MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

THREE PHASE POWER QUALITY METER
FOR HT CONSUMER

MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd.

TECHNICAL SPECIFICATION NO.

No. CE/QC-T/MSC -II/TP
PTF PQM, Date: 18.09.2023

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1.0 SCOPE

This specification covers the design, engineering, supply and installation of Three Phase Power Quality Meter of class A certified and Audit Meter complying IS 14697 for AC balanced/ unbalanced loads of HT Consumers. The Meter should be suitable for connection to 3 phase 4 wire system. Power Quality Meter shall monitor, record and analyze Power Quality parameters of MSEDCL HT Consumer.

Power quality meter shall be suitable for power quality measurements, monitoring and recording as per latest international standards which shall support high sampling rate of 1024 samples/ cycle / channel, extensive data logging capabilities, intuitive colored graphical display and high end communication capabilities. It shall have capabilities to capture, log and report PQ events, provide necessary data for analysis and assessment of power quality compliance to prevailing international standards.

Meter shall comply with IEC 61000-4-7, IEC 61000-4-30 (Class A) & IEEE 519-2014 for measurement of harmonics including other power quality parameters such as voltage sag, swell, flicker, disruptions, etc. It shall have capabilities to capture, log and report PQ events, provide necessary data for analysis and assessment of power quality compliance to prevailing international standards. Meter manufacturer shall supply power quality software for data downloading and analysis. This software shall provision to generate power quality compliance reports, IS17036 and IEEE 519 reports.

Power Quality Meter shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation.

2.0 APPLICATION

Use for- power quality continuous measurement and monitoring in r/o of Designated HT Consumers as per MERC (Electricity Supply Code and Standards of Performance of Distribution Licensees including Power Quality) Regulations , 2021.

As per said regulation the "Designated Consumers" means the consumers using or engaged in any of the following process i.e. Arc Furnace, Induction Furnace, Iron and Steel, Aluminum, Textile, Paper and Pulp, Chlor-Alkali, Petrochemicals, Cement, Pharmaceuticals, IT/ITES, Airports, Malls, Hotels, Banking, Railways/ Metros or as may be specified by the MERC from time to time and connected at supply voltage of 11 kV and Above.

3.0 SERVICE CONDITIONS

Power Quality Meter must perform satisfactorily under Non –Air Conditioned environment. Meter to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Environmental Conditions

(a)   Maximum ambient temperature 55^0 C

(b)   Maximum ambient temperature in shade 50^0 C

(c)   Minimum temperature of air in shade 5^0 C

(d)   Maximum daily average temperature 40^0 C

(e)   Maximum yearly weighted average temperature 32^0 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 mtrs.

(j)   Isoceraunic level   50 days/year

(k)   Seismic level (Horizontal acceleration)   0.3

(l)   Climate: Moderately hot and humid tropical climate
      Conductive to rust and fungus growth

4.0   APPLICABLE STANDARDS

The Power Quality Meter shall conform in all respects including performance and testing thereof to the latest relevant and applicable Indian / International Standards to be read with up to date and latest amendments / revisions thereof:

Purpose	Applicable
IEC 61000-4-30 edition 3	Electromagnetic compatibility (EMC)-Testing and measurement techniques-Power quality measurement methods
IEC 62586-2	Functional tests and uncertainty requirements
IEEE 519-2014	Recommended Practices and Requirements for Harmonic. Control in Electrical Power Systems.
IEC 61000-4-7	Measurement method and limits for harmonics and inter harmonics
IEC 61000-2-4	Limits for conducted disturbances for harmonics and inter Harmonics
IEC 61000-3-8	Mains signaling voltage on the supply voltage for mains signaling frequencies over 3kHz
IEC61000-4-15	Flicker Measurement
IEC 62052-11	Electricity metering equipment (AC)-General requirements, tests and test conditions- Part 11: Metering equipment
IEC62053-22	Electricity metering equipment (AC) – Particular requirement –Static meters for active energy (class 0.2S and 0.5S)
IEC62053-24	Electricity metering equipment (AC) – Particular requirement Static meters for reactive energy (class 2 and 3)
IS 14697	AC static transformer operated Watt-hour and VAR-hour meters for class 0.2s and 0.5s

IS 15959	DLMS Indian Companion Standard – Category 'B' for Boundary/Bank/Ring/ABT Metering
IS17036	Distribution system Supply voltage quality

In case of any difference between provisions of Central Station Software standards, the provisions of this specification shall prevail.

5.0 GENERAL TECHNICAL REQUIREMENTS

1.	Type of installation	Indoor/Outdoor
2.	TYPE	POWER QUALITY METER FOR (THREE PHASE, FOUR WIRE) DESIGNATED HT CONSUMER) HT (IS 14697) 3x110V/√3 V Phase to Neutral (3P4W) Variation -30% to +20%
3.	FREQUENCY	50 HZ ± 5%
4.	Power quality accuracy Class	CLASS " A" CERTIFIED
5.	Rated Voltage (secondary)	3x63.5 V Phase to Neutral (3P4W) Variation -30% to +20%
6.	Current rating (secondary)	Ib: 1A, Imax: 2A or Ib: 5A, Imax: 10A Shall be configurable at site
7.	Power supply	Both Self-Powered and auxiliary powered

6.0 DESIGN AND CONSTRUCTION
6.1 The Power quality meter shall be of Permanent (Non -Portable) type class A meter.
6.2 The Meter shall accurately measure voltage (V), current (A), power factor along with voltage and current harmonics i.e. individual & TDD in the system
6.3 The Meter shall be used with CT secondary current 1A or 5A CT.
6.4 The Meter body shall be type tested for IP51 degree of protection. The type test certificate shall be submitted along with the offer.
6.5 The power quality meter shall indicate waveforms, harmonics trends, three phase voltage sequence, vector diagram with angle displacement between voltage and current as well as.
6.6 The meter shall have dynamic error compensation for CT/VT.

6.7 The power quality meter shall have facility to compute flickers in accordance with IEC- 61000- 4-15.

6.8   The power quality meter shall have capability to detect and measure power quality parameters as defined in IEC 61000-4-30 Class A as per the methods specified therein and as well complying with requirements of IEC 62586-2.

- Supply Frequency
- Magnitude of supply Voltage
- Flicker
- Voltage Swell
- Voltage Interruption
- Voltage harmonics
- Current harmonics
- Voltage inter harmonics
- Current inter harmonics
- Voltage Unbalance
- Voltage Sag or Dip

The power quality meter shall have features to detect and log the occurrence and restoration of power quality events as defined in IEC 61000-4-30 along with date and time of the event. For analysis, the power quality meter shall also have provisions to log 10 cycle including pre and post waveforms with RMS value for voltage sag and swell events.

6.9   The PQ Meter shall measure active, reactive and apparent power **optionally** for each phase and also total values for three phases.

Meter shall support industry standard protocols IEC 61850 for data communication with base computer software, substation automation and monitoring systems. At least, MMXU, MMTR, MHAI, MFLK and MSQI Logical nodes shall be supported.

6.10   The Meter shall measure voltage and current harmonics minimum up to the 50th order for each phase. Power quality meter shall have provision to measure and record all required parameters for compliance report as per IS17036, and IEEE 519-2014. Limits should be configurable as per applicable standard.

6.11   The Power Quality Meter shall have minimum 4-inch graphical color LCD TFT display for easy to use and understand the values. At least following display parameters shall have support on display. Meter shall have also display waveforms of the measurements of voltage, current, power factor and harmonics.

1.	Apparent power
2.	Active power and reactive power
3.	Frequency
4.	Power factor

5.	Frequency
6.	Active energy (total)
7.	Reactive energy (total)
8.	Apparent energy (total)
9.	Inter harmonic trend(voltage/ current): 0.5th to 49.5th order
10.	Vector diagram
11.	Voltage wave form - R Phase
12.	Voltage wave form - Y Phase
13.	Voltage wave form - B Phase
14.	Current wave form - R Phase
15.	Current wave form - Y Phase
16.	Current wave form - B Phase
17.	Voltage % THD- R Phase
18.	Voltage % THD- Y Phase
19.	Voltage % THD- B Phase
20.	Current % THD- R Phase
21.	Current % THD- Y Phase
22.	Current % THD- B Phase
23.	Total demand distortion (TDD) - R Phase
24.	Total demand distortion (TDD) - Y Phase
25.	Total demand distortion (TDD) - B Phase
26.	voltage unbalance (% value)
27.	current unbalance (% value)
28.	Voltage harmonic for 3rd order (phase wise)

29.	Voltage harmonic for 5th order (phase wise)
30.	Voltage harmonic for 7th order (phase wise)
31.	Current harmonic for 3rd order (phase wise)
32.	Current harmonic for 5th order (phase wise)
33.	Current harmonic for 7th order (phase wise)
34.	Instant voltage harmonic graphical trend up to 50th order (Phase wise)
35.	Instant current harmonic graphical trend up to 50th order (Phase wise)
36.	Voltage Flicker (phase wise)
37.	Voltage crest factor (Phase wise)
38.	Current crest factor (Phase wise)
39.	Voltage deviation (Under & Over)
40.	Voltage sequence component
41.	Current sequence component
42.	K- factor
43.	Dip, Swell, Interruption

In addition to above parameters, phasor diagram/waveform shall be available invariably on display.

6.12 Suitable memory capacity at least for duration of 35 days to store data required for IS 17036 and IEEE 519 reports.

6.13 Instrument shall withstand impulse test at 6 kV.

Power quality reports & analysis

Following PQ reports shall provide in pdf format:

- Data for harmonics report (IEEE 519 -2014)
- Data for voltage quality report (IS17036)
- PQ event report (Sag, Swell, Interruption, Rapid voltage change.

Energy data and temper events (PQ Meter related only) shall be available in database to use for audit and analysis. The data interface shall be as per mutual agreement between Designated HT Consumer and utility.

- Tamper/event
- Load survey
- Billing Energy
- Midnight Snap

The meter shall have feature to detect and log the occurrence and restoration of anomalies along with date and time of event.

A) Following configurable events shall be provided in meter for which the persistence/restoration time can be configured through BCS:

- Over voltage
- Under voltage
- Current circuit open
- Current terminal shorting
- Reverse current direction (phase wise)
- Current missing (phase wise)
- Current unbalance
- Power fail
- Missing voltage (phase wise)
- Voltage unbalance
- Invalid Phase Association
- Invalid Voltage

B) Active and Apparent energies shall also be made available by meter in separate energy registers as:

- Active energy Import total
- Active energy Export total
- Active energy Import fundamental
- Active energy Export fundamental
- Apparent energy (while active import)
- Apparent energy (while active export)

C) Net active energy

- Reactive import while active import
- Reactive import while active export
- Reactive export while active import
- Reactive export while active export
- Reactive import

- Reactive export

- Reactive inductive

- Reactive capacitive

- Net reactive energy

- Net Reactive high and low

- Reactive high import and export

- Meter shall have provision to compute apparent energy based on lag only or lag + lead. The same shall be configured at factory end.

Load survey: Meter shall have a non-volatile memory to store the delta energy values, instantaneous parameter and power quality data values for each successive configurable integration period block. The integration period shall be configurable for each logger. It can be configured for 5, 15, or 30 Minutes.

Minimum 35 days with 15-minute interval shall have support in PQ meter. Selection of following parameters shall have provision for logging:

- a. Energy parameters
- b. Voltage (Phase wise)
- c. Current (Phase wise)
- d. Line Voltage
- e. Frequency
- f. Power factor (Phase wise)
- g. Phase angle (Phase wise)
- h. Voltage THD (Phase wise)
- i. Current THD (Phase wise)
- j. Voltage and current harmonic.

The instantaneous parameters can be configured for minimum/maximum/average or instant values for the configured integration period. It shall be possible to select either energy or demand view at Base Computer Software (BCS) end.

All energy parameters including pt no. B & C mentioned above are optional.

Optionally, the meter shall record and store below energies for billing history and daily snaps at midnight:

- a. Cumulative active energy import
- b. Cumulative active energy export
- c. Cumulative net active (Import – Export) energy
- d. Cumulative reactive energy lag while active import
- e. Cumulative reactive energy lead while active import
- f. Cumulative reactive energy lag while active export
- g. Cumulative reactive energy lead while active export
- h. Cumulative apparent energy (while active import)
- i. Cumulative apparent energy (while active export)
- j. Cumulative Reactive High energy
- k. Cumulative Reactive Low energy

The BCS will provide facility to configure the parameters and time.

6.14 COMMUNICATION CAPABILITY

Meter shall have minimum following four ports

1. Optical port complying with hardware specifications detailed in IEC–62056- 21 or USB port which shall be used for local data downloading through Common Meter Reading Instrument (CMRI) /Laptop.

2. Hardware port compatible with RS-232 specifications which shall be used for remote access through suitable 4G intelligent modem/DCU.

3. Hardware port compatible with RS-485 specifications.

4. Dual Ethernet port (configurable on DLMS TCP/MODBUS TCP).

All the ports shall be able to communicate simultaneously.

Meter should support standard recommended practice for transfer of power quality data.

Sealing arrangement for all ports shall be provided. Necessary chord for connecting Optical/USB Port to Laptop of minimum length of 1 (One) meter shall be provided free of cost. Also software required for local meter data downloading through USB port of Laptop shall be provided, free of cost.

(b) Remote communication mode for data retrieval

For AMR communication, meter shall be provided with remote communication device such 4G intelligent modem or router or Data concentrator Unit (DCU) etc.

Such device should be embedded inside meter body or connected externally to meter with suitable interface. Technical specifications of communication device are as below.

1. The communication device should have suitable interface facility to connect with the meter by using the RS-232 cable/Ethernet cable.

2. a) The offered communication device should be capable of operating on Three phase supply drawn from the Meter input or on Auxiliary Power supply.

   b) The operating voltage range for communication device should be 90 V AC P-P to 440 V AC P-P. However the communication device should also be capable of operating on single phase 100 V -270 V, 50 Hz power supply.

   c) The communication device shall be suitably protected against voltage surges (6kV voltage surges and 6kV impulses). Required certificates issued by any Govt. Body/NABL accredited lab is to be produced in this regard.

3. The offered communication device should be supplied with power cable of minimum 1.5 meter length, antenna with co-axial cable of minimum 1.5 meter length, mounting adopter etc. and should complete in all respects.

4. **Sealing :-** The communication device cover and body should have arrangement for sealing. In addition to this, the SIM card holder cover should also have arrangement for sealing.

5. **Antenna**:- The communication device should have flexible external antenna having

suitable gain with screw mount/ wall mount arrangement to enable placement of the antenna at the location of strongest signal.

6. **Outage Notification :** In the event of an outage, the communication device should be able to send alert to server along with date and time of occurrence and restoration. Server will send SMS to predefined number to notify the outage event.

7. **Battery :** The communication device should have in-built rechargeable, maintenance free battery having life of minimum 10 years, for sending power outage notifications as per clause No. 6 (Outage notification). Super capacitor will not be accepted.

8. **Other requirements:-**
    (i)   The communication device shall have sufficient non-volatile memory, so that the registered parameters will not be affected by loss of power.
    (ii) The communication device should be capable of operating with SIMs of local GSM Service provider in the area.
    (iii) The communication device should be capable for continuous working for 24 hours every day under field conditions, even when enclosed in Cubicles at sites.
    (iv) Communication device should support time synchronization from HES or network.
    (v)   Communication device should be capable of working on intelligent mode (Push mode) and transparent mode (Pull mode).
    (vi) By default, the communication device should be working on transparent mode. For every intervals of push schedule configured in communication device, communication device should switch to intelligent mode (Push mode) and push meter data to server. Once the data is pushed successfully, communication device should switch to transparent mode, till next interval of push schedule. There should be provision of minimum three retries, if data is not pushed to server.
    (vii) It should be possible to convert mode of working of communication device from intelligent mode (Push mode) to transparent mode (Pull mode) and vice-versa. Such conversion should be done through locally and remotely, over the air through configuration tool or through SMS. Also such conversion should be done through Designated HT Consumer's HES.

   **Functionalities of communication device in transparent mode (Pull mode) :**
    a) The communication device should act a completely transparent channel i.e. the Commands received from Head End System/MDAS should be conveyed to meter and data from meter should be conveyed to Head End System/MDAS without any changes in the mode.
    b) Data collection from meter should take place only after connection is established between Head End System/MDAS and Meter.
    c) If communication device is working in idle mode more than 5 minutes (i.e. connection is established between communication device and Head End System/MDAS but communication device does not receive any command from Head End System/MDAS for 5 minutes), communication device should close the existing connection after 5 minutes.

    Functionalities of communication device in intelligent mode (Push mode) :
    a) It should be possible to configure the communication device for schedule to download data from meter (eg. 10 minutes/15 minutes/half hourly /hourly /daily /weekly/monthly) through configuration tool and SMS.

b) Communication device should automatically download data from meter at configured intervals. Thereafter, communication device should automatically establish the connection with server configured and data downloaded from meter should be pushed to server.

c) Communication device should close the connection made with server after pushing the data to server. If connection with server could not be established then communication device should retry at least thrice.

9. Communication device shall be suitable for long duration data transmission and shall be protected from external interference of systems working at different bands.

10. **Mechanical Specifications**: - Communication device should be a compact model housed in a polycarbonate / engineering plastic / Metallic enclosure (comply with IP55 degree of protection).

11. **Environmental Specifications**:- The communication device shall meet the following environmental specifications :
    a) Storage Temperature : -20 degrees to +70 degree Celsius
    b) Operating Temperature: -10 degrees to +60 degree Celsius
    c) Humidity:- 95% RH (Non - Condensing)

12. **Communication Capabilities: -**
    a) Communication device should be Dual Band capable of operating at 900 and 1800MHzGSM/GPRS transmission.
    b) Communication device should support Data transmission. In addition, communication device may support SMS transmission (optional). It should have GPRS/EDGE features. In addition, it may have GSM features (optional). Communication device should be 4G and also have facility to fall back to 2G/3G networks, where 4G network is not available.

13. **Interface :-**
    a) Communication device should have a suitable interface such as high speed Ethernet or RS232 through a 9 pin D-type Connector, for connection to Meter. Communication device should be configured through various parameters like baud rate, data bits, stop bits, parity etc. through this port using configuration utility provided by the Designated HT Consumer or through AT commands. Communication device firmware should be reprogrammed using this port. It should be possible to view communication between meter and communication device through this port. This port should also support debugging functionality.
    b) If RS232 interface is provided on communication device, the pin configuration of DB9 connector should be as follows:

DB9 Connector diagram:
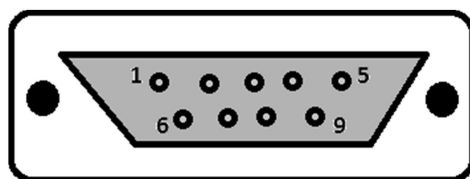
RS232 Pin Description:

Pin No	Signal
1	NC
2	Receive Data (Rx)
3	Transmit Data (Tx)
4	NC
5	Ground (GND)
6	NC
7	Vcc
8	Vcc
9	Vcc

The pin outs shown above should not be changed. Pin 7, 8 , 9 may be combined and used as Vcc. Unused signals (pins) can be made NOT CONNECTED. (NC).

c) The SIM interface should be a 3 V Interface in accordance with GSM 11.12 phase 2 with a retractable SIM cardholder, which should be fully inserted inside the communication device. The holder opening should have a sliding cover with provision for sealing after placing of the SIM card. Or Push fit type SIM cardholder which is suitably covered and sealable is also acceptable. The communication device shall accept the standard SIM Card.

d) Communication device should have a SMA Antenna connector.

14. **Power** :-
   a) Maximum Power Output should be 2W/3W at 900 MHz (Class 4) and 1W at 1800MHz (Class 1). The RF functionalities should comply with the GSM phase II/II+ compliant, EGSM 900/GSM 1800 recommendation.
   b) VA Burden of the communication device should not exceed 5.5 VA during data communication.

15. **Sensitivity :-**

   GSM 900 : < -100 dBm

   GSM 1800 : < -100 dBm

16. **Data Features:** -
   i. TCP/IP stack access via AT commands
   ii. Internet Services : TCP, UDP, HTTP, FTP, SMTP, POP3.
   iii. Min. Baud Rate: for operation over RS232 port - 1200 bits/sec
   iv. Max. Baud Rate: for operation over RS232 port - 115200 bits/sec

GPRS Data transmission features:-

i. GPRS Class B Multi slot class 12 or class B Multi slot class 10

ii. Packet channel support: PBCCH

iii. Coding Schemes: CS1 to CS4 compliant with SMG32 (Release97)

EDGE Data transmission features:-

i. EDGE (EGPRS) Multi slot class 12 or Multi slot class 10

ii. Mobile station Class B

iii. Modulating and coding schemes: MCS 1 to 9

iv. Packet channel support: PBCCH.

17. **SMS Features**: -

i. Text and PDU

ii. Point to point (MT/MO)

iii. Cell broadcast

iv. White listed

18. **Operational Indicator:-**

The communication device should have separate four no. of LED indicators for data transmission (Tx), data reception (Rx), carrier detect and Power ON to indicate Power on position and to indicate the availability & strength of cellular network signal at the place of installation

19. **Soft Reset Feature:-**

Communication device should soft reset itself at configured intervals. The device firmware, settings and stored data should not be affected after soft reset. Soft reset should not be done during transfer data between communication device and Centralized Head End System/MDAS.

20. **Watchdog: -** Communication device should have internal watchdog which will monitor functioning of communication device. For any faults, communication device should auto reboot itself.

21. Communication device should push Network signal strength (CSQ) and other health parameters to server at configured intervals. Such interval should be configurable locally & over the air remotely, using configuration utility.

22. **Configuration of communication device:-**

Communication device should support configuration through PC/Laptop and remote configuration through air.

a) **Configuration through software tool:-**

Designated HT Consumer should provide software for communication device configuration over USB port of PC/Laptop and remote configuration using TCP/UDP and HTTP.

The parameters like baud rate, parity bit, and data bit, flow control, APN details with user name and Password, Server IP, etc. should be configured over RS232

port/Ethernet port and remotely, over the air using this utility. The configuration parameters should be read by this utility over RS232 port/Ethernet port and remotely, over the air, without asking for opening of port with configuration (e.g. baud rate, data bits, stop bit, parity, flow control) similar to that of communication device.

Communication device should be configured over RS232 port/Ethernet port with SIM card inside the SIM card holder of communication device.

The configuration utility should be able to read/write parameters like baud rate, parity bit, data bit, flow control, APN details, Server IP etc. irrespective of the parity configured i.e. even/odd/none, over USB port and remotely, over the air.

Configuration utility should support firmware update over RS232 port/Ethernet port and remotely, over the air for various configurations. The communication device firmware should be upgraded irrespective of parity i.e. even/odd/none configured. In case of remote firmware upgrade, configuration utility should retry at least three times.

Configuration utility should read IP address of SIM card inside the communication device over RS232 port/Ethernet port.

It should be possible to convert the communication device working on transparent mode to intelligent mode and vice-versa through configuration utility locally and remotely, over the air.

Interval for auto-rebooting of communication device & interval for pushing Network signal strength (CSQ) and other health parameters, should be configured, locally & over the air remotely, using this utility.

b) Configuration over the air:-

It should be possible to update communication device firmware remotely, over the air.

Communication device should support over the air configuration of parameters using SMS, like baud rate, parity, data bit, flow control, APN details with user name and Password, Server IP, listening port.

Communication device configurations such as baud rate, parity, data bit, flow control, APN details with user name and Password, Network signal strength (CSQ),Server IP, listening port, IP address of SIM, Master SIM numbers configured should be read by sending SMS to communication device from any mobile phone. The SMS sent by communication device should be readable in mobile phones with various operating systems e.g. Android, i-OS, Windows etc.

Communication device can be configured for various parameters such as baud rate, parity, data bit, flow control, APN details with user name and Password, Server IP, listening port, Master SIM numbers by sending SMS to communication device from master SIM.

Communication device should also support rebooting through SMS. SMS will be sent through master SIM only.

The Designated HT Consumer should share set of instructions required for over the

air configuration through SMS.

The configuration tools including hardware / software and / or the master SIM cards and instruction set required to configure the communication device over the air should be handed over to MSEDCL and the same should be deployed at MSEDCL. Modifications required in communication device firmware, configuration utility should be done by the Designated HT Consumer, free of cost, during guarantee period.

23. **Communication device should meet following EMI/EMC specifications:**

1. Electrostatic Discharge IEC 61000-4-2

2. Fast Transient Burst IEC 61000-4-4

3. Immunity IEC 61000-4-5

4. Conducted emission as per IEC 61000-3-2

7.0 CONNECTIVITY SCOPE :

Designated HT Consumer shall use public SIM cards of any service provider.

The cost of SIM card & recurring monthly charges shall be borne by the Designated HT Consumer. The Designated HT Consumer has to decide location wise service provider.

Details of SIM cards such as SIM number, mobile number, IP address, Service Provider etc. should be available in Designated HT Consumer's HES

8.0 HEAD END SYSTEM (HES) :

8.1 The main objective of Head End System is to acquire meter data automatically from meters without any human intervention and monitor parameters acquired from meters.

8.2 The Designated HT Consumer shall provide HES which is suitable to support collection and storage of meter data as per performance level for advertised quantity of meters with facility of future expansion up to 150% of advertised quantity.

8.3 The HES shall be cloud enabled and support deployment with high availability clustering and automatic load balancing that ensure hardware as well as application failover. Adequate data base and security features for storage of data at HES needs to be ensured. The HES shall be deployed on cloud arranged by the Designated HT Consumer. Cloud charges for instance including cost of all licenses required for OS, database, software tools etc. required for hosting of HES, for entire contract period, will be borne by the Designated HT Consumer. Conditions for cloud deployment are as below.

a. All Services including data should be hosted in India.

b. The cloud instance should be in non-sharable mode, specifically dedicated to MSEDCL and utilized by MSEDCL only.

c. Data transmission charges and all charges related to data connectivity etc.

should be borne by the Designated HT Consumer.

d. The Designated HT Consumer need to ensure that the Cloud Service Providers (CSP) facilities/services are compliant to various security standards and should be verified by third party auditors.

e. CSP should suitably address all the potential risks and issues in cloud implementation including data security and privacy, increased complexity in integration with existing environments, vendor lock-in, application portability between different platforms, exit management / Transition-Out Services etc.

f. Designated HT Consumer has to retain all meter data collected during contract period. Data for at least one year should be online and other data may be stored in archive mode.

g. MSEDCL shall be the sole custodian of the meter data. Data ownership will be entirely of MSEDCL.

h. Designated HT Consumer has to sign non-disclosure agreement as per format given in Annexure-I.

8.4 The HES should be developed in any platform such as Java, .Net etc. based on distributed architecture for scalability without degradation of the performance. The scalability shall ensure the ability to handle applicable workloads up to 150% of advertised quantity of meters.

8.5 **Following minimum functions should be supported by HES.**

a. Acquisition of meter data on demand & at user selectable periodicity:

Meter data pushed by meters should be received by HES & stored in database along with relevant details. Also there should be provision to pull meter data, on demand. On demand meter read may be for single meter (unicast) or for a group of meters (multicast).

b. **Configuration of communication device:** Following communication device configuration should be possible through HES.

i. Configuration for schedule to download & push data from meter (e g. 10 minutes/15minutes/half hourly/hourly/daily/weekly/monthly).

ii. Convert mode of working of communication device from intelligent mode (Push mode) to transparent mode (Pull mode) and vice-versa.

iii. Configuration of parameters such as server IP/URL, listening port etc.

c. Store raw data for minimum 30 days, before it is transferred to the MSEDCL MDAS.

d. Manage time distribution to ensure that meters always have an accurate RTC.

e. Setting of meter programmable parameters.

8.6 **Following facilities should be available in HES**
a. Monitoring of power quality events e.g. Sag swell flicker etc.
b. Monitoring of 10 Min aggregated data (Harmonic Parameters)
c. Data Monitoring at every 15 Min Block

    d. Power quality compliance reporting

    e. Dashboard for 10 min aggregated data for supply quality parameters.

    f. Reports & Trend monitoring

8.7 HES shall support reporting functionalities. Reports for following parameters should be available.

    a. Voltage variation

    b. Voltage flicker

    c. Voltage unbalance

    d. Voltage Dips/Swells

    e. Short Voltage interruptions

    f. Voltage Harmonics

    g. Current Harmonics

    h. Weekly/ monthly report for harmonic emission IEEE 519 (2014)

    i. Weekly/ monthly report as per IS 17036.

    j. Any other power quality compliance report as per requirement of MSEDCL.

There should be provision to export these reports in any format such as PDF/Excel/Word.

8.8 HES shall be suitable for power quality meter configuration for CT/VT ratio, Power quality events threshold, Power quality report parameters, Time set, Logger interval configuration and profile data reading through authenticated keys or there should be provision to make such configuration locally through BCS.

8.9 Access of HES should be given to MSEDCL team with administrator role. MSEDCL users should be able to monitor and control the HES.

8.10 Data upload: In case of meters are not communicating with HES, meter data of power quality meters will be downloaded locally and there shall be provision to upload the same in HES.

8.11 Integration with MSEDCL MDAS: HES should be integrated with MSEDCL MDAS. HES shall export all meter data to MSEDCL MDAS. The integration should be done using web service based APIs or DB to DB. Inter application data exchange may be done through JSON/XML format.

8.12 MSEDCL may suggest changes in functionalities, reports in HES. The Designated HT Consumer shall modify the HES as per the MSEDCL requirements, without any additional cost, during FMS period.

8.13 Consumer/Meter manufacturer shall demonstrate & deploy HES on cloud, before commencement of supply. Also Designated HT Consumer should submit Read API (API1, API2) and convert API (API3), before commencement of supply. Read API should be able to read meter data through AMR & locally. Convert API should be able to convert meter data read through AMR & locally into XML format. Also Designated HT Consumer should submit software to read meter manually through USB port of Laptop. As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software, the same shall be

made available to purchaser immediately on the release date, free of cost.

9.0 MARKINGS

The Meter shall be marked legibly with the following information:
i.   Name or trade mark of manufacturer
ii.   Year and month of manufacture
iii.   Country of origin
iv.   Type/model and serial number

10.0 TYPE TEST & CALIBRATION CERTIFICATES & CYBER SECURITY CERTIFICATE:

The Power Quality Meter shall be supplied along with the valid calibration certificate as per relevant standards. The Power Quality Meter shall be supplied along with the valid calibration certificate as per relevant standards.

- Power quality compliance certificate as per IEC 61000-4-30 Ed. 3, IEC 62586-2 (Class-A)

- Type test report (IS 14697) amended up to date (if applicable.)

- Test Report of DLMS 15959, CAT B amended up to date(if applicable)

- IEC 62443-4-1 & 2 Cyber Security Compliance (for Software System)

- BIS compliance of manufacturing facility.

Communication device should be type tested. Required certificates issued by any Govt. Body/NABL accredited lab is to be produced in this regard.

11.0 GUARANTEED TECHNICAL PARTICULARS

The Consumer/ Meter Manufacturer shall furnish the particulars giving specific required details of meters in schedule `A' attached. The offers without the details in Schedule 'A' stand rejected.

12.0 PACKING:

The Meter shall be suitably packed in corrugated boxes in order to avoid damage during transit or handling.

13.0 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team should be given all assistance and co - operation for inspection and testing at the Designated HT Consumer's works. The meter sample should be kept ready for assessing and testing. The Consumer/ Meter Manufacturer has to give all facilities for carrying out the testing of these samples

14.0 TRAINING

As and when required, the consumer/Meter Manufacturer shall demonstrate MSEDCL's Engineers at their works of familiarization of design, application, operation & maintenance of the instrument.

15.0 ACCESSORIES

a. Power cables
b. Voltage cables
c. Standard warranty certificate and installation manual

16.0 GUARANTEE

The instrument shall be guaranteed for a period of 60 months from the date of commissioning or 66 months from the date of receipt whichever is earlier. The instrument found defective within above guarantee period shall be replaced / repaired / rectified by the supplier free of cost, within one month of receipt of intimation. After the replacement/ repairs / rectification, the accuracy shall not be affected. Test certificate and calibration certificate shall invariably be submitted after rectification / repairs.

If defective equipment is not replaced / repaired / rectified within the specified period as above, the Company shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier

17.0 SCHEDULES.

The Designated HT Consumers/Meter Manufacturer shall fill schedule A i.e. Guaranteed technical particulars.

The discrepancies if any between the specification and the catalogs and / or literatures shall not be considered and representations in this regard shall not be entertained.

SCHEDULE – "A"

GUARANTEED AND TECHNICAL PARTICULARS

ITEM NAME	THREE PHASE POWER QUALITY METER	
SR. NO.	PARTICULARS	GTP VALUES
(1)	MANUFACTURER NAME & ADDRESS	TEXT
(2)	TYPE / MODEL DETAILS OF EQUIPMENT	TEXT
(3)	OPERATING EXPERIENCE OF THE MANUFACTURER	TEXT
(4)	METER SHALL MEASURE VOLTAGE ALONG WITH VOLTAGE AND CURRENT HARMONICS IN ELECTRICAL SYSTEMS	BOOLEAN
(5)	COMPLIANCE TO ALL APPLICABLE STANDARDS MENTIONED UNDER CLAUSE NO. 4.00	BOOLEAN
(6)	FREQUENCY	TEXT
(7)	ACCURACY OF POWER QUALITY METER	TEXT
(8)	RATED VOLTAGE	TEXT
(9)	VOLTAGE RANGE	TEXT
(10)	RATED CURRENT	TEXT
(11)	METER SHALL MEASURE TRUE RMS PHASE TO PHASE AS WELL AS PHASE TO NEUTRAL VOLTAGE WITH MINIMUM AND MAXIMUMVALUES	BOOLEAN
(12)	METER SHALL MEASURE TRUE RMS PHASE TO PHASE AS WELL AS PHASE TO NEUTRAL CURRENT WITH MINIMUM AND MAXIMUM VALUES AND PHASE DISPLACEMENT	BOOLEAN
(13)	METER SHALL INDICATE ANGLE DISPLACEMENT BETWEEN VOLTAGE AND CURRENT AS WELL AS THREE PHASE VOLTAGESEQUENCE	BOOLEAN

(14)	METER SHALL MEASURE ACTIVE, REACTIVE AND APPARENT POWER PER EACH PHASE AND ALSO TOTAL VALUES FOR THREE PHASES (IF APPLICABLE)	BOOLEAN
(15)	METER SHALL MEASURE VOLTAGE AND CURRENT HARMONICS MINIMUM UPTO 50THORDER FOR EACH PHASE EXPRESSED AS A PERCENTAGE OF FUNDAMENTAL	BOOLEAN
(16)	METER SHALL MEASURE ALL QUANTITIES MENTIONED IN CLAUSE NO. 6.1 1	BOOLEAN
(17)	METER SHALL MEASURE TOTAL HORMONICS DISTORTION (THD) OF VOLTAGE AND CURRENT	BOOLEAN
(18)	METER SHALL DISPLAY WAVEFORMS OF THE MEASUREMENTS OF VOLTAGE, CURRENT, POWER FACTOR AND HARMONICS	BOOLEAN
(19)	METER SHALL HAVE MINIMUM OF 5 .0 INCHCOLOR TFT DISPLAY	BOOLEAN
(20)	CALIBRATION CERTIFICATE SUBMITTED ALONGWITH OFFER	BOOLEAN
(21)	CALIBRATION CERTIFICATE NOS. & DATE	TEXT
(22)	SUPPLIER AGREES TO SUPPLY ALL ACCESSORIES AS PER TECHNICAL SPECIFICATION	BOOLEAN
(23)	SUPPLIER AGREES TO DEPUTE THEIR REPRESENTATIVE TO EDUCATE ENGINEERS OF PURCHASER AS AND WHEN THEY WILL BE CALLED FOR AT NO EXTRA COST	BOOLEAN
(24)	GUARANTEE OF POWER QUALITY METER AS PER CLAUSE NO. 16 .0 OF THIS SPECIFICATION	TEXT
(25)	PORTS PROVIDED ON METER	TEXT
(26)	BAUD RATE OF PORTS PROVIDED ON METER	TEXT
(27)	MAKE AND TYPE OF COMMUNICATION DEVICE	TEXT
(28)	OPERATING VOLTAGE RANGE OF COMMUNICATION DEVICE	TEXT

(29)	MAKE AND CHIP SET DETAILS OF COMMUNICATION MODULE USED IN COMMUNICATION DEVICE	TEXT
(30)	MAKE AND CHIP SET DETAIL OF MICRO CONTROLLER USED IN COMMUNICATION DEVICE	TEXT
(31)	GAIN OF ANTENNA SUPPLIED	TEXT
(32)	MAKE, TYPE AND CAPACITY OF BATTERY USED IN COMMUNICATION DEVICE	TEXT
(33)	SIZE OF NON-VOLATILE MEMORY IN COMMUNICATION DEVICE	TEXT
(34)	COMMUNICATION DEVICE COVER AND BODY HAVE SEALING ARRANGEMENT	BOOLEAN
(35)	SEALING ARRANGEMENT FOR COMMUNICATION DEVICE	BOOLEAN
(36)	INTERFACES AVAILABLE ON COMMUNICATION DEVICE	TEXT
(37)	OPERATIONAL INDICATORS PROVIDED ON COMMUNICATION DEVICE	TEXT
(38)	CONFIGUARATION UTILITY IS ABLE TO CONFIGURE COMMUNICATION DEVICE FOR VARIOUS PARAMETERS GIVEN IN TENDER DOCUMENT	BOOLEAN
(39)	OVER THE AIR CONFIGURATION SUPPORTED BY COMMUNICATION DEVICE	BOOLEAN
(40)	COMMUNICATION DEVICE IS TYPE TESTED	BOOLEAN
(41)	COMMUNICATION DEVICE TYPE TEST REPORT NUMBER AND DATE	TEXT