Technical specification and schedule of requirement of **Type-Tested 33 KV, Outdoor type oil immersed CT-PT combined metering unit 3 phase, 4 four (33 kV / 110V, -/5A**)

**Annexure – ‘B’**

* 1. **Scope**

This specification covers the design, manufacture, assembly testing at supplier’s works before despatch and delivery of 33 kV combined type CT-PT units for metering purpose having 3 nos. of single phase potential transformers for 33 kV CT –PT sets and 3 nos. single phase oil immersed current transformers having insulation class-‘A’ (moisture resistant) weather proof bushing for **outdoor** use.

#### Applicable standards

Unless otherwise modified in this specification, the 33 kV CT-PT metering sets shall comply with the following Indian standard specification (latest version).

|  |  |  |  |
| --- | --- | --- | --- |
| IS: | 2705- | 1992 | Specification for current transformers |
| IS: | 3156- | 1992 | Specification for voltage transformers |
| IS: | 5621- | 1980 | Specification for Insulator / Bushing |
| IS: | 2099- | 1986 and |  |
| IS: | 3347- | 1986 |  |
| IS: | 0335- | 1983 and | Specification for new Insulating oil. |
| IS: | 5561- |  | Specification for terminal connector. |

Equipments conforming to any other International Standard, which ensure equal or better quality than the standard mentioned above will also be acceptable and in such case the copy of standards (English version) adopted should be provided.

* 1. The metering units shall be supplied complete with filling of EHV grade new oil conforming to IS 335:1983 with latest revision thereof. Type test certificate of oil used shall be produced at the time of inspection.
  2. The metering equipments shall be contained in a weather proof, **outdoor**, Pole mounting / Platform mounting type M.S tank with 6 No of 33 KV bushing with brass stud as per rating of CT-PT metering units. 3 No bushing on incoming and 3 No bushing on outgoing terminals with M & L marking embossed on incoming and outgoing bushing respectively. Insulation and sealing arrangement of each HT bushes shall be as per drawing enclosed as annex-M’. The insulating material shall be of high grade and heat resistant. The cover should have the facility for sealing with polycarbonate seal bits. The cover should be designed in such a way that appropriate size armoured XLPE cable could be fixed easily.
  3. No fuse either on HT or LT side of P.T shall be provided.
  4. The tank shall be painted with one coat of primer and two coats of rust preventing Synthetic enamel paint of light gray colour on all external surfaces. The internal surface of the tank shall be painted with two coats of suitable paint insoluble in oil.

The quality of paint shall match the best of industry standard.

* 1. The top of the tank shall have slope to drain the rainwater and avoid collection pockets.
  2. Conservator of adequate capacity would be provided along with metering equipment to facilities expansion and contraction of oil due to change in temperature.
  3. A suitable air release valve at the top of the tank cover shall be provided.
  4. Top cover of metering unit shall be provided with sealing arrangement at all four corners and corner bolts will be drilled suitably to insert sealing wire.
  5. The secondary terminal shall be brought out in suitable compartment which shall have a removable transparent glass cover at the front and single compression cable gland suitable to house 2.5 mm², 10/c pvc wire armoured copper control cable. The removable glass cover shall be sliding type which when pushed, locks in helmet locking fashion and it will not be possible to remove the cover without breaking the glass. The LT compartment shall be built in front side /side face of the metering unit and shall not be of detachable type. The terminal box with cover closed and cable in position shall have a degree of protection conforming to IS 2147:1962. There shall be provision for sufficient number and size of studs solidly welded to the tank body for sealing the terminal box. Sealing bolts will be drilled to provide check nuts/ sealing wire to seal the metering unit with

appropriate seal bits. The studs/bolts shall be provided with sufficient nuts, washers. Spacing of secondary terminals shall be such that it gains maxm. clearance for connection. All the terminals inside the secondary terminal box must be suitably marked. The neutral point of HT-PT coil will be earthed inside the secondary box by sold plate in a manner that it can be removed for taking IR value.

* 1. The gaskets used should be of best quality having a minimum thickness of 3 mm. The information about the gasket materials used on the metering equipment should be maintained in the offer.
  2. All the welded joints in the metering equipments tank should be leak-proof and pressure tested.
  3. The thickness of M.S sheet used for fabrication of tank shall not be less than 3.00 mm for sides and 6 mm for top cover and bottom.
  4. The paper used for insulation shall be of high insulation grade. The process of impregnation shall be as per specifications. The core materials of CT-PT shall be of high grade, non- ageing electrical silicon steel having low hystersis loss and high permeability to ensure accuracy at both normal and over current/ voltage.
  5. The CT-PT combined metering units shall be type tested as per relevant I.S from CPRI /ERDA Vadodara / National test house, GOI.
  6. Drawing of CT-PT units must be furnished alongwith complete design details.
  7. The equipments shall be suitable for operation under climatic condition as mentioned below:-

##### Maximum ambient temperature in shade- 50°C

* + 1. Maximum average ambient temperature- 45°C
    2. Minimum ambient temperature- 4°C
    3. Maximum relative humidity- 95%.
    4. Average number of thunderstorm days per annum-50
    5. Number of months of tropical monsoon conditions-4 months
    6. Maximum wind pressure- 100 kg /m²
    7. Altitude not exceeding- 1000 Mtrs. from minimum Sea level.
    8. Maximum temperature attainable exposed to sun- 60°C
    9. Average annual rainfall – 1300 mm
  1. **Fittings and Accessories**

The **outdoor** platform / pole mounting type-metering equipments shall be complete with tank, fittings, accessories and terminal connections as detailed below:-

1 No. Electrically welded sheet steel tank / enclosure for accommodating above instrument transformers with suitable bolted cover.

5 No. **outdoor** single porcelain bushing of reputed make without arcing horns. 3 nos. for incoming and 2 nos. for outgoing.

1 No. Secondary terminal box. The necessary gland / socket shall be in the scope of supply. 1 No. Oil filling hole with cap / plug.

1 No. Plain oil level gauge / indicator with Min. oil level marking.

1. No. Filtration plug with pipe welded to plug and extended up to 25 mm above the bottom of the tank is to be provided for the purpose of oil filtration.
2. No. Lifting lugs for lifting the complete CT-PT unit. 2 No. Earthing terminals.
3. No. Rating and diagram plate.
4. No. base channel 100 mm x 50 mm x 6 mm welded at the bottom of the tank having 4 nos. suitable fixing holes for mounting on platform.

CT terminals should be provided with shorting links.

There shall be no fourth wire arrangement and the cores of PT will not be screened. The cores will be clamped with suitable Flat and spring washers.

20 **Quantity to be purchased**:- 100 sets 33 KV metering unit

|  |  |
| --- | --- |
| a) 30/5A- | 26 set |
| b) 60/5A- | 26 set |
| c) 100/5A- | 21 set |
| d) 200/5A | 11 set |
| e) 400/5A | 08 set |
| f) 600/5A | 08 set |

##### 33 kV / 110V, -/5A

**Total: 100** sets

##### Quantity may increase or decrease at the time of placing orders.

1. **SPECIFICATION FOR 33KV / 110V COMBINED CT,PT, unit, outdoor type**

Potential T/F shall have following ratings:-

|  |  |  |
| --- | --- | --- |
| 1 | Nominal system voltage | 33 KV |
| 2 | Highest system voltage | 36 KV |
| 3 | No of phases | 03 |
| 4 | Frequency | 50 HZ |
| 5 | Ratio | 33000/ 110 V |
| 6 | Rated output | 50 vA per phase |
| 7 | Impulse withstand voltage  (on assembled CT,PT set) | 150 KV (Primary) |
| 8 | Winding connection | Star / Star |
| 9 | Class of accuracy | 0.5 (As per IS 3156 with latest amendment |
| 10 | Earthing | As per IS 3156, clause 5 |
| 11 | Rated voltage factor | 1.2 times continuous and 1.5 times for 30 sec. |
| 12 | Maxm. winding Temp. rise Over ambient | Within limit of IS:3156 with latest amendments / revision |
| 13 | Maxm. ratio error | Within limit of IS 3156 with latest revision |
| 14 | Maxm. phase angle error | -----do---- |
| 15 | Marking | As per clause 8 of IS 3156 |
| 16 | Primary and Secondary winding | Good quality super enamel copper conductor |
| 17 | Core of PT | Good quality CRGO silicon steel B.H curve of  the core material to be used is to be provided. |
| 18 | Class of insulation | Class-A moisture resistant. |
| 19 | One minute power frequency  dry withstand voltage (on assembled CT-PT sets) | Primary 30 kV rms Secondary 3 kV rms |

There shall be no fuse either in HT or LT side and core of the transformer shall not be subject to any type of shielding. The transformer oil provided by the manufacturer shall be of EHV grade and conform to the IS 335 / 1983 with latest amendment. Wherever, the pertinent parameter has not been mentioned in aforesaid table, the relevant section of IS 3156 shall apply as strict quality control measure. All clearances and safety measures shall be taken in compliance of relevant sections of IE rule, 1956.

The L.T terminal cover of the combined CT,PT unit shall be welded to the body of the CT,PT unit. The cover of L.T terminal shall be designed to carry colorless transparent glass, which when pushed, locks in helmet locking fashion. Holes shall be drilled sealing bolts for sealing purpose.

# SPECIFICATION OF CURRENT TRANSFORMER

|  |  |  |
| --- | --- | --- |
| 1 | Nominal system voltage | 33 KV RMS |
| 2 | Highest system voltage | 36 KV RMS |
| 3 | Frequency | 50 HZ |
| 4 | No. of CT | Three |
| 5 | Transformation ratio | 30/5A, 60/5A, 100/5A, 200/5A, 400/5A, 600/5A |
| 6 | Rated output | 15 VA |
| 7 | Class of accuracy | 0.5 |
| 8 | Rated continuous thermal current | 1.2 times of rated primary current |
| 9 | Short time current rating for 1 sec. | 13.1 K.A |
| 10 | Rated dynamic current (peak) | 2.5 times STTC rating |
| 11 | Instrument Security Factor | 5 (the supplier shall conduct instrument security current  test as per clause 7.1.2 of IS2705. |
| 12 | Impulse withstand voltage | 150 KV (peak) |
| 13 | One minute power frequency dry  withstand voltage | 30 KV rms (primary)  03 kV rms (Secondary) |
| 14 | Maxm. Winding temp rise above  ambient | Within limit of IS:2705 / 1992 with latest amendments |
| 15 | Maxm. ratio error | As per IS2705/1992 |
| 16 | Maxm. ratio error | As per IS2705/1992 |
| 17 | Winding (primary and Secondary) | Suitable size good quality, synthetic enamel copper  conductor Maxm. Current density- 1.7A/mm². |
| 18 | Class of insulation | Class A |
| 19 | Core of CT | Good quality CRGO, silicon steel. B-H curve of the core material to be used to be provided. To be designed for  Flux density of 0.1T (Maxm.) |

The primary and secondary of the current transformer must be placed symmetrically in both axial and radial direction. Whenever, the pertinent parameters have not been mentioned in aforesaid table, the relevant section of IS 2705 with latest amendment shall apply as quality control measure.

The core of the CT shall be good quality CRGO silicon steel and the supplier shall provide BH curve of the core material to be used. All clearances and safety measures shall be taken in compliance of relevant sections of IE rule, 1956.

23) i) H.V winding of 33 kV/11 kV instrument T/F shall have proper DPC insulation.

ii) The core materials shall be high grade non aging laminations of low hysteresis loss and high permeability to ensure accuracy at normal and over current / voltage conditions. The excitation current shall be as low as possible and bidder will submit excitation current at rated and 110% of rated voltage with the commercial part of the bid. The C.T characteristic shall be such as to provide satisfactory performance for burdens ranging from 25% to 100% of rated burden. The PT characteristic shall be such as to provide satisfactory performance for burdens ranging from at least 25% to 100% of rated burden over a range of at least 80% to 120% of rated voltage at 0.8 p.f.

The CP-PT unit shall be capable to withstand Electrical and mechanical stresses due to maxm. short circuit current to absorb operational shock and also take care of thermal expansion effect and Ferro resonance effect.

Dimension and elec. characteristic of bushings shall be in accordance with IS 2099/1986, IS5621 /1980 and it’s latest amendments. All routine and type test certificates for bushings should also be enclosed with the offer. All Horizontal and vertical clearance shall be in compliance of relevant IE rule 1956 and IGG**.** The transformer oil shall be used of best quality in strict compliance of IS:335:1983. Routine and type test report of transformer oil shall be submitted by the bidder alongwith tech. & comm. part.

Tank: The tank shall be constructed to provide enough space for mounting of secondary windings and primary windings. It must be continuous welded and pressure tested to ensure proper welding in order to avoid leakage. Thickness of top and bottom plates shall not be less then 6mm and side plates shall not be less then 3mm.

The secondary terminal shall be brought out in suitable compartment which shall have a removable transparent glass cover at the front and double compression cable gland suitable to house 2.5 mm², 10/c pvc wire armoured copper control cable. The removable glass cover shall be sliding type which when pushed, locks in helmet locking fashion and it will not be possible to remove the cover without breaking the gland. The LT compartment shall be built in front side of the metering unit and shall not be of detachable type. The terminal box with cover closed and cable in position shall have a degree of protection conforming to IS 2147:1962. There shall be provision for sufficient number and size of studs solidly welded to the tank body for sealing the terminal box. Sealing bolts will be drilled to provide check nuts/ sealing wire to seal the metering unit with appropriate seal bits. The studs/bolts shall be provided with sufficient nuts, washers. Spacing of secondary terminals shall be such that it gains maxm. clearance for connection.

All nuts, volts & washers shall be phosphor bronze unless otherwise approved by the purchaser.