

Saudi Electricity Company



الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION

40-SDMS-02A, Rev. 06

DATE: 12-03-2010G

40-SDMS-02A

REV. 06

SPECIFICATIONS

FOR

**ELECTRONIC REVENUE
CT AND CT/VT METERS**

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1.0 SCOPE

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

This Specification also describes the technical requirements for the electronic revenue meters to be used in Automatic Meter Reading/Management (AMR/AMM)/ AMI (Advanced Metering Infrastructure) and SMART GRID.

2.0 CROSS REFERENCES

- 2.1 This specification shall be read in conjunction with SEC General Specification No. 01-SDMS-01 (latest revision) titled "General Requirements for all Equipments/Materials" which shall be considered as an integral part of this Specification.
- 2.2 This Specification shall also be read in conjunction with SEC purchase order requirements.

3.0 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 / Manufacturer may propose equipment / material conforming to equivalent alternate codes and standards. However, the provisions of SEC 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 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - 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



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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 62053-22	Electricity metering equipment (a.c.) - static meters for active energy (classes 0.2 and 0.5)
IEC 62053-23	Electricity metering equipment (a.c.) - static meters for reactive energy (classes 2 and 3)
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 62056-47	Electricity metering - Data exchange for meter reading, tariff and load control – COSEM transport layers for IP networks
IEC 62056-53	Electricity metering - Data exchange for meter reading, tariff and load control – COSEM Application layer
IEC 62056-61	Electricity metering - Data exchange for meter reading, tariff and load control – Object identification system (OBIS)
IEC 62056-62	Electricity metering - Data exchange for meter reading, tariff and load control – Interface classes
IEC 62357	Power system control and associated communications – Reference architecture for object models, services and protocols.



IEC 60834-1	Teleprotection equipment of power systems – Performance and testing – Part 1: Command systems
IEC 60664	Insulation coordination within Low Voltage System including clearances and creepage distance for equipments
IEC 60695-2-10	Fire hazard testing part-2 test methods glow wire test and guidance
IEC 60817-1987	Spring operated impact tests apparatus test and its calibration
IEC 60947-7-1	Test requirements of Terminal Blocks
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

4.0 SERVICE CONDITIONS

The meter will be installed indoor and/or outdoor as referred to the latest revision of SEC 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:

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

Limit range for operation -10°C to 70°C

5.0 SYSTEM PARAMETERS

The meter shall be suitable for operation in SEC distribution system conditions as per the latest revision of SEC General Specification No.01-SDMS-01, 40-SDMS-02A/B including supplementary OBIS CODE, 40-SDMS-03 (DCU), 40-SDMS-04 (GSM/GPRS modem), 40-SDMS-05 (PLC modem), The meter shall be deemed to meet the requirements without any adverse effect over the life cycle.

6.0 DESIGN AND CONSTRUCTION

6.1 Case



- 6.1.1 The case of the meter shall be made of nonmetallic material. It shall be made of phenol or high-grade polycarbonate resin.
- 6.1.2 The meter shall have an adequate dust proof and moisture proof case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seals. The degree of protection shall be IP-51 or better.
- 6.1.3 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.
- 6.1.4 Adequate sealing provision shall be provided in different parts of the meter, i.e., terminal cover, meter cover and battery cover if used.
- 6.1.5 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.
- 6.1.6 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.

6.2 Terminals and Terminal Block

- 6.2.1 The terminals shall be grouped in a terminal block of adequate insulating properties and mechanical strength. They shall be arranged for bottom connection.
- 6.2.2 The terminals shall be suitable for copper conductors and provided with minimum of two screws for each conductor. The bore diameter for phase and neutral terminals shall be as given in the table No.1 below.

Table No.1 – Bore diameter

Bore diameter of each terminal (mm)	Kind & size of conductor
4.5 - 5	2.5 mm ² soft drawn stranded copper

- 6.2.3 The terminal block shall include additional connection terminals for the communication interfaces and output relay.



6.3 Terminal Cover

Terminal cover shall be made of the same materials as that of the meter case and sealed independently of the meter cover. The terminal cover shall include information indicating the correct phase sequence and connections as per drawing No. SEC/KWH-S- 03 and 04. The terminal block shall be visible through the clear glassed terminal cover.

6.4 Meter Cover

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

6.4.2 The clear window shall be large enough to view the display and the nameplate details and insured transparency during the whole service life of the meter.

6.4.3 The meter cover shall have enough room to provide the optical port, display push-button, reset push-button and optical test outputs. These components shall be arranged either within or outside the window area.

7.0 ELECTRICAL REQUIREMENTS

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

7.2 The rated current (I_n) and the maximum current (I_{max}) of the meter shall comply with following.

- Rated current (I_n): 1.5 (A)
- Maximum current (I_{max}): 6 (A)

7.3 The reference voltage of the meter shall comply with the value in the Table No.2 below.

Table No.2 – Reference voltage

CT&VT-operated meter	110 V (phase to phase)
CT-operated meter	(Able to cover double voltages) 127/220 V and 220/380 V

7.4 The number of power measuring elements of the meters shall be as given in Table No. 3 below.



Table No.3 – Number of elements

CT&VT-operated meter	2 elements	3 phases – 3 wires
CT-operated meter	3 elements	3 phases – 4 wires

- 7.5 The temperature rise 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.
- 7.6 The meter shall have a fully redundant power supply; i.e. withstanding any phase-neutral inversion, missing phases or missing neutral.
- 7.7 The meter shall be designed and constructed in such a way as to avoid introducing any electromagnetic interference (surge, impulse, noise, etc.) in normal use and under normal conditions.
- 7.8 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 cable.
- 7.9 Accuracy requirements
The accuracy class of the meter shall comply with the value in the Table No.4 below.

Table No.4 – Accuracy class

Active energy	CL 0.5
Reactive energy Apparent energy	CL 2.0

7.9.1 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 62053-22.

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

7.9.2 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 62053-22, 23.



7.9.3 Initial start-up of the meter

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

7.9.4 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 pulse.

For the specified period for no-load test and the detailed test method, clause 8.3.2 of IEC 62053-22 shall be referred.

7.9.5 Starting current

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

Table No.5 – starting current

Power factor	Starting current (CL = 0.5)
1 ($\cos\Phi = 1$)	0.001 I_n

For reactive energy, the meter shall start and continue to register at 0.003 I_n and zero (0) power factor ($\sin\Phi=1$).

7.9.6 If the meter is designed for the measurement of energy in both directions, then this test shall be applied with energy flowing in each direction.

7.9.7 Power consumption

The power consumption of the meter shall not exceed the values in the Table No.6.

Table No.6 - Power consumption of the meter

Meters	Voltage circuit including power supply (per phase)	Current circuit (per circuit) CL = 0.5
3 phase(s)	2 W and 10 VA	1 VA



8.0 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.
- 8.1.2 The LCD shall withstand SEC environmental conditions specified in 01-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 LCD is the same as that of the meter mentioned in clause 4 of this specification.
- 8.1.3 Legends/dimensions as shown in the drawing No. SEC/KWH-S-05 or any other similar LCD 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 support two modes of displaying the energy values as described below.
1. Mode A: Actual energy value with its appropriate unit (register value multiplied by the multiplication factor). The meter shall show the multiplication factor as "1" in the LCD display.
 2. Mode B: Register value with its appropriate unit (without multiplication with the multiplication factor)
- The multiplication factor shall be calculated as CT ratio multiplied by VT ratio. Its default value shall be 1.
- Ex) Multiplication Factor = $300A/5A$ (CT ratio) * $11kV/110V$ (VT ratio) = $60 * 100 = 6000$
- Both modes shall be available and the default mode is Mode A.
- 8.1.6 The number of digits for displaying the energy registers shall be configurable with a minimum of 8 digits.
- For all energy registers the leading zeros shall be padded.
- 8.1.7 The display rules for Mode A and Mode B are different as follows:
- 1) Mode A LCD Display Rule



Units	Kilo (e.g. kWh)	
	Integer	Decimal
Number of displayed digits	8	0

2) Mode B LCD Display Rule

Units	Kilo (e.g. kWh)	
	Integer	Decimal
Number of displayed digits	6	2

8.1.8 For Item No.9 of drawing No. SEC/KWH-S-05, if the meter displays the 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.

8.1.9 The display shall also provide the following whenever it is required:

1. A register value with its appropriate unit, multiplication factor and description or DLMS/COSEM/OBIS code of the parameter of which the register is storing.
2. A tariff number indicates which tariff period is in view.
3. A 3-Phase status indicator remains static throughout the operation and goes off if the corresponding phases trip.
4. An anomaly indicator flashes when there is failure in the electronic components, overflow in calculation or any other error which results in meter malfunction.
5. A reverse direction indicator flashes 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 flash when the measured active energy in one or more of the phases is in the export direction).
6. A battery low indicator flashes when the battery is required replacement.
7. A communication indicator is lighted when the meter is communicating through one of its communication ports.

8.2 Optical testing output device

8.21 The meter shall have one or two optical testing output device(s) 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 shall be inscribed on the front panel of the meter.

- 8.2.2 If only one testing output is used for both active and reactive energy, it shall be possible to choose the required one while testing the meter in the site or laboratory.
- 8.2.3 The requirements for testing outputs shall comply with clause 5.11 of IEC 62052-11.

8.3 Local / Remote Communication Interfaces

8.3.1 Optical Interface

1. The meter shall have an infrared optical interface module to enable the use of a RS-232 / USB compatible optical probe (See Clause 11.2 of this specification) in compliance with IEC-62056-21 or latest version.
2. The optical port shall allow bi-directional communication with a Hand Held Unit (HHU) or IBM compatible PC for rapid, error free electronic data transfer using the DLMS/COSEM protocol as well as IEC 62056-21.
3. The optical port shall be used to configure the meter, read all the register values and load profile data.

8.3.2 RS-485 Communication Interfaces

1. The meter shall be equipped with RS-485 interface having two physical RJ-45 terminals for daisy chaining capability. The first RJ-45 terminal shall have additional two pin-outs for supplying DC power to modem PSU while the second RJ-45 terminal has only two RS-485 communication pin-outs as follows.

- RJ-45 pin-out configuration for the first RJ-45 terminal (front left)

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

- RJ-45 pin-out configuration for the second RJ-45 terminal (front right)



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Pin No.	1	2	3	4	5	6	7	8
Pin-out	NC	NC	NC	RS-485 (+)	RS-485 (-)	NC	NC	NC

2. RJ-45 terminals shall be possible to connect other meters and one communication modem (e.g. GPRS/GSM, PLC, WiMAX, PSTN) with power supply by the meter through the RJ-45 terminal. The power supply (Modem PSU, GND) from the meter to communication modem shall have the electrical characteristics of 12Vdc($\pm 5\%$), over 2.5W.
3. The meter shall operate as a slave RS-485 communication unit, while GPRS/GSM or PLC modem or DCU shall operate as its master unit.
4. The other specification of the RS-485 interface shall be referred to other related specifications (40-SDMS-03 Rev.02, 40-SDMS-04 Rev.00, 40-SDMS-05 Rev.00).

8.4 PLC Signal Interface (for CT operated meter only)

- 8.4.1 The meter shall have AC power connection terminals to transmit and receive the PLC signal via power lines using R-phase and Y-phase (or B-phase) between PLC modem and DCU (Data Concentration Unit). The power rating of the AC power connection terminal shall be 2.5A and maximum 460V AC, its electrical strength is 2.000 V AC for at least one (1) hour.

The insulation resistance of the AC power connection terminals shall be over 100M Ω at 500V DC. The terminal shall be securely covered with appropriate sealing materials.

- 8.4.2 The terminal shall be free of discontinuity, short circuit on rear plane, arcing.

8.5 Protocol

- 8.5.1 All types of meters shall be designed to use DLMS/COSEM protocol with OBIS code defined by SEC.
- 8.5.2 ALL types of meters shall have both DLMS CTT certification and SEC's OBIS code test certification.
- 8.5.3 For detailed communication profile and OBIS code defined by SEC, See the supplement of this specification.
- 8.5.4 Unless otherwise defined by SEC, OBIS shall be comply with the 'List of standardized OBIS codes V 2.3 or latest version' defined by DLMS UA.
- 8.5.5 The meters 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 via RS-485 interface.

8.6 Output Relay

8.6.1 The meter shall have an internally operating output relay whose contacts (C& NO) rated at 250V/1A shall be available at the terminal block.

8.6.2 The meter shall operate the output relay automatically if the current exceeds the trip point and stay there for more than a delay time.

8.6.3 The relay shall switch off if the current falls below the trip point and stay there for the same delay time.

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

8.6.5 The meter shall operate the output relay when received control commands from the remote station (HHU, GSM/GPRS Gateway and AMR/AMM Server).

8.6.6 When the output relay is operated, the exceeded current value, date and time of occurrence shall be logged in the meter.

8.7 kWh Pulse Output Signal Initiator and EOI Signal Initiator (for Demand Side Load Control, CT/VT meter only)

8.7.1 The meter shall have a pulse initiator which sends metrological kWh pulse output externally. It shall be possible to transmit the metrological pulse to external devices (e.g. Load Controller, etc.) via terminals.

8.7.2 The meter shall have an EOI (End Of Interval) Signal Initiator which externally provides time interval pulse signals to an external device configurable 5, 15, 30, 60 minutes (default 15 minutes).

8.7.3 The type of output terminals is Open Collector, using maximum output power of DC 24V, 12mA. The terminal Nos. are as per:

1- Watt-Hour Pulse Output Signal terminals

- Common: No.1
- Output: No.2

2- End Of Interval (EOI) Output Signal terminals

- Common: No.3
- Output: No.4



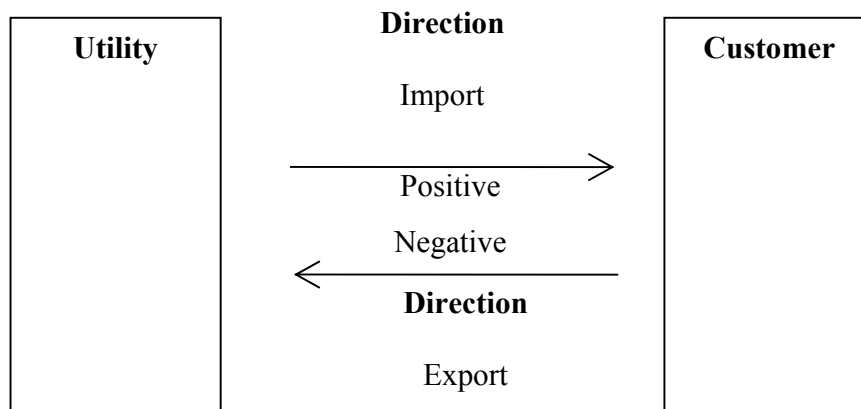
9.0 FUNCTIONAL REQUIREMENTS

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

The convention for energy direction of the meter can be programmed from ANSI and IEC standards, and default is IEC standard.



9.1.2 Basic Energy Measurement

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+).
2. 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.
3. The first and fourth quadrant reactive energy shall also be stored in reactive energy [QI], [QII], [QIII], [QIV] registers respectively.
4. Ten (10) energy quantities mentioned above shall have three (3) registers per each phase per each energy as well as aggregated register (phase I + phase II + phase III).

9.1.3 TOU (Time of Use)

1. Number of TOU channels: at least 8 channels. Quantities to be



recorded can be programmed by users, and 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).

2. Number of rates of TOU: 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 2 YOU rates (TOU#1, TOU#2) and the summation of all TOU rates.
3. Number of hourly segments for TOU: at least 8 segments in a day
4. Number of seasonal segments for TOU: at least 4 segments in a year
5. 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

1. The quantities recorded in the average demand registers are import active power (kW+), export active power (kW-), import reactive power (kVar+), export reactive power (kVar-), import apparent power (kVA+), export apparent power (kVA-), reactive power (QI) and reactive power (QIV).
2. The demand calculations are based on either block method or sliding window method, which shall be configurable. A configurable integration time of 5, 15, 30 or 60 minutes for both methods and a fixed sub interval of 5 minutes for the sliding method shall be used.
3. The current/last average demand and its capture time shall be recorded.

9.1.5 Maximum Demand

1. According to clause 9.1.3 of this specification, all maximum demands related to TOUs shall be recorded in the registers.
2. The time and date of occurrence of the maximum demand shall be recorded.
3. The quantities recorded in the maximum demand registers are same items as the average demand registers.

9.1.6 Cumulative Maximum Demand

1. According to clause 9.1.5 of this specification, all maximum demands



of every billing period shall be accumulated in the cumulative maximum demand registers during the meter's whole operation time.

2. The quantities recorded in the cumulative maximum demand registers are same items as the maximum demand registers.

9.1.7 Load Profile (LP)

1. Number of LP channels: at least 4 channels. Quantities to be recorded can be programmed by users among the registers related to clause 9.1.4, and default quantities are import active power (kW+), export active power (kW-), import reactive power (kVar+), export reactive power (kVar-).
2. Time period of LP: it can be programmed from 5, 15, 30, 60 min, and default is 30 min.
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

1. All TOU values related to 9.1.3 of this specification and all maximum demands related to 9.1.5 of this specification, which is referred to as billing data, shall be recorded into registers as follows.
2. The billing data accumulated from the origin (first start of measurement) to the instantaneous time point of metering, which is called "current total billing", shall be available.
3. The billing data accumulated from the origin to the end of the last (most recent) billing period, which is called "previous total billing", shall be available.
4. The billing data accumulated from the beginning of the current billing period to the instantaneous time point of metering, which is called "current billing" shall be available.
5. The billing data accumulated from the beginning of the last billing period to the end of the last billing period, which is called "previous billing" shall be available.
6. The default current billing period is one month, and the current billing period is the same with automatic reset time & date (the default automatic reset time & date is at 00h 00m on the first day of every month and configurable)

- 9.1.9 For CT-operated meters (3 Phase 4 Wire type) the energy measurements shall be carried out separately for 3 phases and added to the relevant import



or export energy registers.

- 9.1.10 All registers are stored internally to at least 3 decimal places.
- 9.1.11 The CT ratio and VT ratio, if used, shall be able to be configurable. The meter shall automatically calculate and use an appropriate multiplication factor in accordance with the CT and VT ratio configured by user (Regarding the definition of multiplication factor, refer to clause 8.1.5).
- 9.1.12 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 and Status Change data mentioned in the supplementary OBIS Code respectively. When the storage is full, the new data shall overwrite the oldest stored data.

9.2 Reset Function and Historical Data Recording

- 9.2.1 The reset shall be carried through one of the following ways.
1. Manually by pressing the front panel reset push-button.
 2. On command from the HHU or PC via the optical communication port.
 3. On command via the remote communication interface.
 4. Automatically, under control of the meter internal clock, at specific configurable predetermined time.
- 9.2.2 The manual and automatic reset options can be enabled/disabled through configuring the meter. Enabling the manual reset shall disable the automatic reset and vice versa.
- 9.2.3 The manual reset shall be carried out by pressing the reset push-button after breaking the sealing of reset button.
- 9.2.4 If automatic reset is being used and the power supply has failed at the specified time, then the reset may occur immediately following the return of the power supply.
- 9.2.5 On every reset all the registered data specified in clause 9.1 along with the date and time of reset shall be transferred to historical registers storage. The maximum demand registers shall be reset to zero after transferring the data to the historical registers.
- 9.2.6 The meter shall retain the historical register data for at least the last four reset periods.
- 9.2.7 The meter shall retain the historical register data including specified in



‘9.5.2’ of 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, 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 AMR system, such as a server or a DCU or a GSM/GPRS gateway (modem).
- 9.3.3 The clock shall use the notation 00:00 to 23:59. The calendar shall be correct for meter service life 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.

9.4 Battery

- 9.4.1 A suitable battery or Super Capacitor shall support the real time clock in the event of power failure. The battery should offer back-up power for at least 5-year continuous operation and 1 year continuous operation after 10 years storage.
- 9.4.2 The battery shall not be soldered directly to the hardware and be able to be replaced in the field without breaking the seal of the meter cover.
- 9.4.3 In case of battery low/failure the battery low/failure indicator in the display shall be displayed and/or blinked.

9.5 Data Retention

- 9.5.1 All programmed/configured and registered data shall be retained in a nonvolatile memory. The meter shall employ a memory that offers a minimum of 10 years of data retention during power failure.
- 9.5.2 The meter memory shall also be used to record the following security data that may be displayed / read through the communication ports on request.
1. An 8-digit serial number of the meter as indicated in the name-plate, which should not be changed or erased at any cost.
 2. Number of times the meter has been configured.
 3. Date and time of last configuration.
 4. Number of times the meter has been powered down.
 5. Date and time of last power down.
 6. Number of resets.



7. Date and time of last reset.
8. Date of battery install.
9. Date and time of battery fail.
10. Date and time of last reverse run.
11. Date and time of last phase loss.
12. Date and time of clock change (time, data)
13. Date and time of calendar change (Tariff, Holidays, TOU, etc)

9.5.3 The non-volatile memory shall be capable of being read by external equipment via contacts at the edge of the circuit board in the event of damage or component failure, which renders the meter inoperable.

9.6 Instantaneous Measurements

The meter shall measure and display the instantaneous value of the following. The values shall be the secondary-side of instrument transformers. The instantaneous measurement registers shall be capable of storing values to at least three decimal places.

1. 3 Ph – N Voltages (Ph – Ph Voltages for CT&VT-operated meters, Unit: Volt)
2. 3 Phase currents (2 currents for CT&VT-operated meters, Unit: Ampere)
3. Power factor
4. Power (Unit: kW, kVar, kVA)
5. Frequency (Unit: Hz)

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.

1. All TOU registers recorded in the meter (refer to clause 9.1.3) including import & export active energy (kWh), reactive energy (kVarh) and apparent energy (kVAh)
2. All maximum demand for TOU registers stated above and their time and date
3. Demand kW
4. Demand kVAR



5. Demand kVA
6. VT ratio
7. CT ratio
8. Voltage V1 (V12 for CT&VT-operated meters)
9. Voltage V2 (V23 for CT&VT-operated meters)
10. Voltage V3 (V31 for CT&VT-operated meters)
11. Current I1
12. Current I2 (Not applicable for CT&VT-operated meters)
13. Current I3
14. Power factor
15. Power (kW)
16. Frequency
17. Meter serial number
18. Date of battery install
19. Date of last reset
20. Time of last reset
21. Demand integration time
22. Date
23. Time

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 (when applicable) shall be in the same sequential order as given below.

1. Total import active energy (kWh+)
2. Total import active energy [Rate 1] (kWh+)
3. Total import active energy [Rate 2] (kWh+)
4. Time
5. Date



6. Import active energy (kWh+)
7. Import reactive energy (kVarh+)
8. Import apparent energy (kVAh+)
9. Voltage V1 (V12 for CT&VT-operated meters)
10. Voltage V2 (V23 for CT&VT-operated meters)
11. Voltage V3 (V31 for CT&VT-operated meters)
12. Current I1
13. Current I2 (Not applicable for CT&VT-operated meters)
14. Current I3
15. Instantaneous Power factor [Phase 1]
16. Instantaneous Power factor [Phase 2] (Not applicable for CT&VT-operated meters)
17. Instantaneous Power factor [Phase 3]
18. Instantaneous Power factor
19. Current Frequency
20. Meter serial number
21. CT ratio
22. VT ratio (Applied for CT&VT-operated meters only)
23. Instantaneous import active power (kW+)
24. Instantaneous import reactive power (kVar+)
25. Instantaneous import apparent power (kVA+)
26. Import active average demand (kW+)
27. Import reactive average demand (kVar+)
28. Import apparent average demand (kVA+)
29. Maximum demand of import active power (kW+)
30. Date of maximum demand of import active power (kW+)
31. Time of maximum demand of import active power (kW+)
32. Maximum demand of import reactive power (kVar+)
33. Date of maximum demand of import reactive power (kVar+)
34. Time of maximum demand of import reactive power (kVar+)



35. Maximum demand of import apparent power (kVA+)
36. Date of maximum demand of import apparent power (kVA+)
37. Time of maximum demand of import apparent power (kVA+)
38. Total import reactive energy (kVarh+)
39. Total import reactive energy [Rate 1] (kVarh+)
40. Total import reactive energy [Rate 2] (kVarh+)
41. Total import apparent energy (kVAh+)
42. Total import apparent energy [Rate 1] (kVAh+)
43. Total import apparent energy [Rate 2] (kVAh+)
44. Number of meter readings (EOB)
45. Load profile recording interval
46. Recent meter reading date/time
47. Date of battery installation

A momentary press of the display push-button shall cause the display to advance to the next display in the display list. The meter shall revert to its default display of the normal mode after 10 seconds period of button inactivity.

Pressing and holding the display push-button for more than 2 seconds and releasing, it causes the display automatically sequence through the display list. Each register in the display list shall be visible for 1 second.

9.7.3 Test display mode

Pressing and holding the display push-button for more than 5 seconds and releasing, it cause the display to go to the test mode in which the display shows all the energy registers, including display list below. sequentially with all decimal places as mentioned in clause 8.1.7 of this specification. The meter shall revert to its default display after 10 seconds period of button inactivity (or when the sequencing is finished).

1. Total import active energy (kWh+)
2. Total import active energy [Rate 1] (kWh+)
3. Total import active energy [Rate 2] (kWh+)
4. Time
5. Date



6. Import active energy (kWh+)
7. Import reactive energy (kVarh+)
8. Import apparent energy (kVAh+)
9. Export active energy (kWh-)
10. Export reactive energy (kVarh-)
11. Export apparent energy (kVAh-)
12. Voltage V1 (V12 for CT&VT-operated meters)
13. Voltage V2 (V23 for CT&VT-operated meters)
14. Voltage V3 (V31 for CT&VT-operated meters)
15. Current I1
16. Current I2 (Not applicable for CT&VT-operated meters)
17. Current I3
18. Instantaneous Power factor [Phase 1]
19. Instantaneous Power factor [Phase 2] (Not applicable for CT&VT-operated meters)
20. Instantaneous Power factor [Phase 3]
21. Instantaneous Power factor
22. Current Frequency
23. Meter serial number
24. CT ratio
25. VT ratio (Applied for CT&VT-operated meters only)
26. Instantaneous import active power (kW+)
27. Instantaneous import reactive power (kVar+)
28. Instantaneous import apparent power (kVA+)
29. Import active average demand (kW+)
30. Import reactive average demand (kVar+)
31. Import apparent average demand (kVA+)
32. Maximum demand of import active power (kW+)
33. Date of maximum demand of import active power (kW+)
34. Time of maximum demand of import active power (kW+)



35. Maximum demand of import reactive power (kVar+)
36. Date of maximum demand of import reactive power (kVar+)
37. Time of maximum demand of import reactive power (kVar+)
38. Maximum demand of import apparent power (kVA+)
39. Date of maximum demand of import apparent power (kVA+)
40. Time of maximum demand of import apparent power (kVA+)
41. Total import reactive energy (kVarh+)
42. Total import reactive energy [Rate 1] (kVarh+)
43. Total import reactive energy [Rate 2] (kVarh+)
44. Total import apparent energy (kVAh+)
45. Total import apparent energy [Rate 1] (kVAh+)
46. Total import apparent energy [Rate 2] (kVAh+)
47. Total export active energy (kWh-)
48. Total export active energy [Rate 1] (kWh-)
49. Total export active energy [Rate 2] (kWh-)
50. Total export reactive energy (kVarh-)
51. Total export reactive energy [Rate 1] (kVarh-)
52. Total export reactive energy [Rate 2] (kVarh-)
53. Total export apparent energy (kVAh-)
54. Total export apparent energy [Rate 1] (kVAh-)
55. Total export apparent energy [Rate 2] (kVAh-)
56. Number of meter readings (EOB)
57. Load profile recording interval
58. Recent meter reading date/time
59. Date of battery installation
60. import active energy (kWh+) [Mode A]
61. Import reactive energy (kVarh+) [Mode A]
62. import apparent energy (kVAh+) [Mode A]

9.7.4 As an alternate all the above-mentioned display functions may be obtained through some other user-friendly method using two buttons.



9.8 Security access

The meter shall be provided with 3 different programmable security codes for programming/Configuring the meter, reading the data from the meter and reset.

9.9 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 AMR system.

9.10 Any abnormal states, events and alarms shall be recorded in Event log of the meter and displayed on the LCD within maximum one (1) minute after the state change of abnormal state, events and alarms mentioned Supplementary OBIS CODE.

10.0 DEFAULT SETTINGS

All the meters delivered to SEC should have the default setting values according to SEC's request. Unless specified by SEC, the default settings shall comply with the values in Table No. 7.

Table No.7 Default settings

Configuration features	Default settings
Clock	KSA Standard time (GMT + 3.00)
TOU period	
TOU #1	From 12:00 ~ 17:00
TOU #2	From 17:00 ~ 12:00 the next day
TOU #3 ~ #8 or more	Not Used
Automatic reset time & date	At 00h 00m on the first day of every month
Maximum demand	
Integration method	<input type="checkbox"/> Block / <input checked="" type="checkbox"/> Sliding window
Integration time	30 minute (Default)
LP recording (4 channels totally)	Import Active (+), Export Active (-) Import Reactive (+), Export Reactive (-)
CT ratio	1
VT ratio	1



The number of digits for display	
Active energy (kWh)	- Equal to or more than <u>8</u> integer digits (leading zero shall be padded) - 0 decimal digits
Reactive energy (kVarh)	Same to above
Apparent energy (kVAh)	Same to above
Maximum demand power (kW)	Same to above

11.0 PERIPHERAL DEVICES

11.1 Hand Held Unit (HHU)

The Hand Held Unit shall be commonly available and compatible with any meter reading software that operates with DLMS/COSEM protocol. The HHU shall communicate with any meter that conforms to DLMS UA. The HHU shall include a RS-232 or USB data cable to communicate with the PC using MS Windows XP/7 or later version.

11.2 Optical Probe

The optical probe shall be used to transfer data to and from the meter. The probe shall have an optical head on one end to interface with the meter and a 9 pin D-connector or an USB connector on the other end to connect either to the HHU or directly the PC. The communication through optical probe shall conform to DLMS protocol as well as IEC-62056-21 Data Exchange for Meter Reading, Tariff and Load Control.

11.3 SEC purchase order will state the quantities of HHU and optical probe to be supplied by the vendor / manufacturer.

12.0 SUPPORT SYSTEM REQUIREMENTS

12.1 Software

12.1.1 The software shall be a package of one or more software to run under Pentium III or latter PC. The software shall have the following features.

- MS Windows XP/7 or latter based
- Multiple DBMS (Oracle, SQL Server)
- Client/Server 3-Tier model



- Scalable Design with Plug-in Modules

12.1.2 The Software Package shall consist of more than one module that cover (but not limited) the followings:

1. Monitoring/reading
2. Control/operation
3. Diagnostic/troubleshooting/setting/configuration
4. HHU interface
5. Security privilege
6. Billing interface

12.1.3 The software shall be a user friendly, menu driven and have options to use a variety of Hand Held Units.

12.1.4 The software shall have provisions to create user and configure different access levels for the user.

12.1.5 The software shall allow the user to create a consumer data bank grouped into area wise. Each consumer shall be identifiable by a name, consumer number, meter number, telephone number for remote communication and mode of communication.

12.1.6 The software shall allow the user to select the communication from one of the 3 options i.e., the optical port of the meter, the HHU and the remote communication through modem and/or data collection point.

12.1.7 Communication with the meter means it may either configuring the meter, reading the selected register data from the meter or reading the load profile data from the meter.

12.2 Configuring the Meter

12.2.1 Configuring the meter shall be possible through all the communication means given in clause 12.1.6.

12.2.2 Configuring the meter shall be controlled locally via access code/password and remotely via security privilege.

12.2.3 This option shall allow the user to configure the meter from a preset list of Configuration features called Configuration scheme. The list of configuration features is given in Table No.8.

12.2.4 The Configuration features of the meter may be displayed on one or more dialogue boxes through which one can select the required



features and store in the Configuration scheme. One of the many-stored Configuration schemes shall be selected and used for configuring the meter.

12.3 Reading from the Meter

12.3.1 Reading the meter shall be possible through all the communications given in clause 12.1.6.

12.3.2 This option shall allow the user to read the meter from a preset list of readable features called reading scheme.

12.3.3 The readable features of the meter may be displayed on one or more dialogue boxes through which one can select the required features and store in the reading scheme. One of the many-stored reading schemes shall be selected and used for reading the meter.

12.3.4 The readable features are as given below:

1. All Configuration features given in Table No. 8.
2. All registers listed in clause 9.6.3
3. All security data listed in clause 9.4.2
4. The historical data given in clause 9.2

12.3.5 After reading all data it shall be displayed on separate dialogue boxes on the screen.

12.3.6 This option shall allow the user to store all the data in a file with meter number and the date of reading as a reference and later on it may be exported to different data formats for further analysis.

12.4 Reading the Meter for Billing

12.4.1 This option shall be possible through all the communication means given in clause 12.1.6.

12.4.2 This option shall allow the user to read the meter from a preset list of billing features called billing scheme.

12.4.3 The billing features of the meter may be displayed on a dialogue box through which one can select the required features and store in the billing scheme. One of the many-stored billing schemes shall be selected and used for reading the meter for billing purpose.

12.4.4 The readable billing features are as given below:

1. Meter number.
2. All energy tariff registers listed in clause 9.1.



12.4.5 After reading the billing features it shall be displayed on the screen.

12.4.6 All billing readings taken on a single day shall be appended to one file and stored with user name and the date of reading as a reference and later on it may be exported to the mainframe computer in a different data format for billing purpose.

12.5 Reading the Load Profile Data

12.5.1 This option shall be possible through all the communication means given in clause 12.1.6.

12.5.2 This option shall allow the user to download the load profile data from the meter and store in a file with meter number and the date of reading as the reference.

12.5.3 This option shall have a variety of features to incorporate the acquired load profile data into charts and reports to produce flexible and user defined data analysis.

12.6 Data Export

12.6.1 This function shall allow the user to select the required item from the billing features mentioned in clause 12.4.4 and export the corresponding readings to main frame computer format or one of the data format given in clause 12.6.3. The meter numbers and readings are stored in a file as mentioned in clause 12.4.6 from which the user shall select a group of meters for which the data are to be exported.

12.6.2 This function shall also allow the user to export the load profile data to one of the data format given in clause 12.6.3. This data represents the load profile data of a single meter stored in a file as mentioned in clause 12.5.2.

12.6.3 The required export file formats are TXT, EBCDIC, CSV, Microsoft XLS, EDIFACT MSCONS and XML The file extension shall reflect the file format and the export file name shall be given by the user.

12.6.4 Data Export shall be compliant to the standard SAP interface like SAP-ISU CSS and SAP-ISU EDM and must have SAP approval.

13.0 MARKING OF METERS

13.1 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.

13.2 Name-plate shall include the following information:

1. The Manufacturer's name or trademark and place of manufacturing
2. Designation and type
3. The number of phases and the number of wires for which the meter is designed
4. The serial number
5. Year of manufacture
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
7. The rated current and the rated maximum current; for example: 1.5(6) Amps
8. The reference frequency in Hertz, for example: 60 Hz
9. The meter constant in the form Imp/kWh and Imp/kvarh
10. The accuracy class index of the meter
11. The reference temperature if different from 23°C
12. "Property of SEC"
13. SEC Monogram
14. SEC purchase order number
15. SEC item number

13.3 The meter connections shall be suitable for CT and CT&VT-operated metering arrangements as given in Drawing Nos. SEC/KWH-S-03 & 04 respectively. Applicable connection diagram shall be indelibly marked inside the terminal cover of every meter.

14.0 PACKING

- 14.1 Each meter shall be packed in an individual carton capable of withstanding the rigorous of transportation by Air or Sea or Truck. Other packing / shipping requirements shall be given in SEC General Specification 01-SDMS-01 (latest revision).
- 14.2 Materials department shall be contacted for the details of SEC packing requirements.



15.0 GUARANTEE

- 15.1 The Vendor shall guarantee the meters against all defects arising out of faulty design or workmanship or defective material for a period of two years from the date of commissioning or three years from the date of delivery whichever comes first. SEC certificates for date of commissioning shall be accepted.
- 15.2 The meters shipped to SEC warehouse shall be subjected to verification test in the SEC laboratory to satisfy all the requirements given in this specification.
- 15.3 The vendor/manufacture shall guarantee the meter to have more than a 15-year life time. The life time shall verified through the Reliability prediction test (according to IEC 62059-41) performed by domestic or international authorized test agencies.
- 15.4 SEC will carry out the verification test for every meter or on a sample basis. SEC shall specify the method of testing and test reports, and certificates shall be acceptable by the manufacturer.
- 15.4.1 Sample Testing:
Testing (acceptance and rejection) shall be as per IEC-62053-21 and IEC- 1358.
- 15.4.2 Every meter Testing:
Every meter that is shipped to SEC warehouse shall be tested. The meters that are failed in accuracy verification test shall be returned to the manufacturer for replacement.
- 15.5 If equipment and software not mentioned in this technical specification are needed to complete the system performance, the vender/manufacture shall take the responsibility to supply the additional equipment and software free of charge.
- 15.6 Even though the vender/manufacture passed the inspection test executed by SEC, it is the vender/manufacture's responsibility of quality assurance for the relevant items of contract conditions, and the responsibility cannot be exempt.
- 15.7 Because this technical specification only describes the outline of Electronic Revenue Meter, the vender/manufacture shall add the required items and manufacture optimal Electronic Revenue Meter ensuring the interoperability between AMR/AMM Server (FEP) via GSM/GPRS network (and PLC network) and electronic revenue meters using RS-485



interfaces.

- 15.8 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. SEC interpretation of this Specification shall be accepted.

16.0 SUBMITTALS

The following documents shall be submitted by vendor / manufacturer along with the bidding document:

- 16.1 Filled in data sheets.
- 16.2 Original/clear copy of catalogues for offered item(s).
- 16.3 Copy of type and routine test reports for the offered/identical meter. The type test report shall be obtained from an independent testing agency prior to delivery.
- 16.4 Copy of DLMS/COSEM conformance test certificates for each type of meter prior to delivery.
- 16.5 Reference List and experience.
- 16.6 Drawing for the following items:
1. Connection diagram
 2. Overall dimensions
 3. Mounting details
 4. Sealing arrangement
 5. Name-plate
 6. Terminal cover
- 16.7 Sample:
- 16.8 At least one sample meter for each type should be submitted before delivery for final approval. The sample should include a HHU, an optical probe, the software and operational manual for software.
- 16.9 At least one GSM/GPRS Gateway, one PLC modem and DCU compliant with the 40-SDMS-03 Rev.02 40-SDMS-04 Rev.00 and 40-SDMS-05 Rev.00 shall be delivered with the sample in order to assure the interoperability with other manufacturers' products in an AMR/AMM environment for final approval.

**17.0 TESTING**

17.1 A sample meter of a particular type from a vendor / manufacturer shall be declared acceptable to SEC only if the meter satisfy this specification and the type test in all respects. In case of any conflict the decision of SEC shall be final.

17.2 Type Test

17.2.1 Type test of the meter shall include but not limited to the following test:

Table No.8 - Type tests

Description	Related clauses
Tests of insulation properties	in IEC 62052-11
Impulse voltage tests	7.3.2
AC voltage tests	7.3.3
Tests of accuracy requirements	in IEC 62053-21
Test of meter constant	8.4
Test of starting condition	8.3.3
Test of no-load condition	8.3.2
Test of error due to influence quantities	8.2
Test of error due to variation of the current	8.1
Tests of electrical requirements	
Test of power consumption	7.1 of 62053-21
Test of influence of supply voltage	7.1 of 62052-11
Test of influence of short-time over-currents	7.2 of 62053-21
Test of influence of self-heating	7.3 of 62053-21
Test of influence of heating	7.2 of 62052-11
Test of immunity to earth fault	7.4 of 62052-11
Tests for electromagnetic compatibility (EMC)	in IEC 62052-11
Radio interference suppression	7.5.8
Fast transient burst test	7.5.4
Damped oscillatory waves immunity test	7.5.7
Test of immunity to electromagnetic RF fields	7.5.3
Test of immunity to conducted disturbances, induced by radio-frequency fields	7.5.5
Test of immunity to electrostatic discharges	7.5.2
Surge immunity test	7.5.6



Description	Related clauses
Tests of the effect of the climatic environments	in IEC 62052-11
Dry heat test	6.3.1
Cold test	6.3.2
Damp heat, cyclic test	6.3.3
Solar radiation test	6.3.4
Mechanical tests	in IEC 62052-11
Vibration test	5.2.2.3
Shock test	5.2.2.2
Spring hammer test	5.2.2.1
Tests of protection against penetration of dust and water	5.9
Test of resistance to heat and fire	5.8

17.3 Routine Test

17.3.1 Routine test shall be performed for each meter that has been delivered to the SEC Central Stores. The manufacturer's seal shall be taken as an indication that each meter has been tested and conformed to this specification and respective IEC specifications.

17.3.2 Certified and complete routine test report for meters shall be submitted for SEC review/approval prior to shipment.

17.3.3 Routine test of the meter shall include but not limited to the following:

1. Test of meter constant: 8.4 of IEC 62053-21;
2. Test of starting condition: 8.3.3 of IEC 62053-21;
3. Test of no-load condition: 8.3.2 of IEC 62053-21;
4. Test of error due to influence quantities: 8.2 of IEC 62053-21;
5. Test of error due to variation of the current: 8.1 of IEC 62053-21;
6. Test of power consumption: 7.1 of IEC 62053-21.



18.0 TECHNICAL DATA SHEETS

ELECTRONIC REVENUE CT & CT/VT 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		
6	DESIGN AND CONSTRUCTION		
	1. Meter case	Nonmetallic	
	2. Window material	Glass / Polycarbonate	
	3. Terminal bore diameter	See 6.2.2	
	4. Terminal cover	Short cover	
	5. Overall & mounting dimensions (mm)		
	6. Top suspension & bottom mountings	Metallic / Hard plastic	
	7. Optical port	Front of meter	
	8. Two RJ-45 Terminals for RS-485	Terminal block	
	9. Connector for output relay	Terminal block	
	11. PLC Signal Interface	Terminal Block	
	10. Weight (kg)		
7	ELECTRICAL REQUIREMENTS		
	1. Rated current (In)	≤ 5 A	
	2. Maximum current (Imax)	≥ 5 A	
	3. # of elements (stators)	2 for CT&VT 3 for CT	
	4. Temperature rise - Windings - External surface		
	5. Power consumption (VA / Watt) - Voltage circuit (per phase) - Current circuit * CL = 0.5	2W and 10 VA 1 VA	



ELECTRONIC REVENUE CT & CT/VT 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 Table 3 of IEC 62053-21	
	8. Starting current (% of rated current (In))	As per clause 7.7.5 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 62053-31	
8	INPUT AND OUTPUT REQUIREMENT		
	1. LCD Display - Arrangement - Max operation temperature	As Drawing No. SEC/KWH-S-05 or equivalent As per clause 4 of this spec	
	2. Constant for optical pulse output - For active energy (pulse/kWh) - For reactive energy (pulse/kVarh)		
	3. Optical interface for HHU	As per IEC 62056-21	
	4. Communication interfaces - Local communication interface - PLC signal interface	RS-485 460V/2.5A	
	5. Rating of output relay	250V / 1A	



SEC DISTRIBUTION MATERIALS SPECIFICATION

40-SDMS-02A, Rev. 06

DATE: 12-03-2010G

ELECTRONIC REVENUE CT & CT/VT 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. Battery - Guaranteed life - Whether replaceable? - Battery fail indicator	Required 10 years Yes Required	
	9. Super Capacitor - Guaranteed life	Yes/No Not specified	
	10. 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	
	11. Instantaneous measurement	Required	
	12. Default settings	Required	
16	SUBMITTALS		
	1. Submittals as per this specification	Yes/No	
17	SEC DLMS/COSEM OBIS CODE SPECIFICATION SUPPLEMENTARY		
	1. Submittals as per this specification	Required	



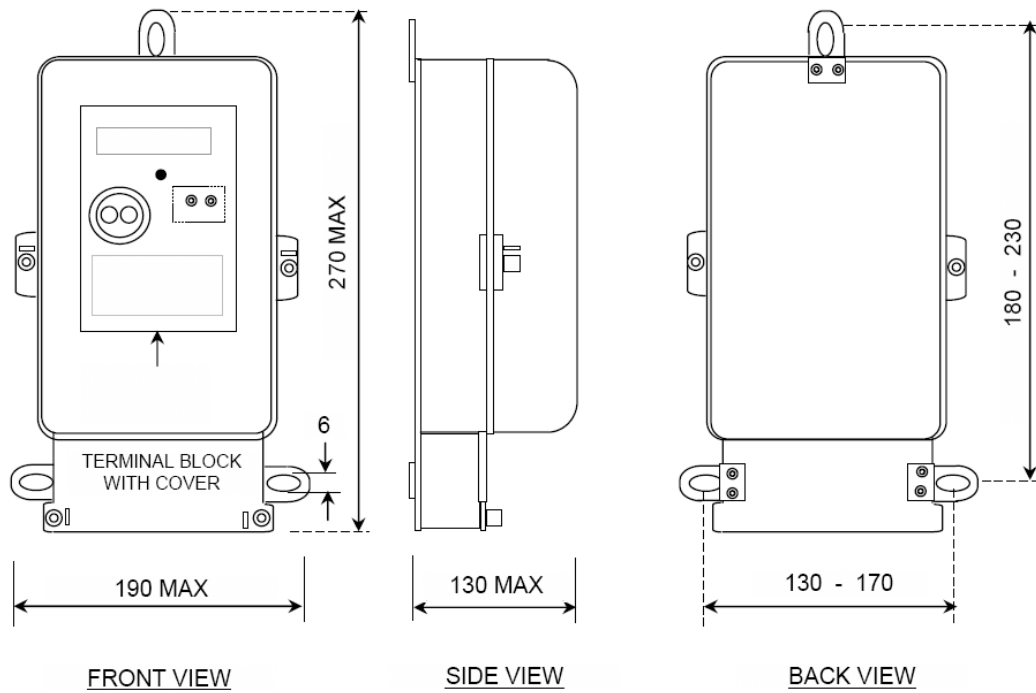
ELECTRONIC REVENUE CT & CT/VT METERS

SEC Inquiry No. _____ Item No. _____

(Sheet 4 of 4)

- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES SPECIFIED BY SEC:
- 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:

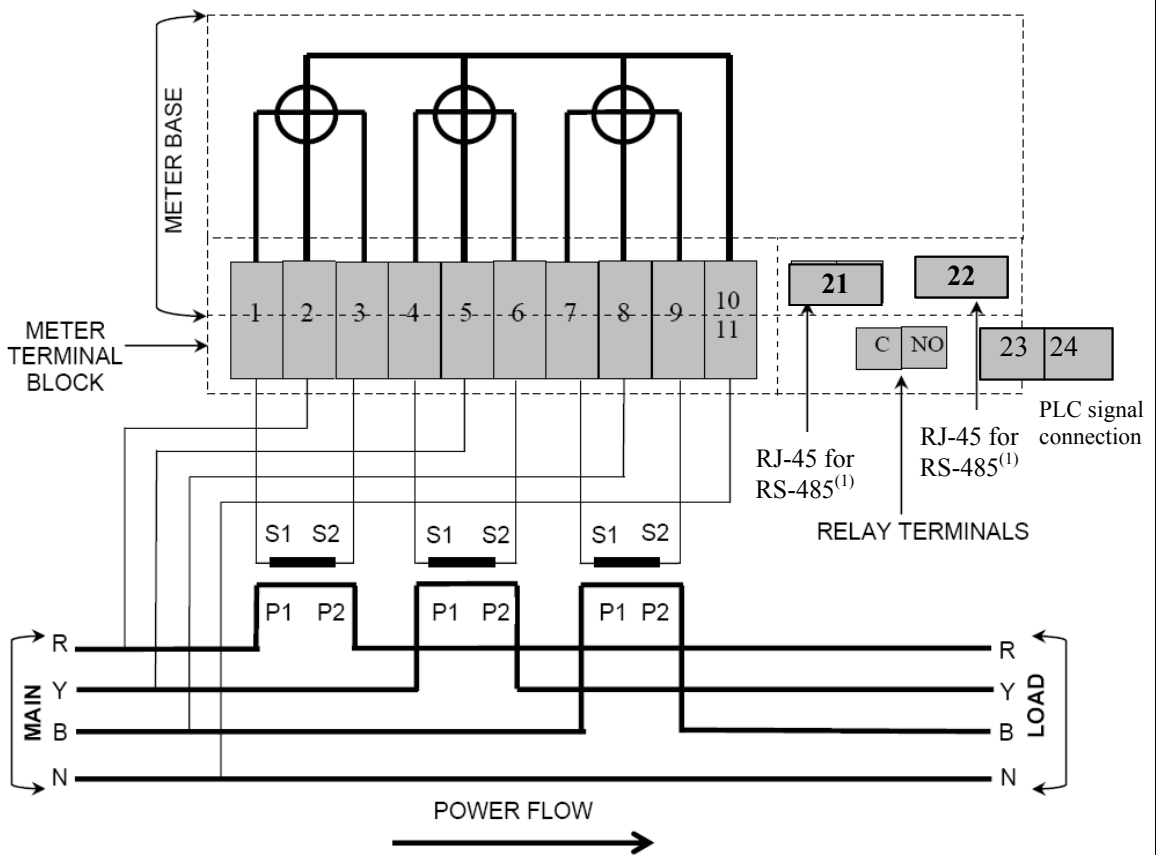
	MANUFACTURER OF MATERIALS/EQUIPMENT	VENDOR / SUPPLIER
Name of Company		
Location and Office address		
Name and signature of Authorized Representative and Date		
Official Seal / Stamp		



**ELECTRONIC KWH METER
OVERALL AND MOUNTING DIMENSIONS**

DRAWING No.
SEC/KWH-S-01

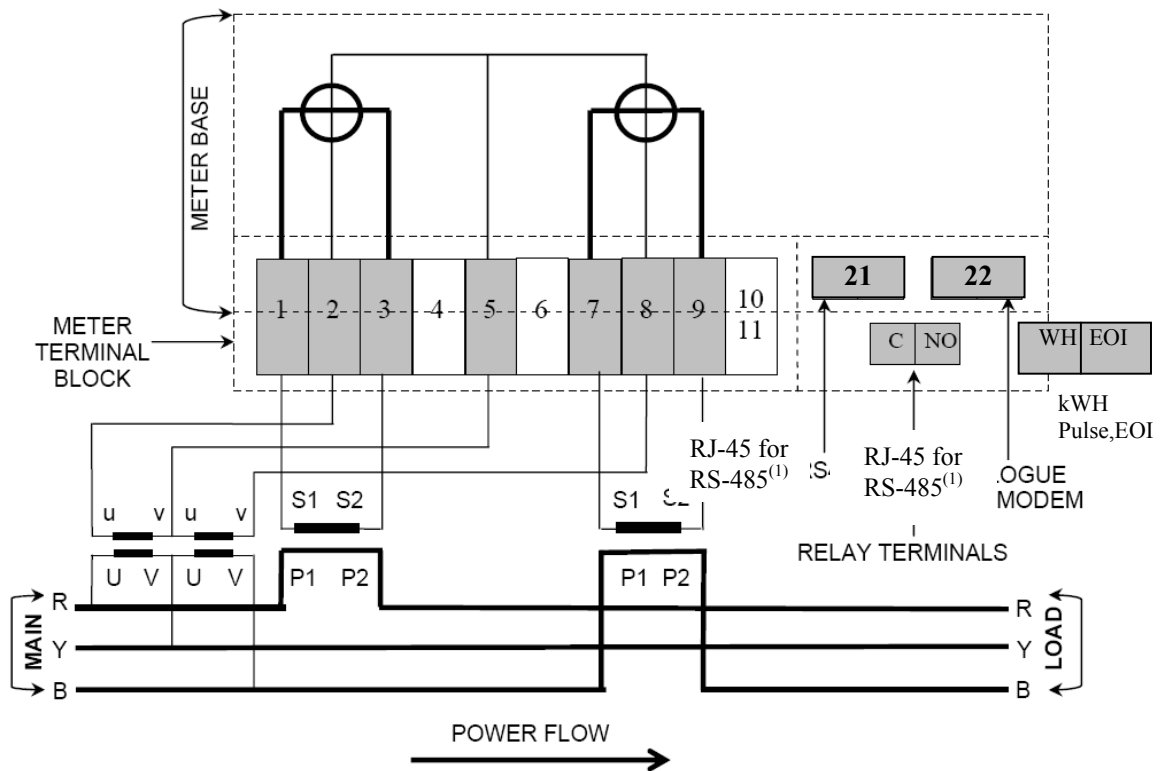
Note: All dimensions are in millimeters with appropriate tolerance.



**CONNECTION ARRANGEMENT FOR 3 PHASE 4 WIRE
CT OPERATED 127/220V OR 220/380V
ELECTRONIC KWH METER**

DRAWING No.
SEC/KWH-S-03

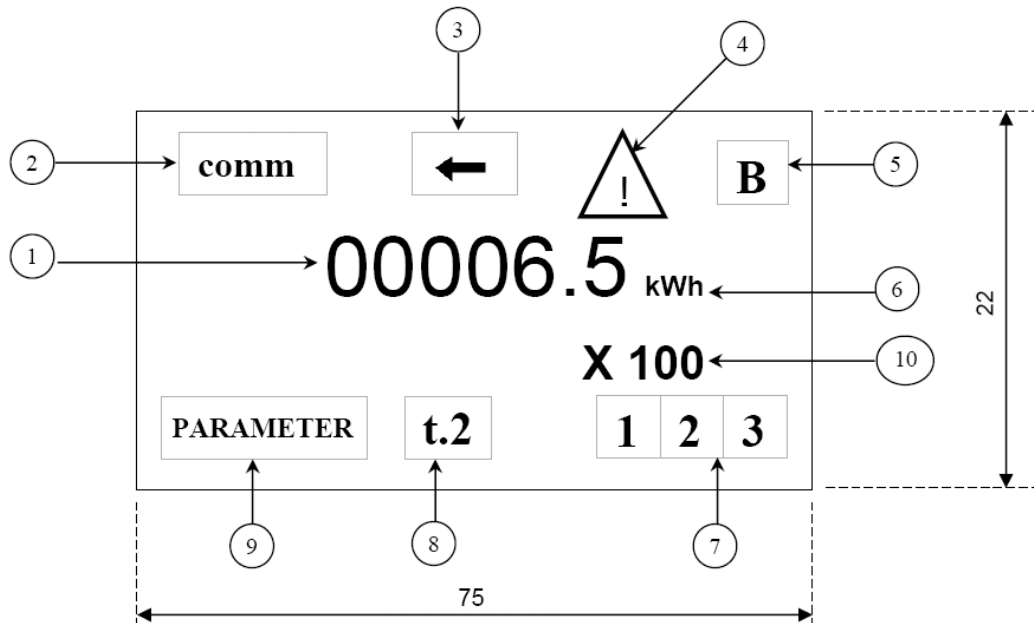
- (1) Refer to clause 8.3.2 of RS-485 interface (21,22) for further details
- (2) Refer to clause 8.4 of PLC signal connection (23,24) for further details



CONNECTION ARRANGEMENT FOR
3 PHASE 3 WIRE CT - VT OPERATED 110V
ELECTRONIC KWH METER

DRAWING No.
SEC/KWH-S-04

- (1) Refer to clause 8.3.2 of RS-485 for further details
- (2) Refer to clause 8.7 of kWh-Pulse output, EOI signals for further details



1. Register value / other metering parameter indicator.
2. Communication indicator.
3. Reverse direction indicator.
4. Anomaly indicator.
5. Battery low 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. Multiplication factor.

DISPLAY ARRANGEMENT

DRAWING No.
SEC/KWH-S-05

Note: All dimensions are in millimeter.
Register digits 6 to 10mm height and all other parameters 3 to 6mm height.