उत्पाद मैन्युअल
आई एस 16544:2016 के अनुसार समस्त ग्लास खाली नालिका सौर जल तापन प्रणाली के लिए

दस्तावेज़ संख्या – पीएम/आईएस 16544/4/जून 2025

भारतीय मानक ब्यूरो की स्कीम-I (अनुरूपता मूलयाांकन) विनियम , 2018 के तहत यह उत्पाद मैन्युअल प्रमाणीकरण के प्रचालन में रीति और पारिर्शिता की सुसंगतता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसी द्वारा संदर्भ सामग्री के रूप में उपयोग किया जाएगा। बीआईएस प्रमाणीकरण लाइसेंस/ प्रमाणपत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज़ का उपयोग किया जा सकता है ।

PRODUCT MANUAL FOR ALL GLASS EVACUATED TUBES SOLAR WATER HEATING SYSTEMACCORDING to IS 16544:2016

Document No.-PM/IS 16544/4/ June 2025

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.

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1.	**Product**	:	IS 16544: 2016
	Title	:	All Glass Evacuated Tubes Solar Water Heating System
	No. of Amendments	:	Two
2.	**Sampling Guidelines:**		
a)	**Raw material**	:	➢ All Glass Evacuated Tubes as per IS 16543 ➢ Direct insertion Storage Water Tank for all glass evacuated tubes solar collector as per IS 16542 ➢ Supporting frame/Stand- • Mild Steel as per IS 2062 with hot dip galvanized or powder coated • Galvanized sheet as per IS 277 with powder coating *(Materials as per IS 2062 and IS 277 are under mandatory BIS Certification and manufacturer shall ensure that materials used in manufacturing frame/stand shall be only ISI Marked material and received with test certificate.)*
b)	**Grouping guidelines**	:	Please refer **ANNEX –A**
c)	**Sample Size**	:	1 No. (Also refer to Cl. 2.2 of IS 16368 for specific requirement of Tank)
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**	:	External thermal shock test (cl. 6.2.4), Internal thermal shock test (Cl. 6.2.5), resistance to impact test (Cl. 6.2.7)
6.	**Scope of the Licence:**	**:**	Please refer **ANNEX –D**
	Any other product specific guidelines	**:**	Please refer **ANNEX-E**

ANNEX A

Grouping Guidelines

1. Different types (Models) of "All Glass evacuated Tubes Solar Water Heating system" as per IS 16544:2016 are to be identified based on the following parameters:

- System capacity (litres per day),
- Collector area,
- No. of Tubes,
- Outer diameter and length of tubes used,
- Material of Tank and
- Material of Tubes

2. Firm shall declare all the models of "All Glass evacuated Tubes Solar Water Heating system" that it intends to get the BIS Licence along with their system capacity (litres per day), Collector area, No. of Tubes, Outer diameter and length of tubes used, Material of Tank and Tubes. Any change in any of the above parameters has to be considered as a different model and shall be tested separately as per the guidelines given below.

3. "All Glass evacuated Tubes Solar Water Heating system" as per IS 16544:2016 are grouped as follows based on their system capacity:

Sl.No.	Group	System Capacity (lpd)
1	Group-1	50, 75 & 100
2	Group-2	150, 200, 250 & 300
3	Group-3	400 & 500

3.1 Considering the above, the following grouping guidelines for Grant of Licence/Change in Scope of Licence shall be followed:

a) "All glass evacuated Tubes Solar Water Heating system" of highest system capacity (declared by the firm) from each group, is to be tested for all requirements to include all the system capacities (declared by the firm) in that particular group, provided all other parameters of that model as mentioned above, are same.

b) In addition to sample of the highest capacity from each applicable group as above, sample of lowest capacity in the entire size range intended to be covered in scope, shall also be tested separately.

c) Separate sample of "All glass evacuated Tubes Solar Water Heating Systems" is to be tested for Systems with different materials of Tank and Tubes. Also, in case of change in outer diameter and length of tube, separate sample is to be tested.

3.2 If the firm declares models of Solar water heating systems having system capacities other than mentioned in the above table (as per Note-4 of Annexure-A), then each of those models shall be tested for considering Grant of Licence/Change in Scope of Licence.

4. 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.	Tests used in with Clause Reference	Test Equipment
1	Pre-conditioning Test, Cl. 6.1	Stop Watch, Pyranometer
2	Exterior Test, Cl. 6.2.1	Thermometer
3	Leakage Test, Cl. 6.2.2	Thermometer, Pressure Gauge, Stop Watch
4	Stagnation Test, Cl. 6.2.3	Pyranometer, Thermometer, Stop Watch, Anemometer(Device for measuring wind speed)
5	External Thermal Shock Test, Cl. 6.2.4	Pyranometer, Stop Watch, Protractor, Thermometer, Flowmeter.
6	Internal Thermal Shock Test, Cl. 6.2.5	Pyranometer, Stop Watch
7	Thermal Performance Test, Cl. 6.2.6	Setup as per fig 1 of IS 16368.
8	Resistance to Impact Test, Cl. 6.2.7	V-shaped groove, 5 mm thick polyurethane liner, steel ball with a mass of 120 ± 10 g

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 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 Assurance Plan defining the control unit i.e. Batch 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 below**.

1.3 **RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT**:

1.3.1 Control Unit: For the guidance of manufacturers in preparing the Quality Assurance Plan, the recommended definition of control unit is the Quantity of "All glass evacuated Solar water heating system" of same capacity (litres per day), manufactured under similar conditions from same consignment of rawmaterial in a fortnight.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1**.

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. Alternatively,the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

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 routine tests where test equipment is required in-house as "R" or other tests which can be sub-contracted as "S". Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.2 For MSME manufacturers, the requirement of maintaining a laboratory/in-house

testing facility for routine tests (indicated as "R" in Column 2 of Table 1) also 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 shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as "R" in Column 2 of Table 1)**, 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 in-house test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of Sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

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 NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. LABELLING AND MARKING – As per the requirement of IS 16544:2016. The Standard mark as given in the schedule of the Licence shall be incorporated legibly and indelibly on each "All glass evacuated Solar water heating system" provided always that the product thus marked conforms to all the requirement of the specification. In addition, the licence no. CM/L-_____ and details of BIS website shall be marked at an appropriate place on product or package as follows: "For details of BIS certification please visit www.bis.gov.in".

4. REJECTION - All the production which conforms to the Indian Standard and covered under scope of the licence shall be marked with 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

(1)				(2)	(3)		
Test Details				**Test equipment requirement** **R: required (or)** **S: Sub-contracting permitted**	**Levels of Control**		
Cl.	**Requirement**	**Test Method**			**No. of Sample**	**Frequency**	**Remarks**
		Clause	**Reference**				
Raw Materials							
4.1(a)	All glass evacuated tubes	**IS 16543**		**S**	One	Each consignment	No further testing is required, if accompanied with the Test Certificate or ISI Marked.
4.1(b)	Storage water tank	**IS 16542**		**S**	One	Each consignment	No further testing is required, if accompanied with the Test Certificate or ISI Marked. Also, see Annex-E of this manual
4.1(c)	Diffuse flat plate reflector	**4.4**	**IS 16544**	**S**	One	Each consignment	—---
4.1(d)	Tube resting caps	**4.5**	**IS 16544**	**S**	One	Each consignment	—---
4.1(f)	Supporting frame/stand	**4.6**	**IS 16544**	**S**	One	Each consignment	No further testing is required, if accompanied with the Test Certificate or ISI Marked.

							Materials as per IS 2062 and IS 277 are under mandatory BIS Certification and manufacturer shall ensure that materials used in manufacturing frame/stand shall be only ISI Marked material and received with test certificate
5.1	General Requirements	**5.1.1, 5.1.2, 5.1.3**	**IS 16544**	**R**	One	Each Control Unit	--
5.2	Over Temperature Protection for system	**5.2**	**IS 16544**	**R**	One	Each Control Unit	--
6.1	Pre-conditioning Test	**6.1.1&6.1.2**	**IS 16544**	**R**	One	One model (other than the models tested previously) produced in a period of 3 years. All the models produced are to be tested in rotation.	
6.2.1	Exterior Test	**Annex B**	**IS 16544**				
6.2.2	Leakage Test	**Annex C**	**IS 16544**				
6.2.3	Stagnation Test	**Annex D**	**IS 16544**	**S**	One		
6.2.4	External Thermal Shock Test	**Annex E**	**IS 16544**				
6.2.5	Internal Thermal Shock Test	**Annex F**	**IS 16544**				
6.2.6	Thermal Performance Test	**6.2.6 7**	**IS 16544 IS 16368**				
6.2.7	Resistance to Impact Test	**Annex F**	**IS 16543**				

ANNEX – D

Scope of the Licence

Licence is granted to use Standard Mark as per IS 16544:2016 with thefollowing scope:	
Name of the product	All Glass Evacuated Tubes Solar Water Heating System
Model No.	
System capacity, lpd	
Collector area, in m2	
Material of Tank	
Material of Tubes	
Outer diameter and length of evacuated tubes	

ANNEX-E

Requirement of BIS Certification for "Direct Insertion Type Storage Water Tank for All Glass Evacuated Tubes Solar Collector" as per IS 16542: 2016 for Manufacturers making and supplying Complete System i.e. "All Glass Evacuated Solar Water Heating System" as per IS 16544: 2016

A. **Introduction**:

1. Both "All glass evacuated Solar water heating system" as per IS 16544: 2016 and "Direct insertion type Storage Water tank for All glass Evacuated Tubes Solat Collector" as per IS 16542: 2016 have been covered under "the Solar Thermal Systems, Devices and Components (Quality Control) Order, 2024" (QCO) issued by MNRE.

2. As per Cl. 4.3 of IS 16544: 2016 (Standard for the complete product i.e. "All glass evacuated Solar water heating system" in this context), "Direct insertion type Storage Water tank for All glass Evacuated Tubes Solar Collector" shall conform to IS 16542. Accordingly, manufacturers applying for grant of BIS Certification for the complete product as per IS 16544: 2016 are required to submit test report of storage tanks as per IS 16542: 2016. Conformity of storage tanks as per IS 16542: 2016 is to be checked for every such application made for grant of licence on complete product as per IS 16544: 2016

3. Many manufacturers are manufacturing storage tanks in-house and are using solely for the captive consumption for the complete product, while it is also possible that some are manufacturing and selling these tanks to the manufacturers of the complete product also.

B. **REQUIREMENT OF BIS CERTIFICATION**: In view of the above, following guidelines are to be followed for certification:

    1. Manufacturers who are manufacturing storage tanks in-house and are using solely for the captive consumption, are **not** required to obtain a separate BIS licence for "Direct insertion type Storage Water tank for All glass Evacuated Tubes Solar Collector" as per IS 16542**, provided** they have valid BIS licence for the **same variety (i.e. material and Capacity)** of the complete product i.e "All Glass Evacuated Solar water Heating System" as per IS 16544. However, all manufacturers shall ensure that the storage tanks manufactured and used by them conform to IS 16542, and records of production and testing shall be maintained as per the levels of control specified in Annex- C of this manual (Whether as per levels of control specified by BIS or as per manufacturer's own designed levels of control).

    2. However, any licensee manufacturer holding BIS licence for complete product, intends to sell the Storage Tanks outside also, then (s)he shall be required to obtain **separate** BIS Certification for "Direct insertion type Storage Water tank for All glass Evacuated Tubes Solar Collector" **also** as per IS 16542, as per the requirement of the QCO. **However, separate sample of storage tank as per IS 16542 need not be drawn or separate test report of storage tank as per IS 16542 need not be submitted, provided that they have valid BIS licence for the same variety (i.e. material and Capacity) of the complete product.**

    3. Any manufacturer who is manufacturing complete product, but procuring the Tank from outside, shall buy only ISI Marked Tanks, the as per the provisions of the QCO. Records of all such procurement indicating traceability of purchase of ISI Marked material shall be maintained.

C. **OPERATION OF BIS LICENCE**:

    1. Records of Production and Dispatch shall be maintained by all manufacturers and manufacturers shall be responsible to establish the consumption of the Tanks (whether used in-house for captive consumption OR sold outside).

2. All manufacturers (***whether holding a separate licence for IS 16542 or not***) shall ensure that the storage tanks manufactured and used by them conform to IS 16542, and records of production and testing shall be maintained as per the levels of control specified in Annex- C of this manual (Whether as per levels of control specified by BIS or as per manufacturer's own designed levels of control).

3. For manufacturers who have licences for both complete product i.e. "All glass evacuated Solar water heating system" as per IS 16544, as well as for "Direct insertion type Storage Water tank for All glass Evacuated Tubes Solar Collector" as per IS 16542, separate sample of storage tank as per IS 16542 need not be drawn if sample of complete product i..e. "All glass evacuated solar water heating system" is already drawn during the visit during Surveillance inspections,