भारतीय मानक
Indian Standard

IS 15959 (Part 3) : 2017

विद्युत मीटर रीडिंग, शुल्क और लोड नियंत्रक के लिए आँकड़ों का विनिमय — सहयोगी विशिष्टि

भाग 3 स्मार्ट मीटर (ट्रान्सफार्मर संचालित kWh और kVARh, वर्ग 0.2 S, 0.5 S और 1.0 S)

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

Part 3 Smart Meter (Transformer Operated kWh and kVARh, Class 0.2 S, 0.5 S and 1.0 S)

ICS 91.140.50; 17.220.20; 35.100.01

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Equipment for Electrical Energy Measurement, Tariff and Load Control Sectional Committee, ETD 13

FOREWORD

This Indian Standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Equipment for Electrical Energy Measurement, Tariff and Load and Load Control Sectional Committee had been approved by the Electrotechnical Division Council.

IS 15959 is published in three parts. The other parts in this series are :

Part 1 Static energy meter
Part 2 Smart meter

This standard (Part 3) is for a.c. static transformer operated watthour and var-hour smart meters, Class 0.2 S, 0.5 S and 1.0 S Part 2 Specification transformer operated smart meters covered under IS 16444 (Part 2) : 2017 (*under print*).

Smart meter covered under this standard are composite unit consisting of metrology elements, two way communication module/modules. It will have functions such as measurement, computation, event capturing, storing and communication. The smart meter covered under this standard would be required to provide data and information that are needed by various smart grid applications for a.c. static transformer operated watthour and var-hour Smart Meters covered under IS 16444 (Part 2) : 2017 (*under print*).

The meters covered under this standard do not support connect, disconnect mechanism.

With development of smart meter standard [*see* IS 16444 : 2015 'a.c. static direct connect watthour smart meter class 1 and 2 — Specification' and IS 16444 (Part 2) : 2017 'a.c. static transformer operated watthour and var-hour Smart Meters, Class 0.2S, 0.5S and 1.0S Part 2 Specification transformer operated smart meters'], it necessitated for enhancement of existing communications protocol standards : IS 15959 (Part 1) : 2011 'Data exchange for electricity meter reading, tariff and load control — Companion Specification Part 1 static energy meter and IS 15959 (Part 2) : 2016 Data Exchange for electricity meter reading tariff and load control — Companion Specification Part 2 Smart meter'. This standard (Part 3) addresses the additional requirements for data exchange for a.c. static transformer operated watthour and var-hour smart meters covered under IS 16444 (Part 2) : 2017 (*under print*). The Committee initiated the work of formulating this standard applicable for smart meters in addition to IS 15959 (Part 1) and IS 15959 (Part 2).

This standard, a companion specification, is intended to provide a field level basis for efficient and secure transfer of electricity metering data in an open manner with judicious application of features and protocols of the international standards.

While formulating this standard it has been endeavored not to contradict on principle of the adopted/referred standards of other international organisations/institutions on which this document is based upon. However, in case of any divergence/disparity, not amounting to conflict of interpretations that may be revealed later, provisions of this standard will prevail.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

DATA EXCHANGE FOR ELECTRICITY METER READING, TARIFF AND LOAD CONTROL — COMPANION SPECIFICATION

PART 3 SMART METER (TRANSFORMER OPERATED kWh AND kVARh, CLASS 0.2 S, 0.5 S AND 1.0 S)

1 SCOPE

1.1 This standard (Part 3) is intended for use along with IS 15959 (Part 1) and IS15959 (Part 2) on data exchange for electricity meter reading, tariff and load control for proper application/implementation of the provisions thereof. This standard is applicable for ac static transformer operated watthour and var-hour smart meters, Class 0.2S, 0.5S and 1.0S that are designed as per IS 16444 (Part 2). Also, COSEM objects, interface classes, their instances, attributes and methods, event and status tables, DLMS services and communication profile that are to be supported are included to enable data exchange to and from smart meter.

1.2 This (Part 3) also specifies the protocol and communication testing requirements.

1.3 The smart meter shall support the following features/services:

a) Smart meter association requirements,
b) In home display services,
c) Push services,
d) Advanced security profile,
e) Communication profile,
f) Firmware upgrade, and
h) Parameter list for smart meters.

The above features are included to support the functional requirements of smart meter that are listed under **10** of IS 16444 (Part 2).

2 REFERENCES

This clause of Part 2 is applicable.

Addition

IS No.	*Title*
15959 (Part 2) : 2016	Data Exchange for electricity meter reading tariff and load control — Companion specification : Part 2 Smart meter

3 DEFINITIONS

This clause of Part 2 is applicable.

4 SMART METER ASSOCIATION REQUIREMENTS

This clause of Part 2 is applicable.

5 IN HOME DISPLAY (IHD)

This clause of Part 2 is applicable.

6 PUSH SERVICES IN SMART METER

This clause of Part 2 is applicable.

7 ADVANCED SECURITY PROFILE

This clause of Part 2 is applicable.

8 IP COMMUNICATION PROFILE SUPPORT

This clause of Part 2 is applicable.

9 FIRM WARE UPGRADE

This clause of Part 2 is applicable.

10 CONNECT/ DISCONNECT

Connect/ Disconnect is not applicable to the meters covered in this part of the standard.

11 PARAMETER LIST FOR SMART METERS

The smart meters that comply with IS 16444 (Part 2) are categorized as follows:

a) D3 — stands for Transformer operated HV/ LV consumer meters (3P-4W CT; 3P-3W/ 3P-4W CT-PT operated consumer meters)
b) D4 — stands for Transformer operated Boundary/Bank/Ring/ABT meters (3P-3W/ 3P- 4W CT-PT operated consumer meters)

11.1 List of Parameters for Category D3

The parameters listed are for transformer operated three phase a.c. static watthour smart meters for HV/LV consumer application are:

a) Instantaneous parameters : Table 1
b) Block load profile : Table 2
c) Daily load profile : Table 3

d) Billing profile : Table 4
e) Indian event reference tables : Table 5 to 11
f) Name plate details : Table 12
g) Programmable parameters : Table 13

Each of the parameters is a separate entity. The OBIS code and interface class for each parameter is identified in the respective tables.

11.1.1 *Instantaneous Parameters*

Association access rights are as follows:

a) *Public client* — Read only for clock and no access for other objects.
b) *Meter reader* — Read only for all objects.
c) *Utility setting* — Read only for all objects.
d) *PUSH service* — Read only for identified objects

The instantaneous parameters are listed in Table 1.

11.1.2 *Snapshot of Instantaneous Parameters*

The parameters of Table 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.

11.1.3 *Scaler Profile*

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 1. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.3.255. The capture objects for this profile shall include the scaler- unit attributes of the instantaneous parameters listed in Table 1 instantaneous parameters that do not have a scaler-unit (like IC = 1) shall not be included in the capture objects list. The profile buffer shall have only one entry. This profile is not required to be updated periodically.

12 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 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 are as follows:

a) *Public client* — No access for all objects.
b) *Meter reader* — Read only for all objects.
c) *Utility setting* — Read only for all objects.

12.1 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 2. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.4.255. The capture objects for this profile shall include the scaler- unit attributes of the parameters listed in Table 2. The profile buffer shall have only one entry. This profile is not required to be updated periodically. Parameters that do not have scaler units (IC = 1) shall not be included in the capture object list

13 DAILY LOAD PROFILE PARAMETERS

This is an array of load survey data captured as a profile generic at the end of 24 h. The OBIS code is 1.0.99.2.0.255 with IC as 7. The capture objects of this daily load profile are as per Table 3 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 1.0.0.8.5.255 of recording interval 2. The capture period attribute shall be statically fixed as 24 h.

Association access rights are as follows:

a) *Public client* — No access for all objects.
b) *Meter reader* — Read only for all objects.
c) *Utility setting* — Read only for all objects.

13.1 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 3. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.5.255. The capture objects for this profile shall include the scaler-unit attributes of the parameters listed in Table 3. The profile buffer shall have only one entry. This profile is not required to be updated periodically. Parameters that do not have scaler units (IC = 1) shall not be included in the capture object list

14 BILLING PROFILE PARAMETERS

The contents of Table 4 are for billing purpose.

The data are stored up to 6 billing cycles. The billing profile is modelled 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 4. 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 **10** of IS 15959 (Part 1) and Table 13.

Table 1 Instantaneous Parameters
(*Clauses* 11.1.1, 11.1.2 *and* 11.1.3)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Real time clock, date and time	0.0.1.0.0.255	8
ii)	Current, I_R	1.0.31.7.0.255	3
iii)	Current, I_Y	1.0.51.7.0.255	3
iv)	Current, I_B	1.0.71.7.0.255	3
v)	Voltage, V_{RN}/V_{RY}	1.0.32.7.0.255	3
vi)	Voltage, V_{YN}	1.0.52.7.0.255	3
vii)	Voltage, V_{BN}/V_{BY}	1.0.72.7.0.255	3
viii)	Signed power factor, *R*-phase	1.0.33.7.0.255	3
ix)	Signed power factor, *Y*-phase	1.0.53.7.0.255	3
x)	Signed power factor, *B*-phase	1.0.73.7.0.255	3
xi)	Three phase power factor, PF	1.0.13.7.0.255	3
xii)	Frequency, Hz	1.0.14.7.0.255	3
xiii)	Apparent power, kVA	1.0.9.7.0.255	3
xiv)	Signed active power, kW (+ Forward; – Reverse)	1.0.1.7.0.255	3
xv)	Signed reactive power, kvar (+ Lag; – Lead)	1.0.3.7.0.255	3
xvi)	Number of power — failures	0.0.96.7.0.255	1
xvii)	Cumulative power — OFF duration in min	0.0.94.91.8.255	3
xviii)	Cumulative tamper count	0.0.94.91.0.255	1
xix)	Cumulative billing count	0.0.0.1.0.255	1
xx)	Cumulative programming count	0.0.96.2.0.255	1
xxi)	Billing date	0.0.0.1.2.255	3
xxii)	Cumulative energy, kWh (Import)	1.0.1.8.0.255	3/2
xxiii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3/2
xxiv)	Cumulative energy kvarh-Q1	1.0.5.8.0.255	3/2
xxv)	Cumulative energy kvarh-Q2	1.0.6.8.0.255	3/2
xxvi)	Cumulative energy kvarh-Q3	1.0.7.8.0.255	3/2
xxvii)	Cumulative energy kvarh-Q4	1.0.8.8.0.255	3/2
xxviii)	Cumulative energy, kVAh (Import)	1.0.9.8.0.255	3/2
xxix)	Cumulative energy, kVAh (Export)	1.0.10.8.0.255	3/2
xxx)	Maximum demand, kW	1.0.1.6.0.255	4/2, 5
xxxi)	Maximum demand, kVA	1.0.9.6.0.255	4/2, 5

NOTES

1 Signed Power factor: (+) indicates lag and (–) indicates lead.

2 The parameters at Sl No. (xvii) to (xx) and (xxii) to (xxix) hold cumulative values at that instant from the date of manufacturing.

3 The above list is identified for the purpose of communication to HHU, DCU or HES.

4 Item at Sl No. (xix) refers to the billing period counter.

5 Item at Sl No. (xxi) — Data type to be same as for attribute 2 of IC = 8, Clock. If not specified the billing date shall be first day of the month and time shall be 00:00hrs.

6 The RTC-Time format by default shall be HH:MM:SS.

7 Signed power factor shall be verified at rated voltage, rated current and rated frequency at 0.5 lag and 0.8 lead.

8 Power and Energy related parameters shall be verified at UPF, 0.5 lag and 0.8 lead.

9 The parameters at Sl No. xxiii, xxv, xxvi and xxix are applicable only for meters supporting 'import and export' energy measurement.

10 V_{RN}, V_{YN} and V_{BN} are for 3ö/4W meter and V_{RY} and V_{BY} are for 3ö/3W meter

11 The parameter current *I*Y and signed power factor, Y – phase are not applicable for 3ö/ 3W meter

12 Please refer Annexure F IS14697 for Quadrant (Q1-Q4) definitions

13 For Sl No. (xxx) and (xxxi), the attributes 2 and 5 of indicated IC shall be captured in instantaneous profile. The attribute 3 of indicated IC shall be captured in Scaler profile. The RTC — Time format shall be HH:MM

Table 2 Block Load Survey Parameters
(*Clauses* 12 *and* 12.1)

Sl No.	Parameter	OBIS Code A.B.C.D. E.F.	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Real time clock, date and time	0.0.1.0.0.255	8/2
ii)	Current, I_R	1.0.31.27.0.255	3/2
iii)	Current, I_Y	1.0.51.27.0.255	3/2
iv)	Current, I_B	1.0.71.27.0.255	3/2
v)	Voltage, V_{RN}/V_{RY}	1.0.32.27.0.255	3/2
vi)	Voltage, V_{YN}	1.0.52.27.0.255	3/2
vii)	Voltage, V_{BN}/V_{BY}	1.0.72.27.0.255	3/2
viii)	Block energy, kWh (Import)	1.0.1.29.0.255	3/2
ix)	Block energy, kWh (Export)	1.0.2.29.0.255	3/2
x)	Block energy, kvarh-Q1	1.0.5.29.0.255	3/2
xi)	Block energy, kvarh-Q2	1.0.6.29.0.255	3/2
xii)	Block energy, kvarh-Q3	1.0.7.29.0.255	3/2
xiii)	Block energy, kvarh-Q4	1.0.8.29.0.255	3/2
xiv)	Block energy, kVAh (Import)	1.0.9.29.0.255	3/2
xv)	Block energy, kVAh (Export)	1.0.10.29.0.255	3/2

NOTES

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 Sl No. (ii) to (vii) are the average values during the block period time and stored at the end of that time block.

3 The parameters at Sl No. (viii) to (xv) are the actual energy consumption during that time block.

4 The RTC-time format by default shall be HH:MM.

5 Energy related parameters shall be verified at UPF, 0.5 lag and 0.8 lead.

6 The time stamp shall be at the end of the capture period (Ist entry value is 00:15 or 00:30 min as applicable and last entry value is 00:00 hrs next day).

7 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

8 The parameters at Sl. No. (ix, xi xii, xv) are applicable only for meters supporting 'import and export' energy measurement.

9 V_{RN}, V_{YN} and V_{BN} are for 3ö/4W meter and V_{RY} and V_{BY} are for 3ϕ/3W meter

10 The parameter current I_Y is not applicable for 3ϕ/ 3W meter

Table 3 Daily Load profile parameters
(*Clauses* 13 *and* 13.1)

Sl No.	Parameter	OBIS Code A.B.C.D. E.F.	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Real time clock, date and time	0.0.1.0.0.255	8/2
ii)	Cumulative energy kWh (Import)	1.0.1.8.0.255	3/2
iii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3/2
iv)	Cumulative energy kVAh (Import)	1.0.9.8.0.255	3/2
v)	Cumulative energy, kVAh (Export)	1.0.10.8.0.255	3/2

NOTES

1 The parameters listed in this table are meant for billing purpose and shall be logged at midnight (00 h).

2 The storage time for these parameters is same as Block load survey.

3 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

4 The parameters at Sl No. (iii) and (v) are applicable only for meters supporting 'import and export' energy measurement

Association access rights are as follows:

a) *Public client* — No access for all objects.
b) *Meter reader* — Read only for all objects.
c) *Utility setting* — Read only for all objects.

14.1 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 4. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.6.255. The capture objects for this profile shall include the scaler- unit attributes of the parameters listed in Table 4 above. The profile buffer shall have only one entry. This profile is not required to be updated periodically. Parameters that do not have scaler units (IC = 1) shall not be included in the capture object list

15 EVENTS

Any exceptional/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 attribute (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 (*see* Tables 5 to10). 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 modelled as profile generic (OBIS = 0.0.99.98.e.255 IC = 7, values of e range from 0 to 5). The buffer attribute (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 in Table 11.

Table 4 Billing Profile Parameters
(*Clauses* 14 *and* 14.1)

Sl No.	Parameter	OBIS Code A.B.C.D. E.F.	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Billing date	0.0.0.1.2.255	3/2
ii)	System power factor for billing period import	1.0.13.0.0.255	3/2
iii)	Cumulative energy, kWh	1.0.1.8.0.255	3/2
iv)	Cumulative energy, kWh for TZ1	1.0.1.8.1.255	3/2
v)	Cumulative energy, kWh for TZ2	1.0.1.8.2.255	3/2
vi)	Cumulative energy, kWh for TZ3	1.0.1.8.3.255	3/2
vii)	Cumulative energy, kWh for TZ4	1.0.1.8.4.255	3/2
viii)	Cumulative energy, kWh for TZ5	1.0.1.8.5.255	3/2
ix)	Cumulative energy, kWh for TZ6	1.0.1.8.6.255	3/2
x)	Cumulative energy, kWh for TZ7	1.0.1.8.7.255	3/2
xi)	Cumulative energy, kWh for TZ8	1.0.1.8.8.255	3/2
xii)	Cumulative energy, kVAh	1.0.9.8.0.255	3/2
xiii)	Cumulative energy, kVAh for TZ1	1.0.9.8.1.255	3/2
xiv)	Cumulative energy, kVAh for TZ2	1.0.9.8.2.255	3/2
xv)	Cumulative energy, kVAh for TZ3	1.0.9.8.3.255	3/2
xvi)	Cumulative energy, kVAh for TZ4	1.0.9.8.4.255	3/2
xvii)	Cumulative energy, kVAh for TZ5	1.0.9.8.5.255	3/2
xviii)	Cumulative energy, kVAh for TZ6	1.0.9.8.6.255	3/2
xix)	Cumulative energy, kVAh for TZ7	1.0.9.8.7.255	3/2
xx)	Cumulative energy, kVAh for TZ8	1.0.9.8.8.255	3/2
xxi)	MD, kW	1.0.1.6.0.255	4/2, 5
xxii)	MD, kW for TZ1	1.0.1.6.1.255	4/2, 5
xxiii)	MD, kW for TZ2	1.0.1.6.2.255	4/2, 5
xxiv)	MD, kW for TZ3	1.0.1.6.3.255	4/2, 5
xxv)	MD, kW for TZ4	1.0.1.6.4.255	4/2, 5
xxvi)	MD, kW for TZ5	1.0.1.6.5.255	4/2, 5
xxvii)	MD, kW for TZ6	1.0.1.6.6.255	4/2, 5
xxviii)	MD, kW for TZ7	1.0.1.6.7.255	4/2, 5
xxix)	MD, kW for TZ8	1.0.1.6.8.255	4/2, 5
xxx)	MD, kVA	1.0.9.6.0.255	4/2, 5
xxxi)	MD, kVA for TZ1	1.0.9.6.1.255	4/2, 5
xxxii)	MD, kVA for TZ2	1.0.9.6.2.255	4/2,5
xxxiii)	MD, kVA for TZ3	1.0.9.6.3.255	4/2, 5
xxxiv)	MD, kVA for TZ4	1.0.9.6.4.255	4/2, 5
xxxv)	MD, kVA for TZ5	1.0.9.6.5.255	4/2, 5
xxxvi)	MD, kVA for TZ6	1.0.9.6.6.255	4/2, 5
xxxvii)	MD, kVA for TZ7	1.0.9.6.7.255	4/2, 5
xxxviii)	MD, kVA for TZ8	1.0.9.6.8.255	4/2, 5
xxxix)	Billing power ON duration in minutes (During billing period)	0.0.94.91.13.255	3/2
xl)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3/2
xli)	Cumulative energy, kVAh (Export)	1.0.10.8.0.255	3/2
xlii)	Cumulative energy, kvarh-Q1	1.0.5.8.0.255	3/2
xliii)	Cumulative energy, kvarh-Q2	1.0.6.8.0.255	3/2
xliv)	Cumulative energy, kvarh-Q3	1.0.7.8.0.255	3/2
xlv)	Cumulative energy, kvarh-Q4	1.0.8.8.0.255	3/2

NOTES

1 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

2 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.

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

4 The Billing Date - Time format by default shall be HH:MM.

5 Billing Date and Time shall be current date and current time.

6 The parameters at Sl No. (lx),(lxi, (lxiii) and (lxiv) are applicable only for meters supporting both forward (import) and reverse (export) measurement.

7 If not specified, the billing date shall be first day of the month and time shall be 00:00 h.

15.1 Indian Event Reference Tables (*see* Table 5 to Table 11)

The document containing test procedure, threshold values and persistence time for event simulation shall be provided by the test requesting organization.

15.2 Capture Parameters for Event as Applicable (Event Log Profile)

Association access rights are as follows:

a) *Public client* — No access.
b) *Meter reading* — Read only.
c) *Utility settings* — Read only.
d) *Push services* — Read only for selected events.

Table 5 Indian Event Reference Table — Voltage Related
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl No.	Event ID	Description
(1)	(2)	(3)
i)	1	*R*-Phase — Voltage missing — Occurrence
ii)	2	*R*-Phase — Voltage missing — Restoration
iii)	3	*Y*-Phase — Voltage missing — Occurrence
iv)	4	*Y*-Phase — Voltage missing — Restoration
v)	5	*B*-Phase — Voltage missing — Occurrence
vi)	6	*B*-Phase — Voltage missing — Restoration
vii)	7	Over voltage in any phase — Occurrence
viii)	8	Over voltage in any phase — Restoration
ix)	9	Low voltage in any phase — Occurrence
x)	10	Low voltage in any phase — Restoration
xi)	11	Voltage unbalance — Occurrence
xii)	12	Voltage unbalance — Restoration

NOTES

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 Occurrence 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 11. The utility shall select the required parameters from Table 11 as per their practice.

5 For each of the occurrence event captured, the cumulative tamper count value shall be incremented

6 Capture parameters mentioned in Table 11 are captured when event occurrence and restoration is logged.

7 The attributes of each of the IC (Interface class) is to be identified while finalizing the Specification.

8 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

9 Sl No. (iii) and (iv) are not applicable for 3ϕ/3W meter.

Table 6 Indian Event Reference Table — Current Related
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	51	R Phase — Current reverse — Occurrence
ii)	52	R Phase — Current reverse — Restoration
iii)	53	Y Phase — Current reverse — Occurrence
iv)	54	Y Phase — Current reverse — Restoration
v)	55	B Phase — Current reverse — Occurrence
vi)	56	B Phase — Current reverse — Restoration
vii)	63	Current unbalance — Occurrence
viii)	64	Current unbalance — Restoration
ix)	65	Current bypass — Occurrence
x)	66	Current bypass — Restoration
xi)	67	Over current in any phase — Occurrence
xii)	68	Over current in any phase — Restoration
xiii)	57	R Phase — Current Open — Occurrence
xiv)	58	R Phase — Current Open — Restoration
xv)	59	Y Phase — Current Open — Occurrence
xvi)	60	Y Phase — Current Open — Restoration
xvii)	61	B Phase — Current Open — Occurrence
xviii)	62	B Phase — Current Open — Restoration

NOTES

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 Occurrence 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 11. The utility shall select the required parameters from Table 11 as per their practice.

5 For each of the occurrence event captured, the cumulative tamper count value shall be incremented

6 Capture parameters mentioned in Table 11 are captured when event occurrence and restoration is logged.

7 The attributes of each of the IC (Interface class) is to be identified while finalizing the Companion Specification.

8 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

9 Sl No. (iii), (iv), (xv) and (xvi) are not applicable for 3ϕ/3W meter.

Table 7 Indian Event Reference Table — Power Related
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	101	Power failure (3 phase) — Occurrence
ii)	102	Power failure (3 phase) — Restoration

NOTES

1 These are the event conditions generally recorded in consumer meters, utilities may select any of 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 Occurrence is considered an event.

3 For these events only date and time of event and event ID shall be captured.

4 The attributes of each of the IC (Interface class) is to be identified while finalizing the Companion Specification.

5 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

Table 8 Indian Event Reference Table — Transaction Related
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	151	Real time clock – Date and time
ii)	152	Demand integration period
iii)	153	Profile capture period
iv)	154	Single-action schedule for billing dates
v)	155	Activity calendar for time zones
vi)	157	New firmware activated
vii)	156	RS485 device address
viii)	161	LLS secret (MR) change
ix)	162	HLS key (US) change
x)	163	HLS key (FW) change
xi)	164	Global key change (encryption and authentication)
xii)	165	ESWF change
xiii)	166	MDI reset
xiv)	167	Metering mode
xv)	169	Image activation single action schedule
xvi)	177	Configuration change to 'Forwarded only' mode
xvii)	178	Configuration change to 'Import-Export' mode

NOTES

1 Occurrence is considered as separate events.

2 For these events only date and time and event code shall be captured**.**

3 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

4 RS 485 device address programmability shall be present in MR and also in US mode. Hence, in MR mode 'Set' is applicable only for RS 485 meter.

5 Device address programmability is only applicable for meters with RS485 ports.

Table 9 Indian Event Reference Table — Others
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	201	Abnormal external magnetic influence – Occurrence
ii)	202	Abnormal external magnetic influence – Restoration
iii)	203	Neutral disturbance (HF, d.c. or alternate method) – Occurrence
iv)	204	Neutral disturbance (HF, d.c. or alternate method) – Restoration
v)	205	Low PF — Occurrence
vi)	206	Low PF — Restoration
vii)	209	Plug in communication module removal – Occurrence
viii)	210	Plug in communication module removal – Restoration
xi)	215	Overload-Occurrence
x)	216	Overload-Restoration

NOTES

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 Occurrence 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 11. The utility shall select the required parameters from Table 11 as per their practice.

5 For each of the occurrence event captured, the cumulative tamper count value shall be incremented.

6 Capture parameters mentioned in Table 11 are captured when event occurrence and restoration is logged.

7 The attributes of each of the IC (Interface class) is to be identified while finalizing the companion specification.

8 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

Table 10 Indian Event Reference Table — Non-rollover Events
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	251	Meter cover opening — Occurrence

NOTES

1 This event condition is generally recorded in consumer meters, utilities may select the above event condition based on their practice. The need and applicability of the event for other type of meters shall be considered by utility.

2 Occurrence is considered an event.

3 For these events only date and time of event and event ID shall be captured on event occurrence.

Table 11 Capture Parameters for Events
(*Clauses* 15, 15.1, 15.2 *and* 15.3)

Sl. No. (1)	Parameter (2)	OBIS Code A.B.C.D.E.F. (3)	Interface Class (4)
i)	Date and time of event	0.0.1.0.0.255	8
ii)	Event code	0.0.96.11.e.255	1
iii)	Current, I_R	1.0.31.7.0.255	3
iv)	Current, I_Y	1.0.51.7.0.255	3
v)	Current, I_B	1.0.71.7.0.255	3
vi)	Voltage, V_{RN}/V_{RY}	1.0.32.7.0.255	3
vii)	Voltage, V_{YN}	1.0.52.7.0.255	3
viii)	Voltage, V_{BN}/V_{BY}	1.0.72.7.0.255	3
xi)	Power factor, *R*-Phase	1.0.33.7.0.255	3
x)	Power factor, *Y*-Phase	1.0.53.7.0.255	3
xi)	Power factor, *B*-Phase	1.0.73.7.0.255	3
xii)	Cumulative energy, kWh (Import)	1.0.1.8.0.255	3
xiii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3
xiv)	Cumulative tamper count	0.0.94.91.0.255	1/2

NOTES

1 For each of the events a certain list of parameters will be captured.

2 The list of capture parameters is given. The utility shall select the required parameters from the table as per their practice

3 Capture parameters mentioned in the table are to be captured when event occurrence and restoration is logged.

4 For event capture, RTC-Time format shall be HH:MM.

5 The parameters at Sl No. (xv) is applicable only for meters supporting 'import and export' energy measurement.

6 V_{RN}, V_{YN} and V_{BN} are for 3ö/4W meter and V_{RY} and V_{BY} are for 3ϕ/3W meter

7 The parameter current I_Y and Power factor, Y-Phase are not applicable for 3ϕ/ 3W meter.

8 For Sl No. (ii) value of 'e' ranges from 0 to 5.

15.3 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 11. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.7.255. The capture objects for this profile shall include the scaler-unit attributes of the parameters listed above. Parameters listed above that do not have a scaler-unit attribute shall not be included in the capture objects of this profile. The profile buffer shall have only one entry. This profile is not required to be updated periodically.

16 GENERAL PURPOSE PARAMETERS

16.1 Name Plate Details

The data are meter specific information.

Association access rights for name plate details are as follows:

a) *Public client* — No access for all objects except meter serial number.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read only for all objects.

The name plate details parameters are listed in Table 12.

This is modelled as profile generic with OBIS code = 0.0.94.91.10.255, IC = 7, Attribute = 2

Table 12 Name Plate Details
(*Clause* 16.1)

Sl No. (1)	Parameter (2)	OBIS Code A.B.C.D.E.F (3)	Interface Class (4)
i)	Meter serial number	0.0.96.1.0.255	1 (Data)
ii)	Device ID	0.0.96.1.2.255	1
iii)	Manufacturer name	0.0.96.1.1.255	1
iv)	Firmware version for meter	1.0.0.2.0.255	1
v)	Meter type	0.0.94.91.9.255	1
vi)	Category	0.0.94.91.11.255	1
viii)	Current rating	0.0.94.91.12.255	1
viii)	Meter year of manufacture	0.0.96.1.4.255	1

NOTES

1 For Sl No. (v), value '8' indicates 3P-4W LTCT smart meter, '9' indicates 3P-3W HTCT smart meter and '10' indicates 3P-4W HTCT smart meter.

2 Sl No. (vi) a value D3 indicates Three phase a.c. static Transformer operated watthour smart meter for HV/LV consumer application.

3 Sl No. (vii) shall indicate current range (I_b–I_{max}) A.

4 For Sl No. (viii) year is mandatory and the format is yyyy.

16.2 Programmable Parameters

Association access rights for programmable parameters as given in Table 13 are as follows:

Table 13 Programmable Parameters
(*Clause* 16.2)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F	Interface Class
(1)	(2)	(3)	(4)
i)	Real time clock – Date and time	0.0.1.0.0.255	8
ii)	Demand integration period	1.0.0.8.0.255	1
iii)	Profile capture period	1.0.0.8.4.255	1
iv)	Single-action schedule for billing dates	0.0.15.0.0.255	22
v)	Activity calendar for time zones	0.0.13.0.0.255	20
vi)	RS 485 Device address	0.0.22.0.0.255	23
vii)	Image transfer	0.0.44.0.0.255	18
viii)	Metering mode	0.0.94.96.19.255	1
ix)	LLS secret	0.0.40.0.2.255	15
x)	HLS key	0.0.40.0.e.255 (e = 3, 5)	15
xi)	Global key change	0.0.43.0.0.255	64
xii)	Image activation single action schedule	0.0.15.0.2.255	22
xiii)	ESWF	0.0.94.91.26.255	1
xiv)	MD reset	0.0.10.0.1.255	9 (method 1)

NOTES

1 The parameters are programmable by the utility engineers with required access rights.

2 Unit for Demand Integration Period and Profile capture period is in 'seconds'. The Demand Integration Period shall be 1 800s (default) and programmable to 900s. The Profile capture period shall be 1 800s (default) and programmable to 900 or 1 800s.

3 On change of time zones settings, the on-going billing cycle data will be generated and a new billing cycle shall be commenced as per new activity calendar.

4 Programming of any of the parameters shall increment the 'Cumulative programming count' value.

5 The RTC–Time format by default shall be HH:MM:SS.

6 Sl No. (vi) Programmability is applicable only for meters with RS485 ports.

7 For Sl No. (viii), value shall be represented in unsigned char format and interpreted as below:

a) 0 => means Forwarded only metering mode

b) 1 => means "Import and Export" mode

8 Parameter listed at Sl No. (vii) shall have Execute access and Parameter listed at Sl No. (xii) shall have set access in FW association only.

9 Parameter listed at Sl No. (xiv) shall have Execute access in US association.

10 Parameter listed at Sl No. (xii) shall have Read Write access in FW association and Read only access in US association.

11 Parameters listed at Sl No. (x) and (xi) shall have Execute access in US association.

12 Parameter listed at SlNo. (ix) shall have Write only access in US association.

a) *Public client* — No access for all objects except real time clock.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read, write for all objects.

17 LIST OF PARAMETERS FOR CATEGORY D4

The parameters listed are for Transformer operated three phase a.c. static watthour smart meters for Boundary/Bank/Ring/ABT metering application

The parameters identified are grouped as under:

a) Instantaneous parameters : Table 14
b) Block load profile : Table 15
c) Daily load profile : Table 16
d) Billing profile : Table 17
e) Indian event reference tables : Table 18 to 24
f) Name plate details : Table 25
g) Programmable parameters : Table 26.

Each of the parameters is a separate entity. The OBIS code and interface class for each parameter is identified in the respective tables.

17.1 Instantaneous Parameters

Association access rights are as follows:

a) *Public client* — Read only for clock and no access for other objects.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read only for all objects.

d) *PUSH service* — Read only for identified objects

The instantaneous parameters are listed in Table 14.

17.2 Snapshot of Instantaneous Parameters

The parameters of Table 14 shall be captured as a profile generic using the country specific OBIS code

Table 14 Instantaneous Parameters
(*Clauses* 17.1, 17.2 *and* 17.3)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Real time clock, date and time	0.0.1.0.0.255	8
ii)	Current, I_R	1.0.31.7.0.255	3
iii)	Current, I_Y	1.0.51.7.0.255	3
iv)	Current, I_B	1.0.71.7.0.255	3
v)	Voltage, V_{RN}/V_{RY}	1.0.32.7.0.255	3
vi)	Voltage, V_{YN}	1.0.52.7.0.255	3
vii)	Voltage, V_{BN}/V_{BY}	1.0.72.7.0.255	3
viii)	Signed power factor, *R*-phase	1.0.33.7.0.255	3
ix)	Signed power factor, *Y*-phase	1.0.53.7.0.255	3
x)	Signed power factor, *B*-phase	1.0.73.7.0.255	3
xi)	Three phase power factor, PF	1.0.13.7.0.255	3
xii)	Frequency – Hz	1.0.14.7.0.255	3
xiii)	Apparent power, kVA	1.0.9.7.0.255	3
xiv)	Signed active power, kW (+ Forward; – Reverse)	1.0.1.7.0.255	3
xv)	Signed reactive power, kvar (+ Lag; – Lead)	1.0.3.7.0.255	3
xvi)	Number of power — failures	0.0.96.7.0.255	1
xvii)	Cumulative power — OFF duration in min	0.0.94.91.8.255	3
xviii)	Cumulative tamper count	0.0.94.91.0.255	1
xix)	Cumulative billing count	0.0.0.1.0.255	1
xx)	Cumulative programming count	0.0.96.2.0.255	1
xxi)	Billing date	0.0.0.1.2.255	3
xxii)	Cumulative energy, kWh (Import)	1.0.1.8.0.255	3/2
xxiii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3/2
xxiv)	Cumulative energy kvarh-Q1	1.0.5.8.0.255	3/2
xxv)	Cumulative energy kvarh-Q2	1.0.6.8.0.255	3/2
xxvi)	Cumulative energy kvarh-Q3	1.0.7.8.0.255	3/2
xxvii)	Cumulative energy kvarh-Q4	1.0.8.8.0.255	3/2
xxviii)	Cumulative energy, kVAh (Import)	1.0.9.8.0.255	3/2
xxix)	Cumulative energy, kVAh (Export)	1.0.10.8.0.255	3/2
xxx)	Maximum demand, kW (Import)	1.0.1.6.0.255	4/2, 5
xxxi)	Maximum demand, kVA (Import)	1.0.9.6.0.255	4/2, 5

NOTES

1 Signed power factor: (+) indicates lag and (–) indicates lead.

2 The parameters at Sl No. (xvii) to (xx) and (xxii) to (xxix) hold cumulative values at that instant from the date of manufacturing.

3 The above list is identified for the purpose of communication to HHU, DCU or HES.

4 Item at Sl No. (xix) refers to the Billing Period Counter.

5 Item at Sl No. (xxi) — Data type to be same as for attribute 2 of IC = 8, Clock. If not specified the billing date shall be first day of the month and time shall be 00:00hrs.

6 The RTC-Time format by default shall be HH:MM:SS.

7 Signed power factor shall be verified at rated voltage, rated current and rated frequency at 0.5 lag and 0.8 lead.

8 Power and Energy related parameters shall be verified at UPF, 0.5 lag and 0.8 lead.

9 V_{RN}, V_{YN} and V_{BN} are for 3ö/4W meter and V_{RY} and V_{BY} are for 3ϕ/3W meter.

10 The parameter current *I*Y and signed power factor, Y – phase are not applicable for 3ϕ/3W meter.

11 Please refer Annexure F IS14697 for Quadrant (Q1-Q4) definitions.

12 For Sl No. (xxx) and (xxxi), the attributes 2 and 5 of indicated IC shall be captured in instantaneous profile. The attribute 3 of indicated IC shall be captured in Scaler profile. The RTC — Time format shall be HH:MM.

13 The demand integration period for interface meters is fixed at 15 min.

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.

17.3 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 14. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.3.255. The capture objects for this profile shall include the scaler-unit attributes of the instantaneous parameters listed in Table 14 instantaneous parameters that do not have a scaler-unit (like IC = 1) shall not be included in the capture objects list. The profile buffer shall have only one entry. This profile is not required to be updated periodically.

18 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 15 and the captured attribute shall be 2 of each interface class.

Association access rights are as follows:

a) *Public client* — No access for all objects.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read only for all objects.

18.1 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 15. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.4.255. The capture objects for this profile shall include the scaler-unit attributes of the parameters listed in Table 15. The profile buffer shall have only one entry. This profile is not required to be updated periodically. Parameters that do not have a scaler-unit (like IC = 1) shall not be included in the capture objects list.

Table 15 Block Load Survey Parameters
(*Clauses* 18 *and* 18.1)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Real time clock, date and time	0.0.1.0.0.255	8/2
ii)	Frequency	1.0.14.27.0.255	3/2
iii)	Current, I_R	1.0.31.27.0.255	3/2
iv)	Current, I_Y	1.0.51.27.0.255	3/2
v)	Current, I_B	1.0.71.27.0.255	3/2
vi)	Voltage, V_{RN}/V_{RY}	1.0.32.27.0.255	3/2
vii)	Voltage, V_{YN}	1.0.52.27.0.255	3/2
viii)	Voltage, V_{BN}/V_{BY}	1.0.72.27.0.255	3/2
ix)	Block energy, kWh (Import)	1.0.1.29.0.255	3/2
x)	Block energy, kWh (Export)	1.0.2.29.0.255	3/2
xi)	Block energy, kWh (Net)	1.0.16.29.0.255	3/2
xii)	Block energy, kvarh-Q1	1.0.5.29.0.255	3/2
xiii)	Block energy, kvarh-Q2	1.0.6.29.0.255	3/2
xiv)	Block energy, kvarh Q3	1.0.7.29.0.255	3/2
xv)	Block energy, kvarh Q4	1.0.8.29.0.255	3/2
xvi)	Block energy, kVAh (Import)	1.0.9.29.0.255	3/2
xvii)	Block energy, kVAh (Export)	1.0.10.29.0.255	3/2

NOTES

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 Sl No. (ii) to (viii) are the average values during the block period time and stored at the end of that time block.

3 The parameters at Sl No. (ix) to (xvii) are the actual energy consumption during that time block.

4 The RTC-time format by default shall be HH:MM.

5 Energy related parameters shall be verified at UPF, 0.5 lag and 0.8 lead.

6 The time stamp shall be at the end of the capture period (Ist entry value is 00:15 or 00:30 min as applicable and last entry value is 00:00 hrs next day).

7 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

8 V_{RN}, V_{YN} and V_{BN} are for 3ϕ/4W meter and V_{RY} and V_{BY} are for 3ϕ/3W meter.

9 The parameter current *I*Y is not applicable for 3ϕ/ 3W meter.

10 The block period time for interface meters is fixed at 15 min for which the data storage will be for 22 days.

19 DAILY LOAD PROFILE PARAMETERS

This is an array of load survey data captured as a profile generic at the end of 24 h. The OBIS code is 1.0.99.2.0.255 with IC as 7. The capture objects of this daily load profile are as per Table A16 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 1.0.0.8.5.255 of recording interval 2. The capture period attribute shall be statically fixed as 24 h.

Association access rights are as follows:

a) *Public client* — No access for all objects.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read only for all objects.

19.1 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 16. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.5.255. The capture objects for this profile shall include the scaler-unit attributes of the parameters listed in Table 16. The profile buffer shall have only one entry. This profile is not required to be updated periodically. Parameters that do not have a scaler-unit (like IC = 1) shall not be included in the capture objects list.

20 BILLING PROFILE PARAMETERS

The contents of Table 17 are for billing purpose. The data are stored up to 6 billing cycles. The billing profile is modelled 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 17. 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 **10** of IS 15959 (Part 1) and Table 27.

Association access rights are as follows:

a) *Public client* — No access for all objects.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read only for all objects.

20.1 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 17. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.6.255. The capture objects for this profile shall include the scaler-unit attributes of the parameters listed in Table 17 above. The profile buffer shall have only one entry. This profile is not required to be updated periodically. Parameters that do not have a scaler-unit (like IC = 1) shall not be included in the capture objects list.

25 EVENTS

Any exceptional/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 6). The value attribute (attr-2) of this object stores identifier

Table 16 Daily Load Profile Parameters
(*Clause* 19.1)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class/ Attribute
(1)	(2)	(3)	(4)
i)	Real time clock, date and time	0.0.1.0.0.255	8/2
ii)	Cumulative energy kWh (Import)	1.0.1.8.0.255	3/2
iii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3/2
iv)	Cumulative energy kVAh (Import)	1.0.9.8.0.255	3/2
v)	Cumulative energy, kVAh (Export)	1.0.10.8.0.255	3/2
vi)	Reactive energy high (V > 103 per cent)	1.0.94.91.1.255	3/2
vii)	Reactive energy low (V < 97 per cent)	1.0.94.91.2.255	3/2
viii)	Cumulative energy kvarh-Q1	1.0.5.8.0.255	3/2
ix)	Cumulative energy kvarh-Q2	1.0.6.8.0.255	3/2
x)	Cumulative energy kvarh-Q3	1.0.7.8.0.255	3/2
xi)	Cumulative energy kvarh-Q4	1.0.8.8.0.255	3/2

NOTES

1 The parameters listed in this table are meant for billing purpose and shall be logged at midnight (00 h).

2 The storage time for these parameters is same as Block load survey.

3 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

4 Parameters (vi) and (vii) are ABT parameters.

Table 17 Billing Profile Parameters
(*Clauses* 20 *and* 20.1)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class No./ Attribute
(1)	(2)	(3)	(4)
i)	Billing date	0.0.0.1.2.255	3/2
ii)	Cumulative energy, kWh (Import)	1.0.1.8.0.255	3/2
iii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3/2
iv)	Cumulative energy, kVAh (Import)	1.0.9.8.0.255	3/2
v)	Cumulative energy, kVAh (Export)	1.0.10.8.0.255	3/2
vi)	Cumulative energy, kvarh-Q1	1.0.5.8.0.255	3/2
vii)	Cumulative energy, kvarh-Q2	1.0.6.8.0.255	3/2
viii)	Cumulative energy, kvarh-Q3	1.0.7.8.0.255	3/2
ix)	Cumulative energy, kvarh-Q4	1.0.8.8.0.255	3/2
x)	Billing power ON duration in minutes (During billing period)	0.0.94.91.13.255	3/2
xi)	MD, kW (Import)	1.0.1.6.0.255	4/2, 5
xii)	MD, kVA (Import)	1.0.9.6.0.255	4/2, 5
xiii)	System power factor for billing period import	1.0.13.0.0.255	3/2

NOTES

1 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

2 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.

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

4 The Billing Date - Time format by default shall be HH:MM.

5 Billing date and time shall be current date and current time.

6 If not specified, the billing date shall be first day of the month and time shall be 00:00 h.

7 The demand integration period for interface meters is fixed at 15 min.

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 (*see* Tables 18 to 23). 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 modelled as Profile generic (OBIS = 0.0.99.98.e.255 IC = 7, values of e range from 0 to 6). The buffer attribute (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 in Table 24.

25.1 Indian Event Reference Tables (*see* Tables 18 to 24)

The document containing test procedure, threshold values and persistence time for event simulation shall be provided by the test requesting organization.

25.2 Capture Parameters for Event as Applicable (Event Log Profile)

Association access rights are as follows:

a) *Public client* – No access.
b) *Meter reading* – Read only.
c) *Utility settings* – Read only.
d) *Push services* – Read only for selected events.

25.3 Scaler Profile

This profile is meant for capturing the scaler-unit of each of the parameter listed in Table 24. This is modelled as profile generic (IC = 7) and is assigned the country specific OBIS code 1.0.94.91.7.255. The capture objects for this profile shall include the scaler-unit attributes of the parameters listed above. Parameters listed above that do not have a scaler-unit attribute shall not be included in the capture objects of this profile. The profile buffer shall have only one entry. This profile is not required to be updated periodically.

26 GENERAL PURPOSE PARAMETERS

26.1 Name Plate Details

The data are meter specific information.

Association access rights for name plate details are as follows:

a) *Public client* — No access for all objects except meter serial number.
b) *Meter reader* — Read only for all objects.
c) *Utility setting* — Read only for all objects.

The name plate details parameters are listed in Table 25.

Table 18 Indian Event Reference Table — Voltage Related
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No. (1)	Event ID (2)	Description (3)
i)	1	*R*-Phase — Voltage missing — Occurrence
ii)	2	*R*-Phase — Voltage missing — Restoration
iii)	3	*Y*-Phase — Voltage missing — Occurrence
iv)	4	*Y*-Phase — Voltage missing — Restoration
v)	5	*B*-Phase — Voltage missing — Occurrence
vi)	6	*B*-Phase — Voltage missing — Restoration
vii)	7	Over voltage in any phase — Occurrence
viii)	8	Over voltage in any phase — Restoration
ix)	9	Low voltage in any phase — Occurrence
x)	10	Low voltage in any phase — Restoration
xi)	11	Voltage unbalance — Occurrence
xii)	12	Voltage unbalance — Restoration

NOTES

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 Occurrence 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 24. The utility shall select the required parameters from Table 24 as per their practice.

5 For each of the occurrence event captured, the cumulative tamper count value shall be incremented

6 Capture parameters mentioned in Table 24 are captured when event occurrence and restoration is logged.

7 The attributes of each of the IC (Interface class) is to be identified while finalizing the Specification.

8 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

9 Sl No. (iii) and (iv) are not applicable for 3ϕ/3W meter.

Table 19 Indian Event Reference Table — Current Related
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No. (1)	Event ID (2)	Descriptions (3)
i)	51	R Phase — Current reverse — Occurrence
ii)	52	R Phase — Current reverse — Restoration
iii)	53	Y Phase — Current reverse — Occurrence
iv)	54	Y Phase — Current reverse — Restoration
v)	55	B Phase — Current reverse — Occurrence
vi)	56	B Phase — Current reverse — Restoration
vii)	63	Current unbalance — Occurrence
viii)	64	Current unbalance — Restoration
ix)	65	Current bypass — Occurrence
x)	66	Current bypass — Restoration
xi)	67	Over current in any phase — Occurrence
xii)	68	Over current in any phase — Restoration
xiii)	57	R Phase — Current Open — Occurrence
xiv)	58	R Phase — Current Open — Restoration
xv)	59	Y Phase — Current Open — Occurrence
xvi)	60	Y Phase — Current Open — Restoration
xvii)	61	B Phase — Current Open — Occurrence
xviii)	62	B Phase — Current Open — Restoration

NOTES

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 Occurrence 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 24. The utility shall select the required parameters from Table 24 as per their practice.

5 For each of the occurrence event captured, the cumulative tamper count value shall be incremented

6 Capture parameters mentioned in Table 24 are captured when event occurrence and restoration is logged.

7 The attributes of each of the IC (Interface class) is to be identified while finalizing the companion specification.

8 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

9 Sl No. (iii), (iv), (xv) and (xvi) are not applicable for 3ϕ/3W meter.

Table 20 Indian Event Reference Table — Power Related
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	101	Power failure (3 phase) — Occurrence
ii)	102	Power failure (3 phase) — Restoration

NOTES

1 These are the event conditions generally recorded in consumer meters, utilities may select any of 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 Occurrence is considered an event.

3 For these events only date and time of event and event ID shall be captured.

4 The attributes of each of the IC (Interface class) is to be identified while finalizing the companion specification.

5 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

Table 21 Indian Event Reference Table — Transaction Related
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	151	Real time clock – Date and time
ii)	154	Single-action schedule for billing dates
iii)	155	Activity calendar for time zones
iv)	157	New firmware activated
v)	156	RS485 device address
vi)	161	LLS secret (MR) change
vii)	162	HLS key (US) change
viii)	163	HLS key (FW) change
ix)	164	Global key change (encryption and authentication)
x)	165	ESWF change
xi)	166	MDI reset
xii)	169	Image activation single action schedule

NOTES

1 Occurrence is considered as separate events.

2 For these events only date and time and event code shall be captured.

3 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

4 RS 485 device address programmability shall be present in MR and also in US mode. Hence, in MR mode 'Set' is applicable only for RS 485 meter.

5 Device address programmability is only applicable for meters with RS485 ports.

Table 22 Indian Event Reference Table — Others
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	201	Abnormal external magnetic influence — Occurrence
ii)	202	Abnormal external magnetic influence — Restoration
iii)	203	Neutral disturbance (HF, d.c. or alternate method) — Occurrence
iv)	204	Neutral disturbance (HF, d.c. or alternate method) — Restoration
v)	205	Low PF — Occurrence
vi)	206	Low PF — Restoration
vii)	209	Plug in communication module removal — Occurrence
viii)	210	Plug in communication module removal — Restoration
xiii)	215	Overload — Occurrence
xiv)	216	Overload — Restoration

NOTES

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 Occurrence 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 24. The utility shall select the required parameters from Table 24 as per their practice.

5 For each of the occurrence event captured, the cumulative tamper count value shall be incremented.

6 Capture parameters mentioned in Table 24 are captured when event occurrence and restoration is logged.

7 The attributes of each of the IC (Interface class) is to be identified while finalizing the companion specification.

8 Support for selective access shall be as defined in **11.3** of IS 15959 (Part 1).

Table 23 Indian Event Reference Table — Non-Rollover Events
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No.	Event ID	Descriptions
(1)	(2)	(3)
i)	251	Meter cover opening — Occurrence

NOTES

1 This event condition is generally recorded in consumer meters, utilities may select the above event condition based on their practice. The need and applicability of the event for other type of meters shall be considered by utility.

2 Occurrence is considered an event.

3 For these events only Date and time of event and event ID shall be captured on event occurrence.

Table 24 Capture Parameters for Events
(*Clauses* 25, 25.1, 25.2 *and* 25.3)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class
(1)	(2)	(3)	(4)
i)	Date and time of event	0.0.1.0.0.255	8
ii)	Event code	0.0.96.11.e.255	1
iii)	Current, I_R	1.0.31.7.0.255	3
iv)	Current, I_Y	1.0.51.7.0.255	3
v)	Current, I_B	1.0.71.7.0.255	3
vi)	Voltage, V_{RN}/V_{RY}	1.0.32.7.0.255	3
vii)	Voltage, V_{YN}	1.0.52.7.0.255	3
viii)	Voltage, V_{BN}/V_{BY}	1.0.72.7.0.255	3
ix)	Power factor, *R*-Phase	1.0.33.7.0.255	3
x)	Power factor, *Y*-Phase	1.0.53.7.0.255	3
xi)	Power factor, *B*-Phase	1.0.73.7.0.255	3
xii)	Cumulative energy, kWh (Import)	1.0.1.8.0.255	3
xiii)	Cumulative energy, kWh (Export)	1.0.2.8.0.255	3
xiv)	Cumulative tamper count	0.0.94.91.0.255	1/2

NOTES

1 For each of the events a certain list of parameters will be captured.

2 The list of capture parameters is given. The utility shall select the required parameters from the table as per their practice.

3 Capture parameters mentioned in the table are to be captured when event occurrence and restoration is logged.

4 For event capture, RTC-Time format shall be HH:MM.

5 V_{RN}, V_{YN} and V_{BN} are for 3ö/4W meter and V_{RY} and V_{BY} are for 3ϕ/3W meter.

6 The parameter current *IY* is not applicable for 3ϕ/ 3W meter

7 For Sl No.(ii) value of 'e' ranges from 0 to 5.

This is modelled as profile generic with OBIS code = 0.0.94.91.10.255, IC = 7, Attribute = 2

26.2 Programmable Parameters

Association access rights for programmable parameters as given in Table 26 are as follows:

a) *Public client* — No access for all objects except real time clock.

b) *Meter reader* — Read only for all objects.

c) *Utility setting* — Read, write for all objects.

27 TESTING

The tests under this clause are applicable for smart meter designed as per IS 16444 (Part 2).

27.1 Tests for Data Exchange Protocol

This test shall be carried out on optical port on both types of smart meter mentioned in **9** of IS 16444 (Part 2). The tests shall be performed for conformity. The tests listed in Table 27 shall be applicable for category 'D3'- Transformer operated three phase a.c. static watthour and var-hour smart meters for HV/LV consumer application. The tests listed in Table 28 shall be applicable for category 'D4'-Transformer operated three phase a.c. static watthour and var-hour smart meters for Boundary/Bank/Ring/ABT metering application

Table 25 Name Plate Details
(*Clause* 26.1)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class
(1)	(2)	(3)	(4)
i)	Meter serial number	0.0.96.1.0.255	1 (Data)
ii)	Device ID	0.0.96.1.2.255	1
iii)	Manufacturer name	0.0.96.1.1.255	1
iv)	Firmware version for meter	1.0.0.2.0.255	1
v)	Meter type	0.0.94.91.9.255	1
vi)	Category	0.0.94.91.11.255	1
vii)	Current rating	0.0.94.91.12.255	1
viii)	Meter year of manufacture	0.0.96.1.4.255	1

NOTES

1 For Sl No. (v), value '9' indicates 3P-3W HTCT smart meter and '10' indicates 3P-4W HTCT smart meter.

2 For Sl No. (vi) a value D4 indicates Three phase a.c. static Transformer operated watthour smart meter for Boundary/ Bank/ Ring/ABT application.

3 For Sl No.(vii) shall indicate current range (I_b-I_{max}) A.

4 For Sl No. (viii) year is mandatory and the format is yyyy.

28 TESTS FOR SMART METER COMMUNICABILITY

The standard IS 16444 (Part 2) provides for use of suitable communication technologies in the design of smart meters. The data shall be presented to the HES in IS 15959 (Part 1) format. The communication capability of the meter for data exchange between meter and network devices over remote communication technology is to be verified as given below. The methodology is explained with a diagram shown in Fig. 1 for Variant-1 and in Fig. 2 for Variant-2.

The left square is the smart meter of Variant-1 having a NAN module. The middle square is a 'white box' having the same identical NAN module. The right square is a computer which can run the smart meter test software module.

The left square is the smart meter of Variant-2 having a WAN module. The right square is a computer which can run the smart meter test software module.

Testing for the test of functional test given in Table 29 shall be done using white Box and the SM software shall be provided by manufacturer.

Table 26 Programmable Parameters
(*Clauses* 26 *and* 26.2)

Sl No.	Parameter	OBIS Code A.B.C.D.E.F.	Interface Class
(1)	(2)	(3)	(4)
i)	Real time clock – Date and time	0.0.1.0.0.255	8
ii)	Single-action schedule for billing dates	0.0.15.0.0.255	22
iii)	Activity calendar for time zones	0.0.13.0.0.255	20
iv)	RS 485 Device address	0.0.22.0.0.255	23
v)	Image transfer	0.0.44.0.0.255	18
vi)	LLS secret	0.0.40.0.2.255	15
vii)	HLS key	0.0.40.0.e.255 (e=3, 5)	15
viii)	Global key change	0.0.43.0.0.255	64
ix)	Image activation single action schedule	0.0.15.0.2.255	22
x)	ESWF	0.0.94.91.26.255	1
xi)	MD reset	0.0.10.0.1.255	9 (method 1)

NOTES

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.

3 The RTC - Time format by default shall be HH:MM:SS.

4 Sl No. (iv) programmability is applicable only for meters with RS485 ports.

5 Parameter listed at Sl No.(v) shall have Execute access and Parameter listed at Sl No.(ix) shall have set access in FW association only.

6 Parameter listed at Sl No.(xi) shall have Execute access in US association.

7 Parameter listed at Sl No.(ix) shall have Read Write access in FW association and Read only access in US association.

8 Parameters listed at Sl No.(vii) and (viii) shall have Execute access in US association.

9 Parameter listed at Sl No(vi) shall have Write only access in US association.

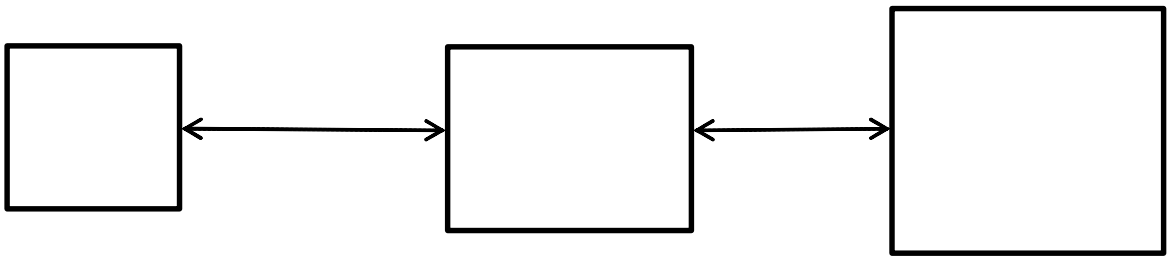

FIG. 1 BLOCK DIAGRAM

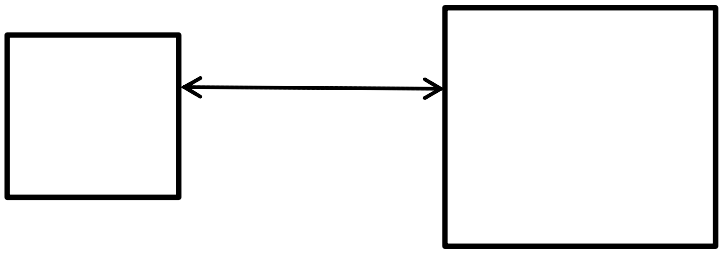

FIG. 2 BLOCK DIAGRAM

Table 27 List of Tests Category D3 Transformer Operated Three Phase a.c. Static Watthour Smart Meters for HV/LV Consumer Metering Application

(*Clause* 27.1)

Item No. (1)	Particulars of Test (2)	Clause Reference to (*see* NOTES) (3)
	COMPLIANCE TEST	
i)	Conformance to DLMS/COSEM (IEC 62056)	K-1 a)
ii)	Parameter Verification:	
iii)	SNRM/UA	4.1 and 4.2
iv)	Object list download	5.1 and 5.2
v)	Association properties	5.1, 5.2 and Table 2
vi)	Security:	7.5
vii)	Lowest level security secret	7.5.1.1
viii)	Low level security (LLS) secret	7.5.1.2
ix)	High level security (HLS) secret	7.5.1.3
x)	Parameter list:	
xi)	Instantaneous parameters	Table 1
xii)	Snap shot of instantaneous parameters	
xiii)	Scaler profile	
xiv)	Block load profile parameters	Table 2
xv)	Selective access by range for block load profile	11.3
xvi)	Daily load profile parameters	Table 3
xvii)	Selective access by range for daily load profile	11.3
xviii)	ToU setting	9
xix)	Billing profile parameters	Table 4
xx)	Billing period	10.1 and 10.2
xxi)	Billing period counter	11.2.1 and 11.2.2
xxii)	Selective access by entry for billing profile	11.3
xxiii)	Event code and Event logging:	8.1, 8.2, G-1, G-2 and Table 11
xxiv)	Indian Event Reference Table – Voltage Related	Table 5
xxv)	Indian Event Reference Table – Current Related	Table 6
xxvi)	Indian Event Reference Table – Power Related	Table 7
xxvii)	Indian Event Reference Table – Transaction Related	Table 8
xxviii)	Indian Event Reference Table – Other	Table 9
xxix)	Indian Event Reference Table – Non Roll Over	Table 10
xxx)	Selective access by Entry for Event Log Profile	11.3
xxxi)	General Purpose Parameters:	
xxxii)	Name Plate Details	Table 12
xxxiii)	Programmable Parameters	Table 13

NOTES

1 Clause numbers refer to IS 15959 (Part 1) and table number refers to this standard.

2 Sl No. (v) Association properties: 'PUSH', 'Firmware upgrade' & 'IHD' are not the part of data verification tests.

3 Sl No. (xxxiii) Programmable Parameter: (vii) and (xi) are not part of data verification test.

4 Meter under test should be tested for configured 'metering mode' as submitted by manufacturer.

The SM test software module shall be used to verify the protocol implementation and parameter verification. The SM test software module shall have required support for carrying out the functional tests in Table 29.

NOTES

1 This test is an optional test, to be mutually decided between the buyer and the seller.

2 The required compatible accessories namely,White box having Variant – 1 NAN Module, router, etc, shall be provided by the respective manufacture for testing along with the test smart meter.

Table 28 List of tests for Category D4 Transformer Operated Three Phase a.c. Static Watthour Smart Meters for Boundary/Bank/Ring/ABT Metering Application

(*Clause* 27.1)

Item No.	Particulars of Test	Clause Reference to (*see* NOTES)
(1)	(2)	(3)
	COMPLIANCE TEST	
i)	Conformance to DLMS/COSEM (IEC 62056)	K-1 a)
ii)	Parameter Verification:	
iii)	SNRM/UA	4.1 and 4.2
iv)	Object list download	5.1 and 5.2
v)	Association properties	5.1, 5.2, and Table 2
vi)	Security:	7.5
vii)	Lowest level security secret	7.5.1.1
viii)	Low level security (LLS) secret	7.5.1.2
ix)	High level security (HLS) secret	7.5.1.3
x)	Parameter list:	
xi)	Instantaneous parameters	Table 14
xii)	Snap shot of instantaneous parameters	
xiii)	Scaler profile	
xiv)	Block load profile parameters	Table 15
xv)	Selective access by range for block load profile	11.3
xvi)	Daily load profile parameters	Table 16
xvii)	Selective access by range for daily load profile	11.3
xviii)	ToU setting	9
xix)	Billing profile parameters	Table 17
xx)	Billing period	10.1 and 10.2
xxi)	Billing period counter	11.2.1 and 11.2.2
xxii)	Selective access by entry for billing profile	11.3
xxiii)	Event code and Event logging:	8.1, 8.2, G-1, G-2 and Table 24
xxiv)	Indian event reference table – Voltage related	Table 18
xxv)	Indian event reference table – Current related	Table 19
xxvi)	Indian event reference table – Power related	Table 20
xxvii)	Indian event reference table – Transaction related	Table 21
xxviii)	Indian event reference table – Other	Table 22
xxix)	Indian event reference table – Non roll over	Table 23
xxx)	Selective access by entry for event log profile	11.3
xxxi)	General Purpose Parameters:	
xxxii)	Name Plate Details	Table 25
xxxiii)	Programmable Parameters	Table 26

NOTES

1 Clause numbers refer to IS 15959 (Part 1) and table number refers to this standard.

2 Sl No. (v) Association properties: 'PUSH', 'Firmware upgrade' and 'IHD' are not the part of data verification tests.

3 Sl No. (xxxiii) Programmable Parameter: (v) and (ix) are not part of data verification test.

Table 29 List of Functional Tests

(*Clause* 28)

Sl No.	Test Description	Transformer Operated Three Phase a.c. Static Watthour Smart Meters for HV/LV Consumer Metering Application	Transformer Operated Three Phase a.c. Static Watthour Smart Meters for Boundary/Bank/Ring/ABT Metering Application
(1)	(2)	(3)	(4)
i)	Association		
ii)	Data read	Table 1 (Any five parameters)	Table 14 (Any five parameters)
iii)	Profile read	Table 4	Table 17
iv)	Selective programmability	Table 13(any two parameters)	Table 24(any two parameters)
v)	Reporting of events	As per push schedule	As per push schedule
vi)	Firmware upgrade	As per **9**	As per **9**

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