

भारतीय मानक
Indian Standard

IS 12933 (Part 1) : 2025

सौर सपाट पट्टिका संग्राहक — विशिष्टि

भाग 1 अपेक्षाएँ

(तीसरा पुनरीक्षण)

**Solar Flat Plate Collector —
Specification**

Part 1 Requirements

(Third Revision)

ICS 27.160

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Price Group 5

Renewable Energy Sources Sectional Committee, MED 04

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Renewable Energy Sources Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1990 and subsequently revised in 1992 and 2003. This standard is being revised again to keep pace with the latest technological developments and international practices. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act*, 2016. In this revision all the amendments have been incorporated.

The following major modifications have been incorporated to the revision of the standard:

- a) Scope of the standard has been modified;
- b) Reference standard for terminology has been changed; and
- c) Acceptance criteria has been modified.

This standard has been published in several parts. The other parts in this series are:

- Part 2 Components (*second revision*)
- Part 3 Measuring instruments (*first revision*)
- Part 5 Test methods (*second revision*)

The composition of the Committee, responsible for the revision of this standard is given at [Annex A](#).

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
SOLAR FLAT PLATE COLLECTOR — SPECIFICATION
PART 1 REQUIREMENTS
(Third Revision)

1 SCOPE

1.1 This Indian Standard (Part 1) specifies the requirements of solar flat plate collector for water heating.

1.2 This standard does not apply to the following:

- a) Collector in whom heat transfer fluid may change phase (that is, heat pipe collectors and steam generating collectors);
- b) Concentrating collectors used in a system designed to generate mechanical energy/electricity;
- c) Collectors in which the thermal storage unit is an integral part of the collector so that the collection and the storage processes cannot be separated;
- d) Unglazed flat plate collector;
- e) Installation or mounting of solar collectors; and
- f) Tracking mechanism of the sun following collector system.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based

on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

<i>IS No.</i>	<i>Title</i>
IS 12933	Solar flat plate collector — Specification:
(Part 2) : 2003	Components (<i>second revision</i>)
(Part 5) : 2003	Test methods (<i>second revision</i>)
IS/ISO 9488 : 2022	Solar energy — Vocabulary (<i>first revision</i>)

3 TERMINOLOGY

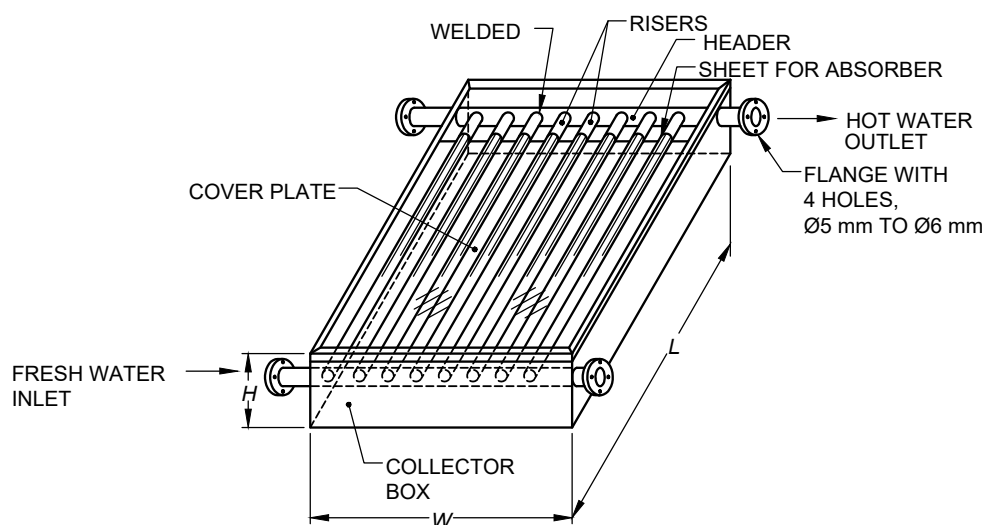
For the purpose of this standard, the terminology and definitions given in IS/ISO 9488 shall apply.

4 COMPONENTS

The components of solar flat plate collector shall be as specified in IS 12933 (Part 2).

5 SHAPE AND DIMENSIONS

Illustrative shape and dimensions of the flat plate collector (sizes a, b, and c) may be as given in [Fig. 1](#). Any other size and shape not mentioned in [Fig. 1](#) may also be used provided other components are made in consonance.



All dimensions in millimetres.

FIG. 1 SOLAR FLAT PLATE COLLECTOR

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IS 12933 (Part 1) : 2025

<i>Sl No.</i>	<i>Size</i>	<i>Length (L)</i>	<i>Breadth (W)</i>	<i>Height (H)</i>
(1)	(2)	(3)	(4)	(5)
i)	a	1 860 ± 10	1 240 ± 10	100 ± 10
ii)	b	2 120 ± 10	1 040 ± 10	100 ± 10
iii)	c	2 050 ± 10	930 ± 10	100 ± 10

All dimensions in millimetres.

FIG. 1 SOLAR FLAT PLATE COLLECTOR

6 ASSEMBLY AND WORKMANSHIP

6.1 The entire assembly shall be free from surface defects. All sharp edges and corners shall be rounded off. The exposed surfaces shall be properly made corrosion resistant.

6.2 The insulation shall be provided in such a way that no slippage occurs when collector is installed at an angle.

6.3 The cover plate shall be fixed with the collector box through gasket which could provide an effective seal against water and dust between the collector box and cover and also to protect the cover plate from damage during its thermal expansion.

6.4 The solar collector shall be so assembled, that replaceable components are accessible for repair or replacement at site in accordance with the manufacturer's instructions.

7 TESTS

Fully assembled unit of solar collector along with the following components is required to carry out full-scale tests contained in this standard.

- One piece of absorber with riser having total minimum area of 400 cm²;
- One piece of grommet;
- One piece of gasket/sealant of about 300 mm length;
- Two numbers of matching flanges/unions;
- Three numbers of flange blanks/plugs for closing the header ends;
- A manufacturer's certificate in respect of R-value of insulation material;
- Information regarding maximum operating temperature and pressure; and
- One piece of each type of collector box material measuring 150 mm × 90 mm *Min.*

7.1 Routine Test

7.1.1 Static Pressure Leakage Test

7.1.1.1 Requirement

Collector shall be hydraulically tested for leakage in accordance with **5.3** of IS 12933 (Part 5).

7.1.1.2 Acceptance criteria

No pressure drop shall occur. There shall not be any appearance of swelling, distortion or ruptures in the risers and headers.

7.2 Type Tests

7.2.1 Outdoor No Flow Exposure Test

7.2.1.1 Requirement

The collector shall be subjected to solar radiation exposure under outdoor conditions with no fluid flow (that is, in stagnation) in accordance with **5.2** of IS 12933 (Part 5).

7.2.1.2 Acceptance criteria

There shall be no:

- appearance of any sign of degradation of rubber material;
- out gassing from the insulation material;
- discolouration or peeling of coating/paint; and
- deposition of water vapour, dust or any other material inside the cover plate when inspected visually.

7.2.2 External Thermal Shock Test

7.2.2.1 Requirement

The collector shall be subjected to external thermal shock in accordance with **5.4** of IS 12933 (Part 5).

IS 12933 (Part 1) : 2025

7.2.2.2 Acceptance criteria

On visual inspection, there shall not be any appearance of:

- a) cracking or distortion of the sealants, grommets, coating/paint and any other component; and
- b) condensation or water penetration inside the solar collector.

7.2.3 Internal Thermal Shock Test

7.2.3.1 Requirement

The collector shall be subjected to internal thermal shock in accordance with 5.5 of IS 12933 (Part 5).

7.2.3.2 Acceptance criteria

On visual inspection, there shall not be any appearance of:

- a) any cracking;
- b) distortion; and
- c) deformation in any part of the collector.

7.2.4 Rain Penetration Test

7.2.4.1 Requirement

The collector shall be subjected to spray of water on all surfaces in accordance with 5.6 of IS 12933 (Part 5).

7.2.4.2 Acceptance criteria

On visual inspection, there shall be no appearance of any ingress of water into the collector.

7.2.5 Impact Resistance Test

7.2.5.1 Requirement

The collector shall be subjected to impacts of steel ball from different test, heights in accordance with 5.7 of IS 12933 (Part 5).

7.2.5.2 Acceptance criteria

There shall be no breakage of glass cover.

7.2.6 Thermal Efficiency Test

7.2.6.1 Requirement

The solar collector shall be subjected to thermal efficiency test in accordance with 6.4 of IS 12933 (Part 5).

7.2.6.2 Acceptance criteria

The collector characteristics shall conform to the following:

- a) $(F_R U_L) \leq 5.5 \text{ W/m}^2 \text{ } ^\circ\text{C}$, this test requirement shall be applicable with effect from 1 January 2007 until then $(F_R U_L) \leq 6.0 \text{ W/m}^2 \text{ } ^\circ\text{C}$ shall continue; and
- b) $F_R(\tau\alpha) \geq 0.68$.

7.2.7 Determination of the Time Constant

The solar collector shall be subjected to thermal tests for determination of effective thermal capacity and time constant in accordance with 6.5 of IS 12933 (Part 5). The value of time constant shall be reported along with the test conditions for the guidance for use in manufacturing/system design/field installation. This requirement shall be applicable with effect from 01 January 2008 as adequate testing facility to carry out this test is not available in the country at present.

7.2.8 Incident Angle Modifier Test

The solar collector shall be subjected to thermal tests for determination incident angle modifier using either of the two methods given in 6.6 of IS 12933 (Part 5). The value of incident angle modifier shall be reported along with graphical presentation. This requirement shall be applicable with effect from 01 January 2008 as adequate testing facility to carry out this test is not available in the country at present.

8 INSTRUCTION MANUAL

The manufacturer shall provide with the collector an instruction manual containing the following minimum information:

- a) Schematic diagram of the solar collector and a domestic hot water system;
- b) Instructions for installation (including mounting details) and use and safety precautions;
- c) Instructions for repair and maintenance including causes for common failures, such as dust ingress on glass cover, peeling of paint, scaling, damaged sealant, gasket and grommets and their remedies; and
- d) List of service outlets.

IS 12933 (Part 1) : 2025

9 MARKING

9.1 Each flat plate collector shall be affixed with a nameplate with the following information.

- a) Manufacturer's name, address and recognized trademark, if any;
- b) Serial number;
- c) Maximum working pressure, in kg/cm²;
- d) Values of $F_R(\tau\alpha)$ and $F_R U_L$ (if these values are better than those given in **7.2.6.2**), the specified values shall also be given in this case;
- e) Absorber material, surface coating (selective/non-selective), weight of the empty collector;

- f) Month and year of manufacture; and
- g) Country of manufacture.

9.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

10 PACKING

Collectors shall be packed as agreed to between the purchaser and the manufacturer.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Renewable Energy Sources Sectional Committee, MED 04

<i>Organization</i>	<i>Representative(s)</i>
Ministry of New and Renewable Energy, New Delhi	DR A. K. TRIPATHI (<i>Chairperson</i>)
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IS 12933 (Part 1) : 2025

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SCIENTIST 'D'/JOINT DIRECTOR
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Amendments Issued Since Publication

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