भारतीय मानक
Indian Standard

IS 16444 : 2015

(Reaffirmed 2020)

ए.सी. स्थैतिक सीधा जुड़ा वाटआवर स्मार्ट मीटर वर्ग 1 एवं 2 — विशिष्टि

a.c. Static Direct Connected Watthour Smart Meter Class 1 and 2 — Specification

ICS 91.140.50

भारतीय मानक ब्यूरो
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August 2015 **Price Group 4**

FOREWARD

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

Several programmes have been launched by Government of India to reform the energy and power sector. One such initiative was introduction of IT enabled services that has set the platform for deploying Smart Grids in India. The Smart Grid via its environment friendly and consumer centric approach would offer enhanced reliability, security, safety and efficiency for grid operations. The transition to Smart Grid would achieve the overarching objectives of Government to reduce AT&C losses and provide 24×7 power for all.

Advanced Metering Infrastructure (AMI) is a crucial part of a Smart Grid. It is an integrated system of smart meters, communication networks and data management systems that enables two way communication between the utilities and consumer premises equipment. The functional blocks of AMI typically include HES — Head end system, WAN — Wide area network, NAN — Neighbourhood area network, Data concentrator unit (DCU)/ Gateway and HAN — Home area network.

Smart Meter is a composite unit consisting of metrology elements, two way communication module/modules and control elements. It will have functions such as measurement, computation, event capturing, storing, communication and control. The smart meter would be required to provide data and information that are needed by various Smart Grid applications.

Smart grid deployment process is still evolving. Various domains of Smart Grids are infused with professional interventions to adopt and rollout standards-based technologies and products. Many standard making bodies like IEC, IEEE, NIST, CEN, CENELEC, ITU, ETSI, IETF are engaged in standardization activities pertaining to Smart Grids.

The Electrotechnical department of Bureau of Indian Standards has prepared many metering standards such as IS13779 : 1999 ‘ac Static watthour meters (Class 1 and 2) (*first revision*)’, IS 14697 : 1999 ‘ac Static transformer operated watthour and var-hour meters, class 0.2S and 0.5S — Specification’, IS 15884 : 2010 ‘Alternating current direct connected static pre-payment meters for active energy (Class 1 and 2) — Specification’ and IS 15959 : 2011 ‘Electricity metering — Data exchange for meter reading, tariff and load control — Companion specification’. This standard on the smart meter has been prepared by Bureau of Indian Standards based on the technical specifications and functional requirements published in June 2013 by Central Electricity Authority.

While preparing this standard it has been endeavoured not to contradict on principle of the adopted/referred standards of other International organizations/institutions on which this standard 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.

This standard specifies the requirements for smart meters only. Requirements for any other components shown or referred in the text or diagrams such as DCU, HES, IHD, HHU may be specified separately for functional and technical aspects taking into consideration the features and provisions of this standard for deployment of AMI. The requirements of other components chosen shall be finalised between buyer and seller.

While finalizing this standard a separate standard covering requirements for data exchange specific to smart meter has been prepares and it is in the final stage of approval. Therefore IS 15959 : 2011 is being revised as follows:

IS 15959 (Part 1) : 2011 ‘Data exchange for electricity meter reading, tariff and load control: Part 1 Comparison specification’ (through Amendment)

IS 15959 (Part 2) : 2011 ‘Data exchange for electricity meter reading, tariff and load control: Part 2 Comparison specification for smart meter (*under preparation*)

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

a.c. STATIC DIRECT CONNECTED WATTHOUR SMART METER CLASS 1 AND 2 — SPECIFICATION

1 SCOPE

1.1 This standard specifies static watt-hour smart meters of accuracy class 1 and 2 for the measurement of alternating current electrical active energy of frequency 50 Hz for single phase and three phase balanced and unbalanced loads. It applies to their type tests, routine tests and acceptance tests.

1.2 It applies to:

a) static watt-hour direct connected meters consisting of measuring element(s), time of use of register(s), display, load switch and built in type bi-directional communication module all integral with the meter housing.

b) alternately the bi-directional communication module could be plug-in type on a dedicated slot with suitable sealing arrangement. The plug-in module shall be field swappable with suitable integrated communication module as agreed between buyer and seller.

1.3 The smart meter types as specified in **1.2** (a) and **1.2** (b) shall be suitable for indoor/outdoor usage and capable of forward (import) or both forward (import) and reverse (export) energy measurement.

1.4 It does not apply to:

a) watt-hour meters where the voltage across the connection terminal exceeds 600 V (line to line voltage for meters for poly phase systems,

b) meters operated with external current transformers,

c) portable meters, and

d) meters without internal load switch.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No./ International Standards	*Title*
13779 : 1999	a.c. Static watthour meters, Class 1 and 2 — Specification
15884 : 2010	Alternating current direct connected static prepayment meters for active energy (Class 1 and 2) — Specification
15959 (Part 1) : 2011	Data exchange for electricity meter reading, tariff and load control : Companion specification
15959 (Part 2) : 2011	Data exchange for electricity meter reading, tariff and load control: Part 2 Companion specification for smart meter
IEEE 802.15.4 : 2003	Standard for local and metropolitan area networks
IEEE 1901 : 2010	Standard for broadband over power line networks: Medium access control and physical layer specifications
IEEE 1901.2 : 2013	Standard for low-frequency narrow band power line communications for smart grid applications
ITU-T G.9901 : 2014	Narrowband orthogonal frequency division multiplexing power line communication transceivers — Power spectral density specification
ITU-T G.9903 : 2014	Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks
ITU-T G.9904 : 2012	Narrowband orthogonal frequency division multiplexing power line communication transceivers for prime networks

3 TERMINOLOGY

3.1 General Definitions — For the purpose of this standard all definitions given in IS 13779, IS 15884 and IS 15959 (Part 1) shall apply. In addition definitions given in **3.2** shall be applicable.

3.2 Definitions of General Smart Metering Terms

3.2.1 *Smart Meter* — Smart meter is an ac static watt-

hour meter with time of use registers, internal connect and disconnect switches with two way communication capability. It is designed to measure flow of forward (import) or both forward (import) and reverse (export), store and communicate the same along with other parameters defined in this standard. It shall be remotely accessed for collecting data/events, programming for select parameters.

3.2.2 *Neighbourhood Area Network [NAN]* — This is a network comprising of group of smart meters and any other network elements such as DCU all of which communicate in a two way mode.

3.2.3 *Data Concentrator Unit [DCU]* — This device is part of NAN. It acts as a secured aggregate router and is an interface between smart meter and HES. It shall facilitate secured two way data transfer either in transparent/store and forward mode as per system designs. The other terminologies like/Network Element/Grid Router/Access point/edge router shall be synonymously used in place of DCU. This standard does not cover the requirements of DCU.

3.2.4 *Head End System [HES]* — This entity is a set of ICT based systems situated at the top of AMI system and receives data and events over NAN/WAN. HES is responsible for using these data/information and manage NAN/WAN components, smart meters and IHD. HES is also responsible for handling security keys, passwords intended for smart meter programmability and firmware upgrade and host applications such as remote connect/disconnect, analytics, billing, messaging etc. This standard does not cover the requirements of HES.

3.2.5 *In Home Display [IHD]* — This is a compact display module meant for mounting inside the consumer premises. The IHD shall receive data/ messages from smart meter and send responses to smart meter as and when required from HES. This standard does not cover the requirements of IHD

3.2.6 *Hand Held Unit [HHU]* — This is a device used to communicating locally over the optical port to the smart meter. Communication functionality requirements are as mentioned in IS 15959 (Part 2).

4 GLOSSARY OF TERMS

AMI	: Advanced metering infrastructure
AT&C	: Aggregate technical and commercial
CEA	: Central electricity authority
COSEM	: Companion specification for energy metering
DCU	: Data concentrator unit
DLMS	: Device language message specification
DoT	: Department of telecom
DSM	: Demand side management
DR	: Demand response
ETA	: Equipment type approval
ETSI	: European telecommunications standards institute
HAN	: Home area network
HES	: Head end system
HHU	: Hand held unit
ICT	: Information and communications technology
IEC	: International electrotechnical commission
IEEE	: Institute of electrical and electronics engineers
IETF	: Internet engineering task force
IHD	: In home display
IS	: Indian standard
ITU	: International telecommunication union
LCD	: Liquid crystal display
NAN	: Neighbourhood area network
OFC	: Optical fibre communication
PLC	: Power line communication
RF	: Radio frequency
ToU	: Time of use
WAN	: Wide area network
WPC	: Wireless planning co-ordination
NFAP	: National frequency allocation Plan

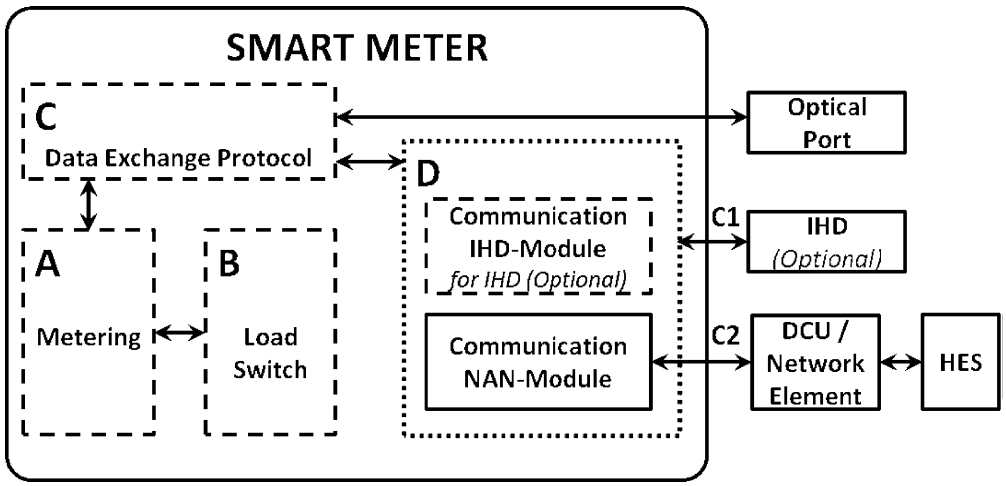
5 SMART METER ARCHITECTURE

5.1 The smart meter is a component of Advanced Metering Infrastructure. For the purpose of this standard the smart meter is conceived as single unit comprising of following functional zones:

a) Metering,
b) Load switch,
c) Metering protocol, and
d) Communication modules.

5.2 The Smart Meters may have wide usage and the buyer may like to choose desired features to meet the objectives of their overall system and site conditions. In order to facilitate such a flexible approach, the Smart Meter architecture are categorized into two variants. Based on the technical feasibility buyer may choose the combination of the variants best suited for a given geographical area. The Smart Meter shall have either NAN or WAN module as mandatory communication module for communicating to DCU or HES respectively. If IHD is chosen, then there could be a suitable additional communication module within the Smart Meter. The two variants are diagrammatically represented in Fig. 1 and Fig. 2. These variants are applicable to both built in type and pluggable type of Smart Meters.

Variant 1



LEGEND

A – Metrology
B – Load switch for control
C – Metering protocol
D – Communication

Optical port — As per IS 15959 (Part 2)
C1 – IHD Connectivity SM ↔ IHD (optional)
C2 – NAN Connectivity SM ↔ DCU

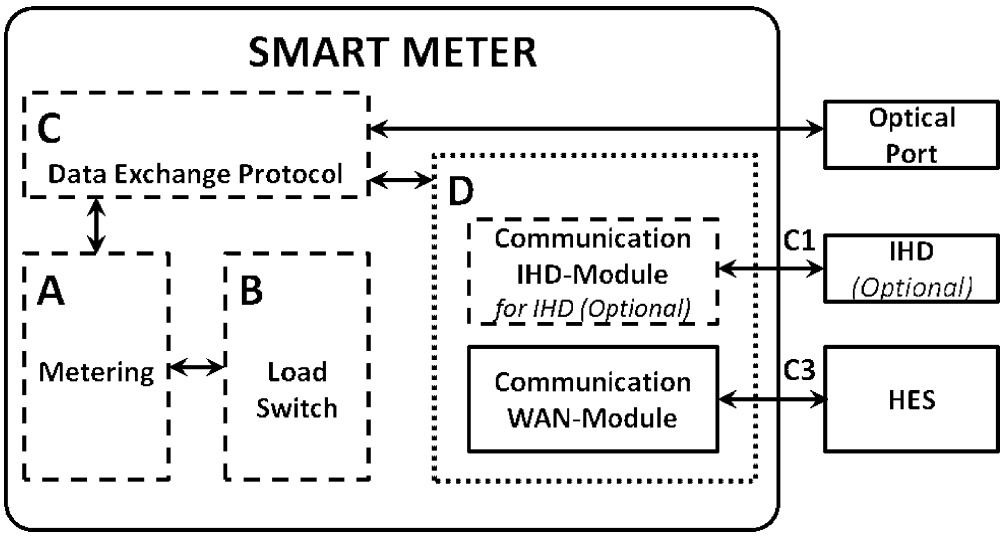
NOTES

1 The Smart Meter variant based on Fig. 1 shall provide connectivity C2 for two way communication with DCU using a NAN module.

2 If IHD is chosen this Smart Meter shall provide connectivity C1 for two way communication with IHD using the same NAN module or a suitable additional module as per buyer-seller agreement.

FIG. 1 SMART METER ARCHITECTURE

Variant 2



LEGEND

A – Metrology
B – Load switch for control
C – Metering protocol
D – Communication

Optical port — As per IS 15959 (Part 2)
C1 – IHD Connectivity SM ↔ IHD (Optional)
C3 – WAN Connectivity SM ↔ HES

NOTES

1 The Smart Meter variant based on Fig. 2 shall provide connectivity C3 for two way communication with HES using a WAN module.

2 If IHD is chosen this Smart Meter shall provide connectivity C1 for two way communication with IHD using a suitable additional module as per buyer-seller agreement.

FIG. 2 SMART METER ARCHITECTURE

6 METERING

6.1 Metering Requirement

Metering and metrology requirement shall be according to IS 13779.

6.1.1 *Classification*

The classification as per **4** of IS 13779 shall apply.

6.1.2 *Ratings*

6.1.2.1 *Standard reference voltage*

As per **5.1** of IS 13779.

6.1.2.2 *Standard basic current*

As per **5.2** of IS 13779.

6.1.2.3 *Maximum current*

As per **5.3** of IS 13779 with maximum current not exceeding 100A for both 3 Phase and 1 Phase meters.

6.1.2.4 *Standard reference frequency*

As per **5.4** of IS 13779

6.2 General Constructional Requirements

The requirements given in **6.1** to **6.4** of IS 13779 shall apply.The communication modules shall be either built in type or plug in type as mentioned in **1.2**. The plug-in communication modules shall be properly secured on the smart meter, both physically and electrically, so as to avoid any possible tampering with adequate provision for sealing. The load switch for disconnect/ connect purpose shall be mounted inside the meter with suitable arrangement.

6.2.1 *Terminals — Terminal Block(s) — Protective Earth Terminal*

The requirements given in **6.4** of IS 13779 shall apply.

6.2.2 *Terminal Cover*

The requirements given in **6.5, 6.5.1, 6.5.2** and **6.7** of IS 13779 shall apply

6.3 Clearance and Creepage Distances

The requirements given in **6.6** of IS 13779 shall apply.

6.4 Resistance to Heat and Fire

The requirements given in **6.8** of IS 13779 shall apply.

6.5 Mechanical Requirements

The requirements for mechanical shall be as per **12.3** of IS 13779 and the requirements for protection against penetration of dust and water shall be as per **6.9** and **12.5** of IS 13779 shall apply.

6.6 Display of Values

The requirements given in **6.10** of IS 13779 shall apply. The non-volatile memory shall support retention period of 10 years.

6.7 Output Device

The requirements given in **6.11** of IS 13779 shall apply. Distinct LED/LCD indicators shall be provided for Communication in Progress (for example — TxD mode, RxD mode), Load switch Close/Open conditions.

6.8 Marking of Smart Meter

6.8.1 The requirements given in **7** of IS 13779 shall apply.

The following additional information shall also be provided as applicable in the name plate:

a) Communication technology for WAN or NAN (with carrier frequency).
b) Communication technology if IHD is supported (with carrier frequency).
c) Symbol of load switch.

6.8.2 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6.9 Climatic Condition

The requirements given in **8** of IS 13779 shall apply.

6.10 Electrical Requirements

6.10.1 *Power Consumption*

The measurement of power consumption in the voltage and current circuits shall be determined as described in the followings.

6.10.1.1 *Voltage circuits*

The active and apparent power consumptions of a direct-connected composite Smart Meter for each circuit at reference voltage, reference temperature, and reference frequency shall not exceed 5.0 W and 15 VA during the idle mode of communication module. This applies to either one NAN or one WAN module present in the Smart Meter. If a separate module for servicing to IHD is present, the above figures shall not exceed 6W and 18VA during the idle mode of communication module.

The additional power requirement during data

transmission shall not exceed 7W per communication module. In the case of plug in communication modules, the Smart Meter shall be capable of sourcing 7W for powering the plug in communication module during data transmission.

6.10.1.2 *Current Circuit*

The apparent power taken by each current circuit of a direct connected payment meter at maximum current, reference frequency and reference temperature shall not exceed a maximum of 4 VA.

6.10.2 *Influence of Supply Voltage*

The requirements given in **4.4.2** of IS 15884 shall apply.

6.10.3 *Influence of Short —Time Overcurrents*

The requirements given in **4.4.3** of IS 15884 shall apply.

6.10.4 *Influence of Self-Heating*

The requirements given in **4.4.4** of IS 15884 shall apply.

6.10.5 *Influence of Heating*

The requirements given in **4.4.5** of IS 15884 shall apply.

6.10.6 *Insulation Requirements*

The requirements given in **9.5** of IS 13779 shall apply.

6.10.7 *Immunity to Earth Fault*

The requirements given in **9.6** of IS 13779 shall apply.

6.11 Electromagnetic Compatibility

The requirements given in **4.5** and **5.5** of IS 15884 shall apply.

6.12 Accuracy Requirements

The requirements given in **11, 11.1, 11.2, 11.3, 11.4, 11.5, 11.6** and **11.7** of IS 13779 shall apply.

6.13 Test and Test Conditions

Given in **10** of this standard.

7 LOAD SWITCH REQUIREMENT

7.1 Load Switching Capability

The smart meter shall be provided with switching elements, integral with the meter enclosure, to control the flow of electricity to the load at the instance of connect/disconnect commands as per functional needs of the system. For Single Phase Smart Meter, two load switches one each in phase and neutral shall be provided. For Three Phase Smart Meters load switches one in each phase shall be provided. The switches are to be rated to carry maximum current continuously under normal operating conditions and to withstand the switching transients during make and break operations.

7.2 Performance Requirements for Load Switching

The requirements given in **4.6.6.2** of IS 15884 shall apply.

8 DATA EXCHANGE PROTOCOL

The requirements as per IS 15959 (Part 1) shall apply. The data exchange protocol chosen for Smart Meter shall be as per IS 15959 (Part 2) including specific requirements for Smart Meters for the application layer. This application layer protocol which is primarily DLMS/COSEM shall work through the other layers as given in **9**.

9 COMMUNICATION REQUIREMENT

The NAN, WAN and IHD communication modules that are shown in Fig. 1 and Fig. 2 are for establishing connectivity with Smart Meter by the external entities such as DCU and HES respectively and optionally with IHD. These are either wired or wireless communication technology, the choice of technology shall be chosen by the buyer based on the technical feasibility best suited for a given geographical area. The communication module(s) may be of PLC or RF for NAN and cellular technologies or OFC technology for WAN.

9.1 Connectivity Technologies

9.1.1 The connectivity C1, C2 and C3 in variant 1 (Fig. 1) and variant 2 (Fig. 2) are generally designed with wired or wireless technology for the physical medium. For connectivity C1 and C2 if PLC (wired) technology is chosen the standards may be any one of those given in **2**. For connectivity C1 and C2 if RF (wireless) technology is chosen the standard may be as per IS 15959 (Part 2).

9.1.2 Wherever PLC technology is used the "AC line connection for coupling/decoupling shall be from within for both plug-in/built in type smart meter".

9.1.3 The technology for WAN may be any of the cellular technologies supporting: 2G/3G/4G or an optical fiber communications network complying to IPv6.

9.1.4 The standards cited in **9.1.1** are indicative and non-exhaustive. Other suitable standards from ITU/ IEC/IEEE/CEN/CENELEC/ETSI may be considered for NAN and WAN as per agreement between the supplier and the purchaser.

9.2 RF Technology Requirements

The RF technology if used for NAN/IHD communication modules shall be in the frequency bands notified by Government of India.

Wireless technologies need to comply with the Indian statutory bodies that govern communication related aspects such as WPC (Wireless Planning Co-ordination wing) which oversees licensing and management of all wireless spectrums in India. Equipment Type Approval (ETA) is to be obtained for communication modules as per Department of Telecom, Government of India requirements.

Radio emission characteristics for the chosen band shall comply with latest NFAP and the G.S.R (General Statutory Rules) notifications from Department of Telecom, Government of India.

9.3 Communication Layer Protocol

9.3.1 The smart meter may use a layered Communication protocol stack. The top four layers of such a stack shall be as mentioned below:

Application	IS 15959 (Part 1) and IS 15959 (Part 2)
Transport	TCP/UDP
Network	IPv6 RPL
Adaptation	6LoWPAN RFC (6282)

9.3.2 For Connectivity C1 and C2 the network protocol shall be IPv6 RPL and 6Low PAN [RFC 6282] for convergence/adoption layer. For Connectivity C3 the network protocol shall be IPv6 RPL and IETF RFC 2464, 5072 and 5121, PPP (IETF RFC 1661).

9.3.3 The other layers may be as per **9.1**.

10 TESTS AND TEST CONDITIONS

The smart meter both built-in and pluggable types as a composite unit shall be subjected to specified tests for meteorology, for load switching capability, for data exchange protocol and for smart meter communicability.

10.1 Test for Metrology

The tests for metrology shall include the "Type Tests, Routine Tests, and Acceptance Tests" identified in IS 13779. The schedule and recommended sequence of type tests shall be as given below in Table 1. In Table 1, the sequence of tests mentioned is as that of Table 20 in IS 13779. The clause numbers in Table 1 against the name of the tests are the numbers of this standard.

10.2 Number of Samples and Criteria for Conformity

The requirements given in **12** of IS 13779 shall apply.

Table 1 Schedule of Type Tests

(*Clause* **10.1**)

Sl No.	Test	Ref. to Clause of this Standard
(1)	(2)	(3)
i)	**Test of Insulation Properties**	**6.10.6**
	Impulse voltage test	
	ac High voltage test	
	Insulation resistance test	
ii)	**Test of Accuracy Requirements**	**6.12**
	Test on limits of error	
	Interpretation of test results	
	Test of meter constant	
	Test of starting condition	
	Test of no-load condition	
	Test of ambient temperature influence	
	Test of repeatability of error	
	Test of influence quantities	
iii)	**Test of Electrical Requirement**	**6.10**
	Test of power consumption test	**6.10.1**
	Test of influence of supply voltage	**6.10.2**
	Test of influence short-time over currents	**6.10.3**
	Test of influence of self-heating	**6.10.4**
	Test of influence of heating	**6.10.5**
	Test of influence of immunity to earth fault	**6.10.7**
iv)	**Test for Electromagnetic Compatibility**	**6.11**
	Radio interference measurement	
	Fast transient burst test	
	Test of immunity to electrostatic discharges	
	Test of immunity to electromagnetic HF field	
	Surge Immunity Test	
v)	**Test for Climatic Influences**	**6.9**
	Dry heat test	
	Cold test	
	Damp heat cyclic test	
vi)	**Test for Mechanical Requirements**	**6.5**
	Vibration test	
	Shock test	
	Spring hammer test	
	Protection against penetration of dust and water	
	Test of resistance to heat and fire	

NOTES

1 Following tests shall be carried out to assess for smart meter functional condition after the "Type test and acceptance test" for metrology is carried out but before 'test of resistance to heat and fire'.

a) Accuracy of the meter at pre-defined points [5 percent I_b, I_b and I_{max}] UPF.

b) Access and data read test.

c) Remote disconnect/connect

2 For procedure to conduct functional tests [(b), (c) of note 1] reference may be made to IS 15959 (Part 2).

10.3 Display

Minimum 6+1 digits LCD display. For testing purpose, high resolution display having at least 3 decimal digits shall be provided.

10.4 Test for Load Switch

The requirements as per **4.6.6.2** of IS 15884 shall apply. This test shall be tested on a separate sample.

10.5 Test for Data Exchange Protocol

This test shall be carried out on optical port and the tests shall be performed as per IS 15959 (Part 1) and IS 15959 (Part 2) for conformity.

10.6 Tests for Smart Meter Communicability

10.6.1 The modules for WAN/NAN/IHD shall be approved by designated agency authorized by DoT and shall have ETA as mentioned in **9.2**.

10.6.2 *Test for Smart Meter Communicability*

This standard provides for use of suitable communication technologies in the design of smart meters. However to assess the communication capability a few tests including a test for end to end communication capability are identified and included in IS 15959 (Part 1) . These tests are meant for carrying out using Connectivity C1, C2 and C3.

11 SMART METER FUNCTIONAL REQUIREMENTS

The Smart Meter developed as per this standard is required to support handling of following operational requirements:

11.1 Disconnection Mechanism

The Smart Meter shall support disconnection (all the switches shall operate) under the following conditions:

a) Over current (minimum 105% of I_{max} in any phase for predefined persistence time),
b) Load control limit (programmable and set by utility),
c) Pre-programmed event conditions (factory set),
d) Disconnect signal from utility control centre, and
e) In case of pre-paid facility under defined/ agreed conditions.

NOTES

1 Persistence time value to be provided by utility.

2 List of events for disconnection to be pre-programmed shall be provided by utility.

11.2 Reconnection Mechanism

The local reconnection due to disconnection under over current and load control limit shall be as follows:

a) The switch re-connection shall be decided by meter locally. It will try to re-connect the load up to predefined time, with predefined interval (time and interval is programmable by utility). If the consumption is within limits meter shall remain in normal connect mode,
b) If the consumption is still more than the programmed limits, it will lock out and wait for 30 min (lock out period). After this period the meter shall reconnect the load and if the consumption is still above the limit, the procedure as defined above in (a) shall be repeated with status update to HES, and
c) In all conditions other than 'Over current and load control limit' reconnection shall normally be done from HES. In case of failure of communication with HES, reconnection shall be possible through optical port locally with specified security.

11.3 Reconnection Mechanism for Prepayment Meter

As per agreed prepayment structure with utility.

11.4 Status of Load Switch

Indication of status of load switch (that is connected/ disconnected) shall be available on display as well as at HES.

11.5 All connections and disconnections shall also be logged as events**.**

11.6 Smart Meters shall respond to:

a) Meter readings on demand from HES,
b) Scheduled meter reading from HES,
c) Remote Firmware upgrade from HES, and
d) All programming requests from HES.

11.7 Smart Meter shall detect 'First breath (power on) and Last gasp (power off)' condition and communicate to HES.

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: ETD 13 (6823).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi