

**GUIDE FOR HANDLING OF THE MOUNTING TYPE  
TRANSFORMER OR SWITCHGEAR BOX**





## 1. INTRODUCTION

We are pleased and proud to offer and deliver high quality transformers, designed in accordance with the applicable local and international standards.

This guide main purpose is to provide some general instructions regarding receipt, handling, storage, mounting, installation and commissioning of mounting type transformers and switch gear boxes.

Information, recommendations, descriptions and safety notes contained herein are based on the guidelines, standards and the experience of MAGNETRON S.A.S. on the equipment above mentioned. This information does not include, nor does it cover all potential contingencies. Therefore, if you require additional information, please contact us.

## 2. GENERALITIES

### 2.1 MOUNTING TRANSFORMER

The mounting transformer is an equipment inside of a cabinet placed outdoors using front dead medium voltage and locking doors.

These transformers are used as part of underground distribution systems, adequate for residential, tourist sites, hotels

and buildings. They are built with sealed safety compartments for low and high voltages, which makes the functioning to be safe and able to prevent possible public accidents.

There are two basic transformer configurations for this mounting type transformers, depending on the circuit type they are going to be installed on: radial and net or ring type.

### Radial Configuration

On this radial configuration the primary feeding goes to each transformer independently (winding coil) and has a medium voltage terminal on each phase.

A two position breaker is used for medium voltage. See figure 1.

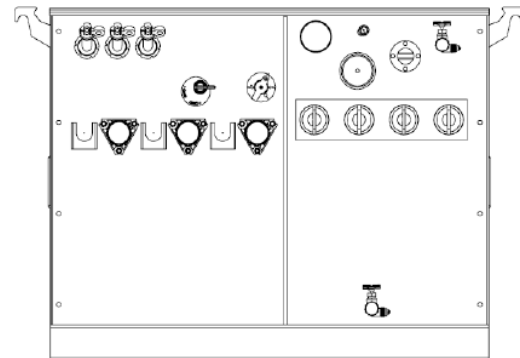


Figure 1. Radial transformer Front

### Net Configuration

On this configuration the primary feeding closes to make a ring having two medium voltage terminals per phase. It brings a four positions breaker, two breakers for two positions each one for



medium voltage. See figure 2

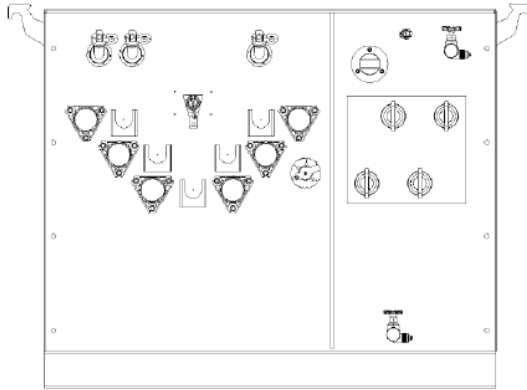


Figure 2. Net Pedestal Front

## 2.2 SWITCHGEAR BOX

These are devices to brake and make derivations on the underground primary feeders. They are designed and built in different types depending on customer requirements and under ANSI C578 12-27 standard.

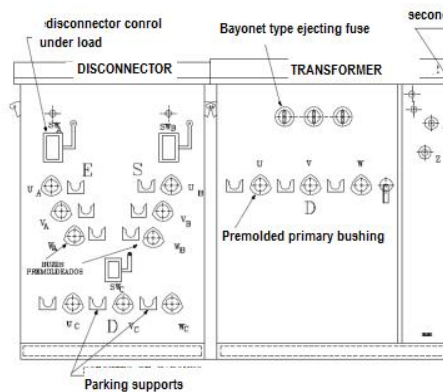


Figure 3. Switchgear Box 3 Ways-Selective Net Type

The tanks are designed to protect the feeding and the outdoors

derivation having access only from the bottom side.

### Switchgear Box - Sequential Net Type

This type brings one entrance, one output and one derivation, connected all through a 4 position breaker of sequential operation under load and oil immersed.

### Switchgear Box- Selective net type

This type brings one entrance, one output and one or more derivations depending on customer needs. It is connected through the same number of ON-OFF breakers, independent and selective operation, low load ad oil immersed.

## 3. RECEIVING

It is very important to make sure upon arrival that your equipment is received in perfect conditions, since it may undergo damage during shipment. All transformers are carefully quality inspected and factory tested.

### Inspection recommendations

Check nameplate information. Data on the nameplate should match data on the shipping documents.

- Serial number
- Capacity
- Primary voltage rating
- Secondary voltage rating
- No. of phases
- Connection

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Verify that transformer is either mounted on a wooden platform or properly crated.

Verify that the transformer brings its cabinet opening key, that the doors can be opened and that the locking system performs correctly.

Verify that the accessories such as valves, meters, LV and HV bushings and terminals, etc., are in good condition and that there are no oil leaks.

Verify that both tank and the radiators are free of dents or scratches and that there are no oil leaks or stains.

Verify that the transformer nomenclature allows identification of the terminals and grounding points.

#### 4. HANDLING

Mounting transformers are provided with lifting hooks or lugs for crane handling. Wherever possible, try to use fiber slings rather than metallic chains or slings, since those prevent damage of the anticorrosion coating. If you are going to use metallic chains or slings, make sure to cover the contact points to avoid damage to the paint finish. Also, avoid hitting the tank or radiators with the slings, since doing so could damage the transformer coated surfaces and produce tank deformation or leaks.

The wooden pallet or crate on which the transformer is shipped can be used for moving it with a forklift. It is

recommended to keep the equipment on the pallet until it reaches the installation site since this is an additional protection. When a crane or forklift are not available, rollers can be used to slide the transformer. For this purpose, use the same transformer base which is designed to slide it on both directions parallel to its axes. Take care not to over tilt it.

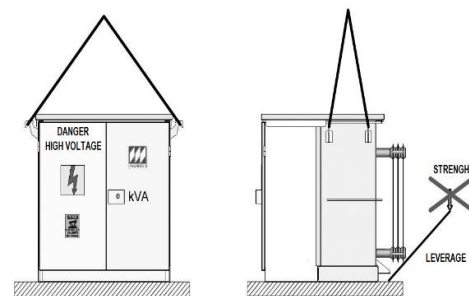


Figure 4. Transformer lifting

**WARNING:** Under no circumstances try to use cabinet or radiators as leverage when attempting to slide or lift the transformer, since these structures are not designed to withstand this kind of stress and may result in deformations or oil leaks.

#### 5. STORAGE

The transformer should be stored fully assembled, as if it were already energized at its final location, and should be kept as far as possible from the presence of water.

Transformers may not be stacked and must be stored on a firm, level foundation.



Figure 5 – Safe Distances

In the event that a transformer must be held in storage for a period in excess of one (1) year, it is recommended that the space above the oil be filled with dry air or nitrogen at two (2) or three (3) psi; this will prevent the presence of moisture.

## 6. MOUNTING

Transformers must be mounted on a flat leveled platform, strong enough to withstand the weight of the transformer itself. The unit should not be tilted in any direction greater than 1.5°. Oil level deviations can increase the possibility of a disruptive failure.

During the assembly there should be enough devices to lift the tank using a cat.

The transformer should be installed in a place with enough free area to allow for the opening of the cabinet doors, that is an angle greater than 135°.

The transformer should not be installed in areas close to people traffic or around mandatory walking areas.

In case the transformer is installed on or close to vehicle traffic areas, containment barriers should be placed.

The mounting of the transformer should guarantee minimum distances in relation to buildings, walls, roads and trees.

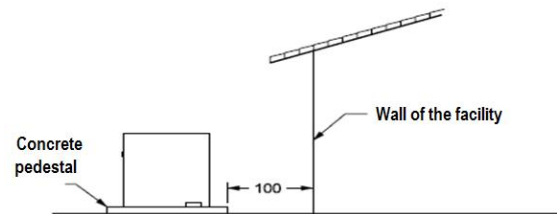


Figure 6 – Safe Distances

It is important to underline that the transformers contain an isolating flammable liquid (mineral oil) which might cause fire and/or explosion when the equipment fails. This should be considered when installing the transformer near building or public streets.

## 7. INSTALLATION

### 7.1 Recommendations prior to installation

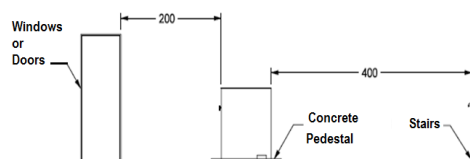
Perform a previous visual inspection of the site where the transformer will be installed. Check for dimensions, base level and adequate ventilation.

Verify that the tap changer is properly fastened and in the correct position.

Verify that all fuses are in a good condition, taking off the bayonets and checking the fuse continuity.

### WARNING

These procedures must be performed while the transformer is de-energized.





## 7.2 Testing

Prior to commissioning a transformer that has been stored for 4 months or more, the following basic tests should be performed.

### Insulation resistance (Megger)

It is recommended to make insulating electric resistance tests to the transformer since these tests allow to verify the condition of the same insulations, between live and dead parts.

### Ohm resistance

Measure the ohm resistance between medium and low voltage phases. The result should be reasonably similar to that shown on the protocol and equal between phases.

### Dielectric strength of the oil or insulating liquid.

A sample of insulating liquid must be taken from the sampling valve provided for that purpose. The dielectric strength of the insulating oil should be at least 30 kV, measured with semi-spherical electrodes placed 25 mm apart.

## 7.3. Installation steps

**NOTE:** The equipment must be grounded at the installation site in accordance with the applicable standards.

1. **Grounding:** It is necessary to make a solid, permanent, low impedance ground connection.

A conductor, in the same gauge of the neutral conductor, will be connected to the grounding system from the neutral terminal of the transformer. The transformer tank or chassis will also be connected to the grounding system. All metal parts that do not carry current and are uncovered must be solidly connected to this grounding point...

The number of wires will depend on the terrain resistivity and that of the grounding system. The grounding system configuration type will be defined by the area, terrain resistivity and the value of the minimum resistance value to be met. All grounding connections will be made with exothermic weld or with connectors according to the standard.

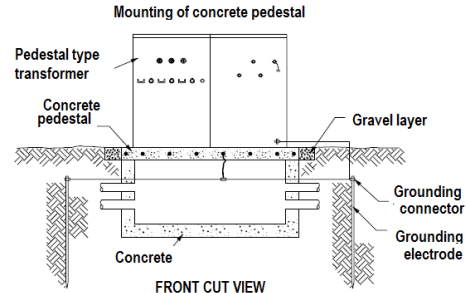


Figure 7. Grounding system

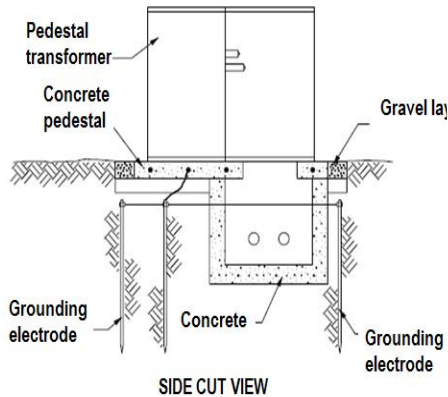


Figure 8 Grounding system

**WARNING:** The transformer must be properly grounded before it is energized. Failure to connect it properly may result in serious personal injury or death.

## 2. Low voltage connection:

To connect the low-voltage cables to the transformer proceed as follows:  
Identify the connection line (conductor) and the cable diameter to be connected to the low-voltage terminals.

The conductor length that will be used in **(L.T low voltage)** should be long enough to prevent excessive tightness over the terminals when connecting the transformer; care must therefore be taken to ensure that the conductor is cut to the appropriate length.

Remove the insulation of the cable in the exact dimension and preferably tin-weld the tip of the cable before connecting it.

Wrap the low voltage

terminals with self-sealing insulating tape to ensure that the installation is dead front and thus prevent accidents to people operating the equipment

Before energizing the transformer, make sure with a Megger that none of the phases are connected to ground and there is no short circuit between them.

**NOTE:** Loose or improper connections may cause the transformer to overheat or may result in network electrical losses.

## 3. Medium voltage connection:

To connect the medium voltage cable to the transformer, proceed as follows:

Identify phases by color-code in the network as well as in the high-voltage terminals.

Verify that pre-molded insulator accessories are tightly fastened and that their terminals are suitable for the conductor gauge to be used.

Connect the dry conductor to the pre-molded accessory without exerting pressure on the high voltage accessory.

Determine if you are going to use screen adaptor from the dry cable to ground or if you are going to properly ground these cables.

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**NOTE:**

- For high voltage connection make sure all accessories are properly working.
- Feeding cables come from the bottom part at ground level.

**WARNING:** Under no circumstance the length of the conductor should never exert stress on the accessories when connected to the transformer; care must therefore be taken to ensure that the conductor is cut to the appropriate length.

To avoid any damage while the transformer is energized or during its operation, take the following precautions:

Be fully clean at any time during the connecting process. Do not let cable or accessories to get contaminated with any foreign substance.

Clean the contact surfaces with a soft cloth using carbon disulphide or turpentine.

**NOTE:**

Make sure all connections are tight. A loose connection will cause overheating, carbonizing the affected part, causing the connection or equipment to fail. Make sure that the surfaces that come in contact between the well hub, insert bushing and elbow are free of dents and scratches.

These circumstances will not

allow a hermetic seal between them and therefore there is the possibility of voltage leaks that can cause the installation to fail.

**WARNING:** Verify that all grounding connections are securely fastened and that the ohm grounding resistance complies with the respective electrical regulatory requirement. This is critical to ensure people safety and proper equipment operation.

**NOTE:**

- Caps covering the bush inserts only serve to protect them from dust or impurities. If the equipment is going to have an unused energized terminal, it must be isolated by means of an insulation cap (Insulation Cap).
- The accessories of the pedestal transformers depend on the request of the customer and the KVA.

4. Connection of the elbow-type DPS (H.V.): the installation of the transient surge protection device must be in accordance with what is indicated in the Electrical Regulations of each Country. It is recommended to locate it in the insert bushing according to the diagram presented in figure 9.



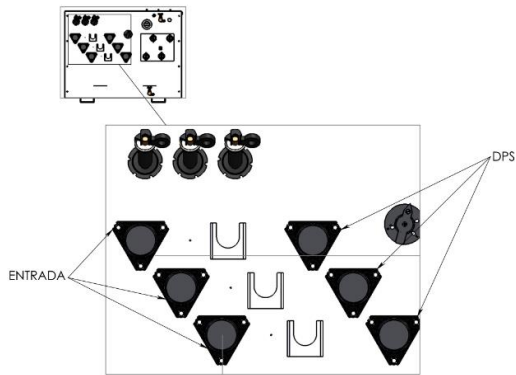


Figure 9. Location of elbow type DPS, on a radial front pedestal.

**NOTE:** the previous one is only a recommendation, for the logical arrangement of the accessories, (ease of access to the support for the parking hub) however it is the end user who decides for convenience of the connection where to locate the elbow and its respective DPS, since inside the cabinet these points are the same, as shown in Figure 10.

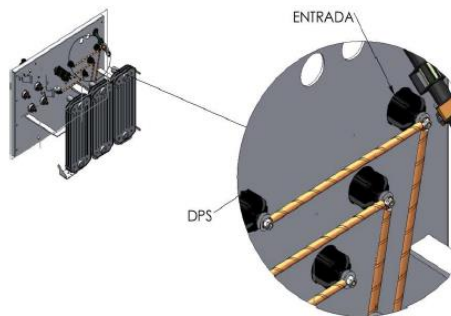


Figure 10. Internal connection of the bushings that externally house the elbow and the elbow type DPS.

The DPS can also be installed in the double insert bushing, Figure 11



Figure 11. Double insert bushing installation.

## 8. COMMISSIONING

Once all tests have been completed and the installation of the transformer verified, transformer operation comes into effect. For this purpose, take the following precautions and follow the steps listed below:

1. Verify that the disconnectors, if any, are in the appropriate transformer position. Do this contrasting with the plate data.



2. It is recommended to properly shield both sides of the transformer.
3. Make sure that the network is neither close to or influenced by any external element that could put the phases in contact.
4. Prior to medium voltage installation and commissioning, take a new measurement of the grounding resistance and make sure that lightning poles are before installing the medium voltage and putting it into operation, measure again the grounding resistance and make sure that the lightning rods are connected to each other and connected to both the tank and the down pipe to the ground.
5. Energize the three phase transformer from the main disconnecter in a three phase fashion, not in phase by phase fashion, or you have the alternative to make it using the ON-OFF disconnecter installed in the transformer. This latter operation should be made

using a pole, in order to avoid any ferro-resonance failure.

6. Once the transformer has been energized, a secondary voltage reading must be taken to ensure that it is correct.
7. If the secondary voltage is not correct, it can be adjusted using the tap changer which is operated at no load and the transformer must therefore be de-energized prior to making the change.

## **9. MAINTENANCE**

In order to guarantee a transformer long life and to ensure its best operation at all times, a periodical inspection and proper maintenance of its operation is mandatory.

**WARNING:** All and any transformer maintenance must be carried out with the transformer de-energized.

**NOTE:** All preventive and/or corrective maintenance activities must be carried out by duly qualified and trained personnel. It is important to follow all applicable safety measures.



### 9.1. Preventive Maintenance

Preventive maintenance can be defined as a set of frequency defined actions taken to prevent deterioration from use and life cycle shortening of the components, parts and materials and any other items. Table 1.

TABLE 1. Preventive Maintenance Frequency by accessory

Parts to be inspected	Frequency	Observation
Thermometers	Once a year	
Accessories with alarm or triggering contacts	Once a year	Verify conditions of contacts operation
Resistance of winding insulating	Once a year	Recording of data for a good follow-up
Measurement at LV Terminals	Once a year	Recording of data for a good follow-up
Dielectric oil strength	Once a year	
External accessories	Every 6 months	Physical conditions
Paint	Once a year	Cleaning of powder or other dirtiness
Transformation ratio	Once a year	

### 10. TIGHTENING TORQUES

The recommended tightening torques for threaded connections (joints) are shown in Table 2.

Table 2. Tightening torques

Accessory	Torque (Nm)
Tap changer	10.8
HV bushing	24.4
LV bushing	31.2
Disconnecter	20.3

### 11. ENVIRONMENTAL RECOMMENDATIONS

This transformer contains dielectric insulating oil. According to manufacturer it is a Class 9 NTC1692.

Some of the oil characteristics according to the Material Safety Data Sheet MSDS are:

- Oil is stable under normal conditions.
- It begins to decompose at 280°C or higher.
- Avoid excess of heat and the presence of highly oxidizing agents.
- It may generate flammable gases which might be harmful.
- In the presence of air, there is a risk of self-ignition at temperatures above 270°C.



Considering the above statements, please keep in mind the following preventive measures before handling the oil:

Ensure availability of proper fire extinguishing equipment: in this case use carbon dioxide (CO<sub>2</sub>) in the form of a dry chemical agent or foam. Water/mist sprinklers may be used. For safety reasons do not use water pressure jets unless handled by authorized personnel. (Risk of combustion stains).

Use appropriate personal protective equipment, such as nitrile gloves, goggles and safety boots.

Ensure availability of oil storage and oil spill control equipment.

To prepare for the possibility of a spill during shipment, installation or repair of the transformer:

Transport the transformer in a vehicle equipped with oil spill control equipment. It is recommended that temporary storage drums be kept available (if that is the case), which have to be labeled.

Once a spill has occurred, prevent the oil from soaking into the ground or leaking into ditches, drainage or sewage systems, or water streams. To this end, use the elements in the spill handling kit.

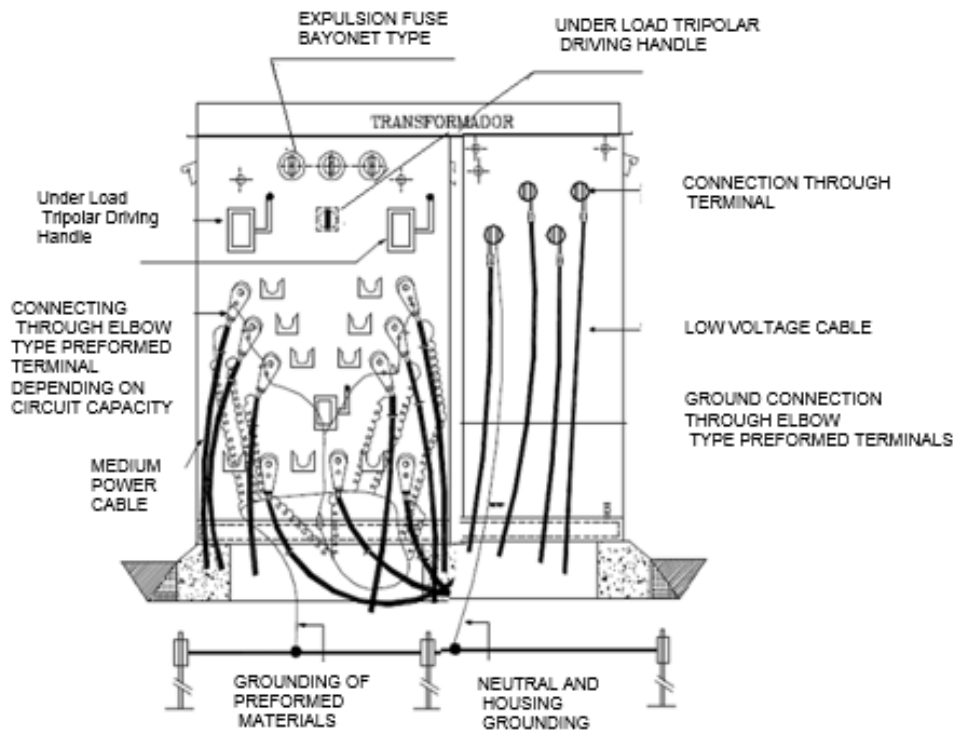
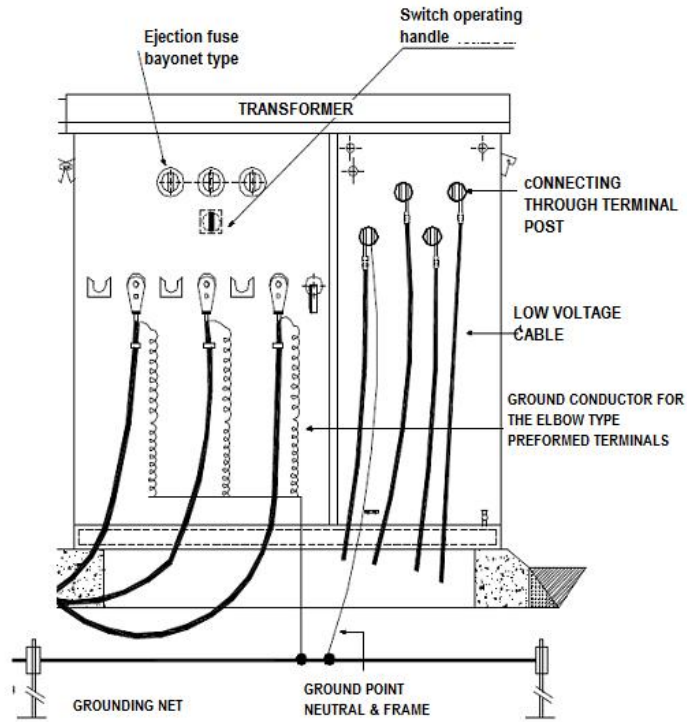
Try to confine the spill as much as possible, keeping it from spreading and collect it using any available absorbent material. It is recommended to use special chemical oil-absorbing powders and rags, otherwise use sand, soil or any other inert material.

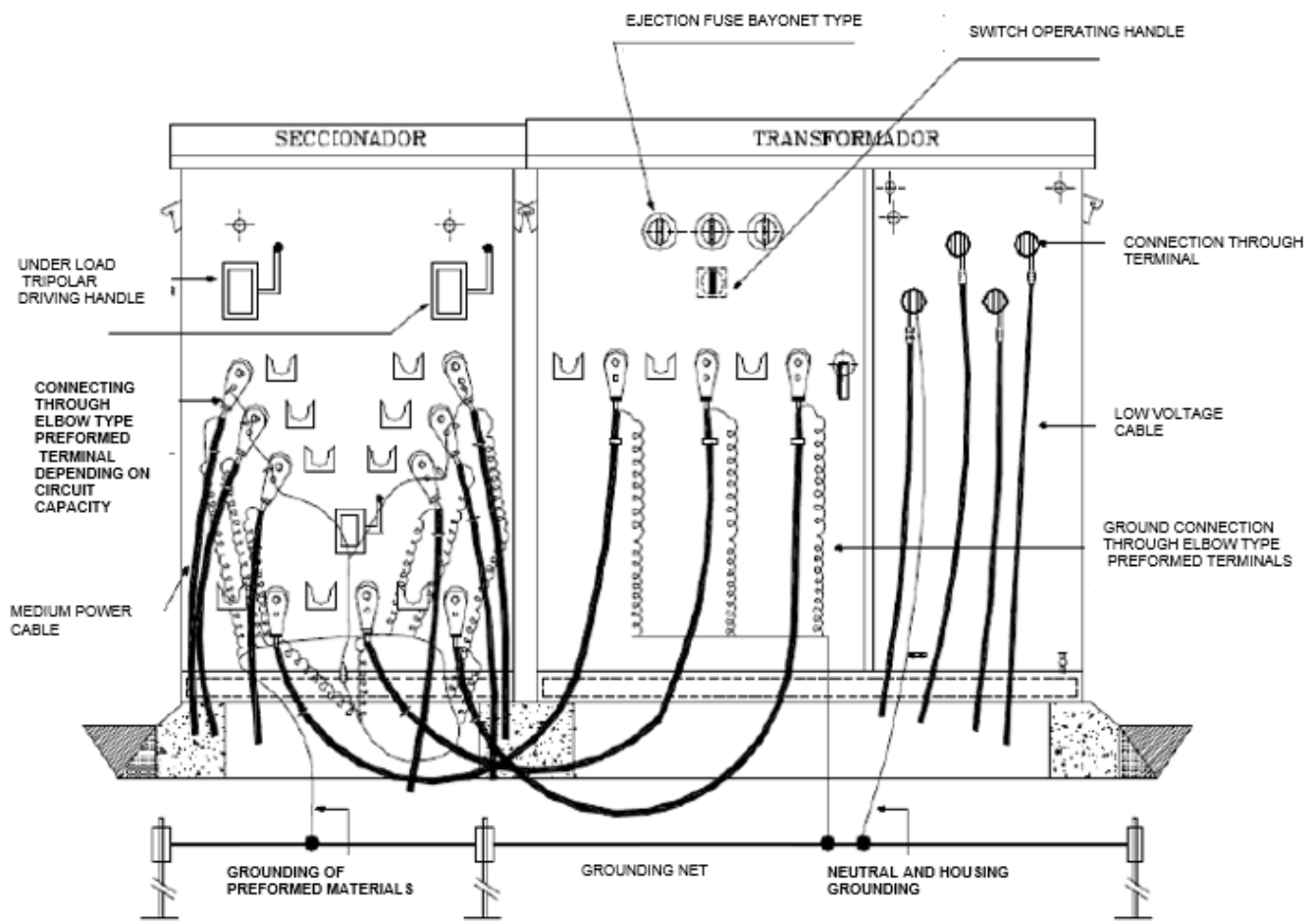
Keep in mind that any residues generated as a result of the handling of oil of the control of spills of emergencies are classified as hazardous and must be disposed as such, and in accordance with local regulations. They must therefore be collected from the site and taken to an authorized location.

If necessary, contact your local safety authorities.

**Personal precautions** Use adequate personal protective equipment. In the event of a major spill, perform the cleaning process wearing the proper protective clothing, such as gloves and boots. Remove contaminated clothing as soon as possible.



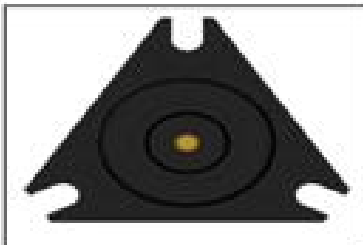


# ANNEX 1









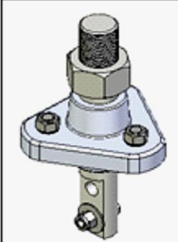
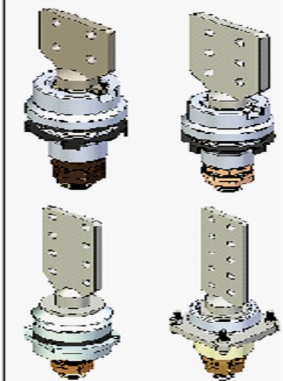
## MT CONNECTION ELEMENTS

Accessories	Name	Function
	200 and 600 amps elbows	It allows to make a connection. It functions as an insulator
	Single and double Insert bushing	It allows to make a connection. It functions as an insulator
	wellbore bushing	It allows to make a connection. It functions as an insulator
	Screen adaptor	Grounds the conductor connecting the adaptor rod
	Shunts interchanger (commutator)	Allows to change the transformation ratio to guarantee that during low voltage the required voltage is delivered



	<p>Breaker ON OFF</p>	<p>Used to energize or de-energize the transformer</p>
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## BT CONNECTION ELEMENTS







Accessories	Name	Function
	<p>Low voltage insulator eye type</p>	<p>Used for low voltage connection for each conductor per phase.</p>
	<p>Low voltage insulator stud type</p>	<p>Used for low voltage connection for each conductor per phase.</p>
	<p>Low voltage insulator blade type 4H, 6H, 8H, 10H</p>	<p>Used for low voltage connection for each conductor per phase.</p>



## PROTECTION ELEMENTS



Accessories	Name	Function
	Overpressure valve	Relieves tank internal pressure when this pressure reaches operating safety limits
	Bayonet	High voltage protection housing of the bayonet assembly
	Current sensing Bay-o-net fuse	Protects equipment from distribution system harmful currents. It is internal to the bayonet assembly
	Bay-o-net fuse Current sensing	Senses current and additionally monitors the temperature at the equipment hot point and limits its overheating from extended overloads or from environmental conditions. It is internal to the assembly.
	Exhaust fuse	It backs up switch operation, acting as an overcurrent protection, insulating the failing network transformer
	Insulating link	To protect equipment from currents exceeding the bayonet type fuse capacity. It additionally protects while the bayonet fuse is replaced when the transformer has failed.

			Current limit fuse	Operates when there is an internal transformer failure or when there are primary high currents, in order to protect the distribution or feeding system
			Draining valve	Used to obtain oil samples for testing
			Internal lighting rod	These lighting rods are mainly used submerged in order to protect them from atmospheric contamination, animal damages, vandalism or humidity.
			Magnex interrupter	Interrupter that protects the distribution transformer from overloads and secondary failures
			Breaker	Protects transformer from overloads or short-circuits by immediately interrupting the continuity of the electrical signal
			DSP (lighting) Elbow type	Protects transformer against the sudden increase of voltages due to atmospheric discharges or switching.