

(see Fig.1) and variant 2 (see 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 shall be any one of those given in Fig. 2. For connectivity C1 and C2, if RF (wireless) technology is chosen the standard may be as per IS 15959 (Part 2).

8.1.2 Wherever, PLC technology is used the 'AC line connection for coupling/decoupling shall be from within for smart meter with plug-in/built in type smart meter'.

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

8.1.4 The standards cited in 8.1.1 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.

8.2 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.

8.3 Communication Layer Protocol

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)

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

NOTE — For network and adaptation layers, the connectivity option is valid only for C1 and C2 not for C3, mentioned in Fig. 1 and Fig. 2.

8.3.2 The other layers may be as per 8.1.

9 TESTS AND TEST CONDITIONS

The smart meter with plug-in/built in communication modules as a composite unit shall be subjected to specified tests for metrology, for data exchange protocol and for smart meter communicability.

9.1 Test for Metrology

The tests for metrology shall include 'Type Tests', 'Routine Tests' and 'Acceptance Tests', as identified in IS 14697. 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 16 in IS 14697. The clause numbers in Table 1 against the name of the tests are the numbers of this standard.

9.2 Number of Samples and Criteria for Conformity

Type tests shall be applied to three test specimens. In the event of one specimen failing to comply in any respect, further three specimens shall be taken, all of which shall comply with the requirement of standards. Additional one sample for test for data exchange protocol shall be submitted.

The requirement given in 12 of IS 14697 shall apply

NOTE — Smart meter is to be submitted along with communication module in its place as integral part of the meter.

9.3 Display

Minimum 7 digits LCD display. For testing purpose, high resolution display having at least 3 decimal digits shall be provided.

9.4 Test for Data Exchange Protocol

This test shall be carried out on optical port as per IS 15959 (Part 3) Table 27 (List of tests Category D3 Transformer operated three phase a.c. static watthour smart meters for HV/LV consumer application) and 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). The test shall be performed on a separate sample.

9.5 Tests for Smart Meter Communicability

9.5.1 The modules for WAN/NAN/IHD shall be approved by designated agency authorized by DoT and shall have ETA as mentioned in 8.2.

Table 1 Schedule of Type Tests
(Clause 9.1)

Sl No. (1)	Test (2)	Ref to, Clause of this Standard (3)
i)	Test of Insulation Properties Impulse voltage test a.c. High voltage test Insulation resistance test	6.10.6
ii)	Test of Accuracy Requirements 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	6.12
iii)	Test of Electrical Requirement Test of power consumption test Test of influence of supply voltage Test of influence short-time over currents Test of influence of self-heating Test of influence of heating Test of influence of immunity to earth fault	6.10 6.10.1 6.10.2 6.10.3 6.10.4 6.10.5 6.10.7
iv)	Test for Electromagnetic Compatibility Radio interference measurement Fast transient burst test Test of immunity to electrostatic discharges Test of immunity to electromagnetic HF field Surge Immunity Test (as per Clause 7.2.6 of IEC62052-11)	6.11
v)	Test for Climatic Influences Dry heat test Cold test Damp heat cyclic test	6.9
vi)	Test for Mechanical Requirements Vibration test Shock test Spring hammer test Protection against penetration of dust and water Test of resistance to heat and fire	6.5

NOTE: Following tests shall be carried out to assess for smart meter functional condition and functionality of communication module after the 'Type test and acceptance test' for metrology is carried out but before 'Test of resistance to heat and fire':

- Accuracy of the meter at pre-defined points [5 percent I_b , I_n and I_{max}] U.P.F.
- Manufacturer shall demonstrate the functionality of communication module by data read test, that is reading kWh energy register through the communication module.

9.5.2 Test for Smart Meter Communicability

Test for Smart meter communicability shall be carried out as per the provisions of 28 of IS 15959 (Part 3).

NOTE — This note is optional test to be mutually decided between the buyer and the seller.

10 SMART METER FUNCTIONAL REQUIREMENTS

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

10.1 Smart meters shall respond to the following:

- Meter readings on demand from HES,
- Scheduled meter reading from HES,
- Remote Firmware upgrade from HES, and
- All programming requests from HES.

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

technical aspects taking into consideration the features and provisions of this standard for deployment of AMI. The requirements of other components chosen shall be finalized between buyer and seller.

A separate standard covering requirements for data exchange specific to smart meter has been formulated and released. Therefore IS 15959 : 2011 has been revised as follows:

IS 15959	Data exchange for electricity meter reading, tariff and load control — Companion specification:
(Part 1) : 2011	Static energy meter
(Part 2) : 2015	Smart meter
(Part 3) : 2017	Smart meter (Transformer operated kWh and kvarh, Class 0.2S, 0.5S and 1.0S) <i>under print</i>

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.

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