



*Green Resin
Transformers*



Discover how our **green** transformer production came about.

Our Story

Ours is a story of **three generations united by a single vision**: to create technological solutions of excellence that stand the test of time. It all began in the **1950s**, in a small electromechanical workshop where a passion for innovation was combined with daily work, carried out by skilled hands and absolute dedication.

Over the decades, that small artisan business has **transformed into a modern industrial company**, but without ever losing sight of its founding values: **technical excellence, attention to detail, and the ability to evolve** with the times. Each generation has made its own contribution, adding technologies and visions, but with the same spirit: to **build** products that are not just machines, but **reliable solutions for the energy challenges of the present and the future**.



1950'S

Our story begins here, more than seventy years ago. The history of CO.EL.GE. **has its roots in the 1950s**, when the grandfather of the current CEO set up the first electromechanical workshop dedicated to the construction and repair of electric motors. The spark of a passionate craftsman, through **commitment and passion**, laid the foundations for a manufacturing and entrepreneurial journey that was destined to grow.

2017 The official foundation

With the acquisition of a branch of a previous group **in 2017**, that small workshop born from the dream of a craftsman officially **became CO.EL.GE.**: a company that carries the legacy of a family in its name and heart, but with its eyes set on the future.

The company over time

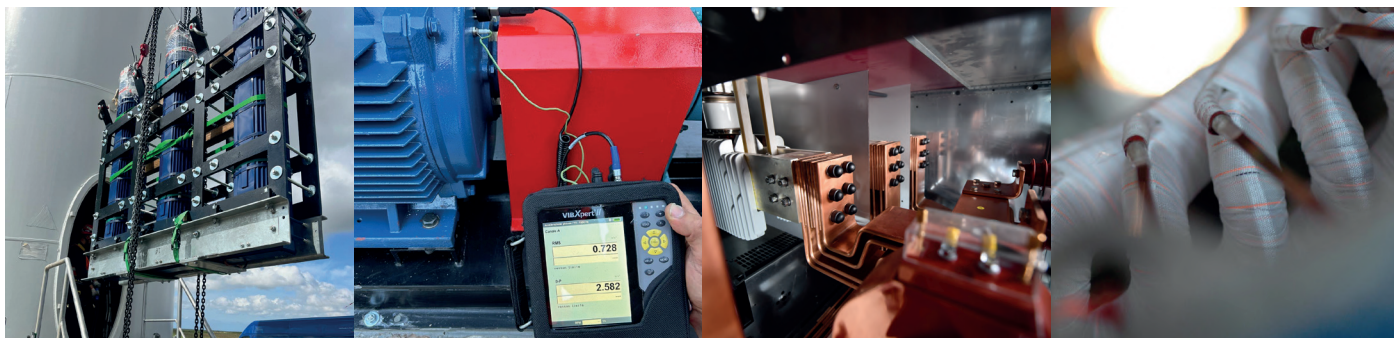
Three generations have passed, each with its own contribution, challenges, and achievements. **Over forty years of experience** have settled like layers of knowledge: from the wisdom of the grandfather's expert hands, through the entrepreneurial intuition of the father, to today's innovative vision. This continuous evolution has allowed the company to equip itself with cutting-edge **technical and production facilities** and to consolidate **technical and organizational skills** that make it a benchmark in the sector today.

The company today

What began as a workshop for electric motors has become a comprehensive company: **today it designs and manufactures medium and low voltage electrical panels, builds motor solutions, and offers maintenance, repair, and advanced diagnostics services** (including an electro-predictive approach) for complex electrical systems.

Behind this transformation lies an **entrepreneurial approach** that combines **traditional values** with **modern skills**.

Today, CO.EL.GE. can count on a solid structure: **a highly competent technical staff, a production area of approximately 3,000 m², departments dedicated to construction, assembly, and testing, and an organization capable of handling complex orders with rigor and punctuality.** A company that has grown, but has not forgotten where it started.



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Green Resin Transformers

Every wind farm or photovoltaic plant has unique requirements: variable load cycles, harmonic peaks, and unstable voltages require precisely designed transformers. That's why we design and manufacture special custom transformers specifically for the renewable energy sector.

Our transformers are the bridge between green production and the power grid: they guarantee high efficiency, withstand the most difficult environmental conditions, and ensure safe insulation thanks to the use of resin. We cover powers up to 5000 kVA, insulation voltages up to 36 kV, primary voltages up to 33 kV, and secondary voltages in the 400V-690V-800V range.

Starting in 2021,
the entry into force
of the European
Commission's new
Ecodesign Directive
imposes stricter
efficiency standards.



From July 2021 (phase 2), Regulation 548/2014 (updated by Regulation 2019/1783) imposes the obligation to produce transformers with no-load losses reduced by 10% compared to previous products

CO.EL.GE. transformers fully comply with the new eco-friendly design rules and guarantee a significant reduction in energy losses, promoting considerable economic savings and a reduction in CO₂ emissions into the atmosphere.



EN 50708-2-1 Standard

Applies to three-phase transformers with a power rating of up to 3150 kVA, supplied at a frequency of 50 Hz and with a maximum voltage per component (Um) greater than 1.1 kV but not exceeding 36 kV.

Regulation (UE) 2019/1783

Of the Commission of October 1, 2019, amends Regulation (EU) 548/2014 of May 21, 2014, and updates the mandatory requirements in European Union countries for the eco-compatible design of electrical transformers with power ratings above 1 kVA, used in electricity transmission and distribution networks.

ECO-FRIENDLY DESIGN REQUIREMENTS

Phase 2 (from July 1, 2021)

Rated power (kVA)	Maximum power losses P_k (W)	Maximum no-load losses P_0 (W)
≤50	A_k (1500)	$A_0 - 10\%$ (180)
100	A_k (1800)	$A_0 - 10\%$ (252)
160	A_k (2600)	$A_0 - 10\%$ (360)
250	A_k (3400)	$A_0 - 10\%$ (468)
400	A_k (4500)	$A_0 - 10\%$ (675)
630	A_k (7100)	$A_0 - 10\%$ (990)
800	A_k (8000)	$A_0 - 10\%$ (1170)
1000	A_k (9000)	$A_0 - 10\%$ (1395)
1250	A_k (11000)	$A_0 - 10\%$ (1620)
1600	A_k (13000)	$A_0 - 10\%$ (1980)
2000	A_k (16000)	$A_0 - 10\%$ (2340)
2500	A_k (19000)	$A_0 - 10\%$ (2790)
3150	A_k (22000)	$A_0 - 10\%$ (3420)

Requirements applicable (loss values) to medium-sized three-phase dry-type transformers with a rated power ≤ 3150 kVA, with a winding with $U_m \leq 24$ kV

Classification

Resin transformers are classified based on the value of **no-load losses** (P_0) and **load losses** (P_k), which are characteristics of the machine itself. P_0 losses are independent of the load and **remain constant** for as long as the transformer remains connected to the electrical network. P_k losses, on the other hand, only occur when a load is connected to the transformer and **vary quadratically with the load itself**.

NO-LOAD LOSSES (P_0)

NO-LOAD LOSSES (P_0)

AA_0

A_k

Sustainability at the end of the working cycle

When the **CO.EL.GE. resin transformer** has reached the end of its working life, **all of its components can be recycled or easily disposed of**, as stated in the **PEP (Product Environmental Profile)** document.

The PEP describes the **environmental impact of the product throughout its entire life cycle**: from the extraction of the raw materials needed to manufacture it, to its final disposal.





Low partial discharges, high quality



Partial **discharges** are microscopic phenomena that occur inside the cavities of the insulating resin and **accelerate its aging**.

For this reason, it is important that the values of these currents **are extremely limited**. According to the standard governing the design of resin transformers (CEI EN 60076-11 or IEC 60076-11), all **windings with a voltage ≥ 3.6 kV** must be subjected to partial discharge measurement and the value detected **must not exceed 10 pC** (pico Coulomb).

When **Green transformers** were subjected to partial discharge measurements, values consistently **below 5 pC** were recorded, which is significantly better than required by the standard.

A low partial discharge value indicates a number of positive factors, including:

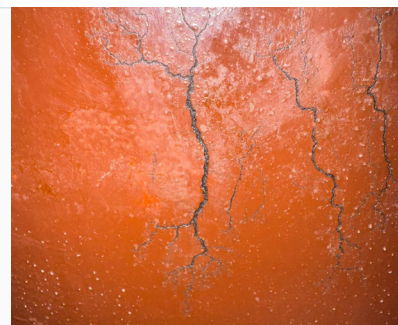
- Appropriate and consolidated design criteria;
- Quality of raw materials used;
- Precision during the conductor tape winding phases;
- Expertise in the epoxy resin casting process around the high - voltage winding;
- High impregnation coefficient of the low-voltage coil;
- Rigorous final assembly of semi-finished products.

It is very easy to understand **that the lower the level of partial discharges** detected, **the greater the resistance** to working stresses and, consequently, the longer the life expectancy of the transformer.

Types of partial discharges

Depending on the type, discharges can be classified as:

- **Corona effect** (discharge mechanism that occurs at pointed ends in a gaseous dielectric);
- **Surface discharges**;
- **Internal discharges** (the main cause of the reduction in the life of insulating material);
- **Treeing** (branched discharge channel): this is the pre-discharge channel that forms as a result of insulation degradation and leads to destructive discharge.



Extreme environmental conditions

The IEC 60076-11 standard identifies the **environmental, climatic, and fire behavior classes** of dry-type transformers with an alphanumeric code. Thanks to the use of **high-quality epoxy resin**, all CO.EL.GE. transformers minimize environmental impact and comply with the following classes:

- Environmental class E3;
- Climate class C2;
- Fire behavior class F1.

This means that they can be **stored, transported**, and, above all, **used** even in **extreme environmental conditions**.



Minimum temperature: -25 °C



Maximum relative humidity: >95%

Furthermore, in their standard configuration, Green transformers guarantee **seismic resistance** up to 0.2g* (light earthquakes) and are equipped with **holes for grounding**, in order to prevent the risk of overturning.

On request, CO.EL.GE. manufactures transformers that can be installed in areas with **higher seismic risk, up to 0.5g (AG5)**.

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

The optimal environmental conditions for operation are a maximum ambient temperature of 40°C. The average monthly temperature in the hottest month must not exceed 30°C, while the average annual temperature is around 20°C.

E3 Environmental testing



E0

Transformer not subject to condensation, negligible pollution, installation in a clean and dry environment.

E1

Transformer subject to occasional slight condensation and moderate pollution.

E2

Transformer suitable for installation in environments with significant condensation and/or intense pollution.

E3

Transformer subject to extreme pollution and significant condensation with humidity above 95%.

E4

CO.EL.GE. can supply transformers for more demanding environments on request.

C2 Climatic tests



C1

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

C2

The transformer can be operated, transported, and stored at temperatures down to -25 °C.

F1 Fire resistance



F0

There is no fire risk and no measures are taken to limit flammability.

F1

The transformer is subject to fire risk and reduced flammability is required. In the event of a fire, flames on the transformer must be extinguished within pre-established limits.

Product News

With the new Green series (Phase 2), CO.EL.GE. provides its customers with a **high-quality** product offering **excellent performance and reduced losses**, in full compliance with **Regulation 548/2014** and subsequent updates (Reg. 2019/1783). Thanks to the use of innovative materials and design features, the transformers are characterized by the following **distinctive elements**:

- The **M.V. (medium voltage)** and **L.V. (low voltage)** terminals have been modified and configured to **facilitate connection** of the product to both windings.

M.V. coil specifications



Aluminum tape (Al $\geq 99.5\%$) Alloy 1050 insulated with a film of **polyester material DMD 50 FAETISO F4** in **insulation class “F 155 °C.”** The various winding discs are connected in series to form the phase coil, which is then embedded in **ISEPOX 60 epoxy resin**, a low-viscosity two-component epoxy system mixed with quartz powder to improve hardness and aluminum powder to optimize thermal resistance, with gelation and polymerization at high temperature. **ISEPOX 60**, a fiber-reinforced fire-retardant component, is particularly suitable for casting power transformers in **Class “F 155 °C”** and guarantees class **“F1”** (fire behavior), **“E2/E3”** (resistance to condensation/humidity), and **“C2”** (thermal shock). The resin is loaded and mixed using a **computerized vacuum encapsulation system in an autoclave**. Windings treated in this way are insensitive to moisture and dust. Medium voltage windings have the same insulation class.

The resin thicknesses between the active part and the exterior are as follows: **upper and lower thickness 30 mm; side thickness 10 mm; cable entry cone height 80 mm; cable entry cone anchor bolts 12 mm; surface switching poles with 8 mm bolts.**

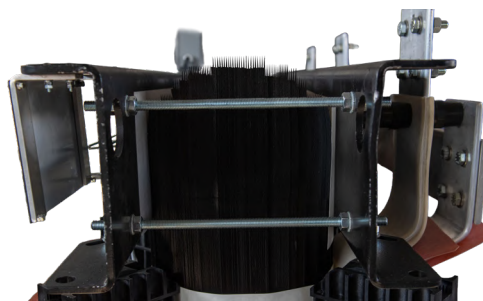
L.V. coil specifications



They are constructed with **aluminum foil conductor (Al $\geq 99.5\%$) Alloy 1050** interwound with **“F 155 °C” class insulating film Filmterm DMD Prepeg**, then subjected to oven drying treatment. The output terminals consist of **120 mm × 10 mm aluminum plates** welded in an inert atmosphere and securely attached to the armature with spacer insulators.

Once the winding is complete, the coil is subjected to heat and the resin polymerizes, cementing the insulation to the conductor and making the winding a highly **compact mass resistant to short-circuit stresses**. The insulation of the **L.V. winding** from the ferromagnetic core is made of polyester material with two layers of **50 μ m DMD 50 FAETISO F4 non-woven polyester fabric** in **insulation class “F 155 °C”**.

New magnetic core



The new grain-oriented magnetic sheet has an even more defined crystallographic structure and makes a decisive contribution to the production of increasingly efficient power supply 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 optimized magnetic domain structure;
- Improved insulation properties;

This means that, when comparing two transformers of the same size, the one with a core made from the new sheet will have significantly lower no-load losses and, consequently, better performance.

Warranty and certified quality

ACCEPTANCE TEST	
Measurement of winding resistance	IEC 60076-11 (art.14.2.1)
Measurement of voltage ratio and angular displacement control	IEC 60076-11 (art.14.2.2)
Measurement of short-circuit voltage and load losses	IEC 60076-11 (art.14.2.3)
Measurement of no-load losses and no-load current	IEC 60076-11 (art.14.2.4)
AC voltage withstand test	IEC 60076-11 (art.14.2.5)
AC induced voltage withstand test	IEC 60076-11 (art.14.2.6)
Measurement of partial discharges	IEC 60076-11 (art.14.2.7)
TYPE TESTS (on request)	
Atmospheric impulse test	IEC 60076-11 (art.14.3.1)
Overtemperature test	IEC 60076-11 (art.14.3.2)
SPECIAL TESTS (on request)	
Noise level measurement	IEC 60076-11 (art.14.4.2)
Short circuit test	IEC 60076-11 (art.14.4.3)



The CO.EL.GE. "IB03" testing laboratory has recently been **certified by EGAC ISO** to operate in accordance with **standard 17025** on all routine tests and certain type tests for medium voltage transformers.

This recognition and qualification is a **significant advantage** that CO.EL.GE. and very few other manufacturers in the world can offer their customers.

All transformers are individually tested.



5 Year warranty

As confirmation of the excellent quality of its transformers, CO.EL.GE. has decided to extend the product WARRANTY to 5 YEARS for all transformers with standard features.

GREEN

M.V./L.V. IN RESIN

Regulatory compliance: IEC 60076-11 and EN 50708

Power: 100–3150 kVA

Frequency: 50 Hz Regulation, MV side: $\pm 2 \times 2.5\%$

Vector group: Dyn11

Insulation system thermal class: 155 °C (F) / 155 °C (F)

Overtemperature: 100 K / 100 K

Environmental class: E3-C2-F1

Primary voltages: from 6 to 11 kV.

Insulation class: 12 kV BIL 75 kV

Secondary no-load voltages: from 400 to 420 V
(insulation class ≤ 1.1 kV)

Primary voltages: from 12 to 15.75 kV.

Insulation class: 17.5 kV BIL 95 kV

Secondary no-load voltages: from 400 to 420 V
(insulation class ≤ 1.1 kV)

Primary voltages: from 20 to 23 kV.

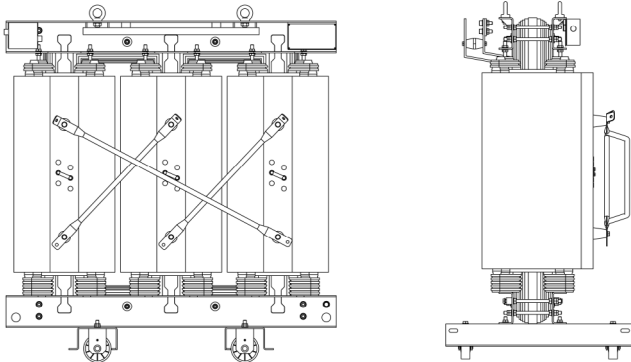
Insulation class: 24 kV BIL 125 kV

Secondary no-load voltages: from 400 to 420 V
(insulation class ≤ 1.1 kV)

Primary voltages: from 25 to 35 kV.

Insulation class: 36 kV BIL 170 kV

Secondary no-load voltages: from 400 to 420 V
(insulation class ≤ 1.1 kV)



Summary reference values

We use the construction drawing for design purposes.

All data shown is subject to change without notice for technical or production reasons or to improve the product.

Products with other combinations of primary and secondary voltages can be manufactured on request.



INSULATION CLASS 12kV

SR [kVA]	Primary voltage [kV]	Secondary voltage [V]	U _k [%]	P ₀ [%]	P _k [W] 120°C	I ₀ [%]	LwA-Acoustic power [dB(A)]	Code	Length [mm]	Width [mm]	Height [mm]	Weight [Kg]	Wheel base [mm]	Wheel diameter [mm]	Type BOX
100	10	400	6	252	1800	1	51	100/12	1150	750	1290	700	520	125	H1
160	10	400	6	360	2600	1	54	160/12	1200	750	1310	820	520	125	H1
250	10	400	6	468	3400	0,9	57	250/12	1300	780	1370	1150	670	125	H1
315	10	400	6	557	3875	0,8	58	315/12	1350	850	1430	1220	670	125	H2
400	10	400	6	675	4500	0,8	60	400/ 2	1350	850	1490	1350	670	125	H2
500	10	400	6	811	5630	0,7	60	500/12	1450	850	1540	1600	670	125	H2
630	10	400	6	990	7100	0,7	62	630/12	1450	850	1600	1750	820	125	H2
800	10	400	6	1170	8000	0,6	64	800/12	1550	1000	1740	2150	670	160	H3
1000	10	400	6	1395	9000	0,6	65	1000/12	1600	1000	1960	2750	670	160	H3
1250	10	400	6	1620	11000	0,6	67	1250/12	1700	1000	1980	3200	670	160	H3
1600	10	400	6	1980	13000	0,5	68	1600/12	1750	1000	2160	3850	670	160	H4
2000	10	400	6	2340	16000	0,4	70	2000/12	1850	1000	2240	4550	670	160	H4
2500	10	400	6	2790	19000	0,4	71	2500/12	2000	1500	2300	5450	1070	200	H5
3150	10	400	6	3420	22000	0,35	71	3150/12	2150	1500	2370	6500	1070	200	H5

This table shows the characteristics and codes of transformers with a 10/0.4 kV ratio and Dyn11 vector group. The information is also valid for different transformation ratios and hourly indices.

INSULATION CLASS 17,5kV

SR [kVA]	Primary voltage [kV]	Secondary voltage [V]	U _k [%]	P ₀ [%]	P _k [W] 120°C	I ₀ [%]	LwA-Acoustic power [dB(A)]	Code	Length [mm]	Width [mm]	Height [mm]	Weight [Kg]	Wheel base [mm]	Wheel diameter [mm]	Type BOX
100	15	400	6	252	1800	1	51	100/17,5	1250	750	1310	830	520	125	H1
160	15	400	6	360	2600	1	54	160/17,5	1250	750	1330	880	520	125	H1
250	15	400	6	468	3400	0,9	57	250/17,5	1300	780	1370	1150	520	125	H1
315	15	400	6	557	3875	0,8	58	315/17,5	1400	850	1450	1350	670	125	H2
400	15	400	6	675	4500	0,8	60	400/17,5	1400	850	1510	1450	670	125	H2
500	15	400	6	811	5630	0,7	60	500/17,5	1450	850	1540	1650	670	125	H2
630	15	400	6	990	7100	0,7	62	630/17,5	1450	850	1620	1850	670	125	H2
800	15	400	6	1170	8000	0,6	64	800/17,5	1550	1000	1750	2200	820	160	H3
1000	15	400	6	1395	9000	0,6	65	1000/17,5	1600	1000	1960	2800	820	160	H3
1250	15	400	6	1620	11000	0,6	67	1250/17,5	1700	1000	2000	3200	820	160	H3
1600	15	400	6	1980	13000	0,5	68	1600/17,5	1750	1000	2150	3750	820	160	H4
2000	15	400	6	2340	16000	0,4	70	2000/17,5	1900	1000	2260	4700	820	160	H4
2500	15	400	6	2790	19000	0,4	71	2500/17,5	2000	1500	2320	5600	1070	200	H5
3150	15	400	6	3420	22000	0,35	71	3150/17,5	2200	1500	2430	7300	1070	200	H5

This table shows the characteristics and codes of transformers with a 15/0.4 kV ratio and Dyn11 vector group. The information is also valid for different transformation ratios and hourly indices. A dedicated application is available for estimating and ordering transformers.

INSULATION CLASS 24kV

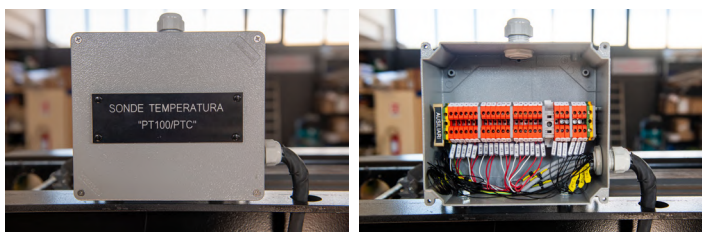
SR [kVA]	Primary voltage [kV]	Secondary voltage [V]	U _k [%]	P ₀ [%]	P _k [W] 120°C	I ₀ [%]	LwA-Acoustic power [dB(A)]	Code	Length [mm]	Width [mm]	Height [mm]	Weight [Kg]	Wheel base [mm]	Wheel diameter [mm]	Type BOX
100	20	400	6	252	1800	1	51	100/24	1350	750	1320	880	520	125	H1
160	20	400	6	360	2600	1	54	160/24	1350	760	1340	920	520	125	H1
250	20	400	6	468	3400	0,9	57	250/24	1400	780	1400	1210	520	125	H1
315	20	400	6	557	3875	0,8	58	315/24	1400	850	1460	1400	670	125	H2
400	20	400	6	675	4500	0,8	60	400/24	1400	850	1520	1500	670	125	H2
500	20	400	6	811	5630	0,7	60	500/24	1450	850	1550	1650	670	125	H2
630	20	400	6	990	7100	0,7	62	630/24	1500	850	1630	1880	670	125	H2
800	20	400	6	1170	8000	0,6	64	800/24	1600	1000	1750	2300	820	160	H3
1000	20	400	6	1395	9000	0,6	65	1000/24	1700	1000	1940	2900	820	160	H3
1250	20	400	6	1620	11000	0,6	67	1250/24	1750	1000	2010	3300	820	160	H3
1600	20	400	6	1980	13000	0,5	68	1600/24	1800	1000	2150	3950	820	160	H4
2000	20	400	6	2340	16000	0,4	70	2000/24	1950	1000	2260	4550	820	160	H4
2500	20	400	6	2790	19000	0,4	71	2500/24	2050	1500	2380	5900	1070	200	H5
3150	20	400	6	3420	22000	0,35	71	3150/24	2250	1500	2440	7250	1070	200	H5

This table shows the characteristics and codes of transformers with a 20/0.4 kV ratio and Dyn11 vector group. The information is also valid for different transformation ratios and hourly indices.

INSULATION CLASS 36kV

SR [kVA]	Primary voltage [kV]	Secondary voltage [V]	U _k [%]	P ₀ [%]	P _k [W] 120°C	I ₀ [%]	LwA-Acoustic power [dB(A)]	Code	Length [mm]	Width [mm]	Height [mm]	Weight [Kg]	Wheel base [mm]	Wheel diameter [mm]	Type BOX
100	33	400	6	280	1980	1,2	51	100/36	1650	850	1800	1800	670	125	AL
160	33	400	6	414	2860	1,2	54	160/36	1600	850	1750	1700	670	125	AL
250	33	400	6	538	3740	1,1	57	250/36	1600	850	1850	2000	670	125	AL
315	33	400	6	641	4264	1	58	315/36	1700	1000	1850	2300	670	125	AL
400	33	400	6	776	4950	1	60	400/36	1700	1000	1850	2300	670	125	AL
500	33	400	6	933	6193	0,8	60	500/36	1750	1000	1900	2500	670	125	AL
630	33	400	6	1138	7810	0,8	62	630/36	1700	1200	2000	2600	820	160	BL
800	33	400	6	1345	8800	0,7	64	800/36	1750	1200	2150	3100	820	160	BL
1000	33	400	6	1604	9900	0,7	65	1000/36	1850	1200	2250	3700	820	160	BL
1250	33	400	6	1863	121000	0,7	67	1250/36	1950	1200	2300	4300	820	160	BL
1600	33	400	8	2277	14300	0,6	68	1600/36	2050	1700	2400	4750	1070	200	CL
2000	33	400	8	2691	17600	0,5	70	2000/36	2150	1700	2450	5400	1070	200	CL
2500	33	400	8	3208	20900	0,5	71	2500/36	2350	1700	2550	6800	1300	200	DT
3150	33	400	8	3933	24200	0,4	71	3150/36	2400	1700	2600	7700	1300	200	DT

This table shows the characteristics and codes of transformers with a 33/0.4 kV ratio and Dyn11 vector group. The information is also valid for different transformation ratios and hourly indices.



TEMPERATURE MEASURING PROBES

The probes are supplied mounted on the transformer and wired to a sturdy IP66 junction box made of die-cast aluminum.

Article	Type	Range [kVA]	N°	Δt [°C]	Assembly
SMT001	Pt100	≤2000	3	-	on the L.V. windings (3)
SMT002	Pt100	≥2500	3	-	on the L.V. windings (3)
SMT003	Pt100	≤2000	3+1	-	on the L.V. windings (3) + on the core (1)
SMT004	Pt100	≥2500	3+1	-	on the L.V. windings + on the core (1)
SMT005	PTC	-	3+3	130-140	on the L.V. windings (3 pairs) for alarm and release
SMT006	PTC	-	3+3	110-120	on the L.V. windings (3 pairs) for alarm and release
SMT007	PTC	-	3+3+3	130-140	on the L.V. windings (3 pairs) for fan control, alarm and release

CONTROL UNITS

Control units are supplied unassembled.

Article	Type	Description
CC001	T154	Temperature control for 3 or 4 Pt100 probes
CC002	MT200 L	Temperature control for 3 or 4 Pt100 probes
CC003	NT935 AD	Temperature control for 3 or 4 Pt100 probes with analog and digital output
CC004	MT200 LITE S	Temperature control for 3 or 4 Pt100 probes with analog and digital output
CC005	NT935 ETH	Temperature control for 3 or 4 Pt100 probes with Ethernet output
CC006	MT200 LITE E	Temperature control for 3 or 4 Pt100 probes with Ethernet output
CC007	NT538 AD	Temperature control up to 8 Pt100 probes with analog and digital output
CC008	T 119	Temperature control for PTC probes
CC009	T119 DIN	Temperature control for 3 or 4 Pt100 probes with Ethernet output
CC010	MT300	Temperature control for 3 or 4 Pt100 probes with analog and digital output
CC011	VRT200	Temperature control for 3 or 4 Pt100 probes
CC012	AT200	Temperature control for 3 or 4 Pt100 probes

SURGE ARRESTORS KIT

Article	MT* [kV]	Ur [kV]
KSS001	6	9
KSS002	10-11	12
KSS003	15	18
KSS004	20	24

*Other IV values available on request.

Ur: nominal voltage of the surge arrester

Installation accessories

VENTILATION BARS

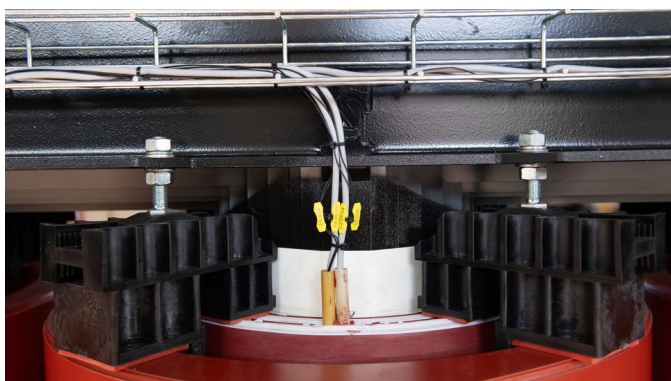
Ventilation bars allow a temporary increase in rated power (under normal operating conditions). According to IEC 60076-1, even if a transformer is equipped with non-continuous ventilation, it is defined as AN.If a transformer with continuous power AF is required, please contact CO.EL.GE.

Article	Range [kVA]	Δt [°C]	Notes
BV001	100-250	+40	Temporary increase under nominal conditions (50Hz)
BV002	315-630	+40	
BV003	800-1000	+40	
BV004	1250-2000	+40	
BV005	2500-3150	+40	



ANTI-VIBRATION RUBBER SUPPORTS

Article	Type	Description
SAG001	≤2000	4 anti-vibration rubber pads supplied for mounting under the transformer wheels
SAG002	≥2500	4 anti-vibration rubber pads supplied for mounting under the transformer wheels



CUPAL PLATES

CUPAL is a bimetallic sheet composed of a copper sheet and an aluminum sheet welded together inseparably using a special mechanical process.

Article	Type	Description
PC001	≤ 160	CUPAL plate 40 x 40
PC002	MT200 L	CUPAL palte 50 x 50
PC003	≥ 315 e ≤ 500	CUPAL plate 60 x 60
PC004	MT200 L	CUPAL plate 80 x 80
PC005	T154	CUPAL plate 120 x 120
PC006	≥ 1000	CUPAL plate 120 x 120

The codes refer to a single CUPAL plate.

EXAMPLE: for a transformer with a power rating of 1250 kVA, the correct CUPAL plate is item 030012. - Quantity calculation: 2 plates x 4 IV terminals = 8 CUPAL plates.

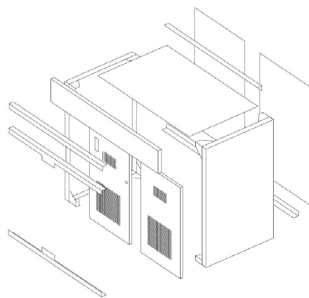
SOLIDARY BOX

Box color

RAL 7035

AREL lock

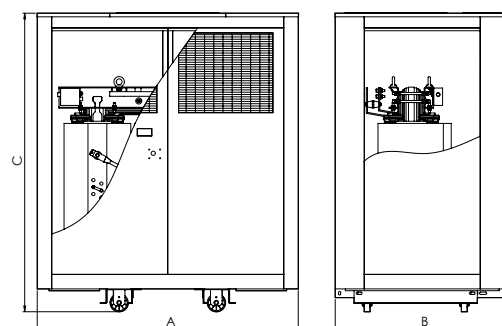
With key on the box: code 230076



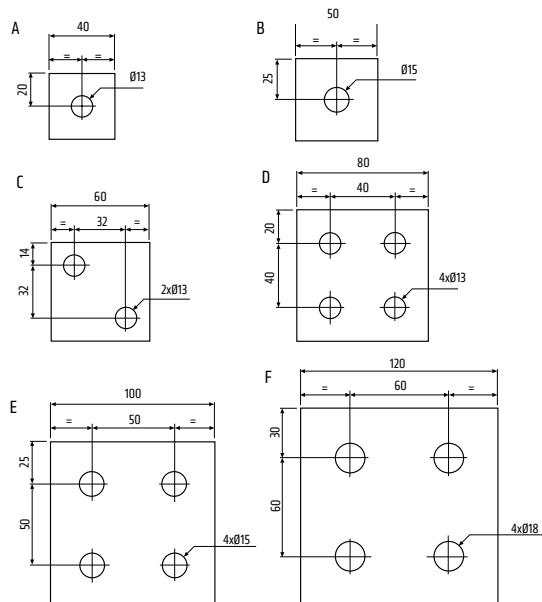
Nine box sizes are available, with a choice of **two types of IP31 and IP23 ventilation grilles** for each. You can also choose whether the transformer should be shipped with the box assembled or disassembled, to be assembled on site. All the protection boxes shown are compatible with the installation of CO.EL.GE. busbars. Customized solutions can be provided based on specific customer requests.

Rating IP	Article	Assembled / Disassembled	Power [kVA]	Type Box	Dimension [mm]			Weight [kg]
					Length (A)	Width (B)	Height (C)	
CLASS 12 kV-17,5 kV-24 kV								
IP31	BX001	M	100 - 160 - 250	H1	1800	1150	1800	160
	BX002	S						
	BX003	M	315 - 400 500 - 630	H2	1800	1200	2100	180
	BX004	S						
	BX005	M	800-1000- 1250	H3	2100	1300	2450	230
	BX006	S						
	BX007	M	1600-2000	H4	2300	1350	2750	270
	BX008	S						
	BX009	M	2500-3150	H5	2600	1500	2750	370
	BX010	S						
IP23	BX011	M	100 - 160 - 250	H1	1800	1150	1800	170
	BX012	S						
	BX013	M	315 - 400 500 - 630	H2	1800	1200	2100	190
	BX014	S						
	BX015	M	800-1000- 1250	H3	2100	1300	2450	240
	BX016	S						
	BX017	M	1600-2000	H4	2300	1350	2750	290
	BX018	S						
	BX019	M	2500-3150	H5	2600	1500	2750	390
	BX020	S						
CLASS 36 kV								
IP31	BX021	M	100 - 160 - 250 - 315 - 400 - 500	AL	2300	1450	2300	250
	BX022	S						
	BX023	M	630 - 800 - 1000 - 1250	BL	2600	1500	2700	320
	BX024	S						
	BX025	M	1600-2000	CL	2900	1700	2900	370
	BX026	S						
	BX027	M	2500-3150	DT	3200	2000	3100	450
	BX028	S						
IP23	BX029	M	100 - 160 - 250 - 315 - 400 - 500	AL	2300	1450	2300	280
	BX030	S						
	BX031	M	630 - 800 - 1000 - 1250	BL	2600	1500	2700	350
	BX032	S						
	BX033	M	1600-2000	CL	2900	1700	2900	400
	BX034	S						
	BX035	M	2500-3150	DT	3200	2000	3100	510
	BX036	S						

BOX DIMENSION



DIMENSIONS AND HOLES OF THE L.V. CONNECTION TERMINALS



DRILLING DETAILS STANDARD

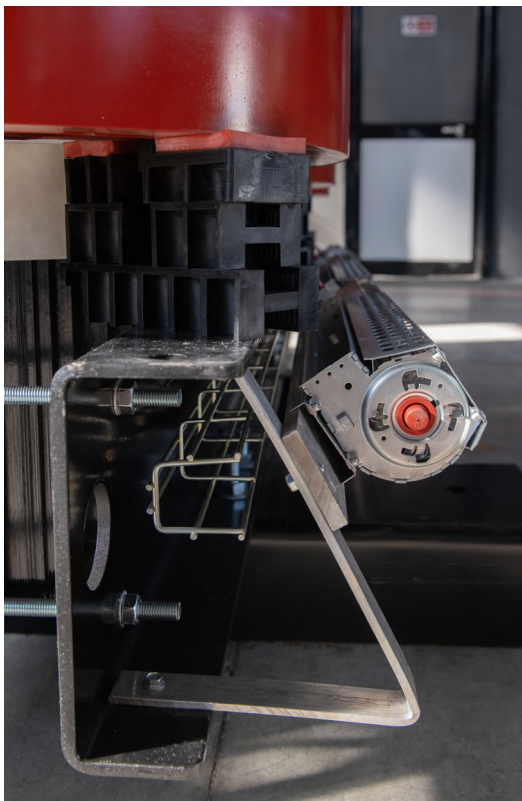
The L.V. connection terminals are made of aluminum. For connecting copper connections, special bimetallic plates in CUPAL can be supplied.

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

The data shown may be modified without prior notice for technical production reasons or product improvement.

Environmental aspects

Sustainability and end-of-life management



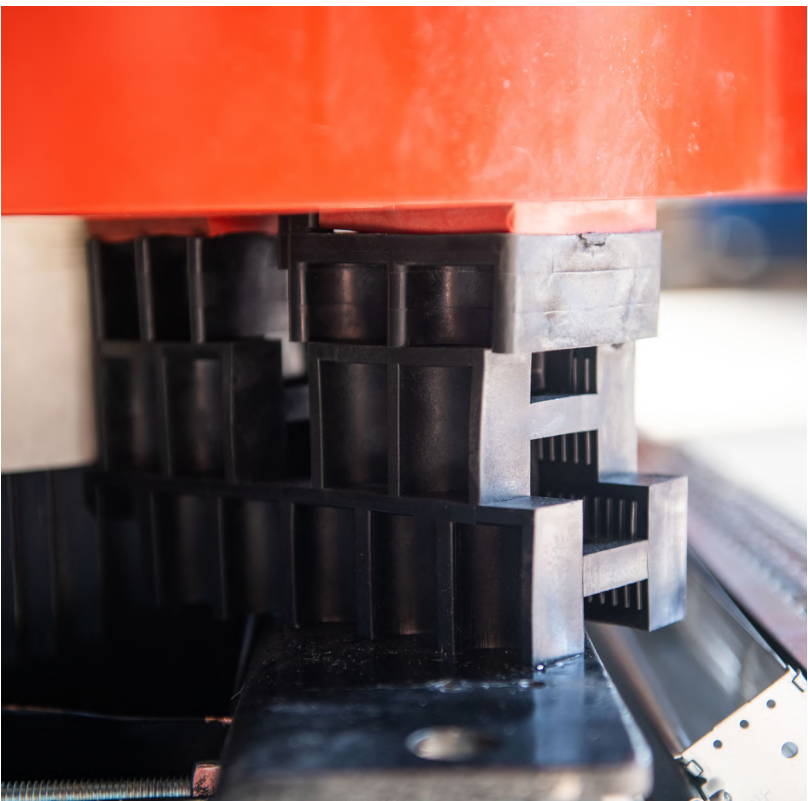
CO.EL.GE. has always been committed to ensuring maximum performance in terms of **simplicity, safety, and flexibility** for its customers. The new design criteria adopted also aim to **create added value** in terms of **environmental aspects**.

In full compliance with regulations, the focus on new material technologies has led **CO.EL.GE.** to play a leading role in **reducing environmental impact**.

The following table shows the **materials used in our products**, which are useful for managing **material recycling** operations through **high-performance end-of-life solutions**. Due to the complexity of the product's manufacture, the table provides the **main materials** of which the transformer is composed, with the relative **quantity by weight**. The precise data for each individual product is indicated on the **specific label** of the transformer itself.

WEIGHTS OF MAJOR TRANSFORMER MATERIALS		
Range	Conductor material Aluminium [kg]	Core material CRGO (Cold- Rolled Grain- Oriented steel)
up to 630 kVA	from 100 to 500	from 200 to 1500
from 800 kVA to 1600 kVA	from 500 to 1100	from 1300 to 2700
from 2000 kVA to 3150 kVA	from 1100 to 1700	from 2700 to 6000

For its high-efficiency transformers, CO.EL.GE. provides PEP (Product Environmental Profile) certificates to guarantee customers eco-friendly solutions and transparency regarding environmental impact.

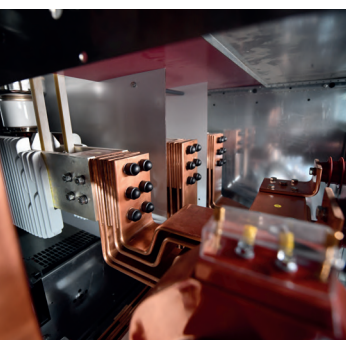




Installation



Global Service



Switchboards



Electromechanic

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