

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2035

Specification Name : 11KV (5-50/5A,0.2s CLASS,10VA CT & 0.2 CLASS ,50VA PT) METERING CUBICLE

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Specification No: ENG-HV-2035

Specification Name: TECHNICAL SPECIFICATION FOR 11KV (5-50/5A, 0.2s CLASS, 10VA) RESIN CAST CT & (0.2 CLASS, 50VA) RESIN CAST PT METERING CUBICLE

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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 11 KV METERING CUBICLE.

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

This specification covers the design, manufacture, testing and supply of 11KV floor mounting indoor type metering cubicle having 3 nos. of Single-phase resin cast CT (accuracy class-0.2s) and 3 no. of 11KV single phase resin cast PT (accuracy class-0.2).

The tenders from only such firms shall be accepted who themselves manufacture metering cubicle of the relevant design conforming to

IS: 2705 (Part-I & II)/1992, Second Revision for CT and

IS: 3156(Part-I & II)/1992, Second Revision for PT and have obtained type test certificates.

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)
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TPCODL/TPNODL/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 CURRENT TRANSFORMER:-

Sr. No	Particulars	Parameters
1	Normal system voltage (kV r.m.s)	11
2	Highest system voltage (kV r.m.s)	12
3	Frequency	50HZ
4	Rated Output (VA) Burden	10VA
5	One-minute power frequency dry withstands voltage	
a.	Primary (kV r.m.s)	28
b.	Secondary (kV r.m.s)	3
6	One minute power frequency wet withstands voltage (kVp)	$\sqrt{2} \times 28$ r.m.s
7	Class of accuracy	0.2s
8	Extended current rating	120%
9	Rated continuous thermal current	1.2 times of rated primary current
10	Short time thermal current rating	6.4 kA for 3 seconds
11	Rated dynamic current	2.5 times of short time thermal current rating
12	Number of cores	One for each phase
13	Instrument security factor	<5
14	Type of Insulation	E
15	Max. ratio error	As per IS:2705/1992
16	Max. phase angle error	As per IS:2705/1992
17	Max. temp. rise over max. ambient temp. of 45 deg. C at rated continuous thermal current at rated frequency and with rated burden.	As per IS:2705/1992

18	Creepage distance	300mm
19	CT ratio	5-50/5A
21	Total weight of core before casting of resin	To be provided by the Bidder
22	Total weight of the unit after casting of resin	To be provided by the Bidder
23	Thickness of Baseplate	5 mm & plate should be properly galvanized with earthing arrangement

Short Circuit Rating of 11 kV CTs: -

- 6.4KA upto 20/5A for 1sec
- 13.1KA upto 100/5A for 1Sec
- 18.4KA above 100/5A for 1sec

4.2 POTENTIAL TRANSFORMER:-

Sr. No	Particulars	Parameters
1	Normal system voltage (kV r.m.s)	11
2	Highest system voltage (kV r.m.s)	12
3	Frequency	50HZ
4	No of phases	1PH (3 no's)
5	Rated Output (VA) Burden	50VA
6	Impulse withstand voltage (kVp)	75kVp
7	One-minute power frequency dry withstands voltage (on assembled CTPT UNIT)	
a.	Primary (kV r.m.s)	28
b.	Secondary (kV r.m.s)	3

8	One minute power frequency wet withstands voltage (on assembled CTPT UNIT)	$\sqrt{2} \times 28 \text{ r.m.s}$
9	Transformation ratio (PT Ratio)	11 KV/ $\sqrt{3}$ / 110V/ $\sqrt{3}$
10	Class of accuracy	0.2
11	Winding connection	Star/Star. Primary Neutral floating. LT neutral to be earthed in the metering box.
12	Rated voltage factor and time	1.2 continuous and 1.9 for 30 seconds.
13	Temp. rise over max. ambient temp.	Within limits of IS:3156/1992
14	Max. Phase angle error	Within limits of IS:3156/1992
15	Max. Ratio error	Within limits of IS:3156/1992
16	Short time thermal current rating	6.4 kA for 3 seconds
17	Type of Insulation	E
18	Creepage distance	300mm

5. General Construction:

The metering panel shall be fabricated with 3mm M.S. plate (powder coated) and shall have external dimensions of 1700X850X800mm (height X width X depth). Total height including base channel will be 1750 to 1800 mm.

- ❖ The panel shall be dust and vermin proof and totally enclosed with IP 55. The panel shall have two separate compartments. The upper one shall provision to house tri-vector energy meter with associated wiring and shall be termed as “**Meter compartment**”. The upper compartment will be double door type (inner door & outer door) and the arrangement for meter fixing will be in inner portion. The other section i.e. lower compartment shall house the 11 kV, 1-Ph, dry type epoxy resin casted CT (3 Nos.) and 11 kV, 1-Ph, dry type epoxy resin casted PT (3 No) and shall be termed as “**HT CT/PT Compartment**” A separate and independent vermin proof door shall be provided for each of the upper and lower compartments with provision of locking and sealing arrangement.
- ❖ The metering cubicle shall be totally enclosed and shall be provided within one no. hinged door made of MS sheet which shall rest on the collar along right sides of cubicle so that the door remains flushed with body of the cubicle.
- ❖ The door shall be provided with a handle and two no’s sealing arrangement. There shall be one fixed (non-open able) window (approximate size 300 X 200 mm) fitted with transparent acrylic glass to enable the meter reader to note down the reading without opening the door of the panel. The glass shall be fitted / tightened with MS Frame form inside of window.

- ❖ The metering panel shall be provided with two nos. MS channel of size 100 X 50mm of 850mm length on the front and rear sides duly welded at the bottom of the panel. These shall have 4 holes of 16 mm for foundation bolts at both the ends of each channel. All the joints of the metering panel shall be welded to provide strong mechanical construction both for transportation as well as during its use. The metering panel shall have arrangement to connect it will earth at two independent points. One earthing knob/bolt shall also be provided in the “**Meter compartment**” for connection to star point of wiring. All three earthing bolts shall be provided with nuts and washers.
- ❖ The metering panel shall be cleaned suitably and will go through phosphating using seven tank dipping procedure and its surface shall be made smooth. It shall be powder coated as per relevant IS specification. The colour of paints shall be decided at the event of order. Height of panel is fixed but width & depth is minimum and may be increased suitably to accommodate CTs/PTs, if required. Thus, total height including base channel will be 1750 mm. and the panel should be provided with 4 Nos. lifting hooks
- ❖ All the moving / mating edges shall be provided with synthetic/ semi synthetic gasket firmly glued to surface to make the metering panel dust & vermin proof. The metering panel shall be provided with two cable entries inside from bottom along with glands/ gland plate for 11 kV XLPE cable of various sizes corresponding the CTs ratio and short circuit current rating has to be provided. There should be suitable provision for clamping the of HT cable boxes has to be provided. There should be suitable provision so that cables boxes along with cable can be taken out of the panel without damage.
 - The meter compartment shall contain hanger arrangement of slotted angle for mounting of tri-vector energy meter having flexibility for moving meters vertically or horizontally. Clearance between all parts and compartments of panel should comply with relevant ISS standard; which shall be checked by TPNODL/TPSODL/TPCODL/TPWODL Utility.

Two 60 W space heater with thermostat must be kept on both corner side of the cubicle chamber with operating switch must kept outside.

5.1 SEALING:

The metering cubicles shall be completely lockable and sealable with at least one locking and two sealing arrangements of the door of each compartment. Apart from sealing arrangement of both compartments, mounting bolts of CTs and PT shall have the provisions for sealing arrangement so that removal of CTs & PTs from the installed positions in the panel (for tampering/ replacement) by the unauthorized person is not possible without breaking/ tampering the sealing arrangement. The hinge arrangement, sealing of CTs and sealing of PTs shall be diagonally arranged in the base of each CTs & PTs. This sealing arrangement shall be checked by the officers at the time of checking of sample and during inspection.

The epoxy resin casting of 11 kV CTs & PTs coils is required to be carried out under vacuum to avoid any blow holes in the casted material. To establish this Epoxy hardener

and accelerator, if any is mixed in the mixing chamber under the vacuum and poured into the dyes placed in the casting chamber which is also kept under vacuum as per relevant IS specifications. The temperature as specified by the Epoxy manufacturer is maintained with thermostatic control so that all the moisture is also drained out under vacuum

5.2 ELECTRICAL COMPONENTS:

A brief details of the various components to be provided in the metering cubicle is given below: -

5.2.1 CURRENT TRANSFORMERS:

There shall be three number single core single ratio dry type epoxy resin cast, current transformers conforming to IS: 2705/ 1992 of latest revision thereof as per details mentioned below: -

The metering CTs shall be suitable for 11kV, 50Hz, Single phase effectively earthed neutral system. The CT Shall be single core, single ratio, epoxy resin cast, copper wound primary type, with rated burden 10VA and accuracy class 0.2s or better and conforming to IS: 2705 (Part-I & II) with latest amendment. The ratio of CTs shall be as per schedule of requirement. The instrument security factor (ISF) shall up to 5.

The secondary terminals of the CTs shall be robust design so as to provide effective and firm termination. The secondary winding resistance of CTs shall be as low as possible. Colour coding viz. Red/Yellow/Blue for main and black for Neutral shall be used. Further, the load side wires shall be provided with Red/Yellow/Blue PVC type rings at both ends for identification. 1S1 & 1S2 shall be used for identification of main and load wires and ferrules shall be used accordingly. No other symbols other than 1S1 & 1S2 shall be accepted without prior approval.

No link/test terminals/terminals shall be provided in wire from CTs to meter terminals. . The base plate should have open slot arrangement for adjustable fixing. Insulation shall be class E.

Dimension: The dimension of the 11kv CT base plate should be 285mm length from hole to hole and 140mm width from hole to hole. The base plate should have open slot arrangement for adjustable fixing.

5.2.2 POTENTIAL TRANSFORMERS:

The PTs shall be indoor dry type epoxy resin cast, copper wound suitable for 11kV 50Hz, effectively earthed neutral system. There shall be 3 Nos 11 kV single phase epoxy resin cast per cubicle with rated burden 50VA and accuracy class 0.2 or better and conforming to IS: 3156 (Part-I & II) with latest amendment. Colour coding viz Red/Yellow/Blue shall be used for identification of phases and black for Neutral. The PT shall be type tested in accordance with IS: 3156 (Part-I & II) with latest amendment.

The PTs shall be uniform insulating and withstand separate source 28 kV Pf. For one minute as per clause 9.3.1.1 of IS 3156 (Part-I)

Dimension: The dimension of the 11kV PT base plate should be 270 mm length from hole to hole and 125 mm width from hole to hole. The base plate should have open slot arrangement for

adjustable fixing.

Insulation shall be class E.

The PTs shall be uniform insulating and withstand separate source 28 kV Pf. for one minute as per clause 9.3.1.1 of IS 3156 (Part-I).

- (i) CTs bus bar:- 40X6mm copper strip or equivalent
- (ii) PTs bus bar:- Copper wire 8SWG or flexible copper flat strip or equivalent to connect PT or CT.
- (iii) Wiring for CTs/PTs secondary circuits: - There should not be any joint/termination between CT/PT secondary terminals to meter terminals. Wiring of CTs and PTs should be done with 4 sqmm. stranded copper insulated conductor, CT wiring should run in independent flexible PVC pipes of appropriate size from HT compartment to meter compartment. The Pipe shall be so laid that no naked wire is visible. From pipes up to the metering the meter chamber, all wiring should be open and visible.

The dimension of the PT base plate should be 454 mm length from hole to hole and 264 mm width from hole to hole. The base plate should have open slot arrangement for adjustable fixing.

6. NAME PLATE:

An Aluminum foil plate shall be affixed on the front of cubicle to indicate the following information against which the desired information is required to be painted at site: -

- ❖ TPNODL/TPCODL/TPSODL/TPWODL property
- ❖ Manufacturer's name
- ❖ PO No & Date
- ❖ Date of Dispatch
- ❖ Serial No of panel
- ❖ Panel CT ratio & accuracy class(0.2s)
- ❖ Panel PT ratio & accuracy class (0.2)
- ❖ Meter CT ratio
- ❖ Meter PT ratio
- ❖ Over all CT-PT multiplying factor
- ❖ Sanctioned load
- ❖ Date of release of connection
- ❖ Warranty up to

In addition to the above, one no. rating and diagram plate made of Aluminum shall be provided on the front door of the HT compartment giving details viz. Serial no. of cubicle CT &

PT, ratio, burden, class of accuracy, year of manufacturing, total weight, P.O No. and date etc.

7. TEST:

7.1 ROUTINE & ACCEPTANCE TEST :

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

7.1.1 CURRENT TRANSFORMERS:

- Verification of terminal marking and polarity.
- High voltage power frequency test on Primary winding
- High voltage power frequency test on Secondary winding
- Over voltage inter-turn test.
- Determination of errors according to the requirement of accuracy class (0.2s).
- Partial discharge test in accordance with IS: 11322/1985

7.1.2 POTENTIAL TRANSFORMER:

- ❖ Verification of terminal marking and polarity.
- ❖ Power frequency dry withstand test on Primary
- ❖ Power frequency withstand test on Secondary
- ❖ Determination of errors according to the requirement of accuracy class (0.2)
- ❖ Partial discharge test measurement test in accordance with IS:11322/1985.

7.2 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.

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the offered product in bid for the tests as mentioned as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any other International Laboratory as per the relevant standards of IS and IEC. Type tests shall have been conducted in certified Test laboratories during the period not exceeding **5 years** from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPNODL/TPCODL/TPWODL/TPSODL.

Bids without all type test report shall stand disqualified.

- The following shall constitute the type tests as per relevant IS:
- Short-time current tests
- Temperature-rise test

- Lightning impulse test
- Power frequency withstand test
- Determination of errors according to the requirement of accuracy class (0.2 for PT & 0.2s for CT).

9. PRE-DISPATCH INSPECTION:

Equipment shall be subjected to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. 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 TPCODL/TPNODL/TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL. Following documents shall be sent along with material

- a) Test reports
- b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
- c) Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- h) Other Documents applicable)

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPNODL/TPSODL/TPWODL 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 Project Engineering department.

11. GUARANTEE PERIOD:

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

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 such a manner as to protect it from damage in transit

13. TENDER SAMPLE:

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 test including partial discharge test as mentioned below. List of plant & machinery and test equipment available at manufacturer's works should necessarily be submitted along with tender.

16.1 CALIBRATION

All instruments used in inspection and testing should be properly calibrated and sealed from any Govt. Test House/ Reputed Agency certified by NABL and the reports shall not be less than an one year old. Calibration 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. SPARES, ACCESSORIES & TOOLS:

Not Applicable.

19. DRAWING & DOCUMENTS:

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

- Completely filled in Technical Particulars
- General description of the equipment and all components including brochures.
- General arrangement for Metering cubicle
- Power flow diagram
- Foundation plan
- Bill of material
- Experience List
- Type test certificates

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/TPSODL/TPWODL approval.

20. GENERAL TECHNICAL PARTICULAR:

20.1 CURRENT TRANSFORMER:

Sr. No	Particulars	Parameters	Bidder's Offer
1	Normal system voltage (kV r.m.s)	11	
2	Highest system voltage (kV r.m.s)	12	
3	Frequency	50HZ	
4	Rated Output (VA) Burden	10VA	
5	One-minute power frequency dry withstands voltage		
a.	Primary (kV r.m.s)	28	
b.	Secondary (kV r.m.s)	3	
6	One minute power frequency wet withstands voltage (kVp)	$\sqrt{2} \times 28$ r.m.s	

7	Class of accuracy	0.2s	
8	Extended current rating	120%	
9	Rated continuous thermal current	1.2 times of rated primary current	
10	Short time thermal current rating	6.4 kA for 3 seconds	
11	Rated dynamic current	2.5 times of short time thermal current rating	
12	Number of cores	One for each phase	
13	Instrument security factor	<5	
14	Type of Insulation	E	
15	Max. ratio error	As per IS:2705/1992	
16	Max. phase angle error	As per IS:2705/1992	
17	Max. temp. rise over max. ambient temp. of 45 deg. C at rated continuous thermal current at rated frequency and with rated burden.	As per IS:2705/1992	
18	Creepage distance	300mm	
19	1.5 micro seconds impulse withstand voltage test	75 Kv _p	
20	Total weight of core before casting of resin	To be provided by the Bidder	
21	Total weight of the unit after casting of resin	To be provided by the Bidder	
22	Thickness of Baseplate	5 mm & plate should be properly galvanized with earthing arrangement	

Potential Transformer

1	Normal system voltage (kV r.m.s)	11	
2	Highest system voltage (kV r.m.s)	12	
3	Frequency	50HZ	
4	No of phases	1 (3 no's)	
5	Rated Output (VA) Burden	50VA	
6	Impulse withstand voltage (kV _p)	75kV _p	
7	One-minute power frequency dry withstands voltage (on assembled CTPT UNIT)		
a.	Primary (kV r.m.s)	28	
b.	Secondary (kV r.m.s)	3	
8	One minute power frequency wet withstands voltage (on assembled CTPT UNIT)	$\sqrt{2} \times 28$ r.m.s	
9	Transformation ratio (PT Ratio)	11 KV/ $\sqrt{3}$ / 110V/ $\sqrt{3}$	

10	Class of accuracy	0.2	
11	Winding connection	Star/Star. Primary Neutral floating. LT neutral to be earthed in the metering box.	
12	Rated voltage factor and time	1.2 continuous and 1.9 for 30 seconds.	
13	Temp. rise over max. ambient temp.	Within limits of IS:3156/1992	
14	Max. Phase angle error	Within limits of IS:3156/1992	
15	Max. Ratio error	Within limits of IS:3156/1992	
16	Short time thermal current rating	6.4 kA for 3 seconds	
17	Type of Insulation	E	
18	Creepage distance	300mm	
19	Total weight of core before casting of resin	To be provided by the Bidder	
20	Total weight of core after casting of resin	To be provided by the Bidder	
21	Thickness of Baseplate	5 mm & plate should be properly galvanized with earthing arrangement	

21. SCHEDULE OF DEVIATION:

(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:

S. No	Clause No.	Details of deviation with justifications

TPC⚡**ODL**
TPW⚡**ODL**

TPN⚡**ODL**
TPS⚡**ODL**

Specification No: ENG-HV-2035

Specification Name: TECHNICAL
SPECIFICATION FOR 11KV (5-50/5A, 0.2s
CLASS,10VA) RESIN CAST CT & (0.2 CLASS,
50VA) RESIN CAST PT METERING CUBICLE

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

Seal of the Company:

Signature

Designation