

**SECTION – V:**

**TECHNICAL SPECIFICATION(TS)  
Three Phase Meter:CMC/ENQ/ASG/KM/005**

**Dated : 29.11.2010**

**The detailed meter specification No. : I-10-3A of  
Three Phase Meter is enclosed**

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## 1.0 SCOPE

This specification covers the design, manufacture, testing and supply of Three-phase Four-wire Static LT Whole Current Energy Meters of Accuracy Class 1.0, 20-100 A, 3 x 240 volts for measurement of energy for power factor range from zero lag-unity-zero lead.

## 2.0 STANDARDS

IS: 13779, IEC 1036 & CBIP Technical report no.88 and its latest amendment along with BSES specifications.

The meter shall be ISI marked (vendor shall be BIS certified) and conform to CEA metering regulation.

## 3.0 TECHNICAL SPECIFICATION

Sr. No.	Parameters	Technical Requirements
3.1	Voltage	Reference Voltage 240 volt (P-N), +20% to -40% Vref. However the meter should withstand the maximum system voltage.
3.2	Display	a) LCD (Seven digits) b) Height: 10 mm X 5 mm min. c) Pin Type d) Viewing angle min. 120 degrees
3.3	Display parameters	a) Display parameters: LCD test, date & time, cumulative KWH, cumulative KVAH & RKVAH, MD in KW & KVA, PF, V, I (All the energies are without decimal.) b) Display order shall be as per Annexure-1
3.4	Power factor range	Zero lag –unity- zero lead
3.5	Power Consumption	Less than 1 Watt & 4VA per phase in voltage circuit, 2 VA in current circuit
3.6	Starting current	0.2 % of I <sub>b</sub>
3.7	Frequency	50 Hz with (+ or -) 5% variation
3.8	Test Output Device	Flashing LED visible from the front
3.9	Billing data	a) Meter serial number, Date and time, KWH, KVAH, RKVAH, MD in KW and KVA, No. of tamper counts, tamper occurrence with date & time, tamper restoration date & time with snap shots. History of KWH, KVAH, RKVAH & MD with occurrence details for last 6 months along with TOD readings.

Sr. No.	Parameters	Technical Requirements														
		<p>b) All the above parameters (namely KWH, KVAH, RKVAH, MD in KW and KVA) are meter readings.</p> <p>c) All these data shall be accessible for reading, recording and spot billing by downloading through optical port with MRI (both Analogic &amp; SANDS) or Laptop computers at site.</p>														
3.10	MD Registration	a) Meter shall store MD in every 15/30 min. period along with date & time. At the end of every 15/30 min, new MD shall be compared with previous MD and store whichever is higher and the same shall be displayed.														
3.11	Auto Reset of MD	Auto reset date for MD shall be indicated at the time of finalizing GTP and provision shall be made to change MD reset date through MRI <u>even after installation of meter on site. Default re-setting date is 00:00</u>														
3.12	TOD metering	<table border="1"> <thead> <tr> <th>Tariff</th> <th>Timings</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>00:00 to 6:00</td> </tr> <tr> <td>2</td> <td>06:00 to 09:30</td> </tr> <tr> <td>3</td> <td>09:30 to 12:00</td> </tr> <tr> <td>4</td> <td>12:00 to 18:00</td> </tr> <tr> <td>5</td> <td>18:00 to 23:00</td> </tr> <tr> <td>6</td> <td>23:00 to 24:00</td> </tr> </tbody> </table> <p>Meter shall be capable of doing TOD metering for KWH, KVARH, KVAH and MD in KW and KVA with 6 time zones (programmable on site through CMRI). Following are the default TODs:-</p>	Tariff	Timings	1	00:00 to 6:00	2	06:00 to 09:30	3	09:30 to 12:00	4	12:00 to 18:00	5	18:00 to 23:00	6	23:00 to 24:00
Tariff	Timings															
1	00:00 to 6:00															
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4	12:00 to 18:00															
5	18:00 to 23:00															
6	23:00 to 24:00															
3.13	Load survey	15/30 min integration period, load profile of KW, RKVA and KVA phase wise voltage and current, for min. 50 days (with 15/ 30 minutes integration period).														
3.14	Time required for data reading from meter and downloading on desktop PC	Meter data consisting of all parameters and 50 days load survey for all parameters (Refer 3.13) shall be read by CMRI (both Analogic & SANDS) and downloaded on desktop PC in minimum possible time (not more then 5 minutes) and it shall be indicated at the time of finalizing GTP.														
3.15	Diagnostic feature	Self diagnostic for time, calendar, RTC battery all display segments and NVM.														
3.16	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, communication write etc														
3.17	Software & communication compatibility	a) Optical port with RS 232 compatible to transfer the data locally through CMRI & remote through PSTN / Optical fiber / GSM / CDMA / RF / any other technology to the main computer.														

Sr. No.	Parameters	Technical Requirements
		<p>b) The Supplier shall supply Software required for CMRI (both for Analogic &amp; SANDS make )&amp; for the connectivity to AMR modules. The supplier shall also provide training for the use of software. The software should be compatible to Microsoft Windows systems menu. The software should have polling feature with optional selection of parameters to be downloaded for AMR application.</p> <p>c) The data transfer (from meter to CMRI / AMR equipment) rate should be minimum 1200 bps.</p> <p>d) The Supplier shall provide meter reading protocols. Vendor to jointly work with BSES IT team to develop CMRI software for meter downloading and further uploading on computer. <b>The vendor has to give an undertaking in this regards.</b></p> <p>e) Communication protocols will be either of following two types.</p> <ul style="list-style-type: none"> <li>• Same as previous supplied meter to BSES, minimum for 10000 Nos <b>OR</b></li> <li>• As per IEC 62056/ DLMS protocol. Other protocols shall not be acceptable.</li> </ul>
3.18	Memory	Non volatile memory independent of battery backup, memory should be retained up-to 10 year in case of power failure
3.19	Climatic conditions	<p>a) The meter should function satisfactorily in India with temperature ranging from 0 - 60°C and humidity upto 96%.</p> <p>b) Also refer IS: 13779 for climatic conditions.</p>
3.20	Calibration	Modification in calibration shall not be possible at site by any means.
3.21	Battery	In case battery removal or total discharge same should not effect the working & memory of the meter.
3.22	KVAh defination	KVAh is computed based on KVArh and KWH value. If PF=1, or leading, then KVAh = KWH. At no instance KVAh < KWh

#### 4.0 CONSTRUCTIONAL FEATURES

Sr. No.	Parameters	Technical Requirements
4.1	Body of Meter	<p>a) Top transparent and base opaque material polycarbonate of LEXAN 143A/943AA or equivalent grade having properties of V0 inflammability level and UV stabilized.</p> <p>b) Front cover &amp; base should be ultrasonically welded and should be provided with the brass sealing screws.</p>
4.2	Terminal Block	Made of polycarbonate of grade 500 R or equivalent grade and shall form Integral part of the meter base, brass or copper current terminals with flat-head brass screws.
4.3	Terminal cover	Transparent terminal cover with provision of sealing through sealing screw.
4.4	Diagram of connections	Diagram of external connections to be shown on terminal cover

Sr. No.	Parameters	Technical Requirements
4.5	Marking on name plates	Meter should have clearly visible, indelible and distinctly name plate marked in accordance with IS & Reliance Energy Ltd specifications.
4.6	Meter Sealing	As per IS 13779 and CEA Metering Regulation 2006, Supplier will fix its seal on meter. In addition, supplier shall affix Buyer seal(s) on side of Meter body as advised by buyer and record should be forwarded to Buyer.
4.7	Guarantee / Warranty	5 Years.
4.8	Insulation	A meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
4.9	Resistance of heat and fire	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per the relevant IS 13779.

## 5.0 TAMPER & ANTI-FRAUD DETECTION/EVIDENCE FEATURES

The meter shall log minimum 200 tamper events (ensuring atleast 20 events for each tamper) compartment wise division of each event and their persistence time shall be indicated in GTP.

The Meter shall not be affected by any remote control device & extra high voltage/ field, shall continue recording energy under any one or combinations of the following conditions:

**5.1 Phase sequence reversal:** The meters shall work accurately irrespective of the phase sequence of the supply.

**5.2 Detection of missing potential:** In case someone intentionally takes out a potential lead, the date and time of such occurrence shall be recorded by the Meter. The restoration of normal supply shall also be similarly recorded. The threshold for the voltages should be programmable.

**5.3 Reversal of C.C. (Current Coil) Polarity:** Meter shall record the reversal of C.C. polarity with time and date, and also the time of restoration. Meter shall however register the energy consumed correctly with any one, two or all three phase c.c. reversal.

**5.4 C.C. Shorting:** Meter shall record C.C. Terminal shorting with time and date and time of restoration. The threshold of the current should be programmable.

**5.5 Power On / Off:** Meter shall detect power OFF (minimum power off period 5 minutes) if all of phase voltages are not present. This event shall be recorded at the time of each power OFF. At the same time power ' ON ' event shall be recorded. This logging shall be available in Tamper details along with cumulative time of failure.

**5.6 Recording of Neutral disturbance:** - Meter shall log all events when AC/DC/ Pulsating voltage is injected in neutral circuit especially when same can disturb the recording of energy.

**5.7 Snap-on parameters:** Meter shall log all three phase voltage, current, power factor etc. at the time of tamper attempt for all such occurrence.

**5.8 External Magnetic tampers:** Meter should log on the events of attempt of tampering by external magnetic field as mentioned in the relevant IS.

The Meter shall record as per actual load once the external abnormal magnetic field is removed. In such conditions the Meter shall log the event for presence of abnormal external magnetic field and its restoration.

**5.9 Protection against HV spark/ ESD:** Meter shall continue to record energy or log the event, in case it is disturbed externally using a spark gun/ ignition coil. Upto 35 KV meter should be immuned.

**5.10 Influence Quantities:** The Meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IS 13779, IEC-1036, and CBIP Technical Report No.88 with latest amendment.

The influence quantities are:

- a) External Magnetic field – 0.2 tesla ( with log on feature)
- b) Electromagnetic field induction,
- c) Radio frequency interference,
- d) Unbalanced load,
- e) Vibration etc,
- f) Wave form 10% of 3rd harmonics,
- g) Phase sequence,
- h) Voltage unbalance,
- i) Electro Magnetic H.F. Field, and
- j) D.C. Immunity test.

**5.11 Manufacturing Detail in memory :-** Meter shall have manufacturing month and year in the memory and should come in data downloading.

**5.12 Neutral current measurement :-** Meter shall have feature of Neutral current measurement and display along with phase currents.

**5.13 Low voltage event :-** Meter shall have feature to log an event in case any of phase voltage is <180 voltage.

**5.14 2Phase connection :-** Meter shall have feature to log an event in case only two phase are connected i.e. remaining one phase & Neutral are absent.

**5.15 Top cover open:** The meter shall have top cover opening detection mechanism. The top cover opening event shall be indicated display continuously in auto scroll mode with kWh or through additional LED and shall be logged in memory. The detection and logging mechanism shall work even when meter is not energized. In case of indication of display, meter display shall get reset in 150 days.

- **Additional feature other than mentioned above will be preferred.**

## **6.0 COMPONENT SPECIFICATIONS**

Sl. No	Component Function	Requirement	Makes and Origin
6.1	Current Transformers	The Meters should be with the current transformers as measuring elements. The current transformer should withstand for the clauses under 5.9.j	The current transformer should withstand for the clauses under 5.9.j
6.2	Measurement or computing chips	The Measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs.	<u>USA</u> : Anolog Devices, Cyrus Logic, Atmel, Phillips, Texas Instruments. <u>South Africa</u> : SAMES <u>Japan</u> : NEC
6.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	<u>USA</u> : Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Microchip <u>Japan</u> : Hitachi or Oki
6.4	Display modules	a) The display modules should be well protected from the external UV radiations.  b) The display visibility should 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).  c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type).  d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range minimum 70 °C.	Truly semiconductor, Tianma/ Haijing Electronics, China
6.5	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	Everlight, Osram, Agilent, NFC
6.6	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power	SMPS Type  (It should take care of

Sl. No	Component Function	Requirement	Makes and Origin
		supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	clause 3.1 and 3.5)
6.7	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.  LED	<u>USA</u> : National Semiconductors, Atmel, Phillips, Texas Instruments, ST, Onsemi <u>Japan</u> : Hitachi, Oki, AVX or Ricoh <u>Korea</u> : Samsung EPCOS, Vishay  Everlight, Agilent
6.8	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.  b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
6.9	Battery	Lithium with guaranteed life of 10 years	Texcell, SAFT, Varta
6.10	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	<u>USA</u> : Philips, Dallas Atmel, Motorola, Microchip <u>Japan</u> : NEC or Oki
6.11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	

- Note: 1) The components used by manufacturer shall have "Minimum Life" more than the 10 years.  
2) In case vendor want to use other make components; same shall be approved by BSES before use. Deviation of component make is not allowed without prior approval.  
3) Even for existing/ par suppliers – pre approval is needed for all deviations.

## 7.0 GENERAL REQUIREMENTS

### 7.1 On the meter name-plate:

- meter serial number should be of 8 digits
- size of the digit of the meter serial number should be minimum 5mm X 3mm.
- bar code should be printed next to / below / above the meter serial number

d) BIS registration mark ( ISI mark)

7.2 Meter Sr. Nos. to be printed in black on the name plate, instead of embossing.

7.3 Buyer's Serial Number sticker should be fixed on window glass from inside or on Meter front cover of minimum digit size 6 mm X 3 mm.

7.4 The supplier should seal meters on both sides. The Buyer shall approve the method of sealing.

7.5 The internal potential links should be in closed position or link less Meters will be preferred and there shall not be any external link.

7.6 The internal potential links should be in closed position or link less Meters will be preferred. There shall not be any external link.

7.7 Deliverable with Meters.

1. Individual meter accuracy test report.

2. Terminal cover

3. Consolidated report of routine test report & seal & initial reading record. (soft copy as per BRPL format)

7.8 Box number, Meter serial number, type, rating should be mentioned on cases / cartons.

7.9 Meters shall be suitably packed with environmental friendly material in order to avoid damage or disturbance during transit or handling and to prevent in grace of moisture and dust. Also refer CEA Metering Regulation 2006.

7.10 In case battery removal/ total discharge same should not effect the working & memory of the meter .

## **8.0 ANNEXURE 1: DISPLAY SEQUENCE FOR THE PARAMETERS**

### **1. 8.1 Default Display:**

#### **Display Parameters:**

#### **Default Display (Auto Mode)**

1. Lamp test
2. Real time
3. Date
4. Cumulative kWh
5. Cumulative kvarh Lag
6. Cumulative kvarh lead
7. Cumulative kVah
8. Current Max. demand in kW & Kva
9. Inst. Avg. Power Factor (3 phase)
10. Inst. Voltage R,Y,B (Phase- Neutral)
11. Inst. Line current R,Y, B
12. Neutral Current.

## **8.2 On-demand Display:**

After using pushbutton the following parameters should be displayed.

1. LCD test
2. Date
3. Real Time
4. Cumulative RKVAH
5. Cumulative KVAH
6. Current MD in KW
7. Current MD in KVA
8. Instantaneous Power factor
9. Instantaneous voltage R phase
10. Instantaneous voltage Y phase
11. Instantaneous voltage B phase
12. Instantaneous current R phase
13. Instantaneous current Y phase
14. Instantaneous current B phase
15. Last month billing Date
16. Last month billing KWH reading
17. Last month billing RKVAH reading
18. Last month billing KVAH reading
19. Last month billing Maximum Demand in KW
20. Last month billing Maximum Demand in KW occurrence Date
21. Last month billing Maximum Demand in KW occurrence Time
22. Last month billing Maximum Demand in KVA
23. Last month billing Maximum Demand in KVA occurrence Date
24. Last month billing Maximum Demand in KVA occurrence Time
25. Neutral Current.

Note: The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 6 seconds.

