





STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : **ENG-HV-2033 (R1)**

Specification Name: 11KV, 3P4W, 5-400/5A,0.2s ACCURACY CLASS, 15VA CT& 0.2 CLASS ,50VA PT
COMBINED, OIL COOLED METERING UNITS

   	Specification No: ENG-HV-2033 (R1) Specification Name: 11KV, 3P4W, 5-400/5A,0.5s ACCURACY CLASS, 15VA CT& 0.5 CLASS ,50VA PT COMBINED, OIL COOLED METERING UNITS.
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Annexure _I Revision 1 ENG-EHV-2033- Technical Specification for 11KV, 3P4W, 5-400/5A,0.5s ACCURACY CLASS, 15VA CT& 0.5 CLASS ,50VA PT COMBINED, OIL COOLED METERING UNITS			
Sl. No.	Particulars	Observations	Actions Taken
1	Short time thermal current and its duration	3KA/1Sec 5/5 A 6.4 KA /1 Sec(10/5A-20/5A) 13.1KA/1Sec (30/5A-75/5A) 25KA/1Sec for 100/5A & above	Incorporated
2	Approved make	Oil, Gasket, Bushing, Channel	Incorporated
3	Clause 7 Test : Type Test	Type test requirement	Incorporated



Specification No: ENG-HV-2033 (R1)

Specification Name: 11KV, 3P4W, 5-400/5A, 0.5s ACCURACY CLASS, 15VA CT & 0.5 CLASS, 50VA PT COMBINED, OIL COOLED METERING UNITS.

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1. **SCOPE:**

This specification covers designing, manufacturing, assembling, stage testing, inspection, supply, loading at factory, transportation to stores, unloading at stores of 11KV, of different ratio 3P4W, 0.5s accuracy class CT & 0.5 accuracy class PT, CTPT Combined, Oil Cooled Metering Units.

2. **APPLICABLE STANDARDS:**

Except where modified by this specification the component parts of the equipment shall comply with the following IS available (the latest versions).

- Current Transformers :IS2705/1992
- Potential Transformers : IS 3156/1992
- HV Porcelain Bushing :IS 2099/1986
- Oil : IS 335/1983
- Electric strength for insulation oil : IS6792/1992
- Galvanization: IS 2633 Primary Terminals : IS 10601

3. **CLIMATIC CONDITIONS OF THE INSTALLATION:**

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)
11	Average Thunderstorms prevailing in the area	90 days per annum
12	Average Dust storms prevailing in the area	150 days per annum

TPCODL/TPNODL/TPSODL/TPCODL/TPWODL/TPWODL/TPSODL service area has **heavy saline conditions along the coast and High cyclonic Intensity winds with speed up to 300 Km ph**. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. **GENERAL TECHNICAL REQUIREMENT:**

4.1 **Metering Unit Rating:-**

The 11KV, 3P4W, CTPT sets shall have the following ratings.

i	Rated Voltage	11 KV
ii	Highest system voltage	12 KV
iii	Insulation level	28 KV
iv	Standard Impulse withstand voltage	75 KV Peak
v	One minute power frequency withstand Voltage	
a)	Primary:	28 KV
b)	Secondary	3 KV
vi	Short time thermal current and its duration	3KA/1Sec 5/5 A 6.4 KA /1 Sec(10/5A-20/5A) 13.1KA/1Sec (30/5A-75/5A) 25KA/1Sec for 100/5A & above
vii	Class of Accuracy	0.5s for CT & 0.5 for PT
viii	Rated burden per Phase	For CTs : 15 VA (5A-400A/5A)
		For PTs : 50 VA (11KV/ $\sqrt{3}$ / 110/ $\sqrt{3}$)
ix	Frequency	50 HZ
x	Maximum attainable winding temperature	80 deg C
xi	Minimum Phase to Phase distance	255 mm
xii	Shortest distance between metal part & earth	190 mm
xiii	Creepage distance of HV bushing	300mm (Min)
xiv	Thickness of MS Tank	Min 5mm for top cover & 3.15 mm bottom & all other side
xv	Galvanization	Entire tank including secondary chamber shall be hot dip galvanized

xvi	Bi-metallic terminal connector	Bi-metallic terminal connector with a nut, plane washer, spring washer & check nut suitable for aluminum conductor required for different rating of metering units. Six nos to be provided with each metering units.
xvii	Minimum volume of oil	Shall not be less than 45 ltrs.

4.2 Metering Unit Type:-

- a) The 3P4W, metering transformer equipment should be of pole mounting type for outdoor use.
- b) They are to be used in 11KV Three Phase system with solidly earthed neutral and should also be suitable for 3 Phase 3 Wire 50 Hz network.
- c) The equipment is required for operation of HT Tri-vector Meters and should be oil cooled.

5. CONSTRUCTION:

5.1 Design:

5.1.1 The equipment shall be designed to ensure satisfactory operation under all conditions of service to facilitate easy inspection, cleaning and repairs.

5.1.2 The design shall incorporate every reasonable precaution and provisions for safety of all those concerned in the operation and maintenance of the equipment. **A pressure relief valve with metallic cap** shall be invariably provided to the CTPT set. It shall be provided at the top cover of the tank.

All outdoor apparatus shall be so designed that water cannot collect at any point and enter the CT/PT set. The top cover of the tank, secondary terminal cover, inspection chamber cover plate may be designed accordingly. All outdoor apparatus shall be so designed that water cannot collect at any point and enter the CT/PT set. The top covers of the tank, secondary terminal cover, inspection chamber cover plate are suitable bent at the edges **(at least 25mm bent)** so that the gaskets are not exposed to moisture.

5.1.3 All connections and terminals shall be of sufficient size for carrying the specified currents continuously without undue heating.

5.1.4 **All bolts, nuts, washers in contact with non-ferrous parts shall be of brass.**

5.1.5 All ferrous parts including bolts & nuts liable to corrosion, forming integral part of the equipment shall be SS.

5.1.6 The secondary terminal box with double door arrangement (Inner & Outer) and oil gauge shall be provided with Metering Units. The inner door of the secondary chamber should be of hinge type with suitable handle/knob& sealing arrangement.

- 5.1.7** The core shall be high grade non-ageing electrical silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy, at both normal and over current/voltage.
- 5.1.8** All winding shall be of insulated high grade Electrolytic copper wire and the manufacturing of the units shall be done in completely closed and air-conditioned room otherwise Fiber glass insulation sleeves are to be provided for primary winding. Details of winding and core shall be furnished.
- 5.1.9** The CTPT set should have Three CTs and One three phase PTs with star / star connection.

5.2 Sealing:

Sealing bolts for sealing at 4 points on the secondary terminal box (both inner & outer door) and the top cover of the tank shall be provided. This may be made by providing a hole on tail of corner bolts of adequate size to pass the sealing wire of above 13 SWG.

5.3 Fluctuation In Voltage And Frequency:

For continuous operation entire equipment shall be subjected to variation of voltage up to +20% & -30% of rated voltage and frequency of +/- 5% of rated frequency.

5.4 Instrument Transformers (CT & PT):

- The voltage and current transformers shall have normal continuous rating as per the schedule of requirement.
- The voltage transformer shall be so designed that the increased magnetizing currents due to any persisting over voltage, does not produce injurious overheating. **Phase barriers shall be provided.**
- The peak value of the rated dynamic current shall not be less than 2.5 times the rated short time thermal current unless stated otherwise. (6.6.2 of ISS : 2705/Part-I of 1992, latest version).
- Modified Polyester Enamel Copper Wire** is to be used for winding and it shall conform to IS-4800/ Part-V (latest version).
- The terminals of the Instrument Transformer shall be clearly marked by distinctive letters as stated in Annex 'C' of IS : 3156/ Part I/ 1992 (latest version) for voltage transformer and Annex "C" of IS-2705/ Part.I/ 1992 (latest version) for current transformers.
- The winding shall be neatly laid and anchored.
- The metering set tank and other metal parts shall be galvanized both inside & outside as per latest IS applicable.

5.5 Incoming side:

5.5.1 Terminals:-

- Brass rods 12 mm dia up to 20A & 16mm dia >20A for Primary and 6 mm dia for secondary. The lugs shall be properly crimped & brazed.

Bushing for outgoing side of CT/PT set:-

- b) The porcelain portion of HT bushings shall be of standard make and conform to IS-2099/1986.
- c) The dimensions of the bushings shall conform to IS: 3347/ Part.III/ 1972. The minimum phase-to-phase clearance shall be as per IS/GTP.
- d) The bushings shall be of reputed manufacturers which are having complete testing facilities. It should be ISI marked.
- e) The bushing stems shall be provided with suitable bimetallic connectors so as to connect the jumper without disturbing the bushing stem. The bush rod stem length should be at least 40 mm and 3 nuts with 2 flat washers of brass material should be provided with each bush rod.

5.6 **Steel Tank:**

- a) The oil filled container incorporating the voltage transformers and current transformers should be fitted with incoming and outgoing primary terminals and secondary terminal box. The secondary terminal box shall be arranged on sides. The general arrangement drawing with 3 bushing on the incoming side and 3 bushings on the outgoing side shall be submitted along with tender. Adequate level of oil shall be maintained in the tank for proper cooling & curb flashover.
- b) The tank shall be built with a plate of 5 mm thick top and 3.15 mm sides and bottom and with all fittings shall be capable of withstanding without leakage or distortion at the standard test pressure. All joints of the tank and fittings shall be hot oil tight and no leakage should occur during service. Both side of the joint should have continuous welding.
- c) It shall be provided with an oil gauge. The oil gauge glass shall be fixed to the side of the raised wall of the inspection box.
- d) The tank shall be provided with necessary lifting lugs. Tank including top cover and secondary chamber shall be hot dip Galvanized.
- e) The secondary terminal box cover, tank cover and other vertical joints where gaskets are used may be suitably bent at least **25 mm** bent with necessary sealing arrangement **with sealing bolts at all corners and bolts should be at least 10 mm diameter GI bolts spaced maximum 70 mm apart**. This is to safeguard against seepage of water into tank in case of damaged gasket. Eye holes shall be made in all bolts used in the tank, inspection chamber, secondary chamber, fixing of bushings for sealing.
- f) The **6 mm** gaskets shall be dovetailed without joints to prevent moisture entry. In case of dovetailed joint, they shall not be more than two. The gaskets shall be of good quality **Neoprene** or **superior quality rubberized gasket**.

5.7 **Earthing:-**

Two earthing terminals shall be adequate size protected against corrosion and metallicly clean and identified by means of the sign marked in a legible and indelible manner on or adjacent to the terminals.

- a) All bolts should be provided with 2 flat washers and a spring washer with a nut.
- b) Conservator should not be provided for these CTPT sets.
- c) The Secondary terminal box incoming hole should be 32 mm diameter and at a suitable height from bottom to avoid replacement/ modification of secondary wires pipe when CTPT set is replaced. The secondary terminals size should be 6 mm diameter, 25 mm stem length,

2 flat washers with 3 nuts of brass material should be provided. The terminals should be provided at least 70 mm height from incoming hole and clearances shall be as per IS to avoid shorting terminals due to secondary wires pipe.

- d) Secondary chamber shall have double door (inner & outer) with suitable arrangement for sealing of both the doors. The inner door shall be of transparent polycarbonate so that secondary terminal connections can be viewed without breaking the inner door seals. The inner door shall be provided with suitable handle/knob.

5.8 **Mounting Arrangement:**

The under base of all CTPT sets shall be provided with two 75 x 40 mm GI channels (Make : TATA/SAIL/JINDAL/RINL (Billet with re-rolling not allowed)) and foundation dimensions shall be suitable placing with tank base uniform for all sets with only +/- 2 mm tolerance, to avoid modification of structure/ plinth, whenever CTPT set is replaced.

5.9 **Oil:**

The insulation oil used in the tank shall comply with the requirements specified in relevant IS: 335/ 93 (latest revision) and Annexure-II.

5.10 **Guaranteed Technical Particulars:**

The Technical Particulars as specified in IS shall be guaranteed. Each bidder should furnish the particulars required and guarantee the values so furnished for the supplies in Annexure -I.

6.0 **NAME PLATE AND MARKING:**

The following additional details shall be embossed / punched / casted/ laser printed on a metallic plate with at least 10 mm letter size and the name plate shall be of non-detachable type & fixed with rivets (not with bolts & nuts).The respective sides shall be painted " INCOMING, OUTGOING, SI. No., CT Ratio, R, Y, B" with suitable font readable from 30feet.

- a) Make- Name of Manufacturer
- b) Ratio (CT & PT)/ Frequency(CT&PT)
- c) Rated Output and corresponding Accuracy Class (CT &PT)
- d) Highest System Voltage, Insulation Level & Short time Thermal Current (CT&PT)
- e) Rated voltage factor & corresponding rated time
- f) Number of phases & method of connection (connection diagram)
- g) Reference standard
- h) Serial No. & Type Designation
- i) Month & Year of Manufacturing
- j) Guarantee- 66months

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k) Purchase Order No. and Date.

l) Property of TPNODL/TPSODL/TPCODL/TPWODL.

7.0 TESTS:

7.1 ROUTINE, ACCEPTANCE AND TYPE TESTS:

The following shall constitute the routine tests, acceptance tests and type test.

Stage Inspection (for both CT & PT) : The manufacturer should have the facility to show the stage inspection i.e during the period of FAT 1 No's sample will be completely destroyed in the Bidder's laboratory in order to check the quality of resin, measurement of core weight, quality of copper used for winding and HV test will be applied for minimum 1min to check the insulation level and the cost for the testing will be beared by the manufacturer.

The following shall be conducted at factory premises for acceptance of material.

- Verification of Terminal marking and polarity.
- Power frequency/ dry withstand tests on primary windings.
- Power frequency dry withstand tests on secondary windings.
- Determination of errors according to the requirements of the appropriate accuracy class.
- Temperature rise Test

8. TYPE TEST CERTIFICATE:-

- a) The equipment offered shall be fully type tested from Govt. approved laboratory such as CPRI/ ERDA / ERTL accredited laboratory by the bidder as per the relevant standards.
- b) The bidder shall furnish copies of Type Test Reports with the bid for the offered material.
- c) The bidders also furnish type test certificates for bushings and oil along with the bid. **The type test certificates shall be not older than 5 years from the date of opening of bid.**

➤ Type Tests For CTs (as per IS-2705:1992Part-1) :

- Verification of terminal marking and polarity
- Short time current Test.
- Temperature rise test.
- Lightning Impulse Test.
- High Voltage Power frequency wet withstand voltage test.
- Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.

Sl. No.	Test Details	Type Test To be Conducted on Individual CTs	Remarks
1	Short-time current tests	1. STC Conducted on 5/5A CTR with 3kA/1sec	1. STC Type Test done on 5/5A CTR
		2. STC Conducted on 10/5A CTR with 6.4kA/1sec	2. STC Type Test done on 10/5A CTR will be applicable upto 20/5A CTR
		3. STC Conducted on 30/5A CTR with 13.1kA/1sec	3. STC Type Test done on 30/5A CTR will be applicable upto 75/5A CTR
		4. STC Conducted on 100/5A CTR with 25kA/1sec	4. STC Type Test done on 100/5A CTR will be applicable upto 400/5A CTR
2	Temperature-rise test	1. Type Test Conducted on 75/5A CTR 2. Type Test Conducted on 400/5A CTR	1. Type Test done on 75/5A CTR will be valid for lower CT Ratios 2. Type Test done on 400/5A CTR will be valid for lower CT Ratios
3	Lightning impulse test		
4	High Voltage Power frequency wet withstand voltage test		

➤ **Type Tests For PTs (as per IS-3156:1992Part-1):**

- Verification of terminal marking and polarity
- Temperature rise test.
- Lightning Impulse test
- High voltage Power frequency wet withstand voltage test.
- Determination of errors according to the requirements of appropriate accuracy class.

➤ **Type Tests For Transformer Bushings (as per IS2099/1986) :**

- Wet power frequency voltage with stand test.
- Dry lightning impulse voltage with stand test.
- Temperature rise test.
- Thermal short time current withstand test.
- Cantilever load withstand test.

➤ **Acceptance and Routine Tests:-**

The following shall be conducted at factory premises for acceptance of material.

- Verification of Terminal marking and polarity.
- Power frequency/ dry withstand tests on primary windings.
- Power frequency dry withstand tests on secondary windings.
- Determination of errors according to the requirements of the appropriate accuracy class.
- Temperature rise Test

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1. Air pressure test on empty tank of transformers opened for physical verification test (One per each lot offered during pre-dispatch inspection) .

- Immediately after finalization of the program for testing, the manufacturer shall give advance intimation (minimum of two weeks in advance) to the purchaser, to enable him to depute his representative for witnessing the tests where the equipment is ready for testing and inspection.
- All acceptance and routine tests as stipulated in the relevant standards for CTs & PTs shall be carried out by the supplier in presence of purchaser's representatives.

9. PRE-DISPATCH INSPECTION:

One MU to be dismantled and checked for all internal components and spacings provided during pre-dispatch inspection.

Equipment shall be subject to inspection by a duly authorized representative of the TPNODL/TPCODL/TPWODL/TPSODL. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Supplier shall grant free access to the places of manufacture to TPNODL/TPCODL/TPWODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPNODL/TPCODL/TPWODL/TPSODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.

Tolerance: Unless otherwise specified herein the test value of the transformers supplied should be within the tolerance limit permitted in the IS on the guarantee values.

Inspection & Testing of MUs:-

- a) The supplier will keep the Purchaser informed in advance of the time of the starting and the progress of manufacture of equipment in its various stages so that arrangement could be made for inspection. The accredited representative of the TPNODL/TPSODL/TPCODL/TPWODL will have access to the supplier's or his subcontractor's work at any time during working hours for the purpose of inspecting the materials during manufacturing of the materials / equipment and testing and may select test samples from the materials going into plant and equipment. The supplier will provide the facilities for testing such samples at any time including access to drawings and production data at no charge to Purchaser. As soon as the materials are ready the supplier will duly send intimation to TPNODL/TPSODL/TPCODL/TPWODL and carry out the tests in the presence of representative of the TPNODL/TPSODL/TPCODL/TPWODL. At the time of factory inspection a random sample of 20 nos or 20% of the offered quantity which is more will be tested and firm will submit routine test report of all metering units basing upon which dispatch instruction will be issued. TPNODL/TPSODL/TPCODL/TPWODL may if deemed fit, can waive off the inspection of material subject to testing of material on receipt in TPNODL/TPSODL/TPCODL/TPWODL store in presence of vendor representative.



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- b) TPNODL/TPSODL/TPCODL/TPWODL may at its option get the materials inspected by the third party if it feels necessary.
- c) The dispatches should be done after Material Dispatch Clearance Certificate (MDCC) is issued by TPNODL/TPSODL/TPCODL/TPWODL based inspection by the TPNODL/TPSODL/TPCODL/TPWODL Officer or if such inspection is waived by the competent authority.
- d) The acceptance of any quantity of materials will in no way relieve the supplier of its responsibility for meeting all the requirements of this specification and will not prevent subsequent rejection if such materials are later found to be defective or deviation from specification/IS.
- e) The supplier will give 15 days advance intimation to enable the Purchaser depute its representative for witnessing the acceptance and routine tests.
- f) Should any inspected or tested materials / equipment fail to conform to the specification, the Purchaser may reject the materials and supplier will either replace the rejected materials or make alterations necessary to meet specifications requirements free of costs to the Purchaser.
- g) After delivery of materials at TPNODL/TPSODL/TPCODL/TPWODL Store 100% ordered materials may be collected & tested at purchaser own laboratory before acceptance. In case of any deviation to the specification, GTP, IS found during the tests the lot will be rejected or will be replaced by supplier.
 - Supplier to share best practices of MU installation and visit the site / Discom store if there is frequent failure of MU to assess the reason of fault.
 - TAT of repairing of MUs. It should be max 45 days.

Inspection and Testing Of Transformer Oil:

To ascertain the quality of transformer oil the manufacturer's test report should be submitted at the time of inspection. Arrangements should also be made for testing the transformer oil, after taking out the samples from the manufactured CTPT sets and tested in the presence of TPNODL/TPSODL/TPCODL/TPWODL representative (or) if desired, in an independent laboratory.



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Sealing of MU(s) After Testing and Individual Test Reports:

- a) After witnessing physical inspection of all offered MUs and testing of random sample of 20 nos or 20% of the offered quantity whichever is more, the purchaser's representative will seal all offered MUs with numbered plastic seals at TWO opposite corners of tank and Secondary Chamber, for delivery of correct inspected materials only.
- b) The manufacturer has to provide test report duly mentioning all test results, seals numbers and Name & Designation of purchaser's representative after inspection is over. The seals number shall also be mentioned in the test reports signed by purchaser's representative submitted for delivery instructions.

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPNODL/TPCODL/TPWODL/TPSODL Store will be inspected for acceptance and shall be liable for rejection if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Plant Engineering department.

11. GUARANTEE:

The supplier shall give Guarantee for the satisfactory functioning of the material / equipment as per specification, for a minimum period of 60 months from date of commissioning or **66 months from the last date of receipt of material in good condition at departmental store for each consignment whichever is earlier**. The bidder shall be liable to undertake the replacement or rectify defects at his own cost within mutually agreed timeframe. The bidder shall further be responsible for free



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replacement for another period of three years from the end of guarantee period for any "latent defect" if noticed and reported to purchaser.

The supplier shall mention the source of all materials. He shall also mention the name of the supplier for conductor, Transformer oil, Electrical Steel Laminations, Construction Steel etc.

12. PACKING:

Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in wooden cages to protect it from damage in transit. The packing should be in such manner that during storage & handling its components should not be damaged.

13. TENDER SAMPLES:

One numbers sample should be ready at the firms' works after issue of LOA for new entrant.

The sample shall be checked for its suitability and conformity with this specification. The drawing of sample must be attached with bid documents showing all views of equipment installed inside the metering panel along with the sketch of sealing arrangement as mentioned above. After placing of purchase order the material shall be supplied as per the approved sample and specification. However, approval of the sample shall not absolve the supplier of his responsibility to supply the material as per specifications.

14. TRAINING: Not Required.

15. QUALITY CONTROL:

The bidder shall submit with the offer, assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

16. MINIMUM TESTING FACILITY:

The manufacturer should have all the testing facilities at their works to carry out all the routine & acceptance tests including partial discharge test as mentioned below. List of plant & machinery and test equipment's available at manufacturer's works should necessarily be submitted along with bid documents.

16.1. CALIBRATION:

All instruments used in inspection and testing should be properly calibrated and sealed from any Govt. Test House/ Reputed Agency certifications when demanded by inspecting officers

shall be provided/ produced for verification purpose

17. MANUFACTURING ACTIVITIES:

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage with quantity. This bar chart shall be in line with the Quality Assurance Plan, submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

18. SPARE, ACCESSORIES AND TOOLS:

Fittings:

The following standard fittings shall be provided with the Metering Units.

SI No	Particulars	Quantity
1	Rating and terminal marking plates non detachable	1No.
2	Earthing terminals with bolt, nuts & washers for connecting earth wire	2Nos
3	Lifting lugs	
a)	for main tank	4Nos
b)	for top cover	2Nos
4	Pressure relief valve with metallic cap	1 No
5	Bimetallic terminal connectors on the HV bushings	6 Nos
6	HV bushings Outdoor	6 Nos
7	Secondary terminals bushings	as per requirement of CT ratio
8	Base Channel	2Nos

19. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPNODL/TPCODL/TPWODL/TPSODL specifications and statutory requirements and shall be submitted with the bid:

- Completely filled in Technical Particulars
- Any deviation sheet or No deviation
- General description of the equipment and all components including brochures.
- General arrangement drawing in enclosure
- Experience List
- All set of Type test certificates for offered design each variant.

Drawings / documents to be submitted for approval after the award of the contract are as under:

Sl. No	Description	For Approval	For Review/ Information	Final Submission
1.	General Technical Particulars (GTP)	√		√
2.	General Arrangement drawings	√		√
3.	Bill of materials	√		√

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish all detailed drawings of components for TPNODL/TPCODL/TPWODL/TPSODL approval.

Two sets of drawings showing clearly the general arrangements, sectional views, fitting details, electrical connections, foundation details, overall dimensions (length, breadth & height) and design features of each component/part should accompany the tender. The bidder has to submit clear & detail drawing with description how he will arrange the double door system in secondary chamber with sealing. Technical leaflets giving the operating instructions should also be furnished along with tender. **Tenders without details are liable to be rejected.**

20. GUARANTEED TECHNICAL PARAMETERS:

For Supply of 11KV, 3P4W, 0.5s accuracy class for CT & 0.5 accuracy class for PT, CTPT Combined, Oil Cooled Metering Units

Sl. No	Particulars	Requirement	Bidder's offer
1	Manufacturer's Name & Address	To be indicated	
2	Manufacturer's Type & Design	To be indicated	
3	Type of cooling	To be indicated	
4	Nominal System Voltage	11 KV	
5	Highest System Voltage	12 KV	
6	Frequency.	50 HZ	
7	Specification of CT & PT of Metering Unit		
(A)	Current Transformer		
i	Type	Oil immersed	
ii	Accuracy Class	0.5s	
iii	Rated output	15 VA	
iv	Insulation level	28 KV _{rms} / 75 KV _{pk}	

v	Short time thermal current rating for 1 sec	3KA/1Sec 5/5 A 6.4 KA /1 Sec(10/5A-20/5A) 13.1KA/1Sec (30/5A-75/5A) 25KA/1Sec for 100/5A & above	
vi	Saturation factor	To be indicated	
vii	Normal current density of primary winding	≤1.6 Amps per Sq.mm	
Viii	Knee Point Voltage	To be indicated	
ix	Continuous percentage over load	120%	
x	ISF	≤ 5	
(B)	Potential Transformer		
i	Type	Oil immersed	
ii	PT ratio	11KV/√3/ 110V/ √3	
iii	Rated output VA/phase	50VA	
iv	Class of accuracy	0.5	
v	Insulation level	28 KV _{rms} / 75 KV _{pk}	
vi	Winding connection	Star/Star	
vii	Rated voltage factor & duration	To be indicated	
8	Details of Metering Unit		
(A)	Current Transformer		
I	Weight of core and winding		
i	Core	To be indicated in a separate sheet for each rating	
ii	Primary winding		
iii	Secondary winding		
II	Resistance of winding per phase at 75° C		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
III	Cross section area of each turn of winding (in sq. mm.)		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
IV	No. of turns		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
V	Winding material type		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
VI	Core material type	To be indicated in a separate sheet for each rating	
(b)	Potential Transformer		
I	Weight of core and winding		
i	Core	To be indicated in a separate sheet for each rating	
ii	Primary winding		
iii	Secondary winding		
II	Resistance of winding per phase at 75° C		

i	Primary		
ii	Secondary	To be indicated in a separate sheet for each rating	
III	Cross section area of each turn of winding (in sq. mm.)		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
IV	No. of turns		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
V	Winding material type		
i	Primary	To be indicated in a separate sheet for each rating	
ii	Secondary		
VI	Core material type	To be indicated in a separate sheet for each rating	
(C)	MS Tank		
I	Construction Material	MS Hot dip Galvanized tank	
II	Galvanization of Tank	Metering Unit tank including top cover ,secondary chamber shall be hot deep galvanized.	
III	Tank Dimension in mm		
i	Length	To be indicated	
ii	Breadth	To be indicated	
iii	Height	To be indicated	
IV	Thickness		
i	Side walls, Bottom.	3.15mm	
ii	Top	5 mm	
V	Edge bending	To be provided in the Top Cover	
VI	Standard pressure & duration that can be withstand.	To be indicated	
(D)	Oil		
i	Grade of oil	To be indicated	
ii	Quantity of oil in ltr	To be indicated (min 45 ltr)	
(E)	HV Bushing		
i	Type	To be indicated	
ii	Make	GE,CJI,JP (This shall be verified during Material Inspection.)	
iii	Creepage distance of HV bushing	300mm (Min)	
iv	Bi-metallic terminal connector	6 nos Bi-metallic terminal connector with nut, plain washer, spring washer & check nut suitable for aluminum conductor as per CT rating to be provided	
(F)	Gasket Details		
I	Type of Gasket to be used on		

		Make	Nu Cork, Anchor Corks (This shall be verified during Material Inspection.)		
	ii	Top cover tank	To be indicated		
	iii	Secondary terminal box	To be indicated		
	iv	HV bushings	To be indicated		
	II	Thickness of Gasket to be used on			
	i	Top cover tank	To be indicated		
	ii	Secondary terminal box	To be indicated		
	iii	HV bushings	To be indicated		
	(G)	Studs Details			
	I	Primary Stud			
	i	Material	To be indicated		
	ii	Size	M12 upto 20A & M16 > 20A		
	II	Secondary Stud			
	i	Material	To be indicated		
	ii	Size	M6		
	III	Gap between I/C & O/G Studs of same phase	Minimum 15° angle with the vertical axis to maintain a good distance at stud levels.		
	IV	All bolts, nuts, washers in contact with non-ferrous parts shall be of brass. All other parts including bolts & nuts liable to corrosion, forming integral part of the equipment shall be SS.			
	(H)	Identification/ Marking			
	I	Primary terminals			
	i	Incoming	RM, YM, BM		
	ii	Outgoing	RL, YL, BL		
	(I)	Secondary terminals			
	i	CT marking	RS1- RS2-RS3, YS1-YS2-YS3, BS1-BS2-BS3		
	ii	PT marking	R, Y, B, N		
	(J)	Clearance			
	I	Minimum phase to phase distance	255mm		
	II	Shortest distance between metal part & earth	190mm		
	9	Total weight of complete MU including all accessories and oil	To be indicated		
	10	Maximum attainable winding temperature	80° C Secondary chamber shall have double door (inner & outer) with suitable		

11	Double door type Secondary Chamber & sealing arrangement	Arrangement for sealing of both the doors. The inner door shall be of transparent polycarbonate so that secondary terminal connections can be viewed without breaking the inner door seals. The inner door of the secondary chamber should be of hinge type with suitable handle/knob& sealing arrangement.	
12	Name Plate	As per tender requirement.	
13	Sealing arrangements	The secondary terminal box cover, tank cover sealing arrangements have to be done with sealing bolts at all corners and bolts should be at least 10 mm diameter GI bolts spaced maximum 70 mm apart. Sealing holes also to be provided in the bolts fitted with bushing & body for sealing, so that one can not open the bushing without breaking seals. Eye holes shall be made in all bolts used in the tank, secondary chamber, fixing of bushings for sealing.	
14	Fittings	As per tender clause 23.0	
15	Packing	Individual Metering Unit shall be packed in wooden crate box(cage type) with the MU fitted with the base to avoid damage during transportation.	
16	Equi potential link	2 nos of diagonally Copper Strip i.e equ potential link to be provided between top cover and bottom cover of the MU.	

ANNEXURE – II

GUARANTEE TECHNICAL PARTICULARS

For Oil to be used in 11KV Metering Units

Sl. No.	Characteristic.	Particulars.	Bidder's offer
1.	Appearance.	The oil shall be clear and transparent and free from suspended matter or sediments and should conform to IS-335/93 or latest versions. Approved Make of Mineral Oil : Savita, Apar, Gandhar ,IOCL, Columbia Petrochem.	

		This shall be verified during Material Inspection.	
2.	Density at 27 degrees C (max)	0.89 g/cm.	
3.	Kinematic Viscosity at 27 degrees C (max)	27 CST.	
4.	Interfacial Tension at 27 Degrees C (max)	0.04 N/M.	
5.	Flash point, pensky –marten (closed) (min)	140 Degrees C.	
6.	Pour point (max)	-10 Degrees C.	
7.	Neutralization Value : a) Total acidity(max) b) In-organic acidity alkalinity.	0.01. Nil	
8.	Corrosive sulphur.	Non-corrosive.	
9.	Electric Strength (breakdown voltage/ minute) a) New unfiltered oil. b) After filtration.	30 KV(rms) 50 KV(rms)	
10.	Dielectric dissipation factor (Tan delta at 90 Deg. C (min)).	0.005.	
11.	Specific resistance (Resistivity). a) At 90 Deg. C(min) b) At 27 Deg. C(min)	30x10 ¹² ohms- cm. 500x10 ¹² ohms-cm	
12.	Oxidation stability a) Neutralization value after oxidation(max) b) Total sludge after oxidation(max)	0.5 mg KOH/g 0.05% by Weight.	
13.	Ageing characteristics after accelerating ageing (open breaker method with copper catalyst) for 96 Hrs. (as per ASTM D. 1934-1978)		
a	Specific resistance (Resistivity)		
	At 27 Deg. C (min)	2.5 x 10 ¹² ohms-cm	
	At 90 Deg. C (min)	0.50 x 10 ¹² ohms-cm	
b	Dielectric dissipation factor Tan delta at 90 Deg. C (max)	0.50	
c	Total sludge value (max)	0.5	
d	Total acidity (max)	0.5	
14.	Presence of oxidation inhibitor.	Nil	
15.	Water content (max)	50 ppm	

21. SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

TPC⚡**ODL**
TPW⚡**ODL**

TPN⚡**ODL**
TPS⚡**ODL**

Specification No: ENG-HV-2033 (R1)

Specification Name: 11KV, 3P4W, 5-400/5A,0.5s ACCURACY CLASS, 15VA CT& 0.5 CLASS ,50VA PT COMBINED, OIL COOLED METERING UNITS.

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above

Seal of the Company:

Signature

Designation