TECHNICAL SPECIFICATION

Document Title

TPSODL

Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1600 A)

Document No.	ENG-EHV-09	Eff. Date: 18.10.2023
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Prepared By:	Reviewed By:	Approved & Issued By:

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1. SCOPE:

SODL

This specification This specification covers technical requirements of design, manufacture, construction, performance, testing at manufacturer's works, packing, forwarding, supply and unloading at stores/site of 33KV Outdoor VCB of 1250 Amps. completed with all accessories for trouble free and efficient performance.

2. APPLICABLE STANDARDS:

- a) IS 13118: Specification for High Voltage Alternating Current Circuit Breakers
- b) IS 12063: Classification of degrees of protection provided by enclosures of electrical equipment
- c) IS 2099: Bushings for alternating voltages above 1000 Volts
- d) IS 2629: Recommended Practice for Hot-Dip Galvanizing of Iron and Steel : Methods for testing uniformity of coating of zinc coated articles
- e) IS 2633: Hot Dip Zinc coatings on structural steel and other allied products
- f) IS 4759: High-voltage switchgear and control gear
- g) IEC 62271-100 Alternating current circuit breakers
- h) IEC 62271-1-: High-voltage switchgear and control gear Part 1: Common specifications
- i) ISO 1460: Metallic coatings Hot dip galvanized coatings on ferrous materials Gravimetric determination of the mass per unit area
- j) BS 729 : Specification for Hot dip galvanized coatings on iron and steel articles

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	100%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120 Days
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)

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

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TPSODL service area has heavy saline conditions along thecoast and High cyclonic Intensity winds with speed upto 300 Kmph. 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 REQUIREMENTS

Reviewed By:

Prepared By:

S No	Particulars	Requirements	
0.110.		33 kV	
4.1	Application	Outdoor	
4.2	Туре	VCB	
4.3	Rated voltage	36 kV	
4.4	Service voltage	33 kV	
4.5	Rated Frequency	50 Hz	
4.6	Number of phases	3	
4.7	Rated insulation level		
4.7.1	Rated Lightning impulse withstand voltage		
а	To earth and b/w Poles	170 kVp	
b	Across the isolating distance	195 kVp	
4.7.2	Rated short duration power frequency withstand voltage		
а	To Earth and between Poles (Dry test for 1 Min)	70 kV	
b	To Earth and between Poles and across the isolating distance (Wet test for 10 Sec)	75 kV	
с	Across Open Switching Device	75 kV	
4.8	Rated normal current	1250 A	
4.9	Rated load breaking current (sym)	26.3 kA (rms)	
4.1	Percentage DC component	<50 %	
4.11	Rated short circuit withstand current for 3 seconds	26.3 kA (rms)	
4.12	Rated short circuit making current	66 kA	
		1.5 for Terminal fault	
4.13	First Pole to Clear factor	1 for Short line fault	
		2.5 for Out of phase fault	
4.14	Rated capacitive switching currents		

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4.14.1	Rated line charging breaking current	10 A (rms)
4.14.2	Rated cable charging breaking current	50 A (rms)
4.14.3	Rated single capacitor bank breaking current	400 A (rms)
4.14.4	Capacitor Banks with series reactors switching capacity	Suitable for 14.4 MVAR Capacitor Banks with series reactors
4.15	Maximum switching over voltages for cable charging & capacitor bank breaking current	2.5 p.u.
4.16	Rated operating sequence	0-0.3sec-CO-3min-CO
4.17	Total Break time(max)	85 ms (Shall not change during operating life)
4.18	Closing time (max)	65 ms (Shall not change during operating life)
4.19	Rated supply voltage of control circuits	48V/24V DC
4.19.1	Range for satisfactory operation of Trip circuit	70% to 110%
4.19.2	Range for satisfactory operation of closing & other circuits	85% to 110%
4.2	Transient recovery voltages	As per IEC 62271-100
4.21	No. of auxiliary contacts	10 NO & 10 NC
4.22	Clearance in air	_
4.22.1	Between phases	420 mm
4.22.2	phase to earth	320 mm
4.23	Min. Creepage distance of insulator	31mm per kV
4.24	Degree of Protection	IP 55
4.25	Operating mechanism	Spring charged by universal motor.
4.26	Operation	Gang operated
4.27	Temp. rise at rated normal current	As per IEC 62271-100
4.28	Minimum Vertical clearance of live conductor from ground level	As per manufacturer's type tested design
4.29	Mechanical Endurance	M2
4.3	Electrical Endurance	E2 Class without Auto-Reclosing
4.31	Restriking Class	C2
4.32	Class	S2
4.33	Material of main contact	Copper chromium, silver plated

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4.34	Interrupter	Vacuum Interrupter should be of same make as that of Breaker manufacturer. Representative shall visit Interrupter manufacturing Facility during Factory Inspection.
4.35	Interrupting Capacity at nominal system voltage	2500 MVA

Circuit Breaker shall be suitable for switching capacitor bank of rating 14.4 MVAR for 33 kV with capacitor bank star point undergrounded and series reactors (rating 6% of capacitor bank rating if connected on line side & 0.2 % if connected on neutral side of the capacitor bank rating). The circuit breakers should withstand capacitor bank inrush currents.

5. GENERAL CONSTRUCTIONS

5.1 GENERAL:

- 5.1.1 Control cabinets shall be of the dust, moisture, vermin proof and free standing floor mounting out door type. Control Cabinets shall be CRCA or better, surface treated for anti-oxidation/corrosion and power coated with epoxy highly suitable for outdoor installations (test reports shall be submitted).
- 5.1.2 Sheet steel shall be at least 2.5.mm thick. 15mm thick neoprene gaskets shall be provided to ensure degree of protection of IP 55.
- 5.1.3 Control cabinets shall be provided with hinged door and padlocking arrangement. The door hinges shall be of union joint type to facilitate easy removal.
- 5.1.4 Door shall be properly braced to prevent wobbling. Cable entry from bottom.
- 5.1.5 All wiring in the control cabinet shall be carried out with 1100V grade single core multi strand flexible copper conductor wires of size not less than 2.5sq.mm with HRPVC insulation and shall be flame retardant, vermin and rodent proof.
- 5.1.6 Suitable heaters shall be mounted in the housing to prevent condensation. On-off switch and fuse shall be provided. Heater shall be suitable for 240V single- phase 50 Hz AC supply. Electrical and Mechanical indications for ON-OFF to be provided which is visible from the front.
- 5.1.7 Terminal boards shall be furnished in the mechanism housing. All the terminal blocks shall be of disconnecting type links. Terminals for DC and AC shall be isolated from each other. A minimum of 20% spare terminals for control wiring shall be provided. All wiring in the housing shall be stranded and the insulation shall be vermin proof. Insulation shall be such that it shall not support combustion. Suitably rated switches shall be provided to enable the control supply to the breaker to be cut off from the mechanism housing. Requisite number of cable entries shall be provided at the bottom of the operating cabinet to receive purchaser's control cables. Number and size of

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cable glands will be intimated to the bidder. A light point with a control switch shall be provided inside the housing of the breaker.

- 5.1.8 Height of operating box of the CB shall be specified. The height of manual operating handle shall not be more than 1500mm from ground level. The operating box shall be provided with T-N-C switch "Pistol Grip" type for local operation. Separate terminal box below the main operating box to accommodate the terminal blocks shall be provided..
- 5.1.9 No external damping circuit shall be acceptable with the CB. Breaker tripping curve to be provided by the bidder. Bidders providing breakers with contact resistance <30 micro ohms and range for satisfactory operation of Trip circuit as 70 % to 110 % shall be given preference. The closing time and opening time shall not change during operating life. And the Contact resistance shall not change by ±10% during operating life.
- 5.1.10 Breaker shall be supplied with Two Tripping Circuit. Provision for Pre & Post Trip Circuit supervision is required in both circuits.

5.2 OPERATING MECHANISM:

- 5.2.1 Circuit breaker shall be power operated through a motor compressed spring charging mechanism. Spring operated mechanism shall be complete with motor, opening spring, closing spring and all necessary accessories to make the mechanism a complete operating unit. Spring_ charging motor shall be universal type with overload protection and overload relay with contacts for annunciation. Each mechanism shall be so designed as to enable a continuous sequence of circuit breaker opening and closing operations to be obtained by the control switch as long as power is available to the motor, and at least one circuit breaker opening and closing after failure of power supply to the motor. Also, the Circuit breaker shall have suitable provision for manual spring charging. Anti-pumping feature shall be provided.
- 5.2.2 Operating mechanism shall normally be operated by remote electrical control. Provision shall be made for local electrical control and a "local/remote" selector switch shall be provided in the operating mechanism cubicle. A conveniently located manual tripping lever or button shall also be provided for tripping the breaker and simultaneously opening the reclosing circuit. A manual closing device that can easily be operated by one person standing on the ground shall also be provided for maintenance purposes. Each circuit breaker unit shall be provided with operation counter.
- 5.2.3 A closing release shall operate correctly at all values of voltage between 70% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage.
- 5.2.4 Working parts of the mechanism shall be of corrosion resisting material. Bearing which require greasing shall be equipped with pressure type grease fittings. Bearing pins, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker.
- 5.2.5 Main poles of each breaker shall be connected together and operated by a common mechanism and shall be so adjusted and arranged that interrupting contacts of all phases can be readily adjusted to touch and part simultaneously.
- 5.2.6 Provision shall be made to enable electrical & Castel Key interlocking with the opening

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or closing of the isolator when breaker is closed. All electrical and mechanical interlocks, which are necessary for safe and satisfactory operation, shall be furnished.

5.2.7 Floor clamps, Foundation bolts, Lifting hooks and one manually operated tank lifting & lowering device for frame-mounted tanks shall be provided. All similar parts, particularly removable ones shall be interchangeable with one another. Exposed live parts shall be placed high enough above ground to meet the statutory requirements and local safety codes. All Terminal blocks shall be stud type. Bidder shall give suitable

provision in CB such as space, auxiliary contact with wiring etc. for providing castle lock by purchaser.

5.3 CONTACTS:

Main contacts shall have sufficient area and contact pressure for carrying the rated current and the short time rated current of the breaker without excessive temperature rise that may cause pitting or welding. Contacts shall be adjustable to allow for wear, easily replaceable and shall have a minimum of movable parts and adjustments to accomplish these results. Main contacts shall be the first to open and the last to close. All contacts shall be silver coated (Thickness shall be specified) and made of Copper Chromium alloy.

5.4 BUSHINGS:

Porcelain used in bushing manufacture shall be a single piece and homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Glazing of the porcelain shall be of uniform brown colour free from blisters, burns and similar other defects. Bushings shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used. All bushings of identical ratings shall be interchangeable. Insulation of bushings shall be coordinated with breaker insulation so that impulse flashovers will occur outside the tank. Puncture strength of bushings shall be greater than the dry flashover value. When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulation or supports by the formation of substances produced by chemical action. No radio disturbance shall be caused by the bushings when operating at the normal rated voltage. Iron parts shall be preferably hot-dip galvanized, all joints shall be airtight. Surfaces of the joints shall be trued up; porcelain parts by grinding and metal parts by machining. Bushing design shall be such as to ensure a uniform compressive pressure on the joints. All current carrying contact surfaces shall be silver-plated. Silver plating shall not be less than one mm thickness. Bushings shall satisfactorily withstand the insulation level specified in the relevant IS.

5.5 PRIMARY TERMINALS:

Primary terminals shall be suitable for wedge type connectors with ZEBRA conductors. Successful bidder shall supply connectors. It should have Primary — terminals (connected at Fixed contact) on Single side at top in case of bypassing CB. terminals (connected at Fixed contact) on eitner side at top in case of bypassing CB.

5.6 GALVANIZING:

All galvanizing shall be carried out by the hot dip process, in accordance with IS 2629/ ISO 1460 amended to date. However, high tensile steel nuts, bolts and spring washers shall be electro -galvanized to service condition four. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or Property of TPSODL- Not to be reproduced without permission of TPSODL

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be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.

The minimum mass of Zinc coatings shall be as per IS 4759. After galvanizing no drilling or welding shall be performed_ on the galvanized parts of the equipment except that nuts may be threaded after galvanizing.

To avoid the formation of white rust, galvanized material shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization. The galvanized steel shall be subjected to tests as per IS-2633/ BS 729 amended to date.

5.7 EARTHING:

Suitable grounding terminals shall be provided on the circuit breaker on opposite sides, for connecting to earth pit. The earthing terminals shall be readily accessible and so placed that the earth connection of the circuit breaker is maintained even when the cover or any other movable part is removed. GI strip for earthing shall be of size 50 mm X 6mm, approx. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. The earthing terminal shall be identified by means standard symbol marked in a legible and indelible manner on case or frame to be earthed adjacent to the terminals.

5.8 CT Mounting Arrangement:

CT Mounting Arrangement shall be in scope of supplier. Supplier has to provide the detailed calculation for selection of all Load Bearing Components . Components shall be GI.

CT Base shall be 450 X 450 mm (Hole Centre to Centre) Minimum weight to be considered: 150kg per CT.

- **5.9** 24V DC LED Type Indicating Lamps shall be mounted inside control cubicle which shall be visible from outside through glass of cubicle door.
 - a. Breaker ON Red
 - b. Breaker OFF Green
 - c. Spring Charged Blue

6. MARKING

Circuit breaker and its operating devices shall be provided with durable and legible nameplates containing all technical parameters. Name plate for Circuit breaker shall be embossed with "PO No. with date", "PROPERTY OF TPSODL", along with the following information: Manufacture's name, Type designation and serial number

- 1. Year of manufacture
- 2. Relevant standard
- 3. Rated voltage
- 4. Rated lightning impulse withstand voltage
- 5. Rated switching impulse withstand voltage
- 6. Rated normal current

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- 7. Rated duration of short circuit
- 8. Rated short circuit breaking current
- 9. DC time constant of the rated short circuit breaking current if different from 45 ms
- 10. DC component of the rated short circuit breaking current at contact separation corresponding to the dc time constant of the rated short circuit breaking current
- 11. Rated operating sequence
- 12. Classification

Name plate for the operating device shall be provided with following information:

- 1. Manufacturer's name
- 2. Type designation and serial number
- 3. Relevant standard

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the Purchaser/his authorized representative. Following tests shall be necessarily conducted in addition to others specified in relevant standards.

7.1 Routine tests:

- 1. Dielectric tests on the main circuit
- 2. Tests on auxiliary and control circuits
- 3. Measurement of the resistance of the main circuit
- 4. Tightness tests
- 5. Design and Visual checks
- 6. Mechanical operating tests
- 7. Dynamic contact resistant measurement (Signature test)

7.2 Type tests:

- 1. Dielectric Tests
- 2. Measurement of the resistance of the main circuits
- 3. Temperature rise tests
- 4. Short time withstand current and peak withstand current tests
- 5. Additional tests on auxiliary and control circuits
- 6. Mechanical operation test at ambient temperature
- 7. Short circuit making and breaking tests
- 8. Verification of the degree of protection
- 9. Tightness tests
- 10. Mechanical tests
- 11. Out of phase making and breaking tests
- 12. Electrical endurance tests
- 13. Double earth fault tests
- 14. Capacitive Current switching tests

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.

The above tests must not have been conducted on the equipment within time frame as per latest CEA Guidelines

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In case of any change in design/type of Breaker already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

8. TYPE TEST CERTIFICATES

The Bidder shall furnish the type test certificates of the Item for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA/CESI/KEMA/KERI/PEHLA as per the relevant standards. Type tests should have been conducted in certified Test laboratories during the period not exceeding years as per CEA Guidelines from the date of opening the bid. In the event of any discrepancy in the test reports,

i.e. any test report not acceptable, same shall be carried out without any cost implication to TPSODL.

9. PRE DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPDCOL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPSODL representatives at all times when the work is in progress. Inspection by the TPSODL or its authorized representatives shall not relieve the bidder 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 TPSODL.

Following documents shall be sent along with material

- a) Test reports
- b) MDCC issued by TPSODL
- c) Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES

The material received at 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 Project Engineering department.

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 36 months from the date of commissioning or 48 months from the date of last supplies made under the contract, whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for "Free Replacement" for another period of THREE years from the end of the guarantee period for any "Latent Defects" if noticed and reported by



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the company.

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 : Not required

14. 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/ Consultant's engineer shall have free access to the manufacturer/sub bidder's works to carry out inspections.

15. MINIMUM TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. 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 should 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.

17. SPARES, ACCESSORIES & TOOLS SPARES:

Following spares shall be supplied along-with CB. 10% spare to be considered. Bidder should quote unit rates for spares. Exact quantity to be finalized during tendering.

- 1. Trip Coil
- 2. Closing coil
- 3. Spring charging motor
- 4. Vacuum interrupter (For VCB type)
- 5. T-N-C Switch
- 6 .Local / remote selector switch
- 7. LED Indicator (Red and Green)
- 8. Contactor/Relay for Control Circuit
- 9. Breaker aux contact

In addition to above bidder shall submit recommended list of spares for 3 years, if any with unit prices and recommended quantity.

ACCESSORIES: The circuit breakers shall be provided with the following accessories, in addition to those needed for normal operation and control

- 1. Breaker position indicator
- 2. Breaker Operation counter
- 3. T-N-C switch
- 4. A local mechanical emergency trip device with necessary shrouds

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- 5. Castle key & Lock (Series will be finalized during detail engineering)
- 6. Electrical & Mechanical interlocks with isolators
- 7. A heater rated 230 volts AC, 50 Hz for the operating mechanism housing heater current monitors

SPECIAL TOOLS & GAUGES: A list of complete set of special tools and gauges required for erection & maintenance and installation procedure shall be submitted

18. DRAWINGS AND DOCUMENTS

Following documents shall be prepared based on TPSODL specifications and statutory requirements with complete BOM and shall be submitted with the bid:

- a) Completely filled in Technical Particulars.
- b) General description of the equipment and all components including brochures.
- c) Type test Certificates
- d) Experience List/Performance Certificates from end users.
- e) Foundation Plan
- f) Operation & Maintenance Manual

After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser

Final S. No Description For For Review Approval Information Submission Technical Parameters 1 $\sqrt{}$ $\sqrt{}$ GA Drawings 2 $\sqrt{}$ $\sqrt{}$ 3 Internal Wiring Diagram $\sqrt{}$ $\sqrt{}$ Foundation Plan 4 $\sqrt{}$ $\sqrt{}$ Installation Instruction 5 $\sqrt{}$ $\sqrt{}$ 6 Transport/Shipping dimension $\sqrt{}$ $\sqrt{}$ Drawing 7 QA & QC Plan $\sqrt{}$ $\sqrt{}$ $\sqrt{}$ Test Certificate $\sqrt{}$ $\sqrt{}$ 8 $\sqrt{}$

Following Drawings/Documents shall be submitted after the award of the contract

All the Documents and Drawings shall be in English Language.

Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. GUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Units	To Be Furnished by Bidder
			33 kV (VCB)
1	Application		
2	Туре		

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3	Rated voltage	kV	
4	Service voltage	kV	
5	Rated Frequency		
6	Number of phases		
7	Rated insulation level		
7.1	Rated Lightning		
	impulse withstand		
	voltage		
а	To earth and b/w	kVp	
	Poles	1.1.7.	
a	Across the isolating	кур	
7.2	Doted abort duration		
1.2	Rated Short duration		
	withstand voltage		
а	To earth and b/w	kV	
<u> </u>	Poles (dry test for 1		
	min)		
b	Across the isolating	kV	
	distance(dry test for 1		
	min)		
С	To earth and b/w	kV	
	Poles and across the		
	isolating distance(wet		
	test for 10 sec)		
8	Rated normal current	<u>A</u>	
9	Rated load breaking	kA (rms)	
	current (sym)		
10	Porcontago DC		
10	component		
11	Rated short circuit	kA	
	withstand current for 3		
	seconds		
12	Rated short circuit	kA	
	making current		
13	First Pole to Clear		
	factor		
14	Rated capacitive		
444	switching currents		
14.1	Rated line charging		
14.0	Dreaking current	^	
14.2	hreaking current	A	
14 3	Rated single canacitor	Δ	
17.0	bank breaking current	/ `	
14.4	Capacitor Banks with	MVAR	
	series reactors		
	switching capacity		

Document Title

TPSODL

TECHNICAL SPECIFICATION

Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1600 A)

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15	Maximum switching over voltages for cable charging & capacitor bank breaking current	p.u.	
16	Rated operating sequence		
17	Total Break time(max)	ms	
18	Total closing time	ms	
19	CO time	ms	
20	Pole discrepancy	ms	
21	Rated supply voltage of control circuits	V	
21.1	Range for satisfactory operation of Trip circuit		
21 2	Range for satisfactory operation of closing & other circuits		
20	Transient recovery voltages		
21	No. of auxiliary contacts		
22	Clearance in air		
22.1	Between phases	mm	
22.2	phase to earth	mm	
23	Min. Creepage distance of insulator	mm	
24	Degree of Protection		
25	Operating mechanism		
26	Anti pumping feature		
27	Spring charging time		
28	Temp. rise at rated normal current	Deg C	
29	Vertical clearance of live conductor	mm	
30	Mechanical Endurance		
31	Electrical Endurance		
32	Restriking Class		
33	Class		
34	Main Contacts		
34.1	Туре		
34.2	Material		
35	Arcing Contacts		
35.1	Туре		
35.2	Material		
36	No. of operations		
36.1	At rated normal current		
36.2	At rated capacitor bank breaking current		

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36.3	At rated short circuit	
	breaking current	
37	No. of breaks per	
	phase	
38	Minimum contact	
	resistance	
39	FOR VCB Type	
39.1	Type of indication for	
	contact erosion	
39.2	Rating of interrupter	
39.3	Make of interrupter	
40	Connectors	
41	Type test certificates	
42	Test for Re-strike free	
	for VCB	
43	Total weight of	
	breaker (Kg)	
44	Dimensions (mm)	

20. 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:

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

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21. SAMPLE DRAWING (For Tender purpose only)





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1.0	SCOPE	 This specification covers non-linear resister type lightning arresters for use in effectively earthed system with a nominal voltage of 33 KV. This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of theLightning Arrestor. The material shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble-free operation under the various operating and atmospheric conditions specified in clause no. 3 Such of the parts that may have not been specifically included, but otherwise form part of the Lightening arrester as per standard trade and/or professional practice and/or are necessary for proper operation, will be deemed to be also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.
2.0	APPLICABLE STANDARDS	Unless otherwise modified in this specification, the lightning arresters shall comply with following IS: IS 3070 : Part 3 : 1993 : Lightning Arresters for Alternating Current Systems - Specification - Part 3 : Metal Oxide Lightning Arresters Without Gaps IS 6209 : 1982 : Methods for Partial Discharge Measurements IEC-60099:2009-05 Part 4 : Metal oxide surge arrestors without gaps for AC Systems IS 2633 : 1986 : Methods for testing uniformity of coating of zinc coated articles IS 4759 : 1996 : Hot-dip zinc coatings on structural steel and other allied product *In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.
3.0	CLIMATIC CONDITIONS OF THE INSTALLATION	 The material shall be suitable for following climatic conditions, 1. Maximum altitude above sea level 1,000m 2. Maximum ambient air temperature 50°C 3. Maximum daily average ambient air temperature 40°C 4. Minimum ambient air temperature 0°C 5. Maximum relative humidity 100% 6. Average number of thunderstorm days per annum (isokeraunic level) 70 7. Average number of rainy days per annum -120 8. Average annual rainfall 150cm 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. Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr. Environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and

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condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas.
Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere
The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4.0	GENERAL TECHNICAL REQUIREMENTS			
	S No	Description	Requirements	
	1	Installation	Outdoor	
	2	Туре	Metal Oxide	
	3	Service voltage	33 kV	
	4	Rated Voltage	30 kV rms	
	5	Arrestor Rating	30 kV rms	
	6	Rated Frequency	50 Hz	
	7	Maximum Continuous Operating voltage (M.C.O.V.))	24 kV rms	
	8	Nominal Discharge Current	10 kA Peak	
	9	Class	Station class	
	10	Line discharge class	Class 1	
	11	Voltage withstand on arrestor housing		
		Power frequency voltage (Dry/ Wet)	70 kV rms	
		Lightning Impulse voltage kV Peak	170 kV Peak	
	12.	Lightning Impulse protection level	105 kA	
	13	Long duration current requirement	Acc. To IS 3070	
	14	High current impulse Operating Duty	100 kA Peak	
	15	Steep current protection level at 10 kA	100 kA	
	16	Creepage distance of Arrestor Housing	900 mm (minimum)	
	17	Partial discharge at 1.05 times M.C.O.V.	<10 pC	
	18	Disconnector	As per IEC 60099	
	19	Material of Insulating terminal cap	Polyolefin	

5.0	GENERAL CONSTRUCTION	 MOUNTING ARRANGEMENT: The lightning arresters shall be of pedestal mounting type suitable for outdoor installation on steel/cement concrete structures. All the clamps, bolts, nuts and washers etc. required for mounting the lightning arresters on the structure (to be specified by the purchaser) shall be supplied along with the arresters and shall be galvanized. Lightning arrestor shall be station Class, zinc oxide, gapless type suitable for operation under the system conditions specified. This shall be self supporting, structure mounting type. Each unit of arrestor assembly shall be hermetically sealed, leak tested and
		protected against ingress of moisture and shall be individual

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		demountable. The seal shall be properly designed and tested for
		operation under extreme weather conditions.
	2.	TERMINAL ARRANGEMENT: The top metal cap and the base of the
		lightning arrester shall be galvanized. The top cap shall be provided with
		a terminal arrangement suitable for both horizontal and vertical take-off.
		The base of the lightning arresters shall be provided with two separate
		terminals distinctly marked for connection to earth.
	3.	SEALING AND PRESSURE RELEASE: The lightning arresters shall be
		hermetically sealed to avoid ingress of moisture. A suitable pressure
		relieving device shall be provided to avoid damage to the external
		insulator in case of a severe discharge.
	4.	Lightning arrestor shall be supplied with the insulating base, terminal
		connector and necessary hard wares. The assembly consists of a stack
		of metal oxide elements. All metal parts shall be of non rusting and non
		corroding metal. Bolts, screws and pins shall be provided with lock
		washers. Lightning arrestor construction shall be suitable to withstand
		seismic loading, short circuit forces, wind load and the force exerted on
		the arrestor base. All similar parts, particularly removable ones, shall be
		interchangeable, i. Housing shall be polymeric to provide thermal
		dissipation of heat generated in the metal oxide elements during
		overvoltage and line discharge. Polymeric housing shall be free from
		flaws affecting the mechanical and electrical strength of the arrestor.
		Housing shall be capable to withstand the desired pollution stresses
		without flashover. Arrestor shall be capable to withstand the temperature
		rise due to the non uniform filed distribution, caused by the pollution on
		the surface of the housing, ii. The arrestor shall have thermal stability to
		withstand the heat generated from the ZnO element due to continuous
		operating voltage and surges, iii, Earth terminals shall be provided with
		the lightning arrestor.
	5.	DISCONNECTORS i. Each individual unit of lightning arrestor with
	_	disconnector shall be hermetically sealed and fully protected against
		ingress of moisture. The hermetic seal shall be effective for the entire life
		time of the lightning arrestor with disconnector under the specified
		service conditions. Disconnectors shall give the visible indication of the
		failed arrestor. The lightning arrestor with disconnector shall be suitable
		for bracket type mounting. Disconnector shall be suitable for direct
		connection with the LA ii. The corresponding units of lightning arrestor
		with disconnector of the same rating shall be interchangeable without
		adversely affecting the performance. All the necessary flanges bolts
		nuts, clamps etc. required for assembly of complete lightning arrestor
		with disconnector and accessories and mounting on purchaser's support
		structure shall be included in bidder's scope of supply. The mounting
		details for mounting the lightning arrestor with disconnector on
		purchaser's support shall be given along with the bid, iii. All metallic
		parts of lightning arrestor shall be hot dip galvanized. The bolts nuts
		screws pins etc. used in the arrestor shall be hot din galvanized. All
		these metallic parts shall be designed to avoid sharp points edges and
		sharp faces

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 The surge arrestor shall not temporary over voltage con arrestor shall change over t shall be suitable for circuit k duty in the system. Surge a system to avoid damage to providing path for flow of ra failure. The reference curre eliminate the influence of gr measured reference voltage 	t operate under power frequency and ditions but under surge conditions, the surge to the conducting mode. The surge arrestor preaker performing 0-0.3secCO-3 min-CO- rrestors shall have a suitable pressure relief the porcelain/silicon polymeric housing and ted fault currents in the event of arrestor nt of the arrestor shall be high enough to rading and stray capacitance on the e.
 SURGE COUNTER SURGE COUNTER Cyclometric 5 digit, non-rshall be provided for each l the number of discharges. I leakage current indicator ar of operation. The value of le abnormal shall be clearly m Surge arrester shall inclucurrent. The milli-ammeter regions. Increase of leakage essentially an indication tha runway condition. The qual health, obtained from the m measures before the arrest Discharge counters and l on structure and shall be m ground level. The reading of visible through an inspectio robust and adequate size a outgoing connections are m The connecting conductod discharge counter incoming	e. resetting type counter, dial type surge counter ightning arrester for automatically recording Each counter shall have a continuous ad shall not require an external power source eakage current beyond which the operation is arked in red colour on the detector. Ide a milli-ammeter to monitor the leakage usually bare a red mark at the higher scale e current to the red marked zone is at the arrester is likely to attain the thermal itative information regarding the arrester iilli-ammeter,helps the user to take preventive er failure. milli-ammeters shall be suitable for mounting ounted at approximately 1.5 meters above i the milli-ammeter and counters shall be n glass panel. The terminals shall be of nd shall be so located that incoming and hade with minimum possible bends. or from lightning arrester earth terminal to the g terminal shall be insulated for a minimum of ductor shall be supplied along with the surge arrester to surge counter connection ulated multi strand copper cable of minimum the fault currents during severe operating be designed to operate/ withstand without rmance for the high current impulse, long rresponding to the discharge class of the
surge arrester and nominal discharge current of the sur 6. The external and internal hermetically sealed to withs temperature and humidity, they are installed. The surg connected to the ground ter metal oxide element satisfy 7. The surge counter shall h	discharged current corresponding to the rge with which it is used. I parts of the surge monitor shall be stand the atmospheric variation of rain and dust encountered in station in which e Monitor line terminal shall be solidly rminal of the surge monitor through an inbuilt ing the operational requirement. have IP 67 protection.

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6.0	NAME PLATE AND MARKING	 The Lightning Arrester shall be provided with durable and legible name plate embossing, effectively secured against removal. The name plate shall be indelibly and distinctly marked with all essential particulars as per the relevant standards along with the following : The Name plate/product shall have marking of "PO no. with date" & "Property of TPSODL" The following information shall be mentioned on the Name Plate: i. Continuous operating Voltage ii. Rated Voltage iii. Rated Frequency iv. Nominal Discharge Current v. Manufacturer's Name vi. Type and Identification of the complete arrester vii. Year of Manufacture viii. Serial Number
7.0	TESTS	 All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. The following type, acceptance and routine tests, as laid down in IS:3070 (Part- I)-1985 and other relevant IS shall be carried out: *In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.
7.1	TYPE TEST	 The following shall constitute the type tests: a) Voltage withstand tests of arrester insulation b) Power-frequency voltage spark over test c) Standard lightning voltage impulse spark over test d) Lightning-voltage impulse spark over voltage test e) Switching-voltage impulse spark over voltage/time curve test f) Residual voltage test g) Current impulse withstand tests h) Operating-duty test i) Pressure-relief tests j) Tests of arrester disconnectors when fitted k) Temperature cycle test l) Galvanizing test on metal parts86 of 363 m) Visual examination n) Sealing test (not specified in IS:3070 (Part-I) - 1985) To prove the effectiveness of sealing of the lightning arresters, either of the following two tests shall be carried out: - i. Bubble Test A positive pressure shall be created inside the arrester and it shall be immersed in water to check if there are any bubbles.

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		ii. Pressure/Vacuum Test Leakage shall be checked by		
		measuring leak rate either by monitoring drop in pressure or		
		rise in vacuum level with time or by making use of special		
		detectors.		
7.2	ROUTINE TEST	The following shall constitute the routine tests:		
		a) Dry power-frequency voltage spark over test		
		h) Visual examination		
		c) Sealing test (See clause 7.1 (o) above)		
7 2	ACCEPTANCE TEST	When the purchaser specifies acceptance tests in the purchase agreement the		
1.5		following tests shall be made on the higher whole number to the cube-root of the		
		number of arresters to be supplied.		
		a) Dry power-frequency voltage spark over test on the complete arrester		
		b) Standard lightning - voltage impulse spark over test on the complete		
		b) Standard lightning - voltage impulse spark over test on the complete		
		c) Residual voltage test at the nominal discharge current on the complete		
		arrester or sections		
		d) Temperature cycle test		
		a) Galvanizing test on metal parts		
		f) Visual examination		
		(a) = Soling test (see clause 7.1 (a) shows)		
		g) Sealing lest (see clause 7.1 (0) above)		
74	SPECIAL TEST as	SPECIAL THERMAL STARILITY TEST as par As par IEC 60000.4 Ed 2 days		
1.4	accentance test	9.2.2 and 8.7 or IS:3070 part3 of 7.3. TPSODI Reserves right to perform		
		special thermal stability test during acceptance if required. No failure from the		
		randomly selected sample shall qualify for accentance		
		WATT LOSS TEST.		
80	TYPE TEST	1 The bidder shall furnish the type test certificates as mentioned above as		
0.0	CERTIFICATES	nor the corresponding standards		
	GERTINICATES	2 All the tests shall be conducted at CPRI / ERDA as per the relevant		
		2. All the tests shall be conducted at OF NY ENDA as per the relevant		
		3 Type tests should have been conducted in cartified Test laboratories		
		5. Type tests should have been conducted in certilined rest laboratories during the period pet exceeding 5 years from the date of opening the		
		during the period not exceeding 5 years from the date of opening the		
		Diu.		
		In the event of any discrepancy in the test reports, i.e., any test report not		
0.0		1 Equipment shall be subject to inspection by a duly authorized		
9.0		representative of TPSODI		
	INSPECTION	2 All tests and inspection shall be made at the place of manufacture		
		2. All tests and inspection shall be made at the place of manufacture unloss otherwise especially agreed upon by the manufacturer and the		
		numers of the equipment if found upperticipatory on to		
		workmanship or material the same is lighted to rejection		
		workmanship or material, the same is liable to rejection.		
		5. Diduel shall grant free access to the places of manufacture to		
		A Inspection by TRCOPL or outboring discrete statistics about structure in the second statistics of the second statistics		
		4. Inspection by IPSODE or authorized representatives shall not relieve		
		the supplier of his obligation of furnishing equipment in accordance		
		with the specifications.		

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		 Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPSODL. Following documents shall be sent along with material: a) Test report b) MDCC issued by TPSODL c) Invoice in duplicate d) Packing list e) Drawings & catalogue f) Guarantee / Warrantee card 	
		g) Delivery Challanh) Other Documents (as applicable)	
10.0	INSPECTION AFTER RECEIPT AT STORE	The material received at TPSODL, Berhampur, Odisha store shall 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 Engineering department.	
11.0	GUARANTEE:	Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company	
12.0	PACKING	Bidder shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.	
13.0	TENDER SAMPLE	Not applicable	
14.0	QUALITY CONTROL	The bidder shall submit with the offer Quality 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 bought out items and fully assembled component and equipment after finishing. 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 engineer or its nominated representative shall have free access to the bidder's works to carry out inspections.	

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		Bidder si	Bidder shall have adequate in house testing facilities for carrying out all							
	FACILITIES	routine te	routine tests, acceptance tests and pre-dispatch inspection as per							
		relevant	relevant International / Indian standards.							
16.0	MANUFACTURING	The s	The successful bidder will have to submit the bar chart for various							
10.0	ACTIVITIES	ma	nufacturing activities	clearly elabor	ating each stac	e. with quantity	_			
		Thi	s bar chart should be	e in line with th	ne Quality assu	rance plan	•			
		sub	mitted with the offer	. This bar cha	rt will have to be	e submitted				
		with	nin 15 days from the	release of the	order.					
			,							
17.0	SPARES,			Not Applic	able					
	ACCESSORIES AND									
	TOOLS									
18.0	DRAWINGS AND		Following do	cuments shall	be prepared ba	ased on TPSOD	L			
	DOCUMENTS		specification	s and statutory	requirements	with complete B	OM			
			and shall be	submitted with	n the bid:					
			a. Completely f	illed in Techni	cal Particulars					
			b. General dese	cription of the	equipment and	all components				
			including bro	chures.						
			c. General Drav	wing arrangen	nent of lightenin	g arrester.				
		d. Bill of material.								
			- F	2	l'at.	e. Experience Certificate and list.				
			e. Experience (Certificate and	list.					
		Drowin	e. Experience (f. Type test cer	Certificate and rtificates.	list.		-1			
		Drawin	e. Experience (f. Type test cer gs / documents to	Certificate and rtificates. be submitted	list. after the awar	d of the contra	ct are			
		Drawin as und	e. Experience (f. Type test cer gs / documents to er:	Certificate and rtificates. be submitted	list. after the awar	d of the contra	ct are			
		Drawin as undo <u>List of D</u>	e. Experience (f. Type test cer gs / documents to er: rawings/Parameter	Certificate and rtificates. be submitted rs to be subm	list. after the awar itted after the	d of the contra award of contr	ct are act:			
		Drawin as und <u>List of D</u>	e. Experience (f. Type test cer gs / documents to er: rawings/Parameter	Certificate and rtificates. be submitted rs to be subm	list. after the awar itted after the	d of the contra award of contr	ct are act:			
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	HOG	
Initiator	(Engineering)	

	TP SOUTHERN ODISHA DISTRIBUITION LIMITED, BERHAMPUR TECHNICAL SPECIFICATION				
Document Title	Specification of 33kV 10kA Distribution Class and Station Class Polymeric Lightening Arrester				
Document No.	ENG-HV-2004	Eff. Date: 07.01.2022			
Revision No.	01	Page 10 of 14			
Prepared By: Ranjan Kumar Sahoo	Reviewed By: Priya Kumar Sharma	Approved & Issued By : Mahendra Kumar Pandey			

		7	I ransport/shippin		\checkmark		
			g dimension				
		-	drawing	1			_
		8	QA & QC Plan	N	N	N	_
		9	Routine,				
			Acceptance and				
			Type test				
			Certificates				
		All the Do the order relevant o	ocuments and Drawin , the successful bidde drawings/Documents	gs shall be i er will be req for TPSODI	n English Langu juired to furnish f _ approval.	age. After rece ive copies of a	ipt of II
		Instruction	on Manuals: Bidder	shall furnish	two (2) soft copi	es (CD) and fo	ur hard
		copies of	nicely bound manual	(in English	Language) cove	ring erection a	nd
		maintena	nce instructions and	all relevant i	nformation perta	ining to the cat	oles.
19.0	GUARANTEED TECHNICAL	S.No.	Descriptio	n	Units	To be spe by the bi	ecified dder
	PARTICULARS	1	Manufacture	er			
		2	Model No.				
		3	Installatior	n l			
		4	Туре				
		5	Service volta	ge	kV (rms)		
		6	Rated Volta	ge	kV (rms)		
		7	Rated freque	ncy	· · · · ·		
		8	Maximum contir	nuous	kV (rms)		
		_	operating volt	age	(-)		
			(M.C.O.V.))			
		9	Arrestor rati	na	kV (rms)		
		10	Nominal discharge	e current	kA		
		11	Class				
		12	Line discharge	class			
		13	Voltage withsta	nd on			
			arrestor hous	ing			
			Power frequency (Dry/ Wet)	voltage	kV (rms)		
			Lightning Impulse kV Peak	voltage	kV (peak)		
		14	Lightning Impo protection le	ulse vel	kA		
		15	Long duration co withstand te	urrent st			
			Peak currer	nt	kA		
			Virtual duration of	peak T	micro sec		
		16	Partial discha	rge	pC		
		17	High current im	pulse	kA		
			operating du	ity			

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Initiator	(Engineering)	

	TP SOUTHERN ODISHA DISTRIBUITION LIMITED, BERHAMPUR TECHNICAL SPECIFICATION					
Document Title	Specification of 33kV 10kA Distribution Class and Station Class Polymeric Lightening Arrester					
Document No.	ENG-HV-2004	Eff. Date: 07.01.2022				
Revision No.	01	Page 11 of 14				
Prepared By: Ranjan Kumar Sahoo	Reviewed By: Approved & Issued By : Priya Kumar Sharma Mahendra Kumar Pandey					

		18	Creepage distance of	mm	
			arrestor housing		
		19	Disconnector		
		20	Cantilever strength		
	21		Reference current	kA	
		22	Reference voltage at	kV	
			reference current		
		23	Maximum switching		
			impulse residual voltage at		
			125 A	kV	
			500 A	kV	
		24	Maximum steep current		
			impulse residual voltage		
		25	Power losses of the		
			arrestor		
		26	Recommended clearances		
			phase to phase		
		27	Heat dissipation capability		
		28	Contamination withstand		
			level		
		29	Dimensions of arrestor	mmXmmXmm	
			disconnector height/max.		
			diameter/weight		
		30	Total height of the arrestor	mm	
		31	Total weight of the arrestor	kg	
		32	Mounting arrangement		
20.0	SCHEDULE OF				
	DEVIATIONS				
	(TO BE ENCLOSED WI	TH THE B	<u>(D)</u>		
	All doviations from this a	nonification	a shall be set out by the Pidders		in thic
		pecification	and in this Schedule the tend	or shall be deemed	to confirm
	the nurchaser's specifica	tions:			
		•	Details of deviation with ius	tifications]
	S.No. Clause No. Details of deviation with justifications				

	HOG	
Initiator	(Engineering)	

	TP SOUTHERN ODISHA DISTRIBUITION	LIMITED, BERHAMPUR				
	TECHNICAL SPECIFI	CATION				
Document Title	Specification of 33kV 10kA Distribution Class and Sta Arrester	Specification of 33kV 10kA Distribution Class and Station Class Polymeric Lightening Arrester				
Document No.	ENG-HV-2004	Eff. Date: 07.01.2022				
Revision No.	01	Page 12 of 14				
Prepared By: Ranjan Kumar Sahoo	Reviewed By: Priya Kumar Sharma	Approved & Issued By : Mahendra Kumar Pandey				

We confirm that	at there are no deviation	ons apart from those detailed above.	
Seal of the Co	mnany:		
	inpariy.	Signature	
		Designation	

	HOG	
Initiator	(Engineering)	

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2015

Specification Name : Technical Specification for 11KV Lightening Arrester (10 KA)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
SRASTANTH MOHANTY	DEEPAK BADATYA	SMARANIKA ACHARYA	Vijender Goyal	KHAJAN BHARDWAJ	POURUSH GARG
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
21-01-2023	23-02-2023	01-03-2023	04-03-2023	18-03-2023	18-03-2023

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Specification No: ENG-HV-2015

Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

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- 2. APPLICABLE STANDARDS
- 3. CLIMATIC CONDITIONS OF THE INSTALLATION

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- 4. GENERAL TECHNICAL REQUIREMENTS
- 5. GENERAL CONSTRUCTIONS
- 6. MARKING
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- 8. TYPE TEST CERTIFICATES
- 9. PRE-DISPATCH INSPECTION
- **10.** INSPECTION AFTER RECEIPT AT STORES
- **11.** GUARANTEE
- 12. PACKING
- 13. TENDER SAMPLE
- 14. QUALITY CONTROL
- **15.** TESTING FACILITIES
- 16. MANUFACTURING FACILITIES
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- **18.** DRAWINGS AND DOCUMENTS
- 19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
- 20. SCHEDULE "B" DEVIATIONS

Specification No: ENG-HV-2015

TPCØDL TPWØDL

TPNØDL TPSØDL

Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

1. SCOPE:

This specification covers the design, manufacture, testing and supply of 12kV,10kA, Station class-SL, (class-II) Metal Oxide Gap less Polymeric Lightning Arrester. The specific requirements are covered in the enclosed technical data sheet. Some of the parts that may have not been specifically included, but otherwise form part of the Lightening arrester as per standard practice or necessary for proper operation, will be deemed to be also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. Scope also includes transportation & unloading at store / site.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IEC 60099-4	Specification for surge arrestor without gap for AC System
IS 15086	Specification for Metal Oxide Gap less Lightning arresters for alternating current System
IS 6209	Method of Partial Discharge Measurement
IS 8704 & IS 731	Guide for selection of creepage distance of polymeric housing insulator.
ISO 48	Rubber, vulcanized or thermoplastic Determination of hardness (hardness between 10 IRHD and 100 IRHD).
IEC 60721-3-2	Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Transportation
IEC 60071	Insulation co-ordination Part 1 definitions, principles and rules; Part 2: Application Guide
IEC 60815-1	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions –Part 1: Definitions, information and general principles
IS 2629	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2633	Methods for testing uniformity of coating of zinc coated articles
IS 4759	Hot-dip zinc coatings on structural steel and other allied products



Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

3. CLIMATIC CONDITIONS:

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	150mm	
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)	

TPCODL/TPWODL/TPNODL/TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. 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 REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
1	Installation	Outdoor
2	Reference standards (Latest Amend.)	IS 15086,Part-4, IEC 60099
3	Arrester Type and Housing	Metal Oxide Gapless Cage type with Polymeric housing
4	Normal System Voltage	11 kV
5	Highest System Voltage	12 kv
6	Rated Frequency	50 Hz
7	Maximum Continuous Operating Voltage (M.C.O.V)	9.6 kV (rms)
8	Arrester Rating	12 kV (rms)
9	Discharge Current	
а	Nominal Discharge Current	10 kA
b	Switching impulse discharge current	0.5kA



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Specification No: ENG-HV-2015

Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

SL.	TECHNICAL PARTICULARS	DESIRED
ŇO.	(Class-SL,Class-II)	VALUE
10	Short Circuit rating	25 kA
11	Voltage Withstand on Arrester Housing	
а	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	28kV (rms)
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	75kV (Peak)
12	Lightning Impulse Protection Level (at 10kA)	49 kV
13	Long Duration Current	
а	Peak Current	75 A
b	Virtual duration of Peak T	1000 T (Micro Sec)
14	High Current impulse Operating Duty	65 kA (Peak)
15	Creepage Distance of Arrester Housing	31mm/KV (min) or 380 mm (min)
16	Partial Discharge at 1.05 times M.C.O. V	<10 pc
17	Energy Absorption capacity (KJ/KV)	>=4KJ/KV
18	Repetitive charge transfer withstand (coloumbs),Qrs	>=1.0
19	Temporary over voltage (TOV)	
а	1 sec	15kVp
b	10 sec	14kVp
20	Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave	
а	at 5kA	35kVp
b	at 10kA	38kVp
С	at 20kA	
21	Maximum switching current impulse residual voltage in kVP at 500 A	21 kVp
22	Max. Cantilever Strength	12 Kg-M(minimum)
23	Total height of the arrester	To be specified by bidder
24	Total weight of the arrester	To be specified by bidder
25	No. of Metal oxide blocks in arrester	To be specified by bidder
26	Rating of individual ZnO blocks used for assembly	To be specified by bidder
27	Power Losses of the Arrester in watt	To be specified by bidder
28	Type of Mounting	Bracket type
29	Material of Insulating base	UV resistant Fire retardant DMC
30	Disconnector (optional)	
а	Disconnector connecting lead	Insulated flexible tinned plated copper braid with lugs
b	Size of Insulated Tinned copper	25 sq.mm

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Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
	braid	
с	Length of Insulated Tinned copper braid	300 mm
31	Insulating Terminal Cap	Polyolefin
32	Material of Nuts and bolts	Stainless Steel

5. GENERAL CONSTRUCTION:

Lighting arrestors shall be station class, zinc oxide and gapless type suitable for operation under the system conditions specified. This shall be self-supporting, structure mounting type. Each unit of arrestor assembly shall be hermitically sealed, leak tested and protected against ingress of moisture and shall be individual demountable. The seal shall be properly designed and tested for operation under extreme weather conditions.

5.1 Assembly:

Lighting arrestor shall be supplied along with the insulating base/Mounting bracket, terminal connector, insulating terminal cap (Polyolefin) and necessary hardwares. The assembly consists of a stack of metal oxide elements arranged in cage type designs. All metal parts shall be of non-rusting and non –corroding metal. Bolts, screws and pins shall be provided with lock washers. Lightning arrestor construction shall be suitable to withstand seismic loading, short circuit forces, wind load, the force exerted on the arrestor base and to terminal imposed by the line conductor. All similar parts, particularly removable ones, shall be interchangeable.

a) The 12kV 10kA station class Lightning Arrester shall have L-shaped terminal clamp suitable for conductor size of 148 sqmm.

b) Housing shall be polymeric to provide thermal dissipation of heat generated in the metal oxide elements during over voltage and line discharge. Polymeric housing shall be free from flaws affecting the mechanical and electrical strength of the arrestor. Housing shall be capable to withstand the temperature rise due to the non-uniform field distribution, caused by the pollution on the surface of the housing.

c) The arrestor shall have thermal stability to withstand the heat generated from ZnO element due to continuous operating voltages and surges. It shall remain in undamaged condition, capable protective function.

d) Arrestors shall incorporate anticontamination feature to prevent arrestor failure, consequent to uneven voltage gradient across the stack in the event of contamination of the arrestor insulating material. These features shall be described in detail when submitting the Bid.

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Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

Arrestors shall be capable of discharging over voltages occurring during switching of unloaded transformers, capacitors banks and long lines. No radio interferences shall be caused by the arrestors operating at the normal rated voltage.

e) Bidder shall mention energy handling capacity.

5.2 EARTHING TERMINALS:

Earth Terminals shall be provided with Lightning arrestor.

5.3 MECHANICAL STRENGTH:

a) The Lightning Arrester and it base shall withstand rated mechanical terminal load and electromagnetic forces without impairing their operational reliability.

b) The Lightning Arrester shall not come out of their positions by gravity, wind pressure, vibrations or reasonable shocks.

5.4 DISCONNECTORS (OPTIONAL):

- a) Each Individual unit of Lighting Arrester with disconnector shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire life time of the Lightning Arrester with disconnector under the specified service conditions. Disconnectors shall give the visible indication of the failed arrestor. The Lightning Arrester with disconnector shall be suitable for bracket type mounting. Disconnector shall be suitable for screwing directly to LA with terminal of M10.
- b) The corresponding units of Lightning Arrester with disconnector of the same rating shall be interchangeable without adversely affecting the performance. All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete Lightning Arrester with disconnector and accessories and mounting on purchaser's support structure shall be included in bidder's scope of supply. The mounting details for mounting the Lightning Arrester with disconnector on purchaser's support shall be given along with bid.

5.5 MOUNTING BRACKET:

- a) The 12kV 10kA Distribution class Lightning Arrester shall be fixed over a mounting bracket made of UV resistance, Fire retardant DMC material.
- b) The 12kV 10kA Station class Lightning Arrester shall be fixed over a mounting arrangement made of Hot dip galvanized MS material.

6. MARKING:

A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each Lightning Arrester in a visible position and shall carry all the information as specified in the standards. The letters on the rating plate shall be engraved black on the white/silver background. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. The Name plate shall be embossed with "PO no. with date" & "TPCODL/TPWODL/TPNODL/TPSODL",

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Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

The following information shall be mentioned on the Name Plate

- a) Continuous operating Voltage
- b) Rated Voltage
- c) Rated Frequency
- d) Nominal Discharge Current
- e) Pressure relief rated current in kA r.m.s.
- f) Manufacturer's Name
- g) Type and Identification of the complete
- h) Year/Month of Manufacture
- i) Serial Number.
- j) Warrantee/guarantee clause

7. TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. Following tests shall necessarily be conducted on lightning arrestor in addition to others specified in IS/IEC standards: -

7.1 ACCEPTANCE TESTS

- a) Measurement of Power frequency reference voltage
- b) Lightning impulse residual voltage test on complete arrestor or arrestor unit.
- c) Internal Partial Discharge test
- d) Visual Examination

All acceptance tests shall be witnessed by TPCODL/TPWODL/TPNODL/TPSODL / the purchaser's or his authorized representative. The above mentioned tests shall be made on 100 % of arrestors to be supplied.

7.2 ROUTINE TESTS

- a) Measurement of reference voltage test
- b) Residual Voltage Test on complete arrester
- c) Internal partial discharge test. This test shall be performed on each arrester unit. The test sample may be shielded against external partial discharges. Internal partial discharge shall not exceed 10 pC
Specification No: ENG-HV-2015



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7.3 TYPE TESTS

- a) Insulation withstand tests, including lightning impulse voltage withstand test
- b) Residual voltage tests, including steep current impulse residual voltage test, lightning impulse residual voltage test and switching impulse residual voltage test.
- c) Operating duty tests
- d) Long duration current impulse withstand test/Repetitive charge transfer rating, Qrs.
- e) Weather ageing test
- f) Short circuit test (low/high current)
- g) Power frequency (voltage vs Time curve)
- h) Bending moment test
- i) Hot dip Galvanizing test on exposed steel parts.
- j) Internal partial discharge test
- k) Wet power frequency voltage withstand test.
- I) Seal leak rate test
- m) Tests on arrestor disconnectors- Time current characteristics (optional)

7.4 SPECIAL THERMAL STABILITY TEST:

The test requires additional agreement between manufacturer and purchaser prior to the commencement of arrestor assembly.

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA as per relevant standard. Type tests should have been conducted 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, shall be carried out without implication same any cost to TPCODL/TPWODL/TPNODL/TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPWODL/TPNODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPWODL/TPNODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPWODL/TPNODL/TPSODL or its authorized representatives shall not relieve the bidder 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/TPWODL/TPNODL/TPSODL.

Following documents shall be sent along with material.

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

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPWODL/TPNODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the predispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for ' free replacement' for another period of THREE years from the end of gurantee period for any 'latent defects' if noticed by the company.

12. PACKING AND TRANSPORT:

Bidder shall ensure that all material 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. The bidder shall provide instructions regarding handling and storage precautions to be taken at site. The material should be packed in vertical position in individual box in such a way that the

shape of rain shed does not get deformed during transportation and storage.

13. TENDER SAMPLE:

One sample to be submitted during technical bid submission. This shall be Non-returnable basis.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. 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 engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

The successful bidder will have to submit technical compliance document and drawing as per RC line items for getting approval before mass manufacturing.

Manufacturing shall start only after getting CAT-A approved drawings or as per intimation from TPCODL/TPWODL/TPNODL/TPSODL.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

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

- a) Completely filled in Technical Particulars and compliance to each clause of the specification General Technical Requirements to Additional Details.
- b) Description of the equipment and all components including brochures.
- c) General Drawing arrangement of lightening arrester.
- d) Sectional drawing showing internal blocks etc.



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- e) Bill of material.
- f) Experience Certificate and list.
- g) Type test certificates.
- h) List of makes of major components.
- i) Foundation plan

Drawings / documents to be submitted after the award of the contract are as under: List of Drawings/Parameters to be submitted:

- a) Technical Parameters as asked in Specification (General Technical Particulars, General Technical Requirements, Additional Details, Fittings, Type test Reports and Routine test certificates of bought out accessories).
- b) General Arrangement Drawing of the Lightening arrester (Front view and Top view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
- c) Sectional drawing showing the blocks arrangement.
- d) Terminal and connection drawings
- e) Type Test Certificates.
- f) Installation/ Mounting Instructions/Drawing.

Additional Documents to be submitted:

- a) List of raw materials as well as bought out accessories and the names of subsuppliers selected from those furnished along with offer.
- b) Type test certificates of the raw materials and bought out accessories.
- c) The successful Bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

All the documents & drawings shall be in English language.

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

Instruction Manuals:

Bidder shall furnish softcopies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

TPCØDL TPWØDL Specification No: ENG-HV-2015

TPSØDL

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Specification Name: Technical Specification for 11KV Lightening Arrester (10 KA)

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
1	Installation	
2	Reference standards (Latest Amend.)	
3	Arrester Type and Housing	
4	Normal System Voltage	
5	Highest System Voltage	
6	Rated Frequency	
7	Maximum Continuous Operating Voltage (M.C.O.V)	
8	Arrester Rating	
9	Discharge Current	
а	Nominal Discharge Current	
b	Switching impulse discharge current	
10	Short Circuit rating	
11	Voltage Withstand on Arrester Housing	
а	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	
	Lightning Impulse Protection Level (at 10kA)	
13	Long Duration Current	
а	Peak Current	
b	Virtual duration of Peak T	
14	High Current impulse Operating Duty	
15	Creepage Distance of Arrester Housing	
16	Partial Discharge at 1.05 times M.C.O. V	
17	Energy Absorption capacity (KJ/KV)	
18	Repetitive charge transfer withstand (coloumbs),Qrs	
19	Temporary over voltage (TOV)	
а	1 sec	
b	10 sec	
20	Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave	
а	at 5kA	
b	at 10kA	
С	at 20kA	
21	Maximum switching current impulse residual voltage in kVP at 500 A	
22	Max. Cantilever Strength	
23	Total height of the arrester	

		Specification No: ENG-HV-2015
TPCØDL	TPNØDL	Specification Name: Technical Specification for
TPWODL	TPS	11KV Lightening Arrester (10 KA)

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
24	Total weight of the arrester	
25	No. of Metal oxide blocks in arrester	
26	Rating of individual ZnO blocks used for assembly	
27	Power Losses of the Arrester in watt	
28	Type of Mounting	
29	Material of Insulating base	
30	Disconnector (optional)	
а	Disconnector connecting lead	
b	Size of Insulated Tinned copper braid	
с	Length of Insulated Tinned copper braid	

20. SCHEDULE "B" 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:

SL. 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

	TP SOUTHERN ODISHA DISTRIBUITION LIMITED, BERHAMPUR		
	TECHNICAL SPECIFICATION		
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1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's work, packing, forwarding, supply and unloading at site/store of 1.1 kV LT XLPE Power Cable for trouble free and efficient operation.

Applicable for 1.1 kV LT XLPE insulated Power Cable of following sizes:

Four Core Cables	Two Core Cables	Single Core Cable
4C X 300 sq.mm.		1C X 630 sq. mm.
4C X 240 sq. mm.	2C X 50 sq. mm	1C X 400sq. mm
4C X 150 sq.mm.	20 X 25 sq. mm	1C X 300 sq. mm.
4C X 95 sq.mm.	20 X 16 sq. mm	1C X 185 sq. mm.
4C X 50 sq.mm.	$2C \times 10$ sq. mm.	1C X 150 sq. mm.
4C X 35 sq.mm.	$2C \times 4$ sq. mm	1C X 95 sq. mm.
4C X 25 sq.mm.	20×4 sq. mm.	1C X 50 sq. mm.
4C X 16 sq.mm.	20 X 0 34. mm.	1C X 25 sq. mm.
4C X 10 sq.mm.		1C X 4 sq. mm.
		1C X 2.5 sq. mm.

2. APPLICABLE STANDARDS:

LT 1.1 kV Cable covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards/ IEC/ International Standards and shall conform to the regulations of local statutory authorities.

Standards	Title		
IS-7098 (Part-I)	Specifications for Cross Linked Polyethylene PVC Sheathed Cables: Part 1-For Working Voltages up to and including 1100 Volts		
IS-8130	Conductor for insulated electric cables & flexible cords.		
IS-5831	PVC insulation and sheath of electric cables.		
IEC-60228/3-	Conductor of insulated cables		
IS 10810	Methods of tests for Cables		
IEC-60502-1	Specification for power cables with extruded solid insulation with a rated voltage rating between 1 kV and 3 kV		
IS-3975	Low carbon galvanized steel wires, formed wires & tapes for armouring of cables		
IS 10418	Specification for Drums of Electric cables		
IS 3961 Part 6	Recommended Current Ratings for Cables – XLPE insulated PVC sheathed cables		
IS 4826	Hot-dipped galvanized coatings on round steel wires		
IS 1554 (Part-1)	PVC insulated (heavy duty) electric cables		
IEC 332-1	Test on electric cables on fire conditions		
IS 10462-1	Fictitious calculation method for determination of dimensions of protective coverings of cables		

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ICEA T-31-610	Test method for conducting longitudinal water penetration resistance tests on blocked conductors
ASTM 2863	Oxygen Index Test
IEC 60754	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content

*In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.

3. CLIMATIC CONDITIONS:

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	1500mm	
6	Average No. of rainy days per annum	120	
7	Altitude above MSL not exceeding	1000mm	
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)	

TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

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4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Parameter		Requirement		
1	Voltage level		1.1 kV (Earthed System)		
2	Nominal System vol	tage		415	V
3	Supply frequency			50 H	łz
4	Variation in supply fi	requency		<u>+</u> 59	%
			4 co	ore (3 phase +	100% neutral),
5	Types of Cables		2 co	ore (1 phase +	100% neutral),
				1 core (1	phase)
		Cable	4 CORE	2 CORE	
		components	CABLE	CABLE	I CORE CABLE
		Conductor			
			Less than 1	150 sq.mm.	Stranded Aluminium
			150 sq.mm.	. and above	Watertight Stranded Aluminum
		Insulation		XLF	ΡE
6		Core	As per Clause No. 5.C of		NA
			ENG-ELC-034		
		Inner sheath	Extruded P	VC ST-2 type	NA
			Annealed low carbon		
		Armour	heavily coated galvanized NA		NA
			5100110		
	Outer sheath			PVC FRLSH	ST-2 type
	1		1		

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 1.1 kV cable (Sioplas/ self-cured) shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 1)/ relevant IEC/International standards and their latest amendments. All material used in the manufacturing of cables shall be virgin and shall be selected as the best available for the intended use. The rating

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factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and for different laying configuration of cables shall be provided by the bidder

I. CONDUCTOR:

S.No.	Parameter	Requirement					
1	Material	Plain Aluminium, grade H2/H4 as per IS 8130					
2	Class			Class I	I		
		No. of C	Cores	Size of cat	ole		Shape
		Single Core Cable		2.5 sq.mm. 4 sq.mm. 16 sq.mm. and		Non-C Strar	Stranded ompacted Circular nded Compacted
				above			Circular
3	Shape	Two Core		Upto 10 sqn	nm.	Non-C	Stranded ompacted Circular
				16 sq.mm. a above	and	Strar	nded Compacted Shaped
		Faur Carr	Cabla	Upto 10 sqn	nm.	Non-C	Stranded ompacted Circular
		Four Core Cable		16 sq.mm. a above	.mm. and Str bove		nded Compacted Shaped
	No. of strands &	Nominal size of conductor mm ² 2.5	Min. number of strands 3	Max. DC resistance @ 20 deg C (Ohm/km) 12.1	Con Short cu ratir 1 se (I	ductor t circuit rrent ng for econd (A) 235	
4	electrical	2.0	5		0.	200	
parameters	4	3	7.41	0.	376		
		6	3	4.61	0.	564	
		10	7	3.08	0	.94	
		16	6	1.91	1	.50	
		25	6	1.20	2	.35	
		35	6	0.868	3	.31	

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		50	6	0.641	4.70		
		95	15	0.320	8.93		
		150	15	0.206	14.2		
		185	30	0.164	17.39		
		240	30	0.125	22.6		
		300	30	0.10	28.20		
		400	53	0.0778	42.9		
		630	53	0.0469	59.22		
	Longitudinal	a) Non-condu provided in be	ctive water etween inter	swellable yarn/ rstices of the co	tape/ combinat	ion of both shall be	
6	conductor	b) Water swellable tape and yarn shall be compatible to withstand conductor continuous temperature of 90 deg C and short circuit					
	(for 150 sq.mm. and above only)	temperature of 250 deg C without any decay.					
		c) It shall not a	nductor.				
	Cleanliness and	 a) Before stra circular, and s and free from 	nding, the c hall have u any defects	cross-section of niform smooth s.	the Aluminium surface, free fr	i conductor shall be om sharp edges	
7	uniformity	 b) Stranded Conductor shall be free from oil traces & aluminum dus Conductor (after stranding) shall be super cleaned. 					
		c) Traces of a	luminum du	ust on conducto	r shall not be a	acceptable.	
8	Raw material supplier	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta only.					
	Diameter of conductor						
9	(for single core cable only)	To be specifie	d by bidder	r			

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	Nominal size of conductor mm ²	Min. weight of conductor (kg/km/core)
	2.5	6.5
	4	10.4
	6	15.6
	10	26
Weight of	16	42
10 conductor/km	25	65
(approx.)	35	91
	50	130
	95	247
	150	390
	185	482
	240	625
	300	780
	400	1700
	630	2700
	300 400 630	780 1700 2700

II. INSULATION:

S.No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through extrusion process.
2	Curing process	Curing shall be done by Sioplas/ self-curing method.
3	Min. thickness of Insulation	As per Table no. 3 of IS 7098 part 1. Tolerance on thickness shall be as per Clause no. 9.3

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		of IS 7098 part 1
4	Raw material supplier	 (i) XLPE compound shall be super cleaned and procured from reputed raw material suppliers viz., Dow, Borealis, Hanwa Kalpana, KLJ only. (ii) XLPE compound from cable manufacturer may be considered only after evaluation of the compound manufacturing process.
5	Thermal stability	The insulation properties shall be stable under thermal conditions arising out of continuous operation at conductor temperature of 90 deg. C rising momentarily to 250 deg. C under short circuit conditions.
6	Insulation fitting to the conductor	 (i) Insulation shall fit tightly to the conductor and shall be applied concentrically about the conductor in thickness consistent with the voltage classification. (ii) The insulation shall be so applied that it shall be possible to remove it without damaging the conductor.
7	Weight of core	To be specified by bidder

III. CORE IDENTIFICATION

	(i) Insulation colour: Black for all cores
	(ii) Core colour: embedded & extruded bright coloured line of XLPE
	for phases:
AC Cabla	'red' for R phase, 'blue' for B phase, 'yellow' for Y phase, shall not
4C Cable	be exceeding depth of 50% of insulation thickness.
	Width to be specified by bidder.
	(iii) For neutral, as core is already black, extruded line is not
	required.
	(i) Insulation colour: Black
	(ii) Core colour: embedded & extruded red coloured bright line of
2C Cable	XLPE for phase shall not be exceeding depth of 50% of insulation
	thickness.
	Width to be specified by bidder.
1C Cable	For single core cable, XLPE insulation shall be black in colour.

IV. LAYING UP OF CORES

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	(i) Cores shall be laid up together as per table-4 of Clause 11.2 of IS 7098, Part-1.
Laying up	(ii) Where necessary, the interstices shall be filled with non-hygroscopic material.

V. INNER SHEATH (For Multi core cables only)

S.No.	Parameter	Requirement			
1	Material	Black coloured Polyvinyl chloride (PVC) type ST-2 compound.			
2	Thickness	 (i) The sheath shall have adequate thickness, mechanical strength and elasticity, as per IS 5831. (ii) Min. thickness of inner sheath shall be as per Table no.5 of IS 7098 part 1. (ii) For 2 Core: Inner sheath shall be applied by pressure extrusion method. For 4 Core: Inner sheath shall be applied by normal extrusion process. 			
3	Raw material supplier	 PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam. PVC compound from cable manufacturer may be considered only after evaluation of the compound manufacturing process. 			

VI. ARMOUR (For Multi core cables only)

S.No.	Parameter	Requirement
1	Material	Annealed (soft) low carbon hot dipped heavily coated galvanized round steel wires.
		It shall comply with the requirements of IS 3975 along with latest amendments.
2	Compliance to Standard	Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires.
		Zinc coating shall be heavily coated as per IS 4826:1979.

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4	Approx. Armour Short circuit rating of	Area of Conductor (sq.mm.) 4 6 10	Short circuit rating of Armour for 1 sec (kA) 1.37 1.53 1.88		
	armour for 1	25	2.54		
	sec(kA)	35	4 30		
		50	5 22		
		95	6.97		
		150	10.98		
		240	13.92		
		300	16.18		
5	Jointing in the armour wires	Not acceptable in any armour wire			
6	Laying of armour	The armor wires shall be applied as closely as practicable. Shall not be less than 90% of total circumference.			
7	Binding	Rubberized cotton binding tape shall be applied to bind the armor wires such that it shall not affect the electrical properties of the armor wires and the overall cable.			
8	Weight of armor Kg/km	To be furnished by Bidder			
9	Raw material supplier Armour steel shall be procured from reputed raw ma suppliers viz., TATA Steel, Jindal Steel, SAIL. Bansal (BWIL)				
			· · · ·		

VII. Outer Sheath

S.No.	Parameter	Requirement
1	Material	Polyvinyl chloride (PVC) ST-2 FRLSH type compound (as per IS 5831) with ' lead napthenate ' additive.
2	Configuratio n	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with 'lead napthenate' additive as 'termite & rodent repellent' shall be applied by extrusion process.

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		The outer sheath shall have adequate thickness, mechanical strength and elasticity, as per IS 5831. Thickness of outer sheath shall be as per Table no. 8 of IS 7098 part 1.			
3	Colour	Blue, colour code: 103 as per IS 5:2007.			
4	Surface uniformity	 (i) The outer sheath shall be ultraviolet protected for operation in direct sunlight. (ii) Surface of outer sheath shall be free from cavity/ nicks/ other visible defects. 			
5	Raw material supplier	 PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM Shri Ram. PVC compound from cable manufacturer may be considered only after compound manufacturing process evaluation. 			
6	Weight of outer sheath kg/km	To be provided by bidder			
7	Weight of complete cable Kg/km	To be provided by bidder			
8	Overall diameter of cable	To be provided by bidder			

VIII. Other Requirements

Parameter	Requirement
End seal	Adhesive coated polyolefin heat shrinkable end caps shall be provided on both ends of cable.

6. MARKING:

Wooden drums shall be free from sharp edges and visual defect.

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Cable length on one drum shall be:

- (a) 4 Core Cable 95 sq.mm. to 300 sq.mm. 500 meters with + 5% tolerance
- (b) 4 Core Cable 10 sq.mm. to 50 sq.mm. 1000 meters with + 5% tolerance
- (c) 2 Core & 1 Core Cables 1000 meters with + 5% tolerance
- i. Following details shall be provided on flanges of **drum**:
- a) Manufacturer's name
- b) Type of Cable
- c) Size of Cable
- d) Voltage Grade
- e) Length of the cable on the drum
- f) Direction of the rotation of the drum
- g) Gross mass
- h) Country of manufacture
- i) Year and month of manufacture
- j) Purchase Order no.
- k) Drum No.
- ii. Following details shall be **embossed** on the **outer PVC sheath**.

Embossing shall be clearly visible. At interval of every 1 meter, following details to be embossed:

- a) Sequential meter marking (shall be marked through printing)
- b) Property of TPSODL
- c) Manufacturer name
- d) Month & Year of Manufacture
- e) Voltage grade
- f) ISI Mark
- g) Size of the cable
- h) Purchase Order no.
- i) Cable code

7. TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by TPSODL's authorized representative. All the components should also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the 1.1 kV cables in additions to others specified in IS/IEC standards.

7.1 ACCEPTANCE TESTS

All acceptance tests mentioned below shall be witnessed by TPSODL's representative during inspection stage.

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		Specific value		Test method	
S.No.	Test name	Clause No.	Reference Standard	Claus e No.	Reference Standard
		(I) Te	st on Conduct	or	
1	Conductor resistance test	Clause No. 5(A.4)	ENG-ELC- 034	10	IS 10810-part 5
2	Test for non- conductivity of water swellable tape/yarn of conductor (For conductor size : 150 sq.mm. and above)	Clause No. 5(A.6)	ENG-ELC- 034	Through multimeter Check for presence of any Aluminium dust	
3	Visual inspection for conductor cleanliness	Clause No. 5(A.7)	ENG-ELC- 034		
4	Tensile test (non-compacted conductor only)	Clause No.3.1	IS 8130	8	IS 10810 part 2
5	Wrapping test (non-compacted conductor only)	Clause No.6.2.2	IS 8130	8	IS 10810 part 3
6	Conductor water penetration test	ICEA T-31-610			
(II) Test on Insulation					
7	Tensile strength & Elongation at break (before ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
8	Insulation thickness	Table 3	IS 7098 part 1	8	IS 10810

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					part 6
9	Depth of embedded, extruded colour line (for mutli-core cable only)	Max depth 50% of insulation thickness	ENG-ELC- 034	Through	profile projector/ magnifying optical scale
10	Brightness of embedded, extruded colour line (for mutli-core cable only)	Clause No. 5.C	ENG-ELC- 034	Visual	check from a distance of 1 meter
11	Hot set test	Table 1	IS 7098 part 1	8	IS 10810 part 30
12	Surface smoothness of insulation	Clause No. 5(B.7)	ENG-ELC- 034	Toł	be checked by inspector
		(V) Tes	t on Inner she	ath	
13	PVC thickness	Table 5	IS 7098 part 1	8	IS 10810 part 6
14	Colour of inner sheath	Clause No. 5 (D.1)	ENG-ELC- 034	To be checked by inspector	
	(VI) Te	st on Armou	ur (for multico	re cables o	only)
15	Tensile test	8	IS 3975		IS 1608
16	Mass of zinc coating	Table 1 Heavily coated soft wire	IS 4826		IS 6745
17	Uniformity of zinc coating	9	IS 3975		IS 2633

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18	Adhesion test	9	IS 3975		IS 3975
19	Diameter	Table 6	IS 7098 part 1	Value to	o be measured by inspector
20	No. of wires & Coverage %	Clause No. 5(E.6)	ENG-ELC- 034	Value to be measured by inspector	
	I	(VII) Test o	on PVC Outer \$	Sheath	
21	Thickness		IS 7098 part 1		IS 10810 Part 6
22	Tensile strength and Elongation at break (before ageing)	Table 2	IS 5831	8	IS 10810 part 7
23	Colour of outer sheath	Clause No. 5 (F.3)	ENG-ELC- 034	To be checked by inspector	
24	Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void, nick, cavity.	Clause No. 5 (F.4)	ENG-ELC- 034	Through rewinding of drum (As per TPSODL specification)	
25	Anti-termite and rodent property test in PVC outer sheath	Chemical test As per To be checked by insper Method		be checked by inspector	
26	Flammability test		IS	6 10810 pa	urt 61
27	Oxygen index	IS 10810 part 58			
28	Temperature Index test	IS 10810 part 64			
29	Acid gas generation	IS 10810 part 59			
30	Smoke density	IS 10810 part 63			

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	(VIII) Tests for complete cable					
31	High voltage test	7.2 kV for 5 minutes As per Clause no. 16.2.1	IS 7098 pai 1	t	8	IS 10810 part 45
		(IX) A	dditional te	sts		
32	Raw material consumption	Clause No D.3, E	. A.8, B.4, .9, F.5	Do	ocumen	t verification as proof to be submitted
		Invoice to be shown from procurement to consumption				irement to consumption
33	Sequential marking check	Clause no. 6.ii	ENG-EL	C-034	T	o be checked by inspector
34	Cable drum length verification	Clause no. 6	^{no.} ENG-ELC-034 To		Т	o be checked by inspector
35	Packaging of cable on cable drum	By recyclable PVC sheet- As per Clause no.12	ENG-EL	ENG-ELC-034		o be checked by inspector
36	End caps	Clause No. G	ENG-EL	C-034	T .	o be checked by inspector
37	Weight of conductor Kg/km	To be checked by inspector				
38	Weight of core Kg/km	To be checked by inspector				
39	Weight of armour	To be checked by inspector				

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	Kg/km	
40	Weight of complete cable Kg/km	To be checked by inspector
41	Overall approx. diameter of complete cable	To be checked by inspector

7.2 ROUTINE TESTS

Test	Clause No.	Reference Standard
Conductor resistance test	15.3	IS 7098 part 1
High voltage test with power frequency	15.3	IS 7098 part 1

7.3 TYPE TESTS

S.N		Specif	ic value		Test method
о.	o. Test	Clause No.	Reference Standard	Clause No.	Reference Standard
		Tests	on Conducto	r	
1	Conductor resistance test	Table 2	IS 8130	10	IS 10810 part 5
2	Conductor water penetration test (For conductor size - 150 sq.mm. and above)	ICEA T-31- 610	ICEA T-31-610	4	ICEA T-31-610
3	Tensile strength (for non-compacted conductor)	6.2.1	IS 8130	8	IS 10810 part 2
4	Wrapping test (for non-compacted	6.2.2	IS 8130	8	IS 10810 part 3

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	conductor)				
		Tests	on Insulation		I
5	Tensile strength & Elongation at break (before ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
6	Ageing in air oven	Table 1	IS 7098 part 1	8	IS 10810 part 11
7	Tensile strength & Elongation at break (after ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
8	Tests for thickness of insulation	Table 3	IS 7098 part 1	8	IS 10810 part 6
9	Hot set test	Table 1	IS 7098 part 1	8	IS 10810 part 30
10	Shrinkage test	Table 1	IS 7098 part 1	8	IS 10810 part 12
11	Gravimetric test (Water absorption)	Table 1	IS 7098 part 1	8	IS 10810 part 33
12	Volume resistivity/ Insulation Resistance	Table 1	IS 7098 part 1	8	IS 10810 part 43
		Tests o	on Inner Sheat	th	
13	PVC thickness	Table 5	IS 7098 part 1	8	IS 10810 part 6
		Tests on C	Outer Sheath (PVC)	
14	Flammability test for outer sheath	Clause No. 16.3	IS 7098 Part 1	As per IEC 332 part 1	
15	Tensile strength and	Table 2	IS 5831	8	IS 10810

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	Elongation at break				part 7	
	(before ageing)					
	Tensile strength and			_	IS 10810	
16	(after ageing)	Table 2	2 IS 5831 8	part 7		
47			10 5004		IS 10810	
17	Variation due to ageing	I able 2	18 5831	8	part 7	
18	Loss of mass tost	Table 2	19 5831	Q	IS 10810	
10			10 000 1	0	part 10	
10	Shrinkage test	Table 2	19 5831	8	IS 10810	
19	Shiinkage test		10 000 1	0	part 12	
20	Hot deformation test	Table 2	19 5831	8	IS 10810	
20			10 0001	0	part 15	
21	Hoot shock tost	Table 2	19 5921	0	IS 10810	
21	Tieat shock lest		10 000 1	0	part 14	
22	Thermal stability test	Table 2	IS 5831	Append ix B	IS 5831:1984	
23	Oxygen index		As	per ASTM	2863	
24	Temperature index			ASTM 28	63	
25	Acid gas generation			IEC 6075	54	
26	Smoke density	ASTM 2843				
	Tests on Armour for multi-core Cable					
27	Tensile test	8	IS 3975	6	IS 1608	
28	Torsion test	8	IS 3975	7	IS 1717	
29	Wrapping test	8	IS 3975	5	IS 1755	
20	Posistance test		10.0075	0	IS 10810	
30		0	10 3973	0	Part 42	

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31	Mass of zinc coating	Table 1	IS 4826	6	IS 6745		
32	Uniformity of zinc coating	9	IS 3975	4	IS 2633		
33	Adhesion test	9	IS 3975	9.3	IS 3975		
	Tests on complete cable						
34High voltage test7.2 kV for 5 minutesIS 7098 part 1IS 1081034High voltage testAs per Clause 							

8. TYPE TEST CERTIFICATES:

Bidder shall furnish the type test report of **1.1 kV** cable for the tests as mentioned in Clause no. 7 of this specification and as per reference standards.

Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. Type test report shall be submitted for the type, size and rating of the cable mentioned in the bid/ OR for any size higher (than required) of similar type and similar voltage grade. Conductor Water penetration test as per ICEA T 31-610 shall be conducted at CPRI/ERDA.

Type test should have been conducted in CPRI/ERDA laboratories during the period not exceeding 5 years from the date of opening of 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 TPSODL.

9. PRE-DISPATCH INSPECTION:

Inspection shall be carried out by duly authorized representative of TPSODL.

Bidder shall grant free access to the places of manufacture to TPSODL's representatives at all times when the work is in progress.

Inspection may be made at any stage of manufacturing at the discretion of TPSODL and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection.

Inspection by TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specification.

Dispatch of material: Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPSODL.

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Following documents shall be sent along with the supplied material:

- a) Test reports
- b) MDCC issued by TPSODL
- c) Invoice in duplicate
- d) Packing list
- e) Delivery Challan

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection .

11. GUARANTEE:

Bidder shall confirm for guarantee towards design, material, workmanship & quality of process / manufacturing for integrated product delivered under the contract.

In the event any defect is found by TPSODL, up to a period of at least 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at their own costs, within mutually agreed time frame, and to the entire satisfaction of TPSODL, failing which TPSODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPSODL's own charges (@ 20% of expenses incurred), from the Bidder or from 'Security cum Performance Deposit' as the case may be.

Free replacement: Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by TPSODL.

12. PACKING AND TRANSPORT:

- a) Standard length of Cable: The cable shall be supplied in continuous standard length as per Clause no.6 of this specification.
- **b) Filling condition:** Drum shall not be overfilled.

c) Cable drum: The cable shall be wound on non-returnable drums without any extra cost to TPSODL as per IS 10418 and its latest amendments.

d) Sealing of cable ends: The ends of the cable shall be sealed by means of heat shrinkable polyolefin end caps.

e) Requirements for Cable drums: Cable drums shall be so constructed as to have required mechanical strength so that the drum flanges and other components do not break during transport, in actual use or in storage. The flanges and the outside surface of the barrel shall be free from protruding materials/projections/ unevenness/ sharp edges that can damage the cable or hands of the operator during rotation of drums.

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Material preservation shall be applied to the entire drum.

f) Bottom end of cable should be clamped on drum by jute or nylon rope.

g) Rail/ Road transportation: The bidder shall ensure that the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit. The drums shall withstand normal handling and transport.

h) Packaging shall be as per climate change perspective.

Cable wound on cable drum shall be covered by recyclable PVC sheet for dust proof.

TPSODL encourages to use environment friendly packaging.

13. TENDER SAMPLE:

Not Applicable

14. QUALITY CONTROL:

The bidder shall submit 'Quality Assurance Plan' followed by him in respect of bought out items, items manufactured by him, Raw materials in process, Final inspection Packaging & Marking. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPSODL reserves the sole rights for the type test of random sample from the lot and in case of any discrepancy or deviation from the Type test certificates submitted along with the bid, the complete Lot shall be rejected. TPSODL's nominated representative shall have free access to the bidder's works to carry out inspections

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder will have to submit (after placement of RC) technical compliance document and drawing of cable as per RC line items for getting approval before mass manufacturing. Bidder shall start manufacturing of mass quantity only after getting CAT-A approved drawings and technical compliances or as per intimation from TPSODL.

17. SPARES, ACCESSORIES AND TOOLS

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Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following documents shall be submitted along with the bid for approval after award of RC/PO:

- a) Completely filled-in clause wise compliance of this specification
- b) Type test Certificates for each specified test
- c) Cross sectional drawing of the cable
- d) Rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables.

Following documents shall be submitted after award of contract for approval before manufacturing:

- a) Completely filled-in clause wise compliance of this specification
- b) Cross sectional drawing of the cable

All the Documents and Drawings shall be in English Language.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.

20. SCHEDULE "B" 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:

SL. 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

Technical Specification

TPSODI

TATA POWER SOUTHERN ODISHA DISTRIBUTION LIMITED, BERHAMPUR

TECHNICAL SPECIFICATION

II SYDE					
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- 3. CLIMATIC CONDITIONS OF THE INSTALLATION
- 4. TECHNICAL REQUIREMENTS
- 5. QUALITY CONTROL
- 6. MINIMUM TESTING FACILITIES
- 7. MANUFACTURING ACTIVITIES
- 8. SERVICES SCOPE AND SLA
- 9. DRAWING AND DOCUMENTS
- 10. SCHEDULE OF DEVIATIONS

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1.0	Scope of work	The scope of this specification covers all the Technical Requirements of Design, Engineering, Manufacturing, testing at manufacturer's works, packing, forwarding, supply and unloading at site/stores complete with all accessories including, installation, testing and commissioning of Control & Relay panels at various sites of TPSODL. This specification will be applicable to all 33/11kV panels in the existing PSS/existing Bays/ Renovated PSS.
		 Installation, testing and commissioning of new Control and Relay panel with complete wiring of relay from CT, PT and DC aux power requirement, extending power supply with proper cable carrier system inside control room with cabling and wiring including proper dressing of wiring. Blocking of all the openings on the bottom plane for rodent and vermin proofing to be ensured. Cat-6/RJ45/Fiber Optic cables (Double Run) from CR panels till Ethernet Switch in GI Flexible Conduit. Loop cables among Ethernet switches installed in 66/33/11 KV Bays and the Ethernet Switches installed in RTU Panel. Double Pole DC MCB OF Suitable ratings (For Each CRP) Terminal Blocks including disconnecting type TB's for CT's, PTs and DC voltage of Elmex make KLTD -M4 of 1.1kV class to be considered for SCADA status/alarm and control requirement. 2.5 Sq mm cable to be considered for CT wiring. This shall be considered for all cabling from all cores of CTs. Pin Type, U-Type, Ring Type Lugs, & sleeves with Printed feruling 1.5 & 2.5 Sq mm LV power and control cable for AC/DC power supply requirement for each CRP inside control room from AC/DC distribution board shall be in bidder's scope. Bidder to ensure that dual source with manual changeover facility shall be provided for DC as well as for AC power supply. Earthing copper bus bar shall be provide inside each CRP which is extended upto the station earthing pit by the bidder. Testing includes primary injection and secondary injection (having three phase double Source arrangement) and also all testing equipment would be provided by Vendor. Point to point as well as configuration logic testing from links to relay as well as from relay to RTU, network Switches and SCADA is in the bidder's scope.

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		12 Submission of As-built drawing within 15 days after successful completion of the respective Sub Station job.
		 Any Miscellaneous accessories required for Commissioning. In case of space constraint in the panel vendor need to supply and mount an additional box for installation of relay.
		Scope of work for MFM-
		 Mounting of the new MFM and extending power supply cables and wiring inside panel, CT & PT wiring along with separate terminal blocks with disconnecting type links for CT & PT wiring. Terminal Blocks including TBs for CTs, PTs and DC as mentioned above in BCPU/relay scope. Pin Type, U-Type, Ring Type Lugs, & sleeves with Printed feruling 1.5 & 2.5 Sq. mm cable for whole activity Submission of As-built drawing within 15 days after successful completion of the Respective Grid Station jobs. Any Miscellaneous accessories required for Commissioning. In case of space constraint in the panel vendor need to supply and mount an additional box for installation of MFM/Relay
		Technical requirements of MFM are detailed in the specification.
2.0	Applicable Standards	The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with latest revisions of relevant Indian/IEC/other applicable standards shall confirm to the regulations of local statutory authorities.
		IEC 60529 has been developed to rate and grade the resistance of enclosures of electric and electronic devices against the intrusion of dust and liquids. It also rates how easy it is for individuals to access the potentially hazardous parts within the enclosure.
		 IEC 61850 (All Parts) IEC 62052-11 - defining communication protocols for intelligent electronic devices at electrical substations. IEC 61131-3- IEC 61131 for programmable logic controllers IEC 62056- standards for electricity metering data exchange by International Electrotechnical Commission IEC 61588/IEEE 1588v2- efines a network protocol, the Precision Time Pretagel (PTP), apphling accurate and provise surgebraization of the real.
		 IEC 62351- IEC 62351 is a standard developed by WG15 of IEC TC57. This is developed for handling the security of TC 57 series of protocols including IEC 60870-5 series

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3.0	3.0 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 Speed	300 Km/hr	
		9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g	
		1(Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)	
		TPSOD	TPSODL service area has heavy saline conditions along the coast and High		
		cyclon	c Intensity winds with speed upto 300 Kmpl	n. The atmosphere is generally	
		laden	vith mild acid, dust in suspension during the	e dry months, and is subjected	
		to fog	n cold months.		
4.0	Technical Requirements				

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4.1	General Requirements from the Business Associates	 The supplier should have at least 10 years of experience in design and supply of control, protection and automation systems for electricity transmission and distribution applications. The manufacturer, whose substation automation and protection system is offered, should have designed, manufactured, tested, installed and commissioned such a system for electricity transmission and distribution for at least 10 years. The manufacturer needs to submit the proof of completing such tasks with other utilities/concerns as its experience certificate. The Numerical Relays should be integrated with SCADA system on standard international protocols. The Business Associate can offer an innovative and advanced system and the ways and cost to integrate the same in the existing infrastructure. The offer is subjected to an approval from TPSODL after a thorough discussion between the BA and TPSODL. In case, an approval is not awarded to the BA's offered innovative system, TPSODL's existing/desired infrastructure prevails and the BA shall provide the system accordingly.
		 The BA should optimize on the cost of software products offered to TPSODL considering already available licenses with TPSODL. The BA should clearly indicate licensing policy for the software tools for IEDs. The BA should provide the ICD/SCD files for the substation project files for the IEDs. The BA should provide necessary training to the personnel recommended by TPSODL to maintain the system and troubleshooting reports.

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4.2	General System Design	Protection and Control IEDs respond to the signals of currents and voltages measured at certain points of the power system, and assess the state of the protected power system component. The System shall be suitable for operation and monitoring of the complete substation including future extensions and shall works on IEC 61850. The offered IEDs shall be compliant to IEC 61850 Edition-2 with backward compatibility to Edition-1. Conventionally, analog values are injected directly into the IED through instrument transformers. IEDs combine analog-to-digital conversion of the signals with their analysis (digital filtering) and decision-making algorithms.
		The systems shall be of the state-of-the art suitable for operation under electrical environment present in high voltage substations (33/11kV), follow the latest engineering practice, and ensure long-term compatibility requirements and continuity of equipment supply and the safety of the operating staff.
		The system shall incorporate the control, monitoring and protection functions specified, self-monitoring, signaling and testing facilities, measuring as well as memory functions, event recording and evaluation of disturbance records. Signals shall be mapped according to signal list mentioned in Annexure-C .
		Maintenance, modification or extension of components shall not cause a shutdown of the whole system at substation. Self-monitoring of components, modules and communication shall be incorporated to increase the availability and the reliability of the equipment and minimize maintenance.
		All IEDs must have conformal coating for protection against harsh environments.
		CRP panels shall be of following types, please refer station SLD in Annexure-E.
		1. 33kV/11kV, Incoming / outgoing feeder panel : This panel shall have numerical relay of O/C & E/F type, Master trip relay of electrical reset type, auxiliary relay for contact multiplication, multifunction meter,

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	indicating lamps, TNC switch, local/remote switch, other auxiliary relays etc. for standard operations, control and monitoring requirements for 33kV/11kV bays in power system. Reset command for Master Trip Relay shall be implemented through SCADA.				
2.	Transformer differential and Over Current/earth fault protection in one relay: 33kV power transformer shall have differential + Over current protection in one relay. Separate master trip relay shall be provided. Auxiliary relays such as RXSF/RXMS/RXKF shall be used for field devices such as				
	2.1 Buchholz alarm & trip				
	2.2 WTI alarm & trip				
	2.3 OTI alarm & trip				
	2.4 MOG alarm				
	2.5 PRD alarm & trip				
	2.6 OSR alarm & trip				
3.	One panel of 800mm x 800mm shall accommodate two bays side by side. If there is any bay remaining alone in a station then it shall be accommodated in a single panel of 500mm or 600mm to save space. Please refer typical panel room layout in Annexure-A .				
4.	Master Trip Relay electrical reset through SCADA shall be implemented except for Transformers.				
5.	IRF monitoring: Internal Relay Failure contact / watchdog contact shall be looped for all 33kV relays and separately for all 11kV relays and shall be connected to RTU for monitoring through SCADA by the bidder.				
6.	Contact multiplication relays (CMR) of reputed make of 24V/48V DC shall be used for status of CB on/off, Spring Charge, Transformer troubles wherever applicable.				
7.	Interconnecting cable schedule (ICS) shall be provided by the bidder for each bay for control, metering and protection purpose. ICS format is enclosed with this document. Please refer Annexure-B .				
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		8. Phase wise fault current shall be made available from Relay/IED to SCADA using IEC 61850 mapping.
		9. Multifunction Meter shall be provided on each control & Relay panel. Multifunction meter on 33kV/11kV PTR Panel, 33kV side shall be self- powered by PT and rest shall be powered by auxiliary supply(24 V DC). In case these metersare required to put in daisy chain, no more than ten MFM shall be considered in each loop. Meter accuracy shall be equal or above 0.2S as per IEC62053:22. The current rating shall be three times continuous and8 times for 1sec. MFM shall communicate on MODBUS RTU or ASCII, selectable at site. Aux power supply range shall be 18-72V DC. Mountingpanel cutout shall be 92 x 92 mm. Real time & average parameters are required. Real time clock and THD measurement is required. User defined registers are preferred.
		10. Mounting space for billing energy meter of 200mm x 200mm and test terminal block shall be made available for purchaser's future requirement, on each panel. Also, bidder to make cutout for billing energy meter based on the dimensions given by owner and fix blanking plate for mounting of billing meter in future.
4.3	Electrical Circuit Grounding	Where grounding is provided with the power source, safety grounding conductors shall be bundled with the power source conductors, but be insulated from the power conductors and from other equipment and wiring conduit. The ground conductor shall be terminated in the cabinet enclosure, and grounded only at the same point that the source of the electrical service to the cabinet or UPS neutral is grounded.
4.3.1	Energy Meter (Multifunction Meter-MFM)	 The Energy Measurements should be preferably done as per 3 wattmeter method. It shall use Potential Transformer and the Metering Core of the respective Current Transformers. The desired Metering class accuracy of 0.2s is expected for metering functions. Supply and Integration of Energy Meters with Software for centralized
		 meter data reading shall be in supplier's scope. Supplied Software shall have independent for meter make or OEM to retrieving the meter data. Supply and Installation of RJ11 Splitters shall be in supplier's scope Supply, Installation and Configuration of TCP/IP to Serial Converter shall be in supplier's scope if required.

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● S n h	 Software configuration for integration of energy meters (at centralized meter data acquisition system) shall be in supplier's scope. Supplier shall have ensured the data communication. 			
The basic	c metering functions should	be additionally supported by following:		
S. No.	Description	Requirement		
01	Type of the Meter	3 Phase 4 Wire, CT/PT Operated Static		
		Meters		
02	Accuracy Class of the	Active Energy – 0.2S		
	Meter	Reactive Energy – 2 or better		
03	Basic Current (Ib) & rated	When Ib=1A; Imax=2A		
	Max. Current (Imax)	When Ib=5A; Imax=10A		
04	Rated Secondary Current	1A or 5A for 66/33kV/11kV (balanced		
	(I _b)	and unbalanced load),		
05	Reference conditions for	V _{ref} = 110V ± 1%		
	testing the performance	Freq = 50Hz ± 0.3%		
	of the meter	Temperature = 27°C ± 2°C		
06	Operating Voltage	110V (P-P), Meter shall be operational		
		with required accuracy from 0.6 V_{ref} to		
		1.2Vref		
07	Operating Frequency	50Hz ± 5%		
08	Power Consumption	Voltage Circuit: Max. 1.5W and 10VA,		
		Current Circuit: Max. 1VA		
09	Starting Current	0.1% of I _b		
10	Short time over current	The meter shall be able to carry for 0.5s		
		a current equal to 20 times the max.		
		current		
11	Influence of heating	Temperature rise at any point of the		
		external surface of the meter shall not		
		exceed by more than 20k with an		
		ambient temperature at 45oC		
12	Rated Impulse withstand	6kV (Shall be applied ten times with one		
	voltage	polarity & then repeated with the other		
		polarity and minimum time between		
		each impulse to be 3s)		
13	AC withstand voltage for 1 min	4kV		

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14	Insulation resistance	Frame & current, voltage circuits
	between	connected together: 5MΩ
		Each current circuit (and voltage circuit)
		& each and every other: $50M\Omega$
15	Mechanical	Meter shall be in compliance with clause
	Requirements	12.3 of IS 14697
16	Resistance to Heat and	The terminal block, terminal cover and
	Fire	Meter case shall ensure safety against
		spread of fire. They should not be
		ignited by thermal overload of live parts
		in contact with them as per clause 6.8 of
		IS 14697. Fire retardant material shall
		be used.
17	Protection against	Degree of Protection: IP 51, but without
	penetration of dust and	suction in the meter
	water	
18	Resistance against	Meter shall be in compliance with clause
	Climatic influence	12.6 of IS 14697
19	Electromagnetic	Meter shall be in compliance with clause
	Compatibility (EMC)	12.8 of IS 14697
20	Accuracy requirements	Meter shall be in compliance with clause
		11.0 of IS 14697
21	Power Factor Range	Zero lag to Zero lead
22	Energy Measurement	Fundamental energy +Energy due to
		Harmonics. Energy meters shall record
		Total Harmonics distortion (THD) in
		voltage and current for at least 30 days
23	Connection Diagram	The connection diagram for the system
		shall be provided on terminal cover
24	Self-Diagnostic Feature	Self-diagnostic for calendar, RTU,
		Battery, all display segments and NVM.
25	Initial startup of meter	Meter shall be fully functional within 5s
		after reference voltage is applied to the
		meter terminals
26	Internal diameter of the	5.5mm (min), 25mm
	terminal holes and Depth	
	of terminal hole	

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	27	Clearance betw	veen	10mm (min)
		adjacent Terminals		
	28	Display		Backlit LCD, Scrolling, 10s for each
				parameter
	29	History requirements		The meter shall be capable of recording
				the last two months data for following
				parameters, at the end of every month
				at 24:00 hrs:
				 Active demand (MW), import
				 Apparent demand (MVA),
				import
				 Reactive energy (MVArh) lag, import
				Reactive energy (MVArh) lead.
				import
				 Active energy (MWh), import
				Apparent energy (MVAh),
				import
				 Active demand (MW), export
				 Apparent demand (MVA), export
				• Reactive energy (MVA) lag,
				export
				• Reactive energy (MVArh) lead,
				export
				 Active energy (MWh), export
				 Apparent Energy (MVAh),
				export
	29	Security feature		Programmable facility to restrict the
				access to the information recorded at
				different security level such as read
				communication, write communication,
				etc.
	30	Software	and	Parameter registers shall be mapped for
		Communication		data transfer.
		compatibility		

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		31	Calibration	Meters shall be software calibrated at
				factory and modifications in calibration
				shall not be possible at site by any
				means.
		32	Preferred make/model	RISHAB, SECURE, SCHNEIDER
4.3.2	Power Supply	Power for the substation automation system shall be derived from substation		
		24/48V [DC system. In the event of Po	ower failure, necessary safeguard software
		shall be	ouilt for proper shutdown ar	nd restart.
4.3.3	Low Voltage	1.5 sqmi	n cable for circuit inside pa	nel and 2.5 sqmm cable for circuit outside
	Control Cables	panel fo	r Relays and RTU wiring sha	all be of 1.1kV class Low voltage cables of
		stranded	copper conductor, PVC ins	ulated. Cables shall be laid in Cables trays
		and in in	door trenches as a complete	e system. Trays shall be supported properly
		from the	e building structure. The er	ntire cable tray system shall be rigid and
		leveled.	The installation of cable tray	support system shall be using the required
		accessories and using grip bolts for proper strength in fixing. All the above		
		required material shall be supplied and installed by the bidder.		
		Control cables shall be stranded copper conductor having minimum 7 strands.		
		extruded PVC inner sheathed, galvanised steel wire armoured, over all sheathed,		
		outer sheath (ST-2) made of FRLS PVC compound. The cables shall conform to IS-		
		1554 (Pa	rt-1) 1988/IEC-60502 (1998)	& IEC-60502- amendment -1 999 in all other
		respects.	In situations where accuracy	y of measurement or voltage drop in control
121	Low Voltago		α cables for the 415V AC 24	AS required shall be used. AC system and 220V DC system shall be
4.5.4	Low Voltage	single core/ Multi core 1100V earthed H4 grade with stranded aluminium/copper		
	Power Cables	conductor, extruded cross-linked polyethylene (XLPE) insulated, core identification		
		by colour coding, extruded PVC (Type -ST 2) inner sheathed, armoured, Aluminium		
		wire armour for single core cables and galvanized steel wire for multi core cables		
		and extr	uded PVC (Type ST-2) oute	r sheathed with FRLS properties, generally
			labove 16 sq mm cables Alu	minium conductor shall be used for LT power
		cables. F	or DC all cables shall be of C	opper conductor irrespective of its size.

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4.3.5	Numerical Over	Following functions shall be available in the Protection Relay for 33KV Incomor / 33KV Outgoing / 11KV Incomor /11KV outgoing 8	
	Current and Earth	33 kV Transformer Feeder	
	Fault Relay / Bay	Current protection (Directional & Non-directional feeder Protection)	
		1) Over current instantaneous (50).	
	Protection Unit	2) Over current IDMT (51).	
		3) Earth fault instantaneous (50N).	
		4) Earth fault IDMT (51N).	
		5) Broken Conductor.	
		6) Breaker Failure Protection.	
		7) Negative Phase Sequence Protection.	
		8) Separate Sensitive Earth fault Protection.	
		9) Separate Measure Earth fault Protection.	
		10) Binary Input-24 & Binary Output-12 Minimum Required.	
		11) Trip and Close Logic Programmable Facility Function required in the	
		Relay.	
		T2) Current & Voltage, Binary Input, Binary Output DR /Event same to be	
		13) The device should have front port serial communication with Software	
		R. 45 USB type or RS232	
		14) Rear ports shall be redundant with RSTP and PRP requirement for	
		client server Communication.	
		15) Rear ports should be either of electrical or optical RJ45 type.	
		16) All configuration and Relay Protection Parameter Setting are	
		uploading or downloading should be possible any of the relay ports	
		irrespective of IEC 61850 configuration.	
		17) Relay output Contact shall be possible for Breaker Close & Open from	
		Remote through SCADA	
		18) All Protection internal triggering logic shall be interface with SCADA.	
		19) Goose Signal interface facility required.	
		20) Relay Suitable for SCADA Application.	
		21) The relay shall have a facility to have communication on IEC61850	
		protocol through redundant rear port (i.e., RJ45 PRP/RSTP) which	
		supports IEC 62439-3 PRP and latest redundant technology for SAS	
		of EMI as indicated in IEC 61850 shall be applicable to these	
		The relay shall support peer to peer communication	
4.3.6	Numerical Relay	Differential Relay Shall have the Following Function Required for	
	for Transformer	transformer Protection:	
	differential	1) Relay shall be capable for Minimum Two Winding Transformer	
	protection	Differential Protection with any rating CT ratio.	
		2) Separate Sensitive Earth Fault and High Impedance Restricted	
		Earth-ault and Stand by earth fault Protection Coll Required in the	
		Reldy. 2) Rippry Input 24.8 Rippry Output 12 Minimum Required	
l	l	j of binary input-24 & binary Output-12 Minimum Required.	

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	4) 2 nd and 5 th Harmonics Blocking.
	5) Overcurrent / Derived Earth Fault / Measured or Sensitive earth Fault / Stand by Earth fault Selection HV or LV side Inbuilt
	programmable Enabled facility required.
	6) Breaker Failure Protection.
	Relay.
	8) Current & Voltage, Binary Input, Binary Output DR /Event same to be mapped with SCADA.
	 The device should have front port serial communication with Software, RJ45, USB type or RS232.
	10) Rear ports shall be redundant with RSTP/PTP requirement for client server Communication.
	11) Rear ports should be of electrical RJ45 type.
	12) All configuration and Relay Protection Parameter Setting are uploading or downloading should be possible any of the relay ports irrespective of IEC 61850 configuration.
	13) Relay output Contact shall be possible Breaker Close & Open from Remote through SCADA.
	14) Downloading/ uploading file from any relay ports shall not change its 61850 engineering and device engineering.
	15) All Protection internal Protection triggering logic shall be interface with SCADA.
	16) Goose Signal interface facility required.
	17)Relay Suitable for SCADA Application.
	18) The relay shall have a facility to have communication on IEC61850 protocol through redundant rear port (i.e., RJ45 PRP/RSTP) which supports IEC 62439-3 PRP and latest redundant technology for SAS
	of EMI as indicated in IEC 61850 shall be applicable to these.

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4.3.7	<u>Relay</u>	1) The relay should be modular type. It will be installed at outdoor or	
	<u>requirement</u>	indoor CR Panel. Standard terminal blocks should be located at the	
	for SCADA	rear of the relay providing connections for all input and output	
	Communication &	circuits.	
	<u>Other</u> <u>Functionalities</u>	 circuits. 2) Large MIMIC display with CB Open Close button for breaker Control from Front 3) Conformal Coating. 4) Ring Type Terminal for CT & VT. 5) IEC 61850 edition / HSR & PRP. 6) Cyber Security. 7) Proper enclosure Protection. 8) The relay shall have a facility to have communication on IEC61850 protocol through redundant rear port (i.e. RJ45 or FO) which supports IEC 62439-3 PRP and latest redundant technology for SAS connectivity without use of any external converter. Further, 	
		the test levels of EMI as indicated in IEC 61850 shall be applicable	
		to these.	
		9) The relay shall support peer to peer communication.	
		standards, interlocking/tripping and also to ensure interoperability with third party relays.	
		12) Necessary user-friendly configuration tool shall be provided to	
		configure the relays. It should be compatible with SCL/SCD files generated by a third-party system.	
		13) Goose signals shall be freely configurable for any kind of signals	
		using graphic tool/user friendly software. Bidder shall also ensure adequate hardware.	
		14) The Relay shall have facility for Time synchronization on IRIG B or SNTP port.	
		Approved Makes for Relays / BCPUs:	
		 ABB India Ltd. Siemens Ltd. GE T&D India Ltd. 	
		4. Schneider Electric	

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4.3.8	Terminal Block and panel wiring	 Terminal Blocks including disconnecting type TB's of Elmex make KLTD - M4 of 1.1kV class to be considered for CT's, PTs and DC voltage SCADA status/alarm and control requirement. 2.5 Sq mm cable to be considered for CT wiring. This shall be considered for all cabling from all cores of CTs. Disconnecting Type Terminal block For DC control and trip, CT & PT Wiring Connection. 2.5Sqmm and 1.5Sqmm. Single Feed Terminal Block or suitable Terminal Block for Control Wire Connection 2.5 Sqmm and 1.5 Sqmm. Din Rails and Support Brackets Different type for Terminal Block and MCB Fixing during Retrofit work. Different Size Bundle wire Cable for 2.5Sqmm/1.5 Sqmm different Colour code (Red, Yellow, Blue, Block, Green & Gray) 	
4.3.9	General Construction of CRP - Simplex panel	 Simplex panel with dust proof design shall consist of a vertical front panel with equipment mounted thereon and having wiring access from rear for control panels & either front or rear for relay panels. Panel shall be having dimensions equal to For Dual Feeder 800mm x 800mm x 2000mof W x D x H For Single Feeder 600mm x 800mm x 2000mof W x D x H Doors shall have handles with either built-in locking facility or will be provided with pad-lock. To save space, rear door of the panel shall be provided with two halves. Please refer typical panel room layout in Annexure-D and accordingly panel layout shall be submitted for review and approval. Control and Relay Board shall be of panels of simplex type design as indicated in bill of quantity. It is the responsibility of the BA to ensure that the equipment specified and such unspecified complementary equipment required for completeness of the protective/control schemes is properly accommodated in the panels without congestion. No price increase at a later date on this account shall be allowed. However, the width of panels that are being offered to be placed in existing switchyard control room. Panels shall be completely metal enclosed and shall he dust, moisture and vermin proof. The enclosure shall provide a degree of protection not less than IP-42 in accordance with IS: 2147. Panels shall be free standing, floor mounting type and shall comprise structural frames completely enclosed with specially selected smooth finished, cold rolled sheet steel of thickness not less than 3 mm for weight bearing members of the panels such as base frame, front sheet and door frames, and 2.0mm for sides, door, top and bottom portions. There shall be 	

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	sufficient reinforcement to provide level transportation and
	 All doors, removable covers and panels shall be gasketed all around with synthetic rubber gaskets Neoprene/EPDM generally conforming to provision of IS 11149. However, XLPE gaskets can also be used for fixing protective glass doors. Ventilating louvers, if provided shall have screens and filters. The screens shall be made of either brass or GI wire mesh.
	 Design, materials selection and workmanship shall be such as to result in neat appearance, inside and outside with no welds, rivets or bolt head apparent from outside, with all exterior surfaces tune and smooth. Panels shall have dual exhaust fan at its rear end for dissipation of heat.
	 Panels shall have base frame with smooth bearing surface, which shall be fixed on the embedded foundation channels/insert plates. Anti-vibration strips made of shock absorbing materials that shall be supplied by the contractor, shall be placed between panel & base frame. Cable entries to the panels shall be from the bottom. Cable gland plate fitted on the bottom of the panel shall he connected to earthing of the panel/station through a flexible braided copper conductor rigidly.
I	Mounting:
	10. All equipment on the panel and inside panels shall be mounted and completely wired to the terminal blocks ready for-external connections. The equipment on front of panel shall be flush mounted. Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent devices and are readily accessible without use of special tools. Terminal marking-on the equipment shall be clearly visible.
	11. The BA shall carry out cut out, mounting and wiring of the free issue items supplied by others which are to be mounted in his panel in accordance with the corresponding equipment manufacturer drawings. Cut outs if any, provided for future mounting of equipment shall be properly blanked off with blanking plate.
	 11. The BA shall carry out cut out, mounting and wiring of the free issue items supplied by others which are to be mounted in his panel in accordance with the corresponding equipment manufacturer drawings. Cut outs if any, provided for future mounting of equipment shall be properly blanked off with blanking plate. 12. The center lines of switches, push buttons and indicating lamps shall be not less than 750mm from the bottom of the panel. The center lines of relays, meters and recorders shall be not less than 450mm from the bottom of the panel.

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4.4	Panel Internal Wiring	 Panels shall be supplied complete with interconnecting wiring provided between all electrical devices mounted and wired in the panels and between the devices and terminal blocks for the devices to be connected to equipment outside the panels. 1. When panels are arranged to be located adjacent to each other all inter panel wiring and connections between the panels shall be furnished and the wiring shall be carried out internally, this is in the BA's scope. 2. All wiring shall be carried out with 1100V grade, single core, stranded copper conductor wires with PVC insulation. 3. The terminal blocks for CTs, VTs and DC supply, trip and alarm shall be provided with disconnecting type terminals specified above. The CT terminal blocks shall be provided with short circuiting and earthing facilities and shall have 20% terminals as spare terminals in each panel. All equipment mounted on front of the panels shall have individual name-plates with equipment designation engraved. Each panel shall also have circuit/feeder designation name plate.
		 All wiring shall be with 1100 V grade, single core, PVC insulated stranded copper conductor. Wires shall be vermin proof. Minimum size of conductor shall be 1.5 sq. mm in general, but for CT & VT circuits it shall be 2.5 sq.mm. CT VT wiring will be colored as per standard sign color configuration including neutral and neutral CT wiring. Rest wiring will be in grey color and earthing will be done by green colored control cable. Contractor shall be solely responsible for completeness and correctness of all the wiring, and for proper functioning of the connected equipment.
		Specification for Auxiliary relays/ MCB's
		6. Fuse Failure relay and trip Circuit Supervision relay shall be suitably selected, considering burden and auxiliary voltage. External circuitry like compensating resistances will not be accepted.
		7. Auxiliary contact multiplier relays should be of reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level must be accounted for (+/-) 10% continuously.
		 DC MCB's should not be substituted by AC MCB's for DC Distribution, irrespective of manufacturer's individual multi usage Recommendations. DC Fail Supervision relay (80) shall be provided on all control and IED
		 panels. DC supply manual changeover circuit shall be provided. 10. LED indication circuit shall be segregated from the control circuit by all means.
		11. Spare I/Os wiring shall be brought upto terminal block for future use. All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Wiring gutters & troughs shall be used for this purpose. Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided near the top of the panels running throughout the entire length of the panels.

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		12. Wire termination shall be made with solder less crimping type and tinned copper lugs, which firmly grip the conductor. Insulated sleeves shall be
		ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks.
		 All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red colored unlettered ferrule.
		14. Longitudinal troughs extending throughout the run length of the panel shall he preferred for inter panel wiring. Inter-connections to adjacent panel shall be brought out to a separate set of terminal blocks located near the slots of holes meant for taking the inter-connecting wires.
		15. BA shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.
ĺ		16. Supply and laying of LV power and control cables from existing switchyard to the supplied panels inside panel room are in TPSODL scope, however, the power supply cables inside the control room from AC and DC distribution beards inside the supplied CBP panels shall be
		in the bidder's scope for supply, laying and terminations including cable tray and its supports and earthing is in bidder's scope.
		 17. Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of external cable on each side All CT &PT circuits: minimum of 2.5 sq. mm copper. AC/DC Power Supply Circuits: 4 sq. mm Copper. All other circuits: minimum of 2.5 sq. mm Copper.
		18. There shall be a minimum clearance of 250 mm between the first row of terminal blocks and the associated cable gland plate or panel side wall. Also the clearance between two rows of terminal blocks edges shall be minimum of 150mm.
		19. Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal blocks is run in parallel and close proximity along each side of the wiring-duct to provide for convenient attachment of internal panel wiring. The side of the terminal block opposite the wiring duct shall he reserved for the Owner's external cable connections. All adjacent terminal blocks shall also share this field wiring corridor. All wiring shall be provided with adequate support inside the panels to hold them firmly and to enable free and flexible termination without causing strain on terminals.
		 Arrangement for DC and AC power supply with dual (redundant) source with manual changeover facility using selector switch shall be provided for all CR panels.
		21. The number and sizes of the TPSODL's multi core incoming external cables will be furnished to the BA after placement of the order. All necessary cable terminating accessories such as gland plates, supporting clamps & brackets, wiring troughs and gutters etc. including glands & lugs shall be included in scope of supply of the bidder.
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4.5	Painting	All sheet steel work shall be phosphate in accordance with the IS: 6005 "Code of practice for phosphate iron and steel". It should follow the seven tank process. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning. Rust and scale shall he removed by pickling with dilute acid followed by washing with running water rinsing with a slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoved type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. Thereafter an established painting procedure like electrostatic painting followed for powder coating the panel. The colour shade shall be Siemens grey RAL 7032
4.6	Miscellaneous Accessories	 Plug Point: 240V, Single phase 50Hz, AC socket with switch suitable to accept 5 Amps and 15 Amps pin round standard Iridian plug, shall be provided in the interior of each cubicle with ON-OFF switch. Interior Lighting: Each panel shall be provided with an LED (6w led panel tub light): lighting fixturerated for 240 Volts, single phase, 50 Hz supply for the interior illumination of the panel controlled by the respective panel door switch. Switches and Fuses: Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breakers (MCB). Selection of the main and sub-circuit faults. MCBs shall confirm to IS: 13947. Each MCB shall be provided with one potential free contact and the same shall be wired for annunciation purpose. However voltage transformer circuits for relaying and metering shall be protected by fuses. All fuses shall he HRC cartridge type conforming to IS: 13703 mounted on plug-in type fuse bases Fuse carrier base as well as MCBs shall have imprints of the fuse 'rating' and 'voltage'. Space Heater: Each panel shall be provided with a space heater rated for 240V, single phase, 50 Hz Ac supply for the internal heating of the panel to prevent condensation of moisture. The fittings shall be complete with switch unit.
4.7	Earthing	All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radiation interference for earth systems under various switching conditions of isolators and breakers. The material and the sizes of the bus bar shall be at least 25 X 6 sq. mm perforated copper with threaded holes at a gap of 50mm with a provision of bolts and nuts for connection with cable armors and mounted equipment etc for effective earthing. When several panels are Mounted adjoining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply of the Contractor. Provision shall he made for extending the earth bus bars to future adjoining panels on either side.

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		Supply shall be included for each bus bar of the end panels for connecting to Substation earthing grid. Necessary terminal clamps and connectors for this					
		purpose shall be included in the scope of supply of BA/bidder.					
		All metallic cases of relays, instruments and other panel mounted equipment					
		including gland plate, shall be connected to the earth bus by copper wires of					
		size not less than 2.5 sq. mm. The colour code of earthing wires shall he					
		areen.					
		Looping of earth connections, which would result in loss of earth connection					
		to other devices when the loop is broken shall not be permitted. However					
		looning of earth connections between equipment to provide alternative paths					
		to earth hus shall be provided					
		VT and CT secondary neutral or common lead shall be earthed at one place					
		only at the terminal blocks where they enter the papel. Such earthing shall					
		be made through links so that earthing may be removed from one group					
		be made infough links so that earthing may be removed from one group					
4.0	Construct Construction	The control quitch of brocker and isolater shall be of apring return to poutrol					
4.8	Control Switches	the control switch of breaker and isolator shall be of spring return to neutral					
		lype. The switch shall have spring return from close and the positions to alter					
		Instrument collection switches shall be of maintained contact (stay put) type					
		Ammeter explorition switches shall have make before break time contact (stay put) type.					
		Animeter selection switches shall have make-belote-bleak type contacts so					
		as to prevent open circulary of CT secondary when changing the position of					
		the switch. Volumeter transfer switches for AC shall be suitable for reading an					
		line- to-line and line-to-neutral voltages for non-effectively earthed systems					
		and for reading all line to line voltages for effectively earthed systems.					
		Lockable type of switches which can be locked in particular positions shall					
		be provided when specified. The key locks shall be fitted on the operating					
		handles.					
		The contacts of all switches shall preferably open and close with snap action					
		to minimize arcing. Contacts of switches shall he spring assisted and contact					
		aces shall be with rivets of pure silver or silver alloy. Springs shall not be					
		used as current carrying parts					
		The contact combination and their operation shall be such as to give					
		completeness to the interlock and function of the scheme.					
		The contact rating of the switches shall be as follows:					
		Contact rating for making and carrying shall be - 10A.					
		Continuous carrying for 0.5 sec shall be - 30A					
		Breaking for resistive load shall be - 20A					
4.9	Indicating Lamps	Indicating lamps shall he of cluster LED type suitable for panel mounting with					
		rear terminal connections. Lamps shall be provided with series connected					
		resistors preferably built in the lamp assembly. Lamps shall have translucent					
		lamp covers to diffuse lights colored red, green, amber, dear white or blue as					

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		specified and mou The lamp be interc if require scope of The indic a continu Red – Bi Green – White – S Amber – Blue - Tri	The lamp cover shall be preferably of screwed type, unbreak lded from heat resisting material. os shall be provided with suitable resistors. Lamps and lenses hangeable and easily replaceable from the front of the panel. ed for replacing the bulbs and lenses shall also be included the supply. cating lamps with resistors shall withstand 120% of rated volta ious basis. reaker ON Breaker OFF Spring Charged 86 operated p circuit failure e indicating Lamps for phases - R , Y, B	able s shall Tools, in the ige on
4.10	Name Plate & Marking	All equipment mounted on front and rear side as well as equipment mou inside the panels shall be provided with individual name plates equipment designation engraved. Also on the top of each panel on fror well as rear side, large and bold nameplates shall be provided circuit/feeder designation. All front mounted equipment shall also be provided at the rear with indivi name plates engraved with tag numbers corresponding to the one show the panel internal wiring to facilitate easy tracing of the wiring. Each IED and meter shall be prominently marked. All relays- and c devices shall be clearly marked with manufacturer's name, manufactu type, serial number and electrical rating data. Name Plates shall be made of anodized Aluminium. Name plates sha black with white engraving lettering. Each switch shall bear clear inscription identifying its function 'BREAKER"52A', "SYNCHRONISING" etc. Similar inscription shall also provided on each device whose function is not other-wise identified. If switch device does not bear this inscription separate name plate givin function shall be provided for it. Switch shall also have clear inscription each position Indication e.g. "Trip- Neutral-Close", "ON-OFF", "R-Y-B-C etc. All the panels shall be provided with name plate mounted inside the p bearing PO No & Date, Name of the Substation & feeder and refere drawing number.		
4.11	TPSODL	S. No.	Make	
	Preferred Make	1	Rittal India	
	tor CRP panel	2	Pyrotech Electronics	
	enclosures	3	Valrack cabinets	

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		4	Siemens	
4.12	Tests	Factory be concl	Acceptance Test: The manufacturing phase of the C&R Pane uded by the factory acceptance test (FAT). The purpose is to e	l shall nsure
		that the Contractor has interpreted the specified requirements correctly a that the FAT includes checking to the degree required by the user. general philosophy shall be to deliver a system to site only after it has be thoroughly tested and its specified performance has been verified, as fai site conditions can be simulated in a test lab. If the FAT comprises on certain portion of the system for practical reason.		
		Hardware Integration Tests shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system The equipment expansion capability shall also be verified during the hardware integration tests.		ems to factory. system. urdware uration system. urdware
		Integrate software equipme system t software tentative	ed System Tests shall verify the stability of the hardware a . During the tests all functions shall run concurrently, a ent shall operate a continuous 100 Hours period. The inter- test shall ensure the IEDs is free of improper interactions be and hardware while the system is operating as a whole. Pleas signal list in Annexure-C.	and the and all egrated etween se refer
		Type Te 1. T 2. E 3. A 4. M	st Certificates : est reports for type tests as per latest IEC standards shall be ubmitted for the Protection IED along with the Bid. MC test tmospheric Environment test lechanical Stress test	

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4.13	Pre-Dispatch Inspection	Equipment shall be subject to inspection by a duly authorized representative of the Purchase. 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, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser 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 the Purchaser. Following documents shall be sent along with material : a) Test reports b) MDCC issued by TPSODL c) Invoice in duplicate d) Packing list e) Drawings & catalogue f) Guarantee / Warranty card g) Delivery Challan h) Other Documents (as applicable)
4.14	Guarantee/ Warranty	Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning supplier shall be liable to undertake to replace/rectify such defects at his own costs within the mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of three years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company
4.15	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.
4.16	Minimum	
	Testing Facilities	The Bidder shall have in house testing facilities for carrying out all routine tests and acceptance tests as per relevant international/Indian standards.
4.17	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. The bar chart will have to be submitted within 15 days from the release of the order.

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4.18	Spares, Accessories and Tools	NA		
4.19	Grounding	 Grounding is required for all equipment. Control and data acquisitionequipment shall not ground a floating power source. Care shall be exercised to ensure ground compatibility when grounded power sources are used. Separate 2 no. of pits required for CRP panel connected separately which will be connected with the Grid Earthing mesh, supply of pits is not in manufacturer scope but connection to up to pits to be provided. Separate trays for cable laying for communication/automation & LV power/control cables shall be used. 		
4.20	Device	Cabinets and device enclosures shall be grounded only at the same point that		
	Grounding	the electrical service or UPS neutral is grounded. All devices within one cabinet		
		shall be grounded together by means of a ground cable or strap. Earthing Strip		
		(Copper) shall be available in panel for device earthing.		

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5.0	Quality Control	The bidder shall submit with the offer, quality 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 engineer or its nominated representative shall have free access to
		the manufacturer/sub-supplier's works to carry out inspections.
		The bidder shall have a proven track of not less than 5 years in manufacturing and servicing of the items in Indian market. The bidder shall submit with the offer Quality 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 bought out items and fully assembled component and equipment after finishing. 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 engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.
		The Bidder shall invariably furnish following information along with his bid, failing which the bid shall be liable for rejection. Information shall be separately given for individual type of equipment offered.
		Statement giving list of important raw materials, 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 the presence of Bidder's representative, copies of test certificates.
		Information and copies of test certificates as in (a) above in respect of bought out accessories.
		List of manufacturing facilities available.
		Quality Assurance Plan (QAP) with holds points for purchaser's inspection.
		The successful Bidder shall within 10 days of placement of order, submit following information to the purchaser.
		List of raw materials as well as bought out accessories and the names of sub-Suppliers selected from those furnished along with offer. Type test certificates of the raw materials and bought out accessories.

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		The successful Bidder shall submit the routine test certificates of bought			
		out accessories and central excise passes for raw material at the time of routine testing			
		routine testing.			
		NAMEPLATE:			
		Name plate shall be provided with non-rusting metal with white engraved			
		so as to be clearly visible			
6.0	Minimum Tosting	The Bidder shall have in house testing facilities for carping outall routing			
0.0	Facilities	tests and accentance tests as nor relevant international (Indian standards			
7.0		The second acceptance tests as per relevant international/indian standards.			
7.0	Activitios	The successful bloder will have to submit the bar chart for various			
	Activities	manufacturing activities clearly elaborating each stage, with quantity. This bar			
		chart shall be in line with the Quality assurance plan submitted with the offer.			
		The bar chart will have to be submitted within 15 days from the release of the			
		order.			
8.1	Support Services SLA	 Services to be included during guarantee period 1. Guarantee shall be for 60 months from the date of commissioning 2. Vendor shall conform in a signed SLA to the following guidelines to mitigate major failure rate. To mitigate major failure like Complete system failure, IED system instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability a. Vendor shall report to site within 48 hours of receipt of reporting of the failure occurrence. b. Vendor shall provide replacement of the faulty equipment within 7 days after confirmation of the fact that the equipment can't be repaired at site. Failure to this clause may have some penalty reference on vendor. c. Vendor always will provide detailed analysis report of the faulty equipment within 30 days from the date of the site visit by BA d. Any spare Equipment replacement, testing and its commissioning to be done by vendor only without any cost implications. Any equipment, any software or any hardware to test the IEDs/RTU to be borne by vendor only. e. Any up gradation in application software and RTU (except hardware) will be informed to us and necessary up gradation to be carried out by vendor without any cost implications. 			

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	Services to be included during tender 1. Tri-party agreement to be made to have protection against quitting of executing vendor.
	2. Vendor need to provide life cycle support and supplies to ensure necessary support in terms of services and spares for next 15 years from date of Purchase Order. Vendor shall provide expected life of IEDs in writing.
	SLA / Delivery Terms/ Period of contract:
	The supply of material shall be completed within 60 days from the date of award, subject to availability of clearance provided by TPSODL. The work of CRP installation & commissioning of supplied Relay of substation, shall be done within 5 days per substation. The site / substation clearance / equipment outage requirement for above activities shall be provided by TPSODL engineer in charge. Overall contract period shall be 5 months from the date of issuance of Work Order.

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8.2	Spares	The bidder is required to list the spares, which may be required for ensuring the availability during the guaranteed availability period. The final list of spares shall
		form part of scope of supply and accordingly the price thereof shall be quoted
		by the bidder and shall be considered in the evaluation of the bids. During the
		guaranteed availability period, the spare parts supplied by the Contractor shall
		be made available to the Contractor for usage subject to replenishment at the
		earliest. Thus, at the end of availability period the inventory of spares with the
		Employer shall be fully replenished by the Contractor. However, any additional
		spares required to meet the availability of the system (which are not a part of
		the above spares supplied by the Contractor) would have to be supplied
		immediately by the Contractor free of cost to the Employer.
		The list shall include the following:
		Item identification
		Recommended spares quantities
		Base price
		Procurement lead time Probability the required item is available given
		its MTBF based on recommended spares and procurement leadtime.
		Ouantity of item held in Local office by Supplier as emergency spare
		narts
		parts
		• Quantity of item neid in nead office as an emergency spare part
		All spare parts shall be fully tested.

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	Mandatory Spares (without any extra cost implication)

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9.0	Drawing and	Following drawings and documents shall be prepared on Purchaser's
	Documents	specifications and statutory requirements and shall be submitted with the bid:
		1. Completely filled in Technical Particulars
		2. General description of the equipment and all components including
		brochures
		3. Bill of material
		4. Type test certificates
		5. Hardware Specification
		After the award of the contract four (4) copies of drawings, drawn to scale,
		describing the equipment in detail shall be forwarded for approval and shall
		subsequently provide four (4) complete sets of final drawings, one of which shall
		be auto positive suitable for reproduction, before the dispatch of the
		equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates
		shall be submitted after the final approval of the same to purchaser.
		All the documents & drawings shall be in English language.
		Instruction Manuals: Bidder shall furnish two softcopies (CD) and four (4) hard
		copies of nicely bound manuals (in English language) covering erection and
		maintenance instructions and all relevant information and drawings pertaining
		to the main equipment as well as auxiliary devices.
		DRAWINGS AND DOCUMENTS:
		Following documents shall be prepared based on TPSODL specifications
		1. Technical Particulars.
		2. General Arrangement drawing of the equipment
		4. Foundation drawing
		5. Bill of Material
		6. Type test Certificates if applicable
		7. Sizing Calculations of various components
		8. ICD/CID Cite (IED capability description file)
		9. SCD file (substation configuration description)
		After the award of the contract, four (4) copies of the drawings, drawn to
		scale, describing the equipment in detail shall be forwarded for approval
		and shall subsequently provide four (4) complete sets of final drawings,
		dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing.
		GTP, test certificates shall be submitted after the final approval of the same
		to the TPSODL.

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		Following Drawings/Documents shall be submitted after the award of the				
		contract:	contract:			
		S	Description	For	For Review	Final Subm
		N N		oval	Informa	ission
		1	Technical	√	$\sqrt{1011}$	\checkmark
		2	General Arrangement	√	√	√
			drawing including panel door layout			
		3	Plan & Section drawings	V		\checkmark
		4	Foundation drawing	V		\checkmark
		5	QA & QC Plan	V		
		6	Schematic drawings including SLD		\checkmark	\checkmark
		7	Document for Factory inspection tests and checks	V		\checkmark
		8	Routine, Acceptance and Type test Certificates as applicable	\sim	\checkmark	\checkmark
		9	Site tests and checks	\checkmark		
		1 0	As -built drawings			
10.0	SCHEDULE OF DEVIATIONS	/ cli Si sp	(TO BE ENCL All deviations from this ause by Clause in this chedule, the tender pecifications:	OSED WITH s specificatio s schedule. U shall be dee	TECHNICAL B n shall be set o nless specificall emed to confirm	ID) but by the Bidders, y mentioned in this m the purchaser's

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S. No	Clause No.	Details of deviation with justifications
Weo	confirm that there a	re no deviations apart from those detailed above.
Seal	of the Company:	
		Signature
		Designation



Specification of WPB POLE & H-POLE

CHAPTER - E10- 2

TECHNICAL SPECIFICATION FOR WPB POLE & H- POLE



Specification of WPB POLE & H- POLE

PART – A

TECHNICAL SPECIFICATION OF WPB POLE TP SOUTHERN ODISHA DISTRIBUITION LIMITED, BERHAMPUR

TECHNICAL SPECIFICATION

Specification of WPB POLE & H- POLE

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Specification of WPB POLE & H- POLE

1. SCOPE:

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This specification covers the design, manufacture, testing and supply of 160mm X 160 mm WPB pole, 11 mtr. & 13 mtr. long having unit weight of 30.44Kg per meter. Scope also includes transportation & unloading of poles at store / site.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS 12778	Hot Rolled Parallel Flange Steel Sections for Beams, Columns and Bearing Piles - Dimensions and Section Properties
IS 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 12779	Rolling and cutting tolerances for hot rolled parallel flange beam and column sections
IS 2629	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2633	Methods for testing uniformity of coating of zinc coated articles
IS 4759	Hot-dip zinc coatings on structural steel and other allied products
IS 6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles

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

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	4	Maximum Humidity	95%
	5	Average Annual Rainfall	150mm
	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
י P S O	10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

DL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. 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 REQUIREMENTS:

SI.NO	TECHNICAL PARTICULARS	DESIRED VALUE
1	Length of Joist in mtr.	11mtr / 13mtr
2	Make	SAIL/RINL/TATA/ JINDAL (Billet with re rolling not allowed)
3	Weight in kg/m with ±2.5% Tolerance	30.44
4	Sectional Area (cm ²)	38.8
5	Flange slope in deg	90
6	Cutting length tolerance	100 (no negative tolerance)
7	Depth(D) of Section (mm) with ±3.0 mm Tolerance	152
8	Width(B) of Flange (mm) with ±0.7mm Tolerance	160
9	Thickness of Flange (Tf) (mm) with ±1.5 mm Tolerance	9
10	Thickness of Web (Tw) (mm) with ±0.7 mm Tolerance	6
11	Corner Radius of fillet or root (R1) (mm)	15
12	Moment of Inertia	

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SI.NO	TECHNICAL PARTICULARS	DESIRED VALUE
а	Ixx (cm⁴)	1673
b	lyy (cm⁴)	615.6
13	Radius of Gyration (cm)	
а	Rxx	6.57
b	Ryy	3.98
14	Modulus of Section Zxx (cm ³)	
а	Zyy (cm ³)	220.1
b	Zxx(cm ³)	76.9
15	GI Base Plate in mm	300 x 300 x 12
16	GI Stiffener Flange in mm	150 x 60 x 6
17	GI Stiffener Web in mm	150 x 100 x 6
18	Mechanical Properties	
a)	Grade	E-350A
b)	Yield stress in Mpa	350 Min
c)	Tensile stress in Mpa	490 min
d)	Lo= (5.65 So) Elongation %	22 min
e)	Bend test	Shall not crack
19	Chemical properties	
a)	Grade	E 350A
b)	Carbon	0.2 % Max
c)	Manganese	1.55 % max
d)	Sulphur	0.045 % max
e)	Phosphorous	0.045 % max
f)	Silicon	0.45 % max
g)	Carbon equivalent	0.47 % max
h)	De oxidation method	Semi killed or killed
20	Supply condition	Hot rolled
21	Galvanizing standard	IS 2633, IS 2629
22	The zinc coating (705 gms per sq.mt / 100Micron) shall be smooth, continuous and uniform. It shall be free from acid spot and shall not scale, blister or be removable by handling or packing. Zinc Coating shall withstand for 6 dips(min) in Dip Test process for WPB Pole	705 gms per sq.mt / 100 Micron with 6 Dips(min)

5. GENERAL CONSTRUCTION:

The Wide Parallel Beam support structures shall be fabricated from mild steel, grade A and in lengths dictated by design parameters. Supplier has to supply Baseplate with dimension 300mm x 300mm x 12mm thickness along with Stiffener 150 x60x6 (flange) & 150x100x6 (web). Complete fabrication drawing shall be submitted for approval. Holes should be as per GA drawing provided by TPSODL.

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Arc welding to be used for fabrication / jointing of Base plate & stiffener to the pole. However, in case of any discrepancy between the above data & the relevant IS, the values indicated in the IS shall prevail. All the acceptance Tests / routine tests shall be carried out as per relevant IS. The approved makes are SAIL, RINL, JINDAL & TATA (**Billet with re rolling not allowed**).

5.1 Galvanization:

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WPB Pole shall be hot dip galvanized, are as following:

- a) All galvanizing shall be carried out by the hot dip process, in accordance with Specification IS 2629. However, high tensile steel nuts, bolts and spring washer shall be electro galvanized.
- b) The zinc coating (705 gms per sq.mt / 100Micron) shall be smooth, continuous and uniform. It shall be free from acid spot and shall not scale, blister or be removable by handling or packing.
- c) There shall be no impurities in the zinc or additives to the galvanic bath which could have a detrimental effect on the durability of the zinc coating. Purity of zinc shall be Zn 99.95% or better.
- d) In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Engineer in Charge or that of his representative.
 Repair of galvanization at site will not be permitted in any situation.
- e) The threads of all galvanized bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specifically approved by the Engineer in Charge. All nuts shall be galvanized. The threads of nuts shall be cleaned with a tap and the threads oiled.
- f) Partial immersion of the work shall not be permitted and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.
- g) After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. To avoid the formation of white rust galvanized materials shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization. The galvanized steel shall be subjected to test as per IS-2633.

Specification of WPB POLE & H- POLE

 h) Quality of Hot Dip Galvanization should comply with IS 2629, ISO1461 & should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.
 These poles are to be used in coastal areas of Odisha where climate is hot, humid & saline. These areas are prone to flood & frequent rainfall.

6. MARKING:

Following distinct non-erasable embossing is to be made on each WPB Poles to be supplied to TPSODL under this Tender.

- a) ISI Mark
- b) WPB 160
- c) E-350 A
- d) Manufacturer Name/ Trade Mark

Engraved Marking (Punching before galvanization)

a) "TPSODL

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Dimension Test & Weight (kg/M) Visual Examination,
- iv) Test in respect of Hot Dip Galvanization i.e. Thickness of zinc coating in microns

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Test in respect of Hot Dip Galvanization i.e. thickness of zinc coating in microns



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8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA as per relevant IS. Type tests should 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, same shall be carried out without any cost implication to TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPSODL's representatives at all times when the work is in progress. Inspection by the TPSODL or its authorized representatives shall not relieve the bidder 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 TPSODL. Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPSODL
- c) TPSODL Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at 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 Engineering department.

11. GUARANTEE:



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Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect found within a period of 24 months from the date of handing over (after successful commissioning), Bidder shall be liable to replace/rectify such defects at their own costs, to the entire satisfaction of the Owner, failing which the Owner will be at liberty to get it replaced/rectified at Bidder's risks & costs and recover all such expenses plus the Owner's own charges, from the Bidder or from the "Performance Deposit" of the Bidder as the case may be.

For any 'Latent Defects' if noticed and reported by Owner, Bidder shall further be responsible for free replacement / rectification during such period mentioned in the Tender Document, from the end of the guarantee period.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.

12. PACKING:

Supplier shall ensure that all material 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. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. 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 engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

14. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

15. MANUFACTURING FACILITIES:
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The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

16. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- a) Completely filled in Schedule "A" Guaranteed Technical Particulars.
- b) Work Experience details
- c) Type test certificates.
- d) Drawing (3 sets) of WPB Pole containing complete information about manufacturing & fabrication etc.

17. REFERENCE DRAWING:



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<u>Note:</u> -All Dimensions are in mm unless noted otherwise specified. This is an indicative drawing of 13Mtr. WPB Pole used for tender purpose only.



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PART - B

13 Mtr H- POLE



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Specification of WPB POLE & H- POLE

1. SCOPE

This specification covers Supply, Erection, Testing and Commissioning design, engineering, manufacture, testing, and inspection of GI H type pole structure. All the galvanized H Pole Structures shall be provided by the Contractor. Bidders are requested to visit the site before participating in the tender.

The approved makes are SAIL, RINL, JINDAL & TATA (**Billet with re rolling not allowed**).

2. APPLICABLE STANDARDS

The steel materials shall comply with the requirements of latest issue of I.S :808 & I.S: 2062 for Gr

- A except where specified otherwise.

3. CLIMATIC CONDITIONS OF INSTALLATION

The H Pole shall be suitable for operation under the following climatic conditions. :-

- A) Maximum altitude above sea level 100m
- B) Max. Ambient Temperature: 50 deg. C
- c) Max. Daily average ambient temp: 35 deg. C
- D) Min. Ambient Temperature: 0 deg. C
- E) Maximum Relative Humidity: 95%
- F) Average No. of thunderstorm days per annum:70
- G) Average Annual Rainfall: 1458 mm
- H) Average No. of rainy days per annum: 120
- Earthquakes of an intensity in horizontal direction equivalent to seismic acceleration of 0.3g
- J) Earthquakes of an intensity in vertical direction equivalent to seismic acceleration of 0.15g
- κ) Wind velocity: 300/hr., 200 km/hr. and 160km/hr.

Environmentally, some of the regions, where the work will take place includes coastal regions, subject to high relative humidity, which can give rise to condensation. On shore winds will frequently be salt laden. On occasions the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for us in exposed, heavily polluted, salty corrosive and humid coastal atmosphere. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1g.

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4. GENERAL CONSTRUCTION

H Pole Structure: The H Pole structures are to be constructed with two parallel run 200 x 75 x 6.2mm G.I. Channels. Both the channels are separated by 150 mm distance (run through the entire length). The channels are further connected with stiffeners (on each side) of size 100 x 270x6mm G.I. Flats welded to both the channels along 80 mm side (separated by 150 mm).



Straight Cross Arm: The s t r a i g h t c r o s s a r m s h all be fabricated from galvanized 100 x 50 x 6 mm GI channels as per the approved drawings / field requirements.

5. NAME PLATE AND MARKING

All columns shall be clearly labelled indicating, where necessary, its purpose and service positions. The material of all labels and the dimensions, legend, and method of printing / embossing shall be as per approval.

All labels and plates for outdoor use shall be of non-corroding material. Where the use of enameled iron plates is approved, the whole surface including the back and edges, shall

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be properly covered and resistant to corrosion. Protective washers of suitable material shall be provided front and back on the securing screws.

Labels shall be engraved in English and Oriya. Name plates shall be white with black engraved lettering and shall carry all the applicable information specified in the applicable items of the Standards.

Any other relevant information which may be required for groups of smaller items for which this is not possible e.g. switch bays etc. a common name plate in Oriya or English with the title and special instructions on it shall be provided.

No scratching, corrections or changes will be allowed on name plates.

Permanent marking shall be provided with the following details:

- a) Property of TPSODL
- b) Item Code
- c) Item Description
- d) Logo/ name of Manufacturer
- e) Year of Manufacture

6. TESTS

All steel channels and other steel sections used in the manufacture of structures shall have been be type tested with respect to their calculated working and ultimate tensile failure loads utilizing the mechanical properties as tabulated in this specification and IS – 808 1964. This shall have been achieved as per the procedure in the Transverse Strength Test.

The steel sections may be tested in either a horizontal or vertical position. If tested in the horizontal position, provisions shall be made to compensate for the overhanging weight of the column.

For this purpose, the overhanging portion of the column shall be supported on a moveable trolley or similar device. The pole shall be rigidly supported at the butt end for a distance equal to the designed depth of planting.

The working load on the column should correspond to those that are likely to come onto the column during it's working life. The offered designs shall meet system requirements with the point of application of the working loads as per the Bidder's design but not more than 600 mm from the top of the column. The steel column shall be deemed to have passed the test if no permanent deformation is visible at the rigidly supported end and the permanent set at the point of load application does not exceed 13 mm. TP SOUTHERN ODISHA DISTRIBUITION LIMITED, BERHAMPUR

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The load shall then be reduced to zero and increased gradually to a load equal to the design working load plus 10% of the minimum ultimate transverse load, and held for 2 minutes. The procedure shall be repeated until the load reaches a value of 80% of the minimum ultimate transverse load and thereafter increased in increments of 5% until failure occurs.

Each time the load is applied, it shall be held from two minutes. The column shall be deemed not to have passed the test if the observed ultimate transverse load is less than the design ultimate transverse load. The factor of safety (FOS) for steel section is 2.

7. PRE-DISPATCH INSPECTION

Successful bidder shall submit GTP, Drawing and a Prototype Sample at TPSODL, Odisha Engineering Department for inspection as per Technical Specification before undertaking further mass manufacturing. Material shall be subject to inspection by a duly authorized representative of TPSODL, Odisha. Inspection may be made at any stage of manufacturing (optional by TPSODL, Odisha) and the material, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the place of manufacturing for TPSODL's representative(s) at all times. Inspection by TPSODL's authorized representative shall not relieve the Supplier of his obligation of furnishing equipment in accordance with the Specification.

Material shall be dispatched by selected bidder only after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPSODL.

Following documents shall be sent by selected bidder along with the sample material:

- a) Test Reports
- b) MDCC issued by TPSODL
- c) Invoice (in duplicate)
- d) Packing list
- e) Drawings & Catalogues
- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable)

8. INSPECTION AFTER RECEIPT AT STORES

Routine and acceptance test shall be conducted at the place of manufacturer. The bidders are requested to furnish details of equipment which will be used for testing along with the bid. The bids of these manufacturers who do not have adequate testing facilities

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for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guarantee certificate for each consignment of materials to be inspected at the time of offer of materials for inspection.

9. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect found within a period of 24 months from the date of handing over (after successful commissioning), Bidder shall be liable to replace/rectify such defects at their own costs, to the entire satisfaction of the Owner, failing which the Owner will be at liberty to get it replaced/rectified at Bidder's risks & costs and recover all such expenses plus the Owner's own charges, from the Bidder or from the "Performance Deposit" of the Bidder as the case may be.

For any 'Latent Defects' if noticed and reported by Owner, Bidder shall further be responsible for free replacement / rectification during such period mentioned in the Tender Document, from the end of the guarantee period.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.

10. PACKING

Bidder shall ensure that Equipment covered under this Specification shall be prepared for rail/road transport and be packed in such a manner so as to protect the equipment from damage during transit.

11. QUALITY CONTROL

Bidder shall submit with the offer 'Quality Assurance Plan' covering the following details:

- a) Stages of Inspection planned,
- b) Tests and Quality Checks carried out on material, components during manufacturing,
- c) Quality Checking of bought out items, fully assembled components and final equipment after finishing.
- d) As part of the 'Quality Assurance Plan', Bidder shall submit an Inspection Schedule for Stage and Final Inspection within defined delivery schedule. TPSODL's

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authorized representative shall have free access to the manufacturer's/sub-supplier's location to carry out quality inspections.

12. 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 should 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 order.

13. DRAWINGS AND DOCUMENTS

Following Technical Documents shall be submitted in addition to Commercial Documentation based on Statutory Requirements and shall be submitted along with the bid:

SI.	Description	For	For	Final
No.		Approval	Review	Submission
1	Technical Parameters			
2	GA Drawing			
3	Installation Instruction			
4	Manual/Catalogues			
5	Dimension drawing			
6	QA & QC Plan			
7	Test Certificates			

After the award of the contract, bidder shall submit 4 copies of Drawings describing the equipment in detail for approval before final dispatch of the equipment. Soft copy of all the Drawings, GTP, Test certificates shall be submitted for final approval by TPSODL, Odisha. All the documents & drawings shall be in English language.

14. WEIGHT CALCULATION OF 13MTR H-POLE:

SI. No	Description of Items		Weight as per Steel Table / SAIL Catalogue
01	H Pole	200x75x6.2mm Channel (2*13Mtr)	579.8kg



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02	Lacing plate	200x270x6mm (28nos)	71.21kg
03	Stiffener Channel	150x75x5.7mm (2*0.7Mtr)	23.52kg
04	Base clit for H-Pole	65x65x6mm Angle (4*0.45Mtr)	10.44kg
05	Joint Plate	150x356x12 (4nos)	20.12kg
06	Joint Plate	65x356x12 (8nos)	17.43kg
		Total	722.52kg =723kg

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1020

Specification Name : Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
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TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
26-05-2023	26-05-2023	01-06-2023	02-06-2023	23-06-2023	24-06-2023

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TPNØDL TPSØDL Specification No: ENG-EHV-1020

Specification Name: Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

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Specification Name: Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

1. SCOPE:

This specification This specification covers technical requirements of design, manufacture, construction, performance, testing at manufacturer's works, packing, forwarding, supply and unloading at stores/site of 33KV Outdoor VCB of 1250 Amps. completed with all accessories for trouble free and efficient performance.

2. APPLICABLE STANDARDS:

a) IS 13118: Specification for High Voltage Alternating Current Circuit Breakers

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- b) IS 12063: Classification of degrees of protection provided by enclosures of electrical equipment
- c) IS 2099: Bushings for alternating voltages above 1000 Volts
- d) IS 2629: Recommended Practice for Hot-Dip Galvanizing of Iron and Steel : Methods for testing uniformity of coating of zinc coated articles
- e) IS 2633: Hot Dip Zinc coatings on structural steel and other allied products
- f) IS 4759: High-voltage switchgear and control gear
- g) IEC 62271-100 Alternating current circuit breakers
- h) IEC 62271-1-: High-voltage switchgear and control gear Part 1: Common specifications
- i) ISO 1460: Metallic coatings Hot dip galvanized coatings on ferrous materials Gravimetric determination of the mass per unit area
- j) BS 729 : Specification for Hot dip galvanized coatings on iron and steel articles

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	100%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	180 KMPH
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	180Km/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)

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

TPCODL/TPNODL/TPWODL/TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto '180 Kmph. The atmosphere is



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generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

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4. GENERAL TECHNICAL REQUIREMENTS

S No	Particulars	Requirements		
0.110.		33 kV		
4.1	Application	Outdoor		
4.2	Туре	VCB		
4.3	Rated voltage	36 kV		
4.4	Service voltage	33 kV		
4.5	Rated Frequency	50 Hz		
4.6	Number of phases	3		
4.7	Rated insulation level			
4.7.1	Rated Lightning impulse withstand voltage			
а	To earth and b/w Poles	170 kVp		
b	Across the isolating distance	195 kVp		
4.7.2	Rated short duration power frequency withstand v	oltage		
а	To Earth and between Poles (Dry test for 1 Min)	70 kV		
b	To Earth and between Poles and across the isolating distance (Wet test for 10 Sec)	75 kV		
с	Across Open Switching Device	75 kV		
4.8	Rated normal current	1250 A		
4.9	Rated load breaking current (sym)	25 kA (rms)		
4.1	Percentage DC component	<50 %		
4.11	Rated short circuit withstand current for 3 seconds	25 kA (rms)		
4.12	Rated short circuit making current	62.5 kA		
		1.5 for Terminal fault		
4.13	First Pole to Clear factor	1 for Short line fault		
		2.5 for Out of phase fault		
4.14	Rated capacitive switching currents			
4.14.1	Rated line charging breaking current	10 A (rms)		
4.14.2	Rated cable charging breaking current	50 A (rms)		
4.14.3	Rated single capacitor bank breaking current	400 A (rms)		

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4.14.4	Capacitor Banks with series reactors switching capacity	Suitable for 14.4 MVAR Capacitor Banks with series reactors
4.15	Maximum switching over voltages for cable charging & capacitor bank breaking current	2.5 p.u.
4.16	Rated operating sequence	0-0.3sec-CO-3min-CO
4.17	Total Break time(max)	65 ms (Shall not change during operating life)
4.18	Closing time (max)	85 ms (Shall not change during operating life)
4.19	Rated supply voltage of control circuits	48V/24V DC
4.19.1	Range for satisfactory operation of Trip circuit	70% to 110%
4.19.2	Range for satisfactory operation of closing & other circuits	85% to 110%
4.2	Transient recovery voltages	As per IEC 62271-100
4.21	No. of auxiliary contacts	10 NO & 10 NC
4.22	Clearance in air	
4.22.1	Between phases	420 mm
4.22.2	phase to earth	320 mm
4.23	Min. Creepage distance of insulator	31mm per kV
4.24	Degree of Protection	IP 55
4.25	Operating mechanism	Spring charged by universal motor.
4.26	Operation	Gang operated
4.27	Temp. rise at rated normal current	As per IEC 62271-100
4.28	Minimum Vertical clearance of live conductor from ground level	As per manufacturer's type tested design
4.29	Mechanical Endurance	M2
4.3	Electrical Endurance	E2 Class without Auto-Reclosing
4.31	Restriking Class	C2
4.32	Class	S2
4.33	Material of main contact	As per Manufacturer's Type Tested Design
4.34	Interrupter	Vacuum Interrupter should be of same make as that of Breaker manufacturer. Representative shall visit Interrupter manufacturing Facility during Factory Inspection.

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4.35	Interrupting Capacity at nominal system voltage	1500 MVA

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Circuit Breaker shall be suitable for switching capacitor bank of rating 14.4 MVAR for 33 kV with capacitor bank star point undergrounded and series reactors (rating 6% of capacitor bank rating if connected on line side & 0.2 % if connected on neutral side of the capacitor bank rating). The circuit breakers should withstand capacitor bank inrush currents.

5. GENERAL CONSTRUCTIONS

5.1 GENERAL:

- 5.1.1 Control cabinets shall be of the dust, moisture, vermin proof and free standing floor mounting out door type. Control Cabinets shall be CRCA or better, surface treated for anti-oxidation/corrosion and power coated with epoxy highly suitable for outdoor installations (test reports shall be submitted).
- 5.1.2 Sheet steel shall be at least2. 5 mmthick. 15mm thick neoprene gaskets shall be provided to ensure degree of protection of IP 55.
- 5.1.3 Control cabinets shall be provided with hinged door and padlocking arrangement. The door hinges shall be of union joint type to facilitate easy removal.
- 5.1.4 Door shall be properly braced to prevent wobbling. Cable entry from bottom.
- 5.1.5 All wiring in the control cabinet shall be carried out with 1100V grade single core multi strand flexible copper conductor wires of size not less than 2.5sq.mm with HRPVC insulation and shall be flame retardant, vermin and rodent proof.
- 5.1.6 Suitable heaters shall be mounted in the housing to prevent condensation. On-off switch and fuse shall be provided. Heater shall be suitable for 240V single- phase 50 Hz AC supply. Electrical and Mechanical indications for ON-OFF to be provided which is visible from the front.
- 5.1.7 Terminal boards shall be furnished in the mechanism housing. All the terminal blocks shall be of disconnecting type links. Terminals for DC and AC shall be isolated from each other. A minimum of 20% spare terminals for control wiring shall be provided. All wiring in the housing shall be stranded and the insulation shall be vermin proof. Insulation shall be such that it shall not support combustion. Suitably rated switches shall be provided to enable the control supply to the breaker to be cut off from the mechanism housing. Requisite number of cable entries shall be provided at the bottom of the operating cabinet to receive purchaser's control cables. Number and size of cable glands will be intimated to the bidder. A light point with a control switch shall be provided inside the housing of the breaker.
- 5.1.8 Height of operating box of the CB shall be specified. The height of manual operating handle shall not be more than 1500mm from ground level. The operating box shall be provided with T-N-C switch "Pistol Grip" type for local operation. Separate terminal box below the main operating box to accommodate the terminal blocks shall be provided..



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5.1.9 No external damping circuit shall be acceptable with the CB. Breaker tripping curve to be provided by the bidder. Bidders providing breakers with contact resistance <30 micro ohms and range for satisfactory operation of Trip circuit as 70 % to 110 % shall be given preference. The closing time and opening time shall not change during operating life. And the Contact resistance shall not change by ±10% during operating life.

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5.1.10 Breaker shall be supplied with Two Tripping Circuit. Provision for Pre & Post Trip Circuit supervision is required in both circuits.

5.2 OPERATING MECHANISM:

- 5.2.1 Circuit breaker shall be power operated through a motor compressed spring charging mechanism. Spring operated mechanism shall be complete with motor, opening spring, closing spring and all necessary accessories to make the mechanism a complete operating unit. Spring_ charging motor shall be universal type with overload protection and overload relay with contacts for annunciation. Each mechanism shall be so designed as to enable a continuous sequence of circuit breaker opening and closing operations to be obtained by the control switch as long as power is available to the motor, and at least one circuit breaker opening and closing after failure of power supply to the motor. Also, the Circuit breaker shall have suitable provision for manual spring charging. Anti-pumping feature shall be provided.
- 5.2.2 Operating mechanism shall normally be operated by remote electrical control. Provision shall be made for local electrical control and a "local/remote" selector switch shall be provided in the operating mechanism cubicle. A conveniently located manual tripping lever or button shall also be provided for tripping the breaker and simultaneously opening the reclosing circuit. A manual closing device that can easily be operated by one person standing on the ground shall also be provided for maintenance purposes. Each circuit breaker unit shall be provided with operation counter.
- 5.2.3 A closing release shall operate correctly at all values of voltage between 70% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage.
- 5.2.4 Working parts of the mechanism shall be of corrosion resisting material. Bearing which require greasing shall be equipped with pressure type grease fittings. Bearing pins, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker.
- 5.2.5 Main poles of each breaker shall be connected together and operated by a common mechanism and shall be so adjusted and arranged that interrupting contacts of all phases can be readily adjusted to touch and part simultaneously.
- 5.2.6 Provision shall be made to enable electrical & Castel Key interlocking with the opening or closing of the isolator when breaker is closed. All electrical and mechanical interlocks, which are necessary for safe and satisfactory operation, shall be furnished.
- 5.2.7 Floor clamps, Foundation bolts, Lifting hooks and one manually operated tank lifting & lowering device for frame-mounted tanks shall be provided. All similar parts, particularly removable ones shall be interchangeable with one another. Exposed live parts shall be placed high enough above ground to meet the statutory requirements and local safety codes. All Terminal blocks shall be stud type. Bidder shall give suitable



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provision in CB such as space, auxiliary contact with wiring etc. for providing castle lock by purchaser.

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5.3 CONTACTS:

Main contacts shall have sufficient area and contact pressure for carrying the rated current and the short time rated current of the breaker without excessive temperature rise that may cause pitting or welding. Contacts shall be adjustable to allow for wear, easily replaceable and shall have a minimum of movable parts and adjustments to accomplish these results. Main contacts shall be the first to open and the last to close.

5.4 BUSHINGS:

Porcelain used in bushing manufacture shall be a single piece and homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Glazing of the porcelain shall be of uniform brown colour free from blisters, burns and similar other defects. Bushings shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used. All bushings of identical ratings shall be interchangeable. Insulation of bushings shall be coordinated with breaker insulation so that impulse flashovers will occur outside the tank. Puncture strength of bushings shall be greater than the dry flashover value. When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulation or supports by the formation of substances produced by chemical action. No radio disturbance shall be caused by the bushings when operating at the normal rated voltage. Iron parts shall be preferably hot-dip galvanized, all joints shall be airtight. Surfaces of the joints shall be trued up; porcelain parts by grinding and metal parts by machining. Bushing design shall be such as to ensure a uniform compressive pressure on the joints.

5.5 PRIMARY TERMINALS:

Primary terminals shall be suitable for wedge type connectors with ZEBRA conductors. Successful bidder shall supply connectors. It should have Primary — terminals (connected at Fixed contact) on Single side at top in case of bypassing CB.

5.6 GALVANIZING:

All galvanizing shall be carried out by the hot dip process, in accordance with IS 2629/ ISO 1460 amended to date. However, high tensile steel nuts, bolts and spring washers shall be electro -galvanized to service condition four. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.

The minimum mass of Zinc coatings shall be as per IS 4759. After galvanizing no drilling or welding shall be performed_ on the galvanized parts of the equipment except that nuts may be threaded after galvanizing.

To avoid the formation of white rust, galvanized material shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization. The galvanized steel shall be subjected to tests as per IS-2633/ BS 729 amended to date.





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5.7 EARTHING:

Suitable grounding terminals shall be provided on the circuit breaker on opposite sides, for connecting to earth pit. The earthing terminals shall be readily accessible and so placed that the earth connection of the circuit breaker is maintained even when the cover or any other movable part is removed. GI strip for earthing shall be of size 50 mm X 6mm, approx. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. The earthing terminal shall be identified by means standard symbol marked in a legible and indelible manner on case or frame to be earthed adjacent to the terminals.

5.8 CT Mounting Arrangement:

CT Mounting Arrangement shall be in scope of supplier. Supplier has to provide the detailed calculation for selection of all Load Bearing Components . Components shall be GI.

CT Base shall be 450 X 450 mm (Hole Centre to Centre) Minimum weight to be considered: 150kg per CT.

- **5.9** 24V DC LED Type Indicating Lamps shall be mounted inside control cubicle which shall be visible from outside through glass of cubicle door.
 - a. Breaker ON Red
 - b. Breaker OFF Green
 - c. Spring Charged Blue

6. MARKING

Circuit breaker and its operating devices shall be provided with durable and legible nameplates containing all technical parameters. Name plate for Circuit breaker shall be embossed with "PO No. with date", "PROPERTY OF TPCODL/TPNODL/TPWODL/TPSODL", along with the following information: Manufacture's name, Type designation and serial number

- 1. Year of manufacture
- 2. Relevant standard
- 3. Rated voltage
- 4. Rated lightning impulse withstand voltage
- 5. Rated switching impulse withstand voltage
- 6. Rated normal current
- 7. Rated duration of short circuit
- 8. Rated short circuit breaking current
- 9. DC time constant of the rated short circuit breaking current if different from 45 ms
- 10. DC component of the rated short circuit breaking current at contact separation corresponding to the dc time constant of the rated short circuit breaking current
- 11. Rated operating sequence
- 12. Classification



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Name plate for the operating device shall be provided with following information:

- 1. Manufacturer's name
- 2. Type designation and serial number

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3. Relevant standard

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the Purchaser/his authorized representative. Following tests shall be necessarily conducted in addition to others specified in relevant standards.

7.1 Routine tests:

- 1. Dielectric tests on the main circuit
- 2. Tests on auxiliary and control circuits
- 3. Measurement of the resistance of the main circuit
- 4. Tightness tests
- 5. Design and Visual checks
- 6. Mechanical operating tests

7.2 Type tests:

- 1. Dielectric Tests
- 2. Measurement of the resistance of the main circuits
- 3. Temperature rise tests
- 4. Short time withstand current and peak withstand current tests
- 5. Additional tests on auxiliary and control circuits
- 6. Mechanical operation test at ambient temperature
- 7. Short circuit making and breaking tests
- 8. Verification of the degree of protection
- 9. Tightness tests
- 10. Mechanical tests
- 11. Out of phase making and breaking tests
- 12. Electrical endurance tests
- 13. Double earth fault tests
- 14. Capacitive Current switching tests

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.

The above tests must not have been conducted on the equipment within time frame as per latest CEA Guidelines

In case of any change in design/type of Breaker already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

8. TYPE TEST CERTIFICATES

The Bidder shall furnish the type test certificates of the Item for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA/CESI/KEMA/KERI/PEHLA as per the relevant standards. Type tests should have been conducted in certified Test laboratories during the period not exceeding years as per CEA Guidelines from the date of opening the bid. In the event of any discrepancy in the test reports,



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i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPWODL/TPSODL.

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9. PRE DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPDCOL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPWODL/TPSODL representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPWODL/TPSODL or its authorized representatives shall not relieve the bidder 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/TPWODL/TPSODL.

Following documents shall be sent along with material

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

10. INSPECTION AFTER RECEIPT AT STORES

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

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 36 months from the date of commissioning or 48 months from the date of last supplies made under the contract, whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for "Free Replacement" for another period of THREE years from the end of the guarantee period for any "Latent Defects" if noticed and reported by the company.

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 : Not required

14. 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, Property of TPCODL/TPNODL/TPWODL/TPSODL- Not to be reproduced without permission of TPCODL/TPNODL/TPWODL/TPSODL



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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/ Consultant's engineer shall have free access to the manufacturer/sub bidder's works to carry out inspections.

15. MINIMUM TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

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16. 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 should 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.

17. SPARES, ACCESSORIES & TOOLS SPARES:

Following spares shall be supplied along-with CB. 10% spare to be considered. Bidder should quote unit rates for spares. Exact quantity to be finalized during tendering.

- 1. Trip Coil
- 2. Closing coil
- 3. Spring charging motor
- 4. Vacuum interrupter (For VCB type)
- 5. T-N-C Switch
- 6 .Local / remote selector switch
- 7. LED Indicator (Red and Green)
- 8. Contactor/Relay for Control Circuit
- 9. Breaker aux contact

In addition to above bidder shall submit recommended list of spares for 3 years, if any with unit prices and recommended quantity.

ACCESSORIES: The circuit breakers shall be provided with the following accessories, in addition to those needed for normal operation and control

- 1. Breaker position indicator
- 2. Breaker Operation counter
- 3. T-N-C switch
- 4. A local mechanical emergency trip device with necessary shrouds
- 5. Castle key & Lock (Series will be finalized during detail engineering)
- 6. Electrical & Mechanical interlocks with isolators

7. A heater rated 230 volts AC, 50 Hz for the operating mechanism housing heater current monitors

SPECIAL TOOLS & GAUGES: A list of complete set of special tools and gauges required for erection & maintenance and installation procedure shall be submitted

18. DRAWINGS AND DOCUMENTS

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

- a) Completely filled in Technical Particulars.
- b) General description of the equipment and all components including brochures.



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- c) Type test Certificates
- d) Experience List/Performance Certificates from end users.
- e) Foundation Plan
- f) Operation & Maintenance Manual

After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser

Following Drawings/Documents shall be submitted after the award of the contract

S. No	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	$\overline{\mathbf{v}}$		\checkmark
2	GA Drawings	\checkmark		\checkmark
3	Internal Wiring Diagram		\checkmark	\checkmark
4	Foundation Plan		\checkmark	\checkmark
5	Installation Instruction		\checkmark	\checkmark
6	Transport/Shipping dimension		\checkmark	\checkmark
	Drawing			
7	QA & QC Plan			\checkmark
8	Test Certificate		\checkmark	\checkmark

All the Documents and Drawings shall be in English Language.

Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. GUARANTEED TECHNICAL PARTICULARS

S.	Description	Units	To Be Furnished by Bidder
NO.			33 kV (VCB)
1	Application		
2	Туре		
3	Rated voltage	kV	
4	Service voltage	kV	
5	Rated Frequency		
6	Number of phases		
7	Rated insulation level		
7.1	Rated Lightning		
	voltage		
а	To earth and b/w	kVp	
	Poles		
b	Across the isolating	kVp	
	distance		
7.2	Rated short duration		
	power frequency		
	withstand voltage		



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а	To earth and b/w Poles (dry test for 1 min)	kV	
b	Across the isolating distance(dry test for 1 min)	kV	
С	To earth and b/w Poles and across the isolating distance(wet test for 10 sec)	kV	
8	Rated normal current	A	
9	Rated load breaking current (sym)	kA (rms)	
10	Percentage DC component		
11	Rated short circuit withstand current for 3 seconds	kA	
12	Rated short circuit making current	kA	
13	First Pole to Clear factor		
14	Rated capacitive switching currents		
14.1	Rated line charging breaking current		
14.2	Rated cable charging breaking current	A	
14.3	Rated single capacitor bank breaking current	А	
14.4	Capacitor Banks with series reactors switching capacity	MVAR	
15	Maximum switching over voltages for cable charging & capacitor bank breaking current	p.u.	
16	Rated operating sequence		
17	Total Break time(max)	ms	
18	Total closing time	ms	
19	CO time	ms	
20	Pole discrepancy	ms	
21	Rated supply voltage of control circuits	V	
21.1	Range for satisfactory operation of Trip circuit		
21 2	Range for satisfactory operation of closing & other circuits		



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Specification No: ENG-EHV-1020

Specification Name: Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

20	Transient recovery		
21	No. of auxiliary		
	contacts		
22	Clearance in air		
22.1	Between phases	mm	
22.2	phase to earth	mm	
23	Min. Creepage	mm	
	distance of insulator		
24	Degree of Protection		
25	Operating mechanism		
26	Anti pumping feature		
27	Spring charging time		
28	Temp. rise at rated	Deg C	
	normal current		
29	Vertical clearance of	mm	
	live conductor		
30	Niechanical		
04	Endurance		
31	Electrical Endurance		
32			
33	Class Main Contacto		
34			
34.1	Type Motorial		
34.Z	Araing Contacto		
30			
30.1	Notorial		
30.2	No of operations		
36 1	At rated normal		
50.1	current		
36.2	At rated capacitor		
00.2	bank breaking current		
36.3	At rated short circuit		
00.0	breaking current		
37	No. of breaks per		
	phase		
38	Minimum contact		
	resistance		
39	FOR VCB Type		
39.1	Type of indication for		
	contact erosion		
39.2	Rating of interrupter		
39.3	Make of interrupter		
40	Connectors		
41	Type test certificates		
42	Test for Re-strike free		
	for VCB		
43	Total weight of		
	breaker (Kg)		
44	Dimensions (mm)		



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20. 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:

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



Specification Name: Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

21. SAMPLE DRAWING (For Tender purpose only)





TP SOUTHERN ODISHA DISTRIBUITION LIMITED, BERHAMPUR TECHNICAL SPECIFICATION

Doc. Title	Technical Specification: High Density Polyethylene (HDPE)pipe-OD- 200 mm PN8 PE80	
Doc. No	ENG-C-27K	Eff. Date: 01/03/2022
Rev. No	00	Page 1 of 6
Prepared by:	Reviewed By:	Approved & Issued By:

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- **20.** SCHEDULE OF DEVIATIONS

Initiator	HOG	
	(ENGINEERING)	

TOCODI	TP SOUTHERN ODISHA DISTRIBUITION LI	MITED, BERHAMPUR		
IPSODL	TECHNICAL SPECIFICATION			
Doc. Title	Technical Specification: High Density Polyethy	ylene (HDPE)pipe-OD-		
	200 mm PN8 PE80			
Doc. No	ENG-C-27K	Eff. Date: 01/03/2022		
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Prepared by:	Reviewed By:	Approved & Issued By:		

1.0	SCOPE	Scope of this Specification includes technical requirement, design, material grade requirement, testing, inspection, supply, packaging and transportation of 'High Density Polyethylene (HDPE) Pipe-ISI marked' of nominal outside diameter of 200 mm PN8 PE80.				
2.0	APPLICABLE STANDARDS	'HDPE pi manufactu Internation IS 498 IS 732	pe' covered ir ured and tester hal Standards a 14:2016 Sp 28:1992 Hig Sp 2530 Me cor	this Specification sh d in accordance with nd shall conform to the ecification for Polyethylen h Density Polyethylen ecification (first revisior thods of test for polyeth npounds	hall unless othe the latest edition regulations of the lene Pipes for W Materials for M hylene moulding	erwise stated, be designed, ons of the following Indian/ ne local Statutory authorities: ater Supply (fifth revision) oulding and Extrusion – materials and polyethylene
3.0	CLIMATIC CONDITIONS OF THE INSTALLATION	The service 1. Maximu 2. Maximu 3. Maximu 4. Minimu 5. Maximu 6. Average 7. Average 8. Average 9. Earthqu 0.3g 10. Earthqu 0.15g (g being a 11. Wind v Environme subject to frequently pollution c areas. Therefore exposed, The desig correspon	ce conditions shum altitude abovum ambient air tum daily averagum ambient air teum enumber of thue number of traile annual rainfaluakes of an intervelocity: 300 km entally, some of high relative hubes alt laden. Conditions for our of equipment ding to an acce	all be as follows: ve sea level 1,000m emperature 50°C e ambient air temperati- emperature 0°C idity 95% nderstorm days per annum 120 150cm nsity in horizontal direct to gravity) n/hr, 200 km/hr and 160 the regions, where the imidity, which can give Dn occasions, the comli- tdoor insulators. Some rial and equipment shall , salty, corrosive and h and accessories shall l leration of 0.1 g.	ure 35°C num (isokerauni) tion - equivalent on - equivalent to) km/hr. e work will take p rise to condensa bination of salt a places are in he places are in he umid coastal atn be suitable to wit	c level) 70 to seismic acceleration of o seismic acceleration of lace includes coastal areas, ation. Onshore winds will nd condensation may create eavily industrial polluted and protected for use in nosphere thstand seismic forces
		S.No.	Cha	aracteristics	Units	Requirements
		1	Nominal size	e or Outside diameter	mm	200
		2	Wa	all thickness	mm	Min.14.9 to Max. 16.6
		3	Standard di	mension ratio (SDR)		13.6
4.0	GENERAL TECHNICAL	4	Min. require @ 20 deg	d strength of PE resin C for 50 years life	MPa	8
	KEQUIREMENTS	5	Melt Flow Ra pre-heated t and weight	te of polymer (sample or 10 mins at 190°C, application of 5kgf)	gm of polymer/10 min	0.4 to 1.1 (Both inclusive)
		6	Raw	material grade		PE-80
		7	Nomina	l pressure rating		PN 8
	Initiator			HOG (ENGINEERI	NG)	

TOCODI	TP SOUTHERN ODISHA DISTRIBUITION LIN	MITED, BERHAMPUR	
IPSODL	TECHNICAL SPECIFICATION		
Doc. Title	Technical Specification: High Density Polyethy 200 mm PN8 PE80	/lene (HDPE)pipe-OD-	
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		R	Range of Base Density of HDPE	ka/mtr ³	930 to 960			
		0	@ 27 deg C	Kg/IIII	930 10 900			
		9	% of Antioxidant	<0.3% b	y mass of finished resin			
		10	Colour of pipe	Black with	blue identification stripes			
				Internal and	External surface of the pipe			
		11	Surface finish	shall be smo	both and free from grooving			
				a	nd other defects			
		12	Carbon Black content	%	2.5 ± 0.5			
		13	Overall migration	Mg/dm ²	Max. 10			
		14	Reversion	%	<= 3%			
		PE resin	used for the manufacture of HDPE pipe	shall conform t	o the following requirements:			
		a) I	Pipe shall be manufactured from virgin I	PE resin. Repro	cessed or recycled materials			
			shall not be used.					
		b) \$	Should not constitute toxic hazard, shou	ld not support r	nicrobial growth and should			
			not give rise to unpleasant taste or odou	ır.	-			
		c) -	The resin shall be compounded with car	bon black. Carl	oon black particle size			
5.0	GENERAL	9	should be less than 0.025 μ.					
	CONSTRUCTION	d) -	The anti-oxidant used shall be physiolog	ically harmless	and shall be selected from			
		t	he list given in IS 10141:1982.					
		e) '	/isual appearance: The internal and ex	kternal surface	of the pipe shall be smooth,			
		(clean and free from grooving and other	defects.				
		f) I	Pipe should be capable to withstand inte	ernal pressure o	creep rupture test without			
		9	showing signs of localized swelling, leak	age or weeping	g and shall not burst.			
		Marking o	on the HDPE pipe shall carry the following	ng minimum infe	ormation:			
		a) Manufacturer name						
		b) Pipe Designation(Material grade, SDR, Nominal outside diameter, Pressure rating)						
6.0	MARKING	c)	SI mark					
		d) Date and year of manufacture						
		e) I	e) Property of TPSODL, Berhampur.					
		Shall be e	embossed at every 1 meter though out t	he length of the	e pipe.			
		All Routin	e, Acceptance & Type Tests shall be ca	arried out in acc	ordance with the relevant IS			
7.0	TESTS	as mentioned above.						
		All Routine /Acceptance Tests shall be witnessed by TPSODL representative.						
		Certifica	te showing proof of relevant Type tests	not exceeding	last 5 years from the date			
		of bio	l opening) shall be furnished by bidder	or:				
		a) -	Tensile strength					
7.1	TYPE TESTS	b) (Overall migration					
		c)	nternal pressure creep rupture test @ 2	7 deg C for 100) hrs			
		d)	nternal pressure creep rupture test @ 8	0 deg C for 16	5 hrs			
		e)	nternal pressure creep rupture test @ 8	0 deg C for 100	00 hrs			
		f) S	Slow crack growth rate test	(7000)				
		I he foll	owing tests shall be conducted in prese	nce of TPSODL	representative on the			
		samples	taken from the offered lot material:					
		a)	Visual appearance and dimensions					
	ROUTINE /	D) I						
7.2	ACCEPTANCE	C) I	Density					
	TEST	a) I						
		e)	=iongation at preak					
		T) (
		g) (Jarbon black dispersion					
		n) (
	Initiator		HOG					

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TDCADI	IP SOUTHERN ODISHA DISTRIBUTION LI	MITED, BERHAMPUR		
IPSODL	TECHNICAL SPECIFICATION			
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		 i) Internal pressure creep rupture test @ 80 deg C for 48 hrs
		Bidder shall furnish the type test report certified from CPRI/ERDA/CIPET accredited lab as
		per the relevant standards.
	TYPE TEST	Type testing date should not exceed last 5 years from the date of opening the bid.
8.0	CERTIFICATION	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 TPSODL.
		Material shall be subject to inspection by duly authorized representative of TPSODL.
		- Inspection may be made at any stage of manufacture at the discretion of TPSODL
		and the equipment, if found unsatisfactory as to workmanship or material, the same
		is liable to rejection.
		 Bidder shall grant free access to the manufacturing location to TPSODL's
		representative at all times when the work is in progress.
		- Inspection by the TPSODL or its authorized representatives shall not relieve the
		bidder of his obligation of furnishing equipment in accordance with the
		specifications.
		- Material shall be dispatched after specific MDCC (Material Dispatch Clearance
9.0	PRE DISPATCH	Certificate) is issued by TPSODL.
5.0	INSPECTION	Following documents shall be sent along with material:
		a) Test reports
		b) MDCC issued by TPSODL
		c) TPSODL invoice in duplicate
		d) Packing list
		e) Drawings & catalogue
		f) Guarantee / Warrantee card
		g) Delivery Challan
		h) Other Documents (as applicable)
		i) Certificate from manufacturer of resin(raw material with mention of material
		grade)
	INSPECTION	The material received at TPSODL, Berhampur, Odisha store shall be inspected for
10.0	AFTER RECEIPT	acceptance and shall be liable for rejection, if found different from the reports of the pre-
	AT STORES	dispatch inspection and one copy of the report shall be sent to Contracts and Engineering
		department.
		Bidder shall stand guarantee towards design, material, workmanship & quality of process /
		manufacturing of items under this contract for due and intended performance of the same, as
		an integrated product delivered under this contract. In the event any defect found by
		IPSODE up to a period of 12 months from the date of commissioning of 18 months from the
		date of last supplies made under the contract whichever is earlier, bidder shall be liable to
11.0	GUARANTEE	undertake to replace/recting such delects at its own costs, within mutually agreed time frame,
		and to the entire satisfaction of TPSODL, failing which TPSODL will be at liberty to get it
		replaced/rectilied at bluder's cost and recover all such expenses plus TPSODE's own charges $(@, 20\%)$ of expenses incurred) from the hidder or from the 'Security sum
		Performance Denosit' as the case may be
		Periornalice Deposit as the case may be. Bidder shall further be responsible for 'free replacement' for another period of 3 years from
		the end of quarantee period for any flatent defects' if noticed and reported by TPSODI
		Ridder shall ensure that the HDPE nine shall be packed in rolls of 500 meters of longth and
12.0	PACKING	shall be prepared for rail/road transport in a manner so as to protect from damage in transit
13.0	TENDER SAMPLE	Not required
14.0	QUALITY	The bidder shall have track record of not less than 10 years in HDPE Pipe manufacturing
	CONTROL	and servicing in Indian market. The bidder shall submit with the offer Quality Assurance
L		

Initiator	HOG	
	(ENGINEERING)	

TPSODI	TP SOUTHERN ODISHA DISTRIBUITION LI	MITED, BERHAMPUR	
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	200 mm PN8 PE80		
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		Plan indica out on the As part of delivery so TPSODL's works to ca	Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material during manufacture. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPSODL's representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.					
15.0	MINIMUM TESTING FACILITIES	Bidder sha acceptanc	- Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.					
16.0	MANUFACTURING ACTIVITIES	The succe clearly ela Quality As The bar ch Pipe man confirmatio	he successful bidder will have to submit the bar chart for various manufacturing activities learly elaborating each stage, with quantity. This bar chart should be in line with the Quality Assurance Plan submitted with the offer. The bar chart will have to be submitted within 15 days from the release of the order. Pipe manufacturer shall obtain a certificate from the raw material supplier as a confirmation to the requirements of non-presence of toxic substance.					
17.0	SPARES, ACCESSORIES AND TOOLS	Not applica	able.					
18.0	DRAWINGS AND	Following (a) C b) B c) T Following S. No. 1 2	documents shall be submitted a ompletely filled in GTP ill of Material ype test Certificates Drawings/Documents shall be s Description Technical Parameters Manual/Catalogues/Drawing	long with the ubmitted after For Approval √	bid: the award of the For Review Information √	contract: Final Submission √		
10.0	DOCUMENTS	3 4 5 6 7	Technical details and test certificates of the component Instructions for use Transport/shipping dimension drawing QA & QC Plan Routine, Acceptance and Type test Certificates					
19.0	DOCUMENTS GUARANTEED TECHNICAL PARTICULARS	3 4 5 6 7 The bidde specificatio	Technical details and test certificates of the component Instructions for use Transport/shipping dimension drawing QA & QC Plan Routine, Acceptance and Type test Certificates er shall submit GTP inline on for review & approval of TPS	$\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{$	√ √ √ √ technical requ	$\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt$		

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	(ENGI	NEERING)

TOCODI	TP SOUTHERN ODISHA DISTRIBUTION LI	MITED, BERHAMPUR	
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	S. No	Clause No.	Details of deviation with justifications	
			victions arout from these datailed above	
	We confirm that there are no deviations apart from those detailed above.			
	Seal of the	Company:	•	
			Signature	
			Designation	

Initiator	HOG	
	(ENGINEERING)	



Doc. Title	Specification for ISI Marked C.T./P.T. Operated 3P4W Static AMR		
	Compatible H.T. Tri-Vector Energy Meter, DLMS CatC1		
Doc. No	ENG-HT- H.T. Tri-Vector Energy	' Meter	Eff. Date: 01-06-2022
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1.0 <u>SCOPE</u>

This specification covers design, manufacturing, testing, supply of high precision three phase four wire static tri-vector energy meters with DLMS Cat.-C1 protocol of accuracy class 0.2s or better, capable of performing functions of energy audit, feeder metering. The HT Tri-vector meter should be 3-phase 4-wire type suitable for connection to a 3 phase 4 wires system. The meter should be capable to record and display KWh, KVArh, KVAh and maximum demand in KVA for 3 phase 4 wire as well as 3 phase 3 wire AC balanced/unbalanced loads for a power factor range of zero (lagging) through unity up to zero (leading) as per requirement given in this specification.

2.0 <u>CLIMATIC CONDITIONS OF THE INSTALLATION</u>

The material shall be suitable for following climatic conditions,

0	
1. Maximum altitude above sea level	1,000m
2. Maximum ambient air temperature	50°C
3. Maximum daily average ambient air temperature	35°C
4. Minimum ambient air temperature	0°C
5. Maximum relative humidity	95%
6. Average number of thunderstorm days per annum (isokeraunic level)	70
7. Average number of rainy days per annum	120
8. Average annual rainfall	150cm
9 Earthquakes of an intensity in horizontal direction - equivalent to seism	nic acceleratio

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 .Wind velocity:

300 km/hr, 200 km/hr and 160

km/hr.

Environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas.

Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.


Doc. Title

Doc. No

Rev. No

Prepared by:

Specification for ISI Marked C.T./P.T. Operated 3P4W Static AMR Compatible H.T. Tri-Vector Energy Meter, DLMS Cat. -C1 ENG-HT- H.T. Tri-Vector Energy Meter Eff. Date: 01-06-2022 00 Page: 2 of 30 Reviewed by: Approved By: Issued By:

3.0 STANDARDS TO WHICH METERS SHALL COMPLY

Guidelines on "Data Exchange for Electricity Meter Reading, Tariff and Load Control-Companion Specification" enclosed with this document as annexure.

IS- 14697 / 1999 (reaffirmed 2004) Specification for AC Static Transformer operated Watt Hour & VAR-Hour meters (class 0.2S);

IS- 15707 Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice.

CBIP technical report No. 304 for Specification for AC Static Electrical Energy Meters with latest amendments.

IEC 62053-33, IEC 62053-22-2003 & IEC 62052-11-2003 for AC Static Watt-hour Meters for Active Energy, class 0.2S & 0.5S

CBIP Technical Report No.111 Revised July 1996 for Specification for Common Meter Reading Instrument.

IS: 9000 for Basic Environmental Testing Procedures for Electronic & Electrical items

IS: 15959 (DLMS/ COSEM) for Open protocol standard for communication of meter data

IS: 15707 for Testing, Evaluation, Installation and maintenance of AC Electricity meters-Code of Practice

The equipment meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standard mentioned above, also shall be considered; in case of conflict related with communication protocol, the Guidelines on "Data Exchange for Electricity Meter Reading, Tariff and Load Control– Companion Specification" enclosed with this document as annexure shall prevail upon. For conflict related with other parts of the specification, the order of priority shall be – i) This technical specification ii) IS: 14697 /1999 (reaffirmed 2004).

For open protocol IS 15959 is published now.

4.0 <u>GENERAL TECHNICAL REQUIREMENTS</u>

1	TYPE	All type of AMR Compatible Static, 3-Ph. 4-Wire Tri-
2	FREQUENCY	50 Hz ± 5%
3	ACCURACY CLASS	0.2 S
4	SECONDARY VOLTAGE	(i) For CT/PT operated HT Meters-Suitable for operation from 110V Ph-Ph or 63.5V Ph-N
5	BASIC CURRENT (Ib)	Both -/1A & -/5A (as applicable) to be provided in the sample meter.

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Doc. Title

Doc. No

Rev. No

Prepared by:

TP SOUTHERN ODISHA DISTRIBUTION LTD. BERHAMPUR WORK INSTRUCTION

 Specification for ISI Marked C.T./P.T. Operated 3P4W Static AMR

 Compatible H.T. Tri-Vector Energy Meter, DLMS Cat. -C1

 ENG-HT- H.T. Tri-Vector Energy Meter
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6	MAXIMUM CONTINUOUS CURRENT	2.0 Ib;
7	STATING CURRENT	0.1% of Ib
8	SHORT TIME CURRENT	as per IS -14697
9	POWER CONSUMPTION	The active and apparent power consumption, in each voltage, circuit at reference voltage, reference temperature and reference frequency shall not exceed 1 W and 4 VA. The apparent power taken by each current circuit, at basic current, reference frequency and reference
10	POWER FACTOR	0.0 Lag - Unity - 0.0 Lead
11	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high
12	NON-VOLATILE BATTERY	Shall be at least for twelve years without battery back-

5.0 <u>CONSTRUCTIONAL REQUIREMENT / METER COVER &</u> <u>SEALING ARRANGEMENT</u>

The Meters should 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

- Personnel safety against electric shock.
- Personnel safety against effects of excessive temperature as per relevant standards.
- Protection against penetration of solid objects, dusts and water as per relevant standards.
- Protection against spread of fire as per relevant standards.
- Detection against fraud or pilferage.

All the materials used in the manufacture of the meters should be of highest quality. The entire design and construction should be capable of withstanding stresses likely to occur in actual service and rough handling during transportation as per standards.

All insulating materials used in the construction of meters should be nonhygroscopic, non-aging and of tested quality and should conform to tests as *Property of TPSODL – Not to be reproduced without permission of TPSODL*



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	Compatible H.T. Tri-Vector I	-C1		
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specified in relevant standards. The meter should be designed on application specific integrated circuit and should be manufactured using SMT (Surface Mount Technology) components except a few PTH components.

The terminal block, the terminal cover and the meter case should have reasonable safety against the spread of fire. They should not be ignited by thermo overload of live parts in contact with them.

The meter must conform to the degree of protection IP-51 against ingress of dust moisture and vermin's.

All the parts which are subjected to corrosion under normal working conditions should be protected effectively. A protective coating should not be liable to damage by ordinary handling or damage due to exposure of air under normal working conditions.

The meters should be so designed that their working should remain unaffected by electromagnetic interference, electrostatic discharges and high voltage transients as specified in CBIP report No. 325 (latest amendments thereof)

For connecting the meters to modem for automatic reading the power supply port shall be provided with breakable plastic cover on the meter cover which shall be broken & used for connecting the modem (this feature is only optional).

Sealable RJ11 connector will be given either under ETBC or side of meter with sealing arrangement.

Magnetic shielding to be provided on all side of meter for electromagnetic interference

5.1 <u>Meter Cover & Case:</u>

The Meter Case & Cover shall conform to IS 11731 (FH-1category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 1984 OR IEC PUB, 60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test as per UL 94 or as per IS 11731(Part-2) 1986.

Meter should be wall mounted projected type, fitted with help of screws and should have handle at its top to facilitate carrying around.

Meter Cover and extended terminal block cover (ETBC) shall be totally transparent & made of unbreakable high grade flame retardant & injection moulded in UV stabilized polycarbonate with minimum thickness of 2.0 mm on all sides and of good dielectric &



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mechanical strength.

Meter cover should be fixed permanently seamless with ultrasonic welding with Meter Case and should not be removable without breakage of top cover. The meter cover should have two covered unidirectional sealing screws, each screw having two sealing holes. These screws should be made of brass and capable of being tightened from the front. The firm shall provide his seals on meter as:

Polycarbonate Double Lock seal with Sl. No. to be provided by Manufacturer in the meters.

Paper seals with Sl. No., Hologram seals with Sl. No., bar code, hologram and continuity bar. The quality of the paper seal should be such that it should not be detachable & if removed will be torn into pieces.

After seamless welding non conductive hologram seals can be given only.

The meter case should have at least three mounting holes. Two holes for mounting screws on terminal block sealed beneath the terminal cover and one for hanging screw on the top.

5.1.1 METER CASE OPEN:

The Meter shall have meter case opening detection mechanism. The event shall be indicated on meter display continuously in auto scroll mode & shall be logged in memory. The detection & logging mechanism shall work even when meter is not energized.

5.2 TERMINALS AND TERMINAL BLOCK

The meter should have tin/nickel plated brass terminals suitable for termination of service cable. The terminal block of the meters should be of high-grade engineering plastic, which should form an extension of the meter case and should have terminal holes of sufficient size to accommodate the insulation of conductors. It should have terminal holes of adequate length and of minimum internal diameter 5.5 mm to accommodate the insulation of conductor. The manner of fixing the conductors to the terminals should ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings that may be loosened and tightened several times during the life of the meter. All parts of each terminal should be such that the risk of corrosion resulting from contact



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Compatible H.T. Tri-Vector Energy Meter, DLMS CatC1			
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with any other metal part is minimized. Two screws should be provided in each current terminal for effectively clamping the external leads or thimbles. Each clamping screw should engage at-least 3 threads in the terminal. The ends of screws should be such as not to pierce the conductor.

The clearances and creepage distances should conform to relevant standard.

All parts of each terminal should be such that the risk of corrosion resulting from contact with any other metal part is minimized.

The electrical connections should be so designed that contact pressure is not transmitted through insulating material.

TERMINAL COVER 5.3

Prepared by:

The terminal cover should be transparent extended type, which can be sealed independently of the meter cover. The terminal cover should enclose the actual terminals. The conductor fixing screws, the external conductors and their insulation i.e. no part of the meter or cables accessories should be accessible from the front of the meter.

When the meter is mounted, no access to the terminals should be possible without breaking the seals of the meter terminal cover. The meter terminal cover should be fitted with the help of seal able screws.

The terminal cover should have two sealing screws independent of each Other. The fixing screws used on the terminal cover for fixing and sealing should be kept captive in the terminal cover.

5.4 **TERMINAL ARRANGEMENTS**

The terminals should be marked properly on terminal block for giving external connections. A sticker showing connections should be provided inside the extended cover of terminal block. The terminal cover should be of extended type such that when it is placed in position it is not possible to approach the connections or connecting wires.

CONNECTION DIAGRAM 5.5

Every meter should be indelibly marked with connection diagram showing the phase sequence for which it is intended and should be attached to the inner side of the extended terminal block cover. In case of any special precautions need to be taken at the time of testing the meter, the same should be indicated along with the circuit diagram.

5.6 **SEALING OF METER**



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Proper sealing arrangement should be provided on the meter to make it tamper proof/evident and avoid mishandling by unauthorized persons. The meter cover should have provision for minimum 2 Nos. seals. The terminal block cover should also be provided with two sealing arrangements. Separate sealing arrangement for the communication ports to CMRI/Modem should also be provided.

6.0 WORKING ENVIRONMENT

As per IS: 14697-1999 (reaffirmed 2004). Meter to perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS)

Meter body will conform to IP51 degree of protection. For outdoor use meter shall be installed in sealed enclosure conforming to IP 54.

The meter shall be suitable designed for satisfactory operation under the hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish, which provided suitable protection to them from any injurious effect of excessive humidity.

7.0 MANUFACTURING PROCESS, ASSEMBLY AND TESTING

Meters shall be manufactured using latest and "state of the art" technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs/Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer "PCB" assembly with "PTH" (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic "pick-and-place" machines, Reflow Soldering oven, for stabilized setting of the components on "PCB". For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of "PCB" with ICs/C-MOS components, to be restricted to bare minimum and precautions to prevent

"ESD" failure to be provided. Complete assembled and soldered PCB should undergo functional testing using computerized Automatic Test Equipment.



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Fully assembled and finished meter shall undergo "burn-in" test process for 12 hrs at 55 degree Celsius (Max. temperature not to exceed 60 degree Celsius) under base current (Ib) load condition.

Test points should be provided to check the performance of each block/stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

8.0 DISPLAYS

The meter shall have 8 digits (with ±indication), parameter identifier, backlit Liquid Crystal Display (LCD) of minimum 10mm height and wide viewing angle. Auto display cycling push button required with persistence time of 10 Seconds. LCD shall be suitable for temperature withstand of 70 deg C; Sequence of display of various instantaneous electrical parameters shall be as desired by Purchaser at the time of order.

The meter should have a high resolution display 2+6 decimal for energy parameters for accuracy testing purpose. The meter shall display MD up to three decimal for KW or KVA.

The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10years. In case of failure of power supply the meter could be powered up through an internal battery backup with a push button arrangement.

9.0 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS 14697-1999 (reaffirmed 2004). The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 14697 (latest version).

10.0 OUTPUT DEVICE

Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front and test output device shall be provided in the form of LED. Resolution of the test output device shall be sufficient to enable the starting



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current test in less than 10 minutes.

11.0 REAL TIME INTERNAL CLOCK (RTC)

RTC shall be pre-programmed for 30 Years Day/date without any necessity for correction. The maximum drift shall not exceed +/- 300 Seconds per year.

The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following:

Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter; From remote server through suitable communication network or Substation data logger "PC". Time set can be done through transaction only. Time synchronization feature is not supported.

12.0 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for poly phase balanced or unbalanced loads:

INSTANTANEOUS PARAMETERS

- 1. Real Time Clock Date and Time
- 2. Current IR
- 3. Current IY
- 4. Current IB
- 5. Voltage VRN
- 6. Voltage VYN
- 7. Voltage VBN
- 8. Signed Power Factor R phase
- 9. Signed Power Factor Y phase
- 10. Signed Power Factor B phase
- 11. Three Phase Power Factor PF
- 12. Frequency
- 13. Apparent Power KVA
- 14. Signed Active Power kW (+ Forward; Reverse)
- 15. Signed Reactive Power kVar (+ Lag; Lead)
- 16. Number of Power failures
- 17. Cumulative Power failure duration
- 18. Cumulative Tamper count





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- 19. Cumulative Billing count
- 20. Cumulative programming count
- 21. Billing date
- 22. Cumulative MD reset count
- 23. Date and Time of last MD reset





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- 24. Cumulative Energy kWh (Absolute)
- 25. Cumulative Energy kVArh Lag
- 26. Cumulative Energy kVArh Lead
- 27. Cumulative Energy kVAh
- 28. Rising Demand with Elapsed Time (kVA)
- 29. Present month Power on hours (Reset at Billing point)
- 30. Previous month TOD Active Energy 1C, 2C (Absolute)
- 31. Previous month TOD Apparent Energy 1C, 2C
- 32. Previous month TOD MD (KVA)
- 33. Tamper magnetic influence display
- 34. Tamper present status
- 35. Tamper last occurrence with Date & Time
- 36. Tamper last restoration with Date & Time

Notes: -



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- a) The items at Sl. No. 5, 6 & 7 are for 3 Ph./4 W system of measurement with Neutral as reference point
- b) Signed power factor (+ indicates lag) and (- indicates lead)
- c) The items at Sl. No. 16 20 hold cumulative values at that instant from the date of manufacturing or installation of the meter as the case may be.
- d) The item at Sl. No. 19 refers to the Billing Period counter

BLOCK LOAD SURVEY PARAMETERS

- 1. Real Time Clock Date and Time
- 2. Current IR
- 3. Current IY
- 4. Current IB
- 5. Voltage VRN
- 6. Voltage VYN
- 7. Voltage VBN
- 8. Block Energy kWh
- 9. Block Energy kVArh lag
- 10. Block Energy kVArh lead
- 11. Block Energy kVAh
- 12. Block Energy KVA

Notes: -

- a) The parameters listed in this table are for load survey purpose and are logged as per the block period time.
- b) The parameters at Sl. No. 2 to 7 are the average values during the block period time and stored at the end of that time block.
- c) The parameters at Sl. No. 8 to 11 are the actual energy consumption during that time block.

BILLING PROFILE PARAMETERS (ONLY 02 TOD ZONE PARAMETERS)

- 1. Billing date
- 2. System Power Factor for billing period
- 3. Cumulative Energy kWh
- 4. Cumulative Energy kWh TZ1
- 5. Cumulative Energy kWh TZ2
- 6. Cumulative Energy kvarh Lag
- 7. Cumulative Energy kvarh Lead

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- 8. Cumulative Energy kVAh
- 9. Cumulative Energy kVAh TZ1
- 10. Cumulative Energy kVAh TZ2
- 11. MD **-** kW
- 12. MD kW TZ1
- 13. MD kW TZ2
- 14. MD **-** kVA
- 15. MD kVA TZ1
- 16. MD kVA TZ2

17. Cumulative Power ON/OFF(Present & History up to 12 Months) To

be updated in line with published standard IS: 15959

13.0 DEMAND INTEGRATION PERIOD

The maximum demand integration period should be Programmable & 15 min by default.

14.0 MD RESET

Auto reset at 24:00 hrs at the end of each billing cycle

15.0 MARKING OF METERS

The marking of meters shall be in accordance with IS: 14697/1999 (reaffirmed 2004). The meters shall bear marking "<u>Property of TPSODL</u>".

The meter shall also store name plate details containing the category of meters viz. DLMS – C1 etc. in capital letters. These shall be readable as a profile as and when required.

16.0 COMMUNICATION CAPABILITY

The meter shall be provided with two ports for communication of the measured/collected data as per guideline document enclosed in the annexure, i.e. a hardware port compatible with RS 232 or RS 485 specifications which shall be used for remote access through suitable Modem (LTE/GPRS/GSM/EDGE/CDMA/PSTN/LPR) and an Optical port complying with hardware specifications detailed in IEC-62056-21. This shall be used for local data downloading through a DLMS compliant HHU.

The RS 485 port shall be used at Substations suitable for multi-drop connections of the meter for exporting data to sub-station data logger/DCU/Computer and the remote end server. The RS 232 port shall be used at boundary points meters and Distribution Transformer meters & consumer meters capable to transfer and export data to the remote end server through suitable communication mediums (GPRS/GSM/EDGE/ CDMA/PSTN/LPR). Both ports



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shall support the default and minimum baud rate of 9600 bps.

17.0 HAND HELD UNIT (HHU)

To enable local reading of meters data a DLMS compliant HHU shall be used. The HHU shall be as per specification given in the enclosed guidelines document. It shall be compatible to the DLMS compliant energy meters that are to be procured/supplied on the basis of this specification.

<u>The HHU shall be supplied by the meter manufacturer along with the</u> meters free of cost one for each 100 meters supplied.

18.0 TAMPER & FRAUD MONITORING FEATURES

The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, harmonic Distortion, Voltage/Frequency Fluctuations, and electromagnetic High Frequency Fields etc. The meter shall be immune to abnormal voltage/frequency generating devices and shall record the occurrence and restoration of such tamper events along with parameters such as current, voltages, kWh, power factor, event code, date & time etc. as given below:

18.1 ABNORMALITY EVENTS DETECTION

The meter will function properly under following common abnormal conditions:

1. Phase sequence reversal	The meter shall keep working accuracy irrespective of the
	sequence of the supply.
2. Missing Neutral	The meter shall continue to record accurately according to
	electrical connections even if the Neutral of potential supply is
	accidentally or incidentally disconnected.
3. Current reversal/	The meter shall be capable of detecting and recording
connection reversal	occurrence and restoration with date and time of CT reversal
	with phase identification. The meter should record actual
	energy.

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4. External magnetic	The metering system shall be provided with adequate magnetic		
influence	shielding so that any external magnetic field (AC Electro		
	Magnet or DC Magnet) as per the values specified in CBIP		
	Technical Report No.325 (with latest amendments) applied on		
	the metering system shall not affect the proper functioning and		
	recording of energy as per error limits prescribed by CBIP.		
5. Diode circuit on outgoing	It should read accurately as per ISS with external diode ckt		
neutral	in the outgoing neutral ckt.		
6. Tamper proof irreplaceable	It should have Tamper proof seals with number matching with		
seal.	that with meter.		
7. Spark discharge of	The accuracy of the meter should not be affected with the		
approximately 35KV	application of abnormal voltage/frequency generating device		
	such as spark discharge of approximately 35 KV.		



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The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes: -

- (i) One any of the phases or neural terminals.
- (ii) On any connecting wires of the meter.
- (iii) Voltage Discharge with 0-10 mm spark gap.
- (iv) At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device(s) with site conditions.

Beside this the meter would have features to detect the occurrence and restoration of, at least, the following common abnormal events:

- a) <u>Missing Potential & Potential imbalance</u>: The meter should be capable of detecting and recording occurrence and restoration with date and time the cases of Potential failure which could happen due to disconnection of potential leads (one or two), failure of phase line fuse from the Transformer primary side & will work as per prevailing electrical conditions. The meter should also detect and log cases of voltage unbalance (from 15% for more than 15minutes or more) & will work as per prevailing electrical conditions.
- b) <u>**Current imbalance:**</u> The meter should be capable of detecting and recording occurrence and restoration with date and time of Current unbalance (30% or more for more than 15 minutes) & will work as per prevailing electrical conditions.
- c) <u>**CT reversal:**</u> The meter should be capable of detecting and recording occurrence and restoration with date and time of CT reversal with phase identification. The meter should record actual energy.
- d) <u>**CT Open:**</u> The meter should be capable of detecting and recording occurrence and restoration with date and time of CT open with phase identification.
- e) <u>**CT Short:</u>** The meter should be capable of detecting and recording occurrence and restoration with date and time of CT Short with phase identification.</u>
- f) <u>Power on/off</u>: The meter should be capable to record power on /off events in the meter memory persisting beyond specified time. Persistence time should be 5 minutes by default. The report will be available through base computer software in a meaningful format indicating occurrence / restoration and total power outage. Property of TPSODL - Not to be reproduced without permission of TPSODL



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- g) <u>Software Changing</u>: Any communication with the meter for any change in meter software or any attempt to write in meter software (software tamper) should be recorded in the meter memory with date and time stamping. However, any communication for reading the meter data should not be recorded in the meter memory. This data should also be available in the display as highlighted in this specification.
- h) <u>Magnetic Tamper</u>: Additionally, meter shall be capable to record the presence/ removal of magnet with date & time stamp in case the influence of magnet exceeds the limit as desired in the CBIP Report- 325 with latest amendments.
- i) <u>**Change of Phase Association:**</u> Meter shall be provided with the proper logic to identify change of phase association & record the event.
- j) <u>Neutral Disturbance</u>: Meter shall be provided with the proper logic to identify neutral disturbance & record the event with date & time of occurrence of date & time.
- k) **Software Locking:** The meter shall have password protected software locking provision for changing the TOD timings & MD integration period.

The bidder may offer any other recordable abnormality event, which should be useful in consumer metering/feeder metering, along with the detailed descriptions, literatures, usefulness and every other implications.

The meter should record the total duration of the above abnormalities, time and date of their occurrences & restorations with a snap shot of electrical conditions viz. Voltage, current, PF etc at Base Computer System for the events a), b), c) as mentioned above, if abnormalities persist for a definite persistence time.

Logic for calculation of voltage imbalance, current imbalance, CT Short &CT Open shall be furnished by the bidder.

The meter will keep records for the minimum last 250 events (occurrence + restoration, occurrence and restoration will be treated as separate events) for above of abnormal conditions. The recording of events will be on FIFO basis. It will be possible to retrieve the abnormal event data along-with all related snap-shots' data through the meter's optical port with the help of a CMRI and download the same to the BCS where it will be available for viewing. All this information will be made available in simple and easily



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understandable format.

The selection of the abnormality events and manner of recording, retrieval etc. shall be decided during the technical evaluation of the offers and will be spelt out in the contract.

The Bidder has to provide Users Manual with each meter. The logic of tamper events such as current imbalance, CT short, CT Open, Low voltage, High Voltage & voltage unbalance etc. shall be provided either in the user's manual or in separate booklet/sheet with each meter.

Tamper details shall be stored in internal memory for retrieval by authorized personnel through either of the following:

1- HHU. 2- Remote access through suitable communication network.

Minimum 200 numbers of events (occurrences & restoration with date & time) should be available in the meter memory.

Meter should have self diagnostic features. The meter should display any suitable indication like "OK/Circuit OK" etc. during meter installation. It should also indicate any failure of RTC battery / memory.

19.0 LOAD SURVEY

50 DAYS, 15 MIN IP with following parameters:

- 1. Real Time Clock Date and Time
- 2. Current IR
- 3. Current IY
- 4. Current IB
- 5. Voltage VRN
- 6. Voltage VYN
- 7. Voltage VBN
- 8. Block Energy kWh
- 9. Block Energy kVArh lag
- 10. Block Energy kVArh lead
- 11. Block Energy kVAh
- 12. Block Energy kVA

19.1 TOD TIMING (Both MD & ENERGY)





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TOD-1: 06:00 Hrs to 22:00 Hrs TOD-2: 22:00 Hrs to 6:00 Hrs

19.2 MD RESET REQUIRED

AUTO MODE ONLY, MANUAL RESET NOT REQUIRED

19.3 APPRENT CALCULATION

Apparent Calculation: - Lag only

19.4 HISTORY: TOD MD - 12 months, All Energy - 12 months

The meter software should distinguish between no load & no power condition in the load survey graph. The meter data (with load survey) downing through CMRI should be possible in the absence of power supply.

Downloading time for all data of meter including billing data, load survey data & tamper data should be 10 min maximum.

Note:

- (a) Apparent Energy is computed considering Reactive Energy to be lag only.
- (b) Demand Integration period should be programmable as a block of 15 minutes and 15 minutes by default.
- (c) TOD Timings: There will be a provision for Two Time of Day Zones for Active Energy, Apparent Energy & Demand for Import & Export. Number and timings of these TOD Zones shall be programmable.

TOD timings will be informed to the supplier by "TPSODL" at least four weeks before commencement of delivery.

- (d) Display sequence of the above mentioned parameter can be changed as desired at the time of placing order or Four (4) weeks before commencement of delivery.
- (e) Display through push button will have priority over the auto display. Two nos. of push buttons may be provided for forward & back ward reading.

20.0 <u>TYPE TESTS</u>

The meter offered should have successfully passed all type tests described in the IS: 14697 and the meter Data Transfer and Communication capability as per enclosed guidelines document. Type test certificate shall be submitted along with the offer and the same shall not be more than 36 months old at the time of bid submission. Make & type of major components used in the type-tested meter shall be indicated in the **QAP**.



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21.0 SAMPLES

One sample meters conforming to this specification duly sealed along with the Type Test certificates shall be submitted with the bid. The above sample meters shall be tested in purchaser's meter testing lab and/or any standard testing lab, if any dispute arises regarding specification and the testing charges will be borne by the supplier. In case sample meters do not conform to the prescribed specifications, the financial bid of offer shall not be opened. It will be compulsory to submit sample meters as above along with the bid, failing which the bid will be ignored. Also the sample meter should be compatible to our existing system, for which the required necessary accessories should be provided by the supplier and the cost should be included with the offer.

22.0 INSPECTION

- **22.1** 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 customer hold points will be defined at the time of issue of final order. The authorized representative of the TPSODL 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 TPSODL by Regd. Post/e-mail and carry out the tests in the presence of representative of the TPSODL. If TPSODL feels necessary may select one sample from the lot at factory to send for testing at CPRI/ NABL Accredited laboratory. In this case all inspection & testing charges in this connection will be borne by the supplier.
- **22.2** The TPSODL may at its option get the materials inspected by the third party if it feels necessary and all inspection charges in this connection will be borne by the supplier.
- **22.3** The dispatches will be affected only if the test results comply with the specification.



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The dispatches will be made only after the inspection by the TPSODL Officer is completed to the TPSODL satisfaction or such inspection is waived by the competent authority.

- **22.4** 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.
- **22.5** The supplier will give 15 days' advance intimation to enable the Purchaser depute his representative for witnessing the acceptance and routine tests.
- **22.6** 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 cost to the Purchaser.
- **22.7** After delivery of materials at 'TPSODL's Store the materials may be verified/ retested in full or taking random samples before acceptance. In case of any deviation to the specification, GTP, IS etc. found during the tests the lot will be rejected or will be replaced by supplier.

23.0 RANDOM SAMPLE TEST AFTER DELIVERED AT STORE

The consignment of meters received at area Stores shall be accepted only after testing of meters at purchaser's laboratory or any other standard laboratory.

Samples of meters shall be selected randomly from a lot of meters supplied and send to purchaser's lab or any other standard laboratory for acceptance test as per relevant ISS, CBIP Report and as per procedure Technical Specification. If the sample fails in the above tests, the entire lot will be rejected.

The following test will be carried out at purchaser's laboratory (with available facility) or any other standard laboratory (if recommended)

- 1. Visual Inspection
- 2. Test of starting conditions
- 3. Test of no-load conditions
- 4. Test of Limits of error
- 5. Test of repeatability of error
- 6. Test of meter constant
- 7. Test of tempered condition



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Other Tests: -

8. Software, Tamper test, test for influence quantities (voltage variation) and display parameters.

24.0 ACCEPTANCE & ROUTINE TESTS

Criteria for selection for such tests and performance requirements shall be as per IS: 14697-1999 (reaffirmed 2004)

Additional acceptance shall include <u>Magnetic Influence Test as per CBIP report-325</u>, <u>Ageing Test</u>, <u>Burn test for 12 hrs in Full Load</u>. One sample meter per order from one of the offered lot shall be subjected to these specific tests. Meters subjected to these tests shall not be used after tests.

Accuracy tests shall be performed at the beginning and at the end of the acceptance tests specified.

25.0 AGEING TEST

Prior to final testing and calibration, at least two random sample meters from each lot offered for inspection shall be subjected to accelerated ageing test to eliminate infant mortality, i.e. meters are to be kept in ovens for 72 hours at 55 deg. Centigrade temperature & atmospheric humid condition. After 72 hours meters should work correctly. Facilities / arrangement for conducting ageing test should be available with the manufacturer.

FULL LOAD TEST FOR 12 HOURS

At least two random sample meters from each lot offered for inspection shall be subjected to a full load operation continuously for a minimum period of 12 hours to test its durability at high loads.

26.0 QUALITY ASSURANCE

The manufacturer shall have a comprehensive quality assurance program at all stages of manufacture for ensuring products giving reliable, trouble-free performance. Details of the bidder's quality assurance and test set up shall be furnished with the bid. A detailed quality assurance program shall be finalized with the successful bidder during the award stage. Bidder shall furnish following information along with his bid:

Organization structure of the manufacturer and his main sub-suppliers (PCBs, SMT cards, CT/PT) with details of "QA" setup, overall workflow; Copy of system manual showing "QAP" (Quality Assurance Plan) as actually practiced during manufacturing and final testing List of *Property of TPSODL – Not to be reproduced without permission of TPSODL*



Doc. Title	Specification for ISI Marked C.T./P.T. Operated 3P4W Static AMR		
	Compatible H.T. Tri-Vector Energy Meter, DLMS CatC1		
Doc. No	ENG-HT- H.T. Tri-Vector Energy Meter		Eff. Date: 01-06-2022
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raw materials and critical components (ASIC chip, crystal clock, memory register Chip, transformers, optical ports etc.) with their suppliers; Stage inspection of product before final testing; Procedure adopted for "In- situ" testing of PCBs, after placement of surface mounted component, for quantitative parametric variation of tolerance by self or sub-contractor.

Testing and calibration facility, date of calibration of test bench, manpower data of bench operators; Sample copies of test certificate of bought out components.

27.0 GUARANTEE

Meters supplied shall be guaranteed for a period of <u>60months from the date of Commissioning or</u> <u>66 months from the date of receipt of last consignment</u> of materials. Bidders shall guarantee to repair or replace the meters (if supplied), which are found to

be defective/ inoperative at the time of installation, or become inoperative/defective during guarantee period. Replacements shall be effected within 1 month from the date of intimation.

28.0 TIME OF DAY (TOD) TARIFF

The meter should be capable to record and store energy consumption as per following time zones of register. This is as per current tariff order. These should be configurable as per TPSODL requirement from time to time.

TOD TIMING (Both MD & ENERGY) TOD-

1: 06:00 Hrs to 22:00 Hrs TOD-2: 22:00 Hrs to 06:00 Hrs

29.0 SOFTWARE LOCKING

The meter shall have password protected software locking for change of TOD timing, IP etc.

30.0 SOFTWARES

Software will be industry specific. The firm has to provide required base computer & MRI software for data down loading & analysis with free of cost.

31.0 METER READING PROTOCOL

The Supplier has to provide Meter Reading Protocols for billing parameters, tamper data etc. at free of cost.



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WORK INSTRUCTION

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ANNEXURE-II

GTP OF 3P4W STATIC HTTV METER, DLMS CATEGORY-C1

SL. NO.	ITEM DESCRIPTION	REQUIRMENTS
1	Make	
2	Туре	
3	Country of Origin	
4	Application	3 phase 4 wire, CT PT operated
5	Rated Voltage	110V/v3 (Phase to Neutral) or 110V for Phase to Phase
6	Rated Current (Basic)	-/5A or -/1A (As Applicable)
7	Frequency	50 Hz ± 5 %
8	Overload capacity	200% of Ib
9	Minimum starting current in % of base current	As per IS: 14697:1999
10	Short Time Current	As per IS: 14697:1999
11	Loss in potential circuit	Less than 1 Watt & 4VA per phase
12	Loss in current circuit	Less than 1 VA
13	Power Factor	0.0 Lag -Unity- 0.0 Lead
14	Change in error due to	
	a. Variation in frequency	50Hz ± 5%
	b. Variation in temperature	As per IS 14697: 1999
	c. Variation in voltage	As per IS: 14697:1999
15	Accuracy Class	0.2s
16	Constructional Requirement/ Meter Cover & sealing arrangement	As per Clause:-5.0 of Technical Specification.
17	Meter Cover & Case	As per Clause:-5.1 of Tech. Specification.
18	Meter Case Opening Temper Recording	As per Clause:-5.1.1 of Tech. Specification.
19	Terminals & Terminal Block	As per Clause:-5.2 of Tech. Specification.
20	Terminal Cover	As per Clause:-5.3 of Tech. Specification.
21	Terminal Arrangement	As per Clause:-5.4 of Tech. Specification.
22	Connection Diagram	As per Clause:-5.5 of Tech. Specification.
23	Sealing of Meter	As per Clause:-5.6 of Tech. Specification.
24	Working environment & degree of protection.	As per Clause:-6.0 of Tech. Specification.

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Doc. Title	Specification for IS Compatible H.T. Tr	Specification for ISI Marked C.T./P.T. Operated 3P4W Static AMR Compatible H.T. Tri-Vector Energy Meter, DLMS CatC1		
Doc. No	ENG-HT- H.T. Tri-Vec	ENG-HT- H.T. Tri-Vector Energy Meter		
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	25	Manufacturing Process, assembly & Testing	As per Clause:-7.0 of Tech. Specification.
F	26	Displays	As per Clause:-8.0 of Tech. Specification.
	27	Non Volatile Memory	The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory
	28	Battery Back up	In case of failure of power supply the meter could be powered up through an internal battery backup with a pushbutton arrangement.
	29	Performance under Influence Quantities	As per IS -14697/1999 (Reaffirmed 2004) & CBIP Technical Report
F	30	Out Put Device	As per Clause:-10 of Tech. Specification.
	31	RTC	As per Clause:-11 of Tech. Specification.
	32	Quantities to be measured & displayed.	As per Clause:-12 of Tech. Specification.
	33	Demand Integration Period	Should be programmable & 15min
	34	MD Reset	Auto reset at 24:00 hrs at the end of each billing cycle
Ī	35	Marking	As per Clause:-15 of Tech. Specification.
	36	Communication Capability	As per Clause:-16 of Tech. Specification.
	37	HHU	As per Clause:-17 of Tech. Specification.
	38	Tamper & Fraud monitoring features	As per Clause:-18 of Tech. Specification.
F		Abnormality Events Detection	
		i. Phase sequence reversal	The meter shall keep working accurately irrespective of the phase sequence of the supply.
		ii. Missing Neutral	The meter shall continue to record accurately according to electrical connections even if the Neutral of potential supply is accidentally or incidentally disconnected.
		iii. Current reversal /connection reversal	The meter shall be capable of detecting and recording occurrence and restoration with date and time of CT reversal with phase identification. The meter should record actual energy.



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39	iv. External magnetic influence	The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet) as per the values specified in CBIP Technical Report No325 (with latest amendments) applied on the metering system shall not affect the proper functioning and recording of energy as per error limits prescribed by CBIP.
	v. Diode circuit on outgoing neutral.	It should read accurately as per ISS with external diode ckt. in the outgoing neutral ckt.
	vi. Spark discharge of approximately 35 KV	The accuracy of the meter should not be affected with the application of abnormal voltage/ frequency generating device such as spark discharge of approximately 35 KV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes: -(i) One any of the phases or neural terminals.(ii) On any connecting wires of the meter.(iii) Voltage Discharge with 0-10 mm spark gap. (iv) At any place in load circuit.The accuracy of meter shall be checked before and after the application of above device(s) with site conditions.
	vii. Missing Potential & Potential imbalance	The meter should be capable of detecting and recording occurrence and restoration with date and time the cases of Potential failure which could happen due to disconnection of potential leads (one or two), failure of phase line fuse from the Transformer primary side & will work as per prevailing electrical conditions. The meter should also detect and log cases of voltage unbalance (from 15 % for more than 15 minutes or more) & will work as per prevailing electrical conditions
	viii. Current imbalance	The meter should be capable of detecting and recording occurrence and restoration with date and time of Current unbalance (30% or more for more than 15 minutes) & will work as per prevailing electrical conditions.



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ix. CT Reversal	The meter should be capable of detecting and recording occurrence and restoration with date and time of CT reversal with phase identification. The meter should record actual energy.
x. CT Open	The meter should be capable of detecting and recording occurrence and restoration with date and time of CT open with phase identification.
xi. CT Short	The meter should be capable of detecting and recording occurrence and restoration with date and time of CT Short with phase identification.
xii. Power on/off	The meter should be capable to record power on /off events in the meter memory persisting beyond specified time. Persistence time should be 5 minutes by default. The report will be available through base computer software in a meaningful format indicating occurrence/ restoration and total power outage.
xiii. Software Changing	Any communication with the meter for any change in meter software or any attempt to write in meter software (software tamper) should be recorded in the meter memory with date and time stamping. However, any communication for reading the meter data should not be recorded in the meter memory. This data should also be available in the display as highlighted in this specification.
xiv. Magnetic Tamper	Additionally, meter shall be capable to record the presence/ removal of magnet with date & time stamp in case the influence of magnet exceeds the limit as desired in the CBIP Report – 325 with latest amendments.
xv. Change of Phase Association	Meter shall be provided with the proper logic to identify change of phase association & record the event
xvi. Neutral Disturbance	Meter shall be provided with the proper logic to identify neutral disturbance & record the event with date & time of occurrence of date & time



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	xvii. Software Locking	The meter shall have password protected software locking provision for changing the TOD timings & MD integration period.
	xviii. Tamper data preservation capacity	Would be able to store at least 200 (occurrences and restoration as separate events)
	xix. Self Diagnostic features	The meter should display any suitable indication like "OK"/Circuit OK etc. during meter installation. It should also indicate any failure of RTC battery/ memory
40	i. Parameter Logged meter	 Real Time Clock-Date and Time Current- IR Current- IY Current- IB Voltage- VRN Voltage- VYN Voltage- VBN Block Energy- kWh Block Energy- kVArh- lag Block Energy- kVArh-lead Block Energy- kVAh
	ii. Logging interval	(PROGRAMMABLE,15 Minutes by default)
	iii. No. of days of Load Survey	50 power on days
	iv. Apparent Calculation	Lag only
41	TOD TIMING (Both MD & Energy)	TOD-1: 06: 00 Hrs to 22:00 Hrs TOD-2: 22:00 Hrs to 06:00 Hrs There will be a provision for Two Time of Day Zones for Active Energy, Apparent Energy & Demand. Number and timings of these TOD Zones shall be programmable.
42	MD RESET REQUIRED	AUTO MODE ONLY, MANUAL RESET NOT REQUIRED
43	Non volatile memory to record History	TOD MD - 12 months All Energy – 12 months.
44	Distinguishing Capacity	The meter software should distinguish between no load & no power condition in the load survey graph.



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45	Down loading in absence of power.	The meter data (with load survey) downing through CMRI should be possible in the absence of power supply.
46	Down loading time	Downloading time for all data of meter including billing data, load survey data & tamper data should be 10 min maximum
47	Push Button	Display through push button will have priority over the auto display. Two nos. of push buttons may be provided for forward & back ward reading.
48	Software	The firm has to provide required base computer & MRI software for data down loading & analysis with free of cost. Software will be industry specific.
49	Meter Reading Protocol	The Supplier has to provide Meter Reading Protocols for billing parameters, tamper data etc. at free of cost.
50	Compatibility of AMR	The Meter should be compatible to all type of 2G/4G Compatible AMR Modems.
51	Absolute Value	The TOD, Instantaneous, Billing parameter must have the Absolute value.

32.0 DRAWINGS AND DOCUMENTS

Following drawings & Documents shall be prepared based on TPSODL specifications and statutory requirements and shall be submitted with the bid:

a)Completely filled-in Technical Parameters.

- b)General arrangement drawing of the meter
- c)Terminal Block dimensional drawing
- d)Mounting arrangement drawings.
- e)General description of the equipment and all components with makes and technical requirement
- f)Type Test Certificates
- g)Experience List
- h)Clause wise compliance of this specification

After the award of the contract, Soft copies of following drawings and documents, describing the equipment in detail shall be forwarded for approval before mass manufacturing & sample to be test approved in MTL.



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S. No.	Description	For	For	Final
		Approval	Review	Submission
			Informa	
			tion	
1	Technical Parameters(GTP)			
2	General Arrangement			
	drawings			
3	Terminal block Dimensional			
	drawings			
4	Mounting			
	arrangemen			
5	Manual/Catalogues			
6	Clause wise compliances of			
	this specifications			
7	QA &QC Plan			
8	Routine, Acceptance			
	and TypeTest			
	Certificates			

Bidder shall subsequently provide soft copy of all the drawings, GTP, comparative analysis (of material of terminal block, terminal cover, terminal screw, meter body, meter base) and Test certificates for the final approval of TPSODL, before mass manufacturing. All the documents & drawings shall be in English language.

33.0 <u>SCHEDULE OF DEVIATIONS</u>

(TO BE ENCLOSED WITH THE 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 TPSODL's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviation apart from those detailed above. Seal of the Company:

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1015

Specification Name : Technical Specification for 33kV and 11kV Outdoor Current Transformer

SWARUP NAYAK	Jyoti Ranjan Sahu	JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPSODL	TPWODL	TPNODL	TPCODL	TPCODL
11-01-2023	13-01-2023	16-01-2023	18-01-2023	21-01-2023	31-01-2023

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TPNØDL TPSØDL Specification No: ENG-EHV-1015

Specification Name: Technical Specification for 33kV and 11kV Outdoor Current Transformer

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- 3. CLIMATIC CONDITIONS OF THE INSTALLATION
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- 9. PRE-DISPATCH INSPECTION
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- 16. MANUFACTURING ACTIVITIES
- 17. SPARES, ACCESSORIES AND TOOLS
- **18.** DRAWINGS AND DOCUMENTS
- **19.** SAMPLE DRAWINGS
- 20. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
- 21. SCHEDULE "B" DEVIATIONS





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Specification Name: Technical Specification for 33kV and 11kV Outdoor Current Transformer

1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturers works, packing, forwarding, supply and unloading at store/site of 11KV & 33 KV Outdoor Current Transformer complete with all accessories for efficient and trouble free operation of rating.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with latest revisions of relevant Indian/IEC/other applicable standards shall confirm to the regulations of local statutory authorities.

IS 2705-1992/IEC 60044-1	Specification for Current Transformer
IS 5621-1980	Specification for Hollow insulator for use in Electrical
10 0021 1000	
IS 2099-1986	Specification of Bushings for AC Voltage above 1000 Volts
IS 335-1983	Specification for new insulation oil
IS 11322-1985	Method for partial discharge measurement in instrument transformer
IS 8603-2008	Dimensions for Porcelain Transformer Bushing for use in heavily polluted atmosphere.

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			

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10	Earthquakes of an intensity in vertical	equivalent	to	seismic
	direction	acceleration of	0.15g	(g being
		acceleration du	e to gra	vity)

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. 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 REQUIREMENTS

GENERAL TECHNICAL REQUIREMENTS										
S.	Description	As specified by TPCODL/TPNODL/TPSODL/TPWODL								
1	Service	33 KV			11 KV					
2	Rated voltage	36 KV				12 KV				
3	Rated	50 Hz				50 Hz				
4	Rated Lightning	170 KVp				75 KVp				
S	Rated primary	800-400	-200 A			800-400-2	00 A			
6	Rated Power frequency dry	70 kV rm	IS			28 KV rms	6			
7	Rated Power frequency Wet	70 kV rms				28 KV rms				
8	Transformatio n Ratio (CT	800-400	-200/1-1-	1A		800-400-200/1-1-1A				
9	Rated continuous	1.2 times of primary current				1.2 times of primary current				
10	Short time thermal	25 kA fo	r 3 sec			25 kA for 3 sec				
11	Rated dynamic	2.5 times current r	s of short ating	time the	rmal	2.5 times rating	of short tim	e thermal c	urrent	
12	Core details	Core-1	Core-	Core-		Core-1	Core-2	Core-3		
12.	Accuracy	PS	0.2s	5P20		PS	0.2s	5P20		
12.	Rated burden		30VA	30VA			30VA	30VA		
12. 3	Knee point voltage (Vk) min.	> 500V at 400/1				> 500V at 400/1				
12. 4	Resistance of Secondary winding,	<6				<6				



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12. 5	Maximum Exciting Current mA at Vk/2	<30mA				<30mA			
12.	Instrument		<5				<5		
13	Tan Delta Value	Shall be years	within 0.7	7% for ne	ew and	l shall rema	in less than	1% for at I	east 5
14	Limits of Current (ratio) Error and phase displacement for metering purpose	IS Per IS	3 2705						
15	Limits of Current (ratio) Error and phase displacement for protection core	Ratio err	or +/-1%	and Pha	se dis	placement -	⊦/-60deg		
16	Limits of Current (ratio) Error for PS class	Ratio err	or +/- 0.2	25%					
17	Maximum temperature rise over ambient temperature	55 deg (C as per	IS 2705-1	1				
18	Minimum creepage for HT bushing	25 mm/ ł	<v< td=""><td></td><td></td><td></td><td></td><td></td><td></td></v<>						
19	Gauge of the tank	3 mm							



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20	Dimension of CT Base LXB Hole Centre- Centre Distance (mm)	450 X 450	310 X 310
21	Oil Details		
а	BDV of Oil (KV)		
b	Standard of oil		
С	Color of oil		
d	Qty of oil (L)		
22	Bushing details:		
а	Make		
b	IS standards		
С	Total creepage (mm)		

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5. GENERAL CONSTRUCTIONS

5.1 CURRENT TRANSFORMER

Design and construction of current transformer shall be sufficient to withstand the thermal and mechanical stresses resulting from the specified short circuit currents. The core lamination shall be of high grade steel or other equivalent alloy. The exciting current shall be as low as possible and the current transformer shall be capable of maintaining its rated accuracy for burden and saturation limits specified in the technical requirement.

Current transformers shall be of dead tank design. The tank material shall be made of GI with 3 mm thickness and painted. The current transfer area of the terminals shall be adequate enough to meet the temperature rise requirements as per IS: 2705. CT shall be supplied complete with required quantity of insulating oil for installing at site. The insulating oil shall comply to IS: 335. P1 and P2 markings shall be permanently riveted. The alignment and center line of CT primary terminals shall be correct so as to avoid bending connections. The primary terminals of CT shall be of silver coated / tinned Copper.

Current transformers shall be provided with a capacitance test tap in the HV lead to enable future monitoring of conditions of HV insulation. Suitable earthing arrangement to be provided for the tap point. Current transformers shall be provided with nameplate showing the particulars and diagram of the connections. CTs shall be provided with suitable lifting arrangement on all the sides.

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CT characteristics shall be such as to provide satisfactory protection for burdens ranging from 25% to 100% of rated burden in case of metering CTs and up to the accuracy limit factor/ knee point voltage in case of protective CTs. CTs shall be complete with accessories such as grounding lugs, filing and drain plugs, oil sight glass (prismatic type), weather proof terminal box, wedge type terminal connector etc.

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5.2 TERMINAL BOX

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The secondary terminals shall be brought in a weather proof terminal box (IP-55). The terminal box shall be provided with glands suitable, steel wire armored and PVC sheathed multicore 6 sq. mm. stranded copper conductor cables. For Tan Delta testing separate terminals shall be provided in the terminal box. The value of Tan Delta test shall be within 0.7% for new CTs and shall remain less than 1% for at least 5 years and if the said criterion is not fulfilled than the Bidder shall be liable to replace the CTs without any additional cost to the purchaser. Polarity marks shall be indelibly marked on the primary terminals of the current transformer and on the secondary lead at the associated terminal block. Suitable facility shall be provided for short circuiting and grounding the CT secondary at the terminal blocks.

5.3 BUSHINGS

Bushings shall be made of homogeneous, vitreous, porcelain of high mechanical and dielectric strength. Glazing of porcelain shall be of uniform brown or dark color, with a smooth surface arranged to shed away rain water. Suitable arrangement shall be provided for indicating oil level. The bushings shall be of Oil filled condenser type. Oil filled bushings shall be hermetically sealed to prevent ingress of moisture. Cast metal and caps for bushing shall be of high strength, hot dip galvanized malleable iron. They shall have smooth surface to prevent discharge taking place between the metal parts and porcelain as a result of ionization.

5.4 GROUNDING TERMINALS

Two grounding terminals shall be provided on the tank of current transformers on opposite sides, for connecting to station earth grid. Earthing terminal shall also be provided in the secondary junction box for earthing of secondary winding of CT. The earthing terminals shall be readily accessible and so placed that the earth connection of the current transformer is maintained even when the cover or any other movable part is removed. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. Under no circumstances shall a movable metal part of the enclosure be insulated from the part carrying the earthing terminal when the movable part is in place. The earthing terminal shall be identified by means of the symbol " "marked in a legible and indelible manner on case or frame to be earthed; adjacent to the terminals.

5.5 TERMINAL CONNECTOR

Suitable bimetallic connector in scope of Bidder ACSR Zebra conductor used for 33KV equipment connection ACSR Panther conductor used for 11KV equipment connection.

5.6 PAINT

All interior and exterior of tanks, and other metal parts shall be thoroughly cleaned to remove all rust, corrosion, grease or other adhering foreign matter. All steel surfaces in contact with
Specification Name: Technical Specification for 33kV and 11kV Outdoor Current Transformer

insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating varnish. Steel surfaces exposed to the weather shall be given a priming coat of zinc chromate and two coats of final paint of shade RAL 7032/ Shade 631 as per 15-5. All metal parts not accessible for painting shall be made of a corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound 'and suitably wrapped, or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale of or wrinkle or to be removed by abrasion due to normal handling. Bolts and nuts exposed to the atmosphere shall be of hot dip galvanized steel.

6. NAME PLATE & MARKING

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The equipment shall be provided with durable and legible name plate. A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each current transformer in a visible position and shall carry all the information as specified in the standards. The terminal markings shall also be in line with relevant standards. The letters on the rating plate shall be engraved black on the white/silver background. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. The Name plate shall be embossed with "PO no. with date" & "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL".

The following information shall be mentioned on the Name Plate

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- i) Manufacturer's name and Country
- ii) Type designation
- iii) Serial number
- iv) Month and Year of manufacture
- v) Rated primary and secondary current
- vi) Rated frequency
- vii) Highest system voltage
- viii) Rated insulation level
- ix) Rated short time thermal current
- x) Rated dynamic current
- xi) Rated output and corresponding accuracy class
- xii) Warrantee/guarantee clause
- xiii) PO no. & date
- xiv) "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL"
- xv) Relevant standards

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. For Bushings all the tests as defined in IS 2099-1986 shall be conducted. For current transformers following tests shall be necessarily conducted in addition to the tests specified in IS/IEC:

7.1 ROUTINE TEST

- a) Verification of terminal marking and polarity
- b) Power frequency dry withstand tests on primary windings
- c) Power frequency dry withstand tests on secondary windings



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- d) Over voltage inter-turn tests
- e) Partial discharge measurement
- f) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class

Optional tests:

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The following optional tests where applicable, shall be carried out by mutual agreement between the purchaser and bidder.

g) Chopped lightning impulse test as a type test.

7.2 ACCEPTANCE TESTS

- i) Verification of terminal marking and polarity
- ii) Power frequency dry withstand tests on primary windings
- iii) Power frequency dry withstand tests on secondary windings

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- iv) Over voltage inter-tum tests
- v) Partial discharge measurement
- vi) Determination of errors or others characteristics according to the requirements of the appropriate designation or accuracy class.
- vii) Tan Delta test as specified in Clause 4

All acceptance tests shall be witnessed by the Purchaser's or his authorized representative. The above mentioned test shall be made on the 100% of arresters to be supplied.

7.3 TYPE TEST

- a) Short time current tests
- b) Temperature rise test,

c) Lightning impulse test for voltage transformers for service in electrically exposed installation.

- d) High voltage power frequency wet withstand voltage tests on outdoor current transformers.
- e) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.

8. TYPE TEST CERTIFICATES

The bidder shall furnish the type test certificates as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA as per the relevant standards. Type tests should 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 same shall be carried out without any cost implication to Purchaser.

9. PRE DISPATCH INSPECTION

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. 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, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its

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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 the Purchaser.

Following documents shall be sent along with material :

a) Test reports

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b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL

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- c) Invoice in duplicate
- d) Packing list
- e) Drawings & catalogue
- f) Guarantee.! Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORES

The material received at Purchaser store shall 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.

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs within the mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company

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

NA

14. QUALITY CONTROL

The bidder shall submit with the offer, quality 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

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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 engineer or its nominated representative shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

15. MINIMUM TESTING FACILITIES

The Bidder shall have in house testing facilities for carrying out all routine tests and acceptance tests as per relevant international/Indian standards.

16. 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. The bar chart will have to be submitted within 15 days from the release of the order.

17. SPARES, ACCESSORIES AND TOOLS

- 1) Double compression gland 25mm dia for each CT unit. (1 no's)
- 2) Suitable size lugs for each CT unit. (10 no's)

18. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be prepared on Purchaser's specifications and statutory requirements and shall be submitted with the bid:

- a) Completely filled in Technical Particulars
- b) General arrangement drawing of the CT
- c) General arrangement drawing of Primary terminal assembly
- d) Terminal Block and connection drawing
- e) Foundation Plan and loading details
- f) General description of the equipment and all components with makes and technical requirement
- g) Type Test Certificate.
- h) Experience List.
- i) Manufacturing schedule and test schedule

Drawings/documents to be submitted after the award of the contract.

S.No.	Description	For Approval	For Review Information	For Final Submission
1	Technical Particulars	\checkmark		\checkmark
2	General Arrangement drawings	\checkmark		\checkmark
3	Terminal block and Connection Drawing	\checkmark		\checkmark





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4	General arrangement drawing of Primary terminal assembly	√		\checkmark
5	Foundation Plan and loading details on Cantilever arrangement of	\checkmark		\checkmark
6	Manual/catalogue		\checkmark	
7	Installation/Commissioning Manuals		\checkmark	
8	Instruction for use		\checkmark	
9	Transport I Shipping dimension drawing		\checkmark	
10	QA & QC Plan	\checkmark	\checkmark	\checkmark
11	Routine, Acceptance and Type Test Certificates	\checkmark	\checkmark	\checkmark

All the Documents and Drawings shall be in English Language.

Instruction Manuals: Bidder shall furnish two (2) soft copies and Three (3) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. SAMPLE DRAWING

NA

20. GUARANTEED TECHNICAL PARTICULARS

GENERAL TECHNICAL REQUIREMENTS				
S.	Description	11kV	33kV	
1	Service			
2	Rated voltage			
3	Rated			
4	Rated Lightning			
S	Rated primary			
6	Rated Power frequency dry withstand voltage			
7	Rated Power frequency Wet withstand voltage			



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8	Transformation Ratio (CT							
9	Rated continuous thermal current							
10	Short time thermal current rating for 1 second							
11	Rated dynamic current							
12	Core details	Core-1	Core-2	Core-3	Core- 1	Core-2	Core-3	
12.1	Accuracy class							
12.2	Rated burden							
12.3	Knee point voltage (Vk)							
12.4	Resistance of Secondary winding,							
12.5	Maximum Exciting Current mA at Vk/2							
12.6	Instrument security factor							
13	Tan Delta Value							
14	Limits of Current (ratio) Error and phase displacement for metering purpose							
15	Limits of Current (ratio) Error and phase displacement for protection							



	(a	
	core (As per IS/IEC)	
16	Limits of Current (ratio) Error for PS class (As per IS IEC)	
17	Maximum temperature rise over ambient temperature	
18	Minimum creepage for HT bushing	
19	Gauge of the tank	
20	Dimension of Tank (mm)	
21	Total Weight of Tank (kg)	
22	Weight of core and winding of CT (Kg)	
22	Bushing Distance between Metal	
23	Clearance Between HV to Earth (mm)	
24	Lifting Attangement	



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21. SCHEDULE OF DEVIATIONS (TO BE ENCLOSED WITH TECHNICAL BID)

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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

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

Seal of the Company:

Signature Designation