



Distribution Transformers

Offer overview - EcoDesign Tier 2

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Introduction

Schneider Electric introduces our EcoDesign range of transformers, fully compliant with the latest Transformer EcoDesign Directive Tier 2 Loss Level regulations*.

Transformer EcoDesign directive Tier 2

With effect from 1st July 2021, small, medium and large power transformers must meet the requirements of Tier 2 losses / efficiency, with transformer manufacturers being fully responsible in applying the law.

Published in the Official Journal of the European Union, the regulation imposes, for supply into the EU, the maximum level of losses and minimum efficiencies for transformers placed on the market / put into service.

* EcoDesign Directive from the European Commission (Commission Regulation (EU) No 548/2014 implementing Directive 2009/125/EC introduced in 2014, and (EU) 2019/1783 of 1 October 2019 amending Regulation (EU) No 548/2014).

EcoDesign range of transformers

Transformers are an integral part of the distribution network. To ensure cost effective and energy efficient configuration, Schneider Electric is able to design, manufacture and deliver transformers and package substations to your specification.

Schneider Electric transformers are designed with efficiency in mind, to meet the very latest EcoDesign Tier 2 directive for transformer losses.



The right transformer for your network

Schneider Electric follows a policy of continuous improvement taking into account the latest worldwide developments and regulations. This ensures that our transformers are state-of-the-art and fully compliant with the modern world's requirements: fast delivery, high quality, low noise and high efficiency levels.

Customer benefits:

- Versatile range
- High quality and reliability
- Economically optimised
- Optimised technology
- Solid construction
- Long life-cycle with low maintenance
- Reduced total cost of ownership

Fluid filled Distribution Transformers

Type of transformer	Free breathing / Free breathing with conservator Hermetically sealed
Style of transformer	Ground Mounted - Cable Connected Ground Mounted - Unit Substation Bespoke manufacture
Choice of dielectric fluid	Mineral oil to IEC60296 Midel 7131 transformer fluid to IEC61099
Ratings	200kVA up to 4000kVA
Voltages	Up to 36kV
Losses	EcoDesign Tier 2 - Commission Regulation (EU) No 548/2014 implementing Directive 2009/125/EC introduced in 2014, and (EU) 2019/1783 of 1 October 2019 amending Regulation (EU) No 548/2014
Availability	Fast Trans EX-STOCK (choice of aluminium or copper windings) Unit substations – 8 weeks Bepoke manufacture – 14 weeks

Standard Tank Fittings	Optional Tank Fittings
Bolted-on lid	Fluid-filled conservator
Plain breather pipe (free breathing types)	Gas & fluid actuated relay
Earthing terminals	Pressure relief device
Thermometer pocket	Dehydrating breather
Base skid	Liquid temperature indicator
Jacking lugs	Winding temperature indicator
Lifting lugs	Marshalling box
Fluid level indicator	Vacuum / pressure gauge
Rating & connection plate	Gas replenishing point
Filling hole and cover (free-breathing types)	Magnetic liquid level indicator with low level alarm and trip contacts
Drain valve and plug (free breathing types)	Upper filter valve
	Padlockable drain valve and plug
	Plain rollers and axles
	Braced windings for motor starting
	Bi-directional rollers and axles
	Earth screen between primary and secondary windings
	Radiator valves

Your fluid filled distribution transformer should be designed to meet the needs of the application and distribution network, whilst offering versatility and flexibility.

Quality based upon years of experience

With more than 80 years of experience and over two million oil-immersed transformers installed worldwide, you can be sure of investing in a proven technology, constantly enhanced in our competence centres.

Your transformer solution

- Ratings from 200kVA up to 4000kVA, 36kV
- 50/60 Hz Free breathing, free breathing with conservator or hermetically sealed type
- Ground mounted (cable connected or unit substation)
- Naturally cooled mineral oil filled (ONAN), or High Fire Point Fluid filled (Midel 7131) (KNAN)
- Normal or low noise levels



The majority of transformers detailed above can be supplied with either directly mounted MV & LV switchgear or they can be supplied with closely coupled free standing switchgear.

Medium power and large power transformers

Fluid filled transformers with ratings > 3150kVA are provided, meeting the Peak Efficiency Index (PEI) requirements of the EcoDesign Tier 2 directive (details upon request).

Medium power and large power transformers with ratings up to 120 MVA and voltages up to 170kV can be offered in addition to transformers for special applications (rectifier, hazardous area, earthing, welding, transformers with OLTC, solar power plant, electric vehicle charging etc.)

High levels of quality for increased reliability

Magnetic core

The magnetic core of the transformer is manufactured from a high grade, cold rolled grain oriented silicon steel. The stacking of the laminations is step lap type. The magnetic core is a multi-layer, circular or oval cross section type, where the cutting of the magnetic core is carried out by automatic machines. The magnetic core and its framework are carefully sized to minimise the vibrations and in particular, the magnetostriction effects which constitute the main sources of sound in distribution transformers.

In order to reduce the no load losses and / or the no load current of the transformer, the quality of the magnetic steel and the induction together with the design of the magnetic core are carefully chosen to meet the customer's requirements.

Surface protection

One of our major quality commitments is to provide high-quality surface protection for our transformers. The coating (paint) type is chosen in accordance with the environmental conditions, considering the degree of pollution, humidity, etc. Choices include; zinc sprayed tank, galvanised radiators, plus other options meeting the requirements of ISO 12944.

HV Tappings for voltage variation

Tapping switches allow voltage adjustment to compensate for variation of the supply network voltages on the primary side of the transformer. They can also be used for increasing or decreasing the secondary voltage of the transformer.

Tappings are provided on the primary winding and connected to a de-energised tapping switch. The standard tapping range is $\pm 2.5\%$ and $\pm 5\%$ of the primary voltage. However we can provide tapping ranges as per customer requirement. For adjustment operations, the transformer needs to be off circuit and de-energised.

High voltage windings

The high voltage windings are wound using high grade copper or aluminium conductors. The shape of the conductor is either round or rectangular. The choice of conductor depends on the load losses and on the rated power. To obtain a controlled temperature gradient, cooling ducts are added in the coil. High voltage coils comprise of multiple layers with interlayer insulation added during the winding process.



Low voltage windings

The low voltage winding material used is either copper or aluminium. The shape of the conductor is either rectangular or foil type.

The choice of conductor depends on the load losses and on the rated power. To obtain a controlled temperature gradient, cooling ducts are added in the coil. An insulating barrier is wound around the low voltage coil in order to provide an electrical separation between the LV/HV coil, after which, the HV winding is wound onto the LV windings. The complete HV/LV coil assembly is then placed onto the magnetic core.

Construction and cooling

The transformer tank is manufactured from robust mild steel, suitably designed to accommodate the forces subjected to the transformer through its operational life.

Cooling of the transformer is achieved by either using bolt on panel radiators or by using corrugated tanks (corrugated cooling fins form an integral part of the tank). To validate the oil-tightness after complete assembly, the tank, all radiators and gasketed joints are inspected to check for signs of leaks and pressure tested to meet the requirements of IEC60076. For hermetically sealed transformers there is a pressure relief device fitted to the tank lid to provide overpressure protection.



EcoDesign Tier 2 Fast Trans - Transformers and Package Sub Stations

The EcoDesign Tier 2 Fast Trans range from Schneider Electric offers distribution transformers to suit many applications with a standard maximum delivery time of 8 weeks (usually available ex-stock).

EcoDesign Tier 2 Fast Trans Transformers:

- available in 7 ratings: 315, 500, 800, 1000, 1250, 1500 and 2000kVA
- free breathing (transformer naturally breaths – no internal pressure)
- ground mounted cable connected type (terminations on opposite sides of transformer)
- mineral oil filled or Midel 7131 fluid filled (high fire point fluid)
- no load voltage ratio of 11000/433 volts
- 6 position de-energised tapping switch +7.5% to -5.0% in 2.5% steps
- transformers are supplied with MV & LV termination boxes as standard
- choice of Ringmaster medium voltage switchgear can be directly mounted on to transformer for package substation applications
- choice of low voltage cabinets can be directly mounted on to transformer for package substation applications

Fast Trans Standard fittings include:

- rating and connection plates
- earthing terminals
- base skid drilled for roller axles
- filling hole and cover
- drain valve & plug
- fluid level indicator
- thermometer pocket
- plain breather pipe
- off circuit tapping switch
- lifting & jacking lugs
- HV & LV termination boxes

Fast Trans Optional fittings include:

- oil filled conservator
- gas & fluid actuated relay
- fluid temperature indicator
- fluid temperature indicator with 2 n/o contacts
- plain rollers
- dehydrating breather and marshalling box

EcoDesign Tier 2 Fast Trans

– technical characteristics

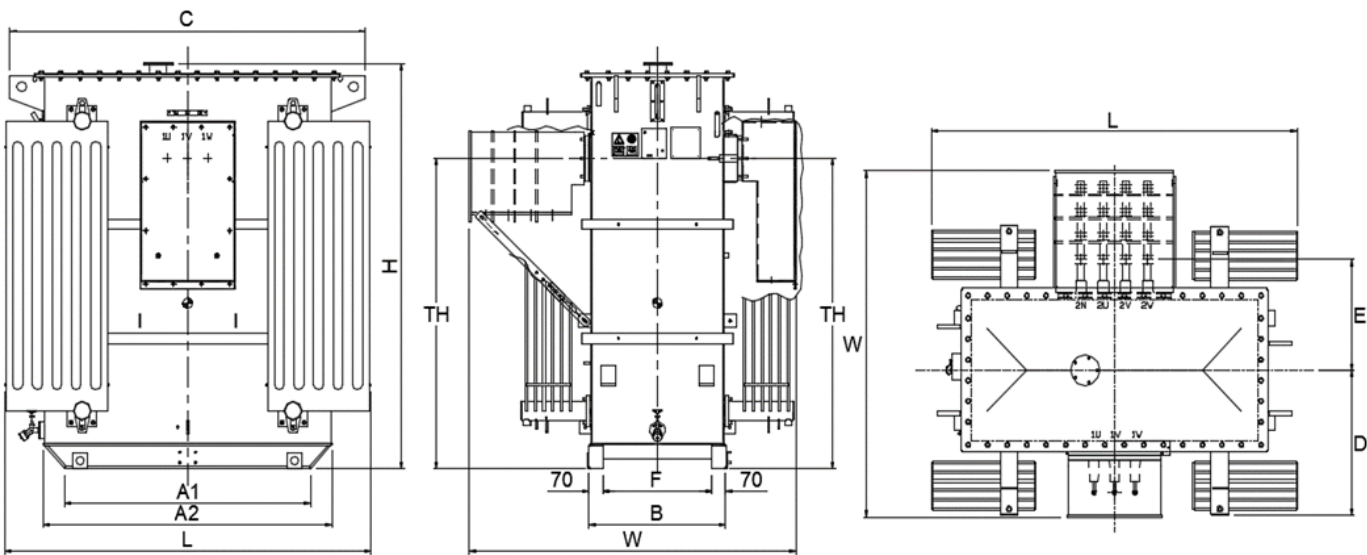
Mineral oil or Midel 7131 fluid filled

Rated power	315kVA	500kVA	800kVA	1000kVA	1250kVA	1500kVA	2000kVA
Rated frequency	50Hz	50Hz	50Hz	50Hz	50Hz	50Hz	50Hz
Phases	3	3	3	3	3	3	3
Rated primary voltage	11kV	11kV	11kV	11kV	11kV	11kV	11kV
Rated primary insulation level	12kV	12kV	12kV	12kV	12kV	12kV	12kV
Power frequency test voltage (r.m.s.)	28kV	28kV	28kV	28kV	28kV	28kV	28kV
Basic Impulse Level (BIL) (peak)	75kV	75kV	75kV	75kV	75kV	75kV	75kV
De-energised tapplings by switch (6 position)	±2.5%, ±5% & +7.5%	±2.5%, ±5% & +7.5%	±2.5%, ±5% & +7.5%	±2.5%, ±5% & +7.5%	±2.5%, ±5% & +7.5%	±2.5%, ±5% & +7.5%	±2.5%, ±5% & +7.5%
Secondary voltage at no-load between phases	433V	433V	433V	433V	433V	433V	433V
Secondary voltage at no-load phase to neutral	250V	250V	250V	250V	250V	250V	250V
Rated secondary insulation level	1.1kV	1.1kV	1.1kV	1.1kV	1.1kV	1.1kV	1.1kV
Power frequency test voltage (r.m.s.)	3kV	3kV	3kV	3kV	3kV	3kV	3kV
Vector group	Dyn 11	Dyn 11	Dyn 11	Dyn 11	Dyn 11	Dyn 11	Dyn 11
No load loss (maximum loss - no positive tolerance)	324w	459w	585w	693w	855w	1015w	1305w
Load losses at 75°C (Maximum loss - no positive tolerance)	2800w	3900w	6000w	7600w	9500w	11285w	15000w
Rated impedance at 75°C (subject to BS EN 60076 tolerances)	4.75%	4.75%	4.75%	4.75%	5.00%	5.50%	6.00%
Sound power level	54dB(A)	56dB(A)	58dB(A)	59dB(A)	60dB(A)	61dB(A)	62dB(A)
Sound pressure at 0.3 m	42dB(A)	44dB(A)	46dB(A)	47dB(A)	48dB(A)	49dB(A)	50dB(A)
Maximum ambient temperature for operation	40°C	40°C	40°C	40°C	40°C	40°C	40°C
Daily average ambient temperature for operation	30°C	30°C	30°C	30°C	30°C	30°C	30°C
Yearly average ambient temperature for operation	20°C	20°C	20°C	20°C	20°C	20°C	20°C

Rated power	315kVA	500kVA	800kVA	1000kVA	1250kVA	1500kVA	2000kVA
Maximum height of operation	1000m	1000m	1000m	1000m	1000m	1000m	1000m
Class of insulation of HV and LV winding	A	A	A	A	A	A	A
Liquid temperature rise	60°C	60°C	60°C	60°C	60°C	60°C	60°C
Winding temperature rise	65°C	65°C	65°C	65°C	65°C	60°C	65°C
Efficiency at Unity Power Factor (ref temp 75°C)							
125% load	98.82%	98.96%	99.01%	99.00%	99.01%	99.02%	99.02%
100% load	99.02%	99.14%	99.18%	99.18%	99.18%	99.19%	99.19%
75% load	99.20%	99.30%	99.34%	99.34%	99.34%	99.35%	99.35%
50% load	99.35%	99.43%	99.48%	99.48%	99.49%	99.49%	99.50%
25% load	99.37%	99.44%	99.52%	99.53%	99.54%	99.54%	99.55%
Efficiency at 0.8 Power Factor (ref temp 75°C)							
125% load	98.53%	98.71%	98.77%	98.76%	98.76%	98.77%	98.78%
100% load	98.78%	98.92%	98.98%	98.97%	98.98%	98.99%	98.99%
75% load	99.01%	99.12%	99.18%	99.18%	99.18%	99.19%	99.19%
50% load	99.19%	99.29%	99.35%	99.36%	99.36%	99.36%	99.37%
25% load	99.21%	99.30%	99.40%	99.42%	99.42%	99.43%	99.44%
Regulation at full load and Unity Power Factor (ref temp 75°C)	1.00%	0.89%	0.86%	0.87%	0.88%	0.90%	0.93%
Regulation at full load and 0.8 Power Factor (ref temp 75°C)	3.56%	3.49%	3.47%	3.48%	3.63%	3.95%	4.26%
% resistance at 75°C	0.8889%	0.7800%	0.7500%	0.7600%	0.7600%	0.7523%	0.7500%
Resistance in Milliohms referred to LV at 75°C	5.290695	2.924828	1.757709	1.424916	1.139933	0.940361	0.703084
% reactance at 75°C	4.67%	4.69%	4.69%	4.69%	4.94%	5.45%	5.95%
Reactance in Milliohms referred to LV at 75°C	27.772703	17.56967	10.992517	8.79099	7.41242	6.80998	5.58055

EcoDesign Tier 2 Fast Trans weights and dimensions

HV/LV windings: Aluminium



Trans- former Rating kVA	Length mm L	Width mm W	Height mm H	Total weight with oil kg	Base length (contact with ground) mm A1	Overall base length mm A2	Base width mm B	Tank length mm C	Centre to MV cable centre mm D	Centre to first LV cable centre mm E	Inside base width mm F	MV & LV terminal height mm TH
315	1673	1182	1659	2210	1010	1230	600	1570	513	460	460	1320
500	1698	1242	1659	2650	1060	1280	620	1620	543	490	480	1320
800	1748	1416	1659	3450	1160	1380	680	1720	568	515	540	1320
1000	1823	1492	1659	3830	1210	1430	700	1770	588	535	560	1320
1250	1876	1492	1709	4050	1210	1430	700	1770	588	535	560	1320
1500	1876	1870	1709	4330	1310	1530	700	1870	588	535	560	1320
2000	1970	1740	1959	5330	1410	1630	740	1970	603	550	600	1500

Dimensions applicable to mineral oil-filled or Midel 7131 fluid filled units. Weight increase applies when Midel is used.

Dimensions shown with MV/LV cable boxes fitted - also available with MV/LV switchgear/fusegear

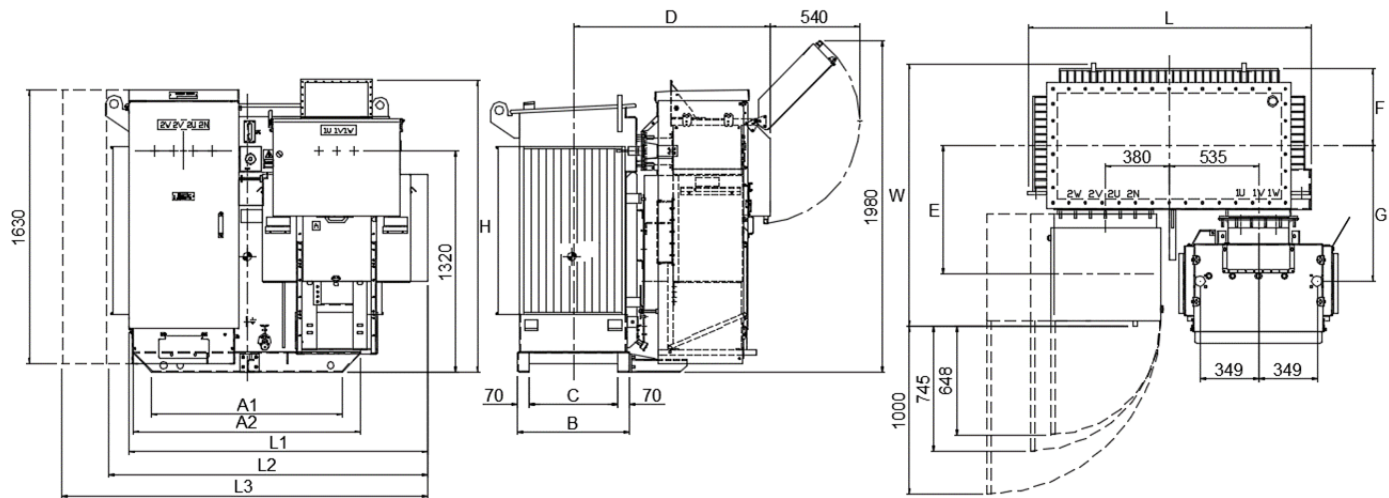
Typical arrangement shown with HV & LV cable boxes and Aluminium windings - Transformers with copper windings can also be supplied

315kVA to 1500kVA EcoDesign Fast Trans do not have a radiator positioned to the left hand side of the LV terminations

LV Bushing Cable Connection Arrangements - single core cables up to 630mm² as follows:

- 315kVA & 500kVA - single take off per phase and single neutral.
- 800kVA, 1000kVA and 1250kVA 2 take off per phase and 2 take off on the neutral.
- 1500kVA 3 take off per phase and 3 on the neutral
- 2000kVA 4 take off per phase and 4 on the neutral

EcoDesign Tier 2 Unit Substation weights and dimensions



Typical arrangement shown with RMU & LV Cabinet – other combinations of switchgear are available.

Trans- former rating kVA	Length (Trans- former only) mm L	Length (Over- all to cabinet type 1) mm L1	Length (Over- all to cabinet type 2) mm L2	Length (Over- all to cabinet type 3) mm L3	Width mm W	Trans- former height mm H	Trans- former weight kg	Trans- former weight with typical RMU and cabinet kg	Base length (contact with ground) mm A1	Overall base length mm A2	Base width mm B	Inside base width mm C	Centre to outside of RMU mm D	Centre to LV cable centres (SAIF cab- inet/ pillar) mm E	Centre to edge of cooling coruga- tions mm ⊠	Centre to RMU cable centres mm ⊠
500	1540	1790	1910	2165	1475	1645	2350	3400	980	1200	580	440	1028	720	365	760
800	1695	1790	1910	2165	1555	1645	3360	4410	1120	1340	660	520	1068	755	445	800
1000	1695	1790	1910	2165	1565	1645	3730	4780	1140	1360	670	530	1076	765	460	805

Approximate dimensions only.

Certified drawings would be issued following receipt of an order.

L1, L2, L3 dimensions applicable to typical LV cabinets based on content of cabinet.

Typical engineered-to-order drawings for larger ratings can be provided on request.

EcoDesign Tier 2 Trihal dry type cast resin distribution transformers

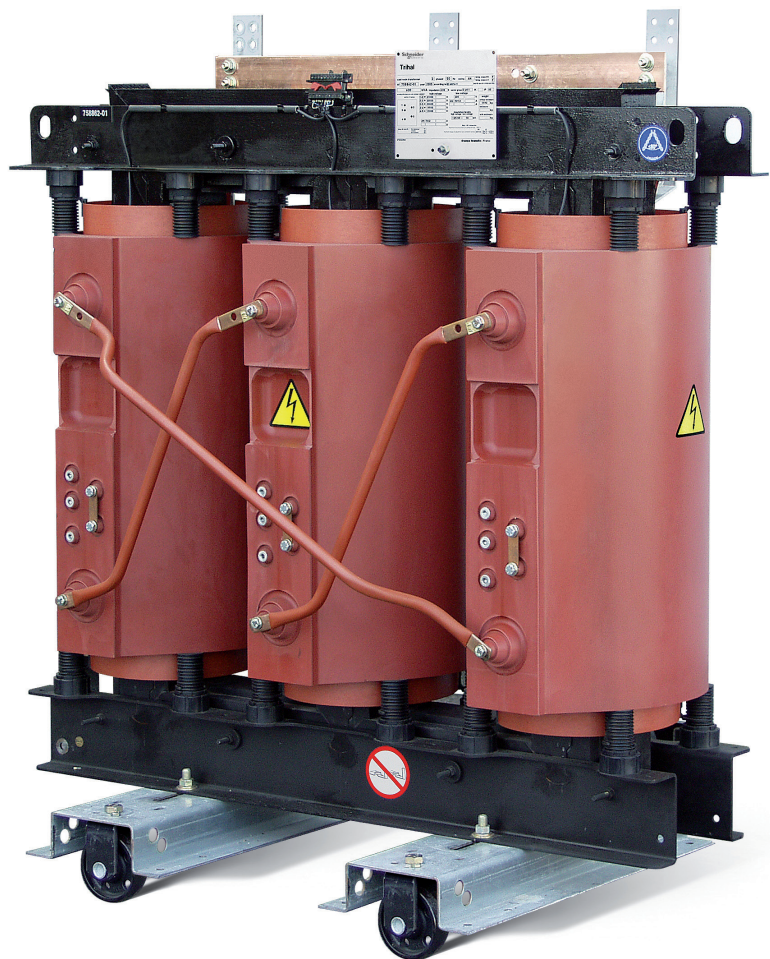
Quality based upon years of experience

Trihal is a best-in-class range of dry-type cast resin transformers renowned for its safety, efficiency and reliability. With a worldwide installed base of over 150,000 units in more than 100 countries, Trihal is an optimised transformer for end users, contractors and panel builders, from mid and large sized buildings and industry to the renewables and electro-sensitive/intensive applications.

With almost 40 years of manufacturing experience, Trihal is engineered to minimise customer's total cost of ownership and best return on investment for a dry type transformer.

High safety and reliability & unrivalled performance

Rigorous climatic, environmental and fire safety testing confirms optimal performance even in harsh conditions (min -50 °C & 95% humidity).



Trihal at a glance

Cast resin, 50 Hz, three-phase distribution transformers with the following characteristics:

- Indoor use / Outdoor use with properly designed enclosure
- Thermal class F - Temperature rise 100 K
- Ambient $\leq 40^{\circ}\text{C}$, altitude $\leq 1000\text{ m}$
- MV windings encapsulated in cast resin
- Pre-impregnated LV windings
- Natural air cooling system (AN type)*
- Core and frame covered with protective coating
- Anti-corrosion surface treatment : corrosivity category class C2

Type of cast resin transformer

TRIHAL IP00 (core & coils only)
TRIHAL with integral sheet steel enclosure

Style of cast resin transformer

Cable connected/through enclosure
Cable connected into cable boxes
Busbar connection into chambers

Standard ratings

500kVA up to 3150kVA (other ratings available on request)

Voltages

Up to 36kV

Losses

EcoDesign Tier 2 - Commission Regulation (EU) No 548/2014 implementing Directive 2009/125/EC introduced in 2014, and (EU) 2019/1783 of 1 October 2019 amending Regulation (EU) No 548/2014

Cast Resin Transformers with ratings $> 3150\text{kVA}$ are also available – meeting the Peak Efficiency Index (PEI) requirements of the EcoDesign Tier 2 directive (details upon request). Other voltages available on request.

* Options for +40% increased power output in addition to AN rating by adding cooling fans considers a fan system for peak emergency loads and not as continuously operated rating. Thus AN power rating applies as the nominal rated power of the transformer (and appears on the rating plate) and guaranteed loss levels are at AN natural cooled rating in accordance with EU Regulation 548/2014.

EcoDesign Tier 2 Trihal dry type cast resin distribution transformers

Technical characteristics

Standard: EN50588-1 - EcoDesign Ter 2 2021
12 kV HV insulation BIL2 (75/28 kV)
1.1 kV LV insulation (415V)
Indoor installation, step-down type

Further ratings available upon request – please contact your Schneider Electric representative.

Rated power	kVA	500	630	800	1000	1250	1600	2000	2500	3150
Installation		Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor
K rating		K1	K1	K1	K1	K1	K1	K1	K1	K1
Rated Frequency	Hz	50	50	50	50	50	50	50	50	50
Primary Voltage	V	11000	11000	11000	11000	11000	11000	11000	11000	11000
Insulation Level	kV	12	12	12	12	12	12	12	12	12
Secondary Voltage (at no-load)*	V	415	415	415	415	415	415	415	415	415
HV Tappings	%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%	+/- 2x2.5%
Vector Group		Dyn11	Dyn11	Dyn11	Dyn11	Dyn11	Dyn11	Dyn11	Dyn11	Dyn11
No Load Losses	W	812	990	1170	1395	1620	1980	2340	2790	3420
Load Losses at 120°C	W	5630	7100	8000	9000	11000	13000	16000	19000	22000
Impedance Voltage	%	6	6	6	6	6	6	6	7	8
Max Altitude	m	1000	1000	1000	1000	1000	1000	1000	1000	1000
Max Ambient Temperature	°C	40	40	40	40	40	40	40	40	40
HV/LV Windings Material		Al/Al	Al/Al	Al/Al	Al/Al	Al/Al	Al/Al	Al/Al	Al/Al	Al/Al

- Notes:
- Transformer Losses are guaranteed as maximum without any positive tolerance.
 - Offer references above are limited to standard K1-rated units. For higher K-ratings (e.g. K-3, K4, K-7, K-13 etc), please consult your Schneider Electric representative.
 - References are for standard primary voltage of 11kV with ±2x2.5% de-energised voltage tapping links and LV side standard no-load voltages of 415V, 417V, 420V and 433V. Short Circuit Impedances are based on our standard. For different voltage ranges, tapping ranges or impedances please consult your Schneider Electric representative.

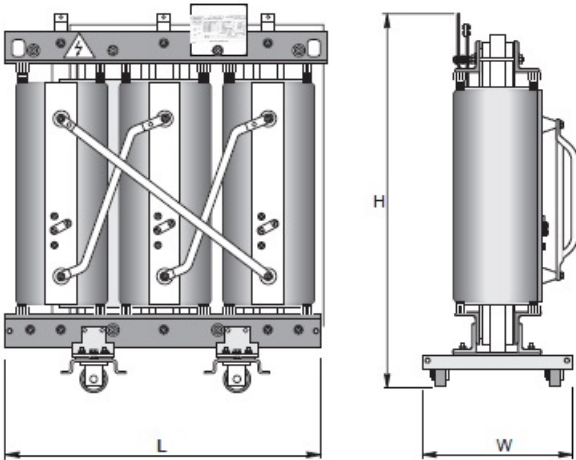
EcoDesign Tier 2 Trihal – Weights, dimensions, technology & acoustic attributes

Note: Table details IP00 core and coil type transformers – no enclosure

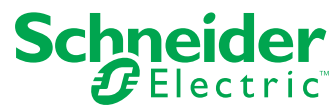
Rated power	kVA	500	630	800	1000	1250	1600	2000	2500	3150
Length (L)	mm	1410	1420	1500	1530	1660	1750	1800	1840	1980
Width (W)	mm	800	800	800	950	950	950	1230	1230	1270
Height (H)	mm	1450	1550	1680	1860	1780	1940	2130	2330	2560
Total weight	kg	1459	1652	2060	2368	2874	3460	3960	4700	6120
Technology										
PIR : Pre-Impregnated Resin on foil conductor	LV	PIR	PIR	PIR	PIR	PIR	PIR	PIR	PIR	PIR
VCR: glass-fibre insulated winding, encapsulated in Vacuum Cast Resin	HV	VCR	VCR	VCR	VCR	VCR	VCR	VCR	VCR	VCR
Noise level										
Sound power Lw(A)	dB(A)	60	61	63	64	66	67	69	70	73
Sound pressure at 1 m Lp(A)	dB(A)	47	48	50	50	52	53	55	55	58

Examples in table above refer to IP00 transformer only, with standard terminations and without an enclosure. If indoor enclosure is required (e.g. IP21 or IP31), please consult your Schneider Electric representative.

The dimensions and weights are approximate only (+/-200mm and +/-20%kg). Schneider Electric will only be held responsible for certified drawings that are issued after order.



Life Is On



Find out more about EcoDesign Tier 2 Transformers

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