Rymel

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

POLE-TYPE DISTRIBUTION TRANSFORMERS

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1. INTRODUCTION

This manual is intended to provide the basic necessary instructions for the reception, installation, commissioning, and maintenance of Rymel single-phase distribution transformers.

Rymel transformers are designed in accordance with national and international technical standards, depending on the country and the specific location where they will be installed. The information contained in this guide includes key aspects regarding the configuration, construction, assembly, installation, and commissioning of conventional single-phase transformers.

The technical recommendations, safety warnings, and descriptions presented are based on RYMEL S.A.S.'s experiencein the design, manufacturing, and operation of this equipment. However, the contents of this document do not cover every possible field situation.

It is important that, in addition to following the instructions described herein, users comply with local regulations and standards as well as the technical requirements of the local power utility.

Please read this manual carefully before putting the system into operation. For additional information or specific cases, do not hesitate to contact us.

2. TRANSFORMER TRANSPORTATION

The transformer must always be transported in a vertical position and properly protected against impacts and external elements that could affect its performance. To ensure this, it is essential to select an appropriate transportation method along with suitable packaging.

The following conditions must be met during transportation:

- The equipment must be placed inside appropriate packaging that guarantees its integrity and prevents any shifting within the vehicle.
- The transformer must be securely fastened to avoid falls or sudden movements that could damage its components.
- The transformer must be correctly attached to the packaging, which should include a base suitable for forklift handling, facilitating movement without compromising its structure.
- The fastening system must not apply pressure or mechanical stress on the bushings, terminals, tap changer, or accessories.
- Avoid stacking transformers on top of each other unless they are fully crated and the packaging system has been structurally and mechanically designed to support such conditions.

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3. RECEPTION OF THE TRANSFORMER

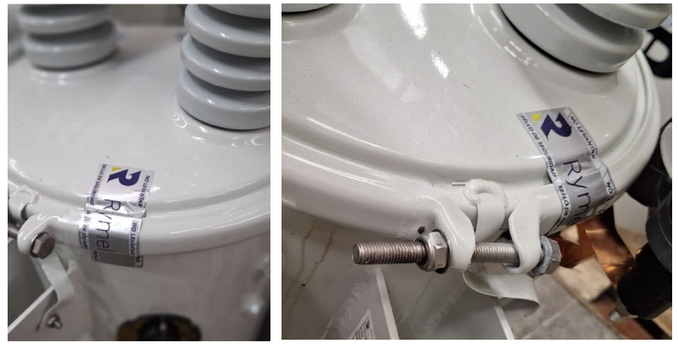
Upon receiving the transformer, it is essential to perform a thorough visual and document inspection, as the equipment may have suffered damage or alterations despite precautions taken during transportation.

All transformers undergo strict quality control and routine testing prior to dispatch, with the results recorded in their respective individual test protocols.

3.1. Physical Inspection of The Equipment

During reception, the following items must be verified:

- Check the condition of the packaging and confirm that the transformer is properly crated and placed on a wooden base.
- Inspect the bushings for cracks in the insulating body and ensure that the bushing cap is properly seated and tightened. Verify that the anti-rotation screw is correctly installed and secured in place.
- Confirm the presence and condition of all connectors, terminals, and screws, ensuring they are properly fastened.
- Confirm that all accessories are present, securely attached, complete, and free from visible damage such as cracks, breaks, scratches, or dents.
- Check that the transformer tank shows no dents or impact marks and is free from leaks or oil stains.
- Ensure that the lid is properly installed and securely fastened with the locking screw.
- Verify that the gasket is free from extrusion or visible damage.
- Check for the absence of leaks and corrosion on any part of the transformer.
- Confirm that the transformer has clearly visible labels identifying the terminals and grounding points.
- Visually verify the presence of dielectric oil through the level indicator, ensuring that the observed level is appropriate.
- Confirm that the pressure relief valve is correctly installed, with no obstructions or mechanical damage.
- If the transformer is supplied with factory-installed surge arresters (DPS), confirm their presence, check for cracks or damage on their bodies, and ensure the connection terminals are firm and correctly installed.
- Verify that the lifting lugs are not deformed.
- Ensure that the transport seals have not been tampered with during shipment.
- For self-protected transformers, check for the presence of the breaker or protection device and the pilot indicator. Verify that the operating mechanism is functional and not blocked.



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Verify that all seals are intact and in proper condition.

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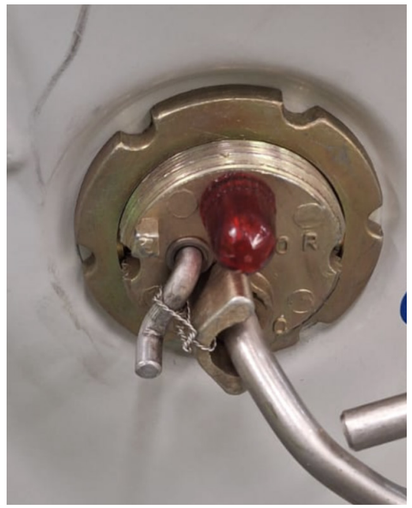
PRESSURE
RELIEF VALVE

SURGE ARRESTERS

LOW-VOLTAGE BUSHING

HIGH-VOLTAGE BUSHING

INSULATING LIQUID
LEVEL INDICATOR



LOW-VOLTAGE
CIRCUIT BREAKER

BUSHINGS FOR CURRENT
TRANSFORMER OUTPUTS
AND TERMINAL BOX

TAP CHANGER

POLE MOUNTING BRACKET

LIFTING LUGS

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3.2. Document Verification

The following documentation aspects must also be carefully reviewed:

- The transformer nameplate must exactly match the purchase order and delivery note. The following should be verified: Serial number, Power rating, Primary and secondary voltages, Number of phases, Vector group, and Number of high and low voltage bushings.
- Verify that the transformer has been delivered with all specified accessories.

3.3. In Case Of Anomalies

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

- Thoroughly document the situation, including a clear description of the issue.
- Take photographic evidence of the findings.
- Immediately notify the manufacturer for prompt resolution.

Following all these recommendations ensures that the transformer is in optimal condition for installation, safe operation, and reliable performance.

4. LIFTING AND HANDLING OF THE TRANSFORMER

The handling, installation, and operation of transformers must be carried out only by qualified personnel with technical knowledge and experience in this type of equipment. Compliance with local standards and regulations, as well as the manufacturer's recommendations, is mandatory.

Safety warning: Under no circumstances should the transformer be lifted or moved by holding onto the high or low voltage terminals, bushings, or any other accessory. These components are fragile, not designed to withstand mechanical stress, and improper handling may result in serious equipment failure.

4.1. Transformer Lifting

Transformers are equipped with lifting lugs (or lifting eyes), specifically designed to support the weight of the equipment during lifting operations. These must always be used simultaneously when lifting the transformer.

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To ensure safe lifting, observe the following recommendations:

- Use all lifting points at the same time to ensure uniform load distribution.
- Ensure the use of certified lifting devices with a minimum safety factor of 5 (i.e., capable of withstanding at least five times the weight of the transformer).
- The transformer must be lifted in a completely vertical position. Tilting is not allowed during the lifting process, as it may compromise the structural integrity or damage internal components.
- During the operation, lifting tension must be applied gradually, avoiding sudden movements or shocks that could damage the housing, chip the paint, or misalign internal parts.
- Protect contact surfaces to prevent damage to the transformer's coating.
- Never leave the transformer suspended in the air for extended periods. Once lifted, it must be placed immediately on a firm and secure base.
- Under no circumstances should the transformer be lifted using straps attached to bushings, terminals, or accessories.

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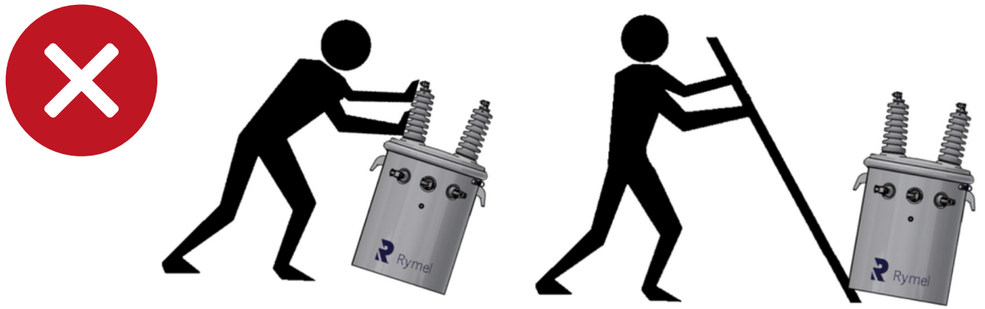
4.2. Transformer Movement

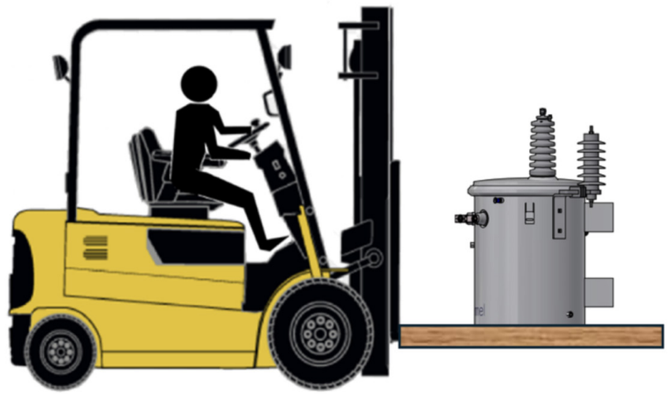
Moving the transformer must be done with extreme caution. The following guidelines apply for transport within the plant or to the installation site:

- Always keep the transformer in a vertical position, without tilting, during any movement.
- Completely avoid sudden or rapid movements that could destabilize the equipment or cause impacts.
- Do not apply force to terminals, bushings, or accessories when attempting to move the transformer. These components are not designed to withstand mechanical loads.
- If using a forklift, the wooden base supplied with the equipment can be used. This base is designed to facilitate transport and protect the bottom of the transformer.
- It is recommended to keep the transformer on this base until it reaches the final installation site, as it provides greater stability, safety, and protection against damage.

Warning: Never drag the transformer directly across the floor. This practice can deform the tank, scratch or peel the paint, and lead to corrosion on the metal surfaces.

Additional Warning: Do not use levers supported on the transformer tank to lift or move the unit. This structure is not designed to withstand leverage forces and may become deformed or develop oil leaks due to undue pressure on joints and covers.





4.3. Rolling Movement of the Transformer

The transformer may be moved using rollers, provided that the necessary precautions are taken:

- During this procedure, avoid excessively tilting the transformer to prevent destabilization or compromising its structure.
- Place wooden planks or other flat elements over the rollers to better distribute the load and avoid stress concentrations that may damage the base or lower structure of the equipment.
- Under no circumstances should the transformer be lifted using straps attached to bushings, terminals, or accessories.
- All handling must be carried out with smooth and controlled movements, avoiding shocks or impacts that could compromise the integrity of the equipment.

These instructions are intended to ensure that the transformer arrives at its installation site in optimal condition, avoiding risks of structural or electrical damage. Strict compliance with these practices ensures safe, reliable, and long-lasting operation of the equipment.

5. TRANSFORMER STORAGE

All transformers must be handled, installed, stored, and operated by qualified personnel with appropriate and certified technical training, in compliance with current national regulations and the technical requirements of the local power utility.

Warning: Improper installation or assembly of the transformer can result in serious property damage, personal injury, or even death. All operations must be carried out under strict safety conditions and in accordance with applicable standards.

5.1. Storage Guidelines

Proper storage of the transformer is essential to preserve its electrical, mechanical, and dielectric properties. The following recommendations are based on widely accepted industry practices:

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- The transformer must be stored fully assembled, on its original wooden base or in the factory crate. The wooden base and packaging should not be removed, especially if the equipment will not be installed immediately.
- Under no circumstances should transformers be stacked, unless they are fully crated and the packaging system has been structurally designed for that purpose.
- The storage location must have a solid and level foundation to ensure vertical stability of the transformer, avoiding tilting or tipping.
- Direct contact with the ground should be avoided. If the original base is not available, use pallets or wooden planks to keep the unit off the floor and protected from moisture.
- The transformer must be stored in a vertical position, in a clean, dry, and ventilated area, protected from impacts and contaminants.
- If the transformer will not be installed immediately upon reception, do not remove the packaging supplied with the unit or its wooden base.

6. TRANSFORMER INSTALLATION

Regulations and General Safety

- All installations must comply with current national standards and regulations, as well as the technical requirements of the local utility company. Handling, installation, and operation of transformers must be carried out only by qualified and competent personnel, in compliance with technical standards and using appropriate personal protective equipment (PPE).
- The transformer must be handled and installed exclusively by specialized personnel, who must use all appropriate safety equipment and follow the electrical safety practices established by the local utility. They must also adhere to applicable laws, regulations, and the instructions provided in this manual.
- All electrical equipment must be de-energized during installation or removal. Energized cables must never be handled directly by hand.
- Always de-energize the transformer before performing any work on it. Use a suitable voltage detector device to verify complete de-energization.

Before putting the transformer into service, remove all packaging elements and clean the bushings and accessories.

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Pre-Installation Inspection

A thorough visual inspection must be carried out to verify the following:

- Bushings must be free of cracks in the insulating body, and the bushing cap must be correctly seated and secured. Ensure that the anti-rotation locking screw is properly installed and tightened.
- All accessories must be present, properly fixed, complete, and free of visible damage such as cracks, breaks, scratches, or dents.
- Check for the presence of terminals, screws, and metal components, and verify they are complete and properly secured.
- The transformer tank must be free of dents or impacts and must not show any signs of oil leaks or stains.
- Visually verify the presence of dielectric oil through the level indicator, if available, ensuring the observed level is appropriate.
- Ensure the pressure relief valve is properly installed, free from obstructions or mechanical damage.
- If surge arresters (DPS) are factory-installed, confirm they are free from cracks or damage and that the connection terminals are properly tightened and installed.
- Check for continuity in the windings.
  Verify that the transport seals have not been tampered with.
- For CSP (Completely Self-Protected) transformers, confirm the presence of the circuit breaker and ensure the operating mechanism is functional and not blocked.
- Verify that the rated voltage and current values indicated on the nameplate match the system to which the transformer will be connected.

6.1. Tap Changer

The transformer is equipped with a tap changer, located on the side wall of the tank, as shown in the corresponding figure. The tap position must only be changed while the transformer is de-energized.

- Verify the nominal position of the tap changer by consulting the data indicated on the transformer's nameplate.
- Using a screwdriver, loosen the locking screw of the handle until it protrudes from the selector disk.
- Rotate the handle to move the tap changer to the desired position.
- Ensure the selector is properly aligned and that the tip of the knob matches the number corresponding to the selected tap.
- Re-tighten the locking screw, making sure it fits securely and completely into the disk.
- Perform a continuity test at the medium-voltage terminals to confirm the tap changer is firmly locked in the selected position.

TAP	Voltage
1	
2	
3 Nominal Position	13200
4	
5	

The tip of the knob must align with the number corresponding to the selected tap.

Pre-Energization Electrical Tests

It is recommended to perform the following tests before energizing the transformer:

- Insulation resistance measurement
- Winding resistance (ohmic) measurement
- Turns ratio test

Compare the results with the values from the factory test report, considering potential temperature variations. Abnormally low insulation resistance may indicate moisture ingress.

6.2. Transformer Mounting

Proper transformer installation is essential to ensure operational safety, mechanical durability, and optimal electrical performance. The installation site must be designed in accordance with national regulations and applicable safety standards. The manufacturer recommends complying with the following minimum requirements during mounting and installation:

- Carefully clean the bushings to remove dust, dirt, and possible condensation.
- The pole must have sufficient structural capacity to support the total mass of the transformer and its accessories. It is recommended that the minimum breaking strength complies with the values indicated in the following table.
- The transformer must be installed using mounting hardware specifically designed for its mass and dimensions. It is recommended that such hardware have a load capacity of at least 2.5 times the total transformer weight.
- Ensure the transformer is properly centered with respect to the pole axis, to maintain stability and prevent additional mechanical stress.
- Make sure the transformer is level.
- Avoid direct contact between the transformer tank and the pole or supporting structural elements.
- Ensure compliance with minimum clearance distances for energized lines according to the voltage level.

6.3. Electrical Connections

Grounding

Connect the grounding wire to the designated ground terminal on the equipment. Ensure the connection is secure and provides good electrical contact. Verify that the overall installation grounding impedance is less than 25 Ohms.

The cross-sectional area of the grounding conductor must be selected based on the expected fault current. The grounding system must comply with all applicable standards and local regulations. Adequate dielectric clearance must be maintained between the grounding conductor and energized parts. All exposed metal parts of the installation that do not carry current must also be grounded.

Warning: The transformer must be properly grounded before being energized. Failure to do so may result in serious injury or death.

Connection to Transformer Terminals

- Identify the incoming power line and appropriate wire gauge.
- The conductor should have sufficient slack to avoid mechanical stress on the terminals, absorb thermal expansion, and minimize mechanical strain on the bushings.
- All connections must be tight to prevent hot spots or power losses.
- Clean the cable terminals if necessary and connect them securely to the transformer terminals, ensuring all connections are well-tightened.
- Use conductors and terminals rated for the corresponding current and voltage level. Connections must be made using proper connectors to ensure firm, mechanically stable, and electrically reliable contact.
- It is recommended to solidly ground both the transformer neutral and the system neutral.
- Surge arresters (DPS) must be installed as close as possible to the high-voltage bushings and connected to the grounding system using low-impedance conductors.
- DPS devices must be connected to the same grounding system as the transformer neutral.

Note: Loose connections can cause hot spots and severe operational damage to the transformer.

6.4. Transformer Energization

- Perform a thorough visual inspection of the installation.
- Remove any forgotten tools or foreign objects.
- Verify that the tap changer is in the correct position.
- Disconnect the load on the low-voltage side.
- Allow the transformer to rest for at least 4 hours before energization.
- Energize the system by closing the switch or fuse holder using an insulating stick, ensuring that the transformer is properly connected.
- Check for unusual noises or odors.
- Confirm that the output voltages are within the normal range.
- Close the low-voltage circuit breaker to connect the load.
- Recheck output voltages under load.

Do not operate the transformer at voltage or current levels exceeding the nameplate ratings, as this can cause overheating and lead to equipment failure.

During energization, an inrush current of up to 25 times the rated current (In) may occur due to the magnetization inrush phenomenon. This is normal behavior. The fuses must be properly rated to prevent nuisance tripping during this transient.

In case of abnormal noises, odors, blown fuses, or overheating:

- Immediately de-energize the transformer.
- Verify the input voltage is correct.
- Check grounding connections.
- Ensure there are no loose terminals.
- Confirm there are no short circuits to ground or between phases, and that the network is free of faults.
- Check for contamination or tracking on the terminals.
- Confirm that the load is not short-circuited.

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- Verify the tap changer position. Move the tap handle twice in each direction and return it to its initial position.
- Measure continuity on both high-voltage and low-voltage windings.

If the issue persists after performing these checks, contact the manufacturer or an authorized distributor for assistance.

7. TRANSFORMER MAINTENANCE

To ensure a long service life and consistent, reliable operation, it is essential to perform periodic maintenance on the transformer. This helps assess its condition, prevent failures, and maintain optimal operating performance.

All maintenance activities, whether preventive or corrective, must be performed with the transformer completely de-energized. Tasks should only be carried out by qualified and trained personnel, familiar with the specific procedures of the equipment, and in compliance with current electrical safety standards, the local utility company's regulations, and the manufacturer's recommendations.

Preventive Maintenance

Preventive maintenance involves a set of periodic actions aimed at avoiding progressive deterioration of the transformer's components due to usage, environmental factors, or the natural aging of materials. These actions are intended to detect anomalies before they evolve into failures or breakdowns.
Rymel recommends conducting these maintenance tasks at least once a year.

General Recommended Activities

During preventive maintenance, the following actions should be carried out:

- Document all activities performed, preferably with photographic records for historical tracking of the equipment.
- Check for the presence of rust, galvanic corrosion, or deterioration in terminals, fasteners, screws, and other metallic parts.
- Inspect all electrical connections, ensuring they are properly tightened to maintain secure and efficient contact.
- Visually inspect bushings and accessories, checking for cracks, fractures, or other mechanical damage.
- Visually inspect the transformer's surface, ensuring there are no oil leaks, paint loss, dents, or impacts.
- Verify the tap changer is properly positioned and that it does not show any cracks or signs of wear.
- Ensure the nameplate is present, legible, and in good condition.
- Clean the bushings, terminals, and accessories.
- Check the condition and operation of breakers and other components.
- Verify the level of insulating oil, if applicable, and ensure it is within the specified range.
- Take an oil sample (if applicable) for physical-chemical analysis and DGA (Dissolved Gas Analysis), especially for long-service or critically loaded equipment.
- Inspect the condition and performance of the oil conservator's breather, ensuring the desiccant (silica gel) is not saturated and replacing it if necessary.
- Verify the integrity of grounding connections for both the transformer and accessories, ensuring proper continuity and tightness.
- Check the condition and attachment of surge arresters, including their grounding connection.
- Inspect the physical condition of the tank paint and exposed components, and perform touch-ups if needed to preserve corrosion protection.
- Test the pressure relief system and safety valves (if the transformer is equipped with them).

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- Ensure proper operation of oil level indicators, thermometers, and other instruments, confirming they provide accurate readings.
- Listen for unusual noises or vibrations during operation.
- Inspect the mechanical integrity and cleanliness of insulator supports and the transformer structure.

Note: This document does not cover all possible scenarios that may arise during installation, operation, or maintenance. For aspects not addressed here, please refer to applicable standards and regulations or contact Rymel directly for technical support.

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