

TECHNICAL SPECIFICATION THREE PHASE LTCT METER

CONTENTS

- 1.0 SCOPE**
- 2.0 APPLICABLE STANDARDS**
- 3.0 CLIMATIC CONDITIONS OF THE INSTALLATION**
- 4.0 GENERAL TECHNICAL REQUIREMENTS**
- 5.0 GENERAL CONSTRUCTIONS**
- 6.0 NAME PLATE AND MARKING**
- 7.0 TESTS**
- 8.0 TYPE TEST CERTIFICATES**
- 9.0 PRE-DESPATCH INSPECTION**
- 10.0 INSPECTION AFTER RECEIPT AT STORE**
- 11.0 GUARANTEE**
- 12.0 PACKING**
- 13.0 TENDER SAMPLE**
- 14.0 QUALITY CONTROL**
- 15.0 MINIMUM TESTING FACILITIES**
- 16.0 MANUFACTURING ACTIVITIES**
- 17.0 SPARES, ACCESSORIES AND TOOLS**
- 18.0 DRAWING AND DOCUMENTS**
- 19.0 GURANTEED TECHNICAL PARTICULARS**

1	SCOPE	<p>This specification covers the technical requirements of design, manufacturing, testing at meter manufacturer's works ,packing, forwarding, supply and unloading at store/site of three phase four Wire,3x230 voltage,100/5A, 200/5A current transformer operated ac static meters of accuracy class 0.5S (here after referred as meters) complete with all accessories for efficient and trouble free operation with communication module (NIC) compatible with 4G technology.</p> <p>It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the TPXODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.</p>																														
2	APPLICABLE STANDARDS	<p>The equipment covered by this specification shall conform to the requirements stated in latest editions & amendments of relevant Indian/ IEC Standards and shall conform to the regulations of local statutory authorities.</p> <table border="1"> <tr> <td>a</td><td>IS 16444 part 2 : 2017</td><td>A.C. Static Transformer operated watt hour and VAR-hour meters, class 0.2s, 0.5s & 1.0S</td></tr> <tr> <td>b</td><td>IS 15959 Part 3 :2017</td><td>Data exchange for electricity meter reading, tariff and load control</td></tr> <tr> <td>c</td><td>IS 9000</td><td>Basic Environmental testing procedure for electrical and electronic items.</td></tr> <tr> <td>d</td><td>IS 12346:1999</td><td>Testing Equipment For Ac Electrical Energy Meters</td></tr> <tr> <td>e</td><td>IS 11000</td><td>Fire Hazard Testing</td></tr> <tr> <td>f</td><td>IEC 62052 Part 11 : 2003</td><td>Electricity metering equipment (AC) - General requirements , tests and test conditions – metering equipment</td></tr> <tr> <td>g</td><td>IEC 62053 Part 22 : 2003</td><td>Electricity metering equipment (a.c.) - Particular Requirements - Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)</td></tr> <tr> <td>h</td><td>IS 15707 : 2006</td><td>Testing Evaluation installation and maintenance of AC Electricity Meters- Code of practice.</td></tr> <tr> <td>I</td><td>IEC 60068</td><td>Environmental testing.</td></tr> <tr> <td>J</td><td>CBIP–TR No.325</td><td>Specification for A.C. Static Electrical Energy Meters (latest amendment)</td></tr> </table>	a	IS 16444 part 2 : 2017	A.C. Static Transformer operated watt hour and VAR-hour meters, class 0.2s, 0.5s & 1.0S	b	IS 15959 Part 3 :2017	Data exchange for electricity meter reading, tariff and load control	c	IS 9000	Basic Environmental testing procedure for electrical and electronic items.	d	IS 12346:1999	Testing Equipment For Ac Electrical Energy Meters	e	IS 11000	Fire Hazard Testing	f	IEC 62052 Part 11 : 2003	Electricity metering equipment (AC) - General requirements , tests and test conditions – metering equipment	g	IEC 62053 Part 22 : 2003	Electricity metering equipment (a.c.) - Particular Requirements - Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)	h	IS 15707 : 2006	Testing Evaluation installation and maintenance of AC Electricity Meters- Code of practice.	I	IEC 60068	Environmental testing.	J	CBIP–TR No.325	Specification for A.C. Static Electrical Energy Meters (latest amendment)
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		K	CEA Regulation (2006)	Installation and operation of meters Dtd: 17/03/2006.
		I	IS 60529	Degree of protection provided by enclosure
		j	IEC62056-61	Electricity metering- Object Identification system (OBIS)
3	CLIMATE CONDITIONS OF THE INSTALLATION	a) Max. Ambient Temperature : 70 deg.C b) Max. Daily average ambient temp.: 40 deg.C c) Min Ambient Temp : -10 deg C d) Maximum Humidity : 100% e) Minimum Humidity : 10% f) Average No. of thunderstorm days per annum : 50 g) Maximum Annual Rainfall : 760 mm h) Average No. of rainy days per annum : 60 i) Rainy months : June to Oct. j) Altitude above MSL not exceeding : 300 meters k) Wind Pressure : 126 kg/sq m up to an elevation at 10 m.		
		The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.3 g.		
4	GENERAL TECHNICAL REQUIREMENTS	S.No.	DESCRIPTION	REQUIREMENT
		4.01	Type of the meter	Three phase four wire, current transformer operated static watt-hour meter. It consisting of measuring elements(s),time of use of register(s) and display and plug in type bi-directional communication module all integral within the meter housing.
		4.02	Accuracy Class of the meter	0.5S
		4.03	Basic Current (Ib) & rated Maximum current (Imax)	Ib= 5A; Imax= 10 Amps
		4.04	Reference Conditions for testing the performance of the meter	Vref = 230 V Frequency = 50Hz Temperature= 27 °C
		4.05	Operating Voltage	Meter shall be operational with required accuracy from 0.6 Vref to 1.2 Vref. However meter shall withstand the maximum system Voltage of

			440V between phase and neutral (for minimum 5 min).
4.06	Operating Frequency		50 Hz \pm 5%.
4.07	Power Consumption		Voltage circuit: Maximum 5W and 15 VA Current Circuit :Maximum 1VA (The additional power requirement during data transmission shall not exceed 7W as mentioned in IS 16444 whichever is lower, per communication module)
4.08	Starting Current		5mA (0.1% of Ib)
4.09	Short time over Current		200 A for 0.5sec (20I _{max})
4.10	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 50° C.
4.11	Rated Impulse withstand voltage		6KV (shall be applied ten times with one polarity and then repeated with the other polarity and minimum time between each impulse to be 3 sec)
4.12	AC withstand Voltage for 1 min		4 KV
4.13	Minimum Insulation resistance at test voltage 500+/- 50 V dc a) Between frame & current ,voltage circuits as well as auxiliary circuits connected together: b) Between each current (or voltage circuit) & each and every other circuit. :		a) 5 M ohm b) 50 M ohm.
4.14	Mechanical requirements		Meter shall be in compliance with clause 12.3 of IS 14697 and IS16444 part 2
4.15	Resistance to heat and fire		The terminal block and Meter case shall ensure safety against the spread of fire. They shall 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.
4.16	Protection against penetration of dust and water.		Degree of protection: IP 51 as per IS 12063/60529, but Without suction in the meter. Meter shall comply with clause 6.9 and 12.5 of IS 14697

	4.17	Resistance against Climatic influence.	Meter shall be in compliance with clause 12.6 of IS 14697.
	4.18	Electromagnetic Compatibility (EMC)	Meter shall be in compliance with clause CBIP report 325 and IS14697
	4.19	Accuracy requirements	Meter shall be in compliance with clause 11 of IS 14697& IS16444 part-2.
	4.20	Power factor range	Zero lag to Zero lead. & meter shall be programed at default 'lag only configuration i.e. Lead to be treated as unity for kVA&KVAh calculations'
	4.21	Energy measurement	Fundamental energy +Energy due to Harmonics
	4.22	Connection Diagram	The connection diagram for the system shall be provided on terminal cover.
	4.23	Self Diagnostic feature	The meter shall have logging with date and time in memory for un satisfactory /non-functioning of (i)Real Time Clock (ii) RTC battery (iii) Non Volatile Memory (iv) NIC card status
	4.24	Initial start up of meter	Meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals.
	4.25	Alternate mode of supply to the meters	In case of meter power failure , reading/data should be retrieved with the help of battery.
	4.26	Sleep Mode	Meter shall not go in sleep mode. Display should not be 'off' at any point of time when power up.
	4.27	Internal diameter of the terminal holes Depth of the terminal holes	5mm (minimum) 20 mm (minimum)
	4.28	Clearance between adjacent terminals	10 mm (minimum)
	4.29	Display	Backlit LCD, Scrolling, 10 seconds for each parameter minimum 8 digits for reading LCD display
	4.30	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication, firmware selection from remote etc.
	4.31	<u>Software and communication compatibility</u>	<u>The bidder shall supply software required for local (MRI – conventional/4G) & remote (AMI) connectivity& Mobile Apk & BCS including required training to use the software free of cost.</u> <u>Following parameters may be updated multiple times during life cycle of meters over the air :</u>

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			Import mode to export Mode and vice versa. Accordingly Display parameters shall be updated remotely.
	4.32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However parameters like RTC,TOD slots, DIP(billing & load survey), display parameters, billing date, etc. shall be reconfigure through MRI and remotely over the air (OTA)and any other support will be provided without any additional cost to TPXODL till the useful life of the meters.
	4.33	Usage Application	Indoor and Outdoor
	4.34	Chemical Bonding	Meter cover and body should have seamless chemically bonded, so that meter should not open without leaving clear mark.
	4.35	Communication module of meter for AMI	As per clause no 1.4 (b) of IS 16444 part 2. Meter should have provision of communication module compatible with both the variant mentioned in IS 16444 part 2. This module should be able to get connected to the WAN network of service provider (4G) of TPXODL. TPXODL intends to leverage 4G as the primary communication technology with hot swappable . Meter should be able to provide required power supply to NIC card provided by communication provider recommended by TPXODL. Size /form factor of NIC card will be provided by TPXODL to the bidder and bidder should make necessary arrangement for the same.
	4.36	Communication Layer Protocol	Should be as per clause 8.3 of IS 16444 part 2
	4.37	Key Management and Security Feature	Should be as per IS 15959 part 2 and 3
	4.38	Harmonics recording	The meter should record the current and voltage THD.The meter should record harmonics up to 20th harmonic Average THD of all phase for voltage THD and current THD. THD values shall have 15 minutes integration period in load survey. Accuracy of



				harmonics recording shall be as per meter accuracy class. The meter shall generate a flag/event whenever the threshold (user configurable) of the 5% THD of the load current and voltage is breached.
		4.39	The terminal pin arrangement	The terminal pin shall be 12 pin,zig zag arrangement with phase voltage terminal in between current terminals as mentioned in clause no. 5.2.12&13 (LTCT Box Sample to be taken from TPCODL for Terminal Fitment Check .
		4.40	The preferred meter size shall be	235x300x120mm (further the bidder can check details space available in existing LTCT box at our TPCODL MMG store before design)

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4.1	NIC MODULE DETAILS & INTEGRATION	<p>With the service providers offering 4G services, TPXODL intends to leverage 4G as the communication technology</p> <ul style="list-style-type: none"> a) The Network Interface Card for 4G shall be modular and pluggable. The NIC shall be interoperable for service provider b) NIC card shall support remote Device Management Capability such as Reset, Configuration, Log Check, Ping, and over the air Firmware upgrade c) NIC shall support two-way communications between smart meter & head-end system such as data exchange, configuration parameters exchange, alarms, operational commands, firmware upgrade of the meter as defined in IS16444 and IS15959. d) NIC shall support push services, alarms services of the smart meter as defined in IS16444 and IS15959. e) 4G NIC card shall support communication protocols as prescribed by 4G HES supplier. f) NIC shall also support on-demand / schedule reading, time sync, configuration and over the air firmware upgrade from the head-end system. g) NIC shall have persistent network connectivity throughout as defined by 4G standards. It shall support self-configuring features. h) NIC shall operate 24*7 and shall recover from any deadlock situation immediately in the field. i) Support for possibility for provision of a unique certificate/key in each card for mutual authentication with the HES from security point of view. j) NIC shall support standard security protocols. k) NIC shall be compliant with cyber security norms. l) NIC shall register with network i.e. login and logout of each terminal to the HES. It shall be recognized in the HES as authorized node. m) Attributes such as Firmware version Billing profile ,Events and Instantaneous parameter, Midnight Profile Hardware version, Signal strength values, packet error rate, should be pushed periodically to HES for effective communication management. n) Billing profile once in a month Instantaneous parameter 4 times a day, Events once a day and alert as and when logged by meter , midnight profile once a day. Parameter Time of pushing of these profiles will be shared in GTP. o) Data must be encrypted with AES-256 bit. p) LED indication for System, Power ON indicator. q) Colour coded LED (a) For latching on to the network (b) For latched on to the network (c) For data flow indication. r) Meter display should have provision for showing if NIC card if : 1. Installed, 2. Getting Network, 3. Latched with HES, 4. Communicating with HES
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4.2	Communication capabilities and software feasibilities	<p>4.3.1 The meter shall have facilities for data transfer locally through Meter Reading Instrument (MRI) (Using optical port/NIC card) and remotely by 4G with proper security via Plug in type NIC. Data transfer locally through optical port via MRI is desired along with data transfer through NIC card. The data downloaded in MRI/hand held device shall be integrated to HES data base.</p> <p>4.3.2 It should be the responsibility of the bidder to ensure integration of meter into HES. For cellular fallback, the Module should have backward compatibility. The fall back provision shall be taken through optical port with external modem by TPXODL. Meter should be capable for sending all data from 4G NIC and optical port.</p> <p>4.3.3 It shall be possible to reconfigure the meters for RTC, TOD slots reprogramming, DIP (Demand Integration period), billing date ,display parameters etc. through proper authentication process locally through MRI & BCS and remotely over the air (OTA). Meter data should remain intact with timings. And billing should be done whenever any above mentioned attribute is changed. The change should be recorded as upgrade event.</p> <p>4.3.4 Necessary keys if required for performing this reconfiguration operation should also be provided along with supply of meter lot & training to TPXODL staff on how to use it free of cost. Bidder to provide this support on a later stage also on the request of TPXODL without any cost implication.</p> <p>4.3.5 Optical Communication port shall be available for communication. Communication ports shall not be affected by any type of injection /unauthenticated signals and having proper sealing arrangement. The complete data shall be downloaded within 5 minutes OTA.</p> <p>4.3.6 Bidder to ensure integration of meter data with head end for data transfer as mentioned in specification.</p> <p>4.3.7 Meter should be supplied to TPXODL along with integrated NIC card. NIC card should be plug in type with proper sealing arrangement.</p> <p>4.3.8 The bidder shall supply software required for local (MRI) & remote (AMI) connectivity including required training to use the software free of cost. Bidder shall provide the communication protocol / APIs for communication with meter through local (MRI) / remote (AMI) as and when required by TPXODL free of cost during life time of meter. The bidder should provide DLMS compliance for Communication with the meter at Optical port and at HES.</p> <p>4.3.9 Bidder should also provide software for changing/upgrading meter firmware in mass and should support integration of this software with HES. Bidder should also provide base computer software (BCS) for viewing the data downloaded through HES/MRI/laptop/HHU in separate PC/laptop. Android based or windows based HHU shall be preferred.</p>
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		<p>4.3.10 For purpose of exercising control, like outage management, the meter should send abnormalities at the consumers' end like Power failure (Last Gasp) instantly, Power Restoration (First Breath) as event. Additional exceptional events should also be communicated to HES by meter immediately after the occurrence through</p> <p>4.3.11 List of events to be reported should be configurable over the air(OTA). The meter should have "Last Gasp" and "First Breath" feature to facilitate sending alerts to the HES during fully powered off / On condition.</p> <p>4.3.12 If there are 2 requests given for communication one from HES and other from local device, request from local device should supersede.</p> <p>4.3.13 Last mile mesh network must support auto-registration and self-healing feature to continue operation using easiest possible available route in case of failure of any communication device in the mesh. Self-registrations in first communication.</p> <p>4.3.14 Meter Serial no will be used for tagging of all data of the meters in all database (at HES / MDM/ DCU level etc). However, it will be the responsibility of the Bidder to establish the complete communication solution involving all the meters in the system. Bidder should come out with it requirements for integration of meter with HES and MDMS clearly during tender submission.</p> <p>4.3.15 The Bidder's supplied meter with third party communication module should have suitable hand-shaking features to allow a third-party MDMS(procured by TPXODL) to configure, command, read and control smart meters installed at site. The Bidder shall extend all necessary assistance in developing the adaptor software through a third-party for facilitating the above.</p> <p>4.3.16 Integration of meter software's with HES / MDMS for seamless transfer of data will also be in scope of bidder till the expiry of warranty of the meters. It is desired meter firmware up gradation/selection should be available over the air. Meter should be able to change to import/export mode if required with firmware upgrade/Profile Activation. In Import/Export Mode meter should work in Lag only configuration during import Instances and forward metering mode should get deactivated The required firmware and any required support for integration with HES shall be provided free of cost till the useful life of the meter.</p> <p>4.3.17 Communication of the meter at optical port /OTA (WAN) should be as per IS 15959 (Part-2):2016. The optical port should be with proper lockable mechanism</p> <p>4.3.18 Communication NIC/network should be immune with any external Magnetic field/ESD/Jammer/HV voltage influence such that it shall not affect the normal overall functionality.</p> <p>4.3.19 Meter once powered up with NIC card should be self-detected by network and its basic name plate details & current readings are transferred to HES. Note- TPXODL Is also going to develop provision of downloading instantaneous data immediately after installation of the meter</p>
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4.3.20 The required OBIS codes will be finalized with successful bidder. The bidder can offer desired codes from Blue Book ensuring the codes reserved or standardized by Bureau of Indian standards. The reserved codes in BIS are to be used/utilized as per guidelines of BIS and remaining codes from blue book can be used for communication of additional features mentioned in this specifications. This is to be done strictly with written approval from TPXODL after verification of proposed codes by manufacturer. In future if BIS adds any OBIS codes then the bidders to provide upgraded firmware with desired changes after in consultation and approval of TPXODL competent authority.

4.3.21 Meter display should have provision for showing if NIC card if : 1. Installed, 2. Getting Network, 3. Latched with HES, 4. Communicating with HES If there are any other codes OEM to specify the same. Preferred codes as given in the table below.

Table : Error Details:-		
Sr. No	Error Details	
1	All Good	Err 00
2	Meter NIC Communication failure	Err 01
3	Modem Initialization failure	Err 02
4	SIM not detected	Err 03
5	SIM invalid	Err 04
6	No GSM Network Coverage	Err 05
7	GPRS Network Registration Failure	Err 06
8	GPRS Registration denied	Err 07
9	No APN Configured	Err 08
10	GPRS Connection not establish	Err 09
11	HES IP/Port not configured	Err 10
12	HES Port not Open	Err 11

4.3.22

4.3.23 If any tamper occurs in power off situation, it should be pushed as soon as the meter is powered on.

4.3.24 Bidder to provide facility for Up-gradation / Modification of Firmware till the usefull life of meter which is assumed to be atleast 10 years

4.3.25 Following parameters may be updated multiple times during life cycle of meters over the air :
Import mode to export Mode and vice versa
Accordingly Display parameters shall be updated remotely.

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4.3	Immunity against external influencing signals	<p>4.3.1 Magnetic Field:</p> <p>Meter shall record accurate energy in case of any external influencing signals in line with IS 14697:1999 Cl.11.2 and variation in limits of error (upto 100% I_{max}) shall be as per the table 13 of IS 14697. Meter shall be immune to any magnetic field such that it shall not affect the normal overall functionality However, in case of abnormal magnetic field as defined below meter shall perform as per the following actions:</p> <p>a. Meter shall log the event in its memory as" Magnet" with date and time stamp along with snapshot and the event logging threshold values as per table no. 1 in 4.5</p> <p>b. The energy recording to shift on I_{max}, V_{ref}. with UPF.</p> <p>Abnormal Magnetic field is defined as below;</p> <p>a. Continuous DC magnetic induction: >0.20 Tesla ± 5% (Value of the magneto motive force to be applied shall be generally >10000 AT.</p> <p>b. AC magnetic induction: >10 milli Tesla (if produced with circular metal core with square cross section as specified in CBIP latest report with 2800 AT)</p> <p>c. Permanent Magnet: Immune up to 0.5T and Event logging >0.5T.</p> <p>4.3.2Electrostatic Discharge (ESD)</p>
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		<p>Meter shall be immune up to 50 kV and shall record accurate energy as per IS-14697:1999/CBIP-325. Meter shall log the event into memory as 'ESD' with date & time stamp for any ESD greater than 50 kV with snap shot, the event logging threshold values as per table no. 1 in 4.5.</p> <p>4.3.3 The shielding around the meter shall be such that it does not get affected by high Voltage and high energy or low energy impulse when comes in contact with meter from any side.</p> <p>4.3.4 Meter should immune to high/low frequency jammer devices. Meter shall log the event in its memory as "JAMMER" with date and time stamp along with snapshot, the threshold values as per table no. 1 in 4.5.</p> <p>4.3.5 The meter should be immune or log the tamper on application of any other higher magnetic field of any frequency waves, micro waves like magnetron etc. the threshold values as per table no. 1 in 4.5.</p>
4.4	Neutral Disturbance & other tampers	<p><u>4.4.24.4.1</u> The meter shall not saturate on passage of direct current, which can cause the meter either to stop recording/ record inaccurately. DC injection shall be tested both in phase and neutral. Measurement by meter shall not get influenced by injection of Chopped signal/ DC signal/ DC pulse upto 330V and for any value beyond this. Meter shall log the event into memory as 'Neutral Disturbance' with date & time stamp the thresholds are as per table no. 1 in 4.5</p> <p><u>4.4.34.4.2</u> The meter should log event with snapshot when all three phase currents are zero and neutral current is present.</p> <p><u>4.4.44.4.3</u> An event to be provided for invalid phase association with name 'Invalid phase association'</p>
4.5	Abnormal Tamper conditions	<p>4.5.1 The meter shall record forward energy under all abnormal tampering conditions and shall be capable of recording occurrence and restoration of abnormal events listed below along with date & time and snap shots of individual voltages, currents, power factors, active energy and apparent energy at the time of occurrence of abnormal event and restoration of normal supply.</p> <p>4.5.2 For all tamper events the time stamp and snapshot parameters shall be recorded at the start time of event for occurrence (T1) and for restoration the time stamp and snapshot parameters shall be recorded at the end time of the event (T3).</p> <p>4.5.3 During abnormal & tamper conditions, the current shall be recorded as active current and line current. Each such event shall be provided with minimum count</p>

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of as per table no.1 to avoid missing of data amidst usual events (like power failure) due to the limitation of FIFO. Persistence time for occurrence and restoration for the events along with their threshold values shall be as per table no. 1 given below.

4.5.4 The events for which the restoration not occurred those should not be removed from meter memory and FIFO should not be applicable for unrestored event.

4.5.5 Tamper event logging along with snapshot during occurrences & restorations shall be as per table no.1. The smart meters manufacturing samples should start recording the abnormal influencing signals with intensity values as defined in the specifications.

4.5.6 All tamper/event logging thresholds values shall be configurable from remotes.

Table No.1

Persistence Time for Occurrences	Persistence Time for Restoration	Threshold Value for Occurrence of Events	Threshold Value for Restoration of Events	Compartment Size
ESD/JAMMER=immediate (record only 1 event on first application & only one event for next 1min) (ESD)	ESD/JAMMER = 0 Hr 01 Min 0 sec (ESD) (should restore after 1 min. of last application)	Immunity up to 50 KV with NIC and logging of event>50 KV	Removal of ESD/JAMMER signal	25
Magnet = 0 Hr2 Min 0 sec (MAG)	Magnet = 0 Hr 2 Min 0 sec (MAG)	>0.5 Tesla for permanent magnet OR DC magnetic induction >0.2T OR AC magnetic induction > 10 mT (of any frequency)	<0.5 Tesla for permanent magnet OR DC magnetic induction < 0.2T or AC magnetic induction <10 mT	25
Meter Top Cover Open (TC Open) Immediate	Meter Top Cover Open (TC Open) Immediate	If meter top cover is opened	NA	05 (Stay put Type)
Potential Missing = 0 Hr 10 Min 0 sec (PM)	Potential Missing = 0 Hr 2 Min 0 sec	Voltage < 70% of Vref AND current > 2% Ibasic	Voltage > 80% of Vref AND current > 2% Ibasic	25

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		Voltage Unbalance = 0 Hr 30 Min 0 sec (VU)	Voltage Unbalance = 0 Hr 2 Min 0 sec	20% or more between the phases and current > 2% Ibasic	Shall be less than 10 % between the phases and current > 2% Ibasic	25
		CT Open (phase wise) = 0 Hr 10 Min 0 sec	CT Open (phase wise) = 0 Hr 2 Min 0 sec	$I_r + I_y + I_b + I_n \geq 10\%$ of Ibasic (vector Sum) AND Phase current < 1% of Ibasic with All current positive	$I_r + I_y + I_b + I_n < 5\%$ of Ibasic. (vector Sum) AND Phase current > 10% of Ibasic with All current positive	25
		CT Reversal = 0 Hr 30 Min 0 sec (CTR)	CT Reversal = 0 Hr 2 Min 0 sec	Active current negative	Active current positive AND > 2 % Ibasic	25
		Current Unbalance = 0 Hr 30 Min 0 sec (CU)	Current Unbalance = 0 Hr 2 Min 0 sec	Current difference $\geq 20\%$ between phases for 100/5A (10% for 200/5A ratio) and I min 10% of Ibasic	Current difference <10% between the phases for 100/5A (5% for 200/5A) and I min >5% of Ib	25
		Low Power Factor = 0 Hr 30 Min 0 sec (LPF)	Low Power Factor = 0 Hr 2 Min 0 sec	$I > 1\%$ of Ib and Power Factor ≤ 0.5 in any phase	$I > 1\%$ of Ib and Power Factor ≤ 0.7 in respective phase	25
		Neutral Disturbance = 0 Hr 01 Min 0 sec (ND)	Neutral Disturbance = 0 Hr 2 Min 0 sec (ND)	Voltage >145% of Vref&Current >10% Ib OR Frequency < 47 Hz OR Frequency > 53 Hz OR DC voltage / signal/ pulse/ chopped signal injection	Voltage <115% of Vref&Current > 10% Ib AND Frequency > 47 Hz OR Frequency < 53 Hz	25
		Power On Off = 0 Hr 02 Min 0 sec	Power On Off = immediate	Actual Voltage off	Actual Voltage On	25
		Over Voltage = 0 Hr 30 Min 0 sec	Over Voltage = 0 Hr 2 Min 0 sec	Voltage > 130% of Vref	Voltage <110% of Vref	25

		Over current= 0hr 30min 0sec (OL)	Over Current = 0hr 2min 0sec	>Preset value (default value set at 120%lb)	I<100%lb	25
		Microwave immediate (record only 1 event on first application & only one event for next 1min)	Microwave 0 Hr 01 Min 0 sec (should restore after 1 min. of last application)	Any higher frequency magnetic waves, micro waves > 10 mT (or mutually decided)	Removal of device	25
		Temperature Rise = 0 Hr 30 Min 0 sec (TR)	Temperature Rise = 0 Hr 02 Min 0 sec (TR)	Temperature >70 C	Temperature <60 C	25 (Stay put type)
		NIC card Removed (Immediate)	NIC Card inserted (Immediate)	On removal of card *	On insertion of card	20
		Invalid Ph Association (Immediate)	PhAssociation (Immediate)	Change of phase Association	Restoration of phase Association	5
		<p>Note: "Meter shall have neutral CT for tamper identification and analysis."</p> <p>4.5.7 Meter shall latch & store cumulative count and cumulative durations all the tamper events which have logged /occurred/stored in memory of meter from the date of energization till life of meter. Total tamper storage should be as per table1 above.</p> <p>4.5.8 The meter shall record in export registers in case of reversal of all CT terminals. The meters are to be used for registration of energy consumed by the consumer,as such the meters shall be programmed for import mode and in case of reversal of energy direction (reversal of all CT terminals) meter shall register energy separately in export mode i.e. in case of CT reversal, meter shall record scalar (not vector sum) sum of energy.</p> <p>4.5.9 The meter shall register correctly if supply neutral is not available at the meter neutral terminal. The meter shall work in absence of any two incoming wires. It shall keep recording correctly in case of unbalance system voltage also as defined above.</p>				

		<p>4.5.10 The meter shall keep working accurately irrespective of the phase sequence of the supply. The meter shall be functional even if somehow change in the phase sequence takes place. Meter shall sufficiently record this event as reverse sequence.</p> <p>4.5.11 An event to be provided for invalid phase association with name 'Invalid phase association'</p> <p>4.5.12 The Meter Shall be able to differentiate between actual CT reversal and condition arising out of unbalanced / unhealthy capacitor bank. The logics for the same to be provided in tender samples also.</p> <p>4.5.13 The Cover Open tamper detection should be through heavy duty, sturdy two number micro switches with OR gate logic such that it should not log false event on vibration or impact during handling or testing.</p> <p>OEM should provide all required features as per OERC billing criteria in meter even if it is not mentioned in the specifications.</p>
4.6	Event compartments	<p>4.6.1 The event compartments shall be IS 15959 Part-1 table 9.</p> <p>4.6.2 The size of the event compartments should be such that all above events (in table no.1 and other required events defined in various clauses of this documents) are accommodated in the assigned event category compartment. i.e. if in case of voltage compartment assigned to 4 number of events then the minimum size of this compartment should be such that it should accommodate sum of all maximum number of events as marked above table 1 .</p> <p>4.6.3 Transaction events compartment size shall be minimum 100 events.</p>
5	GENERAL CONSTRUCTIONS	<p>The Meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially personal safety against electric shock, safety against effect of excessive temperature, protection against spread of fire, protection against penetration of solid objects, dust and water.</p> <p>All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions.</p> <p>The meters shall be designed and manufactured using SMT (Surface Mount Technology) components</p> <p>All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy as given below or any other equivalent make with the strict approval of TPXODL:</p>

S No	Component Function	Requirement	Makes and Origin
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	<u>USA</u> :Analog Devices, Cyrus Logic,Atmel, Phillips, Freescale semiconductor <u>South Africa</u> : SAMES <u>Japan</u> : NEC
2.	Memory chips/NVM	The memory chips should not be affected by the External parameters like sparking, high voltage spikes or electrostatic discharges. The life of NVM shall be 15 years.	<u>USA</u> : Atmel, National Semiconductors, Texas Instruments <u>Phillips</u> , Microchip <u>Japan</u> :Hitachi or Oki <u>Swiss</u> : STMicro
3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not be disturbed with the life of display. Should be with Green LED background. It should be trans-reflective STN type industrial grade with extended temperature range.	<u>Taiwan</u> :Holtek <u>Singapore</u> :Bonafied Technologies <u>Korea</u> :Advantek <u>China</u> : Xiamen,Truly semiconductor
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily. It should be magnetic locking type	<u>USA</u> : National Semiconductors <u>Holland / Korea</u> : Phillips <u>Taiwan</u> : MAXIM, Everlight <u>Japan</u> :Hitachi
5	P.C.B.	Glass Epoxy, fire resistance grade with minimum thickness 1.6 mm	<u>A class consumer</u>
6.	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	<u>USA</u> : National Semiconductors, Atmel,Phillips, Texas Instruments, Vishay <u>Japan</u> :Hitachi, Oki, AVX or Ricoh <u>Korea</u> : Samsung
7.	Battery	Lithium with guaranteed life of 15years	Varta / Tedirun/Vitzrocell / Sanyo

		8.	Micro controller and RTC having separate battery	The accuracy of RTC shall be as per relevant IEC / IS standards and RTC shall be provided with separate battery in its ckt.. The microcontroller shall be of superior quality from Reputed make with long life.	USA: Philips , Dallas, Atmel, Motorola <u>Japan:</u> NEC or Oki
		9.	Temperature sensor	Temperature sensor shall be internal to the meter and its accuracy shall be as per relevant IEC / IS standards. The OEM test report to be furnished. With good performance till life of meter.	USA: Philips , Dallas, Atmel, Motorola <u>Japan:</u> NEC or Oki
Note- Any Deviations related to above table needs prior Approval					
5.1	Meter Body	<p>5.1.1 Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II) with FV0 Fire Retardant, self - extinguishing, UV stabilize, recyclable and Anti oxidation properties.</p> <p>5.1.2 The minimum thickness of the meter enclosure shall be 2mm.</p> <p>5.1.3 Meter base shall be opaque with polycarbonate LEXAN 500R or equivalent on prior approval from the TPXODL. (If different material offered the bidders should submit material data sheet in technical bid)</p> <p>5.1.4 Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the TPXODL. (If different material offered the bidders should submit material data sheet in technical bid)</p> <p>5.1.5 Meter cover & base shall be provided with continuous and seamless chemical welding such that it is not opened without breaking the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence. The damage evidences should be visible externally& should be traceable in such a way that attempts can be proved in court of law.</p> <p>5.1.6 The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s).</p> <p>5.1.7 During meter manufacturing the meter seal fixing should be tightened such that the seal body should be close to meter body.</p> <p>5.1.8 Unidirectional screws to be used on meter covers where ever required.</p> <p>5.1.9 The Meter body shall be such that the liquid or chemical shall not reach the electronic parts if liquid is injected from any side of meter body such as meter</p>			

		terminals, push button, display, NIC card casing etc. Necessary protection and water tight sealing to be provided at terminals and Push buttons etc.
5.2	Terminals, Terminal Block	<p>5.2.1 Terminal block should be in single mould with meter body base. (Not separate)</p> <p>5.2.2 After any attempts the terminal block should not be able to disengaged, opened or loosen from any side. Any attempt to disengage the terminal block should certainly damage the meter body with physical evidences. The damage evidences should be visible externally & should be traceable in such a way that attempts can be proved in court of law.</p> <p>5.2.3 Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block adequate testing of materials shall be taken into account.</p> <p>5.2.4 Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the Heat Deflection temperature test given in ISO 75 for temperature of 135°C and pressure of 1.8MPa as mentioned in IS 14697. Tested as per ISO 75-2/A or ASTM D648.</p> <p>5.2.5 The terminal block shall be of opaque with polycarbonate LEXAN500R or equivalent on prior approval from the TPXODL. (If different material offered the bidders should submit material data sheet in technical bid)</p> <p>5.2.6 The terminals and connections shall be suitable to carry up to 100 % of I_{max} continuously. The size, design & material of Busbar /Shunt/Terminal shall be with suitable cross sectional area so that temperature rise will not be more than 20 °C above ambient temperature of 45°C at 100% of I_{max} loading for 06 hrs continuous. This test of temp. rise shall be done on tender samples & will also be done on any samples from any supplied lot.</p> <p>5.2.7 The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.</p> <p>5.2.8 The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Terminal & screw should not be damaged during regular opening and tightening.</p> <p>5.2.9 Internal diameter of the terminal holes shall be minimum 5 mm; minimum clearance between adjacent terminals shall be 10 mm. Minimum Depth of the terminal holes shall be of 20 mm. all terminals and screws should be nickel plated brass material. With (-) heads</p> <p>5.2.10 Minimum two number of terminal screws to be provided per terminal wire.</p>

		<p>5.2.11 Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.</p> <p>5.2.12 Meter terminal should have 12 pins, zig zag arrangement. Pin Diagram and measurements to be provided by TPCODL</p> <p>5.2.13 Pin configuration shall be R-Cin, R volt, R-Cout, Y-Cin, Y volt, Y-Cout, B-Cin, B-volt, B-Cout, Neutral-in, N, N-out</p> <p>5.2.14 The preferred meter size shall be HxWxT= 235x300x120mm. Height is from the base of the terminal block. Further the bidder can check the dimensions and space availability in the existing TPCODL meter boxes at our MMG department for accommodating the smart meters in same boxes and meter body design should be such that it should be fitted with the proper terminal arrangement in existing LTCT boxes of TPCODL.</p>
5.3	Terminal Cover	<p>5.3.1 Terminal cover shall be short type and transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the TPXODL.</p> <p>5.3.2 Appropriate space shall be available for incoming /out going cables without damaging/stressing terminal cover (terminal cover design shall be as per the TPXODL approval). After sealing the cover, terminals shall not be accessible without breaking the seals.</p> <p>5.3.3 The terminal cover design should be such that the sealing screw locking provision on cover should have min dimension of 3mmx3mm. (Excluding seal lock hole)</p>
5.4	Sealing of meter, terminal cover, SIM Card installation and NIC cover	<p>5.4.1 Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons.</p> <p>5.4.2 For this, one no. Polycarbonate seal and three no. Hologram seal with unique serial numbers (on Left, Right & Top side) shall be provided by the bidder.</p> <p>5.4.3. One polycarbonate seal shall be provided by the TPXODL. This seal shall be fix on right hand side of meter.</p> <p>5.4.4. All the seals with unique serial numbers shall be fixed on meter body by the bidder at his works before calling for inspection.</p> <p>5.4.5 Two sealing provision shall be provided at meter terminal cover, such that terminal shall not be accessible without breaking the seals. All the seals shall be provided on front side only and as per the TPXODL specification. Rear side sealing arrangement shall not be accepted. Bidder shall provide seals be as per CEA regulation (2006). Only patented seals to be used as per CEA requirements.</p>

		<p>5.4.6 The bidder shall provide TPXODL(MMG store and MTL) the soft record of polycarbonate seal and hologram seal serial number and NIC card serial number used against each meter serial number along with its position (RHS/LHS/Top/ NIC Cover) in tabular form for every lot of meter</p> <p>5.4.7 Plug in type NIC card cover should have proper sealing arrangement. Sim Cards should be inserted in the meter before dispatched ,details of meter with respective SIM Card should be provided before GRN is done at TPXODL Central Store. One SIM card per meter will be provided by TPXODL. Keys of meter should also be provided at this stage to respective engineer of TPXODL without marking copy of this E-Mail to any other person</p>										
5.5	TOD Feature	<p>The meter shall be capable of measuring Cumulative Energy (kWh &kVAh), and MD (kW & kVA) with time of day (TOD) registers having 8 zones & 02 seasons (no. of zones& time slot shall be programmable by MRI/ Over the air with adequate security level and in one to one /broadcast mode over the air). Current TOD (during tender) to be given is as below,</p> <table><tr><th>Time Slot</th><th>Remarks</th></tr><tr><td>0000 to 0800 AM</td><td>Normal Hour</td></tr><tr><td>0800AM TO 0400PM</td><td>Solar Hour</td></tr><tr><td>0400PM TO 0600PM</td><td>Normal Hour</td></tr><tr><td>0600 PM To 1200 Mid Night</td><td>Peak Hour</td></tr></table> <p># The bidder to ask TPXODL for latest TOD timing slots before manufacturing of every lot.</p>	Time Slot	Remarks	0000 to 0800 AM	Normal Hour	0800AM TO 0400PM	Solar Hour	0400PM TO 0600PM	Normal Hour	0600 PM To 1200 Mid Night	Peak Hour
Time Slot	Remarks											
0000 to 0800 AM	Normal Hour											
0800AM TO 0400PM	Solar Hour											
0400PM TO 0600PM	Normal Hour											
0600 PM To 1200 Mid Night	Peak Hour											
5.6	MD Integration	<p>The MD integration period shall be 15 minutes (integration period-programmable by MRI at site and also thru AMR with adequate security level). The MD resetting shall be automatic at the 1st of the month i.e. 0000 hours of 1st day of the month. Manual MD reset button shall not be available. Last 6 MD values shall be stored in the memory and one to be displayed in the Auto scroll mode. MD shall be recorded and displayed with minimum three digits before decimal and minimum two digits after decimal points.MD integration shall be of sliding Type at an interval of 5 min.</p>										

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5.7	Parameters in BCS	<p>All these parameters shall be downloaded locally or remotely and interpreted in PC/Laptop. All the parameters shall be recorded and memorized in its Non volatile Memory (NVM). The corresponding non volatile memory shall have a minimum retention time of 10 years. Last twelve months history data (kWh & kVAh* (lag only) cumulative & TOD reading and MD(kW & kVA* (lag only) current, history & TOD) with data and time) and at least last 25 tamper events for each tamper shall be available in the non volatile Memory.</p> <p>Fail' to be log in memory in the following conditions only in BCS not in display</p> <ul style="list-style-type: none"> a) RTC fail b) NVM memory fail c) Battery fail d) NIC card status <p>'High THD' to be log in memory in the following conditions only in BCS not in display</p>
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		<div>e) THDV any phase higher than threshold</div> <div>f) THDI any phase higher than threshold</div> <div>*Meter shall be programed at default 'lag only' configuration i.e. Leading power factor to be treated as unity for kVA & kVAh calculations.</div> <div>All the parameters shall be as per actual without multiplying factor.</div>																																
5.7.1	Load survey(for pre-paid &postpaid meter mode)	<div>The meter shall be capable of recording 15 minutes average of the following parameters for at least last 45 days</div> <div>a) Voltage for each phase</div> <div>b) Current of each phase</div> <div>c) Actual Neutral current</div> <div>d) Average PF</div> <div>e) Average kWh</div> <div>f) Average kVAh (lag only)</div> <div>g) kVArh(Lagging)</div> <div>h) kVArh(Leading)</div> <div>i) Demand KW</div> <div>j) Demand KVA</div> <div>k) THD Voltage phase wise</div> <div>l) THD Current phase wise</div> <div>Meter shall be capable of recording daily Energy and Demand 00:00 to 24:00 Hrs kWh/kVAh, kW/kVA in BCS for 45 days. Midnight energy value of cumulative kWh/kVAh and daily consumption kWh/kVAh should be available in meter memory for last 45 days. Load survey data should be at least with 3 decimal place.</div>																																
5.7.2	Instantaneous Parameters	<div>Meter shall be capable for following Instantaneous Parameters in Memory and should be available in BCS.</div> <table><tr><td>Meter Sr.No.</td><td></td></tr><tr><td>Meter Type</td><td></td></tr><tr><td>Meter date & Time</td><td>DD MM YYYY HH MM SS</td></tr><tr><td>Voltage –R</td><td>000.000V</td></tr><tr><td>Voltage –Y</td><td>000.000V</td></tr><tr><td>Voltage –B</td><td>000.000V</td></tr><tr><td>Line Current -R</td><td>00.000A</td></tr><tr><td>Line Current -Y</td><td>00.000A</td></tr><tr><td>Line Current -B</td><td>00.000A</td></tr><tr><td>Actual Neutral Current</td><td>00.00A</td></tr><tr><td>Active Current –R</td><td>00.000A</td></tr><tr><td>Active Current –Y</td><td>00.000A</td></tr><tr><td>Active Current –B</td><td>00.000A</td></tr><tr><td>Reactive Current-R</td><td>00.000A</td></tr><tr><td>Reactive Current-Y</td><td>00.000A</td></tr><tr><td>Reactive Current-B</td><td>00.000A</td></tr></table>	Meter Sr.No.		Meter Type		Meter date & Time	DD MM YYYY HH MM SS	Voltage –R	000.000V	Voltage –Y	000.000V	Voltage –B	000.000V	Line Current -R	00.000A	Line Current -Y	00.000A	Line Current -B	00.000A	Actual Neutral Current	00.00A	Active Current –R	00.000A	Active Current –Y	00.000A	Active Current –B	00.000A	Reactive Current-R	00.000A	Reactive Current-Y	00.000A	Reactive Current-B	00.000A
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Reactive Current-B	00.000A																																	

	Power factor-R	0.000	
	Power factor-Y	0.000	
	Power factor-B	0.000	
	Average Power factor	0.000	
	Instantaneous Frequency	00.000Hz	
	Instantaneous Load	Active ,Reactive Lag/Lead, Apparent	
	Present Cumulative Energy	Active ,Reactive Lag/Lead, Apparent	
	Cumulative PowerOff Duration	00000	
	Cumulative PowerON Duration	00000	
	Cumulative Tamper count	00000	
	Cumulative Tamper duration	00000	
	Cumulative Billing Count	00000	
	Last Billing date	dd:mm:yy	
	No of Power failure	00000	
	Vector/phasor diagram (also showing neutral current) In case one of the voltage is missing, vector should be madewith2 phase voltage and all currents.		
	General Information	<u>Meter shall be capable for providing below mentioned general parameters in memory</u> <u>Meter Serial number</u> <u>Software Name</u> <u>Version</u> <u>Manufacture Name</u> <u>Manufacture Date (MM/YY)</u> <u>Meter Type</u> <u>Meter Class Meter Constant</u> <u>Meter Voltage Rating Meter Current Rating</u> TOD profile showing timing and seasons #NIC Sr.no. NIC make	

		# if any additional key is required to see this value, it should be provided without any additional cost to TPXODL.
5.7.4	Billing Parameters	<p>1) Cumulative kwh, kVAh (lag only), kVArh lead, lag (all import and export) and TOD1 kWh,TOD2 kWh,,TOD1 kVAh (lag only),TOD2 kVAh (lag only),, For present and last 06 Resets (reset date for all resets/history, time zone register wise)</p> <p>2) Maximum Demand Absolute Active Load and Absolute Apparent load and TOD1 kW,TOD2 kW,TOD3 kW,TOD1 kVA (lag only),TOD2 kVA (lag only), for present and last 06 Resets (reset date for all resets/history, time zone register wise) along with date and time stamp.</p> <p>3) Billing Dates (6 History)</p> <p>4) Cumulative Billing count</p> <p>5) TOD details with day time and season wise.</p> <p>6) Monthly power On/Off hours</p> <p>Last five modes with date & time of switching with cumulative energy parameters kWh, kVAh (lag only), kVArh lead, lag (all import and export) and TOD1 kWh,TOD2 kWh,TOD1 kVAh (lag only),TOD2 kVAh (lag only),</p> <p>Note : Meter must have provision of 8 time zones.</p> <p>Meter Should push mid night reads with all billing parameters and rising demand for KW and KVA on daily basis all the related data should be pushed at 3 AM on daily basis .</p>
5.7.5	Transactions	All the changes in software of meter to be logged along with date & time stamp and readings indicating the particular parameter which has been programmed. Meter should do billing if any billing related transaction is done.
5.7.6	Tamper Events	<p>All events should be logged as per table no-1.</p> <p>The meter should not have any other event logging or any logic other than desired in specs. If any other logic is present then bidder has to disclose during tender and offering of lot and get approval for same. All other logics not mentioned in specs should be removed or disabled in meter firmware if not approved by TPXODL.</p>

5.8	Display units	The display unit shall be Pin type built-in liquid crystal display (Permanently backlit type LCD). The LCD shall be of STN (Super Twisted Nematic) construction suitable for maximum temperature withstands 65°C and minimum temperature withstands 0 °C during normal operating condition. The LCD display shall have a wide viewing angle of 120 degree. When the meter is not energized the electronic display need not be visible. The display shall not be affected by electrical, magnetic disturbances and ESD.
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		# if any additional key is required to see this value, it should be provided without any additional cost to TPXODL.
5.7.4	Billing Parameters	<p>1) Cumulative kwh, kVAh (lag only), kVArh lead, lag (all import and export) and TOD1 kWh,TOD2 kWh,,TOD1 kVAh (lag only),TOD2 kVAh (lag only),, For present and last06 Resets (reset date for all resets/history, time zone register wise)</p> <p>2) Maximum Demand Absolute Active Load and Absolute Apparent load and TOD1 kW,TOD2 kW,TOD3 kW,TOD1 kVA (lag only),TOD2 kVA (lag only), for present and last 06 Resets (reset date for all resets/history, time zone register wise) along with date and time stamp.</p> <p>3) Billing Dates (6 History)</p> <p>4) Cumulative Billing count</p> <p>5) TOD details with day time and season wise.</p> <p>6) Monthly power On/Off hours</p> <p>Last five modes with date & time of switching with cumulative energy parameters kWh, kVAh (lag only), kVArh lead, lag (all import and export) and TOD1 kWh,TOD2 kWh,TOD1 kVAh (lag only),TOD2 kVAh (lag only),</p> <p>Note : Meter must have provision of 8 time zones.</p> <p>Meter Should push mid night reads with all billing parameters and rising demand for KW and KVA on daily basis all the related data should be pushed at 3 AM on daily basis .</p>
5.7.5	Transactions	All the changes in software of meter to be logged along with date & time stamp and readings indicating the particular parameter which has been programmed. Meter should do billing if any billing related transaction is done.
5.7.6	Tamper Events	<p>All events should be logged as per table no-1.</p> <p>The meter should not have any other event logging or any logic other than desired in specs. If any other logic is present then bidder has to disclose during tender and offering of lot and get approval for same. All other logics not mentioned in specs should be removed or disabled in meter firmware if not approved by TPXODL.</p>
5.8	Display units	The display unit shall be Pin type built-in liquid crystal display (Permanently backlit type LCD). The LCD shall be of STN (Super Twisted Nematic) construction suitable for maximum temperature withstands 65°C and minimum temperature withstands 0 °C during normal operating condition. The LCD display shall have a wide viewing angle of 120 degree. When the meter is not energized the electronic display need not be visible. The display shall not be affected by electrical, magnetic disturbances and ESD.

		<p>The display should be readable in direct sunlight. The back lit must be green in color for good visibility of digits in sunlight.</p> <p>The kWh &kVAh register shall have minimum 8 digits reading LCD display and size of the digits shall be minimum 10mmx5mm. Cumulative energy (kWh &kVAh) shall be displayed without decimal in auto scroll mode. (However decimal shall be available in push button mode for high resolution display for testing).</p> <p>All the parameters shall be as per actual without multiplying factor.</p>														
5.8.1	Auto Scroll mode	<p>Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (I.e. if MD1 is displayed in Auto scroll mode, Header (MD1) and value (say 025.238 kW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 10 sec, if push button is not operated. Display should not be stuck for any tamper events. The cumulative energies shall not have any decimal value.</p> <p>Following shall be continuously displayed in auto scroll and push button mode in the given order;</p> <table><tr><th>Sr. No.</th><th>Auto Scroll Display</th></tr><tr><td>1</td><td>LCD CHECK</td></tr><tr><td>2</td><td>Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.</td></tr><tr><td>3</td><td>dd:mm:yy Date</td></tr><tr><td>4</td><td>hh:mm:ss Time</td></tr><tr><td>5</td><td>C kWh Current Cumulative kWh</td></tr><tr><td>6</td><td>C kVAh (lag only) </td></tr></table>	Sr. No.	Auto Scroll Display	1	LCD CHECK	2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.	3	dd:mm:yy Date	4	hh:mm:ss Time	5	C kWh Current Cumulative kWh	6	C kVAh (lag only)
Sr. No.	Auto Scroll Display															
1	LCD CHECK															
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.															
3	dd:mm:yy Date															
4	hh:mm:ss Time															
5	C kWh Current Cumulative kWh															
6	C kVAh (lag only)															

		20	Cumulative Billing count
		21	R Phase Voltage (Instantaneous value).
		22	Y Phase Voltage (Instantaneous value).
		23	B Phase Voltage (Instantaneous value).
		24	R Phase Current (Instantaneous value).
		25	Y Phase Current (Instantaneous value).
		26	B Phase Current (Instantaneous value).
		27	Instantaneous power factor Phase Wise PF1,PF2,PF3 with sign
		28	Instantaneous load in KW
		29	Instantaneous load in KVA
		30	Voltage Sequence R,Y,B
		31	Current Sequence R,Y,B
5.8.2	Push Button Scroll mode	Following parameters shall be displayed in Push button mode in the given order.	
		Sr. No.	Push Button Display
		1	LCD CHECK
		2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.
		3	dd:mm:yy Date
		4	hh:mm:ss Time
		5	C () kWh Current Cumulative kWh
		6	C) kVAh (Lag only) Current Cumulative kVAh
		7	C kVAh lag Current Cumulative kVAh(lag).
		8	C kVAh lead Current Cumulative kVAh(lead).
		9	Individual cumulative kWh for T1,T2,T3,T4
		10	Individual cumulative kVAh(Lag only) for T1,T2,T3,T4
		11	Current MD – kW
		12	Current MD - kVA (lag only)
		13	H 1 kWh kWh reading on 1st of last month at 00.00 hrs.
		14	H 1 Individual cumulative kWh for T1,T2,T3,T4 for last month
		15	H 1 MD in kW on 1st of last month at 00.00 hrs.
		16	H 1 kVAh (Lag only) reading on 1st of last month at 00.00 hrs.
		17	H 1 Individual cumulative kVAh(Lag only) for T1,T2,T3,T4 for last month
		18	H1 MD in KVA on 1st of last month at 00.00 hrs
		19	H 1 Avg. pf
		20	Cumulative Billing count

		21	R Phase Voltage (Instantaneous value).
		22	Y Phase Voltage (Instantaneous value).
		23	B Phase Voltage (Instantaneous value).
		24	R Phase Current (Instantaneous value).
		25	Y Phase Current (Instantaneous value).
		26	B Phase Current (Instantaneous value).
		27	Instantaneous power factor for individual phases R,Y,B
		28	Instantaneous load in kW
		29	Instantaneous load in kVA
		30	Voltage phase sequence R, Y, B
		31	Current phase sequence R, Y, B
		32	In High resolution Cumulative kWh
		33	In High resolution Cumulative kVAh (lag only)
		34	In High resolution Cumulative kVAh Lag
		35	In High resolution Cumulative kVAh Lead
		36	MAG 00 (cumulative count)
		36a	Date of last occurrence
		36b	Time of last occurrence
		37	ESD 00 (cumulative count)
		37a	Date of last occurrence
		37b	Time of last occurrence
		38	TC OPEN 00 (cumulative count)
		38a	First occurrence date
		38b	First occurrence time
		39	Total tamper count 0000
		High Resolution Display	
		SI No	2+4 Digits after Decimal
		1	Cumulative Kwh,
		2	Cumulative KvAh
		3	Cumulative Kvarh (Lag)
		4	Cumulative Kvarh (Lead)
		Meter display should be locked in high resolution mode by holding the push button for 10 seconds and meter should come out of high resolution mode after 5 Minutes if no further command is given .	

5.9	Output Device	<p>5.9.1 Pulse Rate: The meters shall have a suitable test output device. 2 nos of Red color blinking LED (marked as imp/kWh and imp/Kvarh) shall be provided in the front. This device shall be suitable for using with sensing probe used with test benches or reference standard meters. The test output device shall have constant pulse rate of (preferred value- 400) pulse / kWh & pulse/kVArh. Meter constant shall be indelibly printed on the name plate as imp / kWh & imp/kVArh.</p> <p>Meter constant shall be as per actual without multiplying factor.</p> <p>5.9.2 Communication LCD indicator- The meter shall be provided with with suitable LCD indication for communication in progress.</p> <p>5.9.25.9.3 <u>Phase indication : Individual phases should be displayed on LCD display of meter</u></p>
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		<p>5.9.3 Phase Indication : Individual phases should be displayed on LCD display of meter</p>
6.0	<p>NAME PLATE AND MARKING</p>	<p>Meters shall have a name plate clearly visible and effectively secured against removal. The name plate data should be laser printed. The base color of Name plate shall be blue(as of TPXODL logo)Indelibly and distinctly marked with all essential particulars as per relevant standards along with the following.</p> <ol style="list-style-type: none"> Manufacturer's name Type designation Number of phases and wires Serial number (Meter serial number shall be laser printed on name plateinstead on sticker). Month and Year of manufacture Unit of measurement Reference voltage ,frequency Ref. temperature if different from 27 deg. C Rated basic and maximum Current Meter constant (imp/kWh) Meter constant (imp/kVArh) 'BIS' Mark Class index of meter "Property of TPXODL" Purchase Order No. & date Guarantee period. Rated frequency Sign of double square Country of manufacture. Firmware version for meter Category Communication Tech for WAN and NAN(with carrier frequency) Communication Technology is IHD supported (with carrier frequency). <p>However the following shall be printed in bar code/QR Code 1 on the meter nameplate.(shall be laser printed on name plate instead of any sticker).</p> <ol style="list-style-type: none"> 1) Manufacturer's Name . 2) Meter Sr. No 3) PO Number Month/Year of manufacture.

		<p>Barcode /QR Code -2 Serial No details Given by TPXODL</p> <p>Barcode/QR Code 3 NIC card Serial No to be provided on NIC Card through QR/Bar Code</p> <p>The PCB Serial number should be printed on PCB instead of sticker. Content Format for bar code: XXXXXXXXX(9-digit Serial no.)</p> <p>Bidder should ensure that NIC provided in meters are having laser printed Sr. No., MFG date, 'Property of TPXODL' marked, PO date and no. (same as that of meter PO)</p>
7.0	TESTS	All routine, acceptance & type tests shall be carried out on the meter and meter body separately in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the TPXODL/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted in addition to the tests specified in IS/IEC.
7.1	TYPE TEST	<ol style="list-style-type: none"> 1) All tests as defined in IS 16444 part-2 and IS 15959(Part-3):2016 2) Test against abnormal magnetic influence as per CBIP TR 325. 3) Smart meter communicability as per 15959 part-3 4) Meter shall be type tested as per BIS16444 part-2
7.2	ROUTINE TEST	<ol style="list-style-type: none"> 1) AC High Voltage test 2) Insulation test 3) Test on limits of error 4) Test of starting current 5) Test of no load condition 6) Communication check of NIC
7.3	ACCEPTANCE TEST	<ol style="list-style-type: none"> 1) AC High Voltage test 2) Insulation test <p>Test on limits of error</p> <ol style="list-style-type: none"> 3) Test of meter constant 4) Test of starting current 5) Test of no load condition 6) Test of repeatability of error. 7) Test of power consumption. <p>8)Test for Immunity against external influencing signal as per the TPXODL specification</p> <ol style="list-style-type: none"> 9) Test for Immunity against DC Immunity as per the TPXODL specification 10) Test for Immunity against Tamper conditions as per the TPXODL specification 11) Error measurements with all abnormal condition along with ESD, magnet, jammer 12) Test to Influence of Harmonics 13) Supply voltage and frequency variation test 14) Testing of self diagnostic features 15) Tamper count increment and logging with date and time in meter database 16) All tests as defined in IS 15959(Part-2):2016

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		<p>18) Functionality of communication module is 16444 part2</p> <p>19) smart meter communicability as per provision of 28 IS 15959 (part-3)</p> <p>20) Meter reading on HES demand, Scheduled meter reading from HES, remote firmware upgrade from HES and all programming request from HES to be simulated and checked during inspections.</p> <p>21) Physical check of NIC and replaceable ease of the NIC module in meter & logging</p> <p>22) Any other test required as per latest IS 16444, 15999 and relevant parts shall be tested during inspections.</p>
7.4	Special Test	<p>The bidder shall demonstrate the communication capability of the meter through communication modes as defined in the specification before conducting acceptance tests.</p>
8.0	TYPE TEST CERTIFICATE	<p>The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ ERDA/ UL laboratory as per BIS 16444 part-2. For communication testing any national approved laboratory or international acclaimed lab or equivalent will also suffice at the discretion of TPXODL.</p> <p>For technical evaluation of the tender, we may consider Type test report as per IS 14697. In such case the Bidder should provide IS16444-2 compliant test report before starting of supply of meters. Type test 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 or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPXODL.</p>
9.0	PRE-DESPATCH INSPECTION	<p>Inspection may be made at any stage of manufacture at the discretion of the TPXODL of the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection.</p> <p>Equipment shall be subject to inspection by a duly authorized representative of the TPXODL. Bidder shall grant free access to the places of manufacture to TPXODL's representatives at all times when the work is in progress. Inspection by the TPXODL 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 TPXODL.</p> <p>Following documents shall be sent along with material</p> <ol style="list-style-type: none"> Pre Dispatch inspection reports MDCC issued by TPXODL Invoice in duplicate Packing list

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		<p>e) Drawings & catalogue f) Delivery Challan g) Other Documents (as applicable) h) Guarantee / Warrantee card i) Meter No wise Seal & SIM Card details as per pre approved format j) Routine test report in hard copy to be provided alongwith each meter packed inside the meter box. Soft copy of the same to provided separately</p> <p>Note-Photographs of packed lot clearly showing s.no of meters whose inspection call has been requested should be sent along with letter for inspection call.</p> <p>Two meters from the offered lot shall be tested for all tampers at TPXODL laboratory for compliance to anti tamper feature before MDCC. The inspectors shall free to take any two meters from offered lot for testing at our Lab.</p> <p>Bidder should check and ensure each meter and reset each meter for any event logged for any tamper.</p>
10.0	INSPECTION AFTER RECEIPT AT STORE	<p>The material received at TPXODL's 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 Plant Engineering department.</p>
11.0	GUARANTEE	<p>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 is found by the TPXODL up to a period of at least 60 months from the date of commissioning or 66 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 its own costs, within mutually agreed time frame, and to the entire satisfaction of the Company, failing which the TPXODL 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.</p> <p>In the event of any defect in the equipment/materials, arising out of faulty design, inferior quality of raw material used or bad workmanship within the guarantee period, the seller shall guarantee to replace/repair to the satisfaction of purchaser- TPXODL the defective equipment/materials free of cost. Should however the manufacturer fails to do so within a reasonable time , the purchaser reserves the right to recover the amount form the seller either from the bills pending or may recover from the performance guarantee submitted by the Firm.</p> <p>If during the defect liability period any services performed found to be defective, these shall be promptly rectified by seller at its own cost (including the cost of dismantling and reinstallation) on the instructions of the purchaser.</p> <p>The rate of failure of meters within guarantee period shall not exceed more than 1% of the entire supplied quantity (lot wise). In exceeding the rate of failure by 1% TPXODL reserves the right to forfeit and invoke the CPBG.</p> <p>Bidder shall own responsibility for all internal component with an end to end agreement with individual component manufacturer.</p>



12.0	PACKING	<div><div>1. Bidder shall ensure that all material covered under 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 material used for packing shall be environmentally friendly. Packing and transportation shall be as per IS15707:206 clauses 9.1 and 9.2.</div><div>2. Individual meter should be packed in separate box. Routine test report (with manufacturing company logo) of the individual meter shall be kept inside each card board carton of the meter.</div><div>3. On back side of routine test certificate(RTC) the bidder shall print a picture of the meter with its small details like for consumer to know about meter or display parameters sheet.</div><div>4. The softcopy of the routine test certificate of each meter to be provided with each lot to TPXODL, MMG stores.</div><div>5. QR Code should be provided in meter cartoon in which meter serial no to be provided. These QR code should be readable using QR code scanner without changing the position of meter.</div><div>6. Cartoon Box should have suitable strength to stack them indoor store upto height of 6 cartoons.</div></div>
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13.0	SAMPLE	<p>Tendering stage:</p> <p>Bidders are required to manufacture 03 numbers of sample meters as per the TPXODL specification (sealed, unsealed and openable base and cover to view/test the inner circuits) and submit the samples (non-returnable) along with bid for approval. The tender sample as per IS 16444 part 2 & IS 15959 shall be acceptable for verification and other checks. The samples shall be retained at TPXODL.</p> <p>Address of Dispatch: Meter Testing Lab.TPXODL</p> <p>Pre-manufacturing approvals:</p> <p>The successful bidder shall submit four prototype samples of meters at Meter Testing Lab, at location informed by TPXODL during submission time, for further testing and compliance as per specifications and get approval before mass manufacturing.</p> <p>Following accessories to be submitted along with sample at both stages:</p> <ol style="list-style-type: none">1) Detailed manual2) Communication cords3) Tamper logic sheet4) Display parameter annunciator5) BCS6) Internal connection diagram. <p>All meters shall be supplied with 4G enabled Sim cards. Bidder to demonstrate all communication features and performance SLA on their HES.</p>
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Document Title		SPECIFICATION FOR THREE PHASE 4 WIRE SMART LTCT ENERGY METER
Document No.		Eff. Date:
Revision No.		
14.0	QUALITY CONTROL	<p>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.</p> <p>Quality should be ensured at the following stages:</p> <ul style="list-style-type: none"> • At PCB manufacturing stage, each board shall be subjected to computerized bare board testing. • At insertion stage, all components should under go computerized testing for conforming to design parameter and orientation. • Complete assembled and soldered PCB should under go functional testing using Automatic Test Equipment (ATEs). • Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will be kept in ovens for 24 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 24 hours meter should work satisfactorily. <p>TPXODL's engineer or its nominated representative shall have free access to the bidder's/manufacture's works to carry out inspections.</p>
15.0	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. The bidder shall have duly calibrated Reference Standard meter of Class 0.02 accuracy or better. Bidder should have NABL accredited Lab for the acceptance test scope .
16.0	MANUFACTURING ACTIVITIES	The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart shall be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17.0	SPARES, ACCESSORIES AND TOOLS	<div>1. Bidder to be provide free of cost 02 nos of jig (irrespective of order lot) for retrieving data from memory of meter with every new design of meter in which previous jig is supplied cannot be used. Jig should be such that NVM can be push fit on this jig and data can be retrieve from this NVM.</div> <div>2. Bidder should provide 5 Nos of NIC card for 100 Meters or part of for troubleshoot communication problem. TPXODL will return faulty NIC cards and replenish with New NIC card so that non-communication problem can addressed.</div> <div>3. Fifty (50) nos. of optical cord to be provided in first lot for retrieving the data of meter through optical port. Once supplied, it is not required in subsequent lots</div>																																													
18.0	DRAWINGS AND DOCUMENTS	<div>Following drawings & Documents shall be prepared based on TPXODL specifications and statutory requirements and shall be submitted with the bid:</div> <div>a) Completely filled-in Technical Parameters.b) General arrangement drawing of the meter</div> <div>c) Terminal Block dimensional drawing</div> <div>d) Mounting arrangement drawings.</div> <div>e) General description of the equipment and all components with makes and technical requirement</div> <div>f) Type Test Certificatesg) Experience List</div> <div>After the award of the contract, soft copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval along with meter samples,</div> <table><tr><th>S. No.</th><th>Description</th><th>For Approval</th><th>For Review</th><th>Final Submission</th></tr><tr><td>1</td><td>Technical Parameters</td><td></td><td></td><td>✓</td></tr><tr><td>2</td><td>General Arrangement drawings</td><td></td><td></td><td>✓</td></tr><tr><td>3</td><td>Terminal block Dimensional drawings</td><td></td><td></td><td>✓</td></tr><tr><td>4</td><td>Mounting arrangement drawing</td><td></td><td></td><td>✓</td></tr><tr><td>5</td><td>Manual/Catalogues</td><td></td><td></td><td>✓</td></tr><tr><td>6</td><td>Transport/ Shipping dimension drawing</td><td></td><td></td><td>✓</td></tr><tr><td>7</td><td>QA/QC Plan</td><td></td><td></td><td>✓</td></tr><tr><td>8</td><td>Routing, Acceptance and Type Test Certificates</td><td></td><td></td><td>✓</td></tr></table> <div>Bidder shall subsequently provide Soft copy of all the drawing, GTP, Test certificates shall be submitted for the final approval of TPXODL.</div> <div>All the documents & drawings shall be in English language.</div>	S. No.	Description	For Approval	For Review	Final Submission	1	Technical Parameters			✓	2	General Arrangement drawings			✓	3	Terminal block Dimensional drawings			✓	4	Mounting arrangement drawing			✓	5	Manual/Catalogues			✓	6	Transport/ Shipping dimension drawing			✓	7	QA/QC Plan			✓	8	Routing, Acceptance and Type Test Certificates			✓
S. No.	Description	For Approval	For Review	Final Submission																																											
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7	QA/QC Plan			✓																																											
8	Routing, Acceptance and Type Test Certificates			✓																																											

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19.0	GUARANTEED TECHNICAL PARTICULARS		S.No	Description	Units	As Furnished by Bidder
			1	Type of meter		
			2	Accuracy Class of the meter		
			3	Ib & Imax	A	
			4	Operating Voltage for meter	V	
			5	Operating Frequency	Hz	
			6	Power Consumption and Burden		
			7	Starting Current	mA	
			8	Short time over current	A	
			9	Influence of heating		
			10	Rated impulse withstand voltage	KV	
			11	AC withstand Voltage for 1 min	KV	
			12	Insulation resistance a) Between frame & Current, voltage circuits connected together: b) Between each current (or voltage circuit) & each and every other circuit.	M ohm	
			13	Mechanical requirement as per IS 14697 and IS 16444 part 2		
			14	Resistance to heat and fire (As per specification)		
			15	Degree of protection		
			16	Resistance against climatic influence (as per IS 14697 and IS 16444 part-2)		
			17	Electromagnetic Compatibility (EMC)		
			18	Accuracy requirements (As per IS 14697 and IS 16444 part-2)		
			19	Power factor range		
			20	Energy measurement		
			21	Connection Diagram for system on terminal cover	Yes/No	
			22	Self diagnostic feature		

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			23	Initial start up of meter (meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals)		
			24	Terminal block a) Depth of the Terminal holes b) Internal diameter of terminal holes c) Clearance between adjacent terminals	Mm Mm Mm	
			25	Communication capabilities as per clause 4.2		
			26	Immunity against abnormal Magnetic influence, as defined in Cl. 4.3		
			27	Immunity against HV ESD as defined in Cl. 4.3		
			28	DC Immunity as defined in Cl. 4.4		
			29	Abnormal and tamper events and logging with snapshot in all conditions as per table no-1 cl. 4.5	Yes/no	
			30	Grade/Name of material for a) Meter base b) Meter cover c) Terminal block d) Terminal cover		
			31	Tamper counters		
			32	Recording forward energy in all conditions.	Yes/No	
			33	Meter sealing as per clause 5.4	Yes/No	
			34	Non Volatile memory (Retention period)		
			35	Measuring elements used in the meter		
			36	Power supply to circuit in case of supply failure		

			37	Display of measured values (As per specification –clause 5.8)	Yes/No	
			38	LCD display (Type and viewing angle)		
			39	Pulse rate	Imp/kWh, Imp/kVAh	
			40	Name plate marking	Yes/No	
			41	Routine test certificates	Yes/No	
			42	Acceptance test Certificates	Yes/No	
			43	Type test certificates	Yes/No	
			44	Guarantee certificates	Yes/No	
			45	Output device(LEDs)As per CI.5.9	Yes/No	
			46	Terminal Screw dia.		
			47	Chemical welding of cover and base		
			48	Fire retardant category of the material a. Meter body b. Terminal block		
			49	Supply of Zig for retrieval of the damaged/burnt meter data at MTL		
			50	The meter should not have any other event logging than desired in specs. All the other logics should be removed or disabled in firmware.		
			51	Meter shall be programed at default 'lag only' configuration i.e. Leading power factor to be treated as unity for kVA&kVAh calculations		
			52	Dimensions of the meter HxLxT		
			53	The terminal block arrangement with 12pin zig zag configuration (Samples to be provided by TPCODL)		
			54	The meter design ensures that no MF required for any		

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				parameter or energy calculation and Meter constant.		
			55	Offered CT ratio's 100/5A, 200/5A		
			56	NIC module with cover & sealing arrangement provided.		
			57	Harmonics Recording- The recording of harmonics up to 20th harmonic Average THD of all phase for voltage THD and current THD.		
			58	Accuracy of harmonics recording		
			59	Flag in BCS for high THD in any phase V or I		
		B. Electronics parts				
			S No	Component Function	Requirement	Makes and Origin
			1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	
			2.	Memory chips/NVM	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electro static discharges. The life of NVM shall be 15 years.	
			3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. Should be with Green LED background. It should be trans-reflective STN Type industrial grade with extended temperature range.	

		4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily. It should be magnetic locking type	
		5	P.C.B.	Glass Epoxy, fire resistance grade with minimum thickness 1.6 mm	
		6.	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	
		7.	Battery	Lithium with guaranteed life of 15 years	
		8.	Micro controller and RTC having separate battery	The accuracy of RTC shall be as per relevant IEC / IS standards and RTC shall be provided with separate battery in its ckt.. The microcontroller shall be of superior quality from Reputed make with long life.	
		9.	Temperature sensor	Temperature sensor shall be internal to the meter and its accuracy shall be as per relevant IEC / IS standards. The OEM test report to be furnished. With good performance till life of meter.	

CONTENTS

1. SCOPE
2. APPLICABLE STANDARDS
3. CLIMATIC CONDITIONS OF INSTALLATION
4. GENERAL TECHNICAL REQUIREMENTS
5. GENERAL CONSTRUCTION
6. NAME PLATE AND MARKING
7. TESTS
8. TYPE TEST CERTIFICATES
9. PRE-DISPATCH INSPECTION
10. INSPECTION AFTER RECEIPT AT STORES
11. GUARANTEE
12. PACKING
13. SAMPLE
14. TRAINING
15. QUALITY CONTROL
16. MINIMUM TESTING FACILITIES
17. MANUFACTURING ACTIVITIES
18. SPARES, ACCESSORIES AND TOOLS
19. DRAWINGS AND DOCUMENTS
20. GUARANTEED TECHNICAL PARTICULARS
21. SCHEDULE OF DEVIATIONS

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TPWDL	TP WESTERN ODISHA DISTRIBUTION LIMITED		
	TECHNICAL SPECIFICATION		
Document Title	Technical Specification for 100/5A, 200/5A & 400/5A LTCT Meter Boxes		
Document No.	ENG-LV-3014	Eff. Date: 01-03-2021	
Revision No.	00		
Prepared By:	Reviewed By:	Approved By:	Issued By:

1.	SCOPE	<p>This specification covers the technical requirements of design, manufacturing, testing at manufacturer's works, packing, forwarding, supply and unloading at store/site of Three-phase four Wire, 100/5A, 200/5A and 400/5A all types of LTCT Meter Boxes along with respective resin cast CT with bar primary, complete with all accessories for efficient and trouble-free operation.</p> <p>It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the TPXODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.</p> <p>The parameters defined in the specification shall be common for both the LTCT Non-smart Meter Box and LTCT Smart Meter Box, unless stated separately.</p>																		
2.	APPLICABLE STANDARDS	<p>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 statutory authorities.</p> <table><tr><td>IS: 14772-2000</td><td>General requirements for enclosure for accessories for household and similar fixed electrical installations Specification.</td></tr><tr><td>IS: 8623(Part 1)-1993</td><td>Specification for low-voltage switchgear and control gear assemblies: Part 1 for type tested and partially type tested assemblies.</td></tr><tr><td>IS: 11731(Part II)-1992</td><td>Methods of test for determination of Flammability of solid electrical insulating materials when exposed to an igniting source</td></tr><tr><td>IS 4249-1967</td><td>Specification for classification and method of test for non-ignitable and self-extinguishing properties of solid electrical insulating materials.</td></tr><tr><td>IS 8828-1996</td><td>Electrical Accessories—Circuit Breakers for Over Current Protection for Household and Similar Installations</td></tr><tr><td>IS 5133(Part II)—1969</td><td>Specification for boxes for the enclosure of electrical accessories</td></tr><tr><td>IS 2500(Part 1)-2000</td><td>Sampling procedure for inspection by attributes part 1 sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection</td></tr><tr><td>IS 16227 (part1-5)</td><td>Specification of current transformer</td></tr><tr><td>UL 746-C</td><td>Polymeric Materials in Electrical equipment</td></tr></table>	IS: 14772-2000	General requirements for enclosure for accessories for household and similar fixed electrical installations Specification.	IS: 8623(Part 1)-1993	Specification for low-voltage switchgear and control gear assemblies: Part 1 for type tested and partially type tested assemblies.	IS: 11731(Part II)-1992	Methods of test for determination of Flammability of solid electrical insulating materials when exposed to an igniting source	IS 4249-1967	Specification for classification and method of test for non-ignitable and self-extinguishing properties of solid electrical insulating materials.	IS 8828-1996	Electrical Accessories—Circuit Breakers for Over Current Protection for Household and Similar Installations	IS 5133(Part II)—1969	Specification for boxes for the enclosure of electrical accessories	IS 2500(Part 1)-2000	Sampling procedure for inspection by attributes part 1 sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection	IS 16227 (part1-5)	Specification of current transformer	UL 746-C	Polymeric Materials in Electrical equipment
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		IS 6746	Specifications for Unsaturated Polyester Resin Systems
		IS 10192	Synthetic resin bonded glass fibre sheets for electrical purpose.
		IS 7078 (1973)	Plastics used in instrument industry
Initiator		HeG (Plant Engineering)	

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3.	CLIMATIC- CONDITIONS OF INSTALLATION	<ol style="list-style-type: none"> 1. Maximum altitude above sea level 4,000m 2. Maximum ambient air temperature 70°C 3. Maximum daily average ambient air temperature 45°C 4. Minimum ambient air temperature -10°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 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 0.1g.
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		9.	Dielectric withstand for the box	5 kV for 1 minute
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T P WESTERN ODISHA DISTRIBUTION LIMITED

TECHNICAL SPECIFICATION

Document Title	Technical Specification for 100/5A, 200/5A & 400/5A LTCT Meter Boxes		
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Prepared By:	Reviewed By:	Approved By:	Issued By:

5.	GENERAL CONSTRUCTION	C.	For PVC Caps (8 Nos each box)	
		1.	Material	PVC compound Black (FR Grade).
		2.	Color	Black
		3.	Thickness	1.4 mm (+1.0mm)
		4.	Heat Stability	Material shall be tested at 90°C for 24 hrs. and no cracking, melting and defect should be observed
		5.	Tensile strength	Min. 7.0 MPa
		6.	Elongation	Min. 400%
		7.	Dielectric strength	5 kV/mm
		8.	Shore Hardness- (Shore-A)	55 +/- 5
		9.	Viscosity	20-22 cP (centi Poise)
		10.	Specific Gravity	1.12-1.25 gm/cc

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	5.1 Enclosure	<p>The LTCT meter box shall be weather proof, tamper proof and shall be made of injection moulded reinforce virgin polycarbonate material with FV0 fire retardant, self-extinguishing, UV stabilization and Anti oxidation properties. Base and cover both shall be completely transparent, made of virgin polycarbonate material (for 100/5 Amps and 200/5 Amps LTCT meter box, and white cream color in case of SMC material (only for 400/5 Amps, subject to sample approval). The material for base and cover shall be Lexan 943 A or Makrolon 6457/6557 with 3 mm thickness.</p> <p>The box shall be of adequate strength, unbreakable and shall be made in two pieces (case and cover). The Enclosure shall be provided with IP55 degree of protection. Base shall have U groove all around to accommodate 'O' ring/gasket provided all around at the cover. Cover shall be placed on base and fixed by means of sealable bolts at all the corners and middle. Suitable rubber gasket (EPDM rubber – ethylene propylene diene monomer) of round shape (properly provided throughout the periphery) all around the base shall be provided for protection. The box shall be provided with suitable overlap between base and cover. Base shall be provided with meter mounting arrangement along with 3 numbers GI strips suitably made into a channel and fixed horizontally for supporting all the components inside the box. The meter shall be mounted on CT base such that there is a clearance of 50 mm between the meter box and top of the meter. A minimum clearance of 50 mm (between meter and the box) shall be maintained on both sides.</p> <p>The Resin casting arrangement should be such that the CT should not come out from the meter box; necessary locking arrangement and anti-tamper features should be provided. The CT should have manufacturer code & ratio embossed on CT body.</p> <p>The design of the LTCT box shall be such as to facilitate easy wiring and access to the meter terminals. The cable entry shall be from bottom of the box and further connected to the primary of the CT (Copper Bars) with suitable size single compression SGG brass gland as approved by the Purchaser (as per technical specification ENG-LV-3006).</p> <p>For 100/5A– The SGG brass gland shall be suitable for 4Cx95 sq. mm cable. For 200/5A– The SGG brass gland shall be suitable for 4Cx150 sq. mm cable. For 400/5A– The SGG brass gland shall be suitable for 4Cx300 sq. mm cable.</p>
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Prepared By:	Reviewed By:	Approved By:	Issued By:

		<p>A. For LTCT Smart Meter Boxes: The overall dimension of the LTCT smart meter box shall be as below: For 100/5A, 200/5A Length- 700mm\pm2%, Depth- 260 \pm 2% mm and Breadth-350 \pm2% mm and the same shall be approved by the Purchaser. For 400/5A Length- 860mm\pm2%, Depth- 270 \pm 2% mm and Breadth- 450 \pm2%mm and the same shall be approved by the Purchaser. Note: the Dimension should be confirmed during GTP</p>
	5.2 Current Transformer	<p>5.2.1 CTs shall be manufactured with high grade CRGO lamination. The current transformer shall be Resin Cast, Bus-bar Primary type. Three CTs for three phases and fourth CT for Neutral shall be casted as one unit. The resin cast CT unit shall have pin type secondary current terminals and potential terminal on which the meter shall be directly plugged, in such a way that after plug-in of the meter, the pin type terminals (CT secondary terminals / potential terminals) shall be accessible for connections. The suitable Pin type terminals for various type of meter shall be provided for plug in arrangement (the meter/ drawing shall be provided by Purchaser to the successful bidder).</p> <p>5.2.2 The primary of the CT side shall be in form of bar with no joints and secondary shall be of plug in pin type. The bus-bar shall be made of tinned copper whereas the pin shall be made of tinned brass with fine polish. For 100/5A The bus-bar size shall be 20mmX5mm (100 sq. mm min). For 200/5A The bus-bar size shall be 25mmX8mm (200 sq. mm min). For 400/5A The bus-bar size shall be 40mmX8mm (320 sq. mm min). All bus-bars shall have extended length of 50 mm at top, above box and 70 mm at lower end, below box. The bus-bar shall be provided with single hole of dia. 8 mm at both ends for cable termination through suitable size lugs. The clear phase-phase spacing between bus-bar shall be 35 mm (min). The terminations of leads taken from CT shall be suitably brazed on CT end so as to avoid any loose contact. The secondary side PIN should have minimum 4 threads to ensure that sufficient mechanical strength to keep the PINs in its vertical position throughout the useful life of Meter Box.</p> <p>5.2.3</p>

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	5.3 PVC Caps	5.3.1 — PVC cap shall be used for covering the bare part of each bus-bar and termination of LTCT meter box. 5.3.2 — Cap shall be made of PVC compound (FR grade) through Dip molding process. 5.3.3 — Cap shall be made of FR grade and UV resistant material. 5.3.4 — Cap should have good finishing with no crack and air bubbles.
Initiator		HoG (Plant Engineering)

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		<p>5.3.5 _____ Dimensions of Cap shall be as per drawing depicted in Annexure II.</p> <p>5.3.6 _____ PVC caps shall be packed in poly bags/Boxes and shall also be labelled or marked to show the description of material, Manufactures name, Month & Year of manufacturing and quantity.</p>									
	5.4 Mounting Arrangement	The box shall be provided with three numbers SS channels of 2 mm thickness provided horizontally below the base and outside the box for fastening the box on the wall. Two mounting holes shall be provided on each channel. The fixation of CT in the box, should be such that it should not be removed without damage.									
	5.5 Earthing	At bottom of the enclosure, an Electro Galvanized Earthing plate with minimum 1.2 mm thickness shall be provided with two numbers of earthing nut and bolt of suitable size of SS type for providing earth connection. The earth terminal shall be identified by means of the earthing symbol, marked in a legible and indelible manner on or adjacent the terminal									
6.	NAME PLATE AND MARKING	<p>The equipment shall be provided with durable and legible name plate, effectively secured against removal. Name plate shall be embossed with "RC/PO & RO No. with date", "PROPERTY OF TPXODL", "ITEM CODE NUMBER", The name plate shall be indelibly and distinctly marked with all essential particulars as per the relevant standards along with the following information:-</p> <p>a. _____ Manufacturer's name</p> <p>b. _____ Unique Serial number</p> <p>c. _____ Month and Year of manufacture (MM/YYYY)</p> <p>d. _____ Guarantee period</p> <p>e. _____ Rated CT ratio, Accuracy Class & Burden</p> <p>f. _____ No supply number : XXXXXXXXXXXXXXXX (provide during GTP</p> <p>g. _____ Property of TPXODL</p> <p>h. _____ Bar Code should be there which having Sr No & CT Ratio</p> <p>i. _____ Meter Box Sr No should also be laser marked on the Meter Box Base</p>									
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 shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the LTCT meter box in addition to others specified in IS/IEC standards:-									
	7.1 Type tests	<p>For the Box:</p> <table border="1"> <thead> <tr> <th>S.No.</th><th>Tests/ Standard</th><th>Requirements</th></tr> </thead> <tbody> <tr> <td>1</td><td>Protection against electric shock (IS : 14772 - 2000)</td><td>Enclosure shall be so designed that when they are mounted as for normal use, the live parts of any correctly installed accessories or any parts of these accessories which may become live due to a fault shall not be accessible.</td></tr> <tr> <td>2</td><td>Provision for earthing (IS : 14772-2000)</td><td>Enclosure shall be provided with a facility for permanent and reliable connection to earthing</td></tr> </tbody> </table>	S.No.	Tests/ Standard	Requirements	1	Protection against electric shock (IS : 14772 - 2000)	Enclosure shall be so designed that when they are mounted as for normal use, the live parts of any correctly installed accessories or any parts of these accessories which may become live due to a fault shall not be accessible.	2	Provision for earthing (IS : 14772-2000)	Enclosure shall be provided with a facility for permanent and reliable connection to earthing
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		3	Resistance to ageing, humid conditions, ingress of solid objects and to harmful ingress of water (IS : 14772-2000)	Resistance to Ageing: Enclosure shall be kept in a heating cabinet with temp 70 ± 2 deg. C for 7 days as per IS. After completion of the test, the enclosure shall not show any cracks. Humid conditions: Enclosure shall be kept in a cabinet with humidity between 91 to 95 % for 7
Initiator			HoG (Plant Engineering)	

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				days as per IS. After completion of the test, the enclosure shall not show any cracks. Resistance against ingress of solid objects and to harmful ingress of water: Enclosure shall be subjected to test for degree of protection (IP-55) as per IS-12063.
		4	Mechanical strength/- Impact Resistance- Test (IS : 14772-2000)/(UL : 746 C)	The sample shall be subjected to Impact resistance test as per the respective standards and shall not show occurrence of any of the following: 1. _____ Making uninsulated live parts accessible to contact. 2. _____ producing a condition that might affect the mechanical performances of the enclosure producing a condition that would increase the likelihood of an electric shock
		5	Resistance to heat/- Ball Pressure Test (IS : 14772-2000)	The test shall be made on a sample in a heating cabinet at a temp of 125 ±2 deg C for 1 per IS. After completion of test, the diameter of the impression caused by the ball shall be measured and should not exceed 2 mm.
		6	Resistance to Abnormal heat and fire/ Glow wire test (IS : 14772-2000)	Parts of insulating materials which might be exposed to thermal stresses due to electric effects shall not be affected by abnormal heat and by fire. The compliance shall be checked by means of the glow wire test performed at 960 deg C, according to IS-11000(Part 2/sec 1) with no flame and glowing.
		7	Resistance to Tracking (IS-14772-2000)	The sample when tested as per clause no 17 of IS-14772, shall show no flashover after completion.
		8	Flammability test (IS : 14731 (Part II)-1986)/UL : 94)	The sample shall comply to flammability requirements of category FV0/V0 as per respective standards.
		9	Test for self-extinguishing property (IS:4249-1967)	The sample when tested as per clause 3.5.1 of IS-4249, shall comply to the specified requirements.
		10	Resistance to rusting	As per clause 16 of IS-14772 (2000)
		11	Verification of Dielectric properties (IS : 8623 (Part I)-1993)	The enclosure shall be tested as per clause no 3.2.2 of IS-8623(Part 1), with test voltage of 5 kV for 1 minute and withstand it satisfactorily.

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		42	UV Light Exposure- (UL-746C)	The sample when exposed to UV light as per the defined test method, shall comply to following a) Physical Properties: The average value of physical properties after the UV light exposure shall not be lower than 70% of its initial value (without UV-aging) i.e. the variation shall not be more than 30%. b) Flammability Test: After the UV light exposure, the flammability requirement of FV0 shall remain unchanged.
Initiator			HoG (Plant Engineering)	

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Revision No.	00		
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			<p>e) Flexural Strength: After the UV light exposure, Flexural strength shall not be lower than 70% of its initial value (without UV aging) i.e. the variation shall not be more than 30 %.</p>
		<p>Type test for the CT as per applicable Indian Standard:</p> <ol style="list-style-type: none"> Short-time current tests Temp rise test at rated current Lighting impulse test for CT for service in electrically exposed installation High voltage power frequency wet withstand voltage test Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class. Accuracy test Instrument Security Current test <p>Note :</p> <p>a) The dielectric type test for CT in S. No. (3) and (4) shall be carried out on the same transformer unless otherwise agreed.</p> <p>b) After the current transformers have been subjected to the dielectric type test (4) and (5), they shall be subjected to all the routine tests</p> <p>Type test for the PVC Cap:</p> <ol style="list-style-type: none"> Dielectric Strength @ 5kV for 1 min. 	
	7.2 Routine Tests	<p>For Boxes :-</p> <ol style="list-style-type: none"> Marking Visual Examination and Dimensions Protection against electric shock Provision for earthing. <p>For CT :-</p> <ol style="list-style-type: none"> Verification of terminals marking and polarity. CT surface finish on both sides. power frequency dry withstand voltage test on primary windings power frequency dry withstand voltage test on secondary windings Over-voltage inter-turn test. Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class. 	

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	7.3 Acceptance tests	<div><div>1. Markings, as per this technical specification</div><div>2. Visual Examination and Dimensions, as per this technical specification</div><div>3. Protection against electric shock, as per IS 14772: 2000</div><div>4. Provision for earthing, as per IS 14772: 2000</div><div>5. Resistance to Abnormal heat and fire/ Glow wire test @ 960°C</div><div>6. Test for self-extinguishing property as per clause 3.5.1 of IS 4249</div><div>7. Verification of Die electric properties @ 5kV for 1 min.</div><div>8. CT accuracy test as per IS 16227 (Part 1&2)</div><div>9. Heat Stability: PVC Cap shall be tested at 90°C for 24 hrs. and no cracking, melting and defect should be observed</div></div>
Initiator		HoG (Plant Engineering)

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TPWODL	TP WESTERN ODISHA DISTRIBUTION LIMITED		
	TECHNICAL SPECIFICATION		
Document Title	Technical Specification for 100/5A, 200/5A & 400/5A LTCT Meter Boxes		
Document No.	ENG-LV-3014	Eff. Date: 01-03-2021	
Revision No.	00		
Prepared By:	Reviewed By:	Approved By:	Issued By:

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/National Test House/EQDC/Third-party NABL accredited laboratory, 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 the Purchaser.
9.	PRE-DISPATCH-INSPECTION	The successful bidder shall submit two prototype samples (alongwith all asked type Test report which not older than 5 years) for further testing and compliance as per specifications and getting approval before mass manufacturing. 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 the Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or it's authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. One copy of the report shall be sent to Plant Engineering Group. 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 Purchaser 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's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.

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11.	GUARANTEE	<p>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 Purchaser 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. 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 Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum performance Deposit" as the case may be. In case box fails within the guarantee period, the purchaser will immediately inform the bidder who shall take back the failed box within 15 days from the date of intimation at his own cost and replace/repair the box within forty five days of date of intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired/replaced shall not be counted for arriving at the guarantee period. 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 Purchaser.</p>
Initiator		HoG (Plant Engineering)

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19.	DRAWINGS AND DOCUMENTS	Following drawings and documents shall be prepared based on Purchaser specifications and statutory requirements and shall be submitted with the bid:- a) Completely filled in General Technical Particulars b) General description of the equipment and all components including brochures c) General arrangement and pin configuration at CT for meter box d) Experience List e) Type test certificates f) Sample as applicable After the award of the contract, soft copies of following GTP & drawings, describing the equipment in detail shall be forwarded for approval:
Initiator		HoG (Plant Engineering)

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TECHNICAL SPECIFICATION

		<table><tr><th>Sr. No.</th><th>Description</th><th>For Approval</th><th>For Review-Information</th><th>Final-Submission</th></tr><tr><td>1</td><td>Technical Parameters</td><td>✓</td><td></td><td>✓</td></tr><tr><td>2</td><td>GA-Drawing of meter box,- CT & PVC Cap</td><td>✓</td><td></td><td>✓</td></tr><tr><td>3</td><td>Installation Instruction</td><td></td><td></td><td>✓</td></tr><tr><td>4</td><td>Manual/Catalogues</td><td></td><td>✓</td><td></td></tr><tr><td>5</td><td>Transport/ Shipping- dimension drawing</td><td></td><td>✓</td><td>✓</td></tr><tr><td>6</td><td>QA & QC Plan</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>7</td><td>Test Certificates</td><td>✓</td><td>✓</td><td>✓</td></tr></table> <p>Bidder shall subsequently provide soft copy of all the drawings, GTP and data-sheet of virgin polycarbonate material for the final approval of TPXODL, before mass manufacturing. All the documents & drawings shall be in English language.</p>	Sr. No.	Description	For Approval	For Review-Information	Final-Submission	1	Technical Parameters	✓		✓	2	GA-Drawing of meter box,- CT & PVC Cap	✓		✓	3	Installation Instruction			✓	4	Manual/Catalogues		✓		5	Transport/ Shipping- dimension drawing		✓	✓	6	QA & QC Plan	✓	✓	✓	7	Test Certificates	✓	✓	✓
Sr. No.	Description	For Approval	For Review-Information	Final-Submission																																						
1	Technical Parameters	✓		✓																																						
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5	Transport/ Shipping- dimension drawing		✓	✓																																						
6	QA & QC Plan	✓	✓	✓																																						
7	Test Certificates	✓	✓	✓																																						
20.	GUARANTEED-TECHNICAL-PARTICULARS	Clause-wise compliance to this specification.																																								

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