environmental temperature</td>
<td>10 °C</td>
</tr>
<tr>
<td>Maximum mean environmental 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 relative humidity, measured over a 1-month period</td>
<td>&lt; 90 %</td>
</tr>
<tr>
<td>Maximum mean vapour pressure, measured over a 24-hour period</td>
<td>2.2 kPa</td>
</tr>
<tr>
<td>Maximum mean vapour pressure, measured over a 1-month period</td>
<td>1.8 kPa</td>
</tr>
<tr>
<td>Maximum height above sea level</td>
<td>1000 m</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>1000 W/m²</td>
</tr>
<tr>
<td>Pollution due to corrosive and/or inflammable gases</td>
<td>Level II (medium)</td>
</tr>
<tr>
<td>Vibrations due to seismic movements or by external causes</td>
<td>Negligible</td>
</tr>
<tr>
<td>Wind speed</td>
<td>&lt; 34 m/s</td>
</tr>
</tbody>
</table>

(a) For special operating conditions (maximum environmental temperature greater than +40°C), please ask Ormazabal
(b) For higher altitudes, please ask Ormazabal

**Table 4.1. Normal service conditions**
5. Assigned ratings

5.1. Electrical characteristics

<table>
<thead>
<tr>
<th>Electrical characteristics</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage of medium voltage circuits</td>
<td>kV</td>
<td>up to 36</td>
</tr>
<tr>
<td>Number of phases</td>
<td>---</td>
<td>3</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>Hz</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated power</td>
<td>kVA</td>
<td>up to 1000</td>
</tr>
</tbody>
</table>

Table 5.1. Electrical characteristics

5.2. Mechanical characteristics

The dimensions and weights of ormaset are the following:

Figure 5.1. Detail of ormaset enclosure dimensions. Front view

Figure 5.2. Detail of ormaset enclosure dimensions. Rear view

Dimensions in mm.

⚠️ Weight of the ormaset transformer substation without the transformer: 7300 kg.
6. Handling

6.1. Handling ormaset

For correct handing of ormaset, you must ensure the following materials are available:

- 25 t Lifting beam.
- 2 round slings WLL 10 T. E 300 / 6.
- 4 Flat slings CS-6000 Length: 3.1 m.

The following sequence must be followed for handling the ormaset:

1. According to the handling distances required for the unloading and placement of ormaset, select the required crane, following the approximate values listed in the following table:

<table>
<thead>
<tr>
<th>Weight (t)</th>
<th>Crane rated power (t)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3</td>
<td>6 m 8 m 10 m 12 m 14 m 15 m</td>
</tr>
</tbody>
</table>

* The rated power is at a distance of 3 m.

Table 6.1. Crane rated power

2. Attach the four flat sling hooks to the ormaset DEHA couplings, as shown in the figure:

3. Place the end of the lifting beam with holes on the side of the air inlet grille.

4. Install the round transverse balancing slings, taking into account that one of them is placed in the hole marked with the number “1”.

6.2. Handling the roof

If the ormaset roof must be handled in order to install or replace electrical equipment, carry this process out in accordance with the sequence indicated in the first four paragraphs of section 11.2 of this General Instructions document, “Replacing electrical equipment”.

---

 weight of the ormaset transformer substation without the transformer: 7300 kg.

Dimensions in mm.
7. Transport

7.1. Land transport

Transport of ormaset should be carried out using a truck (maximum height of the platform: 1.5 m), following the sequence below:

1. Position the ormaset on four boards measuring 2000 x 150 x 20 mm, distributed evenly throughout the width of the truck.
2. The lashing must be carried out using ropes. These ropes are hooked to the DEHA anchors that ormaset is equipped with, in order to ensure its stability during transport.
3. In order to prevent movements of the roof relative to the body during transport, two 10 m slings must be placed crosswise and tightened with a ratchet, as can be seen in the figure.

7.2. Sea transport

Transport to the place of embarkation should be carried out using a truck (maximum height of the platform: 1.5 m) using a flat rack open container. The dimensions listed in the figure must be observed and the following sequence must be followed:

1. Position the ormaset on four boards measuring 2000 x 150 x 20 mm, distributed evenly throughout the width of the truck.
2. Once ormaset is positioned inside the container, attach four 100 x 100 x 10 mm and 100 mm long squares, one at each corner of the ormaset enclosure. They must be welded to the floor of the container in order to prevent any movement during transport.
3. In order to prevent movements of the roof relative to the body during transport, two 10 m slings must be placed crosswise and tightened with a ratchet, as can be seen in the figure.
8. Storage

Storage of ormaset must be carried out so as to avoid any rainfall or sunlight falling directly on the internal electrical equipment. Store in a non-aggressive environment.

The recommended conditions are as follows:

1. Environmental air temperature should not exceed 55 °C and its mean value, measured in a period of 24 hours, should not exceed 35 °C.
2. The environmental air temperature should not drop below -15 °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 over 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 over 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 environmental pressure at the final destination or during transport. If this is not the case, the manometer needle of the medium voltage switchgear may indicate an incorrect value, even if the equipment’s internal gas pressure is correct.
9. **Installation**

When installing the **ormaset** at its location, it is essential to follow current legislation on installations and electrical networks, laws on occupational safety, local regulations and the specifications of the utility company. The instructions included in this document must be followed during electrical installation.

The site should be visited in advance to check if vehicles can have access and if there is adequate space for the unloading operations, taking into account the distances to overhead lines, slopes, etc.

9.1. **Receiving the equipment**

Upon receipt of the unit, carefully check:

1. The general condition of the assembly.
2. Absence of bangs or breakage, especially at the connection points to other items or close to the DEHA couplings.
3. The state of the paintwork, checking for the absence of chipping, scratches, etc.
4. Presence of other accessories. If damage or absences are observed, immediately inform the transport agent and **Ormazabal**.

9.2. **Location**

The site location should be precisely defined, indicating the alignment levels and the heights of the reference points, such as: roads, kerbs, milestones, pavilions, fences, electricity pylons, etc.

Incorrect levelling may cause the base of the tank or the body to break.

9.3. **Planning**

On the location sketch or drawing, it is advisable to mark out the spaces available for the crane and the transport truck.

The existence of any circumstance or object that could impede or obstruct the smooth operation of the installation must be indicated (posts, cables, ditches, walls, pipelines, etc.), marking their positions on the drawing with the corresponding measurements.
9.4. Preparing the ground

9.4.1. Excavation drawings

For the installation of ormaset, an excavation is required\(^1\), with the dimensions recommended in the following table:

<table>
<thead>
<tr>
<th>Excavation dimensions [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
</tr>
<tr>
<td><strong>Width</strong></td>
</tr>
<tr>
<td><strong>Depth</strong></td>
</tr>
</tbody>
</table>

Table 9.1. Excavation dimensions

![Excavation dimensions diagram](image)

1 Perimeter pavement
2 Levelling area

Figure 9.1. Detail of ormaset excavation dimensions

9.4.2. Safety recommendations

All actions and procedures must be carried out in accordance with the General Safety Plan. There must be a person designated as the Prevention Resource throughout the duration of the activity on site.

The minimum health and safety requirements for construction work should be considered when preparing the ground. Among others:

- Before beginning to open, carry out a preliminary study of the ground to know its stability and the possible existence of conduits.
- Avoid accumulating excavated material and equipment next to the edge of the excavation, taking the necessary precautions to prevent the walls from caving in and materials falling inside.
- In general, keep a 3 m area around the excavation free of materials and vehicle traffic.
- In the case of rain and puddles, carefully inspect the excavation with qualified technicians before resuming the work. Carry out immediate pumping out of water that may be present inside the excavation in order to prevent the stability of the slope from being altered.
- Engine-driven machines that generate gases such as carbon monoxide must not be placed inside the excavation unless adequate equipment is used to extract the gases.
- The operators that work inside the excavation must be properly trained and informed and must use a safety hat as well as the appropriate protective clothing for each specific hazard.

\(^1\) See section 9.6.3 of this General Instructions manual, “External earthing circuit”
9.4.3. Levelling process

In order to properly install the ormaset enclosure, it is important to take ground levelling into account, since this decisively affects the stability of the equipment.

The following tools must be used for carrying out the levelling:

- Spirit level.
- Levelling tools.
- Levelling board.

Once the excavation has been carried out, a layer of sand of approximately 100 mm thick must be laid, then levelled and compacted.

The existence of special ground conditions may require modifying the ormaset installation regarding what has been previously stated.

Non-compacted ground

Prepare a foundation suitable for the ground conditions, and it may even be necessary to construct a reinforced concrete bed to distribute the load over a wider surface.

Levelling with sand must then be carried out.

Sloping ground

The excavation should be carried out in such a way that the base platform is on a hard area, as shown in the figure.

In these cases, it is recommended that rainwater from the higher ground be channelled, to avoid it washing the ground away from under the ormaset.

Ground with a high water table

In those cases where the water table is above the location of the ormaset foundation plate, proceed as indicated in the figure:

Sloping ground

The excavation should be carried out in such a way that the base platform is on a hard area, as shown in the figure.

In these cases, it is recommended that rainwater from the higher ground be channelled, to avoid it washing the ground away from under the ormaset.

Ground at risk of flooding

On ground where a risk of flooding exists, the ormaset foundation layer must be placed above the predicted flooding level, as indicated in the figure.

In cases where the possibility exists for the layer of foundation sand to be washed away, it is recommended that a cement - sand mixture be used for this purpose.
9.5. **Access point for medium voltage and low voltage cables**

**.ormaset** has holes pre-punched for the medium voltage and low voltage cables and the external earthing circuit.

For the medium voltage cable input and output, **ormaset** has three pre-punched holes measuring 150 mm in diameter, located in the buried part of the enclosure, in the area where the medium voltage functions are housed.

For the low voltage cable output, **ormaset** has eight pre-punched holes measuring 110 mm in diameter, located in the buried part of the enclosure, where the low voltage boards are housed.

The closure of these holes is a concrete shell measuring about 10 mm thick.

**Drilling of holes for feeding cables through them**

1. Break the hole closure by striking it with a hammer.

2. Seal the used holes to prevent water from entering using any type of quality flexible sealant.

**Tool:** Quality flexible sealant

![Ormaset cable access in enclosure](image)

9.6. **Earth connection**

**ormaset** has two internal earthing circuits to facilitate the connection of the different elements to the earthing circuit external to the transformer substation.

- Protective earthing circuit (metallic parts).
- Operational earthing circuit (neutral).

9.6.1. **Protective earthing circuit (metallic parts)**

The protective earthing circuit (metallic parts) includes the earthing of the enclosures of the different electrical equipment as well as the concrete enclosure reinforcement:

1. Medium voltage functions.
2. Transformer.
3. Low voltage boards and other metallic elements present in the installation.
4. Concrete enclosure reinforcement (body and roof are interconnected using a copper wire).
5. Metallic parts.

The earthing flatbar is connected to the protective switch box (metallic parts) that is located to the right of **ormaset**’s low voltage access door, using a 50 mm² bare copper connector. This box is connected to the external earthing circuit. Access for the external earthing cables is made using two pre-punched holes measuring 20 mm in diameter.

![Detail of protective earthing connection (metallic parts)](image)
9.6.2. **Operational earthing circuit (neutral)**

The operational earthing circuit (neutral) connects the neutral busbar of the low voltage distribution board to the operational earthing switch box, which is located to the left of the low voltage access door. This connection is made by means of insulated 0.6/1 kV copper or 50 mm² aluminium cable.

![Figure 9.7. Detail of the switch box for connecting the neutral](image)

The low voltage board zero-sequence bar is not connected to the protective earthing flatbar (metallic parts).

9.6.3. **Exterior earthing circuit**

The installer or final user must provide suitable safety measures in order to avoid dangerous touch and step voltage.

The installation project must include the section for implementation of the earthing installation, along with justification of its sizing.

Complementary Technical Instruction ITC-RAT 13, on earthing installations, of the Regulation on technical conditions and safety guarantees in high voltage electrical installations (Royal Decree 337/2014) sets out the requirements for this type of installation.

The conductors' braided wire cross-section, the terminals' contact surface and tightening torques will be suitable for a fault current delimited by network protections. It is recommended that an external protective earthing circuit of bare copper wire be used with a minimum cross-section of 50 mm².

Whenever it is not feasible to maintain the touch and step voltages within the limits set out in Complementary Technical Instruction ITC-RAT 13 of the Regulation on technical conditions and safety guarantees in high voltage electrical facilities (Royal Decree 337/2014), the owner of the facility must implement at least one of the additional safety measures envisaged in this instruction, in order to reduce the risks to people and property.
10. Operations sequence

10.1. Opening and closing the access doors

Proceed as follows to open the access doors in both the medium voltage and the low voltage area and transformer:

1. Open the right door by acting on the lock.

2. Release the bolts of the left-hand door to open it.

3. The doors have an interlocking system at 90° and 180°. To open the door at 90°, pull the rod upwards to release it, and open the door completely until it is interlocked at 180°.

To close the doors, proceed in reverse order, making sure to release the rod before moving the doors from their interlocked at 90° or 180° open position.
10.2. Connecting the generator set before zero switching

**ormaset** has an auxiliary input measuring 140 mm in diameter that allows for a low voltage auxiliary supply. When not in use, this auxiliary input has a lid that maintains the IP 23D rating, in accordance with IEC 60529. It can only be removed from the inside of the concrete enclosure.

![Figure 10.4. Detail of input for auxiliary supply in an ormaset enclosure](image)

The cables from the generator set should run to inside the ormaset prefabricated enclosure through the hole fitted for this purpose. Proceed as follows to open the hole.

1. Loosen the wing nut from inside the prefabricated enclosure.

![Figure 10.5. Loosen the wing nut](image)

2. Loosen the wing nut and the clamp. Set aside both parts.

![Figure 10.6. Loosen the wing nut and the clamp](image)

3. Open the hole by pushing the cover towards the outside of the enclosure. Set aside the cover along with the wing nut and the clamp, in order to close the hole when auxiliary supply with the generator set is complete.

![Figure 10.7. Push the cover](image)

4. Insert the generator set cables through the open hole.

![Figure 10.8. Insert the generator set cables](image)

The power cable connection from the auxiliary unit to the low voltage distribution board will only be made once the opening of the medium voltage cubicle’s switch and the absence of current (momentary interruption of service) have been checked.

Working in the vicinity of live voltage. Operation which can only be carried out by specialist personnel, in accordance with the utility company’s procedures and with rules on electrical safety.
10.3. Commissioning

First check that the primary voltage (medium voltage) of the distribution transformer is suitable for the installation project. This information is printed on the distribution transformer name plate and in the test protocol.

Before commissioning the transformer substation, check that the transformer tap changer is in the position corresponding to its maximum rated voltage and that it is interlocked. In the case of a multi-voltage transformer in medium voltage, check that the rated voltage of the transformer matches the network service voltage.

The tap changers must always be actuated without voltage in the circuit.

Power the medium voltage switchgear with the transformer at no-load (fuse holder bases of the low voltage distribution board open).

When commissioning the transformer substation, check the operating voltage from the low voltage side (fuse-holder bases). Proceed as follows if this does not match the set value:

1. Shut down the medium voltage switchgear\(^3\).
2. Check the absence of voltage in the medium voltage switchgear and in the low voltage distribution board.
3. Earth the medium voltage switchgear and the flatbars of the secondary of the distribution transformer in low voltage.
4. Unlock the transformer tap changer to adapt it to the required power voltage by turning the switch back one position.

With the distribution transformer connected to the medium voltage network at no load, check the service voltage from the distribution board in low voltage. Measure the voltage on the low voltage distribution board to check the correct connection and position of the tap changer.

If the service voltage is incorrect, follow the steps again until the service voltage on the low voltage distribution board is appropriate.

\(^3\) Check the procedure in the General Instructions document included with the medium voltage switchgear.
11. Maintenance

The prefabricated enclosure does not require any maintenance. Depending on the circumstances, the lock may need looking at and greasing. Check the maintenance guidelines for the medium voltage switchgear units, the low voltage switchgear and the distribution transformer in the accompanying General Instructions documents.

11.1. Medium voltage switchgear

The live parts of the main circuit and switching equipment of the medium voltage switchgear do not require inspection or maintenance, as they are completely insulated in SF₆ and therefore unaffected by the external environment. Class E2 electrical endurance tests guarantee there is no restriction on maintenance of the breaking components.

The switchgear’s driving mechanism used for each of the medium voltage functions does not require greasing for correct operation, according to the service conditions specified in IEC 62271-1, throughout its estimated lifetime.

These mechanisms must be inspected when used under extreme conditions (dust, salt, pollution). It is advisable to carry out at least one operation during the inspections.

Whenever the painted metallic components have scratches, bangs or similar damage, they must be repaired in order to prevent corrosion.

11.2. Replacing the switchgear

Follow the safety procedures at all times, in keeping with legislation and regulations on safety.

Carry out the following procedures to replace the electrical equipment inside ormaset:

1. Power down the medium voltage power supply to the ormaset transformer substation. Follow the power removal procedure indicated by the electric utility company.
2. Open the doors to access the medium voltage and low voltage area

3. Disconnect the earth connection braided cable that connects the steel fixing of the enclosure body to the ormaset roof located on the top part of the medium voltage access doors, using a 13 mm spanner.

Tool: 13-mm spanner.

Figure 11.9. Detail of disconnection of the earth connection braided cable

Figure 11.8. Detail of opening of doors to access the medium and low voltage areas.
4. Remove the four protective caps from the threaded inserts of the roof.
5. Screw the four M20 eyebolts on the *ormaset* roof.

![Figure 11.10. Detail of the installation of the eyebolts on the *ormaset* roof](image)

6. Remove the roof using a crane and place it on a flat surface.

![Figure 11.11. Detail of *ormaset* roof removal](image)

| ! | Maximum weight of the *ormaset* roof: 1520 kg |

7. Disconnect the power to the electrical equipment, switching the medium voltage switchgear unit to earthing position.
8. Disconnect the medium voltage and low voltage cables, as well as the earthing cables of the electrical equipment to be replaced.
9. Unscrew the fixing points for the metallic parts of the electrical equipment that is to be replaced.
10. Remove the different equipment (medium voltage functions, low voltage boards or transformer), following the handling procedures set out in the documentation for each of these units. Access to the transformer is via the area where the low voltage boards are located.

11. In order to re-commission the *ormaset* transformer substation, the above procedures must be carried out in reverse order.
12. Accessories included in the supply

The following accessories are sent with ormaset:

- First aid sign.
- Electrical warning sign.
- Lever for actuating the medium voltage switchgear.
- General Instructions document for the ormaset IG-049 compact prefabricated transformer substation.
- General instructions for the corresponding medium voltage cubicles system[4].
- General instructions for the distribution transformer unit[5].
- General Instructions for the low voltage switchgear.

[4] IG-078 for medium voltage cubicles up to 24 kV for the cgmcosmos system and IG-136 for medium voltage cubicles up to 36 kV of Ormazabal’s cgm.3 system.

13. Environmental information

13.1. Recyclability

Ormazabal’s ormaset consists essentially of materials which at the end of their life cycle are catalogued as Inert Industrial Waste.

In accordance with Ormazabal’s commitment to the Environment, endorsed by the ISO 14001 certificate for its Environmental Management System, inert industrial waste generated at the end of its useful life must be, for the main part, handled by waste management companies authorised by the relevant Agency.
Subject to change without prior notice.

For further information, contact Ormazabal.