40-SDMS-02B

Rev.8.1

SPECIFICATIONS

FOR

ELECTRONIC REVENUE WHOLE CURRENT METER

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Revision History

#	Date	Revision No.	Major Revision Description
1	26-06-2022	Rev.08	Adding the following to the specification: • Meter Case Welding • Global Position System (GPS) Module • Meter Firmware (software) changes
2	05-09-2022	Rev.8.1	Adding the following to the specification: • Hexagon Socket (Grade A, Stainless Steel Screws) • Modbus Application Specification Protocol Specification V1.1b3 for ECB communication • ECB connection interface using RS-485 • Torque value on Meter name plate • Enough MCU memory space for future firmware and security upgrade • GMR event Reset to update as per the new GPS solution.

1. SCOPE

This SEC Distribution Materials Specification (SDMS) describes the minimum technical requirements for design, materials, manufacturing, test, performance and supply of programmable electronic revenue meters (static meters) intended to be used for revenue metering in the distribution system of Saudi Electricity Company (hereinafter referred to as COMPANY).

This specification also describes the technical requirements for the electronic revenue meters to be used in SMART METERING and SMART GRID.

2. CROSS REFERENCES

2.1. This specification shall be read in conjunction with SEC General Specification 01-SDMS-01 (latest revision) titled "General Requirements for all Equipment / Materials" considered as an integral part of this specification.

2.2. This specification shall also be read in conjunction with COMPANY purchase order requirements.

3. APPLICABLE CODES AND STANDARDS

The **latest revision** of the following codes and standards shall be applicable for the equipment / material covered by this specification. In case of any deviation, the Vendor may propose equipment / material conforming to equivalent alternative codes and standards. However, the provisions of COMPANY's standards shall supersede the provisions of these standards in case of any conflict.

IEC 60068-2-1	Environmental testing – Part 2-1: Tests – Test A: Cold
IEC 60068-2-2	Environmental testing – Part 2-2: Tests – Test B: Dry heat
IEC 60068-2-30	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)
IEC 60068-2-75	Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests
IEC 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurementtechniques - Electrostatic discharge immunity test
IEC 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test

IEC 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61000-4-8	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
IEC 61000-4-11	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
IEC 62052-11	Electricity metering equipment (AC) – General requirements, tests and test conditions – Metering equipment
IEC 62052-21	Electricity metering equipment (AC) - General requirements, tests and test conditions - Tariff and load control equipment
IEC 62052-31	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests
IEC 62053-23	Electricity metering equipment (a.c.) - static meters for reactive energy (classes 2 and 3)
IEC 62053-31	Electricity metering equipment (a.c.) – Particular Requirement – Part 31: Pulse Output Devices for Electromechnical and Electronic Meters (Two Wires Only)
IEC 62054-11	Electricity metering (a.c.) – Tariff and load control – Particular requirements for electronic ripple control receivers
IEC 62054-21	Electricity metering (a.c.) – Tariff and load control – Particular requirements for time switches
IEC 62056-21	Electricity metering - Data exchange for meter reading, tariff and load control – Direct local data exchange
IEC 62056-42	Electricity metering - Data exchange for meter reading, tariff and load control – Physical layer
IEC 62056-46	Electricity metering - Data exchange for meter reading, tariff and load control – Data link layer
IEC 62056-4-7	Electricity metering data exchange – The DLMS/COSEM suite – DLMS/COSEM transport layers for IP networks
IEC 62056-5-3	Electricity metering data exchange for meter reading, tariff and load control – DLMS/COSEMCOSEM Application layer
IEC 62056-6-1	Electricity metering - Data exchange for meter reading, tariff and load control – Object identification system (OBIS)
IEC 62056-6-2	Electricity metering - Data exchange for meter reading, tariff and load control – Interface classes
IEC 62058-11	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)

IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
IEC 50065	Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kH
IEC 62059-31-1	Electricity metering equipment – Dependability – Accelerated Reliability Testing – Elevated temperature and humidity
IEC TR 62357-1	Power systems management and associated information exchange - Part 1: Reference architecture.
IEC 60834-1	Tele-protection equipment of power systems – Performance and testing – Part 1: Command systems
IEC 60664	Insulation coordination within Low Voltage System including clearances and creep-age distance for equipment
IEC 60695-2-11	Fire Hazard Testing - Part 2-11: Glowing/Hot-Wire Based Test Methods
IEC 60947-7-1	Test requirements of Terminal Blocks
IEC 60947-4-1	Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters
IEC 60529	Degrees of Protection provided by Enclosure IP Classification Designation
IEEE 802.3at	Power over Ethernet+
IEEE C62.41	Recommended Practice on Surge Voltage in Low-Voltage AC Power Circuits
EN 50470-3	Electricity metering equipment Static meters for active energy, classes A, B and C
ASTM D-4098	Thermosetting Resins ASTM D-3935 Polycarbonate Resins
EIA/TIA-485-A	Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems
NIST FIPS 180-1	Secure Hash Standard
NIST SP 800-38D	Recommendation for Block Cipher Modes of Operation : Galois/Counter Mode (GCM) and GMAC
NIST SP 800-57	Recommended for Key Management
NIST SP 800-90A	Recommendation for Random Number Generation Using Deterministic Random Bit Generators
ISO/IEC 11770-3	Information technology - Security techniques - Key management ISO/IEC 18033-2 Information technology - Security techniques – Encryption algorithms - Part 2: Asymmetric cipher
IEC 15426-1	Information technology - Automatic identification and data capture techniques - Bar code verifier conformance specification - Part 1: Linear symbols Green Book 9th Ed. DLMS/COSEM Architecture and Protocols
Green Book 9th Ed.	DLMS/COSEM Architecture and Protocols
Blue Book 12th Ed.	COSEM Interface Classes an OBIS Object Identification System

SG-AMI-1-2009	NEMA Smart Grid Standards Publication - Requirements for Smart Meter Upgradeability
IEC 61000-4-7	Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment.
IEC 60255-151	Measuring relays and protection equipement – Part 151: Functional requirements for over/under current protection
OIML R46-1/-2	Active electrical energy meters. Part 1: Metrological and technical requirements Part 2: Metrological controls and performance test
ASTM B487	Standard Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
IEC/TR 62051-1	Electricity metering - Data exchange for meter reading, tariff and load control - Glossary of terms - Part 1: Terms rela ted to data exchange with metering equipment using DLMS/COSEM
IEC/TR 62051	Electricity metering - Glossary of terms
IEC 62053-21	Electricity metering equipment (a.c.) - Particular requirement s - Part 21: Static meters for active energy (classes 1 and 2)
IEC 62053-52	Electricity metering equipment (AC) - Particular requirement s - Part 52: Symbols
IEC 62053-61	Electricity metering equipment (a.c.) - Particular requirement s - Part 61: Power consumption and voltage requirements
IEC 62056-7-5	Electricity metering data exchange - The DLMS/COSEM su ite - Part 7-5: Local data transmission profiles for Local N etworks (LN)
IEC 62056-8-5	Electricity metering data exchange - The DLMS/COSEM su ite - Part 8-5: Narrow-band OFDM G3-PLC communication profile for neighbourhood networks
IEC 62056-8-6	Electricity metering data exchange - The DLMS/COSEM su ite - Part 8-6: High speed PLC ISO/IEC 12139-1 profile fo r neighbourhood networks
EC TS 62056-1-1	Electricity metering data exchange - The DLMS/COSEM su ite - Part 1-1: Template for DLMS/COSEM communication profile standards
IEC TS 62056-6-9	Electricity metering data exchange - The DLMS/COSEM su ite - Part 6-9: Mapping between the Common Information Model message profiles (IEC 61968-9) and DLMS/COSEM (IEC 62056) data models and protocols
IEC TS 62056-8-20	Electricity metering data exchange - The DLMS/COSEM suite - Part 8-20: Mesh communication profile for neighborhood networks

IEC TS 62056-9-1	Electricity metering data exchange - The DLMS/COSEM suite - Part 9-1: Communication profile using webservices to access a DLMS/COSEM server via a COSEM Access Servi ce (CAS)
IEC 61557-11	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1500 V d.c. Equipment for testing, measuring or monitoring of protective measures – Part 11: Effectiveness of residual current monitors (RCMs) type A and type B in TT, TN and IT systems
IEC/TR 62059-11	Electricity metering equipment - Dependability - Part 11: General concepts
IEC 60417	Database Snapshot Graphical symbols for use on equipment
IEC 61108-1	Maritime navigation and radio communication equipment and systems – Global navigation satellite systems (GNSS) – Part 1: Global positioning system (GPS) – Receiver equipment – Performance standards, methods of testing and required test results
MODBUS	Modbus Application Specification Protocol Specification V1.1b3

4. SERVICE CONDITIONS

The meter will be installed indoor and / or outdoor as referred to the latest revision of General Specification No. 01-SDMS-01. In outdoor installations, the meter shall be enclosed in weatherproof fiberglass meter box. The air temperature inside the meter box may be regarded as 75°C due to direct solar radiation, plus the effect of any internal heating.

Temperature range:

4.1. Limit range for storage and transportation -10°C to 85°C

4.2. Limit range for operation -10°C to 75°C

4.3. Humidity limits from IEC 62052-11 Standard

5. SYSTEM PARAMETERS

The meter shall be suitable for operation in COMPANY's distribution system conditions as per the latest revision of General Specification 01-SDMS-01. The meter shall be deemed to meet the requirements without any adverse effect over the life cycle.

6. DESIGN AND CONSTRUCTION

6.1. General

6.1.1. The Meter shall be compact, rugged and reliable in design. The Vendor shall furnish detailed dimensional drawings of the Meter and its

mounting arrangement along with the offer.

6.1.2. The Meter shall be designed and constructed in such a way as to avoid introducing any danger to the Meter in use and under normal conditions, so as to ensure specially personnel safety against electric shock.

6.1.3. All parts of the Meter, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions.

6.1.4. All parts of the Meter which are subject to corrosion under normal working conditions will show no damage or evidence of corrosion under the following test:

- IEC 60068-2-52, Severity (2)
- Initial measurements:
  - A visual examination shall be performed to verify that all required mounting, case, cable, and signal fasteners are present. In addition, the meter shall have its cover and terminal cover installed as expected for normal operation
- Pre Conditioning
  - No cleaning is permitted before the test is performed. The meters shall be removed from their shipment packaging presumed ready for testing.
  - Any protective coverings used for shipping shall be removed.
- Recovery
  - No washing or rinsing is permitted.
  - Air blast is permitted as specified.
  - Drying as specified.
- Final Measurements
  - A visual examination shall be performed and no exposed metal parts shall show evidence of corrosion.
  - A visual examination shall be performed and no metal parts of the terminals shall show any evidence of corrosion.
  - An insulation test according to IEC 62052-11 clause 7.3 and the voltage limits are located in tables 3a & 3b of this standard.
  - A functional test, including operation of the connect/disconnect switch. Meter shall show no damage or change of information and shall operate correctly.

6.1.5. All internal and external wiring required to install the Meter shall be governed in a way to completely avoid any conflict with the connections of power cables and communication cables.

6.1.6. The components and modules shall be the same ones as those used and tested during the Type Test. All the components and modules shall keep high reliability required during the Meter lifetime.

6.1.7. The cables used shall be easily replaceable and have the sheathed wiring cables with non-flammable characteristics.

6.1.8. Meter Printed Circuit board should not have any flexible wire connected from PCB to PCB.

6.2. Case

6.2.1. The case of the meter shall be made of nonmetallic material. It shall be made of non-flammable phenol or high-grade polycarbonate resin.

6.2.2. The meter shall have an adequate dust proof and moisture proof case. The meter top cover shall be welded /ultrasonic welding with the bottom cover such that meter internal parts are accessible after breaking the welding. The degree of protection shall be IP-54 or better. The meter's electronics shall have a layer of special coating applied to provide sealing against dust, water, and vermin and to ensure high humidity resistance performance.

6.2.3. Top and bottom mountings shall be metallic with anti rust coating. Thickness of these mountings shall not be less than 1.5 mm bolted / riveted to the meter case. Plastic mountings may also be acceptable provided the thickness of the mountings is enough to withstand the mounting pressure. Bottom mounting should be inside the terminal cover.

6.2.4. If plastic mountings are used per 6.2.3, they shall not show any adverse effects (split, crack, gross deformation, break) with a suitably rated fastener under 4.5 N-m (40 in.-lb.) of torque when attached to a concrete surface.

6.2.5. Adequate sealing provision shall be provided in different parts of the meter, i.e., terminal cover, meter cover, manual reset buttons, modules on cover and energy storage device cover if used.

6.2.6. The overall and mounting dimensions and top & bottom mounting arrangements shall be provided similar to the sketch as given in drawing No. SEC/KWH-S-01.

6.2.7. All the screws used in the meter shall be of slotted head type, only except the screws used for the internal assembly of meter parts and terminal screws.

6.2.8. The Meter case shall not show any adverse effects (change of color, cracking, break) following the solar radiation test as specified in Table 10 in Section 15.7.6.

6.3. Terminals and Terminal Block

6.3.1. The terminals shall be grouped in a terminal block of adequate insulating properties and mechanical strength. They shall be arranged for bottom connection. The terminals shall be made according to the requirements described in section 5.4 Terminals – Terminal block (s) – Protective earth terminal of IEC 62052-11. The cover will not be transparent. It will use the same material as top cover.

6.3.2. The terminals (holes) shall have a tightly screwing structure of terminal surfaces for the inserted cables not affecting the meter case in addition to 5.4 of IEC 62052-11.

6.3.3. The terminals shall be suitable for copper conductors and provided with minimum of two (2) hexagon socket screws (Grade A, Stainless Steel) screws for each conductor (The screw bottom diameter shall be more than 8 mm to tightly fix the conductors inside the terminals and shall not chip off during screws tightening or unscrewing). Thickness of terminal coating shall be more than 5 microns and coating material should be Tin or Nickel. The bore diameter for phase and neutral terminals shall be as given in the Table No.1 below.

Table No.1 – Bore diameter

Meter Type	Bore diameter of each terminal (mm)	Kind & Size of conductor
100A	9 – 12	35 ㎟ soft drawn stranded copper
160A	≥ 11	70㎟ soft drawn stranded copper

6.4. Terminal Cover

Terminal cover shall be made of the same materials as that of the meter case and sealed independently up the meter cover. The terminal cover shall include information indicating the correct phase sequence and connections as per drawing No. SEC/KWH-S- 02. The terminal block shall not be visible through the terminal cover.

6.5. Meter Cover and Nameplate

6.5.1. The cover of the meter shall be made of opaque, shatterproof, ultra violet stabilized nonmetallic material with a clear glass or polycarbonate window, if used.

6.5.2. The meter cover shall have enough room to provide the optical port,

display push-button and optical test outputs. These components shall be arranged either within or outside the window area. The metallic ring should be backside of the meter cover.

6.5.3. The meter shall work without any abnormal operation, when the meter cover is pressed down against the meter base.

7. ELECTRICAL REQUIREMENTS

7.1. All electrical requirements shall be referred to General Specification No. 01- SDMS-01.

7.2. The rated current (Ib) and the maximum current (Imax) of the meter shall comply with following.

Table No.2 – Current ratings

Basic current (I_b)	Maximum current (Imax)
10 (A)	100 (A)
20 (A)	160 (A)

7.3. The reference voltage of the meter shall comply with the value in the Table No.3 below.

Table No.3 – Current ratings

Whole Current Meter (Able to cover dual voltages)	133/230 (V)
	230/400 (V)

7.4. Voltage Adaptation: The meter shall auto configure the nominal voltage once powered on. The detection time shall be 1 min. The threshold voltage shall be 160V. If the average detection voltage is below the threshold voltage, then meter shall configure the nominal voltage 133V automatically and 230V if vice versa. During this detection time, voltage related (sag, swell, low voltage) alarms and events shall not be recorded and pushed to HES.

7.5. System (Supply) frequency: 60 Hz (nominal).

7.6. The number of power measuring elements of the meters shall be as given in Table No. 4 below. And it shall be ensured that the wiring connection is the same with Drawings No. SEC/KWH-S-02 in the last pages of this specification. The power measuring elements shall be designed adequately to operate in the reference voltage described above in Clause 7.3 so that they shall not affect the meter accuracy.

Table No.4 – Number of elements

Whole Current Meter	3 elements	3 phases – 4 wires

7.7. The temperature rise (comparing to an ambient temperature) at any point of the electrical circuit, insulation and the external surface of the meter shall not exceed 30°C with an ambient temperature not exceeding 55°C.

7.8. The meter shall have a fully redundant power supply; i.e. withstanding any phase-neutral inversion, missing phases or missing neutral.

7.9. The Meter shall start to calculate consumption and demand quantities less than 5 seconds after power application.

7.10. The meter shall have a protective circuit to protect itself against any electric trouble or electromagnetic interference from other devices connected to the meter through interface such as communication port, signal cable and power cables.

7.11. Accuracy requirements

The accuracy class of the meter shall comply with the value in the Table No.5 below.

Table No.5 – Accuracy class

Active energy	CL 1.0
Reactive energy	CL 2.0

7.11.1. Limits of error due to variation of the current

For active energy the percentage errors of the meters shall comply with the clause 8.1 of IEC 62053-21.

For reactive energy, the percentage errors of the meters shall comply with the clause 8.1 of IEC 62053-23.

7.11.2. Limits of error due to influence quantities

The additional percentage error due to the change of influence quantities with respect to reference conditions shall comply with the clause 8.2 of IEC 62053- 21 , 23.

7.11.3. Initial start-up of the meter

The meter shall be normally functional within five (5) seconds after the reference voltage is applied to the meter terminals

7.11.4. Test of no-load condition

When the voltage equal to 115 % of the reference voltage is

applied for the specified period with no current flowing in the current circuit, the test output of the meter shall not produce more than one (1) pulse.

For the specified period for no-load test and the detailed test method, clause 8.3.2 of IEC 62053-21, -23 shall be referred.

7.11.5. Starting current

For active energy, both imported and exported, the meter shall start and continue to register at the starting current value in the Table No.5 below.

Table No.6 – Starting current

Power factor	Starting current
1 ($\cos\Phi = 1$)	0.004 I_b

For reactive energy, both imported and exported, the meter shall start and continue to register at 0.005 I_b and zero (0) power factor ($\sin\Phi=1$).

7.11.6. Accuracy test due to variation of the load shall be applied with all import / export energies (powers) flowing in both direction and all measurement points, according to IEC 62053-21 and IEC 62053-23.

7.11.7. Power consumption

The power consumption of the meter (except for the power supply to external modem or gateway) shall not exceed the values in the Table 1 of IEC 62053-21, 23 for voltage circuits and the values in the Table 1 of IEC 62053-21, 23 for current circuits.

7.11.8. The internal circuit of the meter shall be designed as to prevent the meter from being influenced by any abnormal status of externally connected devices (e.g. external modem) or communication line (e.g. RS-485).

7.11.9. The meter shall be equipped with protection device against electrical surge flowing into the meter through power supply line, communication line and signal line. The internal power source for the meter and the DC power supply for the external modem shall be isolated.

7.12.1. Prevention of PLC Signal Attenuation and Distortion

7.12.1.1. The meter shall comply in the used frequency band with IEC 50065 family standards in case of transmission between 3kHz and 148.5kHz and with another similar standard in case of use of transmission above 148.5kHz.

7.12.1.2. The PLC signal shall be injected with a level equal or lower than the maximum level according to the selected technology and the used frequency range. This level shall be measured using the IEC 50065 family standards in case of transmission between 3kHz and 148.5kHz and with another similar standard in case of use of transmission above 148.5kHz. If the selected technology has not established the maximum level, the COMPANY will establish it.

7.12.1.3. The meter shall comply with the CISPR 22 class B limits as a regulation for conducted emissions in the used frequency range.

7.12.1.4. The meter's noise level generated from the internal alternating power source or internal modules shall be less than -70 dBm, in any point of the range from 9kHz to 6GHz.

8. INPUT AND OUTPUT REQUIREMENT

8.1. Display

8.1.1. The display shall be of a high-contrast and easy-to-read Liquid Crystal Display (LCD), which offers a wide array of information and flexibility.

8.1.1.1. Viewing angle: The display digits and operation status shall be clearly understandable at least 2m distance from the meter front.

8.1.1.2. Display method: Segment Type or Dot Matrix

8.1.1.3. Connection: Pin or Elastomeric connector

8.1.1.4. The display window shall be polycarbonate or better materials

8.1.1.5. The display shall be visible from different sides and different angles as per the Meter box and specification for general requirements for all equipment and materials document (42-SDMS-01 SPECIFICATIONS FOR FIBERGLASSREINFORCED POLYESTER METERBOXES)

8.1.2. The display shall withstand environmental conditions specified in 42- SDMS-01 latest revision and shall not have any change in color, contrast or brightness during the entire meter life period. The temperature limit range of operation for the display is the same asthat of the meter mentioned in clause 4 of this specification.

8.1.3. Legends / dimensions recommendations shall be as shown in the drawing No. SEC/KWH-S-03 or any other similar display which provides equivalent text / legend information.

8.1.4. The display shall have access to all the metering parameters as given in the functional requirements and shall be tailored to display only the required information by masking-out undesired information.

8.1.5. The meter shall display the primary values of the (total and TOU) energy, average demand, maximum demand, cumulative maximum demand, load profile (clause 9.1.2, 9.1.3, 9.1.4, 9.1.5, 9.1.6, 9.1.7 respectively.

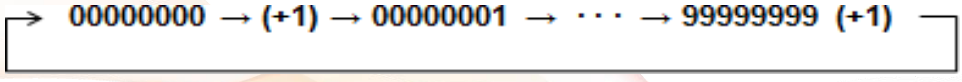
8.1.6. For all register values the number of digits shall be the maximum eight
(8) Digits. The number of digits and decimal places for display shall be configurable.

8.1.7. The default display units and the number of decimals to be displayed shall be as follows. Note that the default numbers and units to display shown below do not define the actual resolution of measurement values. (Refer to the related clauses in the supplementary OBIS specification to see the actually registered resolutions).

Table No.8 – Default Units to Display

Values		Integer	Decimal	Unit
Energy and Demand (Clause 8.1.5)	Energy	8	0	kWh, kVarh, kVAh
	Demand	8	0	W, Var, VA
Instantaneous Measurement Values (Clause 9.6)	Voltage	6	2	Volt
	Current	5	3	Amp
	Power	8	0	W, Var, VA
	Power Factor	1	3	N/A
	Frequency	2	2	Hz

8.1.8. In case the metered energy values exceed eight (8) digits, the displayed value shall be rolled over to zero (0). After the rollover, the lowest eight (8) digits shall be displayed. A flag must be available for this event on LCD, the meter shall have required OBIS codes for this flag.



8.1.9. For Item No.9 of drawing No. SEC/KWH-S-03, the meter shall display the OBIS code including at least three (3) digits of C, D and E codes on the display, and a table containing a short description of the codes shall be fixed on the front panel.

Table No.9 – Display OBIS Code on the Front Panel

Group C		Group D		Group E	
1	ΣLi Active power+	0	Billing period average	0	Total
2	ΣLi Active power-	4	Current average 1	1	Rate 1
3	ΣLi Reactive power+	6	Maximum 1	2	Rate 2
4	ΣLi Reactive power-	7	Instantaneous value	3	Rate 3
5	ΣLi Reactive power QI	8	Time integral 1	4	Rate 4
6	ΣLi Reactive power QII			5	Rate 5
7	ΣLi Reactive power QIII			6	Rate 6
8	ΣLi Reactive power QIV			7	Rate 7
9	ΣLi Apparent power+			8	Rate 8
10	ΣLi Apparent power-				
13	ΣLi Power factor				
14	Supply frequency				

[Remark 8.1.11] If the LCD displays 1.8.0 (or 180), the value means ΣLi Active power+ (1), Time integral 1 (8) and total (0).

8.1.10. The display shall also provide the following indicators whenever it is required:

8.1.10.1. A register value with its appropriate unit, and DLMS/ COSEM/ OBIS code of the parameter of which the register is storing.

8.1.10.2. A tariff number indicates which tariff period is in view.

8.1.10.3. A 3-Phase (L1, L2, L3) and Neutral (N) status indicator remains static throughout the operation and blinks if the corresponding phases trip.

8.1.10.4. The vendor will supply an anomaly indicator, which blinks when there is failure in the electronic components, overflow in calculation or any other error which results in meter malfunction.

8.1.10.5. A reverse direction indicator blinks when the active energy in one or more of the phases is flowing in the reverse (export) direction. Alternately a four quadrant indicator is also acceptable provided it shall blink when the measured active energy in one or more of the phases is in the export direction.

8.1.10.6. An energy storage device level indicator that blinks when the main energy storage device is required replacement. Alternatively, the display can show the percentage of the remaining level of energy storage (open for the vendor).

8.1.10.7. A communication indicator is lighted when the meter is communicating through one of its communication ports.

[Remark 8.1.10] The indicator presentation different from 'DISPLAY ARRANGEMENT' in DRAWING No. SEC/KWH-03 may be accepted at COMPANY's discretion. However, the above functional display requirements shall be fulfilled even in such a case.

8.1.11. The meter periodically check meter status (self-diagnostic information) and display its status on LCD screen. When there is the meter reading data request, the meter shall have the transfer function of self-diagnostic information with meter reading data.

8.1.12. The meter structure shall be securely made to prevent the internal data change, such as measurement data and historical recording through the meter body or communications by unauthorized manipulation.

8.1.13. The detection function of "Phase and neutral wire swapped (L1, L2, L3)" shall be configurable [default: CD, (CD: no condenser installation, CE: condenser installation)], as per the customer's leading phase static condenser installation status.

8.1.13.1. If CE is set, the meter shall detect the abnormal status of "Phase and neutral wire swapped (L1, L2, L3)", only if the consumed current goes over 10% of rated current.

8.1.13.2. The leading phase static condenser will be installed by a customer who has considerable motor load (lagging factor) to improve the power factor by reducing Reactive power.

8.1.13.3. In this case, the meter may detect wrong cable

connections, even there are no wrong cable connections depending on the operation state of the leading phase static condenser of the customer side.

8.1.13.4. Therefore, if the leading phase static condenser is installed at the customer side, set the setting mode with CE and detect a wrong connection only with more than 10% of the rated current of the meter.

8.1.14. Average / maximum voltages and currents per each phase

8.1.14.1. The calculation period of average current and average voltage shall be configurable [default: 5 seconds, (1, 5, 10, 15, 30 or 60 seconds)].

8.1.14.2. If a new average value of current or voltage go beyond the previous average value, the new average value shall be copied on to the maximum load current or the maximum voltage respectively (minimum measurement range: for current - ±0 ~ 120% of maximum current, for voltage - 0~ 120% of Phase-to-Phase reference voltage).

8.1.14.3. Whenever a new maximum value of current or voltage is generated, the generation date / time of the maximum value shall be updated.

8.1.14.4. If a new maximum current load goes beyond the meter's maximum current, the meter shall set maximum current load operation event.

8.1.14.5. If the current load goes under the meter's maximum current, the meter shall reset the maximum current load operation event status.

8.1.14.6. These average and maximum values of current and voltage shall be reset to zero (0), whenever there is EOB reset or Manual Reset.

8.1.15. Temperature of the internal part of the meter

8.1.15.1. The meter shall have an internal temperature sensor and the temperature sensing function shall be configurable (default: enable).

8.1.15.2. The temperature measurement range shall be at least -40 ~ 100℃. The temperature recording shall be

possible by1℃ difference (accuracy range: ±2℃).

8.1.15.3. The meter shall present current temperature, temperature event and have the function to configure temperature over limit threshold (default: 75℃).

8.1.15.4. Whenever the meter's internal temperature goes beyond the temperature over limit threshold value or existing temperature over for more than five (5) seconds, the meter shall update the temperature over value, event and the date/ time of the event.

8.1.15.5. If the temperature goes below the threshold value, the meter shall reset the event status.

8.1.15.6. The temperature over value shall be reset to zero (0), whenever there is EOB reset or Manual Reset.

8.1.16. Voltage under limit threshold (Sag) and over limit threshold (Swell)

8.1.16.1. If the calculation period of Sag and Swell shall be configurable [default: 5 seconds, (1, 5, 10, 15, 30 or 60 seconds)].

8.1.16.2. If Sag or Swell event happens, the event and date / time shall be recorded. Minimum Sag event measurement range is 30 ~ 90% and Minimum Swell event measurement range is 110 ~ 120% of the referenced voltage value.

8.1.16.3. If continuous generations of Sag or Swell occur immediately upon the first Sag or Swell event with within ± 2% voltage setting values, the Sag or Swell value shall not be recorded as additional events.

8.1.17. Meter firmware upgrade and time synchronization (local and remote).

8.1.17.1. The meter shall provide firmware upgrade function remotely and locally by DLMS clients. The vendor shall provide technical support for its meters firmware upgrade via HES. Meters shall comply with SG – AMI – 1 – 2009 for Firmware upgradation.

8.1.17.2. The meter shall provide time synchronization function to remotely and locally by DLMS clients.

8.1.17.3. The meter shall not stop calculation of energy during the firmware upgrade

8.1.17.4. The meter shall record an event when firmware

upgrade begins and ends. Also failure reason shall be indicated if failed.

8.1.17.5. The meter shall provide firmware upgrade functionality to be achieved immediately or on scheduled basis both remotely and locally by DLMS clients.

8.1.18. Self-diagnostics and Alarms on LCD screen

8.1.18.1. Clock Initialization (e.g. blinking "CLK")

8.1.18.2. Memory Error (e.g. blinking "MEM")

8.1.18.3. Energy storage device Low/Failure (e.g. blinking "BAT")

8.1.18.4. Magnetic Field Detection (e.g. blinking "MG")

8.1.18.5. Wrong Password Tried (e.g. blinking "WP")

8.1.18.6. Abnormal Temperature Occurrence (e.g. blinking "T")

8.1.18.7. Disconnect Control (Remote Output Relay Control Operation) (e.g. at reconnection command – blinking "ON" 5 seconds, at disconnection command – blinking "OF" 5 seconds)

8.1.18.8. State of Output Relay (Disconnect) Control Signals (e.g. at reconnected status – keeping "ON", at disconnected status – keeping "OF")

8.1.18.9. Maximum Current Load Operation (e.g. blinking "MC")

8.1.18.10. Total Harmonics Limit Operation (e.g. blinking "TH")

8.1.18.11. Sag Limit Operation (e.g. blinking "SA")

8.1.18.12. Swell Limit Operation (e.g. blinking "SW")

8.1.18.13. Top Cover open

8.1.18.14. Terminal cover open

8.2. Optical testing output device

8.2.1. The meter shall have two (2) optical testing output devices capable of being monitored with suitable testing equipment. The optical output value, i.e., the meter constant in terms of Imp/kWh and Imp/kVarh (default meter constant: 10000 Imp/kWh and 10000 Imp/kVarh) shall be inscribed on the front panel of the meter. The reactive energy testing output shall be used for reactive energy.

8.2.2. The requirements for testing outputs shall comply with clause 5.11 of IEC 62052-11.

8.3. Power Supply for External Communication Devices

8.3.1. The meter shall be able to supply the operational power for external communication devices such as GSM / GPRS / 3G / 4G external type modem, PLC modem or Gateway. Communication should not be interrupted if any of the phase missing or swapped or neutral missing.

8.3.2. The power supply (Modem/Gateway PSU, GND – Clause 8.4.2 2) from the meter side to the external communication device shall have the electrical characteristics of 12Vdc (± 5%), over 5W. The cable to be used for power supply shall be capable of reliably supplying the required power of 12Vdc (± 5%), over 5W, and the cable shall be possible to provide sufficient power supply and communication.

8.4. Local / Remote Communication Interfaces

8.4.1. Optical Interface

8.4.1.1. The meter shall have an infrared optical interface module to enable the use of a RS-232 / USB compatible optical probe in compliance with IEC 62056-21. Metallic ring of optical port should be inside of the meter cover.

8.4.1.2. The optical port shall allow bi-directional communication with a Hand Held Unit (HHU) or most available Laptops / PCs for rapid, error free electronic data transfer using the DLMS/COSEM protocol as well as IEC 62056-21.

8.4.1.3. The optical port shall be used to configure the meter, read all the register values and load profile data.

8.4.2. Communication Interfaces

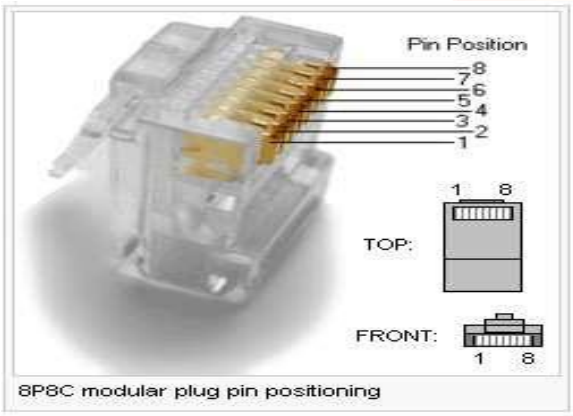
7.4.2.1. The meter shall be equipped with RS-485 interface having two (2) physical RJ-45 terminals. All provided RJ-45 terminal shall be powered.

7.4.2.2. The way how to implement power supply for external communication device from the meter's side depends on the manufacturer's design. However, the provision of both RS-485 communication interface and power supply interface by single RJ-45 terminal is mandatory.

In this case, the first RJ-45 terminal shall have additional two (2) pin-outs for supplying DC power to Modem (or Gateway) PSU while the second RJ-45 terminal has only two (2) RS- 485 communication pin-outs as follows.

A RJ-45 pin-out configuration for both RJ-45 terminal

Pin No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Pin-out	Modem PSU (12 Vdc+)		N C	RS-485 (+)	RS-485 (-)	NC	GND (Vdc-)	



8P8C modular plug pin positioning

7.4.2.3. The RS-485 interface in the meter which is different from the connector (RJ-45) and pin-out configuration described above can also be accepted as long as the corresponding converter (terminal) is supplied. If this is the case, the last end terminal of the converter shall be the same with the specification above (RJ-45 and pin-out configuration) for interoperability between meters of different manufacturers (in this case, at least one (1) converter shall be submitted with a meter).

7.4.2.4. RJ-45 terminals shall be suitable to connect other meters and one (1) communication modem (e.g. GSM/ GPRS/ WCDMA/ LTE, DCU, PLC, etc). The cable to be used for RS-485 communications shall be outdoor UTP Cat5e cable or better.

7.4.2.5. RJ-45 terminals shall be protected by using appropriate protection caps or covers which are at least IP-54 rated for dust ingress protection.

7.4.2.6. The meter shall operate as a slave RS-485 communication unit, while Gateway / Modem or PLC modem or DCU shall operate as its master unit.

7.4.2.7. The other specification of the RS-485 interface shall be referred to other related specifications (40-SDMS-02G Rev.1, 40-SDMS-02H Rev.1 or related latest SEC communication devices specifications.

7.4.2.8. During receive_mode operation, when the meter changes its RS-485 communication mode from receive_mode to send_mode after receiving packets from DLMS client, the meter shall change its receive_mode to send_mode at least minimum 5ms delay. After the meter sends packets to DLMS client, the meter shall change its send_mode to receive_mode within maximum 2ms.

8.4.3. The meter shall support at least two (2) APN networks configuration and its parameters, which can be configured both locally and remotely.

8.4.4. In-home Display (IHD) Support

8.4.3.1. The technologies for communicating with IHD can be either wired (e.g. RS-232, RS-485, PLC, etc.) and / or wireless (Wi-Fi, Zigbee, Microwave, etc.) and the selection of communication protocol between the meter and IHD is open to the manufacturers. However the Vendor shall ensure and verify the availability in the markets of such IHDs which can be used with the meter.

8.4.3.2. The data which are exchanged with IHD shall be configurable on demand of COMPANY users.

8.4.3.3. If the Vendor proposes in their technical proposal more innovative way of implementing the IHD functionality in its own design concept, it will be considered by COMPANY and may

be accepted after COMPANY's review and approval.

8.4.3.4. The communication interface for IHD communications shall not make any harmful effects to communications 1) between Modem / Gateway (or DCU) and the meter, 2) among meters via RS-485 interface, and 3) between HES and the meter.

8.4.3.5. The meter shall be communicated with at least one communication port without any harmful effect on normal meter operation (measurement accuracy, event logging, communication, etc.), when more than two communication connections are requested via different communication ports (optical, RS-485 or IHD port).

8.4.5. Communication speed

8.4.5.1. Baud rate: 300~115,200 bps (default: 9600, configurable)

8.4.5.2. Full LP data transmission period: within 15 minutes

8.5. Protocol

8.5.1. All types of meters shall be designed to use DLMS/COSEM protocol with OBIS code defined by COMPANY.

8.5.2. All types of meters shall have both DLMS CTT certification and COMPANY's DLMS functionality test certification.

8.5.3. For detailed communication profile and OBIS code defined by COMPANY, refer to the supplement of this specification.

8.5.4. If there is no other definition by COMPANY, OBIS code shall be comply with the "List of standardized OBIS codes V.2.3", "Object definition tables V.2.7", or latest versions defined by DLMS-UA.

8.5.5. The meter shall operate based on the 3-layer, connection-oriented, HDLC-based communications profile as per IEC 62056-42, 46, 53 standards, in order to connect the meter with other meters via RS-485 interface.

8.5.6. The same RS-485 interface shall be also used in order to communicate with an external PLC modem, Gateway or Modem (optical, wired, etc.) via RS-485 interface.

8.6. The WC meters rated under or equal to 100A shall have an internal latch relay rated 100A instead an output relay. Its electrical characteristics shall allow connecting and disconnecting customers. Controlling and protecting the internal CB is open to Contractor design within the described requirements:

i) The ratings are: In: 100A (In at 55º)

For Operation Voltage 230/133 V ± 5%:

Short-circuit breaking capacity Icu 3 kA Service breaking capacity Ics = 100% Icu

For Operation Voltage 400/230 V ± 5%:

Short-circuit breaking capacity Icu 3 kA Service breaking capacity Ics = 100% Icu

ii) For the internal latch relay testing, it will be tested according to the tests fully described at 37-SDMS-05 REV.1 – Electronic Circuit Breaker) sections 12.2 to 12.9, both inclusive, with the breaker outside the meter like an independent device.

iii) For Lower ratings (30A &60A), Power limitation functionality will be applied. For higher ratings, an external circuit breaker could be controlled by output relay described in next clause.

8.7. Output Relay and Current Over Limit

8.7.1. The meter shall have an internally operating output relay whose contacts (NC: Normal Close, operating time: within 50 ~ 100ms) rated at 250V/1A, and shall be available at the terminal block. The initial status of output relay for the Disconnection Switch shall be Normal Close. (A contact).

8.7.2. If the current exceeds the trip point and stay there for more than a delay time, the output relay shall be switched on (open) by the meter automatically.

8.7.3. If the current falls below the trip point and stay there for the same delay time, the output relay shall be switched off (close) by the meter automatically.

8.7.4. The trip point which is in percentage of the nominal current of a meter and the delay time in minutes shall be configurable.

8.7.5. The meter shall operate the output relay when received disconnect/ reconnect control commands from the remote station (HHU Gateway (modem), DCU (PLC modem), and HES.

8.7.6. When the output relay is operated, the power value, date and time of occurrence shall be logged in the meter. Notification to HES should be sent whenever the Relay is in operational state"

8.7.7. Current over limit function shall be configurable as described in OBIS codes specification.

8.7.8. Current over limit threshold and Current over limit duration shall be configurable [limit threshold (default: 100%): 0 ~ 120% of maximum current, time duration (default: 3 minutes): 0 ~ 60 minutes].

8.7.9. Current limit auto recovery number [configurable: 0 ~ 1000 times (default: 1, 0: disabled)] shall be configurable. If the meter has performed the output relay open / close operations (Output Relay Operation Times) up to Current Limit Auto Recovery Number automatically, the output relay state shall be locked (permanent open). In this case, if Current Limit Auto Recovery Number is reset, both the Number of Output Relay Operation times and the locked state (permanent open) shall be reset [to zero (0) or open] automatically.

8.7.10. The output relay (i.e. current over limit trip signal) shall be operated according to the remote output relay control clause from the OBIS specification. It shall be operated (open) automatically in case below conditions are met for more than two (2) hours (configurable). The relay shall recover after 10 minutes (configurable) when temperature goes back within temperature operation range:

8.7.10.1. The meter temperature is over the maximum temperature.

8.7.10.2. The Output relay (i.e. current over limit trip signal) shall be operated (close) automatically in case the meter temperature is below the maximum temperature and stays there for a configurable period of time (default: 10 minutes).

8.7.11. The internal output relay shall use the latching relay. The latching relay shall maintain its contact position after the control power has been removed (power off).

8.7.12. For security reason, when the internal latch relay is opened using Local Communication (HHU), the meter shall not accept remote order to close the internal latch relay.

[Note]: The relay open due to temperature supersedes any other relay functional command triggers.

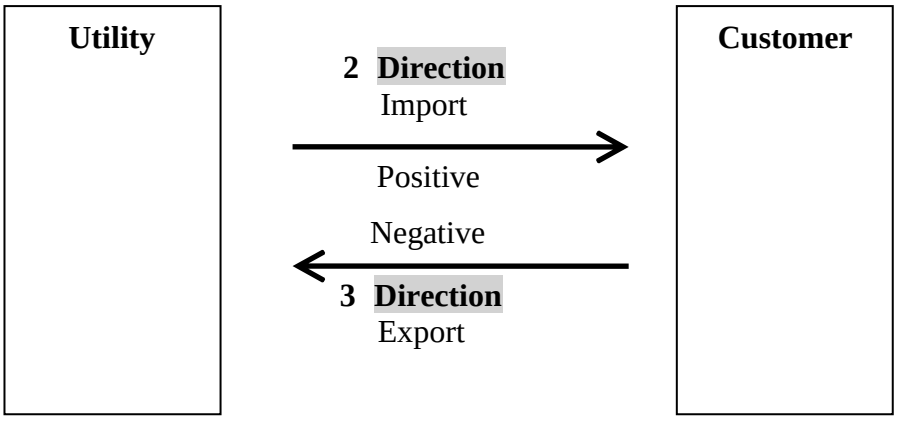
9. FUNCTIONAL REQUIREMENTS

The meter shall contain the following features, any combination of which can be selected to provide the required metering functions. Some features shall be configured by the Vendor and the others shall be configured by the user.

9.1. Registers

9.1.1. Convention for Energy Direction

9.1.1.1. The convention for energy direction of the meter shall follow IEC standards as described below.



9.1.2. Basic Energy Measurement (Refer to Clause 6.1.1 "Total Energy Registers" of the Supplementary OBIS Code specification)

9.1.2.1. Three (3) independent energy registers shall be used to measure total import active energy (kWh+), total import reactive energy (kVarh+) and total import apparent energy (kVAh+).

9.1.2.2. The meter shall detect and measure the reverse energy and flash the reverse energy indicator if the reverse (export) energy measured is greater than the meter's starting threshold. The measurements shall be stored in total export active energy (kWh-) register, total export reactive energy (kVarh-) register and total export apparent energy (kVAh-) register.

9.1.2.3. The four (4) quadrants reactive energy shall also be stored in reactive energy [QI], [QII], [QIII], [QIV] registers respectively.

9.1.2.4. In addition, summation of absolute values of import and export active energies shall be available, i.e. $|$import active energy$|$ + $|$export active energy$|$.

9.1.3. TOU (Time of Use) (Refer to Clause 6.1.2 "TOU Energy Registers" and 6.7.1 "Activity Calendar" of the Supplementary OBIS Code specification)

9.1.3.1. Number of TOU channels supported: at least 8 channels. The number of energy quantities to be recorded per each TOU rate, i.e. TOU channels, shall be configurable among the 40 energy quantities specified in Clause 9.1.2 above. The default quantities are import active energy (kWh+), export active energy (kWh-), import reactive energy (kVarh+), export reactive energy (kVarh-), import apparent energy (kVAh+), export apparent energy (kVAh-), reactive energy (QI) and reactive energy (QIV).

9.1.3.2. Number of TOU rates supported: at least 8 TOU rates (8 rates) and summation of all TOU rates shall be available. The default meter setting shall be made up of the TOU rates according to clause "10.0 Default setting" and the summation of all TOU rates.

9.1.3.3. Memory capacity for TOU registers: at least 64 registers. The selection of TOU registers (i.e. 64 registers out of all possible selection which is 320 registers) to be used shall be configurable (e.g. if user selects 8 TOU rates and 8 TOU channels (energy quantities), total number of TOU registers will be 64).

9.1.3.4. Number of hourly segments for TOU: at least 10 segments in a day (i.e. number of "day_schedule" in a "day_profile", refer to clause 6.7.1 k) of Supplementary OBIS Specification)

9.1.3.5. Number of daily profiles for TOU: at least 8 daily profiles (i.e. number of "day_profile" in a "day_profile_table", refer to

clause 6.7.1 k) of Supplementary OBIS Specification)

9.1.3.6. Number of weekly profiles for TOU: at least 8 weekly profiles (i.e. number of "week_profile" in a "week_profile_table", refer to clause 6.7.1 k) of Supplementary OBIS Specification)

9.1.3.7. Number of seasons for TOU: at least 8 seasons in a year (i.e. number of "season" in a "season_profile", refer to clause 6.7.1 k) of Supplementary OBIS Specification)

9.1.3.8. Each TOU period is independently time controlled using a 24-hour clock so that registration takes place over a restricted period of time. The time control shall have provision to exclude days like weekends and holidays. The tariff period which is active at a given time shall be displayed.

9.1.4. Current/Last Average Demand (Refer to Clause 6.2.1 "Demand Registers" of the Supplementary OBIS Code specification)

9.1.4.1. According to clause 9.1.3 of this specification, all the current/last average demands related to the TOU channels shall be recorded in the corresponding demand registers. And four (4) TOU periods as well as the total tariff period shall be supported for those eight (8) demand quantities (i.e.
5 tariff periods x 8 demand quantities = 40 demand registers).

9.1.4.2. The demand calculations are based on sliding window method. A configurable integration time of 5, 15, 30 or 60 minutes (the default integration time is the same with the load profile interval) and a fixed sub interval of 5 minutes.

9.1.4.3. If a power outage and recovery occurs during a demand integration period, the average demand values shall be calculated (summed) including the outage period. During the power outage period, the meter shall stop Demand calculation and keep the demand values during the demand integration period.

9.1.4.4. When the meter time/date is changed, the demand integration is completed at the time (before change) and the new demand integration starts from the time (after change) and is recorded at the end of the demand integration period.

9.1.4.5. The current/last average demand and its capture time shall be recorded.

9.1.5. Maximum Demand (Refer to Clause 6.2.2 "Maximum Demand Registers" of the Supplementary OBIS Code specification)

8.1.5.1. The maximum demand quantities to be recorded are the same items as the average demand registers in Clause 9.1.4 1.

8.1.5.2. When the sliding window method for demand integration is used, in every sub-interval the maximum demand registers shall be updated.

8.1.5.3. The time and date of occurrence of the maximum demand shall be recorded.

9.1.6. Cumulative Maximum Demand (Refer to Clause 6.2.4 "Cumulative Maximum Demand Registers" of the Supplementary OBIS Code specification)

8.1.6.1. The demand quantities to be determined as maximum during the meter's whole operation period (i.e. cumulative maximum demands) shall be recorded.

8.1.6.2. The cumulative maximum demand quantities to be recorded are the same items as the average demand registers in Clause 9.1.4 1).

8.1.6.3. The time and date of occurrence of the cumulative maximum demand shall be recorded.

9.1.7. Load Profile (LP)

9.1.7.1. Number of LP channels: at least fourteen (14) channels. Quantities to be recorded can be programmed (configurable) by users among the registers , and default quantities are current date/time, status information, import active power (W+), import reactive power (Var+), import apparent power (VA+), import reactive power (QI), export reactive power (QIV), export active power (W-), export reactive power (Var-), and export apparent power (VA-), import average power factor and export average power factor.

9.1.7.2. Time period of LP: it can be programmed (configurable) from 5, 15, 30, 60 min, and default is 30 min (Load Profile interval shall always be same of Demand Integration Period).

9.1.7.3. Each LP date shall be identifiable to its respective date and time. The end of the last LP period in a day shall match with 00:00 hr.

9.1.8. Billing periods
All TOU values related to 9.1.3 of this specification and all maximum demands related to 9.1.5 of this specification, which are referred to as billing data, shall be recorded into registers as follows.

9.1.8.1. The billing data accumulated from the origin (first start of measurement) to the instantaneous time point of metering, which is called "Total Energy Registers (current total billing)", shall be available.

9.1.8.2. The billing data accumulated from the origin to the end of the last (most recent) billing period, which is called "Total Energy Register's Data in most recently captured EOB Data Profile (previous total billing)", shall be available.

9.1.8.3. The billing data accumulated from the beginning of the current billing period to the instantaneous time point of metering, which is called "Energy Registers (current billing)" shall be available.

9.1.8.4. The billing data accumulated from the beginning of the last billing period to the end of the last billing period, which is called "Energy Register's Data in most recently captured EOB Data Profile (previous billing)" shall be available.

9.1.8.5. The default current billing period is one (1) month, and the current billing period is the same with automatic EOB reset time & date (The default automatic EOB reset time & date is at 00h 00m on the first day of every month and configurable).

9.1.8.6. With EOB reset (triggered by internal clock) the maximum demand registers shall be reset to zero (0) after transferring the data to the historical registers.

9.1.9. The energy measurements shall be carried out separately for 3 phases and added to the relevant import or export energy registers.

9.1.10. The measuring resolution of all registers mentioned in this specification shall be in accordance with the supplementary OBIS code specification.

9.1.11. The meter shall have sufficient memory capacity to store all TOU registers, maximum demand registers and LP registers for more than 90 days when the time period of LP is 30 min. Also, the meter shall have sufficient memory capacity to store more than 20 points for each Event Log data mentioned in the supplementary OBIS code specification respectively. When the storage is full, the new data shall overwrite the oldest stored data.

9.1.12. The meter (MCU) shall have enough free memory space to cater future Firmware and security upgrades due to new features and functions.

9.1.13. Power Factor: monthly average PFs (Total, TOUs), previous LP interval average PFs, per phases instantaneous PFs.

9.2. Reset Function and Historical Data Recording

9.2.1. There are various terms regarding the reset methods classified by the different criteria as follows:

9.2.1.1. By reset triggering methods: Manual, Internal Clock (Automatic), Command

9.2.1.2. By scheduled scripts (Internal Clock): Daily Single Action, Monthly Single Action

9.2.2. Reset (Auto / Demand / EOB / On-command)

9.2.2.1. Auto Reset: automatically, under control of the meter internal clock, at specific configurable predetermined time. When Auto Reset is enabled, the Energy Profile Capture occurs every day.

9.2.2.2. Demand Reset: automatically, under control of the meter internal clock, at specific configurable predetermined time. When Demand Reset is enabled, the Demand Profile Capture occurs every month.

9.2.2.3. EOB Reset (Auto Reset and Demand Reset): automatically, under control of the meter internal clock, at specific configurable predetermined time are enabled, and the EOB Profile Capture occurs every month.

9.2.2.4. On-command Reset: on command from the HHU or PC via the optical communication port, or on command via the remote communication interface from the HES. By On-command Reset, Auto Reset, Demand Reset, and EOB Reset shall be able to be triggered selectively.

9.2.3. Auto (Energy) Reset / EOB Reset (Energy + Demand)

9.2.3.1. Auto Reset: all the registers defined in "capture_object" of "Energy profile" objects are captured into the profile (Refer to clause 6.1.4 of the Supplementary OBIS Code Specification).

9.2.3.2. EOB Reset: all the registers defined in "capture_object" of "Energy Profile", "Maximum demand profile", "Cumulative maximum demand profile" objects, monthly energy registers and PF registers are captured into the profiles (Refer to clause 6.1.4, 6.1.5, 6.2.3, and 6.2.5 respectively of the Supplementary OBIS Code Specification), and values of the maximum demand registers are set to zero (0).

9.2.4. Daily Auto Reset / Monthly EOB Reset

9.2.4.1. Daily Auto Reset: performs the Auto Reset every day at predetermined time (default time is 23:00:00).

9.2.4.2. Monthly EOB Reset: performs both Energy Reset and Demand Reset. After that, the last entries of those "Energy Profile", "Maximum demand profile", "Cumulative maximum demand profile" objects, and monthly energy registers and PF registers are captured into the "EOB Data Profile" (Refer to Clause 6.1.5 of the Supplementary OBIS Code Specification).

9.2.5. The Manual Reset and the Internal Clock (Automatic) Reset options can be enabled/disabled through configuring the meter. Enabling the Manual Reset shall disable the Internal Clock Reset (Automatic) and vice versa. The detailed method of Manual and Internal Clock (Automatic) Reset enabling/disabling is described in Clause 6.7.3 of the Supplementary OBIS Code Specification.

9.2.6. The Internal Clock (Automatic) Reset shall be configured for Daily Auto Reset and Monthly EOB Reset respectively.

9.2.7. If Internal Clock (Automatic) Reset is being used and the power supply has failed at the specified time, then the Auto Reset shall occur immediately following the return of the power supply.

9.2.8. The meter shall retain the historical registers data for at least the last 3 reset periods for daily and monthly respectively.

9.2.9. The meter shall also retain the historical register data specified

in Clause 9.5.2 for the last billing period.

9.3. Real Time Clock and Calendar

9.3.1. The meter shall be equipped with a highly reliable quartz controlled real time clock / calendar which generates signals for the switching of various tariffs, internal clock (automatic) reset and integration period for demand and load curves.

9.3.2. The clock of the meter shall be able to be automatically synchronized with the time/date of the HES, such as a server or a DCU, or a Gateway.

9.3.3. The clock shall use the notation 00:00 to 23:59 (Date & Time display: DD: MM: YYYY, HH:MM:SS). The calendar shall be correct during the meter service time (the real-time clock shall be accurate per IEC 62052-21 / 62054-21 to ± 0.5 seconds per day) and automatically cater for leap year.

9.3.4. When the time of the Real Time Clock is changed, both the time before changed and the time after changed shall be recorded. When the time is changed no less than the load profile interval (default: 30 minutes), the Energy Reset shall be triggered.

9.3.5. If the Meter is powered up and find that the Real Time Clock is not accurate either due to the energy storage device being temporarily disconnected or discharged. The meter shall The meter shall automatically set with date and time of the last power down and perform the following actions:

9.3.5.1. The meter clock shall automatically set with date andtime synchronized with HES/DCU/GW

9.3.5.2. The anomaly indicator of the meter shall be turned on. And the indicator shall be turned off after the meter receives a new time setting data.

9.4. Energy Storage Device

9.4.1. A suitable energy storage device shall be embedded inside the meter. The energy storage device shall be used for maintaining the real time clock and tampering events.

9.4.2. The energy storage device shall assure for the life time continuous operation of the real time clock and one (1) year continuous operation without AC power. The shelf-life time of the energy storage device shall be more than twenty (20) years.

9.4.3. The energy storage device shall not be soldered directly to the hardware and shall be able to be replaced in the field without breaking the seal of the meter cover, breaking seal of only energy

storage device cover.

9.4.4. In case of energy storage device low/failure, the energy storage device low/failure indicator in the display shall be displayed and/or blinked.

9.4.5. The meter shall have an energy storage device capacity level indicator on screen, with a minimum resolution of 20%, if indicator used.

9.4.6. The meter shall be operated for the meter reading data checking via LCD screen during power off.

9.4.7. When there is power off, the use priority of auxiliary powers shall be as per below order:

9.4.7.1. Energy storage device for real time clock.

9.4.7.2. Capacity for events/alarms, LCD display.

9.4.7.3. Energy storage device for real time clock, events/alarms, LCD display (in case energy storage device discharged).

9.4.7.4. Energy storage device for real time clock, events/alarms, LCD display (in case energy storage device low/failure).

9.5. Data Retention

9.5.1. All programmed/configured and registered data shall be retained in a non-volatile memory (e.g. flash memory). The meter shall employ a memory that offers a minimum of ten (10) years of data retention during power failure.

9.5.2. All register data shall be written into the non-volatile memory at least once per an hour, and whenever power failure or clock initialization occurs.

9.5.3. The non-volatile memory shall be capable of being read in case of meter damage (except for the case of memory damage). The methods and tools to read and decrypt the information for all the meters provided shall be proposed by the Vendor.

9.5.4. After clock synchronization, if the time is changed from a day to the next day, the meter shall execute the Daily reset, and register the related information. Likewise if the time is changed from a month to the next month, the meter shall execute the EOB reset, and register the related information.

9.5.5. If the data recording of LP, events / logs are superimposed, the new data recording shall be overlapped on the oldest data [FIFO

method].

9.6. Instantaneous and Maximum Measurements

The meter shall measure and display the instantaneous value of the following. The measuring resolution for the instantaneous measurement registers shall be in accordance with the supplementary OBIS Code specification.

9.6.1. 3 Ph – N Voltages

9.6.2. 3 Phase Currents

9.6.3. Power Factor

9.6.4. Power (Unit: W, Var, VA)

9.6.5. Frequency (Unit: Hz)

9.6.6. Maximum Voltages

9.6.7. Maximum Currents

9.7. Display Function

9.7.1. At least the registers shown below shall be able to be displayed. The display list shall be configurable.

9.7.1.1. All Total Energy Registers in the meter (refer to clause 9.1.2)

9.7.1.2. All TOU registers recorded in the meter (refer to clause 9.1.3)

9.7.1.3. All maximum demand for TOU registers stated above and their time and date

9.7.1.4. Demand W

9.7.1.5. Demand Var

9.7.1.6. Demand VA

9.7.1.7. VT ratio for CT and VT meters only

9.7.1.8. CT ratio

9.7.1.9. Voltage V1 (V12 for CT&VT-operated meters)

9.7.1.10. Voltage V2 (V23 for CT&VT-operated meters)

9.7.1.11. Voltage V3 (V31 for CT&VT-operated meters)

9.7.1.12. Current I_1

9.7.1.13. Current $I_{2(not}$ applicable for CT &VT –operated meters)

9.7.1.14. Current I_3

9.7.1.15. Power Factor-instantaneous and average

9.7.1.16. Power (W) – instantaneous

9.7.1.17. Frequency

9.7.1.18. Meter serial number

9.7.1.19. Meter firmware version

9.7.1.20. Date of energy storage device install

9.7.1.21. Date of last reset

9.7.1.22. Time of last reset

9.7.1.23. Demand integration time

9.7.1.24. Date

9.7.1.25. Time

9.7.1.26. DISPLAY ARRANGEMENT in DRAWING No. SEC / KWH-S-04

9.7.2. Normal display mode

Under the normal operating condition, the display should show only the first item in the display list and the phase status indicator as the default display. The total kWh register is the default first item in the display list. The meter should not toggle the display on its own unless there is any failure to indicate. The default display list shall be in the same sequential order as given in OBIS Code Specification.

A momentary press of the display push-button shall cause the display to advance to the next display in the display list (staying 5 seconds without another pressed button). The meter shall revert to its default display of the normal mode after ten (10) seconds period of button inactivity.

LCD indicator Test: - After auto or manual scroll, the LCD will display all LCD indicators for 30 secs and roll off to first display item after the period or by pressing any scroll button.

The method to go to the auto scroll mode shall be proposed by the vendor.

The display control will be proposed by the vendor.

9.7.3. Test display mode

The method to go to the test display mode will be proposed by the vendor. It causes the display to go to the test mode in which the display shows all the energy registers.

To see the items of test display mode on the display: push the display button, the items of test display mode will be changed sequentially with the order of items on the specification one by one. The display shall indicate Test mode.

To go back to the default display mode: leave the display button ten

(10) seconds period with button inactivity (without pushing the button). The display also go back to the default display mode when the sequencing of displaying test display mode items is finished by pushing button.

The Test Display list parameters are mentioned in the OBIS Code Specification.

9.7.4. The displayed values of energy (total, TOU), demand, power factor, instantaneous shall be updated every one (1) second on LCD screen.

9.8. Security access

The meter shall be provided with four (4) different programmable security codes (passwords) for programming/configuring the meter, reading the data from the meter and reset.

If wrong passwords are entered three (3) consecutive times within one (1) hour, an alarm event shall be transferred to a DLMS/COSEM client, i.e. Gateway, DCU, HES, HHU, etc. and the access to the meter shall be blocked until reset. The method for resetting the blocked meter shall be proposed by the Vendors approved by the company and will be located using the HHU.

Moreover, whenever the passwords are changed by any DLMS client, it shall be logged in Event Log with number of changes and time stamps.

9.9. Data transport security

The meter shall apply the data transport security by ciphering the meter data (including the meter passwords stated above in Clause 9.8) that the meter data will not be revealed or sniffed by 3rd parties with malicious intentions. The implementation method of the data transport security shall be compliant with clause “5. Information Security in DLMS” of IEC 62056-5-3 and clause “9.2. Information security” of DLMS GreenBook Ed. 9.

9.9.1. This feature shall be configurable as disable/enable via local or remote communications (default: disabled).

9.9.1.1. Enabled: all metering data transferred shall be encrypted.

9.9.1.2. Disabled: all metering data transferred shall not be encrypted.

9.9.2. Cryptographic protection shall be supported to protect the meter data from any malicious attempt such as eavesdropping or counterfeiting. And the use of cryptographic protection shall not affect metering performance nor disrupt metering functions.

9.9.3. Security for meter data communication shall require below:

9.9.3.1. Confidentiality

9.9.3.2. Integrity

9.9.3.3. Authentication: Low Level Security (LLS), High Level Security (HLS)

9.9.3.4. Availability

9.9.3.5. Encryption

9.9.3.6. Message authentication for messages carrying pricing or control data

9.9.3.7. Message authentication for messages carrying metering data

9.9.3.8. Security logs

9.9.4. Security policy: All messages are authenticated and encrypted

Security suite: Security suite ID "0" shall be used

Security suite Id	Authentication algorithm	Encryption algorithm	Key transport method
0	AES-GCM-128	AES-GCM-128	Key wrapping using AES-GCM-128
All other reserved	-	-	-

Security suite ID “1” could be used in future versions of the specification.

9.9.6. Security material

9.9.6.1. A block cipher key

9.9.6.2. An authentication key

9.9.6.3. An initialization vector

9.9.6.4. System title (Meter ID)

9.9.7. Cryptographic keys and their management

9.9.7.1. Master key

9.9.7.2. Global unicast encryption key

9.9.7.3. Global broadcast encryption key

9.9.7.4. Authentication key (Global)

9.9.7.5. Dedicated (unicast) encryption key

9.9.8. Protection for stored metering data in any meter shall require below:

9.9.8.1. Ultimate minimum data shall be stored and be held in the meter just for the period of service.

9.9.8.2. All metering data stored in the meter registers (clause 9.1
~ 9.6) shall be encrypted

9.9.8.3. Not encrypted values: Date/Time, LCD display, Security setup, LN Association, COSEM Logical Device Name, Class_id, OBIS code (Logical_name), Communication Port Setup (optical, HDLC), Load Profile (Entry numbers), Entry numbers of Energy profile and EOB profile, Billing periods, Time stamps of billing periods, etc.

9.9.9. Meter authentication and identification

9.9.9.1. RBAC (Role Based Access Controls) authentication for each association shall be possible between the meter and DLMS client devices locally (HHU) and remotely (Gateway, DCU, HES).

9.9.9.2. RBAC (Role Based Access Controls) authentication for newly installed meters shall be possible through DLMS client devices locally (HHU) and remotely (Gateway, DCU, HES).

9.9.9.3. Reuse of authentication data shall be prevented.

9.9.10. Meter access control shall be supported to block unauthorized access to critical data such as cryptographic key stored in the meter

9.9.10.1. Mutual authentication shall be supported between the Meter and DLMS client devices locally (HHU) and remotely (Gateway, DCU, HES).

9.9.10.2. Access to each data in the meter shall be restricted and varied on conditions such as user association level and access rights.

9.9.11. Security for meter software (firmware) upgrade shall require below:

9.9.11.1. If any vulnerability is exposed in the meter software (firmware), the software upgrade shall be conducted to remove the vulnerability remotely and locally.

9.9.11.2. Integrity and effectiveness of the upgraded software (firmware) shall be verified prior to upgrade.

9.9.12. Security service and characteristics using encryption

9.9.12.1. Confidentiality is the property whereby information is not disclosed to unauthorized entities. Confidentiality is achieved using encryption, such as block cipher encryption to render the information unintelligible except by authorized entities. In order for encryption to provide confidentiality, cryptographically strong algorithm and proper mode of operation must be designed and implemented so that an unauthorized entity cannot determine the secret or private keys associated with the encryption or be able to derive the plaintext directly without deriving any keys.

9.9.12.2. Data integrity is a property whereby data has not been altered in an unauthorized manner since it was created, transmitted or stored. Alteration includes the insertion, deletion and substitution of data. Cryptographic mechanisms, such as MAC (message authentication code) shall be used to detect with a high probability both accidental modifications and deliberate modifications by any adversaries.

9.9.12.3. Authentication is a service used to establish the origin and integrity of information. Authentication services verify the identity of the user or system that created information. This service supports the receiver in security-relevant decisions, such as “Is the sender an authorized user of this system?” or “Is the sender permitted to read sensitive information?” Several

cryptographic mechanisms, such as message authentication codes or RBAC authentication shall be used to provide authentication services.

9.9.12.4. Authorization is a service concerned with providing an official permission to perform a security function or activity. Normally, authorization is granted to follow a process of authentication. Once authenticated to a specific role, the entity is authorized for all the privileges associated with the role.

9.9.12.5. Non-repudiation is a service used to provide assurance of the integrity and origin of data in such a way that the integrity and origin can be verified by a third party.

[Note]:

A. The policy and methods including detail technical specifications of clause 9.8 Security Access and clause 9.9 Data Transport Security shall be proposed and implemented by the Vendor. The proposed detail technical specifications shall be approved by COMPANY.

B. HHU shall provide the function of the clause "9.9 Data Transport Security". The encrypted meter reading data via HHU shall be decrypted and shall be registered (readable) by the user.

C. The Vendor shall provide technical support for the HES integration between the meter and DLMS client devices locally (HHU) and remotely (Gateway, DCU, HES) using "9.9 Data Transport Security".

D. If necessary, the meter firmware shall be upgraded by the Vendor for the HES integration among Central system DCU (PLC modem) / Gateway and the HHU.

9.10. Anti-tampering/Anti-fraud

The meter shall have Anti-tampering/Anti-fraud functions that has indication and registration locally in the meter and can be transferred to any other device in the HES. The transferred functions will be auxiliary for the non-technical losses calculation and detection.

The meter shall provide the Element by-pass detection function, implemented by different methods by the manufacturer, by which the meter can detect an event when at least one phase is by-passed. The Element by-pass events shall be detected in the meter and the events shall be notified to the HES immediately to avoid possible revenue loss of COMPANY.

9.11. Magnetic Interference Tampering Protection

The meter shall have the protection function against external magnetic interference tampering (500mT±50mT), which may result in the abnormal metering function of the meter (accuracy error rate: within ±2%). In order to detect abnormal magnetic field, a sensor should be provided inside meter to detect the magnetic tempering (more than 200mT ±60mT) and record it as events (magnetic duration time, magnetic detection counter).

9.12. Any abnormal states, events and alarms shall be recorded in the logs of the meter and displayed (blinking repeatedly) on the LCD within maximum one (1) minute (3 second for top and terminal cover open) after the state change of abnormal state, events and alarms mentioned in Supplementary OBIS CODE Specifications. If the source of the abnormal states is removed, then the blinking states shall be stopped and cleared from the LCD Display. (The events of top cover opened and terminal block cover opened shall be recorded immediately and once the Top Cover is opened, the LCD shall display "OPENED or OPEN" permanently on indicator 1 as per the Drawing No. SEC/KWH-S-03, (Self-diagnostics and alarms indicators shall display) also the LCD scrolling shall be disabled until GMR bit 9 is executed remotely or locally to clear the LCD).

9.13. Auto Registration by pushing the meter identification data

The meter shall support the auto registration function. In the auto registration function, when the meter is installed, i.e. power on, the meter shall send a PUSH message including the meter identification data to a DLMS/COSEM client, e.g. Gateway, DCU, HES, etc., so that the client can check if the meter is already registered in the client or not. An approach based on a PULL-option is acceptable provided it does not require a manual trigger.

If the meter does not receive the acknowledgement message from the DLMS client within a predefined repetition_delay (default: five (5) seconds), the meter shall retry the message transmission up to a predefined number_of_retries (default: three (3)). If the meter identification data is determined to be new by the DLMS client, the client can register the newly installed meter based on the transmitted meter identification data. The default values related to randomization_start_interval (default: a random delay after 10 seconds, number_of_retries and repetition_delay shall be configurable.

The meter shall have the displaying functionality on LCD/LED which will show the status of registration, e.g. Already registered, trying to register, registration fail, registration success, etc. (e.g. at registration

success – keeping "R" for 30 minutes, registration fail – blinking "R"). The detailed implementation method for this indication function shall be proposed by the Vendor and shall be approved by COMPANY.

9.14. Global Meter Reset

The meter shall support the Global Meter Reset command. The "reset" in this context means to set all values of registers and internal memories to their default values. It shall be done using Association 4 and through meter configuration software and/or HES. The default setting regarding the effect of Global Meter Reset command shall be as below list. However each of effect listed below shall be selectable and editable so that users may choose the extent of the Global Meter Reset command in different situations.

Global Meter Reset configuration

Sr.#	Description
0	Energy registers are cleared
1	Energy profile data are cleared.
2	Maximum demand profile data are cleared.
3	EOB profile data are cleared.
4	Load Profile data are cleared.
5	All Event Logs, status information and GPS data register are cleared.
6	All Special Days are cleared.
7	All Maximum RMS registers are cleared.
8	Meter Configuration files are set to their default.
9	Top Cover open on LCD display "OPENED" Cleared.
10	Daily and Monthly Single Actions are set to their default.
11	Demand registers parameters are set to their default.
12	Meter reading parameters are set to their default.
13	All threshold registers are set to their default.
14	Normal and Test Display Lists are set to their default.
15	All HDLC and Optical Communication parameters are set to their default.
16	RTC data is kept the current Date & Time (no initialization).
17	CT Open detection is disabled (This is used for CT/VT meter,(WC meter do not carry out this))
18	All relay parameters are set to their default.
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	TOUs (tariff) are kept.

Sr.#	Description
25	Average, maximum and THD values (currents, voltages) are cleared
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

9.15. Meter Password Reset Management

The meter shall have the functionality of resetting the password for each access rights, i.e. Association 1~5, on user's loss of the passwords. The specific process and method for resetting the passwords shall be prepared and submitted for COMPANY approval.

9.16. Total Harmonics Distortion (THD, %)

9.16.1. The meter shall measure instantaneous THDs for voltage and current per phase. Meter should comply with IEC 61000-4-7

9.16.2. The meter shall record the latest 288 THDs (or the latest 3 days) of average voltages, average currents and instantaneous voltages per each phase. The recording period shall be 5, 10, 15, 30, 60 minutes (default: 15, configurable). When the storage is full, the new data shall overwrite the oldest stored data.

9.16.3. If THD recording period for average voltages, currents and instantaneous voltage THDs is changed, the values just prior to the change shall be generated and recorded.

9.16.4. Here, the average voltage per phase means phase-to-phase voltage. Voltage THD is the instantaneous voltage measurement value for ten (10) seconds period just prior to the recording.

[Accuracy error limitation for instantaneous values]

Item			Input Voltage	Current	PF	Accuracy error Limitation
Voltage	Allowed error test (Ph-to Ph voltage)		250V, 230V,133V	-	-	±0.7%
	Average Voltage record test (Ph-to-Ph)	30 min. average	0~15 min.: 200V 15~30 min.: 230V			
	Environment Test (Ph-to-Ph)	Cold (-20°C, 3 Hours)	230V, 15 min. average		-	±1% (all 24 data, 15 min. average)
		Hot (55°C, 3 Hours)	230V, 15 min. average		-	
		Right after Hot/Cold test	230V, 15 min. average		-	±1% (all 24 data, 15 min. average
	Frequency Test	55 Hz	230V, 30 min. average			±0.3%
		65Hz	230V, 30 min. average			
Current				0.2 Ib ~ Imax	-	±2%
Phase angle of voltage and Current			Un	Ib	0.8C,1.0, 0.8L	±2°
Voltage THD			Un	-	1.0	±2 [Indicated Value]

1) Un: Reference voltage of the meter, Ib: rated current, Imax: maximum current
2) Check the test input voltage with Phase-to-Neutral, the error rate with Phase-to-Phase
3) The example of Indicated Value for Ph-N voltage THDs is explained; if 3rd

harmonics 10%, 5th harmonics 8%, 7th harmonics 2%, 11th harmonics 1% are injected, the THD displayed on meter's LCD shall have the value range of 11 ~ 15% considering the accuracy error limitation of Indicated Value.

9.16.5. THD test conditions: test in a state containing the harmonics of each phase voltage.

9.15.5.1. Test under 15th harmonics for odd harmonics.

9.15.5.2. Apply the reference voltage for basic wave voltage.

9.15.5.3. The 3rd ~ 15th harmonics content of the voltage: inject under 10% value of the reference voltage.

9.15.5.4. The voltage phase angle of basic wave and harmonics waves must match at the voltage zero (0) at zero (0) degrees.

9.15.5.5. Harmonics power factor: 1.0

9.16.6. Upper and Low level for relative THD thresholds (voltage and current) shall be configurable as below:

9.16.6.1. Voltage range: 0 ~ 100% of reference voltage, current range: 0 ~ 120% of Maximum current.

9.16.6.2. Default for voltage and current THDs: maximum - 10%, minimum - 0%. The recording of alarm and event shall be outside the defined configurable range.

9.16.6.3. THD is calculated over the full harmonic range from 2 up to 15.

9.16.6.4. The delta between minimum and maximum values shall be at least 3%.

9.17. Other measurement and recording requirements

9.17.1. The meter shall perform normal and accurate measurement functions during communications with DLMS client devices.

9.17.2. Error test shall be tested in the normal operating conditions, not as a separate test mode, with the metering measurement value and the output pulse value.

9.17.3. The meter configuration change, such as TOU structure, weekdays, weekend days, holidays, regular and irregular, shall be possible locally by HHU and remotely by DLMS clients (HES, DCU, Gateway, etc.), and the meter must have advanced reservation function.

9.17.4. An advanced reservation function enacts the reservation program at the

specified date/time. See 9.17.4.

9.17.5. The meter shall present all metering data integrity. If reservation program is applied during the communications with DLMS client, the meter shall apply the reservation program as follows:

9.17.5.1. If LP data is being read before the reservation program execution time, first the meter shall transfer all LP data on the basis of the query point, and then apply the reservation program.

9.17.5.2. The reservation program shall be applied to the reservation date / time.

9.17.4.3. After reservation program application, the meter shall present normal metering data and normal operation.

9.17.4.4. Reservation Program: A program that may be applied at a specified date/time to change the operation of the meter. This change may be one of the items in 9.17.3, or other types of changes related to the meter program.

9.17.6. During Communication with DLMS client, the mechanism which will be used to change the display shall be operated normally.

9.17.7. The display shall operate normally for the limit range of operation temperature

9.17.8. Oscillatory circuit (crystal) shall operate within ±20ppm error rate for the limit range operation temperature

9.18. Latch relay

The latch relay must be opened and closed according to the conditions and sequence explained in the clauses 8.6, 8.7.12 of the present specification and in the clause 6.9.3 of the SEC DLMS/COSEM OBIS Code Specification.

9.19. Global Positioning System(GPS)

The Meter shall have GPS location capabilities of accuracy within three (3) meters.

9.19.1. The meter shall acquire its coordinates once powered on and shall push GPS data (push setup 11)

9.19.1.1 On the midnight of first power on date or whatever the meter power on incase of power outage at midnight.

9.19.1.2 GMR occurrence.

9.19.2. The SM shall update via PUSH setup 2 to HES whenever there is a change in stored co-ordinate location and record as an event.

9.19.3. GPS positioning time 1min.

9.19.4. GPS Indicator

9.19.4.1. The meter shall have a GPS signal indicator.
9.19.4.2. GPS indicator disappear/off indicates no GPS signal.
9.19.4.3. GPS indicator blinks every sec indicates searching GPS signal.
9.19.4.4. GPS indicator static /on indicates normal GPS signal.

[Note]

GPS shall receive signals from internal antenna, however, physical interface (connector) shall be provided for GPS external antenna which shall be protected by using an appropriate protection cap or cover which is at least IP-54 rated for dust ingress protection.

9.20. External Circuit Breaker(ECB) Communication by RS-485

9.20.1. The Meter will communicate with external Circuit Breaker via RS-485 by using a physical port (RJ-45).(Default baud rate:9600bps)
9.20.2. ModBus communication protocol shall be used for ECB functions and their status check.

10. DEFAULT SETTINGS

All the meters delivered to COMPANY shall have the default setting values easily configurable. Unless differently specified by COMPANY request, the default settings shall comply with the values in Table No.9.

Table No.9 Default settings

Configuration features	Default settings
Clock (DD:MM:YYYY, HH:MM:SS)	KSA Standard time (GMT + 3.00)
Time of Use (TOU) Setting	**(#1: Sat ~ Thu, #2: Fri)**
Tariff 1 (TOU 1)	#1: From 12:00 ~ 17:00
Tariff 2 (TOU 2)	#1: From 08:00 ~ 12:00 and 17:00 ~ 24:00 #2: From 09:00 ~ 21:00
Tariff 3 (TOU 3)	#1: From 00:00 ~ 08:00 #2: From 00:00 ~ 09:00 and 21:00 ~ 24:00
Tariff 4 (TOU 4)	Not applied
TOU 5 ~ 8 or more	*Not applied*
Automatic EOB reset time & date	At 00h 00m on the first day of every month

Configuration features	Default settings
Maximum demand Integration method Integration time Sub interval	Sliding window 30 minutes (Default) 5 minutes (Default)
LP recording (at least fourteen (14) channels)	Current date/ time, status information, Import Active Power (+), Import Reactive Power (+), Import Apparent Power (+), Import Reactive Power (QI), Export Reactive Power (QIV), Export Active Power (-), Export Reactive Power (-), Export Apparent Power (-), import average power factor and export average power factor.
The number of digits for the display Active energy (kWh) Reactive energy (kVarh) Apparent energy (kVAh) Maximum demand power (W) Instantaneous values (V, A, W, Var, VA, Hz)	As per Table No.8 – Default Units to Display

11. MARKING OF METERS

11.1. Every meter shall be provided with a suitable size of name-plate inside the meter cover if used. Information shall be bilingual (Arabic and English). These shall be printed clearly, indelibly and readable from outside

11.2. Name-plate shall include the following information:

11.2.1. The Manufacturer's name or trademark and place of manufacturing

11.2.2. Designation and type

11.2.3. The number of phases and the number of wires for which the meter is designed

11.2.4. Meter ID (Refer to Clause 6.12.3 of the WC OBIS Codes Specifications)

11.2.5. Year of manufacture

11.2.6. The reference voltage in the form of the nominal voltage of the system or the secondary voltage of the instrument transformer to which the meter is to be connected.

11.2.7. The rated current and the rated maximum current; for example: 10(100) Amps

11.2.8. The reference frequency in Hertz, for example: 60 Hz

11.2.9. The meter constants in the form Imp/kWh, Imp/kVarh, Imp/kVAh

11.2.10. The accuracy class index of the meter

11.2.11. The reference temperature, if different from 23°C

11.2.12. "Property of SEC"

11.2.13. SEC Monogram

11.2.14. SEC purchase order number

11.2.15. SEC item number

11.2.16. BAR CODE Serial number

11.2.17. The sign of the double square for insulating encased meters of protective class II

11.2.18. DLMS logo

11.2.19. For other markings, refer to Appendix (A)

11.3. The meter connections shall be suitable for metering arrangements as given in Drawing No. SEC/KWH-S-03. Applicable connection diagram shall be indelibly marked outside the terminal cover of every meter and clearly readable throughout life time of the meter.

12. PACKING

12.1. Each meter shall be packed in an individual carton capable of withstanding the rigorous conditions of transportation by Air or Sea or Truck. Other packing / shipping requirements shall be given in General Specification 01-SDMS-01 (latest revision).

12.2. Materials department shall be contacted for the details of COMPANY's packing requirements.

12.3. If any damage happens to the Meter during transportation and storage, the Vendor shall take a full responsibility for the damage caused by the inappropriate packing.

13. GUARANTEE

13.1. The Vendor shall guarantee the meter against all defects arising out of faulty design or workmanship or defective material for a period of two (2) years from the date of commissioning or three (3) years from the date of delivery whichever comes first. COMPANY certificates for date of commissioning shall be accepted.

13.1.1. During warranty period, the Vendor shall resolve the problem by using any applicable methods, if any malfunction or faulty operation caused by the Meter itself arises.

13.1.2. After warranty period, the Vendor shall support technical support requested by COMPANY. In this case, the expense shall be reasonable price under mutual agreement.

1) Repair for defect or fault components during operation

2) Hardware of Software (firmware) upgrade

13.2. The meters shall be subjected to Routine Test in the COMPANY's testing facility or the Manufacturer's factory / laboratory to satisfy all the requirements given in this specification. The testing venue will be determined through discussion with COMPANY.

13.3. The Vendor shall guarantee the meters to maintain durability. The stability of metrological characteristics by applying elevated temperature (according to IEC 62059-31-1) performed by domestic or internationally authorized test agencies. Also, the detail test reports shall be submitted to get COMPANY approval.

13.4. The Routine Test shall be carried out for every meter or on a sample basis. COMPANY shall specify the method of testing and test reports, and certificates shall be acceptable by the manufacturer.

13.5. If equipment and software not mentioned in this technical specification found during Hardware and Software development stage including software version-up are needed to complete the system performance, the Vendor shall take the responsibility to supply the additional equipment and software at no additional cost to the COMPANY.

13.6. Even though the Vendor passed the routine test executed by COMPANY, it is the Vendor's responsibility of quality assurance for the relevant items and functions of contract conditions and the responsibility cannot be exempt.

13.7. Because this technical specification only describes the outline of Electronic Revenue Meter, the Vendor shall add the required items (or update the meter firmware) and manufacture optimal electronic revenue meter ensuring the interoperability between HES via cellular network (and PLC network with DCU) and electronic revenue meters using RS-485 interfaces.

13.8. If no exceptions to this specification are taken and no list of deviations is submitted, it shall be deemed that, in every respect, the meters offered shall conform to this specification. COMPANY interpretation of this specification shall be accepted.

13.9. With respect to the contract, the Vendor shall secure all acquired information and should not provide it to third parties or use it for other purposes.

14. SUBMITTALS

The following documents shall be submitted by the Vendor along with the bidding document and for final approval:

14.1. Clause-By-Clause Compliance Statement, List of different options or List of deviations (if any).

14.2. Filled in data sheets.

14.3. Original / clear copy of catalogues for offered item(s).

14.4. Copy of the certificate of Type Test (Refer to Clause 16.2) and detail reports of Type Test for the offered / identical meter. The certificate and the Type Test report shall be obtained from an independent testing agency prior to delivery.

14.5. Copy of DLMS/COSEM conformance test certificates (CTT, SEC DLMS) for each type of meter prior to delivery.

14.6. Operation / maintenance / troubleshooting manuals and specifications for all offered items (Only for final approval)

14.6.1. Electrical characteristics, circuit drawings

14.6.2. Interface circuits and characteristics

14.6.3. List of major components and parts

14.6.4. Operational Software and functional details

14.6.5. Installation, testing (procedure), operation and maintenance

14.7. Drawing for the following items:

14.7.1. Connection diagram (terminals, powers, communications, outputs)

14.7.2. Overall dimensions and structure (meter body, outside)

14.7.3. Mounting details

14.7.4. Sealing arrangement

14.7.5. Name-plate

14.7.6. Terminal cover and meter cover (shape, dimensions)

14.7.7. The display dimensions and structure

14.7.8. Communication ports structure

14.7.9. Photo coupler structure between meter and modem

14.7.10. Structure to check the error rates of kWh / kVar / kVA

14.8. Reference List, experience, and certification
The meters shall be fabricated in a plant that has an established and credible past record of manufacturing electricity revenue meters of similar ratings for a period of not less than ten (10) years, and that holds an ISO 9001:

2008 certifications for quality management. The Vendor shall submit these related documents.

14.9. Sample:

14.9.1. At least five (5) sample meters for each type shall be submitted before delivery for final approval. The sample should include a HHU, an optical probe, and operational manual for software.

14.9.2. At least one Gateway, compliant with 40-SDMS-02H latest revision (Gateway Unit Specifications) or the latest version shall be delivered with the sample in order to assure the interoperability with other manufacturers' products in an HES environment for final approval.

14.9.3. A sample of the IHD shall be submitted and used for verification test which will prove the IHD interface functionality.

14.10. Copy of original manufacturer's data sheet guaranteeing at least 10-year continuous operation for all materials (or components) used for the meter manufacturing as per the operation conditions of Specifications for general requirements 01-SDMS-01 and 40-SDMS-02B (WC Meter Specifications).

14.11. Industrial Propriety rights of the Meter (design, patent)

14.11.1. Vendor shall warrant that any equipment, delivered and/or developed by Vendor under this technical specification shall not infringe any valid patent, copyright or trade secret owned or controlled by any other party. Vendor shall defend, indemnify, and hold COMPANY harmless from any claims, losses, expenses, or damages arising out of or incurred by reasons of any actual or alleged infringement of any patent, copyright or trade secret.

14.12. Schedule and plan (design, manufacturing, testing, training, technical support plan, warranty, software upgrade, etc.).

14.12.1. Technical support organization, manpower operation, installation, testing, operation and maintenance, recovery software program

14.12.2. Detail training contents, time/duration, training materials (all training cost shall be included in the contract price).

14.13. If additional checking is necessary, COMPANY will request the submission of the related documents to the Vendor, the Vendor shall submit those by the specified date to the COMPANY.

15. TESTING

15.1. A sample meter of a particular type from a Vendor shall be declared acceptable by COMPANY, only if the meter satisfies this specification and the following tests in all respects. This acceptance will be notified by issuing

a written approval letter to the Vendor. In case of any conflict (either not clear parts in IEC standards, this specification, or different opinions), the decision of COMPANY shall be final.

15.2. If it is necessary to complement (or correct) the Meter's Hardware or Software found during the Tests, the Vendor shall notify it to the COMPANY and get COMPANY's approval, then implement the complementary measures to the Meter. In this case, the Vendor shall submit the certified test report for the complemented item(s) by the specified date to the COMPANY.

15.3. The Vendor shall conduct interoperability test with HES, Gateway (DCU) and other manufacturers' Meters in COMPANY's Test Center or other designated place. If there is any problem found, the Vendor shall solve its Meter's problem by the specified date to the COMPANY.

15.4. If the interoperability problem is found among the Meter, Gateway (DCU), and HES, the COMPANY's decision shall be accepted by the Vendor.

15.5. Type Test

15.5.1. Type Test of the meter shall include but not limited to the following test items in Table No.10 and related clauses.

15.5.2. DLMS CTT tests and COMPANY's DLMS functionality tests shall be included as part of test items. The test method and testing organization for the COMPANY's DLMS functionality tests shall be determined through mutual agreement between COMPANY and Vendor during the design or development phase.

15.5.3. The Type Test shall include the interoperability test with the Gateway that is made as per COMPANY's technical specification.

15.5.4. It is Vendor's responsibility to arrange for the Type Test and receive the Type Test certificate which shall be submitted to COMPANY.

15.5.5. Test Quantity (if needed, the Vendor shall provide sufficient meter quantity for the Type Test)

15.5.5.1. Insulation, accuracy, electrical, mechanical, marking:3 EA

15.5.5.2. Effect of the climatic: 3 EA

15.5.5.3. Electromagnetic compatibility: 3 EA

15.5.5.4. Input / Output: 3 EA (including contactor test)

15.5.5.5. Functional: 4 EA [local & remote communication, remote configuration, interoperability, PLC

communication]

15.5.5.6. Field Test: 4 EA (Actual load, 1 month, all log files)

15.5.5.7. Durability Testing: 1 EA

15.5.5.8. Security Access and Data Transport Security Testing: 2 EA

15.5.6. The performance testing or checking of specific components or materials is impossible or difficult in an assembled state, the testing will be replaced with quality assurance (or verifiable documents) of the Vendor. Details shall be discussed with COMPANY, the decision of COMPANY shall be final and be accepted by the Vendor.

15.6. Factory Test

15.6.1. Certified and complete Factory Test reports for each meter shall be submitted for COMPANY review / approval before COMPANY start the Routine Test.

15.6.2. The manufacturer's seal shall be taken as an indication that each meter has been properly tested and is conformed to this specification and related IEC specifications.

15.7. Routine Test

15.7.1. Routine Test shall be performed to verify if the manufactured meters conform to this specification prior to (or after) the delivery to COMPANY-designated place. The Routine Test may be done in the COMPANY's testing facility or the manufacturer's factory / laboratory upon Company's request. In case the test is performed in the manufacturer's factory / laboratory, the Vendor shall provide COMPANY personnel with necessary assistance while the test is performed.

15.7.2. The contracted quantity of meters shall be delivered on delivery batch basis. Whenever the meters in a delivery batch are ready to be shipped, the Vendor shall submit a list of meter serial numbers in the delivery batch.

15.7.3. Some test items of the Routine Test may be performed on sample basis with reception of COMPANY's approval. If the implementation of the sample test is allowed by COMPANY, the test quantity shall be at least 5% of delivered quantity, and the minimum quantity of meters to be tested is ten (10) units. The number of meters in a delivery batch and sample ratio may be changed according to the sampling method defined in IEC 62058-11 as per COMPANY's discretion. COMPANY will choose serial numbers of the sample meters and give the list of serial numbers

to the Vendor. Then the Vendor shall deliver the sample meters to COMPANY-designated place according to the list.

15.7.4. The Routine Test includes the interoperability test with the Gateway and HES having the COMPANY specification (including field operation test).

15.7.5. If any single meter of the tested meters in a certain delivery batch fails to pass the Routine Test, all the meters in the delivery batch shall be rejected.

15.7.6. Interim (or Special) Test

15.7.6.1. Interim Test may be performed by COMPANY to ensure the manufactured meters' quality performance with sample meters of the delivered batch, whenever the meters' quality, compared with the certified qualification level, is decreased considerably.

15.7.6.2. COMPANY will select three (3) sample meters from the delivered batch randomly and test the meters at least once a year. This Interim Test may be commissioned to third party (an international test organization).

Table No.10 – Test Items

Test Items	Type Test	Routine Test	Related clauses
Tests of insulation properties			
Impulse voltage tests	O		7.3 of IEC 62052-11
AC voltage tests	O		7.4 of IEC 62053-21 & 7.4 of IEC 62053-23
Tests of accuracy requirements			
Test of meter constant	O	O	8.4 of IEC 62053-21
Test of starting condition	O	O	8.3.3 of IEC 62053-21
Test of no-load condition	O	O	8.3.2 of IEC 62053-21
Test of error due to influence quantities	O		8.2 of IEC 62053-21
Test of error due to variation of the current	O	O	8.1 of IEC 62053-21
Accuracy tests at reference conditions	O		8.1 of EN50470-3
Repeatability	O		8.2 of EN50470-3

Test Items	Type Test	Routine Test	Related clauses
Maximum permissible error	O		8.4 of EN50470-3
Tests of electrical requirements			
Test of power consumption	O		7.1 of IEC 62053-21
Test of influence of supply voltage	O		7.1 of IEC 62052-11
Test of influence of short-time over-currents	O		7.2 of IEC 62053-21
Test of influence of self-heating	O		7.3 of IEC 62053-21
Test of influence of heating	O		7.2 of IEC 62052-11
Test of immunity to earth fault	O		7.4 of IEC 62052-11
Anti-tampering/Anti-fraud	O		8.10
Magnetic Interference Tampering Protection	O		8.11
Tests for electromagnetic compatibility (EMC)			
Radio interference suppression	O		7.5.8 of IEC 62052-11
Fast transient burst test	O		7.5.4 of IEC 62052-11
Test of immunity to electromagnetic RF fields	O		7.5.3 of IEC 62052-11
Test of immunity to conducted disturbances, induced by radio-frequency fields	O		7.5.5 of IEC 62052-11
Test of immunity to electrostatic discharges	O		7.5.2 of IEC 62052-11
Surge immunity test	O		7.5.6 of IEC 62052-11
Prevention of PLC Signal Attenuation and Distortion	O		6.10.10
Tests of the effect of the climatic environments			
Dry heat test	O		6.3.1 of IEC 62052-11
Cold test	O		6.3.2 of IEC 62052-11
Damp heat, cyclic test	O		6.3.3 of IEC 62052-11
Solar radiation test	O		6.3.4 of IEC 62052-11
Mechanical tests			
Vibration test	O		5.2.2.3 of IEC 62052-11
Shock test	O		5.2.2.2 of IEC 62052-11

Test Items	Type Test	Routine Test	Related clauses
Spring hammer test	O		5.2.2.1 of IEC 62052-11
Terminals (blocks)	O	O	5.4 of IEC 62052-11
Tests of protection against penetration of dust and water	O		5.9 of IEC 62052-11
Test of resistance to heat and fire	O		5.8 of IEC 62052-11
Accelerated Reliability Testing	O		16.10.21
Terminal coating test	O		ASTM B487
Salt spray test	O		IEC 60068-2-52
Input Output Requirement			
Display	O	O	8.1
Power Supply for External Communication Devices	O	O	8.3
Optical Interface	O	O	8.4.1
RS-485 Communication Interfaces	O	O	8.4.2
In-home Display (IHD) Support	O	O	8.4.3
Protocol	O	O	8.5
Latch relay / Output relay	O	O	8.6
Functional tests			
Total Energy registers		O	9.1.2
TOU registers		O	9.1.3
Current/last Average Demand		O	9.1.4
Maximum Demand		O	9.1.5
Cumulative Maximum Demand		O	9.1.6
Load Profile		O	9.1.7
Billing periods		O	9.1.8
Special day settings		O	OBIS 6.7
Reset Function and Historical Data Recording		O	9.2
Real Time Clock and Calendar		O	9.3 (for clock accuracy test, IEC 62052-21 / 62054-21)

Test Items	Type Test	Routine Test	Related clauses
Energy storage device		O	9.4
Data Retention		O	9.5
Instantaneous Measurements		O	9.6
Display Function		O	9.7
Security Access		O	9.8
Data transport security		O	9.9
Anti-tampering/Anti-fraud		O	9.10
Magnetic Interference Tampering Protection		O	9.11
Abnormal status/Event/Alarm		O	9.12
Auto Registration		O	9.13
Global Meter Reset		O	9.14
Meter Password Reset Management		O	9.15
Total Harmonics Distortion		O	9.16
Over/under current protection		O	16.9.26
Latch relay / Output relay		O	9.18
Default Settings		O	10
Marking of Meters			
Name-plate	O	O	12.
Terminal Cover / Meter Cover	O	O	6.3, 6.4, 12
Packing	O	O	12
Interoperability	O	O	14.9
Test Method	O	O	16

16. TESTING METHOD

16.1. Structure Inspection

16.1.1. The meters selected for inspection shall be visually examined in order to verify that they belong to the same type, that their specified markings are correct and that none of them shows signs of damage.

The meters shall be in conformity with the type approval and they shall have the same voltage and current characteristics.

16.1.2. The inspection test for structure, shape, size, color, etc. shall be performed for Clause 6, 8.1 and DRAWING No. SEC/KWH-S-01, 02, and 03. If it is difficult to perform the inspection test with a certain item required for material analysis or component destroy, the item can be tested with the verifiable documents submitted by the manufacturer.

16.1.3. The display shall be checked as per clause 8.1 and DRAWING No. SEC/KWH-S-03.

16.1.4. Energy storage device shall be checked as per clause 6.1.4, 9.3, 9.4 and with technical specification of the energy storage device manufacturer.

16.2. Insulation Performance Test

16.2.1. Impulse voltage test: according to clause 7.3 of IEC 62052-11: voltage 8kV.

16.2.2. AC voltage test: frequency 60Hz, according to clause 7.4 of IEC 62053-21 and clause 7.4 of IEC 62053-23.

16.3. Accuracy Test

16.3.1. Test of starting and no-load condition: as per clause 8.3 of IEC 62053- 21 / IEC 62053-23.

16.3.2. Meter constant test: as per clause 8.3 of IEC 62053-21 / IEC 62053-23.

16.3.3. Limits of error due to variation of the current: as per clause 8.1 of IEC 62053-21 / IEC 62053-23.

16.3.4. Limits of error due to influence quantities: as per clause 8.2 of IEC 62053-21 / IEC 62053-23.

※ Outside temperature range: -10°C to 75°C

※ If cosφ is 0.5, applied mean temperature coefficient is 0.1% / K.

16.3.5. Limits of error due to influence of sub-harmonics: as per clause 8.2.2 of IEC 62053-21.

16.4. Electrical Requirements Test

16.4.1. Influence of supply voltage: as per clause 7.1 of IEC 62052-11.

16.4.2. Temperature rise: as per clause 4.1, 7.5 of this technical specification and clause 7.2 of IEC 62052-11.

16.4.3. Power consumption: as per clause 7.1 of IEC 62053-21 and clause 7.1 of IEC 62053-23.

16.4.4. Influence of short-time overcurrents: as per clause 7.2 of IEC 62053-21 and clause 7.2 of IEC 62053-23.

16.4.5. Influence of self-heating: as per clause 7.3 of IEC 62053-21 and clause 7.3 of IEC 62053-23.

16.5. Electromagnetic Compatibility (EMC) Test

16.5.1. Test of immunity to earth fault: as per clause 7.4 of IEC 62052-11

16.5.2. Test of immunity to electrostatic discharges: as per clause 7.5.2 of IEC 62052-11.

16.5.3. Test of immunity to electromagnetic RF fields: frequency range 80~2000 MHz, unmodulated test field strength 10V/m with operation current, unmodulated test field strength 30V/m without operation current, and as per clause 7.5.3 of IEC 62052-11.

16.5.4. Fast transient burst test: as per clause 7.5.4 of IEC 62052-11

15.5.4.1. Cable length between coupling device and tested meter: 0.5m±0.05m

15.5.4.2. Repetition rate: 0.75ms at 100kHz

16.5.5. Test of immunity to conducted disturbances, induced by radio-frequency fields: as per clause 7.5.5 of IEC 62052-11

16.5.5.1 Voltage level: 10V

16.5.6. Surge immunity test: as per clause 7.5.6 of IEC 62052-11

16.5.6.1. Test voltage on the current and voltage circuits (mains lines): 4 kV

16.5.6.2. Phase angle: pulses to be applied at 60° and 240° relative to zero crossing (5 positive and 5 negative) of AC supply

16.5.6.3. Tested both in differential mode (line to line) and in common mode (line to earth)

16.5.8. Radio interference suppression test : as per CISPR 22

16.4.7.1. Radio interference suppression test: as per clause 7.5.8 of IEC 62052-11.

16.6. Climatic conditions and tests

16.6.1 Temperature range and relative humidity: as per clause 4 of this technical specification and clause 6.1, 6.2 of IEC 62052-11.

16.6.2 Dry heat test: as per clause 4 of this technical specification and clause 6.3.1 of IEC 62052-11.

16.6.3 Cold test: as per clause 4 of this technical specification and clause 6.3.2 of IEC 62052-11.

16.6.4 Damp heat cyclic test: as per clause 4 of this technical specification and clause 6.3.3 of IEC 62052-11.

16.6.5 Solar radiation test: as per clause 6.3.4 of IEC 62052-11

16.7. Mechanical requirements and tests

16.7.1 General mechanical requirements: as per related clause of 01-SDMS- 01 and clause 5.1 of IEC 62052-11.

16.7.2 Case: as per as per clause 6.1 of this technical specification and clause 5.2 of IEC 62052-11.

16.7.3 Spring hammer test: as per clause 5.2.2.1 of IEC 62052-11.

16.7.4 Shock test: as per clause 5.2.2.2 of IEC 62052-11.

16.7.5 Vibration test: as per clause 5.2.2.3 of IEC 62052-11.

16.7.6 Window: as per clause 6.3, 6.4 of this technical specification and clause 5.3 of IEC 62052-11.

16.7.7 Terminals – Terminal block(s) – Protective earth terminal: as per clause 6.2 of this technical specification and clause 5.4 of IEC 62052- 11.

16.7.7.1. Certification of used material characteristics shall be substituted with 3rd parties' test reports.

16.7.8 Clearance and creepage distances: as per clause 5.6 of IEC 62052-11.

16.7.9 Insulating encased meter of protective class II: as per clause 5.7 of IEC 62052-11.

16.7.10 Resistance to heat and fire: as per clause 5.8 of IEC 62052-11.

16.7.11 Protection against penetration of dust and water: as per clause 5.9 of IEC 62052-11.

16.7.12 Terminal coating test according to ASTM B487

16.8. Metering / Measurement Conformance Tests

16.8.1 The metering / measurement values shall be tested and verified as per clause 7.9, 8.1.8, 8.2, 8.7 and 9.1 of this technical specification.

16.8.2 The metering test shall be tested and verified with applied THD (Total Harmonics Distortion) test conditions.

16.8.3 TOU functions shall be tested per season, week, day, time and DST.

16.9. Latch Relay Tests

16.9.1 Latch Relay Tests: as per clauses 6.9.8.4, 6.9.8.5 and 6.10.6 of IEC 62052-31

16.9.2 Utilization Category : UC3

16.9.3 Number of operating cycles is 5500 (other conditions as per IEC 62052- 31)

16.9.4 Temperature test should be as per IEC 62052-31 clause 10.

16.9.5 Latch relay should operate normally during "OIML R46-1/-2 Edition 2012 (E), available at https://www.oiml.org/en/files/pdf_r/r046-p- e12.pdf, section 6.3.13 "continuous (DC) magnetic induction of external origin" Test with external magnetic interference of (500mT ±50mT).

16.10. Meter Function Tests

16.10.1 Reset function and Historical Data recording: as per clause 9.2 of this technical specification.

16.10.2 Clock and calendar: 20 years calendar with leap years, six (6) days time error rate conversed to one (1) month as per clause 9.3 of this technical specification and clause 7.5 of IEC 62054-21.

16.10.3 Energy storage device: consumed energy storage device current, technical specification of energy storage device, capacity operation as per clause 9.4 of this technical specification.

16.10.4 Data retention: tested with accumulated metering data after the meter power is off and one (1) hour of energy storage device removal. When the meter power is recovered (on), the metering data shall be kept normally as per clause 9.5 of this technical specification.

16.10.5 Instantaneous measurements: as per clause 9.6 of this technical specification.

16.10.6 Self-diagnostics and Alarms: as per clause 8.1.18 of this technical specification.

16.10.7 Display function: as per clause 8.1, 9.7 of this technical specification and clause 5.10 of IEC 62052-11.

16.10.8 Output devices: as per clause 8.2, 8.6 of this technical specification and clause 5.11 of IEC 62052-11.

16.10.9 Communication interfaces/devices: as per clause 8.3, 8.4, 8.5 of this technical specification.

16.10.10 Security access: as per clause 9.8 of this technical specification.

16.10.11 Data transport security Access: as per clause 9.9 of this technical specification.

16.10.12 Anti-tampering/Anti-fraud: as per clause 9.10 of this technical specification.

16.10.13 Magnetic Interference Tampering Protection: as per clause 9.11 of this technical specification.

16.10.14 Events/Alarms/Logs: as per clause 9.12 of this technical specification.

16.10.15 Auto Registration: as per clause 9.13 of this technical specification.

16.10.16 Global meter reset: as per clause 9.14 of this technical specification.

16.10.17 Meter password reset management: as per clause 9.15 of this technical specification.

16.10.18 Harmonics: as per clause 9.16 of this technical specification.

16.10.19 Other measurement and recording requirements: as per clause of this technical specification.

16.10.20 Marking and packing of meter: as per clause 12, 13 of this technical specification and clause 5.12 of IEC 62052-11.

16.10.21 Accelerated reliability tests according to IEC 62059-31-1: it shall be conducted taking into account the following conditions:

T.Max = 80ºC and Moisture= 95% R.H and life time output condition

a. n (index characteristic) = 3

b. Ea (Activation Energy) = 0.9eV

c. Temperature/Moisture condition as below

- Tuse: 30 °C
- RHuse: 35%

d. Life time evaluation condition: 15-years life time with Reliability/Confidence level 50%.

e. Five combinations of stresses to be applied:

- Temperature: 80 °C, relative humidity: 95 %

- Temperature: 80 °C, relative humidity: 85 %
- Temperature: 80 °C, relative humidity: 75 %
- Temperature: 75 °C, relative humidity: 95%
- Temperature: 70 °C, relative humidity: 95 %.

16.10.22. Remote Communication and Interoperability Test: with different manufacturers' Meters, Gateway (or DCU/PLC modem) and HES Software as per clause 8.4.2, 14.7 and 14.9 of this technical specification (Alternative interoperability test methods may be proposed by Vendor, but approved by COMPANY).

16.10.23. Contactor (Output Relay) Test: as per clause 8.6 of this technical specification and related clause as per IEC 62052-31.

16.10.23.1. Contactor (Output Relay) test shall be substituted with 3rd party's test report.

16.10.23.2. After testing 5500 times (reference one time: on-off-on), the contactor shall operate normally and contactor temperature shall be less than 27°C (at ambient temperature 23°C).

16.10.23.3. On/off operating time: within 50 ~ 100ms.

16.10.24. PLC Communication Test: as per clause 6.10.10 of this technical specification.

16.10.24.1. The meter shall comply in the used frequency band with IEC 50065 family standards in case of transmission between 3kHz and 148.5kHz and with another similar standard in case of use of transmission above 148.5kHz.

16.10.24.2. The PLC signal shall be injected with a level equal or lower than the maximum level according to the selected technology and the used frequency range. This level shall be measured using the IEC 50065 family standards in case of transmission between 3kHz and 148.5kHz and with another similar standard in case of use of transmission above 148.5kHz. If the selected technology has not established the maximum level, the COMPANY will establish it.

16.10.25. Modem Communication Circuit Test: as per clause 8.4.2, 8.4.4. of this technical specification.

16.10.25.1 Communication speed test: test range 300~115,200bps.

16.10.25.2 Modem interface connector type, pin allocation

16.10.25.3 Modem install and communication LED test

16.10.25.4 Power output to modem test

16.10.25.5 RS-485 insulation test: measure the resistance between one of 1st phases (L1, L2, L3 or N) and one of 2nd side (RS 485+ or RS485-) using Digital Multi Meter. The measured resistance shall be ∞Ω (infinity).

16.10.26. For the internal latch relay testing, it will be tested according IEC 60255-151, with the breaker outside the meter like an independent device.

16.10.27. The Test Procedure for Severe Voltage Variations shall be that of OIML R46-1/-2 Edition 2012 (E), available at https://www.oiml.org/en/files/pdf_r/r046-p-e12.pdf, section 6.3.8. Object of the test is to verify the error shift due to severe voltage variations. The intrinsic error shall first be measured at Unom. It shall then be verified that the error shift, relative to the intrinsic error at Unom compiles with the requirements of Table-4 (as per OIML R46-1/-2 Edition 2012) when the voltage is varied from 0.8 Unom to 0.9 Unom and from 1.1 Unom to 1.15 Unom. For poly-phase meters, the test voltage shall be balanced. If several Unom values are stated, the test shall be repeated for each Unom value.

17. OTHER REQUIREMENTS

17.1. Delivery Scope

17.1.1. Meter Hardware and Software, HHU, its fittings (communication cables, screws, etc.).

17.1.2. Technical support for the quantity and inspection check, performance test, integration test with Gateway (DCU) and HES and trial operation.

17.1.3. Training for installation, operation and maintenance.

17.1.4. Others written in contract documents.

17.2. General Instructions

17.2.1. The Vendor is expected to have understood COMPANY's whole HES operation environment including used Gateway (DCU), communication networks in KSA.

17.2.2. The Vendor shall be responsible for the technical support and the presence to the Meter installation and inspection test (if requested).

17.2.3. The Vendor shall comply to this technical specification, "Schedule A – General Terms and Conditions", contract documents, related laws and regulations.

17.2.4. The Vendor shall perform the responsibilities of manufacturing, factory inspection, delivery, training and warranty.

17.2.5. If there are differences of understanding the communication protocol between the Meter and HES or there are required protocol specifications not defined to be resolved for the communications between the Meter and HES, the Vendor shall accept COMPANY's interpretation of the issues and add software functions (upgrade) to fulfill these requirements.

17.2.6. If there are differences of understanding the Gateway (DCU) communication protocol between the Meter and different manufacturers' meters the Vendor shall accept COMPANY's interpretation of the issues and add software functions (upgrade) to fulfill these requirements

18. TECHNICAL DATA SHEETS

ELECTRONIC REVENUE WHOLE-CURRENT METERS

SEC Inquiry No._____Item No._____

(Sheet 1 of 4)

SEC REF	Descriptions	SEC specified values	Vendor proposed values
3	APPLICABLE CODES AND STANDARDS		
	1. Standards to be applied by the manufacturer	See 3.	
6	DESIGN AND CONSTRUCTION		
	1. Meter case	Nonmetallic See 6.2	
	2. Degree of protection	IP-54	
	3. Window material	Glass / Polycarbonate	
	4. Terminal bore diameter	See 6.3	
	5. Terminal cover	See 6.4	
	6. Coating test	See 6.2.2	
	7. Overall & mounting dimensions (mm)	DRAWING No. SEC/KWH-S-01	
	8. Top suspension & bottom mountings	Metallic / Hard plastic	
	9. Optical port	Front of meter	
	10. Two RJ-45 Terminals for RS-485	RJ-45 terminals	
	11. Connector for output relay	Terminal block	
	12. Weight (kg)		
7	ELECTRICAL REQUIREMENTS		
	1. Rated current (In)	See 7.2	
	2. Maximum current (Imax)	See 7.2	
	3. # of elements	3 elements	
	4. Temperature rise - External surface	See 7.5	
	5. Power consumption (VA / Watt) - Voltage circuit (per phase) - Current circuit (per circuit)	2W and 10 VA 4 VA	

ELECTRONIC REVENUE WHOLE-CURRENT METERS

SEC Inquiry No._____Item No._____

(Sheet 2 of 4)

SEC REF	Descriptions	SEC specified values	Vendor proposed values
	6. Insulation	As per 7.3.1 to 7.3.3 of IEC 62052-11	
	7. Influence of short-time over-current	As per 7.2 of IEC 62053-21	
	8. Starting current (% of rated current (In))	As per clause 7.11.5 of this specification	
	9. Creep voltage (% of reference voltage)	115%	
	10. Accuracy class - Active energy - Reactive energy	As per requirement of SEC	
	11. Limit of error	As per 8.1 & 8.2 of IEC 62053-21	
8	INPUT AND OUTPUT REQUIREMENT		
	1. LCD Display - Arrangement - Max operation temperature	As Drawing No. SEC/KWH-S-03 or equivalent as per clause 8 of this spec	
	2. Constant for optical pulse output - For active energy: 1000 pulse/kWh) - For reactive energy: 1000 pulse/kVarh)		
	3. Optical interface for HHU	As per IEC 62056-21	
	4. Communication interfaces - Local communication interface - PLC signal interface	 RS-485 RS-485	
	5. Rating of output relay	250V / 1A	

ELECTRONIC REVENUE WHOLE-CURRENT METERS

SEC Inquiry No._____Item No._____

(Sheet 3 of 4)

SEC REF	Descriptions	SEC specified values	Vendor proposed values
9	FUNCTIONAL REQUIREMENTS		
	1. Energy measurement	Required	
	2. Reverse energy indicator	Required	
	3. # of TOU (Time of Use) rate	At least 8 rates	
	4. # of TOU Channels	8 channels	
	5. Maximum demand measurement	Required	
	6. Historical recording	Required	
	7. LP (Load profile) recording	Required	
	8. Real Time Clock	≤ ± 0.5 sec/day	
	9. Energy storage device - Guaranteed life - Whether replaceable? - Energy storage device fail indicator	Required 15 years Yes Required	
	10. Energy storage device - for maintaining the display and RTC (without AC power and energy storage device)	for at least 7 day	
	11. Data retention - Type of memory used - Guaranteed year of data retention - Provision to retrieve data in case of meter failure	As per clause 9.5 of this spec	
	12. Instantaneous measurement	Required	
	13. Default settings	Required	
15	SUBMITTALS		
	1. Submittals as per this specification	Yes/No	
16	SEC DLMS/COSEM OBIS CODE SPECIFICATION SUPPLEMENTARY		
	1. Provision as per this specification	Required	

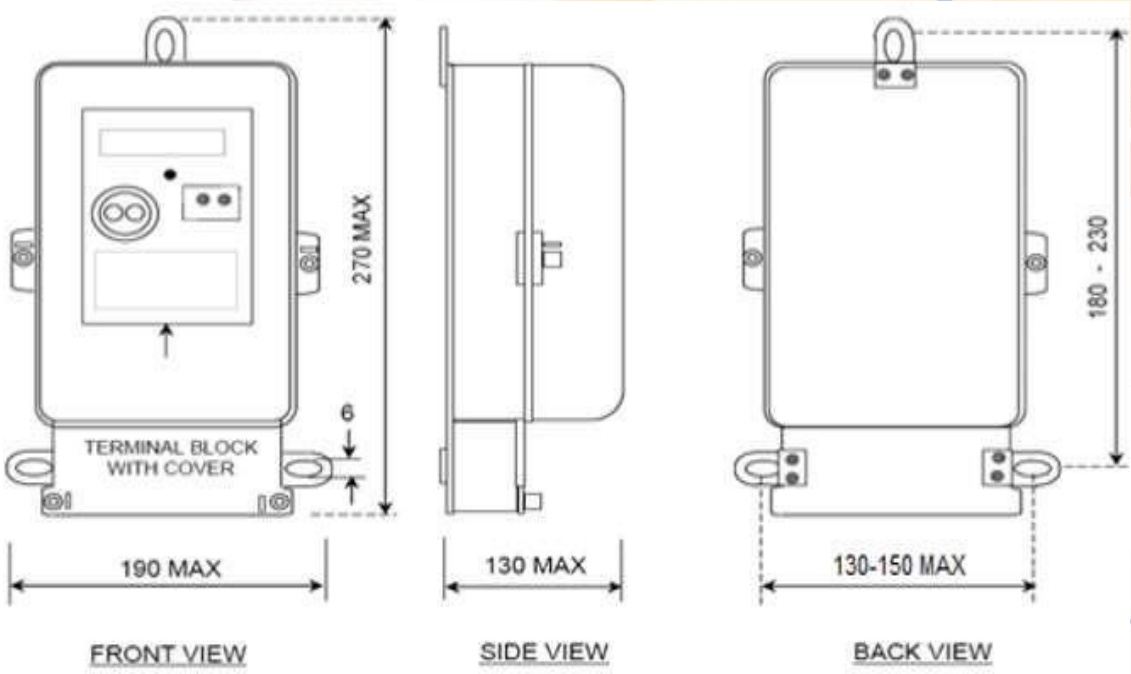
ELECTRONIC REVENUE WHOLE-CURRENT METERS

SEC Inquiry No._____Item No._____

(Sheet 4 of 4)

A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES SPECIFIED BY COMPANY:
B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER:
C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER:
D. LIST OF DEVIATIONS & CLAUSES TO WHICH EXCEPTION IS TAKEN BY THE BIDDER/VENDOR/SUPPLIER:

DESCRIPTION	MANUFACTURER OF MATERIALS/EQUIPMENT	VENDOR / SUPPLIER
Name of Company		
Location and Office address		
Name and signature of Authorized Representative and Date		
Official Seal / Stamp		



ELECTRONIC KWH METER
OVERALL AND MOUNTING
DIMENSIONS

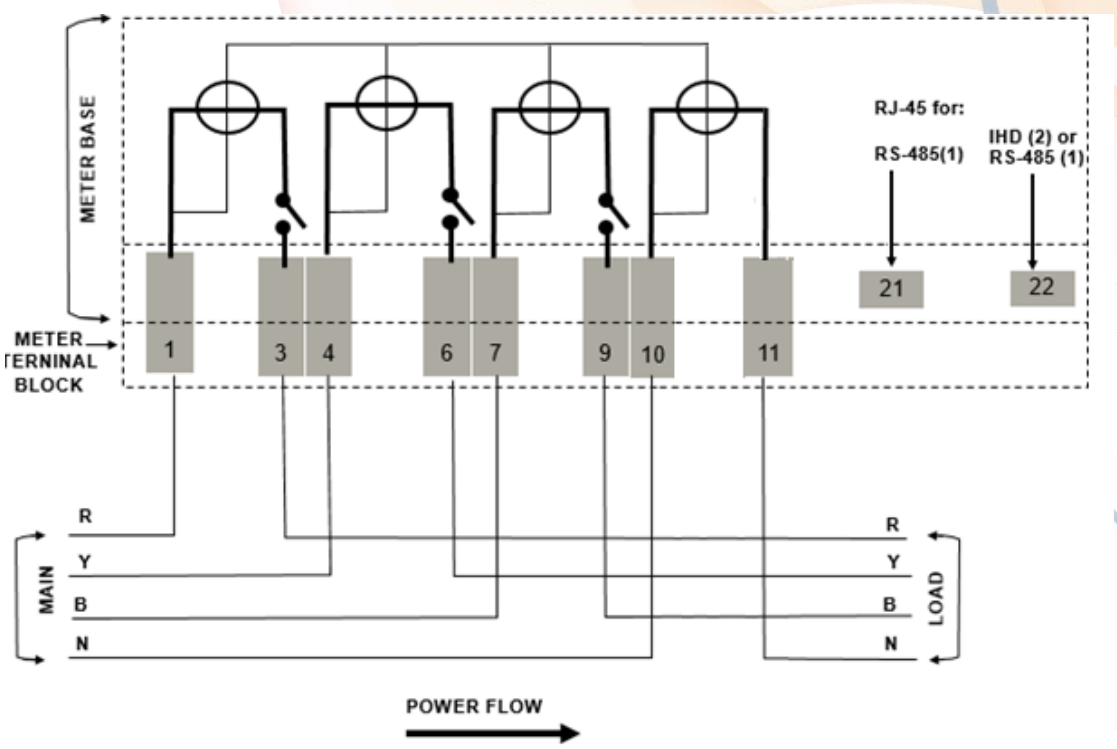
DRAWING No.

SEC/KWH-S 01

(1) This dimension shows a guideline to be fulfilled by manufacturers. The actual dimension shall not exceed each length presented in this drawing.

(2) The drawing aspect is orientative and it is open to the vendors.

(3) The tolerance shall be 1mm for width and depth and 2mm for height.

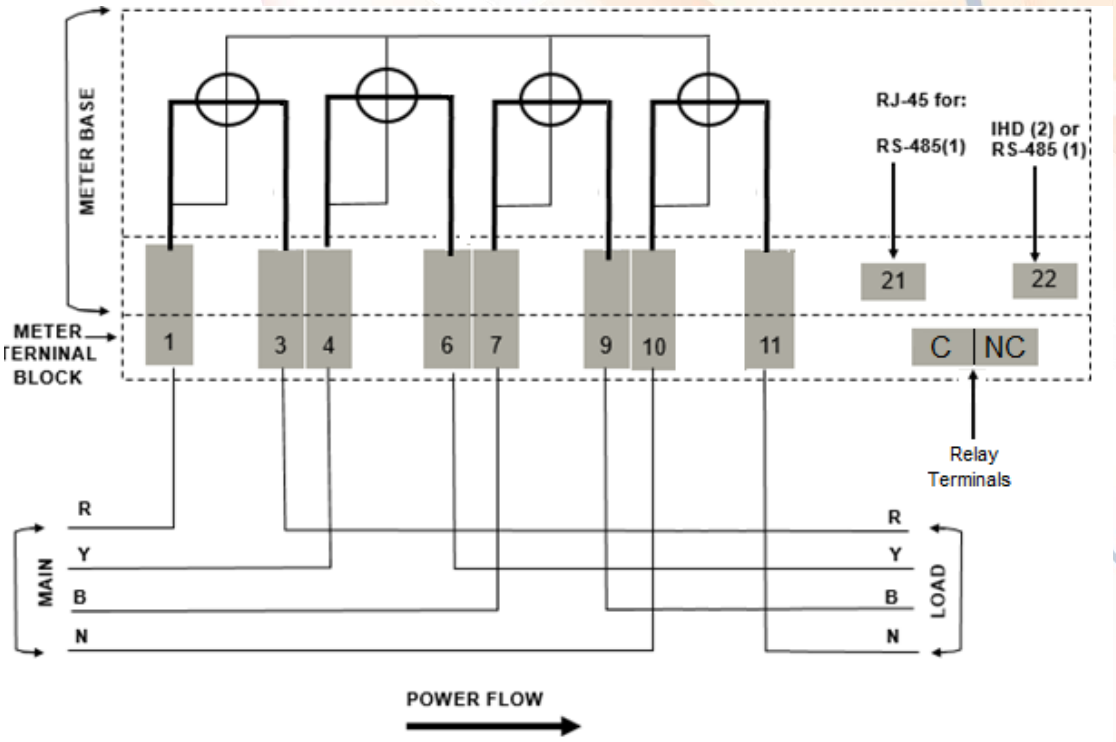


CONNECTION ARRANGEMENT FOR 3 PHASE 4 WIRE WHOLE CURRENT 133/230V OR 230/400V 10(100)A ELECTRONIC KWH METER

DRAWING No.

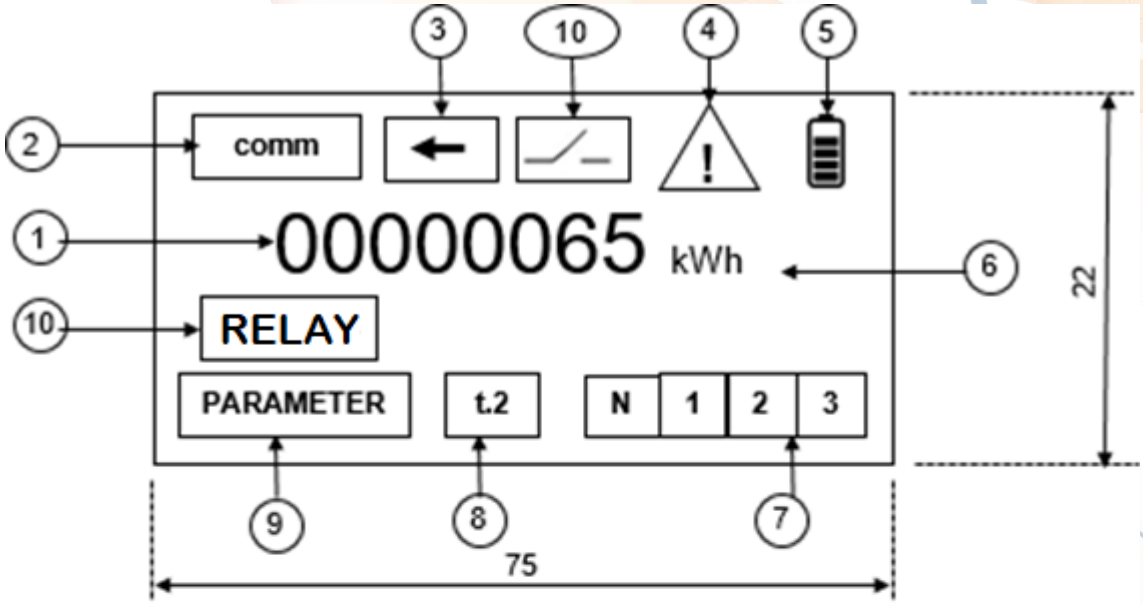
SEC/KWH-S-02

(1) Refer to clause 8.4.2 of RS-485 interface (21, 22) for further details.
(2) Refer to clause 8.4.3 of IHD interface (22) for further details.
(3) Refer to clause 8.6 of Output Relay for further details.



CONNECTION ARRANGEMENT FOR 3 PHASE 4 WIRE WHOLE CURRENT 20(160) A 133/230V OR 230/400V ELECTRONIC KWH METER

(1) Refer to clause 8.4.2 of RS-485 interface (21, 22) for further details.
(2) Refer to clause 8.4.3 of IHD interface (22) for further details.
(3) The RJ-45 port power shall be indicated in the plastic cover



1. Register value / other metering parameter indicator.
2. Communication indicator.
3. Reverse direction indicator.
4. Anomaly indicator.
5. Energy Storage Device level indicator.
6. Unit of the value/parameter displayed in 1.
7. Phase status indicator.
8. Tariff indicator.
9. DLMS/COSEM/OBIS code/Description of the value/parameter displayed in 1.

10 Relay Status(OPEN/CLOSE). Only needed for meter rated until 100A.

Note: All dimensions are in millimeter.

DISPLAY ARRANGEMENT

DRAWING NO.
SEC/KWH-S-03

(1) Self-diagnostics and alarms indicators(segments) including top cover, terminal cover, Rollover should be on LCD as per clause 7.1.18

(2) This display arrangement is presented as COMPANY recommendation. Different presentation of display may be accepted through discussion with COMPANY.

19. APPENDIX (A)

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
1	Every meter shall be provided with a suitable size of name-plate inside the meter cover. Information on this nameplate shall be bilingual (Arabic and English). These shall be printed clearly, indelibly and readable from outside through glass window		40-SDMS-02B (latest rev)	N/A	N/A	N/A	N/A
2	The Manufacturer's name or trademark	For example: 	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	No			
2.1	Place of manufacturing	For example: صنع في Made in USA امريكا	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES			

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
3	Designation and type	IEC 62052-11	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES			
4	The number of phases and the number of wires for which the meter is designed	For example: 3 Phase 4 Wire	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES	3 Phase 4 Wire	٣ أطوار ٤ أسلاك	
5	Meter ID (Refer to Clause 6.10.3 of the Supplementary SEC DLMS/COSEM OBIS CODE SPECIFICATION) 	For example: ABC22208 10000023 ABC: meter manufacturer 22: year of manufacturing 208: Type 10000023: Meter Serial No.	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	NO			

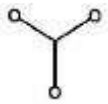
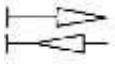
No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
6	Year of manufacture		40-SDMS-02B(latest rev) IEC 62052-11 cl. 6	YES	2022	٢٠٢٢	
7	The rated current and the rated maxi mum current;	For example: 10(100) Amps	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES	For WC10(100)A 10(100)A For WC20(160)A 20(160)A	١٠(١٠٠)امبير ٢٠(١٦٠)	
8	The reference frequency in Hertz,		40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES	60 Hz	٦٠هرتز	

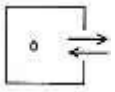
No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
9	The meter constant in the form Imp/k Wh and Imp/ kvarh	For example: 1000 imp/kWh ١٠٠٠ نبضة /ك.و.س For example: 1000 Imp/ kvarh ١٠٠٠ نبضة /ك.غ.ف.س	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES		١٠٠٠ نبضة /ك.و.س ١٠٠٠ نبضة /ك.غ.ف.س	
10	The accuracy class index of the meter	For example: Cl. 1.0 Cl. 2.0	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES		ك.و.س الدقة ١,٠ ك.غ.ف.س الدقة ٢	
11	The reference temperature if different from 23°C	For example: reference temperature 30°C	40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	YES			

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
12	The reference voltage in the form of the nominal voltage of the system or the secondary voltage of the instrument transformer to which the meter is to be connected	For example: 3x 230/ 400V ٣ x ٢٣٠ / ٤٠٠فولت	40-SDMS-02B(latest rev) IEC 62052-11 cl. 6	YES			
13	"Property of SEC"		40-SDMS-02B (latest rev)	YES	Property of SEC	ممتلكات الشركة السعودية للكهرباء ر	
14	SEC purchase order number	For example: P.O No: 25445	40-SDMS-02B (latest rev)	NO			

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
15	SEC item number		40-SDMS-02B (latest rev)	NO	For WC10(100)A SEC ITEM No. 908402208 For WC20(160)A SEC ITEM No. 908402207		
16	The meter connections shall be suitable for WC-operated metering arrangements as given in Drawing No. SEC/K WH-S-02. Applicable connection diagram shall be indelibly marked outside the terminal cover of every meter and clearly readable.		40-SDMS-02B (latest rev) IEC 62052-11 cl. 6				
17	For Item No.9 of drawing No. SEC/ KWH-S-04, the meter shall display th e OBIS code including at least three (3) digits of C, D and E codes on the LCD panel, and a table containing a short description of the codes shall be fixed on the front panel.		40-SDMS-02B (latest rev)	NO			

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
18	SEC Monogram		40-SDMS-02B (latest rev)	NO			
19	The sign of the double square for insulating encased meters of protective class II		IEC 62052-11 cl. 6	NO			
20	DLMS certified product logo		DLMS UA 1002(latest edition)	NO			

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
21	Watt-hour or var-hour meter with three measuring elements, each having a voltage circuit and a current circuit, and connected for the three-wattmeter method (for three-phase four-wire circuits)		40-SDMS-02B (latest rev) IEC 62052-11 cl. 6- →IEC 62053-52	NO			
22	Watt-hour or var-hour meter with two measuring elements, each having a voltage circuit and a current circuit, and connected for the two-wattmeter method (for three-phase three-wire circuits)		40-SDMS-02B (latest rev) IEC 62052-11 cl. 6- →IEC 62053-52 For CT-VT meter	NO			
23	Bidirectional meter Energy received at the measuring point		40-SDMS-02B (latest rev) IEC 62052-11 cl. 6	NO			

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
24	Optical port, bidirectional		40-SDMS-02B (latest rev) IEC 62052-11 cl. 6- →IEC 62053-52	NO			
25	Bar Code		40-SDMS-02B (latest rev) IEC 15426-1	NO	Meter ID (16 Digit)		
26	Manual Reset button label						

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
27	Scrolling button Label						
28	Terminal Block numbering	Check at the connection diagram on the end of document	40-SDMS-02B (latest rev) Drawing No. SEC/KWH-S-02				
29	AC (Alternating Current)						

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
30	Energy storage device type label	For example: 3.6V ½ AA(1.2Ah)					
31	Global Position Indicator	For example: GPS	40-SDMS-02B (latest rev) IEC 60417 (6327-Global positioning system; GPS)				
32	Torque Value	For Example:- M8 10Nm					

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
33	Communication module type marking with a tick on communication module cover	**E.g.** If the module is NB-IoT , tick indication shall be marked on NB-IoT Box Type: □Hybrid (PLC+RF) □4G ☑NB-IoT □PLC prime		No			Type: □Hybrid (PLC+RF) □4G ☑NB-IoT □PLC prime
34	Rated impulse voltage U_{imp}	E.g. U_{imp} 8kV	IEC 62052-11 cl. 6				
35	Utilization category (UC) for directly connected meters only with SCS	E.g. UC3	IEC 62052-11 cl. 6				

No	Description	Clarification / Example	IEC Standard/ Specification	Arabic Translation	English	Arabic	Symbols
36	Reference to standards	E.g. IEC62052-11:2020 IEC62053-21:2020	IEC 62052-11 cl. 6				
37	Specified operating temperature range	E.g. Temperature Range for operation -10°C to 75°C	IEC 62052-11 cl. 6				