Rymel

MANUAL FOR THE RECEPTION, INSTALLATION, COMMISSIONING, AND MAINTENANCE.

PAD MOUNTED TRANSFORMERS

www.rymel.com.co Tel: +57 (604) 444 0430 rymel@rymel.com.co Copacabana - Antioquia -Colombia

SC278-1 SA-CER505894 OS-CER617167

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1.OBJECTIVE

This manual provides the necessary instructions for the reception, installation, commissioning, and maintenance of Rymel dead-front pad-mounted transformers.
Rymel transformers are designed in accordance with applicable national and international technical standards, based on the country and specific installation site.

This guide covers key aspects related to the equipment's configuration, construction, and assembly, as well as recommendations for correct field installation and operation.

The technical recommendations and safety warnings contained herein are based on RYMEL S.A.S.'s experience in the design and manufacture of these units. However, this document does not cover every possible situation that may arise during installation or operation.

In addition to following the guidelines in this manual, it is mandatory to comply with the regulations in force in the country of installation and with the technical requirements of the local utility.

Read this manual carefully before energizing the equipment. For additional information or specific situations, please contact us.

2. PAD-MOUNTED TRANSFORMER

A pad-mounted transformer is a distribution transformer installed at ground level, housed in a sealed metal enclosure, designed to operate on medium-voltage networks (typically between 15 and 36 kV) and to supply low-voltage power to residential, commercial, or industrial users.
It is installed on a concrete pad and features a controlled-access metal enclosure for use in public areas. The transformer core and coil assembly, along with the medium-voltage and low-voltage compartments, are integrated within a single cabinet.
The medium-voltage side is equipped with dead-front bushings, which enhances operational safety. The unit also incorporates the protection and switching elements characteristic of a compact substation.
Pad-mounted transformers may be single-phase or three-phase.

FIGURE 1. THREE-PHASE PAD-MOUNTED TRANSFORMER

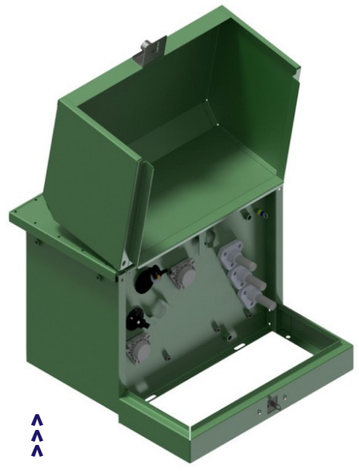

FIGURE 2. SINGLE-PHASE PAD-MOUNTED TRANSFORMER

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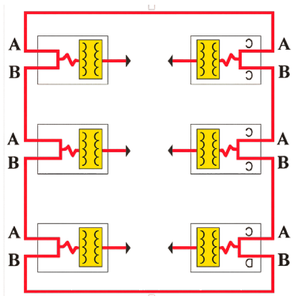
2.1. Loop-Feed Pad-Mounted Transformer

In a loop-feed pad-mounted transformer, the medium-voltage supply is provided through a loop-feed system within underground distribution networks. This system forms part of a distribution ring designed to maintain service continuity in the event of a fault in one section of the circuit.



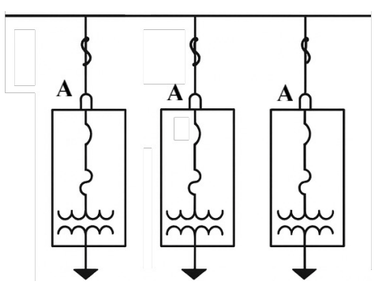
The transformer incorporates a medium-voltage load-break switch that allows switching operations on both loop entry points, identified as Feeder A and Feeder B.
This device enables the operator to:

- Enable both feeders A and B simultaneously and connect the transformer for normal ring operation.
- Disconnect Feeder A only.
- Disconnect Feeder B only.
- Completely isolate the transformer from the system, transferring the supply between A and B without interrupting downstream service.

Thanks to this switching system, the unit can be integrated into looped networks with a high level of reliability, facilitating maintenance operations, fault isolation, and circuit reconfiguration, while minimizing any impact on supply continuity.

2.2. Radial-Feed Pad-Mounted Transformer

In a radial-feed pad-mounted transformer, the medium-voltage supply is provided from a single radial feeder. In this configuration, the unit receives power from a single point on the electrical system, and therefore has only one set of dead-front bushings, forming the sole entry point (Feeder A).
The unit incorporates an ON/OFF load-break switch, which allows the transformer to be safely connected to or disconnected from the medium-voltage feeder for switching operations or maintenance.
In a radial system, energy flows in one direction — from the substation to the load. If a fault occurs upstream, the transformer and all associated downstream loads will be out of service until supply is restored, since there is no alternative source as in loop-feed systems.
This design is widely used in residential, commercial, and industrial underground networks where simplicity, safety, and ease of operation are the primary priorities.



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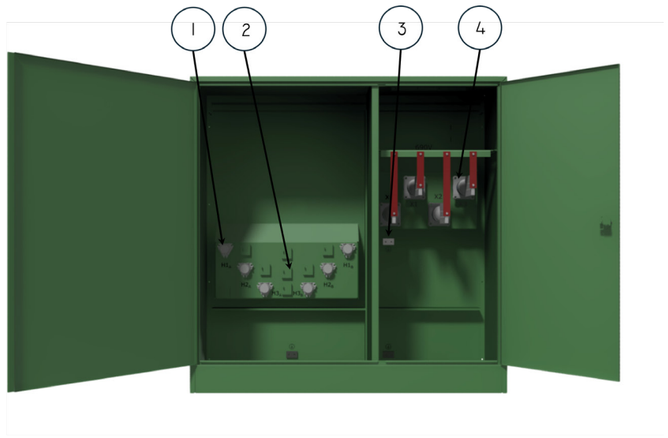
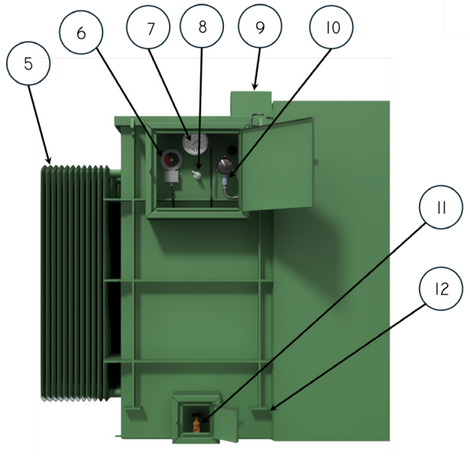
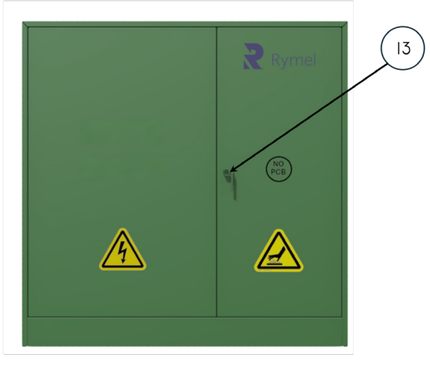
3. PAD-MOUNTED TRANSFORMER COMPONENTS







1. High-Voltage Bushing
2. Stabilizer Support
3. Ground Connection Point
4. Low-Voltage Bushing
5. Radiator
6. Oil Level Indicator
7. Pressure Gauge
8. Load-Break Switch
9. Pressure Relief Device
10. Thermometer
11. Drain Valve with Sampling Port
12. Hydraulic Jack Support
13. Handle Padlock Holder

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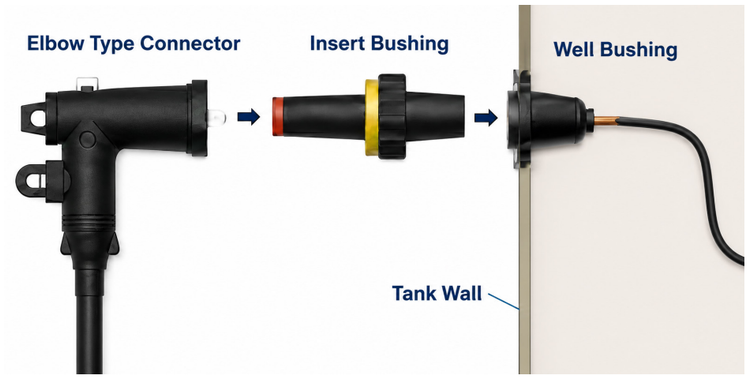
3.1. Dead-Front High-Voltage Bushings

3.1.1. Bushing Well and Insert

A bushing well is an insulated device installed in the medium-voltage compartment, designed to allow safe connection of loadbreak elbow connectors.
It is referred to as a "bushing well" because its configuration is recessed into the tank wall, with the conductor housed within an insulating body, forming a cavity or well where the connection system is installed.
The bushing insert is connected to the bushing well. The insert has a threaded conductor that establishes the connection with the transformer's medium-voltage winding. At the opposite end, the insert mates with the elbow connector, which in turn connects to the underground feeder cable.
The bushing well, insert, and elbow connector together form a dead-front system, in which no energized parts are exposed externally, ensuring operational safety during connection, disconnection, and switching on underground distribution networks.



A double bushing insert may also be installed, allowing two connection points within a single bushing well. This configuration facilitates the simultaneous connection of an elbow connector and an elbow-type surge arrester (DPS), as illustrated in the diagrams.

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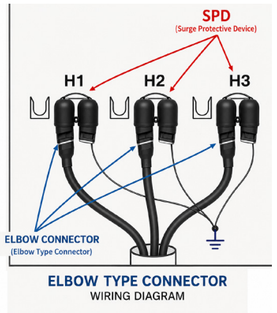
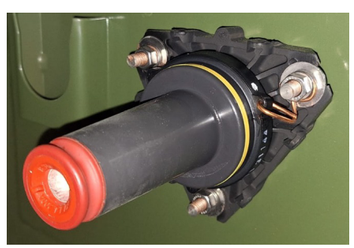


ELBOW TYPE CONNECTOR
WIRING DIAGRAM

3.1.2. Installing the Insert into the Bushing Well

Correct installation of the bushing insert is essential to ensure electrical continuity, hermeticity, dielectric performance, and overall dead-front system reliability. This procedure must be carried out with the equipment de-energized and in compliance with all applicable electrical safety standards.

- Remove the temporary protective cap from the bushing insert and verify that both the insert and well surfaces are free of mechanical damage, cracks, contamination, or moisture.
- Using a clean, dry, lint-free cloth, remove any dust, grease, moisture, or contaminants from both the external surface of the insert and the internal cavity of the bushing well. Surfaces must be completely clean to prevent partial discharge paths or insulation degradation.
- Apply the silicone grease supplied with the insert uniformly to the internal cavity of the bushing well and to the external surface of the insert, specifically in the mating zone between the two components. The silicone grease facilitates mechanical engagement, helps ensure a hermetic seal that prevents moisture ingress, and maintains the dielectric integrity of the system.
- Carefully insert the bushing insert into the bushing well cavity, ensuring the threaded coupling is aligned. Once threading has begun, turn the insert clockwise until it makes firm contact with the bottom of the well. Then perform the final tightening to a torque of 20 N·m.
- Once the insert is installed, replace the temporary protective cap until the connection to the elbow connector or appropriate protection device is made.



Note 1: Do not exceed the specified torque value. Over-tightening may damage the threads, deform the component, or compromise the dielectric seal, thereby affecting the mechanical integrity and electrical performance of the dead-front system.

Note 2: The temporary protective cap is intended to protect the exposed surface of the bushing insert during transport, handling, and storage, preventing contamination, impacts, or mechanical damage. This cap is not designed to withstand electrical voltage and does not provide adequate insulation when the transformer is in service. If a bushing insert is not being used and it is necessary to energize the transformer, an insulating plug rated for the applicable voltage class must be installed to ensure proper sealing and maintain the integrity of the dead-front system.

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3.2. Bay-O-Net Fuse

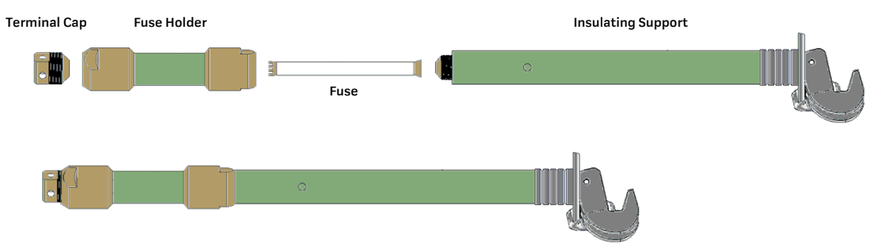
A Bay-O-Net fuse is a protection device against external events such as overloads, secondary network faults, or overheating. It is an expulsion-type fuse designed to interrupt current when it exceeds a preset value, or when a certain temperature threshold is reached (depending on whether the fuse is current-sensing or dual-sensing). It protects the system against sustained overloads, external short circuits, or abnormal thermal conditions.

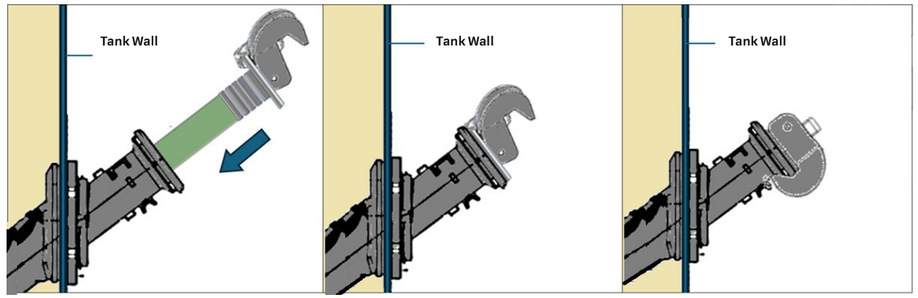
The Bay-O-Net fuse is installed within a fuse holder that is recessed into the side wall of the tank, allowing fuse replacement from the exterior without opening the transformer.

The fuse element is housed within the Fuse Enclosure, which acts as the interruption chamber during operation. At one end, this enclosure has a threaded terminal cap that mechanically secures the fuse in position, providing firm retention and adequate contact pressure.

At the opposite end, the enclosure mates with an insulating support, whose function is to hold the fuse assembly and provide the necessary electrical insulation. This support incorporates a hook mechanism at its end for hot-stick operation, allowing safe installation or removal of the fuse from outside the unit.

The complete assembly is inserted into the side fuse holder permanently installed in the transformer tank wall.





3.2.1 Bay-O-Net Fuse Replacement Procedure

Bay-O-Net fuse replacement must be performed only by qualified personnel, strictly following electrical safety standards and using appropriate dielectric tools. It is recommended to de-energize the transformer and confirm the absence of voltage before any intervention.

- Use a hot stick to actuate the pressure relief valve, keeping it activated until the venting sound completely ceases. This step prevents oil expulsion through the fuse holder due to residual internal pressure.
- Using the hot stick, lift the locking latch on the Bay-O-Net fuse and rotate it 90° clockwise within the housing to break the adhesion between the gasket and the fuse holder. This rotation breaks the seal and releases the assembly.
- Pull the fuse holder out quickly, approximately 6 inches (~15 cm), in a single firm motion. This action opens the circuit and eliminates any residual charge. Wait a few seconds to allow oil to drain back into the tank. Keep the assembly slightly tilted. Then fully remove the fuse holder. This step is critical to prevent spills and ensure operational safety.

With the assembly removed from the transformer, unscrew the Terminal Cap and remove the Fuse Enclosure. Extract the expulsion fuse element. Perform a visual inspection of the Fuse Enclosure, check the contacts, and confirm there is no mechanical damage. Verify the fuse holder is in good condition.

- Insert a new expulsion fuse into the Fuse Enclosure, verifying that the replacement has the same rated current and interrupting characteristics as the original. Firmly tighten the Terminal Cap to avoid hot spots, and attach the insulating support while maintaining correct alignment.
- Insert the complete assembly (Terminal Cap, Fuse Enclosure, Insulating Support) into the Bay-O-Net Fuse Holder installed on the transformer tank and push it in firmly until it reaches the bottom.
- Press the locking latch down and confirm that the locking mechanism is secured. Verify that the hermetic seal is correctly seated.
- Confirm there are no leaks and ensure the oil level is within range. Restore service in a controlled manner and always investigate the cause of fuse operation before re-energizing.

Nota 1: Bay-O-Net fuses are always connected in series with current-limiting fuses or isolation links to provide full-range protection against minor overloads and severe faults.

Note 2: Selection of the Bay-O-Net fuse type takes into account the transformer's rated current, short-circuit level, and inrush current. It is recommended to maintain the fuse reference and specifications as designated by the transformer manufacturer.

3.3. Current-Limiting Fuse

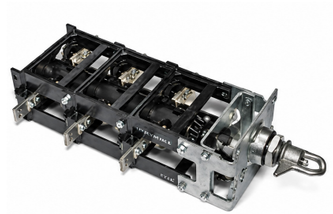
The current-limiting fuse is a medium-voltage protection device designed to interrupt very high fault currents, limiting the energy that enters the transformer during a severe short circuit. Its function is not merely to open the circuit, but to reduce the current peak and the thermal and mechanical energy associated with the fault, thereby decreasing the stresses on the core and coil assembly, the insulation system, and the tank.
Typically, the current-limiting fuse is connected in series with the replaceable Bay-O-Net expulsion fuse. The Bay-O-Net fuse operates under overloads and low-to-moderate fault currents, offering sensitive and easily replaceable protection from outside the unit. When the fault current is high, the current-limiting fuse comes into operation.
Thanks to its current-limiting characteristic, the fuse interrupts the fault before it reaches its maximum short-circuit value, significantly reducing the associated energy. The combined system therefore provides comprehensive protection: the expulsion fuse covers the low-to-medium current range, while the current-limiting fuse handles severe short circuits and additionally provides energy-limiting capability.
In pad-mounted transformers, which typically operate in urban underground networks, this protection is particularly relevant. Since there are no visible protection devices as in overhead networks, the internal fuse system design is of greater importance.

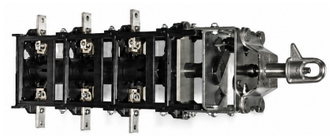
3.4. IsoLink Isolation Link

Some utilities choose to install an IsoLink isolation link instead of a current-limiting fuse. Its primary function is to ensure that a transformer that has suffered an internal fault remains permanently disconnected from the network.
The IsoLink is not a fuse and does not have current-interruption capability on its own; therefore, it is not designed to clear faults or limit current. Its purpose is to ensure the definitive isolation of the equipment once another protection device has operated.
Normally, the IsoLink is installed in series with the Bay-O-Net fuse. Under normal operating conditions, the link carries current without intervening. When a fault occurs and the Bay-O-Net fuse operates to clear it, the event may generate internal currents and stresses that cause the IsoLink to melt. Once it melts, the primary circuit remains permanently open, preventing the faulty transformer from being accidentally re-energized.
This behavior provides additional protection, particularly relevant during switching operations or service restoration attempts following a fault. If re-energization is attempted without verifying the transformer's condition, the melted IsoLink prevents energy from reaching the damaged unit. This reduces the risk of a second, more severe fault, further damage to the transformer, or dangerous events such as an internal arc with overpressure.

3.5. Load-Break Switch

The load-break switch (also known as a loadbreak switch) is a device installed in the medium-voltage compartment of the transformer that allows the primary circuit to be opened or closed while the transformer is energized and under load. Unlike a standard disconnect switch, this device is designed to safely interrupt load current while controlling the electric arc produced during the operation.
Its primary function is to enable switching operations in underground networks without the need to de-energize the entire upstream circuit. This facilitates maintenance work, fault isolation, and network reconfiguration without affecting large sections of the system. Operation is performed with a hot stick from outside the enclosure, maintaining operator safety.





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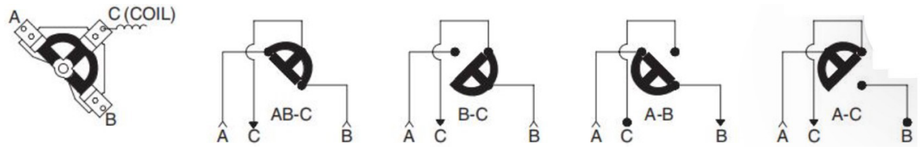
3.5.1 Two-Position Switch (ON–OFF) Radial Applications

- Application: Radial network.
- Single feeder; unidirectional energy flow; no alternate backup source.
- ON: Primary connected to the network. OFF: Transformer fully isolated.
- Purpose: Enable safe transformer isolation for maintenance or replacement.
- Key features: Simple design, lower cost, typical use in residential areas, does not allow service continuity in the event of a feeder fault.

3.5.2 Four-Position Switch Loop-Feed Applications

- Application: Loop or ring network.
- Two feeders; energy can flow from either end; open or closed ring configuration.
- Allows: connecting both sides of the ring; feeding from Side A; feeding from Side B; completely isolating the transformer.
- Purpose: Ensure service continuity and greater operational flexibility.
- Key features: Greater reliability, allows automatic or manual backup, essential in urban underground networks, greater switching capacity.



3.6. Internal Connection of Protection Elements

The medium-voltage protection elements are connected in series, following a defined sequence from the network entry point to the transformer's primary winding.
The sequence begins at the bushing well, which passes through the tank wall and forms the interface between the medium-voltage underground cable and the interior of the unit.
Internally, the bushing conductor connects to the switching and protection system.
From the bushing, the conductor is routed to the load-break switch. At the switch output, the current-limiting fuse is connectedgenerally installed inside the tank, submerged in oil. This device is not externally accessible and is designed to operate under high-magnitude fault currents.
In series with the current-limiting fuse is the Bay-O-Net fuse, installed in a fuse holder that penetrates the tank and is accessible from the exterior. The Bay-O-Net protects against overloads and low-to-moderate fault currents, and is also the replaceable element of the system.
Finally, the Bay-O-Net output connects directly to the primary winding terminal.
This configuration allows switching under load and provides stepped protection against different levels of overcurrent, ensuring selectivity, operational safety, and proper internal coordination within the pad-mounted transformer.

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3.7. Tap Changer

The transformer is equipped with a tap changer located on the tank wall. The tap changer position must only be changed with the transformer de-energized.

- Verify the nominal position of the tap changer by consulting the data on the unit's nameplate.
- Using a screwdriver, loosen the handle locking screw until it protrudes from the disc.
- Turn the handle and move the tap changer to the desired position. Ensure the tap changer is correctly seated and that the tip of the knob aligns with the number corresponding to the selected tap.
- Re-tighten the locking screw, ensuring it fully engages with the disc.
- Perform a continuity check on the medium-voltage terminals to confirm the tap changer is firmly locked in the selected position.

TAP	Voltage
1	13868
2	13530
3 Nominal	13200
4	12870
5	12548

3.8. Filling Plug

Located at the top of the tank, this fitting is used to connect a filter press unit and fill the transformer tank with oil. A vacuum process is performed through this fitting before filling the unit with oil.

3.9. Thermometer

A Celsius thermometer located in the high-voltage compartment is used to record the temperature of the liquid at the top of the main tank. It has two indicators: the first records the current temperature at the top of the tank (typically a white pointer); the second records the maximum temperature the oil has reached during operation (typically a red pointer).
To reset the maximum indicator, manually turn the knob at the center of the device.

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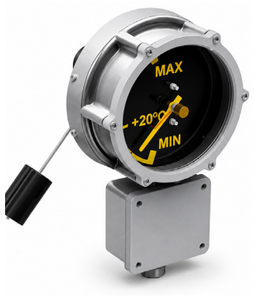
3.10. Oil Level Indicator

Consists of a float arm located in the main tank and a pointer indicator among three reference marks: high level, ambient temperature (25°C), and low liquid level. If the unit was opened for repair or maintenance, the indicator should not be near the low level mark. If it is, the unit must be refilled until the liquid level is near the 25°C mark. This level may vary slightly at the final installation site due to temperature changes.



3.11. Pressure Relief Valve

The pressure relief valve protects the transformer against abnormal increases in internal pressure by automatically releasing excess pressure when it exceeds design values.
The valve must not be operated manually, as doing so may compromise the tank's hermeticity, allowing moisture and contaminants to enter and deteriorate the transformer's insulation system.
Internal pressure increases may result from overloads, external faults, or internal winding faults. Under these conditions, the valve is calibrated to open at 10 ± 2 psi and to reseal when pressure drops to 6 ± 2 psi.

3.12. Drain Valve with Sampling Port

The drain valve with sampling port is located at the bottom of the unit. It is used to collect samples of the dielectric fluid to monitor the condition of the oil over time. Sampling must be performed through the port located on the side of the valve.

4. TRANSFORMER TRANSPORTATION

The transformer must always be transported in an upright position and adequately protected against impacts and external elements that could affect its performance. An appropriate transport scheme and packaging must be selected. The following conditions must be met during transport:

- The unit must be placed inside appropriate packaging that ensures its integrity and prevents any movement within the vehicle.
- The transformer must be firmly secured to prevent falls or sudden movements that could cause impacts on its components.

- The transformer must be properly secured to the packaging, which must have a base that allows the use of a forklift, facilitating handling without compromising its structure.
- The securing system must not compress or generate mechanical stresses on the bushings, terminals, tap changer, or accessories.

5. TRANSFORMER RECEPTION

Upon receiving the transformer, it is essential to perform a thorough visual and documentary inspection, as the unit may have suffered damage or alterations during transport despite all precautions taken. All transformers are previously subjected to strict quality control and routine tests, the results of which are recorded in the individual test protocols.

5.1 Physical Inspection of the Equipment

During transformer reception, the following must be verified:

- Inspect the packaging condition and confirm that the transformer is properly crated and secured on a wooden base.
- Inspect the bushings to ensure they show no cracks, fractures, or damage to their insulating body.
- Confirm the presence and condition of all connectors, terminals, and fastening elements, verifying they are correctly installed and tightened.
- Verify that all supplied accessories are present, complete, properly secured, and free of visible damage such as cracks, fractures, scratches, or dents.
- Verify that the transformer tank shows no deformations, dents, or evidence of oil leaks.
- Check for the absence of corrosion and leaks anywhere on the transformer.
- Verify that the nameplate, identification labels, terminal markings, and ground connection points are legible and correctly installed.
- Visually check the dielectric oil level through the level indicator, ensuring it is within the normal operating range.
- Verify that the pressure relief valve is correctly installed and free of mechanical damage.
- Inspect the lifting lugs to confirm they show no deformations or damage.
- Verify that transport and security seals have not been altered or tampered with during transit.

5.2. Documentation Verification

In addition to the physical inspection, the following documentation must be verified:
Confirm that the information recorded on the nameplate matches the purchase order, delivery note, and documents supplied with the unit. At a minimum, the following must be verified:

- Serial number.
- Rated power (kVA).
- Primary and secondary voltages.
- Number of phases.
- Connection group.
- Number and arrangement of high- and low-voltage bushings.
- Rated frequency.
- Percentage impedance (when applicable).

Verify that the transformer has been delivered with all accessories, technical documents, and certificates specified in the scope of supply.

5.3. In Case of Anomalies

If any damage, irregularity, or inconsistency is detected during the inspection, the following actions must be taken:

- Document the situation in detail, including a clear description of the findings.
- Take photographic records evidencing the observed condition.
- Immediately notify the manufacturer and the carrier (when applicable) for the corresponding follow-up.
- Do not proceed with the installation or commissioning of the transformer until instructions are received from the manufacturer.
- Compliance with these verifications ensures that the transformer has been received in adequate condition for installation, guaranteeing safe operation and reliable long-term performance.

6. LIFTING AND DISPLACEMENT

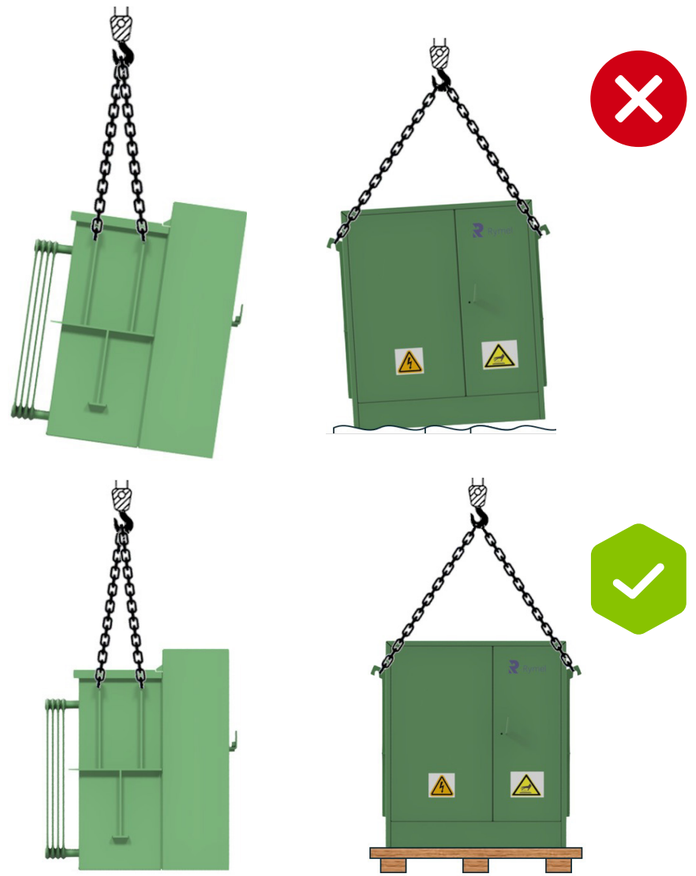
The handling, lifting, displacement, installation, and commissioning of the transformer must be performed only by qualified personnel, duly trained and familiar with this type of equipment.
During these activities, all applicable safety standards, current local regulations, and the manufacturer's recommendations must be strictly followed.
Transformers are equipped with lifting lugs or lifting eyes specifically designed to support the full weight of the unit during hoisting operations. These lifting points must be used in accordance with the manufacturer's instructions and simultaneously when applicable.

6.1. Lifting the Transformer

To perform a safe hoisting operation, observe the following recommendations:

- Use all designated lifting points to ensure uniform load distribution.
- Verify that all lifting equipment and accessories (cranes, slings, shackles, and other rigging elements) are certified and have adequate load capacity for the transformer's weight.
- It is recommended to use lifting elements with a minimum safety factor of 5.
- Keep the transformer in an upright position throughout the entire hoisting operation. Do not allow excessive tilting that could affect stability or cause internal damage.
- Apply the load gradually, avoiding sudden movements, impacts, or abrupt accelerations that could generate additional mechanical stresses on the unit.
- Protect painted surfaces and contact points with slings to prevent damage to the coating system.
- Do not stand under or allow personnel to pass under a suspended load.
- Do not leave the transformer suspended for extended periods. Once the maneuver is complete, place it immediately on a firm, level, and stable surface.
- Under no circumstances use bushings, terminals, radiators, or accessories as lifting or securing points.

SAFETY WARNING: Under no circumstances should the transformer be lifted, displaced, or supported using the bushings, high- or low-voltage terminals, radiators, accessories, or any other component not designed for hoisting. These components are not designed to bear mechanical loads, and improper use may cause equipment damage, compromise personnel safety, and affect operational reliability.



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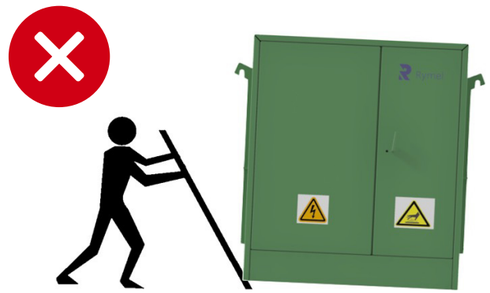
6.2.Displacing the Transformer

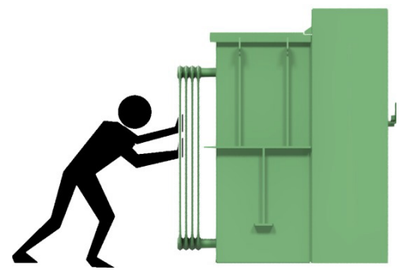
Displacement of the transformer must be carried out with the necessary precautions to prevent equipment damage and ensure the safety of all personnel involved. The following recommendations apply to movement within the facility or to the final installation site:

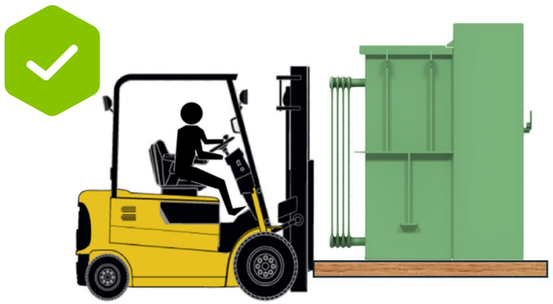
- Keep the transformer in an upright position throughout the entire displacement process. Do not allow tilting that could affect stability or internal components.
- Avoid sudden movements, abrupt accelerations, or impacts that could generate mechanical stresses on the equipment's structure.
- Do not apply force to the bushings, terminals, radiators, or accessories to move the transformer. These elements are not designed to bear mechanical loads.
- When using a forklift, ensure that the forks are fully inserted under the support base and that the load is evenly distributed.
- Whenever possible, use the wooden base supplied with the transformer to facilitate transport and protect the bottom of the tank.
- It is recommended to keep the transformer on its transport base until reaching the final installation site, as this provides greater stability and protection during displacement maneuvers.
- Verify in advance that the transport route is free of obstacles and that the floor load capacity is adequate to support the transformer's weight.

SAFETY WARNING: Never drag the transformer directly on the ground. This practice may cause tank deformation, damage to the coating and paint system, and initiate corrosion processes that compromise the integrity of the equipment.

SAFETY WARNING: Do not use levers braced against the transformer tank to attempt to lift or move it. This structure is not designed to withstand lever forces and may suffer deformations or develop oil leaks due to undue pressure on seals and covers.







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7. TRANSFORMER STORAGE

All transformers must be handled, stored, transported, installed, commissioned, and operated only by competent, duly trained, and authorized personnel for this type of activity. Responsible personnel must comply with applicable industrial safety standards, current country regulations, and the technical requirements established by the corresponding utility..

SAFETY WARNING: Improper handling, installation, operation, or maintenance of the transformer may cause equipment damage, material losses, serious injury to personnel, or even death. All activities related to the equipment must be carried out by strictly following applicable safety practices, current regulations, and the instructions contained in this manual.

Proper storage of the transformer is essential to preserve its electrical, mechanical, and dielectric characteristics until the time of installation and commissioning. To ensure correct equipment preservation, observe the following recommendations:

- Store the transformer fully assembled, on its original wooden base or within the factory packaging. If the unit is not to be installed immediately, it is recommended to retain both the base and the packaging supplied by the manufacturer.
- Do not stack transformers or place loads on top of the unit during storage.
- Place the transformer on a firm, level surface with sufficient load-bearing capacity to support its weight, ensuring stability and preventing tilting or tipping.
- Avoid direct contact between the unit and the floor. If the original base is not available, use supports, pallets, or equivalent elements to keep the transformer elevated from moisture and standing water.
- Keep the transformer in an upright position throughout the entire storage period.
- Store the unit in a clean, dry, and adequately ventilated location, protected from impacts, vibrations, corrosive agents, excessive dust, and other contamination sources.
- Periodically inspect the transformer's general condition and check for oil leaks, corrosion, or visible mechanical damage.
- If the transformer is stored for extended periods, periodic inspections are recommended in accordance with the maintenance practices established by the owner or the manufacturer.

Nota 1: If the transformer will not be installed immediately upon receipt, retain the packaging and transport base supplied by the manufacturer until installation. This helps protect the unit against mechanical damage, contamination, and moisture exposure during storage.

8. TRANSFORMER INSTALLATION

Standards and General Safety

- Installation, commissioning, and operation of the transformer must be performed only by competent, qualified personnel.
- All activities must be carried out in accordance with applicable standards and regulations, the local utility's requirements, and the instructions in this manual.
- Before performing any intervention, ensure that all circuits are de-energized and verify the absence of voltage using appropriate instruments.
- Always use the required personal protective equipment for electrical work.

8.1. Inspección Previa

Before installation, verify:

- General condition of the tank, bushings, and accessories.
- Absence of oil leaks or mechanical damage.
- Adequate dielectric oil level.
- Correct installation of the pressure relief valve.
- Compatibility of nameplate data with the electrical system.
- Winding continuity.

Recommended Electrical Tests
The following tests are recommended before energizing the transformer:

- Insulation resistance.
- Winding DC resistance.
- Turns ratio.

Compare the results obtained with the factory test records, applying the appropriate temperature corrections.

8.2. Transformer Mounting

- Install the transformer on a firm, level base with sufficient load-bearing capacity to support its weight.
- Verify that the site allows for the installation and maintenance maneuvers required for the unit.
- Maintain the safety clearances required by applicable regulations.
- Use only the lifting points designated by the manufacturer.
- Position the transformer upright and ensure uniform support on the base.
- Once installed, firmly anchor the unit to prevent displacement or vibrations.

8.3. Conexiones Eléctricas

Grounding

- Connect the tank and all exposed metal parts to the installation's grounding system.
- Verify that the grounding system meets the requirements established by applicable regulations.
- Select grounding conductors in accordance with the electrical system's characteristics.

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8.4. Transformer Energization

Before energizing, verify that:

- The transformer is correctly mounted, leveled, and anchored.
- All electrical connections have been verified.
- The grounding system is correctly connected.
- The tap changer is in the required position.
- No tools, materials, or foreign objects are present inside the compartments.

Note 1: The transformer must not be energized without an adequate, verified ground connection.

Power Connections

- Make connections in accordance with the supplied wiring diagrams and applicable regulations.
- Use conductors and terminals rated for the system's current and voltage.
- Verify that all connections are secure, clean, and free of contamination.
- Ensure correct grounding of cable screens, connectors, and surge arresters, when applicable.

Energization Procedure

- Energize the transformer without load.
- Check for the absence of abnormal noise, odors, or heating.
- Verify that the output voltages correspond to the expected values.
- Connect the load gradually.
- Monitor transformer operation during the first hours of service.

In Case of Anomalies

If abnormal noise, overheating, protection tripping, or any irregular condition occurs during energization:

- Immediately de-energize the transformer.
- Check electrical connections and grounding.
- Verify the correct position of the tap changer.
- Check for the absence of short circuits or faults in the load.

Note 1: A transient magnetizing inrush current may occur during energization. This is normal behavior in this type of equipment.

9. TRANSFORMER MAINTENANCE

Periodic maintenance is essential to preserve the transformer's operating conditions, extend its service life, and reduce the risk of unexpected failures.
All maintenance activities must be performed with the transformer completely de-energized and by qualified personnel, following current safety standards, the local utility's requirements, and the manufacturer's recommendations.

9.1. Preventive Maintenance

Rymel recommends conducting a preventive inspection at least once a year, or at the frequency determined by the unit's operating conditions.

- During preventive maintenance, the following is recommended:
- Record all activities performed and findings observed.
- Inspect the general condition of the tank, bushings, terminals, accessories, and fastening elements.
- Check for corrosion, coating deterioration, dents, or oil leaks.
- Verify the insulating oil level and the correct functioning of all indicators and instruments.
- Check the condition and tightness of electrical connections and the grounding system.
- Clean bushings, terminals, and accessories to remove dirt and contaminants.
- Verify the condition and operation of protection and switching devices, including fuses, disconnect switches, pressure relief valves, and surge arresters, when applicable.
- Inspect the tap changer condition, verifying its correct position and physical state.
- Check for the absence of abnormal noise, vibrations, or unusual conditions during operation.
- Inspect the condition of the base, support structure, and transformer anchoring system.

Oil Analysis
For transformers in extended service or critical applications, it is recommended to periodically perform dielectric oil analysis, including physicochemical tests and dissolved gas analysis (DGA), to evaluate the condition of the insulation system and detect possible internal anomalies.

9.2. Final Considerations

The frequency and scope of inspections may vary according to environmental conditions, load level, and the criticality of the application.

Important: This manual presents general maintenance recommendations and does not cover all operating conditions that may arise in service. For specific situations or requirements, consult the applicable standards or contact Rymel's technical support department.

Rymel

MANUAL FOR THE RECEPTION, INSTALLATION, COMMISSIONING, AND MAINTENANCE.

PAD MOUNTED TRANSFORMERS

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