



SLOVENSKI STANDARD

SIST EN 12976-1:2022

01-marec-2022

Nadomešča:

SIST EN 12976-1:2017

Toplotni sončni sistemi in sestavni deli - Industrijsko izdelani sistemi - 1. del: Splošne zahteve

Thermal solar systems and components - Factory made systems - Part 1: General requirements

Thermische Solaranlagen und ihre Bauteile - Vorgefertigte Anlagen - Teil 1: Allgemeine Anforderungen

Installations solaires thermiques et leurs composants - Installations préfabriquées en usine - Partie 1 : Exigences générales

[SIST EN 12976-1:2022](https://standards.iteh.ai/catalog/standards/sist/b9d45e24-216e-44bb-87d0-95af66663f96/sist-en-12976-1-2022)

Ta slovenski standard je istoveten z: EN 12976-1:2021

ICS:

27.160

Sončna energija

Solar energy engineering

SIST EN 12976-1:2022

en,fr,de

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

SIST EN 12976-1:2022

<https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022>

EUROPEAN STANDARD

EN 12976-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2021

ICS 27.160

Supersedes EN 12976-1:2017

English Version

Thermal solar systems and components - Factory made systems - Part 1: General requirements

Installations solaires thermiques et leurs composants -
Installations préfabriquées en usine - Partie 1 :
Exigences générales

Thermische Solaranlagen und ihre Bauteile -
Vorgefertigte Anlagen - Teil 1: Allgemeine
Anforderungen

This European Standard was approved by CEN on 14 January 2019.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

[SIST EN 12976-1:2022](https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022)

<https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022>



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	4
Introduction	6
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions	9
4 Requirements	10
4.1 General.....	10
4.1.1 Safety	10
4.1.2 Suitability for drinking water.....	10
4.1.3 Water contamination.....	10
4.1.4 Testing of resistance towards mechanical load	10
4.1.5 Freeze resistance.....	10
4.1.6 Over temperature protection	11
4.1.7 Reverse flow protection.....	12
4.1.8 Pressure resistance	12
4.1.9 Electrical safety.....	12
4.2 Materials.....	12
4.3 Components and pipework	13
4.3.1 Collector	13
4.3.2 Supporting frame	13
4.3.3 Piping.....	13
4.3.4 Heat exchangers	14
4.3.5 Control system	14
4.4 Safety equipment.....	14
4.4.1 Safety valves.....	14
4.4.2 Safety lines and expansion lines.....	14
4.4.3 Blow-off lines.....	14
4.4.4 Expansion vessels	14
4.5 Resistance to external influences.....	15
4.6 Documentation.....	15
4.6.1 General.....	15
4.6.2 Documents for the installer.....	15
4.6.3 Documents for the user.....	18
4.7 Energy labelling.....	20
4.8 System performance	20
Annex A (informative) Conformity assessment	21
Annex B (informative) Material combination with regard to corrosion.....	22
Annex C (normative) System families.....	26
C.1 System family, system subtype.....	26
C.2 Requirements for grouping different system configurations into one system family.....	26
C.3 Testing requirements	30
C.4 Procedure.....	30
C.4.1 General.....	30
C.4.2 Evaluation of the validity of the test result.....	31

C.4.3	Determination of the system parameters.....	32
C.4.4	Calculation of annual performance.....	34
	Bibliography	35

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

[SIST EN 12976-1:2022](https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022)
<https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022>

EN 12976-1:2021 (E)**European foreword**

This document (EN 12976-1:2021) 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 June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12976-1:2017.

The first edition of the EN 12976 series was published in 2000. The standard series provided an important basis for the assessment of the performance as well as the reliability and durability of Factory made solar thermal systems. In the past 15 years or so, several important technological developments and changes of the framework conditions, such as e.g. the aspect of requiring “Energy Labelling”, the EN 12976 series underwent several important changes.

The following modifications are the most important ones that have been implemented in this new edition of EN 12976-1:

- Electrical safety: If the system contains any electrical devices, these shall conform to EN 60335-1 and EN 60335-2 (relevant parts) thus providing the scope due to different sub standards for pumps (EN 60335-2-41 / EN 60335-2-51), heat pumps (EN 60335-2-40, maybe relevant for the future) and maybe other devices in the future.
- safety valves: new requirement that safety valves shall conform with EN 1489;
- resistance to external influences: consideration that the solar components can impact on the performance and durability of essential building elements, e.g. roofs and facades;
- labelling: harmonization with Energy-Related Products Directive (ErP Directive 2009/125/EC);
- Annex C (new): definition of system families; possible range of variations within one system type.

EN 12976, *Thermal solar systems and components — Factory made systems*, is currently composed with the following parts:

- *Part 1: General requirements;*
- *Part 2: Test methods.*

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of

North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

[SIST EN 12976-1:2022](https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022)
<https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022>

Introduction

Drinking water quality:

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

- 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.

Factory Made and Custom Built solar heating systems:

The standards EN 12976-1, EN 12976-2, EN 12977-1, EN 12977-2, EN 12977-3, EN 12977-4 and EN 12977-5 distinguish two categories of solar heating systems: **Factory Made** solar heating systems and **Custom Built** solar heating systems. The classification of a system as Factory Made or Custom Built is a choice of the final supplier, in accordance with the following definitions.

Factory Made solar heating systems are batch products with one trade name, sold as complete and ready to install kits, with fixed configurations. Systems of this category are considered as a single product and assessed as a whole.

If a Factory Made Solar Heating System is modified by changing its configuration or by changing one or more of its components, the modified system is considered as a new system for which a new test report is necessary. Requirements and test methods for Factory Made solar heating systems are given in EN 12976-1 and EN 12976-2.

Custom Built solar heating systems are either uniquely built, or assembled by choosing from an assortment of components. Systems of this category are regarded as a set of components. The components are separately tested and test results are integrated to an assessment of the whole system. Requirements for Custom Built solar heating systems are given in EN 12977-1; test methods are specified in EN 12977-2, EN 12977-3, EN 12977-4 and EN 12977-5. Custom Built solar heating systems are subdivided into two categories:

- **Large Custom Built systems** are uniquely designed for a specific situation. In general HVAC engineers, manufacturers or other experts design them.
- **Small Custom Built systems** offered by a company are described in a so-called assortment file, in which all components and possible system configurations, marketed by the company, are specified. Each possible combination of a system configuration with components from the assortment is considered as **one** Custom Built system.

Table 1 shows the division for different system types:

Table 1 — Division for factory made and custom built solar heating systems

Factory Made Solar Heating Systems (EN 12976-1 and EN 12976-2)	Custom Built Solar Heating Systems (EN 12977-1, EN 12977-2, EN 12977-3, EN 12977-4 and EN 12977-5)
Integrated collector storage systems for domestic hot water preparation	Forced-circulation systems for hot water preparation and/or space heating, assembled using components and configurations described in an assortment file (mostly small systems)
Thermosiphon systems for domestic hot water preparation	
Forced-circulation systems as batch product with fixed configuration for domestic hot water preparation	Uniquely designed and assembled systems for hot water preparation and/or space heating (mostly large systems)

NOTE Forced circulation systems can be classified either as Factory Made or as Custom Built, depending on the market approach chosen by the final supplier.

Both Factory Made and Custom Built systems are performance tested under the same set of reference conditions as specified in EN 12976-2:2019, Annex B, and in EN 12977-2:2012, Annex A. In practice, the installation conditions may differ from these reference conditions.

A Factory Made system for domestic hot water preparation may have an option for space heating, however this option should not be used or considered during testing as a Factory Made system.

(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/b9d45e24-2f6e-44bb-87d0-95af66663f96/sist-en-12976-1-2022>

EN 12976-1:2021 (E)**1 Scope**

This document specifies requirements on durability, reliability and safety for factory made solar heating systems. The document also includes provisions for evaluation of conformity to these requirements (see Annex A). The concept of system families is included as well, in Annex C.

The requirements in this document apply to factory made solar systems as products. The installation of these systems including their integration with roofs or facades is not considered, but requirements are given for the documentation for the installer and the user to be delivered with the system (see also 4.6).

External auxiliary water heating devices that are placed in series with the factory made system are not considered to be part of the system. Cold water piping from the cold water grid to the system as well as piping from the system to an external auxiliary heater or to draw-off points is not considered to be part of the system. Piping between components of the factory made system is considered to be part of the system. Any integrated heat exchanger or piping for space heating option (see Introduction, last paragraph) is not considered to be part of the system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 806-1, *Specifications for installations inside buildings conveying water for human consumption - Part 1: General*

EN 806-2, *Specification for installations inside buildings conveying water for human consumption - Part 2: Design*

EN 809, *Pumps and pump units for liquids - Common safety requirements*

EN 1489, *Building valves - Pressure safety valves - Tests and requirements*

EN 1490, *Building valves - Combined temperature and pressure relief valves - Tests and requirements*

EN 1991-1-1, *Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*

EN 1991-1-3:2003,¹ *Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads*

EN 1991-1-4, *Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions*

EN 1993-1-1, *Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings*

EN 1999-1-1, *Eurocode 9: Design of aluminium structures - Part 1-1: General structural rules*

EN 12897, *Water supply - Specification for indirectly heated unvented (closed) storage water heaters*

EN 12975-1:2006+A1:2010, *Thermal solar systems and components - Solar collectors - Part 1: General requirements*

EN 12976-2:2019, *Thermal solar systems and components - Factory made systems - Part 2: Test methods*

¹ As impacted by EN 1991-1-3:2003/AC:2009 and EN 1991-1-3:2003/A1:2015.

EN 12977-3, *Thermal solar systems and components - Custom built systems - Part 3: Performance test methods for solar water heater stores*

EN 15092, *Building valves - Inline hot water supply tempering valves - Tests and requirements*

EN 16297-1, *Pumps - Rotodynamic pumps - Glandless circulators - Part 1: General requirements and procedures for testing and calculation of energy efficiency index (EEI)*

CEN/TR 16355, *Recommendations for prevention of Legionella growth in installations inside buildings conveying water for human consumption*

EN 16644, *Pumps - Rotodynamic pumps - Glandless circulators having a rated power input not exceeding 200 W for heating installations and domestic hot water installations - Noise test code (vibro-acoustics) for measuring structure- and fluid-borne noise*

EN 60335-1, *Safety of household and similar electrical appliances - Part 1: General requirements (IEC 60335-1)*

EN 60335-2 (all parts), *Household and similar electrical appliances - Safety (IEC 60335-2 series)*

EN ISO 9488:1999, *Solar energy - Vocabulary (ISO 9488:1999)*

EN ISO 9806, *Solar energy - Solar thermal collectors - Test methods (ISO 9806)*

ISO 9459-5, *Solar heating — Domestic water heating systems — Part 5: System performance characterization by means of whole-system tests and computer simulation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9488:1999 and the following apply. <https://standards.iteh.ai/catalog/standards/sist/b9d45e24-286e-441b-8710-95f66663f96/sist-en-12976-1-2022>

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

expansion line

connecting line between the collectors and the pressure expansion vessel in the case of systems with closed expansion vessels; or connecting line between the collector array and the open expansion vessel in the case of systems with open expansion vessels

3.2

safety line

connecting line between the collector array and the safety valve in the case of systems with closed expansion vessels; or connecting line between the collector array and the open expansion vessel in the case of systems with open expansion vessels

3.3

blow-off line

connecting line between the outlet of the safety valve and the environment

EN 12976-1:2021 (E)

3.4 factory-made solar system
packaged solar energy system for the purpose of hot water preparation only, either of the close-coupled or remote-store type, consisting of either one integral component or of a uniform set and configuration of components, produced under conditions which are presumed uniform, and offered for sale under the same trade name

Note 1 to entry Components used for external mounting on or integration with essential building elements, e.g. roofs or facades, will require additional testing to demonstrate the suitability of application.

4 Requirements**4.1 General****4.1.1 Safety**

The system shall fulfil general safety requirements, e.g. care shall be taken to avoid protruding sharp edges on the outside of the system.

4.1.2 Suitability for drinking water

The system shall conform to EN 806-1 and EN 806-2.

NOTE See 4.6.2 c) 7) and 4.6.3 b) 3).

4.1.3 Water contamination

The system shall be designed so as to avoid water contamination or growth of legionella by backflow from all circuits to the drinking main supplies following the guidelines in Technical Report CEN/TR 16355. The Technical Report describes the effect of temperature, the range in which legionella does not proliferate, and heat treatment methods for the purpose of disinfection.

4.1.4 Testing of resistance towards mechanical load

The manufacturer shall define which maximum load the system can withstand. For testing the resistance of not-separable solar thermal systems, EN 12976-2:2019, 5.5 shall be applied.

Test values applied to the cover, the collector box and the fixings between collector box and mounting system should be representative of the maximum loading likely to be experienced in the country where supplied.

4.1.5 Freeze resistance**4.1.5.1 General**

The manufacturer shall state a minimal allowed temperature for the system. The parts of the system that are exposed to the outdoors shall be able to withstand freezing to this specified temperature without any permanent damage.

The manufacturer shall describe the method of freeze protection used for the system.

Any indoor components that are to be installed in places where temperatures can drop below 0 °C, shall be protected against freezing.

The freezing resistance shall be tested in accordance with EN 12976-2:2019, 5.1.