COMPACT KIOSK-TYPE TRANSFORMER SUBSTATION

LIB
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CAUTION!

When MV 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 useful 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's Technical - Commercial Department.
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1. DESCRIPTION AND MAIN CHARACTERISTICS

The PFU Compact Kiosk-type Transformer Substation of Ormazabal, is a walk-in type outdoor Substation for use in public Medium Voltage (MV) distribution networks up to 36 kV, and may contain up to two 1000 kVA transformers with natural ventilation.

This prefabricated kiosk-type substation is designed in accordance with standard EN 62271-202 and applicable regulations.

The Ormazabal PFU Transformer Substation is made up of two main elements:

- Interior switchgear
- Prefabricated concrete enclosure

![Figure 1.1: PFU main components]

1. Interior switchgear
   1.1. MV Switchgear
   1.2. Low Voltage Board
   1.3. Power Transformer
   1.4. Cable Jumpers

2. Cable access

3. Prefabricated Concrete Enclosure
1.1. INTERIOR SWITCHGEAR

Attached to the inside of the enclosure is the electrical equipment made up of the following elements:

- Fully SF₆ gas insulated Medium Voltage (MV) switchgear unit, up to 36 kV.
- Up to two MV/LV distribution transformer units filled with oil and power rating of up to 1000 kVA with natural ventilation.
- Low Voltage (LV) switchgear unit.
- Direct MV and LV cable interconnections. With a maximum of 8 outputs per LVB.

1.2. PREFABRICATED CONCRETE ENCLOSURE

Made up of:

- Prefabricated monoblock concrete enclosure.
- Prefabricated removable concrete cover.
- Hinged doors for accessing the switchgear measuring 900 x 2100 mm (24 kV) and 1100 x 2100 mm (36 kV), folding 180° over the outside wall, with a two-fixing-point lock and a fastening rod to hold it open preventing untimely closures.
- 1260 x 2100 mm transformer access door
- Air inlet grilles for natural ventilation.
- Cable entry and exit holes on the front and rear lower side of the enclosure.
- Oil collection pit with oil collector and firewall made of a layer of pebbles.
- A hole above level 0 on the front wall, of diameter 140 mm, for access of an auxiliary LV supply.
- A protection earth disconnection box (metallic parts) and a service earth disconnection box (neutral) located respectively on the inner left and right side of the front wall.
- Lighting and auxiliary services.

Figure 1.2: Prefabricated concrete enclosure
1.2.1. Low Voltage Auxiliary Feeder

On the front wall of the prefabricated enclosure, next to the transformer, there is a hole measuring 140 mm in diameter that allows for a LVB temporary electrical power supply to be connected from the outside.

This auxiliary input is located 2000 mm above level 0 and when it is not being used, it is closed using a cover that assures an IP 23D rating.

This cover can only be removed by manually loosening the wing nut and unscrewing it from inside the enclosure.

For **PFU** Transformer Substations with 2 transformers, a LV auxiliary input is available for each of the transformers.
1.2.2. Earthing Protection Disconnection Box (Metallic parts)

The earthing protection disconnection box (metallic parts) is located on the inner left-hand side of the enclosure's front wall.

![Figure 1.6: Disconnection Protection Box](image1)

1.2.3. Earthing Service Disconnection Box (Neutral)

The earthing service disconnection box (neutral) is located on the inner right-hand side of the enclosure's front wall.

![Figure 1.7: Service Disconnection Box](image2)
1.3. MECHANICAL CHARACTERISTICS

The dimensions and weights of the PFU family models are shown below:

<table>
<thead>
<tr>
<th>PFU up to 24/36 kV</th>
<th>PFU-3</th>
<th>PFU-4</th>
<th>PFU-5</th>
<th>PFU-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (1) [mm]</td>
<td>3045</td>
<td>3045</td>
<td>3045</td>
<td>3240</td>
</tr>
<tr>
<td>Length [mm]</td>
<td>3280</td>
<td>4460</td>
<td>6080</td>
<td>8080</td>
</tr>
<tr>
<td>Depth [mm]</td>
<td>2380</td>
<td>2380</td>
<td>2380</td>
<td>2380</td>
</tr>
<tr>
<td>Weight (2) [kg]</td>
<td>10545</td>
<td>13465</td>
<td>17460</td>
<td>29090</td>
</tr>
</tbody>
</table>

(1) Optional: Raised cover for 36 kV except in PFU-7 (Standard height + 195 mm).
(2) Weight of the empty building with standard cover and ventilation for 100 kVA.

NOTE:
For more information, please consult Ormazabal’s Technical - Commercial Department.

1.4. NORMAL SERVICE CONDITIONS

The PFU Transformation Substation is equipped to operate under the following outside weather conditions, in accordance with standard EN 62271-1:

<table>
<thead>
<tr>
<th>Air temperature</th>
<th>Maximum ℃</th>
<th>Minimum ℃</th>
<th>Average daily value ℃</th>
<th>Average relative humidity value (1) %</th>
<th>Height above sea level m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ 40</td>
<td>- 25</td>
<td>+ 35</td>
<td>≤ 100</td>
<td>≤ 1000</td>
</tr>
</tbody>
</table>

(1) Measured over a 24-hour period.

Normal interior service conditions prevail within the PFU Transformation Substation in accordance with standard EN 62271-1.

Transformers must comply with the specifications set out in Section 1.2.1. of Standard EN 21428-1.
2. TRANSPORT

In order to transport the PFU Transformer Substation, it is recommended that an articulated gondola-truck is used to prevent cracks due to differential settlements, with a platform height of less than 900 mm.

Generic Authorization for Special Transports of heights up to 4500 mm and total weight of 45 t (weight + load) must be acquired in advance. In the case of transporting PFU-7 (32 t), the weight of the vehicle will not be more than 13 t.

2.1. ACCESS

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

3. INSTALLATION

3.1. LOCATION

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

3.2. PLANNING

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

NOTE:
D: Maximum length of the crane elevation arm.

Figure 3.1: Download operation
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.

The following table shows the different crane powers as an example. These values must be confirmed in each case with Ormazabal's Technical - Commercial Department.

**CAUTION:**
The recommendations listed in the following tables must be compared with the capacity of the cranes to be used during handling.

### Recommended cranes according to the distance "D" for PFU complete up to 24 kV:

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DISTANCE &quot;D&quot; FOR HANDLING THE SUBSTATION *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6000 mm</td>
</tr>
<tr>
<td>PFU-3</td>
<td>40 t</td>
</tr>
<tr>
<td>PFU-4</td>
<td>40 t</td>
</tr>
<tr>
<td>PFU-5</td>
<td>60 t</td>
</tr>
<tr>
<td>PFU-7</td>
<td>80 t</td>
</tr>
</tbody>
</table>

(*) The power rating is in t at 3000 mm.

### Recommended cranes according to the distance "D" for PFU complete up to 36 kV:

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DISTANCE &quot;D&quot; FOR HANDLING THE SUBSTATION *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6000 mm</td>
</tr>
<tr>
<td>PFU-3</td>
<td>40 t</td>
</tr>
<tr>
<td>PFU-4</td>
<td>40 t</td>
</tr>
<tr>
<td>PFU-5</td>
<td>60 t</td>
</tr>
<tr>
<td>PFU-7</td>
<td>80 t</td>
</tr>
</tbody>
</table>

(*) The power rating is in t at 3000 mm.

For any other distance “D” consult with Ormazabal's Technical - commercial department.
3.3. PREPARING THE GROUND

3.3.1. Excavation dimensions\[1\]

In order to carry this out, it is recommended that the minimum construction worksite safety and health Regulations be observed. Among others:

- Before beginning to open, carry out a preliminary study of the ground for the purpose of knowing 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.
- As a general rule, maintain a 3000 mm area around the excavation free of materials and vehicle traffic.
- In the case of rain and puddles, carefully inspect the excavation using 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 CO 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 3.3.2 Excavation Drawings.
3.3.2. Excavation Drawings

Excavation Drawings PFU-3

**EXCAVATION DIMENSIONS:**
4080 mm long x 3180 mm wide x 560 mm deep.

<table>
<thead>
<tr>
<th>Model</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>3045</td>
</tr>
<tr>
<td>Raised</td>
<td>3240</td>
</tr>
</tbody>
</table>

**NOTE:**
Dimensions in millimetres.

⚠️ **IMPORTANT:**
Consult Ormazabal’s Technical-Commercial Department in the event of installation on a slope.
Excavation Drawings PFU-4

**EXCAVATION DIMENSIONS:**
5260 mm long x 3180 mm wide x 560 mm deep.

**Figure 3.3: Excavation Drawing PFU-4**

<table>
<thead>
<tr>
<th>Model</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>3045</td>
</tr>
<tr>
<td>Raised</td>
<td>3240</td>
</tr>
</tbody>
</table>

**IMPORTANT:**
Consult Ormazabal’s Technical-Commercial Department in the event of installation on a slope.

**NOTE:**
Dimensions in millimetres.
Excavation Drawing PFU-5

**EXCAVATION DIMENSIONS:**
6880 mm long x 3180 mm wide x 560 mm deep.

**NOTE:**
Dimensions in millimetres.

**IMPORTANT:**
Consult Ormazabal's Technical-Commercial Department in the event of installation on a slope.

**Table: PFU-5 Models**

<table>
<thead>
<tr>
<th>Model</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>3045</td>
</tr>
<tr>
<td>Raised</td>
<td>3240</td>
</tr>
</tbody>
</table>
EXCAVATION DIMENSIONS:
8880 mm long x 3180 mm wide x 560 mm deep.

NOTE:
Dimensions in millimetres.

IMPORTANT:
Consult Ormazabal’s Technical-Commercial Department in the event of installation on a slope.
3.3.3. Types of Ground

The type of ground on which the PFU Modular Transformer Substation will rest is an essential factor, given the weight of the equipment. The ground could subside or become uneven, or could provide differential settlements, causing cracks in the enclosure. There are two types of ground:

a) **Hard Grounds**: Grounds where the soil is settled and properly compacted by natural causes.
   
   When the excavation is finished, a sand layer of approximately 100 mm should be laid down and compacted until a person can walk on it without leaving footprints. Once the levelling boards have been removed, the gaps they leave should be filled with sand. Take the measures appropriate to each case to prevent the filling sand from eroding.

b) **Soft Grounds**: These are sandy areas, landfills, etc., with a strength of less than 0.9 kg/cm².
   
   In these cases, foundations suitable for the ground conditions must be prepared, and this may imply the construction of a reinforced concrete bed to distribute the load over a wider surface.
   
   Thereafter, it should be levelled using sand, as in the previous case.

3.4. LEVELLING PROCESS

This is an essential task because it affects the stability of the equipment.

3.4.1. Levelling Tools

- 1 Spirit Level
- 1 Pickaxe
- 1 Round-end spade
- 1 Square-end spade
- 1 Wooden or Plastic lump hammer
- 8 Levelling Tools

a) **Normal Conditions**

The levelling boards are placed according to the measurements on the drawing below (the distance of 2800 mm is a minimum value).

![Figure 3.6: Levelling Specifications](image)
Once the levelling rods have been positioned, the levelling boards should be used to check that the ground is in perfect condition.

**b) Sloping Grounds**

The excavation should be prepared in such a way that the base platform is on a hard area.

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

If there are any doubts concerning this subsequent channelling, it is best to use a mixture of sand and cement when levelling the ground.

**c) Ground with a High Water Table**

When there is a high water table, proceed as follows:

1) Establish the water table level.

2) Excavate only the required depth, levelling as in sections a) and b).

---

*Figure 3.7: Sloping Grounds*

*Figure 3.8: Ground with a High Water Table*
### d) Grounds at Risk of Flooding

In these cases, the enclosure bottom plate should be raised to 100 mm above the predicted flood level, and then level the foundations as in section a).

**NOTE:**
Dimensions in millimetres.

![Figure 3.9: Grounds at Risk of Flooding](image)

The landfill should be such that the distance X is at least 400 mm and the slope angle is 45°. A 1000 mm wide pavement around the enclosure is recommended.

Since these cases are found near rivers, the landfill must be firmly retained (with concrete, rockfill, etc) to provide stability to the prefabricated enclosure.

The equipment has holes pre-punched for feeding MV, LV and external earthing cables through them. According to the needs of each case, using a hammer make the necessary holes in the most convenient location.

Once the connections have been made, the feed through holes should be sealed using a polyurethane sealant in order to guarantee the appropriate water tightness.

For a good finishing, it is recommended to fill with sand up to level +360 mm and cover this filler with a 1000 mm wide sidewalk, between 50 and 100 mm below the access door.
3.5. HANDLING

3.5.1. Handling of the body

The PFU Transformer Substation has DEHA hooks that enable it to be handled using a lifting beam (ref. 395204-06), slings and properly hooking them for the purpose of guaranteeing a balanced hoisting.

![Figure 3.10: Correct coupling method using DEHA hooks](image)

![Figure 3.11: PFU lifting process](image)
For transversal balancing, the lifting beam has a series of numbered holes at its end. This lifting beam must be positioned on the side of the doors. The attached table shows the different positions depending on the model.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>LIFTING BEAM POSITION*</th>
<th>HEIGHT H [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFU-3</td>
<td>Without Equipment</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>With Equipment</td>
<td>3</td>
</tr>
<tr>
<td>PFU-4</td>
<td>Without Equipment</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>With Equipment</td>
<td>3</td>
</tr>
<tr>
<td>PFU-5</td>
<td>Without Equipment</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>With Equipment</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Without Equipment</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>With Equipment</td>
<td>3</td>
</tr>
<tr>
<td>PFU-7</td>
<td>Without Equipment</td>
<td>3</td>
</tr>
</tbody>
</table>

*The previous recommendations may vary according to the inner assembling of the enclosures.

**VERY IMPORTANT:**
The handling of the PFU-7 enclosures must be carried out always ensuring its horizontal and vertical balance. To accomplish this, the standard slings for PFU and PFS type enclosures with extensions shall be used. If in doubt, please consult Ormazabal’s Technical - Commercial Department.

![Figure 3.12: View of examples of slings with extensions](image)
The power limitations for handling of transformers, depending on the PFU-7 model, are as follows:

**Diagram for Utilities**

Diagram for Utilities with two transformers installed at both ends of the enclosure:

- It is recommended to handle the PFU-7 Transformer Substation with two completely installed 1000 kVA transformers, with an approximate weight of 2455 kg each.

**Diagram for private installations**

Diagram for private installations, with independent entry into the Utility delivery and switching compartment.

- If the diagram includes metering and protection functions, the handling of the PFU-7 Transformer Substation is limited to two completely installed 400 kVA transformers, with an approximate weight of 1,400 kg each.

- For greater transformer powers, the handling of the PFU-7 Transformer Substation is limited to a single installed 1000 kVA transformer, with an approximate maximum weight of 2455 kg. The transformer will be installed in the most centre part of the enclosure.

**VERY IMPORTANT:**

For safety reasons, it is prohibited to carry out any other type of handling of PFU-7 Transformation Substations with transformers that have a power rating or weight that is greater than those indicated in the previous sections.
### 3.5.2. Handling of the cover

**VERY IMPORTANT:**
The handling of the cover is always carried out using a lifting beam.

The handling of the cover is carried out by screwing in the eyebolts into the cover inserts.

The following table shows the type and number of eyebolts depending on the cover model:

<table>
<thead>
<tr>
<th>MODEL</th>
<th>COVER TYPE</th>
<th>METRIC EYEBOLT</th>
<th>NUMBER OF EYEBOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFU-3</td>
<td>24 kV</td>
<td>M20</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>36 kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFU-4</td>
<td>24 kV</td>
<td>M20</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>36 kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFU-5</td>
<td>24 kV</td>
<td>M20</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>36 kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFU-7</td>
<td>Only model</td>
<td>M24</td>
<td>4</td>
</tr>
</tbody>
</table>
3.6. EARTHING CIRCUIT CONNECTION

The PFU Transformer Substation has 2 internal earth circuits to facilitate the connection of the different elements to the earthing network that is external to the Transformer Substation.

3.6.1. Protective Earth (Metallic parts)

The protective earth line (metallic parts) assembles the earthing the frames of the different elements that make up the switchgear (MV cubicles, power transformer and Low Voltage Boards), as well as the concrete enclosure reinforcement.

This protective earth line (metallic parts) is connected to the disconnection protection box that the PFU Transformer Substation has located at its inner left-hand side, by means of a 50 mm² section of bare copper wire.

The metallic reinforcement of the body and the enclosure cover are connected directly to the disconnection box. Both reinforcements are electrically connected to each other by means of a 50 mm² inner copper braid.

3.6.2. Operational Earth Connection (Neutral)

The operational earth line (neutral) connects the neutral busbar in the distribution transformer with the disconnection box located on the lower right-hand side of the TS enclosure facing the switchgear from the access area. This connection is accomplished using an insulated copper wire.

![Figure 3.13: Neutral Disconnection Box](image)

### VERY IMPORTANT

The neutral flatbar on the LVB is not connected to the protective earth (metallic parts) connection flatbar.

3.6.3. External Earthing Circuit

The installation project must include a section corresponding to the earthing installation (check the Utility’s standard project), as well as the justification of its size.

In order to install the earthing protection electrode (metallic parts) in PFU Transformer Substations it is recommended to:

- Create an equipotential surface for both the switchgear and the operation area.
- Another insulated operating surface clearance of 1000 mm in the area of the MV cubicles to provide a high surface resistivity.

Each project should include the study of the most suitable earthing diagram.
It is recommended that the external earthing circuit is installed simultaneously. To this end, check the Transformer Substation installation standard project available at the Electric Utility that provides the service and is responsible for maintaining safety in the worksite earthing installation.

The copper braid cross-section, the terminations' contact surface and the tightening torques must be suitable for a fault current delimited by network protections. It is recommended an external protective earthing network of bare copper wire with a minimum cross-section of 50 mm².

Where maintaining the values of the step and touch voltages within the limits laid down in the applicable regulations is not viable, the owner of the installation must apply at least one of the additional safety measures laid down in the said technical instruction in order to minimise personal and material hazards.

The recommended tightening torque for electrical connections in the earthing network is shown in the following table:

<table>
<thead>
<tr>
<th>Metric</th>
<th>8.8 Steel</th>
<th>A2 Stainless</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>M10</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>M12</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>
4. ADDITIONAL INFORMATION

4.1. ASSEMBLING OF ANCHORING KIT FOR TRANSFORMER OF UP TO 1000 kVA

4.1.1. Assembling of the lashing Supports

Prior to assembling the fire barrier tray over the PFU TS ribs, the 4 lashing supports will be fastened to the concrete wall at the short area of the support using:

- M12 x 110 mm screw
- Flat washer for M12
- Spring washer A12
- M12 Nut

![Lashing Supports](image1)

**Figure 4.1: Lashing Supports**

4.1.2. Transformer Lashing

1.1.1.1 Over Metal Profiles

The transformer will be fastened to the lashing supports by means of 4 lashing slings measuring a maximum of 4 m long, hook terminals measuring Ø max 12 mm and tensioning device as shown in the following figure.

In the case that the transformer is assembled with wheels, triangular wooden chocks joined with plastic flanges will be placed on the wheels to prevent the transformer from rolling during transport.

![Transformer Lashing](image2)

**Figure 4.2: Transformer Lashing**

Once the Transformer Substation has been assembled, the transportation company will collect the lashing slings transporting them to the corresponding office of Ormazabal.
2.1.1.1 Over concrete floor

For those PFU variants that have a concrete floor, the transformer is fastened to the floor using 4 Z shaped tools and by tightening 4 M16 x 30 mm fastening bolts to the floor as indicated in Figure 4.16:

For the fastening point to the transformer, use the screw joining the wheel to the transformer support frame.

![Figure 4.3: Lashing the transformer to the concrete floor](image-url)
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