

Green T.HE CAST RESIN TRANSFORMERS



THE GLOBAL SPECIALIST
IN ELECTRICAL AND DIGITAL BUILDING INFRASTRUCTURES







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Cast resin transformers GREEN T.HE

From 2021, the new European Commission Ecodesign Directive comes into force imposing stricter efficiency standards.

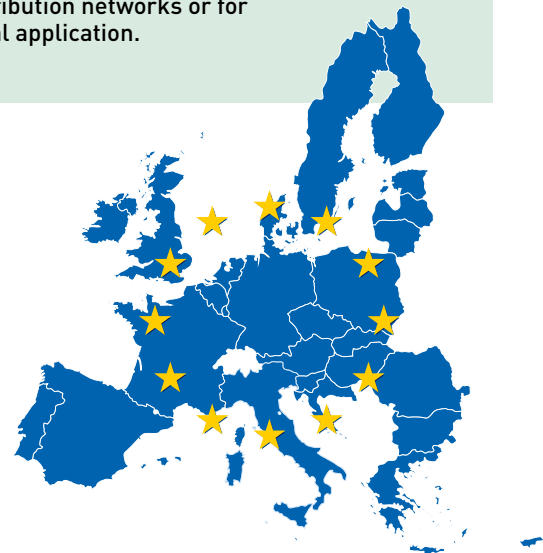
From July 2021 (tier 2), regulation 548/2014 (updated by Regulation 2019/1783) requires manufacturers to produce **transformers with no-load loss reduced by 10%** compared with the previous requirement.

The Legrand Green T.HE transformers fully comply with the new eco-compatible design rules and guarantee a significant reduction in energy consumption, thus promoting significant economic savings and the reduction of CO₂ emissions into the atmosphere.



Standard EN 50708-2-1 applies to medium power transformers with rated powers up to 3150 kVA supplied with frequency 50 Hz and with highest voltage for equipment (U_m) greater than 1.1 kV but not greater than 36 kV.

Commission Regulation (EU) 2019/1783 of 1 October 2019 amends Regulation (EU) 548/2014 of 21 May 2014 and updates the mandatory requirements in European Union countries for the ecodesign of power transformers with a minimum power rating of 1 kVA used in 50 Hz electricity transmission and distribution networks or for industrial application.



CLASSIFICATION

The classification of a cast resin transformer depends on the value of the no-load loss (P_0), as well as the load loss (P_k).

More precisely, P_0 losses are independent from the loads and remain constant for the whole time the transformer is connected to the electrical grid. On the other hand, P_k losses only occur when the transformer is feeding a load and they are proportional to the square of the load.

| NO-LOAD LOSS (P_0) | LOAD LOSS (P_k) |
|---------------------------|----------------------|
| A₀ -10% | A_k |

ECODESIGN REQUIREMENTS

| Rated power [kVA] | TIER 2 (from 1st July 2021) | |
|-------------------|--------------------------------|-----------------------------|
| | Maximum no-load loss P_0 [W] | Maximum load loss P_k [W] |
| ≤ 50 | A ₀ - 10% (180) | A _k (1500) |
| 100 | A ₀ - 10% (252) | A _k (1800) |
| 160 | A ₀ - 10% (360) | A _k (2600) |
| 250 | A ₀ - 10% (468) | A _k (3400) |
| 400 | A ₀ - 10% (675) | A _k (4500) |
| 630 | A ₀ - 10% (990) | A _k (7100) |
| 800 | A ₀ - 10% (1170) | A _k (8000) |
| 1000 | A ₀ - 10% (1395) | A _k (9000) |
| 1250 | A ₀ - 10% (1620) | A _k (11000) |
| 1600 | A ₀ - 10% (1980) | A _k (13000) |
| 2000 | A ₀ - 10% (2340) | A _k (16000) |
| 2500 | A ₀ - 10% (2790) | A _k (19000) |
| 3150 | A ₀ - 10% (3420) | A _k (22000) |

Requirements applicable (losses values) to medium power three-phase transformers with rated power ≤ 3150 kVA dry type, and one winding U_m ≤ 24 kV.

Once the transformer has ended its service life, all of the materials can be easily recycled or disposed of, as indicated in the PEP (Product Environmental Profile) document. This document describes the environmental impact of a product during its entire life cycle (from extraction of the needed raw materials to product disposal).



Product Environmental Profile
Green Transformers High Efficiency

ADVANTAGES OF THE Green T.HE TRANSFORMERS



Low partial discharges,
HIGH quality



Partial discharges are microscopic phenomena occurring inside insulating resin cavities are a factor in the speeding up of the ageing process of a transformer. Therefore, it is important that the values of such currents are limited.

According to the product standard regarding the design of resin transformers (IEC 60076-11), all windings with a voltage of ≥ 3.6 kV are subject to the measure of partial discharges and the value measured **should not exceed 10 pC (picocoulomb)**.

When the Green T.HE transformers were subjected to the measurement of partial discharges, the values detected were **always** below **5 pC**, significantly better than required by the standard.

A low value of partial discharges represents the index of some positive factors, such as:

- proper and solid design criteria
- quality raw materials
- precision during conductor foil winding phases
- competence during the epoxy resin pouring around the high-voltage winding
- accuracy in final assembling of the complete assembly

It is really easy to understand that a **lower** level of partial discharge leads to a **higher** resistance to work stresses and consequently to a higher life expectancy of the transformer under examination.

TYPE OF PARTIAL DISCHARGE

Depending on the type, discharges can be divided into:

- **Corona effect** (discharge mechanism occurring in correspondance of sharp ends in dielectric gas)
- **Superficial discharges**
- **Internal discharges** (representing the main cause of life-cycle decrease of the insulating material)
- **Treeing** (branched discharge channel): it is the pre-discharge channel due to the insulation deterioration leading to destructive discharge.



Extreme environmental conditions

The IEC 60076-11 standard identifies the environmental, climatic and fire behaviour classes of dry-type transformers with an alphanumeric code.

Thanks to the use of high-quality epoxy resins, all Legrand transformers minimize environmental impact and comply with the following classes:

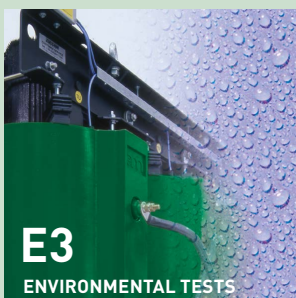
- **Environmental class E3**
- **Climate class C2**
- **Fire behaviour class F1**

This means that they can be stored, transported and above all used under extreme environmental conditions:

- Minimum room temperature: -25 °C
- Maximum relative humidity: 95%

Furthermore, in standard configuration, Green T.HE transformers guarantee a seismic resistance up to 0.2g* (light earthquakes) and can be fixed to the ground, thus avoiding any possibility of overturning.

On request, Legrand manufactures transformers that can be installed in areas with higher seismic hazard, up to 0.5g (AG5).



E3
ENVIRONMENTAL TESTS

E0
No condensation on the transformer, negligible pollution, installation in a clean and dry environment

E1
Occasional condensation and limited pollution

E2
The transformer is subjected to frequent condensation, light pollution, or both

E3
The transformer is subjected to medium pollution and frequent condensation with humidity above 95%

E4
On request, Legrand is also able to supply transformers with E4 environmental classification for heavy pollution



C2
CLIMATE TESTS

C1
The transformer is suitable for operation at temperatures not below -5°C but may be exposed during transport and storage to temperatures down to -25°C.

C2
The transformer can operate, be transported and stored at temperatures as low as -25°C.



F1
RESISTANCE TO FIRE

F0
The risk of fire is not expected and no measures are taken to limit inflammability.

F1
The transformer is subject to the risk of fire and reduced inflammability is required. Fire on the transformer must be extinguished within laid-down limits.

The normal environmental service conditions are as follows:

Maximum operating temperature: 40°C
Monthly average temperature of the hottest month: 30°C
Yearly average temperature: 20°C

*g=9,81m/s² (gravitational acceleration)

PRODUCT News

With the new Green T.HE series (tier 2), Legrand offers its customers a very high-quality product, with excellent performance and reduced losses, in full compliance with regulation 548/2014 and subsequent updates (EU regulation 2019/1783).

Thanks to the use of innovative materials and the measures taken during their design, the new transformers are characterised by the following distinctive features:

- **MV** (medium voltage) and **LV** (low voltage) **terminals** have been modified and built to facilitate the connection of the product on both windings.



Updated LV terminals



Updated MV terminals

- The MV windings are all made in **BIL LIST 2**, thanks to the **reinforced insulation** in the critical points of the unit.
- They guarantee very high performance and reduced losses compared to previous models, while maintaining equivalent weights and dimensions. All this is possible thanks to the completely new **magnetic core** with newly developed and high-performance materials.

REINFORCED INSULATION

NEW MATERIALS FOR THE
MAGNETIC CORE

HIGHER PERFORMANCE
WITH LOW WEIGHTS AND
DIMENSIONS

New magnetic core

The new grain-oriented magnetic sheet has an even sharper crystallographic consistency and makes an important contribution to the realisation of even more efficient power and distribution transformers. The advantages of using this material are:

- lower core weights
- more compact dimensions
- greater energy efficiency through minimal no-load losses
- reduced noise development through optimised magnetic domain structure
- improved insulation properties

This means that when comparing two transformers of the same size, the one with the core built with the new sheet will have significantly lower no-load loss values and therefore better performance.



CERTIFIED quality



TESTING AUTHORIZATION

ACAE (Associazione per la Certificazione delle Apparecchiature Elettriche), Member of **LOVAG** (Low Voltage Agreement Group) authorizes the Laboratory **BTicino S.p.A.** based in Via E. Ferrari, Z.I. Villa Zaccheo – 64020 Castellalto (TE) Laboratory codification number: **IB 03**

to carry out the tests listed in the following, for the purpose to certify the products as stated in the Certificate n° 070B and its enclosure, issued to ACAE by ACCREDIA.

List of the authorized tests on the power transformers:

- Measurement of voltage ratio and check of phase displacement
- Measurement of winding resistance
- Separate-source AC withstand voltage test
- Induced AC voltage withstand test
- Measurement of no-load loss and current
- Measurement of short-circuit impedance and load loss
- Partial discharge measurement
- Insulation resistances measurement
- Temperature-rise test
- Lightning impulse test
- Measurement of sound level

The laboratory has demonstrated to the ACAE's inspector to fulfil the basic requirements of IEC EN 17025 Standard for the above purposes.

ACAE will witness the tests according to its Quality Procedure PA 5.2.1 "Test supervision".

The renewal of the authorization is subjected to annual audit.

First issue date: 2015-08-05

Current issue date: 2015-08-05

Virginio Scarioni
ACAE General Secretary
Mr. Virginio Scarioni



ACCREDIA
Ente Nazionale di Accreditamento
PRD N°070 B
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

ACAE

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Certifications

The Legrand test lab "IB03" has recently received the qualification by ACAE to work in accordance to IEC EN 17025 standard on all routine tests and on some tests for medium-voltage transformers.

Such acknowledgement and qualification is a very important milestone obtained and Legrand, with a limited number of companies around the world, can offer this to their customers.

All Legrand transformers are individually tested before being delivered to the customer.

Thanks to the excellent quality of its transformers, Legrand offers to its customers the possibility of extending, upon request, the purchased product warranty*.

ACCEPTANCE TESTS

| | |
|----------------------------------------------------------------|------------------------------|
| ■ Measurement of the winding resistance | IEC 60076-11 (clause 14.2.1) |
| ■ Measurement of voltage ratio and check of phase displacement | IEC 60076-11 (clause 14.2.2) |
| ■ Measurement of short-circuit impedance and load loss | IEC 60076-11 (clause 14.2.3) |
| ■ Measurement of the no-load loss and the no-load current | IEC 60076-11 (clause 14.2.4) |
| ■ Separate-source AC withstand voltage test | IEC 60076-11 (clause 14.2.5) |
| ■ Induced AC withstand voltage test | IEC 60076-11 (clause 14.2.6) |
| ■ Measurement of the partial discharges | IEC 60076-11 (clause 14.2.7) |

TYPE TESTS (on request)

| | |
|----------------------------|------------------------------|
| ■ Atmospheric impulse test | IEC 60076-11 (clause 14.3.1) |
| ■ Temperature-rise test | IEC 60076-11 (clause 14.3.2) |

SPECIAL TESTS (on request)

| | |
|----------------------------------|------------------------------|
| ■ Measurement of the noise level | IEC 60076-11 (clause 14.4.2) |
| ■ Short-circuit test | IEC 60076-11 (clause 14.4.3) |

CAST RESIN MV/LV Green T.HE

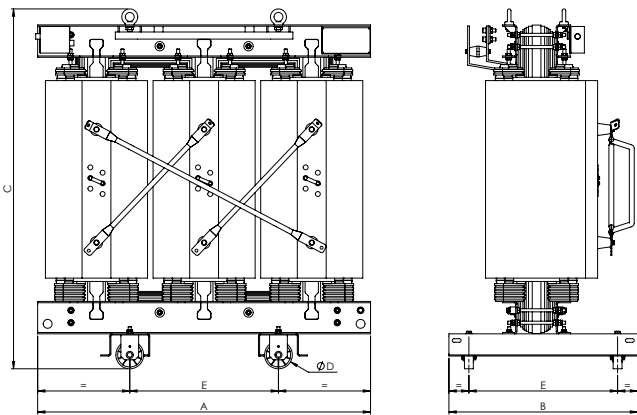
Compliance with the standards: IEC 60076-11 and EN 50708
 Power: 100–3150 kVA
 Frequency: 50 Hz
 Adjustment, MV side: $\pm 2 \times 2.5\%$
 Vector group: Dyn11
 Thermal class of the insulation system: 155 °C (F) / 155 °C (F)
 Temperature rise: 100 K / 100 K
 Environmental Class: E3-C2-F1

Primary Voltages: from 6 to 11 kV. Insulation class: 12 kV BIL 75 kV
 Secondary Voltages no-load: from 400 to 433 V (insulation class $\leq 1,1$ kV)

Primary Voltages: from 12 to 15.75 kV. Insulation class: 17.5 kV BIL 95 kV
 Secondary Voltages no-load: from 400 to 420 V (insulation class $\leq 1,1$ kV)

Primary Voltages: from 20 to 23 kV. Insulation class: 24 kV BIL 125 kV
 Secondary Voltages no-load: from 400 to 420 V (insulation class $\leq 1,1$ kV)

Primary Voltages: from 25 to 35 kV. Insulation class: 36 kV BIL 170 kV
 Secondary Voltages no-load: from 400 to 420 V (insulation class $\leq 1,1$ kV)



Summary reference values. Use the construction drawing for the design.
 All the data given may be modified without warning for reasons of technical production or product improvement.

Possibility to build, on request, products with other combinations of primary and secondary voltage plus bespoke units to meet differing site requirements.



INSULATION CLASS 12 kV

| S _r [kVA] | Primary voltage [kV] | Secondary no-load voltage [V] | U _k [%] | P ₀ [W] | P _k [W] at 120 °C | I ₀ [%] | LwA-Acoustic Power [dB (A)] | Item | Length (A) [mm] | Width (B) [mm] | Height (C) [mm] | Mass [kg] | Wheel centre line (E) [mm] | Wheel diameter (D) [mm] | Enclosure* |
|----------------------|----------------------|-------------------------------|--------------------|--------------------|------------------------------|--------------------|-----------------------------|-----------|-----------------|----------------|-----------------|-----------|----------------------------|-------------------------|------------|
| 100 | 10 | 400 | 6 | 252 | 1800 | 1 | 51 | HB2AIACBA | 1150 | 750 | 1290 | 700 | 520 | 125 | H1 |
| 160 | 10 | 400 | 6 | 360 | 2600 | 1 | 54 | HC2AIACBA | 1200 | 750 | 1310 | 820 | 520 | 125 | H1 |
| 250 | 10 | 400 | 6 | 468 | 3400 | 0.9 | 57 | HE2AIACBA | 1300 | 780 | 1370 | 1150 | 520 | 125 | H1 |
| 315 | 10 | 400 | 6 | 557 | 3875 | 0.8 | 58 | HF2AIACBA | 1350 | 850 | 1430 | 1220 | 670 | 125 | H2 |
| 400 | 10 | 400 | 6 | 675 | 4500 | 0.8 | 60 | HG2AIACBA | 1350 | 850 | 1490 | 1350 | 670 | 125 | H2 |
| 500 | 10 | 400 | 6 | 811 | 5630 | 0.7 | 60 | HH2AIACBA | 1450 | 850 | 1540 | 1600 | 670 | 125 | H2 |
| 630 | 10 | 400 | 6 | 990 | 7100 | 0.7 | 62 | HI2AIACBA | 1450 | 850 | 1600 | 1750 | 670 | 125 | H2 |
| 800 | 10 | 400 | 6 | 1170 | 8000 | 0.6 | 64 | HJ2AIACBA | 1550 | 1000 | 1740 | 2150 | 820 | 160 | H3 |
| 1000 | 10 | 400 | 6 | 1395 | 9000 | 0.6 | 65 | HK2AIACBA | 1600 | 1000 | 1960 | 2750 | 820 | 160 | H3 |
| 1250 | 10 | 400 | 6 | 1620 | 11000 | 0.6 | 67 | HL2AIACBA | 1700 | 1000 | 1980 | 3200 | 820 | 160 | H3 |
| 1600 | 10 | 400 | 6 | 1980 | 13000 | 0.5 | 68 | HM2AIACBA | 1750 | 1000 | 2160 | 3850 | 820 | 160 | H4 |
| 2000 | 10 | 400 | 6 | 2340 | 16000 | 0.4 | 70 | HN2AIACBA | 1850 | 1000 | 2240 | 4550 | 820 | 160 | H4 |
| 2500 | 10 | 400 | 6 | 2790 | 19000 | 0.4 | 71 | HO2AIACBA | 2000 | 1500 | 2300 | 5450 | 1070 | 200 | H5 |
| 3150 | 10 | 400 | 6 | 3420 | 22000 | 0.35 | 71 | HP2AIACBA | 2150 | 1500 | 2370 | 6500 | 1070 | 200 | H5 |

This table shows the characteristics and codes of transformers with 10/0.4 kV ratio and Dyn11 vector group. The losses information is also valid for various transformer ratios and vector groups.

INSULATION CLASS 17.5 kV

| S _r [kVA] | Primary voltage [kV] | Secondary no-load voltage [V] | U _k [%] | P ₀ [W] | P _k [W] at 120 °C | I ₀ [%] | LwA-Acoustic Power [dB (A)] | Item | Length (A) [mm] | Width (B) [mm] | Height (C) [mm] | Mass [kg] | Wheel centre line (E) [mm] | Wheel diameter (D) [mm] | Enclosure* |
|----------------------|----------------------|-------------------------------|--------------------|--------------------|------------------------------|--------------------|-----------------------------|-----------|-----------------|----------------|-----------------|-----------|----------------------------|-------------------------|------------|
| 100 | 15 | 400 | 6 | 252 | 1800 | 1 | 51 | HB3AIAFBA | 1250 | 750 | 1310 | 830 | 520 | 125 | H1 |
| 160 | 15 | 400 | 6 | 360 | 2600 | 1 | 54 | HC3AIAFBA | 1250 | 760 | 1330 | 880 | 520 | 125 | H1 |
| 250 | 15 | 400 | 6 | 468 | 3400 | 0.9 | 57 | HE3AIAFBA | 1300 | 780 | 1370 | 1150 | 520 | 125 | H1 |
| 315 | 15 | 400 | 6 | 557 | 3875 | 0.8 | 58 | HF3AIAFBA | 1400 | 850 | 1450 | 1350 | 670 | 125 | H2 |
| 400 | 15 | 400 | 6 | 675 | 4500 | 0.8 | 60 | HG3AIAFBA | 1400 | 850 | 1510 | 1450 | 670 | 125 | H2 |
| 500 | 15 | 400 | 6 | 811 | 5630 | 0.7 | 60 | HH3AIAFBA | 1450 | 850 | 1540 | 1650 | 670 | 125 | H2 |
| 630 | 15 | 400 | 6 | 990 | 7100 | 0.7 | 62 | HI3AIAFBA | 1450 | 850 | 1620 | 1850 | 670 | 125 | H2 |
| 800 | 15 | 400 | 6 | 1170 | 8000 | 0.6 | 64 | HJ3AIAFBA | 1550 | 1000 | 1750 | 2200 | 820 | 160 | H3 |
| 1000 | 15 | 400 | 6 | 1395 | 9000 | 0.6 | 65 | HK3AIAFBA | 1600 | 1000 | 1960 | 2800 | 820 | 160 | H3 |
| 1250 | 15 | 400 | 6 | 1620 | 11000 | 0.6 | 67 | HL3AIAFBA | 1700 | 1000 | 2000 | 3200 | 820 | 160 | H3 |
| 1600 | 15 | 400 | 6 | 1980 | 13000 | 0.5 | 68 | HM3AIAFBA | 1750 | 1000 | 2150 | 3750 | 820 | 160 | H4 |
| 2000 | 15 | 400 | 6 | 2340 | 16000 | 0.4 | 70 | HN3AIAFBA | 1900 | 1000 | 2260 | 4700 | 820 | 160 | H4 |
| 2500 | 15 | 400 | 6 | 2790 | 19000 | 0.4 | 71 | HO3AIAFBA | 2000 | 1500 | 2320 | 5600 | 1070 | 200 | H5 |
| 3150 | 15 | 400 | 6 | 3420 | 22000 | 0.35 | 71 | HP3AIAFBA | 2200 | 1500 | 2430 | 7300 | 1070 | 200 | H5 |

This table shows the characteristics and codes of transformers with 15/0.4 kV ratio and Dyn11 vector group. The losses information is also valid for various transformer ratios and vector groups.

A dedicated application is available for the cost estimate and the ordering of transformers. For more details please contact Legrand.

* Enclosure with accessories. For more information, please see page 14

INSULATION CLASS 24 kV

| S _R [kVA] | Primary voltage [kV] | Secondary no-load voltage [V] | U _k [%] | P _o [W] | P _k [W] at 120 °C | I _o [%] | LwA-Acoustic Power [dB (A)] | Item | Length (A) [mm] | Width (B) [mm] | Height (C) [mm] | Mass [kg] | Wheel centre line (E) [mm] | Wheel diameter (D) [mm] | Enclosure* type |
|----------------------|----------------------|-------------------------------|--------------------|--------------------|------------------------------|--------------------|-----------------------------|-----------|-----------------|----------------|-----------------|-----------|----------------------------|-------------------------|-----------------|
| 100 | 20 | 400 | 6 | 252 | 1800 | 1 | 51 | HB4AIAGBA | 1350 | 750 | 1320 | 880 | 520 | 125 | H1 |
| 160 | 20 | 400 | 6 | 360 | 2600 | 1 | 54 | HC4AIAGBA | 1350 | 760 | 1340 | 920 | 520 | 125 | H1 |
| 250 | 20 | 400 | 6 | 468 | 3400 | 0.9 | 57 | HE4AIAGBA | 1400 | 780 | 1400 | 1210 | 520 | 125 | H1 |
| 315 | 20 | 400 | 6 | 557 | 3875 | 0.8 | 58 | HF4AIAGBA | 1400 | 850 | 1460 | 1400 | 670 | 125 | H2 |
| 400 | 20 | 400 | 6 | 675 | 4500 | 0.8 | 60 | HG4AIAGBA | 1400 | 850 | 1520 | 1500 | 670 | 125 | H2 |
| 500 | 20 | 400 | 6 | 811 | 5630 | 0.7 | 60 | HH4AIAGBA | 1450 | 850 | 1550 | 1650 | 670 | 125 | H2 |
| 630 | 20 | 400 | 6 | 990 | 7100 | 0.7 | 62 | HI4AIAGBA | 1500 | 850 | 1630 | 1880 | 670 | 125 | H2 |
| 800 | 20 | 400 | 6 | 1170 | 8000 | 0.6 | 64 | HJ4AIAGBA | 1600 | 1000 | 1750 | 2300 | 820 | 160 | H3 |
| 1000 | 20 | 400 | 6 | 1395 | 9000 | 0.6 | 65 | HK4AIAGBA | 1700 | 1000 | 1940 | 2900 | 820 | 160 | H3 |
| 1250 | 20 | 400 | 6 | 1620 | 11000 | 0.6 | 67 | HL4AIAGBA | 1750 | 1000 | 2010 | 3300 | 820 | 160 | H3 |
| 1600 | 20 | 400 | 6 | 1980 | 13000 | 0.5 | 68 | HM4AIAGBA | 1800 | 1000 | 2150 | 3950 | 820 | 160 | H4 |
| 2000 | 20 | 400 | 6 | 2340 | 16000 | 0.4 | 70 | HN4AIAGBA | 1950 | 1000 | 2260 | 4850 | 820 | 160 | H4 |
| 2500 | 20 | 400 | 6 | 2790 | 19000 | 0.4 | 71 | HO4AIAGBA | 2050 | 1500 | 2380 | 5900 | 1070 | 200 | H5 |
| 3150 | 20 | 400 | 6 | 3420 | 22000 | 0.35 | 71 | HP4AIAGBA | 2250 | 1500 | 2440 | 7250 | 1070 | 200 | H5 |

This table shows the characteristics and codes of transformers with 20/0.4 kV ratio and Dyn11 vector group. The losses information is also valid for various transformer ratios and vector groups.

INSULATION CLASS 36 kV

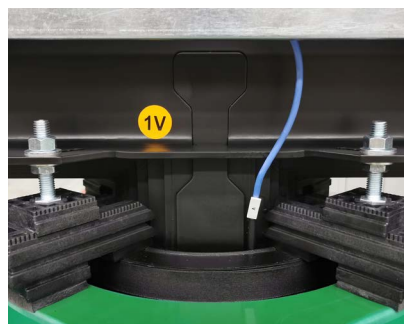
| S _R [kVA] | Primary voltage [kV] | Secondary no-load voltage [V] | U _k [%] | P _o [W] | P _k [W] at 120 °C | I _o [%] | LwA-Acoustic Power [dB (A)] | Item | Length (A) [mm] | Width (B) [mm] | Height (C) [mm] | Mass [kg] | Wheel centre line (E) [mm] | Wheel diameter (D) [mm] | Enclosure* type |
|----------------------|----------------------|-------------------------------|--------------------|--------------------|------------------------------|--------------------|-----------------------------|-----------|-----------------|----------------|-----------------|-----------|----------------------------|-------------------------|-----------------|
| 100 | 33 | 400 | 6 | 289 | 1980 | 1.2 | 51 | HB5AIAQBA | 1650 | 850 | 1800 | 1800 | 670 | 125 | AL |
| 160 | 33 | 400 | 6 | 414 | 2860 | 1.2 | 54 | HC5AIAQBA | 1600 | 850 | 1750 | 1700 | 670 | 125 | AL |
| 250 | 33 | 400 | 6 | 538 | 3740 | 1.1 | 57 | HE5AIAQBA | 1600 | 850 | 1850 | 2000 | 670 | 125 | AL |
| 315 | 33 | 400 | 6 | 641 | 4264 | 1 | 58 | HF5AIAQBA | 1700 | 1000 | 1850 | 2300 | 670 | 125 | AL |
| 400 | 33 | 400 | 6 | 776 | 4950 | 1 | 60 | HG5AIAQBA | 1700 | 1000 | 1850 | 2300 | 670 | 125 | AL |
| 500 | 33 | 400 | 6 | 933 | 6193 | 0.8 | 60 | HH5AIAQBA | 1750 | 1000 | 1900 | 2500 | 670 | 125 | AL |
| 630 | 33 | 400 | 6 | 1138 | 7810 | 0.8 | 62 | HI5AIAQBA | 1700 | 1200 | 2000 | 2600 | 820 | 160 | BL |
| 800 | 33 | 400 | 6 | 1345 | 8800 | 0.7 | 64 | HJ5AIAQBA | 1750 | 1200 | 2150 | 3100 | 820 | 160 | BL |
| 1000 | 33 | 400 | 6 | 1604 | 9900 | 0.7 | 65 | HK5AIAQBA | 1850 | 1200 | 2250 | 3700 | 820 | 160 | BL |
| 1250 | 33 | 400 | 6 | 1863 | 12100 | 0.7 | 67 | HL5AIAQBA | 1950 | 1200 | 2300 | 4300 | 820 | 160 | BL |
| 1600 | 33 | 400 | 8 | 2277 | 14300 | 0.6 | 68 | HMSAIDQBA | 2050 | 1700 | 2400 | 4700 | 1070 | 200 | CL |
| 2000 | 33 | 400 | 8 | 2691 | 17600 | 0.5 | 70 | HN5AIDQBA | 2150 | 1700 | 2450 | 5400 | 1070 | 200 | CL |
| 2500 | 33 | 400 | 8 | 3208 | 20900 | 0.5 | 71 | HO5AIDQBA | 2350 | 1700 | 2550 | 6800 | 1300 | 200 | DT |
| 3150 | 33 | 400 | 8 | 3933 | 24200 | 0.4 | 71 | HP5AIDQBA | 2400 | 1700 | 2600 | 7700 | 1300 | 200 | DT |

This table shows the characteristics and codes of transformers with 33/0.4 kV ratio and Dyn11 vector group. The losses information is also valid for various transformer ratios and vector groups.

A dedicated application is available for the cost estimate and the ordering of transformers. For more details please contact Legrand.

GREEN T.HE - Cast resin transformers

Installation accessories



| Item | TEMPERATURE MEASUREMENT PROBES | | | | |
|----------------|----------------------------------------------------------------------------------------------------------------|-------------|-------|-----------------|----------------------------------------------------------------------|
| | The probes are supplied mounted on the transformer and wired to a robust IP66 die-cast aluminium junction box. | | | | |
| | Type | Range [kVA] | No. | Δt [°C] | Mounting |
| 200073 | Pt100 | ≤ 2000 | 3 | - | on the LV windings (3) |
| 200074 | Pt100 | ≥ 2500 | 3 | - | on the LV windings (3) |
| 200137 | Pt100 | ≤ 2000 | 3+1 | - | on the LV windings (3) + on the core (1) |
| 200138 | Pt100 | ≥ 2500 | 3+1 | - | on the LV windings (3) + on the core (1) |
| CB00120 | PTC | - | 3+3 | 130-140 | on the LV windings (3 pairs) for alarm and release. |
| CB02400 | PTC | - | 3+3 | 110-120 | on the LV windings (3 pairs) for alarm and release. |
| CB0272 | PTC | - | 3+3+3 | 130-140 - 90 | on the LV windings (3 pairs) for fan control, for alarm and release. |

| CONTROL UNITS | | |
|--------------------------------------|---------------------------------------------------------------------------------------|--|
| The control units are supplied loose | | |
| Type | Description | |
| 220002 | T154 temperature control for 3 or 4 Pt100 probes | |
| 220023 | MT200 L temperature control for 3 or 4 Pt100 probes | |
| 220197 | NT935 AD temperature control for 3 or 4 Pt100 probes with analogue and digital output | |
| 220211 | MT200 LITE S temperature control for 3 or 4 Pt100 probes with digital output | |
| 220219 | NT935 ETH temperature control for 3 or 4 Pt100 probes with Ethernet output | |
| 220218 | MT200 LITE E temperature control for 3 or 4 Pt100 probes with Ethernet output | |
| 220212 | NT538 AD temperature control up to 8 Pt100 probes with analogue and digital output | |
| 220004 | T 119 temperature control for PTC probes | |
| 220010 | T119 DIN temperature control for PTC probes preset for DIN rail mounting | |
| 220024 | MT300 temperature control for PTC probes preset for DIN rail mounting | |
| 220035 | VRT200 ventilation bar control | |
| 220174 | AT100 ventilation bar control | |

| Item | VENTILATION BARS | | |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------|
| | The ventilation busbars temporarily increase the rated power (under normal service conditions). According to standard IEC 60076-1, a transformer is called AN even if it is equipped with discontinuous ventilation. If a transformer with AF continuous duty power is required, please contact Legrand. | | |
| | Range [kVA] | Δ Power [%] | Notes |
| CB02444 | 100 - 250 | + 40 | Temporary increase in nominal conditions (50Hz) |
| CB02454 | 315 - 630 | + 40 | |
| CB02464 | 800 - 1000 | + 40 | |
| CB01414 | 1250 - 2000 | + 40 | |
| CB01412 | 2500 - 3150 | + 40 | |

| SURGE ARRESTER KIT | | |
|--------------------|----------|---------|
| | MT* [kV] | Ur [kV] |
| 130075D | 6 | 9 |
| 130054D | 10-11 | 12 |
| 130055D | 15 | 18 |
| 130056D | 20 | 24 |

*other MV values available on request
Ur: rated voltage of the surge arrester

| RUBBER BUFFER SUPPORTS | | |
|------------------------|-------------|------------------------------------------------------------------------|
| | Range [kVA] | Description |
| 170019 | ≤ 2000 | 4 vibration dampers supplied for mounting under the transformer wheels |
| 170020 | ≥ 2500 | 4 vibration dampers supplied for mounting under the transformer wheels |

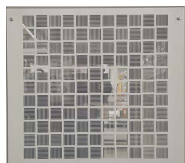
| CUPAL PLATES | | |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------|
| CUPAL is a bimetal sheet made up of one copper sheet and one aluminium sheet welded together through a special mechanical procedure. | | |
| | Range [kVA] | Description |
| 030014 ** | ≤ 160 | 40 x 40 CUPAL plate |
| 030008 ** | 250 | 50 x 50 CUPAL plate |
| 030009 ** | ≥ 315 and ≤ 500 | 60 x 60 CUPAL plate |
| 030010 ** | 630 | 80 x 80 CUPAL plate |
| 030011 ** | 800 | 100 x 100 CUPAL plate |
| 030012 ** | ≥ 1000 | 120 x 120 CUPAL plate |

** the codes refer to a single CUPAL plate

EXAMPLE:
For a transformer with a power of 1250 kVA, the correct CUPAL plate is product code 030012.
- 1 Cupal has 2 plates (1 Aluminium and 1 Copper) therefore for quantity calculation:
2 plates x 4 LV terminals = 8 CUPAL plates

GREEN T.HE - Cast resin transformers

Installation accessories



Enclosure ventilation grid IP31



Enclosure ventilation grid IP23

ENCLOSURES

There are 9 enclosure sizes available, with the possibility to choose 2 types of ventilation grill for each one, IP31 and IP23.

It is also possible to choose the transformer with the enclosure either assembled or disassembled, to be assembled on site.

All the indicated protection enclosures are compatible with the installation of Zucchini busbar ducts

It is also possible to provide customized solutions based on specific requirements: please contact Legrand.

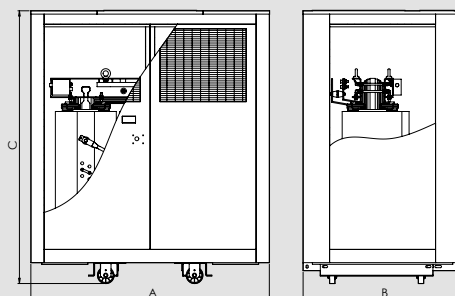
Enclosure colour: RAL 7035

AREL door lock with enclosure key: product code 230076

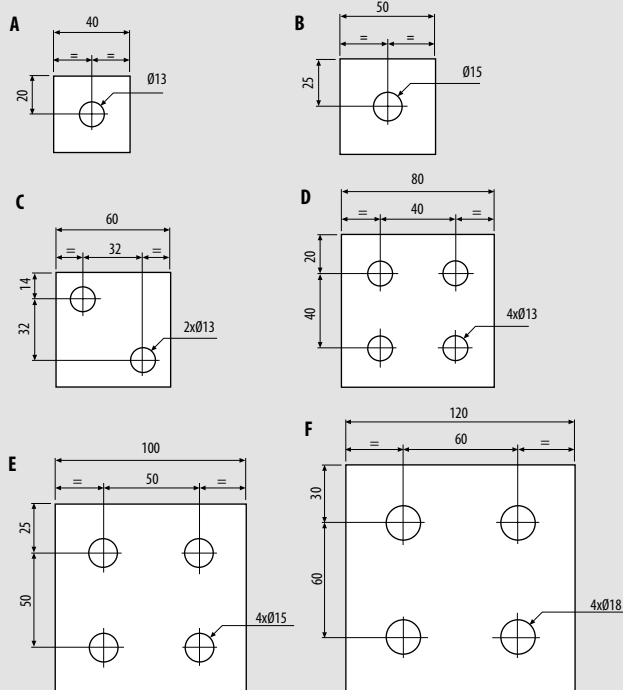
ENCLOSURES

| IP index | Item | Mounted (M)/ Dismantled (S) | Power [kVA] | Enclosure type | Dimensions [mm] | | | Mass [kg] |
|------------------------------------|----------|--------------------------------|-----------------------------------------|----------------|-----------------|-----------|------------|-----------|
| | | | | | Length (A) | Width (B) | Height (C) | |
| 12 kV-17.5 kV-24 kV CLASSES | | | | | | | | |
| IP31 | BXM31H1 | M | 100 - 160 - 250 | H1 | 1800 | 1150 | 1800 | 160 |
| | BXS31H1 | S | | | | | | |
| | BXM31H2 | M | 315 - 400 500 - 630 | H2 | 1800 | 1200 | 2100 | 180 |
| | BXS31H2 | S | | | | | | |
| | BXM31H3 | M | 800-1000- 1250 | H3 | 2100 | 1300 | 2450 | 230 |
| | BXS31H3 | S | | | | | | |
| | BXM31H4 | M | 1600-2000 | H4 | 2300 | 1350 | 2750 | 270 |
| | BXS31H4 | S | | | | | | |
| | BXM31H5 | M | 2500-3150 | H5 | 2600 | 1500 | 2750 | 370 |
| | BXS31H5 | S | | | | | | |
| IP23 | BXM23H1 | M | 100 - 160 - 250 | H1 | 1800 | 1150 | 1800 | 170 |
| | BXS23H1 | S | | | | | | |
| | BXM23H2 | M | 315 - 400 500 - 630 | H2 | 1800 | 1200 | 2100 | 190 |
| | BXS23H2 | S | | | | | | |
| | BXM23H3 | M | 800-1000- 1250 | H3 | 2100 | 1300 | 2450 | 240 |
| | BXS23H3 | S | | | | | | |
| | BXM23H4 | M | 1600-2000 | H4 | 2300 | 1350 | 2750 | 290 |
| | BXS23H4 | S | | | | | | |
| | BXM23H5 | M | 2500-3150 | H5 | 2600 | 1500 | 2750 | 390 |
| | BXS23H5 | S | | | | | | |
| CLASSES 36 kV | | | | | | | | |
| IP31 | BXM31AL | M | 100 - 160 - 250 - 315 - 400 - 500 | AL | 2300 | 1450 | 2300 | 250 |
| | BXS31AL | S | | | | | | |
| | BXM31BL | M | 630 - 800 - 1000 - 1250 | BL | 2600 | 1500 | 2700 | 320 |
| | BXS31BL | S | | | | | | |
| | BXM31CL | M | 1600-2000 | CL | 2900 | 1700 | 2900 | 370 |
| | BXS31CL | S | | | | | | |
| | BXM31DT* | M | 2500-3150 | DT | 3200 | 2000 | 3100 | 450 |
| | BXS31DT* | S | | | | | | |
| IP23 | BXM23AL | M | 100 - 160 - 250 - 315 - 400 - 500 | AL | 2300 | 1450 | 2300 | 280 |
| | BXS23AL | S | | | | | | |
| | BXM23BL | M | 630 - 800 - 1000 - 1250 | BL | 2600 | 1500 | 2700 | 350 |
| | BXS23BL | S | | | | | | |
| | BXM23CL | M | 1600-2000 | CL | 2900 | 1700 | 2900 | 400 |
| | BXS23CL | S | | | | | | |
| | BXM23DT* | M | 2500-3150 | DT | 3200 | 2000 | 3100 | 510 |
| | BXS23DT* | S | | | | | | |

ENCLOSURE DIMENSIONS



DIMENSIONS AND HOLES OF THE LV CONNECTION TERMINALS



STANDARD HOLE DETAILS

The LV connection terminals are made of aluminium. Appropriate CUPAL bimetal plates are also available for copper connections

| Drawing | Range [kVA] | Thickness [mm] |
|---------|-------------|----------------|
| A | 100 | 4 |
| | 160 | |
| B | 250 | 5 |
| C | 315 | 6 |
| | 400 | |
| | 500 | |
| D | 630 | 8 |
| E | 800 | 8 |
| F | 1000 | 8 |
| | 1250 | 10 |
| | 1600 | 12 |
| | 2000 | 16 |
| | 2500 | 20 |
| | 3150 | 24 |

All the data given may be modified without warning for reasons of technical production or product improvement.

ENVIRONMENTAL ASPECTS

Legrand has always taken care of every detail relating to cast resin transformers to guarantee maximum performance to customers in terms of simplicity, safety and flexibility.

The new design criteria adopted also go in the direction of creating added values in terms of environmental aspects.

In compliance with regulations, the attention paid to new material technologies has led Legrand to play a primary role in reducing the environmental impact of dry-type transformers.

The following table shows the material of the components used in our products, useful to manage recycling operations, getting high-performance end-of-life recycling solutions

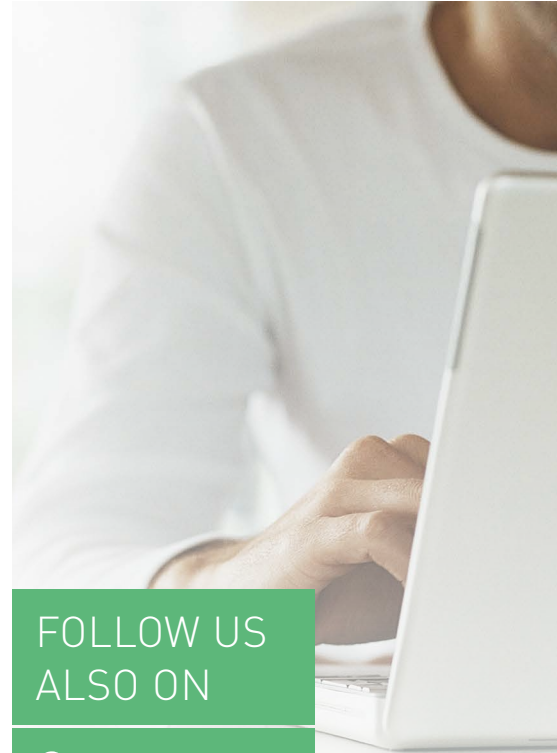
Due to the manufacturing complexity of the product, the table below provides the main materials of which it is composed, and the relative quantity by weight.

The precise data for each single transformer are indicated on the plate of the specific transformer itself.



| WEIGHTS OF THE MAIN TRANSFORMER MATERIALS | | |
|-------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------|
| <i>Range</i> | <i>Conductor material Aluminum [kg]</i> | <i>Core material CRGO (cold-rolled grain-oriented steel) [kg]</i> |
| up to 630 kVA | 100 to 500 | 200 to 1500 |
| from 800 kVA to 1600 kVA | 500 to 1100 | 1300 to 2700 |
| from 2000 kVA to 3150 kVA | 1100 to 1700 | 2700 to 6000 |

For its High Efficiency Green Transformers Legrand makes PEP (Product Environmental Profile) certificates available to offer customers environmentally friendly solutions.



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