

Technical Specification

Three Phase Cast Resin Transformer

GENERAL:

The Cast Resin Transformer shall be suitable for continuous indoor operation in a tropical climate on a 3 phase distribution system with solidly earthed neutral. It shall be of a short circuit, impulse and moisture prove design.

The cast resin transformer shall be designed, manufactured and tested according to the latest edition of International Electrotechnical Commission (IEC) Standard 60076-11. It shall be compact and suitable for easy installation on site.

The transformer shall be suitable to operate in a enclosure of the protection class IP20 and IP 23 without derating. For installation of the cast resin transformer in an enclosure of higher protection class the transformer shall be adopted accordingly.

INSULATION LEVEL:

In general the insulation level of the cast resin transformer used in public and in industrial systems shall comply to the requirements of IEC 60076-11 as follows

Highest voltage for equipment Um (r.m.s.) kV	Rated short duration power frequency (r.m.s.) kV	Rated lightning impulse withstand voltage (BIL) kVp
1,1	3	-
7,2	20	60
12	28	75
17,5	38	95
24	50	125
36	70	170

The relevant figures shall be selected according to the system voltage of the grid. Transformer with an insulation level differing from the above shall be considered separately on request

INSULATION CLASS:

The HV and the LV winding shall be of insulation class F in respect of mechanical and electrical strength (Partial Discharge Test). The maximum continuous operation temperature shall be within the limit of the maximum system temperature according to IEC 726, i.e. 155°C. The maximum temperature rise shall be limited to 100 K at 40°C ambient.

CORE / MAGNETIC CIRCUIT:

The core laminations shall be made of cold rolled grain oriented high quality silicon steel with non hygroscopic insulation material "Carlite" covering both sides. The mitred interleaved joints of the limbs and yokes shall be executed in the STEP LAP stacking process. The flux density shall be selected in the way that the core material used is efficiently operating.

The clamping structure of the core and coil arrangement shall be of robust construction to withstand the stress to which it may be subjected during transport, installation and service.

The clamping frame shall respect the requirements of high voltage equipment. Tie rods shall be located next to the lamination.

Lifting lugs capable to carry the weight of the transformer shall be provided at the core frame.

An adequate painting shall cover the complete core and the clamping structure and shall protect it against corrosion.

HV WINDING

The conductor material used at the HV windings shall be of high grade copper or aluminium.

Enamel insulated wire and fibre glass insulated wire shall be allowed.

The material used for insulation and reinforcement shall be of fibre glass and of pure epoxy resin. Filler shall not be allowed.

The HV winding shall be wound in a multi layer winding technique and shall be in such a way that a linear potential distribution during impulse stresses is achieved.

The resonance frequency of the winding shall be below 20 kHz to avoid resonance with the switching impulse of VCBs and over stress of the insulation.

The winding process must position each winding accurately in order to minimise and control the electric stress on the insulation material.

Cooling ducts formed in the HV winding shall minimise the temperature gradient in the coil and get the cooling most efficient.

The HV coil shall be moulded and cast under vacuum with epoxy resin to ensure complete void-free resin impregnation throughout the entire insulation system. The flexibility of the resin shall be such that the formation of cracks shall be avoided during short circuit stresses and temperature shocks. Penetration of moisture shall be avoided by the vacuum cast process.

The termination of the HV feeder cable shall be made directly at the HV coils.

TAPPINGS:

The HV winding shall be equipped with tapplings preferable at -5 -2,5 0 +2,5 +5 % of the rated voltage.

The tapplings shall be inter connectable by links which shall be located at the dom of the HV winding and shall form part of the delta connection.

LV WINDING:

The conductor material used at the LV windings shall be of high grade copper or aluminium formed as a foil. The width of the foil shall form the height of the winding (foil winding).

Epoxy resin pre impregnated solid multi layer type insulation material of Class F shall be used for insulation. After thermal treatment, the winding shall form a solid structure which shall be capable to withstand the stress occurring during a short circuit.

The LV winding shall not be wound on the core to create a cooling duct between core and LV winding

Cooling ducts formed in the LV winding shall minimise the temperature gradient in the coil and get the cooling most efficient.

Rectangular section terminals shall be rigidly fastened to the upper clamping structure and avoid displacement at a short circuit.

TEMPERATURE CONTROL:

Pre set PTC sensors shall be provided and attached to each of the LV winding as close as possible to the hottest spot.

The PTC sensors shall be selected in order to protect both, HV and LV windings.

COOLING:

The transformer shall be made for AN cooling.

On request the transformer shall be equipped with fans in order to achieve 40 % uprating . The fans shall be temperature controlled by means of temperature sensors which shall be installed at the LV winding of the middle leg.

ACCESSORIES:

The transformer shall be provided with the following accessories:
under carriage with rollers for bi-directional movement

- lifting lugs
- hauling lugs
- earthing terminal
- rating plate
- connection diagram plate

TESTS:

Each transformer shall be routine tested according to IEC 60076-11. Test report to be provided.

Documentation

According SGB Standard.

Gurantee

12 months from delivery ex works.

ENCLOSURE (optional)

Ventilated enclosures of adequate protection for indoor installation shall be supplied. The transformer and the enclosure shall create a compact unit. In order to minimise the space required the HV XLPE cables shall be connected direct to the transformer coils inside the enclosure. Gland plates with cable glands shall be provided at top or bottom. Removable panels shall allow access for cable termination and to the reconnection links.

The LV terminals shall be designed in the way to allow the termination of ample nos. of cables.

In order to minimise the space required the LV terminals shall be placed inside the transformer enclosure.

On request HV and LV cable box shall be provided.

Enclosures of IP20, IP21, IP23, IP30, IP31, IP33 degree of protection are available and have to be selected according to the local protection requirements.

Technical Data (EXAMPLE)

(Guarantee values based on tolerances acc. IEC)

Type		DTTH 1600/10
Rated capacity	kVA	1600
High tension	V	6600
Tappings	%	+ - 2 x 2,5%
Low tension	V	433
Frequency	Hz	50
Vector group		Dyn 11
Highest voltage of equipment		
HV/LV	kV	7,2/1.1
Power frequency withstand voltage		
HV/LV	kV	20/3
Impulse withstand voltage HV/LV	kVp	60/-
Protection		IP00
Cooling		AN
Insulation class		F
Max. temperature rise	K	100
Impedance voltage	%	6
No load losses	W	2800
Load losses at 75 °C	W	12500
Length approx	mm	1850
Width approx	mm	980
Height approx	mm	1650
Weight approx	kg	3600