

**SCHEDULE I-A OF GUARANTEED TECHNICAL PARTICULARS FOR SUPPLY OF
OUTDOOR TYPE THREE PHASE 11/ 0.433 KV COPPER WOUND (TENERGY
EFFICIENT) DISTRIBUTION TRANSFORMERS OF 250 KVA RATING (LEVEL-2).**

| | |
|------------------------------------|---|
| S.N. Particulars | : |
| A. Name of Manufacturer & | : |
| B. Place of manufacture | : |
| C. Make | : |
| 1. Name of Tenderer | : |
| 2. Type : | |
| 3. Rating | : |
| (a) Rated output (KVA) | : |
| (b) Rated voltage-H.V. (Volts) | : |
| (c) Rated Voltage-L.V. (Volts) | : |
| (d) No load voltage ratio | : |
| (e) No. of phases | : |
| (f) Frequency (c/s) | : |
| (g) Vector Group | : |
| 4. Method of Cooling Radiator type | : |
| 5. Internal Dimensions of Tank | |
| (a) Length (mm) | : |
| (b) Breadth (mm) | : |
| (c) Height (mm) | : |
| (d) Thickness of tank sheets : | |
| (i) Sides (mm) | : |
| (ii) Top & Bottom (mm) | : |
| 6. <u>DETAILS OF CORE</u> | |
| (a) Diameter (mm) | : |

- (b) Window Height (mm) :
- (c) Limb Center (mm) :
- (d) Width of the main step :
- (e) Whether yoke is plain or stepped inside window :
- (f) Cross Sectional Area (sq.mm.) :
 - (i) Gross :
 - (ii) Nett :
 (Staking factor of 0.97 shall be taken)
- (g) Working flux density at rated voltage & frequency (Tesla) actual as per your design. :
- (h) Over fluxing without saturation :
(Curve to be furnished by the manufacturer in support of his claim)
- (i) Insulation Material provided for core :
- (j) Grade of Material & Thickness of Lamination used (mm) :
- (k) Total min.weight of stamping used in core and yoke (kg.)
(Please furnish core weight calculations, details of core steps and its drawing) :

7. H.V. COIL CONSTRUCTION DETAILS :

- (a) Type of winding(copper) :
- (b) Type & Size of Conductor (Bare) mm :
- (c) Size of conductor insulated(mm) :
- (d) Cross Sectional area of Conductor (mm²)
 - (i) Gross :
 - (ii) Nett :

- (e) No. of Coils per Limb :
- (f) Outer Diameter of Coil (mm) :
- (g) Inner Diameter of Coil (mm) :
- (h) Mean Diameter of Coil (mm)
- (i) Insulation of Conductor :
- (j) Interlayer reinforcement details :
 - i) Top & bottom layer :
 - ii) In between all layers :
 - iii) End turn insulation :
 - iv) Whether wedges are provided at 50% turns of HV coil. :
- (k) Current at full load (Amp) :
- (l) Working current density as per your design (Amp/Sq.mm) :
- (m) Weight of bare conductor used in one leg of H.V. (Kg.) :
- (n) Weight of insulated conductor used in one leg of H.V. (Kg.) :
- (o) No. of turns per leg :
- (p) Length of mean turns (mm) :
- (q) Resistance of winding (with 5% tolerance)
 - a) at 20 °C (Ohms) :
 - b) at 75 °C (Ohms) :
- (r) I²R at 75°C. :
- (s) Axial Length (mm) :
- (u) Weight of oil soaked coils in one leg :

8. L.V. COIL CONSTRUCTION DETAILS :

- (a) Type of Winding :
- (b) Type, Number and Size of bare conductor. :
- (c) Size of insulated conductor :
- (d) Cross sectional area of bare conductor (sq.mm.)
 - (i) Gross :
 - (ii) Net As per IS:6160 :
- (e) No. of coils per limb :
- (f) Outer diameter of coil (mm) :
- (g) Inner Diameter of Coil (mm) :
- (h) Mean Diameter of Coil (mm) :
- (i) Insulation of Conductor :
- (j) Inter layer reinforcement details :
- (k) Current at full load (Amp) :
- (l) Current density as per your design (A/mm²) :
- (m) End turn insulation :
- (n) Weight of bare conductor used in one leg of LV (kg) :
- (o) Weight of insulated conductor used in one leg of LV (kg.) :
- (p) No. of turns per leg :
- (q) Length of mean turns (mm) :
- (r) Resistance of winding (with 5% tolerance)
 - a) at 20 °C (Ohms) :
 - b) at 75 °C (Ohms) :

- (s) I²R at 75°C :
- (t) Axial Length (mm) :
- (u) Weight of oil soaked coil in one leg :

9. INSULATION DETAILS MATERIAL AND SIZE

- (a) H.V. Coil end packing :
- (b) L.V. coil end packing :
- (c) Inter coil spacer of HT sections :
- (d) Bottom yoke strip insulation at
foot plate :
- (e) Yoke Insulation :
- (f) Clamp Insulation :
- (g) Inter Phase Barrier :
- (h) Core Wrap :
- (i) Cylindrical Insulation Between
H.T. & L.T. :
- (j) Type of blocks used in between coils :
- (k) Weight of total insulating material
in one T/F (oil soaked). :

(Enclose calculation of losses with complete details of factors assumed)

10. DETAILS OF CLEARNACES (mm)

- (a) Internal clearance between inner
walls of Tank & core coil
assembly unit
 - (i) On length(Bushing side) :
 - (ii) On Breadth Side(Non bushing side) :
- (b) Radial clearance between H.V. :
& L.V. Winding

- (c) Phase of phase clearance between :
H.V. Limb
- (d) Clearance from top of the live part of :
top changer to the inside of the top
cover of the tank.
- (e) Radial clearance of L.V. coil :
from core.
- (f) Minimum clearance between LV
Pole to earth)
- (g) Horizontal duct between H.T. :
Section coil
- (h) End clearance of H.T. coil from :
Yoke (With angle shaped windings)
- (i) Minimum clearance between core
& tank bottom.
- (j) Angular ducts between LT & HT winding.

Note: Above clearances include the thickness of insulation.

11. **IMPULSE TEST VOLTAGE OF WINDING FOR 1.2/50 M.S. WAVE
ACCORDING TO RELEVANT ISS :**

- (a) H.V. (KVP) :
- (b) L.V. (KVP) :
12. Volts per coil of H.V. Winding (Volts) :
13. Approximate volts per layer of H.V.
winding (Volts) :
14. Performance reference temperature (°C) :
15. Core loss in watts (Guaranteed value without
any positive tolerance) (Watts)
- a) Normal Voltage :
- b) Maximum Voltage :
16. Full Load losses at 75 °C (Watts) :
(Guaranteed value without any positive tolerance)

17. Load loss at 50% load & at 75 °C :
(Guaranteed value without any positive tolerance)
18. Total Losses at 100% load at 75 °C (Watts) :
(Guaranteed value without any positive tolerance)
19. Total losses at 50% load at 75 °C :
(Guaranteed value without any positive tolerance)
20. Magnetising (No Load) Current at
 - a) 90% Voltage :
 - b) 100% Voltage :
 - c) 110% Voltage :
21. Regulation at normal full load and
 - a) Unity P.F. and :
 - b) 0.8 P.F. :
22. Impedance voltage at rated voltage :
& frequency at 75°C.
23. Percentage reactance at rated voltage :
& frequency at 75°C.
24. Percentage resistance at 75°C. :
25. **PERCENTAGE IMPEDANCE AT 75°C.**
 - (a) With respect to high voltage :
 - (b) With respect to low voltage :
26. Un-balance current as percentage of :
full load current
27. **Efficiency at 75 °C**
 - a) Unity P.F. and :
 - b) 0.8 P.F. :

- i) 125% load :
 - ii) 100% load :
 - iii) 75% load :
 - iv) 50% load :
 - v) 25% load :
28. Permissible duration of overload following Continuous running at normal rated load in Ambient temperature of 50°C.
- (a) 10% overload :
 - (b) 20% overload :
 - (c) 30% overload :
29. RMS value of symmetrical short circuit current which the transformer can withstand and its duration according to clause 9.1 of ISS:2026 or CL:1001 of BSS with latest amendment thereof. :
30. Increase in temperature of winding at full load by resistance method in an ambient temperature of 50°C. :
31. Increase in temperature of oil by thermometer at full load in an ambient temperature of 50°C. :
32. Temperature of hottest spot in the winding at full load in an ambient temperature of 50°C. :
33. Terminal arrangement of H.V. side :
34. Terminal arrangement of L.V. side :
35. **PARTICULARS OF H.V. BUSHING** :
- (a) Name of Manufacturer :
 - (b) Type :
 - (c) Confirming to ISS :

- (d) Dry withstand voltage for one minute :
- (e) Wet withstand voltage for 30 minutes :
- (f) Voltage rating :
- (g) Impulse withstand voltage
1/50 μ sec. wave :
 - (i) Positive :
 - (ii) Negative :
- (h) Total creepage distance in air (mm) :
- (i) Height of bushing above transformer tank. :
- (j) Material & Size of HV terminal spends.

36. **PARTICULARS OF L.V./ NEUTRAL BUSHING :**

- (a) Name of Manufacturer :
 - (b) Type :
 - (c) Confirming to ISS :
 - (d) Voltage rating :
 - (e) Dry withstand voltage for 1 minute :
 - (f) Wet Withstand voltage for 30 min. :
 - (g) Total creepage distance in air (mm) :
 - (h) Material and Size of LT terminal studs :
37. Time constant of transformer :
38. Radiation
- i) Heat dissipation by tank walls (excluding top & bottom) :
 - ii) Heat dissipation by cooling tubes :
 - iii) Diameter and thickness of cooling Tubes :
 - iv) Whether calculation sheet for selecting cooling area to ensure that the transformer

is capable of giving continuous rated output without exceeding temperature rise is enclosed.

39. **TRANSFORMER OIL**

- (a) Grade of Oil :
- (b) Dielectric strength :
- (c) Resistivity :
- (d) Acidity :
- (e) Tan Delta :
- (f) Name of Supplier (only reputed make shall be accepted) :

40. **Quantity of transformer oil**

- a) First filling :
- b) Drained out :

41. **WEIGHT OF THE FOLLOWING**

- (a) Tank & Fitting (Kg) :
- (b) Core coil assembly (Kg) :
- (c) All HV & LV coil (Kg) :
- (d) Core stampings(only) (Kg) :
- (e) Transformer oil (Kg) :
- (f) Total weight of transformer including oil (Kg.) :

42. **OVERALL DIMENSIONS OF TRANSFORMER**

- (a) Length (mm) :
- (b) Breadth (mm) :
- (c) Height (mm) :

- 43. Conservator dimensions :

44. Name of material, number, weight :
and size used for clamping of core
& winding
- (a) Core Clamp :
- (b) Tie Rod :
- (c) Core Bolt :
- (d) Bottom Foot Plate :
45. Line lead support details
46. Silica Gel breather size:
47. Clearance in air between :
- (a) Phase to Phase (HV Side) :
- (b) Phase to Earth (HV Side) :
- (c) Phase to Phase (LV) side
- (d) Phase to Earth (LV Side) :
48. Type Testing:
- (a) Is the offered 11/0.4 KV Conventional :
Type (3 Star rated) Distribution Transformer type tested?
- (b) If yes, when and where it was Type Tested? :
- (b) Is there any deviation in the technical specifications :
of offered transformer, if yes give details

(d) Details of type test reports:

| | Name of test | Date of test | Whether test report enclosed or not (Y/N) | If yes no. of sheets enclosed |
|---|--|--------------|---|-------------------------------|
| 1 | Impulse voltage withstand test at 95 KVP | | | |
| 2 | Temperature rise test | | | |
| 3 | Short circuit withstand test: Thermal and dynamic ability. | | | |
| 4 | Magnetic Balance Test. | | | |
| 5 | Air Pressure Test: As per IS – | | | |

| | | | | |
|---|---|--|--|--|
| | 1180. | | | |
| 6 | Noise-level measurement. | | | |
| 7 | Un-balanced current test: | | | |
| 8 | Measurement of zero-phase sequence impedance. | | | |
| 9 | Measurement of Harmonics of no-load current | | | |

49. Whether you will use specified Aluminium alloy or brass/ copper with suitable bimetallic arrangement for HV/LV connector? Yes/No
50. Have you submitted drawings and calculations of cross sectional area of core? Yes/No
51. Have you submitted calculation for computation of losses 100% and 50% load at 75 deg. C. as per design data of offered transformer? Yes/No
52. Whether the name plate gives all particulars : As required in tender? Yes/No
53. Whether the offer confirms to the limits of : Temperature rise mentioned in the specification Yes/No

IMPORTANT NOTES :

- (1) cross sectional area of core is to be substantiated by drawings and calculations.
- (2) maximum flux density at rated voltage and frequency is to be supported by calculations.
- (3) weight of stampings in core assembly must be substantiated by calculations.
- (4) computation of no load current at 90%, 100% and 110.0% may be supported by calculations.
- (5) computation of no load and full load loss at 75 deg.c. may be supported by calculations.
- (6) details of clearances as given in clause: 11 include thickness of.

SCHEDULE IB
ADDITIONAL DETAILS

| Sl. No. | Description | |
|---------|--|----------|
| 1. | Core Grade | |
| 2. | Core diameter | mm |
| 3. | Gross core area | sq cm |
| 4. | Net core area | sq cm |
| 5. | Flux density | Tesla |
| 6. | Mass of core | kg |
| 7. | Loss per kg core at the specified flux density | watt |
| 8. | Core window height | mm |
| 9. | Center to center distance o the core | mm |
| 10. | No. of LV Turns | |
| 11. | No. of HV Turns | |
| 12. | Size of LV conductor bare/covered | mm |
| 13. | Size of HV conductor bare/covered | mm |
| 14. | No. of parallels | |
| 15. | Current density of LV winding | A/sq mm. |
| 16. | Current density of HV winding | A/sq mm. |
| 17. | Wt. of the winding for Transformer | kg |
| 18. | Wt. of the HV winging of Transformer | kg |
| 19. | No. of LV Coils/phase | |
| 20. | No. of HV Coils/phase | |
| 21. | Height of LV Windings | mm |
| 22. | Height of HV Windings | mm |
| 23. | ID/OD of HV winding | mm |
| 24. | ID/OD of LV winding | mm |
| 25. | Size of the duct in LV winding | mm |
| 26. | Size of the duct in HV winding | mm |
| 27. | Size of the duct between HV and LV | mm |
| 28. | HV winding to tank LV winding clearance | mm |
| 29. | HV winding to tank clearance | mm |
| 30. | Calculated impedance | % |
| 31. | HV to earth creepage distance | mm |
| 32. | LV to earth creepage distance | mm |