ormaSET-M
Prefabricated metallic transformer substation

General Instructions
IG-199-EN, version 03; 6/11/2013
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 protection 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 the forthcoming IEC standard 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.

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.

Guarantee

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 the manufacturer.

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 notification.

These characteristics, as well as the availability of components, are subject to confirmation by Ormazabal.
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1 Description and main characteristics

Ormazabal’s ormaSET-M is a kiosk-type Metallic Prefabricated Transformer Substation, installed on surface and externally operated, with reduced dimensions, standard-built, factory tested and supplied from the factory as a unit.

ormaSET-M Transformer Substation complies with the requirements established in standard IEC 62271-202.

ormaSET-M is designed for end-user networks with rated voltages \( U_r \) up to 36 kV and a rated power of 1000 kVA.

Ormazabal’s ormaSET-M Transformer Substation is made up of the following main components:

- Double access doors and dimensions of 997 x 1400 mm in the medium voltage area and low voltage board area. Folding doors at 90° and 180° on the outside wall, hinged, with a two fixing point and a fastening rod to hold them open preventing untimely closures.
- Snow panel below medium voltage and low voltage doors, dimensions 1997 x 486 mm.
- Access doors to the Transformer: Two accesses to the transformer, one on either side, made up of double doors of 963 x 1890 mm, folding at 90° and 180° on the outside wall, hinged, with a two fixing point and a fastening rod to hold them open preventing untimely closures.
- Air intake and exhaust grille for natural ventilation, fitted with a grille of 6 x 6 mm.
- Optionally, a closing system for the medium voltage input cables in the lower part of the enclosure. Up to 3 input cables for 3 x 1 x 240 mm² XLPE 18/30 kV H16. Maximum single core cable diameter 90 mm.
- Optionally, a closing system for the low voltage input cables in the lower part of the enclosure. Up to 8 input cables for 4 x 1 x 240 mm² XZ1 0.6/1 kV. Maximum single core cable diameter 90 mm.
- Base frame manufactured with laminated profiles UPE 140
- Optionally, an oil collection pit made of galvanised sheet metal, with a capacity of 600 litres.
- Optionally protective earth disconnection box and service earth disconnection box can be supplied, located in the low voltage compartment on the left and right of the low voltage switchgear.
- Earth circuit, copper conductor cross section 50 mm².
- Document holder for general instructions relating to the transformer substation.
- Lighting in the medium voltage, low voltage and transformer compartments supplied.
- Optionally, emergency lighting of 50 Lm 1h NM, IP42, IK04 1 x 6W, class II, 230 V 50/60 Hz. According to standard IEC 60598-2-22.
- Physical separation between the medium voltage compartment, power transformer and low voltage compartment.
1.1 Switchgear and control gear

Anchored to the inside of the enclosure is the switchgear, made up of the following elements:

- Medium voltage (MV) switchgear with full \( \text{SF}_6 \) insulation up to 36 kV, according to IEC 62271-200. The following models can be installed:
  - CGM COSMOS 12 and 24 kV, 400/630 A.
  - CGM.3 36 kV, 400/630 A.

- MV/LV distribution transformer, according to IEC 60076-1, oil filled and hermetically sealed, fully equipped with medium voltage solid insulated bushings up to 1000 kVA 36 kV.

- Low voltage (LV) board, according to IEC 61439-1 with up to 8 outputs for NH 2 size fuses.

- Medium voltage inter-connection: HEPRZ1 3 x 1 x 95/16mm\(^2\) 12/20 kV or 18/30 kV Al.

- Low voltage inter-connection: XLPE 3 x 4x 240 mm\(^2\) XZ1 0.6/1 kV.
2 Service conditions

ormaSET-M prefabricated substation is designed to be used under normal outdoor service conditions according to IEC 62271-1.

Inside the enclosure it is assumed that normal indoor conditions prevail according to IEC 62271-1.

- Medium voltage functional unit: IEC 62271-200
- MV / LV transformer functional unit: IEC 60076 series
- Low voltage functional unit: IEC 61439 series

Air temperature
- Minimum: -5 °C
- Maximum: +40 °C
- Average daily value: +35 °C
- Maximum average annual temperature: +20 °C

Average relative humidity value, measured in a 24 hour period, must not exceed 95%.

- Vapour Pressure average (1 month) = 22 mbar.

Altitude
The altitude of the place of installation must not exceed 1000 m.

For working conditions that differ from those given or that are not mentioned in these instructions, it is necessary to define what they are and to study how they affect the design.

In the event of special conditions of use, please consult Ormazabal.

Degree of pollution
The pollution does not exceed pollution level II (medium), according to Table 1 of IEC 60815.

Solar radiation
Solar radiation up to a level of 1000 W/m² on a clear day at noon is considered.

Ice coating
The ice coating shall be considered in the range from 1 mm up to but not exceeding 20 mm.

Wind speed
The wind speed does not exceed 34 m/s.
3 Dimensions and weights

The dimensions and weights of ormaSET-M, including transformer 1000 kVA, are:

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ormaSET-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height on level zero [mm]</td>
<td>2301</td>
</tr>
<tr>
<td>Length [mm]</td>
<td>3936</td>
</tr>
<tr>
<td>Depth [mm]</td>
<td>2126</td>
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<table>
<thead>
<tr>
<th>24 kV</th>
<th>Weights [kg]</th>
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</thead>
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<tr>
<td>Empty Enclosure</td>
<td>Cover</td>
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<table>
<thead>
<tr>
<th>36 kV</th>
<th>Weights [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty Enclosure</td>
<td>Cover</td>
</tr>
<tr>
<td>ormaSET-M</td>
<td>2100</td>
</tr>
</tbody>
</table>

(1) Compact assembly CGMCOSMOS-2LP and CGM.3-2LP.

A Transformer side gap (1900 mm)
B Transformer side gap (1940 mm)
C Transformer top space (1930 mm)
D Transformer top space (1890 mm)

Fig. 3.1: Dimensions of ormaSET-M
4 Transport

4.1 Road transport
During transport ormaSET-M must be firmly fixed to the truck by the four lifting devices provided on the base frame. Two transport support beams (20 mm height x 100 mm width x 2000 mm length) must be placed under ormaSET-M at the partition walls.

Two straps must be placed on the four lifting devices on the roof with covers to avoid damage during transport.

Fig. 4.1: ormaSET-M

4.2 Sea transport
ormaSET-M can be transported completely assembled in a standard High Cube (HC) 40” feet container. In order to prevent damage to the transformer substation, it is recommended to take into account:

1) A container sea transport wooden base must be placed under ormaSET-M and fixed to it by four screws placed on the corners of ormaSET-M base frame.

2) Once ormaSET-M is in the container, will be secured by straps or airbags to immobilize it on the base.

3) The two lifting points of figure 5.3 must be placed on the front of the base frame in order to permit the extraction out of the container.

4) ormaSET-M must be wrapped in aluminum vacuum-packed covers (MIL-B-131-H). Dehydrating salts must be placed inside. After air is removed the thermal-sealed covers must be sealed.

4.3 Packing
ormaSET-M is delivered unpacked from the factory as standard. If sea transport is required, protective measures such as wooden corners, plastic films and covered ventilation openings must be demanded. These must be removed on-site before installation.
5 Installation

When installing ormaSET-M on-site, local building regulations must be followed. Instructions given in this general instructions document must be taken into account.

The pressure exerted on the ground by ormaSET-M and its switchgear and transformers, must not exceed 0.1 kg/cm².

5.1 Location

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

On the location sketch or drawing, 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.

Attached is a table of values for the different crane powers, taking into consideration that these are provided as a guide and that it is necessary to confirm each case with Ormazabal.

MAXIMUM DISTANCE "D" FOR SELF-PROPELLED CRANE, ormaSET-M - 36 kV

<table>
<thead>
<tr>
<th>MODEL</th>
<th>WEIGHT** [t]</th>
<th>POWER RATING OF THE CRANES*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ormaSET-M</td>
<td>5.2</td>
<td>17 m 45 50 60 70 80</td>
</tr>
</tbody>
</table>

(*) The rated power is in t at 3 m
(**) Weight with transformer of 1000 kV

MAXIMUM DISTANCE "D" FOR TOW-TRUCK, ormaSET-M - 36 kV

<table>
<thead>
<tr>
<th>MODEL</th>
<th>WEIGHT** [t]</th>
<th>POWER RATING OF THE CRANES*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ormaSET-M</td>
<td>5.2</td>
<td>16.5 21.9 26 35 47 58</td>
</tr>
</tbody>
</table>

(*) The rated power is in t at 1 m
(**) Weight with transformer of 1000 kV

5.2 Planning

On the location sketch or drawing, 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.

Attached is a table of values for the different crane powers, taking into consideration that these are provided as a guide and that it is necessary to confirm each case with Ormazabal.

5.3 Preparing the ground

Ormazabal recommends the installation of a concrete slab cast on-site. ormaSET-M must be firmly fixed to the concrete slab by four M12 screws placed on the corners of the base frame. The concrete slab must have medium voltage and low voltage cable entries.

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**Fig. 5.1:** Unloading operation

**Fig. 5.2:** Recommended concrete foundation
5.4 Handling

ormaSET-M has four lifting points on the base with a diameter of 60 mm, which enable correct handling with a lifting beam (ref. 395204-06), slings and properly hooking them for the purpose of guaranteeing a balanced hoisting. Longitudinal levelling is performed using slings or double chain leg adjustable slings with safety hooks. The lifting beam should be anchored directly from the bottom of the sling. In the event of using "WITH RING", the anchoring is performed using the ring to lengthen the two branches from the side of the lifting beam.

5.5 Cable access and sealing

Optionally, ormaSET-M can be supplied with a lower closing system, fitted for accessing cables in the medium voltage area and the low voltage area.

The transformer substation has three cables inputs in the medium voltage compartment, each one up to a single cable diameter of 90 mm. In the low voltage compartment there are 8 outgoings, each one up to a single cable diameter of 90 mm.

![Lifting process for ormaSET-M](image)

**DANGER**

For safety reasons, it is not allowed to carry out any other type of handling.

For transversal balancing, the lifting beam has a series of numbered holes at its end.

![Cable access](image)

**5.6 Earthing circuit connection**

ormaSET-M has a main earthing conductor system provided to connect to the earth all metallic parts of the prefabricated substation not belonging to the main and/or secondary/auxiliary circuits of the equipment. It consists in a main 50 mm² cooper earthing conductor on which each component is connected through a single circuit.

![Earthing circuit connection](image)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Length (mm)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Medium voltage cubicles earthing</td>
<td>4100</td>
</tr>
<tr>
<td>B</td>
<td>Medium voltage cables earthing</td>
<td>2630</td>
</tr>
<tr>
<td>C</td>
<td>Transf. doors earthing</td>
<td>240</td>
</tr>
<tr>
<td>D</td>
<td>Transf. doors earthing</td>
<td>240</td>
</tr>
<tr>
<td>E</td>
<td>Transf. earthing</td>
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<tr>
<td>F</td>
<td>LVB earthing</td>
<td>850</td>
</tr>
<tr>
<td>G</td>
<td>Low voltage doors earthing</td>
<td>315</td>
</tr>
<tr>
<td>H</td>
<td>Medium voltage doors earthing</td>
<td>315</td>
</tr>
<tr>
<td>I</td>
<td>Medium voltage doors earthing</td>
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<tr>
<td>J</td>
<td>Transf. doors earthing</td>
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</tr>
<tr>
<td>K</td>
<td>Transf. doors earthing</td>
<td>240</td>
</tr>
<tr>
<td>L</td>
<td>Low voltage doors earthing</td>
<td>315</td>
</tr>
</tbody>
</table>
5.6.1 Earth Circuit

A main earthing conductor system is provided to connect to the earth all components of the prefabricated substation:

► The enclosure of the prefabricated substation.
► The enclosure of the medium-voltage switchgear and control gear.
► The metal shields and the earthing conductors of the medium-voltage cables
► The transformer tank.
► The frame and/or enclosure of the low-voltage switchgear.
► The earthing connection of automatic controls and remote-control devices.

Optionally this earth circuit can be connected to the protective earth disconnection box fitted to the inner side of ormaSET-M Transformer Substation, to the left of the access door for the low voltage board, using a bare copper cable with a cross-section of 50 mm².

The metallic parts of ormaSET-M prefabricated substation enclosure is designed to carry 30 A (d.c.) from themselves to the prefabricated substation main earthing point, with a voltage drop of maximum 3 V. Installer or final user shall provide adequate earthing measures around the prefabricated substation in order to prevent dangerous touch and step voltages.

The torques to be observed are as follows:

<table>
<thead>
<tr>
<th>METRIC</th>
<th>TORQUE [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Steel 8.8</td>
</tr>
<tr>
<td>M8</td>
<td>21</td>
</tr>
<tr>
<td>M10</td>
<td>38</td>
</tr>
<tr>
<td>M12</td>
<td>60</td>
</tr>
</tbody>
</table>

5.6.2 Service Earth (Neutral)

Optionally, an earthing feeder (neutral) can be supplied that connects the neutral busbar of the distribution transformer to the disconnection box fitted on the right side of the low voltage compartment.

This connection is made using an insulated copper cable of 0.6/1 kV with a cross-section of 50 mm².
6 Replacement electrical equipment

6.1 Medium voltage switchgears and low voltage switchboard substitution

To replace the electrical equipment inside ormaSET-M, follow the next procedure:

1) Remove power supply in the medium voltage and low voltage incomings to ormaSET-M transformer substation. Follow the electric utility company procedure and the local electrical safety regulations.

2) Open the doors to access the medium voltage (MV) and low voltage (LV) areas.

3) Remove the medium voltage cable incomings and the low voltage outgoings as indicated in the general instructions of the corresponding equipment.

4) Disconnect the earth connections of the equipment to the earth circuit of the substation, using a 13 mm spanner.

5) Remove equipment as indicated in the corresponding equipment general instructions.

6) In order to recommission ormaSET-M transformer substation, the above procedures must be carried out in inverse order.

6.2 Transformer substitution

To replace the transformer, follow the procedure below:

1) Remove power supply in the medium voltage and low voltage incomings to ormaSET-M transformer substation. Follow the electric utility company procedure and the local electrical safety regulations.

2) Open the doors to access the transformer area. Both sides are accessible.

3) Unscrew the fixing points of the transformer to the enclosure. Use a 13 mm spanner.

4) Remove the medium voltage cable incomings and the low voltage outgoings of the transformer as indicated in the general instructions of the corresponding equipment.

5) Disconnect the earth connections of the equipment to the earth circuit of the substation, using a 13 mm spanner.

6) Remove the transformer through the door as indicated in the general instructions of the corresponding equipment.

7) In order to recommission ormaSET-M Transformer Substation, the above procedures must be carried out in inverse order.
7 Operation

Clean the substation of all dirt from the storage, transport and installation. If the paint has been damaged, it must be repaired according to Ormazabal instructions. Please contact Ormazabal.
8 Substation maintenance

The substation must be fully maintained according to local regulations. When performing maintenance, local electric safety regulations must be taken into account. Maintenance actions generally include cleaning and inspection of the equipment. Maintenance procedures of the equipment must be fulfilled according to the general instructions of the manufacturer.
Subject to changes without prior notice.

For more information, contact Ormazabal

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