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The supplier does not assume any responsibility for the use or inappropriate use of the products mentioned in this manual. This guide does not cover all the details or possible variations of the entire series of connections, installation and possible operations. For further information or to solve specific problems that are not included in this guide, contact Legrand. READ THIS ENTIRE DOCUMENT BEFORE YOU COMMENCE THE INSTALLATION.
1. Safety guidelines

A cast resin transformer is an electrical equipment. It must be installed, protected and used in compliance with the existing national and international Standards and Regulations. The possible improper installation and use of a cast resin transformer may cause risks of electric shock or fire.

Please, read this installation manual carefully before lifting, moving or energising the transformer.

Every operation on the transformer must be performed when the transformer is not energised.

Do not get close to the cast resin transformer before having connected the windings to earth.

Before operating on the CRT, make sure that the transformer cannot be put undervoltage without your permission.

Do not energise the transformer before having connected the core to earth.

Do not energise the transformer before having carefully and completely inspected it.

Do not access the transformer’s operation area or remove the protection devices when the transformer is undervoltage.

Each transformer generates a magnetic field. For this reason, any carrier of metallic devices as pacemakers should not get closer than 3 m to an energised transformer.

This transformer must be installed according to the installation directions and preferably by a skilled and qualified HV electrician. Do not open, disassemble, alter or modify the transformer with the exception of special indications reported in the Installation Manual. All Legrand products must be opened and repaired only by personnel trained and authorized by Legrand. Legrand is not responsible for any non-authorized opening or repair.
1. Low Voltage Connections (LV)
2. Lifting Eyebolts
3. Rating Plate
4. Magnetic core
5. High voltage (HV) winding
6. Earth terminals
7. Truck with oriented rollers
8. Tappings for voltage settings
9. Medium Voltage Connections (HV)
10. Terminal box for temperature probes
11. Delta Connection
12. Towing points for horizontal movement
13. Temperature probes
2. Reference standards

IEC 60076-11 – Power transformers – Part. 11: Dry – type.
IEC 60076-1 – Power transformers – Part. 1: General.
IEC 60076-2 – Power transformers – Part. 2: Temperature rise.
IEC 60076-3 – Power transformers – Part. 3: Insulation levels, dielectric test and external clearances in air.
IEC 60076-5 – Power transformers – Part. 5: Ability to withstand short circuit.
IEC 60076-10 – Power transformers – Part. 10: Determination of sound levels.
IEC 60085 – Thermal evaluations and designation.
IEC 60270 – High-voltage techniques – Partial discharge measurement.
IEC 60529 – Degree of protection provided by enclosures (IP code).

3. Rating plate

A rating plate showing nominal values and serial number is applied on each transformer.

3.1 Conditions for the correct operation of the transformer

- Respect of all the instructions reported in this manual;
- Operation of the transformer in accordance with the rating plate data;
- Earth connection of the transformer with the correct terminals;
- Protection of the transformer against chemical agents, pollution, atmospheric pollution, sun radiation, vegetation and animals that could influence the normal operating conditions;
- Protection of the transformer against mechanical damages during installation and operation;
- Protection against overvoltages.
4. Transport, receipt and storage

During transport, the transformers must be adequately fixed as indicated in the explanatory images. HV and LV connections must not be stressed by the retaining straps.

Once the transformer is at its destination, it is highly recommended to carefully examine it. In particular the following details have to be verified: HV and LV terminals and connections, presence of scratches and/or cracks on the windings of MV and their centering with respect to the windings of LV, integrity of the protection enclosure (if present), presence of impurities, dirt, foreign body, moisture or water.

Any non-conformity must be recorded on the delivery note and notified to the forwarding agent or to Legrand. If after 5 days no report of anomalies and/or defects will be received by Legrand, we will consider that the transformer has been delivered in perfect condition.
4.1 Lifting the transformer

Use all 4 eye bolts during lifting. Do not allow that the angle between the ropes to exceed 60°.
Gradually increase the tension on the lifting cables to avoid sudden shock or stress to the transformer.
If the transformer is supplied with an enclosure, remove the top window for the attachment of the ropes.

Do not leave the transformer elevated for prolonged periods.
Move the transformer only in vertical position.
Lift the transformer avoiding improper lifting (that may cause it to tip over): be careful about the high centre of gravity of the transformer.
It is prohibited to lift the transformer by inserting the forks of the forklift in the upper part of the core.
4.2 Moving the transformer

**NO**

The transformer (with or without enclosure) must be moved using the track or lower jokes where the proper holes are located.

Do not move the transformers by applying force on the windings or on their connections.

It is recommended to avoid moving the transformer on the rollers more than 10 m.

**YES**

Movement can be made only in two directions, according to the rollers orientation.

4.3 Storing the transformer

If the transformer is not installed immediately, it has to be protected against water, dust, humidity and sunlight even if provided with enclosure.

In case of storage the packaging supplied with the transformer must not be removed.

The temperature during storage and installation must not decrease below -25°C (unless otherwise agreed order stage).

After a long storage at very low temperatures or in an environment with high humidity, the transformer must be dried before being placed in service.
5. Installation

During the operations for the connection and installation, always protect the windings to avoid external parts such as bolts, washers, cable parts, etc. following into the windings and jeopardizing the insulation capability of the transformer.

Dry type cast resin transformers are designed for indoor installations, in a site protected from direct sunlight, in clean and dry environments, without risk of water intrusion. Standard installation must be:

1. At a sea level height not above 1000 m.
2. At a temperature of the cooling air not exceeding the following values:
   a. $20^\circ\text{C}$ yearly average
   b. $30^\circ\text{C}$ warmest month average
   c. $40^\circ\text{C}$ maximum
3. According to all other normal operating conditions as per IEC 60076-11 Standard.

During the installation refer to the safety rules existing in your country.

5.1 Installation examples

The cable connections of Medium and Low Voltage can be done with cables coming from the bottom or the top. Some examples are listed below.

5.1.1 Installation in protection enclosure
5.1.2 Installation without protection enclosure/box (IP00)

Between HV and LV connections and transformers' windings and delta connections, the minimum distances shown in the table must be respected.

HV and LV cables must always be supported to avoid mechanical stress on the terminals.

<table>
<thead>
<tr>
<th>kV</th>
<th>D (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 12</td>
<td>≥ 125</td>
</tr>
<tr>
<td>≤ 17.5</td>
<td>≥ 170</td>
</tr>
<tr>
<td>≤ 24</td>
<td>≥ 225</td>
</tr>
<tr>
<td>≤ 36</td>
<td>≥ 320</td>
</tr>
</tbody>
</table>

HV cables, even if shielded, must not pass inside delta connection on HV side.

<table>
<thead>
<tr>
<th>HV cable from</th>
<th>Sequence of the phases</th>
<th>Activities to be performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>U - V - W</td>
<td>None</td>
</tr>
<tr>
<td>Bottom</td>
<td>V - W - U</td>
<td>Move the bolts from the top to the bottom terminals</td>
</tr>
</tbody>
</table>
5.2 Connections on the Low Voltage side - LV

LV terminals are positioned on the upper part of the transformer and they are in aluminium as standard. We recommend to make the cable connection with tinned-copper cable terminals, connecting one or two cables in each hole.

In the case of connections with busbar it is necessary to use flexible connections to mechanically isolate the transformer from busbars.

In order to prevent corrosion caused by the direct connection between copper and aluminium, it is necessary to use CU-PAL intermediate plates (supplied on request) when connecting untreated copper busbars to the LV aluminium terminals.

5.3 Connections on the High Voltage side - HV

The HV terminals positioned on the opposite side to the LV terminals, are made with brass bolts placed at the two ends of the winding.

In case of connection of cables from the bottom, the upper pins can be inserted on the lower end by inverting the sequence of phases in accordance to the example previously reported in the figure.

Do not replace the brass bolts with bolts of a different material: this could alter the connection.
5.4 Tightening torque for electrical and mechanical connections

Tighten screws and bolts of electrical and mechanical connections in accordance with the values reported in the table: it is recommended to re-test after a few hours of operation to eliminate the effects of any adjustments. During the operations of clamping always use two wrenches to prevent distortion or damage.

<table>
<thead>
<tr>
<th>Screw / Bolt</th>
<th>Electrical connection [Nm]</th>
<th>Mechanical connection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Steel</td>
<td>Brass</td>
</tr>
<tr>
<td>M 6</td>
<td>10 - 15</td>
<td>5 - 10</td>
</tr>
<tr>
<td>M 8</td>
<td>30 - 40</td>
<td>10 - 15</td>
</tr>
<tr>
<td>M 10</td>
<td>50 - 60</td>
<td>20 - 30</td>
</tr>
<tr>
<td>M 12</td>
<td>60 - 70</td>
<td>40 - 50</td>
</tr>
<tr>
<td>M 14</td>
<td>90 - 100</td>
<td>60 - 70</td>
</tr>
<tr>
<td>M 16</td>
<td>120 - 130</td>
<td>80 - 90</td>
</tr>
<tr>
<td>M 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.5 Positioning

Cast resin transformers do not ensure contact insulation.

⚠️ It is absolutely forbidden to touch the cast HV coils while the transformer is energised.

Therefore the transformer must always be installed in a metal enclosure, inside a cage or in a room with doors enabling access only when the transformer is de-energised.

Inside this electrical enclosure the transformer has to be positioned complying with minimal insulation distance from the walls. They are related to the insulation class shown in the Rating plate.

C=B except when there is a voltage switch present on the LV side whereby C = A

In order to prevent horizontal movement of the transformer the mounting direction of the wheels can be modified.
5.6 Ventilation

The transformer during its operation generates losses due to the passage of current through the windings and the effect on the core of the magnetizing current. The losses, the values of which are shown on the test report, are transformed into heat that must be dissipated from the room in which the transformer is installed to comply with the conditions of normal use and prevent over-temperature limits being exceeded.

The room must be equipped with an opening at the bottom part \( S \), to ensure an adequate flow of fresh air and an aperture \( S' \) on the opposite wall in the high part, to extract the hot air that rises due to the chimney effect.

To determine the dimensions of the openings required use the following formulas (valid for an annual average temperature to 20°C).

\[
S = 0.185 \times \left( \frac{TL}{radq(H)} \right);
S' = S \times 1.15
\]

where:
- \( S \) = net surface of entry in \( \text{m}^2 \)
- \( S' \) = net surface of exit in \( \text{m}^2 \)
- \( TL \) = sum of no-load losses and load losses expressed in kW and indicated on the test report
- \( H \) = height between two opening in meter

For transformer directly fixed to the floor without rollers, it is good that they are still lifted off the ground to allow air circulation.

If provided with protective box, the transformers must be placed no closer than 0.2 m from the surrounding walls to allow air circulation.

In the case in which the enclosure was undersized or poorly ventilated it is advisable to install a forced ventilation system which can ensure a flow rate of 3.5 - 4 m\(^3\) of air per minute for each kW of losses.

If the transformer is equipped with ventilation bars please note that their useful life is approximately 20,000 hours and that after that period must be replaced. It is also advisable to start them with temperatures above 90°C and switch off when the temperature is stored at below 80°C.

5.7 Protection against overvoltages

To protect the transformer from overvoltage at power frequency or of atmospheric origin, adequate surge arresters must be installed. They need to have technical characteristics depending on the level of insulation of the transformer and on the characteristics of the MV distribution system.

Possible equipment for the correction of the power factor connected close to the transformer must be equipped with limiters for the inrush current in order to prevent the generation of transient overvoltages.
5.8 Temperature monitoring systems

In standard execution the transformers are equipped with Pt100 temperature probes, realized in accordance with the IEC 60751 Standards.

Connection of the probes:

1. Spare terminals

These are the recommended settings when the transformer is equipped with a temperature monitor device:

Recommended setting:

<table>
<thead>
<tr>
<th>Class</th>
<th>Alarm</th>
<th>Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 °C (H)</td>
<td>140</td>
<td>155</td>
</tr>
<tr>
<td>155 °C (F)</td>
<td>130</td>
<td>140</td>
</tr>
<tr>
<td>130 °C (B)</td>
<td>110</td>
<td>120</td>
</tr>
</tbody>
</table>

Electrical connection diagram, number and function of the electrical contacts, and terminals numeration are detailed on the manuals of the temperature control devices.
6. Commissioning

Legrand is not responsible for the installation of the transformer. Checks need to be done before energised the transformer.

6.1 Earth Connection

The earth conductor must be connected to the appropriate terminals which are on the transformer core. The size of earth conductor must be defined according to fault current and to the current standards.

In any case the earth conductor should never be lower than the following sections:

- copper: 16 mm²
- aluminium 35 mm²
- Steel 50 mm²

Insulation distances between earth conductor and live parts must always be respected.

6.2 HV and LV connections

1. Verify the mutual position of LV and HV windings which must be according to our drawings. Verify that the compression bolts are centred on the spacers. The spacers must be slightly pressed.

2. Check the connections between cables and HV terminals and between cables or flexibles and LV terminals. Tightening torques must be the ones indicated in the table.

3. Verify the correct operation of the temperature control device.

4. If the transformer is equipped with fans, check that fans are correctly positioned and that they work in the right direction.

6.3 Cleaning

If the transformer has been stored for a long period, clean carefully LV and HV windings from dust, dirt and possible condensation.

Clean the HV and LV windings from dust deposits, dirt and condensation. Use a vacuum cleaner to avoid dispersion of dirt and dust on the transformer.

Make sure the room is dry, clean, with sufficient ventilation and without the risk of ingress of water.

Do not attach accessories or ducts to the windings and the core of the transformer.
6.4 Tappings for voltage setting on HV windings

The variation of the nominal HV supplied by the electrical authority can be compensated by the tappings setting in order to keep the nominal LV required and detailed on the rating plate. The voltage setting is made by changing the position of the plates on the tappings.

Standard transformers are equipped with 5 tappings: ±5% in steps of 2.5%.

Before operating on the tappings and modifying the voltage setting, it is necessary that the transformer is off-load.

For transformers with one or two primary voltage windings, the voltage setting indications are detailed on the rating plate.

It is important to set the same tappings on all three HV windings in order to avoid possible damages to the transformer.

Platelets are located in the standard version on the front of the HV windings.

6.5 Measurement of windings earth resistance

The measurement must be performed with a Megohmmeter (Megger), working up to 5000V. HV and LV terminals must be disconnected from the electrical system, during the measurement. The measured values should be approximately as follows:

- 5000 V for 60 s: Terminals HV / LV terminals to earth >= 20 MΩ
- 2500 V for 60 s: Terminals LV / HV terminals to earth >= 10 MΩ
- 2500 V for 60 s: Terminals HV - LV terminals / earth >= 10 MΩ

If the measured values are significantly lower, dry the transformer and, if necessary, contact the after sales department.

6.6 Energising

When the transformer is connected to the electrical system, some sparkles could be visible close to the magnetic core. This physical phenomenon does not influence the correct working of the transformer and it is not related to the quality.

If the protection systems are not correctly set, inrush current will open the circuit breaker which protects the transformer. This can generate high voltages which can damage the windings. For this reason, it is recommended to activate the second harmonic restraint.

After checking the installation and ensuring that no object/tool has been left on the transformer, it is possible to close the circuit breaker on the HV side. After energising the transformer from the HV side, close the LV circuit breaker.
7. Maintenance

In normal operating conditions cast resin transformers do not require specific maintenance except for that indicated in the following table. All the operations performed must be recorded in order to be shown to Legrand in case of necessity. Maintaining within recommended timescales will help to prevent break downs.

7.1 Indicative table on the main maintenance operations

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Control activity</th>
<th>Frequency of checks</th>
<th>Tools to be used</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Correct operation of the temperature sensors Pt100 / PTC</td>
<td>Every 6 months and after exceptional events</td>
<td>Hot air tool for simulated heating</td>
<td>Normal behaviour of the different temperature sensors</td>
</tr>
<tr>
<td>2</td>
<td>Correct operation of the temperature control device</td>
<td>Every 6 months and after exceptional events</td>
<td>Hot air tool for simulated heating</td>
<td>Simulated alarm and trip</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Follow the instructions given in the installation manuals</td>
</tr>
<tr>
<td>3</td>
<td>Cleaning of the windings from dust, dirt, grease and possible foreign bodies</td>
<td>Yearly. If the environment is particularly dusty, the frequency must be adequately increased</td>
<td>Clean, dry compressed air, maximum pressure 3 bar Dry rag</td>
<td>The ventilation gaps between the windings must be completely clean and open</td>
</tr>
<tr>
<td>4</td>
<td>Cleaning of the windings from condensation</td>
<td>After a period with no applied voltage</td>
<td>Heat by short circuit up to 80 °C</td>
<td>External and internal surfaces of the windings perfectly dry</td>
</tr>
<tr>
<td>5</td>
<td>Tightening of the bolts of HV and LV terminals and of all the electrical connections</td>
<td>Yearly / after exceptional events</td>
<td>Torque wrench</td>
<td>Tightening torque according to paragraph 5.4</td>
</tr>
<tr>
<td>6</td>
<td>Measurement of insulation resistance to earth of the windings</td>
<td>After a period with no applied voltage</td>
<td>Mega-ohmmeter (Megger)</td>
<td>See the paragraph 6.5</td>
</tr>
<tr>
<td>7</td>
<td>Verify that each couple of LV and HV windings is perfectly aligned</td>
<td>After exceptional events such as accidental shock or short circuit downstream of the transformer.</td>
<td>Metro</td>
<td>Uniform centering</td>
</tr>
<tr>
<td>8</td>
<td>Tightening of the upper spacer</td>
<td>Yearly / after exceptional events</td>
<td>Torque wrench</td>
<td>Tightening torque between 20 and 40 Nm</td>
</tr>
<tr>
<td>9</td>
<td>Tightening of mechanical parts and fixing to the floor</td>
<td>Yearly and after exceptional events</td>
<td>Torque wrench</td>
<td>Tightening torque according to what is indicated in the table in paragraph 5.4</td>
</tr>
</tbody>
</table>
7.2 Guide for trouble-shooting

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Problem</th>
<th>Possible reason</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overtemperature of a single winding</td>
<td>Load is not distributed uniformly</td>
<td>Check the position of the connection on the tappings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faulty temperature sensors or temperature control device</td>
<td>Replace the faulty piece</td>
</tr>
<tr>
<td>2</td>
<td>General overheating</td>
<td>High ambient temperature</td>
<td>Possible damaged fans. Clean possible openings of the room or of the box which have been blocked. Check as per paragraph 5.4</td>
</tr>
<tr>
<td>3</td>
<td>Overheating in the core</td>
<td>Eddy currents in the magnetic core, due to a damage on the insulation of the ties</td>
<td>Contact Technical Assistance service After Sales.</td>
</tr>
<tr>
<td>4</td>
<td>Abnormal noise</td>
<td>Primary voltage too high</td>
<td>Verify that the voltage on the off-load secondary windings is lower or equal to the one written on the rating plate. Check as per paragraph 6.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rigid connection with the Busbar. Rigid connection with the floor. Bolts of tie rods the lens nucleus</td>
<td>Insert flexible connections between transformer and Busbar. Insert anti-vibration pads under the rollers. Tighten loose bolts of tie rods.</td>
</tr>
<tr>
<td>5</td>
<td>Intervention of the alarm and tripping relay of the temperature control device, due to overtemperature</td>
<td>Faulty temperature sensors or temperature control device</td>
<td>Replace the faulty piece</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Load current higher than the nominal value on the rating plate / high content of harmonics in the load current.</td>
<td>Reduce the load in order to have the nominal rated current or install the air circulation system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Difficult or not enough ventilation airflow</td>
<td>Check as per paragraph 5.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possible poor electrical contact of the temperature sensors</td>
<td>Check, clean and tighten all contacts of the sensors</td>
</tr>
<tr>
<td>6</td>
<td>Untimely intervention of the electrical system protections due to transformer insertion</td>
<td>The setting of the HV circuit breaker for the CRT insertion current is too low</td>
<td>Modify the protection setting paying attention to the H2 control (second harmonic)</td>
</tr>
</tbody>
</table>

7.3 Customer Care

For any information or spare parts do not hesitate to get in contact with our customer service. Call +39 030 2017100 or send a mail to: service-edm@bticino.it. Do not forget the serial number of your transformer.
8. Additional information

Exploded diagram of a cast resin transformer

1. Magnetic core
2. Upper yoke
3. Core lifting rods
4. Upper core clamps
5. Lower core clamps
6. Trucks
7. LV windings
8. LV terminals
9. HV windings
10. HV terminals
11. Upper spacer
12. Lower spacer
13. HV delta connection
14. Insulators lv terminals
15. Insulator supports
16. Lifting eyes
17. Bi-directional wheels
18. Connection earthing
19. Auxiliary circuit box for probes
20. Rating plate
Contact details

Quotations and Technical Support:
The Power Distribution Division of
Legrand Electric Ltd.
Great King Street North,
Birmingham, B19 2LF
Tel: +44 (0) 845 600 6266
Fax: +44 (0) 845 600 6366
E-mail: powersales.uk@legrand.co.uk

Customer Services:
The Power Distribution Division of
Legrand Electric Ltd.
No. 1 Industrial Estate
Medomsley Road, Consett,
County Durham, DH8 6SR
Tel: +44 (0) 845 600 6266
Fax: +44 (0) 845 600 6366
E-mail: powersales.uk@legrand.co.uk

Accounts:
Legrand Electric Ltd.
Great King Street North,
Birmingham, B19 2LF
Tel: +44 (0) 870 608 9000
Fax: +44 (0) 870 608 9004