



# SLOVENSKI STANDARD

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### Sprejemniki sončne energije - Splošne zahteve

Solar collectors - General requirements

Kollektoren - Allgemeine Anforderungen

Capteurs solaires - Exigences générales

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English Version

## Solar collectors - General requirements

Capteurs solaires - Exigences générales

Sonnenkollektoren - Allgemeine Anforderungen

This European Standard was approved by CEN on 31 January 2022.

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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.

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

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**EN 12975:2022 (E)****European foreword**

This document (EN 12975:2022) has been prepared by Technical Committee CEN/TC 312 “Thermal solar systems and components”, the secretariat of which is held by NQIS/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of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by December 2023.

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 12975-1:2006+A1:2010.

In comparison with the previous edition, the following technical modifications have been made:

- the references to the underlying testing standard EN ISO 9806 were updated;
- the gross yield concept is introduced;
- the concept for families of similar collectors is introduced.

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.

## 1 Scope

This document is applicable to all types of fluid heating solar collectors. This document specifies performance requirements for fluid heating solar collectors with respect to durability, reliability, safety and thermal performance.

This document deals with the solar collector and not with assemblies. This document is not applicable to those devices in which a thermal storage unit is an integral part to such an extent that the collection process cannot be separated from the storage process for making the collector thermal performance measurements.

## 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 ISO 9488, *Solar energy - Vocabulary (ISO 9488)*

EN ISO 9806:2017, *Solar energy - Solar thermal collectors - Test methods (ISO 9806:2017)*

EN 13501-1:2018, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 13501-5, *Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests*

EN 13823, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

EN ISO 11925-2, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9488, EN ISO 9806 and the following apply.

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

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

### 3.1

#### Gross Thermal Yield

**GTY**( $\vartheta_{op}$ ,  $Loc$ )

thermal energy yield of a collector for the operating temperature  $\vartheta_{op}$  and the ambient conditions  $Loc$

### 3.2

#### Gross Electric Yield

**GEY**( $\vartheta_{op}$ ,  $Loc$ )

electric energy yield of a collector for the operating temperature  $\vartheta_{op}$  and the ambient conditions  $Loc$

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## 3.3

## Gross Solar Yield

GSY( $\vartheta_{op}$ ,  $Loc$ )

total energy yield of a collector for the operating temperature  $\vartheta_{op}$  and the ambient conditions  $Loc$

## 4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

$\Delta T$	Time span for gross yield calculations. The default value for $\Delta T$ is one year. In some applications also monthly values are used, so that $\Delta T = Jan, Feb, \dots$ ;
$\Delta t$	Sampling interval for the calculation, the default value is one hour $\Delta t = 1h$ ;
$\vartheta_{op}$	Fixed operating temperature equal to the mean temperature of the fluid;
$Loc$	Geographical location;
$Loc_{\beta,\gamma}(t_i)$	Set of tabulated ambient conditions $\{G_b(t_i), G_d(t_i), \vartheta_a(t_i), E_L(t_i), u(t_i), \dots\}$ at $Loc$ adapted for the solar collector installed under azimuth $\gamma$ and tilt angle $\beta$ . The default orientation is due south ( $\gamma = 0$ ) with a slope defined by the geographical latitude - 15°, rounded to the nearest 5°. For tracked collectors, the azimuth and tilt angle are variable depending on the type of tracking;
$Coll$	Set of solar collector performance parameters $\{A_G, \eta_{0,b}, a_1, a_2, a_3, a_4, a_6, a_7, a_8, K(\theta_L, \theta_T), K_d\}$ reported according to Annex A of EN ISO 9806:2017;
$P_{max}$	Peak electric power of co-generating collectors under standard testing conditions (STC);
$\delta$	Temperature coefficient $\delta$ for the electric power of co-generating collectors. If $\delta$ is not known, a default value of 0,5 % / K shall be used.

## 5 Requirements

## 5.1 General

Solar collectors shall be tested according to 5.2.

Compliance with this standard is assumed if:

- the solar collectors fulfil the requirements of 5.2 and none of the findings is rated as “major failure” according to Clause 17 of EN ISO 9806:2017;
- the solar collectors are accompanied with the documentation defined in 5.3;
- the performance is reported according to 5.4.

Annex C shall be considered for solar collector families and Annex D for modifications of solar collectors.



## 5.2 Tests

Collectors shall be tested according to Table 1 of EN ISO 9806:2017 except for the pressure drop measurement which is not required. The results shall be reported as required in the corresponding clauses and as defined in Annex A of EN ISO 9806:2017. Results determined under the previous standards EN ISO 9806:2013 and EN 12975-2:2006 can be converted according to Annex A. If Annex A does not provide a conversion key, partial retesting is required.

## 5.3 Documentation

The solar collector shall be accompanied by technical documentation and shall be marked with a product label, both providing at least the information listed in Clause 6. For families of collectors the documentation shall cover all members of the family.

## 5.4 Performance indicators

The gross solar yield  $GSY(\vartheta_{op}, Loc)$  shall be reported at least for the locations Athens, Würzburg, Strasbourg and Davos for operating temperatures of 25 °C, 50 °C and 75 °C following Annex B. For co-generating collectors the gross thermal yield  $GTY(\vartheta_{op}, Loc)$  and the gross electric yield  $GEY(\vartheta_{op}, Loc)$  shall be reported accordingly.

## 5.5 Recommended tests

### 5.5.1 Pressure drop

The measurement of the pressure drop (Clause 27 of EN ISO 9806:2017) is recommended.

### 5.5.2 Fire safety

#### 5.5.2.1 General

Harmful surface temperatures on a solar collector are linked to malfunctions that are rated as major failure according to Clause 17 of EN ISO 9806:2017. The surface temperatures of parts associated with the transmission of heat are excluded. No findings with a rating as "2 - major failure" according to Clause 17 of EN ISO 9806:2017 thus confirms that no harmful temperatures on the surface of the collector are expected.

#### 5.5.2.2 Reaction to fire

If required, solar collectors which are not classified without testing, shall be tested according to EN 13501-1 applying the standards therein as applicable and following Annex E for the selection, preparation, mounting and fixing of the test samples and for the definition of the field of application.

#### 5.5.2.3 External fire performance

If required, solar collectors embedded in the roof shall be tested and classified in accordance with EN 13501-5 applying the standards therein as applicable and following Annex F for the selection, preparation, mounting, fixing of the samples and for the definition of the field of application.

**EN 12975:2022 (E)****6 Documentation and labelling****6.1 Drawings and data sheets**

The solar collector submitted for testing shall be accompanied by:

- a bill of materials;
- a set of fully dimensioned technical drawings which have an identification code, a date of issue, a possible revision date and the date of release;
- all material specifications as defined in A.2 of EN ISO 9806:2017.

**6.2 Labelling**

Solar collectors shall carry a visible and durable label with at least the following information:

- name of manufacturer;
- model;
- serial number;
- year of production (can be included in the serial number);
- peak power (as defined in 24.3 of EN ISO 9806:2017);
- maximum operation pressure;
- weight of the empty solar collector;
- volume of heat transfer fluid.

**6.3 Installation instruction**

Solar collectors shall be accompanied by an installation instruction and/or by a technical datasheet containing at least the following information:

- dimensions of the solar collector;
- weight of the solar collector;
- instructions about the transport and handling of the solar collector;
- standard stagnation temperature of the solar collector;
- description of the mounting procedure;
- recommendations about lightning protection;
- instructions about the coupling of the solar collectors to one another (if applicable) and the connection of the solar collector field to the heat transfer circuit, including dimensions of pipe connections for solar collector arrays, including also a reminder to follow the national requirements for the thermal insulation of the piping;

- instructions about the heat transfer media which shall be used and precautions which shall be taken during filling, operation and service;
- pressure drop;
- maximum and minimum tilt angle;
- maximum operating pressure;
- maximum operating temperature;
- permissible positive and negative mechanical load;
- maintenance requirements, including specific cleaning procedures if required;
- indications about the requirements concerning free airflow on the backside of the collector;
- indication on the impact resistance;
- climate class for testing.

If the collector can be integrated in the roof or in the building shell, the following recommendations shall be included in the instruction manual, to be considered when the collector is integrated in the roof or in the building shell.

- Permanent stagnation over longer periods shall be avoided. The stagnation time between installation and commissioning of the system shall be less than one month.
- Ventilation behind the collector casing shall be sufficient and in accordance with national regulations and building codes.
- No additional isolation shall be added to the rear side of the collector.
- Piping near the collector shall be installed and isolated such that they are not in contact with wood or other inflammable materials.
- Preventive measures shall be taken to avoid that a leaking connection may lead to ingress of heat transfer fluid into the collector.