



उत्पाद मैनुअल
ए सी स्थैतिक सीधा जुड़ा वाटआवर स्मार्ट मीटर वर्ग १ एवं २ - विशिष्ट
आईएस 16444 (Part 1): 2015 के अनुसार

PRODUCT MANUAL
a.c. Static Direct Connected Watthour Smart Meter Class 1 and 2
according to IS 16444 (Part 1): 2015

यह उत्पाद नियमावली सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसधारियों द्वारा विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम, 2018 की योजना-1 के अंतर्गत प्रमाणन के संचालन में एकरूपता और पारदर्शिता सुनिश्चित करने के लिए संदर्भ सामग्री के रूप में उपयोग की जाएगी। बीआईएस प्रमाणन प्राप्त करने के इच्छुक भावी आवेदक भी इस दस्तावेज़ का उपयोग कर सकते हैं।

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 2
	संशोधनों की संख्या No. of amendments	:	4
2.	नमूनाकरण दिशानिर्देश / Sampling Guidelines		
	a) कच्चा माल Raw material	:	Nil <i>Note: This section indicates the requirements for raw material (if specified in the IS) for which compliance is to be established during Grant of Licence/Change in Scope of Licence/Factory Surveillance.</i>
	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	:	Parameters as given in scope of licence <i>Note: Apart from the above, any other requirements/ parameters may also be declared as per the standard, as applicable.</i>
3.	परीक्षण उपकरण की सूची List of Test Equipment	:	Please refer ANNEX – B

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4.	निरीक्षण एवं परीक्षण योजना 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) Note: This section is for the guidance of BIS Certification Officers/ Technical Auditors of BIS Authorized Outside Surveillance Agencies(OSAs) during factory inspection to provide ready reference regarding the tests which can be witnessed during the inspection in the factory by the officer/ auditor.
6.	लाइसेंस का दायरा /Scope of the Licence:		
“Licence 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 Designation		(as per cl.3.1.4 of IS 13779: 2020)	
Rating		Voltage.....V, ...Hz, Single phase / Three phase	
Current rating		Basic current (Ib), Maximum current (Imax)	
Display type		Electro-mechanical register/ Electronic display	
Load Switching Utilization Category		UC1 / UC2 / UC3	
Communication module:			
Type		Built-in/ Plug-in/ Plug-in (CPCM)	
Module Type (for CPCM)			
Communication Technology		WAN (2G/3G/4G/ an optical fiber communications (OFC) network complying to IPv6) or NAN (PLC/ RF)	

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. Load Switching Utilization Category: UC1, UC2, UC3
 - v. Communication Module type: Built-in/ Plug-in/ Plug-in (CPCM)
 - vi. Communication Technology: WAN (2G/3G/4G/ an optical fiber communications (OFC) network complying to IPv6) or NAN (PLC/ RF)
2. For considering Grant of Licence (GoL) / Change in Scope of Licence (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. The following tests may be carried out for consideration of GoL/CSoL in cases involving a change in the communication module (other than CPCM) in a smart meter already covered in scope of the licence.
 - a) Power Consumption as per Cl. 6.10.1 of IS 16444 (Part 1):2015
 - b) Test of Immunity to electromagnetic HF Fields as per Cl. 5.5.3 of IS 15884:2024
 - c) Test of Immunity to Electrostatic Discharges as per Cl. 5.5.2 of IS 15884:2024
 - d) Test of Radio Interference measurement as per Cl. 5.5.5 of IS 15884:2024
 - e) Test of Limits of Error due to variation of the current as per Cl. 11.1 of IS 13779:2020
 - f) Tests listed in Note 1 (b) & 1 (c) of Table 1 of IS 16444 (Part 1):2015
 - g) RF Technology requirements as per Cl. 9.2 of IS 16444 (Part 1):2015, if applicable
4. Compliance to Annex-A of IS 16444 (Part 1): 2015 may be ensured to cover Common Pluggable Communication Module (CPCM) in the scope of the licence.
5. 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 licence or any new variety intended to be covered in the licence be subjected to all tests or vice-versa. 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.
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 capabilities and Testing arrangements 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 Equipments
(Indicative List, For Guidance Only)

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
3	Impulse Voltage Tester	
4	Insulation Tester	
5	Test bench load with phantom system, Reference Standard Meter	Accuracy requirements Cl.6.12
6	Power Meter	Power Consumption Cl.6.10.1
7	Voltage Dips and Interruption Tester	Influence of supply voltage Cl.6.10.2
8	Short time overcurrent tester	Influence of Short-time over currents, Cl.6.10.3
9	Digital Temperature Measurement Equipment	Influence of Self-heating and heating, Cl.6.10.4 & Cl.6.10.5
10	Dust test equipment, Rain Fall Test Equipment	Mechanical requirements Cl.6.5
11	Shock Test Device	
12	Vibration Test Device	
13	Spring Hammer Test Device	
14	Glow Wire Test Apparatus	Resistance to heat & Fire, Cl. 6.4
15	ESD generator and test setup	Electromagnetic compatibility Cl.6.11
16	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. QUALITY ASSURANCE PLAN

- 1.1 It is expected that during operation of BIS licence manufacturers will implement a Quality Assurance Plan (QAP) 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 Assurance Plan (QAP) defining the control unit (i.e. lot/batch etc.), the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and declare the arrangement for testing i.e. whether in-house or sub-contracting/ sharing for each applicable test and submit the same to BIS Branch Office for information. The manufacturer shall comply with the QAP and maintain test records in accordance with para 2.1.
- 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, Communication module and Load Switching Category)* manufactured in a day shall constitute a control unit.
- 1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in Table 1. Manufacturer has the discretion of declaring their own levels of control or accept the levels of control given in this document.
- 1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan.
- 1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING

The manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard for which they may have in-house test facilities. However, there is no obligation to maintain in-house laboratory. Licensee may use alternative arrangements for tests of the production as per the declared QAP. Various alternatives are available for operation of BIS certification as given below and the relevant guidelines for availing such relaxations by the manufacturers, as amended from time to time, are to be referred:

- i) Shared testing resources like common facility,
- ii) Cluster based testing facility,
- iii) Sub-contracting to outside laboratories which may either be:
 - a) BIS recognised/ empanelled laboratories, or
 - b) Any accredited laboratory as per ISO/IEC 17025

2.1 Test Records- The manufacturers shall maintain test records for the tests carried out (either in-house or at a sub-contracted or at shared test facility) to establish conformity of the product to the Standard for operation of licence. For the tests being subcontracted or conducted at a shared test facility, test results issued by the laboratories or test facilities, shall be made 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 Cl. 6.8 of IS 16444 (Part 1):2015.

3.2 **Additional Marking requirements:** The following details shall also be marked on each product and packaging:

a) "For BIS certification details please visit www.bis.gov.in"

4. REJECTION

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

(Recommended Levels of Control by BIS- for Guidance Only)

-1				2		
Test Details				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	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			
	Insulation Properties (Insulation Resistance Test)	12.7.6.1, 12.7.6.4	IS 13779			
6.12	Accuracy requirement (Limit of Error due to variation of current)	11.1	IS 13779			
	Accuracy requirement (Starting Condition)	11.5	IS 13779			
	Accuracy requirement (No Load condition)	11.4	IS 13779			
6.10.1	Electrical requirement (Power consumption)	6.10.1	IS 16444 (Part 1)	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	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			
6.10.4	Electrical requirement (Influence of self- heating)	4.4.4	IS 15884			
6.10.5	Electrical requirement (Influence of heating)	4.4.5	IS 15884			
6.12	Accuracy requirement (Meter Constant)	11.6	IS 13779	Each smart meter		
6.12	Accuracy requirement (Repeatability of Error)	11.7	IS 13779	As per Cl. 10.2 of IS	Once in a month for each type and rating	

6.3	Clearance & Creepage distances	6.6	IS 13779	16444 (Part 1)	Once in six months for each type and rating	
6.6	Display of values	6.6	IS 16444 (Part 1)	One	Each Control Unit	
		6.10	IS 13779			
6.7	Output Device	6.11	IS 13779			
10.3	Display	10.3	IS 16444 (Part 1)			
9.2	R F Technology Requirements	9.2	IS 16444 (Part 1)	Whenever there is a change in Model/supplier of RF Module		
7, 10.4	Test of Load Switch	4.8.2	IS 15884	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)	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)	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)	One		
6.11	Electromagnetic Compatibility	4.5, 5.5	IS 15884	As per Cl. 10.2 of IS 16444 (Part 1)	Once in a year for each type and rating	
6.12	Accuracy requirement (Limits of error due to influence quantities)	11.2	IS 13779			
6.12	Accuracy requirement (Ambient temperature influence)	11.3	IS 13779			
6.5	Mechanical Requirements (Shock Test)	12.3.1	IS 13779			
	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			
6.9	Test for Climatic Influence	8, 12.6	IS 13779			
6.10.6	Insulation Properties (Impulse Voltage Test)	9.5	IS 13779			
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		Every consignment of insulating material received	
6.4	Mechanical Requirements (Resistance to heat and fire)	6.4 6.8	IS 16444 (Part 1) IS 13779			

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).