

TECHNICAL SPECIFICATION FOR
EPOXY RESIN CAST CURRENT TRANSFORMERS BLOCK FOR
LT CT OPERATED METERS

1. SCOPE

- 1.1. This specification covers general requirements of design, engineering, manufacture, assembly, stage testing, inspection, pre-dispatch testing at manufacturer's works, packing, supply and delivery of LT epoxy moulded metering class current transformers suitable for use with three phase four wire bulk supply energy measuring system (hereafter referred as CT) and for outdoor installation.
- 1.2. The CT bank shall comprise of 4 Nos of CTs (for three phases and neutral circuits) moulded together in resin cast epoxy or equivalent insulating materials to form a single unit.
- 1.3. The material shall be complete with all parts and accessories which are necessary or usual for their efficient and satisfactory operation. Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian / IEC standards and in these specifications. Otherwise the same will be governed by good engineering practices in conformity with required quality of the product.
- 1.4. It is not the intent to specify completely herein all the details of the design and construction of material. However the product shall conform in all respects to high standards of engineering, design and workmanship and shall be performing in continuous commercial operation in manner acceptable to the purchaser. The design, manufacture and performance of equipment shall comply with all currently applicable standards, regulations and safety codes in the locality where the equipment will be installed.

2. APPLICABLE CODES AND STANDARDS

- 2.1. The current transformer shall conform (for performance and testing thereof) in all respects to the IS: 2705/1992 (Part - I & II) with latest amendments thereto unless otherwise specifically mentioned in this specification.
- 2.2. Unless otherwise specified elsewhere in this specification, the current transformer shall conform to the latest version available of the standards as specified above.
- 2.3. The current transformer shall have Type Test certificates from NABL accredited laboratories such as ERDA, NPL, CPRI etc.

3. SERVICE CONDITIONS

- 3.1. The current transformer shall be required to operate satisfactorily and continuously under the following tropical conditions.
 - 3.1.1. Maximum Ambient Air Temperature: 50°C
 - 3.1.2. Minimum Ambient Air Temperature: 2° C
 - 3.1.3. Average Daily Ambient Air Temperature: 40°C
 - 3.1.4. Maximum Relative Humidity: 95%
 - 3.1.5. Average Annual Rainfall (mm): 1500mm

3.1.6. Seismic Zone: III

- 3.2. The overall climatic condition is moderately hot and humid tropical climate, conducive to rust and fungus growth.
- 3.3. The climatic conditions are prone to wide variations in ambient conditions and hence the material shall be of suitable design to work satisfactorily under these conditions.

4. ACCURACY

- 4.1. The Current Transformers shall be of Class 0.5s or better accuracy as per IS 2705: 1992.

5. CT DESIGN VARIANTS

- 5.1. CT block is required for the sizes mentioned in 5.5.1, 5.5.2, 5.5.3 and as per the type of LTCT meters used. Necessary drawings shall be provided for the same for approval.
- 5.2. The CT block shall be suitably designed & provided to match the design of the LTCT meter being used for evaluation and acceptance.
- 5.3. It should also be noted that the design of CT bank shall be done so that the CT Bank and meter are easily accommodated in the Meter box.
- 5.4. CT Banks are required in the following sizes
 - 5.4.1. 4 x 200/5 Amps CT Block
 - 5.4.2. 4 x 300/5 Amps CT Block
 - 5.4.3. 4 x 400/5 Amps CT Block

6. SYSTEM DESCRIPTION

- 6.1. The CT block shall be suitable for outdoor installation (Within meter box) on 3-phase, 50 Hz, 415V LT distribution network in which the neutral is effectively earthed.
- 6.2. Normal System voltage : 415 Volts
- 6.3. System highest voltage : 660 Volts
- 6.4. System frequency : 50 Hz
- 6.5. System fault current : 25 kA

7. POWER SUPPLY VARIATION

- 7.1. The CT block shall be suitable for working with following supply system variations without damage and without degradation of its metrological characteristics.
 - 7.1.1. Voltage : -40% to +20% Rated Voltage
 - 7.1.2. Frequency : 49 Hz to 51 Hz

7.1.3. Power Factor : Zero (Lag) – Unity – Zero (Lead)

8. TECHNICAL PARAMETERS

- 8.1. Type : Epoxy Moulded CT Bank
- 8.2. Primary Current : 200A / 300A / 400A
- 8.3. Secondary current : 5A
- 8.4. Rated continuous thermal factor : 1.2 times
- 8.5. Nominal voltage : 660 Volts
- 8.6. Rated voltage : 415 Volts
- 8.7. Frequency : 50 Hz
- 8.8. Accuracy Class : 0.5s
- 8.9. Limits of Error (Current) : As per IS:2705/1992
- 8.10. Limits of Error (Phase displacement) : As per IS:2705/1992
- 8.11. Rated burden : 1 VA
- 8.12. Instrument Security Factor : ≤ 5
- 8.13. Power frequency withstand voltage : 3 KV rms for 1 minute
- 8.14. Impulse withstand Voltage : 10 KV peak for 1 minute
- 8.15. Short time withstand current / duration 25 KA for 1 Seconds
- 8.16. Temperature rise (Maximum) 70° C

9. DESIGN

- 9.1. The LT measuring current transformer (CT) is required for use with three phase four wire bulk supply static energy measuring meter.
- 9.2. The current transformer shall be of the bar primary type having a ring type core with wound secondary. The accuracy class of the measuring current transformers shall be 0.5s as per the technical requirements.
- 9.3. The CT Block shall have Solid brass conductor studs for secondary side of the CTs. The studs shall be suitably spaced so that energy meter can be plugged in with secured connections at the terminal block of the energy meter. The studs shall be of Semi circular cross-section/construction and the flat surface shall be provided towards front side of CT block for ease of tightening the meter screws.
- 9.4. The CT shall be capable of continuous operation of rated output under the operating conditions of voltage and frequency variations as per statutory limits governed by relevant Indian Standard and its amendments in force.
- 9.5. All the material used in the manufacture of the CT shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

- 9.6. All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions. As CT bank is to be installed outdoor, the same shall have to withstand solar radiation.
- 9.7. All materials used should be of the best quality suitable for withstanding variations of temperatures and atmospheric conditions without undue deterioration or setting up of undue stresses anywhere. The materials shall be non hygroscopic, non-aging and of tested quality. All mountings should be so designed as to avoid collection of water anywhere. All connections and contacts shall be of ample cross sections and surface for carrying specified currents continuously without undue heating and shall be secured by nut bolts, screws with adequate loading arrangement.
- 9.8. The CT shall be designed and constructed in such a way as to avoid introducing any danger in use and under normal conditions so as to ensure specially:
 - 11.9.1 Personnel safety against electric shock.
 - 11.9.2 Personnel safety against effects of excessive temperature.
 - 11.9.3 Protection against spread of fire.
 - 11.9.4 Protection against penetration of solid objects, dust and water.

10. BAR PRIMARY

- 10.1. The bar shall be fabricated from flat EC grade virgin copper bar. The dimensions of the bar primary shall be marked on the drawing to be submitted by the manufacturer.
- 10.2. The manufacturer shall provide good quality GI bolts & nuts of appropriate size for tightening the power cables to the same.

11. COLOUR

- 11.1. The colour the CT block shall be as under:
 - 11.1.1. 4 x 200/5 Amps CT Block : PO Red (O518 or equivalent)
 - 11.1.2. 4 x 300/5 Amps CT Block : Oxford Blue (O119 or equivalent)
 - 11.1.3. 4 x 400/5 Amps CT Block : Bus Green (O209 or equivalent)

12. SECONDARY TERMINALS

- 12.1. The design and size of the secondary studs shall be such that the terminals are suitable to carry up to 10 Amps continuously.
- 12.2. The manner of fixing the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

13. NAMEPLATE AND MARKING

- 13.1. The CT bank shall have a rating clearly visible and effectively secured against removal, indelibly and distinctly marked with all essential particulars as per relevant standards.
- 13.2. The rating plate of the CT shall have distinct background colour so as to be differentiated from other classes / ratings of the CTs. The rating plate shall be fixed on the front side of the CT, so that the technical details are visible from the front side of the CT. The aesthetics and layout of the rating plate shall be approved.
- 13.3. The marking on CT bank shall be in accordance with IS: 2705/1992. In addition to the standard, the following shall be marked on the nameplate.
 - 13.3.1. Manufacturer's name and place of manufacture (including country of origin)
 - 13.3.2. Alphanumeric serial number (Serial number shall be given by the purchaser). It should have letter height of a minimum of 9 mm.
 - 13.3.3. Bar code (Code 3 of 9) of the serial number
 - 13.3.4. Month and Year of manufacture
 - 13.3.5. Rated Primary and Secondary Current
 - 13.3.6. Reference voltage & frequency
 - 13.3.7. Highest System Voltage
 - 13.3.8. CT Ratio
 - 13.3.9. Accuracy Class
 - 13.3.10. VA Burden
 - 13.3.11. Voltage rating
 - 13.3.12. Instrument Security Factor
 - 13.3.13. Insulation level
 - 13.3.14. Rated STC
 - 13.3.15. Text written as "Caution : High Voltage if secondary is open"
- 13.4. The relative polarities shall be permanently marked on the current transformer as per IS: 2705/1992
- 13.5. The marking shall be indelible, distinct & readable.
- 13.6. The layout of the rating plate shall be approved.
- 13.7. The manufacturer shall furnish detailed layout / drawings of the rating plate along with the CT Block.
- 13.8. In addition to the above, following details shall be engraved on the body of the CT bank.
 - 13.8.1. Manufacturer's short name.

- 13.8.2. Alphanumeric serial number (Serial number shall be given by the purchaser)
- 13.8.3. CT Ratio
- 13.8.4. Primary Terminals (P1 and P2)
- 13.8.5. Phases (R, Y, B, N)
- 13.8.6. Serial Number shall also be embossed on R phase primary Bus Bar
- 13.8.7. CT ratio shall also be embossed on Neutral Bus Bar

14. TESTS

14.1. Type Tests

14.1.1. The type test reports (not older than 3 years) of the following tests as per IS: 2705 / 1992 along with the CT Block.

14.1.1.1. Determination of errors

14.1.1.2. Dielectric tests

14.1.1.3. Temperature rise tests

14.1.1.4. Short time current tests

14.1.2. The type test certificate shall clearly indicate the following

14.1.2.1. Name, address and country of the testing authority

14.1.2.2. Date of testing

14.1.2.3. Name of the equipment type tested

14.1.2.4. Number of pages of the type test certificate

14.1.2.5. Manufacturer's identity & Catalogue reference number

14.1.2.6. Basic technical parameters

14.1.2.7. The standard to which the equipment type tested

14.1.2.8. Comments and observations of the testing authority

14.2. Routine Tests

14.2.1. The following Routine Tests shall be carried out on Current Transformer as per IS: 2705 / 1992 and the routine test report shall be submitted along with the CT Block.

14.2.1.1. High Voltage Power frequency dry withstand test on secondary windings.

14.2.1.2. Determination of errors

14.2.1.3. Verification of terminal markings and polarity

14.2.1.4. Over-voltage inter turn test

14.3. Acceptance Tests

- 14.3.1. The following tests shall be carried out on Current Transformer as per IS: 2705 / 1992 and report shall be submitted along with the CT Block.
 - 14.3.1.1. High Voltage Power frequency dry withstand test on secondary windings.
 - 14.3.1.2. Determination of errors
 - 14.3.1.3. Verification of terminal markings and polarity
 - 14.3.1.4. Over-voltage inter turn test

15. MINIMUM TESTING FACILITIES

- 15.1. The manufacturer shall have following testing facilities for carrying out routine and acceptance tests as mentioned in earlier clauses
 - 15.1.1. Automatic CT Test set-up (duly calibrated by NABL Accredited laboratories as applicable) for ratio error and phase angle error measurement
 - 15.1.2. Burden Box
 - 15.1.3. High voltage tester
 - 15.1.4. Test facility for over-voltage inter-turn testing
- 15.2. The manufacturer shall possess duly calibrated Standard CT of Class 0.05 accuracy.
- 15.3. The manufacturer shall submit the list of testing facilities available with him along with the CT Block.

16. INFORMATION TO BE SUBMITTED BY THE MANUFACTURER

The following shall be furnished with the CT Block.

- 16.1. Catalogues describing the equipment and indicating the type and model number.
- 16.2. Constructional features, materials used and relevant technical literature
- 16.3. Complete dimensional drawings
- 16.4. Manufacturing Experience
- 16.5. Details of the information indicated on the Name Plate
- 16.6. Valid Type test certificates from a NABL Accredited laboratory
- 16.7. Quality systems and quality assurance plan

17. DEVIATIONS

It is not allowed to deviate from the principal requirements of the specifications. However, it is required to submit detailed list of all deviations without any ambiguity. Unless otherwise brought out separately by the manufacturer in the schedule of deviations, the CT Block shall conform to the specification scrupulously. The discrepancies between the specification and the catalogues or literature submitted as part of the CT Block shall not be considered as valid deviations unless specifically brought in the schedule of deviations.