

11 kV Outdoor Type, Oil Immersed Potential Transformer

1. This specification covers the design, manufacture, assembly, testing at manufacturer's works, supply and delivery of 11 KV outdoor type, single-phase, Oil immersed voltage transformers for solidly grounded system.

1.1 TYPE & RATING :-

The instrument transformers for 11 KV solidly grounded system shall be of outdoor type, oil cooled, single phase, 50 cycles, self cooled and suitable for operating in humid atmosphere and in the tropical sun with ambient temperatures upto 50 degree C. The equipment should be suitable for use in areas subjected to heavy lightening storms.

1.2 BASIC DESIGN FOR OIL IMMERSSED TYPE PTs:-

The PTs for solidly grounded system shall be outdoor single phase oil immersed and self cooled type suitable for services indicated as above complete in all respect, conforming to modern practices of design and manufacture.

As stated, all PTs shall be paper insulated oil filled. After providing paper insulation they shall be housed in the tank containing oil. Please note epoxy casting in primary & secondary cores is not acceptable. Compound filled PTs are also not acceptable. Manufacturers should describe complete process of manufacturing.

1.2.1 The insulation as per IS:4800 of the instrument transformers shall be so designed that the internal insulation shall have higher electrical withstand capability than the external insulation. The designed dielectric withstands values of external and internal insulations shall be clearly brought out in the guaranteed technical particulars. The dielectric withstand values specified in this specification are meant for fully assembled instrument transformers.

1.2.2 The Instrument transformers should be designed using single Porcelain housing.

1.2.3 No joints shall be provided in the porcelain. The housing shall be made of homogeneous, vitreous porcelain of high mechanical and dielectric strength, glazing of porcelain shall be of uniform brown or dark brown colour with a smooth surface arranged to shed away rain water or condensed water particles, (fog). The profile of porcelain shall be aerodynamic type as per IEC-815.

1.2.4 Details of attachment of metallic flanges to the porcelain shall be brought out in the offer.

1.2.5 Special precaution will have to be taken towards selection of material for the metal tank and the following will have to be ensured. :

- i) Material for metal tank should be minimum 3 mm thick.
- ii) The material should be clearly mentioned against relevant clause of technical questionnaire.
- iii) Welded joints have to be minimised to avoid possibility of oil leakage. In any case welding in horizontal plane shall be avoided.

1.2.6 Prevention of Oil leakages and Entry of Moisture:-

The sealing of PTs shall be properly achieved. The following should be properly taken care of & arrangement provided by the supplier shall be described :

- i) Locations of emergence of primary and secondary terminals.
- ii) Interface between porcelain housing and metal tank/s.
- iii) Cover of the secondary terminal box.

1.2.7 For gasket joints, wherever used, nitrite butyl rubber gaskets neoprene or any other improved material shall be fitted in properly machined groove with adequate space for accommodating the gasket under compression.

You have to justify that the quality of gaskets which will be used between the joints and also for mounting of oil level indicator will be of best quality to avoid leakage of oil. The quality of gasket should be selected keeping in mind that the ambient temperature in Chhattisgarh may touch 50 deg. centigrade.

1.2.8 The Instrument transformers shall be so constructed that it can be easily transported to site within the allowable transport limitation and in horizontal position.

1.2.9 For indication of oil level, suitable arrangement by way of clear glass window or any other superior arrangement shall be provided.

1.2.10 The secondary terminals shall be brought out in a weather proof terminal box. Firstly the connections will be terminated on a internal COMPANY and then the same shall be brought out in the Secondary terminal box. The terminal box shall be provided with removable gland plate and gland/s suitable for 1100 volts grade, PVC insulated, PVC sheathed multi-core 2.5 sq. mm or 4 sq. mm. stranded copper cable

1.2.11 The terminal box shall be dust and vermin proof. Suitable arrangement shall be made for drying of air inside the secondary terminal box. The dimensions of the terminal box and its openings shall be adequate to enable easy access and working space with use of normal tools. The outer cover of secondary terminal box shall have provision for sealing by way of insertion of wire in the bolt hole. A drawing indicating above arrangement may please be furnished alongwith the offer

1.2.12 Polarity shall be invariably marked on each primary and secondary terminal. Facility shall be provided against short circuiting & grounding of the PT secondary terminal inside the terminal box. All marking shall be engraved or through anodised plate to be fixed firmly.

1.2.13 The Instrument transformers shall be provided with a rating plate with dimensions and markings as per IS:3156. The markings shall be punched/engraved and not painted. This rating plate shall also contain our purchase order no. and date.

1.2.14 The instrument transformer shall be vacuum filled with oil after processing and thereafter hermetically sealed to eliminate breathing and to prevent air and moisture from entering the tanks. Oil filling valve/or oil sampling cocks, if provided to facilitate factory processing, should be permanently sealed before despatching. The method adopted for hermetic sealing shall be described in the offer.

1.2.15 The castings of base, collar etc. shall be diecast and tested before assembly to detect cracks and voids if any.

1.2.16 The instrument security factor of metering core shall be low enough and not greater than 5. This shall be demonstrated on all the ratios of the metering core, in accordance with procedure specified in IEC-816 or IS: 3156.

1.2.17 Instrument transformer shall be provided with two separate earthing terminal s for bolted connection to 50 x 8 mm MS flat to be provided by the Purchase for connection to station earth-mat.

1.2.18 Instrument transformer shall be provided with suitable lifting arrangement, to lift the entire unit. The lifting arrangement shall be clearly shown in the general arrangement drawing. Lifting arrangement (lifting eye) shall be positioned in such a way as to avoid any damage to the porcelain housing or the tanks during lifting for installation/transport. Necessary string guides shall be offered which shall be of removable type.

1.3 PRIMARY WINDINGS :-

1.3.1 Primary winding shall be made out of electrolytic grade 99.9% conductivity copper. The primary winding shall be housed in rigid metallic shell. Joints in the primary winding shall not be provided.

1.3.2 It is desired that from the point of view of adequate mechanical strength in the normal course and also during short circuit, proper precaution should be taken as under :-

- i) The primary winding should be housed in rigid metallic shell.
- ii) The winding assembly should be held firmly and for this purpose suitable clamping arrangement at the bottom shall be provided and explained through suitable sketch. Firm clamping arrangement is a must and holding of winding using nylon rope etc. shall not be acceptable.

1.3.3 All primaries of PTs will be connected in phase to neutral with neutral point solidly earthed. The neutral of the system is also solidly earthed.

1.4 SECONDARY WINDINGS :-

Suitably insulated copper wire of 99.9% conductivity electrolytic grade shall be used for secondary windings. All PTs for wye or phase to ground connection shall be provided, with

separate windings. The star winding to be used for metering & relaying shall be of accuracy class as specified for appropriate class. The rated burden of the winding shall not be less than specified value.

1.5 PRIMARY TERMINALS:-

For various rating of PTs, selection of primary terminal only of copper material shall be made carefully. The primary terminal on either side of the tank shall be of not less than 80 mm length to accommodate terminal connector.

The primary terminals shall be standard size of 16 mm dia x 80mm length of heavily tinned electrolytic copper. The minimum thickness of tinning shall be 15 microns. The ratio changing strip shall be of copper and of adequate thickness.

1.6 SECONDARY TERMINALS :-

Secondary terminal studs shall be provided with at least three nuts and adequate plain and spring washers for fixing the leads. The studs, nuts and washers shall be of brass, duly nickel plated. The minimum outside diameter of the studs shall be 8 mm. The length of at least 15 mm shall be available on the studs for inserting the leads. The horizontal spacing between centers of the adjacent studs shall be at least 1.5 times the outside diameter of the nuts. The arrangement should be shown through suitable sketch.

1.7 CORE :

The grade M4 toroidal core shall be of high grade non-ageing electrical silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy. The instrument transformer core to be used for metering shall be of accuracy class specified or appropriate class suitable for commercial and industrial metering.

1.7.1 Enamel, if used for conductor insulation, shall be either polyvinyl / Polyester acetate type or amide type and shall meet the requirements of IS: 13730(part1):1993 and 13730(part 3):1996.

1.8 INSULATION OIL :-

The quantity of oil for first filling of oil in each transformer shall be in the scope of supplier. Only best quality new EHV Gr.I transformer oil should be filled in the equipments with BDV of 70 KV. The BDV of oil filled in the equipment will have to be recorded in the test certificate.

2. PRINCIPAL PARAMETERS FOR 11KV POTENTIAL TRANSFORMERS

The 11 KV & 33 KV Potential Transformers shall have the following rating:-

SR. NO.	PARTICULARS	11KV OIL IMMERSSED AND SELF COOLED TYPE SINGLE PHASE POTENTIAL TRANSFORMERS
1.	Type & Designation (Type shall be stated by the bidder)	Single phase, outdoor, oil immersed and self cooled type pole mounting dry type
2.	Nominal System Voltage	11 KV
3.	Highest System Voltage	12 KV
4.	Rated Primary Voltage	11000/√3 V
5.	Rated secondary voltage (i) WINDING -I (ii) WINDING -II	110/√3 V 110/√3 V
6.	Rated Transformation ratio	11000/√3V/110/√3 V
7.	Frequency	50Hz
8.	Rated Output	50 VA
9.	Rated insulation level	28 KVrms
10.	Accuracy class (i) winding -I(for metering) (ii) winding -II(for protection)	0.5 3P
11.	Number of phases	Single
12.	Type of supply & earthing condition	3 Ph effectively earthed
13.	Rated Voltage factor & duration	1.25 Continuous & 1.5 for 30 Sec.
14.	Rated Burden	

	(i)WINDING –I (ii)WINDING –II	50 VA 50 VA	
15	Max ratio error with rated burden and 5% normal primary voltage	As per IS 3156-1992	
16	Max Phase angle error with rated burden and 5% normal primary voltage	As per IS 3156-1992	
17	Temperature rise at 1.25 times rated voltage with rated burden at 50 °C Ambient.	45 °C (Max.)	
18	Temperature rise for above As per IS 3156	As per IS3156	
19	One minute power frequency withstand voltage Rms	70KV rms	28 KV rms
20	1.2/50 micro second impulse wave withstand test vorage	170 KV (peak)	75 kvp

3 SPECIAL REQUIREMENT FOR POTENTIAL TRANSFORMERS:

3.1 MAXIMUM CONTINUOUS OPERATING VOLTAGE :

It should be specifically confirmed that all PTs offered against the tender specification are suitable for continuous over voltage of 25% of rated system voltage. For this purpose, precaution taken in design of equipment may be suitably explained. For all the PTs which are to be designed for 25% continuous over voltage, the allowable temperature rise at 125% rated voltage shall be as per permissible value as specified in IS.

3.2 CONSISTENCY OF ACCURACY :-

It should be specifically confirmed that with continuous over voltage as given in above para, the ratio/phase angle errors of the PTs shall be maintained strictly within specified limits without any drift and no variation shall take place due to overloading condition.

3.3 STANDARD :-

The instrument transformers shall comply with the latest issue of Indian Standard 3156, BS-3941 or IEC-186 except where specified otherwise, equipments meeting any other authoritative standard which ensures an equal or better quality than the standard mentioned above, is also acceptable.

3.4 CLIMATIC CONDITIONS: -

The PT supplied against these specifications shall be suitable for satisfactory continuous operation under the tropical conditions. The detailed conditions are mentioned in General Terms & Conditions of Purchase (Clause-32 of Annexure-B).

3.5 SURFACE FINISH:-

The metal tanks shall be coated with atleast two coats of zinc rich epoxy painting. All the ferrous parts/hardware, exposed to atmosphere, shall be hot dip galvanised conforming to IS;2633. All other fixing nuts, bolts, washers shall be made out of stainless steel.

3.6 TERMINAL CONNECTORS:-

Terminal connectors shall be suitable for single Dog conductor for 11 KV PTs. The terminal connector suitable for horizontal take off and vertical take off (Universal type) shall be supplied. Suitable terminal for earthing connection shall also be supplied.

The design of clamp shall be to our approval. The details of take off as required by us should be detailed out in drawing and should be submitted along with the offer. In respect of the terminal connectors following should be ensured:-

1. The terminal connector should be made of LM6 Aluminum Alloy and by gravity diecast only. Sand casted terminal connectors are not acceptable.
2. All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges should be rounded off.
3. No part of clamp shall be less than 12 mm thick.
4. The bimetallic strips/sleeve shall be 2 mm thick.
5. All nuts/bolts/washers shall be of stainless steel material only.

3.7 The PTs shall be suitable for mounting on our steel structure which shall be arranged by the purchaser. The structure drawing is placed at Annexure-I.

3.8 TEMPERATURE RISE -

The potential transformers shall be designed to limit the temperature of winding and other parts as specified in the standards, when corrected for the difference between the temperature prevailing at site and temperature specified by the standards. The temperature rise at 1.25 times rated primary voltage for PTs.

4. INSPECTION & TESTS:-

Reports of all type tests as stipulated in latest version of IS:3156 (Part-I,II,III & IV) or IEC 186 shall be supplied alongwith the bids. This is essential. The tenderer must carefully go through our specification regarding short time current rating, impulse level and all type test reports as per IS should be furnished with the technical bid. Type test reports which are older than 5 years shall not be acceptable.

The type test reports of following tests are to be furnished in Technical bid.

5. TYPE TESTS:-

- 1) Temperature rise test (as per clause 9.5 of IS 3156 part I)
- 2) Lightning impulse test (as per clause 9.6 of IS 3156 part-I)
- 3) Determination of errors / Accuracy class.
- 4) High voltage power frequency wet withstand test (as per clause 9.7 of IS:3156 Part-I)

The bidder should furnish (duly self-attested) for above tests as per IS 3156 (with latest amendment) from Govt lab govt recognized independent NABL lab along with his offer.

6. ROUTINE TESTS: - Each instrument transformer shall be subjected to routine tests as specified in IS 2705 and IS; 3156, or IEC 186 in the presence of purchaser. All test report should be submitted and should be got approved by the purchaser before despatch of the equipments. The routine tests to be carried out during final inspection shall be as follows:-

- 1) Verification of terminal markings & polarity (clause 9.2)
- 2) Power frequency dry withstand test on primary winding (clause 9.3)
- 3) Power frequency dry withstand test on secondary winding (clause 9.4)
 - 4) Determination of errors or other characteristics according to requirements and class of accuracy.
- 5) Determination of errors

7. STAGE INSPECTION :-

The COMPANY reserves the right to carryout stage inspection during manufacture. The inspection will include verification of all raw materials, construction practice, quality control process and inspection of primary and secondary winding before final assembly of equipment. Tenderers will have to confirm that they will render all assistance for this purpose.

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