

THYCON

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Dry-type Power Transformers
and Reactors



THYCON

Thycon is a leading manufacturer of power electronic equipment as well as Power Transformers and Reactors for Industrial, Utility and Traction systems from LV to MV (up to 35kV).

Designed and Published by Thycon.

Thycon Transformers

Thycon manufacturer a wide range of transformers including:

- auto-transformers
- tap-changers
- phase-shifters
- “triplen” attenuators

Thycon transformers may be used in a variety of applications including:

- rectifiers
- traction sub-stations
- metal-refining
- motor drives

Thycon chokes

Thycon chokes are available for:

- VAR compensation
- filters and de-tuning
- notch and THD reduction
- arc suppression
- DC smoothing
- fault and di/dt limitation
- EMC (differential and common mode).

Thycon exploits two basic technologies for magnetic components:

- cast resin (CR)
- vacuum/pressure impregnation (VPI)

Dry Type Transformers

The term “dry-type”, meaning “without any fluids” includes both CR and VPI types.

Dry Type Transformers are cooled by air flowing between the windings or over the cast coil, either due to natural convection or by fan-forced air.

Thycon dry-type power transformers are designed, manufactured and tested in accordance with the latest IEC and Australian Standards and are custom built to our customer’s specifications. Modern non-hygroscopic insulation materials permit the use of ventilated dry-type transformers in most environments found in commercial, industrial and mining applications.

Advantages and Areas of Application

Because of the absence of liquid coolants, dry-types are not subject to leakage and do not pose any fire or environmental hazards.

As such they can be easily located close to their loads such as in large commercial or residential buildings, schools, hospitals and underground facilities, allowing shorter and more cost-effective cable runs and improved voltage regulation.



Cast Resin type

Cast Resin magnetics are virtually maintenance-free. The coils are embedded in resin which is vacuum cast in a cylindrical shape to accommodate the radial forces during short-circuits, thus ensuring the highest surge withstand capability. The low voltage winding is not normally cast resin but is wound in a pre-impregnated insulating material and coated in the same resin.

The windings can be made from copper or aluminium, though aluminium is typically preferred in resin casts for having a thermal expansion coefficient closer to that of the resin to avoid the long-term appearance of surface cracks in the casting.

The LV winding is wound using foil which allows a uniform temperature distribution across the winding whereas the HV winding may be either foil or wire, depending on voltage, and is positioned on the outside around the LV winding, away from the core.

Vacuum Pressure Impregnated (VPI) types

This technique applies the varnish coating in alternating cycles of pressure and vacuum. The VPI process uses polyester resin which is then oven-cured. This process allows better penetration of the varnish into the coils offering increased resistance to corona discharge. The absence of a resin cast makes them easier to cool and allows a higher level of temperature excursions for cyclic loads.

Thycon VPI transformers use NOMEX® paper insulation on both the primary and secondary coils which gives our transformer's a V0 rating. Additionally, our transformers are rated at thermal index class R, allowing a withstand temperature of 220°C (though the transformers themselves are rated to 180°C).



Cast resin transformers are impervious to dust and humidity, but the excellent insulating properties of the resin means cast resin designs tend to be larger than others. They are also more susceptible to long thermal overloads and power cycling and therefore better suited to constant loads. By contrast, VPI transformers have better power cycling and overload capability than cast resin as well as better cooling due to better air-flow between the coils.

VPI types also have low maintenance requirements (i.e. no fluid changes). They should be regularly cleaned to avoid the accumulation of dust which would impede air-flow between the windings and consequently cause over-heating. Though this is a simple operation, it nevertheless requires a service interruption which must be considered when choosing this technology – one might require an alternate supply or transformer for certain critical loads.

The LV windings are wound from full-width foil to provide the highest short circuit strength and have excellent cooling performance. The HV windings are wound either from foil or from rectangular cross-section wire supported by combs. The combs are precision manufactured to provide uniform mechanical and electrical spacing. All coils are mouldless vacuum cast to provide protection against high humidity, mechanical and chemical effects.

Magnetic Cores

High permeability grain-oriented silicon steel is used as standard for most line-frequency power transformers but specialty steels are used in particular cases, especially where the capitalised cost of no-load loss is high or the frequency is high (e.g. 400Hz applications for the aeronautic industry).

Both UNICORE and stamped sheet core techniques are used depending on the size and application and these are individually coated with high temperature inorganic insulating material.

Specialty Magnetics

These are manufactured with the same technologies already outlined for standard products but may be custom-made for particular applications. Examples of this are five-limb transformers which may be specially made for reduced height and/or low zero-sequence impedances. "Triplen transformers" are a typical example.

General Specifications

- From 50kVA to 10 MVA
- Primary and secondary voltages up to 35kV
- Environmental temperature from -60 to +55°C
- Relative humidity (highest value) at environmental temperature +35°C: up to 93%.

Standards

All Thycon magnetic components are designed and manufactured to:

- IEC 60076
- EN 50541-1
- IEC 61378-1
- ISO 9001:2008
- ISO 14001:2004

They meet the following application classes:

- Fire behaviour F1
- Environmental class E2
- Climatic class C2
- Partial discharge is less than 10 pC
- IP21 (other IP ratings on request)

Maintenance and Reliability

VPI magnetics have a service life of up to 25 years depending on environment and level of care. Thycon offers repair and refurbishment of existing transformers to extend their life as well as preventive maintenance contracts to avoid premature failures.

Maintenance is important to avoid the buildup of dust between the windings which may impede air flow resulting in hot-spots and reduced life. As well as checking for correct connection torque is important to ensure connections are tight and well formed.

Dry-type transformers are relatively easy to repair and recycle.

Cast resin dry type transformers are relatively immune to dust buildup. Maintenance is largely reduced to verification of connection torque, and operation of any ancillary sensors.

Thycon offers 24 months warranty on all transformers commencing from date of delivery.

Accessories

Thycon transformers and chokes may be supplied alone or in galvanised steel or stainless-steel cubicles.

Common options include:

- forced ventilation,
- circuit breakers or fuses,
- temperature sensors,
- tap changers,
- vibration dampers

Thycon transformers may be supplied as part of an integrated assembly including power electronic equipment such as VAR compensation and voltage regulation.



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