



PRODUCT MANUAL FOR
a.c. STATIC DIRECT CONNECTED WATTHOUR SMART METER -
CLASS 1 AND CLASS 2
ACCORDING TO IS 16444 (PART 1):2015

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	Product	:	IS 16444 (PART 1):2015
	Title	:	a.c. STATIC DIRECT CONNECTED WATTHOUR SMART METER - CLASS 1 AND CLASS 2
	No. of Amendments	:	2
2.	Sampling Guidelines:		
a)	Raw material	:	-----
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	Three meters
3.	List of Test Equipment	:	Please refer ANNEX – B
4.	Scheme of Inspection and Testing	:	Please refer ANNEX – C
5.	Possible tests in a day:	:	Please refer ANNEX – D
6.	Scope of the Licence:		
	Licence is granted to use Standard Mark as per IS 16444(Part 1):2015 with the following scope:		
	ac Static Direct connected Watthour smart meters, Class 1/ 2, Single phase / Three phase, Type designation, Voltage.....V, Basic current (I _b), Maximum current (I _{max}), Frequency, Communication Module WAN / NAN, Electro-mechanical register/Electronic display, Load Switching Utilization Category UC1 / UC2 / UC3		

ANNEX A

Grouping Guidelines

1. Samples of each variety of meters shall be tested considering the following:
 - i. Accuracy Class – 1, 2
 - ii. Category – Single Phase, Three Phase
 - iii. Type of display- Electro-mechanical register, Electronic display
 - iv. Communication Module – NAN, WAN
 - v. Load Switching Utilization Category – UC1, UC2, UC3
2. The following relaxation may be given when a variety is tested for all the requirements:
 - i. Same basic current (I_b) and different current ratio (I_{max}/I_b) – One sample of maximum current ratio (I_{max}/I_b) out of the range offered be subjected to all tests.
 - ii. Different basic current (I_b) but same (I_{max}/I_b) – One sample with highest (I_b) be subjected to all tests.
 - iii. Different basic current (I_b) and different (I_{max}/I_b) – One sample with lowest (I_b) and lowest (I_{max}/I_b) and another sample with highest (I_b) and highest (I_{max}/I_b) be subjected to all tests.
 - iv. For CSoL – If same (I_b) with different (I_{max}/I_b) is to be included in the licence, the varieties offered be subjected to tests applicable at I_{max} only.
3. If the licence covers only ‘Electro mechanical register’ and CSoL of ‘Electronic display’ is to be considered, samples of Smart Meter with ‘Electronic display’ from any one variety already covered in the license or any new variety intended to be covered in the license be subjected to all tests or vice-versa.
4. In case of electronic display, manufacturer’s certificate shall be obtained for compliance to the requirement of Clause 6.6 of IS 16444(Part 1):2015.
5. With respect to a given module of communication (WAN/NAN), the following tests needs to be done while processing GoL/CSoL:
 - Power Consumption as per Cl. 6.10.1 of IS 16444 (Part 1):2015
 - Test of Immunity to electromagnetic HF Fields as per Cl. 5.5.3 of IS 15884:2010
 - Test of Immunity to Electrostatic Discharges as per Cl. 5.5.2 of IS 15884:2010
 - Test of Radio Interference measurement as per Cl. 5.5.5 of IS 15884:2010
 - Test of Limits of Error due to variation of the current as per Cl. 11.1 of IS 13779:1999
 - Tests listed in Note 1 (b) & 1 (c) of Table 1 of IS 16444 (Part 1):2015
 - RF Technology requirements as per Cl. 9.2 of IS 16444 (Part 1):2015
6. The Firm shall declare the varieties of ac static direct connected wathour smart meters they intend to cover in the Licence. One set of drawings representing each of these varieties be sealed and kept in the factory for reference whenever required. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
7. During the operation of the Licence, BO shall ensure that all the Varieties covered in the Licence are tested in rotation to the extent possible.

ANNEX B**List of Test Equipment*****Major test equipment required to test as per the Indian Standard***

Sl.No.	Test Equipment	Tests used in with Clause Reference
1	Vernier Caliper, Micrometer	General Constructional requirements & Clearance and creepage distances Cl. 6.2 & 6.3
2	a.c. High Voltage Tester	Insulation requirements Cl.6.10.6
	Impulse Voltage Tester	
3	Insulation Tester	
4	Test bench load with phantom system, Reference Standard Meter	Accuracy requirements Cl.6.12
5	Power Meter	Power Consumption Cl.6.10.1
6	Voltage Dips and Interruption Tester	Influence of supply voltage Cl.6.10.2
7	Short time overcurrent tester	Influence of Short-time overcurrents Cl.6.10.3
8	Digital Temperature Measurement Equipment	Influence of Self-heating and heating Cl.6.10.4 & Cl.6.10.5
9	Dust test equipment, Rain Fall Test Equipment	Mechanical requirements Cl.6.5
10	Shock Test Device	
11	Vibration Test Device	
12	Spring Hammer Test Device	
13	Glow Wire Test Apparatus	Resistance to heat & Fire Cl. 6.8
14	ESD generator and test setup	Electromagnetic compatibility Cl.6.11
15	Head End System (HES) and DCU (if applicable)	Cl.10.5, Cl.10.6 and Cl.11

The above list is indicative only and may not be treated as exhaustive.

ANNEX C

Scheme of Inspection and Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipment.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING – As per the requirements of IS 16444 (PART 1):2015

4. CONTROL UNIT – All the Smart Meters of the same design manufactured in a day shall constitute a control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of [Table 1](#) and the levels of control in column 3 of [Table 1](#), shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

6. REJECTIONS – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
6.1,6.2	Metering requirement/ General Constructional requirement	4, 5.1 to 5.4, 6.1, 6.2, 6.3	IS 13779	R	Each smart meter	In case of failure of any smart meter, cause of failure shall be identified and corrective action shall be taken to remove the non-conformity.	
6.10.6	Insulating Properties (ac High Voltage test)	12.7.6.1, 12.7.6.3	IS 13779	R			
	Insulation Properties (Insulation resistance)	12.7.6.1, 12.7.6.4	IS 13779	R			
6.12	Accuracy requirement (Limit of Error due to variation of current)	11.1	IS 13779	R			
	Accuracy requirement (Starting Condition)	11.5	IS 13779	R			
	Accuracy requirement (No Load condition)	11.4	IS 13779	R			

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
6.10.1	Electrical requirement (Power consumption)	6.10.1	IS 16444 (Part 1)	R	As per Cl. 10.2 of IS 16444 (Part 1)	Once in six months for each type, communication module and rating	In the case of failure of any sample, double the number of samples shall be taken for testing and no failure in those samples shall be permitted. Otherwise the control unit shall be rejected. After corrective actions two consecutive control units shall be tested as per the samples indicated in the table and then original frequency shall be restored if both the samples pass. For Cl. 6.6 non-volatile memory supplier's test certificate may also be accepted.
6.10.2	Electrical requirement (Influence of supply voltage)	4.4.2	IS 15884	S			
6.10.3	Electrical requirement (Short time over current)	4.4.3	IS 15884	S			
6.10.4	Electrical requirement (Influence of self-heating)	4.4.4	IS 15884	S			
6.10.5	Electrical requirement (Influence of heating)	4.4.5	IS 15884	S			
6.12	Accuracy requirement (Meter Constant)	11.6	IS 13779	R		Once in six months for each type and rating	
	Accuracy requirement (Repeatability of Error)	11.7	IS 13779	S			

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
6.3	Clearance & Creepage distances	6.6	IS 13779	S	As per Cl. 10.2 of IS 16444 (Part 1)	Once in six months for each type and rating	In case of failure of any smart meter, cause of failure shall be identified and corrective action shall be taken to remove the non-conformity.
6.6	Display of values	6.6	IS 16444 (Part 1)	R			
		6.10	IS 13779	R			
6.7	Output Device	6.11	IS 13779	R			
10.3	Display	10.3	IS 16444 (Part 1)	R			
9.2	R F Technology Requirements	9.2	IS 16444 (Part 1)	S	—	Whenever there is a change in Model/supplier of RF Module	In case of unavailability of in house test facility, the same shall be got tested from BIS recognized OSL for ascertaining the conformity. Alternatively, Test Certificate of supplier may also be accepted.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
7, 10.4	Test of Load Switch	4.6.6.2	IS 15884	S	One for UCI, as per G-9 of IS 15884 for UC2 and UC3	Once in a year for each rating and load switching Utilization Category	In the case of failure of any sample, double the number of samples shall be taken for testing and no failure in those samples shall be permitted. Otherwise the control unit shall be rejected. After corrective actions two consecutive control units shall be tested as per the samples indicated in the table and then original frequency shall be restored if both the samples pass.
8, 10.5	Data Exchange Protocol	—	IS 15959 (Part 1) IS 15959 (Part 2)	S	One	Once in two years from BIS recognized Laboratory for Each category as per Cl. 11 of IS 15959 (Part 2)	
9, 10.6	Test of smart meter communicability	9, 10.6	IS 16444 (Part 1)	S	One	Once in a year for Each category as per Cl.11 of IS 15959 (Part 2) and variant as per IS 16444 (Part 1)	
11	Functional Requirement	11	IS 16444 (Part 1)	S	One		

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
6.10.7	Electrical requirement (Immunity to earth fault)	9.6	IS 13779	S	As per Cl. 10.2 of IS 16444 (Part 1)	Once in a year for each type and rating	In the case of failure of any sample, double the number of samples shall be taken for testing and no failure in those samples shall be permitted. Otherwise the control unit shall be rejected. After corrective actions two consecutive control units shall be tested as per the samples indicated in the table and then original frequency shall be restored if both the samples pass.
6.11	Electromagnetic Compatibility	4.5, 5.5	IS 15884	S			
6.12	Accuracy requirement (Limits of error due to influence quantities)	11.2	IS 13779	R			
6.12	Accuracy requirement (Ambient temperature influence)	11.3	IS 13779	R			
6.5	Mechanical Requirements (Shock Test)	12.3.1	IS 13779	S			
	Mechanical Requirements (Vibration Test)	12.3.2	IS 13779	S			
	Mechanical Requirements (Spring Hammer Test)	12.3.3	IS 13779	S			
	Mechanical Requirements (Protection against penetration of dust & water)	6.9, 12.5	IS 13779	S			
6.9	Test for Climatic Influence	8, 12.6	IS 13779	S			
6.10.6	Insulation Properties (Impulse Voltage Test)	9.5	IS 13779	S			

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
6.2.1, 6.2.2	Terminal Blocks and Terminal Cover	6.4, 6.5, 6.5.1, 6.5.2 & 6.7	IS 13779	S	As per Cl. 10.2 of IS 16444 (Part 1)	Every consignment of insulating material received	Test certificate from manufacturer may be accepted. In case of failure, such lot of consignment shall be rejected.
6.4	Mechanical Requirements (Resistance to heat and fire)	6.8	IS 13779	S			

Note-1: Wherever IS 15884 is referred, requirements of IS 15884 w.r.t prepayment functions are applicable only in case of meters with prepayment functions implemented in the meter (Standalone Prepayment Meter)

Note-2: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-3: Levels of control given in column 3 are obligatory in nature.

Note-4: For varieties covered in the scope of License, samples manufactured solely for the purpose of technical qualification which are of non-commercial value and are not going for installation may be kept out of the purview of periodic type testing subject to proper supporting documents with the licensee.

ANNEX D

Possible Tests in a day

1. General and Constructional Requirements (Cl.6.1, CL.6.2)
2. a.c. High Voltage Test (Cl.6.10.6)
3. Insulation Test (Cl.6.10.6)
4. Accuracy Requirements (Limits of Error) (Cl.6.12)
5. Test of starting condition (Cl.6.12)
6. Test of no-load condition (Cl.6.12)
7. Power Consumption (Cl.6.10.1)
8. Display (Cl.10.3)
8. Smart Meter Functional requirements (Cl.11)