



STANDARD
TECHNICAL SPECIFICATION

Of

CT OPERATED ENERGY METERING CABINET
comprising of
100/5 Amps or 50/5 Amps Resin Cast Plug in Type
CTs,
160 Amps (setting at 100 A) or 100 Amps (setting at
50 A) MCCBs
and
LT CT Operated TOD Meter
And
Other Arrangement.

Technical Specification No.
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INDEX

SR. NO.	DESCRIPTION	PAGE NO.
1	SCOPE	1
2	APPLICATION	1
3	SERVICE CONDITIONS	1
4	STANDARDS	2
5	GENERAL TECHNICAL PARTICULARS	2
6	TECHNICAL SPECIFICATION FOR METER	
a.	SCOPE	2
b.	APPLICABLE STANDARDS	2
c.	GENERAL TECHNICAL PARTICULARS	3
d.	CONSTRUCTIONAL REQUIREMENT / METER COVER & SEALING ARRANGEMENT	4
e.	COMMUNICATION CAPABILITY	6
f.	SELF DIAGNOSTIC FEATURES	6
g.	TOD TIMINGS	7
h.	DEMAND INTEGRATION PERIOD	7
i.	MD RESET	7
j.	REAL TIME INTERNAL CLOCK (RTC)	7
k.	TAMPER & FRAUD MONITORING FEATURES (ANTI TAMPER FEATURES)	8
l.	TAMPER EVENTS	8
m.	DISPLAYS	11
n.	QUANTITIES TO BE MEASURED & DISPLAYED	12
o.	PERFORMANCE UNDER INFLUENCE QUANTITIES	17
p.	OUTPUT DEVICE	17
q.	TESTS	17
r.	CONNECTION DIAGRAM AND TERMINAL MARKINGS PRE	19
s.	MANUFACTURING PROCESS, ASSEMBLY AND TESTING	20

STANDARD TECHNICAL SPECIFICATION OF CT OPERATED ENERGY METERING CABINET comprising of 100/5A or 50/5 A Resin Cast Plug in Type CTs, 160 Amps (setting at 100 A) or 100 Amps (setting at 50 A) MCCBs and LT CT Operated TOD Meter And Other Arrangement

t.	COMPONENT SELECTION	22
u.	ANNEXURE I	23
7	TECHNICAL SPECIFICATION FOR CURRENT TRANSFORMER (CT)	26
8	TECHNICAL SPECIFICATION FOR MOULDED CASE CIRCUIT BREAKERS (MCCB)	26
9	TECHNICAL SPECIFICATION FOR ENCLOSURE (METERING CABINET)	28
10	SAFETY ARRANGEMENT	30
11	TESTING & MANUFACTURING FACILITIES	30
12	TESTS & TEST CERTIFICATE	31
13	QUALITY ASSURANCE	32
14	QUALIFYING REQUIREMENTS	33
15	PROTOTYPE & DRAWINGS	34
16	GUARANTEE	34
17	INSPECTION	34
18	RANDIM SAMPLE TESTING	35
19	TENDER SAMPLE	35
20	SCHEDULES	35
21	SCHEDULE-C	37
22	ANNEXURE U-1	38
23	SCHEDULE-A (GTP on e-tendering)	39
24	DRAWINGS	47

1.00 SCOPE

This Specification covers design, manufacture, testing at works, supply and delivery of a sheet steel or SMC moulded cabinet comprising of 100 /5 Amps or 50 / 5 Amps resin cast CTs with plug in type arrangement, 160 Amps (setting at 100 Amps) or 100 Amps (setting at 50 A) MCCBs and LT AC, 3 Phase, 4 Wire, LT CT operated fully Static Tri-Vector Energy Meters for measurement of different electrical parameters and other arrangement as per the specification. The system shall be AC, 3 phase, 4 wire, 415 Volts, 50 Hz with effectively grounded neutral with CT ratios of 100 / 5 Amps or 50/5 Amps.

2.00 APPLICATION

For use in LT Electrical Distribution System in the State of Maharashtra.

3.00 SERVICE CONDITIONS

The equipments to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Environmental Conditions

- | | |
|--|-----------------------|
| a) Maximum ambient temperature | 55°C |
| b) Maximum ambient temperature in shade | 45°C |
| c) Minimum temperature of air in shade | 35°C |
| d) Maximum daily average temperature | 40°C |
| e) Maximum yearly weighted average temperature | 32°C |
| f) Relative Humidity | 10 to 95 % |
| g) Maximum Annual rainfall | 1450 mm |
| h) Maximum wind pressure | 150 kg/m ² |
| i) Maximum altitude above mean sea level | 1000 meters |
| j) Isoceraunic level | 50 days/year |
| k) Seismic level (Horizontal acceleration) | 0.3 g |
| l) Climate: - Moderately hot and humid tropical climate conducive to rust and fungus growth. | |

As per IS 14697-1999 (reaffirmed 2004), the meter to perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS)

Meter body shall conform to IP51 degree of protection. For outdoor use meter shall be installed in sealed enclosure conforming to IP 55.

The meter shall be suitably designed for satisfactory operation under the hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such

material or shall be provided with such protective finish, which provided suitable protection to them from any injurious effect of excessive humidity.

4.00 STANDARDS

Unless otherwise modified in this specification:

- (a) The enclosure box shall comply with IS: 13947 /1993 & IS: 13410 amended upto date.
- (b) The Electronic Energy Meter shall conform to IS: 14697/1999 or IEC: 687 or its latest version thereof.
- (c) The CT shall conform to IS: 2705/1992 or its latest version thereof.
- (d) The MCCB shall comply with IS: 13947 /1993 amended upto date.
- (e) MCCB, CT and meters having relevant BIS certification and ISO certification would be preferred.

5.00 GENERAL TECHNICAL PARTICULARS

- 5.01 These cabinets are to be supplied as complete units consisting of 3 phase 4 wire 100 / 5 Amps or 50 / 5 Amps LT CT Operated TOD Energy Meters along with Resin cast CTs with plug in type arrangement and MCCBs in sheet steel / SMC moulded cabinet duly wired as shown in the general arrangement drawings No. DIST /MM – IV / CTMTR / 2008 / 01, Sheet 1/3, 2/3 & 3/3. The supply shall be as per final approved drawings.
- 5.02 Tenderer shall submit Type Test Reports for offered Meter, Resin cast CTs with plug in type arrangement, MCCB & CT operated metering unit of each rating, along with offer, failing which the offer shall be rejected.
- 5.03 All the Type Test Reports shall be within the period of Five Years from the date of opening of the Tender.

6.00 TECHNICAL SPECIFICATION FOR LT CT OPERATED TOD METERS.

6.01 SCOPE

This specification covers design, manufacturing, testing, supply and delivery of LT AC, 3 Phase, 4 Wire, LT CT operated fully static Tri-Vector Energy Meters for measurement of different electrical parameters listed elsewhere in the document including Active Energy (KWH), Reactive Energy (KVARH) and Apparent Energy (KVAH) etc.

6.02 APPLICABLE STANDARDS

The Meter shall conform to the requirements of IS: 14697/1999 (amended up to date) or IEC: 687; CBIP Tech-Report-88 amended up to date for AC Static Transformer operated Watt Hour & VAR-Hour meters (class 0.5S) and other relevant IS specifications . The specifications given in this document supersedes the relevant clauses of IS: 14697 / 1999 (amended up to date) wherever applicable.

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

The meter must bear ISI Mark.

The equipment meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standard mentioned above, also shall be considered. For conflict related with other parts of the specification, the order of priority shall be – i) This technical specification, ii) IS: 14697 /1999 (reaffirmed 2004).

6.03 GENERAL TECHNICAL REQUIREMENTS

1	TYPE	LT AC Static, 3 Ph, 4 Wire Tri-Vector Energy Meter for use in LT Electrical Distribution System in the State of Maharashtra.
2	FREQUENCY	50 Hz \pm 5%
3	ACCURACY CLASS	0.5S
4	RATED VOLTAGE	Suitable for operation for 415 V Ph-Ph or 230V Ph-N
5	BASIC CURRENT (I _b)	5 Amps
6	MAXIMUM CONTINUOUS CURRENT (I _{max})	The maximum continuous current I _{max} of the meter shall be 2 times (200 %) of I _b .
7	SHORT TIME CURRENT	The Short time current shall be as per IS -14697/ 1999.
8	STARTING CURRENT	The Starting current shall be 0.1% of I _b .
9	VOLTAGE RANGE	The voltage range shall be +15% to – 30% of rated voltage.
10	POWER CONSUMPTION	(i) The active and apparent power consumption, in each voltage circuit at reference voltage, reference temperature and reference frequency shall not exceed 1 W and 4 VA. (ii)The apparent power taken by each current circuit, at basic current I _b , reference frequency and reference temperature shall not exceed 1 VA.
11	POWER FACTOR	0.0 Lag – Unity - 0.0 Lead. For leading Power factor, the value of kVAh shall be equal to kWh. For the purpose of calculation of average power factor (on the basis of kWh/ kVAh) i.e. the value

		of kVAh shall be based on lagging value of kVARh & kWh.
12	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.05 class) software based test bench.
13	POWER SUPPLY	SMPS
14	ISI MARK	The meters so supplied must bear ISI Mark.
15	TEMPERATURE	The standard reference temperature for performance shall be 27°C. The mean temperature co-efficient shall not exceed 0.03%.

6.04 **CONSTRUCTIONAL REQUIREMENT / METER COVER & SEALING ARRANGEMENT**

- 6.04.01 The poly carbonate body of the meter shall conform to IS 11731 (FH-1 category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test as per UL 94 or as per IS 11731(Part-2) 1986.
- 6.04.02 The meter shall be projection type, dust and moisture proof. The cover shall be made of Polycarbonate material so as to give it tough and non-breakable qualities. The meter body shall be type tested for IP51 degree of protection.
- 6.04.03 Moulded single terminal block for current & voltage connections as per IS: 14697/1999 (amended up to date) conforming to relevant standard to meet the requirement of terminal connection arrangement shall be provided. The termination arrangement shall be provided with an extended type transparent terminal cover and shall be sealable independently to prevent unauthorized tampering. Proper size of grooves shall be provided at bottom of this terminal cover for incoming & outgoing service wires.
- 6.04.04 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non ageing and of tested quality.
- 6.04.05 All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.
- 6.04.06 Independent sealing provision shall be made against opening of the terminal cover and front cover. It is necessary to provide unidirectional screws with two holes for sealing purpose. The meter shall be pilfer-proof & tamper-proof.

- 6.04.07 The meter shall have Poly-carbonate transparent base and transparent cover of Poly-carbonate material, which shall be ultra-sonically welded (continuous welding) so that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).
- 6.04.08 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.
- 6.04.09 The meter shall be completely factory sealed except the terminal block cover. The provision shall be made on the Meter for at least two seals to be put by utility user. The Terminal cover shall be transparent with one side hinge with sealing arrangement.
- 6.04.10 The Push button shall be provided for high-resolution reading & display, parameters.
- 6.04.11 The meter shall have a suitable test output device for testing meter. Preferably the blinking LED or other similar device like blinking LCD shall be provided. The test output device shall have constant pulse rate i.e. Pulse/KWh and pulse/KVARh and its value (meter constant) shall be indelibly printed on the name plate.
- 6.04.12 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field on all the sides of meter, i.e. front, sides, top and bottom of the meter as per CBIP Technical Report 88 with latest amendments. If the meter gets affected under influence of any abnormal magnetic field, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering I_{max} and reference voltage at unity power factor in all the three phases.
- 6.04.13 CTs are to be provided with magnetic shielding and they shall be tested separately prior to Assembly.
- 6.04.14 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases & neutral for five minutes.
- 6.04.15 In meter, power supply unit shall be micro control type instead of providing transformer and then conversion to avoid magnetic influence.
- 6.04.16 Non-specified display parameter in the meter shall be blocked and it shall not be accessible for reprogramming at site.
- 6.04.17 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech-report 88 (amended up to date).
- 6.04.18 The meter shall withstand any type of High Voltage and High Frequency surges, which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter. Likewise the accuracy of the meter

shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 KV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes

- i) On any of the phases or neutral terminals
- ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)
- iii) At any place in load circuit. The accuracy of meter shall be checked before and after the application of above device.

6.04.19 **COMMUNICATION CAPABILITY**

The meter shall be provided with two ports for communication of the measured / collected data, i.e. a hardware port compatible with RS 232 or RS 485 specifications (RJ - 11 / RJ 45 type is also acceptable) which shall be used to transfer and export data for remote access through suitable Modem (GPRS / GSM / EDGE / CDMA / PSTN / LPR) and an Optical port. This port shall be used for local data downloading through a HHU like CMRI, Laptop and PC and if possible, through line carrier communication. RS 232 or RS 485 port on terminal block is also acceptable. Sealing arrangement for Optical & RS 232 or RS 485 port as required shall be provided. Both the ports shall support the default and minimum baud rate of 9600 bps.

6.04.20 **SELF DIAGNOSTIC FEATURES**

- 6.04.20.1 The meter shall keep log in its memory for unsatisfactory functioning or nonfunctioning of Real Time Clock battery, also it shall be recorded and indicated in reading file at base computer software computer.
- 6.04.20.2 All display segments: "LCD Test" display shall be provided for this purpose.
- 6.04.20.3 The meter shall have facility to read the default parameters during power supply failure. An internal maintenance free battery (Ni-mh or Li-ion or NICD) of long life of 15 years shall be provided for the same. A suitable push button arrangement for activation of battery shall be provided. This battery may be of INTERNAL OR external type with inductive coupling arrangement. External Battery is to be provided with inbuilt charger, in the ratio of one battery pack per 50 nos. meters.
- 6.04.21 Wire / Cable less design: The meter PCB shall be wire less to avoid improper and loose connections/ contacts.
- 6.04.22 PCB used in meter shall be made by Surface Mounting Technology.
- 6.04.23 The RTC battery & the battery for display in case of power failure shall be separate.
- 6.04.24 The data stored in the meters shall not be lost in the event of power failure. The meter shall have sufficient Non Volatile Memory (NVM) for recording history of billing parameters (Cumulative kWh at the time of reset and kVAMD) for last 6 months, which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

6.05 **TOD TIMINGS**

There shall be a provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable. At present the time zones shall be programmed as below:

TIME ZONE "A" : 00-00 to 06.00 hrs & 22.00 to 24.00 hrs.

TIME ZONE "B" : 06.00 to 09.00 hrs & 12.00 to 18.00 hrs.

TIME ZONE "C" : 09.00 to 12.00 hrs.

TIME ZONE "D" : 18.00 to 22.00 hrs.

6.06 **DEMAND INTEGRATION PERIOD**

The maximum demand integration period shall be set at 15 minute or 30 minute as per requirement.

The data stored in the array shall be the average value for the captured time block and stored at the end of that block, except for energy values. The energy entries are the consumption during respective capture time block and posted at the end of that block. The array of data shall be retained inside the meter memory for the last 22 days for a capture period of 15 minutes or for the last 45 days for a capture period of 30 minutes. The storage days can be expanded by choosing less number of parameters.

6.07 **MD RESET**

It shall be possible to reset MD by the following options:

- i) Communication driven reset through hand held terminal (HHU) / CMRI / PC / LAPTOP.
- ii) Local push button with sealing facility.
- iii) Auto reset at 24:00 hrs at the end of each billing cycle. Automatic reset at the end of certain predefined period (say, end of the month). - This option shall be blocked by default and made programmable through hand held terminal (HHU) for the actual date required.

6.08 **REAL TIME INTERNAL CLOCK (RTC)**

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

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

- (i) Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter;
- (ii) From remote server through suitable communication network or Sub-station data logger 'PC'.

6.09 **TAMPER & FRAUD MONITORING FEATURES (ANTI TAMPER FEATURES)**

The meter shall detect and correctly register energy only in forward direction under the following tamper conditions:

- 6.09.01 The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.
- 6.09.02 Reversal of line and load terminals: Even on interchanging the load and line wires, the meter shall register correct energy passing through the meter. The meter shall also display the energy recorded in reverse mode separately.
- 6.09.03 Drawing of current through local Earth: the meter shall register accurate energy even if load is drawn partially or fully through a local earth.
- 6.09.04 The three-phase meter shall continue to work even without neutral.
- 6.09.05 The three phase meter shall work in absence of any two phases i.e. it shall work on any one phase wire and neutral, to record relevant energy.
- 6.09.06 The meter shall work without earth.
- 6.09.07 The potential link shall not be provided.
- 6.09.08 Visual indication shall be provided to safeguard against wrong connections to the meter terminals.
- 6.09.09 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field on all the sides of meter, i.e. front, sides, top and bottom of the meter as per CBIP Technical Report 88 with latest amendments. If the meter gets affected under influence of any abnormal magnetic field, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering I_{max} and reference voltage at unity power factor in all the three phases.
- 6.09.10 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. The meter shall be immune to abnormal voltage / frequency generating devices and shall record the occurrence and restoration of such tamper events along with parameters such as current, voltages, kWh, power factor, event code, date & time etc.

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

- i) HHU / CMRI / PC / LAPTOP.
- ii) Remote access through suitable communication network.

6.10 **TAMPER EVENTS**

The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter.

It is the responsibility of the meter manufacturer not to use manufacturer specific codes where standard codes are available.

The meter shall have features to detect the occurrence and restoration of the following abnormal events.

6.10.01 Missing potential and potential imbalance

The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of potential failure and low potential, which could happen due to disconnection of potential leads (one or two). Meter shall also detect and log cases of voltage unbalance (10% or more for 5 Minutes.) Higher of the 3 phase voltages shall be considered as reference for this purpose.

6.10.02 Current unbalance

The meter shall be capable of detecting and recording occurrence and restoration with date and time of current unbalance (30% or more for 15 minutes) Higher of the 3 phase currents shall be considered as reference for this purpose

6.10.03 Current Reversal

The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current with phase identification for persistence time of 5 minutes. It shall also possess a current reversal counter.

6.10.04 Power ON / OFF

The meter shall be capable to record power ON/OFF events in the meter memory. All potential failure shall record as power off event.

6.10.05 Current circuit short

The meter shall be capable of detecting and recording occurrences and restoration of shorting of any one or two phases of current, with date & time of occurrence and restoration.

The meter shall keep records for the minimum 280 events. (Occurrence + Restoration). For above abnormal conditions the recording of events shall be on FIFO basis. It shall be possible to retrieve the abnormal event data along with all related snap shots data through the meter optical port with the help of CMRI & downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format.

The tampers detailed above are tabulated as below.

SR. NO.	DESCRIPTION OF TAMPERS
A	VOLTAGE RELATED
1.	R-Phase – PT link Missing (Missing Potential) – Occurrence
2.	R-Phase – PT link Missing (Missing Potential) – Restoration

3.	Y-Phase – PT link Missing (Missing Potential) – Occurrence
4.	Y-Phase – PT link Missing (Missing Potential) – Restoration
5.	B-Phase – PT link Missing (Missing Potential) – Occurrence
6.	B-Phase – PT link Missing (Missing Potential) – Restoration
7.	Over Voltage in any Phase - Occurrence
8.	Over Voltage in any Phase - Restoration
9.	Low Voltage in any Phase - Occurrence
10.	Low Voltage in any Phase - Restoration
11.	Voltage Unbalance - Occurrence
12.	Voltage Unbalance - Restoration
B	CURRENT RELATED
13.	Current Unbalance - Occurrence
14.	Current Unbalance - Restoration
15.	Phase – R CT reverse – Occurrence
16.	Phase – R CT reverse – Restoration
17.	Phase – Y CT reverse – Occurrence
18.	Phase – Y CT reverse – Restoration
19.	Phase – B CT reverse – Occurrence
20.	Phase – B CT reverse – Restoration
21.	Phase – R CT Open - Occurrence
22.	Phase – R CT Open - Restoration
23.	Phase – Y CT Open - Occurrence
24.	Phase – Y CT Open - Restoration
25.	Phase – B CT Open - Occurrence
26.	Phase – B CT Open - Restoration
27.	Phase – R CT short - Occurrence
28.	Phase – R CT short - Restoration
29.	Phase – Y CT short - Occurrence
30.	Phase – Y CT short - Restoration
31.	Phase – B CT short - Occurrence
32.	Phase – B CT short - Restoration

33.	CT Bypass – Occurrence
34.	CT Bypass – Restoration
35.	Over Current in any Phase – Occurrence
36.	Over Current in any Phase – Restoration
C	POWER RELATED
37.	Power failure – Occurrence
38.	Power failure – Restoration
D	TRANSACTION RELATED
39.	TOU Programming
40.	Tamper resetting
41.	Manual MD reset
42.	Demand integration period change
43.	Display change
44.	RTC Programming / Change
45.	Firmware upgrade
46.	Modification of internal ct/pt ratio (even by manufacturer’s proprietary
47.	Software
E	OTHERS
48.	Influence of permanent magnet or AC/ DC electromagnet - Occurrence
49.	Influence of permanent magnet or AC/ DC electromagnet - Restoration
50.	Neutral Disturbance - HF & DC - Occurrence
51.	Neutral Disturbance - HF & DC - Restoration
52.	Very Low PF
F	CONTROL EVENTS
53.	Meter disconnected
54.	Meter connected

6.11 DISPLAYS

The meter shall have 7 digits (with \pm indication), parameter identifier, backlit Liquid Crystal Display (LCD) of minimum 10 mm height and wide viewing angle. **The meter display of 8 digits shall also be preferred.** The decimal units shall not be displayed. Except for high resolution, the auto display cycling push button is required with persistence time of 10 Seconds. LCD shall be suitable for

temperature withstand of 70° C. The adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

The meters shall be pre-programmed for following details. Display other than specified below shall be blocked.

- a) P. T. Ratio: 415 V
- b) C.T. Ratio: 50 / 5 Amps or 100 / 5 Amps as per requirement
- c) M.D. resetting shall be manual as per clause no. 6.07 (i) & (ii)
- d) MD Integration Period is 30 Minutes.
- e) Average power factor with 2 decimal digits shall be displayed.
- f) Tamper data shall be stored in memory and retrieved by HHU, CMRI or Laptop with necessary software.
- g) It shall be possible to upload the HHU / CMRI data to any PC having HHU / CMRI software. A consumer based data uploading facility is required so that HHU / CMRI shall upload data only in that PC which has the concerned consumers` data, the consumer code + meter No. Shall be the key for creating consumers` files or overwriting consumers` files in PC. The software system files and data files shall be stored in different directories.
- h) The “record number field shall be 10 digits Alphanumeric. (2digits for Zones, 2 for Circle & 6 for Transformer Centre No.) Before accepting the data for “Record Number” the system shall wait for pressing of “Enter” key.
- i) Two separate fields shall be provided for consumer name and address – one name field of one line, and other Address field of two lines.
- j) The meter shall measure & record total energy (Active + Reactive) consisting of energy due to harmonics.

6.12 **QUANTITIES TO BE MEASURED & DISPLAYED**

6.12.01 The meter shall be capable of displaying automatically in the following sequence.

I. **Normal mode (with scrolling time 9 sec)**

- (a) LCD Test
- (b) Date and time
- (c) Cumulative kWh
- (d) Cumulative kWh TOD
- (e) Current month MD kVA
- (f) Current month MD kVA TOD
- (g) Previous month MD kVA TOD
- (h) Cumulative kVAh

- (i) Average PF for the month, minimum 2 decimal digits
- (j) Number of MD reset.
- (k) Number of Tamper Count.

II. **Alternate Mode:** After using pushbutton the following parameters shall be displayed.

- (a) Date and time
- (b) Phase Currents
- (c) Phase to Neutral Voltages
- (d) Instantaneous Power Factors Phase wise
- (e) Instantaneous Power Factor
- (f) Frequency
- (g) Cumulative kVAh TOD
- (h) Cumulative kVAh lag / lead
- (i) High Resolution kWh
- (j) Rising MD with remaining time up to EOI
- (k) MD – kVA – M2 TOD
- (l) Date & Time of last MD reset
- (m) MD reset count

Other kVA MD values shall be available in reset backup data for 6 months.

NOTE: The meter display shall return to Default Display mode (mentioned above) if the 'Push button' is not operated for more than 15 seconds.

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

a) **Instantaneous Parameters** such as phase and line voltages, currents, power factors, overall kVA, kW, kVAh, power factor, frequency etc and the display of above various instantaneous electrical parameters shall be as per details given in the table below.

SR. NO.	INSTANTENEOUS PARAMETERS
1.	Real Time Clock – Date and Time
2.	Current - I_R
3.	Current - I_Y
4.	Current – I_B
5.	Voltage - V_{RN}

6.	Voltage – V_{YN}
7.	Voltage – V_{BN}
8.	Signed Power Factor –R phase
9.	Signed Power Factor - Y phase
10.	Signed Power Factor - B phase
11.	Three Phase Power Factor – PF
12.	Frequency
13.	Apparent Power – KVA
14.	Signed Active Power – kW
15.	Signed Reactive Power – kVAr (+ Lag)
16.	Signed Reactive Power – kVAr (- Lead)
17.	Cumulative power-off duration
18.	Cumulative tamper count
19.	Cumulative MD resets count
20.	Cumulative programming count
21.	Date and time of last MD reset

b) **Billing Parameters or Daily Load Profile Parameters** such as cumulative energy kWh / cumulative kVAh /cumulative energy etc as per details given in the table below.

SR. NO.	BILLING PARAMETERS
A	NORMAL MODE (WITH SCROLLING TIME 9 SEC)
1.	LCD Test
2.	Billing Date – Day/Month/Year
3.	Time – Hrs:Min:Sec
4.	Cumulative Energy – kWh
5.	Cumulative Energy – kWh – ZONE A
6.	Cumulative Energy – kWh – ZONE B
7.	Cumulative Energy – kWh – ZONE C
8.	Cumulative Energy – kWh – ZONE D
9.	Current Month MD - kVA

10.	Current Month MD – kVA - ZONE A
11.	Current Month MD - kVA - ZONE B
12.	Current Month MD - kVA - ZONE C
13.	Current Month MD – kVA - ZONE D
14.	Previous Month MD – kVA - ZONE A
15.	Previous Month MD – kVA - ZONE B
16.	Previous Month MD - kVA - ZONE C
17.	Previous Month MD - kVA - ZONE D
18.	Cumulative Energy – kVAh
19.	Power Factor (Average P.F. based on kVAh) with minimum two digits
20.	Total number of Tamper Counts
B	ALTERNATE MODE (ON – DEMAND DISPLAY) (WITH SCROLLING TIME 9 SECS)
21.	Real Time Clock – Date and Time
22.	Current - I_R
23.	Current - I_Y
24.	Current – I_B
25.	Voltage - V_{RN}
26.	Voltage – V_{YN}
27.	Voltage – V_{BN}
28.	Signed Power Factor – R phase
29.	Signed Power Factor - Y phase
30.	Signed Power Factor - B phase
31.	Three Phase Power Factor – PF
32.	Frequency
33.	Cumulative Energy – kVAh - ZONE A
34.	Cumulative Energy – kVAh - ZONE B
35.	Cumulative Energy – kVAh - ZONE C
36.	Cumulative Energy – kVAh - ZONE D
37.	Cumulative Energy – kVARh – Lag
38.	Cumulative Energy – kVARh – Lead

39.	High resolution kWh (For calibration)
40.	Rising MD with remaining time up to EOI (For calibration)
41.	MD – kVA - M2 - ZONE A
42.	MD – kVA - M2 - ZONE B
43.	MD – kVA - M2 - ZONE C
44.	MD – kVA - M2 - ZONE D
45.	Date and time of last MD reset
46.	Total Number of MD reset

- c) **Block Load Profile Parameters** such as kVAh / kWh / kVArh (lag / lead) / Maximum Demand (MD) in kW / kVA / power factor / phase and line voltages / currents etc. as per details given in the table below. Load survey data shall be for every 30 minutes and for previous 45 days for specified parameters. Load survey data shall be first in first out basis (FIFO).

SR. NO.	BLOCK LOAD PROFILE PARAMETERS
1.	Real Time Clock – Date and Time
2.	Current - I_R
3.	Current - I_Y
4.	Current – I_B
5.	Voltage - V_{RN}
6.	Voltage – V_{YN}
7.	Voltage - V_{RY}
8.	Voltage – V_{BY}
9.	Block Energy – kWh
10.	Block Energy – kvarh – lag
11.	Block Energy – kvarh – lead
12.	Block Energy – kVAh
13.	Block MD – kVA
14.	Block Power Factor

- d) In addition to above, the meter shall also record the Name plate details and programmable parameters (readable as profile) as per details given in the table below.

SR.NO.	PARAMETERS
A	NAME PLATE DETAILS
1.	Meter Serial Number
2.	Manufacturer name
3.	Firmware Version for meter
4.	Internal CT ratio
5.	Internal PT ratio
6.	Meter year of manufacture
B	PROGRAMMABLE PARAMETERS
7.	Real Time Clock – Date and Time
8.	Demand Integration Period
9.	Profile Capture Period
10.	Single-action Schedule for Billing Dates
11.	Activity Calendar for Time Zones etc.
12.	Time Zones script table

6.13 **PERFORMANCE UNDER INFLUENCE QUANTITIES**

The meters performance under influence quantities shall be governed by IS: 14697 - 1999 (reaffirmed 2004) and CBIP - 88. The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 14697 (latest version).

6.14 **OUTPUT DEVICE**

Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front and test output device shall be provided in the form of LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes.

6.15 **TESTS**

6.15.01 **Type Tests**

The meter offered shall have successfully passed all type tests described in the IS: 14697. The Type test certificate shall be submitted at the time of submission of bid. Make & type of major components used in the type-tested meter shall be indicated in the QAP.

All the Type Tests specified in the technical specifications and as per IS: 14697 shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI Bangalore / Bhopal, ERDA Baroda, ERTL. Type Test Reports conducted in

manufacturers own laboratory and certified by testing institute shall not be acceptable.

The type test reports shall clearly indicate the constructional features of the type tested meters. The type test reports for each offered type of meters shall be submitted separately

Further purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix-C of Latest – standardization of AC static electrical energy meters – CBIP publication No. – 304 / NPL / CQAL / ERTL / ERDA at the sole discretion of the Purchaser. The supplier has no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier.

It shall be the responsibility of the supplier to arrange such tests and Purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser.

6.15.02 **Acceptance & Routine Tests**

- i) Criteria for selection for such tests and performance requirements shall be as per IS: 14697 - 1999 (reaffirmed 2004). Thus all acceptance tests as per IS: 14697 / 1999 shall be carried out on the meters.
- ii) Accuracy tests shall be performed at the beginning and at the end of the acceptance tests specified.
- iii) All routine tests as per IS: 14697/1999 shall be carried out on all the meters.
- iv) Likewise all routine tests as per IS: 11731 shall be carried out on meter base & cover.

6.15.03 **Transportation Test**

At least 50% of the samples of the meters shall be tested for error at I_{max} , I_b and 5% I_b at unity power factor and 50% I_{max} and 10% I_b at 0.5 lagging Power Factor besides checking them for starting current. This test shall be conducted on ready to install meter i.e. meter cover ultrasonically welded & sealed. After recording these errors, the meters be put in their normal packing and transported for at least 50 km in any transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation shall not exceed 1% at higher loads and 1.5% at loads below I_b .

6.15.04 **Other Acceptance Tests**

Additional acceptance tests shall include the following.

- i) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage / problems.

- ii) Meters shall be tested for tamper conditions as stated in this specification.
- iii) Glow wire testing for polycarbonate body.
- iv) Power consumption tests shall be carried out.
- v) Surge withstand (SWC) for 6 kVp, Lightning impulse test and HF disturbance test as per IS 14697. One sample meter per order from one of the offered lot shall be subjected to these specific tests. Meters subjected to these tests shall not be used after tests.
- vi) All acceptance tests as per IS: 11731 (FH-1 category) shall be carried out on the meter body, heat deflection test as per ISO:75, glow wire test as per the IS:11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test as per UL 94 or as per IS 11731(Part-2) 1986.
- vii) The meter shall comply all the tests for external AC / DC / Permanent magnetic field as per CBIP Tech Report 88 with latest amendments. If the accuracy of meter gets affected under influence of any abnormal magnetic field, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering I_{max} and reference voltage at unity power factor in all the three phases. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If the accuracy of the meter gets affected during the test, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering I_{max} and reference voltage at unity power factor in all the three phases. After removal of magnet, meter shall be subjected to accuracy test as per IS 13779 / 1999 (amended up to date). No deviation in error is allowed in the accuracy as per specifications.
- viii) The meter shall withstand impulse voltage at 10 kV.

The tests 6.15.4, (i) to (vi) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 6.15.4 (vii) & (viii) shall be carried out on one sample from first lot as per procedure laid down in IS: 14697/1999 (amended up to date), CBIP Tech-Report 88 (with latest amendments) & IS: 11731 (FH-1 category) in NABL LAB. All these test reports shall be got approved from Chief Engineer (Dist.) before commencement of supply.

6.15.05 For influence quantities like, voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error shall be as per IS: 14697 / 1999 (amended up to date).

6.16 **CONNECTION DIAGRAM AND TERMINAL MARKINGS**

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be

marked and this marking shall appear in the above diagram. The diagram & terminal marking on sticker shall not be allowed.

6.17 **MANUFACTURING PROCESS, ASSEMBLY AND TESTING**

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

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

A) MANUFACTURING ACTIVITIES

- a) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters shall be kept in ovens for 72 hours at 55 °C temperature and atmospheric humidity under real life condition at its full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.
- b) The calibration of meters shall be done in-house.
- c) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.
- d) Bought out items: A detailed list of bought out items which are used in the manufacture of the meter shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.
- e) List of Plant and Machinery:

SN	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meters	Routine Testing and Calibration of Meters
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meters
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meters Class 0.01 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meters
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmiers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	Resistance network and HMC manufacturing
17	Laser Trimming Machines	Trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO -E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meters

28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meters
30	Short term over Current testing setup	Type testing of Meters
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meters
33	Composite Environmental testing chambers	Type testing of Meters

B) MINIMUM TESTING FACILITIES

Manufacturer shall possess fully automatic computerized Meter Test Bench System having inbuilt source and load adjustment for carrying out routine and acceptance Tests as per IEC: 687 or CBIP-88. In addition this facility shall produce Test Reports for each and every Meter. The tenderer shall have the necessary minimum testing facilities for carrying out the following tests.

Sr. No.	Name of Test
----------------	---------------------

- | | |
|----|---|
| 1 | A.C. Voltage test |
| 2 | Insulation Resistance Test |
| 3 | Test on limits of errors |
| 4 | Test on meter constant |
| 5 | Test of starting condition |
| 6 | Test of no-load condition |
| 7 | Repeatability of error test |
| 8 | Test of power Consumption |
| 9 | Vibration test |
| 10 | Shock Test |
| 11 | Tamper conditions - as per MSEDCL, specification |
| 12 | The manufacturer shall have duly calibrated RSS meter of class 0.1 accuracy |

6.18 **COMPONENT SELECTION: As per Annexure I enclosed.**

ANNEXURE I

Sr. No.	Component function	Requirement	Makes and Origin
1.	Current Transformers	<p>The Meters shall be with the current transformers as measuring elements.</p> <p>The current transformer shall withstand for the clauses under 5 & 9 of IS -14697/1999.</p>	<p>The current transformer shall withstand for the clauses under 5&9 of IS-14697/1999</p>
2.	Measurement or computing chips	<p>The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.</p>	<p>USA: Analog Devices, Cyrus Logic, Atmel, Philips</p> <p>South Africa: SAMES</p> <p>Japan: NEC</p>
3.	Memory chips	<p>The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges.</p>	<p>USA: Atmel, National Semiconductors, Texas Instruments, Philips, ST,</p> <p>Japan: Hitachi</p>
4.	Display modules	<p>a)The display modules shall be well protected from the external UV radiations.</p> <p>b)The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for viewing angle).</p> <p>c)The construction of the modules shall be such that the displayed quantity shall not be disturbed with the life of display (PIN Type).</p> <p>d)It shall be trans-reflective HTN or STN type industrial grade with extended temperature range.</p>	<p>Hong Kong: Genda</p> <p>Singapore: Bonafied Technologies.</p> <p>Korea: Advantek</p> <p>China: Success</p> <p>Japan: Hitachi, Sony.</p>
5.	Communication Modules	<p>Communication modules shall be compatible for the two ports (one</p>	<p>USA: National Semiconductors, HP,</p>

		optical port for communication with meter reading instruments & the other hardwired RS 232 port to communicate with various modems for AMR)	Optonica Holland/Korea: Phillips Japan: Hitachi Taiwan: Ligitek
6.	Optical port	Optical port shall be used to transfer the meter data to meter reading instrument. The mechanical construction of the port shall be such as to facilitate the data transfer easily.	USA: National Semiconductors, HP, Holland/Korea: Phillips Japan: Hitachi Taiwan: Ligitek
7.	Power supply	The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	SMPS Type
8.	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Philips, Texas Instruments Japan: Hitachi, Oki, AVZ or Ricon Korea: Samsung
9.	Mechanical parts	a) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. b) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
10.	Battery	Chargeable maintenance free guaranteed life of 10 years.	Varta, Tedirun, Sanyo or National.
11.	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standards.	USA: Philips, Dallas Atmel, Motorola,

STANDARD TECHNICAL SPECIFICATION OF CT OPERATED ENERGY METERING CABINET comprising of 100/5A or 50/5 A Resin Cast Plug in Type CTs, 160 Amps (setting at 100 A) or 100 Amps (setting at 50 A) MCCBs and LT CT Operated TOD Meter And Other Arrangement

			Microchip Japan: NEC or Oki.
12.	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

7.00 SPECIFICATIONS FOR CURRENT TRANSFORMERS

- 7.01 The Current Transformers shall be resin cast, copper wound primary type. Three CTs with Neutral link shall be casted as one unit. The resin cast CT unit shall have studs for CT / PT connections on which the meter shall be directly plugged in and after plug-in of meter; the terminals shall not be visible. Only the Primary Terminals shall be accessible for connections. The suitable studs shall be provided for plug in arrangement. The Manufacturer of the box shall ensure the plugging of CT with meters used by them.
- 7.02 The current density of current carrying parts shall not exceed 1.6 A/mm²; the primary terminals shall be suitable for double the rated current. C.T. shall confirm to IS: 2705/1992 (Amended up to date) or its latest version. C.Ts. shall have current ratio of 50/5 Amps for 50 Amps meters and 100/5 Amps for 100 Amps meters, and accuracy class of 0.2 S, and rated burden of 5 VA and rated short time current of 7.5 KA for 1 sec. corresponding to rated dynamic peak current of 2.5 x 7.5 KA (peak) for both ratios with instrument security factor (ISF) less than 5. The ratio, name of manufacturer / monogram and year of manufacturing shall be engraved on the body of C.T. In addition, name plate of anodized aluminium indicating the necessary details, year of manufacture etc. engraved on it shall be provided in such a manner that the information is clearly visible after mounting.
- 7.03 The colour of 100/5 Amps C.T. shall be D.A. Gray and 50/5 Amps C.T. shall be Brown. The secondary and primary terminals shall be clearly marked as S1 & S2 and P1 & P2. The incoming terminal of C.T. shall be minimum 80 mm long having two holes and shall be on front or on bottom side for making connection.
- 7.04 The Tenderer shall submit the complete type test reports for offered Resin Cast CT with plug in arrangement along with the offer, failing which offer shall be rejected. The CTs shall be type tested within five years at the time of submission of offer. All the type tests as per relevant IS 2705 (Part 1) / 1992 amended up to date shall be carried out.

8.00 SPECIFICATIONS FOR MOULDED CASE CIRCUIT BREAKERS (MCCBs)

- 8.01 These shall be generally conforming to IS: 13947/1993 as amended upto date. The rated uninterrupted current of MCCBs shall be 100 Amps for 50/5 Amps meter and 160 Amp for 100/5 Amps meter with the overload releases set at 50 Amps and 100 Amps respectively.
- 8.02 The tenderer shall submit the complete type test reports for offered MCCB along with offer, failing which the offer shall be rejected.
- 8.03 The MCCBs shall be manually independent and shall have quick make quick brake mechanism. The detailed specification for MCCBs shall be as under.

Sr. No.	Rated current	100 Amps	160 Amps
1	Fixed overload release setting (AMP)	50 Amps	100 Amps
2	No. of poles	3	3

3	Rated service short circuit breaking capacity (KA) which is equal to ultimate breaking capacity as per IS 13947. (The sequence of operation for this test shall be, O - t - CO - t - CO, and t = 3 min.) The test shall be done at 240 V at 0.4 PF. Voltage rating phase to phase 415 V and phase to earth 240 V.	7.5 KA at 0.4 PF
4	Power factor for short circuit (Max.)	--- 0.4 (lag) ---
5	Utilization category	A

8.04 All nut bolts used for assembly and connections shall be of non-magnetic stainless steel only.

8.05 The L.T. MCCBs shall have the following time current characteristics as per below.

Multiples of Normal Current Setting	Tripping time
1.05	More than 2.5 hrs.
1.2	More than 10 minutes and less than 2 hrs.
1.3	Less than 30 minutes.
1.4	Less than 10 minutes.
2.5	Less than 1 minute.
4.0	Not less than 2 seconds.
6.0	Less than 5 seconds.
12.0	Instantaneous (less than 40 mili seconds.)

8.06 For above time / current characteristics, the reference calibration temperature of the breaker shall be 50°C. Duration, if any, upto 60°C ambient temperature shall not exceed 10% of the current settings indicated above.

8.07 The short circuit breaking capacity as specified above shall be based on the short circuit test carried out at specified power factors. For the purpose of this test, the following operation sequence shall be followed:

Break-3 minutes interval-make break-3 minutes interval-make break.

While the above stipulation regarding the test power factor and the sequence of operation shall be binding, the other procedure for making the short circuit test and circuit etc. shall generally be in accordance with Indian Standard applicable to the type of circuit breakers under test.

8.08 MCCBs shall have locking facility in 'Off' position.

9.00 SPECIFICATIONS FOR ENCLOSURE (METERING CABINET)

- 9.01 There shall be three compartments; The Meter & CT shall be housed in one compartment and MCCB in second compartment and outgoing terminal in third compartment. Separate sheet steel / SMC partition to isolate the three compartments from each other shall be provided.
- 9.02 The compartments shall be made by using sheet Steel of 14 SWG (2 mm) thick. Additional M.S. angle of minimum 20 x 20 x 2 mm or formed channel of 2 mm sheet steel for supporting the Doors shall be provided in sheet steel enclosure only.
- 9.03 The enclosure shall be fabricated by using sheet steel and shall be properly continuous welded from inside. Alternatively the enclosure shall be moulded out of SMC material of S3 grade confirming to IS 13410 of not less than 14 SWG (2 mm) thickness.
- 9.04 The enclosure shall comply with the requirement of IP 44 type as per IS 13947 or the latest version thereof.
- 9.05 Suitable vents fitted with G. I. Double wire mesh shall be provided from inside to ensure that the temperature inside the enclosure is not substantially different from that of the atmosphere.
- 9.06 Fixing of circuit breakers inside the enclosure shall be such as to allow free circulation of air at its back and sides.
- 9.07 Doors of the each chamber shall be provided with panel lock\locks. Two master keys for opening the doors shall be provided. In addition to the panel lock, arrangement for providing pad locks shall be made. The hinges for compartment covers shall be as in the drawing and shall be so designed that the door cannot be opened without breaking the seals i.e. the hinges shall be provided from inside.
- 9.08 The enclosure made with sheet steel shall be powder coated both from inside and outside with suitable weather proof and corrosion resistant paints. The colour of the inside and outside paint shall be dark admiralty gray for 100/5 Amps metering unit and brown for 50/5 Amps metering unit. Likewise, the same colouring pattern shall be adhered to the SMC moulded enclosure.
- 9.09 Necessary fixing arrangement shall be provided at the back of the enclosure. The thickness of the fixing plate shall be minimum 5 mm.
- 9.10 Durable rubber gasket shall be provided around the enclosure to ensure dust and vermin proof door construction. Rubber lining shall at least be 3 mm thick.
- 9.11 Roof shall be sloping down backwards with 5 degree angle.
- 9.12 The flats provided for fixing shall be of welded / fitted construction and the welding shall be on all sides.
- 9.13 The knock out holes shall be provided on the bottom. Suitable size of brass Cable glands shall be provided for these holes. The size of cable shall be 3½ Core 70 sq. mm² & 120 mm² aluminium XLPE armoured cable.

- 9.14 50 x 50 x 2 mm channel shall be welded / fitted below bottom plate so that the box and bottom plate shall not come in direct contact with the ground while it is stored.
- 9.15 Sealing arrangement shall be provided for Meter, CT & MCCB chamber separately.
- 9.16 Inter connecting cable for connection from C.T. to MCCB & to outgoing terminal block shall be single core multi-stranded copper cable of size 35 mm for 50 Amps and 70 mm² for 100 Amps cabinet. For neutral connection, a single core copper multi stranded cable of size 35 mm² & 50 mm² for 50 Amps & 100 Amps cabinets respectively shall be used.
- 9.17 The Danger Board as per MSEDCL drawing no. 62.70, 2/2 and confirming to IS: 2551 / 1982 shall be fitted / moulded on the boxes.
- 9.18 The lugs suitable for single core multi stranded copper cables of size 50 & 70 mm² shall be used for making connections inside the cabinet. All lugs shall be made out of tinned copper.
- 9.19 All holes for internal connections through which cables \ leads are supposed to pass shall be provided with rubber reels.
- 9.20 Handles of 10 mm M.S rod shall be provided to all the doors separately to open and close.
- 9.21 MCCB & CTs shall be mounted on metallic / SMC sheet of 2 mm thick or an angle frame and then it shall be fitted in the enclosure. Meter shall be mounted on the arrangement as shown in the drawing DIST/MM-IV/CTMR/2008/01 Sheet No. 3/3 enclosed.
- 9.22 The thickness of the outgoing terminal block of Bakelite / DMC shall be minimum 300 x 50 x 15 mm for both 100 Amps / 50 Amps cabinets. The tinned copper strip of 25 x 6 mm and 180 mm long size shall be provided for outgoing termination of cables. Incoming terminal of C.T. having 80 mm minimum length shall be bolted directly on the terminal block. Fully threaded Stainless Steel bolts with 2 nuts and washers of size shown in the drawing shall be provided for connections. Two Resin cast Insulators shall be provided for support of each terminal block.
- 9.23 MCCB shall be so mounted that its operating knob / lever can be operated from outside without opening the door. It shall also be possible to lock the MCCB in 'OFF' position so that it cannot be switched 'ON'.
- 9.24 Toughened glass of 200 x 150 x 2 mm size for observing meter reading shall be provided from inside the door. It shall be so fitted that in the event of breaking, it shall be possible to replace it after opening the door.
- 9.25 All the wiring inside the cabinet is included in the scope of work. The internal copper cables shall be suitably clamped inside the cabinet.
- 9.26 CTs shall be fixed with proper clamps using stainless steel bolts. All nuts & bolts used in the cabinet for current carrying path shall be of Stainless Steel only.

9.27 Finish of Cabinet: All sheet metal works shall undergo chemical / mechanical cleaning process before powder coating.

9.28 **SAFETY ARRANGEMENTS**

9.28.01 Two galvanized M.S. earthing studs of 50 mm long and 12 mm diameter shall be provided for external earth connections. These shall be complete with plain washers, spring washers, nuts, etc. Earthing Bolts must be welded / fitted properly to prevent removal of the same from the box.

9.28.02 All live connections shall be insulated with durable insulation material.

9.29 **TESTING AND MANUFACTURING FACILITIES**

9.29.01 **Testing Facilities**

The Tenderer must clearly indicate the details of testing facilities available in the works of manufacturer and whether the facilities are adequate to carry out all the Routine and Acceptance tests. These facilities shall be available to MSEDCL Engineers, if deputed to carry out or witness the tests in the manufacturer's works. The tenderer must have all in-house testing facility to carry out acceptance tests on the Cabinet. If any test cannot be carried out in the manufacturer works, the same shall be clearly stated. All testing equipments shall be duly calibrated in the NABL approved laboratories.

9.29.02 **Manufacturing Facilities:**

The tenderer shall have following minimum manufacturing facilities in house to prove his reliability as a manufacturer of CT Operated Energy Metering Cabinet.

- a) Power operating shearing machine
- b) Power operated press break
- c) Power operated power presses
- d) Welding machines
- e) Assembling tools

If SMC enclosure is offered, the tenderer shall have the following minimum manufacturing facilities in house to prove his reliability as a manufacturer of CT Operated Energy Metering Cabinet.

- (a) SMC material manufacturing machine
- (b) Hydraulic press for hot press compression moulding
- (c) Assembly lines for fabrication and fitting

The tenderer shall furnish detailed process of painting if sheet steel enclosure is offered. In case the painting is to be carried out from outside agency, the tenderer shall furnish the facilities available with sub-contractor.

10.00 TESTS & TEST CERTIFICATES

10.01 TESTS

The type test reports for CT Operated Metering Cabinet as given below shall be furnished with certified drawings to prove that equipment offered meets the requirement of the specification.

- (a) Temperature rise test on complete unit at rated current of unit as per IS: 623 / 1993.
- (b) Degree of protection for IP - 44 on complete unit as per IS: 13947 or latest thereof.
- (c) Tests as per IS: 14772 on the Enclosure
- (d) Test as per IS: 13410 for Material of Construction in case SMC Enclosure is offered.

Acceptance Tests

Following tests shall be carried out as acceptance tests in addition to Routine Tests given below.

On Complete Unit

- a) Temperature Rise Test on One sample of each rating
- b) Time current characteristic for MCCB at 1.05 & 1.2 times overload release setting current.
- c) On C.T. as per relevant IS: 2705 / 1992.
- d) On MCCB as per relevant IS: 13947 / 1993.
- e) Test as per IS: 14772 on the Enclosure.
- f) Test as per IS: 13410 for Material of Construction in case SMC Enclosure.

Routine Tests

- (a) On Complete Unit
- (b) Overall Dimension checking.
- (c) Insulation Resistance Tests.
- (d) High Voltage Test.
- (e) Operation Test on MCCB.
- (f) On C.T. as per relevant IS: 2705 / 1992.
- (g) On MCCB as per relevant IS: 13947/1993.
- (h) Test as per IS: 14772 on the Enclosure.
- (i) Test as per IS: 13410 for Material of Construction in case SMC Enclosure

For MCCB, CT & Meter, required tests shall be carried out at Original Equipment Manufacturer's work.

The L.T. CT. Operated Metering Cabinet, consisting of Meter, MCCB, CTs, etc. and the Meter, MCCB & CT as per the specifications shall be fully type tested in accordance with the relevant standards and as per the MSEDCL requirement at NABL accredited lab. The tenderer shall furnish detailed type test reports of the tests carried out within 5 years prior to due date of opening of offer. The detailed

type test reports are to be submitted in sealed cover duly super-scribed on it following details along with the offer.

“Detail Type Test Report of L.T. C.T. Operated Metering Cabinet, Meter, MCCB & CT against Tender No.....

The detailed type test reports shall be furnished with relevant oscillogram and certified drawings of the equipment tests. The offers without type test reports shall be rejected.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser’s representative at purchaser’s cost. All the above Type Test shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CPRI Bangalore / Bhopal, ERDA, Baroda, to prove that equipments meet the requirement of the specification. The tenderer shall also furnish certificate from laboratories where type tested that required test facility available in house for that particular test. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The tenderer shall also furnish the guaranteed technical particulars of C.T. Operated Metering Cabinet, C.T. Operated Meters, MCCBs & CTs in GTP schedule. The offer without duly filled in GTP schedule stands rejected.

11.00 QUALITY ASSURANCE

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

- i) Organization structure of the manufacturer and his main sub-suppliers (PCBs, SMT cards, CT / PT) with details of ‘QA’ setup, overall workflow;
- ii) Copy of system manual showing ‘QAP’ (Quality Assurance Plan) as actually practiced during manufacturing and final testing.
- iii) List of raw materials and critical components (ASIC chip, crystal clock, memory register Chip, transformers, optical ports etc.) with their suppliers;
- iv) Stage inspection
- v) of product before final testing;
- vi) Procedure adopted for ‘In-situ’ testing of PCBs, after placement of surface mounted component, for quantitative parametric variation of tolerance by self or sub-contractor.
- vii) Testing and calibration facility, date of calibration of test bench, manpower data of bench operators;

viii) Sample copies of test certificate of bought out components.

12.00 QUALIFYING REQUIREMENTS

- 12.01 The Bidder shall be a manufacturer.
- 12.02 LT AC, 3 Phase, 4 Wire, LT CT operated fully Static Tri-Vector Energy Meters
- 12.02.01 The offers from original manufacturers of L.T.A.C. Static Energy Meter shall only be accepted.
- 12.02.02 The following qualifying requirement shall be fulfilled by the bidders / Manufacturers.
- (a) The bidder / manufacturer shall have turnover of Rs. 30.00 Crores during any one of the last three financial years.
- (b) The bidder / manufacturer shall have supplied minimum 5 Lakhs static meters during the last three financial years out of which 2 Lakhs meters shall have been supplied in immediate preceding financial year.
- (c) The bidder / manufacturer shall have minimum experience of three years of supply or manufacturing for static energy meters upto the end of the last financial year.
- 12.02.03 The offers of Indian subsidiary company, whose parent company is located abroad fulfilling the qualifying requirements, shall be considered provided the Indian participant subsidiary company fulfils the minimum experience of three years of supply or manufacturing of static energy meters upto the end of the last financial year. However, the conditions of turnover of Rs. 30.00 Crores during any one of the last three financial years and supply of minimum quantity of 5 Lakhs static energy meters during the last three financial years out of which 2 Lakhs meters shall have been supplied in immediate preceding financial year can be fulfilled by the parent company located abroad on behalf of their Indian subsidiary company. The parent company shall furnish undertaking for accepting responsibility for supplying quality meters as per specifications and execution of the contract on behalf of its India based subsidiary unit who has participated in the tender in Annexure U-I.
- 12.02.04 In case of offers of foreign bidders/manufacturers, they shall fulfill Qualifying Requirement as per Sr. No. 12.02.01 and 12.02.02 above.
- 12.02.05 The offer from any one of Indian manufacturing companies which are sister companies of the same group and with the same management having majority of common Directors and share holders shall be considered provided they are jointly fulfilling the Qualifying Requirements as per Sr. No. 12.02.01 & 12.02.02 above.
- 12.02.06 Bidder must possess the following certifications at the time of submission of the bid.
- a) The meter shall bear ISI mark
- b) ISO 9000
- c) ISO 14000.
- 12.02.07 The bidder shall have all the facility in his works for design, assembly, quality assurance, burn-in test (Fully assembled Energy Meter), testing (all routine and

acceptance tests), automatic calibration of Energy Meter on software based test bench, qualified team of technical and software engineers;

Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, shall the circumstances warrant such assessment in the overall interest of the Purchaser.

13.00 PROTOTYPE & DRAWINGS

The successful tenderer shall have to manufacture the prototype Cabinet for each rating as per these specifications before bulk manufacturing. The tenderer shall intimate the readiness of prototype to the Chief Engineer (Distribution), MSEDCL, 5th floor, Prakashgad, Mumbai. The representative of the Chief Engineer (Distribution) shall inspect the prototype on any day within 15 days from the date of readiness intimated. The inspection report of prototype jointly signed by manufacturer and MSEDCL representative along with the drawings shall be submitted by the tenderer to the Chief Engineer (Distribution). The Tenderer shall submit the final drawings in line with these specifications and the prototype to the Chief Engineer (Distribution) for approval before bulk manufacturing. The approval of prototype & drawings shall be the responsibility of tenderer. No extra period shall be allowed for getting approval of prototype and drawing & this shall be inclusive in the period of delivery schedule given by the tenderer.

14.00 GUARANTEE

Equipments supplied shall be guaranteed for a period of 66 months from the date of supply or 60 months from the date of installation, whichever ends later. Bidders shall guarantee to repair or replace free of cost the meters, CTs, MCCBs and meter boxes (if supplied), which are found to be defective / inoperative at the time of installation, or become inoperative / defective during guarantee period. Replacements shall be effected within 1 month from the date of intimation. If the defective equipments are not replaced / repaired within the specified period above, the MSEDCL shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

The bidder shall extend the guarantee of 5 years. However the backup bank guarantee provided by the bidders shall be valid for 2 years only

15.00 INSPECTION

All tests and inspection on the items like metering cabinet, CT Operated Static Energy Meters, CTs and the MCCBs shall be made at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and the purchaser. The manufacturer shall provide the purchaser all reasonable facilities, without any charge to satisfy him that the material is being supplied in accordance with this specification. Inspection of the first lot shall be carried out jointly by representative of the Chief Engineer (Distribution) and Executive Engineer of Inspection wing.

16.00 RANDOM SAMPLE TESTING (RST)

After dispatch of material against inspected lot to various store centers, the RST shall be carried out at each store. For this purpose, two numbers of samples out of each hundred numbers of received quantities of the Metering Cabinets shall be selected for testing. The RST of all the items, i.e. CT Operated Static Energy Meters, CTs and MCCBs shall be carried out invariably. 5 days advance information shall be given to supplier for joint inspection and the date shall not be altered to the convenience or request of supplier. If the supplier / supplier's representative fails to attend on the date fixed, the RST shall be carried out in his absence & results of RST shall be binding on supplier. If the single item of the meter cabinet fails in RST, the lot received at that particular stores shall be rejected. The meters shall be tested by our Executive Engineer (Testing) for –

- a. No load condition
- b. Limits of error tests
- c. Starting current
- d. Repeatability of error test
- e. Temper conditions as per specifications.

Also for the other items, Acceptance & Routine tests as per specification shall be carried out. In case the selected meter/ other item fail in any of the tests, the lot received at that particular store shall be rejected.

17.00 TENDER SAMPLE

The tenderer are required to submit 05 (Five) number of sample meters and CTs of each offered type / item along with the offer for evaluation. The samples shall be clearly marked with each type / item for which the sample is submitted and the name of bidder. Out of these, one sample of meter shall be without Ultrasonic welding to confirm constructional features. If samples of same make / brand of Meters / CTs are offered by more than one bidders, then only 3 (Three) number of them (of same make) shall be selected randomly amongst samples received from various bidders for type testing at ERDA and the test report thereof shall be applicable to all such bidders for particular make / brand of LT CT meters and CTs.

18.00 SCHEDULES

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule `A' Guaranteed and technical particulars. (As per GTP uploaded on e - tendering site)

Schedule `C' ... Tenderer Experience

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard shall not be entertained. If it is

observed that there are deviations in the offer in Guaranteed Technical Particulars, then, such deviations shall be treated as deviations.

SCHEDULE - "C"

TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed / under execution for supply of CT Operated Energy Metering Cabinet comprising of 100/5 Amps or 50/5 Amps Resin Cast Plug in Type CTs, 160 Amps (setting at 100 A) or 100 Amps (setting at 50 A) MCCBs and LT CT Operated TOD Meter And Other Arrangement by him to whom a reference may be made by purchaser in case he consider such a reference necessary.

Sr. No.	Name of client	Order No. & Date	Qty. Ordered	Qty. Supplied
---------	----------------	------------------	--------------	---------------

NAME OF FIRM _____
NAME & SIGNATURE OF TENDERER _____
DESIGNATION _____
DATE _____

ANNEXURE U - I

“INDEMNITY BOND”

UNDERTAKING TO BE SUBMITTED BY THE PARENT COMPANY SITUATED ABROAD IN
CASE OF THE PARTICIPANT BIDDER WHO IS AN INDIAN BASED SUBSIDIARY ON
GENERAL STAMP OF RUPEES 200/-

To,
The Executive Director (CP),
Maharashtra State Electricity Distribution Co. Ltd.,
Prakashgad, Bandra (E),
Mumbai – 400 051.

Dear Sir

Sub: Undertaking against Tender _____ for procurement of _____

We, M/s. _____ having registered office at _____ are the Parent Company of M/s. _____ who have participated against your Tender No. _____ for procurement of _____.

We have carefully read and have thoroughly understood and agree to the terms and conditions of the subject tender.

We hereby undertake that in case of placement of order against the subject tender on our subsidiary company, M/s. _____, in the event of we accept all the responsibilities and liabilities for supply of quality meters as per specification of the tender and execution of the contract.

We further hereby undertake that we shall be responsible for any liability arising out of the contract placed on M/s. _____ and to pay MSEDCL on demand the sum of rupees as per agreement in the event of any breach of condition of the purchase order, loss and damage of the material till expiry of guarantee period as stipulated in the order.

Our liability here under shall not be impaired or discharged by extension of time or variation or alteration made with or without our knowledge or consent by or between the parties to the said contract. This undertaking shall be valid and binding on us upto and including the execution and guarantee period of the order and shall not be terminable by notice or change in the constitution of any of the companies. In case of any dispute arising out of or in connection with this tender or contract, if concluded, the same shall be subject to the exclusive jurisdiction of the “Court in Mumbai (India).”

Yours faithfully,

(Authorised Signatory)

FOR _____

SCHEDULE A

GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

ITEM NAME	L.T.C.T. OPERATED ENERGY METERING CABINET 50/5 AMPS & 100/5 AMPS RATING ALONG WITH RESIN CAST PLUG IN TYPE CTS, MCCB'S & LT CT OPERATED STATIC TOD ENERGY METER	
SR. NO.	GTP PARAMETERS	GTP VALUES
A	LT CT OPERATED STATIC TOD ENERGY METER	
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TEXT
2.	MAKE AND TYPE OF METER	TEXT
3.	APPLICABLE STANDARD IS AS PER IS: 14697 /1999 (REAFFIRMED 2004), CBIP TECH-REPORT-88 AMENDED UP TO DATE & IS: 15707 / 2006	BOOLEAN
4.	ENERGY METER IS AMR COMPATIBLE THROUGH SUITABLE MODEM (GPRS / GSM / EDGE / CDMA / PSTN / LPR), STATIC, 3 PH, 4 WIRE TRI-VECTOR ENERGY METER	BOOLEAN
5.	FREQUENCY 50 HZ \pm 5%	BOOLEAN
6.	ACCURACY CLASS OF METER 0.5	BOOLEAN
7.	RATED VOLTAGE	TEXT
8.	VOLTAGE RANGE	TEXT
9.	BASIC CURRENT (I_B) OF METER	TEXT
10.	MAXIMUM CONTINUOUS CURRENT (I_{MAX})	TEXT
11.	SHORT TIME OVER CURRENT	TEXT
12.	STARTING CURRENT OF METER	TEXT
13.	POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT	TEXT
14.	APPARENT POWER CONSUMPTION IN EACH CURRENT	TEXT
15.	KVA MD PROVIDED (YES/NO)	BOOLEAN
16.	DISPLAY PARAMETERS AS PER SPECIFICATIONS	BOOLEAN
17.	CT RATIO OF METER.	TEXT
18.	POWER FACTOR IS 0.0 LAG - UNITY- 0.0 LEAD.	BOOLEAN
19.	POWER SUPPLY IS SMPS.	BOOLEAN
20.	METER BEARS ISI MARK	BOOLEAN
21.	STANDARD REFERENCE TEMPERATURE OF METER.	TEXT
22.	MEAN TEMPERATURE CO-EFFICIENT.	TEXT

23.	METER BODY IS MADE OF TRANSPARENT POLY -CARBONATE BASE AND COVER.	BOOLEAN
24.	POLY CARBONATE BODY OF THE METER CONFORMS TO IS: 11731 (FH-1 CATEGORY)	BOOLEAN
25.	DEGREE OF PROTECTION OF METER BODY	TEXT
26.	POLY CARBONATE BODY MEETS THE TEST REQUIREMENT OF HEAT DEFLECTION TEST AS PER ISO 75 \geq 150°C & TYPE TEST REPORT IS ENCLOSED	BOOLEAN
27.	POLY CARBONATE BODY MEETS THE TEST REQUIREMENT OF GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 1984 OR IEC PUB 60695-2-12 AT 900° C & TYPE TEST REPORT IS ENCLOSED.	BOOLEAN
28.	POLY CARBONATE BODY MEETS THE TEST REQUIREMENT OF BALL PRESSURE TEST AS PER IEC--60695-10-2 & TYPE TEST REPORT IS ENCLOSED	BOOLEAN
29.	POLY CARBONATE BODY MEETS THE TEST REQUIREMENT OF FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986 & TYPE TEST REPORT IS ENCLOSED.	BOOLEAN
30.	METER BASE AND COVER DOES NOT CHANGE IN COLOUR, SHAPE, SIZE AND DIMENSION WHEN SUBJECTED TO 200 HOURS ON UV AGEING TEST & TYPE TEST REPORT IS ENCLOSED.	BOOLEAN
31.	PHYSICAL WATER ABSORPTION VALUE OF METER BODY	TEXT
32.	THERMAL HDDT VALUE OF METER BODY	TEXT
33.	TENSILE STRENGTH OF METER BODY	TEXT
34.	FLEXURE STRENGTH OF METER BODY	TEXT
35.	MODULUS OF ELASTICITY OF METER BODY	TEXT
36.	IZOD IMPACT STRENGTH OF METER BODY NOTCHED AT 23°C	TEXT
37.	TERMINAL COVER OF METER IS EXTENDED TYPE, TRANSPARENT AND SEALABLE INDEPENDENTLY	BOOLEAN
38.	PROPER SIZE OF GROOVES ARE PROVIDED AT BOTTOM OF TERMINAL COVER FOR INCOMING & OUTGOING SERVICE WIRES	BOOLEAN
39.	MOULDED SINGLE TERMINAL BLOCK FOR CURRENT & VOLTAGE CONNECTIONS IS PROVIDED AS PER IS: 14697 / 1999 (AMENDED UP TO DATE)	BOOLEAN
40.	INDEPENDENT SEALING PROVISION IS MADE AGAINST OPENING OF THE TERMINAL COVER AND FRONT COVER.	BOOLEAN
41.	UNIDIRECTIONAL SCREWS WITH TWO HOLES FOR SEALING	BOOLEAN

	PURPOSE ARE PROVIDED ON METER BODY	
42.	POLY-CARBONATE TRANSPARENT BASE AND COVER IS ULTRA-SONICALLY WELDED (CONTINUOUS WELDING)	BOOLEAN
43.	THICKNESS OF MATERIAL FOR METER COVER AND BASE	TEXT
44.	TERMINAL COVER IS TRANSPARENT WITH ONE SIDE HINGE WITH SEALING ARRANGEMENT.	BOOLEAN
45.	SEPARATE PUSH BUTTONS ARE PROVIDED FOR HIGH RESOLUTION READING & DISPLAY PARAMETERS AS WELL AS MD RESETTING	BOOLEAN
46.	OUTPUT DEVICE FOR TESTING OF METER IS BLINKING LED OR OTHER SIMILAR DEVICE WITH CONSTANT PULSE RATE	BOOLEAN
47.	METER CONSTANT IS INDELIBLY PRINTED ON THE NAME PLATE OF THE METER	BOOLEAN
48.	METER IS IMMUNE UPTO AC / DC / PERMANENT MAGNETIC FIELD UPTO 0.2 TESLA ON ALL THE SIDES OF METER AS PER CBIP - 88 TECHNICAL REPORT WITH LATEST AMENDMENTS.	BOOLEAN
49.	UNDER INFLUENCE OF ANY MAGNETIC FIELD (AC / DC / PERMANENT) ABOVE 0.2 TESLA, IF THE ERRORS ARE BEYOND PERMISSIBLE LIMITS, METER RECORDS ENERGY CONSIDERING I_{MAX} AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	BOOLEAN
50.	METER ACCURACY IS NOT AFFECTED AFTER REMOVAL OF PERMANENT MAGNET OF 0.5 TESLA APPLIED FOR 15 MINUTES	BOOLEAN
51.	CTS ARE PROVIDED WITH MAGNETIC SHIELDING AND ARE TESTED SEPARATELY PRIOR TO ASSEMBLY	BOOLEAN
52.	METER IS CAPABLE OF MEASURING TOTAL ENERGY CONSISTING OF 50 HZ ENERGY AND HARMONICS ENERGY	BOOLEAN
53.	METER IS CAPABLE TO WITHSTAND AND NOT GET DAMAGED IF PHASE TO PHASE VOLTAGE IS APPLIED BETWEEN PHASES & NEUTRAL FOR FIVE MINUTES	BOOLEAN
54.	METER WITHSTANDS ANY TYPE OF HIGH VOLTAGE & HIGH FREQUENCY SURGES WHICH ARE SIMILAR TO THE SURGES PRODUCED BY INDUCTION COIL TYPE INSTRUMENTS WITHOUT AFFECTING THE ACCURACY OF THE METER	BOOLEAN
55.	ACCURACY OF METER IS NOT AFFECTED WITH APPLICATION OF ABNORMAL VOLTAGE / FREQUENCY GENERATING DEVICE SUCH AS SPARK DISCHARGE OF APPROXIMATELY 35 KV.	BOOLEAN
56.	OPTICAL PORT IS PROVIDED WITH SEALING ARRANGEMENT	BOOLEAN
57.	WIRED RS232 COMMUNICATION PORT IS PROVIDED WITH SEALING ARRANGEMENT	BOOLEAN

58.	INTERNAL MAINTENANCE FREE BATTERY (NI-MH OR LI - ION OR NICD) OF LONG LIFE OF 15 YEARS IS PROVIDED	BOOLEAN
59.	A SUITABLE PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY IS PROVIDED.	BOOLEAN
60.	METER PCB IS WIRE LESS & IS MADE BY SURFACE MOUNTING TECHNOLOGY	BOOLEAN
61.	RTC BATTERY & BATTERY FOR DISPLAY ARE SEPARATE.	BOOLEAN
62.	NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED	BOOLEAN
63.	6 (SIX) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED.	BOOLEAN
64.	PROVISION TO RESET MD THROUGH HAND HELD TERMINAL (HHU) IS PROVIDED.	BOOLEAN
65.	PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED.	BOOLEAN
66.	PROVISION FOR AUTO RESET OF MD AT 24:00 HRS AT THE END OF EACH BILLING CYCLE OR AT THE END OF THE MONTH IS PROVIDED.	BOOLEAN
67.	RTC PRE - PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR CORRECTION.	BOOLEAN
68.	MAXIMUM DRIFT TIME OF RTC PER YEAR	TEXT
69.	ALL ANTI TAMPER FEATURES ARE INCORPORATED IN METER AS PER SPECIFICATIONS	BOOLEAN
70.	TAMPER NO. & TAMPER EVENT IS REGISTERED IN TAMPER EVENT REGISTER	BOOLEAN
71.	METER LOGS THE TAMPER EVENT AS PER SPECIFICATIONS	BOOLEAN
72.	METER DETECTS THE OCCURRENCE AND RESTORATION OF THE ABNORMAL EVENTS AS PER SPECIFICATIONS.	BOOLEAN
73.	METER DOES NOT GET AFFECTED BY THE ACTION OF ANY REMOTE CONTROL DEVICES	BOOLEAN
74.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF MINIMUM 7 DIGITS (WITH \pm INDICATION) AND MINIMUM 10 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED.	BOOLEAN
75.	AUTO DISPLAY CYCLING PUSH BUTTON REQUIRED WITH PERSISTENCE TIME OF 9 SECONDS IS PROVIDED.	BOOLEAN
76.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF 70°C	BOOLEAN
77.	MD INTEGRATION PERIOD IS 30 MINUTES	BOOLEAN

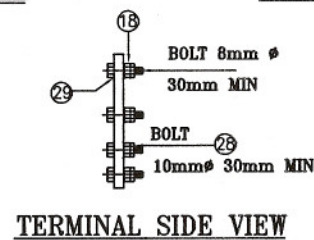
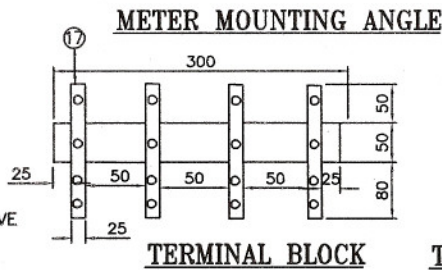
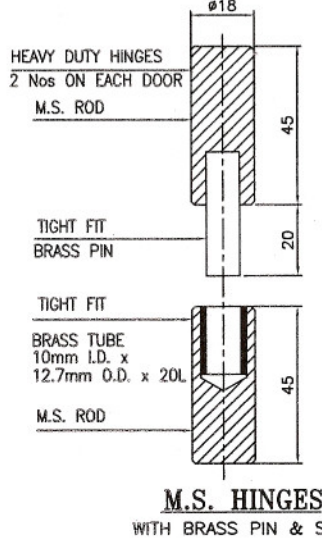
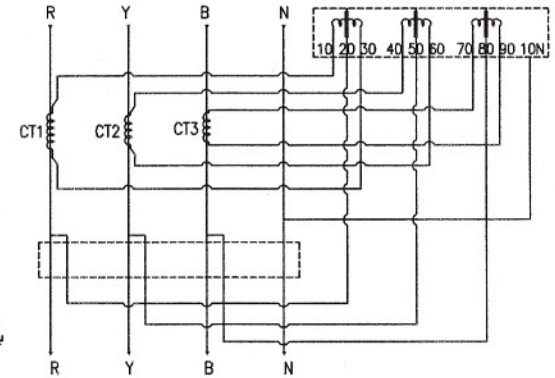
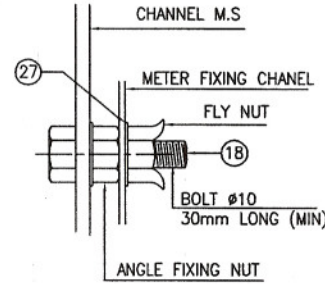
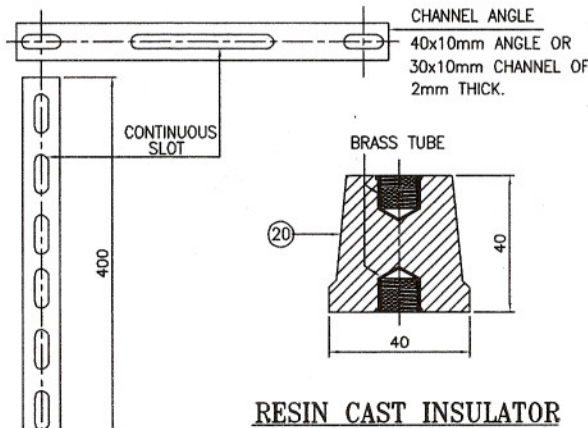
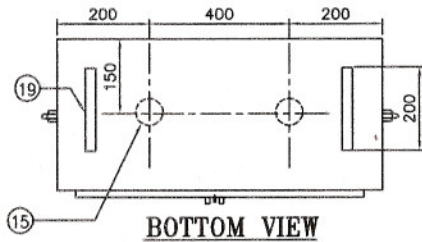
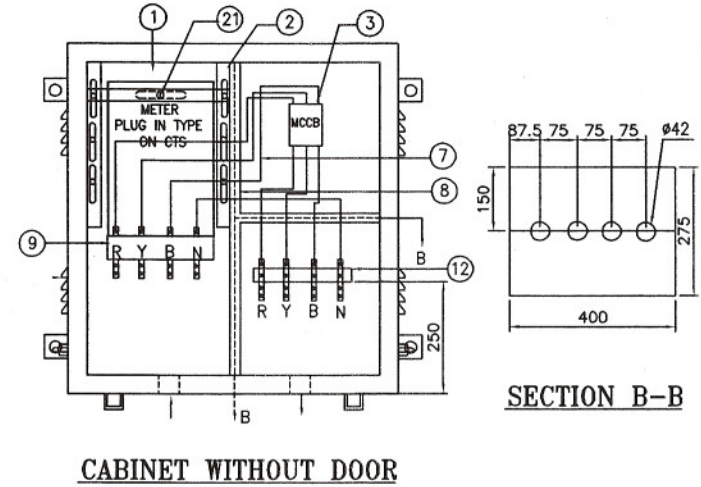
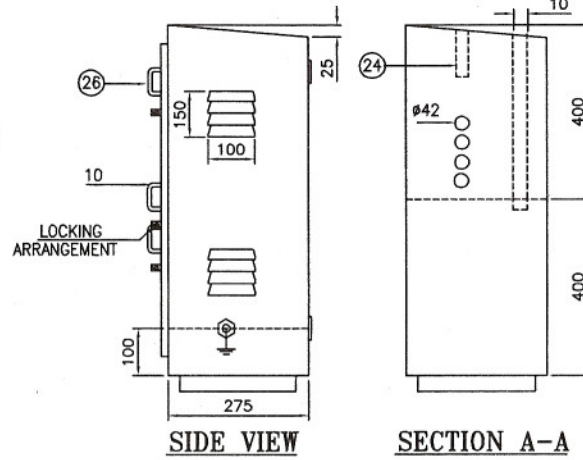
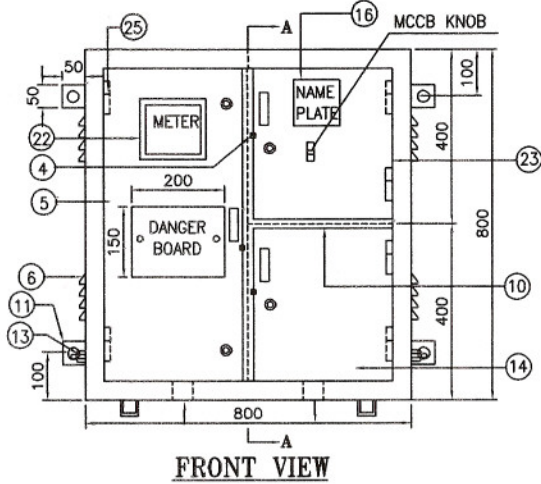
78.	AVERAGE POWER FACTOR WITH 2 DECIMAL DIGITS IS DISPLAYED	BOOLEAN
79.	PROVISION FOR LOAD SURVEY DATA FOR EVERY 30 MINUTES AND FOR PREVIOUS 45 DAYS FOR SPECIFIED PARAMETERS IS MADE.	BOOLEAN
80.	PROVISION OF LOAD SURVEY DATA IS ON FIRST IN FIRST OUT BASIS (FIFO)	BOOLEAN
81.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE SPECIFICATION	BOOLEAN
82.	WHETHER METER IS TYPE TESTED	BOOLEAN
83.	TYPE TEST REPORT NOS.	TEXT
84.	ALL ACCEPTANCE & ROUTINE TESTS AS PER IS 14697-1999 (REAFFIRMED 2004) AND ARE CARRIED OUT ON THE METER.	BOOLEAN
85.	TRANSPORTATION TEST IS CARRIED OUT ON THE METER.	BOOLEAN
86.	QUALITY ASSURANCE PLAN AS PER SPECIFICATIONS IS ENCLOSED	BOOLEAN
87.	QUALIFYING REQUIREMENTS	
a.	WHETHER BIDDER IS A MANUFACTURER	BOOLEAN
b.	TURN OVER OF RS. 30 CRORES DURING ANY ONE OF LAST 3 FINANCIAL YRS.	BOOLEAN
c.	MIN. 3 YRS EXPERINECE OF SUPPLY OR MANUFACTURING STATIC METERS UPTO THE END OF LAST FINANCIAL YEAR.	BOOLEAN
d.	MIN. 5 LAKHS STATIC METERS SUPPLIED DURING LAST 3 FINANCIAL YRS.OUT OF WHICH 2 LAKH METERS IN IMMEDIATE PRECEEDING FINANCIAL YEAR	BOOLEAN
e.	WHETHER THE BIDDER HAVE ALL THE FACILITY IN HIS WORKS FOR DESIGN, ASSEMBLY, QUALITY ASSURANCE, BURN-IN TEST (FULLY ASSEMBLED ENERGY METER), TESTING (ALL ROUTINE AND ACCEPTANCE TESTS), AUTOMATIC CALIBRATION OF ENERGY METER ON SOFTWARE BASED TEST BENCH, QUALIFIED TEAM OF TECHNICAL AND SOFTWARE ENGINEERS;	BOOLEAN
f.	AVERAGE ANNUAL TURNOVER OF THE MANUFACTURER FOR ENERGY METERS FOR THE THREE (3) BEST FINANCIAL YEARS OUT OF LAST FIVE (5) YEARS,	BOOLEAN
88.	METER IS GUARANTEED FOR A PERIOD OF 66 MONTHS FROM THE DATE OF SUPPLY OR 60 MONTHS FROM THE DATE OF INSTALLATION, WHICHEVER ENDS LATER.	BOOLEAN
89.	IN HOUSE TESTING FACILITY IS AVAILABLE FOR	
a)	A.C. VOLTAGE TEST	BOOLEAN

b)	INSULATION RESISTANCE TEST	BOOLEAN
c)	ACCURACY REQUIREMENT	BOOLEAN
d)	TEST ON LIMITS OF ERRORS	BOOLEAN
e)	TEST ON METER CONSTANT	BOOLEAN
f)	TEST OF STARTING CONDITION	BOOLEAN
g)	TEST OF NO-LOAD CONDITION	BOOLEAN
h)	REPEATABILITY OF ERROR TEST	BOOLEAN
i)	TEST OF POWER CONSUMPTION	BOOLEAN
j)	VIBRATION TEST	BOOLEAN
k)	SHOCK TEST	BOOLEAN
l)	TRANSPORTATION TEST AS PER RELEVANT IS	BOOLEAN
m)	TAMPER CONDITIONS – AS PER MSEDCL SPECIFICATION	BOOLEAN
n)	GLOW WIRE TEST	BOOLEAN
o)	LONG DURATION TEST	BOOLEAN
p)	FLAMABILITY TEST	BOOLEAN
90.	MANUFACTURER HAVE DULY CALIBRATED RSS METER OF CLASS 0.01 ACCURACY.	BOOLEAN
91.	TYPE OF BATTERY PROVIDED	TEXT
92.	PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF INTERNAL MAINTENANCE FREE BATTERY IS PROVIDED	BOOLEAN
93.	EXTERNAL BATTERY PROVIDED IN THE RATIO OF ONE BATTERY SET PER 20 NOS. METERS.	BOOLEAN
94.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	TEXT
95.	MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION (DETAILS SHALL BE SUBMITTED SEPARATELY IN A SEALED COVER ALONG WITH OFFER.)	BOOLEAN
C	RESIN CAST PLUG IN TYPE LT CT	
96.	TYPE	TEXT
97.	APPLICABLE STANDARD IS IS: 2705/1992 (AMENDED UP TO DATE)	TEXT
98.	RATED CURRENT	TEXT
99.	RATED SHORT TIME CURRENT	TEXT
100.	RATED VOLTAGE	TEXT

101.	CURRENT RATIO	TEXT
102.	V.A. BURDEN	TEXT
103.	ISF OF CT	TEXT
104.	CLASS OF ACCURACY	TEXT
105.	PRIMARY WOUND TYPE	BOOLEAN
106.	I.S. REFERENCE	TEXT
107.	NAME PLATE BODY	TEXT
108.	CURRENT DENSITY ADOPTED	TEXT
109.	NUMBER OF PRIMARY TURNS	TEXT
110.	NUMBER OF SECONDARY TURNS	TEXT
111.	COLOUR OF CT'S	TEXT
112.	WHETHER TYPE TESTED	BOOLEAN
113.	TYPE TEST REPORT NO.	TEXT
D	MOULDED CASE CIRCUIT BREAKERS	
114.	TYPE	TEXT
115.	APPLICABLE STANDARD IS IS:13947 / 1993 AMENDED UPTO DATE.	TEXT
116.	RATED CURRENT	TEXT
117.	RATED VOLTAGE	TEXT
118.	RATED SERVICE SHORT CIRCUIT RATING	TEXT
119.	RATED SHORT CIRCUIT CAPACITY	TEXT
120.	OVER LOAD CURRENT SETTING	TEXT
121.	UTILIZATION CATEGORY	TEXT
122.	I.S. REFERENCE	TEXT
123.	WHETHER TYPE TESTED	BOOLEAN
124.	TYPE TEST REPORT NO.	TEXT
E	CABINET	
125.	APPLICABLE STANDARD IS IS:13410 OR IS 13947	TEXT
126.	MATERIAL OF CABINET ENCLOSURE (SHEET STEEL / SMC MOULDED)	TEXT
127.	THICKNESS OF ENCLOSURE	TEXT
128.	COLOUR OF ENCLOSURE	TEXT
129.	HEIGHT X WIDTH X DEPTH	TEXT
130.	MATERIAL OF TERMINAL BLOCK	TEXT
131.	SIZE OF TERMINAL BLOCK	TEXT

STANDARD TECHNICAL SPECIFICATION OF CT OPERATED ENERGY METERING CABINET comprising of 100/5A or 50/5 A Resin Cast Plug in Type CTs, 160 Amps (setting at 100 A) or 100 Amps (setting at 50 A) MCCBs and LT CT Operated TOD Meter And Other Arrangement

132.	MATERIAL OF OUTGOING TERMINAL STRIPS	TEXT
133.	SIZE OF OUT GOING TERMINAL STRIPS	TEXT
134.	WHETHER TYPE TESTED	BOOLEAN
135.	TYPE TEST REPORT NOS.	TEXT



THIS IS AN INDICATIVE DRAWING

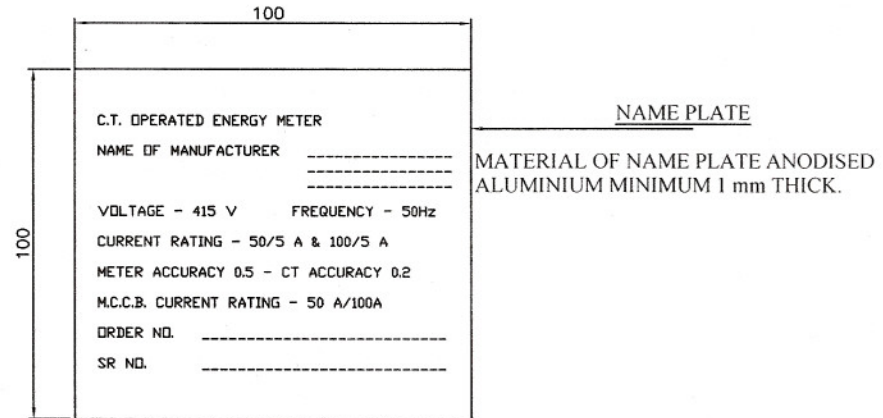
DATE		NAME		M S E D C L	
				MUMBAI	
DSN				ALL DIMENSIONS ARE IN MM	
DRN				MATERIAL	
CAD				G.A. OF CT.OPERATED ENERGY	
APPD				METERING CABINET RATING OF	
SCALE = N.T.S				50/5A & 100/5A	
TOLERANCE : ±5mm				Drg. No. :	
				DIST/MM-IV/CTMTR/	
				2008/01 SHEET 1/3	

LEGEND

1. METER C.T. OPERATED TYPE ...MAKE 3PH, 4W, CLASS-O.5-240V
2. MOUNTING CHANNEL/ ANGLE OF 2MM THICKNESS SHEET.
3. M.C.C.B.MAKE.
4. SEALING ARRANGEMENT FOR METER AND MCCB CHAMBER.
5. METER CHAMBER / C.T. CHAMBER.
6. VENTILATING LOUVERS WITH DOUBLE G.I.WIRE MESH FROM IN SIDE.
7. I. INTER CONNECTING COPPER CABLES FROM C.T.S. TO MCCB AND TO OUT GOING TERMINAL BLOCK WILL BE SINGLE CORE COPPER STRANDED ISI MARK.
II. STANDARD COLOUR CODES SHALL BE USED
8. M.S. CHANNEL FOR SUPPORTING THE DOORS.
9. L.T. CURRENT TRANSFORMERS, WOUND PRIMARY, RESIN CAST, CLASS 0.2 OF CTR 50/5A WITH BROWN COLOUR, AND OF 100/5A WITH D.A. GRAY COLOUR
10. M.S.SHEET (2mm) PARTITIONS.
11. FIXING CLAMPS 60 X 50 X 5 mm.
12. OUTGOING TERMINAL BLOCK (300 X 50 X 15 mm THICK) OF BAKELITE / DMC.
13. EARTHING SCREW 50mm LONG AND 12mm Ø, 2 NOS
14. OUTGOING TERMINAL CHAMBER.
15. BRASS CABLE GLANDS OF SIZE TO SUIT 3 1/2 CORE AL. XLPE ARMoured CABLE 70/120 SQ.mm
16. MANUFACTURERS NAME PLATE.
17. TERMINAL STRIPS OF TINNED COPPER 25 X 6 mm.
18. ALL NUT BOLTS SHALL BE OF STANLESS STEEL ONLY.
19. CHANNEL 50 X 50 X 2 mm.
20. 2 NUMBERS OF RESIN CAST INSULATOR FOR SUPPORTING OF TERMINAL BLOCK TOTAL 2 RESIN CAST INSULATORS.
21. NUT BOLTS FOR FIXING OF METER SHALL BE PROVIDED.
22. TOUGHENED GLASS 200 X 150 X 2 mm THICK.
23. RUBBER GASKET 3 mm. THICK.
24. CABLE HOLDING CLAMPS OF M.S. 2 mm THICK SHEET.
25. HINGES.
26. HANDLES OF 10 mm DIAMETER M.S. ROD.
27. ALL PLAIN WASHERS SHALL BE OF G.I. - 1mm THICK.
28. ALL NUTS SHALL BE OF STAINLESS STEEL 6mm THICK.
29. FOR ALL CONNECTIONS SPRING WASHERS OF G.I. - 1mm THICK SHALL BE USED.

NOTES

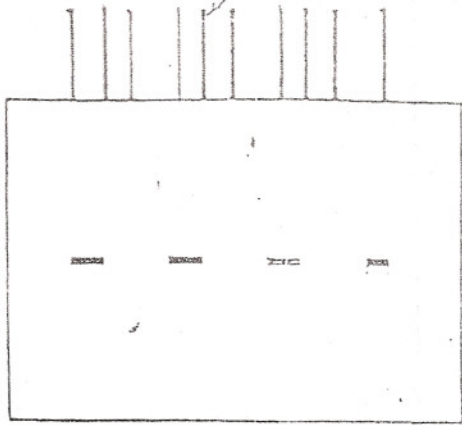
1. BOX SHOULD BE OF MINIMUM THICKNESS OF 2 mm M.S. SHEET WITH SEPARATE DOORS FOR THREE CHAMBERS. THE BOX SHOULD BE POWDER COATED BY GOOD QUALITY POWDER COATING OF BROWN FOR 50/5A AND DA GRAY FOR 100/5A.
2. HANDLE SHOULD BE PROVIDED TO ALL THE DOORS TO CLOSE AND OPEN.
3. THE SEALING ARRANGEMENT FOR MCCB AND METER CHAMBERS SHALL BE PROVIDED.
4. GLASS FOR OBSERVING METER READING SHOULD BE PROVIDED FROM IN SIDE. IN THE EVENT OF BREAKING, IT SHOULD BE POSSIBLE TO REPLACE IT AFTER OPENING THE DOOR.
5. VENTILATION LOUVERS SHOULD BE COVERED WITH G.I. WIRE MESH FROM IN SIDE TO MAKE THE BOX VERMIN PROOF.
6. ALL HOLES THROUGH WHICH CABLE LEADS ARE SUPPOSE TO PASS SHOULD BE PROVIDED WITH RUBBER REELS.
7. OVERLOAD RELEASE SETTING OF MCCB SHOULD BE 50A/100 AMP. IT SHOULD BE SO MOUNTED THAT ITS OPERATING KNOB LEVER CAN BE OPERATED WITHOUT OPENING THE DOOR.
8. THE INTERNAL COPPER CABLES SHOULD BE SUITABLY CLAMPED IN SIDE THE CABINET.
9. C.T.S. SHALL BE FIXED WITH PROPER CLAMPS / BOLTS.
10. TINNED COPPER LUGS SUITABLE FOR SINGLE CORE CABLES SHALL BE PROVIDED FOR MAKING CONNECTIONS INSIDE THE BOX (EXCEPT OUTGOING TERMINALS).
11. ALL WIRING INSIDE THE BOX SHALL BE DONE BY THE FIRM.



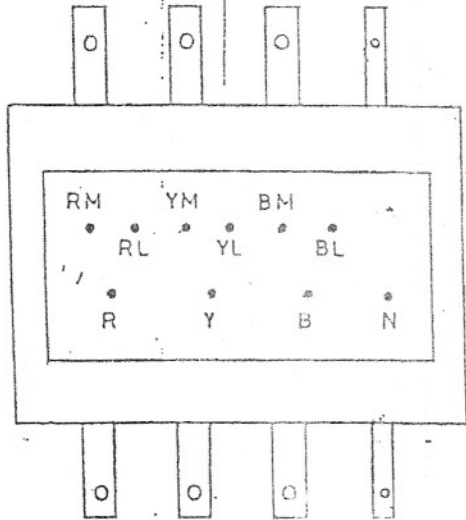
THIS IS AN INDICATIVE DRAWING

DATE	NAME	M S E D C L			
DSN		MUMBAI			
DRN		ALL DIMENSIONS ARE IN MM		MATERIAL	
CAD		ARRANGEMENT FOR CT.OPERATED			
APPD		METERING CABINET RATING OF		Drg. No. :	
SCALE = N.T.S		50/5A & 100/5A		DIST/MM-IV/CTMTR/	
				2008/01 SHEET 2/3	

PIN FOR C.T. / P.T. CONNECTIONS
(PLUG IN ARRANGEMENT)

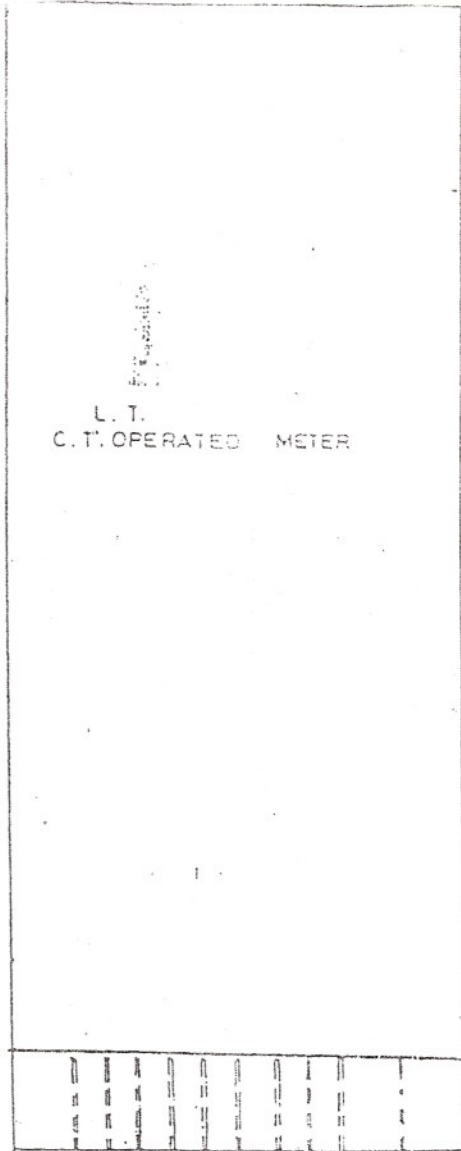


ELEVATION



PLAN

RESIN CAST UNIT OF 3 C.T.S & NEUTRAL
WITH PLUG IN TYPE ARRANGEMENT
FOR METER CONNECTIONS



L. T.
C. T. OPERATED METER

ELEVATION

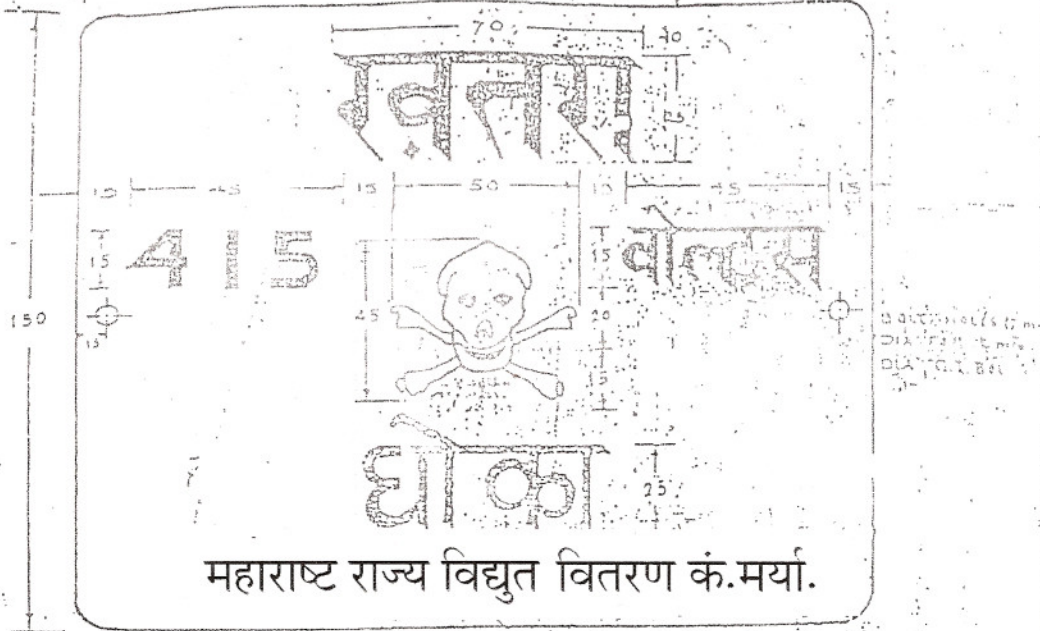
(NOT TO SCALE)

THIS IS AN INDICATIVE
DRAWING

GENERAL DRAWING SHOWING L.T, C.T OPERATED
METER & RESIN CAST 3 C.T.S WITH NEUTRAL
WITH PLUG IN TYPE ARRANGEMENT.
FOR METER CONNECTION

M S E D C L

APP'D	CHECKED	DATE	DRG No. DIST/MM-IV/CTMTR/2008/01 SHEET 3/3	DISTRIBUTION SECT.
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NOTES AND REFERENCES

A. SPECIFICATIONS FOR THE BOARD.

1. MATERIAL : 18 GAUGE H.S. SHEET.
2. SIZE : 200 MM X 150 MM.
3. FRONT SIDE (BACKGROUND) : ENAMELLED WHITE LETTERINGS, FIGURES OF VOLTAGE PAINTING OF SKULL AND BONES SHALL BE IN SIGNAL RED COLOUR
4. BACK SIDE ENAMELLED AS PER IS:2551
5. BOLT HOLES: 2 NOS. 7MM DIA FOR 6MM DIA G.S. BOLT.

NOTE

CORNERS OF THE PLATE SHALL BE ROUNDED. ALL LETTERINGS SHALL BE CENTRALLY SPICED.

DANGER BOARD MARATHI

MSEDCL

DRN
1/1/20

CHECKED

APPROVED

SCALE

1:1.5:30

DRS. NO.

62-70

SHEET NO. 2/2

DISTRIBUTION
DEPARTMENT