



SLOVENSKI STANDARD
SIST EN 12975-1:2002
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Thermal solar systems and components - Solar collectors - Part 1: General requirements

Thermische Solaranlagen und ihre Bauteile - Kollektoren - Teil 1: Allgemeine Anforderungen

Installations solaires thermiques et leurs composants - Capteurs solaires - Partie 1: Exigences générales

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EUROPEAN STANDARD

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Thermal solar systems and components - Solar collectors - Part 1: General requirements

Installations solaires thermiques et leurs composants -
Capteurs solaires - Partie 1: Exigences générales

Thermische Solaranlagen und ihre Bauteile - Kollektoren -
Teil 1: Allgemeine Anforderungen

This European Standard was approved by CEN on 4 October 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 312 "Thermal solar systems and components", the secretariat of which is held by ELOT.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2001, and conflicting national standards shall be withdrawn at the latest by April 2001.

The annexes A, B, C and D are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this standard, it is pointed out that:

- a) This standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;
- b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

1 Scope

This European Standard specifies requirements on durability (including mechanical strength), reliability and safety for liquid heating solar collectors. It also includes provisions for evaluation of conformity to these requirements.

It is not applicable to those collectors in which the thermal storage unit is an integral part of the collector to such an extent, that the collection process cannot be separated from the storage process for the purpose of making measurements of these two processes. It is not applicable to tracking concentrating solar collectors.

Collectors that are custom-built (built in, roof integrated collectors that do not comprise factory made modules and are assembled directly on the place of installation) cannot be tested in their actual form for durability, reliability and thermal performance according to this standard. Instead, a module with the same structure as the ready collector is tested. The module gross area in the case of custom built collectors shall be at least 2 m².

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 9488

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SIST EN 12975-1:2002
Solar Energy - Vocabulary (ISO 9488:1999)

prEN 12975-2:2000

Thermal solar systems and components – Solar collectors – Part 2: Test methods

3 Terms and definitions

For the purposes of this standard the terms and definitions given in EN ISO 9488 apply.

4 Symbols and units

For the purposes of this standard the symbols and units given in EN ISO 9488 and prEN 12975-2:2000 apply.

5 Durability and reliability

5.1 Materials and design

Information about the materials and manufacture of solar collectors, including the materials they are manufactured of and their resistance to all influences which they might meet in service, retaining their operational ability are given in Annex B.

5.2 Required tests

The collector shall be subjected to the following series of tests:

- a) Internal pressure for absorber (see 5.2 of prEN 12975-2:2000);
- b) High temperature resistance (see 5.3 of prEN 12975-2:2000);
- c) Exposure (see 5.4 of prEN 12975-2:2000);
- d) External thermal shock. May be combined with the high temperature resistance or exposure test (see 5.5 of prEN 12975-2:2000);
- e) Internal thermal shock. May be combined with the high temperature resistance or exposure test (see 5.6 of prEN 12975-2:2000);
- f) Rain penetration, only for glazed collectors (see 5.7 of prEN 12975-2:2000);
- g) Mechanical load (see 5.9 of prEN 12975-2:2000);
- h) Thermal performance (see clause 6 of prEN 12975-2:2000);
- i) Freeze resistance, only in the cases specified in 5.8 of prEN 12975-2:2000);
- j) Final inspection (see 5.11 of prEN 12975-2:2000).

The optional test for impact resistance (see 5.10 of prEN 12975-2:2000) shall be carried out if requested. The result shall be recorded.

NOTE Some tests are performed twice. The test sequence and more details are given in 5.1 of prEN 12975-2:2000.

5.3 Pass criteria

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5.3.1 General

The pass criteria for the reliability tests are given for each test in 5.3.2 to 5.3.10. The term "no major failure", denotes that none of the following occurs:

- Absorber leakage or such deformation that permanent contact between absorber and cover is established;
- Breaking or permanent deformation of cover or cover fixing;
- Breaking or permanent deformation of collector fixing points or collector box;
- Vacuum loss, such that vacuum or subatmospheric collectors may no more be classified as such, according to the definition in EN ISO 9488 (only applicable for vacuum and subatmospheric collectors);
- Accumulation of humidity inside the collector.

5.3.2 Internal pressure for absorber

The test pressure shall be as specified in 5.2 of prEN 12975-2:2000. In the case of absorbers made of organic materials, climate class A conditions (Table 2 of prEN 12975-2:2000) shall be applied. After the internal pressure test, the collector shall not show any major failure as defined in 5.3.1.

5.3.3 High temperature resistance

When tested in accordance with 5.3 of prEN12975-2:2000, the collector shall not show any major failure as defined in 5.3.1.

5.3.4 Exposure

When tested in accordance with 5.4 of prEN 12975-2:2000, the collector shall not show any major failure according to 5.3.1 and none of the problems constituting major failure shall be graded 2 on the scale given in B.5.5 of prEN 12975-2:2000.

5.3.5 External thermal shock

When tested in accordance with 5.5 of prEN 12975-2:2000, the collector shall not show any major failure as defined in 5.3.1.

5.3.6 Internal thermal shock

When tested in accordance with 5.6 of prEN 12975-2:2000, the collector shall not show any major failure as defined in 5.3.1.

5.3.7 Rain penetration

NOTE This test is applicable only for glazed collectors.

When tested in accordance with 5.7 of prEN 12975-2:2000, the collector shall not show any major failure as defined in 5.3.1.

In addition, a visual check shall not show any water trace. Moreover, at least one of the following shall be fulfilled:

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- a) by weighing the collector the determined water quantity shall be less than 5 gr/m² or
 - b) a measurement of humidity shall give less than 10 % increase in the humidity value or
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 - c) the measured condensation level shall be less than 5 % of the transparent cover.

5.3.8 Mechanical load test

When tested in accordance with 5.9.1 of prEN 12975-2:2000, for a positive pressure of 1000 Pa on the collector cover, and in accordance with 5.9.2 and 5.9.3 of prEN 12975-2:2000, for a negative pressure of 1000 Pa on the fixings between the cover and the collector box as well as on the collector mountings, the collector shall not show any major failure as defined in 5.3.1. Each manufacturer may determine a higher value for the mechanical load test. This value shall then be recorded in the Conformity Report.

NOTE Individual country's safety requirements may prevail.

5.3.9 Thermal performance

Thermal performance shall be reported. The pass criterion is no major failure as defined in 5.3.1.

5.3.10 Freeze resistance test

This test shall be carried out only in the cases specified in 5.8.1 of prEN 12975-2:2000. The pass criterion is no major failure as defined in 5.3.1 after three freeze-thaw cycles.

5.4 Procedure

One collector shall be available for testing. The collector shall be tested in accordance with 5.2. The collector conforms to this standard, only if all pass criteria are fulfilled.

Freeze resistance shall be tested, for collectors which the manufacturer claims can withstand freezing and freeze/thaw cycling and which are not intended to be filled with antifreeze fluids.

6 Safety

The maximum fluid temperature to be considered in the design of a solar collector or solar plant is the collector stagnation temperature. Materials to be used in the manufacture of collectors or installations incorporating the collector (expansion tanks, safety valves, etc.) shall be chosen taking into account this temperature.

The stagnation temperature shall be calculated in accordance with C.3 of prEN 12975-2:2000 (Approach 2) under the following climate parameters:

- Global irradiance on collector plane 1000 W/m²;
- Surrounding air temperature 30 °C.

The collector shall provide for safe installation and mounting. Sharp edges, loose connections and other potentially dangerous features shall be avoided. If the weight of the empty collector exceeds 60 kg, an anchorage for a lifting device shall be included, except for the collectors that are assembled on the roof. Collectors filled with a heat transfer fluid (irritant to human skin or eyes, or toxic) shall carry a warning label. [SIST EN 12975-1:2002](https://standards.iteh.ai/catalog/standards/sist/c6e986a3-9b0f-46f9-b51b-d496bf656ea6/sist-en-12975-1-2002)

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7 Collector identification

7.1 Drawings and data sheet

The collector submitted for test shall be accompanied by a set of drawings describing the collector's dimensions and structure along with a list of materials used in the collector and important physical and optical properties as well as by the solar collector description in D.2 or F.2 of prEN 12975-2:2000. Drawings shall have a number, date of issue and possible revision date. These documents shall be filed by the test institute for at least the period of time, that the collector type is traded by the manufacturer.

NOTE The manufacturer is usually obliged to keep these drawings for at least the period of time, that the warranty of the collector type is valid.

7.2 Labelling

Collectors shall carry a visible and durable label with the following data:

- Name of manufacturer;
- Type;
- Serial number;
- Year of production;
- Gross area of collector;
- Maximum operation pressure;
- Stagnation temperature at 1000 W/m^2 and $30 \text{ }^\circ\text{C}$;
- Volume of heat transfer fluid;
- Weight of empty collector; Made in:.....

NOTE A declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of this standard, is possible. The accuracy of the claim is solely the claimant's responsibility. Such a declaration should not be confused with third-party certification of conformity.

7.3 Installer instruction manual

Solar collectors shall be accompanied by an installer instruction manual, if traded as stand-alone components. When they are part of a complete system, the system installation manual can cover the complete system. In that case no separate manual for the collector shall be required. The instruction manual shall at least contain the following information:

- dimensions and weight of the collector, instructions about the transport and handling of the collector;
- description of the mounting procedure;
- recommendations about lightning protection;
- instructions about the coupling of the collectors to one another and the connection of the collector field to the heat transfer circuit, including dimensions of pipe connections for collector arrays up to 20 m^2 ;
- recommendations about the heat transfer media which may be used (also with respect to corrosion) and precautions to be taken during filling, operation and service;
- the maximum operation pressure, the pressure drop and the maximum and minimum tilt angle;
- maintenance requirements.

If the collector is traded as a component and sold directly to customers, all relevant documentation concerning personal safety, maintenance and handling of the product shall be made available to the customer in the national language of which country is sold.

Annex A (informative) Information on conformity assessment

A.1 Introduction

Products covered by this European standard should be the subject of acceptance criteria related to the manufacturing system, such as type testing, quality assurance, and when so stated in this annex also third party certification. In accordance with CEN policies, such specifications cannot be included in the normative part of the product standard. Advice on elements of such a system is thus given in this informative annex. Compliance with this annex is not a requirement of this European standard.

Attention is drawn to the fact that within the context of the "Construction Product Directive" (89/106/EEC), a mandate may in future be given to CEN related to the products covered in this European standard. Such a mandate will include a decision on a system of attestation of conformity which may not necessarily be identical to the system described hereafter.

A.2 Initial testing

Initial testing should demonstrate conformity to all requirements specified in clause 5.

A.3 Tests to be carried out by the first party (manufacturer) as part of the production control in the factory

The manufacturer should exercise a permanent internal control of production (eg a quality management system based on the relevant part of the EN ISO 9000 series of standards or other). The manufacturer should record the results of production control (manufacturer's record). These records should include at least the following:

- identification of the product under test;
- the dates of sampling;
- the test methods applied;
- the test and inspection result;
- the date of tests;
- the identification of the responsible authority within the manufacturer;
- calibration records.

In case of second or third party surveillance, the records should be available to the second or third party for examination.