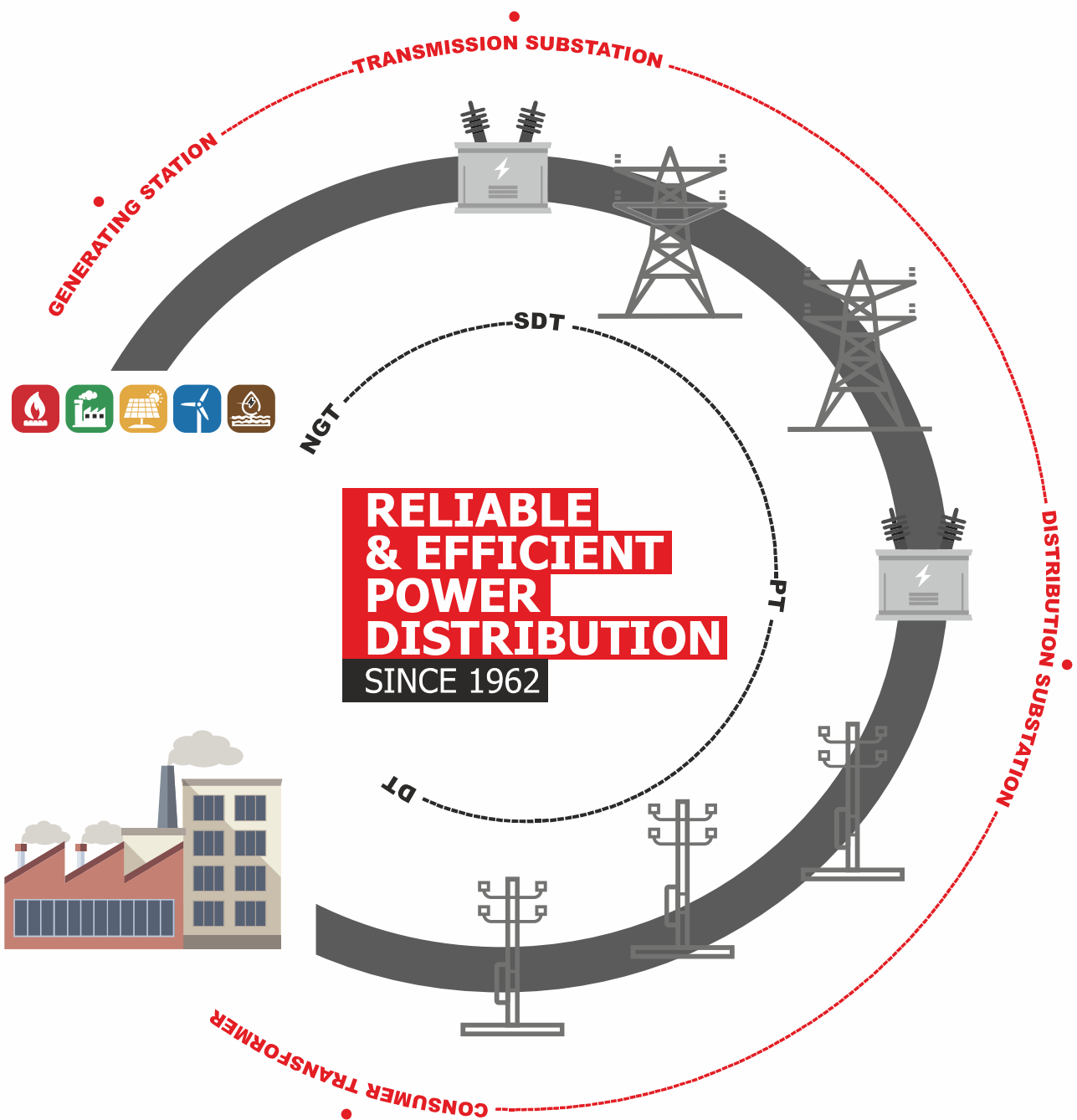


# PRAYOG

ELECTRICALS PVT. LTD.

Since 1962



COIL SET & CORE COIL ASSEMBLY- DT/NGT (VPI/CRT)

## SCOPE

We design, manufacture, inspect, test, pack and deliver product as per customer demand.

Prayog Electricals offers an extensive Range of

- Coil Set (VPI/CRT)
- Core Coil Assembly for DT-CCA (VPI/CRT)
- Core Coil Assembly for NGT (CRT)

Alternatively, we also undertake jobs as per customer design.

## GENERAL

Transformers are AN/AF rated & cooling system mounting/provision can be provided. The transformers are normally IP00 and suitable for installation open or in an enclosure. IP00 dry type transformer are suitable for indoor installation and comply with the latest edition of related IEC 60076 & Customer can make enclosure suitable for outdoor installation.

The core coil equipped with 2 or 4 lifting lugs at the top for crane transportation & assembly in Enclosure.

Our Transformer are designed is such a way that Magnetizing inrush current is limited to 12 times the transformer normal full load current for a period less than 10ms.

## MAGNETIC CIRCUIT (CORE)

- Mechanical Construction of Cores is designed & manufactured in taking view of grade selection, treatment, dust free ambience and handling without distortion in laminations.
- Core is clamped with our special design clamping arrangement to ensure silent & noise free operation. It is robust enough to withstand any shocks to which they may be subjected during lifting, transport, installation and service.
- All structural members of the assembled cores are of suitable steel.
- Maximum flux density of core is 1.65, Unless otherwise agreed.
- Our core coil assemblies are well within limits of standards for Vibration and Noise.
- We ensure Suppression of Harmonics, especially the third and fifth.
- Our Magnetic Circuit is designed & manufactured to avoid static discharges & development of short-circuit flux paths.
- Magnetic shielding can be provided as per agreement, if required to minimize the effect of the return flux path if any. All magnetic circuit are earthed with tinned copper sheet/foil & can be isolated from main parts
- Core and all iron parts are coated with special coating material against corrosion.



**CORE**

## ELECTRICAL CIRCUIT (WINDINGS/COILS)

- Winding's conductor can be copper or aluminum.
- We ensure conductor selection in such a way that width is less than 6 times of thickness.
- Shape of conductor can be round, elliptical, rectangular or foil/sheets as per design which ensures optimum performance.
- Winding's shape can be round, rectangular or oval with layer type, Disc type, Bobbin wound, Cross Over & zigzag construction as per performance need.
- LT Coils can be provided with embedded temperature sensor like PT100 for protection against thermal overload. Alternatively fiber optic sensors can be accommodated as per customer demands
- Coils are resistant to tracking from live parts to Tap connections.
- Coils are non-flammable, self-extinguishing or hard to ignite & no additional toxic gases after eliminating external fire source.
- The coils are designed for temp rise of 90°C as a standard at air natural cooling in IP00 protection or as per agreement with customer.



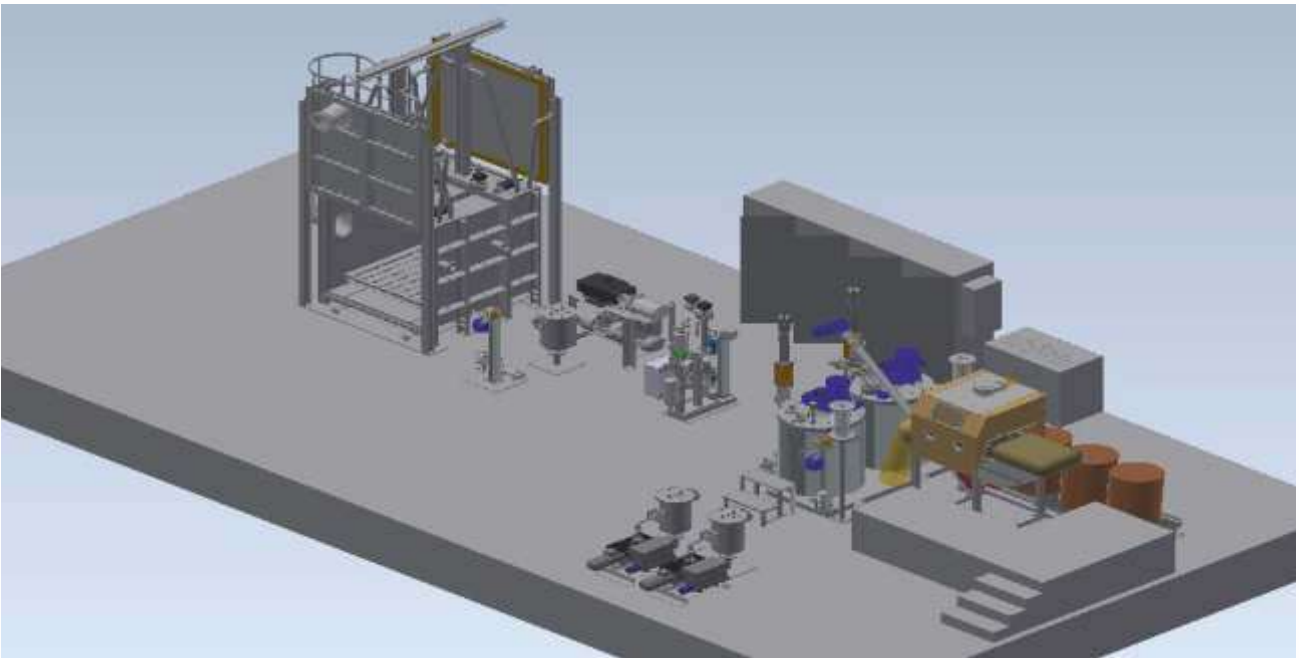
**HV FOIL WINDING PLANT**



**LV FOIL WINDING PLANT**

## CASTING/IMPREGNATION

- Both the MV and LV windings of one phase are impregnated & separately cast as one rigid tubular coil with no rigid mechanical connection between their coaxial arrangements. Alternatively, customer can opt for MV coil cast & LV coil Impregnated. Both windings also can be Impregnated by vacuum pressure technic.
- Coils are processed under stringent process parameters & cast under vacuum to ensure homogenous structure.
- Windings being immune to moisture & homogenous in construction will not absorb any humidity even in tropical climate with ambient temperature of 50°C and 90% air humidity.
- The coils are free of partial discharges up to 1.2 times the rated voltage. It is resistant against short circuits & impulse proof.
- Cast component mixture is designed in such a way that coils withstand mechanical (expansion/contraction) stress produced by rapid changes in temperature due to sudden load fluctuations, or energization at substantially full load in very low ambient temperature environment.



### AUTOMATIC EPOXY CASTING PLANT



**COIL CROSS SECTION**

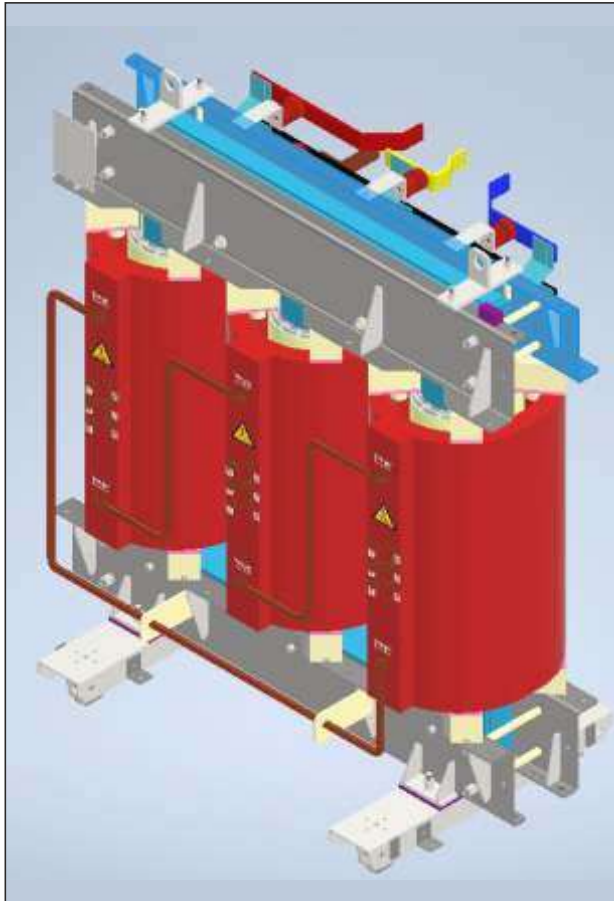
All windings are fully insulated for continuous operation at the specified service rated voltage. Neutral points shall be insulated in accordance with IEC60076. Tapping is arranged at such positions on the windings as will preserve, as far as possible, the electromagnetic balance at all voltage ratios. The insulation of windings and connection are free from insulating composition liable to soften, ooze out, shrink, collapse or deteriorate during service when operating continuously at maximum permissible loads. The coil can be with cooling ducts to enhance cooling efficiency.

A continuous load capacity between 125% - 150% of the rated load can be opted with appropriate directional forced air cooling which can be started at 90°C tripped at 140°C. Efficient cooling design can ensure Temperature rise limit to 90 even at 150% of loading. Continuous Maximum Ratings and Overloads Equipment comply, as regards rating, temperature rise and overload, with the appropriate requirements of IEC 60076 at principal tap.

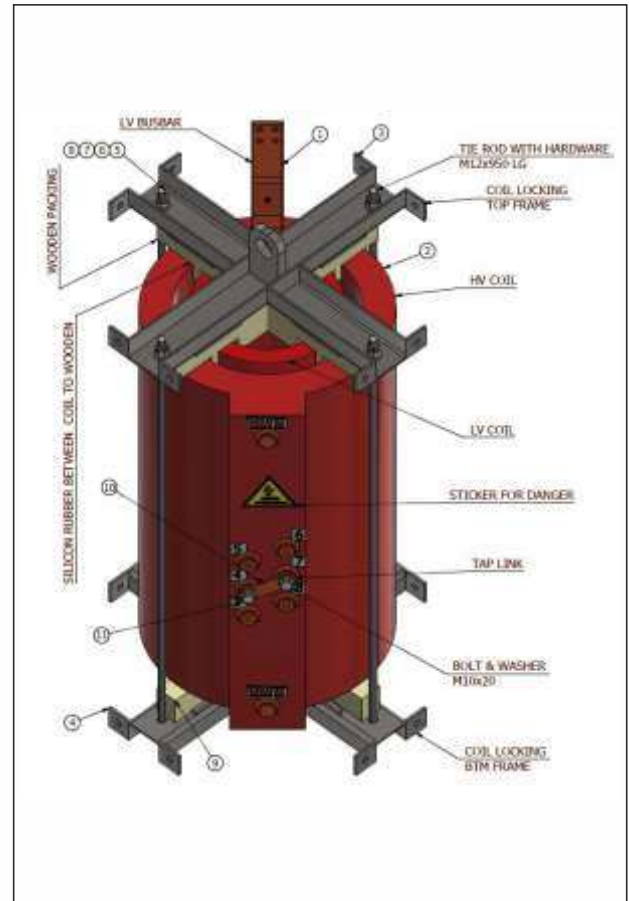


## TRANSFORMER (IP00)

The coils are mounted in such a manner as to reduce any magnetic imbalance & ensure coil concentricity with core. The base of each transformer is designed so that it shall be possible to move the complete unit in any direction without injury when using rollers, plates or rails. We ensure prevention of water retention in every manufacture part. Lifting and Haulage Facilities are built in feature.



**DRY TYPE TRANSFORMER**



**CAST COIL SET**

TECHNICAL SPECIFICATIONS	
Ratings	Upto 3150KVA
Voltage Class	Upto 36kV
Frequency	50Hz & 60Hz
No of Phase	Single & Three Phase
Cooling	AN / AF
Vector Group	As Per Customers Requirement
Winding	Aluminum / Copper
Material	Strip / Foil
Tappings	OCTC OCTL
Insulation Class	F, H
Applicable Standard	IEC 60076 Part-11, 20 BIS 2026 Part-11 ECBC Norms
Compliance	E2 C2 F1
Protection	Ip00

## STANDARD ACCESSORIES

- (a) Rating and diagram plates with data as specified in the appropriate IEC standard recommendations.
- (b) Transformer earthing terminal.
- (c) Lifting fittings.
- (d) Temperature sensor (3-LT windings & 1-optional core)
- (e) Temperature scanner with cooling control signals.
- (f) MV- Connection busbar & hardware
- (g) LV Connection busbar with hardware

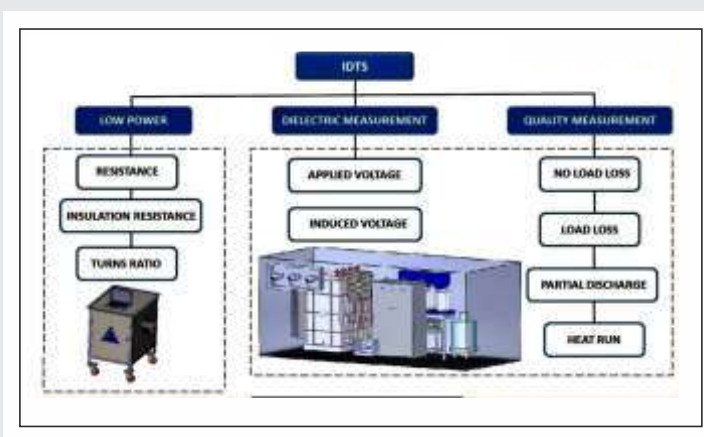
## TEST

As per latest version of IEC 60076 part -11 & part 20 & BIS 1180 series for distribution transformers up to 36KV, 3150KVA (which is on the way of publication).

## ROUTINE TESTS (IEC 60076 LATEST AMENDMENT)

- 1) Measurement of winding resistance
- 2) Measurement of voltage ratio and check of phase displacement
- 3) Measurement of short-circuit impedance and load loss
- 4) Measurement of no-load loss and current
- 5) Separate-source AC withstand voltage test
- 6) Induced AC withstand voltage test
- 7) Partial discharge measurement

Rating KVA	Imp %	Typical Losses in Watts (11kV-Class)	
		50% Load	100% Load
315	4.00	1950	5156
500	4.00	2750	7315
630	4.00	3300	8700
1000	5.00	4350	10550
1600	6.00	6200	15200
2000	6.00	7350	18600
2500	6.00	9020	22100
3150	7.00	11000	25800



## PROCESS

## TYPE TEST

- (a) Impulse voltage Withstand Test (IEC.60076-3)
- (b) Temperature Rise Test

## SPECIAL TEST

- (a) Capacitance Test
- (b) Partial Discharge Test
- (c) Short Circuit Test
- (d) Noise Level Test IEC 60076-10. (Meter conforming to IEC 61672-1/2)
- (e) Frequency Response Analysis (FRA)
- (f) The harmonics of the no-load current

## **TAP CHANGING EQUIPMENT ROUTINE TESTS**

- (a) Operational Tests
- (b) Power frequency withstand test at each tap setting position.

## **MAGNETIC CIRCUITS ROUTINE TESTS**

- (a) 2KV AC or 2.5KV DC between all bolts, side-plates, structural steelwork and the core.
- (b) Magnetic Balance Test

## **STEEL COMPONENTS TEST**

- a. Coating thickness test by thickness tester.
- b. Corrosion resistance test by salt spray.
- c. Tightness test by Torque wrench & marking.
- d. Lifting hook welding compliance (ASTM).

## **IEC 60076-11 IMPOSED THE TRANSFORMERS TO BE CERTIFIED FOR ENVIRONMENTAL, CLIMATIC AND FIRE CLASSES.**

### **Environmental Class E**

- E2: Frequent condensation or light pollution or combination of both
- E3: Frequent condensation or medium pollution or combination of both
- E4: Frequent condensation or heavy pollution or combination of both

### **Climatic Class C**

- C1: the transformer is suitable for operation at ambient temperature not below -5°C, but may be exposed during transport and storage to ambient temperatures down to -25°C
- C2: the transformer is suitable for operation, transport, and storage at ambient temperatures down to -25°C
- C3: the transformer is suitable for transport and storage at — 40°C and operation at -25°C

### **Fire Behavior Class F**

- F1: Transformer is subject to a fire hazard. Restricted flammability is required. The emission of toxic substances and opaque smokes shall be minimised.
- according to IEC 60076-11:2018-10,

Prayog ensures compliance to E2 C2 F1 qualification (Environmental, Climatic and Fire) by using proven resin system, process & matured designs.

## **PACKING**

All transformers & coils are packed and supported by all necessary packing aids and shipped by top open containers / truck. Our packing is customized design to suit rail, road, sea & air transport which prevents damage by mechanical shock, moisture ingress and adverse atmospheric conditions with required Case markings and coding.

## **STANDARD DOCUMENTATION**

- Invoice and shipping documents
- Routine test report
- General assembly drawing
- Rating and diagram plate
- O & M manual (loading and unloading guideline) and warranty certificate