TRANSFORMERS

TS
TRANSFORMERS
LIMITED

POWER TRANSFORMERS

TRANSFORMERS

TS Transformers Limited is Renowned among the Most Trustworthy Transformers Suppliers in Bangladesh. The unmatched Quality and Inexplicable performance of the power supply Transformers in various industrial applications has attracted various leading industries to place repeated orders. . In addition to it, technical specifications like up to 10 MVA, 3 Phase, UP to 33kV, ONAN/ONAF/ OFAF/OFWF Cooling etc. Moreover, customers are also facilitated with the availability of the high Power Transformers at pocket friendly prices and within the stipulated time frame.

Unmatched quality Power Transformer that we provide is the best available in the markets. High grade components together with sophisticated machinery and techniques are used for the fabrication of Power Transformers. Consequently, we are enlisted at the apex in the list of prominent Power Transformers Exporters and Suppliers based in Bangladesh.

- **Applications:**
  Industries, Power Stations, Receiving Stations and Substations, Railways and Ports.

Standard Fittings:

- Lifting Lugs.
- Rating and Diagram Plate.
- Secondary Bushings.
- Silica gel Breather.
- Thermometer.
- Optional Fittings.
- Magnetic Level Gauge.
- Winding Temperature Indicator.
- RTCC Panel.
- Off circuit Tap Switch/on Load Tap.
- Skid Base/ Roller Arrangement.
- Primary Bushings.
- Oil Level Gauge.
- Drain/ Filter Valves.
- Pressure Relief Device / Explosion Vent.
- Terminal Connectors.
- Oil Temperature Indicator.
- Buchholz Relay.
- Condenser Type Bushing for Voltage Class Of 33kV.

Design Requirements:

The TSTL Power Transformers are designed, manufactured and tested according to the latest revision of applicable ANSI C57.12.00, ANSI C57.12.10.

Tank Design:

a) The transformer utilize the sealed-tank system of oil preservation in which the interior of the transformer sealed from the atmosphere throughout a top-oil range of 100^0C and the gas plus oil volume remain constant such that the internal gas pressure not exceed ten(ten) PSI gauge positive or (8) PSI gauge negative.

b) The thickness of all side walls of the transformer are minimum 10(ten) mm and the thickness of top and bottom cover of the transformer are minimum 12 (twelve) mm. The transformer brace on all the walls in order to withstand any possible over pressure. The complete assembled transformer designed to withstand without permanent deformation a pressure of twenty-five percent (25%) greater than the maximum operating pressure.

c) If a separate base of more than twelve inches (12") in height is added to the bottom of the transformer tank in order to meet bushing terminal connector ground clearance requirements, the base bolted to the bottom of the transformer tank.

d) The tank designed to facilitate lifting and permit transportation, with the base removed of the transformer without damage. This is done because of transportation condition in Bangladesh.

e) The exterior color of the transformers is NEMA gray No. 70.

Surge Arrester:

Tank mounting provisions for the 9KV station class arrester provided on the 11 KV side and tank mounting provision for future installation of 36 KV station class arrester provided on the 33 KV side. The lightning arrester, equipped with (3) 14-22 mm dia slots (120^0C apart), 222-254 mm dia Bolt Circle mounting arrangement.

Forced Air Cooling:

The transformer provide d with a control panel, terminal strips and control wiring for the addition of auxiliary forced air Cooling equipment. The fans are Single –phase, 230 volt, 50 Hertz. Temperature control contacts and relays for auxiliary forced air cooling are included**.**

Bushing and Terminal Connectors:

a) High Voltage: The high voltage bushings are 34.5 KV voltage class, 200 KV BIL, interchangeable condenser type and mounted on the transformer tank cover.

b) Low Voltage: The low voltage bushings are 15 KV voltage class, 110 KV BIL, interchangeable type and mounted on the transformer tank cover.

c) Bolted type stud connectors for both the high side (4/O MHDC) and low side (500 MCM, MHDC) transformer bushings which meet the requirements of ANSI C76 (latest version).

TRANSFORMERS

SPECIFICATION OF POWER TRANSFORMER

(1) Type	:	**Out Door Type Oil Immersed Power Transformer**	
(2) Rating	:	1.67 MVA	3.33 MVA
(3) Catalog No.	:	PTO- 36 – 1 – 1.67 MVA	PTO- 36 – 2 – 3.33 MVA
(4) Design Standard	:	ANSI C57.12.00 & ANSI C57.12.10	
(5) Winding Material	:	Double Wound of Electrolytic Copper	
(6) Core Type and Material	:	Stack Core ,CRGO Silicon Steel	
(7) No. Of Phase	:	1 (Single)	
(8) Nominal Voltage	:	HT =33KV , LT = 11 K V	
(9) BIL(Basic Insulation Level)	:	HT Winding = 200 KV, LT Winding =110 KV	
(10) Polarity/Vector Group	:	Subtractive	
(11) Cooling Method	:	ONAN/ONAF	
a. Winding	:	Shall not exceed 65˚C (resistance method)	
b. Insulating Liquid	:	Shall not exceed 60˚C	
(12) Bushing			
a. Type & Material	:	LT= Outdoor type ,Porcelain; HT= Outdoor, Condenser Type, Porcelain	
b. Connectors	:	Bolted type stud connectors	
c. Quantity	:	HT=2 , LT=2	
d. Mounting Position	:	HT & LT –On the tank cover	
(13) Tank	:	Sealed-tank system	
a. Design	:	Bolted type complete with cover	
b. Support lug	:	Shall have support lugs	
c. Painting	:	NEMA Grey 70	
(14) Insulating Oil	:	Mineral oil as per IEC-60296	
(15) Tapping	:	2×(±)2.5 % on 33 KV, visible from ground	
(16) Percentage Impedance at 85^{o}C	:	6% (±0.5%)	
(17) Installation	:	Outdoor ,Tropical, High rainfall and Humidity	
(18) Type of system Earthling	:	Effectively Earthed	
(19) Neutral Insulation		Full insulation and 100% loading capacity	

TRANSFORMERS

SPECIFICATION OF 3 PHASE POWER TRANSFORMER

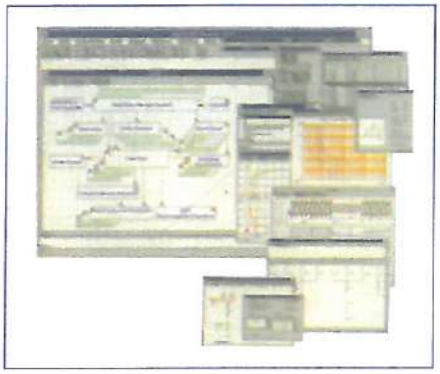
(1) Type	:	**Out Door Type Oil Immersed Power Transformer**	
(2) Rating	:	5/7 MVA	10/14 MVA
(3) Catalog No.	:	PTO- 36 – 3 - 5 MVA	PTO- 36 – 4 - 10 MVA PTO- 36 – 5 - 10 MVA
(4) Design Standard	:	IEC 60076, ANSI C57.12.00, ANSI C57.12.10 and Equivalent.	
(5) Winding Material	:	Double Wound of Electrolytic Copper.	
(6) Core Type and Material	:	Stack Core, Core Type, CRGO Silicon Steel.	
(7) Nominal Voltage	:	HT =33 KV , LT = 11.55 K V	
(8) No. Of Phase	:	3 (Three)	
(9) BIL(Basic Insulation Level)	:	HT Winding = 170 KV, LT Winding =75 KV	
(10) Polarity/Vector Group	:	DYn-1	
(11) Cooling Method	:	ONAN/ONAF	
a. Winding	:	Shall not exceed 60˚C (By resistance method)	
b. Insulating Liquid	:	Shall not exceed 55˚C (By Thermometer)	
(12) Bushing			
a. Type & Material	:	LT= Outdoor type, Porcelain; HT= Outdoor, Condenser Type, Porcelain	
b. Connectors	:	Bolted type stud connectors.	
c. Quantity	:	HT= 3, LT=4	
d. Mounting Position	:	HT & LT – On the tank cover	
(13) Tank	:		
a. Design	:	Bolted type complete with cover	
b. Support lug	:	Shall have support lugs	
c. Conservator	:	Conservator Consisting a transparent Silica Gel Breather and oil Level Indicator.	
(14) Insulating Oil	:	Mineral oil as per IEC-60296	
(15) (a) Tap Changer (OCTC)	:	ABB Make, 5×(±)2.5 % on 33 KV Side, visible from ground	
(b) Tap Changer (OLTC)	:	ABB Make, -18% to +6 on 33 kV Side, On-tank/In-tank with RTCC	
(16) Percentage Impedance at Rated Tap and at 75^{o}C	:	7.0% (+10% Tolerance)	8.0% (+10% Tolerance)
(17) Installation	:	Outdoor, Tropical, High rainfall and Humidity.	
(18) Type of system Earthling	:	Effectively Earthed	
(19) Neutral Insulation	:	Full insulation and 100% loading capacity	

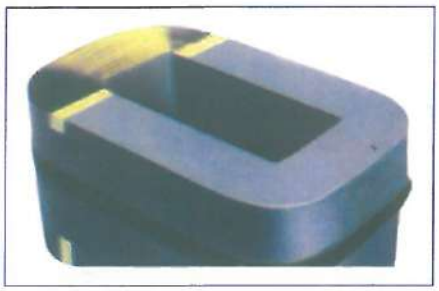
TRANSFORMERS

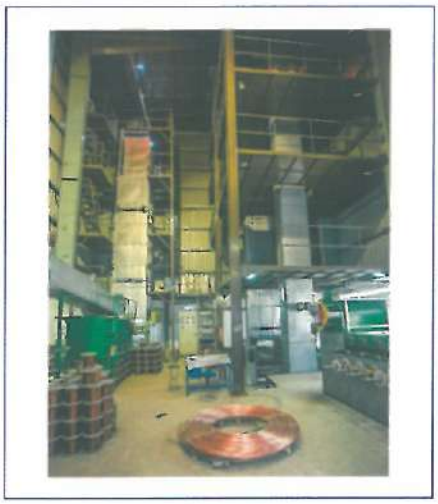
TS TRANSFORMERS LIMITED

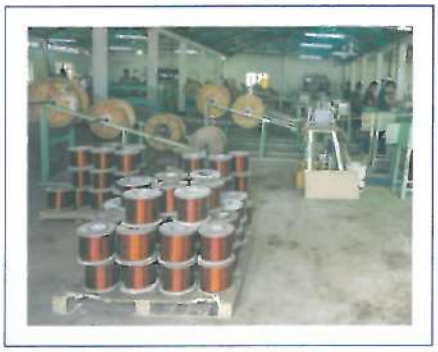
Single Phase Distribution Transformer

Voltage Rating : 6.35 / 0.24 KV
Power Rating : 5 KVA - 167 KVA
Operating Frequency : 50 Hz









TECHNICAL SPECIFICATION

- Standard : ANSI C57.12.00 & C57.12.20
- Distribution transformer : 5 KVA to 167.5 KVA. Single Phase
- Rated system voltage : HT-6350 v, LT-240 v, 1-Phase.
- Type : Wound Core
- Cooling System : ONAN
- Temperature : Max 65°C for winding, 60°C for oil
- Basic Insulation level : As Per standard
- Installation : up to 1000 meter above sea level

DESIGN & ENGINEERING

The design is totally computerized where in house software has been developed for accurate and fast designing. It is Manufactured and tested with high standards. TSTL is reputed for quality and reliability all over Bangladesh.

MANUFACTURING FACILITIES

TSTL is located in a charming clean and green environment. Separate workshops are there for core cutting, core annealing, welding, painting, tanking and assembling. Full testing facilities as per IEC/ANSI are available. The shop floors are adequate high and have level floor area with overhead crain, vacuum oil filling station and other materials handling facilities are also present there. Complete equipment and machineries are exclusively imported from Canada and Japan.

TRANSFORMER FEATURE

CORE

Transformer core is made of thin cold rolled grain oriented insulated silicon steel laminations with extremely low loss. The physical characteristics of the core meet the international standard such as the inherent loss due to hysteresis & eddy currents, thickness, brittleness, degree of waviness, the permeability etc.

CORE ANNEALING

Annealing restore the original magnetic qualities of core by releasing all internal stresses that is developed on core. TSTL have a bell type annealing furnace used to reduce the core loss. After winding by using of core winding machine, core are annealed in a suitable temperature.

WINDING

TSTL transformer windings are designed to meet the three fundamental requirements, a) Electrical stability b) Mechanical stability c) Thermal stability. During design, service factors such as high electrical & mechanical strength of insulation, coil characteristic, uniform electric flux distribution, prevention of corona formation and minimum restriction of free oil circulation winding surge due to lightning & circuit operations etc are taken into consideration. HV winding are made of super enameled wire paper insulated wire.

TANK

Tank is made of a steel plates which is suitable for electric welding. All tanks are pressure tested before leaving the fabrication shop on the label of test pressure depends on the voltage specified. All parts-plates, shape, hosting lugs etc. are welded to ensure greater mechanical strength. Tanks are shot blast/acid clearing to remove rust and welding scale, cleaned, coated by anticorrosive primer paint and then enamel finish paint is applied which has high resistance to chemicals and oil. A coat of heat and transformer oil resistant insulating clear lacquer varnish is applied to the all interior surface which contacts with the transformer oil.

DRYING

Drying is carried out on active parts by using electrical heated ovens to remove moisture and air for a period of time and then immersed urder vaccum condition in fresh filtered oil and allow to stand for a period until all trapped air has escaped.

INSULATION AND IMPREGNATION

The quality of transformer and especially the dielectric strength response of its insulation depends on the treatment of its active part. The treatment consists of an alternation of hot air heating and prolonged vacuum to remove all moisture from the insulating materials. The oil used for imprecation complies with BS-171 and every consignment received is tested before pumped in to storage tanks.

QUALITY CONTROL AND TEST

Full testing facilities as per ANSI/IEC are available and these tests are regularly carried out on each unit under expert supervision.

ROUTINE TESTS

- Measurement of winding resistance
- Measurement of Voltage ratio
- Measurement of losses
- Measurement of no-load currents
- Determination of Voltage Vector group
- Determination of percentage impedance
- Dielectric tests : Induced O/V test, Power Frequency H/V Test

TYPE TESTS

- Short circuit test
- Lightning impulse test
- Temperature rise test

SPECIFICATION OF SINGLE PHASE DISTRIBUTION TRANSFORMER

Rate	Rate Voltage (v)		Frequency	Impedence	F/L Current (Amp)		Dimension(TS)		Weight (kg)	
KVA	High	Low	HZ	(Max)%	High	Low	Diameter	Height	Total	Oil
5	6350	240	50	2.5,+10%	0.787	20.83	325	559	85	19.8
10	6350	240	50	2.5,+10%	1.575	41.67	350	610	115	27.22
15	6350	240	50	2.5,+10%	2.362	62.50	381	660	140	32.17
25	6350	240	50	2.5,+10%	3.937	104.17	435	737	210	49.5
37.5	6350	240	50	2.5,+10%	5.906	156.25	490	813	293	75
50	6350	240	50	3,+10%	7.874	208.33	508	914	350	84.15
75	6350	240	50	3,+10%	11.811	312.50	560	965	540	140.25
100	6350	240	50	3,+10%	15.748	416.67	610	1016	620	155.1
167	6350	240	50	3,+10%	26.23	695.83	660	1118	800	199.65

The Technical Details & Product Characteristics described correspond to the state at the time of printing & canbe subjected to modification.

TRANSFORMERS

TS TRANSFORMERS LIMITED is a one of the leading enterprise in our country for manufacturing various types of low loss transformers with high quality. TSTL has made a name for itself by in flinching faith in quality, efficiency and cost effective competence in all are as. Perfection at every level from definition of requirements to delivery transformers, has become a company standard. Perfection reflects by customer satisfaction, confidence and steady growth. Our Steady growth through strategic planning has allowed us to become the leader in transformer manufacturing in Bangladesh.

TS TRANSFORMERS LIMITED

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Website : www.tstransformers.com

Factory :

Mohona, Bhabanipur, Gazipur, Bangladesh

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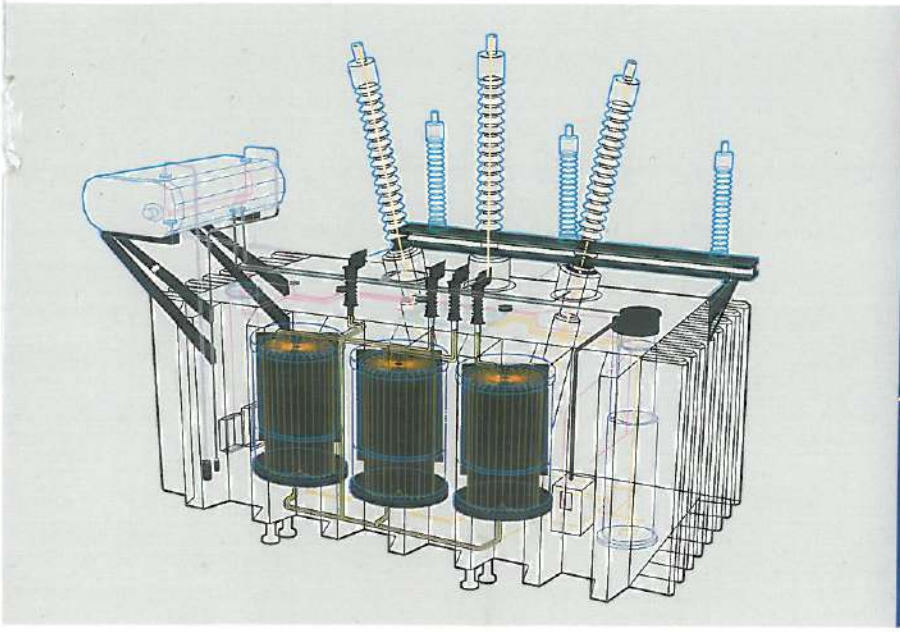


THREE PHASE TRANSFORMERS

- Operating Voltage Rating: 33 kV & 11 kV
- Power Rating 50 KVA - 5 MVA

Approved Design by CPRI & BUET

Certificate of Registration

This is to certify that:

TS TRANSFORMERS LIMITED

Bhabanipur, Gazipur 1700 BANGLADESH

operates a

QUALITY MANAGEMENT SYSTEM

which complies with the requirements of

ISO 9001:2008

for the following scope

The registration covers the Quality Management System for the design, manufacture, installation, testing and comissioning of single phase and three phase power and distribution transformers; and low and medium voltage instrument transformers (CT & PT)

Certificate No: QEC27105

Issued: 28 May 2012
Expires: 28 September 2012

Originally Certified: 29 September 2009
Current Certification: 28 May 2012

William Smith
Certification Manager

Duncan Lilley
Global Head – Assurance Service

ISO 9001

SAI GLOBAL

DESIGN AND ENGINEERING

The design is total computerized. Powerful and sophisticated software tools are used to develop the mechanical and electrical design of all transformers. These tools help insuring optimum electrical design and determining core and copper losses accurately. The high reliability of these transformers ensures maximum availability, lower maintenance cost and reduced life cycle costs.

MANUFACTURING FACILITIES

TSTL is located at a charming and green environment beside the Dhaka-Mymenshing highway. Separate shops for care processing; coil winding, tank fabrication, surface treatment and painting, assembling and testing are developed and furnished with modern machinery. Full testing facilities as per ANSI/IEC are available. The shop floors are adequately high and have level floor area with overhead Cranes. All shops are equipped with appropriate handing facilities. Major manufacturing and testing equipments are imported from Canada and Japan.

TRANSFORMER FEATURE CORE

Transformer core is made of thin cold rolled grain oriented (CRGO) insulated silicon steel lamination with extremely low loss. The physical Characteristics of the core meet the international standard such as the inherent loss due to hysteresis and eddy currents, thickness, and brittleness, degree of waviness, the permeability etc. The silicon steel lamination are insulated on both sides. Primary consideration is to reduce the no load loss and excitation current and noise level. CRGO's are being imported form Nippon Steel, Japan and JFE, Japan. For wound core transformers silted cores are cut in a CNC control progressive shearing machine. Round core coils are made by means of winding machine. Then the round core is shaped to rectangular core by core forming machine. Annealing restore the original magnetic properties of the core by releasing all internal stress that developed on core. TSTL is having Bell type annealing furnace for annealing the core at suitable temperature.

WINDING

Our transformer winding are designing to meet the three fundamental requirements, a) Electrical stability, b) Mechanical stability, c) Thermal stability. During design, service factors such as high electrical and mechanical strength of insulation coil characteristics, uniform electric flux distribution, prevention of coronal formation and minimum restriction of free oil circulation, winding surge due to lightning and circuit breaker operation etc are taken in to consideration. HV winding are made of super enameled copper wires or paper covered strip. Whereas for LV winding one or more copper strips insulated with pure cellulose paper used.

INSULATION AND IMPREGNATION

The quality of transformer and especially the dielectric strength response of its insulation depend on the treatment of its active part. The treatment consists in an

Core Coil Assembly

CRGO Slitting Process

Coil Winding Process

Insulation Process

Hardware & Accessories Processing

alternation of hot air heating and prolonged vacuum so as to remove all moisture from the insulating materials. Pre-compressed press board spacers used in the active part provide rigid insulation structure with low partial discharge levels. A clean, dust free environment ensures the highest standards in quality. By using automated oil filling and processing system and by virtue of leak proof joints in the transformers, there is no oil spillage. The oil used for impregnation complies with BS-171 and every consignment received is tested before being pumped into storage tanks.

Tank Fabrication Process

DRYING

Drying is carried out on an active parts by means of electrical heated ovens to remove moisture and air for a period of time and then immersed under vacuum condition in freshly filtered oil and allow to stand for a period until all trapped air has escaped.

Radiator Fabrication Process

TANK

Tank is made of steel plate suitable for electric welding. All tanks are pressure tested before leaving the fabrication shop. All parts-plates, Shape, Hoisting lugs etc. are welded to ensure greater mechanical strength. Tanks are sand blasted to remove rust and welding scale. In case of small tanks seven tank phosphating is done for surface treatment. Then powder paint is applied which has high resistance to chemical and transformer oil. All gasket surfaces at the tank are treated with utmost core to prevented unwanted oil leakage.

Vacuum Drying Process

TANKING

After inserting the active part into tank, proceed insulating oil is added. The oil passes through a special flushing process in a filter system during which remaining impurities are removed. An advance gasket system used in the grooves ensures the joints are secure, making the transformer leak proof. Processing and handling of oil is done by means of an automated oil handling system, which eliminates any chance of oils intermixing.

QUALITY ASSURANCE

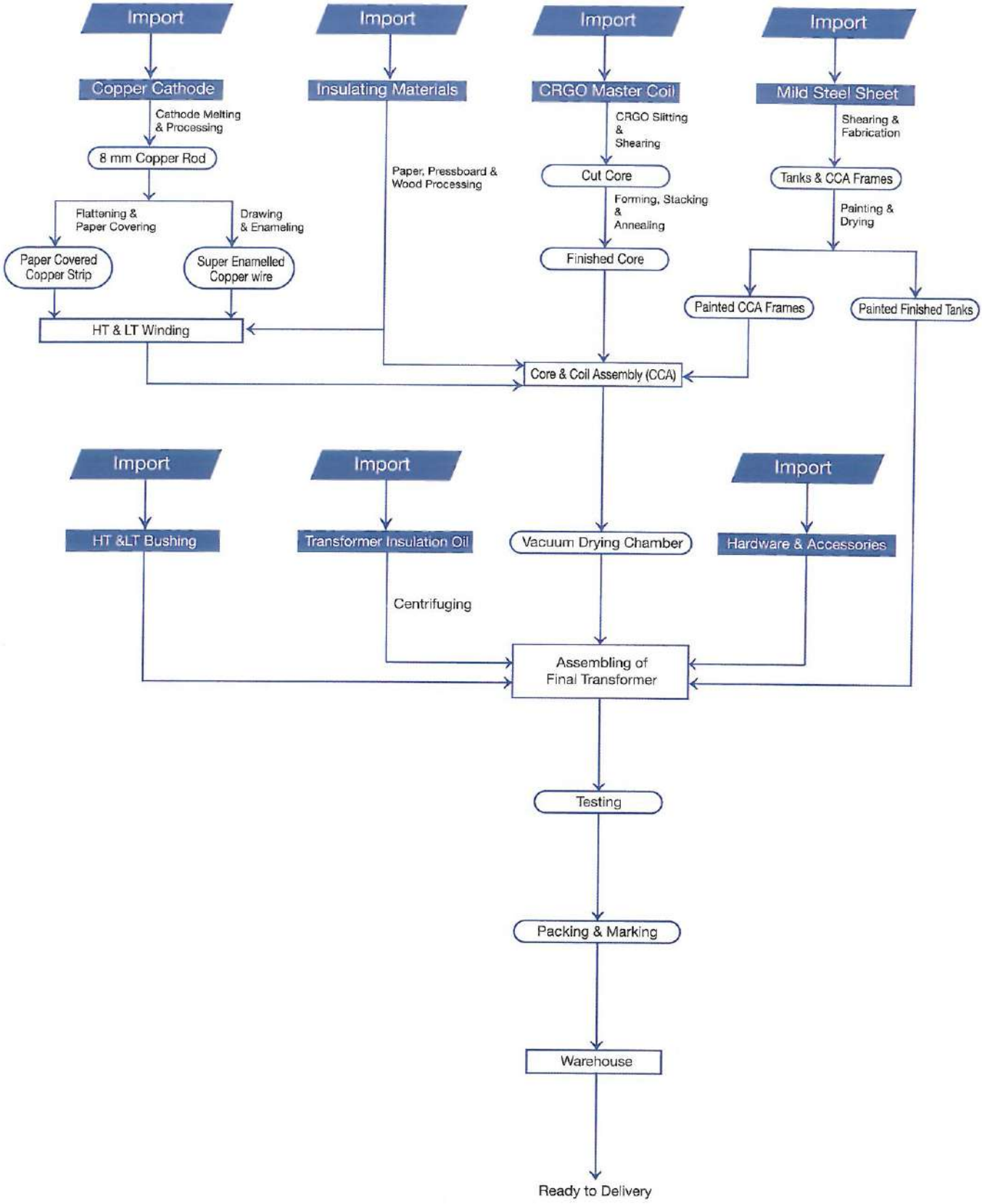
An up-to-date quality assurance system is well in place that covers all aspects involved in the production and testing of all transformers. Quality checks are carried out an all materials and processes at various manufacturing stage to ensure highest quality standards. Quality assurance system is ISO 9001:2008 certified.

Testing and QA Process

TESTING

Our Modern testing facility includes precision power analyzer for loss measurement, High Voltage Test Set, Insulation Tan Delta Test Set, Impulse Voltage Test Set, temperature logger and Insulation oils breakdown Voltage Level Tester to carry out the routine tests and type tests accurately. A special motor-generator set is used to test the transformers at the exact operating frequency to obtain the accurate performance result of the transformer.

TRANSFORMER PRODUCTION PROCESS



SCHEDULE OF TESTS:

- ROUTINE TEST:

These Tests are being conducted on Each Transformers in factory's own testing facility:

a) Insulation Resistance Test (Megger Test)
b) Measurement Winding Resistance
c) Measurement Winding/Voltage Ratio
d) Voltage Vector Group Test
e) Measurement of Transformer Losses:
    1) Measurement of No load Loss and No load Current
    2) Measurement of Full load Loss and Percentage Impedance
f) Dielectric Test:
    1) Power Frequency Withstand Test
    2) Induced Over voltage withstand test.

- TYPE TEST:

These tests are being conducted on each design of Transformers from Central Power Research Institute of India (CPRI) and Bangladesh University of Engineering and Technology (BUET)

a) Short Circuit withstand ability Test
b) Lightning impulse and switching impulse withstand test
c) Temperature rise test

DIFFERENT PARAMETER OF THREE PHASE DISTRIBUTION TRANSFORMERS

Rating Power (KVA)	No-Load Loss (W)	Load Loss At 75 °C (W)	Impedance at 75 °C (Tolarance ±10%)	No Load Current 10(A)	Noise Level (dB)	Voltage Regulation %		% Efficiencies PF = 1		% Efficiencies PF = 0.8		Dimension (mm)			Oil (Ltr)	Weight (Kg)
						PF=1	PF= 0.8	Full Load	% Load	Full Load	% Load	L	W	H		
50	140	950	4	1.2	45	1.71	3.44	98.20	98.80	97.80	98.85	800	400	950	150	500
100	240	1625	4	1.2	45	1.41	3.34	98.66	98.25	98.20	98.71	900	650	1000	200	800
150	388	1800	4	1.2	46	1.15	3.25	98.25	98.70	98.20	98.00	950	700	1100	270	1000
200	430	2800	4	1.2	47	1.08	3.17	98.87	99.19	98.50	98.89	1000	900	1150	300	1050
250	520	3180	4	1.2	48	1.06	3.40	99.10	99.30	98.75	99.20	1100	950	1200	330	1400
315	737	3500	4	1.5	49	1.04	3.33	98.50	98.40	98.20	98.40	1150	1000	1250	350	1520
500	798	4200	6	1.5	50	0.94	4.28	98.60	98.80	98.25	98.59	1200	1050	1300	550	2000
630	888	4800	6	1.5	52	0.96	4.30	98.72	98.96	98.50	98.78	1250	1250	1080	630	2250
750	999	5102	6	1.5	53	0.98	4.32	98.96	99.20	98.70	98.88	1300	1100	1450	700	2600
1000	1198	8200	6	1.5	54	0.99	4.30	99.10	99.358	98.80	98.18	1400	1200	1550	810	3600
1250	1368	11000	6	1.5	56	1.0	4.30	99.12	99.30	98.76	99.12	1500	1300	1700	1010	4300
1600	1665	12400	6	1.5	60	1.0	4.32	99.29	99.76	98.80	99.20	1600	1350	1850	1100	5000
2000	2230	15350	6	1.5	68	1.0	4.34	99.30	99.82	98.94	99.23	1700	1700	1400	1200	6200
2500	2785	18850	6	1.5	72	1.0	4.36	99.32	99.89	98.32	99.32	1800	1800	1450	1350	7500

SPECIFICATIONS OF THREE PHASE DISTRIBUTION TRANSFORMERS

(1)	Design Standard	IEC 60076	
(2)	Type	Three Phase Wound Core/Stack Core	
(3)	Installation	Outdoor, Tropical, High Rainfall & Humidity	
(4)	Winding Material	High Conductivity Copper	
(5)	Core Type and Material	CRGO Silicon Steel	
(6)	Nominal Voltage	HT = 11000 V LT = 415 V	HT = 33000 V LT = 415 V
(7)	Rated Frequency	50 Hz	
(8)	BIL (Basic Insulation Level)	HT Winding =75 KV, LT Winding = 2.5 KV	
(9)	Power Frequency withstand voltage	HT Winding =28 KV, LT Winding = 2.5 KV	
(10)	Vector Group	DYn 11	
(11)	Cooling Method	ONAN	
(12)	Maximum Temperature Rise at Full Load & at rated tape position		
	a. Winding	Shall not exceed 65 °C (Resistance Method)	
	b. Insulating Oil	Shall not exceed 60 °C (Thermometer Method)	
(13)	Tap Changer	Off Load type ; +1 x 2.5%, 0, -3 x 2.5% of rated voltage	
(14)	Bushing		
	a. Type & Material	Outdoor type, Porcelain as per IEC 60137	
	b. Connectors	Bolted ring type	
	c. Quantity	HT= 3, LT= 4	
	d. Mounting Position	HT – On the tank cover, LT - On the side of the tank	
(15)	Tank		
	a. Design	Bolted type complete with cover and gasket	
	b. Ground Provision	With bolted ring type connector	
	c. Lifting Facilities	Provided with Facilities for lifting the core and coil	
	d. Conservator	Provided	
	e. Breather	Silica Gel Breather	
	f. Painting	Light Gray, ANSI Color # 70	
(16)	Insulating Oil	New, Unused, Mineral oil as per IEC 60296 & BS 148	

TRANSFORMERS

TS TRANSFORMERS LIMITED

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