TECHNICAL SPECIFICATIONS
OF
SINGLE PHASE WHOLE CURRENT SMART METER

Central Electricity Authority
February 2020

TECHNICAL SPECIFICATIONS FOR WHOLE CURRENT A.C. SINGLE PHASE TWO WIRE SMART ENERGY METER OF ACCURACY CLASS 1.0 WITH BI-DIRECTIONAL COMMUNICATION FACILITY AND REMOTE CONNECT/ DISCONNECT SWITCH

1. SCOPE

These specifications cover the design, manufacturing, testing, supply and delivery of AC whole current, single phase, 2 wires Smart Energy Meter with bidirectional communication facility & remote connect/disconnect switch. The meter shall communicate with Head End System (HES) on any one of the communication technologies mentioned in IS16444 Part 1, as per the requirement of the utility.

2. BASIC FEATURES

The Smart Meter would have the following minimum basic features-

- Measurement of electrical energy parameters
- Bidirectional Communication
- Integrated Load limiting /connect/disconnect switch
- Tamper event detection, recording and reporting
- Power event alarms as per IS 16444 Part 1
- Remote firmware upgrade
- Pre paid features at MDM end (as per IS 15959 Part 2)
- TOD features
- Net Metering(kWh) features (optional as per requirement of utility)
- On demand reading

3. GENERAL STANDARDS APPLICABLE FOR METERS

S. No.	Standard No.	Title
1	IS 13779 with latest amendments	AC Static Watt-hour Meter class 1& 2
2	IS 15884 with latest amendments	Alternating Current Direct Connected Static Prepayment Meters for Active
3	IS 16444 Part 1 with latest amendments	A.C. Static Direct Connected Watt Hour Smart Meter Class 1 and 2- Specification
4	IS 15959 Part 1 & Part 2 with latest amendments	Data Exchange for Electricity Meter Reading, Tariff and Load Control- Companion Standards

4. COMMUNICATION

Meter shall have the ability to communicate with Head End System (HES) on any one of the communication technologies mentioned in IS16444 Part 1 (RF/PLC /Cellular) in a secure manner. The selection of communication technology should be as per the site conditions and as per design consideration of AMI Implementing agency to meet the performance as per agreed Service Level Agreements (SLAs). In case of Cellular based meter, the meter shall accommodate SIM card of any service provider. In case of Plug in type communication module, the meter shall log communication module removal /non responsive event with snapshot.

4.1 REMOTE CONNECT/DISCONNECT/LOAD LIMITING: Remote Connect/disconnect/Load control facilities would be as per IS 16444 part 1.

5. OTHER SPECIFICATIONS

Particulars	**Specification**
Applicable Standards	The meters shall comply with IS 16444 Part 1 for all requirements.
Reference Voltage	As per relevant IS (240 V)
Current Rating	5-30 A 10-60 A (Other current ratings would not be preferred)
Category	UC1
Starting Current	As per IS 16444 Part 1
Accuracy	Class 1.0 as per IS 16444 Part 1
Limits of error	As per IS 16444 Part 1
Operating Temperature range	As per IS 16444 Part 1
Humidity	As per IS 16444 Part 1
Frequency	As per IS 16444 Part 1
Influence Quantities	As per IS 16444 Part 1
Power Consumption of	As per IS 16444 Part 1
Current and Voltage Circuit	As per IS 16444 Part 1
Running at No Load	As per IS 16444 Part 1
Test output device	As per IS 16444 Part 1
Meter Display	As per IS 16444 Part 1
Name Plate & marking Meter Display	As per IS 16444 Part 1
Parameters to be measured	As per IS 16444 Part 1 / As per IS 15959 Part-2

Maximum Demand resetting	As per IS 15959 Part 2
Time of Use registers	As per IS 15959 part 2
Power Quality Information	As per IS 15959 part 2
LED/LCD Indicators	As per IS 16444 Part 1
Load Survey/Interval Data	As per IS 15959 part 2
Tamper/ Event Recording	As per IS 15959 part 2
Measuring Elements	As per IS 16444 part 1
Alarm	As per IS 16444 Part 1/ 15959 Part 2
Load Control	As per IS 16444 Part 1
Connect/Disconnect switch	UC1(As per IS 16444 part 1)
Status of load switch	As per IS 16444 Part 1
Programmability	As per IS 16444 Part 1
Communication	As per IS 16444. Part 1
Data Exchange Protocol	As per IS 16444 Part 1
Remote Firmware upgrade	As per IS 15959 part 2
Real Time Clock(RTC)	As per IS 16444 Part 1/ IS 15959 Part1 & Part 2 The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following: • From remote server through suitable communication network. • Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter. (as per requirement of utility)
Data Retention	As per CEA regulations
Battery Backup	Meter shall be supplied with separate battery backup for RTC.

Guarantee	60 months from the date of supply. The meter which are found defective/inoperative at the time of installation or become inoperative/defective within the guarantee period, the same shall be replaced/repaired by the manufacturer/supplier within one month of receipt of report. (as per agreement with utility)
First Breath(power on) and Last gasp (power off) condition detection and communication to HES	As per IS 16444 Part 1
Plug-in Communication Module	The Smart Meters shall be have a dedicated sealable slot for accommodating plug-in type bi - directional communication module which shall integrate the respective communication technology (RF/PLC/ Cellular) with the smart meters, leading to easy adaptability for network interfaces (WAN/NAN).The Plug-In module shall be field swappable/ replaceable.

5.1 DATA DISPLAY FACILITY (AUTO/MANUAL)

Data Display shall be in two modes-

1. Auto Scroll
2. Scroll with Push Button

The display parameters shall be:

- Auto Scroll
  - Display Check
  - Date and Time
  - Last Recharge Amount
  - Last Recharge Time
  - Current Balance Amount
  - Current Balance Time
  - Cumulative Active Energy kWh with legend.
  - Current calendar month MD in kW with legend.
  - Instantaneous voltage
  - Instantaneous Phase current
  - Instantaneous Load kW
  - Instantaneous average Power Factor

  These parameters should be displayed on the Meter Display continuously for a period of 10 seconds on Auto scroll.

- Scroll with Push-button

  All Parameters mentioned under Auto-Scroll mode should be displayed. Additionally, the following Parameters shall also be displayed:
  - Internal diagnostics (display check)
  - Meter Serial No.
  - Last month cumulative kWh with legends
  - Last month MD in kW with legends
  - Current month Average Power Factor
  - Last month Average Power Factor

Further, the Meter should display High Resolution energy values with resolution of 3 digits before decimal and 2 digits after decimal in push button mode

The meter's display should return to default display mode (continues auto scroll) if push button is not operated for more than 10 seconds. (The order of display may be revised as per requirement of the utility). Meter display should not go in to sleep mode during Power-On condition.

6. ANTI TAMPER FEATURES

The meter shall continue recording energy under tamper conditions as defined in IS 15959 Part 2 and would log the event and send alarm at Head End System after detection of the defined theft features as per IS 15959 Part 2.

7. TESTS

7.1 Type Tests & Test Certificates

Smart meter shall be type tested for all the tests as per IS: 16444 Part 1 (latest version) in a third party independent lab. The number of sampling for testing of meters and criteria for conformity would be as per IS 16444 Part 1 (as amended up to date).

Necessary copies of test certificates shall be submitted as per agreement with the utility.

7.2 Routine & Acceptance Tests

The Factory Acceptance and Routine tests shall be carried out as per IS 16444 Part 1.

Test as per requirement of utility: The Meter (without communication module) shall be immune under external magnetic influences and shall be tested for high voltage discharge as per CBIP 325.

8. GENERAL & CONSTRUCTIONAL REQUIREMENTS

8.1 Meter shall be BIS marked as per IS 16444 Part 1.

8.2 General & construction requirement shall be as per IS 16444/IS 13779

9. METER BASE & COVER- Meter base & cover shall be as per IS 16444 Part1 / IS 13779. The meter Base & cover shall be 'Break to open' design. The material for meter base and cover shall be made of high grade polycarbonate.

10. **TERMINAL BLOCK & COVER** - As per IS 16444 Part 1/IS 13779

11. DESIGN

Voltage circuit, sealing arrangement, terminal block, terminal cover and nameplate etc. shall be in accordance with IS-16444 Part 1(latest version).

The meter shall be compact and reliable in design, easy to transport and immune to vibration and shock involved in transportation and handling.

12. NAME PLATE AND MARKING

The name plate on the meter should be clearly visible, effectively secured against removal and indelibly/distinctly marked in accordance with relevant IS. In addition, "Name of the Utility", purchase order no. & year/month of manufacturing shall be provided on the name plate. The rating plate information shall be as per relevant IS.

13. CONNECTION DIAGRAM: As per IS 16444 Part 1

14. FIXING ARRANGEMENTS:

The meter shall be mounted type. The Meter should have three fixing holes, one at top and two at the bottom. The Top hole should be such that the holding screw is not accessible to the consumer after fixing the meters. The lower screws should be provided under sealable terminal cover.

15. SEALING ARRANGEMENT:

Arrangements shall be provided for proper sealing of the meter cover so that access to the working parts shall not be possible without breaking the seal. The sealing arrangement and number of seals shall be as per relevant IS/ requirement of utility.

16. **METER BOX:**

The Meter Box if required by utility/purchaser, would be provided as per requirement of the utility/ purchaser and the material of the Meter Box should be such that it does not hamper communications.

17. PACKING

The meters shall be suitably packed for vertical/horizontal support to withstand handling during transportation. The meter shall be packed appropriately to ensure safe transportation, handling, identification and storage. All packing materials shall be as per environment law in force. The primary packing shall ensure protection against humidity, dust, grease and safeguard the meter's performance until its installation. The secondary packing shall provide protection during transportation. The packing case shall indicate "Fragile in nature" and direction of placement of box. The packing shall indicate marking details like Manufacturer's name, S.No. of meters, quantity etc.

18. TRANSPORTATION

- The meter shall be compact in design. The meter block unit shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation.
- The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.
- The meter should not be exposed to undue shock and mishandling during transportation.
- The stacking of box inside transport media should be such as to avoid their free movement.
- The packing should also be protected from rain and dust by transport media.
- The Bidder shall be responsible for any damage during transit due to inadequate or improper packing.

19. TESTING AND MANUFACTURING FACILITIES AT MANUFACTURER'S PLACE

The manufacturer shall have facilities of conducting Acceptance Testing as per IS 16444 Part 1.

20. INSPECTION

- The meters shall be sealed as per the mutual agreement of the supplier and the purchaser
- The utility/ purchaser may inspect the meter randomly as per sampling plan for acceptance test as per IS 16444 Part 1. The meters shall be tested for acceptance test as per IS 16444 Part 1.

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TECHNICAL SPECIFICATIONS
OF
THREE PHASE WHOLE CURRENT SMART METER

Central Electricity Authority
February 2020

TECHNICAL SPECIFICATIONS FOR WHOLE CURRENT A.C. THREE PHASE FOUR WIRE SMART ENERGY METER OF ACCURACY CLASS 1.0 WITH Bi DIRECTIONAL COMMUNICATION FACILITY WITH CONNECT/ DISCONNECT SWITCH

1. SCOPE

The specification covers the design, manufacturing, testing, supply and delivery of AC whole current 3 phase 4 wires Smart Energy Meter with bidirectional communication facility suitable for Advanced Metering Infrastructure (AMI) with connect/disconnect switch. The meter shall communicate with Head End System (HES) on any one of the communication technologies mentioned in IS16444 Part 1, as per the requirement of the utility / authorized system integrator.

2. BASIC FEATURES

The Smart Meter would have the following minimum basic features-

- Measurement of electrical energy parameters
- Bidirectional Communication
- Integrated Load limiting switch /relay
- Tamper event detection, recording and reporting
- Power event alarms as per IS 16444 Part 1
- Remote firmware upgrade
- Pre Paid features at MDM end (as per 15959 part 2)
- TOD feature
- Net Metering(kWh) features (optional as per requirement of utility)
- On demand reading

3. GENERAL STANDARDS APPLICABLE FOR METERS

The performance and testing of the meters shall conform to the following standards with latest amendments thereof:

S.No.	**Standard No.**	**Title**
1	IS 13779 with latest amendments	AC Static Watt-hour Meter class 1& 2
2	IS 15884 with latest amendments	Alternating Current Direct Connected Static Prepayment Meters for Active
3	IS 16444 Part 1 with latest amendments	A.C. Static Direct Connected Watt Hour Smart Meter Class 1 and 2- Specification

4	IS 15959 Part 1 & Part 2 with latest amendments	Data Exchange for Electricity Meter Reading, Tariff and Load Control- Companion Standards

4. COMMUNICATION

Meter shall have the ability to communicate with Head End System (HES) on any one of the communication technologies mentioned in IS16444 Part 1 (RF/PLC/ Cellular) in a secure manner. The selection of communication technology should be as per the site conditions and as per design requirement of AMI Implementing agency to meet the performance as per agreed Service Level Agreements (SLAs). In case of Cellular based meter, the meter shall accommodate SIM card of any service provider. In case of Plug-in type communication module, the meter shall log communication module removal /non responsive event with snapshot.

4.1 REMOTE CONNECT/DISCONNECT/LOAD LIMITING: Remote Connect/disconnect/Load control facilities would be as per IS 16444 Part 1.

5. OTHER SPECIFICATIONS

Particulars	**Specification**
Applicable Standards	The meters shall comply with IS 16444 Part 1 for all requirements.
Reference Voltage	As per relevant IS
Current Rating	10-60 A 20-100 A (Other Current ratings would not be preferred)
Category	UC1
Starting Current	As per IS 16444 Part 1
Accuracy	Class 1.0 as per IS 16444 Part 1
Limits of error	As per IS 16444 Part 1
Operating Temperature range	As per IS 16444 Part 1
Humidity	As per IS 16444 Part 1
Frequency	As per IS 16444 Part 1
Influence Quantities	As per IS 16444 Part 1
Power Consumption of meter	As per IS 16444 Part 1
Current and Voltage Circuit	As per IS 16444 Part 1
Running at No Load	As per IS 16444 Part 1
Test output device	As per IS 16444 Part 1
Meter Display	As per IS 16444 Part 1

Name Plate & marking Meter Display	As per IS 16444 Part 1
Parameters to be measured	As per IS 16444 Part 1 / As per IS 15959 Part-2
Maximum Demand resetting	As per IS 15959 Part-2
Time of Use registers	As per IS 15959 Part-2
Power Quality Information	As per IS 15959 Part-2
LED/LCD Indicators	As per IS 16444 Part 1
Load Survey/Interval Data	As per IS 15959 Part-2
Tamper/ Event Recording	As per IS 15959 Part-2
Measuring Elements	As per Is 16444 Part 1
Alarm	As per IS 16444 Part 1 / As per IS 15959 Part-2
Load Control	As per IS 16444 Part 1
Connect/Disconnect switch	UC1 as per IS 16444 Part 1
Status of Load switch	As per IS 16444 Part 1
Programmability	As per IS 16444 Part 1
Communication	As per IS 16444 Part 1
Communication Protocol	As per IS 16444 Part 1
Remote Firmware upgrade	As per IS 15959 Part-2
Time Synchronization	As per IS 16444 Part 1 / IS 15959 Part 1 & Part 2 The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following: • From remote server through suitable communication network. • Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter, (as per requirement of utility)
Data Retention	As per CEA regulations

Battery Backup	Meter shall be supplied with adequate separate battery backup for RTC.
Guarantee	60 months from the date of supply. The meter which are found defective/inoperative at the time installation or become inoperative/defective within the guarantee period, the same shall be replaced/repaired by the manufacturer/supplier within one month of receipt of report. (as per agreement with utility)
First Breath(Power on) and Last gasp(Power off) condition detection and communication to HES	As per IS 16444 Part 1
Plug-in Communication Module	The Smart Meters shall be have a dedicated sealable slot for accommodating plug-in type bi -directional communication module which shall integrate the respective communication technology (RF/PLC/ Cellular) with the smart meters, leading to easy adaptability for network interfaces (WAN/NAN).The Plug-In module shall be field swappable/ replaceable.

5.1 DATA DISPLAY FACILITY (AUTO/MANUAL)

Data Display shall be in two modes-

1. Auto Scroll
2. Scroll with Push Button

The display Parameters shall be-

- Auto Scroll
  - Display Check
  - Date and Time
  - Last Recharge Amount
  - Last Recharge Time
  - Current Balance Amount
  - Current Balance Time
  - Cumulative Active Energy kWh with legend.

- Cumulative Active Energy kVAh with legend.
- Current month MD in kW with legend.
- Current month average Power Factor
- Instantaneous voltage V_{RN}
- Instantaneous voltage V_{YN}
- Instantaneous voltage V_{BN}
- Instantaneous current I_R
- Instantaneous current I_Y
- Instantaneous current I_B
- Instantaneous current I_N
- Instantaneous Load kW and kVA
- Instantaneous average Power Factor

These parameters should be displayed on the LCD/LED continuously for a period of 10 seconds on Auto scroll.

- Scroll with Push-button

All Parameters mentioned under Auto-Scroll mode should be displayed.
Additionally, the following Parameters shall also be displayed:

- Internal diagnostics (display check)
- Meter Serial No
- Cumulative Energy in kVArh Lag/ Lead with legend
- Cumulative Active Energy kWh ToD wise with legends.
- Cumulative Active Energy kVAh ToD wise with legends.
- Current month MD in kVAh with legends
- Last month cumulative kWh with legends
- Last month cumulative kVAh with legends
- Last month MD in kW with legends
- Last month Average Power Factor

Further, the Meter should display High Resolution energy values with resolution of 3 digits before decimal and 2 digits after decimal in push button mode.

The meter's display should return to default display mode (continues auto scroll) if push button is not operated for more than 10 seconds. (The order of display may be as per the requirement of utility). Meter display should not go in to sleep mode during Power-On condition.

6. ANTI TAMPER FEATURES

The meter shall continue recording energy under temper conditions as defined in IS 15959 Part 2 and would log the event and send alarm at Head End System after detection of the defined theft features as per IS 15959 Part 2.

7. TESTS

7.1 Type Tests & Test Certificates

Smart meter shall be type tested for tests as per IS: 16444 Part 1 (latest version) in a third party independent lab. The number of sampling for testing of meters and criteria for conformity would be as per IS 16444 Part 1.

Necessary copies of test certificates shall be submitted as per agreement with the utility.

7.2 Routine & Acceptance Tests

The Factory Acceptance and Routine tests shall be carried out as per IS 16444 Part 1.

Test as per requirement of utility: The Meter (without Communication Module) shall be immune under external magnetic influences and shall be tested for high voltage discharge as per CBIP 325)

8. GENERAL & CONSTRUCTIONAL REQUIREMENTS

8.1 Meter shall be BIS marked as per IS 16444 Part 1.

8.2 General & construction requirement shall be as per IS 16444 Part 1 /IS 13779.

9. METER BASE & COVER-

The meter Base & cover shall be as per IS 16444 Part 1 /IS 13779. The meter base and cover shall be 'Break to open' design. The material for meter base and cover shall be made of high grade polycarbonate.

10. **TERMINAL BLOCK & COVER** - As per IS 16444 Part 1 /IS 13779

11. DESIGN

Voltage circuit, sealing arrangement, terminal block, terminal cover and nameplate etc. shall be in accordance with IS-16444 Part 1 (latest version).

The meter shall be compact and reliable in design, easy to transport and immune to vibration and shock involved in transportation and handling.

12. NAME PLATE AND MARKING

The meter should bear a name plate clearly visible, effectively secured against removal and indelibly/distinctly marked in accordance with relevant IS. In addition, "Name of the Utility", purchase order no. & year/month of manufacturing shall be provided on the meter name plate. The rating plate information shall be as per relevant IS.

13. CONNECTION DIAGRAM: As per IS 16444 Part 1

14. FIXING ARRANGEMENTS:

The meter shall be mounted type. The Meter should have three fixing holes, one at top and two at the bottom. The Top hole should be such that the holding screw is not accessible to the consumer after fixing the meters. The lower screws should be provided under sealable terminal cover. The requisite fixing screws shall be supplied with each meter.

15. SEALING ARRANGEMENT:

Arrangements shall be provided for proper sealing of the meter cover so that access to the working parts shall not be possible without breaking the seal. The sealing arrangement and number of seals shall be as per relevant IS/ requirement of utility.

16. METER BOX: The Meter Box if required, would be provided as per requirement of the utility/ purchaser and the material of the Meter Box should be such that it does not hamper communications.

17. PACKING

- The meters shall be suitably packed for vertical/horizontal support to withstand handling during transportation.
- The meter shall be packed appropriately to ensure safe transportation, handling, identification and storage.
- All packing materials shall be as per environment law in force. The primary packing shall ensure protection against humidity, dust, grease and safeguard the meter's performance until its installation.
- The secondary packing shall provide protection during transportation.
- The packing case shall indicate "Fragile in nature" and direction of placement of box.
- The packing shall indicate marking details like Manufacturer's name, S.No. of meters, quantity etc.

18. TRANSPORTATION

- The meter shall be compact in design. The meter block unit shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation.
- The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.

- The meter should not be exposed to undue shock and mishandling during transportation.
- The stacking of box inside transport media should be such as to avoid their free movement.
- The packing should also be protected from rain and dust by transport media.
- The Bidder shall be responsible for any damage during transit due to inadequate or improper packing.

19. TESTING AND MANUFACTURING FACILITIES AT MANUFACTURER'S PLACE

The manufacturer shall have facilities of conducting Acceptance Testing as per IS 16444 Part 1.

20. INSPECTION

- ❖ The meters shall be sealed as per the mutual agreement of the supplier and the purchaser

- ❖ The utility/ purchaser may inspect the meter randomly as per sampling plan for acceptance test as per IS 16444 Part 1. The meters shall be tested for acceptance test as per IS 16444 Part 1.

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