



Annexure-A

METAL CLAD INDOOR VOLTAGE TRANSFORMER FOR PLUG-IN SYSTEM FOR 36 kV GIS

1.0 DESCRIPTION:

Voltage Transformers are single pole insulated & casted with epoxy resin for indoor application. The resin body shall be covered with a grounded aluminum box. The PT shall be suitable for installation outside the switchgear up to 36 kV voltage. The equipment shall meet all relevant international standards as per IEC 60044-2.

The primary coil and iron core together with secondary windings shall be completely resin embedded and casted in single process step. The secondary terminals shall be integrated in resin body and protected by an aluminum box.

The cover of aluminum box shall be removable and sealable.

The secondary lead shall be covered with fiber ribbons. The end splices shall be equipped with additional sleeves. Typical picture of secondary lead is as shown in fig-4.

Typical picture of plug in VT is as shown in fig. 1.



Fig-1

The high voltage end of primary winding terminal "A" (Refer fig-2) shall be provided with inner silicon cone of Size-2 and shall be applicable for specific plug in cable connection according. The other end of primary winding terminal "N" shall be grounded inside the secondary terminal box. For other secondary design, the terminal "N" shall be grounded by the manufacturer.

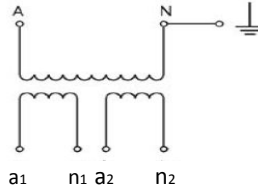
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Fig-2: Terminal marking according to IEC 60044-2

Primary



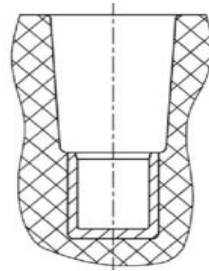
Secondary

Winding 1 a1-n1
Winding 2 a2-n2

PT must be suitable for following features:

- 1) It must have compact design, less space requirement.
- 2) It shall be mounting outside the GIS panel.
- 3) It should be safe to touch because of grounded housing
- 4) It should require no maintenance
- 5) It should have inner cone according to IEC.
- 6) It should have plug in cable connection.

Plug-in system design for inside cone according to IEC shall be as per fig-3 for Size-2 bushing and current rating of 800 A. Typical picture of cable connection is as shown in fig 4



a)Size2 Bushing



b)Cable with Size 2 Termination

Fig-3



Secondary lead

Fig-4

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2.0 TECHNICAL/ DESIGN PARAMETERS

Table-1

CLAUSE NO.	DESCRIPTION	BHEL'S REQUIREMENT	BIDDERS CONFIRMATION /COMMENTS
1.0	Technical Parameters		
1.1	Type	Single phase, Plug In Type for Size 2	
1.2	Design	Metal clad PT single pole insulated for cable connection, inner cone type 2 (800 A) as per IEC 60044-2	
1.3	Winding 1		
1.4	Ratio	33000 / $\sqrt{3}$ /110 $\sqrt{3}$ V	
1.5	Burden	25 VA	
1.6	Accuracy Class	3 P	
1.7	Winding 2	33000 / $\sqrt{3}$ /100 / $\sqrt{3}$ V	
1.8	Burden	25 VA	
1.9	Accuracy Class	0.2	
2.0	Burden	25 VA	
2.1	Voltage Factor	1.5 for 30 sec 1.2 continuously	
2.2	Insulation Class	E	
2.3	Standard	IEC 60044-2	
2.4	Insulation Level	36/70/170 kV	
2.5	Frequency	50 Hz	
2.6	Secondary terminal box	The PT is equipped with a secondary terminal Box made by Al-material.	
2.7	Fuse	Not applicable	
2.8	Insulation	Cast Resin, covered by using an Al-Box	
2.9	System highest voltage, kV	36	
3.0	Power freq. withstands voltage (primary), kV. Power freq. withstand voltage (secondary), kV	70 3	
3.1	Lightening Impulse withstand voltage , kVp	170	
3.2	Outer / Inner Core	Inner	
3.3	Plug in or Cable Connector	Cable Connector	
3.4	Size of plug	2	
3.5	Length of Secondary Lead	3m	

Table-2

ITEM NOS	RATIO	WINDING 1	WINDING 2	Drawing	TYPE	Qty (Nos)
001	33KV/ $\sqrt{3}$ / 110 $\sqrt{3}$ / 110 $\sqrt{3}$	3P,25VA	0.2,25 VA	35176500035-001 Rev 00 Vendor to furnish their PTs drgs.	SINGLE PHASE, SINGLE POLE WITHOUT HT FUSE	50Nos

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3.0 Construction:

3.1 Core

High grade non-ageing cold rolled grain oriented (CRGO-M4 or better) silicone steel of low hysteresis loss and permeability shall be used for core so as to ensure accuracy at both normal and or over Voltages. The flux density shall be limited to **1.6 Tesla** at normal voltage and frequency. There shall be no saturation at any stage during operation.

The instrument security factor of the core shall be low enough so as not to cause damage to the instruments in the event of maximum short circuit current or over voltages.

3.2 Windings

a) The primary and secondary windings shall be electrolytic copper of high purity and conductivity and covered with double paper insulation. The conductor shall be of adequate cross-section so as to limit the temperature rise even during maximum over voltages.

The insulation of windings and connections shall be free from composition liable to soften, ooze, shrink or collapse during service.

b) The secondary windings of the voltage transformers shall also be suitable for continuous over voltage corresponding to the maximum system voltage at the primary winding.

c) The winding supports shall be suitably reinforced to withstand normal handling and the thermal and dynamic stresses during operation without damage. The voltage transformer secondary circuits will be taken out to form the star point and earthed at one point outside the voltage transformers.

d) Both primary and secondary winding terminals shall be clearly and indelibly marked to show polarity in accordance with IEC 60044-2. The connections required for different secondary windings in case of multi-winding voltage transformers shall be clearly indicated in terminal blocks and the wiring diagrams.

4.0 TEST

4.1 Type Test

The voltage transformers shall be tested in accordance with the requirements of the type tests provided in the latest issues of IEC 60044-2.

Vendor to furnish Type test reports along with the offer.

- i. Lightning impulse voltage test
- ii. High voltage power frequency wet withstand voltage
- iii. Temperature rise test
- iv. Short circuit withstand capability test
- v. Determination of limits of voltage error and phase displacement

4.2 Routine Test

The routine tests must be performed on all PTs according to IEC.

- i. Verification of terminal marking and polarity
- ii. Power frequency withstand tests on primary winding
- iii. Power frequency dry withstand tests on secondary winding
- iv. Power frequency withstand tests between sections
- v. Determination of limits of voltage errors and phase displacement
- vi. Insulating Resistance measurement
- vii. Partial discharge measurement.

5.0 PACKAGING

The PTs must be suitably packed for transportation to avoid any damage during transportation

6.0 MAINTANACE

The PT should be maintenance free. PT shall be cleaned from time to time with soft, dry cloth.

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