



PRODUCT MANUAL FOR
a.c. STATIC DIRECT CONNECTED WATTHOUR SMART METER –
CLASS 1 AND CLASS 2
IS 16444 (Part 1):2015

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो) अनुरूपता मूल्यांकन (विनियम, 2018 की योजना -I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity 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.

1.	मानक संख्या IS No.	:	IS 16444 (Part 1):2015
	शीर्षक Title	:	a.c. Static Direct Connected Watthour Smart Meter – Class 1 And Class 2
	संशोधनों की संख्या No. of amendments	:	3
2.	नमूना दिशानिर्देश Sampling Guidelines		
a)	कच्चा माल Raw material	:	---
b)	समूहीकरण दिशानिर्देश Grouping Guidelines	:	Please refer ANNEX – A
c)	नमूने का परिमाण Sample Quantity	:	3 No.
d)	परीक्षण अनुरोध में घोषित किए जाने वाले पैरामीटर Parameters to be Declared in Test Request	:	As per Scope of Licence defined in Sl. No. 6 of PM below
3.	परीक्षण उपकरणों की सूची List of Test Equipment	:	Please refer ANNEX – B
4.	निरीक्षण और परीक्षण की स्कीम Scheme of Inspection and Testing	:	Please refer ANNEX – C
5.	एक दिन में संभावित परीक्षण Possible tests in a day	:	1. Metering and Constructional Requirements (Cl.6.1, Cl.6.2) 2. Insulation requirements (Cl.6.10.6) a) ac High voltage test b) Insulation resistance test

			3. Accuracy Requirements (Cl.6.12) a) Test of starting condition b) Test of no-load condition 4. Electrical requirements (Cl. 6.10) a) Power Consumption (Cl.6.10.1) 5. Display (Cl.10.3) 8. Smart Meter Functional requirements (Cl.11)
6.	लाइसेंस का दायरा /Scope of the Licence:		
“License is granted to use Standard Mark as per IS 16444(Part 1):2015 with the following scope:			
	Name of the product	ac Static Direct connected Watthour smart meters	
	Accuracy Class	Class 1 (or/and) Class 2	
	Type	Single phase / Three phase, Type designation, Voltage.....V, ...Hz	
	Current rating	Basic current (I _b), Maximum current (I _{max})	
	Communication Module	WAN / NAN	
	Network Protocol	IPv6 (RPL or other routing protocols complying to standards from ITU/IEC/ IEEE/CEN/CENELEC/ ETSI/IETF)	
	Display type	Electro-mechanical register/ Electronic display	
	Load Switching Utilization Category	UC1 / UC2 / UC3	

ANNEX A

Grouping Guidelines

1. a.c. Static Direct Connected Watthour Smart Meter are classified based on the following parameters:
 - i. Accuracy Class – Class 1, Class 2
 - ii. Category – Single Phase, Three Phase
 - iii. Type of display- Electro-mechanical register, Electronic display
 - iv. Communication Module – NAN, WAN
 - v. Network Protocol – IPv6 RPL or other routing protocols complying to standards from ITU/IEC/ IEEE/CEN/CENELEC/ ETSI/IETF
 - vi. Load Switching Utilization Category – UC1, UC2, UC3
2. For considering GoL / CSoL, samples of each variety of Smart meters shall be tested. However, 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 watthour 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**

Test equipment required to cover the entire test defined in the IS 302-2-7:2024 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

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

ANNEX C

Scheme of Inspection and Testing

1. QUALITY ASSURANCE PLAN

1.1 It is expected that manufacturers (licensees/applicants) will implement a Quality Control Assurance Plan i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Control system defining the control unit (i.e. lot/batch etc.) and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is: *Smart Meters of the same design (i.e. Accuracy class, Category, display type and Load Switching Category)* manufactured in a day shall constitute a control unit.

1.3.2 As mentioned above, recommended levels of control are given in **Table 1 for guidance only**.

1.3.3 The tests as indicated in Table 1 and at the levels of control in column 3 of Table 1 or the Quality Assurance Plan as submitted by the manufacturer to BIS may be carried out on the whole production of the factory which is covered by this plan and records maintained in accordance with para 2.5.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING- It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer and testing parameters/requirements which can only be performed in the factory.

2.1 For the guidance of manufacturers, Table 1 giving the recommended levels of control is given below. Column 2 of Table 1 indicates where test equipment is required in house i.e. “R” or whether it can be subcontracted as “S”. Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

2.2 For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility is optional.

2.2.1 MSME manufacturers may utilize common cluster based facilities as per guidelines for the utilization of cluster based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 Large Scale manufacturers (including foreign manufacturers) shall maintain an in-house laboratory, which shall be suitably equipped (as given in column 2 of Table 1) and staffed, where different tests given in

the specification shall be carried out in accordance with the method given in the specification. They shall also implement a calibration plan for the test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, these manufacturers can also utilize the provisions of Sharing of testing facilities as per the Annexure-X (Relaxation in test facilities) of the guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process)

2.4 TEST RECORDS- The manufacturers maintaining an in-house laboratory or utilizing common cluster based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empanelled laboratory or any other laboratory having valid accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. PACKING AND MARKING - The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on each a.c. Static Direct Connected Watthour Smart Meter provided always that the Smart meters so marked conforms to each requirement of the specification.

3.1 Packing and Marking shall be done as per marked as per Cl. 6.8 of IS 16444 (Part 1):2015.

3.2 Additional Marking requirements: The material shall also be marked with the following additional requirement on each product and packaging:

(i) “For BIS certification details please visit www.bis.gov.in”

3.3 All the production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark.

4. HYGIENIC CONDITIONS (if applicable) – NA.

5. REJECTION - 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	Metering requirement /	4, 5.1 to 5.4	IS 13779	R	Each smart meter		
6.2	General Constructional requirement	6.1 to 6.4					
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			
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 a month for each type, communication module and rating	
6.10.2	Electrical requirement (Influence of supply voltage)	4.4.2	IS 15884	S	As per Cl. 10.2 of IS 16444 (Part 1)	Once in six months for each type and rating	
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	Each smart meter		
6.12	Accuracy requirement (Repeatability of Error)	11.7	IS 13779	S	As per Cl. 10.2 of IS 16444 (Part 1)	Once in a month for each type and rating	
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	
6.6	Display of values	6.6	IS 16444 (Part 1)	R	One	Each Control Unit	
		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		
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 UC	
8 10.5	Data Exchange		IS 15959 (Part 1) IS 15959 (Part 2)	S	One	Once in every two years from BIS recognized Lab 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		

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	
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	S			
6.12	Accuracy requirement (Ambient temperature influence)	11.3	IS 13779	S	As per Cl. 10.2 of IS 16444 (Part 1)	Once in a year for each type and rating	
6.5	Mechanical Requirements (Shock Test)	12.3.1	IS 13779	S			
	Mechanical Requirements (Vibration Test)	12.3.2	IS 13779				
	Mechanical Requirements (Spring Hammer Test)	12.3.3	IS 13779				
	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			
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		Every consignment of insulating material received	
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).