

ANNEXURE

Dry type class F insulated step down voltage transformer in cubicle enclosure as per IS:11171/IS:2026/ IEC60076-11

ITEM-1

Rating & other specs

Quantity	12 nos.
Rated KVA (continuous duty)	100 KVA
Primary line voltage	11KV
Secondary voltage	130 V
Tappings on primary at	±5% in steps of 2.5% (5 positions)
Phase	3
Vector group	Dyn11
Frequency	50 ± 5Hz
Impedance	< 8%
Regulation	< 5%
Efficiency	> 95%
HV side cable entry/size	To be informed on order placement
LV side cable entry/size	To be informed on order placement
CT for overcurrent protection	3nos. in the primary winding of ratio 15/1A, 10VA class 5P10.
Temperature monitoring	WTI to be mounted on the enclosure complete with potential free contacts for programmable alarm and trip conditions. The meter shall be accessible from the front of the cubicle.

COMMON SPECIFICATIONS TO ABOVE ITEMS

Application

The transformer shall be connected to the high voltage bus and shall feed a three phase fully controlled thyristor bridge which in turn shall feed the excitation to the generator field so as-to maintain the voltage at the generator terminals constant. The transformer will be subjected to a non-sinusoidal load of power factor 0.5 (approx). It should also be suitable for inversion duty.

Service conditions

Ambient temperature	50°C
Humidity	100% tropical
Elevation	<1000m above mean sea level
Cooling	natural air, the ventilation of the transformer is restricted due to cubicle enclosure

Performance specification

- *Overvoltage withstanding capability.*
The transformer should be able to withstand 1.4 times the rated voltage for 6 seconds.
- *Ripple current withstanding capability.*
The transformer should operate continuously with currents of 30% of 5th harmonic and 15% of 7th harmonic superimposed on the fundamental current of 95% rated current.
- *BIL and power frequency withstanding capability.*
As per relevant IS and IEC recommendations: the transformer shall withstand a BIL voltage of 75KV peak and a voltage of 28KV rms.

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- *Maximum temperature rise of HV & LV windings.*
Temperature rise of the hottest spot should not exceed 90°C. Average temperature rise of the windings should not exceed 65°C.
- *Partial discharge.*
At rated voltage it should not exceed 50pC.
- *Life of the transformer.*
25 to 30 years of continuous run.

Constructional features

- The rectifier transformer shall be dry type designed for natural air cooling.
- The insulation used in the transformer shall be of class F or better. Copper shall be used as the winding material. Coils shall be resin cast. Current density in the winding shall be restricted to less than 1.8A/sqmm
- Suitable cable termination shall be provided for both the HV and LV windings. A separate terminal box shall be provided inside the cubicle for all control wire termination. Cable entry for both power and control cables will be from the bottom.
- Fittings, lifting lugs, rating/diagram plate and earthing terminals to be provided. An earth shield shall be provided between the LT and the HT windings.
- Limiting dimensions if any, shall be informed after first submission of dimensional drawings. Doors shall be constructed from 2mm thick sheet steel. The enclosure shall have mesh doors and side covers for ventilation suitable for a protection class of IP21 to IS:2147/IEC60529 and should be epoxy painted to light grey shade 631 of IS:5 both on the inside and the outside.
- Illumination lamps will be provided inside the enclosure, alongwith door switch, to illuminate when any door is open. Door switches shall also accommodate a contact that can be used in the plant relay interlocking to monitor enclosure door open condition.

Tests to be carried out on the transformer

Routine tests

- Measurement of winding resistance
- Measurement of voltage ratio & verification of voltage vector relationship
- Measurement of impedance of voltage, short circuit impedance and load loss on principal tap
- Measurement of no load current and losses
- Separate source voltage withstand test
- Induced overvoltage withstand test

Type tests (to be carried out on one transformer only)

- Partial discharge withstand test
- Temperature rise test
- Impulse test

Information required alongwith the offer

- Acceptance of all the clauses of our specification. Deviation if any should be clearly spelt out.
- The current density, the flux density, the core material and the conductor material.
- Iron and copper losses.
- Temperature rise calculations.
- Efficiency of the transformer

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- OGA drg of transformer

Information required within a fortnight of placement of order

- Six copies of general arrangement drawing showing foundation plan and mounting drawing with termination details to be furnished for approval.
- QA plan to ensure quality of the transformer to be furnished for approval.

Information required alongwith the consignment

- Eight copies of the following final documents (max. A3 size) & a soft copy on CD shall be furnished directly to our MM department while despatching the consignment :
 - ☞ general arrangement drawing alongwith foundation plan
 - ☞ wiring diagram (power and control)
 - ☞ test certificate showing detailed test results
 - ☞ operation & maintenance manual

Notes

- BHEL representative will witness the routine and type tests on the transformer. Testing charges should be included in the offer.
- Acceptance of performance guarantee to be reckoned after successful commissioning of the equipment.