



Maharashtra State Electricity Distribution Company Limited

SPECIFICATION NO. T&QC: MSC-II/Dry Type Current Transformer/2019/06

Date: 28.06.2019

Technical Specification of
11kV, 22kV and 33kV Outdoor Resin Cast (Cycloaliphatic) Dry Type
Current Transformers for Protection and Metering

For

Distribution System

In

MSEDCL

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

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MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

Technical Specification for

11kV, 22kV and 33kV Outdoor Resin Cast (Cycloaliphatic) Dry Type

Current Transformers for Protection and Metering

1.0 Scope :-

- 1.1 This specification covers design, manufacture, assembly, testing before supply, inspection, packing and delivery and other basic technical requirements in respect of 11kV, 22kV, 33kV Outdoor Resin Cast (Cycloaliphatic) Current Transformers for protection and metering to be installed at various 33/11 kV, 33/22 kV, 22/11 kV sub-stations in MSEDCL, Maharashtra. The Outdoor Resin Cast (Cycloaliphatic) Current Transformers to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.
- 1.2 The Outdoor Resin Cast (Cycloaliphatic) Current Transformers offered shall be complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.
- 1.3 It is not the intent to specify herein complete details of design and construction. The Outdoor Resin Cast (Cycloaliphatic) Current Transformers offered shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements.

2.0 System Particulars:-

- 2.1 Nominal System Voltage : 11kV, 22kV, 33kV
- 2.2 Voltage variation on supply side : $\pm 10\%$
- 2.3 Corresponding Highest System Voltage : 12kV, 24kV, 36kV
- 2.4 Frequency : 50 HZ with $\pm 3\%$ tolerance
- 2.5 Transient condition : -20% or +10% combined variation of voltage and frequency
- 2.6 Number of phases : 3 Phases
- 2.7 Neutral Earthing : Solidly Effectively Earthed

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

3.0 Service Conditions:-

A) Outdoor Resin Cast (Cycloaliphatic) Current Transformers to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

3.1 Maximum ambient Temperature (Degree C)	50
3.2 Maximum temperature in shade (Degree C)	45
3.3 Minimum Temperature (Degree C)	3.5
3.4 Relative Humidity (percent)	10 to 100
3.5 Maximum Annual rain fall (mm)	1450
3.6 Maximum wind pressure (kg/sq.m)	150
3.7 Maximum altitude above mean sea level (Meter)	1000
3.8 Isoceranic level (days per year)	50
3.9 Seismic level (Horizontal Acceleration)	0.3g

Moderately hot and humid tropical climate conducive to rust and fungus growth

B) The climatic conditions are prone to wide variations in ambient conditions and hence the Outdoor Resin Cast (Cycloaliphatic) Current Transformers shall be of suitable design to work satisfactorily under these conditions.

4.0 Applicable Standards :-

- 4.1 The design, manufacture and performance of the Outdoor Resin Cast (Cycloaliphatic) Current Transformers shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this specification shall be construed to relieve the bidder off his responsibilities.
- 4.2 Unless otherwise specified, the Outdoor Resin Cast (Cycloaliphatic) Current Transformers offered shall conform to the latest applicable Indian, IEC, British, U.S.A. or International Standards and in particular, to the following:-

Sr. No.	Standards	Particulars
1.	IS 2165	Insulation coordination of highest voltages for equipments
2.	IS 16227 (Part-1)/(Part-2) /2016	Current Transformers
3.	IS 3202	Code of practice for climate proofing of electrical equipments
4.	IS 2071	Method of high Voltage Testing
5.	IS 2147	Degree of protection provided by enclosures for low voltages, Switchgear & Control
6.	IEC 185	Current Transformers

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7.	IEC 270	Partial Discharge measurement
8.	IEC 44(4)	Instrument Transformer measurement of PDs
9.	IEC 60	High Voltage Test Techniques
10.	IEC 8263	Method of RIV Tests on high voltage Insulators

5.0 Principal Technical Parameters of Current Transformers:

The equipment covered under this specification shall conform to specific parameters given below:

5.1 Principal Technical Parameters of 11kV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection and Metering

- i) Type of CT : Single Phase, Outdoor, Resin Cast (Cycloaliphatic), Dry Type Current Transformer
- ii) Type of mounting : Pedestal Type
- iii) Nominal System Voltage : 11kV
- iv) Corresponding Highest System Voltage : 12kV
- v) Frequency : 50 Hz with $\pm 3\%$ tolerance
- vi) Neutral Earthing : Solidly Effectively Earthed
- vii) Lightning Impulse Withstand Voltage (kVp) : 75
- viii) One minute dry/wet power frequency Withstand Voltage primary (kV rms) : 28
- ix) Rated Short Time Withstand Current for 1 Second : 13.1
- x) Rated Dynamic Withstand Current (kAp) : 32.75
- xi) Minimum Creepage Distance (mm) : 300
- xii) Clear height of bushing (Bird Clearance in mm) : 370
- xiii) Power Frequency Over Voltage Withstand requirement for Secondary winding (kVrms) : 3kV
- xiv) Instrument Security Factor : 5 or less for Metering Core
- xv) The die-electric withstand values of External & Internal Insulation : 28 kV/75 kVp
- xvi) Rated Continuous Thermal Current (A) : 120% of the rated Primary current
- xvii) Temperature rise : As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016
- xviii) Ratio taps : Achievable by secondary side reconnection
- xix) Max. Radio Interference Voltage : Less than 500 micro volts
- xx) Core I : Metering

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

xxi) Core II	: Protection
xxii) CT Ratio	: Incomer bay : 600-300/5-5A and Feeder : 400-200-100/5-5A
xxiii) Burden	: 15VA/-
xiv) Class of Accuracy	: 0.2S/5P10
xxv) Minimum Knee Point Voltage at lowest ratio for Protection Core Only	: 15x(Rct+19)
xxvi) Maximum magnetizing Current at guarantee knee point for protection core only	: 100mA
xxvii) Primary Terminal requirement	: Two, 30mm Dia. x 80mm Length
xxviii) Mounting Frame size requirement (mm×mm) and mounting hole diameter(mm)	: 350mmx350mm, Mounting Holes - Dia. 30mm

5.2 Principal Technical Parameters of 22kV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection and Metering

i) Type of CT	: Single Phase, Outdoor, Resin Cast (Cycloaliphatic), Dry Type Current Transformer
ii) Type of mounting	: Pedestal Type
iii) Nominal System Voltage	: 22kV
iv) Corresponding Highest System Voltage	: 24kV
v) Frequency	: 50 Hz with ± 3 % tolerance
vi) Neutral Earthing	: Solidly Effectively Earthed
vii) Lightning Impulse Withstand Voltage (kVp)	: 125
viii) One minute dry/wet power frequency Withstand Voltage primary (kV rms)	: 50
ix) Rated Short Time Withstand Current for 1 Second	: 26.2
x) Rated Dynamic Withstand Current (kAp) (kAp)	: 65.5
xi) Minimum Creepage Distance (mm)	: 600
xii) Clear height of bushing (Bird Clearance in mm)	: 450
xiii) Power Frequency Over Voltage Withstand requirement for Secondary winding (kVrms)	: 3kV
xiv) Instrument Security Factor	: 5 or less for Metering Core
xv) The die-electric withstand values of External & Internal Insulation	: 50kV/125kVp

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

xvi) Rated Continuous Thermal Current (A)	: 120% of the rated Primary current
xvii) Temperature rise	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016
xviii) Ratio taps	: Achievable by secondary side reconnection
xix) Max. Radio Interference Voltage	: Less than 500 micro volts
xx) Core I	: Metering
xxi) Core II	: Protection
xxii) CT Ratio	: Incomer bay : 600-300/5-5A and Feeder : 400-200-100/5-5A
xxiii) Burden	: 15VA/-
xiv) Class of Accuracy	: 0.2S/5P10
xv) Minimum Knee Point Voltage at lowest ratio for Protection Core Only	: 15x(Rct+19)
xvi) Maximum magnetizing Current at guarantee knee point for protection core only	: 100mA
xxvii) Primary Terminal requirement	: Two, 30mm Dia. x 80mm Length
xxviii) Mounting Frame size requirement (mm×mm) and mounting hole diameter(mm)	: 350mmx350mm, Mounting Holes - Dia. 30mm

5.3 Principal Technical Parameters of 33kV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection and Metering

i) Type of CT	: Single Phase, Outdoor, Resin Cast (Cycloaliphatic), Dry Type Current Transformer
ii) Type of mounting	: Pedestal Type
iii) Nominal System Voltage	: 33kV
iv) Corresponding Highest System Voltage	: 36kV
v) Frequency	: 50 Hz with ± 3 % tolerance
vi) Neutral Earthing	: Solidly Effectively Earthed
vii) Lightning Impulse Withstand Voltage (kVp)	: 170
viii) One minute dry/wet power frequency Withstand Voltage primary (kV rms)	: 70
ix) Rated Short Time Withstand Current for 1 Second	: 26.2
x) Rated Dynamic Withstand Current (kAp)	: 65.5

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xi) Minimum Creepage Distance (mm)	: 900
xii) Clear height of bushing (Bird Clearance in mm)	: 450
xiii) Power Frequency Over Voltage Withstand requirement for Secondary winding (kVrms)	: 3kV
xiv) Instrument Security Factor	: 5 or less for Metering Core
xv) The die-electric withstand values of External & Internal Insulation	: 70 kV/170 kVp
xvi) Rated Continuous Thermal Current (A)	: 120% of the rated Primary current
xvii) Temperature rise	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016
xviii) Ratio taps	: Achievable by secondary side reconnection
xix) Max. Radio Interference Voltage	: Less than 500 micro volts
xx) Core I	: Metering
xxi) Core II & III	: Protection
xxii) CT Ratio	: Incomer bay: 400-200-100/1-1-1A (3 Core) 400-200-100/1-1A (2 Core)
xxiii) Burden	: 20VA/ - / - 20VA/ -
xxiv) Class of Accuracy	: 0.2S/5P10/PS 0.2S/5P10
xxv) Minimum Knee Point Voltage at lowest ratio for Protection Core Only	: 15x(Rct+19)
xxvi) Maximum magnetizing Current at guarantee knee point for protection core only	: 100mA
xxvii) Primary Terminal requirement	: Two, 30mm Dia. x 80mm Length
xxviii) Mounting Frame size requirement (mm×mm) and mounting hole diameter(mm)	: 450mmx450mm, Mounting Holes - Dia. 30mm

6.0 General Technical Requirements of Current Transformers :-

6.1 Resin Cast Assembly :-

The Resin Cast assembly shall be of a single piece construction without any joint or coupling. The vertical clearance of Live part to Ground shall be at least 370 mm for 11 KV Current Transformer and 450 mm for both 22KV & 33KV.

6.2 Insulation Material:-

Insulation Material used for Current Transformer should be Cycloaliphatic Epoxy Resin Cast having Insulation Class B. The insulation of the Current Transformers shall

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be so designed that the internal insulation shall have higher electrical withstand capability than the external insulation. The dielectric withstand values specified in this specification are meant for fully assembled Current Transformer. The temperature rise on any part of equipment shall not exceed the maximum temperature rise limits specified in relevant IS.

6.3 Earthing :-

The Current Transformer shall be provided with Two separate Earthing Terminals for bolted connection to MS flat. The size of two numbers of Earthing Terminals shall be 16 mm Dia. x 30 mm length, Hot Dip Galvanized with one plain washer and one nut.

6.4 Name Plate and Rating Plate:-

The Current Transformer shall be provided with non-corrosive, legible Name plate, with the information specified in relevant standards, duly engraved / punched on it. The Current Transformer shall be provided with a rating plate with dimensions and marking as per IS - 16227. The markings shall be punched and not painted. The serial number and code of the supplier shall also be punched on the Current Transformer to identify the unit in case of loss or damage to the rating plate.

6.5 Mounting Details :-

Mounting details for fixing the Current Transformer on supporting structure shall be strictly in accordance with the specified details as follows:

For 11KV & 22KV Current Transformer requirement of Mounting Frame size is 350 mm × 350 mm with mounting holes of Dia. 30mm.

For 33KV Current Transformer requirement of Mounting Frame size is 450 mm×450 mm with mounting holes of Dia. 30mm.

The Terminal connectors required for connection of the Current Transformer are in the scope of purchaser.

6.6 Primary Winding :-

i) Primary winding shall be Wound Type. The primary winding conductor shall be high conductive (electrolytic grade) copper without any joint. Type of insulation used shall be described in the offer. For Primary Winding, current densities shall not exceed the limit 1.6 A/Sq.mm. for highest current ratio.

ii) Enamel, if used for conductor insulation, shall be either polyvinyl acetate type or amide type and shall meet the requirements of IS - 4800. Polyester enamel shall not be used.

iii) The design density for short circuit current as well as conductivity of the metal used for primary winding shall meet the relevant requirement of IS:16227-2016.

iv) The bidder shall, in his offer furnish detailed calculations for selection of winding cross sections. The cross section area of Primary Winding, cross section area of Secondary Winding, number of Primary Turns, number of Secondary Turns, Current Density etc. shall be mentioned by the bidder. The rating and the diagram plates should indicate the connection arrangement / diagram.

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v)The Primary Winding shall be designed for extended primary current at 120% of rated primary current.

6.7 Secondary Winding :-

i)Suitably insulated copper wire of electrolytic grade shall be used for Secondary Windings. Type of insulations used shall be described in the offer. For multi-ratio design, the multi-ratio shall be achieved by reconnection of the Secondary Windings. The cross section area of Secondary Winding, number of Secondary Turns, Current Density etc. shall be mentioned by the bidder.

ii)The excitation current of the CT shall be as low as possible. The bidder shall furnish, along with his offer, the magnetizing curves for all the cores.

6.8 Primary Terminals :-

Each Primary Terminal shall be made out of 1 rod (stud) of 30 mm Dia. x 80 mm length. The primary Terminal shall be of heavily tinned electrolytic copper of 99.9% conductivity. The minimum thickness of tinning shall be 15 microns.

6.9 Secondary Terminals :-

i)Secondary Terminals shall be brought out in a weatherproof metallic Terminal box. The Terminal box shall be provided with removable gland plate and glands. The cable glands shall be suitable for 1100 volts grade plate PVC insulated, PVC sheathed multi core stranded 6 Sq.mm copper conductor cable. This Terminal box shall be dust and vermin proof. The dimensions of the Terminal box and its opening shall be adequate to enable easy access and working space with the use of normal tools.

ii)Secondary Terminal studs shall be provided with at least 3 nuts and adequate plain and spring washer for fixing the leads. The studs, nuts and washer shall be made of brass duly nickel-plated. The minimum outside diameter of stud shall be 6 mm. The length of at least 15 mm shall be available on the studs for inserting the leads. Horizontal spacing between centers of adjacent studs shall be at least 1.5 times the circum dia. of the nuts. The Current Transformer shall be provided with CT ratio changing facility on secondary side only.

6.10 Lifting arrangement :

The C.T. shall be Outdoor Cycloaliphatic Epoxy Resin Cast and shall be so constructed that it can be easily transported to site within the allowable transport limitation. CT shall be provided with lifting lugs suitably located for easy mounting, dismantling & transportation purpose. The lifting arrangement shall be positioned in such a way as to avoid any damage.

6.11Current Transformer characteristic shall be such as to provide satisfactory performance for burdens ranging from 25 % to 100% of rated burden over a range of 5 % to 120% of rated current in case of metering CTs and up to accuracy limit factor / knee point voltage in case of protection CTs.

Polarity shall be invariably marked in each Primary and Secondary terminal. Facility shall be provided for short circuiting and grounding of the CT secondary terminals inside the terminal box.

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The Instrument Security Factor of metering core shall be less than 5. This shall be demonstrated on all the ratios of metering core in accordance with procedure specified in IEC-185 or IS: 16227-2016.

6.12 The antitracking paint shall be applied to CT, the colour shall be Light admiralty grey - Shade No. 697 as per IS 5.

7.0 Tests :

A) Type Test:

The Current Transformer offered in the Bid should have been successfully type tested at NABL laboratories for the tests indicated as follow in line with the relevant standard and technical specification. These Type Tests should have been carried out within five years prior to the date of opening of tender. The bidder shall be required to submit complete set of the type test reports along with the offer.

In case these type tests are conducted earlier than five years, all the type tests as per the relevant standard shall be carried out by the successful bidder at NABL in presence of purchaser's representative free of cost before commencement of supply. The undertaking to this effect should be furnished along with the offer without which the offer shall be liable for rejection.

If there is any change in the design/ type of old type tested current transformers to be offered against this specification, then the offer is considered for placement of order. However, successful bidders have to carry out the said type tests on offered type equipment before commencement of supply at their own expense.

Type Tests :

- 1) Temperature Rise Test
- 2) Impulse Voltage Withstand Test on Primary Terminals
- 3) Wet Test for outdoor Type Transformers
- 4) Tests for accuracy
- 5) Short Time Current Test

B) Acceptance & Routine Tests :-

All acceptance and routine tests as stipulated in the respective applicable standards amended up-to-date for current transformer shall be carried out by the supplier in the presence of purchaser's representative without any extra cost to the purchaser before dispatch.

The bidder shall have full facilities to carry out all the acceptance and routine test as per the applicable standards.

After finalization of the program of type/acceptance/routine testing, the supplier shall give three weeks advance intimation to the purchaser, to enable him to depute his representatives for witnessing the tests.

Acceptance & Routine Tests:

- 1) Power frequency voltage Withstand Test on Primary Terminals

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- 2) Partial discharge measurement
- 3) Power frequency voltage Withstand Test between sections
- 4) Power frequency voltage Withstand Test on secondary Terminals
- 5) Tests for accuracy
- 6) Verification of marking
- 7) Determination of the secondary winding resistance
- 8) Determination of the secondary winding loop time constant
- 9) Test for rated knee point e.m.f. and exiting current at rated knee point e.m.f.
- 10) Inter turn over voltage test

8.0 Inspection:-

- i) The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at any reasonable time when the work is in progress. All facilities must be made available by supplier/ manufacturer for unrestricted inspection of the works, raw material & manufacture of all the accessories & for conducting necessary tests as declared therein.
- ii) The supplier shall keep the purchaser informed, in advance, of the time of starting and of the progress of manufacture of current transformer in its various stages so that arrangement should be made for inspection.
- iii) No current transformer shall be dispatched from its point of manufacture unless the current transformer has been satisfactorily inspected and tested.
- iv) Inspection and acceptance of any current transformer under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing current transformer in accordance with the specification and shall not prevent subsequent rejection, if the current transformer is found to be defective.

9.0 Qualifying requirements:-

The Bidder should have proven experience of not less than 5 years in design, manufacture, supply, and testing at works for the current transformer offered of equal or higher voltage class. The current transformer offered by the Bidder should be in successful operation at least for 2 years as on the date of submission of the tender.

10.0 Quality Assurance Plan :-

- A) The Bidder shall invariably furnish the following information along with his offer, failing which his offer shall be liable for rejection. Information shall be given for offered Current Transformer.
 - i) Statement giving list of important raw materials, including but not limited to:
 - a. Conductor
 - b. Insulation/ core material
 - c. Sealing material
 - d. Insulated Wire
 - ii) Names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested, list of Tests normally carried out on raw materials in presence of bidder's representative, copies of Test Certificates. Information and copies of Test Certificates as in (i) above in respect of bought out materials.

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- iii) List of manufacturing facilities available. In this list the bidder shall specifically mention whether lapping machine, vacuum drying plant, air-conditioned dust free room with positive air pressure for provision of insulation, facility for testing tan-delta of insulation at rated voltage etc. are available as in house testing facilities or hired services.
 - iv) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
 - v) Special features provided in the equipment to make it maintenance free.
- B) The successful Bidder shall, within 30 days of placement of order, submit following information to the Purchaser.
- i) List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished along with offer.
 - ii) Test Certificates of the raw material and bought out accessories.
 - iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchaser's hold points shall be discussed between the purchaser and supplier, before the QAP is finalized.
- C) The successful Bidder shall submit the routine test certificates of bought out accessories at the time of routine testing of the fully assembled Current Transformer.

11.0 Performance Guarantee:

The equipment offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete equipment at site in good condition or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make necessary repairs / replacement of the faulty current transformer at no extra cost to the purchaser.

12.0 Documentation:-

A) List of Drawings & Documents :-

The bidder shall furnish two sets of the following drawings along with his offer.

- a) General outline and assembly drawings of the equipment
- b) Graphs showing the performance of equipments in regard to Magnetization Characteristic.
- c) Sectional views showing :-
 - i) General Constructional features of Current Transformer, size of conductor, it's cross section, Clearance between live part & ground along with all Technical details.
 - ii) The insulation, the winding arrangements, method of connection of the primary / secondary winding to the primary / secondary terminals etc.

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- d) Arrangement of secondary Terminal box & details of connection studs provided.
 - e) Name Plate
 - f) Schematic drawing
 - g) Type Test reports in case the equipment has already been type tested.
 - h) Test reports, literature, pamphlets of the bought out items, and raw material
 - i) Bill of material and packing list.
- B)** The successful bidders shall submit three sets of final versions of all the above said drawings in line with Technical Specifications & Drawings attached for purchaser's approval after placement of LOA. The purchaser shall communicate his comments / approval on the drawings to the supplier within two weeks. The supplier shall, if necessary, modify the drawings and resubmit three copies of the modified drawings for purchaser's approval within two weeks from the date of purchaser's comments. Chief Engineer (Testing & QC Cell) will convey the drawing approval.
- C)** Adequate copies of acceptance and routine Test Certificates, duly approved by the purchaser, shall accompany the dispatched consignment.
- D)** The manufacturing of the current transformers shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the current transformers prior to the approval of the drawing shall be at the supplier's risk.
- E)** One set of nicely printed and bound volume of operation, maintenance and erection manuals in English language per Current Transformer of each voltage rating shall be submitted by the supplier to respective consignees along with the dispatch documents of each unit. The manual shall contain all the drawings and information required for erection, operation and maintenance of the Current Transformer. The manual shall also contain a set of all the approved drawings, Type Test reports etc.
- F)** Approval of drawings by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirement of the Technical Specification, latest revision of applicable standards, rules and codes of practices. The equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which, in his judgment, is not in full accordance therewith.

13.0 Packing & Forwarding :-

- i) The current transformers shall be packed in wooden crates of good quality and shall be suitable for vertical / horizontal transportation as the case may be, and suitable to withstand handling during transport and outdoor storage in stores before erecting. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided.

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- Any material found short inside the packing cases shall be supplied by supplier without any extra cost.
- ii) Each consignment shall be accompanied by a detailed packing list containing the following information:
- a) Name of the consignee
 - b) Details of consignment
 - c) Destination
 - d) Total weight of consignment
 - e) Sign showing upper / lower side of the crate
 - f) Handling and unpacking instructions
 - g) Bill of material indicating contents of each package
- iii) The supplier shall ensure that the packing list and bill of material are approved by the purchaser before dispatch.

14.0 Information to be filled / furnished invariably by Bidder:

The offer shall be complete in all respects, failing which the same are liable for rejection. Guaranteed technical particulars for current transformer shall be elaborate and complete in all respects. It may be noted that the technical evaluation of the tender is made mainly based on the guaranteed technical particulars and deviations from the specifications furnished along with the technical offer.

15.0 Guaranteed Technical Particulars :

The bidder should fill up the details in schedule A – ‘Guaranteed Technical Particulars’ and the statement such as “as per drawing enclosed”, “as per MSEDCL requirement”, “as per IS”, “as per specification” etc. shall be considered as details not furnished and such offers will be rejected.

16.0 Schedules :-

The bidder shall fill in the following Schedule which forms part of the Tender Specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

SCHEDULE – ‘A ‘ - Guaranteed Technical Particulars of 11kV, 22kV & 33kV Resin Cast (Cycloaliphatic) Dry Type Current Transformers (Protection & Metering)

SCHEDULE – ‘B ‘ - List of Type Test Reports to be enclosed with the offer

SCHEDULE – ‘C ‘ - Schedule of Deviations from Specification

SCHEDULE – ‘D ‘ - Schedule of Bidder’s Experience

SCHEDULE – ‘E ‘ - Schedule of Deviations from Specified Standards

SCHEDULE – ‘F ‘ - Deviations from specified Test requirements specified in Relevant Standards and Present Specification

SCHEDULE – ‘G ‘ - Proforma of Undertaking

The Bidder shall submit the list of orders for similar type equipments executed or under execution during last five years, with full details, in the schedule of Bidders experience (Schedule ‘D’) to enable the purchaser to evaluate the tender. In case the

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

equipments are being designed and manufactured in collaboration with other manufacturer, the following additional information shall be submitted by the Bidder along with his offer.

- (i) Copy of collaboration agreement executed between the bidder and the collaborator.
- (ii) List of orders for similar equipments, executed / being executed by the collaborator during last ten years and performance certificate for seven years of satisfactory operation.

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

ANNEXURE - A
Principal Technical Parameters of 11kV & 22kV
Resin Cast (Cycloaliphatic) Dry Type Current Transformers
(Protection & Metering)

Sr. No.	Item	Specification			
1.	Type of CT/Installation	Single Phase, Outdoor, Resin Cast Dry Type Current Transformer (Cycloaliphatic)			
2.	Type of mounting	Pedestal Type			
3.	Suitable for frequency	50 Hz with $\pm 3\%$ tolerance			
4.	Method of Earthing system to be connected to	Solidly Effectively Earthed			
5.	Rated Continuous Thermal Current (A)	120% of the rated Primary current			
6.	Acceptable limit of temperature rise above the specified ambient temperatures for continuous operation at rated current	As per IS: 16227(Part-1) & IS:16227(Part-2) 2016			
7.	Max. Radio Interference Voltage at 1.1 times rated voltage	Less than 500 micro volts			
8.	Core details				
Purpose of core	11 kV CT		22 kV CT		
	I/C	O/G	I/C	O/G	
	Core I for Metering & Core II for Protection	Core I for Metering & Core II for Protection	Core I for Metering & Core II for Protection	Core I for Metering & Core II for Protection	
CT Ratio	600-300/5-5A	400-200-100/5-5A	600-300/5-5A	400-200-100/5-5A	
VA Burden	15/-	15/-	15/-	15/-	
Class of Accuracy	0.2S/5P10	0.2S/5P10	0.2S/5P10	0.2S/5P10	
Minimum Knee Point Voltage at lowest ratio	15x(Rct+19) for Protection Core only	15x(Rct+19) for Protection Core only	15x(Rct+19) for Protection Core only	15x(Rct+19) for Protection Core only	
Maximum magnetizing Current at guarantee knee point	100 mA for protection core only	100 mA for protection core only	100 mA for protection core only	100 mA for protection core only	

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

	Technical Particulars	11 kV	22 kV
9.	Rated Voltage / HSV (kVrms)	11kV/12kV	22kV/24kV
10.	Lightning Impulse Withstand Voltage (kVp)	75	125
11.	One minute dry/wet power frequency withstand voltage primary (kV rms)	28	50
12.	Rated Short Time Withstand Current for 1 Second duration (kA rms)	13.1	26.2
13.	Rated Dynamic Withstand Current for 1 second duration (kAp)	32.75	65.5
14.	Minimum Creepage Distance (mm)	300	600
15.	Primary Terminal requirement	Two, 30 mm Dia. × 80 mm length	
16.	Mounting Frame size requirement (mm×mm), mounting holes diameter (mm)	350mmx350mm, Mounting Holes - Dia. 30mm	
17.	Power Frequency Over Voltage withstand requirement for Secondary winding (kvrms)	3kV	
18.	Instrument Security Factor	5 or less for Metering Core	
19.	The die-electric withstand values of External & Internal Insulation	28 kV/75 kVp	50 kV/125 kVp

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

**ANNEXURE - B
Principal Technical Parameters of 33 kV
Resin Cast (Cycloaliphatic) Dry Type Current Transformers
(Protection & Metering)**

Sr. No.	Item	Specification
1.	Type of CT/ Installation	Single Phase, Outdoor, Resin Cast Dry Type Current Transformer (Cycloaliphatic)
2.	Type of mounting	Pedestal type
3.	Suitable for system frequency	50 Hz
4.	Ratio taps	Achievable by secondary side reconnection
5.	Method of Earthing system to be connected to	Solidly Effectively Earthed
6.	Rated continuous thermal current (A)	120% of the rated primary current
7.	Acceptable limit of temperature rise above the specified ambient temperatures for continuous operation at rated current	As per IS: 16227 (Part-1) & IS: 16227 (Part-2) 2016
8.	Max. radio interference voltage at 1.1 times the rated voltage	Less than 500 micro volts
9.	Current Ratio for Nominal system Voltage of 33KV	400-200-100/1-1-1A, (3 Core) 400-200-100/1-1A, (2 Core)
10.	Rated Voltage / HSV (kV rms)	33kV / 36kV
11.	Lightning Impulse Withstand Voltage(kVp)	170
12.	One minute dry /wet power frequency withstand voltage primary (kV rms)	70
13.	Rated short time withstand current for 1 Second Duration (kA rms)	26.2
14.	Rated dynamic withstand current for 1 second duration (kAp)	65.5
15.	Minimum creepage distance (mm)	900
16.	Primary Terminal requirement	Two, 30mm Dia.×80 mm length
17.	Mounting Frame size requirement (mm×mm), mounting holes diameter (mm)	450mmx450mm, Mounting Holes - Dia. 30mm
18.	Power frequency over voltage withstand requirement for Secondary winding (kVrms)	3kV

**Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type
Current Transformers for Protection & Metering**

19.	Core details (3Core)				
		Core No.	I	II	III
	1.	Purpose	M	P	P
	2.	Burden (VA)	20	-	-
	3.	Class of Accuracy	0.2S	5P10	PS
	4.	Minimum Knee Point Voltage at lowest ratio (Volt)	-	15x(Rct+19)	15x(Rct+19)
5.	Maximum magnetizing current at guarantee knee point voltage (mA)	-	100	100	
20.	Core details (2Core)				
		Core No.	I	II	
	1.	Purpose	M	P	
	2.	Burden (VA)	20	-	
	3.	Class of Accuracy	0.2S	5P10	
	4.	Minimum Knee Point Voltage at lowest ratio (Volt)	-	15x(Rct+19)	
5.	Maximum magnetizing current at guarantee knee point voltage (mA)	-	100		
21.	Instrument Security Factor	5 or less for Metering Core			
22.	The die-electric withstand values of External & Internal Insulation	70 kV/170 kVp			

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

SCHEDULE 'A'

Guaranteed Technical Particulars of 11kV, 22kV & 33kV Resin Cast (Cycloaliphatic) Dry Type Current Transformers (Protection & Metering)

Sr. No.	Particular of GTP Parameter	Type
1.	Manufacturer's Name & address	TEXT
2.	Manufacturer's Type Designation	TEXT
3.	Type of Mounting	TEXT
4.	Equipment Conforming to Standards	TEXT
5.	Rated Voltage/Highest System Voltage in KV	TEXT
6.	Rated Primary Current (Amp)	TEXT
7.	Rated Secondary Current (Amp)	TEXT
8.	Frequency (HZ)	TEXT
9.	Ratio of Current Transformer	TEXT
10.	Details of Cores	
	Core (I II III)	TEXT
i)	Purpose	TEXT
ii)	Burden (VA)	TEXT
iii)	Class of Accuracy	TEXT
iv)	Minimum knee point Voltage at lowest ratio (V)	TEXT
v)	Maximum magnetizing Current at guarantee knee point voltage (mA)	TEXT
11.	Secondary resistance corrected to 75°C (in Ohm)	TEXT
12.	Rated Short Time Withstand Current for 1 Sec. duration	TEXT
13.	Rated Dynamic Withstand Current (KAp)	TEXT
14.	Ratio Selection	TEXT
15.	Method of Earthing system to be connected to	TEXT
16.	One minute Dry Power Frequency Withstand Voltage (KV rms) of Primary Winding	TEXT
17.	One minute Wet Power Frequency Withstand Voltage (KV rms) of Primary Winding	TEXT
18.	1.2/50 micro-second Impulse Withstand Voltage (KVP)	TEXT
19.	The die-electric Withstand values (KVp)of external & internal insulation	TEXT
20.	One minute Power Frequency Withstand Voltage (KV rms) of Secondary Winding	TEXT
21.	Minimum Creepage Distance (mm)	TEXT

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

22.	Total Weight (KG)	TEXT
23.	Mounting details	TEXT
24.	Overall dimension	TEXT
25.	Magnetization Curves are submitted? (Y/N)	TEXT
26.	Type of Winding	TEXT
27.	Material of Winding	TEXT
28.	Size & Cross Section of Primary Winding	TEXT
29.	Size & Cross Section of Secondary Winding	TEXT
30.	No. of Primary Turns	TEXT
31.	No. of Secondary Turns	TEXT
32.	Current Density of Primary & Secondary Winding (max. - 1.6A/sq.mm)	TEXT
33.	Primary Terminal	TEXT
34.	Type of Insulation	TEXT
35.	Whether Current Transformer confirms to Temperature Rise limits	TEXT
36.	Whether Type test reports (within five years) as per Technical Specification are submitted ? (Y/N)	TEXT
37.	Whether Experience Sheet is submitted along with the offer? (Y/N)	TEXT
38.	Whether Two year continuous servicing performance certificate is submitted along with the offer? (Y/N)	TEXT
39.	Whether Turn over sheet is submitted along with the offer? (Y/N)	TEXT
40.	Whether Drawings are submitted along with the offer? (Y/N)	TEXT
41.	Partial Discharge level	TEXT
42.	Rated continuous Thermal Current (120% of the rated Primary Current)	TEXT
43.	Instrument Security Factor (ISF \leq 5)	TEXT
44.	Class of Insulation	TEXT
45.	Actual clearance between live part & ground (mm)	TEXT

Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers for Protection & Metering

SCHEDULE 'B'

List of Type Test Reports to be enclosed with the offer

Sr. No.	Description of Type Test	Type & Make of Current Transformer & its rating	IS/IEC Clause No.	Testing Lab. & Date of Testing	Type test report No., dt & pages	Whether certificate of compliance with IS/IEC is enclosed with T.R.
11kV/22kV/33kV Resin Cast (Cycloaliphatic) Dry Type Current Transformers						
1.	Temperature Rise Test					
2.	Impulse Voltage Withstand Test on Primary Terminals					
3.	Wet Test for outdoor Type Transformers					
4.	Tests for accuracy					
5.	Short Time Current Test					

Name of the firm _____

Signature of the bidder _____

Designation _____

Date _____

**Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type
Current Transformers for Protection & Metering**

SCHEDULE ' C '

Schedule of Deviations from Specification

Sr. No.	Clause No.	Details of Deviations
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Name of the firm_____

Signature of the bidder_____

Designation_____

Date_____

**Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type
Current Transformers for Protection & Metering**

SCHEDULE 'D'
Schedule of Bidder's Experience

Bidder shall furnish here a list of similar orders executed/under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of Client & Description order	Value of order along with size & qty	Period of supply and commissioning	Name & Address to whom reference may be made
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Name of the firm_____

Signature of the bidder_____

Designation_____

Date_____

**Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type
Current Transformers for Protection & Metering**

SCHEDULE 'E'

Schedule of Deviations from Specified Standards

Sr. No.	Particulars	Stipulation of specified standard		Stipulation of standard adopted by bidder		Remarks
		Standard ref.	Stipulations	Standard ref.	Stipulations	
1.						
2.						
3.						
4.						
5.						
6.						
7.						

Name of the firm_____

Signature of the bidder_____

Designation_____

Date_____

**Technical Specification of 11KV, 22KV & 33KV Outdoor Resin Cast (Cycloaliphatic) Dry Type
Current Transformers for Protection & Metering**

SCHEDULE 'F'

**Deviations from specified Test requirements specified in Relevant Standards
and Present Specification**

Sr. No.	Name of Test	Standard No. & Clause No.	Requirement of standards	Proposed deviation	Reasons for deviation.
1.	Type Test				
2	Additional Test				
3	Acceptance Test				
4	Routine Test				

Name of the firm_____

Signature of the bidder_____

Designation_____

Date_____

SCHEDULE 'G'

Proforma Of Undertaking

We hereby confirm that 11kV, 22kV and 33kV Outdoor Resin Cast (Cycloaliphatic) Dry Type Current Transformers offered by us against this tender are of the same design and type as have been supplied to M.S.E.D.C.L. against earlier order No. _____ dtd. _____ and all the Type Test Reports thereof were approved by C.E. (Testing & QC Cell) vide letter No. _____ dtd. _____ (copy enclosed.)

We further confirm that the said Type Test have been carried out at _____ within five years prior to the date of opening of present tender.

SEAL AND SIGNATURE OF BIDDER