Vacuum Pressure Impregnated Transformer
Shipping, Install, Startup and Commissioning, Operation and Maintenance

Thank you for your purchase of the Larson Electronics MT-PDT-VPM-R7-3P-DNZ Series transformer.

WARNING:

READ CAREFULLY BEFORE INSTALLING FIXTURE. RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE.
CRITICAL SAFETY INSTRUCTIONS:

- INSTALLATION SHOULD ONLY BE CONDUCTED BY A QUALIFIED ELECTRICIAN IN ACCORDANCE WITH NEC AND ANY RELEVANT LOCAL BUILDING CODES.
- RISK OF FIRE OR ELECTRIC SHOCK. FIXTURE INSTALLATION REQUIRES KNOWLEDGE OF FIXTURE'S ELECTRICAL SYSTEMS. IF NOT QUALIFIED, CONTACT A QUALIFIED ELECTRICIAN.
- BE CERTAIN ELECTRICAL POWER IS OFF BEFORE AND DURING INSTALLATION AND MAINTENANCE.
- MAKE SURE THE SUPPLY VOLTAGE IS THE SAME AS THE FIXTURE'S RATED VOLTAGE.
- TO PREVENT WIRING DAMAGE OR ABRASION, DO NOT EXPOSE WIRING TO EDGES OF SHEET METAL OR SHARP OBJECTS. SUITABLE FOR DAMP LOCATIONS.

Shipping, Handling, and Storage

The product can be transported using various modes of transportation, including train, ship, truck, or aircraft. The transport vehicles, including the cargo hold or shipping container, should be clean and free of contaminants.

The product must be assembled in compliance with transportation regulations and securely fastened. During transit, the transformer should be protected from damage and movement.

For transformers without packaging, any accessory parts, fittings, and factory documents should be separately packaged and shipped together with the transformer.

Unpackaged products must be securely fastened to the transport vehicle using designated attachment points, such as trolleys, clamps, or lifting ears. Avoid securing or pulling on fragile components such as coils, insulators, spacers, or leads to prevent damage to the product.

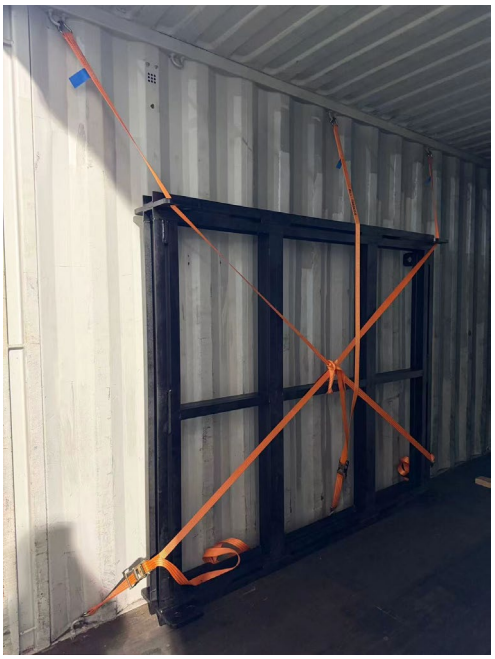
During transportation, the product’s tilt or angle should not exceed 30°.

After unloading or transfer at stations, docks, or terminals, the products should not be stacked. A minimum clearance of 100 mm should be maintained at the bottom for easy handling, and appropriate lifting timber should be used.

Handling

The MT-PDT-VPM-R7-3P-DNZ Series models are large in size and are protected by plastic film and pearl cotton packaging. They are equipped with a specialized lifting device for safe handling and transportation. Please refer to the attached pictures and the previously submitted lifting video for more details.







Storage

Products that require storage should not be moved by their packaging. If removal is necessary for inspection, the product should be carefully returned to its packaging after the inspection.

Since the product is designed for indoor use, it should be protected from exposure to moisture, rain, and dew. After delivery, the product should be stored in a clean, dry warehouse, free from active chemicals and corrosive materials. The storage temperature should be between -25°C and 50°C, with humidity levels not exceeding 90%. Transformers should not be installed or stored in environments below -25°C unless otherwise specified in the agreement.

Stacking of products in the warehouse is not allowed. The transformer should be covered with opaque materials to protect it from moisture, water, dust, and sunlight.

Note: If local conditions require outdoor storage, a simple shelter with a canopy should be constructed. The shelter must ensure proper ventilation, be waterproof, and protect against wind. If the transformer is stored in the shelter, it should be raised at least 100 mm off the ground using timber.

Installation

Characteristics of the Installation Location:

Clean, flat surface.

Clean, dry air free from dust.

Free from any risks related to the presence of flammable or explosive substances.

Free from corrosive gases and vapors.

Free from moisture and direct sunlight.

The area should have natural lighting, preferably from the north.

Maximum altitude: 1,000 meters.

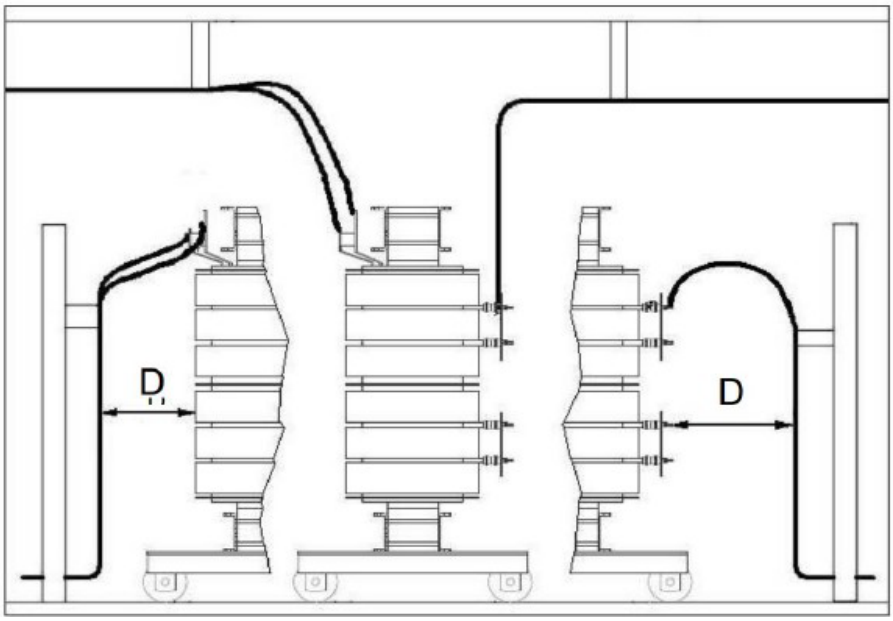
The transformer must be installed in a location that allows for easy inspection. It should not be placed in areas where stored items could obstruct natural air circulation or prevent proper inspection access. Additionally, avoid locations where people could be exposed to live parts during inspection.

Installation Guide

The following image provides examples of both upper and lower connections.

The connecting cable or busbar must always be securely fixed to a solid structure to avoid applying mechanical forces on the transformer connections.

Installed with the distances specified in the table below:



kV	D (mm)
≤ 1,1	≥ 0
≤ 3,6	≥ 60
≤ 7,2	≥ 90
≤ 12	≥ 110
≤ 17,5	≥ 170
≤ 24	≥ 210

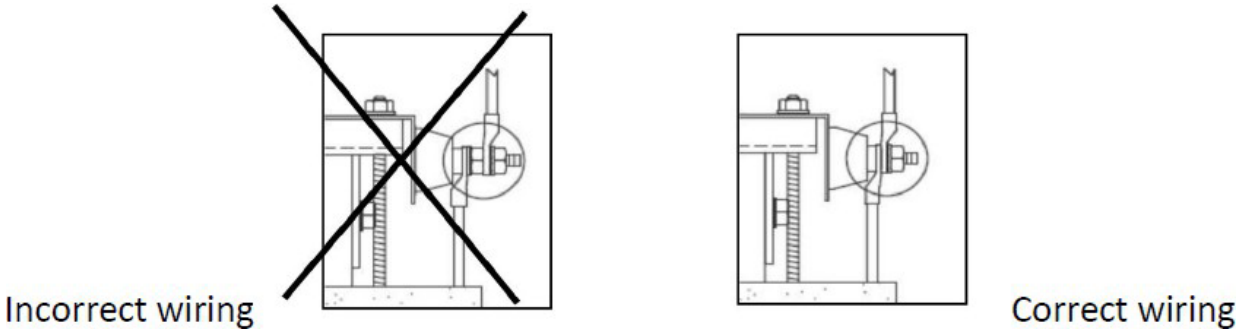
Connections

All connections should be made without placing undue stress on the terminals. Connectors should be securely fastened and adequately supported, with allowances for expansion and contraction.

Cable Connections:

The cable connections should be made using tinned-copper cable terminals. For high-current applications, use one or more cables per connection hole.

The bolts used for connections are typically brass bolts, which are directly connected to the ends of the windings. Do not replace the brass bolts with bolts made from other materials, as this could affect the integrity of the connection.



Connection with Busbar

When connecting aluminum bars to copper bars, creating a direct connection between copper and aluminum, CUPAL intermediate plates must be used.

Tightening Torque for Electrical and Mechanical Connections

Both electrical and mechanical connections should be tightened in accordance with the specified torque values.
When making cable connections or adjusting taps, always use two wrenches to tighten or loosen bolted connections to prevent distortion or damage.

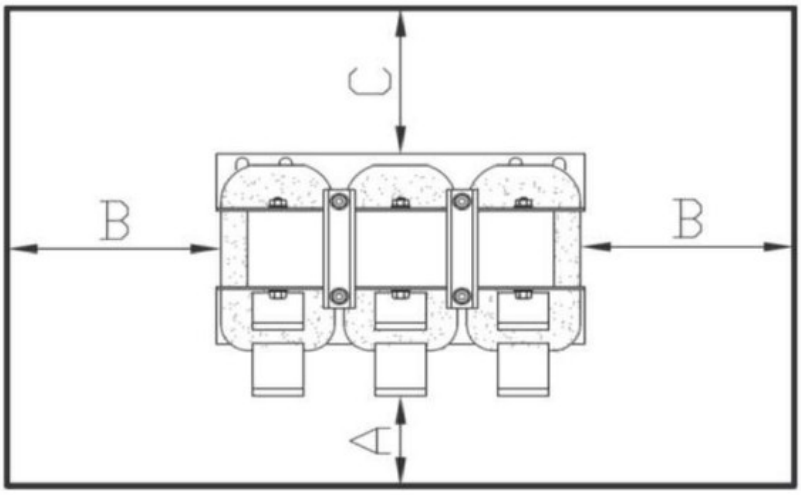
	Electrical connection		Mechanical connection	
	[Nm]		[Nm]	[mm]
Screw / Bolt	Steel	Brass		
M 6	10 - 15	5 - 10	20	10
M 8	30 - 40	10 - 15	35	13
M 10	50 - 60	20 - 30	45	17
M 12	60 - 70	40 - 50	60	19
M 14	90 - 100	60 - 70	100	22
M 16	120 - 130	80 - 90	150	24
M 18	-	-	200	27
M 20	-	-	270	30
M 22	-	-	360	32
M 24	-	-	460	36

Tightening Torque for Electrical and Mechanical Connections

The IP00 transformers do not provide contact insulation. It is strictly forbidden to touch the coils while the transformer is energized.

Distance between a wall to the transformer without enclosure:

kV	A (mm)	B (mm)	C (mm)
≤ 1,1	≥ 20	≥ 20	(*)
≤ 3,6	≥ 60	≥ 40	(*)
≤ 7,2	≥ 90	≥ 40	(*)
≤ 12	≥ 110	≥ 60	(*)
≤ 17,5	≥ 170	≥ 80	(*)
≤ 24	≥ 210	≥ 120	(*)
≤ 36	≥ 280	≥ 200	(*)



Connection Details:

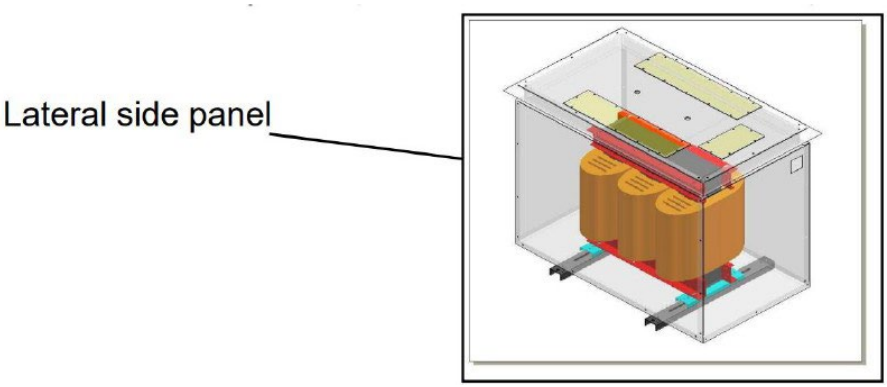
If the connections are only on side A, then C = B on side A.

If the connections are on both side A and side C, then C = A.

Distance Between the Wall and the Transformer Enclosure:

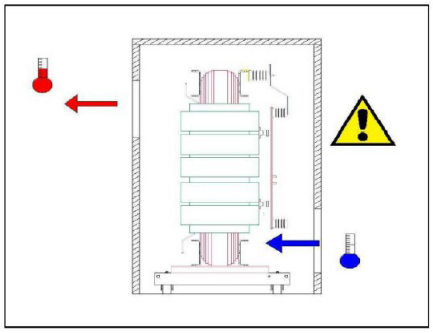
For Ventilation: Proper airflow around the enclosure must be ensured.

For Accessibility: Sufficient space must be provided to allow for the removal of a lateral panel of the enclosure.



Ventilation

Dry-type general-purpose transformers are cooled by the free circulation of surrounding air.
Air must enter from the bottom, flow upward over the core and coil surfaces, and exit through openings near the top.
The transformer is designed to carry full-rated loads continuously as long as the surrounding air temperature does not exceed the limit specified on the label.



Characteristics of cooling air:

- ☐ Dry
- ☐ Clean
- ☐ Free from dust
- ☐ Free from acid vapor and gasses
- ☐ Free from metallic particles

As air must flow over the cooling surfaces, the inlet and exhaust openings should be properly sized. If the airflow is inadequate, the transformer may overheat, which could cause the thermal protection system to trip.

Overvoltages

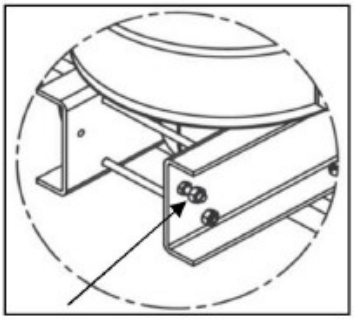
If the transformer is exposed to overvoltages or overloads due to atmospheric events, operation of circuit breakers, or other causes, appropriate surge arresters, fuses, or circuit breakers rated for the insulation level must be used.

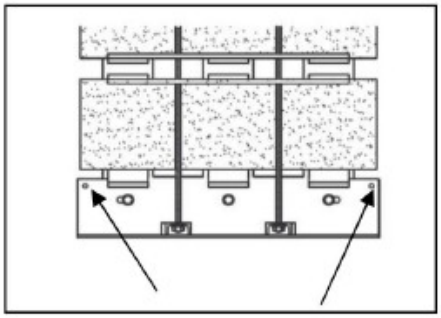
Startup & Commissioning

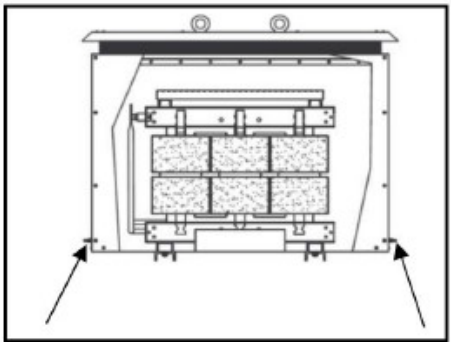
Commissioning

Earth Connection

The grounding cables must be designed based on the fault current calculation.







Cleaning

If the transformer has been stored for an extended period, it should be cleaned thoroughly. Clean the HV and LV windings to remove dust, dirt, and condensation. Use a vacuum cleaner to prevent dirt and dust from spreading onto the transformer. Do not use liquid cleaners.

Electrical Inspection Checklist

All external connections have been properly made (phasing of connections to terminals, etc.).

All connections are tight and secure.

All accessory circuits are operational.

All tap connections are properly positioned.

Neutral and ground connections are correctly made.

Fans (if provided) are operational.

Proper clearance is maintained between high-voltage and low-voltage buses and terminal equipment.

All windings are free from unintended grounds.

Mechanical Inspection Checklist

There is no dust, dirt, or foreign material on the core and coils.

There is no visible moisture on or inside the core, coils, or enclosure.

All plastic wrapping has been removed from the core and coils.

All shipping materials have been removed.

There are no obstructions in or near the ventilation openings.

Startup

After verifying the installation and ensuring that no objects or tools have been left on the transformer, the circuit breaker can be closed. Once the transformer is energized from the supply, close the circuit breaker and apply the load to the transformer.

It is recommended to initially energize the transformer with no load and monitor for any abnormalities over the next 6 to 8 hours.

If the primary side circuit breaker trips after energizing with no load, thoroughly investigate the cause and only re-energize the transformer once the fault has been properly cleared.

If the transformer operates satisfactorily with no load, gradually apply the load and continue to monitor for any abnormalities over the next 6 to 8 hours.

Operation

Before operating the transformer, adjust the tapping switch to the correct position according to the transformer nameplate and the tapping indication board.

For non-excited voltage regulation, connect the voltage regulation tap to the corresponding position based on the symbols on the nameplate and tapping indication board for the power network voltage. Then, check the contact of the regulation tap, removing any oxide film or contamination.

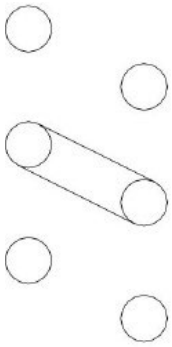
For example, for a transformer with a voltage of 10000±2×2.5%V, the nameplate voltage would be as follows:

①10500V ②.10250V ③10000V ④9750V ⑤9500V

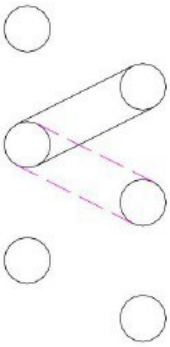
If the actual voltage of the local power network is 10 kV, the tapping switch should be set to 3 positions (as per the product's grade in our company), as shown in Picture 3.

If the output voltage is higher, move the connection switch of the regulation tap upward, as shown in Picture 4.

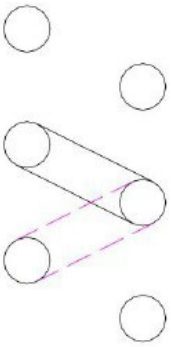
If the output voltage is lower, move the connection switch of the regulation tap downward, as shown in Picture 5.



Picture 3



Picture 4



Picture 5

Note: This regulation applies to conventional cast resin dry-type transformers. For the MT-PDT-VPM-R7-3P-DNZ Series VPI transformers, the voltage can be adjusted according to the indication on the tapping glass cover, as shown in the attached picture.



Warning: When adjusting the tapping gear, the following precautions should be observed:

The transformer must be de-energized, and the inlet and outlet terminals should be properly grounded to prevent severe accidents and potential injury.

The pre-tightening torque for the tapping switch on the operating transformer must meet the specified regulations. Insufficient pre-tightening force may cause poor contact, leading to overheating and possible damage. Over-tightening could damage the transformer's parts.

The voltage regulation for all three coils should be set to the same position.

On-Load Voltage Regulation

For on-load voltage regulation, please refer to the tapping switch operation manual for on-load voltage regulation. When powered off, the tapping switch should be operated after the system has been properly debugged.

Temperature Control

If the transformer is equipped with a temperature control box and temperature display, please refer to the operation manual for the temperature control box and temperature display. After debugging, first power on the transformer and then activate the temperature control and temperature display devices.

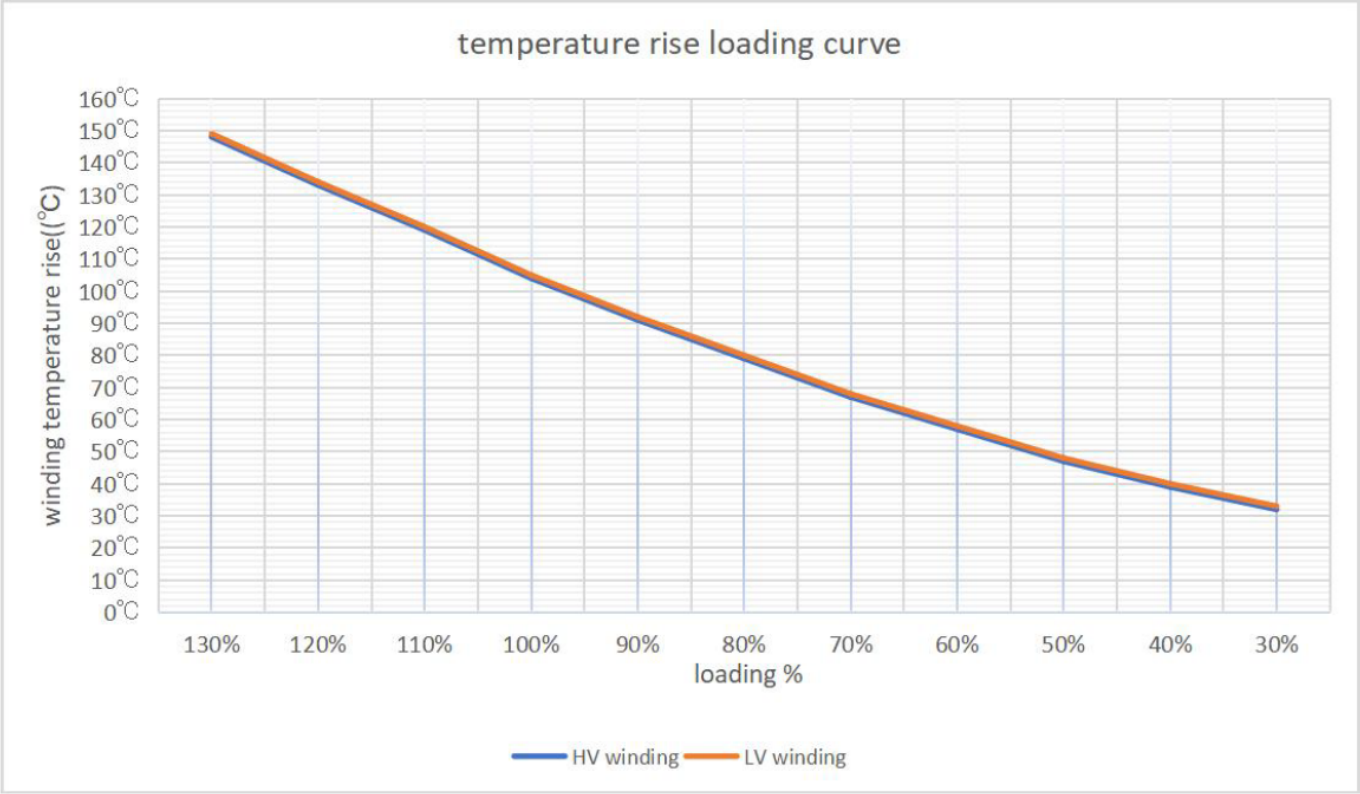
Warning: For impact closing of the transformer, the running voltage on the low-voltage side may fluctuate. This can cause malfunction or damage to the thermostat. Therefore, the operating voltage should not directly affect the thermostat.

The transformer should be initially energized with no load. The maximum switching-in inrush current peak should not exceed 10 times the rated current. The current speed-up protection setting value for the transformer should be higher than the inrush current peak.

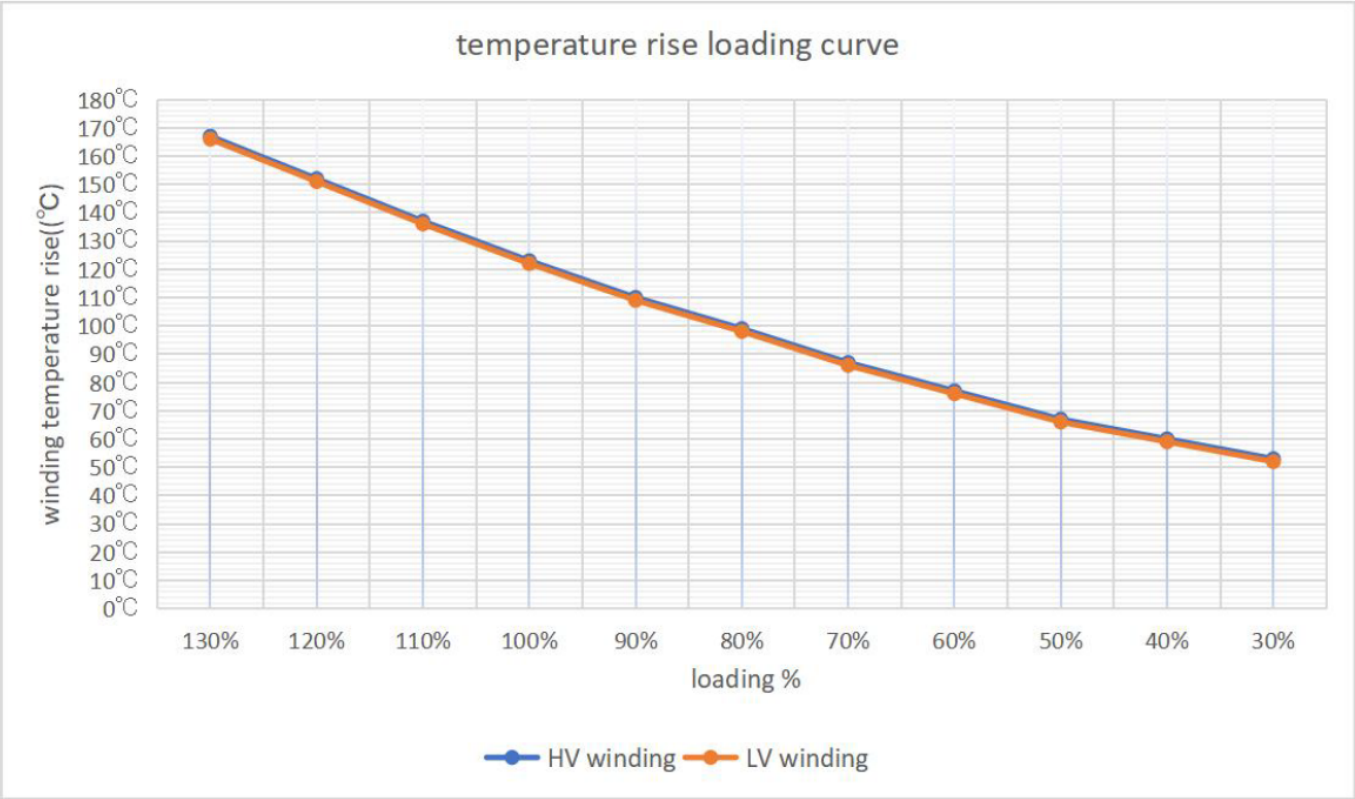
After the transformer has been energized, gradually increase the load. Monitor for any abnormal sounds. It is strictly forbidden to suddenly place the transformer under heavy load.

For short-term emergency overload conditions, refer to the loading curve below.

2MVA Temperature Rising Curve:



2.5MVA Temperature Rising Curve:



After the transformer has stopped running, it can generally be restarted without any additional measures. However, if the transformer is exposed to high humidity and condensation has formed, it should be dried before being restarted. (For 35 kV transformers, special attention is required in such conditions.)

Parallel Operation

If the data from the transformer's testing report meets the following conditions, the transformer can operate in parallel:

The coupling groups are the same.

The voltage ratio difference should not exceed 1%.

The impedance percentage of the transformer should not be greater than 10%.

The transformer's volume ratio should be less than 3:1.

The transformers should be connected in parallel following these steps: First, connect the high-voltage side of the transformer to the network, and disconnect the main switch on the low-voltage side. Then, measure the low-voltage difference between corresponding phases on the low-voltage side of the parallel-connected transformers. The measurements must strictly adhere to safety protocols. If the rated low voltage is high, a voltage transformer should be used. The main switch on the low-voltage side of the transformer should only be closed if there is no voltage difference between the corresponding low-voltage terminals.

After the transformers are operating in parallel, it is recommended to check the load on each transformer to ensure it aligns with the transformer's rated capacity.

Over-voltage Running

The insulation level for the transformer is specified on the nameplate and in the testing report. To protect the transformer from potential super-high impact voltage at the high-voltage line terminal, reliable protection should be implemented. If necessary, a lightning arrester should be installed.

Maintenance

To ensure the transformer operates normally, it is essential to periodically inspect and maintain it.

The transformer should be maintained and repaired following safety regulations. Disconnect the transformer from both the high and low voltage power networks. All terminals of the transformer should be reliably grounded after being shorted.

Caution: After completing inspection and repair, carefully check that all shorted terminals of the transformer have been disconnected to prevent accidental power transmission to the high voltage side and to avoid short circuits on the transformer's low-voltage outlet.

In general, in dry and clean environments, the transformer should be inspected once a year or less. It is recommended to do this before the start of the thunderstorm season. In other environments, such as areas with dust or air containing chemical mist pollutants, inspections should be conducted every six months.

For inspection, if there is significant dust buildup, it should be removed to ensure proper airflow and prevent insulation breakdown. Special attention should be given to cleaning the insulators and the lower timber platform of the transformer. Use clean, dry compressed air (2-5 atmosphere pressure) or completely remove the dust from the ventilation channels.

Inspect whether fasteners and connectors are loose, check for rust or corrosion on the conductive parts, and observe if the insulation surface shows any signs of creepage or carbonization. If necessary, take appropriate corrective measures.

After the transformer has been in operation for several years (5 years is recommended), perform an insulation resistance test as outlined in above to assess whether the transformer can continue to operate. Generally, no additional tests are required.

Maintenance for Temperature Control of Transformer

Carefully read the operation manual for the temperature control system and verify that the power supply is correctly connected.

In the disconnected state, check if the three-phase platinum resistance is balanced (generally, the difference should be less than 10%). If the resistance of a certain phase is significantly higher, this indicates that the platinum resistance may have poor contact or may be damaged.

For transformers using thermal resistors as temperature control elements, check if the corresponding thermal resistor values in the temperature control box are normal (the three-phase series resistance should be less than 400Ω). If the values are abnormal, check if the terminals are loose or disconnected.

If the above checks are normal but the temperature control or temperature display is not functioning properly, it is recommended to replace the temperature display unit (the lifespan of the electronic temperature controller is typically 5 years or 50,000 hours).

Maintenance of Transformer's On-Load Switch

There are two types of on-load switches: the vacuum on-load switch and the air on-load switch. For maintenance, carefully read the operation manual and troubleshooting guidelines provided by the manufacturer. The maintenance should only be performed by qualified professionals.

THESE INSTRUCTIONS MAY NOT COVER ALL DETAILS OR VARIATIONS OF THIS PRODUCT FOR YOUR EQUIPMENT OR INSTALLATION REQUIREMENTS. SHOULD FURTHER INFORMATION NOT COVERED BY THESE INSTRUCTIONS BE REQUIRED, PLEASE CONTACT LARSON ELECTRONICS BY EMAIL AT SALES@LARSONELECTRONICS.COM OR BY PHONE AT 1-877-348-9680 FOR FURTHER ASSISTANCE.

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