# WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

## STANDARD

## TECHNICAL SPECIFCATION

**FOR**

**3-PHASE 4-WIRE CT OPERATED FULLY STATIC AMR COMPATIBLE TRI-VECTOR ENERGY METERS**

**FOR**

**DISTRIBUTION TRANSFORMERS**

*Prepared for*

R-APDRP PROJECTS

**TECHNICAL SPECIFICATION FOR 3-PHASE 4-WIRE CT OPERATED FULLY STATIC AMR COMPATIBLE TRI-VECTOR ENERGY METERS**

## 1.0 SCOPE

Design, manufacturing, testing, supply and delivery of AC, 3 Phase, 4 Wire, CT / PT (if necessary) operated fully Static and AMR compatible Tri-Vector Energy Meters for measurement of different electrical parameters listed elsewhere in the document including Active Energy (KWH), Reactive Energy (KVARH), Apparent Energy (KVAH) etc. The detail scope is given below.

## 2.0 APPLICATION

- On Distribution Transformers

## 3.0 STANDARDS TO WHICH METERS SHALL COMPLY

Guidelines on "Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification" enclosed with this document as annexure.

IEC 62056-21 Electricity metering: Data exchange for meter reading, tariff and load control-Part 21: Direct local data exchange

IEC 62056-31 Electricity metering: Data exchange for meter reading, tariff and load control - Part 31: Local Area Network data exchange

IEC 62056-61 Electricity metering: Data exchange for meter reading, tariff and load control-Part 61: Object identification system (OBIS)

IS-14697 Specification for AC Static Transformer operated Watt Hour & VAR-Hour meters (class 0.5S);

IEC 62052-11 Electricity metering equipment (AC) –General requirements, tests and test conditions -Part 11: Metering equipment;

IEC 62053-22 Electricity metering equipment (AC) –Particular requirements - Part-22: Static Meters for Active Energy (Class 0.5S);

IS-15707 Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice

The equipment meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standard mentioned above, also shall be considered; in case of conflict the Guidelines on "Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification" enclosed with this document as annexure shall prevail upon.

## 4.0 GENERAL TECHNICAL REQUIREMENTS

| | | |
|---|---|---|
| 1 | TYPE | AMR Compatible Static, 3 Ph, 4 Wire Tri-Vector Energy Meter for Distribution Transformers |
| 2 | FREQUENCY | 50 Hz ±5% |
| 3 | ACCURACY CLASS | 0.5S |
| 4 | SECONDARY VOLTAGE | Suitable for operation from 415 Volt Ph-Ph /or 240 Volt Ph-N |
| 5 | BASIC CURRENT (Ib) | -/5 Amps. |
| 6 | MAXIMUM CONTINUOUS CURRENT | 2.0 Ib; Starting and Short time current shall be as per IS-14697 |
| 7 | POWER CONSUMPTION | The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 1. 5 W and 8 VA.<br><br>The apparent power taken by each current circuit, at basic current, reference frequency and reference temperature shall not exceed 1.0 VA |
| 8 | POWER FACTOR | 0.0 Lag -Unity- 0.0 Lead |
| 9 | DESIGN | Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.05 class) software based test bench.<br><br>Assembly of electronic components shall be as per ANSI/IPC-A-610 standard. |

## 5.0 CONSTRUCTIONAL REQUIREMENT/ METER COVER & SEALING ARRANGEMENT

Wherever poly carbonate cover is specified, it shall conform to IS 11731 (FH-1category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS:11000 (part 2/SEC-1) 1984 OR IEC PUB,60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test As per UL 94 or As per IS 11731(Part-2) 1986.

## 5.1 CONSTRUCTION

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance

under all conditions especially during heavy rains / very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter

should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover. This is to be achieved by using continuous Ultrasonic welding on the Meter body or any other technology which is either equally or more efficacious.

The meter should comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter should be of high quality and there should be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter should be compatible with 16 Bit (or better) ASIC with compatible processor and meter should be based on Digital measuring and sampling technique.

The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent, for easy reading of displayed parameters, and observation of operation indicators. The meter base may or may not be transparent, but it should not be black in colour. The meter casing should not change shape, colour, size, dimensions when subjected to 200 hrs on UV test as per ASTMD 53. It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75.

The meter cover should be sealable to the meter base with at least 2 nos. seals.

**The bidder shall submit relevant documents regarding the procurement of polycarbonate material. The polycarbonate material of only the following manufacturers shall be used.**

| | |
|---|---|
| **a) G.E. Plastics :** | **LEXAN 943A or equivalent for cover & Terminal cover/ LEXAN 503R or equivalent base.** |
| **b) BAYER :** | **Grade corresponding to above** |
| **c) DOW Chemicals :** | **-Do-** |
| **d) MITSUBISHI :** | **-Do-** |
| **e) TEJIN :** | **-Do-** |
| **f) DUPONT :** | **-Do-** |

## 5.2 METER CASE AND COVER

The meter should have a case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal and cover. This is to be achieved by used of **Ultrasonic Welding** (Ultrasonically continuously welded at three sides so that the cover cannot be separated from the basic without breaking/damaging the case & cover) or any other technology which is either equally or more efficacious. In case, ultrasonic welding using plate / strip is used the material of plate / strip should be same as that of

cover and base and the strip. The manufacturer‟ s logo should be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.

The meter cover should be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws should be covered with transparent caps, ultrasonically welded with the meter body and the screw covers should be embedded in the meter body in a groove.

The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.88.

**5.3 TERMINAL BLOCK AND COVER :**

The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with nickel plated brass inserts / alloy inserts for connecting terminals.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor with the help of screw adjustable metal plates to increase the surface of contact and reduce the contact resistance. The screws shall have thread size not less than M4 and head having 4-6mm. Diameters.

**The screws shall not have pointed ends at the end of threads.** All terminals and connecting screws and washers should be of tinned / nickel plated brass material.

The internal diameter of terminal hole should be minimum 5.5 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

The terminal cover shall be transparent re-inforced Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover should be sufficient to accommodate adequate length of external cables.

**6.0 WORKING ENVIRONMENT**

As per IS 14697-1999 (reaffirmed 2004). Meter to perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS)

Meter body will conform to IP51 degree of protection. For outdoor use meter shall be installed in sealed in sealed enclosure conforming to IP55 degree of protection.

The meter shall be suitable designed for satisfactory operation under the hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such

protective finish, which provided suitable protection to them from any injurious effect of excessive humidity.

**7.0 MANUFACTURING PROCESS, ASSEMBLY AND TESTING**

Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs/Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs/C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB should undergo functional testing using computerized Automatic Test Equipment.

Fully assembled and finished meter shall under go 'burn-in' test process for 24 Hours at 55 degree Celsius (Max. temperature to not exceed 60 degree Celsius) under base current (Ib) load condition.

Test points should be provided to check the performance of each block/stage of the meter circuitry.
RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

**8.0 DISPLAYS**

The meter shall have 7 digits (with ±indication), parameter identifier, backlit Liquid Crystal Display (LCD) of minimum 10 mm height, wide viewing angle. Auto display cycling push button required with persistence time of 10 Seconds. LCD shall be suitable for temperature withstand of 70 deg C; Sequence of display of various instantaneous electrical parameters shall be as desired by Purchaser at the time of order.

The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

**9.0 PERFORMANCE UNDER INFLUENCE QUANTITIES**

The meters performance under influence quantities shall be governed by IS 14697-1999 (reaffirmed 2004). The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 14697 (latest version).

**10.0 OUTPUT DEVICE**

Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front and test output device shall be provided in the form of LED.

Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes.

**11.0 REAL TIME INTERNAL CLOCK (RTC)**

RTC shall be pre-programmed for 30 Years Day/date without any necessity for correction.
The maximum drift shall not exceed +/- 300 Seconds per year.
The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following:

a) Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter;
b) From remote server through suitable communication network or Sub-station data logger „PC" .

**12.0 QUANTITIES TO BE MEASURED & DISPLAYED**

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc as per details given in the table below and enclosed annexure A2.1 & A2.2.

b) Block Load Profile Parameters such as kVAh, kWh, kVArh (lag, lead), phase voltages, currents etc as per details given in the table below and enclosed annexure.

In addition to above the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters (Table 5.1, 5.2, 6.1 to 6.6 and 6.8 respectively of enclosed document)

Detail of category wise parameters requirement suitable for specific location such as feeder/DT metering, interface points/boundary points is given in following tables of guidelines document enclosed as annexure:

| Category | Parameter group | Annexure Table No. |
|---|---|---|
| Substation Feeder/ Distribution Transformer meter | Instantaneous parameters | A2.1 |
| | Block Load Profile parameters | A2.2 |
| Boundary/Ring fencing/Interface Meters | Instantaneous parameters | A3.1 |
| | Block Load Profile parameters | A3.2 |
| | Daily Load Profile parameters | A3.3 |
| HT Consumer Meters | Instantaneous parameters | A4.1 |
| | Block Load Profile parameters | A4.2 |
| | Current Cycle parameters | A4.3 |

| | | |
|---|---|---|
| | Billing Profile parameters | A4.4 |
| Substation Feeder/ Distribution Transformer/Boundary/Ring fencing/Interface/HT Consumer Meters | Name Plate details | A5.1 |
| | Programmable Parameters | A5.2 |
| | Event Conditions | A6.1 to A6.6 & A6.8 |

### 12.1 Measurement of Energy

The meter should be capable of measuring fundamental energy as well harmonics energy i.e. total energy. Total energy shall be made available on meter-display and the same only shall be used for billing purpose.

The total energy shall be logged in the meter memory and be capable of downloading to the BCS through the HHU and be available for viewing at the BCS end.

## 13.0 DEMAND INTEGRATION PERIOD

As per enclosed guidelines document.

## 14.0 MD RESET

It should be possible to reset MD by any of the following options:

- Remote MD reset
- Local MD Reset for manually triggered at site.
- MD reset by HHU through Authenticated command.

## 15.0 MARKING OF METERS

The marking of meters shall be in accordance with IS: 14697 /1999 (reaffirmed 2004).

The meter shall also store name plate details as given in the table A5.1 of annexure. These shall be readable as a profile as and when required.

## 16.0 COMMUNICATION CAPABILITY

The meter shall be provided with two ports for communication of the measured/collected data as per document enclosed in the annexure, i.e. a hardware port compatible with RS 232 or RS 485 specifications which shall be used for remote access through suitable Modem (GPRS/GSM/EDGE/CDMA/ PSTN/LPR) and an Optical port complying with hardware specifications detailed in IEC-62056-21. This shall be used for local data downloading through a DLMS compliant HHU.

The RS 485 port shall be used at Substations suitable for multi-drop connections of the meter for exporting data to sub-station data logger/DCU/Computer and the remote end server. The RS 232 port shall be used at boundary points meters and Distribution Transformer meters capable to transfer and export data to the remote end server through suitable communication mediums (GPRS/GSM/EDGE/CDMA/ PSTN/LPR). Both ports shall support the default and minimum baud rate of 9600 bps.

## 17.0 HAND HELD UNIT (HHU)

To enable local reading of meters data a DLMS compliant HHU shall be used. The HHU shall be as per specification given in the enclosed guidelines document. It shall be compatible to the DLMS compliant energy meters that are to be procured/ supplied on the basis of this specification.

## 18.0 TAMPER & FRAUD MONITORING FEATURES

The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Vibrations, harmonic Distortion, Voltage/Frequency Fluctuations, and electromagnetic High Frequency Fields etc. The meter shall be immune to abnormal voltage/frequency generating devices and shall record the occurrence and restoration of such tamper events along with parameters such as current, voltages, kWh, power factor, event code, date & time etc. (listed in Table A 6.1 to A 6.8 in enclosed document).

Tamper details shall be stored in internal memory for retrieval by authorized personnel through either of the following:

i) HHU.

ii) Remote access through suitable communication network.

Minimum 200 numbers of events (occurrences & restoration with date & time) should be available in the meter memory.

## 19.0 TYPE TESTS

The meter offered should have successfully passed all type tests described in the IS 14697 and the meter Data Transfer and Communication capability as per enclosed guidelines document. Type test certificate shall be submitted along with the offer and the same shall not be more than 36 months old at the time of bid submission. Make & type of major components used in the type-tested meter shall be indicated in the QAP. *The condition are to be relaxed by the purchasers (utilities) for the bids to be issued in next six months (i.e. upto Feb 2010) to accommodate design, development and testing of the new standard meters, conforming to the guidelines document enclosed as annexure, by manufacturers. The bidder shall have to submit the required type test certificate along with tested energy meters (as per bid requirement)to the purchaser (utility) at the time of meters delivery.*

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix-C of CBIP 88 / NPL / CQAL/ ERTL / ERDA at the sole discretion of the Purchaser. The supplier has no right to contest the test results of the third party lab or for additional test and has to replace/take corrective action at the cost of the supplier.

It shall be the responsibility of the supplier to arrange such tests and Purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser.

Manufacturer shall have to submit a certificate confirming that as the basic design of the meter as per IEC 62056 protocol & DLMS compliant has not been changed & only firmwire has been modified, no fresh type test for such type of meter is required.

Conformity test certificates with DLMS logo issued by CPRI, Bangalore i.r.o. additional features/tests should be submitted with the bid as per guideline of CEA dt. 25.01.2010.

**20.0 ACCEPTANCE & ROUTINE TESTS**

Criteria for selection for such tests and performance requirements shall be as per IS 14697-1999 (reaffirmed 2004)

Additional acceptance shall include Surge withstand (SWC) for 6 $kV_p$ as per IEC 62052-11, Lightning impulse and HF disturbance as per IS 14697. One sample meter per order from one of the offered lot shall be subjected to these specified tests. Meters subjected to these tests shall not be used after tests.

Accuracy tests shall be performed at the beginning and at the end of the acceptance tests specified.

**20.1 INSPECTION**

The inspection shall be carried out at any stage of manufacture, by the WBSEDCL‟s authorised representatives, with 15 days prior intimation to the supplier. The manufacturer shall grant all reasonable facilities free of charge for inspection and testing to satisfy the purchaser that the materials to be supplied are in accordance with their specification.

The supplier shall keep the WBSEDCL informed in advance, about the manufacturing programme so that the arrangement can be made for inspection.

The representative / Engineer of the WBSEDCL attending the above testing shall carry out testing as per relevant standards and issue test certificate approval to the manufacturer and give clearance for dispatch.

**21.0 QUALITY ASSURANCE**

The manufacturer shall have a comprehensive quality assurance program at all stages of manufacture for ensuring products giving reliable, trouble free performance. Details of the bidder‟s quality assurance and test set up shall be furnished with the bid. A detailed quality assurance program shall be finalized with the successful bidder during the award stage. Bidder shall furnish following information along with his bid :

i) Organization structure of the manufacturer and his main sub-suppliers (PCBs, SMT cards, CT/PT) with details of „QA‟ setup, overall workflow;
ii) Copy of system manual showing „QAP‟ (Quality Assurance Plan) as actually practiced during manufacturing and final testing.
iii) List of raw materials and critical components (ASIC chip, crystal clock, memory register Chip, transformers, optical ports etc.) with their suppliers;
iv) Stage inspection of product before final testing;
v) Procedure adopted for „In-situ‟ testing of PCBs, after placement of surface mounted component, for quantitative parametric variation of tolerance by self or sub-contractor.

vi) Testing and calibration facility, date of calibration of test bench, manpower data of bench operators;

vii) Sample copies of test certificate of bought out components.

## 22.0 QUALIFYING REQUIREMENTS

i) Bidder should be a manufacturer;

ii) He should have all the facility in his works for design, assembly, quality assurance, burn-in test (Fully assembled Energy Meter), testing (all routine and acceptance tests), automatic calibration of Energy Meter on software based test bench, qualified team of technical and software engineers;

iii) The average annual turnover of the manufacturer for Energy meters for the three (3) best financial years out of last five (5) years, should be at least Rs 6.0 Crore.

iv) Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, should the circumstances warrant such assessment in the overall interest of the Purchaser.

## 23.0 GUARANTEE

Equipment (Meter) supplied shall be guaranteed for a period of 66 months from the date of supply or 60 months from the date of installation, whichever ends later. Bidders shall guarantee to repair or replace the meters and meter boxes (if supplied), which are found to be defective/ inoperative at the time of installation, or become inoperative/ defective during guarantee period. Replacements shall be effected within 1 month from the date of intimation.

The bidder shall extend the guarantee period for another 5 years for the replaced meters. However the backup bank guarantee provided by the bidders shall be valid for 2 years only.

## 24.0 FIXING & CONNECTION ARRANGEMENT

Manufacturer shall ensure following technical points :

i) Meter shall be suitable for mounting on Simplex type vertical panel with front door; CAT-M4 disconnecting type TBs to be used for Current circuit; Panel wiring to be properly dressed and harnessed; External cables to enter panel from bottom gland plate using double compression glands.

ii) Energy Meter terminals block shall be adequately sized with regard to maximum conductor dimension, commensurate with current rating of Energy Meter.

## 25.0 SUPPLY OF POWER PACK & HHU

For every 100 meters and part thereof one power pack unit for external use (not applicable for separate internal battery back up unit) and one HHU of 8MB RAM size should be supplied free of cost. Power pack unit & HHU shall be guaranteed for a period of 66 months from the date of supply. Bidders shall guarantee to repair or replace Power pack unit & HHU (if supplied), which are found to be defective/ inoperative at the time of installation, or become inoperative/ defective during guarantee period. Replacements shall be effected within 1 month from the date of intimation.

## 26.0 SUBMISSION OF SAMPLE & DOCUMENTS

Tender paper will be submitted to the office of the Material Controller, WBSEDCL, Bidyut Bhavan, 10th floor, Block – A & D, Salt Lake, Kol-91, on any working day, from 11.00 Hrs to 16.00 Hrs. on week days & from 11.00 Hrs to 12.00 Hrs on Saturday within the specified period of submission of the tender document for which he will be given a receipt by the Office of the Material Controller.

The bidder will submit his sample Meters in sealed casing / cartoon along with relevant documents as per Schedule - D, on any working day, from 11.00 Hrs to 16.00 Hrs. on weeks days & from 11.00 Hrs. to 13.00 Hrs. on Saturday within the specified period of submission of tender documents latest by 16.00 Hrs. on the last day of submission of bid to the Office of the Chief Engineer (DTD), Abhikshan, Sec-V, Salt Lake, Kolkata-91.

The bidder will be given a receipt, jointly signed by the bidder and DTD officials, mentioning the samples and papers submitted by the bidder as per check list.

a) While submitting the samples and required documents as per Schedule D, the bidder has to submit two numbers of sealed meters as per the specifications stated herein before, without the welding of the meter base and cover and body screw caps.

b) They should also submit one prototype of meter base and cover (with body screw caps) properly welded.

c) The date of testing of sample meters will be intimated to the bidders by C.E.(DTD) and on the date of testing of sample meters of a particular bidder, he shall come prepared with the following :

- BCS (as per specification)
- HHU compatible with BCS and loaded with HHU software and laptop compatible with BCS.
- Any other accessories required for observing the performance and capabilities of the meters.
- Operating/threshold value at which the meter will record energy as per specified limits of errors and also logic at which meter log tamper at different tamper conditions.
- Power Pack Unit (if required)

**During such testing, other bidders will also be allowed to witness the testing.**

## 27.0 DOCUMENTATION

Sets of operating manuals shall be supplied to the office of the Chief Engineer (DTD) and to different consignees at the time of delivery of meters.

**One set of routine test certificates shall accompany each dispatch consignment.**

**28.0 PACKING & FORWARDING**

The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

The packing shall be done as per the standard practice as mentioned in IS 15707 : 2006. Each package shall clearly indicate the marking details (for e.g., manufacturer‟ s name, Sl. Nos. of meters in the package, quantity of meter, and other details as per supply order). However, he should ensure the packing is such that, the material should not get damaged during transit by Rail / Road.

**SCHEDULES:**

The Bidder shall submit the following schedules, which is part and parcel of the Specification.

Schedule A Guaranteed Technical Particulars (as per enclosed Standard Format)

Schedule B List of Raw Materials (as per enclosed Standard Format)

Schedule C Pre-qualification Conditions.

Schedule D List of Documents to be submitted during sample submission.

Schedule E Deviations from Specified Standards (as per standard format of the bidder).

Schedule F Deviations from Specified test Requirements (as per standard format of the bidder).

Schedule G Deviations from Technical Specification
(as per Annexure-IV – Deviation Sheet of GCC)

Schedule H Bidder‟ s experience (as per standard format of the bidder and also Copies of orders executed along with GTP of the supplied meters)

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**SCHEDULE A**

**GUARANTEED TECHNICAL PARTICULARS**

| Sl.No. | Description | To be specified by Manufacturer |
|---|---|---|
| 1 | Maker" s name and country | |
| 2 | Type of meter/model | |
| 3 | Standards Applicable | |
| 4 | Accuracy/Interface class | |
| 5 | Parameters displayed | |
| 6 | P.F. Range | |
| 7 | Basic Current (Ib) (-/5A) | |
| 8 | Maximum Current ($I_{max}$) | |
| 9 | Minimum starting current | |
| 10 | Rated Voltage | |
| 11 | Meter constant | |
| 12 | Variation of voltage at which meter functions normally | |
| 13 | Rated Frequency | |
| 14 | Power Loss in Voltage circuit (VA & watt) & Current circuits (VA) | |
| 15 | Dynamic range | |
| 16 | MD reset Provisions | |
| 17 | Display : | |
| | a) Type of Register | |
| | b) No. of digits of display and height of character | |
| | c) Auto display mode & scroll mode | |
| | d) Type of push button for scroll mode | |
| 18 | Non volatile memory | |

| | | |
|---|---|---|
| 19 | Details of provision for taking reading during power off condition | |
| 20 | Principle of operation | |
| 21 | MD Integration period | |
| 22 | Weight of meter | |
| 23 | Dimensions | |
| 24 | Warranty | |
| 25 | Outline drawings & Leaflets | |
| 26 | a) Remote meter-readout facility | |
| | b) Communication protocol used. | |
| | c) Sealing provision for meter & optical port. | |
| | d) Baud rate of data transmission | |
| | e) Required software to be resident in HHU and BCS. | |
| | f) Ultrasonic welding of body | |
| | g) Manufacturers Seal provided | |
| 27 | Base Computer Software | |
| 28 | Type Test Certificates | |
| 29 | Time of Day Zones (Selectable) | |
| 30 | Whether meter measures both fundamental & Harmonic Energy | |
| 31 | Real Time Clock Accuracy | |
| 32 | Battery for Real Time Clock | |
| 33 | Anti Tamper Features | |
| 34 | Effect of accuracy under tamper conditions | |
| 35 | Drift in accuracy of measurement with time | |
| 36 | Name plate details | |
| 37 | Type of calibration | |

| | | |
|---|---|---|
| 38 | Type of mounting | |
| 39 | Testing facility | |
| 40 | Data retention by NVM without battery back up and un-powered condition | |
| 41 | Type of material used | |
| 42 | Base | |
| 43 | Cover | |
| 44 | Terminal Block | |
| 45 | Terminal cover | |
| 46 | Screw | |
| | (i) Material | |
| | (ii) Size | |
| 47 | Internal diameter of Terminal Hole | |
| 48 | Centre to Centre clearances between adjacent terminals | |
| 49 | Security Profiles | |
| | a) Basic Security | |
| | b) Advance Security | |
| 50 | Past experience | Copies of order executed in last 3 (three) years along with GTP of the supplied meters to be enclosed. Past experience to be considered for manufacturing meter as per IS: 14697 & CBIP-88/304 |

**SCHEDULE B**

**LIST OF RAW MATERIALS & CRITICAL COMPONENTS**

| Sl. no. | Raw Materials / Component | Make / Origin |
|---|---|---|
| 1. | Current Element | |
| 2. | Measurement / Computing chips | |
| 3. | Memory chips | |
| 4. | Display modules | |
| 5. | Communication modules | |
| 6. | Optical port | |
| 7. | Power Supply | |
| 8. | Electronic components | |
| 9. | Mechanical parts | |
| 10. | Battery | |
| 11. | RTC / Micro controller | |

**SCHEDULE C**

**PRE-QUALIFICATION CONDITIONS**

| Sl. No. | Particulars | Remarks |
|---|---|---|
| 1 | Bidder should certify that as the basic design of the meter as per IEC 62056 protocol & DLMS compliant has not been changed & only firmwire has been modified, no fresh type test for such type of meter is required. | Yes / No |
| 2 | Bidder should submit Conformity Test Certificates with DLMS logo issued by CPRI, Bangalore i.r.o. additional features/tests should be submitted with the bid as per guideline of CEA dt. 25.01.2010. | Yes / No |
| 3 | Bidder has Type Test certificate for the type of offered meter not more than 3 (three) years old. | Yes / No |
| 4 | Bidder preferably posses ISO 9001 certification. | Yes / No |
| 5 | Bidder should be manufacturers of static meters having supplied Static 1-ph or 3-phase meters with memory and LCD display to Electricity Boards / Utilities in the past 3 (three) years. | Yes / No |
| 6 | Bidders should have dust free, static protected environment for manufacture, assembly and Testing. | Yes / No |
| 7 | Bidder should have automatic computerized test bench for lot testing of meters. | Yes / No |
| 8 | Bidder has facilities of Oven for ageing test. | Yes / No |

## SCHEDULE D

## LIST OF DOCUMENTS TO BE SUBMITTED DURING SAMPLE SUBMISSION

| Sl. No. | DOCUMENTS TO BE SUBMITTED | |
|---|---|---|
| 1 | Attested copy of type test reports from NABL accredited laboratory | |
| 2 | Attested copy of type test certificates as regards material used for meter case, cover & terminal block. | |
| 3 | Tender Documents under Schedule B | |
| 4 | Tender Documents under Schedule C | |
| 5 | Operating manual & tamper logic of the sample meter submitted | |

**WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED**

# TECHNICAL SPECIFCATION

**FOR**

PILFER PROOF METER BOX (PPMB)

**FOR**

3-Phase 4-WIRE CT OPERATED FULLY STATIC
AMR COMPATIBLE TRI-VECTOR ENERGY METERS
FOR DISTRIBUTION TRANSFORMERS

**TECHNICAL SPECIFICATION FOR PILFER PROOF METER BOX FOR DTR METER**

**1.0 SCOPE:**

1.1 This specification covers manufacture and supply of Pilfer Proof Meter Box (PPMB) suitable to house Three Phase Static Energy Meter for DTR, TTB & Modem. The Meter Box shall be suitable for outdoor installation & pole mounted type and shall have ability to offer protection of electrical equipment against harsh weather. The box shall be anti-corrosive, dust proof, shock, vermin & waterproof, pilfer proof, fire proof and UV stabilized. The enclosures shall not deform or melt when exposed to fire.

**2.0 TECHNICAL REQUIREMENT :**

2.1 The Meter Box i.e base and cover shall be made of hot press moulded, unbreakable, high grade, fire retardant sheet moulded compound (SMC), with minimum thickness 2.5 mm having good di-electric and mechanical strength. The material must be UV stabilized such that the Meter Box should not change in colour, shape. size, dimensions when subjected to 200 Hrs. of UV Ageing Test. The Meter Box should have top tapered surface and round corners to prevent any water logging on the top of meter box cover.

2.2 The Meter Box should be capable of withstanding the mechanical, electrical and thermal stresses well as the effects of humidity which are likely to be encountered in service. At the same time the box should ensure desired degree of safety. The material used should be adequately stabilized against detrimental effect of light and weather. The surface appearance of the moulded parts must be smooth, non-porous and homogeneous, free of ripples, defects and marks. No fillers of fibers should be visible at any place.

2.3 The box should comply in all respect with the requirement of latest amendments of IS 13410-1992 for “General requirements for enclosure for accessories for fixing electric installation. Applicable degree of protection shall be IP 55.

2.4 All accessories like nuts, bolts, washers etc. shall be galvanized.

**3.0 CONSTRUCTION :**

3.1 The enclosure shall be single piece moulded with hot process compression moulding.

3.2 Dimension : Minimum inside dimensions of meter box are 540 mm(Height) X 310 mm (Width) X 200 mm (Depth).

3.3 The inside dimension of the meter box should be such that there should be minimum clearance in between meter surface and inside wall of meter box as below :

a) 55±2 mm clearance from at top.
b) 70±2 mm clearance at both sides.
c) 75±2 mm clearance from the bottom of the extended terminal cover of the TTB.
d) 25±2 mm at the front of the meter.

3.4 Meter Box with higher dimensions may be considered if found suitable.

3.5 The meter enclosure shall have 4 nos. of mounting brackets made out of same material as meter box with provision for 6 mm dia hole for mounting the enclosure on a pole/wall. Suitable nuts, bolts & washers are to be provided for mounting the meter box.

3.6 There should be provision of 2 nos. Metallic "U" clamp at a distance of 100 mm from the top and the bottom of the meter box with hole for sealing of meter box.

3.7 The cover of meter box should be fitted with base with 2 nos. brass/stainless steel hinges in left side of the box. The hinges of the door shall be concealed and they shall be fixed to the flanges provided on the body and cover of the enclosure in such a manner that the door opens by a minimum of 120 degrees.

3.8 Suitable handle/knob with locking arrangement shall be provided for opening of the enclosure door.

3.9 Earthing Bolt :

1 no. G.I Earthing Bolt with double nuts & washers of 3 mm thickness are to be provided at both sides of meter box for earthing of all metal parts. Size of the Earthing Bolt will be of dimension M6 X 25 mm.

4.0 Incoming and outgoing cable arrangement :

Suitable 2 (two) Nos. of holes, one for entry of 2.5 Sq.mm 12 core control cable and other for entry of 2.5 Sq.mm 4 core cable to be used for connection at meter terminal from CT secondary and busbar voltage, with single compression M.S/Aluminium Alloy/ Brass Gland shall be provided at bottom of the box.

4.1 Base and Cover details :

Thickness of the meter box shall not be less than 2.5 mm on all sides including door. The meter box cover shall be made overlapping type having collars on all four (4) sides and shall be provided with Neoprene rubber gasket of minimum 2.5 mm dia. to fit completely in the grooves of the base. The base of the meter box must have a groove to hold the gasket and the overlap of the top cover with base should be 6 mm. The cover shall rest on the collar of the Meter base in such a way that any access to inside the meter box is not possible from outside. The tongue of the base shall ensure

proper sealing arrangement against ingress of rainwater and dust inside the box.

Detachable base supports of suitable dimensions & thickness should be provided for mounting meter and TTB inside the box. The base supports should be raised by 10±2 mm from the rear wall of meter box for ease of wiring.

4.2 Viewing Window :

For convenient manual & remote meter reading, viewing window of scratch proof, break resistant, UV resistant , transparent polycarbonate of size 180 mm x100 mm having thickness of at least 2 mm (Minimum) engraved with the word “WBSEDCL” in the lower right corner shall be provided in the door of the meter box.

Fixing the polycarbonate shall be only from inside and should be properly fixed by using metal supporting clamps & Neoprene Rubber Gasket. No screw/ rivets should be visible from outside of the meter box surface. Replacement of viewing material (Polycarbonate) should be possible only on opening the door breaking the seals. Arrangement for taking MRI reading should not be available from outside of the meter Box. It should be done after opening the meter box.

4.3 Soft neoprene/nitride rubber gaskets shall be provided all round wherever required for protection against entry of dust and water. The gasket shall confirm to Type-III as per

per IS-11149. The enclosure shall comply with IP-55 degree of protection.

4.4 The enclosure shall be off admiral grey / ivory or as specified by the owner.

4.5 A metallic name plate with following marking shall be fixed on the front door of the meter box in a suitable position :

i) Property of WBSEDCL

ii) Purchase Order No. & Date

iii) Name of Manufacturer

iv) Meter Box Sl. Nos.

A separate metallic plate of size 4" x 3" with marking of “Sign of Danger” etc. as per ISS shall be fixed on the front door of the box in a suitable position.

4.6 Internal wiring with proper colour code (for phase identification) for connection in between Meter & TTB inside the meter box are to be provided.

**5.0 Submission of Sample :**

5.1 The bidder shall submit a sample Meter Box as per our specification with a meter & TTB mounted & connected with internal wiring inside the meter box to the office of the Chief Engineer (DTD), Abhikshan Bhavan, Sector-V, Salt Lake, Kolkata-91 before the last day of submission of bid.

5.2 Submission of sample meter box as per size available with the bidder but conforming to our specification towards its quality is acceptable.

**6.0 Guarantee:**

The Pilfer Proof Meter Box should be guaranteed against any manufacturing defects arising out of faulty design or bad workmanship or component failure for a period of 5 years from the date of supply.

The meter box found defective within the above guarantee period shall be replaced by the supplier free of cost within one month of the receipt of intimation of failure/defect. Defective meter box are to be replaced by new one with new sl. nos. as allotted by Chief Engineer (DTD).

**7.0 Replacement of defective Meter Box :**

The Meter Box declared defective by the WBSEDCL shall be replaced by the supplier up to the full satisfaction of the WBSEDCL at the cost of supplier. Failure to do so within the time limit prescribed shall lead to imposition of penalty of twice the cost of meter box. The same may lead to black listing even, as decided by WBSEDCL. In this connection the decision of WBSEDCL shall be final.

**8.0 Testing:**

**a) Type Test:**

The bidder must furnish type test report including material verification of the offered/sample meter box from any NABL/Govt. approved laboratory as available with them along with technical bid without which the offer will not be considered. **Type test report should not be more than 5 (five) years old.**

Type testing including material identification (IR Spectrometry test) of one meter box manufactured as per specification is to be conducted at any NABL accredited laboratory/CIPET by the supplier at their own cost after placement of order. For type testing the meter box will be selected from the first offered lot of meter with meter box. If the type test results are not found satisfactory, the offered lot of meter along with meter box will be rejected.

**b) Acceptance Test:**

The acceptance test as stipulated in Annexure-I shall be carried out at the time of inspection of the offered material.

**c) Routine Test:**

The routine tests as stipulated in the Annexure-I shall be carried out and routine test certificate/reports shall be submitted to Chief Engineer (DTD), WBSEDCL, Abhikshan, Sector-V, Salt Lake City, Kolkata-700091 while offering inspection & testing of the meter with meter box.

1.1.1

**Notes :**

1) Where facilities do not exist at supplier's works for carrying out one or more of the Acceptance Tests as per Annexure-I, such tests may be carried out at any of the approved laboratories such as CIPET/IIT/National Test House/Govt. approved laboratory etc. in presence of WBSEDCL's representative.

2) The sampling plan for carrying out the acceptance tests shall be as per IS.

**9.0 Submission of Drawing:**

Three (3) copies of drawing complete in all respect should be submitted to the Chief Engineer (DTD) under intimation to the Material Controller for accordance of approval immediately after placement of order. 25 copies of approved drawing are to be submitted for distribution to sites.

**10.0 Inspection:**

The inspection will be carried out as per inspection & testing clause of General Conditions of Contract (GCC).

**11.0 Guaranteed Technical Particulars:**

The tenderer shall furnish all the necessary information as per Annexure-II - Guaranteed Technical Particulars. If the tenderer desire to furnish any
other information in addition to the details as asked for, the same may be furnished.

**ANNEXURE-I**

**1.1.2 LIST OF TESTS TO BE CARRIED OUT ON PILFER PROOF METER BOX**

| Sl. No. | Name of Indian standard/equivalent international standard | Test requirement | Test particulars |
|---|---|---|---|

| | | | Type test | Routine Test | Acceptance Test |
|---|---|---|---|---|---|
| 1. | IS : 14772 | Marking | T | R | A |
| 2. | IS : 14772 | Dimensions | T | R | A |
| 3. | IS / ASTM | Protection against electric shock | T | R | A |
| 4. | IS / ASTM | Construction | T | R | A |
| 5. | IS / ASTM | Resistance to ageing, to humid conditions, to ingress of solid object and to harmful ingress of water | T | | |
| | | Water absorption | | | |
| | | Glow wire test at $960^0$ C | | | |
| | | Flammability test | | | |
| 6. | IS / ASTM | Mechanical strength | T | | |
| | | Resistance to tracking at 175 Volts | | | |
| 7. | IS :14772-2000 | Resistance to heat at $130^0$ C | T | | |
| | IS :14772-2000 | Resistance of insulating material to abnormal heat & fire ($960^0$ C) | | | |
| 8. | IS / ASTM | Resistance to rusting | T | | |
| 9. | IS / ASTM | Resistance to tracking | T | | |
| 10. | IS / ASTM | Test for resistance to heat & fire (Glow wire test at $650^0$ C) | T | | |
| 11. | IS : 13411 | Heat deflection temp. (Above $150^0$ C) | T | R | A |
| 12. | IS : 4249 | Exposure to flame (Self Extinguishing) | T | R | A |
| 13. | ASTMD 3418 | Melting point (Does not melt up to $400^0$ C) | T | R | A |
| 14. | IS : 8623 | Verification of di-electric properties, insulation test | T | | |

| | | | | | |
|---|---|---|---|---|---|
| | | with 500V DC megger | | | |
| | ASTM G154/155 | UV ageing for 200 Hrs. | | | |
| 15. | CIPET/IR<br>Spectrometry | Material identification | T | | |
| 16. | IS / ASTM | Physical water absorption (Max. 0.35%) | T | | |
| | Note : Applicable degree of protection shall be IP42 or better.<br>Legend : T- Type Test, R- Routine Test, A- Acceptance Test | | | | |

**ANNEXURE-II**

**GUARANTEED TECHNICAL PARTICULARS OF PILFER PROOF METER BOX**

| Sl. No. | Description | Detailed requirement | Offered by the bidder |
|---|---|---|---|
| 1. | Material used for moulded meter box | Sheet moulded Compound (SMC) | |
| 2. | Grade of Material | Fire Retardant, Self Extinguishing | |

| | | | |
|---|---|---|---|
| 3. | Properties of material for meter box | | |
| (a) | Heat Deflection Temperature (Min. 140$^0$ C @ 1.8 MPa) (Ref. Std. IS/ASTM) | Above 150$^0$ C | |
| (b) | Exposure to flame (Ref. Std..IS/ASTM) | Self-extinguishing | |
| (c) | Melting Point (Ref. Std. IS/ASTM) | Does not melt upto 400$^0$ C | |
| (d) | Resistance to heat & fire | Glow wire test at 650$^0$ C | |
| (e) | Mechanical Property | | |
| i) | Tensile Strength (MPa) | To be specified by the bidder | |
| ii) | Flexural Strength (MPa) | - Do - | |
| iii) | Modulus of Elasticity (MPa) | - Do - | |
| 4. | Constructional features of the box | | |
| (a) | Clear inside dimensions (minimum) of Meter Box | Refer Drawing | |
| | i) Height | 540 mm | |
| | ii) Width | 310 mm | |
| | iii) Depth | 200 mm | |
| | iv) Rust & Vermin proofing | Neoprene Rubber Gasket (NRG) | |
| (b) | Thickness | 2.5 mm | |
| (c) | Minimum clearance from meter on all 4 sides | i) 55±2 mm clearance from at top.<br>ii) 70±2 mm clearance at both sides.<br>iii) 75±2 mm clearance from the bottom of the extended terminal cover of the TTB.<br>iv) 25±2 mm at the front of the meter. | |
| (d) | Minimum clearance from back of meter | 10±2 mm | |
| | Viewing Window : | | |
| (e) | i) Material of transparent cover | Polycarbonate | |
| | ii) Thickness | 2.0 mm (Minimum) | |

| | | | | |
|---|---|---|---|---|
| | iii) | Size of opening (Min.) | 180 mm x 100 mm | |
| | iv) | Fixing method | Fixed from inside by metal supporting clamps & neoprene rubber gasket | |
| (f) | Earthing arrangement | | 1 No. M6x25 mm GI Earthing Bolt with double nuts & washers of 3 mm thickness to be provided. | |
| (g) | Sealing Arrangement | | 2 nos. U clamps with holes for wire seal. | |
| (h) | Colour of Meter Box (base & cover) | | Grey / Off-White / Ivory | |
| (i) | Box mounting arrangement | | | |
| | i) | Mounting bracket | 4 Nos. brackets with holes | |
| | ii) | Dimension of holes | 6 mm | |
| | iii) | Dimension of bolts, nuts & washers for fixing of box | To be specified by the bidder | |
| | iv) | Total no. of fixing bolts, nuts & washers to be provided | 4 nos. bolts and 8 nos. nuts & washers | |
| (j) | Hinges | | 2 nos. brass/stainless steel concealed hinges | |
| (k) | Door opening | | $120^0$ (minimum) | |
| (l) | Incoming & outgoing cable holes | | 2 No. holes (one for entry of 12 core 2.5 sq.mm cable & other for 4 core 2.5 sq.mm cable) to be provided at bottom with single compression M.S/Aluminium Alloy/ Brass gland. | |
| (m) | Whether the cover is overlapping type having collars on all four sides | | Yes | |
| (n) | Whether the cover/base provided with semicircular/circular neoprene rubber gasket of 2.5 mm dia (Min.) to completely fit in the grove of the base | | Yes | |
| (o) | Weight of complete box in Kg with +/- tolerance | | To be specified by the bidder | |
| 5. | Type test report as per Technical Specification | | To be submitted by the bidder | |
| 6. | Degree of protection | | IP 55 | |

| | | | |
|---|---|---|---|
| 7. | Locking arrangement | Handle/Knob with locking arrangement to be provided | |
| 8. | Detachable base support for meter & TTB mounting | To be provided | |
| 9. | Name Plate | Metallic name plate with marking as per Specification | |
| 10. | Danger Plate | 4" x 3" metallic plate with sign of danger. | |
| 11. | Any other information | | |

**ANNEXURE - III**

**TESTING**

1. Sample selected from first lot should be type tested at any NABL accredited laboratory for compliance of performance parameters as given in GTP including material identification to be carried out by CIPET (IR Spectrometry test).

2. The test report should be submitted to WBSEDCL before offering inspection of second lot.

3. Inspection of each lot & sampling plans for acceptance test : 1 no. selected randomly from lot for testing at works.

| Sl. No. | Test Requirement for moulded meter box | Reference Standards |
|---|---|---|
| a) | Marking | IS : 14772 |
| b) | Dimensions & construction | IS : 14772 |
| c) | Protection against electric shock | IS/ASTM |

| | | |
|---|---|---|
| d) | Heat Deflection Temperature – above $150^0$ C | IS : 13411 |
| e) | Exposure to flame (Self Extinguishing) | IS : 4249 |
| f) | Melting point – Does not melt up to $400^0$ C | ASTMD 3418 |

## WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

## TECHNICAL SPECIFCATION

FOR

# LT CURRENT TRANSFORMER

# AND

# CT BUSBAR CHAMBER

FOR

## DISTRIBUTION TRANSFORMER METERING

### TECHNICAL SPECIFICATION FOR RESIN CAST L.T. CURRENT TRANSFORMER

A set of 4 nos. Resin Cast LT Current Transformers (CT) of Accuracy Class 0.5 for low tension energy metering shall be supplied with each meter. The CTs are to be housed in the Bus-Bar chamber as per specification enclosed.

**1.0 REFERENCE STANDARD**

As per IS:2705, 1992 (Part 1 & Part 2) or latest version thereof

**2.0 GENERAL TECHNICAL REQUIREMENT :**

a) Type of Current Transformer : i) Ring type for CT ratio 600/5A,400/5A, 200/5A, & 100/5A

b) Rated Voltage : 240 Volts (Phase to Neutral), 433V (Ph-Ph)

c) Supply System Variation : Voltage Vref + 20% to -40%

d) Rated Current (I Basic) : 5 Amps balanced & Unbalanced load

e) Rated Frequency : 50 Hz.

f) Accuracy Class : 0.5

g) Power Factor : Unity to Zero (all power factor lag/ or lead)

h) Max/Min Ambient Temperature : + 55 C / - 10 C

i) Supply System Variation:

Frequency : 50 Hz ± 5 %

j) Highest System Voltage : 600V

k) Current Transformer Ratio : 600/5A, 400/5A, 200/5A, & 100/5A

l) ISF : Less than 5

m) Rated Output Burden : 5 VA at 0.8 pf (lag)

n) Rated Continuous thermal Temperature

rise over Ambient temperature : Maximum temp. rise limit of 50deg C at 1.2 times rated primary current.

o) One minute withstand of

Power Frequency Voltage : 3 KV

p) Between primary and secondary

Insulation level voltage (HV Test) : 3 KV

q) Short time current rating (STC) : 5 KA for 1 second.
HV test and accuracy test to be performed after 24 hours of carrying out STC test.

r) Dynamic peak current : 2.5 times STC

s) Power frequency withstand : 3 KV for 1 min., 50 Hz shall be carried out
voltage (Primary to Secondary) on unit after submerging unit in salty water for 6-8 hours.

**3.0 CONSTRUCTIONAL REQUIREMENTS :**

**3.1 SECONDARY TERMINATION**

The CT Secondary terminals shall be of studded type so that lead wires can be connected for metering purpose.

**3.2 RATING PLATE**

Primary & Secondary terminal identification scheme shall be embossed on the CT. Beside this there shall be self adhesive laminated paper rating plate suitable for outdoor installations. Rating plate to be secured on the body such that it is retained for outdoor applications and it should not come out easily. The rating plate shall carry following information:

1. Type, Ratio, Burden & Accuracy Class

2. Applicable Standard
3. I.L
4. STC Rating
5. ISF
6. Continuous thermal current
7. Caution against open secondary.
8. Batch No.
9. Manufacturer's Name
10. Manufacturing month and year
11. Serial No.

**4.0 TESTS**

**4.1 TYPE TEST :**

The offered CTs should be type tested at any NABL accredited / Govt. approved laboratory in accordance with IS:2705, 1992 (Part 1 & Part 2) or latest version thereof. The type test report should not be more than 5 (Five) years old. A copy of the Type

Test results should be enclosed with the offer. If there is any modification in the design/parameters of the specifications or use of constituent materials in the offered CTs which may affect the characteristics as well as parameters of the CTs from the CTs which was type tested, revised type test certificates as per the design, parameters and constituent material used in the offered CTs shall have to be submitted failing which the offer may be liable to be rejected.

i) Schedule of type tests for CT (As per Reference Standard) to be conducted are as below :

a) Verification of terminal marking and polarity.
b) High voltage power frequency test.
c) Over voltage inter turn test.
d) Determination of error according to the requirement of appropriate accuracy class at 5%, 20%, 100% and 120% with full and quarter burden.
e) Short Time current test and peak dynamic current test.
f) Temperature rise test.
g) ISF test.

Beside this the following tests shall also be conducted :

a) Extended Life Cycle test.
b) Ingress protection.

**4.2 ROUTINE & ACCEPTANCE TESTS :**

Schedule of Routine & Acceptance test for CT :

a) Verification of terminal marking and polarity.
b) Determination of error according to the requirement of appropriate accuracy class at 5%, 20%, 100% and 120% with full and quarter burden.
c) ISF test.

**4.3 TEST FACILITIES :**

The tests for CTs shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the instruments available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipments/ instruments.

The standard instruments used for conducting tests shall be calibrated periodically at any NABL Accredited / Govt. approved Test Laboratories and valid calibration test certificates shall be available at Works for verification by purchasers representative

**4.4 RETESTING AFTER DELIVERY :**

WBSEDCL may carry out re-testing of the supplied CTs at their laboratory. Re-testing of the supplied CTs will be conducted on sample CTs collected from different stores of the consignees as per the procedure followed for acceptance test during inspection & testing of the supplied CTs at manufacturer's works. Re-testing of the supplied CTs will be completed within one month from the date of receipt of CTs at different stores.

In case the CTs are not in order as per our observation during inspection and testing of the supplied CTs, the lot will be declared defective and in that event CTs supplied are to be replaced by the manufacturers free of cost including free transportation from the site to their works and back. The replaced CTs are to be offered for inspection & testing and Acceptance test of will have to be carried out by the supplier in presence of purchaser's representative.

**5.0 SUBMISSION OF SAMPLE CT :**

One no. sample CT for ratio 200 /5 A and One no. sample CT for ratio 600 /5 A are to be submitted in sealed casing/cartoon to the Office of the Chief Engineer (DTD), Abhikshan, Sector-V, Salt Lake, Kolkata-91 on any working day, from 11.00 Hrs to 16.00 Hrs. on weeks days & from 11.00 Hrs. to 13.00 Hrs. on Saturday within the specified period of submission of tender documents latest by 13.00 Hrs. on the last day of submission of bid. for testing and approval.

**6.0 GUARANTEE :**

The CTs should be guaranteed against any manufacturing defects arising out of faulty design or bad workmanship or component failure for a period of 3 years from the date of supply.

The CTs found defective within the above guarantee period shall be replaced by the supplier free of cost within 60 days of the receipt of intimation of failure / defect.

The CTs declared defective by the WBSEDCL shall be replaced by the supplier up to the full satisfaction of the WBSEDCL at the cost of supplier. Failure to do so within the time limit prescribed shall lead to imposition of penalty of twice the cost of CTs. The same may lead to black listing even, as decided by WBSEDCL. In this connection the decision of WBSEDCL shall be final.

**5.0 PACKING AND FORWARDING :**

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and suitable for handling during transport and outdoor storage in transit. The easily damageable materials shall be packed carefully and marked with appropriate caution symbol. Any material found short inside the packing cases, supplier shall provide short material without any extra cost.

## GUARANTEED TECHNICAL PARTICULARS FOR RESIN CAST LT CURRENT TRANSFORMER

| Sl. No | Item | Requirement as per Specification | Bidders to specify |
|---|---|---|---|
| 1. | Manufacturer's name, address, country of origin | | |
| 2. | Class of Accuracy | 0.5 (As per I.S.) | |
| 3. | Type of CT | i) Ring type for CT ratio 600/5A, 400/5A, 200/5A, & 100/5A . | |
| 4. | Rated voltage & Frequency | 433 Volts (phase to phase), 50 Hz ± 5% | |
| 5. | Maximum system voltage | 600V | |
| 6. | No. of phases | Single | |
| 7. | Current transformer ratio<br>(Rated primary current) | • 100A<br>• 200A<br>• 400A<br>• 600A | |
| 8. | Rated secondary current | 5 Amps(Balance and unbalance load) | |
| 9. | Supply frequency | 50 Hz ± 5% | |
| 10. | Temperature | Ref. Temp. 27 deg C | |
| 11. | Supply system variation | V ref. +20% to –40% | |
| 12. | Highest system voltage | 600V | |
| 13. | ISF | Less than 5 | |
| 14. | Number of secondary winding | One | |

| | | | |
|---|---|---|---|
| 15. | Rated output burden | 5VA at 0.8 p.f. (Lag) | |
| 16. | Rated continuous thermal current temperature rise over ambient | 1.2 times rated primary current with maximum temp. rise limit of 50 deg C. | |
| 17. | One minute withstand of power frequency voltage between primary and secondary | 3 KV | |
| 18. | Insulation level voltage (HV test) | 3 KV | |
| 19. | Material of core | Low loss CRGO high grade<br>(Core loss should not exceed 0.8 watt/Kg at 1.5 tesla) | |
| 20. | Short time current rating | 5KA for 1 second | |
| 21. | Dynamic peak current | 2.5 times STC | |
| 22. | Primary frequency withstand voltage (primary to secondary) | 3KV for 1 min. , 50 Hz. | |
| 23. | Material of conductor | Super enameled copper wire as per IS 4800 Part IX/ IEC 317 | |
| 24. | Material of insulation | Class of insulation “F” for outdoor application.<br>Provide details on properties of material. | |
| 25. | Secondary termination | Stud type terminal. | |
| 26. | Polarity marking | Indelibly marked/ coded for primary and secondary. | |
| 27. | Weight | To be furnished | |
| 28. | Outline drawing/ leaflet | To be furnished | |
| 29. | Type test certificate | To be furnished | |
| 30. | Guarantee | 3 years from the date of supply | |

**TECHNICAL SPECIFICATION FOR METALLIC ENCLOSURE FOR HOUSING BUS-BAR AND L.T. CURRENT TRANSFORMERS**

The Metallic Enclosure should be designed suitable for housing Bus-bar and 4 nos. L.T C.Ts of appropriate ratings in accordance with the rating of the transformers.

**A) Construction :**

1. Enclosure should be designed suitably for housing ring type CTs of ratio 100/5A, 200/5A, 400/5A & 600/5A.
2. The enclosure shall be suitable for outdoor installation & pole mounted type and shall have ability to offer protection of electrical equipment against harsh weather. For pole mounting type the enclosure shall have 4 nos. of mounting brackets made out of same material as of enclosure with provision of suitable size holes and nuts, bolts & washers for mounting the enclosure. Suitable nuts, bolts & washers are to be provided for mounting the meter box. The enclosure should be made of M.S/CRCA sheet metal of 18 SWG. The roof of the enclosure should be tapered at both sides from the middle
3. In case of Ring type CTs, four nos. Bus-bar for phase & neutral made of copper/aluminium of appropriate sizes matching with current carrying capacity and thermal capacity in accordance with the rating of the transformers should be provided. Arrangement for firm fixing of CTs inside the enclosure should be provided. Necessary arrangement for connecting 2.5Sq.mm wire on the busbars is to be provided.
4. The Bus bars should be placed on porcelain/epoxy/resin insulators of appropriate size and clearances. The fixing of the Bus-bars to the porcelain insulators should be made with non-corrosive nuts and bolts of appropriate material, size and ratings. Insulating sleeves are to be provided on the busbars.
5. Both ends of the busbars should be extended outside the enclosure sufficiently so that incoming and outgoing cables can be connected properly to the busbars. For extension of the busbar outside the enclosure, proper sealing of the enclosure against ingress of moisture & rain water should be made. On the extended portion of busbars suitable holes of proper size subject to CT ratio and suitable nut & bolts are to be provided for connecting the cable.
6. All the surfaces of the enclosure shall be sand blasted etc. to produce a smooth clean surface free of any scale, grease and rust. The surface should be given a coat of high quality Red-Oxide or steel chromate primer and then shall be finished with super enamel paint.
7. Earthing arrangement with markings on either side is to be provided. Two nos. GI Earthing Bolts with 2 nos. nuts and washers are to be provided for earthing. Size of Earthing bolt should be M6x40 mm.

9. A metal plate with marking of the name of the supplier, CT ratio, Box Serial number and also with marking of "PROPERTY OF WBSEDCL" along with Purchase Order No. & date with year of manufacturing shall be fixed with rivet on the front of the enclosure at a suitable portion. A Danger Plate 3"x2" should be provided at a visible location of the enclosure.

10. The door of the enclosure should be fitted with the base of the enclosure by using 2 nos. non-corrosive & non-detachable type internal hinges in such a manner that the door opens by minimum $120^0$. Neoprene rubber gasket should be provided at door of the enclosure for protection against entry of moisture & rain water.

11. Two numbers of holes with suitable single compression MS glands are to be provided on the enclosure for cable entry. Dimension of the holes should be such that holes are suitable for entry of one 2.5Sq.mm 12 core control cable and other for 2.5Sq.mm 4 core cable to be used for wiring of CT secondary and busbar voltage to meter.

12. Suitable handle/knob and locking arrangement should be provided for opening of the enclosure door.
Necessary arrangements for sealing of the door at two points are also to be provided.

13. Colour of the enclosure should be admiral gray/off white/ivory.

14. The CT ratio should be paint marked at the bottom of the enclosure.

15. The enclosure should comply with IP54 or better degree of protection.

**B) Submission of Sample :**

The bidder shall submit samples for enclosure mounted with 600/5A & 200/5A CTs & busbars as per our specification to the office of the Chief Engineer, (DTD), Abhikshan Bhavan, Sector-V, Salt Lake, Kolkata-91 before the last day of submission of bid.

**C) Guarantee :**

The enclosure should be guaranteed against any manufacturing defects arising out of faulty design or bad workmanship or component failure for a period of 5 years from the date of supply.

The enclosure found defective within the above guarantee period should be replaced by the supplier free of cost within one month of the receipt of intimation of failure/defect. Defective enclosure are to be replaced by new one with new sl. nos. as allotted by Chief Engineer (DTD).

**D) Replacement of defective Meter Box :**

The Meter Box declared defective by the WBSEDCL shall be replaced by the supplier up to the full satisfaction of the WBSEDCL at the cost of supplier. Failure to do so within the time limit

prescribed shall lead to imposition of penalty of twice the cost of meter box. The same may lead to black listing even, as decided by WBSEDCL. In this connection the decision of WBSEDCL shall be final.

**E) Submission of Drawing :**

Three copies of the drawings as per specified constructional features showing details of the dimensions of the enclosure along with the fixing arrangements of bus-bar, CT etc. are to be submitted at the time of submission of tender.

Three (3) copies of drawing complete in all respect should be submitted to the Chief Engineer (DTD) under intimation to the Chief Engineer (Procurement & Contracts) for accordance of approval immediately after placement of order. Sufficient copies of approved drawing are to be submitted for distribution to sites.

**F) Inspection :**

The inspection will be carried out as per inspection & testing clause of General Conditions of Contract (GCC)

**G) Guaranteed Technical Particulars :**

The tenderer shall furnish all the necessary information as per Annexure-I – Guaranteed Technical Particulars. If the tenderer desire to furnish any other information in addition to the details as asked for, the same may be furnished.

**ANNEXURE I**

**GUARANTEED TECHNICAL PARTICULARS FOR ENCLOSURE FOR HOUSING BUS-BAR AND L.T. CURRENT TRANSFORMERS**

| Sl. No | Item | Requirement as per Specification | Bidders to specify |
|---|---|---|---|
| 1. | Manufacturer's name, address, country of origin. | To be furnished | |
| 2. | Enclosure : | | |
| a) | Material used for enclosure. | MS/CRCA | |
| b) | Dimension of enclosure<br>(Height x Width x Depth) | To be specified | |
| c) | Thickness of sheet metal. | 18 SWG | |
| d) | i) Colour of enclosure<br>ii) Type of paint used. | i) Admiral gray/off white/ ivory<br>ii) To be specified | |
| e) | Whether suitable for outdoor installation | To be specified | |
| f) | i) Whether gasket provided for door<br>ii) Type of gasket used | i) To be provided<br>ii) Neoprene Rubber Gasket | |
| g) | Whether mounting brackets provided. | 4 nos. mounting brackets with holes, bolts, nut & washers | |
| h) | Hinges | 2 nos. internal hinges | |
| i) | Cable entry | 2 nos. holes with single compression MS gland | |
| 3. | CT mounting arrangement | To be furnished | |
| 4. | Busbar : | | |
| a) | Material used for Busbar. | Copper/Aluminium | |
| b) | Dimension of different size Busbars used for different CT ratio (1600/5A,800/5A,600/5A, 400/5A,200/5A,100/5A, 50/5A) | To be specified | |
| c) | Current carrying capacity & thermal capacity for of different size Busbars. | To be specified | |
| d) | Length of extended portion of Busbars outside the enclosure | To be specified | |

| | | | |
|---|---|---|---|
| e) | Size of holes on the extended portion of Busbars & dimension of nuts & bolts | To be specified | |
| f) | Whether arrangement for connecting voltage wires at busbars provided. | To be provided | |
| 5. | i) Earthing arrangement<br><br>ii) Size of Earthing Bolt | i) 2 nos. GI Bolt with 2nos. nuts & washers.<br><br>ii) M6x40 mm | |
| 6. | Name Plate & Danger Plate details | As per specification | |
| 7. | Handle/Knob | 2 nos. holes with MS gland | |
| 8. | Locking arrangement | To be provided | |
| 9. | Sealing arrangement | To be provided | |
| 10. | Degree of protection | IP54 or better | |
| 11. | Guarantee | 5 years from the date of supply | |
| 12 | Drawing | To be furnished | |

GUIDELINE DOCUMENT

# Data Exchange for Electricity Meter Reading, Tariff and Load Control
## – Companion Specification

Guide line specification for R-APDRP

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# Revision History

| Sl.No. | Section | Description | Version | Date |
|---|---|---|---|---|
| 1 | 1.1 | Table 1.1 updated | 1.1 | 31/08/2009 |
| 2 | 3 | Added BCS | 1.2 | 02/09/2009 |
| 3 | 4 | MRI replaced with HHU | 1.2 | 02/09/2009 |
| 4 | 12 | Deleted Para on TCP-IP | 1.2 | 02/09/2009 |
| 5 | Annexure – A1 | Editorial & Renaming | 1.2 | 02/09/2009 |
| 6 | Annexure – A2 | Interface Class with Attribute and OBIS Code Corrected | 1.2 | 02/09/2009 |
| 7 | Annexure – A3 | Interface Class with Attribute and OBIS Code Corrected | 1.2 | 02/09/2009 |
| 8 | Annexure – A4 | Interface Class with Attribute and OBIS Code Corrected | 1.2 | 02/09/2009 |
| 9 | Annexure – A5 | OBIS Code corrected | 1.2 | 02/09/2009 |
| 10 | 1,1.1,1.2,2.1, 5.2,6.3,7.2,7.4 8.1,8.2,8.2.1 11.1,11.2,13 | Editorial | 1.2 | 02/09/2009 |

# Contents

# Foreword

This guideline specification gives the rules and procedures for adapting the open protocol IEC62056 (DLMS/COSEM) standard for communication of metering data to a remote host. It takes as basis the International Standard “Energy Metering - Data exchange for meter reading, tariff, and load control” and:

- Selects options and specifies parameters of the International Standard to permit interoperability.
- Clarifies and explains elements for the chosen provisions of the International Standard.

The present document also includes recommendations concerning client services, data-collection devices (HHUs), data storage and conformance testing of any implementation.

It is the intention of this Companion Specification to provide a basis for efficient and secure transfer of energy-metering data in an open manner that will promote the practice of interoperability between equipment from diverse sources.

This document is the outcome of concerted effort of Government organisations, Electric Utilities, Manufacturers and System Integrators.

# 1. Scope

A. This document is the Companion Standard intended for use in India in the design and operation of an open and interoperable messaging system for reading, configuring and controlling the DLMS / COSEM energy meters meant for electricity measurements. Such meters are also referred often as Servers in the context of intelligent data collection system with the HOST end referred as Client.

B. This document covers the minimum requirements for building the intelligent meter data collection system based on the DLMS / COSEM protocol which is adopted as a standard by IEC.

C. This document is to be read with current versions of main BIS documents listed under Section 2.1 that are being adopted out of corresponding IEC standards.

D. This document includes the chosen provisions of the DLMS / COSEM protocol that are relevant and important for bringing in uniformity and interoperability in Indian meter data collection process.

E. This document specifies the requirements for reading the meter at site using the HHU as well as reading the meter from a remote location using the HOST.

F. The protocol requirements brought out in this document applies to Category of meters listed under Section 1.1.

G. The following are kept outside the purview of this document and for these; reference shall be made to the appropriate standards.

I. Connectivity between HOST and METER – The choice of communication medium and its requirements for formation of a data channel to exchange messages between HOST and METER shall be decided among User, Manufacturer and SI.

II. DCE - The compatible Data Communication Equipment (e.g.-MODEM) and its requirements suitable for the chosen communication medium shall be decided among User, Manufacturer and SI.

III. Values and distribution methods of secret keys, etc. shall be decided among User, Manufacturer and SI.

IV. The metrological properties to be complied with by the electricity meter for which appropriate Standards shall be referred.

## 1.1 Categories of Meter

The DLMS / COSEM meter mentioned in this companion specification is an electricity meter with messaging capabilities. The messages to be sent and received by a server are many. This document is aligned with a national report which was prepared with the objective of ushering in homogeneity and interoperability. The national reports are listed under Section – 2.2. Accordingly this version of the document has absorbed within itself the list of meters as listed in Table – 1.1.

Table-1.1

| Meter Category | Meter / Server Purpose | Annexure Reference |
|---|---|---|
| A | Energy Accounting and Audit Metering | A2, A5,A6 |
| B | Boundary / Bank / Ring / ABT Metering | A3, A5,A6 |
| C | HT (PT / CT) and LT (CT) Consumer Metering | A4, A5,A6 |

The meters or servers listed in Table-1.1 shall be required to send or receive the parameters listed under the various tables included in the Annexure mentioned against each category in Table 1.1 These parameters are classified as electrical quantities, load survey data, billing quantities, programmable data and events.

Each of the parameter listed under the tables in Annexure cited in Table 1.1 is assigned a set of identifiers called as OBIS code. The OBIS codes are unambiguous and unique. The implication of this is that if the HOST system sends a read request with an OBIS code from any of the table to the meter (server) the latter shall respond with the corresponding data quantity. The OBIS code and the corresponding response are to be embedded in to a message packet structure defined by this open protocol and exchanged between HOST and Server.

In the process of maintaining the homogeneity and interoperability, additions and alterations that are introduced in all aspects of Table 1.1 will be posted in an exclusive website. Till such time those changes are absorbed by this document by way of amendments and made mandatory the users may visit the designated website and adopt as per their needs.

## 1.2 Relation to Reports of DLMS UA & Standards

The standards are currently maintained by DLMS UA which publishes the coloured books from time to time. The “Blue, Green, Yellow and White Books” form the technical reports all of which describe the rules governing modelling, messaging, transporting and testing of protocol implementation. These books are revised and updated taking in to consideration technical developments, industry needs and business processes. These are listed in 2.1 and shall form normative reference documents.

The coloured books are adopted by IEC and released as series of Standards under the IEC 62056 series, with the title as “Electricity metering: Data exchange for meter reading, tariff and load control”. The current versions of those IEC standards are given as list of non normative references in 2.1. The coloured books and the IEC standards describe all the provisions, rules, syntax and semantics for effective implementation of DLMS / COSEM protocol.

This companion specification has defined the options available so as to achieve uniformity in the DLMS/COSEM implementations for the Indian power sector. Apart from such standardising efforts nothing in this document is intended to conflict with the provisions of versions of those standards in effect, at the time of creating this document.

This is an Indian National document and therefore in the event of any conflict with the Coloured Books this document shall prevail.

# 2 References

## 2.1 Normative Reference

The following standards are referenced in this companion standard.

| S.No | BIS DOC No.* | Description |
|---|---|---|
| 1 | ETD 13(6001) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part-61: Object identification system (OBIS) |
| 2 | ETD 13(6002) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 62: Interface classes |
| 3 | ETD 13(6000) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 53: COSEM application layer |
| 4 | ETD 13(5999) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 46: Data link layer using HDLC protocol |
| 5 | ETD 13(5998) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 42: Physical layer services and procedures for connection-oriented asynchronous data exchange |
| 6 | ETD 13(5997) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 21: Direct local data exchange |
| 7 | IS STD-6 | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 47: COSEM transport layers for IPv4 networks |

* - It shall be replaced with Actual BIS Number when it is published.

## 2.2 Non-normative References

These additional references are specified for informative purposes only. The references made below to the DLMS-UA Colored books are substantiated with excerpts included in this Companion specification wherever applicable. The excerpts reproduced within this document shall be normative.

| Sno | Document | Description |
|---|---|---|
| 1. | CEA Regulations 2006 | Central Electricity Authority (installation and Operation of Meters) Regulations, 2006 |
| 2. | CEA report | Report of High Level Committee on Standardization of Meter Protocol, DEC 2008 |
| 3. | CPRI report | Report on Standardization of Parameters – April 2009 |

| | | |
|---|---|---|
| 4. | DLMS UA 1000-1 ed.9, 2009 | Blue book, COSEM Identification System and Interface Classes |
| 5. | DLMS UA 1000-2 ed.6, 2007 | Green book, DLMS/COSEM Architecture and Protocols |
| 6. | DLMS UA 1002: ed.1, 2003 | White book, COSEM Glossary of Terms |
| 7. | DLMS UA 1001-1:2007 ed-3 | Yellow Book, Companion Testing Process |
| 8. | IEC 62056-61 Ed 2.0 (2006-11) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Object identification system (OBIS) |
| 9. | IEC 62056-62 Ed 2.0 (2006-11) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 62: Interface classes |
| 10. | IEC 62056-53 Ed 2.0 (2006-12) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 53: COSEM application layer |
| 11. | IEC 62056-46 Ed.1.1 (2002-07) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 46: Data link layer using HDLC protocol |
| 12. | IEC 62056-42 Ed.1.0 (2002) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 42: Physical layer services and procedures for connection-oriented asynchronous data exchange |
| 13. | IEC 62056-47 Ed 1.0 (2006-11) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 47: COSEM transport layers for IPv4 networks |
| 14. | IEC 62056-21 Ed 1.0 (2005-08) | Electricity metering : Data exchange for meter reading, tariff and load control<br>Part 21: Direct local data exchange |
| 15. | IEC/TR 62051-1 Ed 1.0 (2004-01) | Electricity metering : Data exchange for meter reading, tariff and load control - Glossary of terms<br>Part 1: Terms related to data exchange with metering equipment using DLMS/COSEM |
| 16. | IEC 61334-4-32 Ed. 1.0 (1996-09) | Distribution automation using distribution line carrier systems<br>Part 4: Data communication protocols - Section 32: Data link layer - Logical link control (LLC) |
| 17. | NIST SP 800-38-D | Recommendations for Block Cipher Modes of Operation: Galios / Counter Mode (GCM) and GMAC |
| 18. | IEC 60051 | Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories |
| 19. | IS 14697 | AC static Transformer operated Watt-hour and VAR-hour meters, Class 0.2S AND 0.5S specification. |

# 3 Terminology

The following items are additional to terms found in Ref. [2], IEC/TR 62051-1, Electricity metering: Data exchange for meter reading, tariff and load control - Glossary of terms Part 1: Terms related to data exchange with metering equipment using DLMS/COSEM.

Class
The term Class is a short form of Interface Class.

DLMS
"DLMS" is the acronym for "Device Language Message Specification", and refers to the messaging system defined in IEC 61334-4-41 (named "Distribution Line Message Specification" in that specification). It is commonly used to refer to collective use of several parts of IEC 62056 including Part 53.

HOST computer
A computer system to which data collected by HHUs is returned for processing, and/or which can collect data remotely from a meter or data concentrator.

Network
The term "network" is used to indicate interconnection of a number of devices in a way concordant with the communications profile selected. It does not necessarily mean a diverse or wide-ranging set of connections, nor any routing capability. Where a wide-area or similar network is in use it is encapsulated; message routing is outside of the scope of DLMS/COSEM.

Object List
Attribute 2 of Class 12 or 15 (instantiated as the Association object) contains a list of all objects supported within the scope of the selected application association. This is commonly known as the Object List. The "Object-List" is also commonly referred to as "OBIS-List".

Parameter, parameterization
The term Parameter refers to a single identifiable metering or other quantity which may be read or altered within meter readings, tariffication, or control. A parameter may have multiple aspects such as its value, scaling, timestamp, etc.

The term Parameterization refers to the setting of those parameters that define the configuration of the metering device.

Profile
The term Profile in the context of DLMS/COSEM data access refers to a method of combining multiple parameters into a single structure, normally repetitive.

The structure is identified by a single OBIS code, and it is returned using the Profile Class. One attribute of this class defines the individual contained parameters, by means of OBIS codes, classes, and attributes.

The term Profile in the context of DLMS/COSEM communications or security refers to a combination of options to form a particular protocol suitable to the media (in one case) or security procedures (in the other case) required by the system user.

Data Concentrator

This refers to a device used to hold the data from a number of meters, in a way that identifies the data from each meter, and allows it to be accessed in real time by a higher-level data collector. Typically a concentrator is accessed in a similar manner to the meters, but supports faster or cheaper communication, and has greater storage capacity, than is available with the meters themselves. An example of use is to concentrate data from a number of electrical distribution substations.

HHU Hand Held Unit

The HHU or equivalent unit functions as a local client for collecting data from a slave (Meter).

BCS- Base Computer Software

# 4 Architecture

The typical connectivity scheme between the SERVER and CLIENT, considered for this specification is shown in FIG-1.

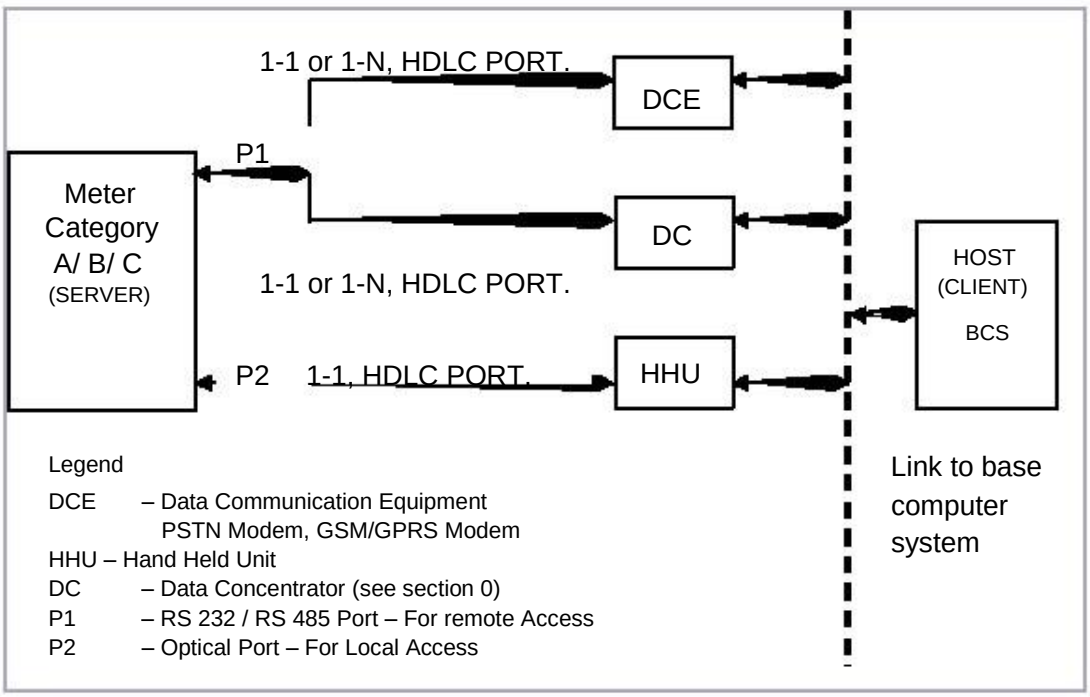


Fig 1: Message flow connectivity scheme between SERVER and CLIENT.

## 4.1 Physical Requirements

The server shall support a minimum of two ports for data communication, as given below and as per FIG-1.

1. P1 – A hardware port compatible with RS 232 or RS 485 specifications. This shall be used for remote access from the HOST (CLIENT) or DC (CLIENT).
2. P2 – An Optical port complying with hardware specifications detailed in IEC-62056-21. This shall be used for local access form a HHU.
3. The P1 and P2 both shall support the 3-layer Connection Oriented COSEM/HDLC profile, with a minimum and default baud rate of 9600.

The optical port is not required to support any mode of IEC-62056-21, that is, mode of usage shall be direct HDLC.

## 4.2 Requirements for simultaneous operation

The server is not required to allow more than one association to be open at any one time. If messages are received destined for any association other than one that is currently open then the server shall handle the new request without disruption to operations already in progress.

At any one time no more than one invocation shall be in progress. If requests are received that would cause additional invocations to exist then the server shall handle the new request without disruption to operations in progress on existing invocations. The result code 'temporary-failure' may be returned.

Optical port shall have priority when both ports are accessed simultaneously. This means that if the electrical port is connected and being accessed for data, any attempt to connect on optical port shall cause the connection on electrical port to be interrupted and the optical connection processed after sending "temporary-failure" code to HOST. Any further attempts to communicate on electrical port while the optical port is being used shall be returned with a "temporary-failure" code. This is an indication to the host that the meter is temporarily busy.

# 5. Logical Structure of Meters

The meter represents one physical device as mentioned in IEC 62056-21 clause 4.5.

The physical device (meter) hosts one logical device as mentioned in IEC 62056-21 clause 4.5, which is the Management logical device. This has SAP (Service Access Point) address 1, as mandated in [3] IEC 62056-53

The meter shall support the Logical Name (LN) referencing mechanism as defined in IEC 62056-62 Annex C.

Short name referencing as defined in IEC 62056-62 Annex C is not required to be supported.

The meter shall support three associations in the Management Logical Device

a. Public Client association (PC)

b. Meter Reader association (MR)

c. Utility Settings association (US)

## 5.1 Mandatory Objects

The following objects are mandated by [2] IEC 62056-62

| Object | OBIS Code | Interface Class | Requirements |
|---|---|---|---|
| Logical device name | 0.0.42.0.0.255 | IC-1 (Data) | Value data type will be octet-string with maximum length 16. |
| Current Association | 0.0.40.0.0.255 | IC-15 (Association LN) | This object will refer to the currently connected association object (among the list of associations supported in the meter) |

The Logical Device name shall have a maximum length of 16 characters, and shall have as its first three characters the manufacturer's 3-letter code as specified in [2] - ETD 13(6002) section 4.6.2

## 5.2 Association Properties

The required associations shall have the following properties.

| Feature | Public Client | Meter Reader | Utility Settings |
|---|---|---|---|
| SAP Address pair in format (client, server) | (16,1) | (32,1) | (48,1) |
| Application Context – Basic security | LN without ciphering | LN without ciphering | LN without ciphering |
| Application Context – Advanced security | Not applicable | LN-Ciphered | LN-Ciphered |
| Signon Authentication Mechanism | Lowest Level | Low Level | High Level |
| Services required in conformance block | Get, Get with Block transfer | Get, Get with Block transfer, Selective Access | Get, Set, Action, Get and Set with Block transfer, Selective Access |

The PC association shall contain in addition to mandatory objects

1 The meter's real-time clock;

The MR association shall contain in addition to mandatory objects

1 Profile objects allowing bulk collection of data defined by the parameter lists in Annexure A2, A3, A4, A5 and A6

2 Simple objects allowing ad-hoc access to items in the instantaneous parameters list. Ad-hoc access to the profile objects shall also be possible.

The US association shall contain in addition to mandatory objects

1 All the objects accessible via the US association;

2 Simple and compound objects allowing tariffication and configuration of the meter.

The composition of each association is detailed in Annexure A2, A3, A4, and A5. Mandatory objects do not necessarily appear in these tables.

Access rights for each data item are also shown in Annexure A2, A3, A4, and A5.

## 5.3 Descriptive Notes for Logical Structuring

1. Associations: Each Logical device can organize the data objects into different

associations, each having different access rights to the list of objects. Each association defines the SAP address pair of the client and server logical device addresses that participate in the data transaction.

2. Objects: All meter data is represented by objects or instances of the standard Interface classes.
3. Attributes & Methods: The actual placeholders of the different data elements of the meter are the attributes of the objects, whereas the methods exposed by the objects allow manipulating the attributes in defined manners.

Referencing Methods

DLMS/COSEM provides two referencing methods to access the meter data, Logical name referencing and Short Name referencing. Under LN referencing, data is accessed by specifying the Logical name (OBIS code) of the object and the attribute (or method) index. Under SN referencing each attribute and method of each object has its own individual address.

Access rights are specified for each attribute and each method of every data object in the meter. Attributes may have the following access rights

- No access
- Read access
- Write access
- Read-Write access

Methods may have the following access rights

- No access
- Execute access

Access rights are specific to each association. Different associations may award different access rights to the same set of data objects. Thus the grouping of data into associations is also only a logical partitioning.

# 6 Usage of DLMS / COSEM Provisions

## 6.1 Usage of Interface Classes

This Companion Standard defines the set of Interface Classes to be used in the national context for various types of data. The interface class for the identified parameters is specified in the Annexure A2 to A6.

Either requiring support or offering support for a class shall not imply support for all its attributes. Required attributes are listed under respective Annexure as Notes.

Attribute 0 (indicating access to all attributes in one request) is not required to be supported in any case.

References to classes may be made in the form of capture-IDs or register-table entries even if the corresponding classes are not supported for direct data access.

References to OBIS codes may be made in the form of capture-IDs, masks, or scripts even if the corresponding objects are not individually accessible. In this case those items will not appear in the Association object.

## 6.2 Requirements for interoperability.

1. A client device supporting the parameters, functions, and classes of the Minimum Specification, along with suitable configuration of system-dependent features (such as physical addresses, timeout thresholds, and secret keys), shall be able to retrieve all of the specified data items and perform any of the specified updates without particular knowledge about the server.
2. Given the knowledge that a certain client or a certain server implements particular additional features defined as in this specification, a server can be built to return data and receive updates from that client, or a client can be built to retrieve data and perform updates upon that server, respectively, without further special knowledge other than system-dependent features.
3. Interpretation of the data shall be possible by any user with adequate knowledge of electricity metering provided that a complete set of data has been retrieved.

## 6.3 Country-specific OBIS codes

Within this Companion Specification, country-specific variations or additions to quantities such as energy types are managed by the allocation of new codes in the full OBIS format. The country specific OBIS codes introduced in this document are in the format - a.b.94.91.e.f. along with interface class and attributes.

# 7. Association and Data Security

As per the provisions of the DLMS/COSEM protocol, Data access control mechanism and Encryption / Authentication mechanism shall be supported. Access control mechanisms shall be used in the Association establishment phase and Encryption / Authentication mechanism shall be used in the Data communication phase.

## 7.1 Security Profiles

Two Security schemes are defined in this companion standard:

1. Basic Security: The basic security profile does not provide for encryption or authentication during data communication stage. The only security provided for is the Sign-on authentication security provided by Low Level and High level security as applicable for the respective Associations.
2. Advanced security: encryption, authentication, or both can be performed by the application program and transferred using ciphered PDUs.

All systems must implement Basic Security. Implementation of Advanced security is discretionary. When implemented it shall use NIST SP 800-38-D

## 7.2 Security setup (class_id: 64, version: 0)

The following interface class is defined in addition to those published in the international standard [IEC 62056-62]
Instances of this IC contain the necessary information on the security policy applicable and the security suite in use within a particular AA, between two systems identified by their client system title and server system title respectively. They also contain methods to increase the level of security and to transfer the global keys.

| **Security setup** | | **0...n** | **class_id = 64, version = 0** | | | |
|---|---|---|---|---|---|---|
| ***Attributes*** | | ***Data type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logical_name | (static) | octet-string | | | | x |
| 2. security_policy | (static) | enum | | | | x + 0x08 |
| 3. security_suite | (static) | enum | | | | x + 0x10 |
| 4. client_system_title | (dyn.) | octet-string | | | | x + 0x18 |
| 5. server_system_title | (static) | octet-string | | | | x + 0x20 |
| ***Specific methods*** | | ***m/o*** | | | | |
| 1. security_activate | | o | | | | x + 0x28 |
| 2. global_key_transfer | | o | | | | x + 0x30 |

## 7.3 Security Setup objects

The following object identifiers are defined in addition to those published in the international standard [IEC 62056-62]
Instances of the IC "Security setup" – see clause 0 – are used to set up the message security features. For each Association object, there is one Security setup object managing security within that AA. Value group E numbers the instances.

| Security Setup objects | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Security Setup | 64 – Security Setup | 0 | b | 43 | 0 | e | 255 |

This companion standard defines 2 values for E corresponding to the 2 associations as below:

| SNo | Security Setup object OBIS Code | Association description |
|---|---|---|
| 1 | 0.b.43.0.1.255 | Meter Reader Association |
| 2 | 0.b.43.0.2.255 | Utility Settings Association |

## 7.4 LN Association Interface Class

This companion specification utilizes version 1 of the Association LN Interface Class (IC 15). The version 1 of IC 15 adds an extra attribute “security_setup_reference” (attribute 9) which will be used to contain the reference to an instance of a Security Setup class (namely one of the two instances defined in the table above in 7.3

The following Interface Class definition is defined in addition to those published in the international standard [IEC 62056-62]

COSEM logical devices able to establish AAs within a COSEM context using LN referencing, model the AAs through instances of the “Association LN” IC. A COSEM logical device has one instance of this IC for each AA the device is able to support.

| **Association LN** | | **0...MaxNbofAss.** | **class_id = 15, version = 1** | | | |
|---|---|---|---|---|---|---|
| *Attributes* | | *Data type* | *Min.* | *Max.* | *Def.* | Short name |
| 1. logical_name | (static) | octet-string | | | | x |
| 2. object_list | (static) | object_list_type | | | | x + 0x08 |
| 3. associated_partners_id | | associated_partners_type | | | | x + 0x10 |
| 4. application_context_name | | application_context_name | | | | x + 0x18 |
| 5. xDLMS_context_info | | xDLMS_context_type | | | | x + 0x20 |
| 6. authentication_mechanism_name | | mechanism_name | | | | x + 0x28 |
| 7. secret | | octet-string | | | | x + 0x30 |
| 8. association_status | | enum | | | | x + 0x38 |
| 9. security_setup_reference | (static) | octet-string | | | | x + 0x40 |
| *Specific methods* | | *m/o* | | | | |
| 1. reply_to_HLS_authentication (data) | | o | | | | x + 0x60 |
| 2. change_HLS_secret (data) | | o | | | | x + 0x68 |
| 3. add_object (data) | | o | | | | x + 0x70 |
| 4. remove_object (data) | | o | | | | x + 0x78 |

## 7.5 Descriptive Notes for Data Security

### 7.5.1 Access Control for Association

The DLMS/COSEM standard provides three different sign-on authentication mechanisms for each association’s access to meter data applied at the time of performing COSEM OPEN operation.

#### 7.5.1.1 Lowest Level security

Open access without any authentication at sign-on.

#### 7.5.1.2 Low Level security (LLS)

Password based sign-on where the client authenticates itself to the meter using a password. The Utility settings association shall provide access to read/write the password for all associations that utilize this authentication scheme (Currently only the Meter Reader association object). This is accomplished by providing read/write access to the “secret” attribute (attribute number 7) of the Meter Reader association LN object. This read/write access is provided only through the Utility Settings association.

#### 7.5.1.3 High Level security (HLS)

HLS mechanism defines a 4-pass sign-on scheme where the client and server exchange challenges (a random number or code) and then reply to the challenges with a processed response. The processing performed on the challenges is an encryption using a secret “key”. The key is stored under the “secret” attribute (attribute number 7) of the Association objects that utilize High Level authentication (currently only the Utility Settings associations). The Utility Settings association shall provide read/write access to the “secret” attribute of the Utility Settings association.

The encryption mechanism used for processing the challenges shall be AES-GCM-128 algorithm as provided in the information security standard NIST SP 800-38-D

### 7.5.2 Encryption for Data Communication

The secrecy of data communicated between the meter and the client is handled by the encryption mechanism chosen in the Application Context. Associations utilizing the “Logical Name with ciphering” application context provide encryption/decryption services for data messages.

NOTE: The encryption key referred to in the High Level authentication described above is only used to encrypt the challenges during association establishment. It is only for authentication. This has no relation to the encryption that may be used in actual data communication

# 8. Event handling

This section adds the definitions for the Event Code object and Event Log object in sections 8.1 and 8.2 as below.

## 8.1 Event Code

An event code object is used to hold the identifier corresponding to most recent event. Data, Register or Extended Register classes can be used to model this object. DLMS allows defining country specific reference table that lists all possible events with corresponding identifier (Refer to Annexure A6 – Table A6.1 to A6.7 for the Indian Event reference table entries). For the purposes of this companion standard the Interface Class used for this object is restricted to IC-1 (Data). The value attribute of the object will have a DLMS data type “long unsigned” (16 bit integer) which will contain the event identifier for the last recorded event (identifier taken from the reference tables A6.1 to A6.7.

| Event code | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F |
| Event code | 1 – Data | 0 | b | 96 | 11 | e | 255 |

Value group E allows to classify events into different categories as needed. Currently DLMS allows 10 values (0...9) for value group E, enabling user to define up to 10 event categories.

This companion specification defines 7 categories for classification of events and correspondingly 7 Event code objects as below

| Sno | Event Code object OBIS Code | Event Category Description |
|---|---|---|
| 1 | 0.b.96.11.0.255 | Voltage related events |
| 2 | 0.b.96.11.1.255 | Current related events |
| 3 | 0.b.96.11.2.255 | Power failure related events |
| 4 | 0.b.96.11.3.255 | Transaction related events |
| 5 | 0.b.96.11.4.255 | Other events |
| 6 | 0.b.96.11.5.255 | Non-rollover events |
| 7 | 0.b.96.11.6.255 | Control events for connect/disconnect |

NOTE: The 7th Event code object is required only where remote load control by means of connect/disconnect are specified by agreement between the Utility and the manufacturer

Refer to Annexure A6 – Table A6.1, A6.2, A6.3, A6.4, A6.5, A6.6 and A6.7 for the valid Event Identifier values defined for the above 7 categories by this companion specification.

## 8.2 Event Log

These are profile generic objects to store historic values in its buffer attribute. The capture object includes object attribute definitions of associated data. Associated data includes event code and other relevant information such as timestamp, instantaneous electricity related information (such as current/voltage/energy register, contents etc at the time of the event).

For the purposes of this companion standard, the capture objects will include the entries specified in Annexure A6 – Table A6.8

| Event logs | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| Event log | 7 – Profile Generic | 0 | b | 99 | 98 | e | 255 |

Value group E allows to classify event logs into different categories as needed. Currently

DLMS allows 10 values (0...9) for value group E allowing to define up to 10 event log categories.

This companion specification defines 7 categories for classification of event log objects with a one-to-one correspondence with the 7 event code categories defined in section 8.1 above.

| SNo | Event Log object OBIS Code | Event Category Description |
|---|---|---|
| 1 | 0.b.99.98.0.255 | Voltage related events |
| 2 | 0.b.99.98.1.255 | Current related events |
| 3 | 0.b.99.98.2.255 | Power failure related events |
| 4 | 0.b.99.98.3.255 | Transaction related events |
| 5 | 0.b.99.98.4.255 | Other events |
| 6 | 0.b.99.98.5.255 | Non-rollover events |
| 7 | 0.b.99.98.6.255 | Control events for connect/disconnect |

NOTE: The 7th Event log category is required only where remote load control by means of connect/disconnect are specified by agreement between the Utility and the manufacturer

### 8.2.1 Event Log storage recommendations

This companion specification recommends a minimum total storage of 200 events in the Event logs. The division of the specified storage space across the 7 compartments specified above shall be by agreement between the Utility and the Manufacturer.

The event code and event log parameters are accessible through the MR and US associations with read-only access.

## 9.TOD Metering

DLMS/COSEM provides a number of Interface Classes to deal with TOD metering. These include Activity Calendars (objects that specify the time-switches for tariffs based on a season/week/day profile tree) and Schedules (a simple tabular listing of time-switch scripts associated with a date-time).

These objects associate a script (stored in a Script Table object, IC-9) with each time-switch. The script usually defines the list of registers that get enabled for that time-switch using a Register Activation object (IC-6) that stores “masks” of registers that can be selectively enabled/disabled.

For the purpose of this companion specification, the Activity Calendar (IC-20) shall be used.

| Activity Calendar | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | CD | E | | F |
| Activity Calendar | 20 – Activity Calendar | 0 | b 1 | 3 | 0 | 0 | 255 |

An instance of a Script Table class, the Tariffication Script Table object will be used to store the scripts related to each time-switch in the Schedule.

| Script Table | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| Tariffication Script Table | 9 – Script Table | 0 | b 1 | 0 | 0 | 100 | 255 |

This Companion specification utilizes a simple mechanism for associating TOD/TOU scripts with Tariffs, as described below. Use of the Register Activation object is not required.

Under this mechanism, script identifiers in the Tariffication Script Table are inherently associated with Tariffs, as defined below.

Script identifiers from 1 to 16 are associated with the Activation of Tariff Rate Registers 1 to 16. Implementations that do not require 16 different tariff rates shal use identifiers from 1 to the required number. For example if 8 tariffs are defined, script identifiers 1 to 8 shall be used, where scripts 9 to 16 are reserved for future use.
Scripts identifiers 17 to 32 are associated with Maximum Demand tariffs 1 to 16. Implementations that do not require 16 different tariff rates shall use identifiers from 1 to the required number.

The Activity Calendar shall be used to associate activation times to different Tariff rates simply by using the appropriate script identifiers. All scripts shall point to a dummy OBIS code and attribute index which has no associated meaning.

Use of the Special Days table is not considered presently in this companion standard.

# 10.Billing Periods

Billing period resets are driven by an instance of the Single Action Schedule class in conjunction with a Script Table. The Data of the Billing Period is stored in a Profile Generic object as below. Each entry in the profile buffer captures the billing period values for a specific Billing Period.

| Profile Generic | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| Data of Billing Period Profile | 7 – Profile Generic | 1 | b 9 | 8 | 1 | 0 | 255 |

This companion specification specifies the following Single Action Schedule object to drive the end of billing period resets. The object will contain the time-date entries at

which billing period resets are scheduled.

| Single Action Schedule | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| MDI Reset / End of Billing Period | 22 – Single Action Schedule | 0 | b 1 | 5 | 0 | 0 | 255 |

Each time-date entry in the “execution_time” array will be associated with a link to a single Script in the MDI Reset/End of Billing Period Script Table. The Script table object as specified below will be programmed with scripts to handle the Billing period resets

| Script Table | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| MDI Reset / End of Billing Period Script Table | 9 – Script Table | 0 | b 1 | 0 | 0 | 1 | 255 |

The script table will contain a single script that specifies the “capture” method invocation for the corresponding Data of Billing Period profile (1.0.98.1.0.255). Therefore a Single Action Schedule entry will trigger a call to the Script table to execute the capture method at a specific time (viz. the end of the billing period) which will cause a billing period entry to be made in the profile for the current period and trigger the start of a new billing period. Other actions internal to the meter may also be triggered by the end of each billing period, but are not required to be expressed as scripts here.

# 11. Historic data

Historic data can be accessed by two mechanisms in DLMS-COSEM. One mechanism provides access to past values of specific quantities by using a VZ (billing period number) related value for F in the OBIS code of the original quantity. The other mechanism provides access to historic data stored as growing buffers in a Profile generic object.

## 11.1 VZ handling – Billing Period Counter

The meter will contain an instance of a Billing period counter object

| Billing Period Counter | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| Billing Period Counter | 1 – Data | 0 | b | 0 | 1 | 0 | 255 |

The value attribute of the object will have a DLMS data type “unsigned” (8-bit character) and will follow a modulo-100 scheme at a minimum. The value will thus start with 0, increment upto 99 and then rollover to 0 again. The current value of this attribute is called “VZ”. Implementations must support at least modulo-100, but higher capacities for the billing period counter value attribute may also be supported.

The meter will contain an instance of a Data object that provides the number of available billing periods in the meter

| Number of Billing periods | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| Available Billing periods | 1 – Data | 0 | b | 0 | 1 | 1 | 255 |

The above can be read by the client to identify how many previous billing period’s data is available in the meter. The value attribute of the above object will have a DLMS data type “unsigned” (8-bit character)

For specific data objects (especially data of the billing period objects), it is possible to retrieve the individual historic values of past billing periods using specific values for the “F” value field of the OBIS code. For example if the active energy of the current billing period is 1.0.1.8.0.255, then the active energy of the immediately previous billing period is available at 1.0.1.8.0.101. Further historic periods can be accessed by using “102”, “103”, … etc. up to the limit that is identified by the “Number of Available Billing Periods” object above. For example a value of 106 can be used to represent the data of the 6th previous billing period. Simple objects can only be used to represent values of historical billing periods, if “Profile generic” objects are not implemented

## 11.2 Profiles

Historic data like Load profiles etc. are supported in IEC-62056 by the Profile generic Interface Class (IC 7). This object supports capture of other meter object attributes at specific intervals or on demand. The captured data is stored in the buffer attribute (Attribute 2) of the Profile generic class. This class also supports Selective access to filter the buffer data in response to GET requests. There are two mechanisms for selective access viz. Selective access by Entry and Selective Access by Range.

This companion specification requires that the Selective Access by Range shall be supported for Block Load profile and Daily Load profile. This companion specification requires support for Selective Access by Entry for Billing data profile and Event log profiles.

In case of Selective access by Range, this companion specification imposes that the restricting object is to be an instance of the Clock interface class (IC-8) and the date-time attribute of the object is captured in the buffer.

# 12. Communication Profiles

IEC 62056 adopts the Open Systems Interconnection Reference Model, in a reduced three-layer form suitable for low-resource applications such as electricity metering. The Fig-12.1 below illustrates this system.

This companion specification requires that the three-layer serial Connection-Orientated (CO) profile shall at least be supported as depicted by the circled sections in Fig 12.1.

The 3-layer serial CO profile consists of COSEM, Logical Link Control (LLC), and High-Level Distribution Line Control (HDLC) on a serial physical channel. This profile may be extended by using modems to handle different carriers such as PSTN, GSM, or GPRS, Radio, Zigbee etc.

The addition of dial-up modem connections as described in IEC 62056-42 is required only where modem is fitted internal to the meter.

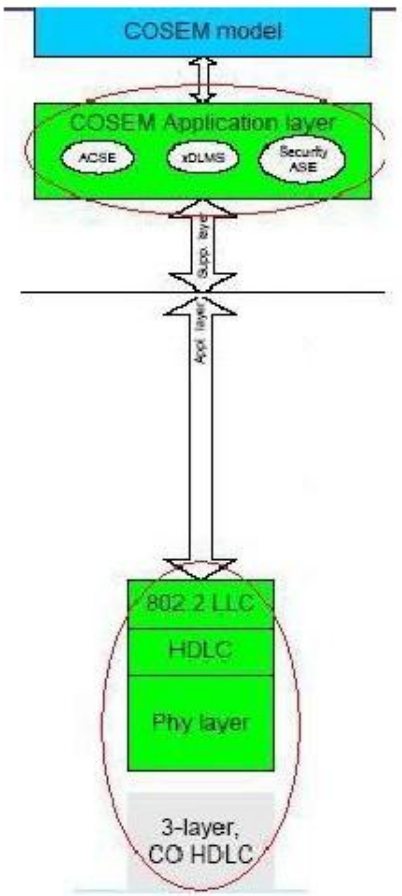


Fig 12.1: Communication profile options

# 13. Communication Setup Objects

This companion standard requires the following communication setup objects to be supported in the meter implementation. This document also recommends that a specific baud rate may be fixed between the utility and the manufacturer for each project. The suggested default baud rate is given in section 4.1

| Communication Setup and related objects for serial communication | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| IEC HDLC Setup | 23 - IEC HDLC Setup | 0 | b 22 | | 0 | 0 | 255 |

# 14. Connect/Disconnect control

In implementations that require remote Connect/Disconnect control, effected by operation of an output pulse from the meter, this companion specification requires support for the Disconnector class object as below

| Disconnector | IC | OBIS code | | | | | |
|---|---|---|---|---|---|---|---|
| | | AB | | C | D | E | F |
| Disconnect Control | 70 – Disconnect Control | 0 | b 96 | | 3 | 10 | 255 |

# Annexure A1

## Introduction to Standardized Meter Parameters list

The contents in this and the following Annexure are excerpts from the national "Report on Standardisation of Metering Parameters – April 2009". The report has identified three categories of meters.

## A1.1] Categories of meters:

(i) Category A Meter – This meter is identified for use at sub-station feeders and Distribution Transformer Centers. The parameters listed for this category is for "Energy Accounting and Audit" purposes.

(ii) Category B Meter – This meter is identified for use at Meter Banks and Network boundaries. The parameters listed for this category is for import / export of energy. This meter is also suitable for Availability Based Tariff (ABT) regime.

(iii) Category C Meter – This meter is identified for use at HT (PT and CT operated) and LT (CT operated) consumers. The parameters listed for this category is for consumers who draw energy from the grid. For consumers who also supply energy to grid the category B Meter is recommended..

## A1.2] Classification of Parameters

The parameters which constitute the data for communication is classified into:
a) Instantaneous Parameters
b) Block Profile / Load Survey Parameters.
c) Daily Profile Parameters.
c) Parameters for accounting / billing.
d) Abstract quantities
- Name Plate Details.
- Programmable parameters

e) Event Conditions.

For each of the above category of meter the data or parameters classification is standardized and tabulated in the Annexure against each as shown in Table – A1.1.

The measurement and computation of each of these parameters and events shall be based on standard methods or based on utilities prudent practices or as directed by respective Regulatory Commission.

Table A1.1

| Meter Category | Purpose | Annexure Reference |
|---|---|---|
| A | Energy Accounting and Audit Metering | A2, A5, A6 |
| B | Boundary / Bank / Ring / ABT Metering | A3, A5, A6 |
| C | HT (PT / CT) and LT (CT) consumer Metering | A4, A5, A6 |

For each of the identified parameter the OBIS code, Interface Class and the attributes are given in the various tables in corresponding Annexure. The OBIS codes listed are applicable for LN referencing and is mandatory to adhere to by the SERVERS and CLIENTS.

## A1.3] Instantaneous Parameters

The Instantaneous parameters are to be calculated at a particular instant of time and displayed on the meter. These values shall be continuously updated by the meter hardware / software as per internal sampling and computation time. The energy values in the table shall be cumulative readings from the date of manufacturing or installation of meter as the case may be. These shall be continuously updated and last updated value shall be available for downloading as and when required. Each of the parameters shall be readable at any instant by the HOST from remote or by HHU at site. The snap shot of all the instantaneous values of all parameters shall be readable by the HOST computer.

## A1.4] Profile Generic or load survey parameters (capture time block 15 or 30 minutes)

This is an array of parameters identified for capturing and storing at specified time intervals or capture times. The capture times shall be either 15 or 30 minutes. The capture times shall be programmable by the utilities. The tables lists the parameters whose profile (survey) is to be captured and stored in the meter as per set capture time period. The profiles shal be readable at any time by the HOST from remote or by HHU at site for any specified range and time.

IN the case of Category B meters the capture time shall be of 15 minutes duration.

The data stored in the array shall be the average value for the captured time block and stored at the end of that block, except for energy values. The energy entries are the consumption during respective capture time block and posted at the end of that block. The array of data shall be retained inside the meter memory for the last 22 days for a capture period of 15 minutes or for the last 45 days for a capture period of 30 minutes. The storage days can be expanded by choosing less number of parameters.

The block load profiles shall not store or return values (typically zero values) for conditions where the meter is powered down for a full day, where a full day is defined as the 24 hour period from midnight 00 Hrs to the next midnight 00 Hrs. Under such conditions the block load profile for the entire 24 Hour period shall not be stored nor padded with zero entries. However if the meter is powered up even for a small amount of time (sufficient for it to boot up and record the Power up event) during the 24 Hour period, it shall store and return the Block load profile for the entire 24 hour duration.

## A1.5] Parameters for Accounting / Billing Purpose

These are parameters identified for accounting / billing purposes. These shall be generated by the meter for each billing cycle and stored in the memory. The set of data for last 6 (six) cycles shall be stored in the memory. At the end of each cycle corresponding set of data shall be readable by the HOST from remote or by HHU at site.

## A1.6] Abstract quantities

### A1.6.1] Name Plate Details

These parameters are non electrical quantities and are static in nature. details are abstract parameters and are grouped as “Name Plate Details”. The parameters identified and grouped as “Name Plate Details” under this classification are applicable for all category of meters. These are readable as a profile as and when required. Some of the pertinent information about the supplied meter is included in this table.

### A1.6.2] Programmable Parameters

These parameters are non electrical quantities. The parameters identified and grouped as “Programmable Parameters”. These parameters shall be programmable by the Utility engineers. For the purpose of setting / altering the values of these parameters, the security and access rights in line with the methodology described in protocol, shall be mutually agreed between utility and manufacturer. The parameters shall be programmable by HOST from remote and HHU at site. These are applicable for all categories of meters. These are readable as a profile as and when required.

## A1.7] Event Conditions:

Any abnormal or a tamper condition is defined as an Event. The meters shall identify, resolve and log both occurrence and restoration of such events. The meters shall also capture some of the parameters at the instance of above said log. The report has identified the events to be logged and the parameters to be captured for each of those events.

This companion specification has further classified those events in sub groups for easy handling. The sub groups are

a. Voltage related events
b. Current related events
c. Power Failure related events
d. Transactional events
e. Other events
f. Non rollover events
g. Control events

The number of events stored in each compartment shall be decided by agreement between the Utility and Manufacturers. However the total number of events shall be 200.

The event conditions identified are listed in Table – A6.1 to A6.7 covering all the subgroups. For each type of event condition the parameters to be captured are listed in Table – A6.8. The required capture parameters for selected event condition shall be chosen by the utility as per its practices and directives.

The types of events to be recorded may be selected by the Utility out of the list provided in tables A6.1 to A6.7 as per Utility need and practice. The parameters for which Snapshot is to be recorded at time of tamper / event can also be selected out of list of parameters provided in “Capture Parameters” in table A6.8.

The event conditions identified are listed in Tables - A6.1 to A6.7 covering all the subgroups. Number of events stored in each compartment shall be decided by agreement between the Utility and Manufacturers where the total number of events shall be 200. Events are grouped in the following seven different compartments:

a. Voltage related events
b. Current related events
c. Power Failure related events
d. Transactional events
e. Other events
f. Non rollover events
g. Control events

The Table A1.2 summarizes for each category of meter the Annexure reference and Table reference for viewing the names of parameters and the assigned OBIS codes of the electrical and non-electrical parameters.

Table –A1.2

| Category/ Purpose | Annexure Reference | Table reference |
|---|---|---|
| A - Energy Accounting and Audit Metering | A2, A5, A6 | A2.1,A2.2,<br>A5.1,A5.2<br>A6.1,A6.2, A6.3, A6.4,<br>A6.5, A6.6, A6.7, A6.8 |
| B - Boundary / Bank / Ring / ABT Metering | A3, A5, A6 | A3.1, A3.2, A3.3<br>A5.1,A5.2<br>A6.1, A6.2, A6.3 A6.4,<br>A6.5, A6.6, A6.7, A6.8 |
| C - HT (PT / CT) and LT (CT) Consumer Metering | A4, A5, A6 | A4.1, A4.2, A4.3<br>A5.1,A5.2<br>A6.1, A6.2, A6.3, A6.4,<br>A6.5, A6.6, A6.7, A6.8 |

The servers shall provide the entire list of parameters listed in the respective Annexure. However the user, depending on the need, may choose required parameters from the full list. The OBIS code for such selected parameters however shall remain as assigned.

# Annexure A2

## Parameter List for 'Category A' meters

The parameters listed here are for Energy Accounting & Audit purposes. These meters are identified for Feeder metering and DTC metering where the power flow is unidirectional. In circumstances where bidirectional power flow is to be measured then Category B Meters shall be deployed.

The parameters identified are grouped under Instantaneous (Table-A2.1) and Block load profile (Table –A2.2). The tables include the name of the parameter, the OBIS code and Interface class.

Association Access Rights:

Public Client - Read Only for Clock and no access for other objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read & Write for Clock And Read Only for others.

TABLE- A2.1 – Instantaneous Parameters

Each of the parameters is a separate entity. The OBIS code for each parameter is identified as per DLMS /COSEM protocol.

| S.No | Parameter | OBIS code<br><br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |
| 2 | Current - $I_R$ | 1.0.31.7.0.255 | 3/2 |
| 3 | Current - $I_Y$ | 1.0.51.7.0.255 | 3/2 |
| 4 | Current – $I_B$ | 1.0.71.7.0.255 | 3/2 |
| 5 | Voltage - VRN | 1.0.32.7.0.255 | 3/2 |
| 6 | Voltage – $V_{YN}$ | 1.0.52.7.0.255 | 3/2 |
| 7 | Voltage – $V_{BN}$ | 1.0.72.7.0.255 | 3/2 |
| 8 | Voltage - $V_{RY}$ | 1.0.32.7.0.255 | 3/2 |
| 9 | Voltage – $V_{BY}$ | 1.0.52.7.0.255 | 3/2 |
| 10 | Signed Power Factor –R phase | 1.0.33.7.0.255 | 3/2 |
| 11 | Signed Power Factor - Y phase | 1.0.53.7.0.255 | 3/2 |
| 12 | Signed Power Factor - B phase | 1.0.73.7.0.255 | 3/2 |
| 13 | Three Phase Power Factor – PF | 1.0.13.7.0.255 | 3/2 |
| 14 | Frequency | 1.0.14.7.0.255 | 3/2 |
| 15 | Apparent Power – KVA | 1.0.9.7.0.255 | 3/2 |
| 16 | Signed Active Power – kW (+ Forward; - Reverse) | 1.0.1.7.0.255 | 3/2 |
| 17 | Signed Reactive Power – kvar (+ Lag; - Lead) | 1.0.3.7.0.255 | 3/2 |
| 18 | Cumulative Energy – kWh | 1.0.1.8.0.255 | 3/2 |
| 19 | Cumulative Energy – kvarh – Lag | 1.0.5.8.0.255 | 3/2 |
| 20 | Cumulative Energy – kvarh – Lead | 1.0.8.8.0.255 | 3/2 |
| 21 | Cumulative Energy – kVAh | 1.0.9.8.0.255 | 3/2 |
| 22 | Cumulative power-off duration. | 0.0.96.7.15.255 | 1/2 |
| 23 | Cumulative tamper count | 0.0.94.91.0.255 | 1/2 |

| | | | |
|---|---|---|---|
| 24 | Cumulative MD resets count | 0.0.0.1.0.255 | 1/2 |
| 25 | Cumulative programming count | 0.0.96.2.0.255 | 1/2 |
| 26 | Date and time of last MD reset | 0.0.0.1.2.255 | 8/2 |
| 27 | Maximum Demand – kW | 1.0.1.6.0.255 | 4 / 2, 5 |
| 28 | Maximum Demand – kVA | 1.0.9.6.0.255 | 4 / 2, 5 |

Note for TABLE- A2.1:

1. The items at 5, 6, and 7 are for 3Φ / 4W system of measurement with NEUTRAL as reference point.
2. The items at 8, 9 are for 3 Φ / 3W system of measurement with Y-PHASE as reference point.
3. Signed Power factor – (+ indicates lag) and (- indicates lead).
4. The parameters at S No. 18 to 25 hold cumulative values at that instant from the date of manufacturing or installation of meter as the case may be.
5. The above list is identified for the purpose of communication to HOST or HHU.
6. The utilities may choose, based on needs, additional parameters for display purpose ONLY.
7. Association Table

Snap shot of Instantaneous parameters: The parameters of TABLE – A2.1 shall be captured as a profile generic using the country specific OBIS code 1.0.94.91.0.255; The attribute 2 of each of the capture objects shall be copied into the profile at the instant of a request from the Host.

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A2.1. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.3.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This profile is not required to be updated periodically.

TABLE- A2.2 – Block Load profile Parameters

This is an array of load survey data captured as a profile generic. The OBIS code is 1.0.99.1.0.255, with Interface class as 7. The capture objects of this block load profile are as per Table-A2.2 and the captured attribute shall be attribute 2 of each interface class. The capture object values will be copied into buffer of this array automatically as per capture period which shall be set through OBIS code 1.0.0.8.4.255 of recording interval 1.

Association Access Rights:

Public Client - No access for all objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read Only for all objects.

| S.No | Parameter | OBIS code<br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |

| | | | |
|---|---|---|---|
| 2 | Current - $I_R$ | 1.0.31.27.0.255 | 3/2 |
| 3 | Current - $I_Y$ | 1.0.51.27.0.255 | 3/2 |
| 4 | Current – $I_B$ | 1.0.71.27.0.255 | 3/2 |
| 5 | Voltage - $V_{RN}$ | 1.0.32.27.0.255 | 3/2 |
| 6 | Voltage – $V_{YN}$ | 1.0.52.27.0.255 | 3/2 |
| 7 | Voltage – $V_{BN}$ | 1.0.72.27.0.255 | 3/2 |
| 8 | Voltage - $V_{RY}$ | 1.0.32.27.0.255 | 3/2 |
| 9 | Voltage – $V_{BY}$ | 1.0.52.27.0.255 | 3/2 |
| 10 | Block Energy – kWh | 1.0.1.29.0.255 | 3/2 |
| 11 | Block Energy – kvarh – lag | 1.0.5.29.0.255 | 3/2 |
| 12 | Block Energy – kvarh – lead | 1.0.8.29.0.255 | 3/2 |
| 13 | Block Energy – kVAh | 1.0.9.29.0.255 | 3/2 |

Note (TABLE- A2.2):

1. The items at 5, 6, and 7 are for 3Φ / 4W system of measurement with NEUTRAL as reference point.
2. The items at 8, 9 are for 3 Φ / 3W system of measurement with Y-PHASE as reference point.
3. The parameters at S. No. 2 to 9 are the average values during the block period time and stored at the end of that time block.
4. The parameters at S. No. 10 to 13 are the actual energy consumption during that time block.
5. Capture objects for 3 Φ / 4W are items 1, 2,3,4,5,6,7,10,11,12,13.
6. Capture objects for 3 Φ / 3W are items 1, 2,3,4,8,9,10,11,12,13.
7. Support for Selective access shall be as defined in Section 11.2

Parameters for Accounting / Billing - The list of parameters in Table – A2.1 and A2.2 shall be used for computing the daily accounting data at the HOST.

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A2.2. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.4.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This profile is not required to be updated periodically.

# Annexure A3

## Parameter list for Category B meters

The parameters listed here are for Boundary / Bank / Ring Fencing / ABT Metering.
The meter records parameters under import and or export conditions.

The parameters identified for this are grouped under Instantaneous (Table-A3.1), Block load profile (Table –A3.2) and Daily Load profile (Table –A3.3). The tables include the name of the parameter, the OBIS code and Interface class.

Table – A3.1 – Instantaneous Parameters

Each of the parameters is a separate entity. The OBIS code for each parameter is identified as per DLMS /COSEM protocol.

Association Access Rights:

Public Client - Read Only for Clock and no access for other objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read & Write for Clock And Read Only for others.

| S.No | Parameter | OBIS code A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |
| 2 | Current - $I_R$ | 1.0.31.7.0.255 | 3/2 |
| 3 | Current - $I_Y$ | 1.0.51.7.0.255 | 3/2 |
| 4 | Current – $I_B$ | 1.0.71.7.0.255 | 3/2 |
| 5 | Voltage - $V_{RN}$ | 1.0.32.7.0.255 | 3/2 |
| 6 | Voltage – $V_{YN}$ | 1.0.52.7.0.255 | 3/2 |
| 7 | Voltage – $V_{BN}$ | 1.0.72.7.0.255 | 3/2 |
| 8 | Voltage - $V_{RY}$ | 1.0.32.7.0.255 | 3/2 |
| 9 | Voltage – $V_{BY}$ | 1.0.52.7.0.255 | 3/2 |
| 10 | Signed Power Factor - R phase | 1.0.33.7.0.255 | 3/2 |
| 11 | Signed Power Factor - Y phase | 1.0.53.7.0.255 | 3/2 |
| 12 | Signed Power Factor - B phase | 1.0.73.7.0.255 | 3/2 |
| 13 | Three Phase Power Factor – PF | 1.0.13.7.0.255 | 3/2 |
| 14 | Frequency | 1.0.14.7.0.255 | 3/2 |
| 15 | Apparent Power – KVA | 1.0.9.7.0.255 | 3/2 |
| 16 | Active Power – kW (Export) | 1.0.1.7.0.255 | 3/2 |
| 17 | Active Power – kW (Import) | 1.0.2.7.0.255 | 3/2 |
| 18 | Reactive Power – kvar (Export) | 1.0.3.7.0.255 | 3/2 |
| 19 | Reactive Power – kvar (Import) | 1.0.4.7.0.255 | 3/2 |
| 20 | Cumulative Energy – kWh (Import) | 1.0.1.8.0.255 | 3/2 |
| 21 | Cumulative Energy – kWh (Export) | 1.0.2.8.0.255 | 3/2 |
| 22 | Cumulative Energy – kVAh(Import) | 1.0.9.8.0.255 | 3/2 |
| 23 | Cumulative Energy – kVAh(Export) | 1.0.10.8.0.255 | 3/2 |
| 24 | Cumulative power-off duration. | 0.0.96.7.15.255 | 1/2 |

| | | | |
|---|---|---|---|
| 25 | Cumulative tamper count | 0.0.94.91.0.255 | 1/2 |
| 26 | Cumulative MD resets count | 0.0.0.1.0.255 | 1/2 |
| 27 | Cumulative programming count | 0.0.96.2.0.255 | 1/2 |
| 28 | Date and time of last MD reset | 0.0.0.1.2.255 | 8/2 |

Note (Table – A3.1):

1. The items at 5, 6, and 7 are for 3Φ / 4W system of measurement with NEUTRAL as reference point.
2. The items at 8, 9 are for 3 Φ / 3W system of measurement with Y-PHASE as reference point.
3. Signed Power factor – (+ indicates lag) and (- indicates lead).
4. The parameters at S No. 20 to 27 hold cumulative values at that instant from the date of manufacturing or installation of meter as the case may be.
5. The above list is identified for the purpose of communication to HOST or HHU.
6. The utilities may choose, based on needs, additional parameters for display purpose ONLY.

Snap shot of Instantaneous parameters: The parameters of TABLE – A3.1 shall be captured as a profile generic using the country specific OBIS code 1.0.94.91.0.255; The attribute 2 of each of the capture objects shall be copied into the profile at the instant of a request from the Host.

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A3.1. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.5.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This buffer is not required to be updated periodically.

TABLE- A3.2 – Block Load profile Parameters

This is an array of load survey data captured as a profile generic. The OBIS code is 1.0.99.1.0.255, with Interface class as 7. The capture objects of this block load profile are as per Table-A3.2 and the captured object shall be attribute 2 of each interface class. The capture object values will be copied into a buffer of this array automatically as per capture period which shall be set through OBIS code 1.0.0.8.4.255 of recording interval 1.

Association Access Rights:

Public Client – No access for all objects
Meter Reader – Read Only for all objects.
Utility Setting – Read Only for all objects.

| S.No | Parameter | OBIS code<br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |
| 2 | Frequency | 1.0.14.27.0.255 | 3/2 |
| 3 | Voltage - $V_{RN}$ | 1.0.32.27.0.255 | 3/2 |
| 4 | Voltage – $V_{YN}$ | 1.0.52.27.0.255 | 3/2 |

| | | | |
|---|---|---|---|
| 5 | Voltage – $V_{BN}$ | 1.0.72.27.0.255 | 3/2 |
| 6 | System Power Factor – PF | 1.0.13.7.0.255 | 3/2 |
| 7 | Net Energy – kWh | 1.0.16.29.0.255 | 3/2 |
| 8 | Energy – kvarh – Quadrant 1 | 1.0.5.29.0.255 | 3/2 |
| 9 | Energy – kvarh – Quadrant 2 | 1.0.6.29.0.255 | 3/2 |
| 10 | Energy – kvarh – Quadrant 3 | 1.0.7.29.0.255 | 3/2 |
| 11 | Energy – kvarh – Quadrant 4 | 1.0.8.29.0.255 | 3/2 |

Note (TABLE- A3.2):

1. The parameters listed in this table are for load survey purpose and are logged as per the block period time.
2. The Block period time for Interface meters is fixed at 15 min for which the data storage will be for 22 days.
3. The parameters at S. No. 3 to 6 are the average values of 15 min block and stored at the end of that time block.
4. The parameters at S. No. 7 to 11 are the actual energy consumption during the 15 min time block.
5. Item 2 is an ABT parameter for absolute average value.
6. Item 7 is an ABT parameter for Net energy in the current 15 min block.
7. Support for Selective access shall be as defined in Section 11.2

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A3.2. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.6.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This profile is not required to be updated periodically.

TABLE- A3.3 – Daily Load profile Parameters

This is an array of load survey data captured as a profile generic at the end of 24 hours. The OBIS code is 1.0.99.2.0.255, with Interface class as 7. The capture objects of this daily load profile are as per Table-A3.3 and the captured attribute shall be attribute 2 of each interface class. The capture object values will be copied into a buffer of this array automatically as per capture period which shall be set through OBIS code 1.0.0.8.5.255 of recording interval 2. The capture period attribute shall be statically fixed as 24 hours.

Association Access Rights:

Public Client – No access for all objects
Meter Reader – Read Only for all objects.
Utility Setting – Read Only for all objects.

| S.No | Parameter | OBIS code<br><br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |
| 2 | Cumulative Energy – kWh – import | 1.0.1.8.0.255 | 3/2 |
| 3 | Cumulative Energy – kWh – export | 1.0.2.8.0.255 | 3/2 |

| | | | |
|---|---|---|---|
| 4 | Cumulative Energy – kVAh while kW import | 1.0.9.8.0.255 | 3/2 |
| 5 | Cumulative Energy – kVAh while kW export | 1.0.10.8.0.255 | 3/2 |
| 6 | Reactive energy high (V > 103%) | 1.0.94.91.1.255 | 3/2 |
| 7 | Reactive energy low (V < 97%) | 1.0.94.91.2.255 | 3/2 |
| 8 | Cumulative Energy – kvarh – Quadrant 1 | 1.0.5.8.0.255 | 3/2 |
| 9 | Cumulative Energy – kvarh – Quadrant 2 | 1.0.6.8.0.255 | 3/2 |
| 10 | Cumulative Energy – kvarh – Quadrant 3 | 1.0.7.8.0.255 | 3/2 |
| 11 | Cumulative Energy – kvarh – Quadrant 4 | 1.0.8.8.0.255 | 3/2 |

Note (TABLE- A3.3):

1. The parameters listed in this table are meant for billing purpose and shall be logged at midnight (00 Hrs).
2. The storage time for these parameters is 22 days.
3. The parameters are the actual energy consumption during the 24 Hrs time block.
4. These parameters shall be readable any instant by HOST/ HHU for any of the parameters for any specified range and time.
5. Selected values can be read as profile.
6. The OBIS code (d=30) may be used when daily energy readings are needed by the user.
7. Item 6 is an ABT parameter.
8. Item 7 is an ABT parameter.
9. Support for Selective access shall be as defined in Section 11.2

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A3.3. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.7.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This profile is not required to be updated periodically.

# Annexure A4

## Parameter list for Category C meters

The parameters listed here are for HT (PT / CT) and LT (CT) consumer metering. This meter records energy in import mode. These meters shall be capable of recoding Import of energy. For customers who import energy and also export energy, use of category B meters is recommended.

The parameters identified for this are grouped under Instantaneous (Table-A4.1), Block load profile (Table –A4.2), and Billing (Table – A4.3). The tables include the name of the parameter, the OBIS code and Interface class.

Table – A4.1 – Instantaneous Parameters

Each of the parameters is a separate entity. The OBIS code for each parameter is identified as per DLMS /COSEM protocol.

Association Access Rights:

Public Client - Read Only for Clock and no access for other objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read & Write for Clock And Read Only for others.

| S.No | Parameter | OBIS code<br><br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |
| 2 | Current - $I_R$ | 1.0.31.7.0.255 | 3/2 |
| 3 | Current - $I_Y$ | 1.0.51.7.0.255 | 3/2 |
| 4 | Current – $I_B$ | 1.0.71.7.0.255 | 3/2 |
| 5 | Voltage - $V_{RN}$ | 1.0.32.7.0.255 | 3/2 |
| 6 | Voltage – $V_{YN}$ | 1.0.52.7.0.255 | 3/2 |
| 7 | Voltage – $V_{BN}$ | 1.0.72.7.0.255 | 3/2 |
| 8 | Voltage - $V_{RY}$ | 1.0.32.7.0.255 | 3/2 |
| 9 | Voltage – $V_{BY}$ | 1.0.52.7.0.255 | 3/2 |
| 10 | Signed Power Factor –R phase | 1.0.33.7.0.255 | 3/2 |
| 11 | Signed Power Factor - Y phase | 1.0.53.7.0.255 | 3/2 |
| 12 | Signed Power Factor - B phase | 1.0.73.7.0.255 | 3/2 |
| 13 | Three Phase Power Factor – PF | 1.0.13.7.0.255 | 3/2 |
| 14 | Frequency | 1.0.14.7.0.255 | 3/2 |
| 15 | Apparent Power – KVA | 1.0.9.7.0.255 | 3/2 |
| 16 | Signed Active Power – kW (+ Forward; - Reverse) | 1.0.1.7.0.255 | 3/2 |
| 17 | Signed Reactive Power – kvar (+ Lag; - Lead) | 1.0.3.7.0.255 | 3/2 |
| 18 | Cumulative power-off duration. | 0.0.96.7.15.255 | 1/2 |
| 19 | Cumulative tamper count | 0.0.94.91.0.255 | 1/2 |
| 20 | Cumulative MD resets count | 0.0.0.1.0.255 | 1/2 |
| 21 | Cumulative programming count | 0.0.96.2.0.255 | 1/2 |
| 22 | Date and time of last MD reset | 0.0.0.1.2.255 | 8/2 |

Note (Table – A4.1):

1. The items at 5, 6, and 7 are for 3Φ / 4W system of measurement with NEUTRAL as reference point.
2. The items at 8, 9 are for 3 Φ / 3W system of measurement with Y-PHASE as reference point.
3. Signed Power factor – (+ indicates lag) and (- indicates lead).
4. The parameters at S No. 18 to 21 hold cumulative values at that instant from the date of manufacturing or installation of meter as the case may be.
5. The above list is identified for the purpose of communication to HOST or HHU.
6. The utilities may choose, based on needs, additional parameters for display purpose ONLY.
7. Item 22 - Data type to be as for attribute 2 of IC 8, Clock.

Snap shot of Instantaneous parameters: The parameters of TABLE – A4.1 shall be captured as a profile generic using the country specific OBIS code 1.0.94.91.0.255. The attribute 2 of each of the capture objects shall be copied into the profile at the instant of a request from the Host.

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A4.1. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.8.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This buffer is not required to be updated periodically.

TABLE- A4.2 – Block Load profile Parameters

This is an array of load survey data captured as a profile generic. The OBIS code is 1.0.99.1.0.255, with Interface class as 7. The capture objects of this block load profile are as per Table-A4.2 and the captured attribute shall be 2 of each interface class. The capture object values will be copied into a buffer of this array automatically as per capture period which shall be set through OBIS code 1.0.0.8.4.255 of recording interval 1.

Association Access Rights:

Public Client – No access for all objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read Only for all objects.

| S.No | Parameter | OBIS code<br><br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8/2 |
| 2 | Current - $I_R$ | 1.0.31.27.0.255 | 3/2 |
| 3 | Current - $I_Y$ | 1.0.51.27.0.255 | 3/2 |
| 4 | Current – $I_B$ | 1.0.71.27.0.255 | 3/2 |
| 5 | Voltage - $V_{RN}$ | 1.0.32.27.0.255 | 3/2 |
| 6 | Voltage – $V_{YN}$ | 1.0.52.27.0.255 | 3/2 |
| 7 | Voltage – $V_{BN}$ | 1.0.72.27.0.255 | 3/2 |
| 8 | Voltage - $V_{RY}$ | 1.0.32.27.0.255 | 3/2 |

| | | | |
|---|---|---|---|
| 9 | Voltage – $V_{BY}$ | 1.0.52.27.0.255 | 3/2 |
| 10 | Block Energy – kWh | 1.0.1.29.0.255 | 3/2 |
| 11 | Block Energy – kvarh – lag | 1.0.5.29.0.255 | 3/2 |
| 12 | Block Energy – kvarh – lead | 1.0.8.29.0.255 | 3/2 |
| 13 | Block Energy – kVAh | 1.0.9.29.0.255 | 3/2 |

Note (TABLE- A4.2):

1. The parameters listed in this table are for load survey purpose and are logged as per the block period time.
2. The parameters at S. No. 2 to 9 are the average values during the block period time and stored at the end of that time block.
3. The parameters at S. No. 10 to 13 are the actual energy consumption during that time block.
4. Capture objects for 3 Φ / 4W are items 1, 2,3,4,5,6,7,10,11,12,13.
5. Capture objects for 3 Φ / 3W are items 1, 2,3,4,8,9,10,11,12,13.
6. Support for Selective access shall be as defined in Section 11.2

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A4.2. This is modeled as profile generic (IC=7) and is assigned the country specific OBIS code 1.0.94.91.9.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This profile is not required to be updated periodically.

## Table – A4.3 - Billing profile parameters

The contents of this table are for billing purpose.

Association Access Rights:

Public Client – No access for all objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read Only for all objects.

| S.No | Parameter | OBIS code<br><br>A.B.C.D.E.F | Interface Class No / Attribute |
|---|---|---|---|
| 1 | Billing date | 1.0.0.1.2.255 | 3/2 |
| 2 | System Power Factor for billing period | 1.0.13.0.0.255 | 3/2 |
| 3 | Cumulative Energy – kWh | 1.0.1.8.0.255 | 3/2 |
| 4 | Cumulative Energy – kWh – TZ1 | 1.0.1.8.1.255 | 3/2 |
| 5 | Cumulative Energy – kWh – TZ2 | 1.0.1.8.2.255 | 3/2 |
| 6 | Cumulative Energy – kWh – TZ3 | 1.0.1.8.3.255 | 3/2 |
| 7 | Cumulative Energy – kWh – TZ4 | 1.0.1.8.4.255 | 3/2 |
| 8 | Cumulative Energy – kWh – TZ5 | 1.0.1.8.5.255 | 3/2 |
| 9 | Cumulative Energy – kWh – TZ6 | 1.0.1.8.6.255 | 3/2 |
| 10 | Cumulative Energy – kWh – TZ7 | 1.0.1.8.7.255 | 3/2 |
| 11 | Cumulative Energy – kWh – TZ8 | 1.0.1.8.8.255 | 3/2 |
| 12 | Cumulative Energy – kvarh – Lag | 1.0.5.8.0.255 | 3/2 |

| | | | |
|---|---|---|---|
| 13 | Cumulative Energy – kvarh – Lead | 1.0.8.8.0.255 | 3/2 |
| 14 | Cumulative Energy – kVAh | 1.0.9.8.0.255 | 3/2 |
| 15 | Cumulative Energy – kVAH – TZ1 | 1.0.9.8.1.255 | 3/2 |
| 16 | Cumulative Energy – kVAH – TZ2 | 1.0.9.8.2.255 | 3/2 |
| 17 | Cumulative Energy – kVAH – TZ3 | 1.0.9.8.3.255 | 3/2 |
| 18 | Cumulative Energy – kVAH – TZ4 | 1.0.9.8.4.255 | 3/2 |
| 19 | Cumulative Energy – kVAH – TZ5 | 1.0.9.8.5.255 | 3/2 |
| 20 | Cumulative Energy – kVAH – TZ6 | 1.0.9.8.6.255 | 3/2 |
| 21 | Cumulative Energy – kVAH – TZ7 | 1.0.9.8.7.255 | 3/2 |
| 22 | Cumulative Energy – kVAH – TZ8 | 1.0.9.8.8.255 | 3/2 |
| 23 | MD – kW | 1.0.1.6.0.255 | 4 / 2 ,5 |
| 24 | MD – kW – TZ1 | 1.0.1.6.1.255 | 4 / 2 ,5 |
| 25 | MD – kW – TZ2 | 1.0.1.6.2.255 | 4 / 2 ,5 |
| 26 | MD – kW – TZ3 | 1.0.1.6.3.255 | 4 / 2 ,5 |
| 27 | MD – kW – TZ4 | 1.0.1.6.4.255 | 4 / 2 ,5 |
| 28 | MD – kW – TZ5 | 1.0.1.6.5.255 | 4 / 2 ,5 |
| 29 | MD – kW – TZ6 | 1.0.1.6.6.255 | 4 / 2 ,5 |
| 30 | MD – kW – TZ7 | 1.0.1.6.7.255 | 4 / 2 ,5 |
| 31 | MD – kW – TZ8 | 1.0.1.6.8.255 | 4 / 2 ,5 |
| 32 | MD – kVA | 1.0.9.6.0.255 | 4 / 2 ,5 |
| 33 | MD – kVA – TZ1 | 1.0.9.6.1.255 | 4 / 2 ,5 |
| 34 | MD – kVA – TZ2 | 1.0.9.6.2.255 | 4 / 2 ,5 |
| 35 | MD – kVA – TZ3 | 1.0.9.6.3.255 | 4 / 2 ,5 |
| 36 | MD – kVA – TZ4 | 1.0.9.6.4.255 | 4 / 2 ,5 |
| 37 | MD – kVA – TZ5 | 1.0.9.6.5.255 | 4 / 2 ,5 |
| 38 | MD – kVA – TZ6 | 1.0.9.6.6.255 | 4 / 2 ,5 |
| 39 | MD – kVA – TZ7 | 1.0.9.6.7.255 | 4 / 2 ,5 |
| 40 | MD – kVA – TZ8 | 1.0.9.6.8.255 | 4 / 2 ,5 |

Note:

1. The data are stored up to 6 billing cycles. The data are the actual consumption during the billing period. The Billing profile is modeled as Profile generic (IC: = 7) object with OBIS Code 1.0.98.1.0.255. The capture objects of this load profile are as per Table-A4.3. The capture object values will be copied into buffer of this object either automatically or asynchronously. The capture period is set to zero, billing action is controlled by billing dates as provided in section 10 and table A5.2.

2. Support for Selective access shall be as defined in Section 11.2

3. The current cycle billing parameters shall be readable as the values of the latest billing period, on demand. This shall be in addition to the last 6 billing period data which shall be available in the Profile buffer as the last 6 entries in the buffer.

4 The captured attributes in case of Interface Class 4 (Extended register)used for MD values will be attributes 2 and 5 (Value and Timestamp)

Scaler Profile: This profile is meant for capturing the Scaler-unit of each of the parameter listed in Table A4.3. This is modeled as profile generic (IC=7) and is

assigned the country specific OBIS code 1.0.94.91.10.255. There shall be only one entry in the profile which is the attribute 3 of the Interface Class identified for each object. This profile is not required to be updated periodically.

# Annexure A5

## Abstract Parameters

Table A5.1 – Name Plate Details.

The contents of this table are common to all meters. The data are meter specific information.

Association Access Rights:

Public Client – No access for all objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read Only for all objects.

| S.No | Parameter | OBIS code A.B.C.D.E.F | Interface Class |
|---|---|---|---|
| 1 | Meter Serial Number | 0.0.96.1.0.255 1 | Data) |
| 2 | Manufacturer name 0.0.96.1.1.255 | | 1 |
| 3 | Firmware Version for meter | 0.0.96.1.2.255 1 | |
| 4 | Firmware Version for communications | 0.0.96.1.3.255 1 | |
| 5 | Internal CT ratio | 1.0.0.4.2.255 1 | |
| 6 | Internal PT ratio | 1.0.0.4.3.255 1 | |
| 7 | Meter year of manufacture | 0.0.96.1.4.255 1 | |

Table A5.2 – Programmable Parameters.
Association Access Rights:

Public Client – No access for all objects.
Meter Reader – Read Only for all objects.
Utility Setting – Read Write for all objects.

| S.No | Parameter | OBIS code A.B.C.D.E.F | Interface Class |
|---|---|---|---|
| 1 | Real Time Clock – Date and Time | 0.0.1.0.0.255 | 8 (Clock) |
| 2 | Demand Integration Period | 1.0.0.8.0.255 | 1 (Data) |
| 3 | Profile Capture Period | 1.0.0.8.4.255 | 1 |
| 4 | Single-action Schedule for Billing Dates | 0.0.15.0.0.255 | 22 |
| 5 | Activity Calendar for Time Zones etc. | 0.0.13.0.0.255 | 20 |
| 6 | Time Zones script table | 0.0.10.0.100.255 | 9 |

Note (Table A5.2):

1. The parameters are programmable by the utility engineers with required access rights.
2. Programming of any of the parameters shall increment the “Cumulative programming count” value.

Annexure A6

# Event Reference Table

## Events

Any abnormal / fraud / tamper condition is considered as an Event and stored in an Event code object (OBIS: = 0.0.96.11.e.255 IC: = 1, values of E range from 0 to 5). The value (attr-2) of this object stores identifier corresponding to most recent event occurred in the meter. Unique identifier is assigned to occurrence and restoration of all possible events (identified so far) in the event reference tables (Table-A6.1 to A6.7). Thus event code object will tell only about the most recent event and to get a picture of all events and associated information (at the time of event) an Event log object is used. An event log object is modeled as Profile generic (OBIS: = 0.0.99.98.e.255 IC: = 7, values of E range from 0 to 5). The buffer (attr-2) of this profile object will store (asynchronously) a new entry for every event (occurrence and restoration are considered as separate events). The capture objects for the event log object is define below in Table-A6.8.

Table – A6.1] – Indian Event Reference Table – Voltage Related

| EVENT ID | Descriptions |
|---|---|
| 1. | R-Phase – PT link Missing (Missing Potential) – Occurrence |
| 2. | R-Phase – PT link Missing (Missing Potential) – Restoration |
| | |
| 3. | Y-Phase – PT link Missing (Missing Potential) – Occurrence |
| 4. | Y-Phase – PT link Missing (Missing Potential) – Restoration |
| | |
| 5. | B-Phase – PT link Missing (Missing Potential) – Occurrence |
| 6. | B-Phase – PT link Missing (Missing Potential) – Restoration |
| | |
| 7. | Over Voltage in any Phase - Occurrence |
| 8. | Over Voltage in any Phase - Restoration |
| | |
| 9. | Low Voltage in any Phase - Occurrence |
| 10. | Low Voltage in any Phase - Restoration |
| | |
| 11. | Voltage Unbalance - Occurrence |
| 12. | Voltage Unbalance - Restoration |

Table – A6.2] – Indian Event Reference Table – Current Related

| EVENT ID | Descriptions |
|---|---|
| 1. | Phase – R CT reverse – Occurrence |
| 2. | Phase – R CT reverse – Restoration |
| | |
| 3. | Phase – Y CT reverse – Occurrence |
| 4. | Phase – Y CT reverse – Restoration |

| | |
|---|---|
| | |
| 5. | Phase – B CT reverse – Occurrence |
| 6. | Phase – B CT reverse – Restoration |
| | |
| 7. | Phase – R CT Open - Occurrence |
| 8. | Phase – R CT Open - Restoration |
| | |
| 9. | Phase – Y CT Open - Occurrence |
| 10. | Phase – Y CT Open - Restoration |
| | |
| 11. | Phase – B CT Open - Occurrence |
| 12. | Phase – B CT Open - Restoration |
| | |
| 13. | Current Unbalance - Occurrence |
| 14. | Current Unbalance - Restoration |
| | |
| 15. | CT Bypass – Occurrence |
| 16. | CT Bypass – Restoration |
| | |
| 17. | Over Current in any Phase – Occurrence |
| 18. | Over Current in any Phase – Restoration |

Table – A6.3] – Indian Event Reference Table – Power Related

| EVENT ID | Descriptions |
|---|---|
| 1 | Power failure – Occurrence |
| 2 | Power failure – Restoration |

Table – A6.4] – Indian Event Reference Table – Transaction Related

| EVENT ID | Descriptions |
|---|---|
| 1 | TOU Programming |
| 2 | Tamper resetting |
| 3 | Manual MD reset |
| 4 | Demand integration period change |
| 5 | Display change |
| 6 | RTC Programming / Change |
| 7 | Firmware upgrade |
| 8 | Modification of internal ct/pt ratio (even by manufacturer's proprietary software) |
| 9 | Communication driven MD Reset |

Table – A6.5] – Indian Event Reference Table – Others

| EVENT ID | Descriptions |
|---|---|
| 1 | Influence of permanent magnet or AC/ DC electromagnet - Occurrence |
| 2 | Influence of permanent magnet or AC/ DC electromagnet - Restoration |
| | |

| | |
|---|---|
| 3 | Neutral Disturbance - HF & DC - Occurrence |
| 4 | Neutral Disturbance - HF & DC - Restoration |
| | |
| 5 | Very Low PF - Occurrence |
| 6 | Very Low PF - Restoration |

Table – A6.6] – Indian Event Reference Table – Non-rollover Events

| EVENT ID | Descriptions |
|---|---|
| 1 | Meter Cover Opening – Occurrence |

Table – A6.7] – Indian Event Reference Table – Control events

| EVENT ID | Descriptions |
|---|---|
| 1 | Meter disconnected |
| 2 | Meter connected |

Table- A6.8] – Capture parameters for event as applicable
(Event Log Profile)

| Sno | Parameter | A | B | C | D | E | F | IC |
|---|---|---|---|---|---|---|---|---|
| 1. | Date and Time of event | 0 | 0 | 1 | 0 | 0 | 255 | 8 (Clock) |
| 2. | Event Code | 0 | 0 | 96 | 11 | 0 | 255 | 1 (Data) |
| 3. | Current - $I_R$ | 1 | 0 | 31 | 7 | 0 | 255 | 3 (Register) |
| 4. | Current - $I_Y$ | 1 | 0 | 51 | 7 | 0 | 255 | 3 (Register) |
| 5. | Current – $I_B$ | 1 | 0 | 71 | 7 | 0 | 255 | 3 (Register) |
| 6. | Voltage - VRN ($3\Phi$ / 4W) | 1 | 0 | 32 | 7 | 0 | 255 | 3 (Register) |
| 7. | Voltage – VYN ($3\Phi$ / 4W) | 1 | 0 | 52 | 7 | 0 | 255 | 3 (Register) |
| 8. | Voltage – VBN ($3\Phi$ / 4W) | 1 | 0 | 72 | 7 | 0 | 255 | 3 (Register) |
| 9. | Voltage - VRY (3 $\Phi$ / 3W) | 1 | 0 | 32 | 7 | 0 | 255 | 3 (Register) |
| 10. | Voltage – VYB ($3\Phi$ / 3W) | 1 | 0 | 52 | 7 | 0 | 255 | 3 (Register) |
| 11. | Power Factor – R phase | 1 | 0 | 33 | 7 | 0 | 255 | 3 (Register) |
| 12. | Power Factor – Y phase | 1 | 0 | 53 | 7 | 0 | 255 | 3 (Register) |
| 13. | Power Factor – B phase | 1 | 0 | 73 | 7 | 0 | 255 | 3 (Register) |
| 14. | Cumulative Energy – kWh | 1 | 0 | 1 | 8 | 0 | 255 | 3 (Register) |

NOTE for Tables – A6.1, A6.2, A6.3, A6.4, A6.5, A6.6, A6.7 and A6.8,

1. These are the event conditions generally recorded in consumer meters, utilities may select any the above event conditions based on their practice. The need and applicability of these events for other type of meters shall be considered by Utility.
2. Either Occurrence or Restoration is considered an event.
3. For each of the events a certain list of parameters will be captured.
4. The list capture parameters are given in Table-A6.8. The utility shall select the required parameters from the table A6.8 as per their practice.
5. For each of the event captured “Cumulative tamper count” value will be incremented except for events from Tables A6.3, A6.4 and A6.7

6. Capture parameters mentioned in Table A6.8 are captured when event occurrence and restoration is logged.
7. For events “Power On-OFF” and “Cover Open” no parameters shall be captured.
8. The attributes of each of the IC (Interface Class) is to be identified while finalizing the Companion Standard.
9. For 3 Φ / 4W the reference point is NEUTRAL
10. For 3 Φ / 3W the reference point is Y-Phase
11. Support for Selective access shall be as defined in Section 11.2

# Annexure A7

## Conformance Testing

Meters claiming conformance to this companion specification will be required to

- Conform to the DLMS/COSEM base standards ( IS ….) as certified by the conformance test tool (CTT)
- Conform to the specific requirements and constraints of this companion specification as certified by CPRI or any other laboratory having facilities for the purpose.

- This certification shall ensure
  - o All mandatory parameters applicable to the category of the meter under test are implemented
  - o All data types where specified are conforming to this document
  - o All Application Associations are implemented as specified in this document with all specified services supported
  - o Association object lists conform to this document with access rights and OBIS codes as specified here
  - o Event related DLMS objects are implemented with Event identifiers as specified in the Event reference tables in this document

The test report from an accredited laboratory and having membership with DLMS UA shall be considered as a proof of conformance of protocol implementation.

Systems once created in accordance with this companion specification and contemporary standards, shall be deemed acceptable, provided such systems are tested and certified through standard evaluation process.

# Annexure A8

## HHU Considerations

Communication standards in the Indian metering scenario require supporting considerations for the utilization of those standards in HHUs (Hand held units) or in CHHUs (Common Meter Reading Instrument). This annexure provides a suitable approach to the implementation of the IEC-62056 standards and this Indian Companion Specification in such devices

The terms of this suggested implementation are as below

1) HHUs may retrieve data from DLMS/COSEM Meters conforming to this standard using the same DLMS/COSEM communication port that is provided for remote meter reading
2) HHUs shall exclusively use the Meter Reading association (MR) and shall support all the features and specifications listed in this specification for the MR Association
3) HHUs shall have the same data access rights that are available to the MR Association, as that available for remote meter reading.
4) HHUs shall implement the DLMS/COSEM communication standard conforming to this specification to provide a DLMS/COSEM client protocol driver to communicate with the meters to download billing data or perform other services available to the MR Association
5) HHUs shall provide a DLMS/COSEM server interface to the BCS (Base Computer System – the Data collection software) over a suitable communication medium (local serial port implementing the DLMS/COSEM CO 3-layer stack is suggested)
6) HHUs shall internally map the individual meter data to Logical Devices (one Logical Device for each meter). Inside each Logical Device the structure and naming of the data shall be the same as that retrieved from the meter
7) The BCS shall maintain a mapping table that maps the individual meter identifications (the same IDs that are used to identify the meter during remote meter reading) to Logical Device addresses. During upload of data from HHU to BCS, the BCS shall query each Logical device to download the data of each meter over the local serial port
8) The mapping table described in Item 7 above shall require that the Logical device addresses allocated to each meter are at least unique across all meters that are to be retrieved using one HHU. Other HHUs may re-use the same addressing from their own range of allocated meters. The BCS shall take care to ensure that the re-use of addresses does not create conflicts in Meter identification.

Annexure A9

## Descriptive Notes on Profile Generic Interface Class

"Profile generic" interface class is used to model objects which capture historic values of other objects (called "capture objects") either periodically or occasionally. The "buffer" attribute stores the historic record of values of "capture objects" in a table-like format where each capture object is a column and each new entry is a row. A DLMS Client can access the historic data using the "Get" service either fully or partially.

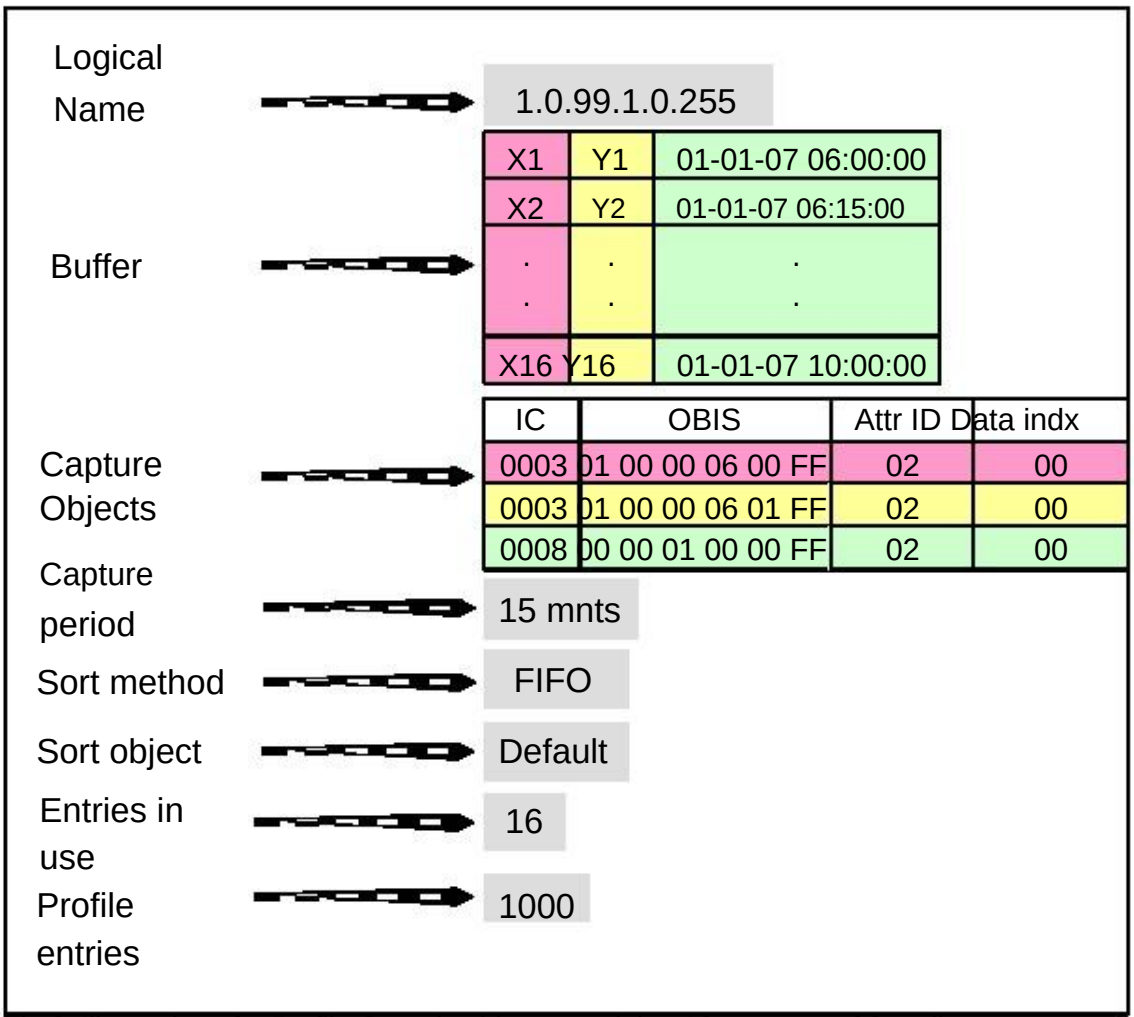


Fig 2: Illustration of a Profile Generic object containing 16 captures of 3 attributes

There are two types of selective access which allows reading the buffer selectively.

### 1 Selective Access by Entry

Selective Access by Entry provides a set of 4 integers to filter the contents of the "buffer" attribute in response to Get requests. The 4 integers are as below

1. From-entry : The index of the first entry to return from the buffer
2. To-Entry : The index of the last entry to return from the buffer
3. From-Value : The index of the first column to return
4. To-Value : The index of the last column to return

Thus the selective access parameters as above can be used to select not only a subset of the rows from the buffer table but also a subset of the columns from among the selected rows. Refer to the illustration in Fig3.

However this mechanism does not permit retrieving discontinuous ranges of columns from the buffer.

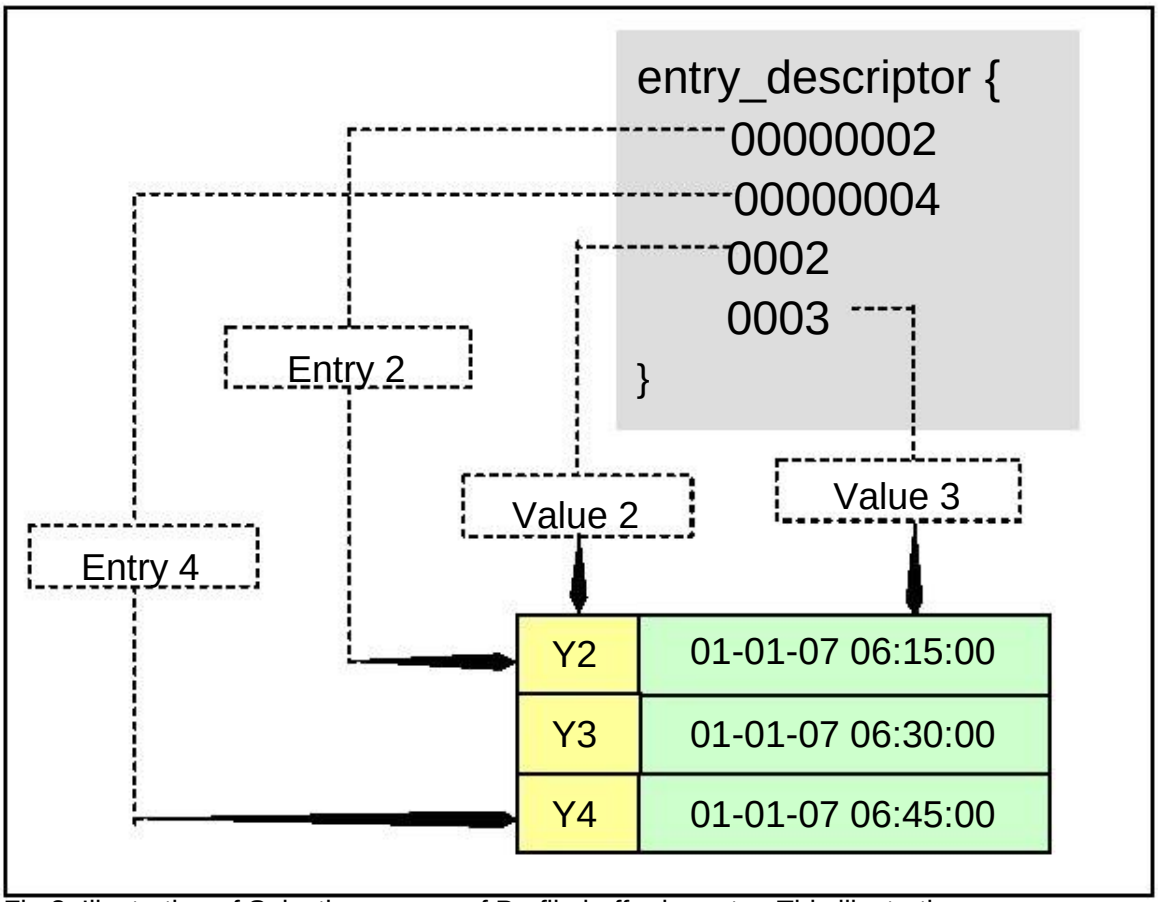


Fig 3: Illustration of Selective access of Profile buffer by entry. This illustration requests only the 2nd and 3rd columns of data from the 2nd row to the 4th row.

## 2 Selective Access by Range

Selective Access by Range permits a client to retrieve a subset of the rows and columns in the Profile buffer based on the value of one of the capture objects. Typically the capture object selected for this purpose is the Clock's date-time attribute which is usually one of the capture objects in most profiles. The selective access parameters in this case are as below

1. Restricting object : This parameter identifies the capture object whose value will be used to filter the buffer. The object is defined by the OBIS code and attribute index of the selected object
2. From-Value : The start-range value for the subset. All selected rows in the buffer will have a value for the restricted object that is higher than or equal to this limit
3. To-Value : The stop-range value for the subset. All selected rows in the buffer will have a value for the restricting object that is lower than or equal to this limit.
4. Selected-Values : An array of column indices specifying the columns that should be returned from the selected rows.

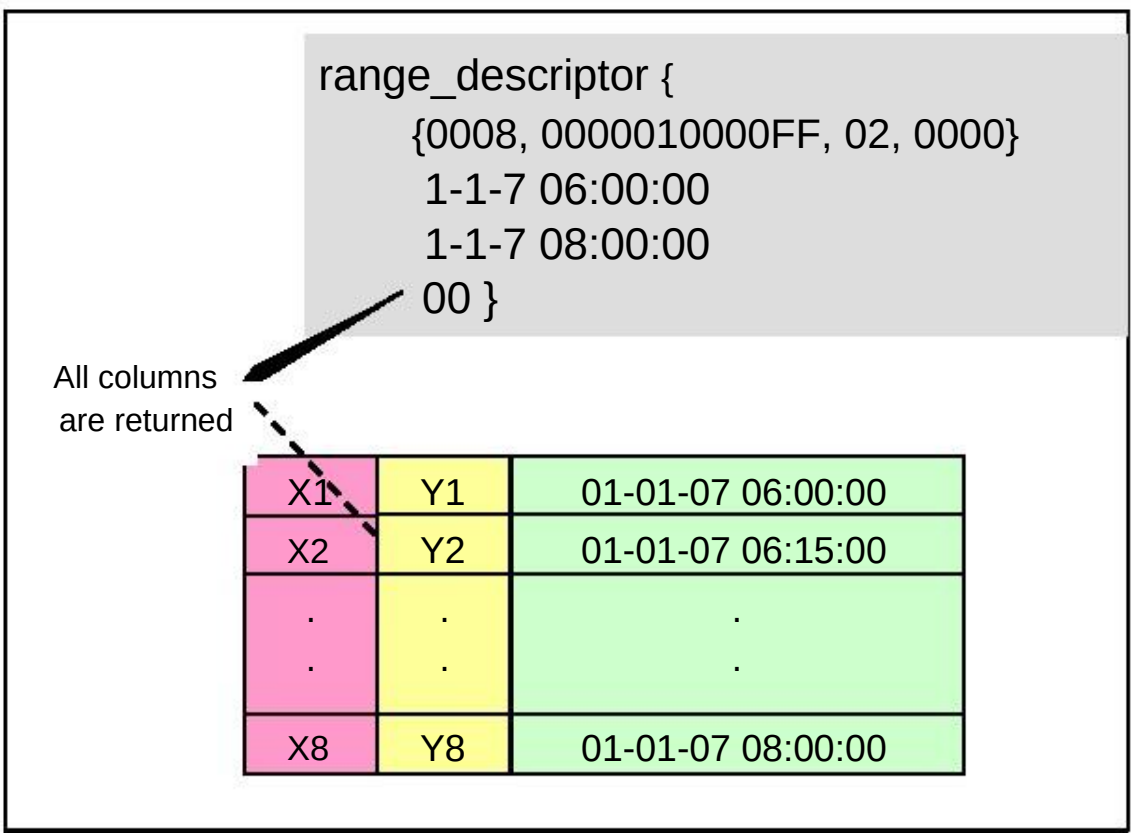


Fig 4: Illustration of selective access of profile buffer by range